FCC PART 15.247

TEST REPORT

For

Autel Robotics Co., Ltd.

9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen, China

FCC ID: 2AGNTAC5824A

Report Type:	**Product Type:**
Original Report	X-Star series

Test Engineer:	David Lee
Report Number:	RSZ151201006-00B
Report Date:	2016-02-01
Reviewed By:	Candy Li RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Autel Robotics Co., Ltd.'s* product, model number: *X-Star (FCC ID: 2AGNTAC5824A)* or the "EUT" in this report was an *X-Star series (a new generation of smart unmanned aerial vehicle),* which was measured approximately: 28.0 cm (L) x 28.0 cm (W) x 18.5 cm (H), rated with input voltage: DC 14.8V Li-Po battery.

**All measurement and test data in this report was gathered from production sample serial number: 1507243 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-12-01.*

Objective

This report is prepared on behalf of *Autel Robotics Co., Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS, FCC Part 15.407 NII submissions with FCC ID: 2AGNTRC5824A.
Part 15.407 NII submission with FCC ID: 2AGNTAC5824A.

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 at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with RF radiated emission is 5.81 dB for 30MHz-1GHz.and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication 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 October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10-2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. 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

For 802.11g and 802.11n-HT20 mode, 11 channels are provided to testing:

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

For 802.11g, 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

“Atheros Radio Test 2” software was used.

Pre-test the power for every data rate and the data rate of max power is as below:
802.11g: Data rate: 6 Mbps, Power level: 16
802.11n-HT20: Data rate: MCS0, Power level: 16

Support Equipment List and Details

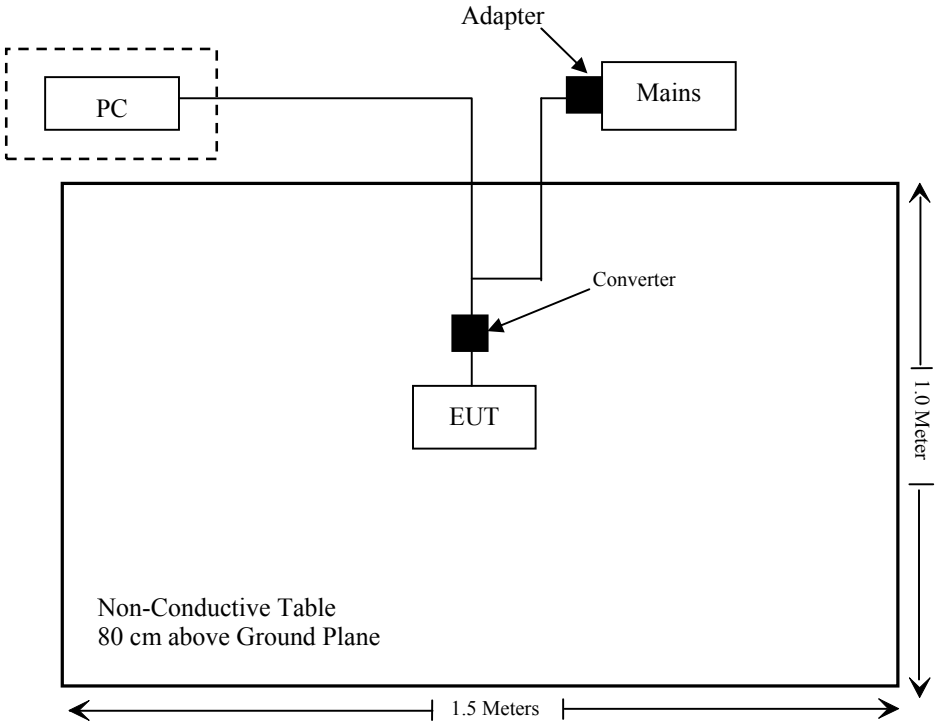
Manufacturer	Description	Model	Serial Number
KING	Adapter(Auxiliary)	/	/

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Un-detachable DC Cable	2.0	Adapter	Converter
Un-shielding Un-detachable USB Cable	0.2	Converter	EUT
Un-shielding Detachable RJ45 Cable	3.0	Converter	PC

Block Diagram of Test Setup

Below 1 GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§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 EUT was powered by battery.
Note:
The Adapter(Auxiliary) is only use for power the converter to test wifi transmitting.

FCC§15.247 (i), §1.1307 (b) (1) & §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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

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

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

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

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:

Mode	**Frequency (MHz)**	**Antenna Gain**		**Max tune-up Conducted Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
		(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
802.11g	2412-2462	2.5	1.78	15.50	35.48	20	0.013	1.0
802.11n20	2412-2462	2.5	1.78	18.00	63.10	20	0.022	1.0
5.8G	5727-5799	2.5	1.78	15.50	35.48	20	0.013	1.0

According to KDB 447498 D01 General RF Exposure Guidance v06,EUT has one 2.4G Wifi module and one 5.8G module transmitting simultaneously. And the worst case sum of MPE ratio is 0.035 which is less than 1.0, So the collocation exposure exclusion applies.

Result: Compliance

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.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has two dipole antennaS arrangement for 2.4G Wifi, which was permanently attached and the antenna gain is 2.5dBi, 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;

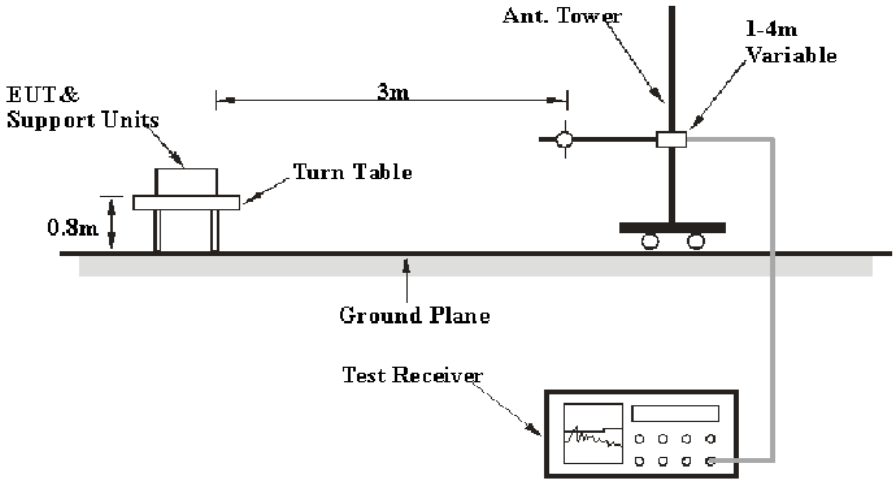
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

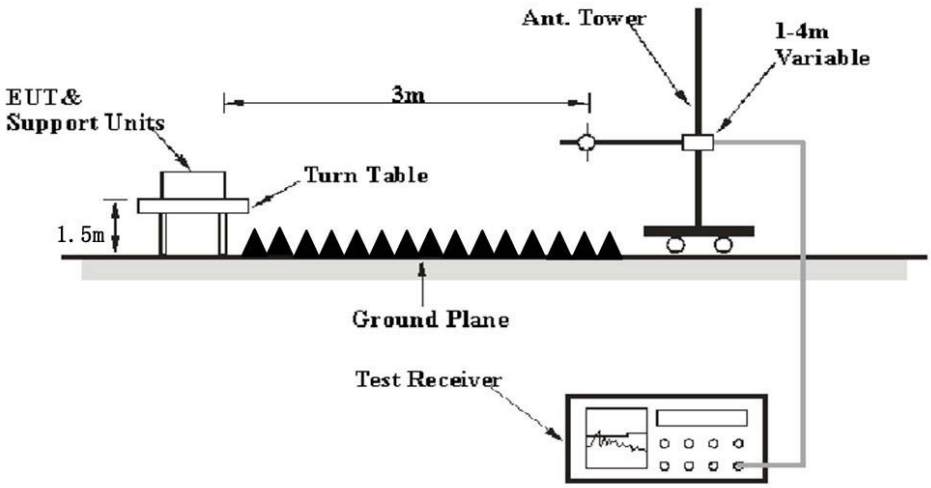
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.81 dB for 30MHz-1GHz and 4.88 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup

Below 1 GHz:



Above 1GHz:



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

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	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2015-05-06	2016-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2015-12-15	2016-12-14
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Mini	Amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-23
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2013-10-14	2016-10-13
TDK	Chamber	Chamber A	2#	2013-10-15	2016-10-15
TDK	Chamber	Chamber B	1#	2015-07-23	2016-07-22
DUCOMMUN	Pre-amplifier	ALN-22093530-01	991373-01	2015-08-03	2016-08-03
R&S	Auto test Software	EMC32	V9.10	NCR	NCR

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

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 Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

1.88 dB at **2389.83 MHz** in the **Horizontal** polarization for **802.11n-HT20** Mode Low channel

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David Lee on 2016-01-30.

EUT operation mode: Transmitting

30 MHz-25 GHz:

802.11g Mode: *(Pre-scan with two antennas, but only one at a time, and the worst case as below)*

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
400.00	45.75	QP	298	2.1	V	-4.4	41.35	46	4.65
2412.00	80.18	PK	232	2.3	H	32.61	112.79	/	/
2412.00	69.93	Ave.	232	2.3	H	32.61	102.54	/	/
2412.00	78.13	PK	106	1.2	V	32.61	110.74	/	/
2412.00	67.42	Ave.	106	1.2	V	32.61	100.03	/	/
2388.93	32.34	PK	288	1.8	H	32.61	64.95	74	9.05
2388.93	17.01	Ave.	288	1.8	H	32.61	49.62	54	4.38
2389.83	35.04	PK	326	2.0	H	32.61	67.65	74	6.35
2389.83	18.34	Ave.	326	2.0	H	32.61	50.95	54	3.05
2493.71	28.86	PK	334	2.0	H	34.21	63.07	74	10.93
2493.71	13.48	Ave.	334	2.0	H	34.21	47.69	54	6.31
4824.00	47.18	PK	237	1.0	H	3.79	50.97	74	23.03
4824.00	32.32	Ave.	237	1.0	H	3.79	36.11	54	17.89
7236.00	40.44	PK	239	2.1	V	9.79	50.23	74	23.77
7236.00	29.04	Ave.	239	2.1	V	9.79	38.83	54	15.17
9648.00	41.18	PK	198	1.4	V	11.85	53.03	74	20.97
9648.00	29.14	Ave.	198	1.4	V	11.85	40.99	54	13.01

