FCC TEST REPORT

Product Name:	Wireless mouse Dongle
Trade Mark:	ATRIX, gamestop, Geeknet,Inc
Model No.:	ME4
Report Number:	211026004RFC-2
Test Standards:	FCC 47 CFR Part 15 Subpart C
FCC ID:	2AO23-ME4
Test Result:	PASS
Date of Issue:	November 22, 2021

Prepared for:

Chug,Inc.
7157 Shady Oak Road Eden Prairie, Washington Minnesota United States

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
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Dylan Zhang
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Approved by: *Kevin Liang — Date: November 22, 2021

Assistant Manager

Version

Version No.	Date	Description
V1.0	November 22, 2021	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Chug, Inc.
Address of Applicant:	7157 Shady Oak Road Eden Prairie, Washington Minnesota United States
Manufacturer:	SHENZHEN XINCHUNQI TECHNOLOGY CO.,LTD.
Address of Manufacturer:	501 Bailichun building, no.28, Xintang road, Xintian community, Fuyong street, Baoan district, Shenzhen, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Wireless mouse Dongle
Model No.:	ME4
Trade Mark:	ATRIX, gamestop, Geeknet,Inc
DUT Stage:	Identical Prototype
EUT Supports Function:	General 2.4GHz Technique
Power Supply:	DC 5V/20 mA
Software Version:	V13.30
Hardware Version:	V1.0
Sample Received Date:	October 27, 2021
Sample Tested Date:	November 2, 2021 to November 15, 2021

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2405 MHz to 2475 MHz
Modulation Technique:	General 2.4GHz Technique
Type of Modulation:	GFSK
Number of Channels:	16
Channel Separation:	≥3 MHz
Antenna Type:	PCB Antenna
Antenna Gain:	-1.0 dBi
Maximum Field Strength:	89.10 dBμV/m
Normal Test Voltage:	5.0 Vdc

1.4 OTHER INFORMATION

Operation Frequency Each of Channel								
Channel	1	2	3	4	5	6	7	8
Frequency (MHz)	2405	2408	2414	2419	2422	2426	2436	2439
Channel	9	10	11	12	13	14	15	16
Frequency (MHz)	2441	2445	2453	2459	2463	2466	2471	2475

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust
Notebook Adapter	LENOVO	ADLX65NLC3A	5A10J75114	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	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, 518109
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	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209	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	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215 (c)	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 Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	22-Jan-2021	21-Jan-2024
☒	Receiver	R&S	ESIB26	100114	18-Nov-2020	17-Nov-2021
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 14, 2020	Nov. 13, 2022
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	14-Nov-2020	13-Nov-2022
☒	Preamplifier	HP	8447F	2805A02960	Nov. 10, 2020	Nov. 10, 2021
					Nov. 5, 2021	Nov.4, 2022
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	Apr. 30, 2021	Apr. 29, 2023
☒	Preamplifier	ETS-LINDGREN	00118385	00201874	Nov. 10, 2020	Nov. 9, 2021
					Nov. 6, 2021	Nov.5, 2022
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

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	101181	18-Nov-2020	17-Nov-2021
☒	LISN	R&S	ESH2-Z5	860014/024	18-Nov-2020	17-Nov-2021
☒	Test Software	Audix	e3	Software Version: 9 20151119i		

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	Apr. 22, 2021	Apr. 21, 2022

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	DC 5V	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)	Tested by
Conducted Emission	24.8	45	101.1	David Zhang
Radiated Emission	25.2	52	100.10	Fire Huo
Restricted bands around fundamental frequency (Radiated Emission)	25.2	52	100.10	Fire Huo
20dB Occupied Bandwidth	25.2	52	100.10	Fire Huo

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
GFSK	2405 MHz to 2475 MHz	Channel 1	Channel 9	Channel 16
		2405 MHz	2441 MHz	2475 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: CompxTest.exe

