

FCC PART 15.247

TEST REPORT

For

Deliberant LLC

138 Mountain Brook Dr., Canton, GA 30115, USA

FCC ID: UB8-APC2S20

Report Type: Original Report	Product Type: Broadband Digital Transmission System
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Report Number: <u>RSZ110623011-00</u>	
Report Date: <u>2011-10-27</u>	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, or any agency of the Federal Government.

* 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

Product Description for Equipment under Test (EUT)

The *Deliberant LLC*'s product, model number: *APC 2S-20 (FCC ID: UB8-APC2S20)* (the "EUT") in this report is a *Broadband Digital Transmission System*, which was measured approximately: 24.8 cm (L) x 21.1 cm (W) x 10.0 cm (H), rated input voltage: DC 18V from adapter.

Adapter information:

Model: VA16A-180100

Input: 100-240V_{AC} 0.5A 50-60Hz

Output: 18V_{DC} 1.0A

** All measurement and test data in this report was gathered from production sample serial number: 0202112200000021 (Assigned by applicant). The EUT was received on 2011-06-23.*

Objective

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

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

Related Submittal(s)/Grant(s)

No related submission.

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.

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 802.11g and 802.11n-HT20 mode, 11 channels are provided to testing, 802.11n-HT40 7 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 & 802.11n-HT20 mode were tested with Channel 1, 6 and 11. 802.11n-HT40 mode was tested with channel 3, 6 and 9.

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

QA_RT3052 V1.0.1.9

The test was performed under:

802.11b: Data rate: 1 Mbps.

802.11g: Data rate: 6 Mbps.

802.11n-HT20: Data rate: 6.5Mbps

802.11n-HT40: Data rate: 6.5Mbps

Equipment Modifications

No modification was made to the unit tested.

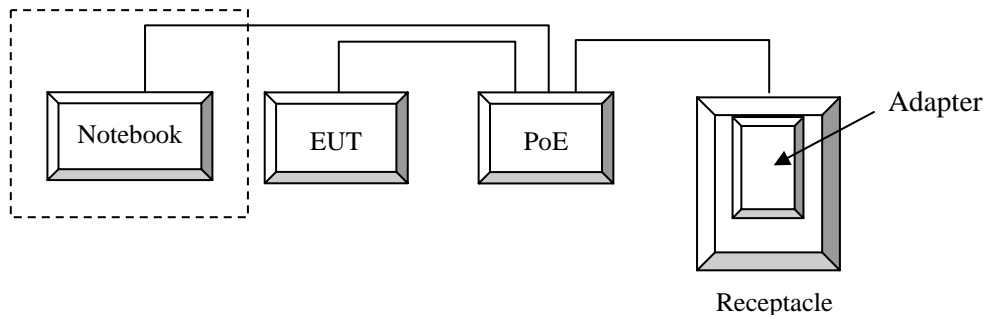
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Notebook	D600	00045-438-852-864

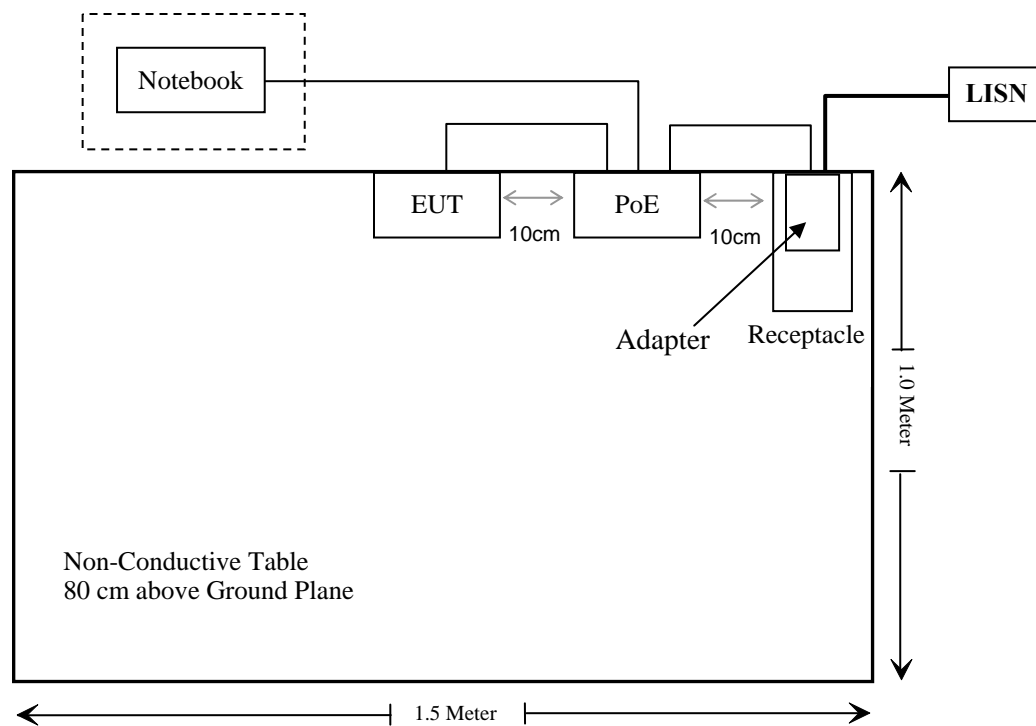
External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Detachable Power Cable	1.75	Adapter	PoE

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §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 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 FCC §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;

MPE Calculation

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm²);

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

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

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	20	100	11.01	12.62	265	0.00140	1.0
802.11g	2412	20	100	9.37	8.65	265	0.00098	1.0
802.11n20	2412	20	100	9.57	9.06	265	0.00102	1.0
802.11n40	2422	20	100	10.07	10.16	265	0.00115	1.0

Note: The antenna has 20 dBi gain and needs to be installed professionally, the manufacture specified the minimum distance of 8.7 feet (265 cm) in the manual.

Result: The device meets FCC MPE limit at 8.7 feet distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

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

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

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in 1 dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT consists of radio module and unique coupling parts (antenna grid and reflector), the radio module contains internal antenna, which can be used with supplied unique coupling parts (antenna grid and reflector). The details please refer to the EUT photos and the User manual.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

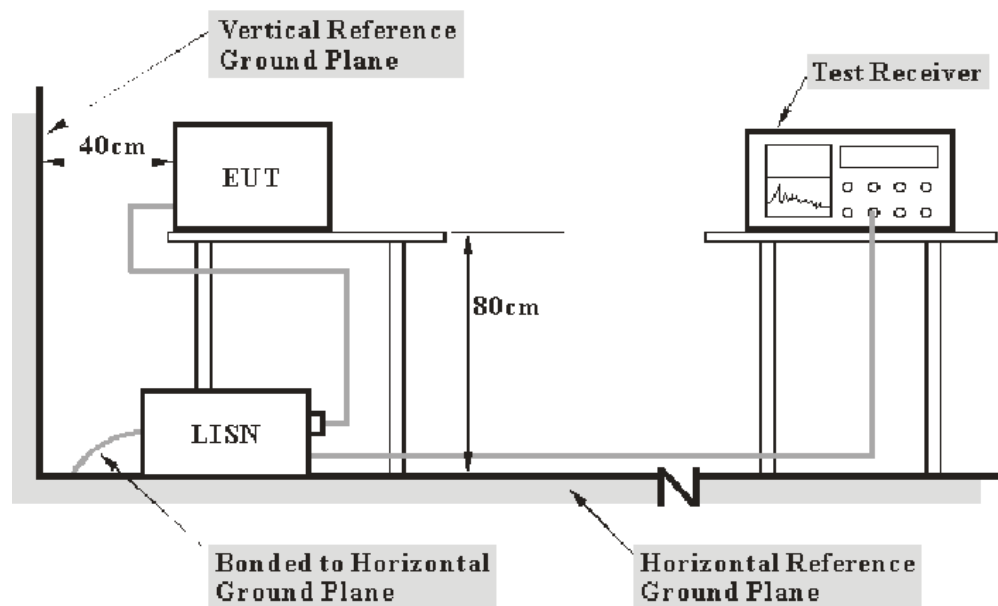
FCC §15.207

Measurement Uncertainty

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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is ± 2.4 dB ($k=2$, 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 18VDC adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

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

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245	2011-03-03	2012-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-03-09	2012-03-08

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

Test Procedure

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

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

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

Test Results Summary

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

17.21 dB at 13.360 MHz in the **Line** conducted mode

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

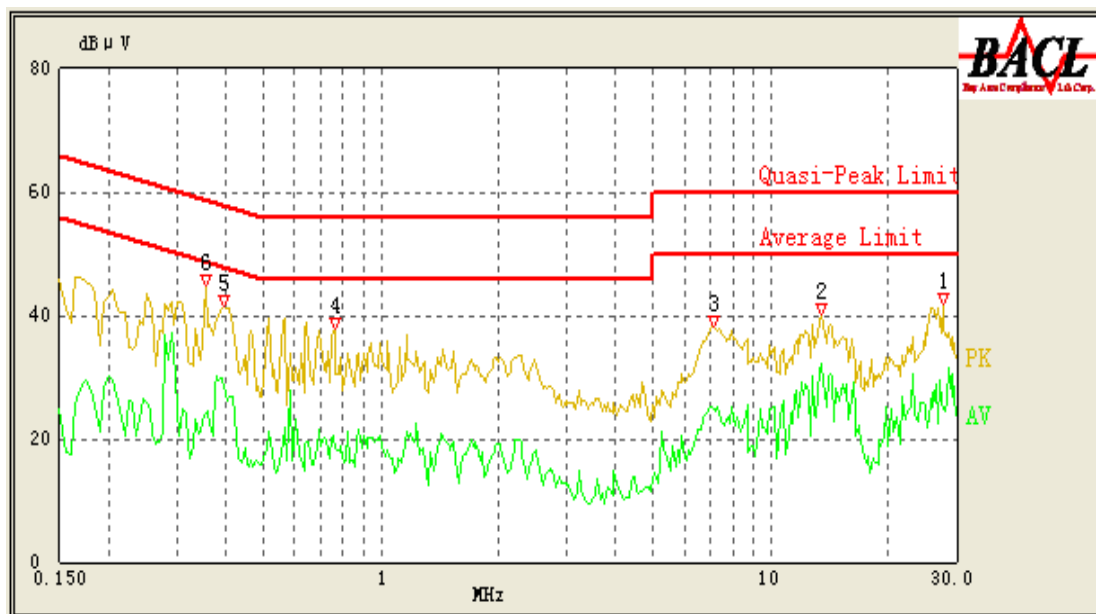
The testing was performed by Bruce Zhang on 2011-09-14.

Test Mode: Transmitting

AC 120 V, 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)
13.360	32.79	10.10	50.00	17.21	Ave.
26.610	29.28	10.10	50.00	20.72	Ave.
0.650	25.15	10.10	46.00	20.85	Ave.
2.025	21.98	10.10	46.00	24.02	Ave.
13.360	35.50	10.10	60.00	24.50	QP
7.020	24.98	10.10	50.00	25.02	Ave.
0.645	27.78	10.10	56.00	28.22	QP
26.550	31.21	10.10	60.00	28.79	QP
7.065	30.69	10.10	60.00	29.31	QP
2.050	26.41	10.10	56.00	29.59	QP
4.625	14.65	10.10	46.00	31.35	Ave.
4.575	20.41	10.10	56.00	35.59	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)
13.420	32.16	10.10	50.00	17.84	Ave.
0.395	28.63	10.10	49.00	20.37	Ave.
0.395	38.28	10.10	59.00	20.72	QP
13.420	36.13	10.10	60.00	23.87	QP
27.345	25.82	10.10	50.00	24.18	Ave.
7.085	25.05	10.10	50.00	24.95	Ave.
0.755	20.50	10.10	46.00	25.50	Ave.
0.355	24.20	10.10	50.14	25.94	Ave.
0.355	32.95	10.10	60.14	27.19	QP
7.130	31.54	10.10	60.00	28.46	QP
0.760	26.39	10.10	56.00	29.61	QP
27.695	20.59	10.10	60.00	39.41	QP

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

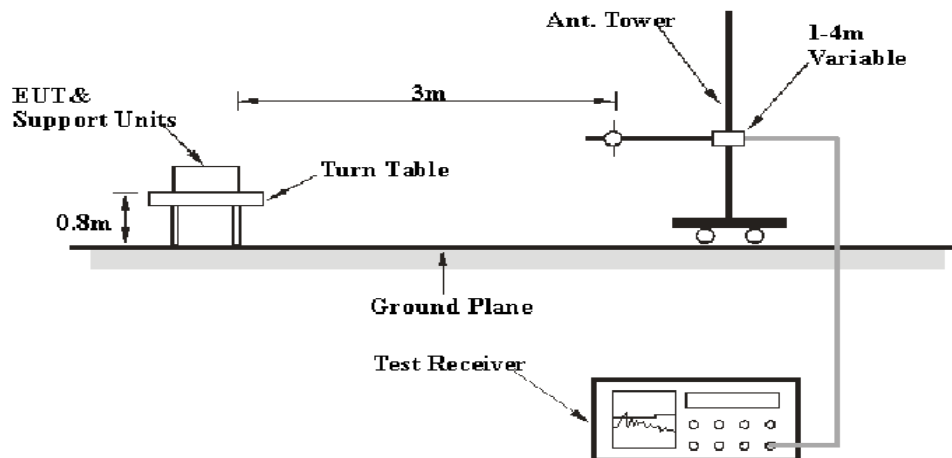
Measurement Uncertainty

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.

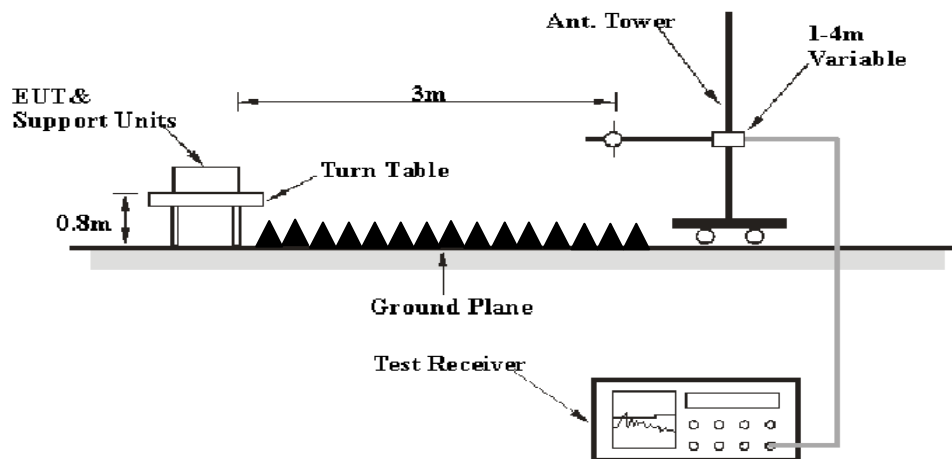
Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is ± 4.0 dB(k=2, 95% level of confidence) .

