



FCC COMPLIANCE TEST REPORT

Technical Statement of Conformity
in accordance with 47 CFR Part 15 Subpart C

The product

Equipment Under Test	: Remote wireless horn button hub mount, 2.4G, SD
Identification code	: KH9320100-6
Model Number	: 431050-1
Product Series	: N/A
Report Number	: HA190961-RA
Issue Date	: 24-Mar-2020

is produced by

Sea-Dog Line

P.O. Box 479, Everett, WA 98206, U.S.A



HongAn TECHNOLOGY CO., LTD.
HongAn TECHNOLOGY EMC Laboratory

NO.15-1, CWEISHUH KENG, CWEIPIN VILLAGE, LINKOU DIST, NEW TAIPEI CITY, TAIWAN, R. O. C.

TEL: +886-2-26030362 **FAX:** +886-2-26019259 **E-mail:** hatlab@ms19.hinet.net



Contents

1	General Description	7
1.1	Description of EUT	7
1.2	Test Instruments	8
1.3	Auxiliary Equipments	9
1.4	EUT SETUP	9
1.5	Identifying the Final Test Mode	9
1.6	Final Test Mode	9
1.7	Condition of Power Supply	10
1.8	EUT Configuration	10
1.9	Test Methodology	10
1.10	General Test Procedures	10
1.11	Modification	10
1.12	FCC Part 15.205 restricted bands of operations	11
1.13	Qualification of Test Facility	11
2	Power line Conducted Emission Measurement	12
2.1	Test Instruments	12
2.2	Test Arrangement and Procedure	12
2.3	Limit (§ 15.207)	12
2.4	Test Result	12
3	Radiated Emission Test	13
3.1	Test Instruments	13
3.2	Test Arrangement and Procedure	13
3.3	Limit of Field Strength of Fundamental (§ 15.249)	14
3.4	Limit of Spurious Emission (§ 15.209)	14
3.5	Test Result	14
4	Out of Band Emission Test	25
4.1	Test Instruments	25
4.2	Test Arrangement and Procedure	25
4.3	Limit of Field Strength of Fundamental (§ 15.249(d))	25
4.4	Test Result	25
5	20 dB Bandwidth	30
5.1	Test Instruments	30
5.2	Test Arrangement and Procedure	30
5.3	Limit	30



5.4	Test Result	30
-----	-------------	----

6	Antenna requirement	33
----------	----------------------------	-----------

6.1	Limit (§ 15.203)	33
-----	------------------	----

6.2	Test Result	33
-----	-------------	----



Release control Record

Report Version	Description	Issued Date
V00	Original release.	10-Dec-2019
V01	1. Page 1- add in- 『Identification code』 2. Remove Receiver 3. Page 9- Updated Chapter 1.4 4. Page 9 、 10- Update 15.247 to 15.249 5. Page 9- Add worst case description 6. Page 15~20 、 26~29- Update limited to peak	13-Mar-2020
V02	Page 5- Correct the FCC ID	24-Mar-2020

Test Result Certification

Applicant : Sea-Dog Line
Address of Applicant : P.O. Box 479, Everett, WA 98206, U.S.A
Manufacturer : KHAN'S ENTERPRISE CO., LTD.
Address of Manufacturer : 1921 Chun Ri Road, Taoyuan, Taiwan
Trade Name : Sea-Dog Line
Equipment Under Test : Remote wireless horn button hub mount, 2.4G, SD
Model Number : 431050-1
Product Series : N/A
FCC ID : 2AVQE431050-1
Filing Type : Certification
Sample Received Date : 09-Oct-2019
Test Standard :

☒ FCC Part 15 Subpart C §15.249

Deviations from standard test methods & any other specifications : NONE

Remark:

1. This report details the results of the test carried out on one sample.
2. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in both ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.203, 15.207, 15.209, 15.249.
3. This report applies to the above sample only and shall not be reproduced in part without written approval of HongAn Technology Co., Ltd.
4. Test Location: HongAn Technology Co., Ltd., No.15-1 Cweishuh Keng, Cweipin Village, Linkou Dist., New Taipei City, Taiwan, R.O.C. FCC Designation No.: TW1071, TW1163.

Documented by:

Cherry Chi

Date: 24-Mar-2020

Cherry Chi / ADM. Dept. Staff

Tested by:

Andrew Lin

Date: 04-Dec-2019

Andrew Lin / ENG. Dept. Staff

Approved by:

Adam Yang

Date: 24-Mar-2020

Adam Yang / SEC. Manager

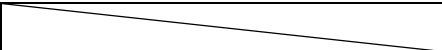


Summary of Test Result

	Test Item	Applicable Standard	Test Result
1	Antenna Requirement	FCC part 15 subpart C §203	Compliance
2	Conducted Emission	FCC part 15 subpart C §207	N/A
3	Restricted Band of Operation	FCC part 15 subpart C §205	Compliance
4	Radiated Emission	FCC part 15 subpart C §209	Compliance
5	Field Strength	FCC part 15 subpart C §249(a)	Compliance
6	Out of Band Emission	FCC part 15 subpart C §249(d)	Compliance
7	20dB Bandwidth	FCC part 15 subpart C §215(c)	Compliance

