FCC PART 15.247

TEST REPORT

For

Shenzhen Xinguodu Technology Co., Ltd.

17B JinSong Mansion, Terra Industrial & Trade Park Chegongmiao, Futian District, Shenzhen, China, 518040

FCC ID: XDQN5

Report Type:	**Product Name:**
Original Report	POS Terminal

Report Number:	RDG171215001-00C
Report Date:	2018-01-15
Reviewed By:	Jerry Zhang EMC Manager Jerry Zhang
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

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		POS Terminal
EUT Model:		N5
FCC ID:		XDQN5
Rated Input Voltage:		DC3.7V from battery or DC 5V from adapter
Adapter Information	**Model:**	ADS-12CG-06 05010EPCU
	Input:	100-240V~ 50/60Hz Max. 0.3A
	Output:	DC 5V , 2.0A
External Dimension:		Length (18.6cm)*Width (8.2cm)*High (6.4cm)
Serial Number:		171215001
EUT Received Date:		2017.12.15

Objective

This report is prepared on behalf of *Shenzhen Xinguodu Technology Co., Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: XDQN5.
FCC Part 15C DXX submissions with FCC ID: XDQN5.
FCC Part 22H, 24E, 27 PCB submissions with FCC ID: XDQN5.
FCC Part 15B JBP submissions with FCC ID: XDQN5.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB 558074 D01 DTS Meas Guidance v04

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

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

For 2.4GHz band, 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 802.11n ht40 mode was tested 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.

EUT Exercise Software

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

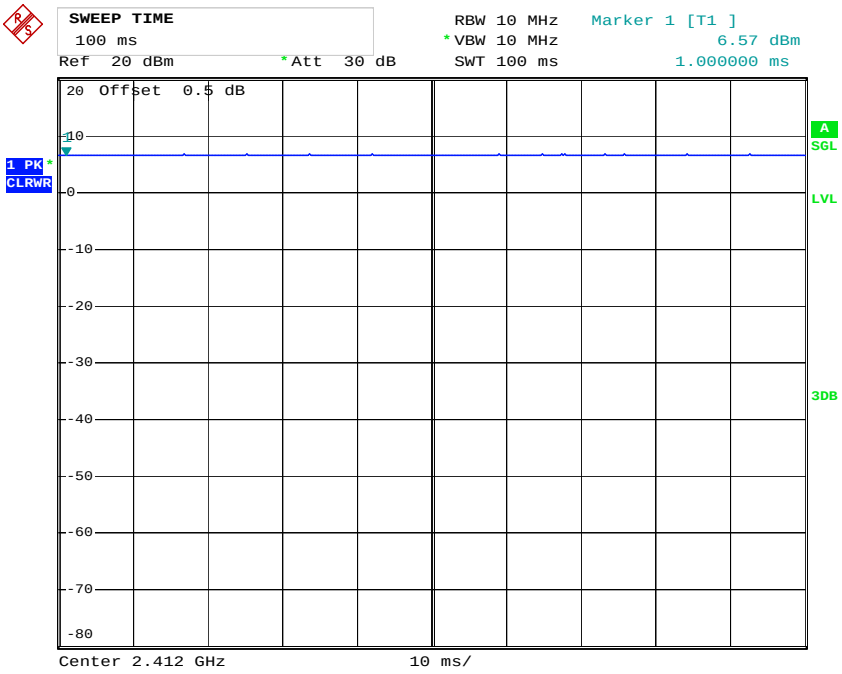
Test Mode	Test Software Version	Engineering Mode		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level Setting	17	15	15
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level Setting	17	15	15
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting Chain	16	15	15
802.11n ht40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting Chain	17	16	15

Bluetooth LE mode was configured by the system default setting

The maximum duty cycle as following table:

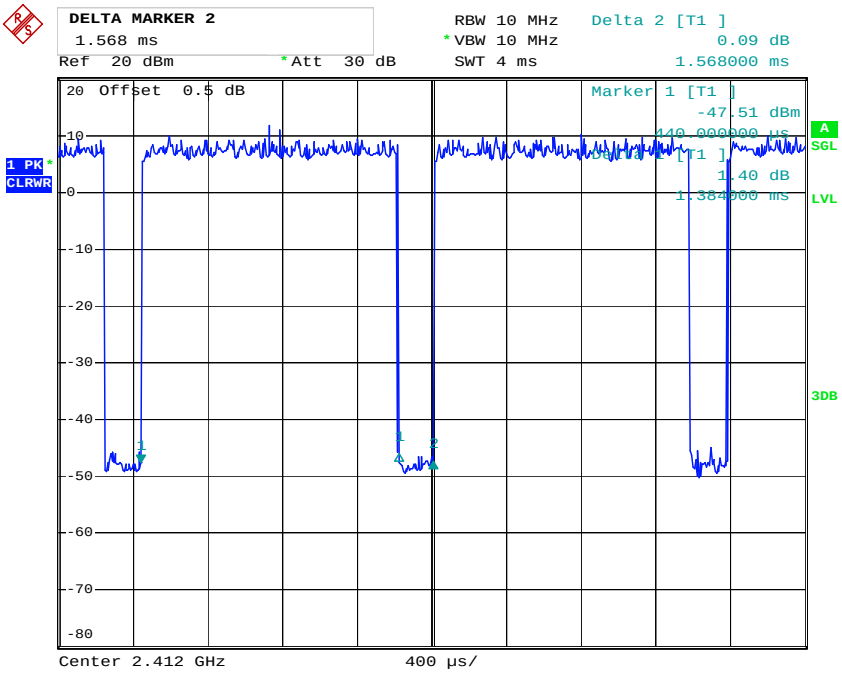
Test mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	100	100	100
802.11g	1.384	1.568	88.27
802.11 n20	1.294	1.478	87.55
802.11 n40	0.650	0.836	77.75
BLE	0.439	0.632	69.46

802.11b



Date: 28.DEC.2017 11:52:04

802.11g



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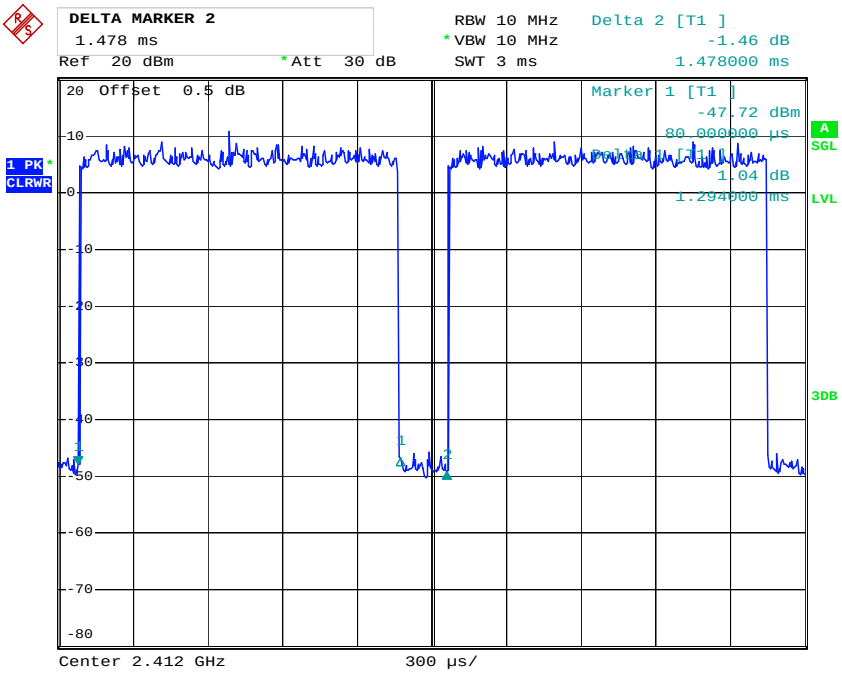
802.11 n20



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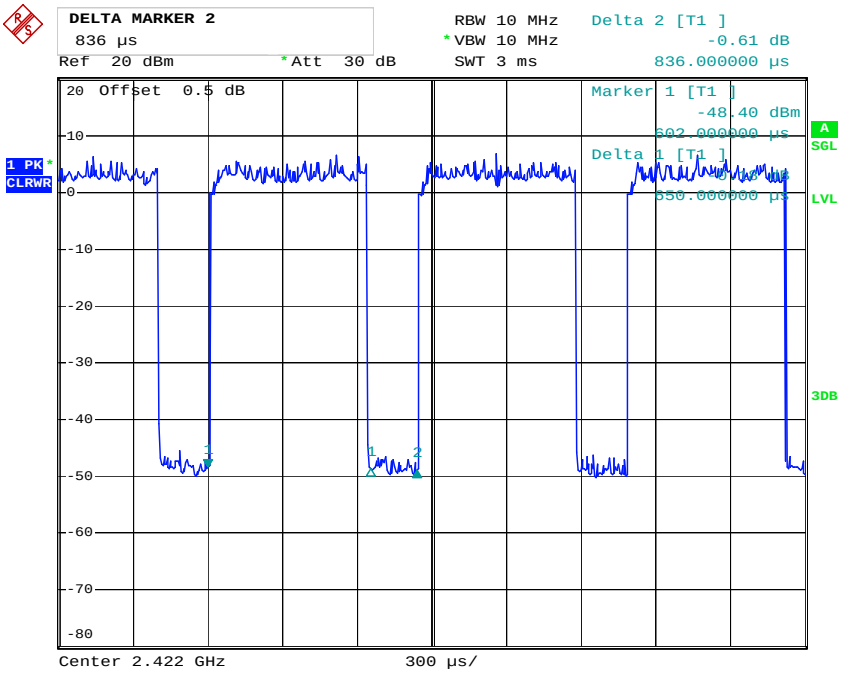
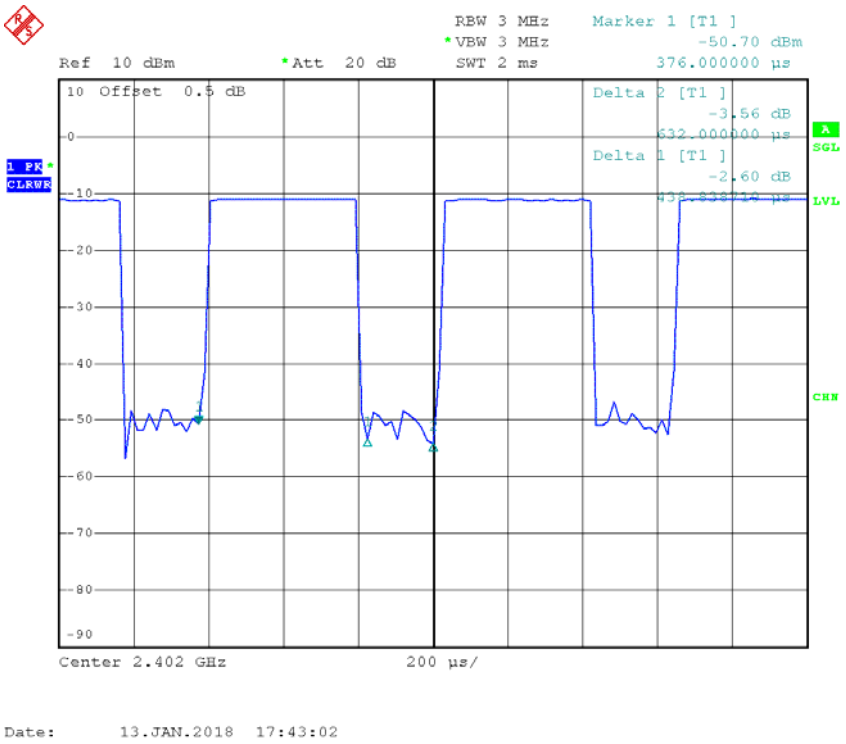
802.11 n40



Date: 28.DEC.2017 11:56:01

BLE



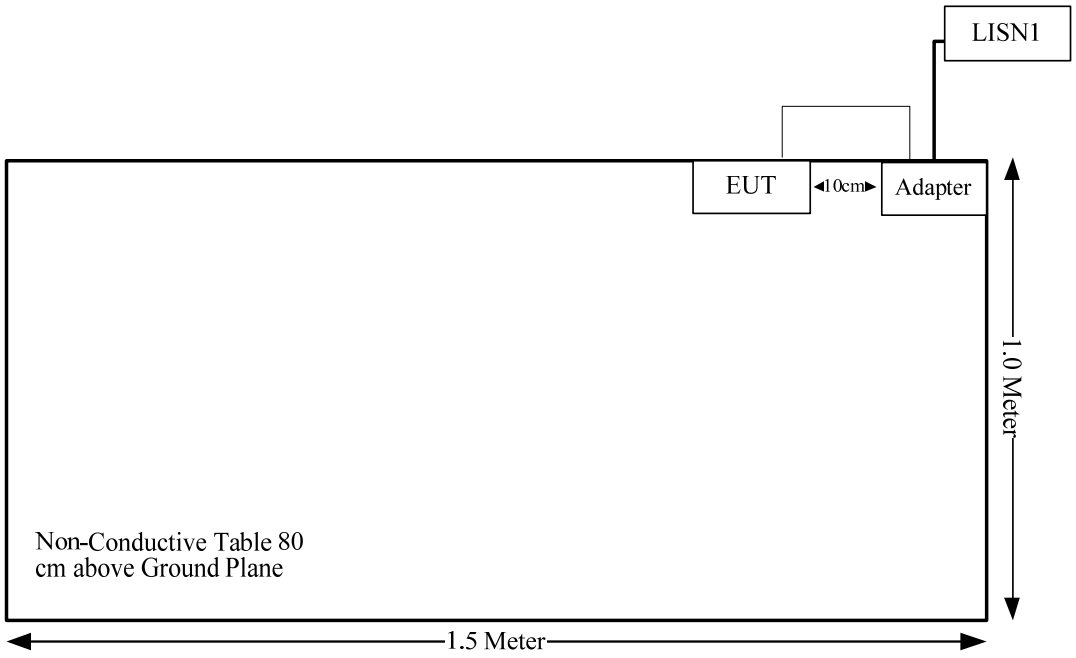
Equipment Modifications

No modification was made to the EUT.

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
USB Cable	No	No	1.0	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

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

Applicable Standard

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

According to KDB447498 D01 General RF Exposure Guidance v06:

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

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

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

Measurement Result

For 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) = 0.2 < 3.0

For WLAN mode:
The max conducted power including tune-up tolerance is 9.6 dBm (9.12 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 9.12/5*(√2.462) = 2.9< 3.0

So the stand-alone SAR evaluation is not necessary.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has one internal antenna arrangement for BT and WIFI, and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

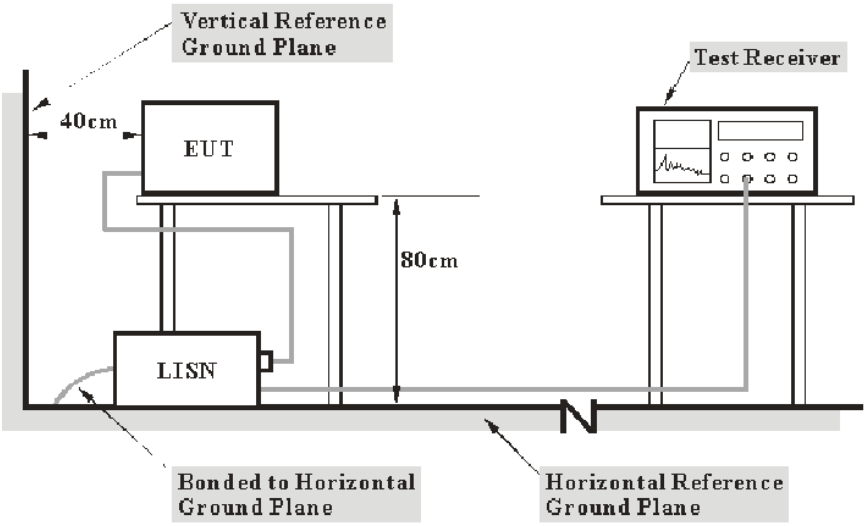
Result: Compliance.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

EUT Setup



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

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

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	L.I.S.N	ESH2-Z5	892107/021	2017-09-25	2018-09-25
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
BACL	Capacitive Voltage Probe	CVP	150603	2017-09-25	2018-09-25
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

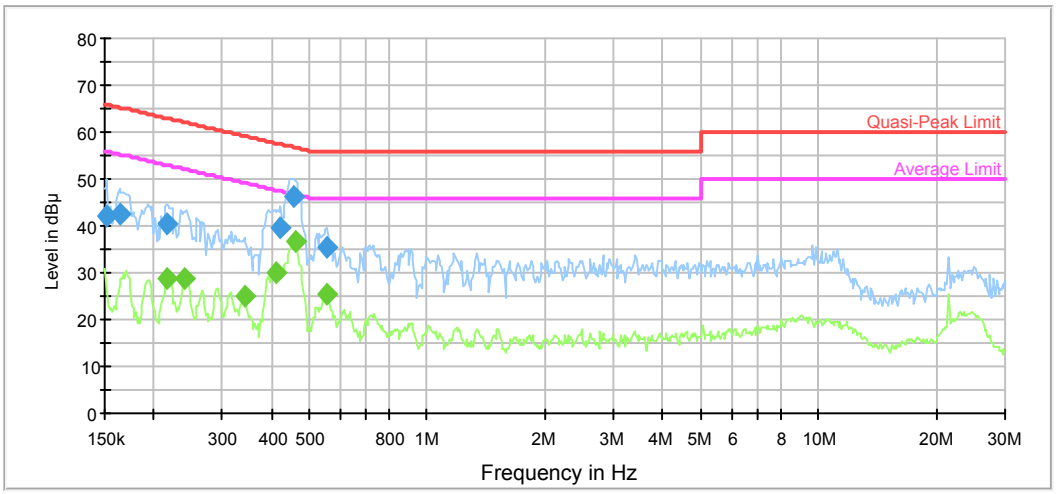
Environmental Conditions

Temperature:	21.7 °C
Relative Humidity:	35 %
ATM Pressure:	102.7 kPa

The testing was performed by Alex You on 2017-12-21.