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2437 MHz)									
400.00	45.30	QP	50	1.4	V	-4.4	40.90	46	5.10
2437.00	79.32	PK	303	1.4	H	32.61	111.93	/	/
2437.00	69.33	Ave.	303	1.4	H	32.61	101.94	/	/
2437.00	77.97	PK	62	2.2	V	32.61	110.58	/	/
2437.00	67.36	Ave.	62	2.2	V	32.61	99.97	/	/
2388.87	30.08	PK	145	2.2	H	32.61	62.69	74	11.31
2388.87	15.23	Ave.	145	2.2	H	32.61	47.84	54	6.16
2483.76	30.94	PK	177	1.6	H	34.21	65.15	74	8.85
2483.76	15.41	Ave.	177	1.6	H	34.21	49.62	54	4.38
2485.64	30.51	PK	66	1.6	H	34.21	64.72	74	9.28
2485.64	15.37	Ave.	66	1.6	H	34.21	49.58	54	4.42
4874.00	45.65	PK	12	1.1	H	3.56	49.21	74	24.79
4874.00	30.81	Ave.	12	1.1	H	3.56	34.37	54	19.63
7311.00	41.16	PK	334	1.9	V	10.11	51.27	74	22.73
7311.00	29.33	Ave.	334	1.9	V	10.11	39.44	54	14.56
9748.00	40.75	PK	95	2.3	V	11.85	52.60	74	21.40
9748.00	29.59	Ave.	95	2.3	V	11.85	41.44	54	12.56
High Channel (2462 MHz)									
400.00	45.19	QP	106	1.6	V	-4.4	40.79	46	5.21
2462.00	78.44	PK	348	1.9	H	34.21	112.65	/	/
2462.00	68.15	Ave.	348	1.9	H	34.21	102.36	/	/
2462.00	77.54	PK	305	1.6	V	34.21	111.75	/	/
2462.00	66.59	Ave.	305	1.6	V	34.21	100.80	/	/
2385.03	28.41	PK	76	2.4	H	32.61	61.02	74	12.98
2385.03	13.48	Ave.	76	2.4	H	32.61	46.09	54	7.91
2483.73	32.11	PK	256	1.8	H	34.21	66.32	74	7.68
2483.73	17.01	Ave.	256	1.8	H	34.21	51.22	54	2.78
2484.35	30.88	PK	79	2.2	H	34.21	65.09	74	8.91
2484.35	15.43	Ave.	79	2.2	H	34.21	49.64	54	4.36
4924.00	46.31	PK	248	1.4	H	3.56	49.87	74	24.13
4924.00	32.32	Ave.	248	1.4	H	3.56	35.88	54	18.12
7386.00	41.37	PK	324	1.0	V	8.17	49.54	74	24.46
7386.00	30.68	Ave.	324	1.0	V	8.17	38.85	54	15.15
9848.00	40.52	PK	54	2.3	V	13.21	53.73	74	20.27
9848.00	30.67	Ave.	54	2.3	V	13.21	43.88	54	10.12

802.11n-HT20 Mode: *(Transmitting with two antennas at a time, and the worst case as below)*

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
400.00	45.82	QP	77	1.5	V	-4.4	41.42	46	4.58
2412.00	80.12	PK	99	1.4	H	32.61	112.73	/	/
2412.00	69.54	Ave.	99	1.4	H	32.61	102.15	/	/
2412.00	77.66	PK	26	2.3	V	32.61	110.27	/	/
2412.00	66.07	Ave.	26	2.3	V	32.61	98.68	/	/
2388.83	35.98	PK	209	1.8	H	32.61	68.59	74	5.41
2388.83	18.34	Ave.	209	1.8	H	32.61	50.95	54	3.05
2389.83	36.77	PK	41	1.8	H	32.61	69.38	74	4.62
2389.83	19.51	Ave.	41	1.8	H	32.61	52.12	54	**1.88**
2487.93	29.84	PK	33	1.8	H	34.21	64.05	74	9.95
2487.93	15.44	Ave.	33	1.8	H	34.21	49.65	54	4.35
4824.00	46.58	PK	238	2.3	H	3.79	50.37	74	23.63
4824.00	31.47	Ave.	238	2.3	H	3.79	35.26	54	18.74
7236.00	40.97	PK	230	1.1	V	9.79	50.76	74	23.24
7236.00	29.16	Ave.	230	1.1	V	9.79	38.95	54	15.05
9648.00	40.35	PK	11	2.5	V	11.85	52.20	74	21.80
9648.00	30.25	Ave.	11	2.5	V	11.85	42.10	54	11.90
Middle Channel (2437 MHz)									
400.00	44.50	QP	291	2.4	V	-4.4	40.10	46	5.90
2437.00	79.41	PK	123	1.2	H	32.61	112.02	/	/
2437.00	69.44	Ave.	123	1.2	H	32.61	102.05	/	/
2437.00	77.49	PK	263	1.8	V	32.61	110.10	/	/
2437.00	65.75	Ave.	263	1.8	V	32.61	98.36	/	/
2389.75	29.87	PK	274	1.2	H	32.61	62.48	74	11.52
2389.75	17.13	Ave.	274	1.2	H	32.61	49.74	54	4.26
2485.78	30.98	PK	33	1.1	H	34.21	65.19	74	8.81
2485.78	15.47	Ave.	33	1.1	H	34.21	49.68	54	4.32
2487.76	30.67	PK	249	1.9	H	34.21	64.88	74	9.12
2487.76	15.42	Ave.	249	1.9	H	34.21	49.63	54	4.37
4874.00	46.46	PK	261	2.1	H	3.56	50.02	74	23.98
4874.00	31.11	Ave.	261	2.1	H	3.56	34.67	54	19.33
7311.00	41.20	PK	104	1.1	V	10.11	51.31	74	22.69
7311.00	29.20	Ave.	104	1.1	V	10.11	39.31	54	14.69
9748.00	40.39	PK	134	1.7	V	11.85	52.24	74	21.76
9748.00	30.14	Ave.	134	1.7	V	11.85	41.99	54	12.01

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2462 MHz)									
400.00	44.39	QP	264	1.8	V	-4.4	39.99	46	6.01
2462.00	78.33	PK	157	1.6	H	34.21	112.54	/	/
2462.00	67.05	Ave.	157	1.6	H	34.21	101.26	/	/
2462.00	77.48	PK	359	1.9	V	34.21	111.69	/	/
2462.00	66.46	Ave.	359	1.9	V	34.21	100.67	/	/
2385.27	29.53	PK	138	1.6	H	32.61	62.14	74	11.86
2385.27	14.73	Ave.	138	1.6	H	32.61	47.34	54	6.66
2483.83	35.24	PK	189	2.1	H	34.21	69.45	74	4.55
2483.83	17.01	Ave.	189	2.1	H	34.21	51.22	54	2.78
2485.73	32.74	PK	233	1.3	H	34.21	66.95	74	7.05
2485.73	15.34	Ave.	233	1.3	H	34.21	49.55	54	4.45
4924.00	46.52	PK	201	2.0	H	3.56	50.08	74	23.92
4924.00	31.06	Ave.	201	2.0	H	3.56	34.62	54	19.38
7386.00	41.29	PK	171	1.4	V	8.17	49.46	74	24.54
7386.00	29.36	Ave.	171	1.4	V	8.17	37.53	54	16.47
9848.00	40.72	PK	347	1.6	V	13.21	53.93	74	20.07
9848.00	29.65	Ave.	347	1.6	V	13.21	42.86	54	11.14

Note:

The fundamental test was without the Amplifier.
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

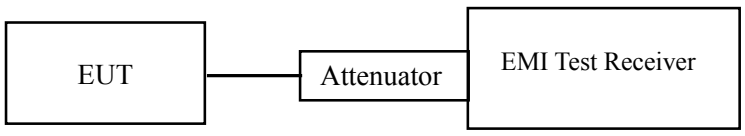
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2015-06-13	2016-06-13

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

Test Data

Environmental Conditions

Temperature:	20~23 ℃
Relative Humidity:	50~51 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by David Lee on 2015-12-18 and 2015-12-19.

EUT operation mode: Transmitting

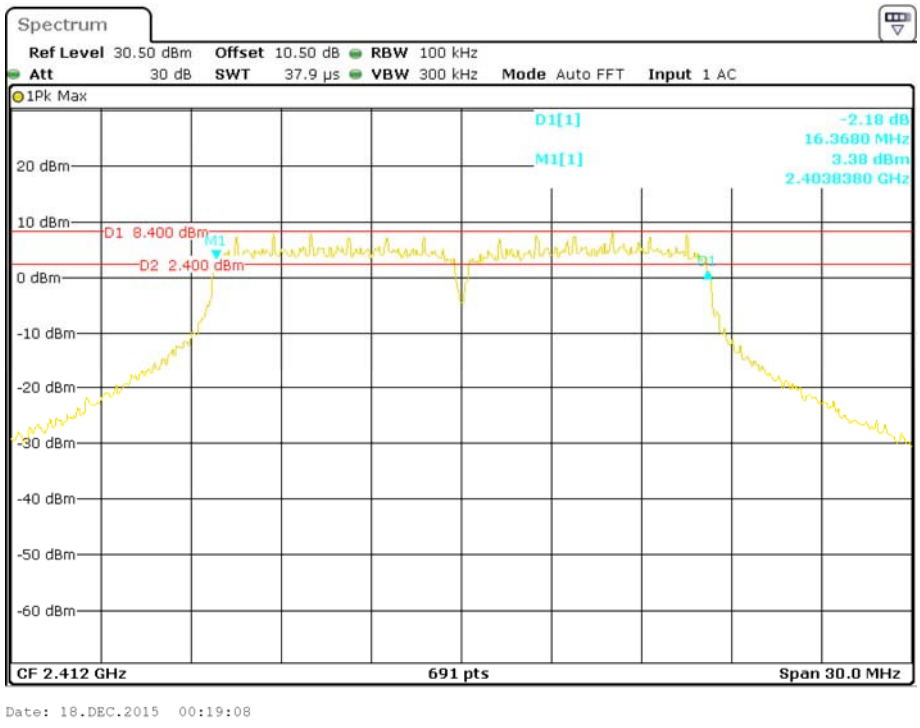
Test Result: Pass.

Please refer to the following tables and plots.

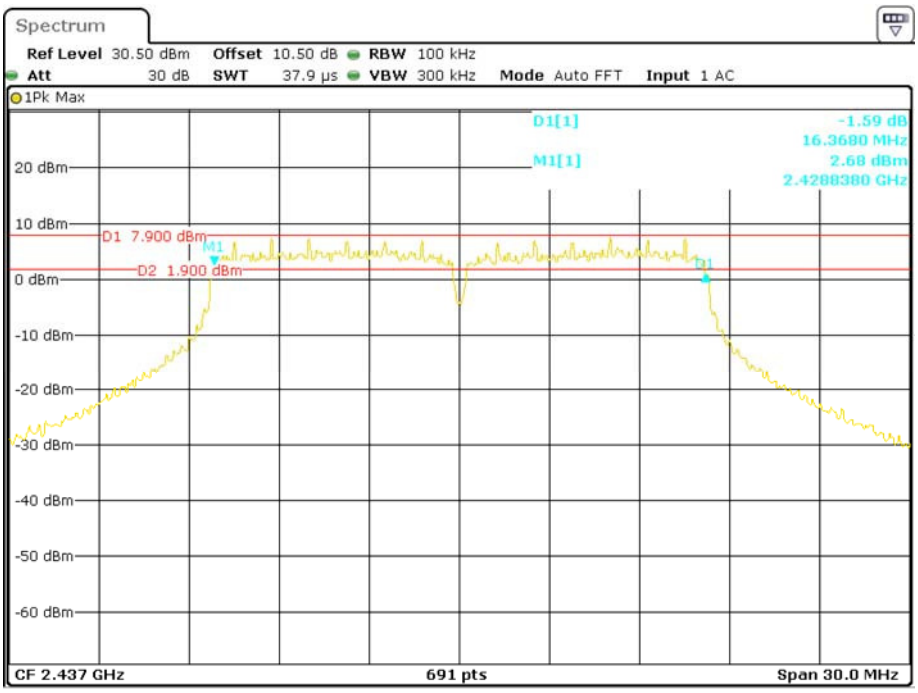
Antenna 1:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
802.11g mode			
Low	2412	16.37	≥500
Middle	2437	16.37	≥500
High	2462	16.32	≥500
802.11n-HT20 mode			
Low	2412	17.58	≥500
Middle	2437	17.58	≥500
High	2462	17.32	≥500

