FCC PART 15.247

TEST REPORT

For

Qingdao Yeelink Information Technology Co., Ltd.

F10-B4, Bldg.B, International Innovation Park, 1#

Keyuanweiyi Rd., Laoshan, Qingdao, Shandong

FCC ID: 2ABEU-YLDP03YL

Report Type:	Product Type:
Original Report	YEELIGHT LED BULB (COLOR)

Test Engineer:	Chris Wang
Report Number:	RKS161116002-00B
Report Date:	2016-12-07
Reviewed By:	Jesse Huang EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Qingdao Yeelink Information Technology Co., Ltd.'s product, model number: YLDP03YL (FCC ID: 2ABEU-YLDP03YL) or the "EUT" in this report was a YEELIGHT LED BULB (COLOR), which was measured approximately: 120mm (L) x55 mm (W). Rated input voltage: AC120V.

**All measurement and test data in this report was gathered from production sample serial number: 20161111003. (Assigned by the BACL. The EUT supplied by the applicant was received on 2016-11-11)*

Objective

This report is prepared on behalf of Qingdao Yeelink Information Technology 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)

N/A.

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 FCC KDB558074 D01 DTS Meas Guidance v03r05.

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

Measurement uncertainty with RF radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road,Kunshan,Jiangsu province,China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) 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 November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. 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 802.11b, 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	/	/

EUT was tested with Channel 1, 6 and 11.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

DutApiWiFi8845BrdigeUart.exe

The worst case was performed under:

802.11b: Data rate:1 Mbps, Power level: 19
802.11g: Data rate: 6 Mbps, Power level: 20
802.11n-HT20: Data rate: MCS0, Power level: 19

Support Equipment List and Details

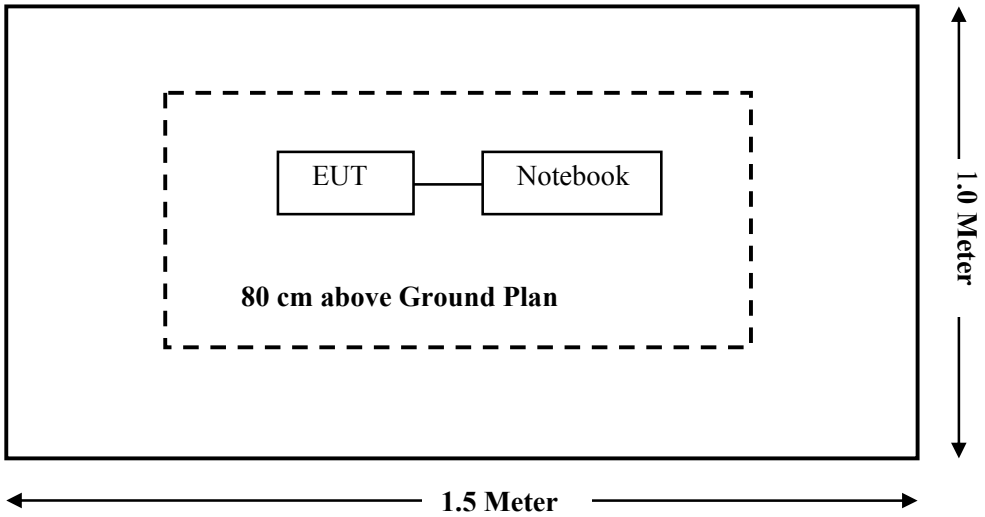
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152

External I/O Cable

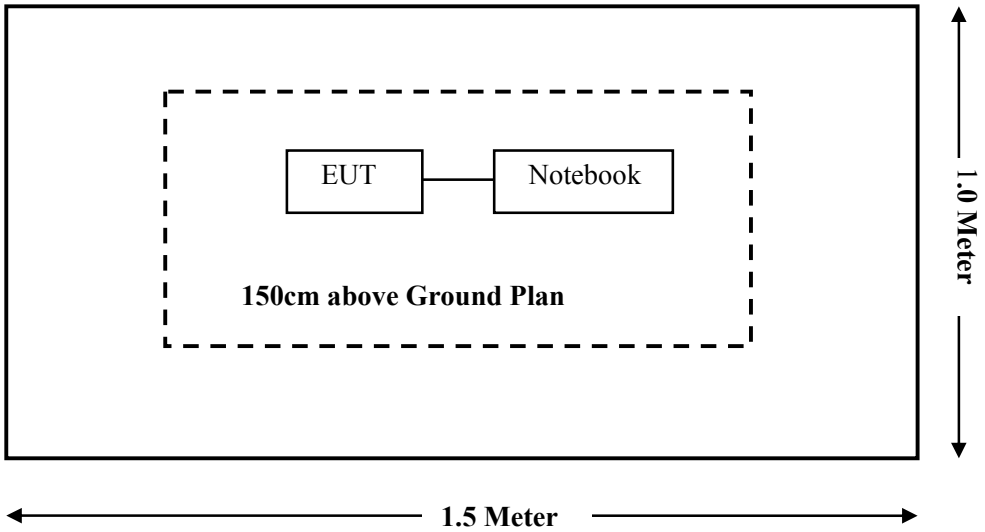
Cable Description	Length (m)	From Port	To
USB Cable	0.3	EUT	Notebook

Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



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	Compliance
§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

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

Applicable Standard

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

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

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

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

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

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 Range**	**Antenna Gain**		**Output Power**		**Evaluation Distance**	**Power Density**	**MPE Limit**
	(MHz)	**(dBi)**	**(numeric)**	**(dBm)**	**(mW)**	**(cm)**	**(mW/cm^2)**	**(mW/cm^2)**
802.11b	2412-2462	2.2	1.66	22	158.49	20	0.0523	1
802.11g	2412-2462	2.2	1.66	24	251.19	20	0.0829	1
802.11n HT20	2412-2462	2.2	1.66	23	199.53	20	0.0659	1

Note: The target output power:
802.11b： 21±1dBm, which declared by the Manufacturer.
802.11g： 23±1dBm, which declared by the Manufacturer.
802.11n HT20： 22±1dBm, 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.
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 a PCB antenna arrangement for wifi, which the antenna gain is 2.2 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

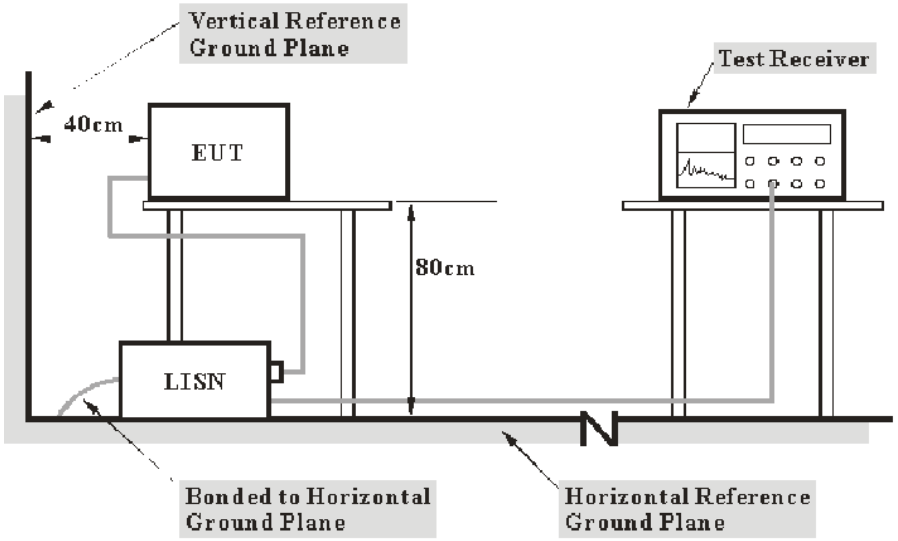
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Kunshan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

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 limits.

The adapter was connected to a 120 VAC/60 Hz 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 outlet of the 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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	934115/007	2016-11-12	2017-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-10
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	/	/
MICRO-COAX	Coaxial line	UFB-293B-1-0480-50X50	97F0173	2016-10-01	2017-10-01

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

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB 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 Part 15.207, the worst margin reading as below:

22.84dB at **0.960000 MHz** in the **Neutral** conducted mode

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

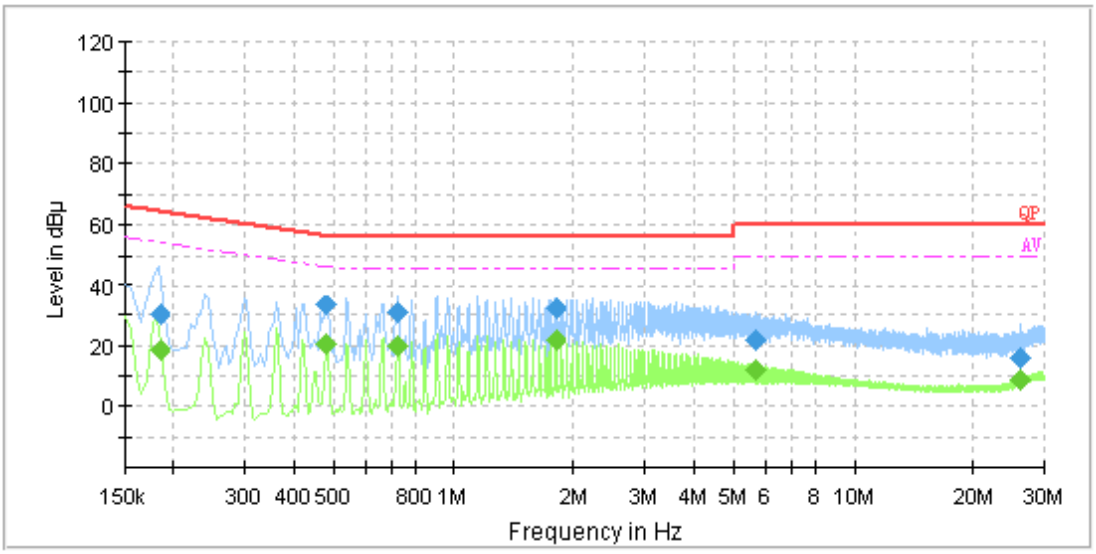
Environmental Conditions

Temperature:	22.8 ℃
Relative Humidity:	55 %
ATM Pressure:	101.1kPa

The testing was performed by Chris Wang on 2016-11-16.