Test Mode: Transmitting (Wi-Fi 802.11b mode Middle channel was the worst)

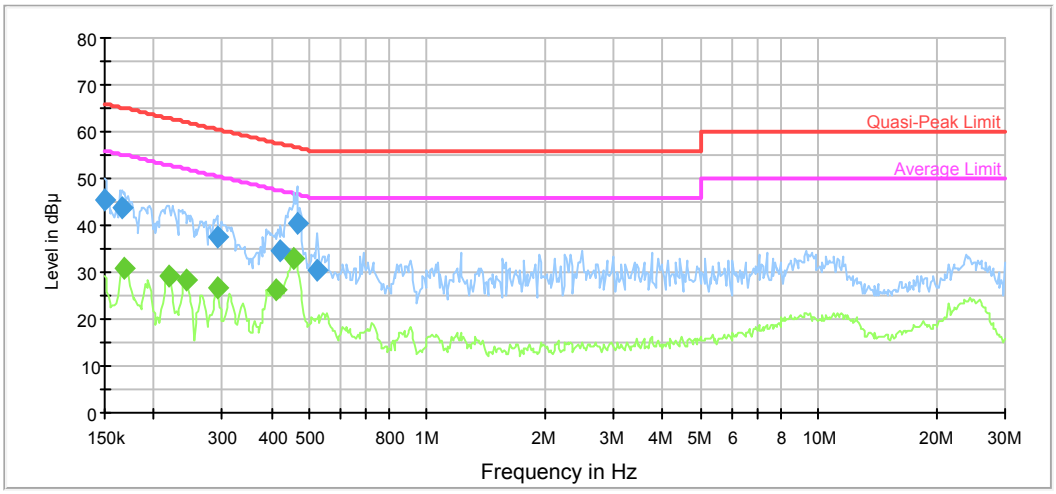
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	42.3	9.000	L1	11.2	23.6	65.9	Compliance
0.163741	42.7	9.000	L1	11.0	22.6	65.3	Compliance
0.216409	40.3	9.000	L1	10.5	22.7	63.0	Compliance
0.422630	39.5	9.000	L1	10.0	17.9	57.4	Compliance
0.457684	46.3	9.000	L1	9.9	10.4	56.7	Compliance
0.554139	35.4	9.000	L1	9.9	20.6	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.216409	28.6	9.000	L1	10.5	24.4	53.0	Compliance
0.240029	28.9	9.000	L1	10.4	23.2	52.1	Compliance
0.340821	25.2	9.000	L1	10.1	24.0	49.2	Compliance
0.409372	30.1	9.000	L1	10.0	17.6	47.7	Compliance
0.461346	36.5	9.000	L1	9.9	10.2	46.7	Compliance
0.554139	25.6	9.000	L1	9.9	20.4	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	45.5	9.000	N	11.2	20.5	66.0	Compliance
0.166371	43.8	9.000	N	10.9	21.3	65.1	Compliance
0.290613	37.7	9.000	N	10.2	22.8	60.5	Compliance
0.422630	34.4	9.000	N	9.9	23.0	57.4	Compliance
0.465037	40.3	9.000	N	9.9	16.3	56.6	Compliance
0.524077	30.4	9.000	N	9.9	25.6	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.169044	30.9	9.000	N	10.9	24.1	55.0	Compliance
0.218141	29.2	9.000	N	10.5	23.7	52.9	Compliance
0.241949	28.4	9.000	N	10.4	23.6	52.0	Compliance
0.290613	26.6	9.000	N	10.2	23.9	50.5	Compliance
0.412647	26.3	9.000	N	10.0	21.3	47.6	Compliance
0.457684	33.1	9.000	N	9.9	13.6	46.7	Compliance

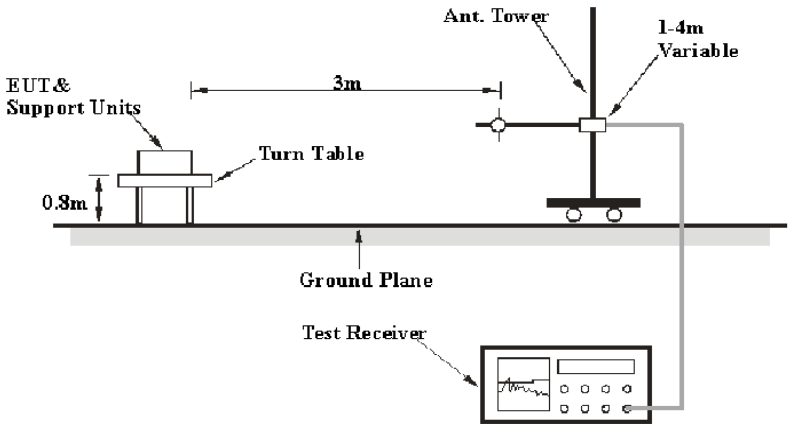
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

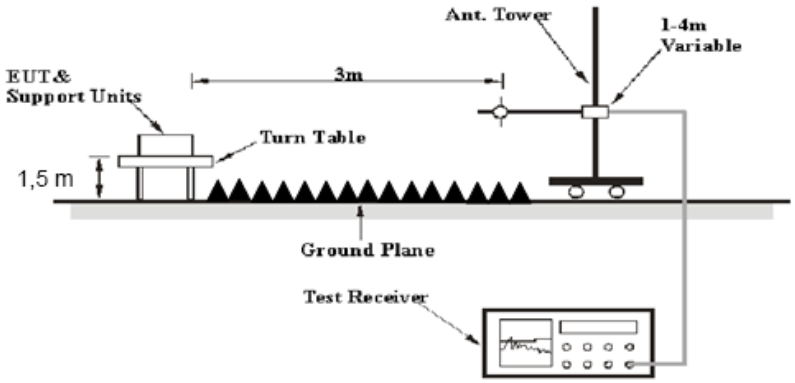
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters distance, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 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:

Detector	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	2020-11-10
HP	Amplifier	8447D	2727A05902	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
Agilent	Spectrum Analyzer	E4440A	SG43360054	2017-12-08	2018-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-05
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
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
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:	25.8C
Relative Humidity:	30.8 %
ATM Pressure:	102.3 kPa

The testing was performed by Blake Yang on 2017-12-22

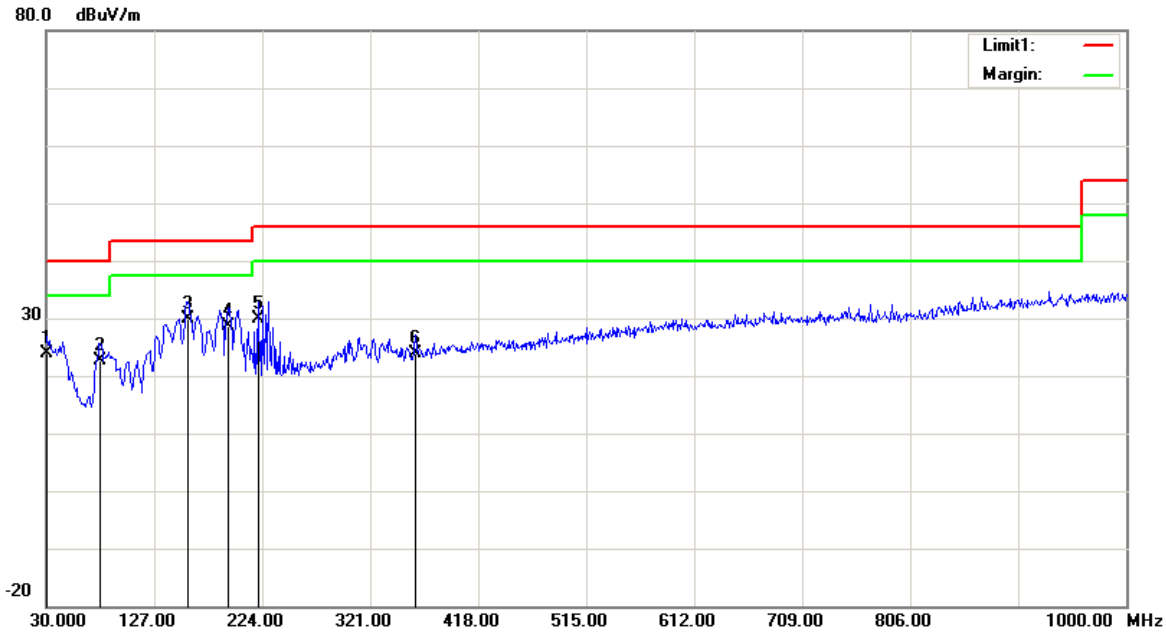
Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

1) 30MHz-1GHz

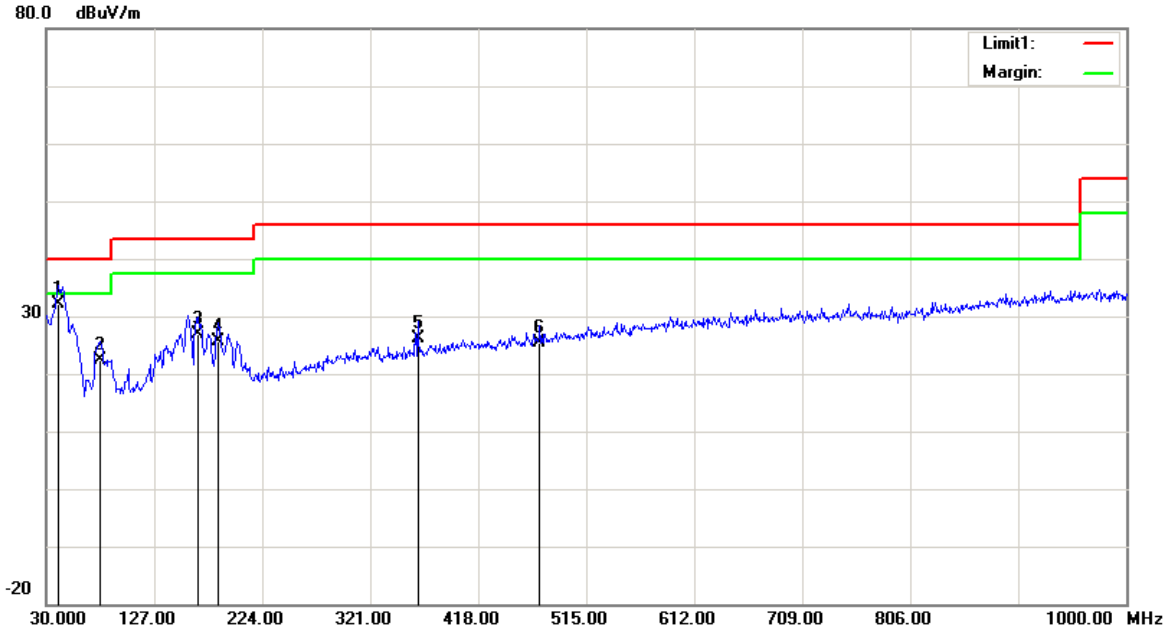
Wifi(802.11b modeMiddle channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	26.10	QP	-2.30	23.80	40.00	16.20
78.5000	35.94	QP	-13.34	22.60	40.00	17.40
157.0700	36.49	QP	-6.69	29.80	43.50	13.70
192.9600	36.12	QP	-7.42	28.70	43.50	14.80
220.1200	38.18	QP	-8.38	29.80	46.00	16.20
361.7400	27.13	QP	-3.13	24.00	46.00	22.00

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
40.6700	39.31	QP	-7.11	32.20	40.00	7.80
78.5000	35.84	QP	-13.34	22.50	40.00	17.50
165.8000	33.57	QP	-6.77	26.80	43.50	16.70
184.2300	33.25	QP	-7.55	25.70	43.50	17.80
363.6800	29.19	QP	-3.09	26.10	46.00	19.90
473.2900	25.87	QP	-0.47	25.40	46.00	20.60

2) 1-25GHz:
802.11b Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412.00	63.81	PK	H	24.84	5.41	0.00	94.06	N/A	N/A
2412.00	59.01	AV	H	24.84	5.41	0.00	89.26	N/A	N/A
2412.00	60.31	PK	V	24.84	5.41	0.00	90.56	N/A	N/A
2412.00	55.72	AV	V	24.84	5.41	0.00	85.97	N/A	N/A
2390.00	24.87	PK	H	24.80	5.36	0.00	55.03	74.00	18.97
2390.00	12.26	AV	H	24.80	5.36	0.00	42.42	54.00	11.58
4824.00	45.62	PK	H	29.75	7.34	27.41	55.30	74.00	18.70
4824.00	34.25	AV	H	29.75	7.34	27.41	43.93	54.00	10.07
7236.00	42.21	PK	H	33.98	9.08	27.22	58.05	74.00	15.95
7236.00	31.48	AV	H	33.98	9.08	27.22	47.32	54.00	6.68
5653.00	48.82	PK	H	31.31	7.97	26.49	61.61	74.00	12.39
5653.00	34.81	AV	H	31.31	7.97	26.49	47.60	54.00	6.40
Middle Channel: 2437 MHz									
2437.00	64.27	PK	H	24.89	5.41	0.00	94.57	N/A	N/A
2437.00	59.18	AV	H	24.89	5.41	0.00	89.48	N/A	N/A
2437.00	60.55	PK	V	24.89	5.41	0.00	90.85	N/A	N/A
2437.00	56.86	AV	V	24.89	5.41	0.00	87.16	N/A	N/A
4874.00	47.62	PK	H	29.85	7.56	27.54	57.49	74.00	16.51
4874.00	34.12	AV	H	29.85	7.56	27.54	43.99	54.00	10.01
7311.00	46.31	PK	H	34.10	9.33	27.28	62.46	74.00	11.54
7311.00	33.28	AV	H	34.10	9.33	27.28	49.43	54.00	4.57
High Channel: 2462 MHz									
2462.00	63.56	PK	H	24.93	5.41	0.00	93.90	N/A	N/A
2462.00	59.02	AV	H	24.93	5.41	0.00	89.36	N/A	N/A
2462.00	60.12	PK	V	24.93	5.41	0.00	90.46	N/A	N/A
2462.00	56.33	AV	V	24.93	5.41	0.00	86.67	N/A	N/A
2483.50	26.12	PK	H	24.97	5.41	0.00	56.50	74.00	17.5
2483.50	12.86	AV	H	24.97	5.41	0.00	43.24	54.00	10.76
4924.00	47.31	PK	H	29.95	7.65	27.51	57.40	74.00	16.6
4924.00	34.25	AV	H	29.95	7.65	27.51	44.34	54.00	9.66
7386.00	46.13	PK	H	34.22	9.08	27.18	62.25	74.00	11.75
7386.00	33.58	AV	H	34.22	9.08	27.18	49.70	54.00	4.3

802.11g Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412.00	63.53	PK	H	24.84	5.41	0.00	93.78	N/A	N/A
2412.00	62.01	AV	H	24.84	5.41	0.00	92.26	N/A	N/A
2412.00	58.71	PK	V	24.84	5.41	0.00	88.96	N/A	N/A
2412.00	54.32	AV	V	24.84	5.41	0.00	84.57	N/A	N/A
2390.00	25.07	PK	H	24.80	5.36	0.00	55.23	74.00	18.77
2390.00	10.36	AV	H	24.80	5.36	0.00	40.52	54.00	13.48
4824.00	47.52	PK	H	29.75	7.34	27.41	57.20	74.00	16.80
4824.00	33.75	AV	H	29.75	7.34	27.41	43.43	54.00	10.57
7236.00	41.01	PK	H	33.98	9.08	27.22	56.85	74.00	17.15
Middle Channel: 2437 MHz									
2437.00	63.97	PK	H	24.89	5.41	0.00	94.27	N/A	N/A
2437.00	58.97	AV	H	24.89	5.41	0.00	89.27	N/A	N/A
2437.00	60.49	PK	V	24.89	5.41	0.00	90.79	N/A	N/A
2437.00	57.08	AV	V	24.89	5.41	0.00	87.38	N/A	N/A
4874.00	47.42	PK	H	29.85	7.56	27.54	57.29	74.00	16.71
4874.00	34.32	AV	H	29.85	7.56	27.54	44.19	54.00	9.81
7311.00	46.38	PK	H	34.10	9.33	27.28	62.53	74.00	11.47
7311.00	33.48	AV	H	34.10	9.33	27.28	49.63	54.00	4.37
High Channel: 2462 MHz									
2462.00	63.50	PK	H	24.93	5.41	0.00	93.84	N/A	N/A
2462.00	59.31	AV	H	24.93	5.41	0.00	89.65	N/A	N/A
2462.00	60.37	PK	V	24.93	5.41	0.00	90.71	N/A	N/A
2462.00	56.09	AV	V	24.93	5.41	0.00	86.43	N/A	N/A
2483.50	25.90	PK	H	24.97	5.41	0.00	56.28	74.00	17.72
2483.50	12.96	AV	H	24.97	5.41	0.00	43.34	54.00	10.66
4924.00	47.57	PK	H	29.95	7.65	27.51	57.66	74.00	16.34
4924.00	34.51	AV	H	29.95	7.65	27.51	44.60	54.00	9.4
7386.00	45.90	PK	H	34.22	9.08	27.18	62.02	74.00	11.98
7386.00	33.63	AV	H	34.22	9.08	27.18	49.75	54.00	4.25

802.11n20 Mode:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412.00	63.75	PK	H	24.84	5.41	0.00	94.00	N/A	N/A
2412.00	59.31	AV	H	24.84	5.41	0.00	89.56	N/A	N/A
2412.00	61.11	PK	V	24.84	5.41	0.00	91.36	N/A	N/A
2412.00	55.22	AV	V	24.84	5.41	0.00	85.47	N/A	N/A
2390.00	22.97	PK	H	24.80	5.36	0.00	53.13	74.00	20.87
2390.00	14.86	AV	H	24.80	5.36	0.00	45.02	54.00	8.98
4824.00	43.32	PK	H	29.75	7.34	27.41	53.00	74.00	21.00
4824.00	36.75	AV	H	29.75	7.34	27.41	46.43	54.00	7.57
7236.00	41.51	PK	H	33.98	9.08	27.22	57.35	74.00	16.65
7236.00	31.88	AV	H	33.98	9.08	27.22	47.72	54.00	6.28
Middle Channel: 2437 MHz									
2437.00	63.98	PK	H	24.89	5.41	0.00	94.28	N/A	N/A
2437.00	59.14	AV	H	24.89	5.41	0.00	89.44	N/A	N/A
2437.00	60.48	PK	V	24.89	5.41	0.00	90.78	N/A	N/A
2437.00	57.01	AV	V	24.89	5.41	0.00	87.31	N/A	N/A
4874.00	47.61	PK	H	29.85	7.56	27.54	57.48	74.00	16.52
4874.00	33.87	AV	H	29.85	7.56	27.54	43.74	54.00	10.26
7311.00	46.31	PK	H	34.10	9.33	27.28	62.46	74.00	11.54
7311.00	33.30	AV	H	34.10	9.33	27.28	49.45	54.00	4.55
High Channel: 2462 MHz									
2462.00	63.48	PK	H	24.93	5.41	0.00	93.82	N/A	N/A
2462.00	58.84	AV	H	24.93	5.41	0.00	89.18	N/A	N/A
2462.00	59.95	PK	V	24.93	5.41	0.00	90.29	N/A	N/A
2462.00	56.20	AV	V	24.93	5.41	0.00	86.54	N/A	N/A
2483.50	26.21	PK	H	24.97	5.41	0.00	56.59	74.00	17.41
2483.50	12.69	AV	H	24.97	5.41	0.00	43.07	54.00	10.93
4924.00	47.09	PK	H	29.95	7.65	27.51	57.18	74.00	16.82
4924.00	33.95	AV	H	29.95	7.65	27.51	44.04	54.00	9.96
7386.00	46.38	PK	H	34.22	9.08	27.18	62.50	74.00	11.5
7386.00	33.65	AV	H	34.22	9.08	27.18	49.77	54.00	4.23

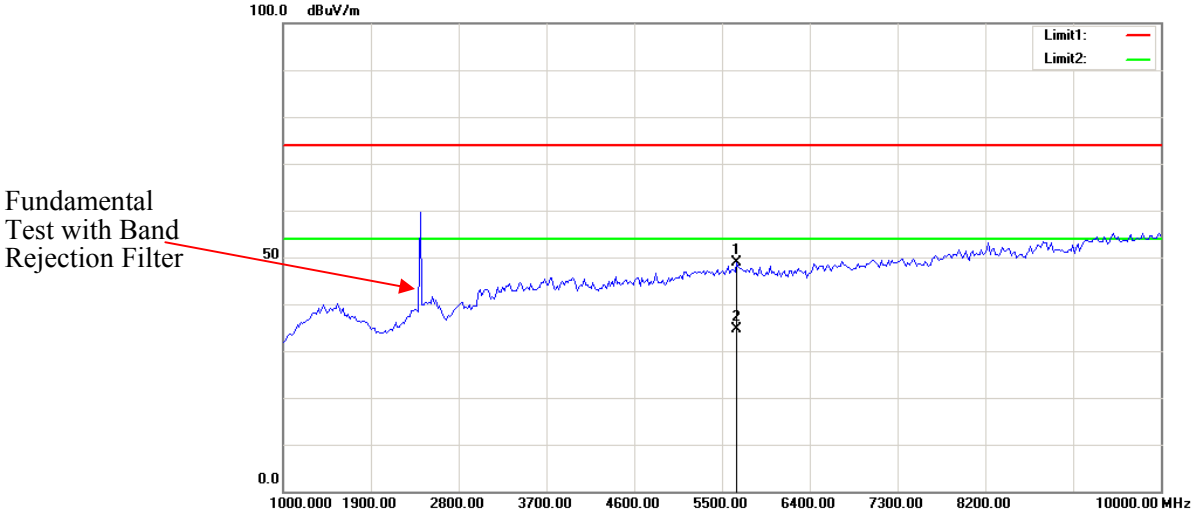
802.11n40 Mode:

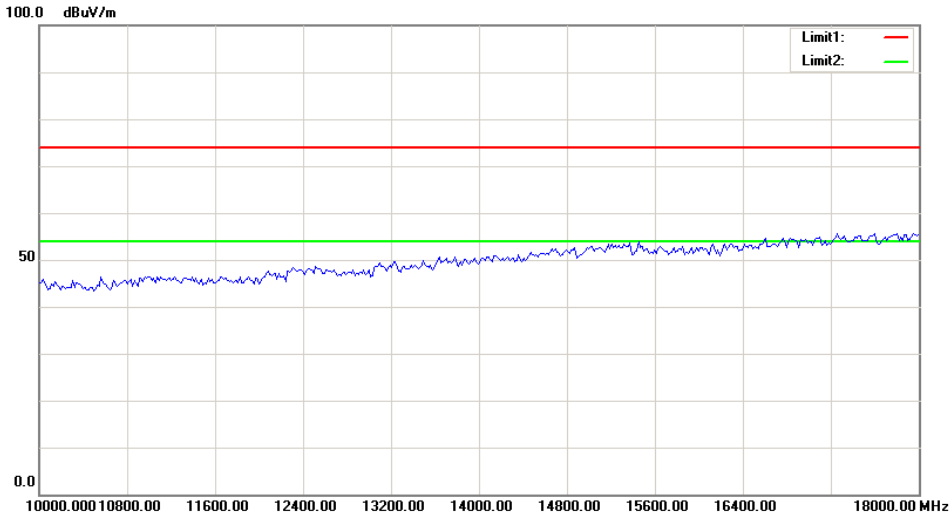
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2422 MHz									
2422.00	63.75	PK	H	24.86	5.41	0.00	94.02	N/A	N/A
2422.00	59.31	AV	H	24.86	5.41	0.00	89.58	N/A	N/A
2422.00	61.11	PK	V	24.86	5.41	0.00	91.38	N/A	N/A
2422.00	55.22	AV	V	24.86	5.41	0.00	85.49	N/A	N/A
2390.00	22.97	PK	H	24.80	5.36	0.00	53.13	74.00	20.87
2390.00	14.86	AV	H	24.80	5.36	0.00	45.02	54.00	8.98
4844.00	43.32	PK	H	29.79	7.42	27.46	53.07	74.00	20.93
4844.00	36.75	AV	H	29.79	7.42	27.46	46.50	54.00	7.50
7266.00	41.51	PK	H	34.03	9.21	27.25	57.50	74.00	16.50
7266.00	31.88	AV	H	34.03	9.21	27.25	47.87	54.00	6.13
Middle Channel: 2437 MHz									
2437.00	64.01	PK	H	24.89	5.41	0.00	94.31	N/A	N/A
2437.00	59.22	AV	H	24.89	5.41	0.00	89.52	N/A	N/A
2437.00	60.65	PK	V	24.89	5.41	0.00	90.95	N/A	N/A
2437.00	56.86	AV	V	24.89	5.41	0.00	87.16	N/A	N/A
4874.00	47.76	PK	H	29.85	7.56	27.54	57.63	74.00	16.37
4874.00	34.35	AV	H	29.85	7.56	27.54	44.22	54.00	9.78
7311.00	46.57	PK	H	34.10	9.33	27.28	62.72	74.00	11.28
7311.00	33.42	AV	H	34.10	9.33	27.28	49.57	54.00	4.43
High Channel: 2452 MHz									
2452.00	63.37	PK	H	24.91	5.41	0.00	93.69	N/A	N/A
2452.00	59.25	AV	H	24.91	5.41	0.00	89.57	N/A	N/A
2452.00	59.86	PK	V	24.91	5.41	0.00	90.18	N/A	N/A
2452.00	56.30	AV	V	24.91	5.41	0.00	86.62	N/A	N/A
2483.50	26.18	PK	H	24.97	5.41	0.00	56.56	74.00	17.44
2483.50	12.64	AV	H	24.97	5.41	0.00	43.02	54.00	10.98
4904.00	47.53	PK	H	29.91	7.67	27.58	57.53	74.00	16.47
4904.00	34.34	AV	H	29.91	7.67	27.58	44.34	54.00	9.66
7356.00	45.84	PK	H	34.17	9.18	27.22	61.97	74.00	12.03
7356.00	33.64	AV	H	34.17	9.18	27.22	49.77	54.00	4.23

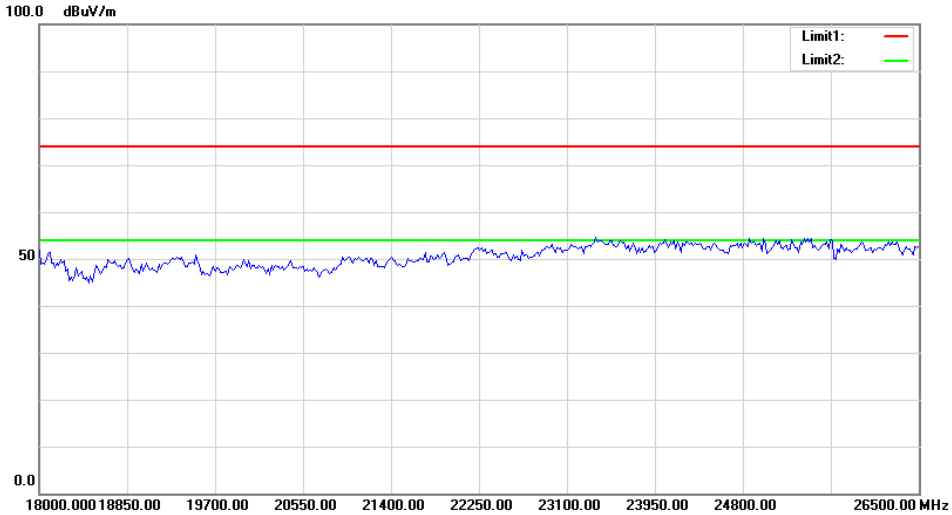
BLE Mode:

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)					
Low Channel: 2402 MHz									
2402.00	63.05	PK	H	24.82	5.41	0.00	93.28	N/A	N/A
2402.00	57.24	AV	H	24.82	5.41	0.00	87.47	N/A	N/A
2402.00	58.21	PK	V	24.82	5.41	0.00	88.44	N/A	N/A
2402.00	52.09	AV	V	24.82	5.41	0.00	82.32	N/A	N/A
2390.00	22.41	PK	H	24.80	5.36	0.00	52.57	74.00	21.43
2390.00	11.90	AV	H	24.80	5.36	0.00	42.06	54.00	11.94
4804.00	47.16	PK	H	29.71	7.25	27.36	56.76	74.00	17.24
4804.00	35.11	AV	H	29.71	7.25	27.36	44.71	54.00	9.29
7206.00	46.55	PK	H	33.93	8.94	27.19	62.23	74.00	11.77
7206.00	34.77	AV	H	33.93	8.94	27.19	50.45	54.00	3.55
Middle Channel: 2440 MHz									
2440.00	63.31	PK	H	24.89	5.41	0.00	93.61	N/A	N/A
2440.00	57.52	AV	H	24.89	5.41	0.00	87.82	N/A	N/A
2440.00	58.57	PK	V	24.89	5.41	0.00	88.87	N/A	N/A
2440.00	52.44	AV	V	24.89	5.41	0.00	82.74	N/A	N/A
4880.00	47.25	PK	H	29.86	7.58	27.55	57.14	74.00	16.86
4880.00	35.17	AV	H	29.86	7.58	27.55	45.06	54.00	8.94
7320.00	46.75	PK	H	34.11	9.30	27.26	62.90	74.00	11.10
7320.00	34.36	AV	H	34.11	9.30	27.26	50.51	54.00	3.49
High Channel: 2480 MHz									
2480.00	62.57	PK	H	24.96	5.41	0.00	92.94	N/A	N/A
2480.00	56.94	AV	H	24.96	5.41	0.00	87.31	N/A	N/A
2480.00	57.78	PK	V	24.96	5.41	0.00	88.15	N/A	N/A
2480.00	52.42	AV	V	24.96	5.41	0.00	82.79	N/A	N/A
2483.50	27.06	PK	H	24.97	5.41	0.00	57.44	74.00	16.56
2483.50	14.68	AV	H	24.97	5.41	0.00	45.06	54.00	8.94
4960.00	47.95	PK	H	30.02	7.63	27.37	58.23	74.00	15.77
4960.00	35.35	AV	H	30.02	7.63	27.37	45.63	54.00	8.37
7440.00	45.92	PK	H	34.30	9.09	27.22	62.09	74.00	11.91
7440.00	34.31	AV	H	34.30	9.09	27.22	50.48	54.00	3.52

Test plots(802.11b Middle channel was the worst)
Horizontal:

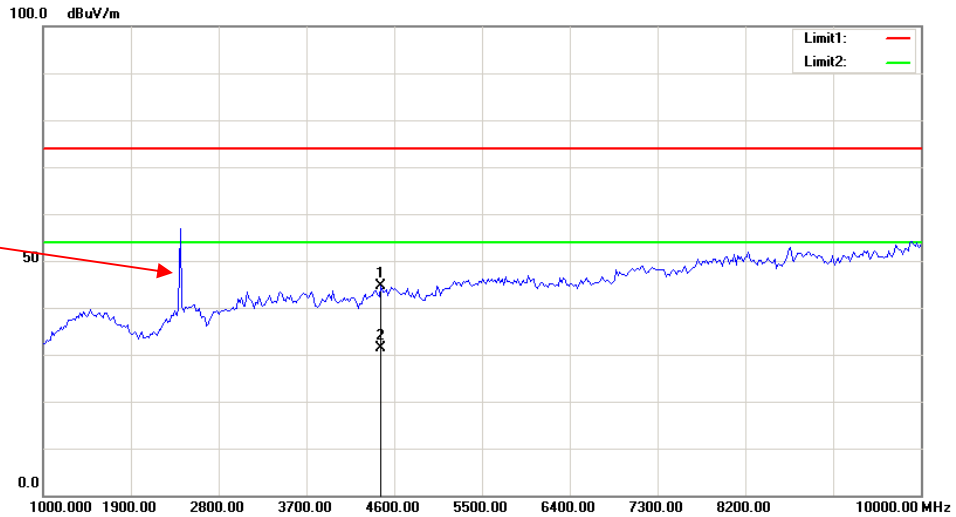


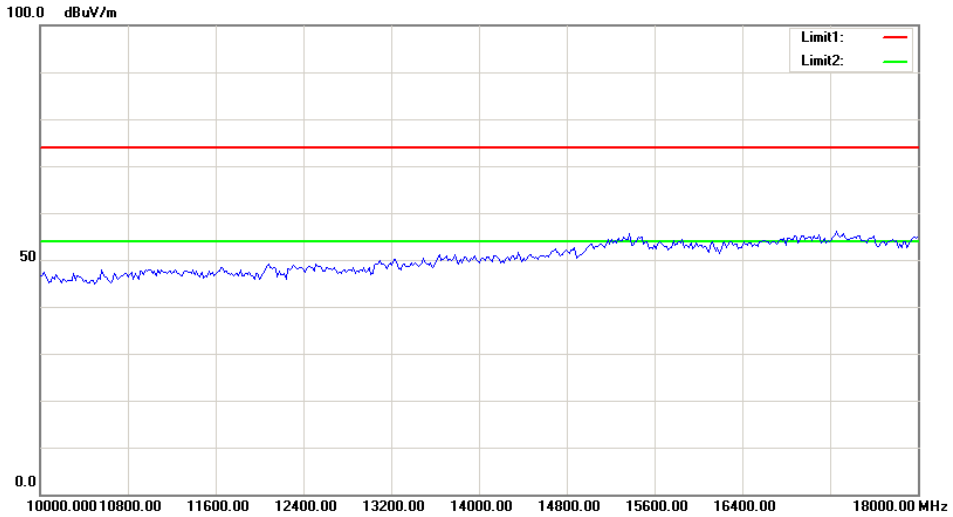


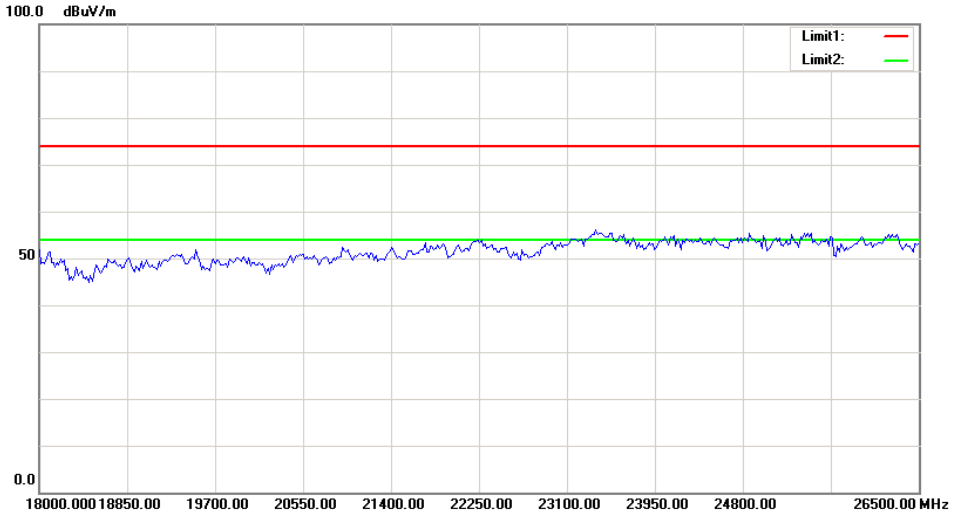


Vertical:

Fundamental Test with Band Rejection Filter







FCC §15.247(a) (2)& RSS-247 §5.2 a)–6 dB EMISSION BANDWIDTH

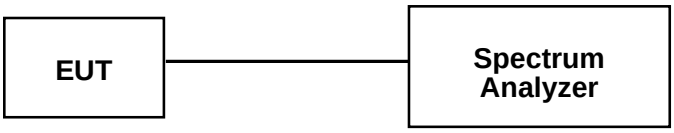
Applicable Standard

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.

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	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	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:	42 %
ATM Pressure:	101.4 kPa

** The testing was performed by Kami Zhou on 2017-12-28.*

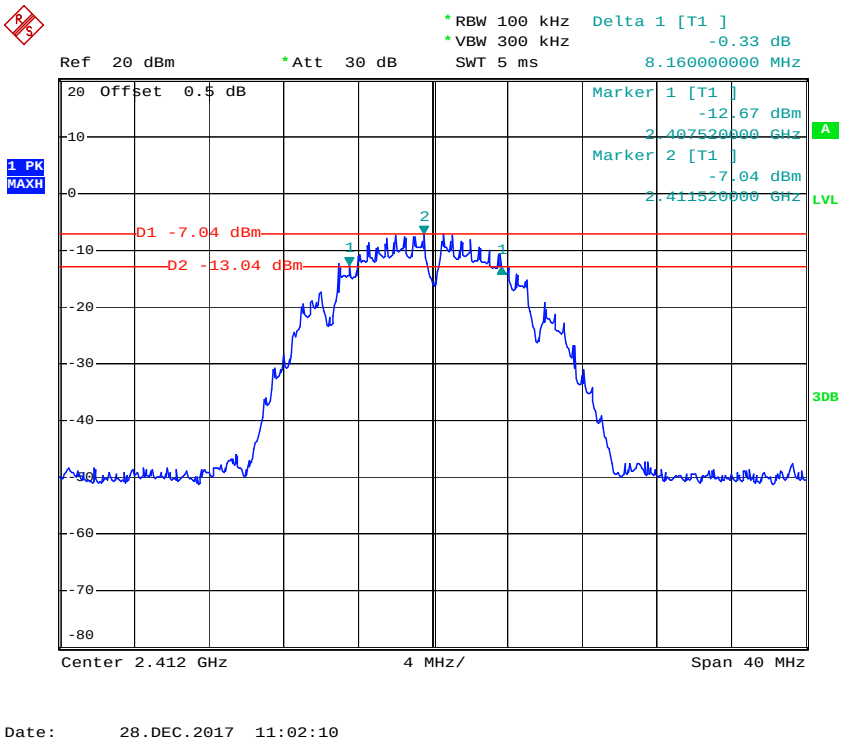
Test Mode: Transmitting

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

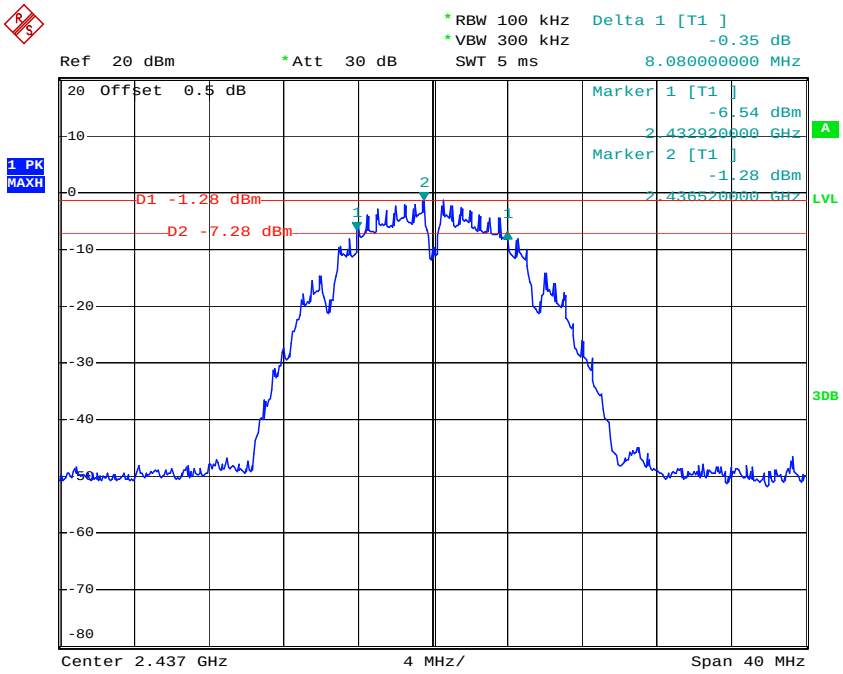
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	8.16	13.52	≥0.5
	Middle	2437	8.08	12.8	≥0.5
	High	2462	8.56	12.72	≥0.5
802.11g	Low	2412	16	17.6	≥0.5
	Middle	2437	16.32	17.04	≥0.5
	High	2462	16.08	16.96	≥0.5
802.11n20	Low	2412	17.28	18.4	≥0.5
	Middle	2437	17.44	17.92	≥0.5
	High	2462	17.12	17.92	≥0.5
802.11n40	Low	2422	35.2	37.44	≥0.5
	Middle	2437	33.76	36.32	≥0.5
	High	2452	35.36	36.64	≥0.5
BLE	Low	2402	0.67	1.07	≥0.5
	Middle	2440	0.66	1.07	≥0.5
	High	2480	0.67	1.07	≥0.5

6dB bandwidth:

802.11b Low Channel

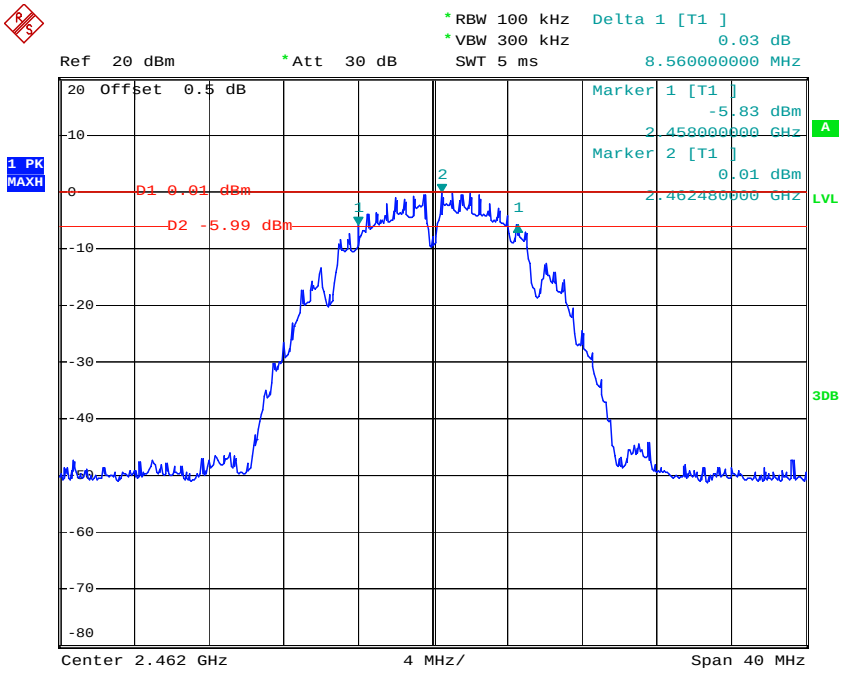


802.11b Middle Channel



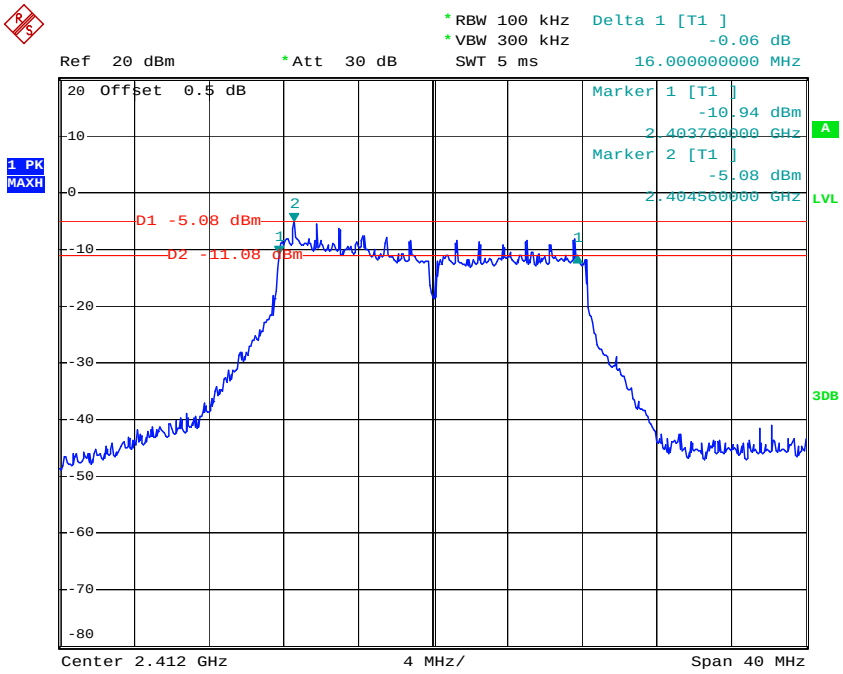
Date: 28.DEC.2017 10:52:12

802.11b High Channel



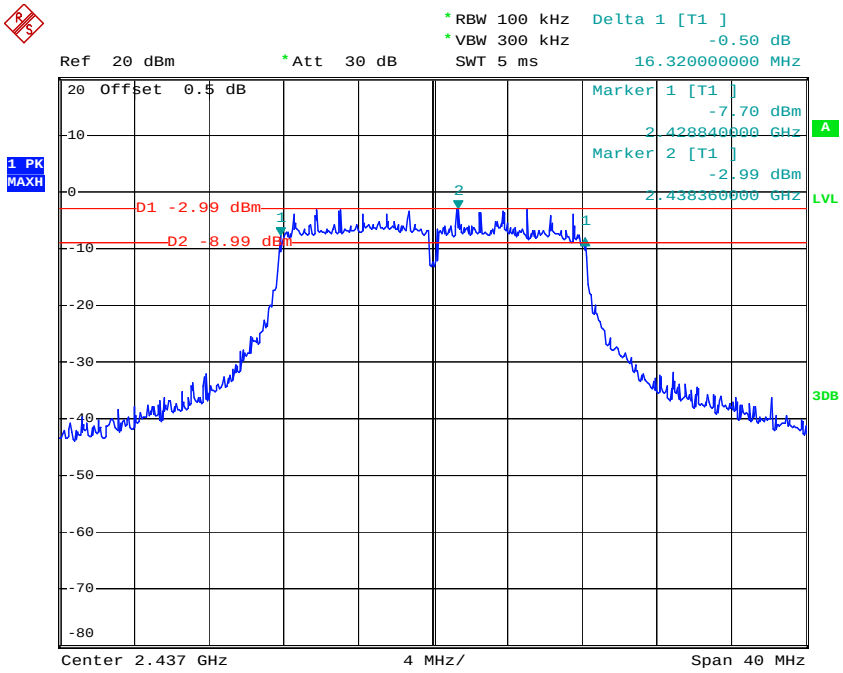
Date: 28.DEC.2017 10:59:33

802.11g Low Channel



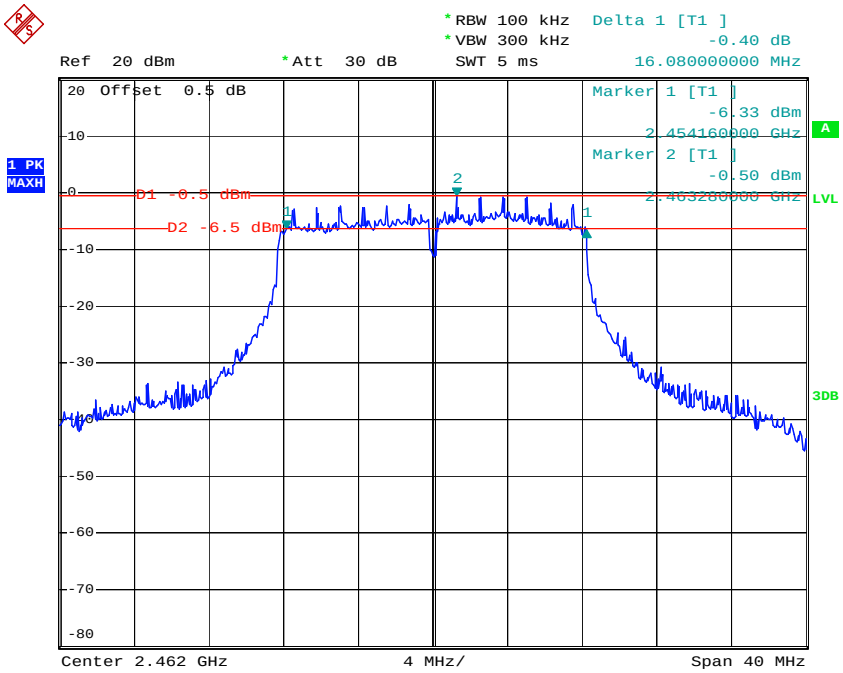
Date: 28.DEC.2017 11:13:06

802.11g Middle Channel



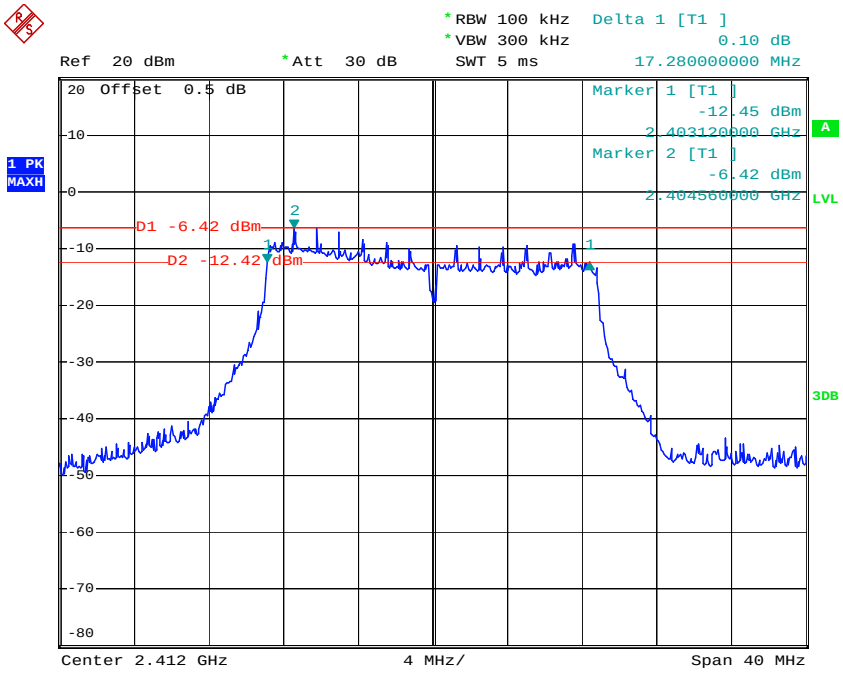
Date: 28.DEC.2017 11:15:47

802.11g High Channel



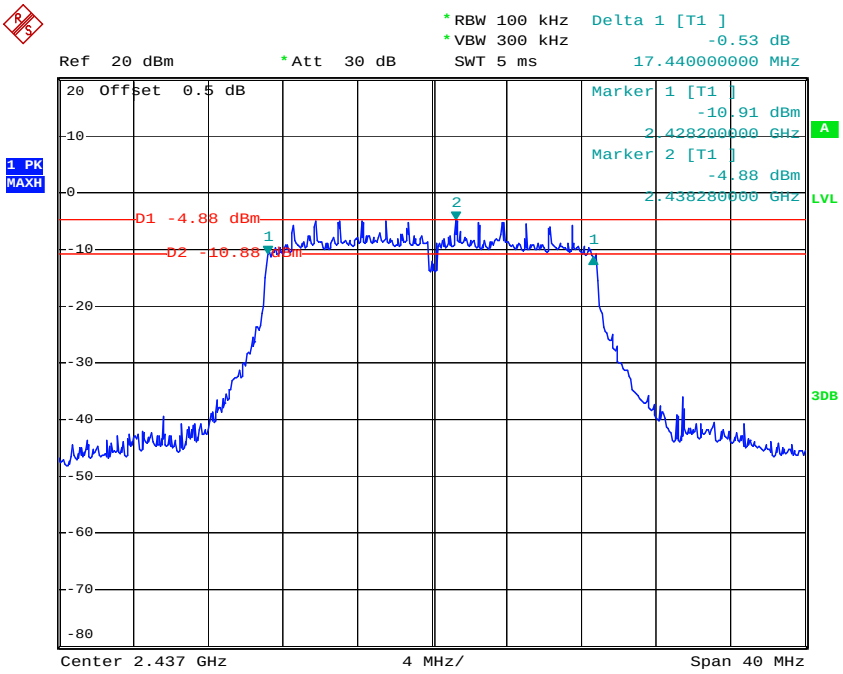
Date: 28.DEC.2017 11:18:34

802.11n ht20 Low Channel



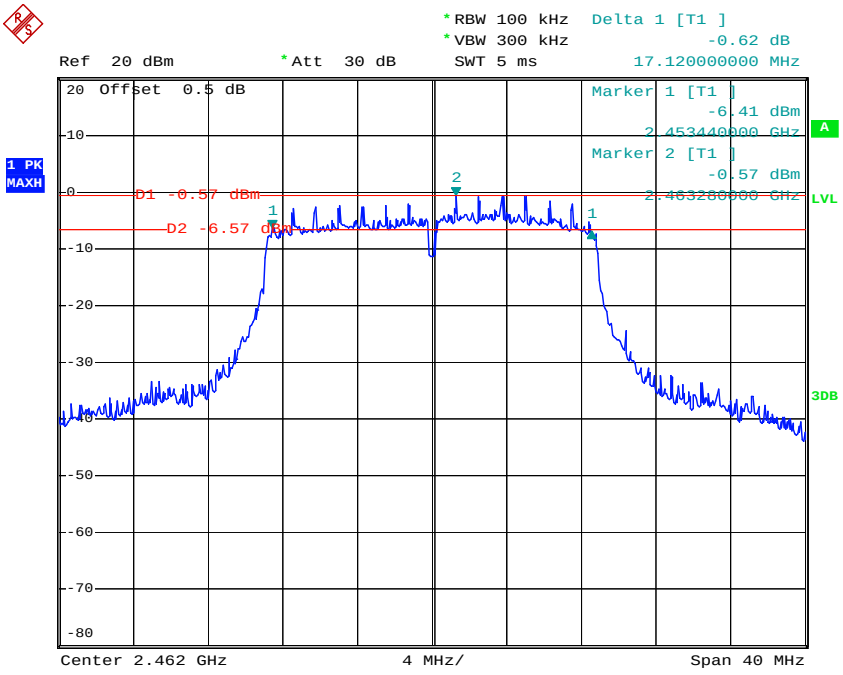
Date: 28.DEC.2017 11:27:17

802.11n ht20 Middle Channel



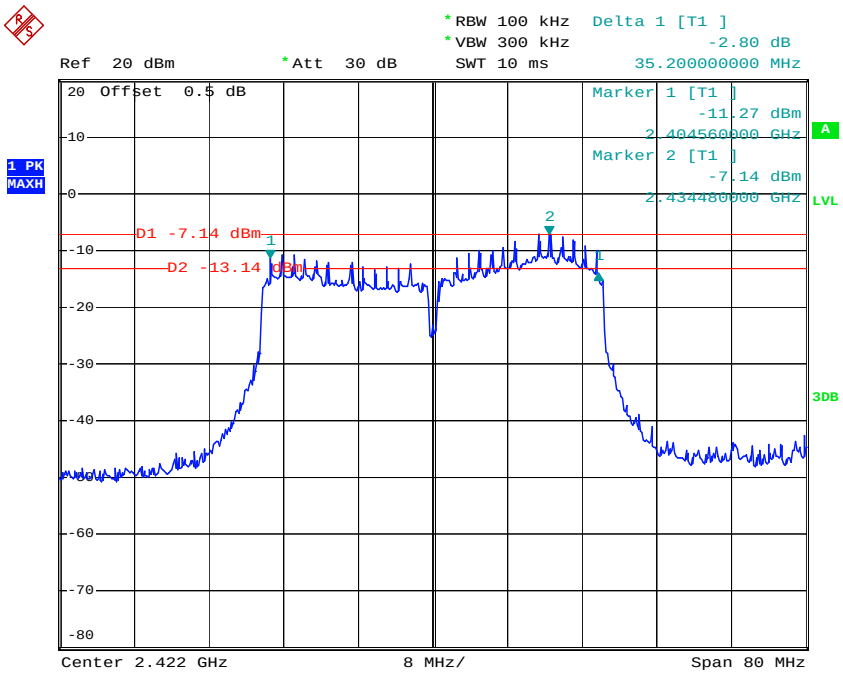
Date: 28.DEC.2017 11:25:29

802.11n ht20 High Channel



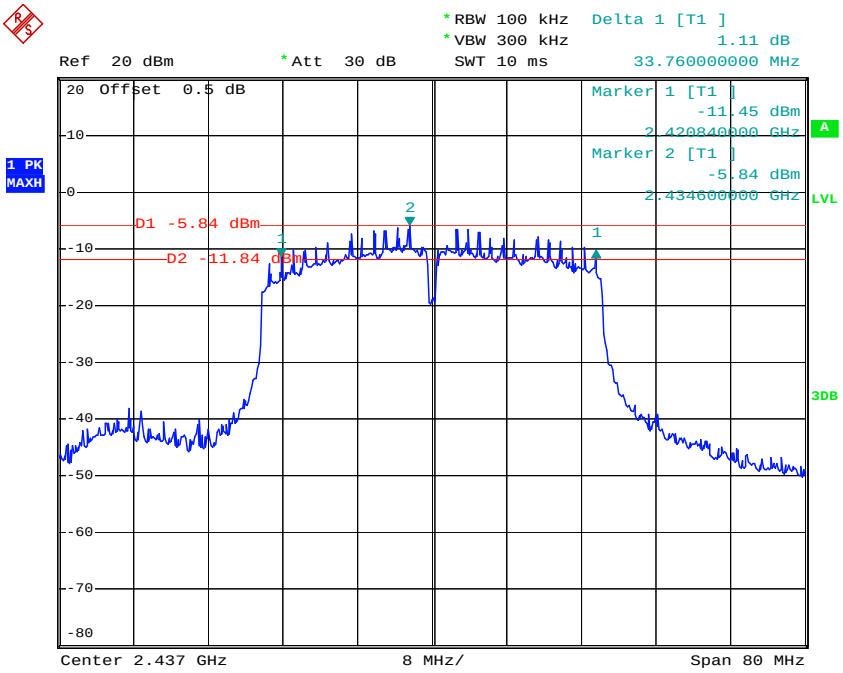
Date: 28.DEC.2017 11:23:11

802.11n ht40 Low Channel



Date: 28.DEC.2017 11:33:06

802.11n ht40 Middle Channel



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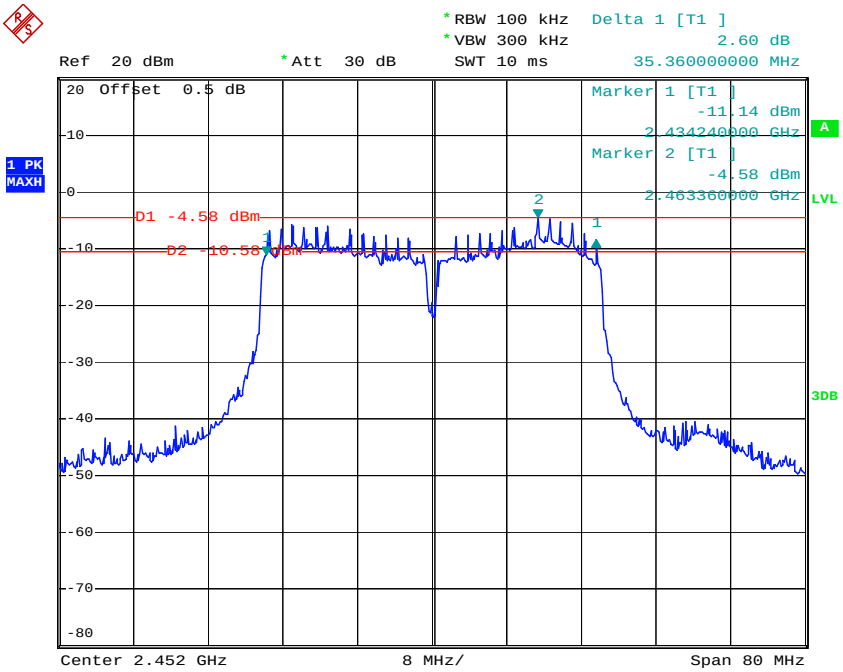
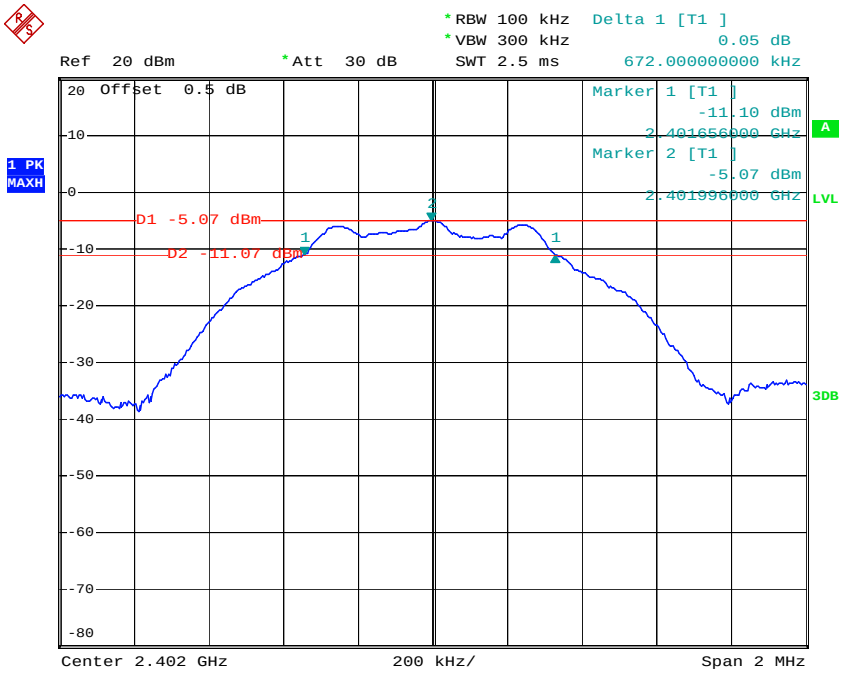
802.11n ht40 High Channel



