NVLAP LAB CODE 200707-0

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Tobii Technology AB

Karlsrovägen 2D, 18253 Danderyd, Sweden

FCC ID: W5MTOBIIC15

Report Type:	Product Type:
Original Report	TOBII C15

Test Engineer:	Tim Zhang
Report Number:	RSZ10062501-WiFi
Report Date:	2010-08-23
Reviewed By:	Merry Zhao EMC Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Tobii Technology AB's* product, model number: *T-C15-R1.0A-V0 (FCC ID: W5MTOBIIC15)* or the "EUT" as referred to in this report is a *TOBII C15,* which measures approximately: 37 cm (L) x 30 cm (W) x 4 cm (H), rated input voltage: DC 24 V adapter or DC 14.8 V battery.

Adapter information: AC Power Adapter
Manufacturer: Powerbox
Model: EXM 80 5121;
Input: 100-240VAC, 1.7A, 50-60 Hz;
Output: 24VDC, 2.9A

All measurement and test data in this report was gathered from production sample serial number: 1006060 (Assigned by BACL, Shenzhen). The EUT was received on 2010-06-25.

Objective

This Type approval report is prepared on behalf of *Tobii Technology AB in* accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 22H and 24E, FCC Part 15.247(BT) and FCC Part 15B submission with FCC ID: W5MTOBIIC15.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 21, 2007. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).

NVLAP LAB CODE 200707-0

The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2007070.htm

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b and 802.11g mode, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

EUT was tested with CH 1, 6, 11 for 802.11b,g and n20, CH1, 6, 9 for 802.11n40.

The worst-case data rates are determined to be as follows for each mode based upon inverstigation by measuring the average power and PSD across all date rates bandwidths, and modulations.

EUT Exercise Software

The test was performed under:
802.11b: TX Power level 0D, data rate: 1Mbps.
802.11g: TX Power level 0F, data rate: 6 Mbps.
802.11n (20): TX Power level 0F, data rate: 7.2 Mbps.
802.11n (40): TX Power level 0F, data rate: 15 Mbps.

Equipment Modifications

No modification was made to the unit tested.

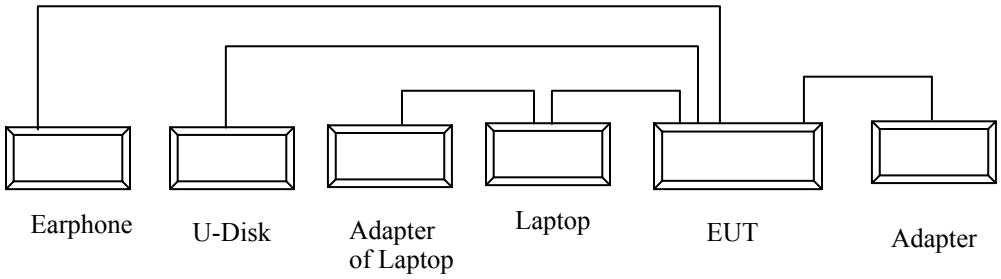
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
PHILIPS	Earphone	SBCHP250	N/A	DOC
DELL	Keyboard	L100	CNORH656658907BL04TY	DOC
N/A	U-Disk	N/A	N/A	N/A
Compaq	Laptop	PP2040	N/A	N/A

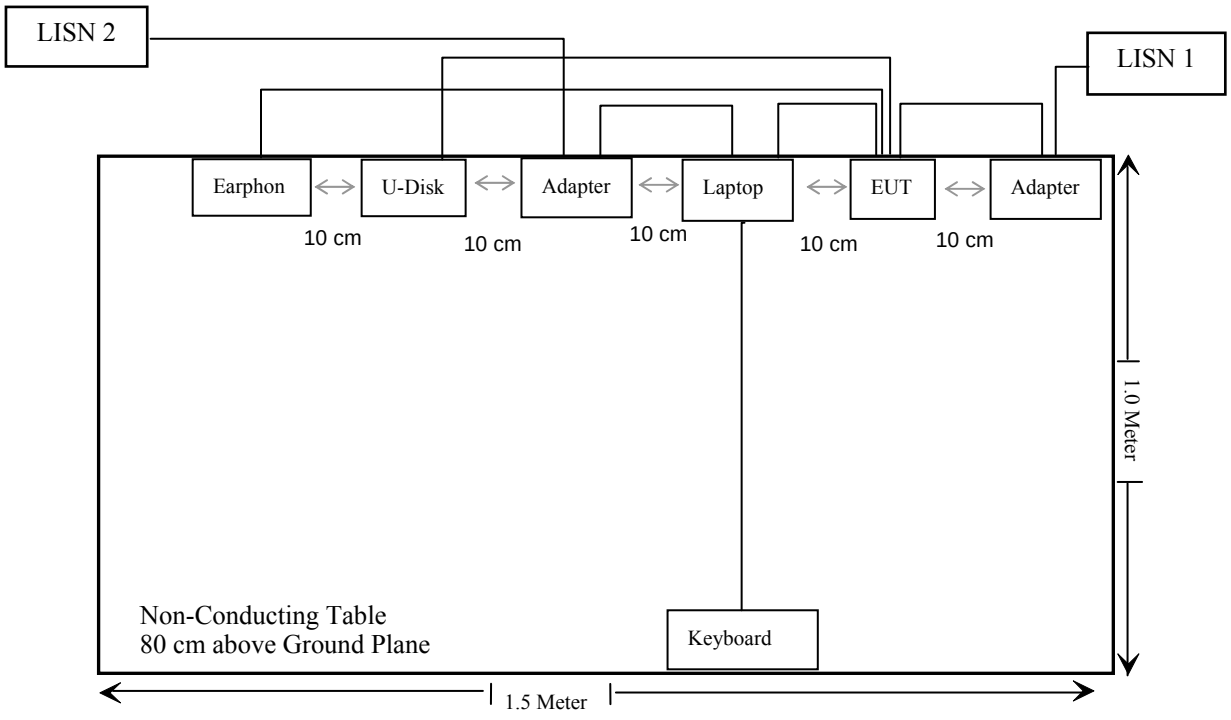
External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable RJ45 Cable	1.5	Laptop	EUT

