FCC PART 15.247

TEST REPORT

For

Shenzhen zero-tech UAV Limited

A,NO.1 qianwan road 1,qianhai Shenzhen-HK Cooperative District,Shenzhen,China

FCC ID: 2AGEPUM2210

Report Type:	**Product Type:**
Original Report	XPLORER Mini

Test Engineer:	Emily Wang
Report Number:	RDG160520002-00
Report Date:	2016-07-22
Reviewed By:	Ivan Cao Assistant Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen zero-tech UAV Limited* 's product, model number: *UM2210 (FCC ID: 2AGEPUM2210)* (the "EUT") in this report was a *XPLORER Mini,* which was measured approximately: 30 cm (L) x18 cm (W) x 5.5 cm (H), rated input voltage: DC11.4V from battery.

All measurement and test data in this report was gathered from production sample serial number: 160520002 (Assigned by BACL, Dongguan). The EUT was received on 2016-05-23.

Objective

This report is prepared on behalf of *Shenzhen zero-tech UAV Limited* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communications Commission's rules

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

Related Submittal(s)/Grant(s)

No Related Grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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

Test Facility

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

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.
For 2.4GHz band, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

For 802.11b, 802.11g, and 802.11n ht20 modes were tested with channel 1, 6 and 11.

The device support SISO and MIMO at 802.11b, g and n20 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. MIMO mode was the worst mode recorded in this report.

Equipment Modifications

No modification was made to the EUT tested.

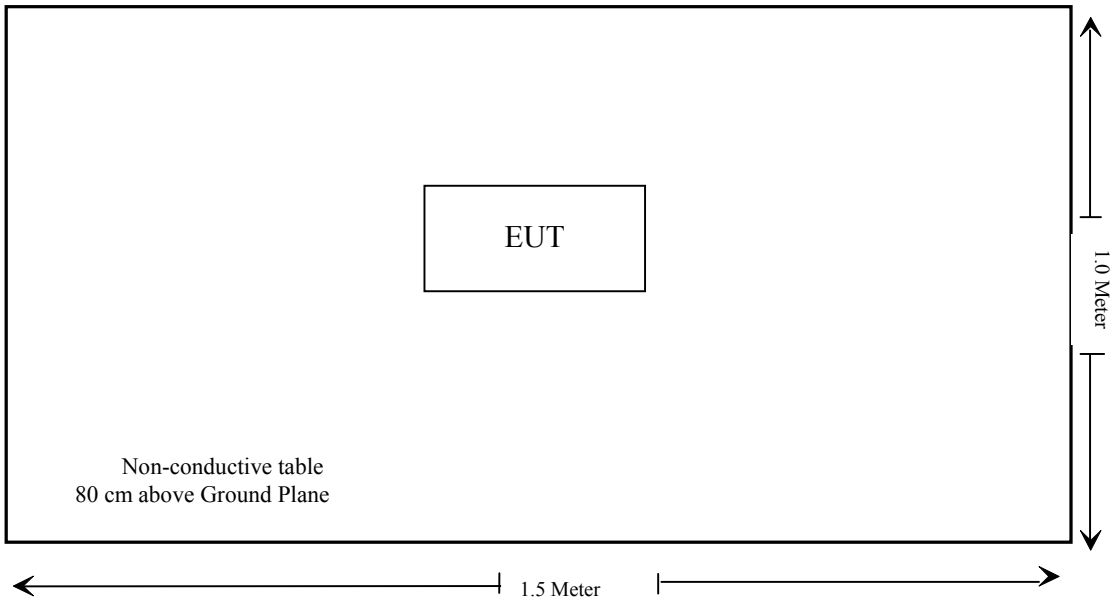
EUT Exercise Software

Atheros Radio Test2(ART2-GUT) was used in test, which was provided by manufacturer, the worst condition (maximum power with 100% duty cycle) was setting by command as following table:

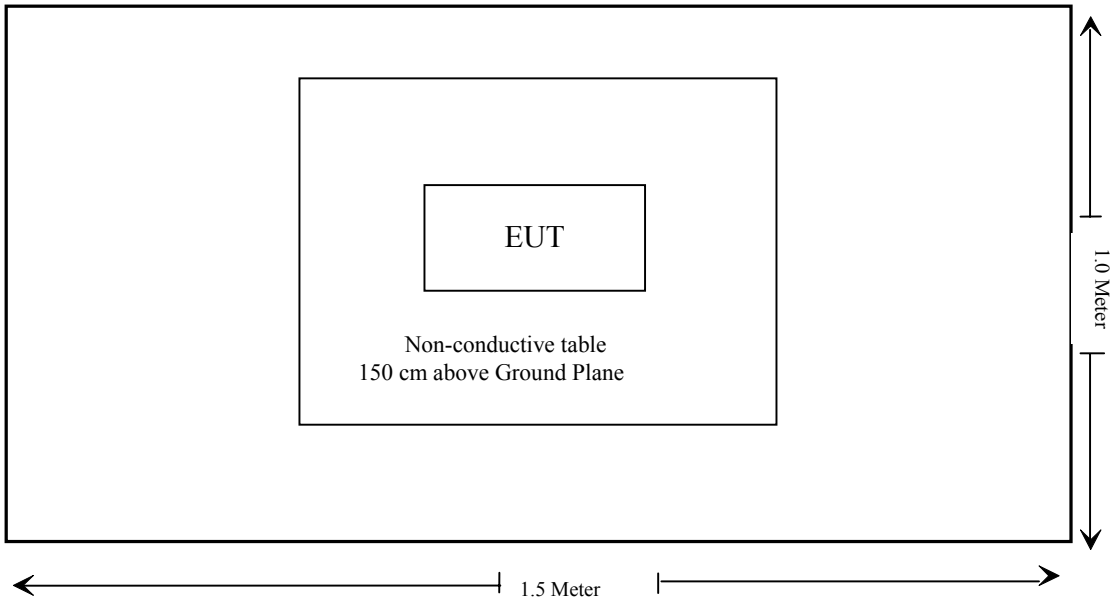
Antenna 0&Antenna 1				
Test Mode	Test Software Version	Atheros Radio Test2(ART2-GUT)		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level Setting	18	18	18
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level Setting	17	17	20
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS8	MCS8	MCS8
	Power Level Setting	19	18	18

Block Diagram of Test Setup

30MHz-1GHz:



1-25GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	MPE	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum conducted output power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Not Applicable: the device is powered by battery.

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

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 ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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

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

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

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

Calculated Formulary:

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

Calculated Data:

Frequency	**Antenna Gain**		**Conducted Power**		**Evaluation Distance**	**Power Density**	**MPE Limit**
(MHz)	**(dBi)**	**(numeric)**	**(dBm)**	**(mW)**	**(cm)**	**(mW/cm^2)**	**(mW/cm^2)**
2412-2462	2.30	1.70	28	630.96	20.00	0.2133	1.00

Note: The maximum couducted out power including tune-up tolerance is 28dBm, which declared by the manufacturer.

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has two internal antenna arrangement, and the antenna gain is 2.3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 2, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

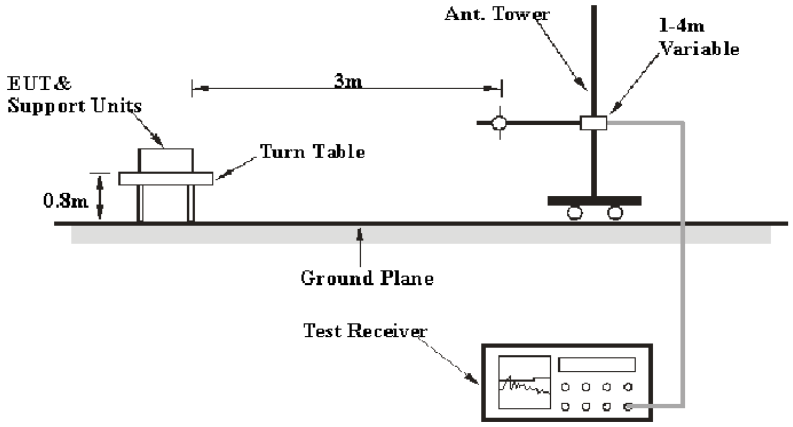
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

Table 2 – Values of U_{cispr}

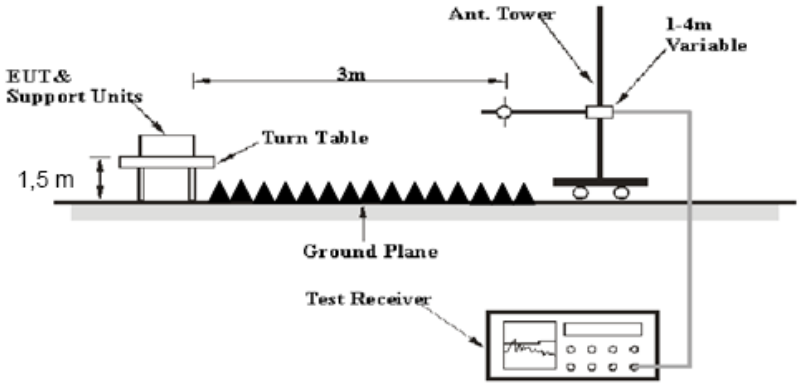
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
R&S	Spectrum Analyzer	FSEM	DE23437	2015-11-23	2016-11-22
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
N/A	Coaxial Cable	14m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	8m	N/A	2016-05-06	2017-05-06
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2015-09-06	2016-09-06

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

1.41 dB at **4924 MHz i**n the **Horizontal** polarization for **802.11g Mode**

Test Data

Environmental Conditions

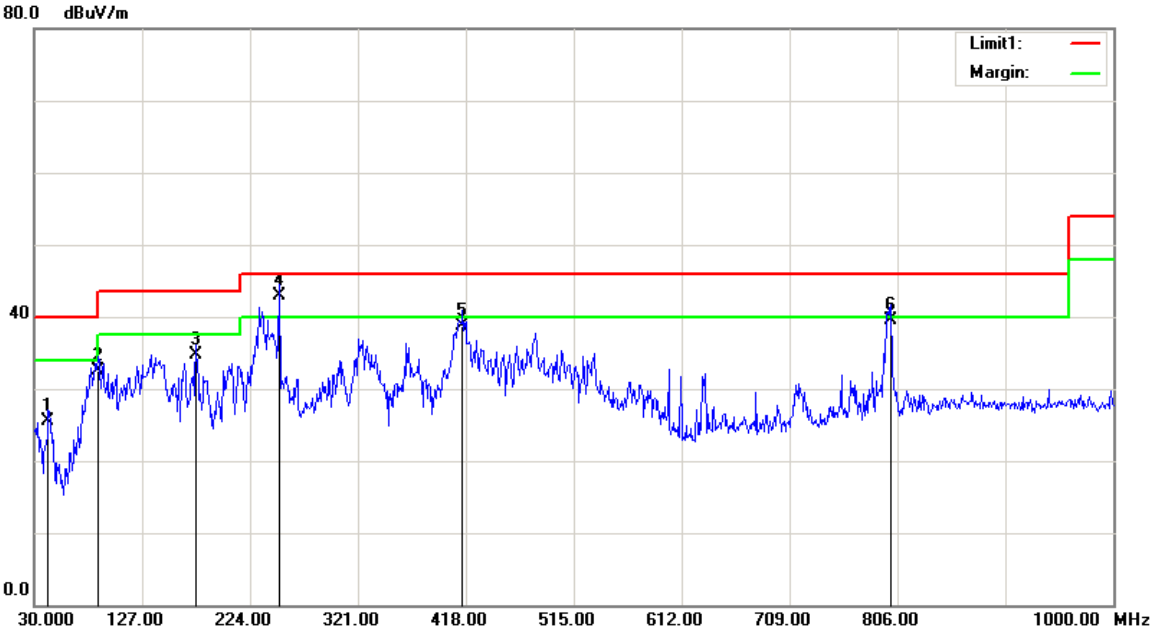
Temperature:	26.5 °C
Relative Humidity:	61%
ATM Pressure:	100.3kPa

The testing was performed by Emily Wang on 2016-06-01.

