

FCC PART 15.247

TEST REPORT

For

CHUNGHSIN INTERNATIONAL ELECTRONICS CO.,LTD

618 GONGREN WEST ROAD,JIAOJIANG AREA TAIZHOU ZHEJIANG 318000 China

FCC ID: 2AI5MN1481Q

Report Type: Original Report	Product Type: Notebook
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Report Number:	RDG160622801-00C
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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. (Dongguan).

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FINAL

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *CHUNGHSIN INTERNATIONAL ELECTRONICS CO.,LTD*'s product, model number: *M11401(FCC ID: 2A15MN1481Q)* (the "EUT") in this report was a *Notebook*, which was measured approximately: 35 cm (L) x 23.5 cm (W) x 2.0 cm (H), rated input voltage: DC 3.7V rechargeable Li-ion battery or DC5V charging from adapter.

Adapter #1 Information:

MODEL: BSYB050250U U

INPUT: 100-240V ~, 50/60Hz, 0.4A

OUTPUT: DC 5.0V, 2.5A

Adapter#2 Information:

MODEL: JK050250-S04US

INPUT: 100-240V ~, 50/60Hz, 0.5A

OUTPUT: DC 5.0V, 2500mA

All measurement and test data in this report was gathered from production sample serial number: 160622801 (Assigned by BACL, Dongguan). The EUT was received on 2016-06-28.

Objective

This report is prepared on behalf of *CHUNGHSIN INTERNATIONAL ELECTRONICS CO.,LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communications Commission's 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 JBC submissions with FCC ID: 2A15MN1481Q.

FCC Part 15C DSS submissions with FCC ID: 2A15MN1481Q.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxihu 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 Communications 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 06, 2015.

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.

FINAL

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.
For 2.4GHz band, 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	/	/

For 802.11b, 802.11g, and 802.11n ht20 modes were tested with channel 1, 6 and 11.
For 802.11n ht40 mode were 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.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404
...
...
..	...	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

The worst condition (maximum power with 100% duty cycle) was setting by the software as following table:

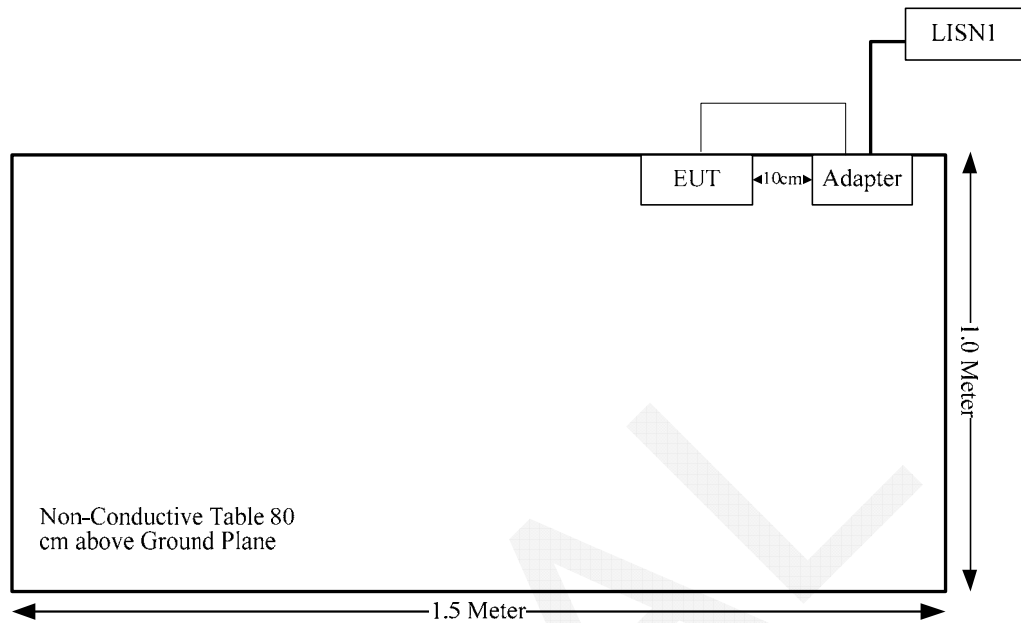
Test Mode	Test Software Version	MPTool		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level Setting	46	45	45
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level Setting	52	51	50
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting	51	50	50
802.11n ht40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting	51	51	50

Note: BLE mode configured as maximum power by the system default setting.

External I/O Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC Cable	No	No	1.2	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	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 conducted 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) & §1.1310 & §2.1093- RF EXPOSURE**Applicable Standard**

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

For bluetooth LE mode

The max tune-up conducted power is 4.3 dBm (2.69 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$
 $= 2.69/5 \cdot (\sqrt{2.48}) = 0.9 < 3.0$

The stand-alone SAR evaluation for BLE is not necessary.

For Wlan, please refer to the SAR report: RDG160622801-20

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

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

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

Antenna Connector Construction

The EUT has one integral antenna arrangement for Wifi/BT, and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner :

If U_{lab} is less than or equal to U_{cisp} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} of Table 1, then:

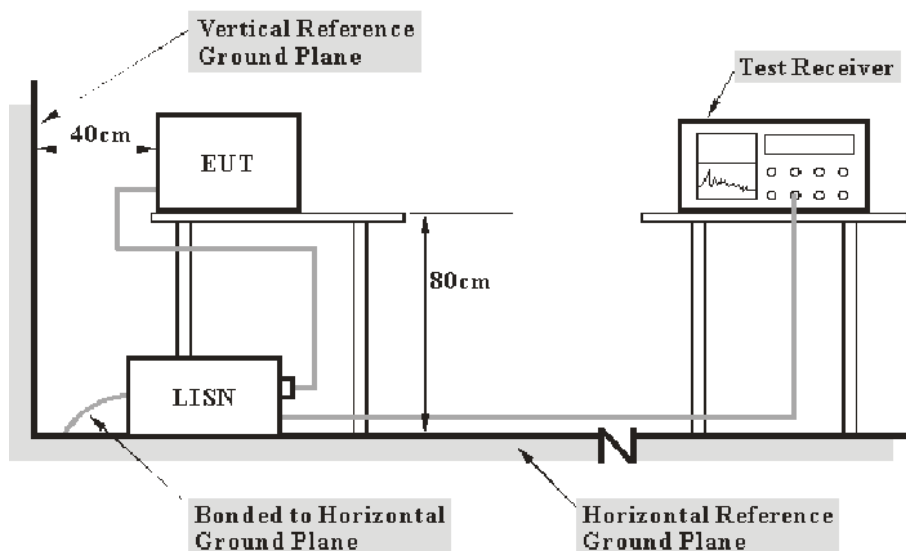
- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.12 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cisp}

Measurement	U_{cisp}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

EUT Setup



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

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

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

EMI Test Receiver Setup

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

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

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

Test Procedure

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum 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
R&S	EMI Test Receiver	ESCS 30	830245/006	2015-12-10	2016-12-09
R&S	L.I.S.N	ESH2-Z5	892107/021	2016-07-16	2017-07-15
R&S	Two-line V-network	ENV 216	3560.6550.12	2015-11-26	2016-11-25
N/A	Coaxial Cable	1.8m	N/A	2016-05-06	2017-05-06
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data**Environmental Conditions**

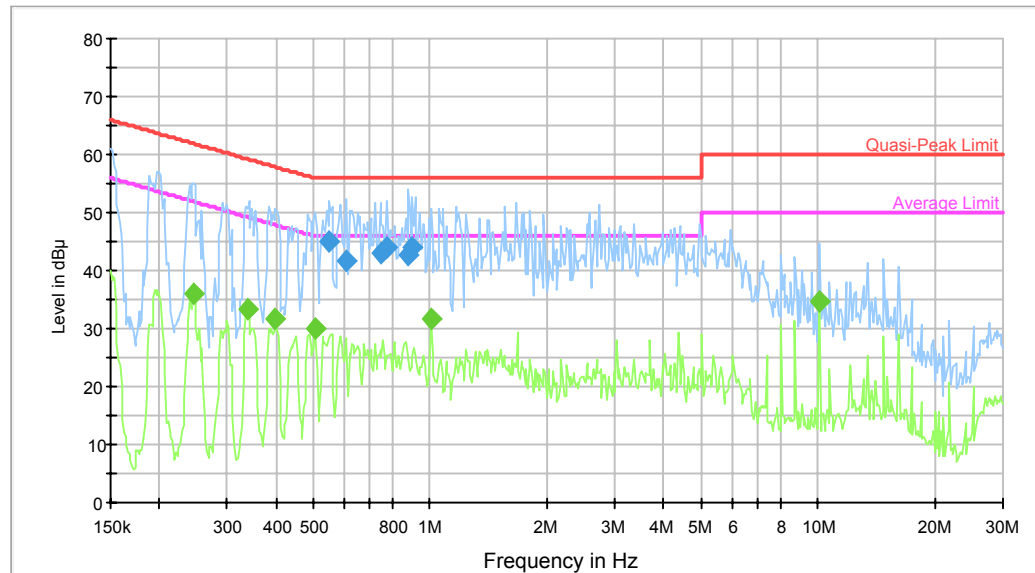
Temperature:	29.7 °C
Relative Humidity:	57 %
ATM Pressure:	100.5 kPa

The testing was performed by Rocky Xiao on 2016-07-21.

Test Mode: Transmitting (Wi-Fi)

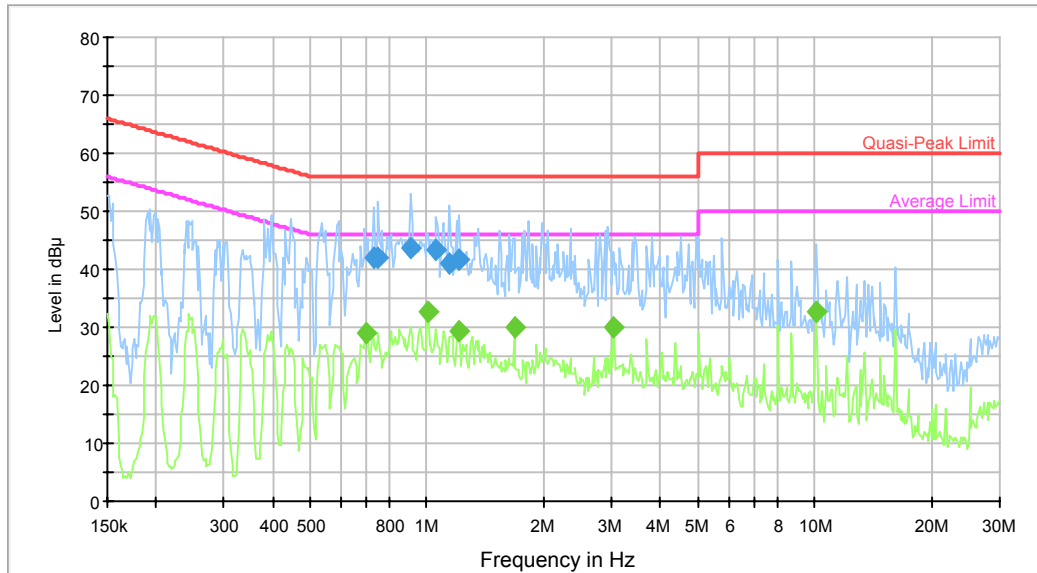
Adapter #1

AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.549741	45.0	9.000	L1	10.1	11.0	56.0	Compliance
0.609741	41.5	9.000	L1	10.3	14.5	56.0	Compliance
0.744147	43.0	9.000	L1	10.4	13.0	56.0	Compliance
0.774393	43.8	9.000	L1	10.4	12.2	56.0	Compliance
0.879690	42.8	9.000	L1	10.4	13.2	56.0	Compliance
0.900972	44.1	9.000	L1	10.4	11.9	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.245835	36.0	9.000	L1	10.2	15.9	51.9	Compliance
0.338116	33.2	9.000	L1	10.3	16.0	49.2	Compliance
0.399703	31.7	9.000	L1	10.2	16.2	47.9	Compliance
0.503608	30.1	9.000	L1	10.1	15.9	46.0	Compliance
1.007300	31.6	9.000	L1	10.4	14.4	46.0	Compliance
10.075173	34.7	9.000	L1	10.6	15.3	50.0	Compliance

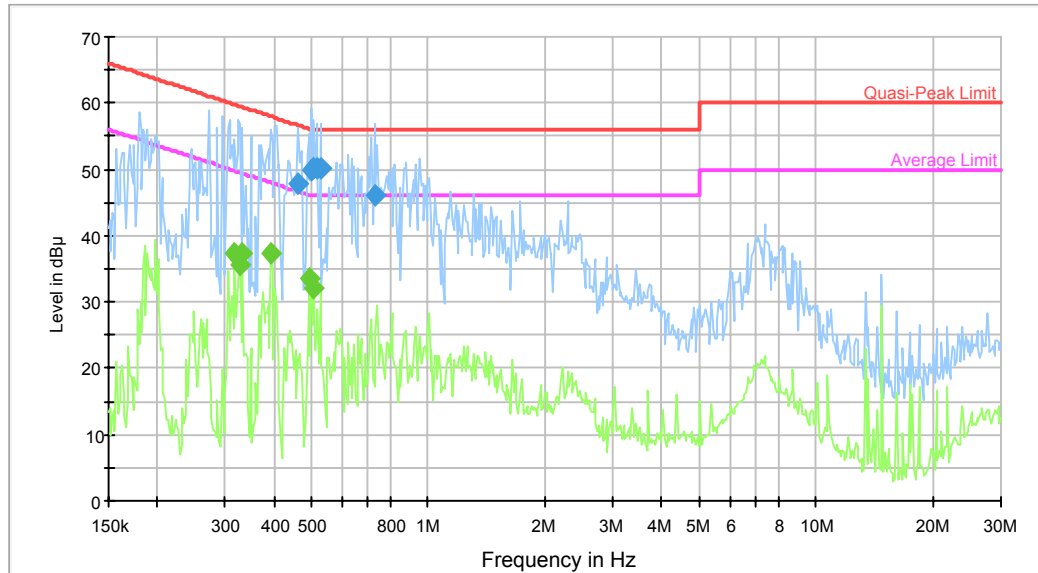
AC120 V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.726569	42.1	9.000	N	10.4	13.9	56.0	Compliance
0.750100	41.8	9.000	N	10.4	14.2	56.0	Compliance
0.908180	43.7	9.000	N	10.4	12.3	56.0	Compliance
1.056628	43.4	9.000	N	10.4	12.6	56.0	Compliance
1.144267	41.0	9.000	N	10.4	15.0	56.0	Compliance
1.209904	41.7	9.000	N	10.4	14.3	56.0	Compliance

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.698191	29.1	9.000	N	10.4	16.9	46.0	Compliance
1.007300	32.7	9.000	N	10.4	13.3	46.0	Compliance
1.209904	29.3	9.000	N	10.4	16.7	46.0	Compliance
1.677385	30.0	9.000	N	10.4	16.0	46.0	Compliance
3.024908	29.8	9.000	N	10.5	16.2	46.0	Compliance
10.075173	32.8	9.000	N	10.5	17.2	50.0	Compliance