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247 (d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247 (d)	Radiated Spurious Emissions	Compliance
§15.247 (a) (2)	6 dB Bandwidth	Compliance*
§15.247 (b) (3), (b) (4), (c)	Maximum Peak Output Power	Compliance*
§15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Compliance*
§15.247 (e)	Power Spectral Density	Compliance*

Note: *Please refer to FCC ID: RUJ-LR802UKN granted on 2008-07-08, report number: RF970425L14, which was issued by Advance Data Technology Corporation issued on 2008-06-30.

FCC §15.247 (i) & §2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 Mobile Portable RF Exposure v03r03, no SAR required if power is lower than the flowing threshold:

When routine evaluation is required for SAR and the output power is ≤ 60/f(GHz) mW, the test reduction and test exclusion procedures given herein, or in KDB 616217 or KDB 648474, are applicable.

When the output power of a simultaneous transmitting antenna is ⩽ 60/f(GHz) mW and it is either ⩾ 5 cm from all other simultaneous transmitting antennas or it is deployed on the display screen at ⩾ 5 cm from users and nearby persons, the contributions of such antennas to the overall exposure potential of the laptop computer is generally small. SAR evaluation for these types of simultaneous transmission configurations is unnecessary. For simultaneous transmitting antennas with outputs > 60/f, the separation distances between these antennas are used to assess the overall exposure potential. The number and types of tests required for each simultaneous transmitting antenna to show compliance are based on the defined antenna configurations.

Measurement Result:

Conducted P_{Max} = 11.12 dBm, Antenna Gain = -0.7 dBi, Maximum Output Power is 10.42 dBm (i.e. 11 mw)

SAR exempted threshold: $60/f_{GHz} = 60/2.462 = 24.37$ mW

$P_{Max} < 60/f_{GHz}$

The distance among the BT, WiFi and GSM antenna are more than 5 cm.

SAR evaluation can be exempted due to the maximum output power is less than the threshold.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The last original grant was performanced with a dipole antenna, and this report was performanced with a integral PIFA antenna, which distance among the BT, WiFi and GSM are more than 5 cm, it's gain is -0.7 dBi, which in accordance to section 15.203, please refer to the internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

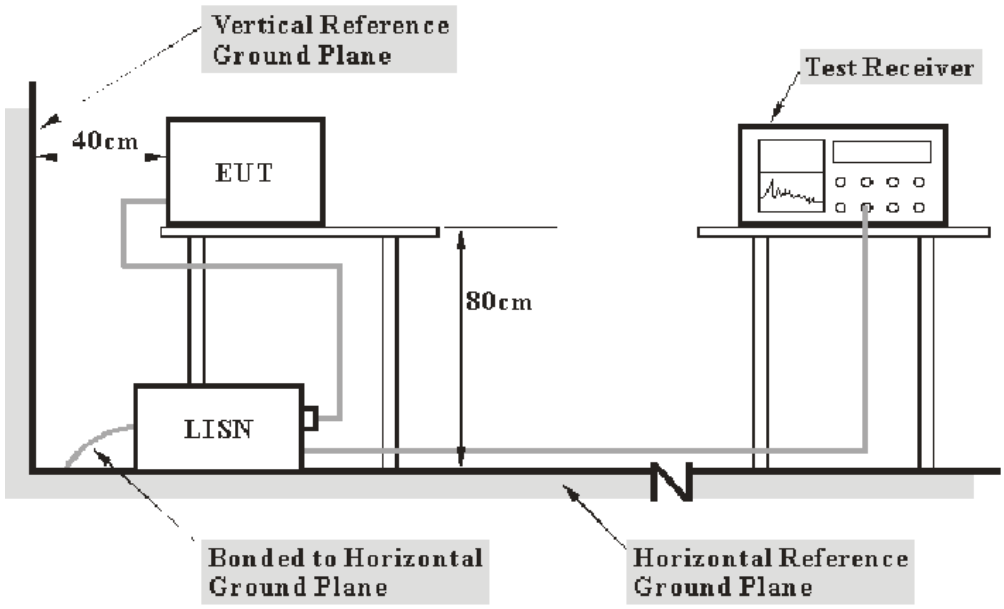
FCC §15.207

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is ±2.4 dB.

