FCC PART 15.247

TEST REPORT

For

Mirahome (Shanghai) Technology Co., ltd.

Room 2403，Wiselogic International Center,No. 66 North Shanxi Road, Shanghai, China

FCC ID: 2AJ5M-MPB-001

Report Type:	**Product Type:**
Original Report	Intelligent Controller

Test Engineer:	Ada Yu
Report Number:	RKS161031002-00A
Report Date:	2016-11-30
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Mirahome (Shanghai) Technology Co., ltd.'s product, model number: MPB-001and MM-001 (FCC ID: 2AJ5M-MPB-001)) or the "EUT" in this report was a Intelligent Controller, which was measured approximately: 91 mm (L) x89 mm (W)) x35 mm (H), rated input voltage: DC 19V supply by adapter.

**All measurement and test data in this report was gathered from production sample serial number: 20161020008 (Assigned by the BACL. The EUT supplied by the applicant was received on 2016-10-20)*

Objective

This report is prepared on behalf of Mirahome (Shanghai) 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

RF test tool: COM debug tool V3.8.1.

The worst case (the duty cycle=100%) was performed under:
802.11b: Data rate:1 Mbps, Power level:17
802.11g: Data rate: 6 Mbps, Power level: 17
802.11n-HT20: Data rate: MCS0, Power level: 17

Support Equipment List and Details

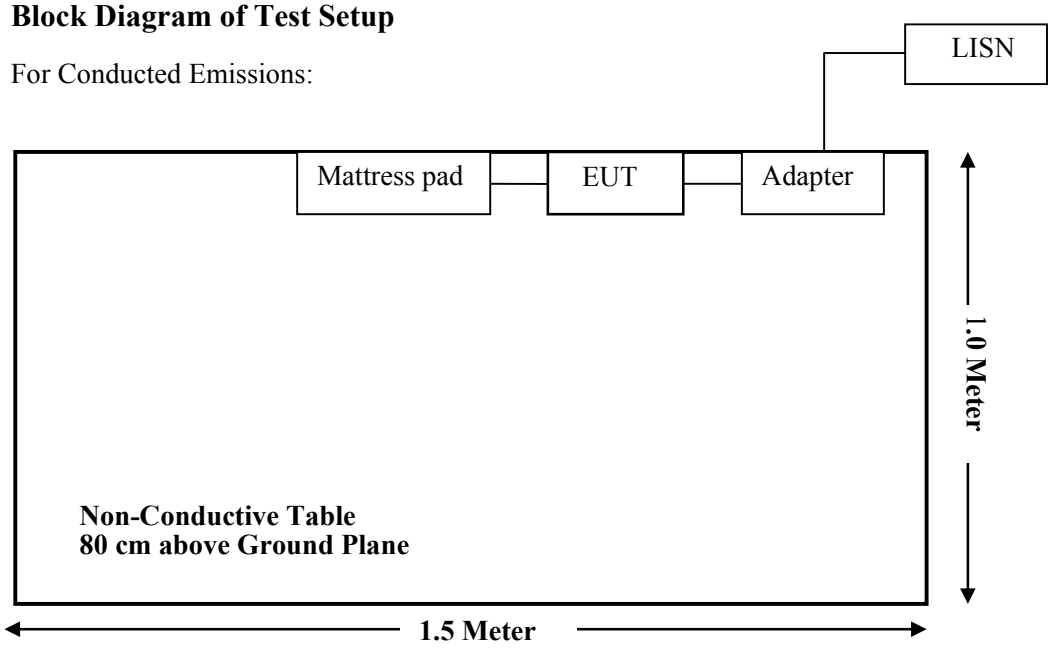
Manufacturer	Description	Model	Serial Number
Mirahome	mattress pad	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Power Cable	0.8	Power Source	Adapter

Block Diagram of Test Setup

For Conducted Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1091	RF Exposure	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 –RF Exposure

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 (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2437	1.5	1.41	18.00	63.10	20	0.0177	1.0
802.11g	2437	1.5	1.41	17.00	50.12	20	0.0141	1.0
802.11n HT20	2412	1.5	1.41	17.00	50.12	20	0.0141	1.0

Note: The target output power: 802.11b:17±1.0dBm
802.11g:16±1.0dBm
802.11n:16±1.0dBm

Please refer to the Technical Specification, 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 are 1.5 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

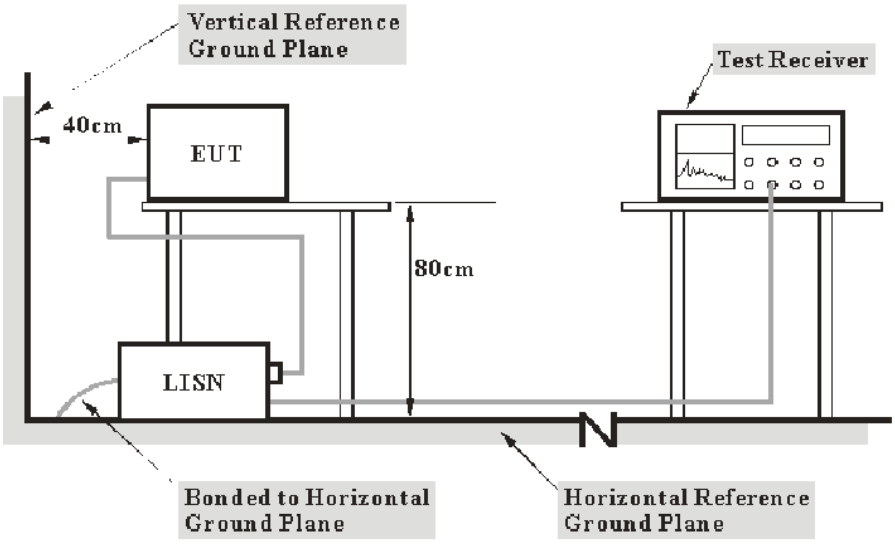
Measurement Uncertainty

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	834115/007	2016-11-12	2017-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-10
FCC	ISN	FCC-TLISN-T8-02	20376	2016-07-04	2017-07-03
MICRO-COAX	Coaxial line	UFB-293B-1-0480-50X50	97F0173	2016-09-08	2017-09-07
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	/	/

*** 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:

18.44dB at **0.445000 MHz** in the **Line** 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

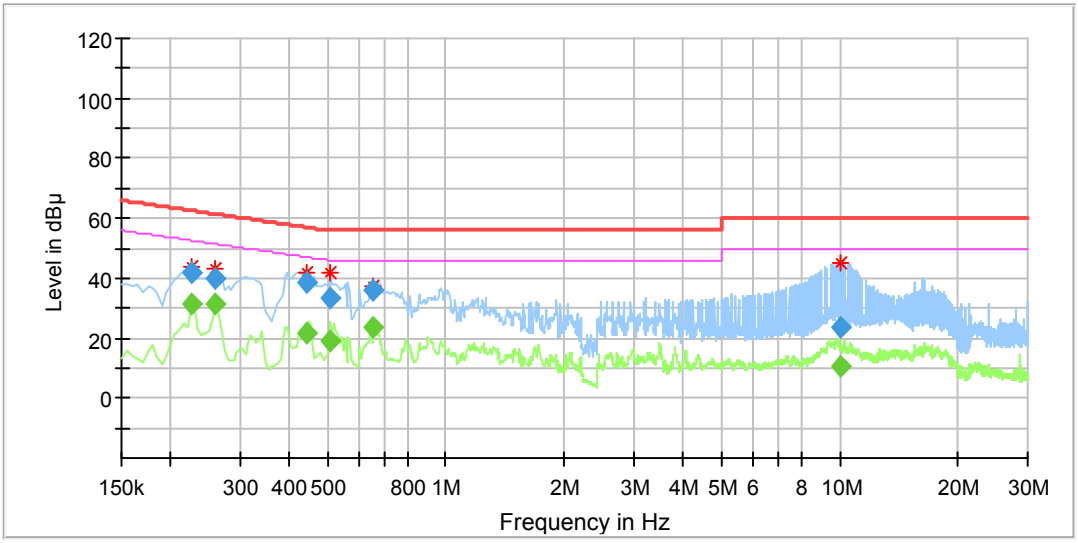
Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Peter Jiang on 2016-11-29.

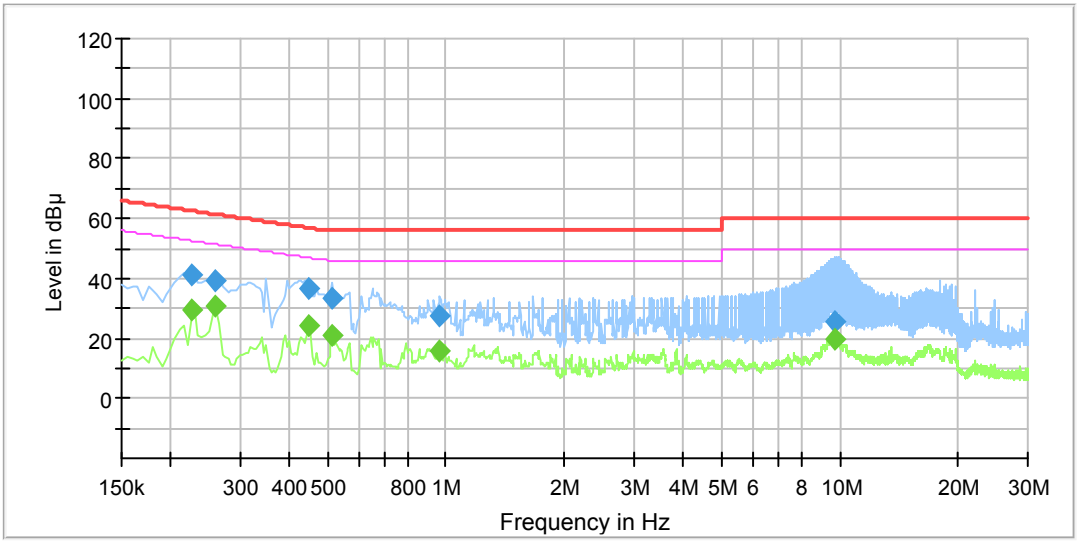
Test Mode: Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.225000	---	31.20	9.000	L1	10.3	21.43	52.63	Compliance
0.225000	41.97	---	9.000	L1	10.3	20.66	62.63	Compliance
0.260000	---	31.24	9.000	L1	10.3	20.19	51.43	Compliance
0.260000	40.16	---	9.000	L1	10.3	21.27	61.43	Compliance
0.445000	---	21.72	9.000	L1	10.3	25.25	46.97	Compliance
0.445000	38.53	---	9.000	L1	10.3	18.44	56.97	Compliance
0.510000	---	18.94	9.000	L1	10.3	27.06	46.00	Compliance
0.510000	33.63	---	9.000	L1	10.3	22.37	56.00	Compliance
0.655000	---	23.95	9.000	L1	10.3	22.05	46.00	Compliance
0.655000	35.70	---	9.000	L1	10.3	20.30	56.00	Compliance
10.000000	---	10.77	9.000	L1	10.5	39.23	50.00	Compliance
10.000000	23.68	---	9.000	L1	10.5	36.32	60.00	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.225000	---	29.55	9.000	N	10.3	23.08	52.63	Compliance
0.225000	41.23	---	9.000	N	10.3	21.40	62.63	Compliance
0.260000	---	30.66	9.000	N	10.3	20.77	51.43	Compliance
0.260000	38.97	---	9.000	N	10.3	22.46	61.43	Compliance
0.450000	---	24.41	9.000	N	10.3	22.47	46.88	Compliance
0.450000	36.82	---	9.000	N	10.3	20.06	56.88	Compliance
0.515000	---	20.84	9.000	N	10.3	25.16	46.00	Compliance
0.515000	33.21	---	9.000	N	10.3	22.79	56.00	Compliance
0.965000	---	15.84	9.000	N	10.3	30.16	46.00	Compliance
0.965000	27.47	---	9.000	N	10.3	28.53	56.00	Compliance
9.685000	---	19.44	9.000	N	10.5	30.56	50.00	Compliance
9.685000	25.88	---	9.000	N	10.5	34.12	60.00	Compliance

