FCC PART 15.247

TEST REPORT

For

Hena Digital Technology (Shenzhen) Co., Ltd.

3F, South Tower, Jiuzhou Electric Building, Southern No, 12Rd, High-tech Industrial Park, Nanshan District, Shenzhen, China

FCC ID: M7C-P909

Report Type:	**Product Type:**
Original Report	MID

Test Engineer:	Rocky Xiao
Report Number:	RDG160722011-00C
Report Date:	2016-08-12
Reviewed By:	Dean Liu RF Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
RELATED SUBMITTAL(S)/GRANT(S) 4
TEST METHODOLOGY 4
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EQUIPMENT MODIFICATIONS 6
EUT EXERCISE SOFTWARE 7
EXTERNAL CABLE 7
BLOCK DIAGRAM OF TEST SETUP 8
SUMMARY OF TEST RESULTS **9**
FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE **10**
APPLICABLE STANDARD 10
FCC §15.203 - ANTENNA REQUIREMENT **11**
APPLICABLE STANDARD 11
ANTENNA CONNECTOR CONSTRUCTION 11
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS **12**
APPLICABLE STANDARD 12
MEASUREMENT UNCERTAINTY 12
EUT SETUP 12
EMI TEST RECEIVER SETUP 13
TEST PROCEDURE 13
CORRECTED AMPLITUDE & MARGIN CALCULATION 13
TEST EQUIPMENT LIST AND DETAILS 14
TEST RESULTS SUMMARY 14
TEST DATA 14
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS **19**
APPLICABLE STANDARD 19
MEASUREMENT UNCERTAINTY 19
EUT SETUP 19
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 20
TEST PROCEDURE 20
CORRECTED AMPLITUDE & MARGIN CALCULATION 21
TEST EQUIPMENT LIST AND DETAILS 21
TEST DATA 21
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH **31**
APPLICABLE STANDARD 31
TEST PROCEDURE 31
TEST EQUIPMENT LIST AND DETAILS 31
TEST DATA 31
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER **40**
APPLICABLE STANDARD 40

TEST PROCEDURE 40
TEST EQUIPMENT LIST AND DETAILS 40
TEST DATA 40

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE 42

APPLICABLE STANDARD 42
TEST PROCEDURE 42
TEST EQUIPMENT LIST AND DETAILS 42
TEST DATA 42

FCC §15.247(e) - POWER SPECTRAL DENSITY 48

APPLICABLE STANDARD 48
TEST PROCEDURE 48
TEST EQUIPMENT LIST AND DETAILS 48
TEST DATA 48

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hena Digital Technology (Shenzhen) Co., Ltd.*'s product, model number: *MID-9526 (FCC ID: M7C-P909)* (the "EUT") in this report was a *MID* , which was measured approximately: 23.8 cm (L) x 14.8 cm (W) x 1.1cm (H), rated input voltage: DC 3.7V rechargeable Li-ion battery or DC5V from adapter.

Adapter information:
MODEL: TEKA006-0501500UKU
INPUT: 100-240V ~ 50/60Hz 0.3A MAX
OUTPUT: DC 5.0V, 1.5A

Note: The series product, model MID-9526, MID-9526LB, M9526L, MW9526L, MY9526L, MID9526L, M9526, MW9526, MY9526, MID9526, M9526, MW9526*, MY9526*, MID9526*(* can be replaced by letter from A to Z), 873846, 873845, 873844, P909BK, P909, P909C, P916 are electrically identical, the difference between them just is the model name, we selected MID-9526 for fully testing, the details was explained in the declaration letter.*

All measurement and test data in this report was gathered from production sample serial number: 160722011 (Assigned by BACL, Dongguan). The EUT was received on 2016-07-22.

Objective

This report is prepared on behalf of *Hena Digital Technology (Shenzhen) 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 JBP submissions with FCC ID: M7C-P909
FCC Part 15C DSS submissions with FCC ID: M7C-P909

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, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal 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.

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:

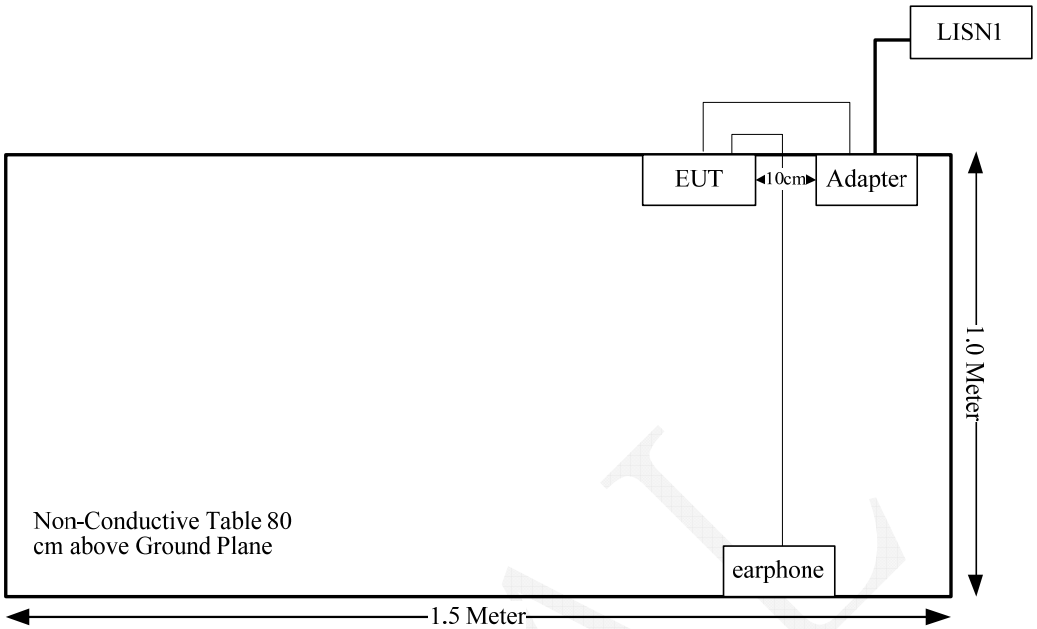
Test Mode	Test Software Version	Engineering Mode		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level Setting	39	40	40
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level Setting	40	40	39
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting	40	39	39
802.11n ht40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting	39	40	40

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

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	Yes	No	0.85	Adapter	EUT
Earphone	No	No	1.15	EUT	Earphone

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
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum 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:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(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 WiFi mode

The max tune-up conducted power is 9.8 dBm (9.55 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 9.55/5*(√2.462) = 3.0 ≤3.0

For bluetooth LE mode

The max tune-up conducted power is -4.0 dBm (0.4 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 0.4/5*(√2.48) = 0.1 <3.0

So the stand-alone SAR evaluation is not necessary.

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 internal 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_{cispr} 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.

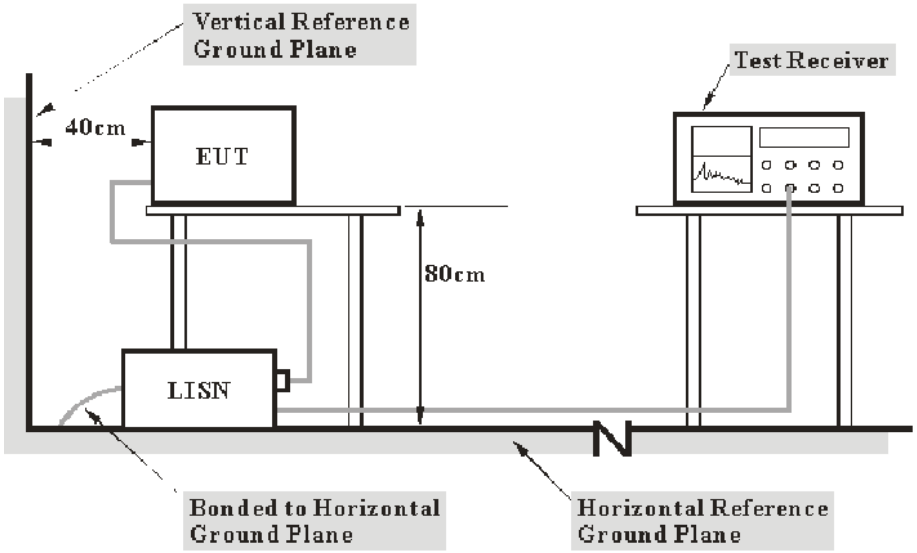
If U_{lab} is greater than U_{cispr} of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), 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_{cispr}

Measurement	U_{cispr}
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:

Margin = Limit – 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, with the worst margin reading of:

3.7 dB at **3.721226 MHz** in the **Neutral** conducted mode for Wifi

Test Data

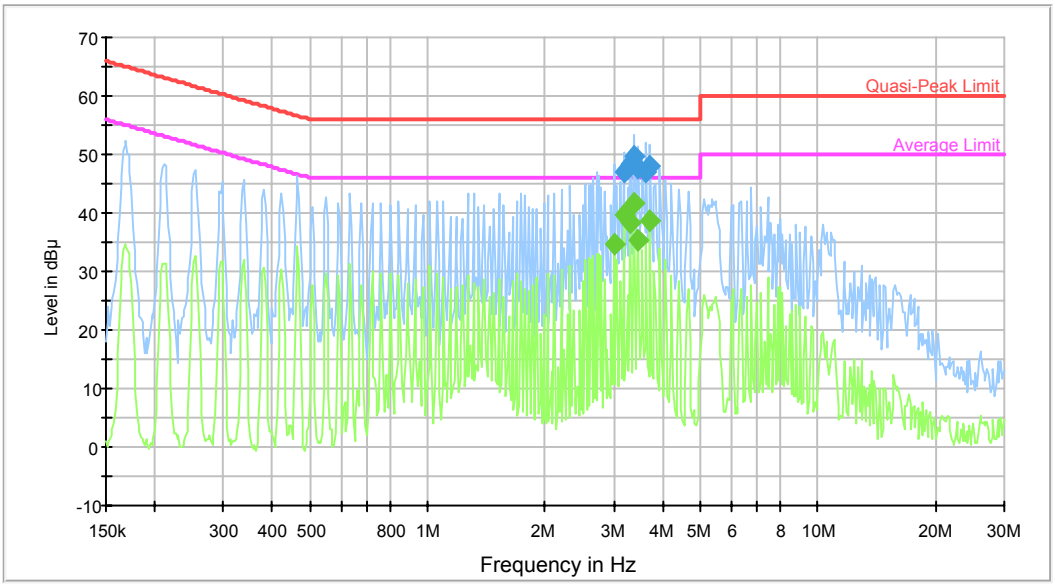
Environmental Conditions

Temperature:	29.1°C
Relative Humidity:	51 %
ATM Pressure:	100.2 kPa

The testing was performed by Rocky Xiao on 2016-07-27.

Test Mode: Transmitting (Wi-Fi)

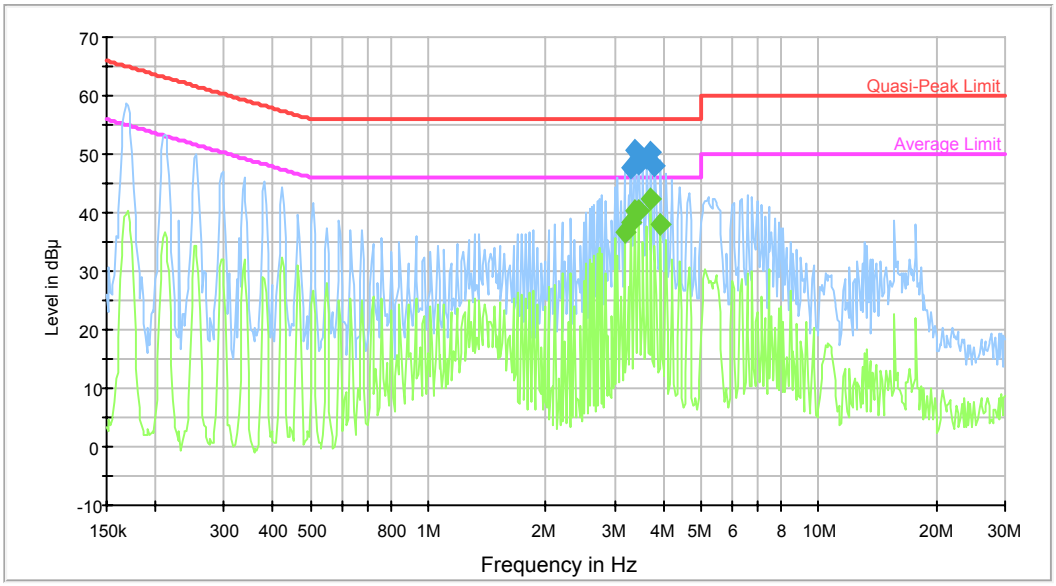
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.173039	47.1	9.000	L1	10.6	8.9	56.0	Compliance
3.302007	48.3	9.000	L1	10.6	7.7	56.0	Compliance
3.381891	49.6	9.000	L1	10.6	6.4	56.0	Compliance
3.463707	47.6	9.000	L1	10.6	8.4	56.0	Compliance
3.633326	47.0	9.000	L1	10.6	9.0	56.0	Compliance
3.721226	48.1	9.000	L1	10.6	7.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.000901	34.8	9.000	L1	10.6	11.2	46.0	Compliance
3.173039	39.6	9.000	L1	10.6	6.4	46.0	Compliance
3.302007	38.5	9.000	L1	10.6	7.5	46.0	Compliance
3.381891	41.7	9.000	L1	10.6	4.3	46.0	Compliance
3.463707	35.4	9.000	L1	10.6	10.6	46.0	Compliance
3.721226	38.8	9.000	L1	10.6	7.2	46.0	Compliance

AC120 V, 60 Hz, Neutral:

