TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.247

RSS-GEN, ISSUE 4, NOVEMBER 2014

RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Fujian LANDI Commercial Equipment Co., Ltd.

Building 17, Section A, Software Park, No. 89 Software Road, Gulou District, Fuzhou Municipality, Fujian Province, P.R. China.

FCC ID: 2AG6NAC01116
IC: 23725-AC01116

Report Type:	**Product Type:**
Original Report	RF Module

Report Number:	RXM171225063-00A
Report Date:	2018-07-10
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)

EUT Name:	AC01116
EUT Type:	RF Module
EUT Model:	AC01116
FCC ID:	2AG6NAC01116
IC:	23725-AC01116
Rated Input Voltage:	DC 3.9V
External Dimension:	Length (41mm)*Width (41mm)*High (2.8mm)
Serial Number:	171225063
EUT Received Date:	2017.12.25

Objective

This report is prepared on behalf of ***Fujian Landi Commercial Equipment Co., Ltd.*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

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 and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: 2AG6NAC01116 .
FCC Part 22H,24E,27,90 PCB submissions with FCC ID: 2AG6NAC01116 .
RSS-247 FHSs, RSS-132, RSS-133, RSS-139, RSS-199, RSS-130 submissions with IC: 23725-AC01116

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 and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

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, total 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 802.11 n20 modes were test with channel 1,6,11. For 802.11 n40 mode were test with channel 3,6,9.

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.

Antenna Information:

Manufacturer	Description	Model	Antenna Gain/Frequency Range
Huayuan ANT	Dippole antenna	HYT-2400-2	2.0 dBi/2400-2500MHz

EUT Exercise Software

The software "QRCT.exe" was used for testing, which was provided by manufacturer. The maximum power was configured as below table, that provided by the manufacturer:

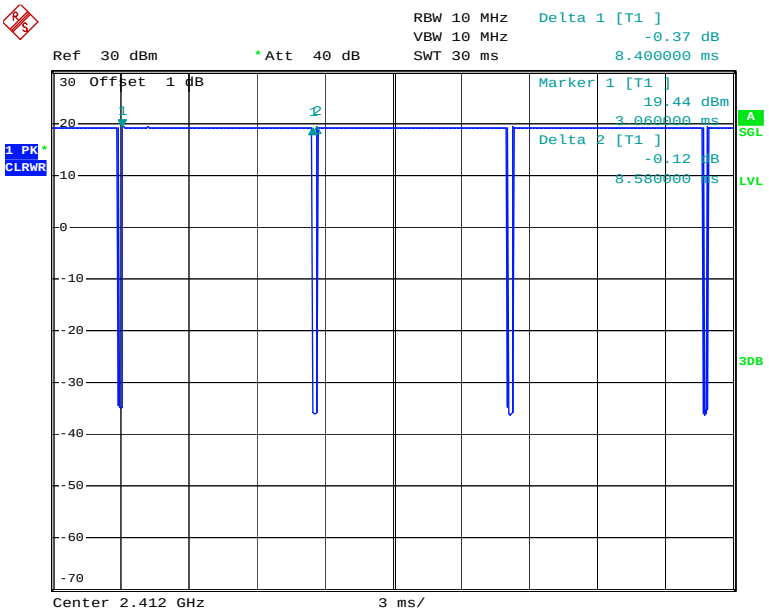
Mode	Channel	Frequency (MHz)	Data rate	Power level
802.11b	Low	2412	1 Mbps	15
	Middle	2437	1 Mbps	15
	High	2462	1 Mbps	15
802.11g	Low	2412	6 Mbps	15
	Middle	2437	6 Mbps	15
	High	2462	6 Mbps	15
802.11 n20	Low	2412	MCS0	15
	Middle	2437	MCS0	15
	High	2462	MCS0	15
80.211 n40	Low	2422	MCS0	15
	Middle	2437	MCS0	15
	High	2452	MCS0	15

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

The maximum duty cycle as following table:

Test mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	8.400	8.580	97.90
802.11g	1.388	1.592	87.19
802.11n ht20	1.292	1.496	86.36
802.11n ht40	0.648	0.854	75.88
BLE	0.418	0.625	66.88

802.11b



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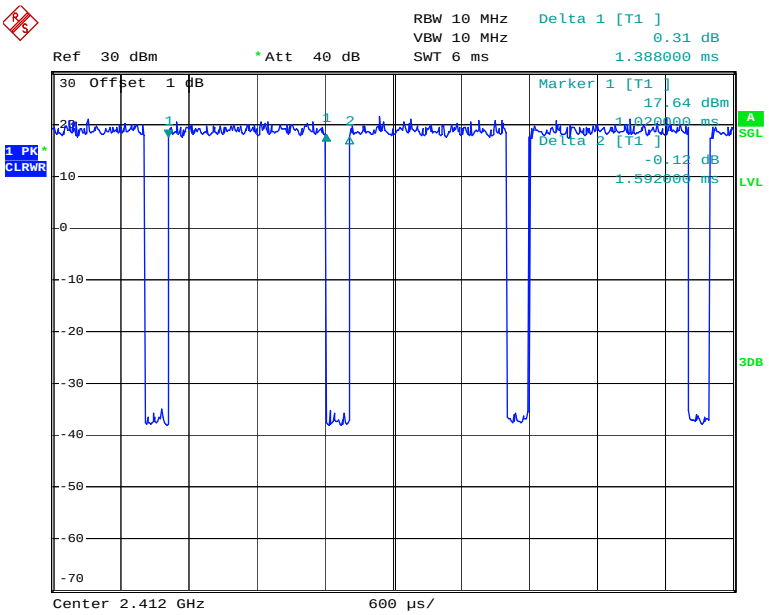
802.11g



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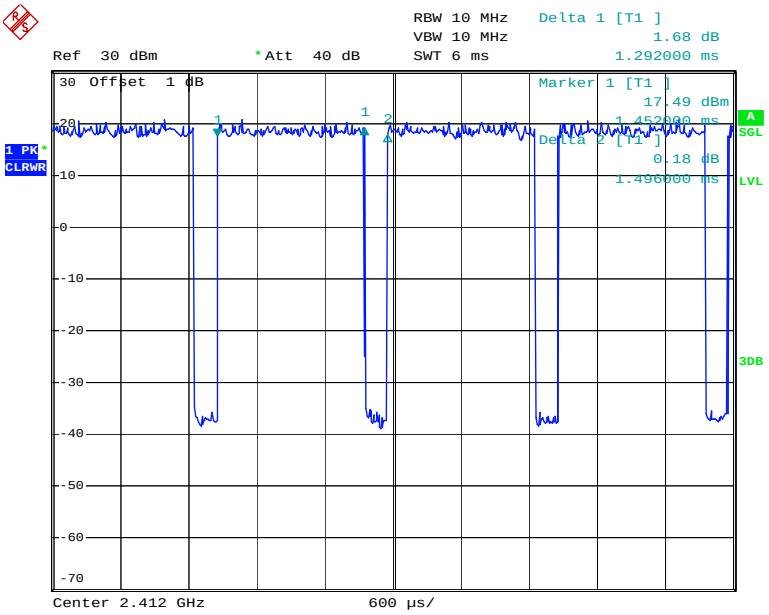
802.11n ht20



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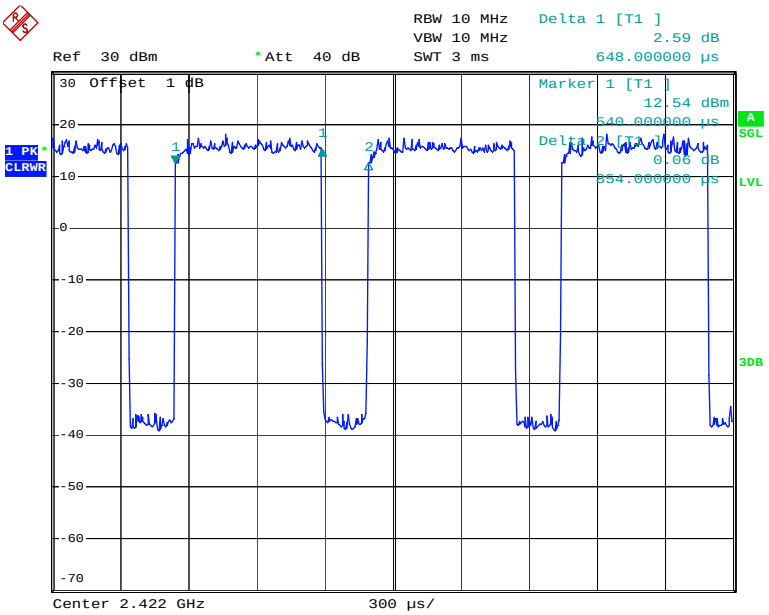
802.11n ht40



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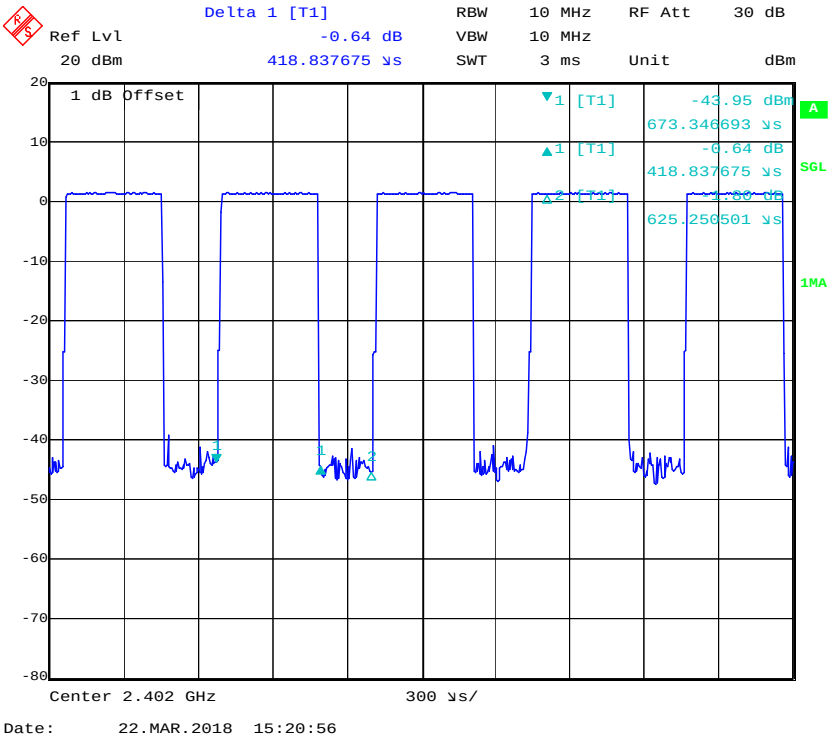
BLE



Equipment Modifications

No modification was made to the EUT.

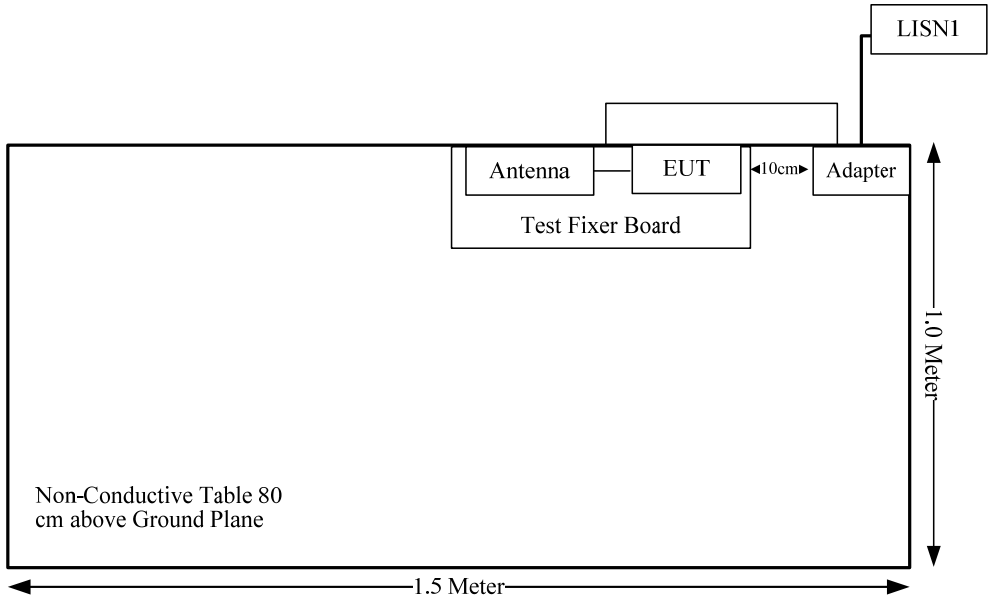
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Huntkey	Adapter	HKC0115021-2D	H11S90181A000061
Fujian Landi Commercial Equipment Co., Ltd.	Test Fixer Board	N/A	N/A

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	No	No	1.5	adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i),§1.1310, §2.1091 RSS-102§4	Maximum Permissible Exposure(MPE)	Compliance
§15.203 RSS-GEN Clause 8.3	Antenna Requirement	Compliance
§15.207 (a) RSS-Gen Clause 8.8	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d) RSS-247 Clause 5.5 RSS-Gen Clause 8.10	Spurious Emissions	Compliance
§15.247 (a)(2) RSS-247 Clause 5.2 a)	6 dB Bandwidth and 99% Occupied Bandwidth	Compliance
§15.247(b)(3) RSS-247 Clause 5.4 d)	Maximum Conducted Output Power	Compliance
§15.247(d) RSS-247 Clause5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e) RSS-247 Clause5.2 b)	Power Spectral Density	Compliance

FCC §1.1310, §2.1091& RSS-102 § 4 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to 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/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

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

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

According to RSS-102 § 4Table 4, RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

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);

$=>G=S4\pi R^2/P$

For simultaneously system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

For WLAN part:

Mode	Frequency Band	Antenna Gain		Max. Target Power including Tolerance		Evaluation Distance (cm)	FCC Power Density (mW/cm^2)	ISEDC Power Density (W/m^2)	FCC MPE Limit (mW/cm^2)	ISEDC MPE Limit (W/m^2)
		(dBi)	(numeric)	(dBm)	(mW)					
BDR/EDR	2402-2480	2	1.58	13.5	22.39	20.00	0.007	0.07	1.0	5.35
BLE	2402-2480	2	1.58	2	1.58	20.00	0.0005	0.005	1.0	5.35
WIFI	2412-2462	2	1.58	24	251.19	20.00	0.07924	0.7924	1.0	5.37

Note: Bluetooth and WIFI can`t transmit simultaneously.
Bluetooth or WIFI can transmit simultaneously with WWAN. The maximum MPE to limit ratio for WLAN is WIFI: 0.7924/5.37=0.148 (ISEDC limit was the used for calculation)

Calculated Maximum antenna gain allowed base on ERP/EIRP:

Mode	Frequency Range (MHz)	Conducted Power including Tolerance (dBm)	ERP/EIRP Limit (dBm)	Maximum Antenna Gain Allowed (dBi)
GSM850	824-849	32	38.45	6.45
GSM1900	1850-1910	30	33	3
WCDMA Band 2	1850-1910	24	33	9
WCDMA Band 4	1710-1755	24	30	6
WCDMA Band 5	824-849	24	38.45	14.45
LTE Band 2	1850-1910	24	33	9
LTE Band 4	1710-1755	24	30	6
LTE Band 5	824-849	24	38.45	14.45
LTE band 7	2500-2570	24	33	9
LTE band 12	699-716	24	34.77	10.77
LTE band 13	777-787	24	34.77	10.77
LTE band 17	704-716	24	34.77	10.77
LTE band 25	1850-1915	24	33	9
LTE band 26	814-849	24	38.45	14.45
LTE band 41	2496-2690	24	33	9

Calculated Maximum antenna gain allowed base on MPE:

Mode	Frequency Range (MHz)	Conducted Power including Tolerance (dBm)	power density Limits (W/m^2)	Maximum Power Density (S_{WWAN}) (W/m^2)	Evaluation Distance (cm)	Maximum Antenna Gain Allowed base on MPE	
						(numeric)	(dBi)
GSM850	824-849	29	2.58	2.198	20	1.39	1.43
GSM1900	1850-1910	27	4.48	3.817	20	3.83	5.83
WCDMA Band 2	1850-1910	24	4.48	3.817	20	7.63	8.83
WCDMA Band 4	1710-1755	24	4.24	3.612	20	7.22	8.59
WCDMA Band 5	824-849	24	2.58	2.198	20	4.40	6.43
LTE Band 2	1850-1910	24	4.48	3.817	20	7.63	8.83
LTE Band 4	1710-1755	24	4.24	3.612	20	7.22	8.59
LTE Band 5	824-849	24	2.58	2.198	20	4.40	6.43
LTE band 7	2500-2570	24	5.50	4.686	20	9.37	9.72
LTE band 12	699-716	24	2.30	1.960	20	3.92	5.93
LTE band 13	777-787	24	2.47	2.104	20	4.21	6.24
LTE band 17	704-716	24	2.31	1.968	20	3.94	5.95
LTE band 25	1850-1915	24	4.48	3.817	20	7.63	8.83
LTE band 26	814-849	24	2.55	2.173	20	4.35	6.38
LTE band 41	2496-2690	24	5.49	4.677	20	9.35	9.71

Note 1: for GSM850 and 1900, maximum time-average was reduced by 3dBc for worst 4 up time slots
Note 2: the strict limit is ISEDC, which was used for MPE evaluation.
Note 3:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

$= S_{WLAN} / S_{limit\text{-}WLAN} + S_{WWAN} / S_{limit\text{-}WWAN}$

=>Maximum $S_{WWAN} = (1 - S_{WLAN} / S_{limit\text{-}WLAN}) * S_{limit\text{-}WWAN} = (1-0.148) * S_{limit\text{-}WWAN} = 0.852 * S_{limit\text{-}WWAN}$

Result: The device meets MPE requirement for Devices Used by the General Public at 20cm distance with the maximum antenna gain for each band as below table:

Frequency Range (MHz)	Maximum Antenna Gain Allowed (dBi)
814-849	1.43
1850-1915	3.0
1710-1755	6.0
699-716	5.93
777-787	6.24
2496-2690	9.0

FCC §15.203& RSS-GEN CLAUSE 8.3 - 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.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

According to RSS-Gen §8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.
Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

Antenna Connector Construction

The EUT has a dipole antenna use a unique type of connector to attach to the EUT for Bluetooth/WIFI, and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

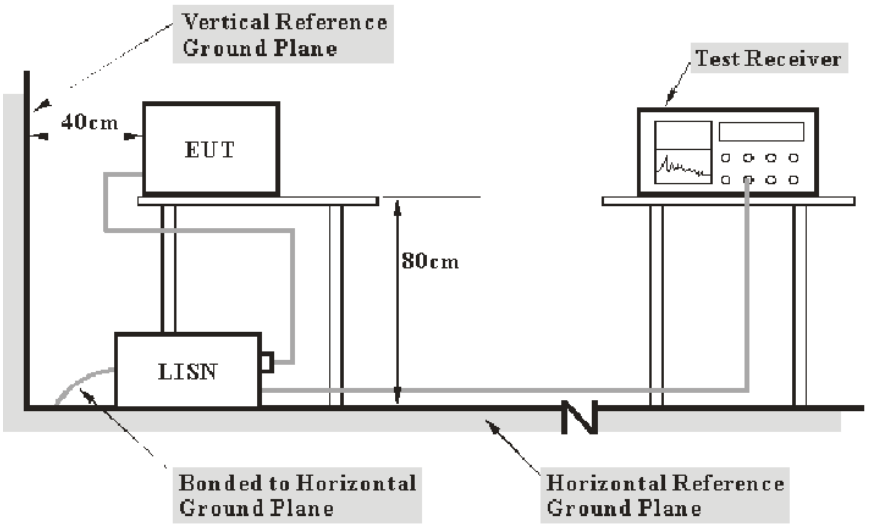
Result: Compliance.

