FCC & ISED TEST REPORT

Product Name:	Soundbar speaker and Wireless subwoofer
Trade Mark:	or PHILIPS
Model No. / HVIN:	TAB7207SO/37
Add. Model No.:	TAB7207, TAB7207SO, TAB7207/10, TAB7207SO/10, TAB7207/98, TAB7207SO/98, TAB7207/37, TAB7207xx/yy (x=A-Z or nil, yy =00-99 for country code)
Report Number:	220310002RFC-3
Test Standards:	FCC 47 CFR Part 15 Subpart C RSS-Gen Issue 5 RSS-210 Issue 10
FCC ID:	2AR2STAB7207
IC:	24589-TAB7207
Test Result:	PASS
Date of Issue:	April 22, 2022

Prepared for:

MMD Hong Kong Holding Limited
Unit 1006, 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

Prepared by:

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Approved by: Kevin Liang — Assistant Manager

Date: April 22, 2022

Version

Version No.	Date	Description
V1.0	April 22, 2022	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	MMD Hong Kong Holding Limited
Address of Applicant:	Unit 1006, 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong
Manufacturer:	MMD Hong Kong Holding Limited
Address of Manufacturer:	Unit 1006 , 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Soundbar speaker and Wireless subwoofer
Model No. / HVIN:	TAB7207SO/37
Add. Model No.:	TAB7207, TAB7207SO, TAB7207/10, TAB7207SO/10, TAB7207/98, TAB7207SO/98, TAB7207/37, TAB7207xx/yy (x=A-Z or nil, yy =00-99 for country code)
Trade Mark:	or PHILIPS
DUT Stage:	Production Unit
EUT Supports Function: (Provided by the customer)	General 2.4GHz Technique
Software Version:	V1.0 (Provided by the customer)
Hardware Version:	V1.0 (Provided by the customer)
Sample Received Date:	February 22, 2022
Sample Tested Date:	April 21, 2022 to April 21, 2022
Note: The additional model TAB7207, TAB7207SO, TAB7207/10, TAB7207SO/10, TAB7207/98, TAB7207SO/98, TAB7207/37, TAB7207xx/yy (x=A-Z or nil, yy =00-99 for country code) is identical with the test model TAB7207SO/37 except the model number for marketing purpose.	

1.2.2 Description of Accessories

Cable	
Description:	AC Cable
Cable Type:	Unshielded without ferrite
Length:	1.50 Meter

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz	
Frequency Range:	2405 MHz to 2479 MHz	
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)	
Type of Modulation:	GFSK	
Number of Channels:	16	
Channel Separation:	5 MHz	
Antenna Type:	FPCB Antenna (TX)	
	PCB Antenna (RX)	
Antenna Gain: (Provided by the customer)	0 dBi	
Maximum Field Strength:	83.68 dBμV/m	
Normal Test Voltage:	Transmitter unit:	120 Vac
	Receiver unit:	120 Vac

1.4 OTHER INFORMATION

Operation Frequency Each of Channel					
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
0	2405 MHz	1	2409 MHz	2	2414 MHz
3	2419 MHz	4	2424 MHz	5	2429 MHz
6	2434 MHz	7	2439 MHz	8	2444 MHz
9	2449 MHz	10	2454 MHz	11	2459 MHz
12	2464 MHz	13	2469 MHz	14	2474 MHz
15	2479 MHz	-	-	-	-

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	DELL	Latitude 3400	16238087894	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust
LED TV	KTC	32GS-FATSC	NA	UnionTrust
LED TV	Skyworth	32E3A	NA	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.20 Meter	UnionTrust
2	USB serial port	USB	0.30 Meter	UnionTrust
3	HDMI Cable	HDMI	1.5 m	UnionTrust
4	Optical Cable	Optical	1.2 m	UnionTrust
5	Audio Cable	3.5mm Jack	0.8 m	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China 5
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.2 dB
2	Conducted emission 150KHz-30MHz	±2.7 dB
3	Radiated emission 9KHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

2. TEST SUMMARY

Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203 RSS-Gen Issue 5, Section 6.8	ANSI C63.10-2013	PASS
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013	PASS
Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209 RSS-210 Issue 10 B.10	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	FCC 47 CFR Part 15 Subpart C Section 15.249(a)/15.205 RSS-210 Issue 10 B.10	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215 (c) RSS-Gen Issue 5, Section 6.7	ANSI C63.10-2013	PASS

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	3m SAC	ETS-Lindgren	3m	Euroshiedpn-CT001270-1317	Jan. 22, 2021	Jan. 21, 2024
☒	Loop Antenna	ETS-Lindgren	6502	00202525	Nov. 11, 2021	Nov. 10, 2022
☒	Receiver	ROHDE & SCHWARZ	ESIB26	100114	Nov. 5, 2021	Nov. 4, 2022
☒	Broadband Antenna (Pre-amplifier)	ETS-Lindgren	3142E	00201566	Apr. 30, 2021	Apr. 29, 2023
☒	Pre-amplifier	HP	8447F	2805A02960	Nov. 5, 2021	Nov. 4, 2022
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 11, 2021	Nov. 10, 2023
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-Lindgren	3117-PA	00201541	Apr. 30, 2021	Apr. 29, 2023
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	Nov. 6, 2021	Nov. 5, 2022
☐	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-Lindgren	3116C-PA	00202652	Nov. 14, 2020	Nov. 13, 2022
☐	Pre-amplifier	ETS-Lindgren	00118384	202652	Nov. 14, 2020	Nov. 13, 2022
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 5, 2021	Nov. 4, 2022
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	Nov. 5, 2021	Nov. 4, 2022
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290020	Apr. 21, 2021	Apr. 20, 2022
☒	Wideband Radio Communication Tester	R&S	CMW500	120932	Apr. 22, 2021	Apr. 21, 2022
☒	Test Software	AutomationTestSystem	ECIT	Software Version: 1.0.7515.16529		

Conducted Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 5, 2021	Nov.4, 2022
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 5, 2021	Nov.4, 2022
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 5, 2021	Nov.4, 2022
☒	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 5, 2021	Nov.4, 2022
☒	Test Software	Audix	e3	Software Version: 9.20151119i		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	120~60Hz	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Emission	24.5	50.0	101.1	220222002-A01/4	David Zhang
Radiated Emission	24.3	51.0	100.2	220222002-C01/1	Asia Yan
Restricted bands around fundamental frequency (Radiated Emission)	24.3	51.0	100.2	220222002-C01/1	Asia Yan
20dB Occupied Bandwidth	24.5	55.0	101.1	220222002-A03/4	Hank Wu

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
GFSK	2405 MHz to 2479 MHz	Channel 0	Channel 8	Channel 16
		2405 MHz	2444 MHz	2479 MHz

4.3 EUT TEST STATUS

Modulation Mode	Tx Function	Description
GFSK	1Tx	Keep the EUT in continuously transmitting with modulation test single.

Power Setting
Power Setting: not applicable, test used software default power level.

Test Software
Test software name: Update_V255;