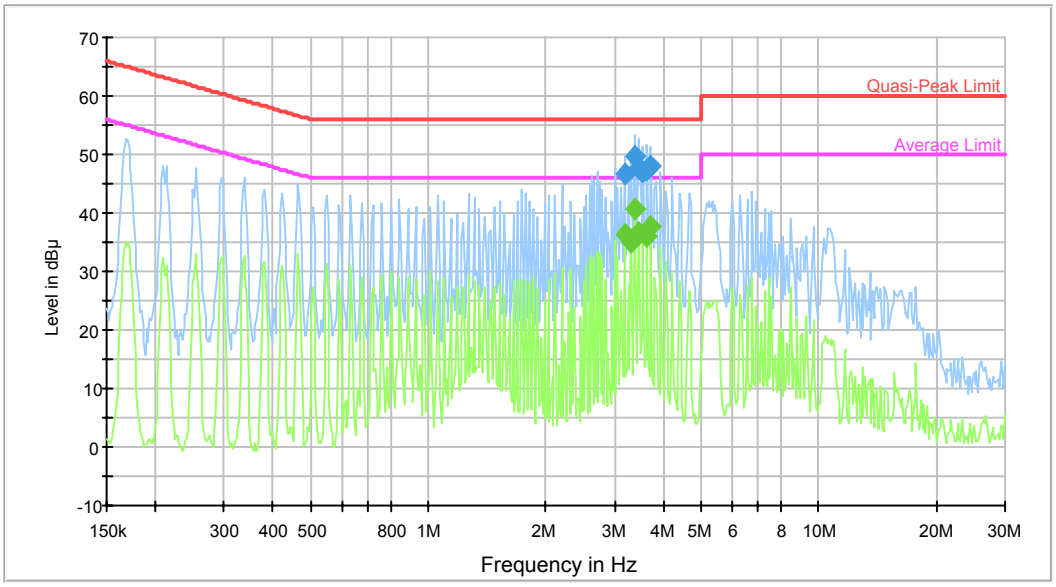


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.302007	47.7	9.000	N	10.6	8.3	56.0	Compliance
3.381891	50.5	9.000	N	10.6	5.5	56.0	Compliance
3.463707	48.3	9.000	N	10.6	7.7	56.0	Compliance
3.633326	49.4	9.000	N	10.6	6.6	56.0	Compliance
3.721226	50.2	9.000	N	10.6	5.8	56.0	Compliance
3.811251	47.9	9.000	N	10.6	8.1	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.173039	36.8	9.000	N	10.6	9.2	46.0	Compliance
3.302007	38.5	9.000	N	10.6	7.5	46.0	Compliance
3.381891	40.4	9.000	N	10.6	5.6	46.0	Compliance
3.463707	40.4	9.000	N	10.6	5.6	46.0	Compliance
3.721226	42.3	9.000	N	10.6	3.7	46.0	Compliance
3.934683	38.1	9.000	N	10.7	7.9	46.0	Compliance

Test Mode: Transmitting (BLE)

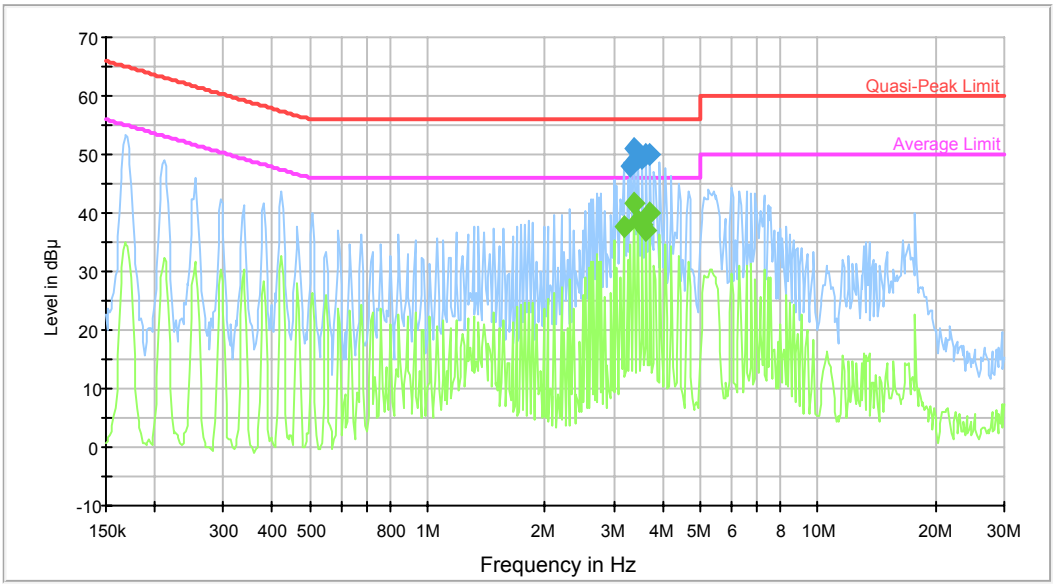
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.173039	46.8	9.000	L1	10.6	9.2	56.0	Compliance
3.381891	49.7	9.000	L1	10.6	6.3	56.0	Compliance
3.463707	47.7	9.000	L1	10.6	8.3	56.0	Compliance
3.547503	47.1	9.000	L1	10.6	8.9	56.0	Compliance
3.633326	47.3	9.000	L1	10.6	8.7	56.0	Compliance
3.721226	48.0	9.000	L1	10.6	8.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.173039	36.4	9.000	L1	10.6	9.6	46.0	Compliance
3.302007	34.9	9.000	L1	10.6	11.1	46.0	Compliance
3.381891	40.5	9.000	L1	10.6	5.5	46.0	Compliance
3.463707	36.8	9.000	L1	10.6	9.2	46.0	Compliance
3.633326	35.9	9.000	L1	10.6	10.1	46.0	Compliance
3.721226	37.6	9.000	L1	10.6	8.4	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.302007	47.9	9.000	N	10.6	8.1	56.0	Compliance
3.381891	50.9	9.000	N	10.6	5.1	56.0	Compliance
3.463707	49.3	9.000	N	10.6	6.7	56.0	Compliance
3.547503	49.4	9.000	N	10.6	6.6	56.0	Compliance
3.633326	50.0	9.000	N	10.6	6.0	56.0	Compliance
3.721226	50.1	9.000	N	10.6	5.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.173039	37.6	9.000	N	10.6	8.4	46.0	Compliance
3.381891	41.7	9.000	N	10.6	4.3	46.0	Compliance
3.463707	38.5	9.000	N	10.6	7.5	46.0	Compliance
3.547503	37.9	9.000	N	10.6	8.1	46.0	Compliance
3.633326	37.0	9.000	N	10.6	9.0	46.0	Compliance
3.721226	40.1	9.000	N	10.6	5.9	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_{cispr} 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_{cispr} of Table 2, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

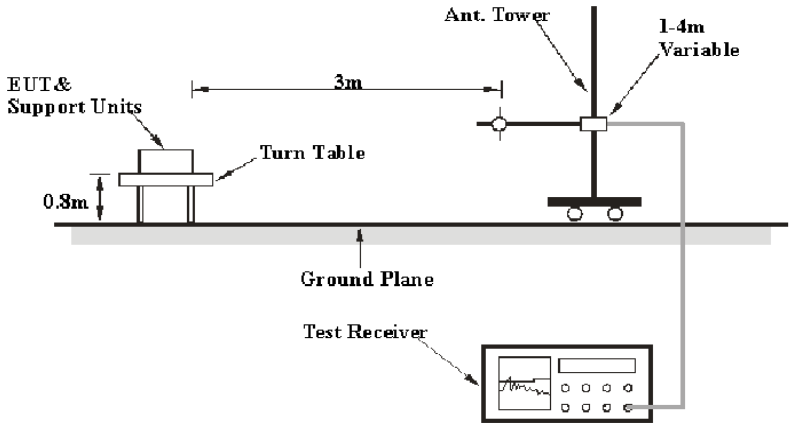
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

Table 2 – Values of U_{cispr}

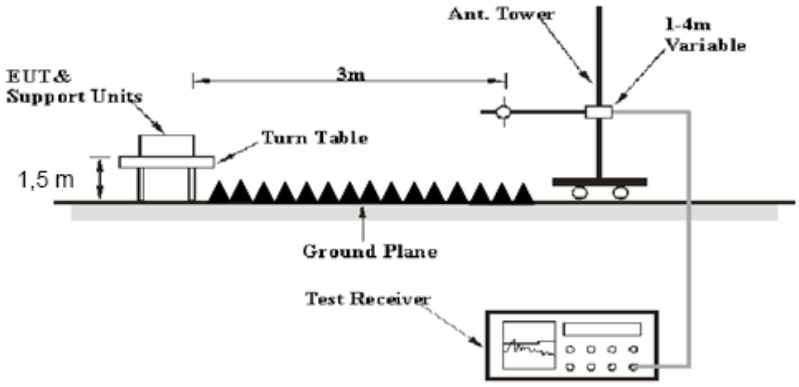
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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:

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

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

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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 Technolagies	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

*** 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

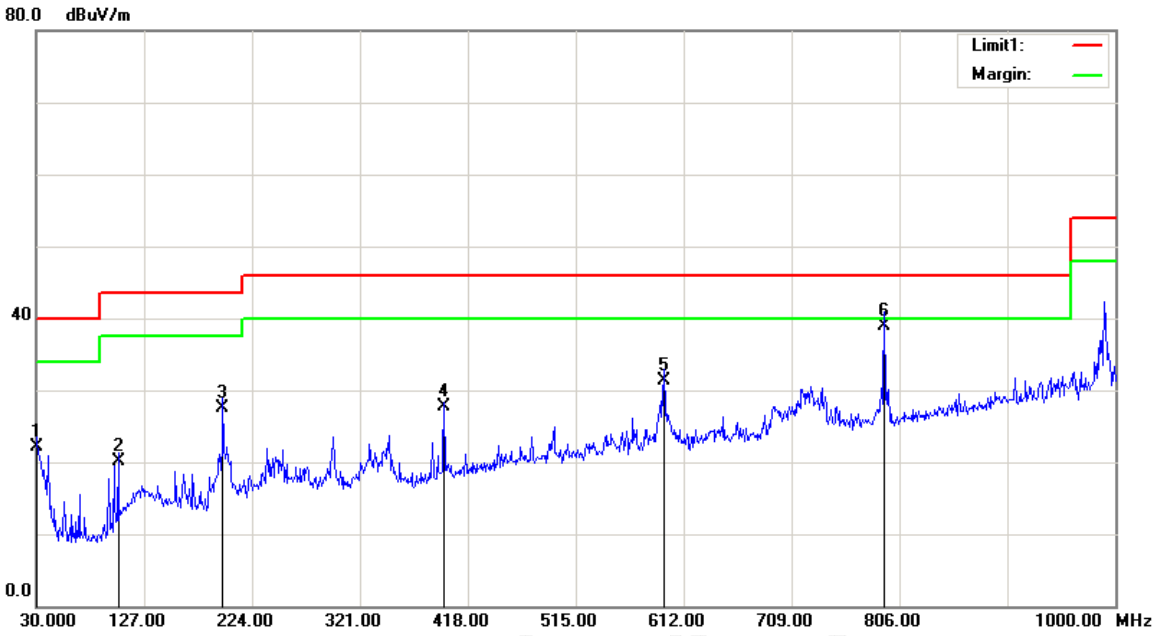
Temperature:	26.7°C
Relative Humidity:	39 %
ATM Pressure:	100.4 kPa

** The testing was performed by Rocky Xiao on 2016-08-10.*

Test Mode: Transmitting

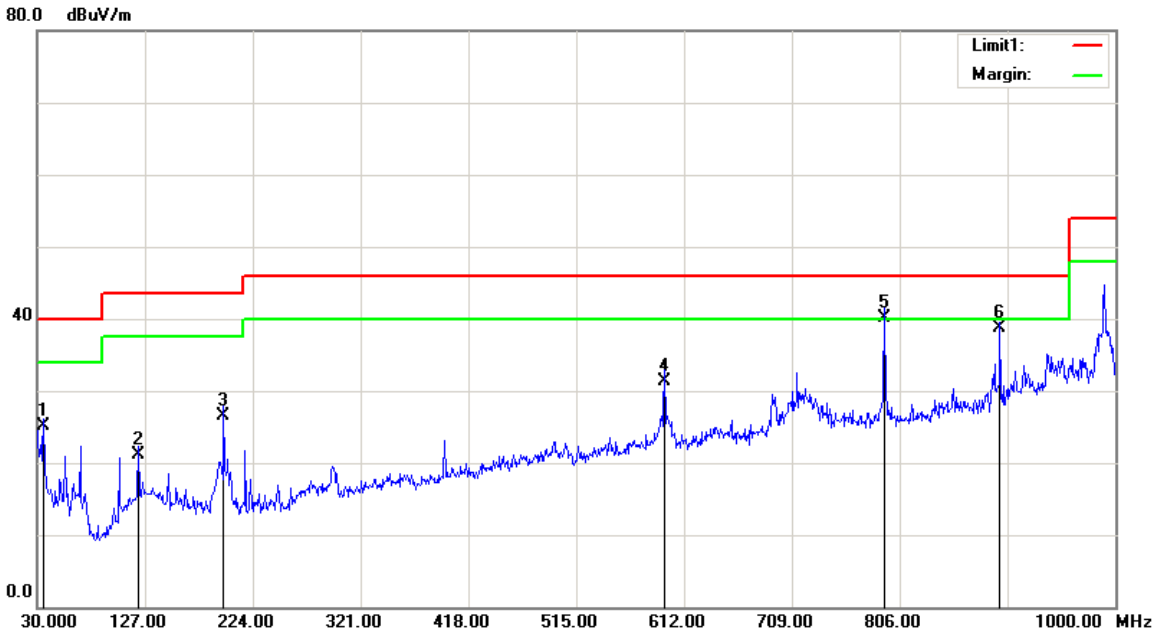
1) Below 1GHz(802.11b mode middle channel was the worst**):**

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	21.15	QP	0.95	22.10	40.00	17.90
103.7200	28.70	QP	-8.60	20.10	43.50	23.40
197.8100	35.15	QP	-7.55	27.60	43.50	15.90
396.6600	31.48	QP	-3.68	27.80	46.00	18.20
594.5400	32.14	QP	-0.74	31.40	46.00	14.60
792.4200	35.93	QP	2.97	38.90	46.00	7.10

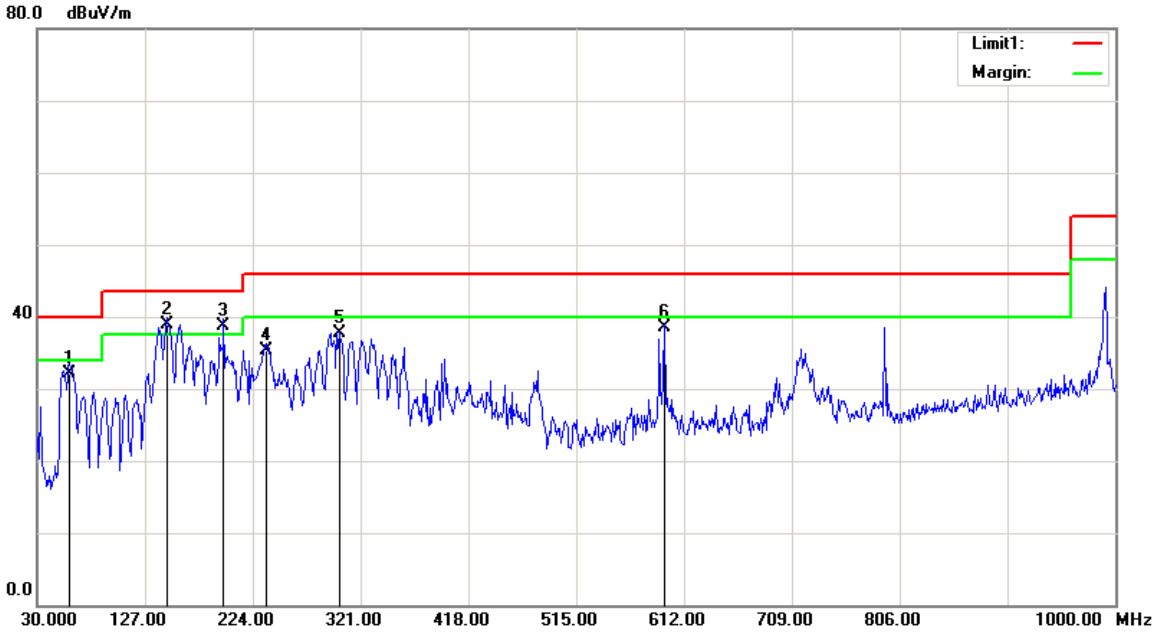
Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
35.8200	28.36	QP	-3.26	25.10	40.00	14.90
121.1800	26.80	QP	-5.60	21.20	43.50	22.30
197.8100	34.05	QP	-7.55	26.50	43.50	17.00
594.5400	32.14	QP	-0.74	31.40	46.00	14.60
792.4200	37.13	QP	2.97	40.10	46.00	5.90
896.2100	34.45	QP	4.25	38.70	46.00	7.30