Test Mode: Transmitting

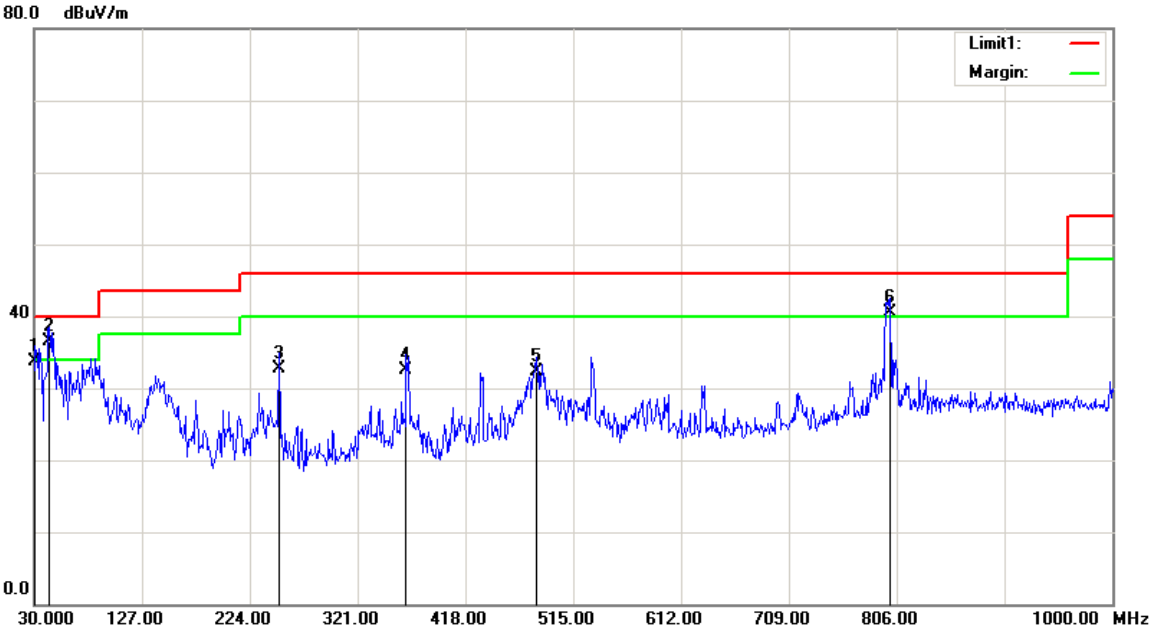
1) Below 1GHz(802.11b mode middle channel is the worst**):**

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.6100	33.84	QP	-8.34	25.50	40.00	14.50
87.2300	44.76	QP	-12.16	32.60	40.00	7.40
175.5000	42.87	QP	-8.17	34.70	43.50	8.80
250.1900	50.57	QP	-7.67	42.90	46.00	3.10
415.0900	42.13	QP	-3.33	38.80	46.00	7.20
800.1800	36.45	QP	3.15	39.60	46.00	6.40

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector (PK/QP/Ave)	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	33.58	QP	0.22	33.80	40.00	6.20
43.5800	45.55	QP	-9.05	36.50	40.00	3.50
250.1900	40.47	QP	-7.67	32.80	46.00	13.20
364.6500	37.11	QP	-4.51	32.60	46.00	13.40
482.0200	34.02	QP	-1.72	32.30	46.00	13.70
800.1800	37.35	QP	3.15	40.50	46.00	5.50

2) Above 1GHz:

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	85.31	PK	H	25.67	3.68	0.00	114.66	N/A	N/A
2412	82.59	AV	H	25.67	3.68	0.00	111.94	N/A	N/A
2412	76.84	PK	V	25.67	3.68	0.00	106.19	N/A	N/A
2412	72.98	AV	V	25.67	3.68	0.00	102.33	N/A	N/A
2390	36.16	PK	H	25.61	3.63	0.00	65.40	74.00	8.60
2390	16.7	AV	H	25.61	3.63	0.00	45.94	54.00	8.06
4824	45.14	PK	H	30.64	5.03	27.41	53.40	74.00	20.60
4824	41.56	AV	H	30.64	5.03	27.41	49.82	54.00	4.18
7236	33.68	PK	H	34.17	6.65	25.90	48.60	74.00	25.40
7236	29.87	AV	H	34.17	6.65	25.90	44.79	54.00	9.21
3210	34.5	PK	H	27.87	6.13	27.36	41.14	74.00	32.86
3210	21.98	AV	H	27.87	6.13	27.36	28.62	54.00	25.38
Middle Channel: 2437 MHz									
2437	83.84	PK	H	25.74	3.75	0.00	113.33	N/A	N/A
2437	80.96	AV	H	25.74	3.75	0.00	110.45	N/A	N/A
2437	75.41	PK	V	25.74	3.75	0.00	104.90	N/A	N/A
2437	71.77	AV	V	25.74	3.75	0.00	101.26	N/A	N/A
4874	44.81	PK	H	30.77	5.14	27.42	53.30	74.00	20.70
4874	42.31	AV	H	30.77	5.14	27.42	50.80	54.00	3.20
7311	33.33	PK	H	34.35	6.74	25.88	48.54	74.00	25.46
7311	29.85	AV	H	34.35	6.74	25.88	45.06	54.00	8.94
3156	32.55	PK	H	27.70	6.87	27.41	39.71	74.00	34.29
3156	20.13	AV	H	27.70	6.87	27.41	27.29	54.00	26.71
3250	33.97	PK	H	28.00	6.31	27.33	40.95	74.00	33.05
3250	21.51	AV	H	28.00	6.31	27.33	28.49	54.00	25.51
High Channel: 2462 MHz									
2462	82.16	PK	H	25.80	3.75	0.00	111.71	N/A	N/A
2462	79.11	AV	H	25.80	3.75	0.00	108.66	N/A	N/A
2462	73.62	PK	V	25.80	3.75	0.00	103.17	N/A	N/A
2462	70.5	AV	V	25.80	3.75	0.00	100.05	N/A	N/A
2483.5	34.35	PK	H	25.86	3.67	0.00	63.88	74.00	10.12
2483.5	22.81	AV	H	25.86	3.67	0.00	52.34	54.00	1.66
4924	44.42	PK	H	30.90	5.34	27.43	53.23	74.00	20.77
4924	41.98	AV	H	30.90	5.34	27.43	50.79	54.00	3.21
7386	32.94	PK	H	34.53	6.83	25.86	48.44	74.00	25.56
7386	29.46	AV	H	34.53	6.83	25.86	44.96	54.00	9.04
3230	33.29	PK	H	27.94	6.22	27.34	40.11	74.00	33.89
3230	20.86	AV	H	27.94	6.22	27.34	27.68	54.00	26.32

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	79.04	PK	H	25.67	3.68	0.00	108.39	N/A	N/A
2412	67.81	AV	H	25.67	3.68	0.00	97.16	N/A	N/A
2412	73.84	PK	V	25.67	3.68	0.00	103.19	N/A	N/A
2412	63.51	AV	V	25.67	3.68	0.00	92.86	N/A	N/A
2390	32.3	PK	H	25.61	3.63	0.00	61.54	74.00	12.46
2390	17.5	AV	H	25.61	3.63	0.00	46.74	54.00	7.26
4824	57.83	PK	H	30.64	5.03	27.41	66.09	74.00	7.91
4824	43.72	AV	H	30.64	5.03	27.41	51.98	54.00	2.02
7236	32.36	PK	H	34.17	6.65	25.90	47.28	74.00	26.72
7236	20.21	AV	H	34.17	6.65	25.90	35.13	54.00	18.87
3198	33.29	PK	H	27.83	6.12	27.37	39.87	74.00	34.13
3198	21.01	AV	H	27.83	6.12	27.37	27.59	54.00	26.41
Middle Channel: 2437 MHz									
2437	80.2	PK	H	25.74	3.75	0.00	109.69	N/A	N/A
2437	69.075	AV	H	25.74	3.75	0.00	98.57	N/A	N/A
2437	75.285	PK	V	25.74	3.75	0.00	104.78	N/A	N/A
2437	64.67	AV	V	25.74	3.75	0.00	94.16	N/A	N/A
4874	58.87	PK	H	30.77	5.14	27.42	67.36	74.00	6.64
4874	43.5	AV	H	30.77	5.14	27.42	51.99	54.00	2.01
7311	33.28	PK	H	34.35	6.74	25.88	48.49	74.00	25.51
7311	21.01	AV	H	34.35	6.74	25.88	36.22	54.00	17.78
3198	34.2	PK	H	27.83	6.12	27.37	40.78	74.00	33.22
3198	22.17	AV	H	27.83	6.12	27.37	28.75	54.00	25.25
3680	32.41	PK	H	29.20	4.60	27.31	38.90	74.00	35.10
3680	20.16	AV	H	29.20	4.60	27.31	26.65	54.00	27.35
High Channel: 2462 MHz									
2462	81.02	PK	H	25.80	3.75	0.00	110.57	N/A	N/A
2462	69.94	AV	H	25.80	3.75	0.00	99.49	N/A	N/A
2462	76.53	PK	V	25.80	3.75	0.00	106.08	N/A	N/A
2462	65.53	AV	V	25.80	3.75	0.00	95.08	N/A	N/A
2483.5	37.85	PK	H	25.86	3.67	0.00	67.38	74.00	6.62
2483.5	19.53	AV	H	25.86	3.67	0.00	49.06	54.00	4.94
4924	58.7	PK	H	30.90	5.34	27.43	67.51	74.00	6.49
4924	43.78	AV	H	30.90	5.34	27.43	52.59	54.00	1.41
7386	34.23	PK	H	34.53	6.83	25.86	49.73	74.00	24.27
7386	22.1	AV	H	34.53	6.83	25.86	37.60	54.00	16.40
3198	33.89	PK	H	27.83	6.12	27.37	40.47	74.00	33.53
3198	21.58	AV	H	27.83	6.12	27.37	28.16	54.00	25.84

802.11 n ht20 Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	80.38	PK	H	25.67	3.68	0.00	109.73	N/A	N/A
2412	69.31	AV	H	25.67	3.68	0.00	98.66	N/A	N/A
2412	75.21	PK	V	25.67	3.68	0.00	104.56	N/A	N/A
2412	65.17	AV	V	25.67	3.68	0.00	94.52	N/A	N/A
2390	42.97	PK	H	25.61	3.63	0.00	72.21	74.00	1.79
2390	20.25	AV	H	25.61	3.63	0.00	49.49	54.00	4.51
4824	58.08	PK	H	30.64	5.03	27.41	66.34	74.00	7.66
4824	43.57	AV	H	30.64	5.03	27.41	51.83	54.00	2.17
7236	35.44	PK	H	34.17	6.65	25.90	50.36	74.00	23.64
7236	23.1	AV	H	34.17	6.65	25.90	38.02	54.00	15.98
3198	32.5	PK	H	27.83	6.12	27.37	39.08	74.00	34.92
3198	20.11	AV	H	27.83	6.12	27.37	26.69	54.00	27.31
Middle Channel: 2437 MHz									
2437	79.34	PK	H	25.74	3.75	0.00	108.83	N/A	N/A
2437	68.625	AV	H	25.74	3.75	0.00	98.12	N/A	N/A
2437	74.295	PK	V	25.74	3.75	0.00	103.79	N/A	N/A
2437	64.31	AV	V	25.74	3.75	0.00	93.80	N/A	N/A
4874	59	PK	H	30.77	5.14	27.42	67.49	74.00	6.51
4874	43.73	AV	H	30.77	5.14	27.42	52.22	54.00	1.78
7311	33.85	PK	H	34.35	6.74	25.88	49.06	74.00	24.94
7311	21.54	AV	H	34.35	6.74	25.88	36.75	54.00	17.25
3198	33.16	PK	H	27.83	6.12	27.37	39.74	74.00	34.26
3198	20.76	AV	H	27.83	6.12	27.37	27.34	54.00	26.66
3680	32.82	PK	H	29.20	4.60	27.31	39.31	74.00	34.69
3680	30.38	AV	H	29.20	4.60	27.31	36.87	54.00	17.13
High Channel: 2462 MHz									
2462	78.04	PK	H	25.80	3.75	0.00	107.59	N/A	N/A
2462	67.84	AV	H	25.80	3.75	0.00	97.39	N/A	N/A
2462	73.18	PK	V	25.80	3.75	0.00	102.73	N/A	N/A
2462	63.05	AV	V	25.80	3.75	0.00	92.60	N/A	N/A
2483.5	40.91	PK	H	25.86	3.67	0.00	70.44	74.00	3.56
2483.5	18.39	AV	H	25.86	3.67	0.00	47.92	54.00	6.08
4924	57.66	PK	H	30.90	5.34	27.43	66.47	74.00	7.53
4924	41.88	AV	H	30.90	5.34	27.43	50.69	54.00	3.31
7386	34.24	PK	H	34.53	6.83	25.86	49.74	74.00	24.26
7386	21.89	AV	H	34.53	6.83	25.86	37.39	54.00	16.61
3198	34.63	PK	H	27.83	6.12	27.37	41.21	74.00	32.79
3198	22.1	AV	H	27.83	6.12	27.37	28.68	54.00	25.32

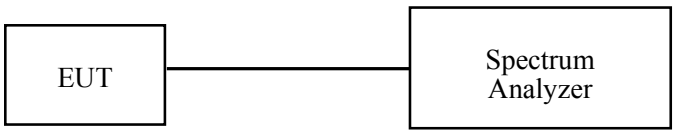
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	28.7°C
Relative Humidity:	61%
ATM Pressure:	100.2 kPa

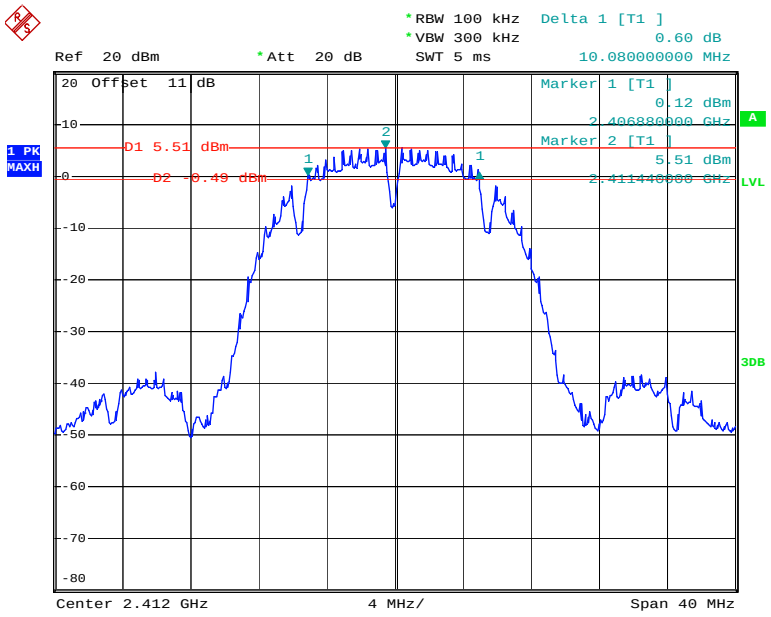
** The testing was performed by Emily Wang on 2016-05-25.*

