Lab Code: 200707-0

FCC PART 15.247

TEST REPORT

For

Suga Electronics Limited

22/F.,Tower B, Billion Centre, 1 Wang Kwong Road, Kowloon Bay, Kowloon, Hong Kong

FCC ID: VZFSWN21MB

Report Type:	**Product Type:**
Original Report	802.11 b/g/n WLAN USB Module

Test Engineer:	Jimmy Xiao
Report Number:	RSZ120411003-00
Report Date:	2012-04-18
Reviewed By:	Alvin Huang EMC Engineer
Test Laboratory:	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 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Suga Electronics Limited*'s product, model number: *SWN21MB (FCC ID: VZFSWN21MB)* or the "EUT" in this report was an *802.11 b/g/n WLAN USB Module*, which was measured approximately: 39.5 mm (L) x 19.0 mm (W) x 4.5 mm (H) (excludes pin header), rated input voltage: DC 5V from USB port.

** All measurement and test data in this report was gathered from production sample serial number: ccYXddddddd (Assigned by applicant). The EUT was received on 2012-04-11.*

Objective

This report is prepared on behalf of *Suga Electronics Limited* 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, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, 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.

The uncertainty of any RF tests which use conducted method measurement is 0.96 dB, the uncertainty of any radiation on emissions measurement is 4.0 dB

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on 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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

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 an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (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 for 802.11b, 802.11g and 802.11 n-HT20 modes were tested with Channel 1, 6 and 11.

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

EUT Exercise Software

The test was performed under “RT3x7xQA” which was provided by the manufacturer.

The test was performed under:
802.11b: Data rate: 1 Mbps.
802.11g: Data rate: 6 Mbps.
802.11n-HT20: Data rate: 6.5 Mbps.

Equipment Modifications

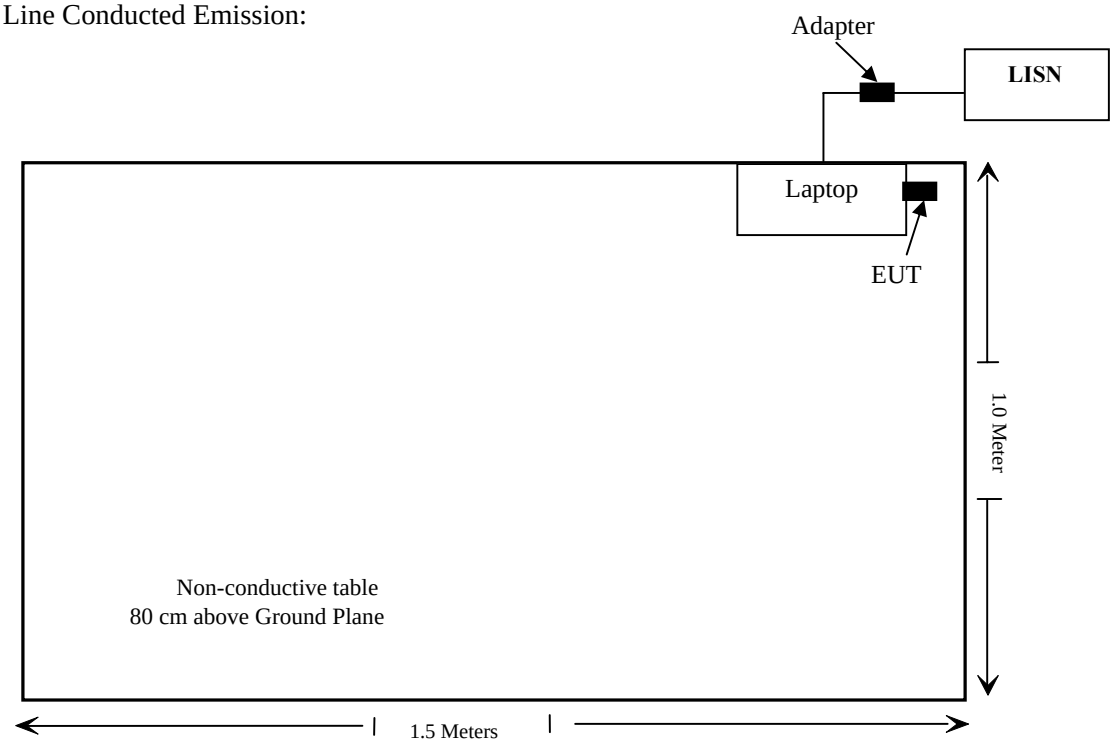
No modification was made to the EUT tested.

Local Support Equipment List and Details

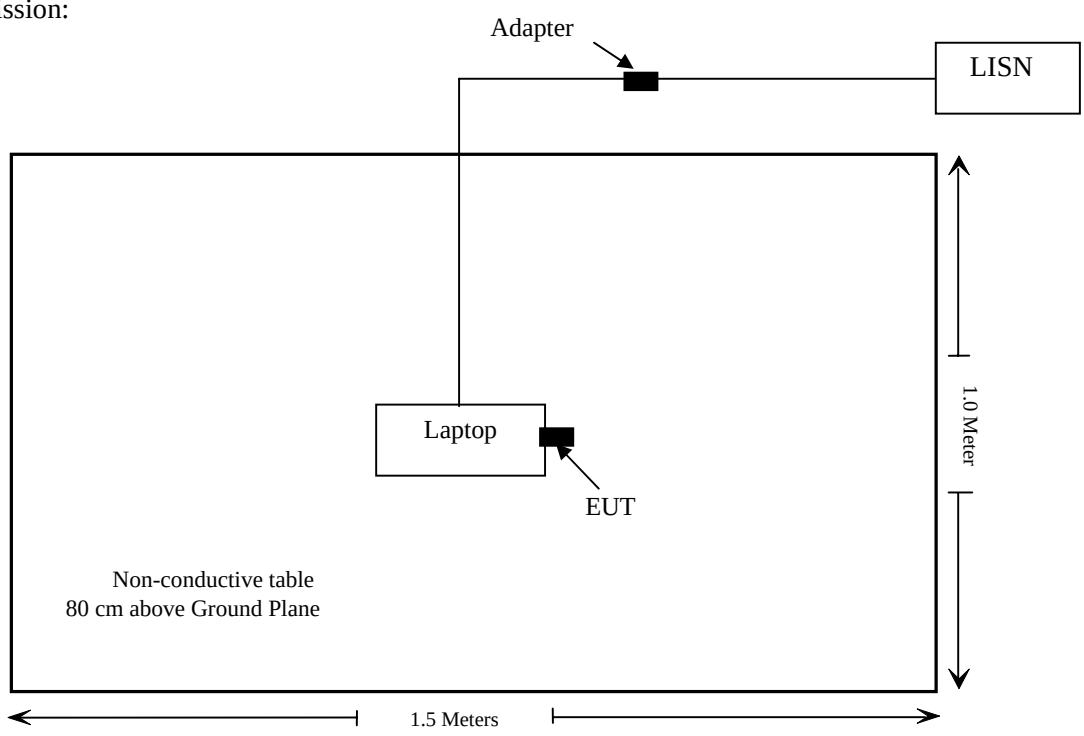
Manufacturer	Description	Model	Serial Number
IBM	Laptop	2371	X0873060

Block Diagram of Test Setup

AC Power Line Conducted Emission:



Radiated Emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b)(1), §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Power Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Terminal	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412	1.5	1.41	15.26	33.57	20	0.0094	1.0
802.11g	2412	1.5	1.41	14.68	29.38	20	0.0082	1.0
802.11n-HT20	2462	1.5	1.41	14.89	30.83	20	0.0086	1.0

Result: The device meets FCC MPE limit at 20 cm distance as a mobile device specified in §2.1091. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by §2.1093.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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.

Antenna Connector Construction

The EUT has an integrated PCB antenna arrangement, which was permanently attached and the maximum gain was 1.5 dBi, fulfill the requirement of this section. 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 CISPR 16-4-4, 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 (k=2, 95% level of confidence).
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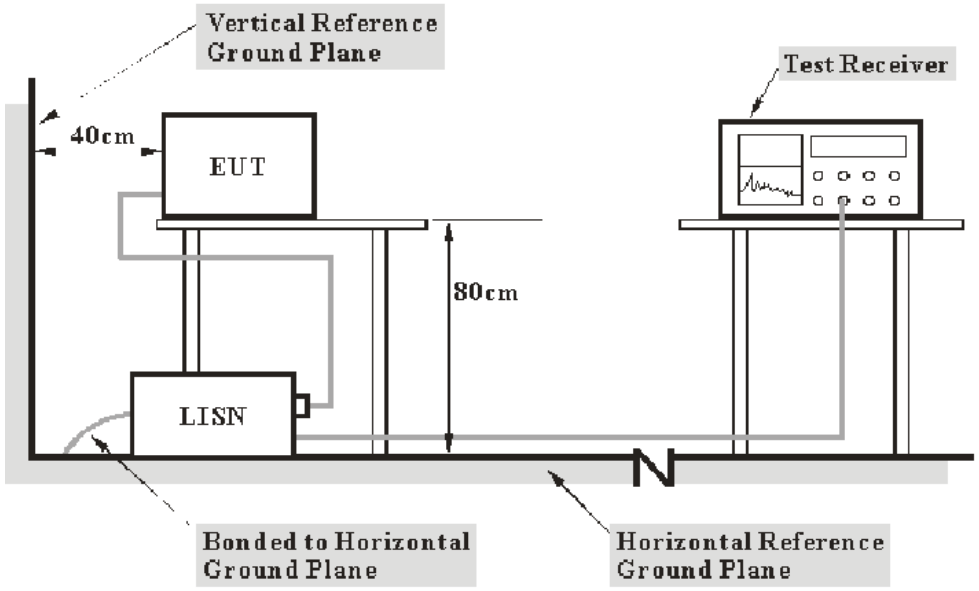
EUT Setup



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 C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The adapter of laptop 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 Procedure

During the conducted emission test, the adapter of laptop was connected to the outlet of 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2011-11-24	2012-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-11-17	2012-11-16
Rohde & Schwarz	Pulse limiter	ESH3Z2	DE25985	2011-07-08	2012-07-07

*** 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 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:

9.91 dB at **9.655 MHz** in the **Line** conducted mode

Test Data

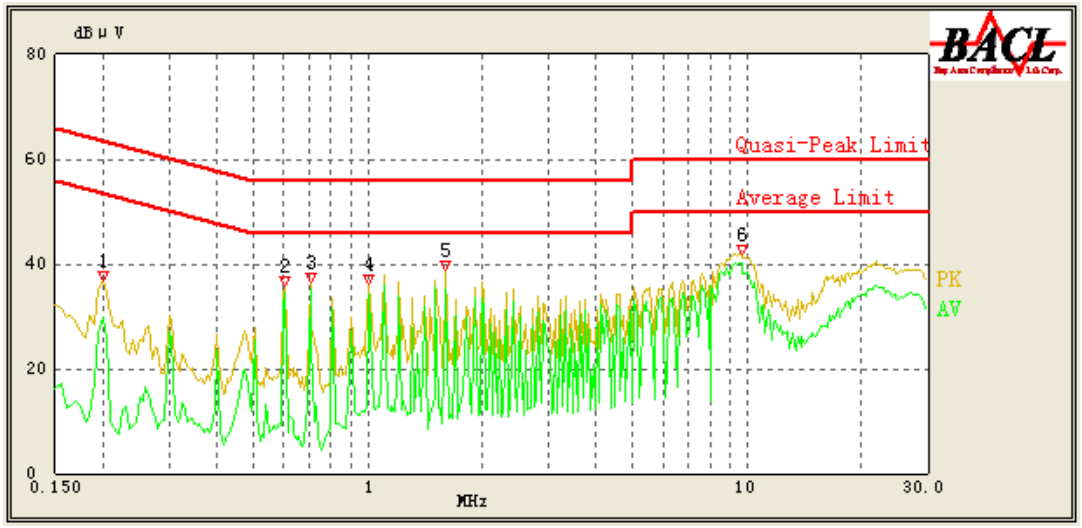
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Jimmy Xiao on 2012-04-15.