1 General Description

1.1 Description of EUT

Equipment Under Test	:	Remote wireless horn button hub mount, 2.4G, SD				
Model Number of EUT	:	431050-1				
Product Series	:	N/A				
Power Supply	:	DC 3V (Battery : Manufacturer : Panasonic, Model No.: CR 2032, Specification : DC 3V)				
Frequency Range	:	2433 、 2448MHz				
Number of Channels	:	2 Channels				
Carrier Frequency of Each Channel	:	00	2433	01	2448	
Antenna Specification	:	PCB Antenna / Gain: 3.20 dBi				
Modulation Technique	:	GFSK				
Transmit Data Rate	:	1Mbps				
Specification	:	Dimensions : ϕ 56.8 x 23 mm Intended Function : The EUT is a Remote wireless horn button hub mount, 2.4G, SD. Product Variance : N/A.				

1.2 Test Instruments

Instrument Name	Manufacture	Model Number	Serial Number	Last Cal. Date	Next Cal. Date
EMI Receiver	R&S	ESCI	100931	08-Aug-2019	07-Aug-2020
Spectrum Analyzer	R&S	FSV 30	101629	25-Dec-2018	24-Dec-2019
Preamplifier	CHASE	CPA 9231A	0405	24-Dec-2018	23-Dec-2019
Preamplifier	Com-Power	PAM-118A	443027	27-Dec-2018	26-Dec-2019
Microwave Preamplifier	Com-Power	PAM-840	461269	17-May-2019	16-May-2020
Bilog Antenna	TESEQ	CBL6111D	25769	29-Jan-2019	28-Jan-2020
Double-Ridged Waveguide Horn	EMCO	3115	9912-5992	15-May-2019	14-May-2020
Horn Antenna	Com-Power	AH-840	101042	21-May-2019	20-May-2020
Coaxial Cable	N/A	8D-FB	HA2-10MSITE	23-Aug-2019	22-Aug-2020
Microflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3368/2	17-May-2019	16-May-2020
Microflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3367/2	17-May-2019	16-May-2020
Software	Audix	e3	N/A	N/A	N/A

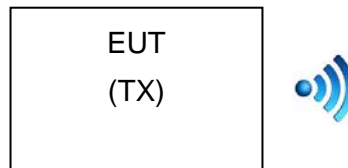
※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.

1.3 Auxiliary Equipments

1.3.1. Provided by HongAn Technology Co., Ltd. for Test.
N/A

1.3.2. Provided by the Manufacturer
N/A

1.4 EUT SETUP



Note: Main Test Sample: 431050-1

1.5 Identifying the Final Test Mode

1. Mode 1: TX mode (1Mbps) CH 00.
2. Mode 2: TX mode (1Mbps) CH 01.
- 3.

Note:

1. The test mode has evaluated the configuration directions of the X, Y, and Z axes. The worst-case is the X-axis direction, so the report only shows the test results in the X-axis direction.
2. The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements. During the tests, there was no Test Software has been used.
3. Channel (2433 MHz), (2448 MHz) were chosen for full testing.
4. According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.207, 15.209 and 15.249 under the FCC Rules Part 15 Subpart C.

1.6 Final Test Mode

Conducted Emission: N/A

Radiated Emission (30~1000 MHz): All Modes.

Radiated Emission (1~26.5GHz): All Modes.



1.7 Condition of Power Supply

DC 3V

1.8 EUT Configuration

1. Setup the EUT as shown in Sec.1.4 Block Diagram.
2. Turn on the power of all equipments.
3. Activate the selected Final Test Mode.

1.9 Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10 (2013) and FCC CFR 47 15.203, 15.207, 15.209 and 15.249.

1.10 General Test Procedures

Conducted Emissions

The EUT is set according to the requirements in Section 6.2 of ANSI C63.10 (2013).

Radiated Emissions

The EUT is set according to the requirements in Section 6.3 of ANSI C63.10 (2013).

1.11 Modification

N/A

1.12 FCC Part 15.205 restricted bands of operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37635-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

1.13 Qualification of Test Facility

Name of Test Facility : HongAn TECHNOLOGY CO., LTD.

Address of Test Facility : NO.15-1, CWEISHUH KENG, CWEIPIN VILLAGE, LINKOU DIST, NEW TAIPEI CITY, TAIWAN, R.O.C.