4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup

Figure 1. Below 30MHz

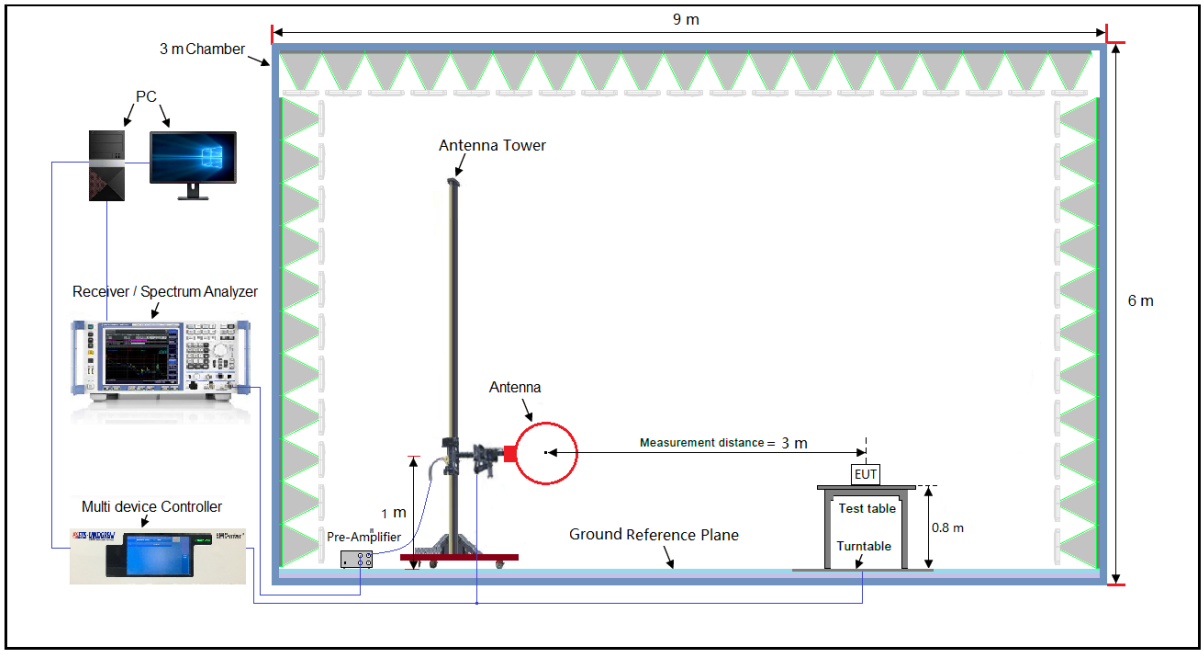


Figure 2. 30MHz to 1GHz

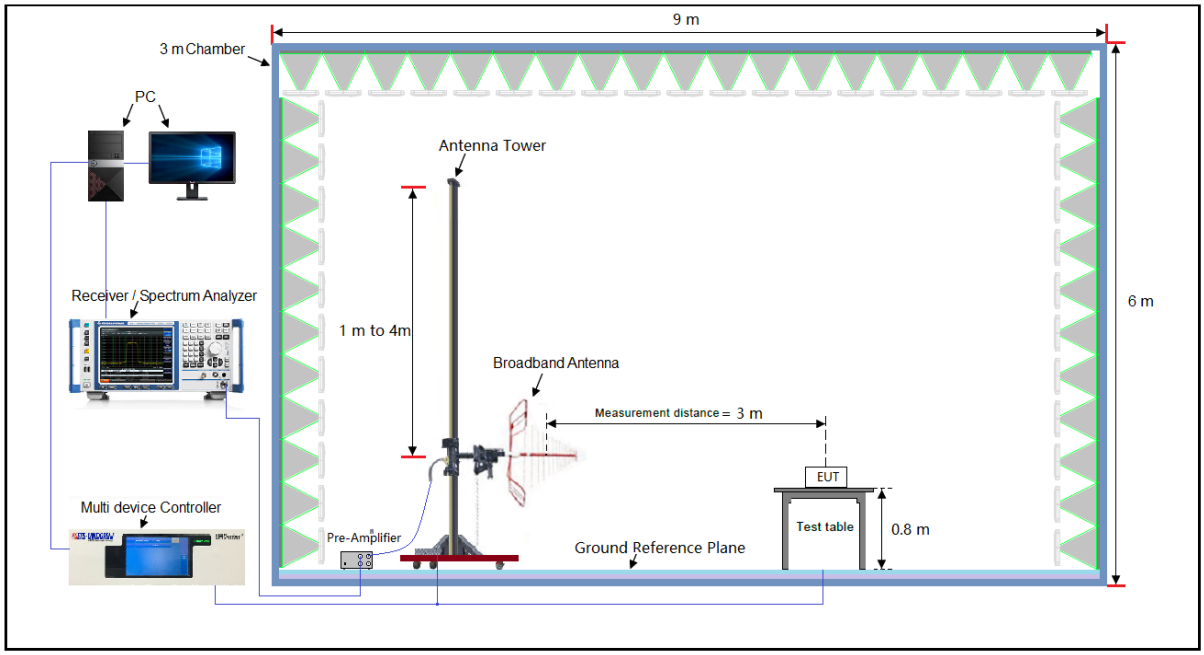
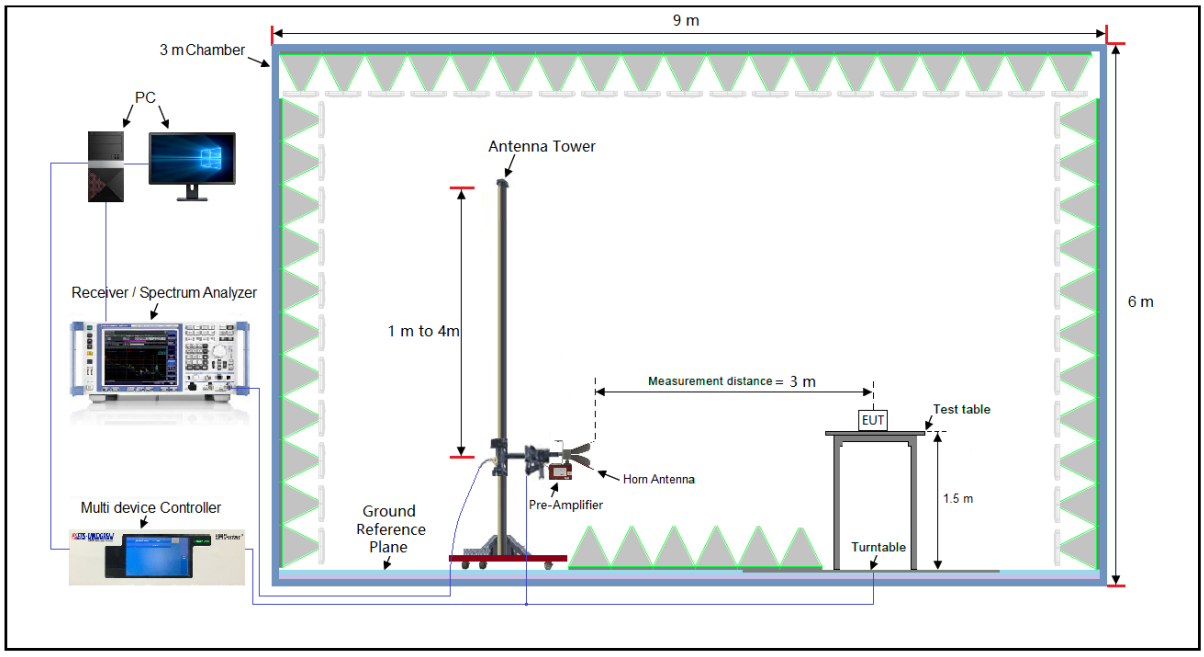
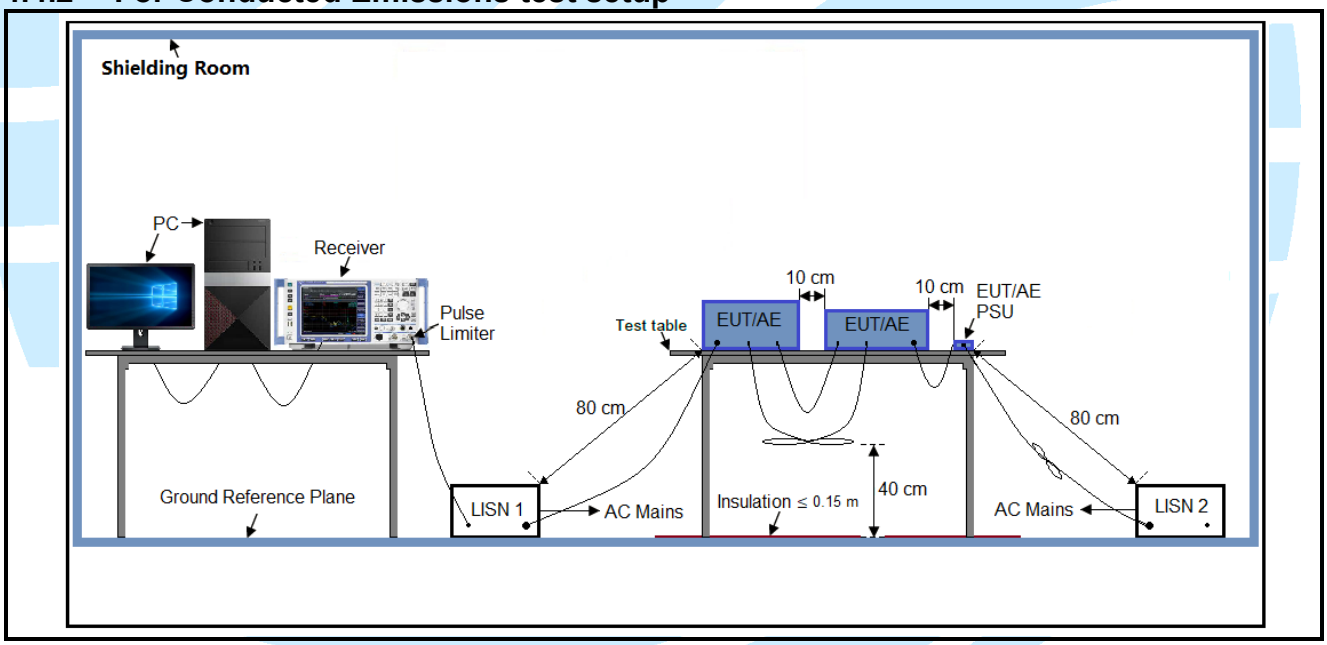