FCC §15.207 (a) & RSS-Gen CLAUSE 8.8– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a) and RSS-Gen§8.8.

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 and RSS-Gen limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC 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 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
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05
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 Data

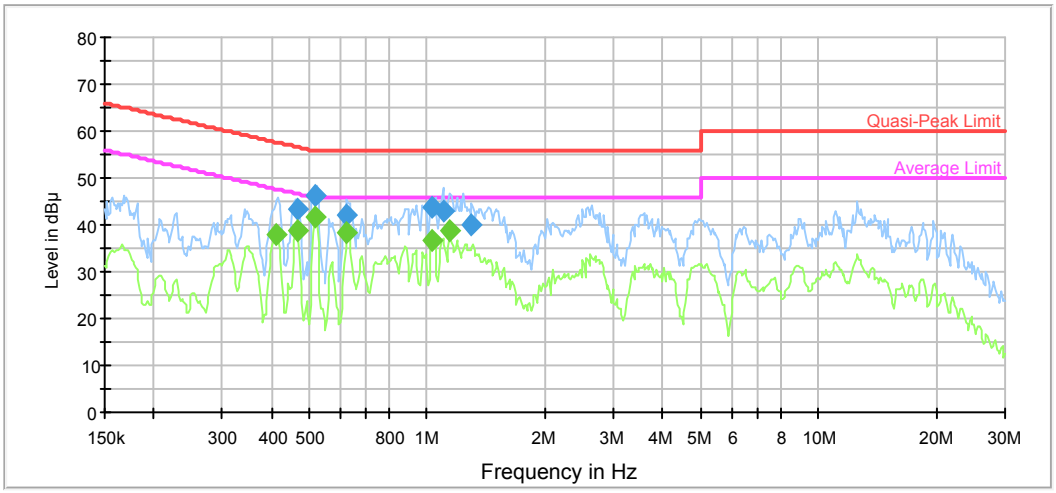
Environmental Conditions

Temperature:	27.5 °C
Relative Humidity:	57 %
ATM Pressure:	101.7 kPa

The testing was performed by Sider Huang on 2018-04-25.

Test Mode: Transmitting

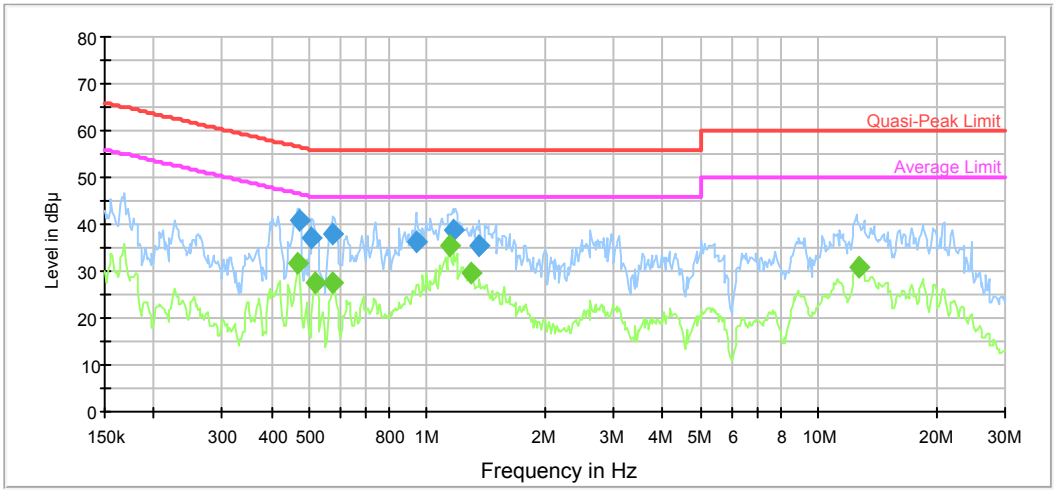
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.465037	43.3	9.000	L1	9.9	13.3	56.6	Compliance
0.515791	46.3	9.000	L1	9.9	9.7	56.0	Compliance
0.624492	42.0	9.000	L1	9.8	14.0	56.0	Compliance
1.031669	43.9	9.000	L1	9.8	12.1	56.0	Compliance
1.099574	43.1	9.000	L1	9.8	12.9	56.0	Compliance
1.299858	40.1	9.000	L1	9.8	15.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.412647	37.9	9.000	L1	10.0	9.7	47.6	Compliance
0.465037	38.9	9.000	L1	9.9	7.7	46.6	Compliance
0.519918	41.7	9.000	L1	9.9	4.3	46.0	Compliance
0.624492	38.5	9.000	L1	9.8	7.5	46.0	Compliance
1.031669	36.6	9.000	L1	9.8	9.4	46.0	Compliance
1.144267	38.8	9.000	L1	9.8	7.2	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.472507	40.8	9.000	N	9.9	15.7	56.5	Compliance
0.507637	36.9	9.000	N	9.9	19.1	56.0	Compliance
0.576662	37.9	9.000	N	9.8	18.1	56.0	Compliance
0.937592	36.3	9.000	N	9.8	19.7	56.0	Compliance
1.162648	38.6	9.000	N	9.8	17.4	56.0	Compliance
1.363512	35.5	9.000	N	9.7	20.5	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.468757	31.9	9.000	N	9.9	14.6	46.5	Compliance
0.519918	27.5	9.000	N	9.9	18.5	46.0	Compliance
0.576662	27.3	9.000	N	9.8	18.7	46.0	Compliance
1.144267	35.3	9.000	N	9.8	10.7	46.0	Compliance
1.289541	29.5	9.000	N	9.8	16.5	46.0	Compliance
12.694276	30.7	9.000	N	9.9	19.3	50.0	Compliance

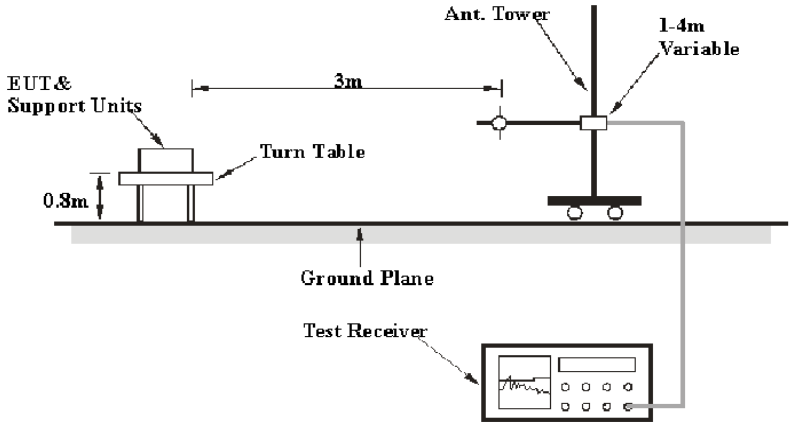
FCC §15.209, §15.205 & §15.247(d) &RSS-247 CLAUSE 5.5, RSS-GEN CLAUSE 8.10- SPURIOUS EMISSIONS

Applicable Standard

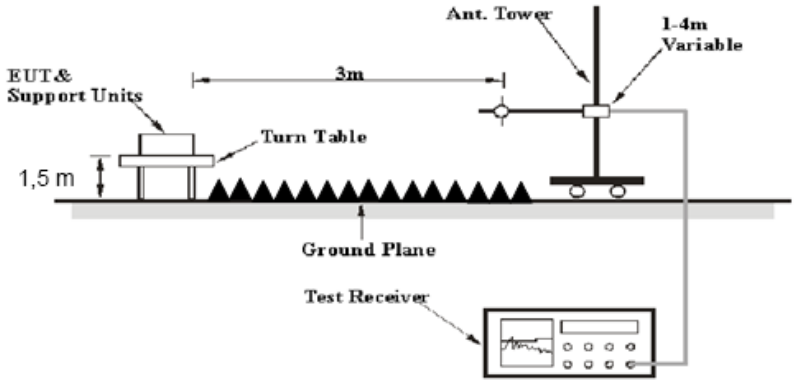
FCC §15.247 (d); §15.209; §15.205 and RSS-247 §5.5, RSS-GEN §8.10.

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits and RSS-247 §5.5,RSS-Gen §8.10 limits..

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
AV	>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	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2017-12-08	2018-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	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 Data

Environmental Conditions

Temperature:	21.8~21.9 °C
Relative Humidity:	34~52 %
ATM Pressure:	100.6~101.1 kPa

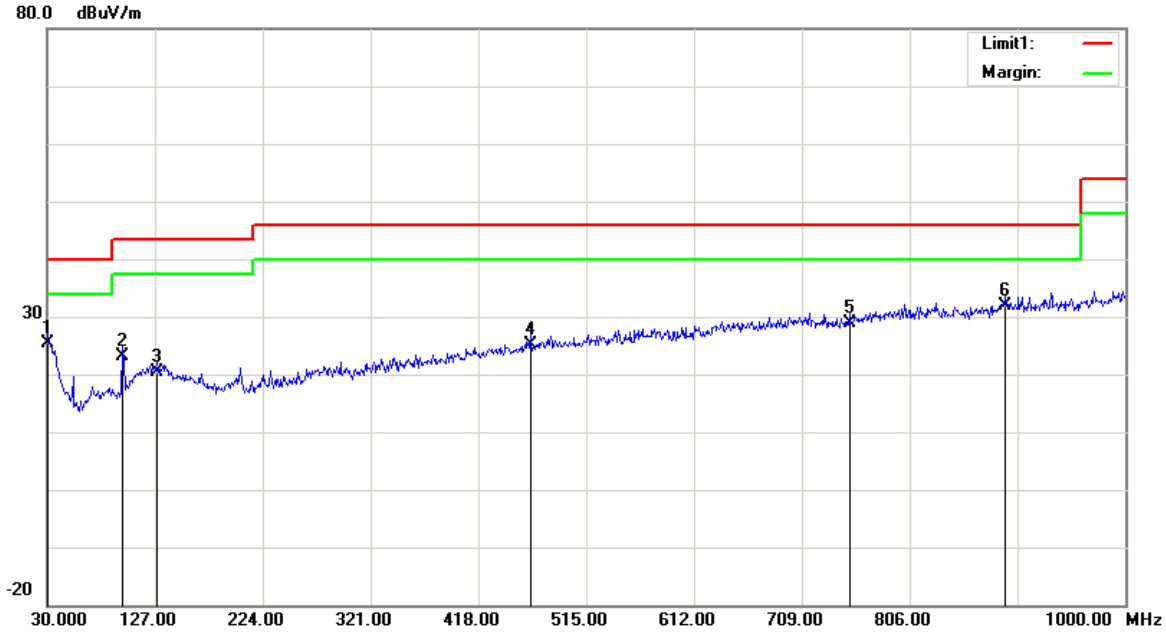
** The testing was performed by Sunny Cen and Blake Yang on 2018-03-13 & 2018-03-19.*

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

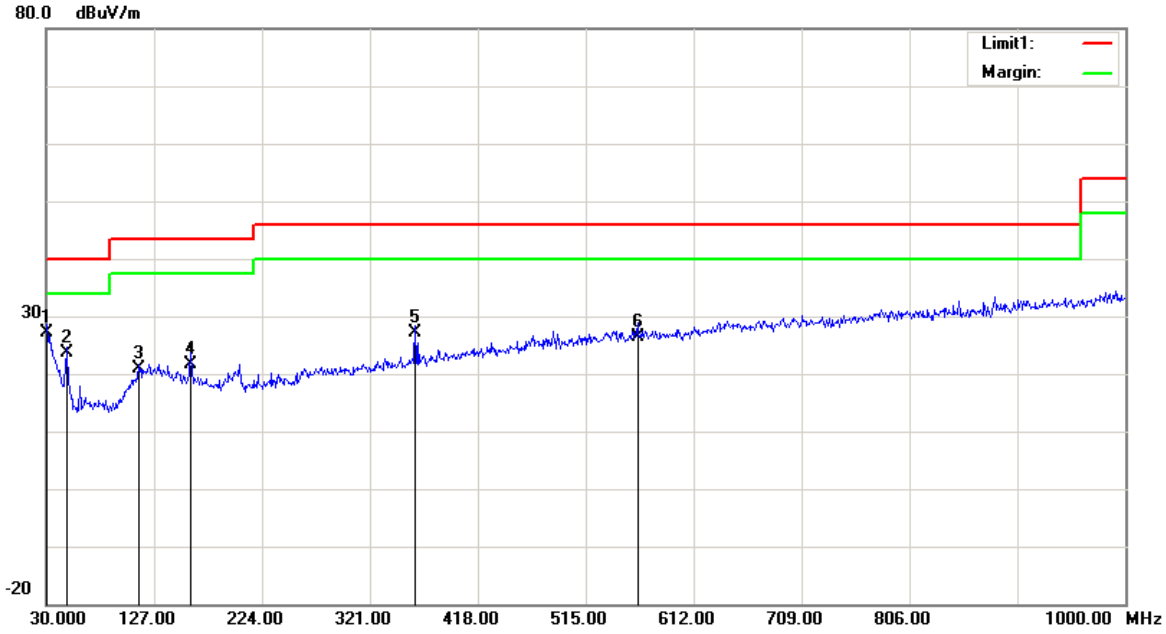
1) 30MHz-1GHz (Wifi 802.11b mode Low channel was the worst)**:**

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	23.76	QP	1.54	25.30	40.00	14.70
97.9000	32.72	QP	-9.62	23.10	43.50	20.40
128.9400	25.20	QP	-4.90	20.30	43.50	23.20
464.5600	25.86	QP	-0.66	25.20	46.00	20.80
751.6800	25.23	QP	3.67	28.90	46.00	17.10
892.3300	25.88	QP	5.92	31.80	46.00	14.20

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	25.56	QP	1.54	27.10	40.00	12.90
48.4300	34.50	QP	-10.80	23.70	40.00	16.30
113.4200	26.52	QP	-5.72	20.80	43.50	22.70
159.9800	27.61	QP	-6.01	21.60	43.50	21.90
361.7400	30.02	QP	-2.82	27.20	46.00	18.80
561.5600	25.98	QP	0.52	26.50	46.00	19.50

2) 1-25GHz:

802.11b Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	73.62	PK	H	28.12	1.81	0.00	103.55	N/A	N/A
2412.00	69.64	AV	H	28.12	1.81	0.00	99.57	N/A	N/A
2412.00	75.28	PK	V	28.12	1.81	0.00	105.21	N/A	N/A
2412.00	71.96	AV	V	28.12	1.81	0.00	101.89	N/A	N/A
2390.00	26.22	PK	V	28.08	1.80	0.00	56.10	74.00	17.90
2390.00	14.61	AV	V	28.08	1.80	0.00	44.49	54.00	9.51
4824.00	47.62	PK	V	32.95	3.19	37.20	46.56	74.00	27.44
4824.00	42.51	AV	V	32.95	3.19	37.20	41.45	54.00	12.55
7236.00	45.36	PK	V	35.81	4.77	37.27	48.67	74.00	25.33
7236.00	41.22	AV	V	35.81	4.77	37.27	44.53	54.00	9.47
Middle Channel: 2437 MHz									
2437.00	73.35	PK	H	28.17	1.82	0.00	103.34	N/A	N/A
2437.00	69.34	AV	H	28.17	1.82	0.00	99.33	N/A	N/A
2437.00	74.85	PK	V	28.17	1.82	0.00	104.84	N/A	N/A
2437.00	71.03	AV	V	28.17	1.82	0.00	101.02	N/A	N/A
4874.00	47.53	PK	V	33.05	3.26	37.21	46.63	74.00	27.37
4874.00	42.75	AV	V	33.05	3.26	37.21	41.85	54.00	12.15
7311.00	45.75	PK	V	36.01	4.64	37.36	49.04	74.00	24.96
7311.00	40.95	AV	V	36.01	4.64	37.36	44.24	54.00	9.76
High Channel: 2462 MHz									
2462.00	74.41	PK	H	28.22	1.83	0.00	104.46	N/A	N/A
2462.00	70.64	AV	H	28.22	1.83	0.00	100.69	N/A	N/A
2462.00	75.20	PK	V	28.22	1.83	0.00	105.25	N/A	N/A
2462.00	70.25	AV	V	28.22	1.83	0.00	100.30	N/A	N/A
2483.50	26.07	PK	V	28.27	1.84	0.00	56.18	74.00	17.82
2483.50	15.34	AV	V	28.27	1.84	0.00	45.45	54.00	8.55
4924.00	48.52	PK	V	33.15	3.27	37.22	47.72	74.00	26.28
4924.00	43.64	AV	V	33.15	3.27	37.22	42.84	54.00	11.16
7386.00	46.77	PK	V	36.20	4.51	37.46	50.02	74.00	23.98
7386.00	41.27	AV	V	36.20	4.51	37.46	44.52	54.00	9.48