FCC Designation No. : TW1071, TW1163

TAF Accreditation No. : 1163

2 Power line Conducted Emission Measurement

2.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

2.2 Test Arrangement and Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

2.3 Limit (§ 15.207)

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency (MHz)	Limits (dBuV)	
	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.0	56	46
5.0 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

2.4 Test Result

N/A

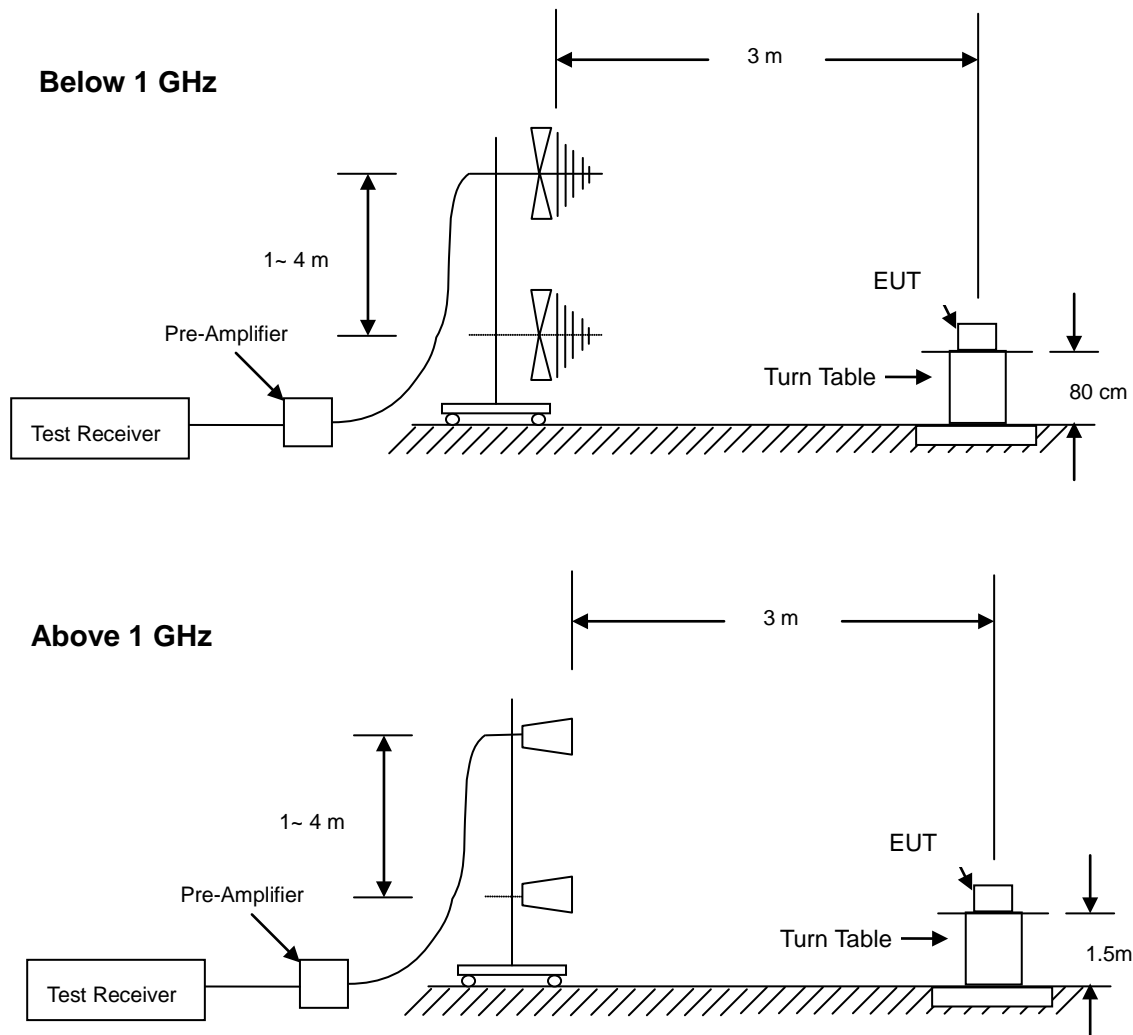
The EUT applies battery for its power supply.

3 Radiated Emission Test

3.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

3.2 Test Arrangement and Procedure



1. The EUT is placed on a turntable, which is 0.8 m (below 1GHz) and 1.5m (above 1GHz) above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
4. Maxium procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer. Refer to each test results for detail setting up.
7. Repeat above procedures until the meausreemnts for all frequencies are complete.

3.3 Limit of Field Strength of Fundamental (§ 15.249)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/ meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Note:

1. Field strength limits are specified at a distance of 3 meters.
2. For frequencies above 1000 MHz, the field strength limits in above table are based on average limits. 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.

3.4 Limit of Spurious Emission (§ 15.209)

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 § 15.209, whichever is lesser attenuation.

Frequency (MHz)	Field strength (microvolts/ meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

