

PART II

(For Antenna 2 :Vendor: GigaAnt, Model:GA30038-YMSE)

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

of

WLAN a+b+g mini-PCI Module

Model

**CM9
(Brand: Wistron NeWeb)**

Applied by:

Wistron Neweb Corporation
No. 10-1, Li-hsin Road 1,
Science-based Indus
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-04LR018FC

Issue Date: 2004/05/26

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
1.1	Certification of Accuracy of Test Data.....	1
2.	TEST RESULTS (802.11a) (for Dual Band WLAN antenna).....	2
2.1	Maximum Peak Output Power [Section 15.407 (a)(1)(2)(3)].....	2
2.1.1	Test Procedure	2
2.1.2	Test Setup.....	2
2.1.3	Test Data: (Normal Mode).....	2
2.1.4	Test Data: (Turbo Mode).....	2
2.2	Peak Power Spectral Density [Section 15.407(a)(1)(2)(3)]	3
2.2.1	Test Procedure	3
2.2.2	Test Setup.....	3
2.2.3	Test Data: (Normal Mode).....	3
2.2.4	Test Data: (Turbo Mode).....	3
2.3	Peak Power Excursion Measurement [Section 15.407(a)(6)]	4
2.3.1	Test Procedure	4
2.3.2	Test Setup.....	4
2.3.3	Test Data: (Normal Mode).....	4
2.3.4	Test Data: (Turbo Mode).....	4
2.4	Powerline Conducted Emissions [Section 15.207 & 15.407 (b)(5)]	5
2.4.1	EUT Configuration	5
2.4.2	Test Procedure	5
2.4.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	5
2.4.4	Test Data:.....	6
2.5	Radiated Emission Measurement [Section 15.209 & 15.407(b)(5)]	7
2.5.1	EUT Configuration	7
2.5.2	Test Procedure	7
2.5.3	EMI Receiver/Spectrum Analyzer Configuration	7
2.5.4	Test Data (30MHz – 1GHz)	8
2.5.5	Test Data (1GHz – 40 GHz, Transmitting)	9
2.6	Band Edge Measurement (Section 15.407 (b) (1) (2)).....	20
2.6.1	Test Procedure (Conducted).....	20
2.6.2	Test Setup (Conducted)	20
2.6.3	Test Data (conducted):.....	20
2.6.4	Bandedge Measurement Test Procedure (Radiated)	21
2.6.5	Test Setup (Radiated).....	22
2.6.6	Test Data (Radiated):	23
2.7	RF Exposure Measurement [Section 15.407(f)(4) & 1.1307(b)].....	33
2.8	Frequency Stability [Section 15.407(g)]	34
2.8.1	Limits of Frequency Stability Measurement.....	34
2.8.2	Test Procedure	34
2.8.3	Test Setup.....	34
2.8.4	Test Data.....	35

3. TEST RESULTS (802.11b) (for Dual Band WLAN antenna)	36
3.1 Powerline Conducted Emissions [Section 15.207]	36
3.1.1 EUT Configuration	36
3.1.2 Test Procedure	36
3.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	36
3.1.4 Test Data:.....	37
3.2 Bandwidth for DSSS [Section 15.247 (a)(2)].....	38
3.2.1 Test Procedure	38
3.2.2 Test Setup.....	38
3.2.3 Test Data:.....	38
3.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)].....	39
3.3.1 Test Procedure	39
3.3.2 Test Setup.....	39
3.3.3 Test Data.....	39
3.4 Radiated Emission Measurement [Section [15.247(c)(4)]	40
3.4.1 EUT Configuration	40
3.4.2 Test Procedure	40
3.4.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	40
3.4.4 Test Data (30MHz – 1GHz):.....	41
3.4.5 Test Data (1GHz – 25 GHz)	42
3.5 Band Edge Measurement	45
3.5.1 Test Procedure (Conducted).....	45
3.5.2 Test Setup (Conducted).....	45
3.5.3 Test Data:.....	45
3.5.4 Test Procedure (Radiated).....	46
3.5.5 Test Setup (Radiated).....	46
3.5.6 Test Data.....	47
3.6 RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)].....	50
3.7 DSSS Peak Power Spectral Density [Section 15.247(d)]	51
3.7.1 Test Procedure	51
3.7.2 Test Setup.....	51
3.7.3 Test Data.....	51
4. TEST RESULTS (802.11g) (for Dual Band WLAN antenna)	52
4.1 Powerline Conducted Emissions [Section 15.207]	52
4.1.1 EUT Configuration	52
4.1.2 Test Procedure	52
4.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	52
4.1.4 Test Data:.....	53
4.2 Bandwidth for DSSS [Section 15.247 (a)(2)].....	54
4.2.1 Test Procedure	54
4.2.2 Test Setup.....	54
4.2.3 Test Data:.....	54
4.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)].....	55
4.3.1 Test Procedure	55
4.3.2 Test Setup.....	55
4.3.3 Test Data.....	55
4.4 Radiated Emission Measurement [Section [15.247(c)(4)]	56
4.4.1 EUT Configuration	56
4.4.2 Test Procedure	56
4.4.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	56
4.4.4 Test Data (30MHz – 1GHz):.....	57
4.4.5 Test Data (1GHz – 25 GHz)	58

4.5	Band Edge Measurement	61
4.5.1	Test Procedure (Conducted).....	61
4.5.2	Test Setup (Conducted).....	61
4.5.3	Test Data:.....	61
4.5.4	Test Procedure (Radiated).....	62
4.5.5	Test Setup (Radiated).....	62
4.5.6	Test Data.....	63
4.6	RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)].....	66
4.7	DSSS Peak Power Spectral Density [Section 15.247(d)]	67
4.7.1	Test Procedure	67
4.7.2	Test Setup.....	67
4.7.3	Test Data.....	67
4.8	Appendix : Antenna Spec.....	68

1. General

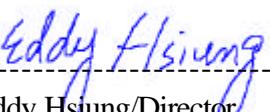
1.1 Certification of Accuracy of Test Data

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:	WLAN a+b+g mini-PCI Module
Model:	CM9
Applied by:	Wistron Neweb Corporation
Sample received Date:	2004/05/10
Final test Date :	2004/05/11-2004/05/20
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 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 4 parts, this part totally 72 pages, including 1 cover page , 3 contents page, and 68 pages for the test description.

This report must not be used 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 (802.11a) (for Dual Band WLAN antenna)

2.1 Maximum Peak Output Power [Section 15.407 (a)(1)(2)(3)]

2.1.1 Test Procedure

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

2.1.2 Test Setup



Frequency Band	Limit
5.15 – 5.25 GHz	The lesser of 50mW (17dBm) or 4dBm+10logB
5.25 – 5.35GHz	The lesser of 250mW (24dBm) or 11dBm+10logB
5.725-5.825GHz	The lesser of 1W (30dBm) or 17dBm+10logB

Note: B is the 26dB emission bandwidth in MHz

2.1.3 Test Data: (Normal Mode)

Please refer to ISL report 04LR018FC part 1.

