TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.247

TEST REPORT

For

Lithe Audio Ltd

Unit 3 Stockwell Works, Stephenson Way, Crawley, West Sussex, UK RH10 1TN

FCC ID: 2AQOB-LWF1

Report Type:	**Product Type:**
Original Report	WI-FI CEILING SPEAKER

Test Engineer:	Stone Zhang
Report Number:	RSHA180906008-00B
Report Date:	2018-12-25
Reviewed By:	Oscar Ye RF Leader
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)

Applicant	Lithe Audio Ltd
Test Model	LWF1
Product Type	WI-FI CEILING SPEAKER
Dimension	22.5mm(L)*22.5mm(W)*10mm(H)
Rate Voltage	DC 24V from adapter

Adapter Information:
Model: TDX-2402500
Input: AC100-240 V 50/60Hz 2A
Output:24.0V, 2.5A

**All measurement and test data in this report was gathered from production sample serial number: 20180906008 (Assigned by the BACL. The EUT supplied by the applicant was received on 2018-09-06)*

Objective

This report is prepared on behalf of *Lithe Audio Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A 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)

No related Submittal(s)/Grant(s)

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 15.247 Meas Guidance v05.

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

Item		Measurement Uncertainties
AC Power Lines Conducted Emissions		±3.19 dB
RF conducted test with spectrum		±0.9dB
RF Output Power with Power meter		±0.5dB
Radiated emission	30MHz~1GHz	±6.11dB
	1GHz~6GHz	±4.45dB
	6GHz~18GHz	±5.23dB
	18GHz~40GHz	±5.65dB
Occupied Bandwidth		±0.5kHz
Temperature		±1.0℃
Humidity		±6%

The Measurement Uncertainties listed above have been calculated for a k=2 Coverage Factor(corresponding to approximately a 95% level of confidence). These Uncertainty values were not taken into account in determining compliance with Limits.

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.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel list for 802.11b, 802.11g and 802.11n-HT20 mode:

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.

For Conducted Test:

802.11b & 802.11g&802.11n: each transmit chains were tested

For Radiated Test:

802.11b & 802.11g, SISO for each transmit chain
For 802.11n: MIMO for two transmit chains

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

RF test tool: teraterm-4.85

Pre-scan with all the data rates, and the worst case was performed as below:

Mode	Data rate	Power level	
		Chain 0	Chain 1
802.11b	1 Mbps	5	7
802.11g	6 Mbps	0	0
802.11n-HT20	MCS0	0	0

Support Equipment List and Details

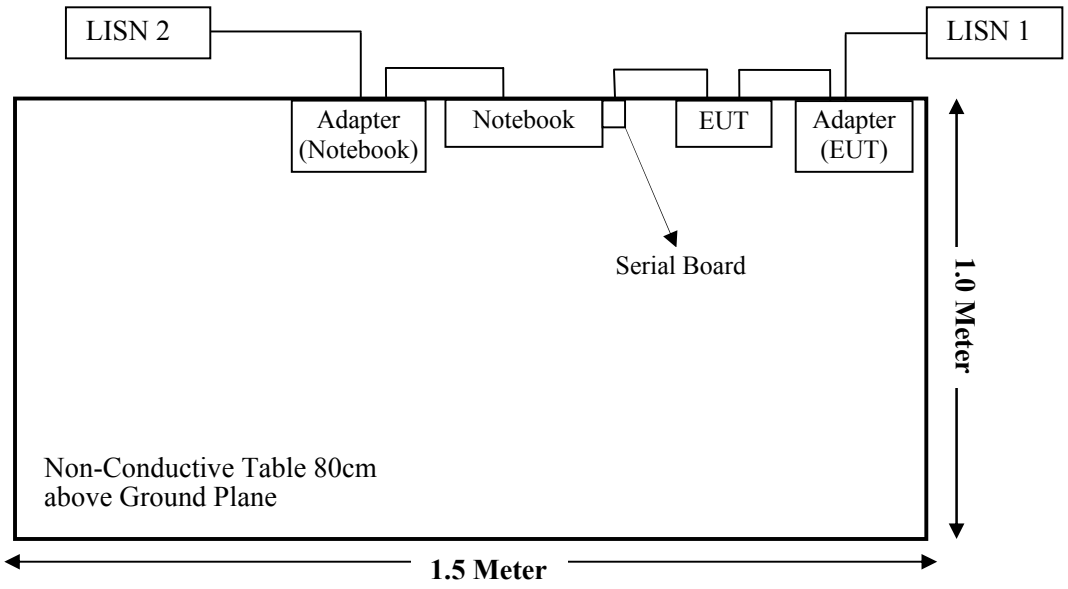
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263
Lithe Audio	Serial Board	/	/

External I/O Cable

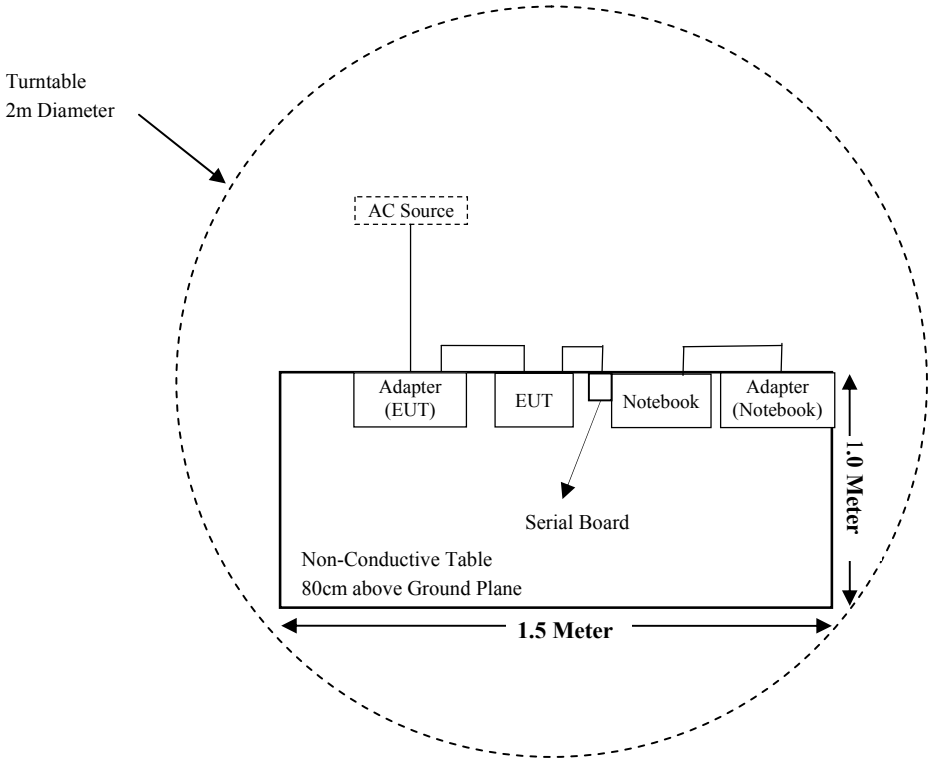
Cable Description	Length (m)	From Port	To
Power Cable-1	1.0	EUT	Adapter (EUT)
Power Cable-2	1.2	Notebook	Adapter (Notebook)
RJ45 Cable	1.8	EUT	Notebook

Block Diagram of Test Setup

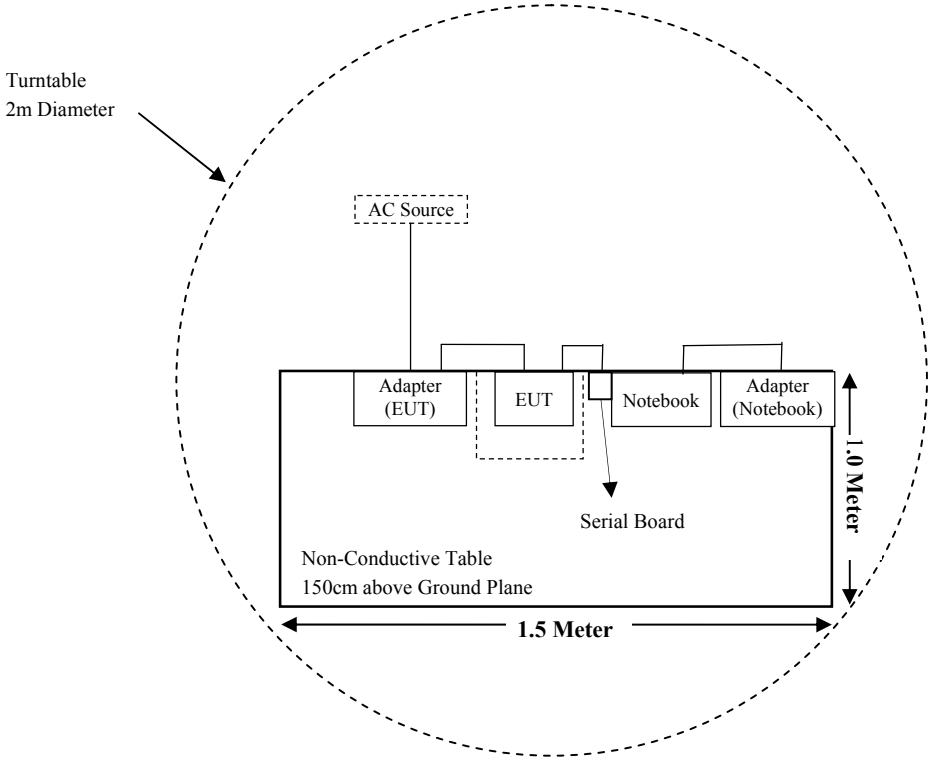
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



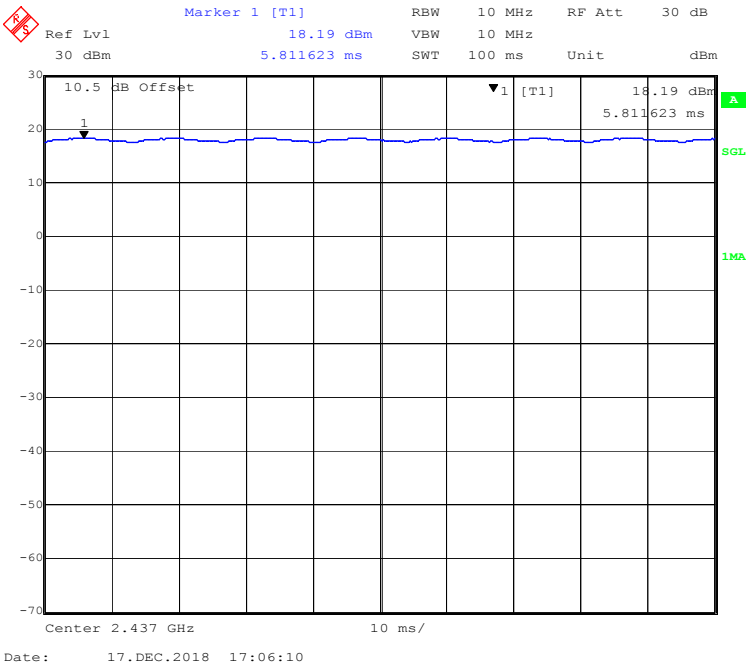
SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

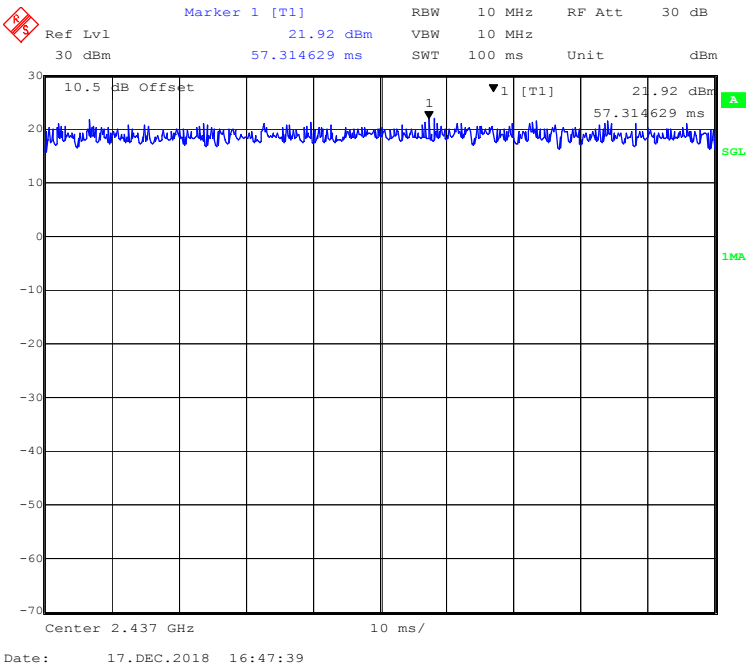
Duty Cycle Pre-scan

Duty Cycle (Chain 0):

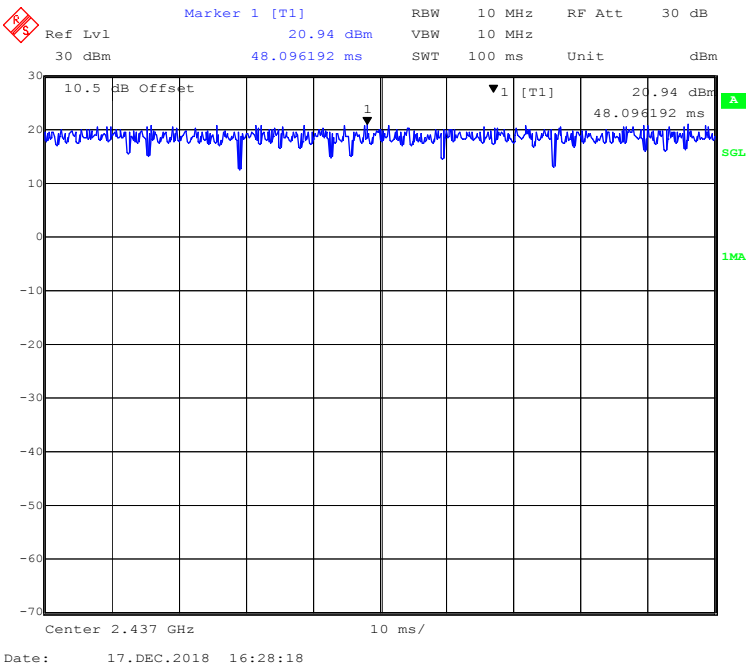
802.11b Mode Middle Channel



802.11g Mode Middle Channel

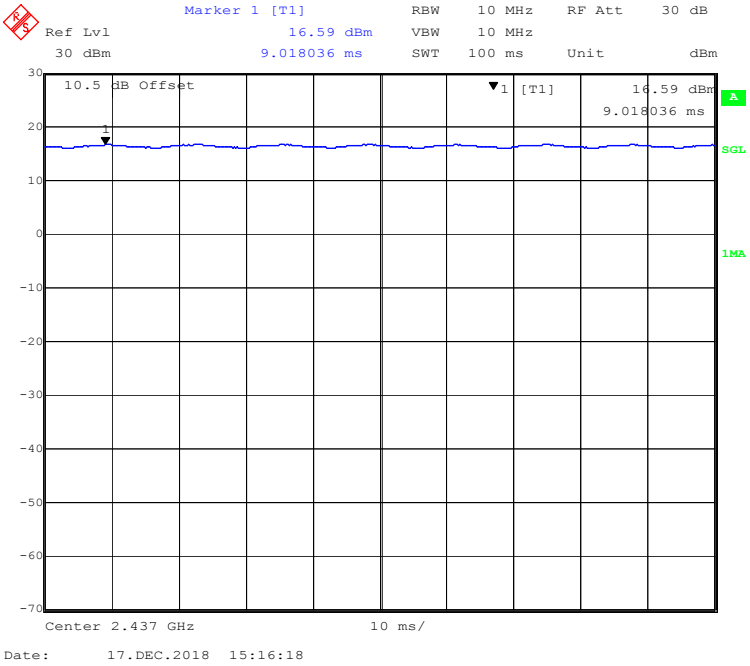


802.11n-HT20 Mode Middle Channel

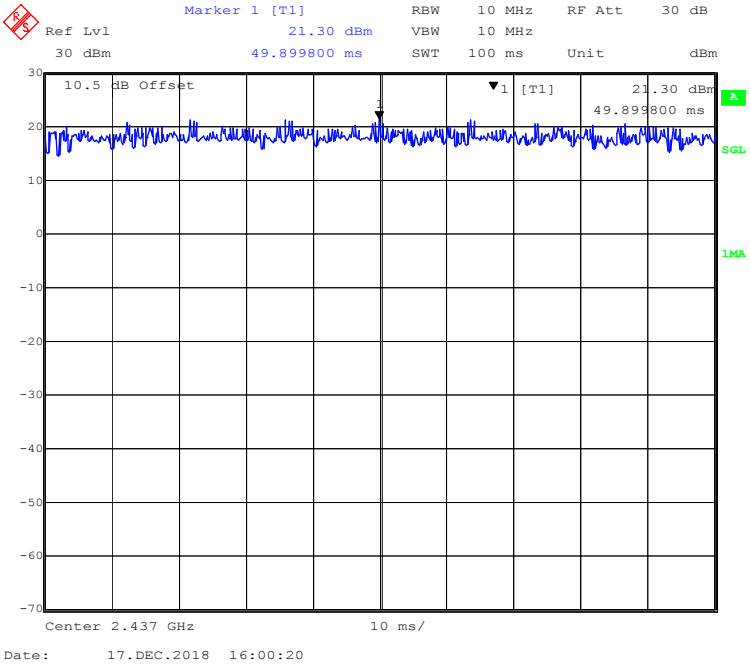


Duty Cycle (Chain 1):

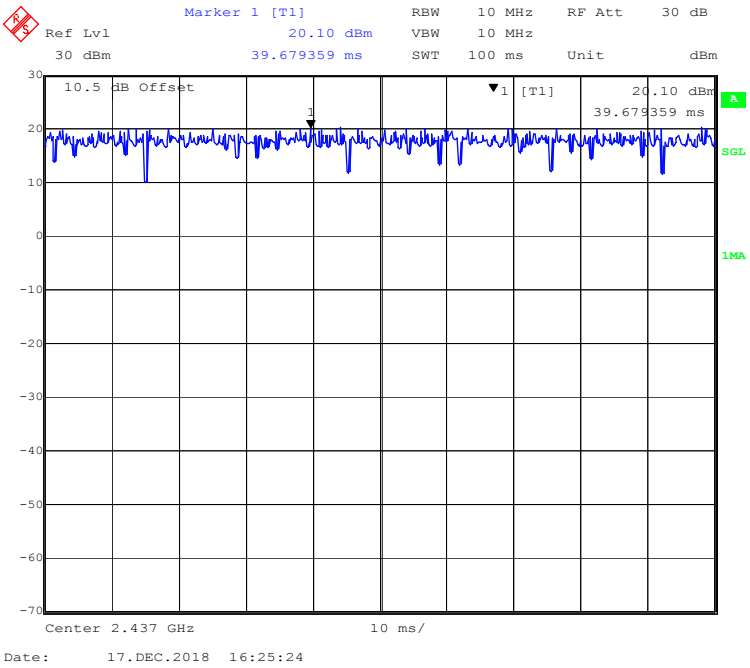
802.11b Mode Middle Channel



802.11g Mode Middle Channel



802.11n-HT20 Mode Middle Channel



Mode	Duty Cycle	T(ms)	1/T(kHz)	10log(1/x)
802.11b	100.00%	/	/	0.00
802.11g	100.00%	/	/	0.00
802.11n-HT20	100.00%	/	/	0.00

Note: “x” means the Duty Cycle.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-12	2019-11-11
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2018-08-15	2019-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-27	2019-08-26
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
A.H.Systems, inc	Amplifier	2641-1	466	2018-09-11	2019-09-10
EM Electronics	Amplifier	EM18G40G	060726	2018-03-22	2019-03-21
MICRO-TRONICS	Notch filter	BRM50702	F02	2018-08-05	2019-08-04
Narda	Attenuator	10dB	010	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2018-08-15	2019-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2018-11-12	2019-11-11
Narda	Attenuator	10dB	010	2018-12-12	2019-12-11
Agilent	Power Meter	N1912A	MY5000492	2018-11-18	2019-11-17
Agilent	Power Sensor	N1921A	MY54210024	2018-11-18	2019-11-17
Lithe	RF Cable	Lithe01	C01	Each Time	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2018-11-12	2019-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2018-11-12	2019-11-11
Rohde & Schwarz	LISN	ENV216	3560655016	2018-11-12	2019-11-11
BACL	Auto test Software	BACL-EMC	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2018-01-10	2019-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2018-08-15	2019-08-14

*** 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).

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

Applicable Standard

According to §2.1091 and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

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:

For worst case:

Mode	Frequency (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412-2462	2.00	1.58	19	79.43	20	0.0630	1.0000
802.11g		2.00	1.58	21	125.89	20	0.0999	1.0000
802.11n-HT20		2.00	1.58	23	199.53	20	0.1584	1.0000

Note:

According to 662911 D01 Multiple Transmitter Output v02r01, for 802.11n:
Directional gain = G_{ANT} + 10*log(N_{ANT}) dBi=2.0dBi+10*log(2)=5.01dBi

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 two FPC antennas, which use unique type of connector to attach to the EUT; fulfill the requirement of this section. Please refer to the EUT photos.

Chain	Antenna Type	Max. Antenna Gain
0	FPC	2.0 dBi
1	FPC	2.0 dBi

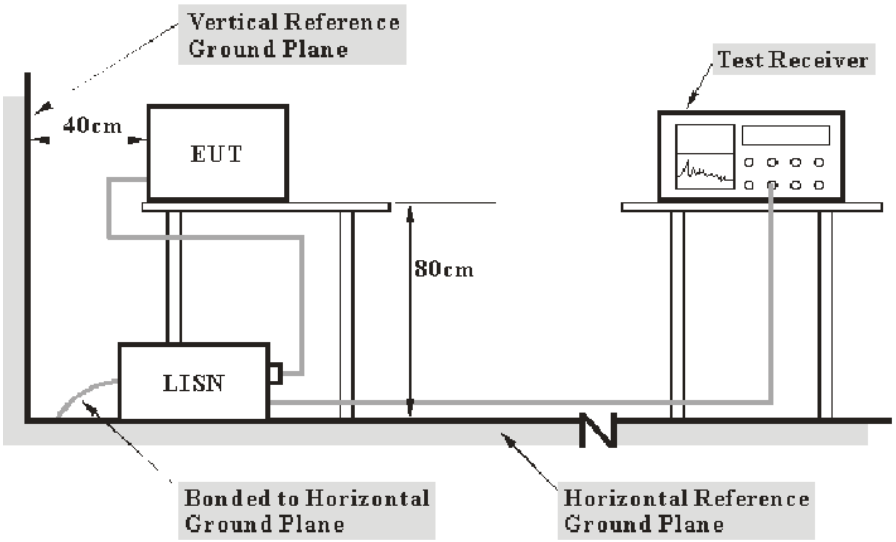
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

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.

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.

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:

Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

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 (dB) = Limit (dBμV) – Corrected Amplitude (dBμV)

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

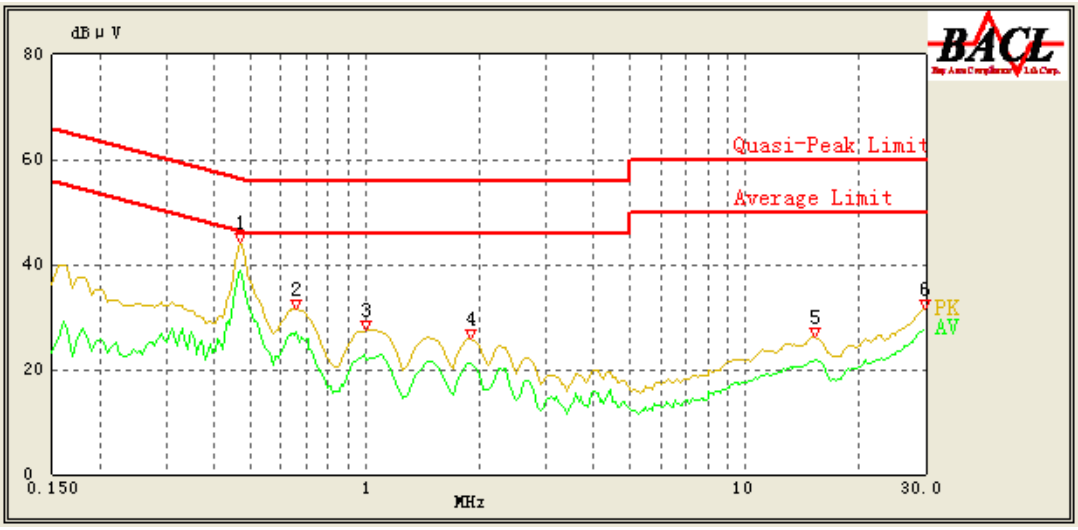
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	48 %
ATM Pressure:	101.3 kPa

The testing was performed by Stone Zhang on 2018-12-17.