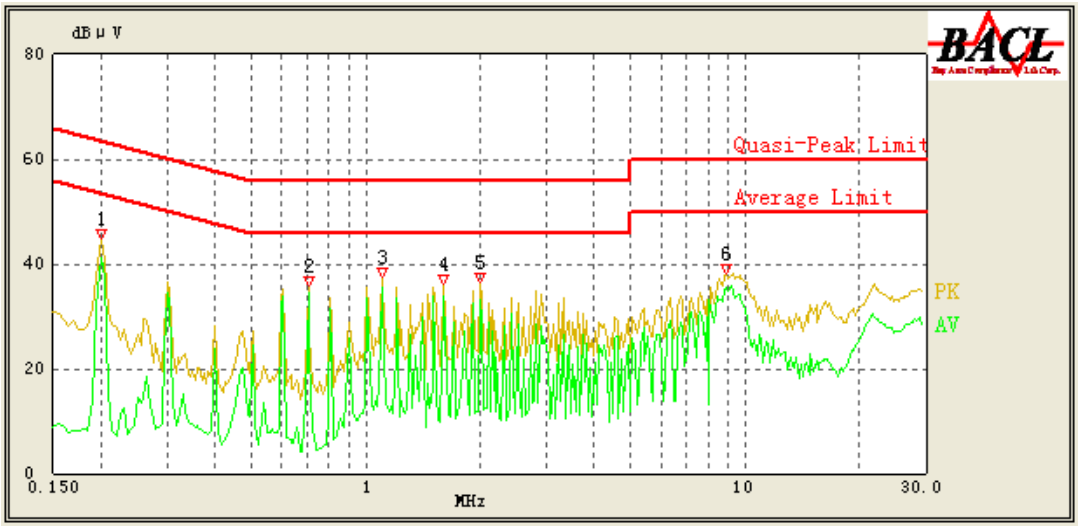
Test Mode: Transmitting

AC 120V, 60 Hz, Line:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
9.655	40.09	9.99	50.00	9.91	Ave.
0.705	35.17	9.72	46.00	10.83	Ave.
1.610	35.09	9.80	46.00	10.91	Ave.
0.605	34.45	9.69	46.00	11.55	Ave.
1.005	34.32	9.80	46.00	11.68	Ave.
0.705	38.12	9.72	56.00	17.88	QP
9.655	40.31	9.99	60.00	19.69	QP
1.610	35.28	9.80	56.00	20.72	QP
1.005	35.01	9.80	56.00	20.99	QP
0.605	34.81	9.69	56.00	21.19	QP
0.200	29.74	9.60	54.57	24.83	Ave.
0.200	34.23	9.60	64.57	30.34	QP

AC 120V, 60 Hz, Neutral:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
8.950	49.98	9.96	60.00	10.02	QP
1.105	35.57	9.80	46.00	10.43	Ave.
0.705	34.55	9.72	46.00	11.45	Ave.
1.610	33.81	9.80	46.00	12.19	Ave.
2.010	33.05	9.80	46.00	12.95	Ave.
0.200	41.07	9.60	54.57	13.50	Ave.
8.950	35.57	9.96	50.00	14.43	Ave.
2.010	39.79	9.80	56.00	16.21	QP
0.705	38.53	9.72	56.00	17.47	QP
1.105	35.87	9.80	56.00	20.13	QP
1.610	34.39	9.80	56.00	21.61	QP
0.200	41.64	9.60	64.57	22.93	QP

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

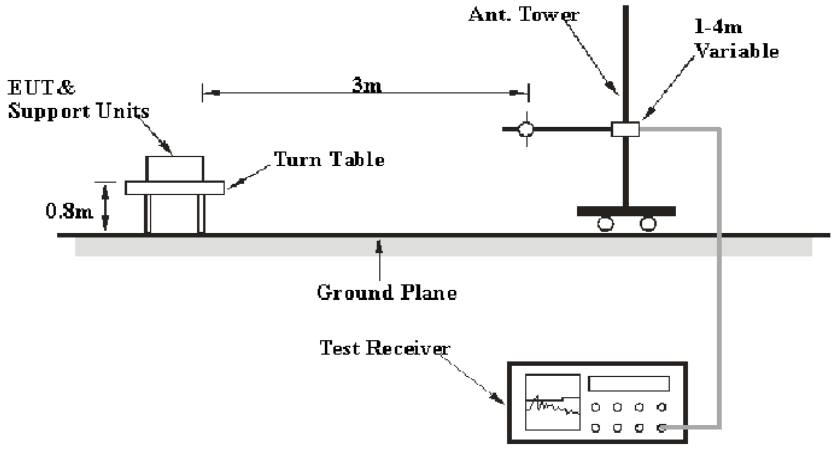
Measurement Uncertainty

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.

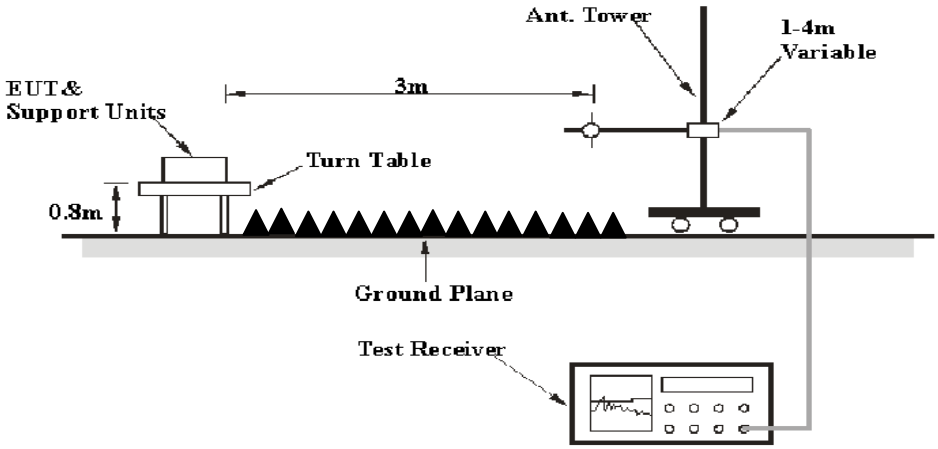
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB(k=2, 95% level of confidence) .

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2009. 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 adapter of 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	120 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	Ave.

Test Procedure

For the radiated emissions test, the adapter of laptop was connected to 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, 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 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2012-03-17	2013-03-16
Mini-circuits	Pre-Amplifier	ZVA-213+	T-E27H	2011-11-24	2012-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2012-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07
Agilent	Spectrum Analyzer	8564E	3943A01781	2012-04-12	2013-04-11
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2011-10-14	2012-10-13

*** 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 Results Summary

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

2.26 dB at **3261.3 MHz** in the **Horizontal** polarization

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Jimmy Xiao on 2012-04-14.

30 MHz-25 GHz:

802.11b Mode:

Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
2412	98.31	PK	320	1.5	H	28.90	3.03	26.50	103.74	/	/	fund
2412	81.08	Ave.	320	1.5	H	28.90	3.03	26.50	86.51	/	/	fund
3261.3	43.91	Ave.	90	15	H	30.60	3.49	26.50	51.50	54	2.50*	spurious
4824	30.85	Ave.	170	1.3	H	34.50	4.30	26.50	43.15	54	10.85	harmonic
2383.2	33.97	Ave.	120	1.3	H	28.90	3.03	26.50	39.40	54	14.60	spurious
4824	46.77	PK	170	1.3	H	34.50	4.30	26.50	59.07	74	14.93	harmonic
3261.3	49.05	PK	90	1.5	H	30.60	3.49	26.50	56.64	74	17.36	spurious
2483.7	29.32	Ave.	50	1.2	H	28.90	3.11	26.50	34.83	54	19.17	spurious
2383.2	47.36	PK	120	1.3	H	28.90	3.03	26.50	52.79	74	21.21	spurious
7236	17.12	Ave.	330	1.1	V	36.80	5.22	26.50	32.64	54	21.36	harmonic
2483.7	45.94	PK	50	1.2	H	28.90	3.11	26.50	51.45	74	22.55	spurious
2341.1	25.49	Ave.	250	1.1	V	28.80	2.98	26.50	30.77	54	23.23	spurious
2341.1	45.27	PK	250	1.1	V	28.80	2.98	26.50	50.55	74	23.45	spurious
7236	34.13	PK	330	1.1	V	36.80	5.22	26.50	49.65	74	24.35	harmonic
Middle Channel (2437 MHz)												
2437	98.54	PK	230	1.4	H	28.90	3.11	26.50	104.05	/	/	fund
2437	81.78	Ave.	230	1.4	H	28.90	3.11	26.50	87.29	/	/	fund
3261.3	44.15	Ave.	80	1.3	H	30.60	3.49	26.50	51.74	54	2.26*	spurious
4874	28.79	Ave.	30	1.0	V	35.00	4.36	26.50	41.65	54	12.35	harmonic
7311	24.35	Ave.	300	1.4	H	36.80	5.09	26.50	39.74	54	14.26	harmonic
4874	44.90	PK	30	1.0	V	35.00	4.36	26.50	57.76	74	16.24	harmonic
2354.9	32.09	Ave.	100	1.1	H	28.80	2.98	26.50	37.37	54	16.63	spurious
3261.3	49.45	PK	80	1.3	H	30.60	3.49	26.50	57.04	74	16.96	spurious
7311	37.68	PK	300	1.4	H	36.80	5.09	26.50	53.07	74	20.93	harmonic
2354.9	47.30	PK	100	1.1	H	28.80	2.98	26.50	52.58	74	21.42	spurious
2341.3	25.48	Ave.	120	1.2	V	28.80	2.98	26.50	30.76	54	23.24	spurious
2341.3	44.74	PK	120	1.2	V	28.80	2.98	26.50	50.02	74	23.98	spurious
2499.5	22.96	Ave.	90	1.6	H	29.00	3.29	26.50	28.75	54	25.25	spurious
2499.5	40.27	PK	90	1.6	H	29.00	3.29	26.50	46.06	74	27.94	spurious

Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2462 MHz)												
2462	98.99	PK	230	1.3	H	28.90	3.11	26.50	104.50	/	/	fund
2462	82.21	Ave.	230	1.3	H	28.90	3.11	26.50	87.72	/	/	fund
3262.8	43.67	Ave.	140	1.4	H	30.60	3.62	26.50	51.39	54	2.61*	spurious
4924	29.19	Ave.	110	1.2	H	35.00	4.40	26.50	42.09	54	11.91	harmonic
7386	24.16	Ave.	140	1.1	V	36.80	5.21	26.50	39.67	54	14.33	harmonic
2383.1	33.97	Ave.	250	1.5	H	28.90	3.03	26.50	39.40	54	14.60	spurious
4924	46.23	PK	110	1.2	H	35.00	4.40	26.50	59.13	74	14.87	harmonic
3262.8	50.81	PK	140	1.4	H	30.60	3.62	26.50	58.53	74	15.47	spurious
2483.7	29.32	Ave.	210	1.3	H	28.90	3.11	26.50	34.83	54	19.17	spurious
2383.1	47.36	PK	250	1.5	H	28.90	3.03	26.50	52.79	74	21.21	spurious
2483.7	45.94	PK	210	1.3	H	28.90	3.11	26.50	51.45	74	22.55	spurious
7386	35.63	PK	140	1.1	V	36.80	5.21	26.50	51.14	74	22.86	harmonic
2341.1	25.49	Ave.	310	1.4	V	28.80	2.98	26.50	30.77	54	23.23	spurious
2341.1	45.27	PK	310	1.4	V	28.80	2.98	26.50	50.55	74	23.45	spurious

802.11g Mode:

Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
2412	99.35	PK	120	1.2	H	28.90	3.03	26.50	104.78	/	/	fund
2412	65.69	Ave.	120	1.2	H	28.90	3.03	26.50	71.12	/	/	fund
3262	44.12	Ave.	310	1.5	H	30.60	3.49	26.50	51.71	54	2.29*	spurious
7236	22.76	Ave.	90	1.3	H	36.80	5.22	26.50	38.28	54	15.72	harmonic
4824	45.71	PK	80	1.0	V	34.50	4.30	26.50	58.01	74	15.99	harmonic
3262	49.58	PK	310	1.5	H	30.60	3.49	26.50	57.17	74	16.83	spurious
2389.8	50.92	PK	210	1.3	H	28.90	3.03	26.50	56.35	74	17.65	spurious
4824	22.73	Ave.	80	1.0	V	34.50	4.30	26.50	35.03	54	18.97	harmonic
2341.7	48.43	PK	150	1.1	H	28.80	2.98	26.50	53.71	74	20.29	spurious
2341.7	28.10	Ave.	150	1.1	H	28.80	2.98	26.50	33.38	54	20.62	spurious
2389.8	27.74	Ave.	210	1.3	H	28.90	3.03	26.50	33.17	54	20.83	spurious
2498.2	26.60	Ave.	230	1.2	H	28.90	3.11	26.50	32.11	54	21.89	spurious
7236	36.15	PK	90	1.3	H	36.80	5.22	26.50	51.67	74	22.33	harmonic
2498.2	45.50	PK	230	1.2	H	28.90	3.11	26.50	51.01	74	22.99	spurious
Middle Channel (2437 MHz)												
2437	98.18	PK	40	1.3	H	28.90	3.11	26.50	103.69	/	/	fund
2437	63.48	Ave.	40	1.3	H	28.90	3.11	26.50	68.99	/	/	fund
3262	43.96	Ave.	310	1.4	H	30.60	3.49	26.50	51.55	54	2.45*	spurious
7311	23.54	Ave.	160	1.3	H	36.80	5.09	26.50	38.93	54	15.07	harmonic
4874	44.93	PK	50	1..0	V	35.00	4.36	26.50	57.79	74	16.21	harmonic
3262	49.63	PK	310	1.4	H	30.60	3.49	26.50	57.22	74	16.78	spurious
4874	22.18	Ave.	50	1.0	V	35.00	4.36	26.50	35.04	54	18.96	harmonic
2489.4	26.49	Ave.	160	1.5	H	28.90	3.11	26.50	32.00	54	22.00	spurious
2352.3	26.32	Ave.	30	1.0	V	28.80	2.98	26.50	31.60	54	22.40	spurious
2489.4	45.33	PK	160	1.5	H	28.90	3.11	26.50	50.84	74	23.16	spurious
2352.3	45.44	PK	30	1.0	V	28.80	2.98	26.50	50.72	74	23.28	spurious
2370.6	25.12	Ave.	120	1.1	V	28.90	3.03	26.50	30.55	54	23.45	spurious
2370.6	44.66	PK	120	1.1	V	28.90	3.03	26.50	50.09	74	23.91	spurious
7311	34.22	PK	160	1.3	H	36.80	5.09	26.50	49.61	74	24.39	harmonic

Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2462 MHz)												
2462	98.04	PK	110	1.4	H	28.90	3.11	26.50	103.55	/	/	fund
2462	62.90	Ave.	110	1.4	H	28.90	3.11	26.50	68.41	/	/	fund
3262	43.93	Ave.	230	1.5	H	30.60	3.62	26.50	51.65	54	2.35*	spurious
2484.2	54.08	PK	160	1.3	H	28.90	3.11	26.50	59.59	74	14.41	spurious
3262	50.49	PK	230	1.5	H	30.60	3.62	26.50	58.21	74	15.79	spurious
4924	44.21	PK	250	1.4	H	35.00	4.40	26.50	57.11	74	16.89	harmonic
7386	21.35	Ave.	310	1.3	H	36.80	5.21	26.50	36.86	54	17.14	harmonic
4924	22.45	Ave.	250	1.4	H	35.00	4.40	26.50	35.35	54	18.65	harmonic
2484.2	26.95	Ave.	160	1.3	H	28.90	3.11	26.50	32.46	54	21.54	spurious
7386	36.24	PK	310	1.3	H	36.80	5.21	26.50	51.75	74	22.25	harmonic
2341.6	24.21	Ave.	130	1.5	V	28.80	2.98	26.50	29.49	54	24.51	spurious
2341.6	43.64	PK	130	1.5	V	28.80	2.98	26.50	48.92	74	25.08	spurious
2348.6	23.03	Ave.	140	1.1	V	28.80	2.98	26.50	28.31	54	25.69	spurious
2348.6	42.75	PK	140	1.1	V	28.80	2.98	26.50	48.03	74	25.97	spurious

802.11n-HT20 Mode:

Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
2412	98.7	PK	120	1.5	H	28.90	3.03	26.50	104.13	/	/	fund
2412	62.69	Ave.	120	1.5	H	28.90	3.03	26.50	68.12	/	/	fund
3262	44.03	Ave.	60	1.6	H	30.60	3.49	26.50	51.62	54	2.38*	spurious
2389.6	57.69	PK	130	1.2	H	28.90	3.03	26.50	63.12	74	10.88	spurious
7236	23.68	Ave.	270	1.0	H	36.80	5.22	26.50	39.20	54	14.80	harmonic
3262	49.78	PK	60	1.6	H	30.60	3.49	26.50	57.37	74	16.63	spurious
4824	44.96	PK	310	1.4	V	34.50	4.30	26.50	57.26	74	16.74	harmonic
4824	23.21	Ave.	310	1.4	V	34.50	4.30	26.50	35.51	54	18.49	harmonic
2389.6	27.54	Ave.	130	1.2	H	28.90	3.03	26.50	32.97	54	21.03	spurious
2496.5	45.5	PK	30	1.3	H	28.90	3.11	26.50	51.01	74	22.99	spurious
2496.5	25.47	Ave.	30	1.3	H	28.90	3.11	26.50	30.98	54	23.02	spurious
7236	35.36	PK	270	1.0	H	36.80	5.22	26.50	50.88	74	23.12	harmonic
2348.6	24.58	Ave.	110	1.1	V	28.80	2.98	26.50	29.86	54	24.14	spurious
2348.6	44.37	PK	110	1.1	V	28.80	2.98	26.50	49.65	74	24.35	spurious
Middle Channel (2437 MHz)												
2437	97.91	PK	260	1.3	H	28.90	3.11	26.50	103.42	/	/	fund
2437	62.68	Ave.	260	1.3	H	28.90	3.11	26.50	68.19	/	/	fund
3262	44.13	Ave.	60	1.2	H	30.60	3.49	26.50	51.72	54	2.28*	spurious
7311	22.96	Ave.	90	1.1	H	36.80	5.09	26.50	38.35	54	15.65	harmonic
3262	49.71	PK	60	1.2	H	30.60	3.49	26.50	57.30	74	16.70	spurious
4874	43.99	PK	70	1.5	V	35.00	4.36	26.50	56.85	74	17.15	harmonic
4874	22.33	Ave.	70	1.5	V	35.00	4.36	26.50	35.19	54	18.81	harmonic
7311	36.39	PK	90	1.1	H	36.80	5.09	26.50	51.78	74	22.22	harmonic
2488.7	44.8	PK	50	1.2	H	28.90	3.11	26.50	50.31	74	23.69	spurious
2340.3	44.07	PK	330	1.5	V	28.80	2.98	26.50	49.35	74	24.65	spurious
2488.7	23.63	Ave.	50	1.2	H	28.90	3.11	26.50	29.14	54	24.86	spurious
2348.3	43.34	PK	120	1.1	V	28.80	2.98	26.50	48.62	74	25.38	spurious
2340.3	23.12	Ave.	330	1.5	V	28.80	2.98	26.50	28.40	54	25.60	spurious
2348.3	22.14	Ave.	120	1.1	V	28.80	2.98	26.50	27.42	54	26.58	spurious

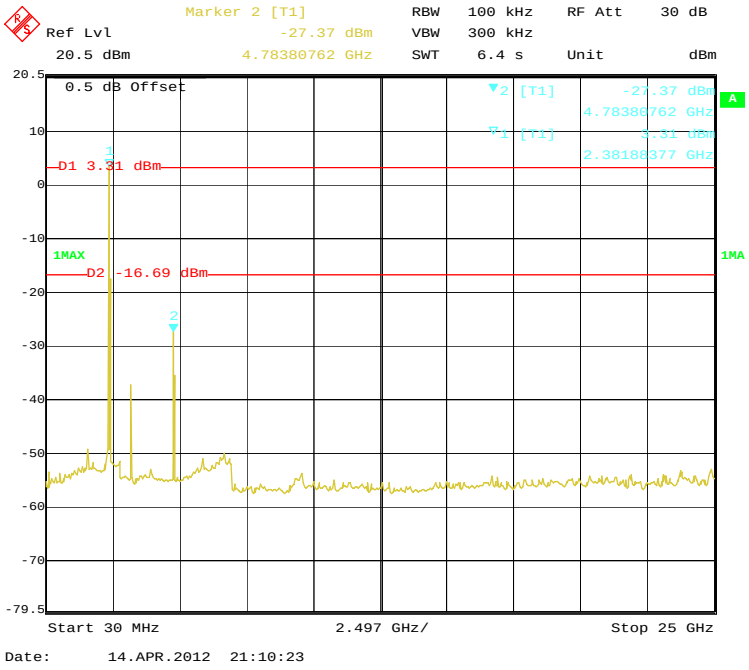
Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.209/15.205			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2462 MHz)												
2462	97.72	PK	80	1.6	H	28.90	3.11	26.50	103.23	/	/	fund
2462	61.84	Ave.	80	1.6	H	28.90	3.11	26.50	67.35	/	/	fund
3262	43.97	Ave.	320	1.2	H	30.60	3.62	26.50	51.69	54	2.31*	spurious
2484.7	56.11	PK	230	1.1	H	28.90	3.11	26.50	61.62	74	12.38	spurious
7386	23.63	Ave.	360	1.6	H	36.80	5.21	26.50	39.14	54	14.86	harmonic
3262	50.75	PK	320	1.2	H	30.60	3.62	26.50	58.47	74	15.53	spurious
4924	24.05	Ave.	330	1.5	V	35.00	4.40	26.50	36.95	54	17.05	harmonic
4924	43.91	PK	330	1.5	V	35.00	4.40	26.50	56.81	74	17.19	harmonic
2484.7	27.72	Ave.	230	1.1	H	28.90	3.11	26.50	33.23	54	20.77	spurious
2376.2	47.39	PK	60	1.6	H	28.90	3.03	26.50	52.82	74	21.18	spurious
7386	36.54	PK	360	1.6	H	36.80	5.21	26.50	52.05	74	21.95	harmonic
2376.2	25.47	Ave.	60	1.6	H	28.90	3.03	26.50	30.90	54	23.10	spurious
2341.6	43.85	PK	90	1.4	V	28.80	2.98	26.50	49.13	74	24.87	spurious
2341.6	23.11	Ave.	90	1.4	V	28.80	2.98	26.50	28.39	54	25.61	spurious

**within measurement uncertainty*

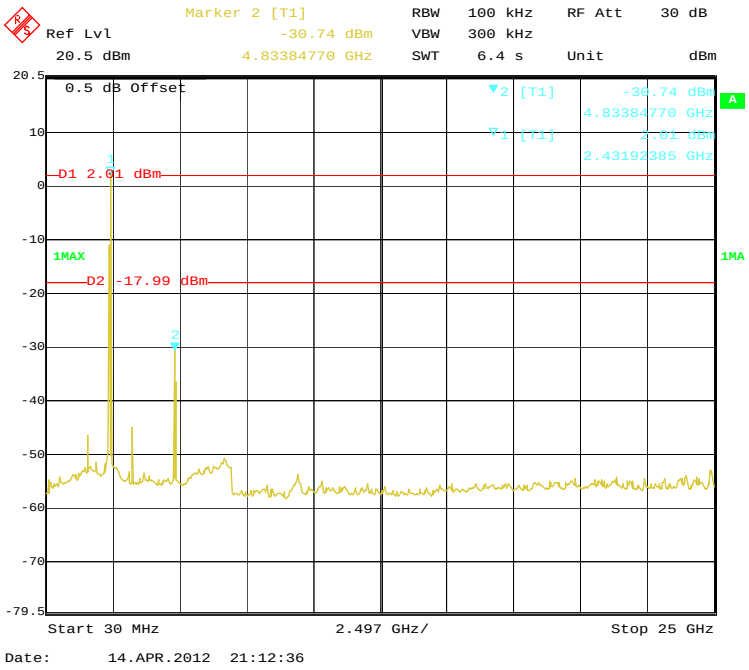
Spurious Emissions at Antenna Terminal

Please refer to the following plots:

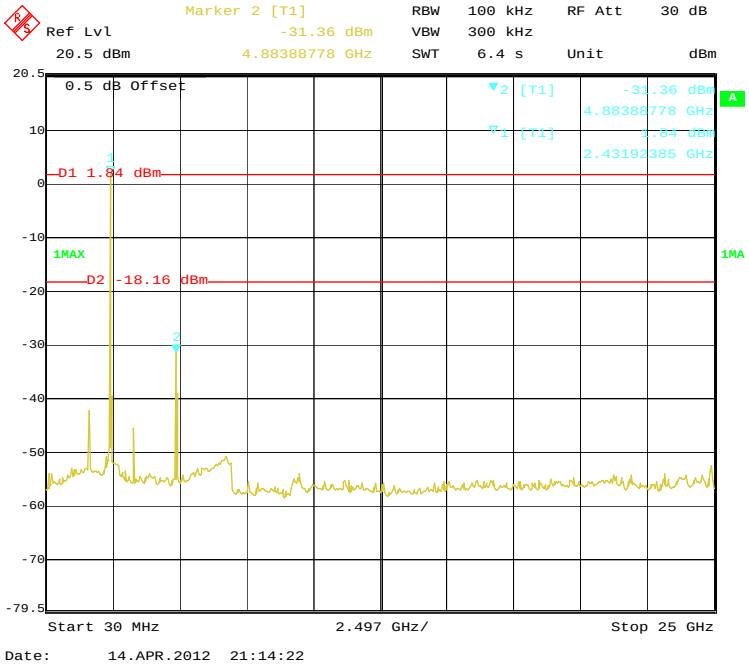
802.11b Low Channel



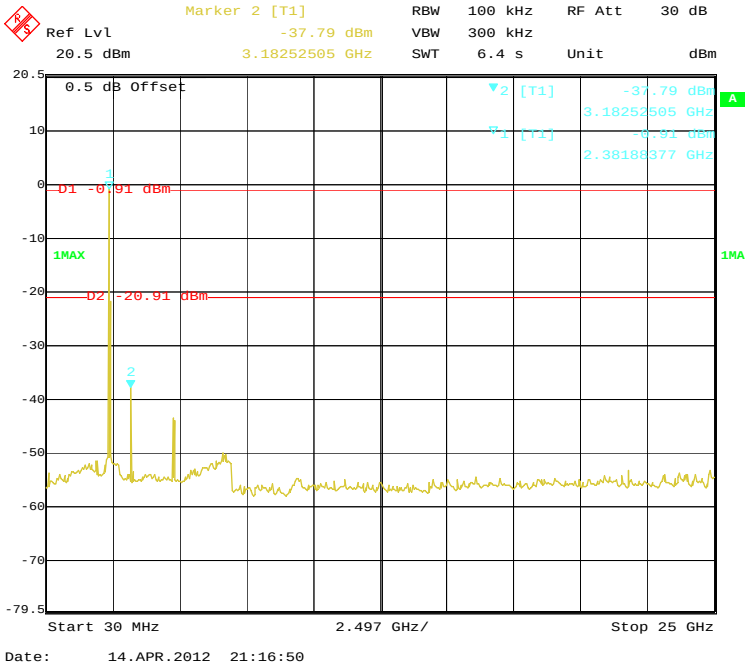
802.11b Middle Channel



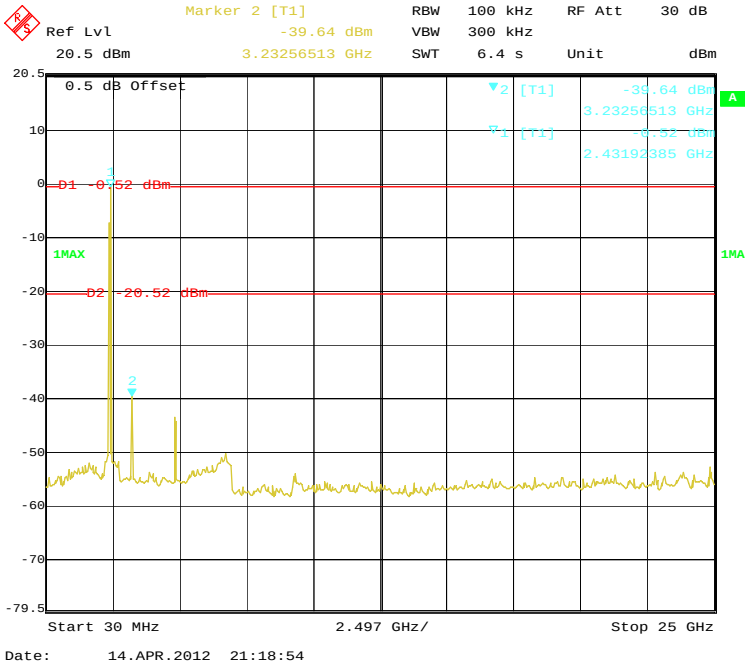
802.11b High Channel



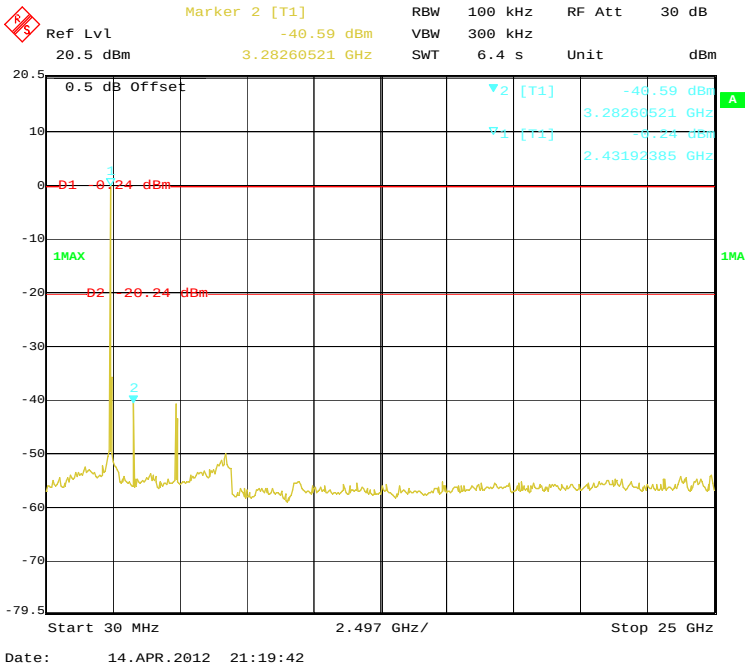
802.11g Low Channel



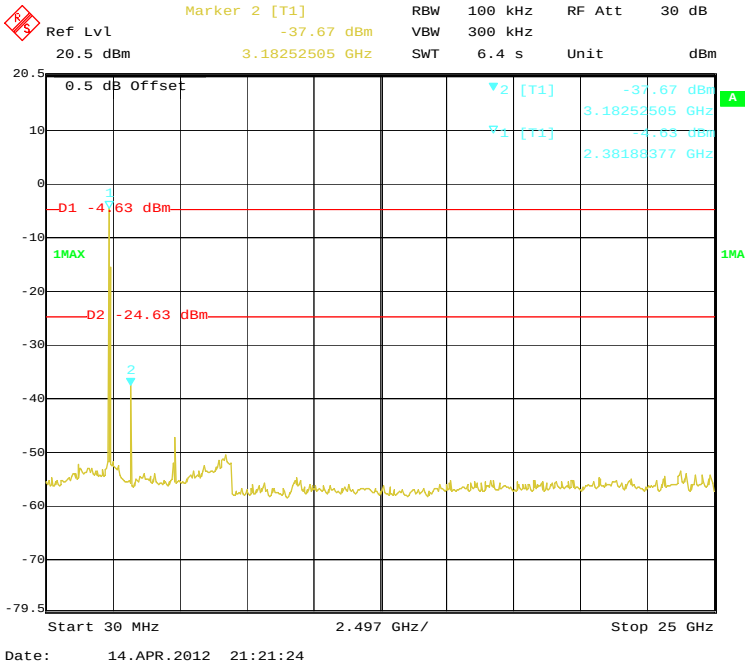
802.11g Middle Channel



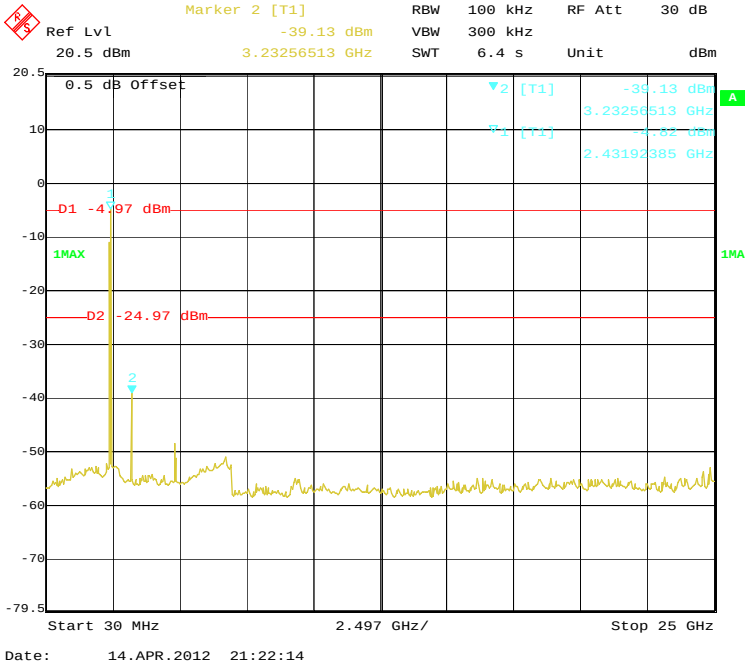
802.11g High Channel



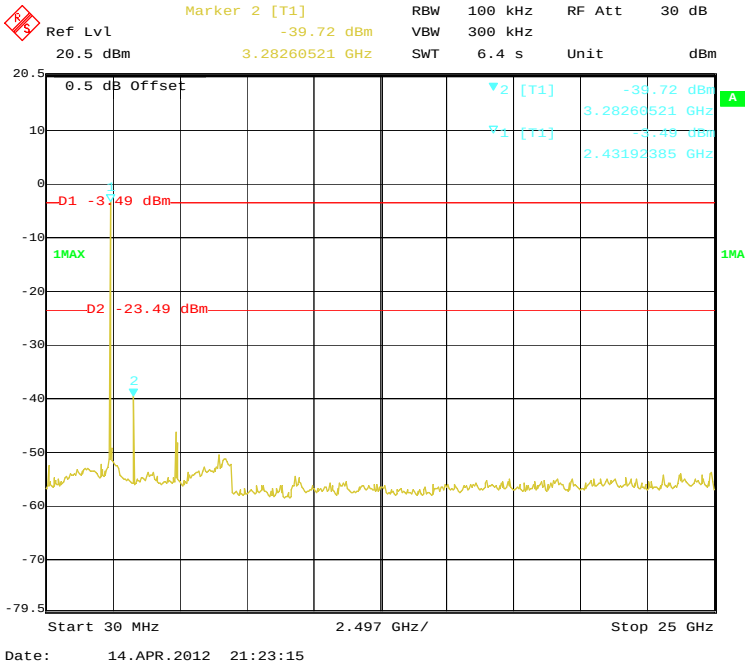
802.11n-HT20 Low Channel



802.11n-HT20 Middle Channel



802.11n-HT20 High Channel



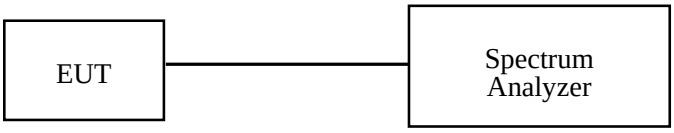
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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 Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

*** 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 Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	56%
ATM Pressure:	100.0kPa

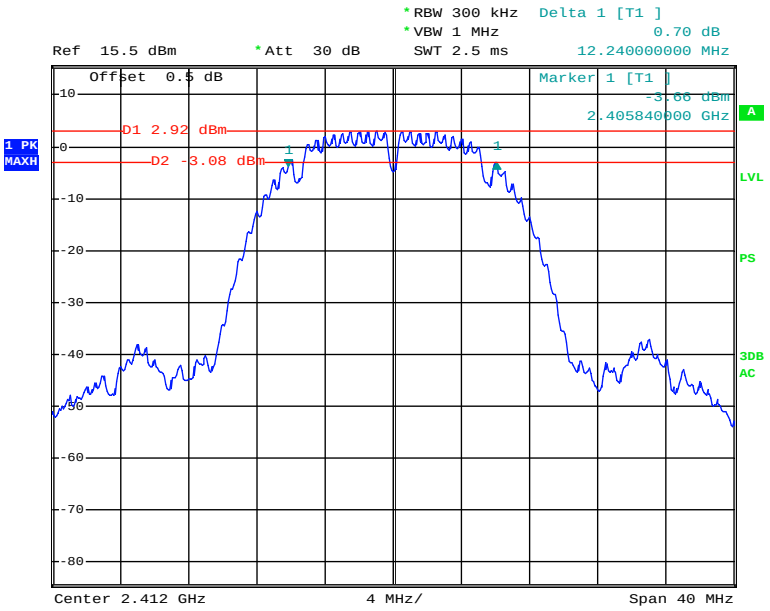
The testing was performed by Jimmy Xiao on 2012-04-11.