802.11g Low Channel

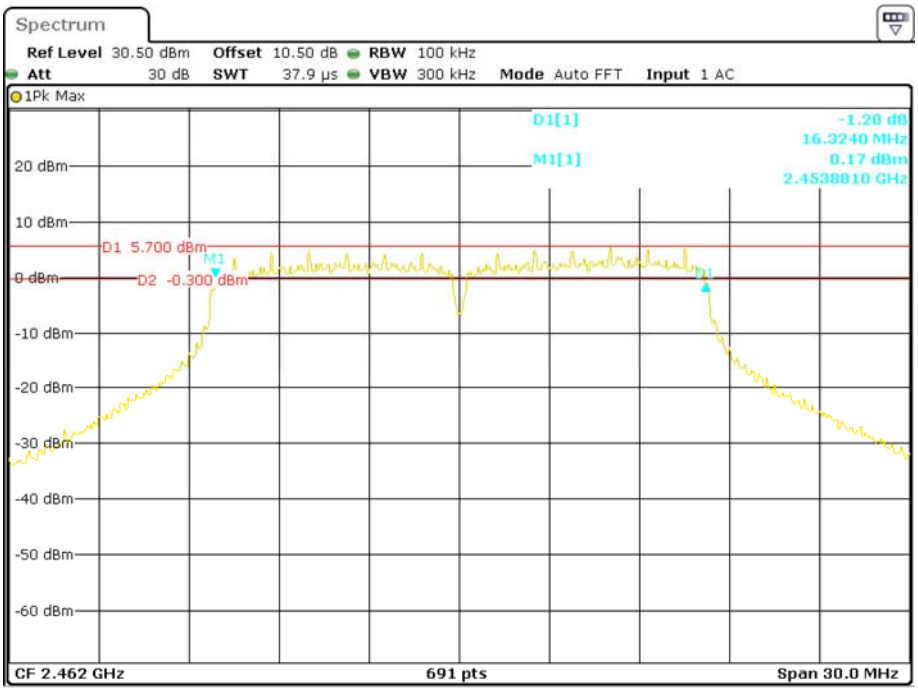


802.11g Middle Channel



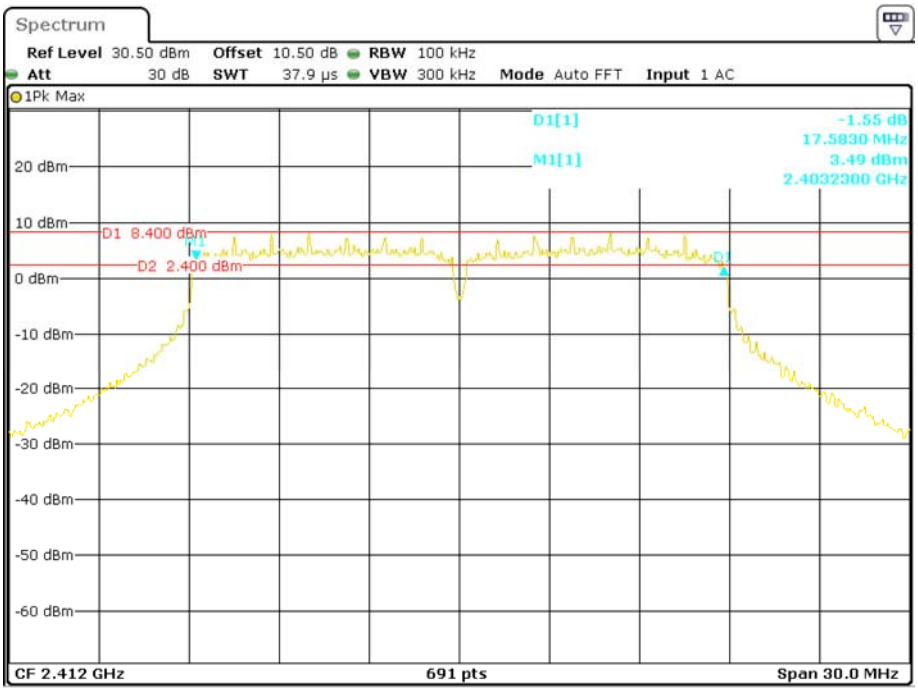
Date: 18.DEC.2015 00:21:36

802.11g High Channel



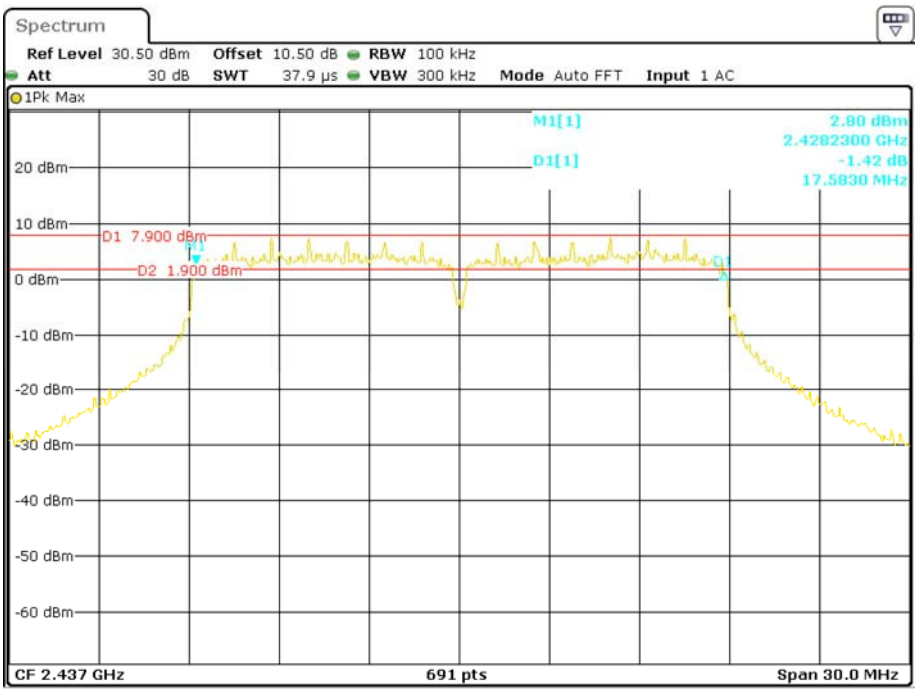
Date: 18.DEC.2015 00:25:34

802.11n-HT20 Low Channel



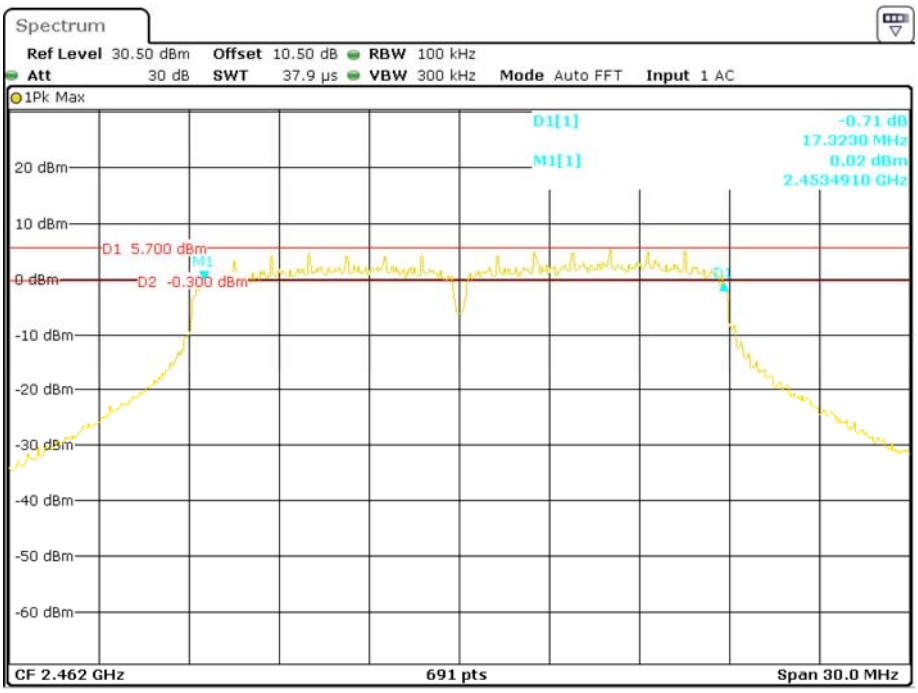
Date: 18.DEC.2015 00:17:50

802.11n-HT20 Middle Channel



Date: 18.DEC.2015 00:22:25

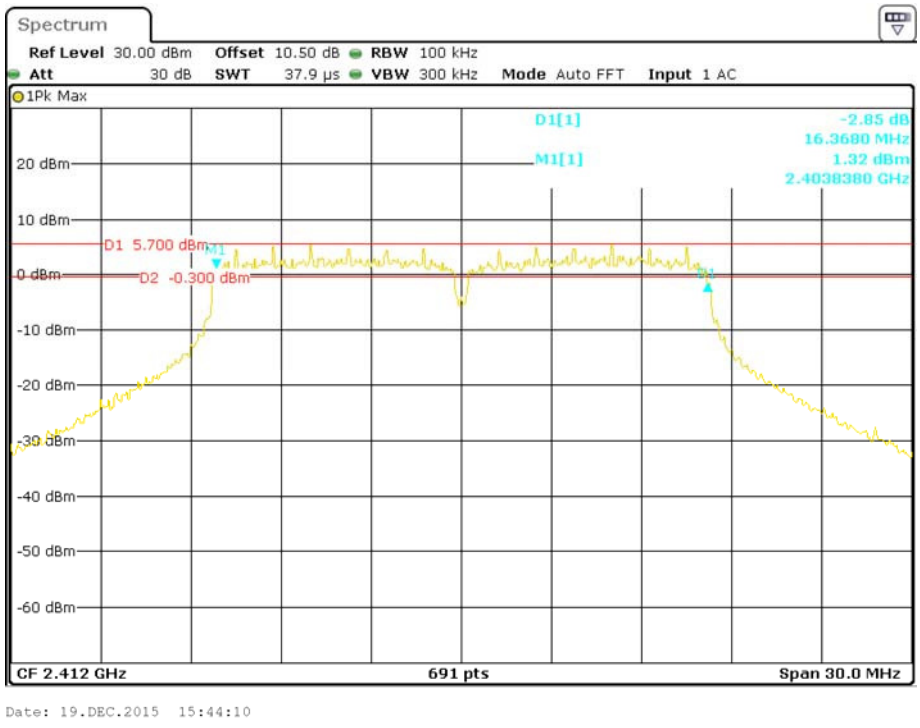
802.11n-HT20 High Channel



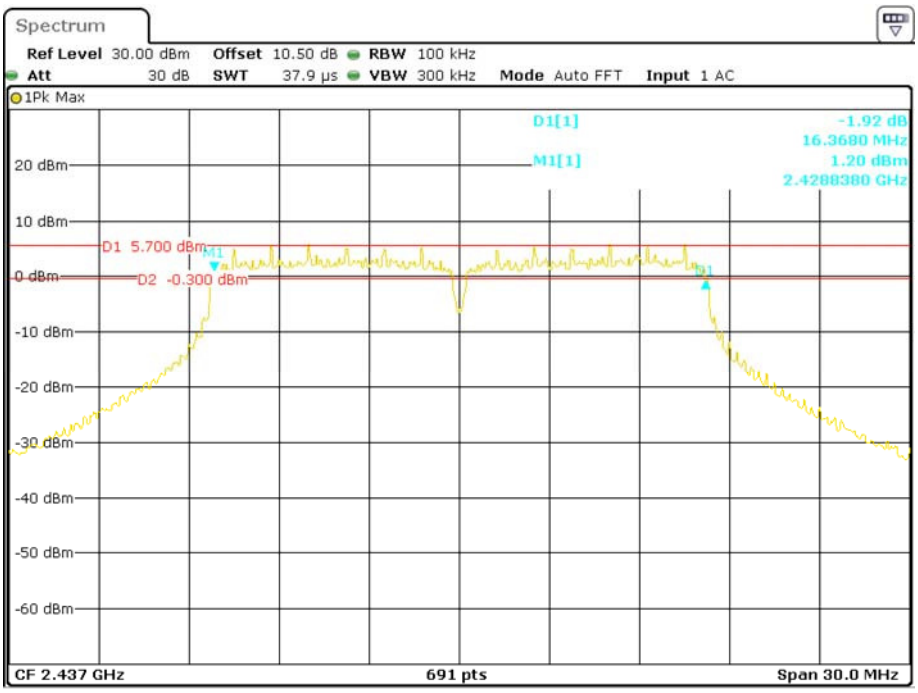
Antenna 2:

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
802.11g mode			
Low	2412	16.37	≥500
Middle	2437	16.37	≥500
High	2462	16.37	≥500
802.11n-HT20 mode			
Low	2412	17.58	≥500
Middle	2437	17.58	≥500
High	2462	17.58	≥500

802.11g Low Channel

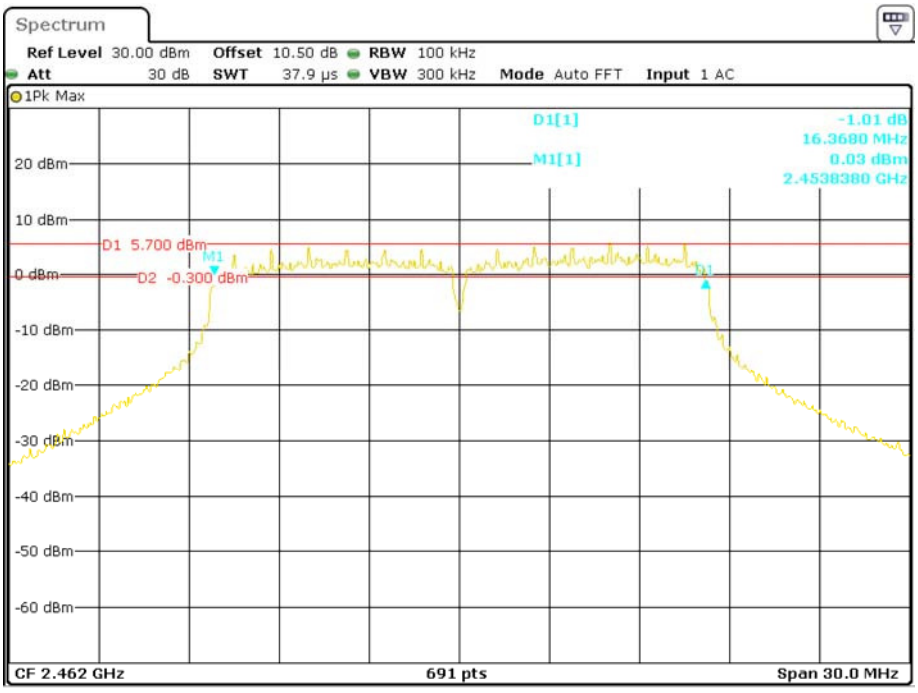


802.11g Middle Channel



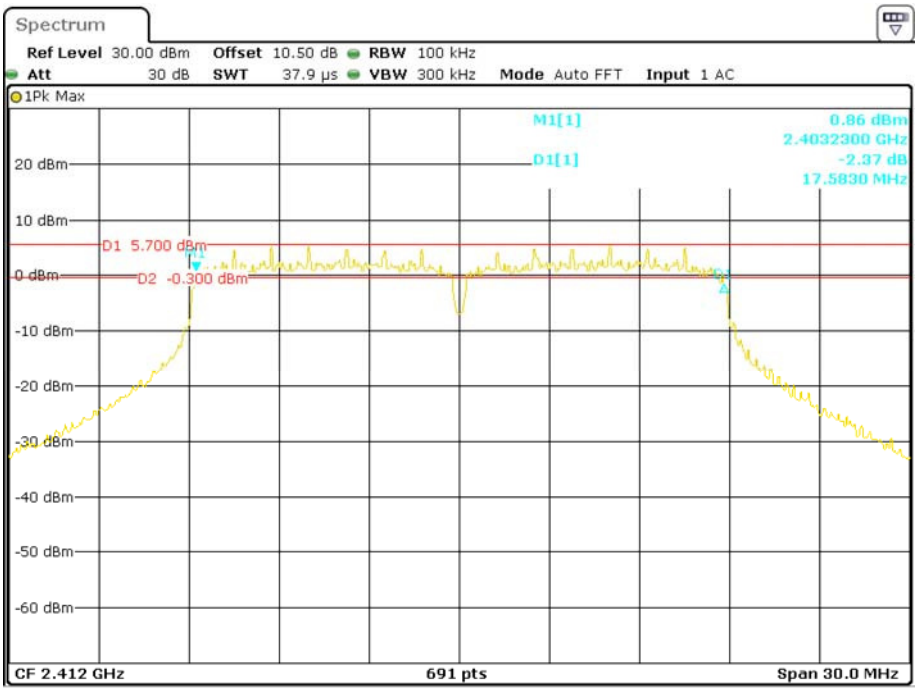
Date: 19.DEC.2015 15:45:44

802.11g High Channel

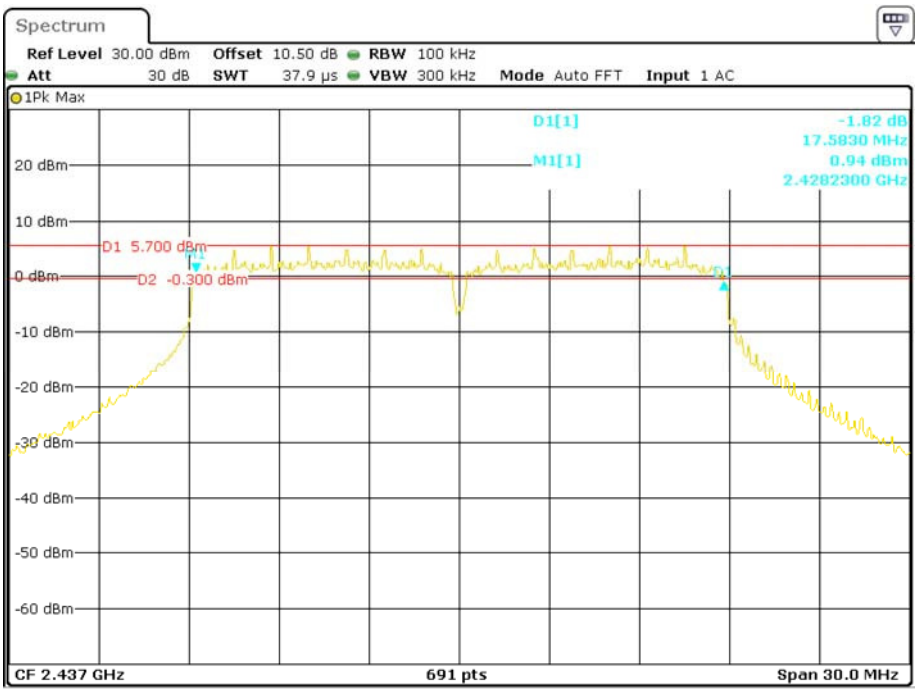


Date: 19.DEC.2015 15:47:11

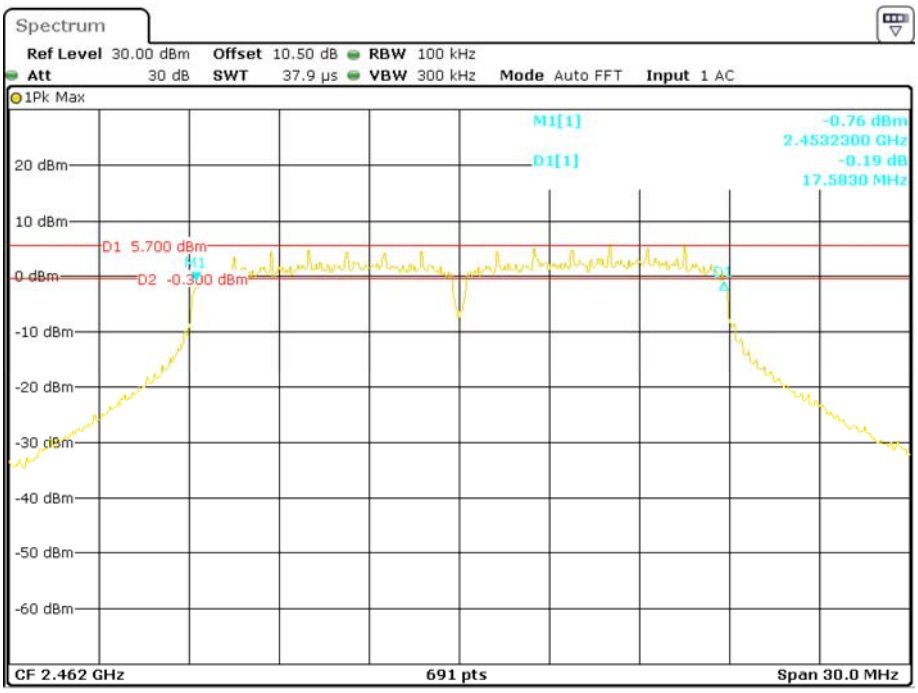
802.11n-HT20 Low Channel



802.11n-HT20 Middle Channel



802.11n-HT20 High Channel



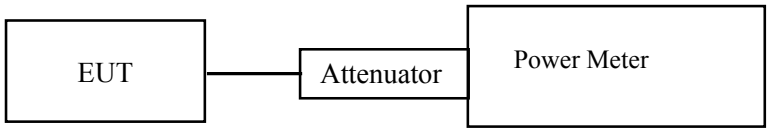
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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 one 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
HP	Power Meter	N1912A	MY5000448	2015-12-18	2016-12-17
HP	Power Sensor	N1921A	MY54210016	2015-12-18	2016-12-17

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

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David Lee on 2016-01-26.