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	***IF B/W***
150 kHz – 30 MHz	9 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2010-03-03	2011-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2010-03-09	2011-03-08

*** Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

3.67 dB at **0.480 MHz** in the **Neutral** conductor mode

Test Data

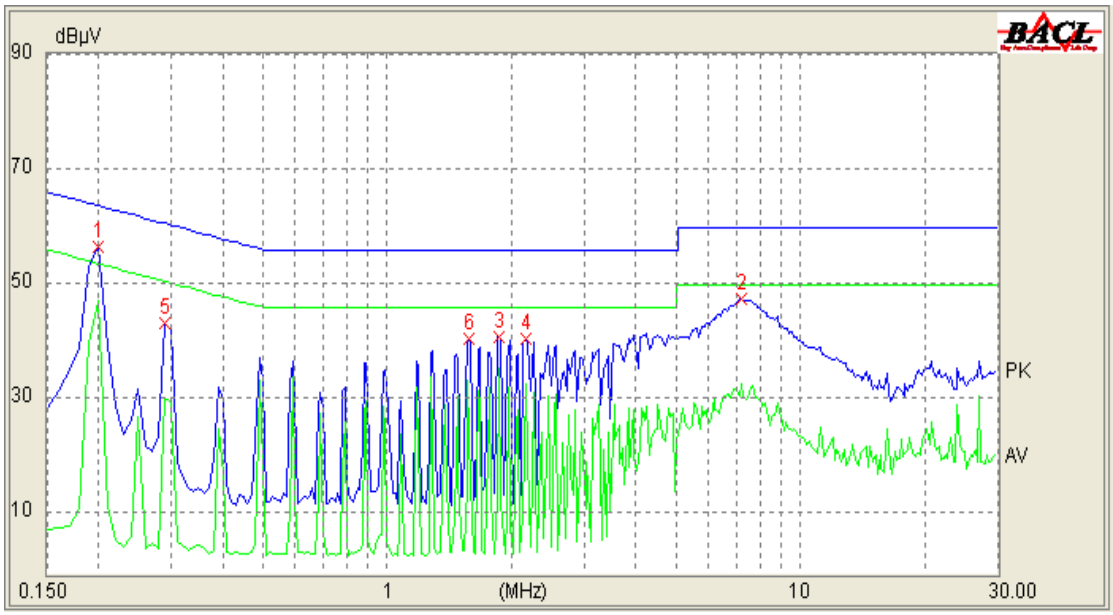
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	101 kPa

The testing was performed by Tim Zhang on 2010-08-08.

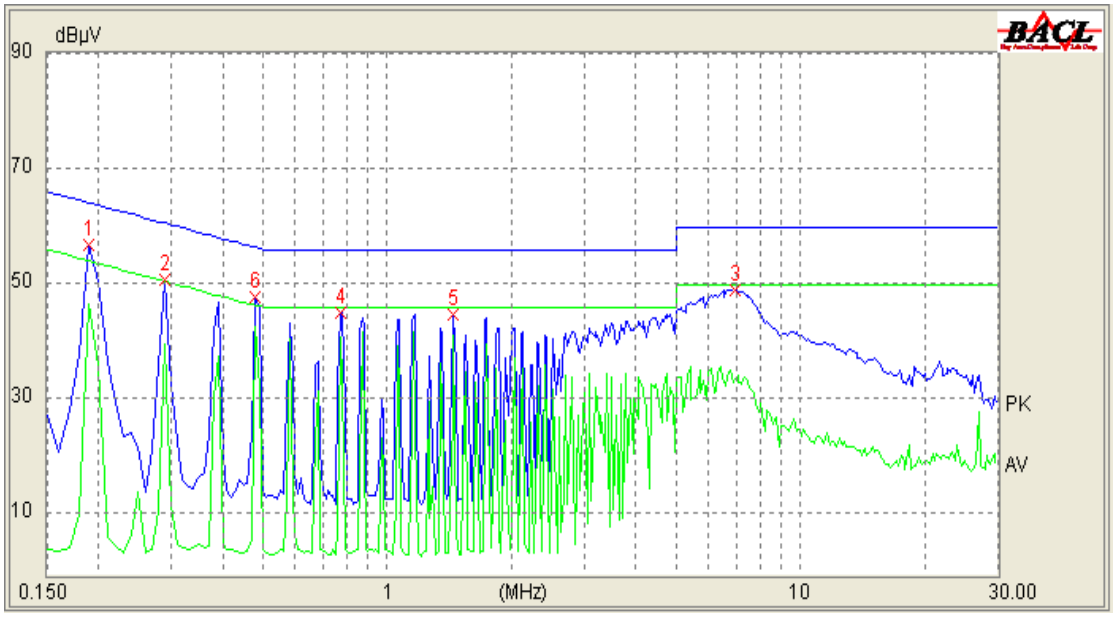
Test Mode: Transmitting

AC 120 V/60 Hz, Line



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	**Correction Factor (dB)**	**Cord. Result (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Detector (PK/QP/Ave)**
0.200	10.10	47.26	53.69	6.43	Ave
0.200	10.10	53.23	63.69	10.46	QP
1.870	10.10	35.52	46.00	10.48	Ave
1.570	10.10	33.33	46.00	12.67	Ave
2.160	10.10	32.79	46.00	13.21	Ave
7.180	10.20	44.36	60.00	15.64	QP
1.870	10.10	40.00	56.00	16.00	QP
2.160	10.10	39.19	56.00	16.81	QP
7.180	10.20	32.88	50.00	17.12	Ave
1.580	10.10	38.78	56.00	17.22	QP
0.290	10.10	30.51	50.61	20.10	Ave
0.290	10.10	38.11	60.61	22.50	QP