2.1.4 Test Data: (Turbo Mode)

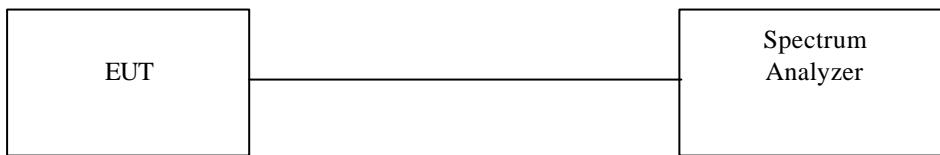
Please refer to ISL report 04LR018FC part 1.

2.2 Peak Power Spectral Density [Section 15.407(a)(1)(2)(3)]

2.2.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN: 30MHz or 50MHz
RBW: 1MHz
VBW: 3MHz
Sweep time: 30 or 50 sec.
Center frequency: fundamental frequency tested
2. Peak search was read to the peak power after maximum hold function is completed.

2.2.2 Test Setup



2.2.3 Test Data: (Normal Mode)

Please refer to ISL report 04LR018FC part 1.

2.2.4 Test Data: (Turbo Mode)

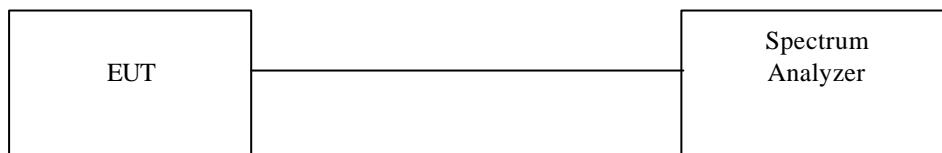
Please refer to ISL report 04LR018FC part 1

2.3 Peak Power Excursion Measurement [Section 15.407(a)(6)]

2.3.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
2. Frequency SPAN of Spectrum: 30MHz or 50MHz.
3. Trace 1 : RBW: 1MHz, VBW: 1MHz. Using peak detector and Max -hold
4. Trace 2 : RBW: 1MHz, VBW:30KHz. Using peak detector and Max-hold
5. Record the largest difference between Trace 1 and Trace 2.

2.3.2 Test Setup



2.3.3 Test Data: (Normal Mode)

Please refer to ISL report 04LR018FC part 1.

2.3.4 Test Data: (Turbo Mode)

Please refer to ISL report 04LR018FC part 1.

2.4 Powerline Conducted Emissions [Section 15.207 & 15.407 (b)(5)]

2.4.1 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 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.

2.4.2 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.

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

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

2.4.4 Test Data:

Please refer to ISL report 04LR018FC part 1.

2.5 Radiated Emission Measurement [Section 15.209 & 15.407(b)(5)]

2.5.1 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.

2.5.2 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 – 40GHz: 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 para. 6.5.3.

For the test of 2nd to 10th harmonics frequencies , the equipment setup was also refer to para.6.5.3. 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.

2.5.3 EMI Receiver/Spectrum Analyzer Configuration

Frequency Range Tested:	30MHz~1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth (RBW):	120KHz
Video Bandwidth (VBW)	1MHz
Frequency Range Tested:	1GHz – 40 GHz
Detector Function:	Peak Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	1MHz
Frequency Range Tested:	30MHz – 40 GHz
Detector Function:	Average Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	10 Hz

2.5.4 Test Data (30MHz – 1GHz) .

30M – 1GHz Open Field Radiated Emissions (Horizontal)

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

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
98.87	22.02	10.07	3.00	0.00	35.09	43.50	-8.41	150.00	126.00
198.78	24.66	8.86	4.18	0.00	37.70	43.50	-5.80	200.00	347.00
232.73	26.62	9.33	4.50	0.00	40.45	46.00	-5.55	200.00	12.00
298.69	22.15	13.57	4.69	0.00	40.42	46.00	-5.58	100.00	175.00
364.65	22.93	14.80	5.07	0.00	42.80	46.00	-3.20	100.00	192.00
398.6	19.59	15.95	5.31	0.00	40.86	46.00	-5.14	100.00	241.00
431.58	19.78	16.25	5.61	0.00	41.64	46.00	-4.36	150.00	175.00
464.56	15.20	16.78	5.87	0.00	37.85	46.00	-8.15	100.00	12.00
564.47	14.34	19.04	6.57	0.00	39.95	46.00	-6.05	100.00	314.00
864.2	6.89	20.54	8.24	0.00	35.67	46.00	-10.33	100.00	126.00

30M – 1GHz Open Field Radiated Emissions (Vertical)

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

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
99.84	17.49	10.27	3.02	0.00	30.78	43.50	-12.72	200.00	107.00
133.79	17.41	11.02	3.52	0.00	31.95	43.50	-11.55	100.00	254.00
364.65	15.44	14.80	5.07	0.00	35.31	46.00	-10.69	150.00	205.00
431.58	12.84	16.25	5.61	0.00	34.70	46.00	-11.30	100.00	205.00
488.81	12.94	17.41	5.99	0.00	36.33	46.00	-9.67	100.00	9.00
497.54	14.58	17.64	6.04	0.00	38.25	46.00	-7.75	100.00	254.00
644.01	8.38	19.08	7.01	0.00	34.47	46.00	-11.53	150.00	254.00
652.74	14.06	19.09	7.05	0.00	40.20	46.00	-5.80	100.00	238.00
661.47	9.34	19.08	7.07	0.00	35.48	46.00	-10.52	200.00	238.00
864.2	5.27	20.54	8.24	0.00	34.06	46.00	-11.94	250.00	9.00

* NOTE:

During the pre-test, the EUT has been tested for Channel 1, 4, 5, 8, 9, 12 of Normal Mode and Channel 1, 2, 3 ,4, 5 of Turbo mode and 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

2.5.5 Test Data (1GHz – 40 GHz, Transmitting).

1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 1 : 5180 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2442.16	46.65	30.91	2.74	46.21	34.09	54.00	-19.91	101	182
2837.76	46.94	31.04	2.82	46.46	34.33	54.00	-19.67	103	306
3093.11	46.35	31.17	2.68	46.59	33.61	54.00	-20.39	103	333
7099.50	45.32	39.26	3.06	46.27	41.38	54.00	-12.62	100	124
8488.81	34.84	41.68	3.37	42.50	37.39	54.00	-16.61	101	140
16443.4	31.91	44.58	6.26	42.08	40.67	54.00	-13.33	10-	238

1GHz~ 40 GHz (Vertical), Normal Mode, Channel 1: 5180 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2391.81	51.13	30.92	2.67	46.21	38.51	54.00	-15.49	101	166
2442.16	48.19	30.91	2.74	46.21	35.63	54.00	-18.37	101	182
2812.59	46.71	31.03	2.82	46.44	34.11	54.00	-19.89	100	298
3449.15	47.90	31.46	2.15	46.64	34.86	54.00	-19.14	103	242
4840.96	52.95	35.00	1.27	46.90	42.31	54.00	-11.69	100	16
14549.0	34.02	44.50	3.92	41.61	40.84	54.00	-13.16	101	23

Note:

“ * ”: Fundamental Frequency

“ pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m, } -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 4: 5240 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2391.81	47.58	30.92	2.67	46.21	34.96	54.00	-19.04	101	166
2769.43	48.20	31.01	2.82	46.41	35.61	54.00	-18.39	102	285
3258.54	46.34	31.31	2.43	46.62	33.47	54.00	-20.53	103	291
7955.44	45.50	40.54	3.06	43.96	45.13	54.00	-8.87	100	248
10970.6	33.23	39.49	3.35	40.53	35.54	54.00	-18.46	102	226
15782.5	33.18	43.70	5.74	41.85	40.77	54.00	-13.23	102	151

1GHz~ 40 GHz (Vertical), Normal Mode, Channel 4: 5240 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2445.75	48.68	30.91	2.74	46.21	36.12	54.00	-17.88	101	183
3100.30	49.28	31.18	2.67	46.59	36.54	54.00	-17.46	103	331
3488.71	48.05	31.49	2.09	46.65	34.98	54.00	-19.02	103	231
4840.96	52.88	35.00	1.27	46.90	42.24	54.00	-11.76	100	16
9110.49	34.68	40.90	3.18	42.76	36.00	54.00	-18.00	103	18
15714.0	33.05	43.48	5.64	42.08	40.09	54.00	-13.91	101	138

Note:

“ * ”: Fundamental Frequency

“ pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m, } -27 \text{ dBm EIRP} = 68.3 \text{ dBuV}$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 5 : 5260 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
1413.59	52.43	26.40	1.78	46.18	34.43	54.00	-19.57	101	83
2388.21	47.05	30.92	2.66	46.21	34.42	54.00	-19.58	101	165
2773.03	47.60	31.01	2.82	46.41	35.02	54.00	-18.98	102	286
7408.79	44.56	39.75	3.26	46.13	41.45	54.00	-12.55	101	169
9869.23	34.16	40.09	3.09	41.48	35.86	54.00	-18.14	101	3
17207.0	28.32	46.62	6.31	42.08	39.17	54.00	-14.83	100	276

1GHz~ 40 GHz (Vertical), Normal Mode, Channel 5 : 5260 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2388.21	49.41	30.92	2.66	46.21	36.78	54.00	-17.22	101	165
2445.75	47.26	30.91	2.74	46.21	34.70	54.00	-19.30	101	183
2611.19	46.26	30.94	2.82	46.29	33.73	54.00	-20.27	102	235
7847.55	45.05	40.39	3.12	44.46	44.09	54.00	-9.91	100	233
10515.4	34.45	39.40	3.32	40.82	36.35	54.00	-17.65	102	120
15772.7	36.43	43.67	5.72	41.88	43.94	54.00	-10.06	102	149

Note:

“*”: Fundamental Frequency

“pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$E = \frac{1000000\sqrt{30P}}{3} \text{ mV / m, } -27 \text{ dBm EIRP} = 68.3 \text{ dBuV}$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 8: 5320 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1467.53	56.08	26.65	1.82	46.21	38.34	54.00	-15.66	101	80
2395.40	47.19	30.92	2.67	46.21	34.57	54.00	-19.43	101	167
2769.43	49.80	31.01	2.82	46.41	37.22	54.00	-16.78	102	285
7840.36	44.47	40.38	3.12	44.50	43.47	54.00	-10.53	100	232
10613.3	33.43	39.42	3.33	40.75	35.43	54.00	-18.57	102	143
14490.2	33.90	44.57	3.86	41.38	40.94	54.00	-13.06	102	26

1GHz~ 40 GHz (Vertical), Normal Mode, Channel 8: 5320 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2129.27	46.94	30.97	2.29	46.20	34.00	54.00	-20.00	100	84
2391.81	50.35	30.92	2.67	46.21	37.73	54.00	-16.27	101	166
2445.75	48.30	30.91	2.74	46.21	35.74	54.00	-18.26	101	183
4837.36	53.05	34.98	1.27	46.90	42.40	54.00	-11.60	100	16
10632.9	34.05	39.43	3.33	40.74	36.06	54.00	-17.94	102	147
15958.7	35.94	44.27	5.99	41.27	44.93	54.00	-9.07	102	185

Note:

“ * ”: Fundamental Frequency

“pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m}, -27\text{dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 9: 5745 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2808.99	45.70	31.02	2.82	46.44	33.10	54.00	-20.90	102	297
2909.69	45.42	31.06	2.82	46.51	32.79	54.00	-21.21	103	329
3826.77	47.34	31.96	2.14	46.30	35.13	54.00	-18.87	102	145
7430.37	44.73	39.79	3.28	46.12	41.68	54.00	-12.32	101	172
11479.7	34.56	40.65	3.35	41.55	37.02	54.00	-16.98	101	162
17936.4	29.97	49.33	5.48	40.62	44.16	54.00	-9.84	102	213

1GHz~ 40 GHz (Vertical), Normal Mode, Channel 9: 5745 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2122.08	59.94	30.98	2.28	46.20	46.99	54.00	-7.01	100	81
2442.16	53.59	30.91	2.74	46.21	41.03	54.00	-12.97	101	182
3183.02	48.30	31.25	2.55	46.61	35.49	54.00	-18.51	103	310
4858.94	54.70	35.06	1.26	46.92	44.11	54.00	-9.89	100	14
11484.6	43.13	40.66	3.35	41.56	45.58	54.00	-8.42	101	161
17221.7	29.36	46.67	6.31	42.09	40.25	54.00	-13.75	100	275

Note:

“ * ”: Fundamental Frequency

“ pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV / m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Normal Mode, Channel 12 : 5805 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1715.68	58.31	28.61	1.96	46.21	42.67	54.00	-11.33	101	63
2388.21	46.67	30.92	2.66	46.21	34.05	54.00	-19.95	101	165
3866.33	46.91	32.01	2.14	46.25	34.82	54.00	-19.18	102	134
7800.80	45.53	40.32	3.15	44.68	44.32	54.00	-9.68	100	226
11602.1	42.82	41.03	3.41	41.82	45.43	54.00	-8.57	101	144
17696.5	27.95	48.33	5.91	41.49	40.69	54.00	-13.31	101	234

1GHz~ 40 GHz (Vertical), Normal Mode, Channel 12 : 5805 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2442.16	48.23	30.91	2.74	46.21	35.67	54.00	-18.33	101	182
3139.86	46.57	31.21	2.61	46.60	33.79	54.00	-20.21	103	321
3866.33	47.83	32.01	2.14	46.25	35.73	54.00	-18.27	102	134
7786.41	45.69	40.30	3.15	44.75	44.39	54.00	-9.61	100	224
11602.1	47.18	41.03	3.41	41.82	49.79	54.00	-4.21	101	144
17980.4	28.56	49.52	5.40	40.46	43.02	54.00	-10.98	102	210

Note:

“*”: Fundamental Frequency

“pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Turbo Mode, Channel 1: 5210 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1715.68	51.95	28.61	1.96	46.21	36.30	54.00	-17.70	101	63
1870.33	49.49	29.91	2.04	46.21	35.24	54.00	-18.76	100	52
2776.62	48.05	31.01	2.82	46.41	35.46	54.00	-18.54	102	287
7175.03	45.29	39.38	3.11	46.23	41.55	54.00	-12.45	101	135
10270.6	33.82	39.58	3.19	40.97	35.63	54.00	-18.37	101	63
15846.2	32.09	43.91	5.83	41.64	40.18	54.00	-13.82	102	163