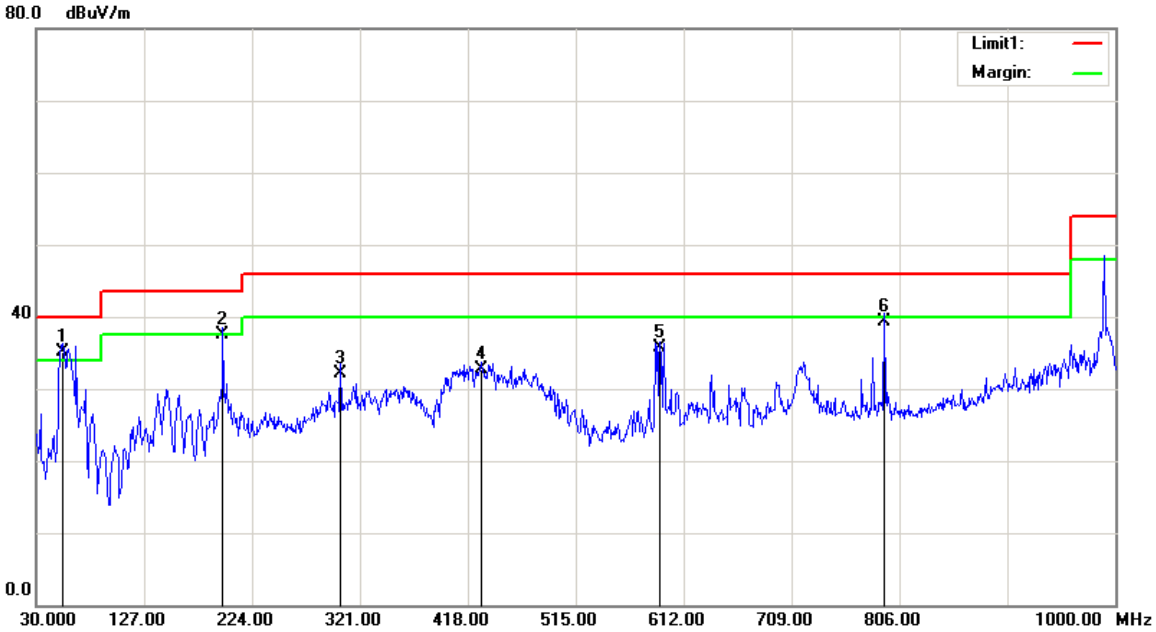
BLE:

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
59.1000	45.10	QP	-13.00	32.10	40.00	7.90
146.4000	45.95	QP	-7.05	38.90	43.50	4.60
197.8100	46.25	QP	-7.55	38.70	43.50	4.80
235.6400	43.25	QP	-7.85	35.40	46.00	10.60
301.6000	43.55	QP	-5.75	37.80	46.00	8.20
594.5400	39.34	QP	-0.74	38.60	46.00	7.40

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
53.2800	47.90	QP	-12.70	35.20	40.00	4.80
197.8100	45.15	QP	-7.55	37.60	43.50	5.90
303.5400	37.80	QP	-5.70	32.10	46.00	13.90
429.6400	35.72	QP	-3.02	32.70	46.00	13.30
590.6600	36.54	QP	-0.74	35.80	46.00	10.20
792.4200	36.43	QP	2.97	39.40	46.00	6.60

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	60.65	PK	H	25.67	3.68	0.00	90.00	N/A	N/A
2412	57.04	AV	H	25.67	3.68	0.00	86.39	N/A	N/A
2412	60.01	PK	V	25.67	3.68	0.00	89.36	N/A	N/A
2412	56.17	AV	V	25.67	3.68	0.00	85.52	N/A	N/A
2390	25.02	PK	H	25.61	3.63	0.00	54.26	74.00	19.74
2390	13.36	AV	H	25.61	3.63	0.00	42.60	54.00	11.40
4824	35	PK	H	30.64	5.03	27.41	43.26	74.00	30.74
4824	27.14	AV	H	30.64	5.03	27.41	35.40	54.00	18.60
7236	33.6	PK	H	34.17	6.65	25.90	48.52	74.00	25.48
7236	29.41	AV	H	34.17	6.65	25.90	44.33	54.00	9.67
3163	44.69	PK	H	27.72	6.75	27.40	51.76	74.00	22.24
3163	32.17	AV	H	27.72	6.75	27.40	39.24	54.00	14.76
Middle Channel: 2437 MHz									
2437	61.68	PK	H	25.74	3.75	0.00	91.17	N/A	N/A
2437	58.23	AV	H	25.74	3.75	0.00	87.72	N/A	N/A
2437	60.67	PK	V	25.74	3.75	0.00	90.16	N/A	N/A
2437	56.72	AV	V	25.74	3.75	0.00	86.21	N/A	N/A
4874	35.26	PK	H	30.77	5.14	27.42	43.75	74.00	30.25
4874	27.37	AV	H	30.77	5.14	27.42	35.86	54.00	18.14
7311	33.82	PK	H	34.35	6.74	25.88	49.03	74.00	24.97
7311	29.7	AV	H	34.35	6.74	25.88	44.91	54.00	9.09
3263	44.94	PK	H	28.04	6.01	27.32	51.67	74.00	22.33
3263	32.41	AV	H	28.04	6.01	27.32	39.14	54.00	14.86
3560	44.21	PK	H	28.93	4.53	27.26	50.41	74.00	23.59
3560	30.65	AV	H	28.93	4.53	27.26	36.85	54.00	17.15
High Channel: 2462 MHz									
2462	62.64	PK	H	25.80	3.75	0.00	92.19	N/A	N/A
2462	59.19	AV	H	25.80	3.75	0.00	88.74	N/A	N/A
2462	61.04	PK	V	25.80	3.75	0.00	90.59	N/A	N/A
2462	56.99	AV	V	25.80	3.75	0.00	86.54	N/A	N/A
2483.5	25.42	PK	H	25.86	3.67	0.00	54.95	74.00	19.05
2483.5	14.05	AV	H	25.86	3.67	0.00	43.58	54.00	10.42
4924	35.48	PK	H	30.90	5.34	27.43	44.29	74.00	29.71
4924	27.65	AV	H	30.90	5.34	27.43	36.46	54.00	17.54
7386	34.05	PK	H	34.53	6.83	25.86	49.55	74.00	24.45
7386	29.94	AV	H	34.53	6.83	25.86	45.44	54.00	8.56
3163	45.23	PK	H	27.72	6.75	27.40	52.30	74.00	21.70
3163	32.71	AV	H	27.72	6.75	27.40	39.78	54.00	14.22

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	57.38	PK	H	25.67	3.68	0.00	86.73	N/A	N/A
2412	48.94	AV	H	25.67	3.68	0.00	78.29	N/A	N/A
2412	57.17	PK	V	25.67	3.68	0.00	86.52	N/A	N/A
2412	48.91	AV	V	25.67	3.68	0.00	78.26	N/A	N/A
2390	25.14	PK	H	25.61	3.63	0.00	54.38	74.00	19.62
2390	13.37	AV	H	25.61	3.63	0.00	42.61	54.00	11.39
4824	33.49	PK	H	30.64	5.03	27.41	41.75	74.00	32.25
4824	21.02	AV	H	30.64	5.03	27.41	29.28	54.00	24.72
7236	32.96	PK	H	34.17	6.65	25.90	47.88	74.00	26.12
7236	20.35	AV	H	34.17	6.65	25.90	35.27	54.00	18.73
3163	46.92	PK	H	27.72	6.75	27.40	53.99	74.00	20.01
3163	35.41	AV	H	27.72	6.75	27.40	42.48	54.00	11.52
Middle Channel: 2437 MHz									
2437	58.8	PK	H	25.74	3.75	0.00	88.29	N/A	N/A
2437	50.17	AV	H	25.74	3.75	0.00	79.66	N/A	N/A
2437	57.99	PK	V	25.74	3.75	0.00	87.48	N/A	N/A
2437	49.54	AV	V	25.74	3.75	0.00	79.03	N/A	N/A
4874	33.72	PK	H	30.77	5.14	27.42	42.21	74.00	31.79
4874	21.26	AV	H	30.77	5.14	27.42	29.75	54.00	24.25
7311	33.24	PK	H	34.35	6.74	25.88	48.45	74.00	25.55
7311	20.59	AV	H	34.35	6.74	25.88	35.80	54.00	18.20
3163	47.19	PK	H	27.72	6.75	27.40	54.26	74.00	19.74
3163	35.63	AV	H	27.72	6.75	27.40	42.70	54.00	11.30
3560	46.35	PK	H	28.93	4.53	27.26	52.55	74.00	21.45
3560	32.78	AV	H	28.93	4.53	27.26	38.98	54.00	15.02
High Channel: 2462 MHz									
2462	59.98	PK	H	25.80	3.75	0.00	89.53	N/A	N/A
2462	51.29	AV	H	25.80	3.75	0.00	80.84	N/A	N/A
2462	58.6	PK	V	25.80	3.75	0.00	88.15	N/A	N/A
2462	49.8	AV	V	25.80	3.75	0.00	79.35	N/A	N/A
2483.5	25.77	PK	H	25.86	3.67	0.00	55.30	74.00	18.70
2483.5	14.1	AV	H	25.86	3.67	0.00	43.63	54.00	10.37
4924	34.98	PK	H	30.90	5.34	27.43	43.79	74.00	30.21
4924	23.59	AV	H	30.90	5.34	27.43	32.40	54.00	21.60
7386	33.42	PK	H	34.53	6.83	25.86	48.92	74.00	25.08
7386	20.88	AV	H	34.53	6.83	25.86	36.38	54.00	17.62
3163	47.48	PK	H	27.72	6.75	27.40	54.55	74.00	19.45
3163	35.99	AV	H	27.72	6.75	27.40	43.06	54.00	10.94

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	58.73	PK	H	25.67	3.68	0.00	88.08	N/A	N/A
2412	49.94	AV	H	25.67	3.68	0.00	79.29	N/A	N/A
2412	57.44	PK	V	25.67	3.68	0.00	86.79	N/A	N/A
2412	48.61	AV	V	25.67	3.68	0.00	77.96	N/A	N/A
2390	24.83	PK	H	25.61	3.63	0.00	54.07	74.00	19.93
2390	13.45	AV	H	25.61	3.63	0.00	42.69	54.00	11.31
4824	33.71	PK	H	30.64	5.03	27.41	41.97	74.00	32.03
4824	21.23	AV	H	30.64	5.03	27.41	29.49	54.00	24.51
7236	33.13	PK	H	34.17	6.65	25.90	48.05	74.00	25.95
7236	20.55	AV	H	34.17	6.65	25.90	35.47	54.00	18.53
2950	47.1	PK	H	27.07	6.61	27.54	53.24	74.00	20.76
2950	35.6	AV	H	27.07	6.61	27.54	41.74	54.00	12.26
Middle Channel: 2437 MHz									
2437	59.23	PK	H	25.74	3.75	0.00	88.72	N/A	N/A
2437	50.58	AV	H	25.74	3.75	0.00	80.07	N/A	N/A
2437	56.21	PK	V	25.74	3.75	0.00	85.70	N/A	N/A
2437	48.78	AV	V	25.74	3.75	0.00	78.27	N/A	N/A
4874	33.95	PK	H	30.77	5.14	27.42	42.44	74.00	31.56
4874	21.44	AV	H	30.77	5.14	27.42	29.93	54.00	24.07
7311	33.42	PK	H	34.35	6.74	25.88	48.63	74.00	25.37
7311	20.86	AV	H	34.35	6.74	25.88	36.07	54.00	17.93
3163	47.38	PK	H	27.72	6.75	27.40	54.45	74.00	19.55
3163	35.84	AV	H	27.72	6.75	27.40	42.91	54.00	11.09
3560	46.2	PK	H	28.93	4.53	27.26	52.40	74.00	21.60
3560	35.01	AV	H	28.93	4.53	27.26	41.21	54.00	12.79
High Channel: 2462 MHz									
2462	59.44	PK	H	25.80	3.75	0.00	88.99	N/A	N/A
2462	50.85	AV	H	25.80	3.75	0.00	80.40	N/A	N/A
2462	54.61	PK	V	25.80	3.75	0.00	84.16	N/A	N/A
2462	48.72	AV	V	25.80	3.75	0.00	78.27	N/A	N/A
2483.5	26.27	PK	H	25.86	3.67	0.00	55.80	74.00	18.20
2483.5	14.14	AV	H	25.86	3.67	0.00	43.67	54.00	10.33
4924	34.26	PK	H	30.90	5.34	27.43	43.07	74.00	30.93
4924	21.73	AV	H	30.90	5.34	27.43	30.54	54.00	23.46
7386	33.66	PK	H	34.53	6.83	25.86	49.16	74.00	24.84
7386	21.07	AV	H	34.53	6.83	25.86	36.57	54.00	17.43
3163	47.64	PK	H	27.72	6.75	27.40	54.71	74.00	19.29
3163	36.08	AV	H	27.72	6.75	27.40	43.15	54.00	10.85