4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup

Figure 1. Below 30MHz

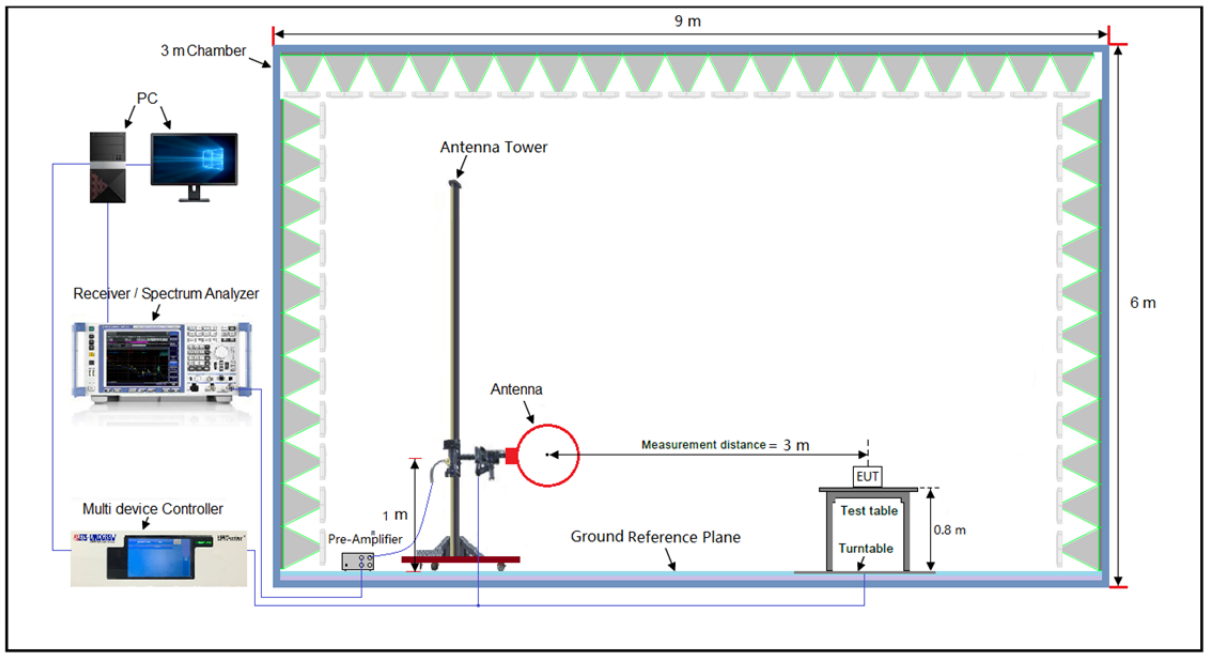


Figure 2. 30MHz to 1GHz

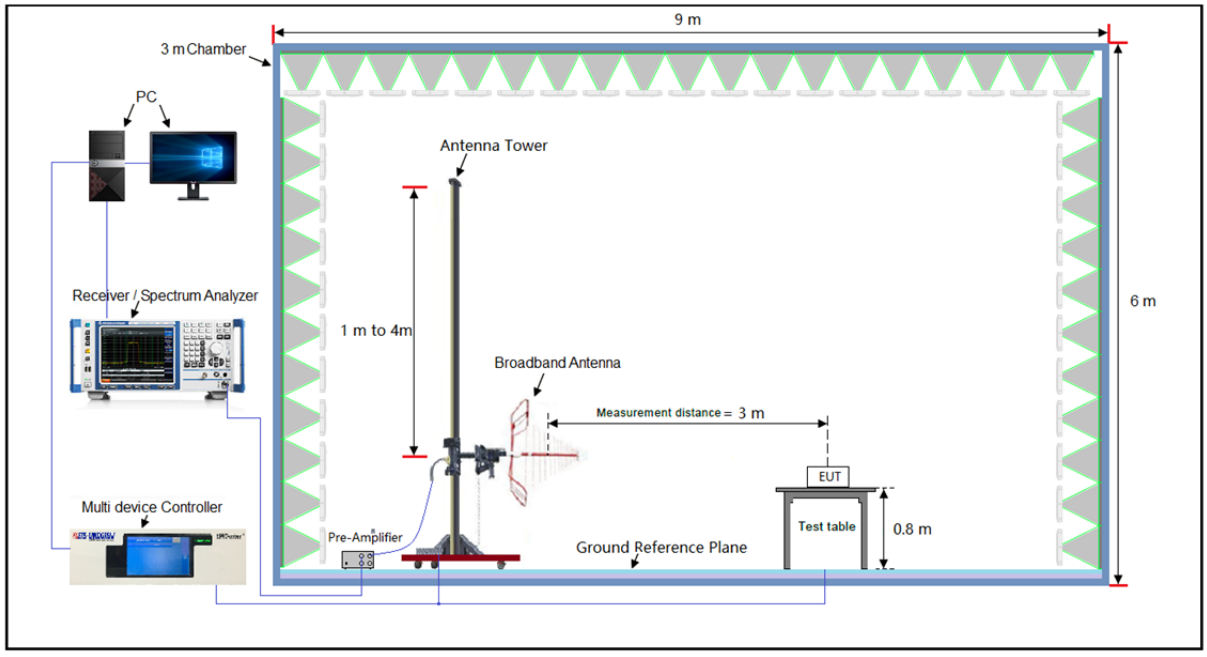
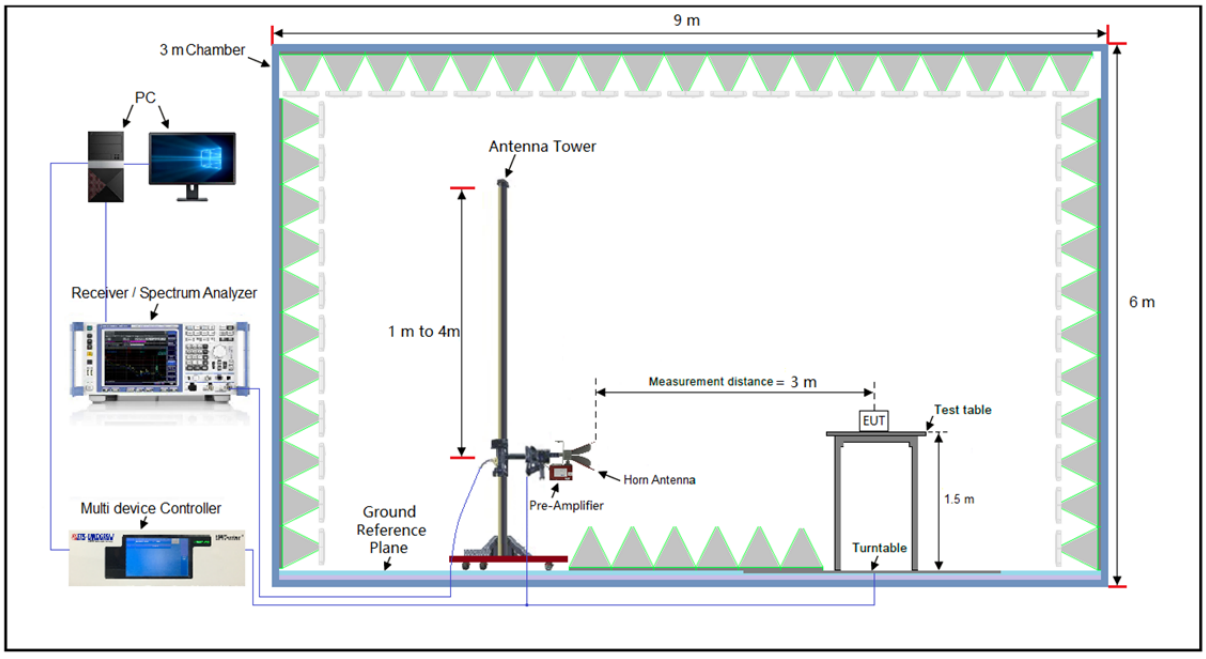
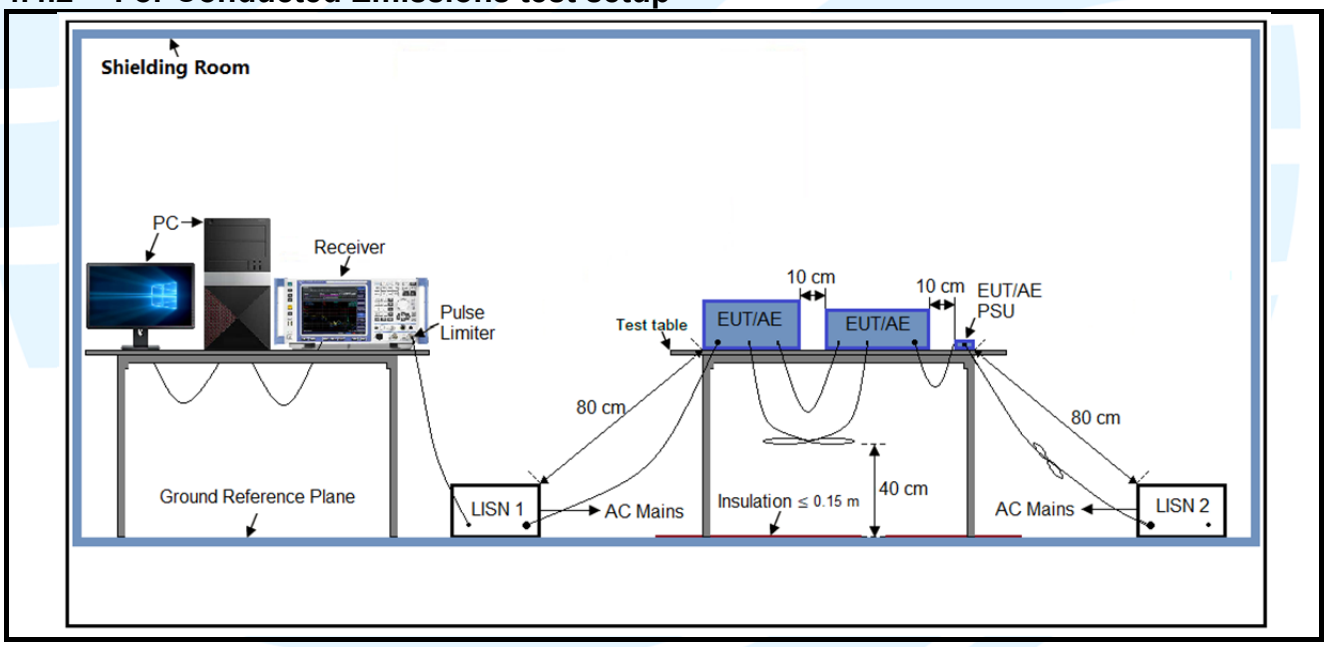


