FCC PART 15.247
RSS-GEN, ISSUE 4, NOVEMBER 2014
RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

DT Research, Inc.

6F, NO.1, NingPo E. St. Taipei, 100 Taiwan

FCC ID: YE3801I
IC: 7647A-801I

Report Type:	**Product Name:**
Original Report	Mobile Tablet

Report Number:	RDG171205015-00B
Report Date:	2018-02-09
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:		Mobile Tablet
EUT Model:		DT301A
FCC ID:		YE3801I
IC:		7647A-801I
Rated Input Voltage:		DC 11.4V from battery or DC 19V from Adapter
Adapter Information	**Model:**	A11-065N1A
	Input:	100-240V~1.7A, 50/60Hz
	Output:	DC 19V, 3.42A 65W
External Dimension:		Length (28.5cm)*Width (20cm)*High (5.4cm)
Serial Number:		171205015
EUT Received Date:		2017.12.07

Note: The device built in a Qualcomm Atheros module, Model: QCNFA364A, FCC ID:PPD-QCNFA364AH, which support Bluetooth 4.1 standard include BLE and 802.11a/b/g/n/ac.

Objective

This report is prepared on behalf of ***DT Research, Inc.*** 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: YE3801I.
FCC Part 15E NII submissions with FCC ID: YE3801I.
FCC Part 22H, 24E, 27 PCB submissions with FCC ID: YE3801I.
RSS-247 DSSs, RSS-247 LE-LAN, RSS-130, RSS-132, RSS-133, RSS-139 submissions with IC: 7647A-801I.

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, 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 802.11n ht20 modes were test with channel 1,6,11.
For 802.11n ht40 mode was test with channel 3,6,9.
The device supports SISO at all modes and MIMO at 802.11n modes

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.

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:

SISO:

Mode	Channel	Frequency (MHz)	Data rate	Power Level	
				Main Chain	Aux Chain
802.11b	Low	2412	1 Mbps	21	20
	Middle	2437	1 Mbps	22	20
	High	2462	1 Mbps	21	20
802.11g	Low	2412	6 Mbps	18	17
	Middle	2437	6 Mbps	19	18
	High	2462	6 Mbps	17	16
802.11n ht20	Low	2412	MCS0	19	17
	Middle	2437	MCS0	20	18
	High	2462	MCS0	18	16
802.11n ht40	Low	2422	MCS0	19	18
	Middle	2437	MCS0	19	18
	High	2452	MCS0	15	14

MIMO:

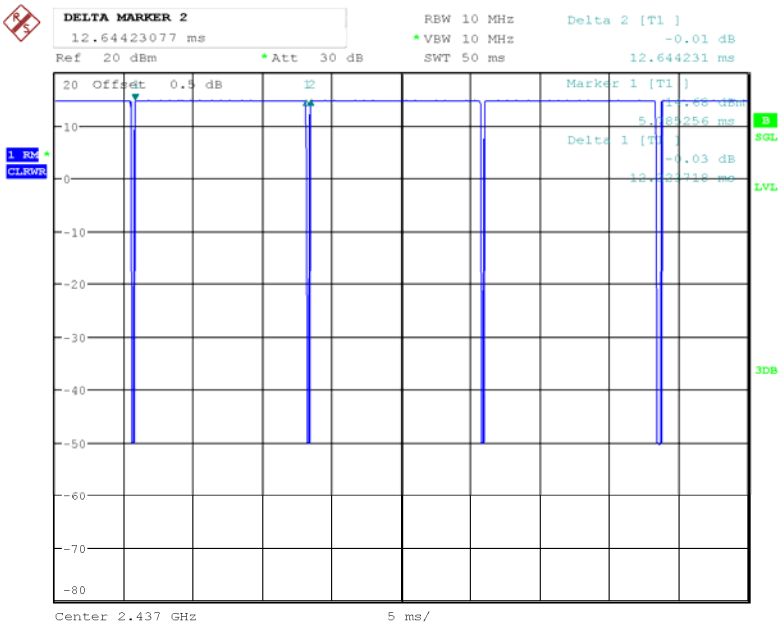
Mode	Channel	Frequency (MHz)	Data rate	Power Level (Main&Aux Chain)
802.11n ht20	Low	2412	MCS8	16
	Middle	2437	MCS8	16
	High	2462	MCS8	15
802.11n ht40	Low	2422	MCS8	16
	Middle	2437	MCS8	17
	High	2452	MCS8	14

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	12.324	12.644	97.5
802.11g	2.074	2.285	90.8
802.11n ht20	3.838	4.048	94.8
802.11n ht40	1.874	2.104	89.1
BLE	0.420	0.635	66.1

802.11b



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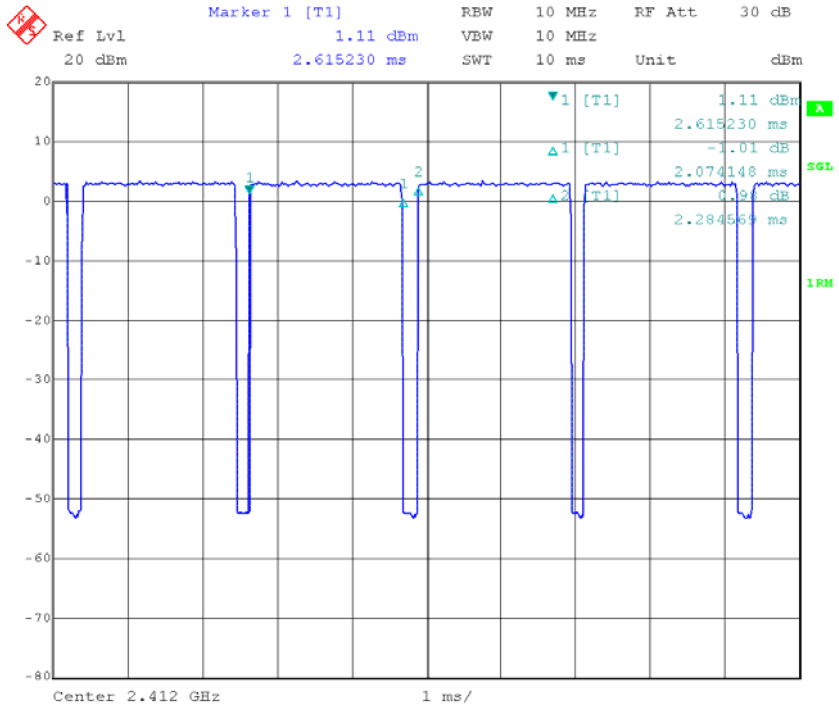
802.11g



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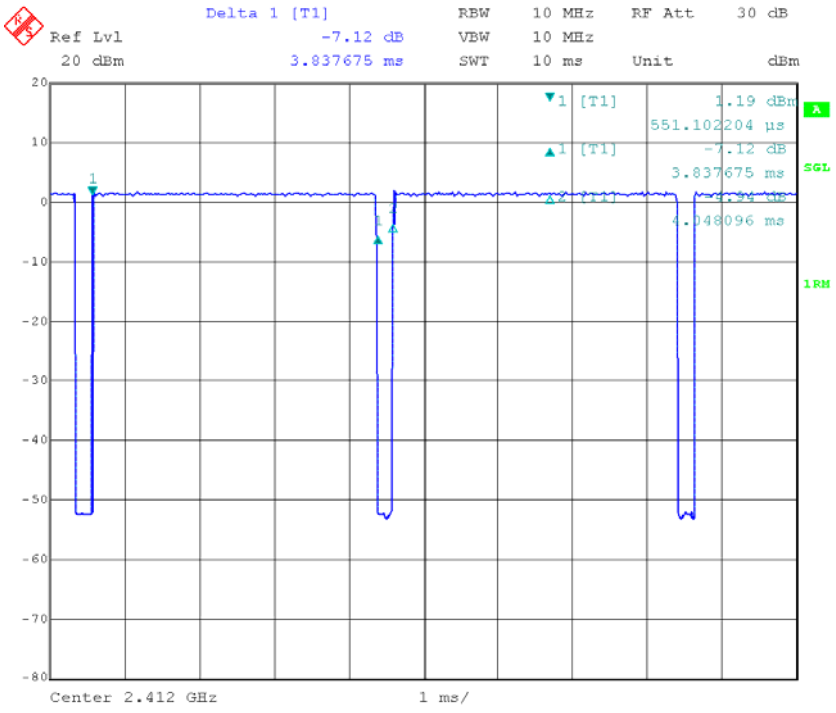
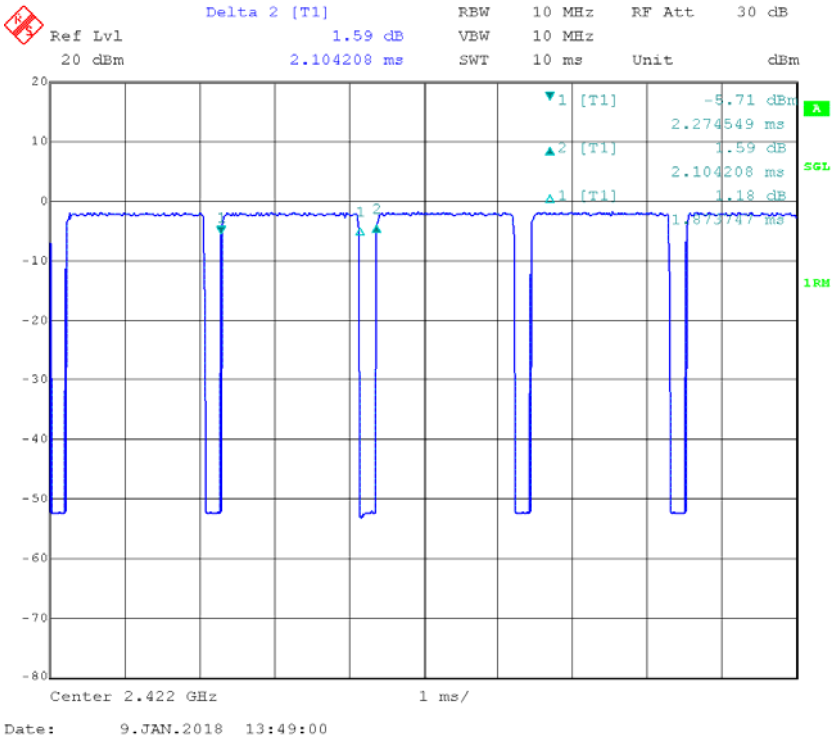
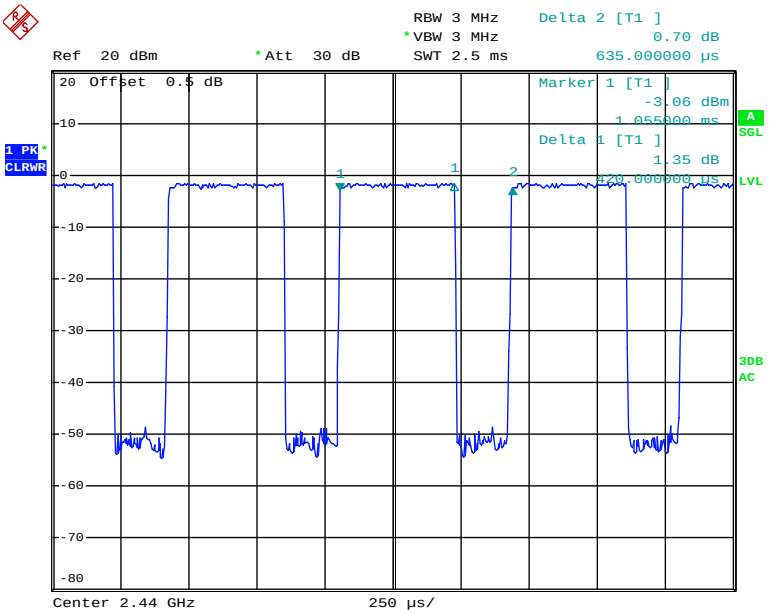
802.11n ht20



802.11n ht40



BLE



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Equipment Modifications

No modification was made to the EUT.

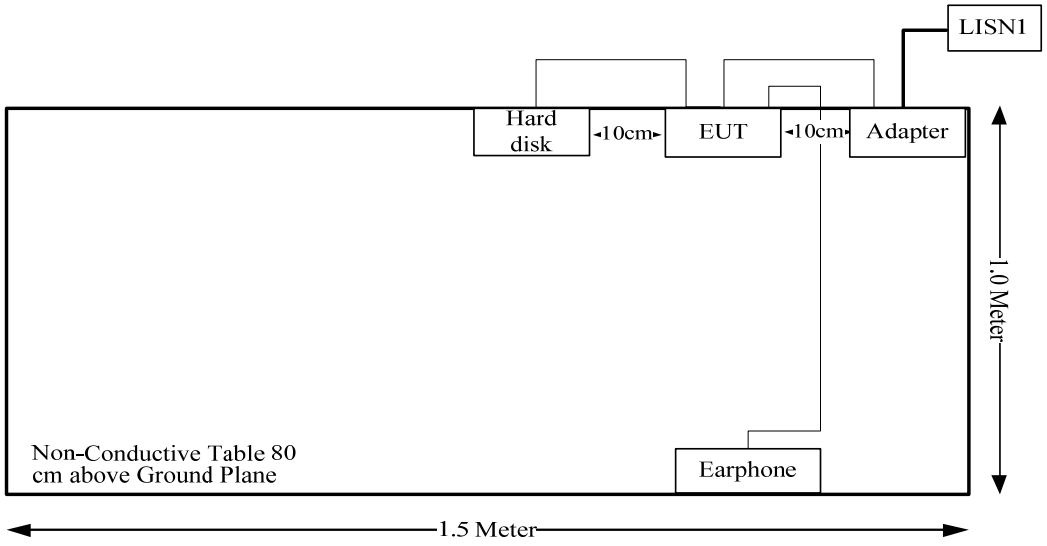
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Keenion	Earphone	KDM-911	6951812200215
TOSHIBA	HDD	DTP105	247BSYVUSRE8

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Earphone Cable	No	No	1.26	EUT	Earphone
USB Cable	yes	No	1.0	EUT	HDD

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
RSS-102 Clause 2.5.1	Exemption Limits for Routine Evaluation -SAR Evaluation	Compliance
FCC §15.203 RSS-Gen Clause 8.3	Antenna Requirement	Compliance
FCC §15.207 (a) RSS-Gen Clause 8.8	AC Line Conducted Emissions	Compliance
FCC §15.205, §15.209, §15.247(d) RSS-247 Clause 5.5 RSS-Gen Clause 8.10	Spurious Emissions	Compliance
FCC §15.247 (a)(2) RSS-247 Clause 5.2 a)	6 dB Emission Bandwidth And 99% Occupied Bandwidth	Compliance
FCC §15.247(b)(3) RSS-247 Clause 5.4 d)	Maximum Conducted Output Power	Compliance
FCC §15.247(d) RSS-247 Clause5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
FCC §15.247(e) RSS-247 Clause5.2 b)	Power Spectral Density	Compliance

FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

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

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

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

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

Measurement Result

For Bluetooth LE mode:

The max conducted power including tune-up tolerance is -1.0 dBm (0.79 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
=0.79/5*(√2.480) = 0.25< 3.0

So the stand-alone SAR evaluation is not necessary.

For WLAN mode:

Please refer the SAR report:RDG171205015-20.

RSS-102 CLAUSE 2.5.1 EXEMPTION LIMITS FOR ROUTINE EVALUATION – SAR EVALUATION

Applicable Standard

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Measurement Result:

For Bluetooth LE mode:
The maximum conducted output power including tune up tolerance is -1.0 dBm, which was declared by manufacturer. The antenna gain is 3.0 dBi, EIRP= 2.0 dBm(1.58 mW)

The exemption power(P) limits for routine evaluation in 2402-2480MHz is:
(2480-2450)/(3500-2450)=(4-P)/(4-2)
=>P=3.96 mW@2480MHz
> 1.58 mW

So the SAR evaluation can be exempted.

For WLAN mode:
please refer to the SAR report: RDG171205015-20.

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 two internal antenna arrangement for WLAN, and the Aux antenna was used for Bluetooth, the main antenna gain is 1.4 dBi in 2.4GHz band, and Aux antenna gain is 3.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

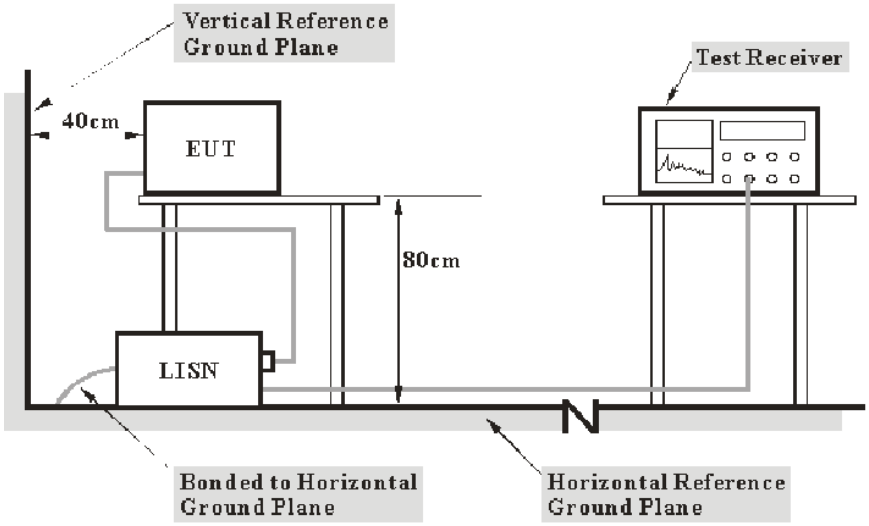
Result: Compliance.

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	2016-12-11	2017-12-11
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-25	2018-09-25
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05

*** 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

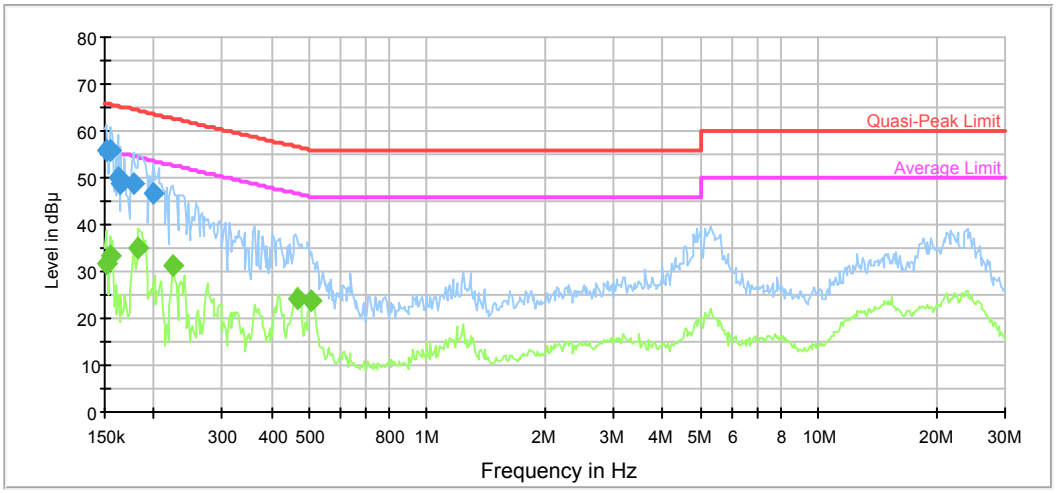
Environmental Conditions

Temperature:	24.8 °C
Relative Humidity:	40 %
ATM Pressure:	101.2 kPa

The testing was performed by Alex You on 2017-12-07.

Test Mode: Transmitting

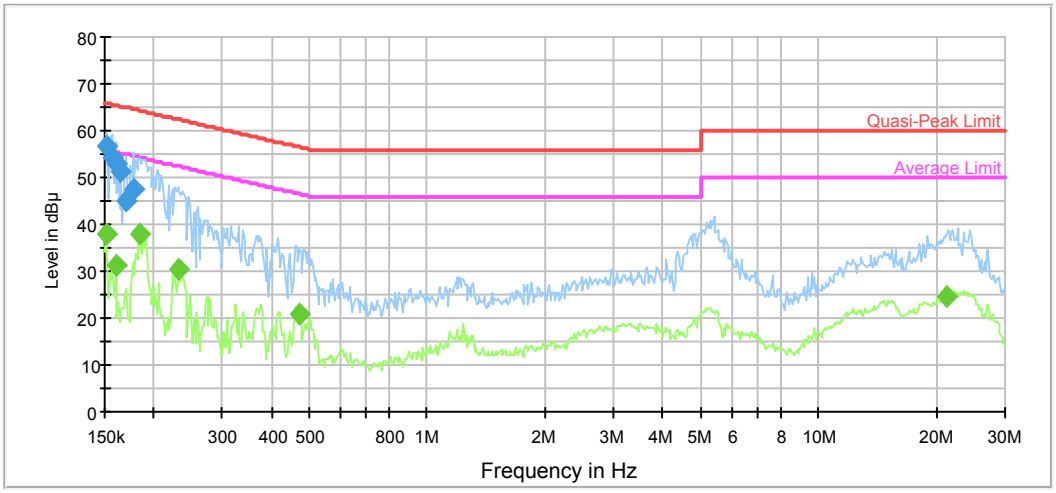
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	55.6	9.000	L1	11.2	10.3	65.9	Compliance
0.154858	55.8	9.000	L1	11.1	9.9	65.7	Compliance
0.162441	50.1	9.000	L1	11.0	15.2	65.3	Compliance
0.165051	48.6	9.000	L1	11.0	16.6	65.2	Compliance
0.177322	48.6	9.000	L1	10.8	16.0	64.6	Compliance
0.199835	46.8	9.000	L1	10.6	16.8	63.6	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	31.6	9.000	L1	11.2	24.3	55.9	Compliance
0.154858	33.4	9.000	L1	11.1	22.3	55.7	Compliance
0.183065	35.1	9.000	L1	10.8	19.2	54.3	Compliance
0.225205	31.4	9.000	L1	10.5	21.2	52.6	Compliance
0.468757	24.0	9.000	L1	9.9	22.5	46.5	Compliance
0.507637	23.8	9.000	L1	9.9	22.2	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	56.7	9.000	N	11.2	9.2	65.9	Compliance
0.157346	54.2	9.000	N	11.1	11.4	65.6	Compliance
0.159873	52.9	9.000	N	11.0	12.6	65.5	Compliance
0.165051	51.1	9.000	N	11.0	14.1	65.2	Compliance
0.170396	44.9	9.000	N	10.9	20.0	64.9	Compliance
0.177322	47.5	9.000	N	10.8	17.1	64.6	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	37.7	9.000	N	11.2	18.2	55.9	Compliance
0.159873	31.1	9.000	N	11.0	24.4	55.5	Compliance
0.184529	37.8	9.000	N	10.8	16.5	54.3	Compliance
0.232499	30.4	9.000	N	10.4	22.0	52.4	Compliance
0.472507	20.7	9.000	N	9.9	25.8	46.5	Compliance
21.307992	24.4	9.000	N	10.0	25.6	50.0	Compliance

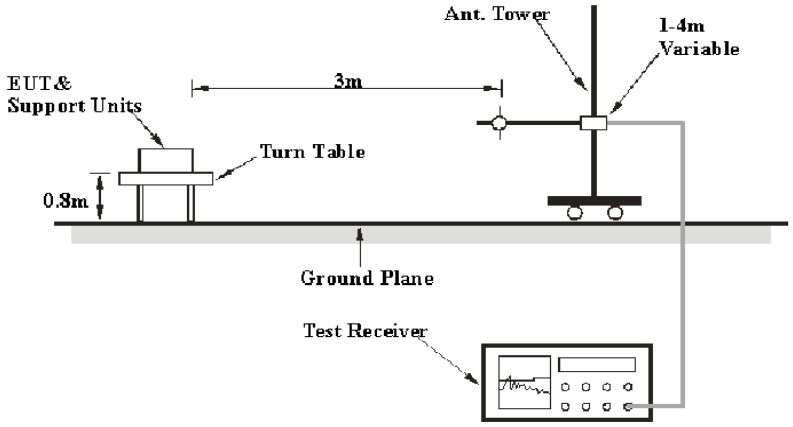
FCC §15.209, §15.205 & §15.247(d) &RSS-247 CLAUSE 5.5, RSS-GEN CLAUSE 8.10 - SPURIOUS EMISSIONS

Applicable Standard

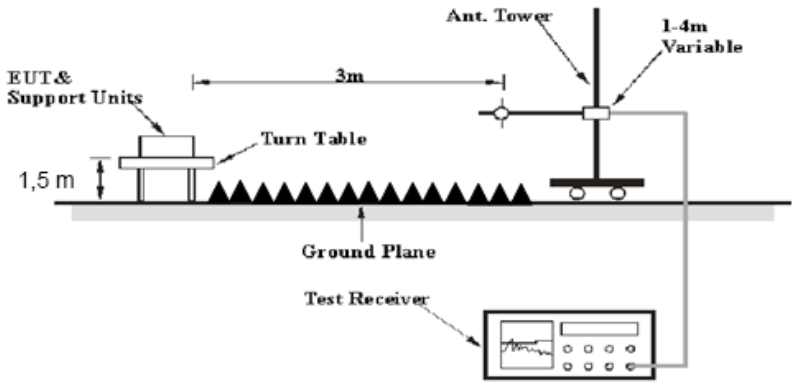
FCC §15.247 (d); §15.209; §15.205; and RSS-247 §5.5, RSS-GEN §8.10

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters distance, 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
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2018-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
R&S	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	1007726-02 1304	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	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
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2017-09-05	2018-09-05

*** 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:	20.1~26.8 °C
Relative Humidity:	30.8~37 %
ATM Pressure:	102~102.2 kPa