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters 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 adapter 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>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>	<i>Detector</i>
30MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	PK

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	2010-11-11	2011-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-03-11	2012-03-10
Mini-circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	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 Procedure

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

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

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

Corrected Amplitude & Margin Calculation

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

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

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 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:

Below 1 GHz:

1.1 dB at 47.799750 MHz in the Vertical polarization

Above 1 GHz:

0.35 dB at 2386.8 MHz in the Vertical polarization for 802.11n-HT40 mode

Test Data

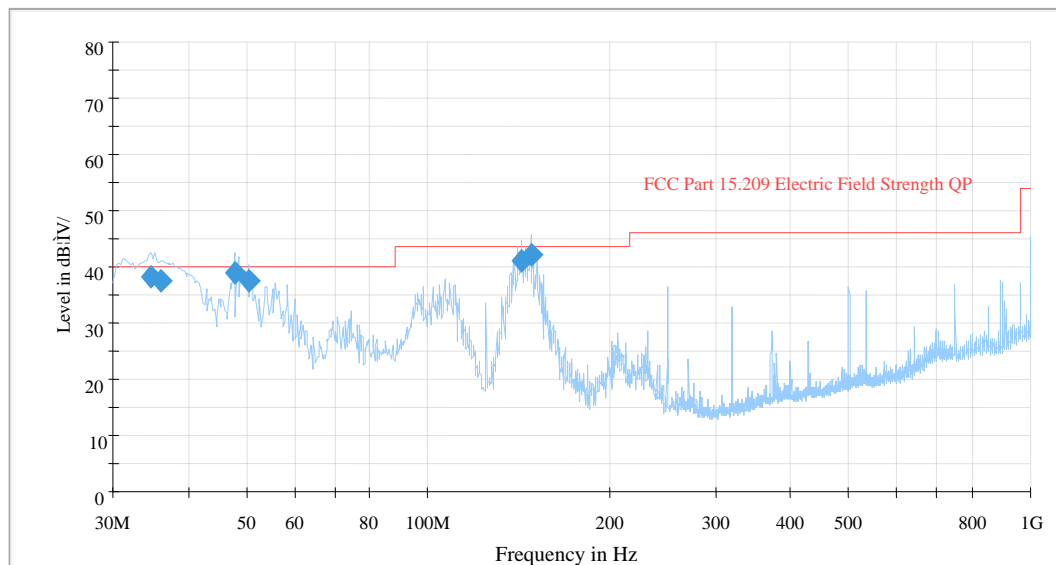
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Bruce Zhang on 2011-09-10.

Below 1 GHz:*Test Mode: Transmitting (worse case)*

Auto Test (FCC 15.209)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Ant. Height (cm)	Ant. Polarity (H/V)	Turntable Position (degree)	Limit (dBµV/m)	Margin (dB)
47.799750	38.9	104.0	V	95.0	40.0	1.1*
148.108750	42.0	201.0	H	0.0	43.5	1.5*
34.705000	38.1	103.0	V	95.0	40.0	1.9*
50.447000	37.6	102.0	V	112.0	40.0	2.4*
143.306500	41.1	189.0	H	350.0	43.5	2.4*
36.103500	37.3	102.0	V	144.0	40.0	2.7*

* Within measurement uncertainty.

Above 1 GHz:

802.11b Mode:

Indicated		Detector (PK/Ave.)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247/15.209			
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)												
2380.2	46.18	Ave.	175	1.0	H	30.6	2.98	26.83	52.93	54	1.07*	spurious
2380.2	44.57	Ave.	175	1.0	V	30.6	2.98	26.83	51.32	54	2.68*	spurious
4824.0	36.7	Ave.	175	1.0	H	36.6	4.3	26.75	50.85	54	3.15*	harmonic
4824.0	37.8	Ave.	175	1.0	V	35.4	4.3	26.75	50.75	54	3.25*	harmonic
2380.2	61.54	PK	175	1.0	V	30.6	2.98	26.83	68.29	74	5.71	spurious
2380.2	58.65	PK	175	1.0	H	30.6	2.98	26.83	65.4	74	8.60	spurious
4824.0	40.21	PK	175	1.0	H	36.6	4.3	26.75	54.36	74	19.64	harmonic
4824.0	41.22	PK	175	1.0	V	35.4	4.3	26.75	54.17	74	19.83	harmonic
Middle Channel (2437 MHz)												
4874.0	36.56	Ave.	175	1.0	H	36.6	4.36	26.75	50.77	54	3.23*	harmonic
4874.0	37.44	Ave.	175	1.0	V	35.4	4.36	26.75	50.45	54	3.55*	harmonic
4874.0	40.17	PK	175	1.0	H	36.6	4.36	26.75	54.38	74	19.62	harmonic
4874.0	41.31	PK	175	1.0	V	35.4	4.36	26.75	54.32	74	19.68	harmonic
High Channel (2462 MHz)												
4924.0	36.26	Ave.	175	1.0	H	36.6	4.4	26.75	50.51	54	3.49*	harmonic
4924.0	36.88	Ave.	175	1.0	V	35.4	4.4	26.75	49.93	54	4.07	harmonic
2485.6	58.64	PK	175	1.0	V	30.6	3.11	26.88	65.47	74	8.53	spurious
2485.6	37.05	Ave.	175	1.0	V	30.6	3.11	26.88	43.88	54	10.12	spurious
2487.8	33.64	Ave.	175	1.0	H	30.6	3.11	26.88	40.47	54	13.53	spurious
2487.8	51.63	PK	175	1.0	H	30.6	3.11	26.88	58.46	74	15.54	spurious
4924.0	40.15	PK	175	1.0	H	36.6	4.4	26.75	54.4	74	19.60	harmonic
4924.0	40.56	PK	175	1.0	V	35.4	4.4	26.75	53.61	74	20.39	harmonic

* Within measurement uncertainty.

802.11g Mode:

Indicated		Detector (PK/Ave)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247/15.209			
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)												
2388.6	63.15	PK	173	1.0	V	30.6	2.98	26.83	69.90	74	4.10	spurious
2389.5	42.6	Ave.	173	1.0	H	30.6	2.98	26.83	49.35	54	4.65	spurious
2389.5	62.5	PK	173	1.0	H	30.6	2.98	26.83	69.25	74	4.75	spurious
2388.6	40.67	Ave.	173	1.0	V	30.6	2.98	26.83	47.42	54	6.58	spurious
4824.0	23.06	Ave.	173	1.0	H	36.6	4.30	26.75	37.21	54	16.79	harmonic
4824.0	22.6	Ave.	173	1.0	V	35.4	4.30	26.75	35.55	54	18.45	harmonic
4824.0	40.12	PK	173	1.0	H	36.6	4.30	26.75	54.27	74	19.73	harmonic
4824.0	39.56	PK	173	1.0	V	35.4	4.30	26.75	52.51	74	21.49	harmonic
Middle Channel (2437 MHz)												
4874.0	22.65	Ave.	173	1.0	H	36.6	4.36	26.75	36.86	54	17.14	harmonic
4874.0	22.35	Ave.	173	1.0	V	35.4	4.36	26.75	35.36	54	18.64	harmonic
4874.0	40.23	PK	173	1.0	H	36.6	4.36	26.75	54.44	74	19.56	harmonic
4874.0	39.68	PK	173	1.0	V	35.4	4.36	26.75	52.69	74	21.31	harmonic
High Channel (2462 MHz)												
2483.6	60.39	PK	173	1.0	V	30.6	3.11	26.88	67.22	74	6.78	spurious
2483.6	60.08	PK	173	1.0	H	30.6	3.11	26.88	66.91	74	7.09	spurious
2483.6	38.15	Ave.	173	1.0	V	30.6	3.11	26.88	44.98	54	9.02	spurious
2483.6	35.63	Ave.	173	1.0	H	30.6	3.11	26.88	42.46	54	11.54	spurious
4924.0	22.33	Ave.	173	1.0	H	36.6	4.40	26.75	36.58	54	17.42	harmonic
4924.0	22.26	Ave.	173	1.0	V	35.4	4.40	26.75	35.31	54	18.69	harmonic
4924.0	40.15	PK	173	1.0	H	36.6	4.40	26.75	54.4	74	19.6	harmonic
4924.0	39.38	PK	173	1.0	V	35.4	4.40	26.75	52.43	74	21.57	harmonic

802.11n-HT20 Mode:

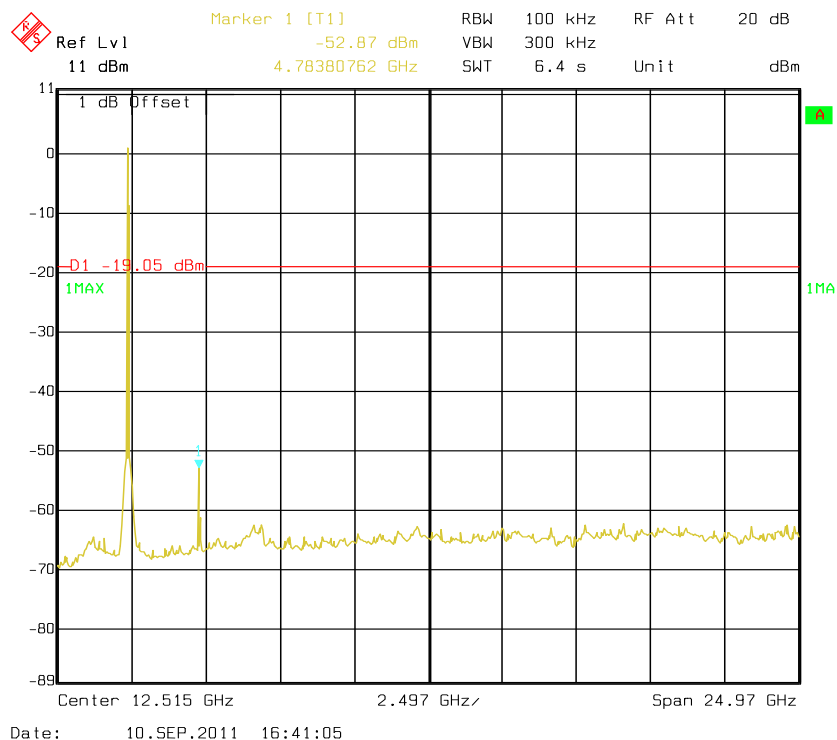
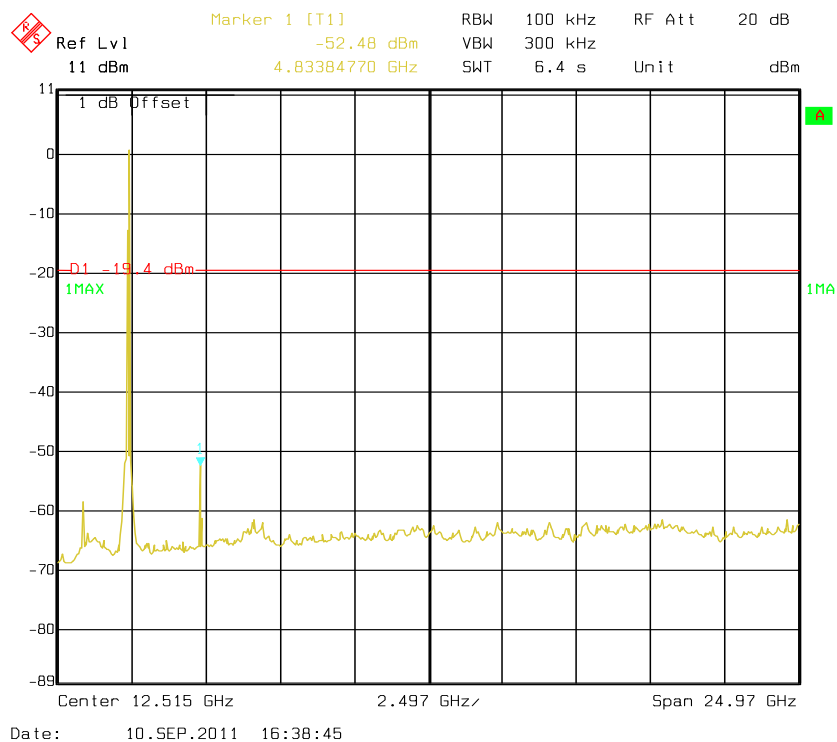
Indicated		Detector (PK/Ave.)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247/15.209			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
2386.9	66.52	PK	190	1.0	V	30.6	2.98	26.83	73.27	74	0.73*	spurious
2386.3	65.47	PK	190	1.4	H	30.6	2.98	26.83	72.22	74	1.78*	spurious
2386.3	43.15	Ave.	190	1.4	H	30.6	2.98	26.83	49.9	54	4.10	spurious
2386.9	41.97	Ave.	190	1.0	V	30.6	2.98	26.83	48.72	54	5.28	spurious
4824.0	46.00	PK	315	1.4	H	36.6	4.30	26.75	60.15	74	13.85	harmonic
4824.0	24.05	Ave.	315	1.4	H	36.6	4.30	26.75	38.2	54	15.80	harmonic
4824.0	23.06	Ave.	60	1.8	V	35.4	4.30	26.75	36.01	54	17.99	harmonic
4824.0	41.95	PK	60	1.8	V	35.4	4.30	26.75	54.9	74	19.10	harmonic
Middle Channel (2437 MHz)												
4874	46.05	PK	130	1.5	H	36.6	4.36	26.75	60.26	74	13.74	harmonic
4874	41.25	PK	60	1.8	V	35.4	4.36	26.75	54.26	74	19.74	harmonic
4874	23.14	Ave.	60	1.8	V	35.4	4.36	26.75	36.15	54	17.85	harmonic
4874	24.34	Ave.	130	1.5	H	36.6	4.36	26.75	38.55	54	15.45	harmonic
High Channel (2462 MHz)												
2483.6	64.74	PK	190	1.5	V	30.6	3.11	26.88	71.57	74	2.43*	spurious
2483.6	58.49	PK	190	1.4	H	30.6	3.11	26.88	65.32	74	8.68	spurious
4924.0	46.54	PK	250	1.8	H	36.6	4.40	26.75	60.79	74	13.21	harmonic
2483.6	32.66	Ave.	190	1.5	V	30.6	3.11	26.88	39.49	54	14.51	spurious
2483.6	31.85	Ave.	190	1.4	H	30.6	3.11	26.88	38.68	54	15.32	spurious
4924.0	23.56	Ave.	250	1.8	H	36.6	4.40	26.75	37.81	54	16.19	harmonic
4924.0	23.03	Ave.	60	1.8	V	35.4	4.40	26.75	36.08	54	17.92	harmonic
4924.0	41.05	PK	60	1.8	V	35.4	4.40	26.75	54.1	74	19.90	harmonic