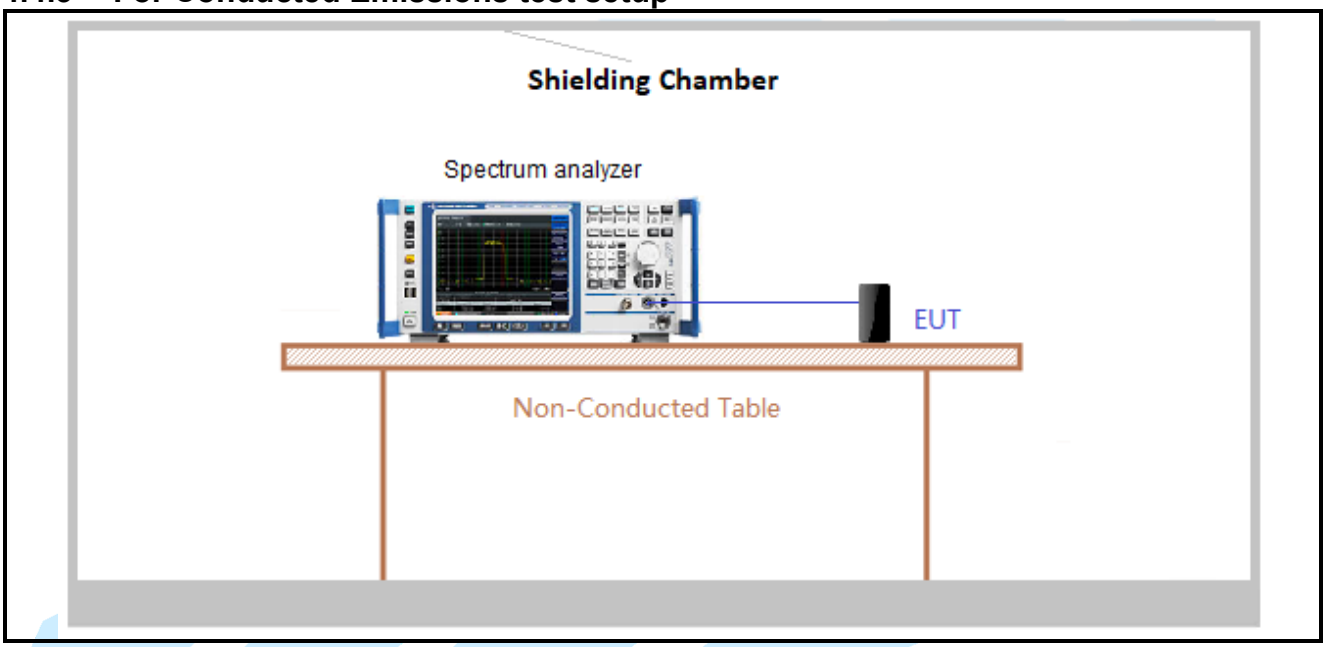
Figure 3. Above 1GHz



4.4.2 For Conducted Emissions test setup



4.4.3 For Conducted Emissions test setup



4.5 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by 120V~60Hz. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	Y axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.6 DUTY CYCLE

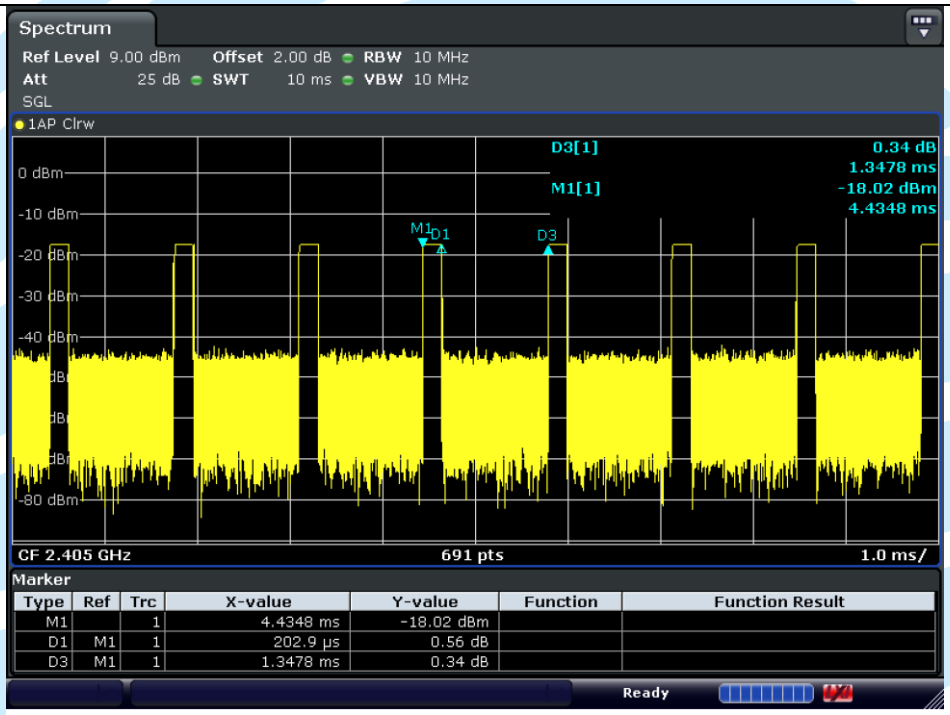
Test Procedure: ANSI C63.10-2013 Clause 11.6.

Test Results

Type of Modulation	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Average Factor (dB)
GFSK	1.3478	4.4348	0.30	30.39	-10.34

Remark:
1) Duty cycle= On Time/ Period;
2) Duty Cycle factor = 10 * log(1/ Duty cycle);
3) Average factor = 20 $\log_{10}$ Duty Cycle.

The test plot as follows



5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 15	Radio Frequency Devices
2	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
3	RSS-210 Issue 10	Licence-Exempt Radio Apparatus: Category I Equipment
4	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 Requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. **RSS-Gen Issue 5, Section 6.8 requirement:** According to RSS-Gen Issue 5, Section 6.8, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.
EUT Antenna:
Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 0 dBi.

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.209 and 15.249
RSS-210 Issue 10 B.10

Test Method: ANSI C63.10-2013 Section 6.6.4.3

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-0.090 MHz	Peak	10 kHz	30 KHz	Peak
0.009 MHz-0.090 MHz	Average	10 kHz	30 KHz	Average
0.090 MHz-0.110 MHz	Quasi-peak	10 kHz	30 KHz	Quasi-peak
0.110 MHz-0.490 MHz	Peak	10 kHz	30 KHz	Peak
0.110 MHz-0.490 MHz	Average	10 kHz	30 KHz	Average
0.490 MHz -30 MHz	Quasi-peak	10 kHz	30 kHz	Quasi-peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Quasi-peak
Above 1 GHz	Peak	5 MHz	20 MHz	Peak
	Peak	5 MHz	10 Hz	Average

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Field strength of the fundamental signal

Frequency	Limit (dBμV/m @3m)	Remark
2400 MHz-2483.5 MHz	94.0	Average
	114.0	Peak

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to

heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2. Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
2) Test the EUT in the lowest channel ,middle channel, the Highest channel
3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.
4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Field Strength of the Fundamental Signal					
Result (dBμV/m)	**Limit (dBμV/m)**	**Margin (dB)**	**Remark**	**Antenna Polaxis**	**Pass/Fail**
Lowest Channel					
73.34	94.00	-20.66	Average	Horizontal	Pass
83.68	114.00	-30.32	Peak	Horizontal	Pass
70.96	94.00	-23.04	Average	Vertical	Pass
81.30	114.00	-32.70	Peak	Vertical	Pass
Middle Channel					
69.99	94.00	-24.01	Average	Horizontal	Pass
80.33	114.00	-33.67	Peak	Horizontal	Pass
68.51	94.00	-25.49	Average	Vertical	Pass
78.85	114.00	-35.15	Peak	Vertical	Pass
Highest Channel					
71.18	94.00	-22.82	Average	Horizontal	Pass
81.52	114.00	-32.48	Peak	Horizontal	Pass
70.16	94.00	-23.84	Average	Vertical	Pass
80.50	114.00	-33.50	Peak	Vertical	Pass

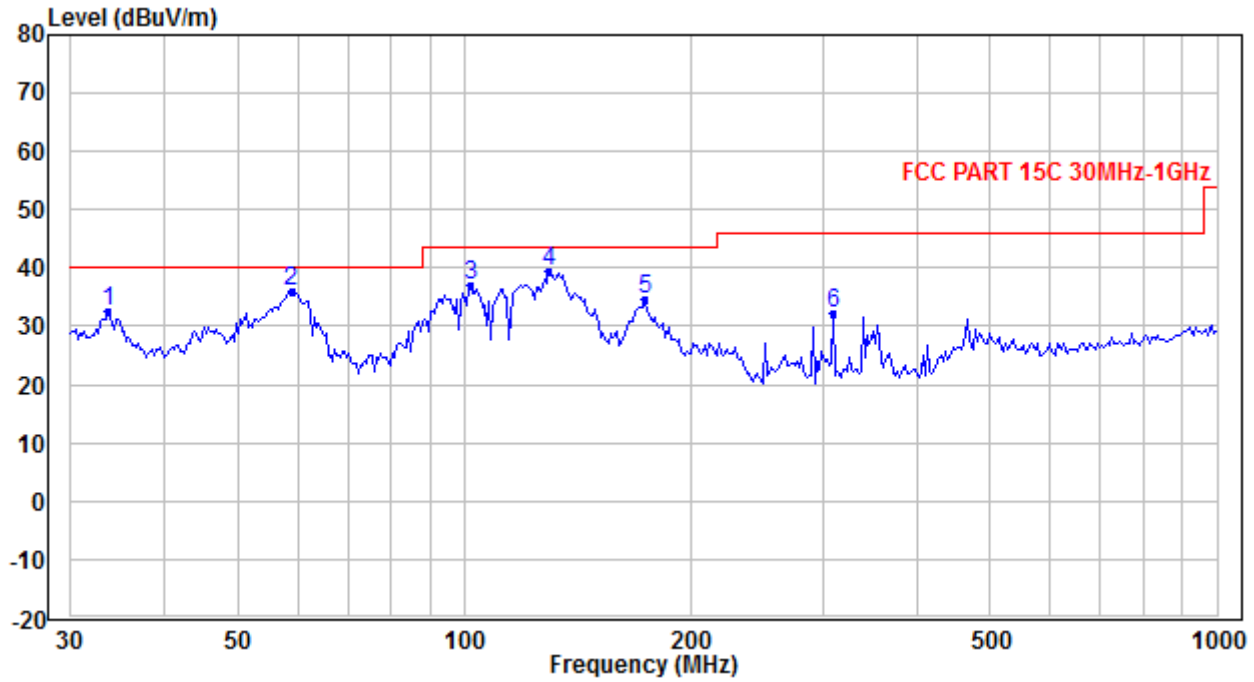
Remark: Average result = Peak result + Average Factor