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

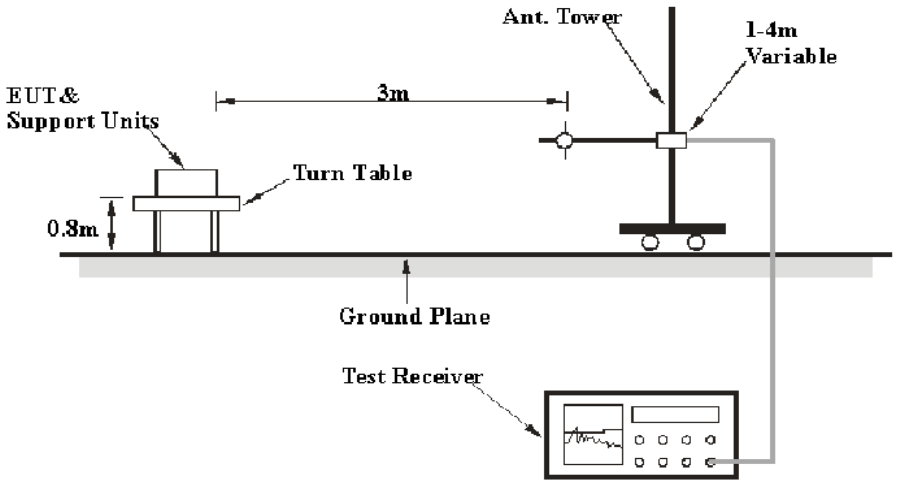
Measurement Uncertainty

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.

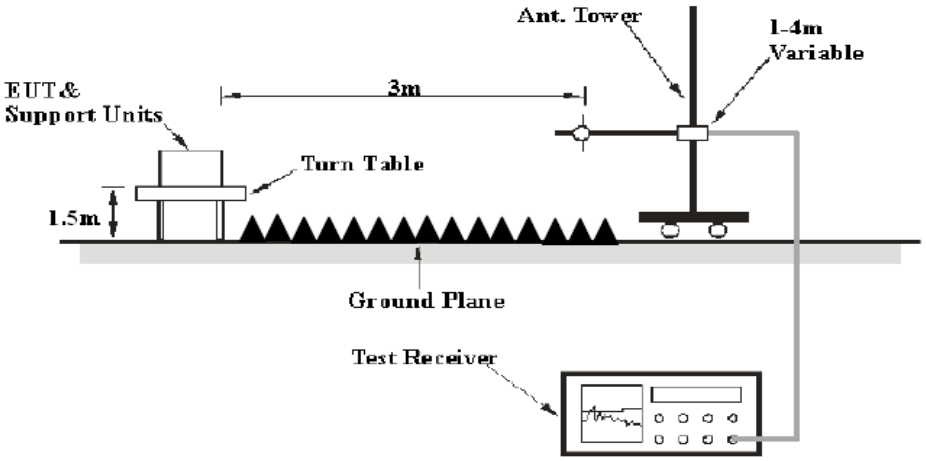
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration 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	FSV40	101116	2016-07-04	2017-07-03
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-09-08	2017-09-08
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 Subpart C, section 15.205, 15.209 and 15.247.

2.94 dB at **144.002000MHz** in the **Vertical** polarization

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

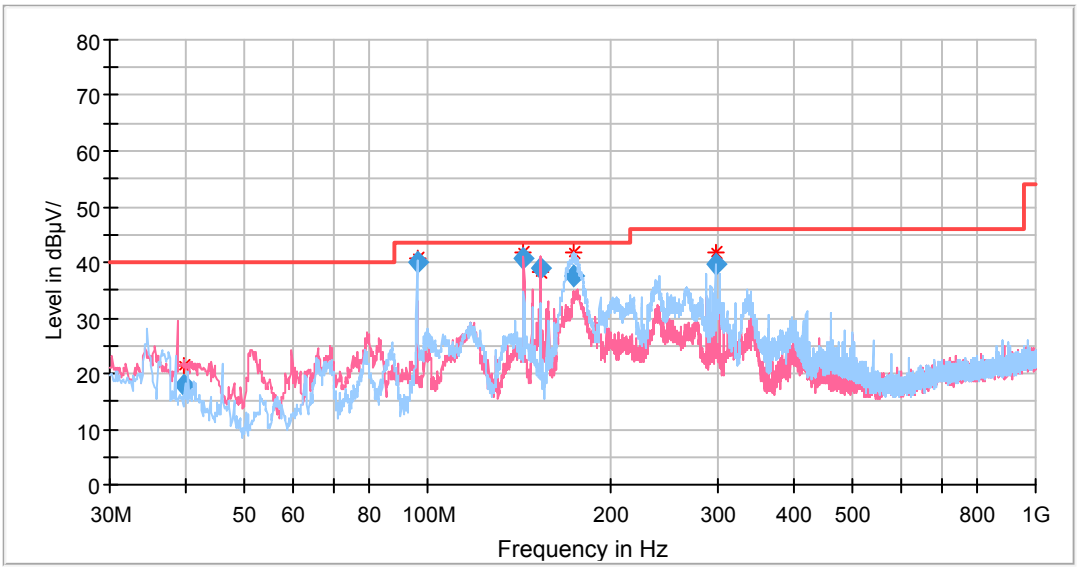
Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Ada Yu on 2016-11-30.

EUT operation mode: Transmitting

30 MHz-1 GHz

The worst case was performed under 802.11b mode



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)
39.573600	28.00	QP	246.0	101.0	V	-10.0	18.00	40.00	22.00
96.012200	56.34	QP	232.0	199.0	H	-16.2	40.14	43.50	3.36
144.002000	52.56	QP	172.0	101.0	V	-12.0	40.56	43.50	2.94
153.606400	51.30	QP	178.0	101.0	V	-12.3	39.00	43.50	4.50
174.203150	49.53	QP	301.0	199.0	H	-12.1	37.43	43.50	6.07
297.606000	50.07	QP	249.0	101.0	H	-10.4	39.67	46.00	6.33

1GHz-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)	(dB µ V/m)	(dB)
Low Channel (2412 MHz)									
2412.0	102.45	PK	97	143	V	-3.0	99.41	/	/
2412.0	98.03	Ave	97	143	V	-3.0	94.99	/	/
2412.0	97.72	PK	198	131	H	-3.0	94.68	/	/
2412.0	92.97	Ave	198	131	H	-3.0	89.93	/	/
2390.0	44.36	PK	227	185	V	-3.0	41.32	74	32.68
2390.0	31.61	Ave	227	185	V	-3.0	28.57	54	25.43
2400.0	45.08	PK	350	144	V	-3.0	42.04	74	31.96
2400.0	34.65	Ave	350	144	V	-3.0	31.61	54	22.39
4824.0	32.58	PK	238	199	H	7.2	39.77	74	34.23
4824.0	27.44	Ave	238	199	H	7.2	34.63	54	19.37
6620.0	31.51	PK	68	211	V	13.6	45.09	74	28.91
6620.0	23.32	Ave	68	211	V	13.6	36.90	54	17.10
7236.0	28.53	PK	305	230	H	16.0	44.53	74	29.47
7236.0	22.76	Ave	305	230	H	16.0	38.76	54	15.24

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)	(dB µ V/m)	(dB)
Middle Channel (2437 MHz)									
2437.0	101.78	PK	275	116	V	-3.0	98.76	/	/
2437.0	97.16	Ave	275	116	V	-3.0	94.14	/	/
2437.0	97.74	PK	108	118	H	-3.0	94.72	/	/
2437.0	93.19	Ave	108	118	H	-3.0	90.17	/	/
1853.3	39.42	PK	337	149	V	-5.7	33.72	74	34.48
1853.3	22.0	Ave	337	149	V	-5.7	16.33	54	31.87
1696.0	44.08	PK	173	114	H	-5.4	38.65	74	35.35
1696.0	34.23	Ave	173	114	H	-5.4	28.80	54	25.20
4874.0	33.96	PK	177	230	V	7.3	41.22	74	32.78
4874.0	29.73	Ave	177	230	V	7.3	36.99	54	17.01
6677.0	31.37	PK	132	204	H	13.8	45.16	74	28.84
6677.0	22.84	Ave	132	204	H	13.8	36.63	54	17.37
7311.0	28.40	PK	80	233	H	16.3	44.73	74	29.27
7311.0	22.45	Ave	80	233	H	16.3	38.78	54	15.22

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)									
2462.0	103.00	PK	63	212	V	-3.0	99.99	/	/
2462.0	98.14	Ave	63	212	V	-3.0	95.13	/	/
2462.0	99.12	PK	239	226	H	-3.0	96.11	/	/
2462.0	94.94	Ave	239	226	H	-3.0	91.93	/	/
2483.5	45.73	PK	224	196	V	-3.0	42.74	74	31.26
2483.5	32.27	Ave	224	196	V	-3.0	29.28	54	24.72
2563.0	46.78	PK	190	130	V	4.2	50.98	74	23.02
2563.0	36.42	Ave	190	130	V	4.2	40.62	54	13.38
4924.0	32.48	PK	161	229	H	14.0	46.48	74	27.52
4924.0	28.31	Ave	161	229	H	14.0	42.31	54	11.69
6681.0	29.44	PK	12	178	H	13.8	43.24	74	30.76
6681.0	21.85	Ave	12	178	H	13.8	35.65	54	18.35
7386.0	27.60	PK	139	168	H	16.7	44.25	74	29.75
7386.0	22.53	Ave	139	168	H	16.7	39.18	54	14.82

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)	(dB µ V/m)	(dB)
Low Channel (2412 MHz)									
2412.0	96.45	PK	112	193	V	-3.0	93.41	/	/
2412.0	92.19	Ave	112	193	V	-3.0	89.15	/	/
2412.0	93.04	PK	5	134	H	-3.0	90.00	/	/
2412.0	88.24	Ave	5	134	H	-3.0	85.20	/	/
2390.0	43.97	PK	71	227	V	-3.0	40.93	74	33.07
2390.0	33.24	Ave	71	227	V	-3.0	30.20	54	23.80
2400.0	43.70	PK	87	198	V	-3.0	40.66	74	33.34
2400.0	35.64	Ave	87	198	V	-3.0	32.60	54	21.40
4824.0	32.43	PK	218	133	H	7.2	39.62	74	34.38
4824.0	27.74	Ave	218	133	H	7.2	34.93	54	19.07
6620.0	31.82	PK	214	119	V	13.6	45.40	74	28.60
6620.0	22.01	Ave	214	119	V	13.6	35.59	54	18.41
7236.0	28.92	PK	351	163	H	16.0	44.92	74	29.08
7236.0	24.65	Ave	351	163	H	16.0	40.65	54	13.35