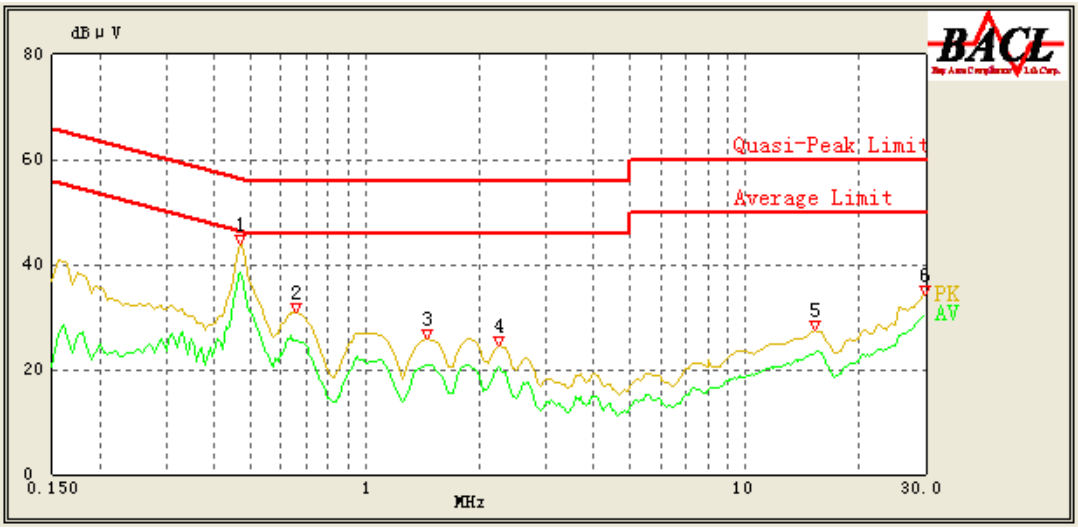
EUT operation mode: Transmitting in 802.11g mode low channel of Chain0 (Worst case)

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.470	44.01	QP	9.000	L1	16.07	56.51	12.85	Compliance
0.470	38.73	AV	9.000	L1	16.07	46.51	8.13	Compliance
0.655	31.49	QP	9.000	L1	15.98	56.00	24.51	Compliance
0.655	27.25	AV	9.000	L1	15.98	46.00	18.75	Compliance
1.000	27.43	QP	9.000	L1	15.88	56.00	28.57	Compliance
1.000	21.87	AV	9.000	L1	15.88	46.00	24.13	Compliance
1.900	25.99	QP	9.000	L1	15.85	56.00	30.01	Compliance
1.900	21.30	AV	9.000	L1	15.85	46.00	24.70	Compliance
15.300	26.18	QP	9.000	L1	16.22	60.00	33.82	Compliance
15.300	21.95	AV	9.000	L1	16.22	50.00	28.05	Compliance
29.750	31.62	QP	9.000	L1	16.58	60.00	28.38	Compliance
29.750	27.95	AV	9.000	L1	16.58	50.00	22.05	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.470	43.75	QP	9.000	N	16.10	56.51	13.11	Compliance
0.470	38.56	AV	9.000	N	16.10	46.51	8.30	Compliance
0.655	30.87	QP	9.000	N	16.02	56.00	25.13	Compliance
0.660	25.46	AV	9.000	N	16.01	46.00	20.54	Compliance
1.450	25.80	QP	9.000	N	15.93	56.00	30.20	Compliance
1.450	20.98	AV	9.000	N	15.93	46.00	25.02	Compliance
2.250	24.36	QP	9.000	N	15.91	56.00	31.64	Compliance
2.250	20.34	AV	9.000	N	15.91	46.00	25.66	Compliance
15.300	27.37	QP	9.000	N	16.02	60.00	32.63	Compliance
15.300	23.21	AV	9.000	N	16.02	50.00	26.79	Compliance
29.800	34.25	QP	9.000	N	16.34	60.00	25.75	Compliance
29.850	30.44	AV	9.000	N	16.34	50.00	19.56	Compliance

Note:
1) Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Margin (dB) = Limit (dBμV) – Corrected Amplitude (dBμV)

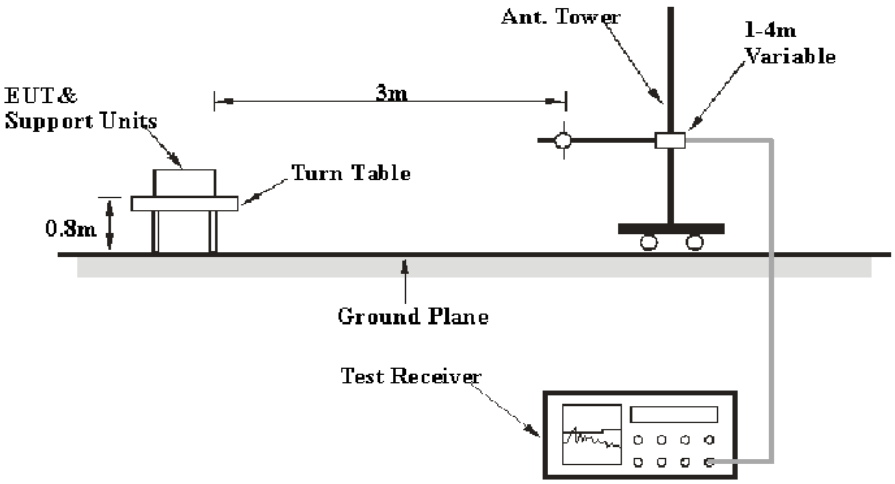
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

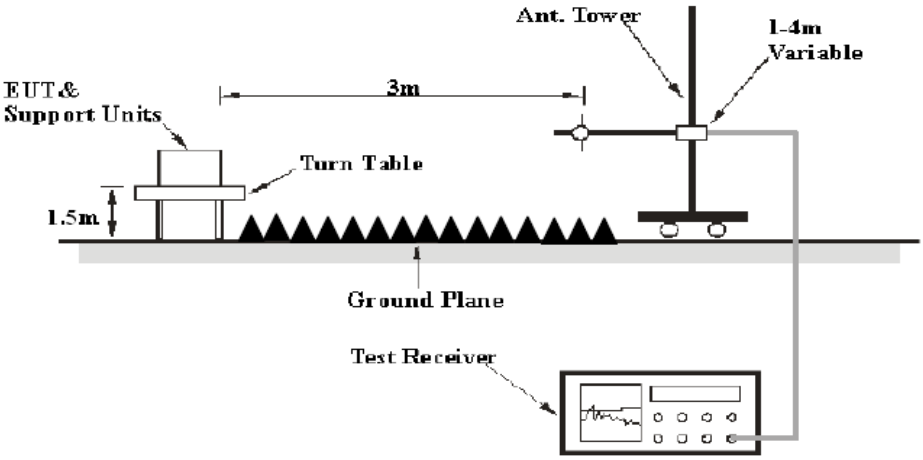
FCC §15.247 (d); §15.209; §15.205;

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.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz - 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Ave
	1MHz	＞1/T Note 2		Ave

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

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 mode for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude (dBμV /m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

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 (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

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.

Test Data

Environmental Conditions

Temperature:	24.8℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

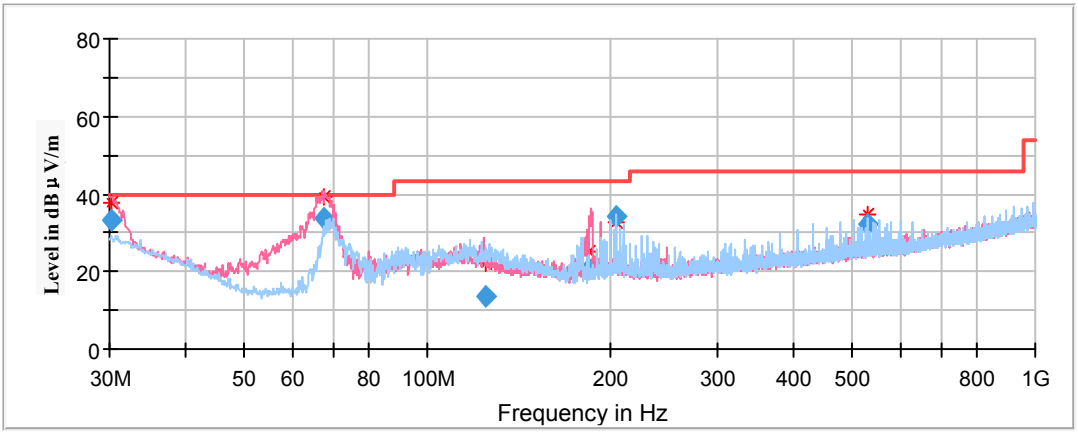
The testing was performed by Stone Zhang on 2018-12-17

Test Result: Compliant.

Spurious Emission Test:

30MHz-1GHz:

Pre-scan with 802.11b, 802.11g and 802.11n-HT20 modes of operation in the X,Y and Z axes of orientation, the worst case 802.11g mode low channel of chain 0 in X-axis of orientation was recorded



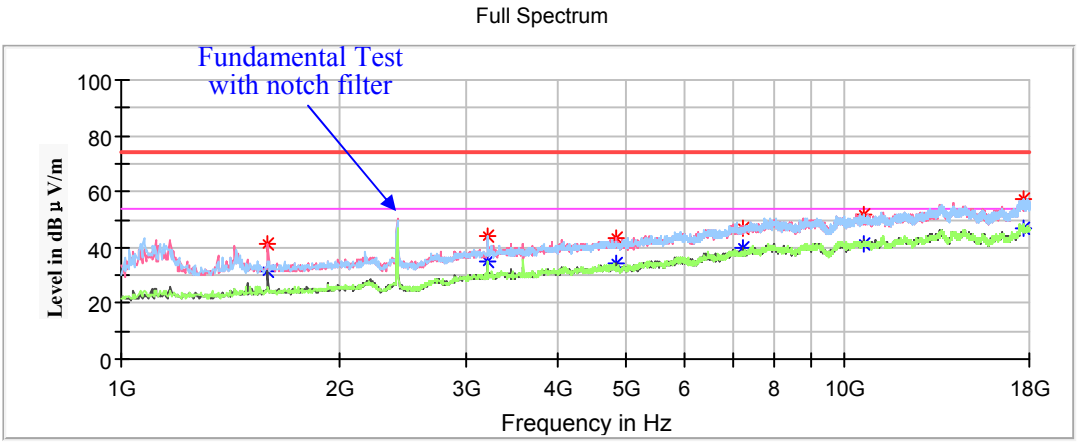
Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dBµV/m)	Height (cm)	Polar (H/V)				
30.187345	33.27	101.0	V	173.0	-4.1	40.00	6.73
67.582750	33.77	101.0	V	147.0	-17.4	40.00	6.23
124.581050	13.69	101.0	V	278.0	-11.4	43.50	29.81
185.022600	20.57	101.0	V	220.0	-13.3	43.50	22.93
204.992550	34.02	199.0	H	34.0	-12.3	43.50	9.48
528.374750	32.40	199.0	H	110.0	-5.9	46.00	13.60

1GHz-18GHz

802.11b Mode (Chain 0):
*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)*

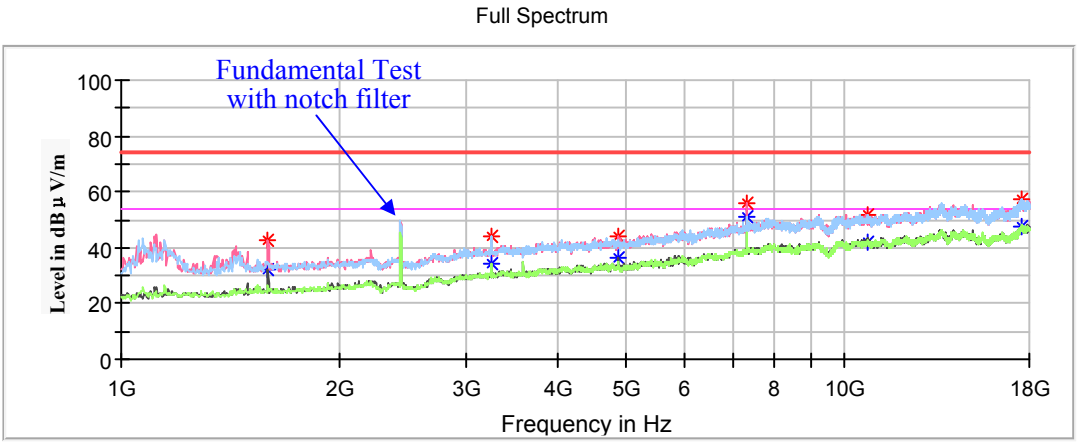
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

Low Channel: 2412MHz



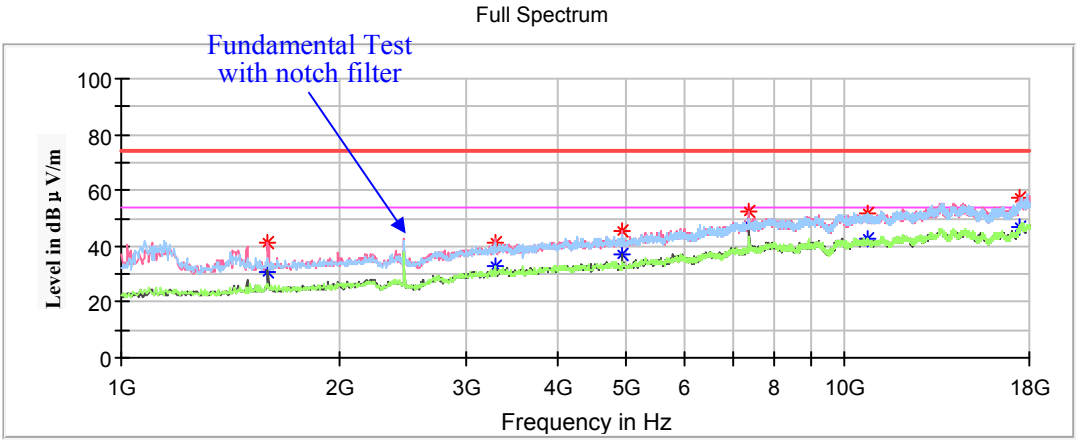
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	31.27	150.0	V	61.0	-7.2	54.00	22.73
1591.600000	41.14	---	150.0	V	61.0	-7.2	74.00	32.86
3213.400000	---	34.79	200.0	H	130.0	-1.3	54.00	19.21
3213.400000	44.30	---	200.0	H	130.0	-1.3	74.00	29.70
4824.000000	---	34.26	200.0	V	46.0	1.9	54.00	19.74
4824.000000	43.59	---	200.0	V	46.0	1.9	74.00	30.41
7236.000000	47.14	---	200.0	V	5.0	9.0	74.00	26.86
7236.000000	---	39.62	200.0	V	5.0	9.0	54.00	14.38
10622.000000	---	41.18	200.0	H	302.0	12.9	54.00	12.82
10622.000000	51.96	---	200.0	H	302.0	12.9	74.00	22.04
17643.000000	---	46.74	200.0	H	78.0	17.3	54.00	7.26
17643.000000	57.17	---	150.0	H	78.0	17.3	74.00	16.83

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	32.32	200.0	V	66.0	-7.2	54.00	21.68
1595.000000	42.51	---	200.0	V	66.0	-7.2	74.00	31.49
3247.400000	---	34.37	150.0	H	137.0	-1.2	54.00	19.63
3247.400000	43.84	---	150.0	H	137.0	-1.2	74.00	30.16
4874.000000	---	36.65	150.0	V	25.0	1.9	54.00	17.35
4874.000000	43.75	---	150.0	V	25.0	1.9	74.00	30.25
7311.000000	55.71	---	150.0	V	200.0	9.2	74.00	18.29
7311.000000	---	51.34	150.0	V	200.0	9.2	54.00	2.66
10754.600000	---	41.74	200.0	H	77.0	13.1	54.00	12.26
10754.600000	51.68	---	200.0	H	77.0	13.1	74.00	22.32
17547.800000	---	47.27	150.0	H	335.0	17.2	54.00	6.73
17547.800000	57.33	---	150.0	H	335.0	17.2	74.00	16.67

High Channel: 2462MHz



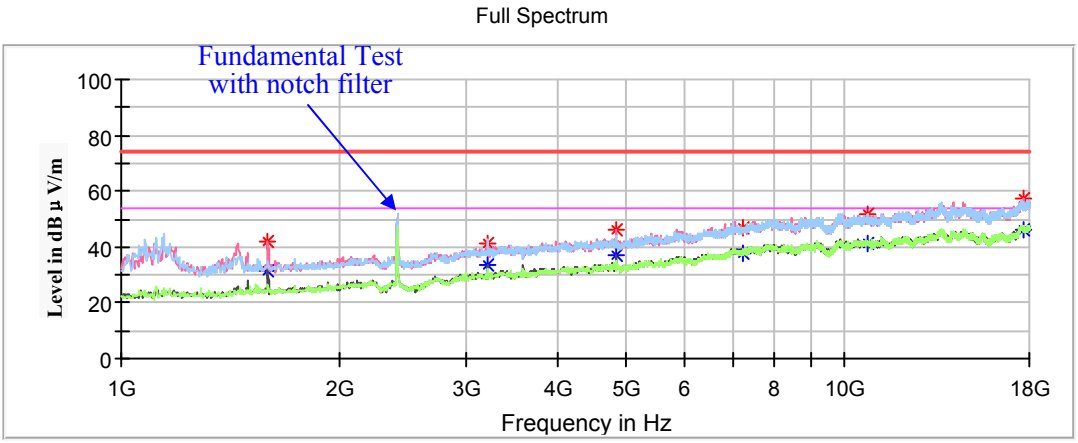
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	30.98	150.0	V	72.0	-7.2	54.00	23.02
1591.600000	41.00	---	150.0	V	72.0	-7.2	74.00	33.00
3281.400000	41.48	---	200.0	H	276.0	-1.2	74.00	32.52
3281.400000	---	33.00	200.0	H	276.0	-1.2	54.00	21.00
4924.000000	---	37.26	150.0	V	34.0	2.0	54.00	16.74
4924.000000	45.72	---	150.0	V	34.0	2.0	74.00	28.28
7386.000000	---	47.40	150.0	V	200.0	9.4	54.00	6.60
7386.000000	52.28	---	150.0	V	200.0	9.4	74.00	21.72
10741.000000	---	42.49	200.0	H	245.0	13.1	54.00	11.51
10741.000000	51.75	---	200.0	H	245.0	13.1	74.00	22.25
17466.200000	---	46.85	150.0	V	355.0	17.0	54.00	7.15
17466.200000	57.50	---	150.0	V	355.0	17.0	74.00	16.50

802.11b Mode (Chain 1):

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)*

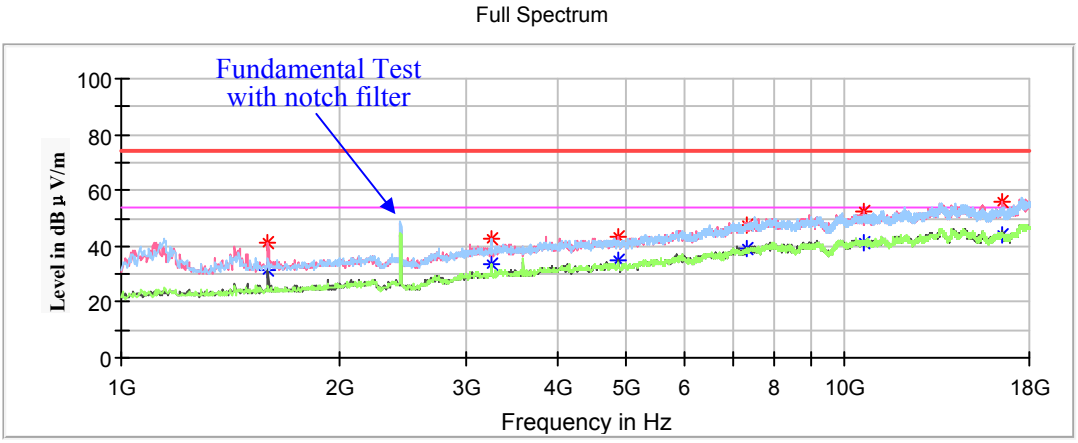
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

Low Channel: 2412MHz



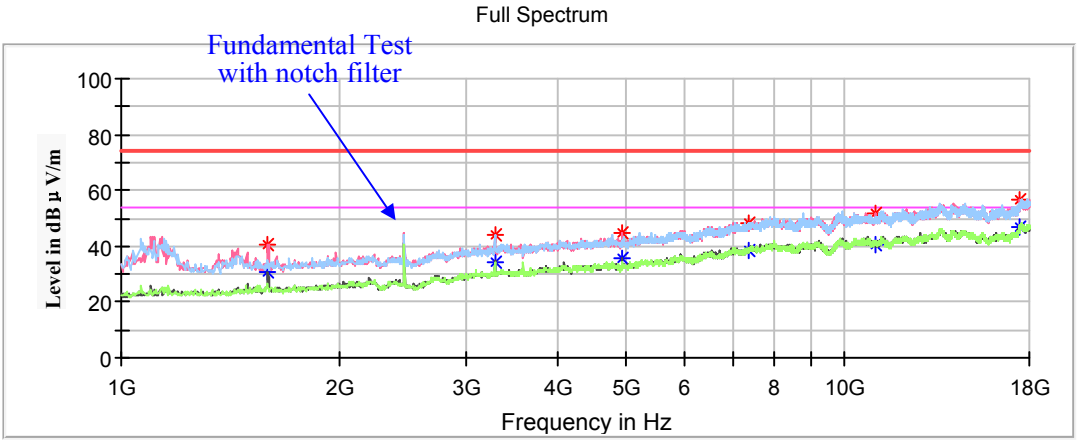
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	31.40	200.0	V	66.0	-7.2	54.00	22.60
1591.600000	41.71	---	200.0	V	66.0	-7.2	74.00	32.29
3213.400000	---	33.48	150.0	V	226.0	-1.3	54.00	20.52
3213.400000	41.28	---	150.0	V	226.0	-1.3	74.00	32.72
4824.000000	---	37.23	200.0	H	19.0	1.9	54.00	16.77
4824.000000	46.21	---	200.0	H	19.0	1.9	74.00	27.79
7236.000000	46.55	---	200.0	H	178.0	9.0	74.00	27.45
7236.000000	---	38.06	200.0	H	178.0	9.0	54.00	15.94
10747.800000	---	41.57	150.0	H	124.0	13.1	54.00	12.43
10747.800000	52.05	---	150.0	H	124.0	13.1	74.00	21.95
17643.000000	---	46.11	150.0	V	84.0	17.3	54.00	7.89
17643.000000	57.05	---	150.0	V	84.0	17.3	74.00	16.95

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	31.79	150.0	V	59.0	-7.2	54.00	22.21
1595.000000	40.95	---	150.0	V	59.0	-7.2	74.00	33.05
3247.400000	---	33.37	200.0	H	307.0	-1.2	54.00	20.63
3247.400000	42.84	---	200.0	H	307.0	-1.2	74.00	31.16
4874.000000	---	34.92	200.0	H	27.0	1.9	54.00	19.08
4874.000000	43.29	---	200.0	H	27.0	1.9	74.00	30.71
7311.000000	---	38.88	200.0	H	35.0	9.2	54.00	15.12
7311.000000	47.89	---	200.0	H	35.0	9.2	74.00	26.11
10649.200000	---	41.46	150.0	V	201.0	12.9	54.00	12.54
10649.200000	52.34	---	150.0	V	201.0	12.9	74.00	21.66
16514.200000	---	44.15	200.0	V	124.0	13.7	54.00	9.85
16514.200000	55.63	---	200.0	V	124.0	13.7	74.00	18.37

High Channel: 2462MHz



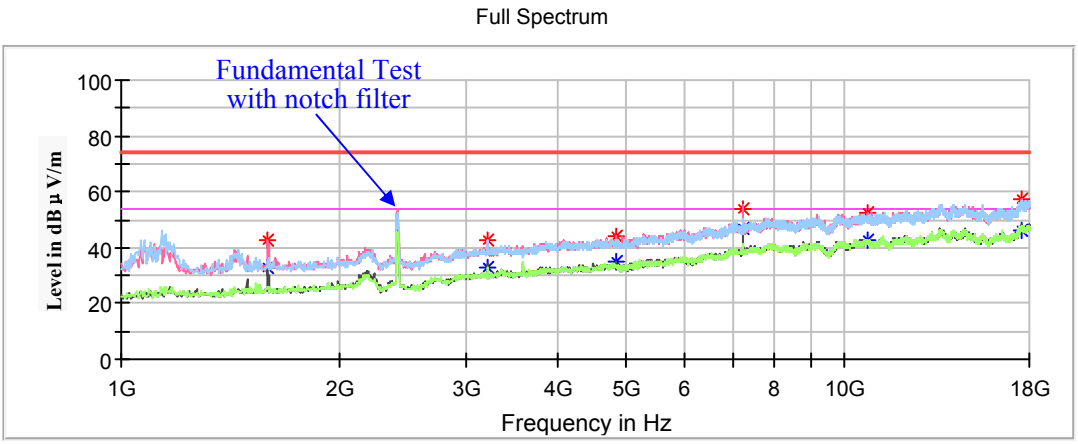
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	40.28	---	150.0	V	57.0	-7.2	74.00	33.72
1595.000000	---	30.76	150.0	V	57.0	-7.2	54.00	23.24
3281.400000	---	34.50	200.0	H	352.0	-1.2	54.00	19.50
3281.400000	44.14	---	200.0	H	352.0	-1.2	74.00	29.86
4924.000000	---	35.61	200.0	H	314.0	2.0	54.00	18.39
4924.000000	44.43	---	200.0	H	314.0	2.0	74.00	29.57
7386.000000	---	38.71	200.0	H	257.0	9.4	54.00	15.29
7386.000000	48.23	---	200.0	H	257.0	9.4	74.00	25.77
11033.400000	---	40.77	150.0	V	339.0	13.4	54.00	13.23
11033.400000	51.55	---	150.0	V	339.0	13.4	74.00	22.45
17500.200000	---	46.86	200.0	V	21.0	17.2	54.00	7.14
17500.200000	56.96	---	200.0	V	21.0	17.2	74.00	17.04