Test Result: Pass.

Please refer to the following tables and plots.

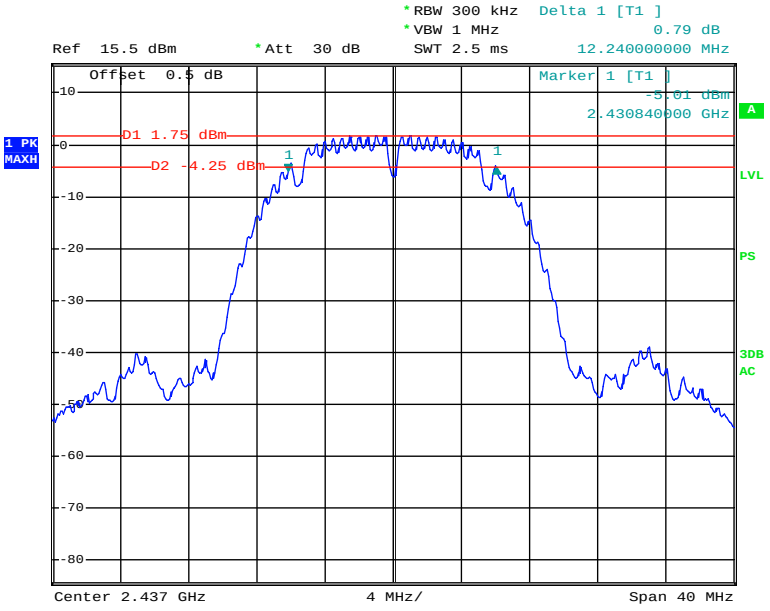
Channel	Frequency (MHz)	Data Rate (Mbps)	6dB bandwidth (MHz)	Limit (kHz)	Result
802.11b mode					
Low	2412	1	12.24	>500	Pass
Middle	2437	1	12.24	>500	Pass
High	2462	1	12.24	>500	Pass
802.11g mode					
Low	2412	6	16.48	>500	Pass
Middle	2437	6	16.48	>500	Pass
High	2462	6	16.48	>500	Pass
802.11 n-HT20 mode					
Low	2412	6.5	17.44	>500	Pass
Middle	2437	6.5	17.44	>500	Pass
High	2462	6.5	17.44	>500	Pass

802.11b Low Channel



Date: 11.APR.2012 20:02:40

802.11b Middle Channel



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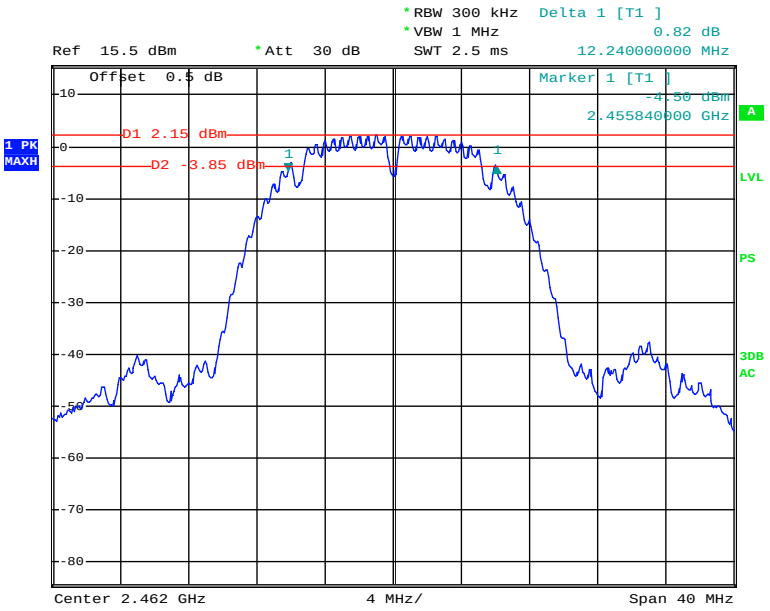
802.11b High Channel



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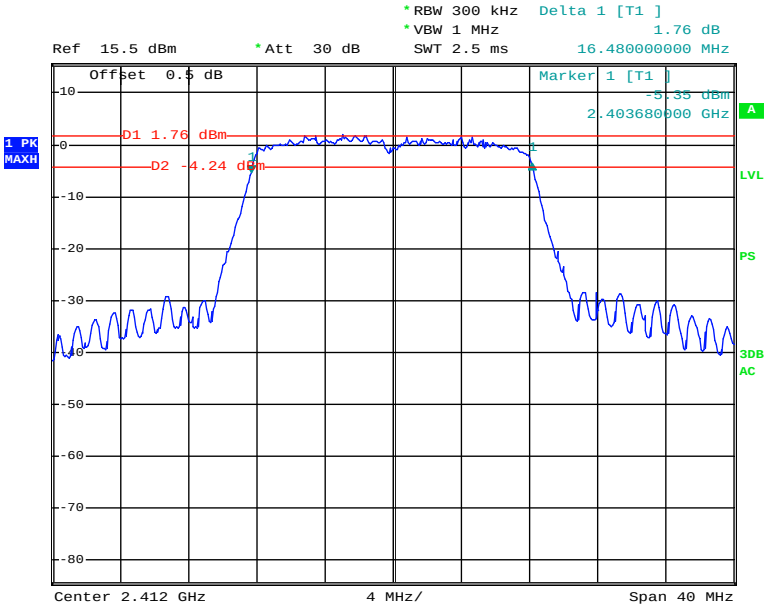
802.11g Low Channel



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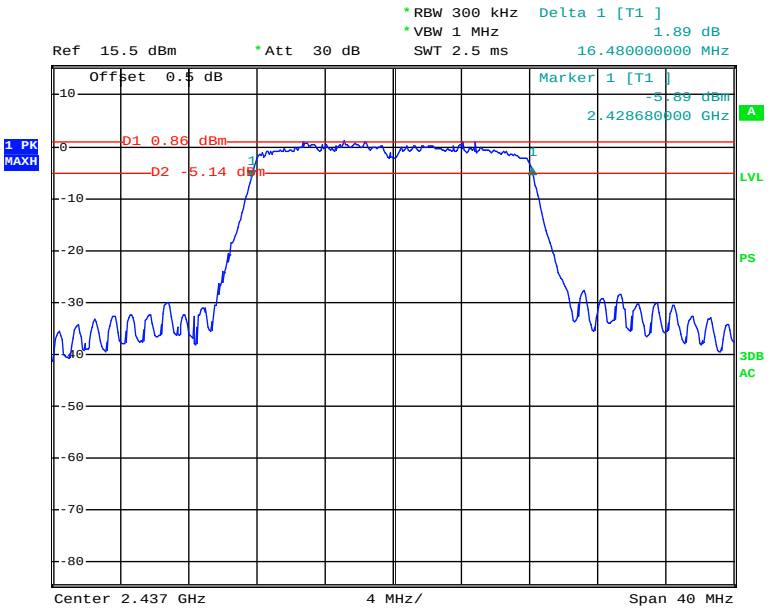
802.11g Middle Channel



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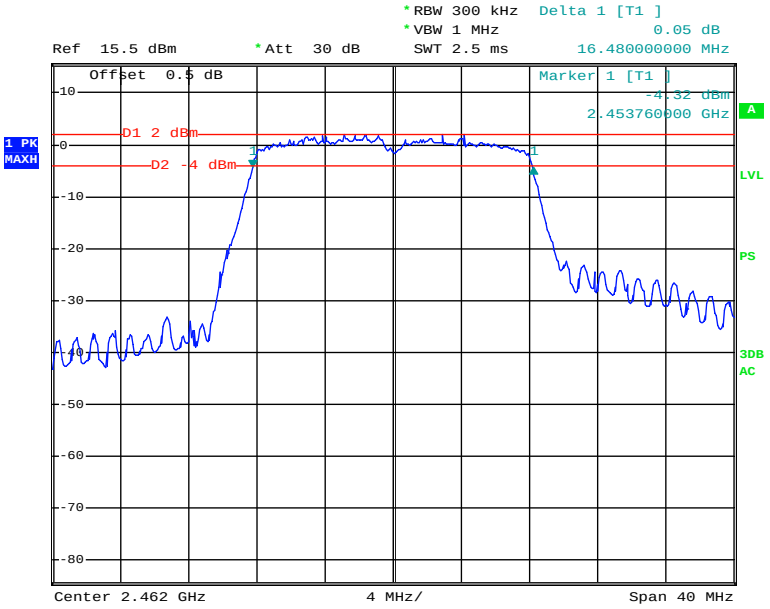
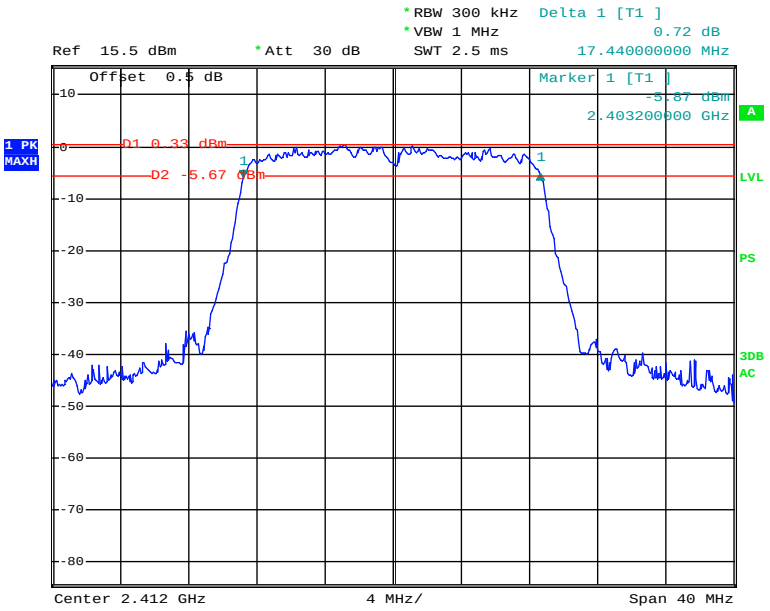
802.11g High Channel



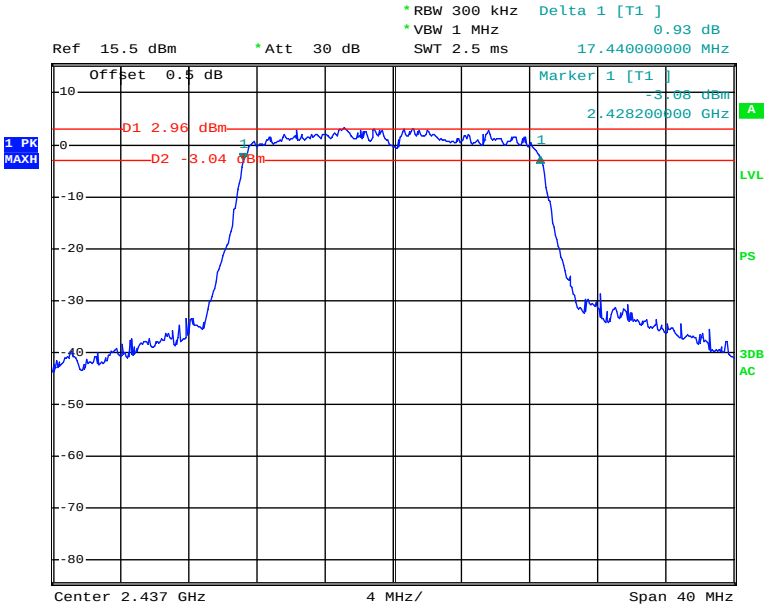
Date: 11.APR.2012 20:46:00

802.11n-HT20 Low Channel



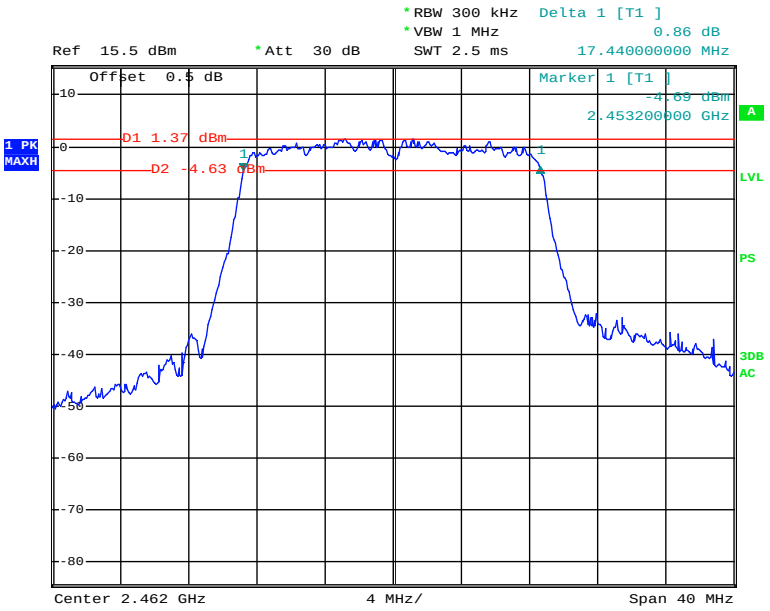
Date: 11.APR.2012 21:09:46

802.11n-HT20 Middle Channel



Date: 11.APR.2012 21:10:49

802.11n-HT20 High Channel



Date: 11.APR.2012 21:12:20

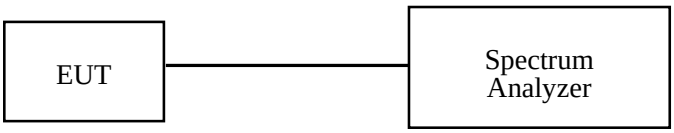
FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