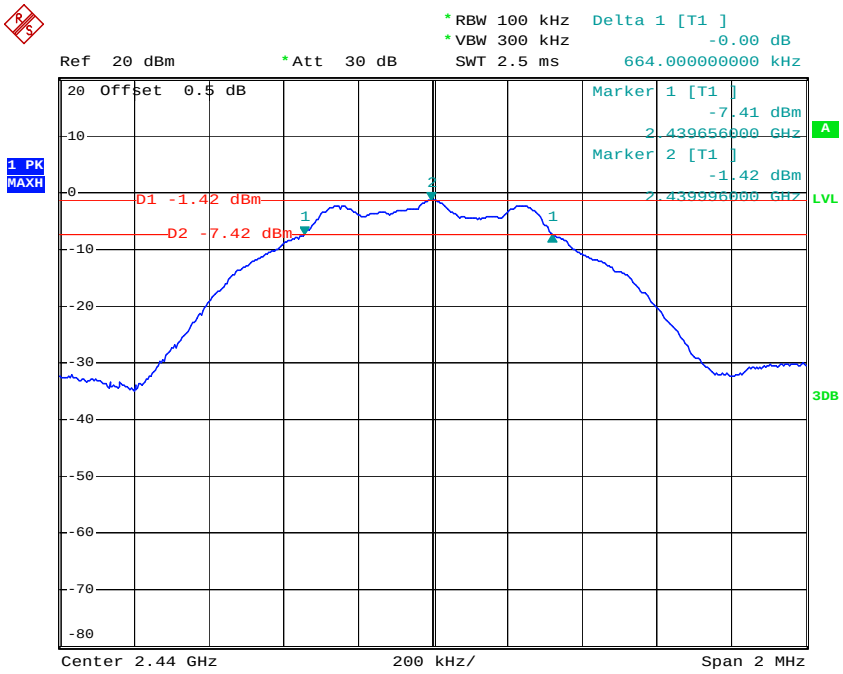
Date: 28.DEC.2017 11:37:45

BLE Low Channel



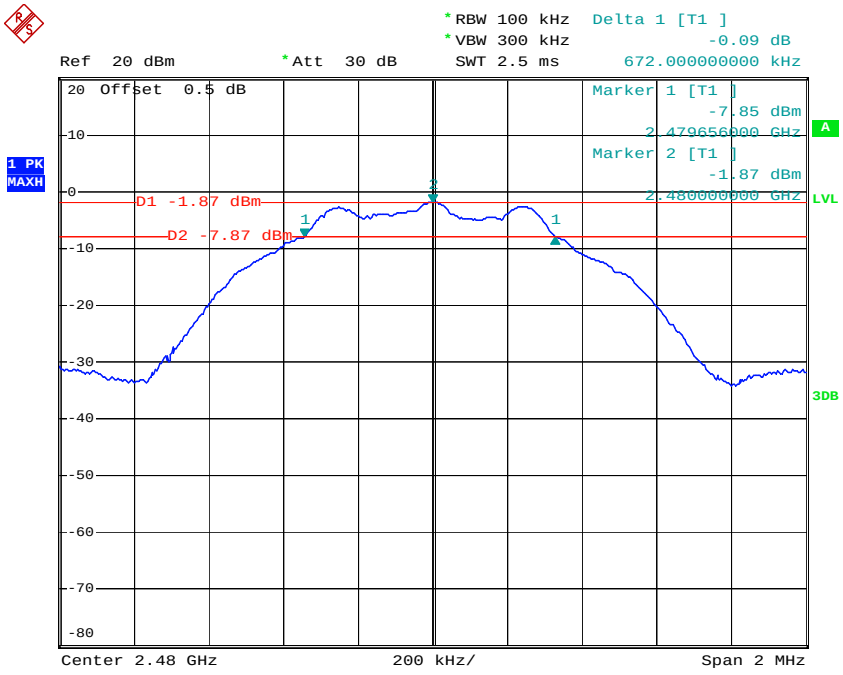
Date: 28.DEC.2017 13:22:20

BLE Middle Channel



Date: 28.DEC.2017 13:23:56

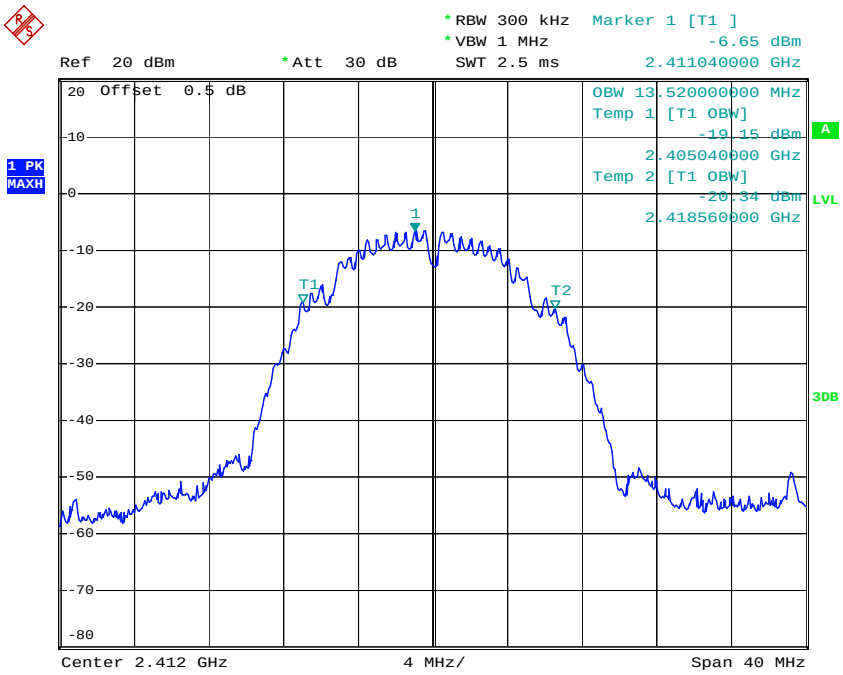
BLE High Channel



Date: 28.DEC.2017 13:25:34

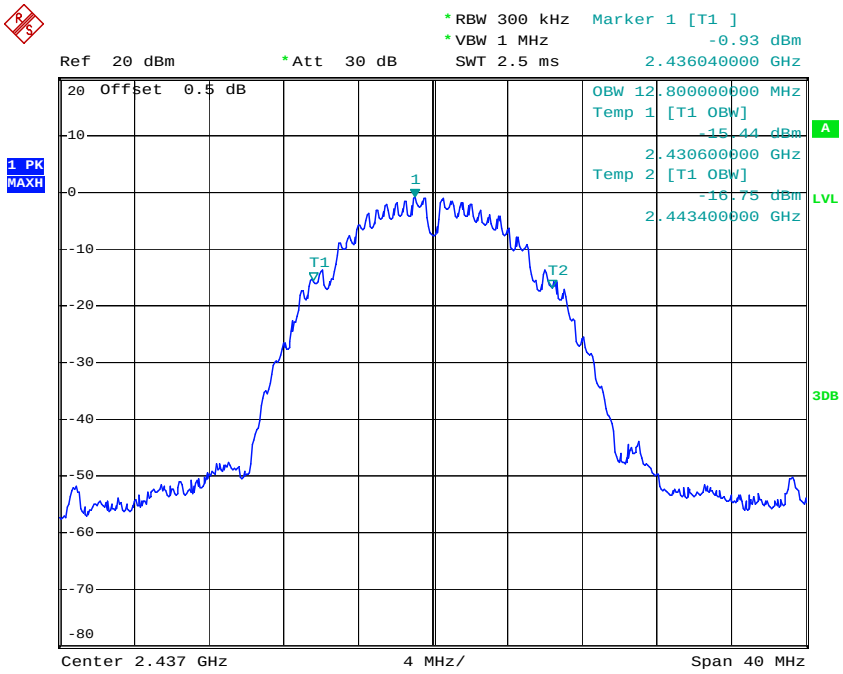
99% Occupied bandwidth:

802.11b Low Channel



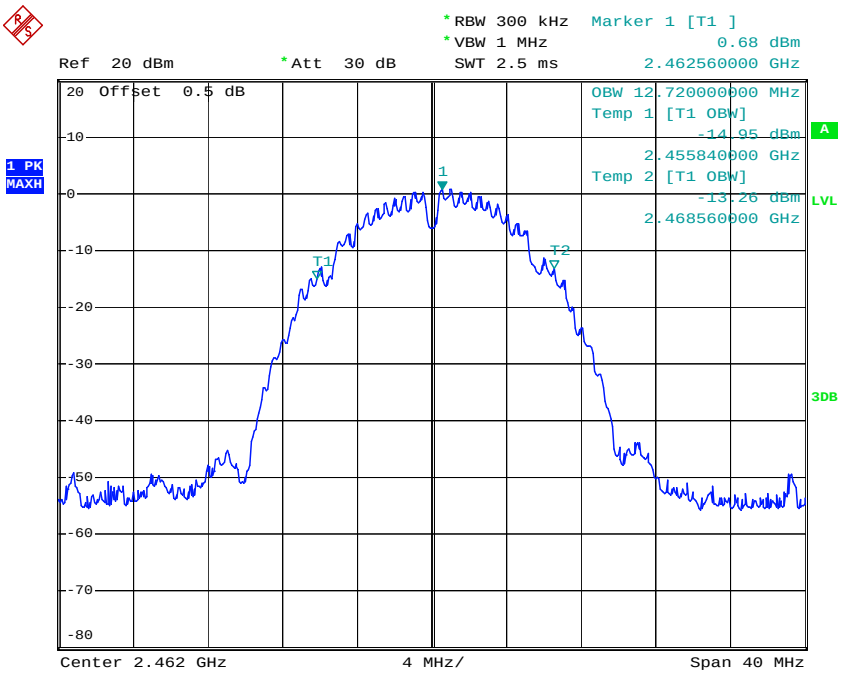
Date: 28.DEC.2017 11:02:22

802.11b Middle Channel



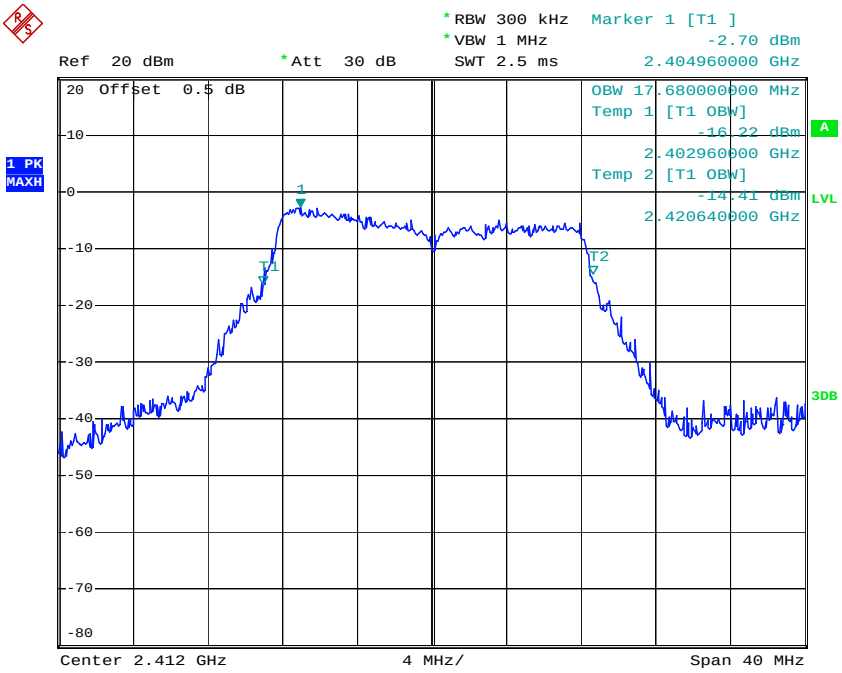
Date: 28.DEC.2017 10:52:25

802.11b High Channel



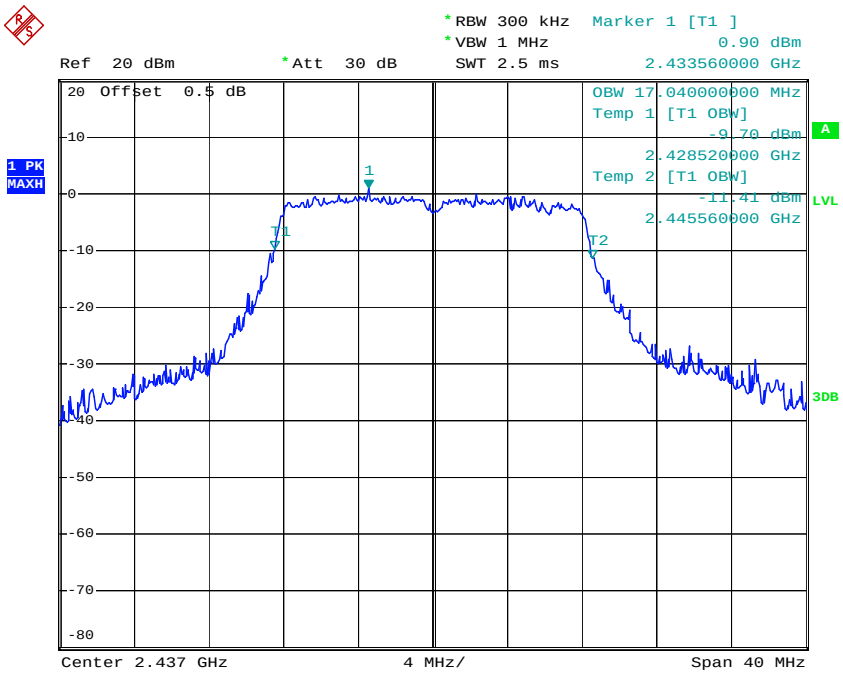
Date: 28.DEC.2017 10:59:47

802.11g Low Channel



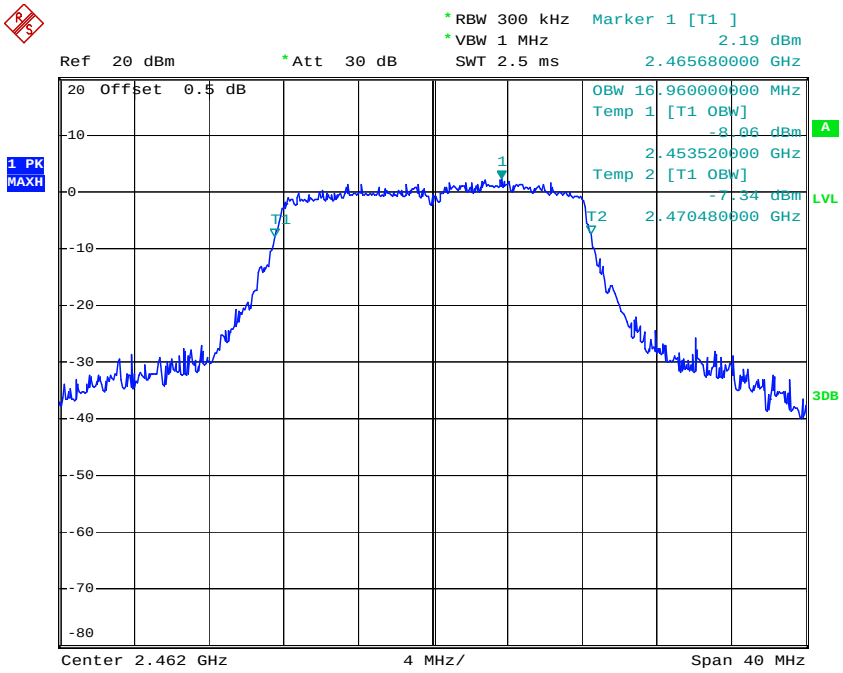
Date: 28.DEC.2017 11:13:19

802.11g Middle Channel



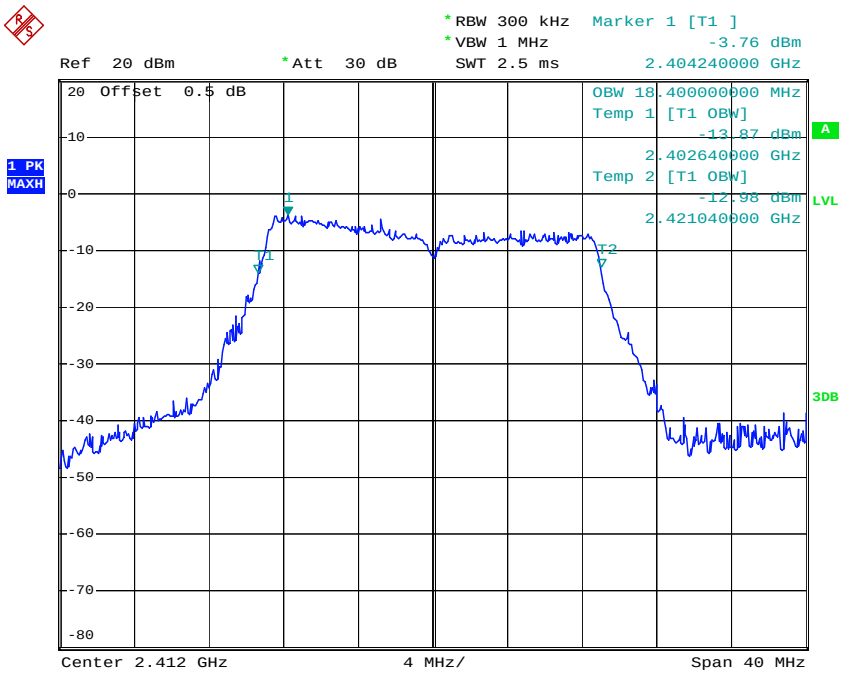
Date: 28.DEC.2017 11:16:00

802.11g High Channel



Date: 28.DEC.2017 11:18:47

802.11n ht20 Low Channel



Date: 28.DEC.2017 11:27:30

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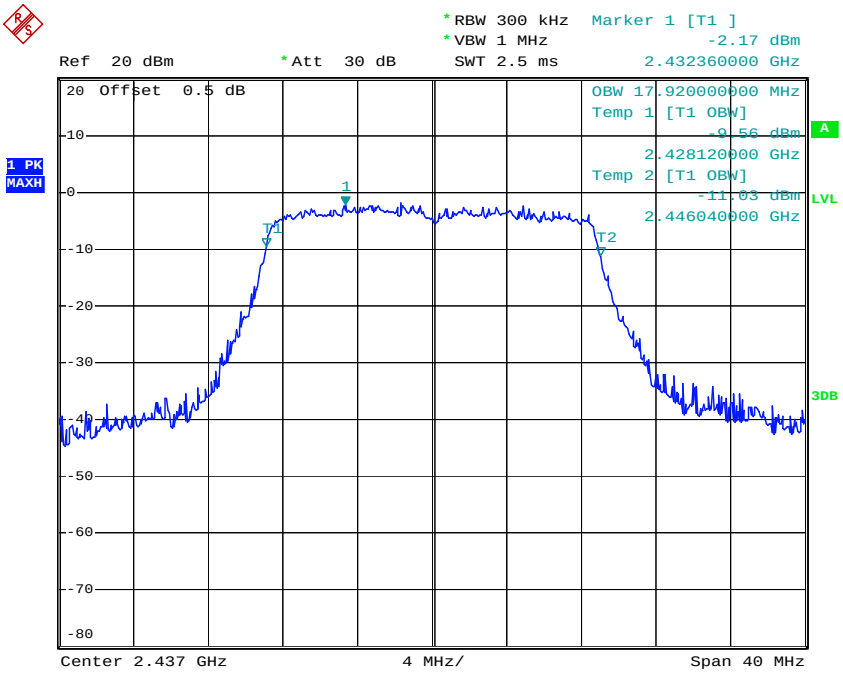
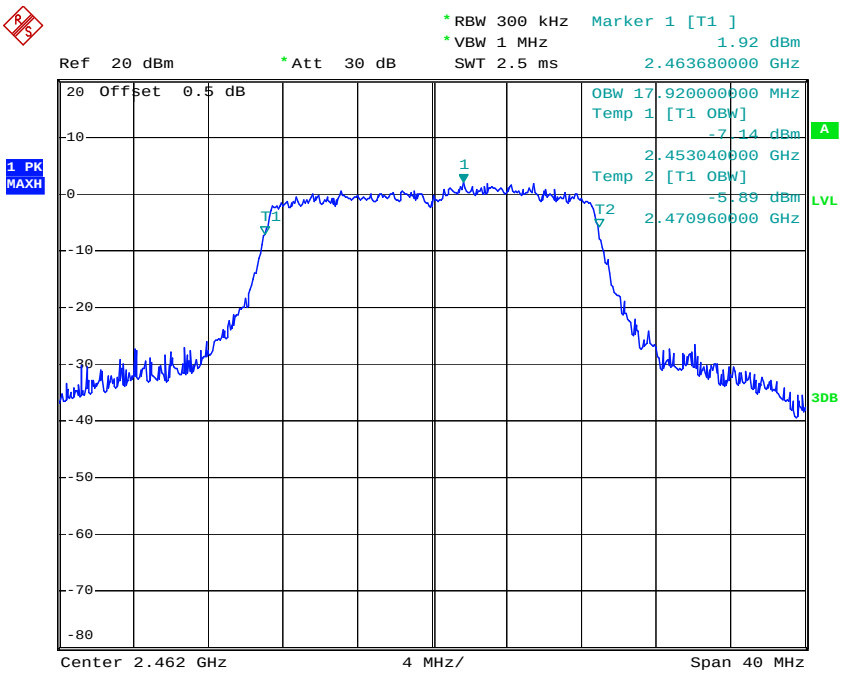