Radiated Emission Test Data (9 KHz ~ 30 MHz):
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (30 MHz ~ 1 GHz):

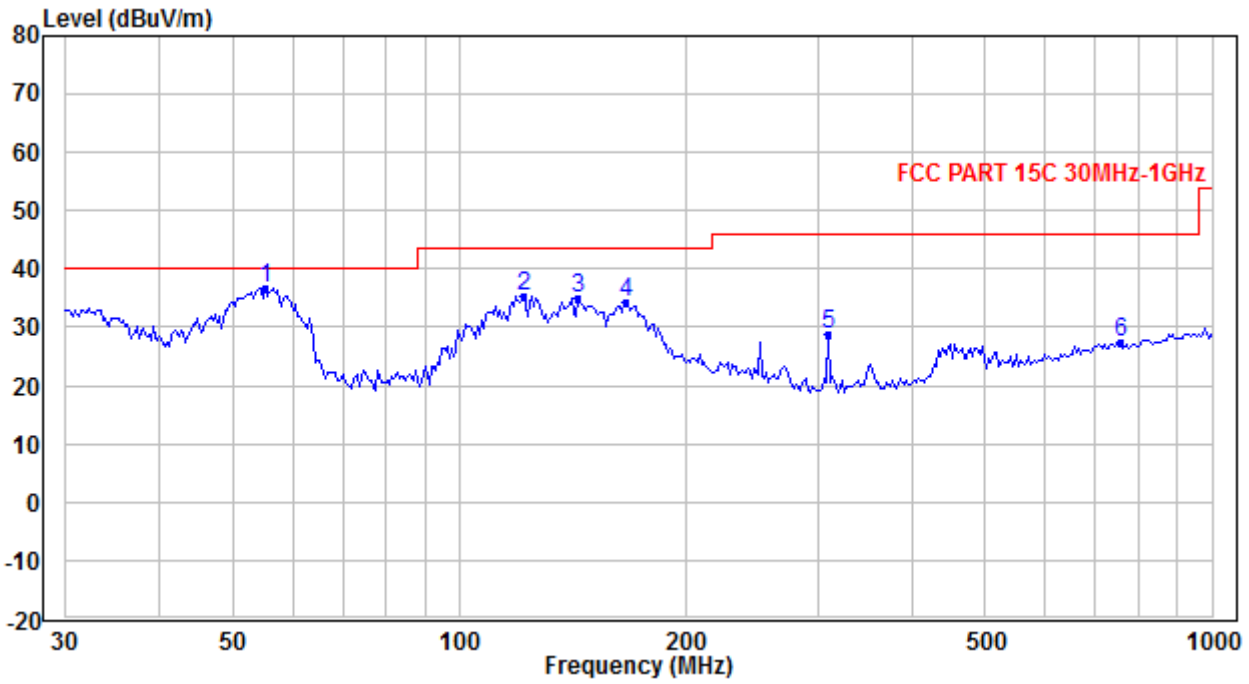
Lowest Channel

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	33.570	37.36	-4.91	32.45	40.00	-7.55	QP
2	58.898	53.34	-17.23	36.11	40.00	-3.89	QP
3	101.893	52.74	-15.78	36.96	43.50	-6.54	QP
4	129.392	55.09	-15.69	39.40	43.50	-4.10	QP
5	173.815	46.06	-11.41	34.65	43.50	-8.85	QP
6	309.271	38.26	-6.14	32.12	46.00	-13.88	QP

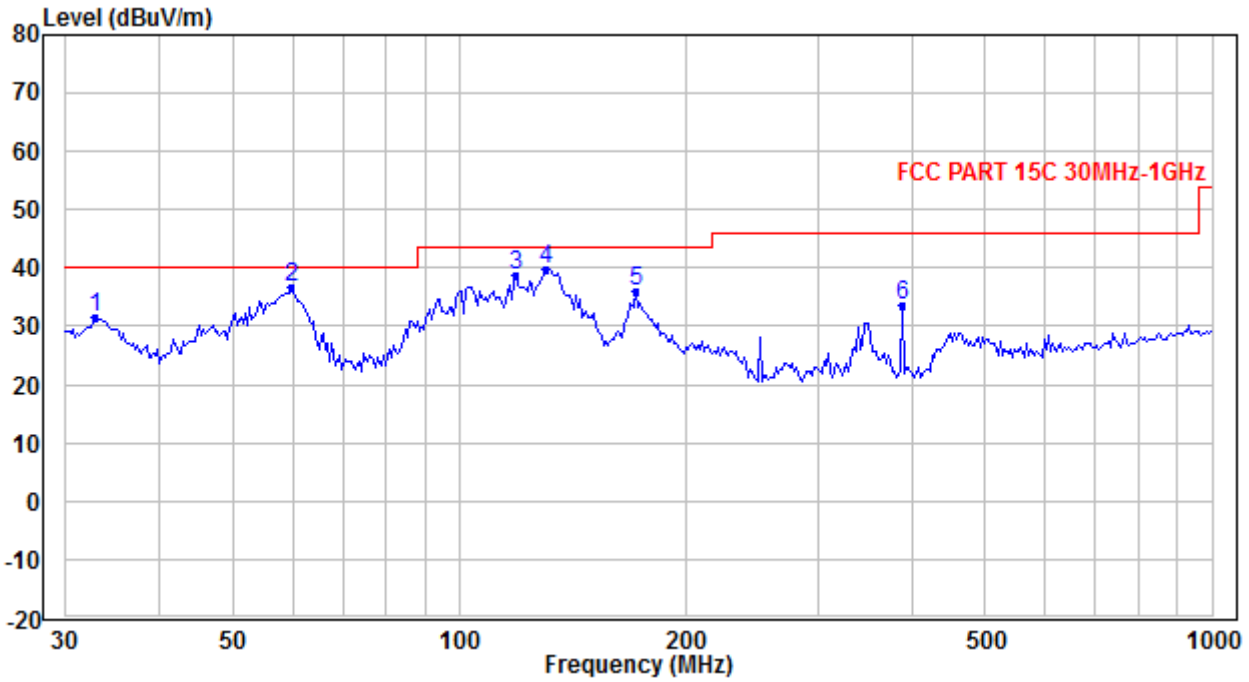
Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	55.288	53.84	-17.11	36.73	40.00	-3.27	QP
2	121.462	51.39	-15.89	35.50	43.50	-8.00	QP
3	143.776	50.82	-15.68	35.14	43.50	-8.36	QP
4	166.639	46.51	-12.31	34.20	43.50	-9.30	QP
5	309.271	35.08	-6.14	28.94	46.00	-17.06	QP
6	754.963	25.75	1.71	27.46	46.00	-18.54	QP