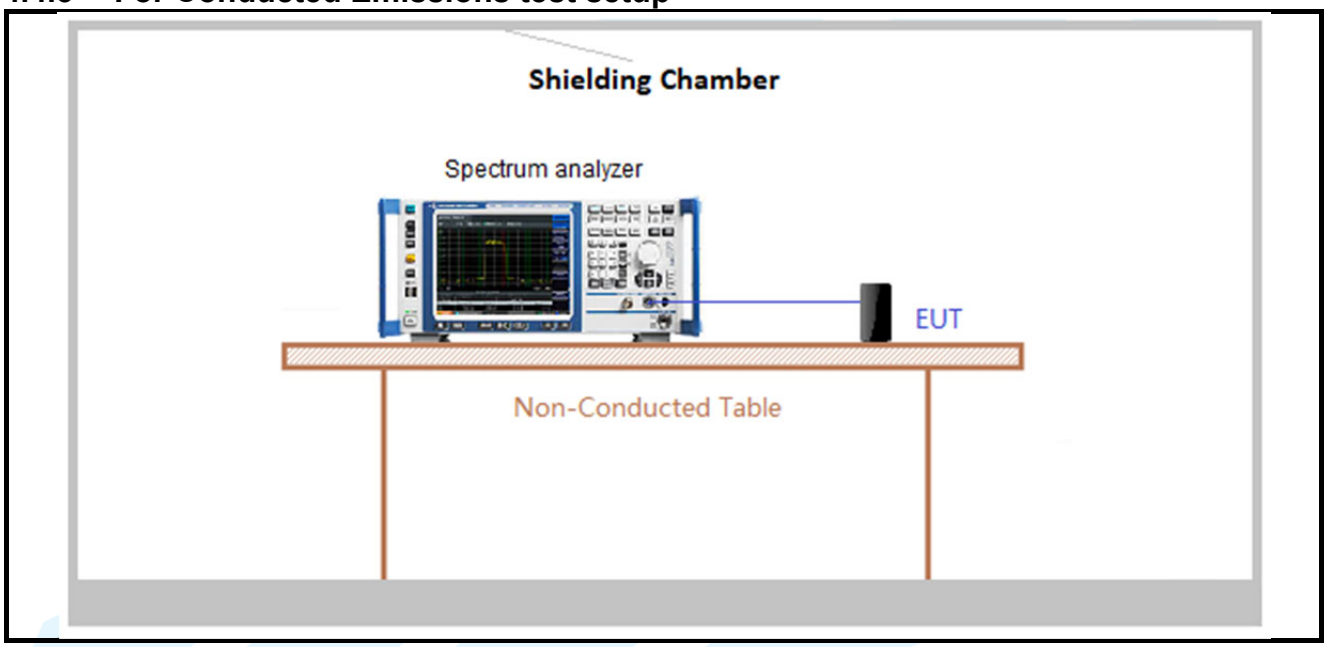
Figure 3. Above 1GHz



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 a 5Vdc by computer. 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	X 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.

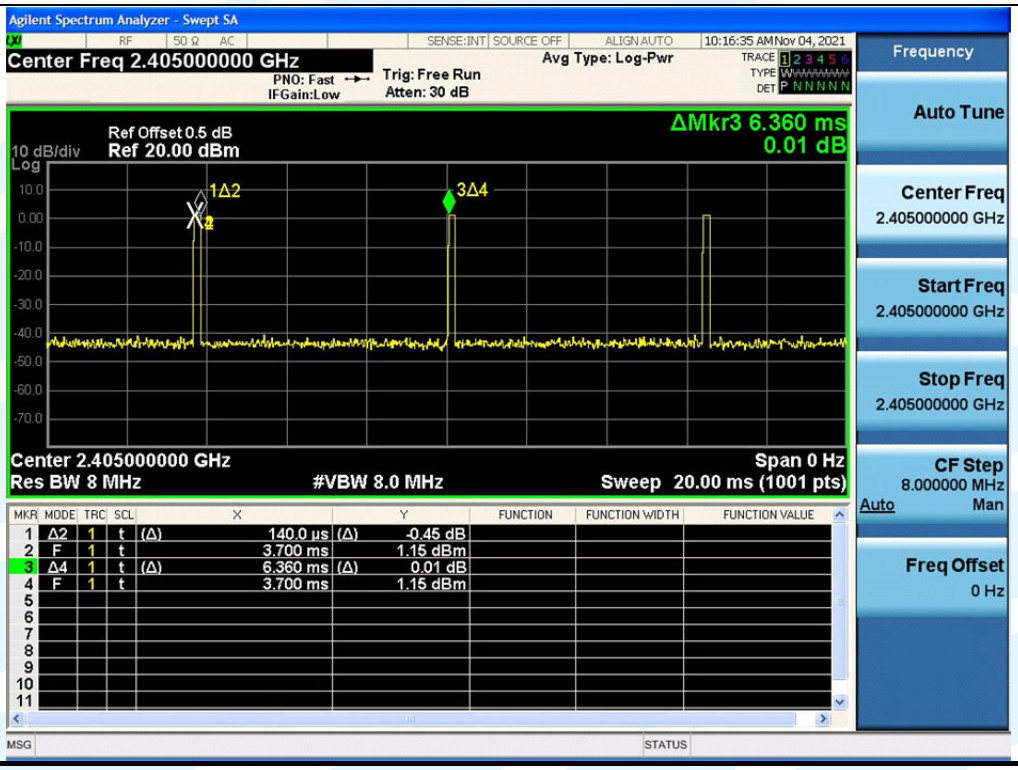
Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.6 DUTY CYCLE

Type of Modulation	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Average Factor (dB)
GFSK	0.140	6.360	0.02	2.20	-16.99

Remark:
1) Duty cycle= On Time/ Period;
2) Duty Cycle factor = 10 * log(1/ Duty cycle);
3) Average factor = 10 $\log_{10}$ 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	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.
EUT Antenna:
Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is -1dBi.

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.209 and 15.249

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	1 MHz	3 MHz	Peak
	Peak	1 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 X 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					
72.11	94.00	-21.89	Average	Horizontal	Pass
89.10	114.00	-24.90	Peak	Horizontal	Pass
70.77	94.00	-23.23	Average	Vertical	Pass
87.67	114.00	-26.33	Peak	Vertical	Pass
Middle Channel					
69.53	94.00	-24.47	Average	Horizontal	Pass
86.52	114.00	-27.48	Peak	Horizontal	Pass
71.98	94.00	-22.02	Average	Vertical	Pass
88.97	114.00	-25.03	Peak	Vertical	Pass
Highest Channel					
70.51	94.00	-23.49	Average	Horizontal	Pass
87.50	114.00	-26.50	Peak	Horizontal	Pass
71.06	94.00	-22.94	Average	Vertical	Pass
88.05	114.00	-26.50	Peak	Vertical	Pass

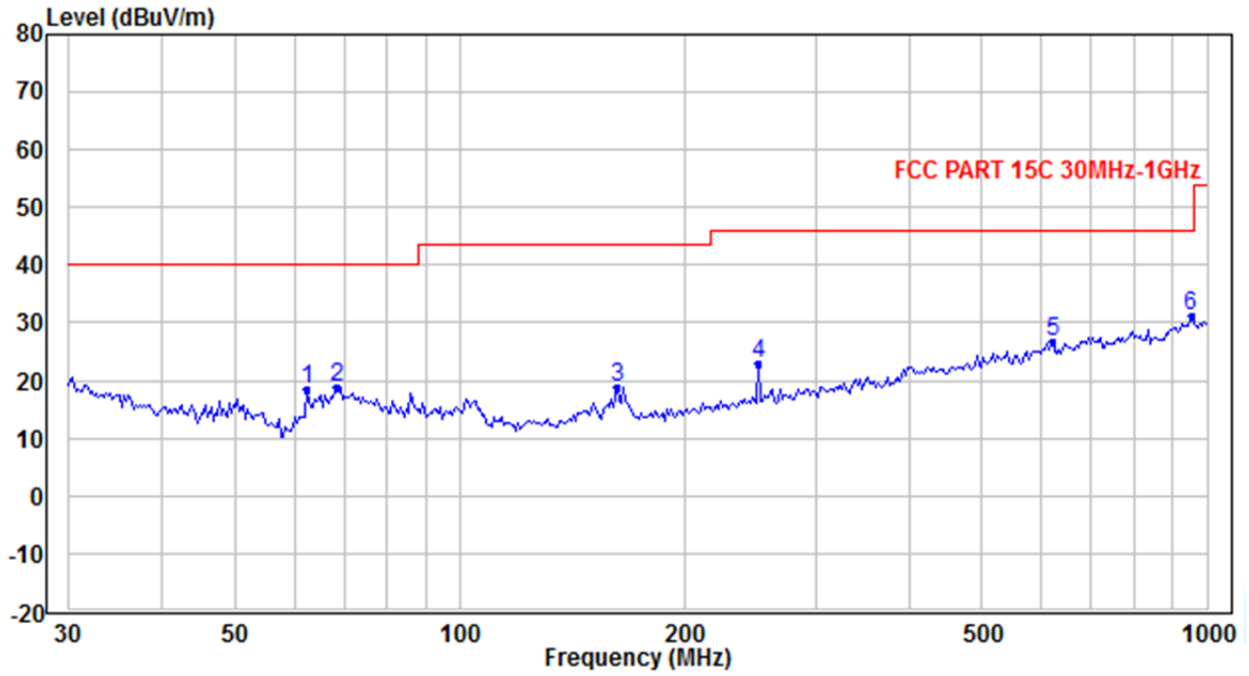
Remark: Average result = Peak result + Average Factor