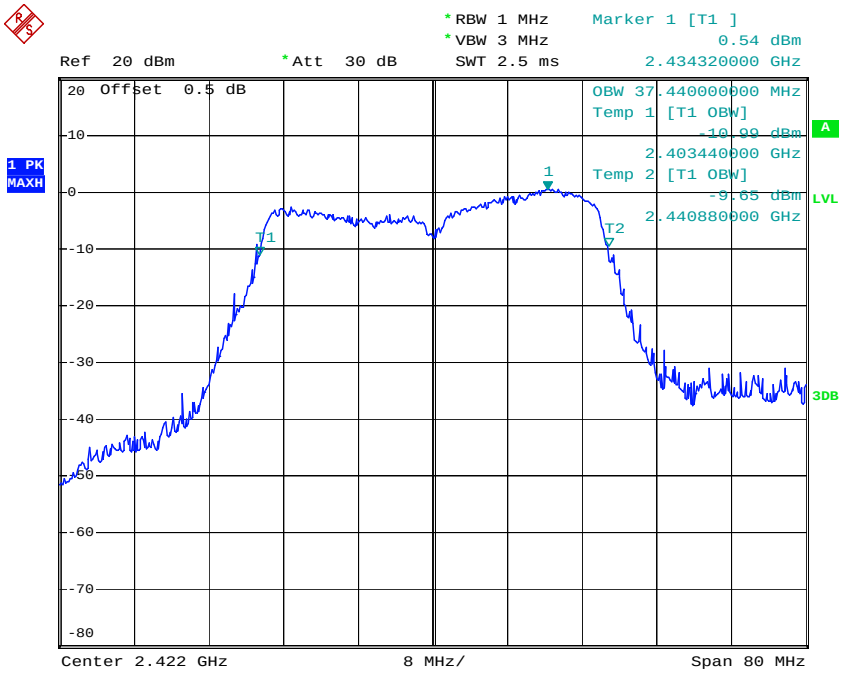
Date: 28.DEC.2017 11:25:43

802.11n ht20 High Channel



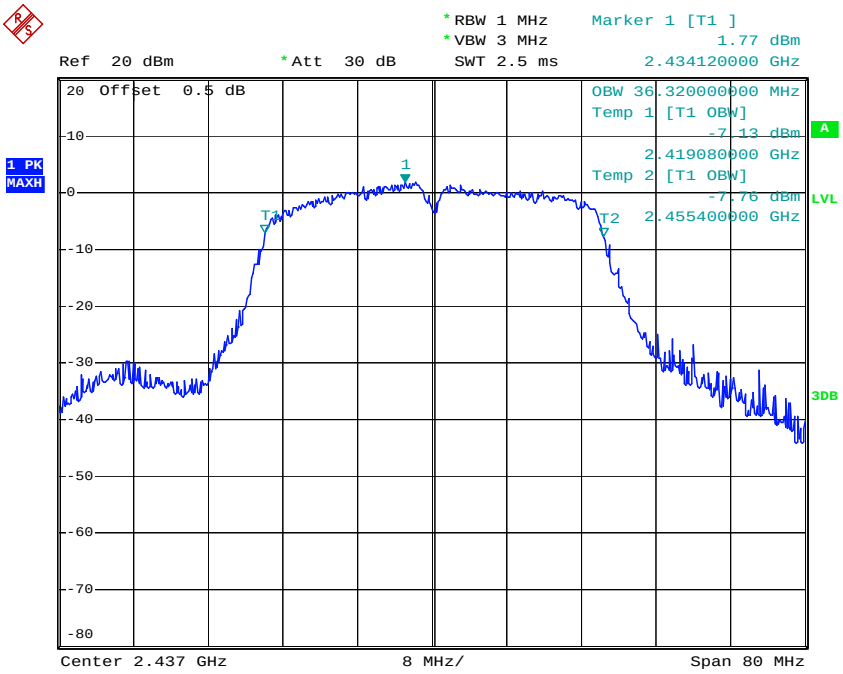
Date: 28.DEC.2017 11:23:24

802.11n ht40 Low Channel



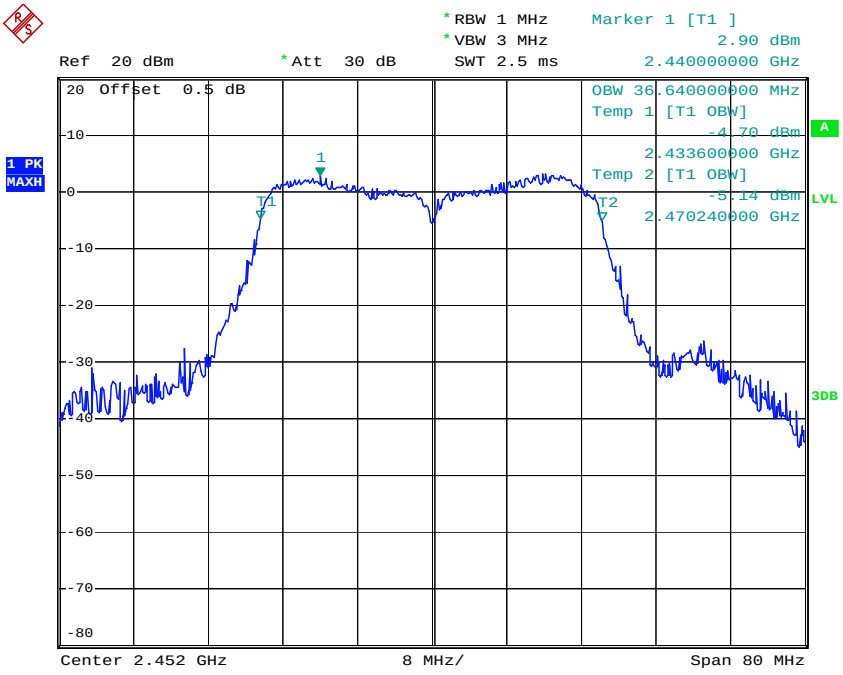
Date: 28.DEC.2017 11:33:18

802.11n ht40 Middle Channel



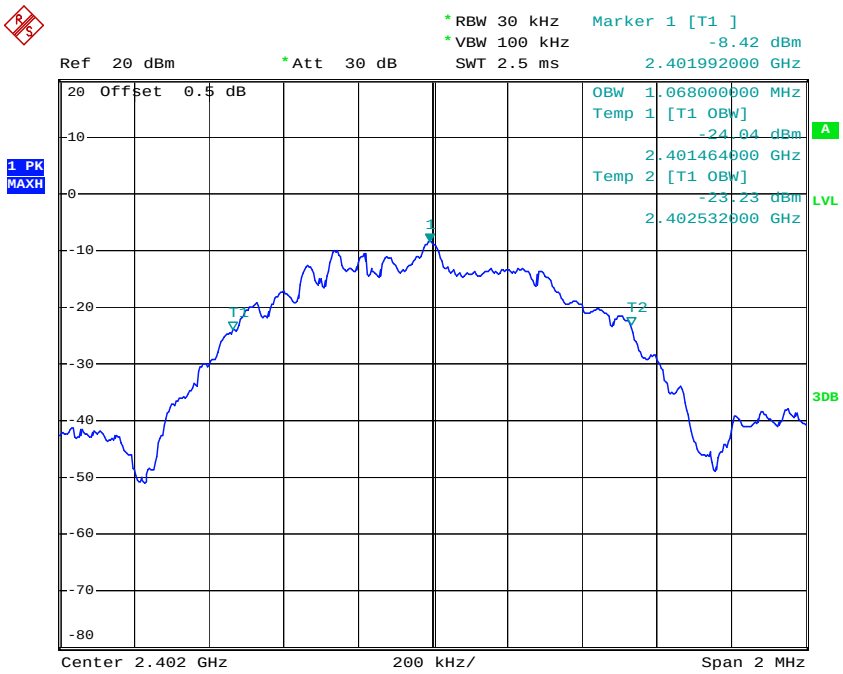
Date: 28.DEC.2017 11:35:55

802.11n ht40 High Channel



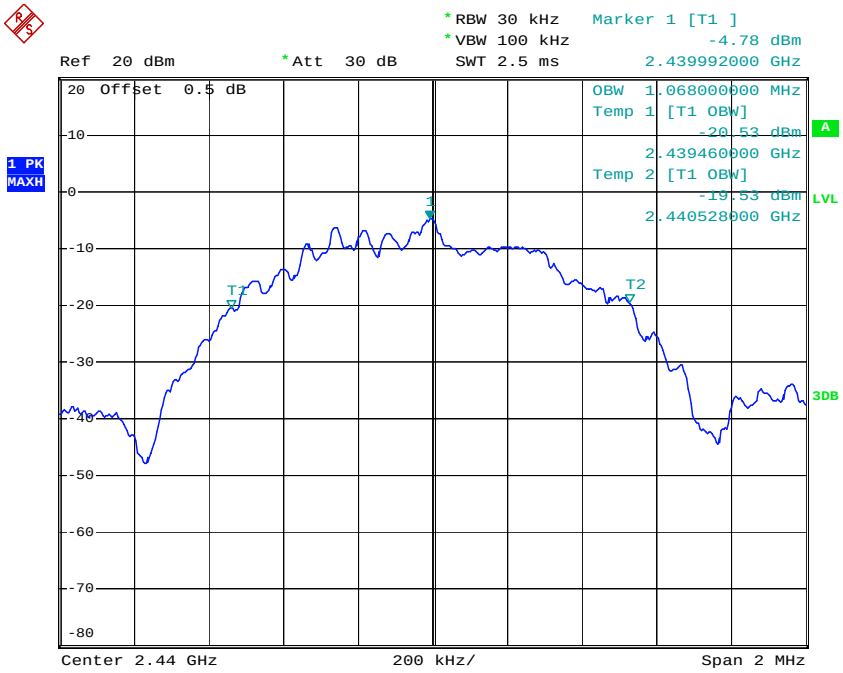
Date: 28.DEC.2017 11:37:57

BLE Low Channel



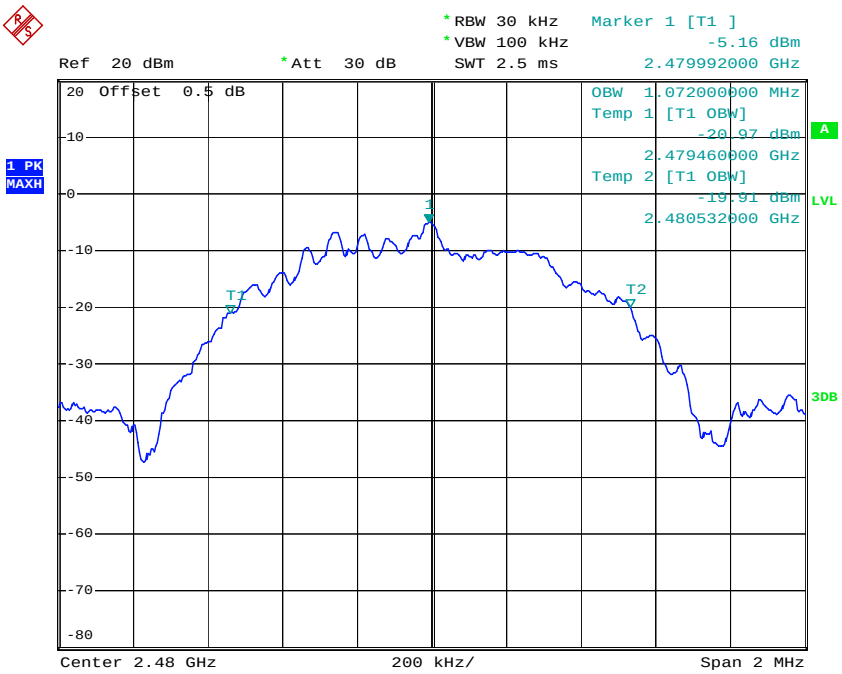
Date: 28.DEC.2017 13:22:31

BLE Middle Channel



Date: 28.DEC.2017 13:24:07

BLE High Channel



Date: 28.DEC.2017 13:25:47

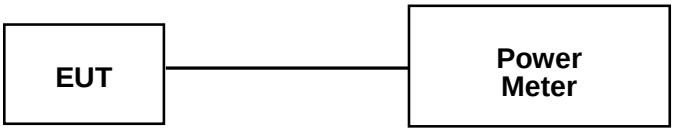
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER

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.

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
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	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:	42 %
ATM Pressure:	101.4 kPa

** The testing was performed by Kami Zhou on 2017-12-28.*

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	11.12	9.21	30
	Middle	2437	11.47	9.18	30
	High	2462	11.26	9.45	30
802.11g	Low	2412	16.46	9.47	30
	Middle	2437	16.47	9.4	30
	High	2462	16.17	9.49	30
802.11n20	Low	2412	16.65	9.46	30
	Middle	2437	16.63	9.23	30
	High	2462	16.13	9.38	30
802.11n40	Low	2422	16.56	9.41	30
	Middle	2437	16.81	9.24	30
	High	2452	16.11	9.48	30
BLE	Low	2402	-1.81	/	30
	Middle	2440	-1.27	/	30
	High	2480	-1.67	/	30

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

Applicable Standard

According to FCC§15.247(d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	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

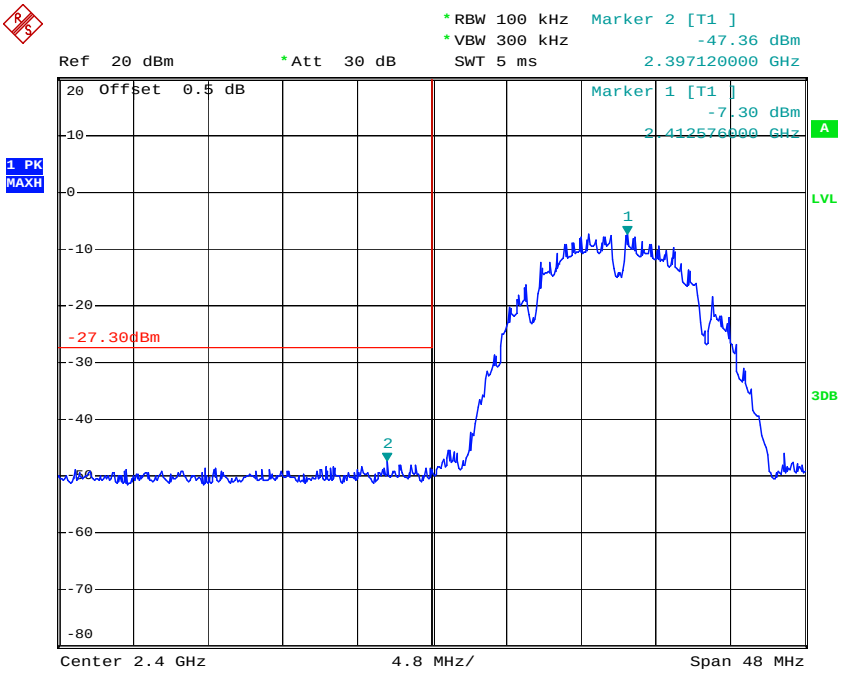
Temperature:	24.9 °C
Relative Humidity:	42 %
ATM Pressure:	101.4 kPa

** The testing was performed by Kami Zhou on 2017-12-28.*

Test mode: Transmitting

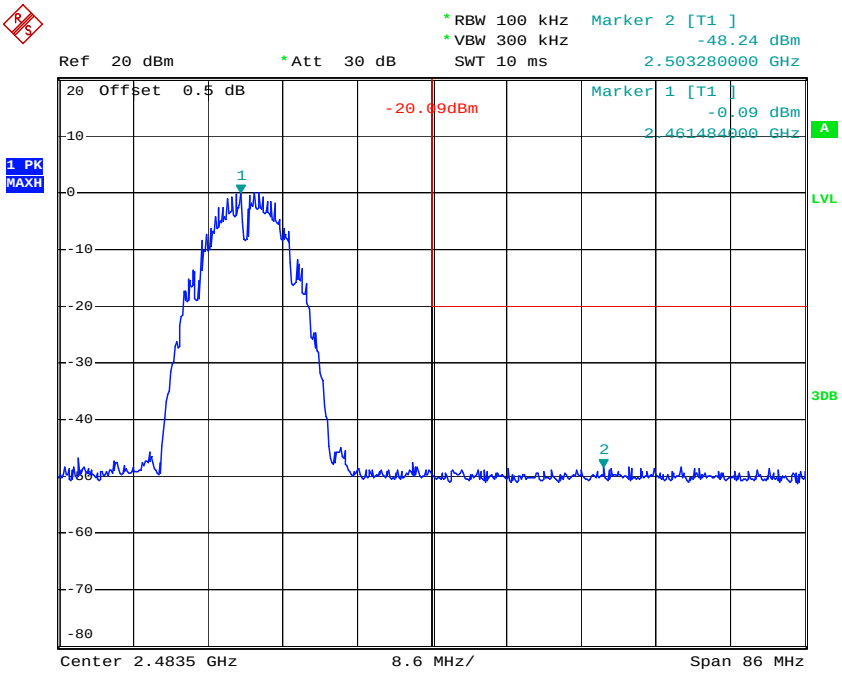
Test Result: Compliant. Please refer to following plots.

