



TESTING LABORATORY  
CERTIFICATE#4323.01



FCC PART 15.247

## TEST REPORT

For

**George Robotics Limited**

Salisbury House, Station Road, Cambridge, United Kingdom

**FCC ID: 2AT9I-PYBD**

<b>Report Type:</b> Original Report	<b>Product Type:</b> PYBD-SF2W
<b>Test Engineer:</b> Jack Jiao	<i>Jack Jiao</i>
<b>Report Number:</b> RSHA190521001-00A	
<b>Report Date:</b> 2019-08-05	
Kyle Xu	
<b>Reviewed By:</b> RF Leader	<i>Kyle Xu</i>
<b>Prepared By:</b> Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>4</b>
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
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>6</b>
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
<b>SUMMARY OF TEST RESULTS .....</b>	<b>12</b>
<b>TEST EQUIPMENT LIST .....</b>	<b>13</b>
<b>FCC §1.1310 &amp; §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE) .....</b>	<b>14</b>
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>15</b>
APPLICABLE STANDARD .....	15
ANTENNA CONNECTOR CONSTRUCTION .....	15
<b>FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS .....</b>	<b>16</b>
APPLICABLE STANDARD .....	16
EUT SETUP .....	16
EMI TEST RECEIVER SETUP.....	16
TEST PROCEDURE .....	17
CORRECTED FACTOR & OVER LIMIT CALCULATION.....	17
TEST RESULTS SUMMARY .....	17
TEST DATA .....	17
<b>FCC §15.209, §15.205 &amp; §15.247(d) - SPURIOUS EMISSIONS.....</b>	<b>22</b>
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
<b>FCC §15.247(a) (2) - 6 dB EMISSION BANDWIDTH .....</b>	<b>66</b>
APPLICABLE STANDARD .....	66
TEST PROCEDURE .....	66
TEST DATA .....	66
<b>FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....</b>	<b>74</b>
APPLICABLE STANDARD .....	74
TEST PROCEDURE .....	74
TEST DATA .....	74
<b>FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....</b>	<b>78</b>
APPLICABLE STANDARD .....	78

---

TEST PROCEDURE .....	78
TEST DATA .....	78
<b>FCC §15.247(e) - POWER SPECTRAL DENSITY .....</b>	<b>83</b>
APPLICABLE STANDARD .....	83
TEST PROCEDURE .....	83
TEST DATA .....	83

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Applicant:	George Robotics Limited
Tested Model:	PYBD-SF2W
Series Model:	PYBD-SF3W, PYBD-SF6W, PYBD-SH3W, PYBD-SH0W
Model Difference:	Model type of the MCU mounted
Product Type:	PYBD-SF2W
Dimension:	33.5mm (L)* 23.8mm (W)* 7mm(H)
Power Supply:	DC 5.0V

*\*All measurement and test data in this report was gathered from production sample serial number: 20190521001. (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-05-21.*

### Objective

This report is prepared on behalf of *George Robotics Limited* 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 Compliant 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: 2AT9I-PYBD.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliant Testing of Unlicensed Wireless Devices and FCC 558074 D01 15.247 Meas Guidance v05r02.

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

**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°C
Humidity		6%

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

**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 and CAB identifier CN0004 under the ISED requirement. 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**

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

Note: the difference of models cannot affect the radio parameters. we only tested SF2W mode. The difference test show in the part 15B SDoC report.

**Equipment Modifications**

No modification was made to the EUT tested.

**EUT Exercise Software**

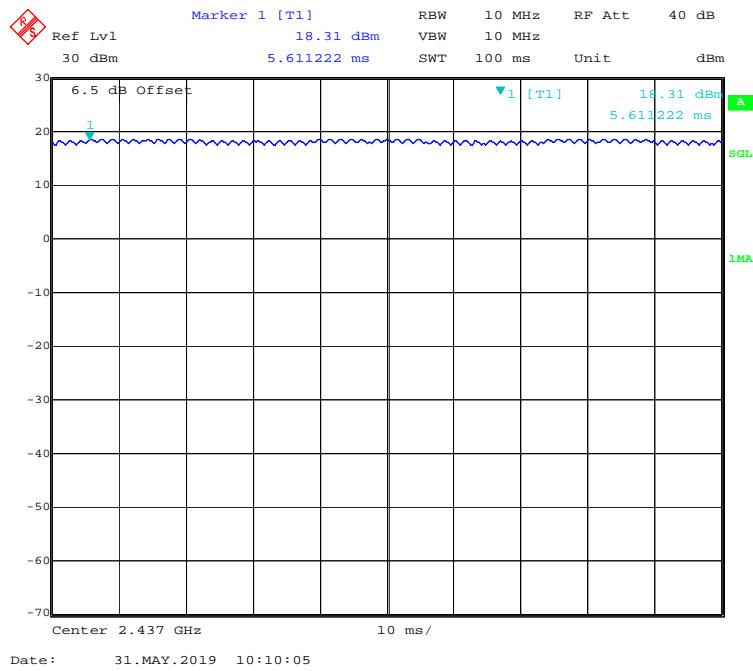
RF test tool: Secure CRT

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

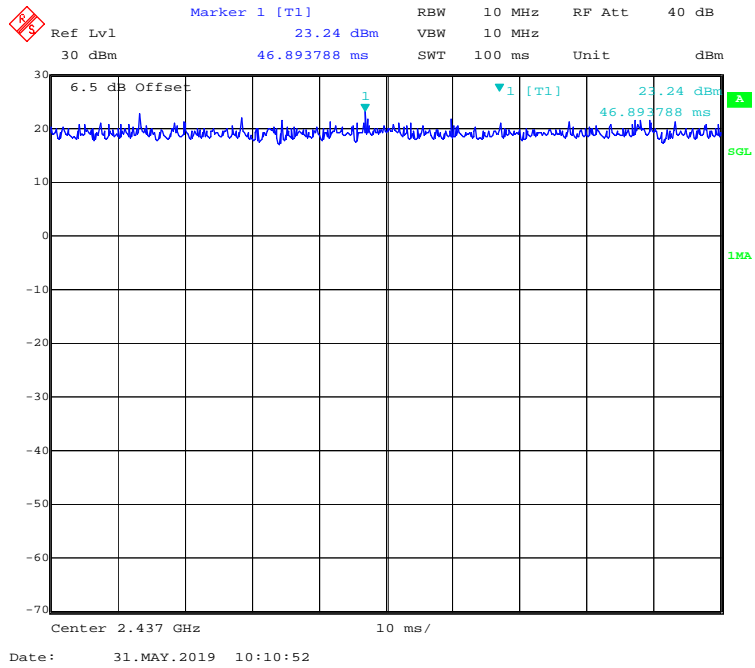
Mode	Data Rate	Power Level
802.11b	1Mbps	15
802.11g	1Mbps	14
802.11n-HT20	6 Mbps	12
BLE	1Mbps	3.0

**Duty Cycle:**

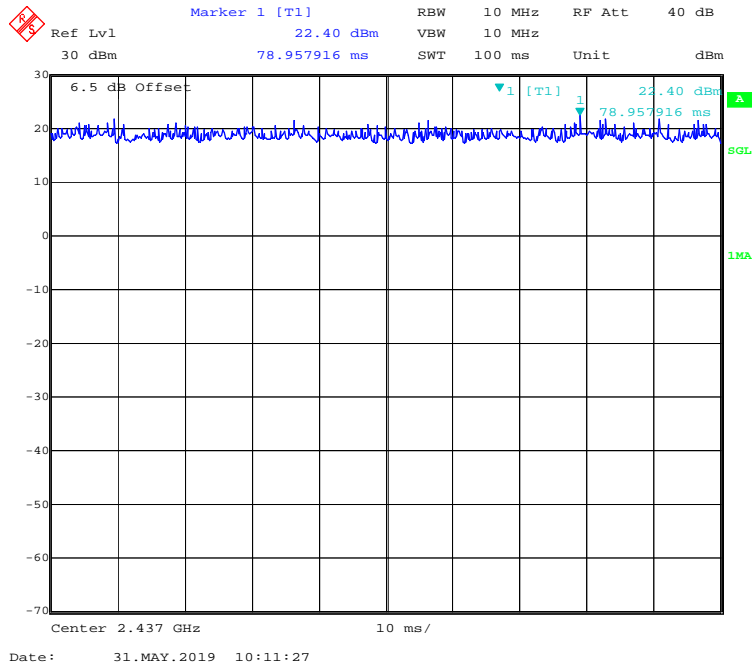
**802.11b Mode Middle Channel**



### 802.11g Mode Middle Channel

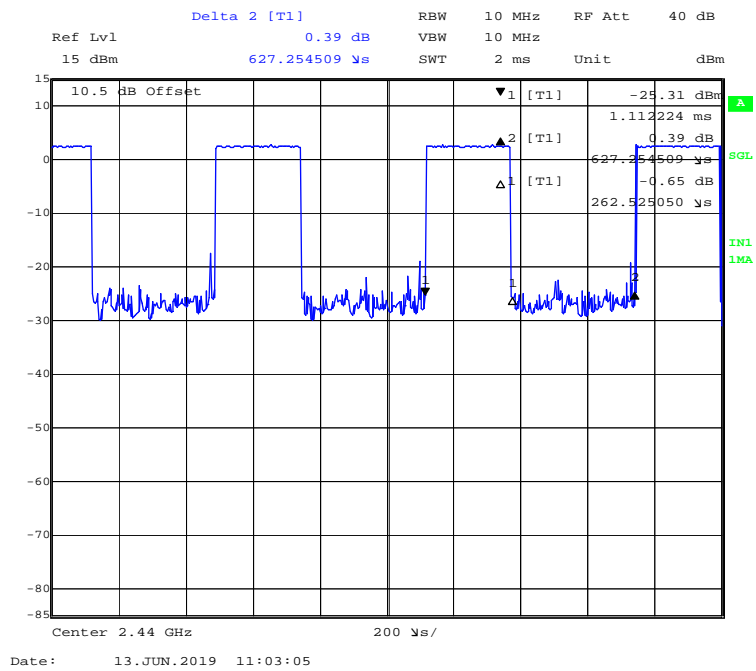


### 802.11n-HT20 Mode Middle Channel





**BLE Mode Middle Channel**



Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
802.11b	100	/	/	0
802.11g	100	/	/	0
802.11n-HT20	100	/	/	0
BLE	41.85	0.263	3.80	3.78

**Note:** “x” means the Duty Cycle.

**Support Equipment List and Details**

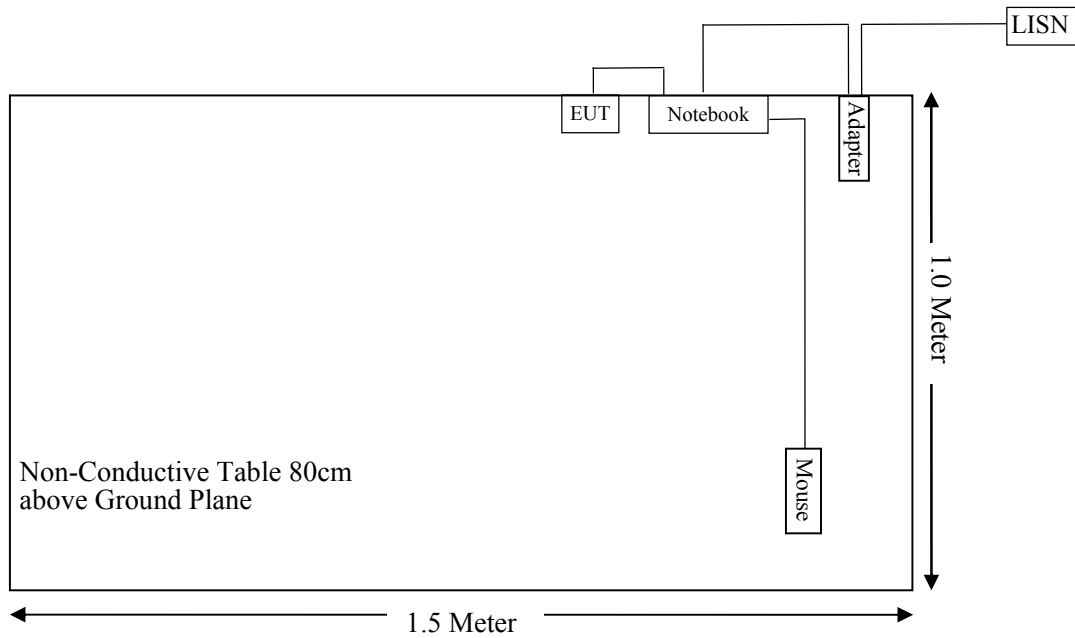
Manufacturer	Description	Model	Serial Number
Dell	Notebook	E6410	3094742521
Logitech	Mouse	M-U0026	HS529HB
DELL	Adapter	LA65NS0-00	DF263

**External I/O Cable**

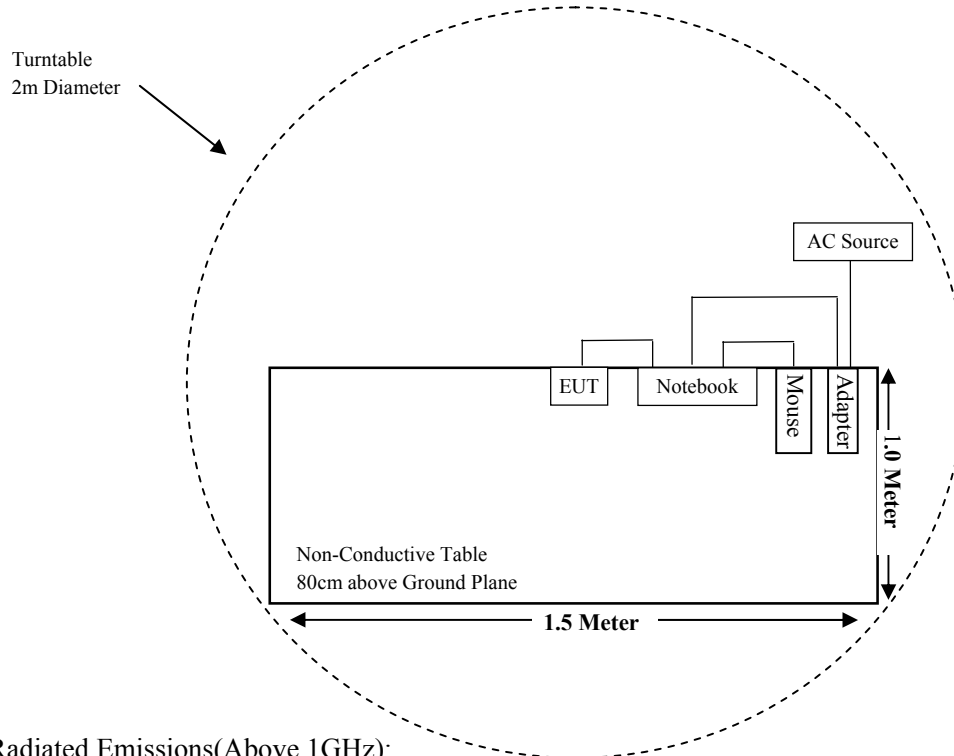
Cable Description	Length (m)	From Port	To
RF Cable	0.3	EUT	Notebook
USB Cable	0.8	Notebook	Mouse
Power Cable	1.0	Notebook	Adapter
Power Cable	1.0	Adapter	AC Source

**Block Diagram of Test Setup**

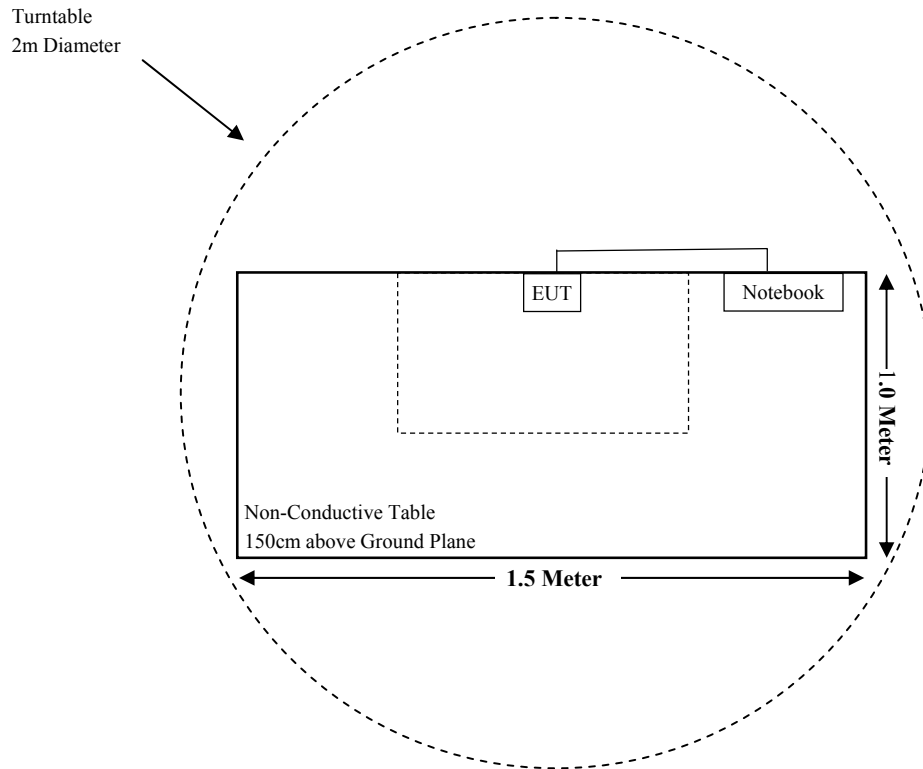
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§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)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test (Chamber 1#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-30	2019-11-29
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2018-08-14	2019-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
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
<b>Radiated Emission Test (Chamber 2#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-27	2019-08-26
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-12-12	2019-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
SELECTOR	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2018-08-05	2019-08-04
Narda	Attenuator	10dB	010	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
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
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2018-11-30	2019-11-29
Agilent	Power Meter	N1912A	MY5000492	2018-11-18	2019-11-17
Agilent	Power Sensor	N1921A	MY54210024	2018-11-18	2019-11-17
Narda	Attenuator	10dB	010	2018-08-15	2019-08-14
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
George	RF Cable	George C01	C01	Each Time	N/A
<b>Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-07-11	2020-07-10
Rohde & Schwarz	LISN	ENV216	3560655016	2018-11-30	2019-11-29
Audix	Test Software	e3	V9	--	--
Narda	Attenuator/6dB	10690812-2	26850-6	2019-01-10	2020-01-09
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 subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

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

<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
<b>Frequency Range (MHz)</b>	<b>Electric Field Strength (V/m)</b>	<b>Magnetic Field Strength (A/m)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>Averaging Time (minutes)</b>
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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<sup>2</sup>);

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:**

<b>Mode</b>	<b>Frequency Range (MHz)</b>	<b>Antenna Gain</b>		<b>Tune-up Conducted Power</b>		<b>Evaluation Distance (cm)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>MPE Limit (mW/cm<sup>2</sup>)</b>
		<b>(dBi)</b>	<b>(numeric)</b>	<b>(dBm)</b>	<b>(mW)</b>			
802.11b	2412~2462	2.2	1.66	11.00	12.59	20	0.0042	1.0
802.11g		2.2	1.66	11.00	12.59	20	0.0042	1.0
802.11 n-HT20		2.2	1.66	10.00	10.00	20	0.0033	1.0
BLE	2402~2480	2.2	1.66	3.00	2.00	20	0.0007	1.0
BT3.0	2402~2480	2.2	1.66	0.00	1.00	20	0.0003	1.0

**Note:** (1) For the above Tune-up Conducted power were all declared by the manufacturer.

(2) Wi-Fi and BLE can’t transmit simultaneously.

**Conclusion:** The EUT meets exemption requirement - RF exposure evaluation greater than 20cm distance specified in § 2.1091. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by § 2.1093.

## **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 Compliant 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 antennas for Wi-Fi and BLE which was permanently attached; fulfill the requirement of this section. Please refer to the EUT photos.

<b>ANT</b>	<b>Antenna Type</b>	<b>Max. Antenna Gain</b>
0	Dipole	2.2dBi
1	Ceramic	2.2dBi

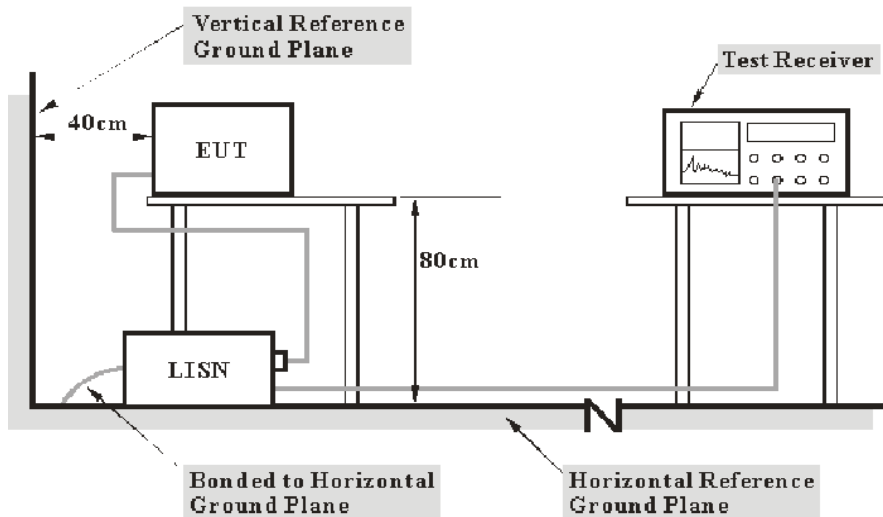
**Result:** Compliant.