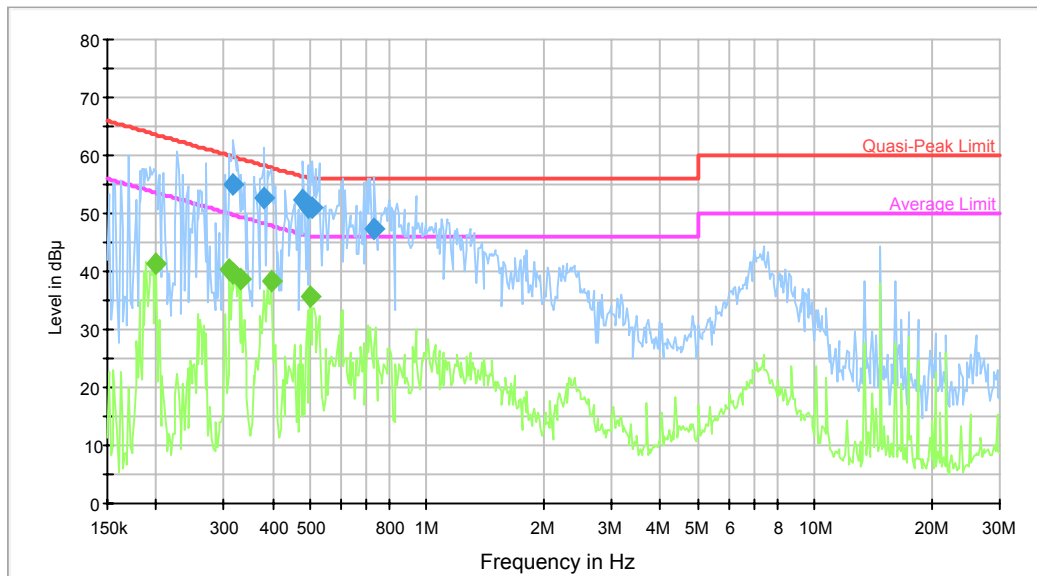
Adapter #2

AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.461346	47.9	9.000	L1	10.1	8.8	56.7	Compliance
0.499611	49.8	9.000	L1	10.1	6.2	56.0	Compliance
0.507637	50.2	9.000	L1	10.1	5.8	56.0	Compliance
0.515791	50.2	9.000	L1	10.1	5.8	56.0	Compliance
0.528270	50.3	9.000	L1	10.1	5.7	56.0	Compliance
0.726569	46.1	9.000	L1	10.4	9.9	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.317235	37.4	9.000	L1	10.3	12.4	49.8	Compliance
0.327509	35.5	9.000	L1	10.3	14.0	49.5	Compliance
0.332770	37.2	9.000	L1	10.3	12.2	49.4	Compliance
0.393383	37.4	9.000	L1	10.2	10.6	48.0	Compliance
0.491712	33.5	9.000	L1	10.1	12.6	46.1	Compliance
0.507637	32.1	9.000	L1	10.1	13.9	46.0	Compliance

AC120 V, 60 Hz, Neutral:

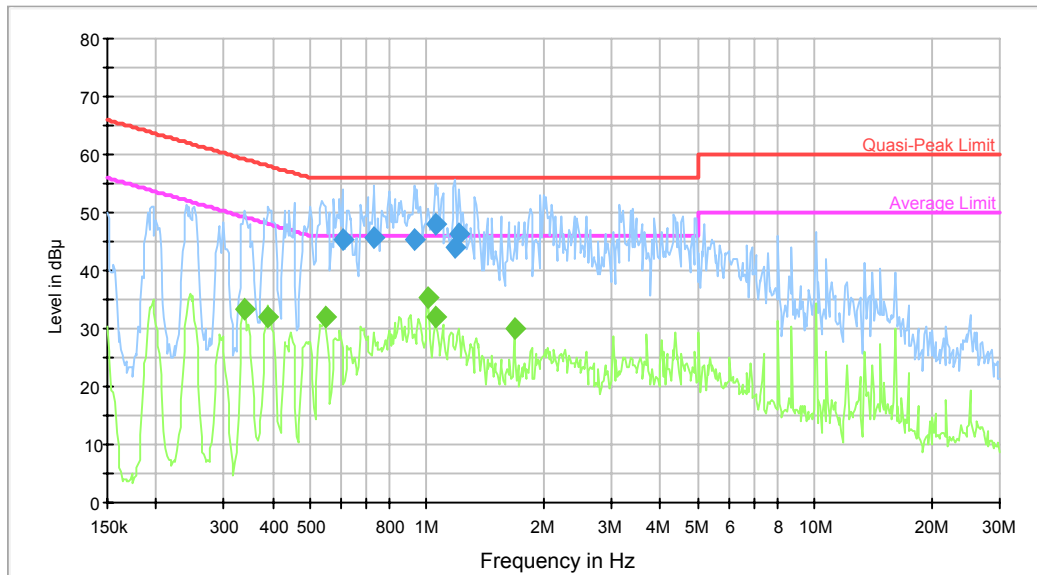
Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.317235	54.9	9.000	N	10.3	4.9	59.8	Compliance
0.381043	52.7	9.000	N	10.2	5.6	58.3	Compliance
0.480097	52.2	9.000	N	10.1	4.1	56.3	Compliance
0.491712	51.1	9.000	N	10.1	5.0	56.1	Compliance
0.507637	51.1	9.000	N	10.1	4.9	56.0	Compliance
0.732382	47.3	9.000	N	10.4	8.7	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.199835	41.5	9.000	N	10.2	12.1	53.6	Compliance
0.309742	40.2	9.000	N	10.3	9.8	50.0	Compliance
0.314718	39.7	9.000	N	10.3	10.1	49.8	Compliance
0.332770	38.6	9.000	N	10.3	10.8	49.4	Compliance
0.396530	38.2	9.000	N	10.2	9.7	47.9	Compliance
0.499611	35.6	9.000	N	10.1	10.4	46.0	Compliance

Test Mode: Transmitting (BLE)

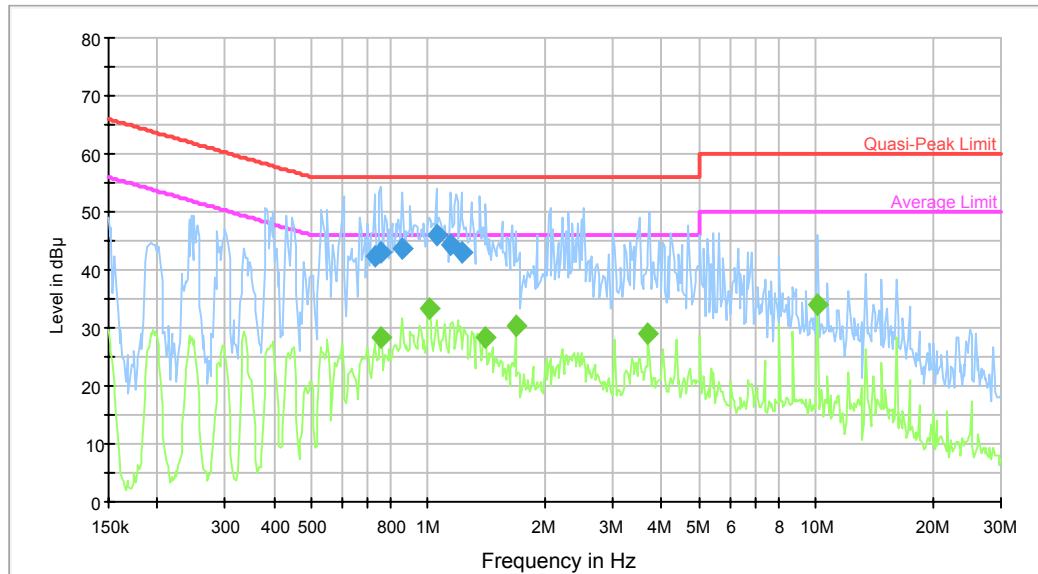
Adapter #1

AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.604902	45.4	9.000	L1	10.3	10.6	56.0	Compliance
0.732382	45.7	9.000	L1	10.4	10.3	56.0	Compliance
0.930151	45.3	9.000	L1	10.4	10.7	56.0	Compliance
1.048242	48.0	9.000	L1	10.4	8.0	56.0	Compliance
1.181325	43.9	9.000	L1	10.4	12.1	56.0	Compliance
1.209904	46.2	9.000	L1	10.4	9.8	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.338116	33.5	9.000	L1	10.3	15.7	49.2	Compliance
0.390261	32.0	9.000	L1	10.2	16.1	48.1	Compliance
0.545378	31.9	9.000	L1	10.1	14.1	46.0	Compliance
1.007300	35.4	9.000	L1	10.4	10.6	46.0	Compliance
1.048242	32.1	9.000	L1	10.4	13.9	46.0	Compliance
1.677385	29.9	9.000	L1	10.4	16.1	46.0	Compliance

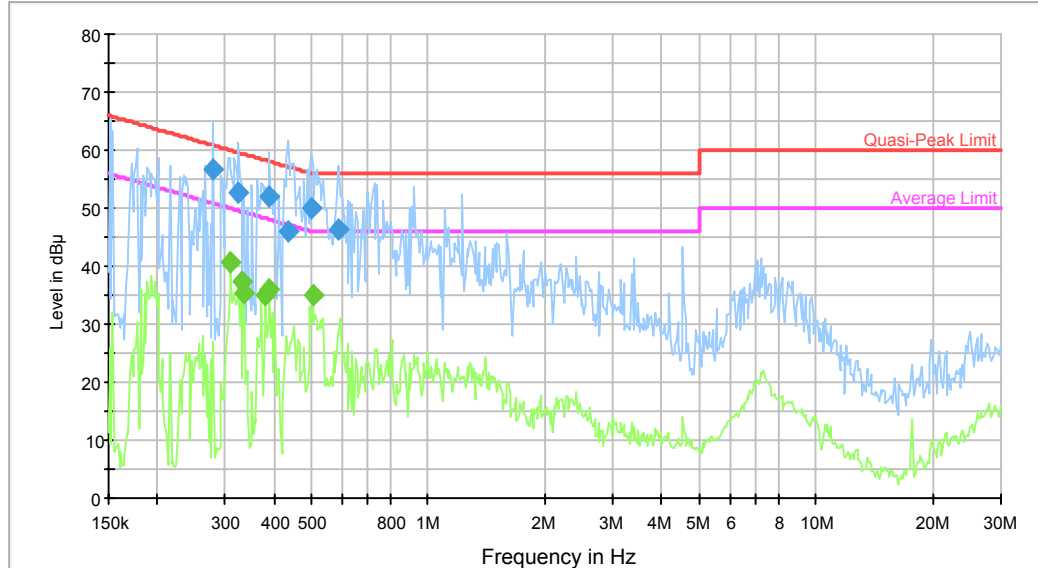
AC120 V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.726569	42.4	9.000	N	10.4	13.6	56.0	Compliance
0.756101	43.1	9.000	N	10.4	12.9	56.0	Compliance
0.858911	43.8	9.000	N	10.3	12.2	56.0	Compliance
1.048242	46.0	9.000	N	10.4	10.0	56.0	Compliance
1.144267	44.3	9.000	N	10.4	11.7	56.0	Compliance
1.219583	43.1	9.000	N	10.4	12.9	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.756101	28.3	9.000	N	10.4	17.7	46.0	Compliance
1.007300	33.3	9.000	N	10.4	12.7	46.0	Compliance
1.407671	28.3	9.000	N	10.4	17.7	46.0	Compliance
1.677385	30.5	9.000	N	10.4	15.5	46.0	Compliance
3.691692	29.1	9.000	N	10.6	16.9	46.0	Compliance
10.075173	33.8	9.000	N	10.5	16.2	50.0	Compliance

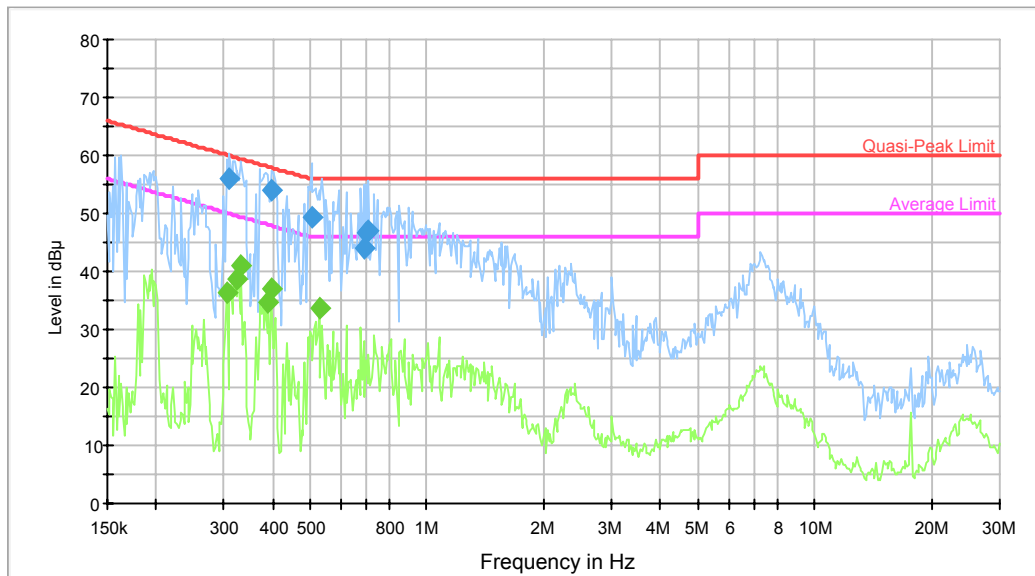
Adapter #2

AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.279263	56.8	9.000	L1	10.2	4.0	60.8	Compliance
0.324910	52.7	9.000	L1	10.3	6.9	59.6	Compliance
0.390261	52.1	9.000	L1	10.2	6.0	58.1	Compliance
0.436318	46.1	9.000	L1	10.2	11.0	57.1	Compliance
0.499611	50.1	9.000	L1	10.1	5.9	56.0	Compliance
0.585926	46.5	9.000	L1	10.2	9.5	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.309742	40.7	9.000	L1	10.3	9.3	50.0	Compliance
0.330129	37.5	9.000	L1	10.3	11.9	49.4	Compliance
0.335433	35.2	9.000	L1	10.3	14.1	49.3	Compliance
0.381043	34.9	9.000	L1	10.2	13.4	48.3	Compliance
0.390261	36.1	9.000	L1	10.2	12.0	48.1	Compliance
0.503608	34.9	9.000	L1	10.1	11.1	46.0	Compliance

AC120 V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.309742	55.8	9.000	N	10.3	4.2	60.0	Compliance
0.399703	54.1	9.000	N	10.2	3.8	57.9	Compliance
0.503608	49.5	9.000	N	10.1	6.5	56.0	Compliance
0.687153	43.9	9.000	N	10.4	12.1	56.0	Compliance
0.698191	46.6	9.000	N	10.4	9.4	56.0	Compliance
0.709407	47.1	9.000	N	10.4	8.9	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.304845	36.5	9.000	N	10.3	13.6	50.1	Compliance
0.324910	38.5	9.000	N	10.3	11.1	49.6	Compliance
0.332770	41.0	9.000	N	10.3	8.4	49.4	Compliance
0.390261	34.8	9.000	N	10.2	13.3	48.1	Compliance
0.396530	37.0	9.000	N	10.2	10.9	47.9	Compliance
0.528270	33.6	9.000	N	10.1	12.4	46.0	Compliance

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner :

If U_{lab} is less than or equal to U_{cisp} of Table 2, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} of Table 2, then:

– compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;

– non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit.