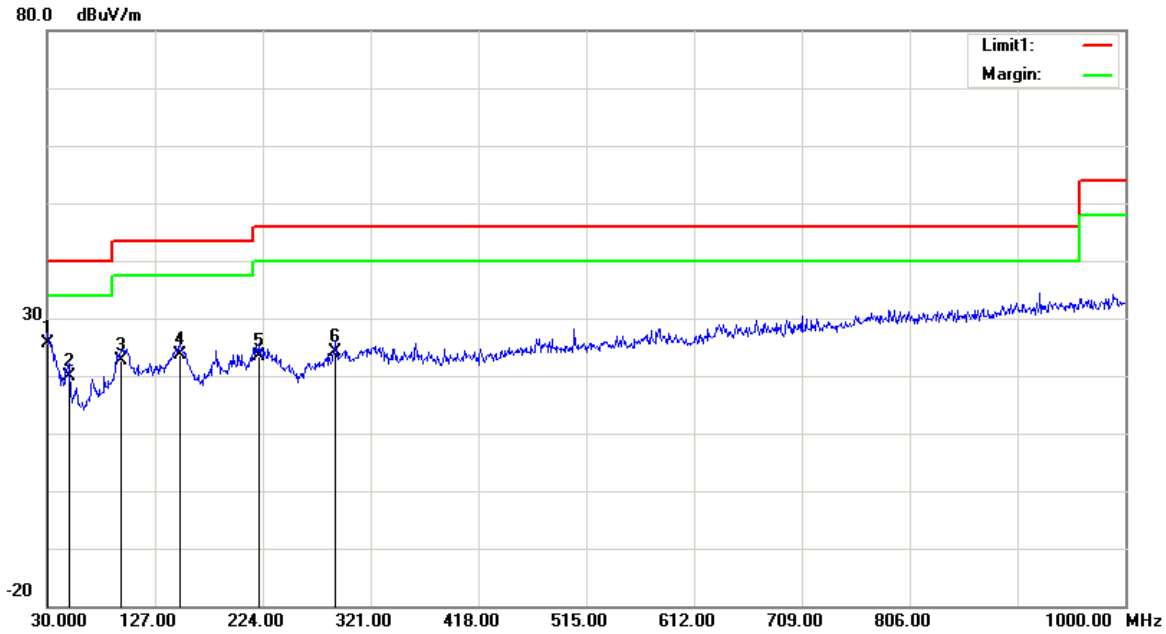
** The testing was performed by Sunny Cen & Kakaxi Chen from 2017-12-15 to 2017-12-18.*

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

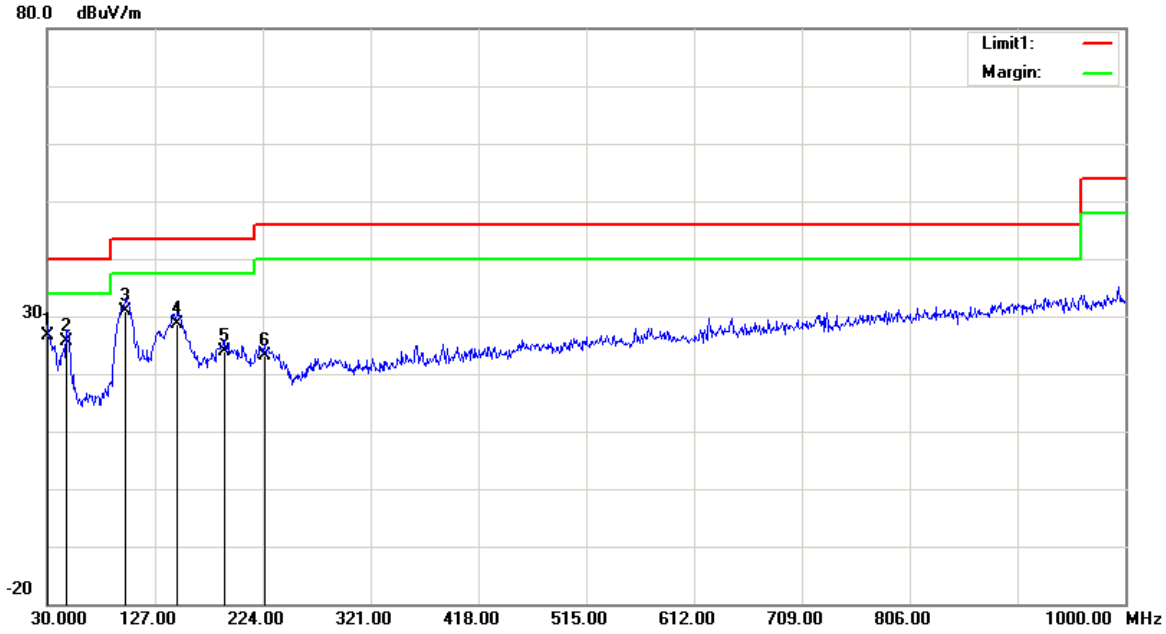
1) 30MHz-1GHz (802.11b mode High channel was the worst**):**

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	25.35	QP	0.35	25.70	40.00	14.30
49.4000	31.34	QP	-11.34	20.00	40.00	20.00
96.9300	31.87	QP	-9.27	22.60	43.50	20.90
149.3100	30.06	QP	-6.46	23.60	43.50	19.90
221.0900	30.27	QP	-6.77	23.50	46.00	22.50
288.9900	28.01	QP	-3.91	24.10	46.00	21.90

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	25.52	QP	1.08	26.60	40.00	13.40
47.4600	36.40	QP	-10.70	25.70	40.00	14.30
100.8100	39.01	QP	-8.01	31.00	43.50	12.50
147.3700	35.09	QP	-6.49	28.60	43.50	14.90
189.0800	31.52	QP	-7.72	23.80	43.50	19.70
225.9400	29.86	QP	-6.76	23.10	46.00	22.90

2) 1-25GHz:
802.11b Mode(SISO mode Aux chain was the worst):

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	78.96	PK	H	28.12	1.81	0.00	108.89	N/A	N/A
2412.00	75.45	AV	H	28.12	1.81	0.00	105.38	N/A	N/A
2412.00	77.98	PK	V	28.12	1.81	0.00	107.91	N/A	N/A
2412.00	74.37	AV	V	28.12	1.81	0.00	104.3	N/A	N/A
2390.00	29.84	PK	H	28.08	1.80	0.00	59.72	74.00	14.28
2390.00	16.55	AV	H	28.08	1.80	0.00	46.43	54.00	7.57
4824.00	57.11	PK	H	32.95	3.19	37.20	56.05	74.00	17.95
4824.00	54.06	AV	H	32.95	3.19	37.20	53	54.00	1
7236.00	44.39	PK	H	35.81	4.77	37.27	47.7	74.00	26.3
7236.00	33.51	AV	H	35.81	4.77	37.27	36.82	54.00	17.18
3511.00	54.52	PK	H	31.32	2.39	36.98	51.25	74.00	22.75
3511.00	45.26	AV	H	31.32	2.39	36.98	41.99	54.00	12.01
Middle Channel: 2437 MHz									
2437.00	77.46	PK	H	28.17	1.82	0.00	107.45	N/A	N/A
2437.00	74.84	AV	H	28.17	1.82	0.00	104.83	N/A	N/A
2437.00	75.65	PK	V	28.17	1.82	0.00	105.64	N/A	N/A
2437.00	72.46	AV	V	28.17	1.82	0.00	102.45	N/A	N/A
4874.00	56.23	PK	H	33.05	3.26	37.21	55.33	74.00	18.67
4874.00	51.34	AV	H	33.05	3.26	37.21	50.44	54.00	3.56
7311.00	47.38	PK	H	36.01	4.64	37.36	50.67	74.00	23.33
7311.00	34.69	AV	H	36.01	4.64	37.36	37.98	54.00	16.02
5899.00	46.54	PK	H	34.26	3.79	37.22	47.37	74.00	26.63
5899.00	34.16	AV	H	34.26	3.79	37.22	34.99	54.00	19.01
6125.00	45.87	PK	H	34.28	4.06	37.27	46.94	74.00	27.06
6125.00	33.75	AV	H	34.28	4.06	37.27	34.82	54.00	19.18
High Channel: 2462 MHz									
2462.00	77.51	PK	H	28.22	1.83	0.00	107.56	N/A	N/A
2462.00	74.28	AV	H	28.22	1.83	0.00	104.33	N/A	N/A
2462.00	75.34	PK	V	28.22	1.83	0.00	105.39	N/A	N/A
2462.00	72.42	AV	V	28.22	1.83	0.00	102.47	N/A	N/A
2483.50	38.15	PK	H	28.27	1.84	0.00	68.26	74.00	5.74
2483.50	22.79	AV	H	28.27	1.84	0.00	52.9	54.00	1.1
4924.00	58.16	PK	H	33.15	3.27	37.22	57.36	74.00	16.64
4924.00	54.28	AV	H	33.15	3.27	37.22	53.48	54.00	0.52
7386.00	46.37	PK	H	36.20	4.51	37.46	49.62	74.00	24.38
7386.00	34.56	AV	H	36.20	4.51	37.46	37.81	54.00	16.19
5698.00	45.63	PK	H	34.18	3.68	37.35	46.14	74.00	27.86
5698.00	33.82	AV	H	34.18	3.68	37.35	34.33	54.00	19.67

802.11g Mode(SISO mode Aux chain was the worst):

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	77.28	PK	H	28.12	1.81	0.00	107.21	N/A	N/A
2412.00	66.98	AV	H	28.12	1.81	0.00	96.91	N/A	N/A
2412.00	77.14	PK	V	28.12	1.81	0.00	107.07	N/A	N/A
2412.00	67.42	AV	V	28.12	1.81	0.00	97.35	N/A	N/A
2390.00	40.59	PK	H	28.08	1.80	0.00	70.47	74.00	3.53
2390.00	22.04	AV	H	28.08	1.80	0.00	51.92	54.00	2.08
4824.00	56.47	PK	H	32.95	3.19	37.20	55.41	74.00	18.59
4824.00	42.95	AV	H	32.95	3.19	37.20	41.89	54.00	12.11
7236.00	47.35	PK	H	35.81	4.77	37.27	50.66	74.00	23.34
7236.00	34.67	AV	H	35.81	4.77	37.27	37.98	54.00	16.02
5965.00	45.85	PK	H	34.29	3.82	37.29	46.67	74.00	27.33
5965.00	33.59	AV	H	34.29	3.82	37.29	34.41	54.00	19.59
Middle Channel: 2437 MHz									
2437.00	77.39	PK	H	28.17	1.82	0.00	107.38	N/A	N/A
2437.00	67.24	AV	H	28.17	1.82	0.00	97.23	N/A	N/A
2437.00	75.42	PK	V	28.17	1.82	0.00	105.41	N/A	N/A
2437.00	65.12	AV	V	28.17	1.82	0.00	95.11	N/A	N/A
4874.00	56.52	PK	H	33.05	3.26	37.21	55.62	74.00	18.38
4874.00	42.92	AV	H	33.05	3.26	37.21	42.02	54.00	11.98
7311.00	47.48	PK	H	36.01	4.64	37.36	50.77	74.00	23.23
7311.00	34.84	AV	H	36.01	4.64	37.36	38.13	54.00	15.87
5899.00	45.79	PK	H	34.26	3.79	37.22	46.62	74.00	27.38
5899.00	33.52	AV	H	34.26	3.79	37.22	34.35	54.00	19.65
6125.00	45.64	PK	H	34.28	4.06	37.27	46.71	74.00	27.29
6125.00	33.58	AV	H	34.28	4.06	37.27	34.65	54.00	19.35
High Channel: 2462 MHz									
2462.00	74.52	PK	H	28.22	1.83	0.00	104.57	N/A	N/A
2462.00	64.73	AV	H	28.22	1.83	0.00	94.78	N/A	N/A
2462.00	73.74	PK	V	28.22	1.83	0.00	103.79	N/A	N/A
2462.00	63.68	AV	V	28.22	1.83	0.00	93.73	N/A	N/A
2483.50	38.15	PK	H	28.27	1.84	0.00	68.26	74.00	5.74
2483.50	22.28	AV	H	28.27	1.84	0.00	52.39	54.00	1.61
4924.00	54.64	PK	H	33.15	3.27	37.22	53.84	74.00	20.16
4924.00	41.15	AV	H	33.15	3.27	37.22	40.35	54.00	13.65
7386.00	47.41	PK	H	36.20	4.51	37.46	50.66	74.00	23.34
7386.00	34.79	AV	H	36.20	4.51	37.46	38.04	54.00	15.96
6256.00	45.66	PK	H	34.25	4.30	37.20	47.01	74.00	26.99
6256.00	33.52	AV	H	34.25	4.30	37.20	34.87	54.00	19.13

802.11n ht20 Mode(MIMO mode was the worst):

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	81.62	PK	H	28.12	1.81	0.00	111.55	N/A	N/A
2412.00	70.78	AV	H	28.12	1.81	0.00	100.71	N/A	N/A
2412.00	79.94	PK	V	28.12	1.81	0.00	109.87	N/A	N/A
2412.00	68.45	AV	V	28.12	1.81	0.00	98.38	N/A	N/A
2390.00	38.92	PK	H	28.08	1.80	0.00	68.8	74.00	5.2
2390.00	23.45	AV	H	28.08	1.80	0.00	53.33	54.00	0.67
4824.00	55.67	PK	H	32.95	3.19	37.20	54.61	74.00	19.39
4824.00	45.32	AV	H	32.95	3.19	37.20	44.26	54.00	9.74
7236.00	51.29	PK	H	35.81	4.77	37.27	54.6	74.00	19.4
7236.00	41.29	AV	H	35.81	4.77	37.27	44.6	54.00	9.4
5396.00	48.67	PK	H	33.93	3.61	37.36	48.85	74.00	25.15
5396.00	37.29	AV	H	33.93	3.61	37.36	37.47	54.00	16.53
Middle Channel: 2437 MHz									
2437.00	81.53	PK	H	28.17	1.82	0.00	111.52	N/A	N/A
2437.00	70.24	AV	H	28.17	1.82	0.00	100.23	N/A	N/A
2437.00	78.12	PK	V	28.17	1.82	0.00	108.11	N/A	N/A
2437.00	67.27	AV	V	28.17	1.82	0.00	97.26	N/A	N/A
4874.00	54.68	PK	H	33.05	3.26	37.21	53.78	74.00	20.22
4874.00	44.26	AV	H	33.05	3.26	37.21	43.36	54.00	10.64
7311.00	47.26	PK	H	36.01	4.64	37.36	50.55	74.00	23.45
7311.00	36.59	AV	H	36.01	4.64	37.36	39.88	54.00	14.12
5469.00	46.58	PK	H	34.05	3.56	37.35	46.84	74.00	27.16
5469.00	35.47	AV	H	34.05	3.56	37.35	35.73	54.00	18.27
5211.00	46.38	PK	H	33.64	3.58	37.40	46.2	74.00	27.8
5211.00	35.69	AV	H	33.64	3.58	37.40	35.51	54.00	18.49
High Channel: 2462 MHz									
2462.00	80.58	PK	H	28.22	1.83	0.00	110.63	N/A	N/A
2462.00	70.12	AV	H	28.22	1.83	0.00	100.17	N/A	N/A
2462.00	79.21	PK	V	28.22	1.83	0.00	109.26	N/A	N/A
2462.00	69.37	AV	V	28.22	1.83	0.00	99.42	N/A	N/A
2483.50	42.05	PK	H	28.27	1.84	0.00	72.16	74.00	1.84
2483.50	21.38	AV	H	28.27	1.84	0.00	51.49	54.00	2.51
4924.00	52.84	PK	H	33.15	3.27	37.22	52.04	74.00	21.96
4924.00	41.36	AV	H	33.15	3.27	37.22	40.56	54.00	13.44
7386.00	47.69	PK	H	36.20	4.51	37.46	50.94	74.00	23.06
7386.00	36.74	AV	H	36.20	4.51	37.46	39.99	54.00	14.01
6577.00	46.35	PK	H	34.35	4.82	37.05	48.47	74.00	25.53
6577.00	35.29	AV	H	34.35	4.82	37.05	37.41	54.00	16.59

802.11n ht40 Mode:

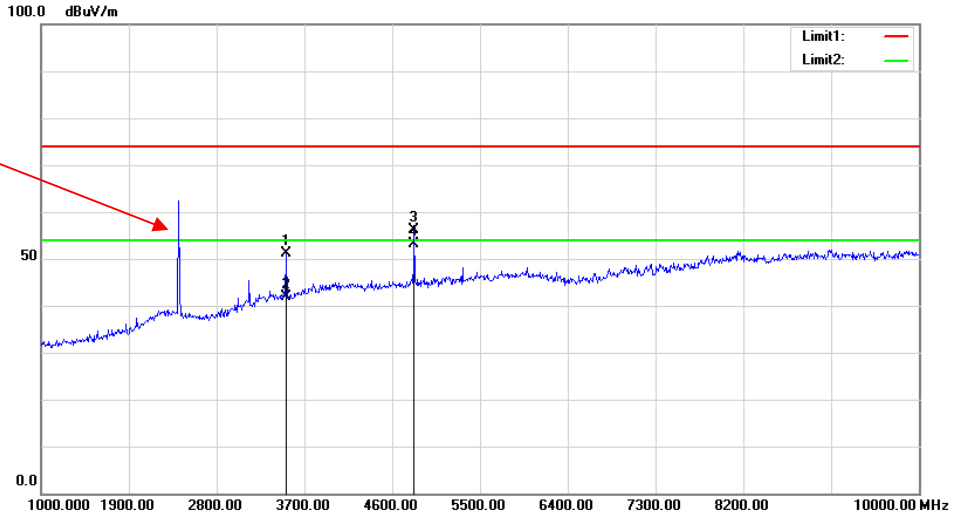
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)					
Low Channel: 2422 MHz									
2422.00	76.89	PK	H	28.14	1.81	0.00	106.84	N/A	N/A
2422.00	64.75	AV	H	28.14	1.81	0.00	94.7	N/A	N/A
2422.00	74.87	PK	V	28.14	1.81	0.00	104.82	N/A	N/A
2422.00	63.38	AV	V	28.14	1.81	0.00	93.33	N/A	N/A
2390.00	41.65	PK	H	28.08	1.80	0.00	71.53	74.00	2.47
2390.00	22.23	AV	H	28.08	1.80	0.00	52.11	54.00	1.89
4844.00	47.59	PK	H	32.99	3.22	37.20	46.6	74.00	27.4
4844.00	36.59	AV	H	32.99	3.22	37.20	35.6	54.00	18.4
7266.00	45.29	PK	H	35.89	4.72	37.31	48.59	74.00	25.41
7266.00	34.28	AV	H	35.89	4.72	37.31	37.58	54.00	16.42
5658.00	46.59	PK	H	34.16	3.63	37.45	46.93	74.00	27.07
5658.00	35.47	AV	H	34.16	3.63	37.45	35.81	54.00	18.19
Middle Channel: 2437 MHz									
2437.00	77.19	PK	H	28.17	1.82	0.00	107.18	N/A	N/A
2437.00	66.26	AV	H	28.17	1.82	0.00	96.25	N/A	N/A
2437.00	75.43	PK	V	28.17	1.82	0.00	105.42	N/A	N/A
2437.00	64.59	AV	V	28.17	1.82	0.00	94.58	N/A	N/A
4874.00	52.45	PK	H	33.05	3.26	37.21	51.55	74.00	22.45
4874.00	41.67	AV	H	33.05	3.26	37.21	40.77	54.00	13.23
7311.00	47.26	PK	H	36.01	4.64	37.36	50.55	74.00	23.45
7311.00	37.26	AV	H	36.01	4.64	37.36	40.55	54.00	13.45
5623.00	46.28	PK	H	34.15	3.60	37.53	46.5	74.00	27.5
5623.00	35.47	AV	H	34.15	3.60	37.53	35.69	54.00	18.31
6023.00	46.28	PK	H	34.30	3.87	37.32	47.13	74.00	26.87
6023.00	35.66	AV	H	34.30	3.87	37.32	36.51	54.00	17.49
High Channel: 2452 MHz									
2452.00	75.58	PK	H	28.20	1.83	0.00	105.61	N/A	N/A
2452.00	63.64	AV	H	28.20	1.83	0.00	93.67	N/A	N/A
2452.00	73.56	PK	V	28.20	1.83	0.00	103.59	N/A	N/A
2452.00	61.34	AV	V	28.20	1.83	0.00	91.37	N/A	N/A
2483.50	38.84	PK	H	28.27	1.84	0.00	68.95	74.00	5.05
2483.50	22.96	AV	H	28.27	1.84	0.00	53.07	54.00	0.93
4904.00	47.65	PK	H	33.11	3.30	37.21	46.85	74.00	27.15
4904.00	36.59	AV	H	33.11	3.30	37.21	35.79	54.00	18.21
7356.00	45.69	PK	H	36.13	4.56	37.42	48.96	74.00	25.04
7356.00	35.2	AV	H	36.13	4.56	37.42	38.47	54.00	15.53
5239.00	46.28	PK	H	33.68	3.53	37.38	46.11	74.00	27.89
5239.00	35.61	AV	H	33.68	3.53	37.38	35.44	54.00	18.56

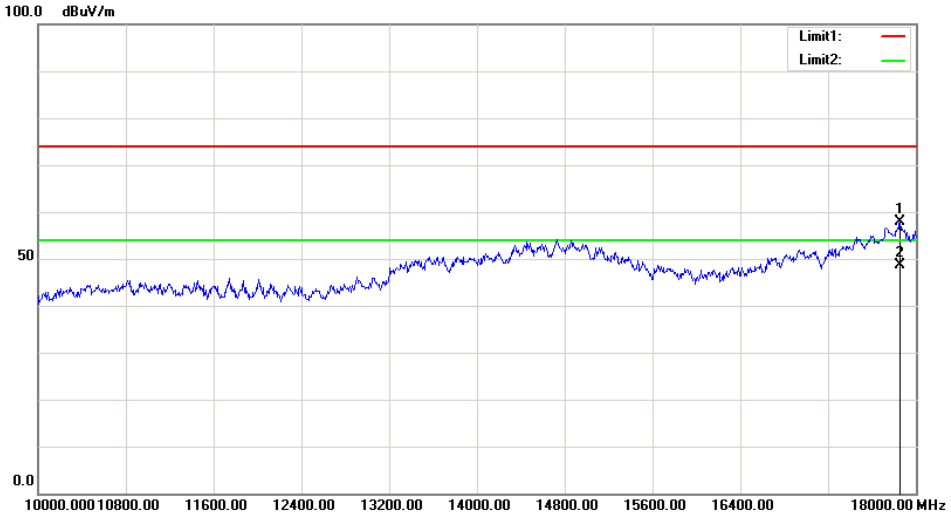
BLE Mode

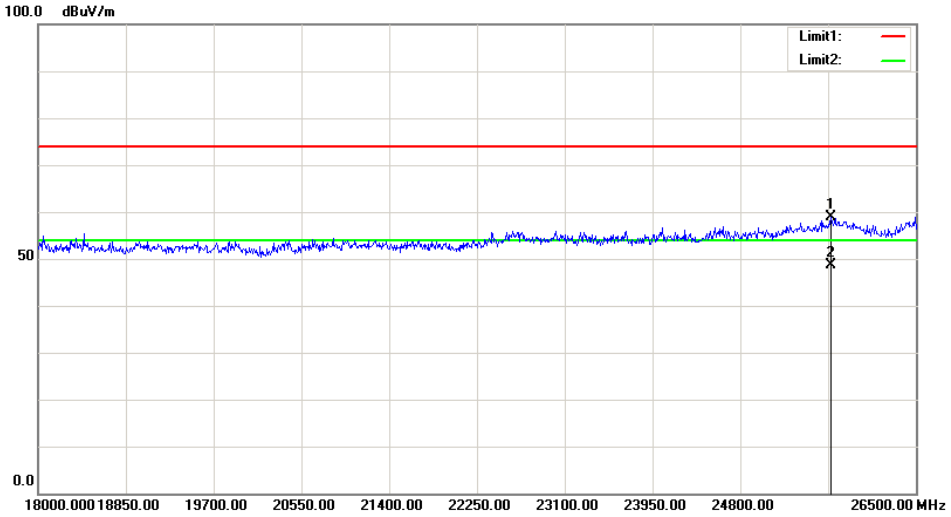
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	61.32	PK	H	28.10	1.80	0.00	91.22	N/A	N/A
2402.00	55.15	AV	H	28.10	1.80	0.00	85.05	N/A	N/A
2402.00	58.26	PK	V	28.10	1.80	0.00	88.16	N/A	N/A
2402.00	52.15	AV	V	28.10	1.80	0.00	82.05	N/A	N/A
2390.00	25.89	PK	H	28.08	1.80	0.00	55.77	74.00	18.23
2390.00	13.34	AV	H	28.08	1.80	0.00	43.22	54.00	10.78
4804.00	48.36	PK	H	32.91	3.17	37.20	47.24	74.00	26.76
4804.00	34.68	AV	H	32.91	3.17	37.20	33.56	54.00	20.44
7206.00	47.54	PK	H	35.74	4.82	37.23	50.87	74.00	23.13
7206.00	33.62	AV	H	35.74	4.82	37.23	36.95	54.00	17.05
5162.50	47.59	PK	H	33.56	3.57	37.38	47.34	74.00	26.66
5162.50	33.67	AV	H	33.56	3.57	37.38	33.42	54.00	20.58
Middle Channel: 2440 MHz									
2440.00	61.48	PK	H	28.18	1.82	0.00	91.48	N/A	N/A
2440.00	55.34	AV	H	28.18	1.82	0.00	85.34	N/A	N/A
2440.00	58.39	PK	V	28.18	1.82	0.00	88.39	N/A	N/A
2440.00	52.22	AV	V	28.18	1.82	0.00	82.22	N/A	N/A
4880.00	48.25	PK	H	33.06	3.27	37.21	47.37	74.00	26.63
4880.00	34.48	AV	H	33.06	3.27	37.21	33.6	54.00	20.4
7320.00	47.47	PK	H	36.03	4.62	37.37	50.75	74.00	23.25
7320.00	33.58	AV	H	36.03	4.62	37.37	36.86	54.00	17.14
5899.00	46.41	PK	H	34.26	3.79	37.22	47.24	74.00	26.76
5899.00	33.43	AV	H	34.26	3.79	37.22	34.26	54.00	19.74
6125.00	46.58	PK	H	34.28	4.06	37.27	47.65	74.00	26.35
6125.00	33.38	AV	H	34.28	4.06	37.27	34.45	54.00	19.55
High Channel: 2480 MHz									
2480.00	61.61	PK	H	28.26	1.84	0.00	91.71	N/A	N/A
2480.00	55.48	AV	H	28.26	1.84	0.00	85.58	N/A	N/A
2480.00	58.85	PK	V	28.26	1.84	0.00	88.95	N/A	N/A
2480.00	52.69	AV	V	28.26	1.84	0.00	82.79	N/A	N/A
2483.50	25.57	PK	H	28.27	1.84	0.00	55.68	74.00	18.32
2483.50	13.62	AV	H	28.27	1.84	0.00	43.73	54.00	10.27
4960.00	48.49	PK	H	33.22	3.23	37.25	47.69	74.00	26.31
4960.00	34.53	AV	H	33.22	3.23	37.25	33.73	54.00	20.27
7440.00	47.57	PK	H	36.34	4.41	37.52	50.8	74.00	23.2
7440.00	33.49	AV	H	36.34	4.41	37.52	36.72	54.00	17.28
5338.00	46.45	PK	H	33.84	3.49	37.35	46.43	74.00	27.57
5338.00	33.56	AV	H	33.84	3.49	37.35	33.54	54.00	20.46