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	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	76.20	PK	H	28.12	1.81	0.00	106.13	N/A	N/A
2412.00	66.34	AV	H	28.12	1.81	0.00	96.27	N/A	N/A
2412.00	77.93	PK	V	28.12	1.81	0.00	107.86	N/A	N/A
2412.00	68.43	AV	V	28.12	1.81	0.00	98.36	N/A	N/A
2390.00	38.34	PK	V	28.08	1.80	0.00	68.22	74.00	5.78
2390.00	21.06	AV	V	28.08	1.80	0.00	50.94	54.00	3.06
4824.00	47.82	PK	V	32.95	3.19	37.20	46.76	74.00	27.24
4824.00	37.56	AV	V	32.95	3.19	37.20	36.50	54.00	17.50
7236.00	46.44	PK	V	35.81	4.77	37.27	49.75	74.00	24.25
7236.00	36.31	AV	V	35.81	4.77	37.27	39.62	54.00	14.38
Middle Channel: 2437 MHz									
2437.00	75.82	PK	H	28.17	1.82	0.00	105.81	N/A	N/A
2437.00	65.47	AV	H	28.17	1.82	0.00	95.46	N/A	N/A
2437.00	77.48	PK	V	28.17	1.82	0.00	107.47	N/A	N/A
2437.00	67.54	AV	V	28.17	1.82	0.00	97.53	N/A	N/A
4874.00	48.67	PK	V	33.05	3.26	37.21	47.77	74.00	26.23
4874.00	38.61	AV	V	33.05	3.26	37.21	37.71	54.00	16.29
7311.00	45.25	PK	V	36.01	4.64	37.36	48.54	74.00	25.46
7311.00	35.74	AV	V	36.01	4.64	37.36	39.03	54.00	14.97
High Channel: 2462 MHz									
2462.00	76.73	PK	H	28.22	1.83	0.00	106.78	N/A	N/A
2462.00	66.54	AV	H	28.22	1.83	0.00	96.59	N/A	N/A
2462.00	78.01	PK	V	28.22	1.83	0.00	108.06	N/A	N/A
2462.00	68.55	AV	V	28.22	1.83	0.00	98.60	N/A	N/A
2483.50	40.84	PK	V	28.27	1.84	0.00	70.95	74.00	3.05
2483.50	17.63	AV	V	28.27	1.84	0.00	47.74	54.00	6.26
4924.00	45.25	PK	V	33.15	3.27	37.22	44.45	74.00	29.55
4924.00	35.22	AV	V	33.15	3.27	37.22	34.42	54.00	19.58
7386.00	43.72	PK	V	36.20	4.51	37.46	46.97	74.00	27.03
7386.00	33.54	AV	V	36.20	4.51	37.46	36.79	54.00	17.21

802.11n 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	Polar (H/V)	Factor (dB/m)					
Low Channel: 2412 MHz									
2412.00	76.32	PK	H	28.12	1.81	0.00	106.25	N/A	N/A
2412.00	66.14	AV	H	28.12	1.81	0.00	96.07	N/A	N/A
2412.00	75.82	PK	V	28.12	1.81	0.00	105.75	N/A	N/A
2412.00	65.33	AV	V	28.12	1.81	0.00	95.26	N/A	N/A
2390.00	41.17	PK	V	28.08	1.80	0.00	71.05	74.00	2.95
2390.00	20.63	AV	V	28.08	1.80	0.00	50.51	54.00	3.49
4824.00	48.87	PK	V	32.95	3.19	37.20	47.81	74.00	26.19
4824.00	38.65	AV	V	32.95	3.19	37.20	37.59	54.00	16.41
7236.00	46.72	PK	V	35.81	4.77	37.27	50.03	74.00	23.97
7236.00	36.35	AV	V	35.81	4.77	37.27	39.66	54.00	14.34
Middle Channel: 2437 MHz									
2437.00	76.64	PK	H	28.17	1.82	0.00	106.63	N/A	N/A
2437.00	66.37	AV	H	28.17	1.82	0.00	96.36	N/A	N/A
2437.00	78.42	PK	V	28.17	1.82	0.00	108.41	N/A	N/A
2437.00	68.65	AV	V	28.17	1.82	0.00	98.64	N/A	N/A
4874.00	46.50	PK	V	33.05	3.26	37.21	45.60	74.00	28.40
4874.00	36.57	AV	V	33.05	3.26	37.21	35.67	54.00	18.33
7311.00	47.22	PK	V	36.01	4.64	37.36	50.51	74.00	23.49
7311.00	36.85	AV	V	36.01	4.64	37.36	40.14	54.00	13.86
High Channel: 2462 MHz									
2462.00	75.66	PK	H	28.22	1.83	0.00	105.71	N/A	N/A
2462.00	64.78	AV	H	28.22	1.83	0.00	94.83	N/A	N/A
2462.00	76.70	PK	V	28.22	1.83	0.00	106.75	N/A	N/A
2462.00	66.01	AV	V	28.22	1.83	0.00	96.06	N/A	N/A
2483.50	40.25	PK	V	28.27	1.84	0.00	70.36	74.00	3.64
2483.50	19.31	AV	V	28.27	1.84	0.00	49.42	54.00	4.58
4924.00	48.75	PK	V	33.15	3.27	37.22	47.95	74.00	26.05
4924.00	38.88	AV	V	33.15	3.27	37.22	38.08	54.00	15.92
7386.00	45.72	PK	V	36.20	4.51	37.46	48.97	74.00	25.03
7386.00	35.57	AV	V	36.20	4.51	37.46	38.82	54.00	15.18

802.11n ht40 Mode:

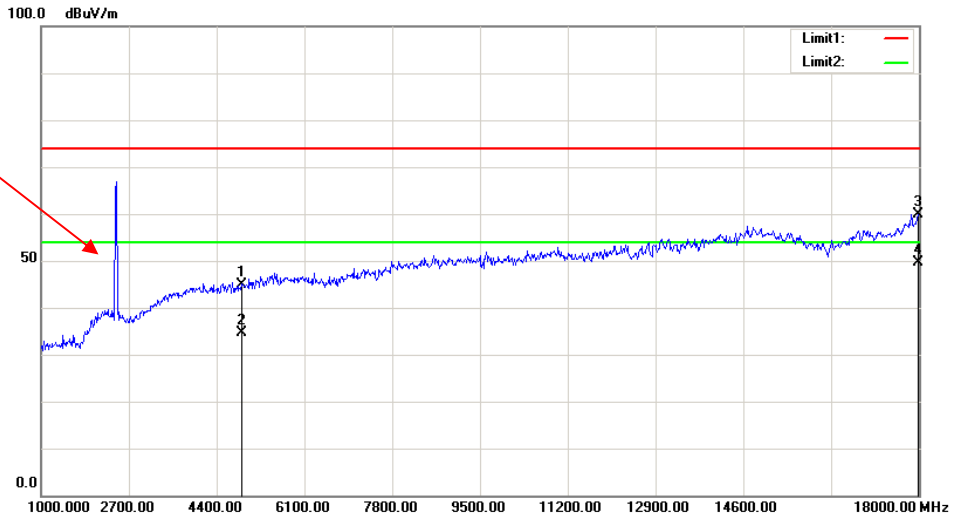
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)					
Low Channel: 2422 MHz									
2422.00	68.47	PK	H	28.14	1.81	0.00	98.42	N/A	N/A
2422.00	58.34	AV	H	28.14	1.81	0.00	88.29	N/A	N/A
2422.00	71.71	PK	V	28.14	1.81	0.00	101.66	N/A	N/A
2422.00	61.98	AV	V	28.14	1.81	0.00	91.93	N/A	N/A
2390.00	40.95	PK	V	28.08	1.80	0.00	70.83	74.00	3.17
2390.00	20.53	AV	V	28.08	1.80	0.00	50.41	54.00	3.59
4844.00	46.55	PK	V	32.99	3.22	37.20	45.56	74.00	28.44
4844.00	36.34	AV	V	32.99	3.22	37.20	35.35	54.00	18.65
7266.00	47.52	PK	V	35.89	4.72	37.31	50.82	74.00	23.18
7266.00	36.84	AV	V	35.89	4.72	37.31	40.14	54.00	13.86
Middle Channel: 2437 MHz									
2437.00	70.46	PK	H	28.17	1.82	0.00	100.45	N/A	N/A
2437.00	60.44	AV	H	28.17	1.82	0.00	90.43	N/A	N/A
2437.00	73.33	PK	V	28.17	1.82	0.00	103.32	N/A	N/A
2437.00	62.84	AV	V	28.17	1.82	0.00	92.83	N/A	N/A
4874.00	48.74	PK	V	33.05	3.26	37.21	47.84	74.00	26.16
4874.00	38.69	AV	V	33.05	3.26	37.21	37.79	54.00	16.21
7311.00	47.57	PK	V	36.01	4.64	37.36	50.86	74.00	23.14
7311.00	37.55	AV	V	36.01	4.64	37.36	40.84	54.00	13.16
High Channel: 2452 MHz									
2452.00	69.32	PK	H	28.20	1.83	0.00	99.35	N/A	N/A
2452.00	59.87	AV	H	28.20	1.83	0.00	89.90	N/A	N/A
2452.00	74.04	PK	V	28.20	1.83	0.00	104.07	N/A	N/A
2452.00	64.35	AV	V	28.20	1.83	0.00	94.38	N/A	N/A
2483.50	41.11	PK	V	28.27	1.84	0.00	71.22	74.00	2.78
2483.50	18.10	AV	V	28.27	1.84	0.00	48.21	54.00	5.79
4904.00	48.75	PK	V	33.11	3.30	37.21	47.95	74.00	26.05
4904.00	37.82	AV	V	33.11	3.30	37.21	37.02	54.00	16.98
7356.00	46.11	PK	V	36.13	4.56	37.42	49.38	74.00	24.62
7356.00	36.54	AV	V	36.13	4.56	37.42	39.81	54.00	14.19

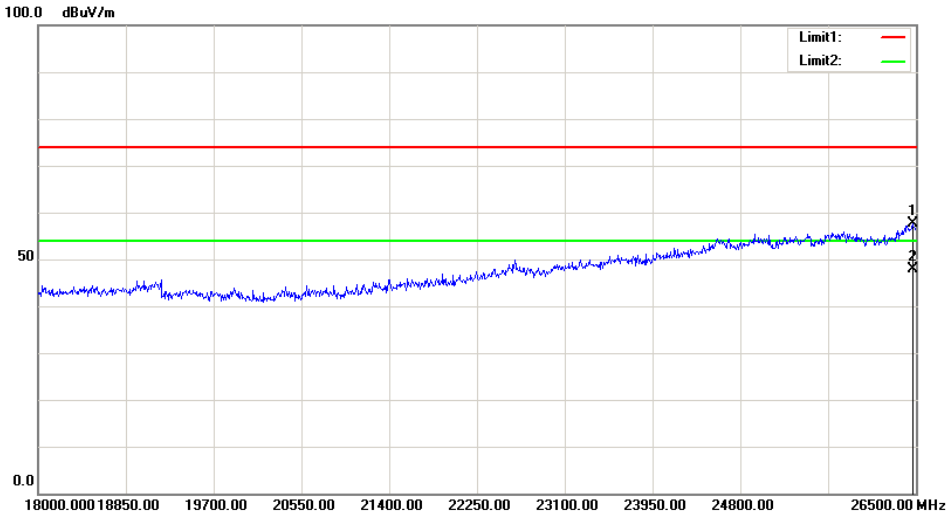
BLE Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	62.07	PK	H	28.10	1.80	0.00	91.97	N/A	N/A
2402.00	56.71	AV	H	28.10	1.80	0.00	86.61	N/A	N/A
2402.00	64.74	PK	V	28.10	1.80	0.00	94.64	N/A	N/A
2402.00	60.94	AV	V	28.10	1.80	0.00	90.84	N/A	N/A
2390.00	24.48	PK	V	28.08	1.80	0.00	54.36	74.00	19.64
2390.00	14.45	AV	V	28.08	1.80	0.00	44.33	54.00	9.67
4804.00	47.02	PK	V	32.91	3.17	37.20	45.90	74.00	28.10
4804.00	43.01	AV	V	32.91	3.17	37.20	41.89	54.00	12.11
7206.00	44.80	PK	V	35.74	4.82	37.23	48.13	74.00	25.87
7206.00	39.42	AV	V	35.74	4.82	37.23	42.75	54.00	11.25
Middle Channel: 2440 MHz									
2440.00	61.64	PK	H	28.18	1.82	0.00	91.64	N/A	N/A
2440.00	54.34	AV	H	28.18	1.82	0.00	84.34	N/A	N/A
2440.00	64.13	PK	V	28.18	1.82	0.00	94.13	N/A	N/A
2440.00	60.64	AV	V	28.18	1.82	0.00	90.64	N/A	N/A
4880.00	49.24	PK	V	33.06	3.27	37.21	48.36	74.00	25.64
4880.00	44.72	AV	V	33.06	3.27	37.21	43.84	54.00	10.16
7320.00	45.97	PK	V	36.03	4.62	37.37	49.25	74.00	24.75
7320.00	40.01	AV	V	36.03	4.62	37.37	43.29	54.00	10.71
High Channel: 2480 MHz									
2480.00	60.33	PK	H	28.26	1.84	0.00	90.43	N/A	N/A
2480.00	55.62	AV	H	28.26	1.84	0.00	85.72	N/A	N/A
2480.00	64.97	PK	V	28.26	1.84	0.00	95.07	N/A	N/A
2480.00	59.30	AV	V	28.26	1.84	0.00	89.40	N/A	N/A
2483.50	25.04	PK	V	28.27	1.84	0.00	55.15	74.00	18.85
2483.50	15.65	AV	V	28.27	1.84	0.00	45.76	54.00	8.24
4960.00	47.00	PK	V	33.22	3.23	37.25	46.20	74.00	27.80
4960.00	42.78	AV	V	33.22	3.23	37.25	41.98	54.00	12.02
7440.00	44.45	PK	V	36.34	4.41	37.52	47.68	74.00	26.32
7440.00	39.37	AV	V	36.34	4.41	37.52	42.60	54.00	11.40

Worst plots(802.11b Low channel)
Horizontal

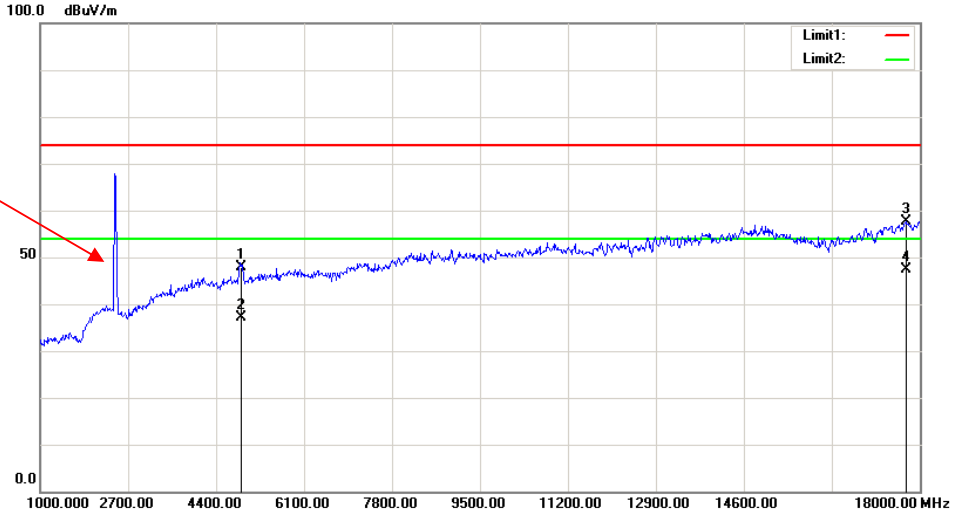
Fundamental Test with Band Rejection Filter

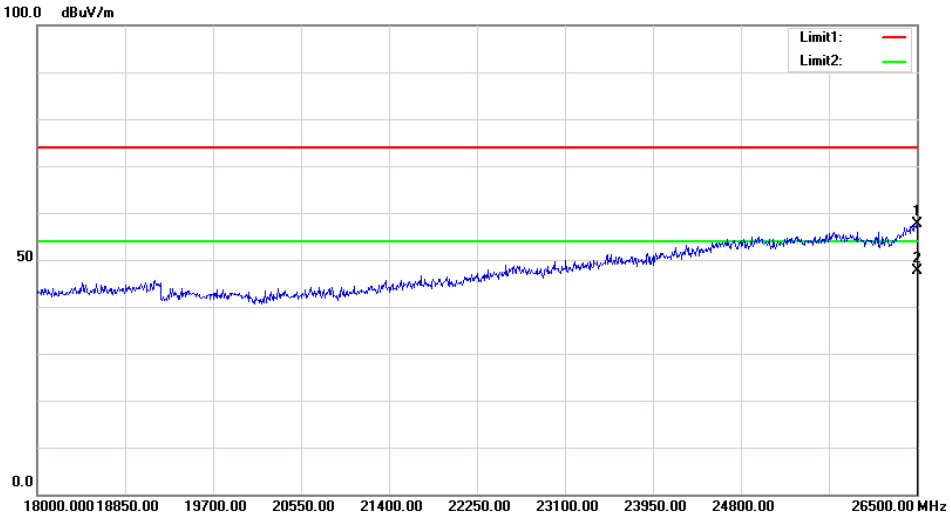




Vertical

Fundamental Test with Band Rejection Filter





FCC §15.247(a) (2)& & RSS-247 CLAUSE 5.2 a) &RSS-247 CLAUSE 5.2 a) &RSS-GEN CLAUSE 6.6–6 dB EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (2)

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.

According to RSS-247 §5.2 a)

The minimum 6 dB bandwidth shall be 500 kHz.