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	55.39	PK	H	25.70	3.71	0.00	84.80	N/A	N/A
2422	46.73	AV	H	25.70	3.71	0.00	76.14	N/A	N/A
2422	53.48	PK	V	25.70	3.71	0.00	82.89	N/A	N/A
2422	44.78	AV	V	25.70	3.71	0.00	74.19	N/A	N/A
2390	25.56	PK	H	25.61	3.63	0.00	54.80	74.00	19.20
2390	13.44	AV	H	25.61	3.63	0.00	42.68	54.00	11.32
4844	33.28	PK	H	30.69	4.99	27.42	41.54	74.00	32.46
4844	20.79	AV	H	30.69	4.99	27.42	29.05	54.00	24.95
7266	32.73	PK	H	34.24	6.68	25.89	47.76	74.00	26.24
7266	20.08	AV	H	34.24	6.68	25.89	35.11	54.00	18.89
3163	46.71	PK	H	27.72	6.75	27.40	53.78	74.00	20.22
3163	35.15	AV	H	27.72	6.75	27.40	42.22	54.00	11.78
Middle Channel: 2437 MHz									
2437	55.69	PK	H	25.74	3.75	0.00	85.18	N/A	N/A
2437	47.01	AV	H	25.74	3.75	0.00	76.50	N/A	N/A
2437	54.28	PK	V	25.74	3.75	0.00	83.77	N/A	N/A
2437	45.65	AV	V	25.74	3.75	0.00	75.14	N/A	N/A
4874	33.48	PK	H	30.77	5.14	27.42	41.97	74.00	32.03
4874	21.03	AV	H	30.77	5.14	27.42	29.52	54.00	24.48
7311	33.02	PK	H	34.35	6.74	25.88	48.23	74.00	25.77
7311	20.35	AV	H	34.35	6.74	25.88	35.56	54.00	18.44
3163	46.92	PK	H	27.72	6.75	27.40	53.99	74.00	20.01
3163	35.38	AV	H	27.72	6.75	27.40	42.45	54.00	11.55
3560	45.21	PK	H	28.93	4.53	27.26	51.41	74.00	22.59
3560	34.59	AV	H	28.93	4.53	27.26	40.79	54.00	13.21
High Channel: 2452 MHz									
2452	55.81	PK	H	25.78	3.78	0.00	85.37	N/A	N/A
2452	47.04	AV	H	25.78	3.78	0.00	76.60	N/A	N/A
2452	54.9	PK	V	25.78	3.78	0.00	84.46	N/A	N/A
2452	46.17	AV	V	25.78	3.78	0.00	75.73	N/A	N/A
2483.5	25.71	PK	H	25.86	3.67	0.00	55.24	74.00	18.76
2483.5	14.11	AV	H	25.86	3.67	0.00	43.64	54.00	10.36
4904	33.77	PK	H	30.85	5.31	27.43	42.50	74.00	31.50
4904	21.3	AV	H	30.85	5.31	27.43	30.03	54.00	23.97
7356	33.23	PK	H	34.45	6.79	25.87	48.60	74.00	25.40
7356	20.67	AV	H	34.45	6.79	25.87	36.04	54.00	17.96
3163	47.11	PK	H	27.72	6.75	27.40	54.18	74.00	19.82
3163	35.61	AV	H	27.72	6.75	27.40	42.68	54.00	11.32

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	56.57	PK	H	25.65	3.66	0.00	85.88	N/A	N/A
2402	52.03	AV	H	25.65	3.66	0.00	81.34	N/A	N/A
2402	53.91	PK	V	25.65	3.66	0.00	83.22	N/A	N/A
2402	49.2	AV	V	25.65	3.66	0.00	78.51	N/A	N/A
2390	24.35	PK	H	25.61	3.63	0.00	53.59	74.00	20.41
2390	13.27	AV	H	25.61	3.63	0.00	42.51	54.00	11.49
4804	33.54	PK	H	30.59	5.06	27.41	41.78	74.00	32.22
4804	20.94	AV	H	30.59	5.06	27.41	29.18	54.00	24.82
7206	33.16	PK	H	34.09	6.61	25.91	47.95	74.00	26.05
7206	20.47	AV	H	34.09	6.61	25.91	35.26	54.00	18.74
3325	40.28	PK	H	28.24	4.97	27.26	46.23	74.00	27.77
3325	31.84	AV	H	28.24	4.97	27.26	37.79	54.00	16.21
Middle Channel: 2440 MHz									
2440	57.12	PK	H	25.74	3.76	0.00	86.62	N/A	N/A
2440	52.54	AV	H	25.74	3.76	0.00	82.04	N/A	N/A
2440	54.87	PK	V	25.74	3.76	0.00	84.37	N/A	N/A
2440	50.17	AV	V	25.74	3.76	0.00	79.67	N/A	N/A
4880	33.8	PK	H	30.79	5.18	27.42	42.35	74.00	31.65
4880	21.25	AV	H	30.79	5.18	27.42	29.80	54.00	24.20
7320	33.48	PK	H	34.37	6.75	25.88	48.72	74.00	25.28
7320	20.83	AV	H	34.37	6.75	25.88	36.07	54.00	17.93
3186	40.54	PK	H	27.80	6.33	27.38	47.29	74.00	26.71
3186	32.18	AV	H	27.80	6.33	27.38	38.93	54.00	15.07
3563	38.99	PK	H	28.94	4.53	27.26	45.20	74.00	28.80
3563	26.66	AV	H	28.94	4.53	27.26	32.87	54.00	21.13
High Channel: 2480 MHz									
2480	57.33	PK	H	25.85	3.68	0.00	86.86	N/A	N/A
2480	52.65	AV	H	25.85	3.68	0.00	82.18	N/A	N/A
2480	55.57	PK	V	25.85	3.68	0.00	85.10	N/A	N/A
2480	50.8	AV	V	25.85	3.68	0.00	80.33	N/A	N/A
2483.5	25.63	PK	H	25.86	3.67	0.00	55.16	74.00	18.84
2483.5	13.82	AV	H	25.86	3.67	0.00	43.35	54.00	10.65
4960	33.64	PK	H	31.00	5.34	27.43	42.55	74.00	31.45
4960	21.08	AV	H	31.00	5.34	27.43	29.99	54.00	24.01
7440	33.32	PK	H	34.66	6.89	25.97	48.90	74.00	25.10
7440	20.65	AV	H	34.66	6.89	25.97	36.23	54.00	17.77
3367	40.4	PK	H	28.37	4.92	27.23	46.46	74.00	27.54
3367	32.01	AV	H	28.37	4.92	27.23	38.07	54.00	15.93

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

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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:	30.1 ~ 32.2 °C
Relative Humidity:	48 ~ 58 %
ATM Pressure:	99.4 ~ 100.4 kPa

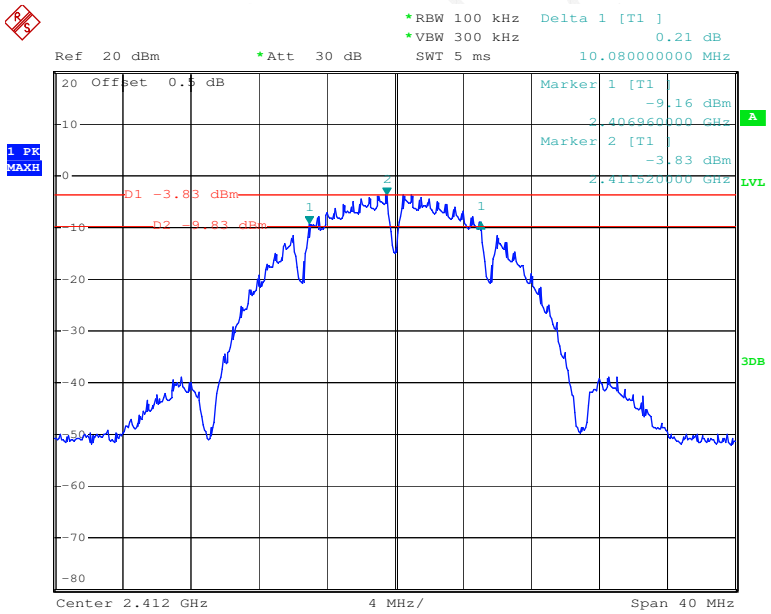
** The testing was performed by Rocky Xiao from 2016-07-27 to 2016-08-08.*

Test Mode: Transmitting

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

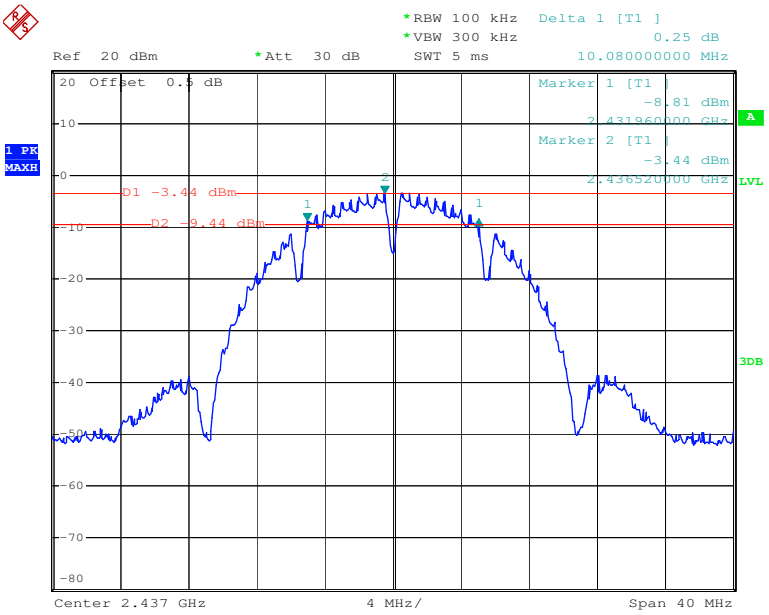
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.08	≥0.5
	Middle	2437	10.08	≥0.5
	High	2462	10.08	≥0.5
802.11g	Low	2412	16.64	≥0.5
	Middle	2437	16.64	≥0.5
	High	2462	16.64	≥0.5
802.11n20	Low	2412	17.92	≥0.5
	Middle	2437	17.84	≥0.5
	High	2462	17.92	≥0.5
802.11n40	Low	2422	36.64	≥0.5
	Middle	2437	36.64	≥0.5
	High	2452	36.64	≥0.5
BLE	Low	2402	0.75	≥0.5
	Middle	2440	0.75	≥0.5
	High	2480	0.72	≥0.5