Worst plots(802.11b high channel)
Horizontal

Fundamental
Test with Band
Rejection Filter

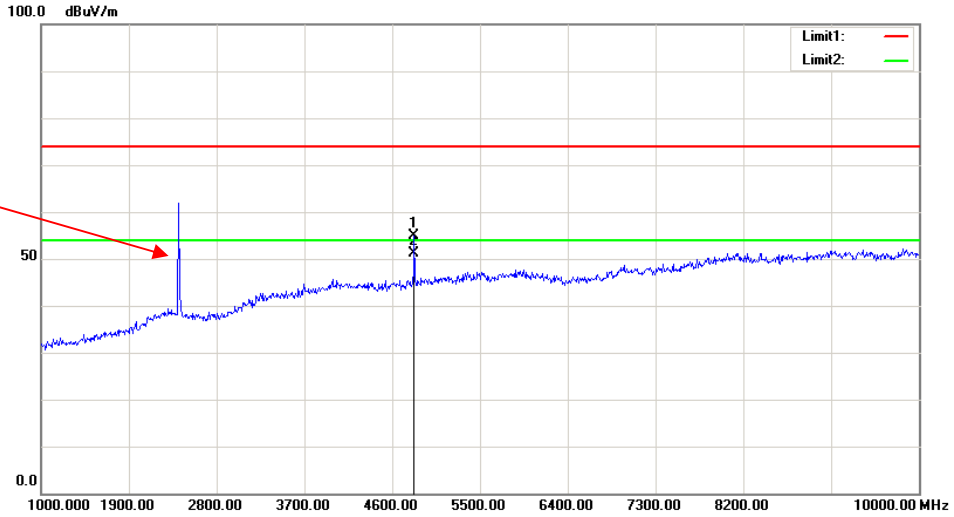


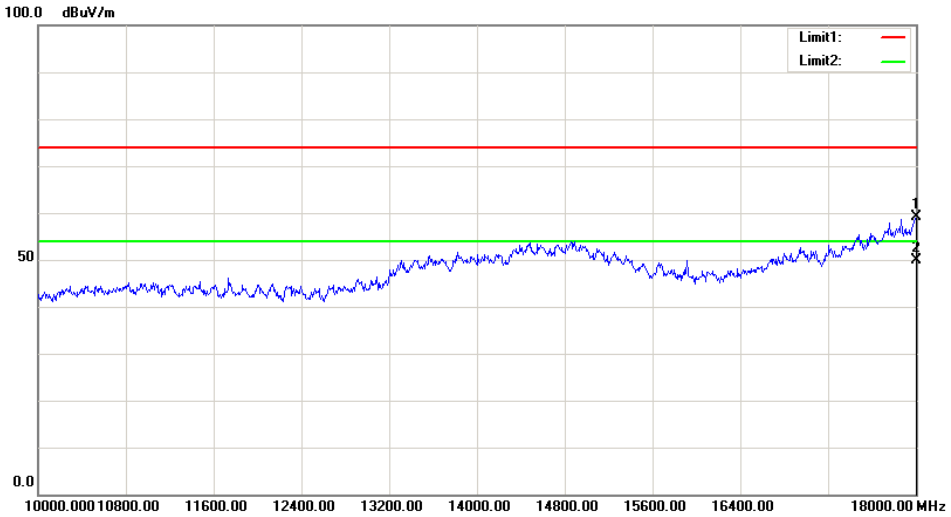


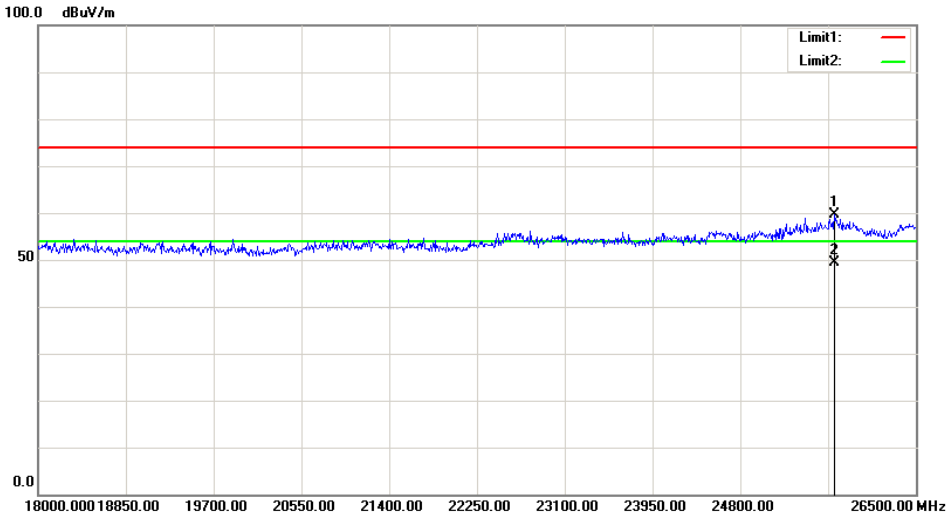


Vertical

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.

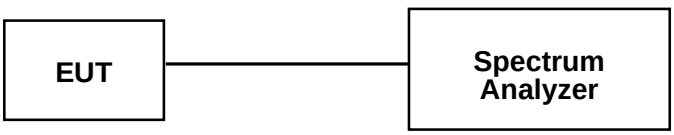
According to RSS-Gen §6.6

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.
h) Measure the 99% bandwidth use OBW test function.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	25.1~25.5 °C
Relative Humidity:	41~49 %
ATM Pressure:	101.2 kPa

** The testing was performed by Mark Pan from 2017-12-04 to 2017-12-07.*

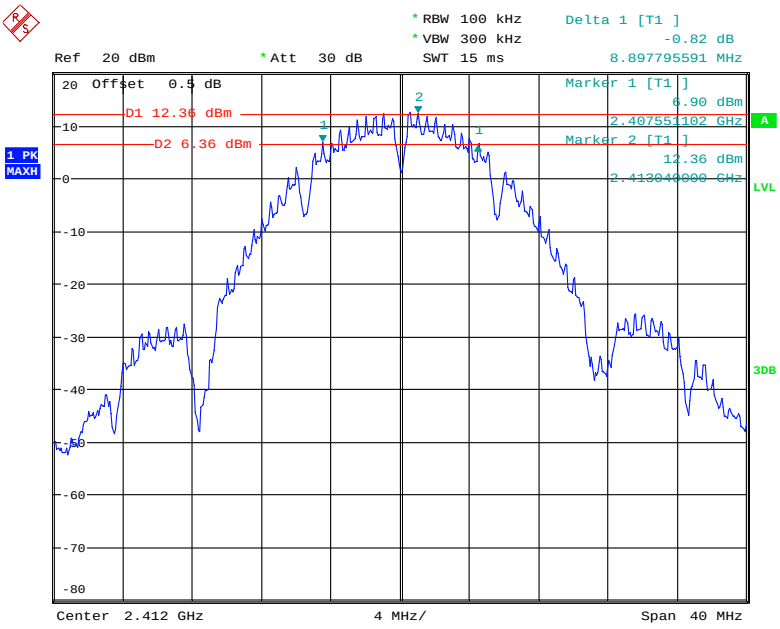
Test Mode: Transmitting(Test was performed at main chain for WLAN and Aux chain for BLE)

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	8.9	13.84	≥0.5
	Middle	2437	7.54	14.08	≥0.5
	High	2462	8.9	13.92	≥0.5
802.11g	Low	2412	14.99	16.48	≥0.5
	Middle	2437	15.15	16.48	≥0.5
	High	2462	15.23	16.56	≥0.5
802.11n ht20	Low	2412	14.99	17.76	≥0.5
	Middle	2437	15.63	17.68	≥0.5
	High	2462	14.99	17.68	≥0.5
802.11n ht40	Low	2422	34.95	36.32	≥0.5
	Middle	2437	34.95	36.32	≥0.5
	High	2452	34.95	36.32	≥0.5
BLE	Low	2402	0.50	1.04	≥0.5
	Middle	2440	0.67	1.04	≥0.5
	High	2480	0.68	1.06	≥0.5

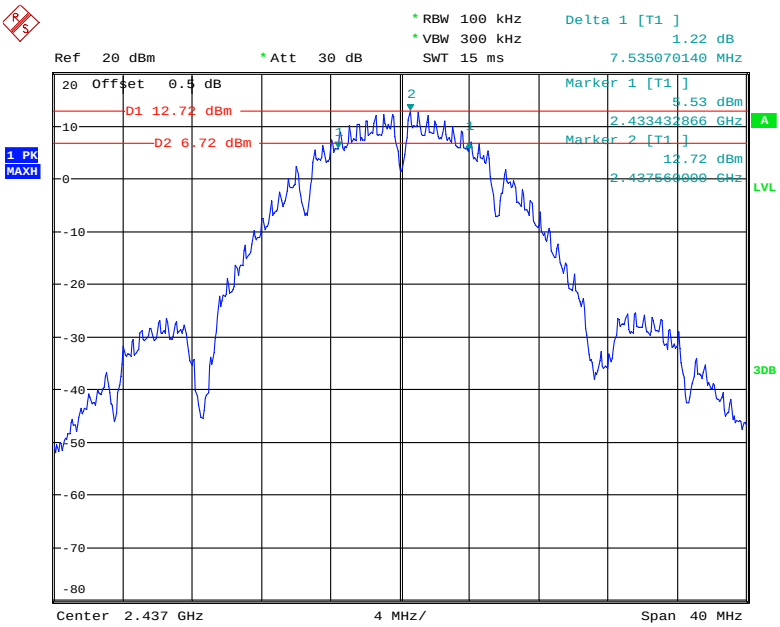
6dB bandwidth:

802.11b Low Channel



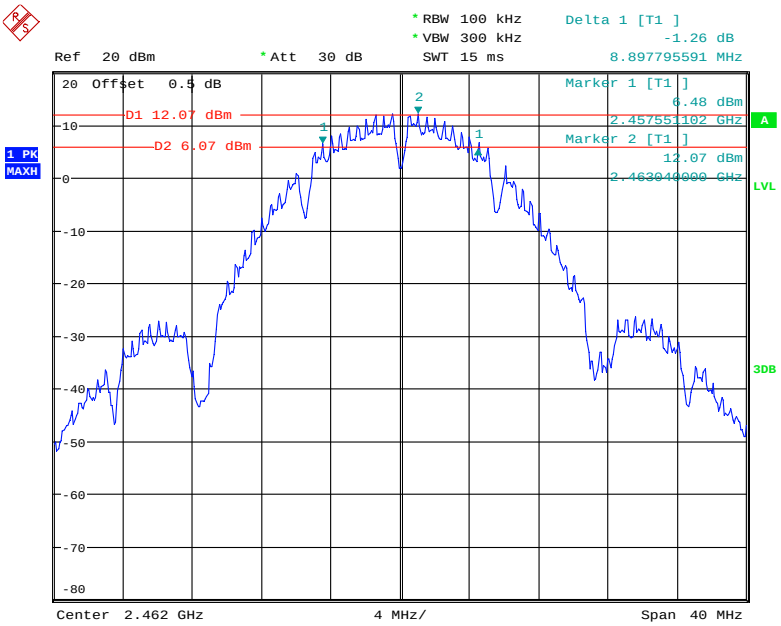
Date: 7.DEC.2017 20:03:45

802.11b Middle Channel



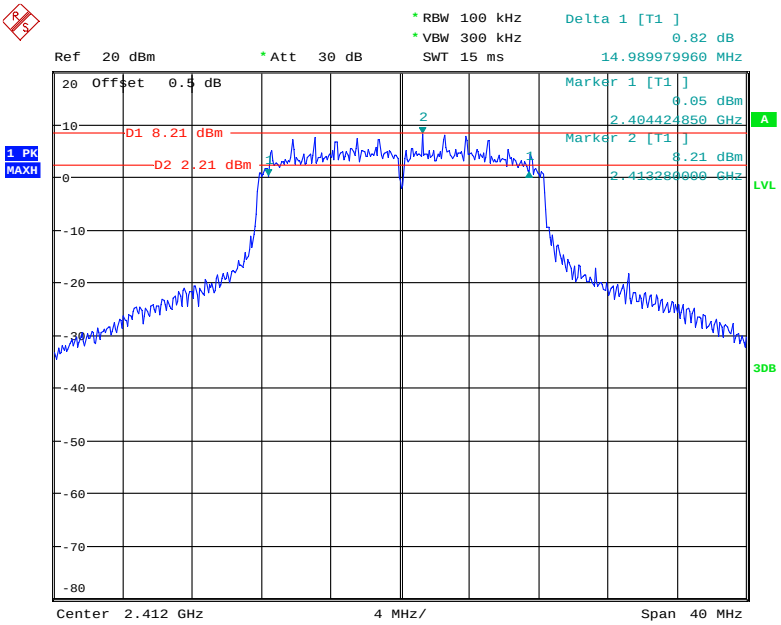
Date: 7.DEC.2017 20:07:50

802.11b High Channel



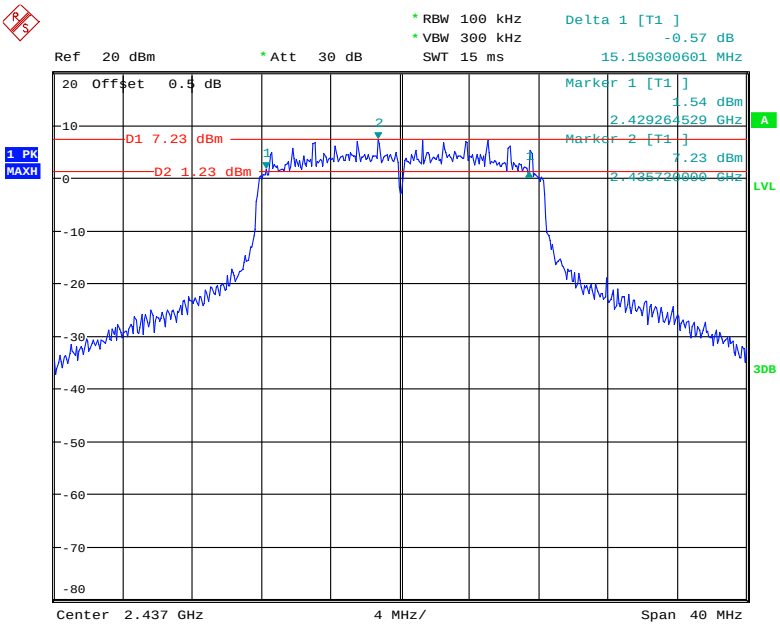
Date: 7.DEC.2017 20:09:52

802.11g Low Channel



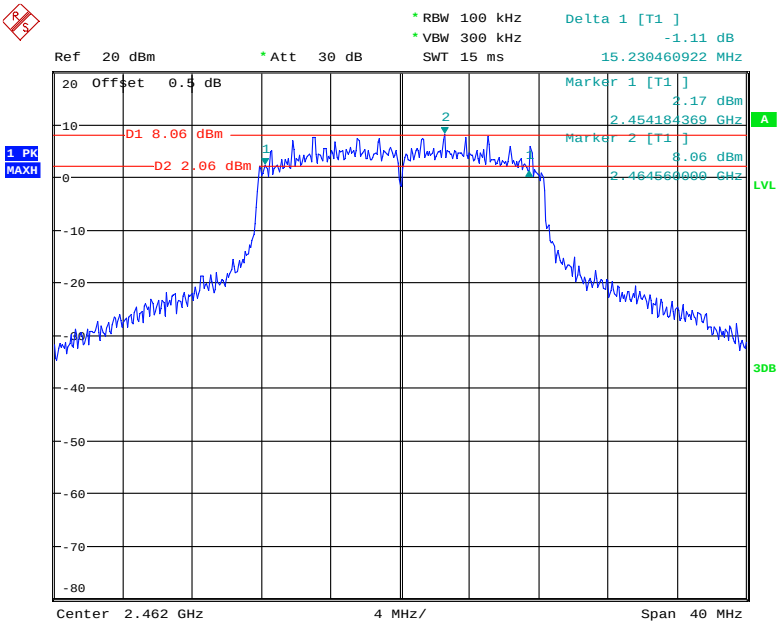
Date: 7.DEC.2017 20:26:34

802.11g Middle Channel



Date: 7.DEC.2017 20:24:38

802.11g High Channel



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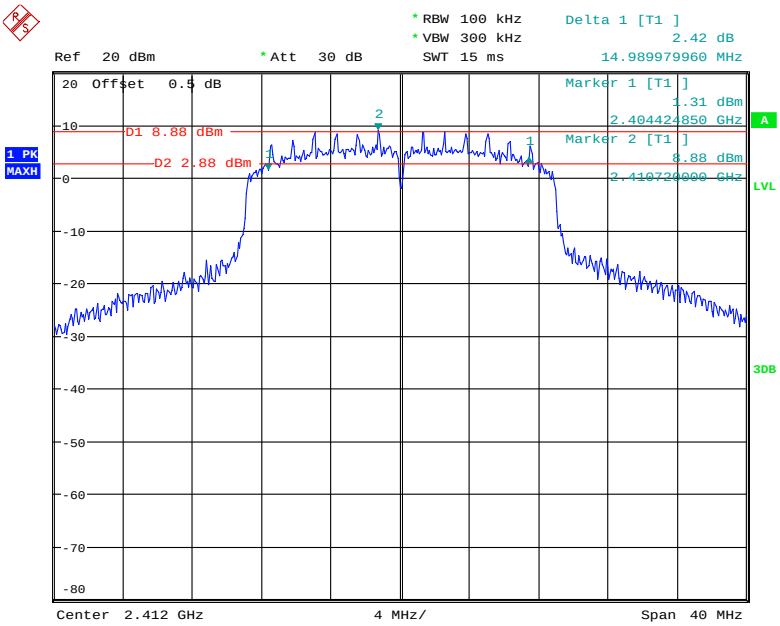
802.11n ht20 Low Channel



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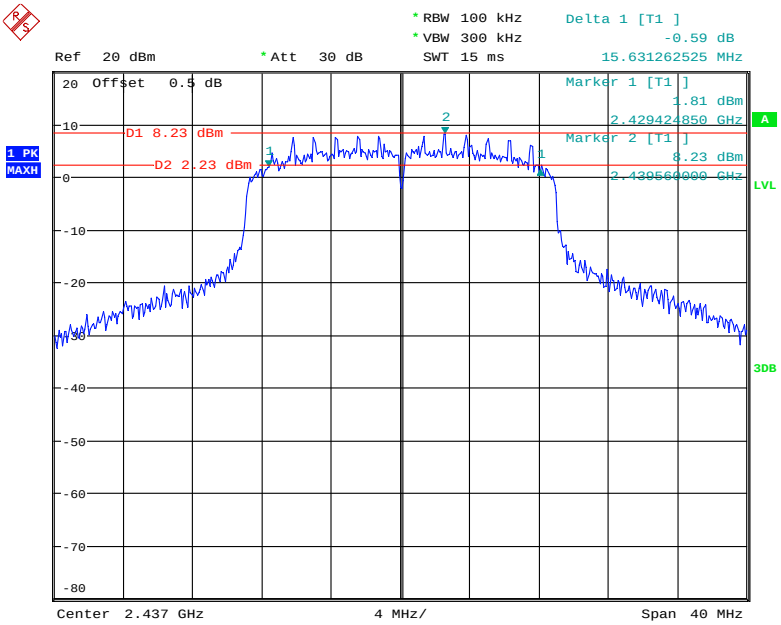
802.11n ht20 Middle Channel



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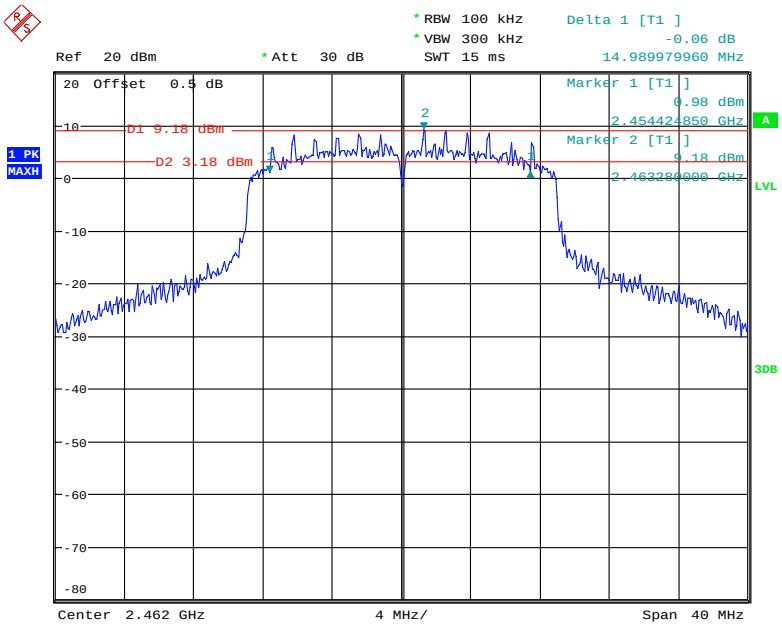
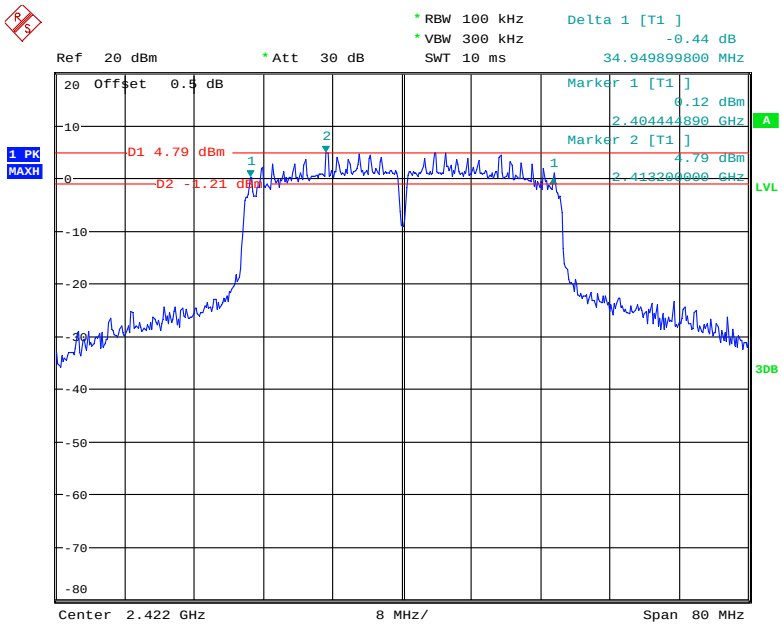
802.11n ht20 High Channel



Date: 7.DEC.2017 20:39:00

802.11n ht40 Low Channel



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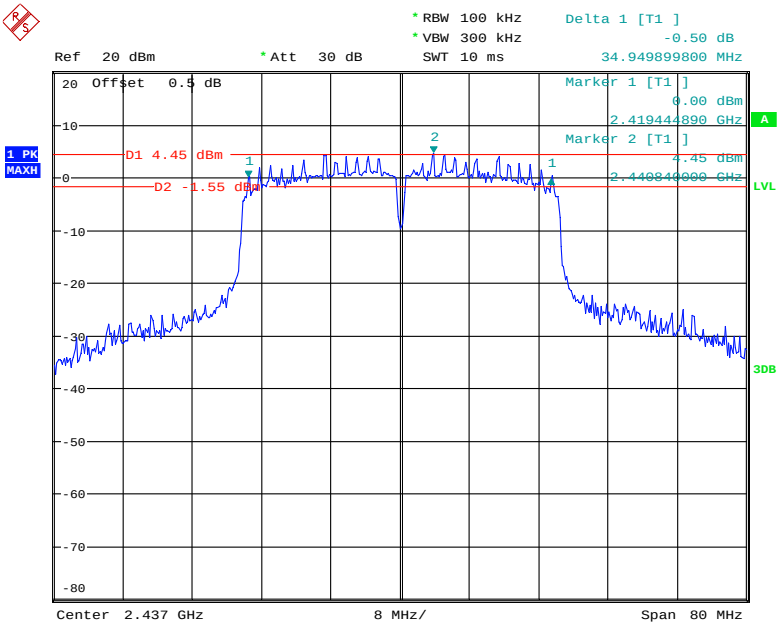
802.11n ht40 Middle Channel