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.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI Test Receiver.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

*** 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 Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

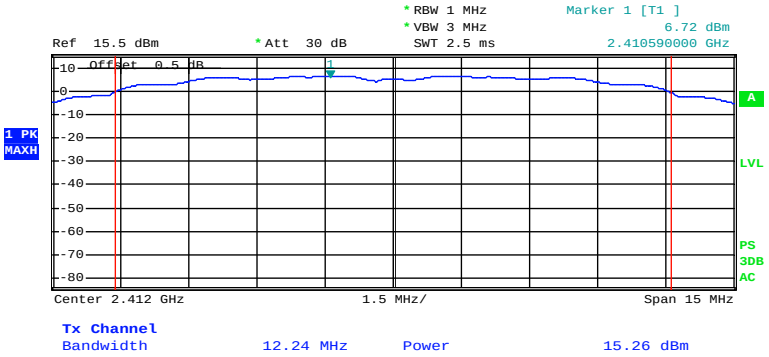
The testing was performed by Jimmy Xiao on 2012-04-11.

Test Mode: Transmitting

Test Result: Compliance. Please refer to the following table and plots:

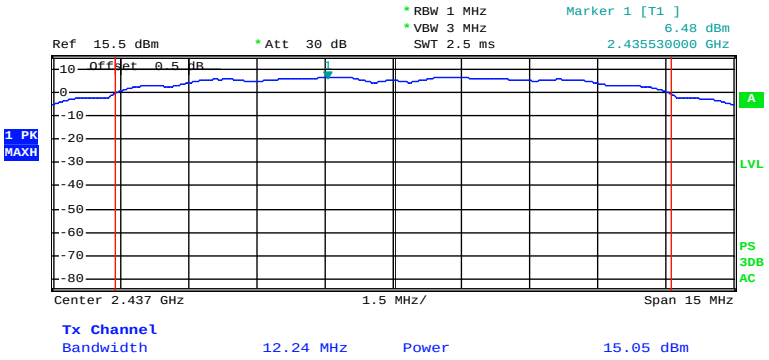
Channel	Frequency (MHz)	Data Rate (Mbps)	Reading Power (dBm)	Limit (dBm)	Result
802.11b mode					
Low	2412	1	15.26	30	Pass
Middle	2437	1	15.05	30	Pass
High	2462	1	15.24	30	Pass
802.11g mode					
Low	2412	6	14.68	30	Pass
Middle	2437	6	14.48	30	Pass
High	2462	6	15.16	30	Pass
802.11n-HT20 mode					
Low	2412	6.5	14.77	30	Pass
Middle	2437	6.5	14.46	30	Pass
High	2462	6.5	14.89	30	Pass

802.11b RF Output Power, Low Channel



Date: 11.APR.2012 20:11:13

802.11b RF Output Power, Middle Channel



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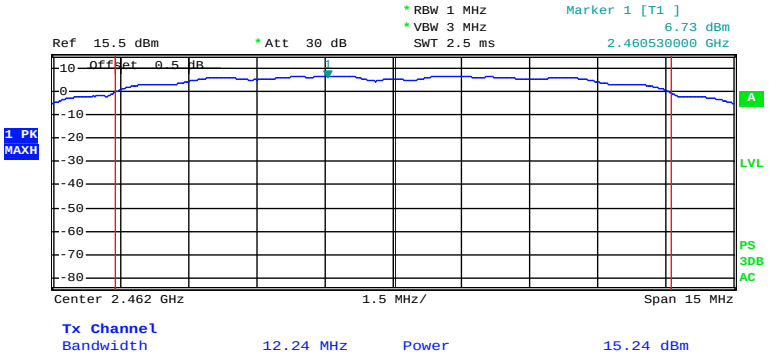
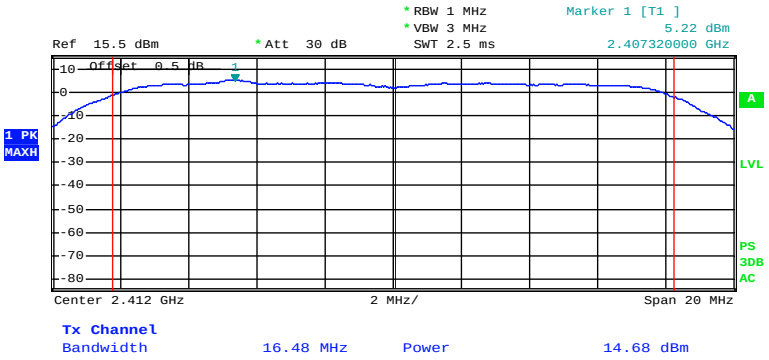
802.11b RF Output Power, High Channel



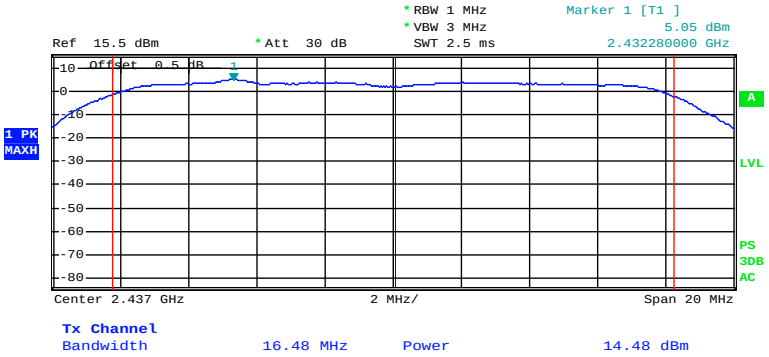
Date: 11.APR.2012 20:35:21

802.11g RF Output Power, Low Channel



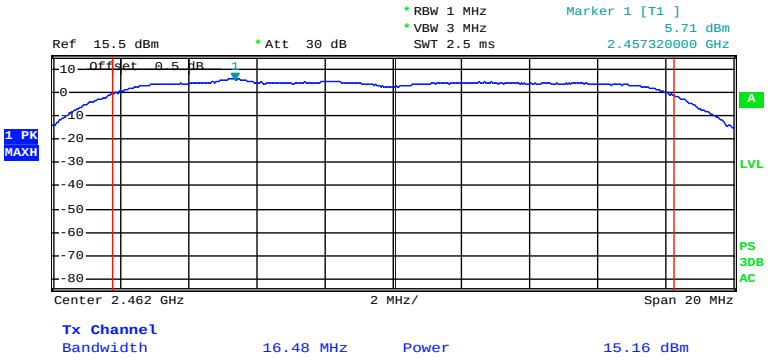
Date: 11.APR.2012 20:58:05

802.11g RF Output Power, Middle Channel



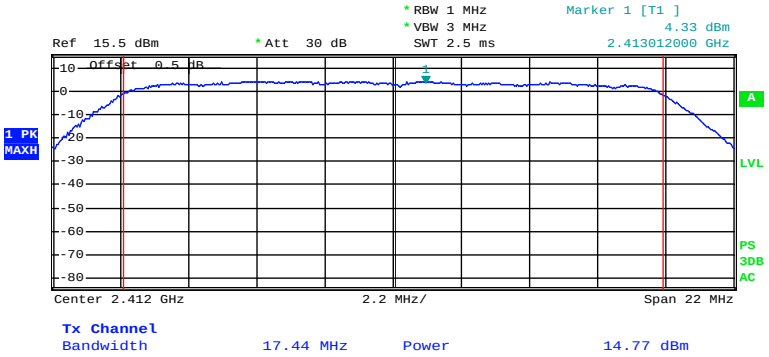
Date: 11.APR.2012 20:55:26

802.11g RF Output Power, High Channel



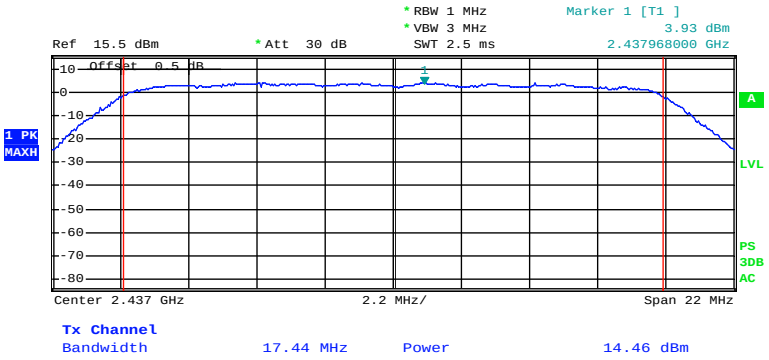
Date: 11.APR.2012 20:49:23

802.11n-HT20 RF Output Power, Low Channel



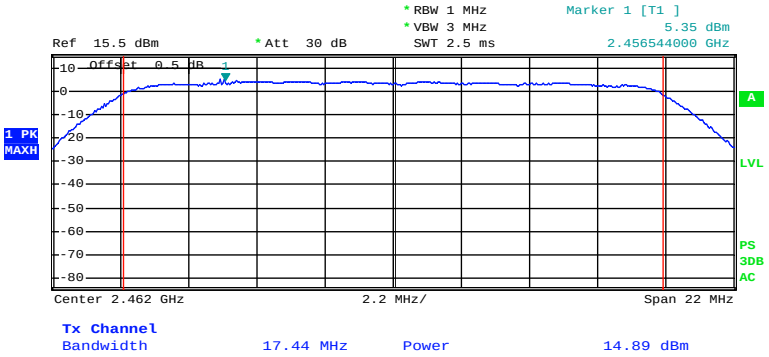
Date: 11.APR.2012 21:16:46

802.11n-HT20 RF Output Power, Middle Channel



Date: 11.APR.2012 21:15:49

802.11n-HT20 RF Output Power, High Channel



Date: 11.APR.2012 21:14:33

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 Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

*** 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 Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

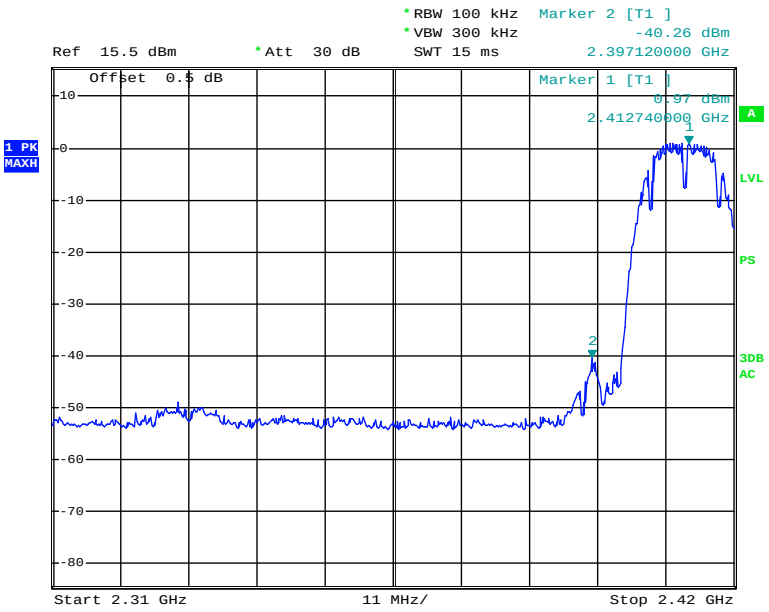
The testing was performed by Jimmy Xiao on 2012-04-11.