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)	(dB µ V/m)	(dB)
Middle Channel (2437 MHz)									
2437.0	97.33	PK	331	224	V	-3.0	94.31	/	/
2437.0	92.84	Ave	331	224	V	-3.0	89.82	/	/
2437.0	94.27	PK	111	125	H	-3.0	91.25	/	/
2437.0	90.00	Ave	111	125	H	-3.0	86.98	/	/
1477.0	43.14	PK	293	173	V	-7.0	36.16	74	37.84
1477.0	32.02	Ave	293	173	V	-7.0	25.04	54	28.96
1696.0	45.87	PK	163	230	H	-5.4	40.44	74	33.56
1696.0	34.80	Ave	163	230	H	-5.4	29.37	54	24.63
4874.0	33.96	PK	302	167	V	7.3	41.22	74	32.78
4874.0	28.31	Ave	302	167	V	7.3	35.57	54	18.43
6677.0	31.57	PK	132	146	H	13.8	45.36	74	28.64
6677.0	21.90	Ave	132	146	H	13.8	35.69	54	18.31
7311.0	26.34	PK	338	129	H	16.3	42.67	74	31.33
7311.0	21.37	Ave	338	129	H	16.3	37.70	54	16.30

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)									
2462.0	97.42	PK	122	136	V	-3.0	94.41	/	/
2462.0	93.30	Ave	122	136	V	-3.0	90.29	/	/
2462.0	93.59	PK	263	149	H	-3.0	90.58	/	/
2462.0	89.17	Ave	263	149	H	-3.0	86.16	/	/
2483.5	43.03	PK	113	122	V	-3.0	40.04	74	33.96
2483.5	32.59	Ave	113	122	V	-3.0	29.60	54	24.40
2563.0	46.38	PK	231	171	V	4.2	50.58	74	23.42
2563.0	37.01	Ave	231	171	V	4.2	41.21	54	12.79
4924.0	32.07	PK	312	185	H	14.0	46.07	74	27.93
4924.0	26.39	Ave	312	185	H	14.0	40.39	54	13.61
6681.0	29.87	PK	262	145	H	13.8	43.67	74	30.33
6681.0	22.95	Ave	262	145	H	13.8	36.75	54	17.25
7386.0	26.21	PK	195	214	H	16.7	42.86	74	31.14
7386.0	20.92	Ave	195	214	H	16.7	37.57	54	16.43

802.11n-HT20 Mode:

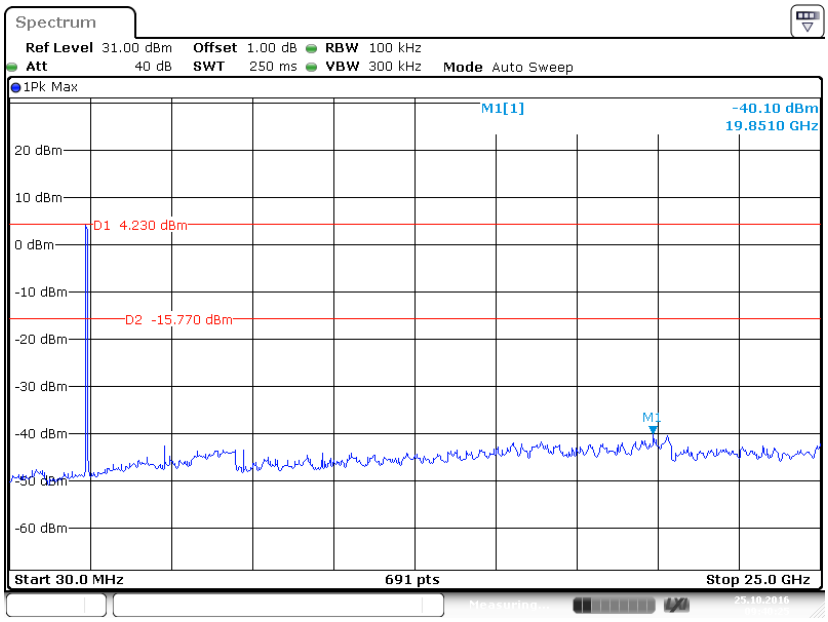
Frequency	Receiver		Turntable	Rx Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/205/209	
	Reading	Detector		Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave.)	Degree	(cm)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Low Channel (2412 MHz)									
2412.0	96.06	PK	156	173	V	-3.0	93.02	/	/
2412.0	91.07	Ave	156	173	V	-3.0	88.03	/	/
2412.0	92.24	PK	104	248	H	-3.0	89.20	/	/
2412.0	87.60	Ave	104	248	H	-3.0	84.56	/	/
2390.0	44.64	PK	320	153	V	-3.0	41.60	74	32.40
2390.0	32.79	Ave	320	153	V	-3.0	29.75	54	24.25
2400.0	45.13	PK	307	248	V	-3.0	42.09	74	31.91
2400.0	34.62	Ave	307	248	V	-3.0	31.58	54	22.42
4824.0	33.67	PK	200	240	H	7.2	40.86	74	33.14
4824.0	29.06	Ave	200	240	H	7.2	36.25	54	17.75
6620.0	30.03	PK	144	242	V	13.6	43.61	74	30.39
6620.0	22.05	Ave	144	242	V	13.6	35.63	54	18.37
7236.0	28.92	PK	15	186	H	16.0	44.92	74	29.08
7236.0	24.63	Ave	15	186	H	16.0	40.63	54	13.37

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)									
2437.0	96.12	PK	120	130	V	-3.0	93.10	/	/
2437.0	91.46	Ave	120	130	V	-3.0	88.44	/	/
2437.0	92.98	PK	254	240	H	-3.0	89.96	/	/
2437.0	88.95	Ave	254	240	H	-3.0	85.93	/	/
1477.0	43.18	PK	214	144	V	-7.0	36.20	74	37.80
1477.0	32.85	Ave	214	144	V	-7.0	25.87	54	28.13
1696.0	45.71	PK	129	136	H	-5.4	40.28	74	33.72
1696.0	36.19	Ave	129	136	H	-5.4	30.76	54	23.24
4874.0	32.76	PK	338	225	V	7.3	40.02	74	33.98
4874.0	27.33	Ave	338	225	V	7.3	34.59	54	19.41
6677.0	31.72	PK	240	238	H	13.8	45.51	74	28.49
6677.0	21.40	Ave	240	238	H	13.8	35.19	54	18.81
7311.0	26.23	PK	334	156	H	16.3	42.56	74	31.44
7311.0	20.55	Ave	334	156	H	16.3	36.88	54	17.12

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)									
2462.0	96.80	PK	341	110	V	-3.0	93.79	/	/
2462.0	92.79	Ave	341	110	V	-3.0	89.78	/	/
2462.0	91.10	PK	100	235	H	-3.0	88.09	/	/
2462.0	86.17	Ave	100	235	H	-3.0	83.16	/	/
2483.5	42.90	PK	245	224	V	-3.0	39.91	74	34.09
2483.5	32.82	Ave	245	224	V	-3.0	29.83	54	24.17
2563.0	45.26	PK	354	125	V	4.2	49.46	74	24.54
2563.0	35.28	Ave	354	125	V	4.2	39.48	54	14.52
4924.0	32.80	PK	330	126	H	14.0	46.80	74	27.20
4924.0	26.95	Ave	330	126	H	14.0	40.95	54	13.05
6681.0	29.06	PK	97	152	H	13.8	42.86	74	31.14
6681.0	23.10	Ave	97	152	H	13.8	36.90	54	17.10
7386.0	27.70	PK	97	215	H	16.7	44.35	74	29.65
7386.0	22.50	Ave	97	215	H	16.7	39.15	54	14.85

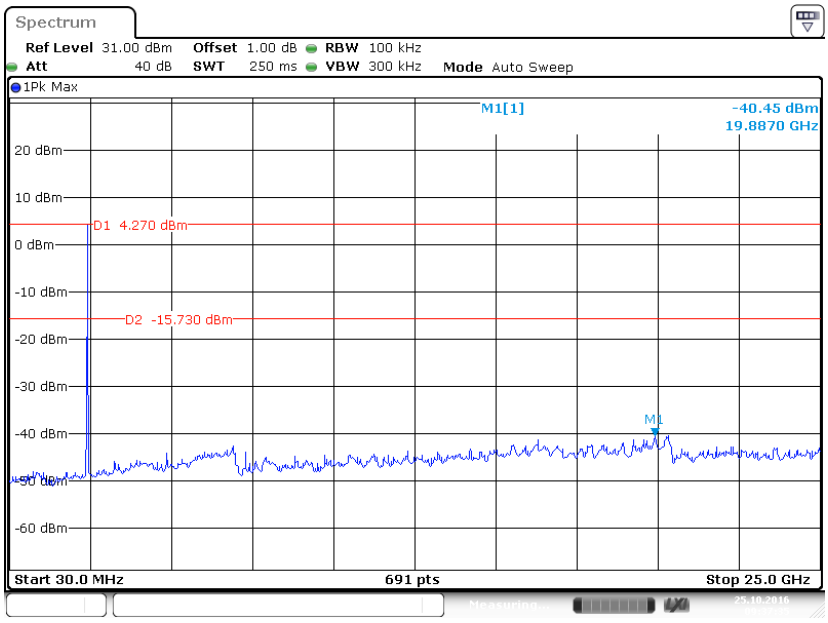
Conducted Spurious Emissions at Antenna Port

