

FCC PART 15.247

TEST REPORT

For

**SHENZHEN TENDA TECHNOLOGY CO., LTD.**

Tenda Industrial Park, No. 34-1, Shilong Rd., Shiyan Town, Bao'an District, Shenzhen, P.R.China

**FCC ID: V7TA5**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless N Travel Router
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<b>Report Number:</b>	R1DG120405003-00A
<b>Report Date:</b>	2012-04-26
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\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *SHENZHEN TENDA TECHNOLOGY CO., LTD.*'s product, model number: A5 (FCC ID: V7TA5) or ("EUT") in this report is a Wireless N Travel Router, which was measured approximately: 8.2cm (L) x 2.8 cm (W) x 7.0 cm (H), rated input voltage: 100-240V~ 50/60 Hz 0.6 A. The operating frequency for 802.11b/g/n20 were 2412-2462 MHz and n40 were 2422-2452MHz.

*\* All measurement and test data in this report was gathered from production sample serial number: 1204052 (Assigned by BACL). The EUT was received on 2012-04-12.*

### Objective

This report is prepared on behalf of *SHENZHEN TENDA TECHNOLOGY CO., LTD.* 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 the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

### Related Submittal(s)/Grant(s)

FCC Part 15B JBP submissions with FCC ID: V7TA5.

### 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  $\pm 0.96$  dB, the uncertainty of any radiation on emissions measurement is  $\pm 4.0$  dB

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) 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 February 02, 2012. 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.: 273710. 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, 802.11n20 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 n20 modes were tested with Channel 1, 6 and 11.

For 802.11n40 mode, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2422	6	2447
2	2427	7	2452
3	2432	/	/
4	2437	/	/
5	2442	/	/

EUT was tested with Channel 1, 4 and 7.

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 data rates bandwidths, and modulations.

### EUT Exercise Software

The test was performed under “*Duck 1.1.9*” which was provided by the manufacturer:

### Equipment Modifications

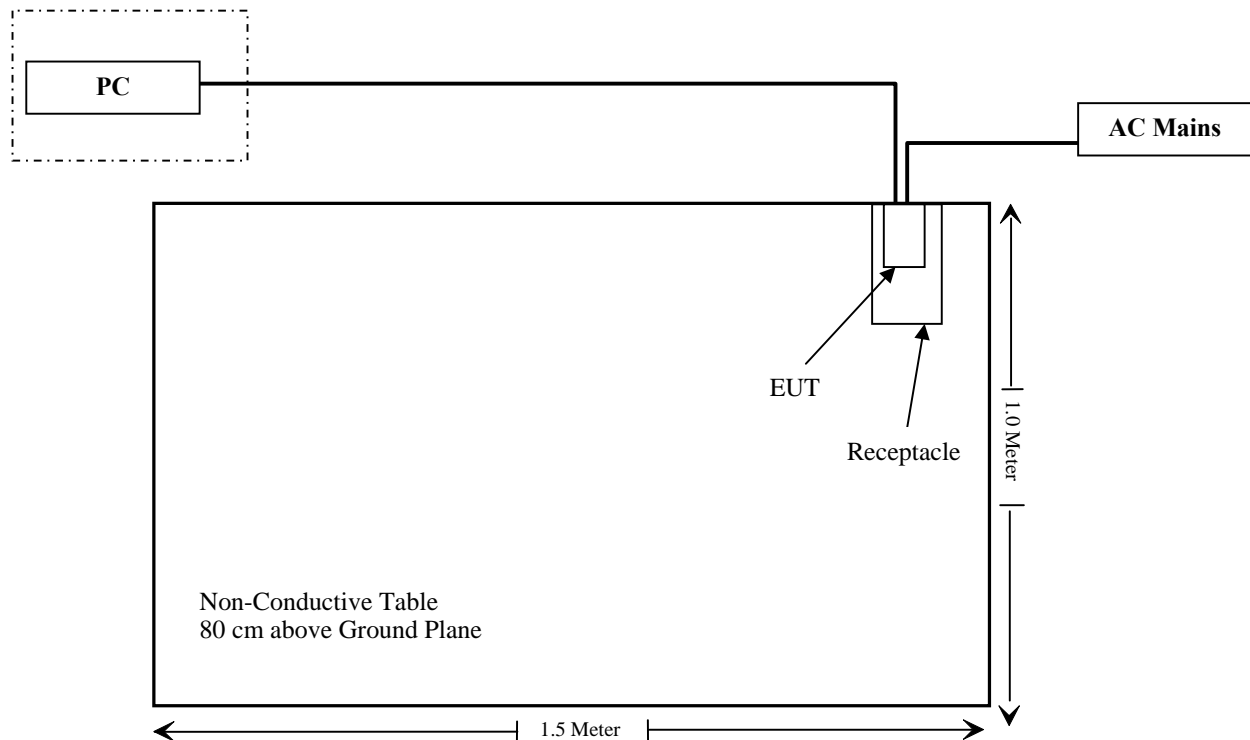
No modification was made to the EUT tested.

**Remote Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
DELL	PC	GX620	CK2Z891

**External I/O Cable**

Cable Description	Length (m)	From/Port	To
RJ 45 Cable	10	EUT	PC

**Block Diagram of Test Setup**

**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 Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	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) & §1.1307 (b) (1) & §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 <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	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<sup>2</sup>);

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 <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412	1	1.259	16.71	46.88	20	0.01175	1.0
802.11g	2412	1	1.259	16.19	41.59	20	0.01042	1.0
802.11n20	2437	1	1.259	16.05	40.27	20	0.01009	1.0
802.11n40	2422	1	1.259	15.03	31.84	20	0.00798	1.0

**Result:** The device meet FCC MPE at 20cm distance

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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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 a PCB antenna, which complied with 15.203, the maximum gain is 1.0dBi, please refer to the internal photos.

**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

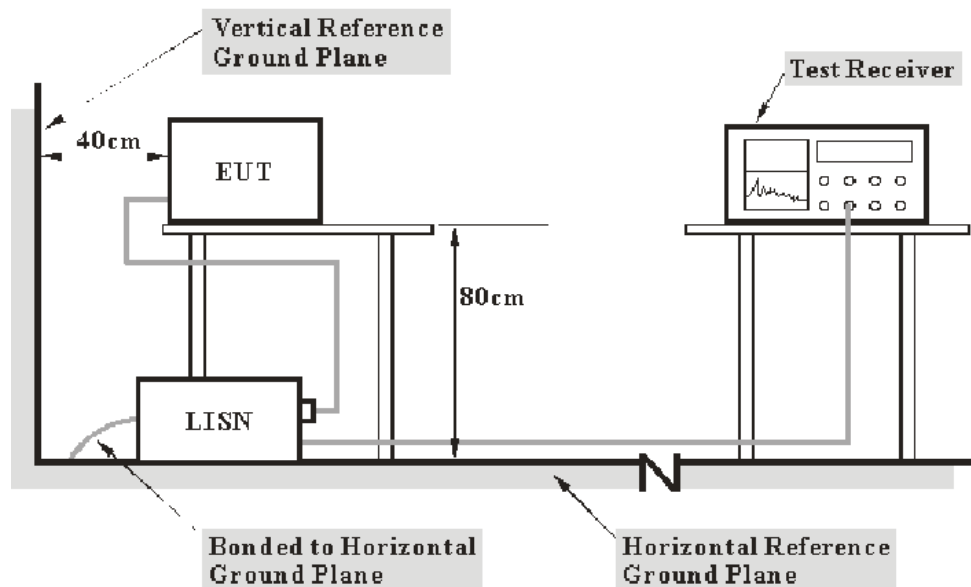
FCC§15.207

### 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  $\pm 2.4$  dB (k=2, 95% level of confidence).

### 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 spacing between the peripherals was 10 cm.

The EUT 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:

<b><i>Frequency Range</i></b>	<b><i>IF B/W</i></b>
150 kHz – 30 MHz	9 kHz

## Test Procedure

During the conducted emission test, the notebook 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245	2011-11-24	2012-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-11-17	2012-11-16

\* **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:

**12.66 dB at 0.515 MHz in the Neutral conducted mode**

## Test Data

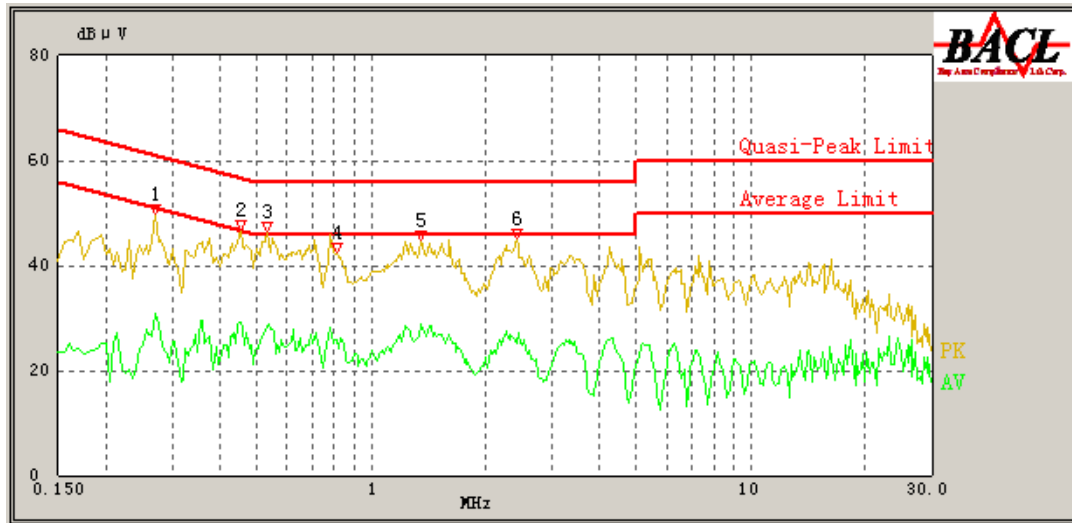
### Environmental Conditions

<b>Temperature:</b>	25 ° C
<b>Relative Humidity:</b>	48 %
<b>ATM Pressure:</b>	100.0 kPa

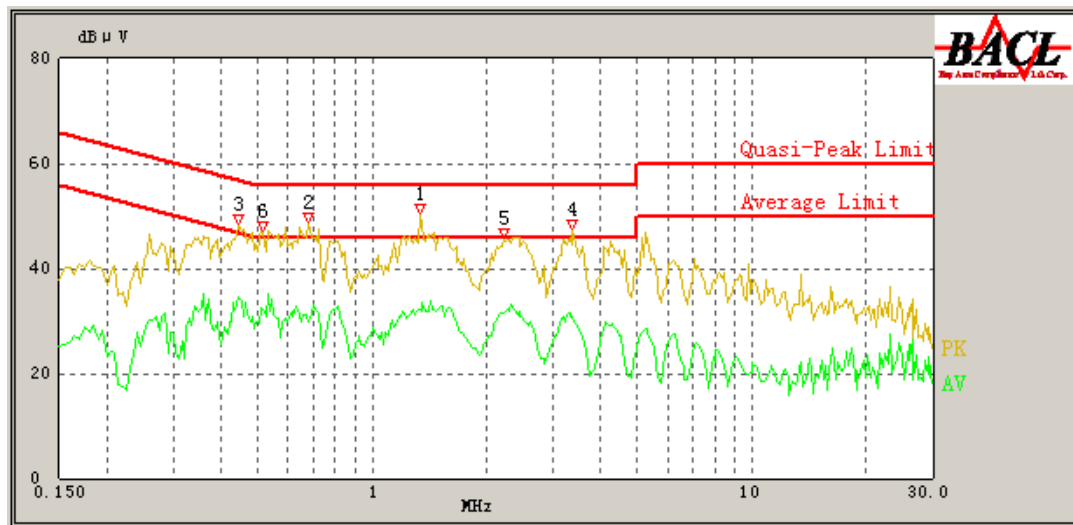
*The testing was performed by Bin Jiang on 2012-04-12.*

*Test Mode: Transmitting*

120 V, 60 Hz, Line:



Frequency (MHz)	Corrected Result (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK /QP/Ave.)
0.530	39.28	0.42	56.00	16.72	QP
1.355	28.68	0.46	46.00	17.32	Ave
0.455	39.76	0.42	57.29	17.53	QP
0.530	28.28	0.42	46.00	17.72	Ave
1.355	38.25	0.46	56.00	17.75	QP
0.810	37.80	0.44	56.00	18.20	QP
0.455	29.08	0.42	47.29	18.21	Ave
2.410	37.15	0.48	56.00	18.85	QP
0.810	25.94	0.44	46.00	20.06	Ave
2.415	25.24	0.48	46.00	20.76	Ave
0.270	30.71	0.42	52.57	21.86	Ave
0.270	39.97	0.42	62.57	22.60	QP

**120V, 60 Hz, Neutral:**

Frequency (MHz)	Corrected Result (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK /QP/Ave.)
0.515	43.34	0.42	56.00	12.66	QP
0.445	34.37	0.42	47.57	13.20	Ave
0.680	42.54	0.44	56.00	13.46	QP
0.445	43.57	0.42	57.57	14.00	QP
1.345	31.89	0.46	46.00	14.11	Ave
0.520	31.75	0.42	46.00	14.25	Ave
2.225	31.65	0.48	46.00	14.35	Ave
1.335	40.97	0.46	56.00	15.03	QP
3.375	30.86	0.49	46.00	15.14	Ave
2.225	40.82	0.48	56.00	15.18	QP
3.375	40.42	0.49	56.00	15.58	QP
0.680	29.90	0.44	46.00	16.10	Ave

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

### Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

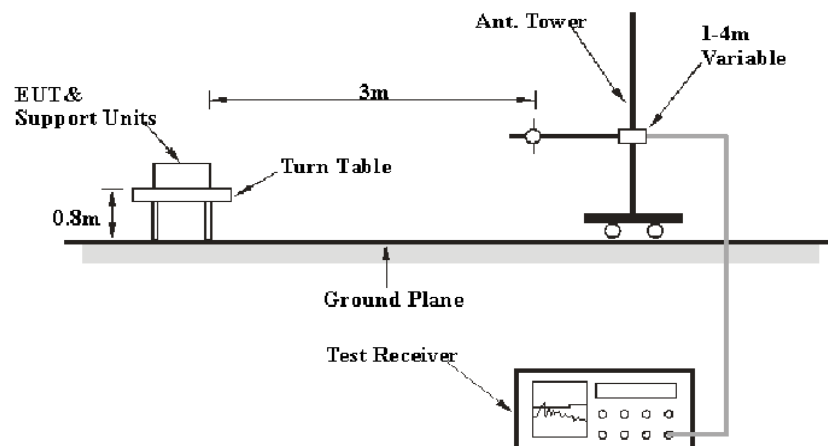
### Measurement Uncertainty

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.