Test Mode: Transmitting

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

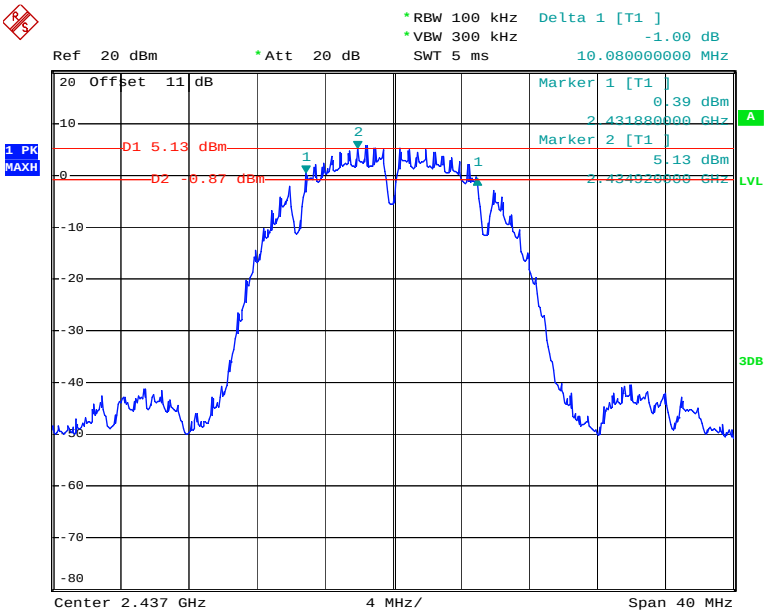
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Limit (MHz)
			Chain 0	Chain 1	
802.11b	Low	2412	10.08	10.08	≥0.5
	Middle	2437	10.08	9.76	≥0.5
	High	2462	10.16	10.08	≥0.5
802.11g	Low	2412	16.48	16.48	≥0.5
	Middle	2437	16.48	16.48	≥0.5
	High	2462	16.48	16.48	≥0.5
802.11n20	Low	2412	17.68	17.60	≥0.5
	Middle	2437	17.60	17.60	≥0.5
	High	2462	17.60	17.60	≥0.5