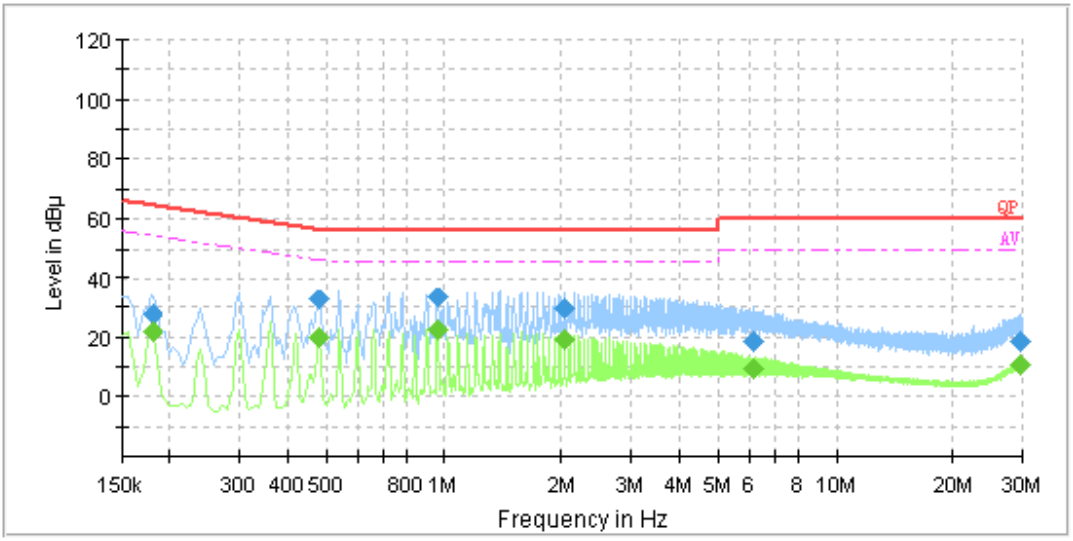
EUT operation mode: Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.185000	---	18.57	9.000	L1	10.3	35.69	54.26	Compliance
0.185000	29.88	---	9.000	L1	10.3	34.38	64.26	Compliance
0.480000	---	20.65	9.000	L1	10.3	25.69	46.34	Compliance
0.480000	33.45	---	9.000	L1	10.3	22.89	56.34	Compliance
0.725000	---	19.76	9.000	L1	10.3	26.24	46.00	Compliance
0.725000	30.50	---	9.000	L1	10.3	25.50	56.00	Compliance
1.805000	---	21.44	9.000	L1	10.4	24.56	46.00	Compliance
1.805000	32.23	---	9.000	L1	10.4	23.77	56.00	Compliance
5.660000	---	12.02	9.000	L1	10.5	37.98	50.00	Compliance
5.660000	21.40	---	9.000	L1	10.5	38.60	60.00	Compliance
26.180000	---	8.40	9.000	L1	10.5	41.60	50.00	Compliance
26.180000	15.81	---	9.000	L1	10.5	44.19	60.00	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.180000	---	21.73	9.000	N	10.3	32.76	54.49	Compliance
0.180000	27.76	---	9.000	N	10.3	36.73	64.49	Compliance
0.480000	---	19.45	9.000	N	10.3	26.89	46.34	Compliance
0.480000	32.46	---	9.000	N	10.3	23.88	56.34	Compliance
0.960000	---	22.19	9.000	N	10.3	23.81	46.00	Compliance
0.960000	33.16	---	9.000	N	10.3	22.84	56.00	Compliance
2.040000	---	18.86	9.000	N	10.4	27.14	46.00	Compliance
2.040000	29.78	---	9.000	N	10.4	26.22	56.00	Compliance
6.125000	---	9.44	9.000	N	10.6	40.56	50.00	Compliance
6.125000	18.74	---	9.000	N	10.6	41.26	60.00	Compliance
29.815000	---	10.85	9.000	N	10.6	39.15	50.00	Compliance
29.815000	18.20	---	9.000	N	10.6	41.80	60.00	Compliance

Note:

1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
2) Corrected Amplitude = Reading + Corr.
3) Margin = Limit –Corrected Amplitude

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

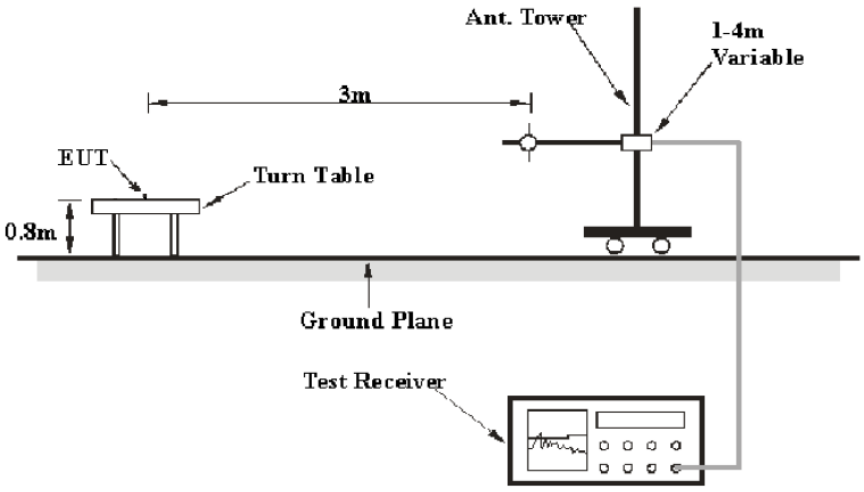
Measurement Uncertainty

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.

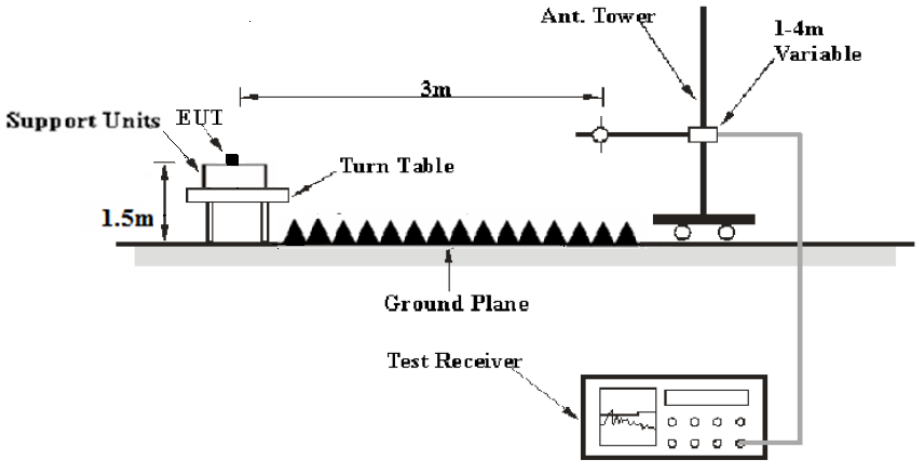
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration for the test data recorded in the report

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters 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 adapter was connected to a 120 VAC/60 Hz power source.

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
Sonoma Instrunent	Amplifier	330	171377	2016-10-21	2017-10-21
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-12	2017-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
ETS	Horn Antenna	3115	6229	2016-11-07	2017-11-06
EMCO	Horn Antenna	3116	2516	2016-11-07	2019-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-21
Mini	Pre-amplifier	ZVA-183-S+	857001418	2016-09-16	2017-09-16
DUCOMMUN	Pre-amplifier	ALN-22093530-01	990147	2016-09-16	2017-09-16
champrotek	Chamber	Chamber A	1#	/	/
R&S	Auto test Software	EMC32	V 09.10.0	/	/
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2016-09-16	2017-09-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) 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.

3.17 dB at **2483.5 MHz** in **802.11n-HT20 Mode High Channel**

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

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

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

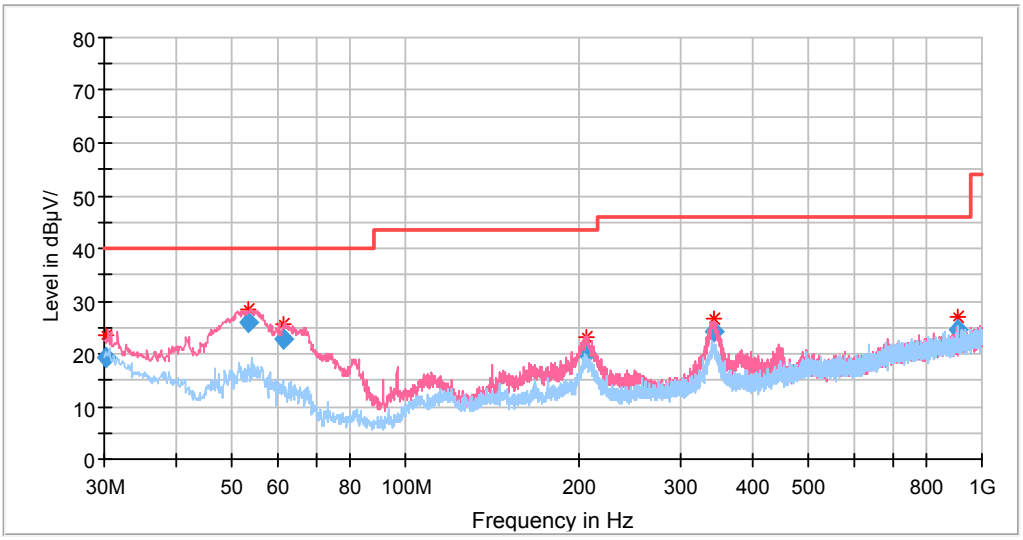
Environmental Conditions

Temperature:	25.1 ℃
Relative Humidity:	54 %
ATM Pressure:	101.2kPa

The testing was performed by Chris Wang on 2016-11-12 to 2016-11-13.

EUT operation mode: Transmitting

30M-1GMHz



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 (cm)	Polar (H/V)			Limit (dB µ V/m)	Margin (dB)
30.120000	24.34	QP	118.0	101.0	V	-5.0	19.34	40.00	20.66
53.493400	42.54	QP	132.0	101.0	V	-16.6	25.94	40.00	14.06
61.528850	39.67	QP	193.0	101.0	V	-16.9	22.77	40.00	17.23
205.903050	32.44	QP	195.0	199.0	V	-12.5	19.94	43.50	23.56
341.787550	33.93	QP	236.0	199.0	V	-9.6	24.33	46.00	21.67
908.008500	25.47	QP	301.0	199.0	H	-0.8	24.67	46.00	21.33

1GMHz-25GHz

802.11b Mode:

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Low Channel (2412 MHz)									
2412	108.99	PK	48	250	V	-3.0	105.99	/	/
2412	104.97	Ave	48	250	V	-3.0	101.97	/	/
2412	105.69	PK	254	157	H	-3.0	102.69	/	/
2412	101.67	Ave	254	157	H	-3.0	98.67	/	/
2390	61.28	PK	335	230	H	-3.5	57.78	74	16.22
2390	30.98	Ave	335	230	H	-3.5	27.48	54	26.52
2400	44.73	PK	350	246	H	-3.7	41.03	74	32.97
2400	28.25	Ave	350	246	H	-3.7	24.55	54	29.45
4824	48.66	PK	349	148	V	7.2	55.86	74	18.14
4824	34.32	Ave	349	148	V	7.2	41.52	54	12.48
6663	35.75	PK	209	143	H	13.4	49.15	74	24.85
6663	21.88	Ave	209	143	H	13.4	35.28	54	18.72
7236	35.7	PK	179	122	V	14.7	50.40	74	23.60
7236	21.16	Ave	179	122	V	14.7	35.86	54	18.14
Middle Channel (2437 MHz)									
2437	108.91	PK	5	241	V	-3.0	105.91	/	/
2437	103.93	Ave	5	241	V	-3.0	100.93	/	/
2437	104.25	PK	90	185	H	-3.0	101.25	/	/
2437	99.79	Ave	90	185	H	-3.0	96.79	/	/
1574	43.73	PK	185	140	V	-7.2	36.53	74	37.47
1574	28.61	Ave	185	140	V	-7.2	21.41	54	32.59
3058	38.9	PK	96	121	V	0.3	39.20	74	34.80
3058	24.8	Ave	96	121	V	0.3	25.10	54	28.90
4874	48.24	PK	215	207	V	7.9	56.14	74	17.86
4874	32.98	Ave	215	207	V	7.9	40.88	54	13.12
6663	36.23	PK	189	201	H	13.4	49.63	74	24.37
6663	22.7	Ave	189	201	H	13.4	36.10	54	17.90
7311	34.73	PK	10	186	V	15.0	49.73	74	24.27
7311	20	Ave	10	186	V	15.0	35.00	54	19.00

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
High Channel (2462 MHz)									
2462	109.62	PK	44	215	V	-3.0	106.62	/	/
2462	104.75	Ave	44	215	V	-3.0	101.75	/	/
2462	105.51	PK	265	199	H	-3.0	102.51	/	/
2462	101.36	Ave	265	199	H	-3.0	98.36	/	/
2483.5	57.25	PK	24	116	H	-3.2	54.05	74	19.95
2483.5	33.1	Ave	24	116	H	-3.2	29.90	54	24.10
2588	41.79	PK	56	121	V	-2.5	39.29	74	34.71
2588	26.67	Ave	56	121	V	-2.5	24.17	54	29.83
4924	47.9	PK	57	119	V	8.5	56.40	74	17.60
4924	32.46	Ave	57	119	V	8.5	40.96	54	13.04
6663	37.16	PK	240	160	H	13.4	50.56	74	23.44
6663	22.85	Ave	240	160	H	13.4	36.25	54	17.75
7386	34.37	PK	180	106	V	15.2	49.57	74	24.43
7386	20.21	Ave	180	106	V	15.2	35.41	54	18.59

802.11g Mode:

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Low Channel (2412 MHz)									
2412	108.18	PK	265	238	V	-3.0	105.18	/	/
2412	104.04	Ave	265	238	V	-3.0	101.04	/	/
2412	103.02	PK	222	126	H	-3.0	100.02	/	/
2412	98.35	Ave	222	126	H	-3.0	95.35	/	/
2390	72.35	PK	217	136	H	-3.5	68.85	74	5.15
2390	47.25	Ave	217	136	H	-3.5	43.75	54	10.25
2400	48.26	PK	292	250	H	-3.8	44.46	74	29.54
2400	29.12	Ave	292	250	H	-3.8	25.32	54	28.68
4824	47.67	PK	225	200	V	7.2	54.87	74	19.13
4824	27.37	Ave	225	200	V	7.2	34.57	54	19.43
6692	35.73	PK	126	193	H	13.4	49.13	74	24.87
6692	22.56	Ave	126	193	H	13.4	35.96	54	18.04
7236	42.1	PK	207	181	V	14.7	56.8	74	17.20
7236	20.95	Ave	207	181	V	14.7	35.65	54	18.35

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Middle Channel (2437 MHz)									
2437	107.46	PK	247	203	V	-3.0	104.46	/	/
2437	102.87	Ave	247	203	V	-3.0	99.87	/	/
2437	101.56	PK	325	222	H	-3.0	98.56	/	/
2437	97.3	Ave	325	222	H	-3.0	94.30	/	/
1593	51.3	PK	173	105	V	-7.1	44.20	74	29.80
1593	35.9	Ave	173	105	V	-7.1	28.80	54	25.20
3058	38.35	PK	92	121	V	0.3	38.65	74	35.35
3058	24.8	Ave	92	121	V	0.3	25.10	54	28.90
4874	46.63	PK	186	124	V	7.9	54.53	74	19.47
4874	26	Ave	186	124	V	7.9	33.90	54	20.10
6692	35.95	PK	191	234	H	13.4	49.35	74	24.65
6692	22.43	Ave	191	234	H	13.4	35.83	54	18.17
7311	41.34	PK	213	175	V	15.0	56.34	74	17.66
7311	20.01	Ave	213	175	V	15.0	35.01	54	18.99

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
High Channel (2462 MHz)									
2462	108.24	PK	61	119	V	-3.0	105.24	/	/
2462	103.36	Ave	61	119	V	-3.0	100.36	/	/
2462	104.81	PK	127	109	H	-3.0	101.81	/	/
2462	100.73	Ave	127	109	H	-3.0	97.73	/	/
2483.5	73.6	PK	314	149	H	-3.2	70.40	74	3.60
2483.5	43.82	Ave	314	149	H	-3.2	40.62	54	13.38
2589	45.72	PK	209	239	V	-2.5	43.22	74	30.78
2589	26.68	Ave	209	239	V	-2.5	24.18	54	29.82
4924	46.01	PK	0	120	V	8.5	54.51	74	19.49
4924	25.06	Ave	0	120	V	8.5	33.56	54	20.44
6692	36.05	PK	95	172	H	13.4	49.45	74	24.55
6692	21.75	Ave	95	172	H	13.4	35.15	54	18.85
7386	41.38	PK	320	239	V	15.2	56.58	74	17.42
7386	20.39	Ave	320	239	V	15.2	35.59	54	18.41

802.11n-HT20 Mode:

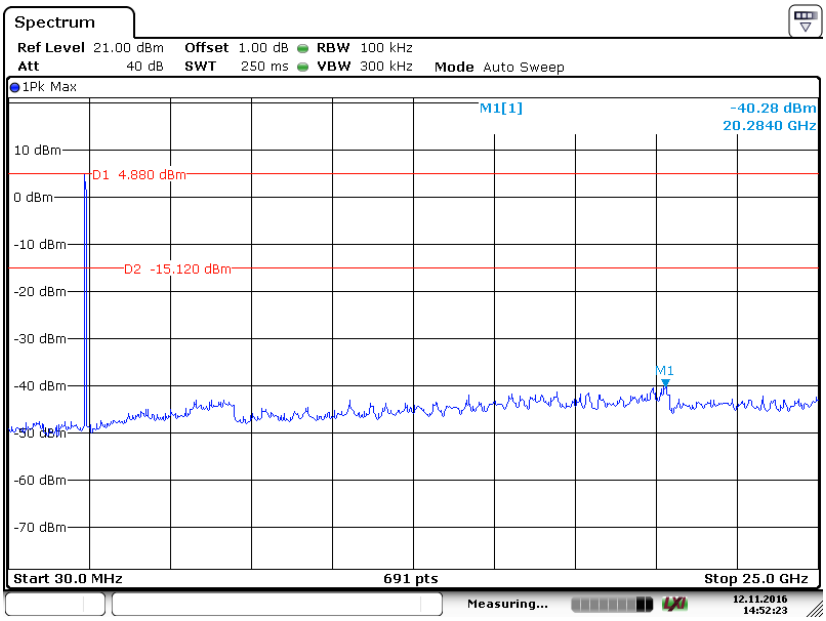
Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Low Channel (2412 MHz)									
2412	107.45	PK	21	105	V	-3.0	104.45	/	/
2412	103.21	Ave	21	105	V	-3.0	100.21	/	/
2412	103.3	PK	230	123	H	-3.0	100.30	/	/
2412	98.52	Ave	230	123	H	-3.0	95.52	/	/
2324	47.38	PK	350	195	V	-3.7	43.68	74	30.32
2324	30.41	Ave	350	195	V	-3.7	26.71	54	27.29
2400	71.18	PK	335	128	H	-3.5	67.68	74	6.32
2400	48.52	Ave	335	128	H	-3.5	45.02	54	8.98
4824	48.46	PK	138	155	H	7.2	55.66	74	18.34
4824	29.04	Ave	138	155	H	7.2	36.24	54	17.76
6624	36.31	PK	239	108	H	13.3	49.61	74	24.39
6624	21.82	Ave	239	108	H	13.3	35.12	54	18.88
7236	38.31	PK	110	192	H	14.7	53.01	74	20.99
7236	19.73	Ave	110	192	H	14.7	34.43	54	19.57

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Middle Channel (2437 MHz)									
2437	107.23	PK	199	137	V	-3.0	104.23	/	/
2437	102.85	Ave	199	137	V	-3.0	99.85	/	/
2437	103.96	PK	358	150	H	-3.0	100.96	/	/
2437	99.87	Ave	358	150	H	-3.0	96.87	/	/
1599	47.67	PK	109	148	V	-7.0	40.67	74	33.33
1599	31.54	Ave	109	148	V	-7.0	24.54	54	29.46
3316	39.3	PK	78	224	V	1.1	40.40	74	33.60
3316	25.82	Ave	78	224	V	1.1	26.92	54	27.08
4874	47.3	PK	44	234	H	7.9	55.20	74	18.80
4874	28	Ave	44	234	H	7.9	35.90	54	18.10
6624	36.23	PK	7	237	H	13.3	49.53	74	24.47
6624	22.38	Ave	7	237	H	13.3	35.68	54	18.32
7311	38.24	PK	50	192	H	15.0	53.24	74	20.76
7311	20	Ave	50	192	H	15.0	35.00	54	19.00

Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
High Channel (2462 MHz)									
2462	107.43	PK	31	179	V	-3.0	104.43	/	/
2462	103.02	Ave	31	179	V	-3.0	100.02	/	/
2462	101.84	PK	97	126	H	-3.0	98.84	/	/
2462	97.15	Ave	97	126	H	-3.0	94.15	/	/
2483.5	74.03	PK	24	203	H	-3.2	70.83	74	3.17
2483.5	53.21	Ave	24	203	H	-3.2	50.01	54	3.99
2509	52.86	PK	228	108	V	-3.0	49.86	74	24.14
2509	28.37	Ave	228	108	V	-3.0	25.37	54	28.63
4924	46.66	PK	33	150	H	8.5	55.16	74	18.84
4924	27.37	Ave	33	150	H	8.5	35.87	54	18.13
6624	36.34	PK	105	240	H	13.3	49.64	74	24.36
6624	22.85	Ave	105	240	H	13.3	36.15	54	17.85
7386	37.86	PK	75	113	H	15.2	53.06	74	20.94
7386	19.69	Ave	75	113	H	15.2	34.89	54	19.11

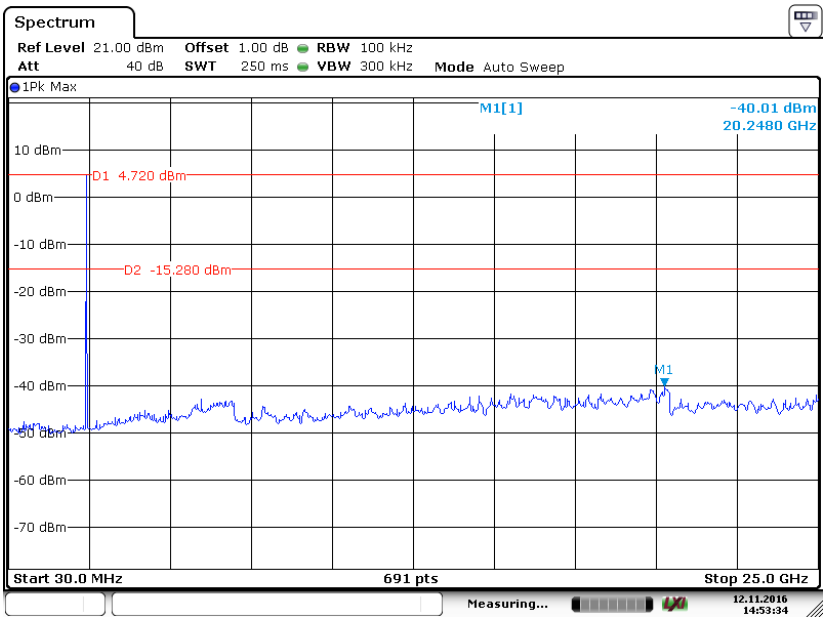
Conducted Spurious Emissions at Antenna Port

802.11b Low Channel



Date: 12.NOV.2016 14:52:23

802.11b Middle Channel



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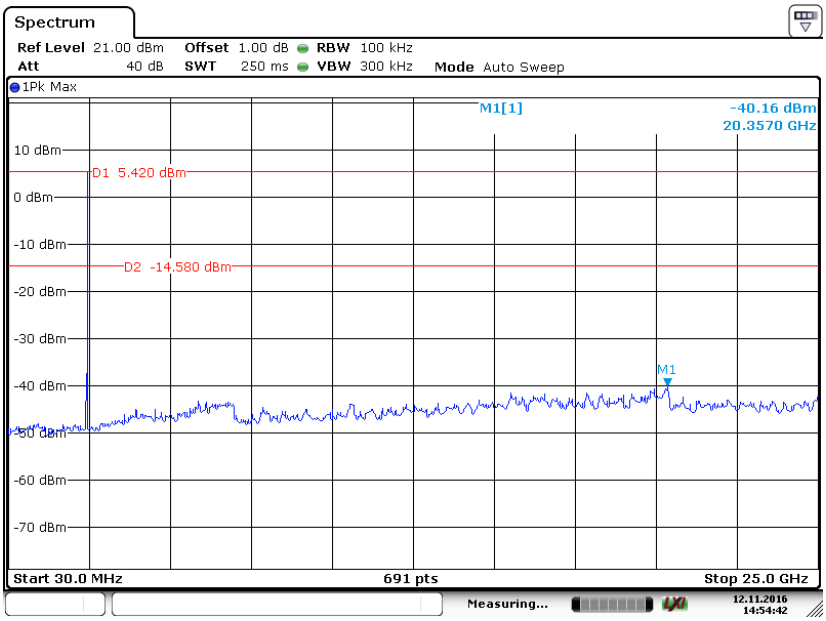
802.11b High Channel



