TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.247

TEST REPORT

For

Shanghai Ratta Smart Technology Co.,Ltd.

Room 301, Building No.1,168 Jixin Road, Minhang, Shanghai, China 201104

FCC ID: 2AQZ9-SNA5

Report Type:	**Product Type:**
Original Report	SuperNote

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Report Number:	RSHA181017002-00A
Report Date:	2018-12-03
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TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
RELATED SUBMITTAL(S)/GRANT(S) 4
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 5
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EQUIPMENT MODIFICATIONS 6
EUT EXERCISE SOFTWARE 7
SUPPORT EQUIPMENT LIST AND DETAILS 10
EXTERNAL I/O CABLE 10
BLOCK DIAGRAM OF TEST SETUP 10
SUMMARY OF TEST RESULTS **12**
TEST EQUIPMENT LIST **13**
FCC §15.247 (I) & §1.1310 & §2.1093 - RF EXPOSURE **14**
MEASUREMENT RESULT 14
FCC §15.203 - ANTENNA REQUIREMENT **15**
APPLICABLE STANDARD 15
ANTENNA CONNECTOR CONSTRUCTION 15
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS **16**
APPLICABLE STANDARD 16
EUT SETUP 16
EMI TEST RECEIVER SETUP 16
TEST PROCEDURE 17
CORRECTED FACTOR & MARGIN CALCULATION 17
TEST RESULTS SUMMARY 17
TEST DATA 17
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS **22**
APPLICABLE STANDARD 22
EUT SETUP 22
EMI TEST RECEIVER SETUP 23
TEST PROCEDURE 23
CORRECTED AMPLITUDE & MARGIN CALCULATION 23
TEST RESULTS SUMMARY 23
TEST DATA 24
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH **50**
APPLICABLE STANDARD 50
TEST PROCEDURE 50
TEST DATA 50
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER **58**
APPLICABLE STANDARD 58
TEST PROCEDURE 58
TEST DATA 59

FCC §15.247(d) – BAND EDGE.....62
APPLICABLE STANDARD 62
TEST PROCEDURE 62
TEST DATA 62
FCC §15.247(e) - POWER SPECTRAL DENSITY 67
APPLICABLE STANDARD 67
TEST PROCEDURE 67
TEST DATA 67

FINAL

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Shanghai Ratta Smart Technology Co.,Ltd.
Tested Model	SN-A5
Product Type	SuperNote
Dimension	245.0 mm (L)* 178.0 mm (W)*6.5mm(H)
Power Supply	DC 3.8V from battery and DC 5.0V charging by USB Port
Firmware	001.002.009.0068.0293

**All measurement and test data in this report was gathered from production sample serial number: 20181017002. (Assigned by the BACL. The EUT supplied by the applicant was received on 2018-10-17)*

Objective

This report is prepared on behalf of Shanghai Ratta Smart Technology Co.,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)

FCC Part 15.247 DSS submissions with FCC ID: 2AQZ9-SNA5.

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.

FINAL

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
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%

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.

FINAL

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Test channel list is as below:

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

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

For BLE mode, EUT was tested with channel 0, 19 and 39.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
18	2438	38	2478
19	2440	39	2480

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

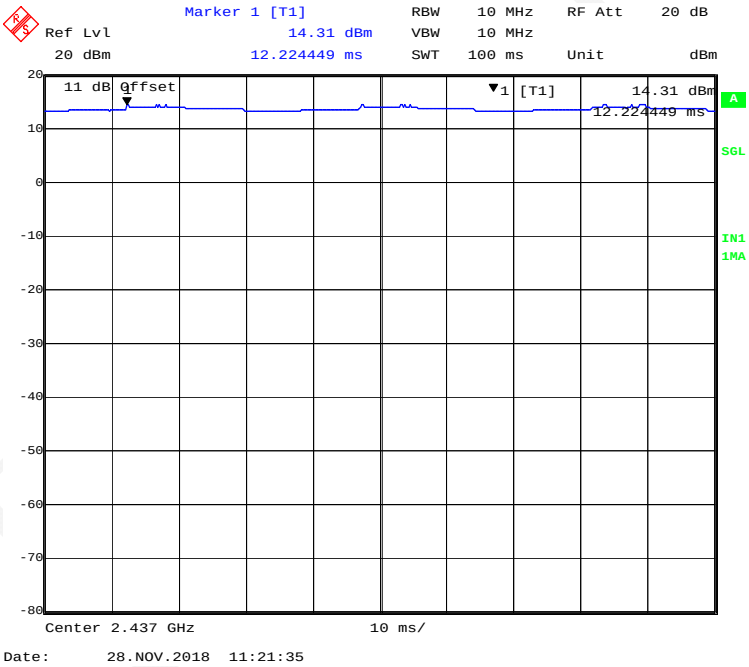
RF test tool: Secure CRT

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

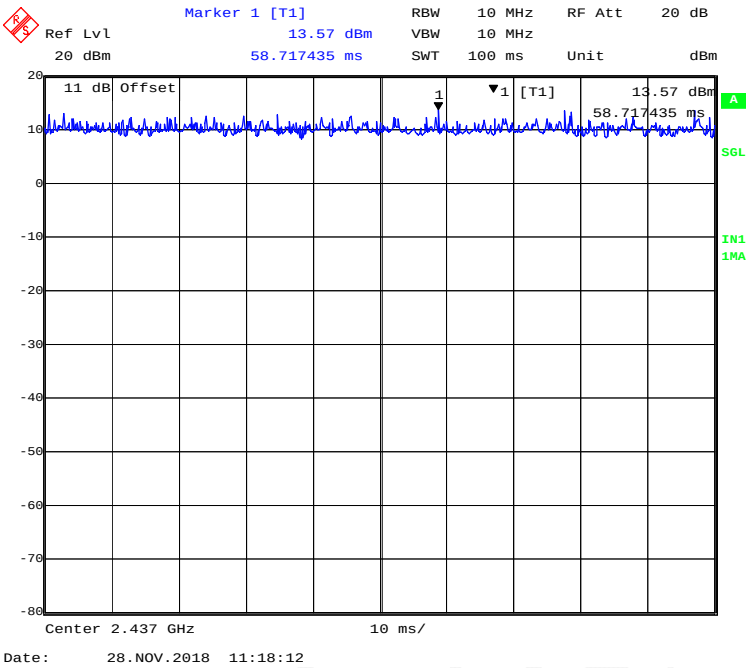
Mode	Data Rate	Power Level
802.11b	1 Mbps	12
802.11g	6 Mbps	5
802.11n-HT20	MCS0	5
BLE	1Mbps	3

Duty Cycle:

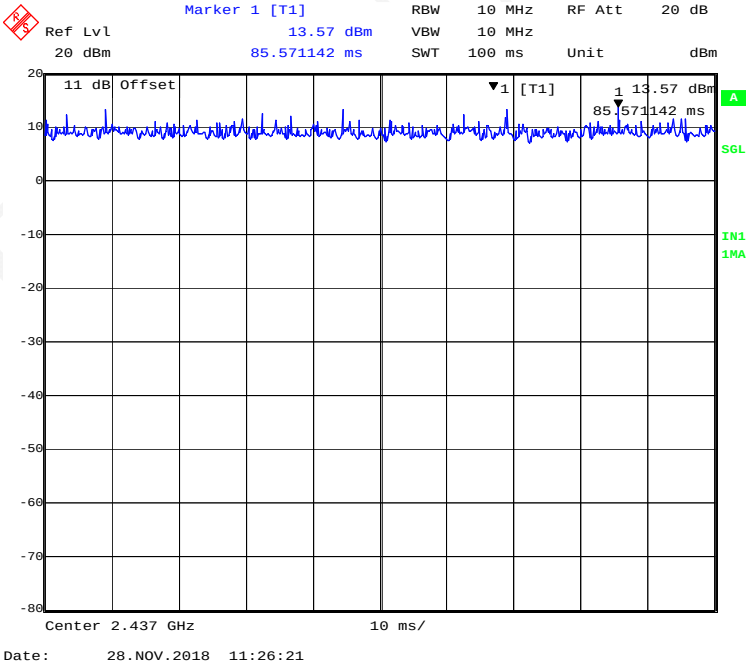
802.11b Mode Middle Channel



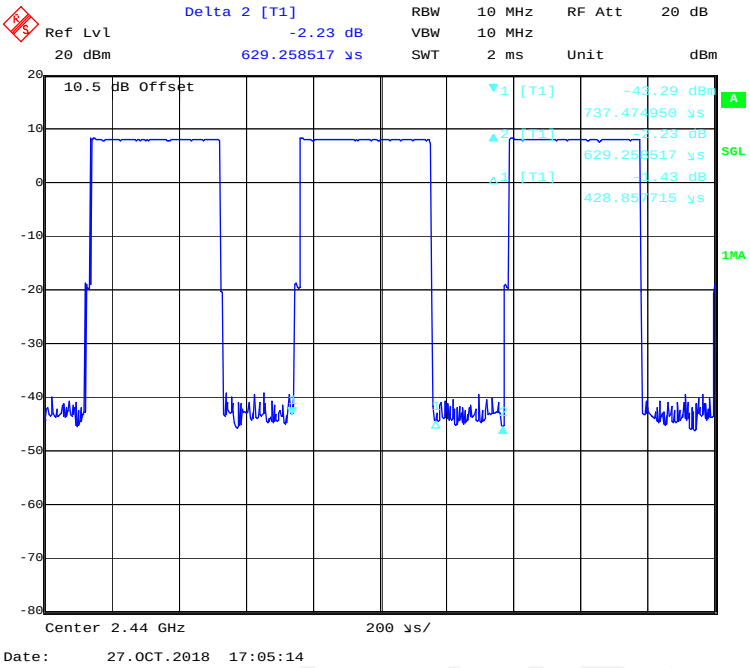
802.11g Mode Middle Channel



802.11n-HT20 Mode Middle Channel



BLE Mode Middle Channel



Date: 27.OCT.2018 17:05:14

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
BLE	68.15	0.429	2.331	1.67

Note: "x" means the Duty Cycle.

Support Equipment List and Details

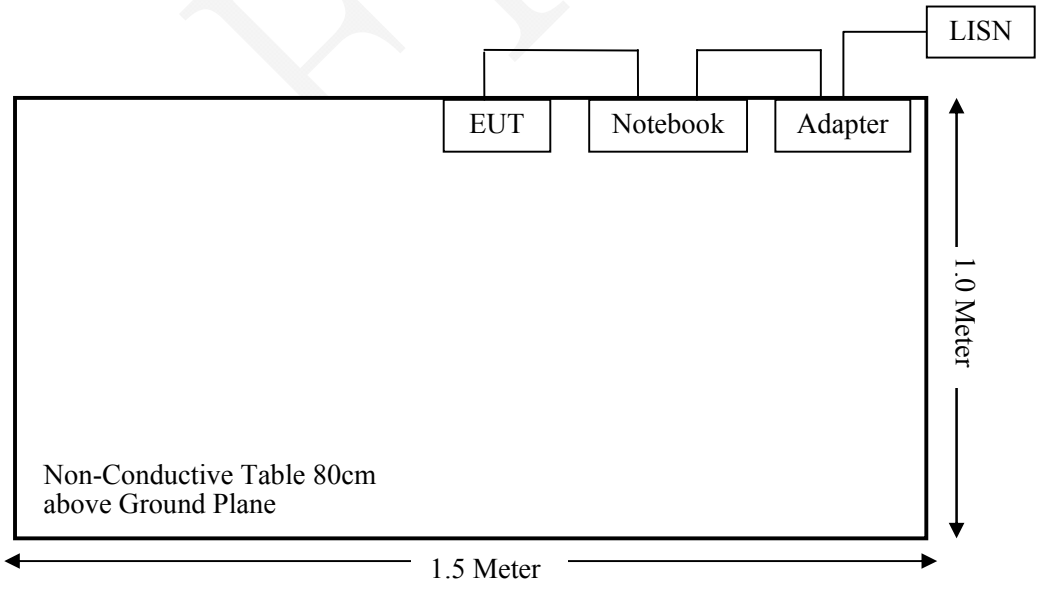
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263
Ratta	Debug Board	/	/

External I/O Cable

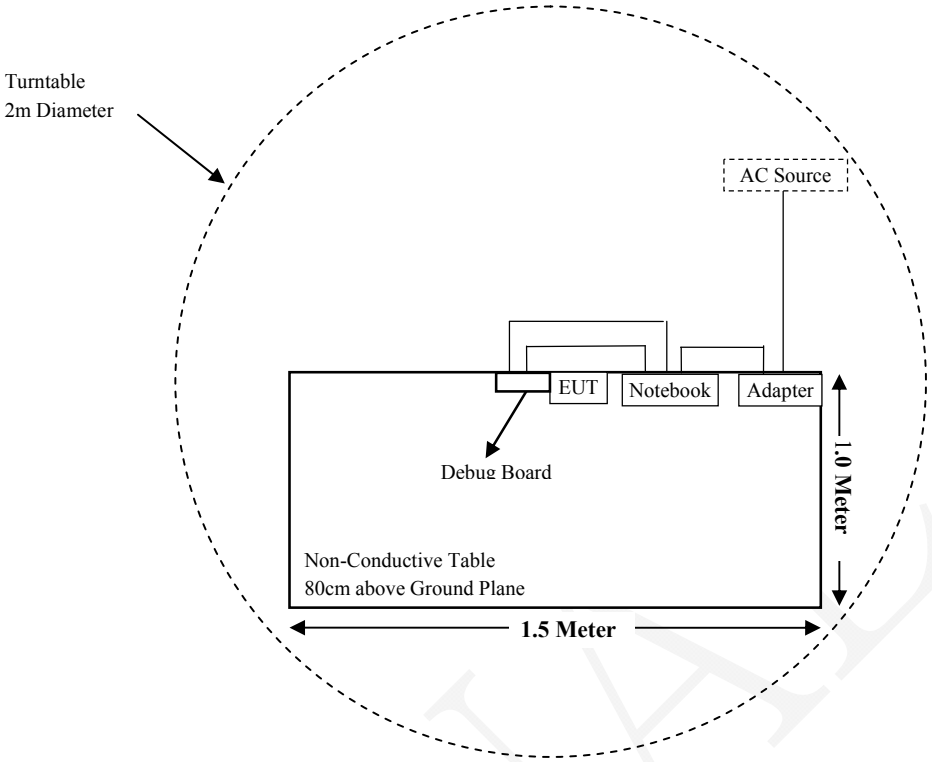
Cable Description	Length (m)	From Port	To
Power Cable	1.2	Notebook	Adapter
USB Cable	0.8	Notebook	Debug Board
Data Cable	0.8	Notebook	Debug Board
USB Cable	0.8	Notebook	EUT

Block Diagram of Test Setup

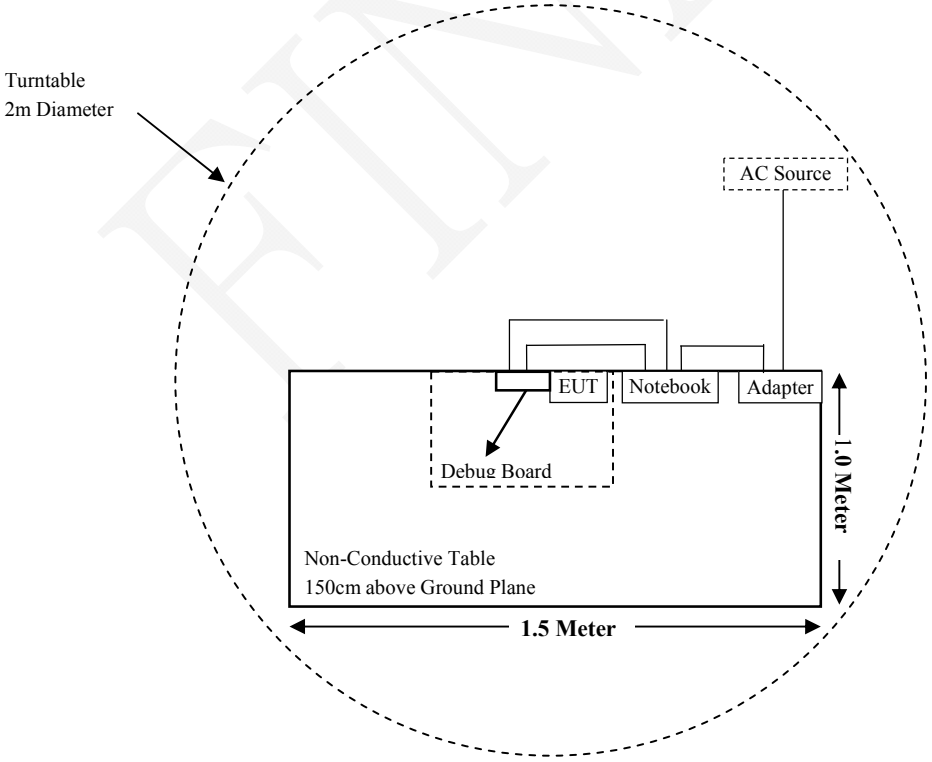
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (I), §1.1310 & §2.1093	RF Exposure	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

FINAL

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	2017-11-12	2018-11-11
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	/	2018-08-05	2019-08-04
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	2017-11-12	2018-11-11
Agilent	Power Meter	N1912A	MY5000492	2017-11-18	2018-11-17
Agilent	Power Sensor	N1921A	MY54210024	2017-11-18	2018-11-17
Narda	Attenuator/10dB	10dB	010	2018-01-10	2019-01-09
Ratta	RF Cable	Ratta01	C01	Each	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2017-11-12	2018-11-11
Rohde & Schwarz	LISN	ENV216	3560655016	2017-11-15	2018-11-14
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 §15.247 (I) & §1.1310 & §2.1093 - RF EXPOSURE

Applicable Standard

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

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

For Wi-Fi:

Please refer to SAR Report: RSH181127050-20A

For BLE:

For worst case:

Mode	Frequency Range (MHz)	Max Tune-up Conducted Power		Calculated Distance (mm)	Calculated Value	Threshold (1-g SAR)	SAR Test Exclusion
		(dBm)	(mW)				
BLE	2402-2480	8.00	6.31	5.0	2.0	3.0	Yes

Result: So the standalone SAR evaluation is not necessary.

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 FPC antenna for Wi-Fi & BLE, which the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

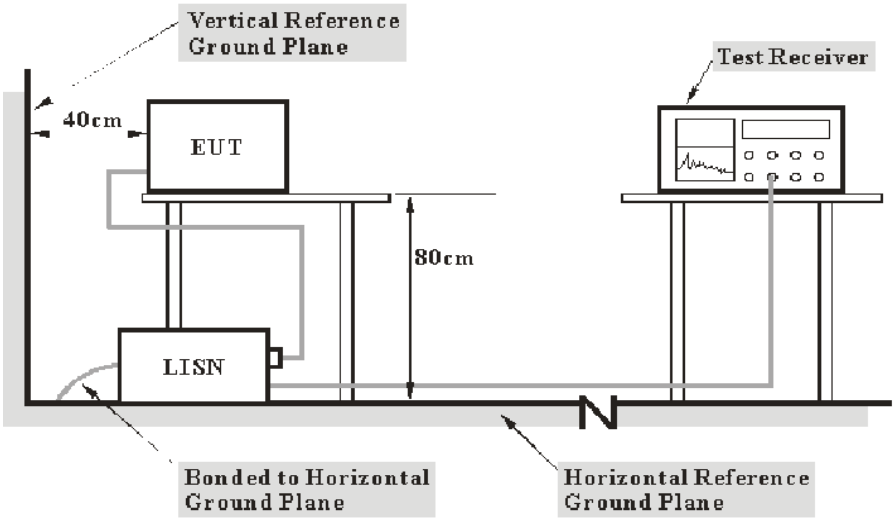
FINAL

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

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

ANSI C63.10-2013 clause 6.2

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 final 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:	20.2 ℃
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Stone Zhang on 2018-10-30.

Test Result: Compliant.