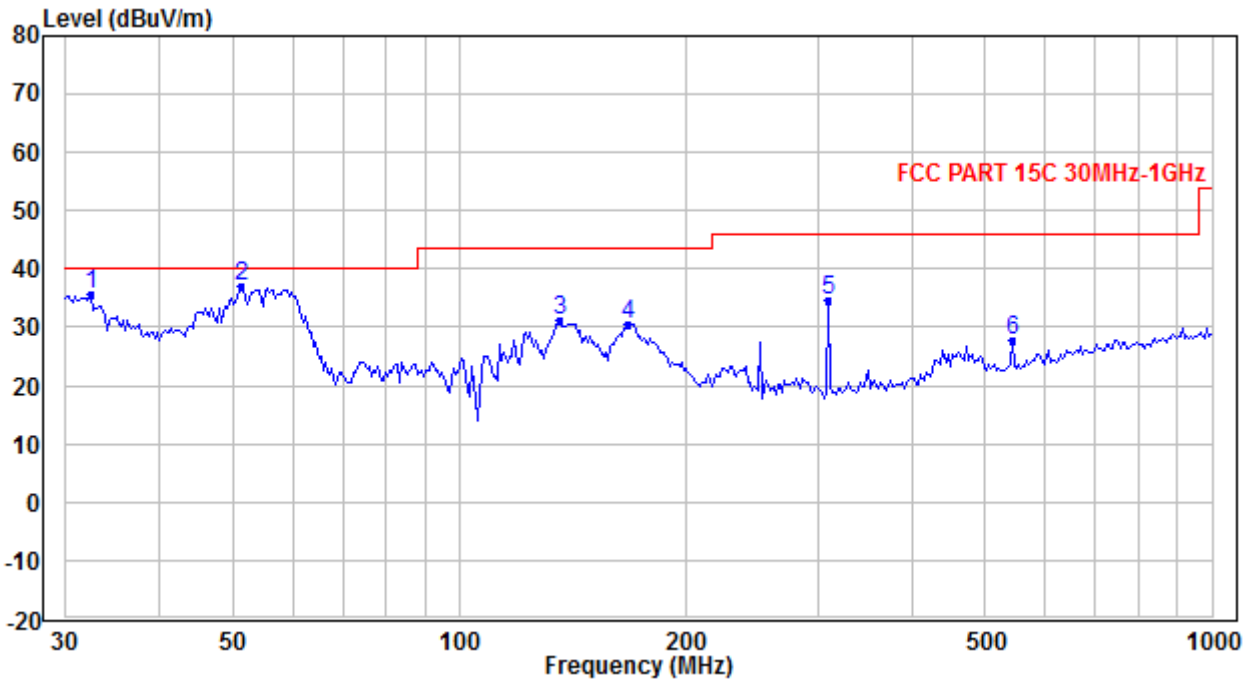
Middle Channel

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	32.870	36.29	-4.81	31.48	40.00	-8.52	QP
2	59.732	54.14	-17.37	36.77	40.00	-3.23	QP
3	118.929	54.48	-15.67	38.81	43.50	-4.69	QP
4	130.305	55.37	-15.59	39.78	43.50	-3.72	QP
5	171.389	47.25	-11.17	36.08	43.50	-7.42	QP
6	387.257	38.44	-4.79	33.65	46.00	-12.35	QP

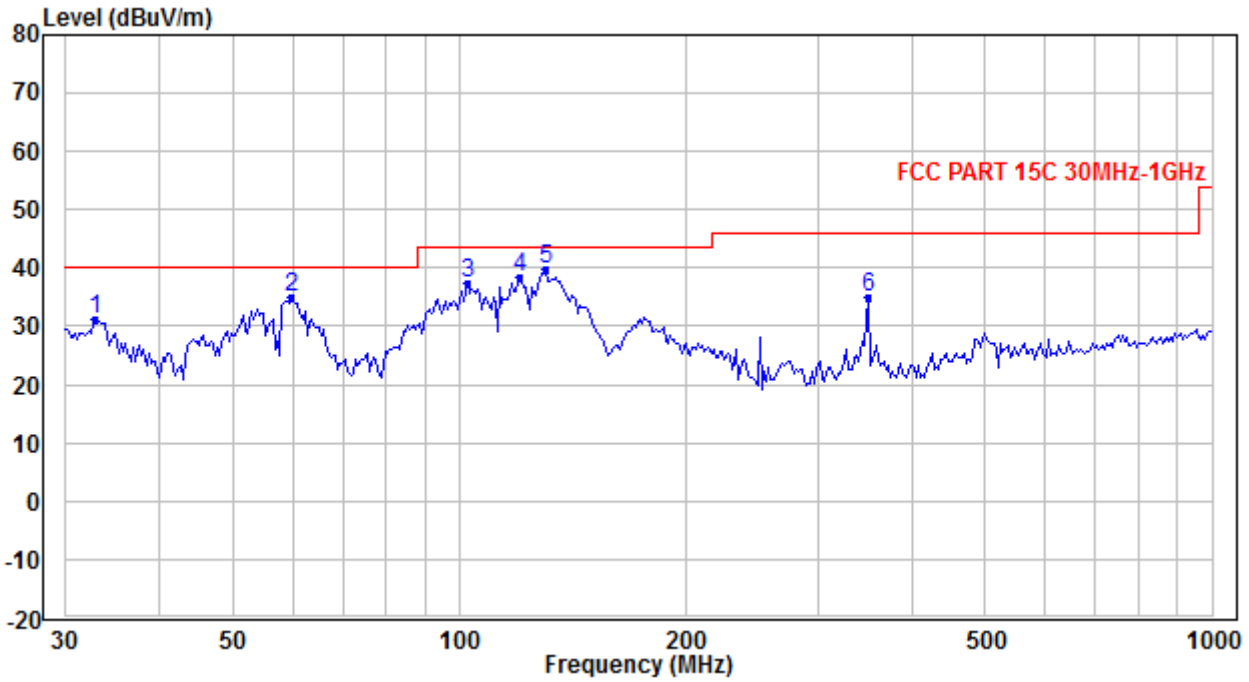
Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	32.411	40.29	-4.77	35.52	40.00	-4.48	QP
2	51.176	52.16	-15.13	37.03	40.00	-2.97	QP
3	135.916	46.75	-15.61	31.14	43.50	-12.36	QP
4	167.814	42.43	-12.01	30.42	43.50	-13.08	QP
5	309.271	40.90	-6.14	34.76	46.00	-11.24	QP
6	542.610	29.62	-1.86	27.76	46.00	-18.24	QP

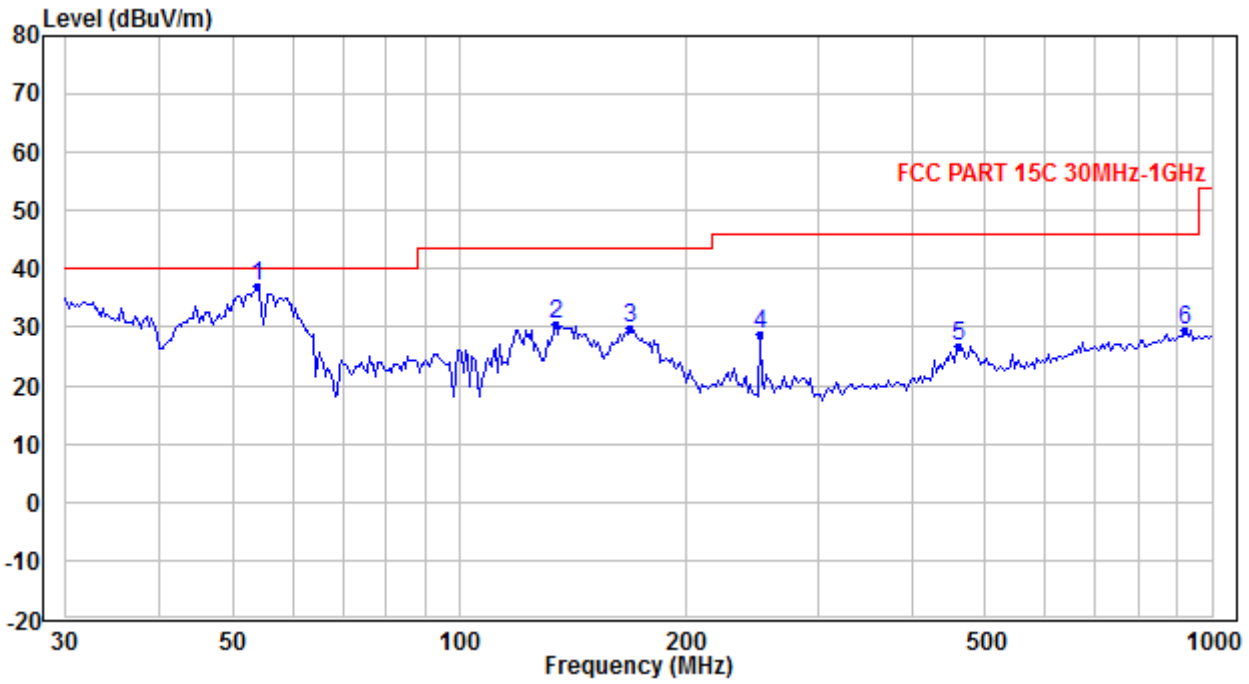
Highest Channel

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	32.870	36.08	-4.81	31.27	40.00	-8.73	QP
2	59.732	52.38	-17.37	35.01	40.00	-4.99	QP
3	102.612	53.31	-15.79	37.52	43.50	-5.98	QP
4	120.612	54.28	-15.86	38.42	43.50	-5.08	QP
5	130.305	55.35	-15.59	39.76	43.50	-3.74	QP
6	348.514	40.04	-5.19	34.85	46.00	-11.15	QP

Vertical



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	53.756	53.68	-16.61	37.07	40.00	-2.93	QP
2	134.019	46.30	-15.73	30.57	43.50	-12.93	QP
3	168.997	41.60	-11.75	29.85	43.50	-13.65	QP
4	250.486	37.56	-8.82	28.74	46.00	-17.26	QP
5	461.631	30.29	-3.62	26.67	46.00	-19.33	QP
6	919.132	25.08	4.42	29.50	46.00	-16.50	QP