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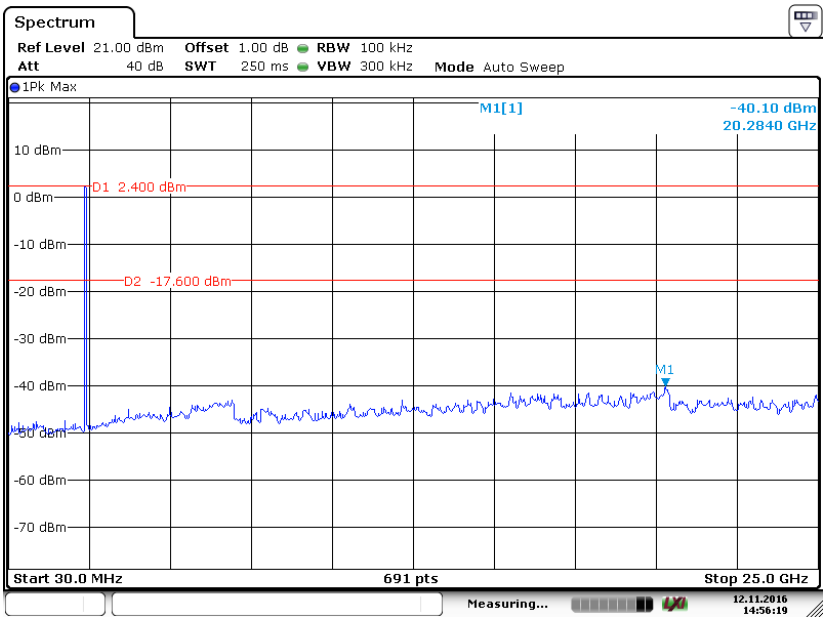
802.11g Low Channel



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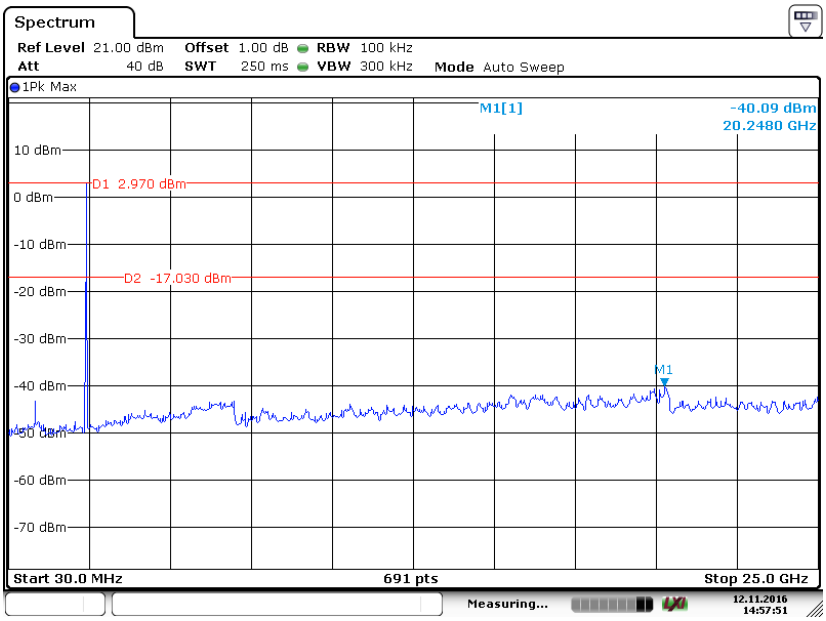
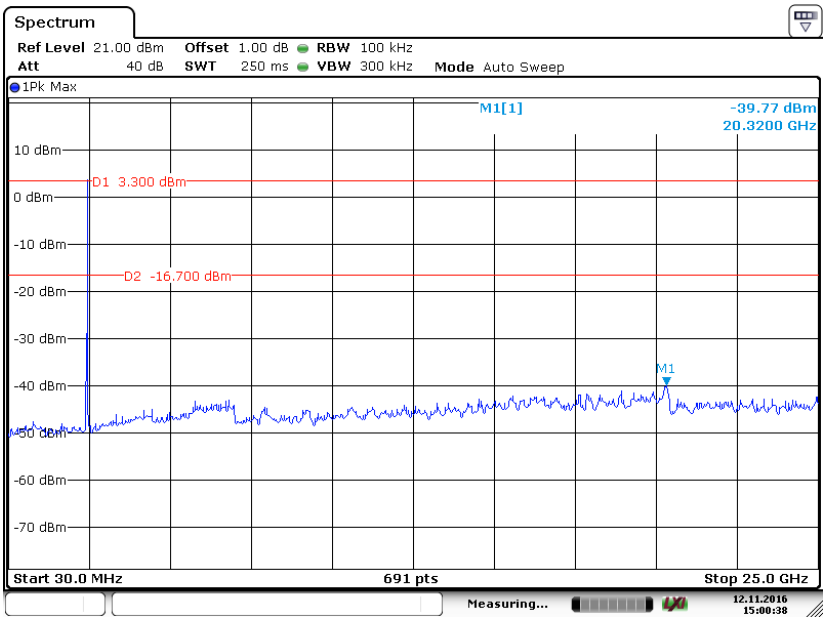
802.11g Middle Channel



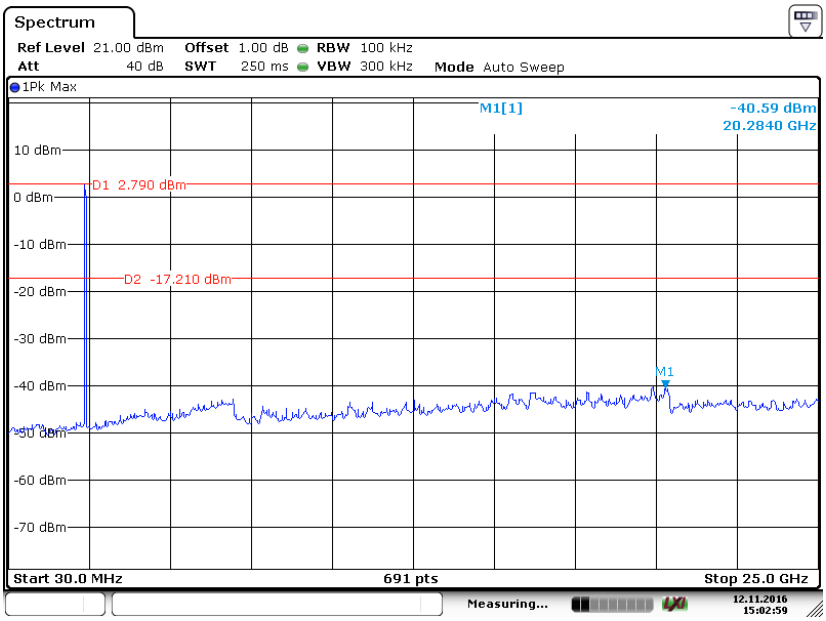
Date: 12.NOV.2016 14:57:50

802.11g High Channel



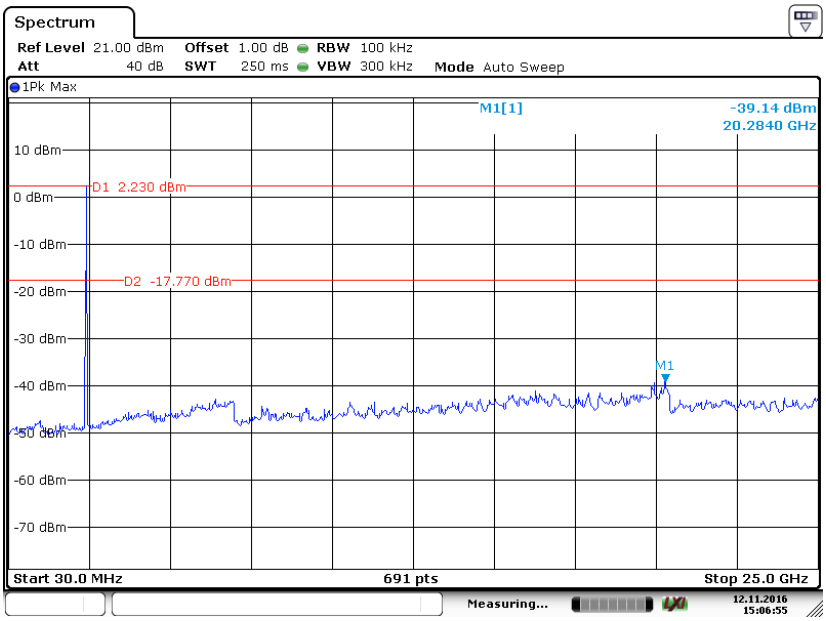
Date: 12.NOV.2016 15:00:38

802.11n-HT20 Low Channel



Date: 12.NOV.2016 15:02:59

802.11n-HT20 Middle Channel



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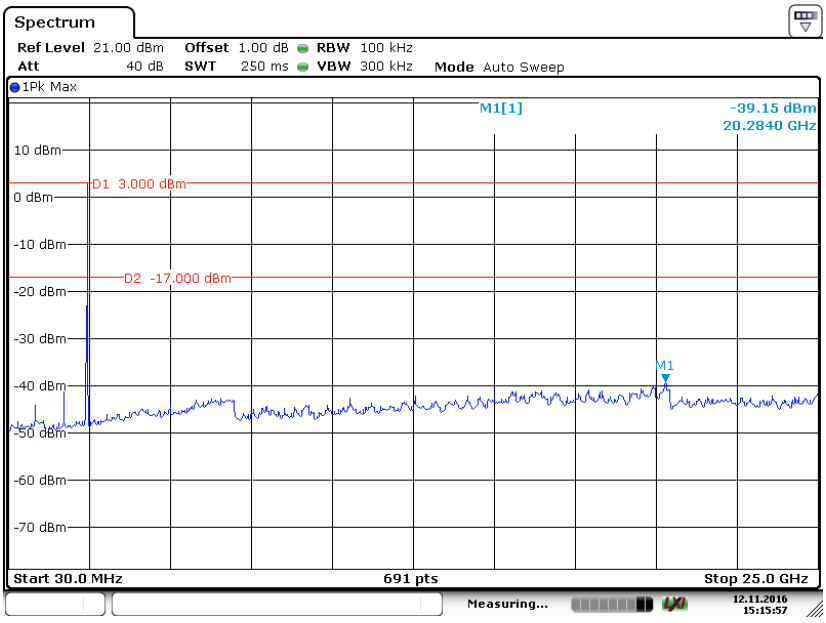
802.11n-HT20 High Channel



Date: 12.NOV.2016 15:15:57

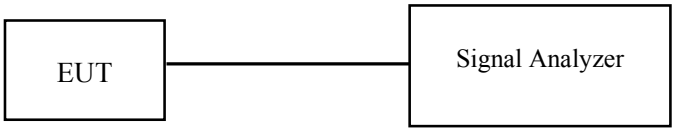
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) 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:	27 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-12.

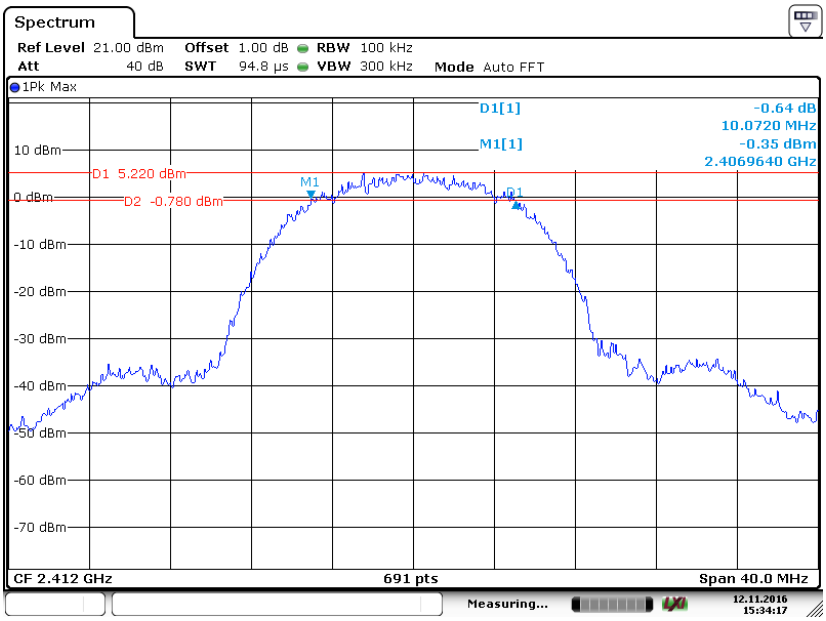
Test Result: Pass.

Please refer to the following tables and plots.