802.11b Low Channel-Chain 0



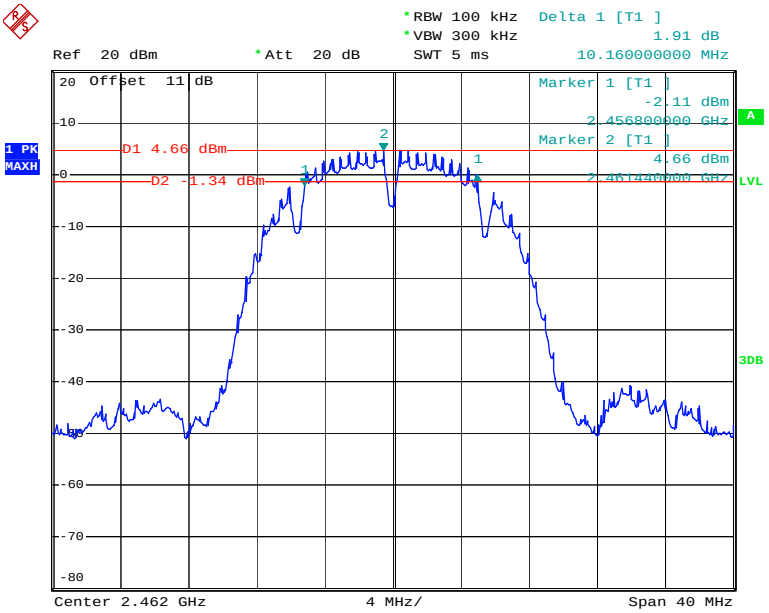
Date: 25.MAY.2016 23:02:28

802.11b Middle Channel-Chain 0



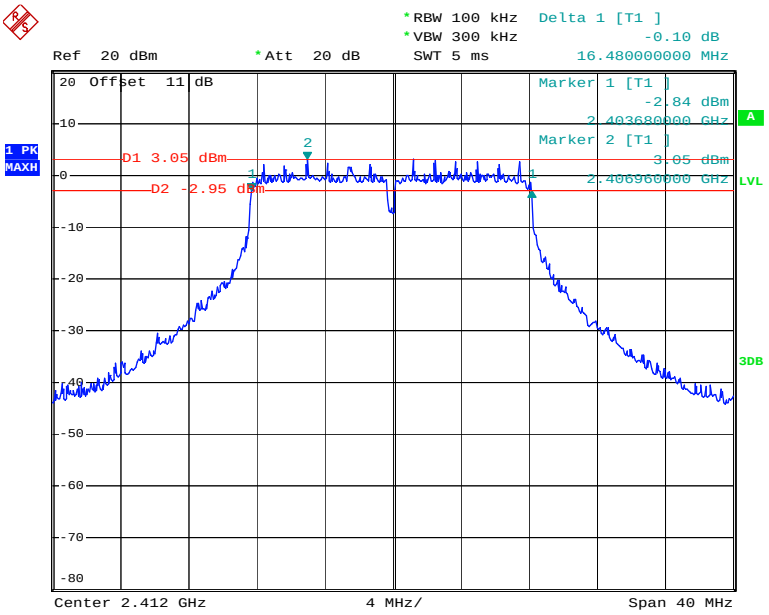
Date: 25.MAY.2016 23:05:24

802.11b High Channel-Chain 0



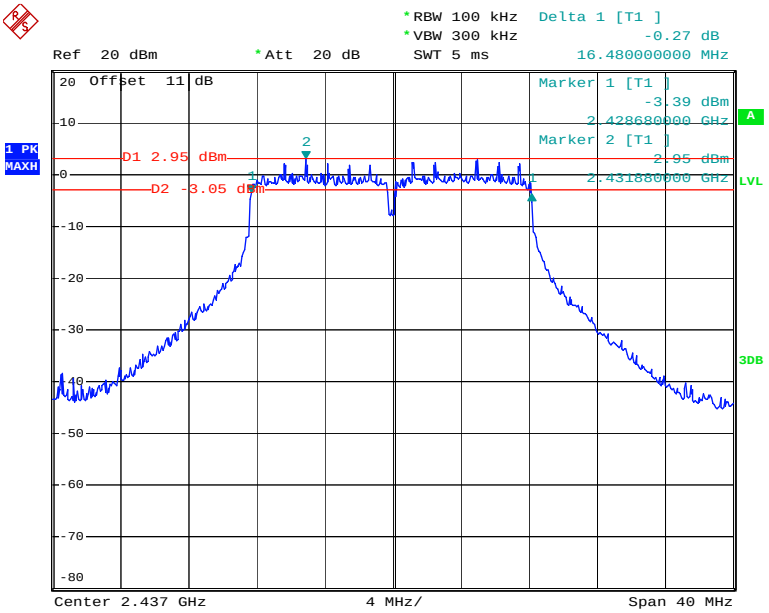
Date: 25.MAY.2016 23:08:30

802.11g Low Channel-Chain 0



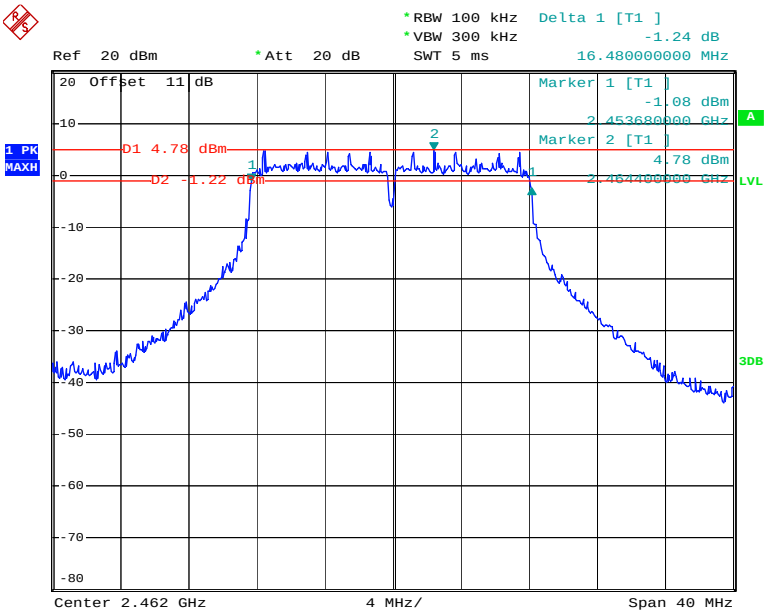
Date: 25.MAY.2016 22:28:22

802.11g Middle Channel-Chain 0



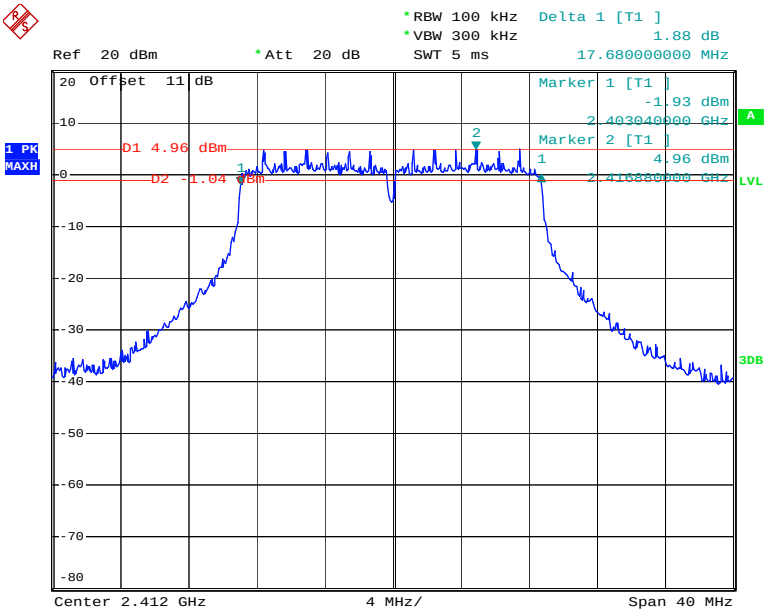
Date: 25.MAY.2016 22:31:33

802.11g High Channel-Chain 0



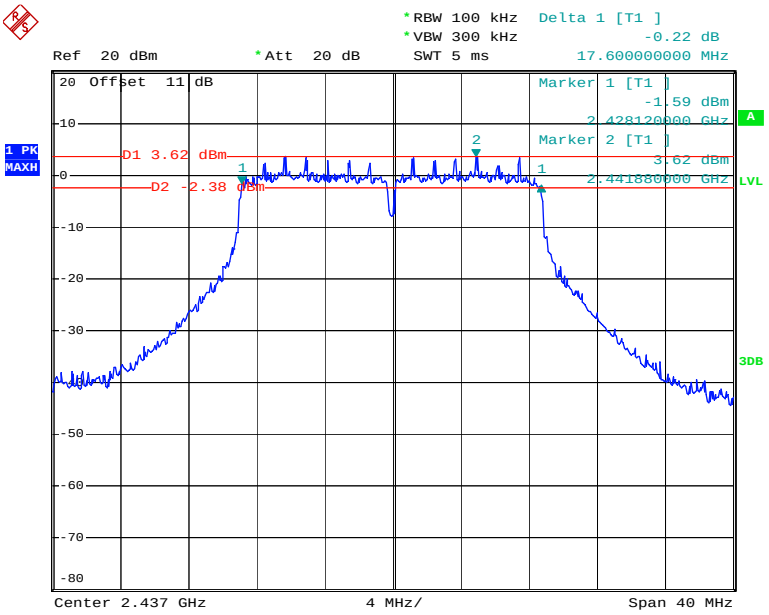
Date: 25.MAY.2016 22:34:50

802.11n ht20 Low Channel-Chain 0



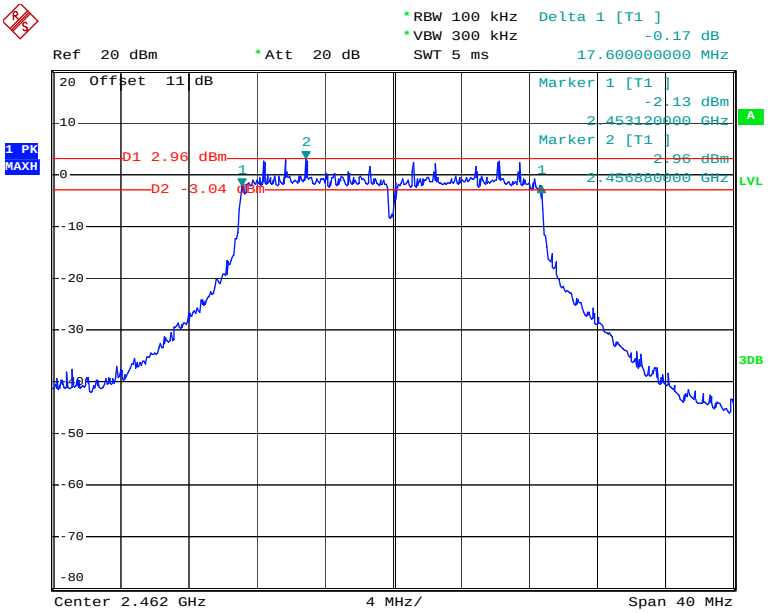
Date: 25.MAY.2016 22:57:25

802.11n ht20 Middle Channel-Chain 0



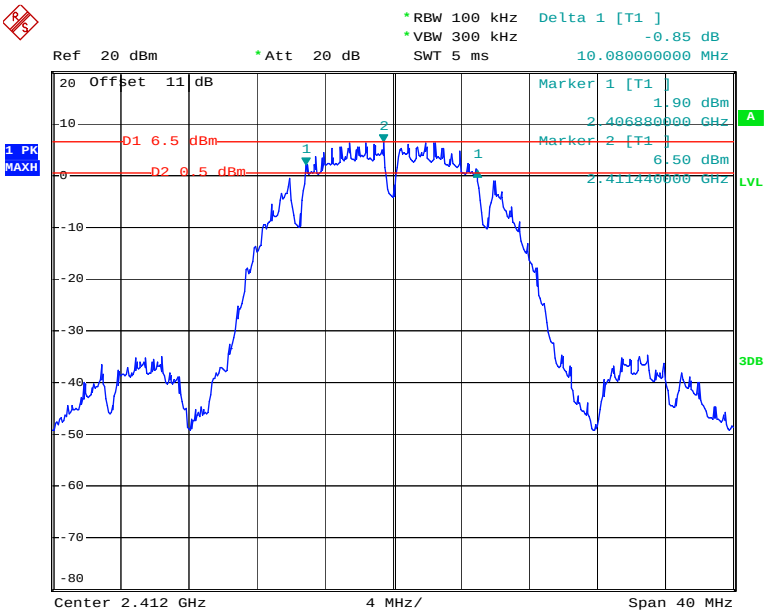
Date: 25.MAY.2016 22:54:21

802.11n ht20 High Channel-Chain 0



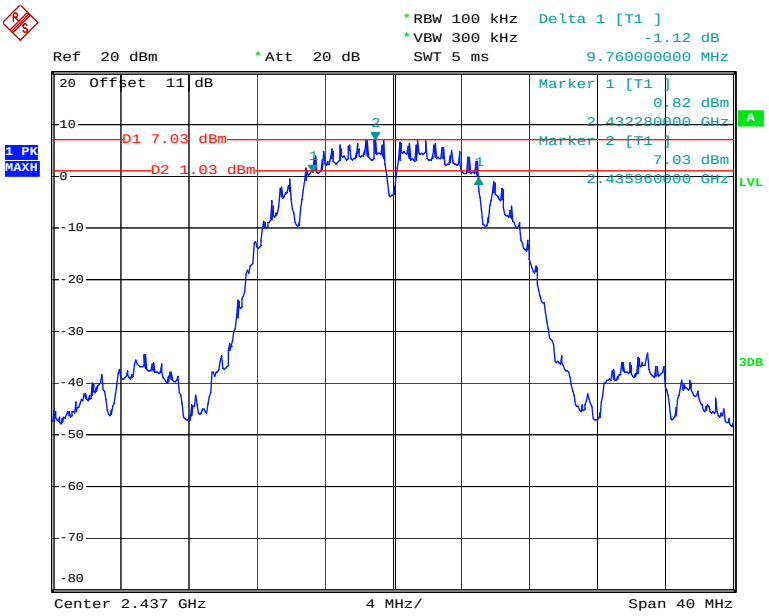
Date: 25.MAY.2016 22:38:38

802.11b Low Channel-Chain 1



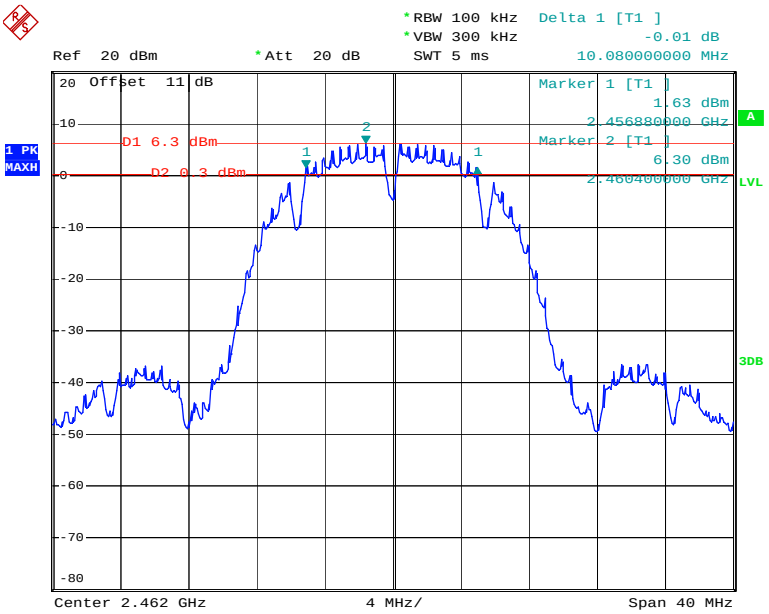
Date: 25.MAY.2016 23:20:26

802.11b Middle Channel-Chain 1



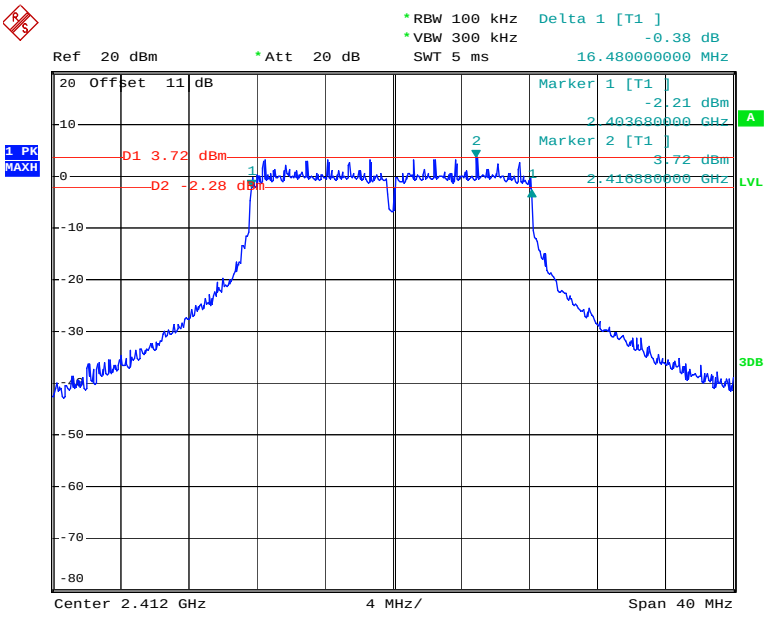
Date: 25.MAY.2016 23:23:21

802.11b High Channel-Chain 1



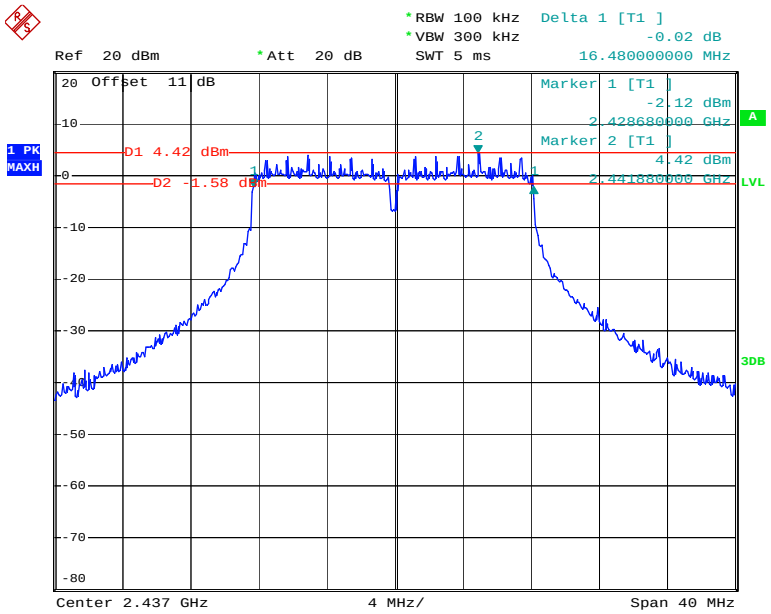
Date: 25.MAY.2016 23:26:00

802.11g Low Channel-Chain 1



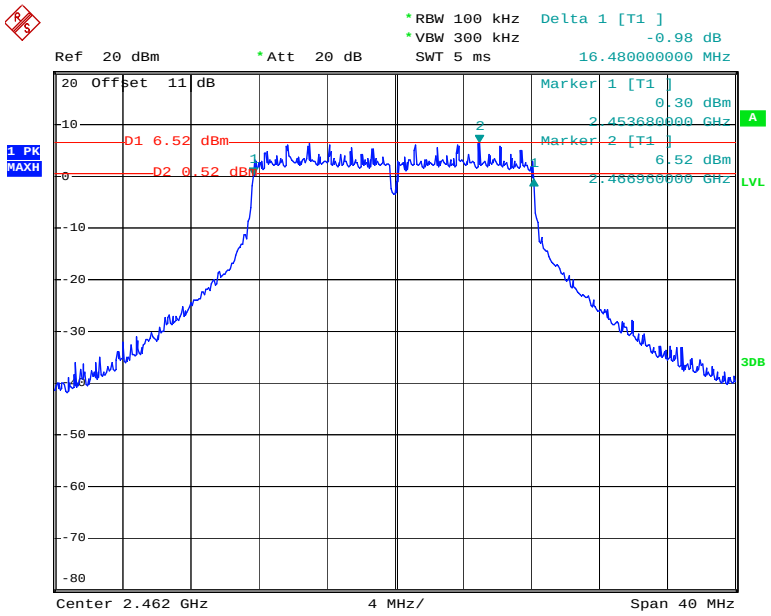
Date: 25.MAY.2016 23:34:56

802.11g Middle Channel-Chain 1



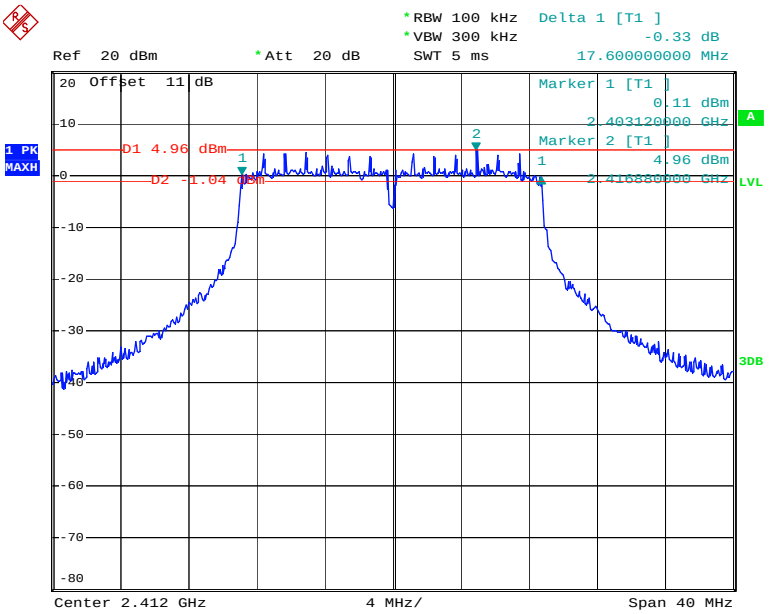
Date: 25.MAY.2016 23:38:04

802.11g High Channel-Chain 1



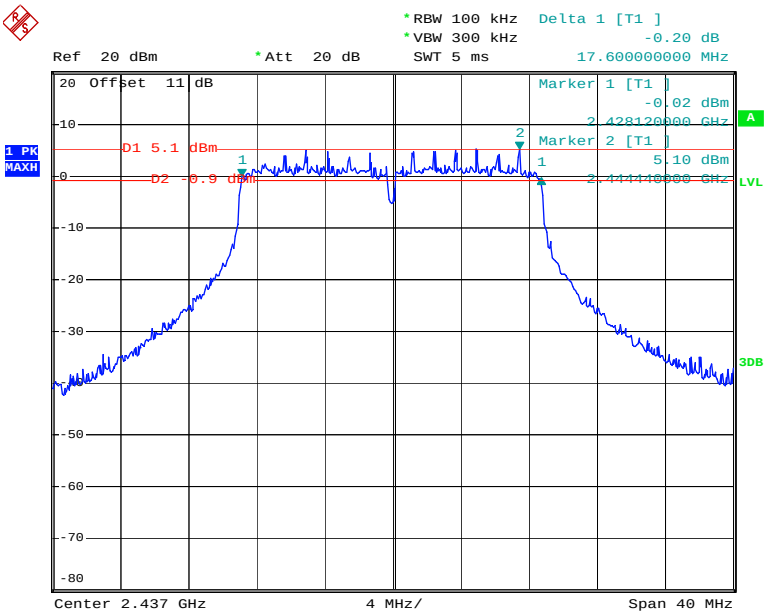
Date: 25.MAY.2016 23:40:54

802.11n ht20 Low Channel-Chain 1