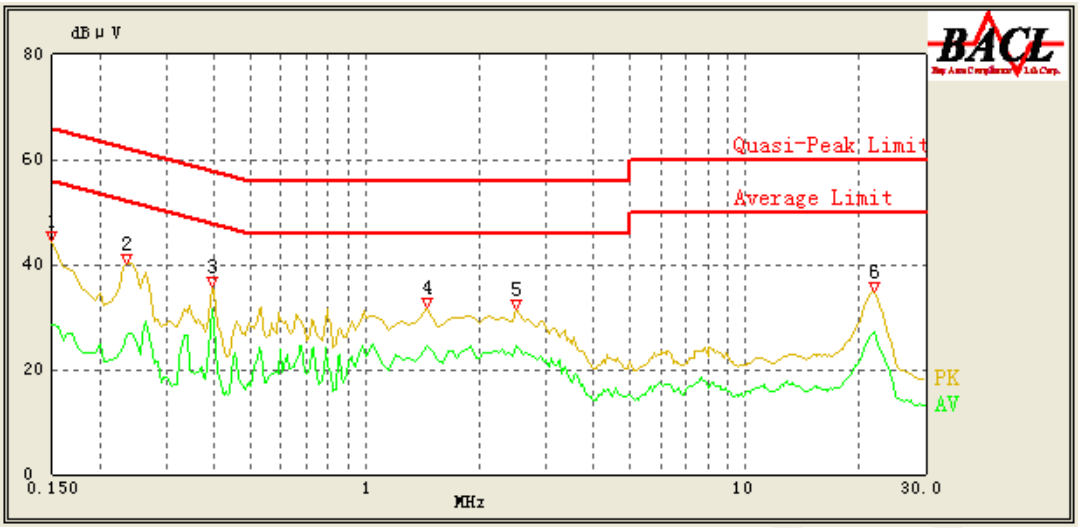
For Wi-Fi Mode:

EUT operation mode: Transmitting in 802.11b mode high channel (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
0.150	44.14	QP	9.000	L1	16.06	66.00	21.86	Compliance
0.150	32.00	AV	9.000	L1	16.06	56.00	24.00	Compliance
0.235	40.27	QP	9.000	L1	16.02	62.27	22.00	Compliance
0.235	27.65	AV	9.000	L1	16.02	52.27	24.62	Compliance
0.665	32.96	QP	9.000	L1	15.97	56.00	23.04	Compliance
0.665	24.85	AV	9.000	L1	15.97	46.00	21.15	Compliance
1.050	31.13	QP	9.000	L1	15.88	56.00	24.87	Compliance
1.050	23.82	AV	9.000	L1	15.88	46.00	22.18	Compliance
7.100	29.48	QP	9.000	L1	15.98	60.00	30.52	Compliance
7.150	21.57	AV	9.000	L1	15.98	50.00	28.43	Compliance
21.550	33.31	QP	9.000	L1	16.45	60.00	26.69	Compliance
21.600	25.02	AV	9.000	L1	16.45	50.00	24.98	Compliance

AC 120V/60 Hz, Neutral



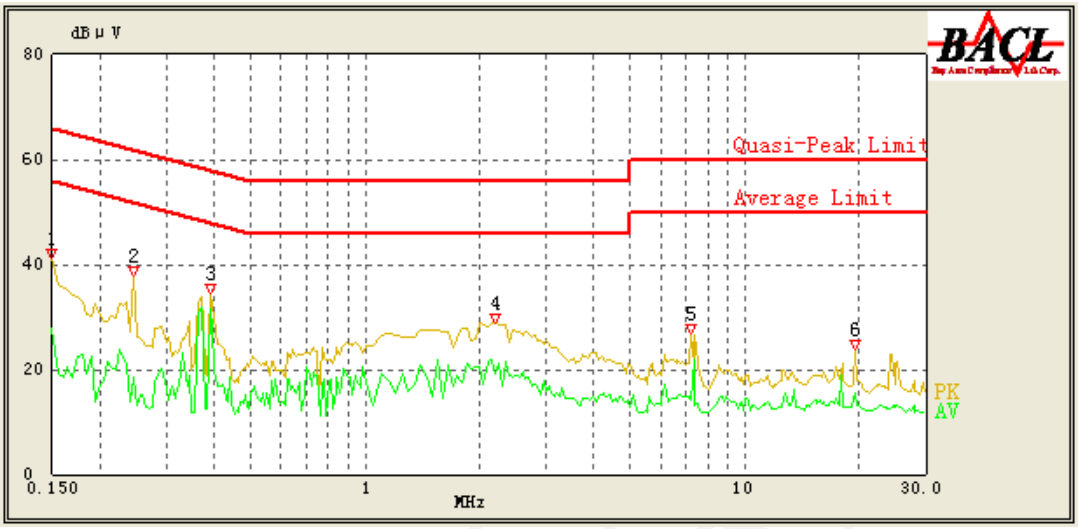
Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	44.63	QP	9.000	N	16.06	66.00	21.37	Compliance
0.150	28.53	AV	9.000	N	16.06	56.00	27.47	Compliance
0.235	40.23	QP	9.000	N	16.06	62.27	22.04	Compliance
0.235	26.46	AV	9.000	N	16.06	52.27	25.81	Compliance
0.395	35.79	QP	9.000	N	16.09	57.96	22.17	Compliance
0.395	31.38	AV	9.000	N	16.09	47.96	16.58	Compliance
1.450	31.68	QP	9.000	N	15.93	56.00	24.32	Compliance
1.450	24.42	AV	9.000	N	15.93	46.00	21.58	Compliance
2.500	31.53	QP	9.000	N	15.90	56.00	24.47	Compliance
2.500	24.65	AV	9.000	N	15.90	46.00	21.35	Compliance
22.050	34.94	QP	9.000	N	16.19	60.00	25.06	Compliance
22.050	27.06	AV	9.000	N	16.19	50.00	22.94	Compliance

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

For BLE Mode:

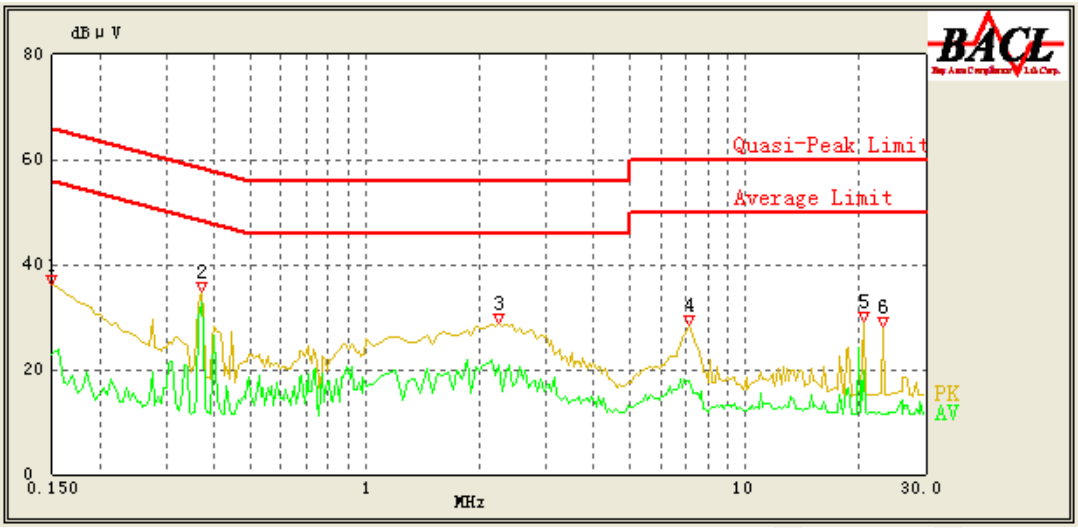
EUT operation mode: Transmitting in middle channel (worst case)

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
0.150	41.22	QP	9.000	L1	16.06	66.00	24.78	Compliance
0.150	27.90	AV	9.000	L1	16.06	56.00	28.10	Compliance
0.245	37.93	QP	9.000	L1	16.02	61.92	23.99	Compliance
0.245	18.60	AV	9.000	L1	16.02	51.92	33.32	Compliance
0.390	34.45	QP	9.000	L1	16.05	58.06	23.61	Compliance
0.390	31.40	AV	9.000	L1	16.05	48.06	16.66	Compliance
2.200	28.86	QP	9.000	L1	15.85	56.00	27.14	Compliance
2.200	19.21	AV	9.000	L1	15.85	46.00	26.79	Compliance
7.200	26.78	QP	9.000	L1	15.99	60.00	33.22	Compliance
7.200	14.30	AV	9.000	L1	15.99	50.00	35.70	Compliance
19.550	23.86	QP	9.000	L1	16.42	60.00	36.14	Compliance
19.550	15.36	AV	9.000	L1	16.42	50.00	34.64	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
0.150	36.25	QP	9.000	N	16.06	66.00	29.75	Compliance
0.150	22.69	AV	9.000	N	16.06	56.00	33.31	Compliance
0.370	34.96	QP	9.000	N	16.08	58.50	23.54	Compliance
0.370	32.88	AV	9.000	N	16.08	48.50	15.62	Compliance
2.250	28.84	QP	9.000	N	15.91	56.00	27.16	Compliance
2.250	20.71	AV	9.000	N	15.91	46.00	25.29	Compliance
7.150	28.34	QP	9.000	N	15.92	60.00	31.66	Compliance
7.150	17.99	AV	9.000	N	15.92	50.00	32.01	Compliance
20.550	29.03	QP	9.000	N	16.17	60.00	30.97	Compliance
20.550	19.72	AV	9.000	N	16.17	50.00	30.28	Compliance
23.200	28.20	QP	9.000	N	16.21	60.00	31.80	Compliance
23.250	11.52	AV	9.000	N	16.21	50.00	38.48	Compliance

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

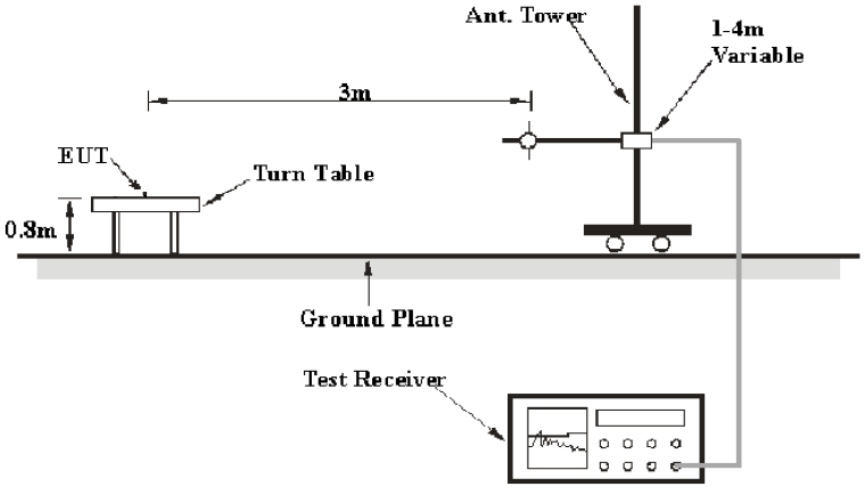
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

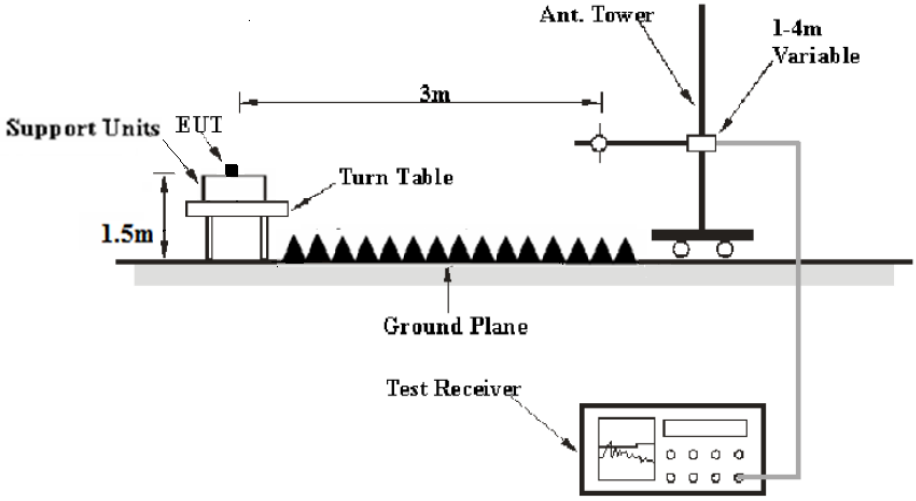
FCC §15.247 (d); §15.209; §15.205;

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 Setup was set with the following configurations:

Frequency Range	RBW	VBW	Detector	Duty Cycle	Measurement method
30 MHz - 1000 MHz	120 kHz	/	QP	/	QP
Above 1GHz	1MHz	3 MHz	PK	/	PK
	1MHz	3 MHz	RMS	≥98%	Ave
	1MHz	1/T	PK	＜98%	Ave

Test Procedure

According to ANSI C63.10-2013 clause 6.5, 6.6 and 6.7.

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:	24.1 ℃~24.5℃
Relative Humidity:	50 %~52 %
ATM Pressure:	101.2kPa~101.5kPa

The testing was performed by Stone Zhang from 2018-10-27 to 2018-11-13.

Test Result: Compliant.

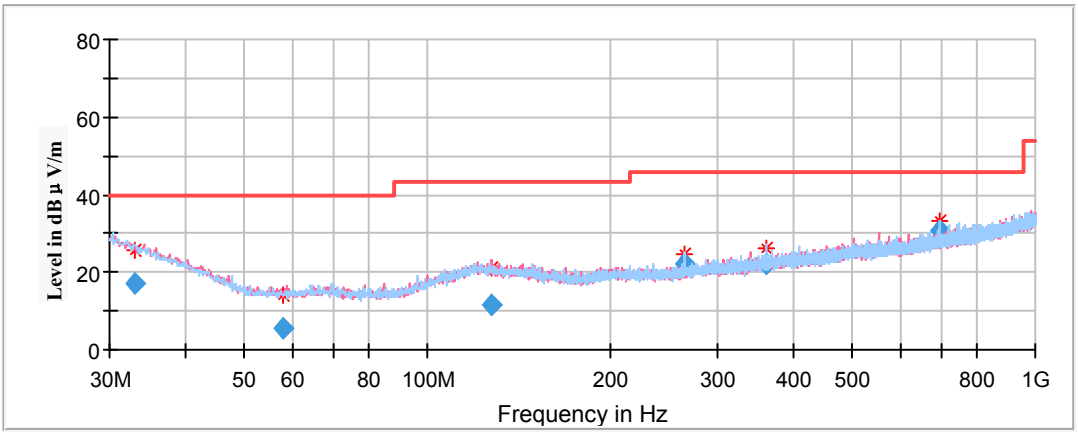
EUT operation mode: Transmitting

For Wi-Fi Mode:

Spurious Emission Test:

30MHz-1GHz:

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 ***high channel of 802.11b mode in X-axis of orientation*** *was recorded*



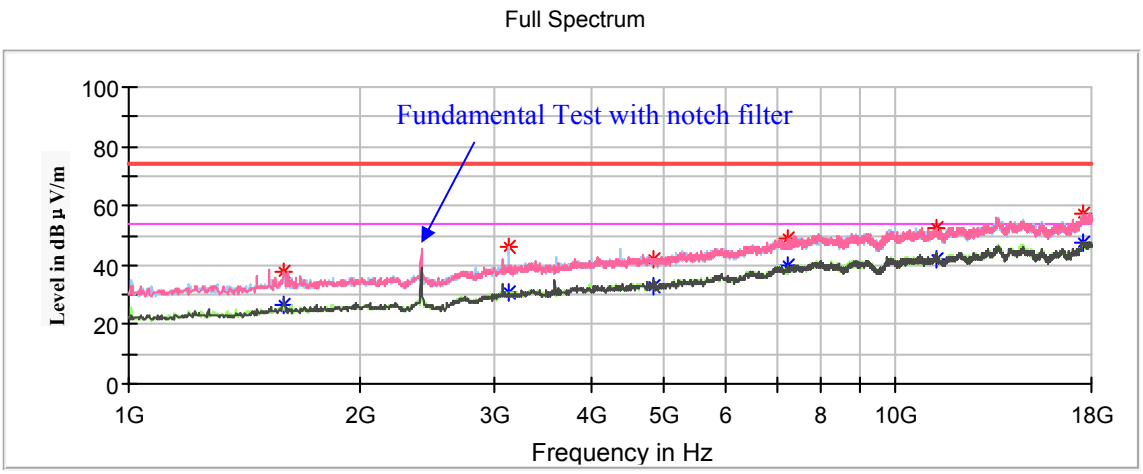
Frequency (MHz)	Corrected Amplitude QuasiPeak (dBµV/m)	Rx Antenna Height (cm)	Rx Antenna Polar (H/V)	Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
33.128950	17.02	199.0	V	234.0	-6.1	40.00	22.98
57.664100	5.60	101.0	V	342.0	-17.8	40.00	34.40
127.712650	11.78	101.0	V	234.0	-11.5	43.50	31.72
263.983700	21.94	101.0	H	25.0	-11.6	46.00	24.06
359.974400	22.05	101.0	H	204.0	-9.1	46.00	23.95
695.997750	30.78	101.0	H	219.0	-3.2	46.00	15.22

1GHz-18GHz:

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

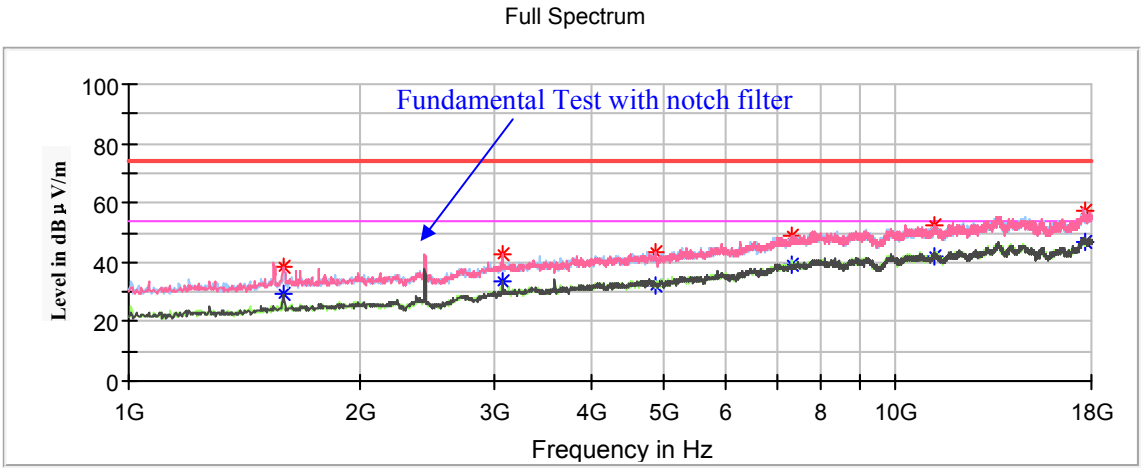
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV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

Low Channel: 2412MHz



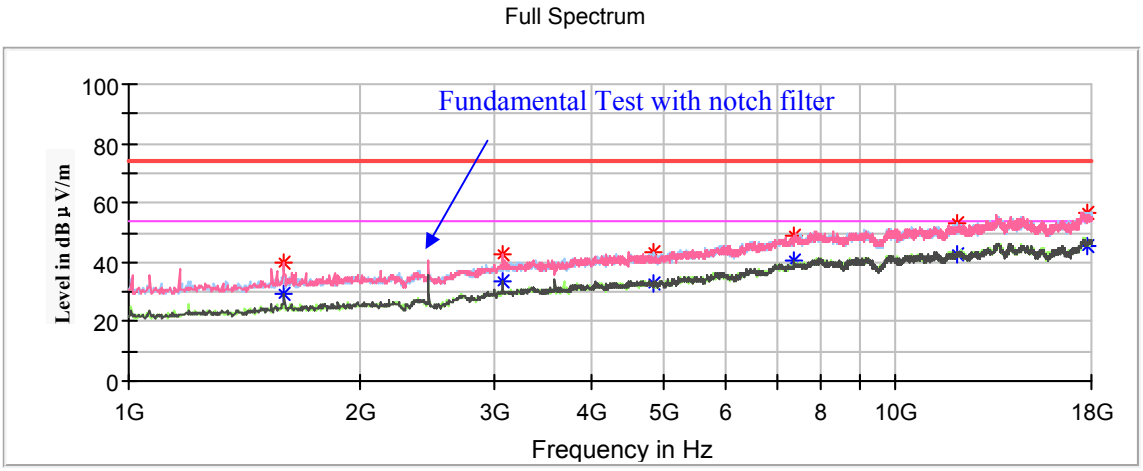
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	26.76	200.0	H	309.0	-7.2	54.00	27.24
1595.000000	38.07	---	200.0	H	309.0	-7.2	74.00	35.93
3135.200000	---	30.73	200.0	H	348.0	-1.4	54.00	23.27
3135.200000	46.06	---	200.0	H	348.0	-1.4	74.00	27.94
4824.000000	---	32.74	150.0	V	181.0	1.9	54.00	21.26
4824.000000	42.21	---	150.0	V	181.0	1.9	74.00	31.79
7236.000000	---	39.87	200.0	V	347.0	9.0	54.00	14.13
7236.000000	49.09	---	200.0	V	347.0	9.0	74.00	24.91
11285.000000	---	42.20	100.0	V	55.0	13.1	54.00	11.80
11285.000000	52.33	---	100.0	V	55.0	13.1	74.00	21.67
17534.200000	---	47.46	150.0	V	322.0	17.2	54.00	6.54
17534.200000	57.36	---	150.0	V	322.0	17.2	74.00	16.64