EUT operation mode: Transmitting

Peak Output Power:

Channel	Frequency (MHz)	Antenna Port	Peak Output Power (dBm)		Limit (dBm)
802.11g mode					
Low	2412	1	22.10		30
		2	22.15		
Middle	2437	1	21.96		30
		2	22.32		
High	2462	1	21.94		30
		2	21.80		
802.11n-HT20 mode					
Low	2412	1	22.20	25.33	30
		2	22.44		
Middle	2437	1	21.79	25.14	30
		2	22.45		
High	2462	1	21.88	24.92	30
		2	21.94		

Average Output Power:

Channel	Frequency (MHz)	Antenna Port	Average Output Power (dBm)		Limit (dBm)
802.11g mode					
Low	2412	1	14.67		30
		2	15.04		
Middle	2437	1	14.65		30
		2	15.10		
High	2462	1	14.69		30
		2	14.72		
802.11n-HT20 mode					
Low	2412	1	14.91	17.89	30
		2	14.84		
Middle	2437	1	14.59	17.72	30
		2	14.83		
High	2462	1	14.53	17.60	30
		2	14.64		

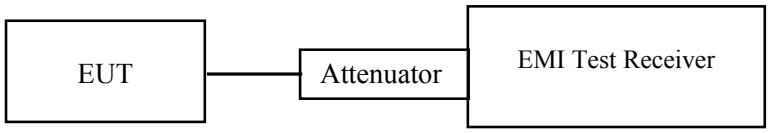
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

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
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03 -101746-zn	2015-06-13	2016-06-13

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

Test Data

Environmental Conditions

Temperature:	23～24 ℃
Relative Humidity:	50～51 %
ATM Pressure:	100.0～101.0 kPa

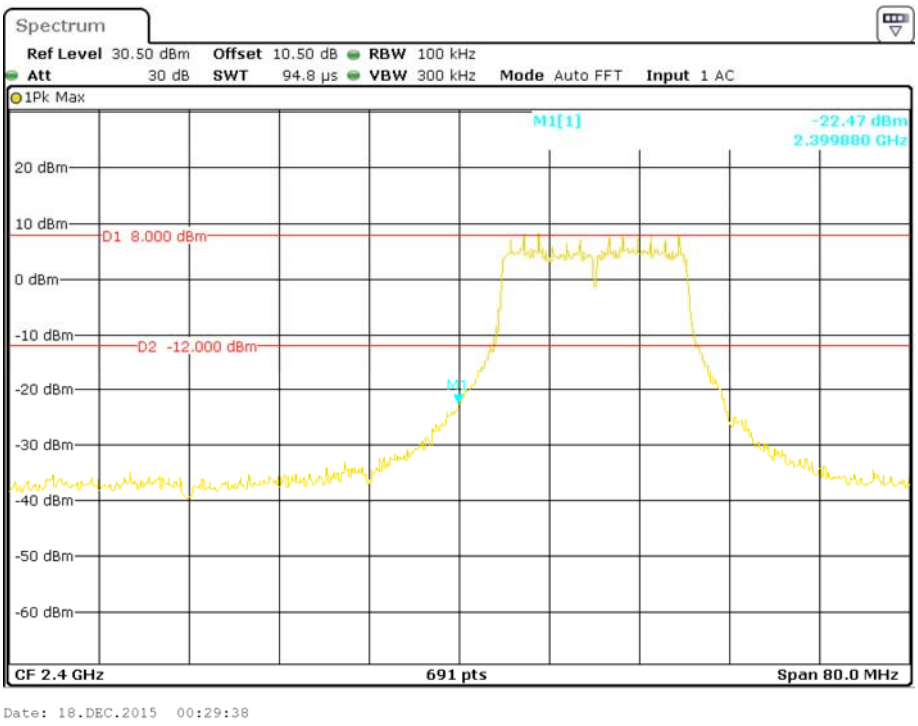
The testing was performed by David Lee on 2015-12-18 and 2015-12-19.

Test Result: *Compliance*

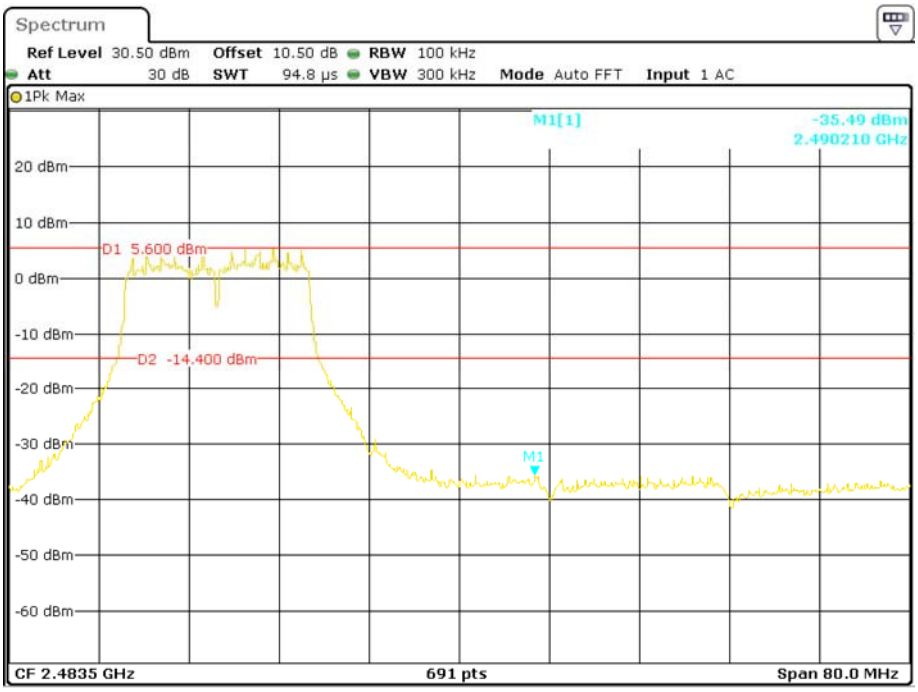
Please refer to the following plots.

Antenna 1:

802.11g: Band Edge, Left Side

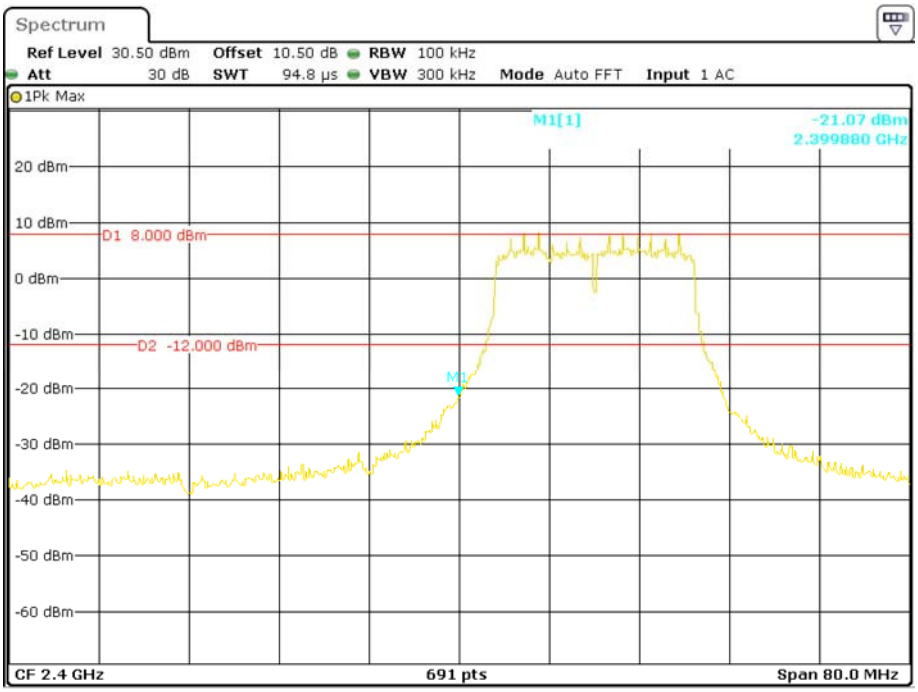


802.11g: Band Edge, Right Side



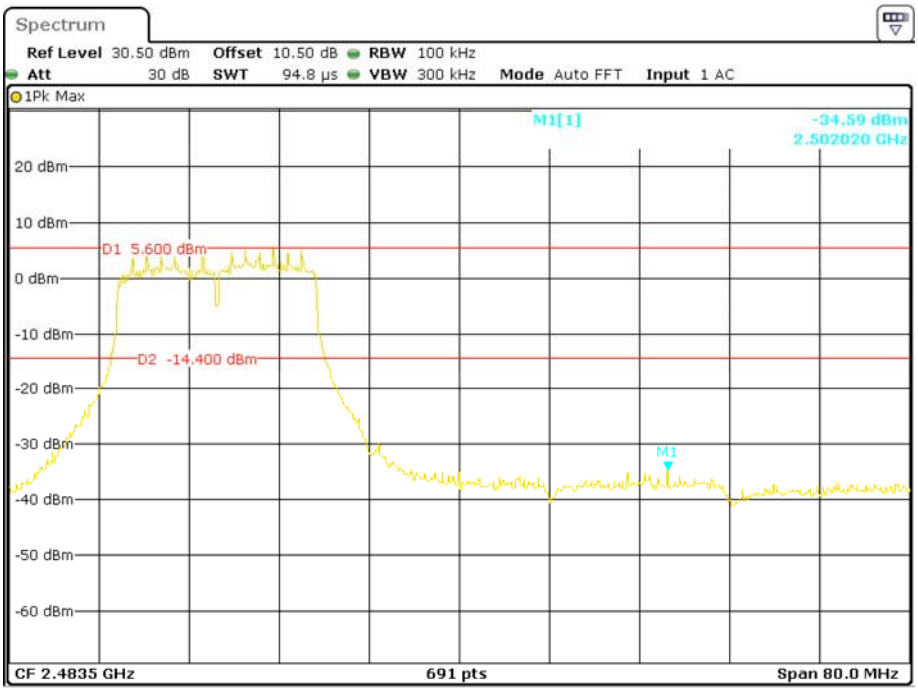
Date: 18.DEC.2015 00:30:35

802.11n-HT20: Band Edge, Left Side



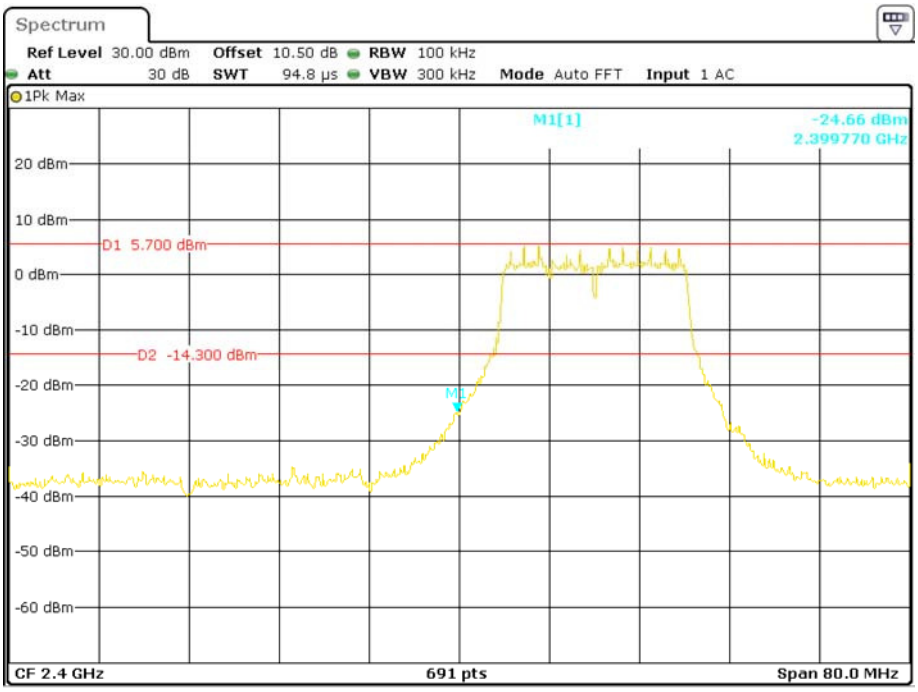
Date: 18.DEC.2015 00:28:57

802.11n-HT20: Band Edge, Right Side



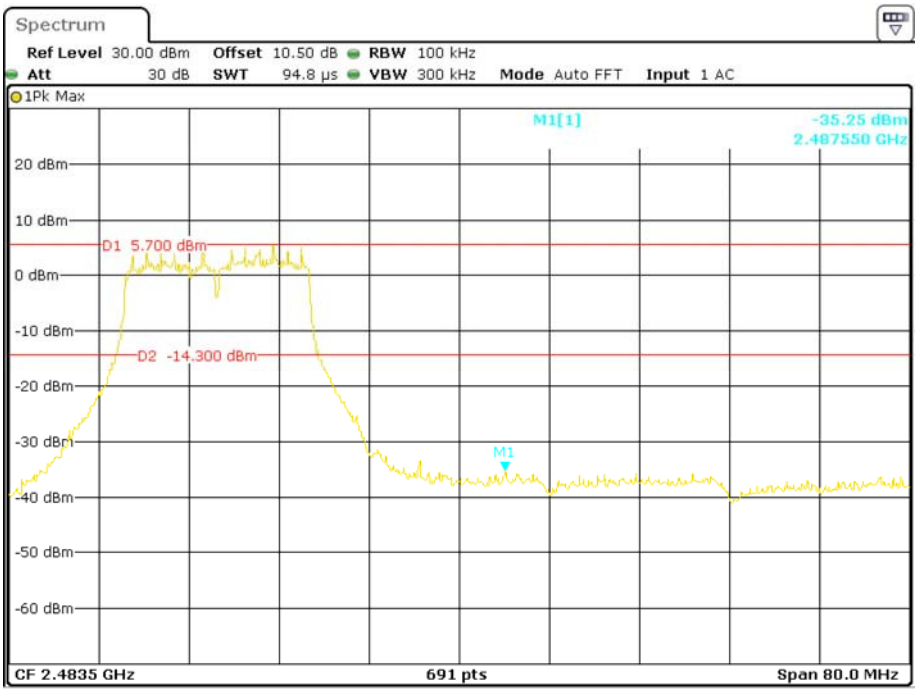
Antenna 2:

802.11g: Band Edge, Left Side



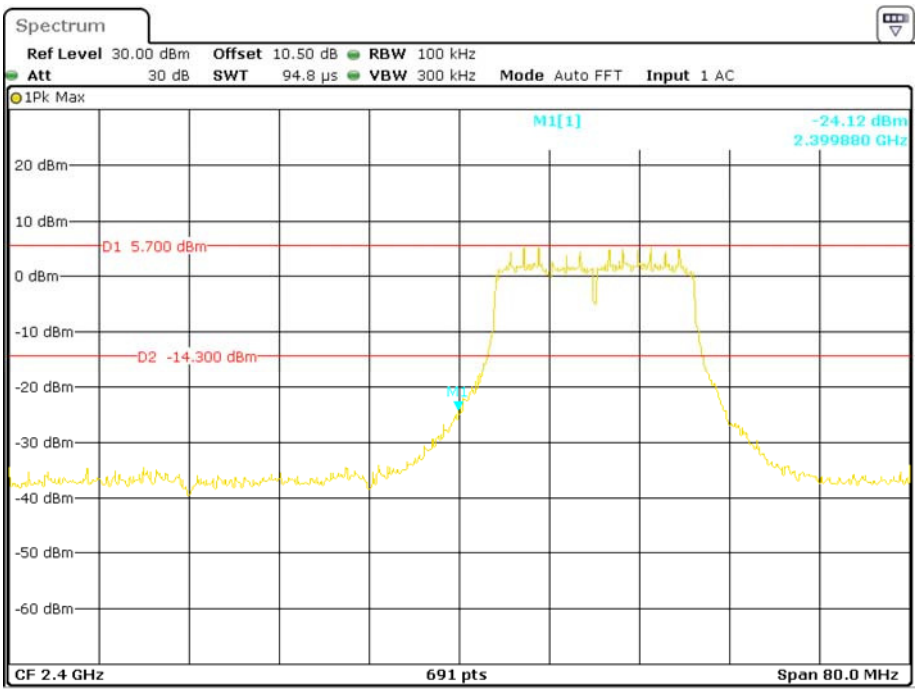
Date: 19.DEC.2015 15:54:00

802.11g: Band Edge, Right Side



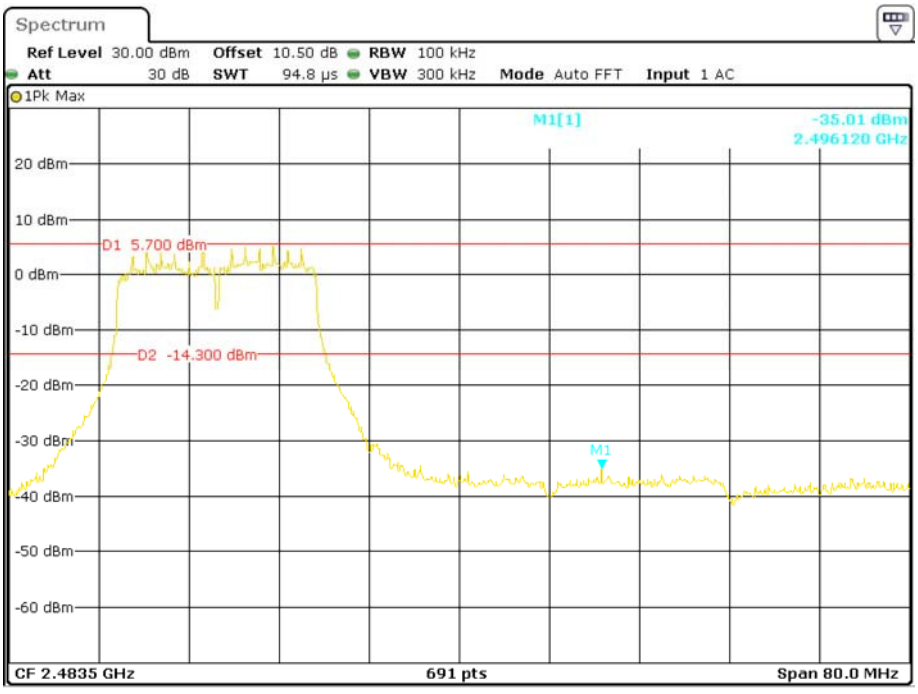
Date: 19.DEC.2015 15:54:57

802.11n-HT20: Band Edge, Left Side



Date: 19.DEC.2015 15:53:05

802.11n-HT20: Band Edge, Right Side



Date: 19.DEC.2015 15:55:41

FCC §15.247(e) - POWER SPECTRAL DENSITY

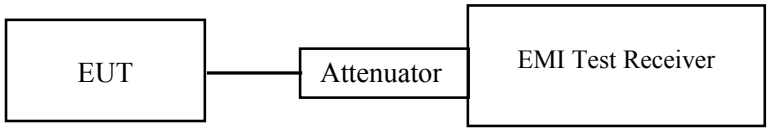
Applicable Standard

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

According to KDB558074 D01 DTS Meas Guidance v03r04 sub-clause 10.2

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. 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
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03 -101746-zn	2015-06-13	2016-06-13

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

Test Data

Environmental Conditions

Temperature:	22 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David Lee on 2015-12-18.

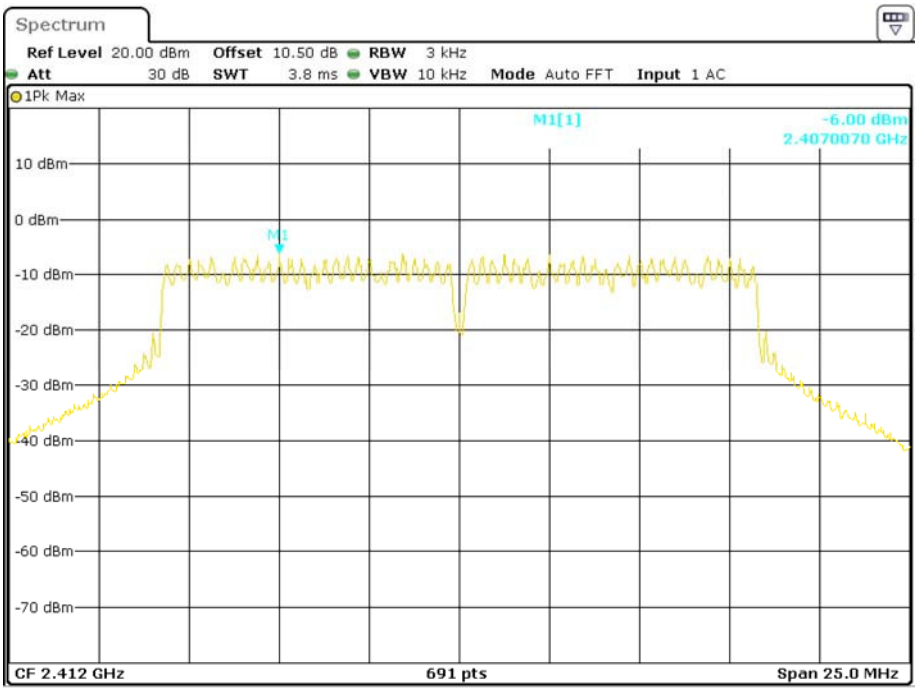
EUT operation mode: Transmitting

Test Result: Pass

Channel	Frequency (MHz)	Antenna Port	Data Rate (Mbps)	Power spectral density (dBm/3kHz)		Limit (dBm/3kHz)	Result
802.11g mode							
Low	2412	1	6	-6.00		8	Pass
		2		-9.55		8	Pass
Middle	2437	1	6	-6.21		8	Pass
		2		-8.90		8	Pass
High	2462	1	6	-8.39		8	Pass
		2		-9.71		8	Pass
802.11n-HT20 mode							
Low	2412	1	6.5	-6.54	-4.94	8	Pass
		2		-10.05		8	Pass
Middle	2437	1	6.5	-6.94	-4.99	8	Pass
		2		-9.41		8	Pass
High	2462	1	6.5	-9.23	-6.49	8	Pass
		2		-9.79		8	Pass