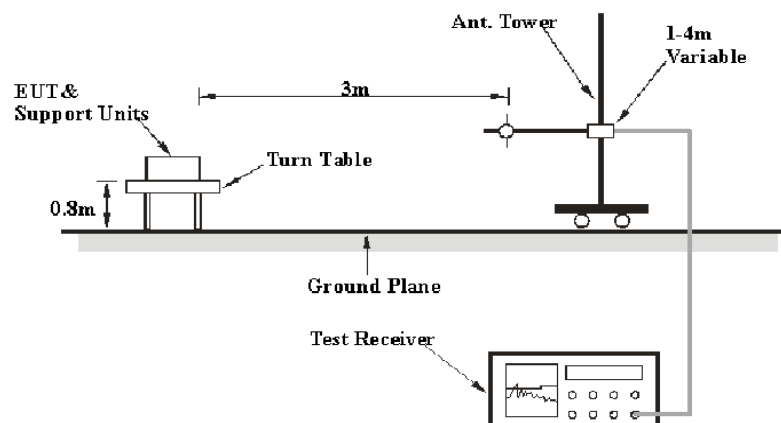
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

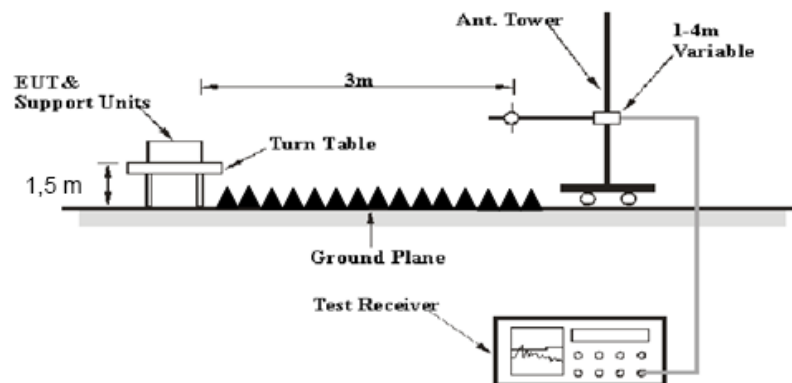
Table 2 – Values of U_{cisp}

Measurement	U_{cisp}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 C63.10-2013. 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.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

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 Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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
R&S	EMI Test Receiver	ESCI	100224	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2015-09-06	2016-09-06
N/A	Coaxial Cable	14m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	8m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

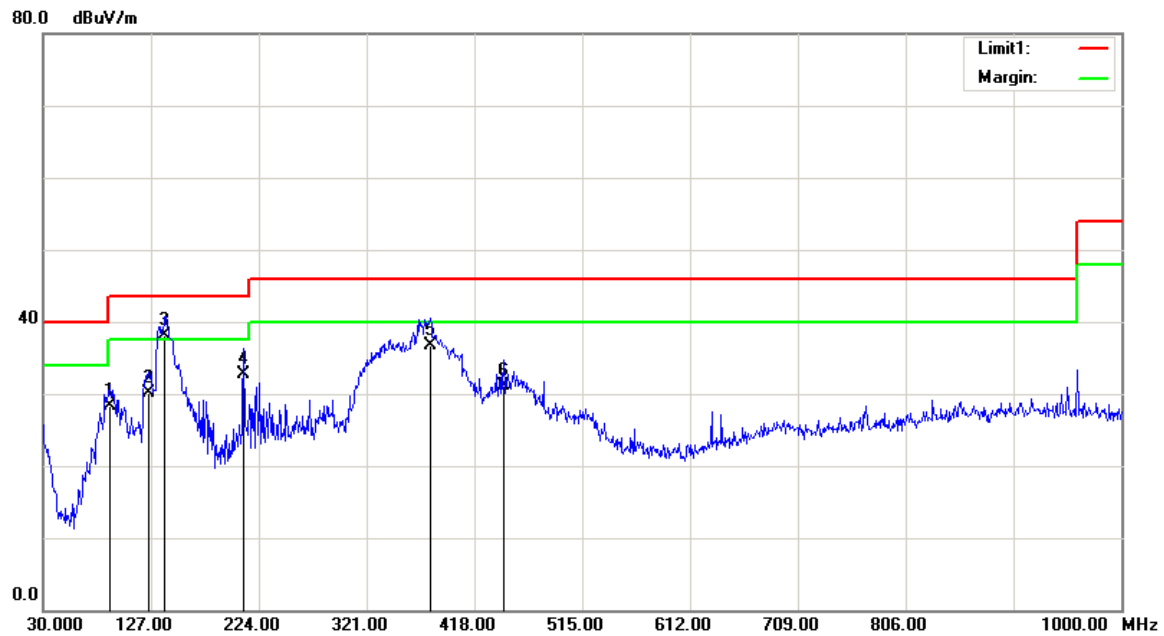
Temperature:	27.7°C
Relative Humidity:	53 %
ATM Pressure:	100.2 kPa

* The testing was performed by Rocky Xiao on 2016-07-22.

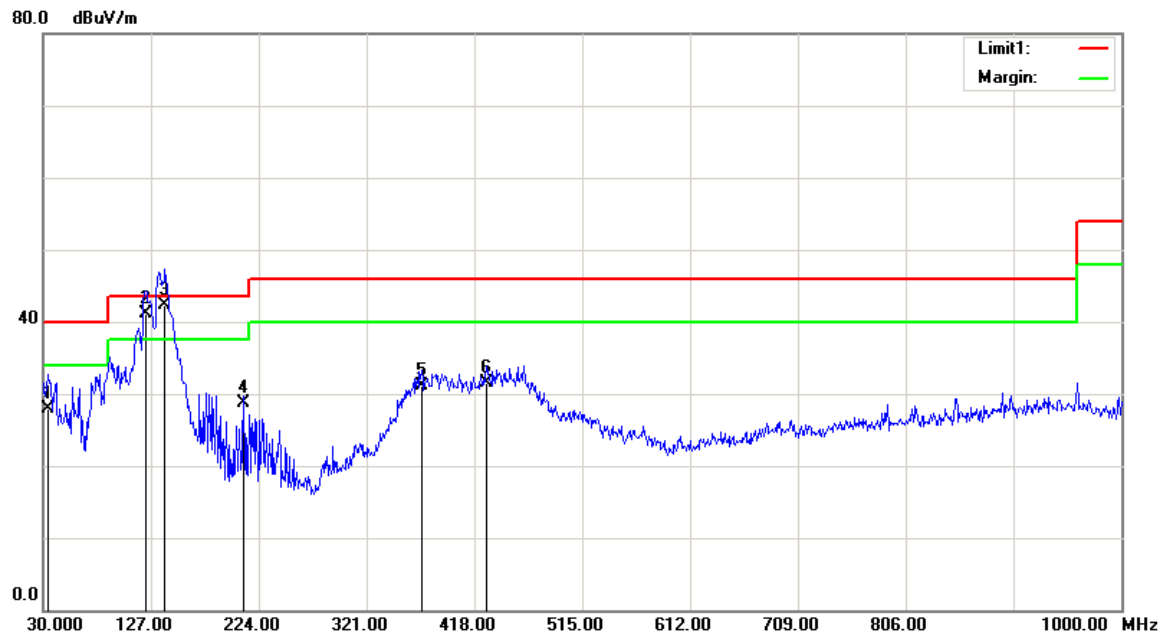
Test Mode: Transmitting

1) Below 1GHz(802.11b mode middle channel was the worst):

Adapter #1

Horizontal

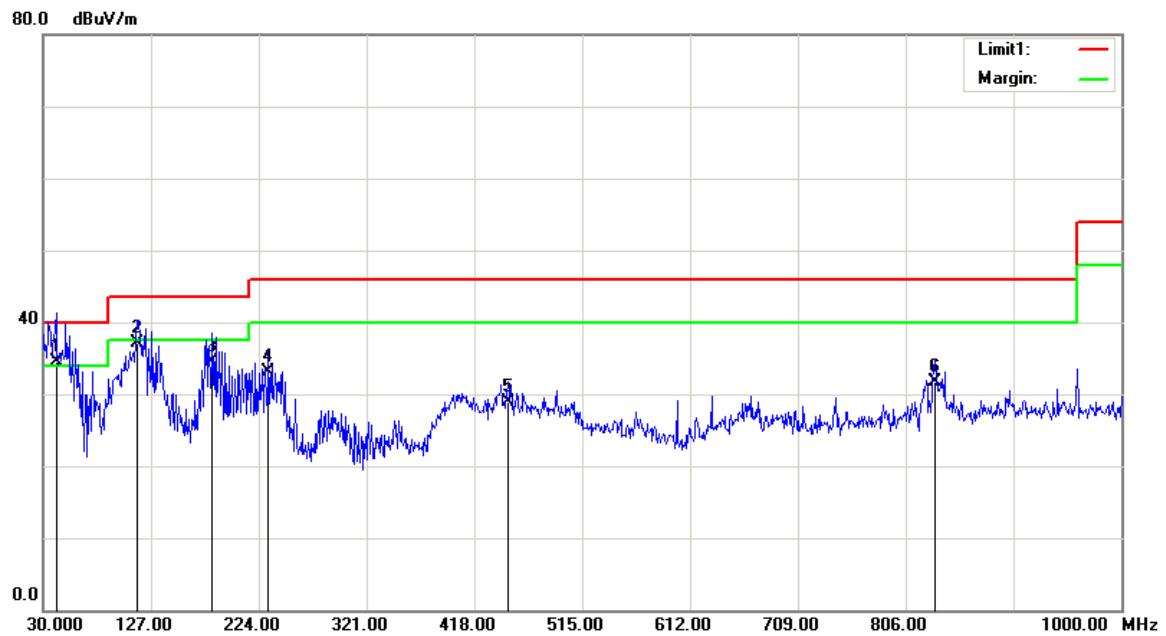
Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
90.1400	40.24	QP	-11.94	28.30	43.50	15.20
125.0600	35.64	QP	-5.54	30.10	43.50	13.40
139.6100	44.70	QP	-6.60	38.10	43.50	5.40
210.4200	41.71	QP	-9.01	32.70	43.50	10.80
378.2300	40.97	QP	-4.27	36.70	46.00	9.30
444.1900	33.88	QP	-2.68	31.20	46.00	14.80

Vertical

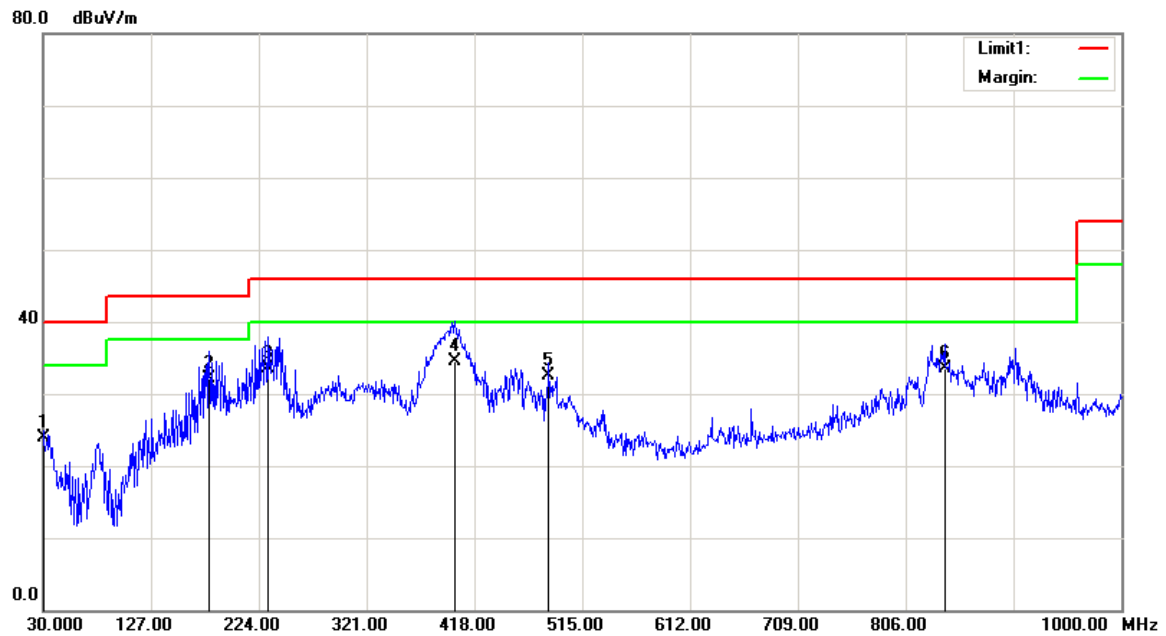
Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
33.8800	29.97	QP	-1.97	28.00	40.00	12.00
122.1500	46.71	QP	-5.51	41.20	43.50	2.30
139.6100	49.00	QP	-6.60	42.40	43.50	1.10
210.4200	37.71	QP	-9.01	28.70	43.50	14.80
370.4700	35.71	QP	-4.51	31.20	46.00	14.80
428.6700	34.63	QP	-3.03	31.60	46.00	14.40

Adapter #2

Horizontal



Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
41.6400	42.15	QP	-7.65	34.50	40.00	5.50
114.3900	43.47	QP	-6.27	37.20	43.50	6.30
182.2900	43.01	QP	-8.41	34.60	43.50	8.90
232.7300	41.06	QP	-7.96	33.10	46.00	12.90
448.0700	31.56	QP	-2.56	29.00	46.00	17.00
832.1900	28.32	QP	3.38	31.70	46.00	14.30

Vertical

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	23.05	QP	0.95	24.00	40.00	16.00
179.3800	40.50	QP	-8.30	32.20	43.50	11.30
232.7300	41.56	QP	-7.96	33.60	46.00	12.40
400.5400	38.17	QP	-3.57	34.60	46.00	11.40
484.9300	34.31	QP	-1.71	32.60	46.00	13.40
840.9200	29.98	QP	3.52	33.50	46.00	12.50

2) 1-25GHz:

802.11b Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	68.49	PK	H	25.67	3.68	0.00	97.84	N/A	N/A
2412	65.03	AV	H	25.67	3.68	0.00	94.38	N/A	N/A
2412	53.97	PK	V	25.67	3.68	0.00	83.32	N/A	N/A
2412	50.11	AV	V	25.67	3.68	0.00	79.46	N/A	N/A
2400	24.93	PK	H	25.64	3.65	0.00	54.22	74.00	19.78
2400	13.56	AV	H	25.64	3.65	0.00	42.85	54.00	11.15
4824	33.34	PK	H	30.64	5.03	27.41	41.60	74.00	32.40
4824	20.87	AV	H	30.64	5.03	27.41	29.13	54.00	24.87
7236	33.52	PK	H	34.17	6.65	25.90	48.44	74.00	25.56
7236	21.03	AV	H	34.17	6.65	25.90	35.95	54.00	18.05
3198	32.71	PK	H	27.83	6.12	27.37	39.29	74.00	34.71
3198	20.34	AV	H	27.83	6.12	27.37	26.92	54.00	27.08
Middle Channel: 2437 MHz									
2437	66.88	PK	H	25.74	3.75	0.00	96.37	N/A	N/A
2437	63.35	AV	H	25.74	3.75	0.00	92.84	N/A	N/A
2437	52.83	PK	V	25.74	3.75	0.00	82.32	N/A	N/A
2437	49.34	AV	V	25.74	3.75	0.00	78.83	N/A	N/A
4874	33.18	PK	H	30.77	5.14	27.42	41.67	74.00	32.33
4874	20.71	AV	H	30.77	5.14	27.42	29.20	54.00	24.80
7311	33.4	PK	H	34.35	6.74	25.88	48.61	74.00	25.39
7311	20.91	AV	H	34.35	6.74	25.88	36.12	54.00	17.88
3131	32.64	PK	H	27.62	6.93	27.43	39.76	74.00	34.24
3131	20.33	AV	H	27.62	6.93	27.43	27.45	54.00	26.55
3793	32.07	PK	H	29.44	4.64	27.38	38.77	74.00	35.23
3793	19.59	AV	H	29.44	4.64	27.38	26.29	54.00	27.71
High Channel: 2462 MHz									
2462	65.05	PK	H	25.80	3.75	0.00	94.60	N/A	N/A
2462	61.57	AV	H	25.80	3.75	0.00	91.12	N/A	N/A
2462	51.58	PK	V	25.80	3.75	0.00	81.13	N/A	N/A
2462	48.24	AV	V	25.80	3.75	0.00	77.79	N/A	N/A
2483.5	25.46	PK	H	25.86	3.67	0.00	54.99	74.00	19.01
2483.5	13.87	AV	H	25.86	3.67	0.00	43.40	54.00	10.60
4924	32.99	PK	H	30.90	5.34	27.43	41.80	74.00	32.20
4924	20.62	AV	H	30.90	5.34	27.43	29.43	54.00	24.57
7386	33.19	PK	H	34.53	6.83	25.86	48.69	74.00	25.31
7386	20.68	AV	H	34.53	6.83	25.86	36.18	54.00	17.82
3139	32.57	PK	H	27.64	6.95	27.42	39.74	74.00	34.26
3139	20.3	AV	H	27.64	6.95	27.42	27.47	54.00	26.53