802.11b Low Channel



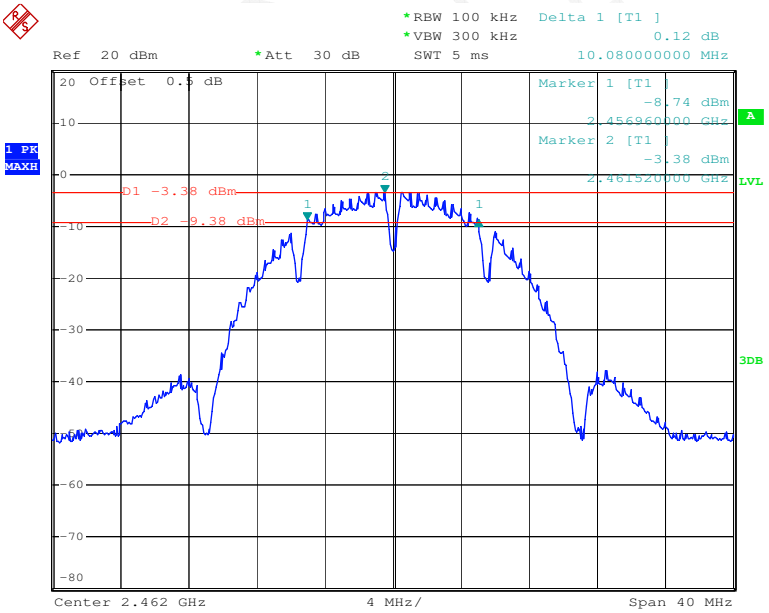
Date: 27.JUL.2016 13:58:41

802.11b Middle Channel



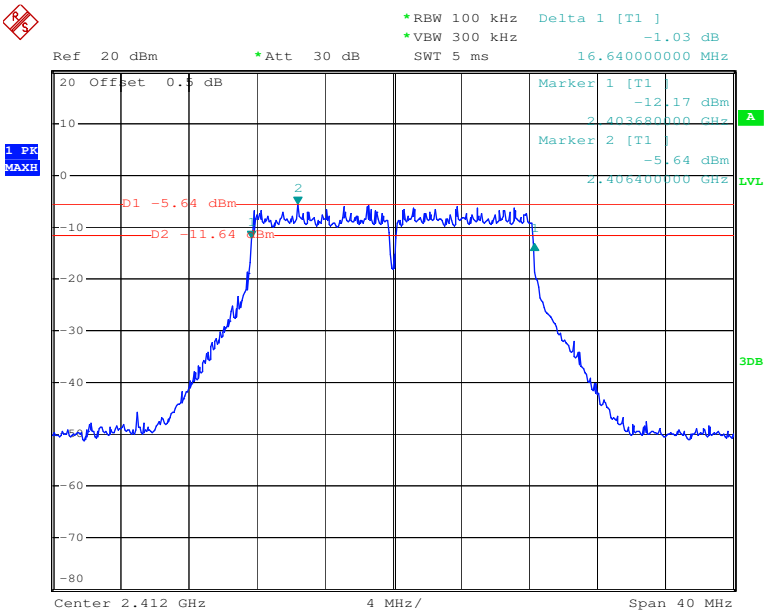
Date: 27.JUL.2016 14:02:03

802.11b High Channel



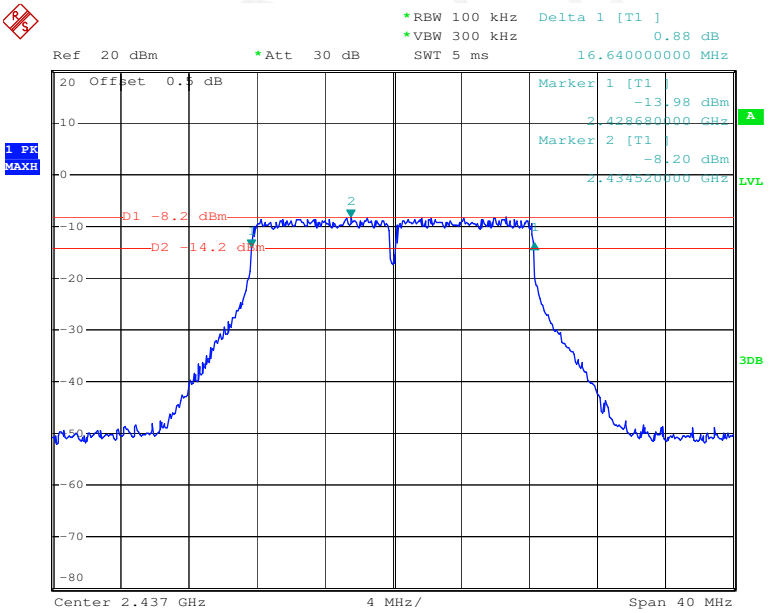
Date: 27.JUL.2016 14:04:06

802.11g Low Channel



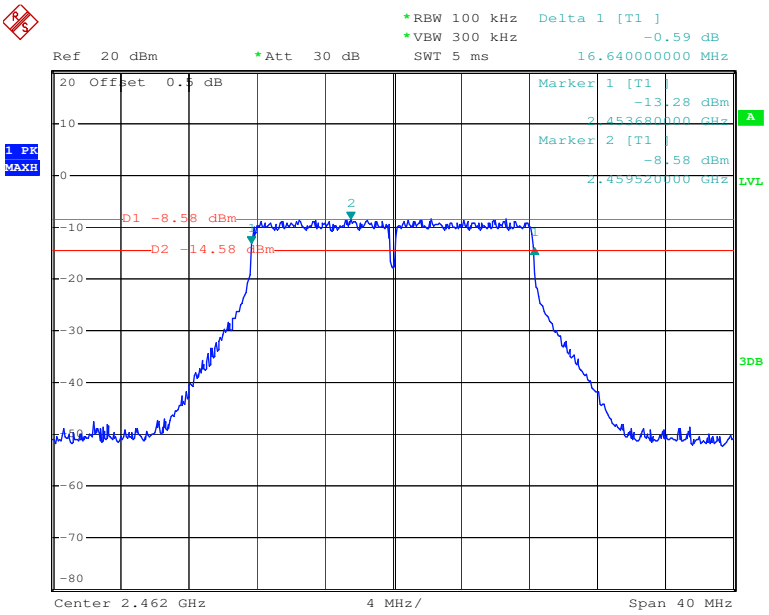
Date: 27.JUL.2016 14:12:47

802.11g Middle Channel



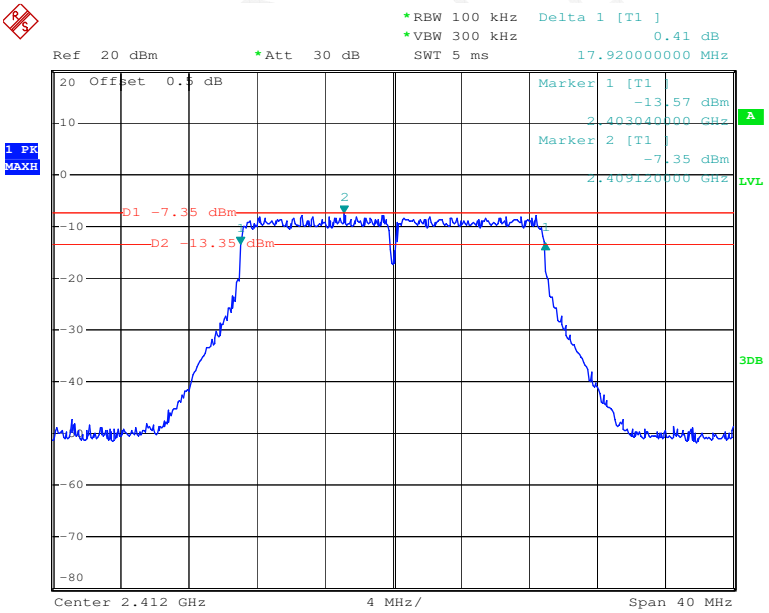
Date: 27.JUL.2016 14:20:16

802.11g High Channel



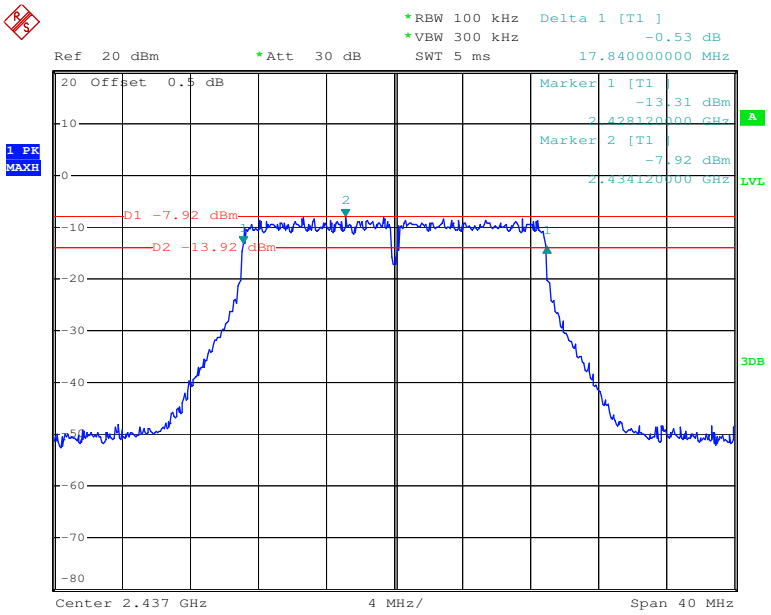
Date: 27.JUL.2016 14:26:44

802.11n ht20 Low Channel



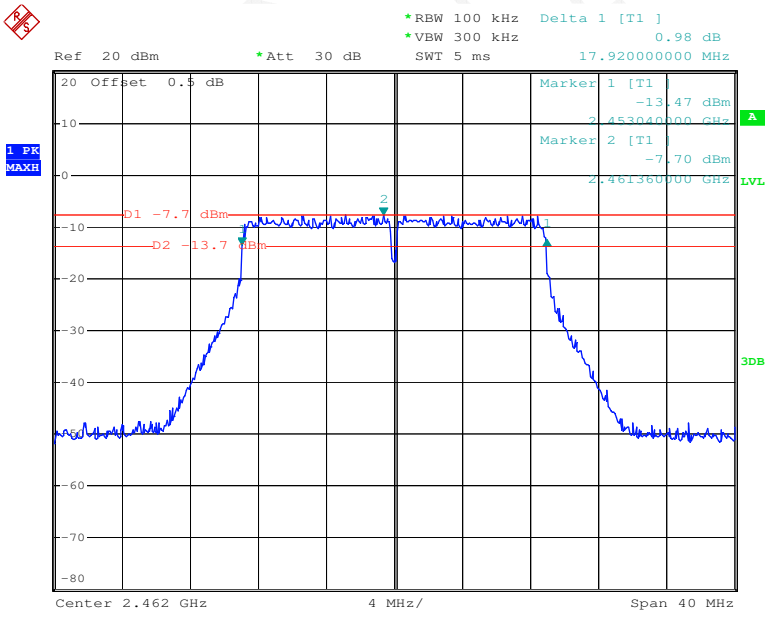
Date: 27.JUL.2016 14:34:53

802.11n ht20 Middle Channel



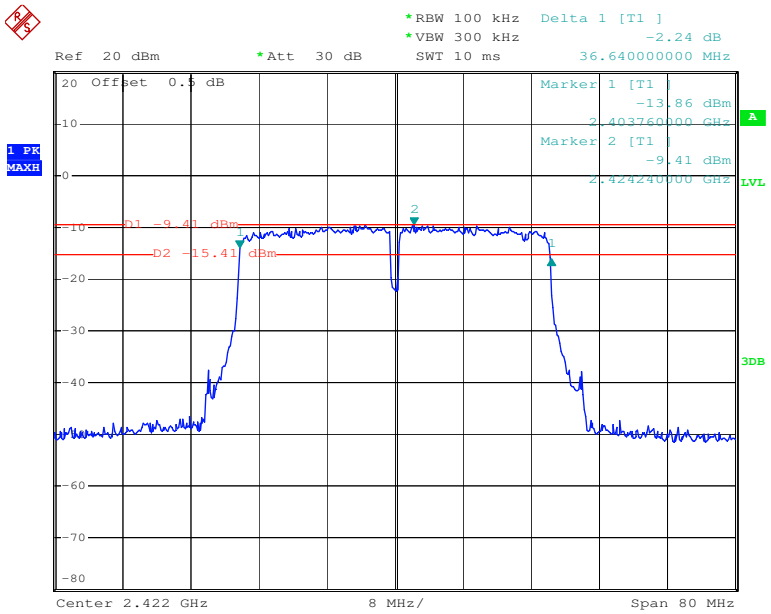
Date: 27.JUL.2016 14:42:37

802.11n ht20 High Channel



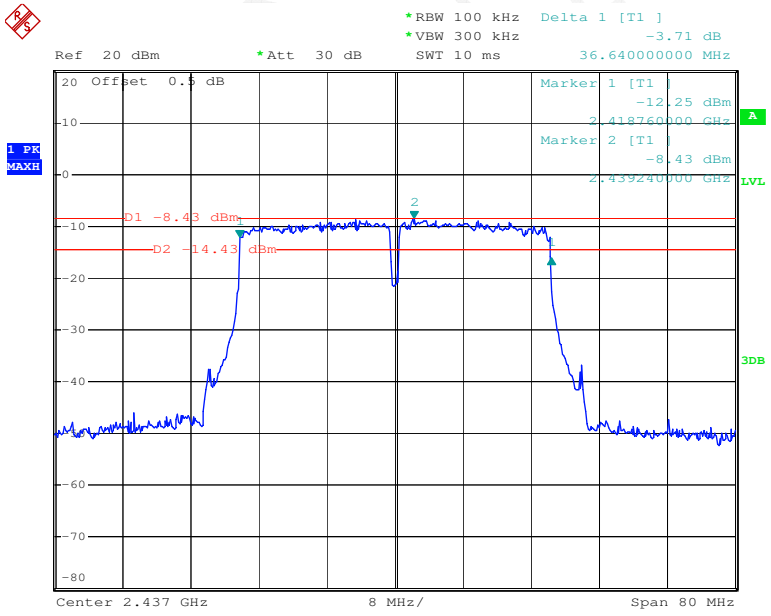
Date: 27.JUL.2016 14:47:32

802.11n ht40 Low Channel



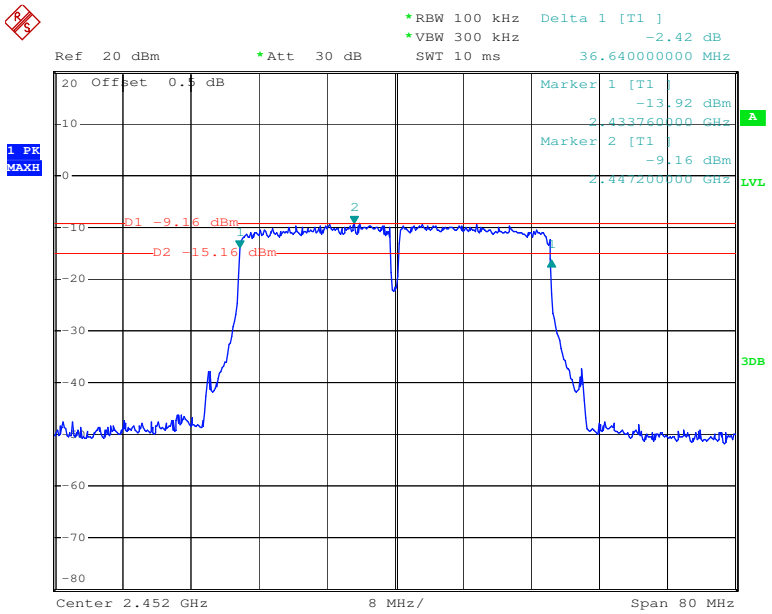
Date: 27.JUL.2016 14:58:42

802.11n ht40 Middle Channel



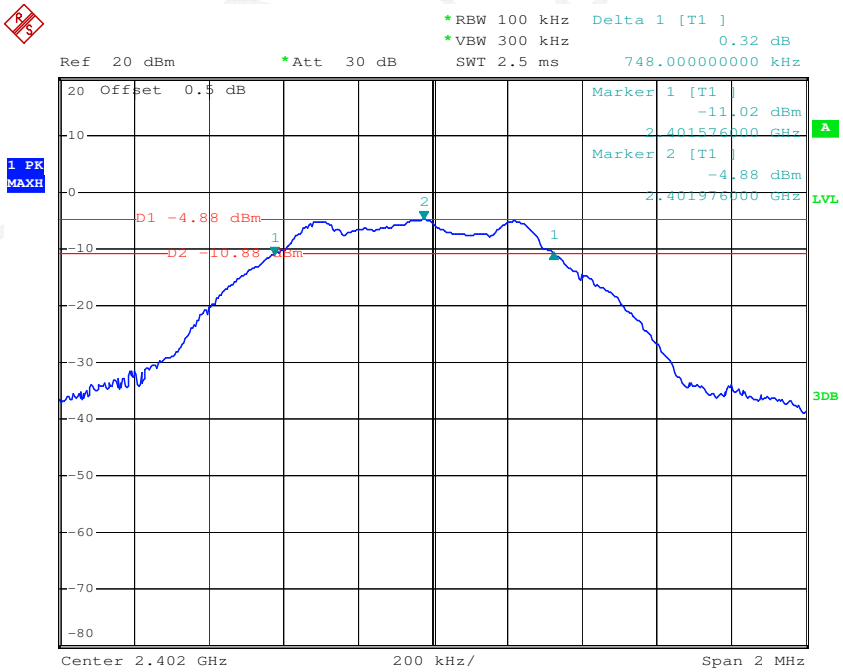
Date: 27.JUL.2016 15:04:07

802.11n ht40 High Channel



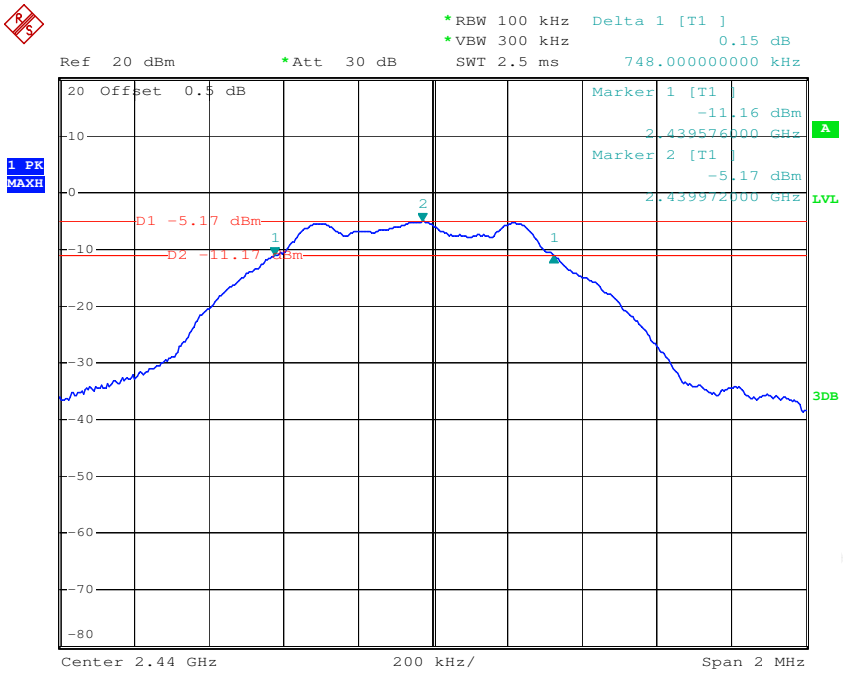
Date: 27.JUL.2016 15:06:31

BLE Low Channel



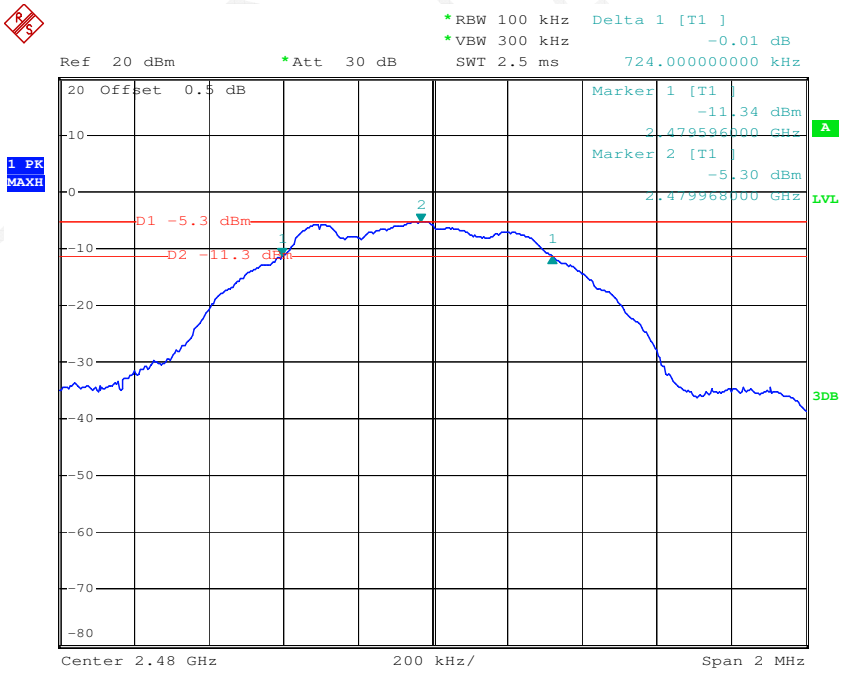
Date: 8.AUG.2016 17:51:01

BLE Middle Channel



Date: 8.AUG.2016 18:02:01

BLE High Channel



Date: 8.AUG.2016 18:04:24

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:	31.2 °C
Relative Humidity:	54 %
ATM Pressure:	100.2 kPa