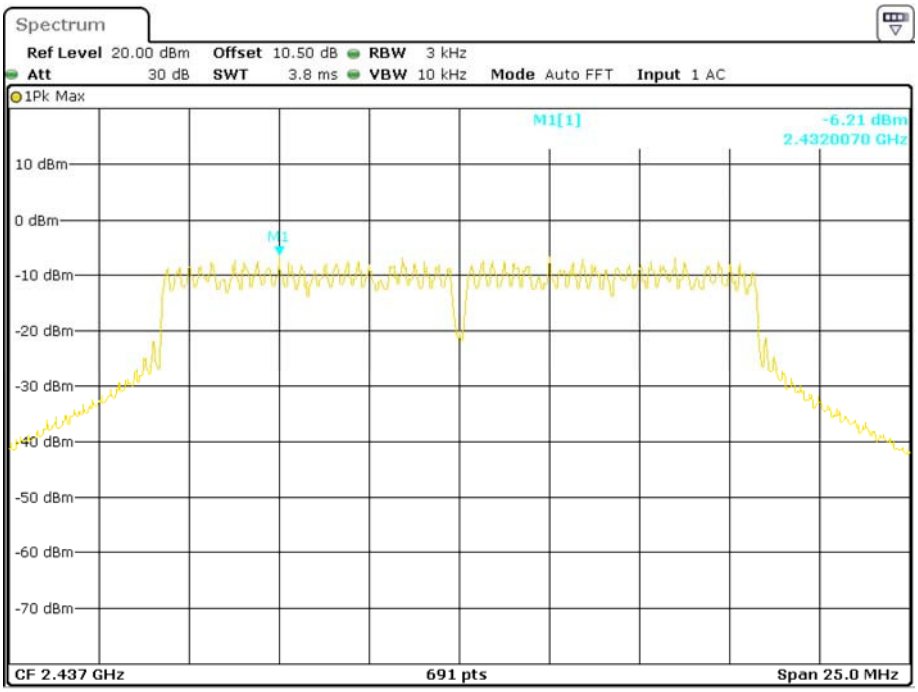
Antenna 1:

Power Spectral Density, 802.11g Low Channel



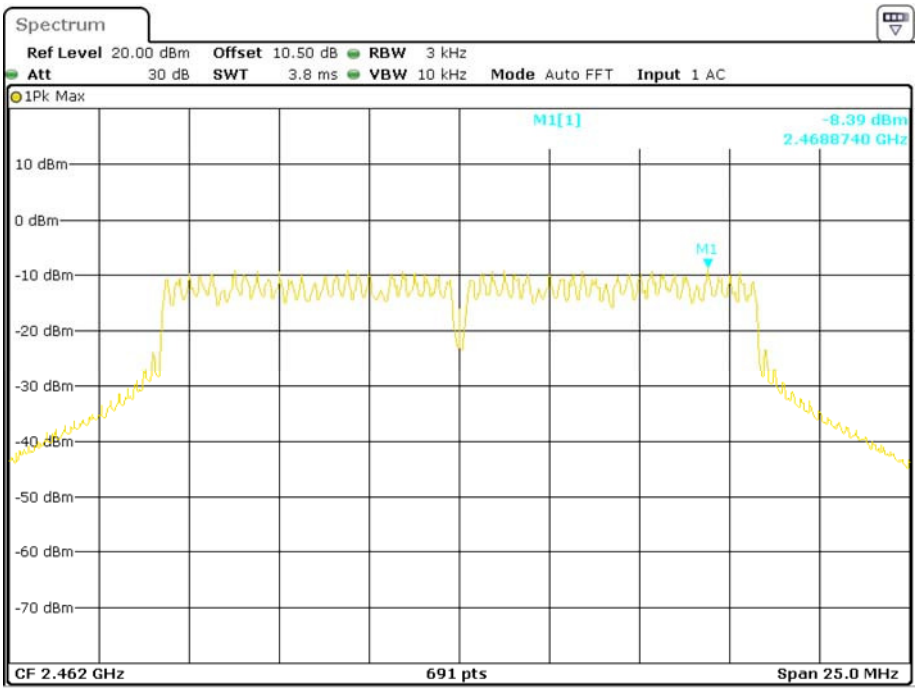
Date: 18.DEC.2015 00:36:36

Power Spectral Density, 802.11g Middle Channel



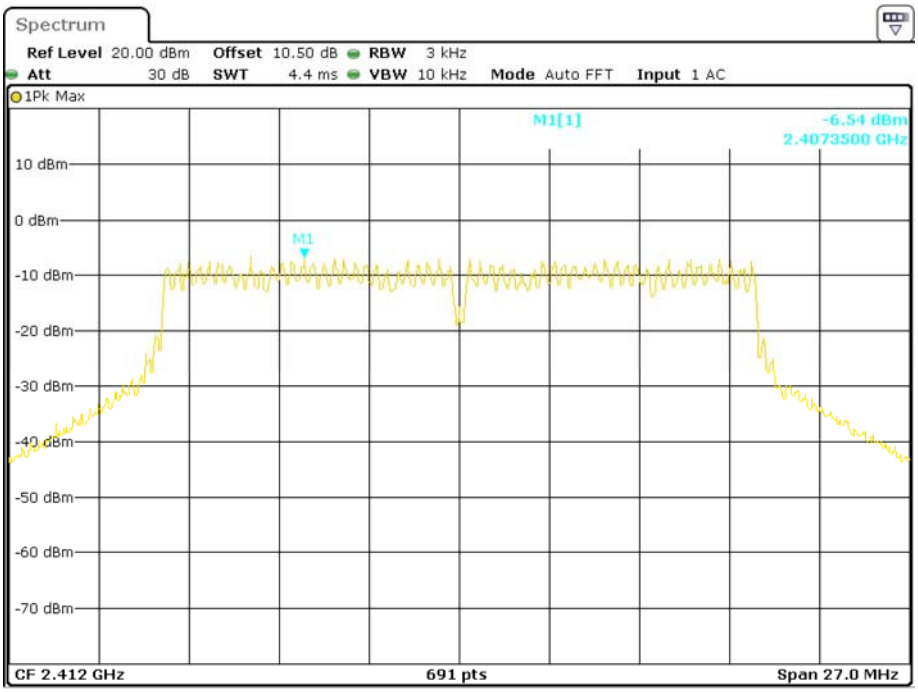
Date: 18.DEC.2015 00:37:17

Power Spectral Density, 802.11g High Channel



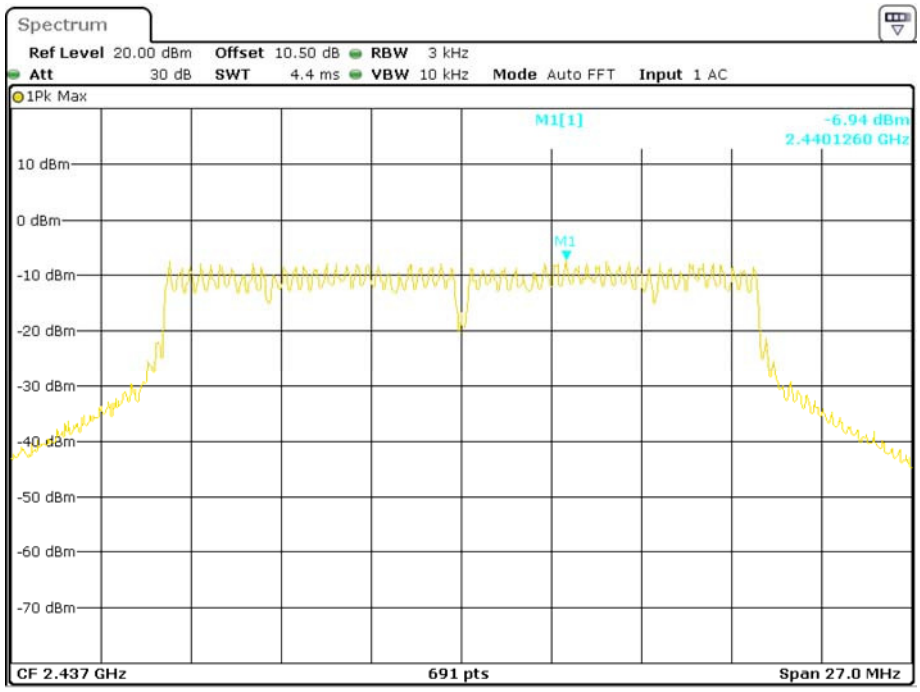
Date: 18.DEC.2015 00:37:45

Power Spectral Density, 802.11n-HT20 Low Channel

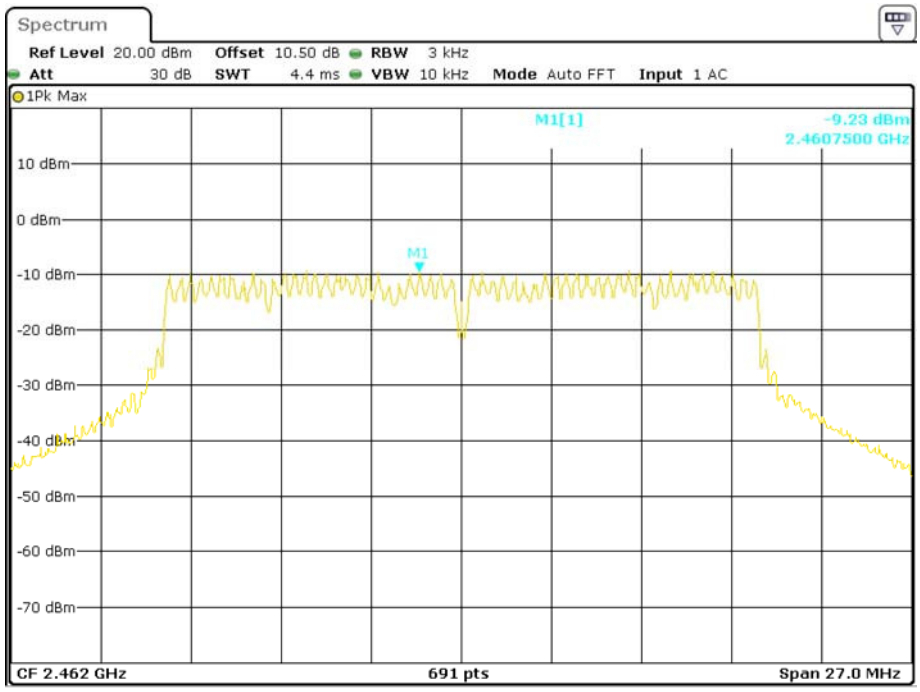


Date: 18.DEC.2015 00:39:21

Power Spectral Density, 802.11n-HT20 Middle Channel

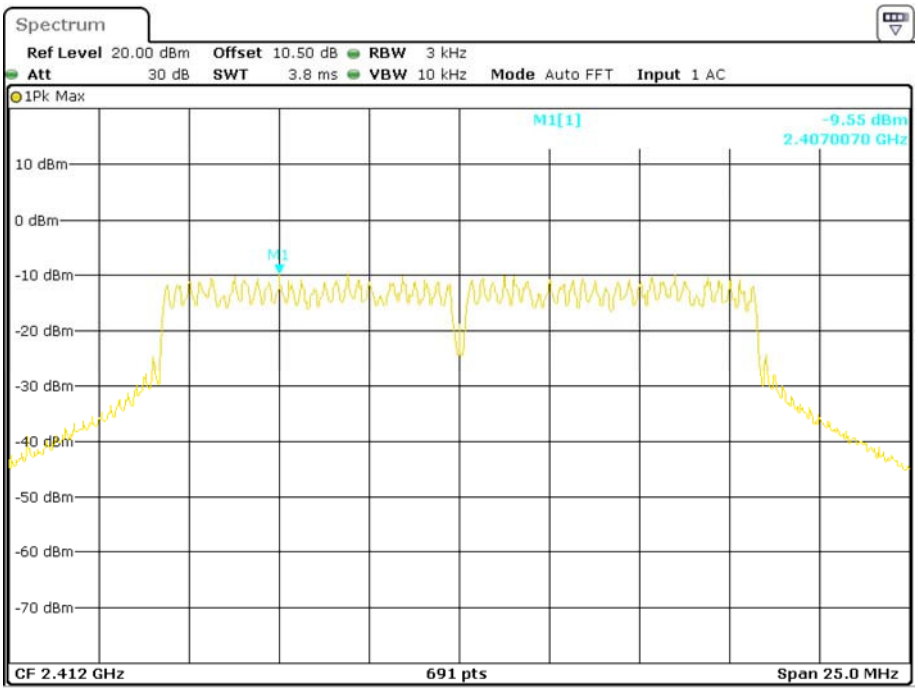


Power Spectral Density, 802.11n-HT20 High Channel



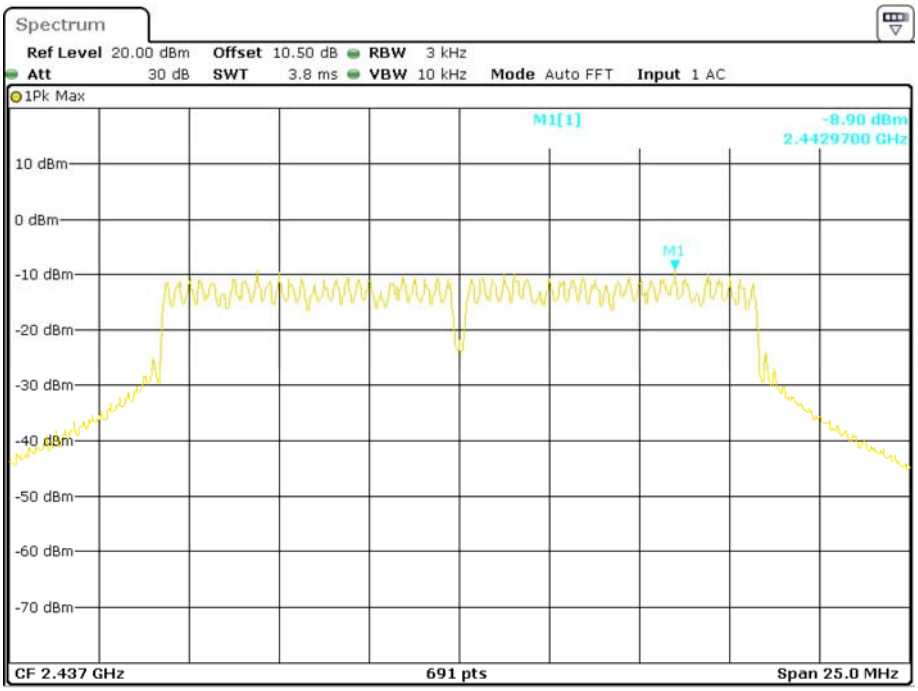
Antenna 2:

Power Spectral Density, 802.11g Low Channel



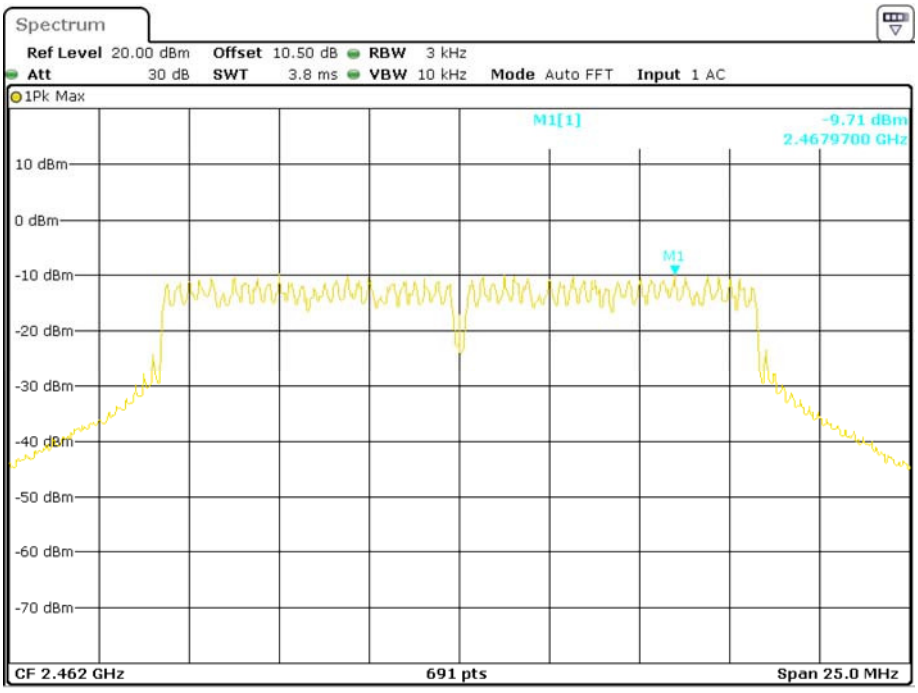
Date: 18.DEC.2015 00:42:58

Power Spectral Density, 802.11g Middle Channel

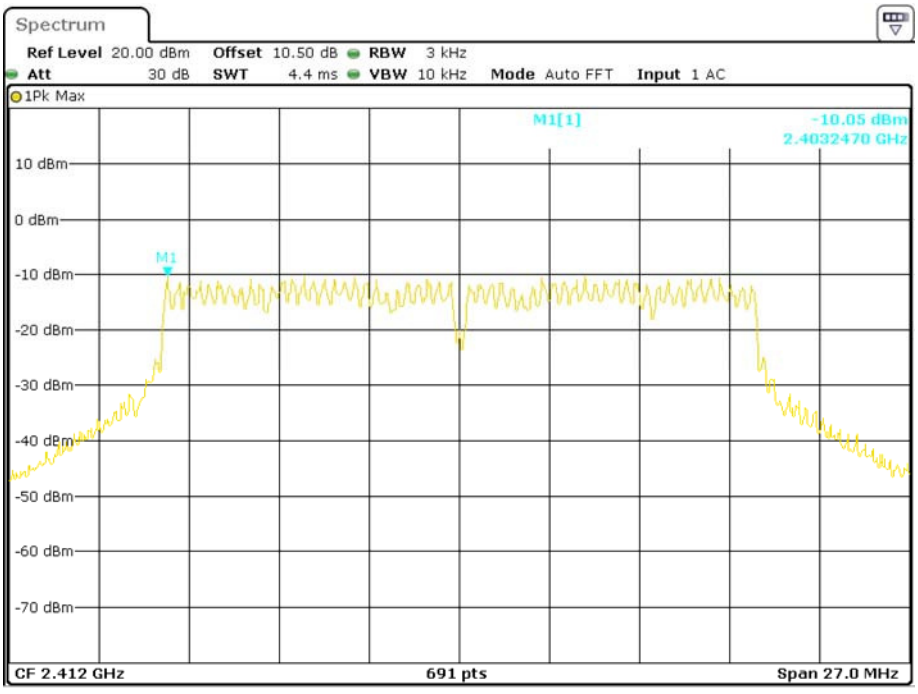


Date: 18.DEC.2015 00:42:25

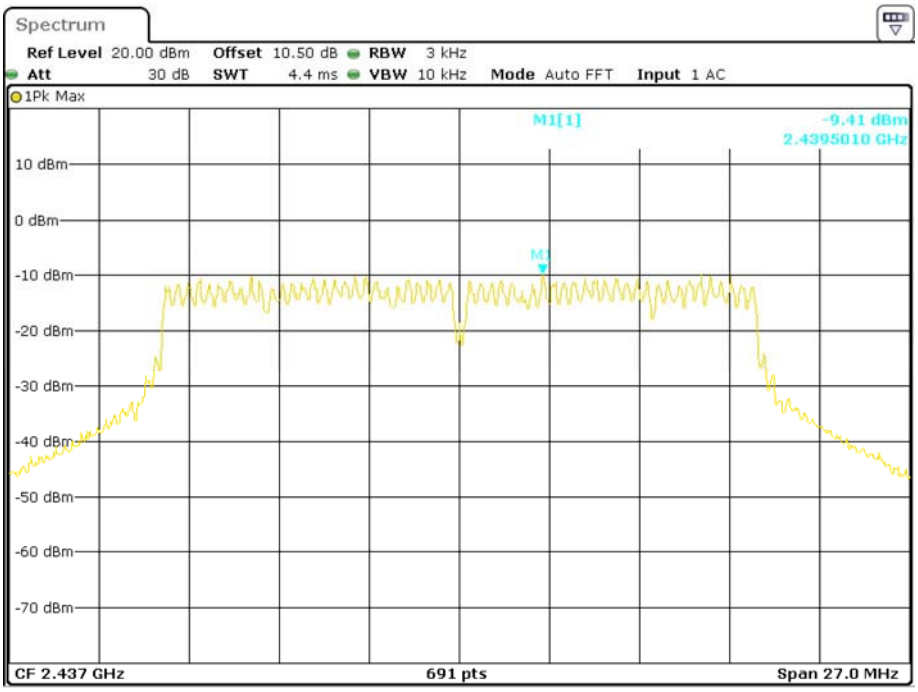
Power Spectral Density, 802.11g High Channel



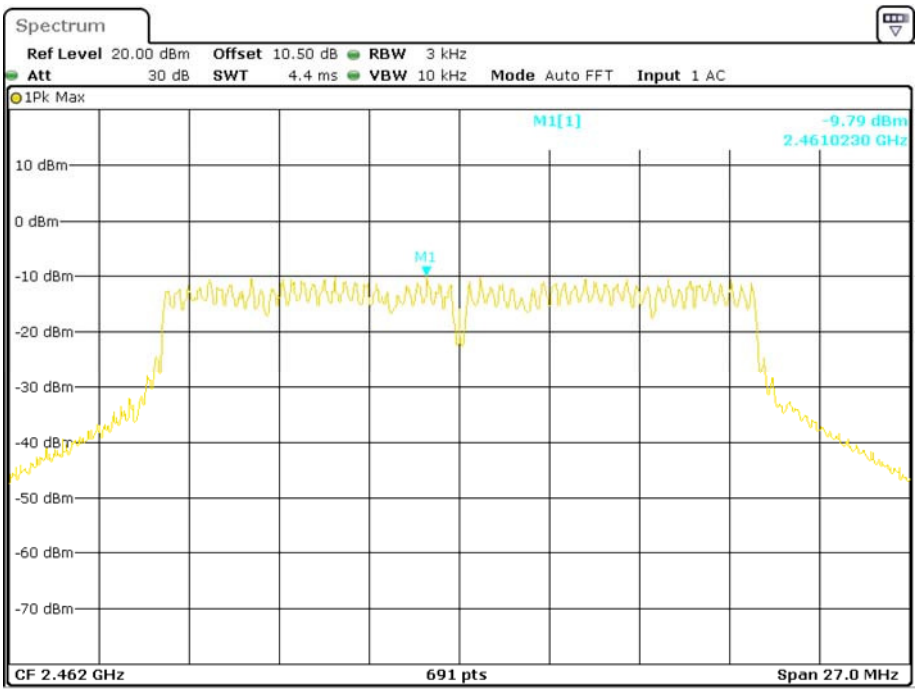
Power Spectral Density, 802.11n-HT20 Low Channel



Power Spectral Density, 802.11n-HT20 Middle Channel



Power Spectral Density, 802.11n-HT20 High Channel



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