802.11g Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	67.43	PK	H	25.67	3.68	0.00	96.78	N/A	N/A
2412	59.01	AV	H	25.67	3.68	0.00	88.36	N/A	N/A
2412	52.72	PK	V	25.67	3.68	0.00	82.07	N/A	N/A
2412	43.88	AV	V	25.67	3.68	0.00	73.23	N/A	N/A
2390	26.99	PK	H	25.61	3.63	0.00	56.23	74.00	17.77
2390	14.13	AV	H	25.61	3.63	0.00	43.37	54.00	10.63
4824	34.49	PK	H	30.64	5.03	27.41	42.75	74.00	31.25
4824	22.07	AV	H	30.64	5.03	27.41	30.33	54.00	23.67
7236	34.48	PK	H	34.17	6.65	25.90	49.40	74.00	24.60
7236	22	AV	H	34.17	6.65	25.90	36.92	54.00	17.08
3230	32.89	PK	H	27.94	6.22	27.34	39.71	74.00	34.29
3230	20.1	AV	H	27.94	6.22	27.34	26.92	54.00	27.08
Middle Channel: 2437 MHz									
2437	65.92	PK	H	25.74	3.75	0.00	95.41	N/A	N/A
2437	57.5	AV	H	25.74	3.75	0.00	86.99	N/A	N/A
2437	52.31	PK	V	25.74	3.75	0.00	81.80	N/A	N/A
2437	43.27	AV	V	25.74	3.75	0.00	72.76	N/A	N/A
4874	34.38	PK	H	30.77	5.14	27.42	42.87	74.00	31.13
4874	21.92	AV	H	30.77	5.14	27.42	30.41	54.00	23.59
7311	34.28	PK	H	34.35	6.74	25.88	49.49	74.00	24.51
7311	21.87	AV	H	34.35	6.74	25.88	37.08	54.00	16.92
3169	32.84	PK	H	27.74	6.64	27.39	39.83	74.00	34.17
3169	20.08	AV	H	27.74	6.64	27.39	27.07	54.00	26.93
3587	33.29	PK	H	28.99	4.60	27.27	39.61	74.00	34.39
3587	20.87	AV	H	28.99	4.60	27.27	27.19	54.00	26.81
High Channel: 2462 MHz									
2462	64.28	PK	H	25.80	3.75	0.00	93.83	N/A	N/A
2462	55.85	AV	H	25.80	3.75	0.00	85.40	N/A	N/A
2462	51.59	PK	V	25.80	3.75	0.00	81.14	N/A	N/A
2462	42.36	AV	V	25.80	3.75	0.00	71.91	N/A	N/A
2483.5	25.76	PK	H	25.86	3.67	0.00	55.29	74.00	18.71
2483.5	13.93	AV	H	25.86	3.67	0.00	43.46	54.00	10.54
4924	34.24	PK	H	30.90	5.34	27.43	43.05	74.00	30.95
4924	21.82	AV	H	30.90	5.34	27.43	30.63	54.00	23.37
7386	34.17	PK	H	34.53	6.83	25.86	49.67	74.00	24.33
7386	21.72	AV	H	34.53	6.83	25.86	37.22	54.00	16.78
3256	32.81	PK	H	28.02	6.17	27.32	39.68	74.00	34.32
3256	19.97	AV	H	28.02	6.17	27.32	26.84	54.00	27.16

802.11 n ht20 Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	66.87	PK	H	25.67	3.68	0.00	96.22	N/A	N/A
2412	57.63	AV	H	25.67	3.68	0.00	86.98	N/A	N/A
2412	52.67	PK	V	25.67	3.68	0.00	82.02	N/A	N/A
2412	42.79	AV	V	25.67	3.68	0.00	72.14	N/A	N/A
2400	29.35	PK	H	25.64	3.65	0.00	58.64	74.00	15.36
2400	14.01	AV	H	25.64	3.65	0.00	43.30	54.00	10.70
4824	34.21	PK	H	30.64	5.03	27.41	42.47	74.00	31.53
4824	21.88	AV	H	30.64	5.03	27.41	30.14	54.00	23.86
7236	34.25	PK	H	34.17	6.65	25.90	49.17	74.00	24.83
7236	21.74	AV	H	34.17	6.65	25.90	36.66	54.00	17.34
3210	32.73	PK	H	27.87	6.13	27.36	39.37	74.00	34.63
3210	19.96	AV	H	27.87	6.13	27.36	26.60	54.00	27.40
Middle Channel: 2437 MHz									
2437	65.45	PK	H	25.74	3.75	0.00	94.94	N/A	N/A
2437	56.35	AV	H	25.74	3.75	0.00	85.84	N/A	N/A
2437	51.54	PK	V	25.74	3.75	0.00	81.03	N/A	N/A
2437	42.18	AV	V	25.74	3.75	0.00	71.67	N/A	N/A
4874	34.04	PK	H	30.77	5.14	27.42	42.53	74.00	31.47
4874	21.64	AV	H	30.77	5.14	27.42	30.13	54.00	23.87
7311	33.95	PK	H	34.35	6.74	25.88	49.16	74.00	24.84
7311	21.5	AV	H	34.35	6.74	25.88	36.71	54.00	17.29
3123	32.55	PK	H	27.59	6.90	27.43	39.61	74.00	34.39
3123	19.82	AV	H	27.59	6.90	27.43	26.88	54.00	27.12
3595	32.15	PK	H	29.01	4.62	27.27	38.51	74.00	35.49
3595	19.71	AV	H	29.01	4.62	27.27	26.07	54.00	27.93
High Channel: 2462 MHz									
2462	63.72	PK	H	25.80	3.75	0.00	93.27	N/A	N/A
2462	54.75	AV	H	25.80	3.75	0.00	84.30	N/A	N/A
2462	50.29	PK	V	25.80	3.75	0.00	79.84	N/A	N/A
2462	41.38	AV	V	25.80	3.75	0.00	70.93	N/A	N/A
2483.5	25.31	PK	H	25.86	3.67	0.00	54.84	74.00	19.16
2483.5	13.89	AV	H	25.86	3.67	0.00	43.42	54.00	10.58
4924	33.75	PK	H	30.90	5.34	27.43	42.56	74.00	31.44
4924	21.36	AV	H	30.90	5.34	27.43	30.17	54.00	23.83
7386	33.73	PK	H	34.53	6.83	25.86	49.23	74.00	24.77
7386	21.24	AV	H	34.53	6.83	25.86	36.74	54.00	17.26
3152	32.38	PK	H	27.69	6.94	27.41	39.60	74.00	34.40
3152	19.65	AV	H	27.69	6.94	27.41	26.87	54.00	27.13

802.11 n ht40 Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2422 MHz									
2422	62.88	PK	H	25.70	3.71	0.00	92.29	N/A	N/A
2422	54.2	AV	H	25.70	3.71	0.00	83.61	N/A	N/A
2422	51.59	PK	V	25.70	3.71	0.00	81.00	N/A	N/A
2422	42.98	AV	V	25.70	3.71	0.00	72.39	N/A	N/A
2390	26.79	PK	H	25.61	3.63	0.00	56.03	74.00	17.97
2390	15.28	AV	H	25.61	3.63	0.00	44.52	54.00	9.48
4844	33.95	PK	H	30.69	4.99	27.42	42.21	74.00	31.79
4844	21.54	AV	H	30.69	4.99	27.42	29.80	54.00	24.20
7266	33.34	PK	H	34.24	6.68	25.89	48.37	74.00	25.63
7266	20.69	AV	H	34.24	6.68	25.89	35.72	54.00	18.28
3213	32.9	PK	H	27.88	6.14	27.36	39.56	74.00	34.44
3213	20.34	AV	H	27.88	6.14	27.36	27.00	54.00	27.00
Middle Channel: 2437 MHz									
2437	61.89	PK	H	25.74	3.75	0.00	91.38	N/A	N/A
2437	53.12	AV	H	25.74	3.75	0.00	82.61	N/A	N/A
2437	51.42	PK	V	25.74	3.75	0.00	80.91	N/A	N/A
2437	42.69	AV	V	25.74	3.75	0.00	72.18	N/A	N/A
4874	33.78	PK	H	30.77	5.14	27.42	42.27	74.00	31.73
4874	21.37	AV	H	30.77	5.14	27.42	29.86	54.00	24.14
7311	33.23	PK	H	34.35	6.74	25.88	48.44	74.00	25.56
7311	20.57	AV	H	34.35	6.74	25.88	35.78	54.00	18.22
3210	33.5	PK	H	27.87	6.13	27.36	40.14	74.00	33.86
3210	20.96	AV	H	27.87	6.13	27.36	27.60	54.00	26.40
3747	32.03	PK	H	29.34	4.55	27.35	38.57	74.00	35.43
3747	19.74	AV	H	29.34	4.55	27.35	26.28	54.00	27.72
High Channel: 2452 MHz									
2452	60.67	PK	H	25.78	3.78	0.00	90.23	N/A	N/A
2452	51.95	AV	H	25.78	3.78	0.00	81.51	N/A	N/A
2452	51.04	PK	V	25.78	3.78	0.00	80.60	N/A	N/A
2452	42.09	AV	V	25.78	3.78	0.00	71.65	N/A	N/A
2483.5	26.17	PK	H	25.86	3.67	0.00	55.70	74.00	18.30
2483.5	14	AV	H	25.86	3.67	0.00	43.53	54.00	10.47
4904	33.61	PK	H	30.85	5.31	27.43	42.34	74.00	31.66
4904	21.24	AV	H	30.85	5.31	27.43	29.97	54.00	24.03
7356	33.06	PK	H	34.45	6.79	25.87	48.43	74.00	25.57
7356	20.42	AV	H	34.45	6.79	25.87	35.79	54.00	18.21
3213	31.26	PK	H	27.88	6.14	27.36	37.92	74.00	36.08
3213	18.86	AV	H	27.88	6.14	27.36	25.52	54.00	28.48

BLE Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2402 MHz									
2402	71.11	PK	H	25.65	3.66	0.00	100.42	N/A	N/A
2402	55.33	AV	H	25.65	3.66	0.00	84.64	N/A	N/A
2402	54.33	PK	V	25.65	3.66	0.00	83.64	N/A	N/A
2402	38.25	AV	V	25.65	3.66	0.00	67.56	N/A	N/A
2390	24.77	PK	H	25.61	3.63	0.00	54.01	74.00	19.99
2390	13.38	AV	H	25.61	3.63	0.00	42.62	54.00	11.38
4804	30.85	PK	H	30.59	5.06	27.41	39.09	74.00	34.91
4804	18.16	AV	H	30.59	5.06	27.41	26.40	54.00	27.60
7206	30.22	PK	H	34.09	6.61	25.91	45.01	74.00	28.99
7206	17.73	AV	H	34.09	6.61	25.91	32.52	54.00	21.48
3235	32.67	PK	H	27.95	6.24	27.34	39.52	74.00	34.48
3235	20.34	AV	H	27.95	6.24	27.34	27.19	54.00	26.81
Middle Channel: 2440 MHz									
2440	70.88	PK	H	25.74	3.76	0.00	100.38	N/A	N/A
2440	55.03	AV	H	25.74	3.76	0.00	84.53	N/A	N/A
2440	53.83	PK	V	25.74	3.76	0.00	83.33	N/A	N/A
2440	37.69	AV	V	25.74	3.76	0.00	67.19	N/A	N/A
4880	31.47	PK	H	30.79	5.18	27.42	40.02	74.00	33.98
4880	18.79	AV	H	30.79	5.18	27.42	27.34	54.00	26.66
7320	30.82	PK	H	34.37	6.75	25.88	46.06	74.00	27.94
7320	18.39	AV	H	34.37	6.75	25.88	33.63	54.00	20.37
3235	32.61	PK	H	27.95	6.24	27.34	39.46	74.00	34.54
3235	20.51	AV	H	27.95	6.24	27.34	27.36	54.00	26.64
4045	33.46	PK	H	29.89	4.62	27.17	40.80	74.00	33.20
4045	21.25	AV	H	29.89	4.62	27.17	28.59	54.00	25.41
High Channel: 2480 MHz									
2480	70.45	PK	H	25.85	3.68	0.00	99.98	N/A	N/A
2480	54.59	AV	H	25.85	3.68	0.00	84.12	N/A	N/A
2480	53.18	PK	V	25.85	3.68	0.00	82.71	N/A	N/A
2480	37.07	AV	V	25.85	3.68	0.00	66.60	N/A	N/A
2483.5	26.21	PK	H	25.86	3.67	0.00	55.74	74.00	18.26
2483.5	13.65	AV	H	25.86	3.67	0.00	43.18	54.00	10.82
4960	31.76	PK	H	31.00	5.34	27.43	40.67	74.00	33.33
4960	19.34	AV	H	31.00	5.34	27.43	28.25	54.00	25.75
7440	31.29	PK	H	34.66	6.89	25.97	46.87	74.00	27.13
7440	18.93	AV	H	34.66	6.89	25.97	34.51	54.00	19.49
3235	32.51	PK	H	27.95	6.24	27.34	39.36	74.00	34.64
3235	20.26	AV	H	27.95	6.24	27.34	27.11	54.00	26.89

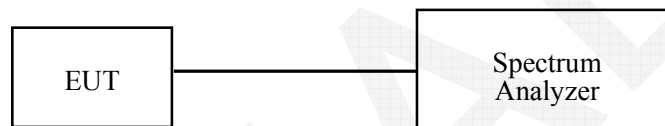
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.8 – 27.9 °C
Relative Humidity:	46 - 50 %
ATM Pressure:	100 – 100.3 kPa

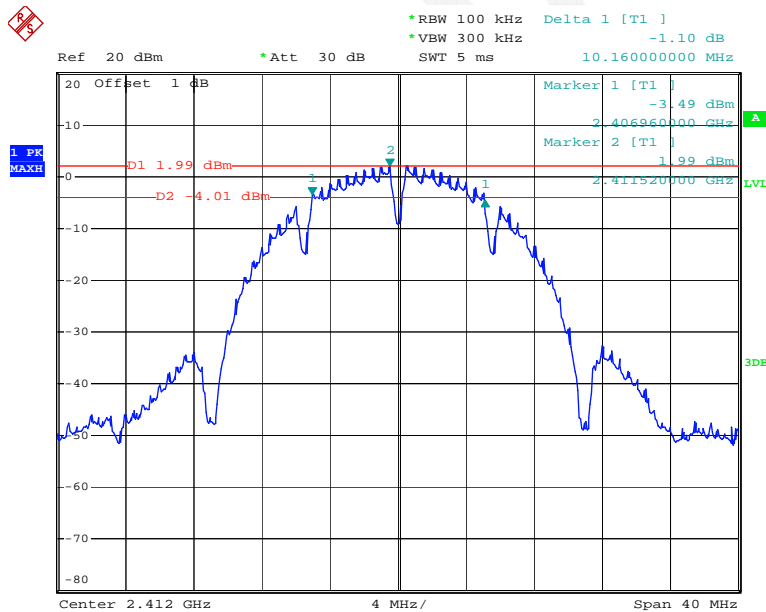
* The testing was performed by Rocky Xiao from 2016-07-01 to 2016-07-07.