802.11g Mode(Chain 0):

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)*

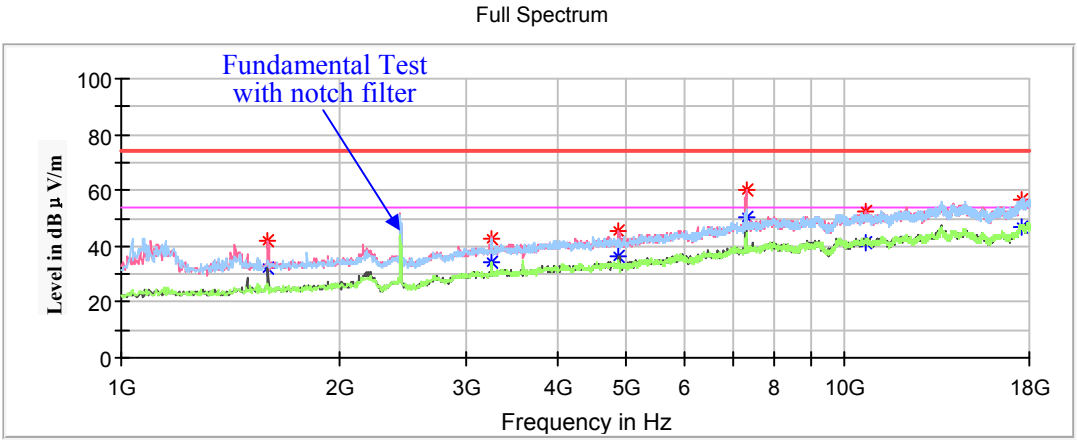
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

Low Channel: 2412MHz



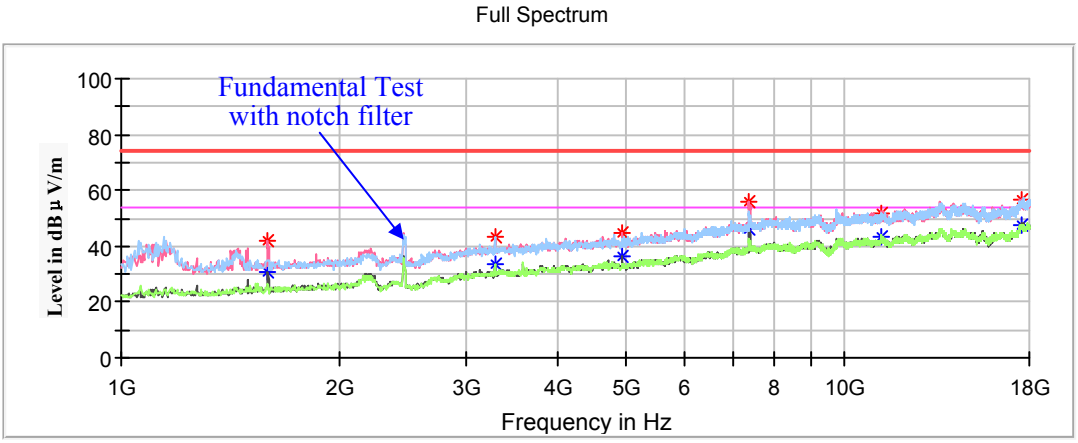
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	42.60	---	150.0	V	63.0	-7.2	74.00	31.40
1591.600000	---	32.93	150.0	V	63.0	-7.2	54.00	21.07
3213.400000	42.80	---	200.0	H	358.0	-1.3	74.00	31.20
3213.400000	---	32.94	200.0	H	358.0	-1.3	54.00	21.06
4824.000000	43.82	---	150.0	V	0.0	1.9	74.00	30.18
4824.000000	---	34.94	150.0	V	0.0	1.9	54.00	19.06
7236.000000	54.13	---	150.0	V	3.0	9.0	74.00	19.87
7236.000000	---	46.55	150.0	V	3.0	9.0	54.00	7.45
10741.000000	---	42.32	200.0	V	121.0	13.1	54.00	11.68
10741.000000	52.64	---	200.0	V	121.0	13.1	74.00	21.36
17544.400000	---	46.27	150.0	V	140.0	17.2	54.00	7.73
17544.400000	57.18	---	150.0	V	140.0	17.2	74.00	16.82

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	32.22	150.0	V	72.0	-7.2	54.00	21.78
1595.000000	41.64	---	150.0	V	72.0	-7.2	74.00	32.36
3247.400000	42.76	---	200.0	H	332.0	-1.2	74.00	31.24
3247.400000	---	34.60	200.0	H	332.0	-1.2	54.00	19.40
4874.000000	---	36.06	150.0	V	21.0	1.9	54.00	17.94
4874.000000	45.26	---	150.0	V	21.0	1.9	74.00	28.74
7311.000000	---	50.58	150.0	V	200.0	9.2	54.00	3.42
7311.000000	60.15	---	150.0	V	200.0	9.2	74.00	13.85
10673.000000	---	41.51	200.0	V	354.0	13.0	54.00	12.49
10673.000000	52.31	---	200.0	V	354.0	13.0	74.00	21.69
17575.000000	---	46.75	150.0	H	200.0	17.3	54.00	7.25
17575.000000	56.97	---	150.0	H	200.0	17.3	74.00	17.03

High Channel: 2462MHz



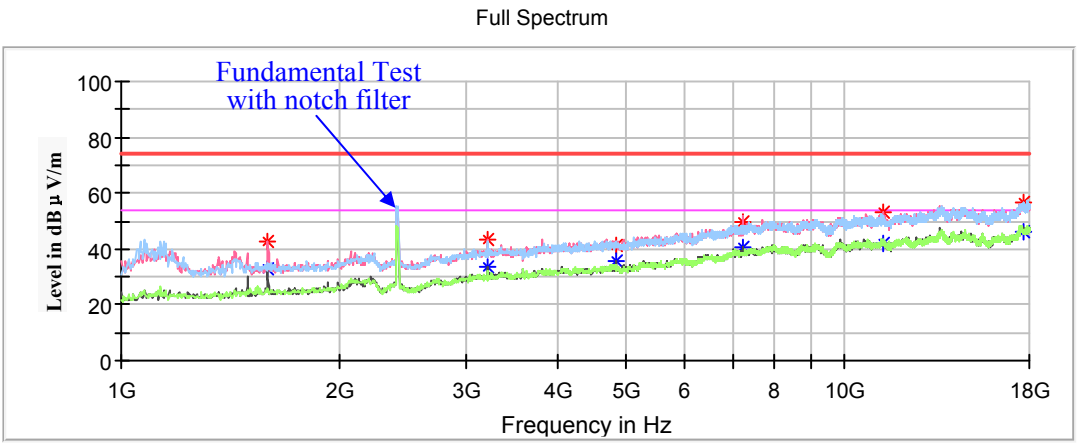
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	30.83	200.0	V	66.0	-7.2	54.00	23.17
1591.600000	41.83	---	200.0	V	66.0	-7.2	74.00	32.17
3281.400000	---	33.54	200.0	H	332.0	-1.2	54.00	20.46
3281.400000	43.62	---	200.0	H	332.0	-1.2	74.00	30.38
4924.000000	---	36.50	150.0	V	27.0	2.0	54.00	17.50
4924.000000	44.70	---	150.0	V	27.0	2.0	74.00	29.30
7386.000000	---	46.27	150.0	V	9.0	9.4	54.00	7.73
7386.000000	56.20	---	150.0	V	9.0	9.4	74.00	17.80
11237.400000	---	43.14	200.0	H	320.0	13.2	54.00	10.86
11237.400000	51.91	---	200.0	H	320.0	13.2	74.00	22.09
17564.800000	---	47.29	150.0	V	123.0	17.3	54.00	6.71
17564.800000	56.84	---	150.0	V	123.0	17.3	74.00	17.16

802.11g Mode(Chain 1):

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)*

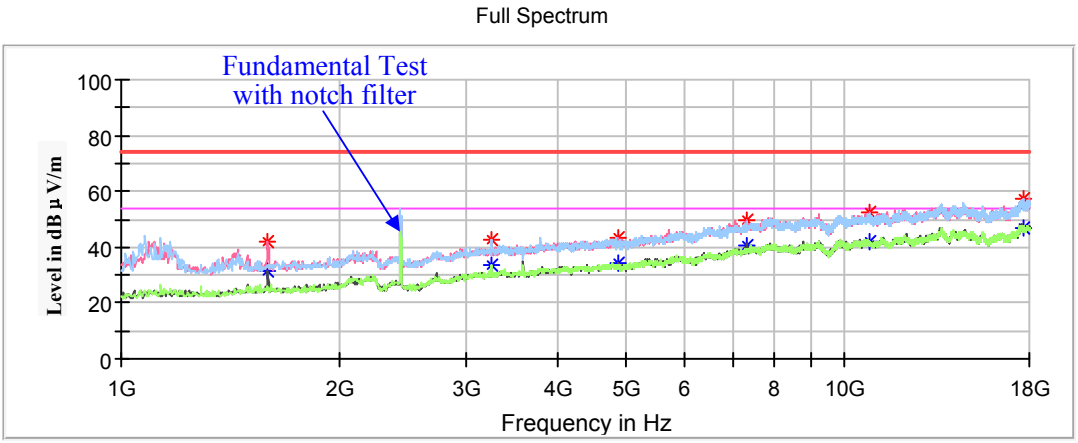
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

Low Channe1: 2412MHz



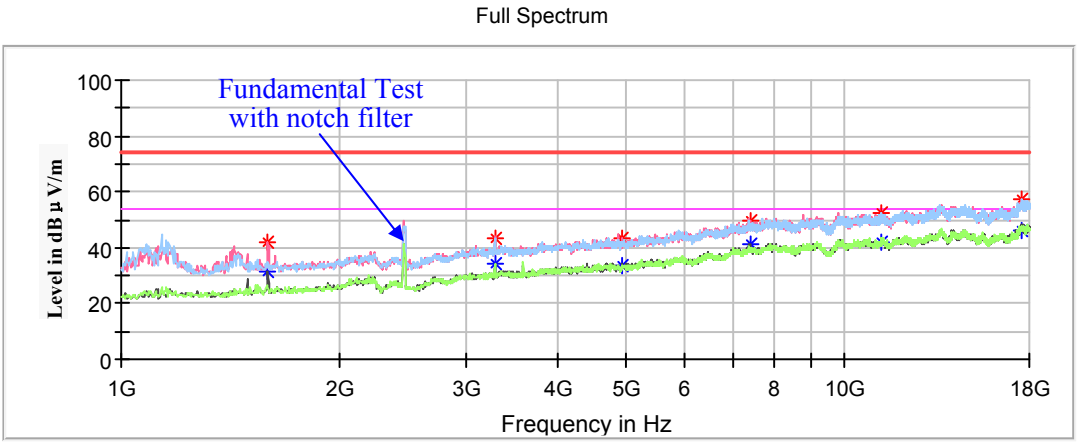
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	32.74	200.0	V	66.0	-7.2	54.00	21.26
1591.600000	42.78	---	200.0	V	66.0	-7.2	74.00	31.22
3213.400000	---	33.47	150.0	V	246.0	-1.3	54.00	20.53
3213.400000	43.23	---	150.0	V	246.0	-1.3	74.00	30.77
4824.000000	41.53	---	200.0	V	27.0	1.9	74.00	32.47
4824.000000	---	35.55	200.0	V	27.0	1.9	54.00	18.45
7236.000000	49.35	---	200.0	V	246.0	8.9	74.00	24.65
7236.000000	---	40.70	200.0	V	246.0	8.9	54.00	13.30
11291.800000	---	42.28	200.0	V	220.0	13.1	54.00	11.72
11291.800000	53.43	---	200.0	V	220.0	13.1	74.00	20.57
17653.200000	---	46.32	150.0	H	181.0	17.4	54.00	7.68
17653.200000	56.37	---	150.0	H	181.0	17.4	74.00	17.63

Middle Channel: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	31.75	200.0	V	66.0	-7.2	54.00	22.25
1591.600000	41.88	---	200.0	V	66.0	-7.2	74.00	32.12
3247.400000	---	33.50	150.0	H	97.0	-1.2	54.00	20.50
3247.400000	42.46	---	150.0	H	97.0	-1.2	74.00	31.54
4874.000000	---	34.53	150.0	V	35.0	1.9	54.00	19.47
4874.000000	43.23	---	150.0	V	35.0	1.9	74.00	30.77
7311.000000	---	40.87	150.0	V	225.0	9.2	54.00	13.13
7311.000000	49.90	---	150.0	V	225.0	9.2	74.00	24.10
10815.800000	---	42.06	150.0	V	199.0	13.2	54.00	11.94
10815.800000	52.12	---	150.0	V	199.0	13.2	74.00	21.88
17615.800000	---	46.92	200.0	H	230.0	17.3	54.00	7.08
17615.800000	57.27	---	200.0	H	230.0	17.3	74.00	16.73

High Channel: 2462MHz

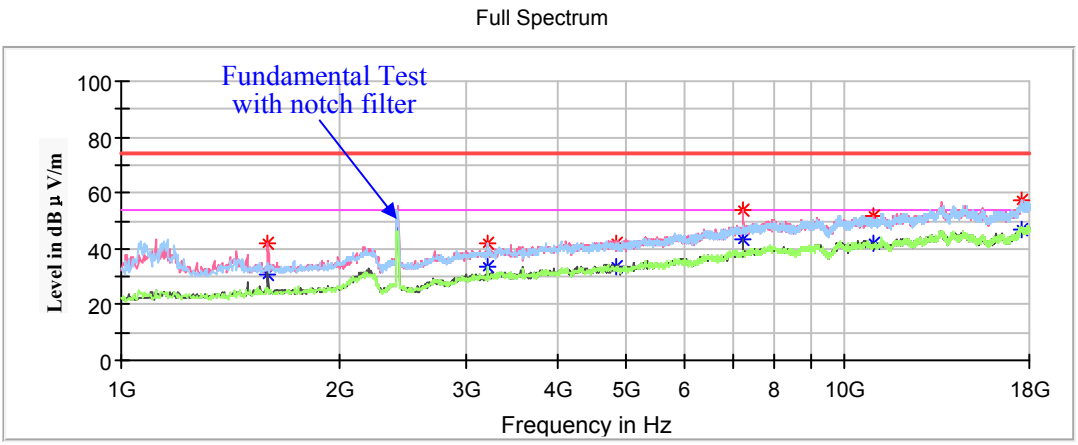


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	31.49	150.0	V	57.0	-7.2	54.00	22.51
1591.600000	41.88	---	150.0	V	57.0	-7.2	74.00	32.12
3281.400000	---	34.44	200.0	H	0.0	-1.2	54.00	19.56
3281.400000	43.44	---	200.0	H	0.0	-1.2	74.00	30.56
4924.000000	---	33.77	200.0	V	25.0	2.0	54.00	20.23
4924.000000	43.67	---	200.0	V	25.0	2.0	74.00	30.33
7386.000000	---	41.22	200.0	V	251.0	9.4	54.00	12.78
7386.000000	49.88	---	200.0	V	251.0	9.4	74.00	24.12
11230.600000	---	42.15	200.0	H	282.0	13.2	54.00	11.85
11230.600000	52.36	---	200.0	H	282.0	13.2	74.00	21.64
17602.200000	57.23	---	150.0	V	355.0	17.3	74.00	16.77
17602.200000	---	46.33	150.0	V	355.0	17.3	54.00	7.67

802.11n-HT20 Mode(Chain0+Chain1):

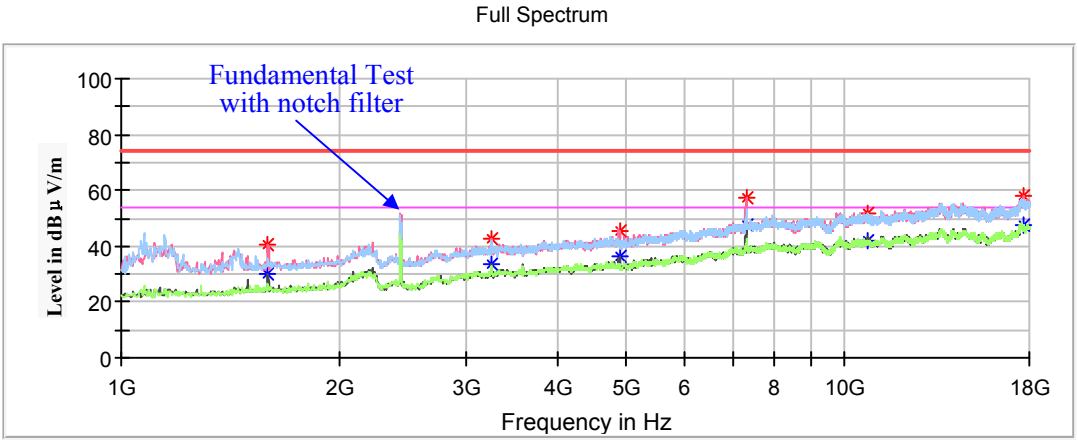
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

Low Channel: 2412MHz



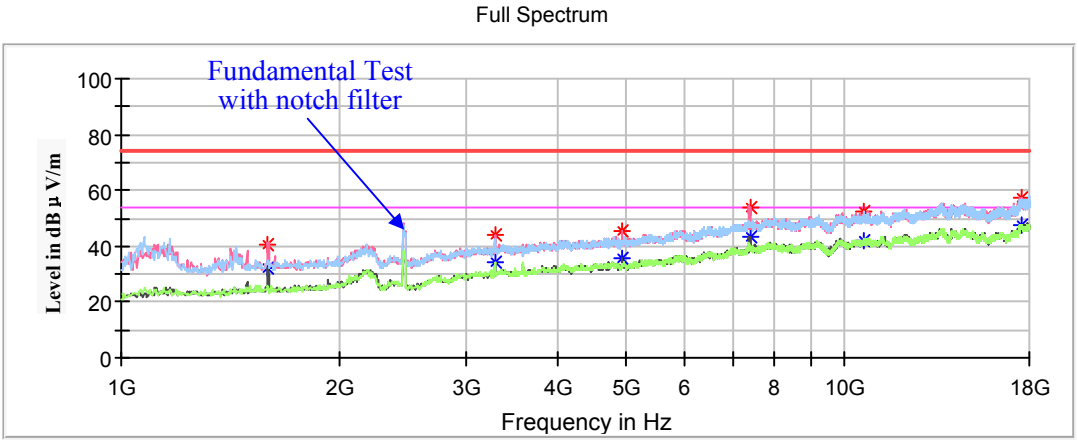
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	30.44	150.0	V	61.0	-7.2	54.00	23.56
1591.600000	41.99	---	150.0	V	61.0	-7.2	74.00	32.01
3213.400000	---	33.45	150.0	H	130.0	-1.3	54.00	20.55
3213.400000	42.18	---	150.0	H	130.0	-1.3	74.00	31.82
4824.000000	---	33.61	200.0	V	346.0	1.9	54.00	20.39
4824.000000	41.90	---	200.0	V	346.0	1.9	74.00	32.10
7236.000000	---	43.05	200.0	V	188.0	9.0	54.00	10.95
7236.000000	54.11	---	200.0	V	188.0	9.0	74.00	19.89
10928.000000	---	41.87	200.0	V	0.0	13.4	54.00	12.13
10928.000000	51.77	---	200.0	V	0.0	13.4	74.00	22.23
17554.600000	---	47.17	150.0	H	290.0	17.2	54.00	6.83
17554.600000	57.51	---	150.0	H	290.0	17.2	74.00	16.49

Middle Chain0+Chain1: 2437MHz



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	30.39	150.0	V	69.0	-7.2	54.00	23.61
1591.600000	40.53	---	150.0	V	69.0	-7.2	74.00	33.47
3247.400000	42.46	---	200.0	V	239.0	-1.2	74.00	31.54
3247.400000	---	33.87	200.0	V	239.0	-1.2	54.00	20.13
4874.000000	45.32	---	200.0	V	34.0	1.9	74.00	28.68
4874.000000	---	36.04	200.0	V	34.0	1.9	54.00	17.96
7311.000000	57.67	---	200.0	V	200.0	9.2	74.00	16.33
7311.000000	---	47.30	200.0	V	200.0	9.2	54.00	6.70
10758.000000	---	41.80	150.0	H	27.0	13.1	54.00	12.20
10758.000000	51.78	---	150.0	H	27.0	13.1	74.00	22.22
17636.200000	---	47.62	200.0	V	175.0	17.3	54.00	6.38
17636.200000	57.93	---	200.0	V	175.0	17.3	74.00	16.07

High Chain0+Chain1: 2462MHz

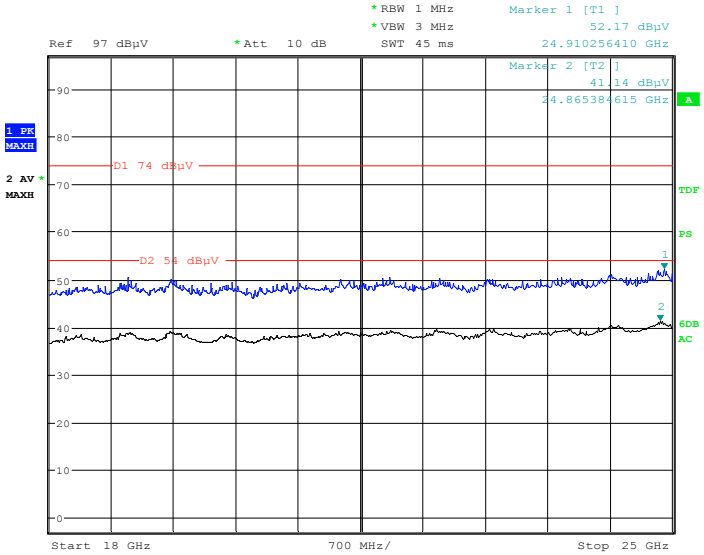


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	31.87	150.0	V	58.0	-7.2	54.00	22.13
1595.000000	40.64	---	150.0	V	58.0	-7.2	74.00	33.36
3281.400000	---	34.12	200.0	V	239.0	-1.2	54.00	19.88
3281.400000	43.74	---	200.0	V	239.0	-1.2	74.00	30.26
4924.000000	---	35.95	200.0	V	26.0	2.0	54.00	18.05
4924.000000	45.26	---	200.0	V	26.0	2.0	74.00	28.74
7386.000000	54.12	---	200.0	V	2.0	9.4	74.00	19.88
7386.000000	---	43.50	200.0	V	2.0	9.4	54.00	10.50
10642.400000	---	41.79	150.0	H	142.0	12.9	54.00	12.21
10642.400000	52.18	---	150.0	H	142.0	12.9	74.00	21.82
17602.200000	---	47.44	200.0	V	11.0	17.3	54.00	6.56
17602.200000	57.34	---	150.0	V	11.0	17.3	74.00	16.66

18GHz-25GHz

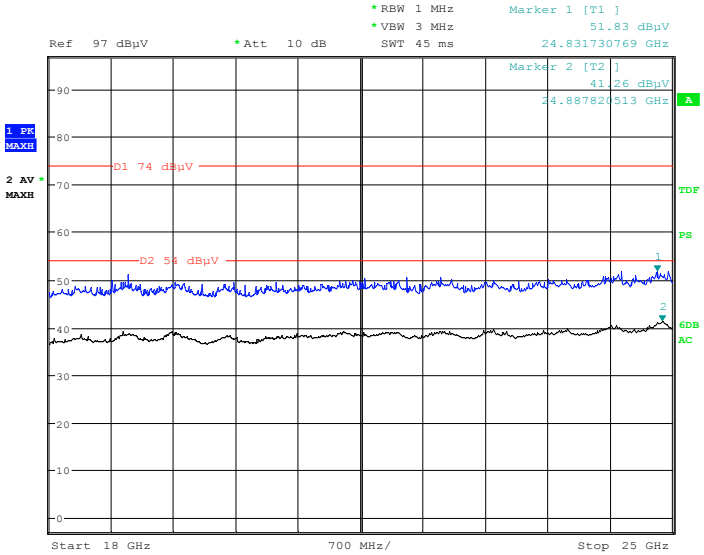
Pre-scan with 802.11b, 802.11g and 802.11n-HT20 modes of operation in the X,Y and Z axes of orientation, the worst case 802.11g mode low channel of chain 0 in X-axis of orientation was recorded