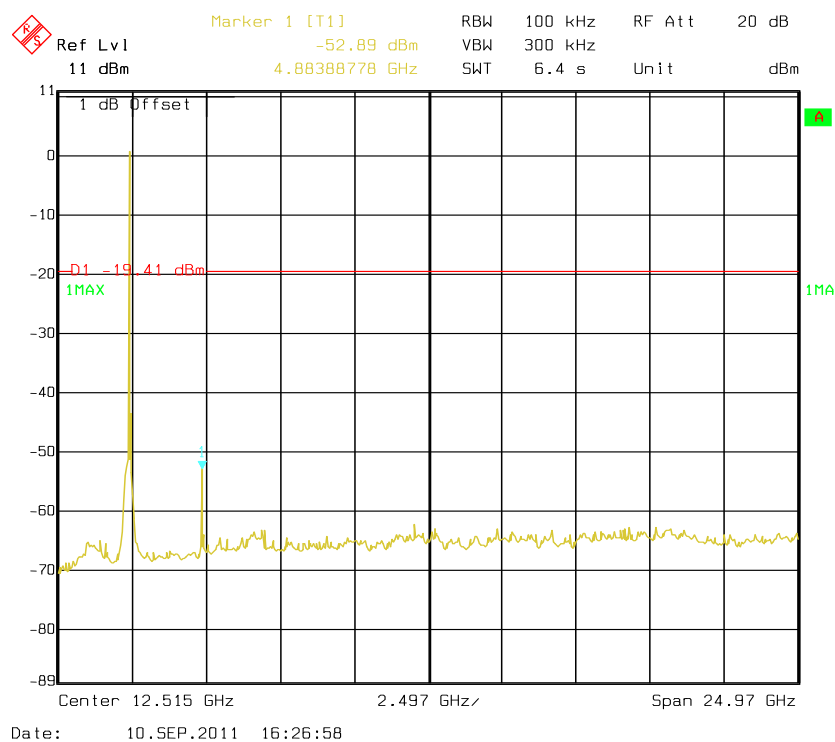
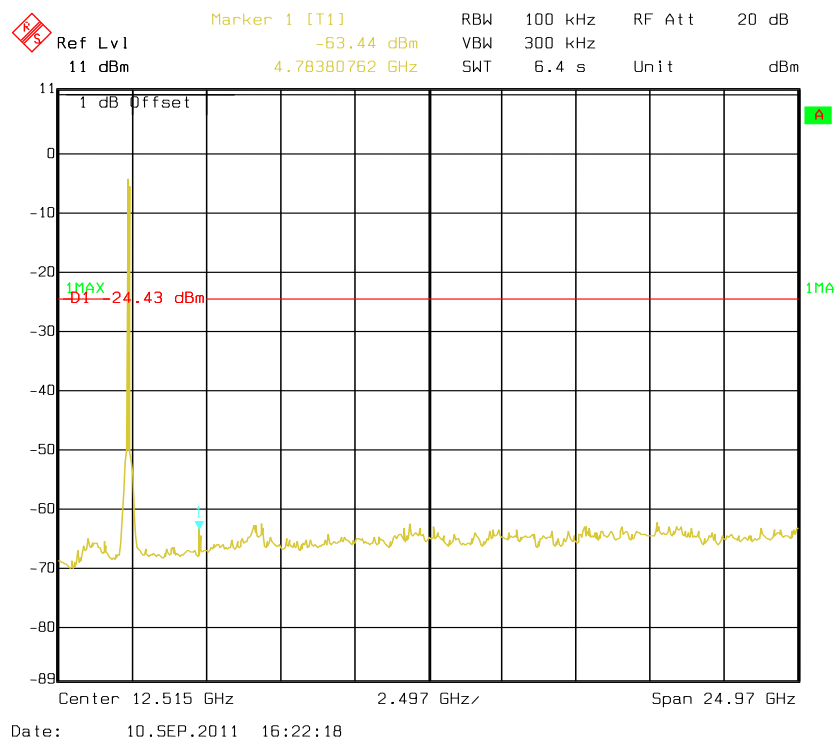
* Within measurement uncertainty.

802.11n-HT40 Mode:

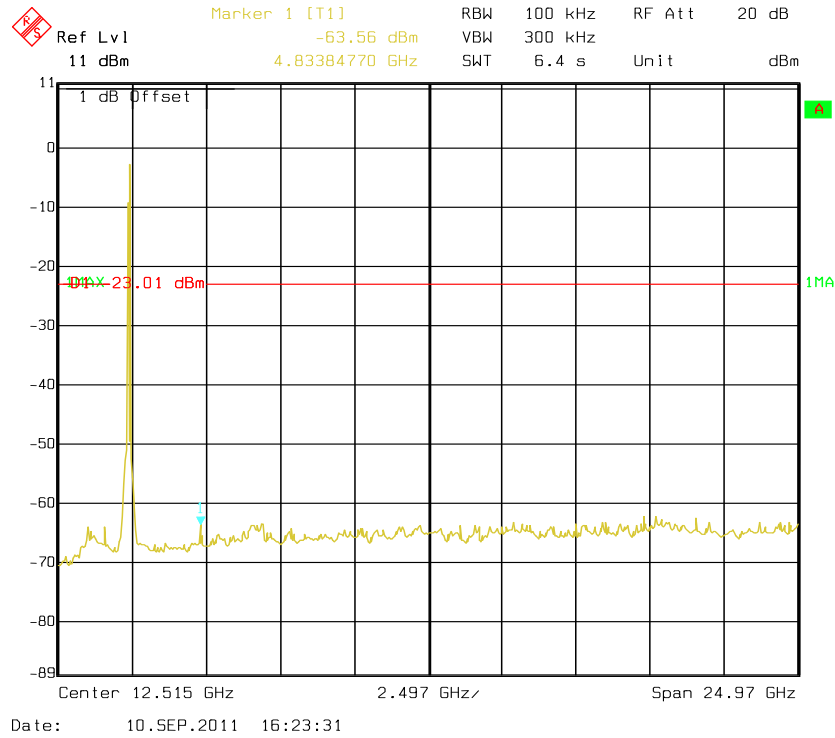
Indicated		Detector (PK/Ave)	Table Angle Degree	Test Antenna		Correction Factor			FCC Part 15.247/15.209			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2422 MHz)												
2386.8	66.90	PK	42	1.0	V	30.6	2.98	26.83	73.65	74	0.35*	spurious
2390.0	66.61	PK	110	1.0	H	30.6	2.98	26.83	73.36	74	0.64*	spurious
2390.0	40.80	Ave.	110	1.0	H	30.6	2.98	26.83	47.55	54	6.45	spurious
2386.8	39.24	Ave.	42	1.0	V	30.6	2.98	26.83	45.99	54	8.01	spurious
4844.0	20.58	Ave.	130	1.5	H	36.6	4.30	26.75	34.73	54	19.27	harmonic
4844.0	20.22	Ave.	60	1.8	V	35.4	4.30	26.75	33.17	54	20.83	harmonic
4844.0	37.56	PK	130	1.5	H	36.6	4.30	26.75	51.71	74	22.29	harmonic
4844.0	36.95	PK	60	1.8	V	35.4	4.30	26.75	49.90	74	24.10	harmonic
Middle Channel (2437 MHz)												
4874.0	20.42	Ave.	130	1.5	H	36.6	4.36	26.75	34.63	54	19.37	harmonic
4874.0	20.18	Ave.	60	1.8	V	35.4	4.36	26.75	33.19	54	20.81	harmonic
4874.0	37.85	PK	130	1.5	H	36.6	4.36	26.75	52.06	74	21.94	harmonic
4874.0	37.77	PK	60	1.8	V	35.4	4.36	26.75	50.78	74	23.22	harmonic
High Channel (2452 MHz)												
2484.5	66.40	PK	37	1.0	V	30.6	3.11	26.88	73.23	74	0.77*	spurious
2483.6	60.23	PK	270	1.0	H	30.6	3.11	26.88	67.06	74	6.94	spurious
2484.5	32.45	Ave.	37	1.0	V	30.6	3.11	26.88	39.28	54	14.72	spurious
2483.6	31.22	Ave.	270	1.0	H	30.6	3.11	26.88	38.05	54	15.95	spurious
4904.0	22.75	Ave.	60	1.8	V	35.4	4.40	26.75	35.80	54	18.20	harmonic
4904.0	20.68	Ave.	250	1.8	H	36.6	4.40	26.75	34.93	54	19.07	harmonic
4904.0	37.24	PK	250	1.8	H	36.6	4.40	26.75	51.49	74	22.51	harmonic
4904.0	37.16	PK	60	1.8	V	35.4	4.40	26.75	50.21	74	23.79	harmonic

* Within measurement uncertainty.

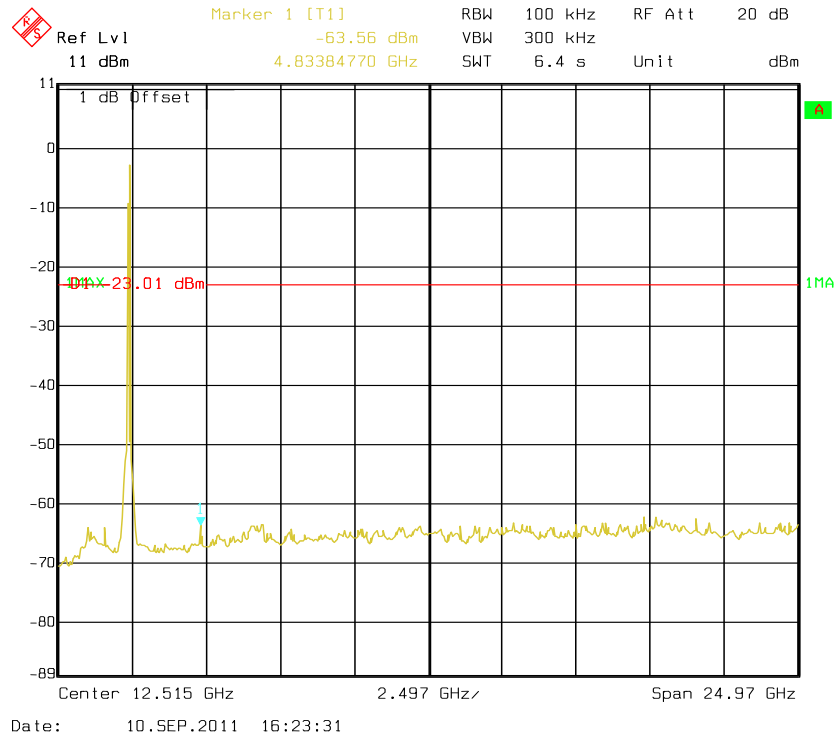
Antenna Port Conducted Spurious Emissions:**802.11b Low Channel****802.11b Middle Channel**

