FCC PART 15.247

TEST REPORT

For

AKUVOX (XIAMEN) NETWORKS CO., LTD.

10/F, No.56, Software Park II , Xiamen, China

FCC ID: 2AHCR-C313X

Report Type:	Product Name:
Original Report	Indoor Monitor

Report Number:	RXM171218055-00
Report Date:	2018-01-15
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***AKUVOX (XIAMEN) NETWORKS CO., LTD.***'s product, model number: ***C313W*** ***(FCC ID: 2AHCR-C313X)*** (the "EUT") in this report was an ***Indoor Monitor ,*** which was measured approximately: 20cm(L)*13.2cm(W)*2.55cm(H), rated power: DC 12V from adapter or DC 48V from PoE port.

Note: The series product, models C313W, OT-IP-VDP-V5/C4 are electrically identical, The difference between them please refer to the declaration letter for details. For marketing purpose, we selected C313W for fully test.

**All measurement and test data in this report was gathered from production sample serial number: 171218055 (Assigned by BACL,Dongguan). The EUT was received on 2017-12-18.*

Objective

This report is prepared on behalf of ***AKUVOX (XIAMEN) NETWORKS CO., LTD.*** in accordance with Part 2, Subpart J, Part 15, Subparts A, and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

N/A

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 and KDB 558074 D01 DTS Meas Guidance v04.

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

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	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~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

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 Industry Area, Tangxia, Dongguan, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For 2.4GHz band, 11 channels are provided:

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 test with channel 1,6,11.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

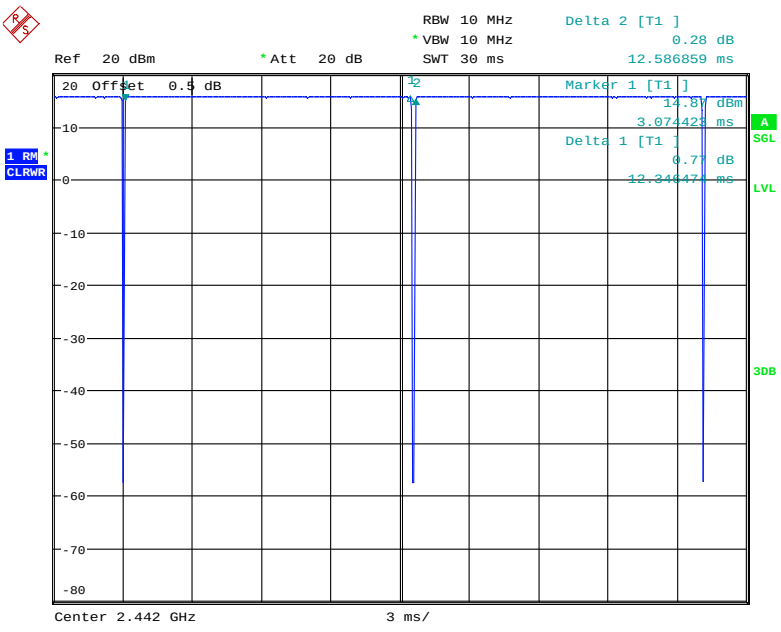
The software “Engineering Mode” was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all date rates bandwidths, and modulations. The maximum power was configured as below table, that provided by the manufacturer:

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Power level
802.11b	Low	2412	1	52
	Middle	2437	1	52
	High	2462	1	53
802.11g	Low	2412	6	56
	Middle	2437	6	56
	High	2462	6	58
802.11n ht20	Low	2412	6.5	57
	Middle	2437	6.5	58
	High	2462	6.5	58

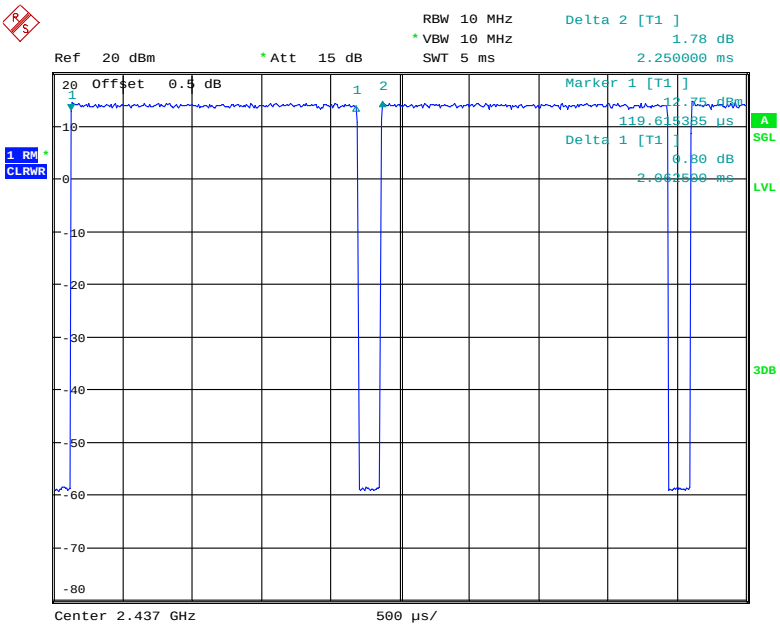
The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	12.35	12.59	98.1
802.11g	2.06	2.25	91.6
802.11n ht20	1.91	2.03	94.1

802.11b



802.11g



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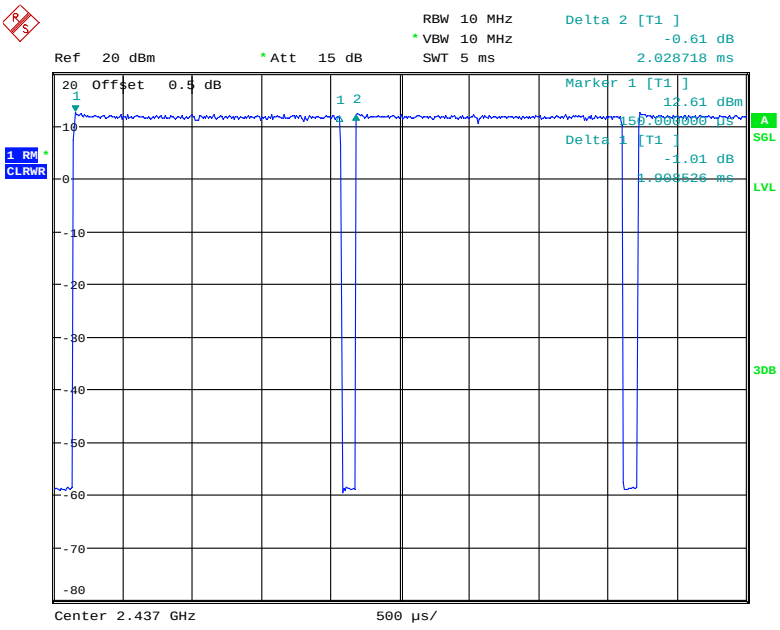
802.11n ht20



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Local Support Equipment List and Details

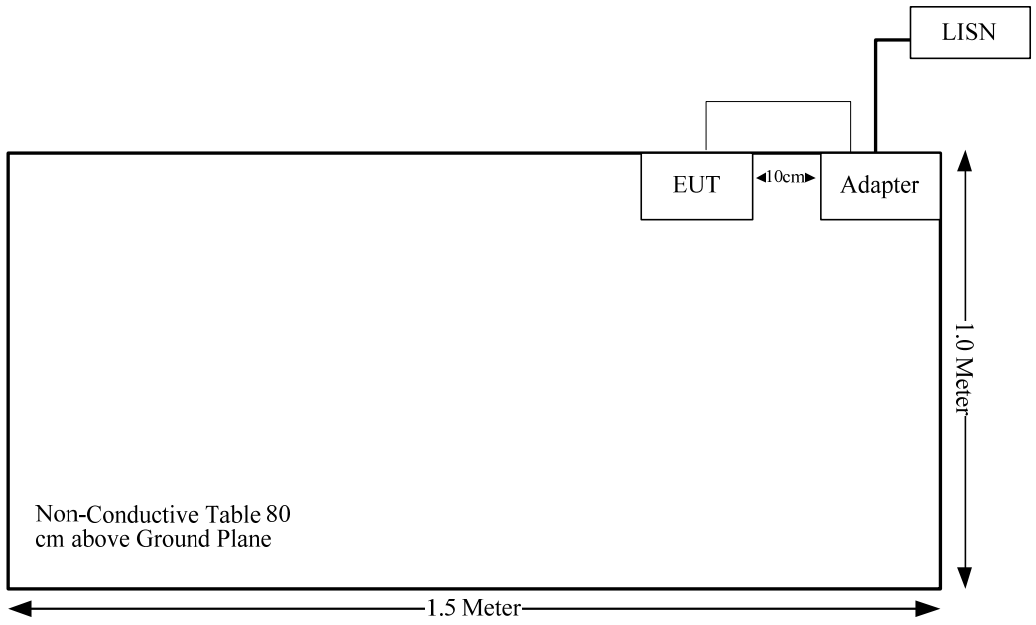
Manufacturer	Description	Model	Serial Number
PHIHONG	POE Adapter	POE31U-1AT	/
KLEC	AC Power Adapter	SW-3530	/

Support Cable List and Details

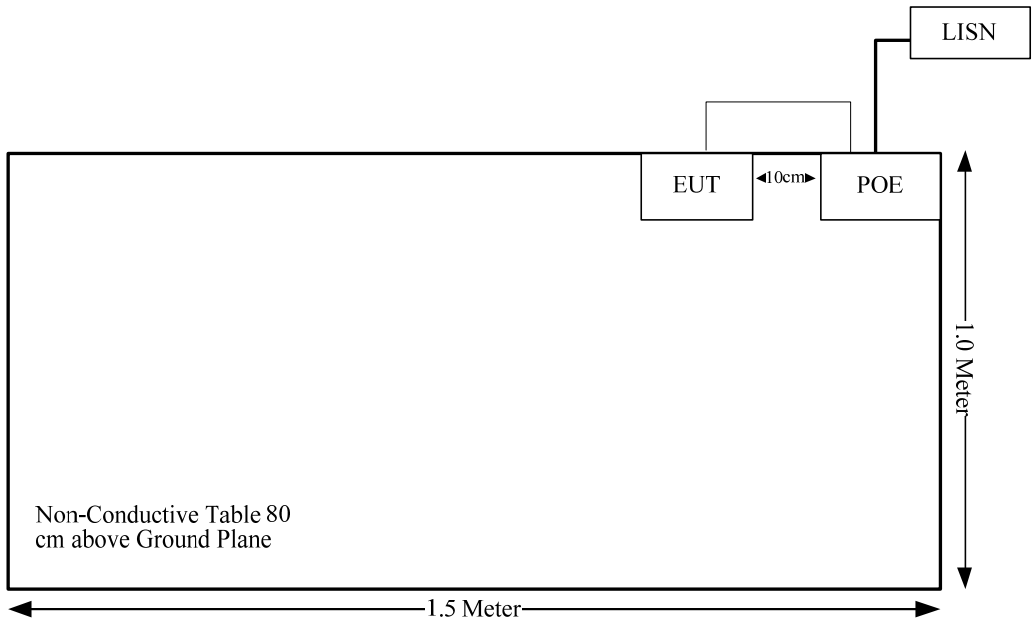
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	Yes	no	1.2	POE	EUT
DC Cable	No	No	1.2	adaper	EUT

Block Diagram of Test Setup

AC/DC Adapter mode:



POE Adapter Mode:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissable Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum conducted output power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

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

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

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

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

Calculation formula:

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

Calculated Data:

Frequency (MHz)	**Antenna Gain**		**Conducted output power including Tune-up Tolerance**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2412-2462	2	1.58	24	251.19	20.00	0.08	1.0