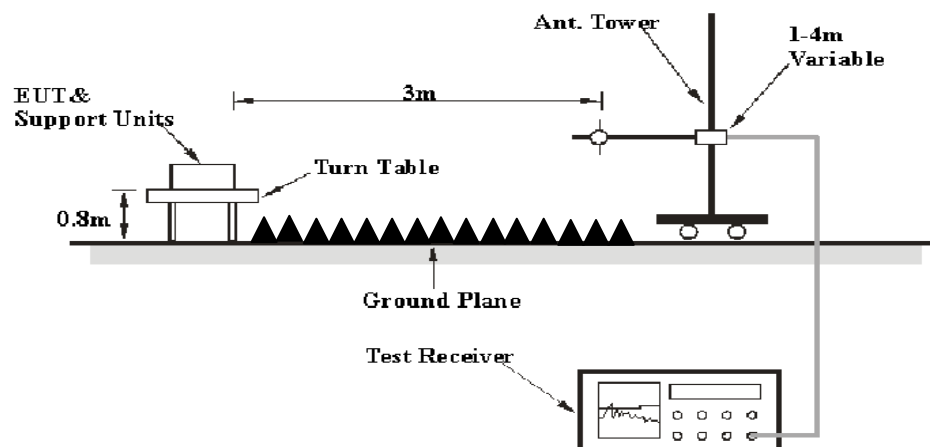
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB(k=2, 95% level of confidence) .

### EUT Setup

#### Below 1GHz:



#### Above 1GHz:



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 spacing between the peripherals was 10 cm.

The EUT 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:

<i><b>Frequency Range</b></i>	<i><b>RBW</b></i>	<i><b>Video B/W</b></i>	<i><b>Detector</b></i>
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	Ave.

### Test Procedure

During the radiated emission test, the notebook 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, 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$



**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-08-02	2012-08-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-07-05	2012-07-04
Mini-circuits	Amplifier	ZVA-213+	T-E27H	2011-11-24	2012-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

\* **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, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

**2.17 dB at 2390MHz in the vertical polarization (802.11n mode)**

**Test Data****Environmental Conditions**

Temperature:	25 ° C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

*The testing was performed by Bin Jiang on 2012-04-13 to 2012-04-19.*

**1).30MHz-25GHz***Mode: Transmitting*

802.11b Mode:

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Comment
Low Channel (2412MHz)								
2390	15.08	Ave.	V	35.36	50.44	54	3.56*	spurious
2390	14.67	Ave.	H	35.36	50.03	54	3.97*	spurious
4824	35.03	Ave.	V	10.79	45.82	54	8.18	Harmonic
4824	34.26	Ave.	H	10.79	45.05	54	8.95	Harmonic
2390	26.32	PK	V	35.36	61.68	74	12.32	spurious
2390	25.5	PK	H	35.36	60.86	74	13.14	spurious
400.01	35.69	QP	V	-2.98	32.71	46	13.29	spurious
400.01	34.53	QP	H	-2.98	31.55	46	14.45	spurious
4824	46.32	PK	V	10.79	57.11	74	16.89	Harmonic
4824	45.41	PK	H	10.79	56.2	74	17.8	Harmonic
2412	70.08	PK	H	35.53	105.61	N/A	N/A	Fundamental
2412	64.83	Ave.	H	35.53	100.36	N/A	N/A	Fundamental
2412	76.37	PK	V	35.53	111.9	N/A	N/A	Fundamental
2412	65.48	Ave.	V	35.53	101.01	N/A	N/A	Fundamental
Middle Channel (2437MHz)								
4874	37.03	Ave.	V	11.08	48.11	54	5.89	Harmonic
4874	36.99	Ave.	H	11.08	48.07	54	5.93	Harmonic
400.01	35.83	QP	V	-2.98	32.85	46	13.15	spurious
4874	48.63	PK	V	11.08	59.71	74	14.29	Harmonic
400.01	34.66	QP	H	-2.98	31.68	46	14.32	spurious
4874	48.42	PK	H	11.08	59.5	74	14.5	Harmonic
2437	71.49	PK	H	35.58	107.07	N/A	N/A	Fundamental
2437	66.27	Ave.	H	35.58	101.85	N/A	N/A	Fundamental
2437	76.58	PK	V	35.58	112.16	N/A	N/A	Fundamental
2437	66.32	Ave.	V	35.58	101.9	N/A	N/A	Fundamental
High Channel (2462MHz)								
2483.5	15.23	Ave.	V	35.4	50.63	54	3.37*	spurious
2483.5	14.21	Ave.	H	35.4	49.61	54	4.39	spurious
400.32	37.14	QP	V	-2.97	34.17	46	11.83	spurious
2483.5	25.88	PK	V	35.4	61.28	74	12.72	spurious
2483.5	25.34	PK	H	35.4	60.74	74	13.26	spurious
400.32	35.21	QP	H	-2.97	32.24	46	13.76	spurious
4924	18.63	Ave.	V	10.98	29.61	54	24.39	Harmonic
4924	18.47	Ave.	H	10.98	29.45	54	24.55	Harmonic
4924	28.19	PK	V	10.98	39.17	74	34.83	Harmonic
4924	28.04	PK	H	10.98	39.02	74	34.98	Harmonic
2462	70.09	PK	H	35.53	105.62	N/A	N/A	Fundamental
2462	65.88	Ave.	H	35.54	101.42	N/A	N/A	Fundamental
2462	75.36	PK	V	35.54	110.9	N/A	N/A	Fundamental
2462	66.12	Ave.	V	35.54	101.66	N/A	N/A	Fundamental

\*Within measurement uncertainty!

802.11g Mode:

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dBmV/m)	Margin (dB)	Comment
Low Channel (2412MHz)								
2390	16.02	Ave.	V	35.36	51.38	54	2.62*	spurious
2390	15.3	Ave.	H	35.36	50.66	54	3.34*	spurious
4824	36.94	Ave.	V	10.79	47.73	54	6.27	Harmonic
4824	36.48	Ave.	H	10.79	47.27	54	6.73	Harmonic
2390	27.46	PK	V	35.36	62.82	74	11.18	spurious
2390	27.07	PK	H	35.36	62.43	74	11.57	spurious
400.57	36.88	QP	V	-2.98	33.9	46	12.1	spurious
400.66	35.02	QP	H	-2.98	32.04	46	13.96	spurious
4824	44.5	PK	V	10.79	55.29	74	18.71	Harmonic
4824	42.27	PK	H	10.79	53.06	74	20.94	Harmonic
2412	69.79	PK	H	35.53	105.32	N/A	N/A	Fundamental
2412	55.97	Ave.	H	35.53	91.5	N/A	N/A	Fundamental
2412	73.26	PK	V	35.53	108.79	N/A	N/A	Fundamental
2412	56.34	Ave.	V	35.53	91.87	N/A	N/A	Fundamental
Middle Channel (2437MHz)								
400.41	36.52	QP	V	-2.98	33.54	46	12.46	spurious
400.43	36.01	QP	H	-2.98	33.03	46	12.97	spurious
4874	18.67	Ave.	V	11.08	29.75	54	24.25	Harmonic
4874	18.46	Ave.	H	11.08	29.54	54	24.46	Harmonic
4874	28.66	PK	H	11.08	39.74	74	34.26	Harmonic
4874	28.42	PK	V	11.08	39.5	74	34.5	Harmonic
2437	72.14	PK	H	35.58	107.72	N/A	N/A	Fundamental
2437	58.22	Ave.	H	35.58	93.8	N/A	N/A	Fundamental
2437	76.02	PK	V	35.58	111.6	N/A	N/A	Fundamental
2437	59.11	Ave.	V	35.58	94.69	N/A	N/A	Fundamental
High Channel (2462MHz)								
2483.5	15.63	Ave.	V	35.53	51.16	54	2.84*	spurious
2483.5	15.28	Ave.	H	35.53	50.81	54	3.19*	spurious
4924	38.44	Ave.	H	7.64	46.08	54	7.92	Harmonic
4924	37.64	Ave.	V	7.64	45.28	54	8.72	Harmonic
2483.5	27.55	PK	V	35.53	63.08	74	10.92	spurious
2483.5	27.01	PK	H	35.53	62.54	74	11.46	spurious
400.46	35.67	QP	V	-2.98	32.69	46	13.31	spurious
400.43	35.24	QP	H	-2.98	32.26	46	13.74	spurious
4924	19.82	PK	V	7.64	27.46	74	46.54	Harmonic
4924	19.63	PK	V	7.64	27.27	74	46.73	Harmonic
2462	71.37	PK	H	35.4	106.77	N/A	N/A	Fundamental
2462	57.16	Ave.	H	35.4	92.56	N/A	N/A	Fundamental
2462	75.44	PK	V	35.4	110.84	N/A	N/A	Fundamental
2462	58.31	Ave.	V	35.4	93.71	N/A	N/A	Fundamental

\*Within measurement uncertainty!

802.11n20 Mode:

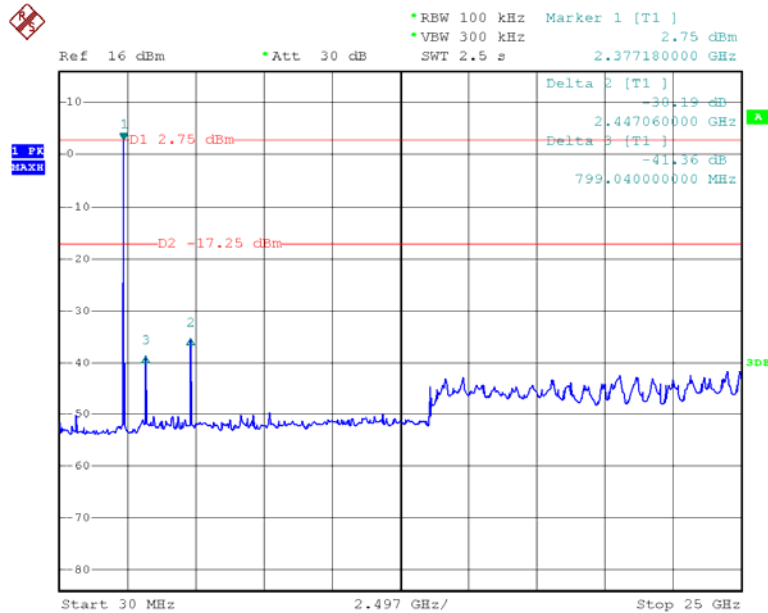
Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Comment
Low Channel (2412MHz)								
2390	36.47	PK	V	35.36	71.83	74	2.17*	spurious
2390	36.35	PK	H	35.36	71.71	74	2.29*	spurious
2390	15.69	Ave.	V	35.36	51.05	54	2.95*	spurious
2390	15.43	Ave.	H	35.36	50.79	54	3.21*	spurious
4824	38.46	Ave.	V	10.79	49.25	54	4.75	Harmonic
4824	36.36	Ave.	H	10.79	47.15	54	6.85	Harmonic
400.51	36.33	QP	V	-2.98	33.35	46	12.65	spurious
400.51	35.42	QP	H	-2.98	32.44	46	13.56	spurious
4824	49.33	PK	H	10.79	60.12	74	13.88	Harmonic
4824	48.76	PK	V	10.79	59.55	74	14.45	Harmonic
2412	69.77	PK	H	35.53	105.3	N/A	N/A	Fundamental
2412	56.29	Ave.	H	35.53	91.82	N/A	N/A	Fundamental
2412	72.41	PK	V	35.53	107.94	N/A	N/A	Fundamental
2412	56.38	Ave.	V	35.53	91.91	N/A	N/A	Fundamental
Middle Channel (2437MHz)								
4874	36.66	Ave.	V	11.08	47.74	54	6.26	Harmonic
4874	35.72	Ave.	H	11.08	46.8	54	7.2	Harmonic
400.12	36.56	QP	V	-2.98	33.58	46	12.42	spurious
400.11	35.44	QP	H	-2.98	32.46	46	13.54	spurious
4874	48.31	PK	V	11.08	59.39	74	14.61	Harmonic
4874	47.64	PK	H	11.08	58.72	74	15.28	Harmonic
2437	70.62	PK	H	35.58	106.2	N/A	N/A	Fundamental
2437	57.12	Ave.	H	35.58	92.7	N/A	N/A	Fundamental
2437	73.61	PK	V	35.58	109.19	N/A	N/A	Fundamental
2437	57.33	Ave.	V	35.58	92.91	N/A	N/A	Fundamental
High Channel (2462MHz)								
2483.5	15.82	Ave.	V	35.4	51.22	54	2.78*	spurious
2483.5	15.47	Ave.	H	35.4	50.87	54	3.13*	spurious
2483.5	29	PK	V	35.4	64.4	74	9.6	spurious
2483.5	28.98	PK	H	35.4	64.38	74	9.62	spurious
4924	35.67	Ave.	V	7.64	43.31	54	10.69	Harmonic
4924	35.58	Ave.	H	7.64	43.22	54	10.78	Harmonic
400.41	36.44	QP	V	-2.98	33.46	46	12.54	spurious
400.34	35.55	QP	H	-2.98	32.57	46	13.43	spurious
4924	50.12	PK	V	7.64	57.76	74	16.24	Harmonic
4924	49.54	PK	H	7.64	57.18	74	16.82	Harmonic
2462	72.08	PK	H	35.54	107.62	N/A	N/A	Fundamental
2462	57	Ave.	H	35.54	92.54	N/A	N/A	Fundamental
2462	74.62	PK	V	35.54	110.16	N/A	N/A	Fundamental
2462	57.22	Ave.	V	35.54	92.76	N/A	N/A	Fundamental

\*Within measurement uncertainty!