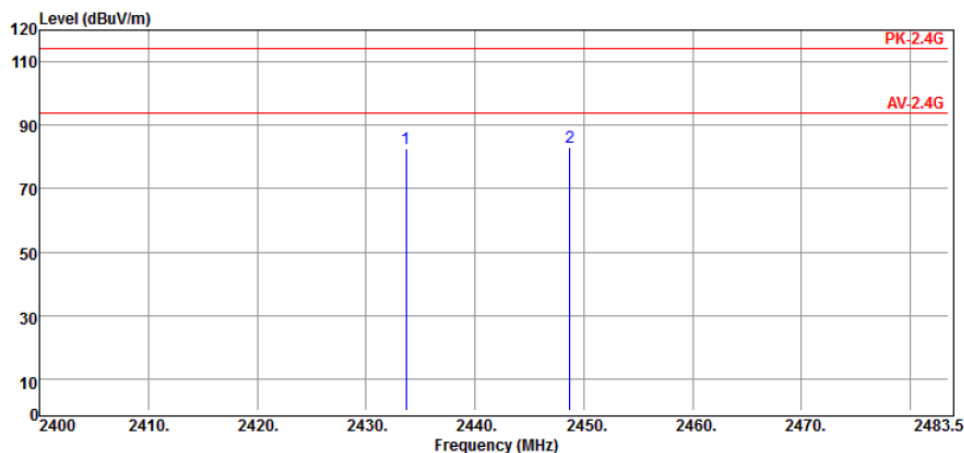
3.5 Test Result

Compliance

The final test data are shown on the following page(s).

Radiated Emission Test Data (Field Strength of Fundamental)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH00, 01 (1Mbps)
EUT Position	: X axis		



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	2433.700	89.23	-6.70	82.53	114.00	-31.47	HORIZONTAL	Peak
2	2448.700	89.88	-6.72	83.16	114.00	-30.84	HORIZONTAL	Peak

Remark :

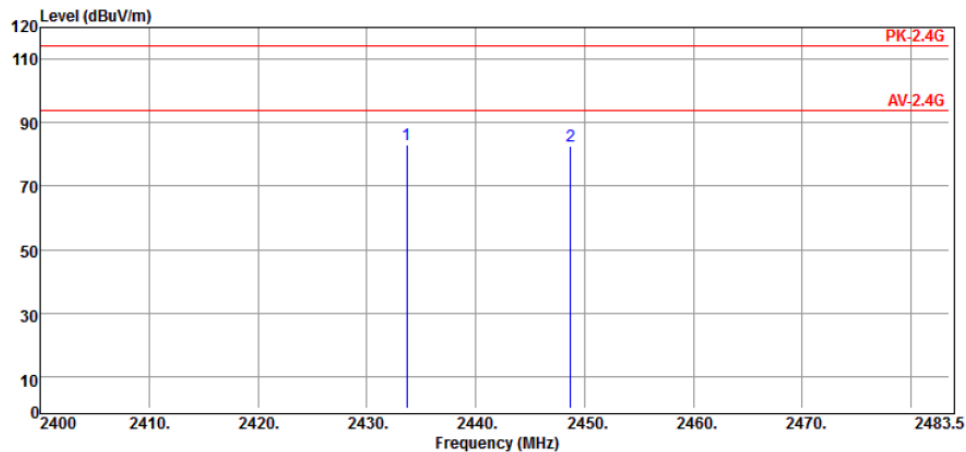
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:

Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 3MHz, VBW = 10MHz, Sweep = AUTO.

Note: Because the 20 dB Bandwidth is over 1MHz, the RBW setting of measuring Field strength of Fundamental should be 3MHz, and VBW should be at 10 MHz.

Radiated Emission Test Data (Field Strength of Fundamental)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH00, 01 (1Mbps)
EUT Position	: X axis		



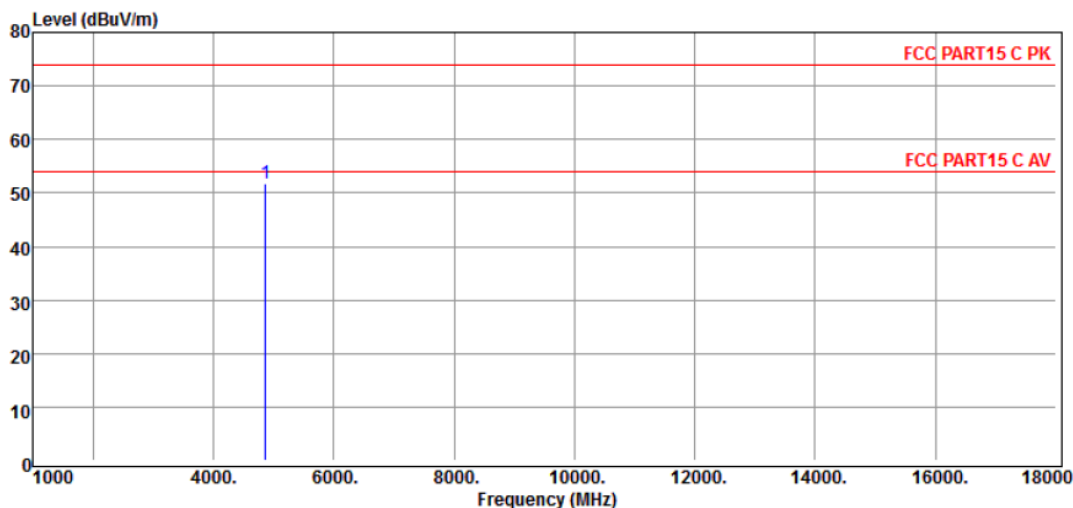
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	2433.700	89.88	-6.70	83.18	114.00	-30.82	VERTICAL	Peak
2	2448.700	89.38	-6.72	82.66	114.00	-31.34	VERTICAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
Peak Setting 1GHz to 10th harmonics of fundamental, RBW = 3MHz, VBW = 10MHz, Sweep = AUTO.
Note: Because the 20 dB Bandwidth is over 1MHz, the RBW setting of measuring Field strength of Fundamental should be 3MHz, and VBW should be at 10 MHz.