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)				
1588.200000	38.72	---	200.0	V	290.0	-7.3	74.00	35.28
1588.200000	---	29.42	200.0	V	290.0	-7.3	54.00	24.58
3070.600000	42.51	---	200.0	V	9.0	-1.5	74.00	31.49
3070.600000	---	33.52	200.0	V	9.0	-1.5	54.00	20.48
4874.000000	43.16	---	150.0	V	64.0	1.9	74.00	30.84
4874.000000	---	32.48	150.0	V	64.0	1.9	54.00	21.52
7311.000000	49.17	---	200.0	V	100.0	9.2	74.00	24.83
7311.000000	---	39.44	200.0	V	100.0	9.2	54.00	14.56
11227.200000	---	41.94	100.0	H	302.0	13.2	54.00	12.06
11227.200000	52.39	---	100.0	H	302.0	13.2	74.00	21.61
17636.200000	---	46.72	150.0	H	187.0	17.3	54.00	7.28
17636.200000	57.28	---	150.0	H	187.0	17.3	74.00	16.72

High Channel: 2462MHz

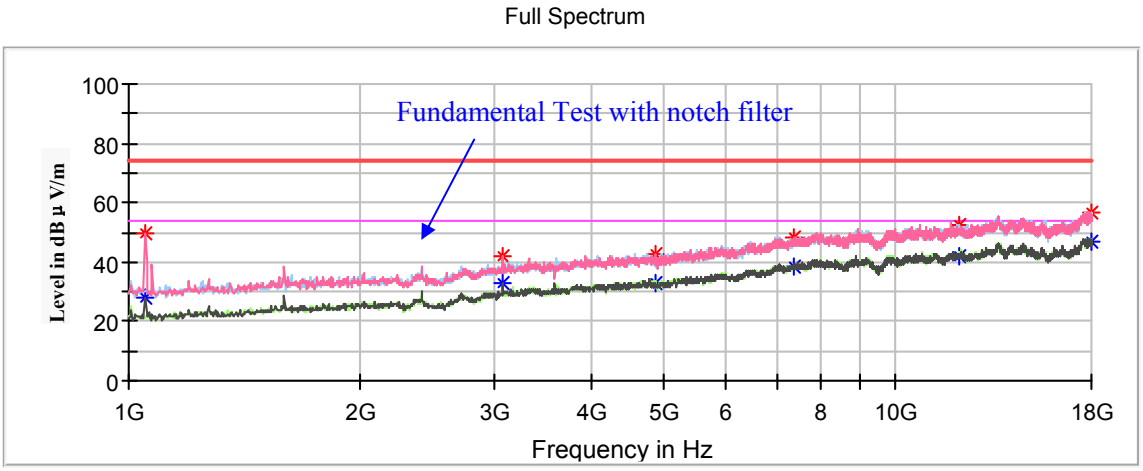


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	29.32	150.0	V	263.0	-7.2	54.00	24.68
1591.600000	39.58	---	150.0	V	263.0	-7.2	74.00	34.42
3070.600000	---	33.44	200.0	V	283.0	-1.5	54.00	20.56
3070.600000	42.32	---	200.0	V	283.0	-1.5	74.00	31.68
4924.000000	---	32.90	200.0	V	321.0	1.9	54.00	21.10
4924.000000	43.05	---	200.0	V	321.0	1.9	74.00	30.95
7386.000000	---	40.59	200.0	V	10.0	9.4	54.00	13.41
7386.000000	48.65	---	200.0	V	10.0	9.4	74.00	25.35
12016.000000	---	42.60	150.0	H	70.0	13.3	54.00	11.40
12016.000000	53.48	---	150.0	H	70.0	13.3	74.00	20.52
17768.800000	---	45.53	200.0	H	333.0	17.5	54.00	8.47
17768.800000	56.69	---	200.0	H	333.0	17.5	74.00	17.31

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

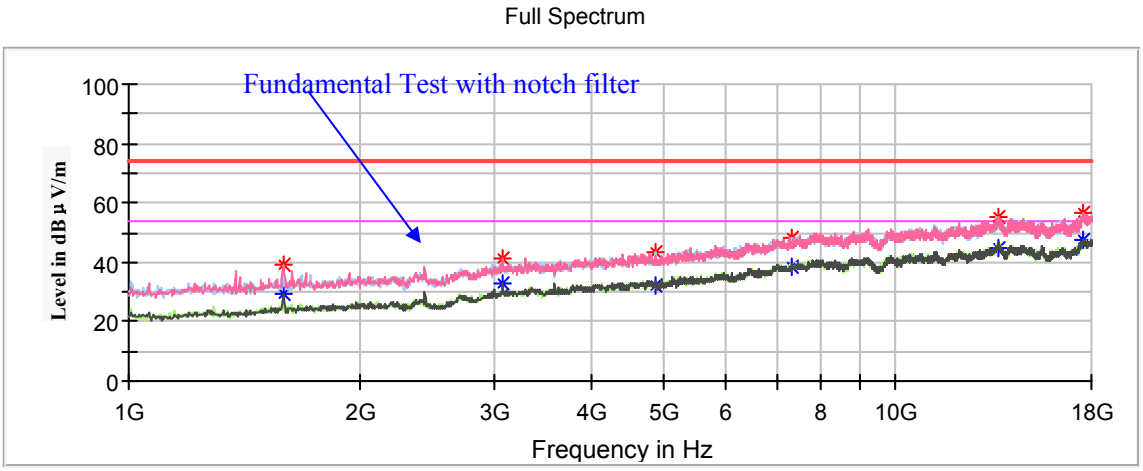
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV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

Low Channel: 2412MHz



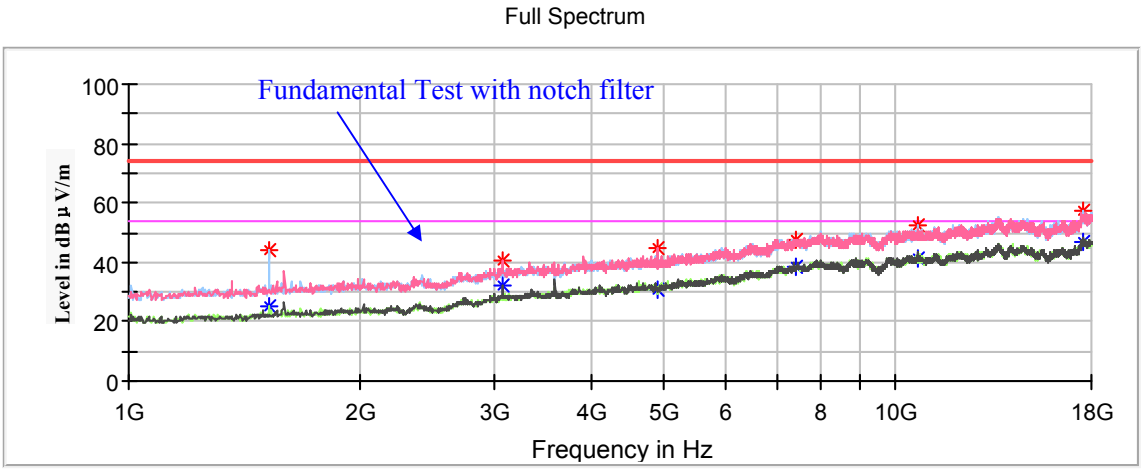
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1051.000000	---	27.65	150.0	V	320.0	-10.2	54.00	26.35
1051.000000	49.53	---	150.0	V	320.0	-10.2	74.00	24.47
3070.600000	---	32.70	150.0	V	358.0	-1.5	54.00	21.30
3070.600000	41.90	---	150.0	V	358.0	-1.5	74.00	32.10
4824.000000	---	32.75	200.0	V	52.0	1.9	54.00	21.25
4824.000000	42.42	---	200.0	V	52.0	1.9	74.00	31.58
7236.000000	---	38.27	150.0	V	330.0	9.4	54.00	15.73
7236.000000	48.49	---	150.0	V	330.0	9.4	74.00	25.51
12077.200000	---	42.15	150.0	H	106.0	13.3	54.00	11.85
12077.200000	52.70	---	150.0	H	106.0	13.3	74.00	21.30
17952.400000	---	46.53	150.0	H	222.0	17.7	54.00	7.47
17952.400000	56.53	---	150.0	H	222.0	17.7	74.00	17.47

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)				
1588.200000	---	29.38	150.0	V	276.0	-7.3	54.00	24.62
1588.200000	39.16	---	150.0	V	276.0	-7.3	74.00	34.84
3070.600000	---	32.82	150.0	V	100.0	-1.5	54.00	21.18
3070.600000	41.08	---	150.0	V	100.0	-1.5	74.00	32.92
4874.000000	---	31.85	150.0	V	357.0	1.9	54.00	22.15
4874.000000	43.55	---	150.0	V	357.0	1.9	74.00	30.45
7311.000000	---	38.25	150.0	V	95.0	9.2	54.00	15.75
7311.000000	48.56	---	150.0	V	95.0	9.2	74.00	25.44
13593.600000	---	45.01	200.0	V	211.0	14.7	54.00	8.99
13593.600000	55.58	---	200.0	V	211.0	14.7	74.00	18.42
17537.600000	---	47.61	150.0	H	351.0	17.2	54.00	6.39
17537.600000	56.48	---	150.0	H	351.0	17.2	74.00	17.52

High Channel: 2462MHz

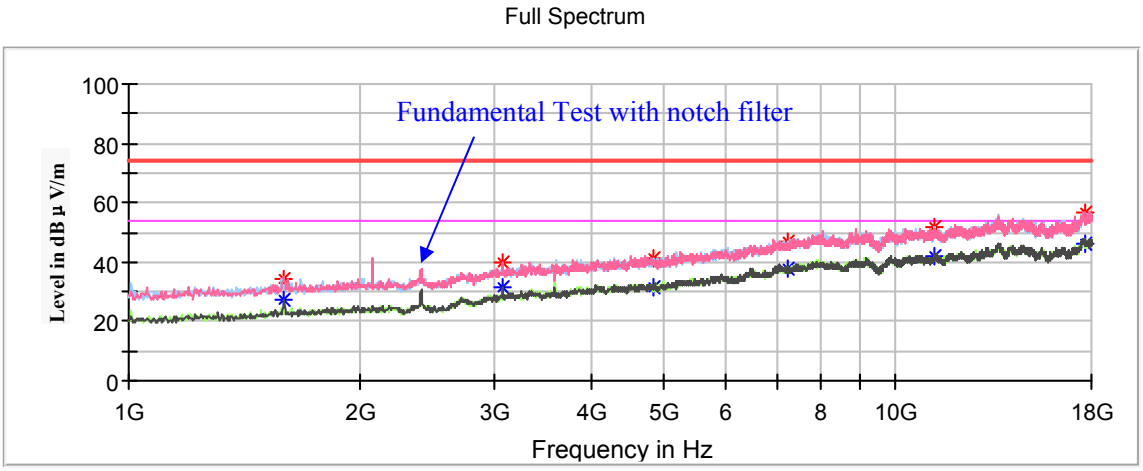


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1523.600000	---	24.89	150.0	H	180.0	-7.5	54.00	29.11
1523.600000	43.81	---	150.0	H	180.0	-7.5	74.00	30.19
3070.600000	---	31.91	150.0	V	3.0	-1.5	54.00	22.09
3070.600000	40.50	---	150.0	V	3.0	-1.5	74.00	33.50
4924.000000	---	30.88	200.0	V	283.0	1.9	54.00	23.12
4924.000000	44.91	---	200.0	V	283.0	1.9	74.00	29.09
7386.000000	---	38.19	150.0	V	10.0	9.6	54.00	15.81
7386.000000	47.88	---	150.0	V	10.0	9.6	74.00	26.12
10662.800000	---	41.18	150.0	H	344.0	13.0	54.00	12.82
10662.800000	52.17	---	150.0	H	344.0	13.0	74.00	21.83
17554.600000	---	46.78	150.0	H	97.0	17.2	54.00	7.22
17554.600000	57.24	---	150.0	H	97.0	17.2	74.00	16.76

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

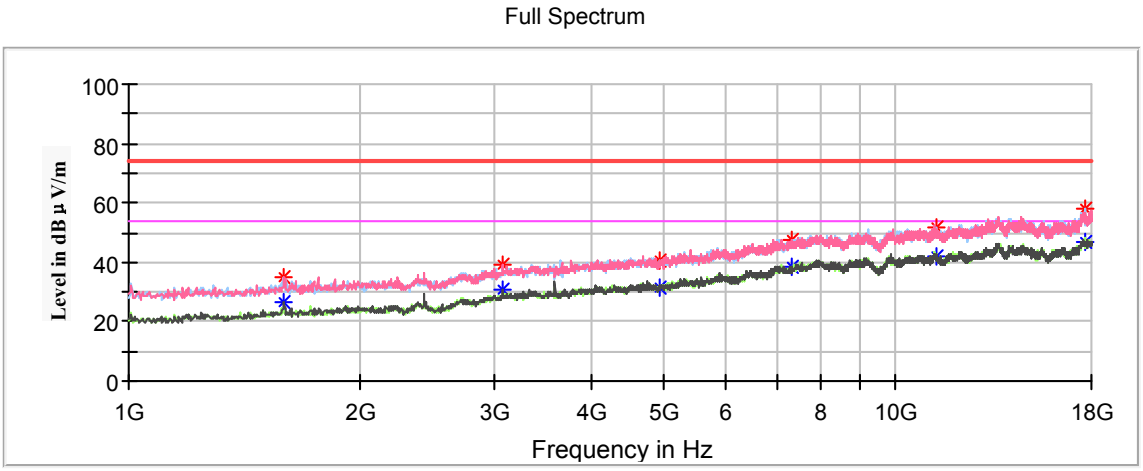
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV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

Low Channel: 2412MHz



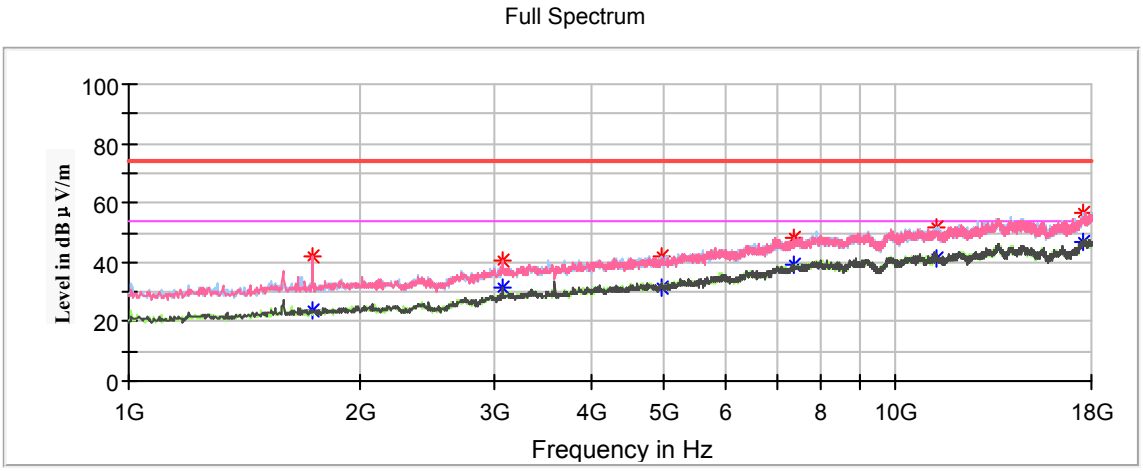
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	27.31	150.0	V	290.0	-7.2	54.00	26.69
1595.000000	34.46	---	150.0	V	290.0	-7.2	74.00	39.54
3070.600000	---	31.55	150.0	V	90.0	-1.5	54.00	22.45
3070.600000	39.80	---	150.0	V	90.0	-1.5	74.00	34.20
4824.000000	---	31.62	200.0	V	225.0	1.9	54.00	22.38
4824.000000	41.11	---	200.0	V	225.0	1.9	74.00	32.89
7236.000000	---	37.78	150.0	V	355.0	9.0	54.00	16.22
7236.000000	46.55	---	150.0	V	355.0	9.0	74.00	27.45
11234.000000	---	41.77	150.0	H	263.0	13.2	54.00	12.23
11234.000000	52.03	---	150.0	H	263.0	13.2	74.00	21.97
17632.800000	---	46.26	150.0	V	109.0	17.3	54.00	7.74
17632.800000	56.80	---	150.0	V	109.0	17.3	74.00	17.20

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	---	26.75	150.0	V	289.0	-7.2	54.00	27.25
1591.600000	34.71	---	150.0	V	289.0	-7.2	74.00	39.29
3070.600000	---	30.68	150.0	V	100.0	-1.5	54.00	23.32
3070.600000	38.90	---	150.0	V	100.0	-1.5	74.00	35.10
4874.000000	---	31.62	200.0	V	172.0	2.0	54.00	22.38
4874.000000	40.84	---	200.0	V	172.0	2.0	74.00	33.16
7311.000000	---	38.55	150.0	V	334.0	9.2	54.00	15.45
7311.000000	47.29	---	150.0	V	334.0	9.2	74.00	26.71
11271.400000	---	42.23	150.0	H	217.0	13.1	54.00	11.77
11271.400000	52.09	---	150.0	H	217.0	13.1	74.00	21.91
17636.200000	---	46.87	150.0	H	2.0	17.3	54.00	7.13
17636.200000	57.98	---	150.0	H	2.0	17.3	74.00	16.02

High Channel: 2462MHz

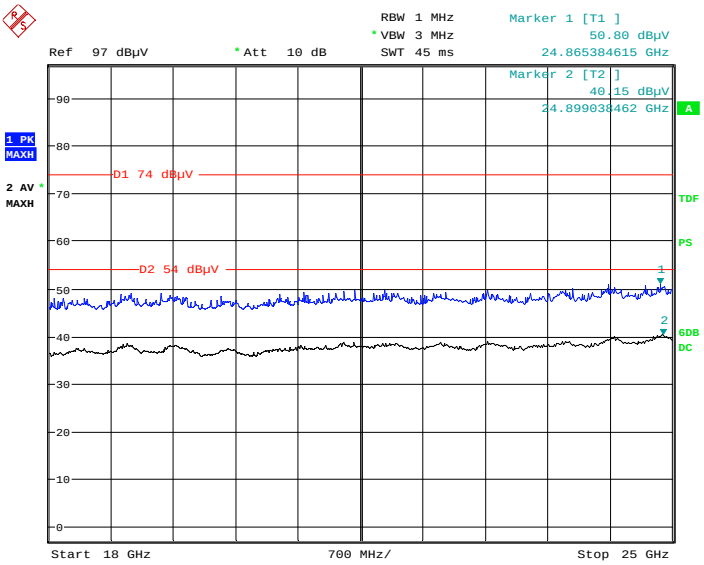


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1737.800000	---	23.43	150.0	V	325.0	-6.7	54.00	30.57
1737.800000	41.64	---	150.0	V	325.0	-6.7	74.00	32.36
3070.600000	---	31.31	150.0	V	289.0	-1.5	54.00	22.69
3070.600000	40.29	---	150.0	V	289.0	-1.5	74.00	33.71
4924.000000	---	31.77	150.0	V	10.0	2.0	54.00	22.23
4924.000000	42.14	---	150.0	V	10.0	2.0	74.00	31.86
7386.000000	---	39.40	150.0	V	21.0	9.4	54.00	14.60
7386.000000	48.23	---	150.0	V	21.0	9.4	74.00	25.77
11295.200000	---	41.46	200.0	H	330.0	13.1	54.00	12.54
11295.200000	51.94	---	200.0	H	330.0	13.1	74.00	22.06
17547.800000	---	47.17	150.0	H	348.0	17.2	54.00	6.83
17547.800000	56.48	---	150.0	H	348.0	17.2	74.00	17.52