** The testing was performed by Rocky Xiao on 2016-07-27.*

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	10.18	9.28	30
	Middle	2437	10.42	9.54	30
	High	2462	10.49	9.59	30
802.11g	Low	2412	12.79	9.39	30
	Middle	2437	13.05	9.7	30
	High	2462	12.66	9.27	30
802.11n20	Low	2412	13.18	9.62	30
	Middle	2437	12.88	9.42	30
	High	2462	13.07	9.58	30
802.11n40	Low	2422	15.44	9.17	30
	Middle	2437	15.74	9.55	30
	High	2452	15.72	9.47	30
BLE	Low	2402	-4.11	/	30
	Middle	2440	-4.42	/	30
	High	2480	-4.6	/	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

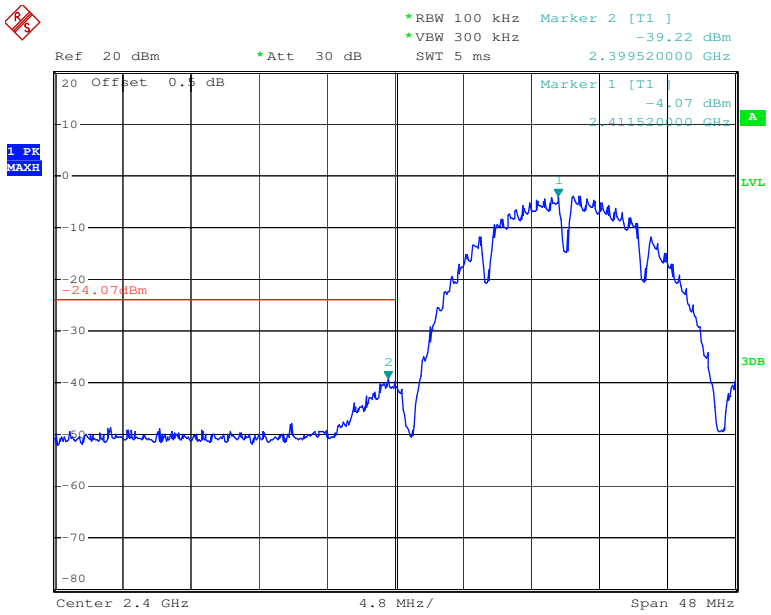
Temperature:	30.1 ~ 32.2 °C
Relative Humidity:	48 ~ 58 %
ATM Pressure:	99.4 ~ 100.4 kPa

** The testing was performed by Rocky Xiao from 2016-07-27 to 2016-08-08.*

Test mode: Transmitting

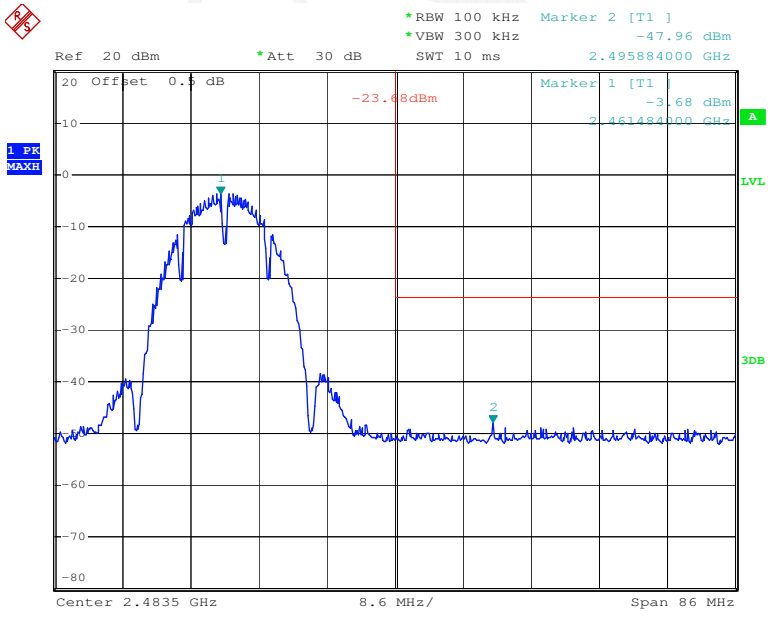
Test Result: Compliant. Please refer to following plots.