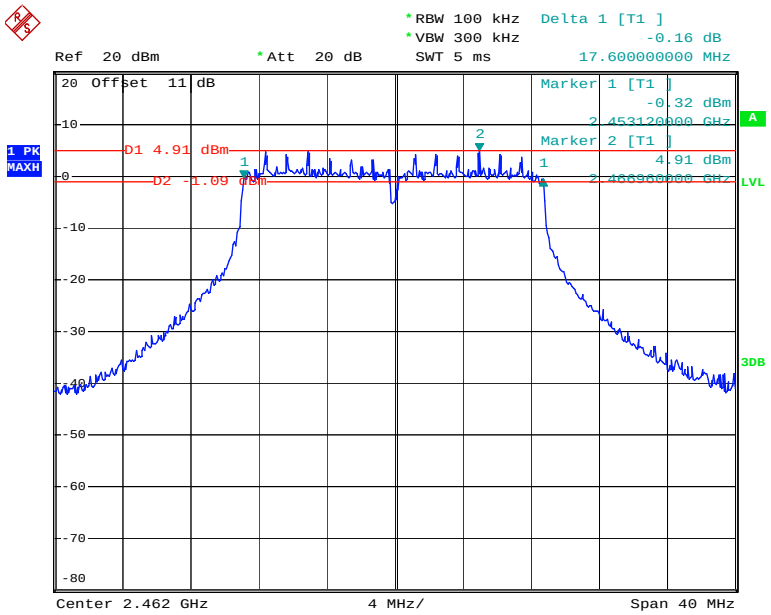
Date: 25.MAY.2016 23:50:15

802.11n ht20 Middle Channel-Chain 1



Date: 25.MAY.2016 23:47:01

802.11n ht20 High Channel-Chain 1



Date: 25.MAY.2016 23:44:04

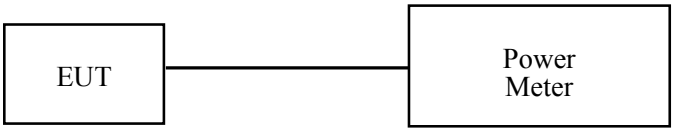
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2015-11-03	2016-11-03
Agilent	Wideband Power Sensor	N1921A	MY54170013	2015-11-03	2016-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2015-11-03	2016-11-03
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	28.7°C
Relative Humidity:	61%
ATM Pressure:	100.2 kPa

** The testing was performed by Emily Wang on 2016-05-25.*

Test Mode: Transmitting

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

Test mode	Channel	Frequency	Max Peak Conducted Output Power (dBm)			Limit
		(MHz)	Chain0	Chain1	Total	(dBm)
802.11b	Low	2412	19.20	20.01	22.63	30
	Middle	2437	18.68	20.09	22.45	30
	High	2462	18.29	19.66	22.04	30
802.11g	Low	2412	21.51	22.36	24.97	30
	Middle	2437	21.02	22.79	25.00	30
	High	2462	23.54	25.05	27.37	30
802.11n20	Low	2412	23.33	23.16	26.26	30
	Middle	2437	22.04	23.47	25.82	30
	High	2462	21.72	23.00	25.42	30

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

Applicable Standard

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

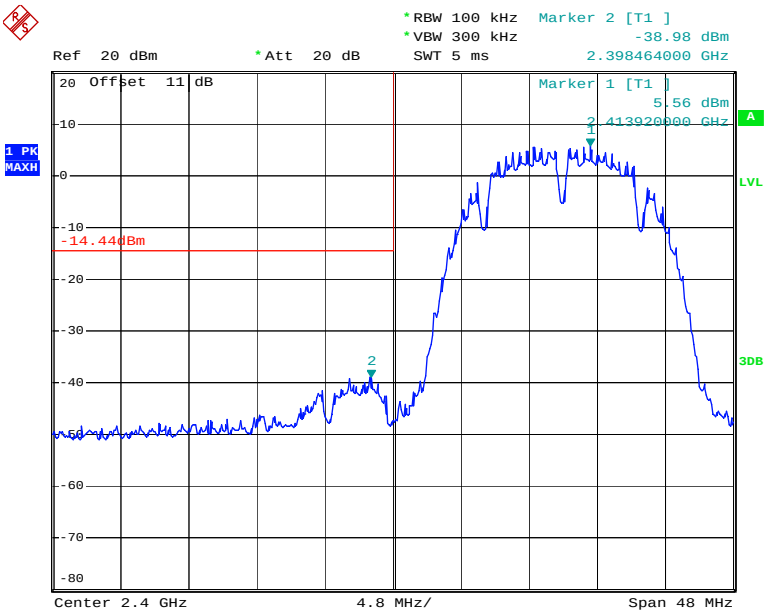
Environmental Conditions

Temperature:	28.7°C
Relative Humidity:	61%
ATM Pressure:	100.2 kPa

** The testing was performed by Emily Wang on 2016-05-25.*
Test mode: Transmitting

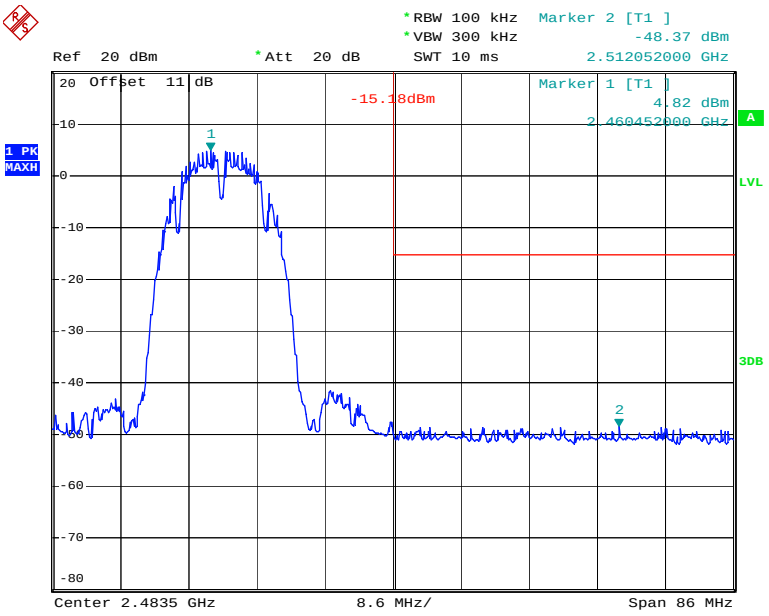
Test Result: Compliant. Please refer to following plots.