Horizontal



Date: 22.DEC.2018 14:29:45

Vertical



Date: 22.DEC.2018 15:16:13

Fundamental Test & Restricted Bands Emissions Test:

Note:
1. The test was performed with a 10dB Attenuator.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB) + Attenuator (dB)
Corrected Amplitude (dBμV /m) = Corrected Factor (dB/m) + Reading (dBμV)
Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

802.11b Mode (Chain 0): *(Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)*

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412	---	105.46	269	H	251	16	/	/
2412	107.74	---	269	H	251	16	/	/
2412	---	104.26	130	V	225	16	/	/
2412	106.34	---	130	V	225	16	/	/
2390	---	48.93	243	H	219	16.1	54	5.07
2390	58.55	---	243	H	219	16.1	74	15.45
Middle Channel: 2437MHz								
2437	108.5	---	125	H	193	16.2	/	/
2437	---	106.54	125	H	193	16.2	/	/
2437	107.81	---	295	V	210	16.2	/	/
2437	---	105.43	295	V	210	16.2	/	/
High Channel: 2462MHz								
2462	---	105.62	158	H	207	16.3	/	/
2462	107.49	---	158	H	207	16.3	/	/
2462	---	104.57	106	V	218	16.3	/	/
2462	106.31	---	106	V	218	16.3	/	/
2483.5	---	49.64	165	H	237	16.3	54	4.36
2483.5	61.61	---	165	H	237	16.3	74	12.39

802.11b Mode (Chain 1): *(Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)*

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412	---	103.65	134	H	251	16.1	/	/
2412	105.79	---	134	H	251	16.1	/	/
2412	---	102.81	103	V	237	16.1	/	/
2412	104.35	---	103	V	237	16.1	/	/
2390	---	49.38	276	H	219	16.1	54	4.62
2390	58.3	---	276	H	219	16.1	74	15.7
Middle Channel: 2437MHz								
2437	105.81	---	290	H	193	16.2	/	/
2437	---	103.82	290	H	193	16.2	/	/
2437	104.65	---	150	V	201	16.2	/	/
2437	---	102.83	150	V	201	16.2	/	/
High Channel: 2462MHz								
2462	---	104.35	170	H	207	16.3	/	/
2462	106.4	---	170	H	207	16.3	/	/
2462	---	103.52	205	V	215	16.3	/	/
2462	105.84	---	205	V	215	16.3	/	/
2483.5	---	49.54	283	H	237	16.3	54	4.46
2483.5	59.05	---	283	H	237	16.3	74	14.95

802.11g Mode (Chain 0): *(Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)*

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412	---	102.86	158	H	251	16.1	/	/
2412	104.57	---	158	H	251	16.1	/	/
2412	---	102.58	272	V	245	16.1	/	/
2412	103.56	---	272	V	245	16.1	/	/
2390	---	50.38	302	H	219	16.1	54	3.62
2390	61.15	---	302	H	219	16.1	74	12.85
Middle Channel: 2437MHz								
2437	103.6	---	129	H	193	16.2	/	/
2437	---	102.37	129	H	193	16.2	/	/
2437	103.23	---	204	V	189	16.2	/	/
2437	---	101.43	204	V	189	16.2	/	/
High Channel: 2462MHz								
2462	---	101.24	344	H	207	16.3	/	/
2462	103.32	---	344	H	207	16.3	/	/
2462	---	100.96	170	V	225	16.3	/	/
2462	102.64	---	170	V	225	16.3	/	/
2483.5	---	52.46	135	H	237	16.3	54	1.54
2483.5	65.59	---	135	H	237	16.3	74	8.41

802.11g Mode (Chain 1): *(Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)*

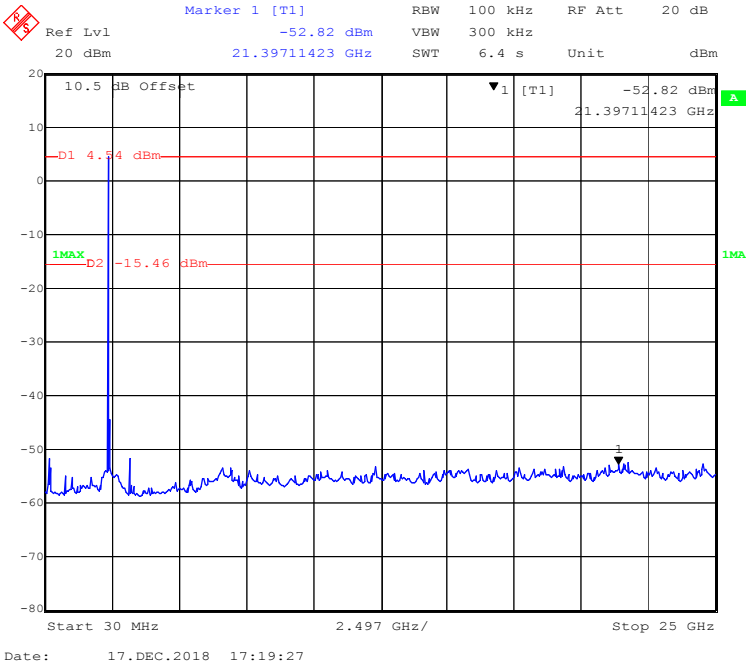
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412	---	101.36	159	H	251	16.1	/	/
2412	102.58	---	159	H	251	16.1	/	/
2412	---	100.91	152	V	238	16.1	/	/
2412	101.76	---	152	V	238	16.1	/	/
2390	---	50.32	196	H	219	16.1	54	3.68
2390	60.97	---	196	H	219	16.1	74	13.03
Middle Channel: 2437MHz								
2437	101.27	---	331	H	193	16.2	/	/
2437	---	100.32	331	H	193	16.2	/	/
2437	100.98	---	135	V	198	16.2	/	/
2437	---	99.86	135	V	198	16.2	/	/
High Channel: 2462MHz								
2462	---	100.52	315	H	207	16.3	/	/
2462	102.6	---	315	H	207	16.3	/	/
2462	---	100.37	222	V	226	16.3	/	/
2462	101.94	---	222	V	226	16.3	/	/
2483.5	---	51.77	129	H	237	16.3	54	2.23
2483.5	61.63	---	129	H	237	16.3	74	12.37

802.11n-HT20 Mode (Chain0+Chain1): *(Pre-scan in the X, Y and Z axes of orientation, the worst case in Y-axis of orientation was recorded)*

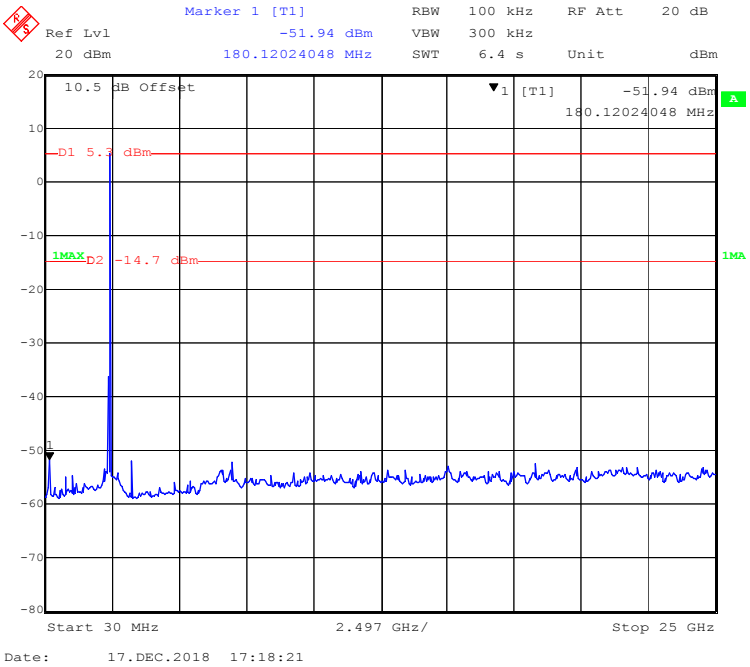
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412	---	101.36	182	H	251	16.1	/	/
2412	103.39	---	182	H	251	16.1	/	/
2412	---	100.85	307	V	247	16.1	/	/
2412	102.65	---	307	V	247	16.1	/	/
2390	---	51.85	203	H	219	16.1	54	2.15
2390	63.47	---	203	H	219	16.1	74	10.53
Middle Channel: 2437MHz								
2437	104.24	---	156	H	193	16.2	/	/
2437	---	102.65	156	H	193	16.2	/	/
2437	103.65	---	307	V	202	16.2	/	/
2437	---	101.26	307	V	202	16.2	/	/
High Channel: 2462MHz								
2462	---	102.28	226	H	207	16.3	/	/
2462	103.81	---	226	H	207	16.3	/	/
2462	---	101.31	306	V	228	16.3	/	/
2462	102.86	---	306	V	228	16.3	/	/
2483.5	---	51.84	264	H	237	16.3	54	2.16
2483.5	67.29	---	264	H	237	16.3	74	6.71