Result: The device meet FCC MPE at 20 cm distance

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, and the antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

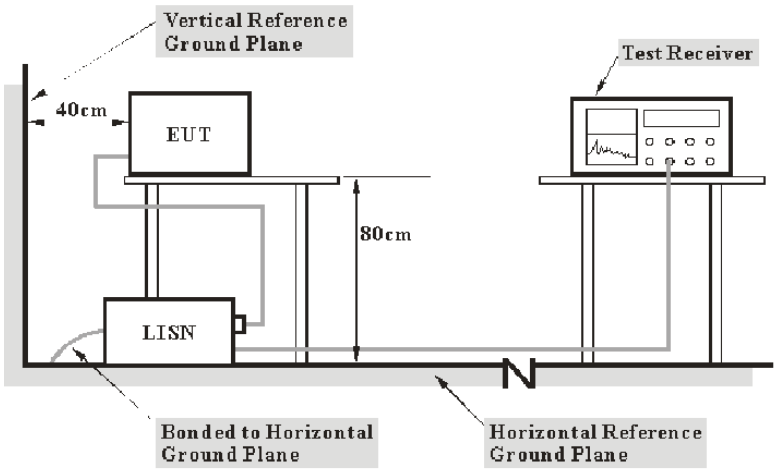
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

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 EUT was connected to the main lisn with AC 120 V/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 EUT 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 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	2017-12-11	2018-12-11
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-9-5	2018-9-5
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2017-12-8	2018-12-8
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-9-25	2018-9-25

*** 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

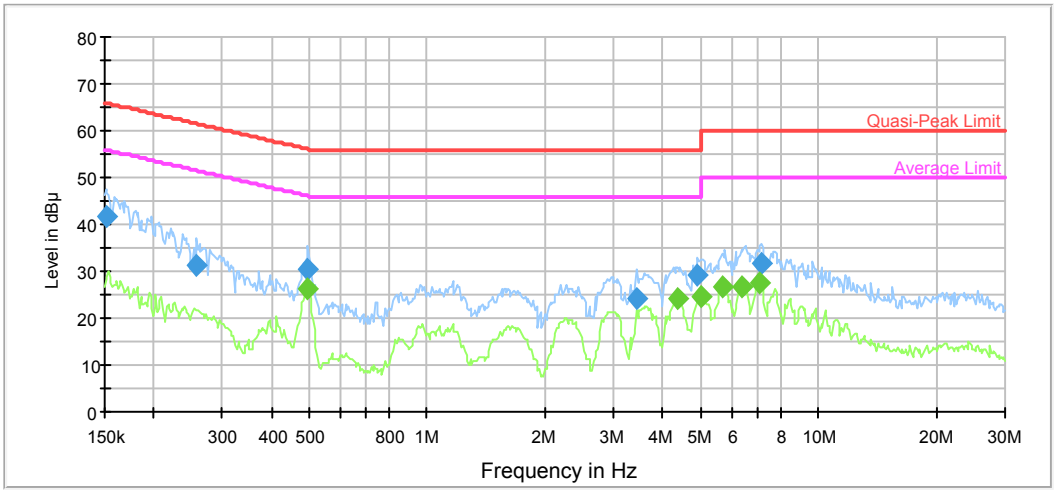
Temperature:	24.4 °C
Relative Humidity:	30 %
ATM Pressure:	101.5kPa

The testing was performed by Jim Zhang on 2018-01-15.

Test Mode: Transmitting

AC/DC Adapter:

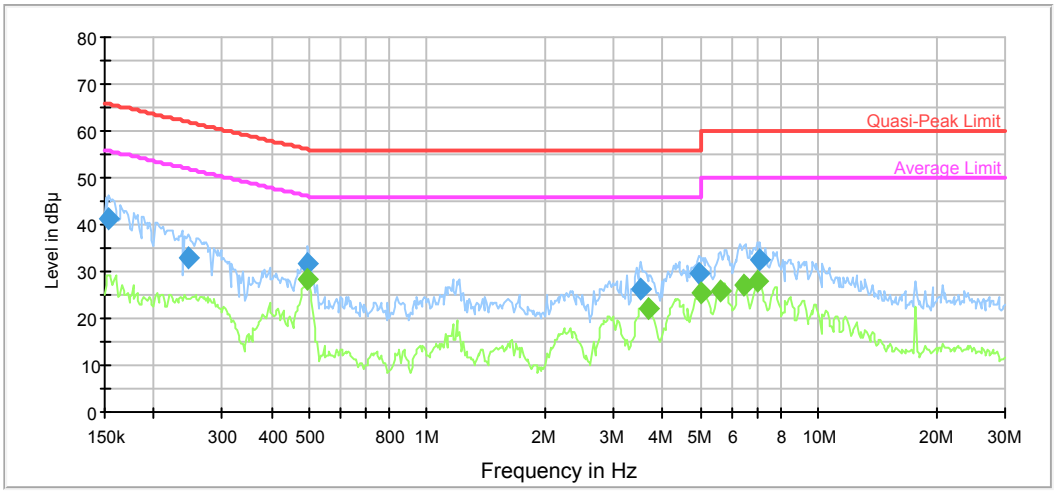
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	41.7	9.000	L1	11.2	24.2	65.9	Compliance
0.257874	31.1	9.000	L1	10.3	30.4	61.5	Compliance
0.495646	30.5	9.000	L1	9.9	25.6	56.1	Compliance
3.436218	24.4	9.000	L1	9.8	31.6	56.0	Compliance
4.918182	29.0	9.000	L1	9.8	27.0	56.0	Compliance
7.152364	31.6	9.000	L1	9.8	28.4	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.495646	26.1	9.000	L1	9.9	20.0	46.1	Compliance
4.364119	24.0	9.000	L1	9.8	22.0	46.0	Compliance
4.997188	24.6	9.000	L1	9.8	21.4	46.0	Compliance
5.676677	26.7	9.000	L1	9.8	23.3	50.0	Compliance
6.397380	26.7	9.000	L1	9.8	23.3	50.0	Compliance
7.095599	27.4	9.000	L1	9.8	22.6	50.0	Compliance

AC120 V, 60 Hz, Neutral:

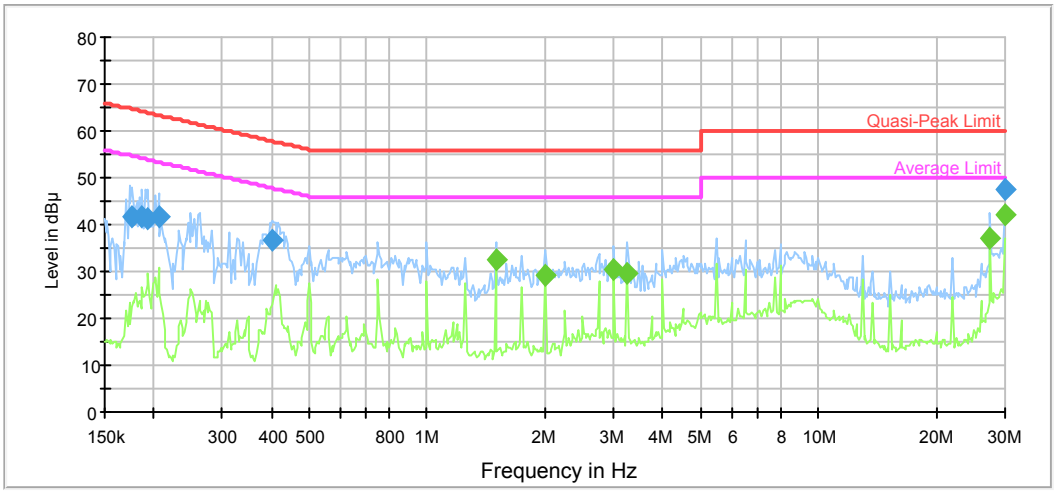


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153629	41.3	9.000	N	11.1	24.5	65.8	Compliance
0.245835	32.8	9.000	N	10.3	29.1	61.9	Compliance
0.495646	31.5	9.000	N	9.9	24.6	56.1	Compliance
3.519348	26.2	9.000	N	9.8	29.8	56.0	Compliance
4.957528	29.7	9.000	N	9.8	26.3	56.0	Compliance
7.095599	32.6	9.000	N	9.8	27.4	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.495646	28.2	9.000	N	9.9	17.9	46.1	Compliance
3.691692	22.0	9.000	N	9.8	24.0	46.0	Compliance
4.997188	25.5	9.000	N	9.8	20.5	46.0	Compliance
5.631624	25.9	9.000	N	9.8	24.1	50.0	Compliance
6.448559	27.3	9.000	N	9.8	22.7	50.0	Compliance
6.983418	27.9	9.000	N	9.8	22.1	50.0	Compliance

POE Adapter:

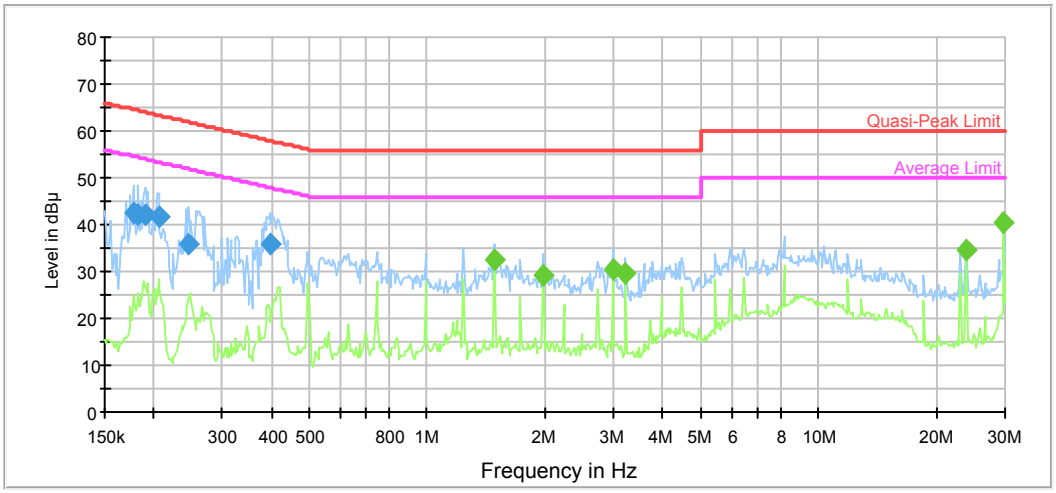
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.175915	41.5	9.000	L1	10.9	23.2	64.7	Compliance
0.187494	41.6	9.000	L1	10.7	22.5	64.1	Compliance
0.193566	41.1	9.000	L1	10.7	22.8	63.9	Compliance
0.206306	41.5	9.000	L1	10.6	21.9	63.4	Compliance
0.402900	36.6	9.000	L1	10.0	21.2	57.8	Compliance
30.000000	47.4	9.000	L1	10.2	12.6	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
1.500325	32.3	9.000	L1	9.7	13.7	46.0	Compliance
1.998778	29.2	9.000	L1	9.7	16.8	46.0	Compliance
3.000901	30.5	9.000	L1	9.8	15.5	46.0	Compliance
3.249802	29.8	9.000	L1	9.8	16.2	46.0	Compliance
27.496635	37.3	9.000	L1	10.2	12.7	50.0	Compliance
30.000000	42.0	120.000	L1	10.2	8.0	50.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.177322	42.3	9.000	N	10.8	22.3	64.6	Compliance
0.183065	42.3	9.000	N	10.8	22.0	64.3	Compliance
0.190505	41.9	9.000	N	10.7	22.1	64.0	Compliance
0.206306	41.6	9.000	N	10.6	21.8	63.4	Compliance
0.245835	35.8	9.000	N	10.3	26.1	61.9	Compliance
0.396530	35.9	9.000	N	10.0	22.0	57.9	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
1.488418	32.5	9.000	N	9.7	13.5	46.0	Compliance
1.982914	29.1	9.000	N	9.7	16.9	46.0	Compliance
2.977084	30.6	9.000	N	9.8	15.4	46.0	Compliance
3.224010	29.5	9.000	N	9.8	16.5	46.0	Compliance
23.822645	34.7	9.000	N	10.1	15.3	50.0	Compliance
29.777269	40.4	9.000	N	10.2	9.6	50.0	Compliance