## 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 & Over Limit 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:

$$\text{Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over Limit of 7dB means the emission is 7 dB above the limit. The equation for over Limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)} - \text{Limit (dB}\mu\text{V)}$$

## Test Results Summary

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

## Test Data

### Environmental Conditions

<b>Temperature:</b>	22°C
<b>Relative Humidity:</b>	50%
<b>ATM Pressure:</b>	101.3kPa

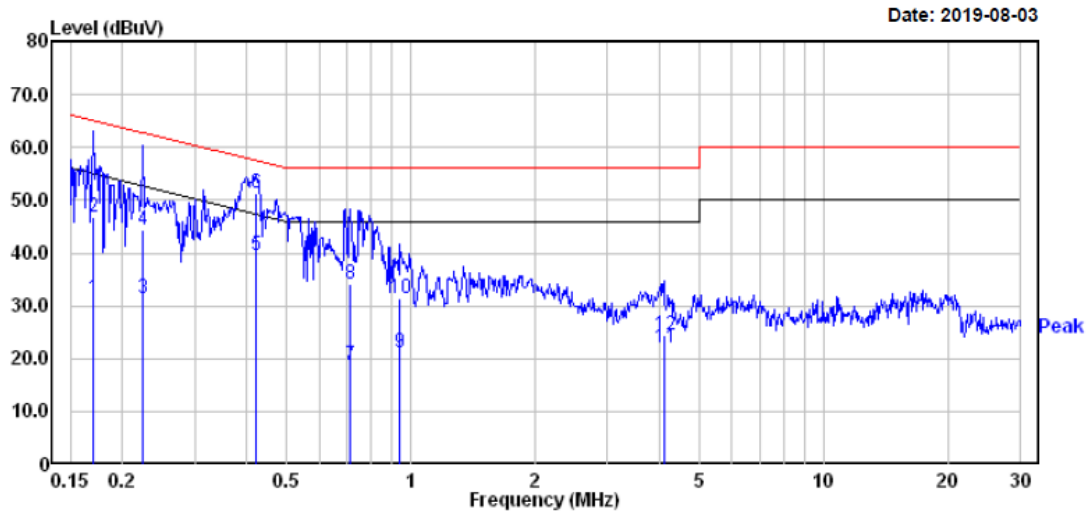
*The testing was performed by Jack Jiao 2019-08-03.*

**Test Result:** Compliant.

**For Wi-Fi Mode:**

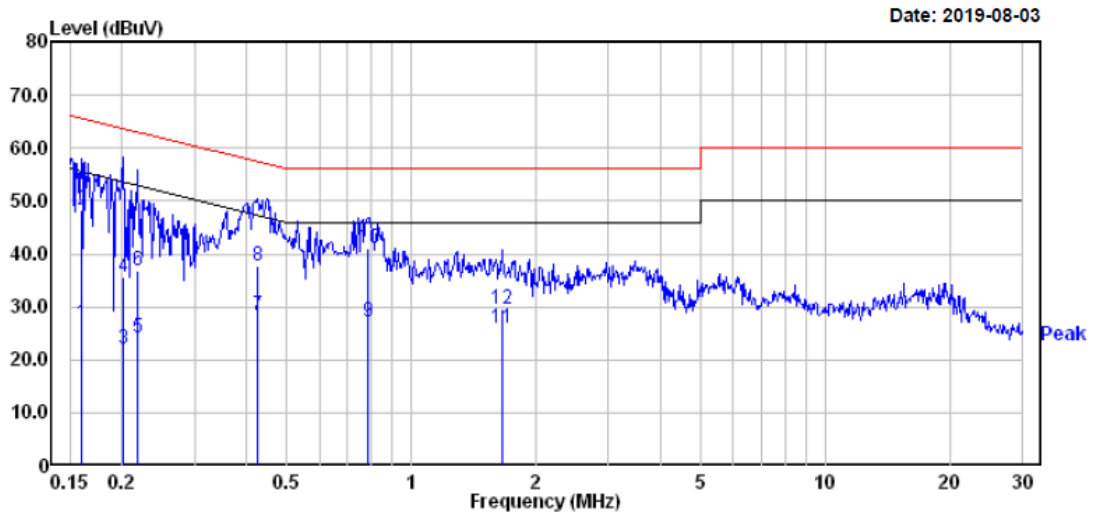
EUT operation mode: Transmitting in 802.11b mode low channel for ANT2 (worst case)

**AC 120V/60 Hz, Line**



	Read	Limit	Over				
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.169	11.70	19.83	31.53	54.99	-23.46	Average
2	0.169	27.10	19.83	46.93	64.99	-18.06	QP
3	0.224	11.70	19.82	31.52	52.66	-21.14	Average
4	0.224	24.50	19.82	44.32	62.66	-18.34	QP
5	0.421	19.70	19.74	39.44	47.42	-7.98	Average
6	0.421	31.50	19.74	51.24	57.42	-6.18	QP
7	0.712	-0.90	19.74	18.84	46.00	-27.16	Average
8	0.712	14.30	19.74	34.04	56.00	-21.96	QP
9	0.943	1.50	19.77	21.27	46.00	-24.73	Average
10	0.943	11.70	19.77	31.47	56.00	-24.53	QP
11	4.114	2.60	19.47	22.07	46.00	-23.93	Average
12	4.114	4.90	19.47	24.37	56.00	-31.63	QP

**AC 120V/60 Hz, Neutral**



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.160	7.10	19.83	26.93	55.47	-28.54	Average
2	0.160	28.50	19.83	48.33	65.47	-17.14	QP
3	0.201	2.10	19.82	21.92	53.58	-31.66	Average
4	0.201	15.90	19.82	35.72	63.58	-27.86	QP
5	0.219	4.20	19.82	24.02	52.88	-28.86	Average
6	0.219	16.90	19.82	36.72	62.88	-26.16	QP
7	0.424	8.69	19.75	28.44	47.37	-18.93	Average
8	0.424	18.09	19.75	37.84	57.37	-19.53	QP
9	0.783	7.40	19.71	27.11	46.00	-18.89	Average
10	0.783	21.20	19.71	40.91	56.00	-15.09	QP
11	1.654	6.00	19.84	25.84	46.00	-20.16	Average
12	1.654	9.80	19.84	29.64	56.00	-26.36	QP

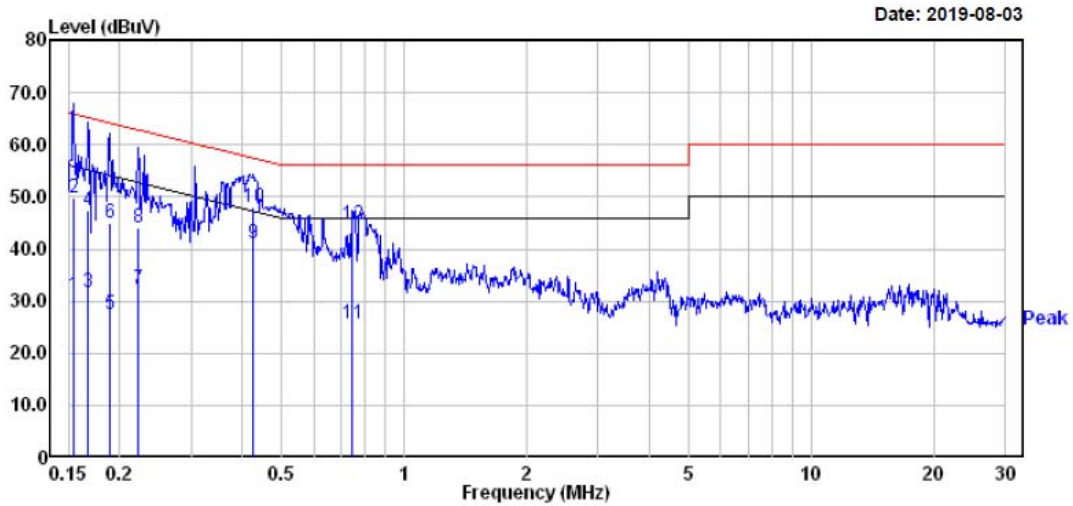
**Note:**

- 1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
- 2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

**For BLE Mode:**

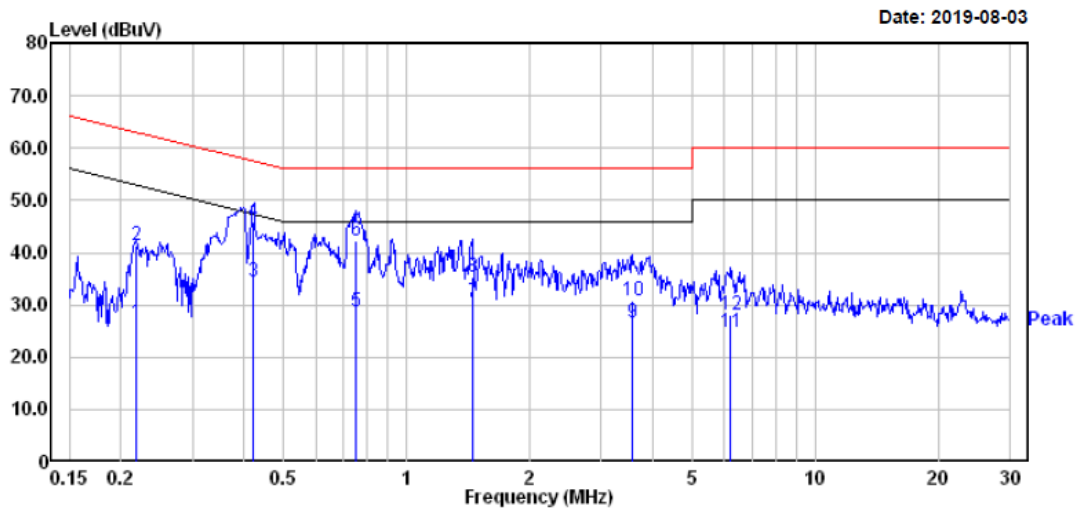
*EUT operation mode: Transmitting in low channel for ANTI (worst case)*

**AC 120V/60 Hz, Line**



		Read			Limit	Over	
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.154	11.30	19.82	31.12	55.78	-24.66	Average
2	0.154	29.90	19.82	49.72	65.78	-16.06	QP
3	0.168	12.00	19.83	31.83	55.08	-23.25	Average
4	0.168	27.60	19.83	47.43	65.08	-17.65	QP
5	0.189	7.80	19.82	27.62	54.06	-26.44	Average
6	0.189	25.10	19.82	44.92	64.06	-19.14	QP
7	0.222	12.40	19.82	32.22	52.74	-20.52	Average
8	0.222	24.30	19.82	44.12	62.74	-18.62	QP
9	0.426	21.40	19.75	41.15	47.33	-6.18	Average
10	0.426	28.40	19.75	48.15	57.33	-9.18	QP
11	0.743	5.90	19.73	25.63	46.00	-20.37	Average
12	0.743	25.00	19.73	44.73	56.00	-11.27	QP

**AC 120V/60 Hz, Neutral**



	Read Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.217	6.70	19.82	26.52	52.92	-26.40	Average
2	0.217	21.40	19.82	41.22	62.92	-21.70	QP
3	0.421	14.60	19.74	34.34	47.42	-13.08	Average
4	0.421	26.20	19.74	45.94	57.42	-11.48	QP
5	0.755	8.90	19.72	28.62	46.00	-17.38	Average
6	0.755	22.60	19.72	42.32	56.00	-13.68	QP
7	1.449	10.80	19.84	30.64	46.00	-15.36	Average
8	1.449	15.40	19.84	35.24	56.00	-20.76	QP
9	3.565	7.20	19.47	26.67	46.00	-19.33	Average
10	3.565	11.40	19.47	30.87	56.00	-25.13	QP
11	6.219	5.30	19.51	24.81	50.00	-25.19	Average
12	6.219	8.60	19.51	28.11	60.00	-31.89	QP

Note:

- 1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
- 2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

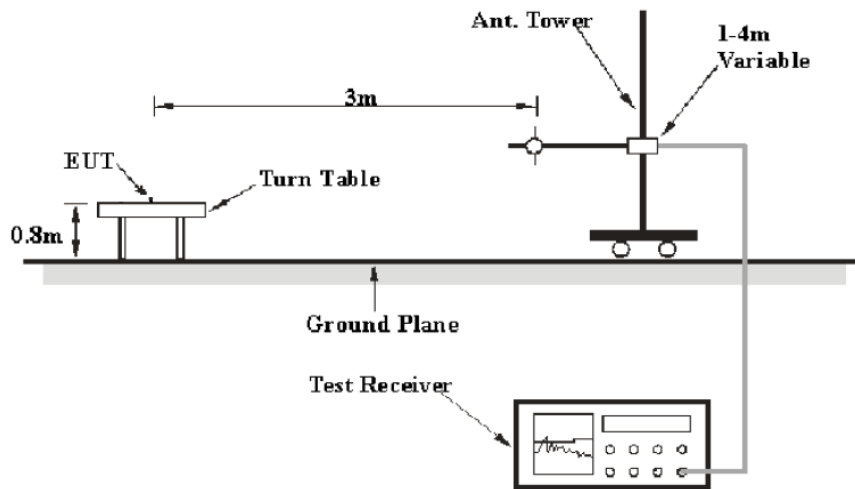
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

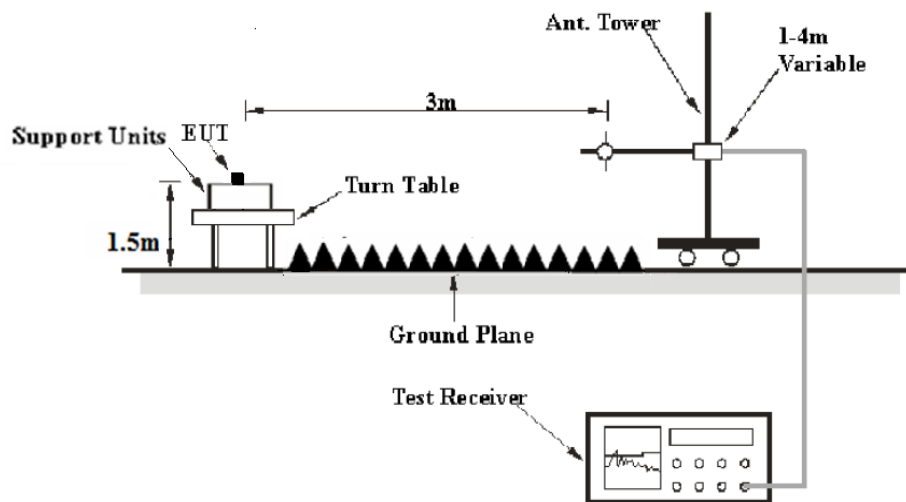
FCC §15.247 (d); §15.209; §15.205;

### 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	Video B/W	Duty Cycle	Detector	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	/	/	QP	120 kHz	QP
1GHz-18GHz	1MHz	3 MHz	/	PK	/	PK
	1MHz	10 Hz	≥98%	PK	/	Ave.
	1MHz	1/T	<98%	PK	/	Ave.
18GHz-25GHz	1MHz	3 MHz	/	PK	/	PK
	1MHz	3 MHz	/	Ave.	/	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 30MHz - 1GHz, 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:

$$\text{Corrected Amplitude (dB}\mu\text{V/m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

The “**Margin**” column of the following data tables indicates the degree of Compliant 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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V/m)}$$

### 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**

<b>Temperature:</b>	24.6~25.2 °C
<b>Relative Humidity:</b>	48~50 %
<b>ATM Pressure:</b>	101.1~101.2kPa

The testing was performed by Jack Jiao from 2019-05-31 to 2019-08-02.

EUT operation mode: Transmitting

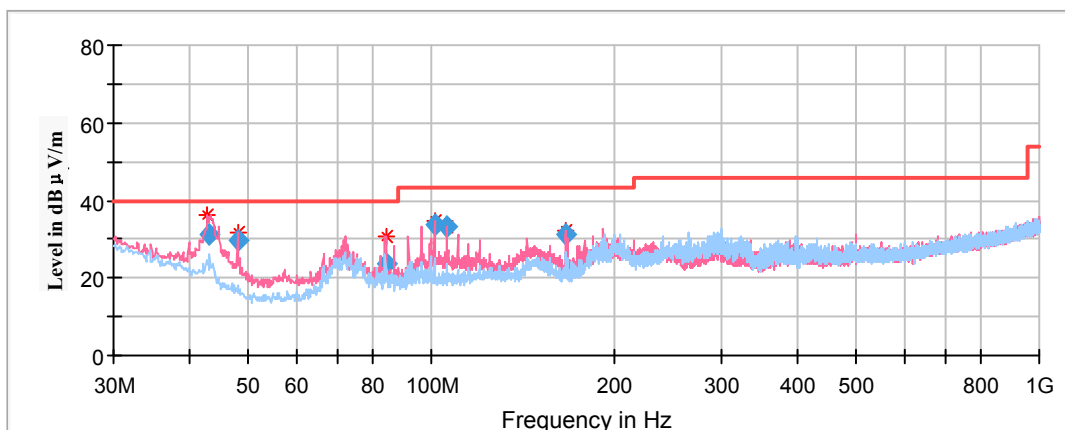
**For Wi-Fi Mode**

**Spurious Emission Test:**

**ANT1:**

**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 low channel of 802.11b mode in Z-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)				
42.924800	31.30	101.0	V	23.0	-12.7	40.00	8.70
47.992100	29.93	101.0	V	163.0	-16.1	40.00	10.07
84.022550	23.89	199.0	V	257.0	-17.7	40.00	16.11
101.150600	33.82	101.0	V	335.0	-14.7	43.50	9.68
105.822050	33.22	101.0	V	281.0	-13.8	43.50	10.28
166.010900	31.29	101.0	V	2.0	-13.0	43.50	12.21



**1GHz-18GHz:**

**802.11b Mode:**

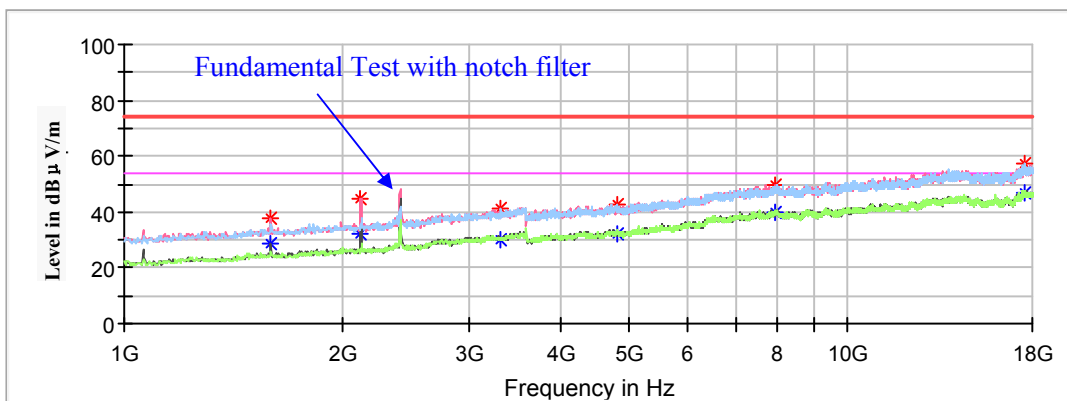
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

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**

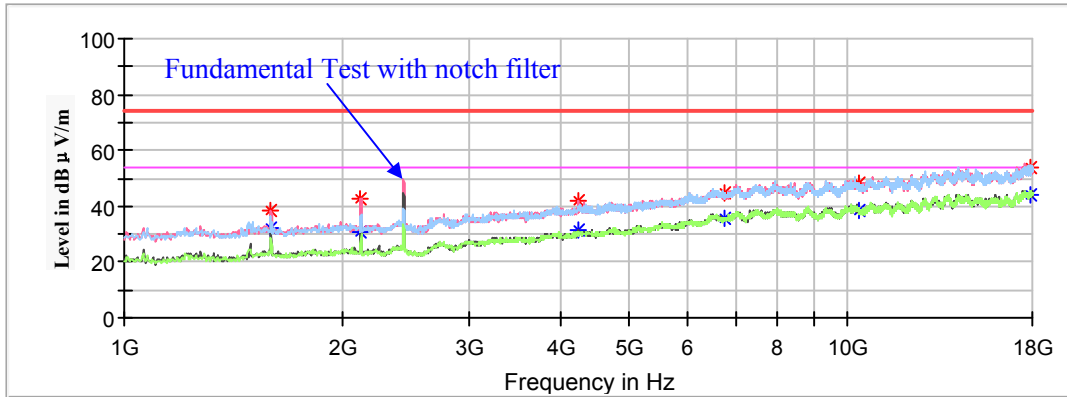
Full Spectrum



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	---	28.50	150.0	V	142.0	-9.6	54.00	25.50
1595.000000	37.56	---	150.0	V	142.0	-9.6	74.00	36.44
2122.000000	---	31.86	200.0	V	177.0	-7.9	54.00	22.14
2122.000000	44.86	---	200.0	V	177.0	-7.9	74.00	29.14
3318.800000	---	30.34	200.0	H	99.0	-3.8	54.00	23.66
3318.800000	41.00	---	200.0	H	99.0	-3.8	74.00	33.00
4791.000000	---	31.92	150.0	H	342.0	-0.6	54.00	22.08
4791.000000	42.43	---	150.0	H	342.0	-0.6	74.00	31.57
7959.800000	---	39.56	200.0	V	200.0	7.0	54.00	14.44
7959.800000	49.80	---	200.0	V	200.0	7.0	74.00	24.20
17554.600000	---	46.62	200.0	H	169.0	14.2	54.00	7.38
17554.600000	57.58	---	200.0	H	169.0	14.2	74.00	16.42

**Middle Channel: 2437MHz**

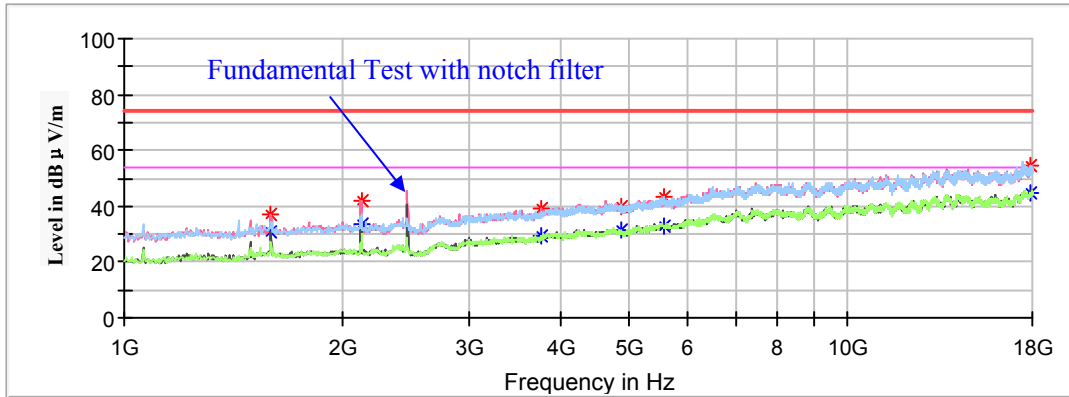
Full Spectrum



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	---	32.12	250.0	V	183.0	-9.6	54.00	21.88
1595.000000	38.33	---	250.0	V	183.0	-9.6	74.00	35.67
2122.000000	---	30.64	250.0	V	164.0	-7.9	54.00	23.36
2122.000000	42.70	---	250.0	V	164.0	-7.9	74.00	31.30
4250.400000	---	31.36	200.0	V	310.0	-1.4	54.00	22.64
4250.400000	42.08	---	200.0	V	310.0	-1.4	74.00	31.92
6749.400000	---	35.99	150.0	H	238.0	4.9	54.00	18.01
6749.400000	44.62	---	150.0	H	238.0	4.9	74.00	29.38
10333.000000	---	38.35	150.0	H	15.0	8.7	54.00	15.65
10333.000000	48.23	---	150.0	H	15.0	8.7	74.00	25.77
17915.000000	---	44.27	200.0	H	89.0	13.6	54.00	9.73
17915.000000	53.95	---	200.0	H	89.0	13.6	74.00	20.05

**High Channel: 2462MHz**

Full Spectrum



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	---	30.98	150.0	V	197.0	-9.6	54.00	23.02
1595.000000	37.12	---	150.0	V	197.0	-9.6	74.00	36.88
2125.400000	---	33.38	250.0	V	145.0	-7.9	54.00	20.62
2125.400000	42.26	---	250.0	V	145.0	-7.9	74.00	31.74
3774.400000	---	29.08	200.0	V	117.0	-2.6	54.00	24.92
3774.400000	39.30	---	200.0	V	117.0	-2.6	74.00	34.70
4848.800000	---	31.19	250.0	H	117.0	-0.5	54.00	22.81
4848.800000	39.77	---	250.0	H	117.0	-0.5	74.00	34.23
5583.200000	---	32.73	200.0	H	297.0	1.6	54.00	21.27
5583.200000	43.36	---	200.0	H	297.0	1.6	74.00	30.64
17881.000000	---	44.67	150.0	H	164.0	13.7	54.00	9.33
17881.000000	54.27	---	150.0	H	164.0	13.7	74.00	19.73

**802.11g Mode:**

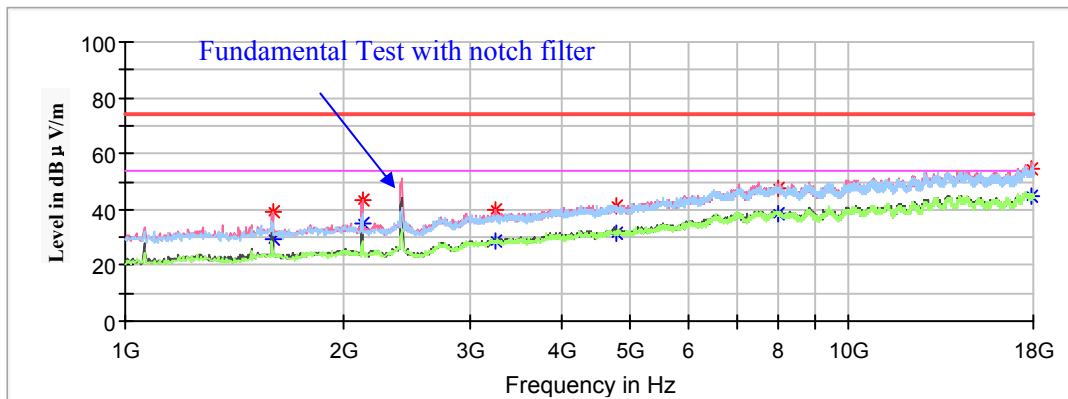
(Pre-scan in the X,Y and Z axes of orientation, the worst case Z-axis of orientation was recorded)