Radiated Emission Test Data (Above and Field Strength to 10th Harmonic)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH00
EUT Position	: X axis	Data rate	: 1Mbps



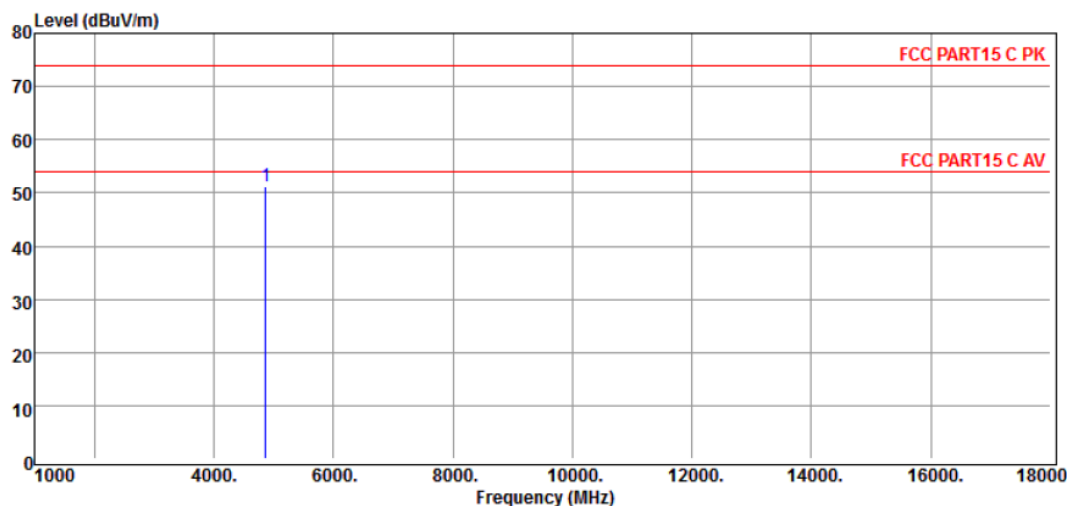
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	4867.000	50.79	1.01	51.80	74.00	-22.20	HORIZONTAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (Above and Field Strength to 10th Harmonic)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH00
EUT Position	: X axis	Data rate	: 1Mbps



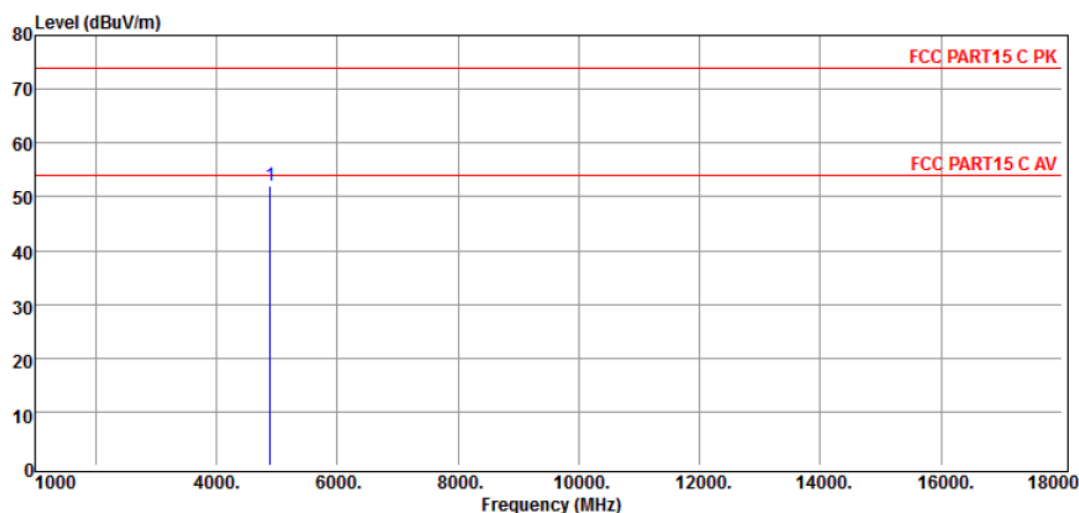
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	4867.000	50.31	1.01	51.32	74.00	-22.68	VERTICAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (Above and Field Strength to 10th Harmonic)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH01
EUT Position	: X axis	Data rate	: 1Mbps