802.11b: Band Edge, Left Side, Chain 0



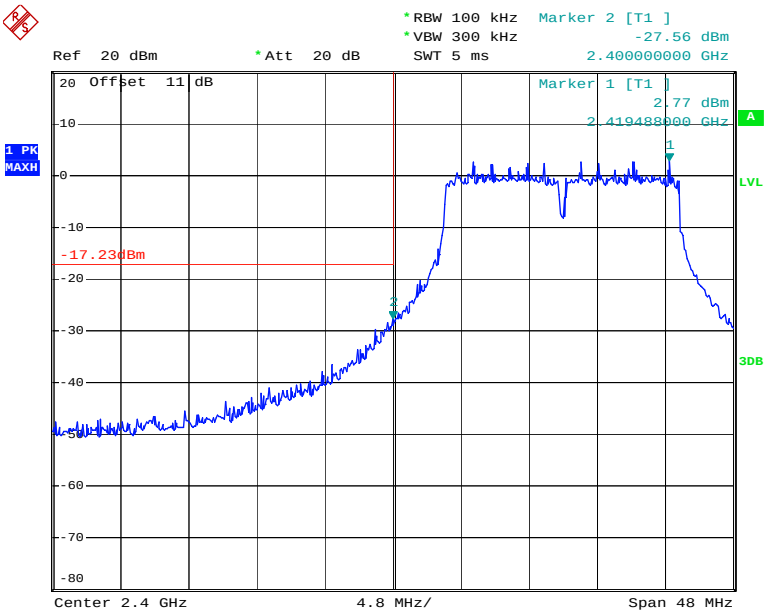
Date: 25.MAY.2016 23:04:24

802.11b: Band Edge, Right Side, Chain 0



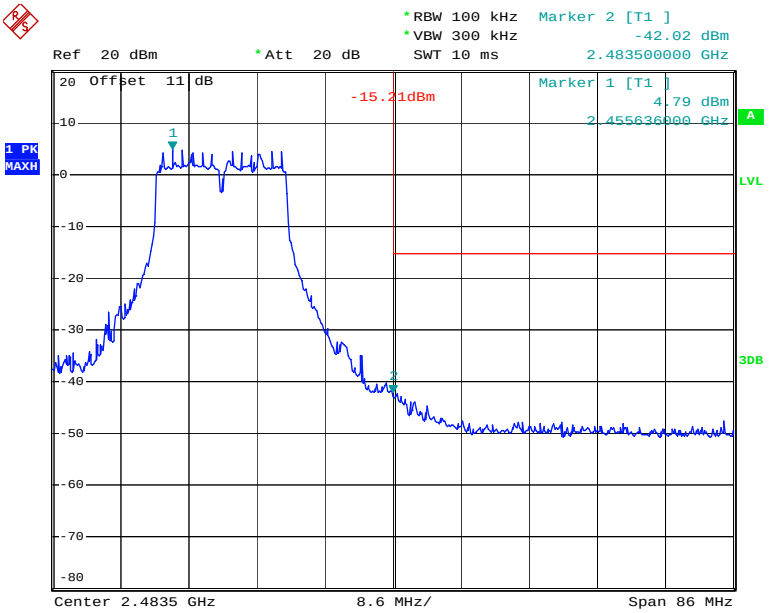
Date: 25.MAY.2016 23:10:27

802.11g: Band Edge, Left Side, Chain 0



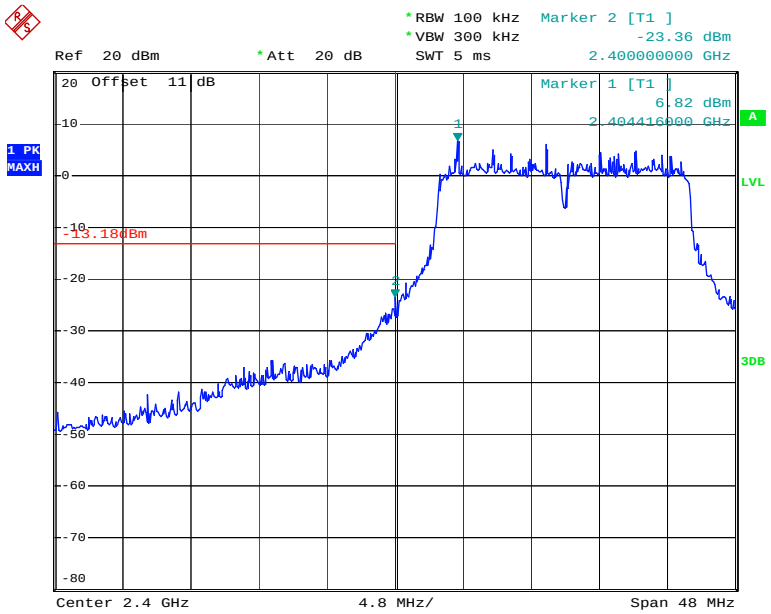
Date: 25.MAY.2016 22:30:35

802.11g: Band Edge, Right Side, Chain 0



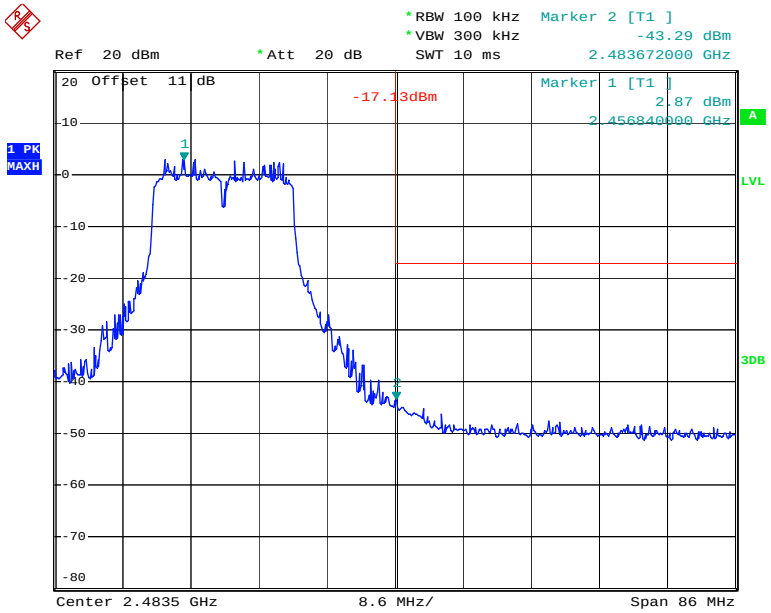
Date: 25.MAY.2016 22:37:00

802.11n ht20 Band Edge, Left Side, Chain 0



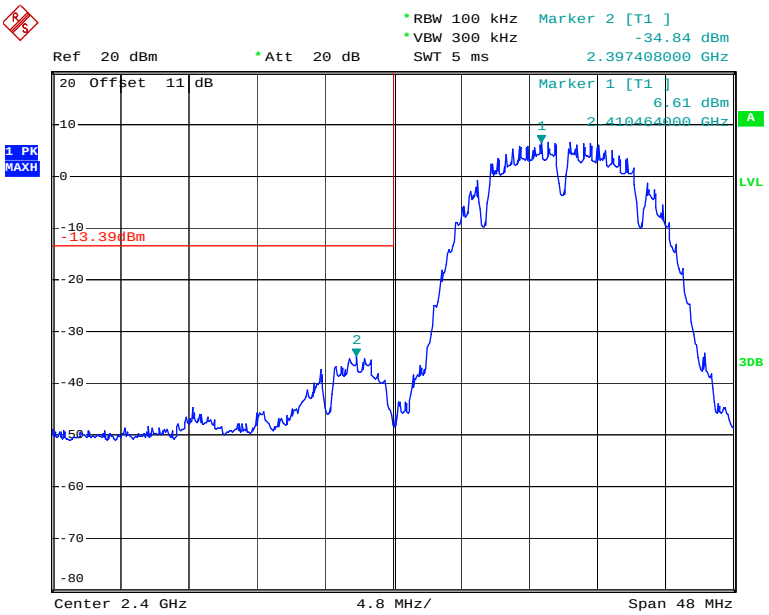
Date: 25.MAY.2016 22:59:34

802.11n ht20 Band Edge, Right Side, Chain 0



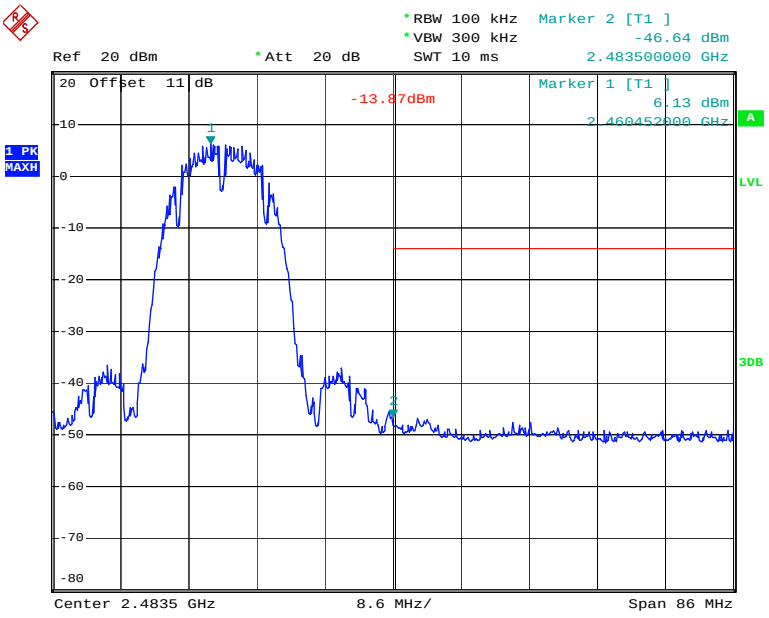
Date: 25.MAY.2016 22:40:40

802.11b: Band Edge, Left Side, Chain 1



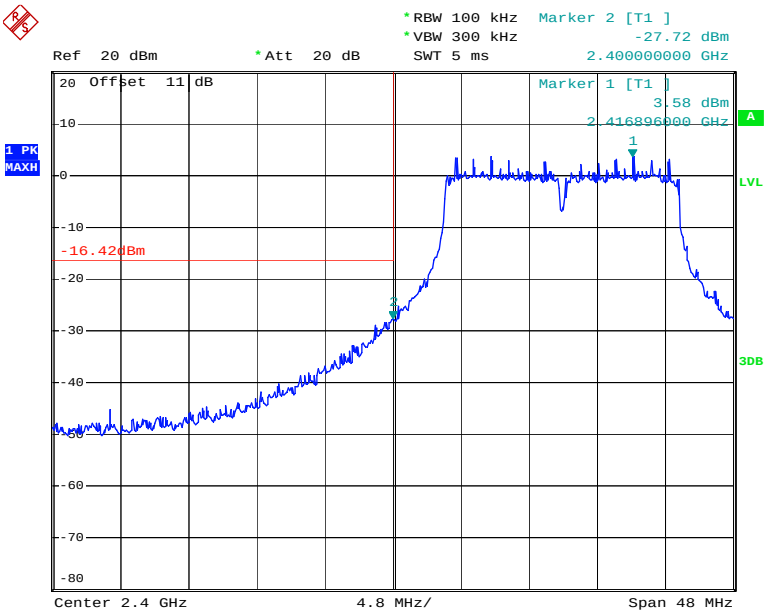
Date: 25.MAY.2016 23:22:32

802.11b: Band Edge, Right Side, Chain 1



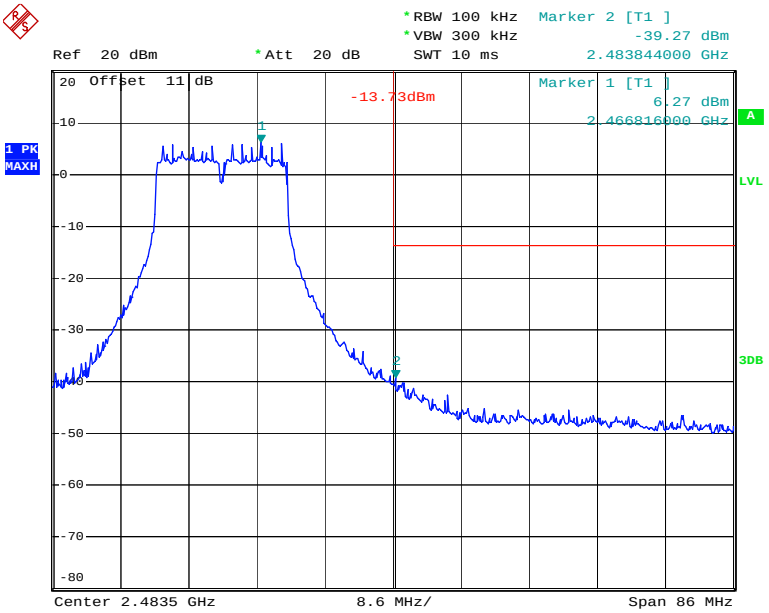
Date: 25.MAY.2016 23:28:01

802.11g: Band Edge, Left Side, Chain 1



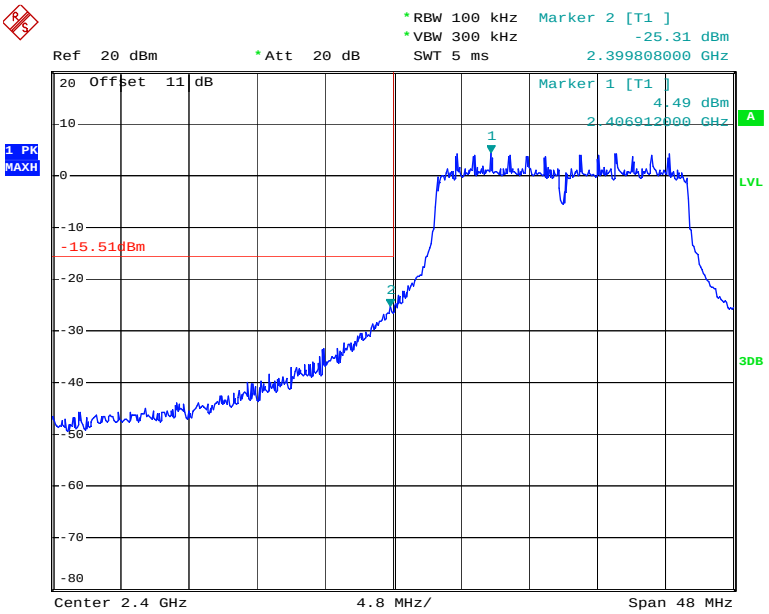
Date: 25.MAY.2016 23:37:10

802.11g: Band Edge, Right Side, Chain 1



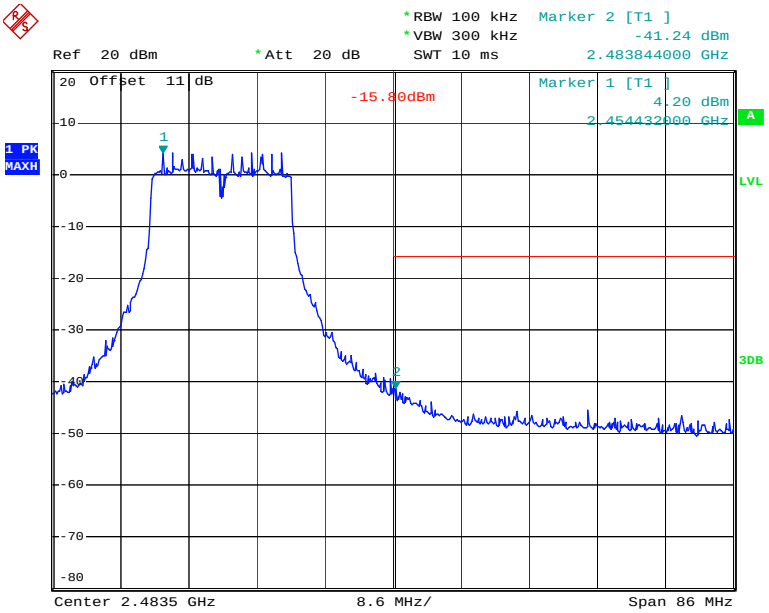
Date: 25.MAY.2016 23:43:01

802.11n ht20 Band Edge, Left Side, Chain 1



Date: 25.MAY.2016 23:52:29

802.11n ht20 Band Edge, Right Side, Chain 1



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FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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

Test Procedure

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3×RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	28.7°C
Relative Humidity:	61 %
ATM Pressure:	100.2 kPa

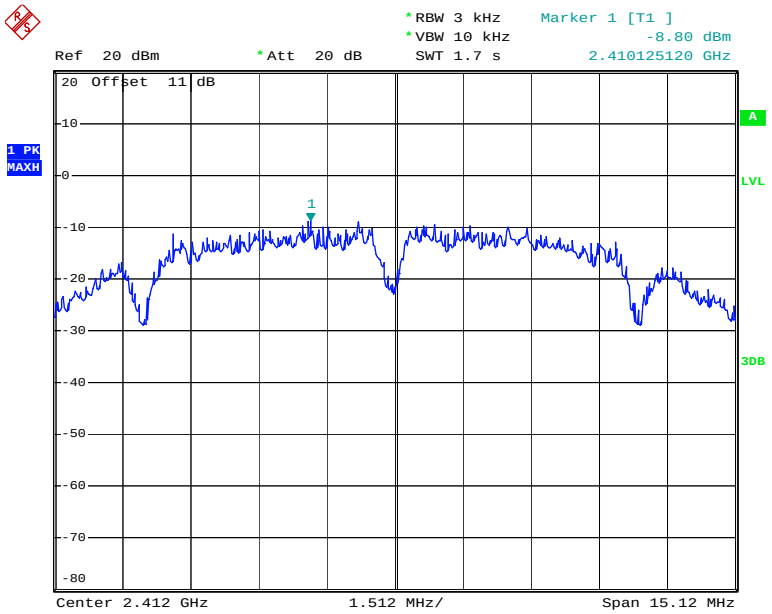
** The testing was performed by Emily Wang on 2016-05-25.*

Test Mode: Transmitting

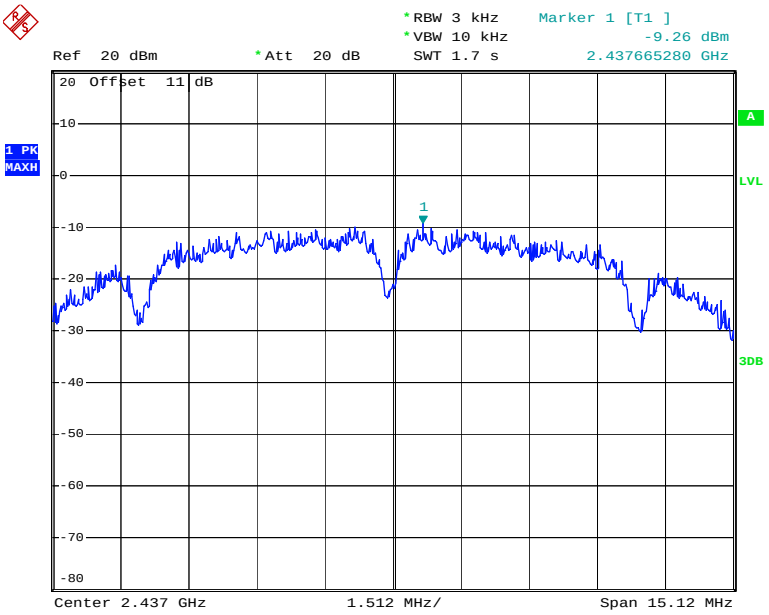
Test Result: Compliant. Please refer to the following table and plots