AC 120 V/ 60 Hz, Neutral:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Correction Factor (dB)	Cord. Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector (PK/QP/Ave)
0.480	10.10	42.76	46.43	3.67	Ave
1.450	10.10	41.37	46.00	4.63	Ave
0.770	10.10	40.92	46.00	5.08	Ave
0.190	10.10	46.63	54.13	7.50	Ave
0.290	10.10	39.61	50.61	11.00	Ave
6.970	10.20	33.70	50.00	16.30	Ave
6.960	10.20	42.75	60.00	17.25	QP
0.290	10.10	40.91	60.61	19.70	QP
0.190	10.10	42.42	64.13	21.71	QP
0.480	10.10	28.45	56.43	27.98	QP
0.770	10.10	16.88	56.00	39.12	QP
1.450	10.10	10.73	56.00	45.27	QP

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS RADIATED EMISSIONS

Applicable Standard

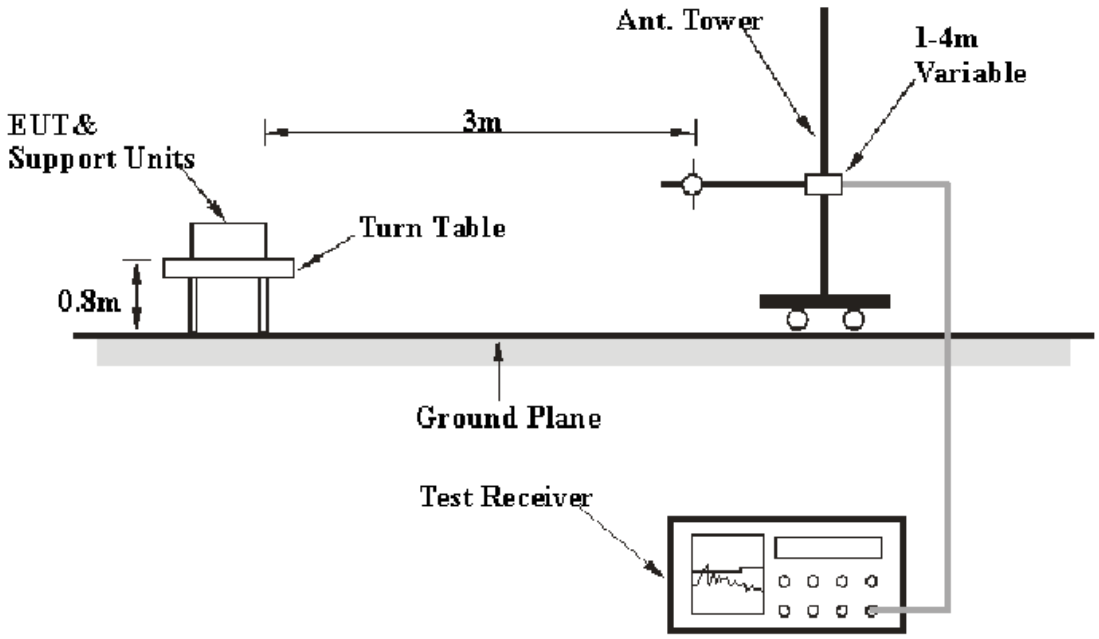
FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is ±4.0 dB.

EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter of the laptop was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	***RBW***	***Video B/W***	***Detector***
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	AV

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
HP	Amplifier	2VA-213+	T-E27H	2010-03-08	2011-03-08
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-08

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

For the radiated emissions test, the adapter of laptop was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, and section 15.205, 15.209 and 15.247, with the worst margin reading of:

30 -1000 MHz:

6.5 dB at **30.859250 MHz** in the **Horizontal** polarization

Above 1 GHz:

802.11b (Low Channel): **3.96 dB** at **4824 MHz** in the **Horizontal** polarization

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	101 kPa

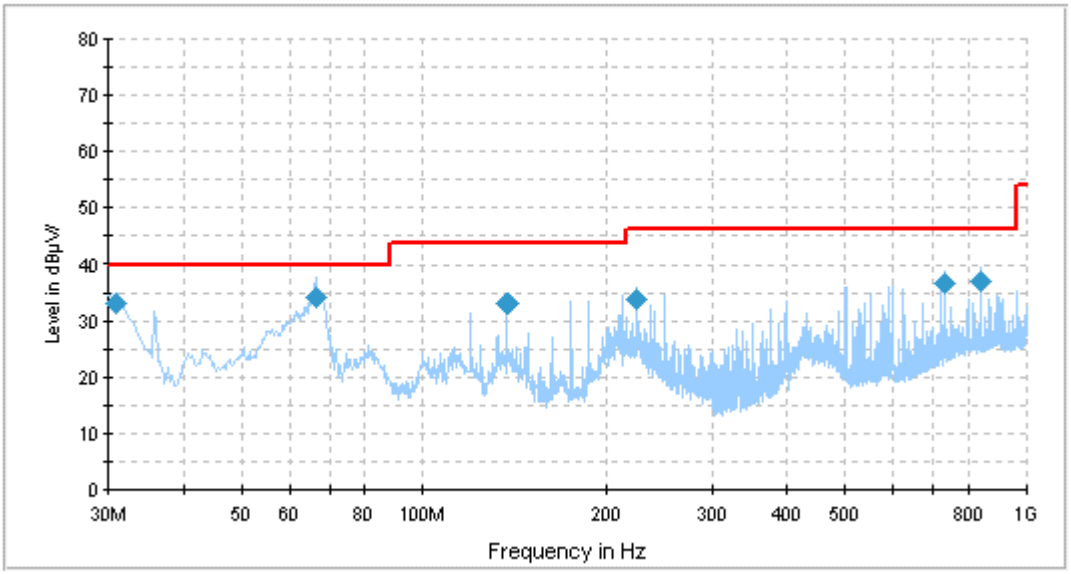
The testing was performed by Tim Zhang on 2010-08-22.