802.11b: Band Edge, Left Side



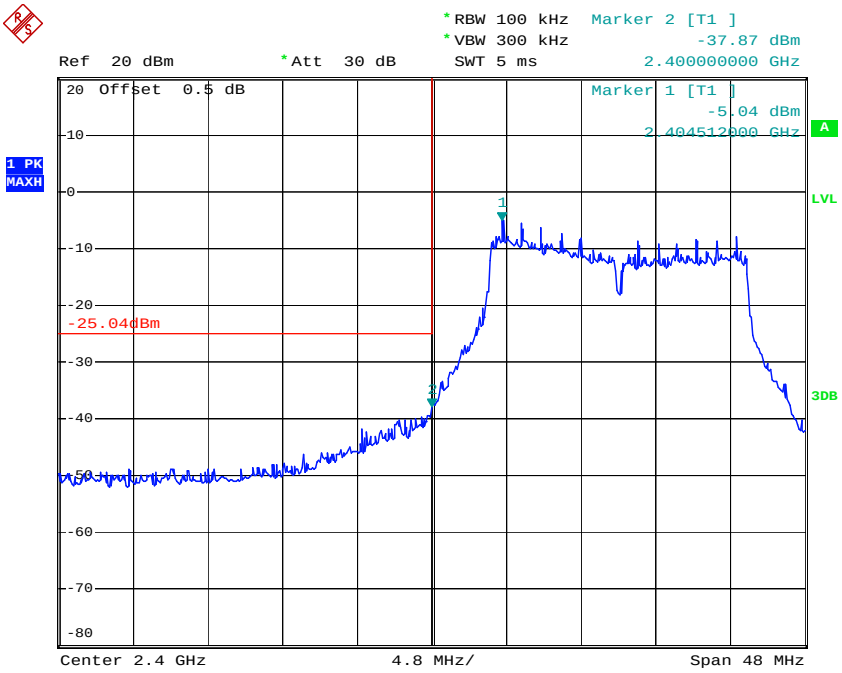
Date: 28.DEC.2017 11:03:31

802.11b: Band Edge, Right Side



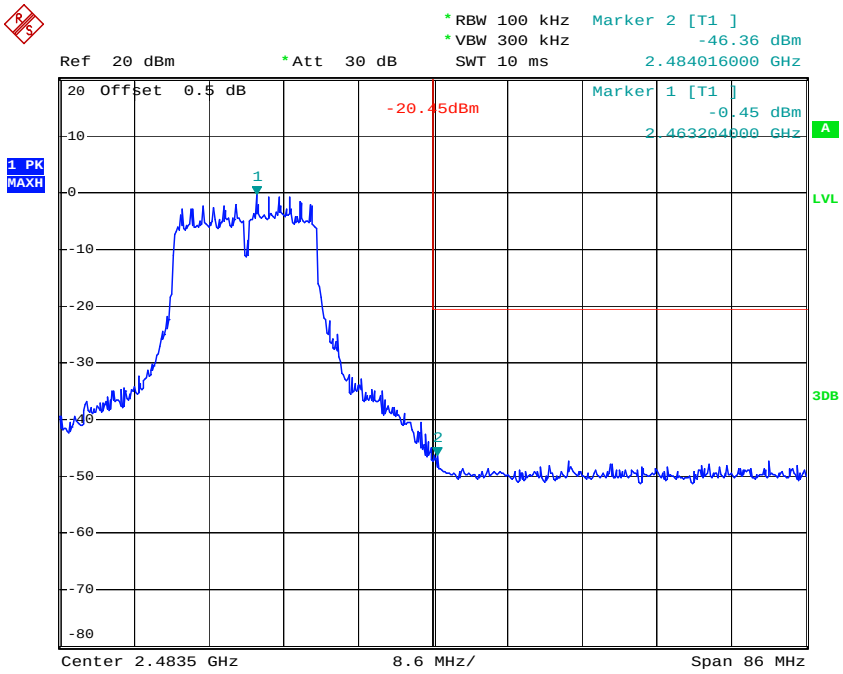
Date: 28.DEC.2017 11:01:02

802.11g: Band Edge, Left Side



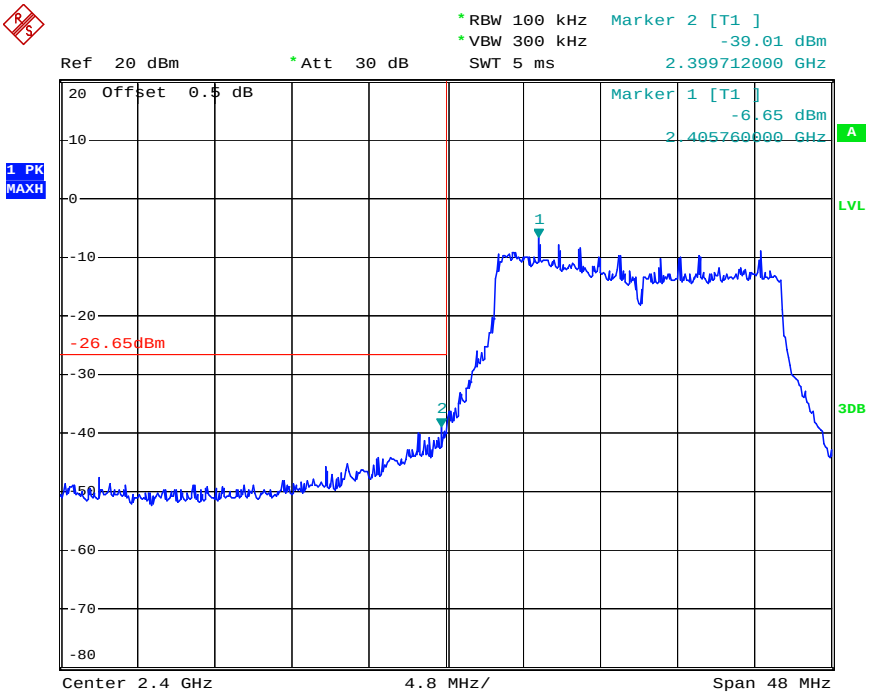
Date: 28.DEC.2017 11:14:32

802.11g: Band Edge, Right Side



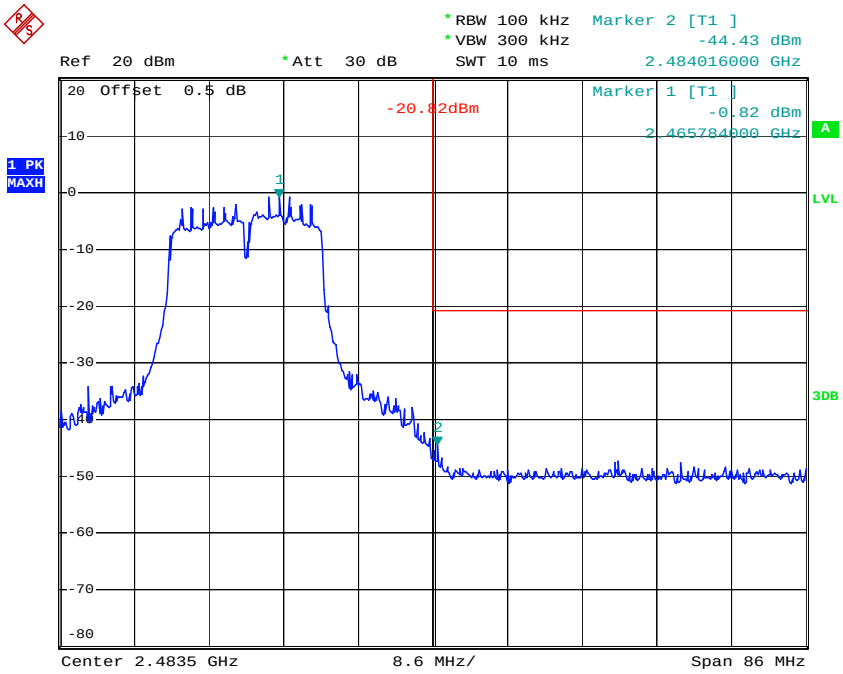
Date: 28.DEC.2017 11:20:12

802.11n ht20 Band Edge, Left Side



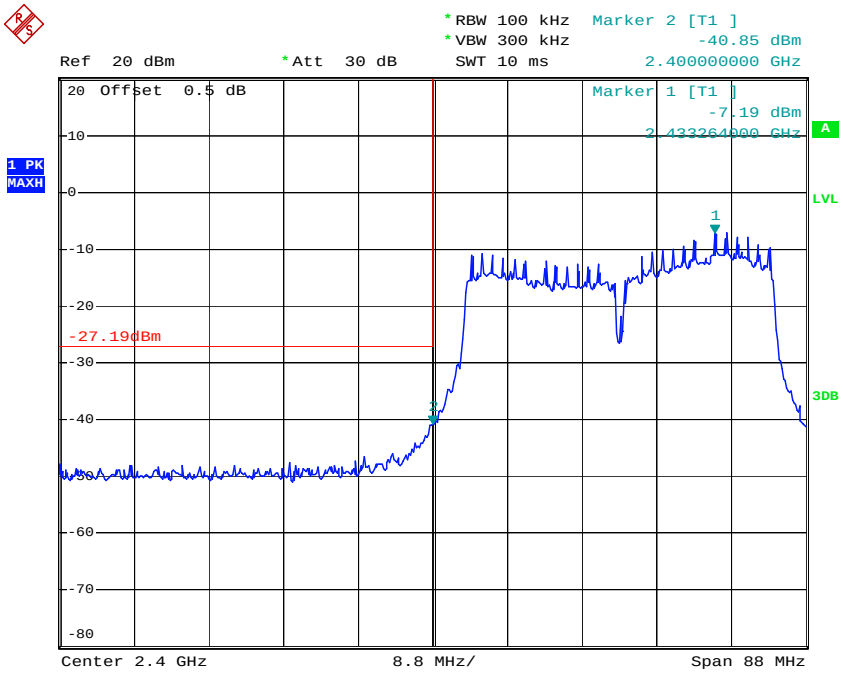
Date: 28.DEC.2017 11:28:44

802.11n ht20 Band Edge, Right Side



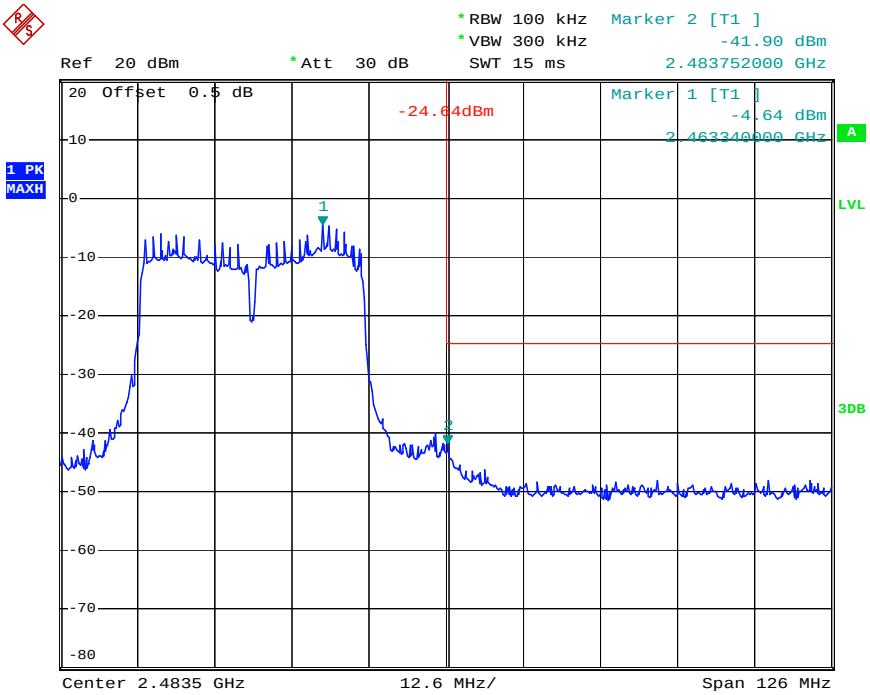
Date: 28.DEC.2017 11:24:35

802.11n40: Band Edge, Left Side



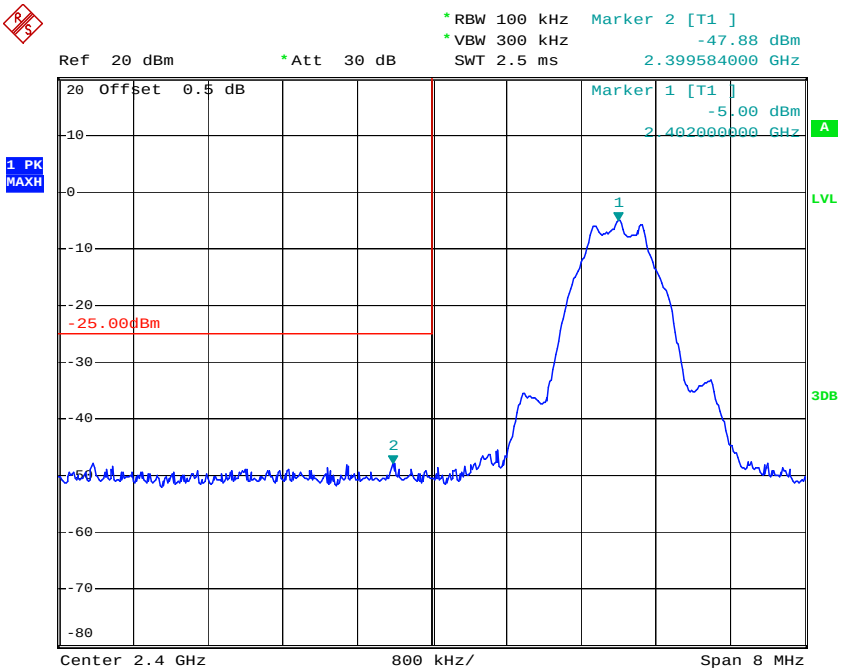
Date: 28.DEC.2017 11:34:57

802.11n ht40 Band Edge, Right Side



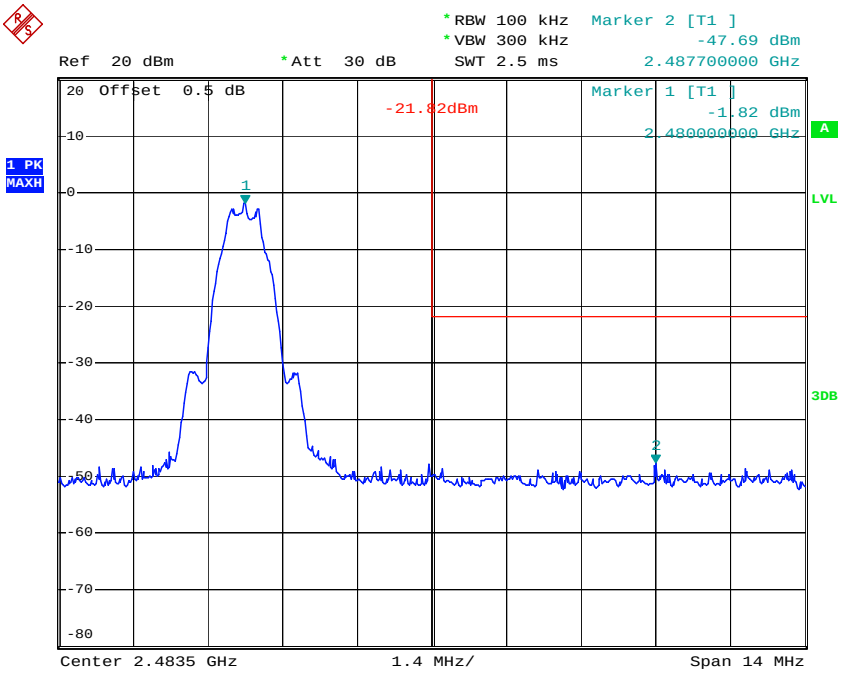
Date: 28.DEC.2017 11:39:27

BLE Band Edge, Left Side



Date: 28.DEC.2017 13:23:26

BLE Band Edge, Right Side



Date: 28.DEC.2017 13:26:26

FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	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:	42 %
ATM Pressure:	101.4 kPa

** The testing was performed by Kami Zhou on 2017-12-28.*

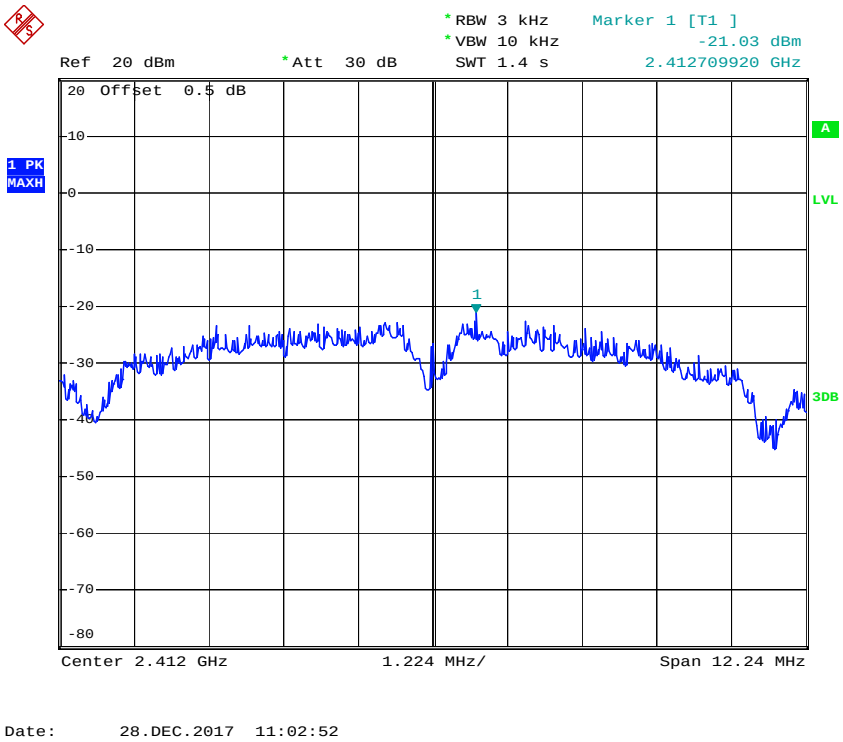
Test Result: Compliance

Test Mode: Transmitting

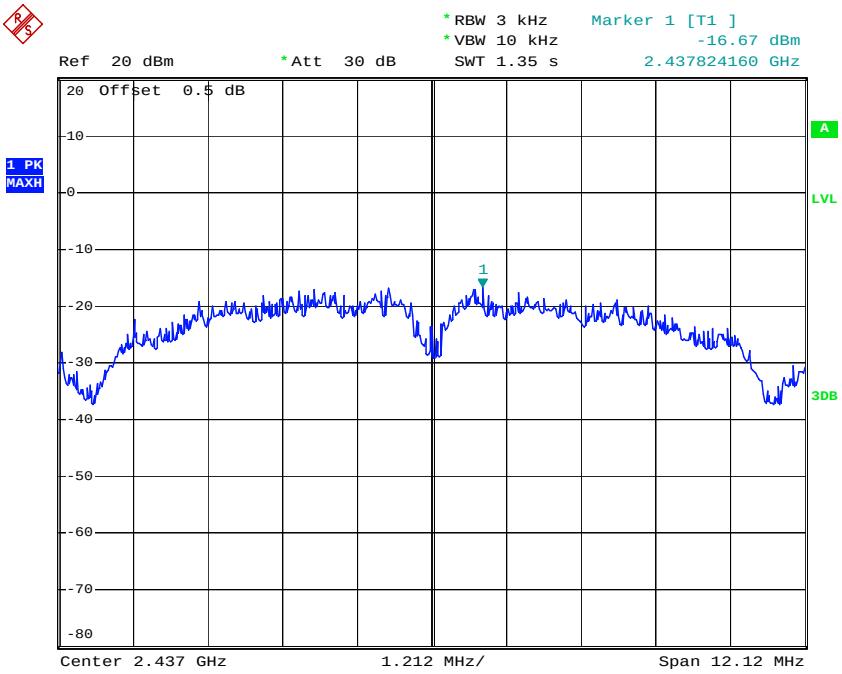
Test Result: Compliant. Please refer to the following table and plots

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	Low	2412	-21.03	≤8
	Middle	2437	-16.67	≤8
	High	2462	-14.69	≤8
802.11g	Low	2412	-19.48	≤8
	Middle	2437	-16	≤8
	High	2462	-15.48	≤8
802.11n20	Low	2412	-20.12	≤8
	Middle	2437	-19.44	≤8
	High	2462	-14.34	≤8
802.11n40	Low	2422	-23.21	≤8
	Middle	2437	-20.85	≤8
	High	2452	-19.89	≤8
BLE	Low	2402	-20.41	≤8
	Middle	2440	-16.86	≤8
	High	2480	-17.21	≤8

Power Spectral Density, 802.11b Low Channel



Power Spectral Density, 802.11b Middle Channel



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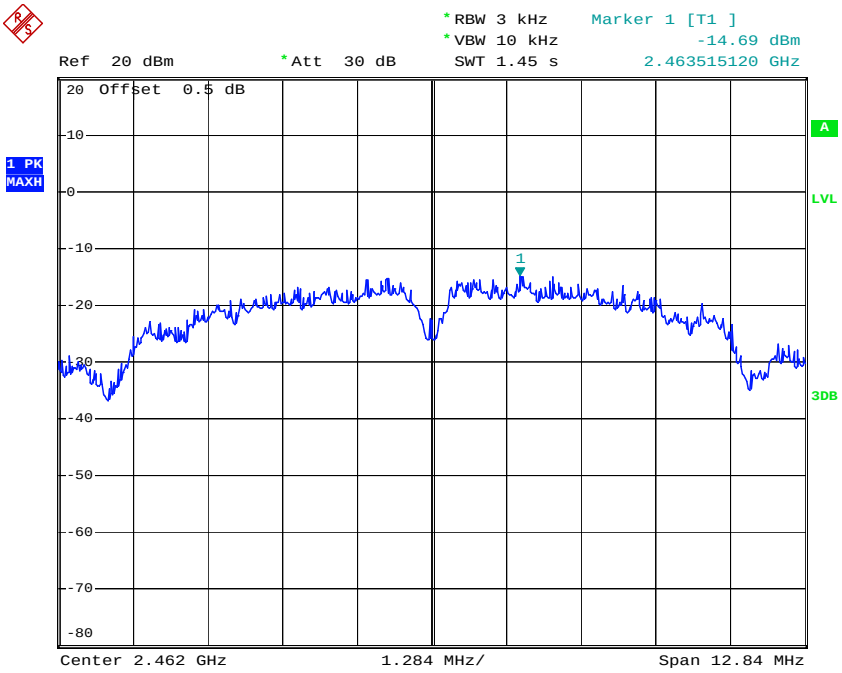
Power Spectral Density, 802.11b High Channel



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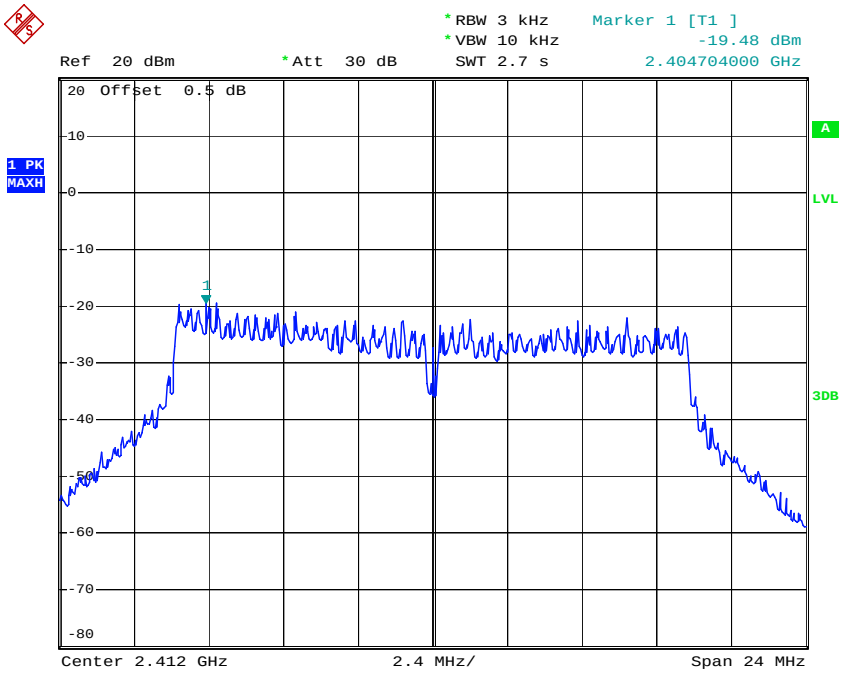
Power Spectral Density, 802.11g Low Channel