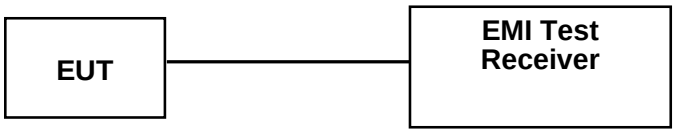
According to RSS-Gen §6.6

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

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	FSP 38	100478	2017-12-08	2018-12-08
Unknow	Coaxial Cable	C-SJ00-0010	C0010/02	Each Time	/

*** 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:	25.9~27 °C
Relative Humidity:	49~53 %
ATM Pressure:	100.7~101.1 kPa

** The testing was performed by Swim Lv from 2018-03-07 to 2018-04-02.*

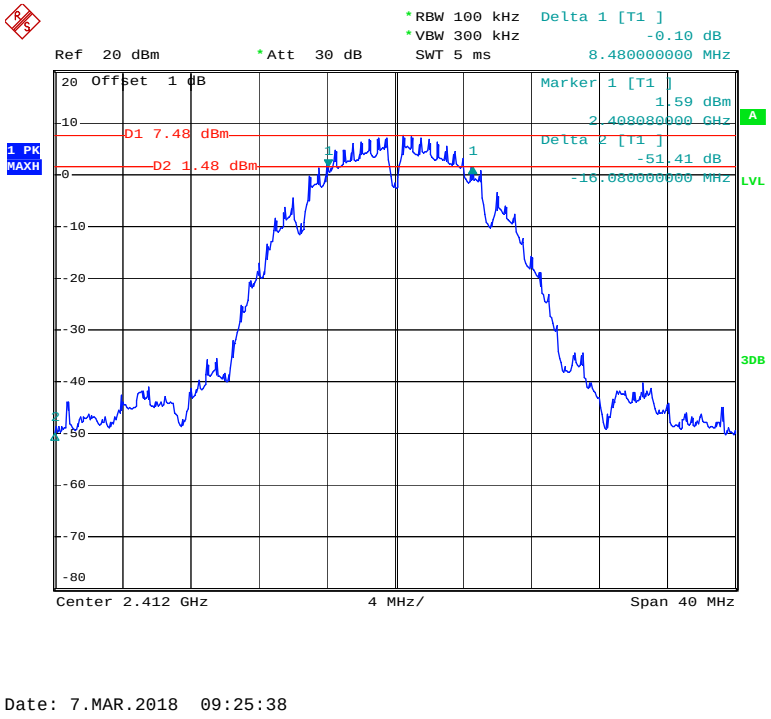
Test Mode: Transmitting

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

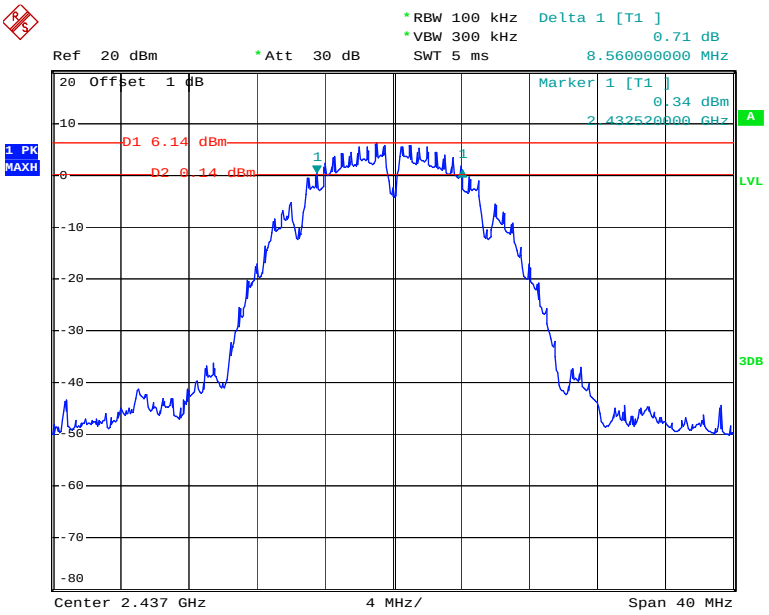
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	8.48	13.04	≥0.5
	Middle	2437	8.56	13.20	≥0.5
	High	2462	8.56	13.20	≥0.5
802.11g	Low	2412	16.24	17.44	≥0.5
	Middle	2437	16.48	17.52	≥0.5
	High	2462	16.48	17.44	≥0.5
802.11n ht20	Low	2412	17.52	18.48	≥0.5
	Middle	2437	17.68	18.48	≥0.5
	High	2462	17.68	18.48	≥0.5
802.11n ht40	Low	2422	35.20	37.12	≥0.5
	Middle	2437	36.00	37.92	≥0.5
	High	2452	35.52	37.28	≥0.5
BLE	Low	2402	0.717	1.062	≥0.5
	Middle	2440	0.721	1.062	≥0.5
	High	2480	0.717	1.062	≥0.5

6 dB Bandwidth:

802.11b Low Channel

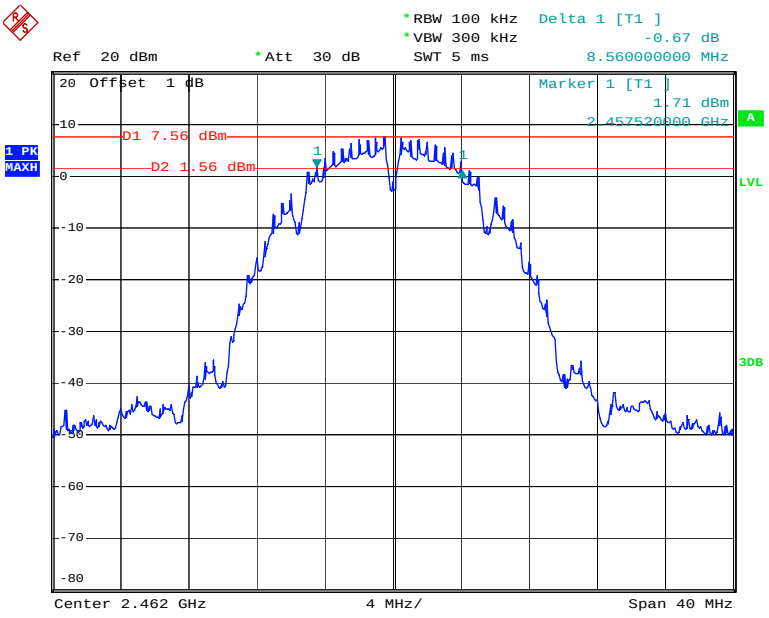


802.11b Middle Channel



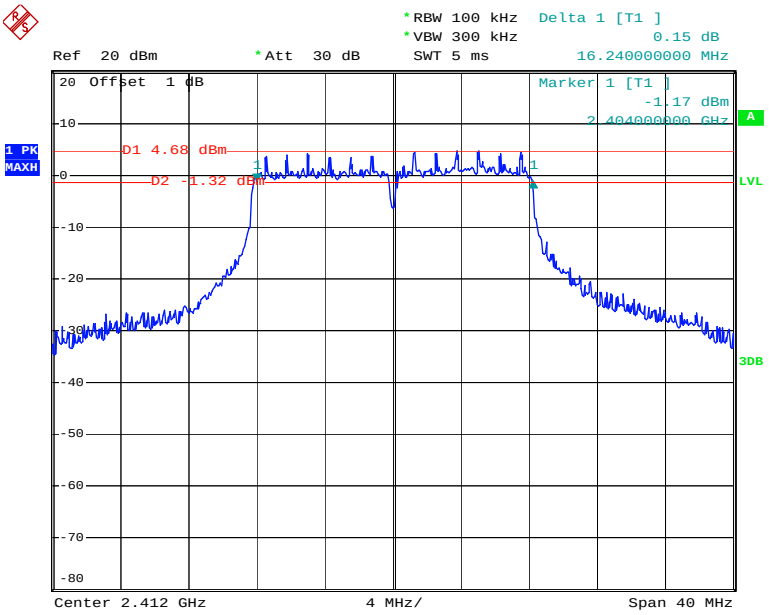
Date: 7.MAR.2018 09:29:19

802.11b High Channel



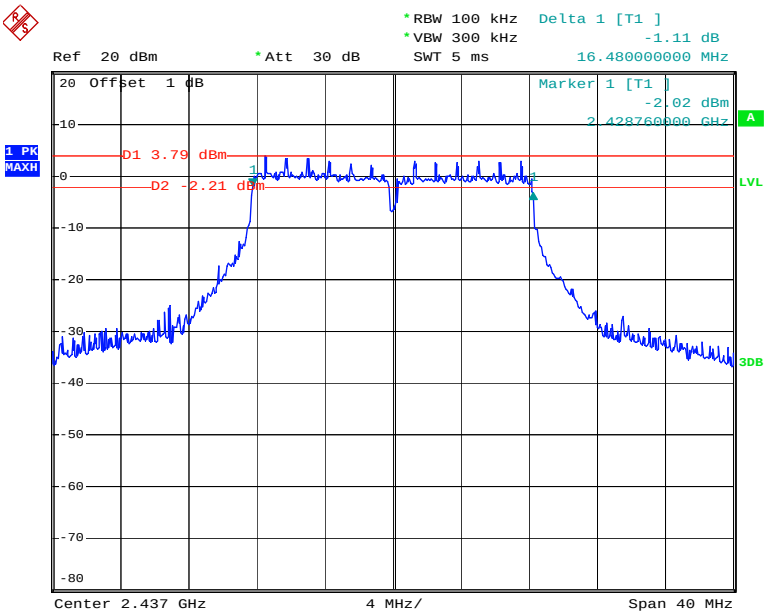
Date: 7.MAR.2018 09:32:50

802.11g Low Channel



Date: 7.MAR.2018 09:42:50

802.11g Middle Channel



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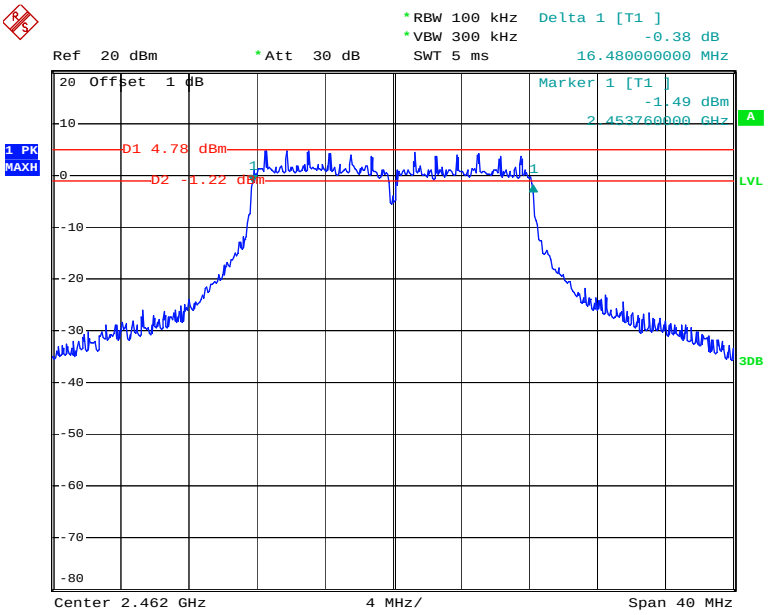
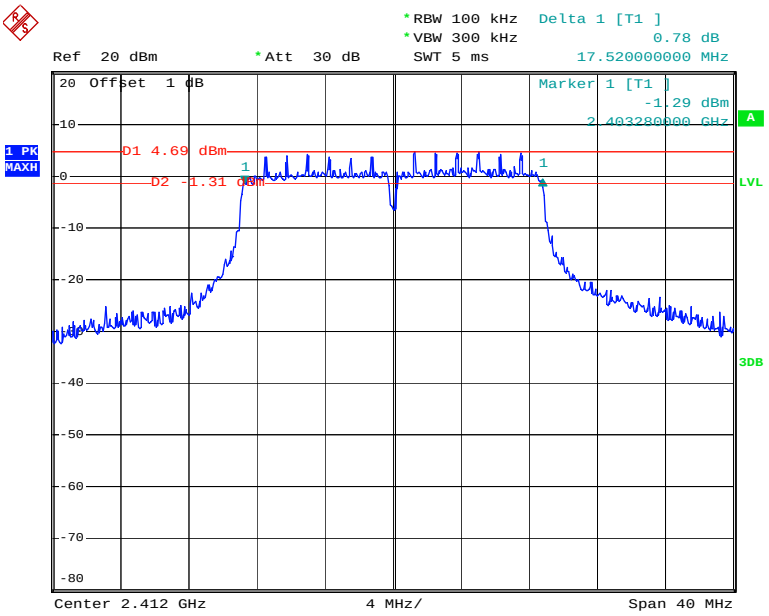
802.11g High Channel



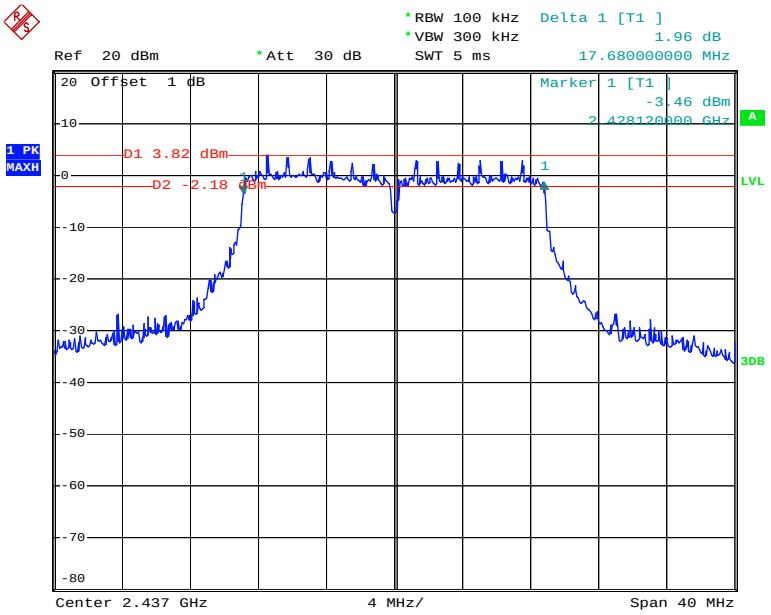
Date: 7.MAR.2018 09:50:00

802.11n ht20 Low Channel



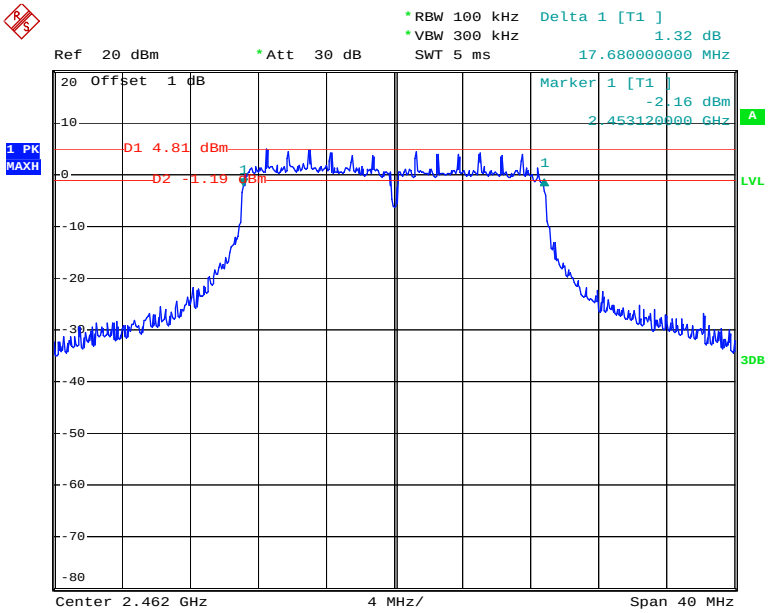
Date: 7.MAR.2018 09:56:07

802.11n ht20 Middle Channel



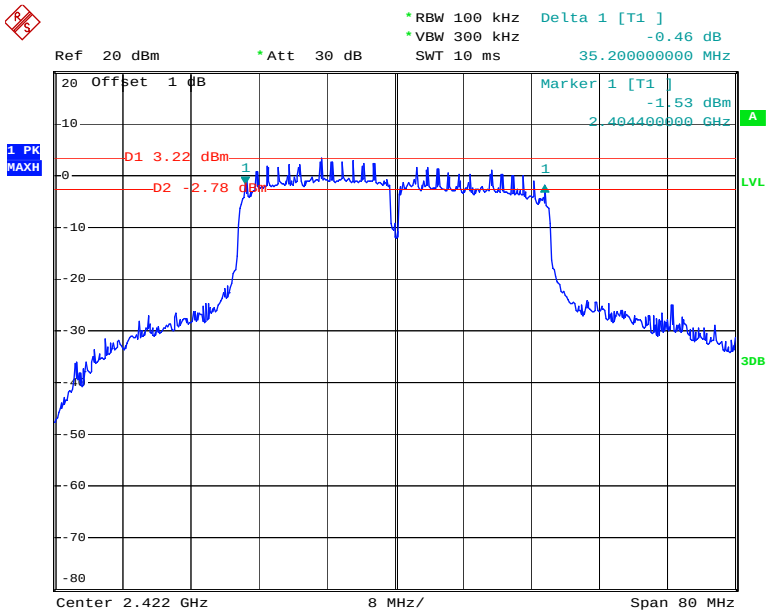
Date: 7.MAR.2018 10:01:38

802.11n ht20 High Channel



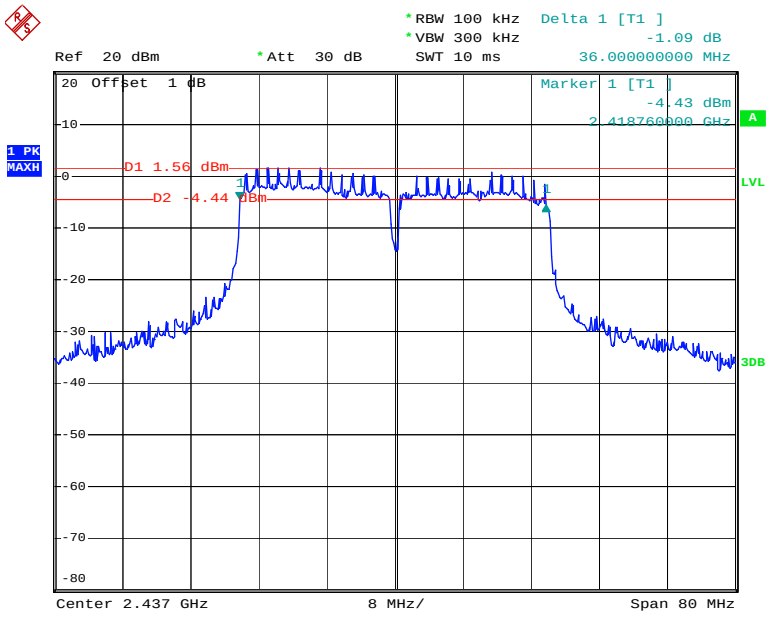
Date: 7.MAR.2018 10:07:00

802.11n ht40 Low Channel



Date: 7.MAR.2018 10:11:55

802.11n ht40 Middle Channel



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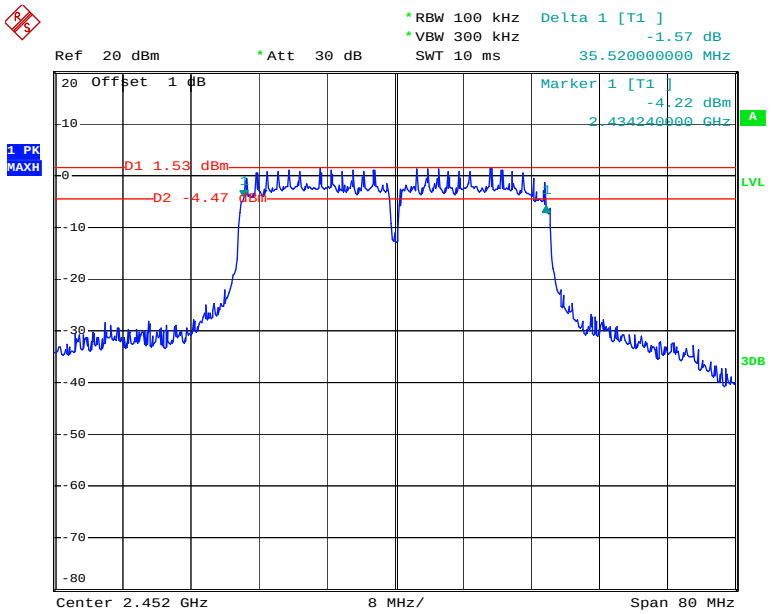
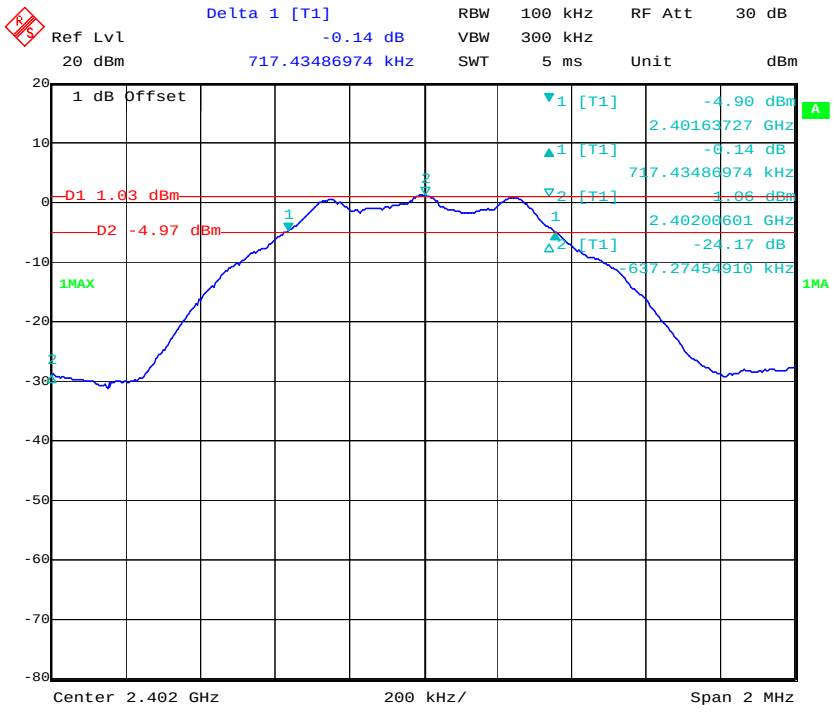
802.11n ht40 High Channel