EUT operation mode: Transmitting

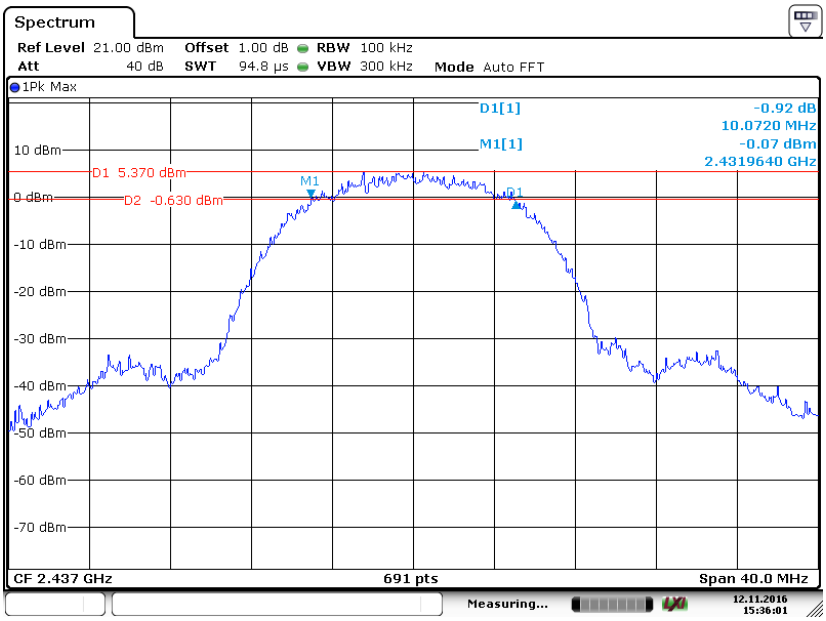
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b mode			
Low	2412	10.072	≥0.5
Middle	2437	10.072	≥0.5
High	2462	10.014	≥0.5
802.11g mode			
Low	2412	16.556	≥0.5
Middle	2437	16.556	≥0.5
High	2462	16.556	≥0.5
802.11n-HT20 mode			
Low	2412	17.656	≥0.5
Middle	2437	17.656	≥0.5
High	2462	17.656	≥0.5

802.11b Low Channel



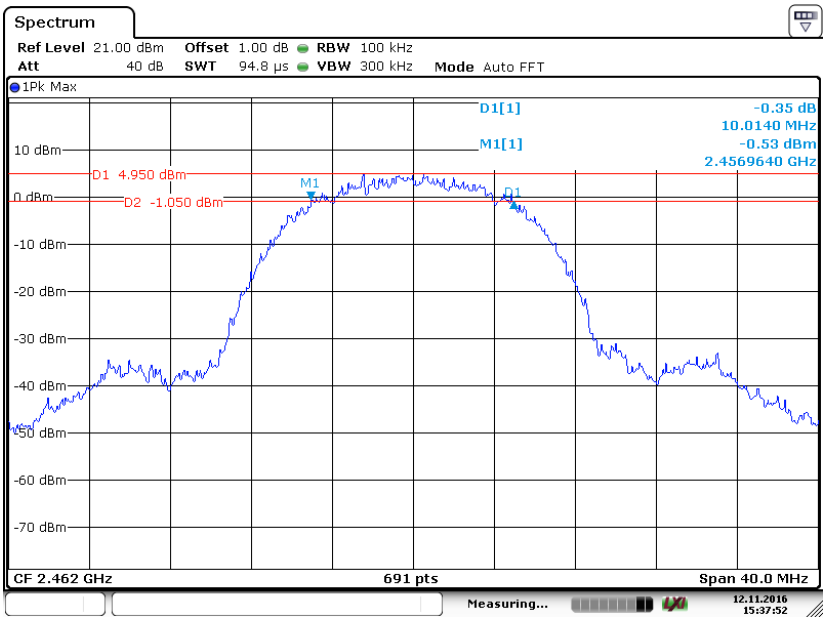
Date: 12.NOV.2016 15:34:17

802.11b Middle Channel



Date: 12.NOV.2016 15:36:01

802.11b High Channel



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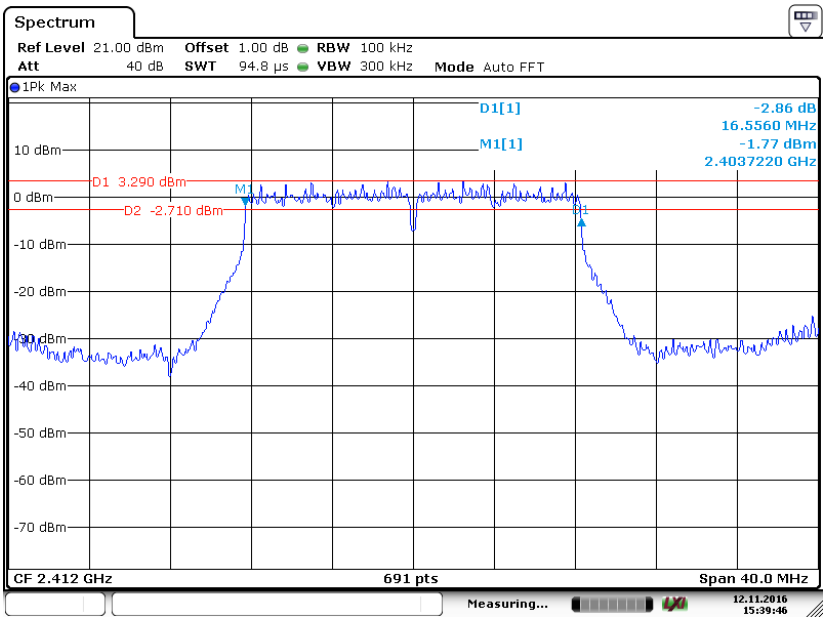
802.11g Low Channel



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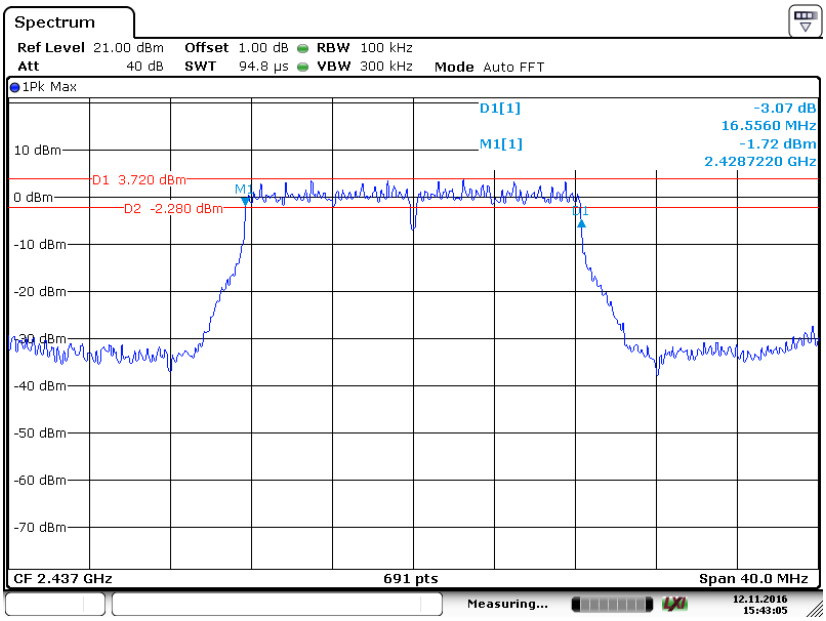
802.11g Middle Channel



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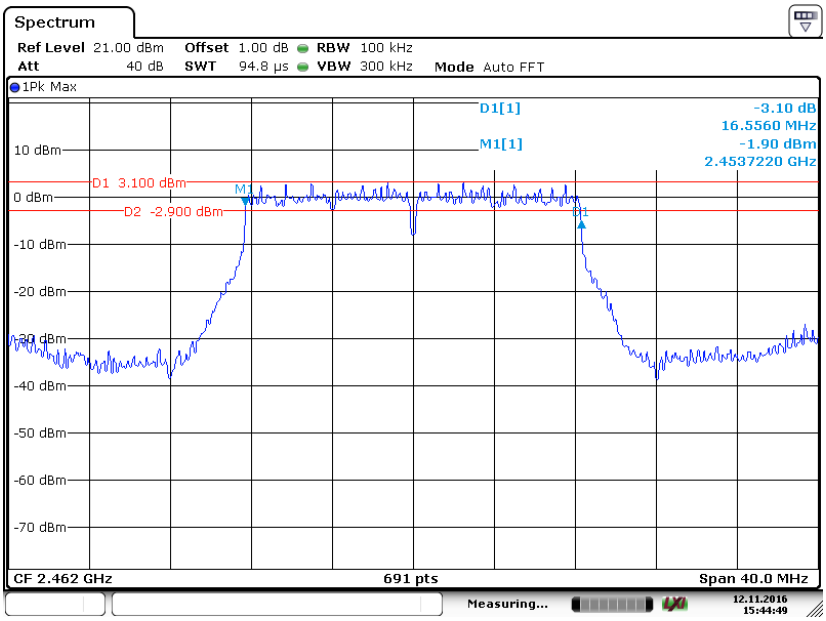
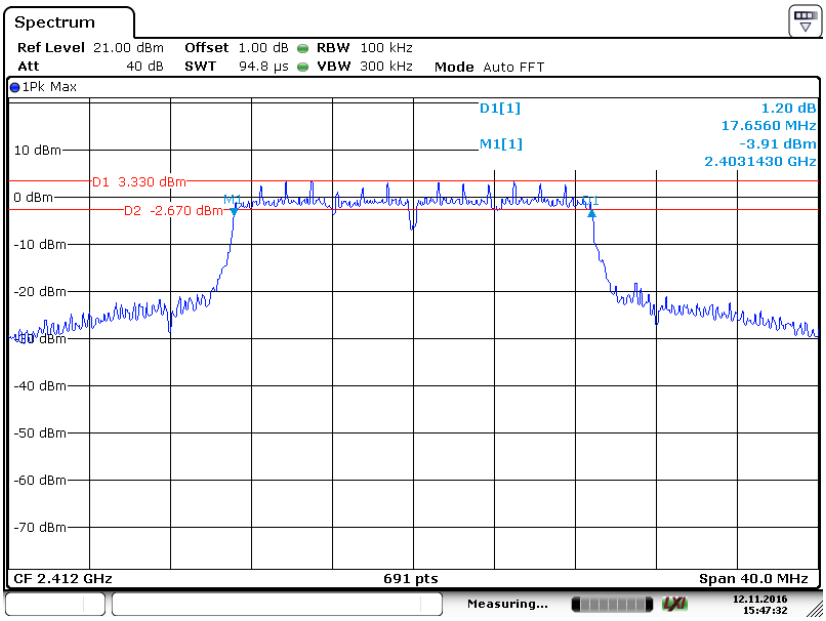
802.11g High Channel



Date: 12.NOV.2016 15:44:50

802.11n-HT20 Low Channel



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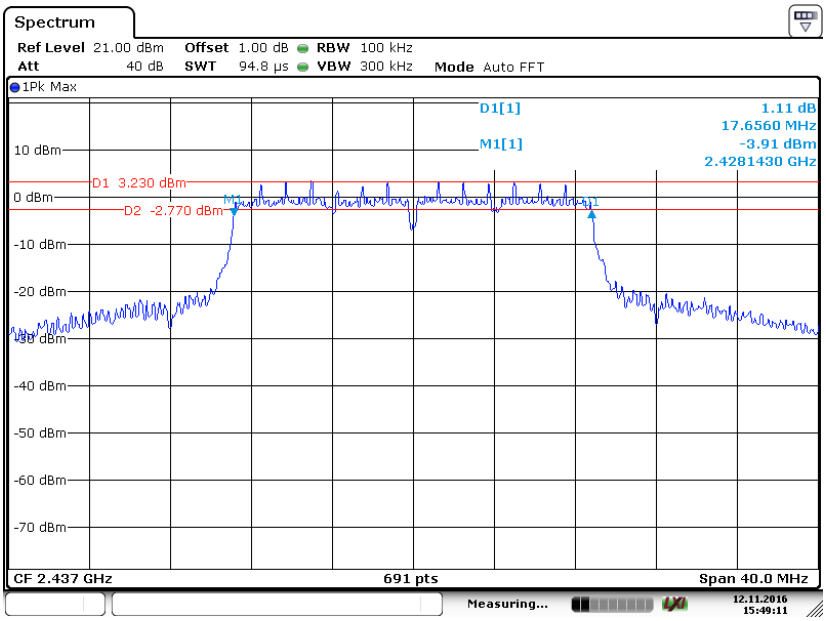
802.11n-HT20 Middle Channel