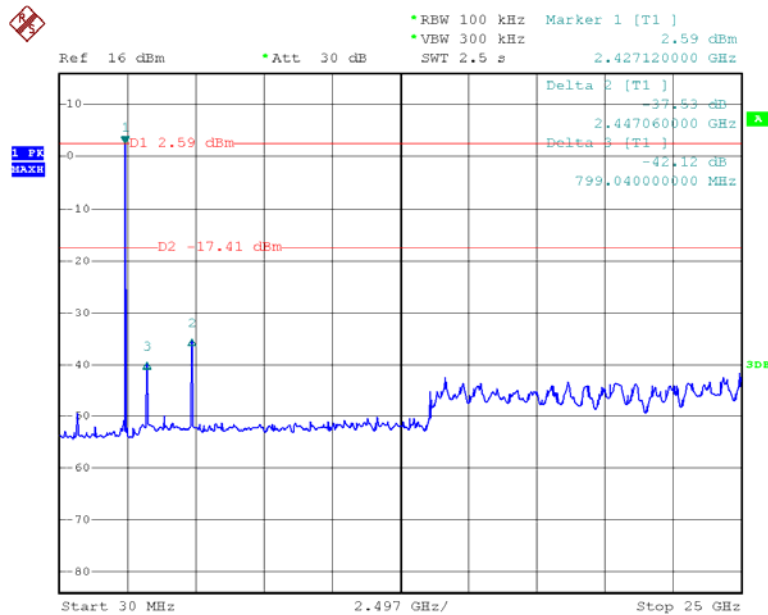
802.11n40 Mode:

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Comment
Low Channel (2412MHz)								
2390	16.03	Ave.	V	35.36	51.39	54	2.61*	spurious
2390	15.24	Ave.	H	35.36	50.6	54	3.4*	spurious
4844	39.42	Ave.	V	11.03	50.45	54	3.55*	Harmonic
4844	38.61	Ave.	H	11.03	49.64	54	4.36	Harmonic
2390	31.02	PK	V	35.36	66.38	74	7.62	spurious
2390	29.58	PK	H	35.36	64.94	74	9.06	spurious
400.43	36.99	QP	V	-2.98	34.01	46	11.99	spurious
4844	49.41	PK	V	11.03	60.44	74	13.56	Harmonic
400.42	35.24	QP	H	-2.98	32.26	46	13.74	spurious
4844	48.55	PK	H	11.03	59.58	74	14.42	Harmonic
2422	68.02	PK	H	36.41	104.43	N/A	N/A	Fundamental
2422	52.44	Ave.	H	36.41	88.85	N/A	N/A	Fundamental
2422	69.37	PK	V	36.41	105.78	N/A	N/A	Fundamental
2422	52.65	Ave.	V	36.41	89.06	N/A	N/A	Fundamental
Middle Channel (2437MHz)								
400.02	46.16	QP	H	-2.98	43.18	46	2.82*	spurious
4874	38.87	Ave.	V	11.08	49.95	54	4.05	Harmonic
4874	38.62	Ave.	H	11.08	49.7	54	4.3	Harmonic
400.76	35.47	QP	V	-2.98	32.49	46	13.51	spurious
4874	48.76	PK	V	11.08	59.84	74	14.16	Harmonic
4874	48.04	PK	H	11.08	59.12	74	14.88	Harmonic
2437	67.99	PK	V	35.59	103.58	N/A	N/A	Fundamental
2437	52.83	Ave.	V	35.59	88.42	N/A	N/A	Fundamental
2437	67.67	PK	H	35.59	103.26	N/A	N/A	Fundamental
2437	51.12	Ave.	H	35.59	86.71	N/A	N/A	Fundamental
High Channel (2452MHz)								
2483.5	15.77	Ave.	V	35.4	51.17	54	2.83*	spurious
2483.5	15.46	Ave.	H	35.4	50.86	54	3.14*	spurious
4904	38.97	Ave.	V	10.54	49.51	54	4.49	Harmonic
4904	38.63	Ave.	H	10.54	49.17	54	4.83	Harmonic
2483.5	32.04	PK	V	35.4	67.44	74	6.56	spurious
2483.5	31.76	PK	H	35.4	67.16	74	6.84	spurious
400.33	36.61	QP	V	-2.98	33.63	46	12.37	spurious
400.33	35.32	QP	H	-2.98	32.34	46	13.66	spurious
4904	49.15	PK	V	10.54	59.69	74	14.31	Harmonic
4904	47.96	PK	H	10.54	58.5	74	15.5	Harmonic
2452	68.03	PK	H	35.61	103.64	N/A	N/A	Fundamental
2452	50.78	Ave.	H	35.61	86.39	N/A	N/A	Fundamental
2452	69.24	PK	V	35.61	104.85	N/A	N/A	Fundamental
2452	51.39	Ave.	V	35.61	87	N/A	N/A	Fundamental

\*Within measurement uncertainty!

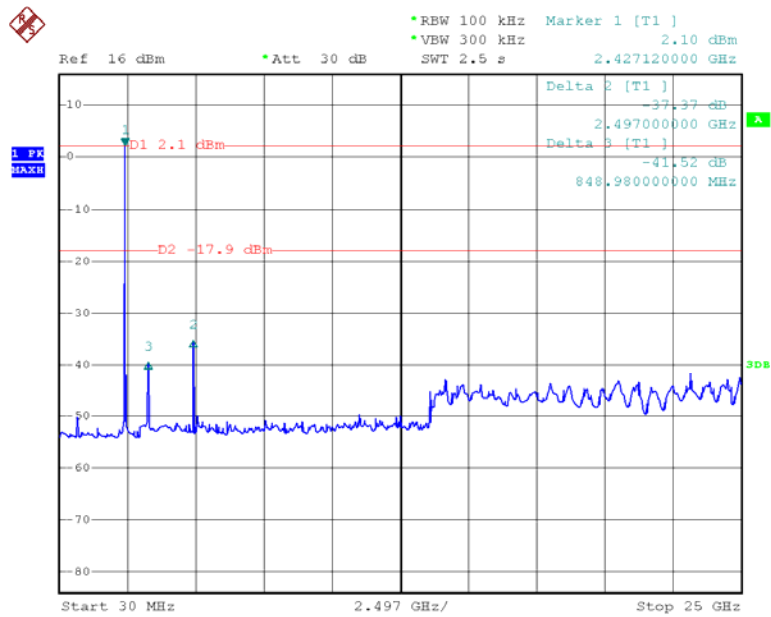
**Conducted Spurious Emissions at Antenna Port****802.11b Low Channel**