802.11b: Band Edge, Left Side



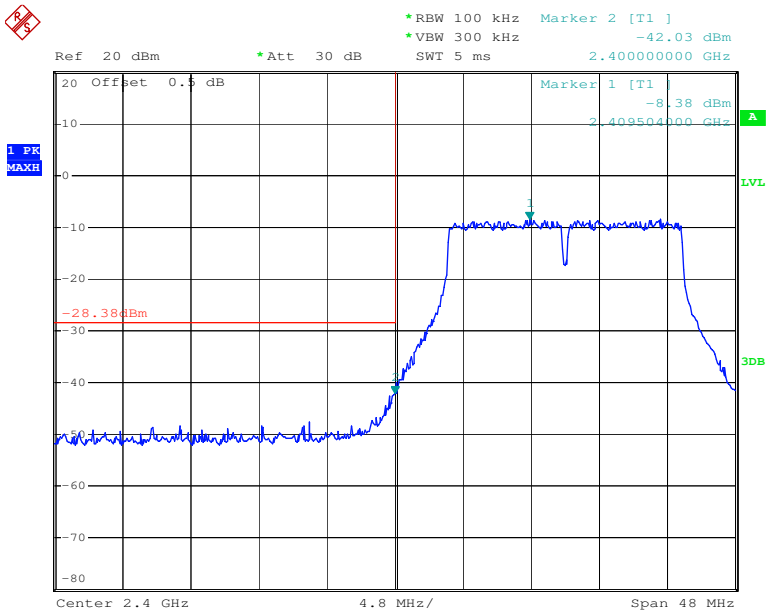
Date: 27.JUL.2016 14:00:31

802.11b: Band Edge, Right Side



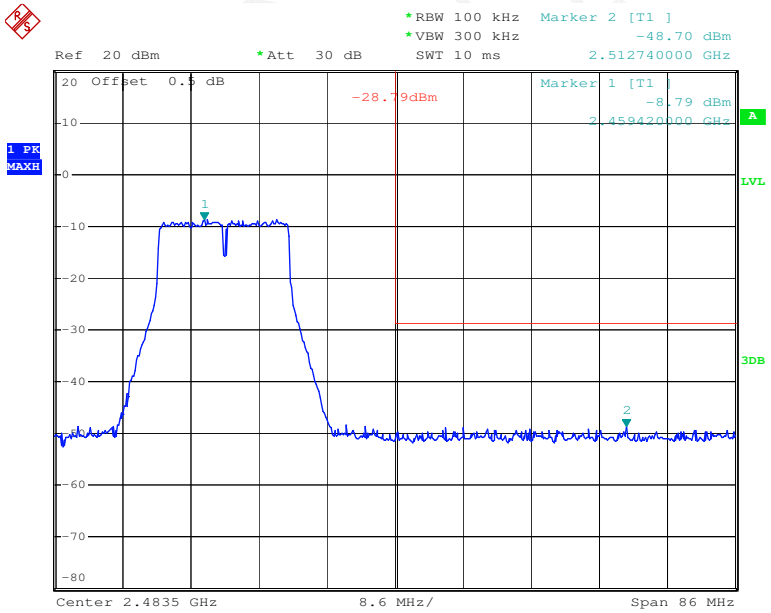
Date: 27.JUL.2016 14:05:39

802.11g: Band Edge, Left Side



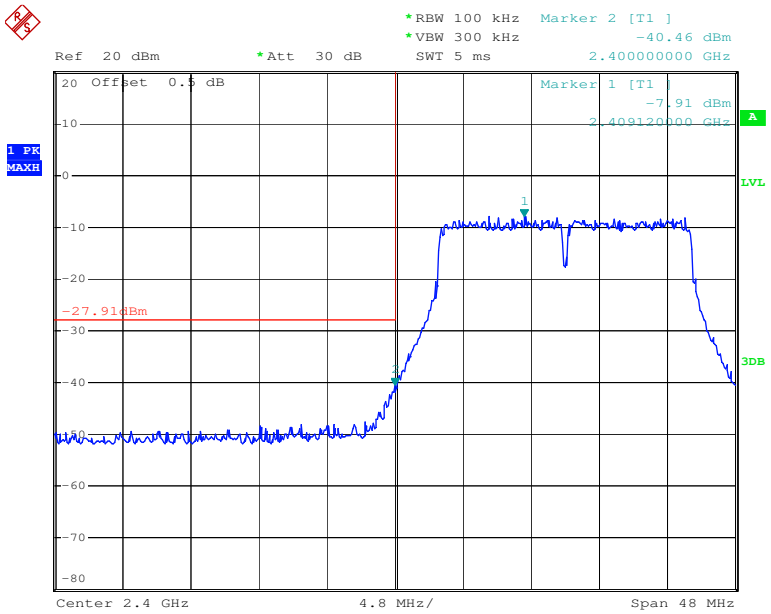
Date: 27.JUL.2016 14:14:36

802.11g: Band Edge, Right Side



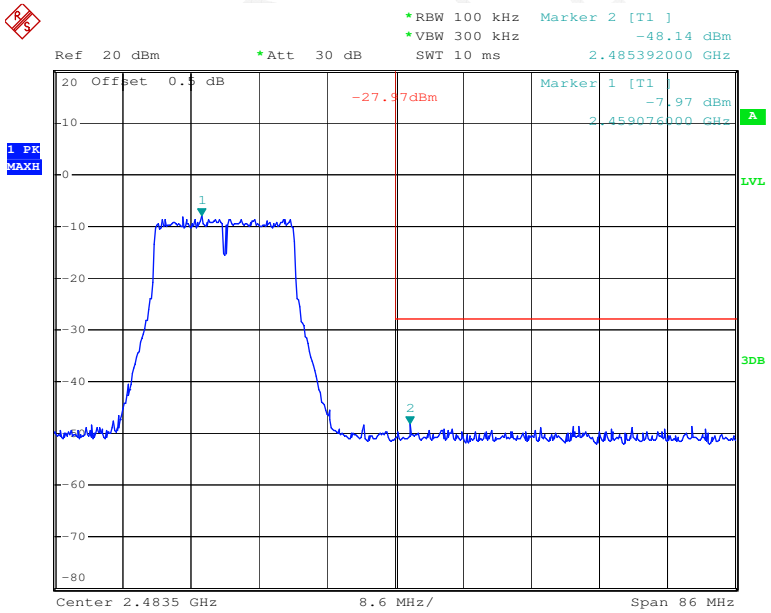
Date: 27.JUL.2016 14:28:23

802.11n ht20 Band Edge, Left Side



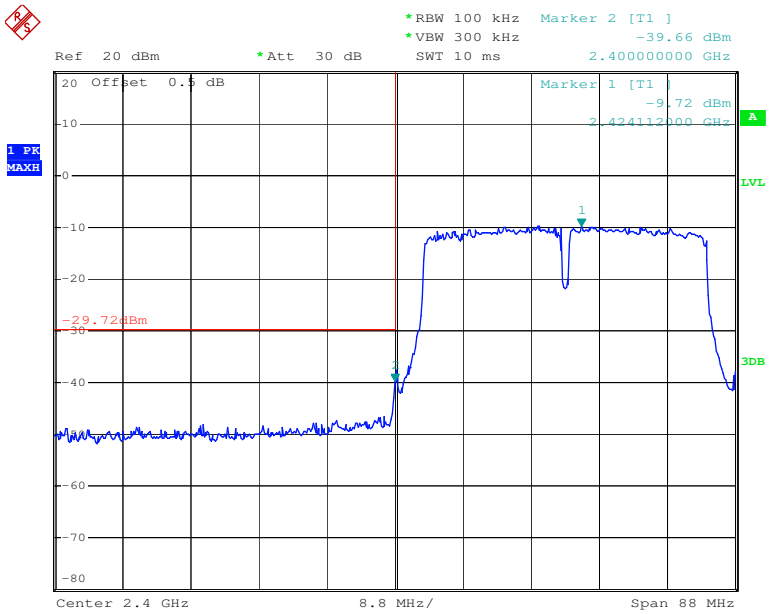
Date: 27.JUL.2016 14:36:39

802.11n ht20 Band Edge, Right Side



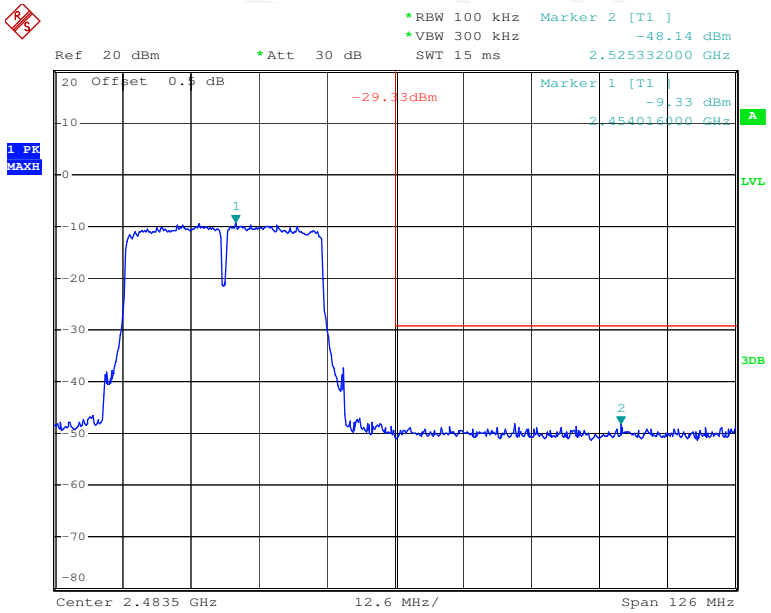
Date: 27.JUL.2016 14:49:12

802.11n ht40 Band Edge, Left Side



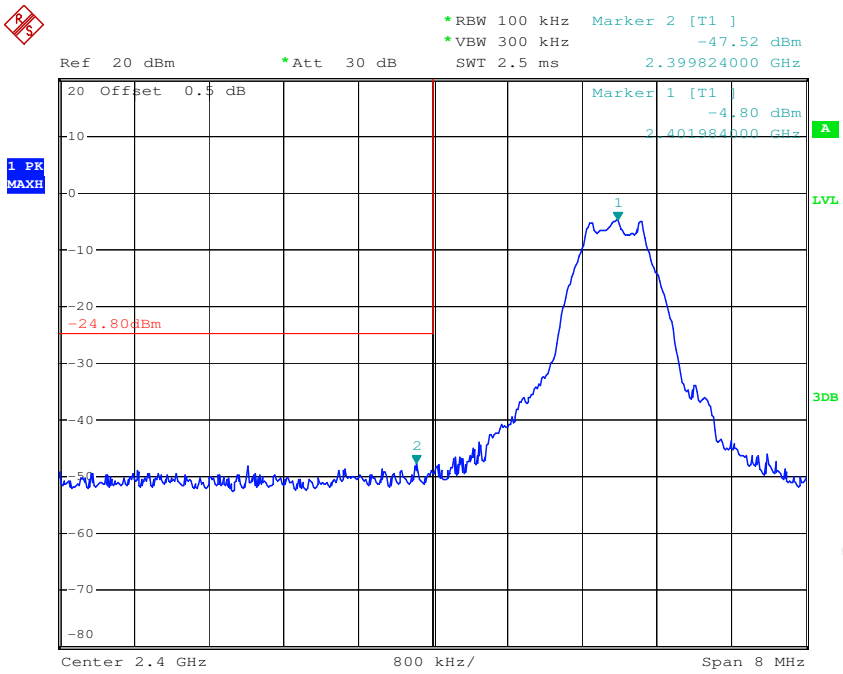
Date: 27.JUL.2016 15:01:01

802.11n ht40 Band Edge, Right Side



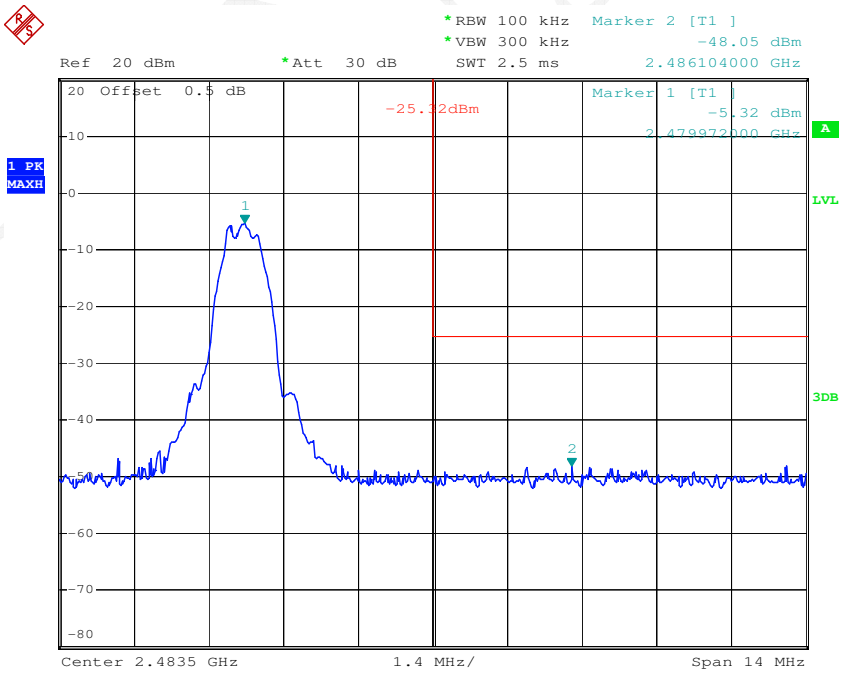
Date: 27.JUL.2016 15:08:40

BLE Band Edge, Left Side



Date: 8.AUG.2016 17:51:53

BLE Band Edge, Right Side



Date: 8.AUG.2016 18:05:19

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

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3×RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) 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:	30.1 ~ 32.2 °C
Relative Humidity:	48 ~ 58 %
ATM Pressure:	99.4 ~ 100.4 kPa

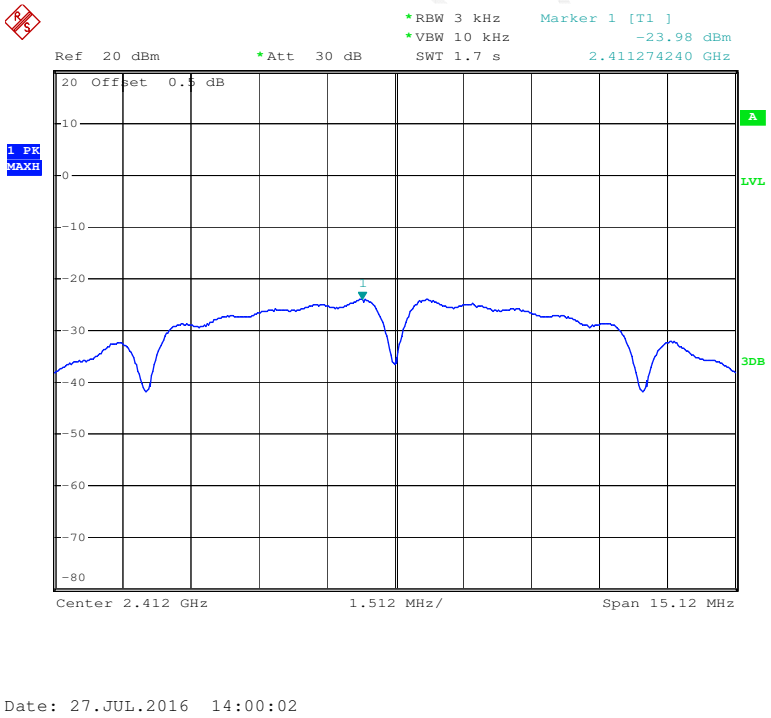
** The testing was performed by Rocky Xiao from 2016-07-27 to 2016-08-08.*

Test Mode: Transmitting

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

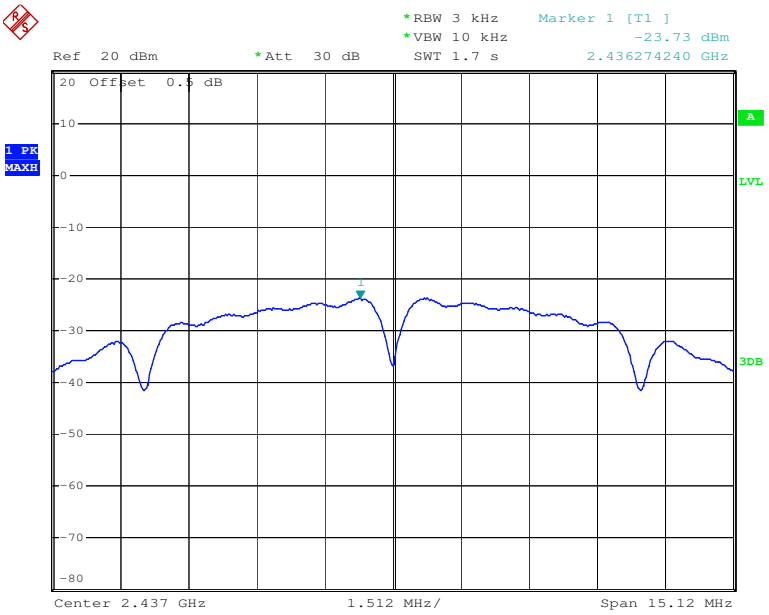
Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-23.98	≤8
	Middle	2437	-23.73	≤8
	High	2462	-23.70	≤8
802.11g	Low	2412	-22.55	≤8
	Middle	2437	-22.67	≤8
	High	2462	-22.99	≤8
802.11n20	Low	2412	-21.57	≤8
	Middle	2437	-21.7	≤8
	High	2462	-22.73	≤8
802.11n40	Low	2422	-20.2	≤8
	Middle	2437	-22.52	≤8
	High	2452	-21.43	≤8
BLE	Low	2402	-19.5	≤8
	Middle	2440	-19.9	≤8
	High	2480	-19.84	≤8