Test Result: *Compliance*

Please refer to the following table and plots:

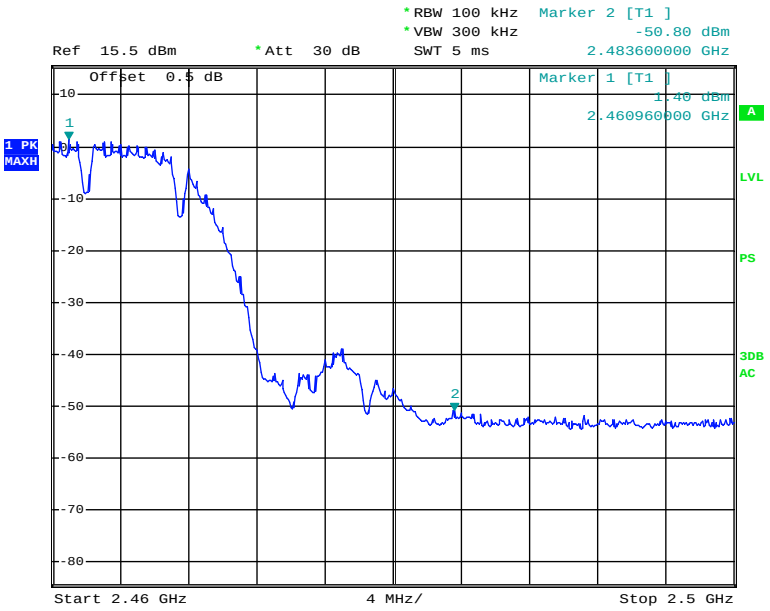
Channel	Frequency (MHz)	Delta Peak to band emission (dBc)	Delta Limit (dBc)	Result
802.11b mode				
Low	2397.12	41.23	20	Pass
High	2483.60	52.20	20	Pass
802.11g mode				
Low	2398.88	36.77	20	Pass
High	2483.68	40.71	20	Pass
802.11n-HT20 mode				
Low	2399.10	39.36	20	Pass
High	2483.6	48.28	20	Pass

802.11b: Band Edge, Left Side



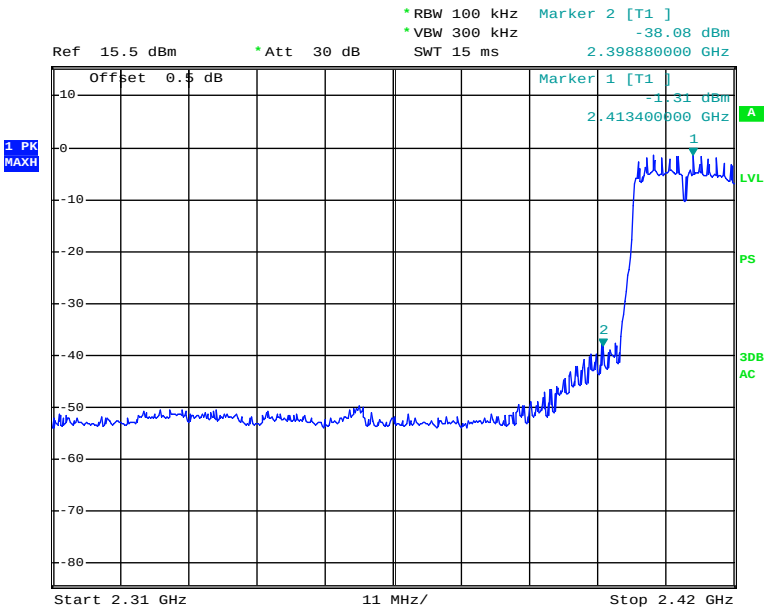
Date: 11.APR.2012 20:15:02

802.11b: Band Edge, Right Side



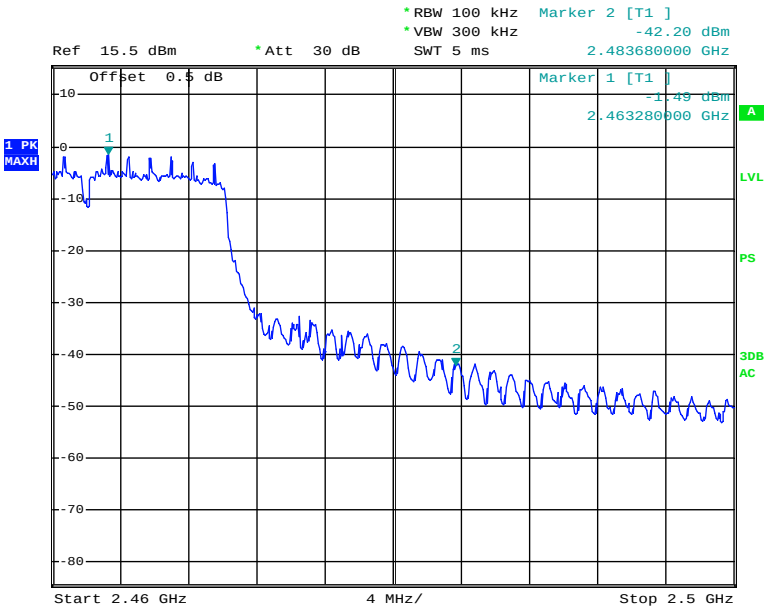
Date: 11.APR.2012 20:40:06

802.11g: Band Edge, Left Side



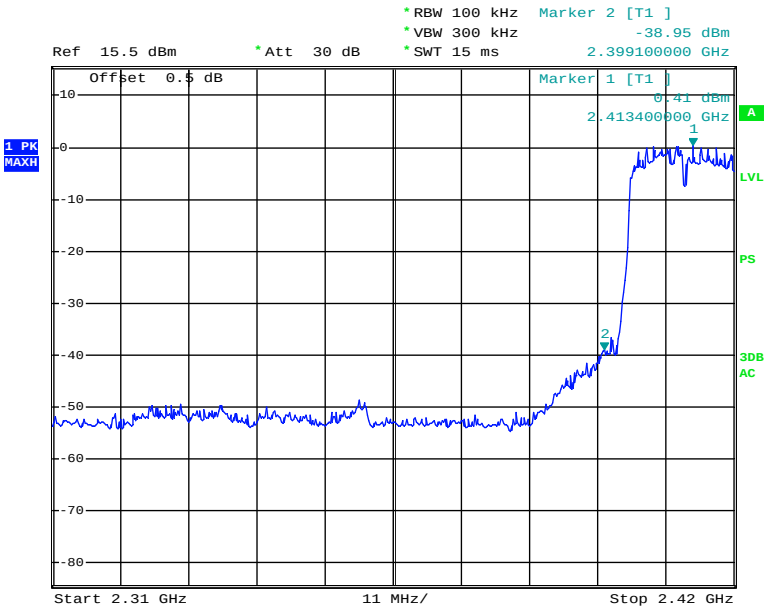
Date: 11.APR.2012 21:04:22

802.11g: Band Edge, Right Side



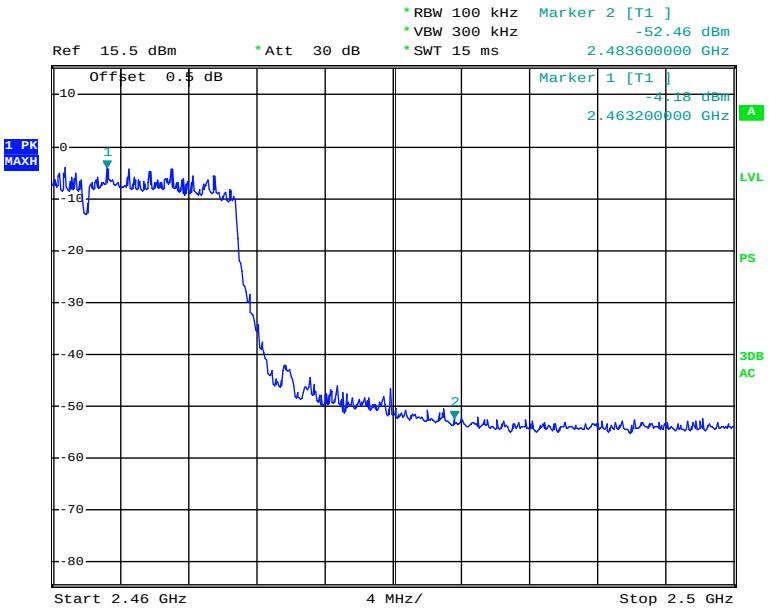
Date: 11.APR.2012 21:02:48

802.11n-HT20: Band Edge, Left Side



Date: 11.APR.2012 21:29:55

802.11n-HT20: Band Edge, Right Side



Date: 11.APR.2012 21:28:52

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 Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 100 kHz, VBW ≥ 300 kHz, set the span to 5-30 % greater than the EBW.
4. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
5. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

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

Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Jimmy Xiao on 2012-04-11.

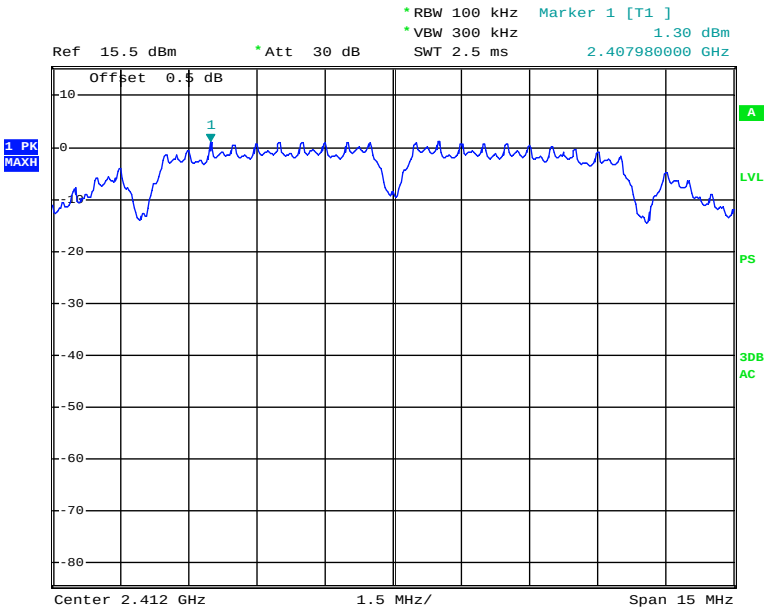
Test Mode: Transmitting

Test Result: Pass

Please refer to the following table and plots

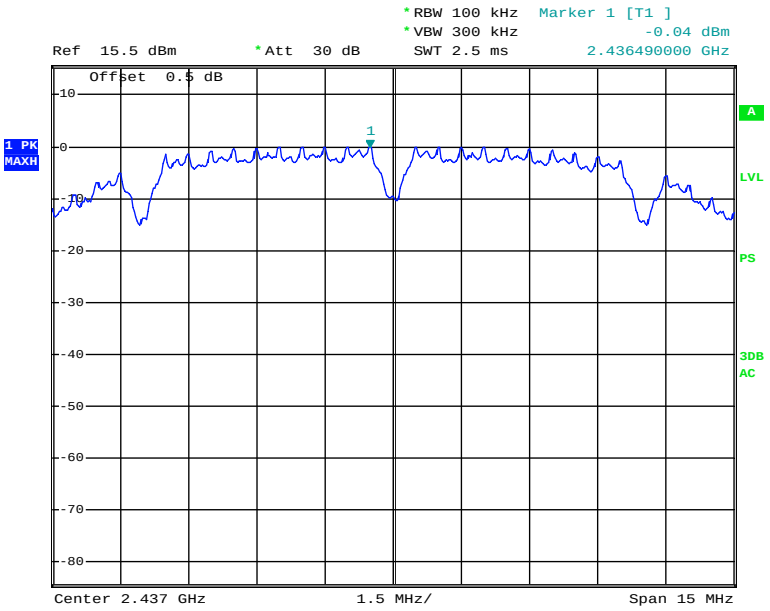
Channel	Frequency (MHz)	Data Rate (Mbps)	Power spectral density (dBm/100kHz)	Corrected Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11b mode						
Low	2412	1	1.30	-13.90	8	Pass
Middle	2437	1	-0.04	-15.24	8	Pass
High	2462	1	0.46	-14.74	8	Pass
802.11g mode						
Low	2412	6	-1.79	-16.99	8	Pass
Middle	2437	6	-1.92	-17.12	8	Pass
High	2462	6	-1.36	-16.56	8	Pass
802.11n-HT20 mode						
Low	2412	6.5	-3.64	-18.84	8	Pass
Middle	2437	6.5	-3.30	-18.50	8	Pass
High	2462	6.5	-4.06	-19.26	8	Pass