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):

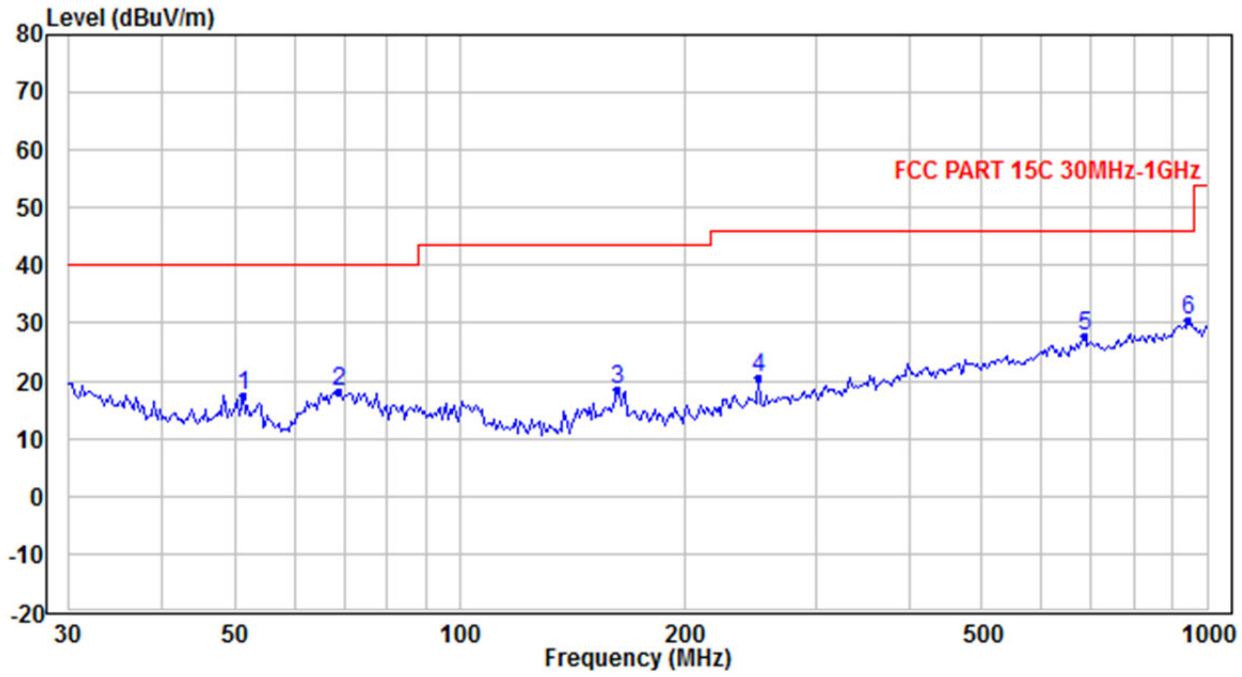
Lowest Channel

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	62.304	33.58	-15.20	18.38	40.00	-21.62	QP
2	68.264	33.47	-14.68	18.79	40.00	-21.21	QP
3	162.020	29.86	-10.90	18.96	43.50	-24.54	QP
4	250.486	30.81	-7.87	22.94	46.00	-23.06	QP
5	620.117	26.77	0.05	26.82	46.00	-19.18	QP
6	952.000	26.02	5.11	31.13	46.00	-14.87	QP

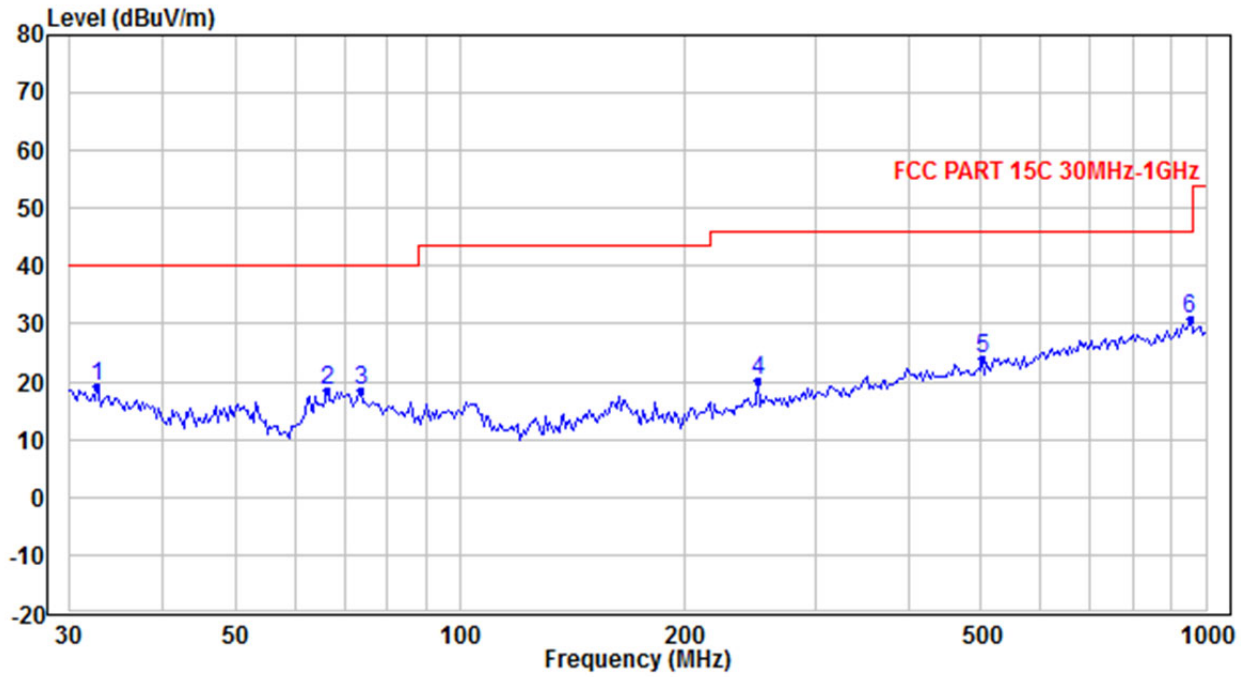
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	51.176	32.25	-14.76	17.49	40.00	-22.51	QP
2	68.745	32.86	-14.63	18.23	40.00	-21.77	QP
3	162.020	29.39	-10.90	18.49	43.50	-25.01	QP
4	250.486	28.48	-7.87	20.61	46.00	-25.39	QP
5	684.226	26.31	1.31	27.62	46.00	-18.38	QP
6	945.334	25.49	4.99	30.48	46.00	-15.52	QP