18GHz-25GHz:

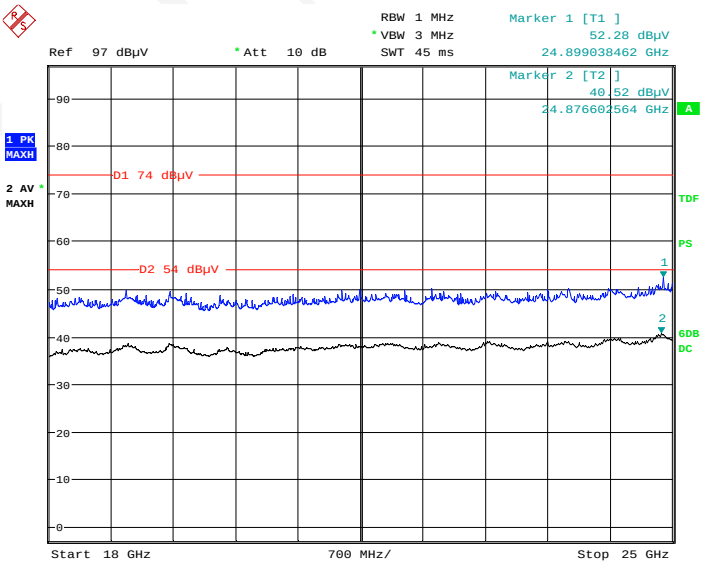
Scan with 802.11b, 802.11g and 802.11n-HT20 modes of operation in the X,Y and Z axes of orientation, the worst case ***low channel of 802.11b mode in X-axis of orientation*** *was recorded*

Horizontal



Date: 13.NOV.2018 23:24:47

Vertical



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Fundamental Test & Restricted Bands Emissions Test:

Note:
1. 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)

802.11b Mode: *(Scan in the X,Y and Z axes of orientation, the worst case X-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								
2412.000000	107.77	---	200.0	V	74.0	6.1	/	/
2412.000000	---	105.80	200.0	V	74.0	6.1	/	/
2412.000000	105.58	---	150.0	H	116.0	6.1	/	/
2412.000000	---	103.45	150.0	H	116.0	6.1	/	/
2390.000000	---	40.14	150.0	V	41.0	6.0	54.00	13.86
2390.000000	48.13	---	150.0	V	41.0	6.0	74.00	25.87
Middle Channel: 2437MHz								
2437.000000	107.65	---	150.0	V	85.0	6.2	/	/
2437.000000	---	105.65	150.0	V	85.0	6.2	/	/
2437.000000	105.34	---	200.0	H	205.0	6.2	/	/
2437.000000	---	103.27	200.0	H	205.0	6.2	/	/
High Channel: 2462MHz								
2462.000000	108.51	---	200.0	V	2.0	6.2	/	/
2462.000000	---	106.50	200.0	V	2.0	6.2	/	/
2462.000000	106.13	---	200.0	H	334.0	6.2	/	/
2462.000000	---	104.39	200.0	H	334.0	6.2	/	/
2483.500000	---	40.91	150.0	V	19.0	6.3	54.00	13.09
2483.500000	52.86	---	150.0	V	19.0	6.3	74.00	21.14

802.11g Mode: *(Scan in the X,Y and Z axes of orientation, the worst case X-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								
2412.000000	100.67	---	100.0	V	127.0	6.1	/	/
2412.000000	---	93.65	100.0	V	127.0	6.1	/	/
2412.000000	98.25	---	100.0	H	31.0	6.1	/	/
2412.000000	---	91.62	100.0	H	31.0	6.1	/	/
2390.000000	47.92	---	150.0	V	147.0	6.0	74.00	26.08
2390.000000	---	39.65	150.0	V	147.0	6.0	54.00	14.35
Middle Channel: 2437MHz								
2437.000000	100.87	---	150.0	V	264.0	6.2	/	/
2437.000000	---	93.81	150.0	V	264.0	6.2	/	/
2437.000000	98.49	---	150.0	H	140.0	6.2	/	/
2437.000000	---	91.77	150.0	H	140.0	6.2	/	/
High Channel: 2462MHz								
2462.000000	100.96	---	250.0	V	45.0	6.2	/	/
2462.000000	---	93.92	250.0	V	45.0	6.2	/	/
2462.000000	98.60	---	250.0	H	64.0	6.2	/	/
2462.000000	---	91.56	250.0	H	64.0	6.2	/	/
2483.500000	---	40.28	200.0	V	234.0	6.3	54.00	13.72
2483.500000	54.54	---	200.0	V	234.0	6.3	74.00	19.46

FINAL

802.11n-HT20 Mode: *(Scan in the X,Y and Z axes of orientation, the worst case X-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								
2412.000000	100.83	---	200.0	V	262.0	6.1	/	/
2412.000000	---	93.86	200.0	V	262.0	6.1	/	/
2412.000000	98.40	---	150.0	H	75.0	6.1	/	/
2412.000000	---	91.63	150.0	H	75.0	6.1	/	/
2390.000000	---	40.67	200.0	V	355.0	6.0	54.00	13.33
2390.000000	49.28	---	200.0	V	355.0	6.0	74.00	24.72
Middle Channel: 2437MHz								
2437.000000	100.91	---	150.0	V	191.0	6.2	/	/
2437.000000	---	94.11	150.0	V	191.0	6.2	/	/
2437.000000	98.68	---	150.0	H	131.0	6.2	/	/
2437.000000	---	91.62	150.0	H	131.0	6.2	/	/
High Channel: 2462MHz								
2462.000000	100.65	---	200.0	V	43.0	6.2	/	/
2462.000000	---	93.38	200.0	V	43.0	6.2	/	/
2462.000000	98.53	---	200.0	H	302.0	6.2	/	/
2462.000000	---	91.36	200.0	H	302.0	6.2	/	/
2483.500000	---	40.40	150.0	V	27.0	6.3	54.00	13.60
2483.500000	49.81	---	150.0	V	27.0	6.4	74.00	24.19

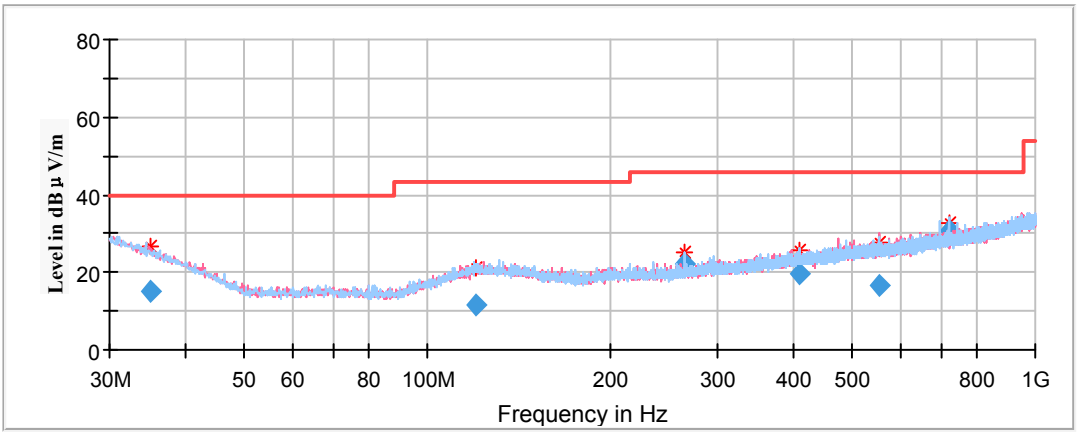
FINAL

For BLE Mode:

Spurious Emission Test:

30MHz-1GHz

(Scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case ***high channel of operation in the X axis of orientation*** *was recorded)*



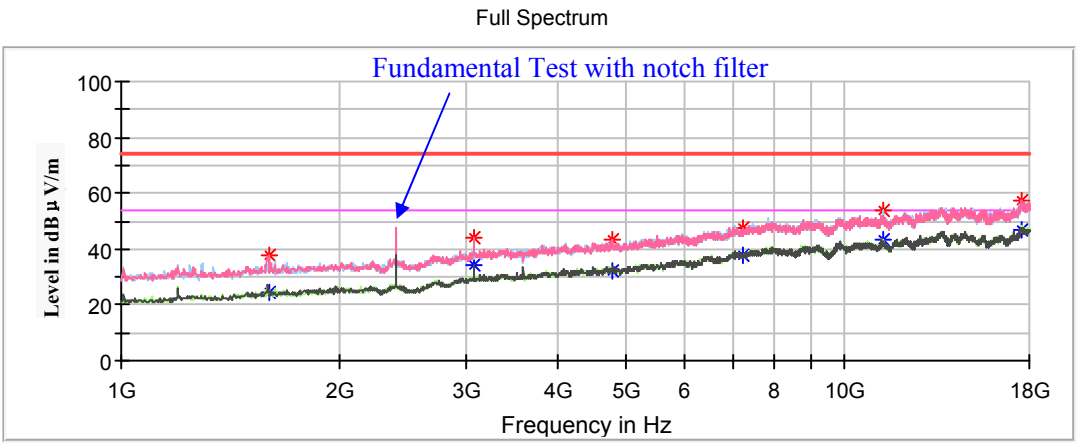
Frequency (MHz)	Corrected Amplitude QuasiPeak (dBµV/m)	Rx Antenna Height (cm)	Rx Antenna Polar (H/V)	Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
35.112350	15.09	101.0	H	215.0	-7.4	40.00	24.91
120.615050	11.46	101.0	V	14.0	-11.2	43.50	32.04
263.993600	21.89	101.0	H	40.0	-11.6	46.00	24.11
408.035900	19.49	101.0	V	152.0	-8.0	46.00	26.51
552.352650	16.59	101.0	V	320.0	-5.6	46.00	29.41
720.002850	30.62	101.0	H	220.0	-2.9	46.00	15.38

1GHz-18GHz

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

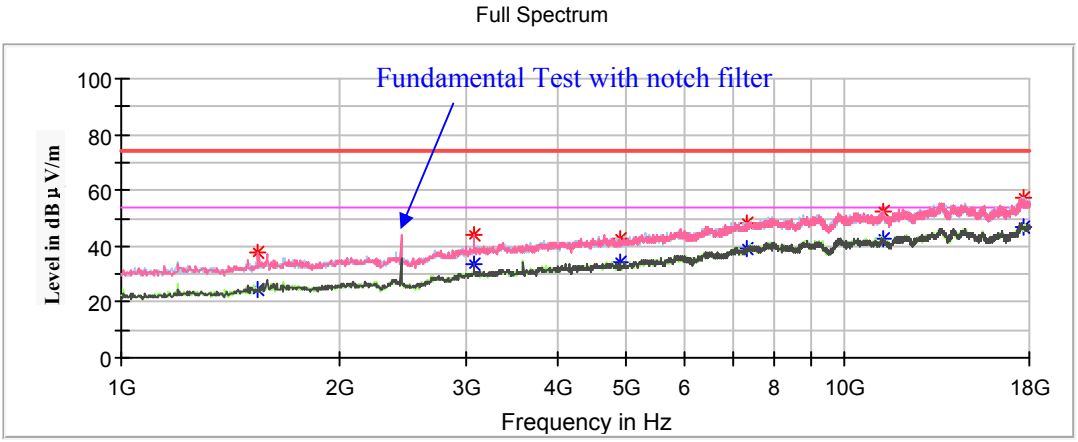
Note:
1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
   Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)
   Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV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

Low Channel: 2402MHz



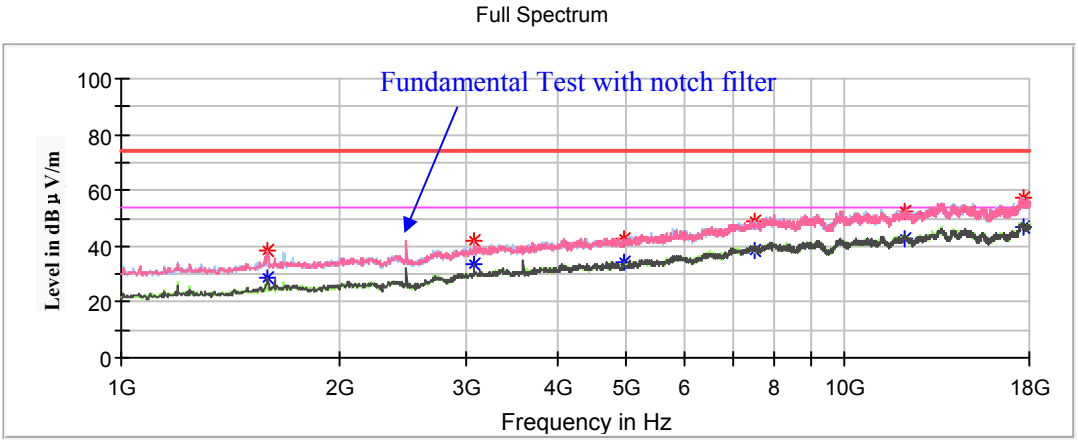
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1598.400000	---	24.18	200.0	V	148.0	-7.2	54.00	29.82
1598.400000	37.55	---	200.0	V	148.0	-7.2	74.00	36.45
3070.600000	---	34.46	200.0	V	83.0	-1.5	54.00	19.54
3070.600000	44.30	---	200.0	V	83.0	-1.5	74.00	29.70
4804.000000	---	32.04	200.0	V	169.0	1.8	54.00	21.96
4804.000000	43.13	---	150.0	V	169.0	1.8	74.00	30.87
7206.000000	---	38.09	150.0	V	63.0	9.0	54.00	15.91
7206.000000	47.39	---	100.0	V	63.0	9.0	74.00	26.61
11291.800000	---	43.36	100.0	H	89.0	13.1	54.00	10.64
11291.800000	53.57	---	100.0	H	89.0	13.1	74.00	20.43
17513.800000	---	46.56	150.0	V	303.0	17.2	54.00	7.44
17513.800000	57.30	---	150.0	V	303.0	17.2	74.00	16.70

Middle Channel: 2440MHz



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)				
1547.400000	37.91	---	200.0	V	99.0	-7.4	74.00	36.09
1547.400000	---	24.43	200.0	V	99.0	-7.4	54.00	29.57
3070.600000	43.81	---	150.0	V	218.0	-1.5	74.00	30.19
3070.600000	---	33.63	150.0	V	218.0	-1.5	54.00	20.37
4880.000000	42.33	---	150.0	V	308.0	1.9	74.00	31.67
4880.000000	---	33.92	150.0	V	308.0	1.9	54.00	20.08
7320.000000	48.09	---	100.0	V	35.0	9.3	74.00	25.91
7320.000000	---	39.01	100.0	V	35.0	9.3	54.00	14.99
11285.000000	---	42.74	150.0	H	190.0	13.1	54.00	11.26
11285.000000	52.66	---	150.0	H	190.0	13.1	74.00	21.34
17632.800000	---	47.08	200.0	H	158.0	17.3	54.00	6.92
17632.800000	57.37	---	200.0	H	158.0	17.3	74.00	16.63

High Channel: 2480MHz

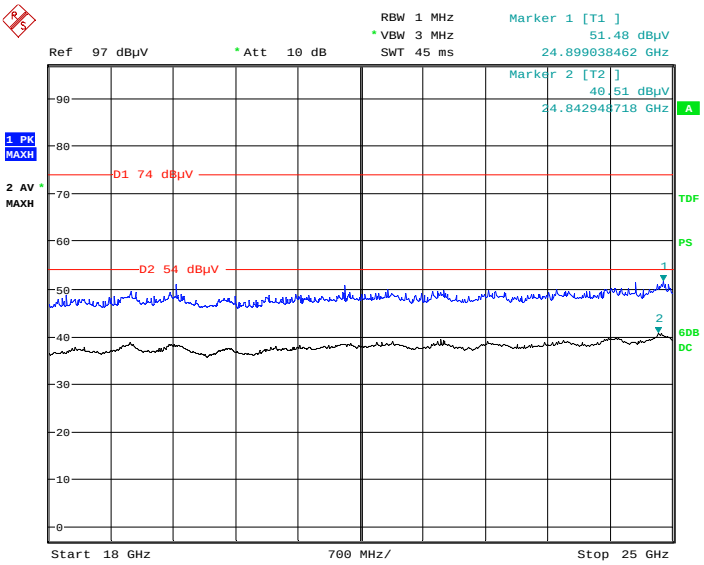


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1591.600000	---	28.41	150.0	V	169.0	-7.2	54.00	25.59
1591.600000	38.81	---	150.0	V	169.0	-7.2	74.00	35.19
3070.600000	---	33.54	200.0	V	79.0	-1.5	54.00	20.46
3070.600000	42.27	---	200.0	V	79.0	-1.5	74.00	31.73
4960.000000	---	34.21	100.0	V	329.0	2.0	54.00	19.79
4960.000000	42.51	---	100.0	V	329.0	2.0	74.00	31.49
7440.000000	---	38.75	200.0	V	186.0	9.8	54.00	15.25
7440.000000	49.29	---	200.0	V	186.0	9.8	74.00	24.71
12090.800000	---	42.65	100.0	H	84.0	13.3	54.00	11.35
12090.800000	52.68	---	100.0	H	84.0	13.3	74.00	21.32
17615.800000	---	47.18	200.0	H	175.0	17.3	54.00	6.82
17615.800000	57.61	---	200.0	H	175.0	17.3	74.00	16.39

18GHz-25GHz

*(Scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **high channel of operation in the X axis of orientation** was recorded)*

Horizontal



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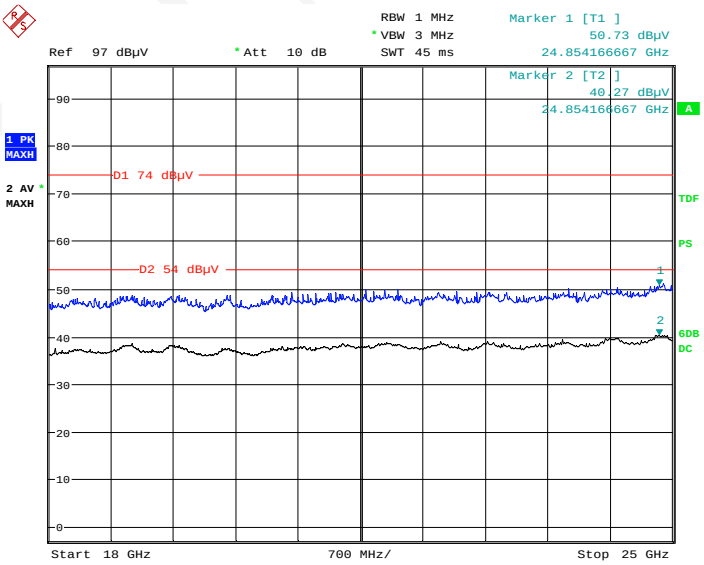
Vertical