802.11b High Channel**802.11g Low Channel**

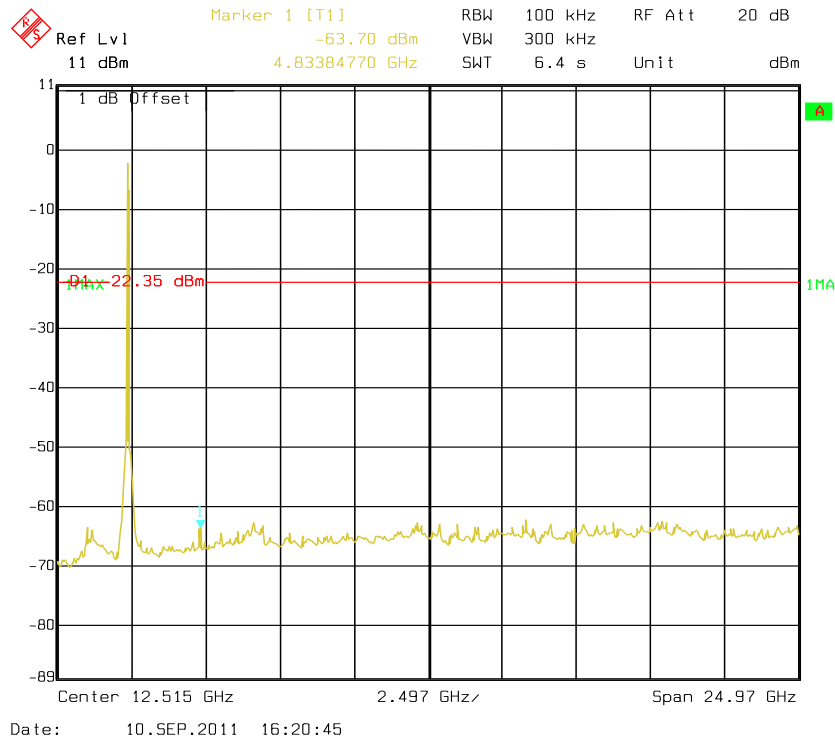
802.11g Middle Channel



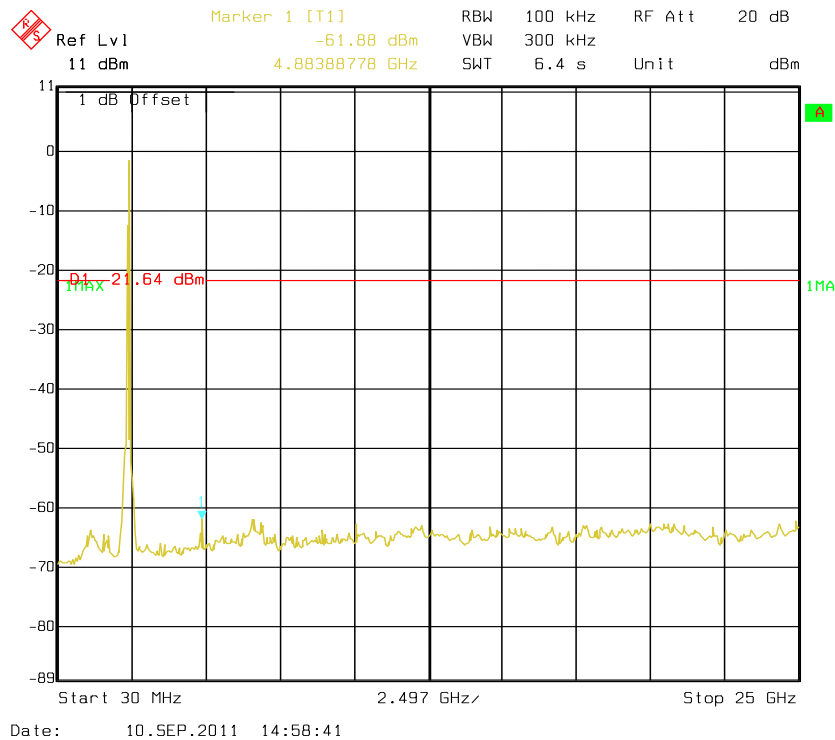
802.11g High Channel



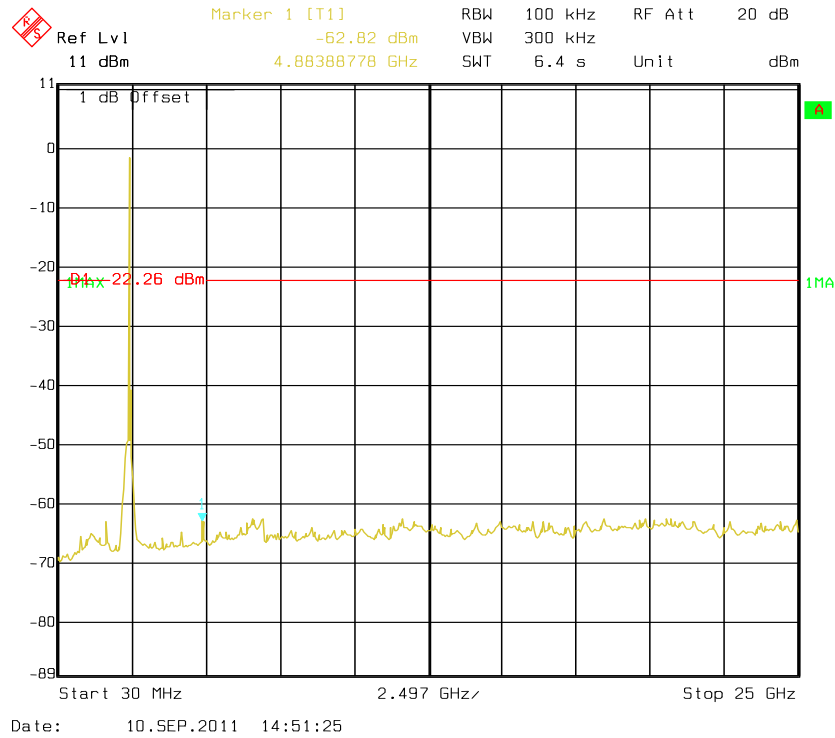
802.11n-HT20 Low Channel



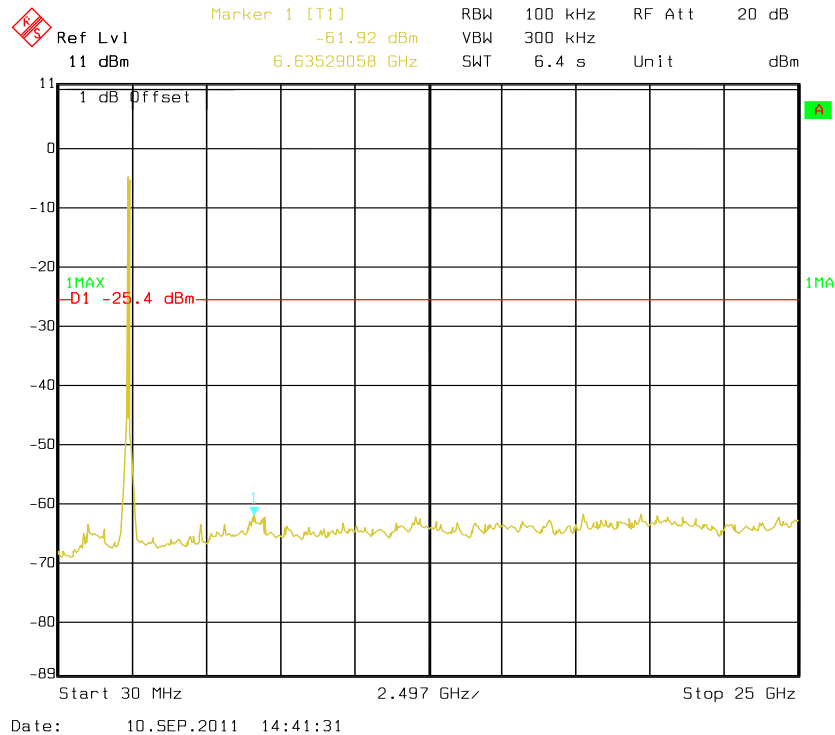
802.11n-HT20 Middle Channel



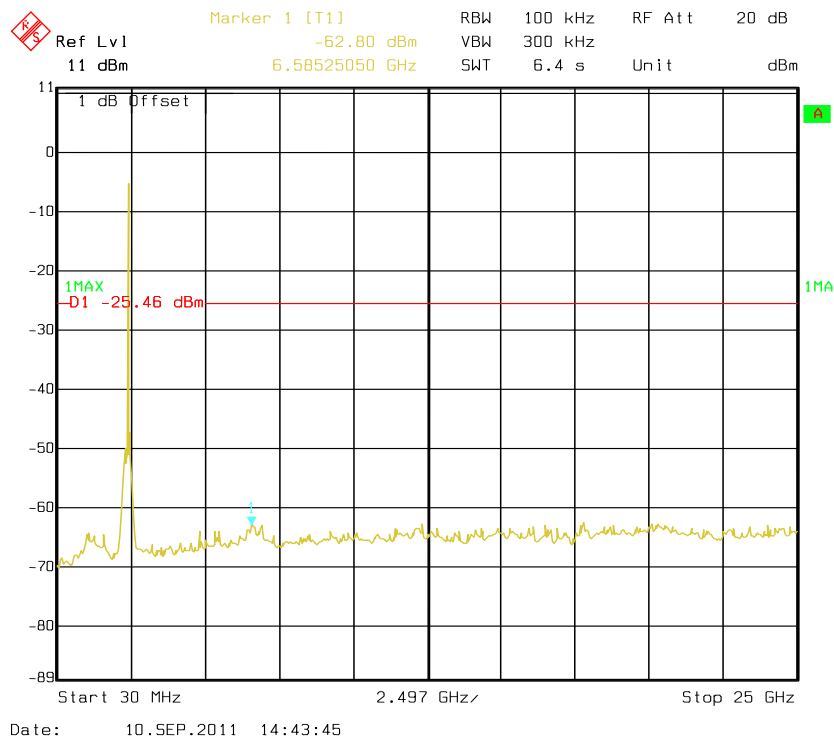
802.11n-HT20 High Channel



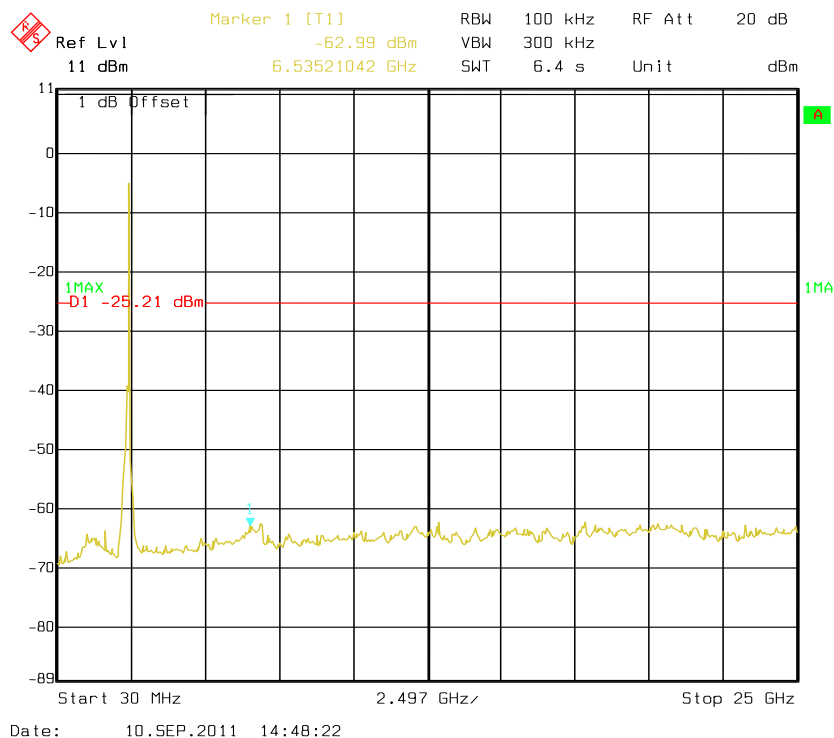
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



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

Applicable Standard

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

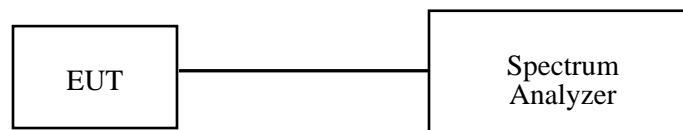
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10

* **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 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 Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

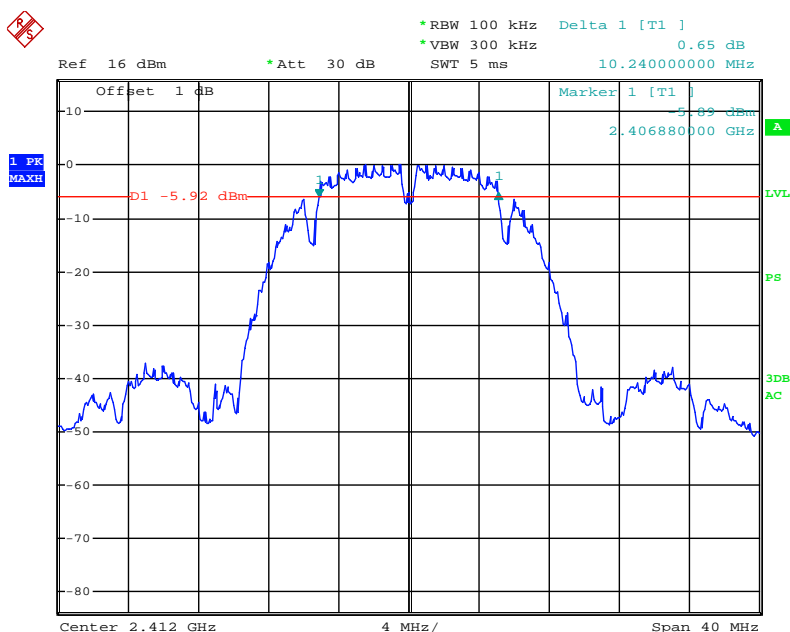
The testing was performed by Bruce Zhang on 2011-09-04.

Test Result: Pass.

Please refer to the following tables and plots.

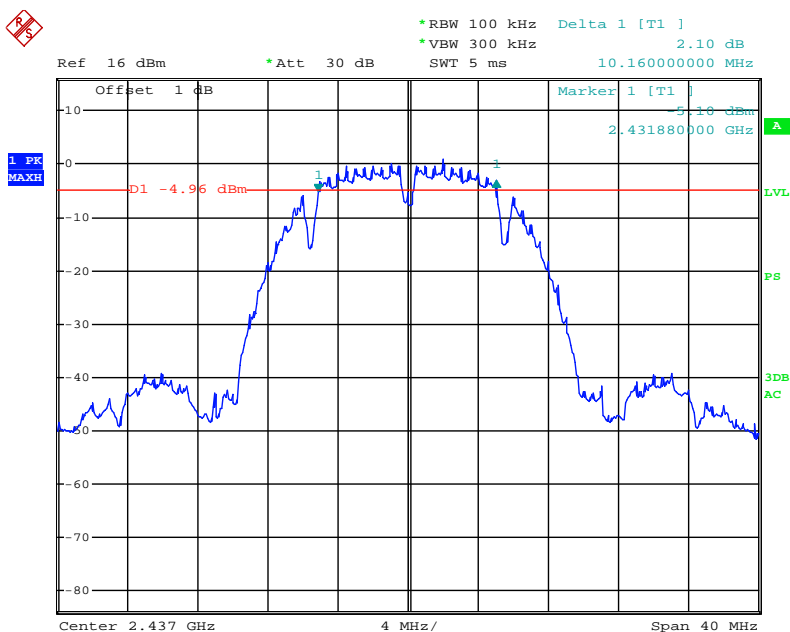
Channel	Frequency (MHz)	Data Rate (Mbps)	6 dB Emission Bandwidth (MHz)	Part 15.247 Limit (kHz)
802.11b				
Low	2412	1	10.24	> 500
Middle	2437	1	10.16	> 500
High	2462	1	12.00	> 500
802.11g				
Low	2412	6	16.88	> 500
Middle	2437	6	16.80	> 500
High	2462	6	16.72	> 500
802.11n-HT20				
Low	2412	6.5	16.88	> 500
Middle	2437	6.5	16.88	> 500
High	2462	6.5	16.72	> 500
802.11n-HT40				
Low	2422	6.5	35.68	> 500
Middle	2437	6.5	35.52	> 500
High	2452	6.5	35.52	> 500