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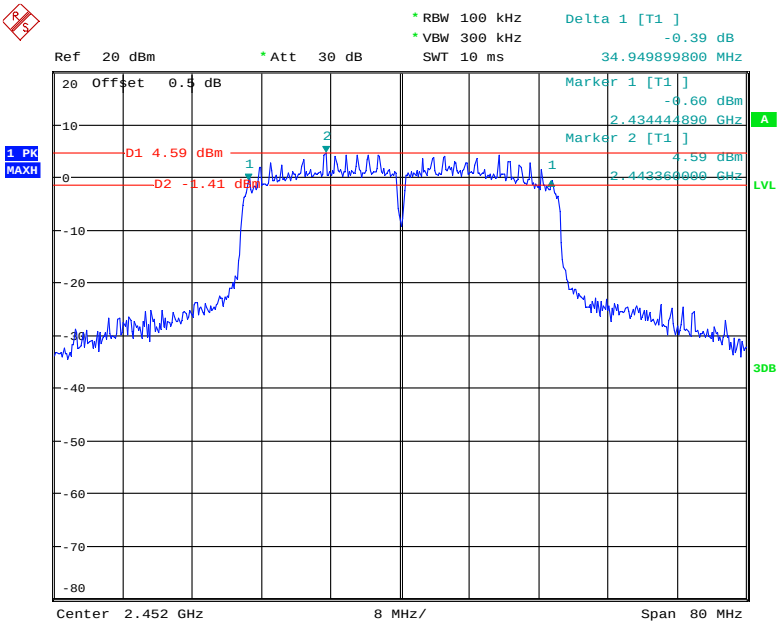
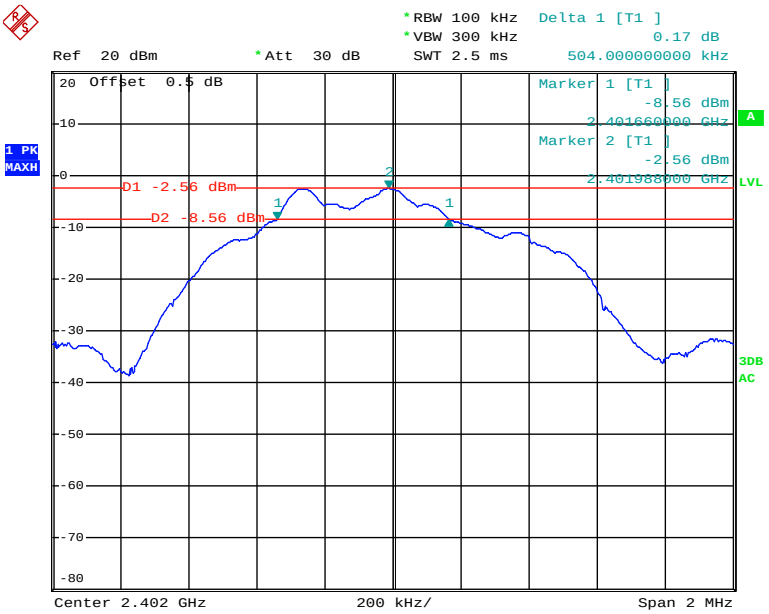
802.11n ht40 High Channel



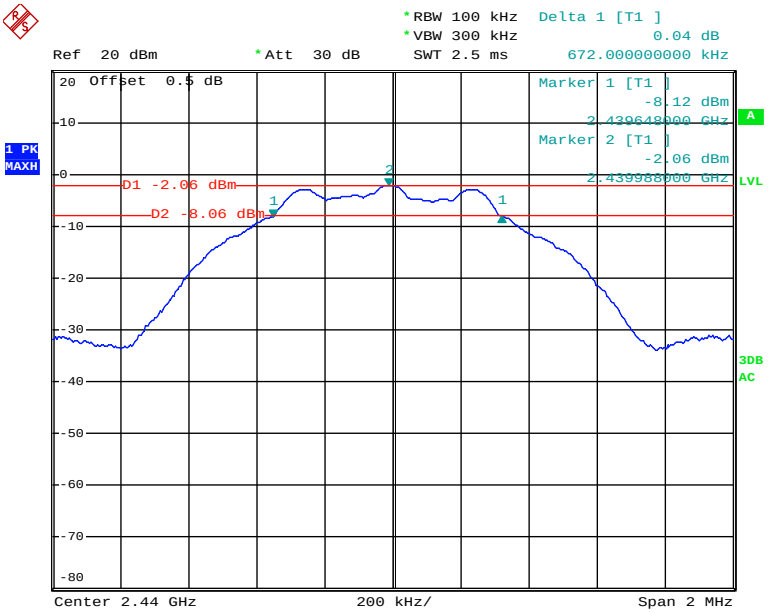
Date: 7.DEC.2017 20:54:10

BLE Low Channel



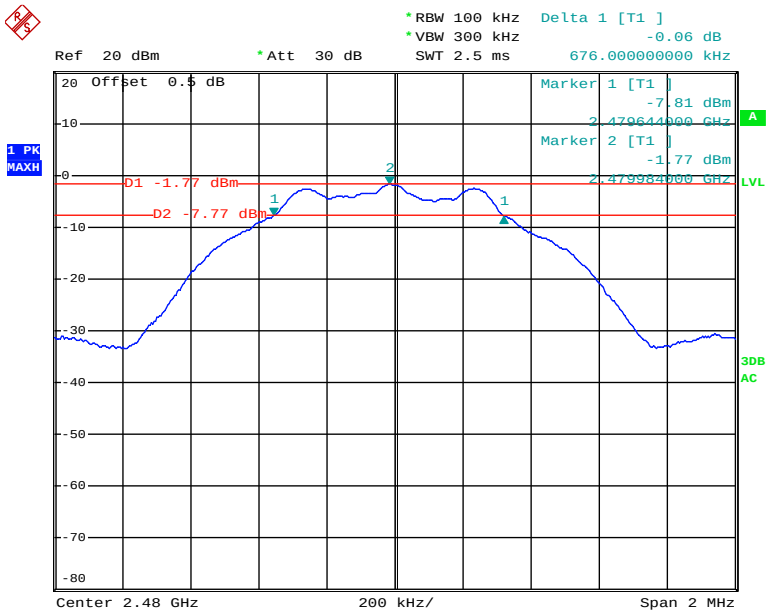
Date: 4.DEC.2017 19:37:10

BLE Middle Channel



Date: 4.DEC.2017 19:36:12

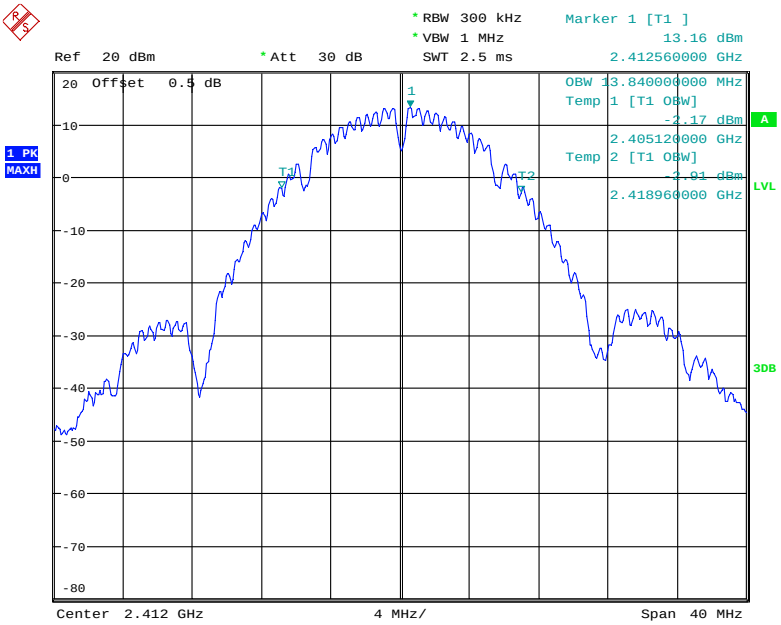
BLE High Channel



Date: 4.DEC.2017 19:34:52

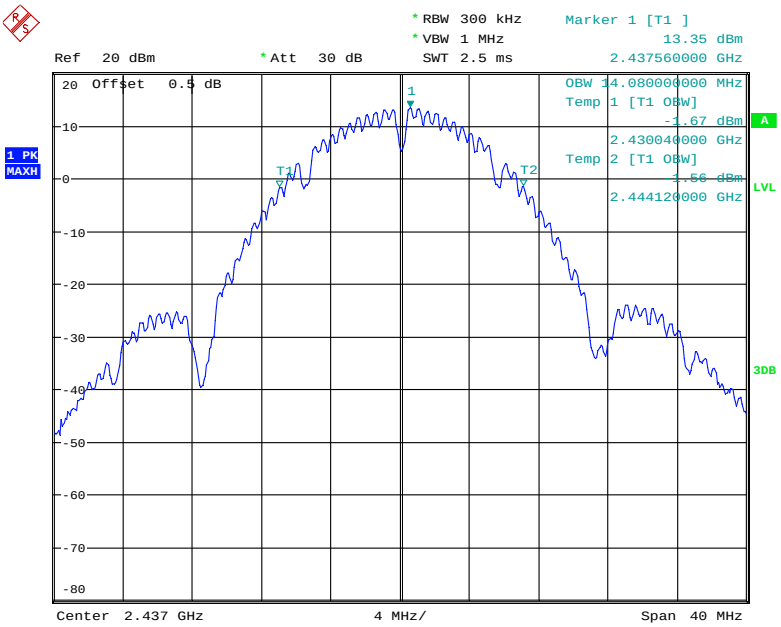
99% Occupied bandwidth:

802.11b Low Channel



Date: 7.DEC.2017 20:03:58

802.11b Middle Channel



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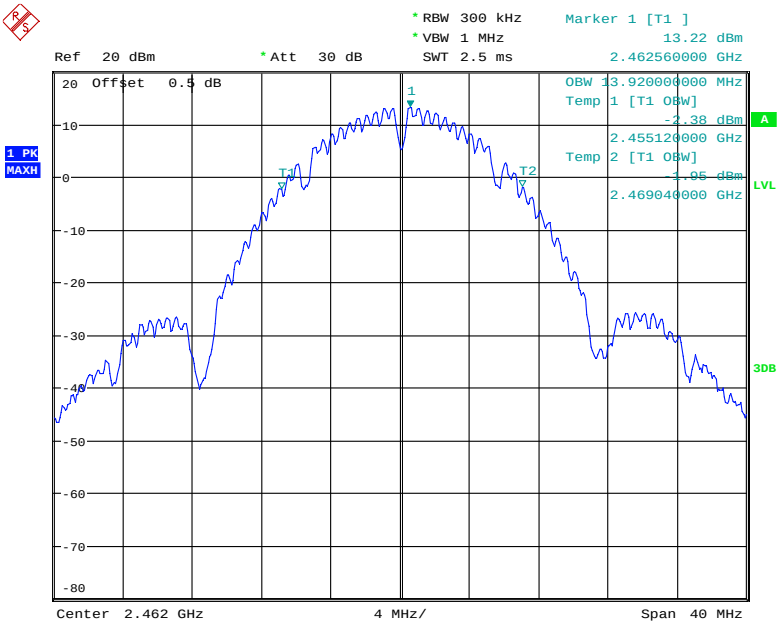
802.11b High Channel



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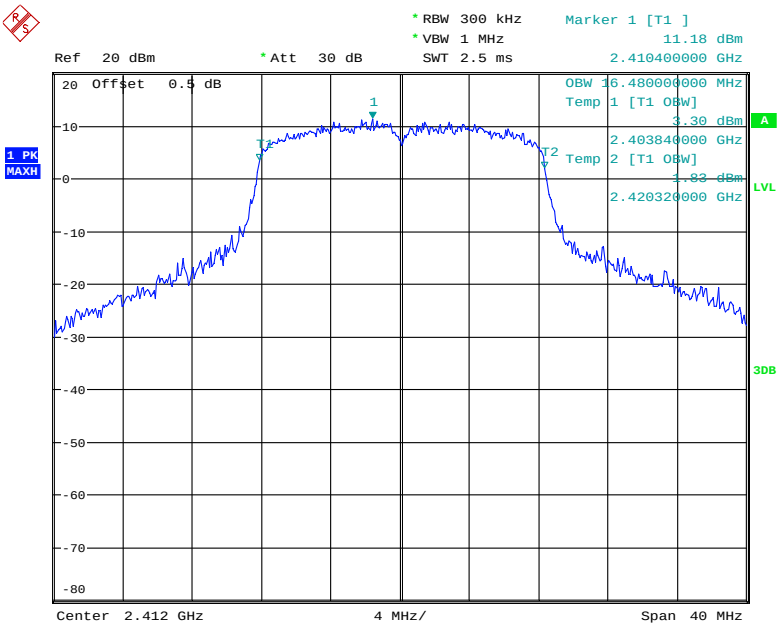
802.11g Low Channel



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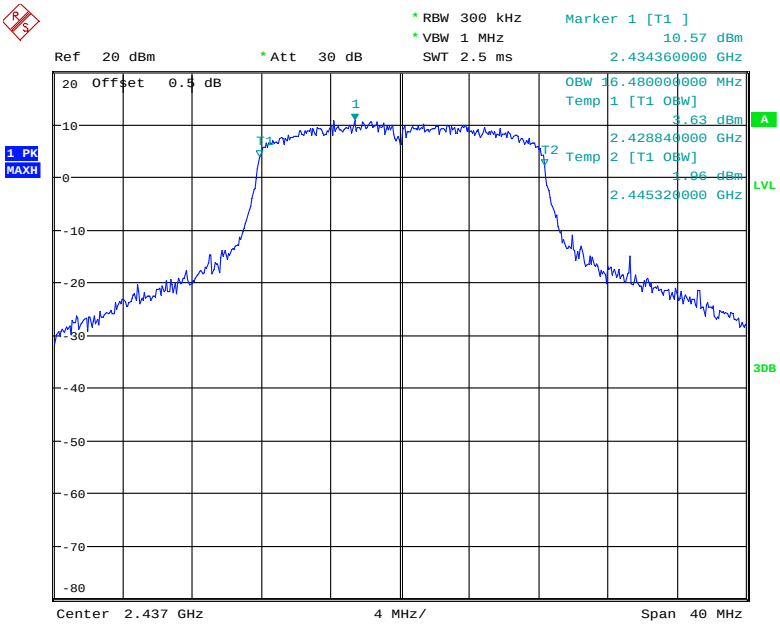
802.11g Middle Channel



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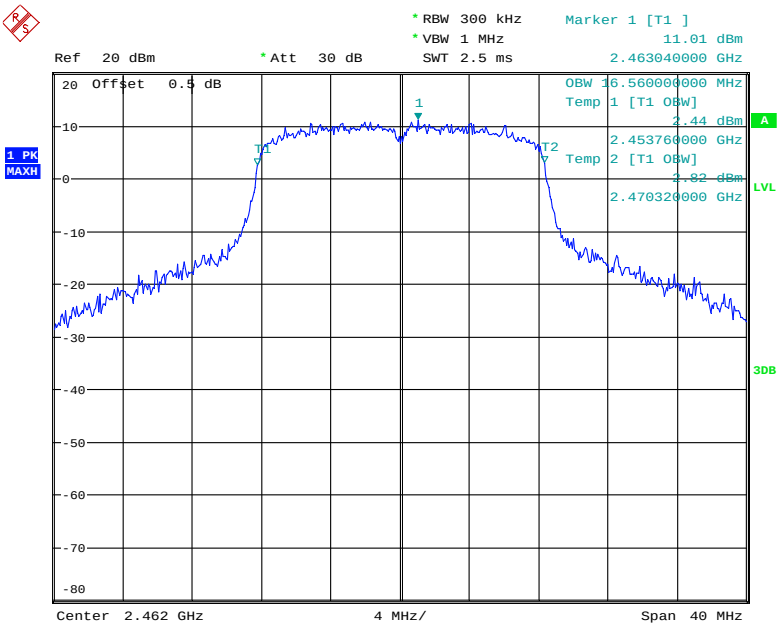
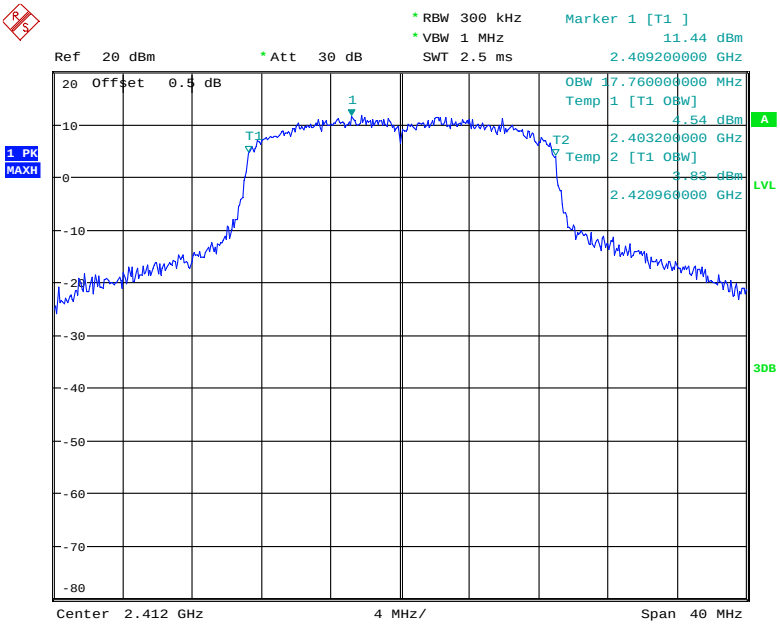
802.11g High Channel



Date: 7.DEC.2017 20:28:41

802.11n ht20 Low Channel



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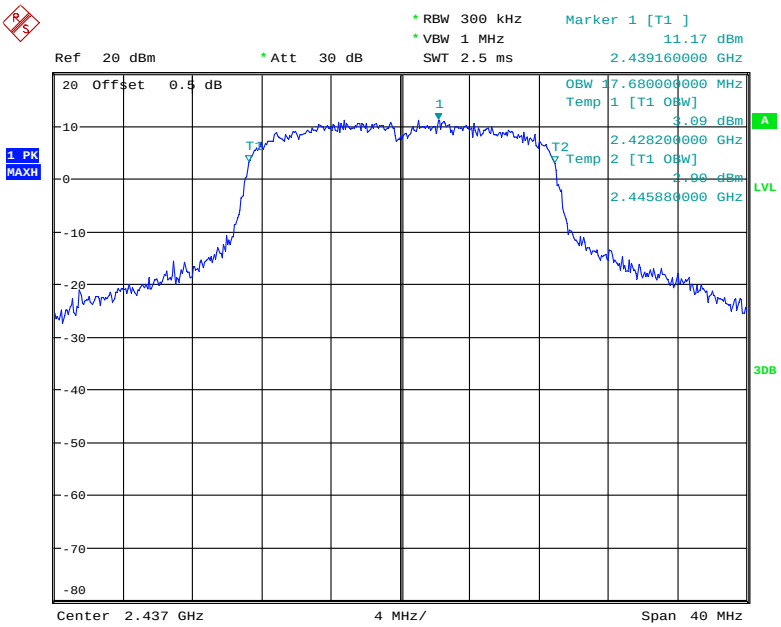
802.11n ht20 Middle Channel



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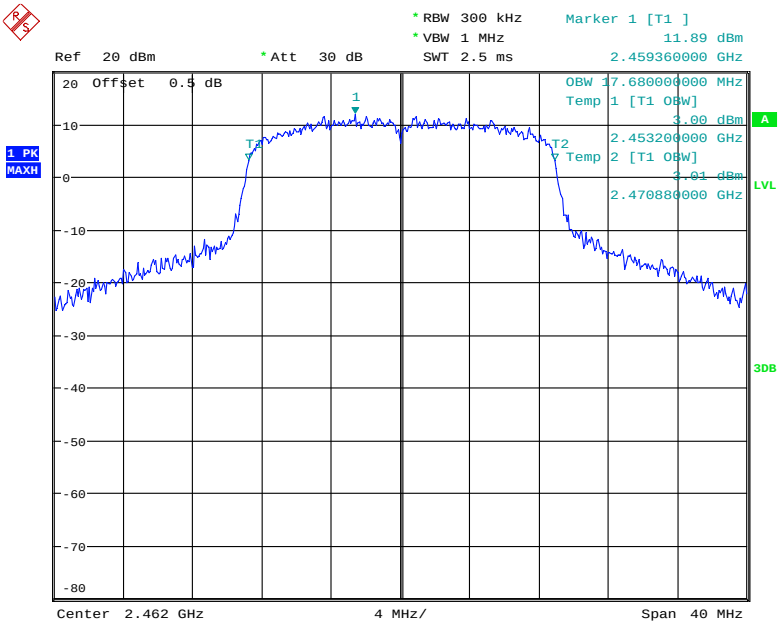
802.11n ht20 High Channel



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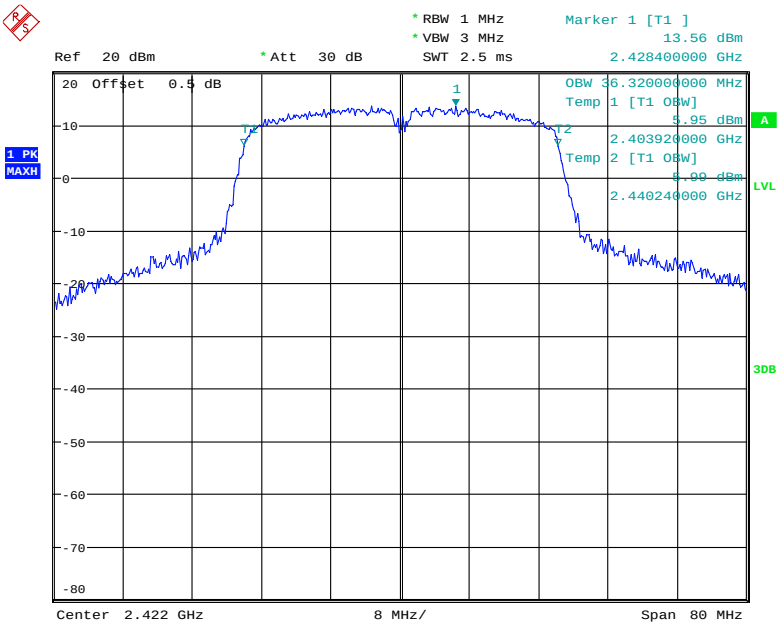
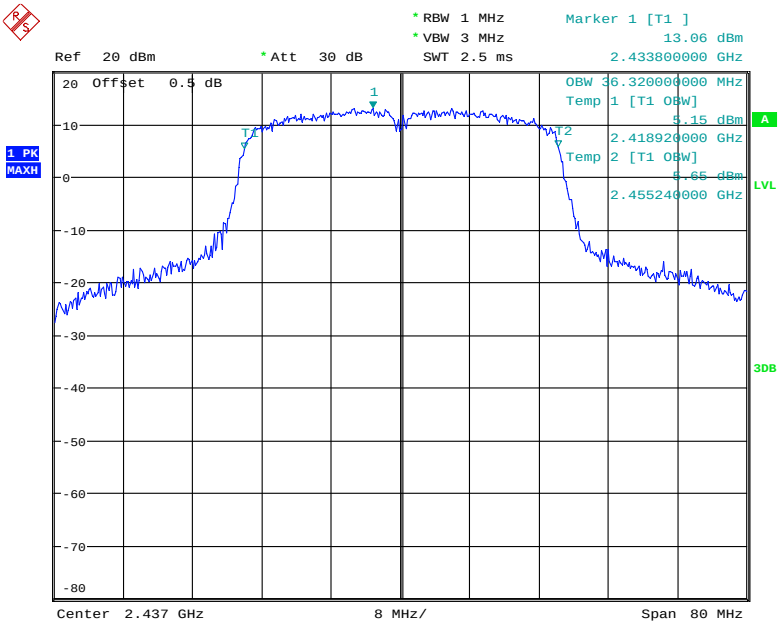
802.11n ht40 Low Channel



Date: 7.DEC.2017 20:46:36

802.11n ht40 Middle Channel



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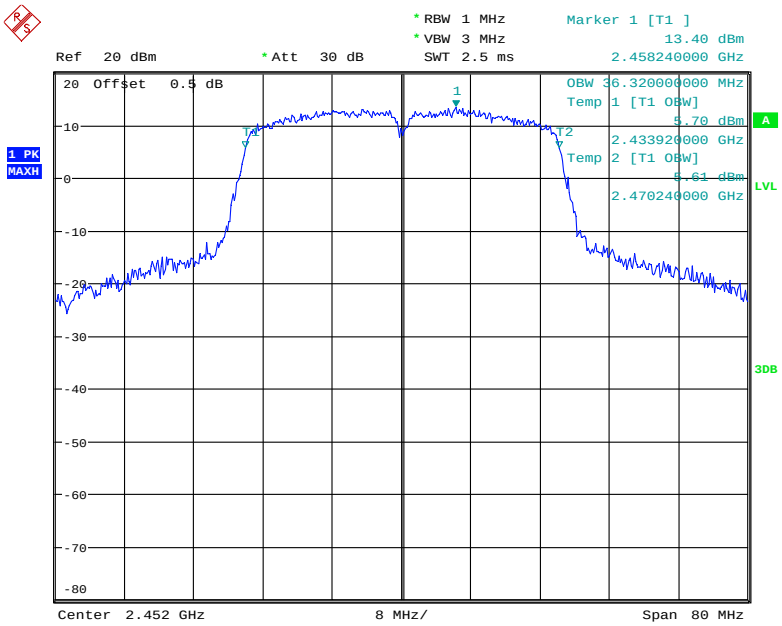
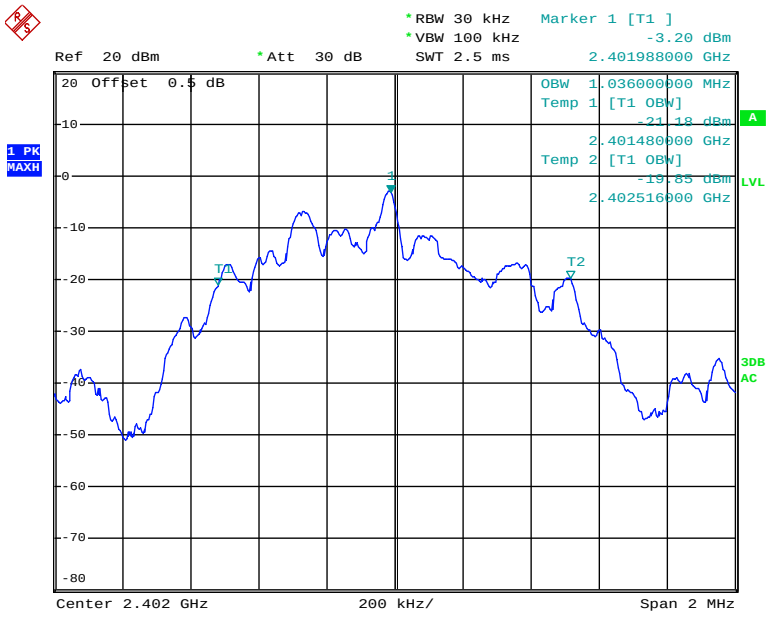