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**

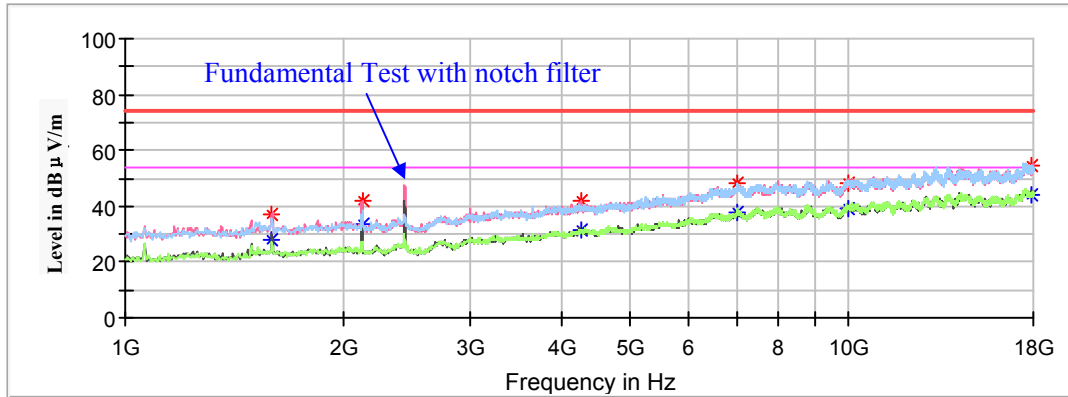
Full Spectrum



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	---	29.48	200.0	V	215.0	-9.6	54.00	24.52
1598.400000	39.05	---	200.0	V	215.0	-9.6	74.00	34.95
2128.800000	---	35.20	150.0	V	173.0	-7.9	54.00	18.80
2128.800000	43.09	---	150.0	V	173.0	-7.9	74.00	30.91
3247.400000	---	28.41	150.0	V	241.0	-4.0	54.00	25.59
3247.400000	39.61	---	150.0	V	241.0	-4.0	74.00	34.39
4763.800000	---	31.39	200.0	H	181.0	-0.6	54.00	22.61
4763.800000	41.11	---	200.0	H	181.0	-0.6	74.00	32.89
8010.800000	---	38.60	200.0	H	320.0	7.0	54.00	15.40
8010.800000	47.60	---	200.0	H	320.0	7.0	74.00	26.40
17843.600000	---	44.62	150.0	H	347.0	13.7	54.00	9.38
17843.600000	54.52	---	150.0	H	347.0	13.7	74.00	19.48

**Middle Channel: 2437MHz**

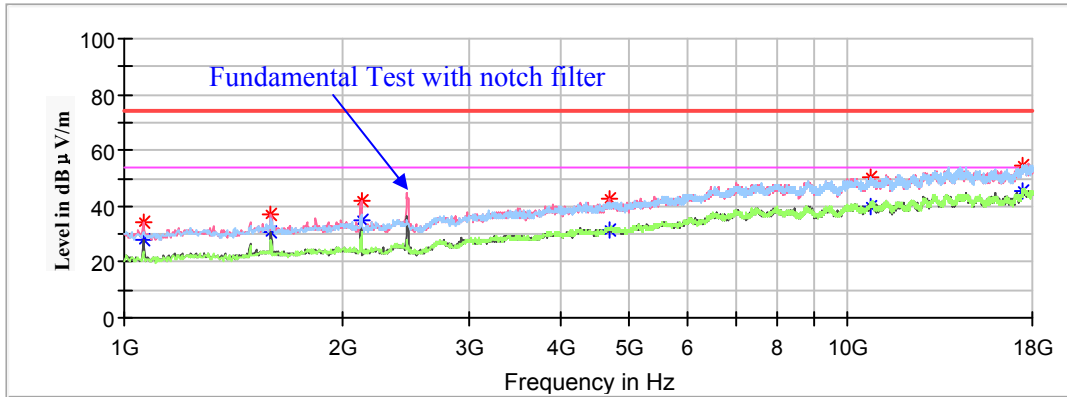
Full Spectrum



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	---	28.18	200.0	V	137.0	-9.6	54.00	25.82
1591.600000	37.39	---	200.0	V	137.0	-9.6	74.00	36.61
2125.400000	---	33.47	200.0	V	166.0	-7.9	54.00	20.53
2125.400000	42.02	---	200.0	V	166.0	-7.9	74.00	31.98
4257.200000	---	31.18	200.0	V	235.0	-1.4	54.00	22.82
4257.200000	42.02	---	200.0	V	235.0	-1.4	74.00	31.98
7031.600000	---	38.02	150.0	H	21.0	5.4	54.00	15.98
7031.600000	48.05	---	150.0	H	21.0	5.4	74.00	25.95
10006.600000	---	39.21	200.0	H	157.0	8.2	54.00	14.79
10006.600000	48.46	---	200.0	H	157.0	8.2	74.00	25.54
17836.800000	---	44.28	150.0	H	295.0	13.7	54.00	9.72
17836.800000	54.63	---	150.0	H	295.0	13.7	74.00	19.37

**High Channel: 2462MHz**

Full Spectrum



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)				
1061.200000	---	28.09	200.0	V	1.0	-12.3	54.00	25.91
1061.200000	34.14	---	200.0	V	1.0	-12.3	74.00	39.86
1595.000000	---	30.52	200.0	V	201.0	-9.6	54.00	23.48
1595.000000	37.10	---	200.0	V	201.0	-9.6	74.00	36.90
2128.800000	---	34.98	150.0	V	194.0	-7.9	54.00	19.02
2128.800000	42.19	---	150.0	V	194.0	-7.9	74.00	31.81
4672.000000	---	31.65	150.0	V	296.0	-0.7	54.00	22.35
4672.000000	42.62	---	150.0	V	296.0	-0.7	74.00	31.38
10737.600000	---	40.00	200.0	H	0.0	9.4	54.00	14.00
10737.600000	50.61	---	200.0	H	0.0	9.4	74.00	23.39
17503.600000	---	45.19	150.0	V	34.0	14.3	54.00	8.81
17503.600000	54.57	---	150.0	V	34.0	14.3	74.00	19.43

**802.11n-HT20 Mode:**

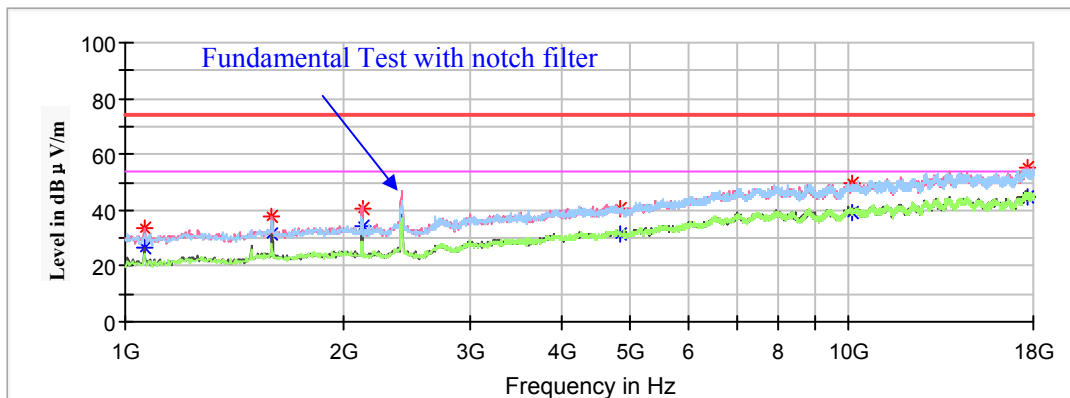
(Pre-scan in the X,Y and Z axes of orientation, the worst case Z-axis of orientation was recorded)

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**

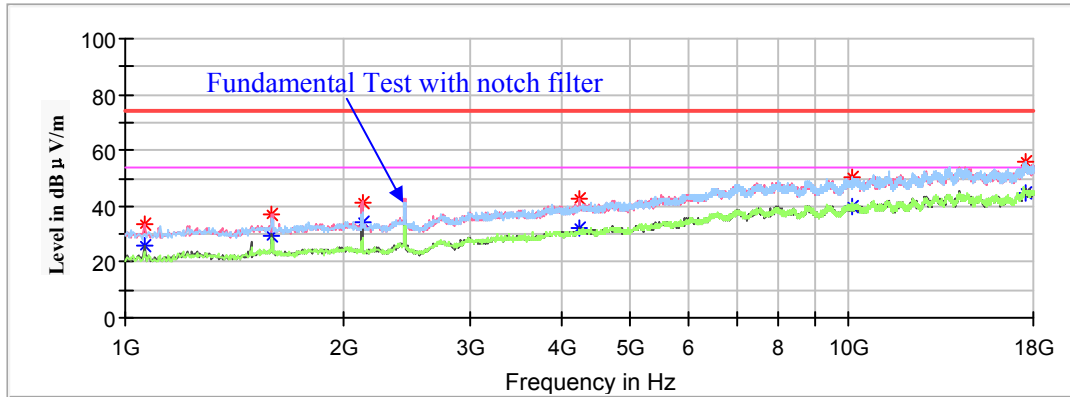
Full Spectrum



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)				
1061.200000	---	26.66	150.0	V	354.0	-12.3	54.00	27.34
1061.200000	33.66	---	150.0	V	354.0	-12.3	74.00	40.34
1595.000000	---	31.80	200.0	V	195.0	-9.6	54.00	22.20
1595.000000	37.47	---	200.0	V	195.0	-9.6	74.00	36.53
2128.800000	---	34.49	200.0	V	21.0	-7.9	54.00	19.51
2128.800000	40.36	---	200.0	V	21.0	-7.9	74.00	33.64
4824.000000	---	31.79	150.0	H	133.0	-0.5	54.00	22.21
4824.000000	40.26	---	150.0	H	133.0	-0.5	74.00	33.74
10105.200000	---	39.18	200.0	V	215.0	8.4	54.00	14.82
10105.200000	49.51	---	200.0	V	215.0	8.4	74.00	24.49
17677.000000	---	44.98	150.0	V	170.0	14.0	54.00	9.02
17677.000000	55.49	---	150.0	V	170.0	14.0	74.00	18.51

**Middle Channel: 2437MHz**

Full Spectrum

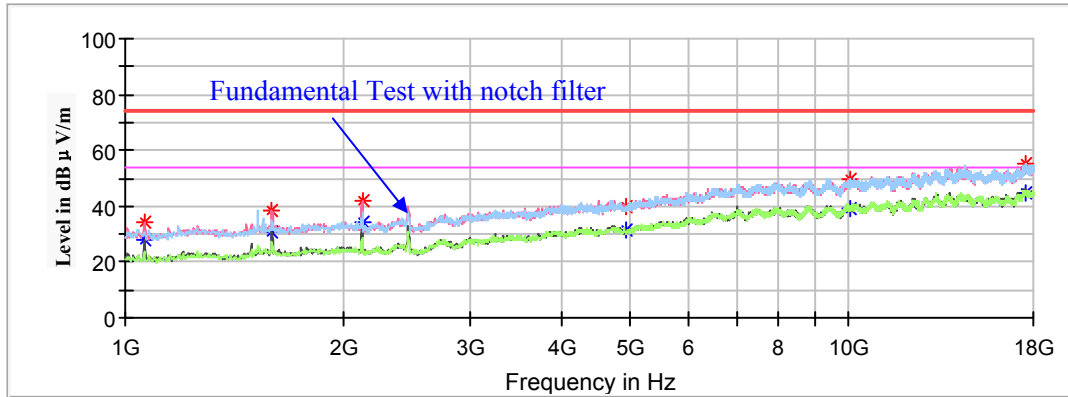


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1061.200000	---	25.98	200.0	V	2.0	-12.3	54.00	28.02
1061.200000	33.81	---	200.0	V	2.0	-12.3	74.00	40.19
1591.600000	---	29.71	200.0	V	194.0	-9.6	54.00	24.29
1591.600000	36.88	---	200.0	V	194.0	-9.6	74.00	37.12
2128.800000	---	34.60	150.0	V	154.0	-7.9	54.00	19.40
2128.800000	41.25	---	150.0	V	154.0	-7.9	74.00	32.75
4250.400000	---	31.89	200.0	V	256.0	-1.4	54.00	22.11
4250.400000	42.73	---	200.0	V	256.0	-1.4	74.00	31.27
10125.600000	---	39.63	150.0	H	358.0	8.4	54.00	14.37
10125.600000	50.69	---	150.0	H	358.0	8.4	74.00	23.31
17517.200000	---	44.89	200.0	H	177.0	14.3	54.00	9.11
17517.200000	55.66	---	200.0	H	177.0	14.3	74.00	18.34



**High Channel : 2462MHz**

Full Spectrum

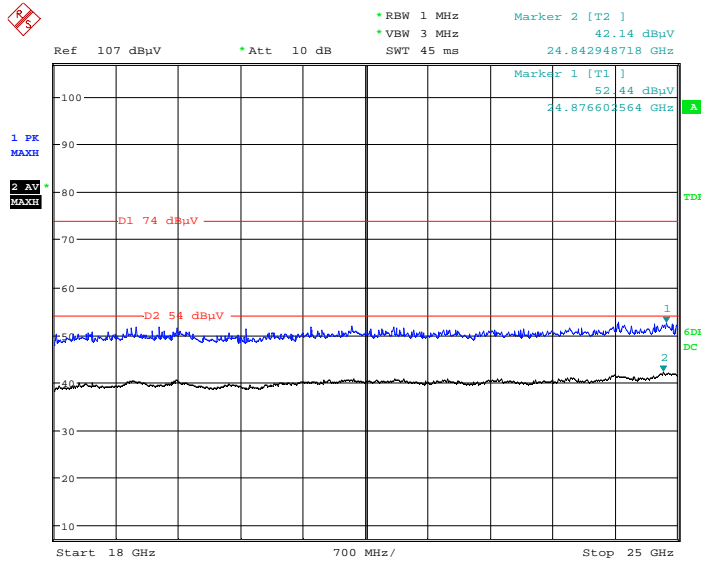


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1061.200000	---	28.01	200.0	V	358.0	-12.3	54.00	25.99
1061.200000	33.98	---	200.0	V	358.0	-12.3	74.00	40.02
1591.600000	---	31.11	200.0	V	206.0	-9.6	54.00	22.89
1591.600000	38.25	---	200.0	V	206.0	-9.6	74.00	35.75
2128.800000	---	34.35	150.0	V	130.0	-7.9	54.00	19.65
2128.800000	41.79	---	150.0	V	130.0	-7.9	74.00	32.21
4924.000000	---	31.16	200.0	V	247.0	-0.4	54.00	22.84
4924.000000	40.12	---	200.0	V	247.0	-0.4	74.00	33.88
10033.800000	---	39.28	150.0	H	351.0	8.3	54.00	14.72
10033.800000	49.81	---	150.0	H	351.0	8.3	74.00	24.19
17602.200000	---	44.90	150.0	H	175.0	14.1	54.00	9.10
17602.200000	55.01	---	150.0	H	175.0	14.1	74.00	18.99

**18GHz-25GHz:**

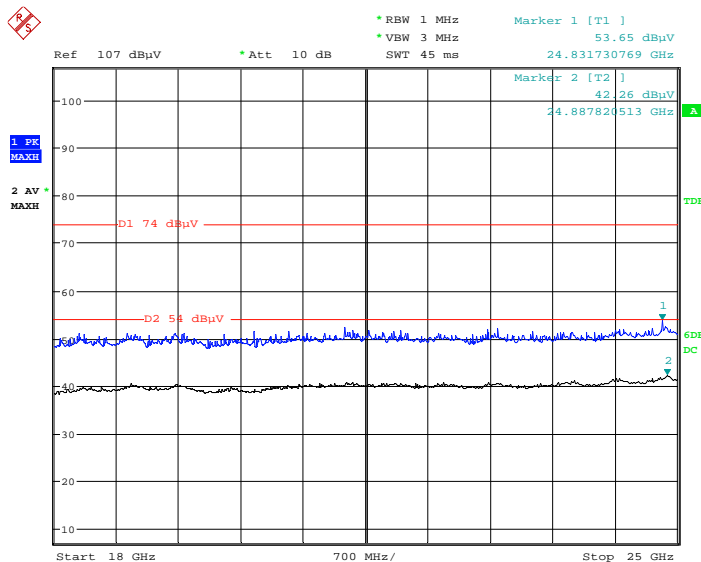
*Pre-scan with 802.11b, 802.11g and 802.11n-HT20 modes of operation in the X,Y and Z axes of orientation, the worst case low channel of 802.11b mode in Z-axis of orientation was recorded*

**Vertical**



Date: 2.AUG.2019 04:40:10

**Horizontal**



Date: 2.AUG.2019 05:42:05

**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:** (Pre-scan in the X, Y and Z axes of orientation, the worst case Z-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								
2390.000000	---	40.09	200.0	V	42.0	2.8	54.00	13.91
2390.000000	49.33	---	200.0	V	42.0	2.8	74.00	24.67
High Channel: 2462MHz								
2483.500000	---	43.08	150.0	V	220.0	3.0	54.00	10.92
2483.500000	49.32	---	150.0	V	220.0	3.0	74.00	24.68

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

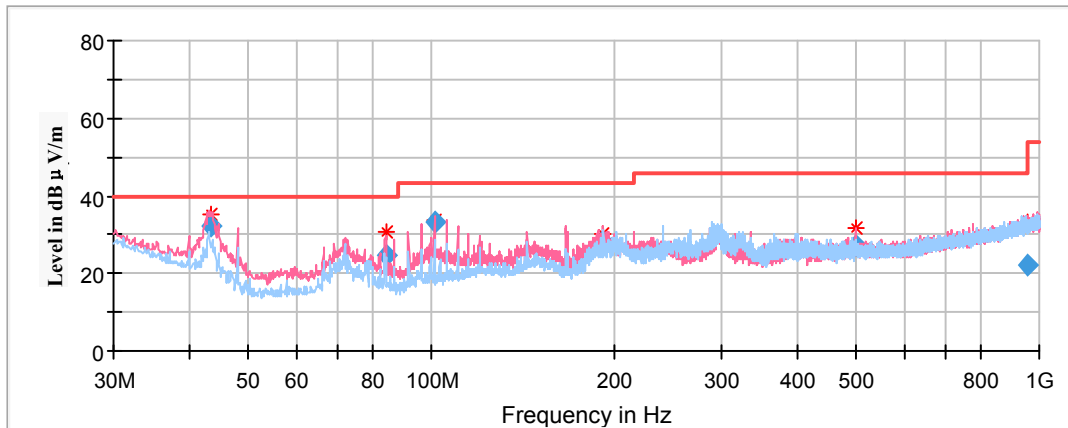
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2390.000000	---	48.02	150.0	V	260.0	2.8	54.00	5.98
2390.000000	57.70	---	150.0	V	260.0	2.8	74.00	16.30
High Channel: 2462MHz								
2483.500000	---	48.89	200.0	V	273.0	3.0	54.00	5.11
2483.500000	59.77	---	200.0	V	223.0	3.0	74.00	14.23

**802.11n-HT20 Mode:** (Pre-scan in the X, Y and Z axes of orientation, the worst case Z-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								
2390.000000	---	39.28	150.0	V	122.0	2.8	54.00	14.72
2390.000000	50.02	---	150.0	V	122.0	2.8	74.00	23.98
High Channel: 2462MHz								
2483.500000	---	41.89	200.0	V	13.0	3.0	54.00	12.11
2483.500000	50.95	---	200.0	V	13.0	3.0	74.00	23.05

**ANT2:  
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 middle channel of 802.11b mode in Z-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)				
43.272050	32.42	100.0	V	23.0	-12.9	40.00	7.58
84.052000	24.45	100.0	V	314.0	-17.7	40.00	15.55
101.148250	32.96	200.0	V	330.0	-14.7	43.50	10.54
191.969000	28.42	200.0	V	0.0	-12.8	43.50	15.08
498.156300	27.33	100.0	V	347.0	-6.2	46.00	18.67
956.025150	22.18	100.0	V	309.0	1.4	46.00	23.82

**1GHz-18GHz:**

**802.11b Mode:**

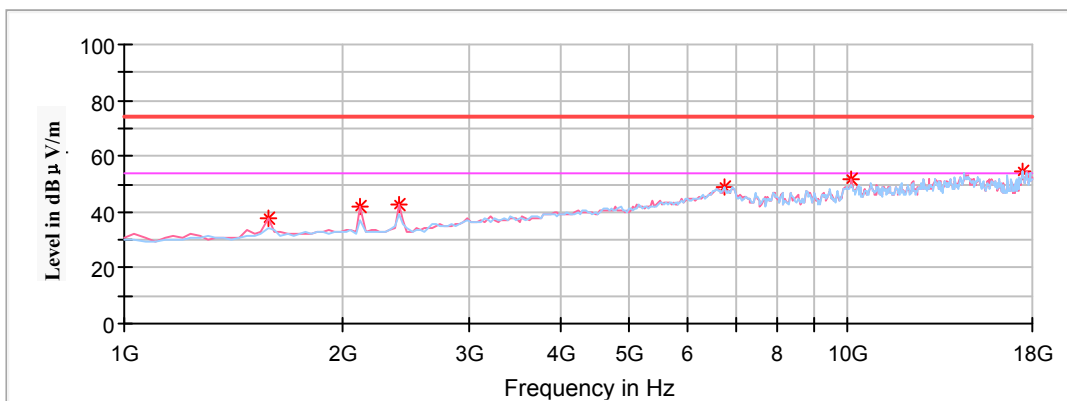
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

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**

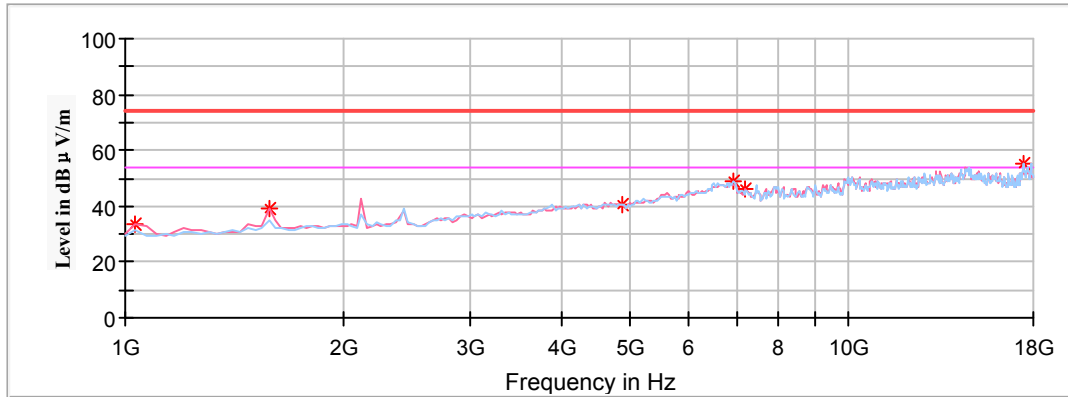
Full Spectrum



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)				
1579.160000	---	30.25	250	V	127	-9.7	54.00	23.75
1579.160000	37.65	---	250	V	127	-9.7	74.00	36.35
2124.230000	---	32.66	250	V	121	-7.9	54.00	21.34
2124.230000	41.76	---	250	V	121	-7.9	74.00	32.24
2396.790000	---	37.26	200	V	191	-7.2	54.00	16.74
2396.790000	42.95	---	200	V	191	-7.2	74.00	31.05
6757.520000	---	41.58	100	H	128	4.9	54.00	12.42
6757.520000	49.24	---	100	H	128	4.9	74.00	24.76
10130.260000	---	43.46	200	V	235	8.4	54.00	10.54
10130.260000	51.47	---	200	V	235	8.4	74.00	22.53
17454.910000	---	45.36	100	H	32	14.0	54.00	8.64
17454.910000	54.86	---	100	H	32	14.0	74.00	19.14