802.11b Low Channel

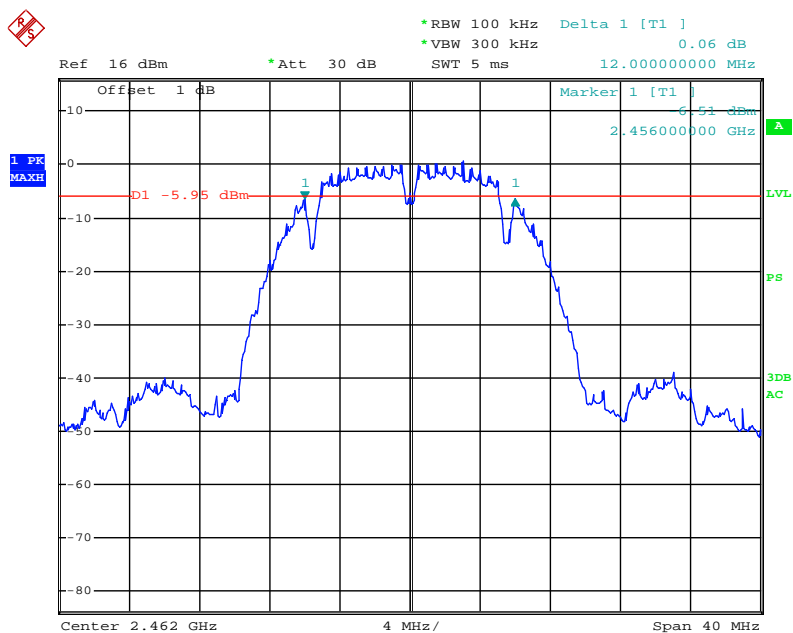


Date: 4.SEP.2011 18:03:11

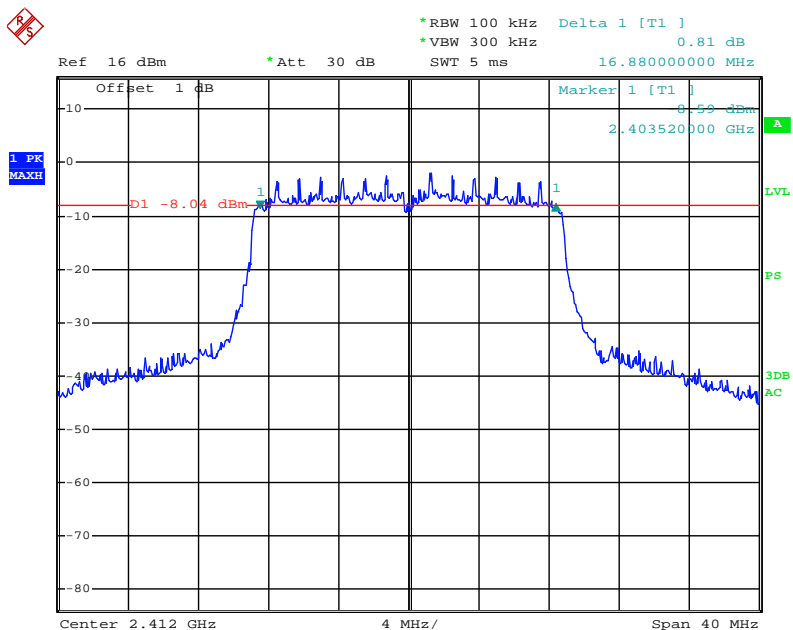
802.11b Middle Channel



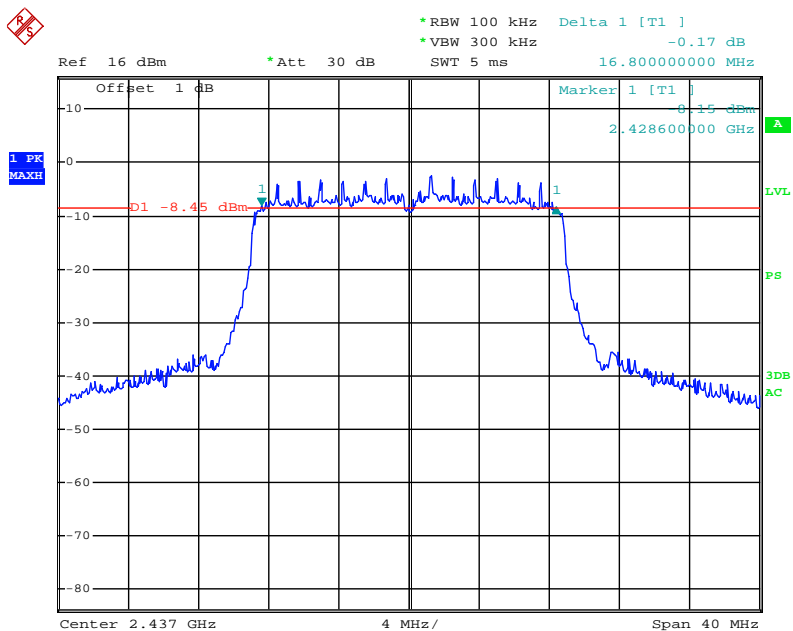
Date: 4.SEP.2011 18:02:02

802.11b High Channel

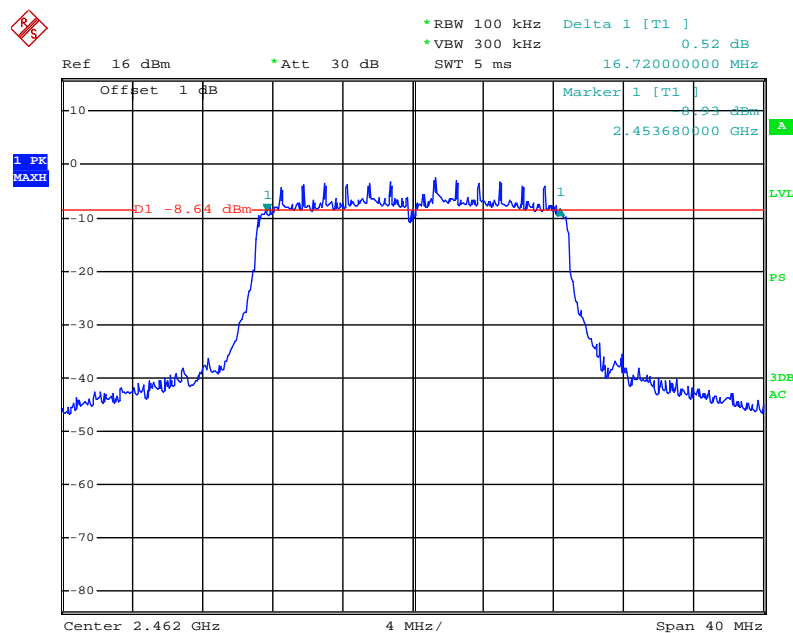
Date: 4.SEP.2011 18:00:19

802.11g Low Channel

Date: 4.SEP.2011 17:48:52

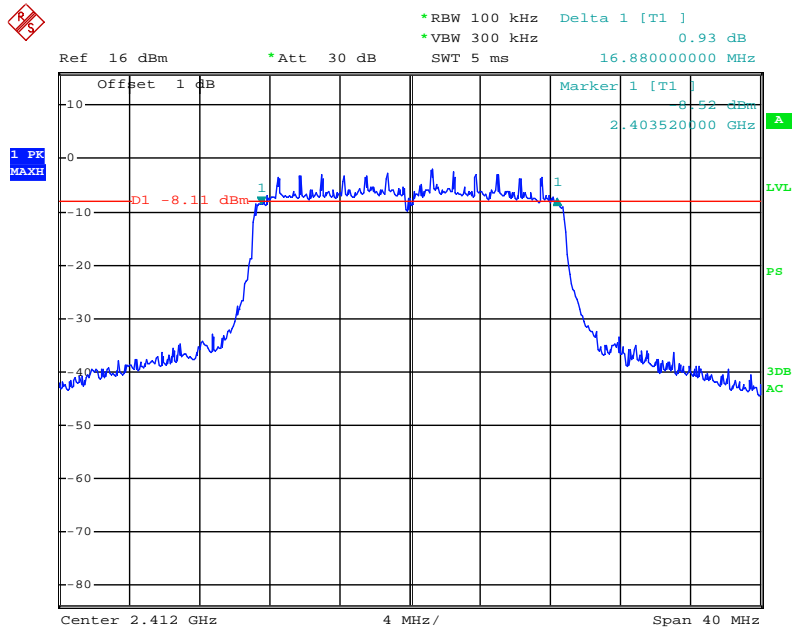
802.11g Middle Channel

Date: 4.SEP.2011 17:46:28

802.11g High Channel

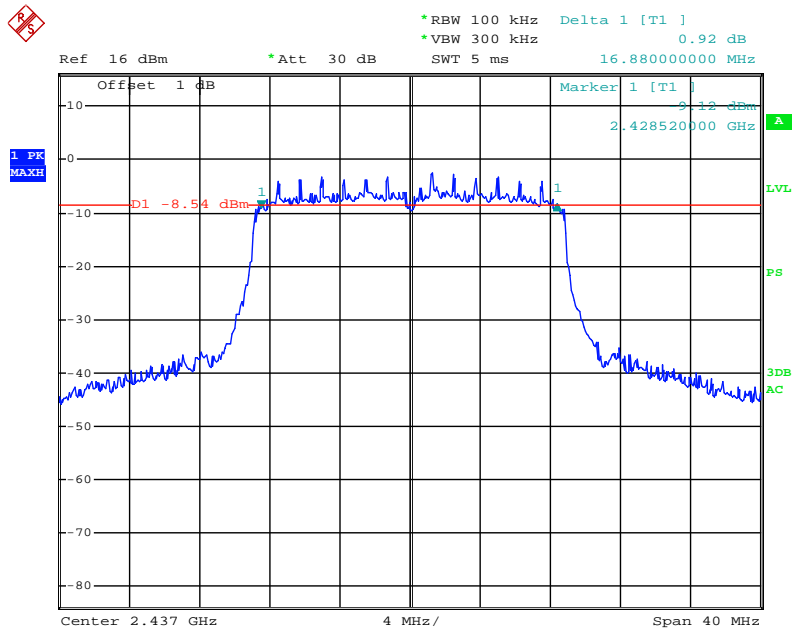
Date: 4.SEP.2011 17:43:17

802.11n-HT20 Low Channel

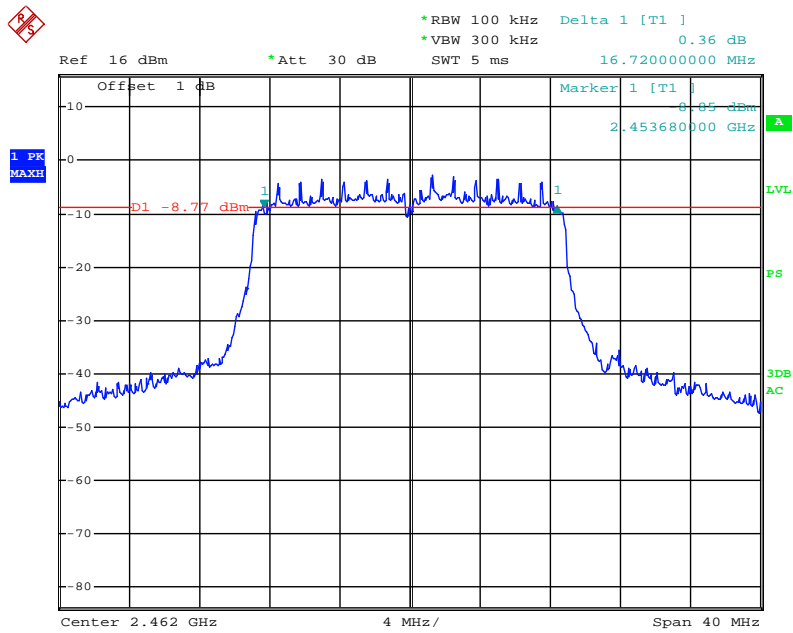


Date: 4.SEP.2011 17:34:26

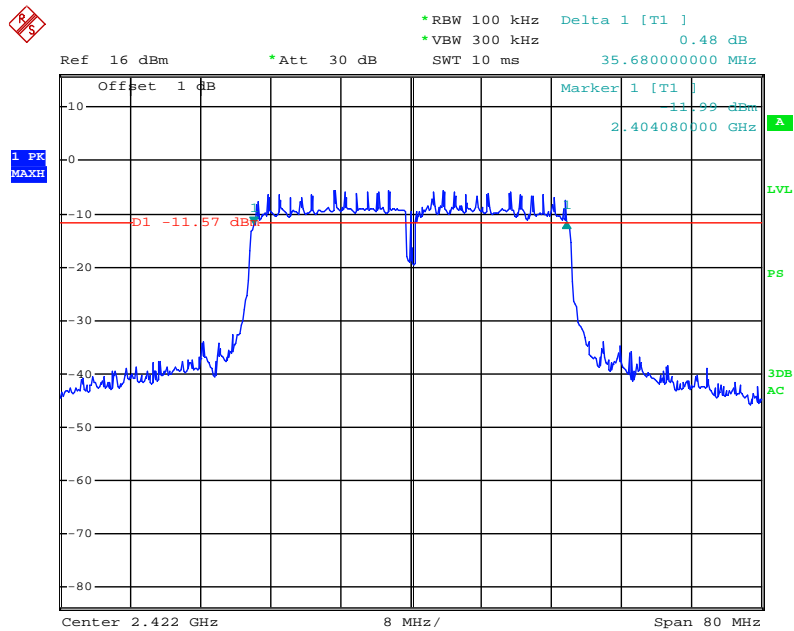
802.11n-HT20 Middle Channel



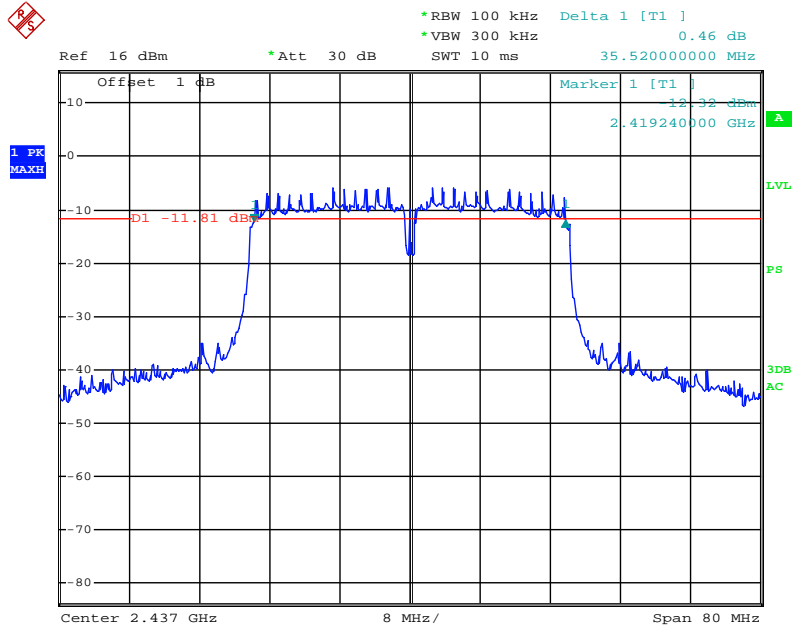
Date: 4.SEP.2011 17:36:43

802.11n-HT20 High Channel

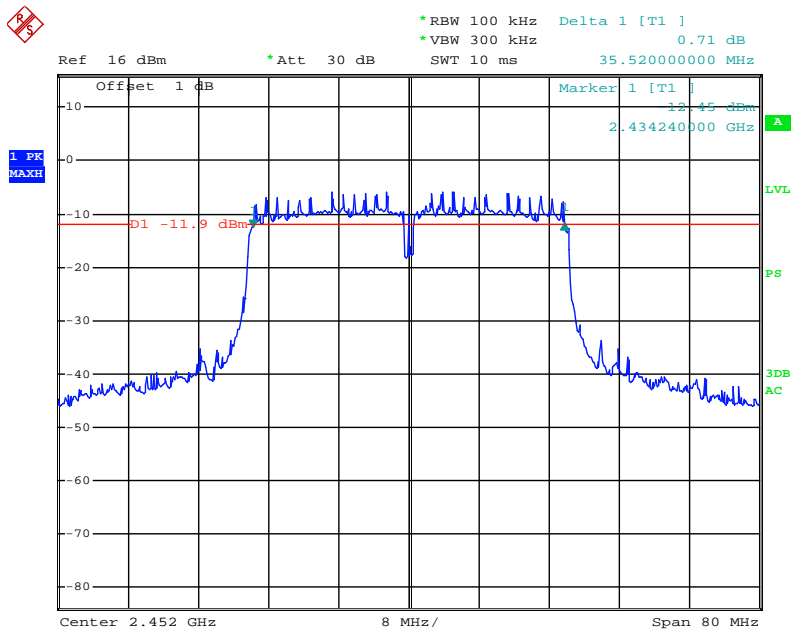
Date: 4.SEP.2011 17:40:51

802.11n-HT40 Low Channel

Date: 4.SEP.2011 17:30:59

802.11n-HT40 Middle Channel

Date: 4.SEP.2011 17:29:21

802.11n-HT40 High Channel

Date: 4.SEP.2011 17:27:49

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.

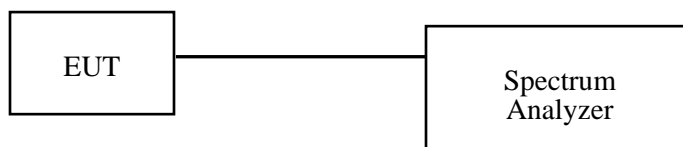
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10

* **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 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 Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Bruce Zhang on 2011-09-04.

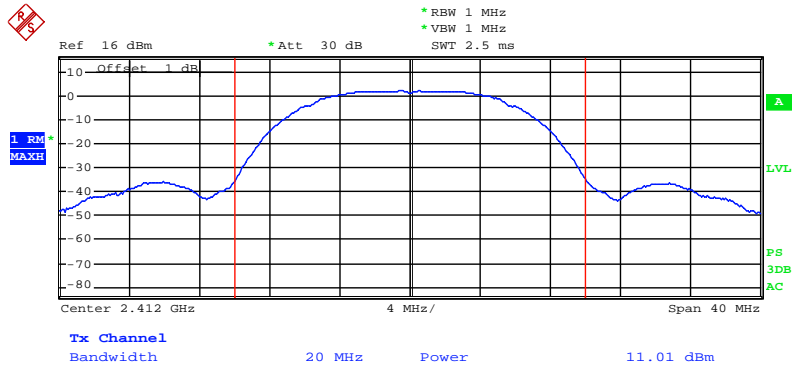
Test Mode: Transmitting

Channel	Frequency (MHz)	Data Rate (Mbps)	Conducted Output Power (dBm)	Limit (dBm)	Result
802.11b					
Low	2412	1	11.01	25	Pass
Middle	2437	1	10.54	25	Pass
High	2462	1	10.22	25	Pass
802.11g					
Low	2412	6	9.37	25	Pass
Middle	2437	6	9.18	25	Pass
High	2462	6	8.74	25	Pass
802.11n-HT20					
Low	2412	6.5	9.57	25	Pass
Middle	2437	6.5	9.03	25	Pass
High	2462	6.5	8.76	25	Pass
802.11n-HT40					
Low	2422	6.5	10.07	25	Pass
Middle	2437	6.5	10.00	25	Pass
High	2452	6.5	9.28	25	Pass

Note: The Antenna gain of EUT is 20 dBi, According to FCC §15.247(b), for P-to-P operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

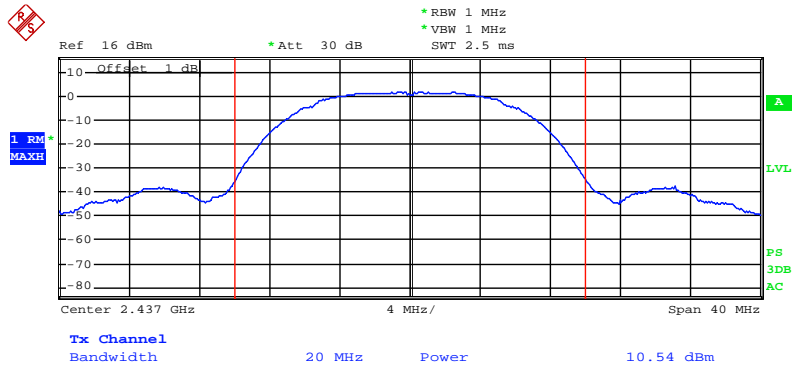
Conducted output power limit is $30 - 5 = 25$ dBm