Date: 13.NOV.2018 23:47:13

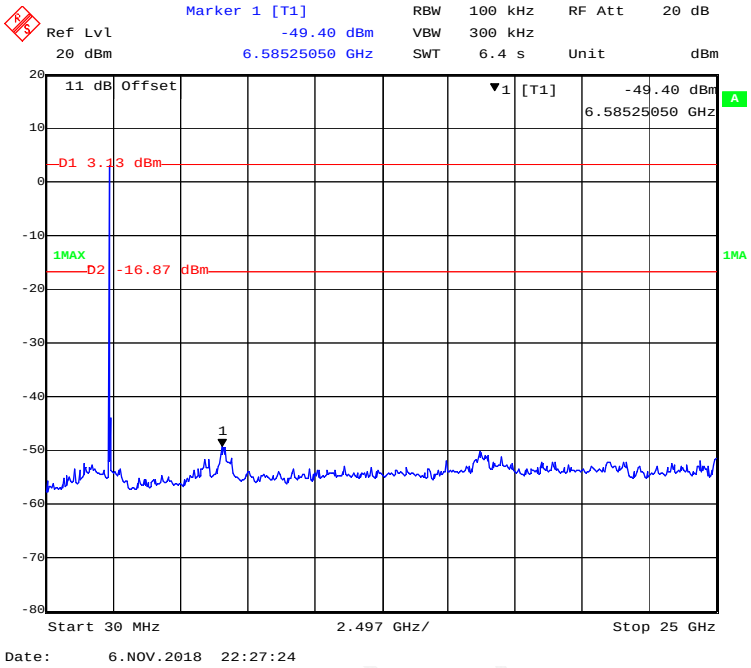
Fundamental Test & Restricted Bands Emissions Test:
*(Scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)*

Note:
1. 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)

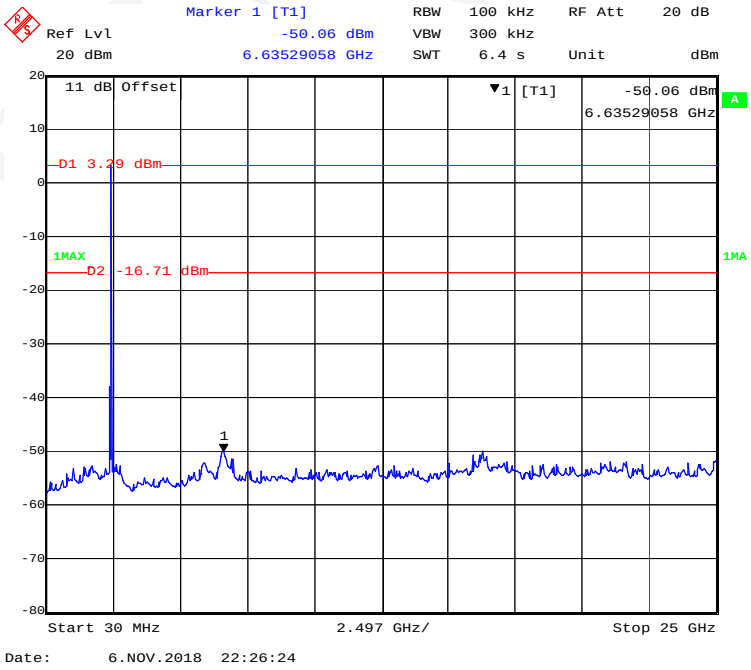
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2402.000000	104.38	---	200.0	V	128.0	6.0	/	/
2402.000000	---	103.23	200.0	V	128.0	6.0	/	/
2402.000000	101.99	---	100.0	H	202.0	6.0	/	/
2402.000000	---	100.88	100.0	H	202.0	6.0	/	/
2390.000000	49.18	---	250.0	V	10.0	6.0	74.00	24.82
2390.000000	---	39.77	250.0	V	10.0	6.0	54.00	14.23
Middle Channel: 2440MHz								
2440.000000	104.48	---	100.0	V	131.0	6.2	/	/
2440.000000	---	103.25	100.0	V	131.0	6.2	/	/
2440.000000	102.46	---	200.0	H	108.0	6.2	/	/
2440.000000	---	100.99	200.0	H	108.0	6.2	/	/
High Channel: 2480MHz								
2480.000000	104.71	---	100.0	V	12.0	6.3	/	/
2480.000000	---	103.74	100.0	V	12.0	6.3	/	/
2480.000000	102.33	---	250.0	H	183.0	6.3	/	/
2480.000000	---	101.27	250.0	H	183.0	6.3	/	/
2483.500000	---	39.78	200.0	V	343.0	6.3	54.00	14.22
2483.500000	48.82	---	200.0	V	343.0	6.3	74.00	25.18

Conducted Spurious Emissions at Antenna Port

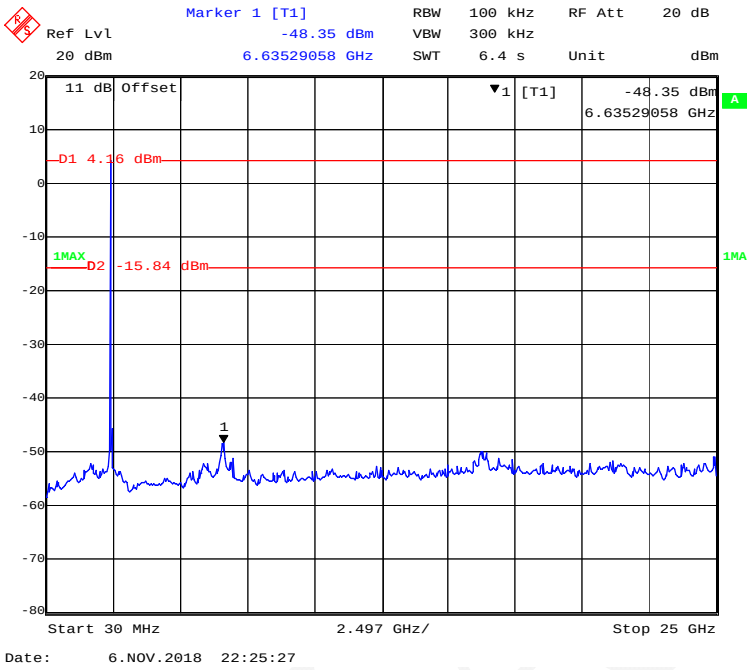
802.11b Mode Low Channel



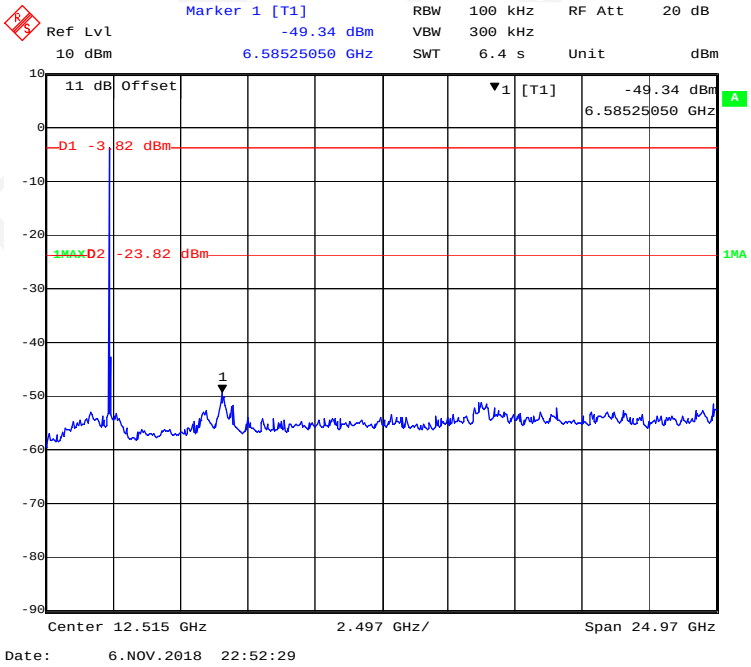
802.11b Mode Middle Channel



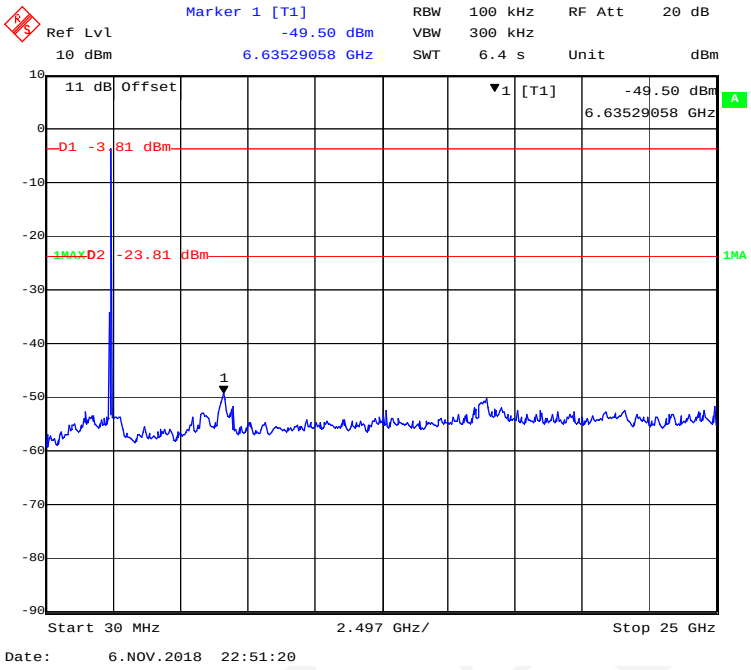
802.11b Mode High Channel



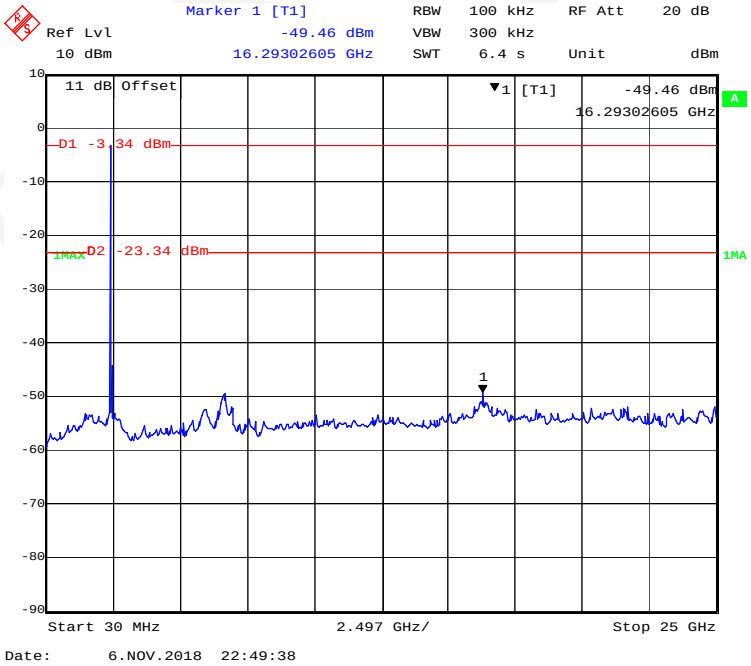
802.11g Mode Low Channel



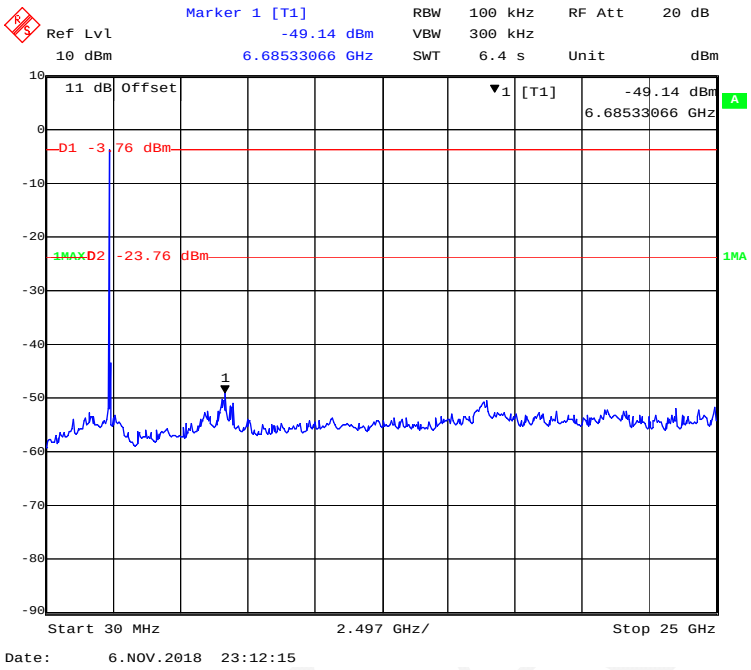
802.11g Mode Middle Channel



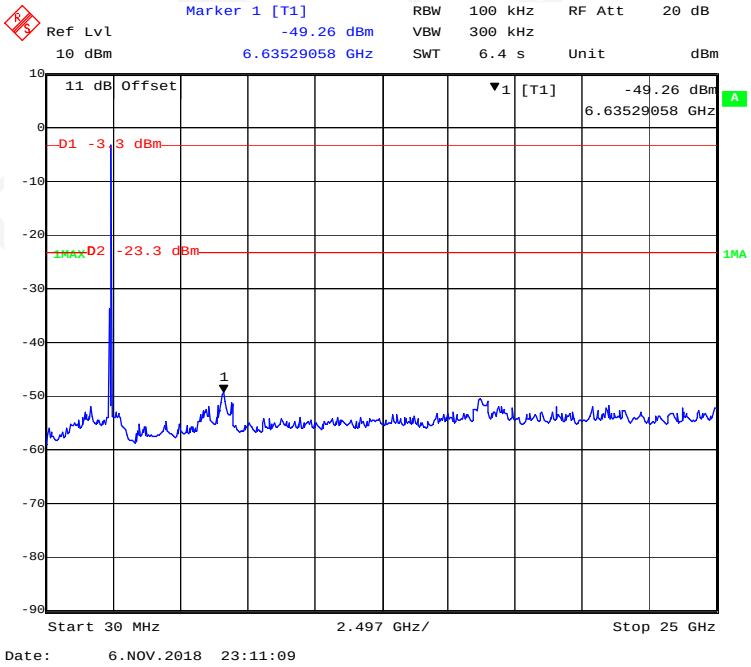
802.11g Mode High Channel



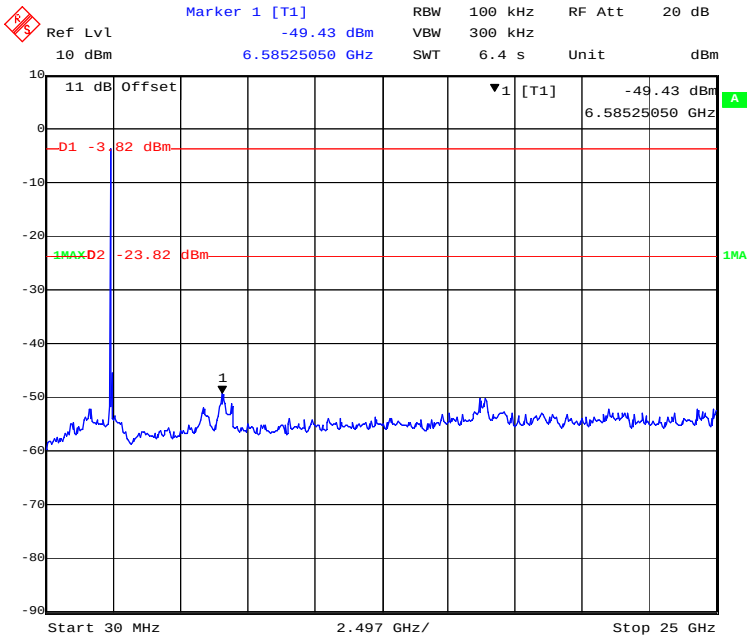
802.11n-HT20 Mode Low Channel



802.11n-HT20 Mode Middle Channel

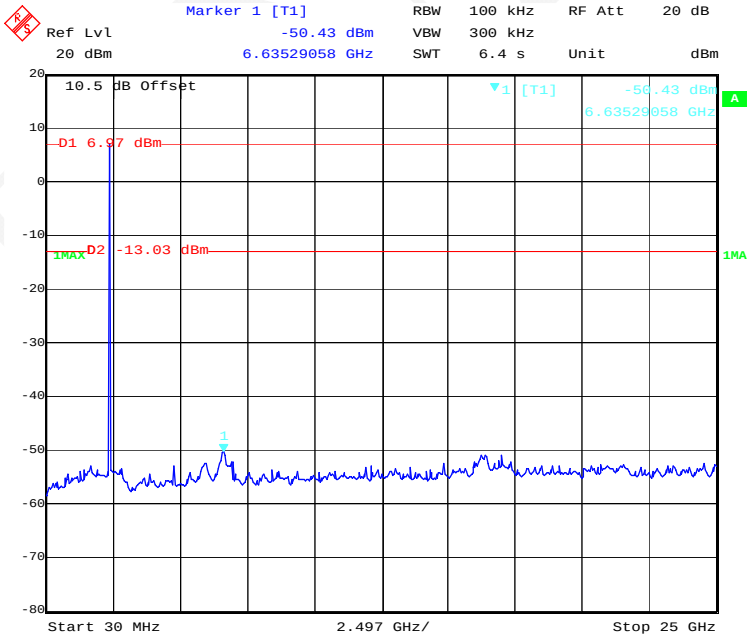


802.11n-HT20 Mode High Channel



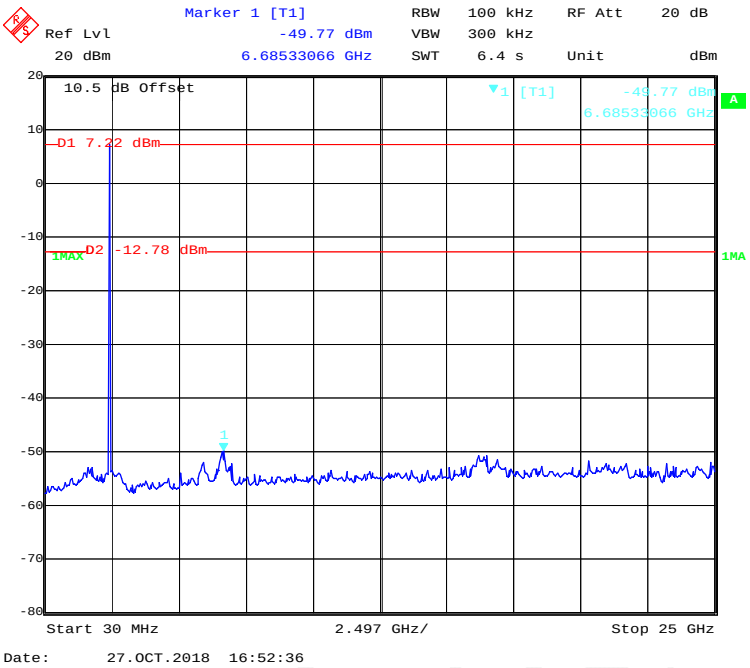
Date: 6.NOV.2018 23:09:43

BLE Mode Low Channel

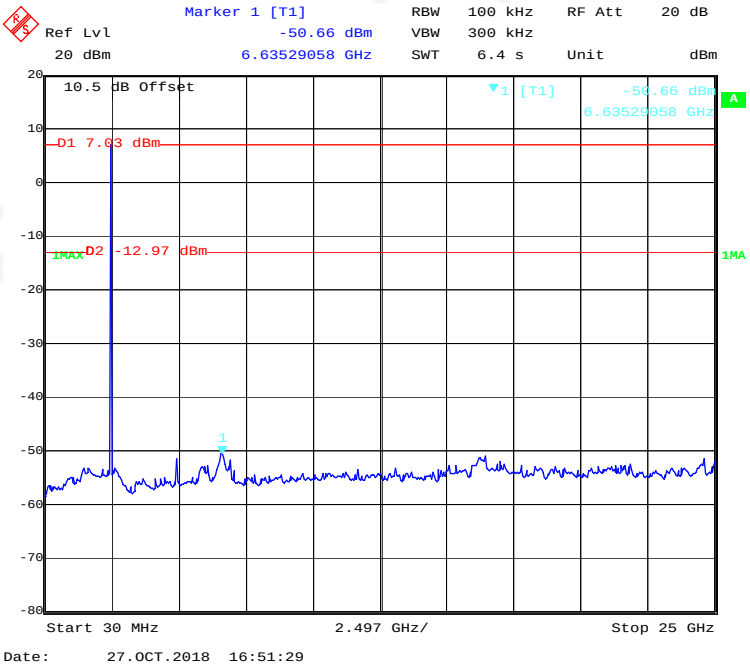


Date: 27.OCT.2018 16:54:12

BLE Mode Middle Channel



BLE Mode High Channel



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

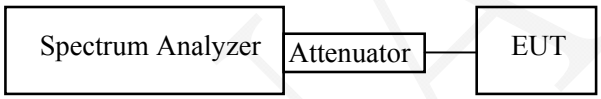
Applicable Standard

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:	24.1-24.3 ℃
Relative Humidity:	48-50%
ATM Pressure:	101.1-101.3 kPa

The testing was performed by Stone Zhang from 2018-10-27to 2018-11-06.