**Middle Channel: 2437MHz**

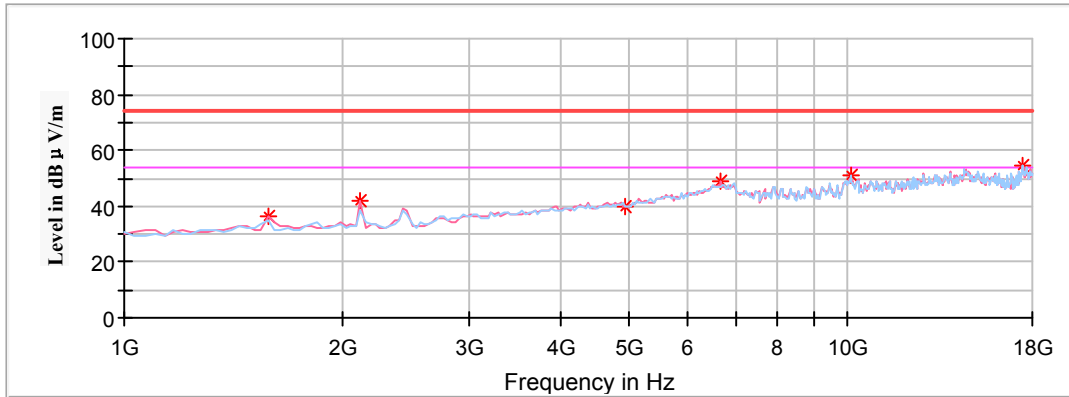
Full Spectrum



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)				
1034.070000	---	24.89	250	V	222	-12.5	54.00	29.11
1034.070000	33.53	---	250	V	222	-12.5	74.00	40.47
1579.160000	---	31.65	250	V	144	-9.7	54.00	22.35
1579.160000	39.12	---	250	V	144	-9.7	74.00	34.88
4849.700000	---	32.69	200	V	231	-0.5	54.00	21.31
4849.700000	40.69	---	200	V	231	-0.5	74.00	33.31
6927.860000	---	41.25	100	H	86	5.2	54.00	12.75
6927.860000	48.90	---	100	H	86	5.2	74.00	25.1
7200.400000	---	36.81	200	V	117	5.7	54.00	17.19
7200.400000	45.81	---	200	V	117	5.7	74.00	28.19
17454.910000	---	47.25	100	H	86	14.0	54.00	6.75
17454.910000	55.36	---	100	H	86	14.0	74.00	18.64

**High Channel: 2462MHz**

Full Spectrum



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)				
1579.160000	---	26.36	250	V	72	-9.7	54.00	27.64
1579.160000	36.25	---	250	V	72	-9.7	74.00	37.75
2124.250000	---	32.25	250	V	64	-7.9	54.00	21.75
2124.250000	41.73	---	250	V	64	-7.9	74.00	32.27
4917.840000	---	30.58	200	V	82	-0.4	54.00	23.42
4917.840000	40.05	---	200	V	82	-0.4	74.00	33.95
6689.380000	---	39.21	100	H	262	4.8	54.00	14.79
6689.380000	48.78	---	100	H	262	4.8	74.00	25.22
10096.190000	---	41.43	200	V	141	8.4	54.00	12.57
10096.190000	50.71	---	200	V	141	8.4	74.00	23.29
17454.910000	---	45.15	100	H	326	14.0	54.00	8.85
17454.910000	54.58	---	100	H	326	14.0	74.00	19.42

**802.11g Mode:**

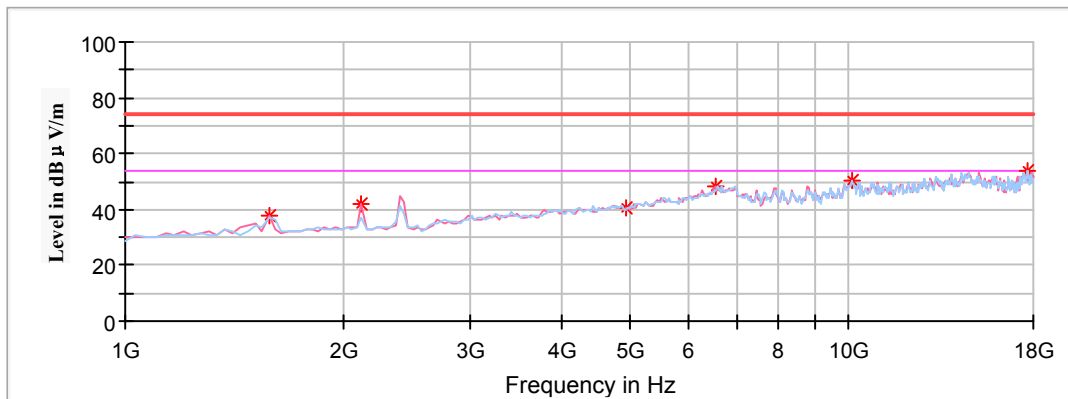
(Pre-scan in the X,Y and Z axes of orientation, the worst case Z-axis of orientation was recorded)

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**

Full Spectrum

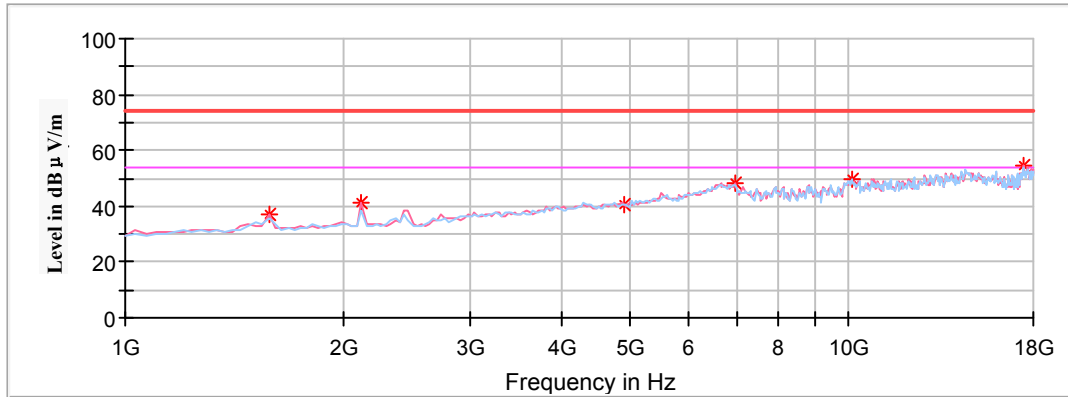


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	Max Peak (dBµV/m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1579.160000	---	37.89	250	V	136	-9.7	54.00	16.11
1579.160000	37.75	---	250	V	136	-9.7	74.00	36.25
2124.250000	---	42.58	250	V	114	-7.9	54.00	11.42
2124.250000	41.67	---	250	V	114	-7.9	74.00	32.33
4917.840000	---	31.25	200	V	1	-0.4	54.00	22.75
4917.840000	40.71	---	200	V	1	-0.4	74.00	33.29
6553.110000	---	39.36	100	H	30	4.5	54.00	14.64
6553.110000	48.46	---	100	H	30	4.5	74.00	25.54
10096.190000	---	41.35	200	V	333	8.4	54.00	12.65
10096.190000	50.42	---	200	V	333	8.4	74.00	23.58
17659.320000	---	44.78	100	H	314	14.0	54.00	9.22
17659.320000	53.84	---	100	H	314	14.0	74.00	20.16



**Middle Channel: 2437MHz**

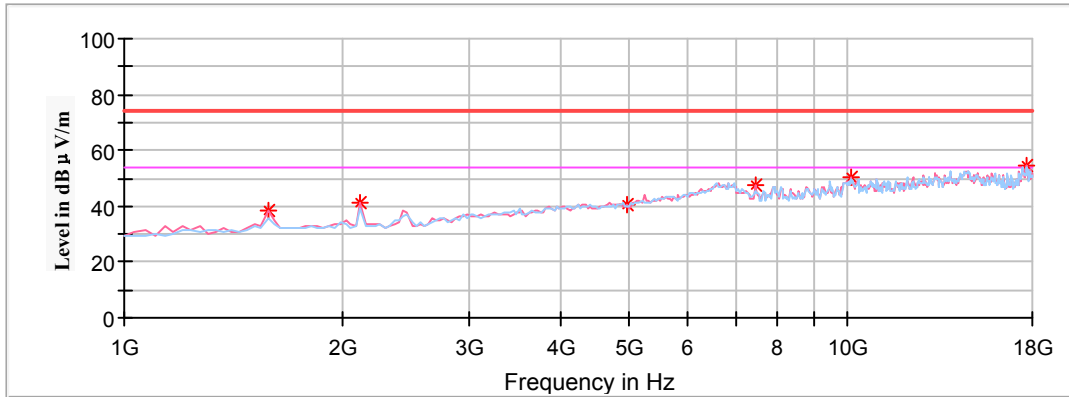
Full Spectrum



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)				
1579.160000	---	26.02	250	V	62	-9.7	54.00	27.98
1579.160000	36.93	---	250	V	62	-9.7	74.00	37.07
2124.250000	---	30.36	250	V	108	-7.9	54.00	23.64
2124.250000	41.33	---	250	V	108	-7.9	74.00	32.67
4883.770000	---	30.89	200	V	176	-0.4	54.00	23.11
4883.770000	40.58	---	200	V	176	-0.4	74.00	33.42
6961.920000	---	37.64	100	H	306	5.3	54.00	16.36
6961.920000	48.06	---	100	H	306	5.3	74.00	25.94
10096.190000	---	38.69	200	V	20	8.4	54.00	15.31
10096.190000	49.94	---	200	V	20	8.4	74.00	24.06
17454.910000	---	45.69	100	H	199	14.0	54.00	8.31
17454.910000	54.26	---	100	H	199	14.0	74.00	19.74

**High Channel: 2462MHz**

Full Spectrum



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)				
1579.160000	---	37.21	250	V	130	-9.7	54.00	16.79
1579.160000	38.24	---	250	V	130	-9.7	74.00	35.76
2124.250000	---	30.26	250	V	145	-7.9	54.00	23.74
2124.250000	41.14	---	250	V	145	-7.9	74.00	32.86
4951.900000	---	30.62	200	V	314	-0.3	54.00	23.38
4951.900000	40.36	---	200	V	314	-0.3	74.00	33.64
7438.880000	---	36.52	100	H	26	6.0	54.00	17.48
7438.880000	47.63	---	100	H	26	6.0	74.00	26.37
10096.190000	---	39.15	200	V	44	8.4	54.00	14.85
10096.190000	50.32	---	200	V	44	8.4	74.00	23.68
17659.320000	---	43.39	100	H	234	14.0	54.00	10.61
17659.320000	54.32	---	100	H	234	14.0	74.00	19.68

**802.11n-HT20 Mode:**

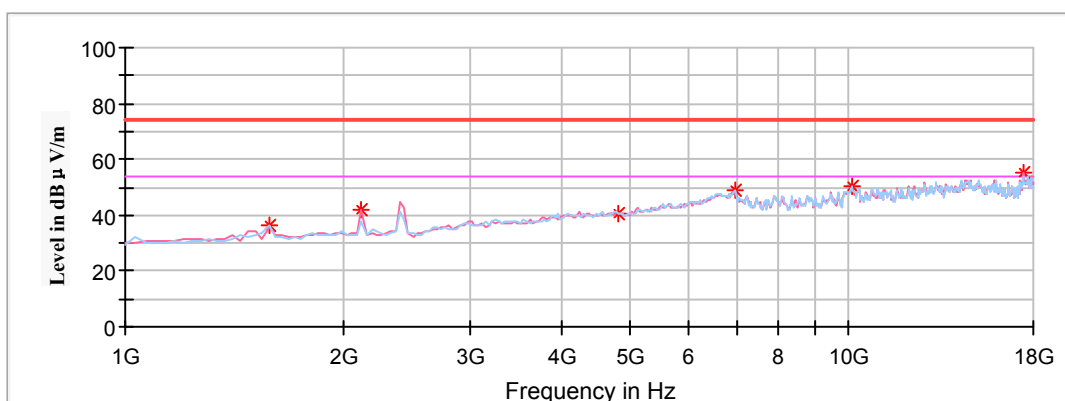
(Pre-scan in the X,Y and Z axes of orientation, the worst case Z-axis of orientation was recorded)

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**

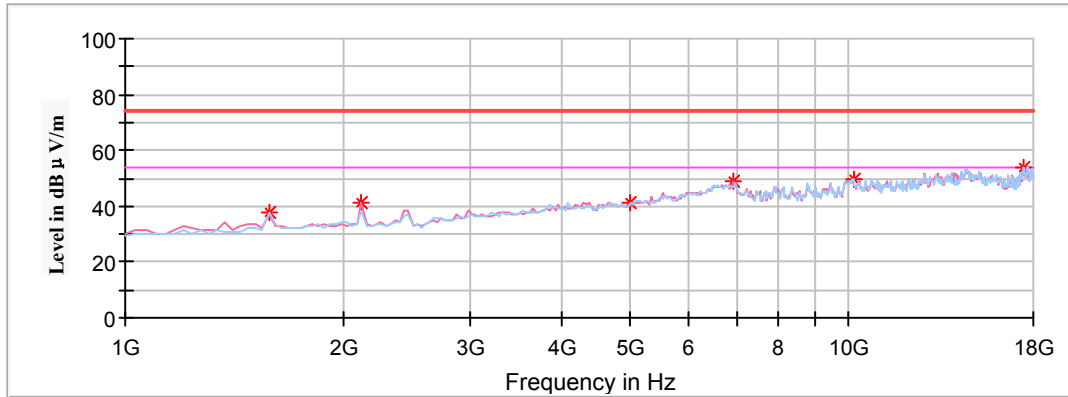
Full Spectrum



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)				
1579.160000	---	35.33	250	V	32	-9.7	54.00	18.67
1579.160000	36.40	---	250	V	32	-9.7	74.00	37.60
2124.250000	---	30.25	250	V	334	-7.9	54.00	23.75
2124.250000	41.73	---	250	V	334	-7.9	74.00	32.27
4815.630000	---	30.15	200	V	92	-0.5	54.00	23.85
4815.630000	40.58	---	200	V	92	-0.5	74.00	33.42
6961.920000	---	38.69	100	H	348	5.3	54.00	15.31
6961.920000	49.29	---	100	H	348	5.3	74.00	24.71
10096.190000	---	39.36	200	V	31	8.4	54.00	14.64
10096.190000	50.16	---	200	V	31	8.4	74.00	23.84
17454.910000	---	44.14	100	H	354	14.0	54.00	9.86
17454.910000	55.20	---	100	H	354	14.0	74.00	18.80

**Middle Channel: 2437MHz**

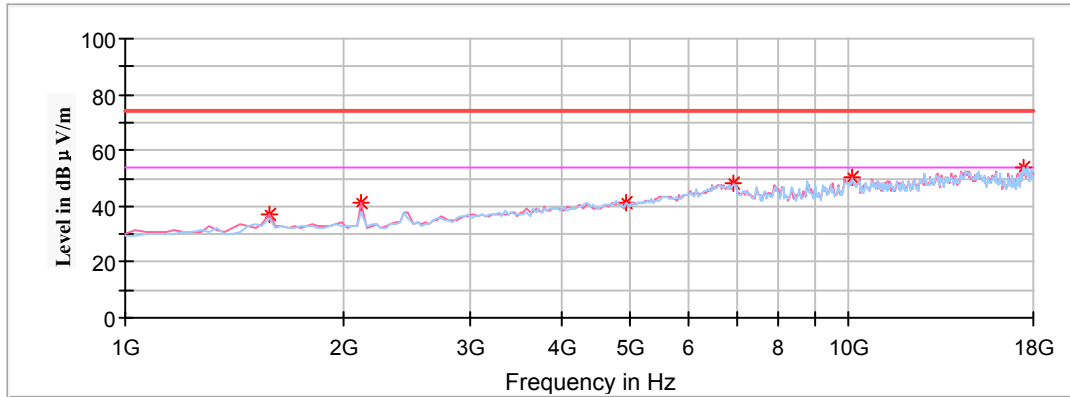
Full Spectrum



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)				
1579.160000	---	26.36	250	V	81	-9.7	54.00	27.64
1579.160000	37.93	---	250	V	81	-9.7	74.00	36.07
2124.250000	---	30.32	250	V	359	-7.9	54.00	23.68
2124.250000	41.42	---	250	V	359	-7.9	74.00	32.58
4985.970000	---	30.48	200	V	310	-0.3	54.00	23.52
4985.970000	41.53	---	200	V	310	-0.3	74.00	32.47
6927.860000	---	37.25	100	H	184	5.2	54.00	16.75
6927.860000	48.88	---	100	H	184	5.2	74.00	25.12
10164.330000	---	38.36	200	V	108	8.5	54.00	15.64
10164.330000	49.58	---	200	V	108	8.5	74.00	24.42
17454.910000	---	44.36	100	H	25	14.0	54.00	9.64
17454.910000	54.19	---	100	H	25	14.0	74.00	19.81

**High Channel : 2462MHz**

Full Spectrum

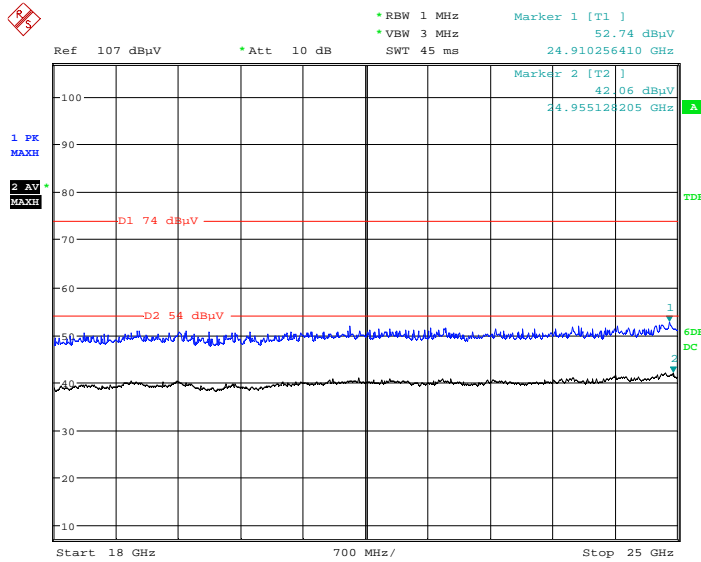


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1579.160000	---	36.36	250	V	11	-9.7	54.00	17.64
1579.160000	37.32	---	250	V	11	-9.7	74.00	36.68
2124.250000	---	40.65	250	V	185	-7.9	54.00	13.35
2124.250000	41.51	---	250	V	185	-7.9	74.00	32.49
4917.840000	---	31.06	200	V	211	-0.4	54.00	22.94
4917.840000	41.10	---	200	V	211	-0.4	74.00	32.90
6927.860000	---	37.56	100	H	231	5.2	54.00	16.44
6927.860000	48.21	---	100	H	231	5.2	74.00	25.79
10096.190000	---	39.25	200	V	173	8.4	54.00	14.75
10096.190000	50.25	---	200	V	173	8.4	74.00	23.75
17454.910000	---	43.36	100	H	201	14.0	54.00	10.64
17454.910000	54.09	---	100	H	201	14.0	74.00	19.91

**18GHz-25GHz:**

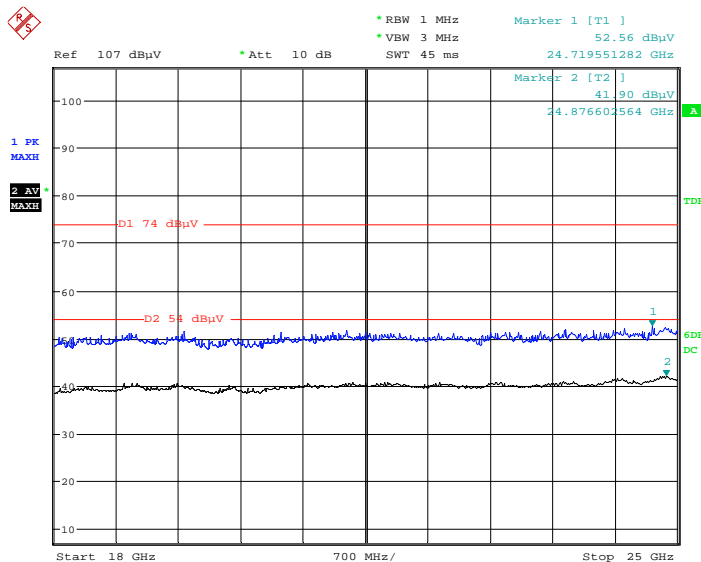
Pre-scan with 802.11b, 802.11g and 802.11n-HT20 modes of operation in the X,Y and Z axes of orientation, the worst case low channel of 802.11b mode in Z-axis of orientation was recorded

**Vertical**



Date: 2.AUG.2019 06:16:17

**Horizontal**



Date: 2.AUG.2019 06:36:15

**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:** (Pre-scan in the X, Y and Z axes of orientation, the worst case Z-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								
2390.000000	---	33.35	100	V	78	2.8	54.00	20.65
2390.000000	44.99	---	100	V	78	2.8	74.00	29.01
High Channel: 2462MHz								
2483.500000	---	37.20	100	V	213	3.0	54.00	16.80
2483.500000	47.79	---	100	V	213	3.0	74.00	26.21

**802.11g Mode:** (Pre-scan in the X, Y and Z axes of orientation, the worst case Z-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								
2390.000000	---	39.51	100	V	4.0	2.8	54.00	14.49
2390.000000	49.53	---	100	V	4.0	2.8	74.00	24.47
High Channel: 2462MHz								
2483.500000	---	41.10	100	V	305	3.0	54.00	12.90
2483.500000	54.81	---	100	V	305	3.0	74.00	19.19

**802.11n-HT20 Mode:** (Pre-scan in the X, Y and Z axes of orientation, the worst case Z-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								
2390.000000	---	39.58	100	V	96	2.8	54.00	14.42
2390.000000	48.23	---	100	V	96	2.8	74.00	25.77
High Channel: 2462MHz								
2483.500000	---	36.71	100	V	32	3.0	54.00	17.29
2483.500000	52.23	---	100	V	32	3.0	74.00	21.77

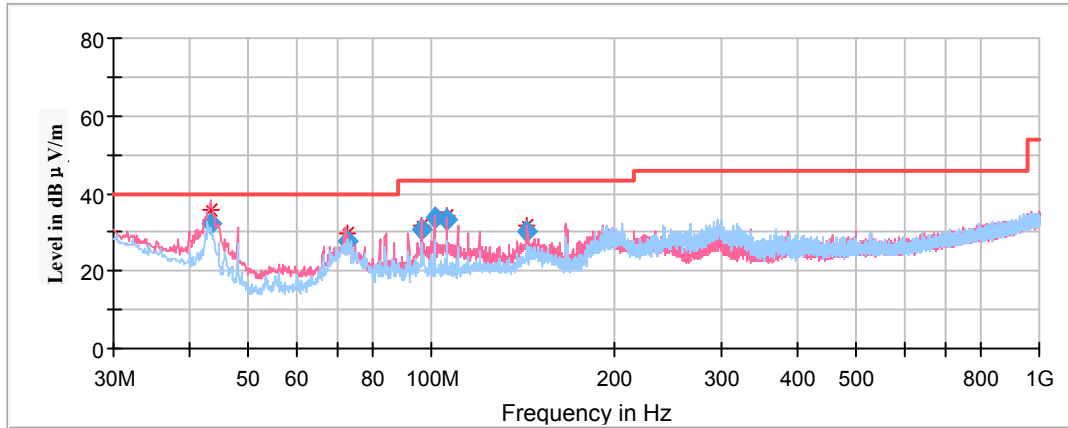
**For BLE Mode**

**Spurious Emission Test:**

**ANT1:**

**30MHz-1GHz:**

*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case low channel of operation in the 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)				
43.294600	32.25	100.0	V	155.0	-13.0	40.00	7.75
72.918850	27.85	200.0	V	324.0	-17.4	40.00	12.15
96.454900	30.70	100.0	V	0.0	-15.8	43.50	12.80
101.137400	33.85	100.0	V	263.0	-14.7	43.50	9.65
105.827750	33.32	100.0	V	248.0	-13.8	43.50	10.18
144.007700	30.31	100.0	V	263.0	-12.1	43.50	13.19



**1GHz-18GHz:**

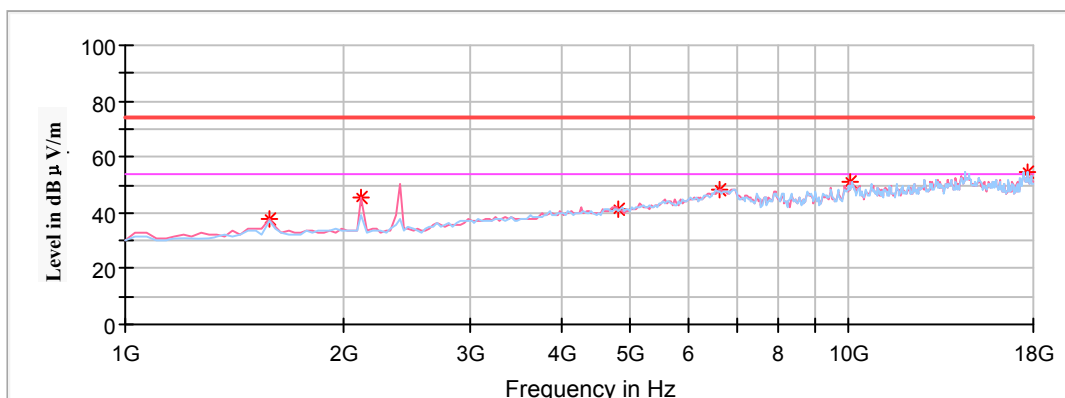
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