802.11b Low Channel



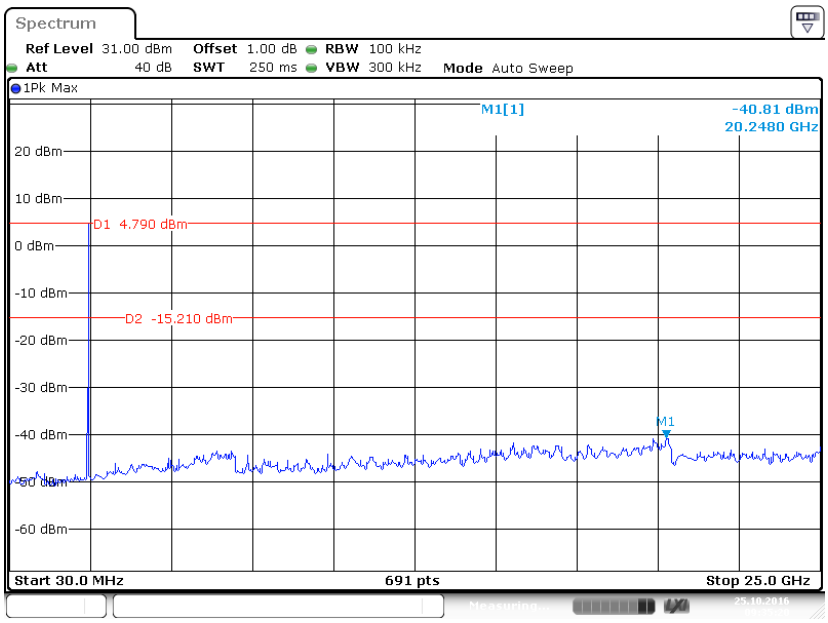
Date: 25.OCT.2016 09:40:25

802.11b Middle Channel

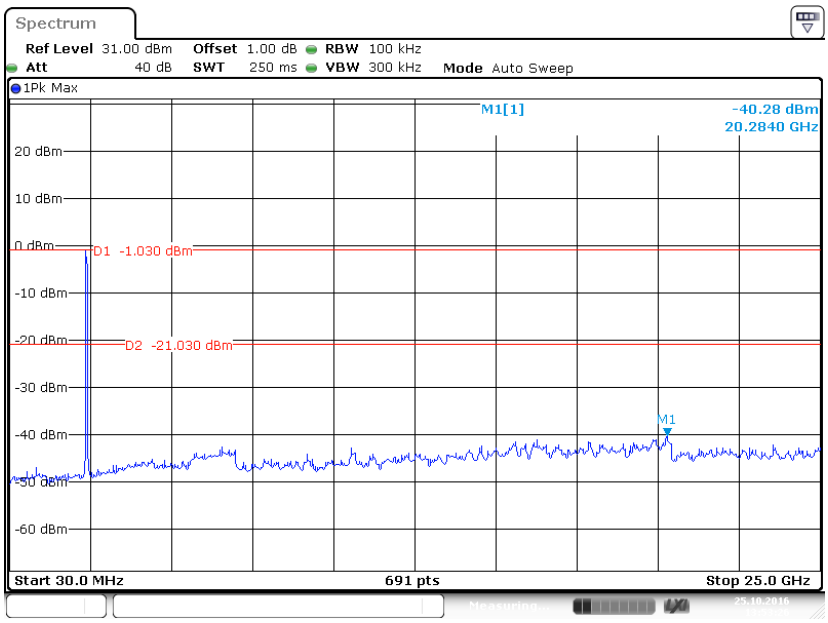


Date: 25.OCT.2016 09:37:34

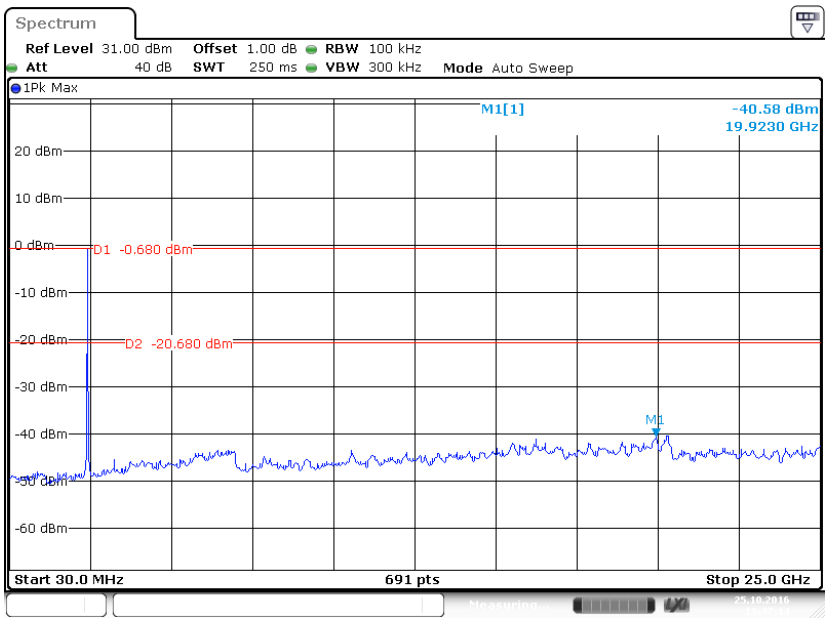
802.11b High Channel



802.11g Low Channel

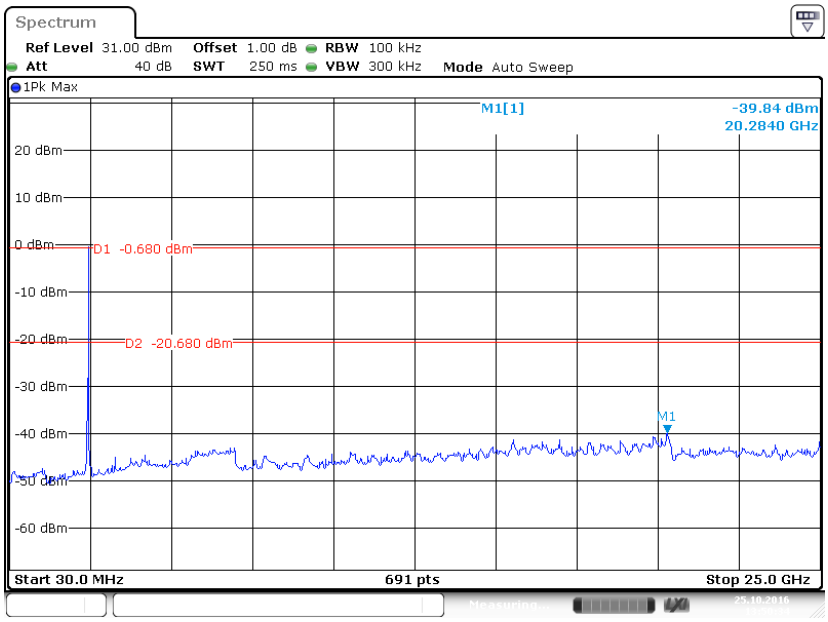


802.11g Middle Channel



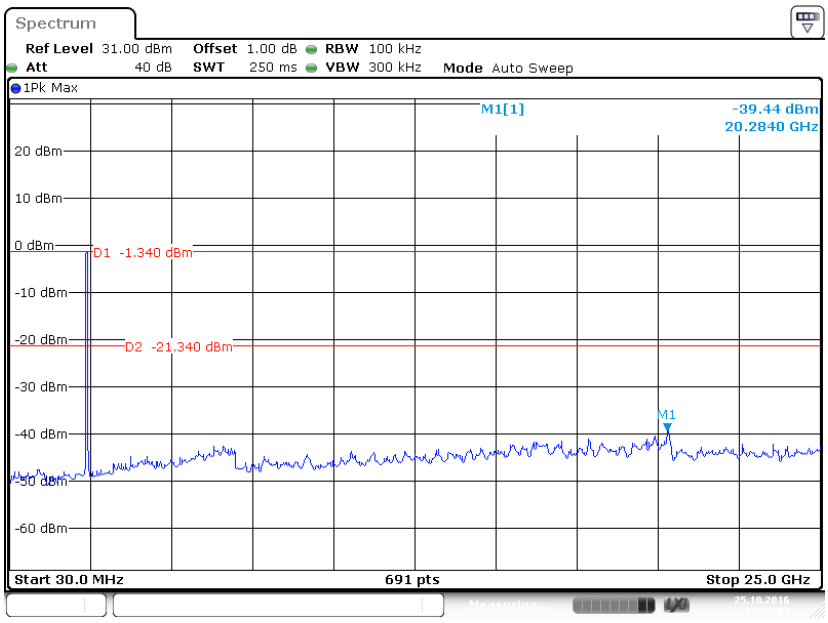
Date: 25.OCT.2016 13:47:15

802.11g High Channel



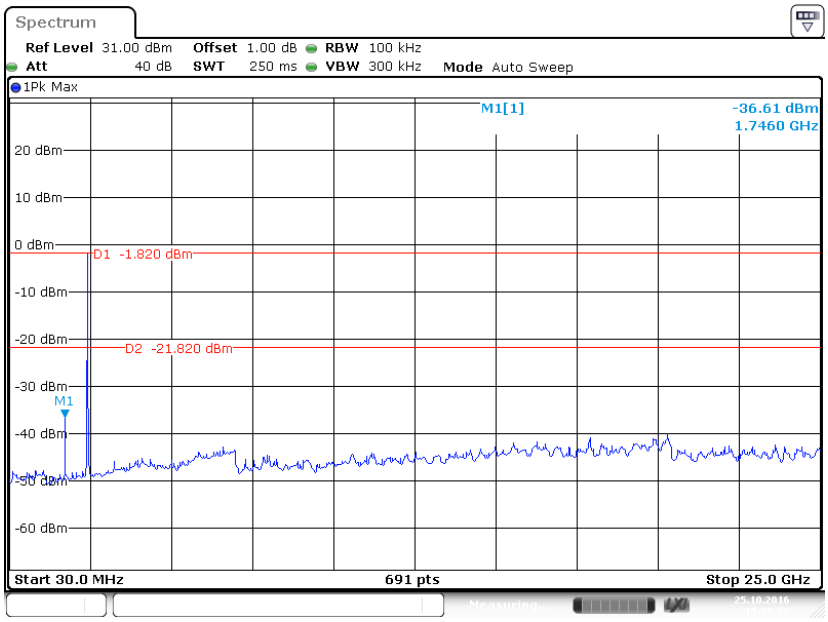
Date: 25.OCT.2016 13:50:34

802.11n-HT20 Low Channel



Date: 25.OCT.2016 15:23:01

802.11n-HT20 Middle Channel



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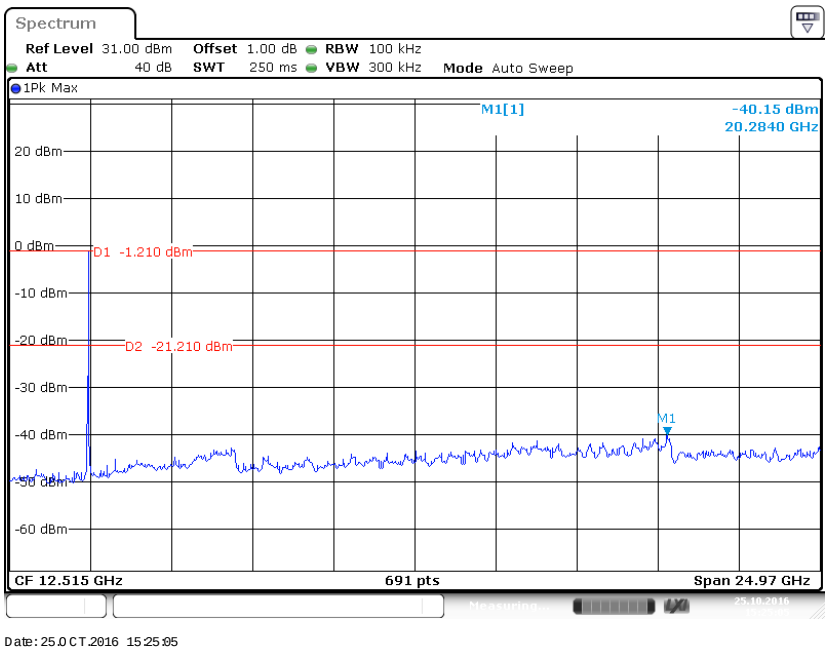
802.11n-HT20 High Channel