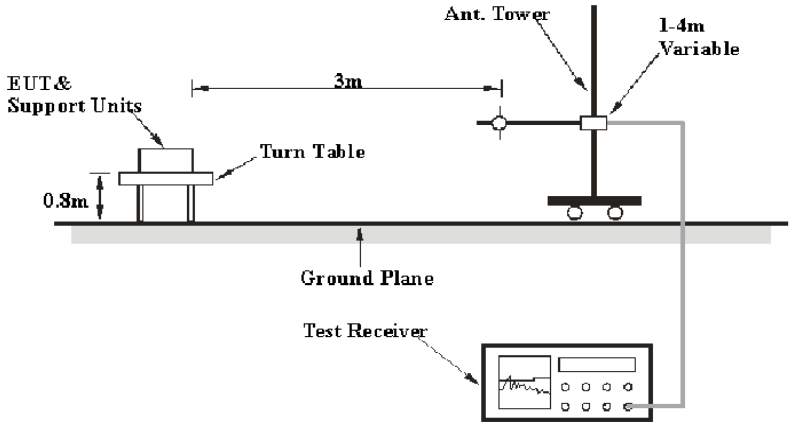
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

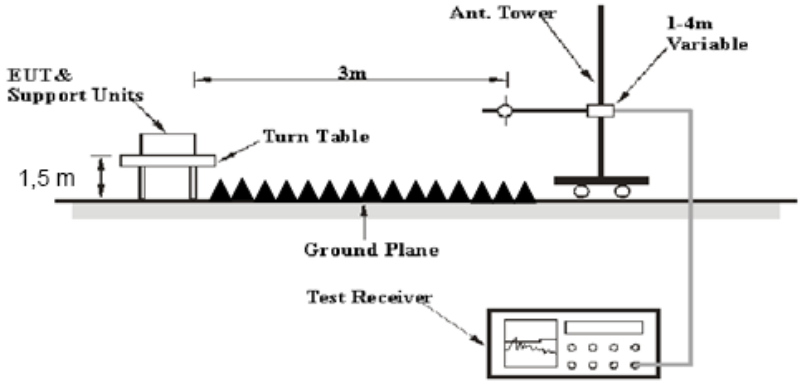
FCC §15.247 (d); §15.209; §15.205;

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:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

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

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

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

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
HP	Amplifier	8447D	2727A05902	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-9-5	2018-9-5
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-1-5	2019-1-4
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-1-4	2019-1-4
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-9-5	2018-9-5
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-9-5	2018-9-5
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-6-27	2018-6-27
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2017-9-05	2018-9-5

*** 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

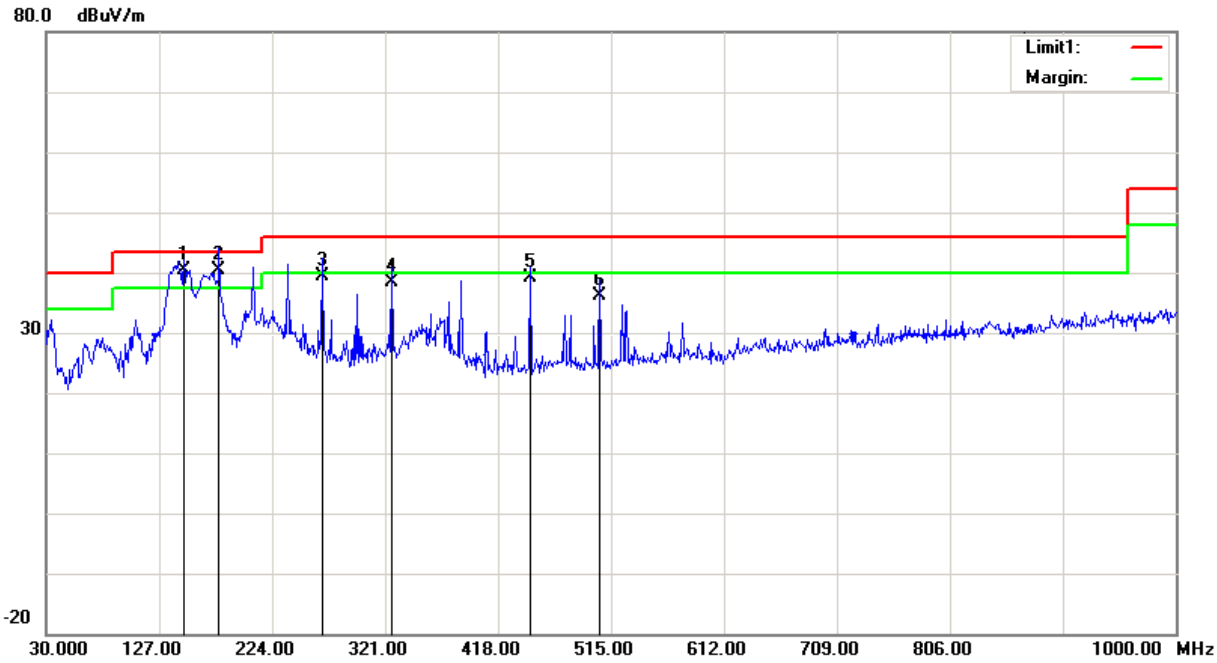
Temperature:	18.3~21.9 °C
Relative Humidity:	32~34 %
ATM Pressure:	101.8~102 kPa

** The testing was performed by Sunny Cen & Eric Xiao from 2018-01-09 to 2018-01-10.*

Test Mode: Transmitting

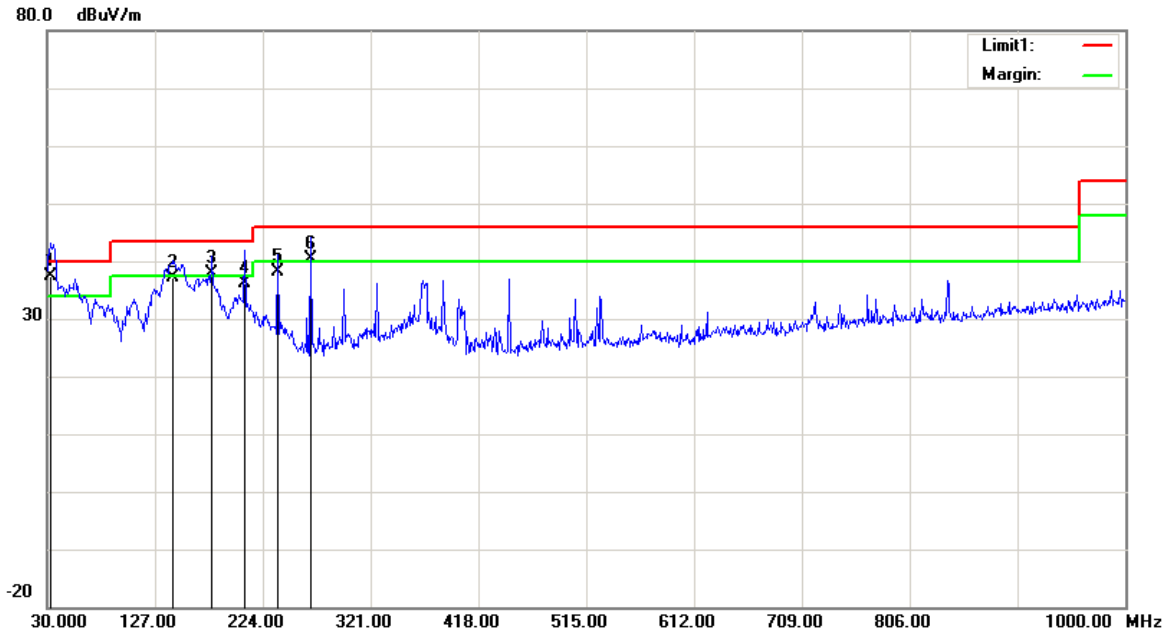
1) Below 1GHz(POE mode, 802.11n20 mode middle channel was the worst):

Horizontal



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
148.3400	46.80	QP	-6.50	40.30	43.50	3.20
178.4100	48.09	QP	-7.79	40.30	43.50	3.20
266.6800	43.80	QP	-4.30	39.50	46.00	6.50
326.8200	42.15	QP	-3.85	38.30	46.00	7.70
445.1600	40.77	QP	-1.57	39.20	46.00	6.80
505.3000	37.08	QP	-0.88	36.20	46.00	9.80

Vertical



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
32.9100	38.60	QP	-1.10	37.50	40.00	2.50
143.4900	43.56	QP	-6.36	37.20	43.50	6.30
178.4100	45.69	QP	-7.79	37.90	43.50	5.60
207.5100	43.57	QP	-7.37	36.20	43.50	7.30
237.5800	44.40	QP	-6.30	38.10	46.00	7.90
266.6800	44.60	QP	-4.30	40.30	46.00	5.70

802.11b

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/m)					
Low Channel: 2412 MHz									
2412.00	73.24	PK	H	28.12	1.81	0.00	103.17	N/A	N/A
2412.00	69.58	AV	H	28.12	1.81	0.00	99.51	N/A	N/A
2412.00	78.40	PK	V	28.12	1.81	0.00	108.33	N/A	N/A
2412.00	74.09	AV	V	28.12	1.81	0.00	104.02	N/A	N/A
2390.00	25.12	PK	V	28.08	1.80	0.00	55.00	74.00	19.00
2390.00	15.12	AV	V	28.08	1.80	0.00	45.00	54.00	9.00
4824.00	55.47	PK	V	32.95	3.19	37.20	54.41	74.00	19.59
4824.00	44.37	AV	V	32.95	3.19	37.20	43.31	54.00	10.69
7236.00	47.38	PK	V	35.81	4.77	37.27	50.69	74.00	23.31
7236.00	36.48	AV	V	35.81	4.77	37.27	39.79	54.00	14.21
Middle Channel: 2437 MHz									
2437.00	74.14	PK	H	28.17	1.82	0.00	104.13	N/A	N/A
2437.00	69.72	AV	H	28.17	1.82	0.00	99.71	N/A	N/A
2437.00	78.17	PK	V	28.17	1.82	0.00	108.16	N/A	N/A
2437.00	74.33	AV	V	28.17	1.82	0.00	104.32	N/A	N/A
4874.00	52.34	PK	V	33.05	3.26	37.21	51.44	74.00	22.56
4874.00	44.57	AV	V	33.05	3.26	37.21	43.67	54.00	10.33
7311.00	48.75	PK	V	36.01	4.64	37.36	52.04	74.00	21.96
7311.00	38.54	AV	V	36.01	4.64	37.36	41.83	54.00	12.17
High Channel: 2462 MHz									
2462.00	73.68	PK	H	28.22	1.83	0.00	103.73	N/A	N/A
2462.00	69.45	AV	H	28.22	1.83	0.00	99.50	N/A	N/A
2462.00	77.89	PK	V	28.22	1.83	0.00	107.94	N/A	N/A
2462.00	73.85	AV	V	28.22	1.83	0.00	103.90	N/A	N/A
2483.50	25.34	PK	V	28.27	1.84	0.00	55.45	74.00	18.55
2483.50	15.37	AV	V	28.27	1.84	0.00	45.48	54.00	8.52
4924.00	51.72	PK	V	33.15	3.27	37.22	50.92	74.00	23.08
4924.00	43.55	AV	V	33.15	3.27	37.22	42.75	54.00	11.25
7386.00	46.72	PK	V	36.20	4.51	37.46	49.97	74.00	24.03
7386.00	37.88	AV	V	36.20	4.51	37.46	41.13	54.00	12.87