Antenna Port Conducted Spurious Emissions

Please refer to FCC ID: RUJ-LR802UKN granted on 2008-07-08, report number: RF970425L14.

Test mode: Transmitting

Below 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Position (degree)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)				
30.859250	33.5	237.0	H	96.0	-19.4	40.0	6.5
66.429250	33.2	305.0	V	173.0	-17.6	40.0	6.8
840.292000	37.0	100.0	H	340.0	-1.4	46.0	9.0
728.992500	36.2	105.0	V	128.0	-3.7	46.0	9.8
137.505750	33.2	167.0	H	168.0	-14.3	43.5	10.3
224.970750	34.0	117.0	H	316.0	-11.0	46.0	12.0

Above 1 GHz:

802.11b Mode:

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Part 15.247/15.209	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)											
4824	36.51	Ave	215	1.2	H	36.0	4.30	26.77	50.04	54	3.96*
4824	35.82	Ave	220	1.1	V	34.6	4.30	26.77	47.95	54	6.05
2492	36.29	Ave	152	1.0	H	30.6	3.11	26.85	43.15	54	10.85
2492	34.99	Ave	150	1.0	V	30.6	3.11	26.85	41.85	54	12.15
1408	39.17	Ave	175	1.3	V	25.8	2.20	26.51	40.66	54	13.34
4824	44.33	PK	215	1.2	H	36.0	4.30	26.77	57.86	74	16.14
1408	33.95	Ave	180	1.3	H	26.7	2.20	26.51	36.34	54	17.66
4824	43.78	PK	220	1.1	V	34.6	4.30	26.77	55.91	74	18.09
2492	46.67	PK	150	1.0	V	30.6	3.11	26.85	53.53	74	20.47
2492	45.04	PK	152	1.0	H	30.6	3.11	26.85	51.90	74	22.10
1408	47.70	PK	175	1.3	V	25.8	2.20	26.51	49.19	74	24.81
1408	44.51	PK	180	1.3	H	26.7	2.20	26.51	46.90	74	27.10
Middle Channel (2437 MHz)											
4874	36.19	Ave	219	1.3	H	36.1	4.35	26.76	49.88	54	4.12
4874	36.82	Ave	170	1.7	V	34.6	4.35	26.76	49.01	54	4.99
2516	41.20	Ave	140	1.5	V	30.6	3.26	26.83	48.23	54	5.77
1408	43.20	Ave	75	1.0	V	25.8	2.20	26.51	44.69	54	9.31
2516	34.10	Ave	310	1.0	H	30.7	3.26	26.83	41.23	54	12.77
4874	46.51	PK	219	1.3	H	36.1	4.35	26.76	60.20	74	13.80
4874	44.97	PK	170	1.7	V	34.6	4.35	26.76	57.16	74	16.84
1408	34.55	Ave	160	1.6	H	26.7	2.20	26.51	36.94	54	17.06
2516	45.59	PK	310	1.0	H	30.7	3.26	26.83	52.72	74	21.28
2516	45.12	PK	140	1.5	V	30.6	3.26	26.83	52.15	74	21.85
1408	50.41	PK	75	1.0	V	25.8	2.20	26.51	51.90	74	22.10
1408	48.23	PK	160	1.6	H	26.7	2.20	26.51	50.62	74	23.38
High Channel (2462 MHz)											
4924	35.02	Ave	160	1.4	H	36.4	4.39	26.75	49.06	54	4.94
4924	35.54	Ave	130	1.4	V	35.2	4.39	26.75	48.38	54	5.62
2560	39.17	Ave	210	1.0	V	30.6	3.20	26.83	46.14	54	7.86
2560	38.52	Ave	110	1.0	H	30.9	3.20	26.83	45.79	54	8.21
1408	40.13	Ave	190	1.8	V	25.80	2.20	26.51	41.62	54	12.38
4924	46.77	PK	160	1.4	H	36.4	4.39	26.75	60.81	74	13.19
4924	44.64	PK	130	1.4	V	35.2	4.39	26.75	57.48	74	16.52
2560	49.87	PK	210	1.0	V	30.6	3.20	26.83	56.84	74	17.16
1408	34.15	Ave	190	1.2	H	26.70	2.20	26.51	36.54	54	17.46
2560	46.79	PK	110	1.0	H	30.9	3.20	26.83	54.06	74	19.94
1408	47.16	PK	190	1.2	H	26.70	2.20	26.51	49.55	74	24.45
1408	48.00	PK	190	1.8	V	25.80	2.20	26.51	49.49	74	24.51

*Within measurement uncertainty.