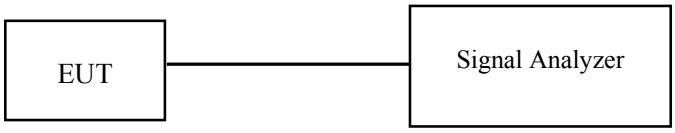
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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	2015-06-16	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 Ada Yu on 2016-10-25

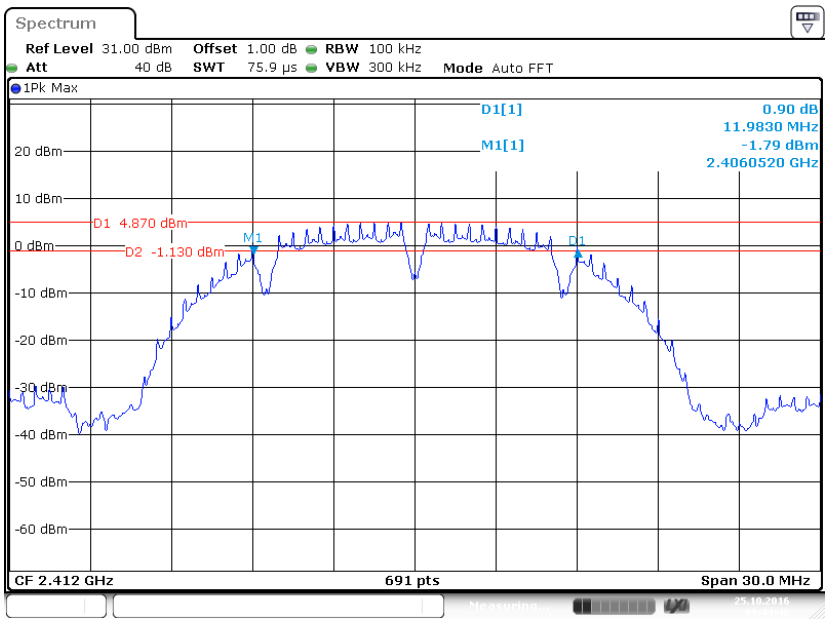
Test Result: Pass.

Please refer to the following tables and plots.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
802.11b mode			
Low	2412	11.98	≥500
Middle	2437	11.98	≥500
High	2462	12.03	≥500
802.11g mode			
Low	2412	16.41	≥500
Middle	2437	16.37	≥500
High	2462	16.41	≥500
802.11n-HT20 mode			
Low	2412	17.63	≥500
Middle	2437	17.63	≥500
High	2462	17.63	≥500

802.11b Low Channel



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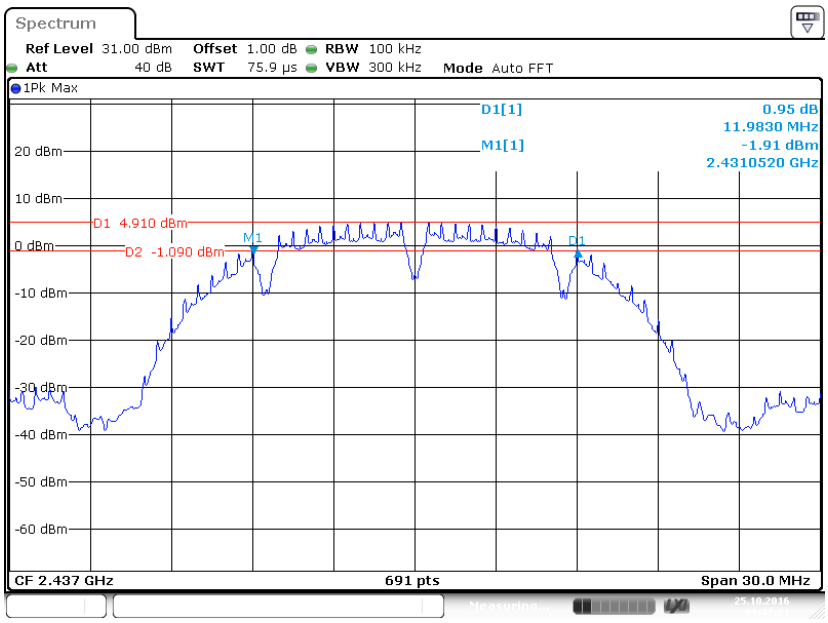
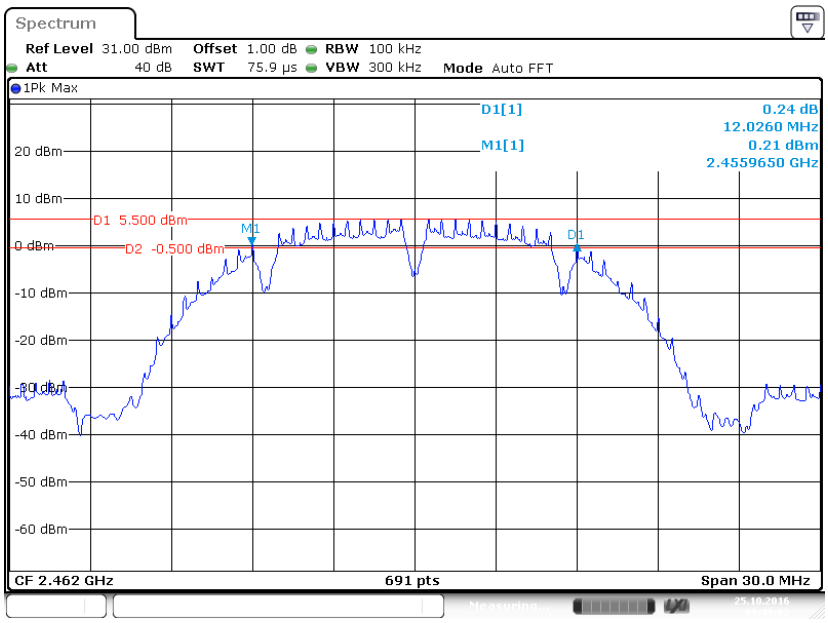
802.11b Middle Channel



Date: 25.OCT.2016 09:47:21

802.11b High Channel



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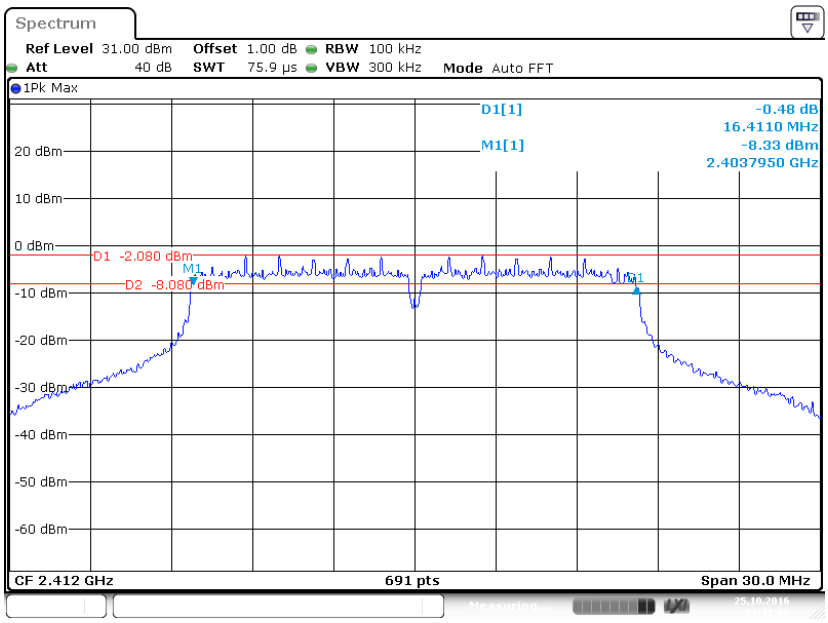
802.11g Low Channel



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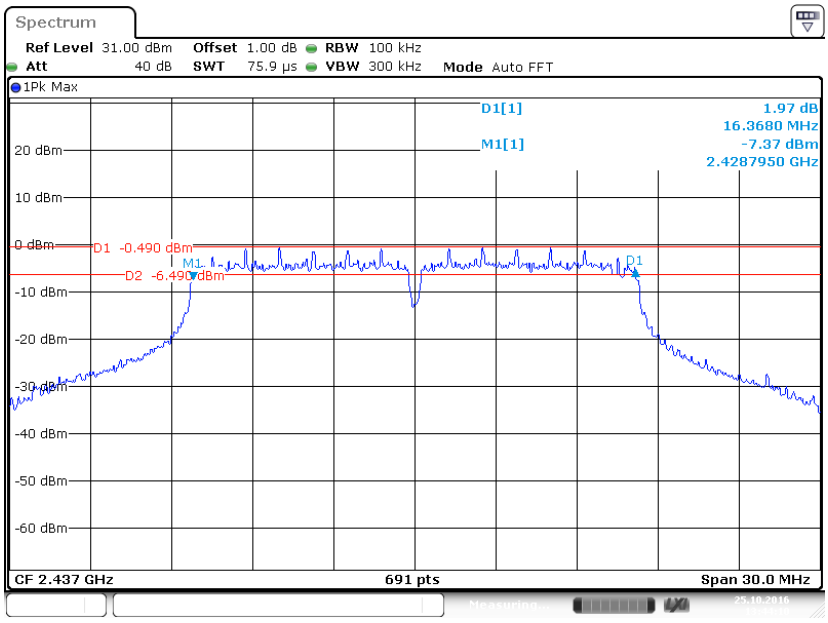
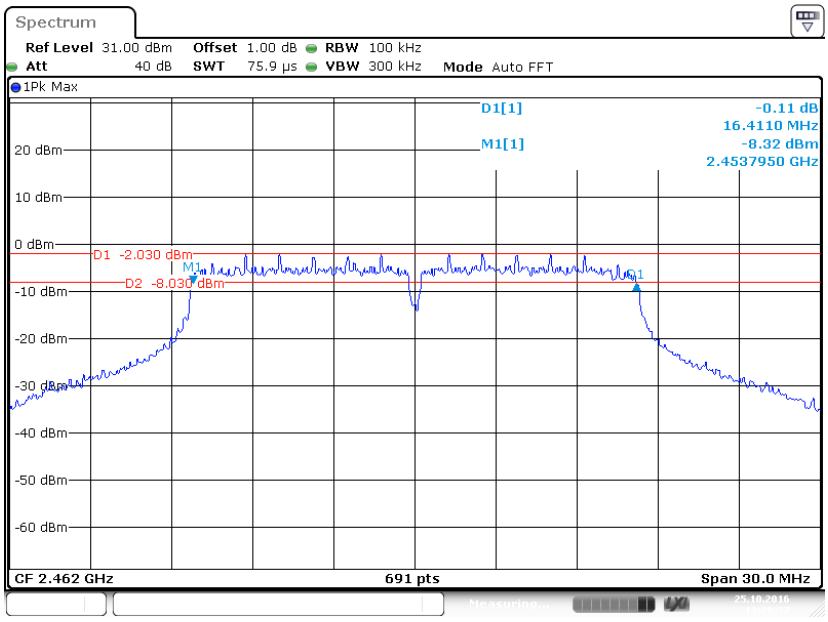
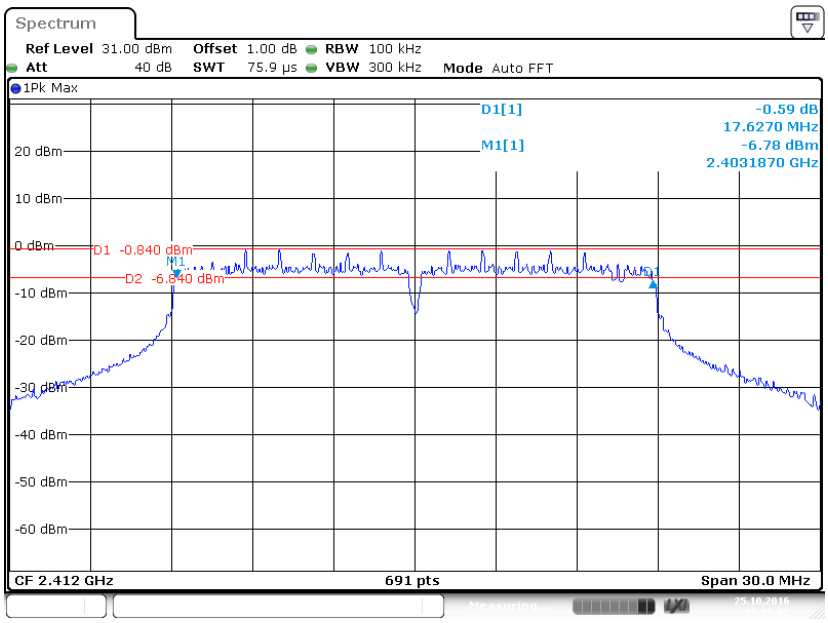
802.11g Middle Channel