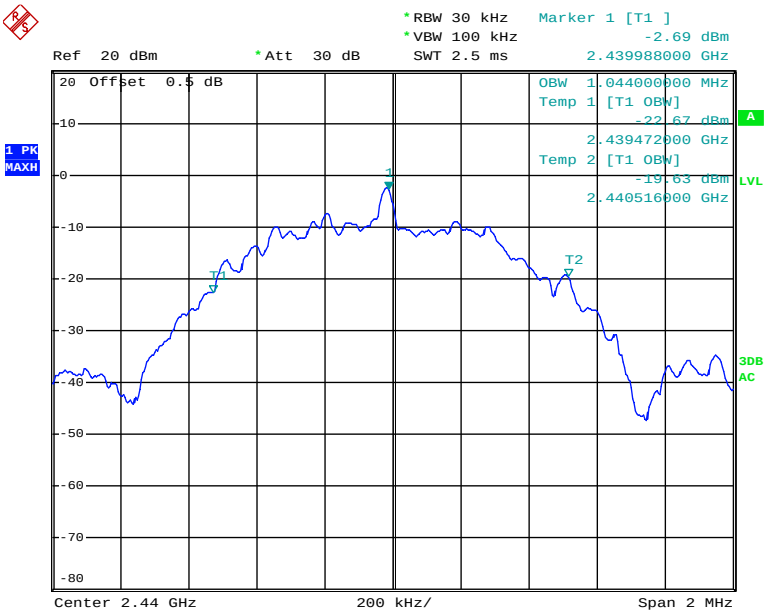
Date: 7.DEC.2017 20:54:22

BLE Low Channel



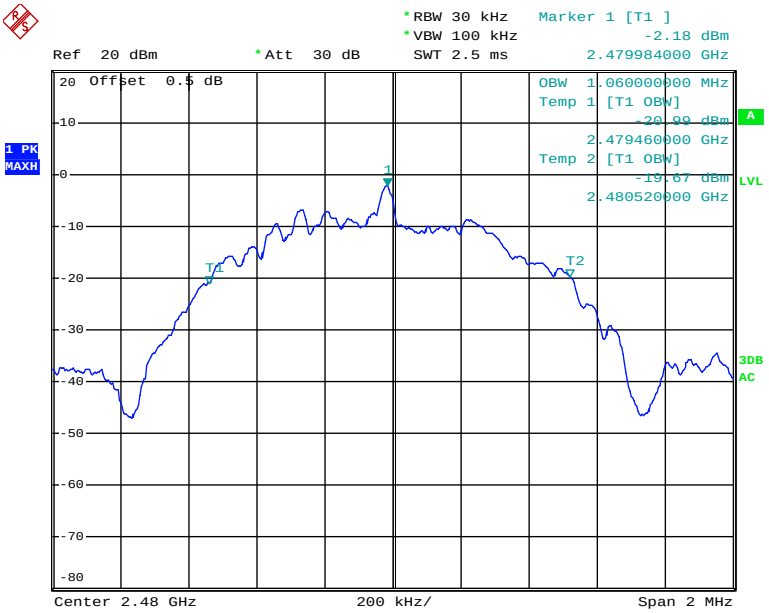
Date: 4.DEC.2017 18:27:19

BLE Middle Channel



Date: 4.DEC.2017 18:28:35

BLE High Channel



Date: 4.DEC.2017 18:29:38

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

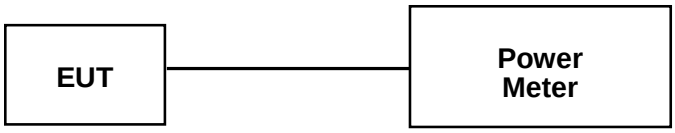
Applicable Standard

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	Wideband Power Sensor	N1921A	MY54170013	2017-11-03	2018-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2017-11-03	2018-11-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each Time	/
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	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:	25.1~25.5 °C
Relative Humidity:	41~49 %
ATM Pressure:	101.2 kPa

** The testing was performed by Mark Pan from 2017-12-04 to 2017-12-07.*

Test Mode: Transmitting

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

WLAN
SISO:

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Limit (dBm)
			Main	Aux	
802.11b	Low	2412	23.64	22.93	30
	Middle	2437	23.44	23.14	30
	High	2462	23.65	23.36	30
802.11g	Low	2412	25.85	24.62	30
	Middle	2437	26.53	26.18	30
	High	2462	24.68	24.65	30
802.11n ht20	Low	2412	25.85	24.51	30
	Middle	2437	26.15	25.85	30
	High	2462	25.37	24.43	30
802.11n ht40	Low	2422	24.54	23.98	30
	Middle	2437	24.31	24.16	30
	High	2452	23.8	23.3	30

Test mode	Channel	Frequency (MHz)	Max Conducted Average Output Power (dBm)		Limit (dBm)
			Main	Aux	
802.11b	Low	2412	19.64	19.33	30
	Middle	2437	19.62	19.42	30
	High	2462	19.51	19.66	30
802.11g	Low	2412	17.92	16.86	30
	Middle	2437	18.21	17.14	30
	High	2462	16.76	16.83	30
802.11n ht20	Low	2412	17.88	16.73	30
	Middle	2437	18.32	17.71	30
	High	2462	17.68	16.72	30
802.11n ht40	Low	2422	17.11	16.72	30
	Middle	2437	17.21	17.52	30
	High	2452	15.98	16.11	30

MIMO:

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)			Limit (dBm)
			Main	Aux	Total	
802.11n ht20	Low	2412	23.34	23.52	26.44	30
	Middle	2437	23.14	23.25	26.21	30
	High	2462	23.57	23.43	26.51	30
802.11n ht40	Low	2422	21.3	22.74	25.09	30
	Middle	2437	22.51	23.43	26.00	30
	High	2452	22.48	23.07	25.80	30

Test mode	Channel	Frequency (MHz)	Max Conducted Average Output Power (dBm)			Limit (dBm)
			Main	Aux	Total	
802.11n ht20	Low	2412	15.11	14.35	17.76	30
	Middle	2437	14.95	14.66	17.82	30
	High	2462	14.99	14.87	17.94	30
802.11n ht40	Low	2422	13.29	14.85	17.15	30
	Middle	2437	15.26	16.54	18.96	30
	High	2452	14.48	15.52	18.04	30

BLE:

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
Low	2402	-1.94	30
Middle	2440	-1.39	30
High	2480	-1.15	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	EMI Test Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each Time	/
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	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:	25.1~25.5 °C
Relative Humidity:	41~49 %
ATM Pressure:	101.2 kPa

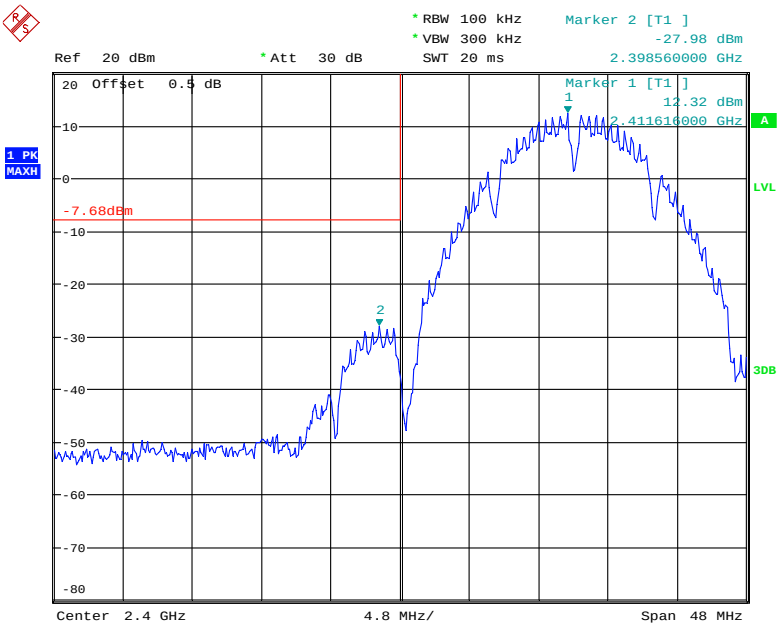
** The testing was performed by Mark Pan from 2017-12-04 to 2018-01-19.*

Test mode: Transmitting

Test Result: Compliant. For 802.11n only SISO mode was test, since the output power is more than MIMO mode, please refer to following plots.

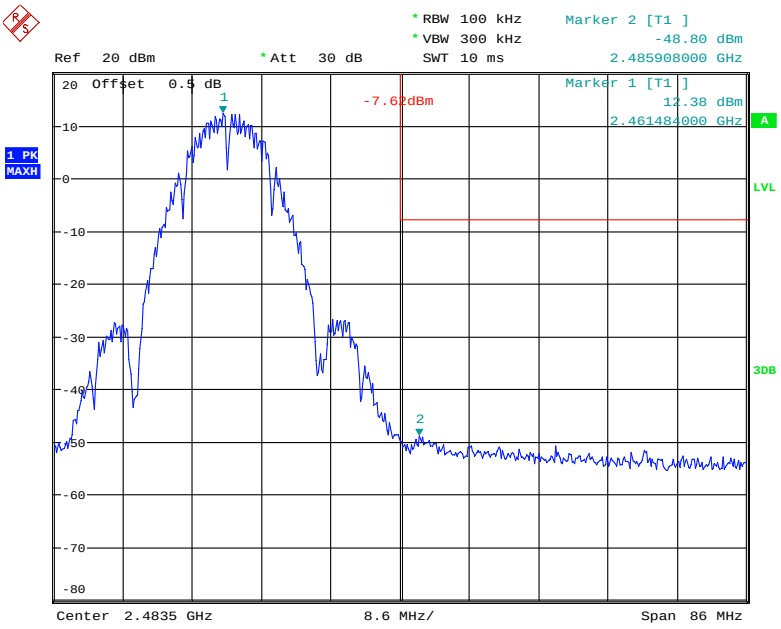
Main Chain:

802.11b: Band Edge, Left Side



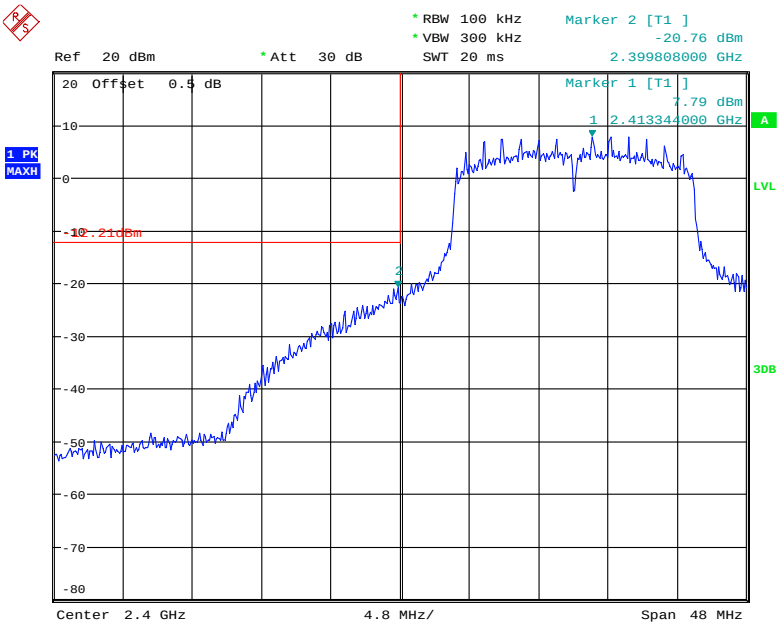
Date: 7.DEC.2017 20:05:03

802.11b: Band Edge, Right Side



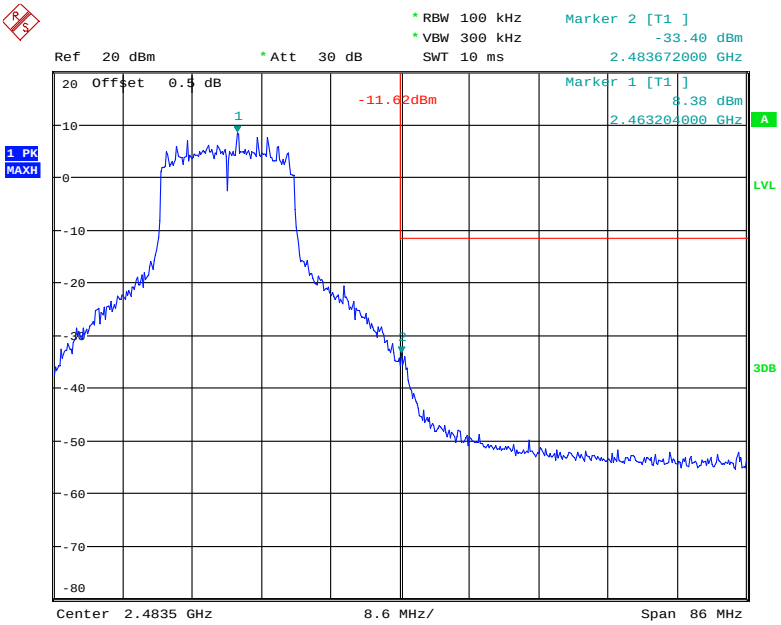
Date: 7.DEC.2017 20:11:10

802.11g: Band Edge, Left Side



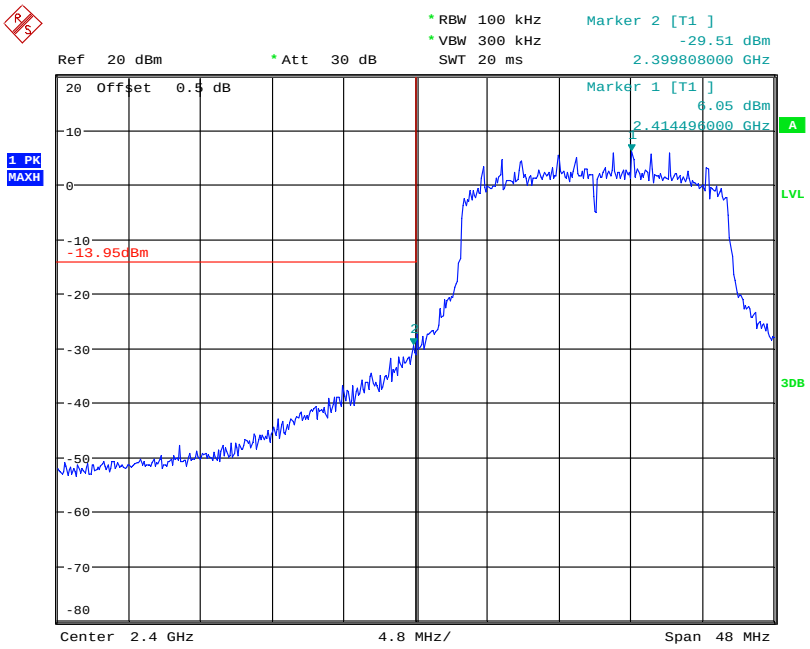
Date: 7.DEC.2017 20:27:44

802.11g: Band Edge, Right Side



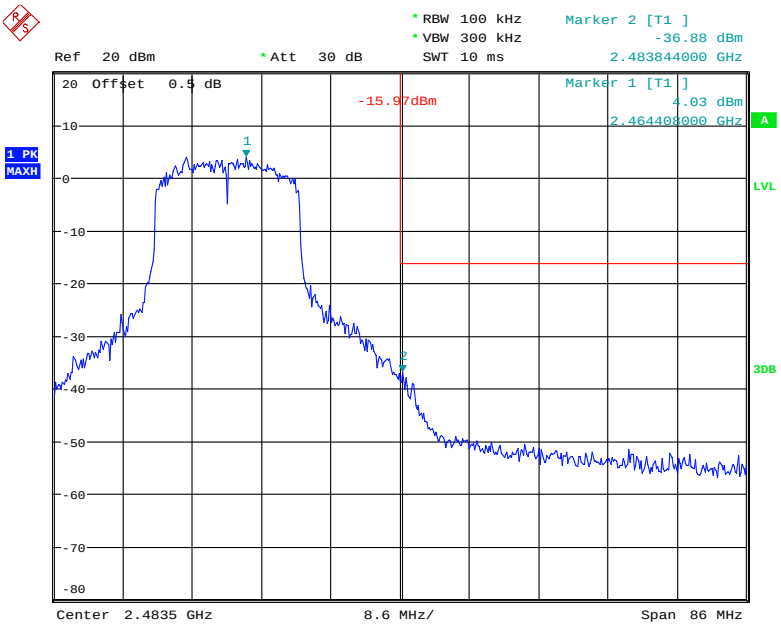
Date: 7.DEC.2017 20:29:54

802.11n ht20 Band Edge, Left Side



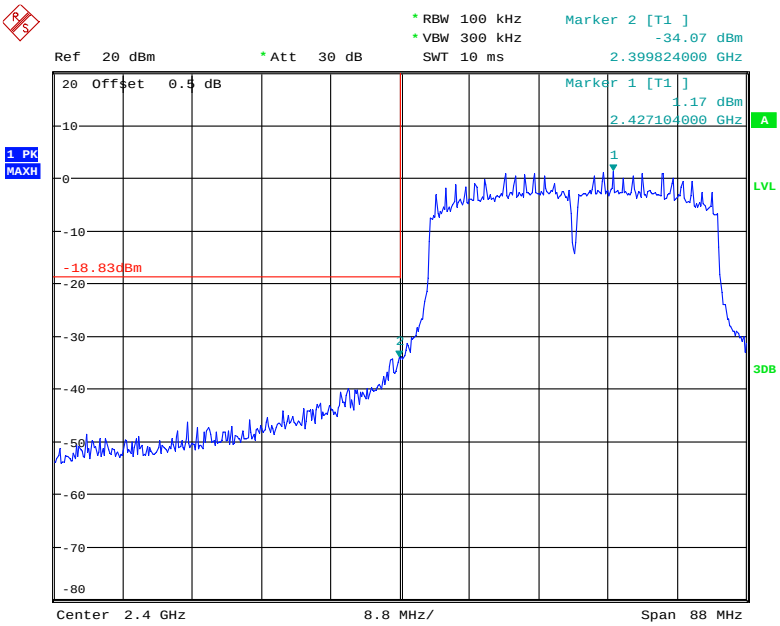
Date: 19.JAN.2018 09:58:15

802.11n ht20 Band Edge, Right Side



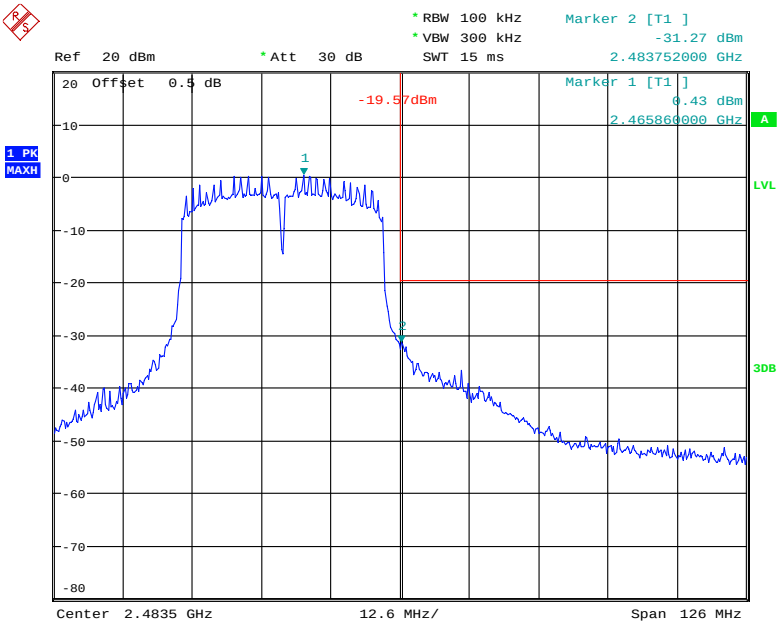
Date: 19.JAN.2018 09:59:27

802.11n ht40 Band Edge, Left Side



Date: 19.JAN.2018 10:02:30

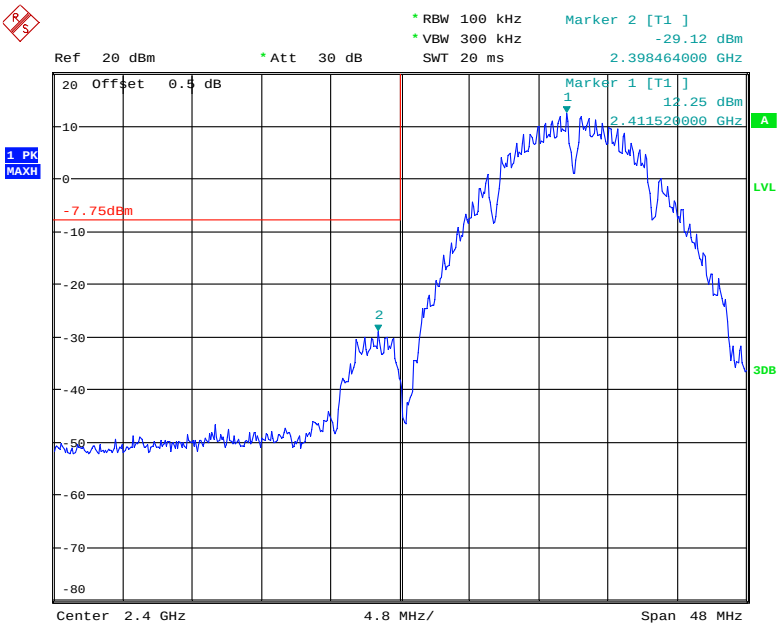
802.11n ht40 Band Edge, Right Side



Date: 19.JAN.2018 10:03:31

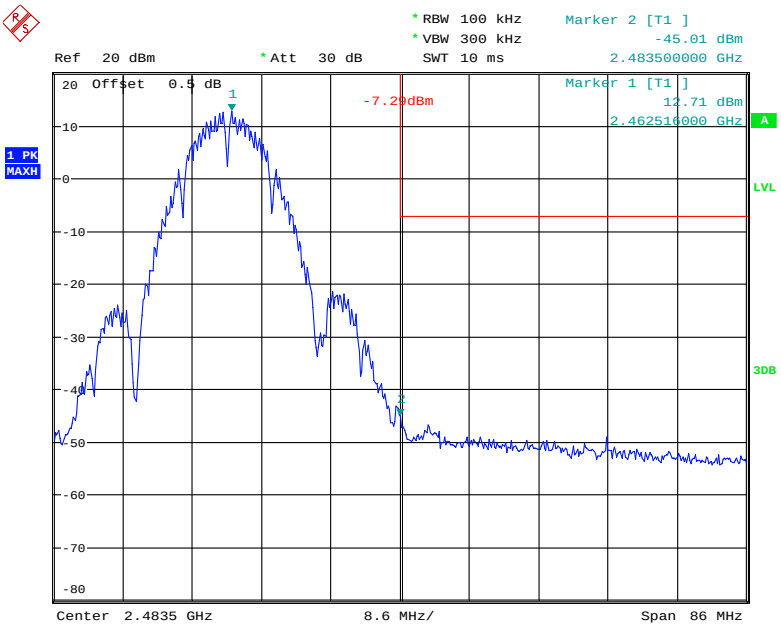
Aux Chain:

802.11b: Band Edge, Left Side



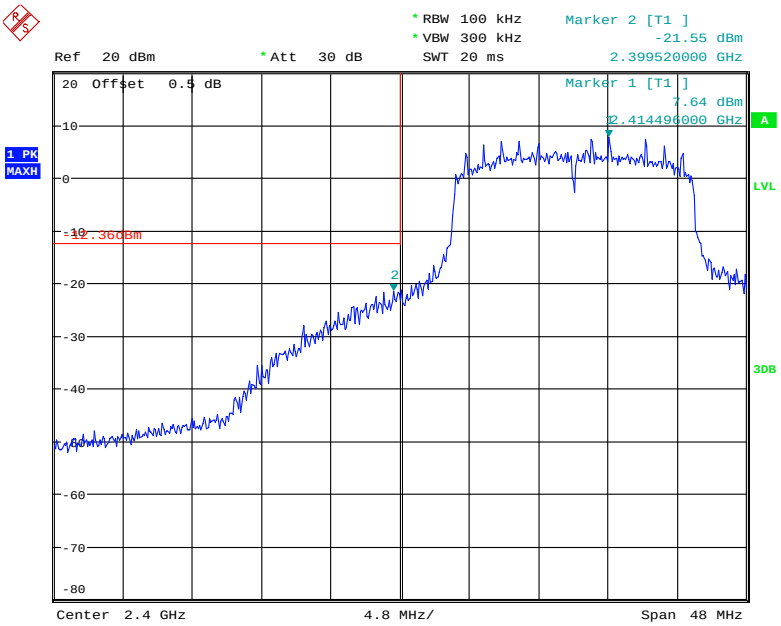
Date: 7.DEC.2017 21:03:18

802.11b: Band Edge, Right Side



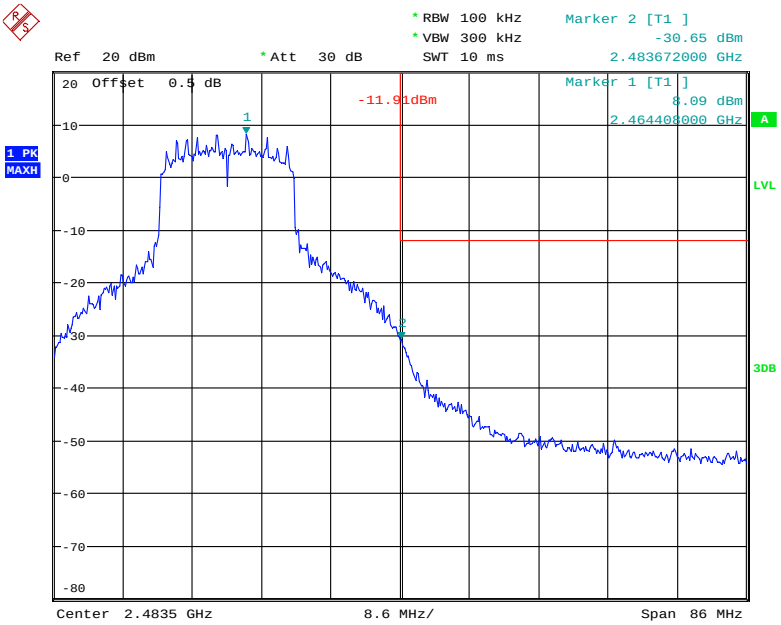
Date: 7.DEC.2017 21:07:23

802.11g: Band Edge, Left Side



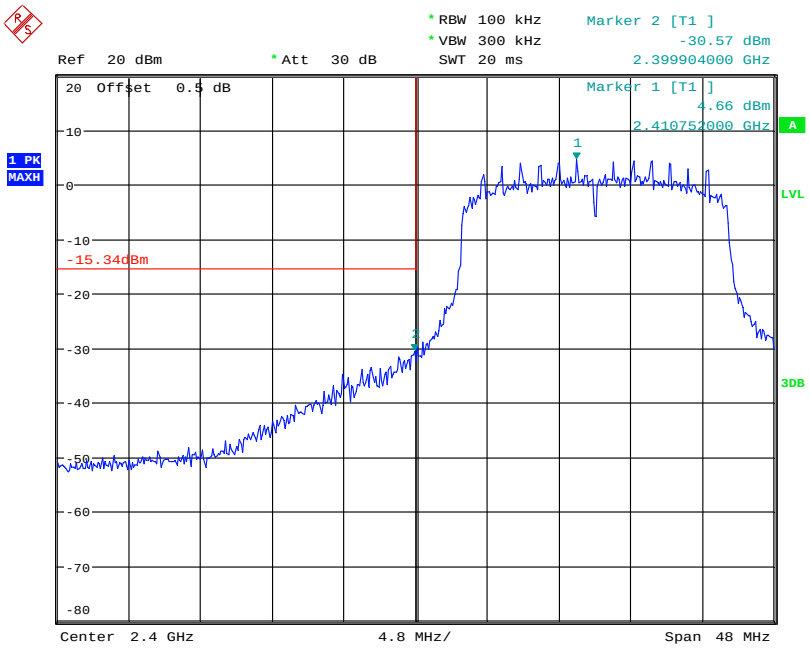
Date: 7.DEC.2017 21:10:58

802.11g: Band Edge, Right Side



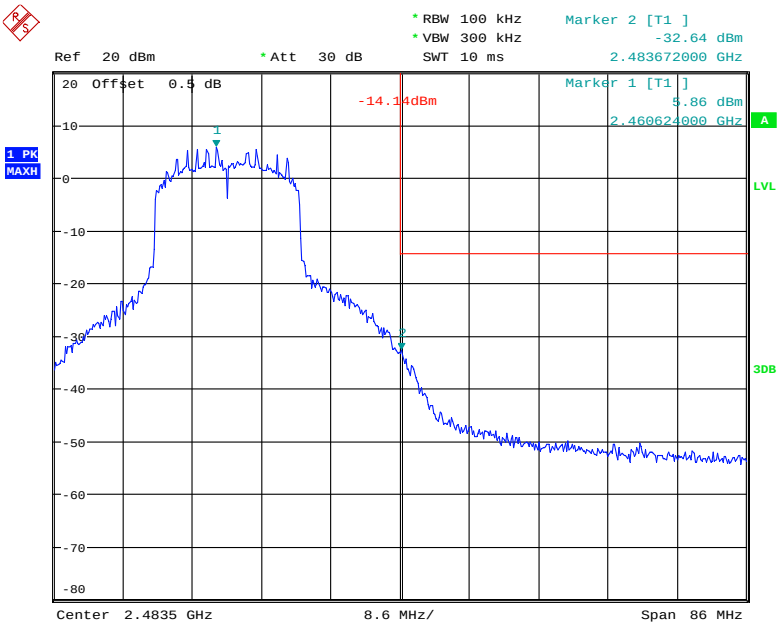
Date: 7.DEC.2017 21:15:12

802.11n ht20 Band Edge, Left Side



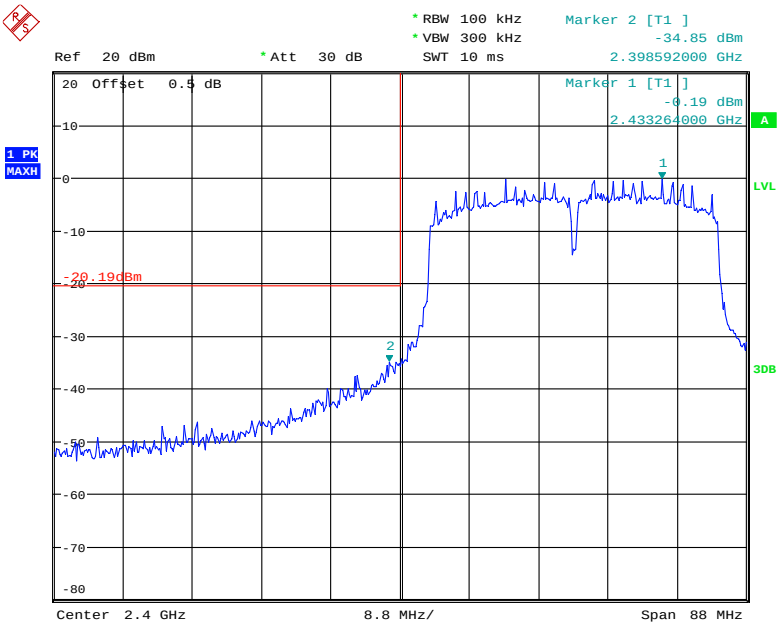
Date: 19.JAN.2018 09:45:51

802.11n ht20 Band Edge, Right Side



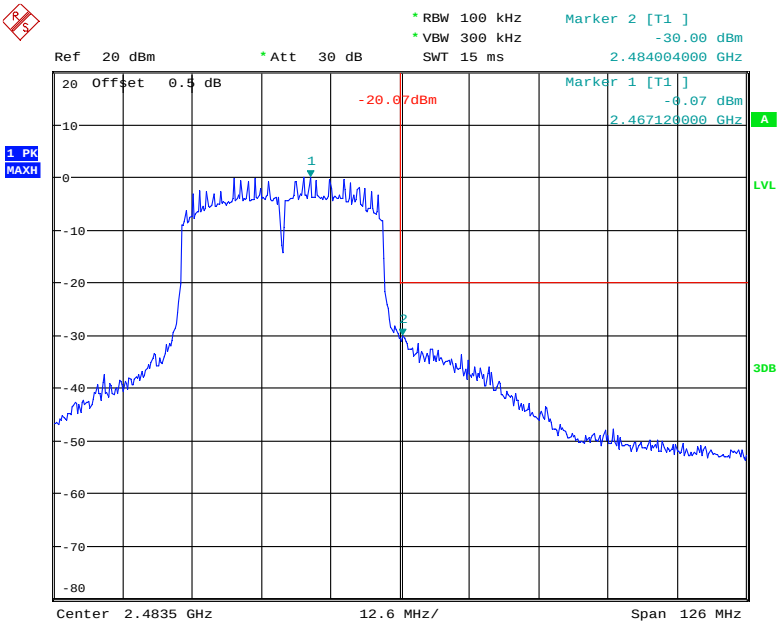
Date: 19.JAN.2018 09:49:23

802.11n ht40 Band Edge, Left Side



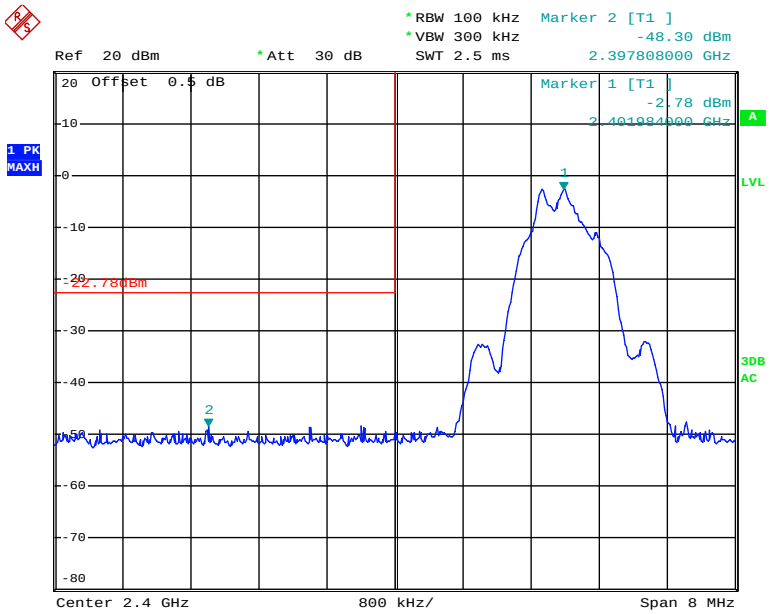
Date: 19.JAN.2018 09:53:51

802.11n ht40 Band Edge, Right Side



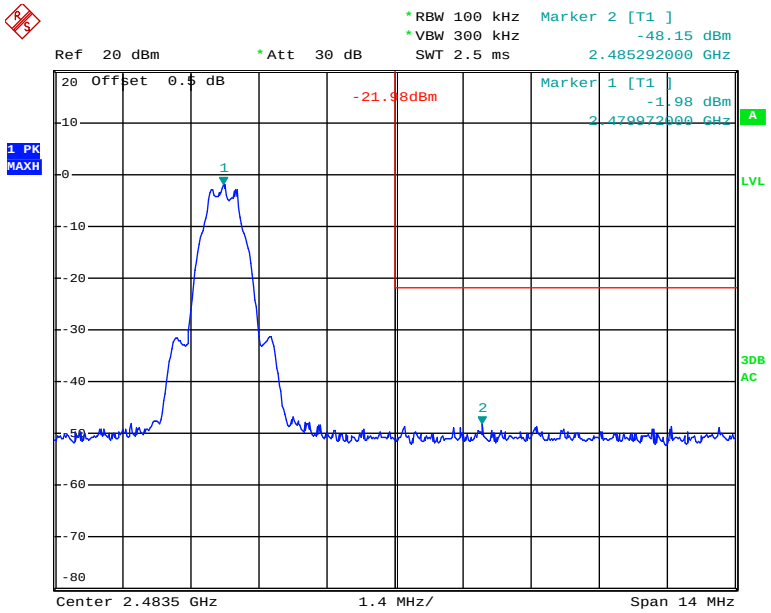
Date: 19.JAN.2018 09:54:43

BLE Band Edge,Left Side



Date: 4.DEC.2017 18:27:35

BLE Band Edge, Right Side



Date: 4.DEC.2017 18:30:00

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	EMI Test Reciever	ESCI	100221	2017-08-04	2018-08-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	25.1~25.5 °C
Relative Humidity:	41~49 %
ATM Pressure:	101.2 kPa

** The testing was performed by Mark Pan from 2017-12-04 to 2017-12-07.*

Test Result: Compliance

Test Mode: Transmitting

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

WLAN:
SISO:

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Limit (dBm/3kHz)
			Main	Aux	
802.11b	Low	2412	-1.53	-1.06	≤8
	Middle	2437	-1.05	-1.03	≤8
	High	2462	-0.10	-0.85	≤8
802.11g	Low	2412	-6.77	-8.17	≤8
	Middle	2437	-7.85	-6.78	≤8
	High	2462	-6.45	-6.74	≤8
802.11n ht20	Low	2412	-5.48	-7.20	≤8
	Middle	2437	-6.55	-6.19	≤8
	High	2462	-6.10	-7.00	≤8
802.11n ht40	Low	2422	-9.40	-10.42	≤8
	Middle	2437	-9.71	-10.30	≤8
	High	2452	-9.15	-9.47	≤8

MIMO:

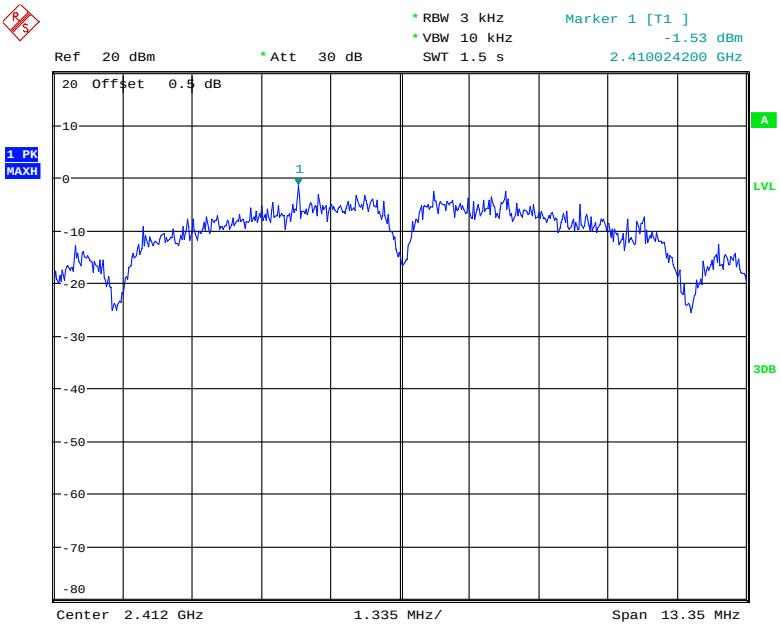
Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
			Main	Aux		
802.11n ht20	Low	2412	-9.88	-9.03	-6.42	≤8
	Middle	2437	-9.8	-9.42	-6.6	≤8
	High	2462	-10.16	-8.94	-6.5	≤8
802.11n ht40	Low	2422	-11.64	-10.94	-8.27	≤8
	Middle	2437	-11.33	-11.45	-8.38	≤8
	High	2452	-11.11	-10.8	-7.94	≤8

BLE:

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-16.7	≤8
Middle	2440	-16.3	≤8
High	2480	-17.22	≤8

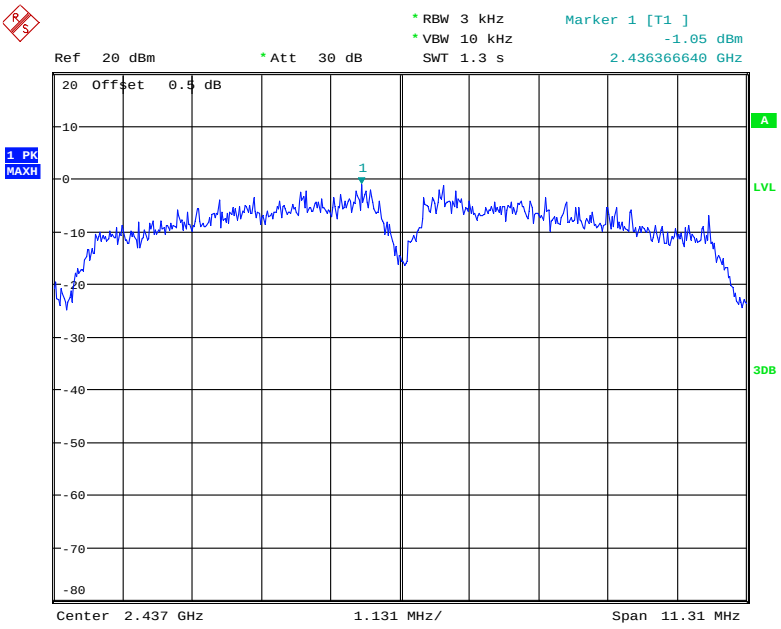
WLAN, SISO:
Main Chain:

Power Spectral Density, 802.11b Low Channel



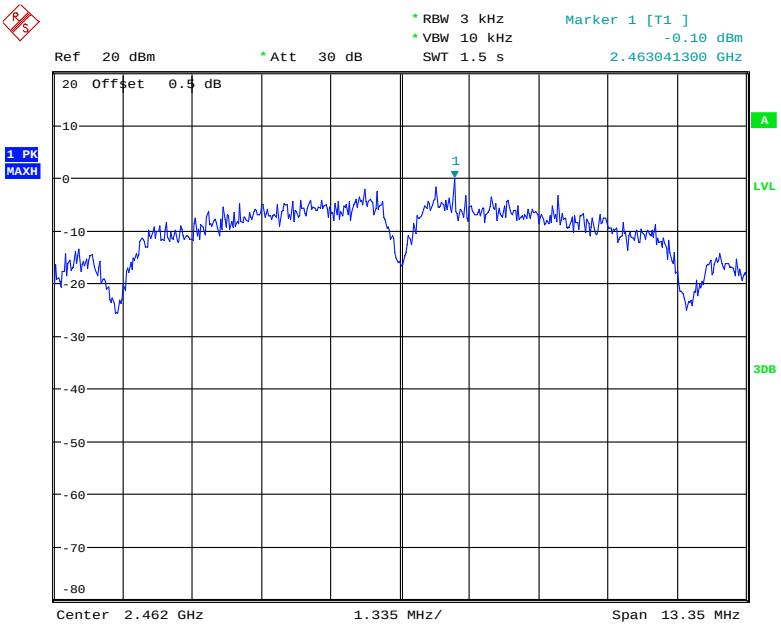
Date: 7.DEC.2017 20:04:43

Power Spectral Density, 802.11b Middle Channel



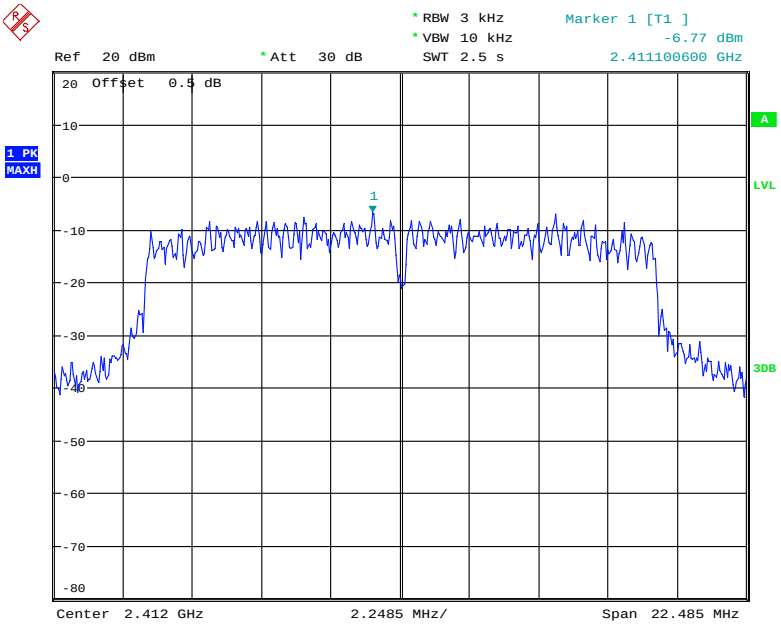
Date: 7.DEC.2017 20:08:43

Power Spectral Density, 802.11b High Channel



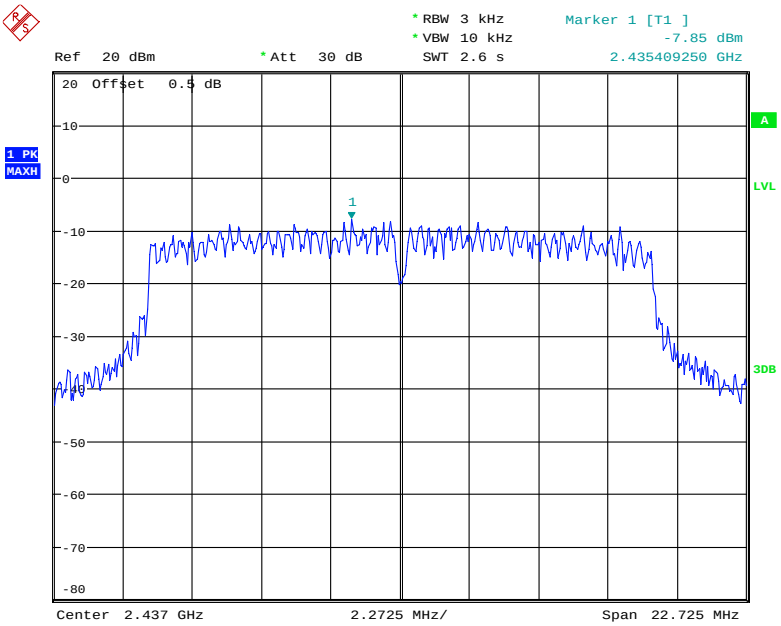
Date: 7.DEC.2017 20:10:45

Power Spectral Density, 802.11g Low Channel



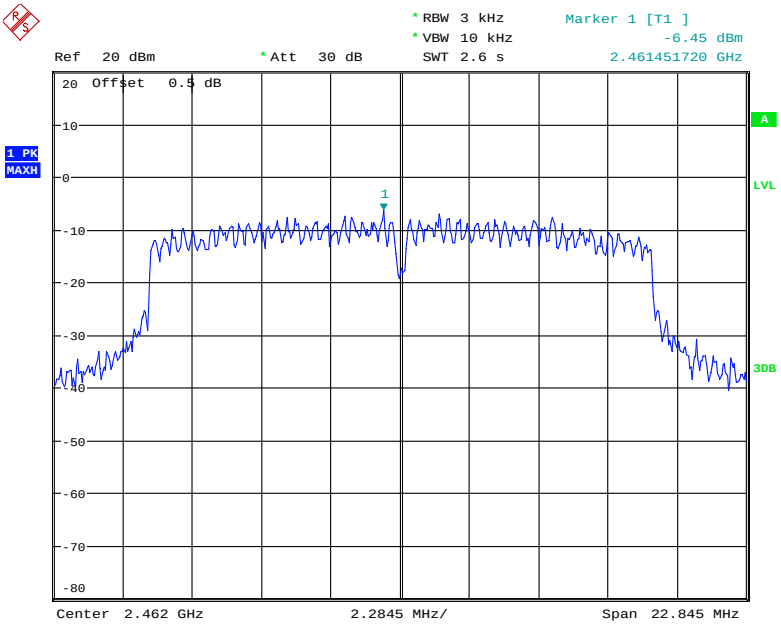
Date: 7.DEC.2017 20:27:26

Power Spectral Density, 802.11g Middle Channel



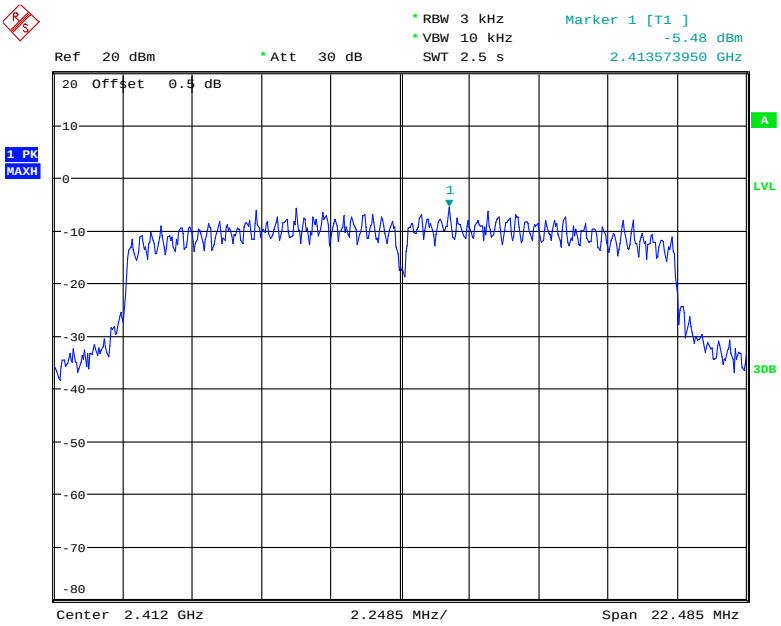
Date: 7.DEC.2017 20:25:32

Power Spectral Density, 802.11g High Channel



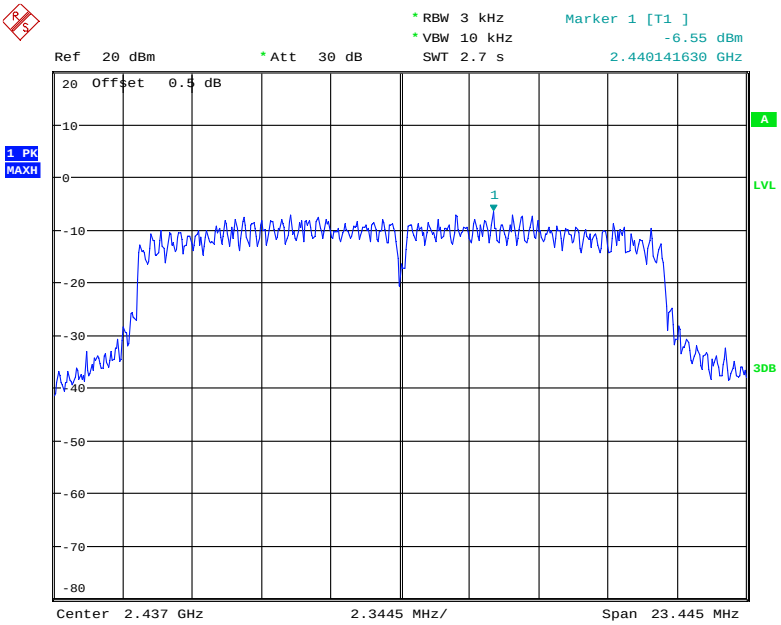
Date: 7.DEC.2017 20:29:30

Power Spectral Density, 802.11n ht20 Low Channel



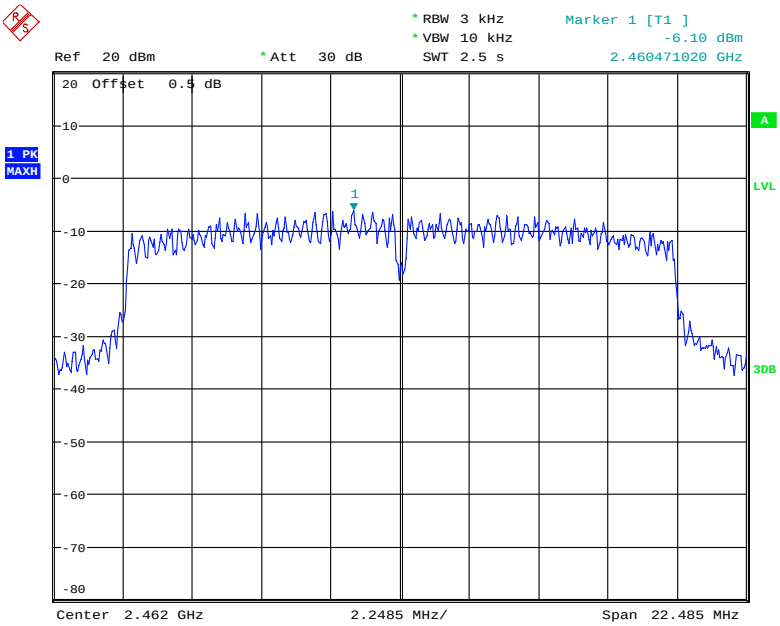
Date: 7.DEC.2017 20:37:34

Power Spectral Density, 802.11n ht20 Middle Channel



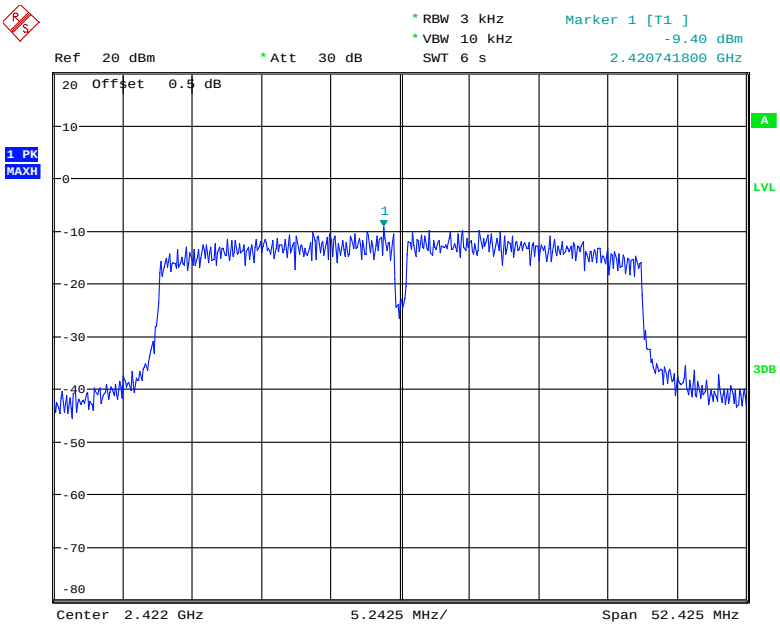
Date: 7.DEC.2017 20:35:29

Power Spectral Density, 802.11n ht20 High Channel



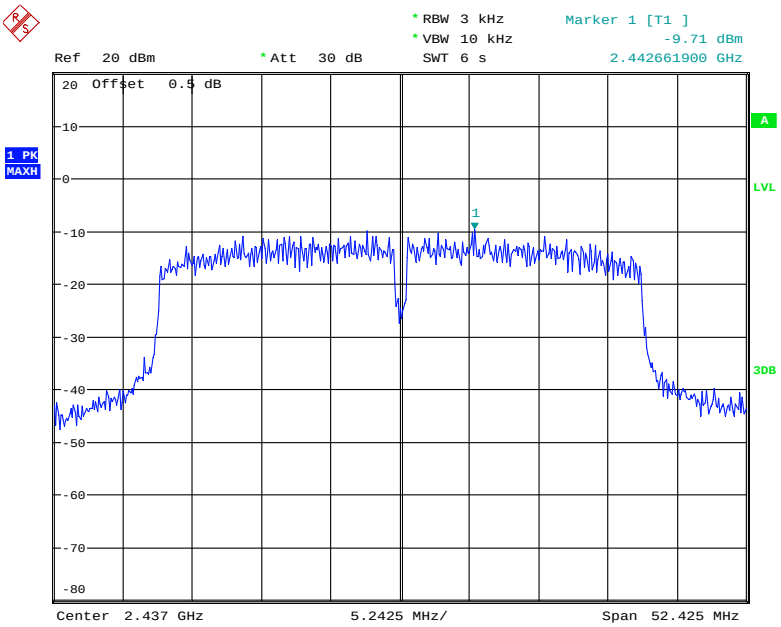
Date: 7.DEC.2017 20:40:00

Power Spectral Density, 802.11n ht40 Low Channel



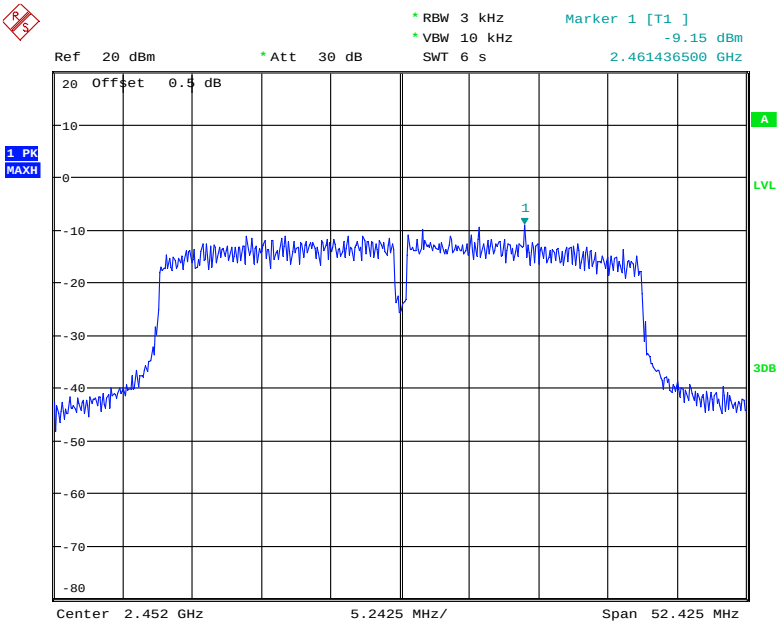
Date: 7.DEC.2017 20:47:46

Power Spectral Density, 802.11n ht40 Middle Channel



Date: 7.DEC.2017 20:53:16

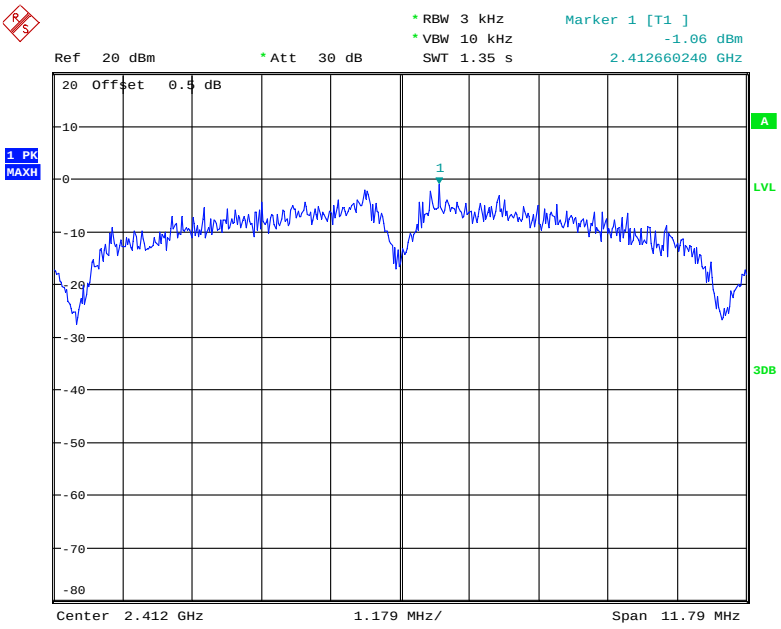
Power Spectral Density, 802.11n ht40 High Channel



Date: 7.DEC.2017 20:55:18

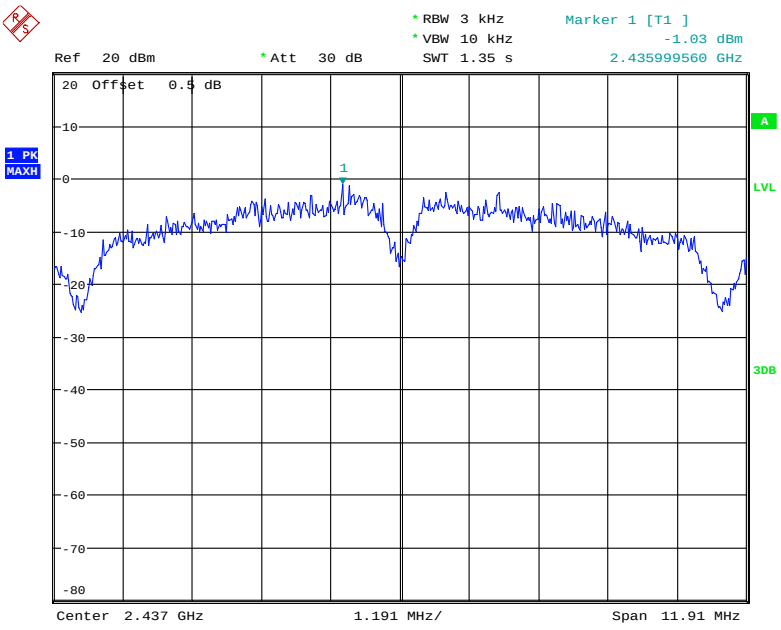
Aux:

Power Spectral Density, 802.11b Low Channel



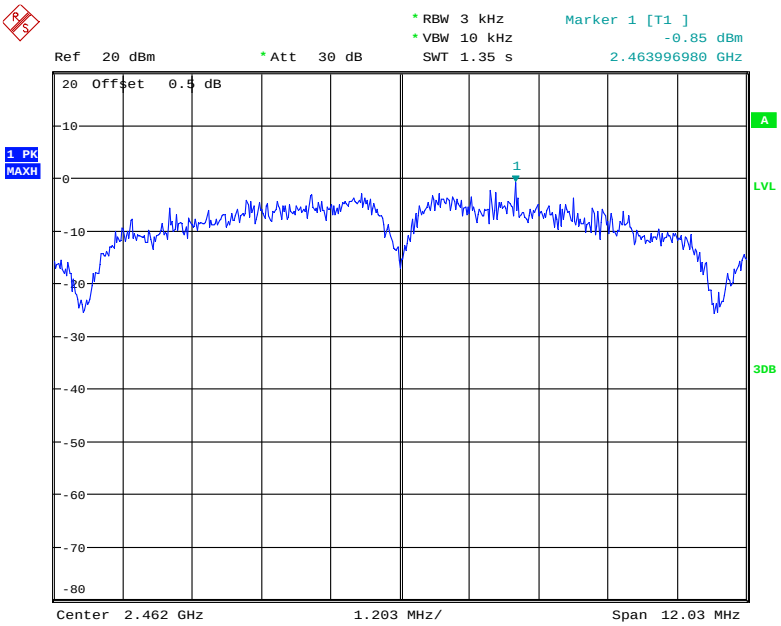
Date: 7.DEC.2017 21:03:01

Power Spectral Density, 802.11b Middle Channel



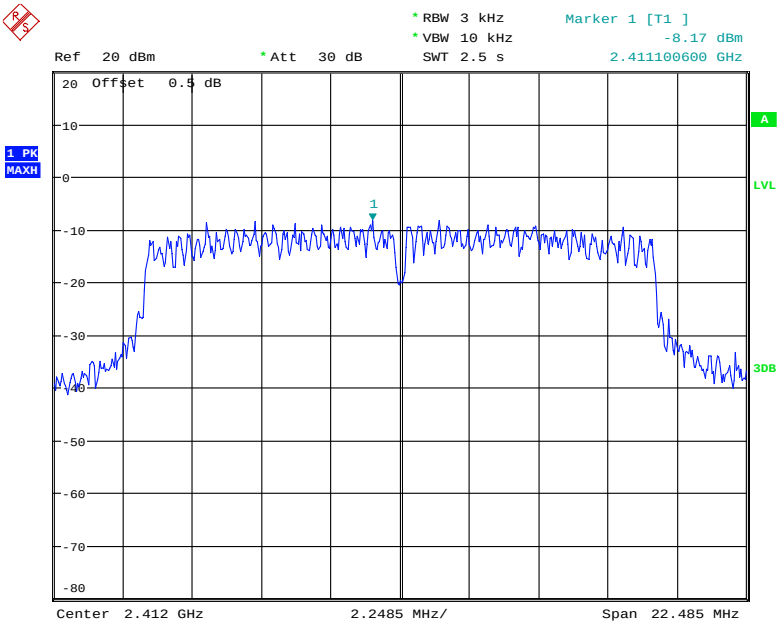
Date: 7.DEC.2017 21:05:18

Power Spectral Density, 802.11b High Channel



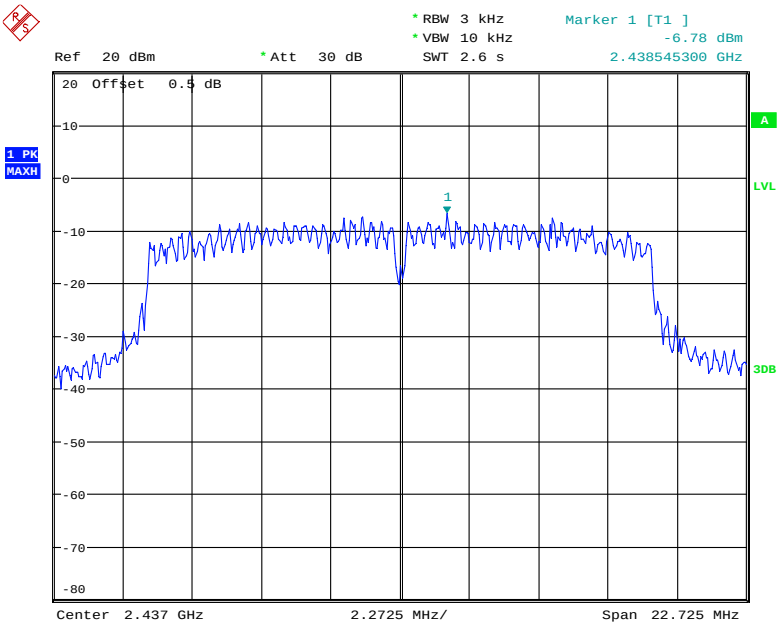
Date: 7.DEC.2017 21:06:59

Power Spectral Density, 802.11g Low Channel



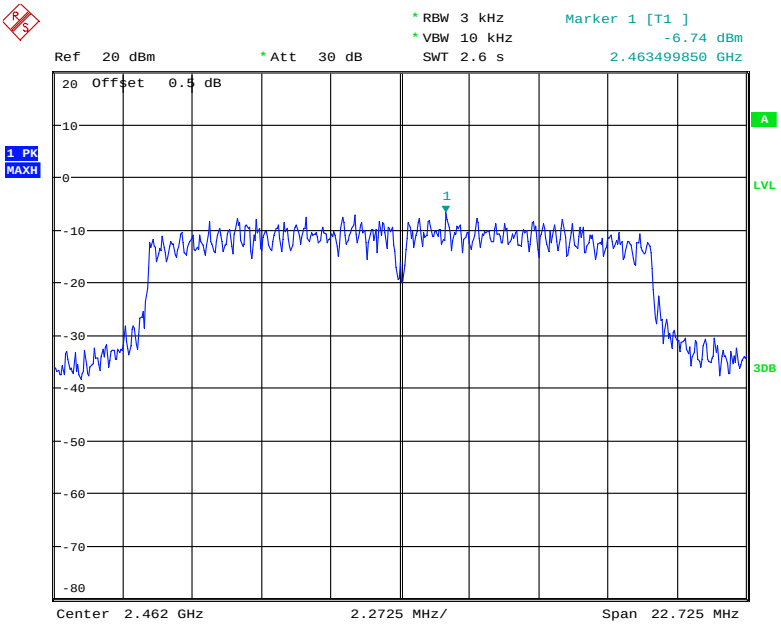
Date: 7.DEC.2017 21:10:41

Power Spectral Density, 802.11g Middle Channel



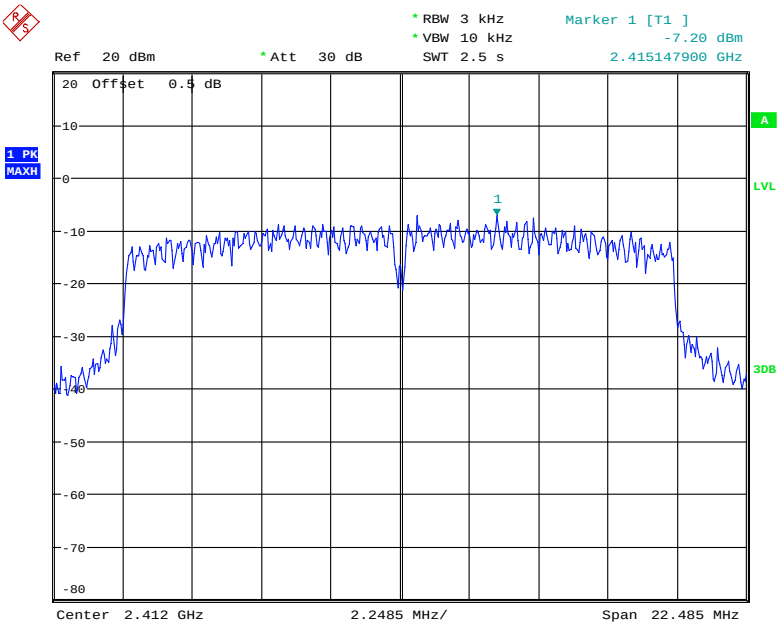
Date: 7.DEC.2017 21:12:42

Power Spectral Density, 802.11g High Channel



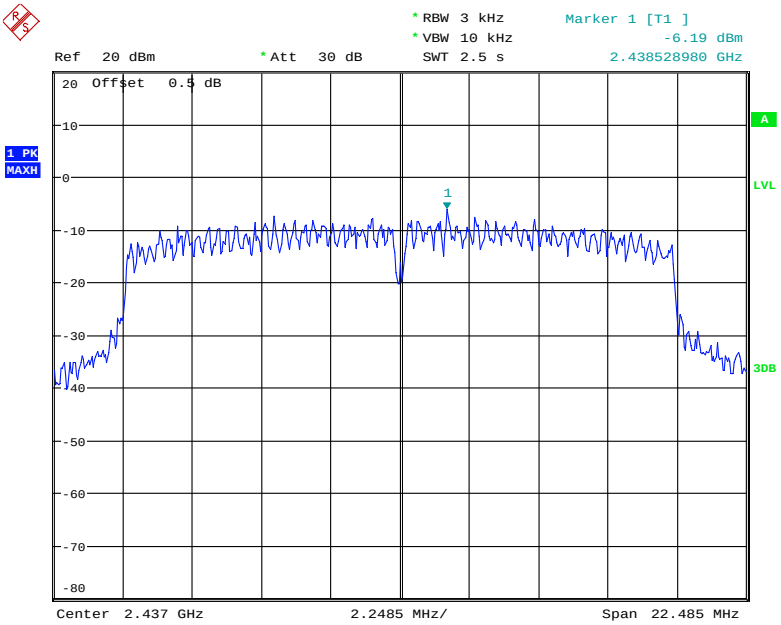
Date: 7.DEC.2017 21:14:54

Power Spectral Density, 802.11n ht20 Low Channel



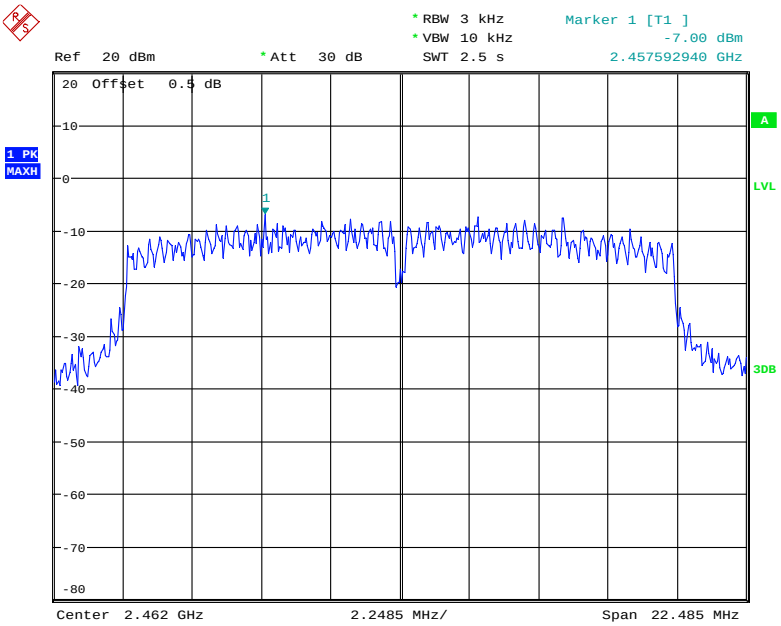
Date: 7.DEC.2017 21:17:55

Power Spectral Density, 802.11n ht20 Middle Channel



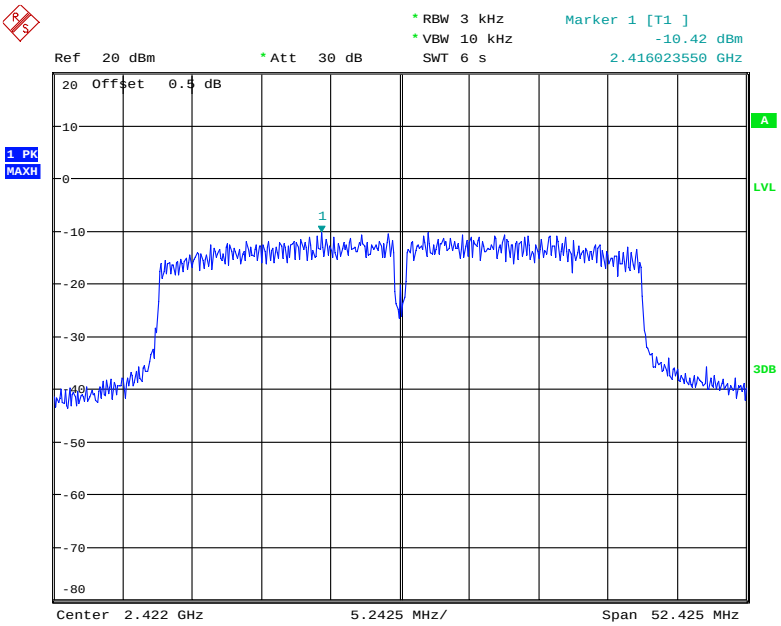
Date: 7.DEC.2017 21:19:55

Power Spectral Density, 802.11n ht20 High Channel



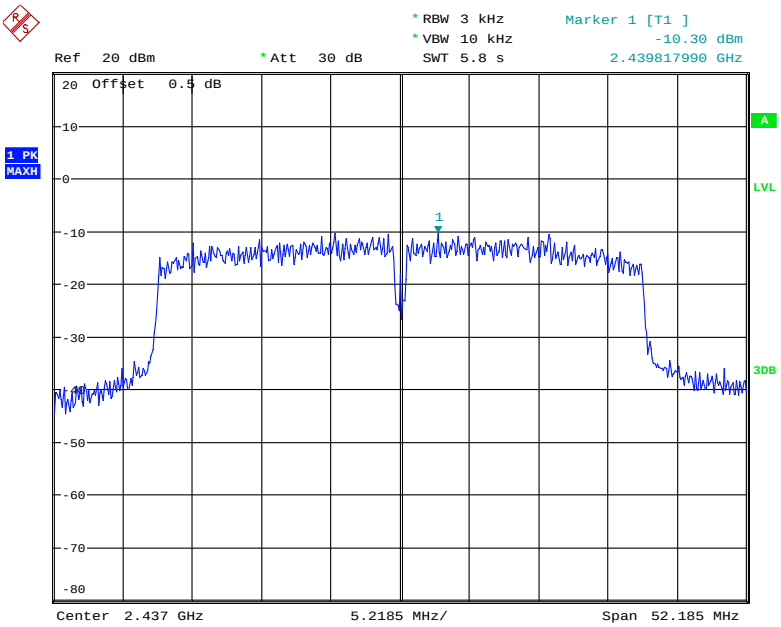
Date: 7.DEC.2017 21:21:59

Power Spectral Density, 802.11n ht40 Low Channel



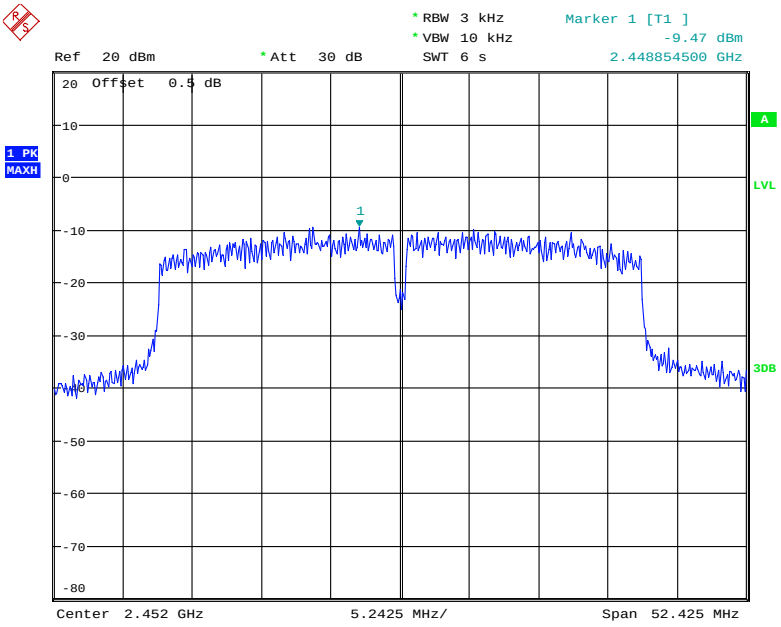
Date: 7.DEC.2017 21:27:08

Power Spectral Density, 802.11n ht40 Middle Channel



Date: 7.DEC.2017 21:29:18

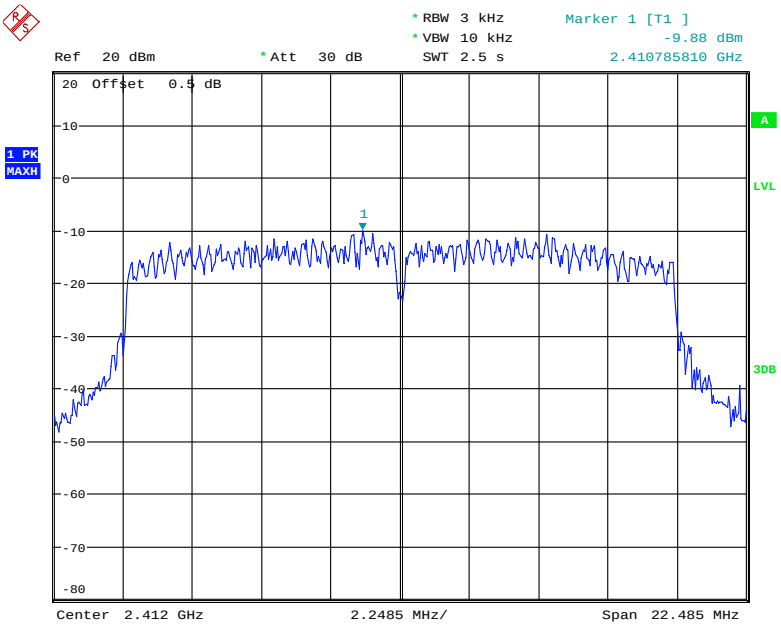
Power Spectral Density, 802.11n ht40 High Channel