Test Mode: Transmitting

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

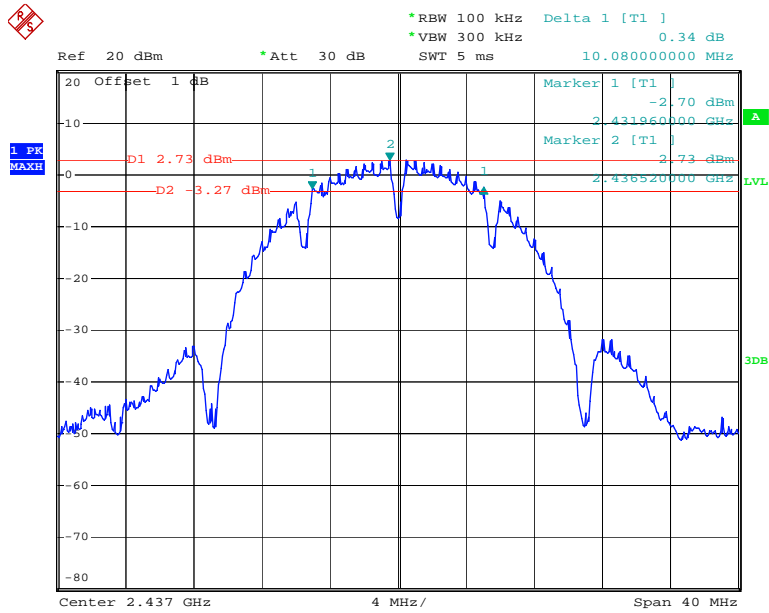
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.16	≥ 0.5
	Middle	2437	10.08	≥ 0.5
	High	2462	10.16	≥ 0.5
802.11g	Low	2412	16.64	≥ 0.5
	Middle	2437	16.64	≥ 0.5
	High	2462	16.64	≥ 0.5
802.11n20	Low	2412	17.92	≥ 0.5
	Middle	2437	17.84	≥ 0.5
	High	2462	17.92	≥ 0.5
802.11n40	Low	2422	36.64	≥ 0.5
	Middle	2437	36.64	≥ 0.5
	High	2452	36.64	≥ 0.5
BLE	Low	2402	0.716	≥ 0.5
	Middle	2440	0.632	≥ 0.5
	High	2480	0.732	≥ 0.5