802.11g Mode:

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Part 15.247/15.209	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)											
4824	34.03	Ave	162	1.2	H	36.0	4.30	26.77	47.56	54	6.44
2560	38.62	Ave	150	1.3	H	30.9	3.20	26.83	45.89	54	8.11
2516	38.55	Ave	180	1.0	V	30.6	3.26	26.83	45.58	54	8.42
4824	32.98	Ave	215	1.0	V	34.6	4.30	26.77	45.11	54	8.89
2560	37.53	Ave	172	1.1	V	30.6	3.20	26.83	44.50	54	9.50
2516	36.35	Ave	110	1.0	H	30.7	3.26	26.83	43.48	54	10.52
4824	43.95	PK	162	1.2	H	36.0	4.30	26.77	57.48	74	16.52
2516	46.86	PK	180	1.0	V	30.6	3.26	26.83	53.89	74	20.11
4824	40.88	PK	215	1.0	V	34.6	4.30	26.77	53.01	74	20.99
2560	45.90	PK	172	1.1	V	30.6	3.20	26.83	52.87	74	21.13
2560	45.55	PK	150	1.3	H	30.9	3.20	26.83	52.82	74	21.18
2516	45.39	PK	110	1.0	H	30.7	3.26	26.83	52.52	74	21.48
Middle Channel (2437 MHz)											
4874	33.68	Ave	220	1.1	H	36.1	4.35	26.76	47.37	54	6.63
2560	39.66	Ave	140	1.6	V	30.6	3.20	26.83	46.63	54	7.37
2516	39.33	Ave	190	1.5	H	30.7	3.26	26.83	46.46	54	7.54
2560	38.80	Ave	170	1.2	H	30.9	3.20	26.83	46.07	54	7.93
4874	32.28	Ave	210	1.3	V	34.6	4.35	26.76	44.47	54	9.53
2516	36.67	Ave	180	1.4	V	30.6	3.26	26.83	43.70	54	10.30
4874	43.49	PK	220	1.1	H	36.1	4.35	26.76	57.18	74	16.82
2560	47.39	PK	140	1.6	V	30.6	3.20	26.83	54.36	74	19.64
2560	46.71	PK	170	1.2	H	30.9	3.20	26.83	53.98	74	20.02
2516	46.60	PK	190	1.5	H	30.7	3.26	26.83	53.73	74	20.27
2516	46.49	PK	180	1.4	V	30.6	3.26	26.83	53.52	74	20.48
4874	40.37	PK	210	1.3	V	34.6	4.35	26.76	52.56	74	21.44
High Channel (2462 MHz)											
4924	35.54	Ave	215	1.1	H	36.4	4.39	26.75	49.58	54	4.42
2560	39.65	Ave	170	1.5	H	30.9	3.20	26.83	46.92	54	7.08
4924	30.56	Ave	222	1.0	V	35.2	4.39	26.75	43.40	54	10.60
2560	36.29	Ave	150	1.6	V	30.6	3.20	26.83	43.26	54	10.74
1408	39.67	Ave	165	1.2	H	26.70	2.20	26.51	42.06	54	11.94
1408	38.53	Ave	120	1.3	V	25.80	2.20	26.51	40.02	54	13.98
4924	45.34	PK	215	1.1	H	36.4	4.39	26.75	59.38	74	14.62
2560	47.53	PK	170	1.5	H	30.9	3.20	26.83	54.80	74	19.20
4924	40.94	PK	222	1.0	V	35.2	4.39	26.75	53.78	74	20.22
2560	45.81	PK	150	1.6	V	30.6	3.20	26.83	52.78	74	21.22
1408	47.85	PK	165	1.2	H	26.70	2.20	26.51	50.24	74	23.76
1408	46.67	PK	120	1.3	V	25.80	2.20	26.51	48.16	74	25.84

802.11n20 Mode:

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Part 15.247/15.209	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)											
4824	34.98	Ave	220	1.0	H	36.0	4.30	26.77	48.51	54	5.49
4824	33.80	Ave	211	1.5	V	34.6	4.30	26.77	45.93	54	8.07
2492	35.99	Ave	150	1.3	V	30.6	3.26	26.83	43.02	54	10.98
2492	35.68	Ave	130	1.3	H	30.7	3.26	26.83	42.81	54	11.19
1408	37.59	Ave	120	1.1	H	26.70	2.20	26.51	39.98	54	14.02
1408	38.35	Ave	130	1.2	V	25.80	2.20	26.51	39.84	54	14.16
4824	45.24	PK	220	1.0	H	36.0	4.30	26.77	58.77	74	15.23
4824	44.08	PK	211	1.5	V	34.6	4.30	26.77	56.21	74	17.79
2492	47.67	PK	150	1.3	V	30.6	3.26	26.83	54.70	74	19.3
2492	46.85	PK	130	1.3	H	30.7	3.26	26.83	53.98	74	20.02
1408	46.56	PK	120	1.1	H	26.70	2.20	26.51	48.95	74	25.05
1408	46.17	PK	130	1.2	V	25.80	2.20	26.51	47.66	74	26.34
Middle Channel (2437 MHz)											
4874	33.38	Ave	218	1.0	H	36.1	4.35	26.76	47.07	54	6.93
4874	34.68	Ave	220	1.1	V	34.6	4.35	26.76	46.87	54	7.13
2492	38.10	Ave	160	1.2	V	30.6	3.26	26.83	45.13	54	8.87
2492	35.29	Ave	250	1.0	H	30.7	3.26	26.83	42.42	54	11.58
1408	36.77	Ave	180	1.2	H	26.70	2.20	26.51	39.16	54	14.84
1408	37.58	Ave	170	1.0	V	25.80	2.20	26.51	39.07	54	14.93
4874	44.12	PK	218	1.0	H	36.1	4.35	26.76	57.81	74	16.19
4874	43.37	PK	220	1.1	V	34.6	4.35	26.76	55.56	74	18.44
2492	47.19	PK	160	1.2	V	30.6	3.26	26.83	54.22	74	19.78
2492	46.67	PK	250	1.0	H	30.7	3.26	26.83	53.80	74	20.20
1408	47.13	PK	180	1.2	H	26.70	2.20	26.51	49.52	74	24.48
1408	46.33	PK	170	1.0	V	25.80	2.20	26.51	47.82	74	26.18
High Channel (2462 MHz)											
4924	34.54	Ave	175	1.0	H	36.4	4.39	26.75	48.58	54	5.42
4924	34.80	Ave	216	1.5	V	35.2	4.39	26.75	47.64	54	6.36
2492	38.06	Ave	120	1.2	V	30.6	3.26	26.83	45.09	54	8.91
2492	36.65	Ave	160	1.2	H	30.7	3.26	26.83	43.78	54	10.22
1408	38.64	Ave	120	1.1	H	26.70	2.20	26.51	41.03	54	12.97
1408	37.29	Ave	130	1.3	V	25.80	2.20	26.51	38.78	54	15.22
4924	44.36	PK	175	1.0	H	36.4	4.39	26.75	58.40	74	15.60
4924	44.19	PK	216	1.5	V	35.2	4.39	26.75	57.03	74	16.97
2492	47.35	PK	120	1.2	V	30.6	3.26	26.83	54.38	74	19.62
2492	45.72	PK	160	1.2	H	30.7	3.26	26.83	52.85	74	21.15
1408	46.42	PK	120	1.1	H	26.70	2.20	26.51	48.81	74	25.19
1408	46.55	PK	130	1.3	V	25.80	2.20	26.51	48.04	74	25.96

802.11n40 Mode:

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Part 15.247/15.209	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
Low Channel (2422 MHz)											
2560	39.10	Ave	150	1.1	H	30.9	3.20	26.83	46.37	54	7.63
4844	30.08	Ave	220	1.0	H	36.0	4.30	26.77	43.61	54	10.39
2560	36.24	Ave	160	1.1	V	30.6	3.20	26.83	43.21	54	10.79
1408	40.58	Ave	140	1.3	H	26.70	2.20	26.51	42.97	54	11.03
4844	30.37	Ave	219	1.0	V	34.6	4.30	26.77	42.50	54	11.50
1408	37.62	Ave	180	1.3	V	25.80	2.20	26.51	39.11	54	14.89
4844	44.01	PK	220	1.0	H	36.0	4.30	26.77	57.54	74	16.46
4844	44.10	PK	219	1.0	V	34.6	4.30	26.77	56.23	74	17.77
2560	48.61	PK	150	1.1	H	30.9	3.20	26.83	55.88	74	18.12
2560	47.31	PK	160	1.1	V	30.6	3.20	26.83	54.28	74	19.72
1408	49.11	PK	140	1.3	H	26.70	2.20	26.51	51.50	74	22.50
1408	47.23	PK	180	1.3	V	25.80	2.20	26.51	48.72	74	25.28
Middle Channel (2437 MHz)											
2560	40.59	Ave	120	1.4	V	30.6	3.20	26.83	47.56	54	6.44
2560	40.25	Ave	130	1.0	H	30.9	3.20	26.83	47.52	54	6.48
4874	30.06	Ave	210	1.0	H	36.1	4.35	26.76	43.75	54	10.25
1408	41.26	Ave	140	1.5	V	25.80	2.20	26.51	42.75	54	11.25
4874	30.16	Ave	160	1.3	V	34.6	4.35	26.76	42.35	54	11.65
1408	39.52	Ave	120	1.3	H	26.70	2.20	26.51	41.91	54	12.09
4874	42.91	PK	210	1.0	H	36.1	4.35	26.76	56.6	74	17.4
2560	48.67	PK	120	1.4	V	30.6	3.20	26.83	55.64	74	18.36
2560	48.20	PK	130	1.0	H	30.9	3.20	26.83	55.47	74	18.53
4874	42.86	PK	160	1.3	V	34.6	4.35	26.76	55.05	74	18.95
1408	48.82	PK	140	1.5	V	25.80	2.20	26.51	50.31	74	23.69
1408	47.37	PK	120	1.3	H	26.70	2.20	26.51	49.76	74	24.24
High Channel (2452 MHz)											
2560	38.67	Ave	240	1.3	V	30.6	3.20	26.83	45.64	54	8.36
2560	38.34	Ave	130	1.6	H	30.9	3.20	26.83	45.61	54	8.39
4904	30.68	Ave	215	1.1	H	36.4	4.39	26.75	44.72	54	9.28
4904	30.60	Ave	219	1.0	V	35.2	4.39	26.75	43.44	54	10.56
1408	40.33	Ave	160	1.5	H	26.70	2.20	26.51	42.72	54	11.28
1408	41.05	Ave	130	1.0	V	25.80	2.20	26.51	42.54	54	11.46
4904	43.86	PK	215	1.1	H	36.4	4.39	26.75	57.90	74	16.10
4904	43.61	PK	219	1.0	V	35.2	4.39	26.75	56.45	74	17.55
2560	46.87	PK	130	1.6	H	30.9	3.20	26.83	54.14	74	19.86
2560	47.11	PK	240	1.3	V	30.6	3.20	26.83	54.08	74	19.92
1408	48.74	PK	130	1.0	V	25.80	2.20	26.51	50.23	74	23.77
1408	47.52	PK	160	1.5	H	26.70	2.20	26.51	49.91	74	24.09