1GHz~ 40 GHz (Vertical), Turbo Mode, Channel 1: 5210 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2391.81	48.65	30.92	2.67	46.21	36.03	54.00	-17.97	101	166
2442.16	46.34	30.91	2.74	46.21	33.78	54.00	-20.22	101	182
2844.96	46.13	31.04	2.82	46.47	33.53	54.00	-20.47	103	308
7142.66	44.77	39.33	3.09	46.25	40.94	54.00	-13.06	101	130
10686.7	33.55	39.44	3.33	40.71	35.61	54.00	-18.39	102	160
15625.9	34.93	43.20	5.51	42.37	41.27	54.00	-12.73	101	121

Note:

“ * ”: Fundamental Frequency

“ pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV / m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal) , Turbo Mode, Channel 2 : 5250 MHZ

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1708.49	63.86	28.55	1.95	46.21	48.15	54.00	-5.85	101	63
2122.08	47.12	30.98	2.28	46.20	34.17	54.00	-19.83	100	81
2769.43	47.45	31.01	2.82	46.41	34.87	54.00	-19.13	102	285
7099.50	45.10	39.26	3.06	46.27	41.16	54.00	-12.84	101	124
9732.17	34.24	40.39	3.14	41.84	35.93	54.00	-18.07	102	5
14612.6	35.36	44.37	4.01	41.94	41.80	54.00	-12.20	101	20

1GHz~ 40 GHz (Vertical), Turbo Mode, Channel 2: 5250 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2280.32	46.37	30.94	2.51	46.21	33.61	54.00	-20.39	101	131
2388.21	48.97	30.92	2.66	46.21	36.34	54.00	-17.66	101	165
2445.75	47.50	30.91	2.74	46.21	34.94	54.00	-19.06	101	183
7725.27	45.91	40.22	3.19	45.04	44.28	54.00	-9.72	100	215
10774.8	33.38	39.45	3.34	40.65	35.51	54.00	-18.49	102	181
15733.6	38.04	43.55	5.67	42.01	45.24	54.00	-8.76	101	142

Note:

“ * ”: Fundamental Frequency

“ pk ”: peak reading

“ av ”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV / m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Turbo Mode, Channel 3 : 5290 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1794.81	57.02	29.28	2.00	46.21	42.09	54.00	-11.91	100	57
2118.48	50.82	30.98	2.28	46.20	37.87	54.00	-16.13	100	80
2391.81	48.95	30.92	2.67	46.21	36.33	54.00	-17.67	101	166
7790.01	45.06	40.31	3.15	44.73	43.79	54.00	-10.21	100	224
9898.06	41.09	40.02	3.08	41.41	42.79	54.00	-11.21	101	2
14514.7	33.86	44.57	3.87	41.43	40.87	54.00	-13.13	101	25

1GHz~ 40 GHz (Vertical) , Turbo Mode, Channel 3: 5290 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1794.81	58.18	29.28	2.00	46.21	43.25	54.00	-10.75	100	57
2391.81	48.08	30.92	2.67	46.21	35.46	54.00	-18.54	101	166
2445.75	48.09	30.91	2.74	46.21	35.53	54.00	-18.47	101	183
7678.52	46.48	40.15	3.22	45.25	44.60	54.00	-9.40	100	208
10569.2	34.77	39.41	3.32	40.78	36.73	54.00	-17.27	102	133
15865.7	42.27	43.97	5.86	41.58	50.52	54.00	-3.48	102	167

Note:

“ * ”: Fundamental Frequency

“pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal), Turbo Mode, Channel 4 : 5760 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
1226.57	56.18	25.54	1.65	46.10	37.28	54.00	-16.72	102	96
1388.41	57.28	26.29	1.76	46.17	39.16	54.00	-14.84	101	85
2122.08	47.32	30.98	2.28	46.20	34.38	54.00	-19.62	100	81
7998.60	44.54	40.60	3.03	43.76	44.41	54.00	-9.59	100	255
11509.1	35.49	40.73	3.36	41.61	37.97	54.00	-16.03	101	158
17260.8	29.92	46.78	6.30	42.10	40.90	54.00	-13.10	101	272

1GHz~ 40 GHz (Vertical) , Turbo Mode, Channel 4: 5760 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2118.48	60.08	30.98	2.28	46.20	47.13	54.00	-6.87	100	80
2391.81	50.72	30.92	2.67	46.21	38.10	54.00	-15.90	101	166
2445.75	48.88	30.91	2.74	46.21	36.33	54.00	-17.67	101	183
7696.50	44.98	40.18	3.21	45.17	43.20	54.00	-10.80	100	211
11514.0	41.45	40.74	3.36	41.62	43.93	54.00	-10.07	101	157
17486.0	28.98	47.46	6.26	42.19	40.50	54.00	-13.50	101	252

Note:

“ * ”: Fundamental Frequency

“pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV / m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

1GHz~ 40 GHz (Horizontal) , Turbo Mode, Channel 5 : 5800 MHZ

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
1708.49	50.90	28.55	1.95	46.21	35.19	54.00	-18.81	101	63
2122.08	47.55	30.98	2.28	46.20	34.60	54.00	-19.40	100	81
2395.40	47.91	30.92	2.67	46.21	35.30	54.00	-18.70	101	167
7660.54	46.18	40.12	3.23	45.34	44.19	54.00	-9.81	100	205
11592.3	34.47	41.00	3.40	41.80	37.07	54.00	-16.93	101	145
17407.7	29.10	47.22	6.28	42.16	40.44	54.00	-13.56	101	259

1GHz~ 40 GHz (Vertical), Turbo Mode, Channel 5: 5800 MHz

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2449.35	48.48	30.91	2.75	46.21	35.93	54.00	-18.07	101	184
2535.66	51.10	30.91	2.82	46.24	38.60	54.00	-15.40	102	211
2769.43	47.82	31.01	2.82	46.41	35.24	54.00	-18.76	102	285
8027.37	46.27	40.66	3.05	43.68	46.30	54.00	-7.70	100	249
11597.2	38.60	41.01	3.41	41.81	41.21	54.00	-12.79	101	145
17549.7	28.40	47.71	6.17	42.02	40.26	54.00	-13.74	101	247

Note:

“ * ”: Fundamental Frequency

“ pk”: peak reading

“av”: average reading

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.

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m}, -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

All frequencies from 1GHz to 40 GHz have been tested.

2.6 Band Edge Measurement (Section 15.407 (b) (1) (2))

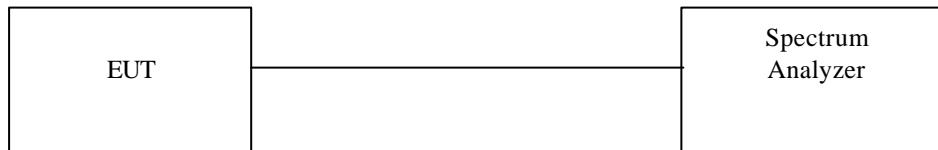
2.6.1 Test Procedure (Conducted)

1. The Transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer

Peak Mode:	
SPAN	100MHz
RBW	1MHz
VBW	1MHz
Sweep Time	200msec.