802.11g High Channel

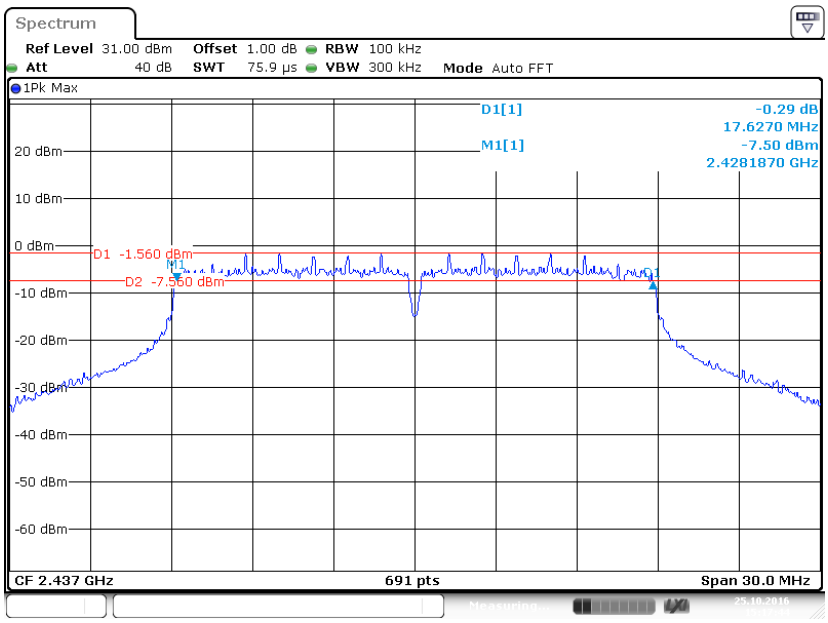


802.11n-HT20 Low Channe



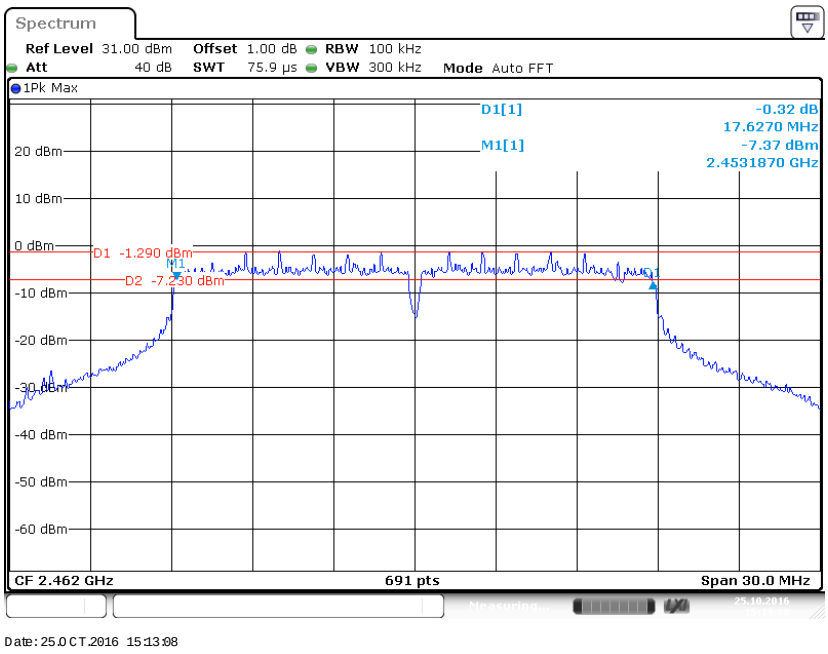
Date: 25.OCT.2016 15:15:03

802.11n-HT20 Middle Channel



Date: 25.OCT.2016 15:17:45

802.11n-HT20 High Channel



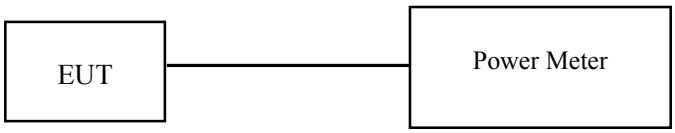
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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
Rohde & Schwarz	OSP120 BASE UNIT	OSP120	101247	2016-07-04	2017-07-03
Agilent	Power Sensor	N1921A	MY54210016	2015-12-18	2016-12-17
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-06-16	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:	55 %
ATM Pressure:	101.1 kPa

The testing was performed by Ada Yu on 2016-10-25

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)
802.11b			
Low	2412	16.23	30
Middle	2437	17.01	30
High	2462	16.82	30
802.11g			
Low	2412	15.58	30
Middle	2437	16.19	30
High	2462	15.81	30
802.11n-HT20			
Low	2412	16.07	30
Middle	2437	15.57	30
High	2462	15.83	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
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-06-16	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

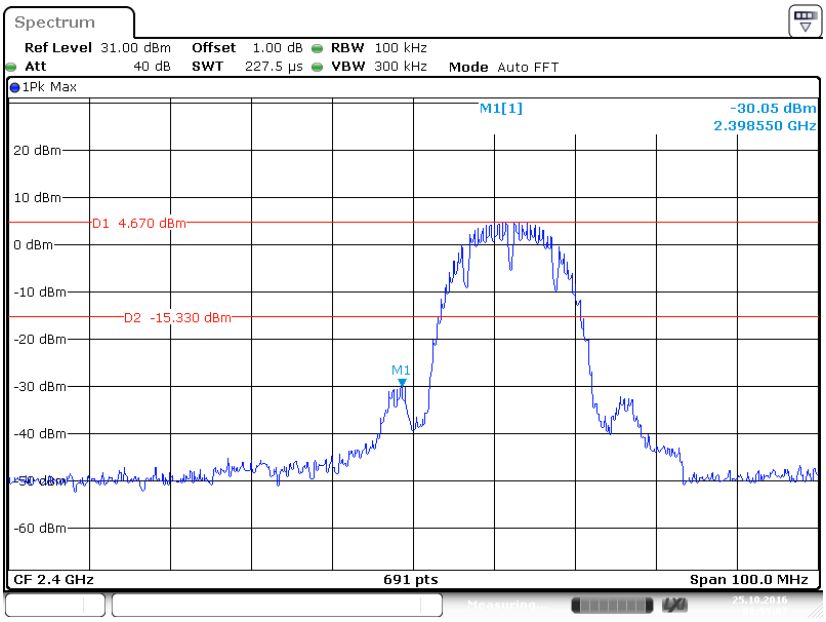
Temperature:	27 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Ada Yu on 2016-10-25.

Test Result: *Compliance*

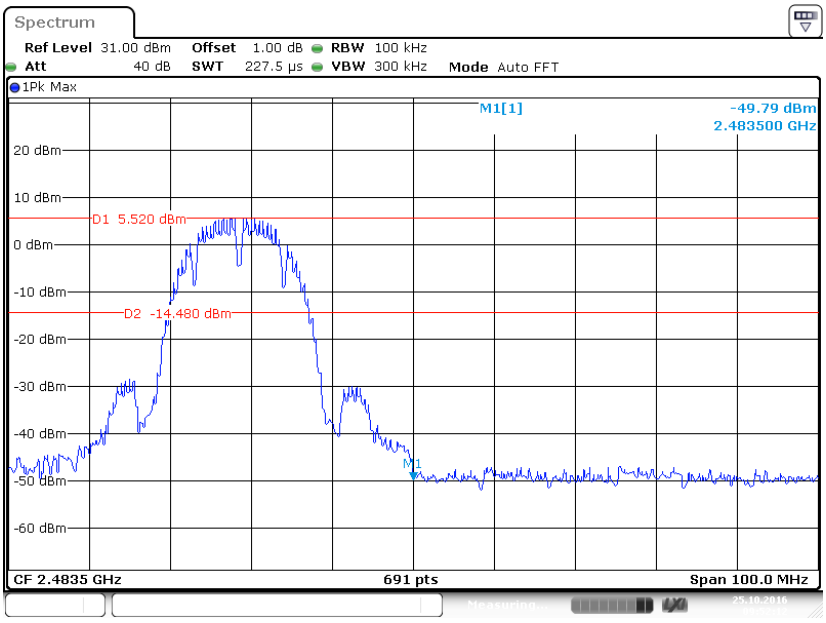
Please refer to the following table and plots.