802.11b Low Channel



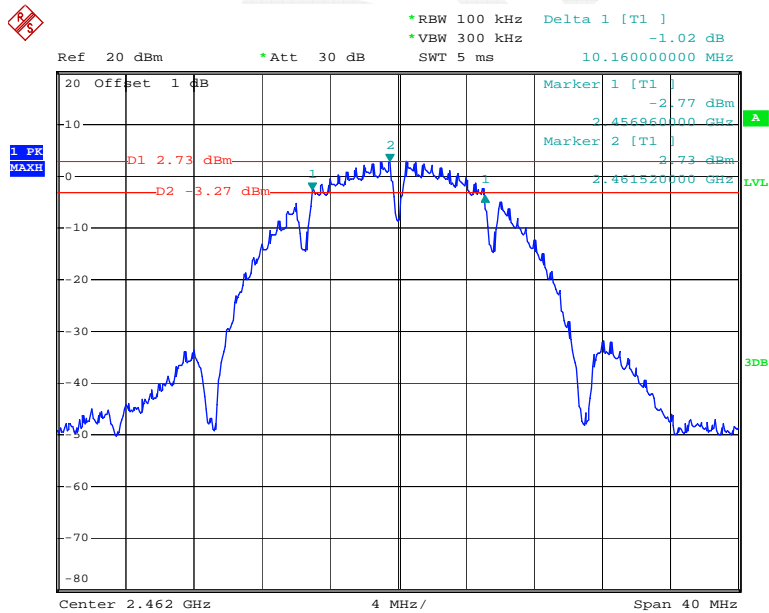
Date: 1.JUL.2016 16:54:59

802.11b Middle Channel



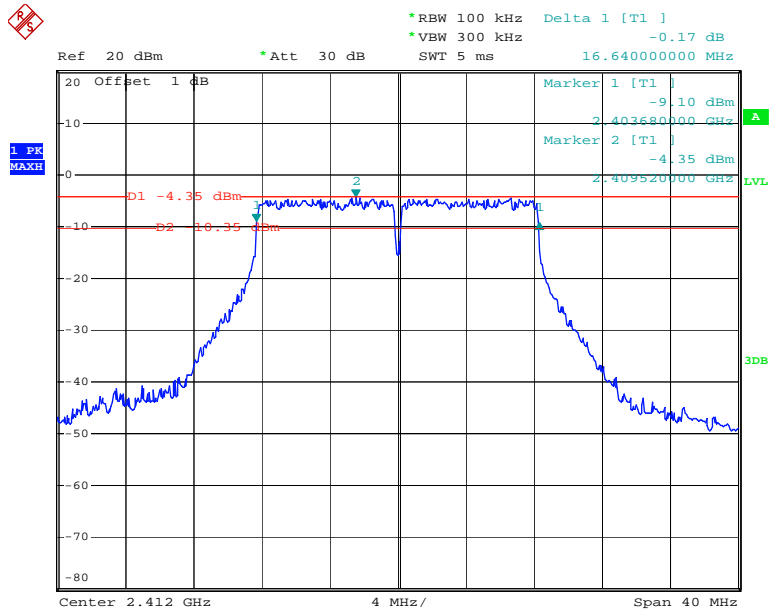
Date: 1.JUL.2016 16:57:13

802.11b High Channel



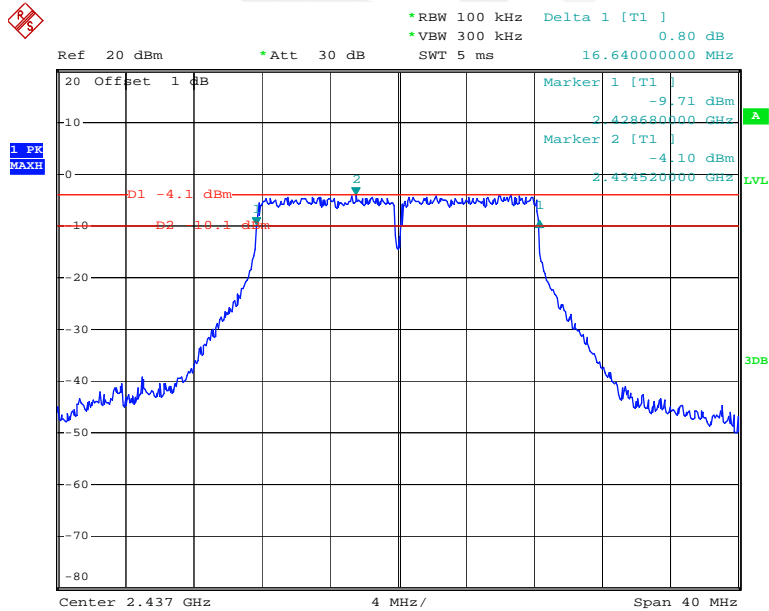
Date: 1.JUL.2016 17:05:09

802.11g Low Channel

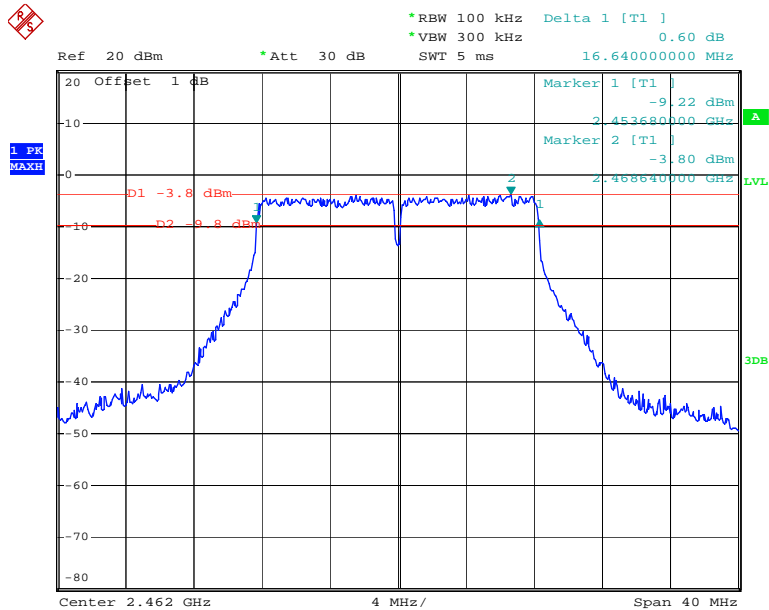


Date: 1.JUL.2016 17:10:48

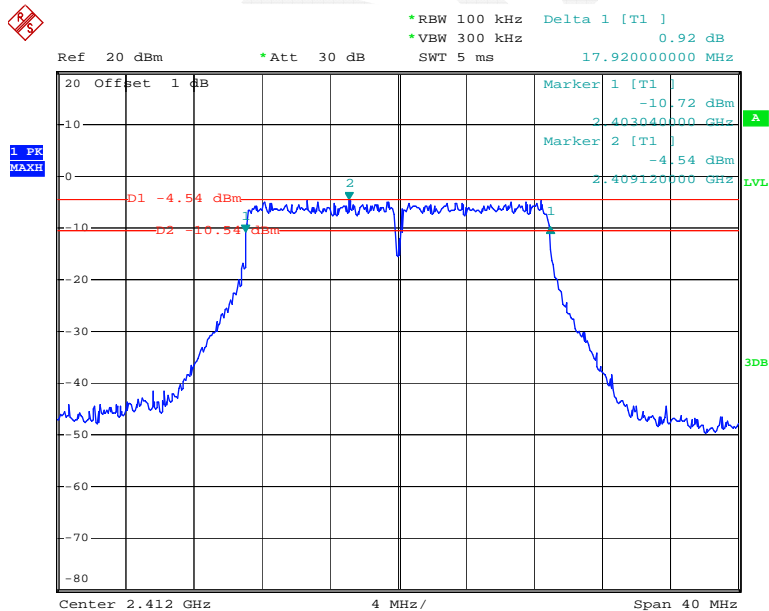
802.11g Middle Channel



Date: 1.JUL.2016 17:13:23

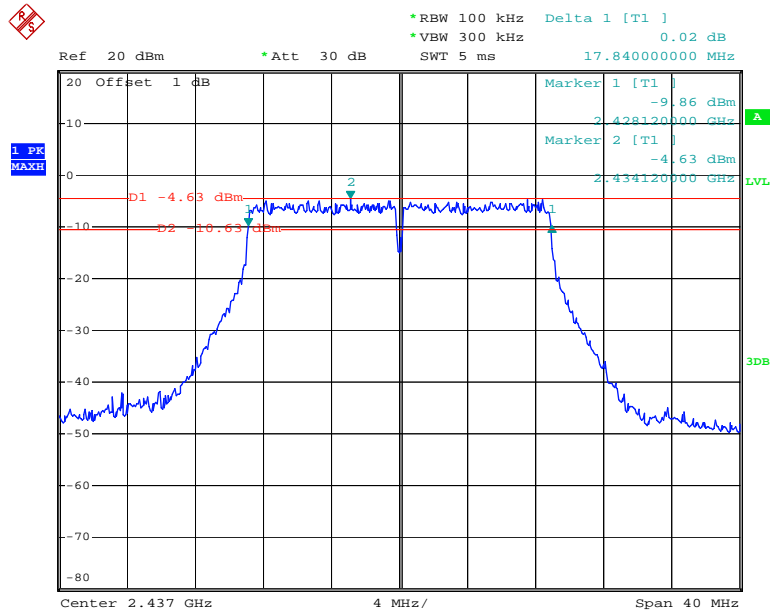
802.11g High Channel

Date: 1.JUL.2016 17:15:25

802.11n ht20 Low Channel

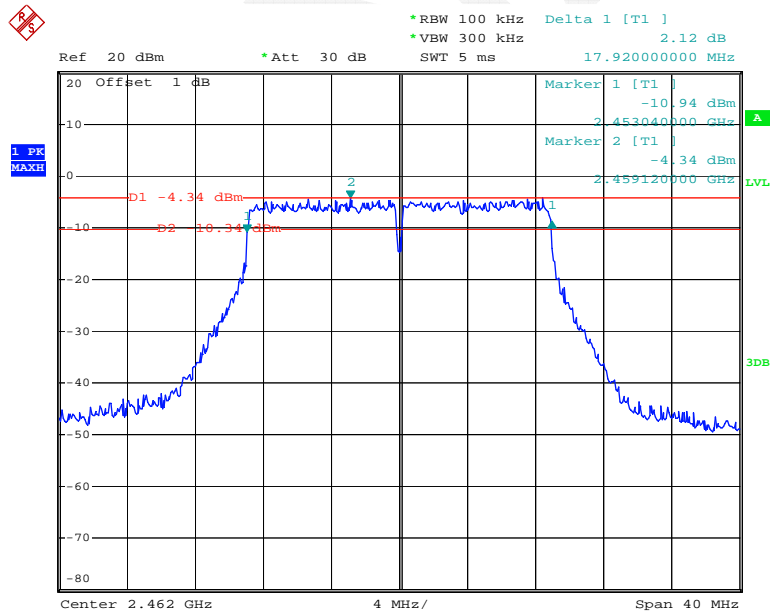
Date: 1.JUL.2016 17:19:06

802.11n ht20 Middle Channel



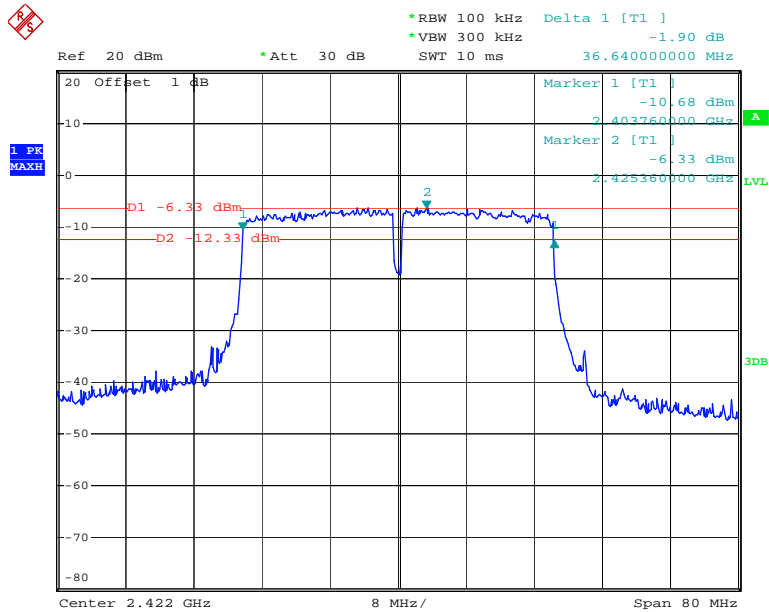
Date: 1.JUL.2016 17:21:36

802.11n ht20 High Channel



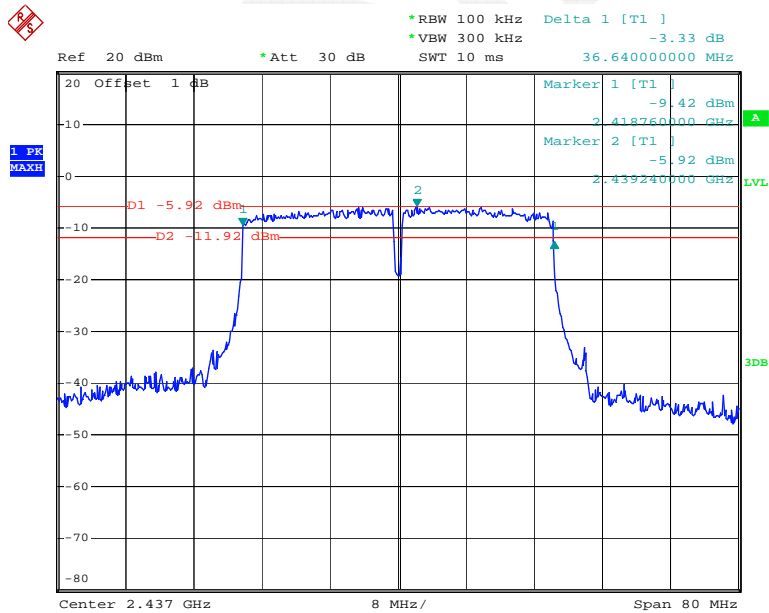
Date: 1.JUL.2016 17:23:43

802.11n ht40 Low Channel

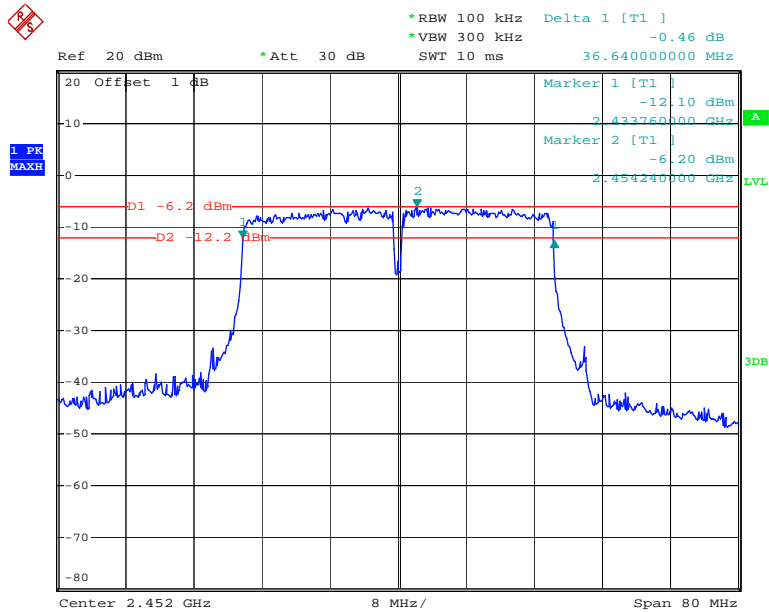


Date: 1.JUL.2016 17:28:07

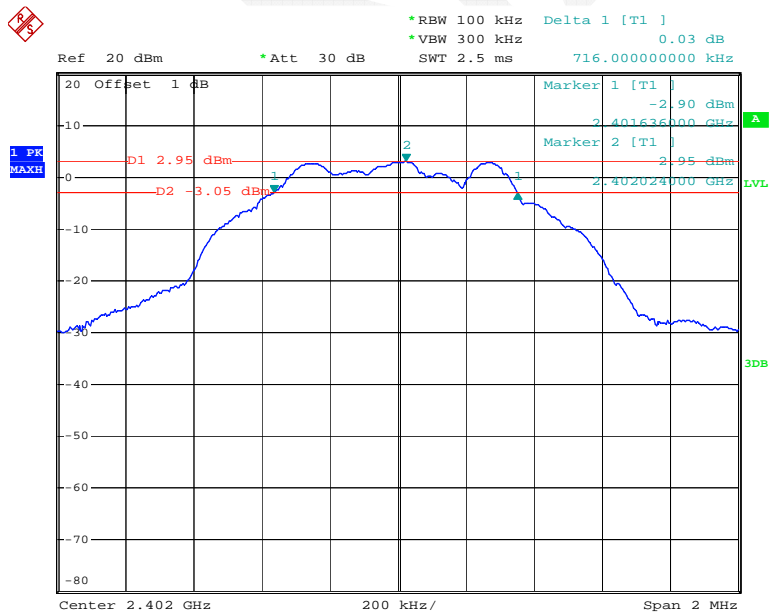
802.11n ht40 Middle Channel



Date: 1.JUL.2016 17:30:54

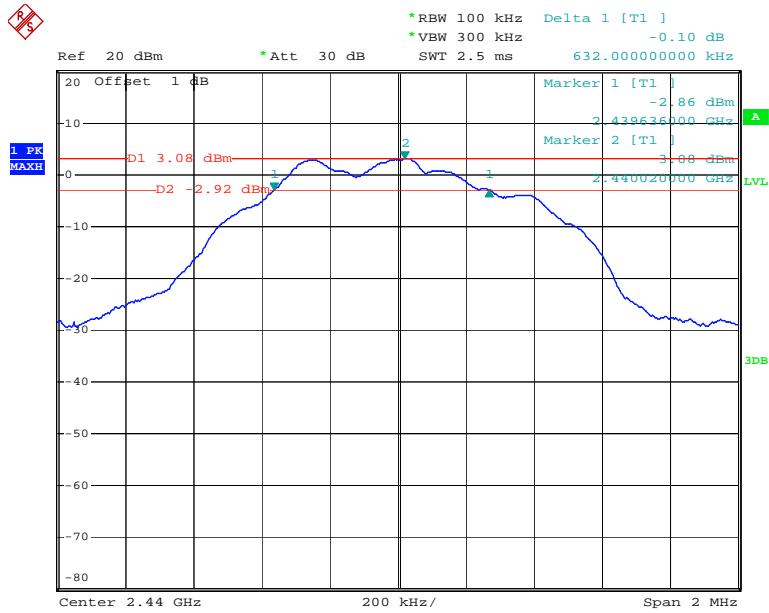
802.11n ht40 High Channel

Date: 1.JUL.2016 17:33:37

BLE Low Channel

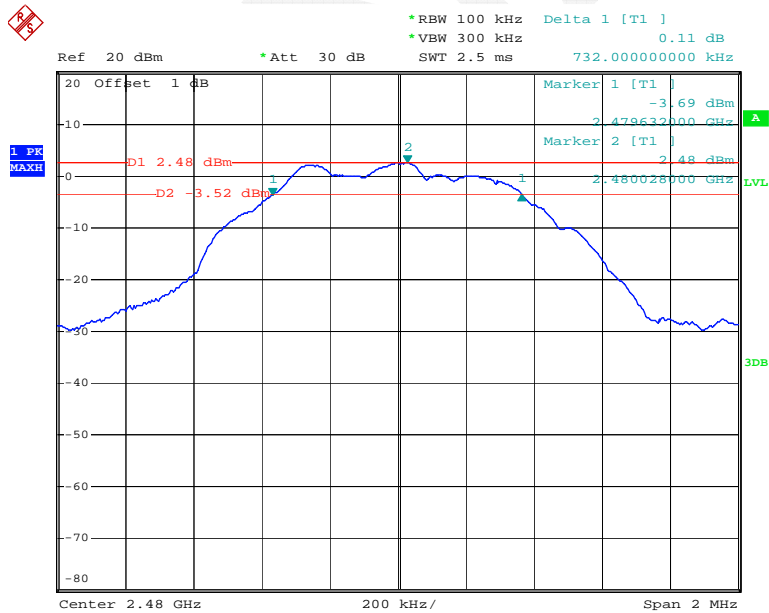
Date: 7.JUL.2016 10:19:11

BLE Middle Channel



Date: 7.JUL.2016 10:20:50

BLE High Channel



Date: 7.JUL.2016 10:22:00

FCC §15.247(b) (3) - MAXIMUM CONDUCTED 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 test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2015-11-03	2016-11-03
Agilent	Wideband Power Sensor	N1921A	MY54170013	2015-11-03	2016-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2015-11-03	2016-11-03
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	30.2 °C
Relative Humidity:	52 %
ATM Pressure:	100 kPa

* The testing was performed by Rocky Xiao on 2016-07-07.

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table.

Test mode	Channel	Frequency	Max Peak Conducted Output Power	Max Conducted Average Output Power	Limit
		(MHz)	(dBm)	(dBm)	(dBm)
802.11b	Low	2412	16.56	14.64	30
	Middle	2437	16.80	14.87	30
	High	2462	16.84	14.90	30
802.11g	Low	2412	16.85	12.39	30
	Middle	2437	17.09	12.75	30
	High	2462	17.30	12.88	30
802.11n20	Low	2412	16.43	11.85	30
	Middle	2437	16.29	11.75	30
	High	2462	16.72	12.16	30
802.11n40	Low	2422	18.77	11.51	30
	Middle	2437	18.94	11.69	30
	High	2452	18.88	11.65	30
BLE	Low	2402	4.01	/	30
	Middle	2440	4.16	/	30
	High	2480	3.58	/	30

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
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

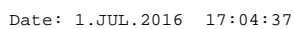
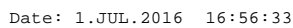
Environmental Conditions

Temperature:	26.8 – 27.9 °C
Relative Humidity:	46 - 50 %
ATM Pressure:	100 – 100.3 kPa

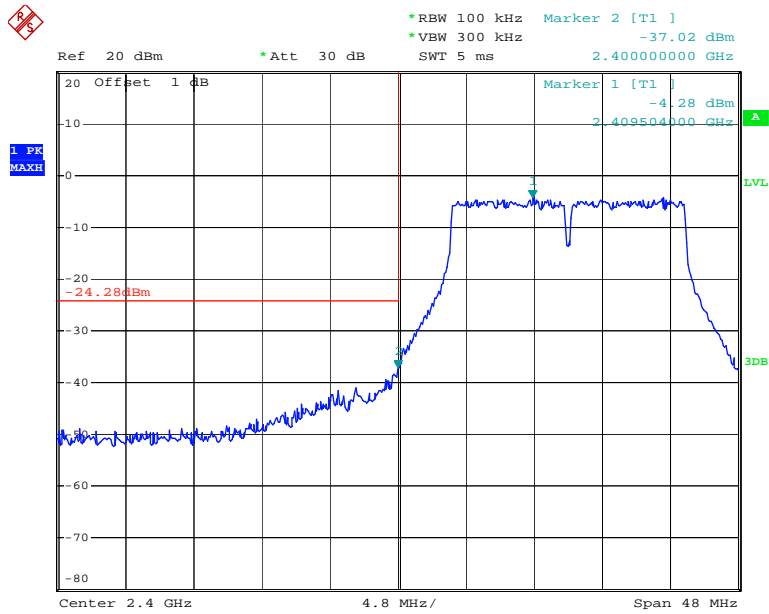
* The testing was performed by Rocky Xiao from 2016-07-01 to 2016-07-07.