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**

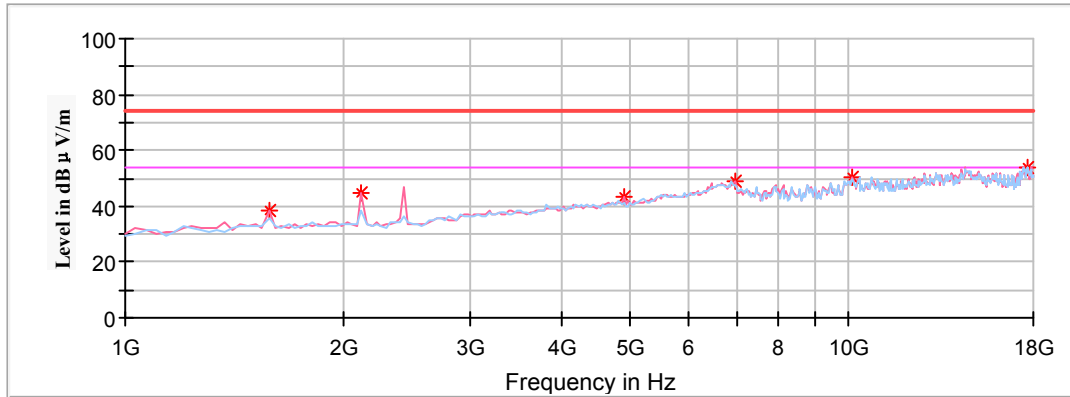
Full Spectrum



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)				
1579.160000	---	26.65	250	V	65	-9.7	54.00	27.35
1579.160000	37.54	---	250	V	65	-9.7	74.00	36.46
2124.250000	---	34.96	250	V	201	-7.9	54.00	19.04
2124.250000	45.23	---	250	V	201	-7.9	74.00	28.77
4815.630000	---	30.36	200	V	191	-0.5	54.00	23.64
4815.630000	41.31	---	200	V	191	-0.5	74.00	32.69
6621.240000	---	37.69	100	H	156	4.6	54.00	16.31
6621.240000	48.60	---	100	H	156	4.6	74.00	25.4
10028.060000	---	40.25	200	V	221	8.3	54.00	13.75
10028.060000	50.88	---	200	V	221	8.3	74.00	23.12
17659.320000	---	45.63	100	H	316	14.0	54.00	8.37
17659.320000	54.39	---	100	H	316	14.0	74.00	19.61

**Middle Channel: 2440MHz**

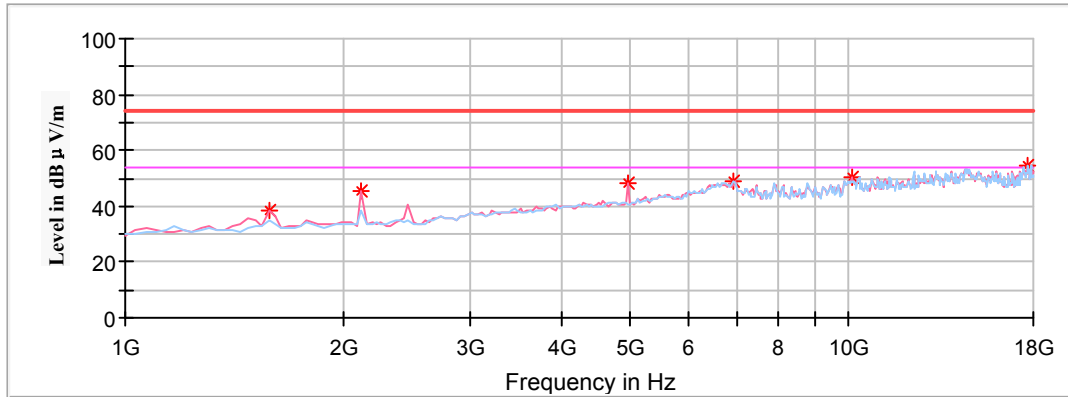
Full Spectrum



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)				
1579.160000	---	26.75	250	V	200	-9.7	54.00	27.25
1579.160000	38.33	---	250	V	200	-9.7	74.00	35.67
2124.250000	---	33.65	250	V	295	-7.9	54.00	20.35
2124.250000	44.99	---	250	V	295	-7.9	74.00	29.01
4883.770000	---	31.25	200	V	8	-0.4	54.00	22.75
4883.770000	43.44	---	200	V	8	-0.4	74.00	30.56
6961.920000	---	36.83	100	H	151	5.3	54.00	17.17
6961.920000	48.93	---	100	H	151	5.3	74.00	25.07
10096.190000	---	38.64	200	V	350	8.4	54.00	15.36
10096.190000	50.07	---	200	V	350	8.4	74.00	23.93
17659.320000	---	42.36	100	H	236	14.0	54.00	11.64
17659.320000	54.04	---	100	H	236	14.0	74.00	19.96

**High Channel: 2480MHz**

Full Spectrum

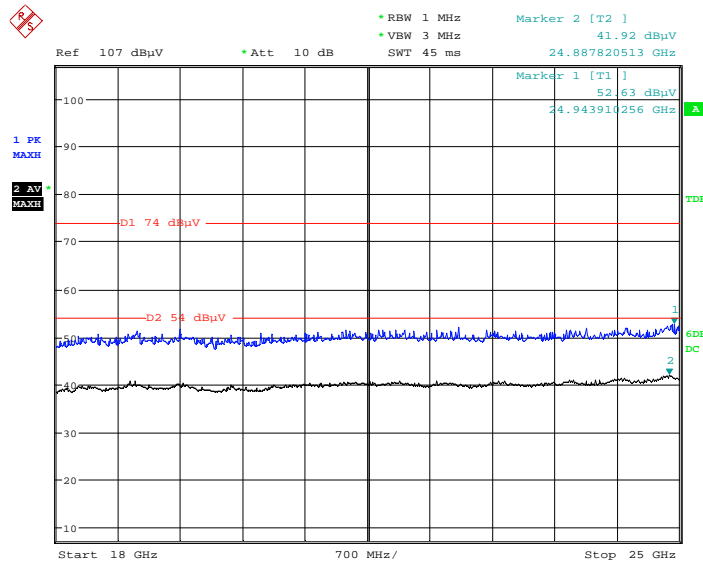


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1579.160000	---	27.36	250	V	264	-9.7	54.00	26.64
1579.160000	38.60	---	250	V	264	-9.7	74.00	35.40
2124.250000	---	34.25	250	V	167	-7.9	54.00	19.75
2124.250000	45.44	---	250	V	167	-7.9	74.00	28.56
4951.910000	---	37.59	200	V	26	-0.3	54.00	16.41
4951.910000	48.45	---	200	V	26	-0.3	74.00	25.55
6927.860000	---	38.15	100	H	11	5.2	54.00	15.85
6927.860000	49.09	---	100	H	11	5.2	74.00	24.91
10096.190000	---	40.68	200	V	260	8.4	54.00	13.32
10096.190000	50.48	---	200	V	260	8.4	74.00	23.52
17693.390000	---	43.45	100	H	235	14.0	54.00	10.55
17693.390000	54.60	---	100	H	235	14.0	74.00	19.40

**18GHz-25GHz:**

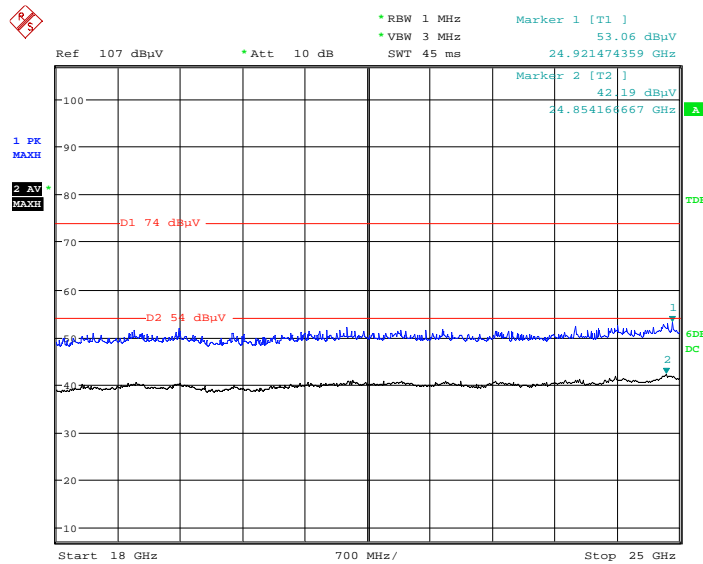
*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case low channel of operation in the X axis of orientation was recorded)*

**Vertical**



Date: 2.AUG.2019 06:56:08

**Horizontal**



Date: 2.AUG.2019 07:23:59

**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)

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

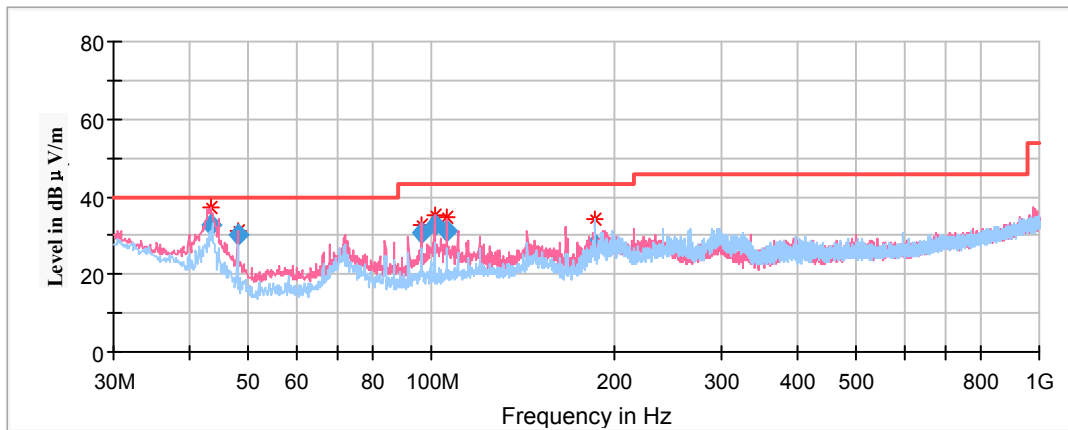
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2390.000000	---	35.93	100	V	115	2.8	54.00	18.07
2390.000000	46.11	---	100	V	115	2.8	74.00	27.89
High Channel: 2480MHz								
2483.500000	---	45.36	100	V	81	3.0	54.00	8.64
2483.500000	56.19	---	100	V	81	3.0	74.00	17.81

**Spurious Emission Test:**

**ANT2:**

**30MHz-1GHz:**

*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case low channel of operation in the 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)				
43.337500	32.50	100.0	V	73.0	-12.7	40.00	7.50
48.005900	30.38	100.0	V	99.0	-16.2	40.00	9.62
96.425500	30.77	100.0	V	287.0	-15.8	43.50	12.73
101.150900	32.64	100.0	V	250.0	-14.7	43.50	10.86
105.817250	31.36	100.0	V	265.0	-13.8	43.50	12.14
185.796350	27.88	200.0	H	314.0	-13.2	43.50	15.62

**1GHz-18GHz:**

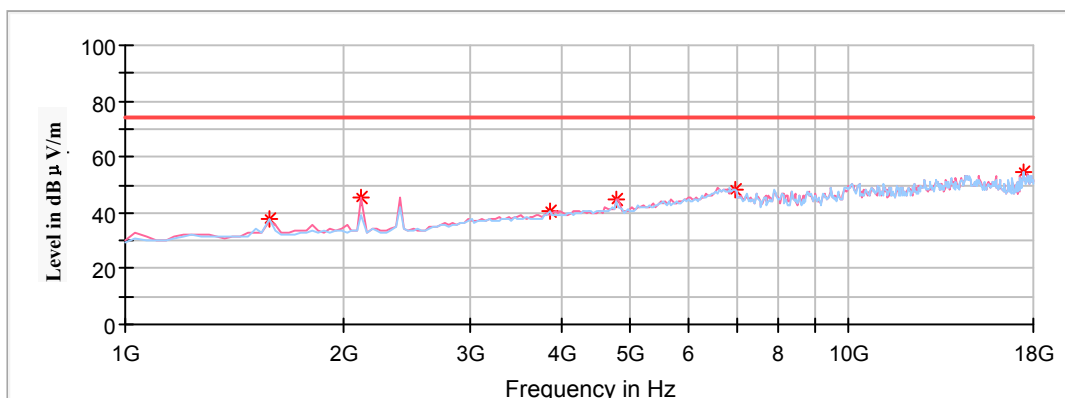
(Pre-scan in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)

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**

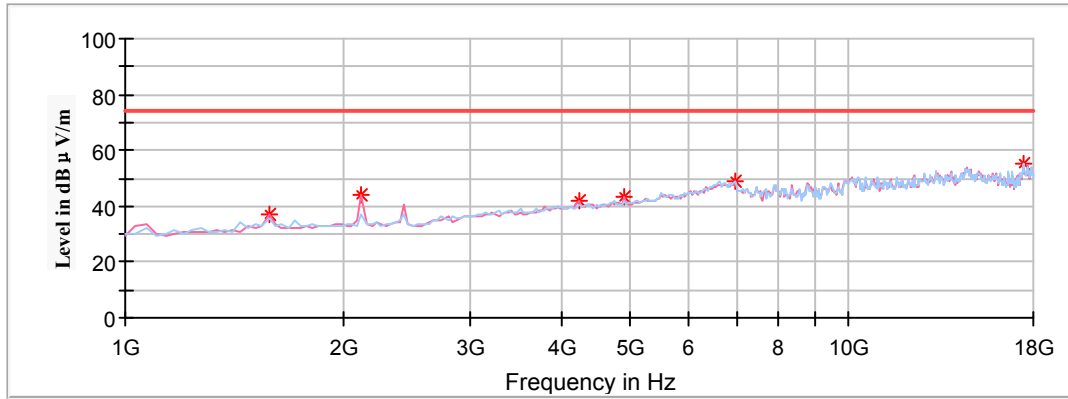
Full Spectrum



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)				
1579.160000	---	26.35	250	V	109	-9.7	54.00	27.65
1579.160000	37.53	---	250	V	109	-9.7	74.00	36.47
2124.250000	---	34.36	250	V	279	-7.9	54.00	19.64
2124.250000	45.18	---	250	V	279	-7.9	74.00	28.82
3861.720000	---	30.24	200	V	229	-2.3	54.00	23.76
3861.720000	40.39	---	200	V	229	-2.3	74.00	33.61
4781.560000	---	33.69	100	H	158	-0.6	54.00	20.31
4781.560000	44.86	---	100	H	158	-0.6	74.00	29.14
6961.920000	---	36.48	200	V	107	5.3	54.00	17.52
6961.920000	48.51	---	200	V	107	5.3	74.00	25.49
17454.910000	---	43.36	100	H	358	14.0	54.00	10.64
17454.910000	54.45	---	100	H	358	14.0	74.00	19.55

**Middle Channel: 2440MHz**

Full Spectrum

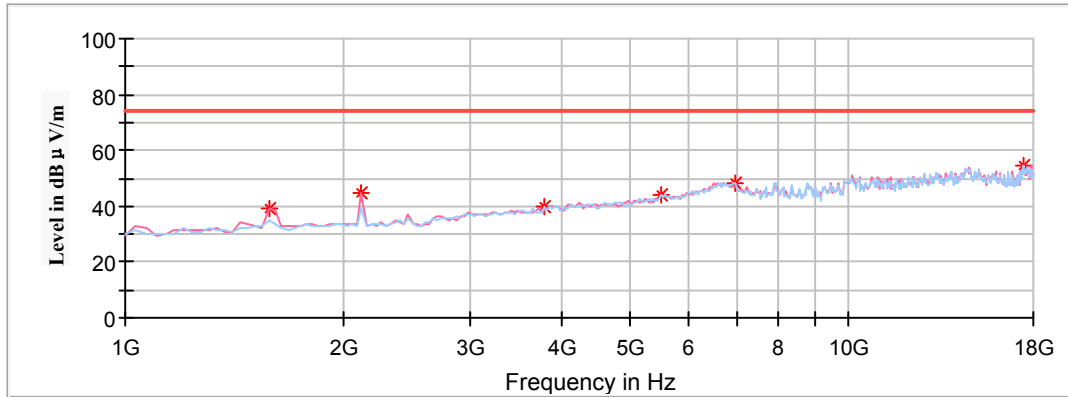


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1579.160000	---	25.36	250	V	134	-9.7	54.00	28.64
1579.160000	36.83	---	250	V	134	-9.7	74.00	37.17
2124.250000	---	34.18	250	V	284	-7.9	54.00	19.82
2124.250000	44.19	---	250	V	284	-7.9	74.00	29.81
4236.470000	---	33.69	200	V	51	-1.4	54.00	20.31
4236.470000	44.71	---	200	V	51	-1.4	74.00	29.29
4880.000000	---	32.16	100	H	356	-0.4	54.00	21.84
4880.000000	43.08	---	100	H	356	-0.4	74.00	30.92
6961.920000	---	36.36	200	V	55	5.3	54.00	17.64
6961.920000	48.68	---	200	V	55	5.3	74.00	25.32
17454.910000	---	42.58	100	H	122	14.0	54.00	11.42
17454.910000	54.95	---	100	H	122	14.0	74.00	19.05



**High Channel: 2480MHz**

Full Spectrum

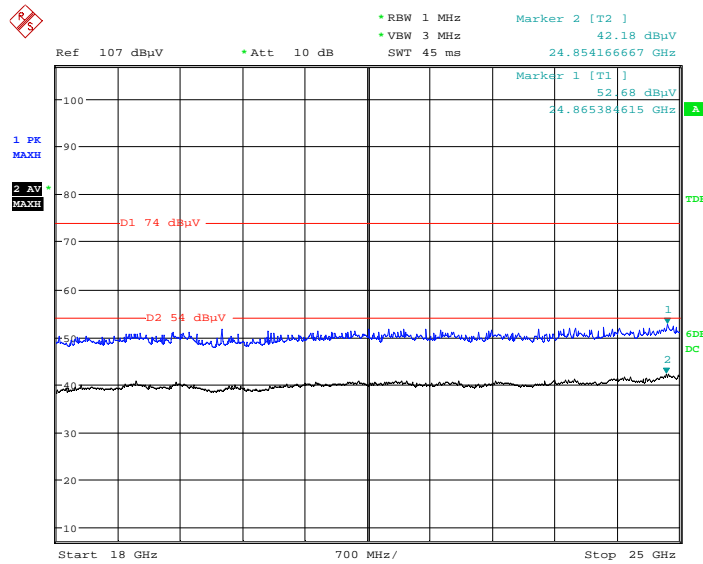


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1579.160000	---	28.36	250	V	283	-9.7	54.00	25.64
1579.160000	39.31	---	250	V	283	-9.7	74.00	34.69
2124.250000	---	32.64	250	V	203	-7.9	54.00	21.36
2124.250000	44.72	---	250	V	203	-7.9	74.00	29.28
3793.590000	---	28.65	200	V	19	-2.6	54.00	25.35
3793.590000	39.74	---	200	V	19	-2.6	74.00	34.26
5496.990000	---	34.26	100	H	104	1.4	54.00	19.74
5496.990000	44.10	---	100	H	104	1.4	74.00	29.90
6961.920000	---	37.65	200	V	332	5.3	54.00	16.35
6961.920000	48.43	---	200	V	332	5.3	74.00	25.57
17454.910000	---	42.36	100	H	73	14.0	54.00	11.64
17454.910000	54.49	---	100	H	73	14.0	74.00	19.51

18GHz-25GHz:

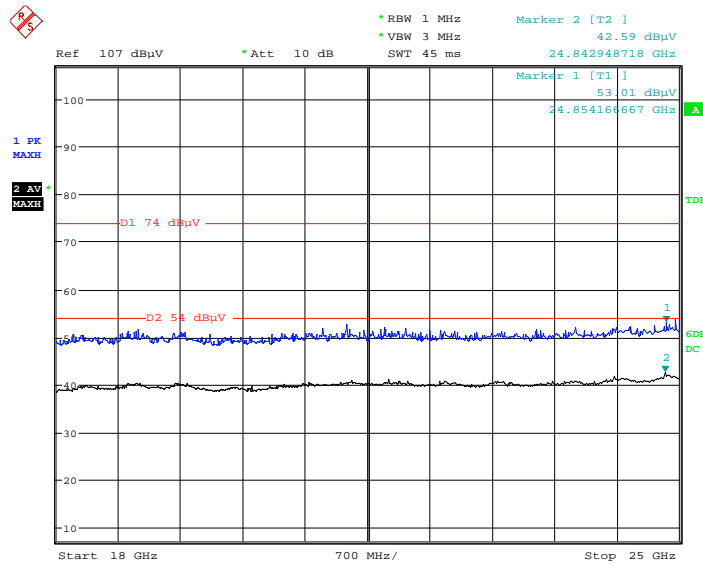
(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **low** channel of operation in the X axis of orientation was recorded)

Vertical



Date: 2.AUG.2019 07:41:54

Horizontal



Date: 2.AUG.2019 08:01:50

**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)

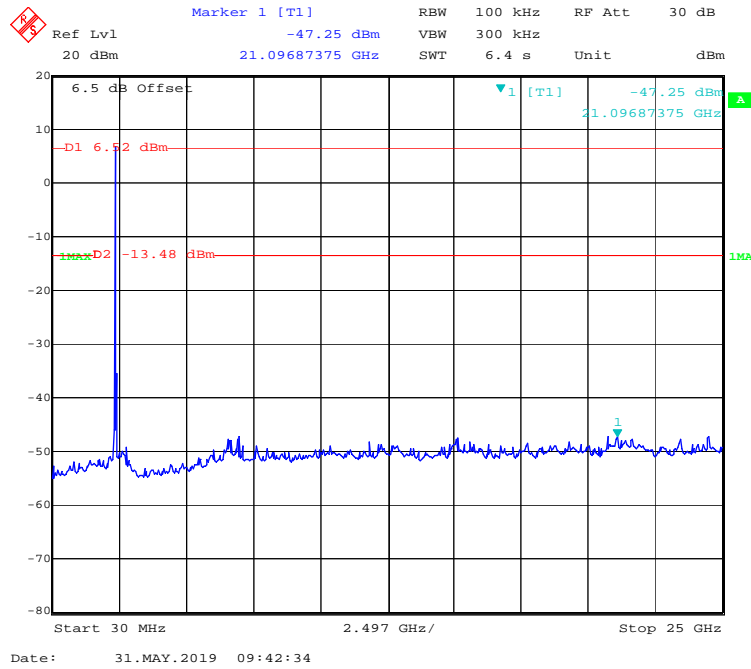
Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

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

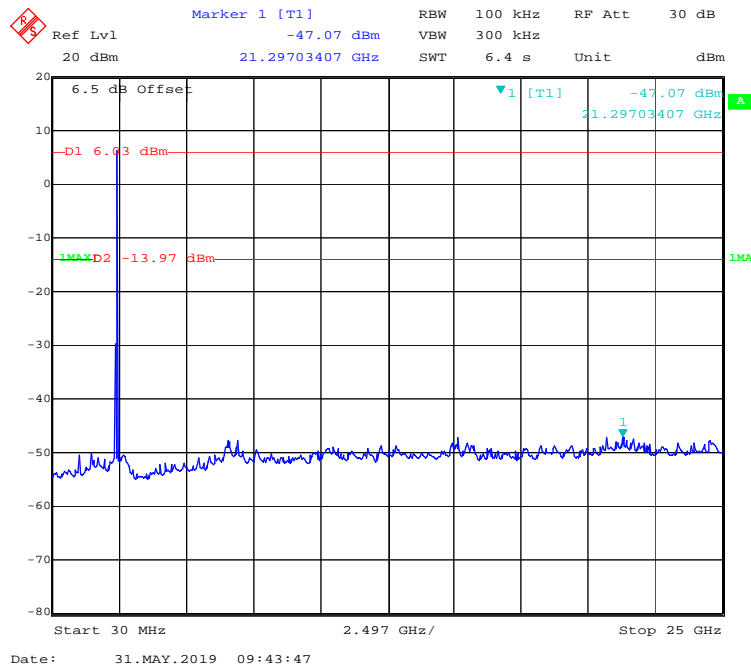
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2390.000000	---	34.36	100	V	332	2.8	54	19.64
2390.000000	44.56	---	100	V	332	2.8	74	29.44
High Channel: 2480MHz								
2483.500000	---	41.06	100	V	314	3.0	54	12.94
2483.500000	51.37	---	100	V	314	3.0	74	22.63