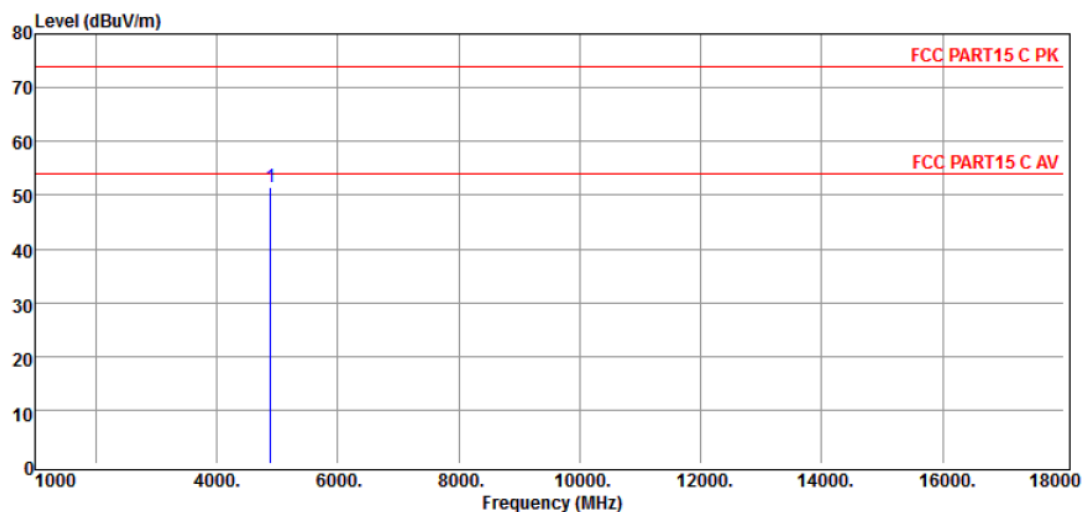
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	4897.000	50.88	1.03	51.91	74.00	-22.09	HORIZONTAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (Above and Field Strength to 10th Harmonic)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH01
EUT Position	: X axis	Data rate	: 1Mbps



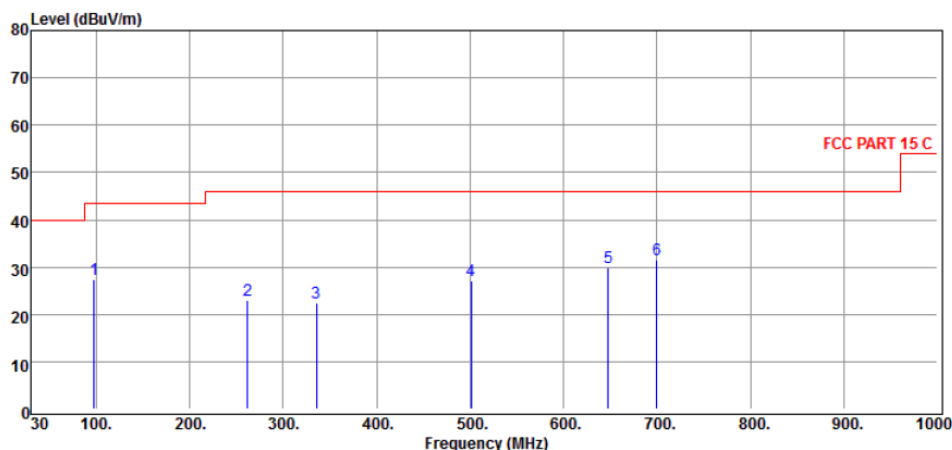
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	4897.000	50.32	1.03	51.35	74.00	-22.65	VERTICAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (Below 1 GHz)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH00
EUT Position	: X axis	Data rate	: 1Mbps



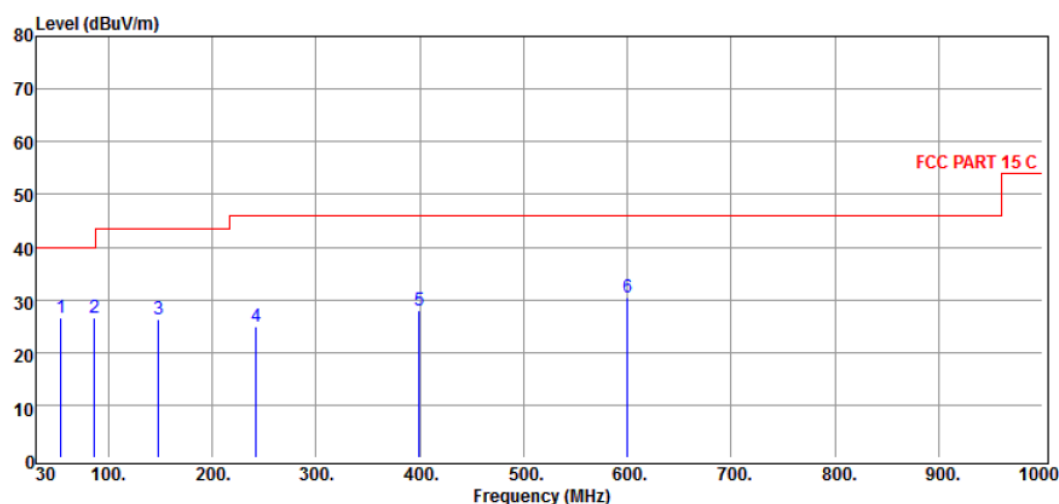
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	97.900	40.66	-13.38	27.28	43.50	-16.22	383	40	HORIZONTAL	QP
2	261.830	32.04	-9.00	23.04	46.00	-22.96	384	80	HORIZONTAL	QP
3	335.550	30.03	-7.47	22.56	46.00	-23.44	389	110	HORIZONTAL	QP
4	501.420	30.30	-3.30	27.00	46.00	-19.00	395	150	HORIZONTAL	QP
5	647.890	30.55	-0.66	29.89	46.00	-16.11	394	130	HORIZONTAL	QP
6	700.270	31.44	-0.02	31.42	46.00	-14.58	392	120	HORIZONTAL	QP