Test mode: Transmitting

802.11b: Band Edge, Left Side

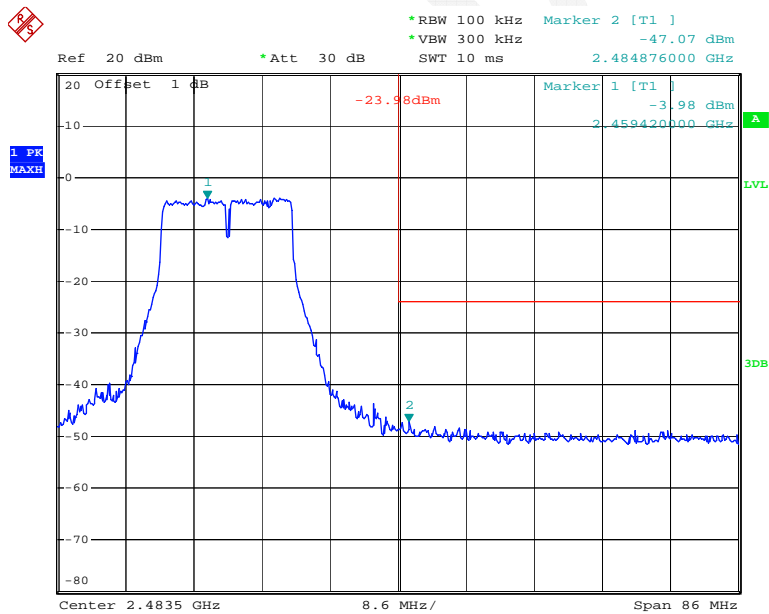


802.11g: Band Edge, Left Side



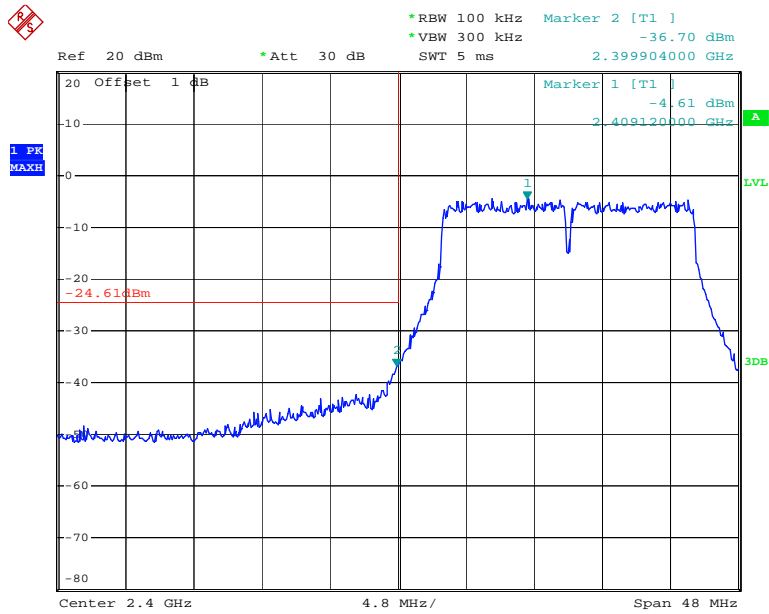
Date: 1.JUL.2016 17:12:36

802.11g: Band Edge, Right Side



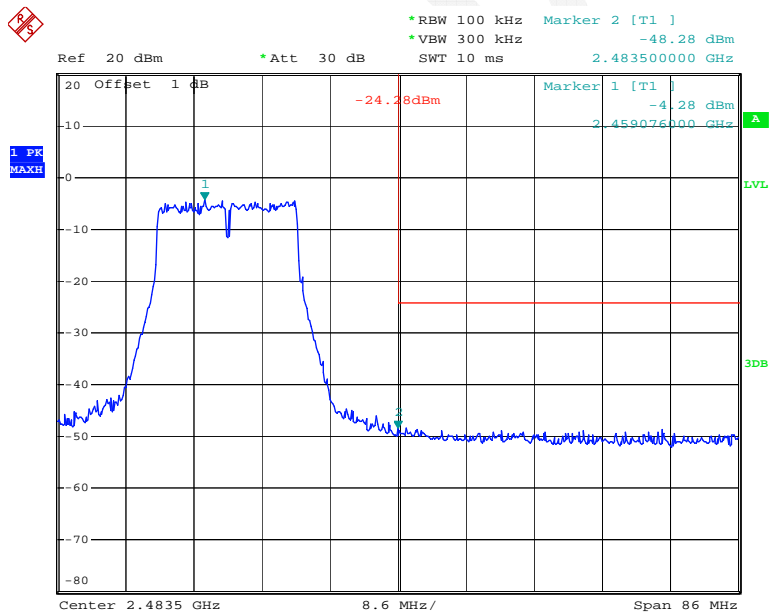
Date: 1.JUL.2016 17:17:16

802.11n ht20 Band Edge, Left Side



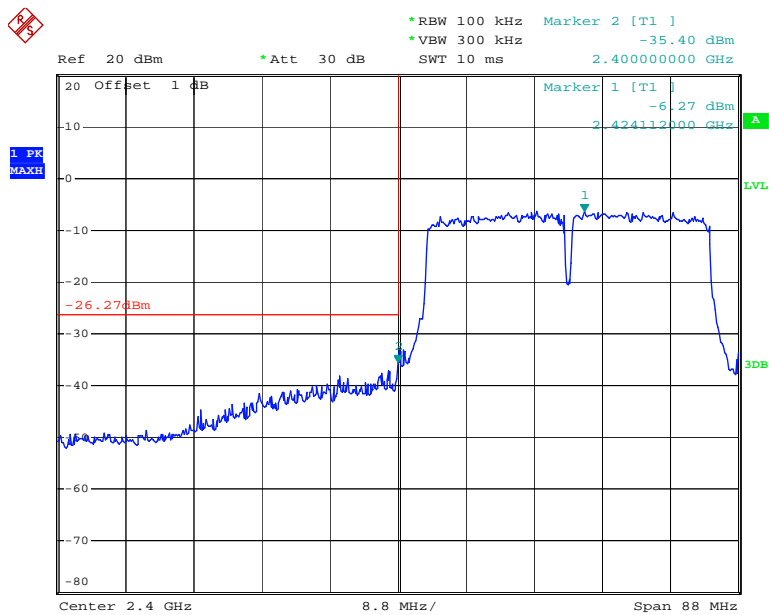
Date: 1.JUL.2016 17:20:56

802.11n ht20 Band Edge, Right Side



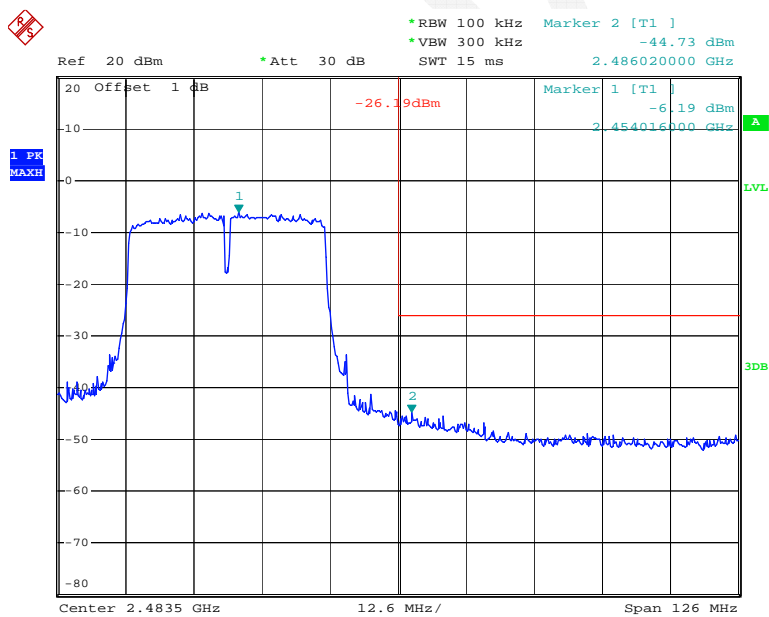
Date: 1.JUL.2016 17:25:21

802.11n ht40 Band Edge, Left Side



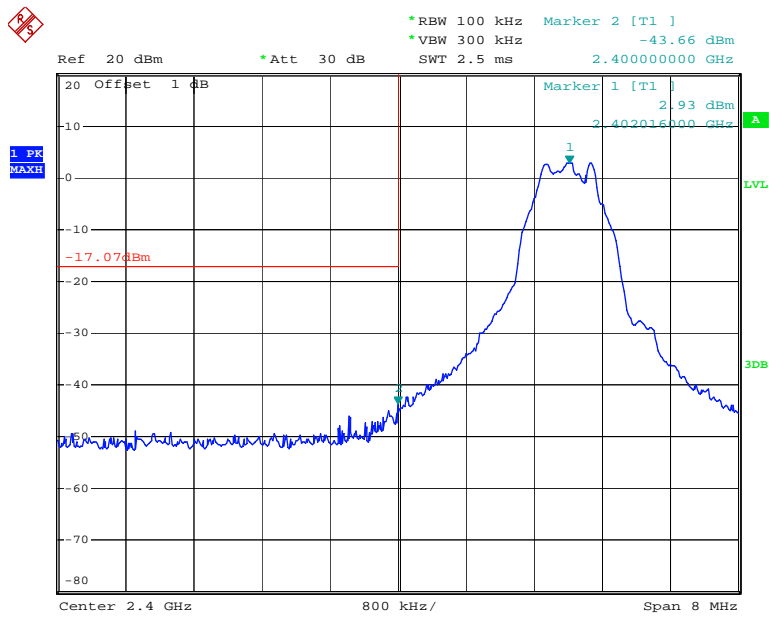
Date: 1.JUL.2016 17:30:02

802.11n ht40 Band Edge, Right Side



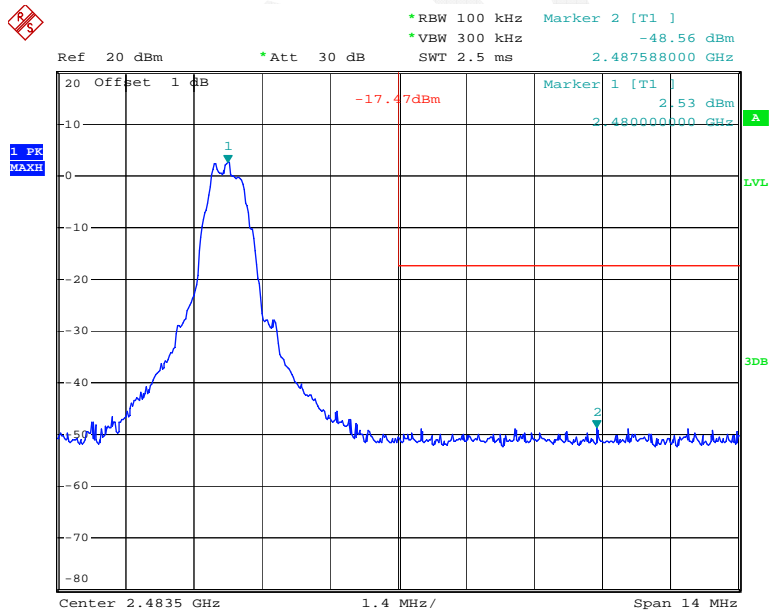
Date: 1.JUL.2016 17:35:42

BLE Band Edge , Left Side



Date: 7.JUL.2016 10:20:13

BLE Band Edge, Right Side



Date: 7.JUL.2016 10:23:01

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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.8 – 27.9°C
Relative Humidity:	46 - 50 %
ATM Pressure:	100 – 100.3 kPa

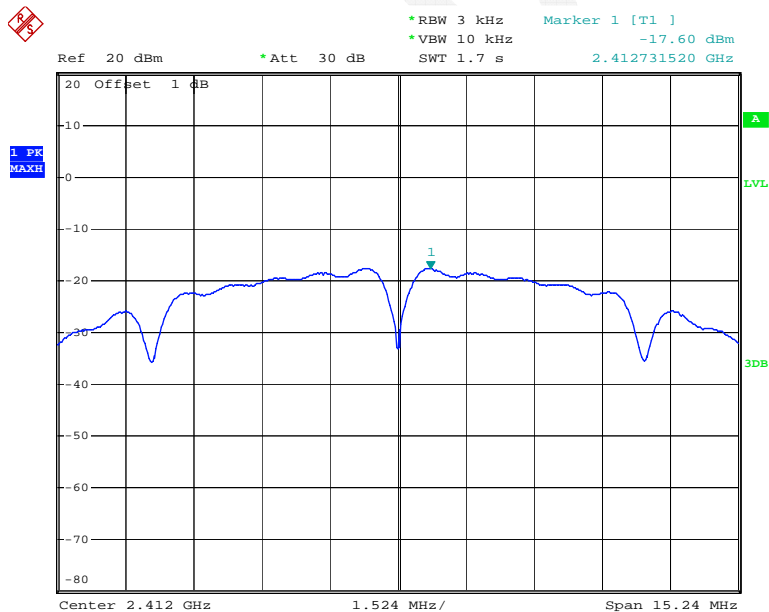
* The testing was performed by Rocky Xiao from 2016-07-01 to 2016-07-07.

Test Mode: Transmitting

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

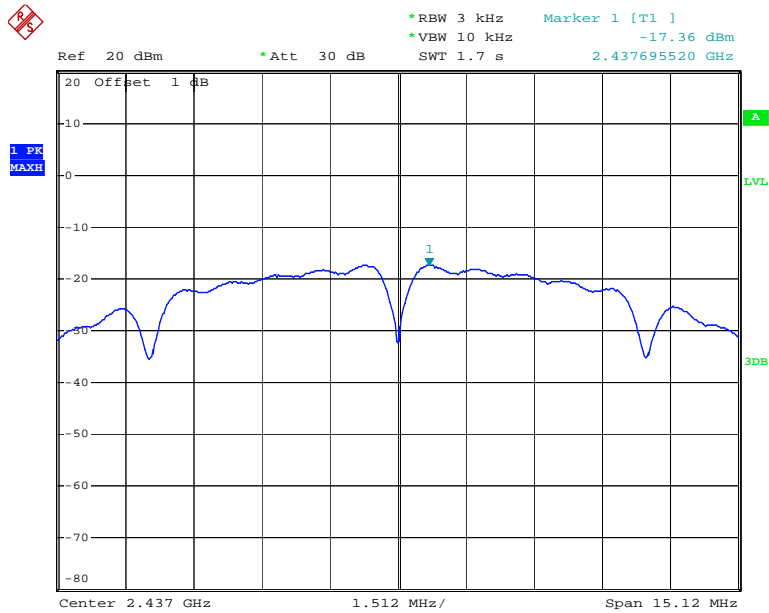
Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-17.60	8
	Middle	2437	-17.36	8
	High	2462	-17.24	8
802.11g	Low	2412	-18.76	8
	Middle	2437	-18.48	8
	High	2462	-18.02	8
802.11n20	Low	2412	-18.00	8
	Middle	2437	-18.48	8
	High	2462	-17.95	8
802.11n40	Low	2422	-18.86	8
	Middle	2437	-18.71	8
	High	2452	-18.61	8
BLE	Low	2402	-13.65	8
	Middle	2440	-13.38	8
	High	2480	-14.87	8