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.

2.6.2 Test Setup (Conducted)



2.6.3 Test Data (conducted):

Please refer to ISL report 04LR018FC part 1.

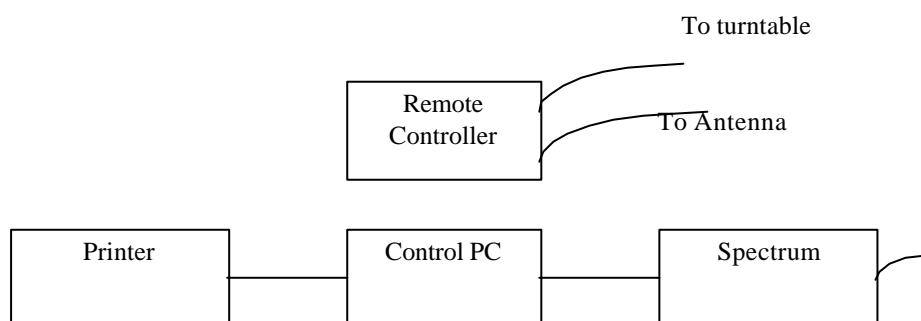
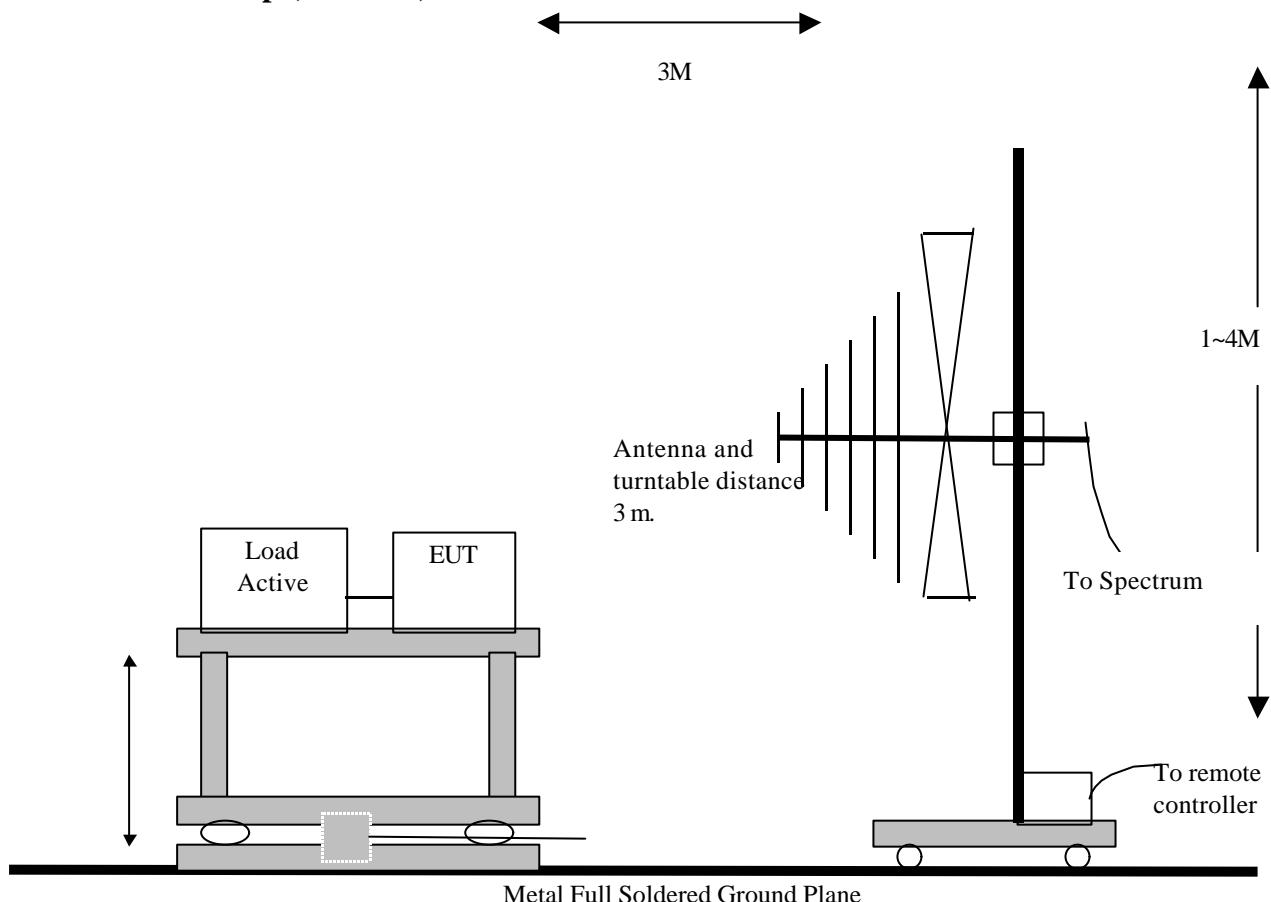
2.6.4 Bandedge Measurement Test Procedure (Radiated)

1. Antenna and Turntable test procedure same as Radiated Emissions measurement listed in Para. 6.5
Equipment mode: Spectrum analyzer

Peak Mode:	
SPAN	100MHz
RBW	1MHz
VBW	1MHz
Sweep Time	200msec.
AVE Mode:	
SPAN	100MHz
RBW	1MHz
VBW	10Hz
Sweep Time	20 sec.

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. Get the spectrum reading after Maximum Hold function is completed.

2.6.5 Test Setup (Radiated)



2.6.6 Test Data (Radiated):

Band Edge measurement (Radiated)

Test Engr:	Mailes Hsieh	Temp. (deg. C):	25			
Outside Channel (Normal)	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Humidity (%):	50
1 (Peak)	5136.1	21.56	38.21	59.77	74	Pass
1 (Average)	5149.3	7.99	38.21	46.2	54	Pass
8 (Peak)	5382.3	21.97	38.21	60.18	74	Pass
8 (Average)	5368.6	8.14	38.21	46.35	54	Pass
9 (Peak)	5711.6	21.74	38.21	59.95	74	Pass
9 (Average)	5715	8.63	38.21	46.84	54	Pass
12 (Peak)	5853.8	22.51	38.21	60.72	74	Pass
12 (Average)	5835.1	8.65	38.21	46.86	54	Pass

Outside Channel (Turbo)	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Pass/Fail
1 (Peak)	5143.5	21.64	38.21	59.85	74	Pass
1 (Average)	5147.5	8.02	38.21	46.23	54	Pass
3 (Peak)	5354.4	21.66	38.21	59.87	74	Pass
3 (Average)	5350.7	8.16	38.21	46.37	54	Pass
4 (Peak)	5703.6	21.91	38.21	60.12	74	Pass
4 (Average)	5715	8.59	38.21	46.8	54	Pass
5 (Peak)	5850.2	22.22	38.21	60.43	74	Pass
5 (Average)	5835.1	9.11	38.21	47.32	54	Pass

Note:

“pk”: peak reading

“av”: average reading

Emission Level=Spectrum Reading+Correction Factor

Correction Factor =Antenna Factor+cable loss

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

The restricted band limit is 54dBuV, the out of band limit is 68.3dBuV. All test data can meet this both limit.

$$(E = \frac{1000000\sqrt{30P}}{3} \text{ mV/m, } -27 \text{ dBm EIRP} = 68.3 \text{ dBuV})$$

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



Normal Mode (Channel 1) Average Data



Normal Mode (Channel 8) Peak data



Normal Mode (Channel 8) Average data



Normal Mode (Channel 9) Peak data



Normal Mode (Channel 9) Average Data



Normal Mode (Channel 12) Peak data



Normal Mode (Channel 12) Average Data



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



Turbo Mode (Channel 1) Average data



Turbo Mode (Channel 3) Peak data



Turbo Mode (Channel 3) Average Data



Turbo Mode (Channel 4) Peak data



Turbo Mode (Channel 4) Average data



Turbo Mode (Channel 5) Peak data



Turbo Mode (Channel 5) Average Data



2.7 RF Exposure Measurement [Section 15.407(f)(4) & 1.1307(b)]

Refer to MPE Test Report

2.8 Frequency Stability [Section 15.407(g)]

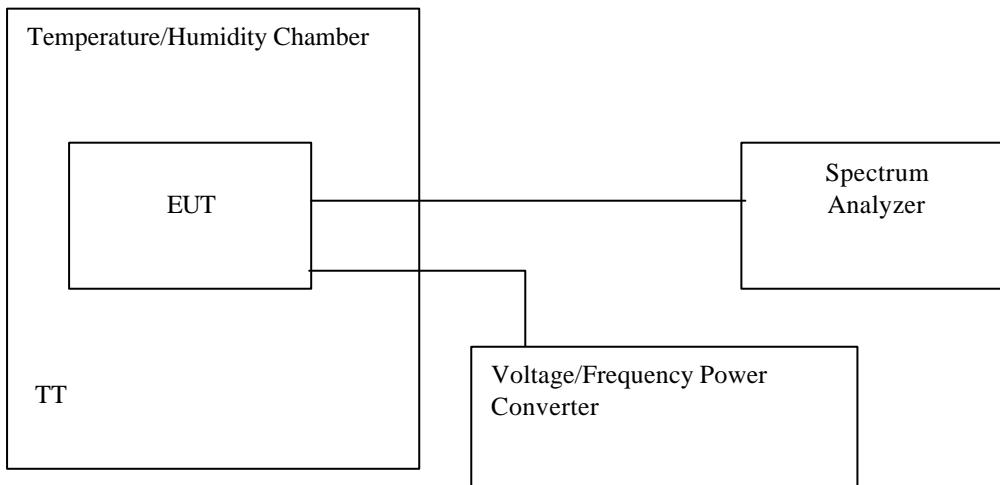
2.8.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier sing shall be maintained within +/- 0.02% of the operating frequency over the operation temperature range of EUT (0°C ~ 35°C), and variation in the primary supply voltage from 85% to 115% of the rated supply voltage (115V AC) at 20°C .

2.8.2 Test Procedure

1. The EUT was placed in the Temperature/Humidity Chamber and powered by a Voltage/Frequency Power converter.
2. Connect the RF output of EUT to Spectrum. Turn on the EUT.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the chamber temperature to stabilize. Turn the EUT on and measure the operating frequency after 2, 5, 10 minutes.
5. Set the Voltage/Frequency Power Converter to 85% and 115% of supply voltage, then repeat step 2, 3, 4 respectively.
6. Repeat step 2 , 3, 4, 5 with the temperature of chamber set to the lowest temperature.
7. Repeat step 2 , 3, 4, 5 with the temperature of chamber set to 20°C .

2.8.3 Test Setup



2.8.4 Test Data

Please refer to ISL report 04LR018FC part 1

3. TEST RESULTS (802.11b) (for Dual Band WLAN antenna)

3.1 Powerline Conducted Emissions [Section 15.207]

3.1.1 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.

3.1.2 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.

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

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

3.1.4 Test Data:

Please refer to ISL report 04LR018FC part 1.

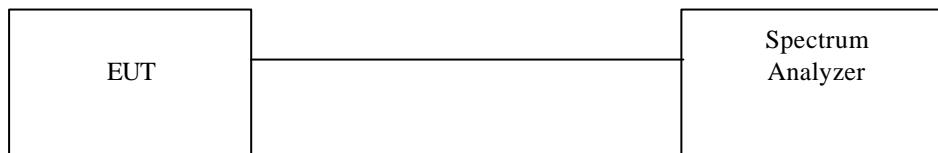
3.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

3.2.1 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

3.2.2 Test Setup



3.2.3 Test Data:

Please refer to ISL report 04LR018FC part 1

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

3.3.1 Test Procedure

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

3.3.2 Test Setup



3.3.3 Test Data

Please refer to ISL report 04LR018FC part 1

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

3.4.1 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.

3.4.2 Test Procedure

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

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

1GHz – 25GHz: The highest emissions were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. During test the EMI receiver and spectrum was setup according to *EMI Receiver/Spectrum Analyzer Configuration*.

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

3.4.3 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

3.4.4 Test Data (30MHz – 1GHz):

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

Operator: Mailes Hsieh

Humidity (%): 46
Temperature (C): 25

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
99.84	22.11	10.27	3.02	0.00	35.39	43.50	-8.11	150.00	11.00
198.78	25.21	8.86	4.18	0.00	38.25	43.50	-5.25	150.00	49.00
232.73	27.08	9.33	4.50	0.00	40.90	46.00	-5.10	200.00	65.00
298.69	21.99	13.57	4.69	0.00	40.26	46.00	-5.74	100.00	241.00
325.85	18.52	13.96	4.76	0.00	37.24	46.00	-8.76	100.00	32.00
364.65	22.62	14.80	5.07	0.00	42.48	46.00	-3.52	200.00	257.00
397.63	19.98	15.92	5.30	0.00	41.20	46.00	-4.80	150.00	273.00
431.58	18.73	16.25	5.61	0.00	40.59	46.00	-5.41	100.00	208.00
464.56	16.59	16.78	5.87	0.00	39.24	46.00	-6.76	100.00	65.00
563.5	13.96	19.05	6.56	0.00	39.57	46.00	-6.43	100.00	158.00

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

Operator: Mailes Hsieh

Humidity (%): 46
Temperature (C): 25

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
139.61	17.62	10.44	3.56	0.00	31.62	43.50	-11.88	100.00	288.00
232.73	20.98	9.33	4.50	0.00	34.81	46.00	-11.19	150.00	222.00
364.65	14.98	14.80	5.07	0.00	34.85	46.00	-11.15	100.00	238.00
431.58	12.94	16.25	5.61	0.00	34.80	46.00	-11.20	150.00	271.00
497.54	14.04	17.64	6.04	0.00	37.71	46.00	-8.29	100.00	353.00
564.47	8.10	19.04	6.57	0.00	33.71	46.00	-12.29	250.00	255.00
644.01	8.85	19.08	7.01	0.00	34.94	46.00	-11.06	200.00	304.00
652.74	13.60	19.09	7.05	0.00	39.74	46.00	-6.26	150.00	304.00
662.44	9.66	19.08	7.07	0.00	35.81	46.00	-10.19	150.00	304.00
863.23	7.37	20.55	8.23	0.00	36.15	46.00	-9.85	150.00	50.00