802.11b RF Output Power, Low Channel

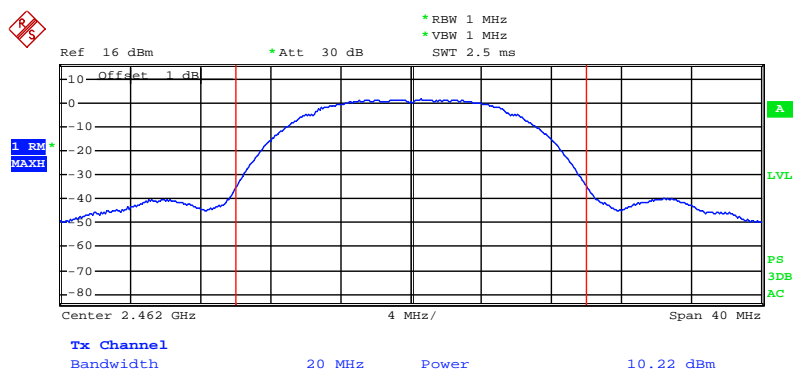


Date: 4.SEP.2011 17:03:13

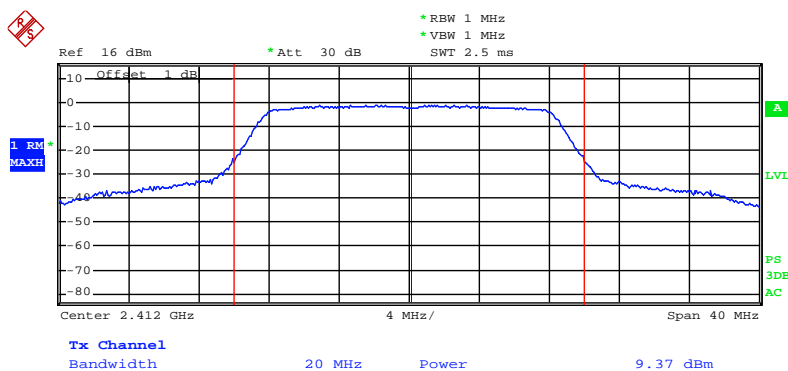
802.11b RF Output Power, Middle Channel



Date: 4.SEP.2011 17:04:22

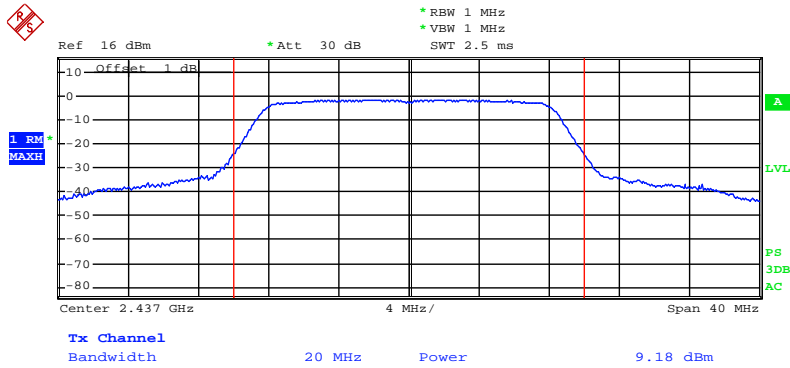
802.11b RF Output Power, High Channel

Date: 4.SEP.2011 17:05:20

802.11g RF Output Power, Low Channel

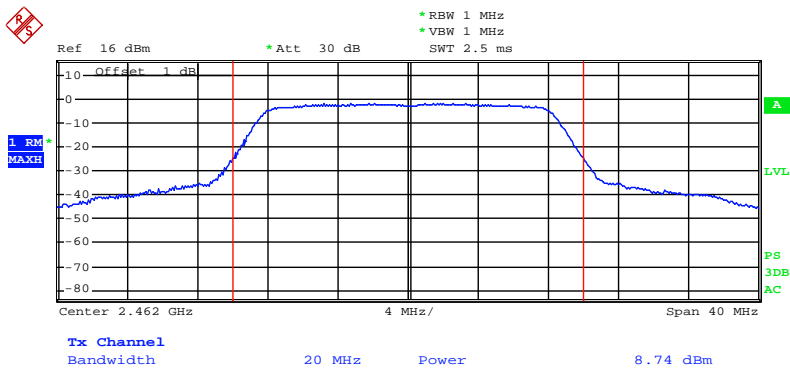
Date: 4.SEP.2011 17:11:55

802.11g RF Output Power, Middle Channel



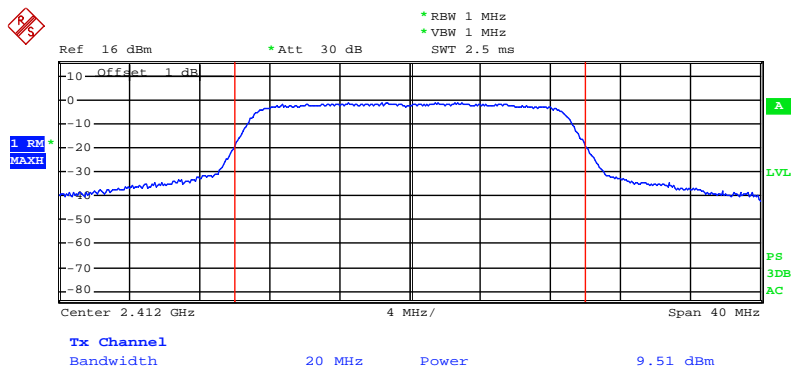
Date: 4.SEP.2011 17:11:17

802.11g RF Output Power, High Channel



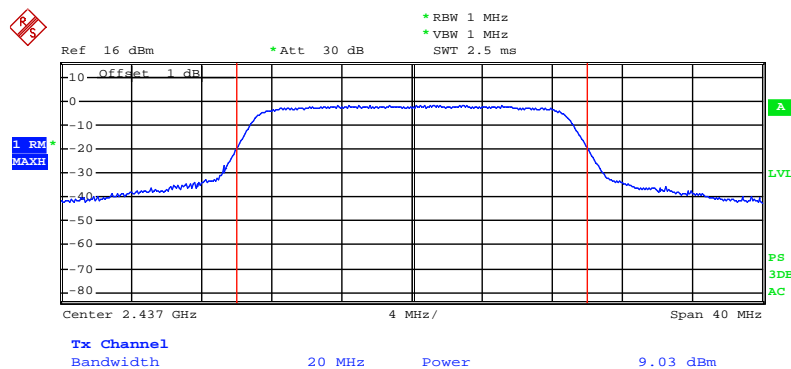
Date: 4.SEP.2011 17:13:05

802.11n-HT20 RF Output Power, Low Channel

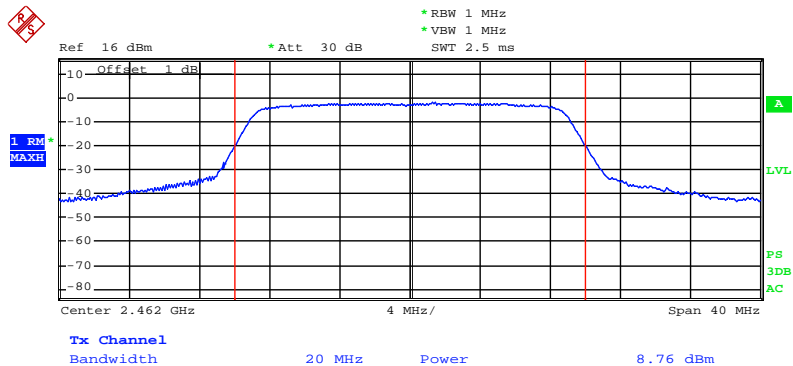


Date: 4.SEP.2011 17:14:14

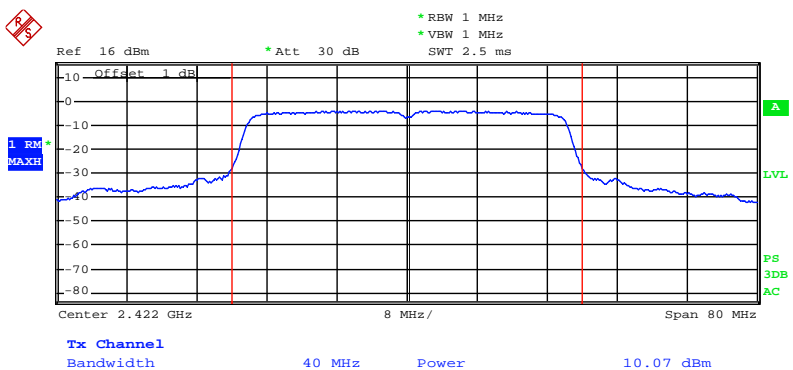
802.11n-HT20 RF Output Power, Middle Channel



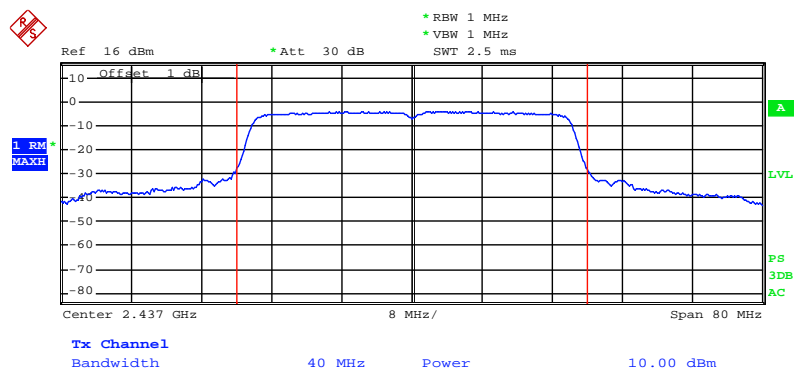
Date: 4.SEP.2011 17:15:02

802.11n-HT20 RF Output Power, High Channel

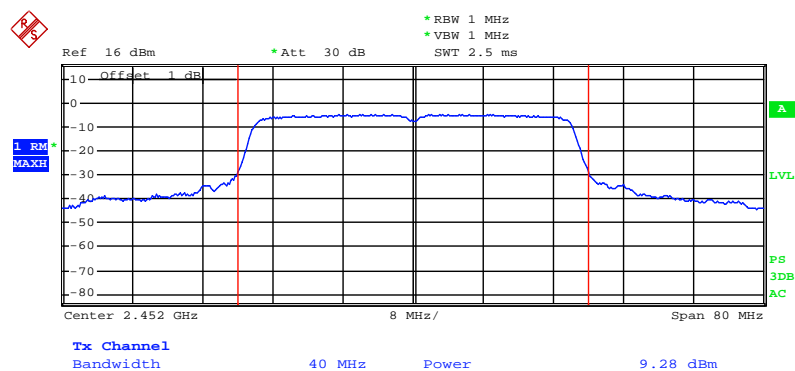
Date: 4.SEP.2011 17:15:48

802.11n-HT40 RF Output Power, Low Channel

Date: 4.SEP.2011 17:21:34

802.11n-HT40 RF Output Power, Middle Channel

Date: 4.SEP.2011 17:23:19

802.11n-HT40 RF Output Power, High Channel

Date: 4.SEP.2011 17:24:19

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10

* **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 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 1 MHz and VBW of spectrum analyzer to 1 MHz 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 Data

Environmental Conditions

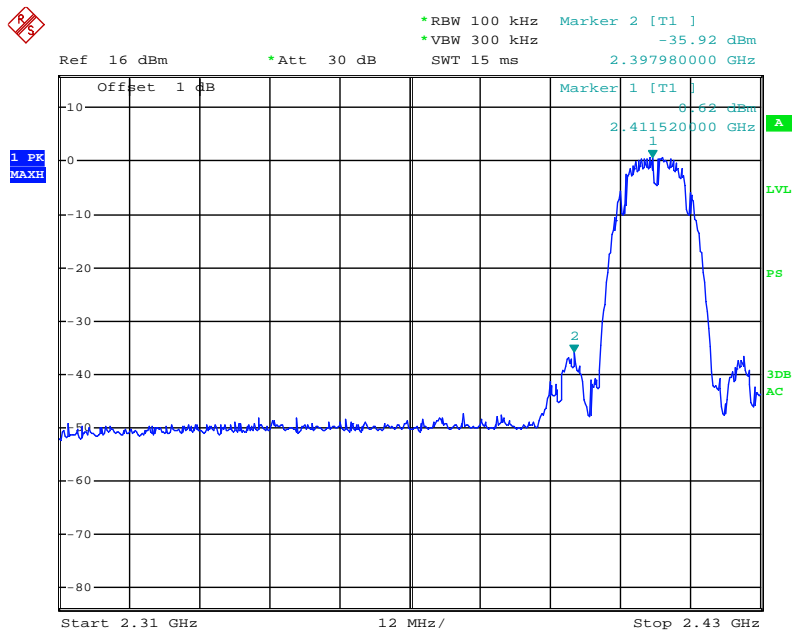
Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Bruce Zhang on 2011-09-09.

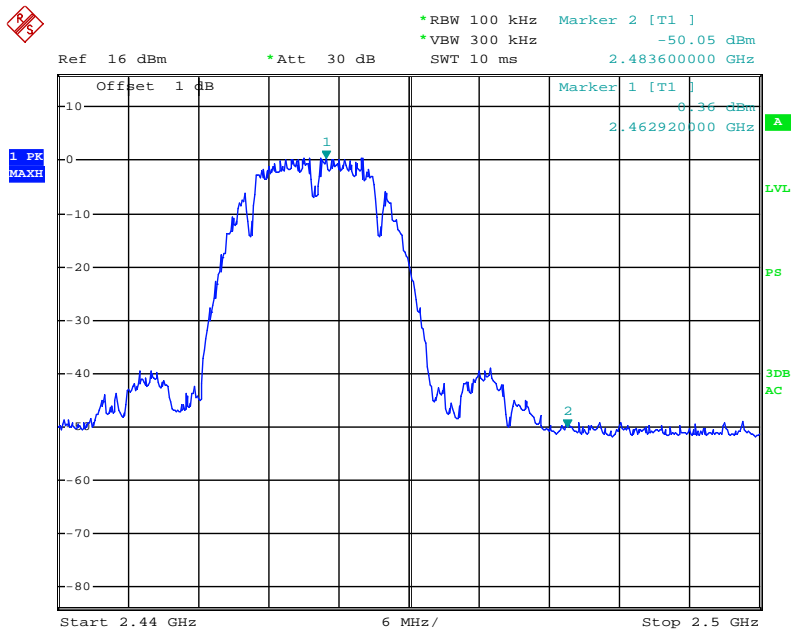
Test Result: *Compliance*

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
802.11b			
2397.98	36.54	20	Pass
2483.6	50.41	20	Pass
802.11g			
2399.9	33.75	20	Pass
2483.6	45.92	20	Pass
802.11n-HT20			
2399.9	33.77	20	Pass
2483.6	42.17	20	Pass
802.11n-HT40			
2398.5	28.12	20	Pass
2483.6	36.08	20	Pass

Please refer to following plots.