802.11g

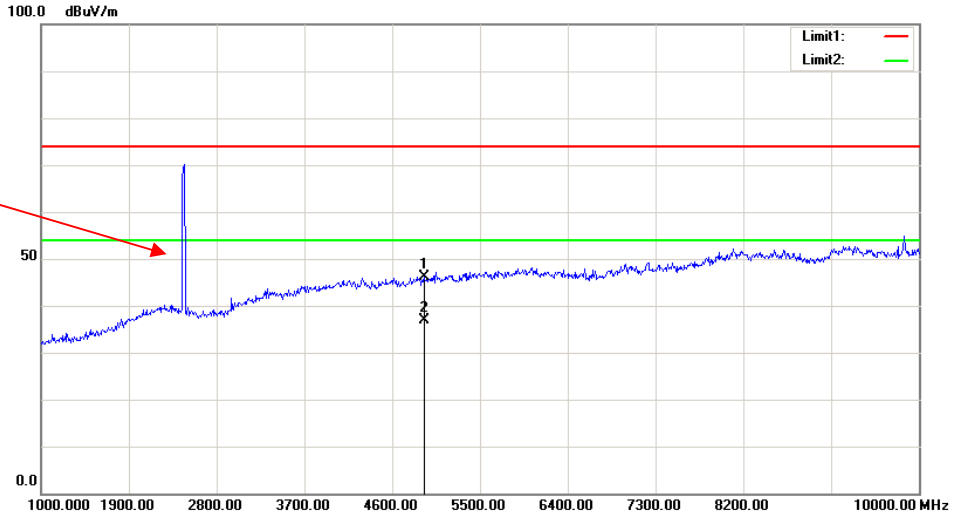
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	71.48	PK	H	28.12	1.81	0.00	101.41	N/A	N/A
2412.00	61.34	AV	H	28.12	1.81	0.00	91.27	N/A	N/A
2412.00	76.87	PK	V	28.12	1.81	0.00	106.80	N/A	N/A
2412.00	68.56	AV	V	28.12	1.81	0.00	98.49	N/A	N/A
2390.00	37.88	PK	V	28.08	1.80	0.00	67.76	74.00	6.24
2390.00	21.91	AV	V	28.08	1.80	0.00	51.79	54.00	2.21
4824.00	53.62	PK	V	32.95	3.19	37.20	52.56	74.00	21.44
4824.00	43.37	AV	V	32.95	3.19	37.20	42.31	54.00	11.69
7236.00	46.24	PK	V	35.81	4.77	37.27	49.55	74.00	24.45
7236.00	37.45	AV	V	35.81	4.77	37.27	40.76	54.00	13.24
Middle Channel: 2437 MHz									
2437.00	73.68	PK	H	28.17	1.82	0.00	103.67	N/A	N/A
2437.00	64.89	AV	H	28.17	1.82	0.00	94.88	N/A	N/A
2437.00	78.64	PK	V	28.17	1.82	0.00	108.63	N/A	N/A
2437.00	68.52	AV	V	28.17	1.82	0.00	98.51	N/A	N/A
4874.00	53.24	PK	V	33.05	3.26	37.21	52.34	74.00	21.66
4874.00	42.82	AV	V	33.05	3.26	37.21	41.92	54.00	12.08
7311.00	49.75	PK	V	36.01	4.64	37.36	53.04	74.00	20.96
7311.00	39.64	AV	V	36.01	4.64	37.36	42.93	54.00	11.07
High Channel: 2462 MHz									
2462.00	72.38	PK	H	28.22	1.83	0.00	102.43	N/A	N/A
2462.00	63.49	AV	H	28.22	1.83	0.00	93.54	N/A	N/A
2462.00	77.34	PK	V	28.22	1.83	0.00	107.39	N/A	N/A
2462.00	69.43	AV	V	28.22	1.83	0.00	99.48	N/A	N/A
2483.50	40.92	PK	V	28.27	1.84	0.00	71.03	74.00	2.97
2483.50	21.25	AV	V	28.27	1.84	0.00	51.36	54.00	2.64
4924.00	53.42	PK	V	33.15	3.27	37.22	52.62	74.00	21.38
4924.00	44.15	AV	V	33.15	3.27	37.22	43.35	54.00	10.65
7386.00	50.72	PK	V	36.20	4.51	37.46	53.97	74.00	20.03
7386.00	41.57	AV	V	36.20	4.51	37.46	44.82	54.00	9.18

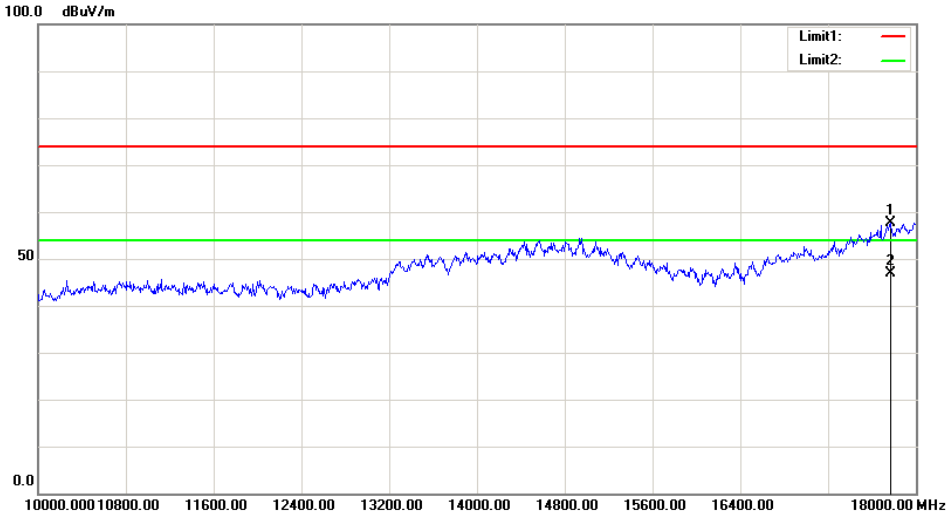
802.11n ht20

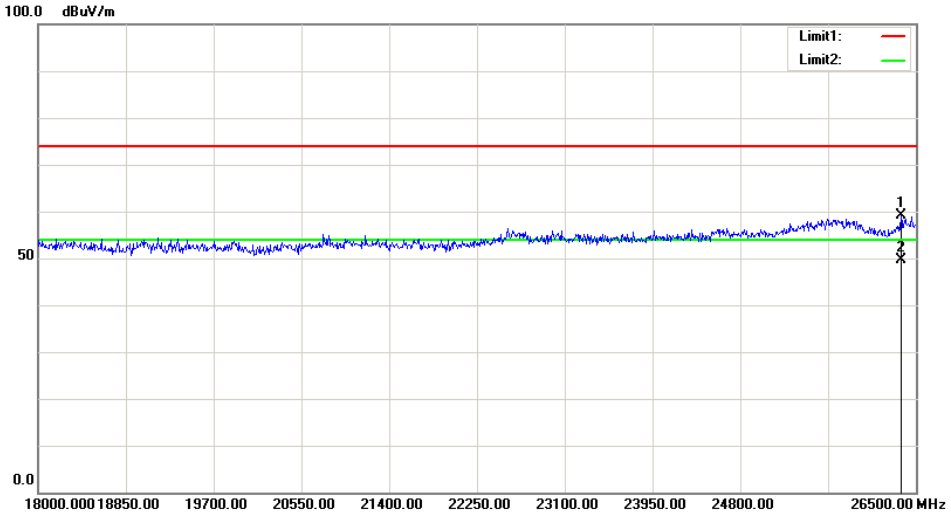
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	71.42	PK	H	28.12	1.81	0.00	101.35	N/A	N/A
2412.00	62.34	AV	H	28.12	1.81	0.00	92.27	N/A	N/A
2412.00	75.73	PK	V	28.12	1.81	0.00	105.66	N/A	N/A
2412.00	67.23	AV	V	28.12	1.81	0.00	97.16	N/A	N/A
2390.00	40.01	PK	V	28.08	1.80	0.00	69.89	74.00	4.11
2390.00	21.86	AV	V	28.08	1.80	0.00	51.74	54.00	2.26
4824.00	55.34	PK	V	32.95	3.19	37.20	54.28	74.00	19.72
4824.00	44.27	AV	V	32.95	3.19	37.20	43.21	54.00	10.79
7236.00	48.75	PK	V	35.81	4.77	37.27	52.06	74.00	21.94
7236.00	38.68	AV	V	35.81	4.77	37.27	41.99	54.00	12.01
Middle Channel: 2437 MHz									
2437.00	73.24	PK	H	28.17	1.82	0.00	103.23	N/A	N/A
2437.00	64.84	AV	H	28.17	1.82	0.00	94.83	N/A	N/A
2437.00	78.83	PK	V	28.17	1.82	0.00	108.82	N/A	N/A
2437.00	68.98	AV	V	28.17	1.82	0.00	98.97	N/A	N/A
4874.00	56.34	PK	V	33.05	3.26	37.21	55.44	74.00	18.56
4874.00	46.87	AV	V	33.05	3.26	37.21	45.97	54.00	8.03
7311.00	52.34	PK	V	36.01	4.64	37.36	55.63	74.00	18.37
7311.00	42.75	AV	V	36.01	4.64	37.36	46.04	54.00	7.96
High Channel: 2462 MHz									
2462.00	72.90	PK	H	28.22	1.83	0.00	102.95	N/A	N/A
2462.00	63.48	AV	H	28.22	1.83	0.00	93.53	N/A	N/A
2462.00	76.35	PK	V	28.22	1.83	0.00	106.40	N/A	N/A
2462.00	67.75	AV	V	28.22	1.83	0.00	97.80	N/A	N/A
2483.50	41.89	PK	V	28.27	1.84	0.00	72.00	74.00	2.00
2483.50	21.87	AV	V	28.27	1.84	0.00	51.98	54.00	2.02
4924.00	52.47	PK	V	33.15	3.27	37.22	51.67	74.00	22.33
4924.00	42.68	AV	V	33.15	3.27	37.22	41.88	54.00	12.12
7386.00	49.67	PK	V	36.20	4.51	37.46	52.92	74.00	21.08
7386.00	39.84	AV	V	36.20	4.51	37.46	43.09	54.00	10.91