Date: 13.APR.2012 21:21:39

**802.11b Middle Channel**

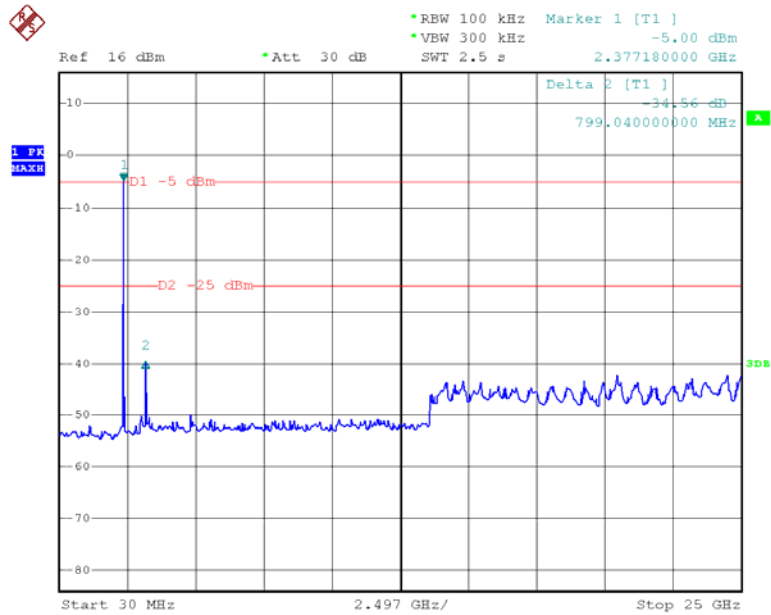
Date: 13.APR.2012 21:26:51

### 802.11b High Channel



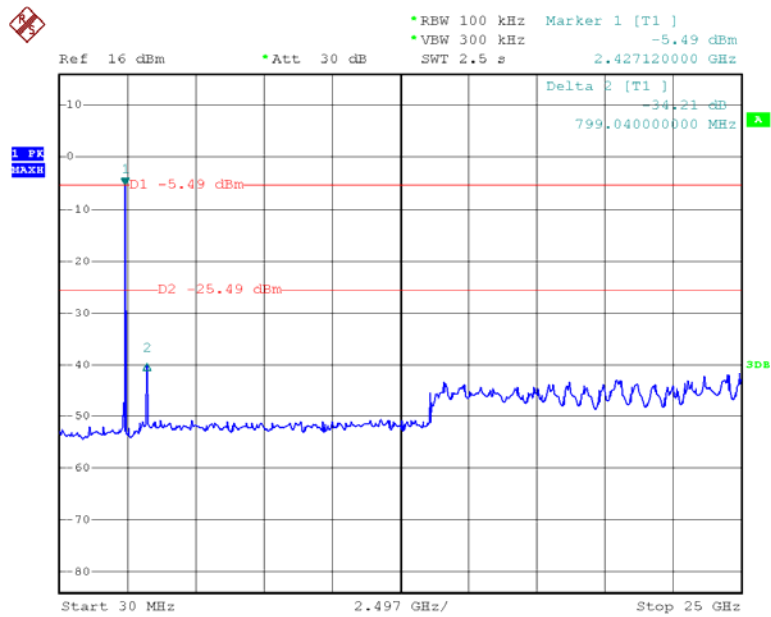
Date: 13.APR.2012 21:28:41

### 802.11g Low Channel



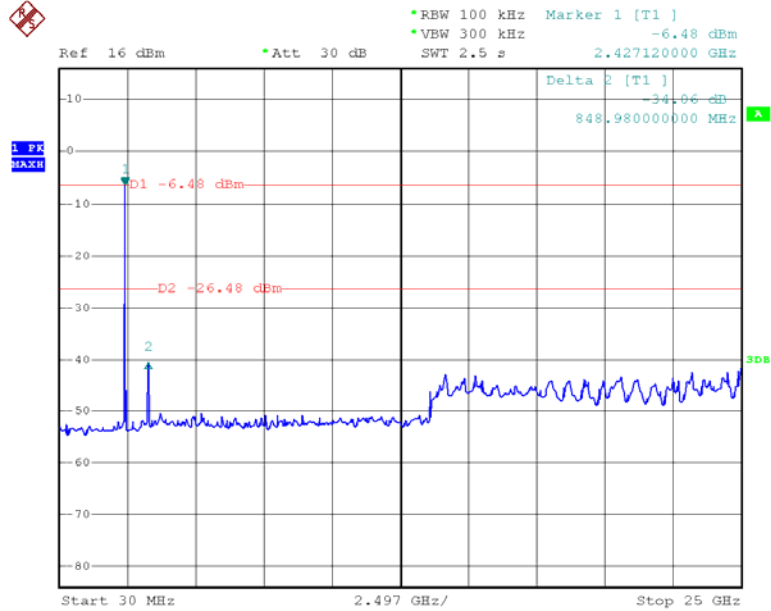
Date: 13.APR.2012 21:36:00

### 802.11g Middle Channel



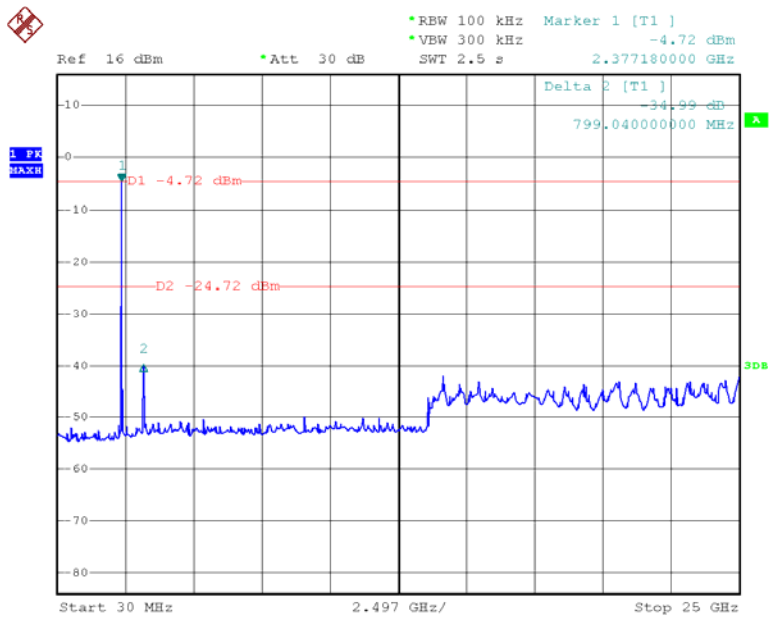
Date: 13.APR.2012 21:33:55

### 802.11g High Channel

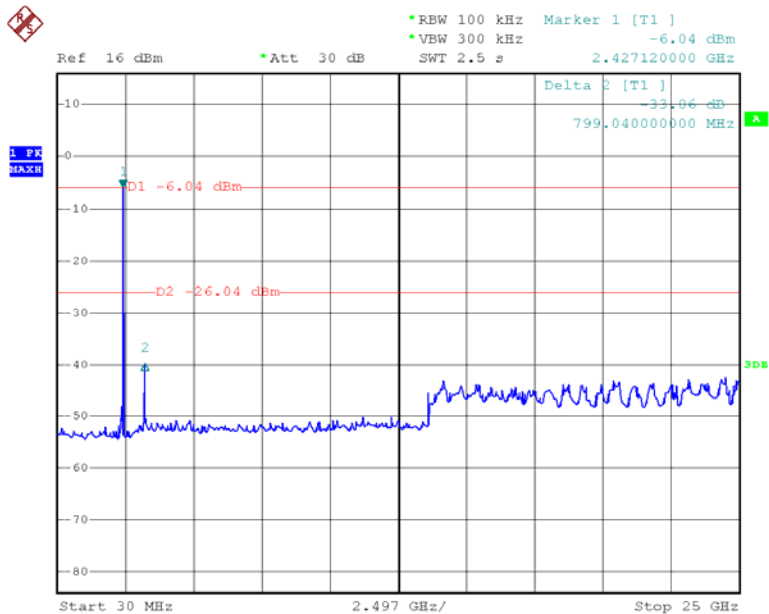


Date: 13.APR.2012 21:31:42



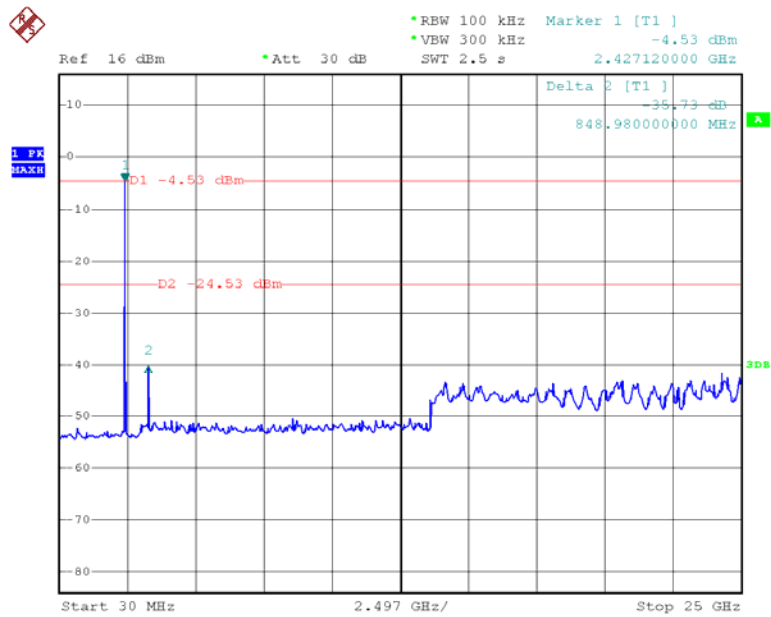
**802.11n20 Low Channel**

Date: 13.APR.2012 21:37:34

**802.11n20 Middle Channel**

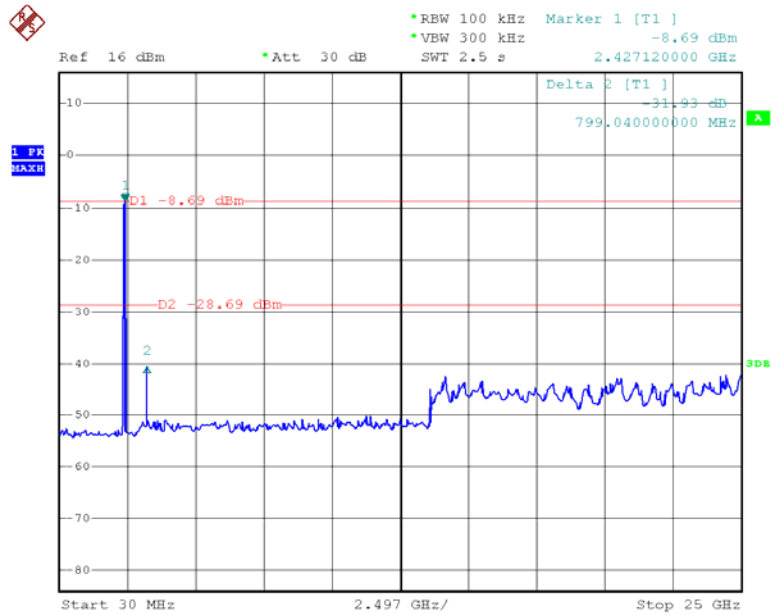
Date: 13.APR.2012 21:39:37

### 802.11n20 High Channel



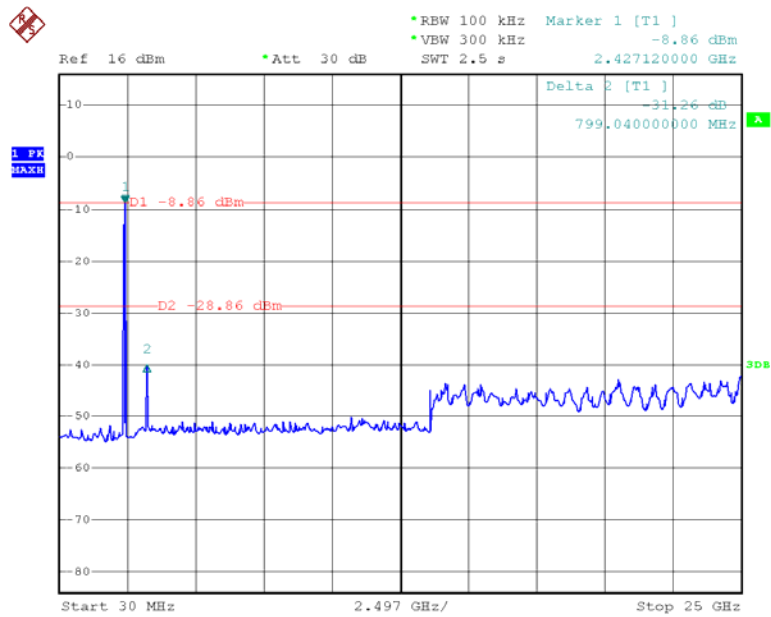
Date: 13.APR.2012 21:42:16

### 802.11n40 Low Channel



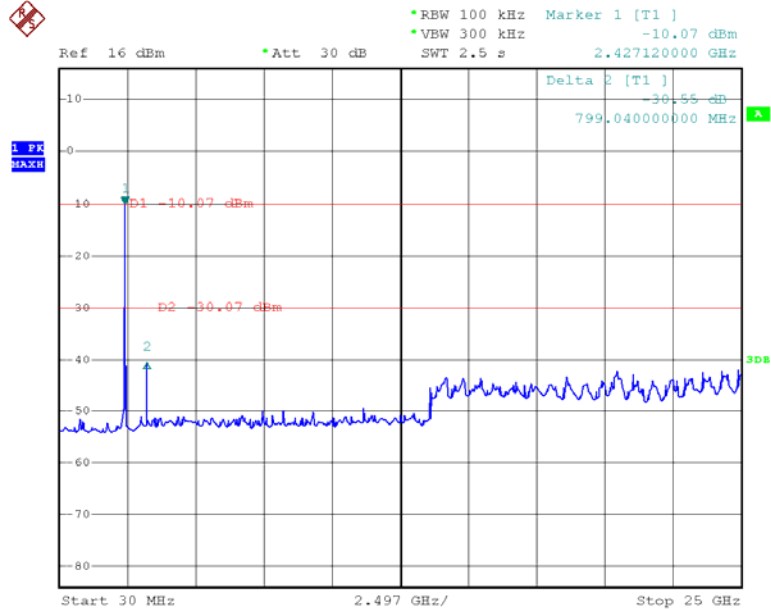
Date: 13.APR.2012 21:49:34

### 802.11n40 Middle Channel



Date: 13.APR.2012 21:46:41

### 802.11n40 High Channel



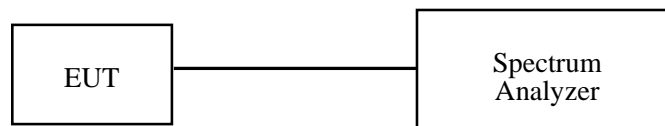
Date: 13.APR.2012 21:44:55

**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	100035	2011-11-11	2012-11-10

\* **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 ° C
Relative Humidity:	48 %
ATM Pressure:	100.0kPa

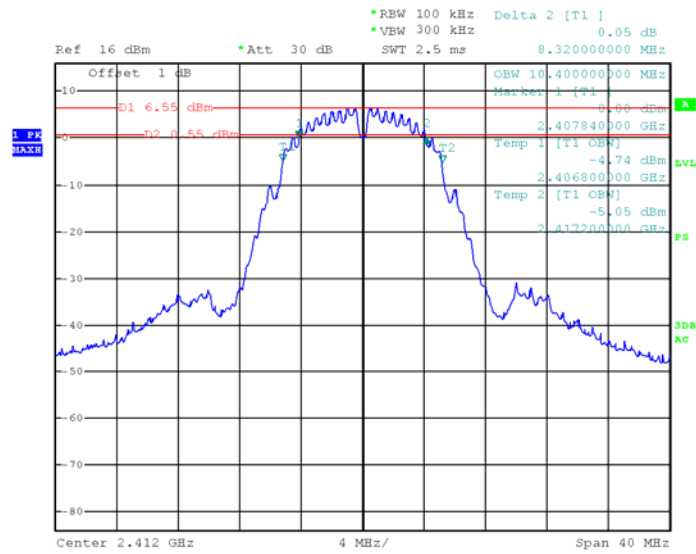
*The testing was performed by Bin Jiang on 2012-04-19.*

**Test Result:** Pass.

Please refer to the following tables and plots.

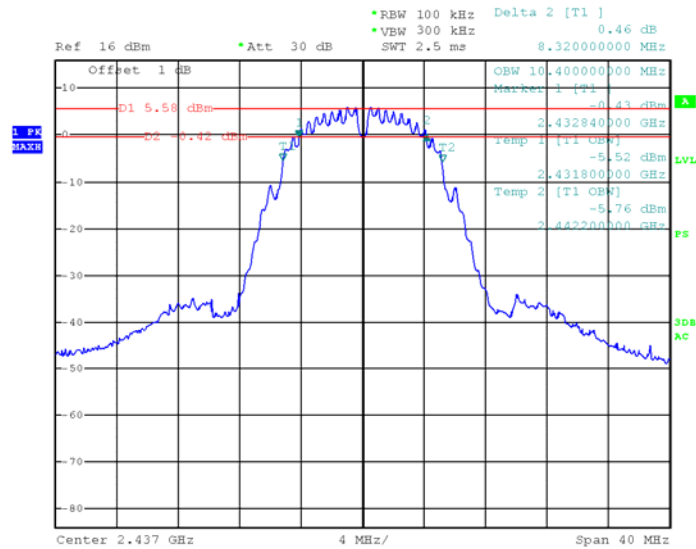
Channel	Frequency (MHz)	Data Rate (Mbps)	6 dB Bandwidth (MHz)	Limit (KHz)
802.11b mode				
Low	2412	1	8.32	>500
Middle	2437	1	8.32	>500
High	2462	1	8.32	>500
802.11g mode				
Low	2412	6	15.92	>500
Middle	2437	6	16.08	>500
High	2462	6	16.08	>500
802.11n20 mode				
Low	2412	6.5	17.2	>500
Middle	2437	6.5	16.96	>500
High	2462	6.5	17.28	>500
802.11n40 mode				
Low	2422	13.5	36.64	>500
Middle	2437	13.5	36.80	>500
High	2452	13.5	36.64	>500