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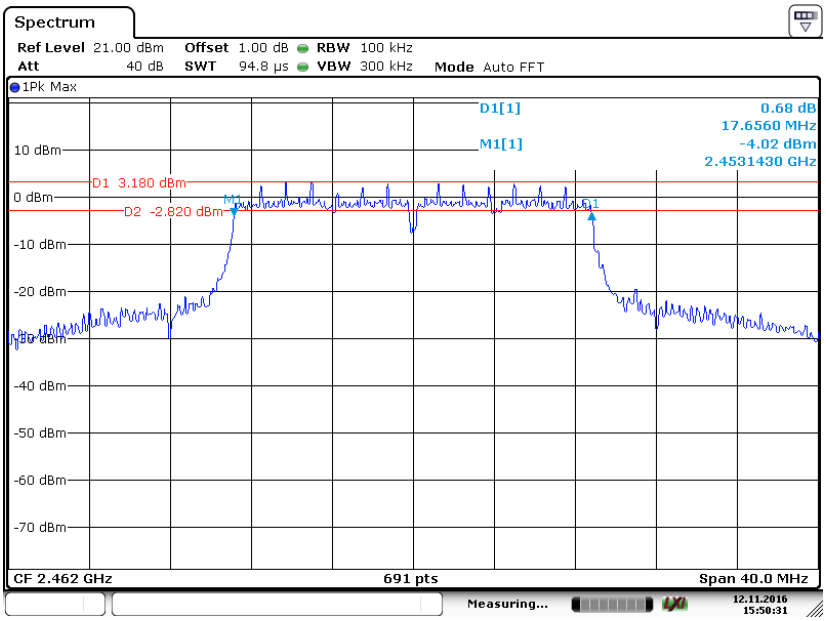
802.11n-HT20 High Channel



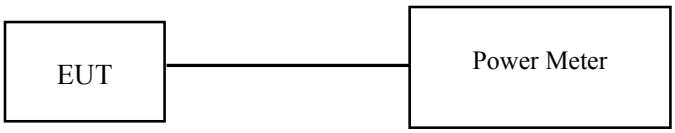
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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
Agilent	Power Meter	N1912A	MY5000492	2016-11-18	2017-11-17
Agilent	Power Sensor	N1921A	MY54210024	2016-11-18	2017-11-17
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) 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:	26℃
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

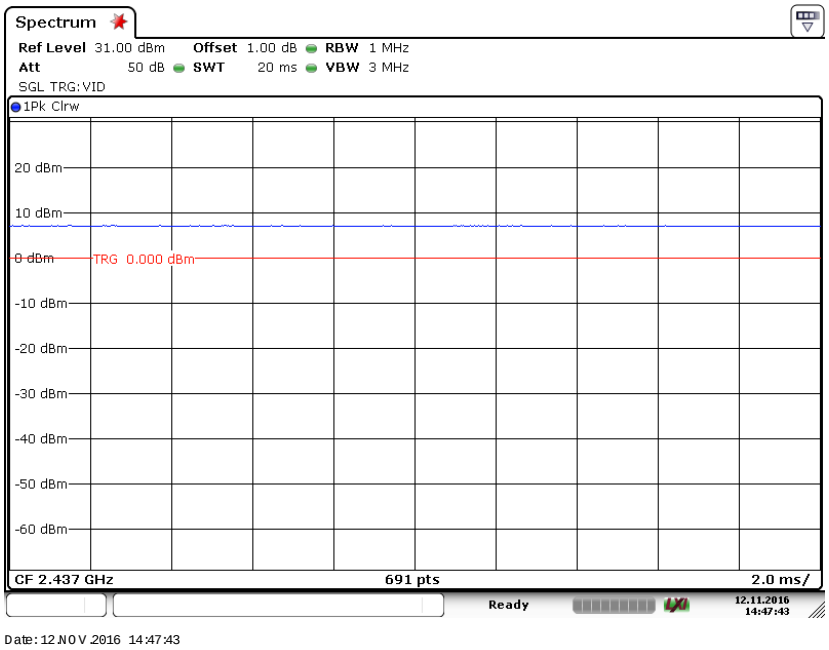
The testing was performed by Chris Wang on 2016-11-12.

EUT operation mode: Transmitting

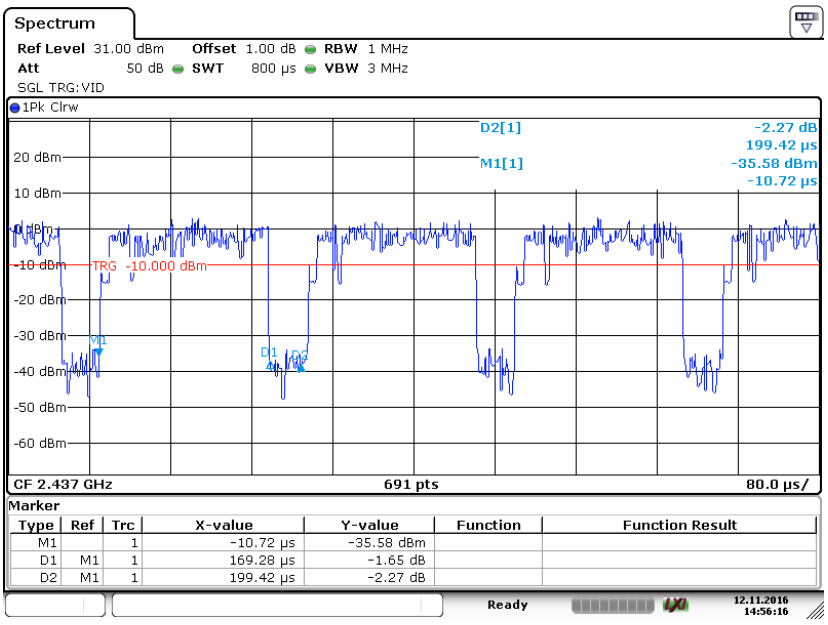
Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Conducted Average Output Power Reading (dBm)	Corrected Factor 10log(1/x) (dB)	Conducted Average Output Power (dBm)	Limit (dBm)	Result
802.11b							
Low	2412	21.07	18.77	0	18.77	30	Pass
Middle	2437	21.02	19.04	0	19.04	30	Pass
High	2462	20.91	18.60	0	18.60	30	Pass
802.11g							
Low	2412	23.43	19.88	0.71	20.59	30	Pass
Middle	2437	23.32	19.94	0.71	20.65	30	Pass
High	2462	22.23	19.66	0.71	20.37	30	Pass
802.11n-HT20							
Low	2412	22.38	19.00	0.70	19.70	30	Pass
Middle	2437	22.37	18.81	0.70	19.51	30	Pass
High	2462	22.40	18.89	0.70	19.59	30	Pass

Note: x is the duty cycle. For 802.11b: x=1.0, 802.11g: x=0.849, 802.11n-HT20: x=0.851.
Conducted Average Output Power= Reading+ Corrected Factor
The reading value is reading from the test software.

802.11b Mode Middle Channel duty cycle

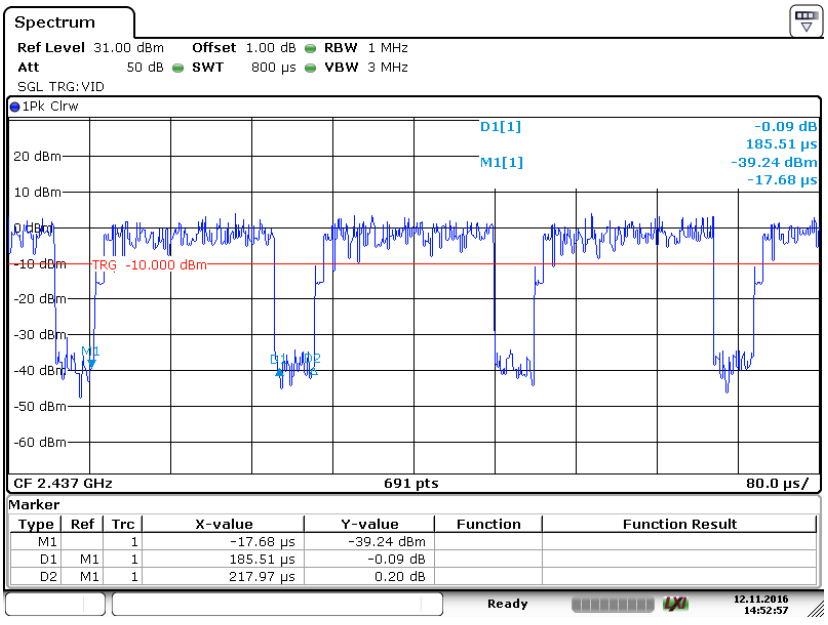


802.11g Mode Middle Channel duty cycle



Date:12.NOV.2016 14:56:16

802.11n-HT20 Mode Middle Channel duty cycle



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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	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) 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

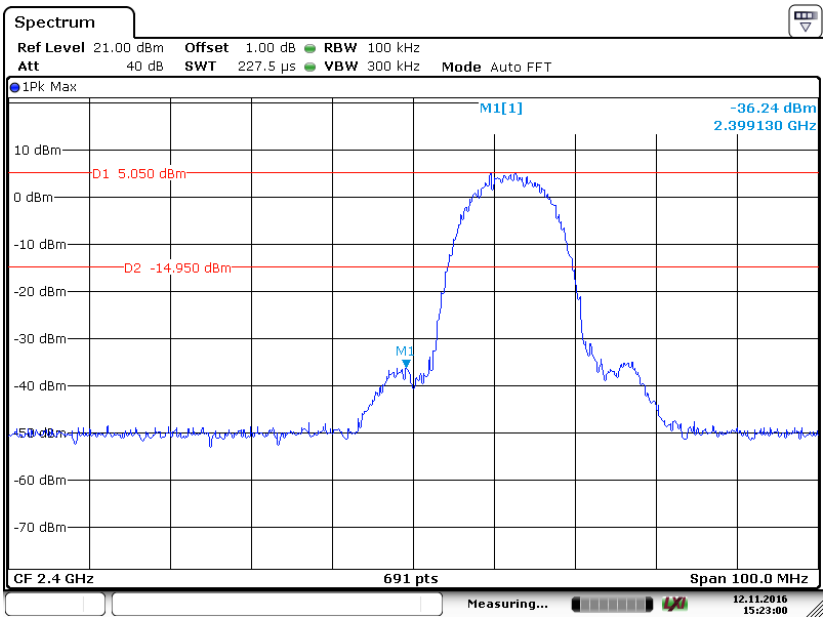
Temperature:	27.1 ℃
Relative Humidity:	55 %
ATM Pressure:	101.3 kPa

The testing was performed by Chris Wang on 2016-11-12.

Test Result: *Compliance*

Please refer to the following table and plots.