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

3.4.5 Test Data (1GHz – 25 GHz) .

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

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2341.16	63.32	30.93	2.59	46.21	50.64	54.00	-3.36	101	150
2503.50	62.60	30.90	2.82	46.21	50.11	54.00	-3.89	102	201
3751.75	41.45	31.85	2.12	46.38	29.04	54.00	-24.96	102	164
4821.68	37.35	34.92	1.28	46.88	26.67	54.00	-27.33	100	18
8396.60	34.26	41.47	3.31	42.73	36.30	54.00	-17.70	101	162
9469.53	32.70	40.90	3.22	42.47	34.34	54.00	-19.66	102	11

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

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2126.37	45.84	30.97	2.29	46.20	32.91	54.00	-21.09	100	83
2373.63	58.08	30.93	2.64	46.21	45.44	54.00	-8.56	101	160
2608.39	45.35	30.94	2.82	46.29	32.82	54.00	-21.18	102	234
3793.71	48.48	31.91	2.13	46.33	36.19	54.00	-17.81	102	153
4821.68	42.24	34.92	1.28	46.88	31.56	54.00	-22.44	100	18
7233.77	44.48	39.47	3.15	46.21	40.90	54.00	-13.10	101	143

Note:

“ * ”: Fundamental Frequency

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

“ 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 (%): 46
Temperature (C): 25

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
2353.65	63.12	30.93	2.61	46.21	50.45	54.00	-3.55	101	154
2525.97	62.70	30.91	2.82	46.23	50.20	54.00	-3.80	102	208
4087.41	40.07	32.46	2.04	46.20	28.38	54.00	-25.62	102	91
4870.63	38.30	35.11	1.25	46.93	27.73	54.00	-26.27	100	13
7305.69	37.95	39.59	3.20	46.18	34.55	54.00	-19.45	101	154
8702.30	35.05	41.38	3.30	42.62	37.10	54.00	-16.90	102	90

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2398.60	62.41	30.92	2.68	46.21	49.80	54.00	-4.20	101	168
2775.72	46.66	31.01	2.82	46.41	34.08	54.00	-19.92	102	287
3793.71	47.76	31.91	2.13	46.33	35.46	54.00	-18.54	102	153
4870.63	48.04	35.11	1.25	46.93	37.47	54.00	-16.53	100	13
7305.69	46.72	39.59	3.20	46.18	43.33	54.00	-10.67	101	154
12178.8	32.60	42.09	3.71	42.81	35.59	54.00	-18.41	100	132

Note:

“ * ”: Fundamental Frequency

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

“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 (%): 46
Temperature (C): 25

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
2378.62	62.70	30.92	2.65	46.21	50.06	54.00	-3.94	101	162
2530.97	63.08	30.91	2.82	46.23	50.58	54.00	-3.42	102	210
4923.08	45.42	35.31	1.23	46.97	34.98	54.00	-19.02	100	8
3751.75	40.30	31.85	2.12	46.38	27.89	54.00	-26.11	102	164
7377.62	44.00	39.70	3.24	46.14	40.80	54.00	-13.20	101	164
8744.26	34.77	41.31	3.28	42.66	36.70	54.00	-17.30	102	80

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2298.70	46.05	30.94	2.53	46.21	33.32	54.00	-20.68	101	137
2401.10	52.14	30.92	2.68	46.21	39.53	54.00	-14.47	101	169
2770.73	49.02	31.01	2.82	46.41	36.44	54.00	-17.56	102	285
4923.08	50.98	35.31	1.23	46.97	40.55	54.00	-13.45	100	8
7377.62	48.83	39.70	3.24	46.14	45.63	54.00	-8.37	101	164
12304.7	31.93	41.93	3.76	42.86	34.76	54.00	-19.24	100	165

Note:

“*”: Fundamental Frequency

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

“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.

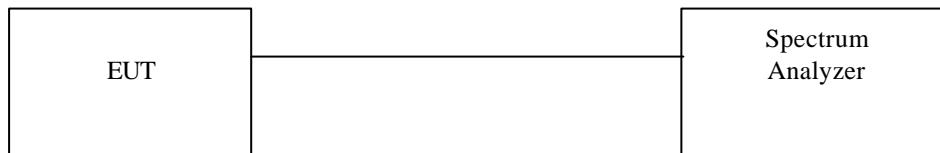
All frequencies from 1GHz to 25 GHz have been tested.

3.5 Band Edge Measurement

3.5.1 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

3.5.2 Test Setup (Conducted)



3.5.3 Test Data:

Please refer to ISL report 04LR018FC part 1

3.5.4 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.

3.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

3.5.6 Test Data

Table Band Edge measurement (Radiated)

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	dBr (Limit: > 20dBr)	Limit (dBuV/m)	Test Engr:	Mailes Hsieh	Temp. (deg. C):	25
									Humidity (%):	50
1(peak mode)	2410.8	68.76	31.1	99.86	---	---			1MHz	---
Outside band	2397.5	46.93	31.1	78.03	21.83	---			1MHz	Pass
1(average mode)	2412.6	60.39	31.1	91.49	---	---			10Hz	---
Restricted band	2390	9.45	31.1	40.55	---	54			10Hz	Pass
11(peak mode)	2460.8	69.19	31.1	100.29	---	---			1MHz	---
Outside band	2477	42.07	31.1	73.17	27.12	---			1MHz	Pass
11(average mode)	2461.3	60.8	31.1	91.9	---	---			10Hz	---
Restricted band	2483.5	9.09	31.1	40.19	---	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)



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

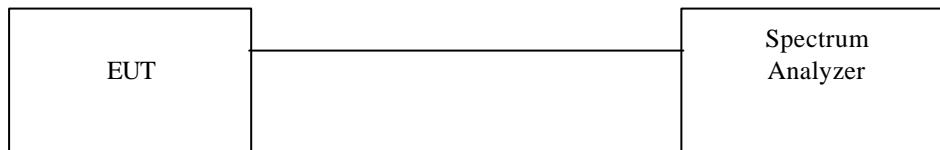
See MPE report

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

3.7.1 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.

3.7.2 Test Setup



3.7.3 Test Data

Please refer to ISL report 04LR018FC part 1.

4. TEST RESULTS (802.11g) (for Dual Band WLAN antenna)

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 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:

Please refer to ISL report 04LR018FC part 1.

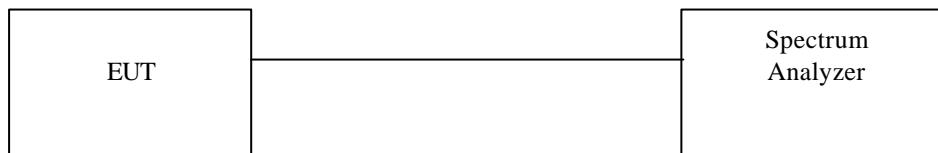
4.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

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:

Please refer to ISL report 04LR018FC part 1.