### 802.11b Low Channel

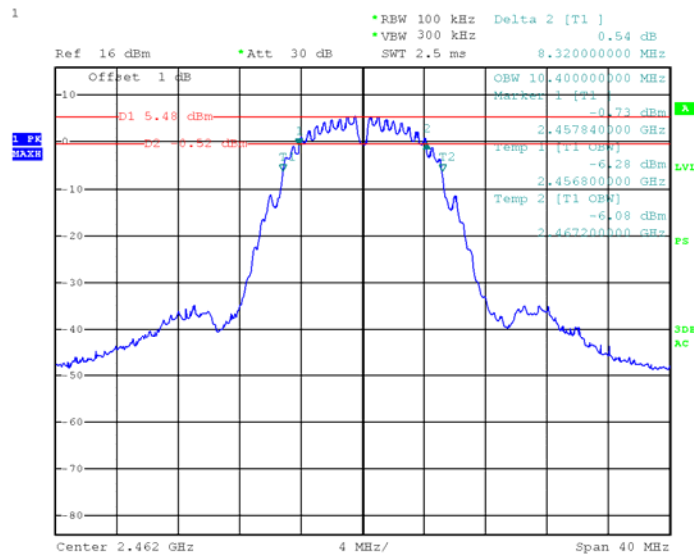


Date: 19.APR.2012 09:59:16

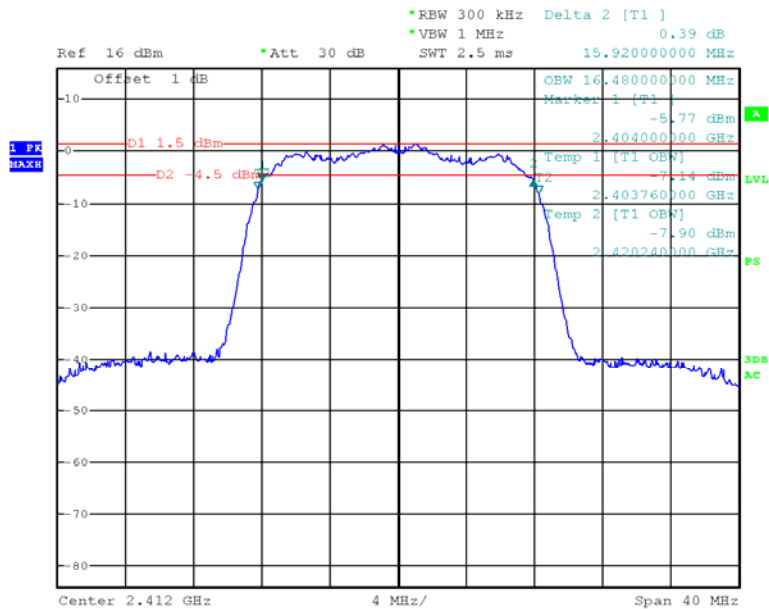
### 802.11b Middle Channel



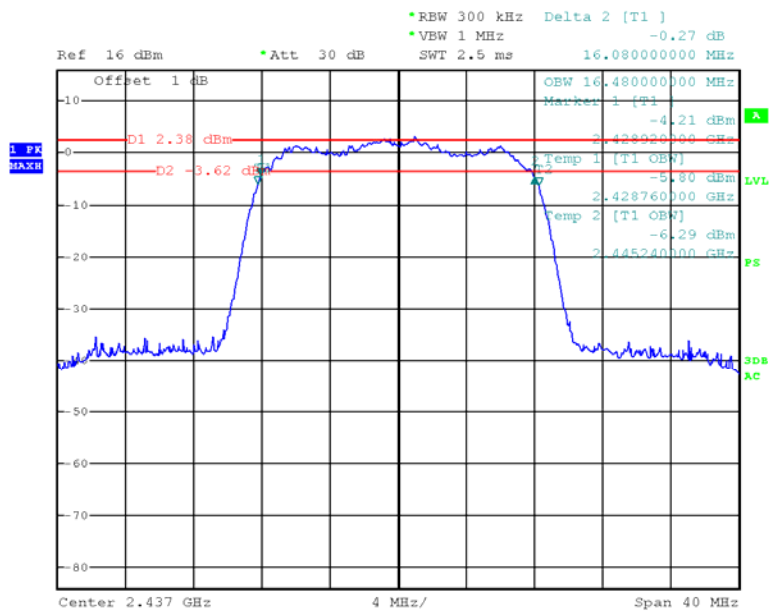
Date: 19.APR.2012 10:18:14

**802.11b High Channel**

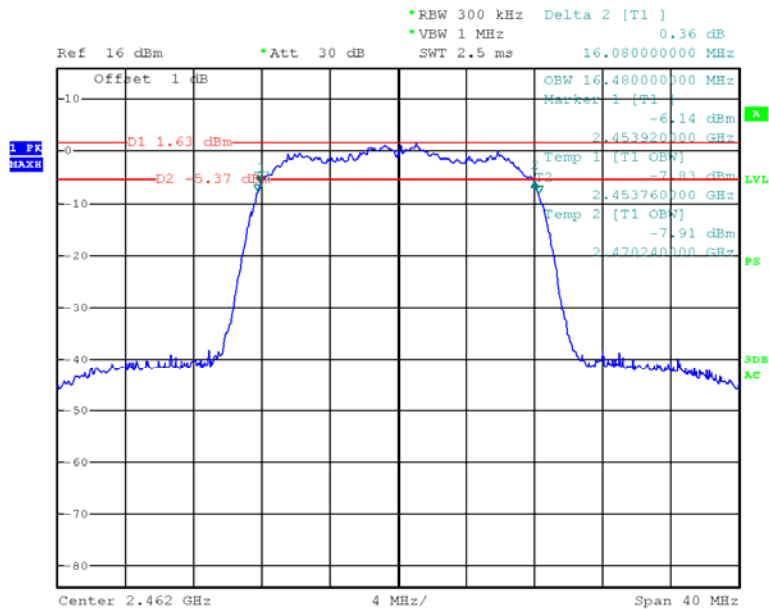
Date: 19.APR.2012 10:22:41

**802.11g Low Channel**

Date: 19.APR.2012 10:53:15

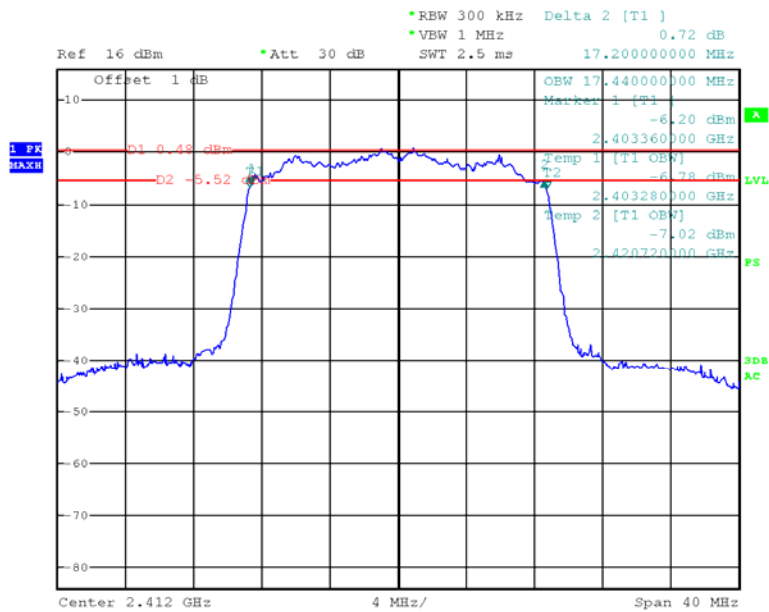
**802.11g Middle Channel**

Date: 19.APR.2012 10:46:23

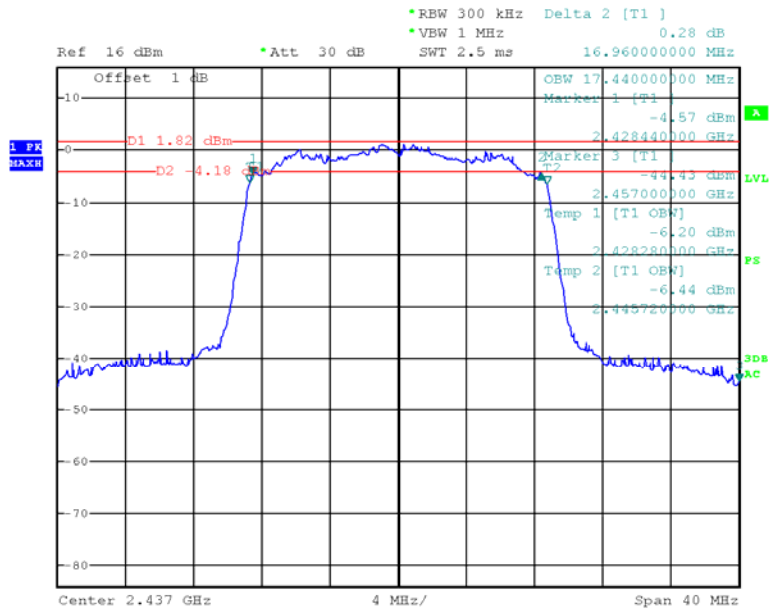
**802.11g High Channel**

Date: 19.APR.2012 10:58:50

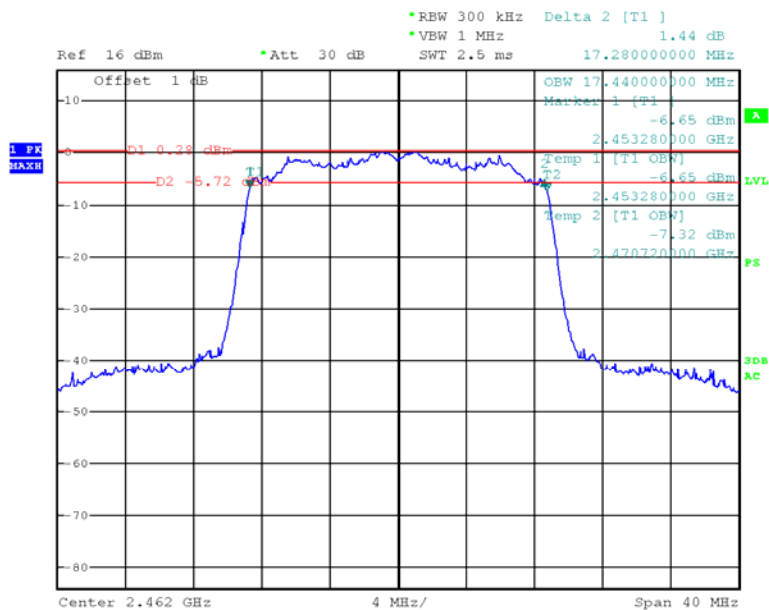


**802.11n20 Low Channel**

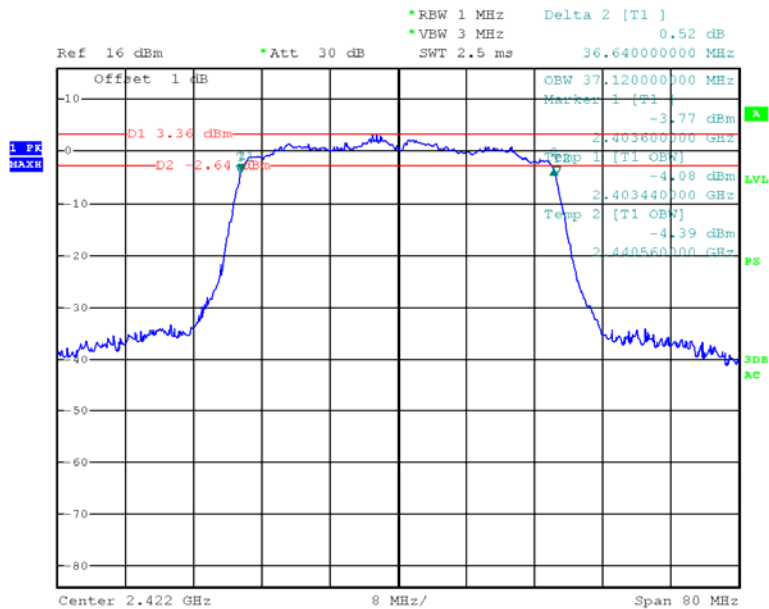
Date: 19.APR.2012 11:26:33

**802.11n20 Middle Channel**

Date: 19.APR.2012 11:18:13

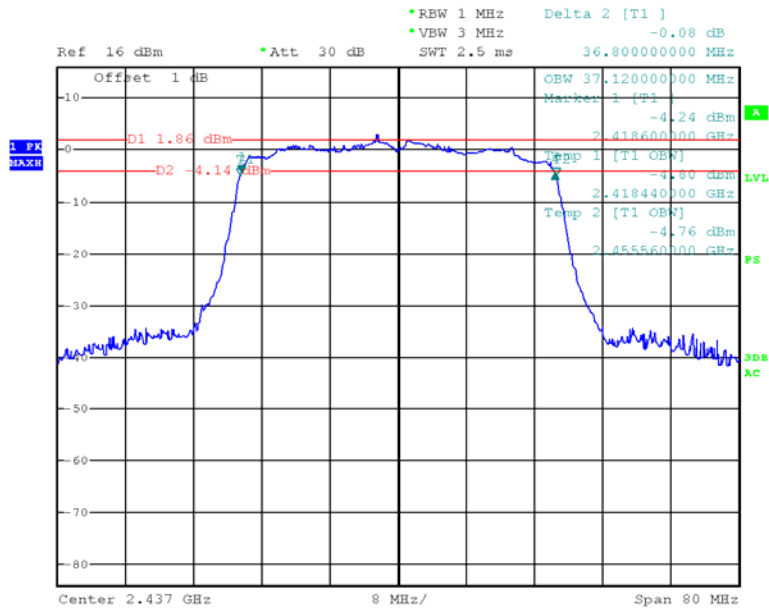
**802.11n20 High Channel**

Date: 19.APR.2012 11:09:07

**802.11n40 Low Channel**

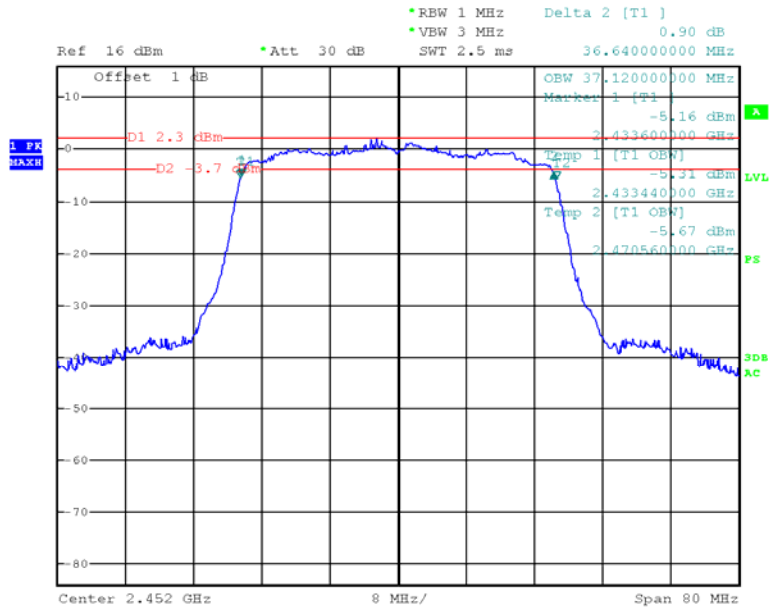
Date: 19.APR.2012 14:20:16

### 802.11n40 Middle Channel



Date: 19.APR.2012 14:27:14

### 802.11n40 High Channel



Date: 19.APR.2012 14:33:05

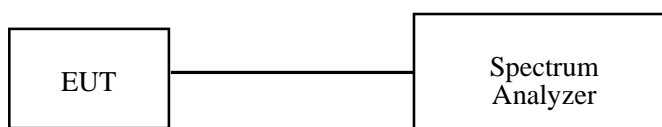
## FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

### 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	100035	2011-11-11	2012-11-10

\* **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 ° C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

*The testing was performed by Bin Jiang from 2012-04-19 to 2012-04-20.*

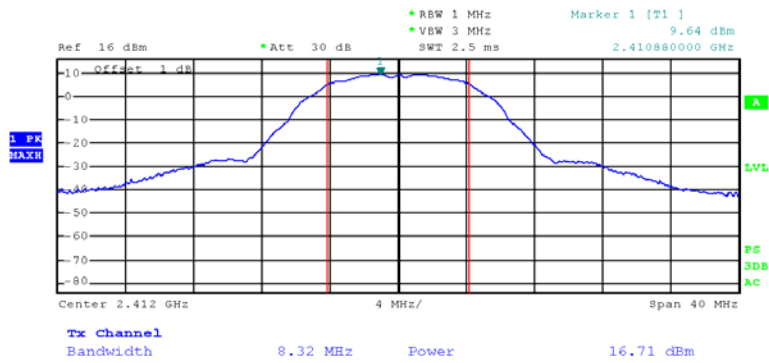
*Test Mode: Transmitting*

Channel	Frequency (MHz)	Data Rate (Mbps)	Reading Power (dBm)	Limit (dBm)	Result
802.11b					
Low	2412	1	16.71	30	pass
Middle	2437	1	16.55	30	pass
High	2462	1	16.47	30	pass
802.11g					
Low	2412	6	16.19	30	pass
Middle	2437	6	16.09	30	pass
High	2462	6	15.98	30	pass
802.11n20					
Low	2412	6.5	15.4	30	pass
Middle	2437	6.5	16.05	30	pass
High	2462	6.5	15.83	30	pass
802.11n40					
Low	2422	13.5	15.03	30	pass
Middle	2437	13.5	14.89	30	pass
High	2452	13.5	14.82	30	pass