Worst plots(802.11n20 middle channel)
Horizontal

Fundamental
Test with Band
Rejection Filter

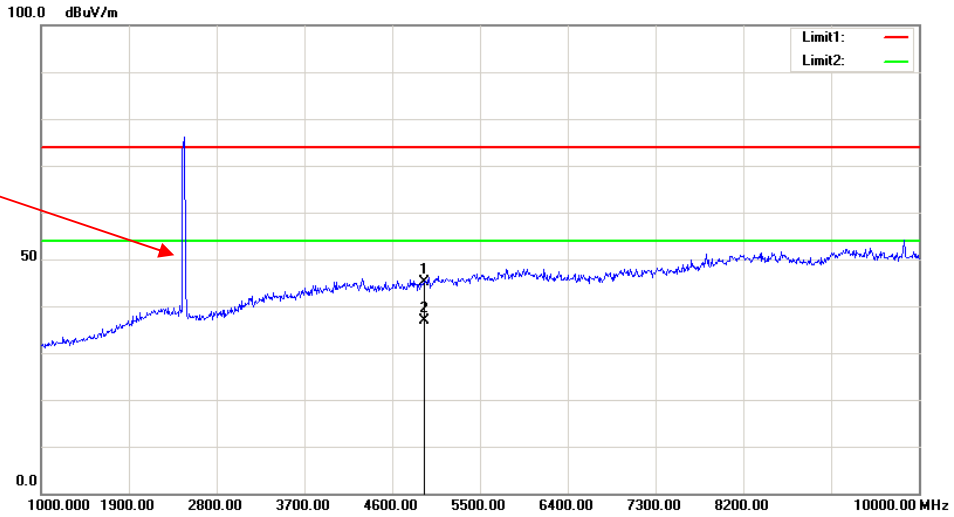


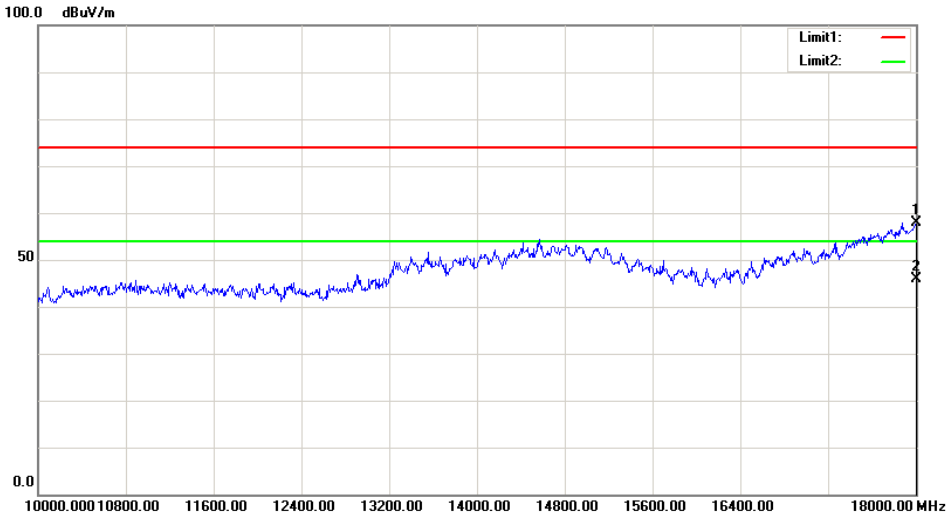


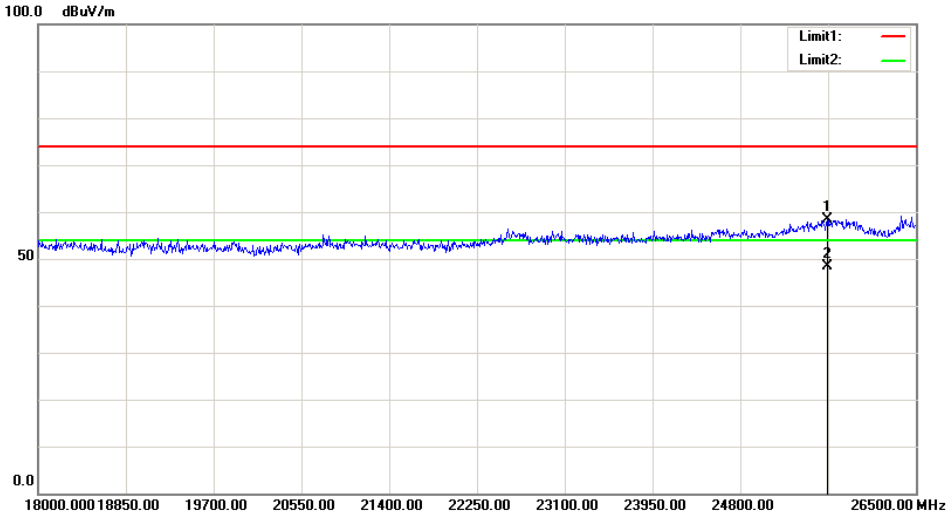


Vertical

Fundamental Test with Band Rejection Filter







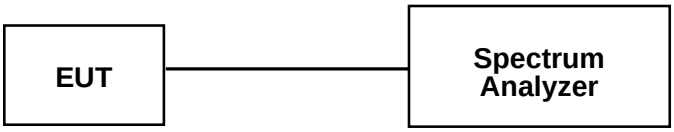
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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
R&S	Spectrum Analyzer	FSU 26	200256	2017-12-8	2018-12-8
N/A	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	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 Data

Environmental Conditions

Temperature:	26.1 °C
Relative Humidity:	42 %
ATM Pressure:	101.3 kPa

** The testing was performed by Harry Yang on 2018-01-06.*

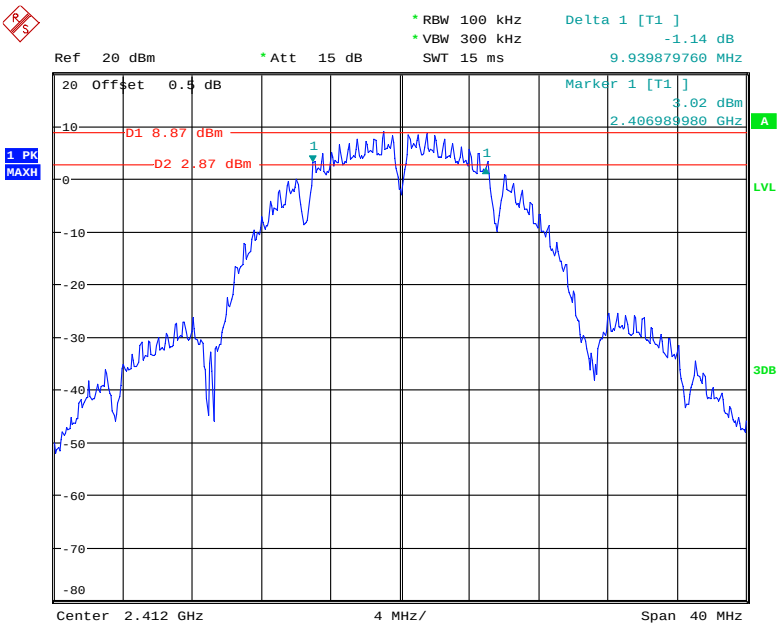
Test Mode: Transmitting

Test Result: Compliant

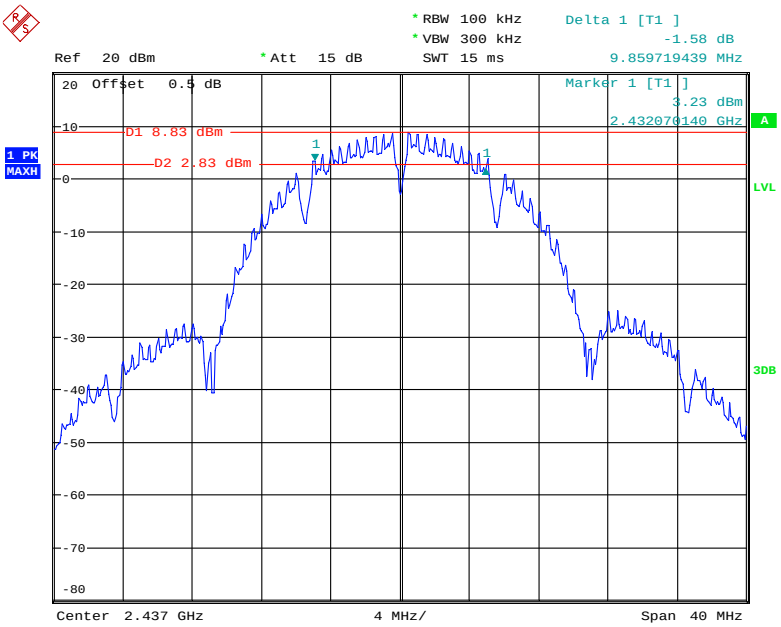
please refer to the following table and plots.

Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	9.94	≥0.5
	Middle	2437	9.86	≥0.5
	High	2462	9.46	≥0.5
802.11g	Low	2412	16.03	≥0.5
	Middle	2437	16.11	≥0.5
	High	2462	16.19	≥0.5
802.11n ht20	Low	2412	17.39	≥0.5
	Middle	2437	17.31	≥0.5
	High	2462	17.47	≥0.5