Radiated Emission Test Data (Above 1GHz):

Lowest Channel:

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4810.00	35.51	-1.40	34.11	74.00	-39.89	Peak	Horizontal
2	4810.00	24.77	-1.40	23.37	54.00	-30.63	Average	Horizontal
3	7215.00	37.18	1.30	38.48	74.00	-35.52	Peak	Horizontal
4	7215.00	24.85	1.30	26.15	54.00	-27.85	Average	Horizontal
5	4810.00	37.32	-1.40	35.92	74.00	-38.08	Peak	Vertical
6	4810.00	24.85	-1.40	23.45	54.00	-30.55	Average	Vertical
7	7215.00	37.20	1.30	38.50	74.00	-35.50	Peak	Vertical
8	7215.00	24.85	1.30	26.15	54.00	-27.85	Average	Vertical

Middle Channel:

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4888.00	37.69	-1.37	36.32	74.00	-37.68	Peak	Horizontal
2	4888.00	35.62	-1.37	24.36	54.00	-29.64	Average	Horizontal
3	7332.00	38.49	1.29	39.78	74.00	-34.22	Peak	Horizontal
4	7332.00	35.93	1.29	27.88	54.00	-26.12	Average	Horizontal
5	4888.00	39.06	-1.37	37.69	74.00	-36.31	Peak	Vertical
6	4888.00	25.95	-1.37	24.58	54.00	-29.42	Average	Vertical
7	7332.00	39.11	9.29	48.40	74.00	-25.60	Peak	Vertical
8	7332.00	26.85	9.29	28.14	54.00	-25.86	Average	Vertical

Highest Channel:

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4958.00	38.11	-1.34	36.77	74.00	-37.23	Peak	Horizontal
2	4958.00	25.94	-1.34	24.60	54.00	-29.40	Average	Horizontal
3	7437.00	38.33	1.30	39.63	74.00	-34.37	Peak	Horizontal
4	7437.00	26.58	1.30	27.88	54.00	-26.12	Average	Horizontal
5	4958.00	38.73	-1.34	37.39	74.00	-36.61	Peak	Vertical
6	4958.00	25.94	-1.34	24.60	54.00	-29.40	Average	Vertical
7	7437.00	39.35	1.30	40.65	74.00	-33.35	Peak	Vertical
8	7437.00	26.58	1.30	27.88	54.00	-26.12	Average	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. All possible modes of operation were investigated, and testing at two nominal voltages of 240V/50Hz and 120V/60Hz. only the worst-case emissions reported. It is TX and Bluetooth are working simultaneously.

5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY

Test Requirement: FCC 47 CFR Part 15.209 and 15.205
RSS-210 B.10

Test Method: ANSI C63.10-2013

Limits:

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Frequency	Limit (dBμV/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

Radiated band edge measurements at 2400 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

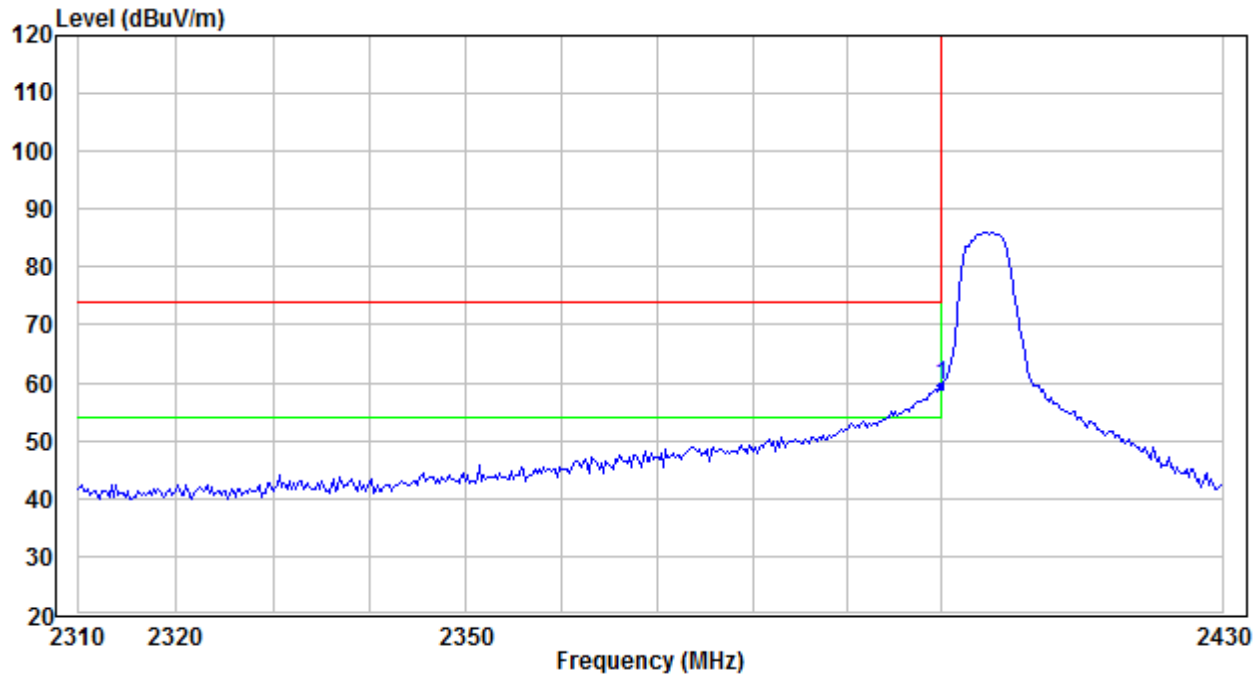
1. Use radiated spurious emission test procedure described in clause 5.3. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

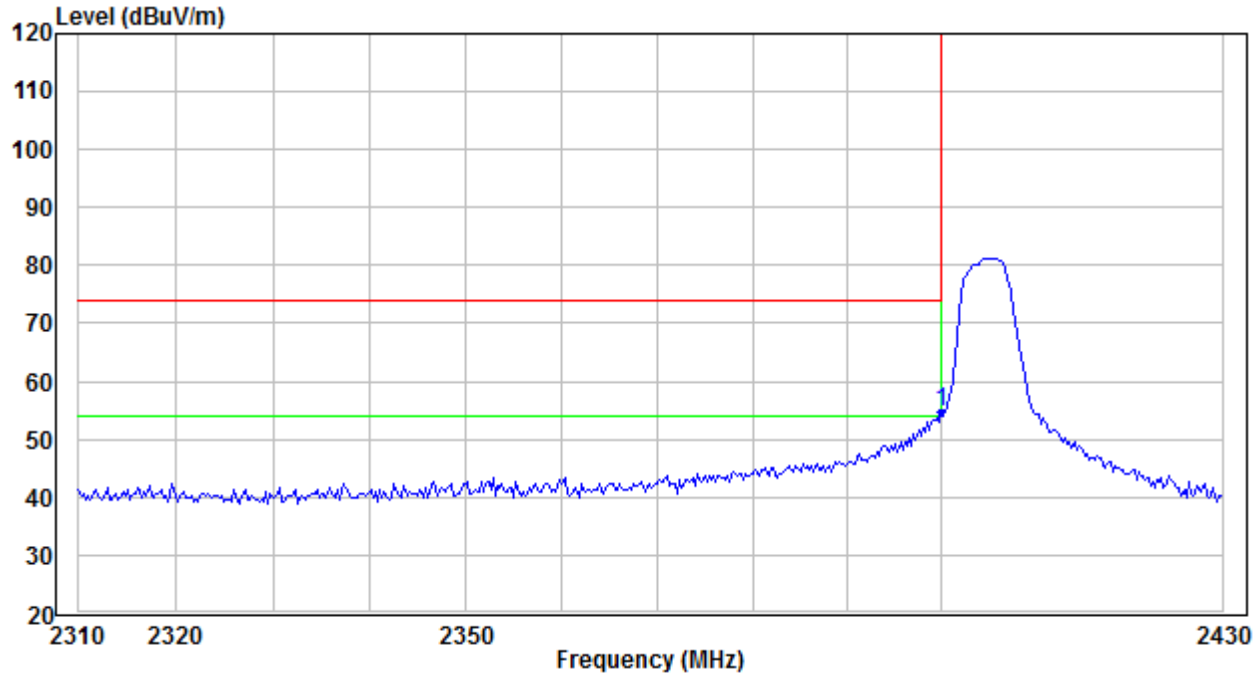
The measurement data as follows:

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



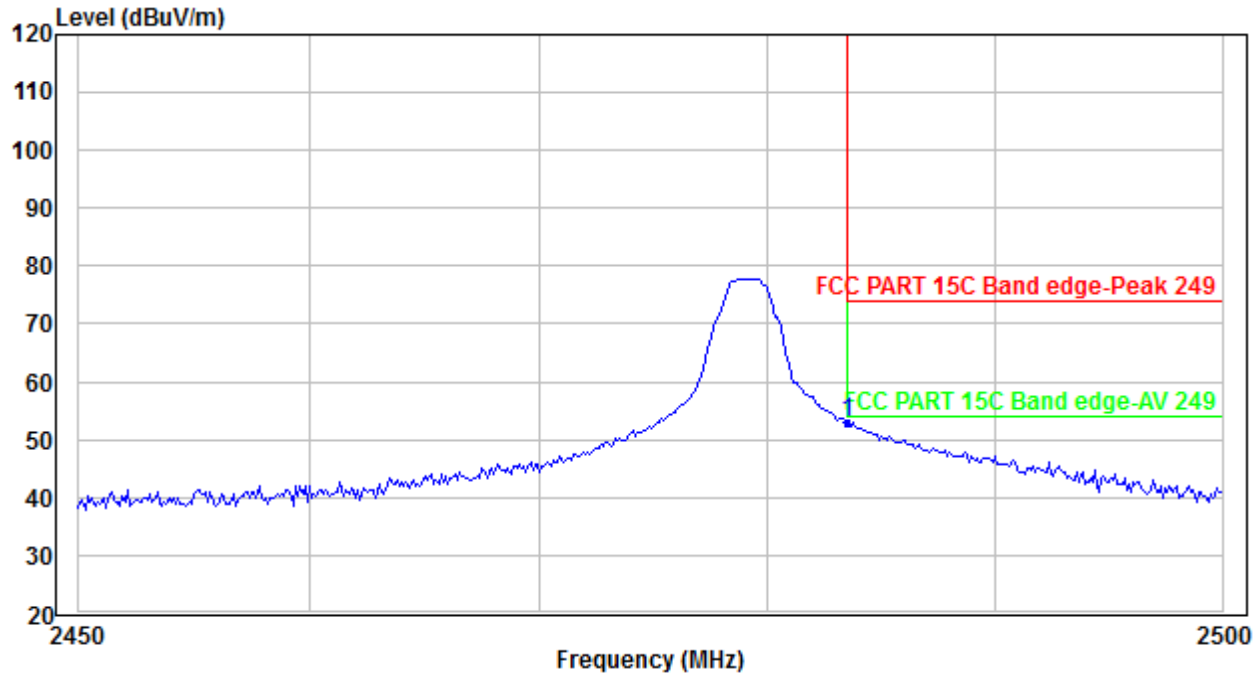
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2400.000	59.51	74	49.17	54	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



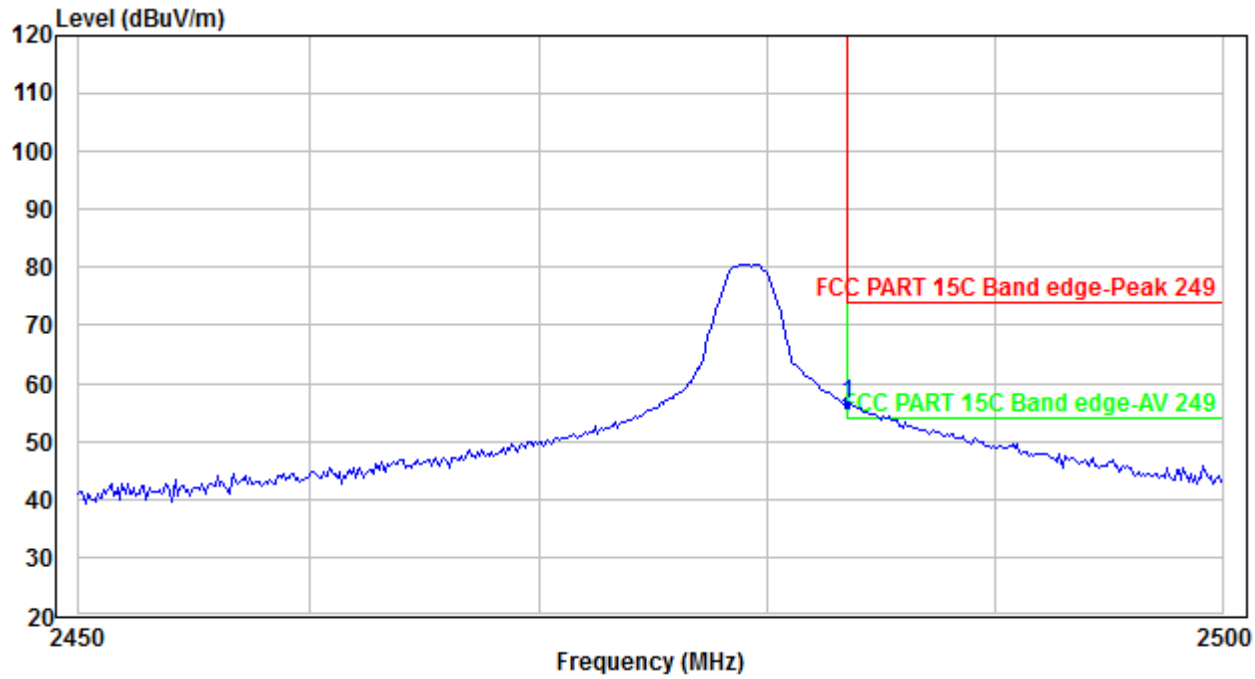
Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2400.000	54.59	74	44.25	54	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	53.14	74	42.8	54	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBμV/m)	Peak Limit (dBμV/m)	AV level (dBμV/m)	AV Limit (dBμV/m)	Conclusion
2483.500	56.47	74	46.13	54	Pass

Remark: Average result = Peak result + Average Factor

5.5 20DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15.215
RSS-Gen Issue 5 Section 6.7

Test Method: ANSI C63.10-2013

Test Setup: Refer to section 4.4.3 for details.

Limits: N/A

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement procedure shall be as follows:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:

a) Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
b) RBW ≥ 1% of the 20 dB bandwidth
c) VBW ≥ RBW
d) Sweep = auto;
e) Detector function = peak
f) Trace = max hold
g) All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Result: Pass

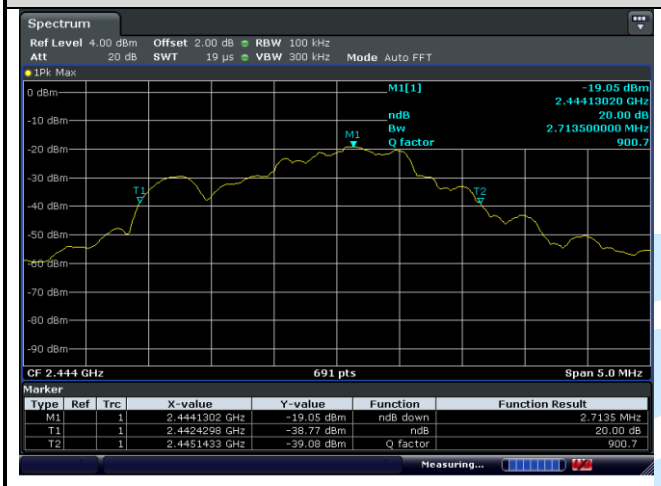
The measurement data as follows:

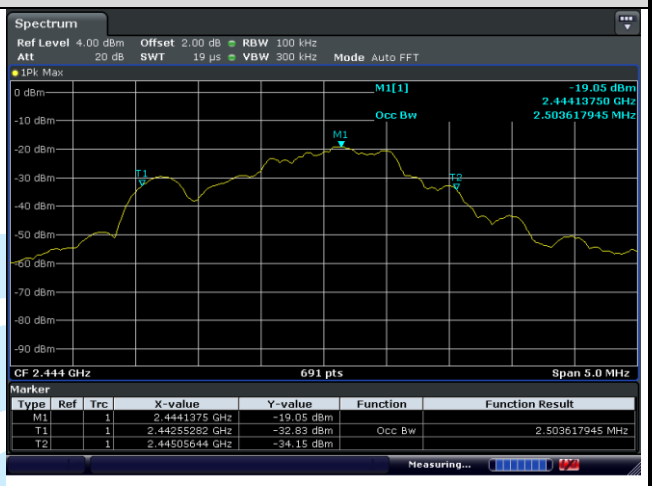
Test Channel	20 dB Bandwidth (MHz)	Occupied Bandwidth (MHz)
Lowest	3.7771	3.9826
Middle	2.7135	2.5036
Highest	2.1491	1.9030

The test plot as follows:

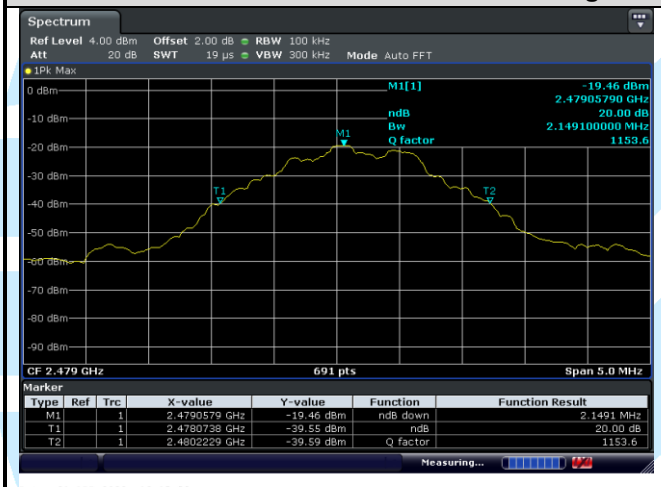
Lowest Channel

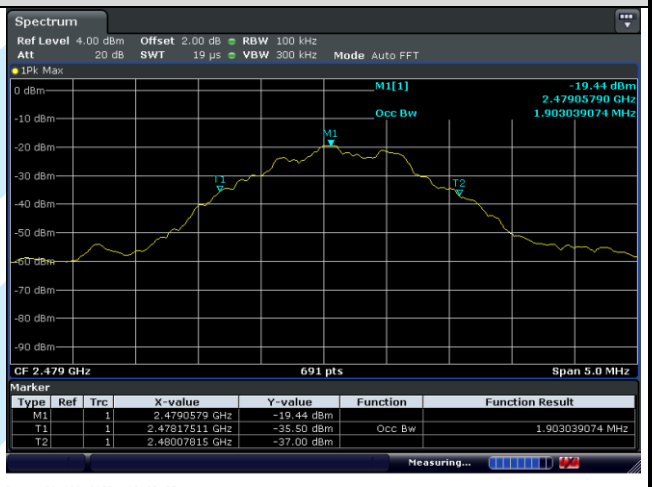
Middle Channel





Highest Channel





5.6 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.207
RSS-Gen Section 8.8

Test Method: ANSI C63.10-2013 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

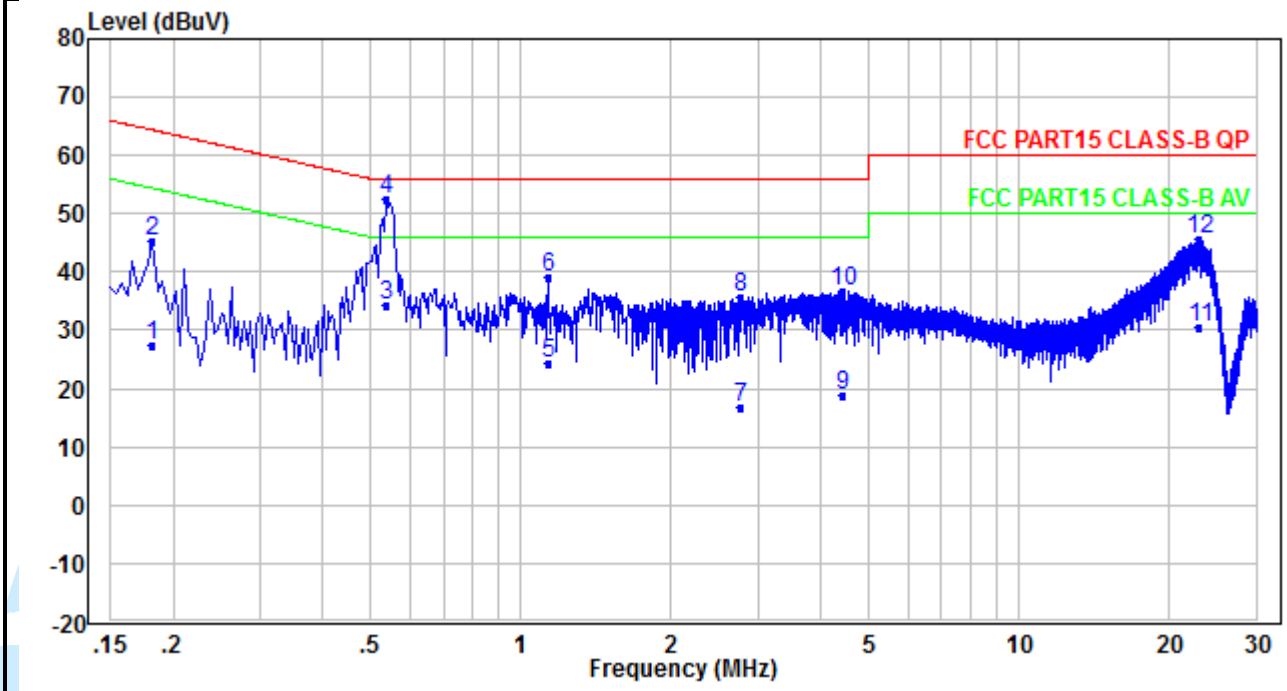
1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

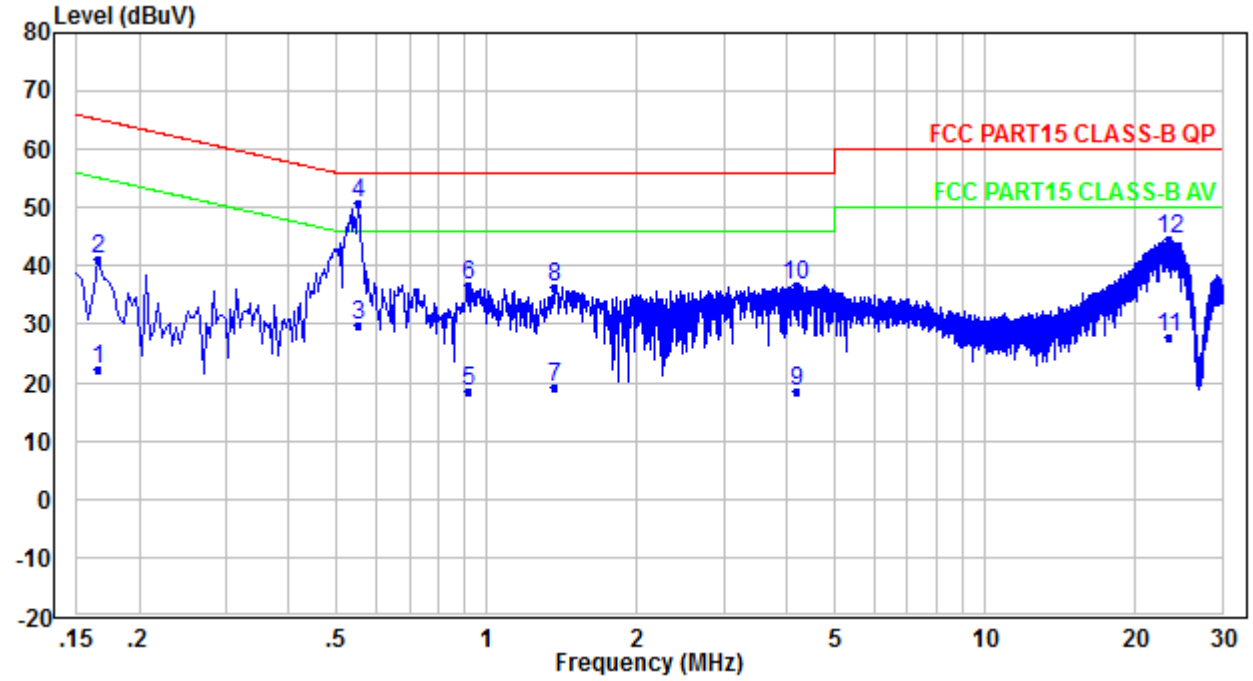
The measurement data as follows:
Quasi Peak and Average:
TX Link

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Remark
1	0.182	17.27	10.12	27.39	54.39	-27.00	Average
2	0.182	35.27	10.12	45.39	64.39	-19.00	QP
3	0.538	24.24	10.16	34.40	46.00	-11.60	Average
4	0.538	42.24	10.16	52.40	56.00	-3.60	QP
5	1.134	13.98	10.22	24.20	46.00	-21.80	Average
6	1.134	28.98	10.22	39.20	56.00	-16.80	QP
7	2.766	6.41	10.26	16.67	46.00	-29.33	Average
8	2.766	25.41	10.26	35.67	56.00	-20.33	QP
9	4.450	8.44	10.30	18.74	46.00	-27.26	Average
10	4.450	26.44	10.30	36.74	56.00	-19.26	QP
11	23.068	19.52	10.95	30.47	50.00	-19.53	Average
12	23.068	34.52	10.95	45.47	60.00	-14.53	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Remark
1	0.298	35.46	10.78	46.24	50.30	-4.06	Average
2	0.298	35.74	10.78	46.52	60.30	-13.78	QP
3	0.497	23.36	10.63	33.99	46.06	-12.07	Average
4	0.497	27.74	10.63	38.37	56.06	-17.69	QP
5	2.779	20.02	10.28	30.30	46.00	-15.70	Average
6	2.779	23.88	10.28	34.16	56.00	-21.84	QP
7	4.862	19.58	10.13	29.71	46.00	-16.29	Average
8	4.862	25.21	10.13	35.34	56.00	-20.66	QP
9	9.784	33.57	10.08	43.65	50.00	-6.35	Average
10	9.784	38.96	10.08	49.04	60.00	-10.96	QP
11	14.462	25.90	10.27	36.17	50.00	-13.83	Average
12	14.462	31.49	10.27	41.76	60.00	-18.24	QP

Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.
5. All possible modes of operation were investigated, and testing at two nominal voltages of 240V/50Hz and 120V/60Hz. only the worst-case emissions reported. It is TX and Bluetooth are working simultaneously.

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***