Power Spectral Density, 802.11b Low Channel



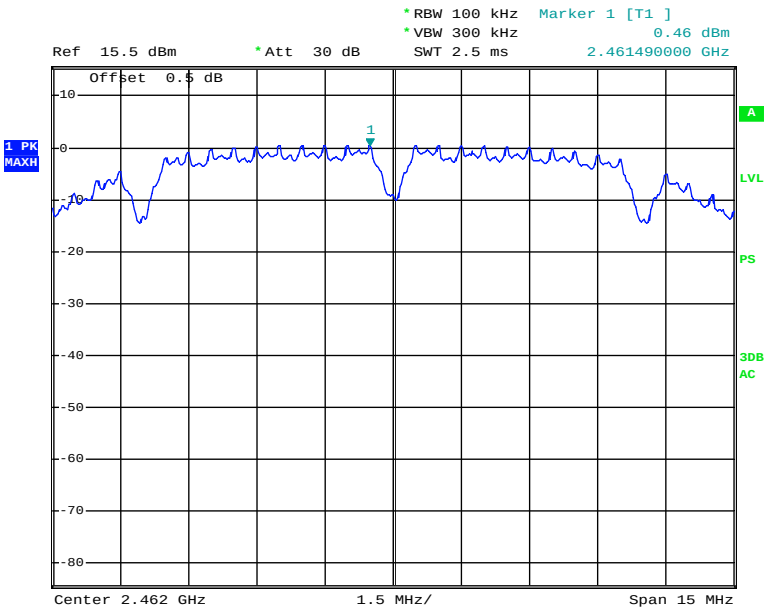
Date: 11.APR.2012 20:33:02

Power Spectral Density, 802.11b Middle Channel



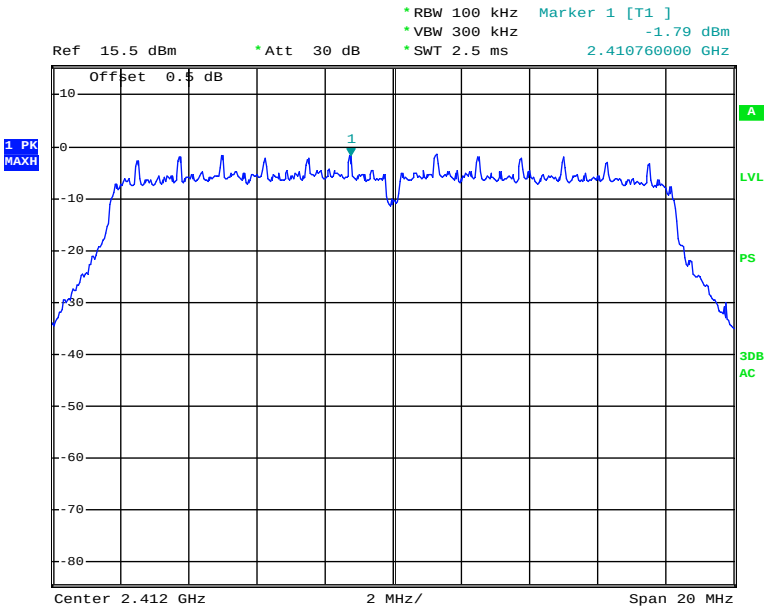
Date: 11.APR.2012 20:32:40

Power Spectral Density, 802.11b High Channel



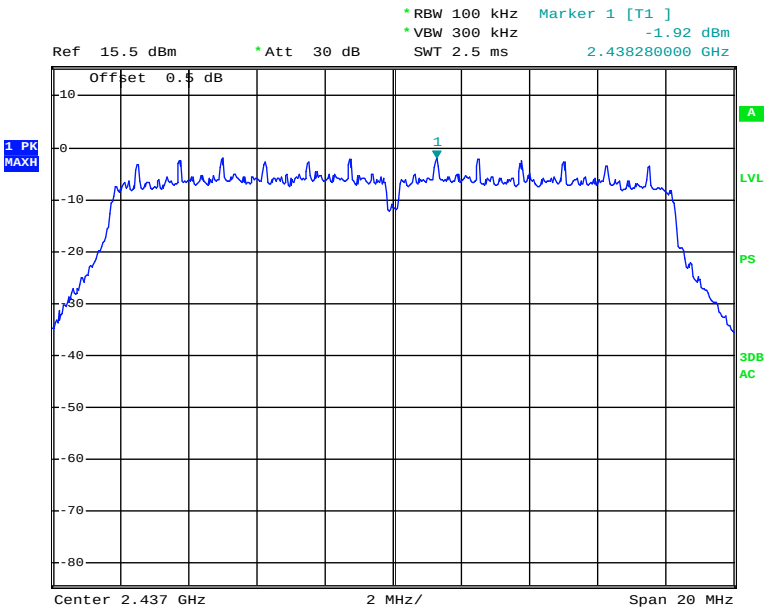
Date: 11.APR.2012 20:31:33

Power Spectral Density, 802.11g Low Channel



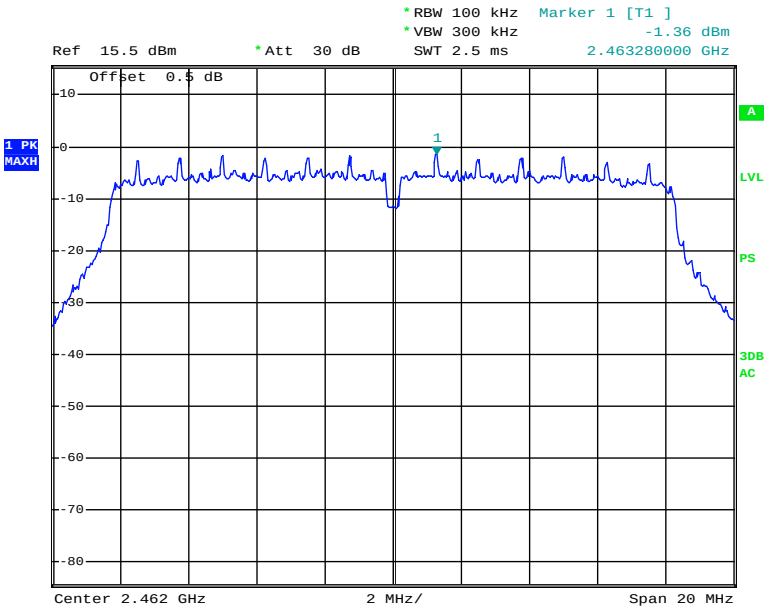
Date: 11.APR.2012 21:23:03

Power Spectral Density, 802.11g Middle Channel



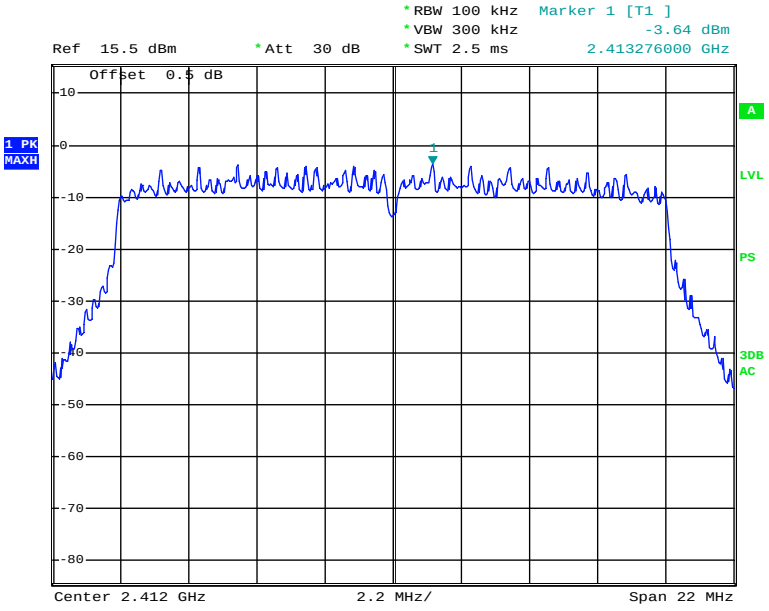
Date: 11.APR.2012 20:59:08

Power Spectral Density, 802.11g High Channel



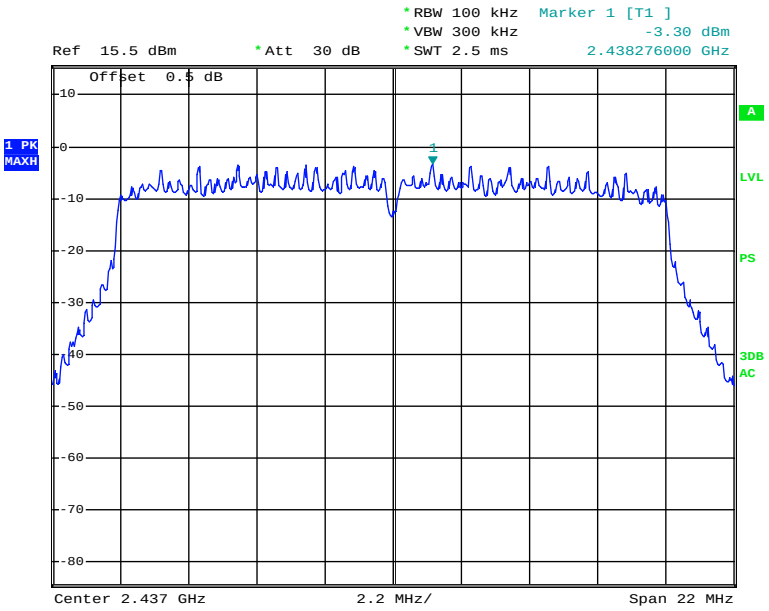
Date: 11.APR.2012 20:59:43

Power Spectral Density, 802.11n-HT20 Low Channel



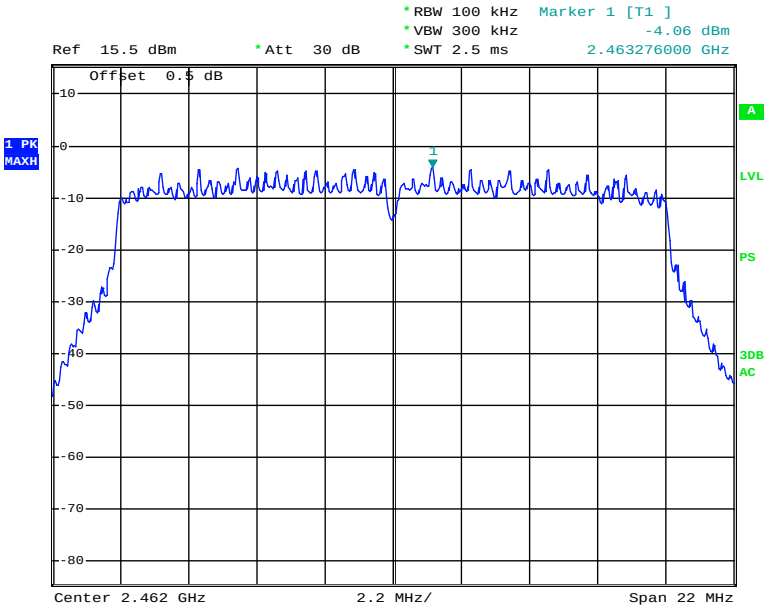
Date: 11.APR.2012 21:25:01

Power Spectral Density, 802.11n-HT20 Middle Channel



Date: 11.APR.2012 21:26:17

Power Spectral Density, 802.11n-HT20 High Channel



Date: 11.APR.2012 21:27:25

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