Remark :

1. Measuring frequencies from 30 MHz to 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
4. All readings are Peak values. None of the peak value reading exceeds the Q.P. limit. Hence, Q.P. reading was not measured.
5. The IF bandwidth of SPA between 30 MHz to 1 GHz was 100 kHz.

**Radiated Emission Test Data (Below 1 GHz)**

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH00
EUT Position	: X axis	Data rate	: 1Mbps



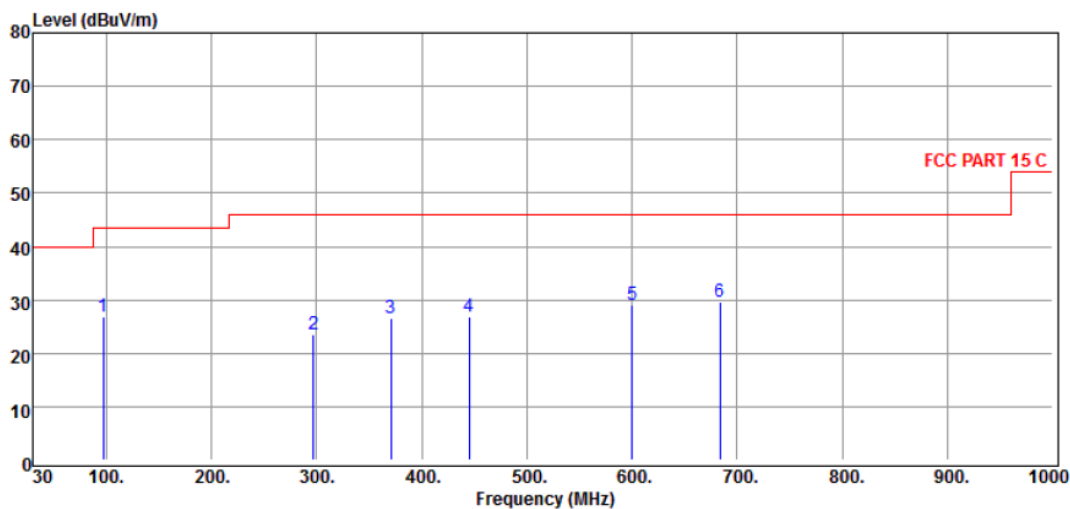
No.	Freq MHz	Reading dB μ V	C.F dB	Result dB μ V/m	Limit dB μ V/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	54.250	43.07	-16.39	26.68	40.00	-13.32	111	50	VERTICAL	QP
2	86.260	41.37	-14.92	26.45	40.00	-13.55	114	80	VERTICAL	QP
3	148.340	37.66	-11.36	26.30	43.50	-17.20	118	110	VERTICAL	QP
4	242.430	35.49	-10.59	24.90	46.00	-21.10	121	150	VERTICAL	QP
5	399.570	33.29	-5.35	27.94	46.00	-18.06	120	120	VERTICAL	QP
6	600.360	31.88	-1.55	30.33	46.00	-15.67	117	90	VERTICAL	QP

Remark :

1. Measuring frequencies from 30 MHz to 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
4. All readings are Peak values. None of the peak value reading exceeds the Q.P. limit. Hence, Q.P. reading was not measured.
5. The IF bandwidth of SPA between 30 MHz to 1 GHz was 100 kHz.

Radiated Emission Test Data (Below 1 GHz)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH01
EUT Position	: X axis	Data rate	: 1Mbps