**Note:** the antenna gain is 1.0dBi.

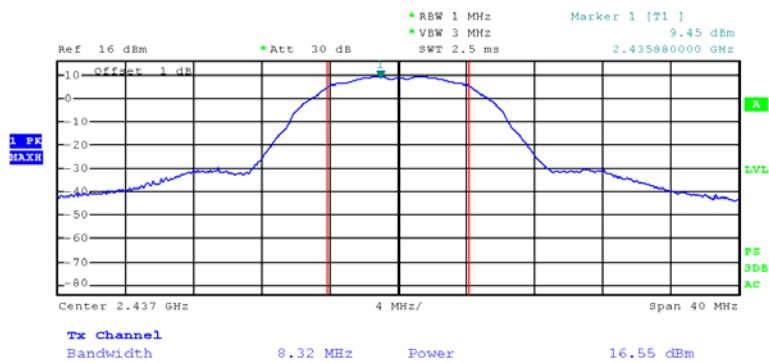
Please refer to the following plots

### 802.11b RF Output Power, Low Channel



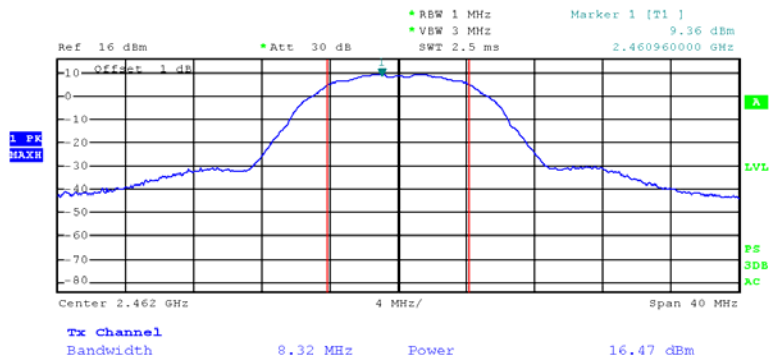
Date: 19.APR.2012 10:04:17

### 802.11b RF Output Power, Middle Channel



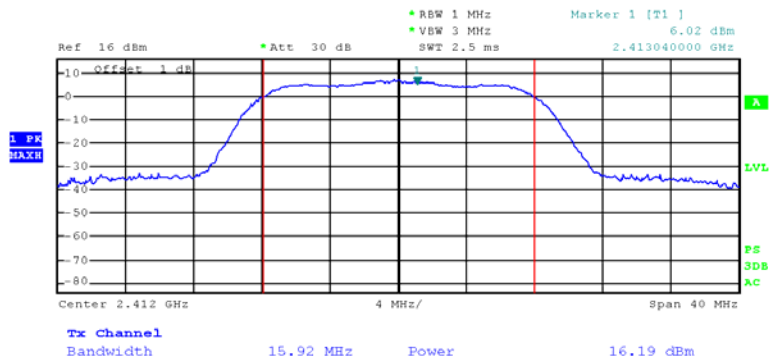
Date: 19.APR.2012 10:18:59

### 802.11b RF Output Power, High Channel



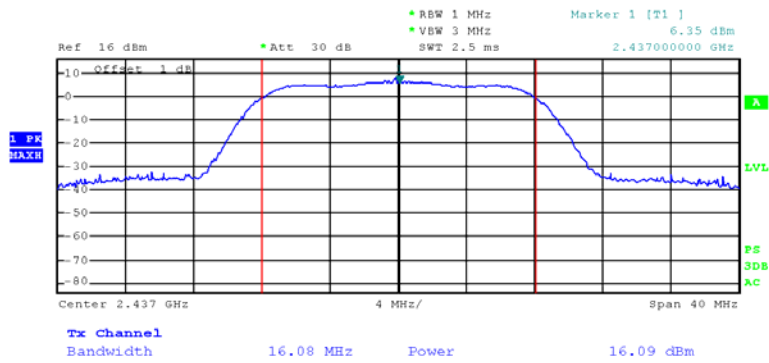
Date: 19.APR.2012 10:21:30

### 802.11g RF Output Power, Low Channel



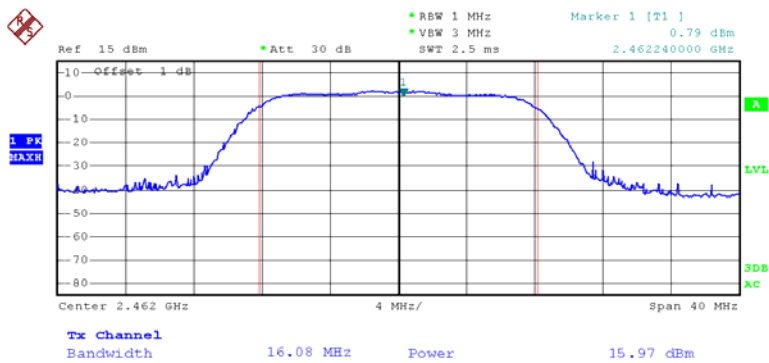
Date: 19.APR.2012 10:56:58

### 802.11g RF Output Power, Middle Channel



Date: 19.APR.2012 10:49:36

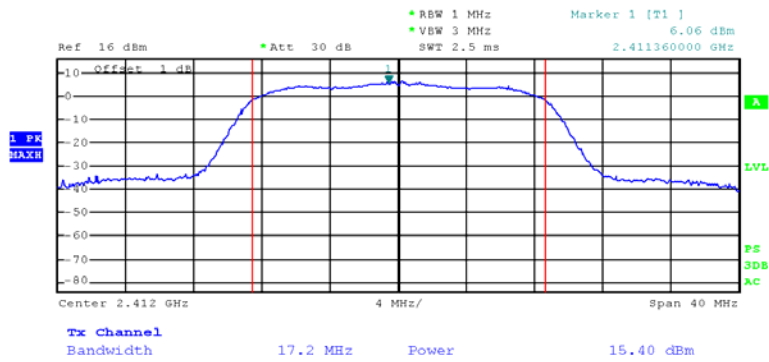
### 802.11g RF Output Power, High Channel



Date: 6.MAR.2012 15:53:23

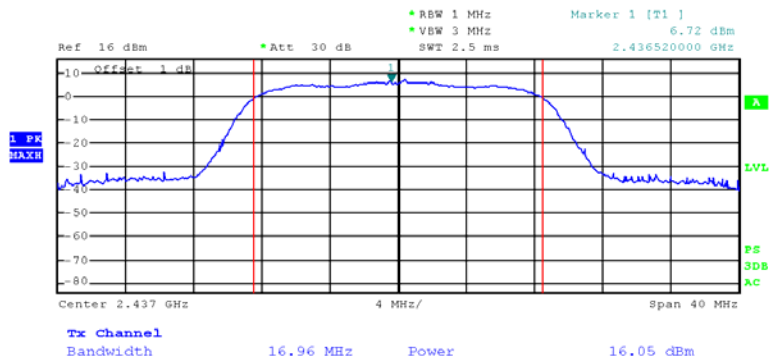


### 802.11n20 RF Output Power, Low Channel



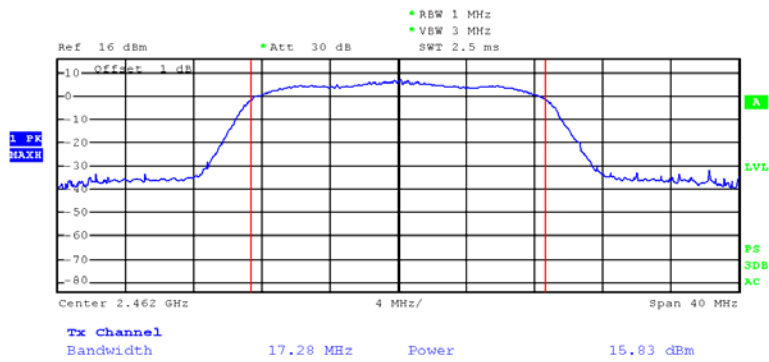
Date: 19.APR.2012 11:27:46

### 802.11n20 RF Output Power, Middle Channel



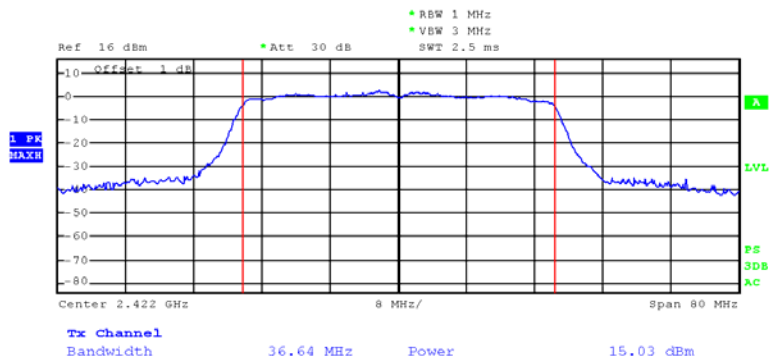
Date: 19.APR.2012 11:22:01

### 802.11n20 RF Output Power, High Channel



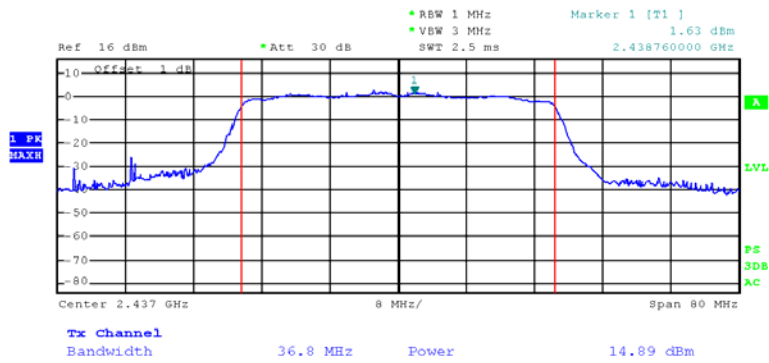
Date: 19.APR.2012 11:12:20

### 802.11n40 RF Output Power, Low Channel



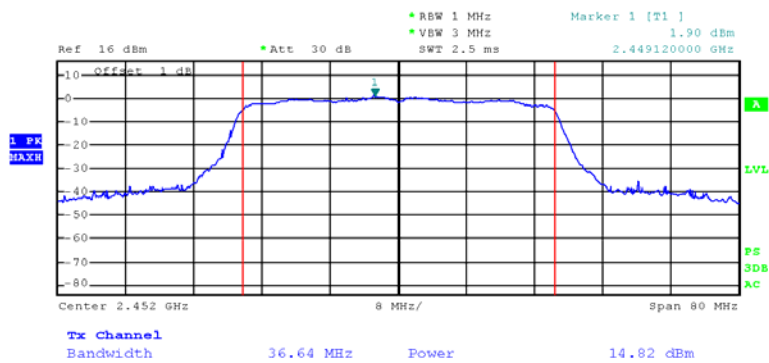
Date: 19.APR.2012 14:21:40

### 802.11n40 RF Output Power, Middle Channel



Date: 19.APR.2012 14:27:53

### 802.11n40 RF Output Power, High Channel



Date: 19.APR.2012 14:40:00

## **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	100035	2011-11-11	2012-11-10

\* **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**

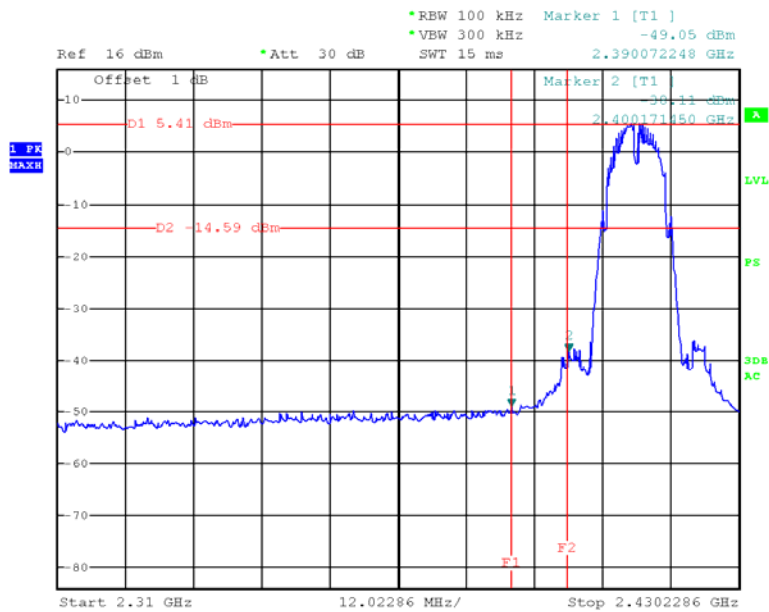
Temperature:	25 °C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

*The testing was performed by Bin Jiang on 2012-04-19.*

**Test Result:** *Compliance*

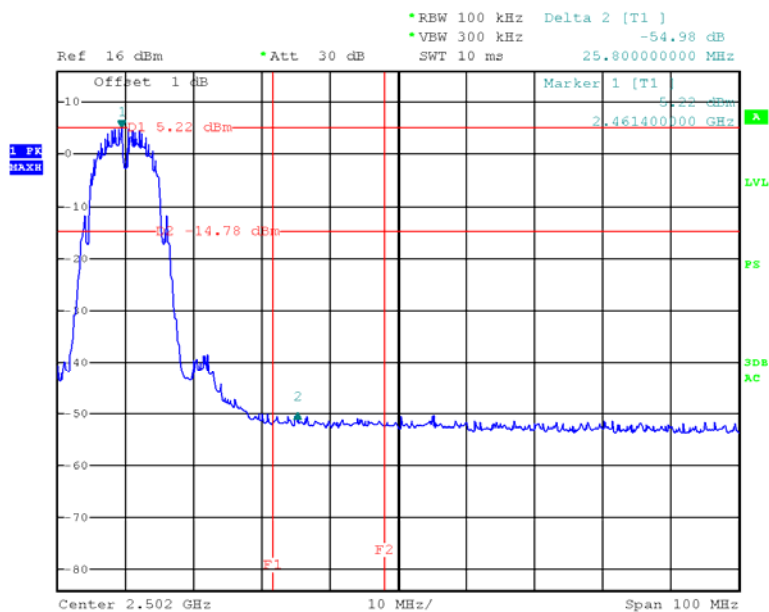
Please refer to following plots.