Test Result: Compliant.

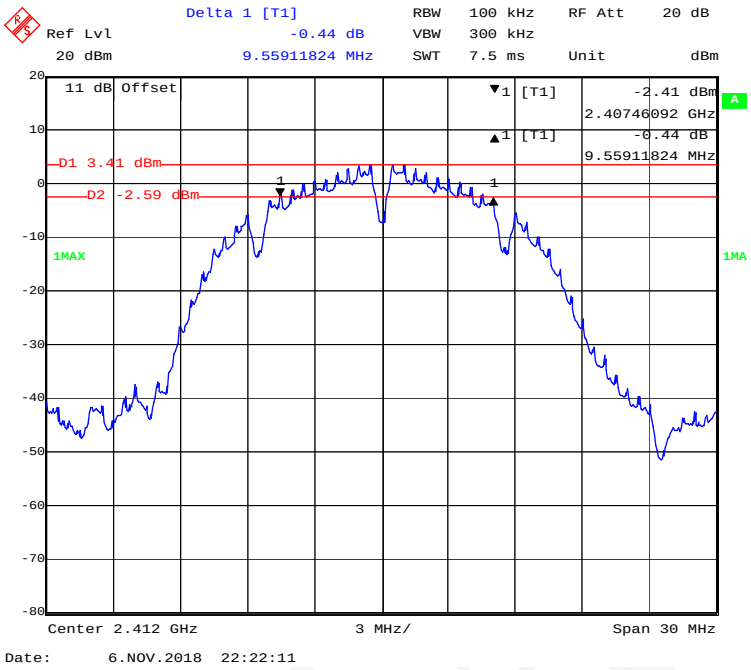
FINAL

EUT operation mode: Transmitting

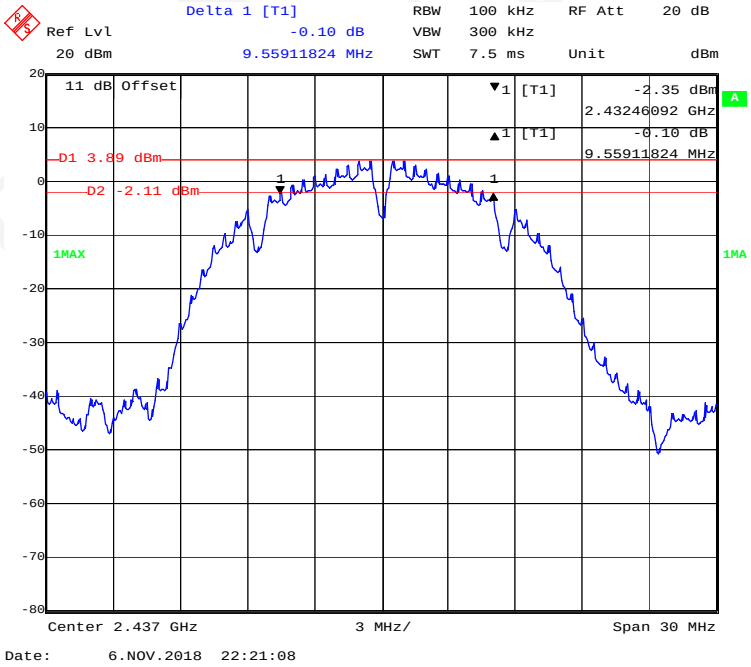
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b Mode			
Low	2412	9.559	≥0.5
Middle	2437	9.559	≥0.5
High	2462	9.078	≥0.5
802.11g Mode			
Low	2412	15.210	≥0.5
Middle	2437	15.210	≥0.5
High	2462	15.210	≥0.5
802.11n-HT20 Mode			
Low	2412	15.271	≥0.5
Middle	2437	15.271	≥0.5
High	2462	15.271	≥0.5
BLE Mode			
Low	2402	0.739	≥0.5
Middle	2440	0.739	≥0.5
High	2480	0.752	≥0.5

FINAL

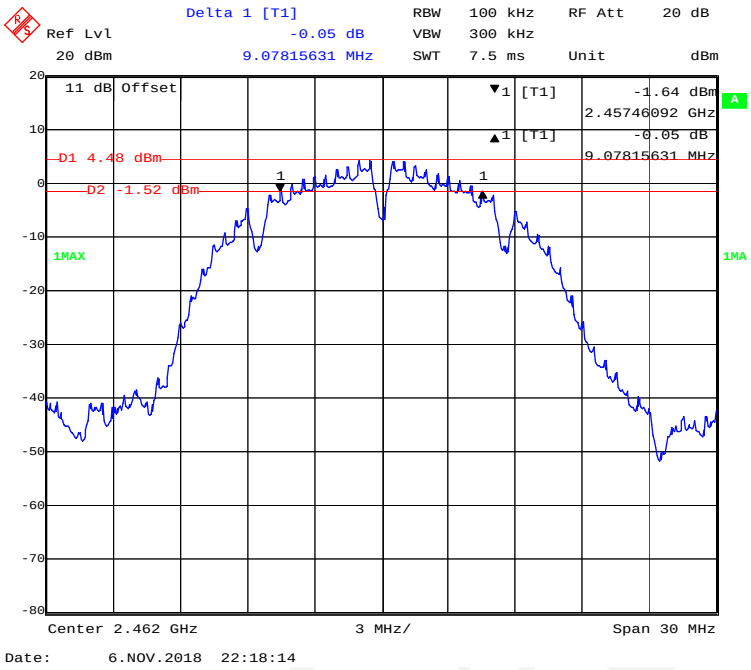
802.11b Mode Low Channel



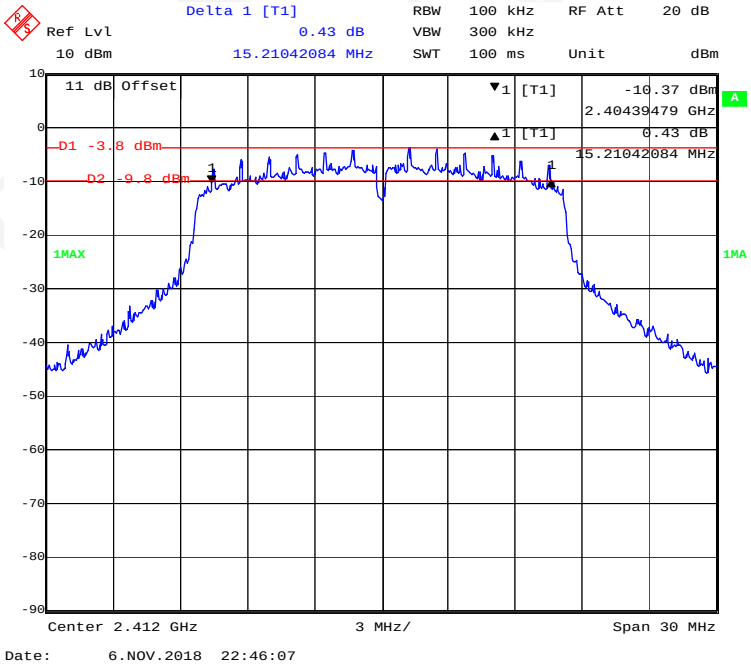
802.11b Mode Middle Channel



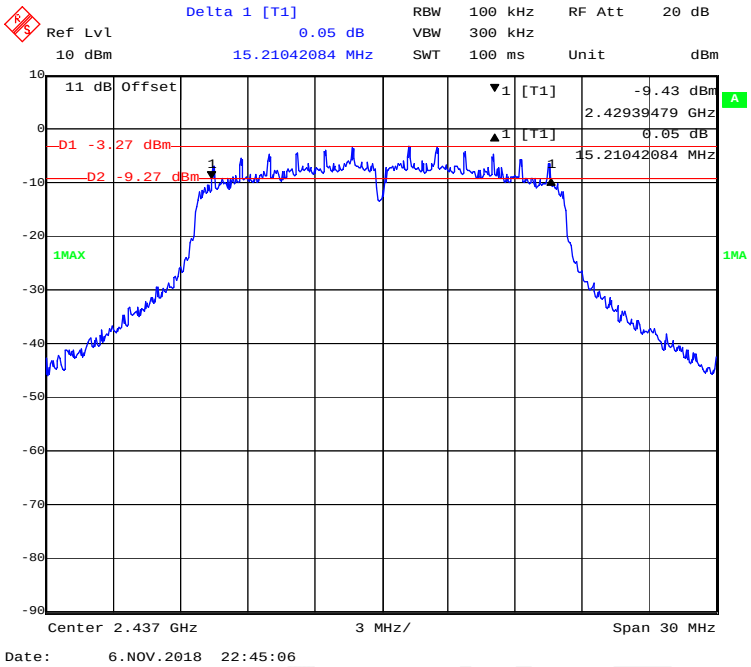
802.11b Mode High Channel



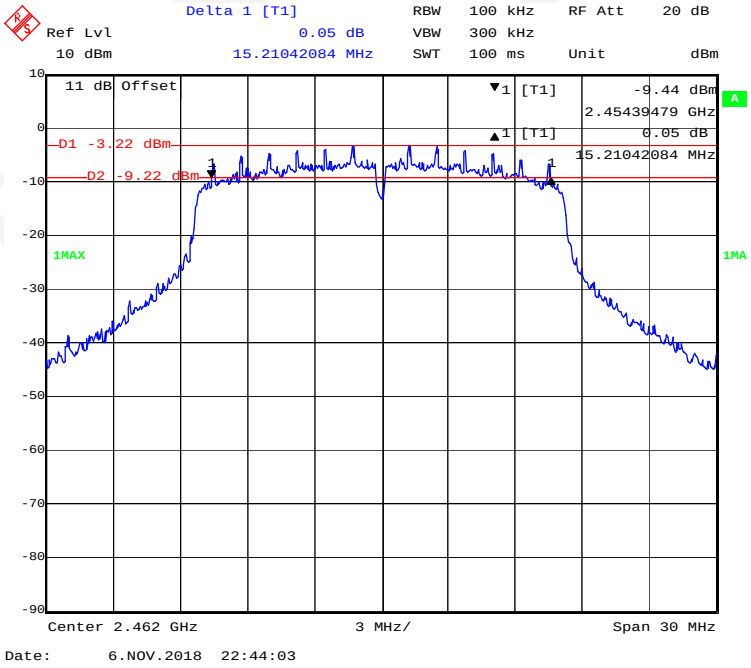
802.11g Mode Low Channel



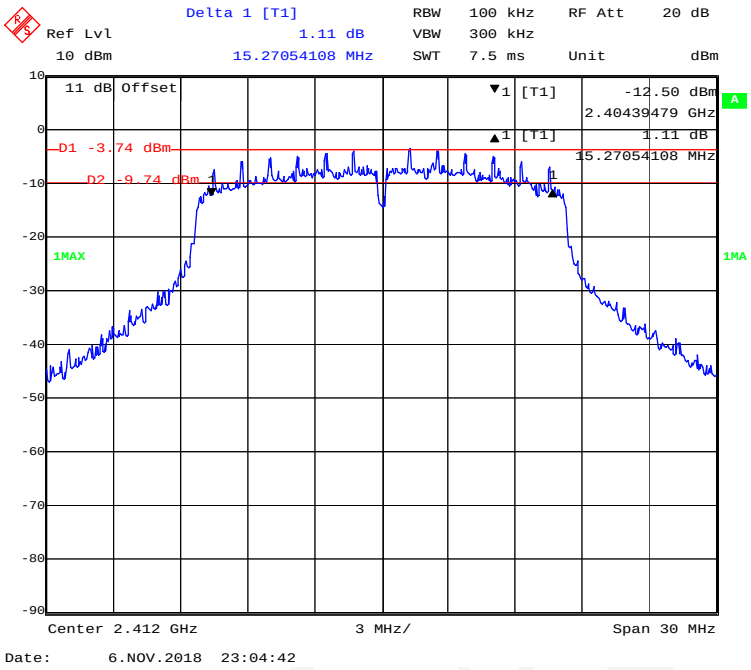
802.11g Mode Middle Channel



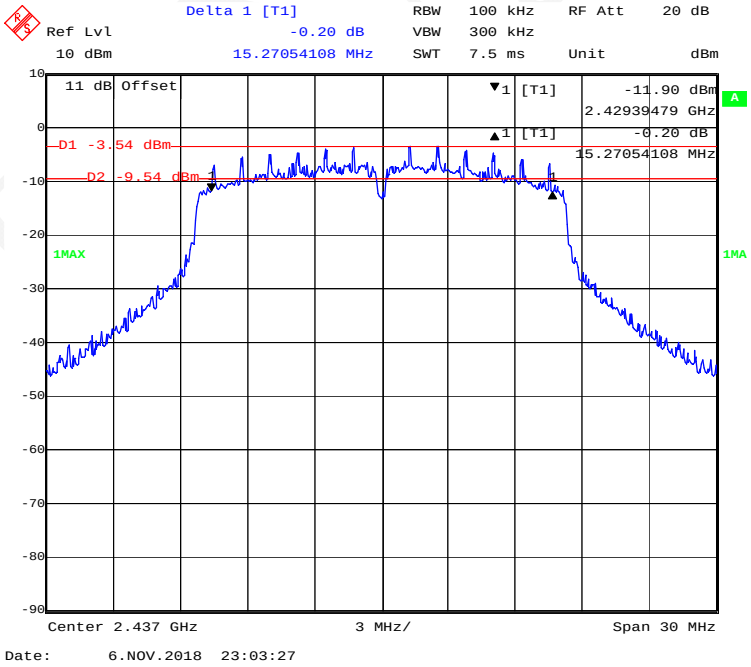
802.11g Mode High Channel



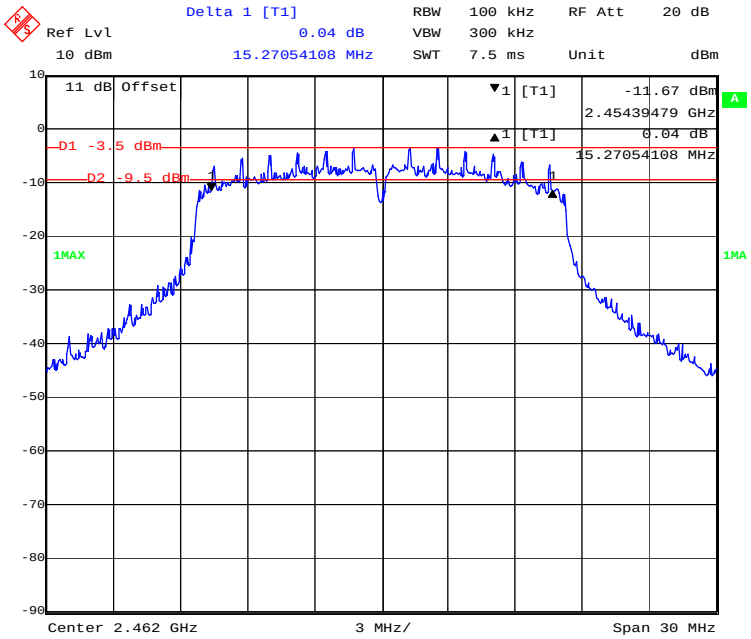
802.11n-HT20 Mode Low Channel



802.11n-HT20 Mode Middle Channel

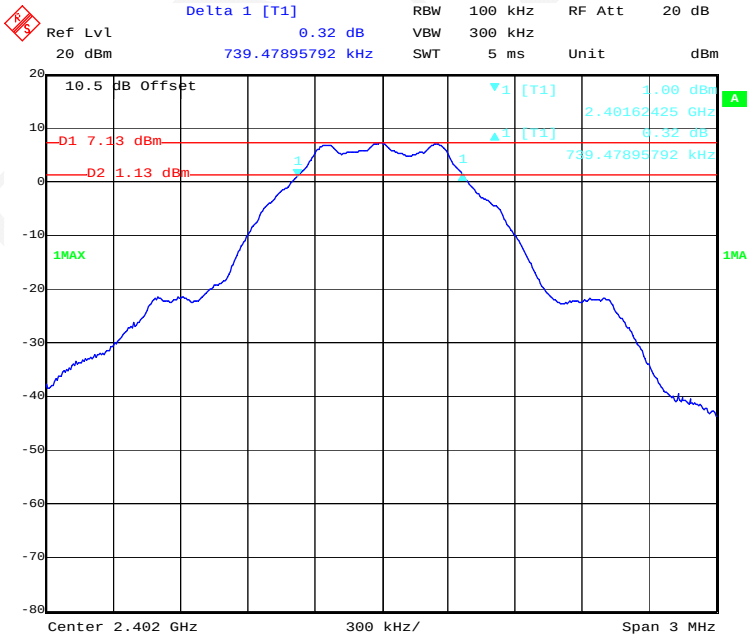


802.11n-HT20 Mode High Channel



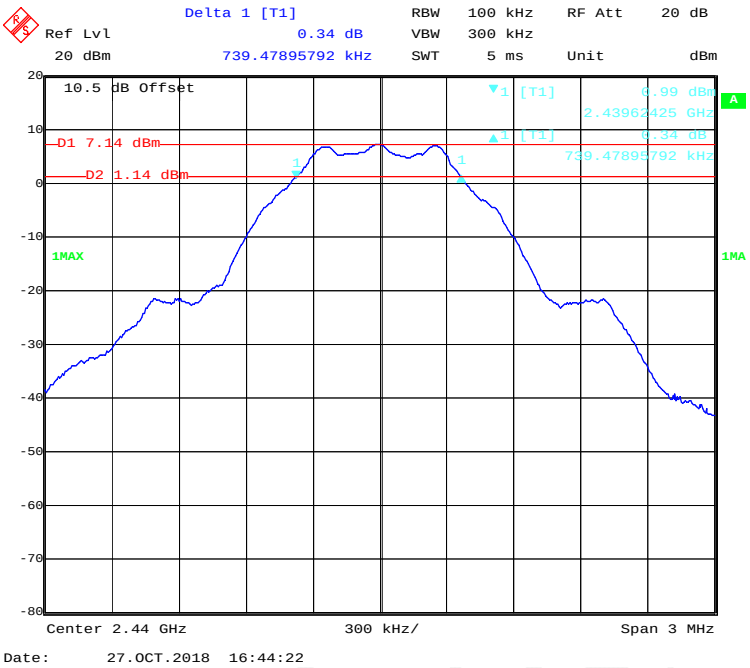
Date: 6.NOV.2018 23:02:27

BLE Mode Low Channel

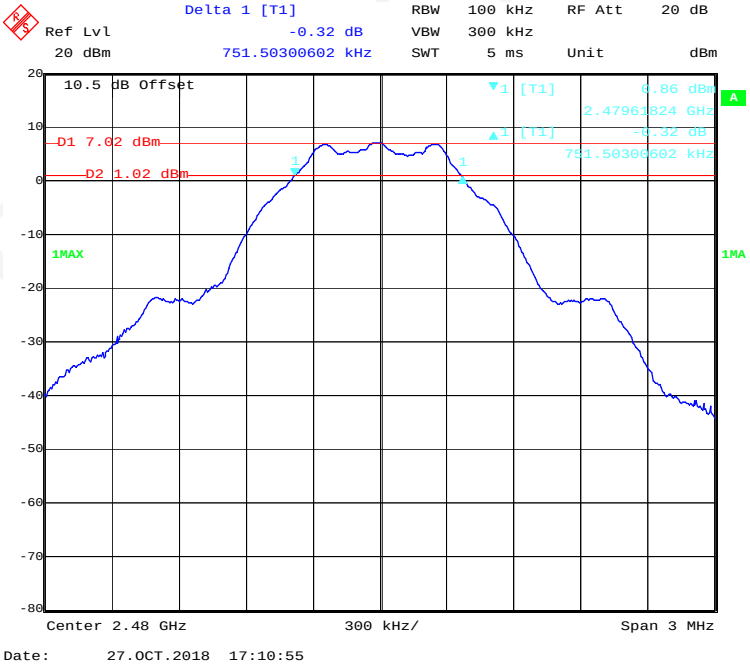


Date: 27.OCT.2018 16:46:01

BLE Mode Middle Channel



BLE Mode High Channel



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

Applicable Standard

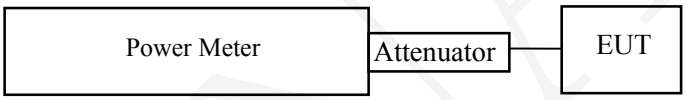
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, Compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted 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

For Wi-Fi:

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

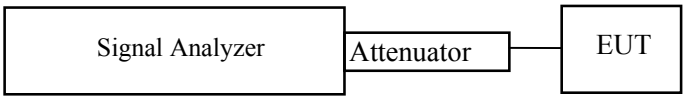
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.