802.11b –Low Channel

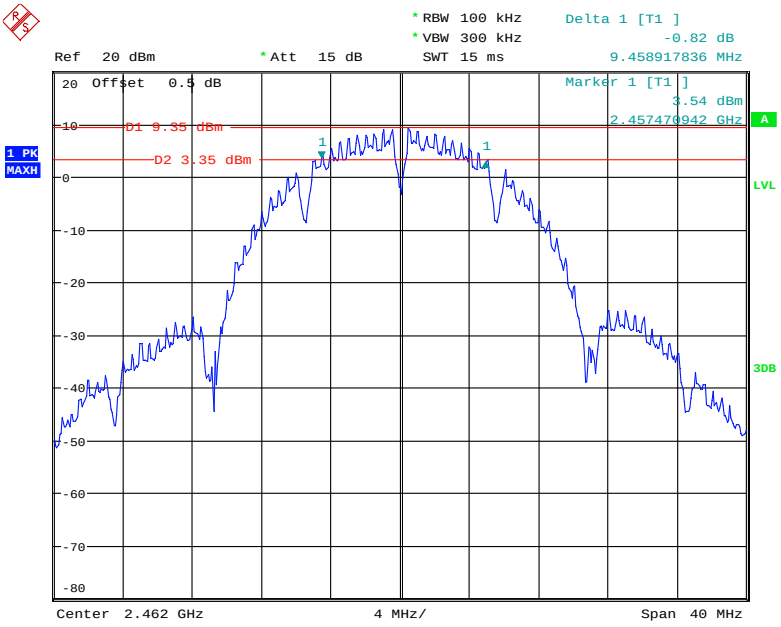


802.11b- Middle Channel



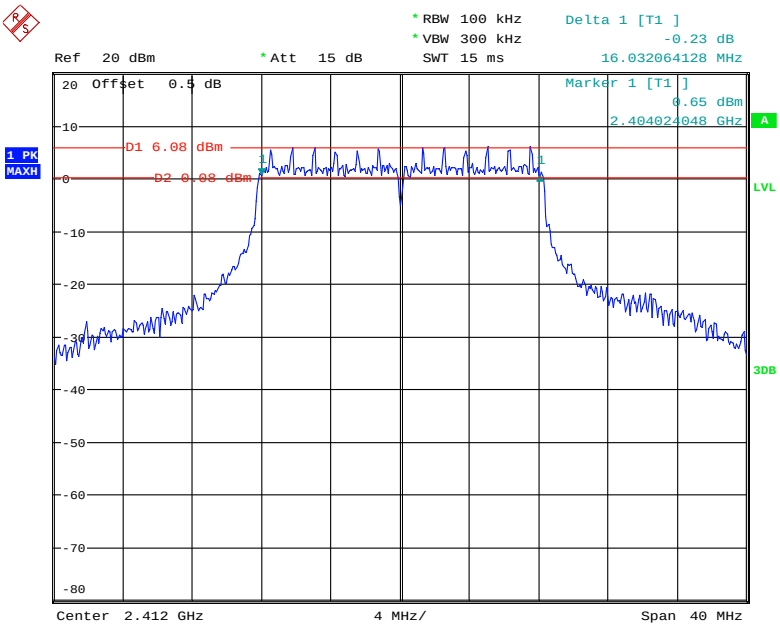
Date: 6.JAN.2018 10:43:15

802.11b –High Channel



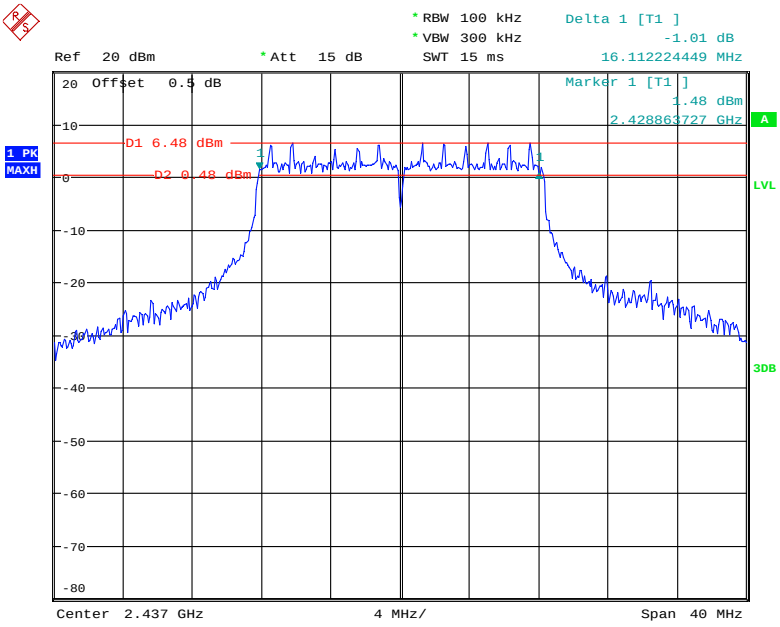
Date: 6.JAN.2018 10:50:05

802.11g- Low Channel



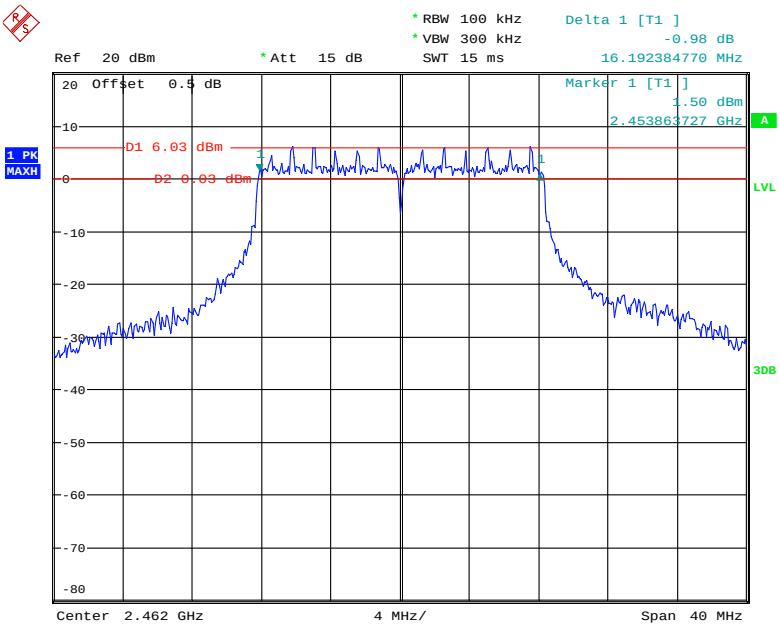
Date: 6.JAN.2018 10:58:12

802.11g - Middle Channel



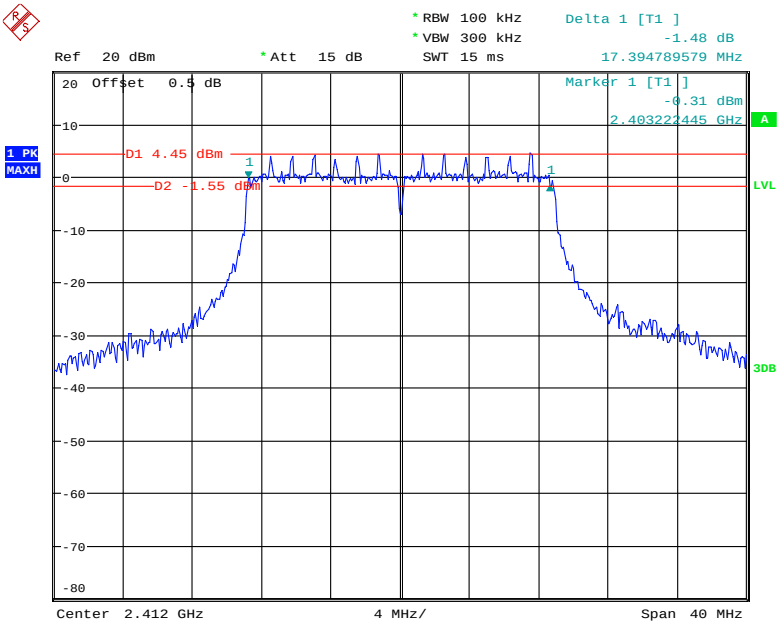
Date: 6.JAN.2018 11:02:34

802.11g- High Channel



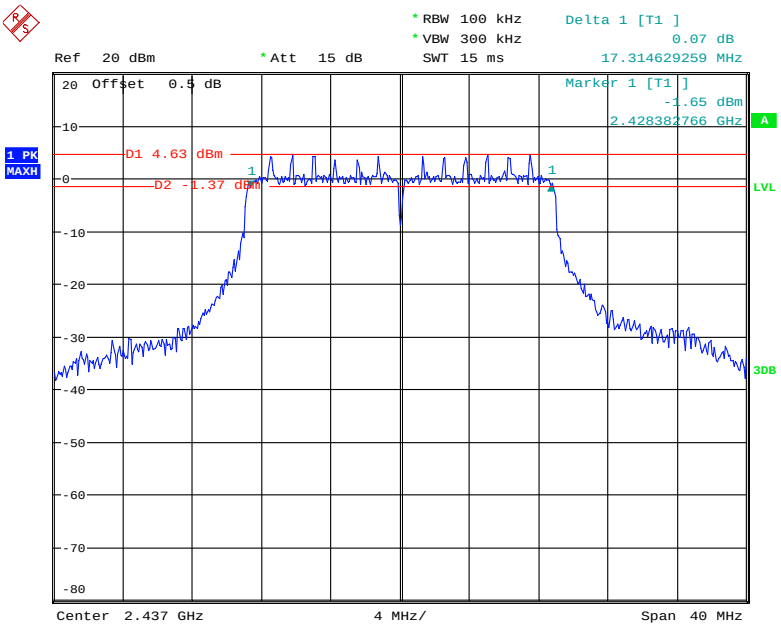
Date: 6.JAN.2018 11:11:43

802.11n ht20- Low Channel



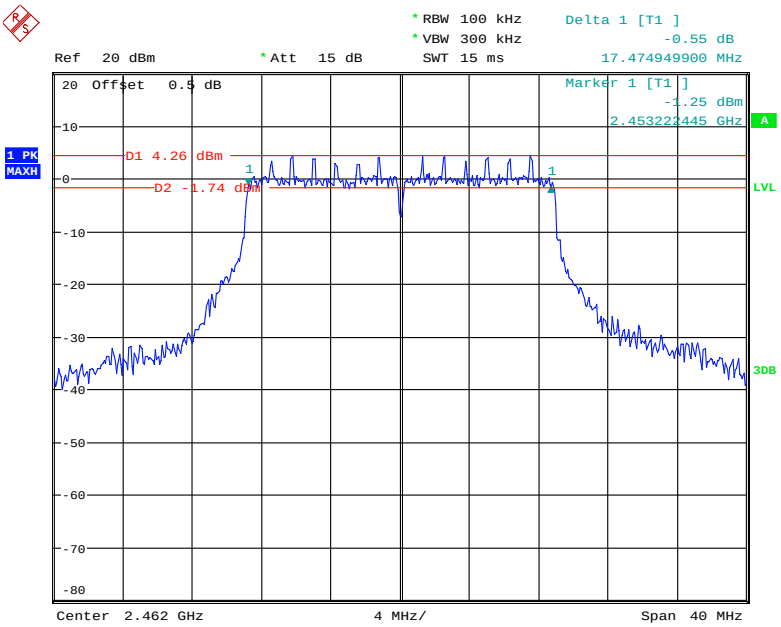
Date: 6.JAN.2018 11:15:37

802.11n ht20- Middle Channel



Date: 6.JAN.2018 11:22:52

802.11n ht20- High Channel



Date: 6.JAN.2018 11:29:21

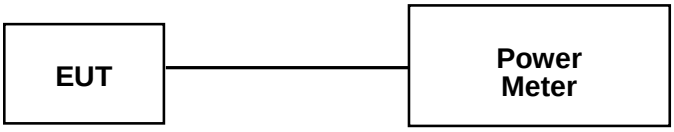
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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.
4. Set the power Meter to test Peak output power, record the result as peak power.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2017-11-03	2018-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2017-11-03	2018-11-03
N/A	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	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 Data

Environmental Conditions

Temperature:	26.1 °C
Relative Humidity:	42 %
ATM Pressure:	101.3 kPa

** The testing was performed by Harry Yang on 2018-01-06.*

Test Mode: Transmitting

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)
802.11b	Low	2412	18.71	14.15	30
	Middle	2437	18.5	15.96	30
	High	2462	18.49	15.81	30
802.11g	Low	2412	23.28	11.83	30
	Middle	2437	23.69	12.23	30
	High	2462	23.45	12.42	30
802.11n20	Low	2412	21.98	9.21	30
	Middle	2437	21.94	10.39	30
	High	2462	21.54	10.09	30

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

Applicable Standard

According to FCC§15.247(d):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
R&S	Spectrum Analyzer	FSU 26	200256	2017-12-8	2018-12-8
N/A	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	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 Data

Environmental Conditions

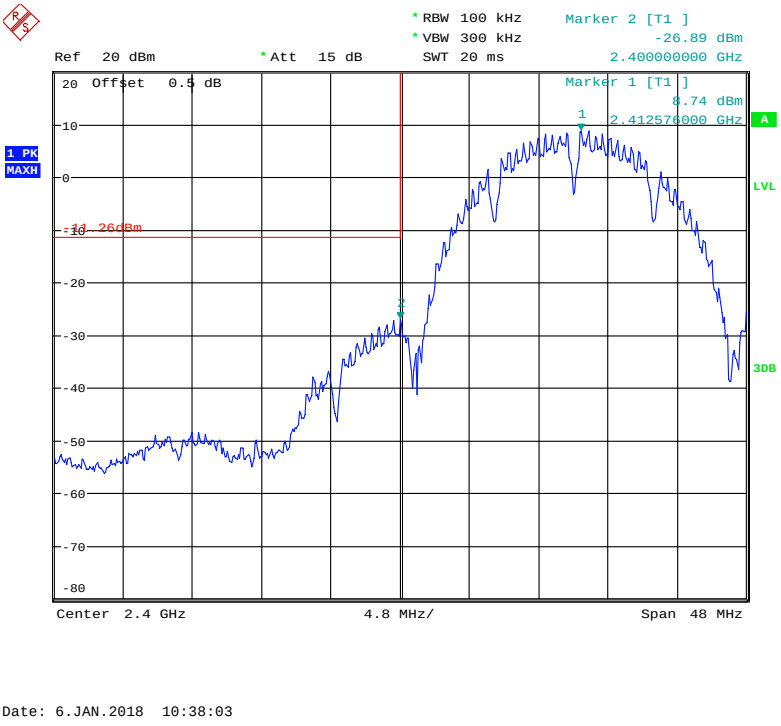
Temperature:	26.1 °C
Relative Humidity:	42 %
ATM Pressure:	101.3 kPa