Conducted Spurious Emissions at Antenna Port

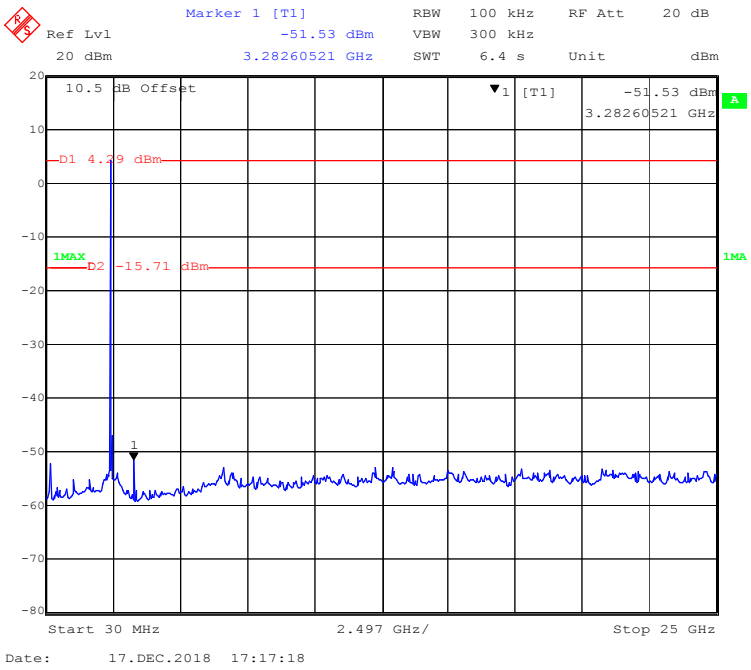
Chain0: 802.11b Low Channel



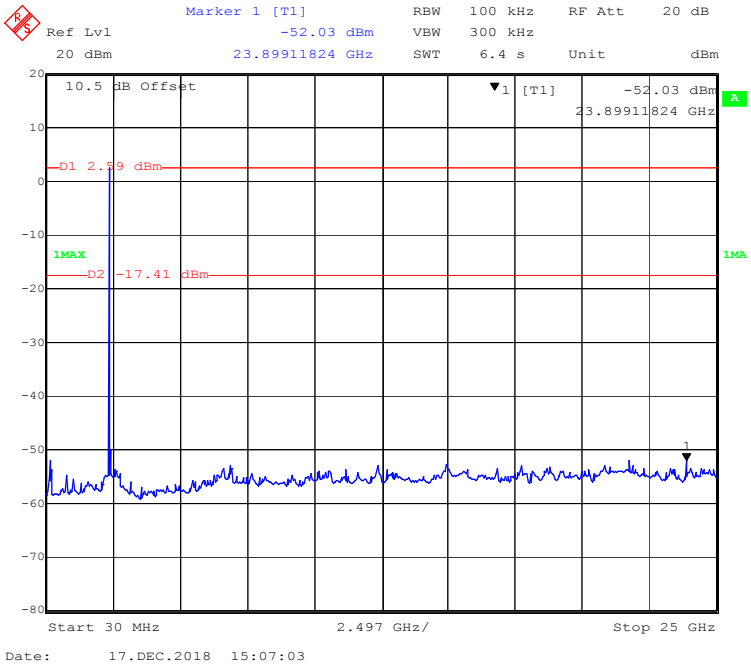
Chain0: 802.11b Middle Channel



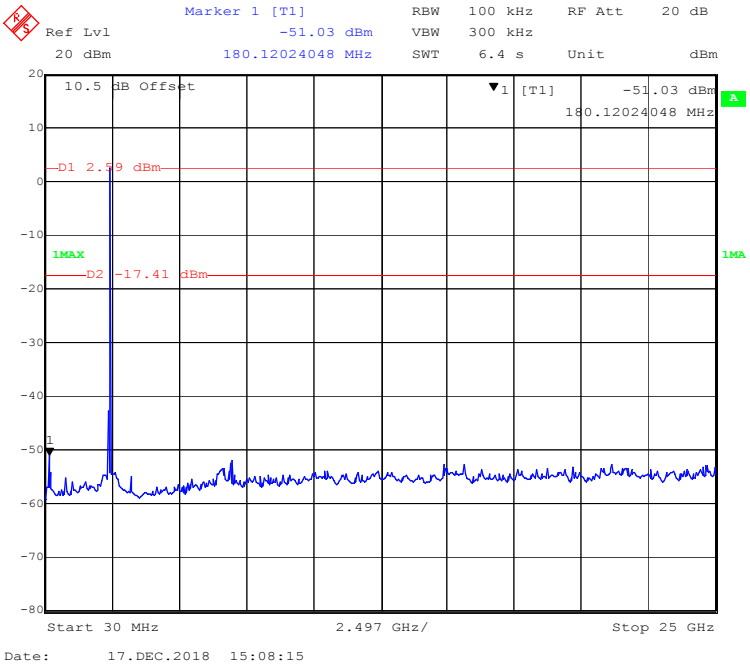
Chain0: 802.11b High Channel



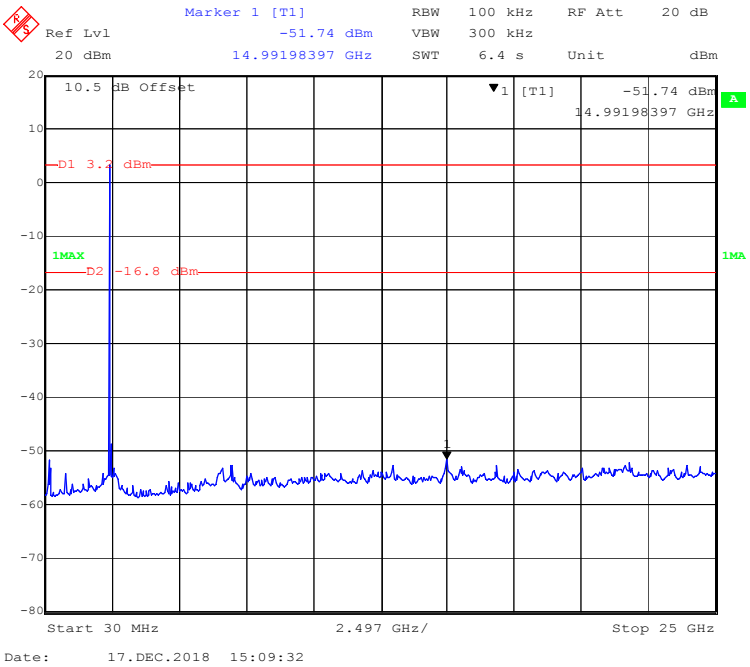
Chain1: 802.11b Low Channel



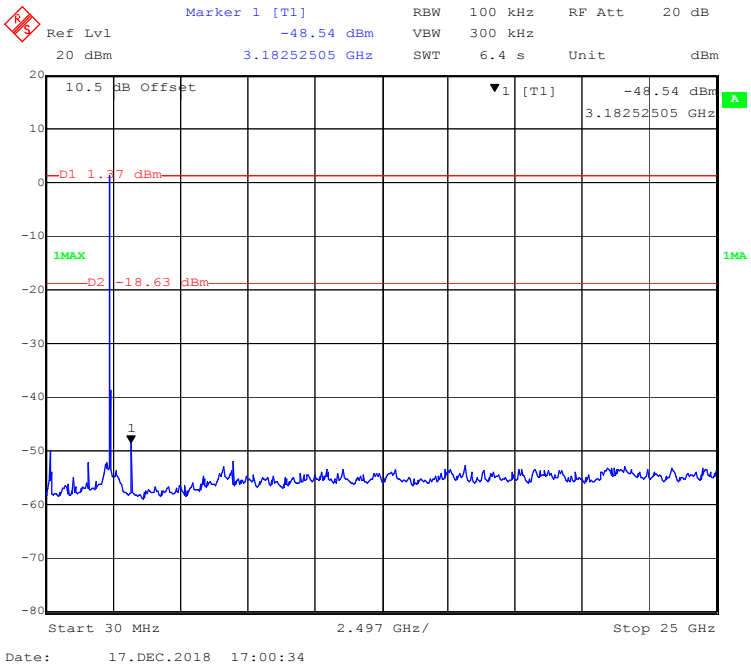
Chain1: 802.11b Middle Channel



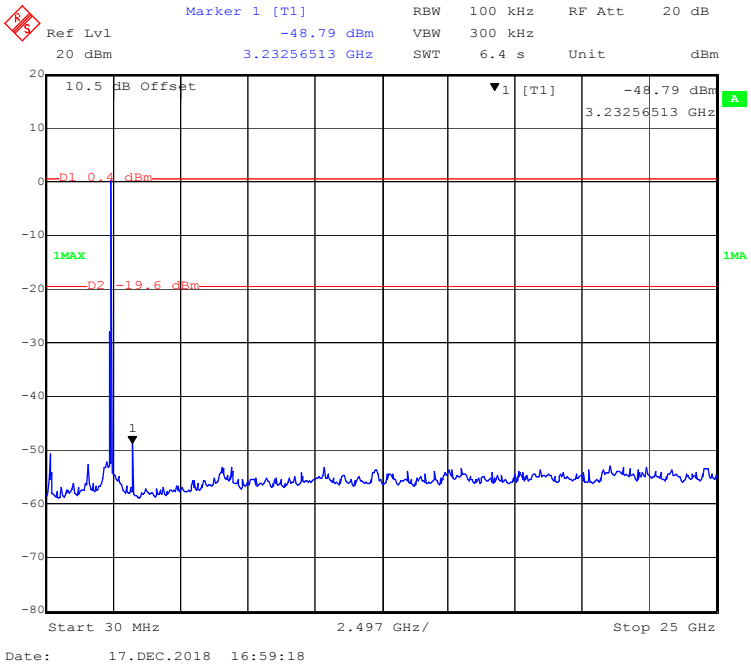
Chain1: 802.11b High Channel



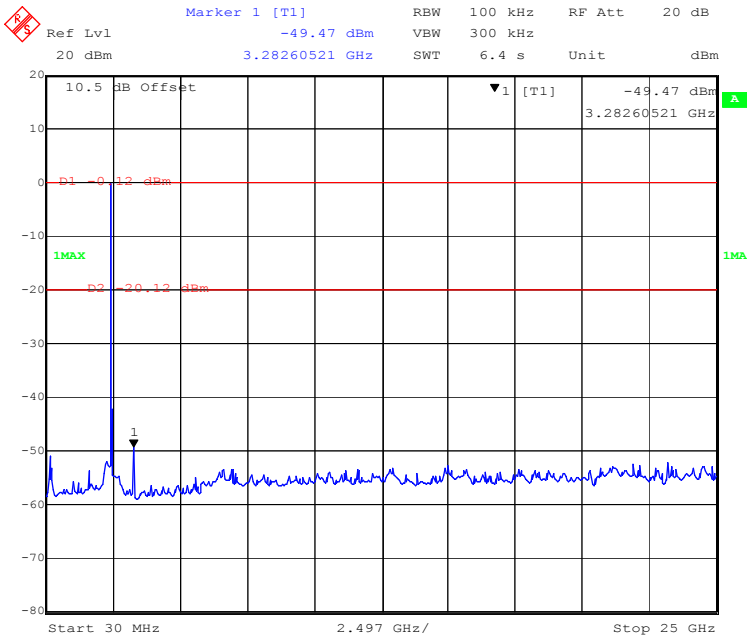
Chain0: 802.11g Low Channel



Chain0: 802.11g Middle Channel

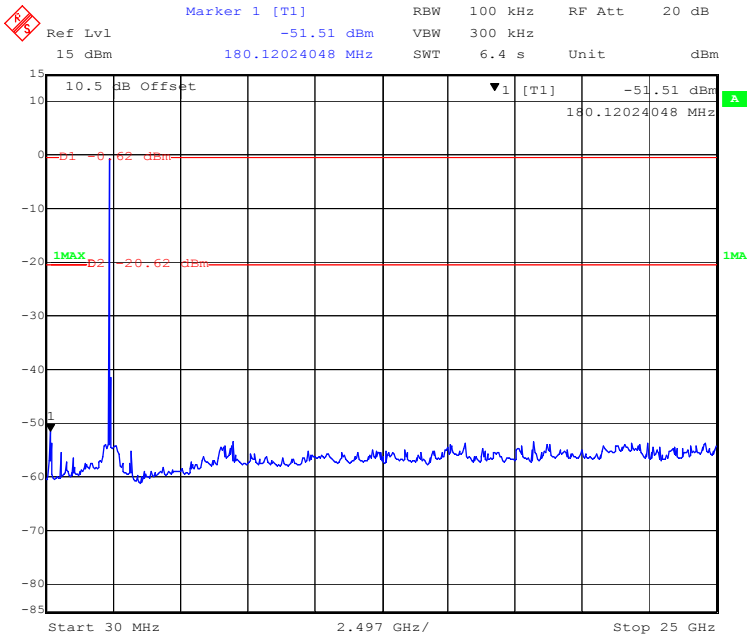


Chain0: 802.11g High Channel



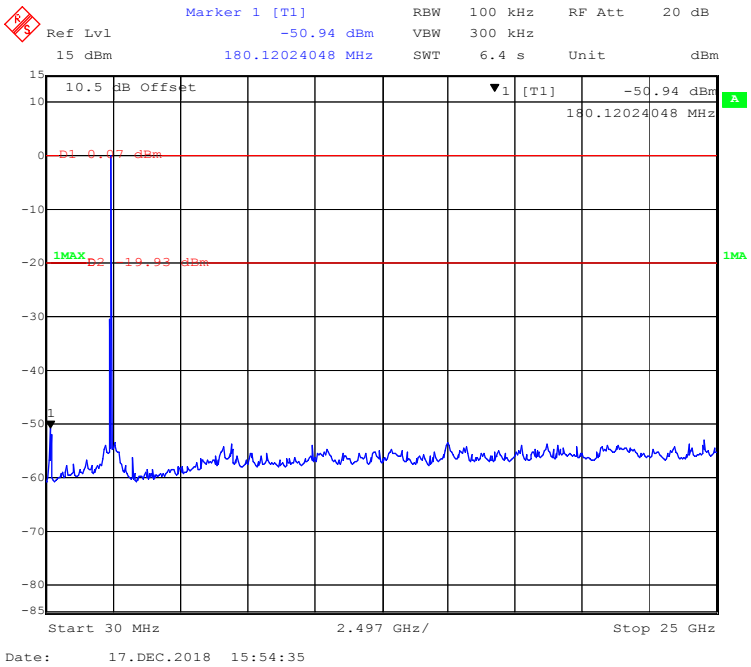
Date: 17.DEC.2018 16:58:20

Chain1: 802.11g Low Channel

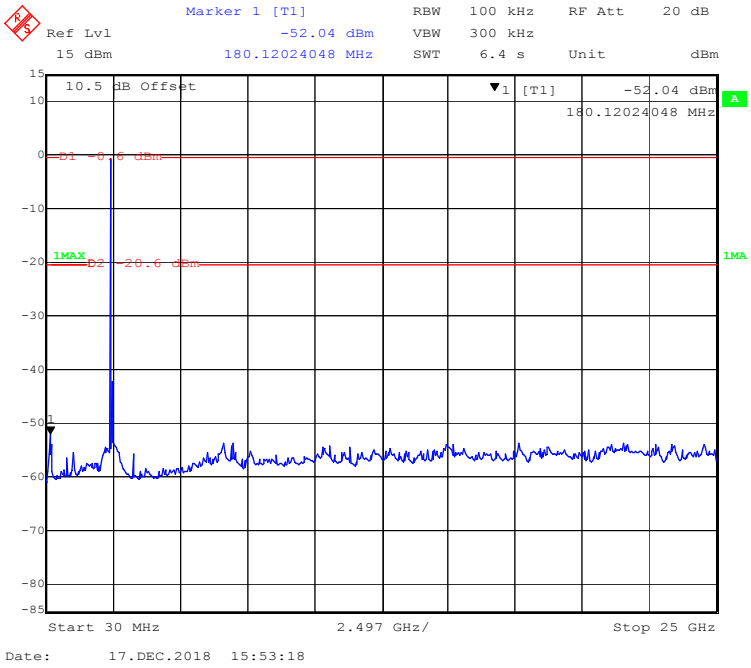


Date: 17.DEC.2018 15:55:52

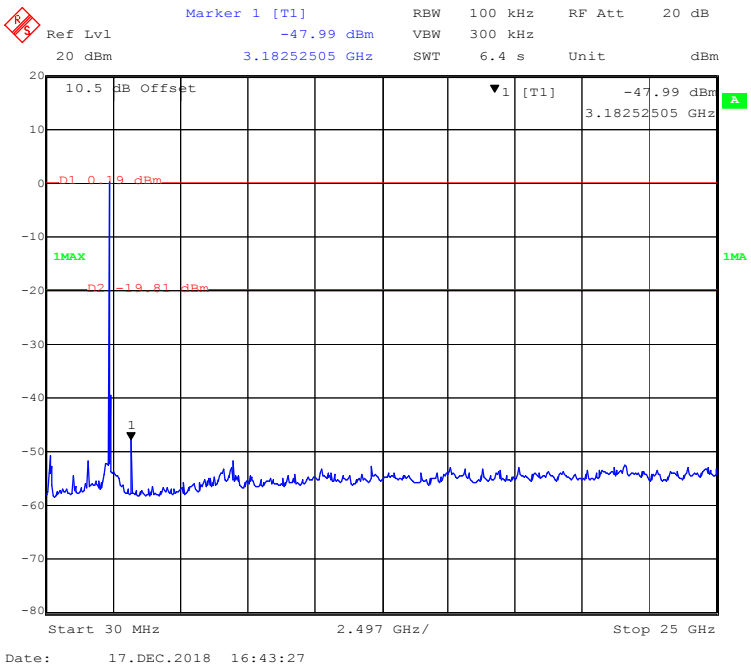
Chain1: 802.11g Middle Channel



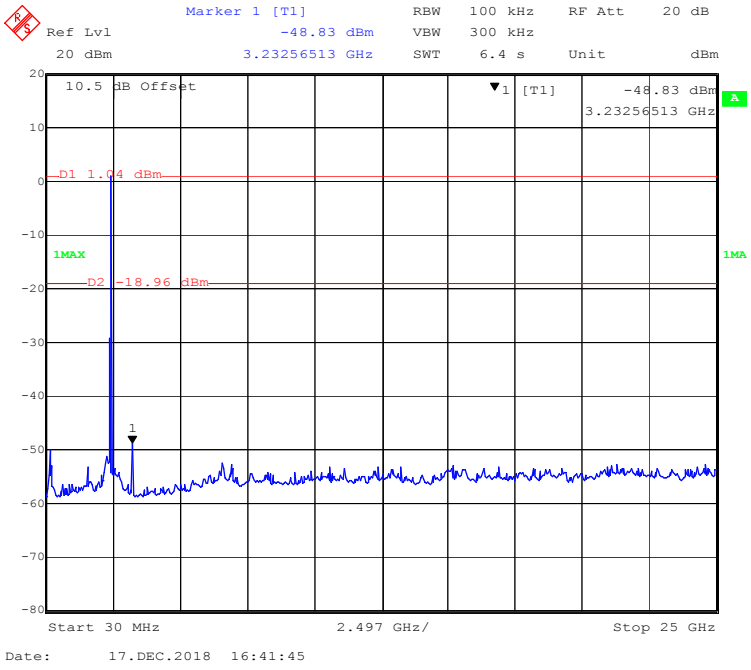
Chain1: 802.11g High Channel



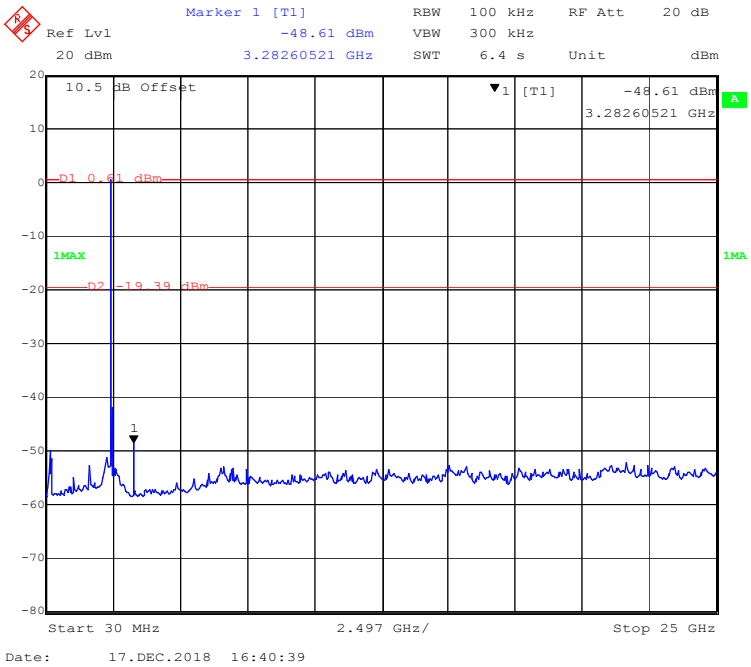
Chain0: 802.11n-HT20 Low Channel



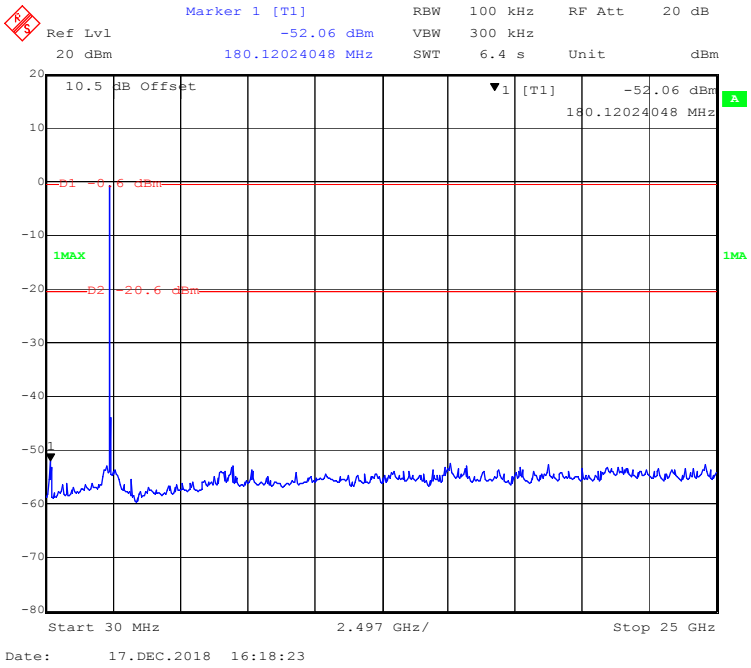
Chain0: 802.11n-HT20 Middle Channel



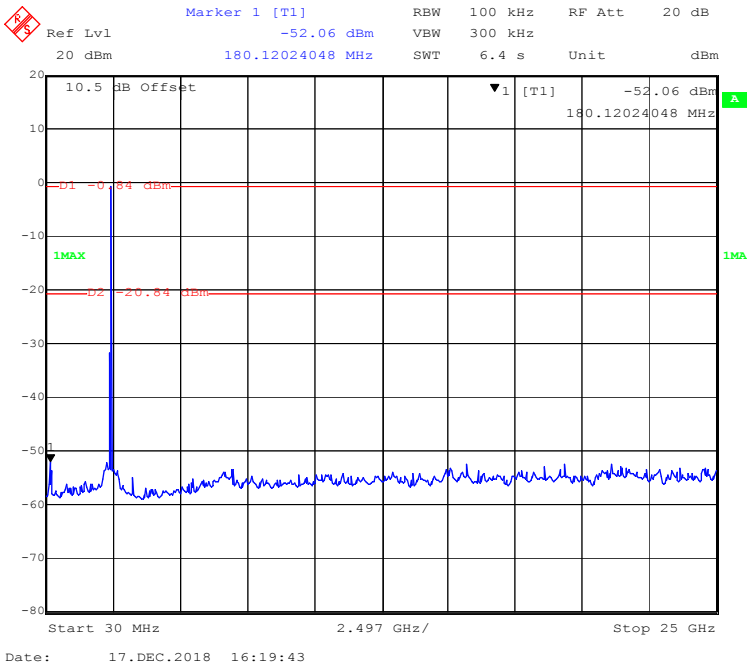
Chain0: 802.11n-HT20 High Channel



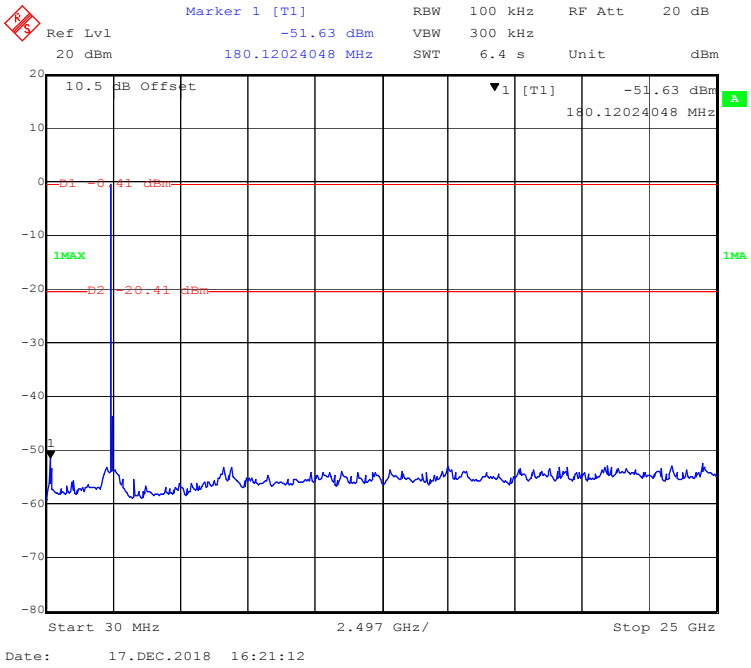
Chain1: 802.11n-HT20 Low Channel



Chain0: 802.11n-HT20 Middle Channel



Chain0: 802.11n-HT20 High Channel



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

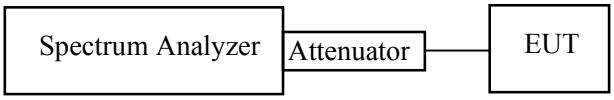
Applicable Standard

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

According to ANSI C63.10-2013 sub-clause 11.8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	24.8℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

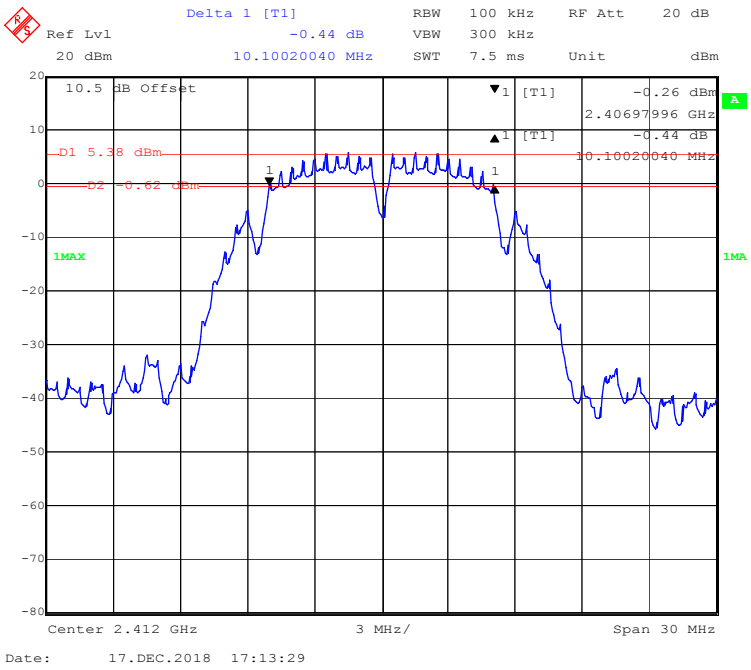
The testing was performed by Stone Zhang on 2018-12-17

Test Result: Compliant.

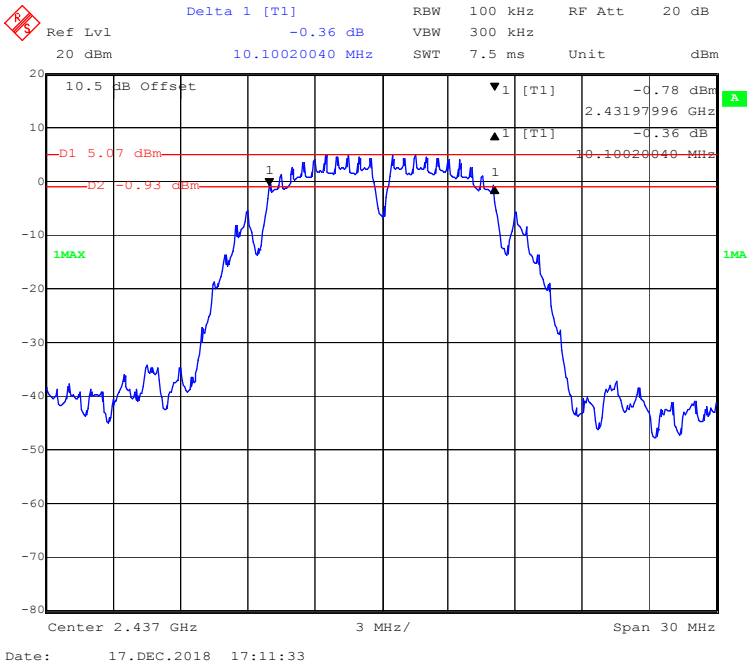
EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)		Limit (kHz)
		Chain0	Chain1	
802.11b mode				
Low	2412	10.100	10.100	≥500
Middle	2437	10.100	10.100	≥500
High	2462	10.040	10.100	≥500
802.11g mode				
Low	2412	16.473	16.473	≥500
Middle	2437	16.473	16.473	≥500
High	2462	16.473	16.473	≥500
802.11n-HT20 mode				
Low	2412	17.375	17.375	≥500
Middle	2437	17.375	17.555	≥500
High	2462	17.555	17.555	≥500