Power Spectral Density, 802.11b Low Channel



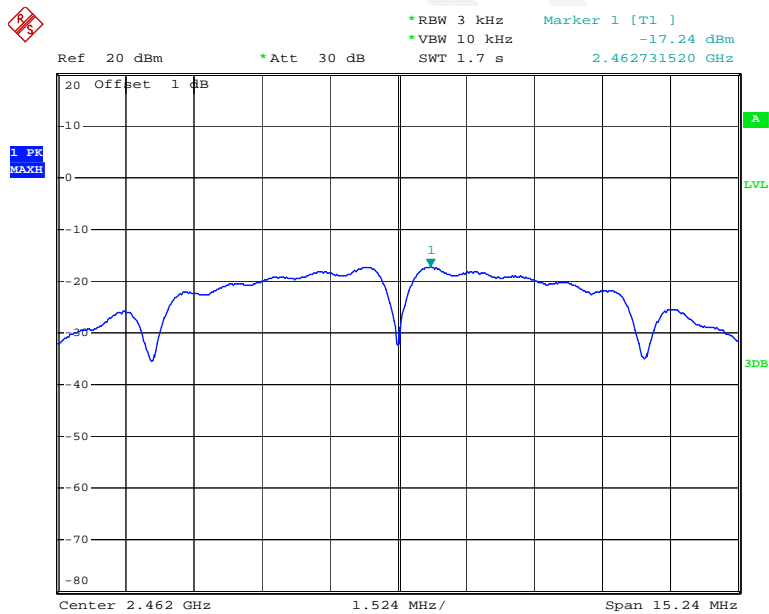
Date: 1.JUL.2016 16:56:15

Power Spectral Density, 802.11b Middle Channel



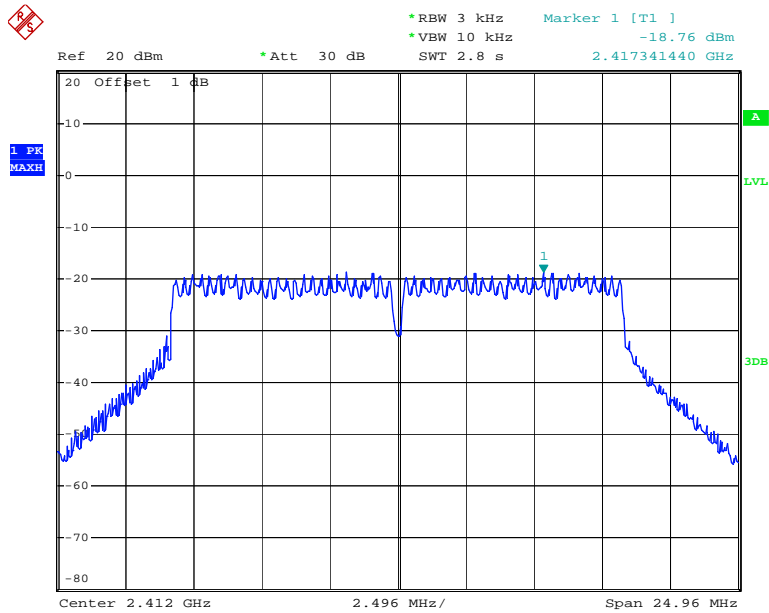
Date: 1.JUL.2016 16:58:29

Power Spectral Density, 802.11b High Channel



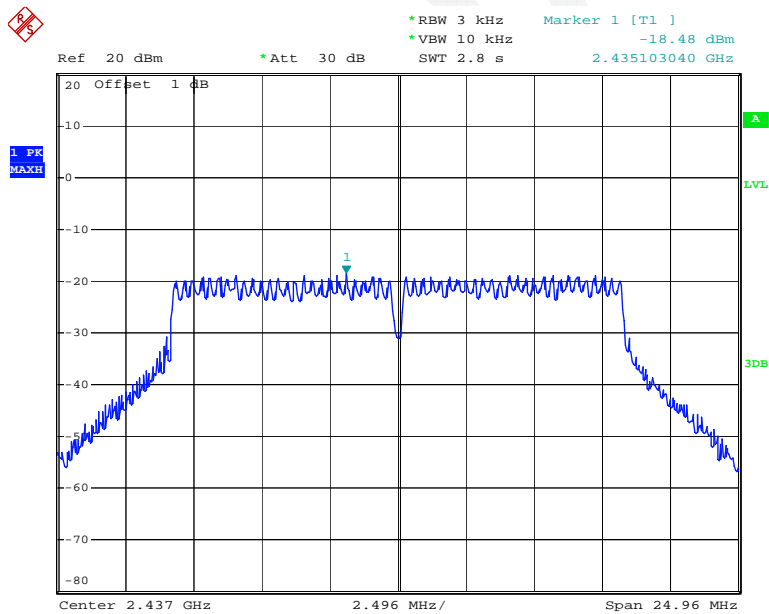
Date: 1.JUL.2016 17:04:20

Power Spectral Density, 802.11g Low Channel



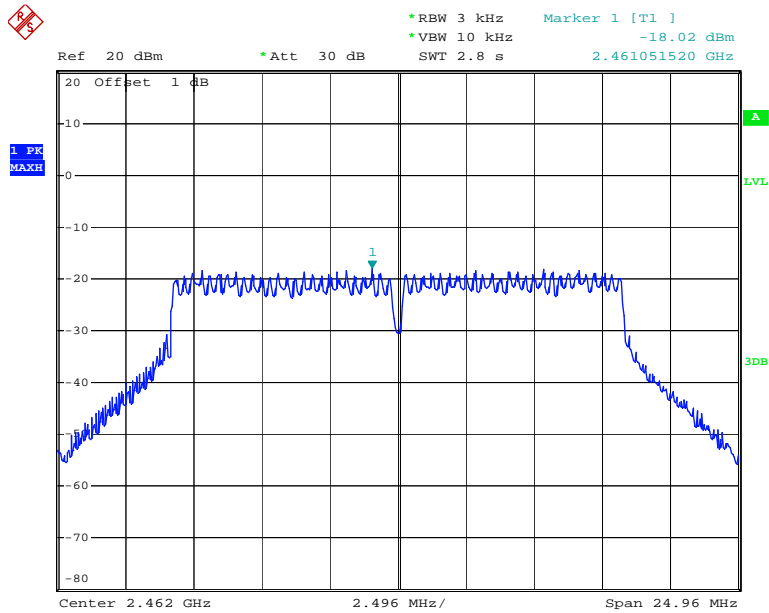
Date: 1.JUL.2016 17:12:17

Power Spectral Density, 802.11g Middle Channel



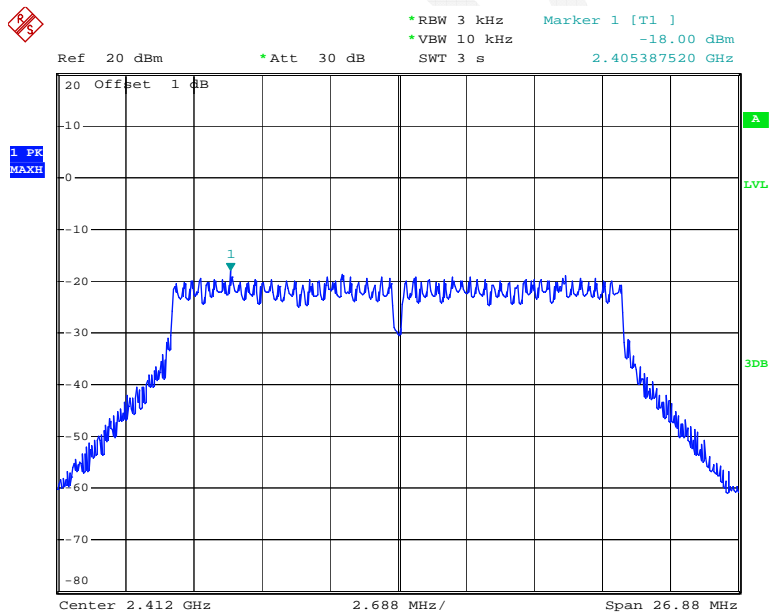
Date: 1.JUL.2016 17:14:43

Power Spectral Density, 802.11g High Channel



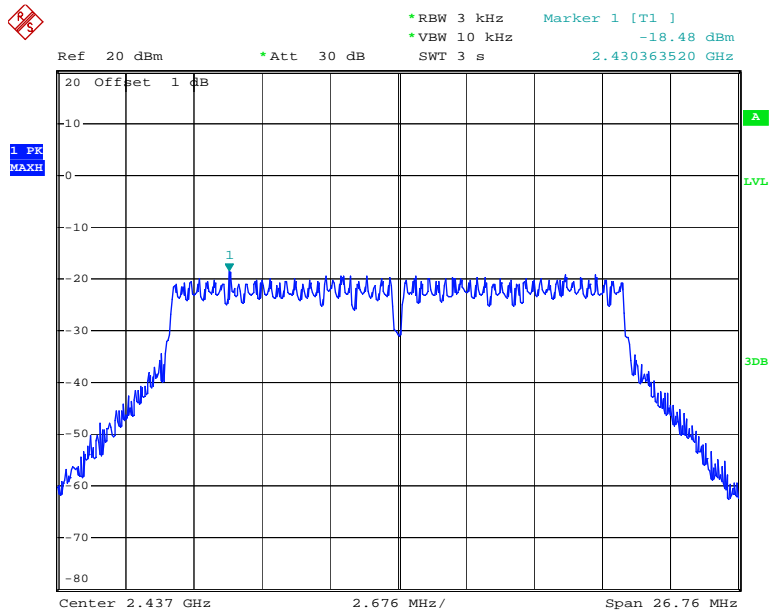
Date: 1.JUL.2016 17:16:53

Power Spectral Density, 802.11n ht20 Low Channel



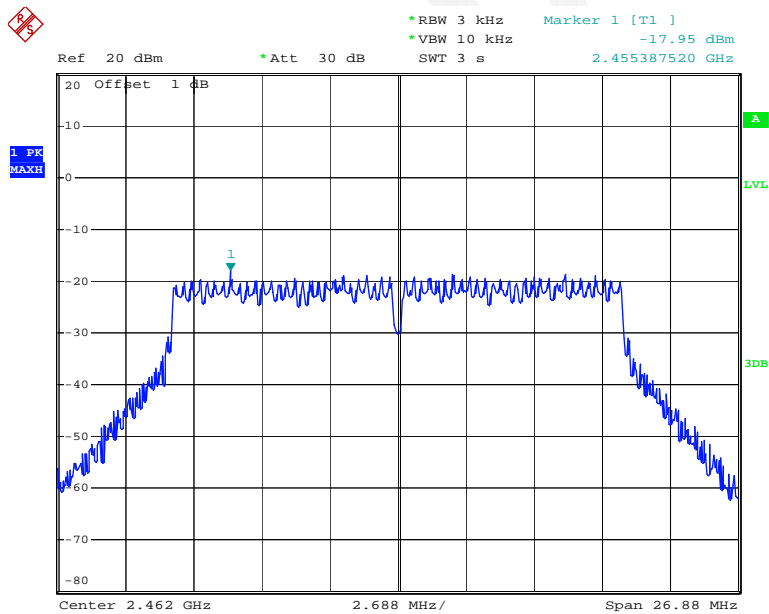
Date: 1.JUL.2016 17:20:32

Power Spectral Density, 802.11n ht20 Middle Channel



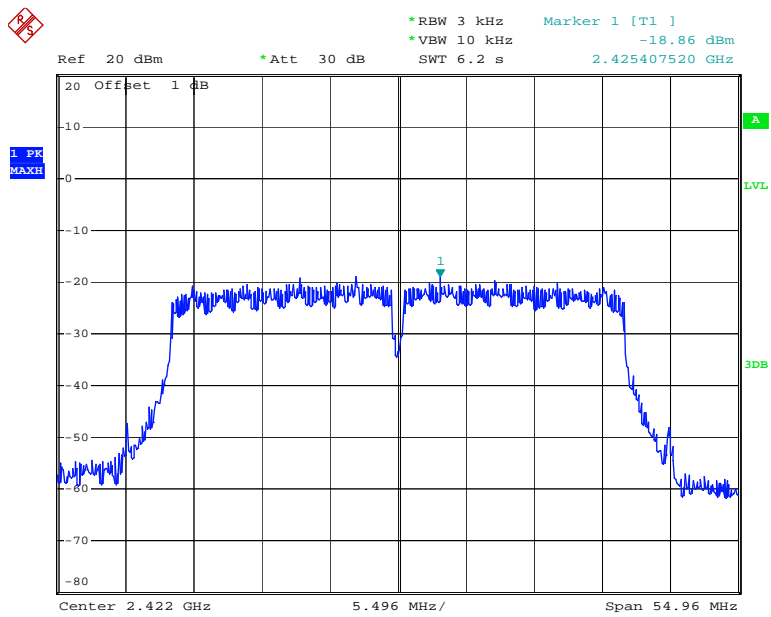
Date: 1.JUL.2016 17:22:59

Power Spectral Density, 802.11n ht20 High Channel



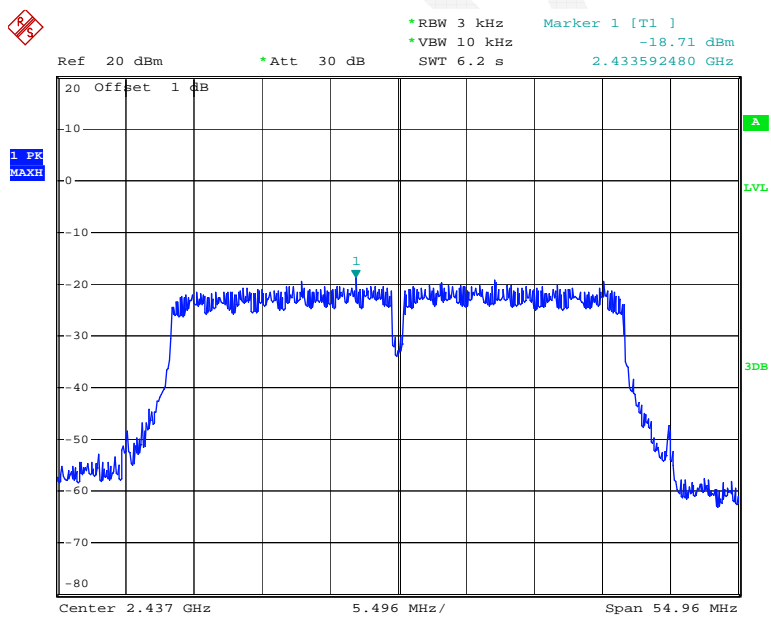
Date: 1.JUL.2016 17:25:04

Power Spectral Density, 802.11n ht40 Low Channel



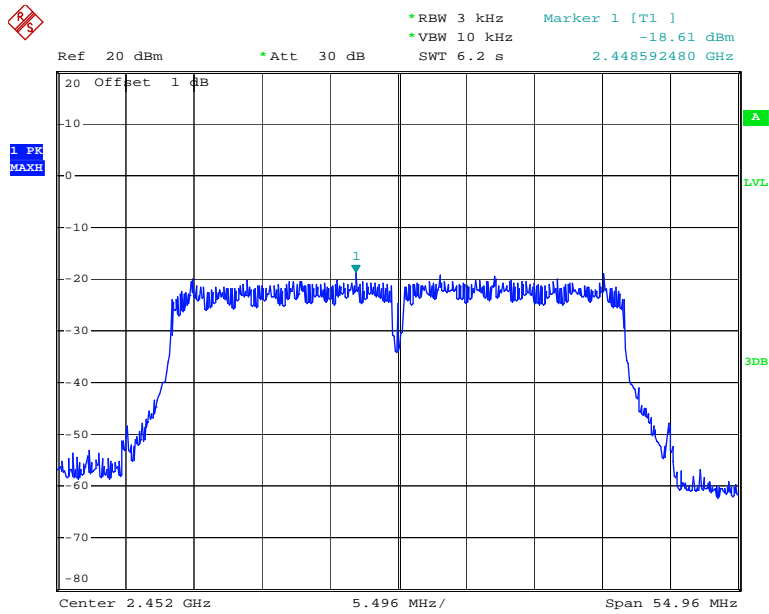
Date: 1.JUL.2016 17:29:44

Power Spectral Density, 802.11n ht40 Middle Channel



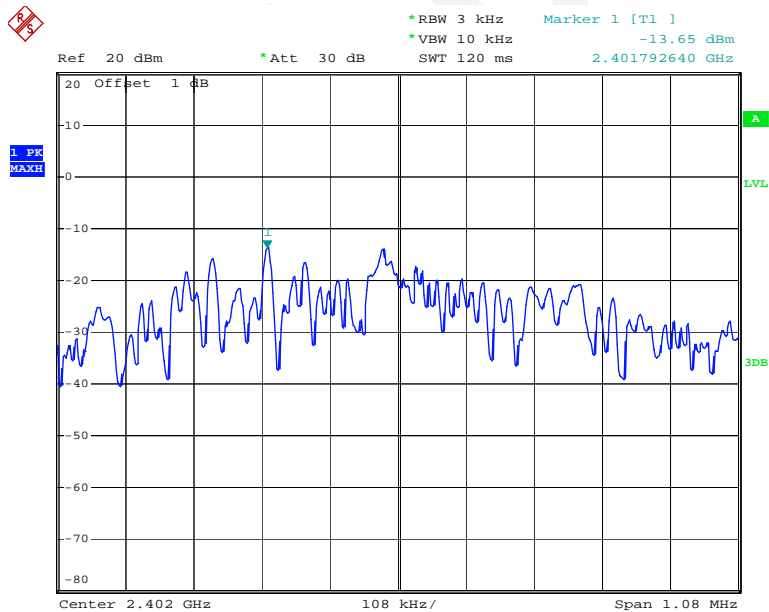
Date: 1.JUL.2016 17:32:28

Power Spectral Density, 802.11n ht40 High Channel



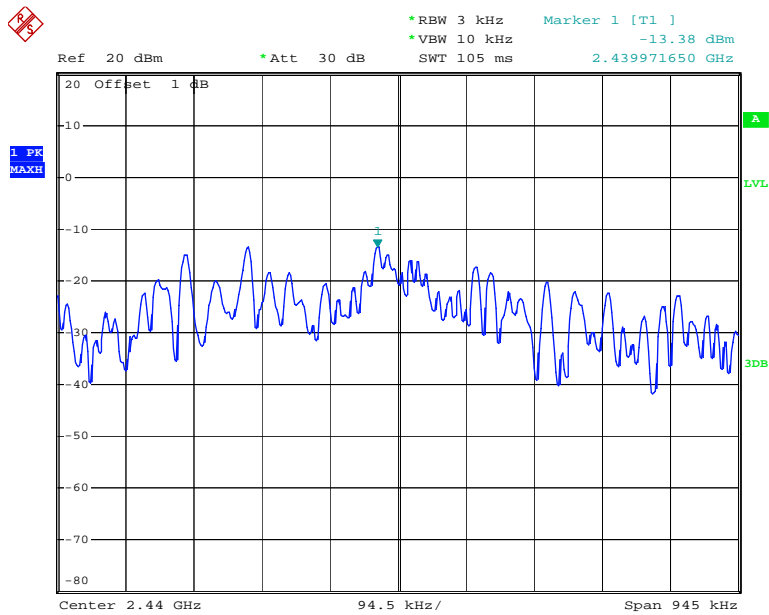
Date: 1.JUL.2016 17:35:24

Power Spectral Density, BLE Low Channel



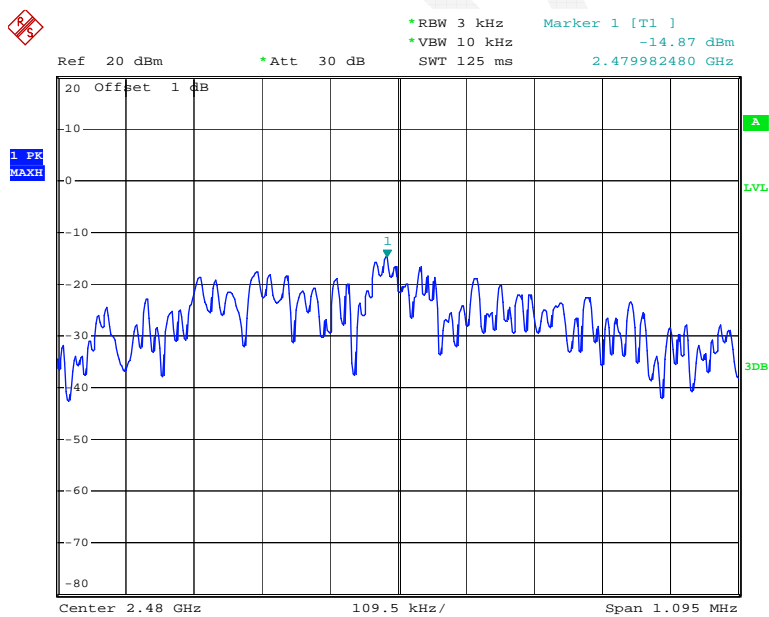
Date: 7.JUL.2016 10:19:49

Power Spectral Density, BLE Middle Channel



Date: 7.JUL.2016 10:21:26

Power Spectral Density, BLE High Channel



Date: 7.JUL.2016 10:22:38

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