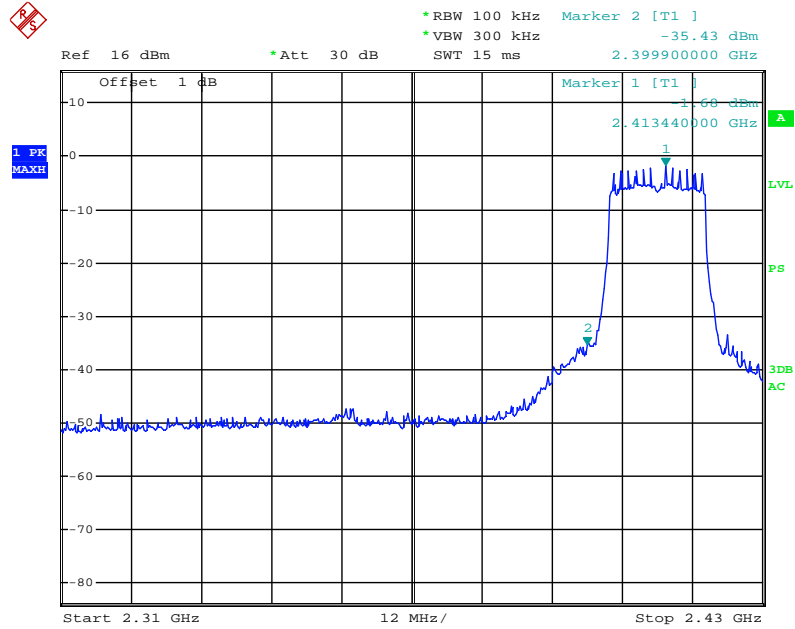
802.11b: Band Edge, Left Side

Date: 9.SEP.2011 10:48:51

802.11b: Band Edge, Right Side

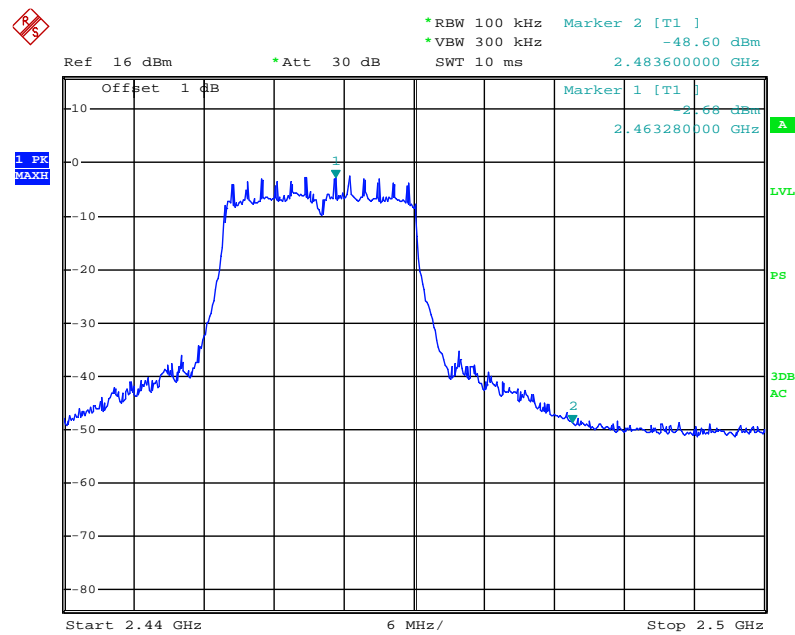
Date: 9.SEP.2011 10:49:32

802.11g: Band Edge, Left Side

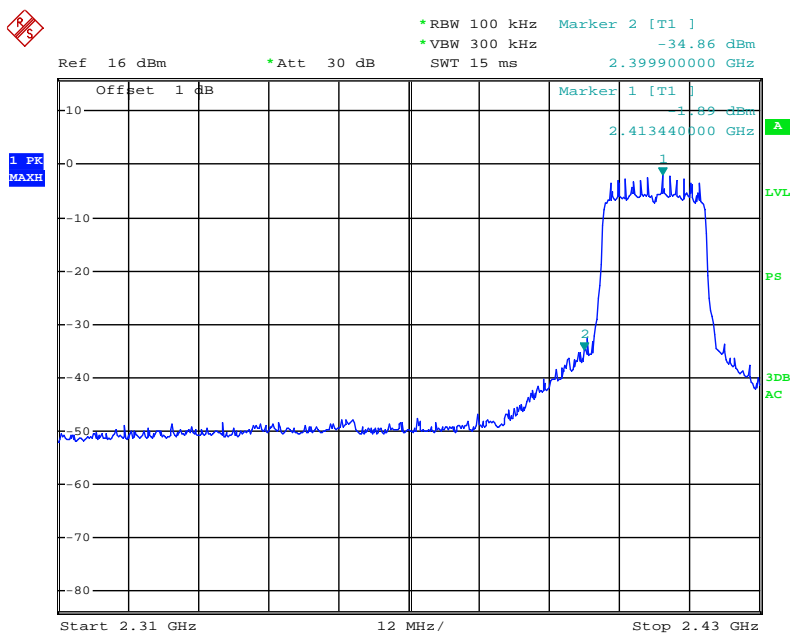


Date: 9.SEP.2011 10:51:48

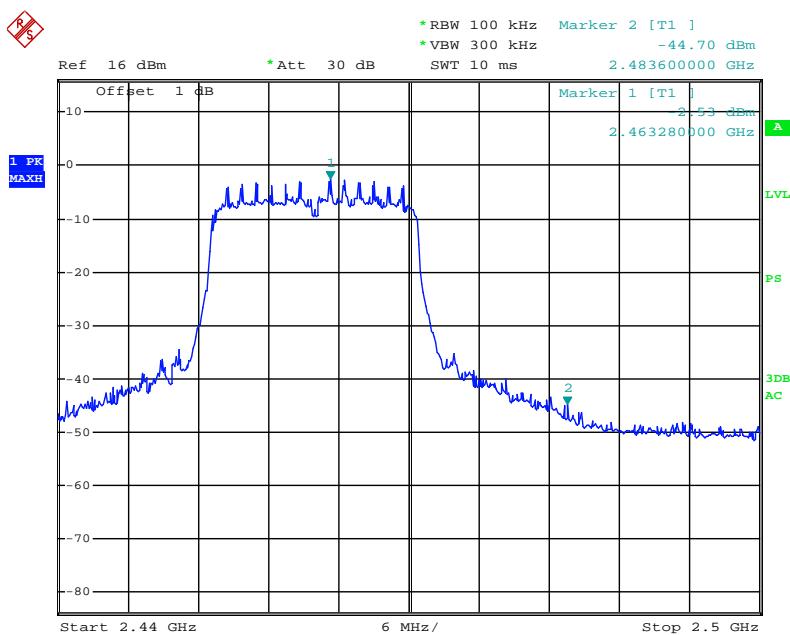
802.11g: Band Edge, Right Side



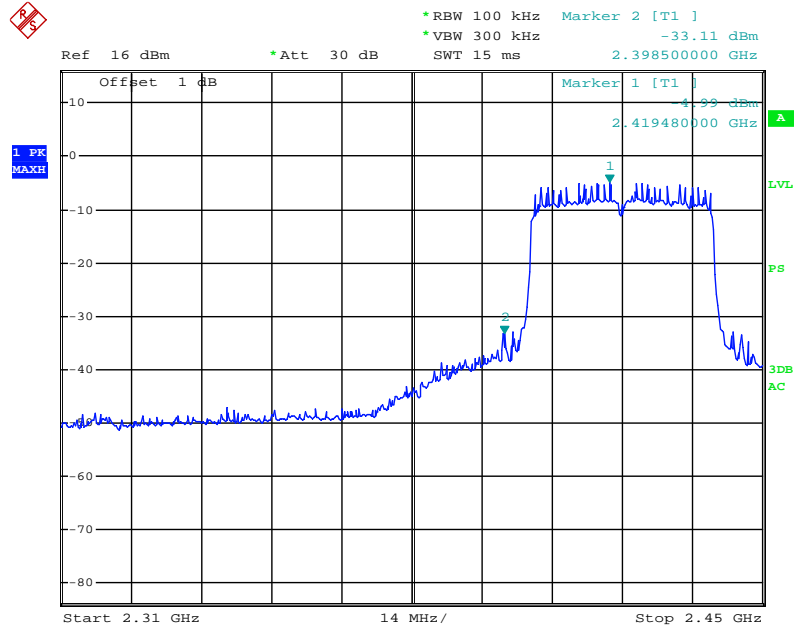
Date: 9.SEP.2011 10:50:44

802.11n-HT20: Band Edge, Left Side

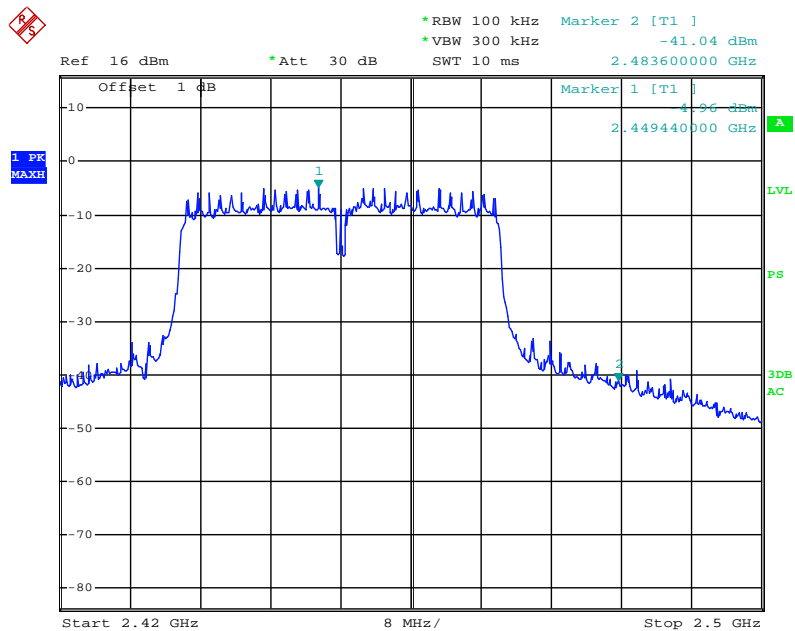
Date: 9.SEP.2011 10:52:49

802.11n-HT20: Band Edge, Right Side

Date: 9.SEP.2011 10:53:40

802.11n-HT40: Band Edge, Left Side

Date: 9.SEP.2011 11:01:50

802.11n-HT40: Band Edge, Right Side

Date: 9.SEP.2011 10:59:52

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10

* **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 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. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

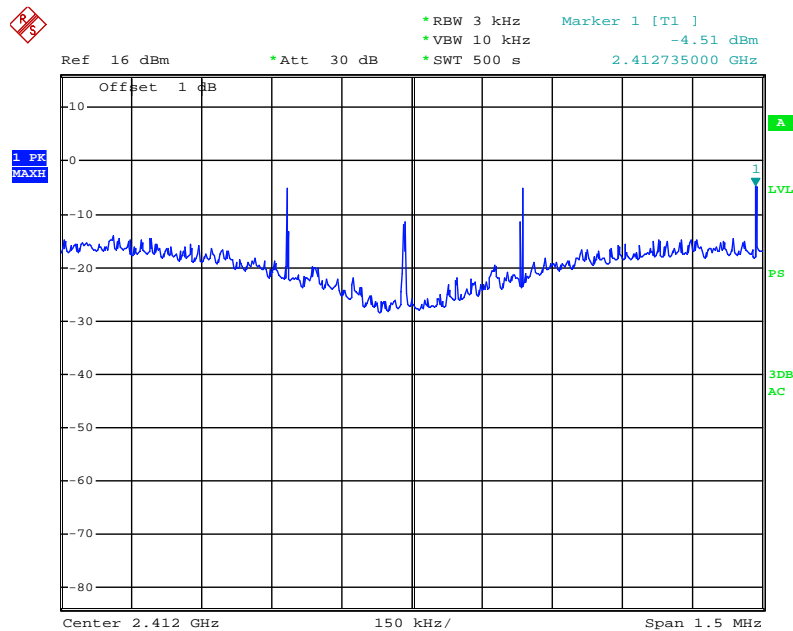
The testing was performed by Bruce Zhang on 2011-09-04 to 2011-09-08.

Test Mode: Transmitting

Test Result: Pass

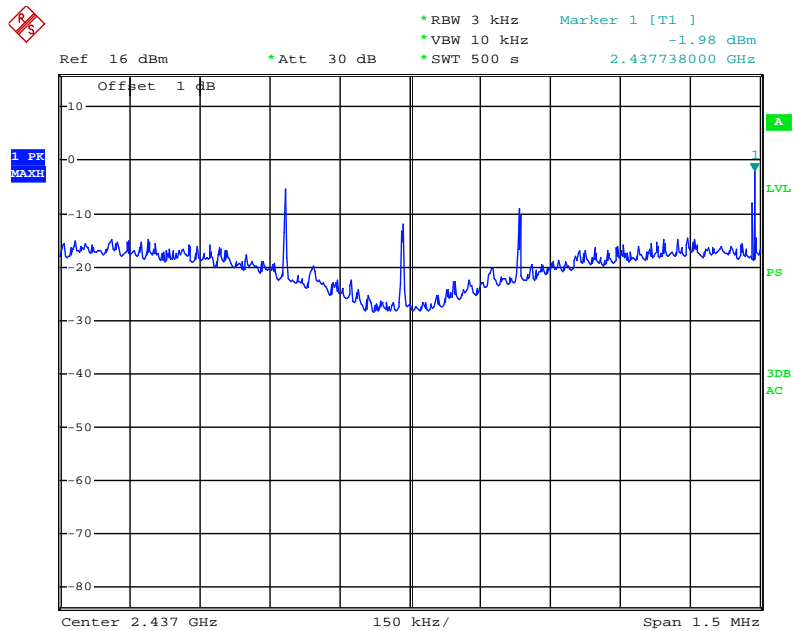
Channel	Frequency (MHz)	Data Rate (Mbps)	PSD (dBm)	Limit (dBm)	Result
802.11b					
Low	2412	1	-4.51	3	Pass
Middle	2437	1	-1.98	3	Pass
High	2462	1	-5.83	3	Pass
802.11g					
Low	2412	6	-11.55	3	Pass
Middle	2437	6	-11.99	3	Pass
High	2462	6	-12.21	3	Pass
802.11n-HT20					
Low	2412	6.5	-11.35	3	Pass
Middle	2437	6.5	-11.24	3	Pass
High	2462	6.5	-11.65	3	Pass
802.11n-HT40					
Low	2422	6.5	-17.52	3	Pass
Middle	2437	6.5	-17.62	3	Pass
High	2452	6.5	-17.93	3	Pass

Power Spectral Density, 802.11b Low Channel

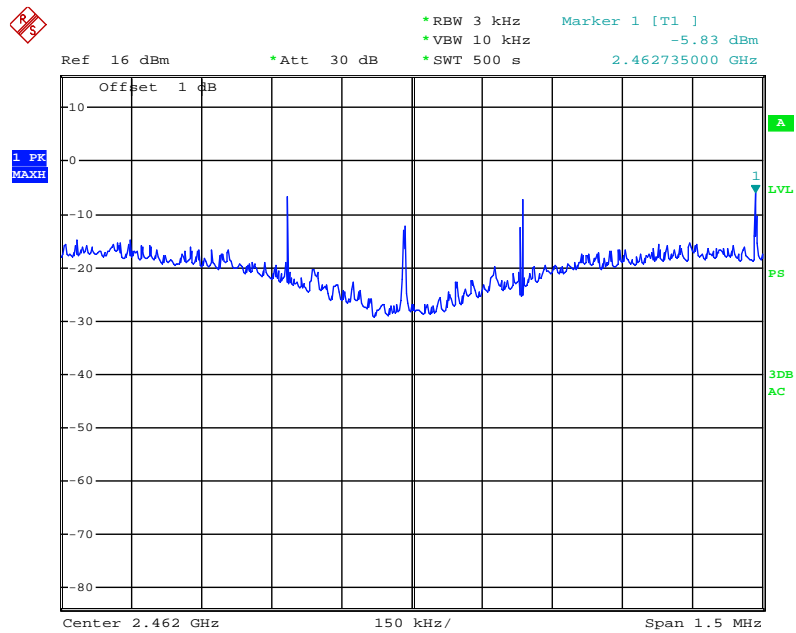


Date: 4.SEP.2011 18:20:04

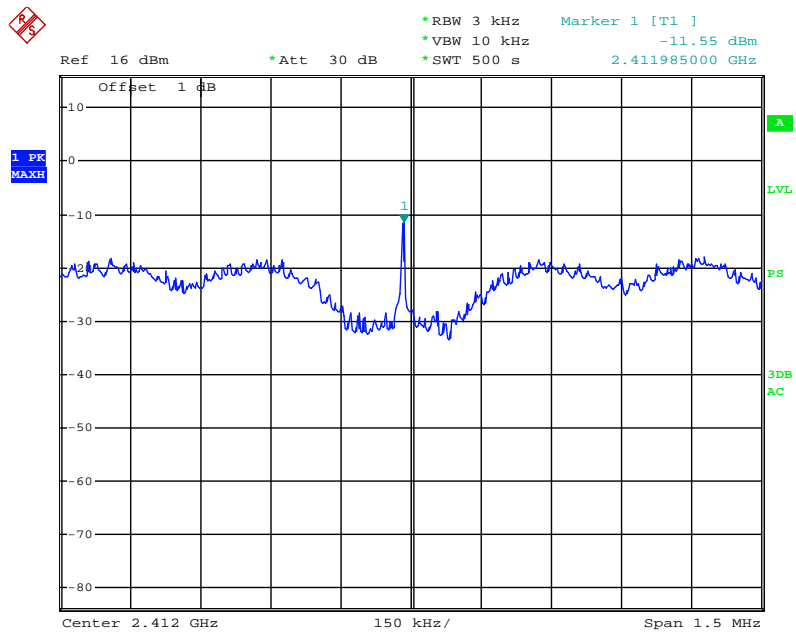
Power Spectral Density, 802.11b Middle Channel