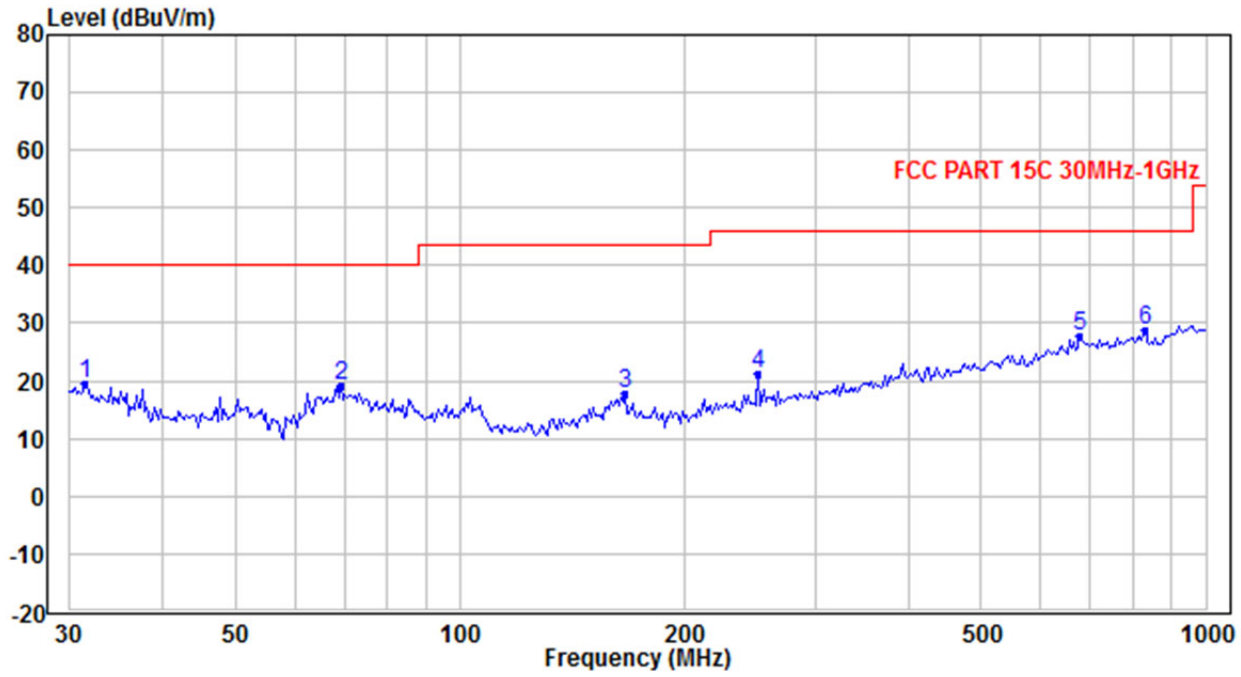
Middle Channel

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.640	26.22	-7.02	19.20	40.00	-20.80	QP
2	66.371	33.39	-14.83	18.56	40.00	-21.44	QP
3	73.750	32.87	-14.37	18.50	40.00	-21.50	QP
4	250.486	28.05	-7.87	20.18	46.00	-25.82	QP
5	502.247	26.69	-2.65	24.04	46.00	-21.96	QP
6	952.000	25.67	5.11	30.78	46.00	-15.22	QP

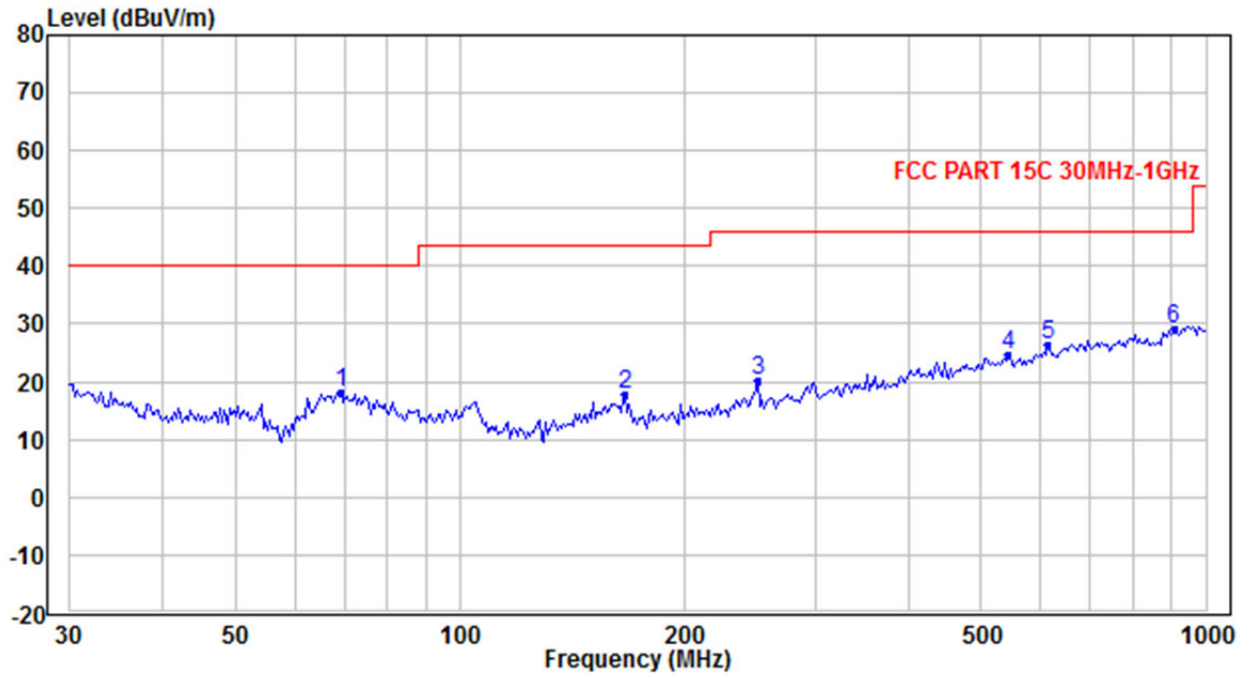
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	31.513	26.04	-6.45	19.59	40.00	-20.41	QP
2	69.230	33.90	-14.57	19.33	40.00	-20.67	QP
3	166.639	29.16	-11.24	17.92	43.50	-25.58	QP
4	250.486	28.94	-7.87	21.07	46.00	-24.93	QP
5	679.435	26.68	1.22	27.90	46.00	-18.10	QP
6	827.179	26.29	2.46	28.75	46.00	-17.25	QP