### Conducted Spurious Emissions at Antenna Port

#### 802.11b Mode Low Channel

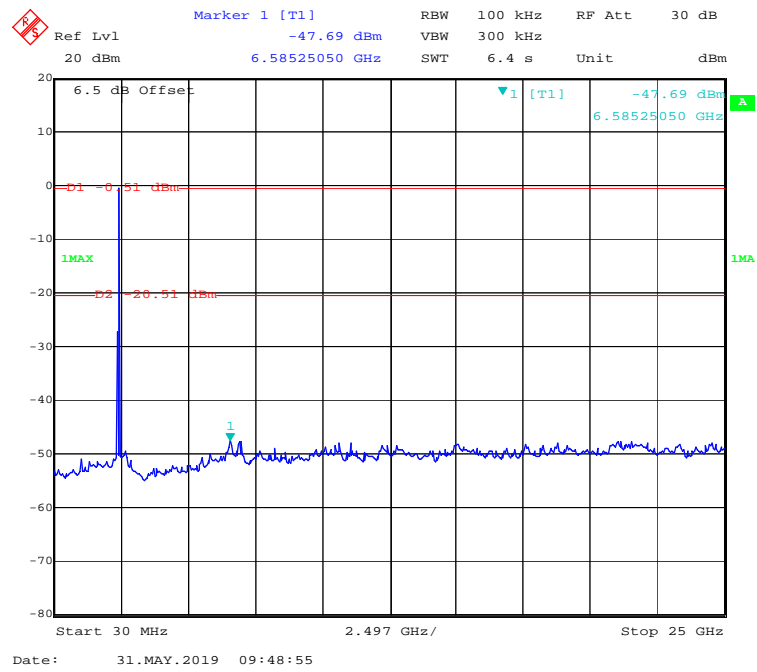


#### 802.11b Mode Middle Channel

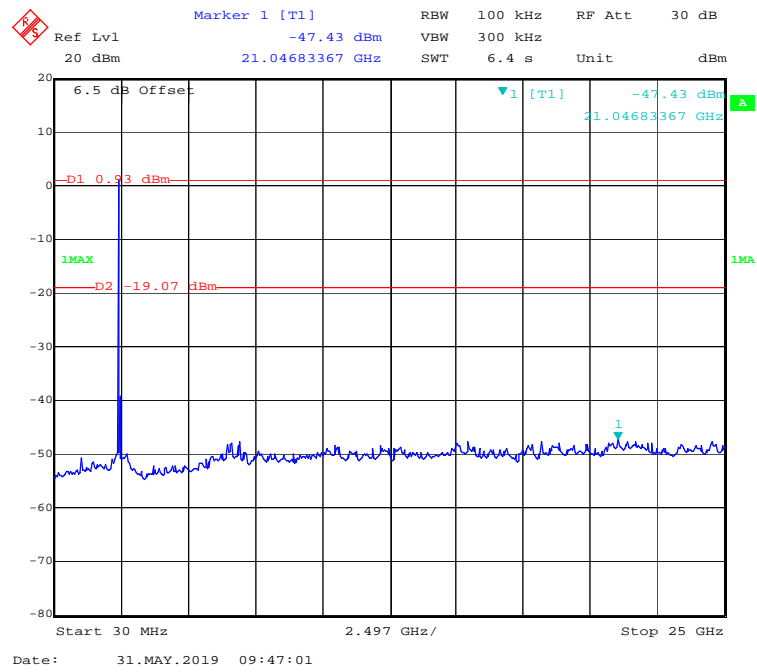




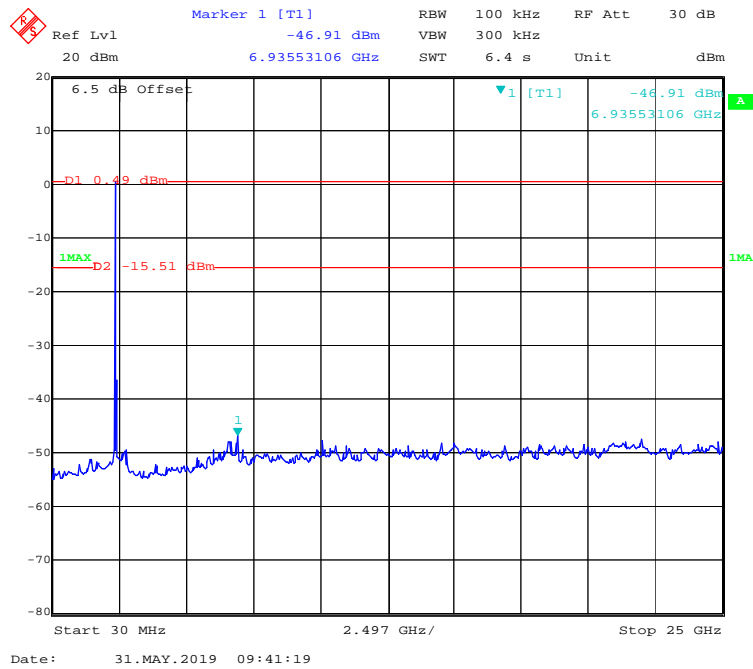
### 802.11g Mode Middle Channel



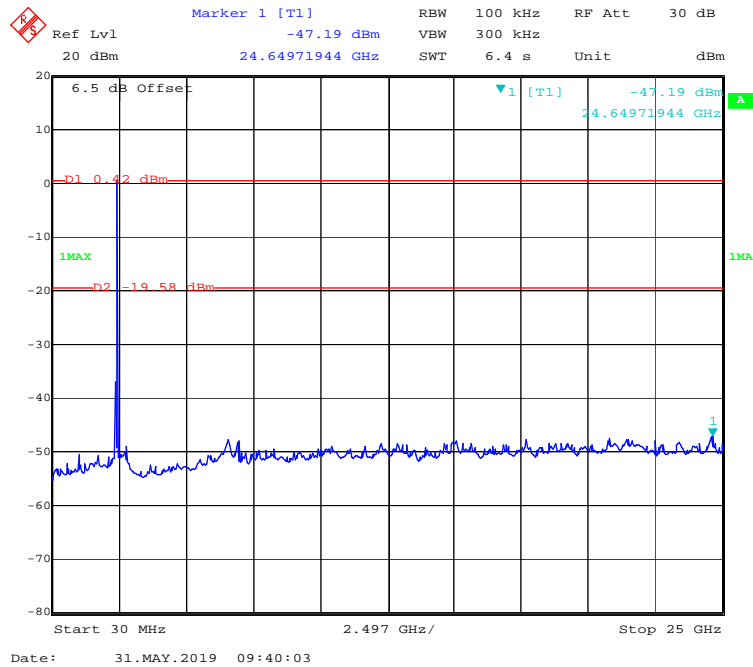
### 802.11g Mode High Channel



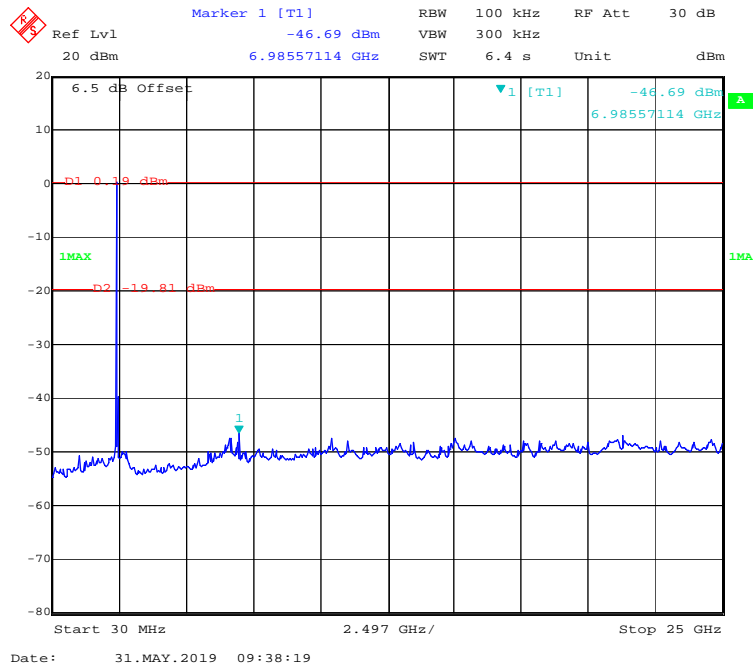
**802.11n-HT20 Mode Low Channel**



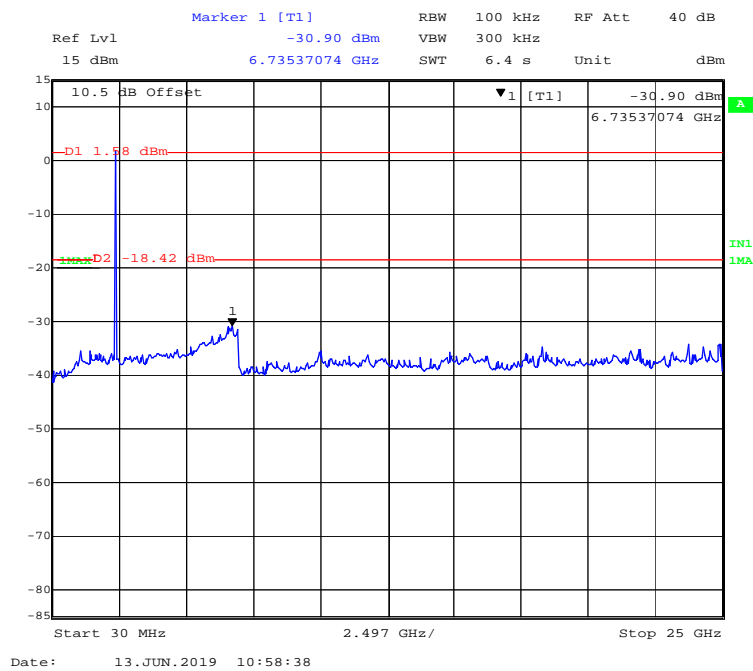
**802.11n-HT20 Mode Middle Channel**



### 802.11n-HT20 Mode High Channel

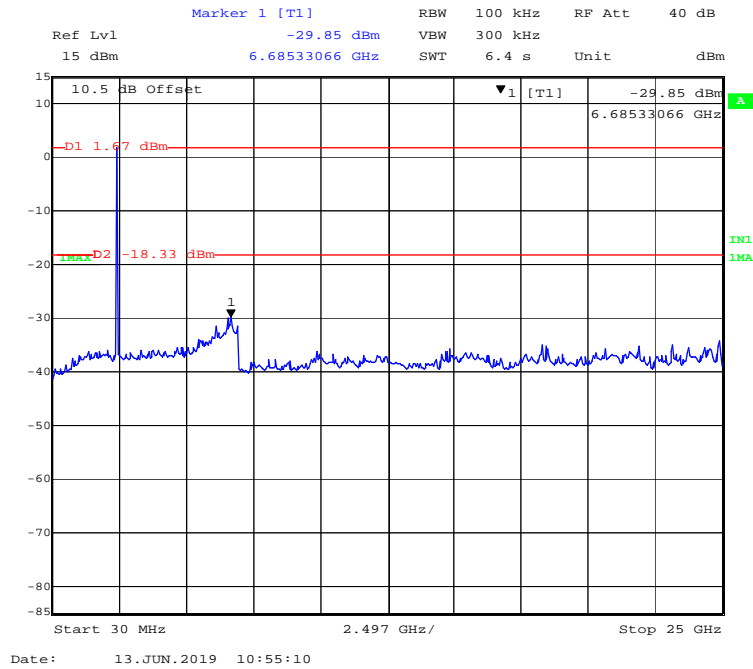


### BLE Mode Low Channel

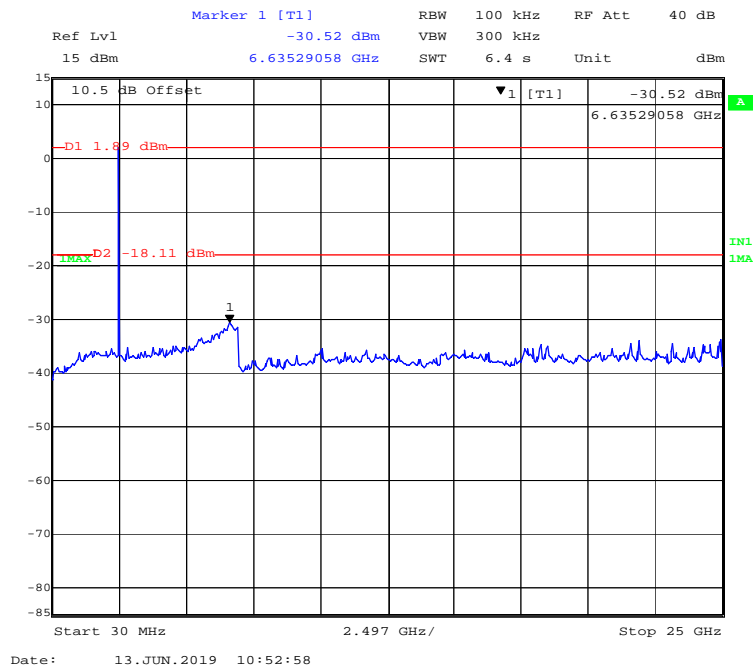




### BLE Mode Middle Channel



### BLE Mode High Channel



**FCC §15.247(a) (2) - 6 dB EMISSION BANDWIDTH**

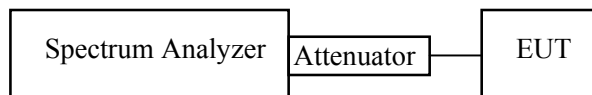
**Applicable Standard**

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)  $\geq 3 * RBW$ .
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**

<b>Temperature:</b>	24~24.6 °C
<b>Relative Humidity:</b>	47~50 %
<b>ATM Pressure:</b>	101.1~101.3kPa

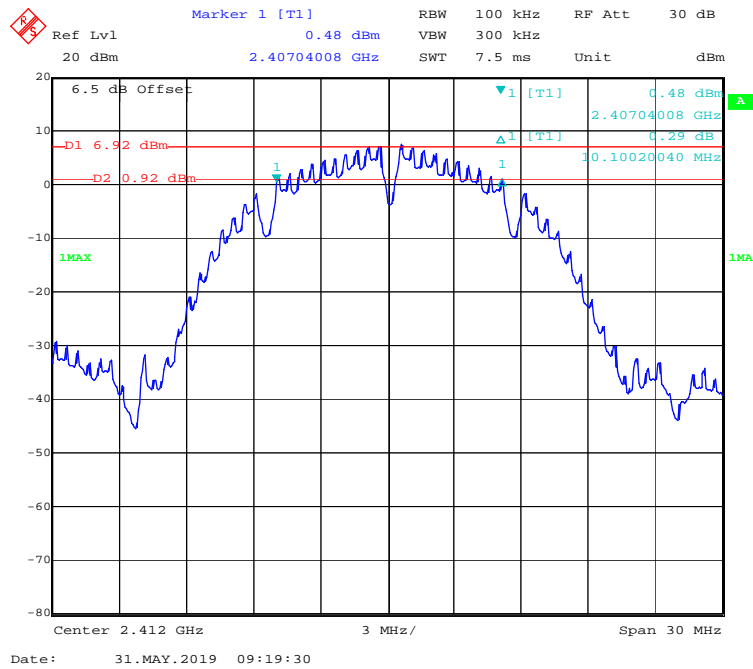
*The testing was performed by Jack Jiao from 2019-05-31 to 2019-06-13.*

*EUT operation mode: Transmitting*

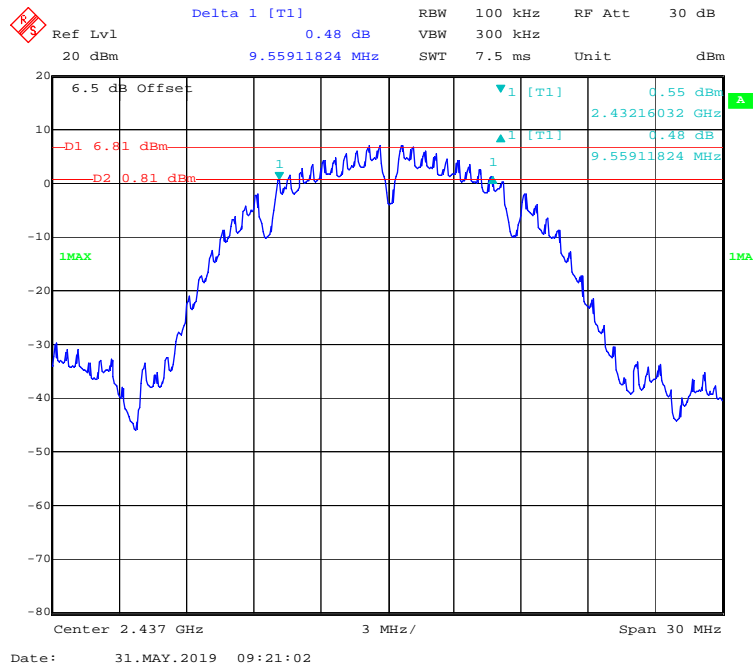
**Test Result:** Pass

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b Mode			
Low	2412	10.100	≥0.5
Middle	2437	9.559	≥0.5
High	2462	9.018	≥0.5
802.11g Mode			
Low	2412	15.331	≥0.5
Middle	2437	15.271	≥0.5
High	2462	15.271	≥0.5
802.11n-HT20 Mode			
Low	2412	15.271	≥0.5
Middle	2437	15.271	≥0.5
High	2462	15.331	≥0.5
BLE Mode			
Low	2402	0.733	≥0.5
Middle	2440	0.739	≥0.5
High	2480	0.733	≥0.5