** The testing was performed by Harry Yang on 2018-01-06.*

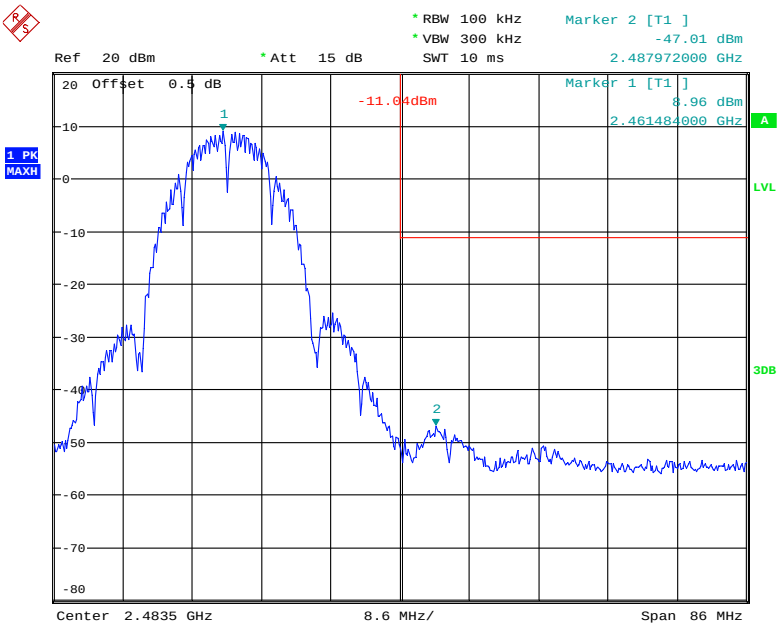
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

802.11b: Band Edge, Left Side

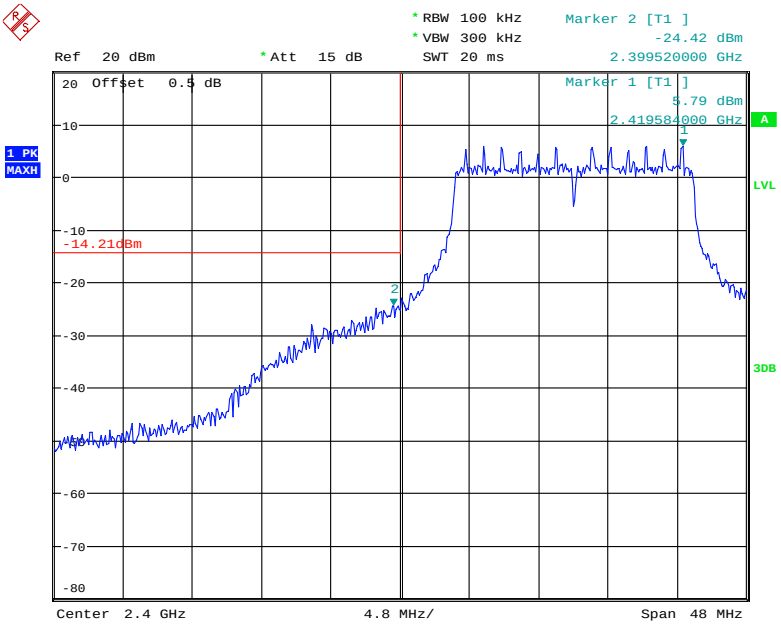


802.11b: Band Edge, Right Side



Date: 6.JAN.2018 10:52:08

802.11g: Band Edge, Left Side



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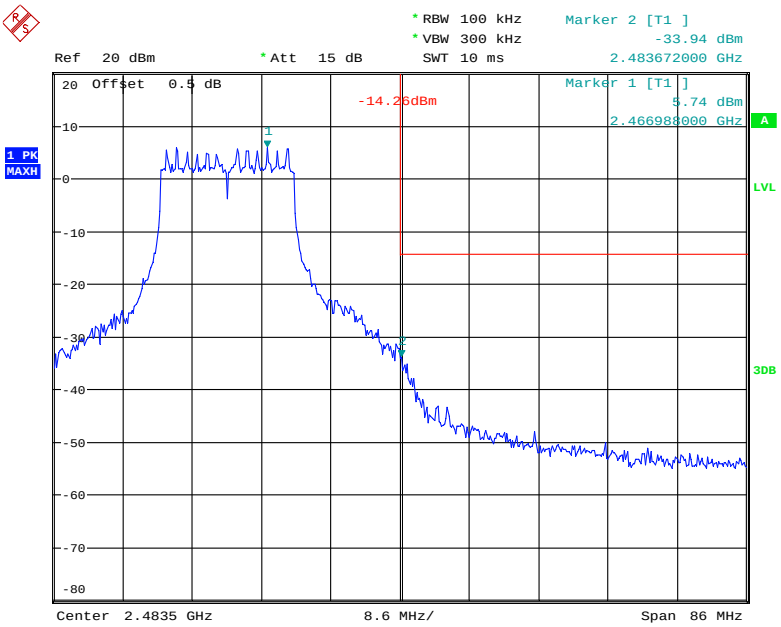
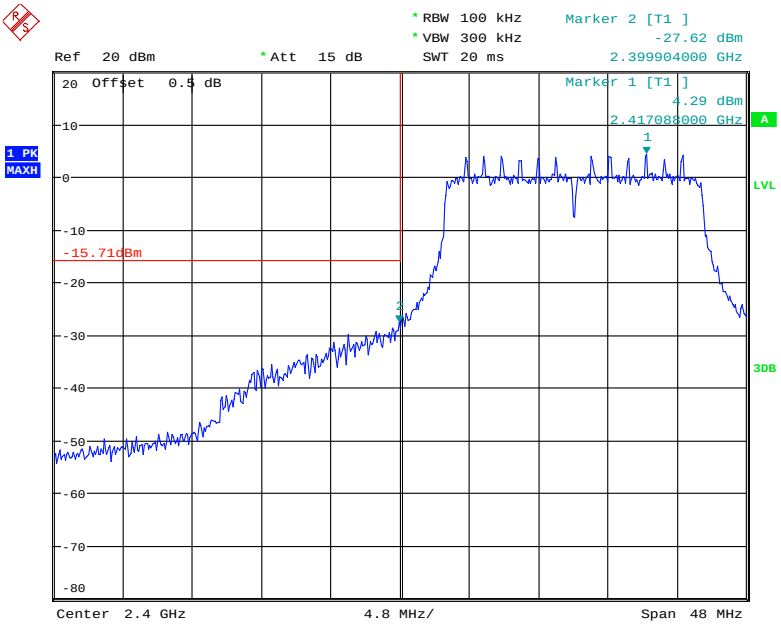
802.11g: Band Edge, Right Side



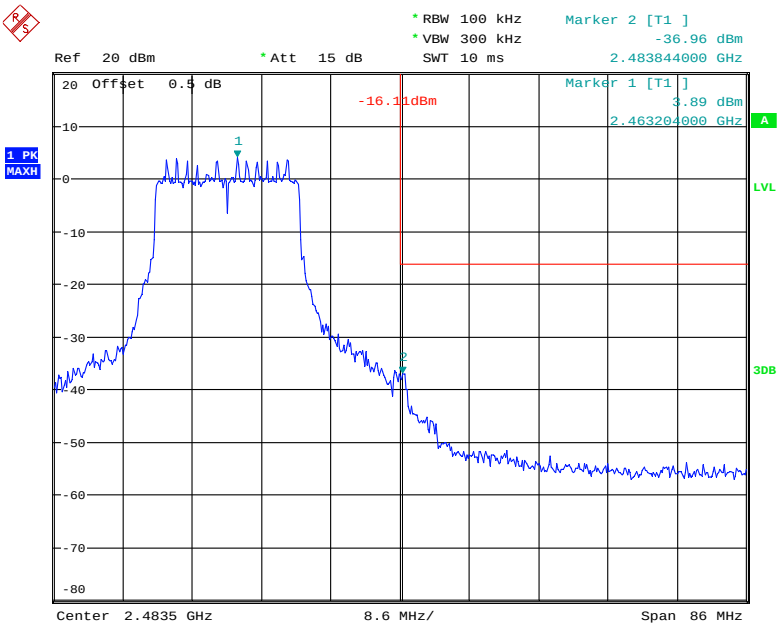
Date: 6.JAN.2018 11:13:40

802.11n ht20 Band Edge, Left Side



Date: 6.JAN.2018 11:17:57

802.11n ht20 Band Edge, Right Side



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FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2017-12-8	2018-12-8
N/A	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	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 Data

Environmental Conditions

Temperature:	26.1 °C
Relative Humidity:	42 %
ATM Pressure:	101.3 kPa

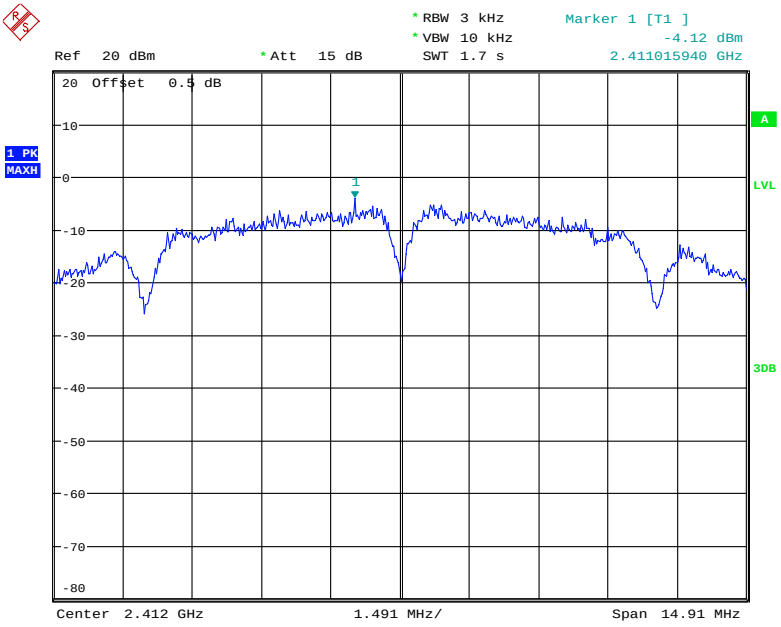
** The testing was performed by Harry Yang on 2018-01-06.*

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	-4.12	≤8
	Middle	2437	-4.58	≤8
	High	2462	-4.76	≤8
802.11g	Low	2412	-8.43	≤8
	Middle	2437	-8.1	≤8
	High	2462	-8.99	≤8
802.11n20	Low	2412	-10.11	≤8
	Middle	2437	-9.87	≤8
	High	2462	-10.76	≤8

Power Spectral Density, 802.11b, Low Channel



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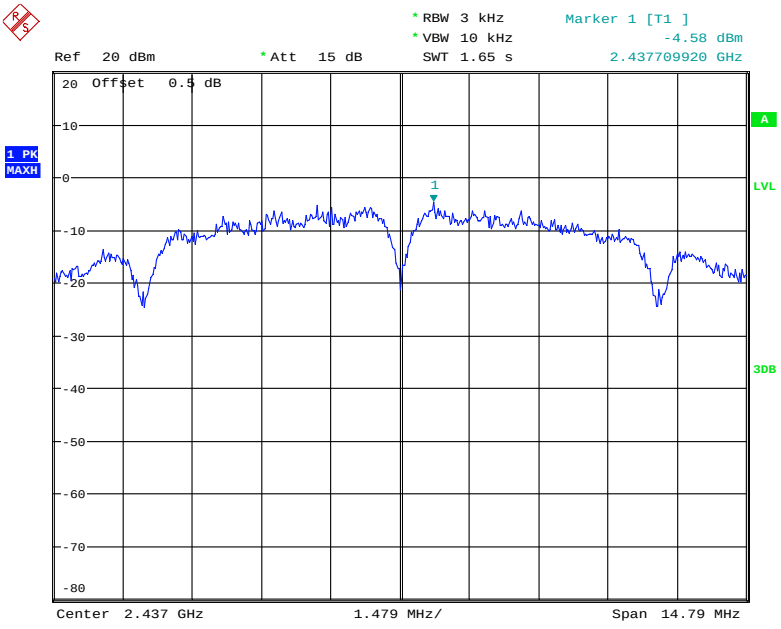
Power Spectral Density, 802.11b, Middle Channel