802.11b: Band Edge, Left Side



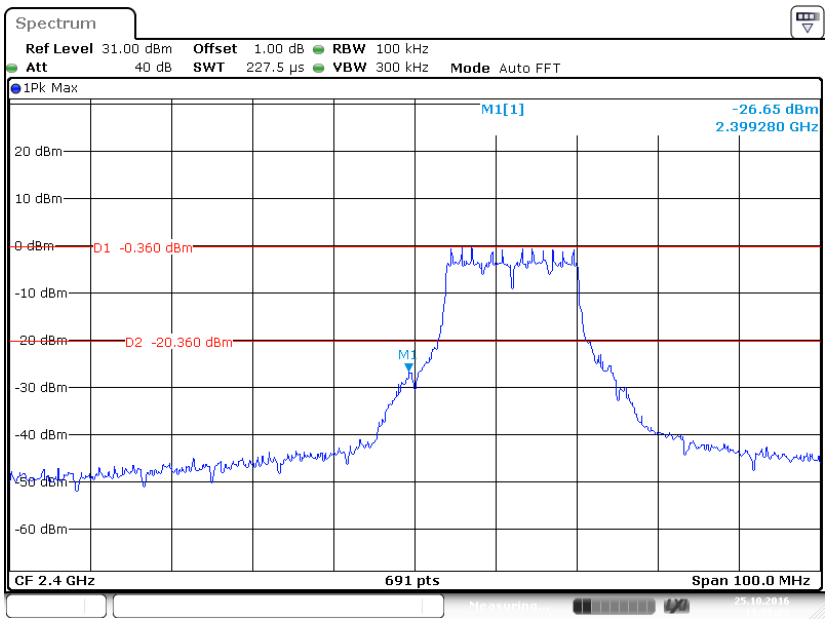
Date: 25.OCT.2016 09:55:07

802.11b: Band Edge, Right Side



Date: 25.OCT.2016 09:52:11

802.11g: Band Edge, Left Side



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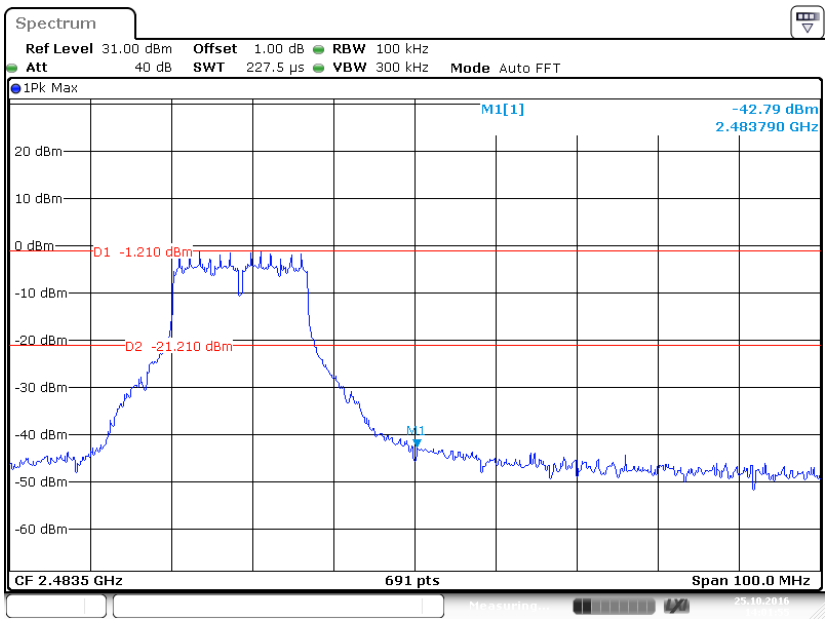
802.11g: Band Edge, Right Side



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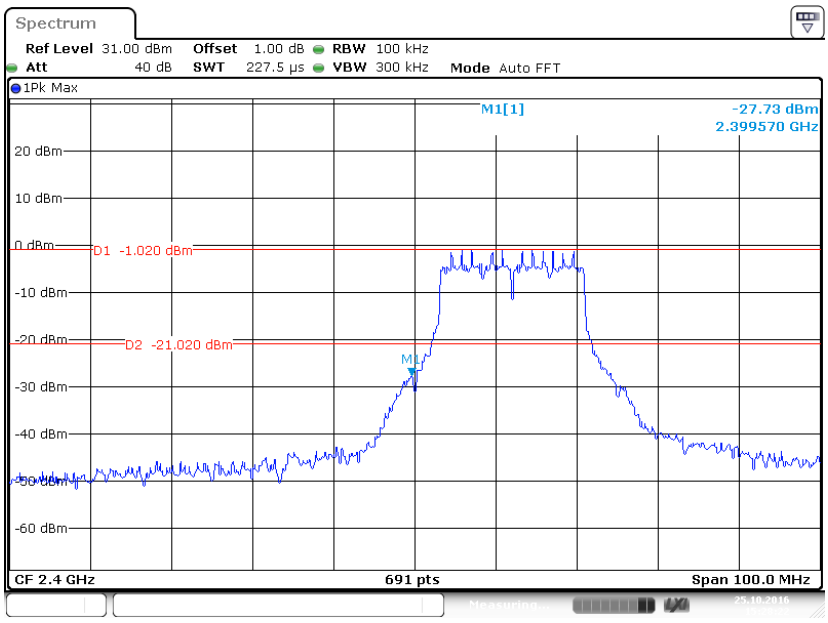
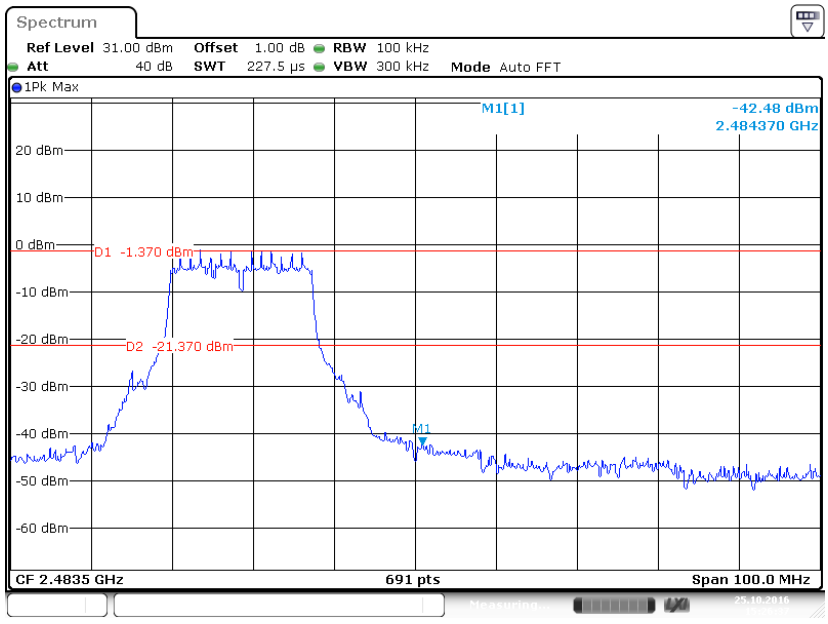
802.11n-HT20: Band Edge, Left Side



Date: 25.OCT.2016 15:28:22

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 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	Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-06-16	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

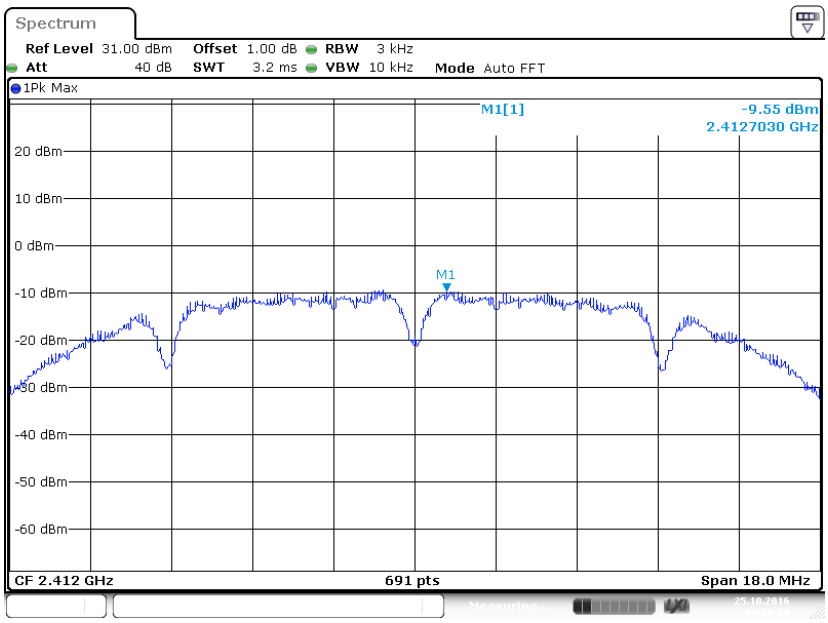
The testing was performed by Ada Yu on 2016-10-25.

EUT operation mode: Transmitting

Test Result: Pass

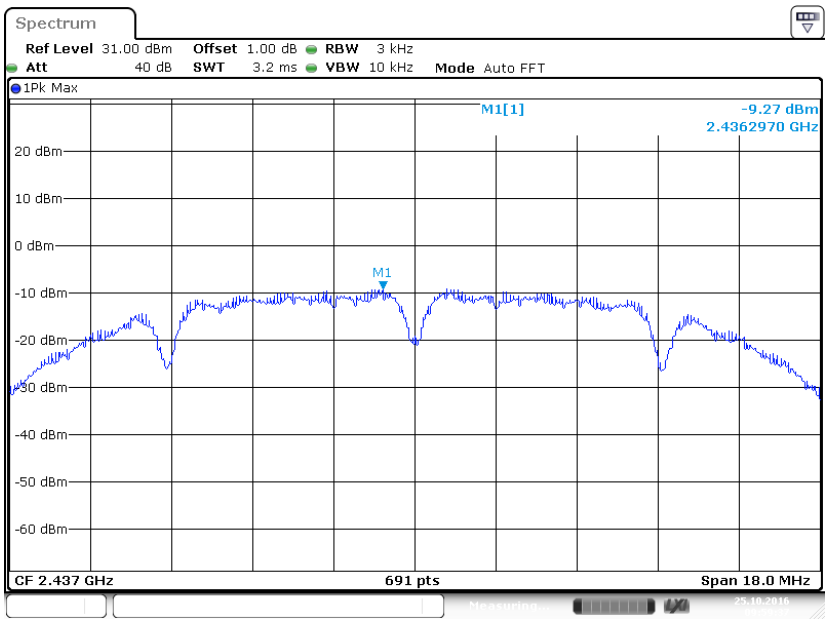
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-9.55	≤8
Middle	2437	-9.27	≤8
High	2462	-8.52	≤8
802.11g mode			
Low	2412	-13.52	≤8
Middle	2437	-13.92	≤8
High	2462	-14.2	≤8
802.11n-HT20 mode			
Low	2412	-14.14	≤8
Middle	2437	-14.79	≤8
High	2462	-14.48	≤8

Power Spectral Density, 802.11b Low Channel



Date: 25.OCT.2016 09:58:19

Power Spectral Density, 802.11b Middle Channel



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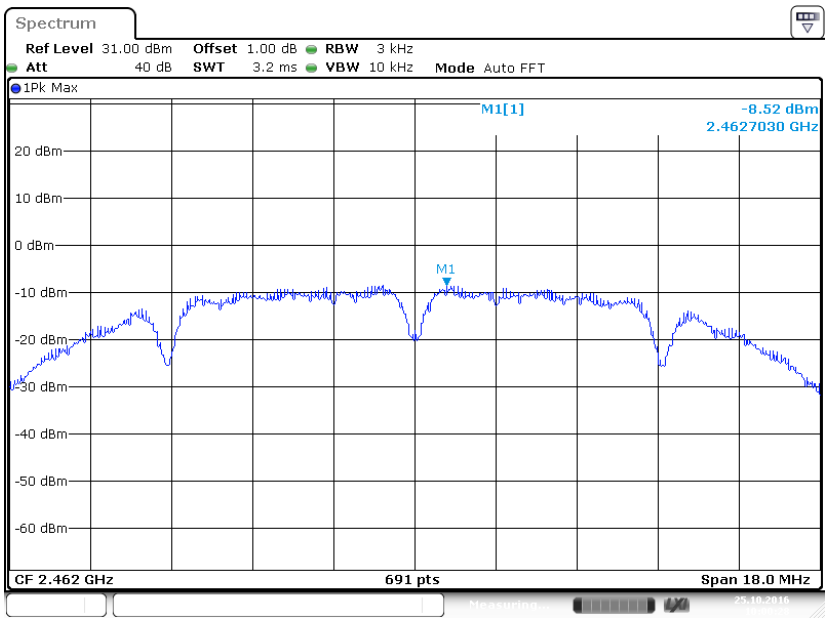
Power Spectral Density, 802.11b High Channel