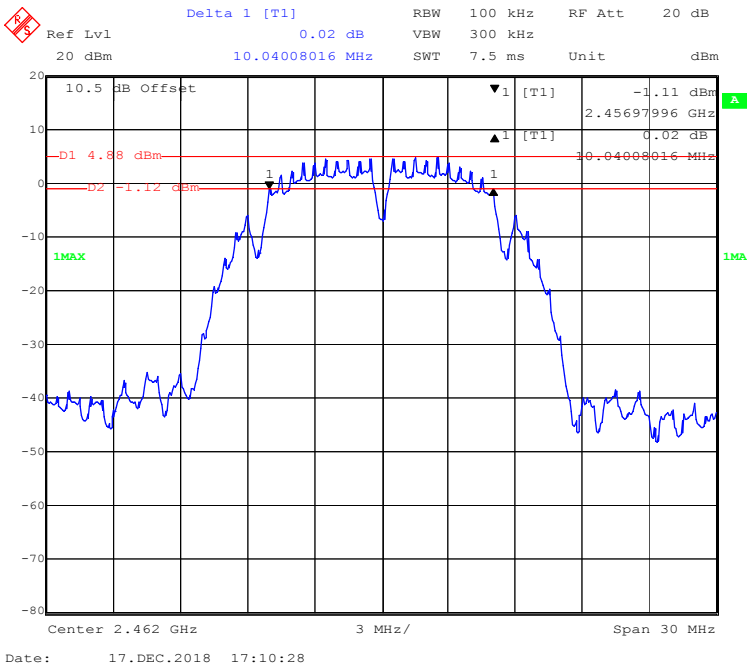
Chain0: 802.11b Low Channel



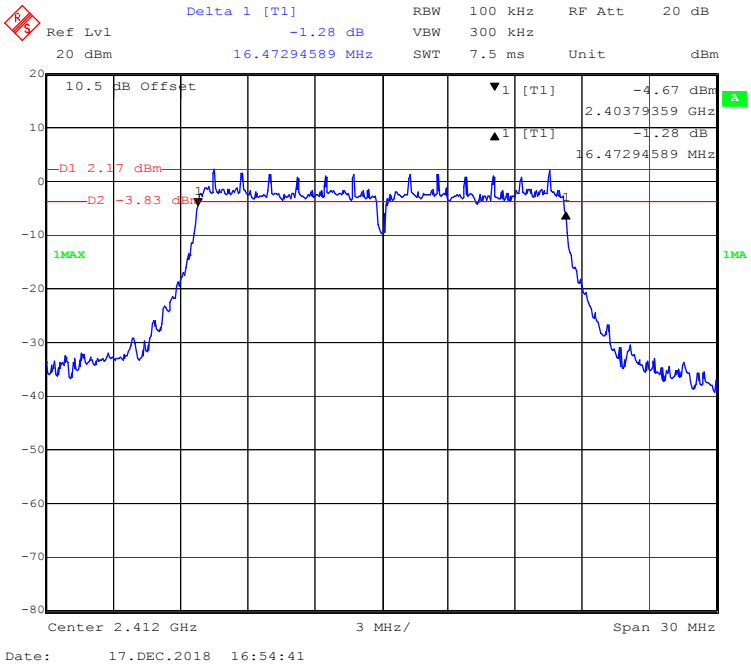
Chain0: 802.11b Middle Channel



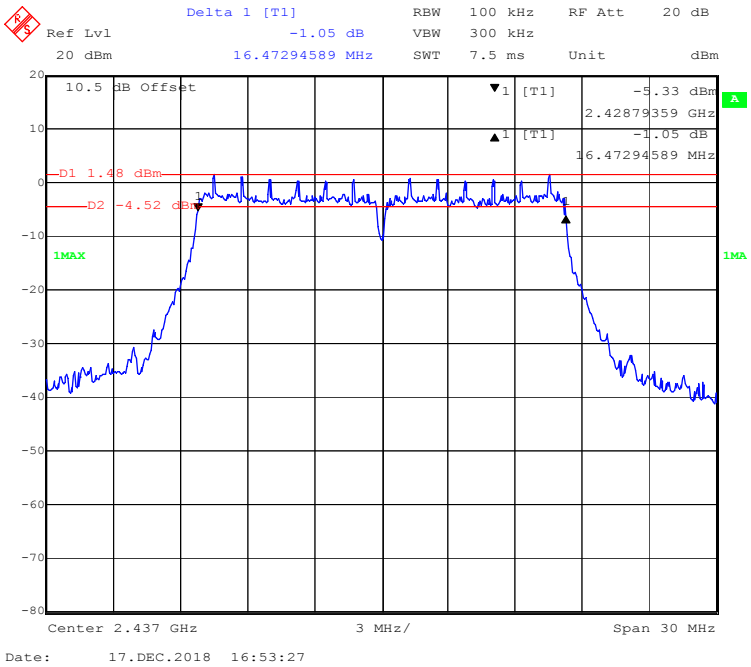
Chain0: 802.11b High Channel



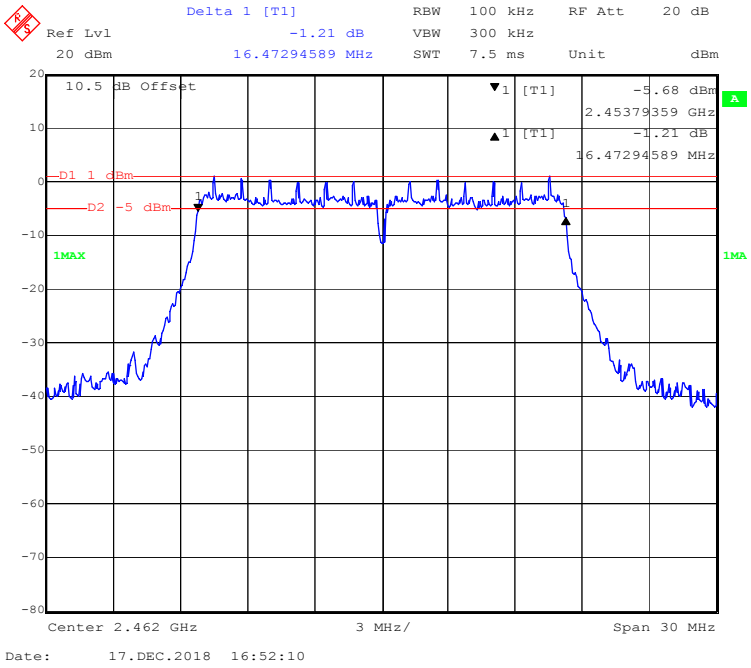
Chain0: 802.11g Low Channel



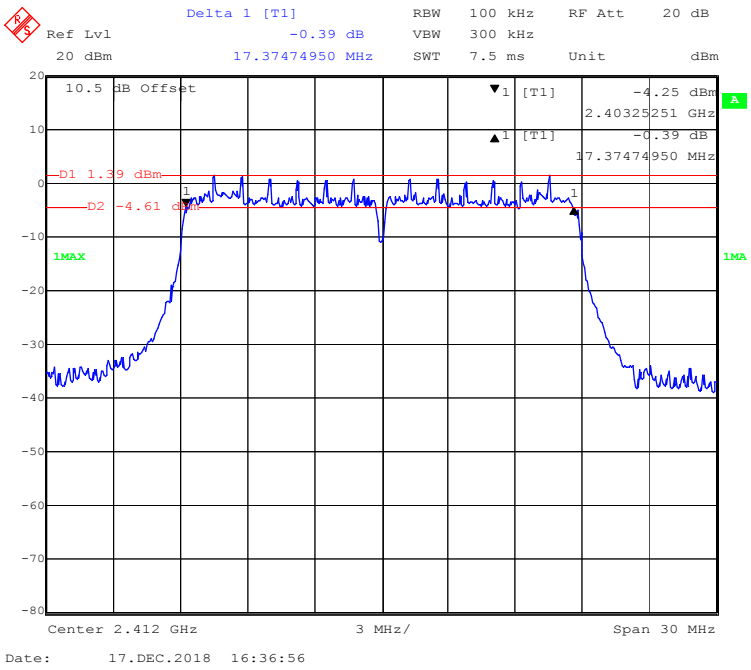
Chain0: 802.11g Middle Channel



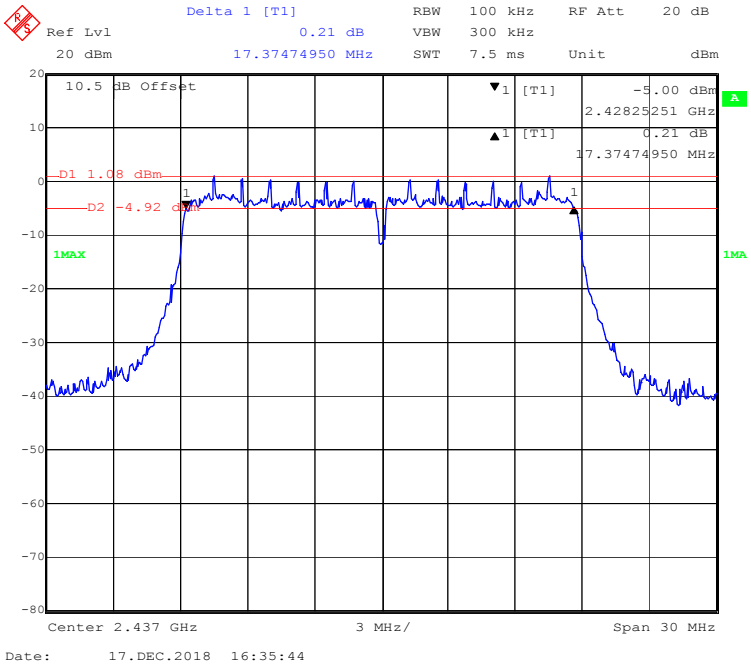
Chain0: 802.11g High Channel



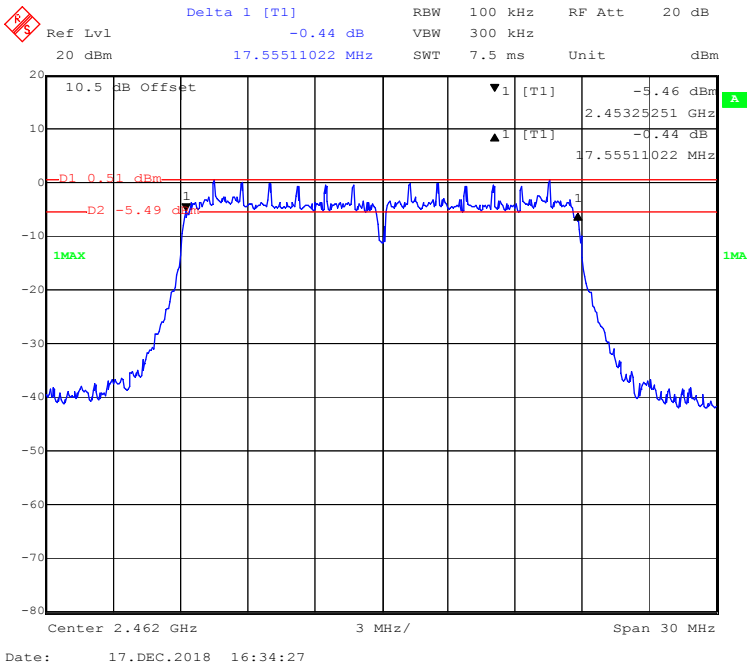
Chain0: 802.11n-HT20 Low Channel



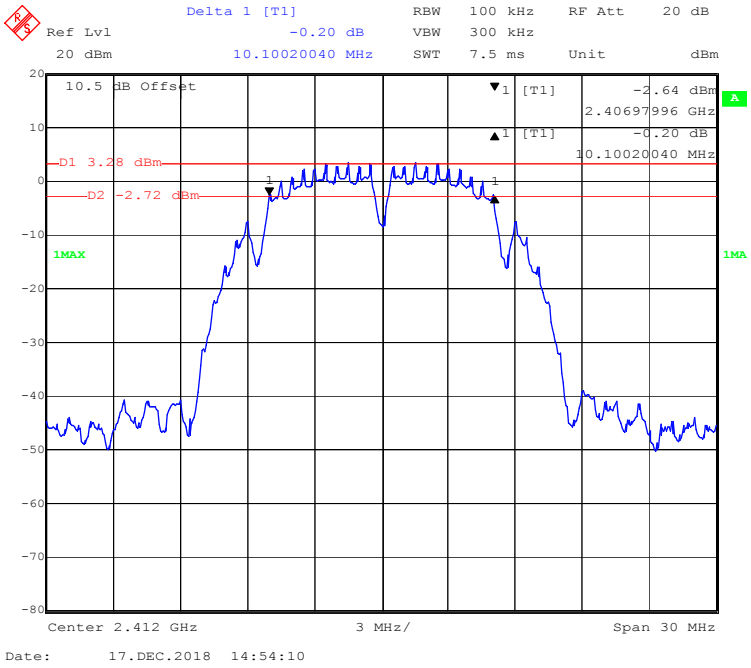
Chain0: 802.11n-HT20 Middle Channel



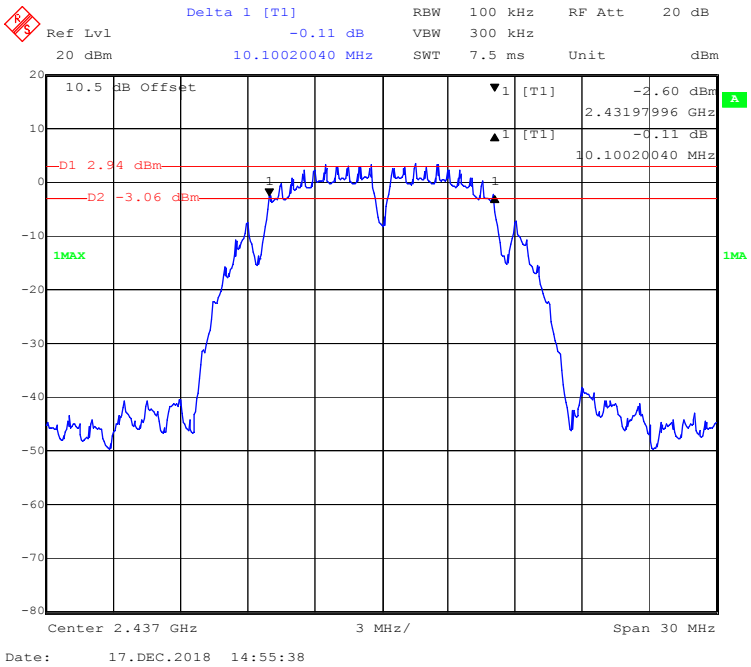
Chain0: 802.11n-HT20 High Channel



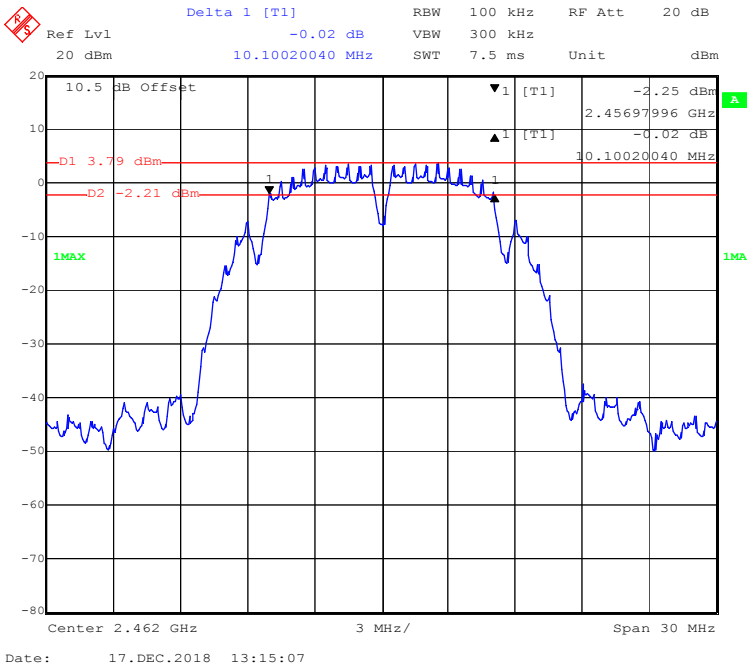
Chain1: 802.11b Low Channel



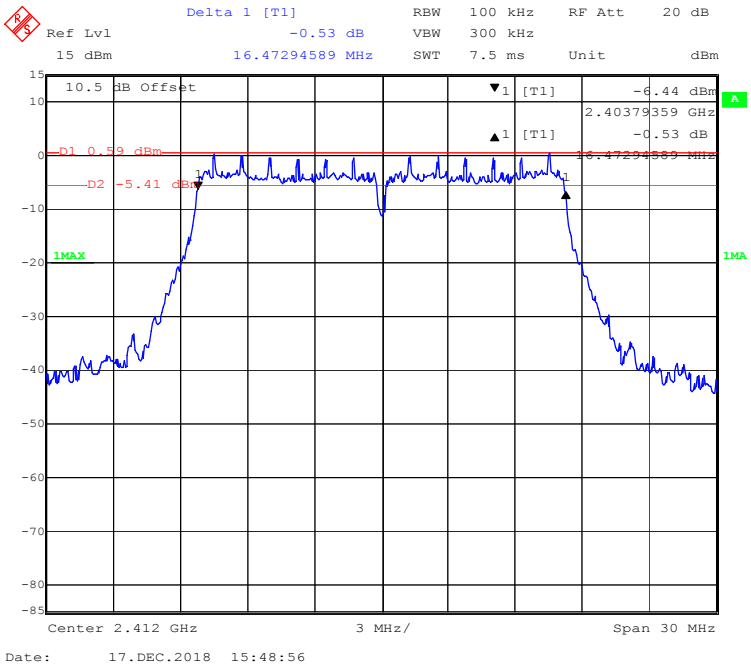
Chain1: 802.11b Middle Channel



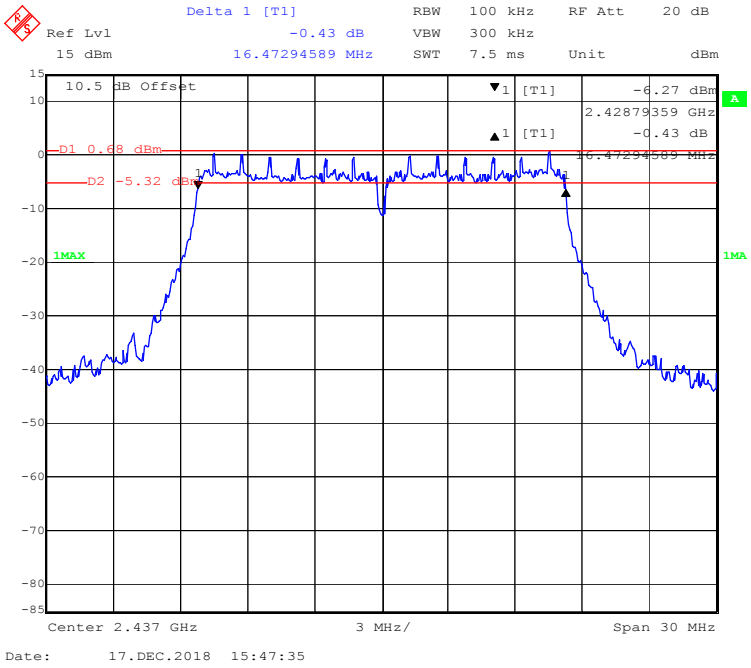
Chain1: 802.11b High Channel



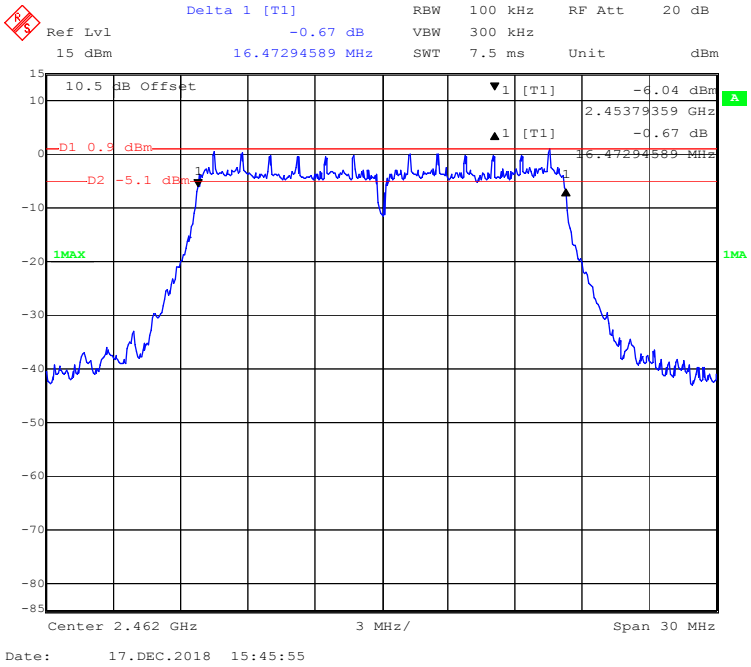
Chain1: 802.11g Low Channel



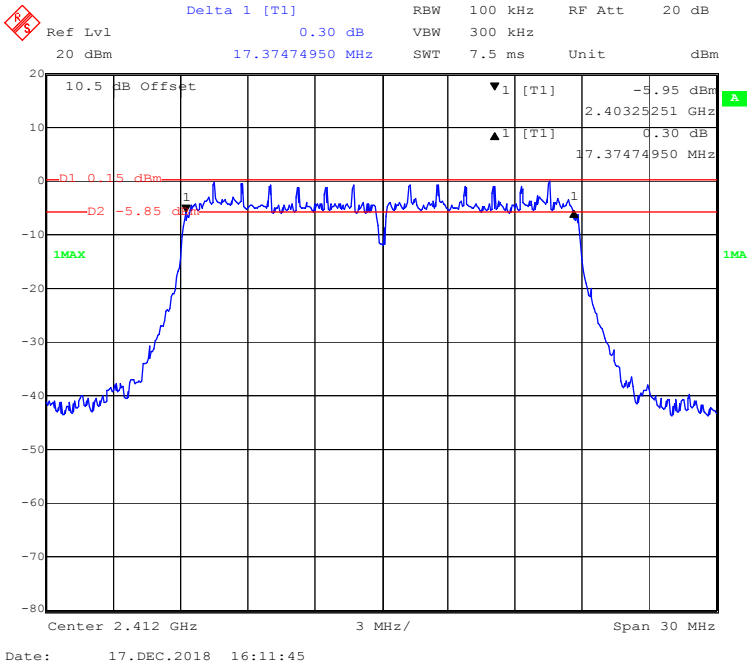
Chain1: 802.11g Middle Channel



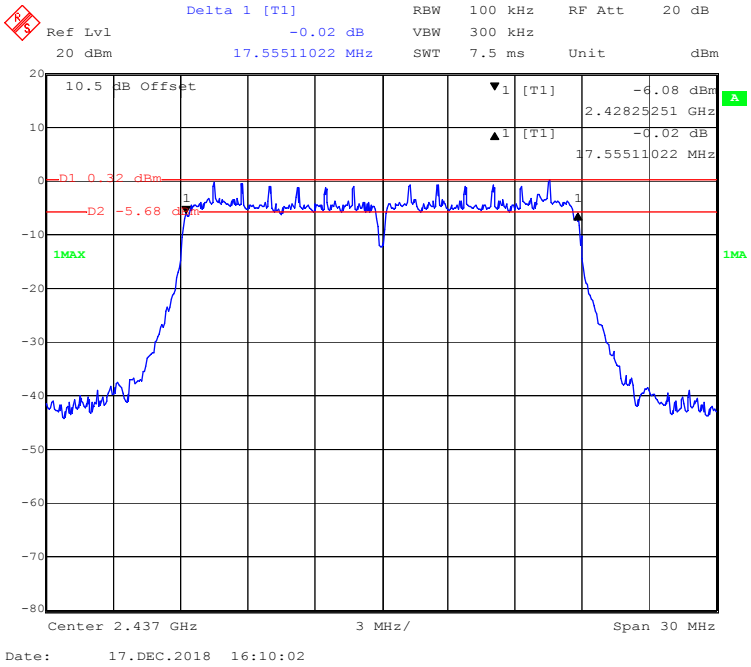
Chain1: 802.11g High Channel



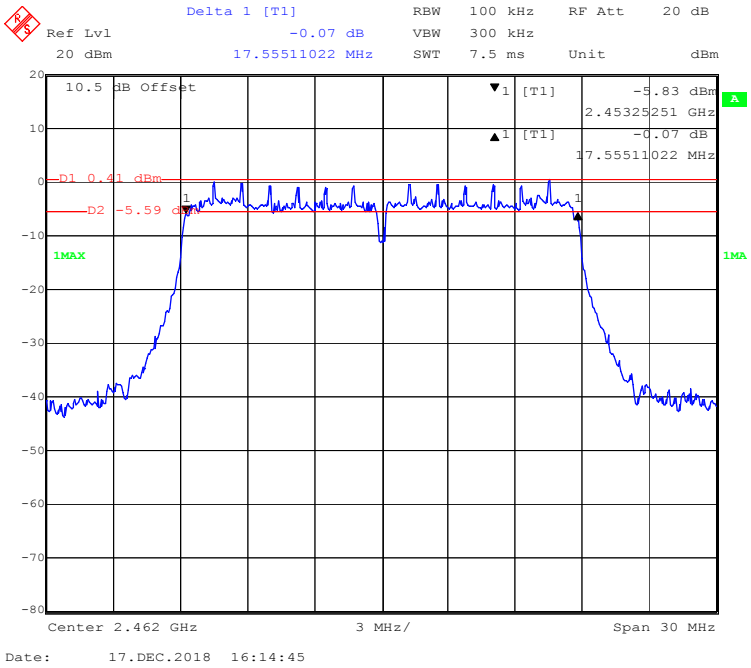
Chain1: 802.11n-HT20 Low Channel



Chain1: 802.11n-HT20 Middle Channel



Chain1: 802.11n-HT20 High Channel



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

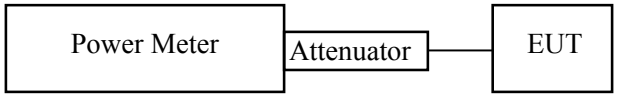
Applicable Standard

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

According to ANSI C63.10-2013 sub-clause 11.9.1.3

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.



Test Data

Environmental Conditions

Temperature:	24.8℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Stone Zhang on 2018-12-17.

Test Result: Compliant.

EUT operation mode: Transmitting

Test mode	Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)			Limit (dBm)	Result
			Chain0	Chain1	Total		
802.11b	Low	2412	18.55	16.29	/	30	Pass
	Middle	2437	18.03	16.39	/	30	Pass
	High	2462	17.66	16.69	/	30	Pass
802.11g	Low	2412	20.93	19.71	/	30	Pass
	Middle	2437	20.52	19.66	/	30	Pass
	High	2462	19.99	19.77	/	30	Pass
802.11n-HT20	Low	2412	19.98	19.22	22.63	30	Pass
	Middle	2437	20.60	19.22	22.97	30	Pass
	High	2462	19.60	19.35	22.49	30	Pass

Note: The total output power=10Log$_{10}$ (10^ (Chain 0/10) +10^ (Chain 1/10))

FCC §15.247(d) – 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

According to ANSI C63.10-2013 sub-clause 6.10.

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 Data

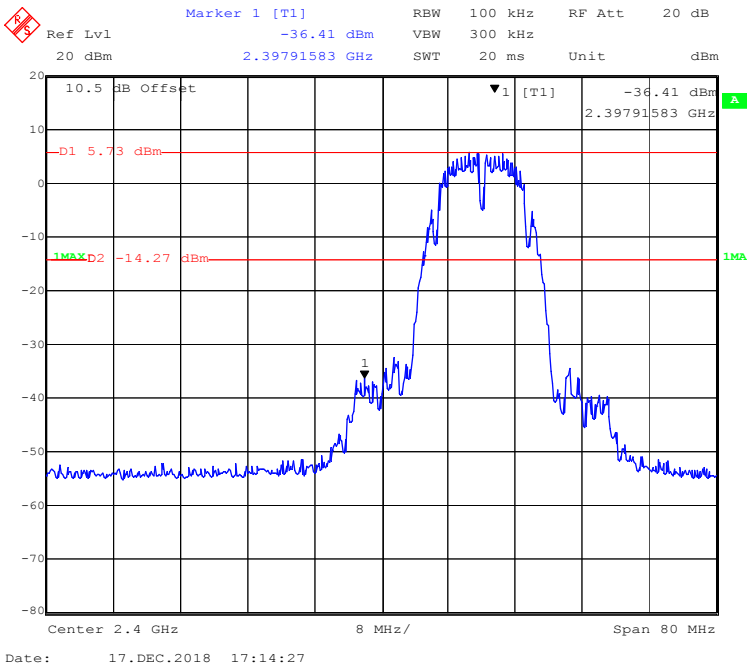
Environmental Conditions

Temperature:	24.8℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

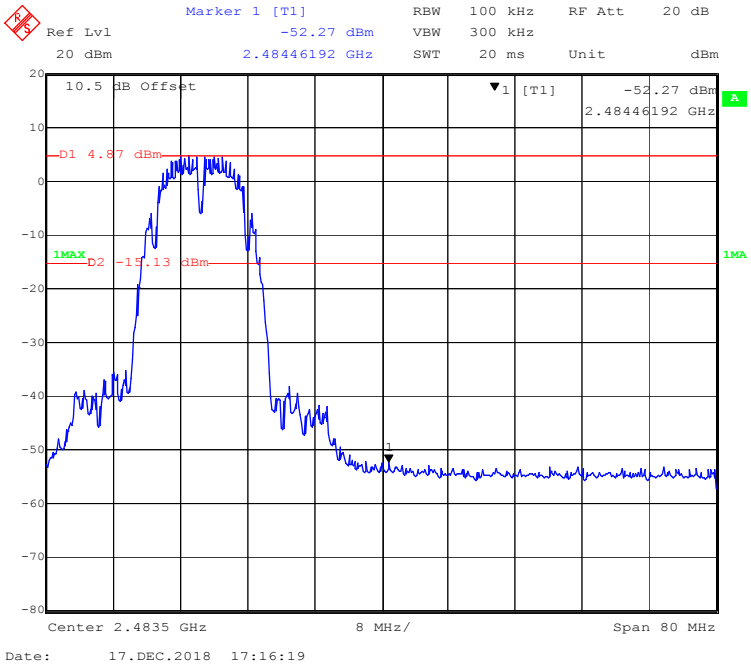
The testing was performed by Stone Zhang on 2018-12-17 .