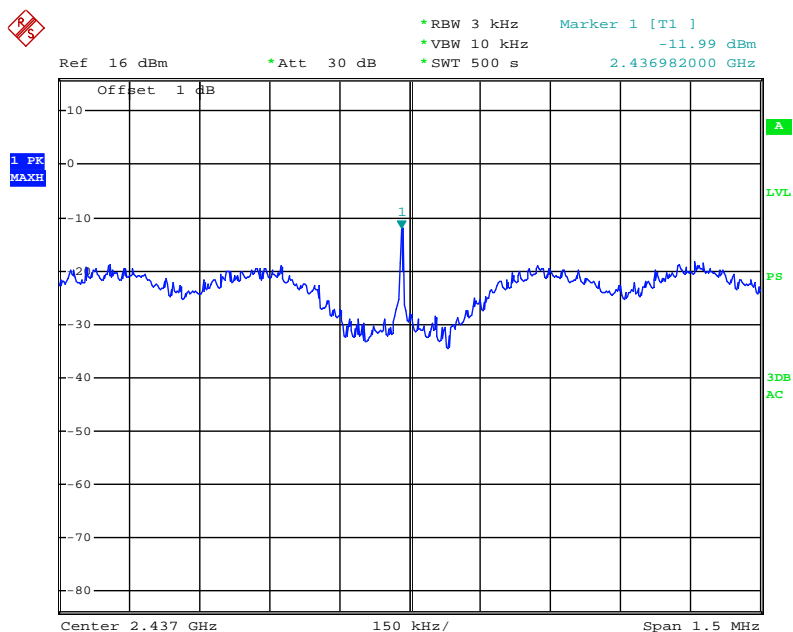
Date: 4.SEP.2011 18:33:08

Power Spectral Density, 802.11b High Channel

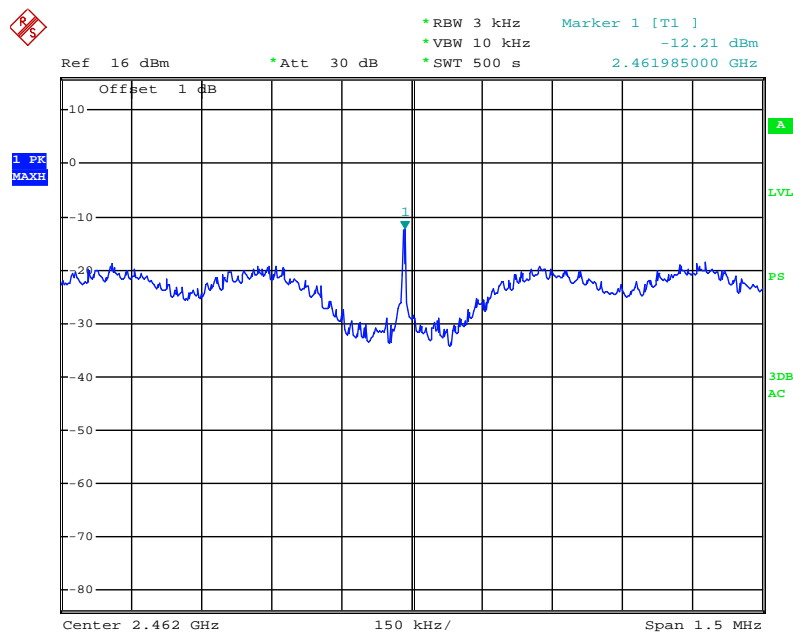
Date: 4.SEP.2011 18:43:25

Power Spectral Density, 802.11g Low Channel

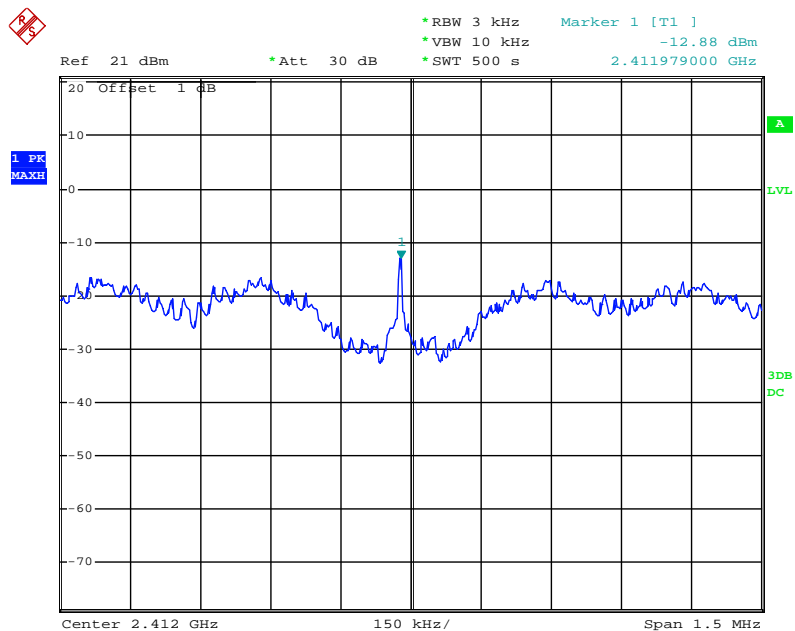
Date: 4.SEP.2011 19:14:56

Power Spectral Density, 802.11g Middle Channel

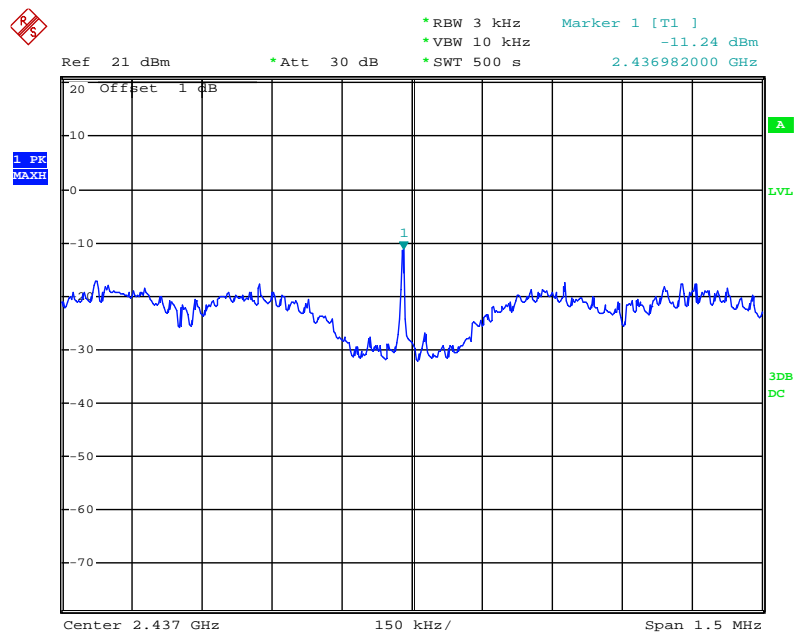
Date: 4.SEP.2011 19:02:38

Power Spectral Density, 802.11g High Channel

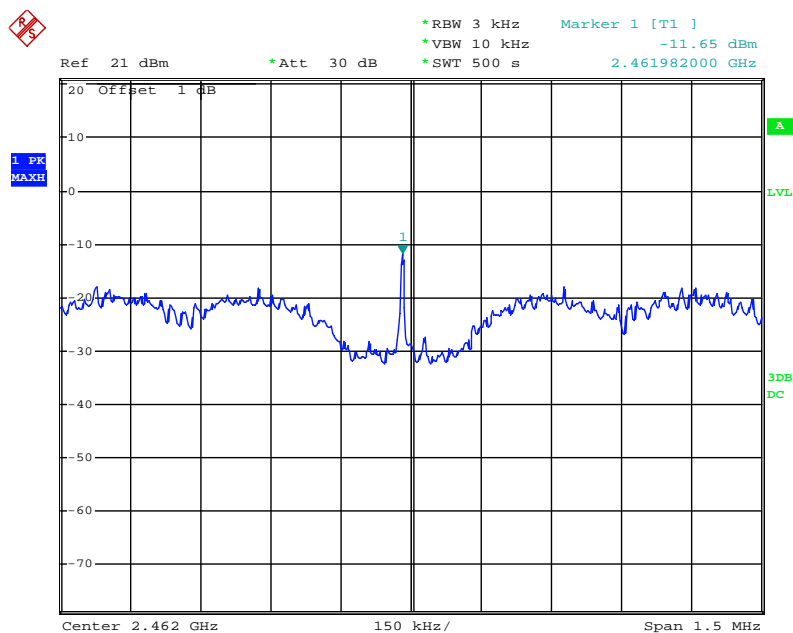
Date: 4.SEP.2011 18:53:10

Power Spectral Density, 802.11n-HT20 Low Channel

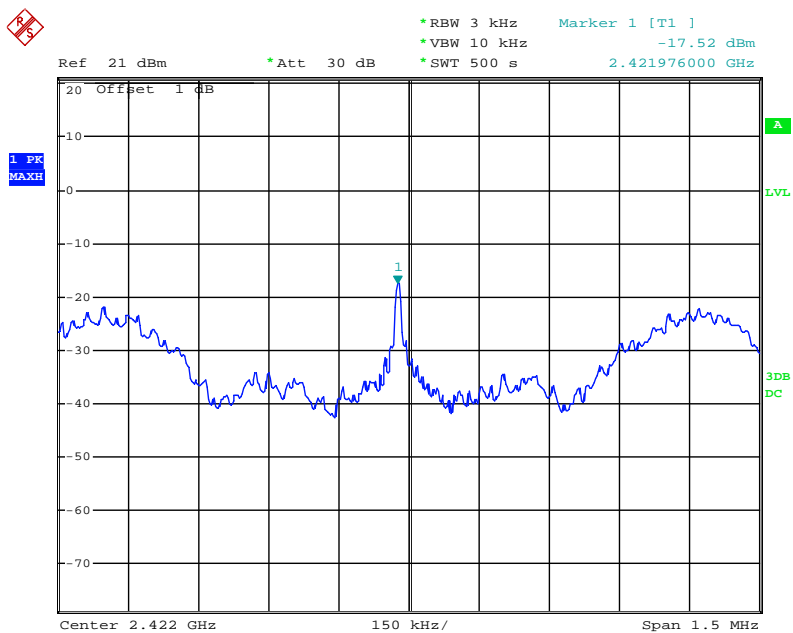
Date: 8.SEP.2011 06:09:30

Power Spectral Density, 802.11n-HT20 Middle Channel

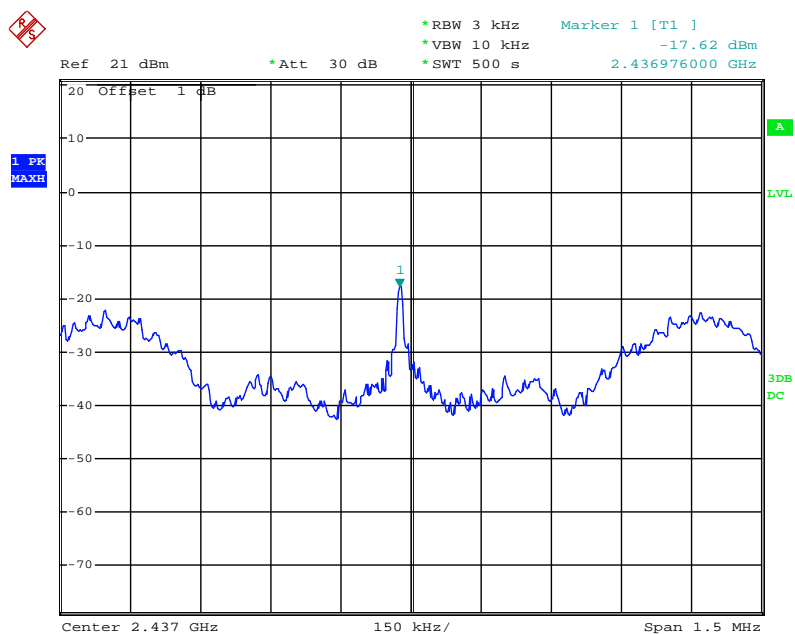
Date: 8.SEP.2011 04:23:47

Power Spectral Density, 802.11n-HT20 High Channel

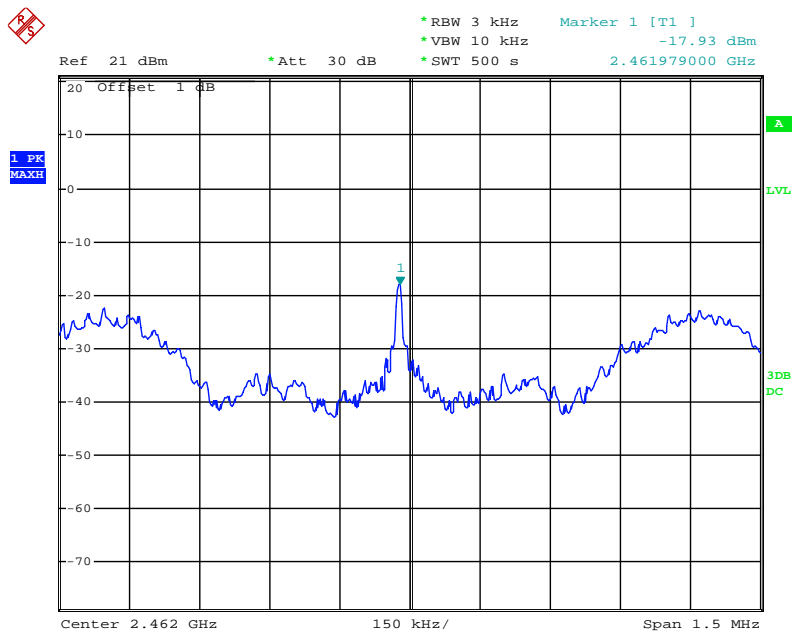
Date: 8.SEP.2011 04:50:37

Power Spectral Density, 802.11n-HT40 Low Channel

Date: 8.SEP.2011 06:22:41

Power Spectral Density, 802.11n-HT40 Middle Channel

Date: 8.SEP.2011 06:32:16

Power Spectral Density, 802.11n-HT40 High Channel

Date: 8.SEP.2011 06:42:54

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