Spurious Emissions in Restrict Bands

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/QP/Ave)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Part 15.247/15.209	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
802.11b mode											
2484.89	34.46	Ave	0	1.0	H	30.6	3.11	26.85	41.32	54	12.68
2387.45	33.12	Ave	0	1.0	H	30.4	3.01	26.84	39.69	54	14.31
2387.45	32.93	Ave	0	1.0	V	30.4	3.01	26.84	39.50	54	14.50
2484.89	32.42	Ave	0	1.0	V	30.6	3.11	26.85	39.28	54	14.72
2484.89	45.69	PK	10	1.0	H	30.6	3.11	26.85	52.55	74	21.45
2484.89	45.56	PK	0	1.2	V	30.6	3.11	26.85	52.42	74	21.58
2387.45	45.56	PK	20	1.2	H	30.4	3.01	26.84	52.13	74	21.87
2387.45	44.78	PK	30	1.2	V	30.4	3.01	26.84	51.35	74	22.65
802.11g mode											
2389.52	34.92	Ave	360	1.2	V	30.4	3.01	26.84	41.49	54	12.51
2485.82	34.26	Ave	60	1.1	H	30.6	3.11	26.85	41.12	54	12.88
2485.92	32.42	Ave	10	1	V	30.6	3.11	26.85	39.28	54	14.72
2389.52	32.56	Ave	90	1.1	H	30.4	3.01	26.84	39.13	54	14.87
2485.82	46.62	PK	10	1.1	H	30.6	3.11	26.85	53.48	74	20.52
2389.52	45.88	PK	30	1.2	V	30.4	3.01	26.84	52.45	74	21.55
2389.52	44.98	PK	20	1.3	H	30.4	3.01	26.84	51.55	74	22.45
2485.92	44.56	PK	0	1.2	V	30.6	3.11	26.85	51.42	74	22.58
802.11n 20 mode											
2484.89	36.46	Ave	79	1.6	H	30.6	3.11	26.85	43.32	54	10.68
2387.45	34.57	Ave	260	1.6	V	30.4	3.01	26.84	41.14	54	12.86
2387.45	34.53	Ave	90	1.5	H	30.4	3.01	26.84	41.10	54	12.90
2484.89	32.59	Ave	86	1.6	V	30.6	3.11	26.85	39.45	54	14.55
2484.89	47.69	PK	60	1.5	H	30.6	3.11	26.85	54.55	74	19.45
2387.45	47.56	PK	20	1.2	H	30.4	3.01	26.84	54.13	74	19.87
2484.89	45.56	PK	80	1.2	V	30.6	3.11	26.85	52.42	74	21.58
2387.45	44.78	PK	30	1.2	V	30.4	3.01	26.84	51.35	74	22.65
802.11n40 mode											
2386.75	35.93	Ave	256	1.3	V	30.4	3.01	26.84	42.50	54	11.50
2485.26	34.46	Ave	90	1.2	H	30.6	3.11	26.85	41.32	54	12.68
2485.26	34.42	Ave	360	1.2	V	30.6	3.11	26.85	41.28	54	12.72
2386.75	34.59	Ave	53	1.6	H	30.4	3.01	26.84	41.16	54	12.84
2386.75	47.21	PK	20	1.2	H	30.4	3.01	26.84	53.78	74	20.22
2485.26	46.56	PK	129	1.2	V	30.6	3.11	26.85	53.42	74	20.58
2386.75	46.78	PK	85	1.2	V	30.4	3.01	26.84	53.35	74	20.65
2485.26	45.59	PK	109	1.6	H	30.6	3.11	26.85	52.45	74	21.55

FCC §15.247(a) (2) – 6 dB BANDWIDTH TESTING

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Data

Please refer to FCC ID: RUJ-LR802UKN granted on 2008-07-08, report number: RF970425L14.

FCC §15.247(b) - MAXIMUM PEAK OUTPUT POWER

Applicable Standard

According to FCC §15.247 (b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to FCC §15.247(b) (4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to FCC §15.247 (c), Operation with directional antenna gains greater than 6 dBi.
(1) Fixed point-to-point operation:
(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
(iii) Fixed, point-to-point operation, as used in paragraphs (c) (1) (i) and (c) (1) (ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.
(2) In addition to the provisions in paragraphs (b) (1), (b) (3), (b) (4) and (c) (1) (i) of this section, transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:
(i) Different information must be transmitted to each receiver.
(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b) (1) or (b) (3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:
(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

Test Data

Please refer to FCC ID: RUJ-LR802UKN granted on 2008-07-08 report number. RF970425L14.

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Data

Please refer to FCC ID: RUJ-LR802UKN granted on 2008-07-08, report number: RF970425L14.

FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Data

Please refer to FCC ID: RUJ-LR802UKN granted on 2008-07-08, report number: RF970425L14.

******* END OF REPORT *******