Date: 7.DEC.2017 21:31:22

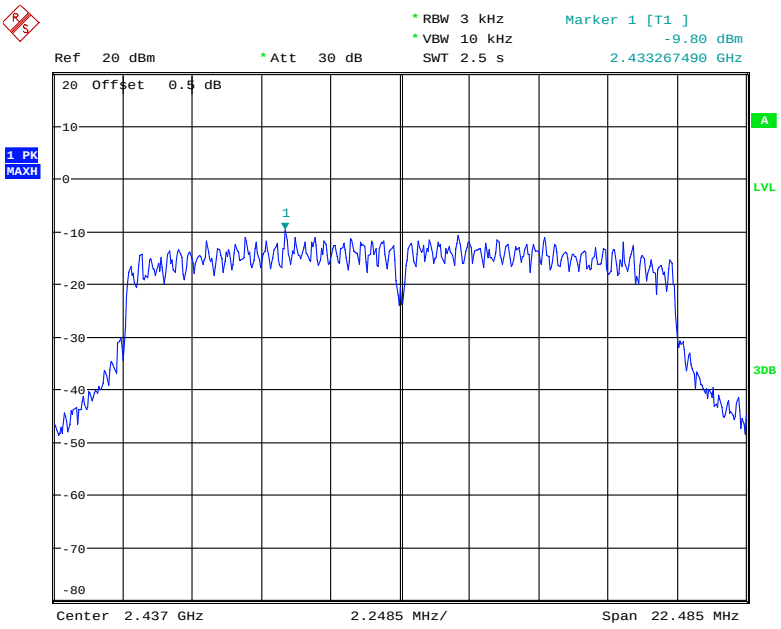
MIMO:
Main:

Power Spectral Density, 802.11n ht20 Low Channel



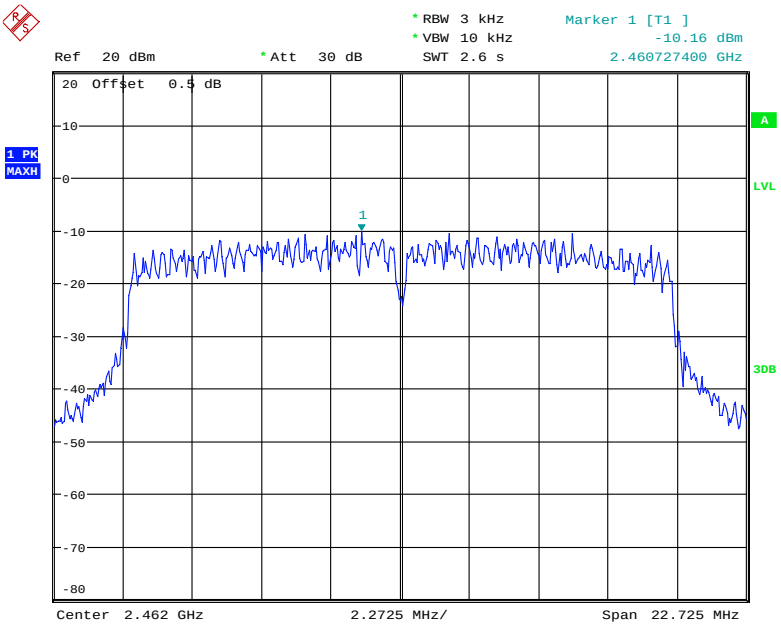
Date: 7.DEC.2017 21:47:42

Power Spectral Density, 802.11n ht20 Middle Channel



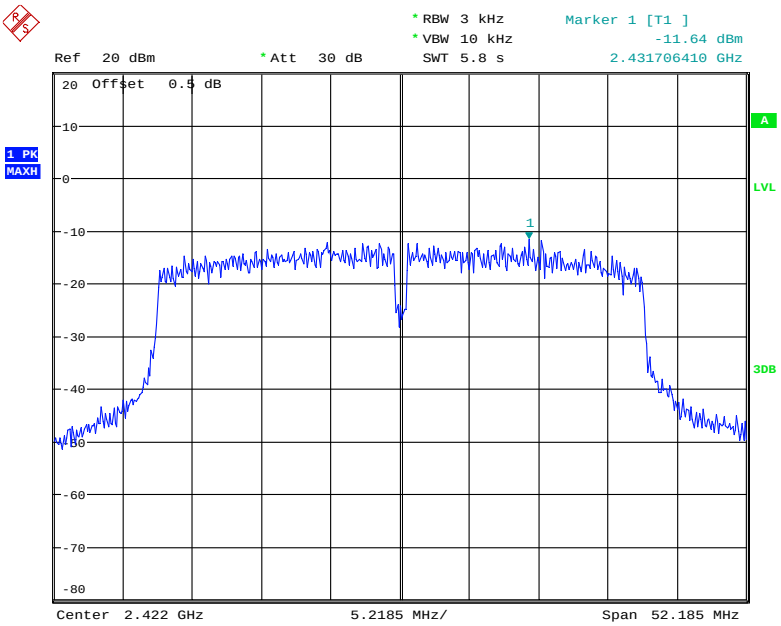
Date: 7.DEC.2017 21:50:11

Power Spectral Density, 802.11n ht20 High Channel



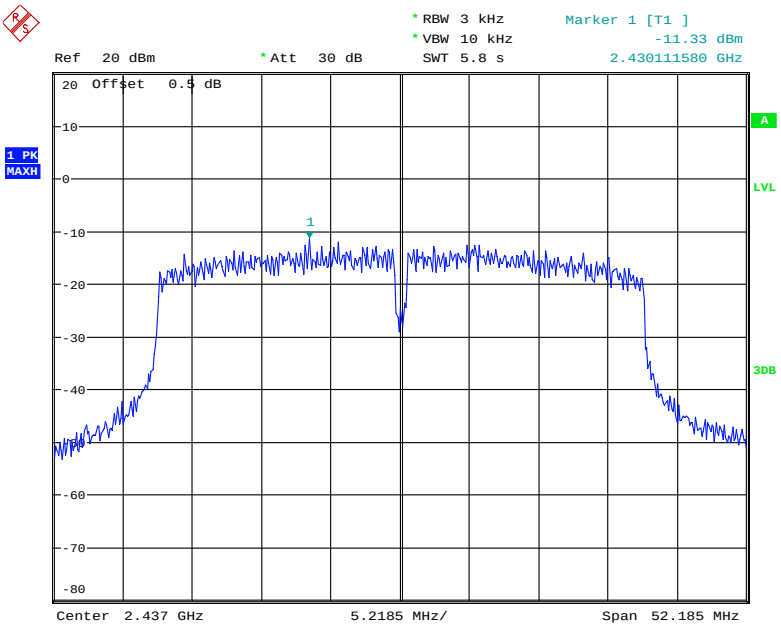
Date: 7.DEC.2017 21:57:12

Power Spectral Density, 802.11n ht40 Low Channel



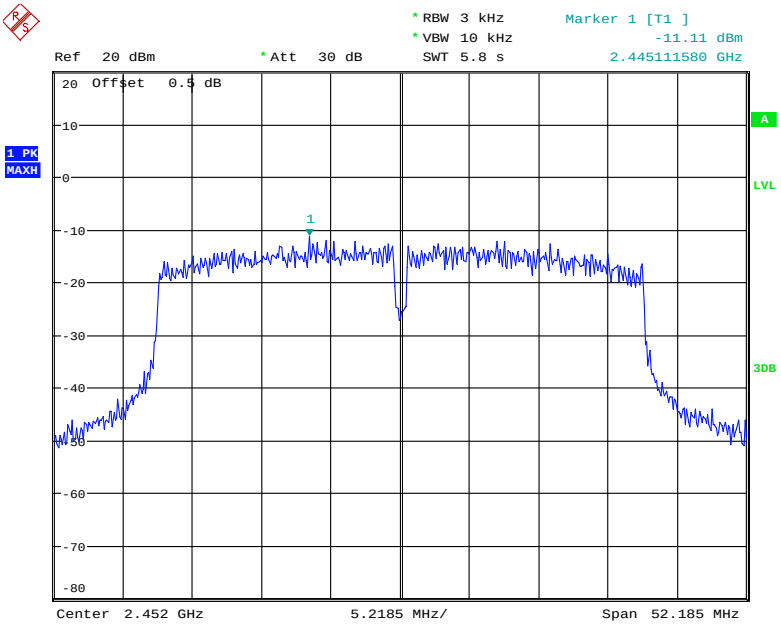
Date: 7.DEC.2017 22:02:56

Power Spectral Density, 802.11n ht40 Middle Channel



Date: 7.DEC.2017 22:19:08

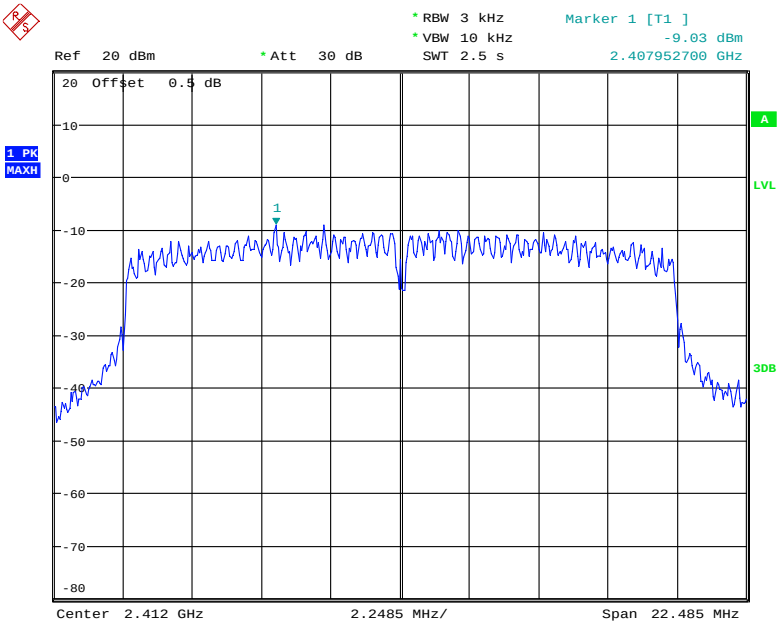
Power Spectral Density, 802.11n ht40 High Channel



Date: 7.DEC.2017 22:21:09

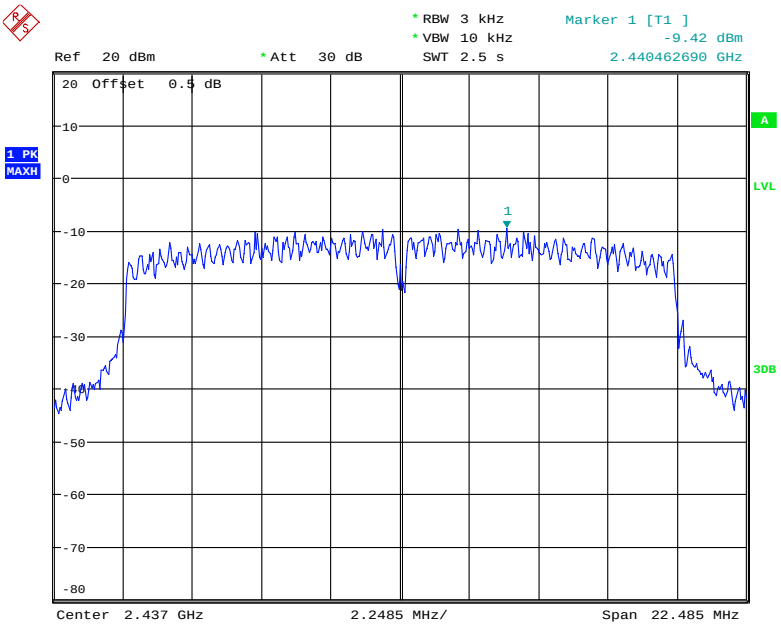
Aux:

Power Spectral Density, 802.11n ht20 Low Channel



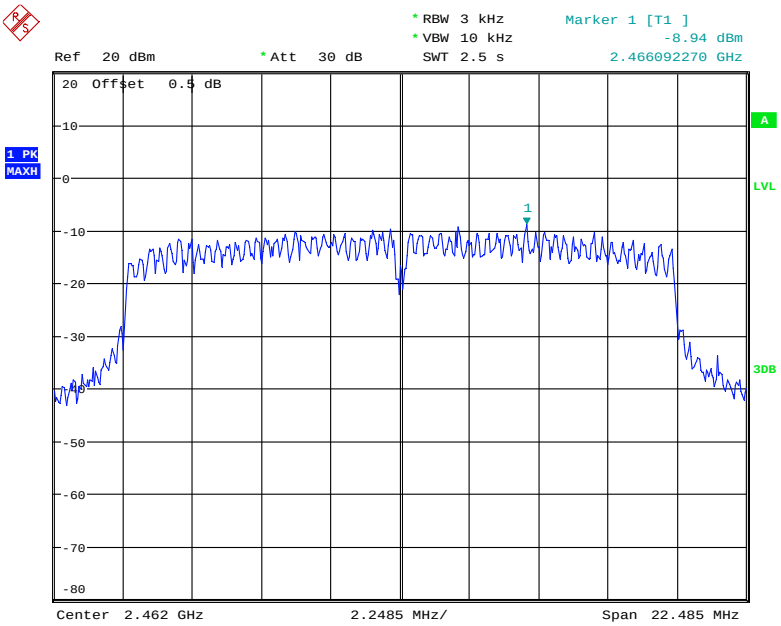
Date: 7.DEC.2017 21:45:09

Power Spectral Density, 802.11n ht20 Middle Channel



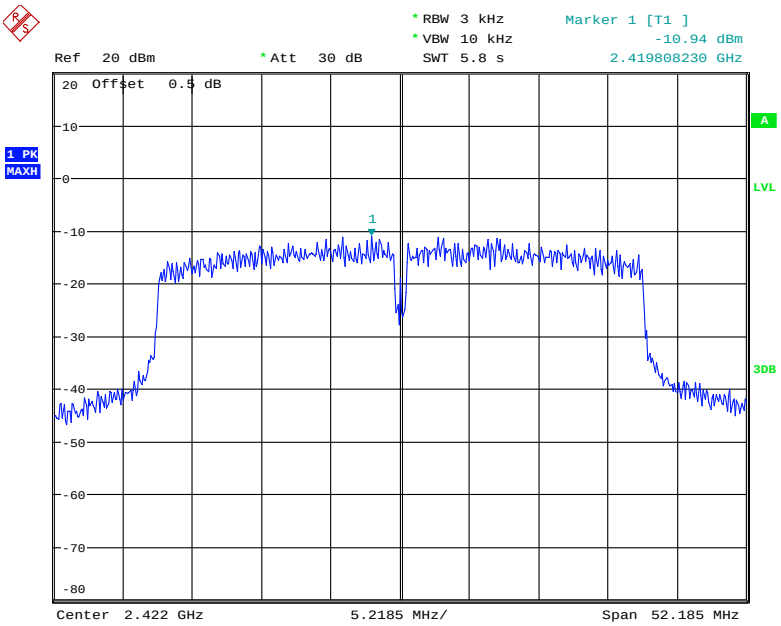
Date: 7.DEC.2017 21:52:29

Power Spectral Density, 802.11n ht20 High Channel



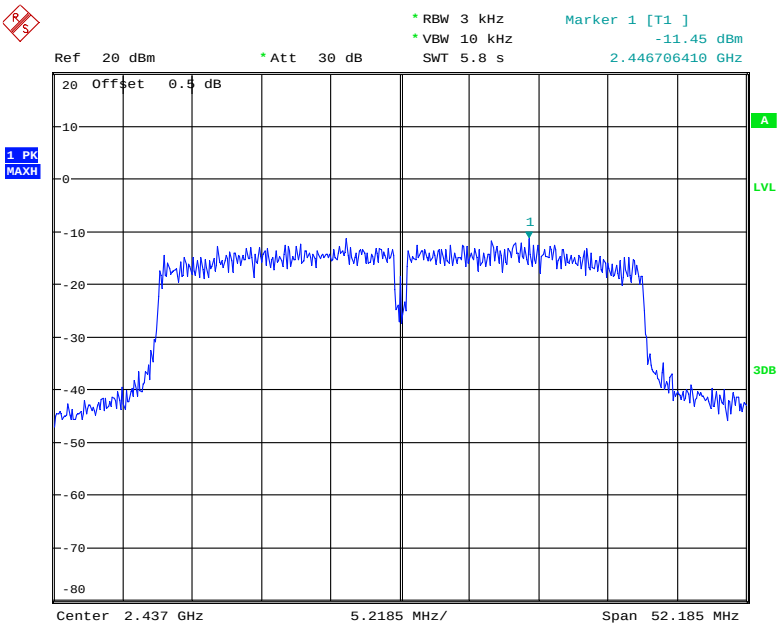
Date: 7.DEC.2017 21:54:34

Power Spectral Density, 802.11n ht40 Low Channel



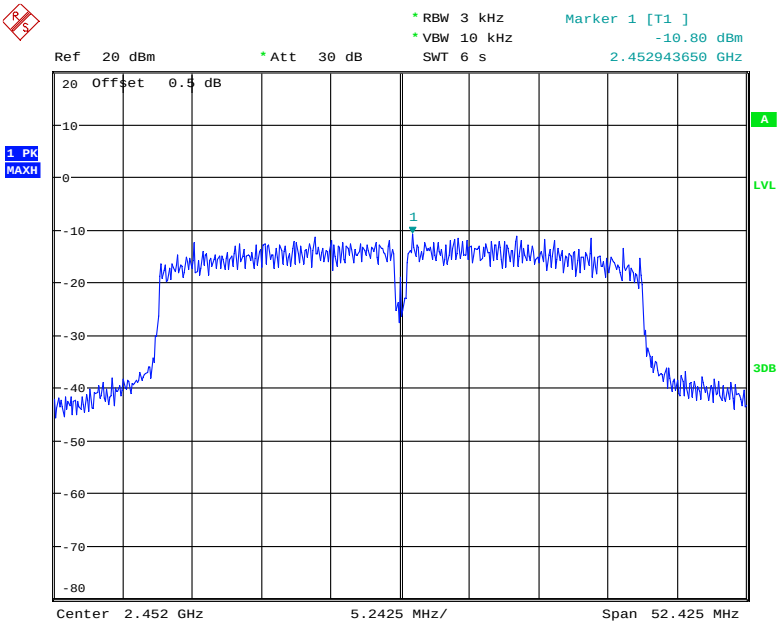
Date: 7.DEC.2017 22:08:42

Power Spectral Density, 802.11n ht40 Middle Channel



Date: 7.DEC.2017 22:16:47

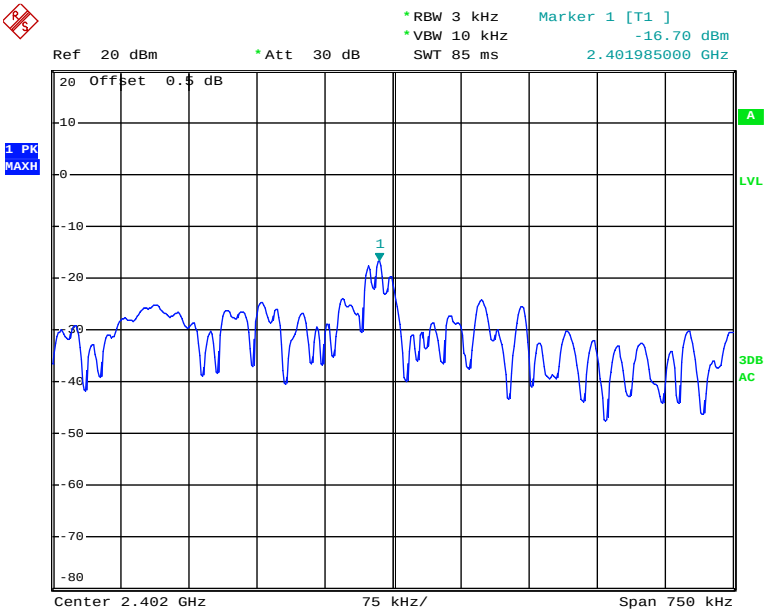
Power Spectral Density, 802.11n ht40 High Channel



Date: 7.DEC.2017 22:24:45

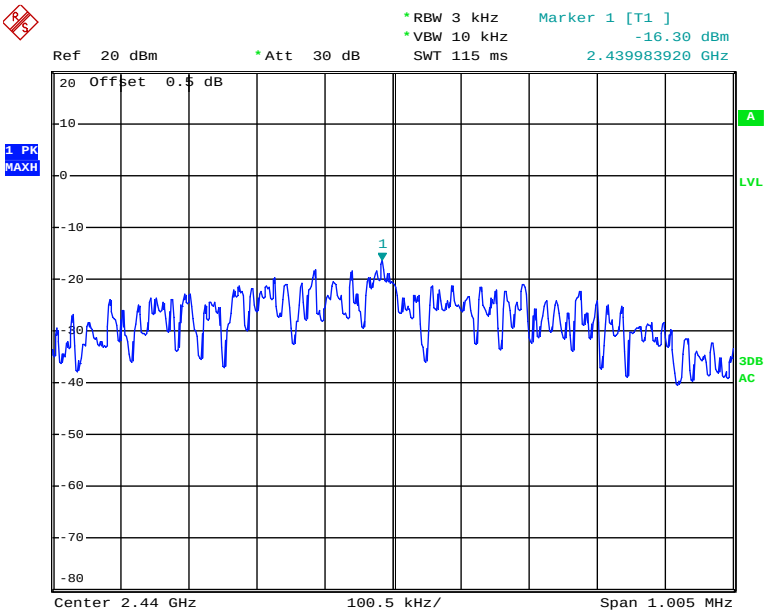
BLE:

Power Spectral Density, BLE Low Channel



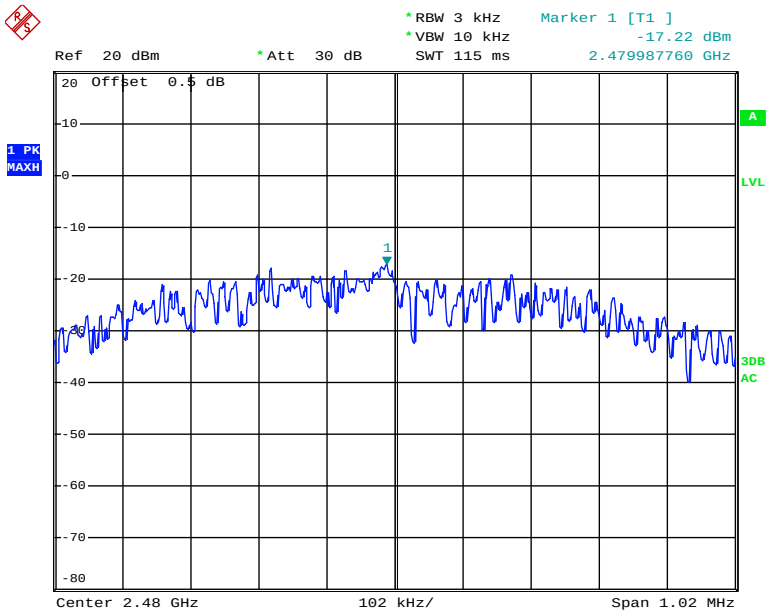
Date: 4.DEC.2017 19:37:26

Power Spectral Density, BLE Middle Channel



Date: 4.DEC.2017 19:36:29

Power Spectral Density, BLE High Channel



Date: 4.DEC.2017 19:35:10

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