Power Spectral Density, 802.11b Low Channel



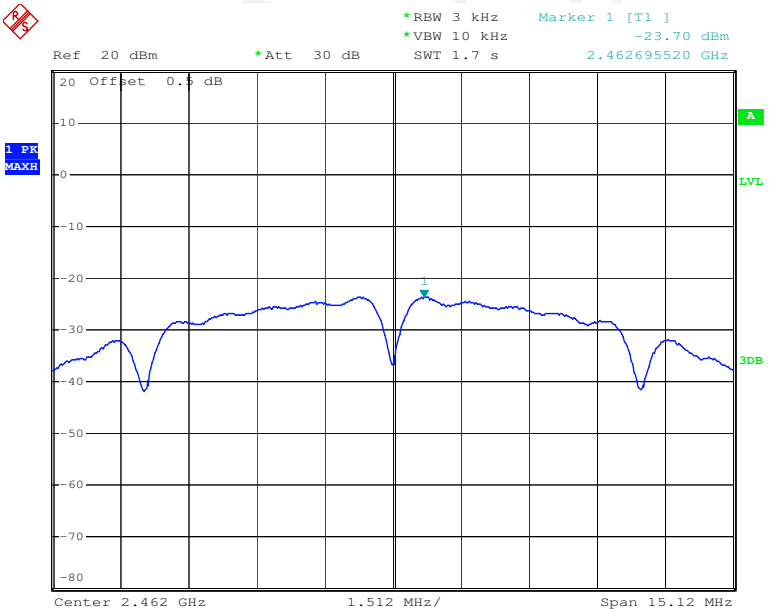
Date: 27.JUL.2016 14:00:02

Power Spectral Density, 802.11b Middle Channel



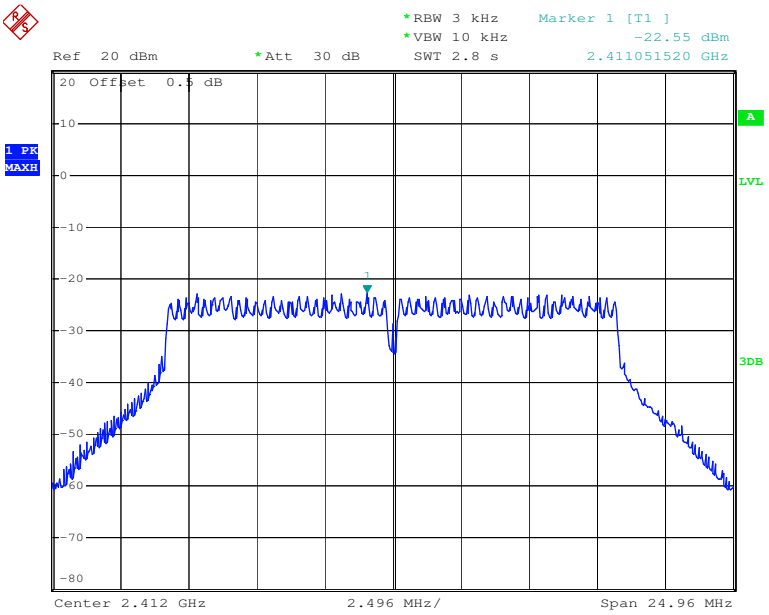
Date: 27.JUL.2016 14:03:20

Power Spectral Density, 802.11b High Channel



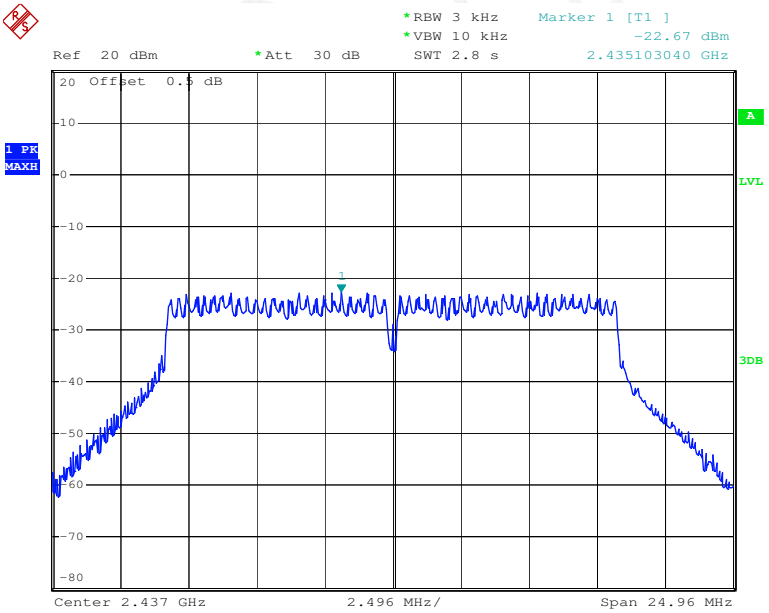
Date: 27.JUL.2016 14:05:21

Power Spectral Density, 802.11g Low Channel



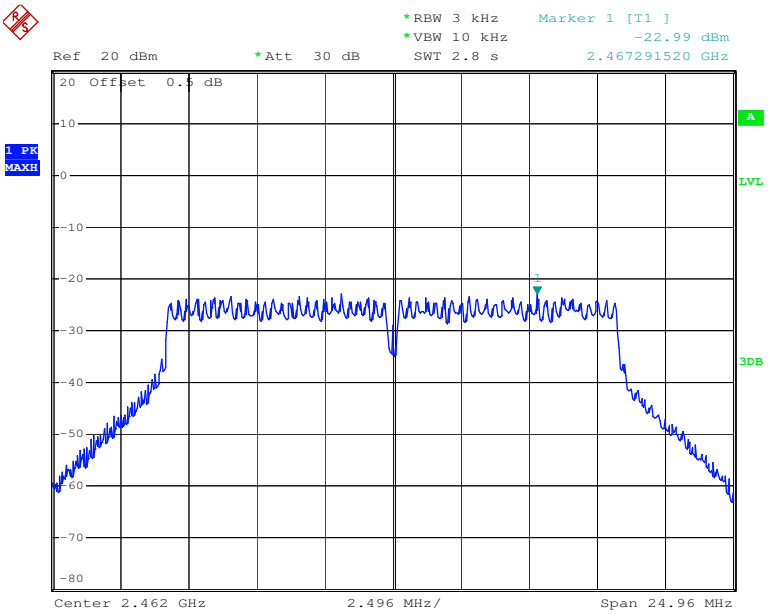
Date: 27.JUL.2016 14:14:18

Power Spectral Density, 802.11g Middle Channel



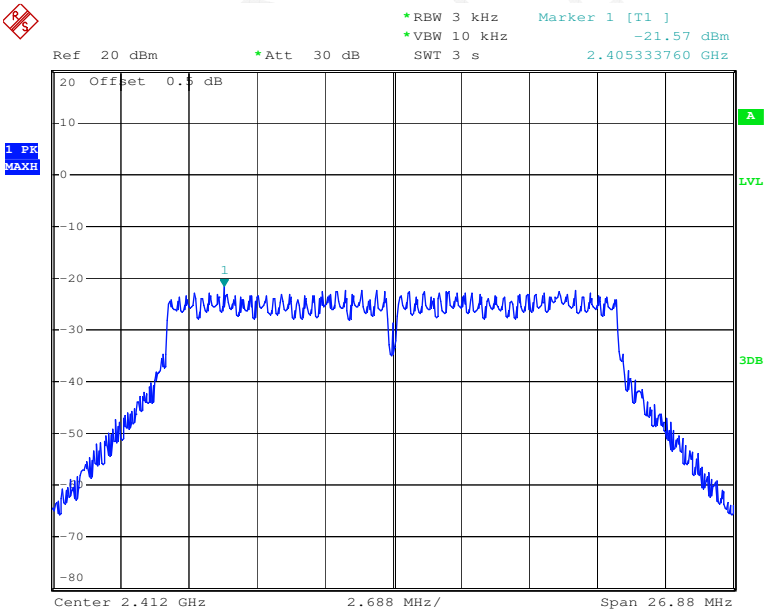
Date: 27.JUL.2016 14:21:35

Power Spectral Density, 802.11g High Channel



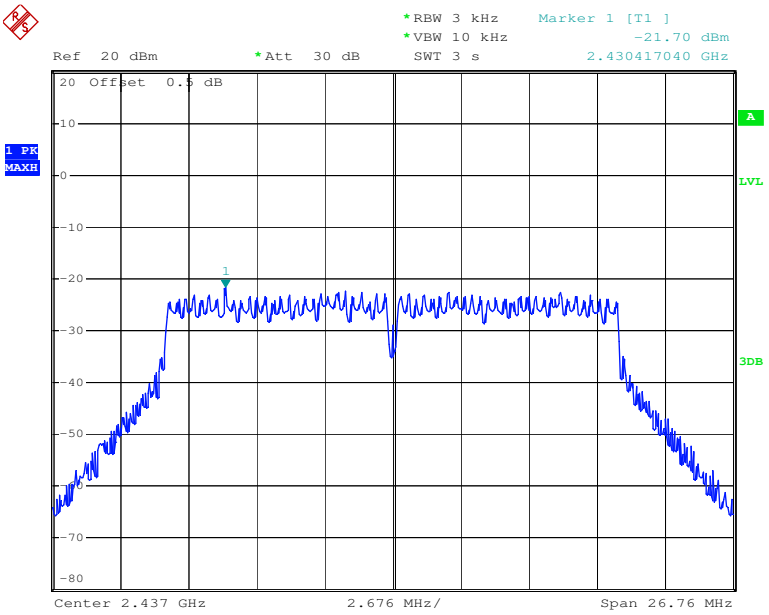
Date: 27.JUL.2016 14:28:05

Power Spectral Density, 802.11n ht20 Low Channel



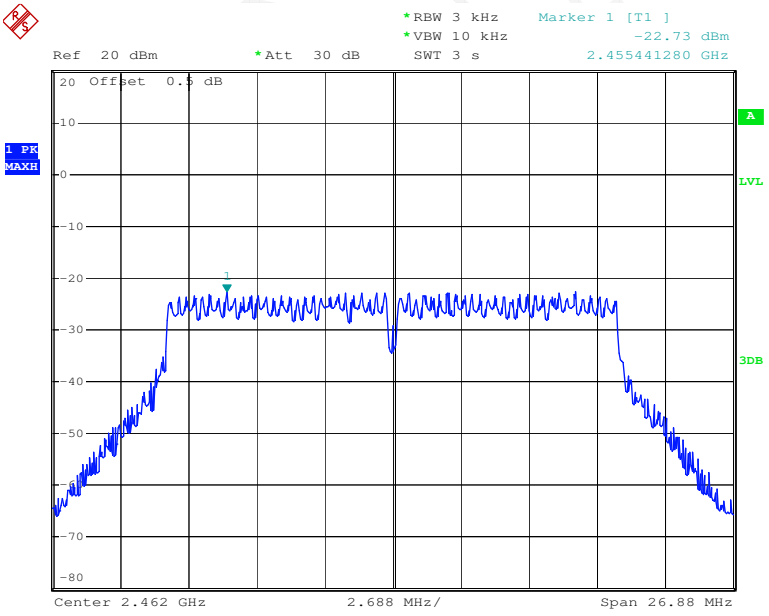
Date: 27.JUL.2016 14:36:20

Power Spectral Density, 802.11n ht20 Middle Channel



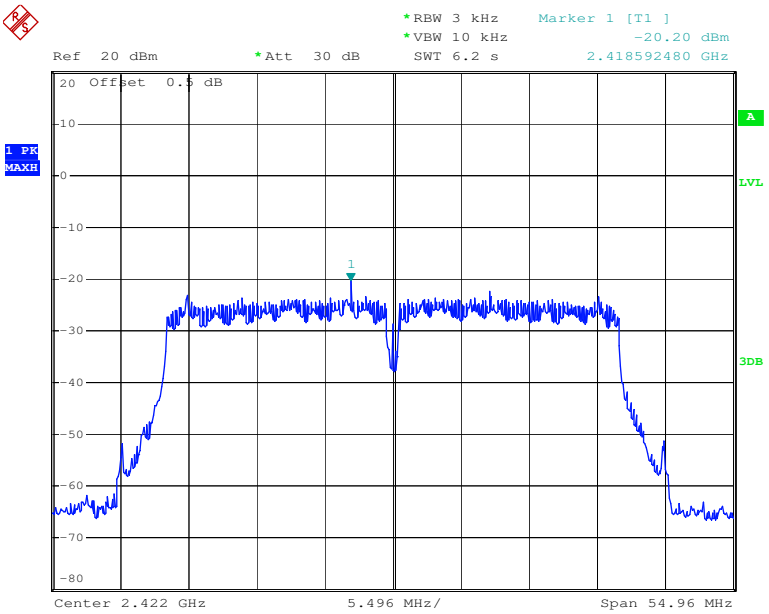
Date: 27.JUL.2016 14:44:05

Power Spectral Density, 802.11n ht20 High Channel



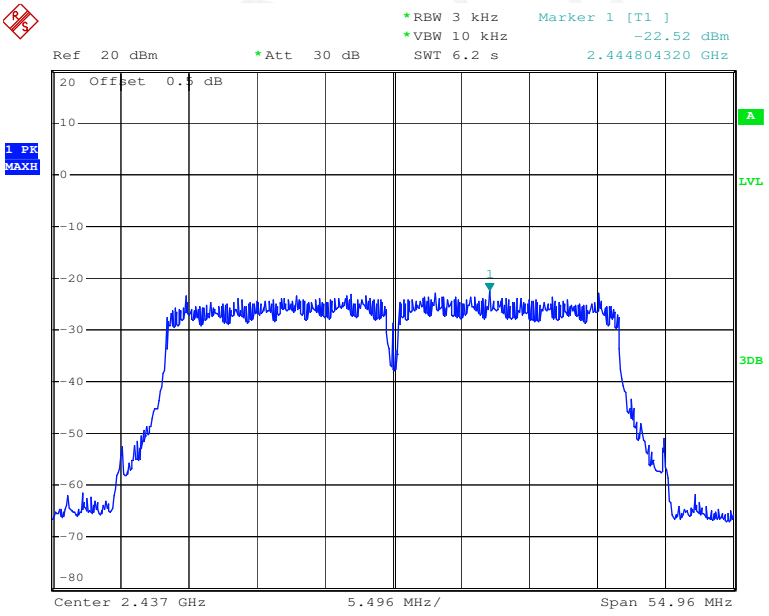
Date: 27.JUL.2016 14:48:54

Power Spectral Density, 802.11n ht40 Low Channel



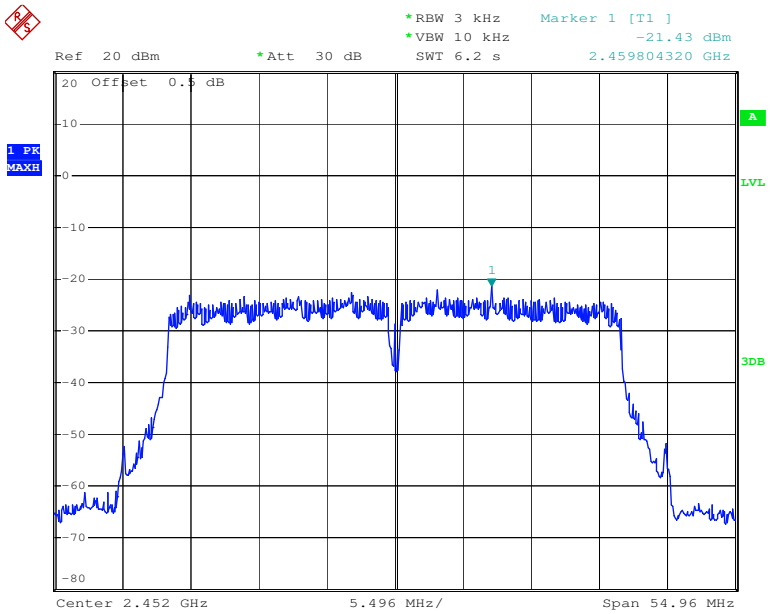
Date: 27.JUL.2016 15:00:31

Power Spectral Density, 802.11n ht40 Middle Channel



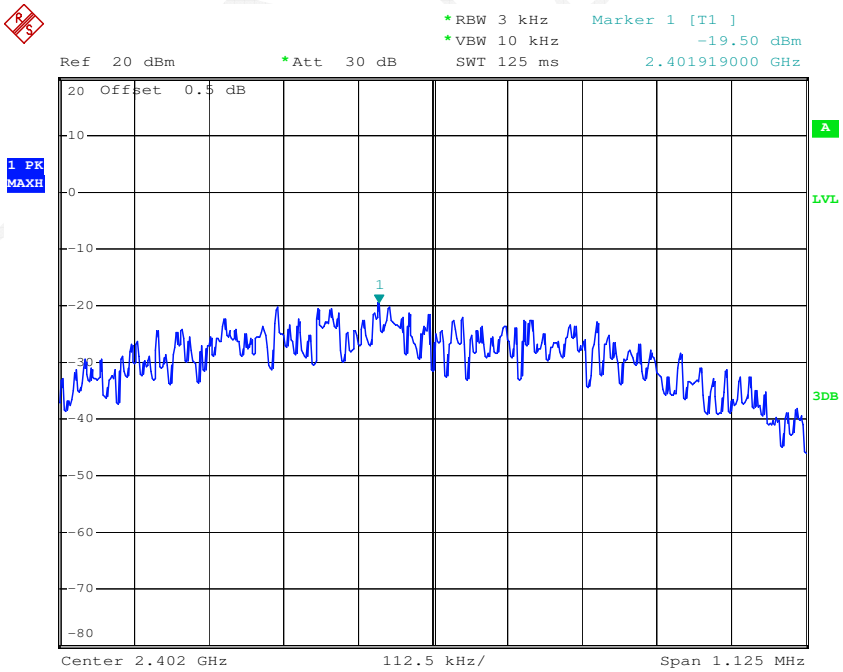
Date: 27.JUL.2016 15:05:44

Power Spectral Density, 802.11n ht40 High Channel



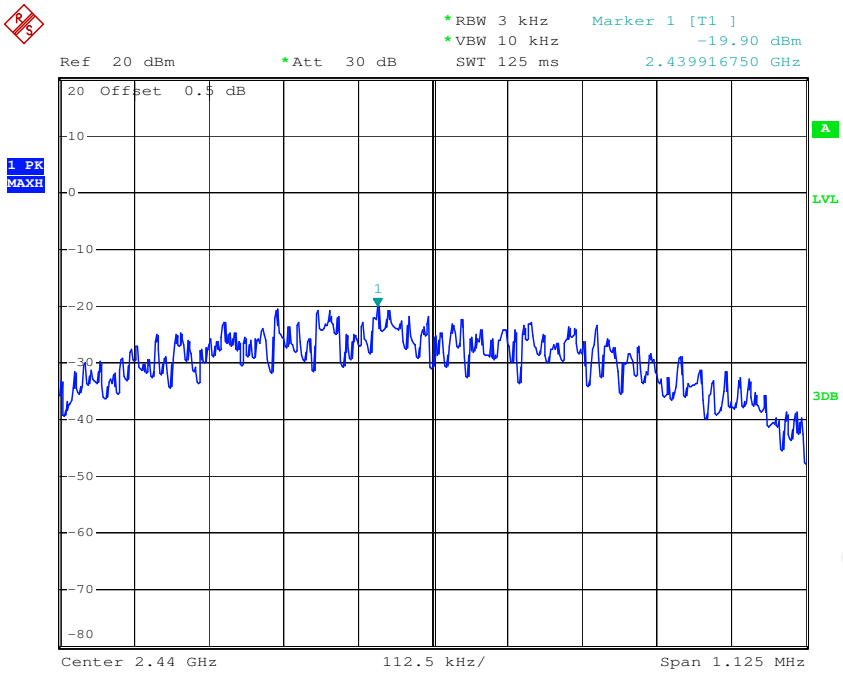
Date: 27.JUL.2016 15:08:07

Power Spectral Density, BLE Low Channel



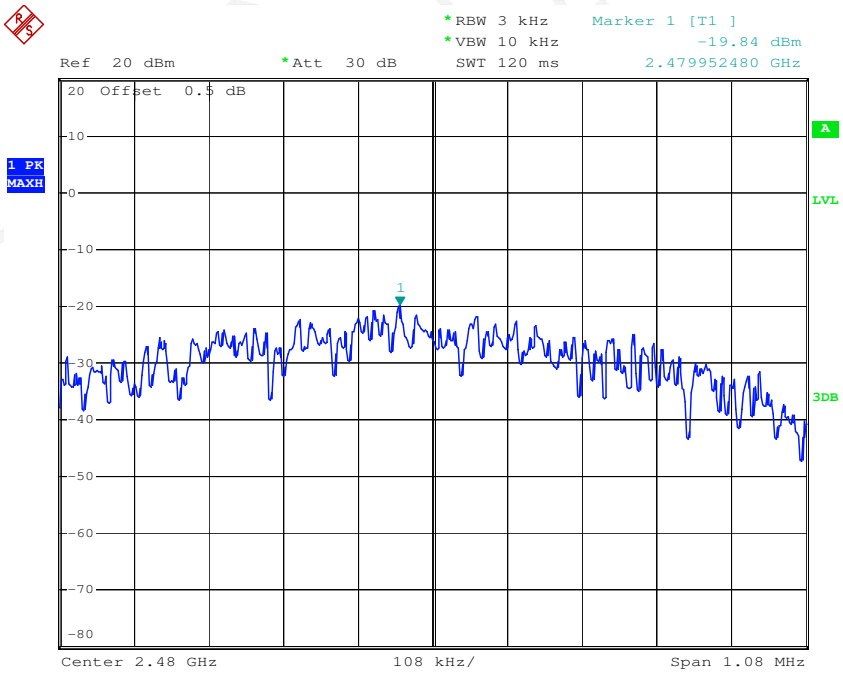
Date: 8.AUG.2016 17:51:35

Power Spectral Density, BLE Middle Channel



Date: 8.AUG.2016 18:02:35

Power Spectral Density, BLE High Channel



Date: 8.AUG.2016 18:05:00

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