For BLE:

According to ANSI C63.10-2013 sub-clause 11.9.1.1

1. Set the RBW ≥ DTS bandwidth.
2. Set VBW ≥ 3 x RBW.
3. Set span ≥ 3 x RBW
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.



Test Data

Environmental Conditions

Temperature:	23.8℃
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

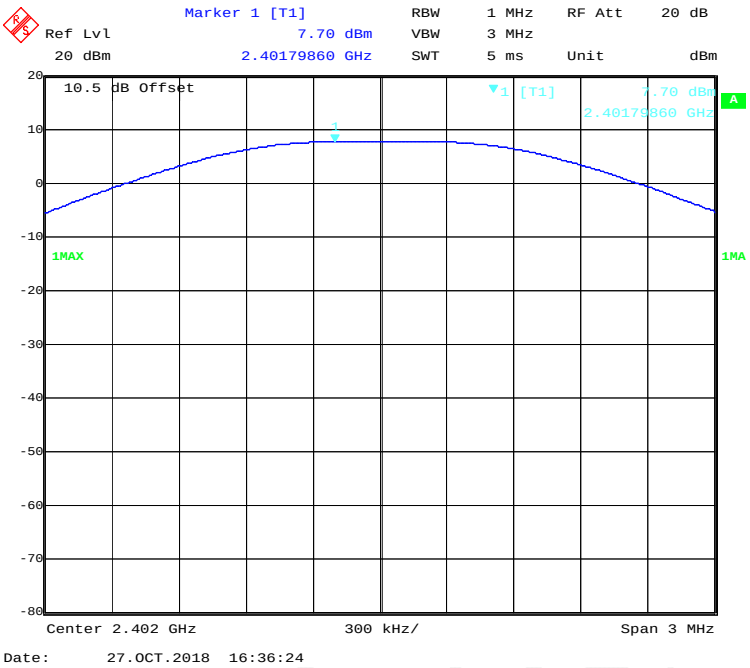
The testing was performed by Stone Zhang on 2018-10-27.

Test Result: Compliant.

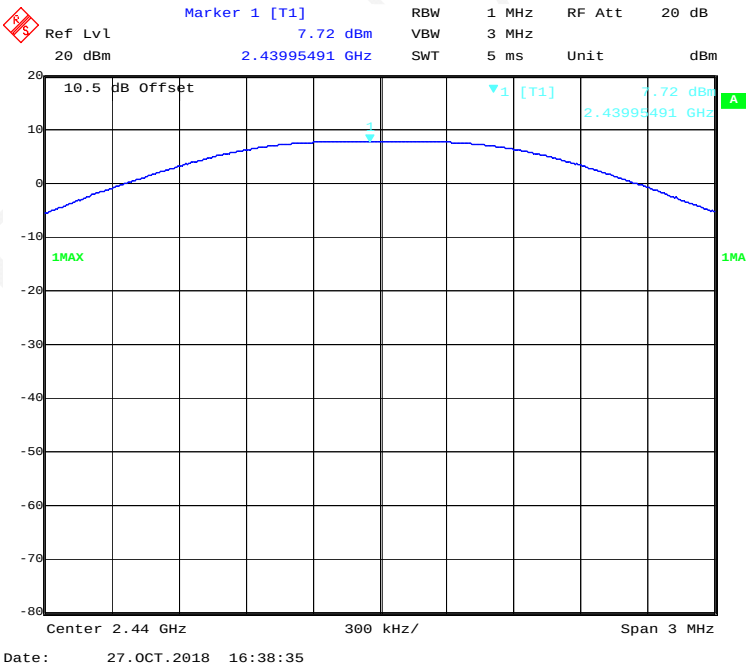
EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)	Result
802.11b Mode					
Low	2412	16.30	12.06	30	Pass
Middle	2437	16.59	12.15	30	Pass
High	2462	16.97	12.11	30	Pass
802.11g Mode					
Low	2412	14.78	8.06	30	Pass
Middle	2437	14.64	8.13	30	Pass
High	2462	14.99	8.09	30	Pass
802.11n-HT20 Mode					
Low	2412	14.36	7.93	30	Pass
Middle	2437	14.25	7.76	30	Pass
High	2462	14.23	8.11	30	Pass
BLE Mode					
Low	2402	7.70	/	30	Pass
Middle	2440	7.72	/	30	Pass
High	2480	7.57	/	30	Pass

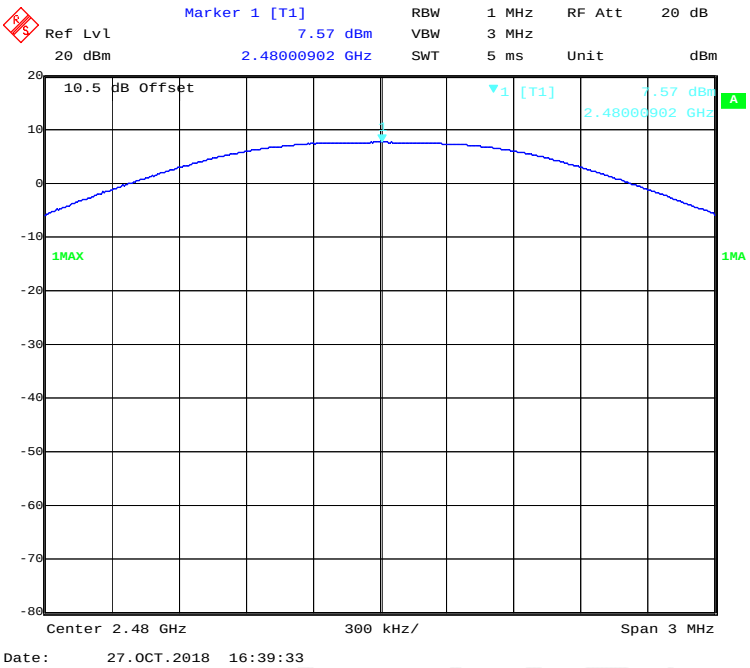
BLE Mode Low Channel



BLE Mode Middle Channel



BLE Mode High Channel



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:	24.1-24.3 ℃
Relative Humidity:	48-50%
ATM Pressure:	101.1-101.3 kPa

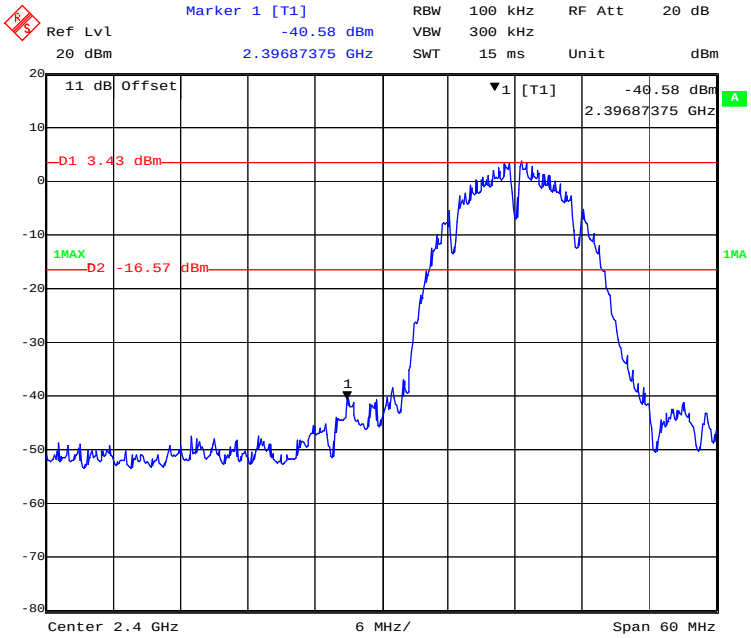
The testing was performed by Stone Zhang from 2018-10-27 to 2018-11-06.

Test Result: Compliant.

FINAL

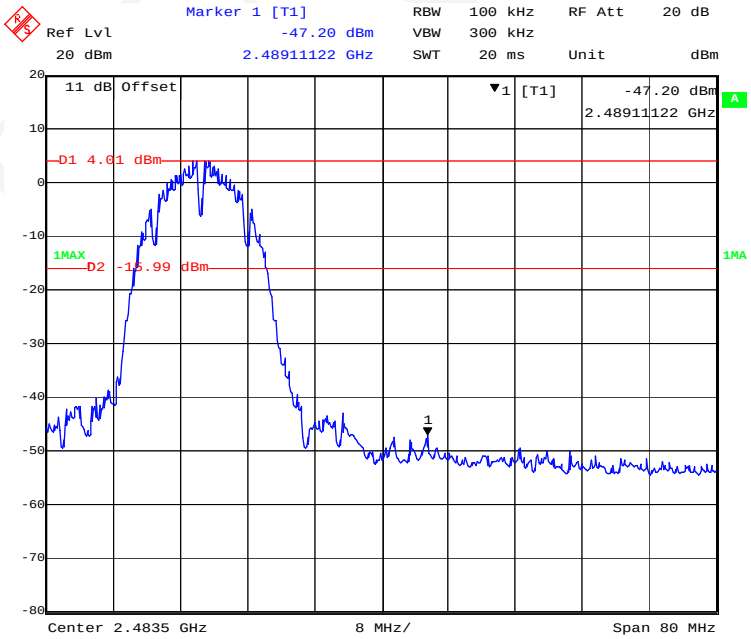
EUT operation mode: Transmitting

802.11b Mode Left Side



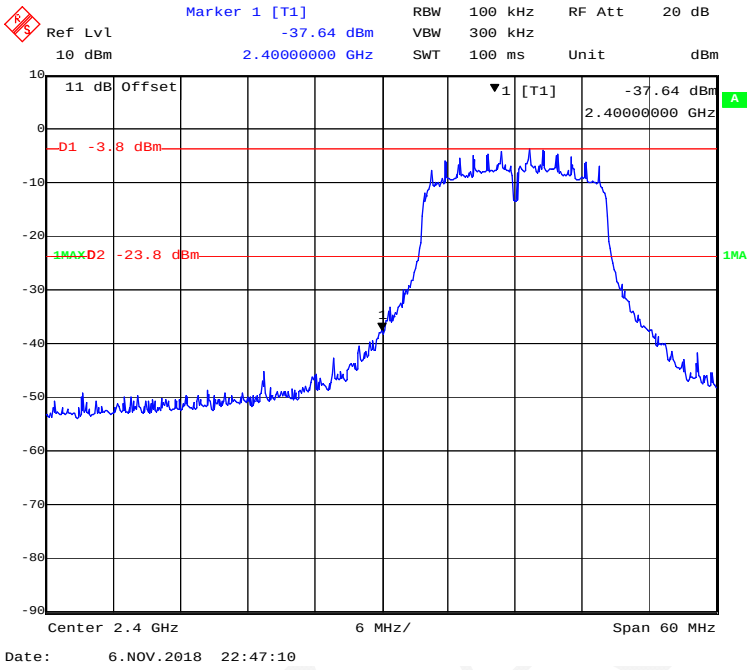
Date: 6.NOV.2018 22:23:18

802.11b Mode Right Side

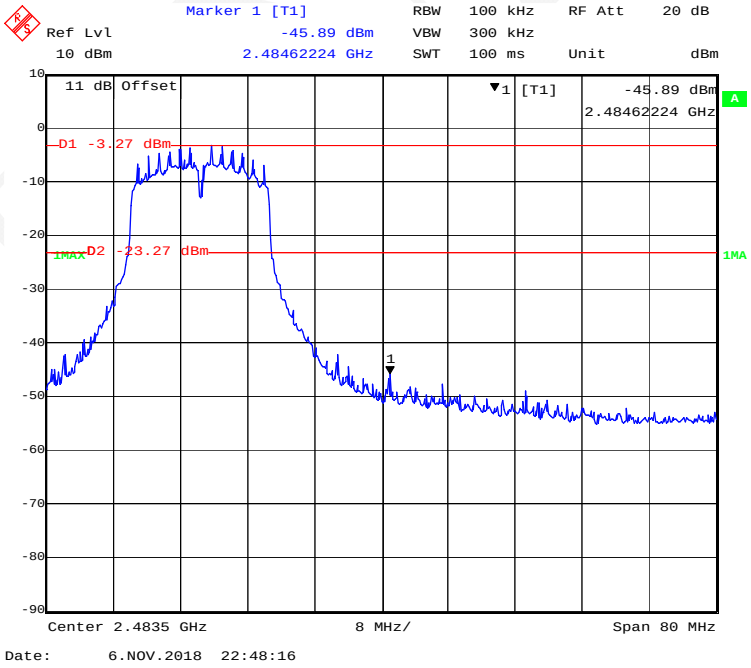


Date: 6.NOV.2018 22:24:27

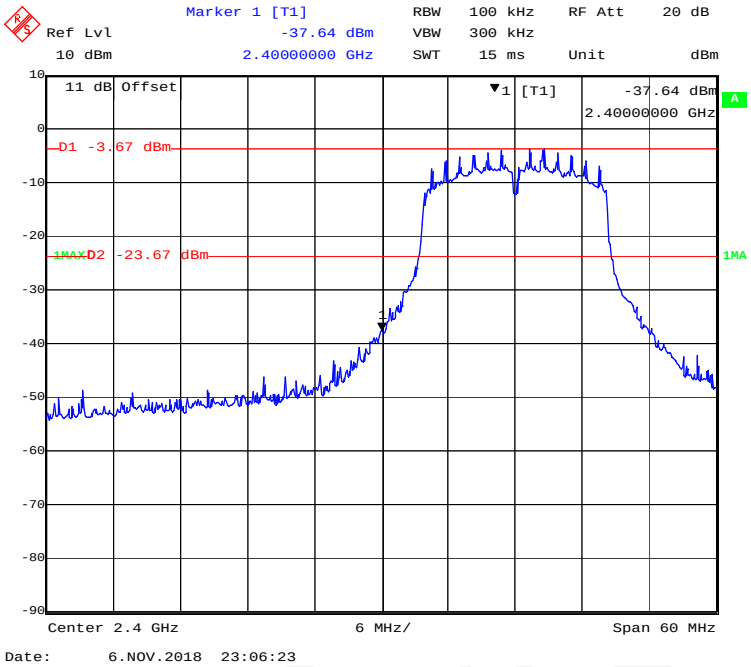
802.11g Mode Left Side



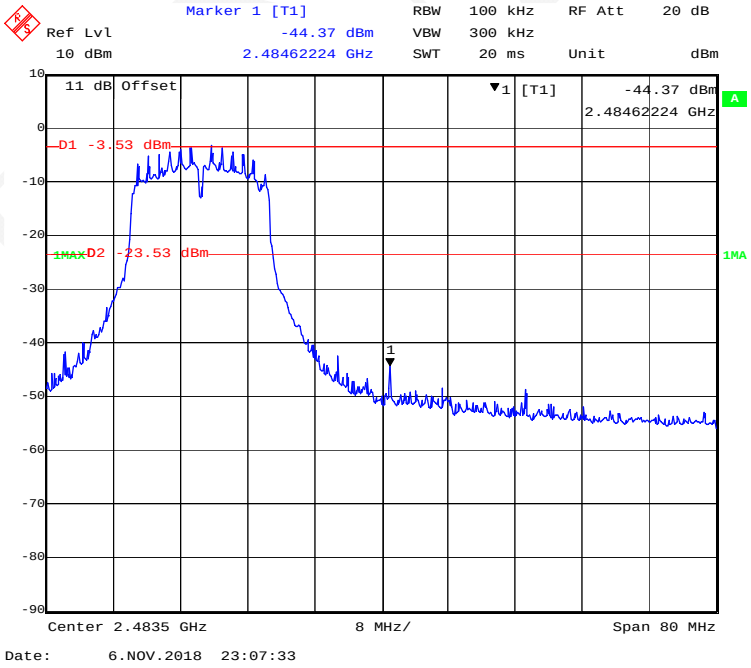
802.11g Mode Right Side



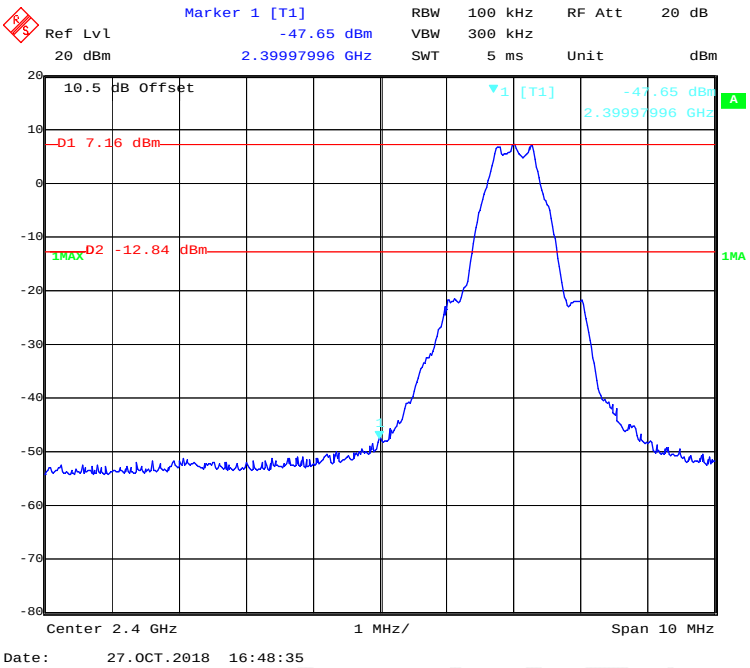
802.11n-HT20 Mode Left Side



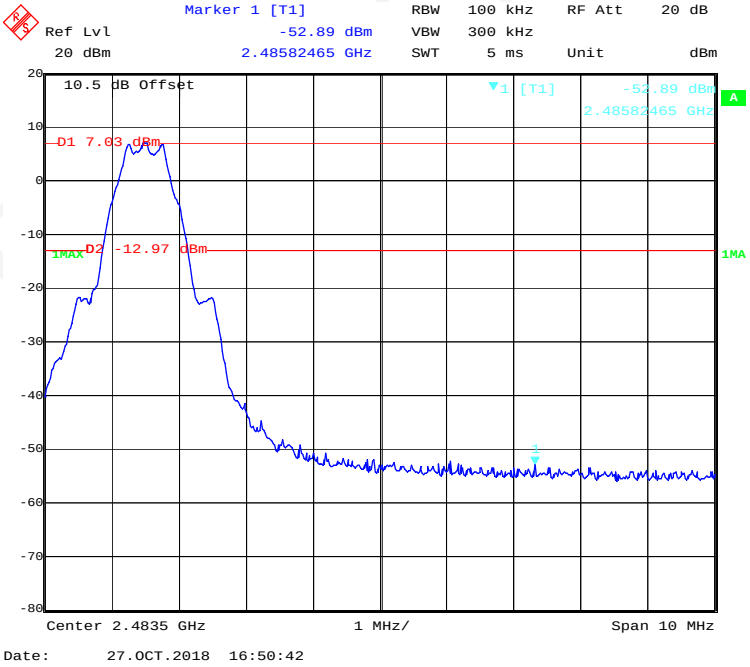
802.11n-HT20 Mode Right Side



BLE Mode Left Side



BLE 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

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

1. Set the RBW to: 3kHz≤ RBW≤100 kHz.
2. Set the VBW ≥ 3xRBW.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	24.1-24.3 ℃
Relative Humidity:	48-50%
ATM Pressure:	101.1-101.3 kPa

The testing was performed by Stone Zhang from 2018-10-27to 2018-11-06.