### 802.11b: Band Edge, Left Side

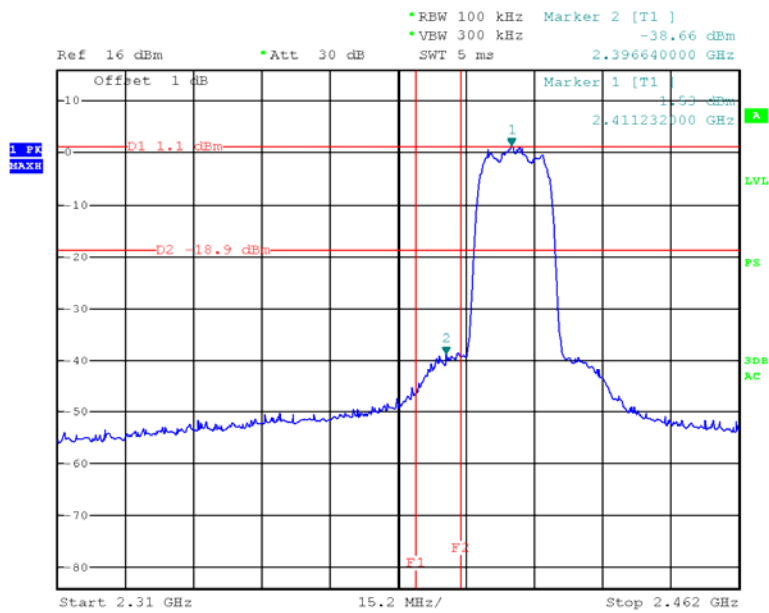


Date: 19.APR.2012 10:10:43

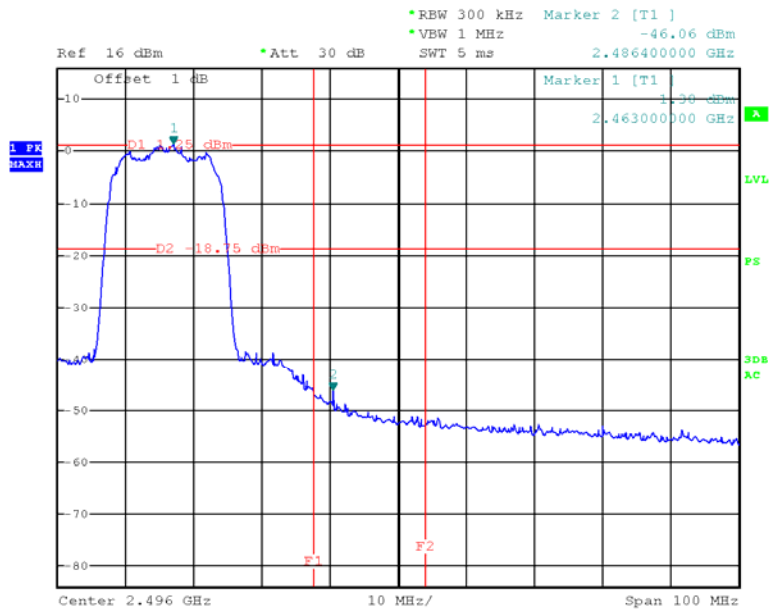
### 802.11b: Band Edge, Right Side



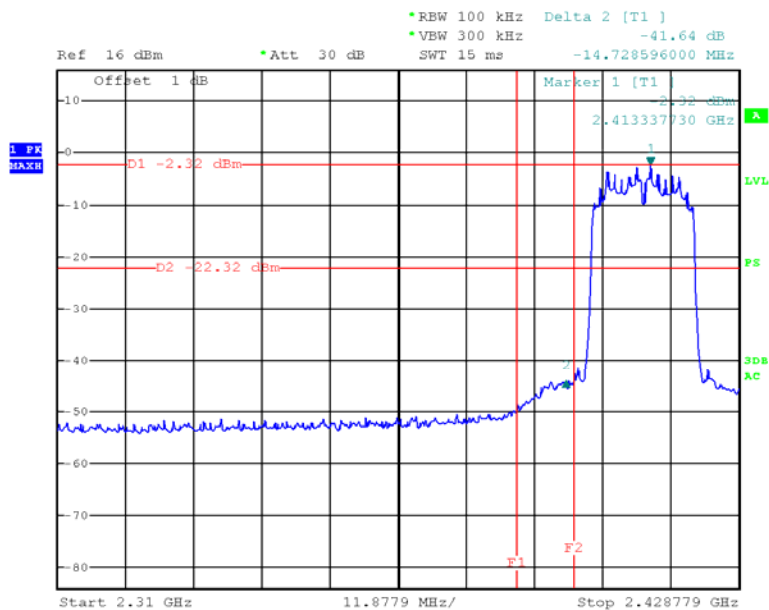
Date: 19.APR.2012 10:24:41

**802.11g: Band Edge, Left Side**

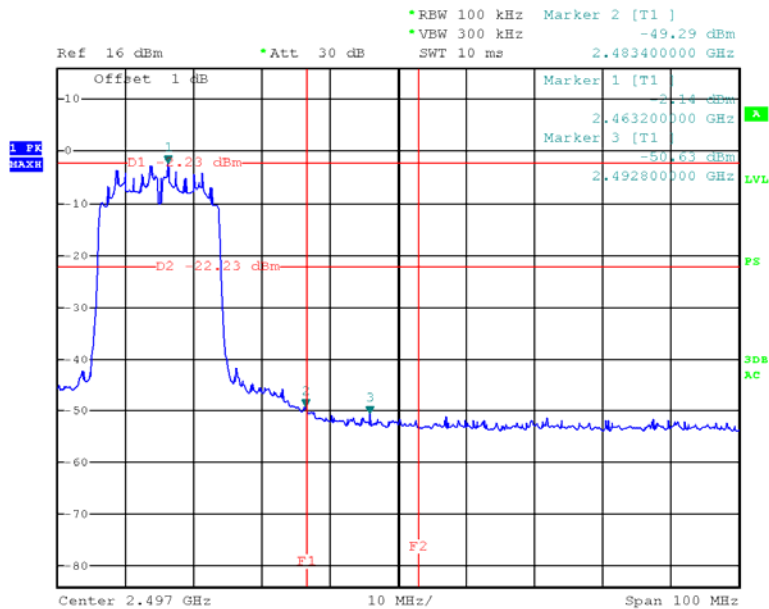
Date: 19.APR.2012 10:54:55

**802.11g: Band Edge, Right Side**

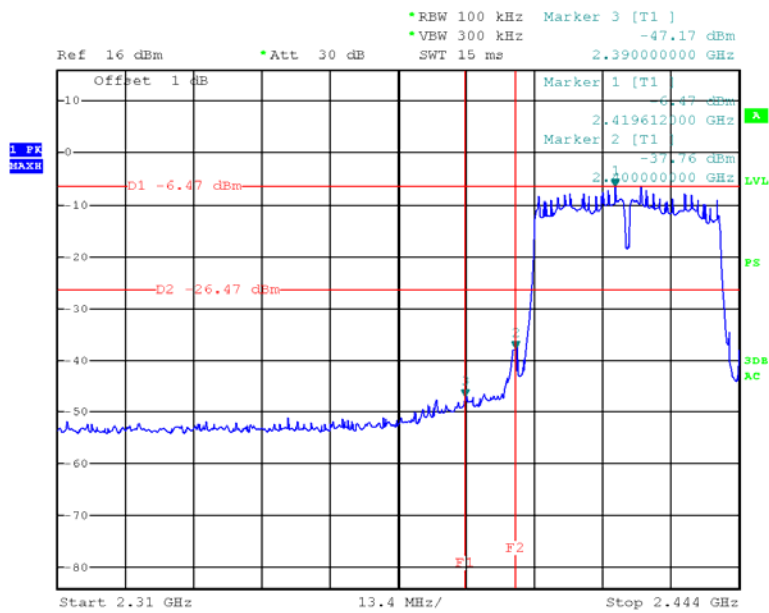
Date: 19.APR.2012 11:00:10

**802.11n20: Band Edge, Left Side**

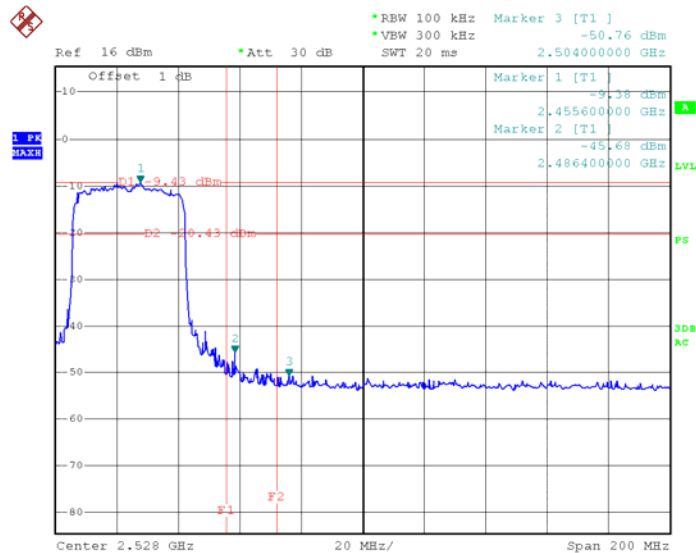
Date: 19.APR.2012 11:30:50

**802.11n20: Band Edge, Right Side**

Date: 19.APR.2012 11:14:55

**802.11n40: Band Edge, Left Side**

Date: 19.APR.2012 14:24:53

**802.11n40: Band Edge, Right Side**

Date: 19.APR.2012 14:37:06



## 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. Follow KDB 558074 D01 DTS Meas Guidance v01, Set the RBW = 100 kHz, VBW  $\geq$  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  $BWCF = 10\log(3\text{ kHz}/100\text{ kHz}) = -15.2\text{ dB}$ .

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

\* **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 ° C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

*The testing was performed by Bin Jiang on 2012-04-19.*

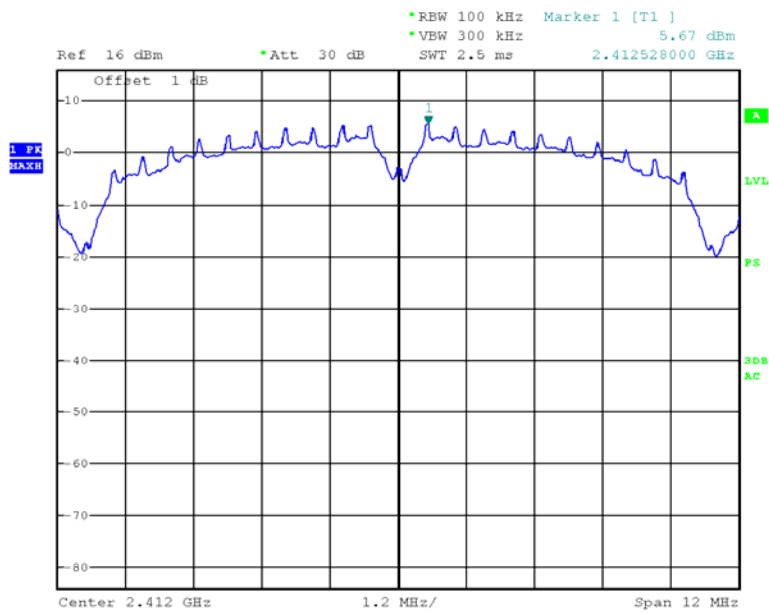
*Test Mode: Transmitting*

**Test Result:** Pass

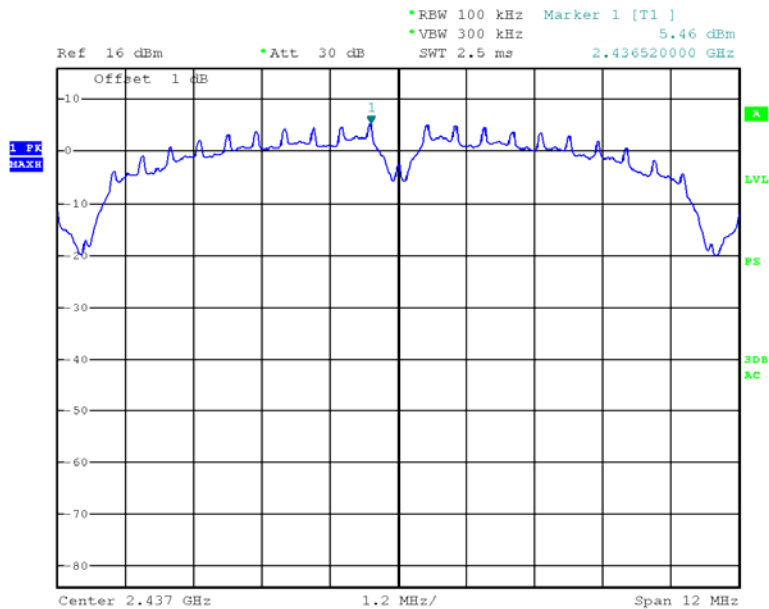
Channel	Frequency (MHz)	Data Rate (Mbps)	Reading Level (dBm/100kHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11b						
Low	2412	1	5.67	-9.53	8	pass
Middle	2437	1	5.46	-9.74	8	pass
High	2462	1	5.24	-9.96	8	pass
802.11g						
Low	2412	6	-2.46	-17.66	8	pass
Middle	2437	6	-2.20	-17.4	8	pass
High	2462	6	-2.07	-17.27	8	pass
802.11n20						
Low	2412	6.5	-2.42	-17.62	8	pass
Middle	2437	6.5	-1.51	-16.71	8	pass
High	2462	6.5	-2.31	-17.51	8	pass
802.11n40						
Low	2422	13.5	-6.68	-21.88	8	pass
Middle	2437	13.5	-6.79	-21.99	8	pass
High	2452	13.5	-7.50	-22.7	8	pass