Date: 7.MAR.2018 10:27:07

BLE Low Channel



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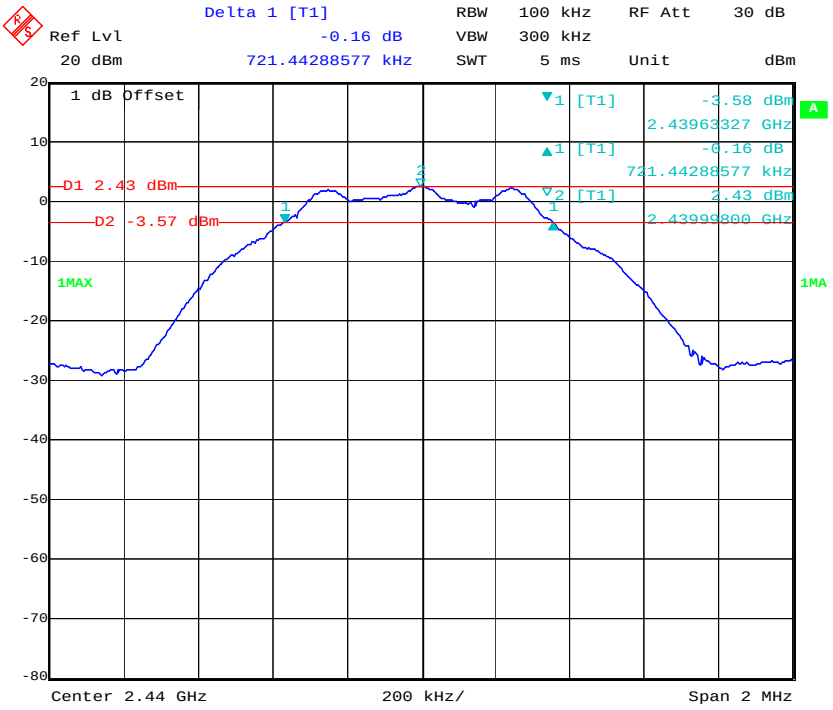
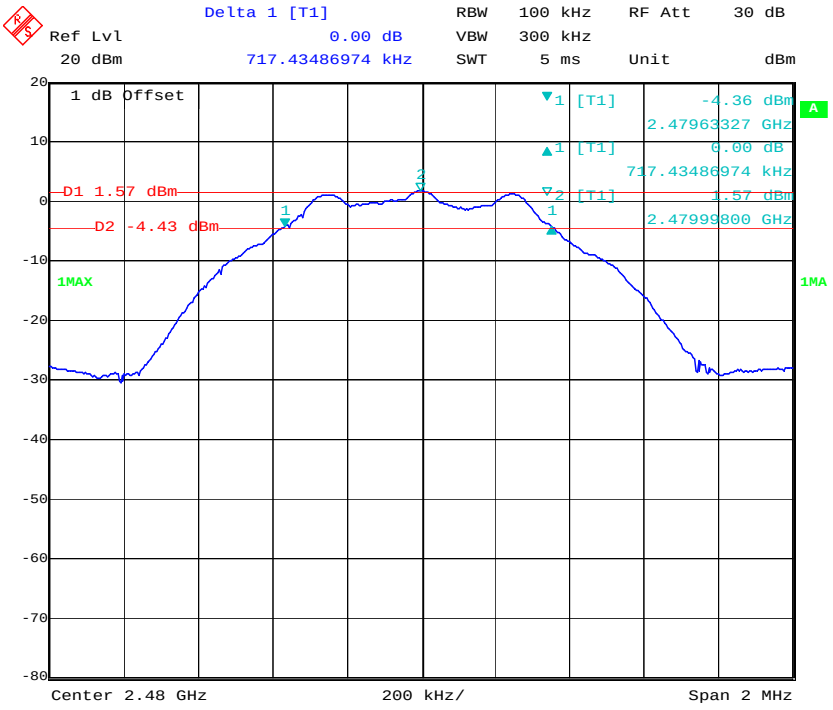
BLE Middle Channel



Date: 22.MAR.2018 15:25:32

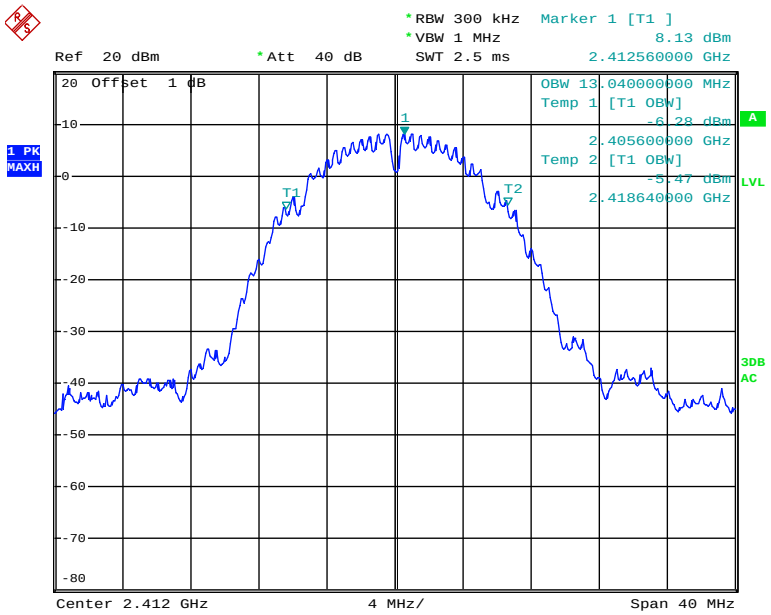
BLE High Channel



Date: 22.MAR.2018 15:27:36

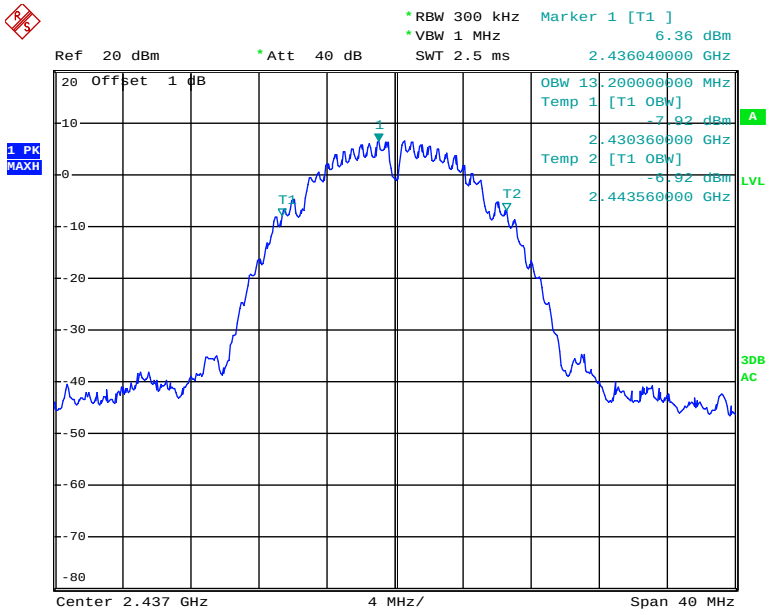
99% Occupied bandwidth:

802.11b Low Channel



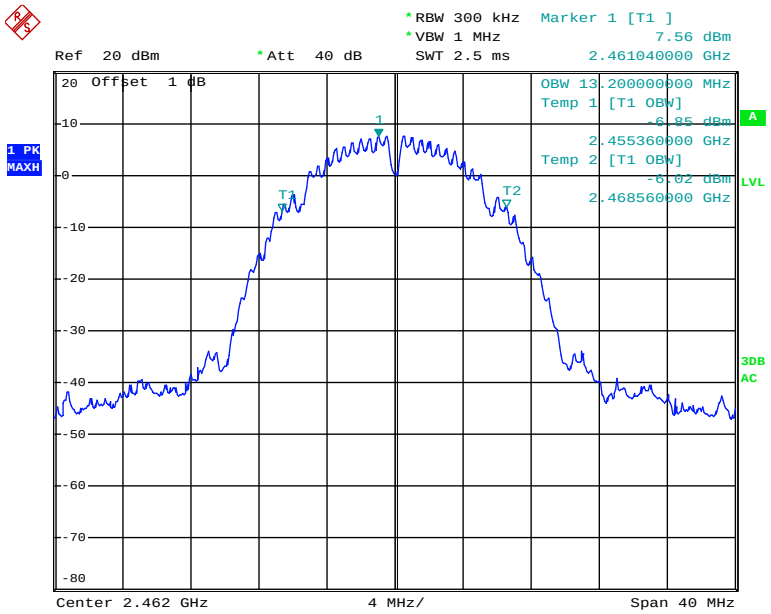
Date: 2.APR.2018 11:58:23

802.11b Middle Channel



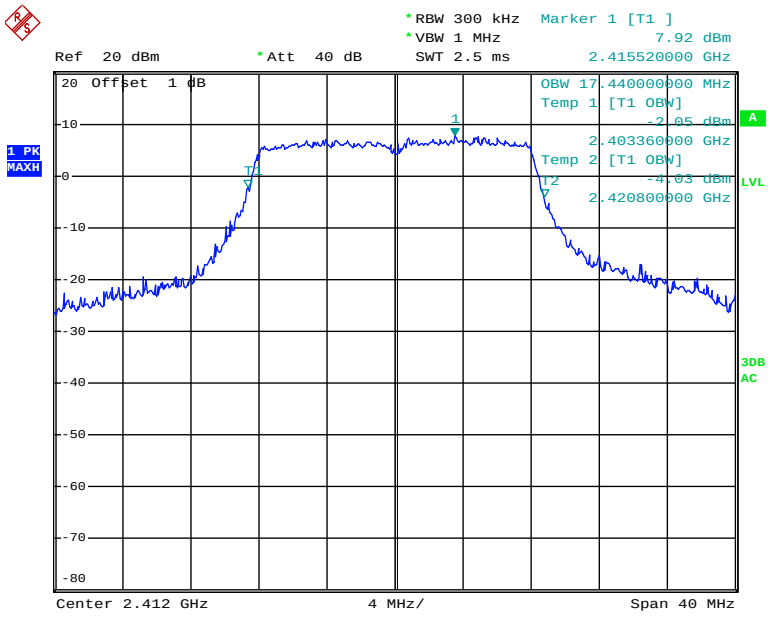
Date: 2.APR.2018 12:01:48

802.11b High Channel



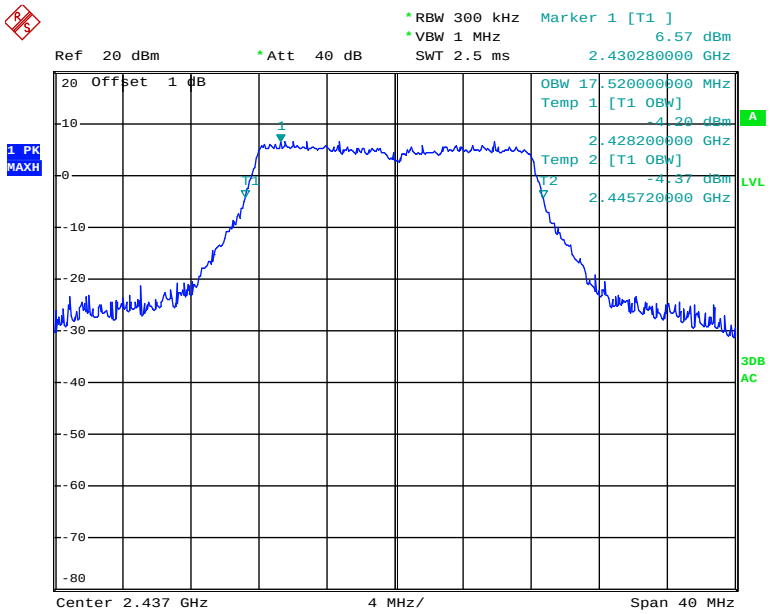
Date: 2.APR.2018 11:59:46

802.11g Low Channel



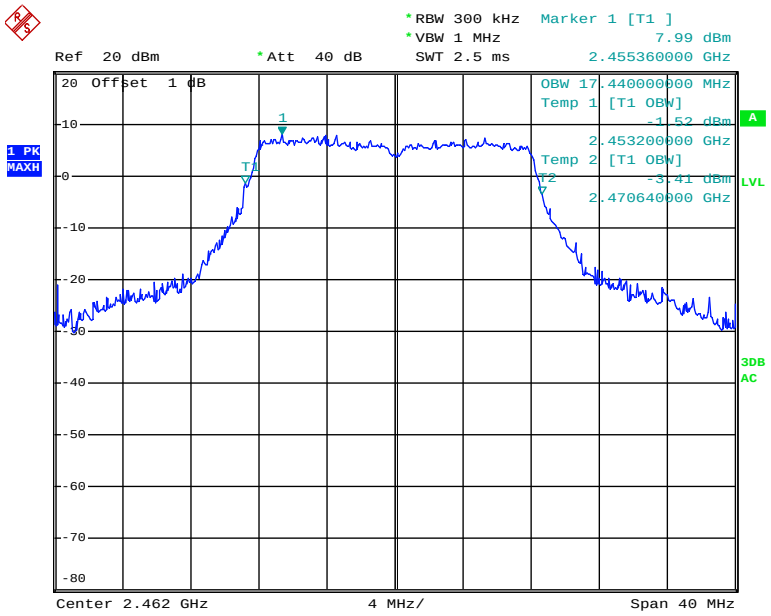
Date: 2.APR.2018 12:01:14

802.11g Middle Channel



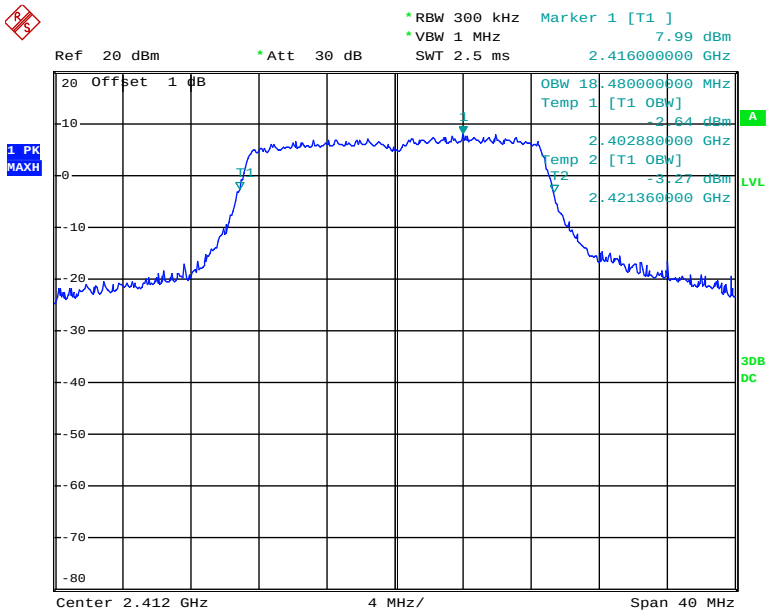
Date: 2.APR.2018 12:00:49

802.11g High Channel



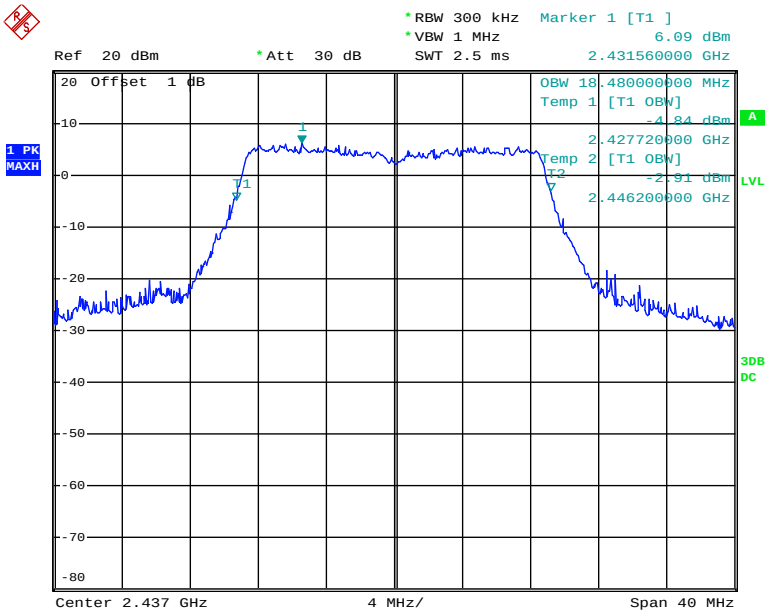
Date: 2.APR.2018 12:00:17

802.11n ht20 Low Channel



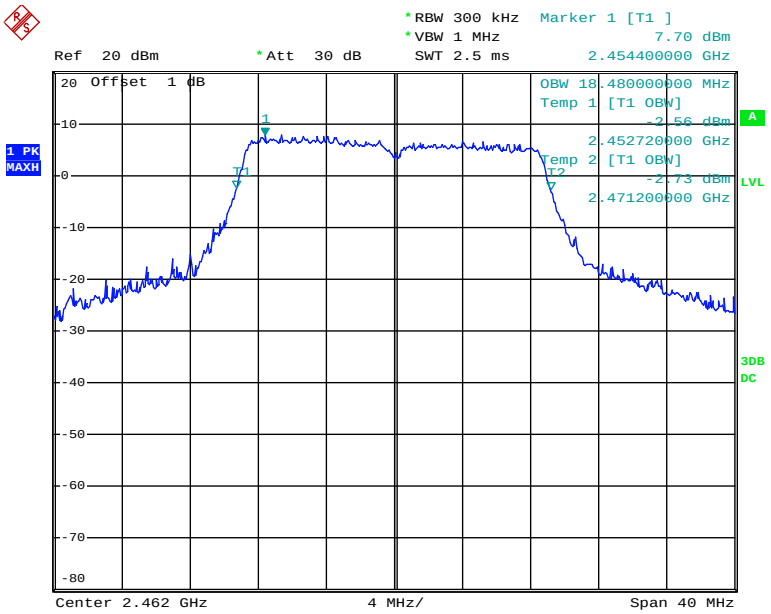
Date: 2.APR.2018 18:14:12

802.11n ht20 Middle Channel



Date: 2.APR.2018 18:14:45

802.11n ht20 High Channel



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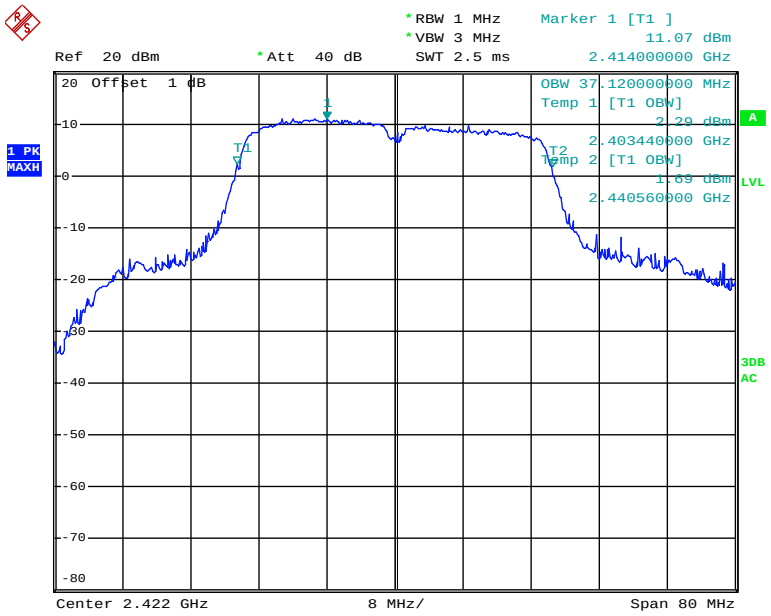
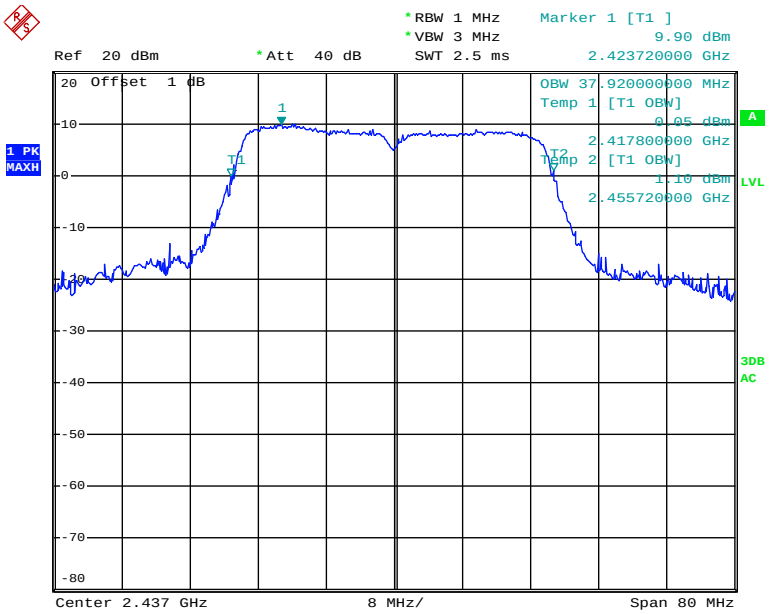
802.11n ht40 Low Channel



Date: 2.APR.2018 12:04:40

802.11n ht40 Middle Channel



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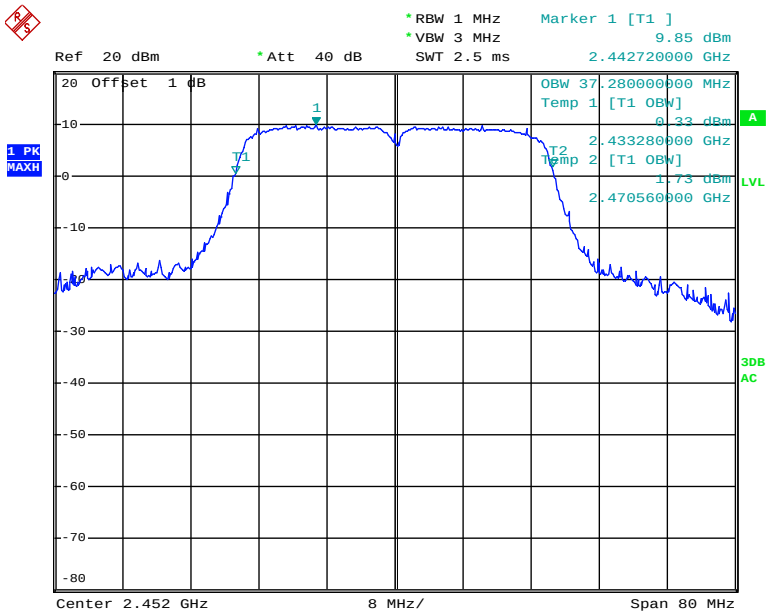
802.11n ht40 High Channel



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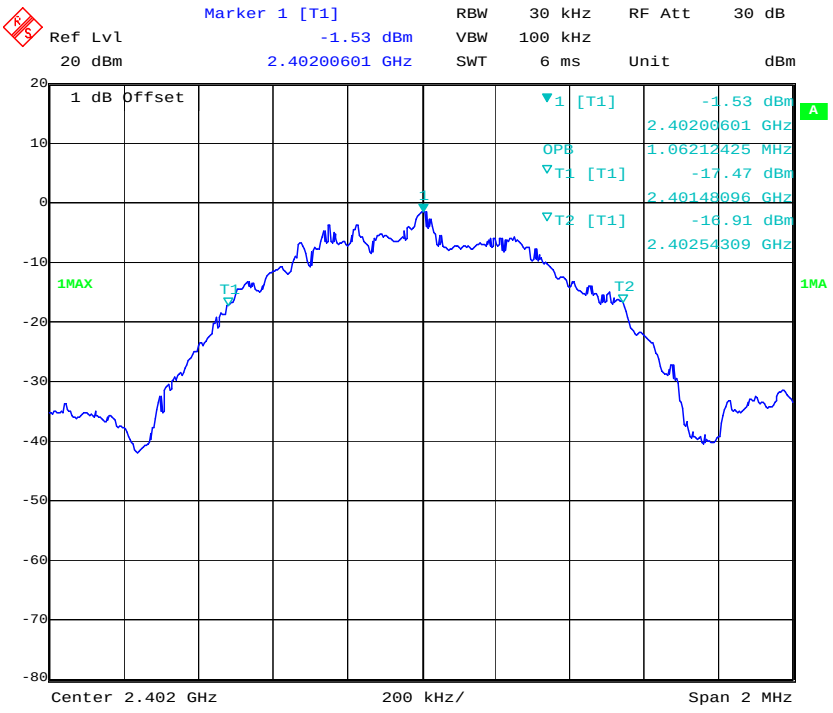
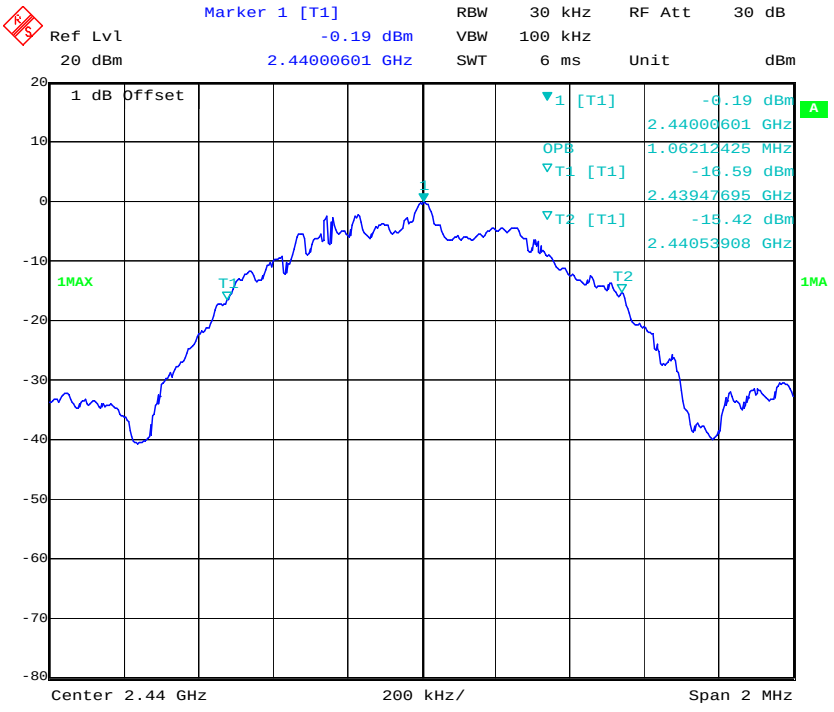
BLE Low Channel



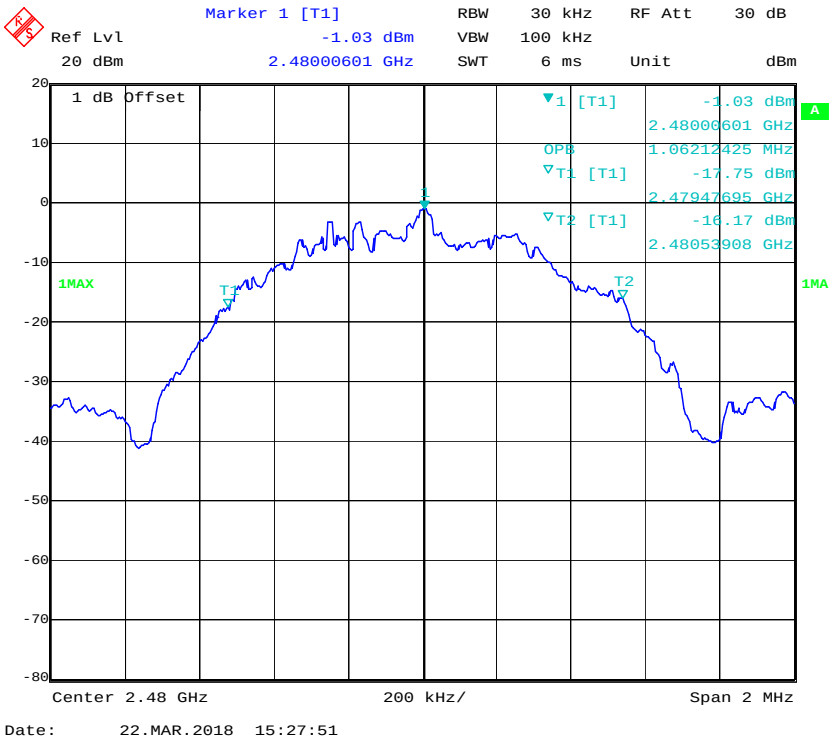
Date: 22.MAR.2018 15:23:12

BLE Middle Channel



Date: 22.MAR.2018 15:25:47

BLE High Channel



FCC §15.247(b) (3) &RSS-247 CLAUSE 5.4 d)- MAXIMUM PEAK CONDUCTED OUTPUT POWER

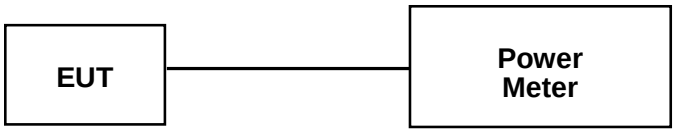
Applicable Standard

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.

According to RSS-247§5.4 d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(e), the e.i.r.p. shall not exceed 4 W.
As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling 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 transmitting at a reduced power level. If multiple modes of operation are implemented, 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.
5. Set the power meter to test average output power, record the result as average 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	/

*** 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:	24.9 °C
Relative Humidity:	38 %
ATM Pressure:	101.2 kPa

** The testing was performed by Swim Lv on 2018-03-22.*

Test Mode: Transmitting

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

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)
802.11b	Low	2412	19.34	16.53	30
	Middle	2437	18.97	16.06	30
	High	2462	19.55	16.59	30
802.11g	Low	2412	21.92	14.34	30
	Middle	2437	22.94	15.9	30
	High	2462	22.7	14.44	30
802.11n20	Low	2412	21.87	14.36	30
	Middle	2437	23.11	15.94	30
	High	2462	22.49	14.43	30
802.11n40	Low	2422	21.3	13.66	30
	Middle	2437	22.57	15.71	30
	High	2452	21.79	13.67	30
BLE	Low	2402	1.29	/	30
	Middle	2440	1.79	/	30
	High	2480	1.79	/	30

FCC §15.247(d) & RSS-247 CLAUSE 5.5– 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)).

According to RSS-247 Clause 5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/02	Each Time	/

*** 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

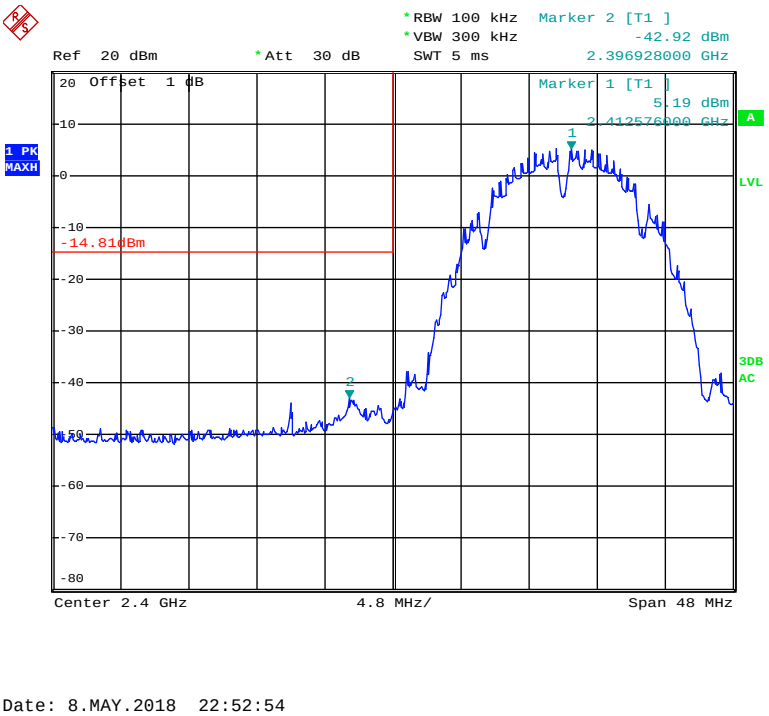
Temperature:	24.9~27.8 °C
Relative Humidity:	38~64 %
ATM Pressure:	100.7~101.2 kPa

** The testing was performed by Swim Lv from 2018-03-22 to2018-07-06.*

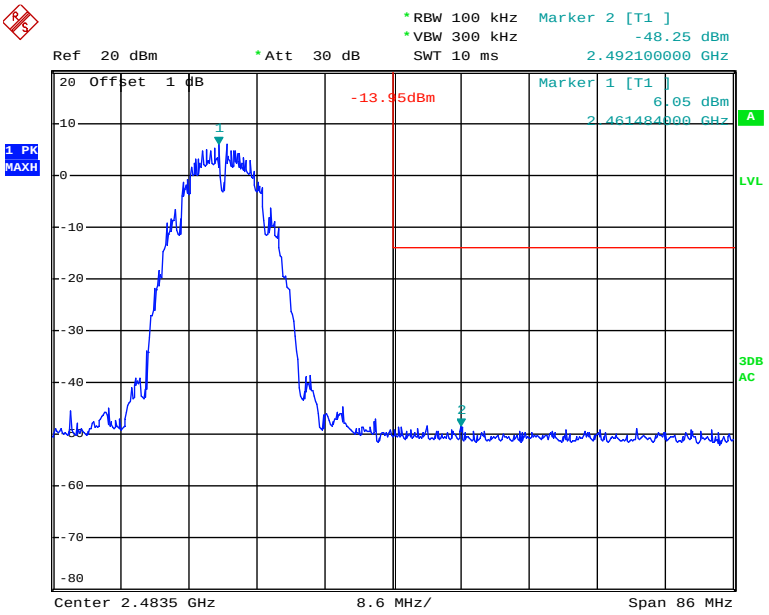
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