802.11b: Band Edge, Left Side



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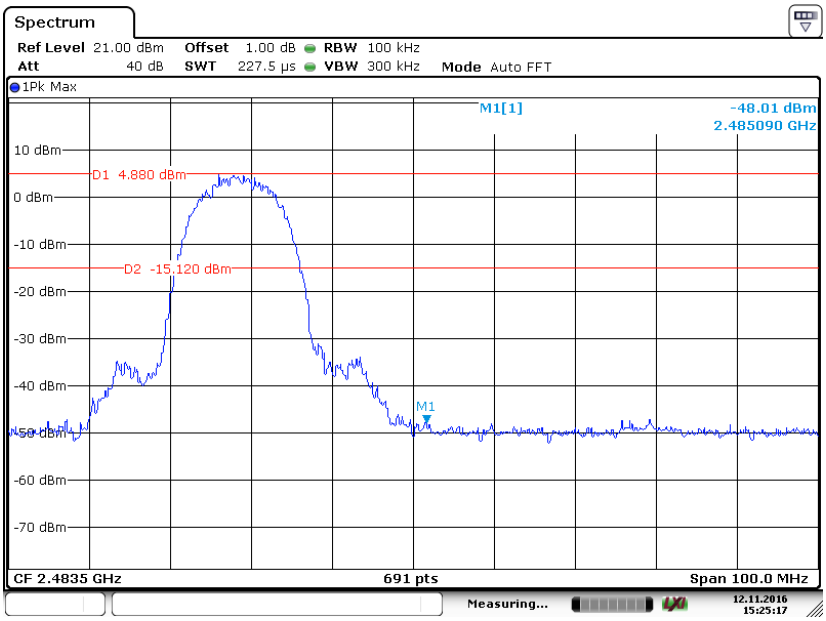
802.11b: Band Edge, Right Side



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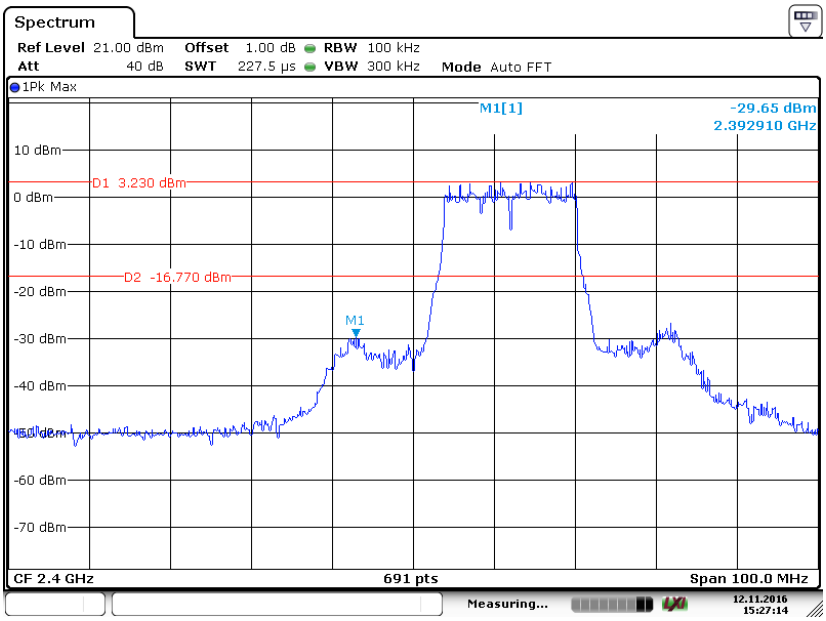
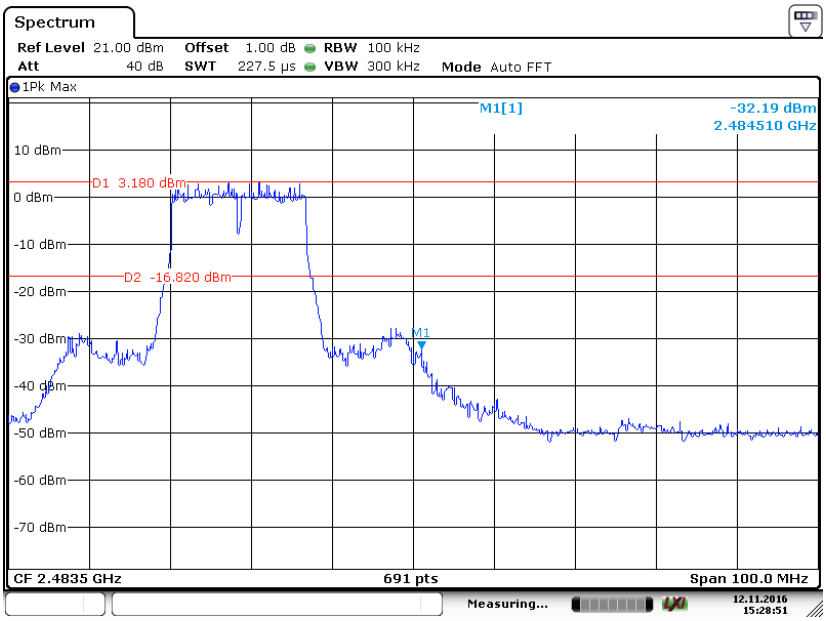
802.11g: Band Edge, Left Side



Date: 12.NOV.2016 15:27:14

802.11g: Band Edge, Right Side



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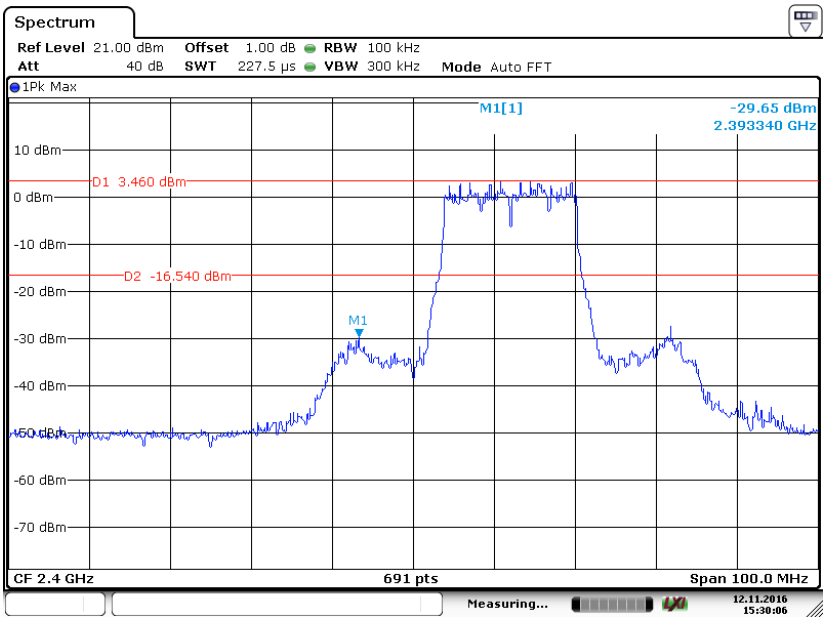
802.11n-HT20: Band Edge, Left Side



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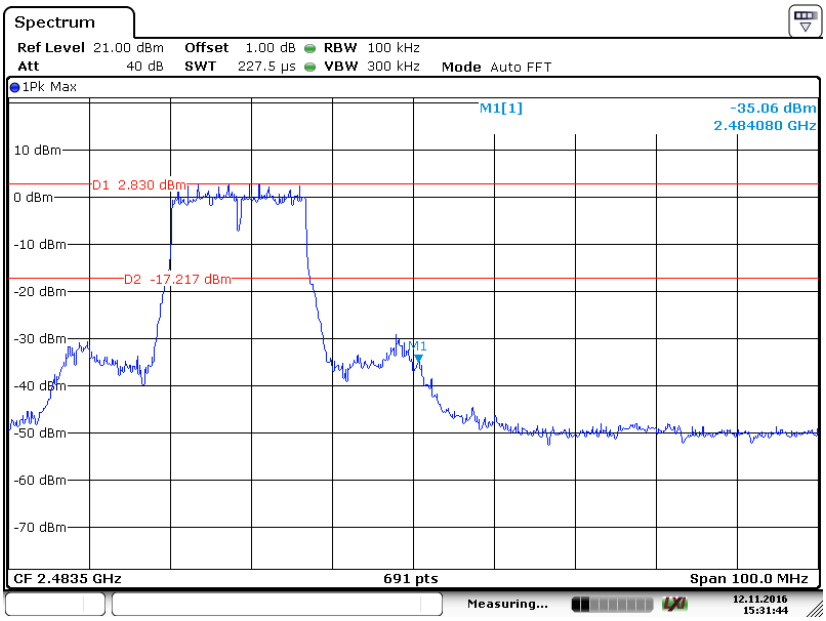
802.11n-HT20: Band Edge, Right Side



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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

According to KDB558074 D01 DTS Meas Guidance v03r05.

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	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) 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:	27.1 ℃
Relative Humidity:	54 %
ATM Pressure:	101.3 kPa

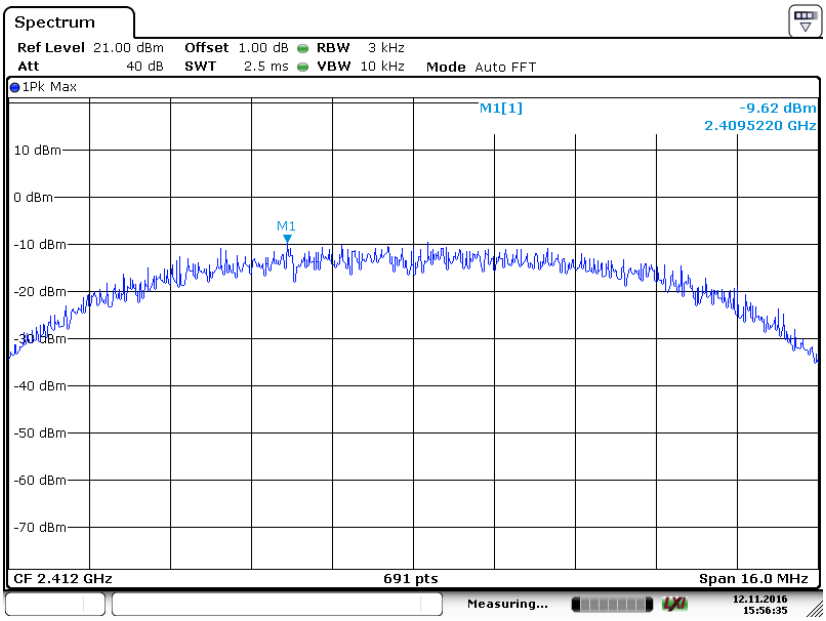
The testing was performed by Chris Wang on 2016-11-12.

Test Result: Pass

EUT operation mode: Transmitting

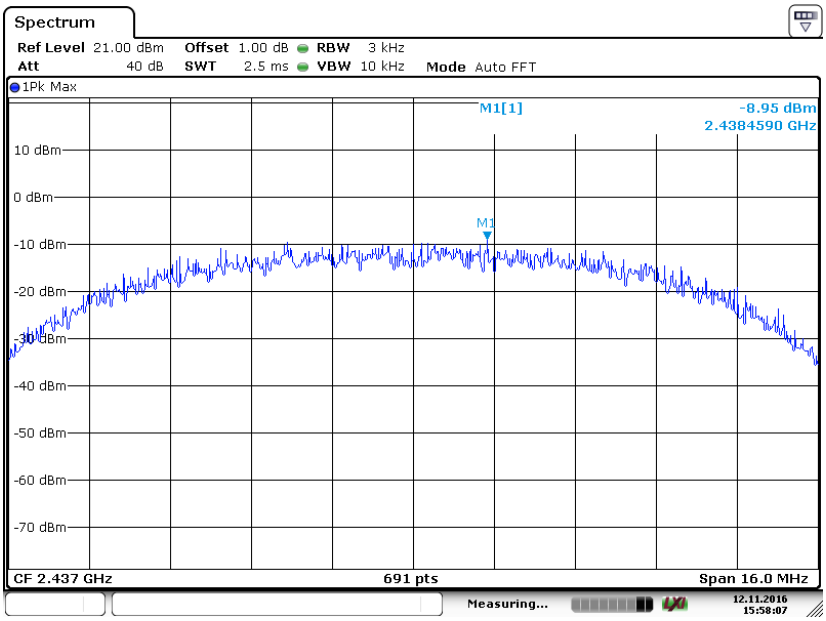
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-9.62	≤8
Middle	2437	-8.95	≤8
High	2462	-9.85	≤8
802.11g mode			
Low	2412	-10.70	≤8
Middle	2437	-10.58	≤8
High	2462	-11.13	≤8
802.11n-HT20 mode			
Low	2412	-10.55	≤8
Middle	2437	-9.78	≤8
High	2462	-11.07	≤8