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

Please refer to ISL report 04LR018FC part 1.

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

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

Humidity (%): 46
Temperature (C): 25

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
99.84	22.23	10.27	3.02	0.00	35.51	43.50	-7.99	150.00	312.00
198.78	25.09	8.86	4.18	0.00	38.13	43.50	-5.37	200.00	312.00
232.73	26.98	9.33	4.50	0.00	40.81	46.00	-5.19	150.00	18.00
298.69	22.35	13.57	4.69	0.00	40.62	46.00	-5.38	150.00	182.00
397.63	19.93	15.92	5.30	0.00	41.15	46.00	-4.85	100.00	165.00
431.58	18.78	16.25	5.61	0.00	40.64	46.00	-5.36	100.00	182.00
464.56	14.52	16.78	5.87	0.00	37.17	46.00	-8.83	250.00	336.00
478.14	18.12	17.13	5.93	0.00	41.18	46.00	-4.82	100.00	336.00
498.51	18.95	17.66	6.04	0.00	42.66	46.00	-3.34	100.00	296.00
564.47	13.62	19.04	6.57	0.00	39.23	46.00	-6.77	100.00	312.00

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

Operator: Mailes Hsieh

Humidity (%): 46
Temperature (C): 25

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
99.84	18.43	10.27	3.02	0.00	31.71	43.50	-11.79	200.00	91.00
137.67	18.02	10.63	3.55	0.00	32.20	43.50	-11.30	100.00	238.00
232.73	20.99	9.33	4.50	0.00	34.82	46.00	-11.18	100.00	157.00
364.65	14.98	14.80	5.07	0.00	34.84	46.00	-11.16	200.00	190.00
498.51	13.66	17.66	6.04	0.00	37.36	46.00	-8.64	200.00	272.00
643.04	8.22	19.07	7.00	0.00	34.29	46.00	-11.71	100.00	222.00
652.74	14.69	19.09	7.05	0.00	40.83	46.00	-5.17	100.00	238.00
660.5	10.61	19.08	7.07	0.00	36.75	46.00	-9.25	100.00	238.00
733.25	7.66	19.73	7.54	0.00	34.93	46.00	-11.07	150.00	272.00
864.2	5.59	20.54	8.24	0.00	34.38	46.00	-11.62	100.00	9.00

NOTE:

During the Pre-test, the EUThas 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 (%): 46

Temperature (C): 25

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
2311.19	55.49	30.94	2.55	46.21	42.78	54.00	-11.22	101	141
2316.18	58.41	30.94	2.56	46.21	45.70	54.00	-8.30	101	142
2515.98	54.19	30.91	2.82	46.22	41.69	54.00	-12.31	102	205
4073.43	41.27	32.42	2.06	46.18	29.57	54.00	-24.43	102	93
5381.12	35.48	35.90	1.13	47.29	25.23	54.00	-28.77	100	109
8816.18	34.09	41.19	3.25	42.71	35.82	54.00	-18.18	102	63

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

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
1796.70	60.30	29.29	2.00	46.21	45.38	54.00	-8.62	100	57
1961.54	46.70	30.68	2.09	46.20	33.26	54.00	-20.74	100	46
2228.77	46.28	30.95	2.43	46.20	33.47	54.00	-20.53	101	115
4821.68	37.75	34.92	1.28	46.88	27.06	54.00	-26.94	100	18
7233.77	37.87	39.47	3.15	46.21	34.28	54.00	-19.72	101	143
9679.32	32.35	40.51	3.16	41.98	34.03	54.00	-19.97	102	6

Note:

“ * ”: Fundamental Frequency

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

“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 (%): 46

Temperature (C): 25

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
2323.68	52.36	30.94	2.57	46.21	39.66	54.00	-14.34	101	145
2346.15	58.75	30.93	2.60	46.21	46.08	54.00	-7.92	101	152
2685.81	53.27	30.97	2.82	46.35	40.72	54.00	-13.28	102	258
4877.62	34.66	35.13	1.25	46.93	24.12	54.00	-29.88	100	12
7863.14	36.14	40.41	3.11	44.39	35.27	54.00	-18.73	100	235
9571.43	32.36	40.74	3.19	42.26	34.03	54.00	-19.97	102	9

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

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

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
2203.80	45.86	30.96	2.40	46.20	33.01	54.00	-20.99	101	107
2505.99	45.84	30.90	2.82	46.21	33.34	54.00	-20.66	102	202
2773.23	48.98	31.01	2.82	46.41	36.40	54.00	-17.60	102	286
3790.21	47.95	31.91	2.13	46.34	35.64	54.00	-18.36	102	154
4881.12	42.47	35.15	1.25	46.94	31.93	54.00	-22.07	100	12
7317.68	42.02	39.61	3.20	46.17	38.66	54.00	-15.34	101	155

Note:

“ * ”: Fundamental Frequency

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

“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 (%): 46
Temperature (C): 25

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
2328.67	50.92	30.93	2.58	46.21	38.23	54.00	-15.77	101	146
2343.66	51.88	30.93	2.60	46.21	39.21	54.00	-14.79	101	151
2356.14	58.82	30.93	2.62	46.21	46.16	54.00	-7.84	101	155
4926.57	37.48	35.32	1.23	46.98	27.06	54.00	-26.94	100	7
6996.50	31.66	39.08	2.99	46.31	27.43	54.00	-26.57	101	110
8828.17	36.05	41.17	3.24	42.72	37.74	54.00	-16.26	102	60

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 46
Temperature (C): 25

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
2396.10	49.71	30.92	2.67	46.21	37.10	54.00	-16.90	101	167
2403.60	48.78	30.92	2.68	46.21	36.18	54.00	-17.82	101	170
2593.41	45.58	30.94	2.82	46.28	33.06	54.00	-20.94	102	229
3751.75	50.88	31.85	2.12	46.38	38.48	54.00	-15.52	102	164
4923.08	43.31	35.31	1.23	46.97	32.87	54.00	-21.13	100	8
7383.62	42.02	39.71	3.25	46.14	38.84	54.00	-15.16	101	165

Note:

“ * ”: Fundamental Frequency

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

“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.

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:

Please refer to ISL report 04LR018FC part 1

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)

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	dBr (Limit: > 20dBr)	Mailes Hsieh	Temp. (deg. C):	25
							Humidity (%):	50
1(peak mode)	2407	61.73	31.1	92.83	---	---	1MHz	---
Outside band	2400	41.13	31.1	72.23	20.6	---	1MHz	Pass
1(average mode)	2405.1	51.82	31.1	82.92	---	---	10Hz	---
Restricted band	2390	8.66	31.1	39.76	---	54	10Hz	Pass
11(peak mode)	2455.6	62.49	31.1	93.59	---	---	1MHz	---
Outside band	2476.2	34.8	31.1	65.9	27.69	---	1MHz	Pass
11(average mode)	2455.6	52.31	31.1	83.41	---	---	10Hz	---
Restricted band	2483.5	8.11	31.1	39.21	---	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

Please refer to ISL report 04LR018FC part 1

4.8 Appendix : Antenna Spec.

Please refer to the attached file.