802.11b: Band Edge, Left Side

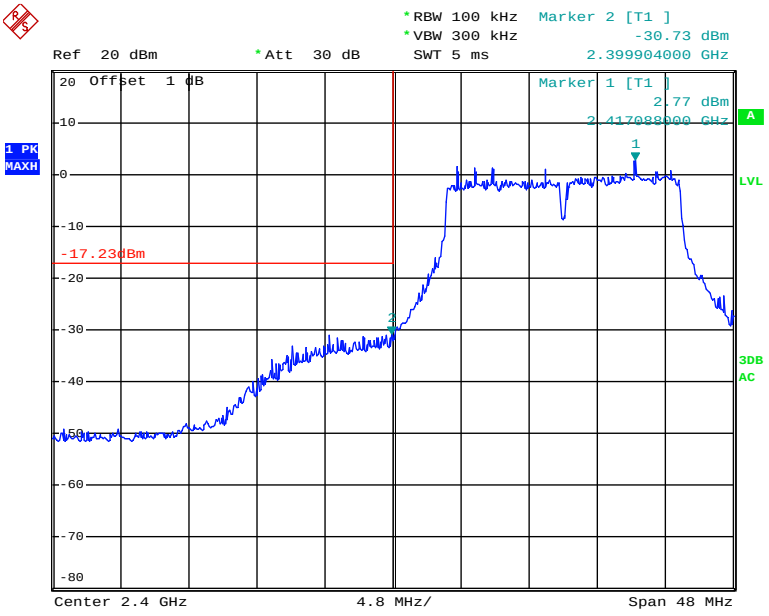


802.11b: Band Edge, Right Side



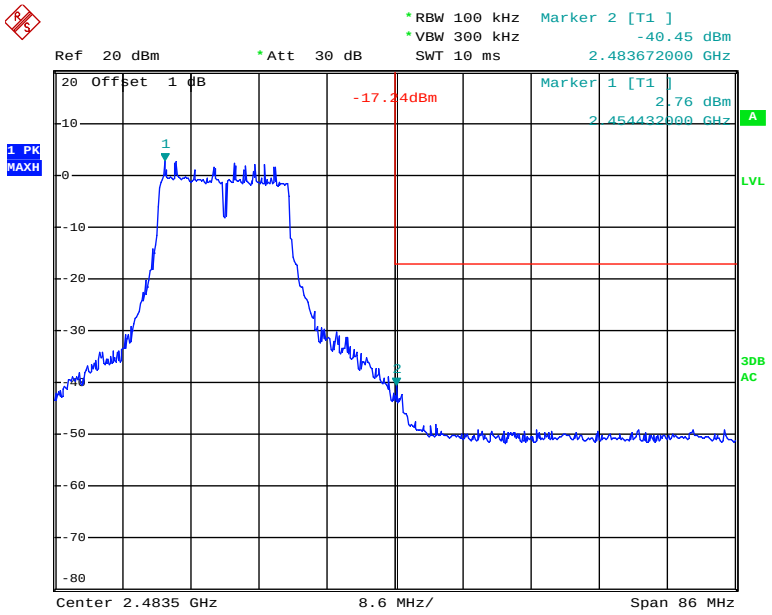
Date: 8.MAY.2018 22:53:36

802.11g: Band Edge, Left Side



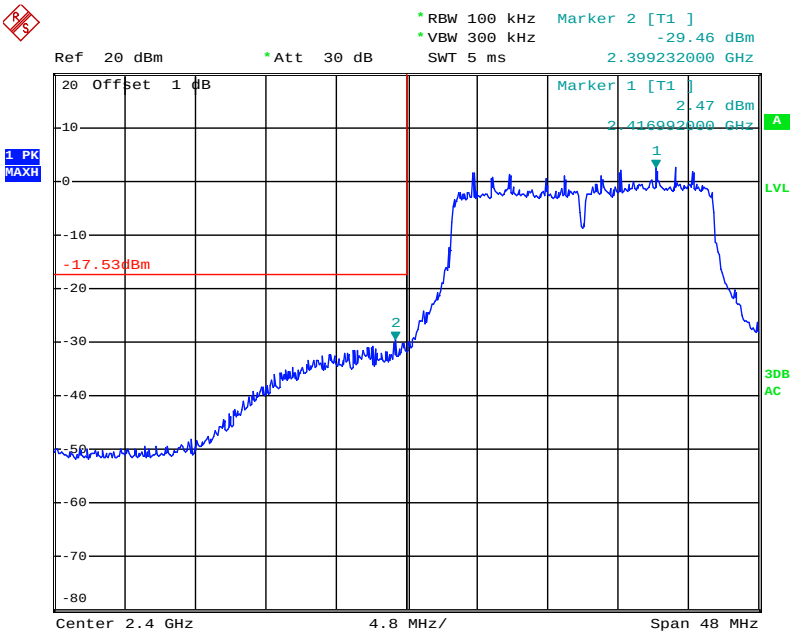
Date: 8.MAY.2018 22:55:20

802.11g: Band Edge, Right Side



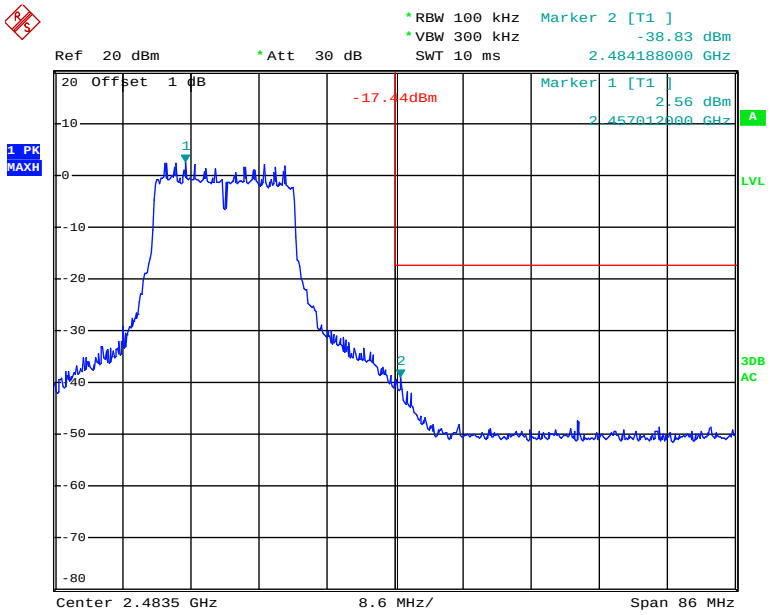
Date: 8.MAY.2018 22:54:28

802.11n ht20 Band Edge, Left Side



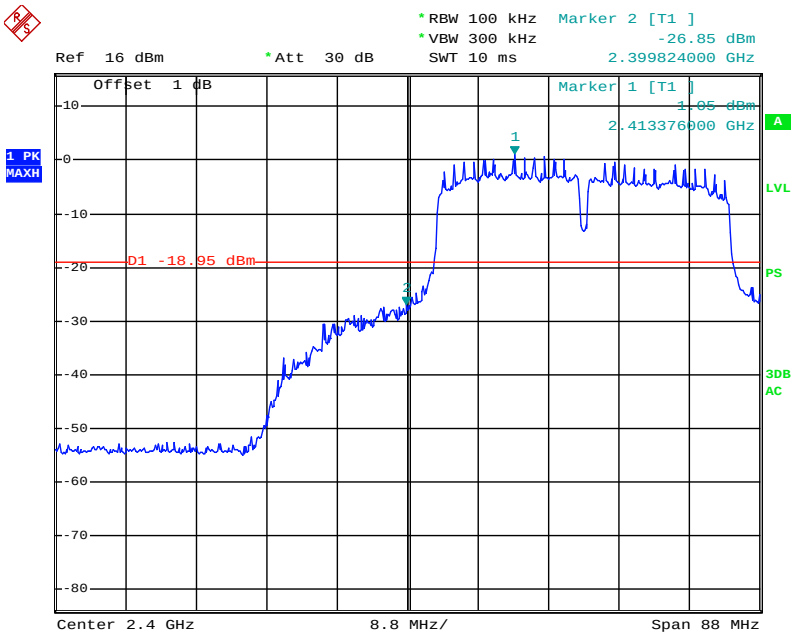
Date: 8.MAY.2018 22:56:23

802.11n ht20 Band Edge, Right Side



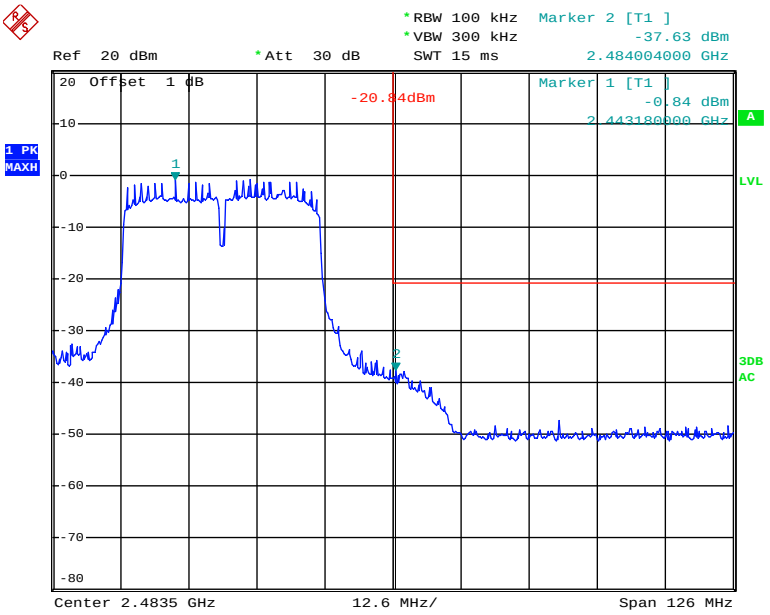
Date: 8.MAY.2018 22:57:31

802.11n ht40 Band Edge, Left Side



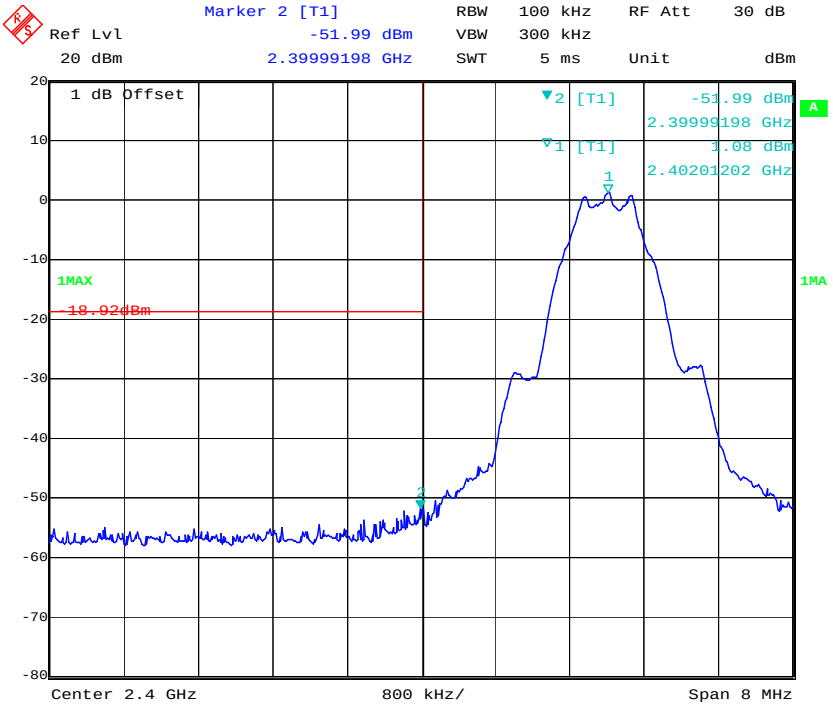
Date: 6.JUL.2018 21:27:32

802.11n ht40 Band Edge, Right Side



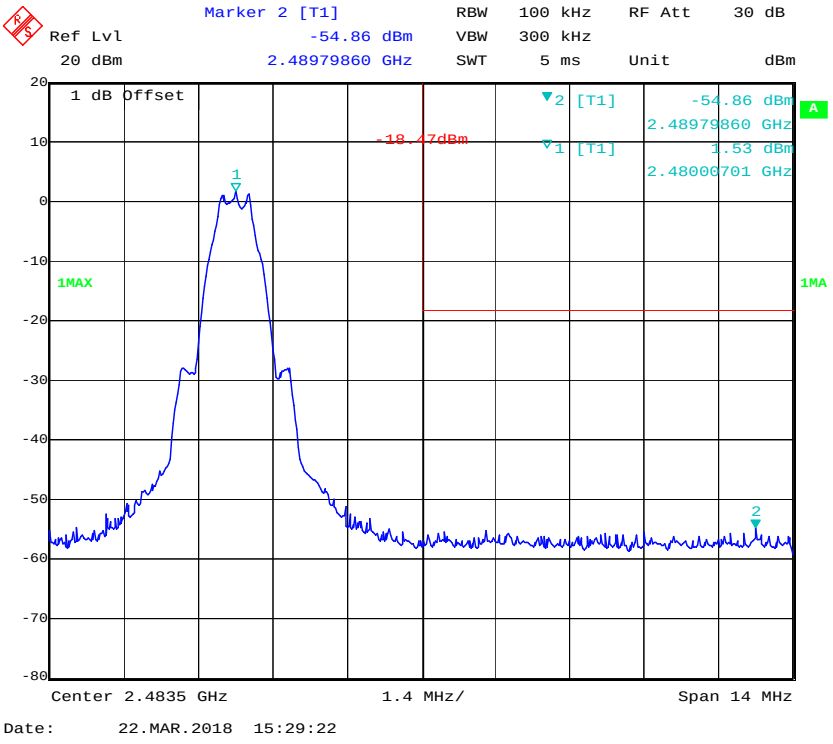
Date: 8.MAY.2018 22:48:44

BLE Band Edge, Left Side



Date: 22.MAR.2018 15:24:39

BLE Band Edge, Right Side



FCC §15.247(e) & RSS-247 CLAUSE 5.2 b - 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.

According to RSS-247 §5.2 b):

b) The transmitter power spectral density conducted from the transmitter 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 section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

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	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/02	Each Time	/

*** 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:	24.9~25.9 °C
Relative Humidity:	38~49 %
ATM Pressure:	101.1~101.2 kPa

** The testing was performed by Swim Lv on 2018-03-07 and 2018-03-22.*

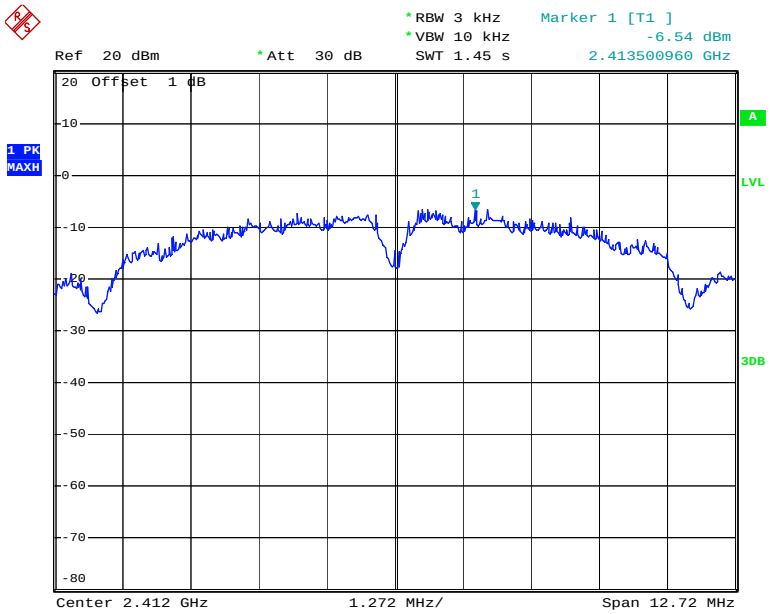
Test Result: Compliance

Test Mode: Transmitting

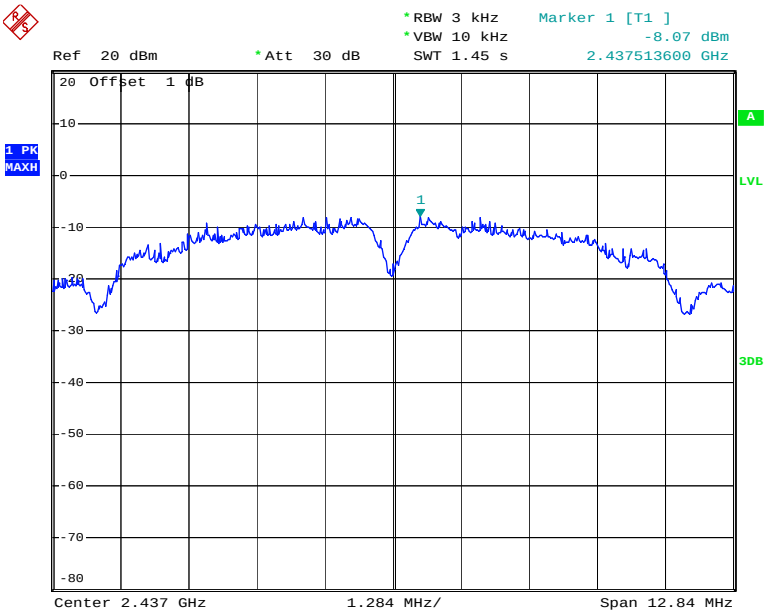
Test Result: Compliant. Please refer to the following table and plots

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
802.11 b	Low	2412	-6.54	≤8.00
	Middle	2437	-8.07	≤8.00
	High	2462	-6.34	≤8.00
802.11 g	Low	2412	-9.01	≤8.00
	Middle	2437	-10.30	≤8.00
	High	2462	-8.66	≤8.00
802.11 n20	Low	2412	-8.08	≤8.00
	Middle	2437	-10.60	≤8.00
	High	2462	-8.49	≤8.00
802.11 n40	Low	2422	-11.21	≤8.00
	Middle	2437	-11.85	≤8.00
	High	2452	-12.48	≤8.00
BLE	Low	2402	-14.12	≤8.00
	Middle	2440	-12.76	≤8.00
	High	2480	-13.53	≤8.00