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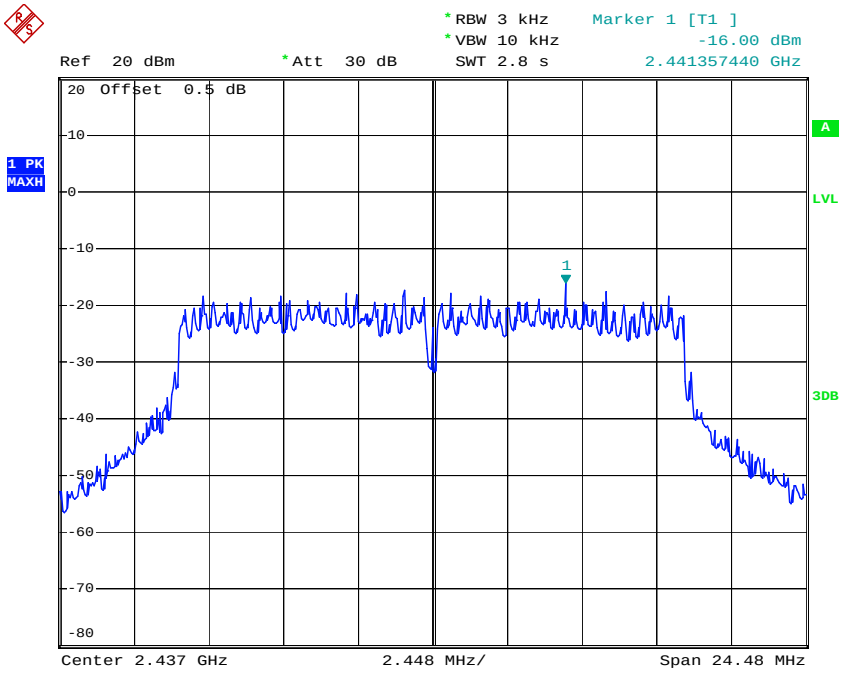
Power Spectral Density, 802.11g Middle Channel



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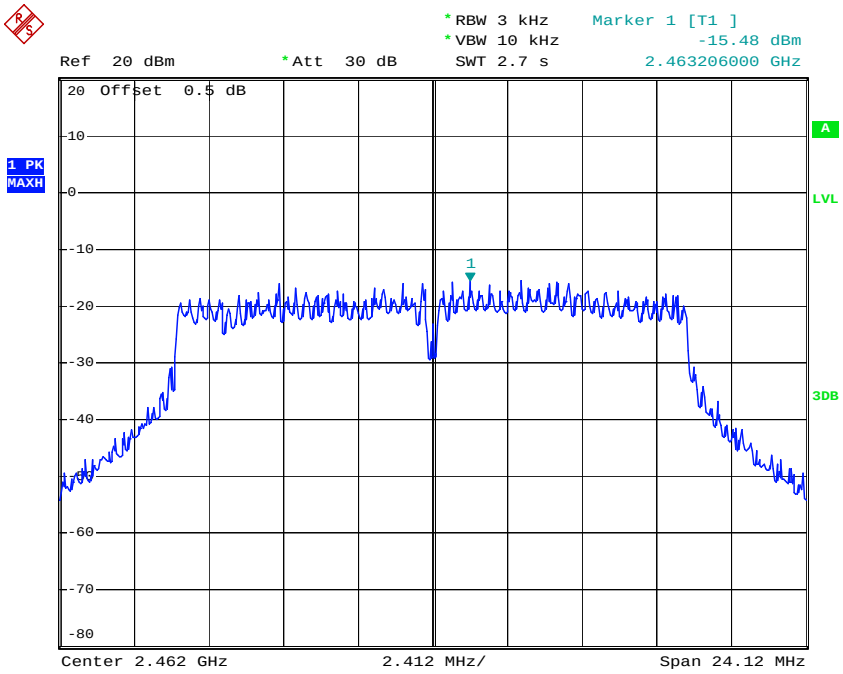
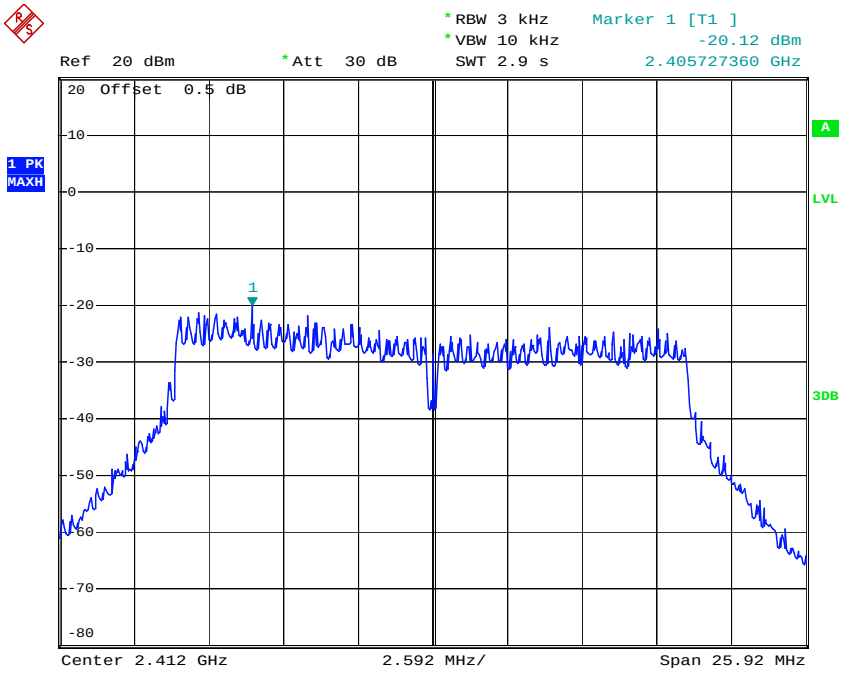
Power Spectral Density, 802.11g High Channel



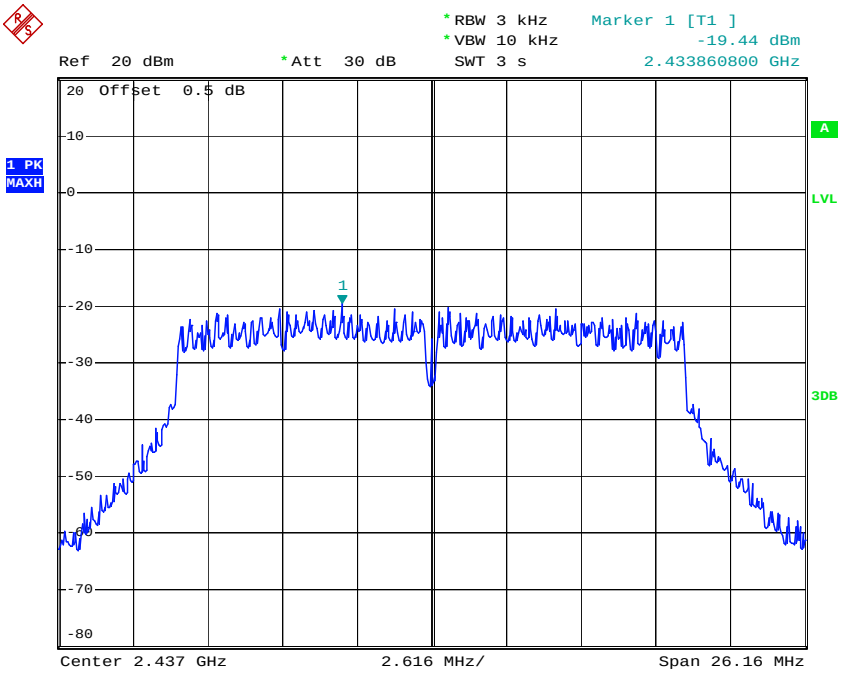
Date: 28.DEC.2017 11:19:26

Power Spectral Density, 802.11n ht20 Low Channel



Date: 28.DEC.2017 11:28:07

Power Spectral Density, 802.11n ht20 Middle Channel



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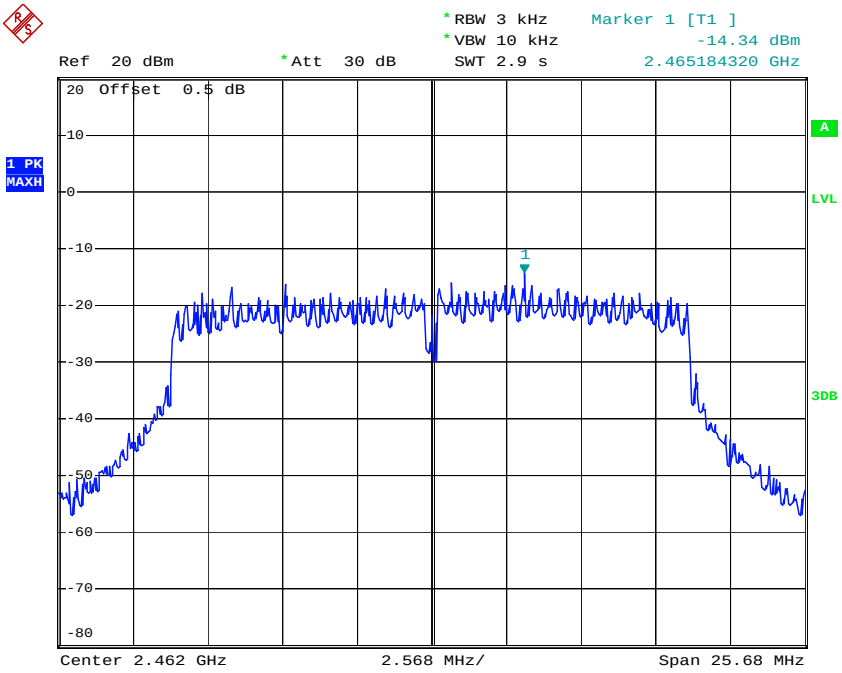
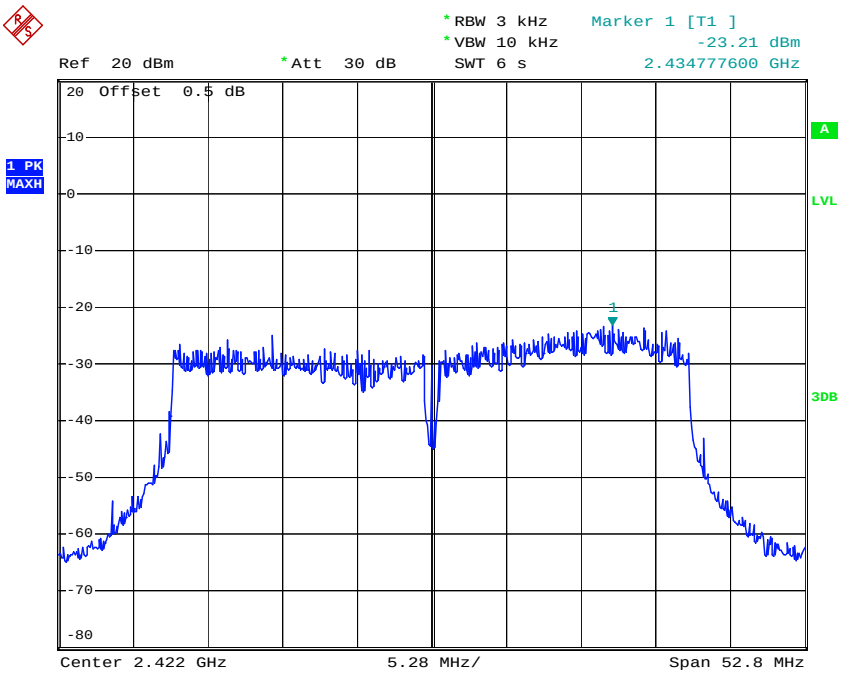
Power Spectral Density, 802.11n ht20 High Channel



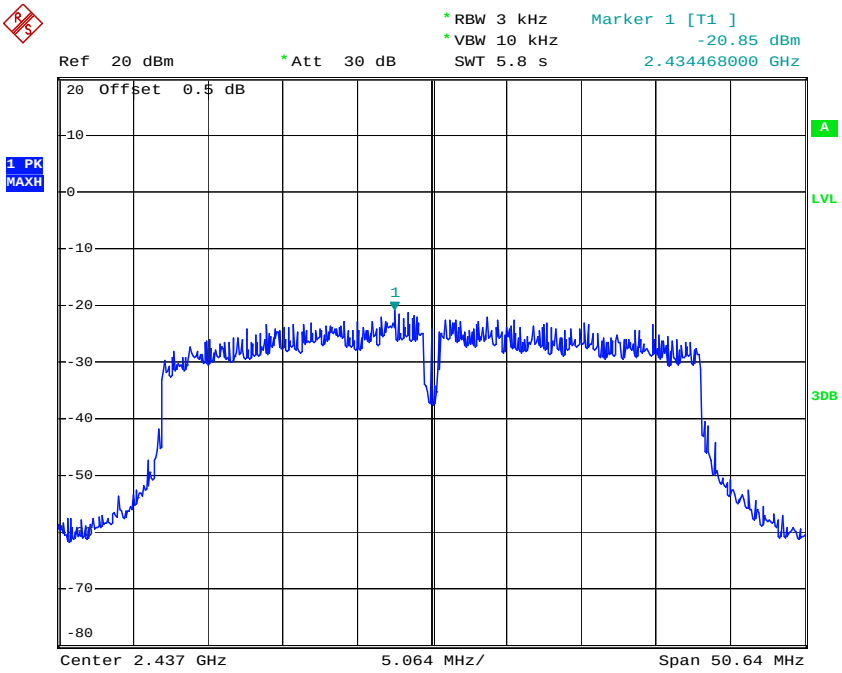
Date: 28.DEC.2017 11:23:56

Power Spectral Density, 802.11n ht40 Low Channel



Date: 28.DEC.2017 11:34:04

Power Spectral Density, 802.11n ht40 Middle Channel



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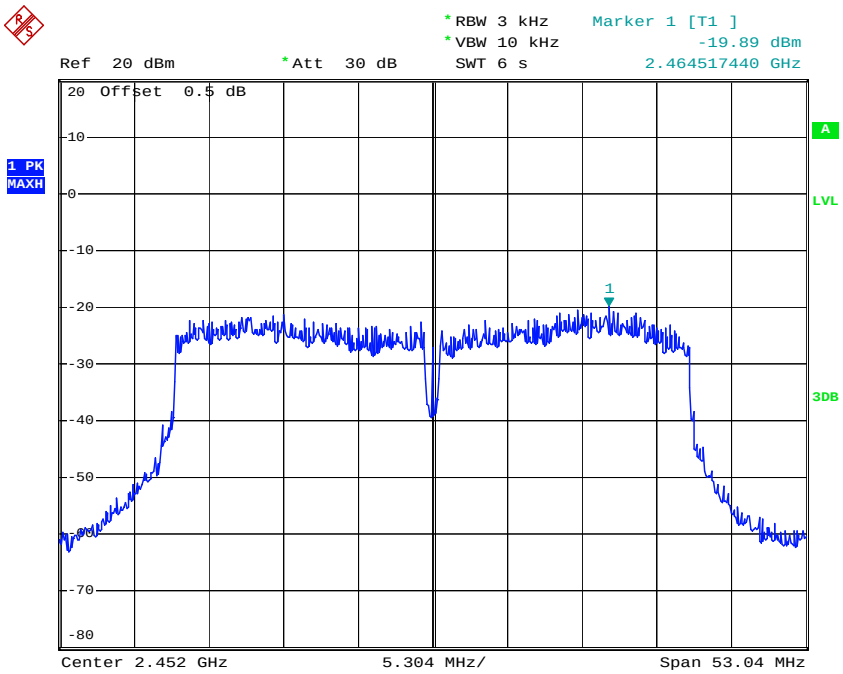
Power Spectral Density, 802.11n ht40 High Channel



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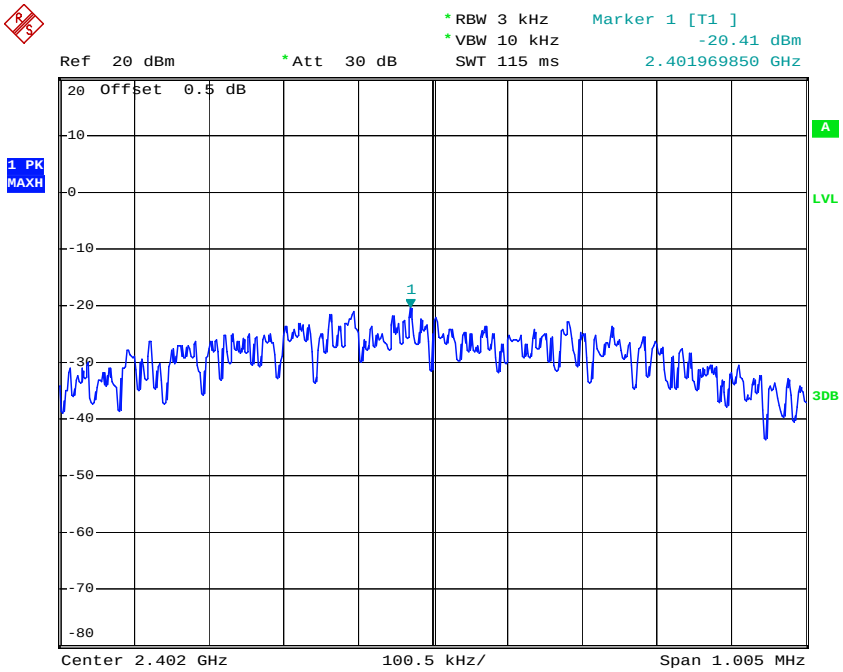
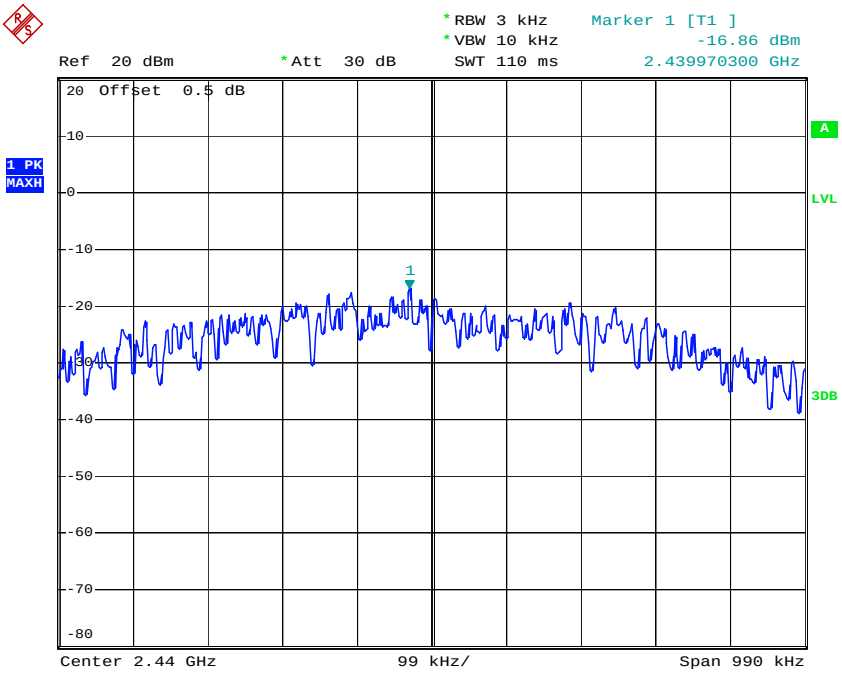
Power Spectral Density, BLE Low Channel



Date: 28.DEC.2017 13:22:56

Power Spectral Density, BLE Middle Channel



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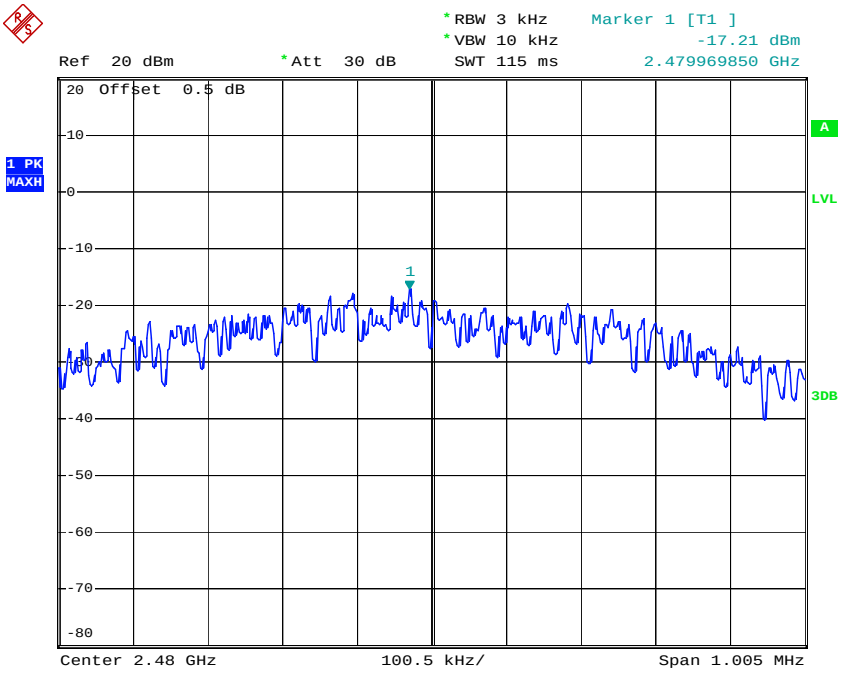
Power Spectral Density, BLE High Channel



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