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)			Limit (dBm/3kHz)
			Chain 0	Chain 0	Total	
802.11b	Low	2412	-8.80	-8.27	-5.52	≤8
	Middle	2437	-9.26	-7.10	-5.04	≤8
	High	2462	-9.47	-8.58	-5.99	≤8
802.11g	Low	2412	-10.95	-9.61	-7.22	≤8
	Middle	2437	-10.67	-9.62	-7.1	≤8
	High	2462	-9.83	-8.25	-5.96	≤8
802.11n20	Low	2412	-8.85	-9.41	-6.11	≤8
	Middle	2437	-9.44	-9.26	-6.34	≤8
	High	2462	-10.87	-10.42	-7.63	≤8

Power Spectral Density, 802.11b Low Channel-Chain 0



Power Spectral Density, 802.11b Middle Channel-Chain 0



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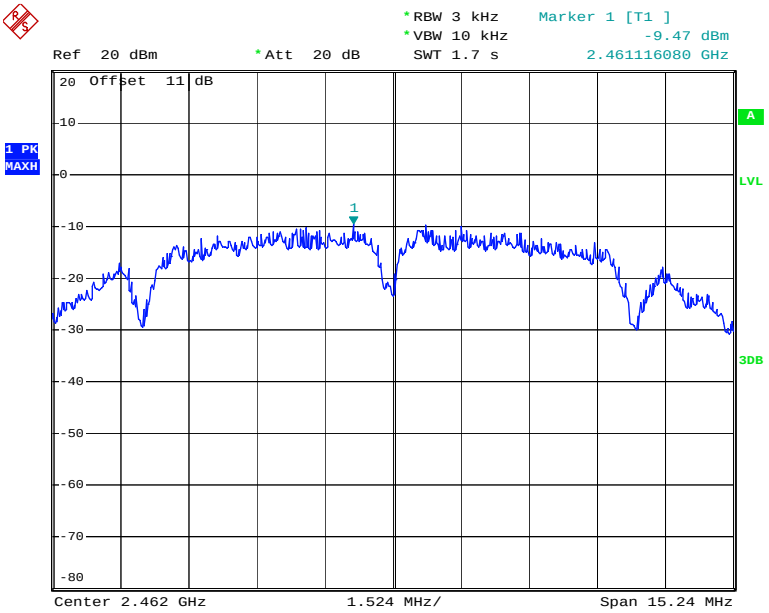
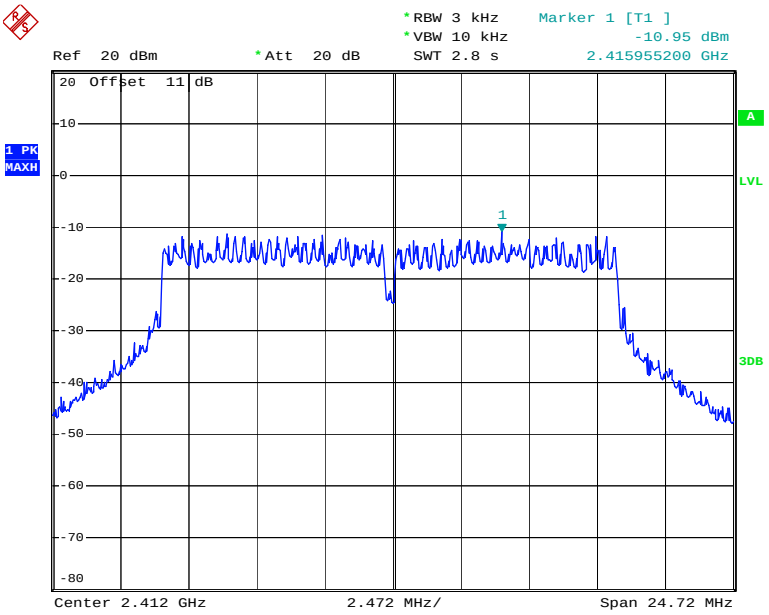
Power Spectral Density, 802.11b High Channel-Chain 0



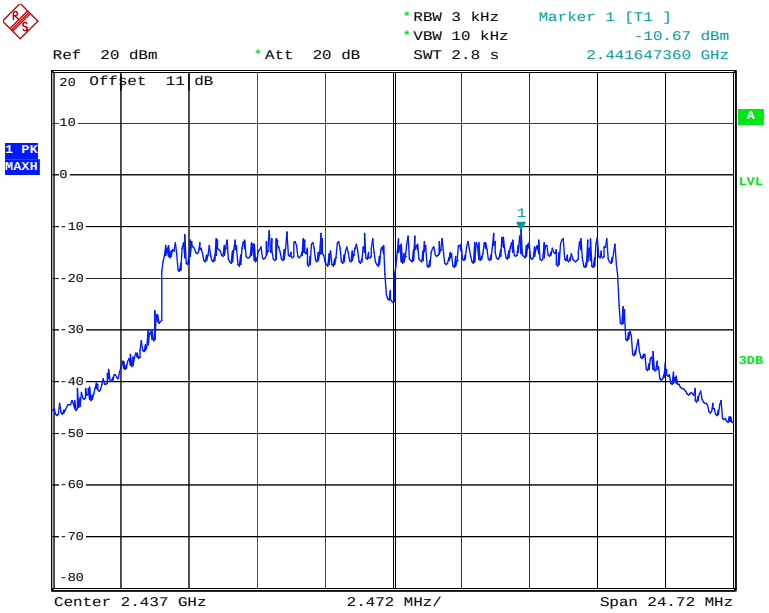
Date: 25.MAY.2016 23:09:47

Power Spectral Density, 802.11g Low Channel-Chain 0



Date: 25.MAY.2016 22:29:56

Power Spectral Density, 802.11g Middle Channel-Chain 0



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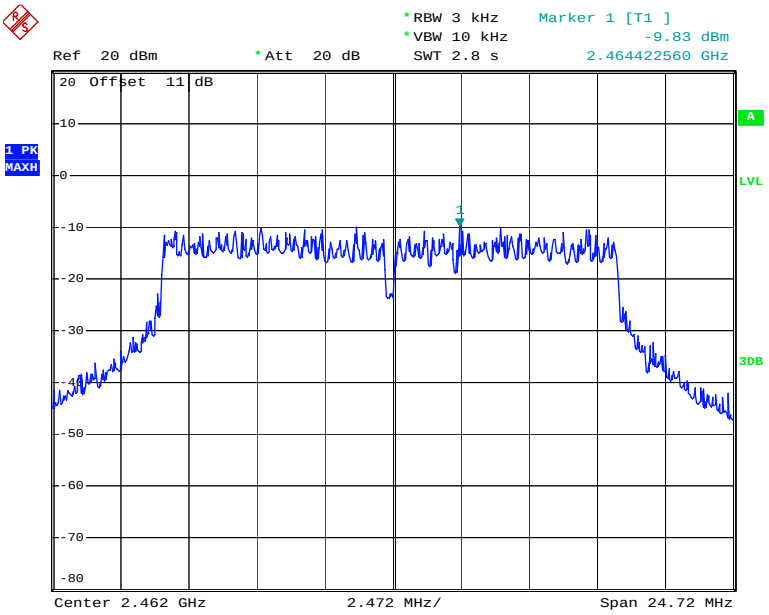
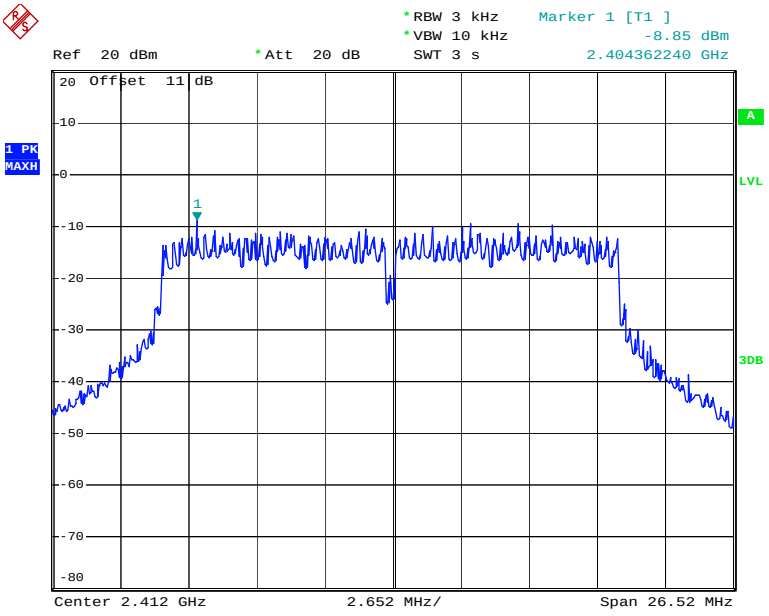
Power Spectral Density, 802.11g High Channel-Chain 0