**Note:** the antenna gain is 1.0 dBi.

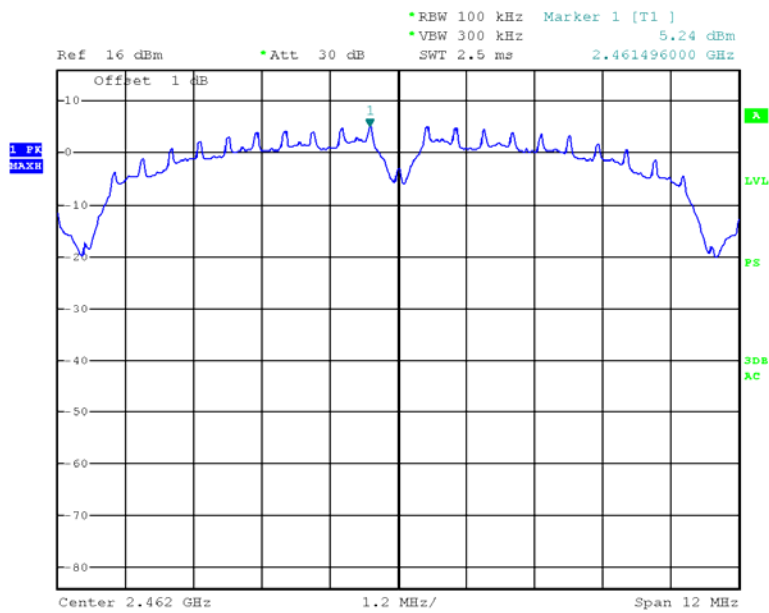
Please refer to the following plots

**Power Spectral Density, 802.11b Low Channel**

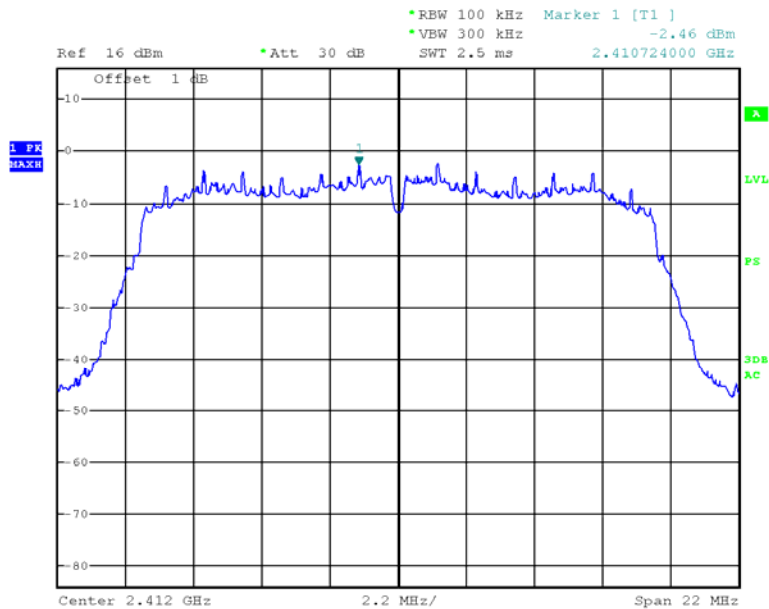
Date: 19.APR.2012 10:15:33

**Power Spectral Density, 802.11b Middle Channel**

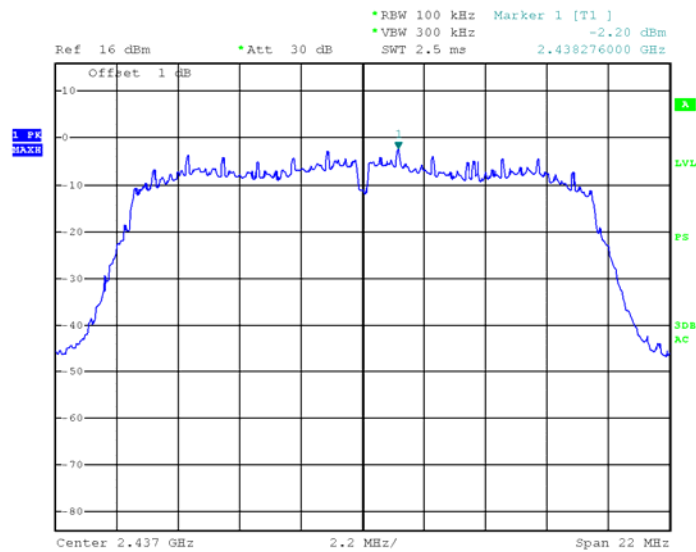
Date: 19.APR.2012 10:16:54

**Power Spectral Density, 802.11b High Channel**

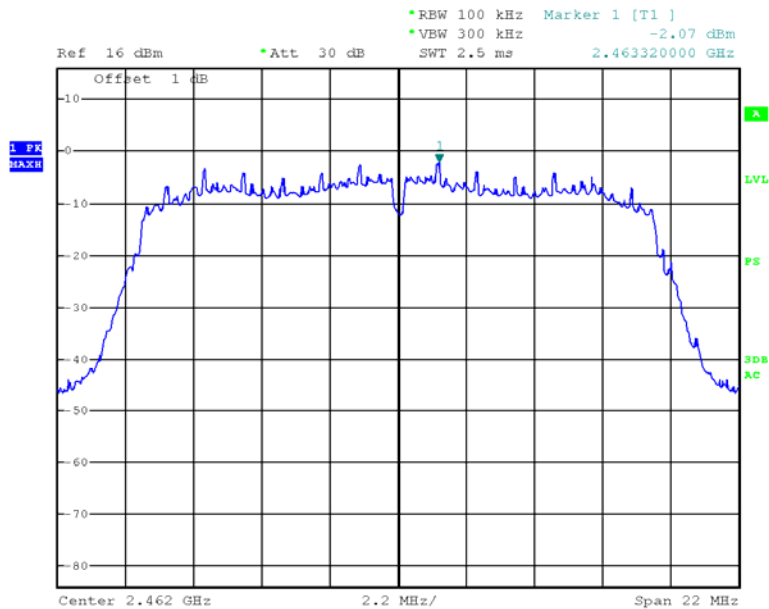
Date: 19.APR.2012 10:25:39

**Power Spectral Density, 802.11g Low Channel**

Date: 19.APR.2012 10:51:49

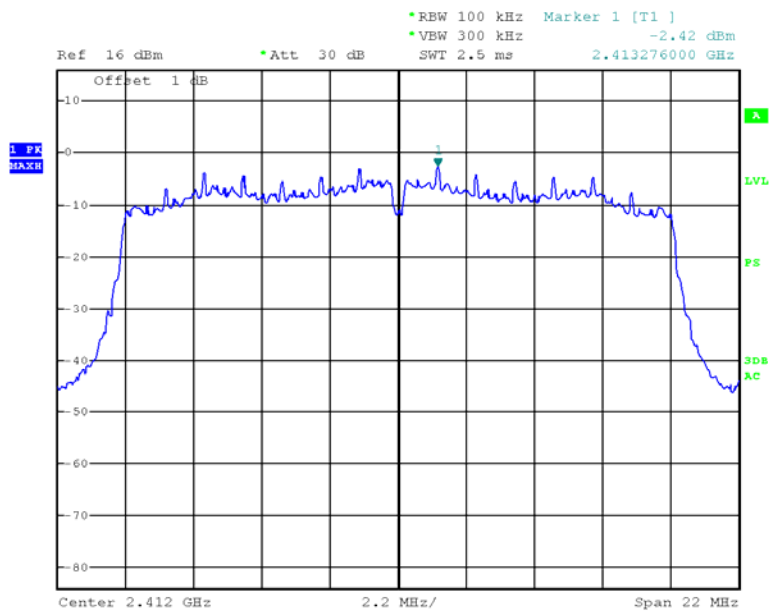
**Power Spectral Density, 802.11g Middle Channel**

Date: 19.APR.2012 10:50:57

**Power Spectral Density, 802.11g High Channel**

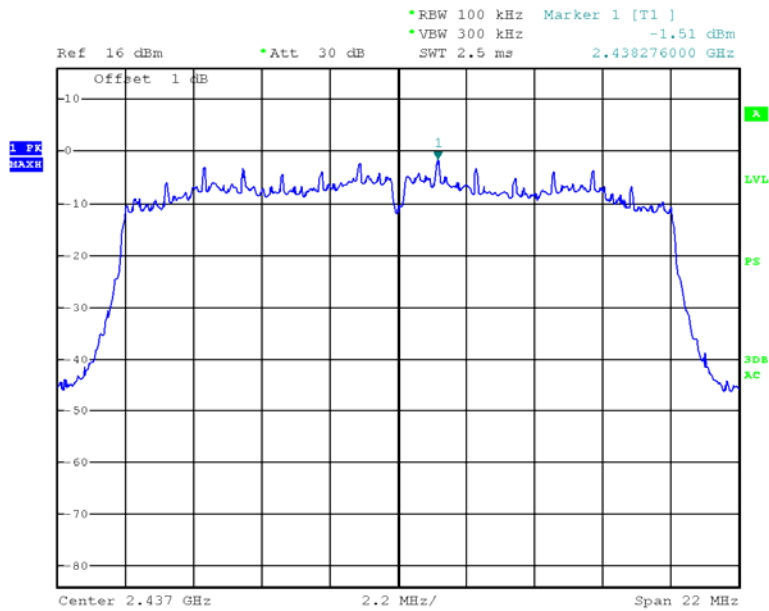
Date: 19.APR.2012 11:02:17

### Power Spectral Density, 802.11n20 Low Channel



Date: 19.APR.2012 11:24:44

### Power Spectral Density, 802.11n20 Middle Channel



Date: 19.APR.2012 11:23:06

Ref 16 dBm Att 30 dB RBW 100 kHz VEW 300 kHz SWT 2.5 ms

Marker 1 [T1] -2.13 dBm 2.463276000 GHz

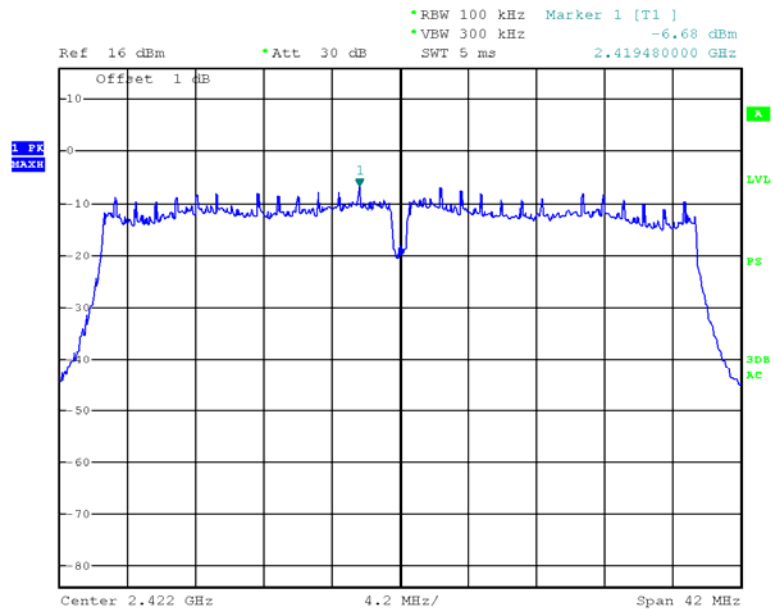
Offset 1 dB

1. PK

1

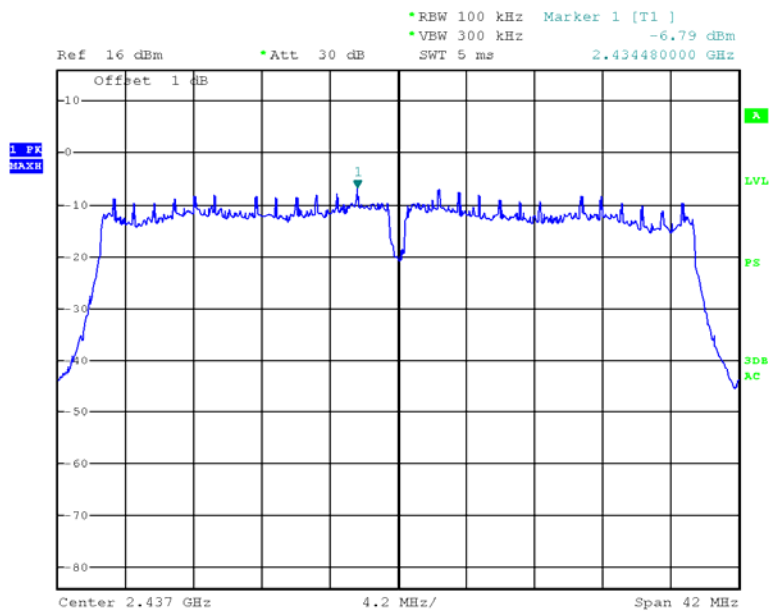
Center 2.462 GHz 2.2 MHz/ Span 22 MHz

### Power Spectral Density, 802.11n40 Low Channel



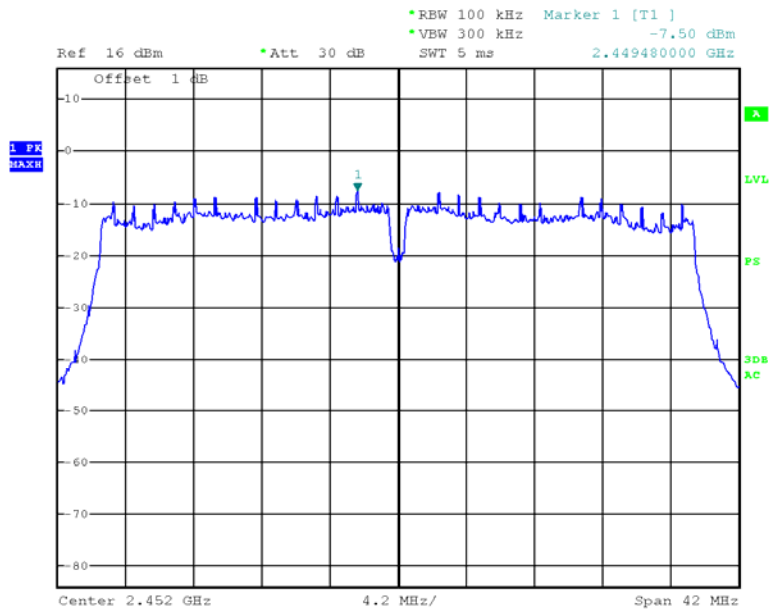
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### Power Spectral Density, 802.11n40 Middle Channel



Date: 19.APR.2012 14:28:34

### Power Spectral Density, 802.11n40 High Channel



Date: 19.APR.2012 14:30:53

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