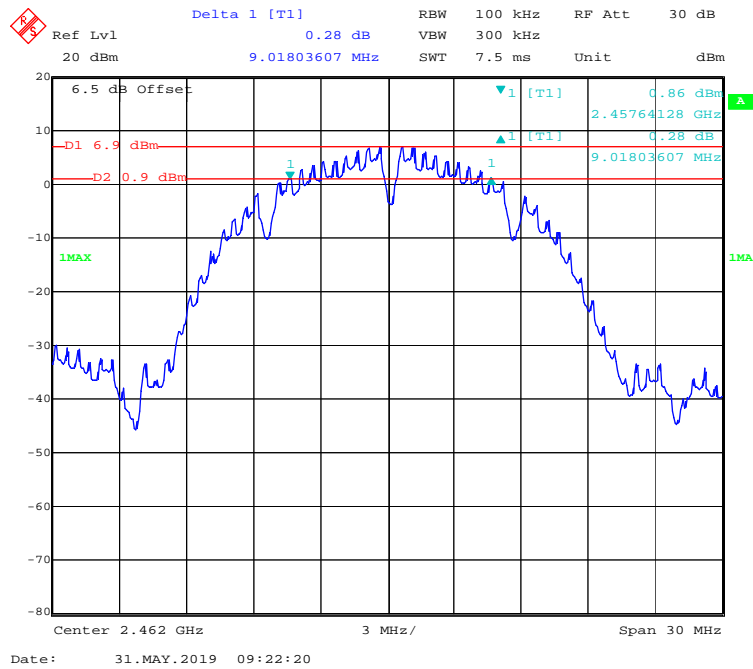
### 802.11b Mode Low Channel



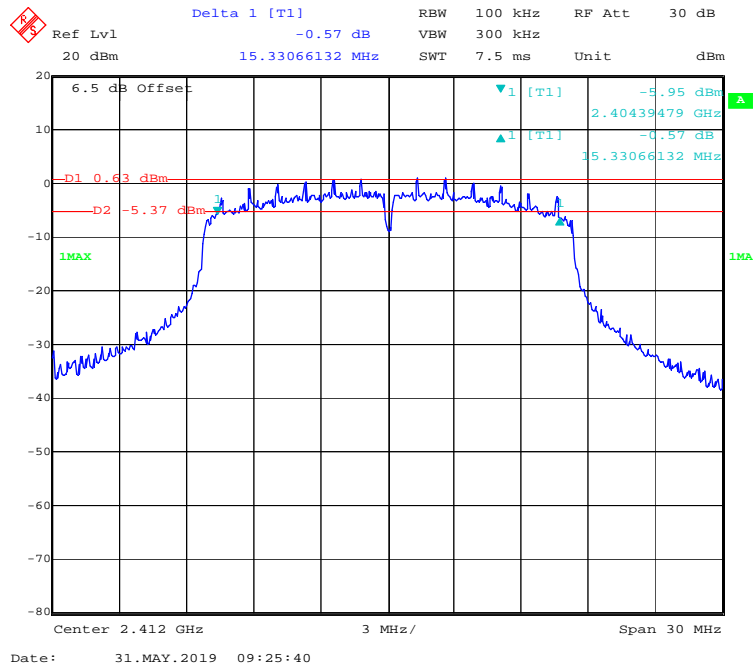
### 802.11b Mode Middle Channel



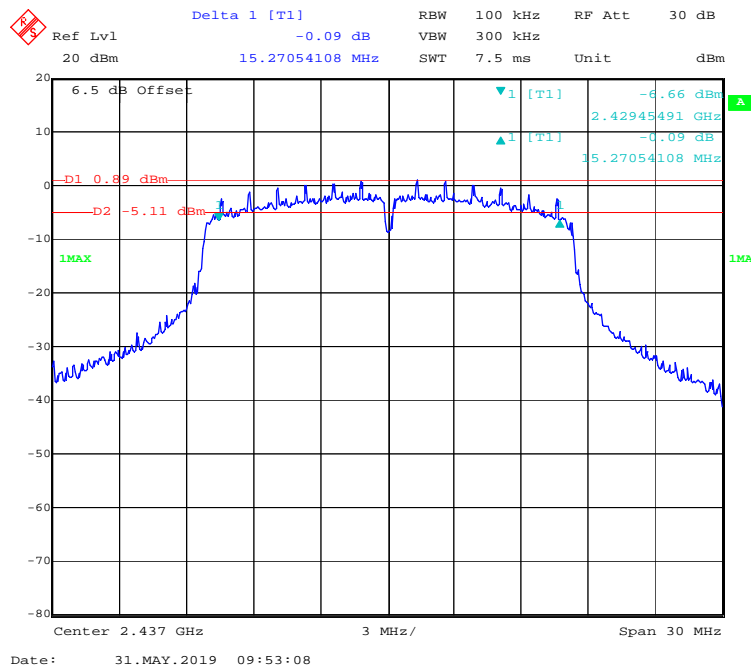
### 802.11b Mode High Channel



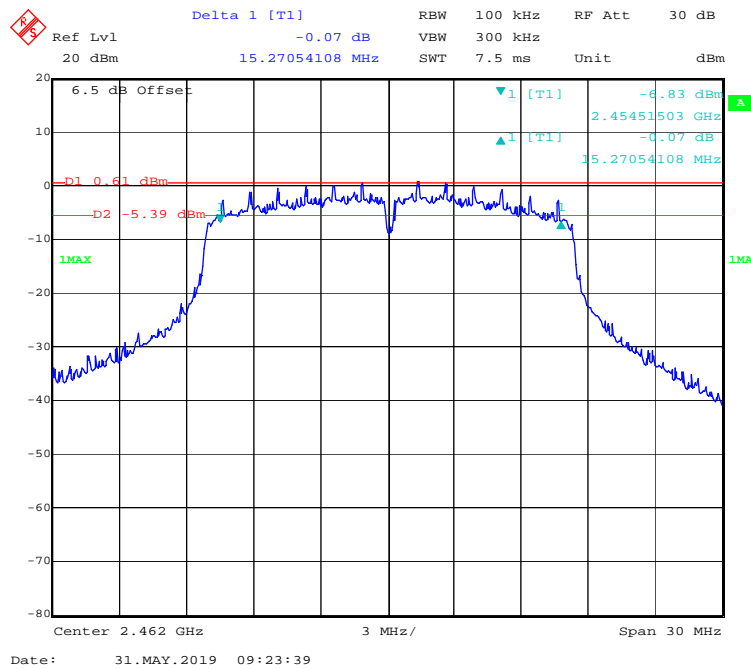
### 802.11g Mode Low Channel



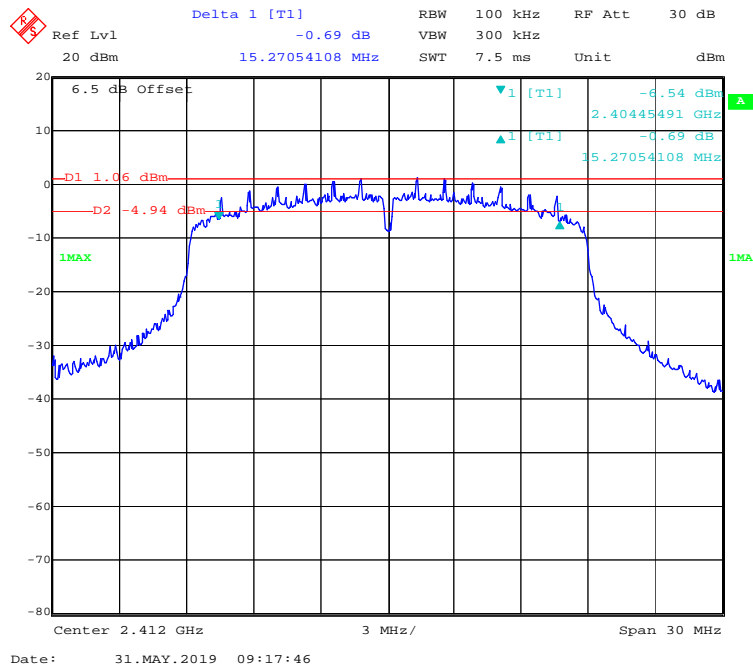
### 802.11g Mode Middle Channel



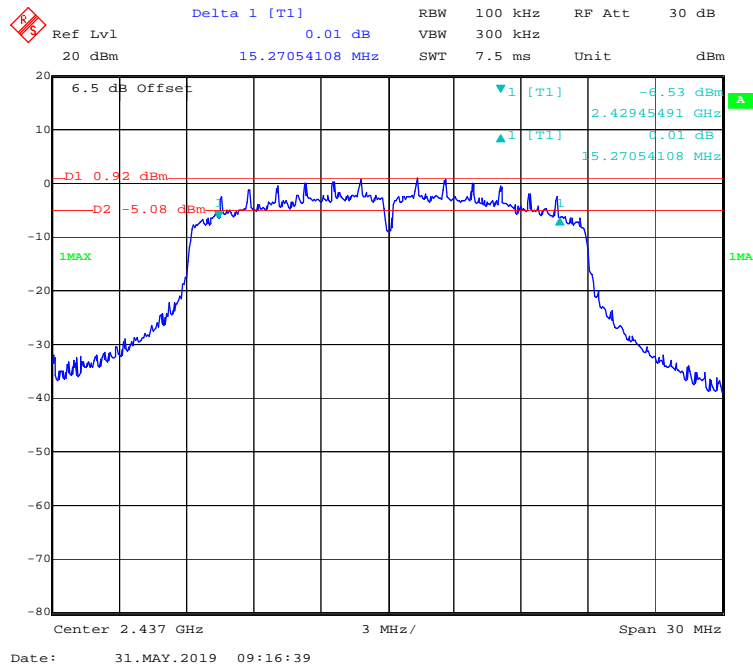
### 802.11g Mode High Channel



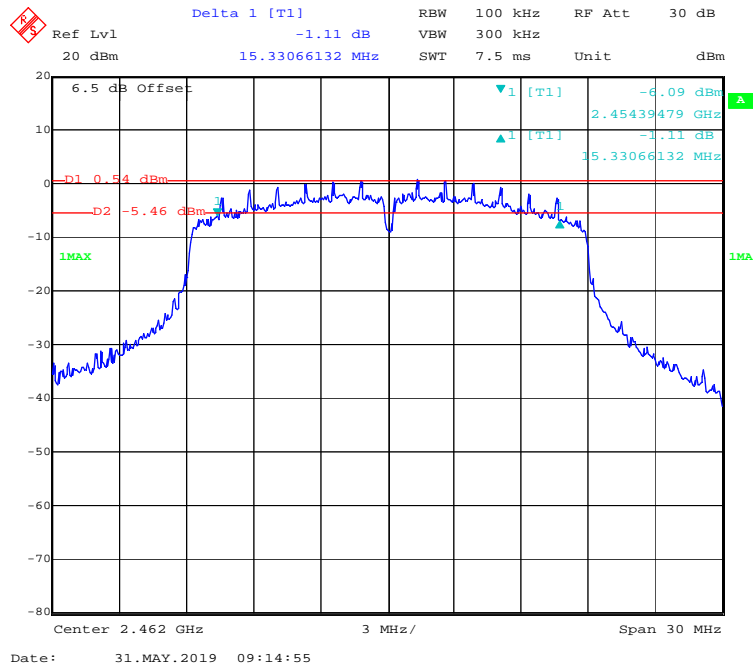
### 802.11n-HT20 Mode Low Channel



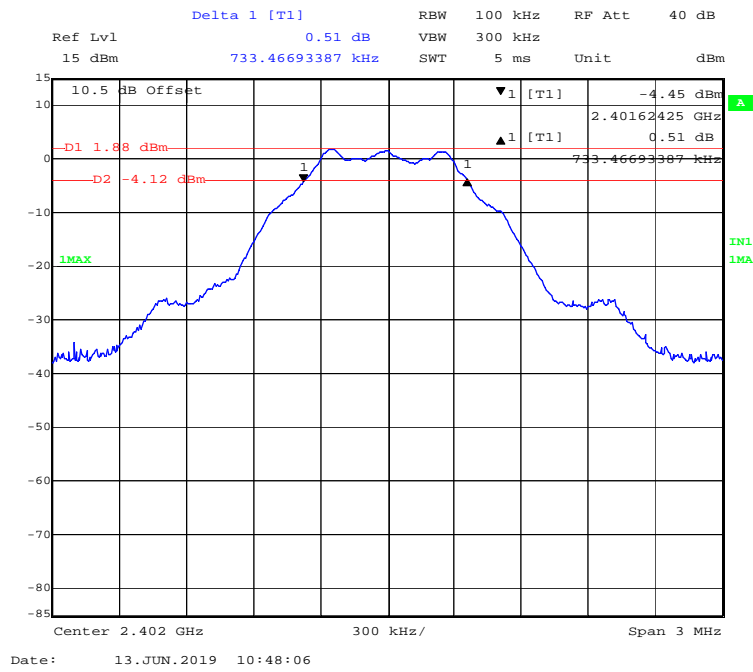
### 802.11n-HT20 Mode Middle Channel



### 802.11n-HT20 Mode High Channel

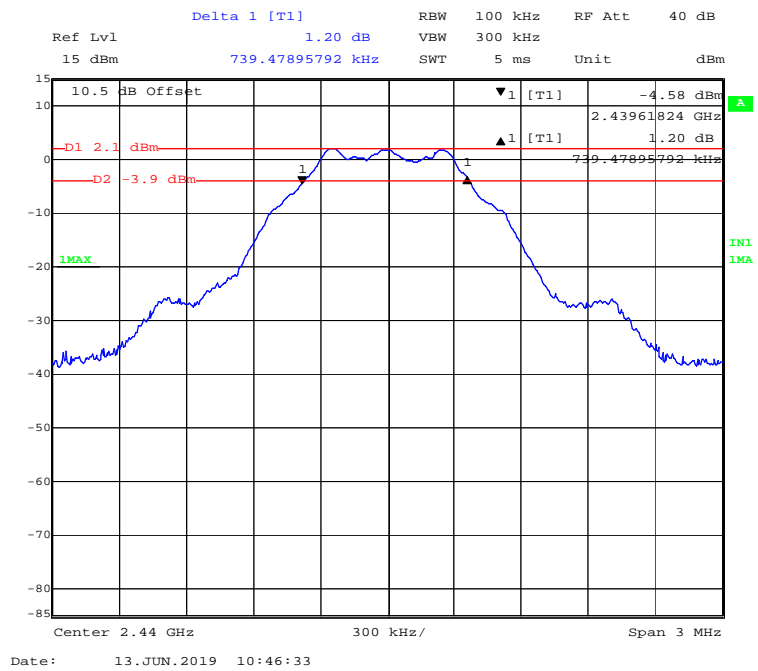


### BLE Mode Low Channel

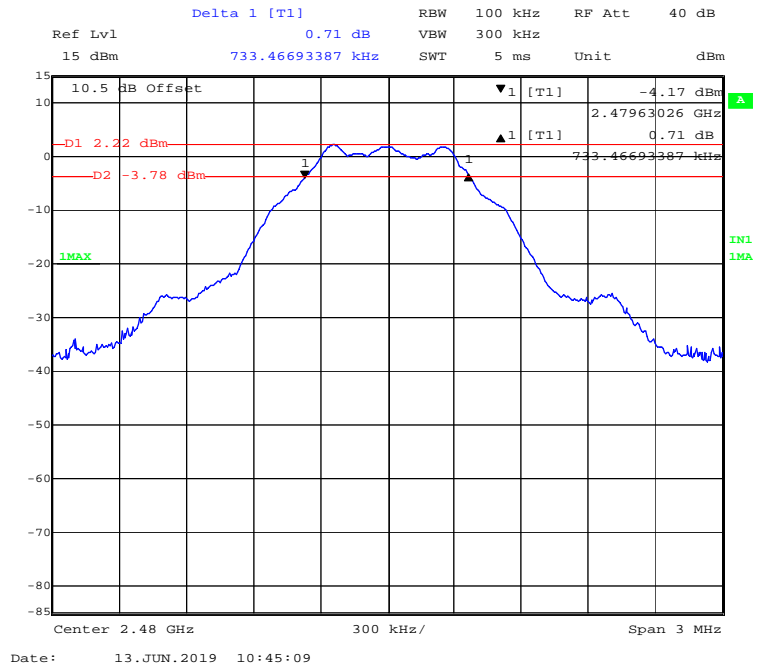




### BLE Mode Middle Channel



### BLE Mode High Channel



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

### **Applicable Standard**

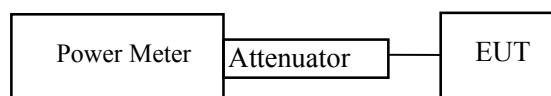
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, Compliant with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted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

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



### **Test Data**

#### **Environmental Conditions**

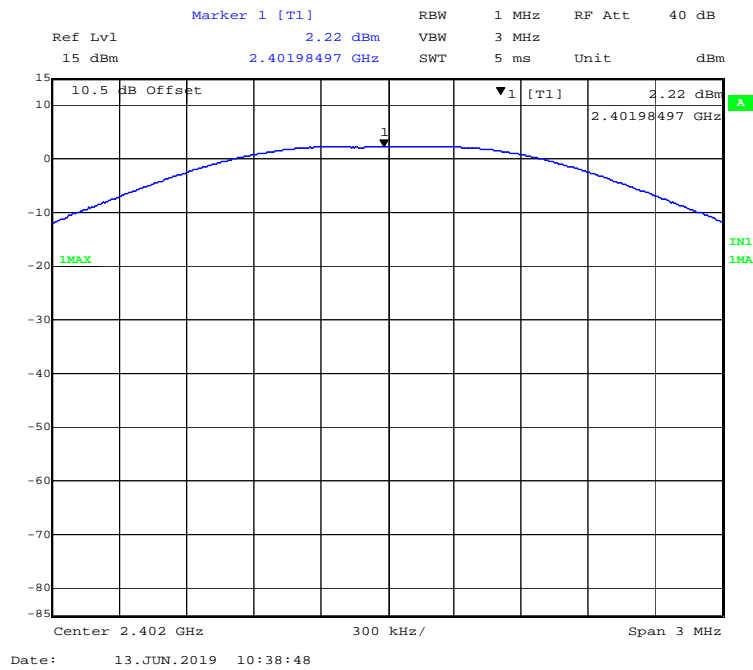
<b>Temperature:</b>	23.8~24.2°C
<b>Relative Humidity:</b>	48~50%
<b>ATM Pressure:</b>	101.2~101.4 kPa

*The testing was performed by Jack Jiao from 2019-05-31 to 2019-06-13.*

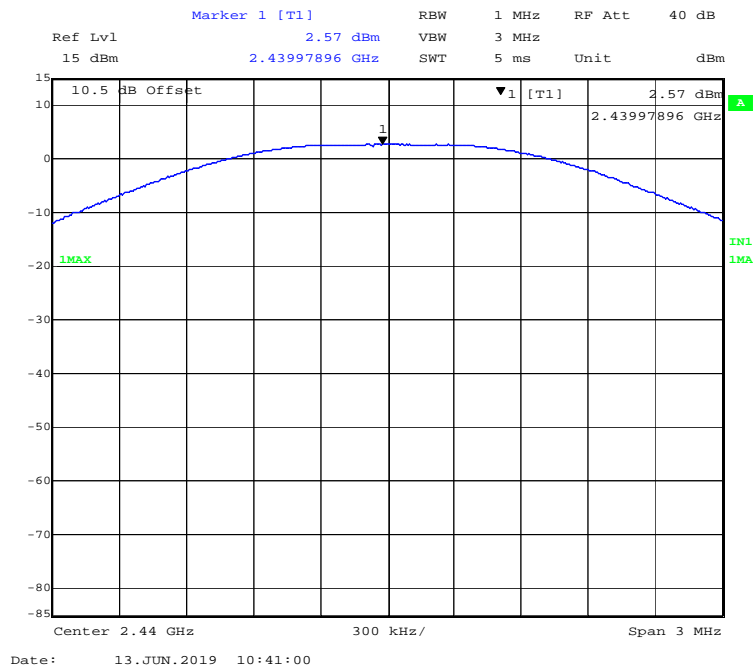
*EUT operation mode: Transmitting*

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b Mode				
Low	2412	10.88	30	Pass
Middle	2437	10.86	30	Pass
High	2462	10.81	30	Pass
802.11g Mode				
Low	2412	10.03	30	Pass
Middle	2437	10.76	30	Pass
High	2462	10.10	30	Pass
802.11n-HT20 Mode				
Low	2412	9.45	30	Pass
Middle	2437	9.47	30	Pass
High	2462	9.40	30	Pass
BLE Mode				
Low	2402	2.22	30	Pass
Middle	2440	2.57	30	Pass
High	2480	2.78	30	Pass

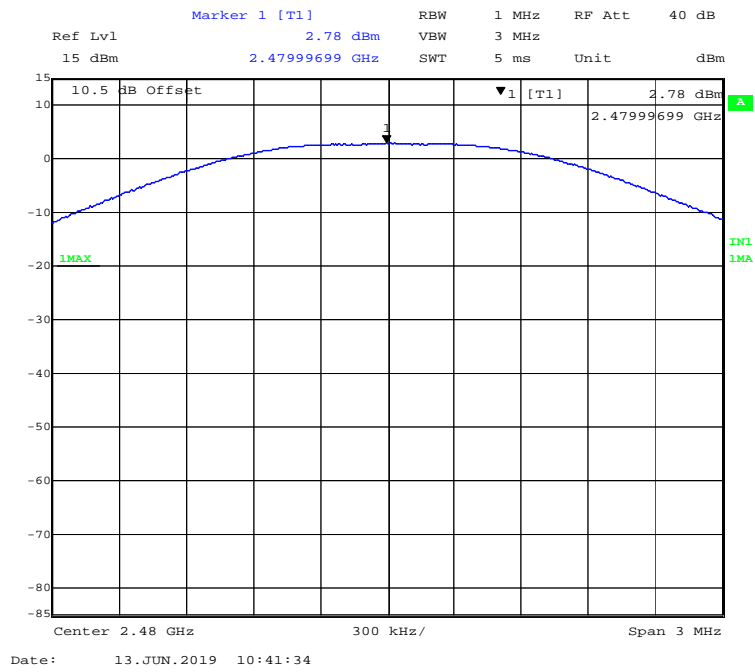
**BLE Mode Low Channel**



**BLE Mode Middle Channel**



**BLE Mode High Channel**



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

### **Applicable Standard**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates Compliant 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**

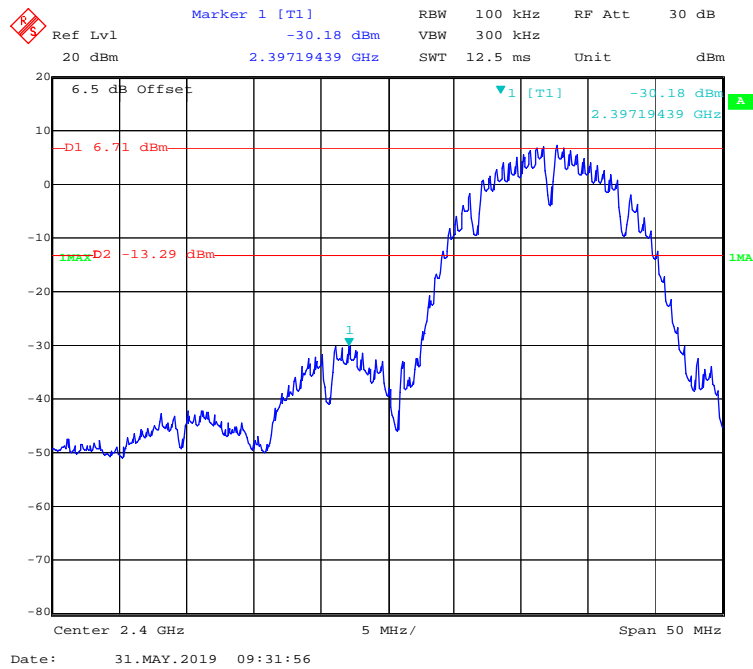
<b>Temperature:</b>	24.3~25.2 °C
<b>Relative Humidity:</b>	48~50 %
<b>ATM Pressure:</b>	101.1~101.3kPa