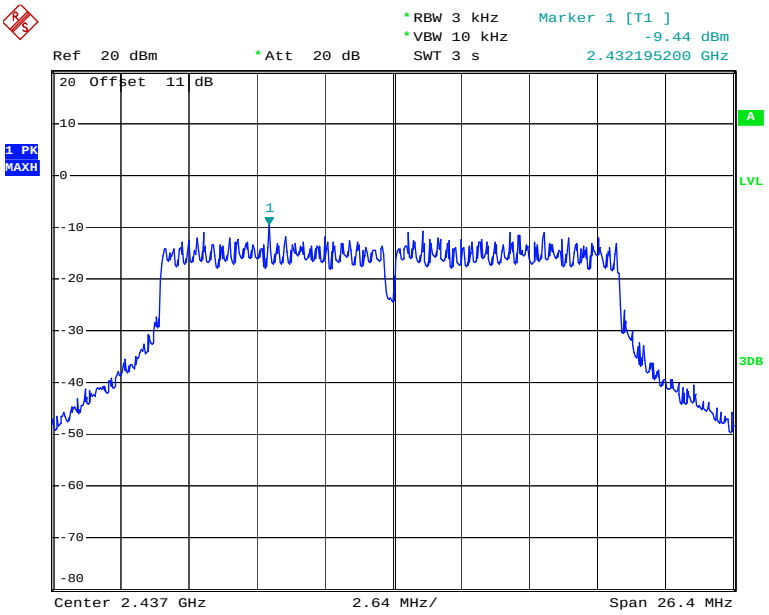
Date: 25.MAY.2016 22:36:18

Power Spectral Density, 802.11n ht20 Low Channel-Chain 0



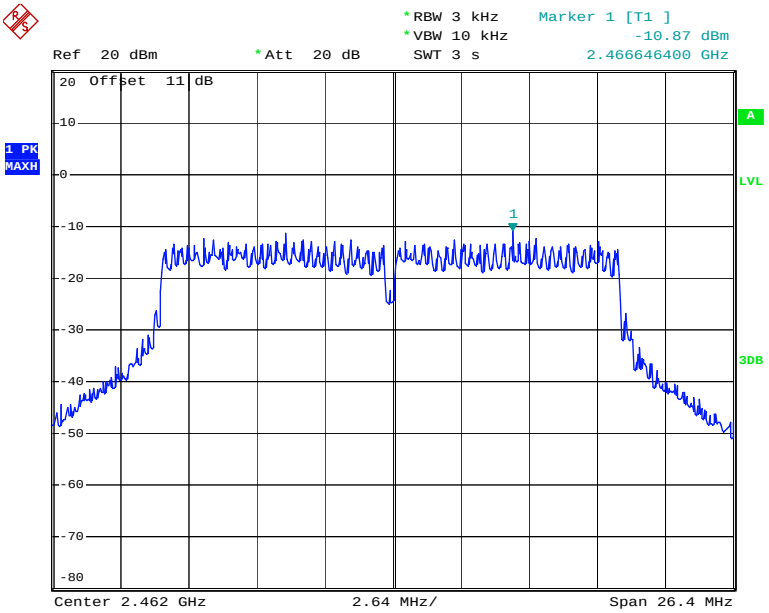
Date: 25.MAY.2016 22:58:53

Power Spectral Density, 802.11n ht20 Middle Channel-Chain 0



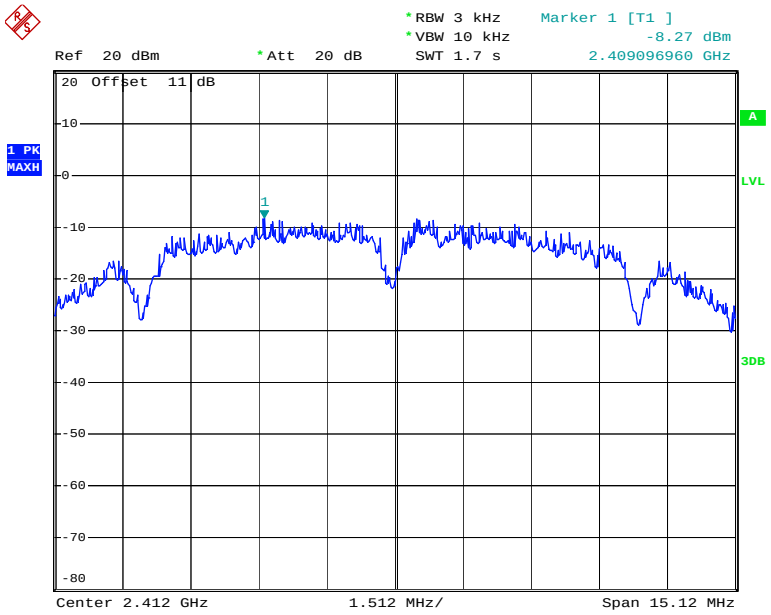
Date: 25.MAY.2016 22:55:49

Power Spectral Density, 802.11n ht20 High Channel-Chain 0



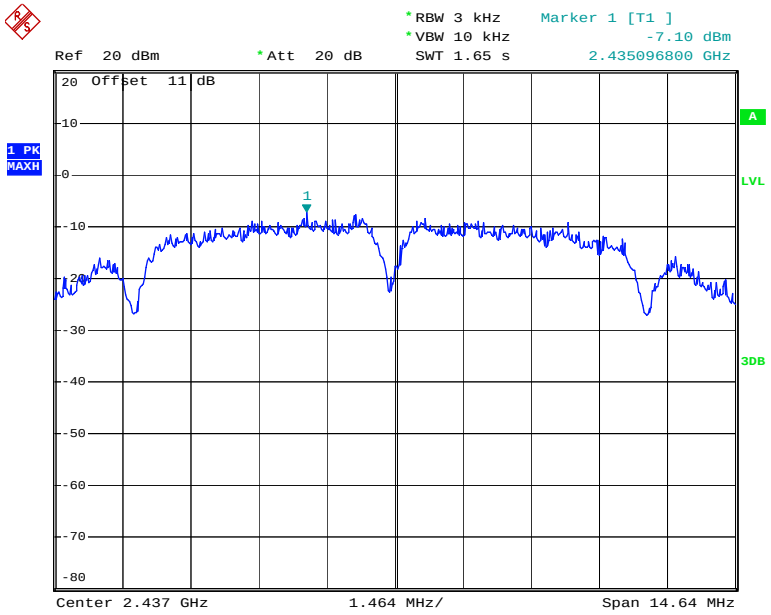
Date: 25.MAY.2016 22:40:01

Power Spectral Density, 802.11b Low Channel-Chain 1



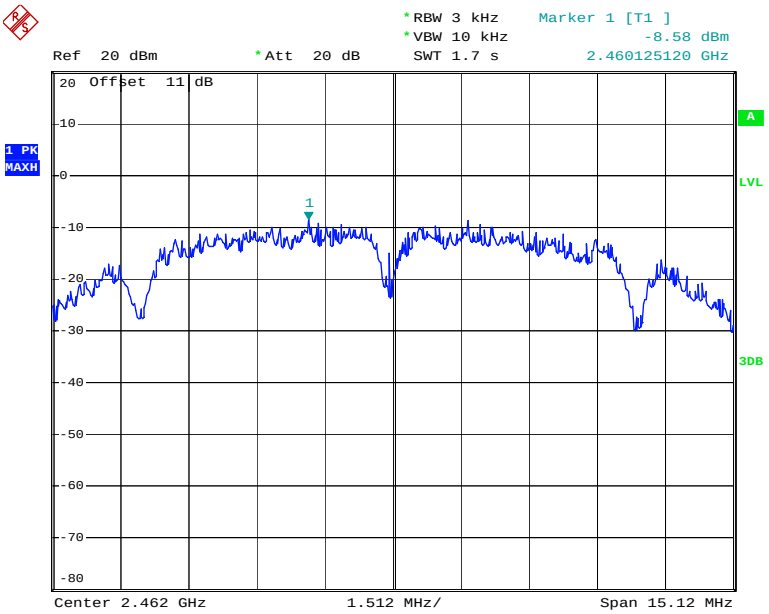
Date: 25.MAY.2016 23:21:44

Power Spectral Density, 802.11b Middle Channel-Chain 1



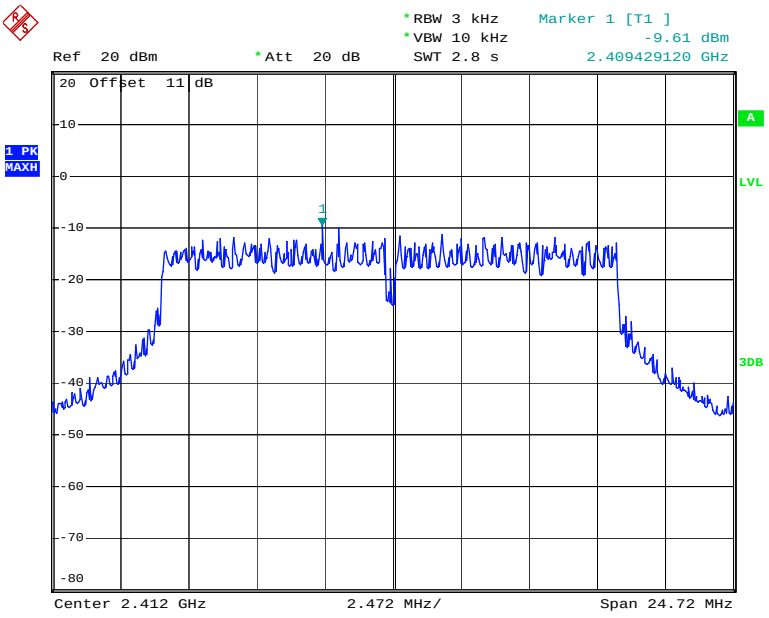
Date: 25.MAY.2016 23:24:45

Power Spectral Density, 802.11b High Channel-Chain 1



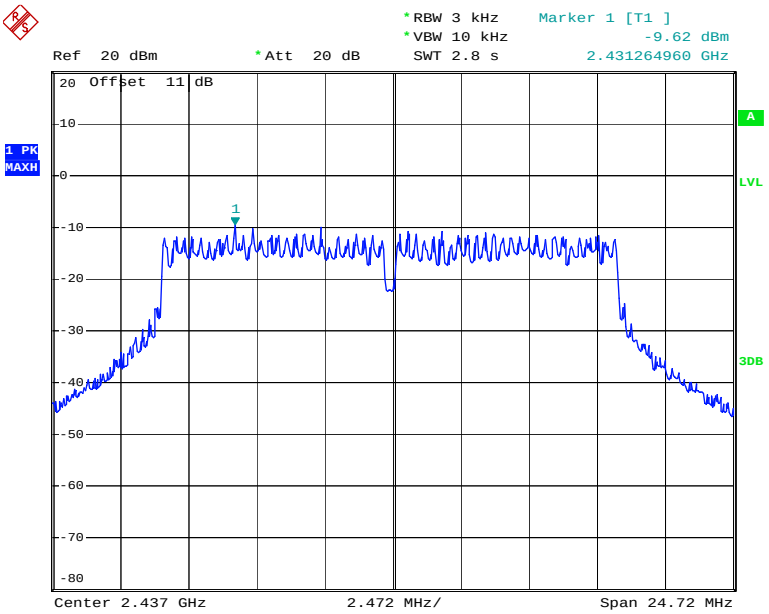
Date: 25.MAY.2016 23:27:15

Power Spectral Density, 802.11g Low Channel-Chain 1



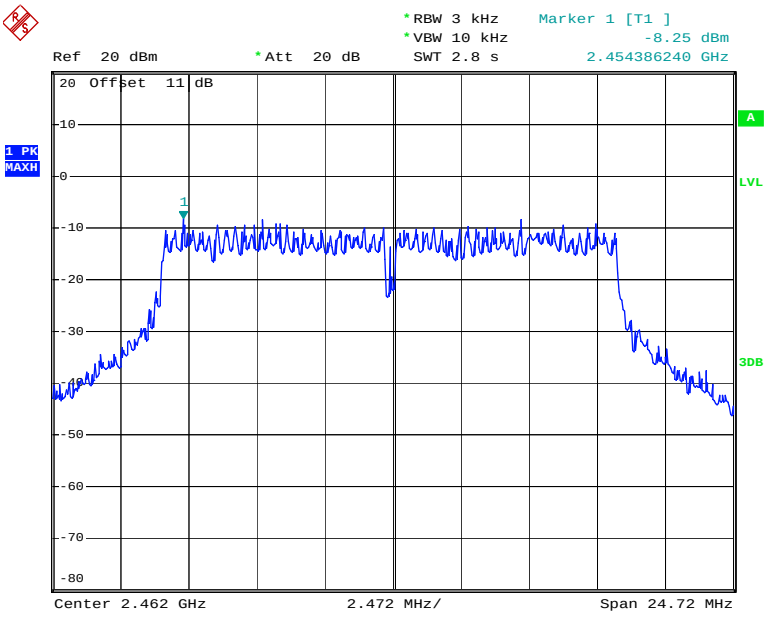
Date: 25.MAY.2016 23:36:24

Power Spectral Density, 802.11g Middle Channel-Chain 1



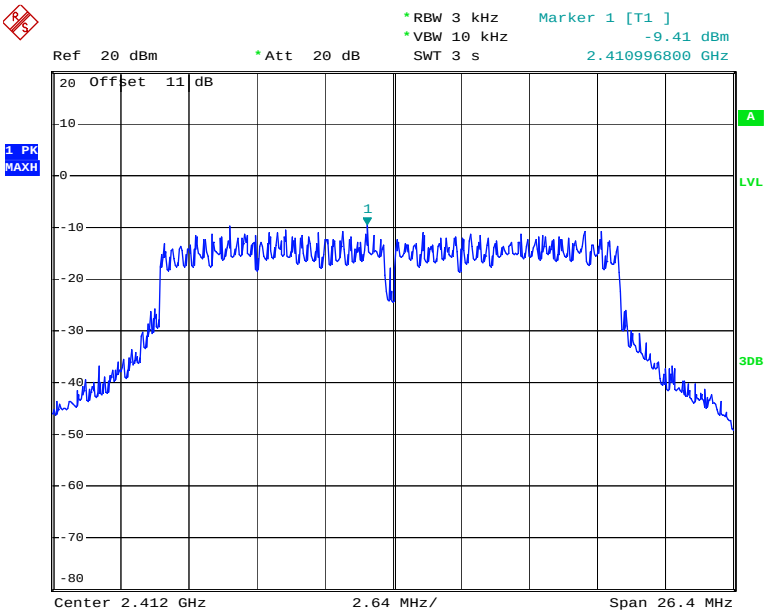
Date: 25.MAY.2016 23:39:40

Power Spectral Density, 802.11g High Channel-Chain 1



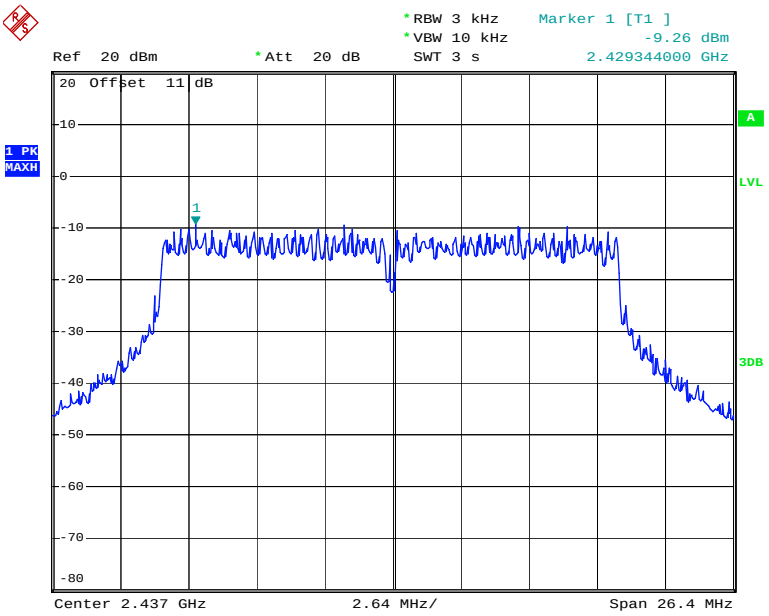
Date: 25.MAY.2016 23:42:19

Power Spectral Density, 802.11n ht20 Low Channel-Chain 1



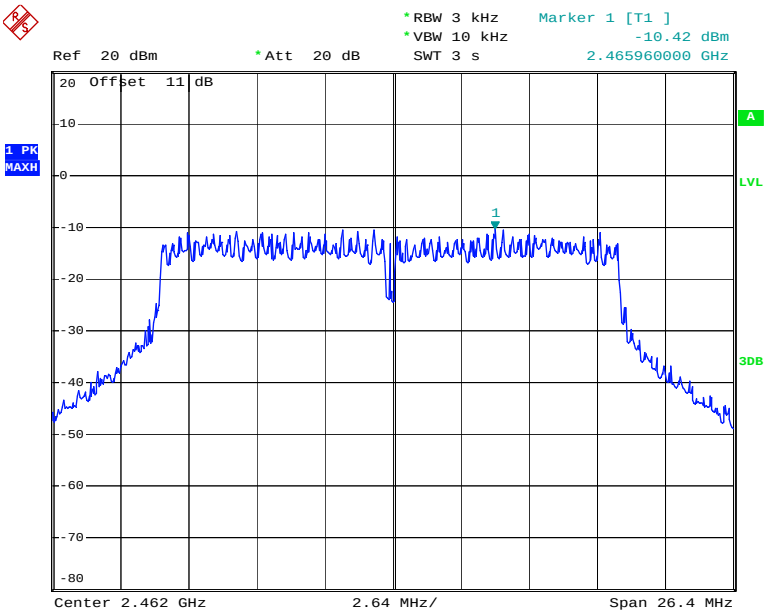
Date: 25.MAY.2016 23:51:43

Power Spectral Density, 802.11n ht20 Middle Channel-Chain 1



Date: 25.MAY.2016 23:48:33

Power Spectral Density, 802.11n ht20 High Channel-Chain 1



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