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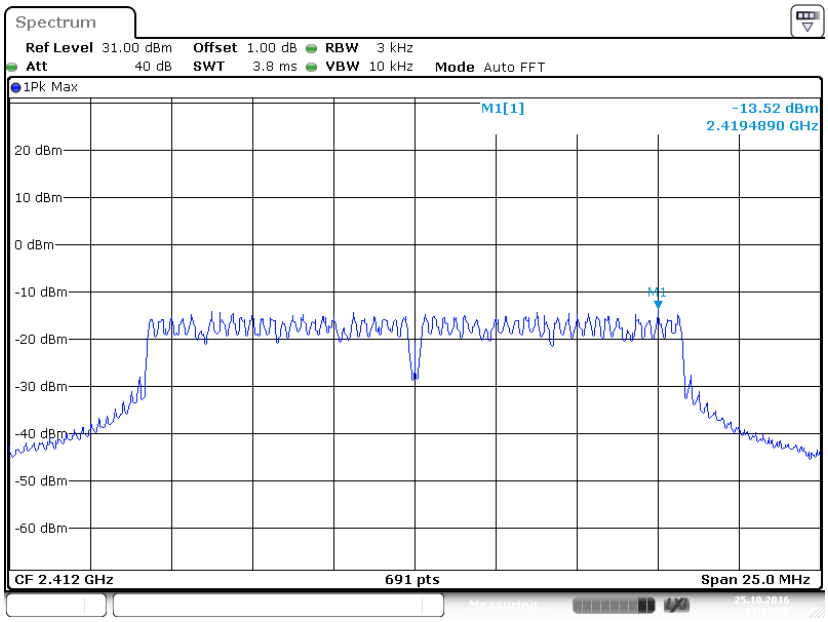
Power Spectral Density, 802.11g Low Channel



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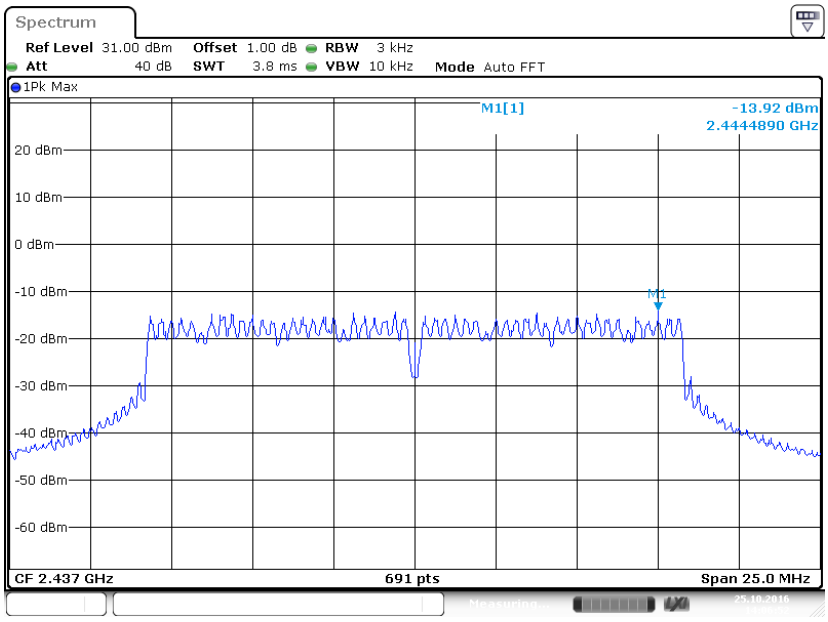
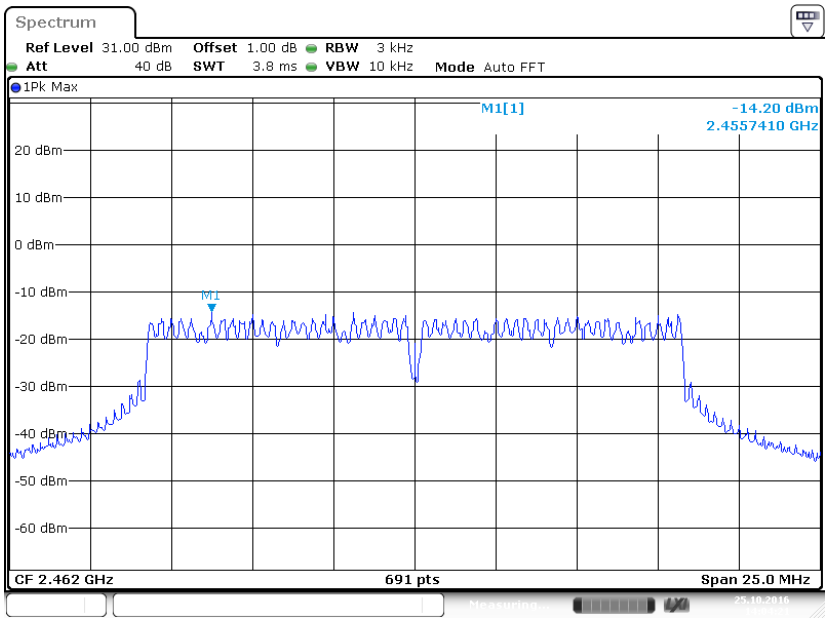
Power Spectral Density, 802.11g Middle Channel



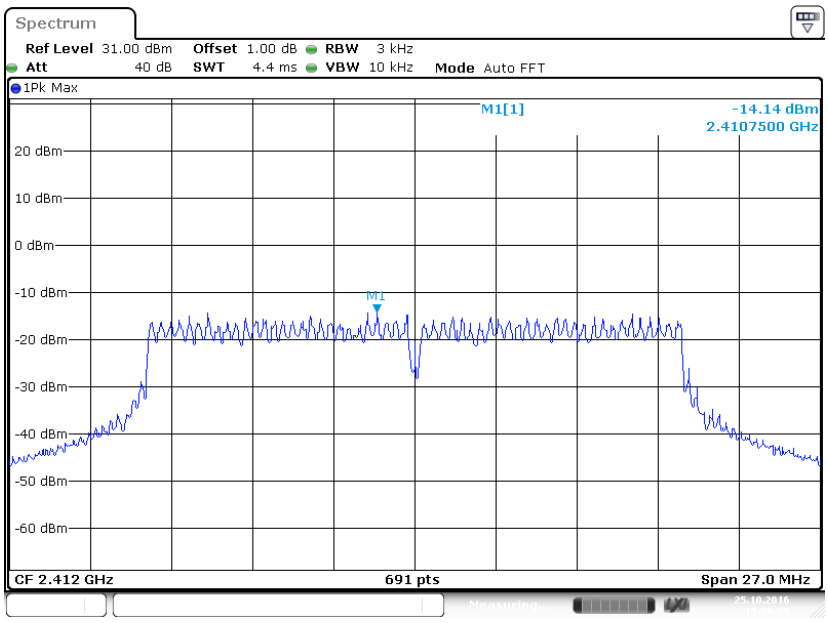
Date: 25.OCT.2016 14:06:52

Power Spectral Density, 802.11g High Channel



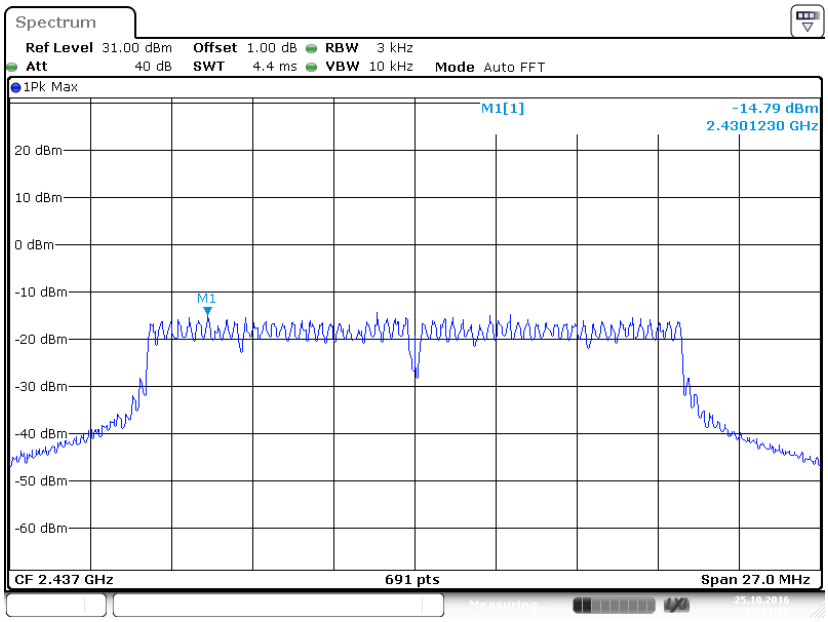
Date: 25.OCT.2016 14:04:21

Power Spectral Density, 802.11n-HT20 Low Channel



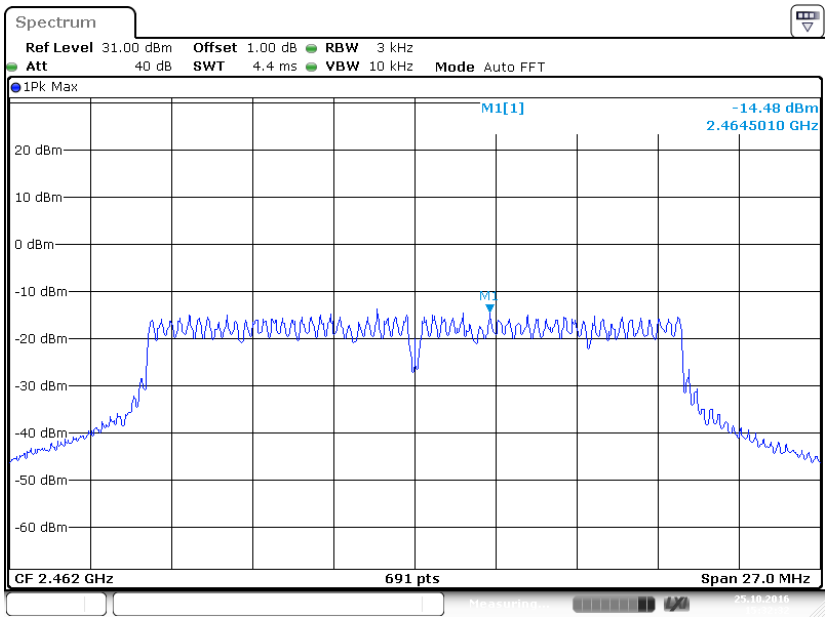
Date: 25.OCT.2016 15:30:29

Power Spectral Density, 802.11n-HT20 Middle Channel



Date: 25.OCT.2016 15:31:36

Power Spectral Density, 802.11n-HT20 High Channel



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