*The testing was performed by Jack Jiao from 2019-05-31 to 2019-06-13.*

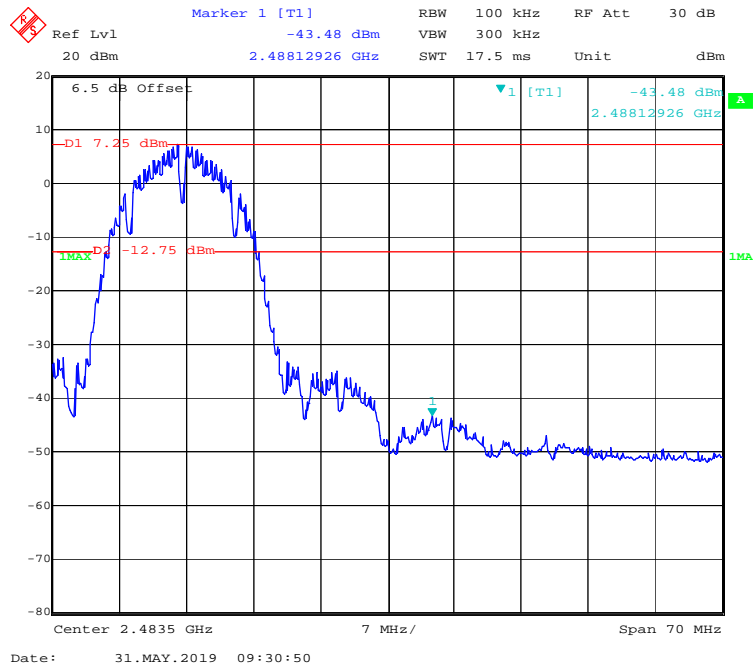
*EUT operation mode: Transmitting*

**Test Result:** Compliant

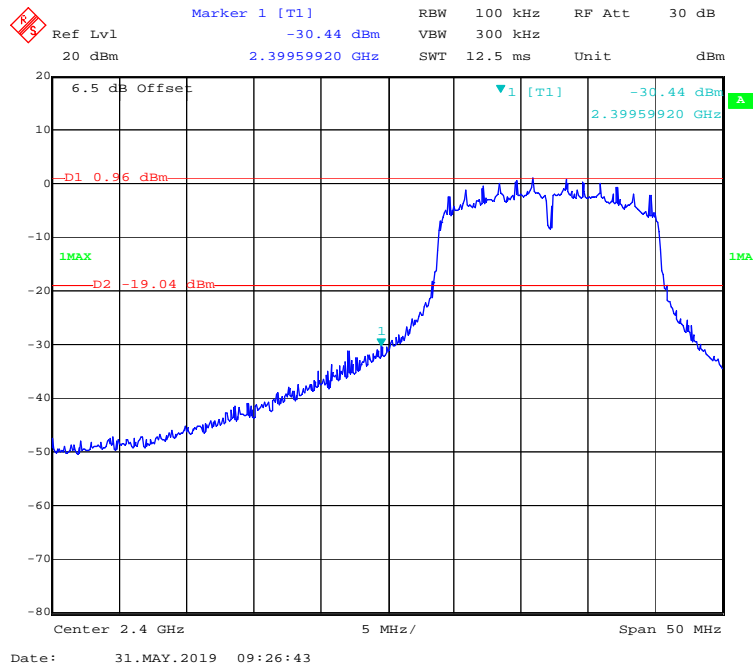
### 802.11b Mode Left Side



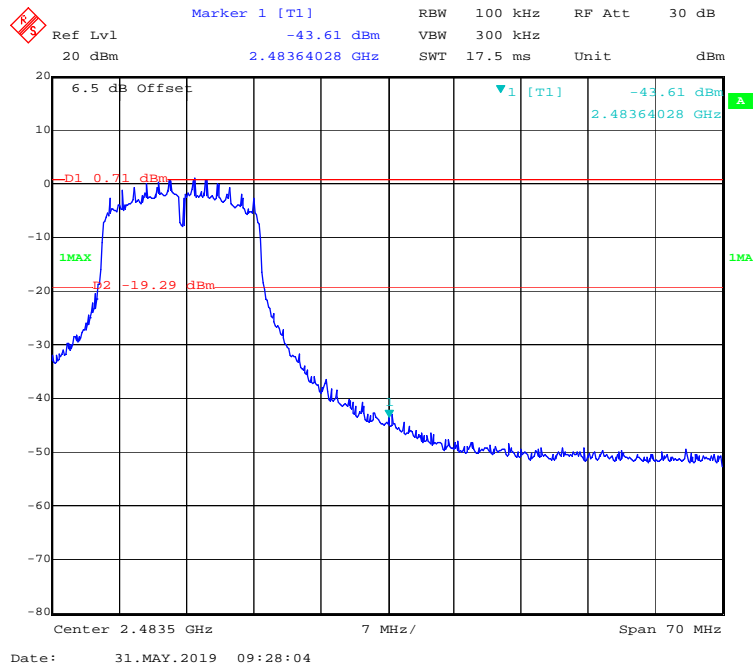
### 802.11b Mode Right Side



### 802.11g Mode Left Side

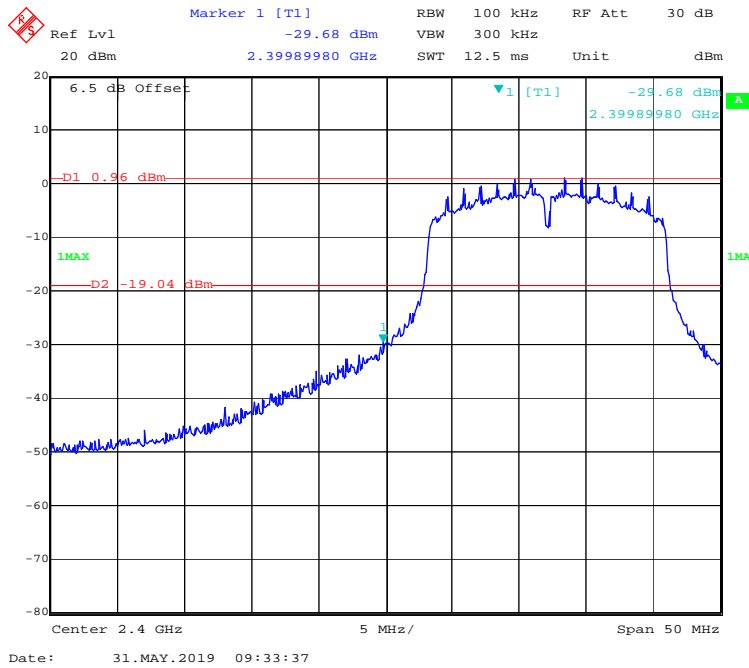


### 802.11g Mode Right Side

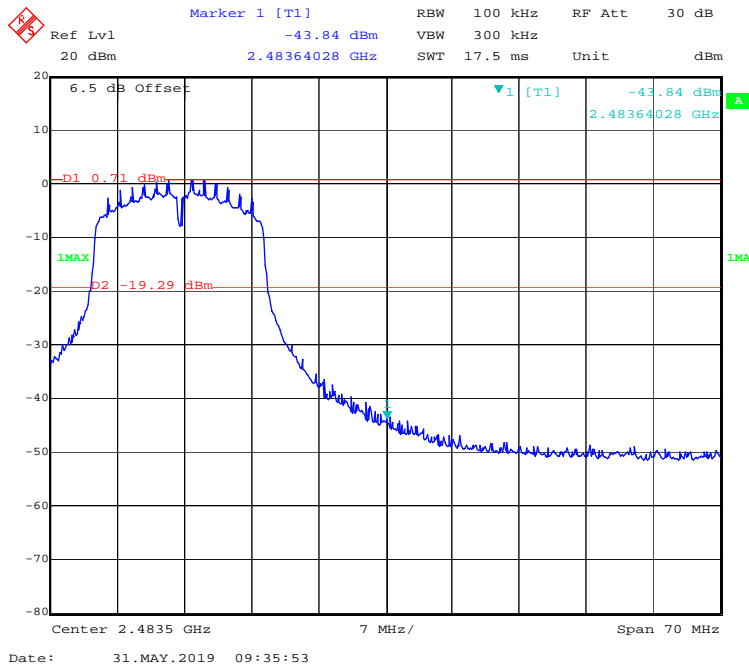




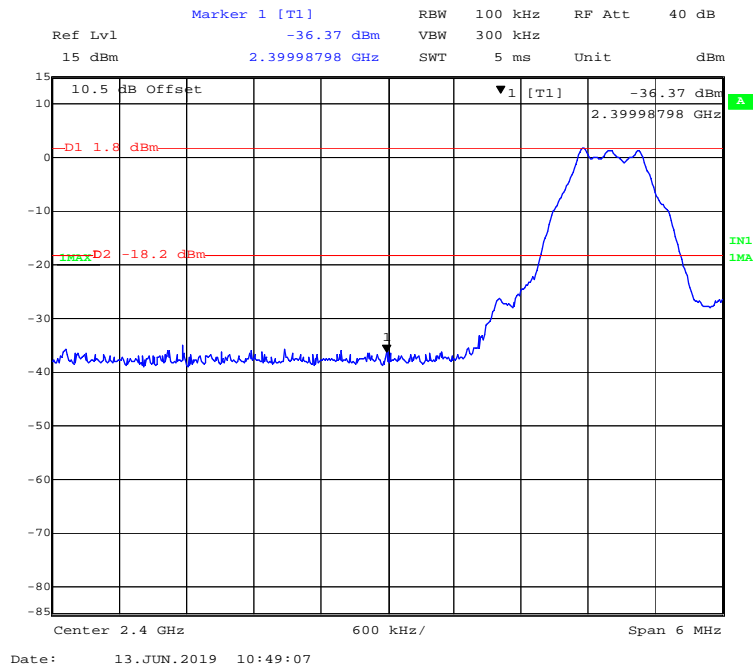
**802.11n-HT20 Mode Left Side**



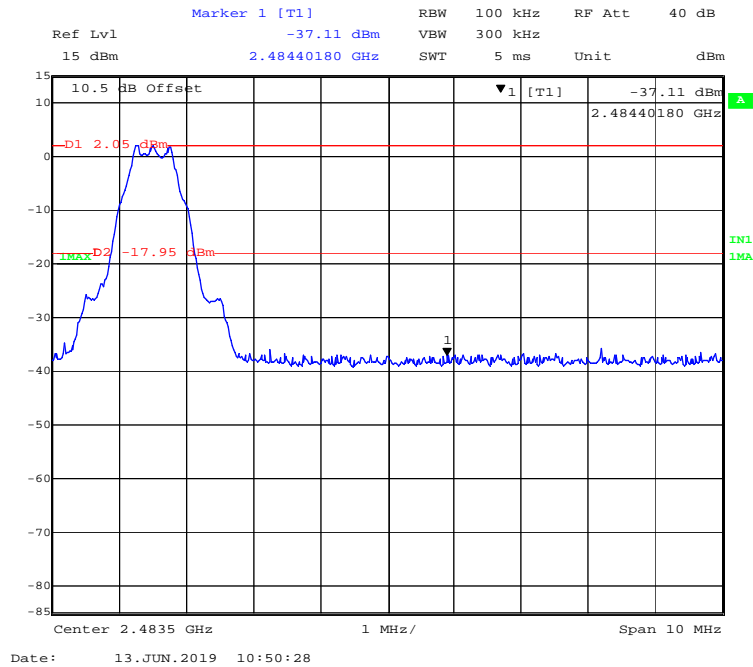
**802.11n-HT20 Mode Right Side**



### 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 Compliant, and it is optional if the maximum conducted (average) output power was used to determine Compliant:

1. Set the RBW to:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
2. Set the VBW  $\geq 3 \times \text{RBW}$ .
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**

<b>Temperature:</b>	24.1 °C~24.3 °C
<b>Relative Humidity:</b>	50%~52%
<b>ATM Pressure:</b>	101.3 kPa~101.5kPa

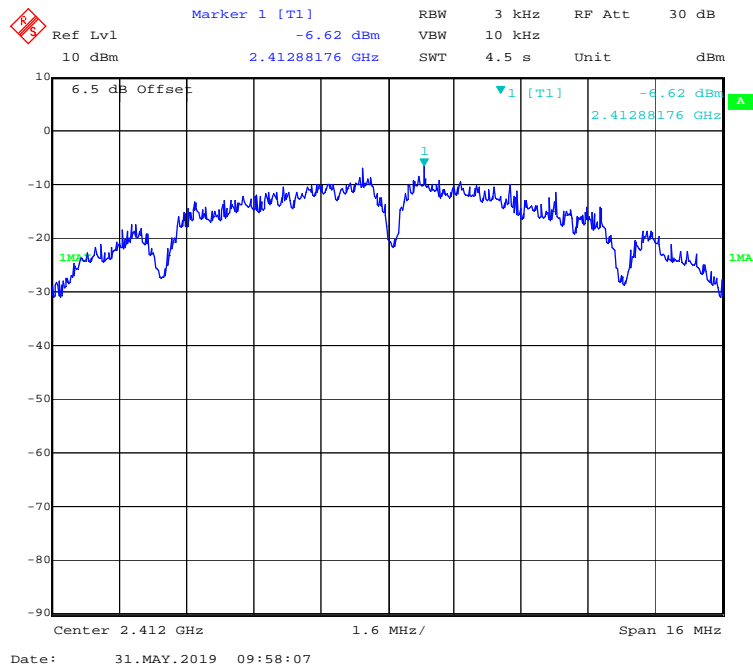
*The testing was performed by Jack Jiao from 2019-05-31 to 2019-06-13.*

*EUT operation mode: Transmitting*

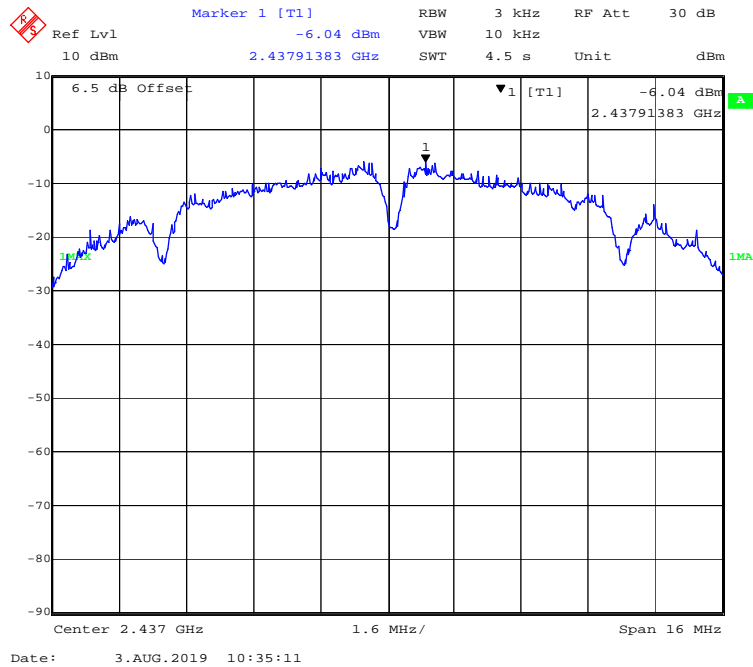
**Test Result:** Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode			
Low	2412	-6.62	≤8
Middle	2437	-6.04	≤8
High	2462	-8.38	≤8
802.11g Mode			
Low	2412	-13.57	≤8
Middle	2437	-14.41	≤8
High	2462	-14.93	≤8
802.11n-HT20 mode			
Low	2412	-13.43	≤8
Middle	2437	-14.76	≤8
High	2462	-13.91	≤8
BLE Mode			
Low	2402	-13.28	≤8
Middle	2440	-12.85	≤8
High	2480	-12.93	≤8

### 802.11b Mode Low Channel



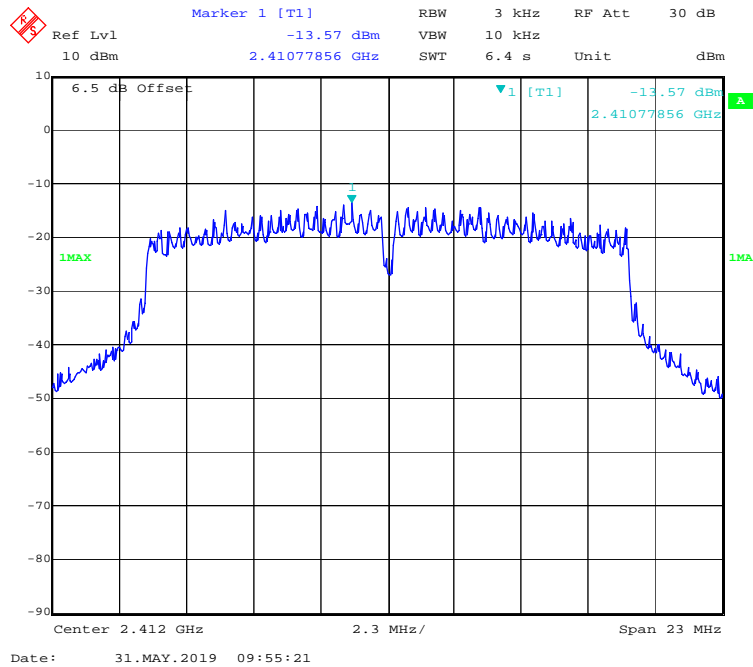
### 802.11b Mode Middle Channel



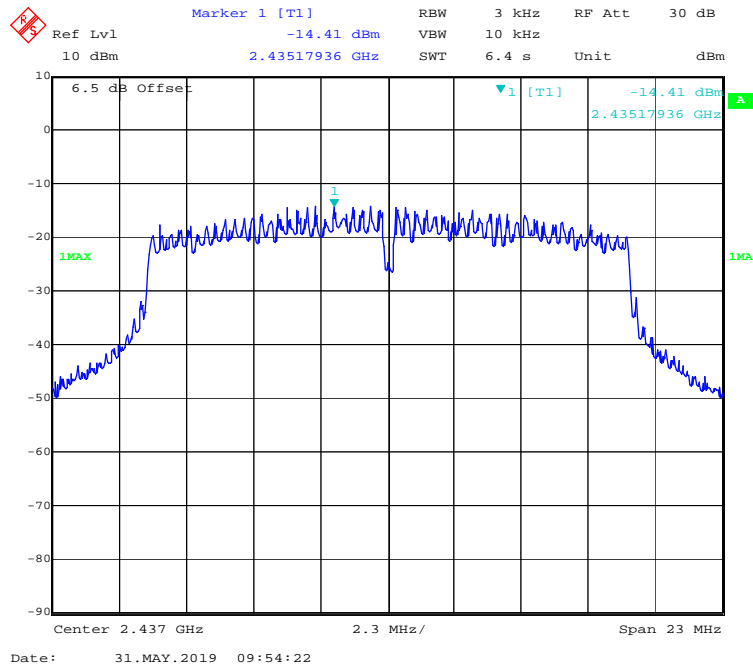
### 802.11b Mode High Channel



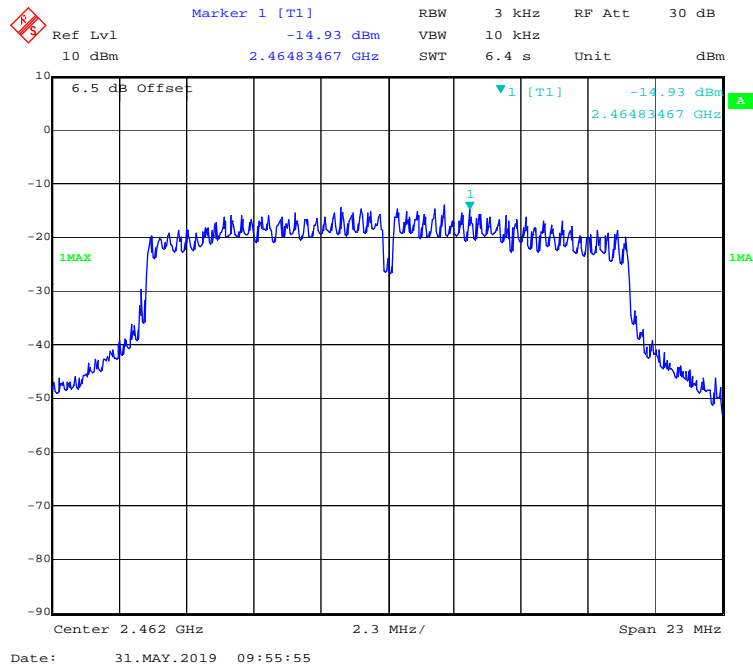
### 802.11g Mode Low Channel



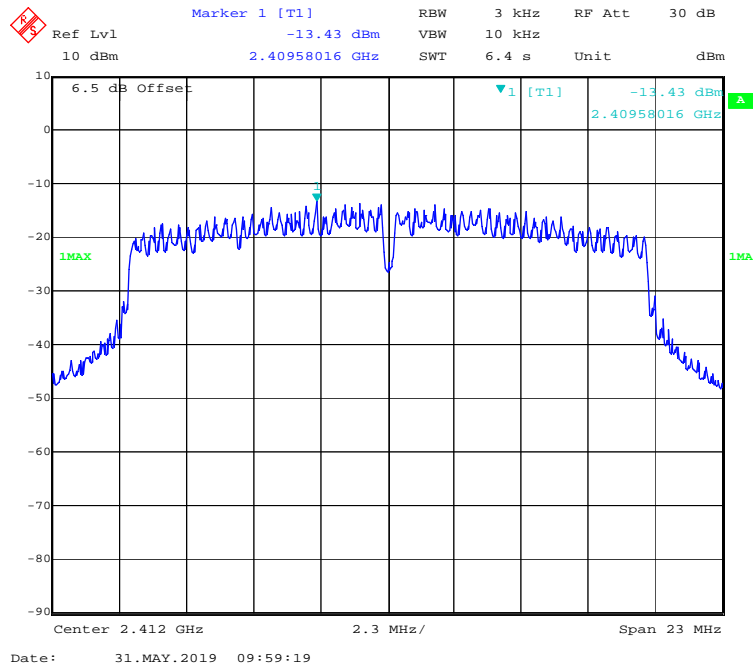
### 802.11g Mode Middle Channel



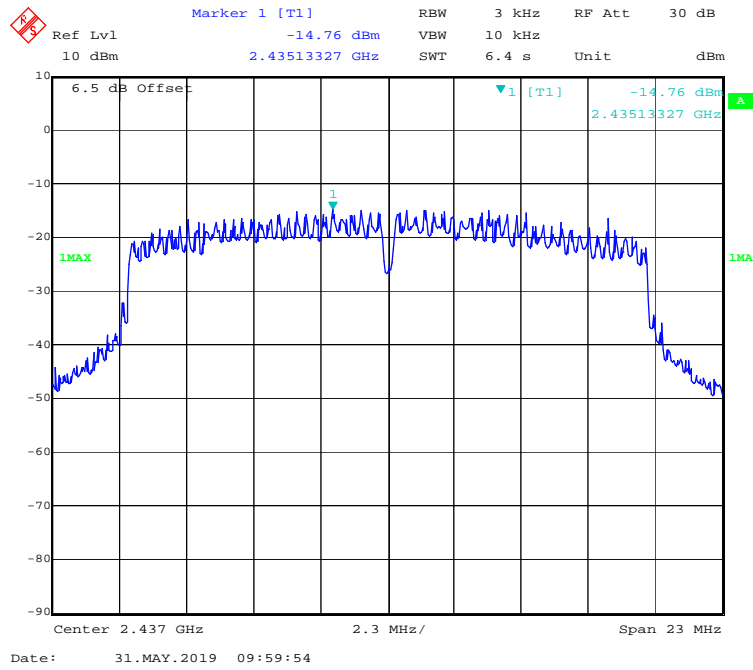
### 802.11g Mode High Channel



### 802.11n-HT20 Mode Low Channel

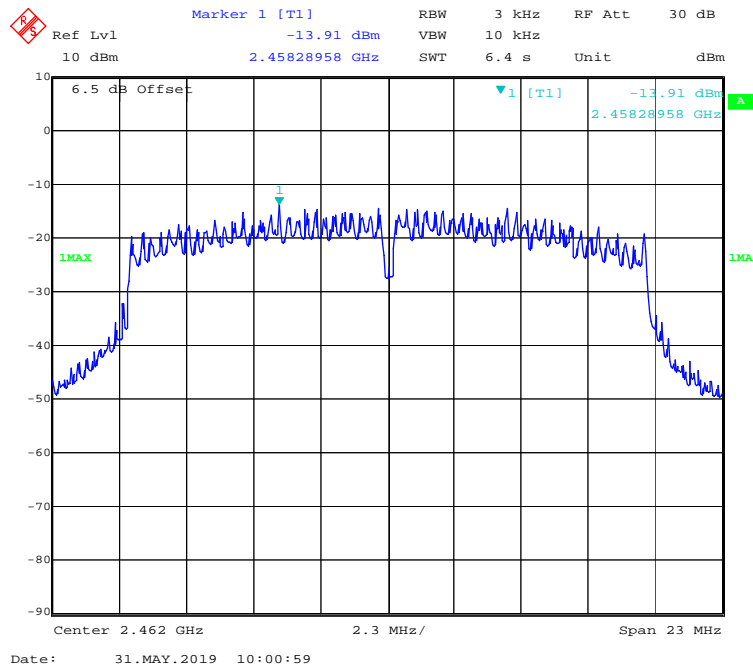


### 802.11n-HT20 Mode Middle Channel

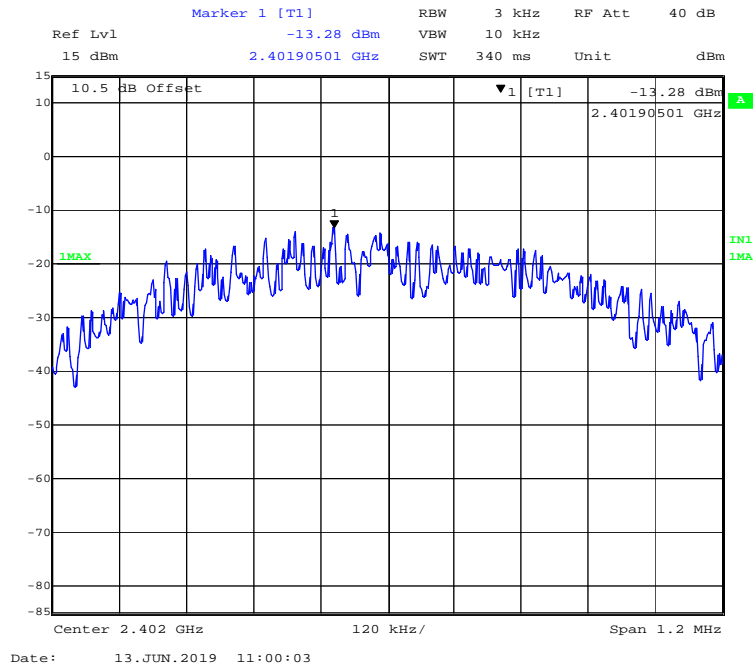




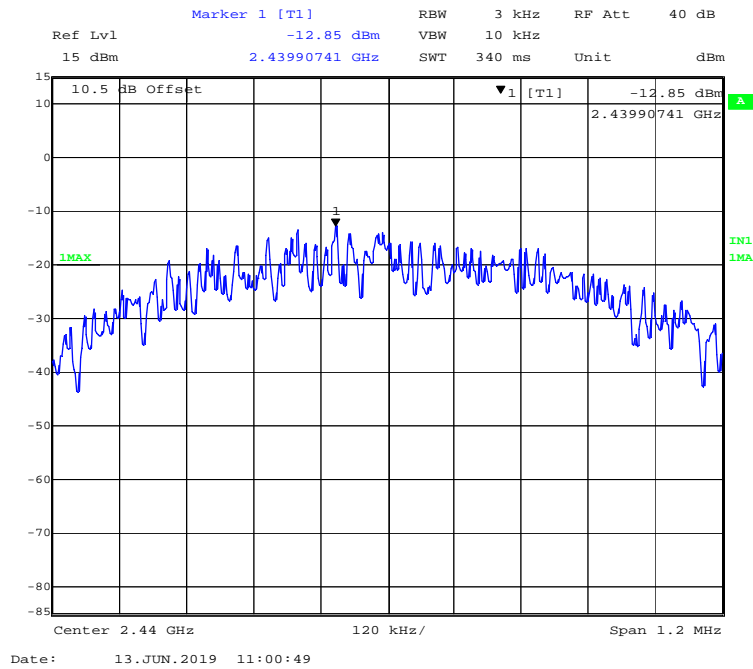
### 802.11n-HT20 Mode High Channel



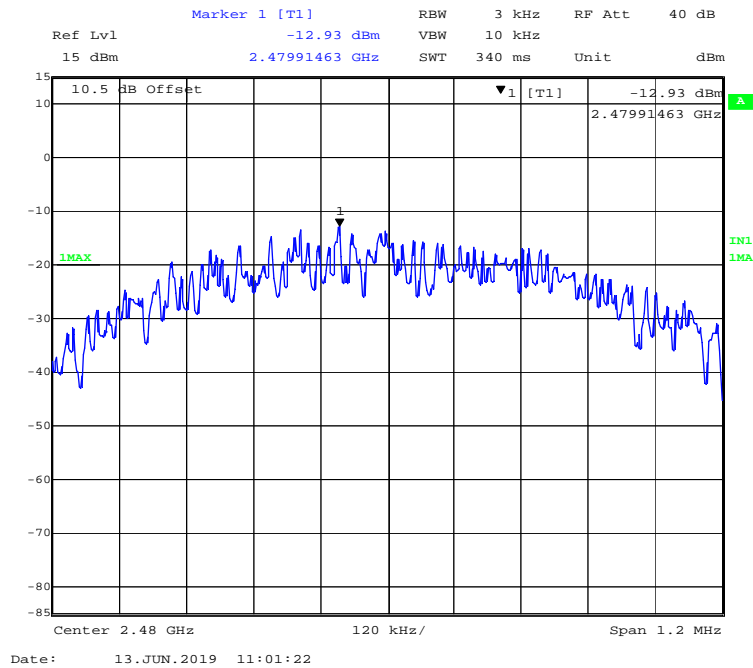
### BLE Mode Low Channel



### BLE Mode Middle Channel



### BLE Mode High Channel



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