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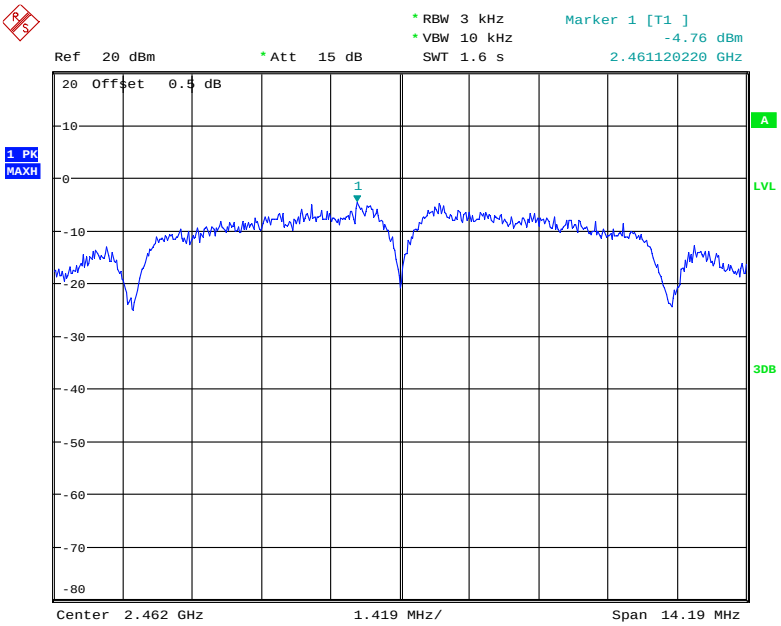
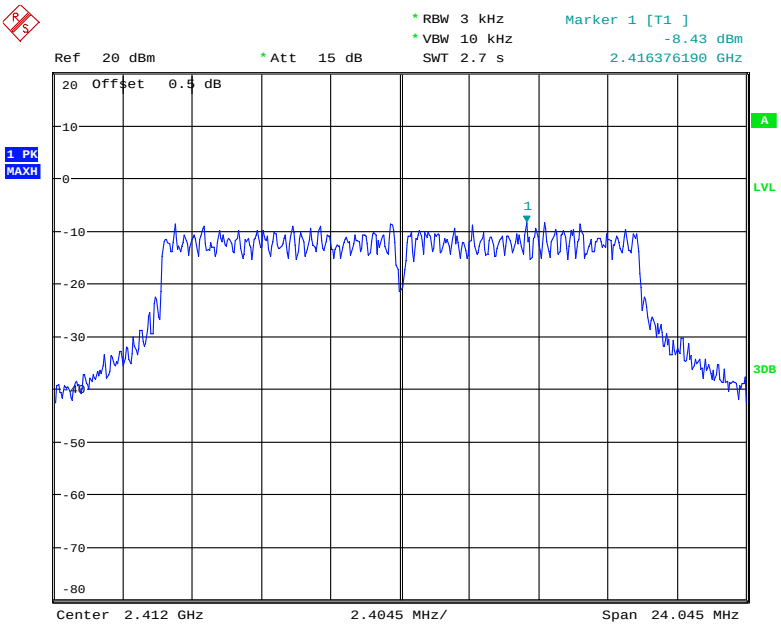
Power Spectral Density, 802.11b, High Channel



Date: 6.JAN.2018 10:51:42

Power Spectral Density, 802.11g, Low Channel



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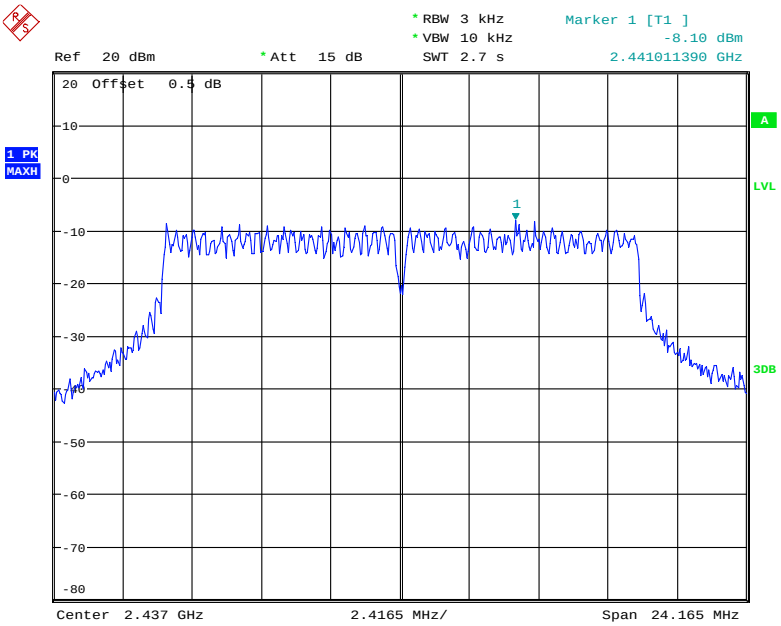
Power Spectral Density, 802.11g, Middle Channel



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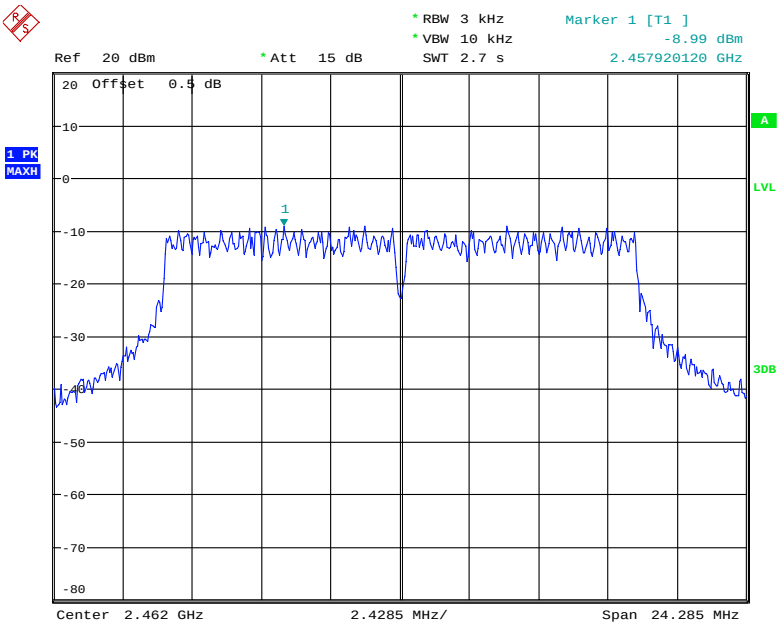
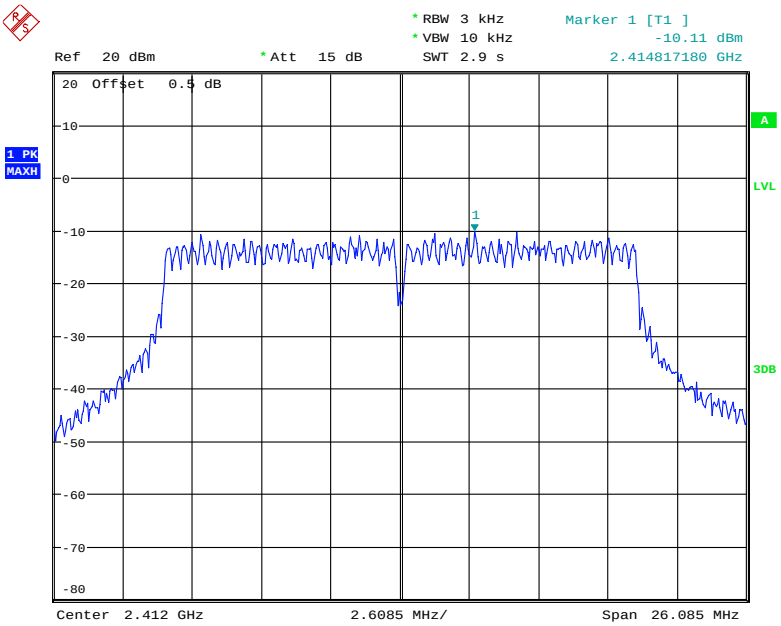
Power Spectral Density, 802.11g, High Channel



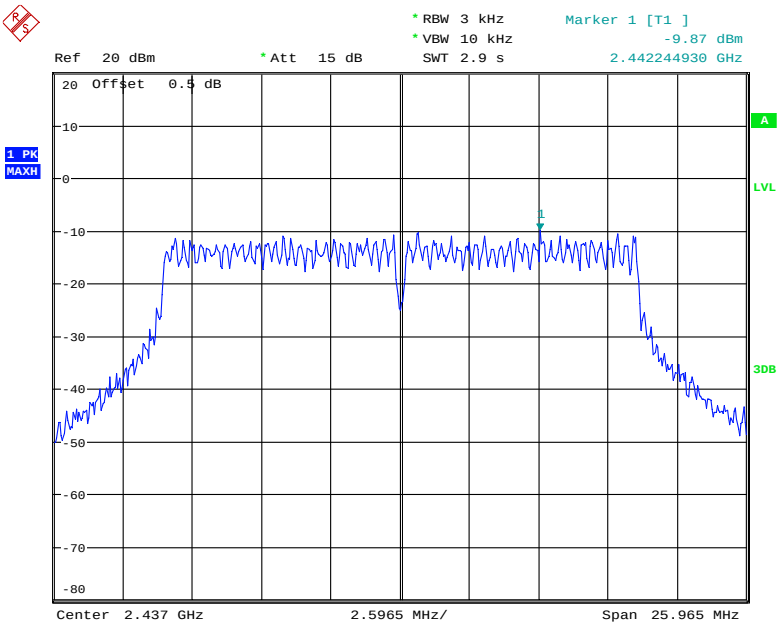
Date: 6.JAN.2018 11:13:08

Power Spectral Density, 802.11n ht20, Low Channel



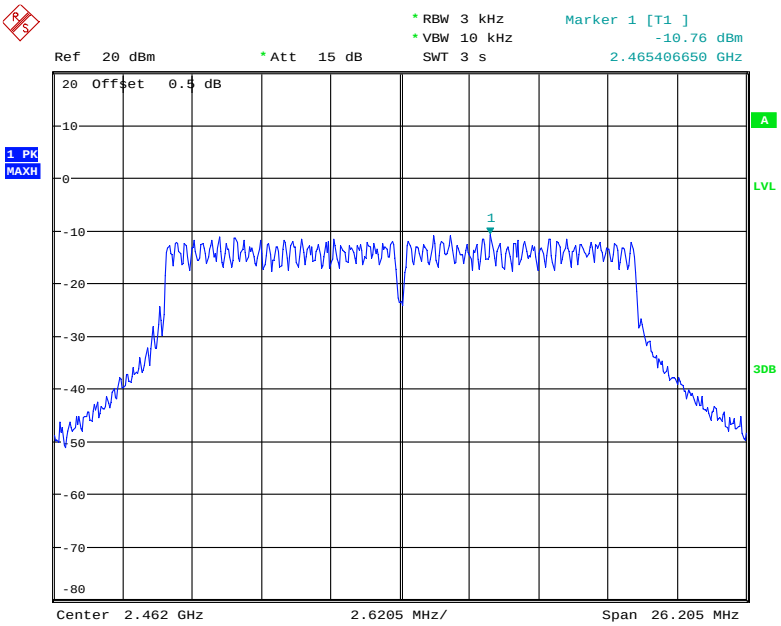
Date: 6.JAN.2018 11:17:28

Power Spectral Density, 802.11n ht20, Middle Channel



Date: 6.JAN.2018 11:24:38

Power Spectral Density, 802.11n ht20, High Channel



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