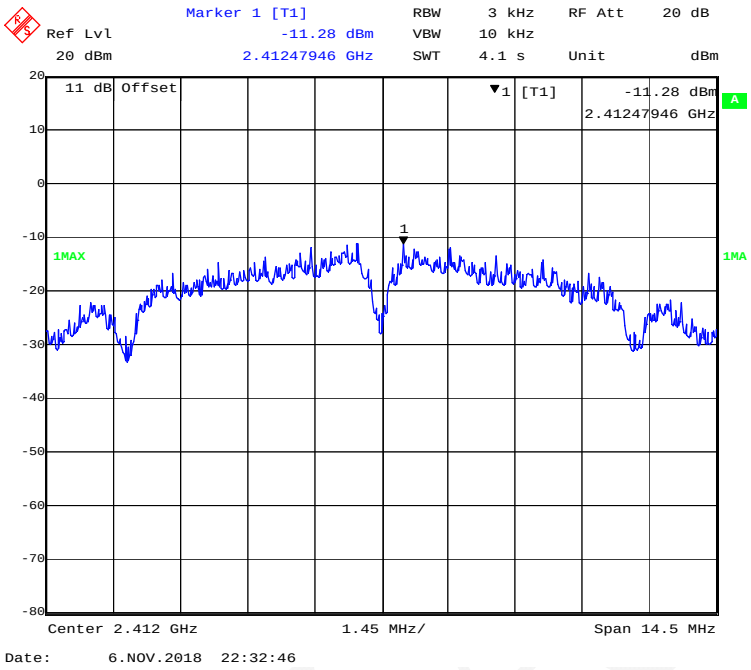
Test Result: Compliant.

EUT operation mode: Transmitting

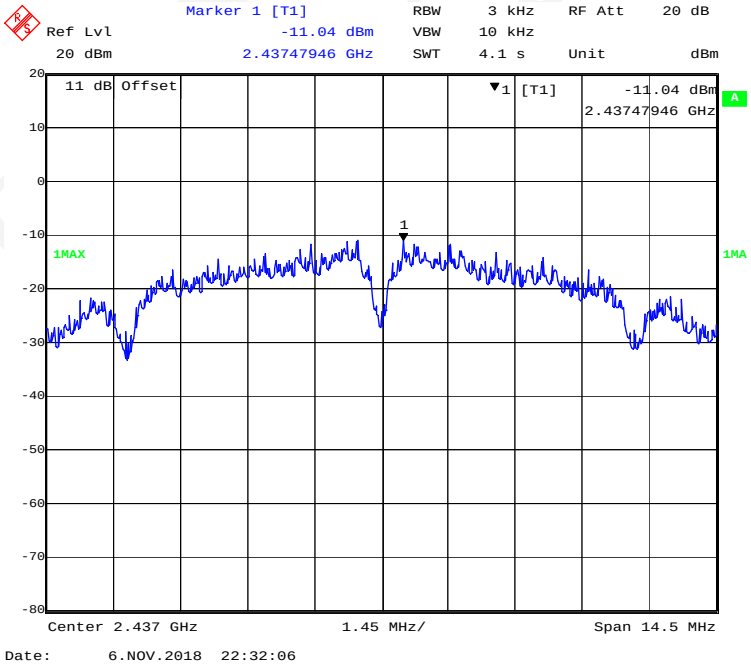
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode			
Low	2412	-11.28	≤8
Middle	2437	-11.04	≤8
High	2462	-10.74	≤8
802.11g Mode			
Low	2412	-23.30	≤8
Middle	2437	-22.94	≤8
High	2462	-21.82	≤8
802.11n-HT20 mode			
Low	2412	-22.66	≤8
Middle	2437	-19.39	≤8
High	2462	-23.37	≤8
BLE Mode			
Low	2402	-6.78	≤8
Middle	2440	-6.75	≤8
High	2480	-7.06	≤8

FINAL

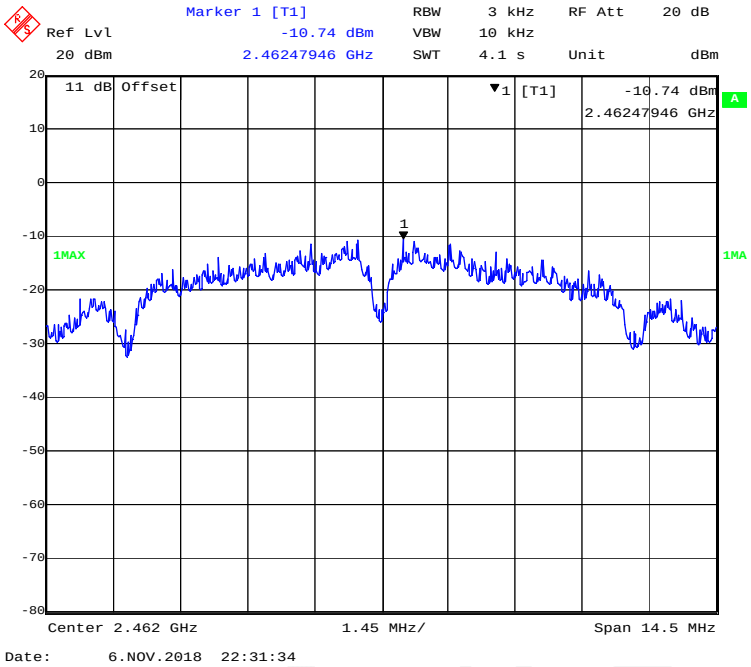
802.11b Mode Low Channel



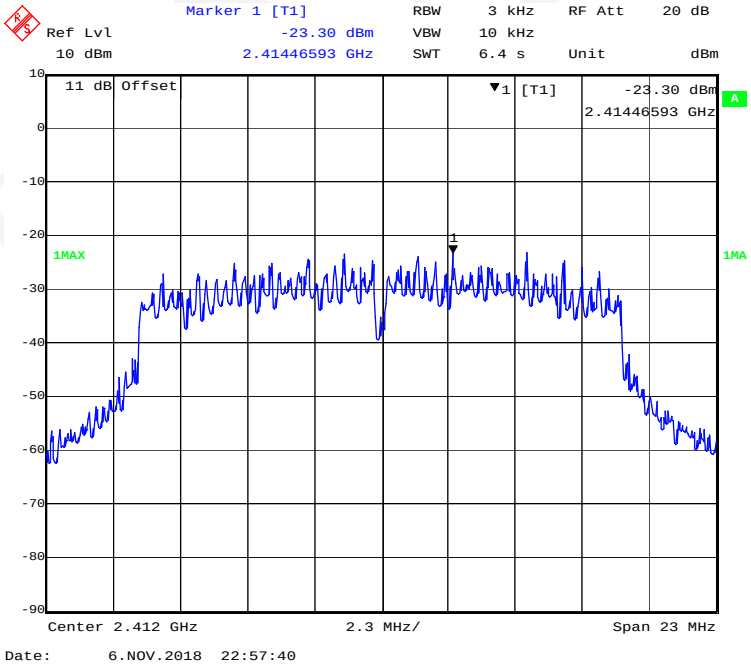
802.11b Mode Middle Channel



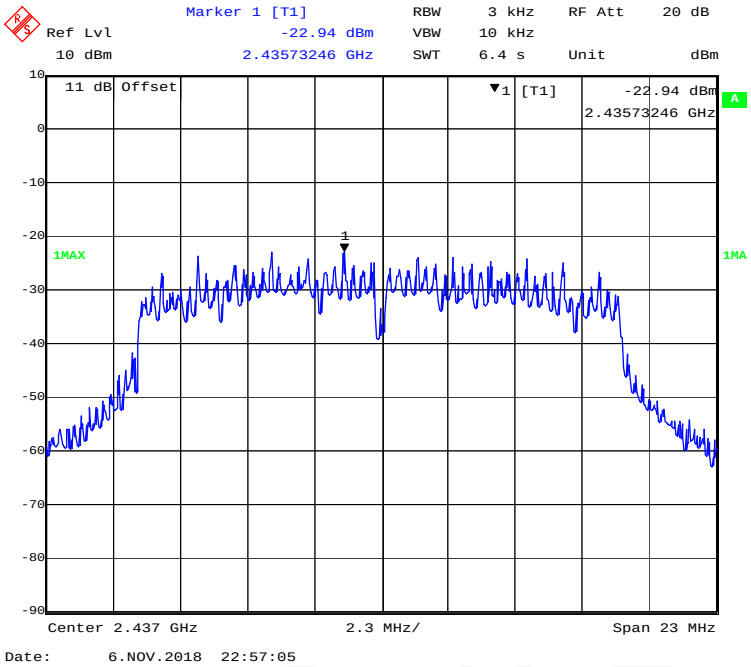
802.11b Mode High Channel



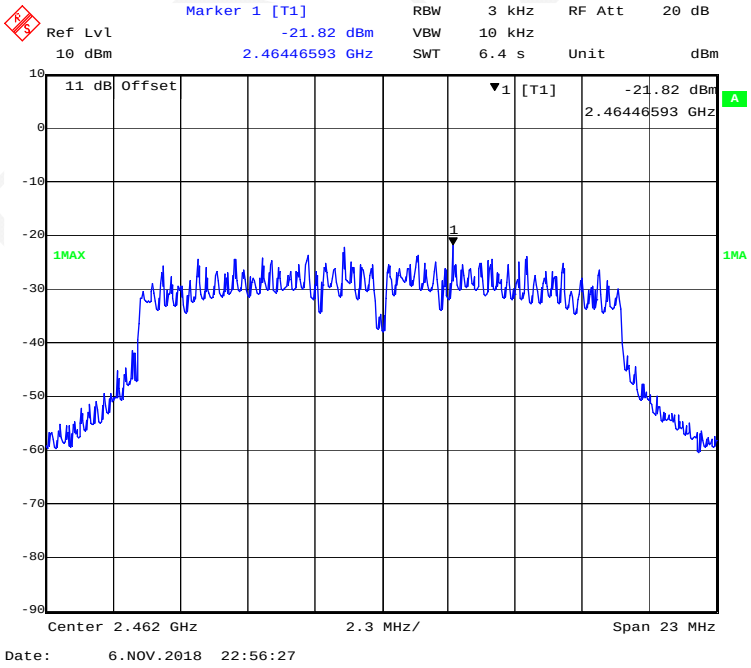
802.11g Mode Low Channel



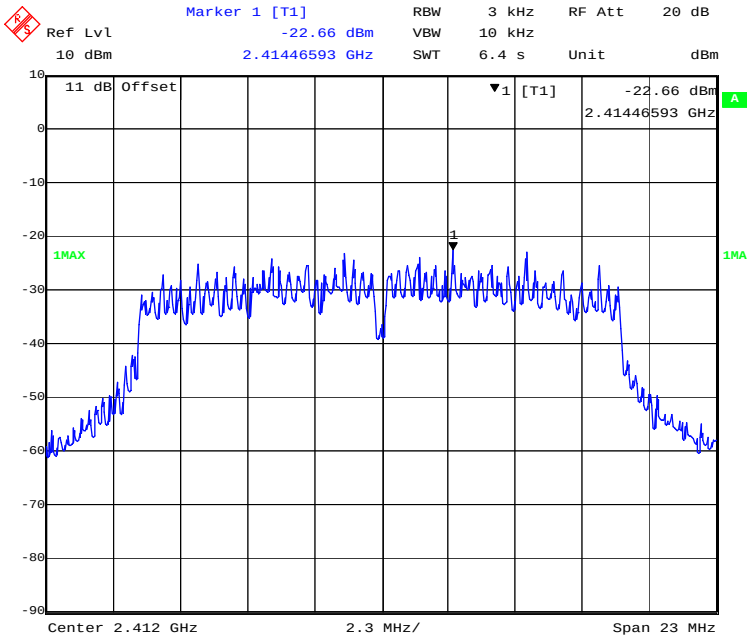
802.11g Mode Middle Channel



802.11g Mode High Channel

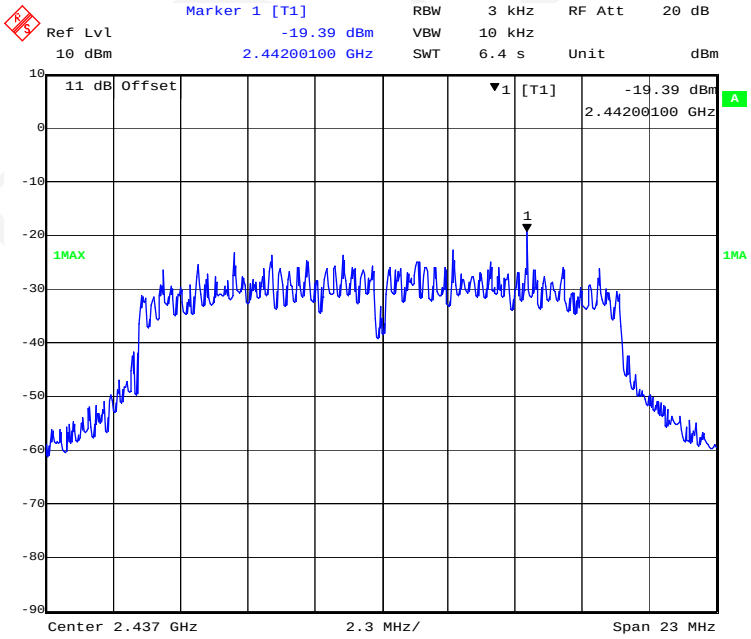


802.11n-HT20 Mode Low Channel



Date: 6.NOV.2018 23:16:18

802.11n-HT20 Mode Middle Channel



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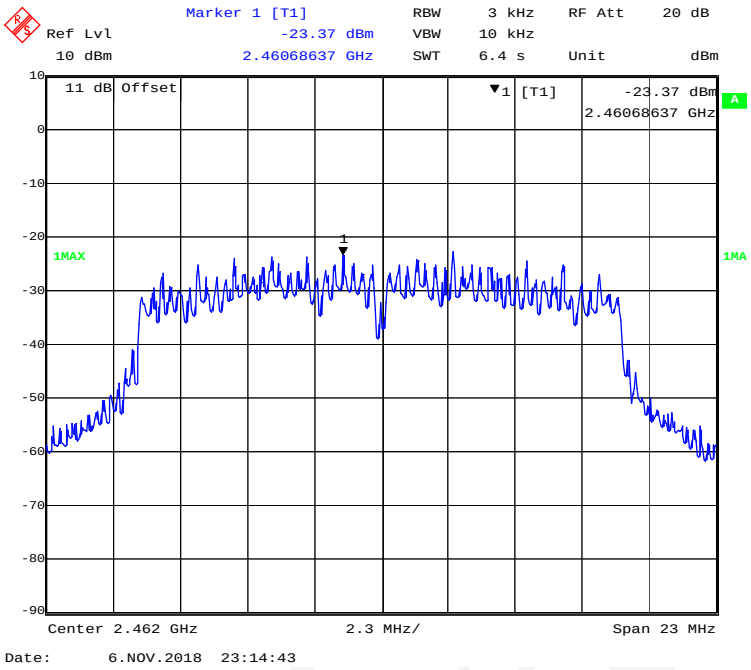
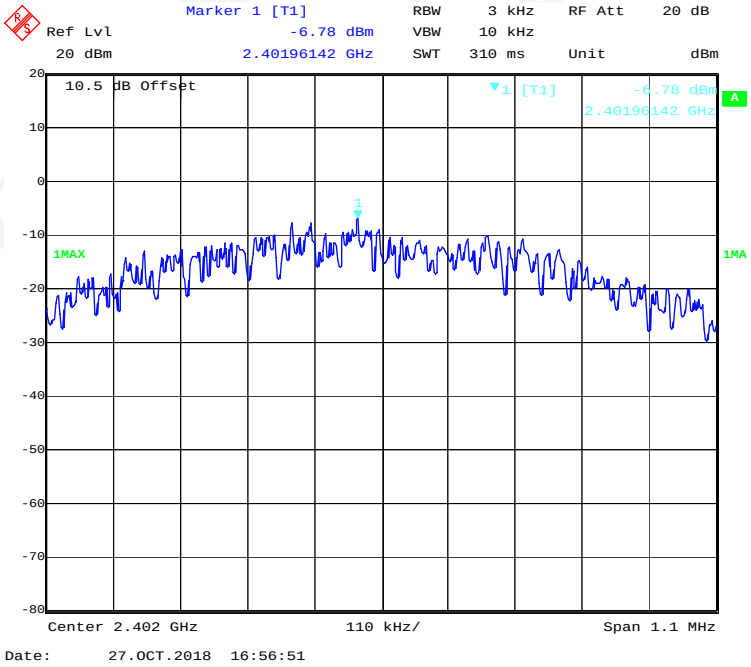
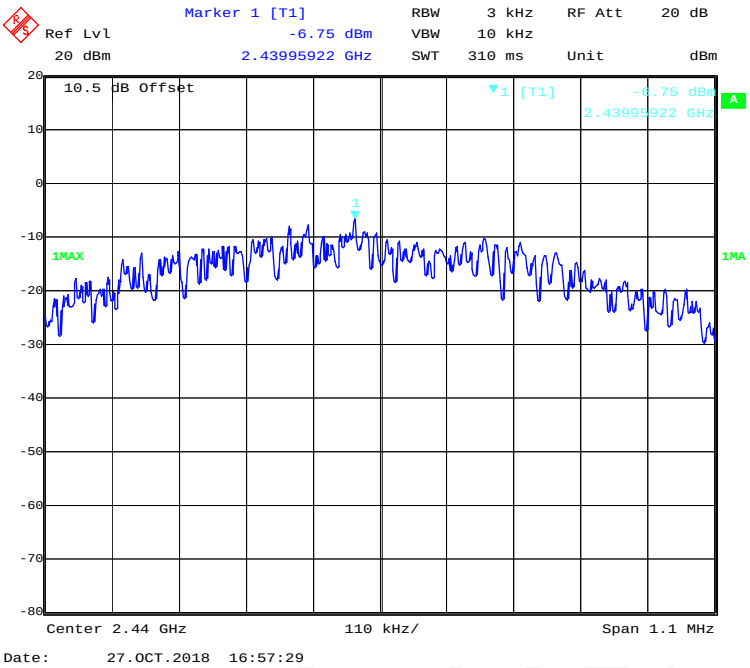
802.11n-HT20 Mode High Channel



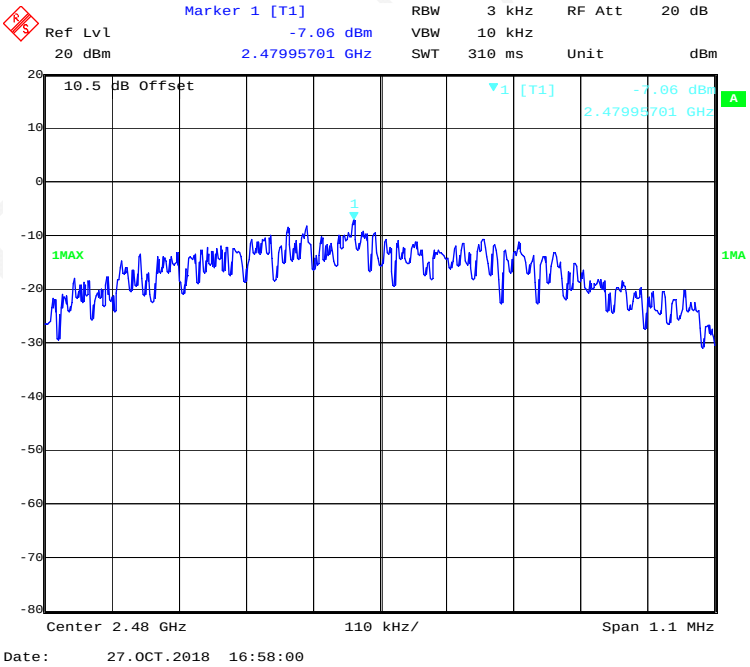
BLE Mode Low Channel



BLE Mode Middle Channel



BLE Mode High Channel



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