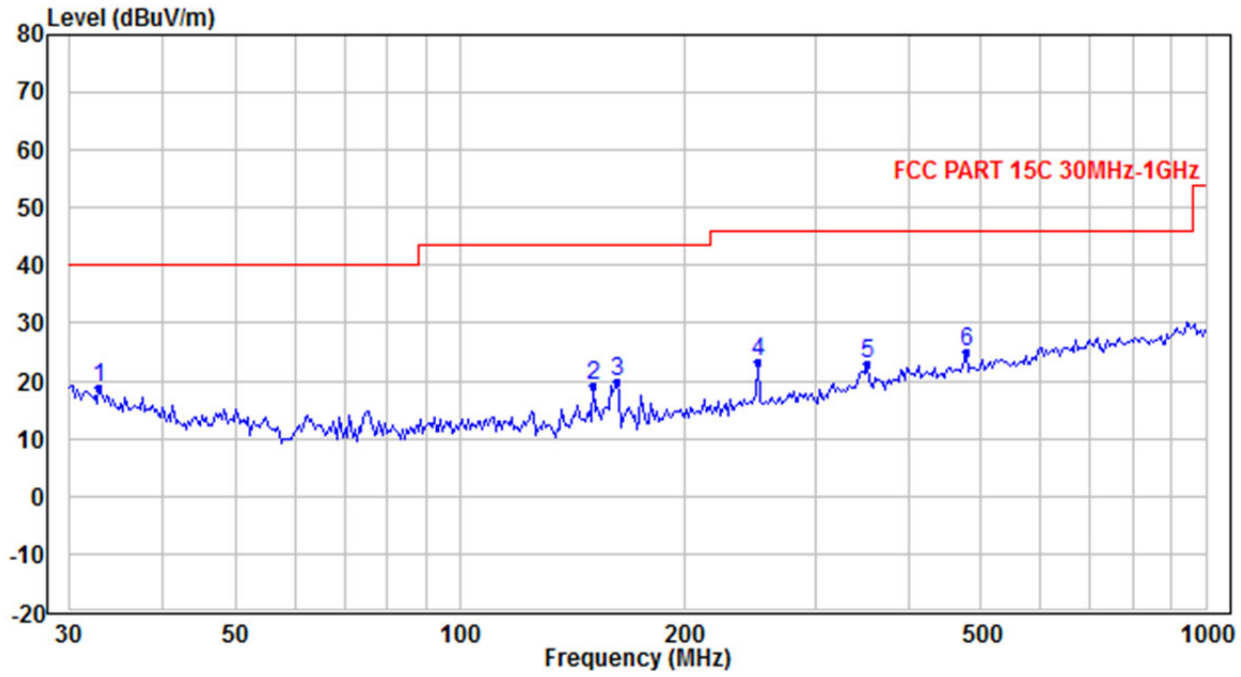
Highest Channel

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	69.230	32.76	-14.57	18.19	40.00	-21.81	QP
2	166.639	29.06	-11.24	17.82	43.50	-25.68	QP
3	250.486	28.03	-7.87	20.16	46.00	-25.84	QP
4	542.610	26.28	-1.60	24.68	46.00	-21.32	QP
5	615.774	26.25	-0.02	26.23	46.00	-19.77	QP
6	906.304	25.35	3.87	29.22	46.00	-16.78	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.870	25.82	-7.14	18.68	40.00	-21.32	QP
2	151.025	30.98	-11.65	19.33	43.50	-24.17	QP
3	162.020	30.91	-10.90	20.01	43.50	-23.49	QP
4	250.486	31.18	-7.87	23.31	46.00	-22.69	QP
5	350.972	27.67	-4.86	22.81	46.00	-23.19	QP
6	478.139	27.74	-2.74	25.00	46.00	-21.00	QP

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

Radiated Emission Test Data (Above 1GHz):

Lowest Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4810.00	40.88	74.00	-33.12	Peak	Horizontal
2	4810.00	26.12	54.00	-27.88	Average	Horizontal
3	7215.00	62.29	74.00	-11.71	Peak	Horizontal
4	7215.00	37.92	54.00	-16.08	Average	Horizontal
5	4810.00	42.08	74.00	-31.92	Peak	Vertical
6	4810.00	26.65	54.00	-27.35	Average	Vertical
7	7215.00	57.72	74.00	-16.28	Peak	Vertical
8	7215.00	34.80	54.00	-19.20	Average	Vertical

Middle Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4882.00	39.37	74.00	-34.63	Peak	Horizontal
2	4882.00	26.34	54.00	-27.66	Average	Horizontal
3	7323.00	63.92	74.00	-10.08	Peak	Horizontal
4	7323.00	38.98	54.00	-15.02	Average	Horizontal
5	4882.00	37.61	74.00	-36.39	Peak	Vertical
6	4882.00	26.23	54.00	-27.77	Average	Vertical
7	7323.00	59.71	74.00	-14.29	Peak	Vertical
8	7323.00	35.98	54.00	-18.02	Average	Vertical

Highest Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4950.00	39.93	74.00	-34.07	Peak	Horizontal
2	4950.00	29.05	54.00	-24.95	Average	Horizontal
3	7425.00	59.32	74.00	-14.68	Peak	Horizontal
4	7425.00	35.39	54.00	-18.61	Average	Horizontal
5	4950.00	40.21	74.00	-33.79	Peak	Vertical
6	4950.00	28.83	54.00	-25.17	Average	Vertical
7	7425.00	52.99	74.00	-21.01	Peak	Vertical
8	7425.00	32.27	54.00	-21.73	Average	Vertical

Remark:

1. Result = Reading + Correct Factor.
2. Margin = Result – Limit
3. Average result = Peak result + Average Factor

5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY

Test Requirement: FCC 47 CFR Part 15.209 and 15.205

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).

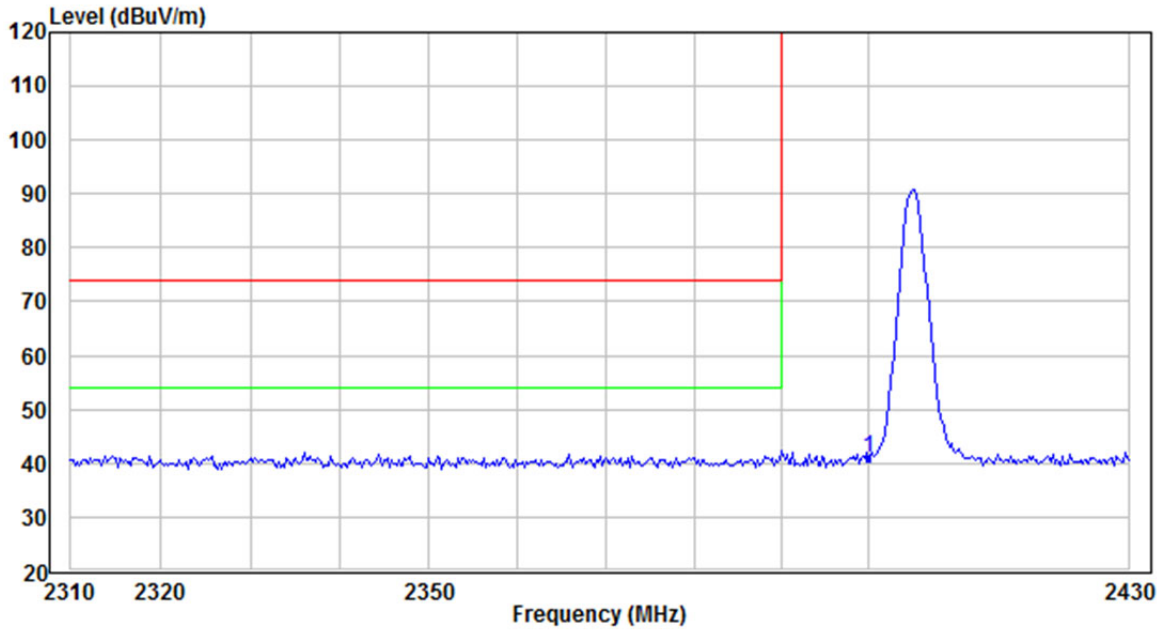
1. Use radiated spurious emission test procedure described in clause 5.3. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

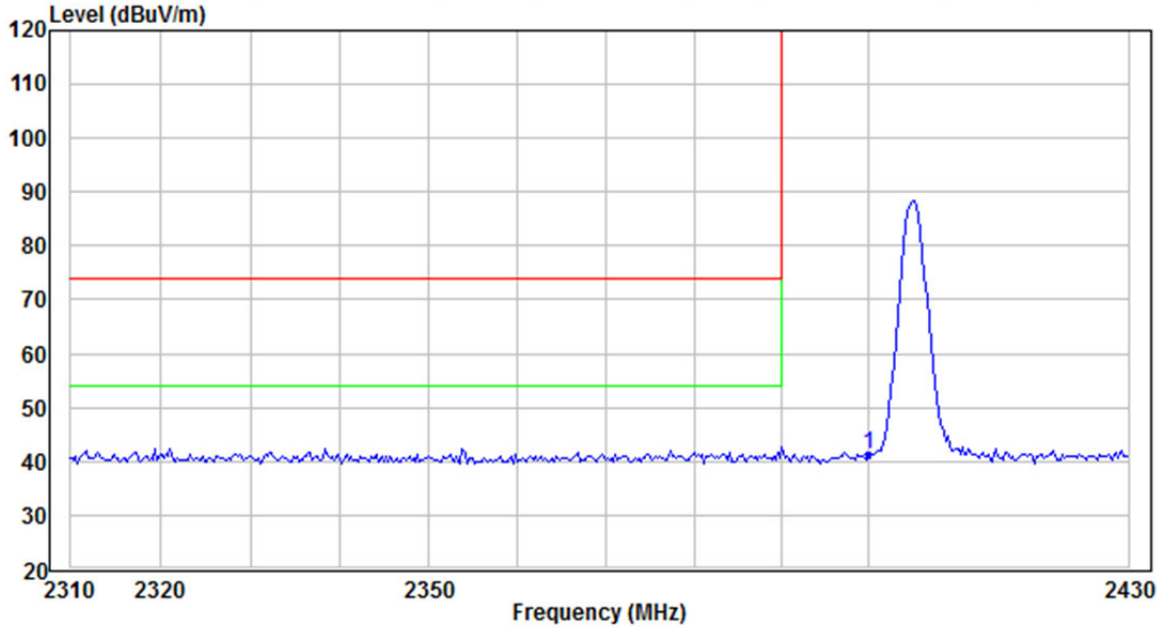
The measurement data as follows:

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



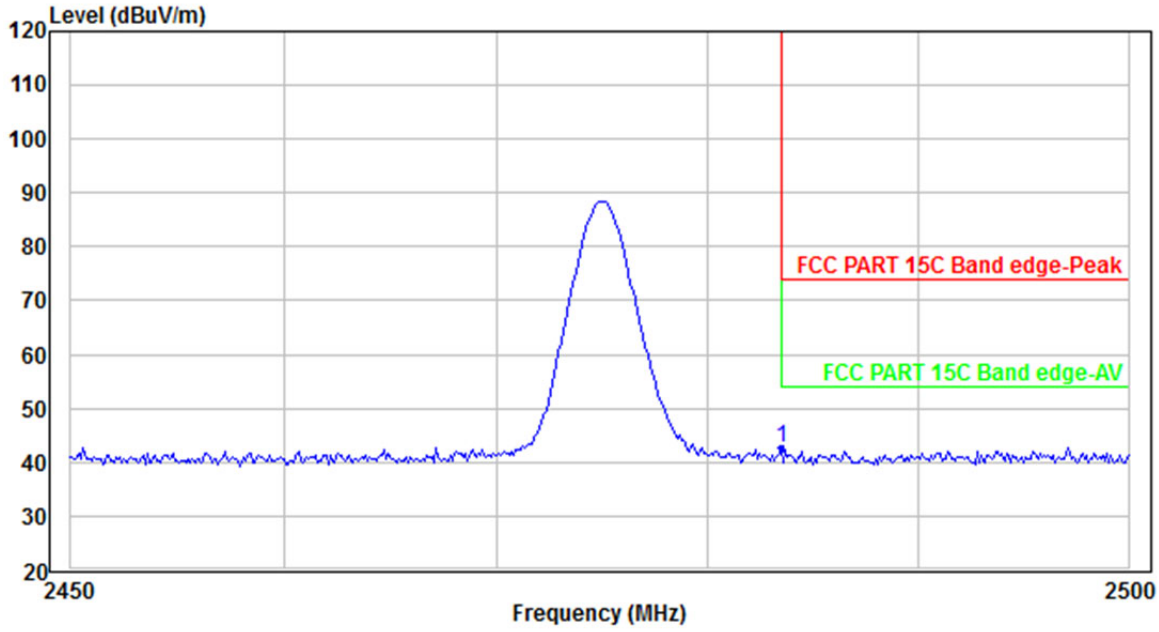
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2400.000	40.98	74	23.99	54	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



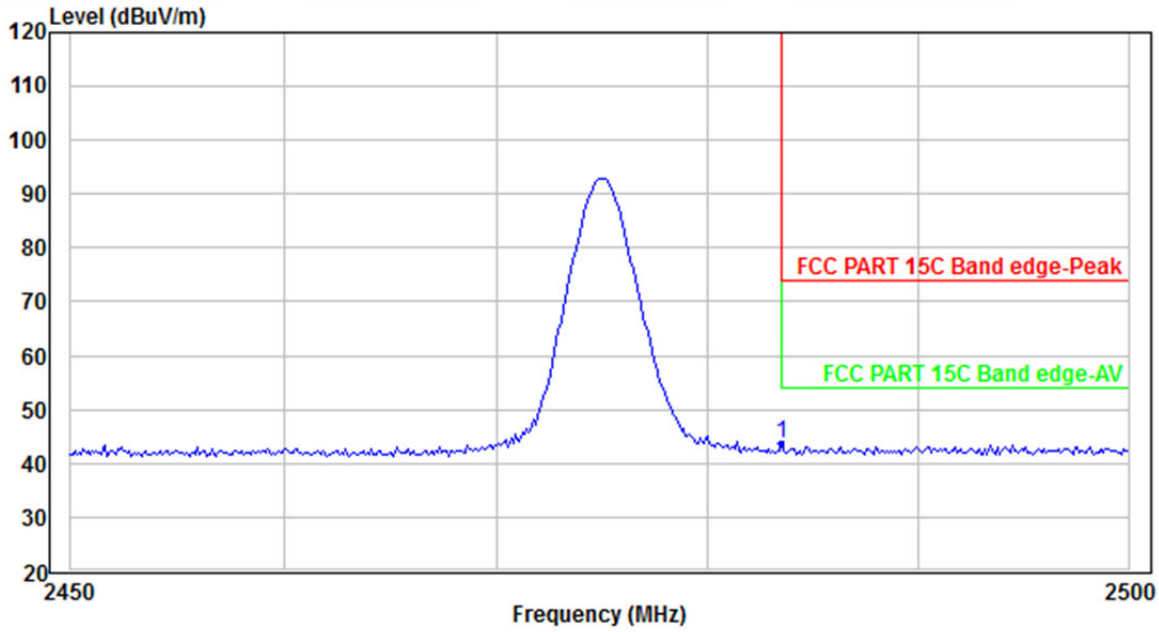
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2400.000	41.27	74	24.28	54	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.500	42.78	74	25.79	54	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.500	43.67	74	26.68	54	Pass

Remark: Average result = Peak result + Average Factor

5.5 20DB OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15.215
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.

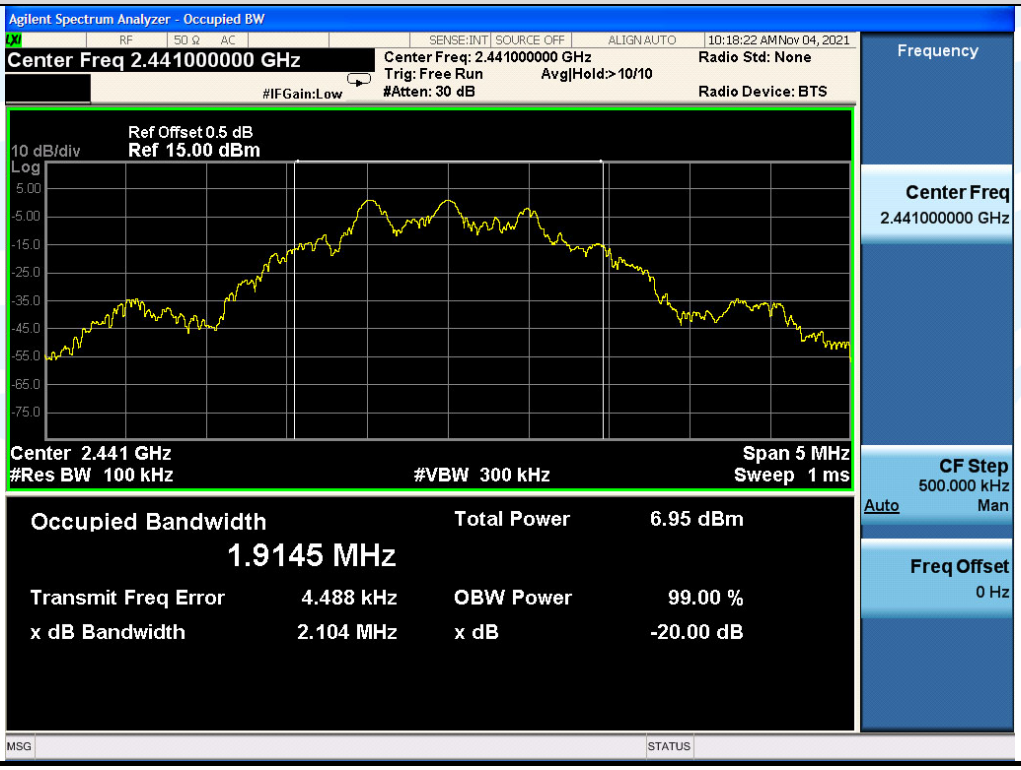
Test Result: Pass
The measurement data as follows:

Test Channel	20 dB Bandwidth (MHz)
Lowest	2.131
Middle	2.104
Highest	2.095

The test plot as follows:

Lowest Channel

Middle Channel



Highest Channel

5.6 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.207

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.

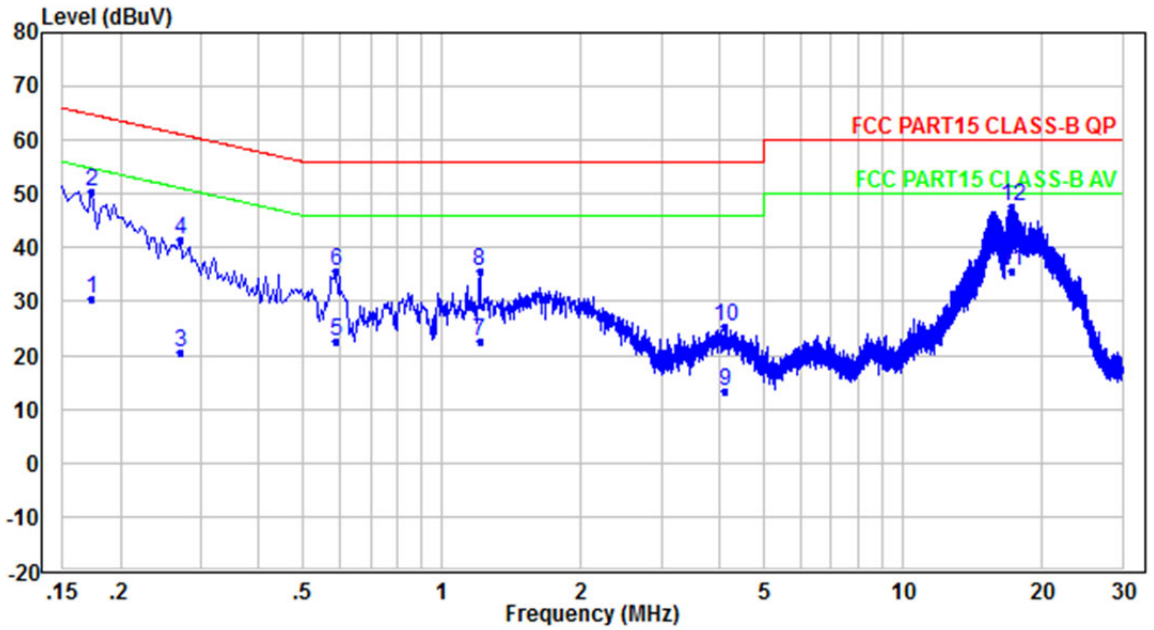
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

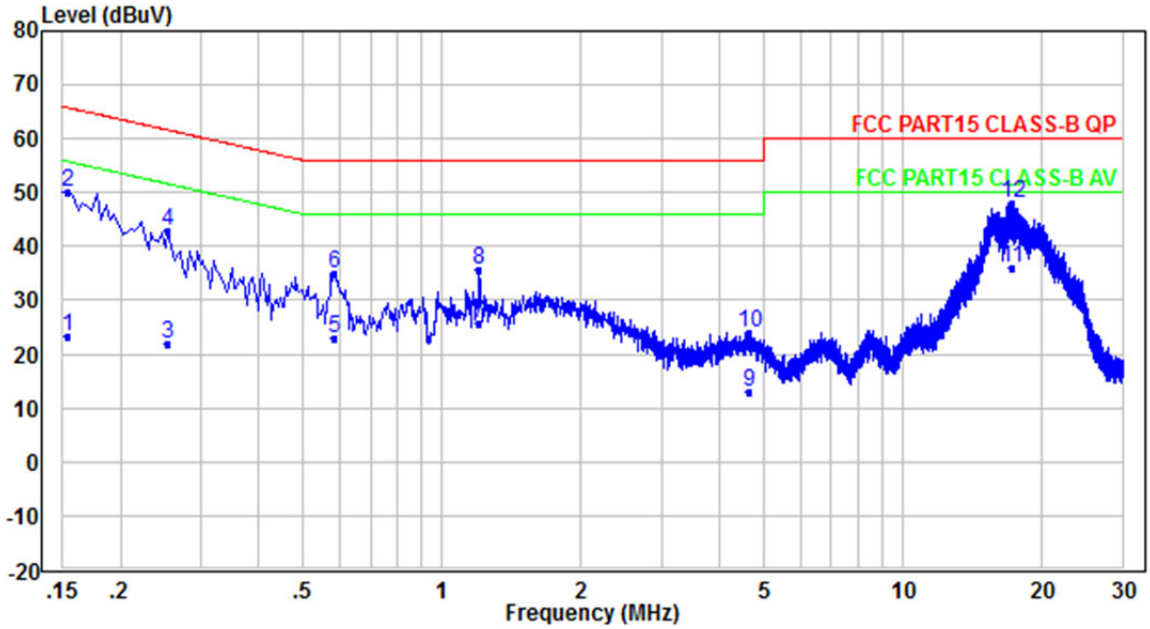
Quasi Peak and Average:

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.174	20.73	9.75	30.48	54.77	-24.29	Average
2	0.174	40.73	9.75	50.48	64.77	-14.29	QP
3	0.270	10.74	9.75	20.49	51.12	-30.63	Average
4	0.270	31.74	9.75	41.49	61.12	-19.63	QP
5	0.590	12.73	9.85	22.58	46.00	-23.42	Average
6	0.590	25.73	9.85	35.58	56.00	-20.42	QP
7	1.206	12.65	9.90	22.55	46.00	-23.45	Average
8	1.206	25.65	9.90	35.55	56.00	-20.45	QP
9	4.130	3.18	10.13	13.31	46.00	-32.69	Average
10	4.130	15.18	10.13	25.31	56.00	-30.69	QP
11	17.257	25.22	10.46	35.68	50.00	-14.32	Average
12	17.257	37.22	10.46	47.68	60.00	-12.32	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.154	13.51	9.75	23.26	55.78	-32.52	Average
2	0.154	40.51	9.75	50.26	65.78	-15.52	QP
3	0.254	12.07	9.75	21.82	51.63	-29.81	Average
4	0.254	33.07	9.75	42.82	61.63	-18.81	QP
5	0.582	13.05	9.79	22.84	46.00	-23.16	Average
6	0.582	25.05	9.79	34.84	56.00	-21.16	QP
7	1.202	15.73	9.86	25.59	46.00	-20.41	Average
8	1.202	25.73	9.86	35.59	56.00	-20.41	QP
9	4.646	2.91	10.11	13.02	46.00	-32.98	Average
10	4.646	13.91	10.11	24.02	56.00	-31.98	QP
11	17.261	25.66	10.51	36.17	50.00	-13.83	Average
12	17.261	37.66	10.51	48.17	60.00	-11.83	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.

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 ***