Power Spectral Density, 802.11b Low Channel

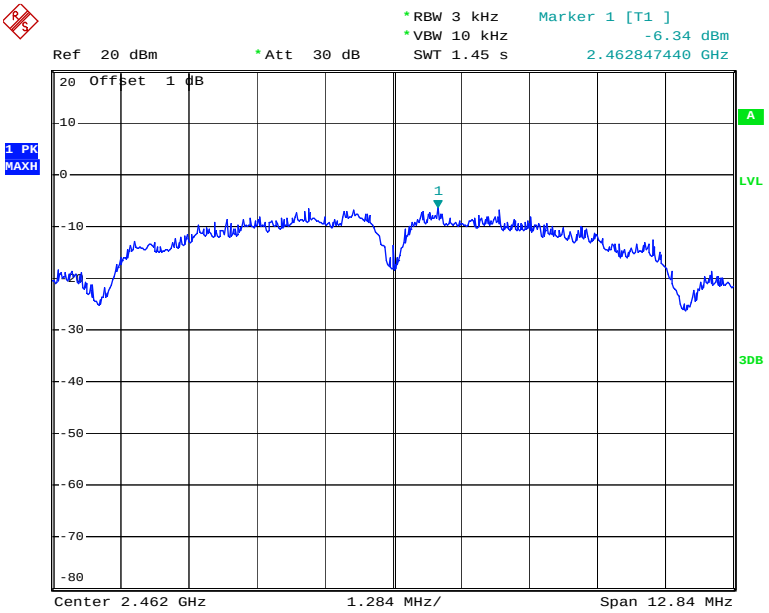


Power Spectral Density, 802.11b Middle Channel



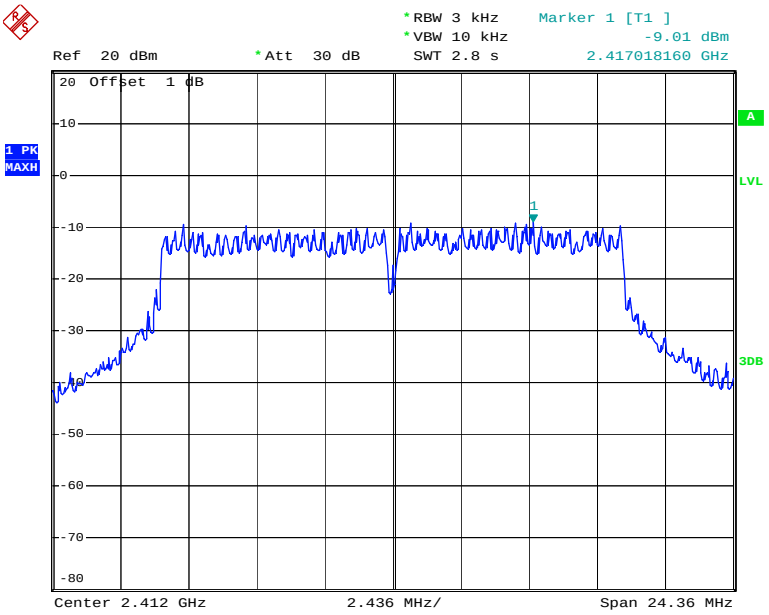
Date: 7.MAR.2018 09:30:56

Power Spectral Density, 802.11b High Channel



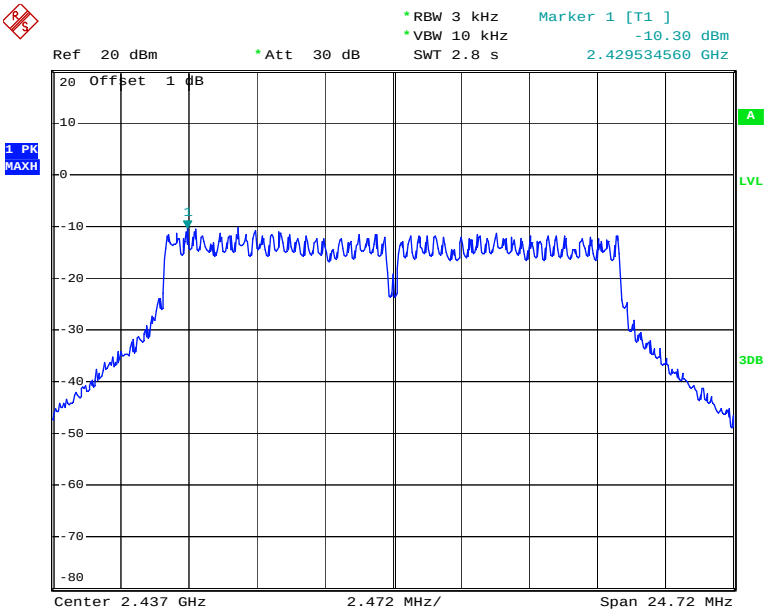
Date: 7.MAR.2018 09:34:19

Power Spectral Density, 802.11g Low Channel



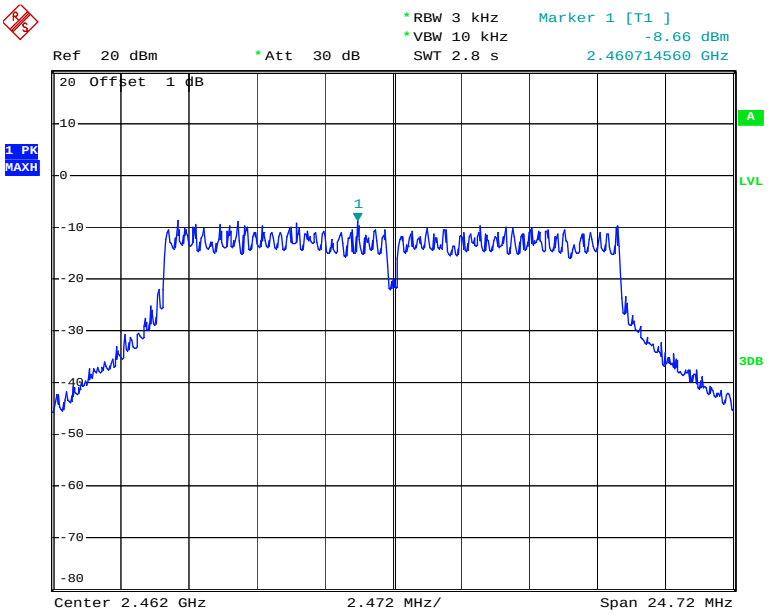
Date: 7.MAR.2018 09:39:47

Power Spectral Density, 802.11g Middle Channel



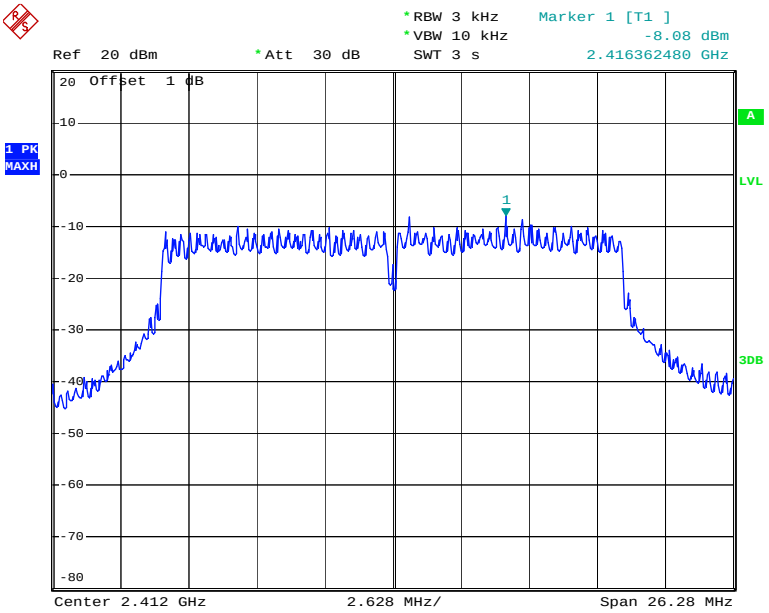
Date: 7.MAR.2018 09:47:20

Power Spectral Density, 802.11g High Channel



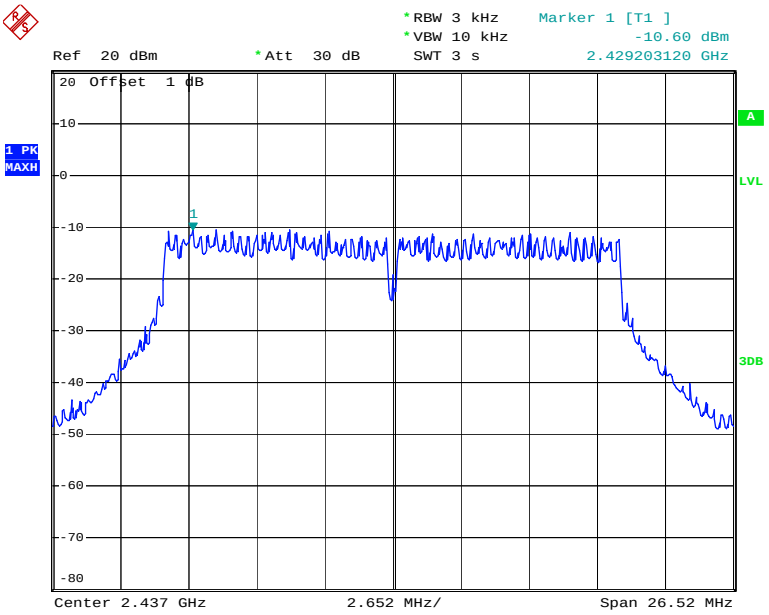
Date: 7.MAR.2018 09:52:31

Power Spectral Density, 802.11n ht20 Low Channel



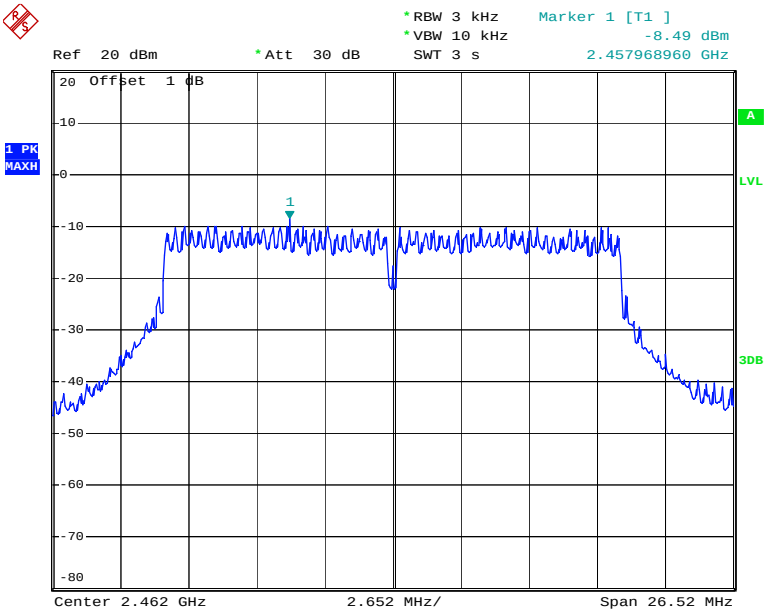
Date: 7.MAR.2018 09:59:04

Power Spectral Density, 802.11n ht20 Middle Channel



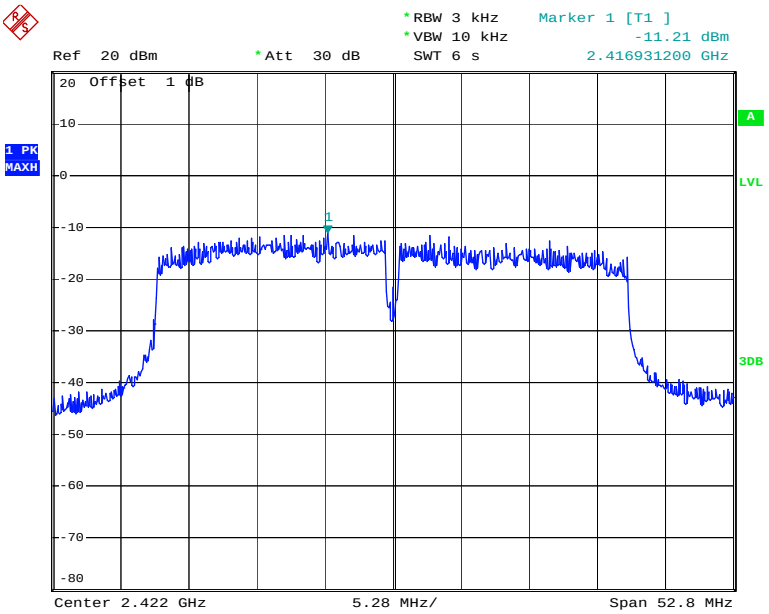
Date: 7.MAR.2018 10:04:21

Power Spectral Density, 802.11n ht20 High Channel



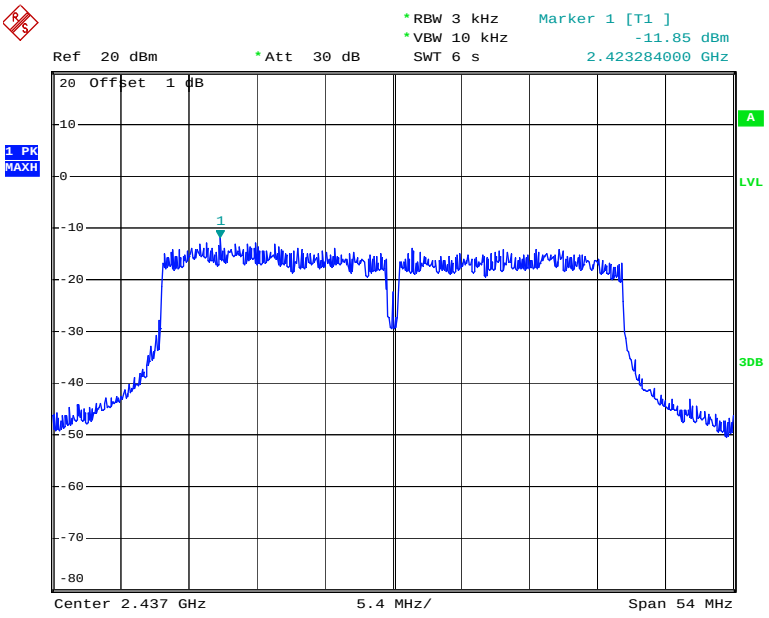
Date: 7.MAR.2018 10:09:39

Power Spectral Density, 802.11n ht40 Low Channel



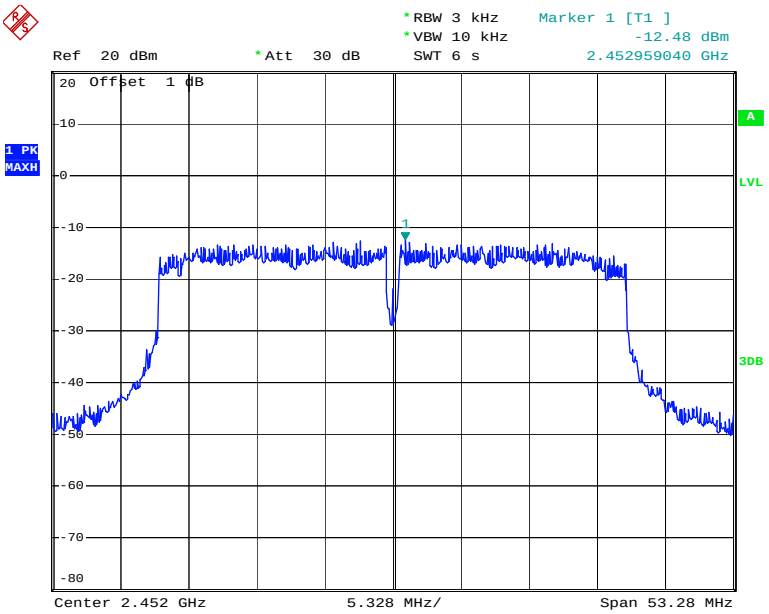
Date: 7.MAR.2018 10:16:19

Power Spectral Density, 802.11n ht40 Middle Channel



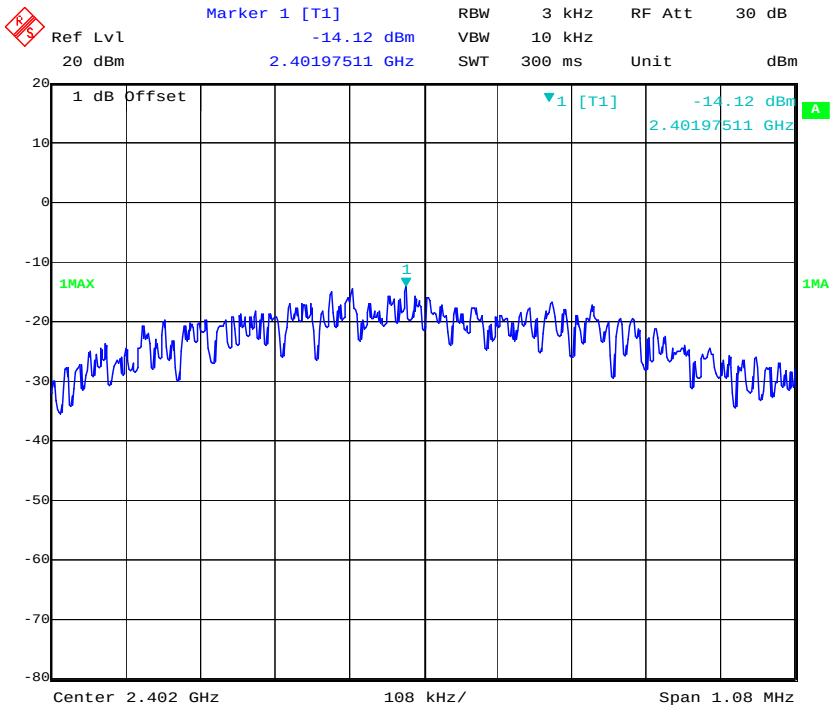
Date: 7.MAR.2018 10:24:27

Power Spectral Density, 802.11n ht40 High Channel



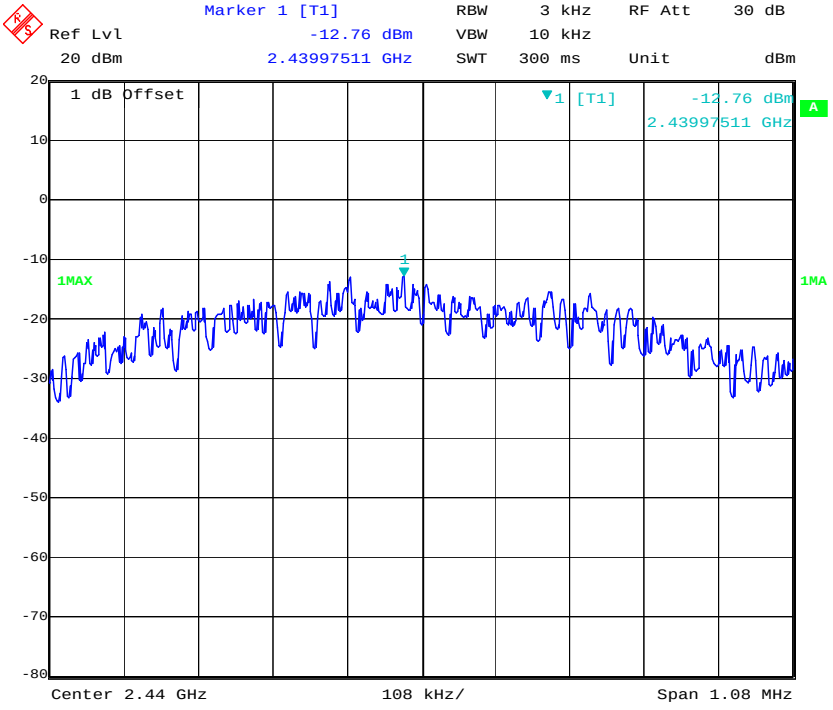
Date: 7.MAR.2018 10:31:31

Power Spectral Density, BLE Low Channel



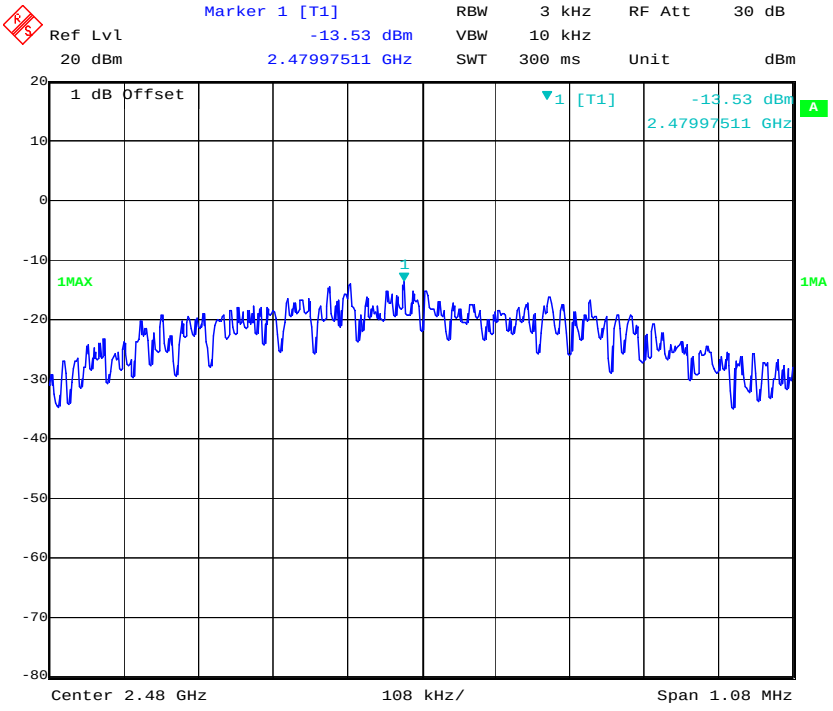
Date: 22.MAR.2018 15:23:41

Power Spectral Density, BLE Middle Channel



Date: 22.MAR.2018 15:26:15

Power Spectral Density, BLE High Channel



Date: 22.MAR.2018 15:28:19

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