Test Result: *Compliant.*

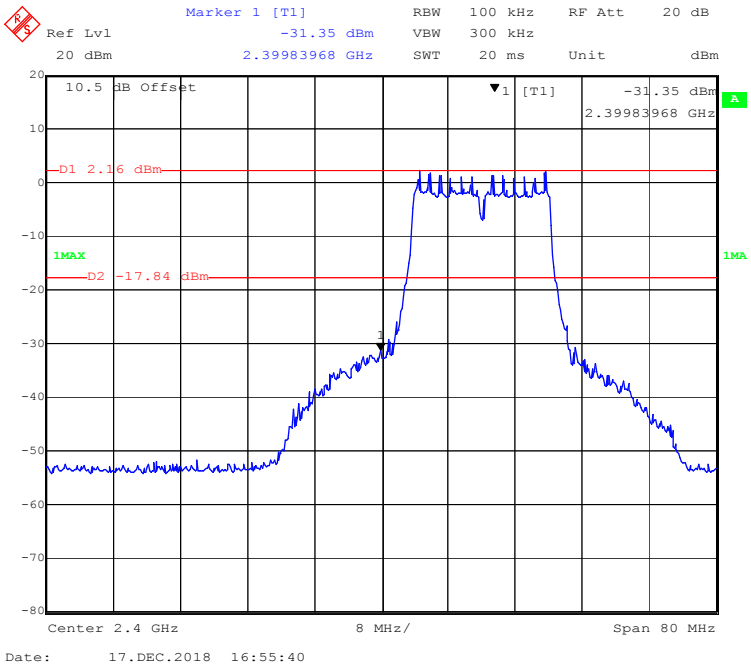
Chain0: 802.11b Mode Left Side



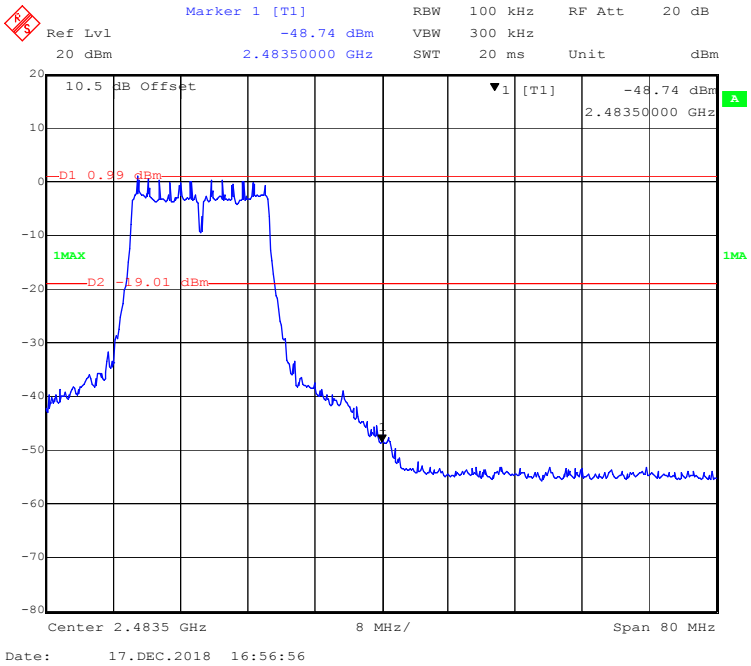
Chain0: 802.11b Mode Right Side



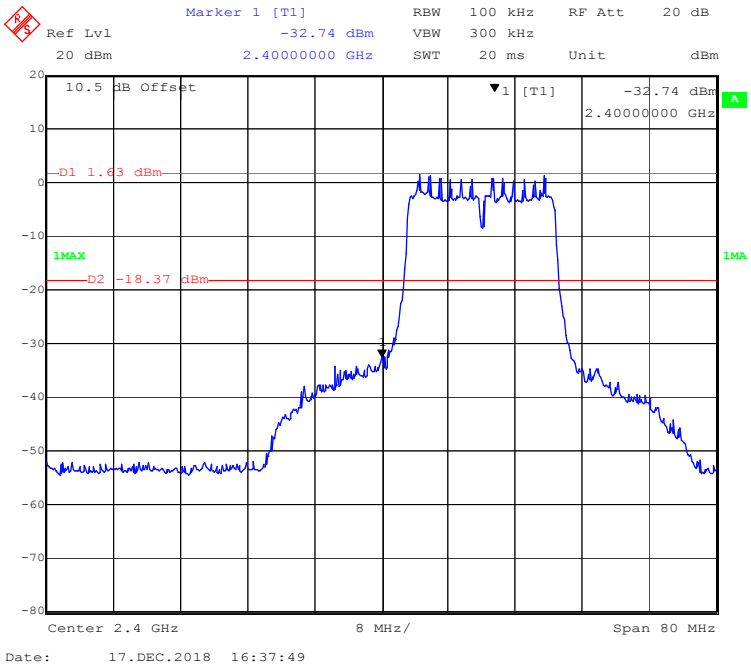
Chain0: 802.11g Mode Left Side



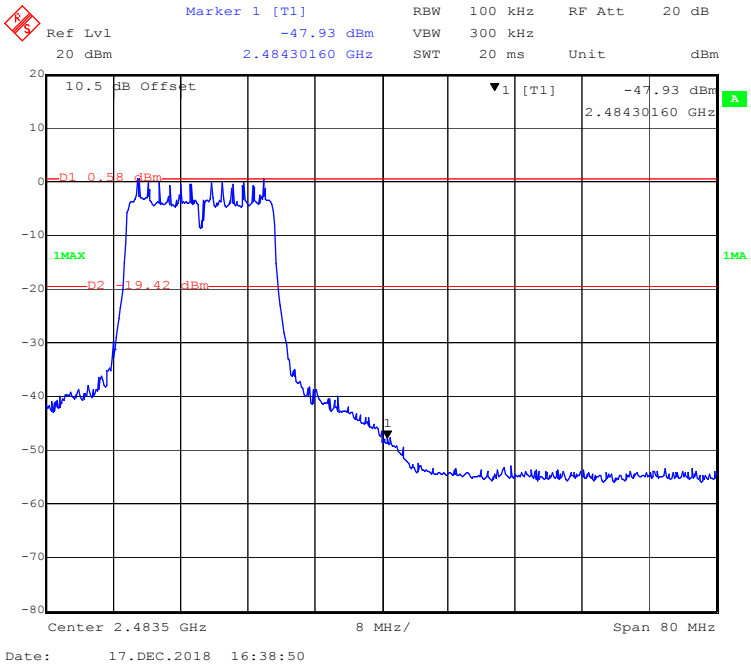
Chain0: 802.11g Mode Right Side



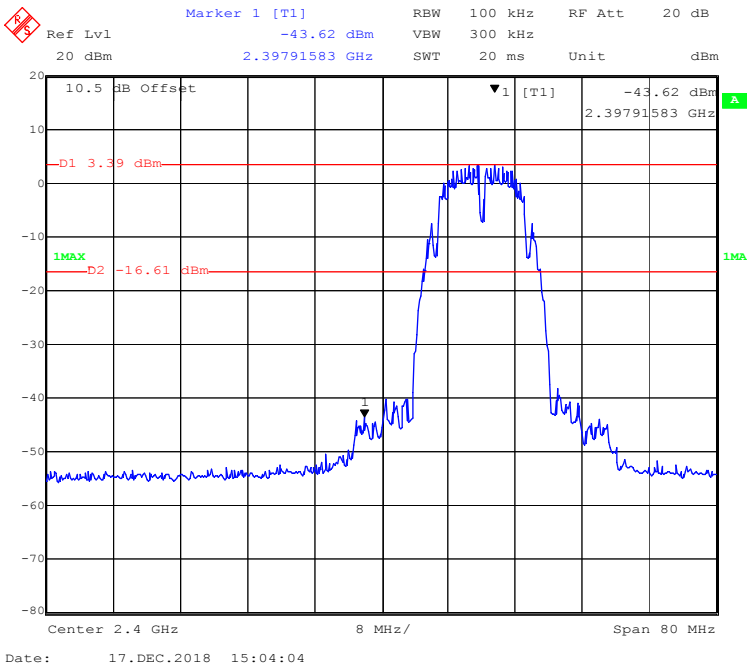
Chain0: 802.11n-HT20 Mode Left Side



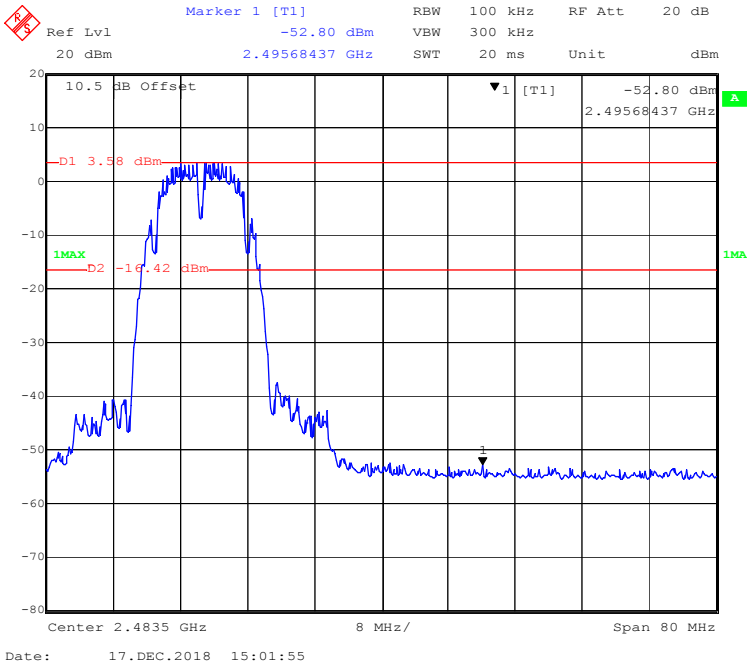
Chain0: 802.11n-HT20 Mode Right Side



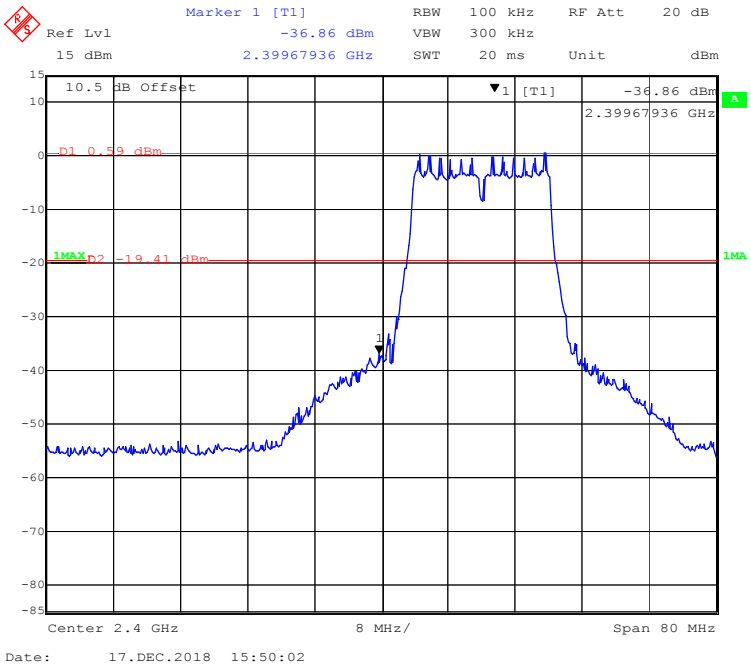
Chain1: 802.11b Mode Left Side



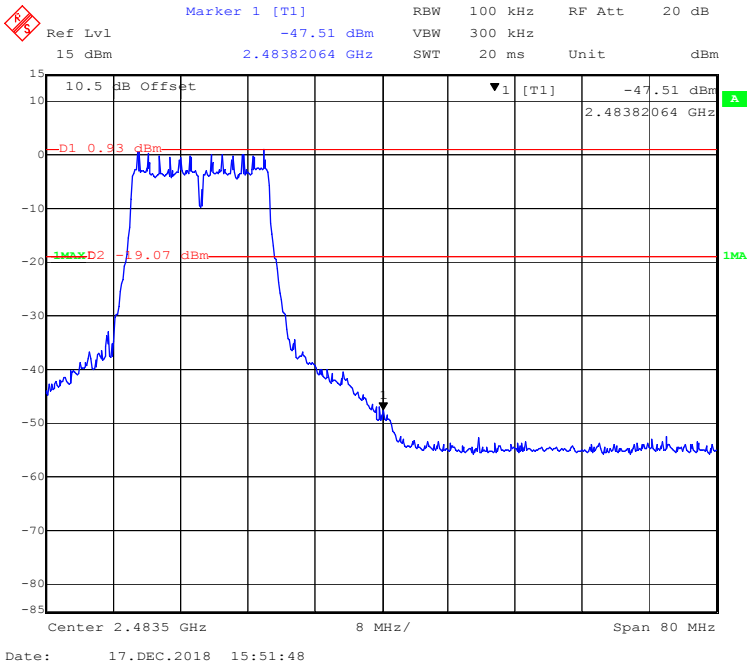
Chain1: 802.11b Mode Right Side



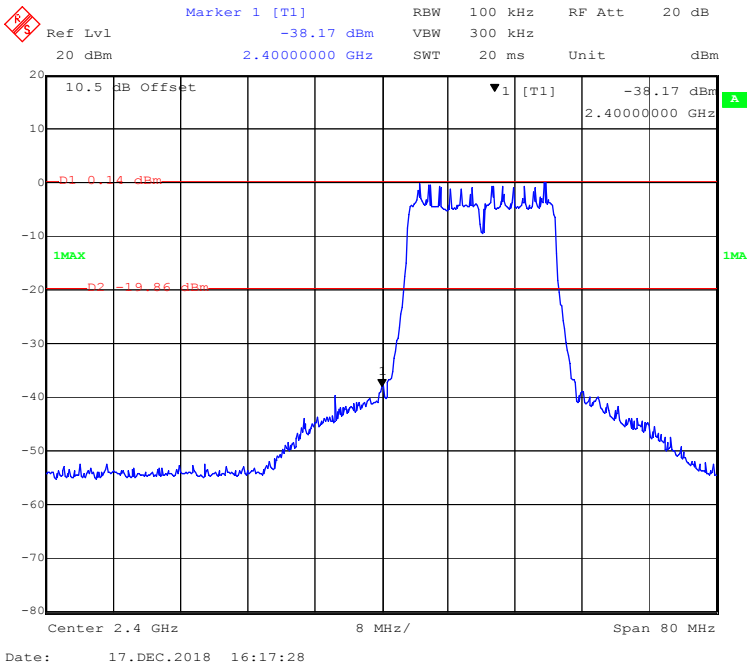
Chain1: 802.11g Mode Left Side



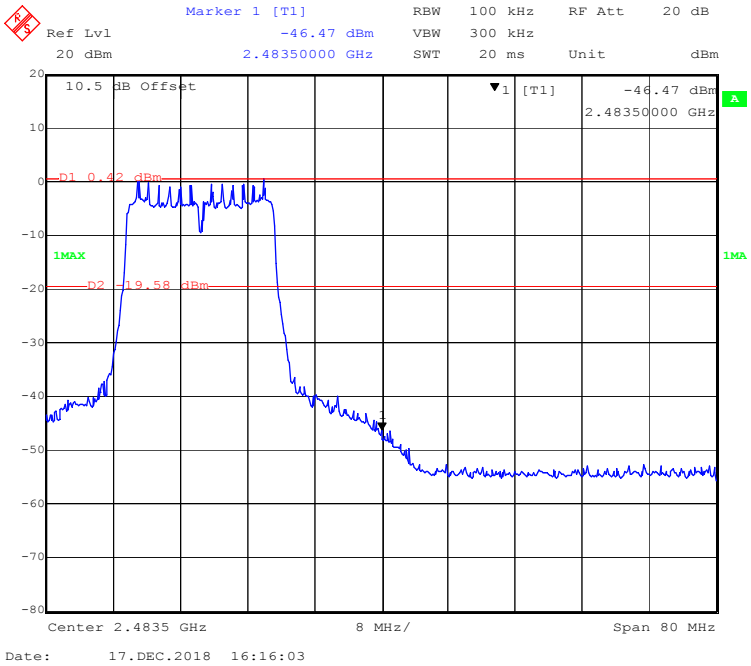
Chain1: 802.11g Mode Right Side



Chain1: 802.11n-HT20 Mode Left Side



Chain1: 802.11n-HT20 Mode Right Side



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 ANSI C63.10-2013 sub-clause 11.10.2

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 Data

Environmental Conditions

Temperature:	24.8℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

The testing was performed by Stone Zhang on 2018-12-17

Test Result: Compliant

EUT operation mode: Transmitting

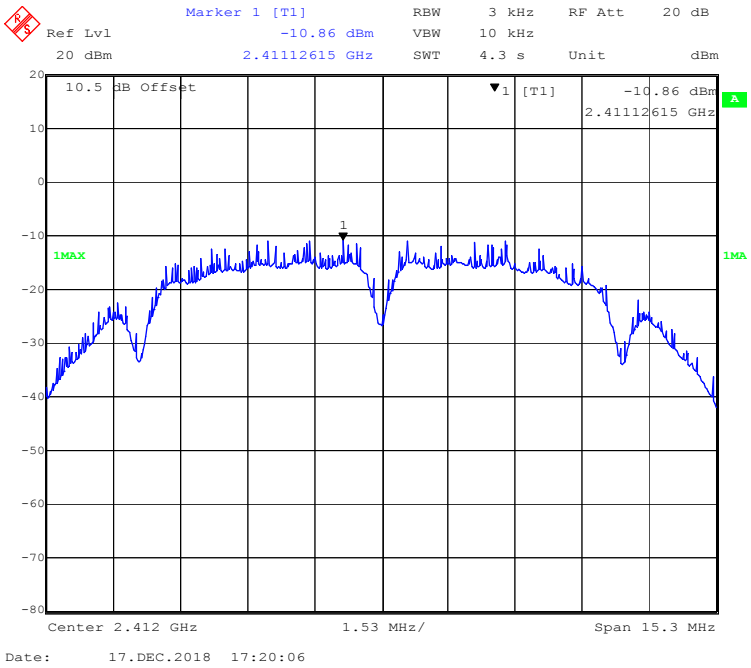
Channel	Frequency (MHz)	PSD (dBm/3kHz)			Limit (dBm/3kHz)
		Chain0	Chain1	Total	
802.11b mode					
Low	2412	-10.86	-13.02	/	≤8
Middle	2437	-11.24	-12.84	/	≤8
High	2462	-12.01	-12.41	/	≤8
802.11g mode					
Low	2412	-14.31	-15.90	/	≤8
Middle	2437	-15.82	-16.48	/	≤8
High	2462	-15.88	-16.35	/	≤8
802.11n-HT20 mode					
Low	2412	-15.23	-16.22	-12.69	≤8
Middle	2437	-15.13	-15.15	-12.13	≤8
High	2462	-15.56	-16.47	-12.98	≤8

Note:

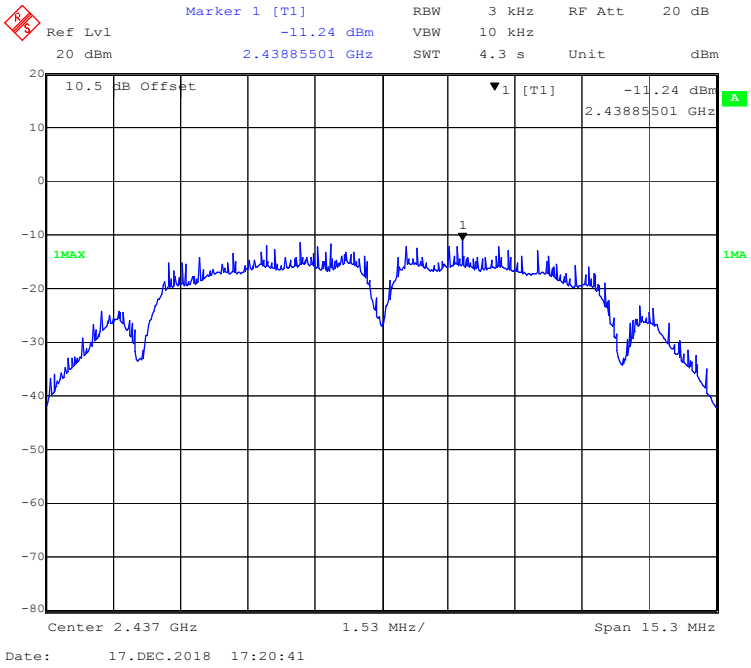
The total PSD=10 Log_{10} (10^ (Chain 0/10) +10^ (Chain 1/10))

Chain0:

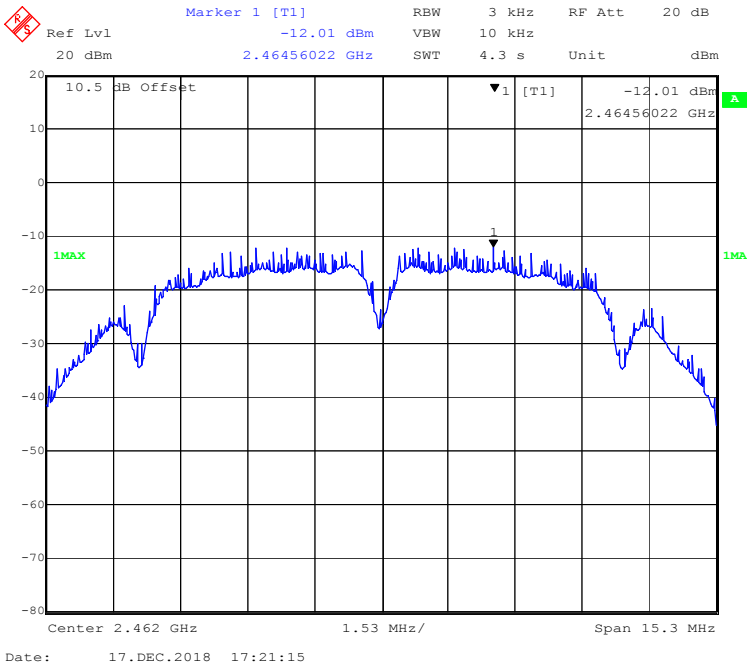
802.11b Low Channel



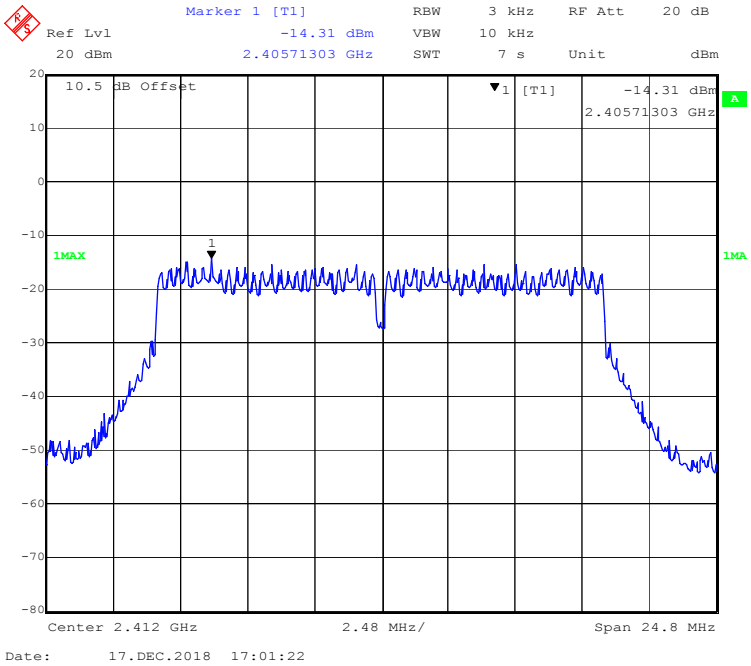
802.11b Middle Channel



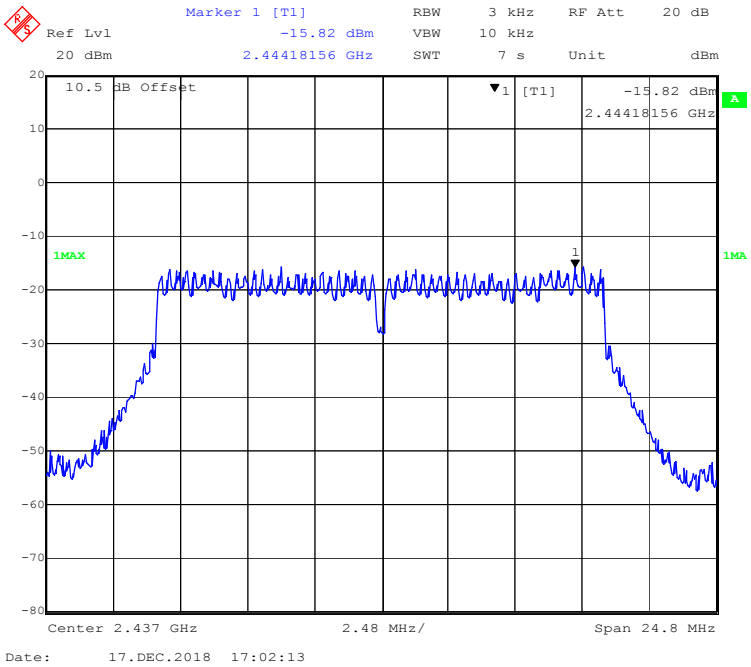
802.11b High Channel



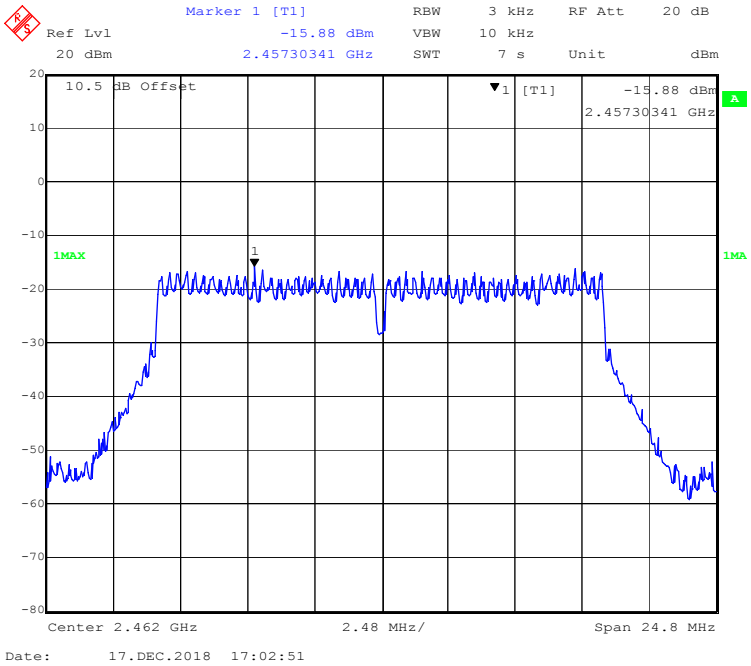
802.11g Low Channel



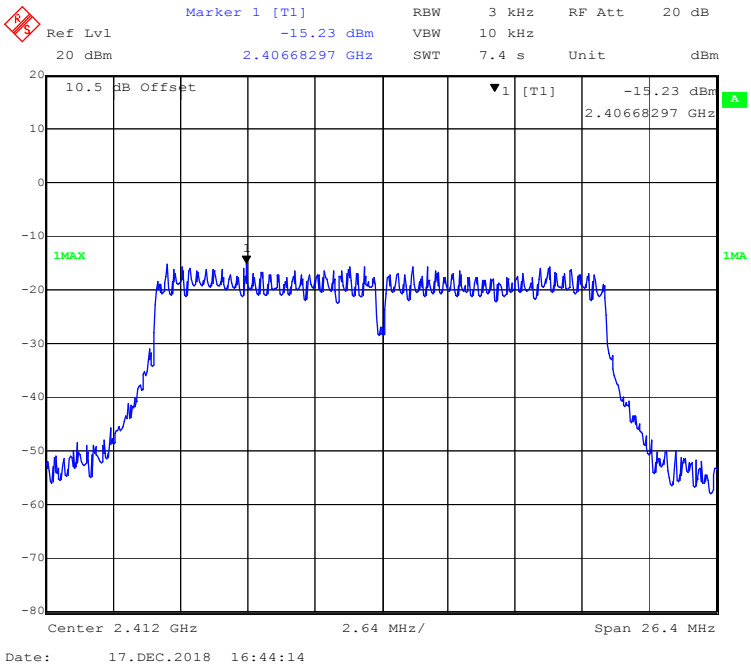
802.11g Middle Channel



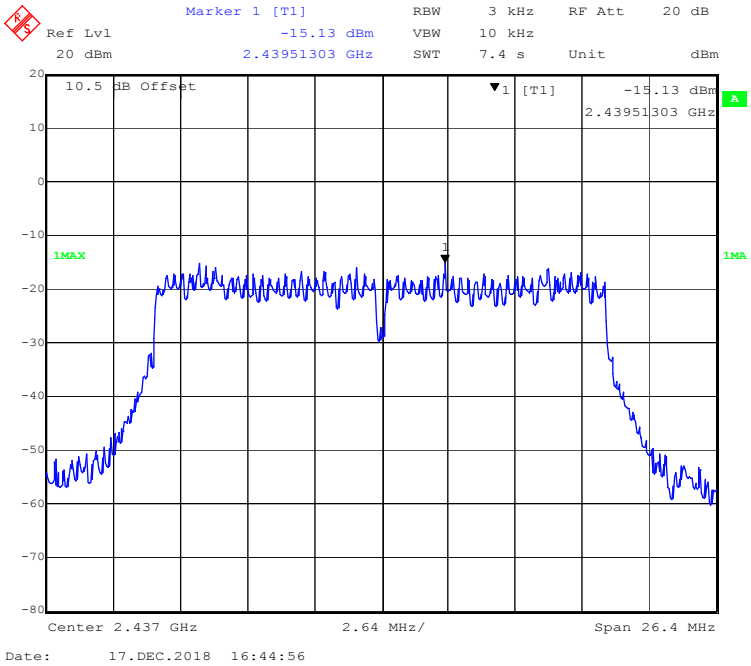
802.11g High Channel



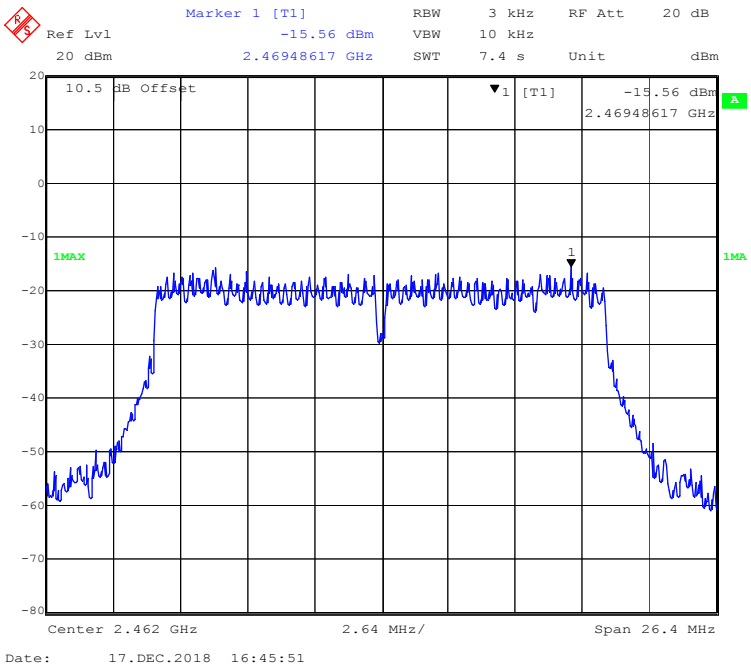
802.11n-HT20 Low Channel



802.11n-HT20 Middle Channel

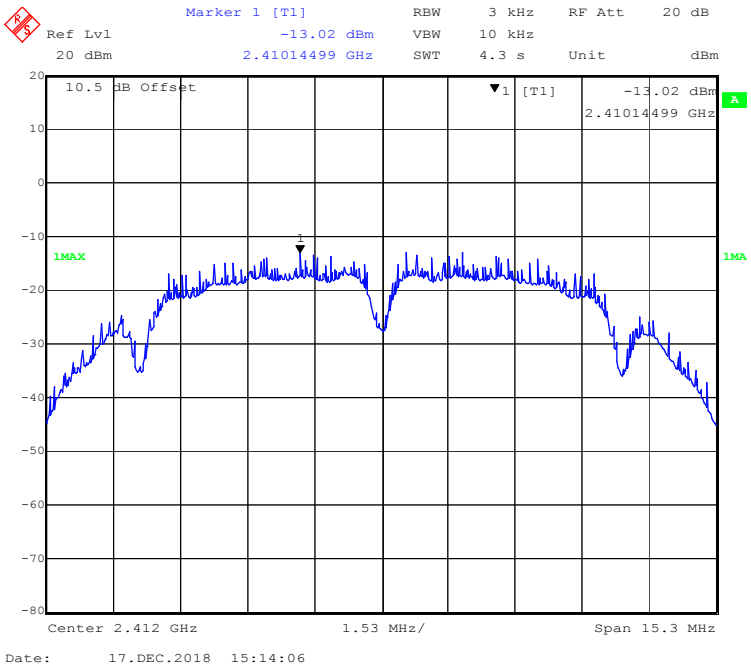


802.11n-HT20 High Channel

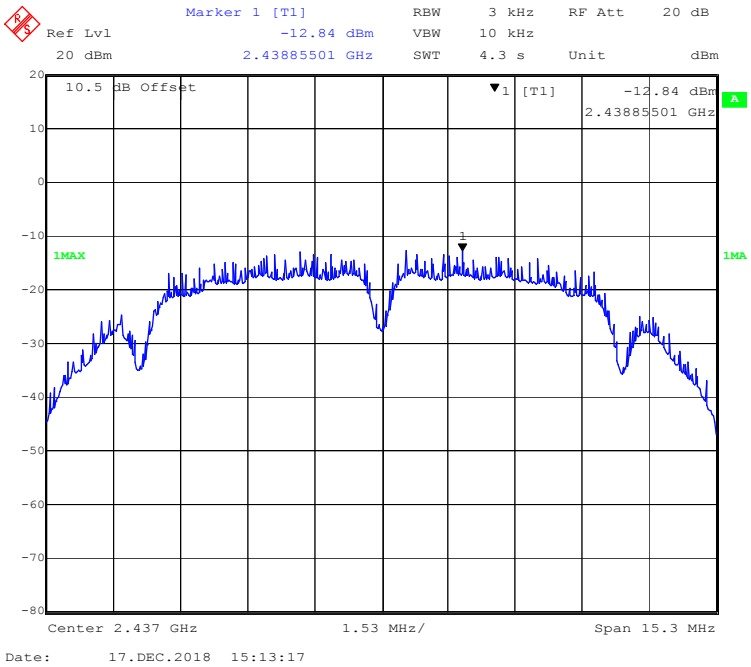


Chain1:

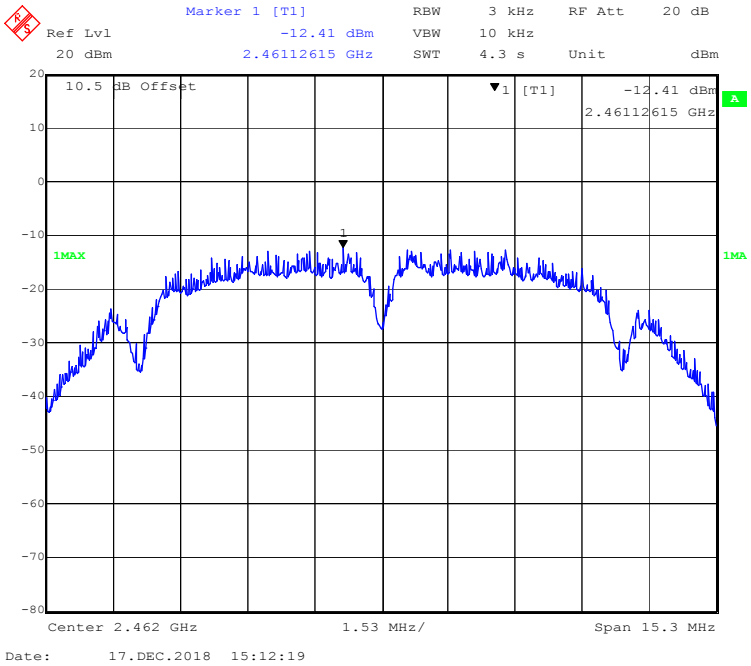
802.11b Low Channel



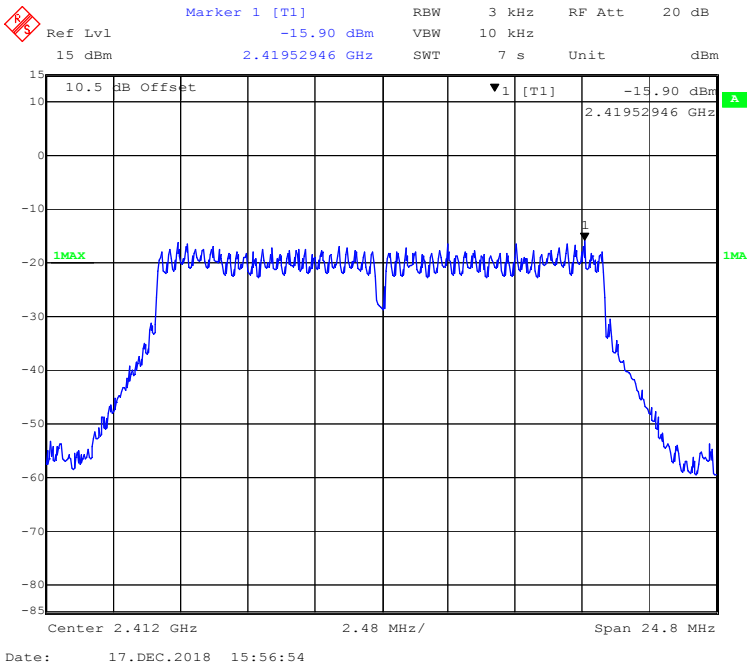
802.11b Middle Channel



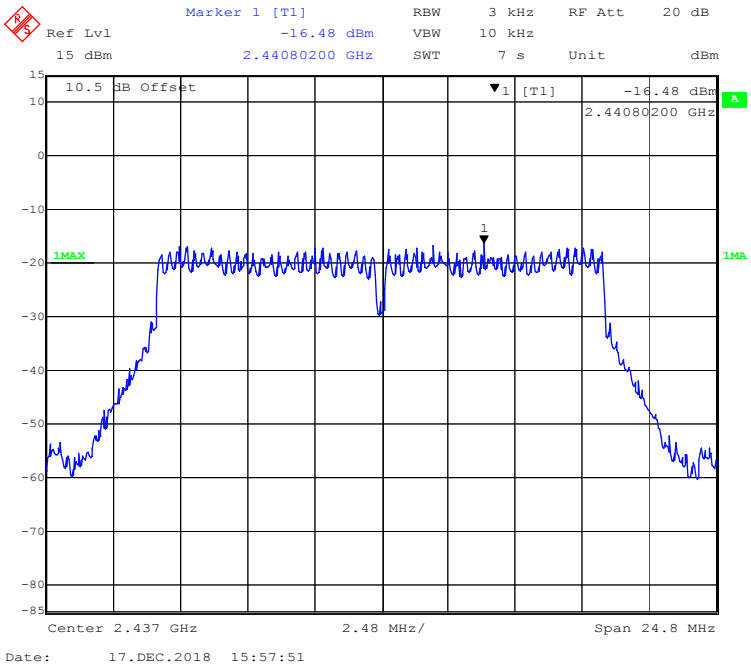
802.11b High Channel



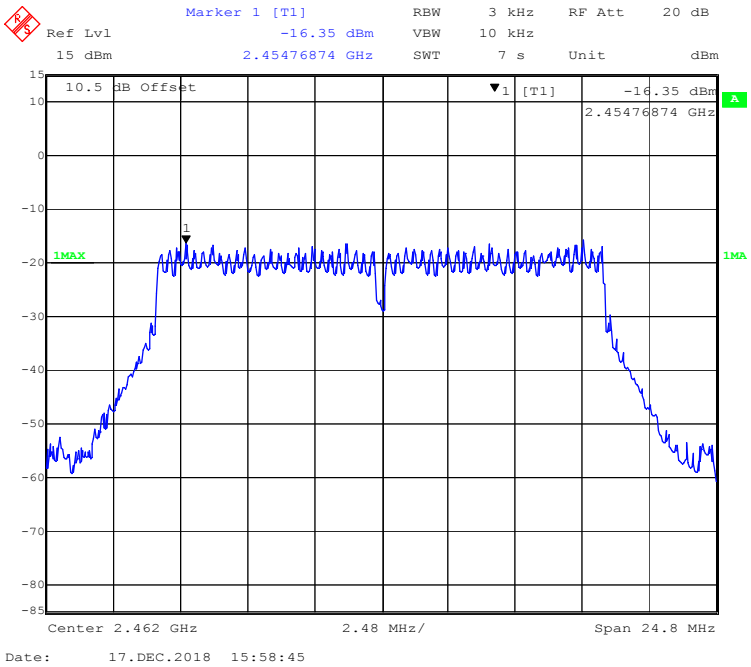
802.11g Low Channel



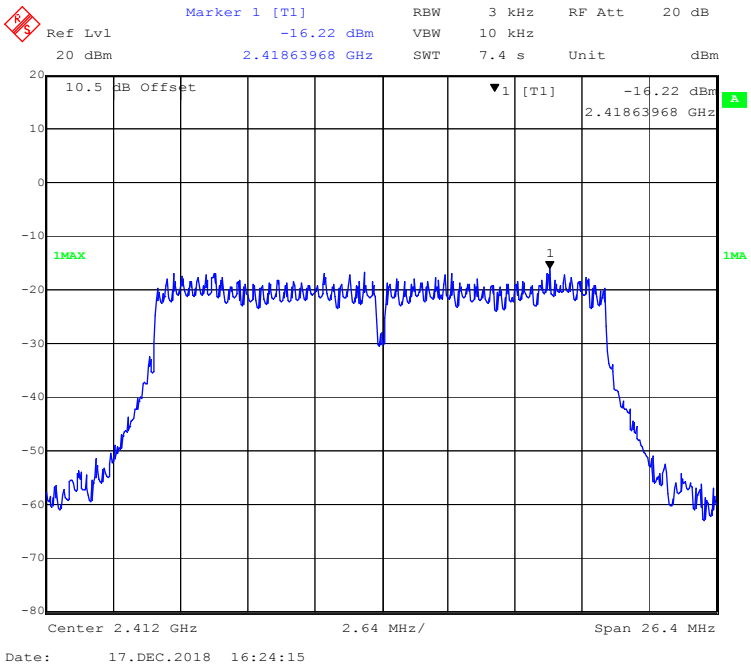
802.11g Middle Channel



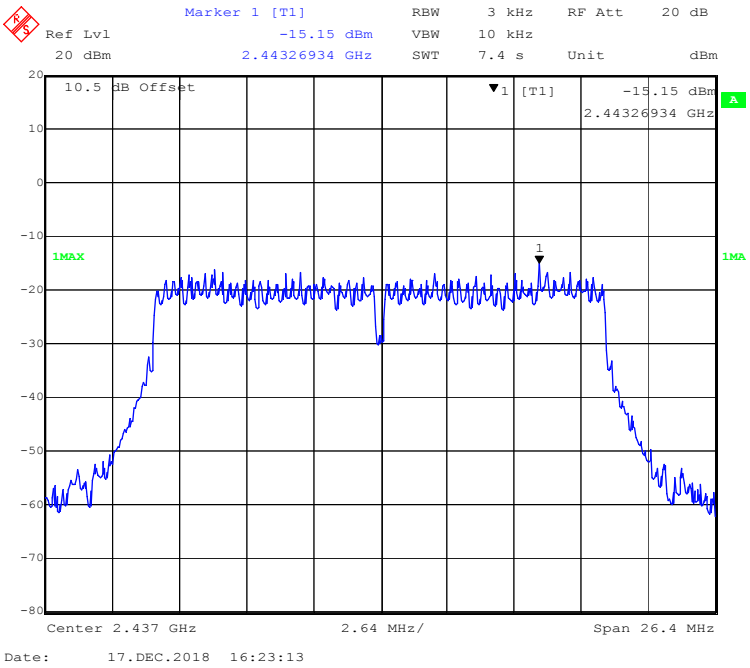
802.11g High Channel



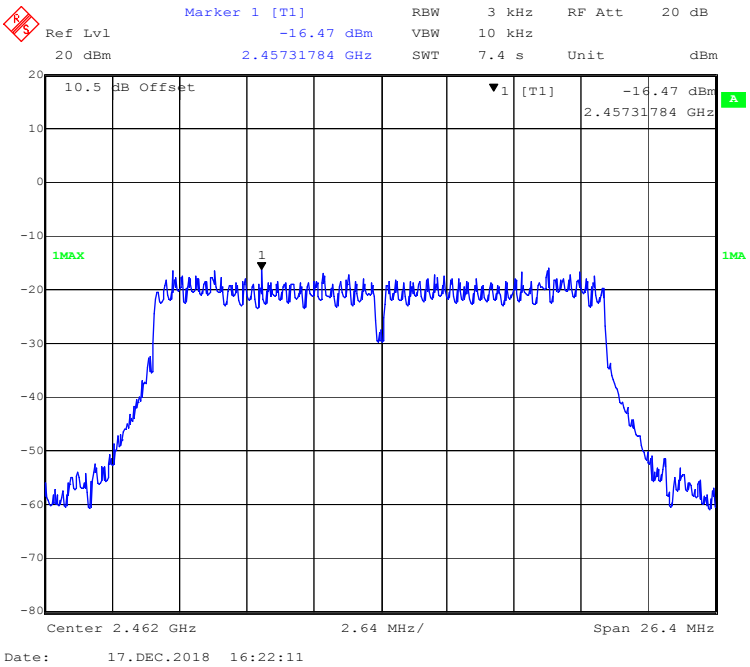
802.11n-HT20 Low Channel



802.11n-HT20 Middle Channel



802.11n-HT20 High Channel



APPENDIX A (INFORMATIVE)- A2LA CERTIFICATE AND SCOPE OF ACCREDITATION

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

BAY AREA COMPLIANCE LABORATORIES CORP. (KUNSHAN)
No. 248 Chenghu Road
Kunshan, Jiangsu Province, People's Republic of China
Mr. John Chan Phone: +86 0512 86175000

ELECTRICAL

Valid To: September 30, 2020 Certificate Number: 4323.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following EMC, Radio, and Telecommunication tests:

Test Technology:	Test Method(s):
Emissions	
Radiated and Conducted	ANSI C63.4:2014; ANSI C63.10:2010; ANSI C63.26:2015; ANSI 63.17:2013; FCC 47 CFR Parts 15B (using ANSI C63.4:2014) and 18 (using FCC MP-5:1986); FCC OST/MP-5 (1986); EN 55011; IEC/CISPR 11; AS/NZS CISPR 11; EN 55014-1; IEC/CISPR 14-1; AS/NZS CISPR 14.1; EN 55014-2; IEC/CISPR 14-2; AS/NZS CISPR 14.2; CNS 13439; CNS 13803; CNS 14115; CNS 13438 (up to 6GHz); CNS 13783-1; EN 55015; IEC CISPR 15; AS/NZS CISPR 15; EN 61547; IEC 61547; EN 55032; IEC/CISPR 32; AS/NZS CISPR 32; GB 9254; EN 55024; CISPR 24; AS/NZS CISPR 24; CISPR 25; EN 55035; CISPR 35; VCCI V-3; VCCI-CISPR 32; EN 50130-4; ICES-003 Issue 6 (2016); ICES-005 Issue 4 (Dec 2015); IDA TS EMC, Issue 1, Rev. 1 (March 2000)
Harmonics	EN 61000-3-2; IEC 61000-3-2; AS/NZS 61000.3.2; GB 17625.1
Flicker	EN 61000-3-3; IEC 61000-3-3; AS/NZS 61000.3.3; GB 17625.2

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5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

Test Technology:	**Test Method(s):**
Immunity	
Electrostatic Discharge (ESD)	EN 61000-4-2; IEC 61000-4-2
Radiated Immunity	EN 61000-4-3; IEC 61000-4-3
Electrical Fast Transient (EFT) / Burst	EN 61000-4-4; IEC 61000-4-4
Surge	EN 61000-4-5; IEC 61000-4-5
Conducted Immunity	EN 61000-4-6; IEC 61000-4-6
Magnetic Field Immunity	EN 61000-4-8; IEC 61000-4-8
Voltage Dips, Short Interrupts, and Variations	EN 61000-4-11; IEC 61000-4-11
Generic and Product Family Standards	EN 61000-6-1; IEC 61000-6-1; EN 61000-6-2; IEC 61000-6-2; EN 61000-6-3; IEC 61000-6-3; AS/NZS 61000-6.3; EN 61000-6-4; IEC 61000-6-4; AS/NZS 61000.6.4; EN 61326-1; IEC 61326-1; EN 61326-2-1; IEC 61326-2-1; EN 61326-2-2; IEC 61326-2-2; EN 61326-2-3; IEC 61326-2-3; EN 61326-2-4; IEC 61326-2-4; EN 61326-2-5; IEC 61326-2-5; EN 61326-2-6; IEC 61326-2-6
Specific Absorption Rate(SAR)	EN 50360; EN 50566; EN 62209-1; IEC 62209-1; EN 62209-2; IEC 62209-2; RSS-102, Issue 5 (March 2015); MIC Article 14-2; IEEE 1528:2013
RF Exposure	EN 50364; EN 50385; EN 50383; EN 50400; EN 50421; EN 50663; IEC 62233; EN 62311; IEC 62311; EN 62479; EN 62493; IEC 62493; IEEE Std C95.3; IEEE Std C95.1; EN 50384

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Test Technology:	**Test Method(s):**
Radio	
ACA	ACA Standard 2013 Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2013
AS/NZS	AS/NZS 4268; AS/NZS 4295; AS/NZS 4771; AS/CA S042.1; AS/ACIF S042.3; AS/CA S042.4; AS/NZS 2772.1; AS/NZS 2772.2
Europe	ETSI EN 300 086; ETSI EN 300 113; ETSI EN 300 219; ETSI EN300 220-1; -2; -3-1; -3-2; -4; ETSI EN 300 296; ETSI EN 300 328; ETSI EN 300 330; ETSI EN 300 373-1; ETSI EN 300 390; ETSI EN 300 422-1; -2; -3; -4; ETSI EN 300 440; ETSI EN 301 166; ETSI EN 301 178; ETSI EN 301 357; ETSI EN 301 406; ETSI EN 301 489-1; -3; -5; -6; -9; -17; -19; -23; -34; -50; -52; ETSI EN 301 502; ETSI EN 301 511; ETSI EN 301 526; ETSI EN 301 783; ETSI EN 301 893; ETSI EN 301 908-1; -2; -3; -8; -9; -10; -11; -12; -13; -14; -15; -16; -17; -18; -19; -20; -21; -22; ETSI EN 302 208; ETSI EN 302 208; ETSI EN 303 345; ETSI EN303 413; ETSI EN 303 417; ETSI EN 303 609
HKCA	HKTA 1033 ISSUE 6; HKTA 1034 ISSUE 3; HKTA 1035 ISSUE 6; HKTA 1039 ISSUE 4; HKTA 1048 ISSUE 2; HKTA 1061 ISSUE 1

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Test Technology:	**Test Method(s):**
Japan	MIC Article 2-1 Item (8); MIC Article 2-1 Item (13); MIC Article 2-1 Item (19); MIC Article 2-1 Item (19)-2; MIC Article 2-1 Item (19)-3; MIC Article 2-1 Item (19)-3-2; MIC Article 2-1 Item (19)-11
Canada	RSS-112, Issue 1 (February 2008); RSS-119, Issue 12 (May 2015); RSS-123, Issue 3, (February 2015); RSS-130, Issue 1 (October 2013); RSS-131, Issue 3 (January 2017 Updated May 2017); RSS-132, Issue 3 (January 2013); RSS-133, Issue 6 (January 2013); RSS-134, Issue 2 (February 5, 2016); RSS-139, Issue 3 (July 2015); RSS-199, Issue 3 (December 2016); RSS-210, Issue 9 (August 2016); RSS-213, Issue 3 (March 2015); RSS-215, Issue 2 (June 2009); RSS-216, Issue 2 (January 20, 2016); RSS-247, Issue 2 (February 2017); RSS-310, Issue 4 (July 2015); RSS-Gen, Issue 5 (April 2018); RSS-102 Issue 5 March 2015
Singapore (IMDA)	IDA TS CMT Issue 1; IDA TS SRD Issue 1 Rev 7; IMDA TS CBS Issue 1; IMDA TS CMT Issue 1
Taiwan	LP0002; PLMN04; PLMN05; PLMN06; PLMN08; LP0001; PLMN09; PLMN10
FCC/US	TIA/EIA 603-D (2010); ANSI/TIA 603-D (2010); TIA/EIA 603-E (2016); ANSI/TIA 603-E (2016); TIA-102.CAAA-E; TIA-102.CAAA-D; TIA-470.210:2010; 47 CFR FCC Part 15/C/D/E (with DFS)/E (without DFS)/F, 18, 20, 22, 24, 25, 27, 73, 74, 80, 87, 90, 95, 97, 101

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Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[1]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5:1986	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	325000
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
U-NII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	200000
Commercial Mobile Services (FCC Licensed Radio Service Equipment) Parts 22 (cellular), 24, 25 (non-microwave), and 27	ANSI/TIA-603-D/E; TIA-102.CAAA-D/E; ANSI C63.26:2015	40000
General Mobile Radio Services (FCC Licensed Radio Service Equipment) Parts 22 (non-cellular), 90 (non-microwave), 95, 97, and 101 (non-microwave)	ANSI/TIA-603-D/E; TIA-102.CAAA-D/E; ANSI C63.26:2015	40000
Maritime and Aviation Radio Services Parts 80 and 87	ANSI/TIA-603-D/E; ANSI C63.26:2015	40000
Microwave and Millimeter Bands Radio Services Parts 25, 30, 74, 90 (M, DSRC, Y, Z), Part 95 (M and L), and 101	ANSI/TIA-603-D/E; TIA-102.CAAA-D/E; ANSI C63.26:2015	40000

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Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[1]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Broadcast Radio Services		
Parts 73 and 74 (non-microwave)	ANSI/TIA-603-D/E; TIA-102.CAAA-D/E; ANSI C63.26:2015	40000
RF Exposure		
Devices Subject to SAR Requirements	IEEE Std 1528:2013	2600
Signal Boosters		
Part 20(Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters)	ANSI C63.26:2015	40000

[1]Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

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Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP. (KUNSHAN)

Jiangsu Province, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 9th day of August 2018.

President and CEO
For the Accreditation Council
Certificate Number 4323.01
Valid to September 30, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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