Power Spectral Density , 802.11b Low Channel



Date: 12.NOV.2016 15:56:35

Power Spectral Density , 802.11b Middle Channel



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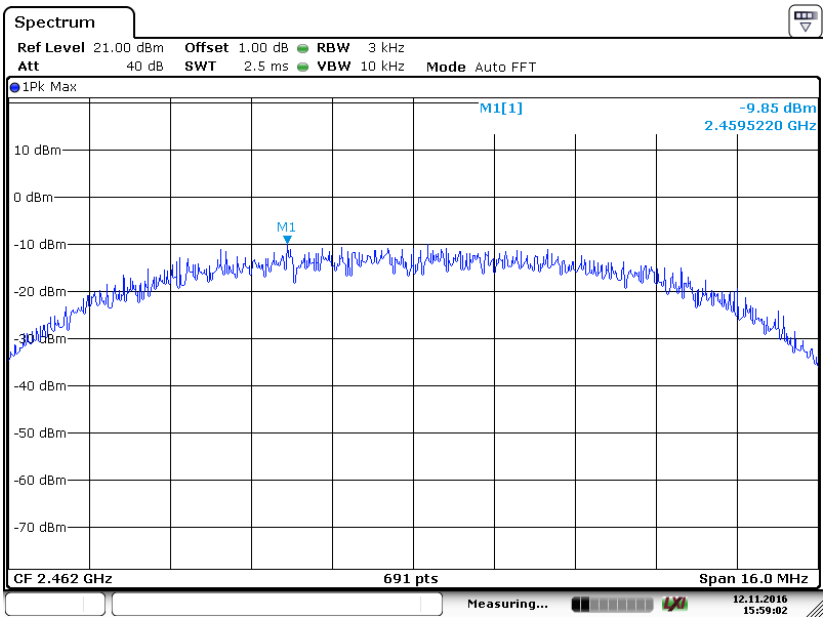
Power Spectral Density , 802.11b High Channel



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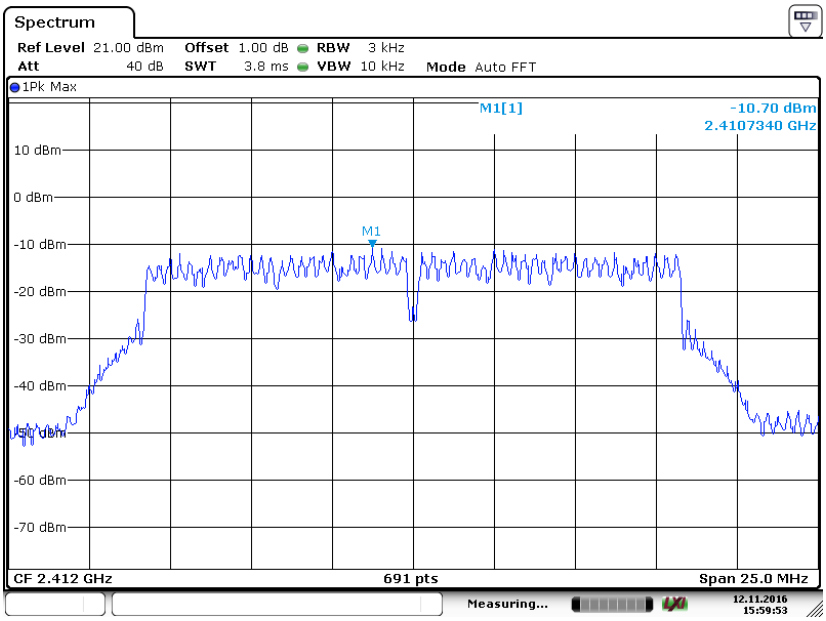
Power Spectral Density , 802.11g Low Channel



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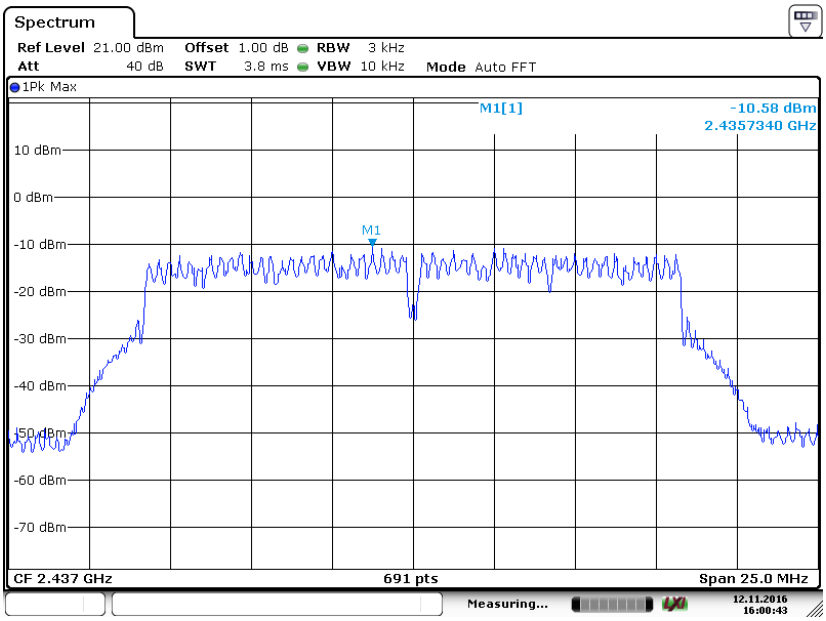
Power Spectral Density , 802.11g Middle Channel



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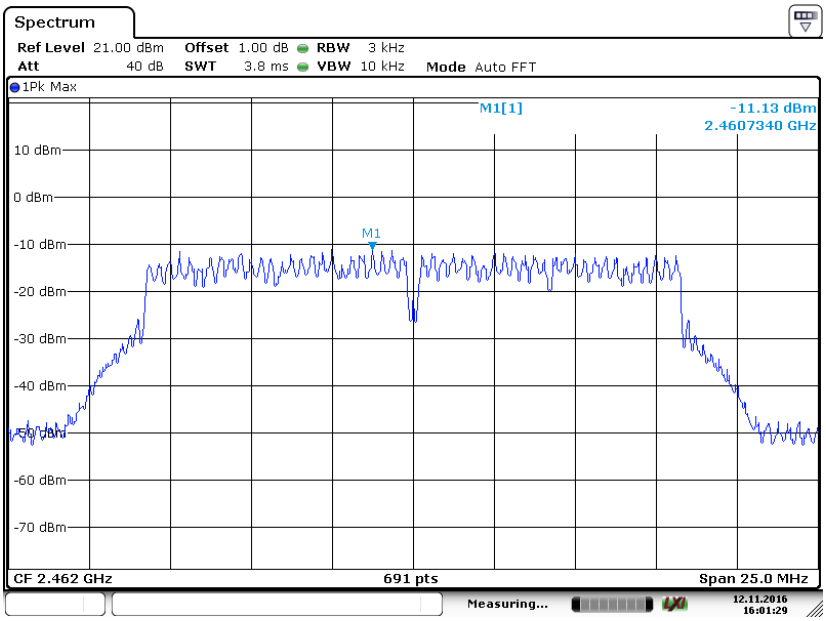
Power Spectral Density , 802.11g High Channel



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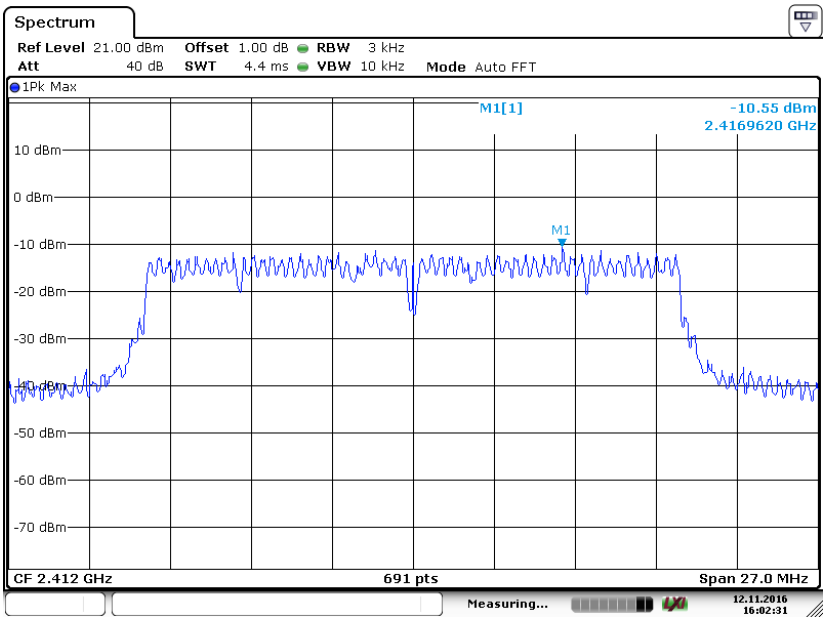
Power Spectral Density , 802.11n-HT20 Low Channel



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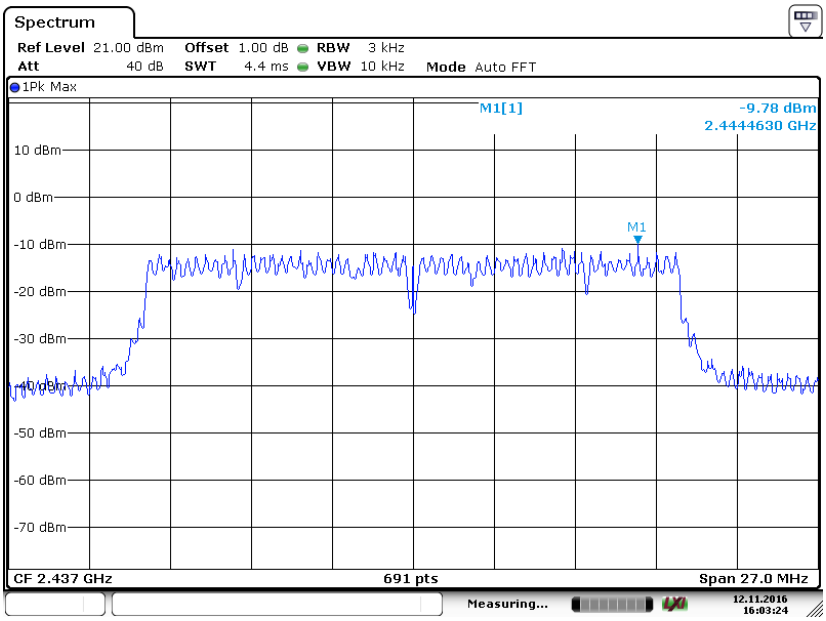
Power Spectral Density , 802.11n-HT20 Middle Channel



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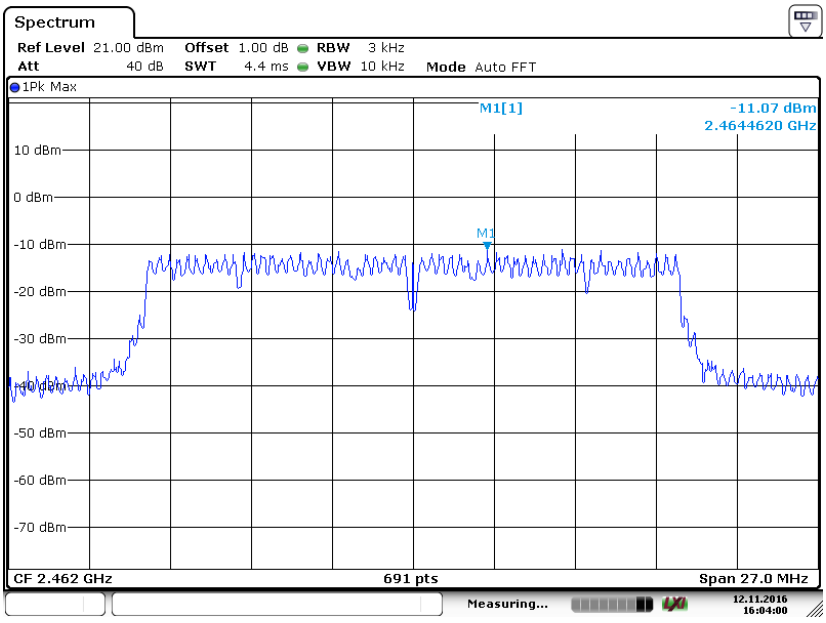
Power Spectral Density , 802.11n-HT20 High Channel



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