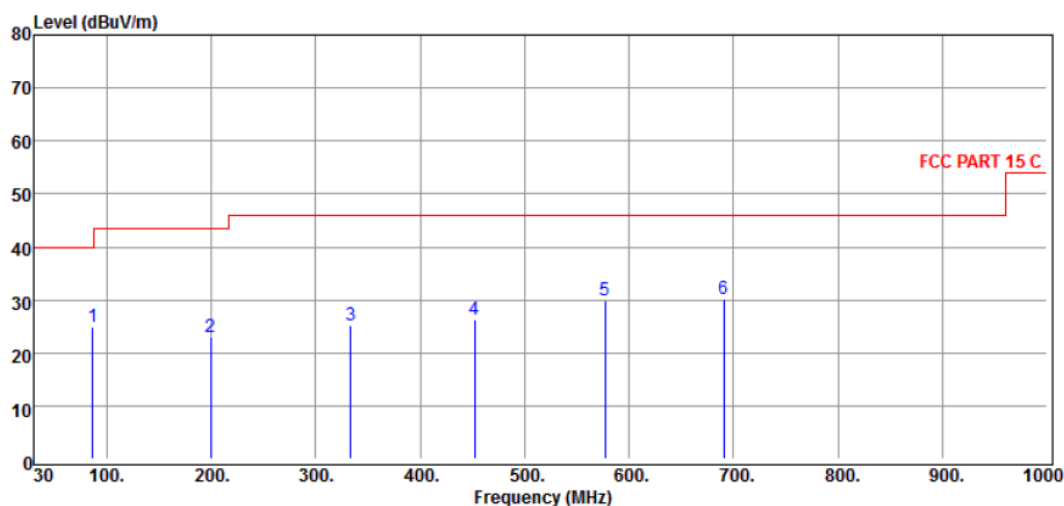
No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV/m	Limit dBμV/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	96.930	40.42	-13.49	26.93	43.50	-16.57	385	70	HORIZONTAL	QP
2	296.750	32.34	-8.71	23.63	46.00	-22.37	382	50	HORIZONTAL	QP
3	370.470	32.85	-6.40	26.45	46.00	-19.55	388	130	HORIZONTAL	QP
4	445.160	31.44	-4.63	26.81	46.00	-19.19	389	120	HORIZONTAL	QP
5	600.360	30.48	-1.55	28.93	46.00	-17.07	393	100	HORIZONTAL	QP
6	683.780	29.65	-0.09	29.56	46.00	-16.44	391	80	HORIZONTAL	QP

Remark :

1. Measuring frequencies from 30 MHz to 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
4. All readings are Peak values. None of the peak value reading exceeds the Q.P. limit. Hence, Q.P. reading was not measured.
5. The IF bandwidth of SPA between 30 MHz to 1 GHz was 100 kHz.

Radiated Emission Test Data (Below 1 GHz)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH01
EUT Position	: X axis	Data rate	: 1Mbps



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	86.260	39.87	-14.92	24.95	40.00	-15.05	111	80	VERTICAL	QP
2	199.750	35.73	-12.84	22.89	43.50	-20.61	115	60	VERTICAL	QP
3	333.610	32.63	-7.55	25.08	46.00	-20.92	117	100	VERTICAL	QP
4	451.950	30.63	-4.47	26.16	46.00	-19.84	121	130	VERTICAL	QP
5	577.080	31.62	-1.73	29.89	46.00	-16.11	119	120	VERTICAL	QP
6	690.570	30.20	-0.07	30.13	46.00	-15.87	120	90	VERTICAL	QP

Remark :

1. Measuring frequencies from 30 MHz to 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
4. All readings are Peak values. None of the peak value reading exceeds the Q.P. limit. Hence, Q.P. reading was not measured.
5. The IF bandwidth of SPA between 30 MHz to 1 GHz was 100 kHz.



4 Out of Band Emission Test

4.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

4.2 Test Arrangement and Procedure

Refer to Sec. 3.2.

4.3 Limit of Field Strength of Fundamental (§ 15.249(d))

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 § 15.209, whichever is the lesser attenuation.

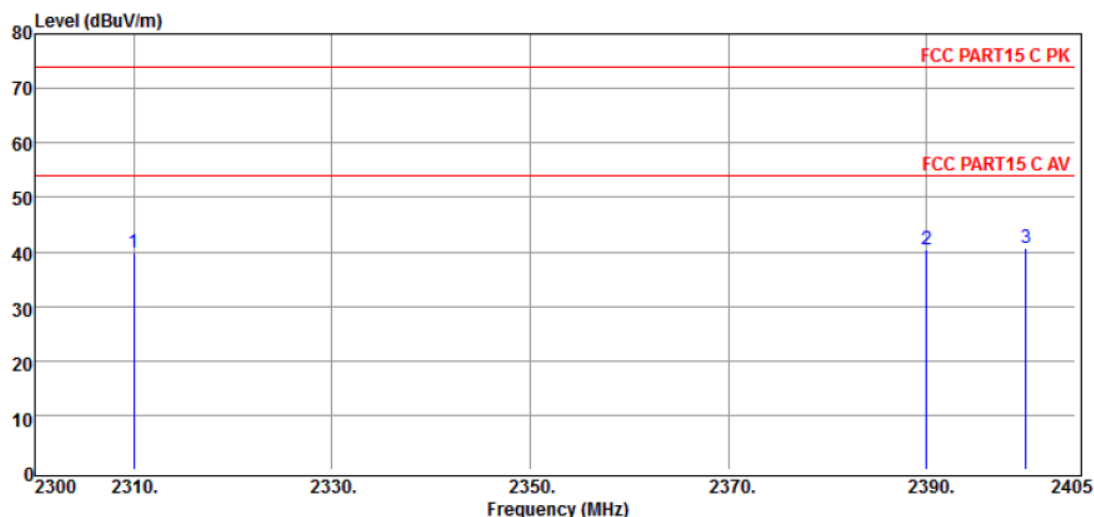
4.4 Test Result

Compliance

The final test data are shown on the following page(s).

Band-Edge Test Data (Lower Edge)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH00
EUT Position	: X axis	Data Rate	: 1Mbps



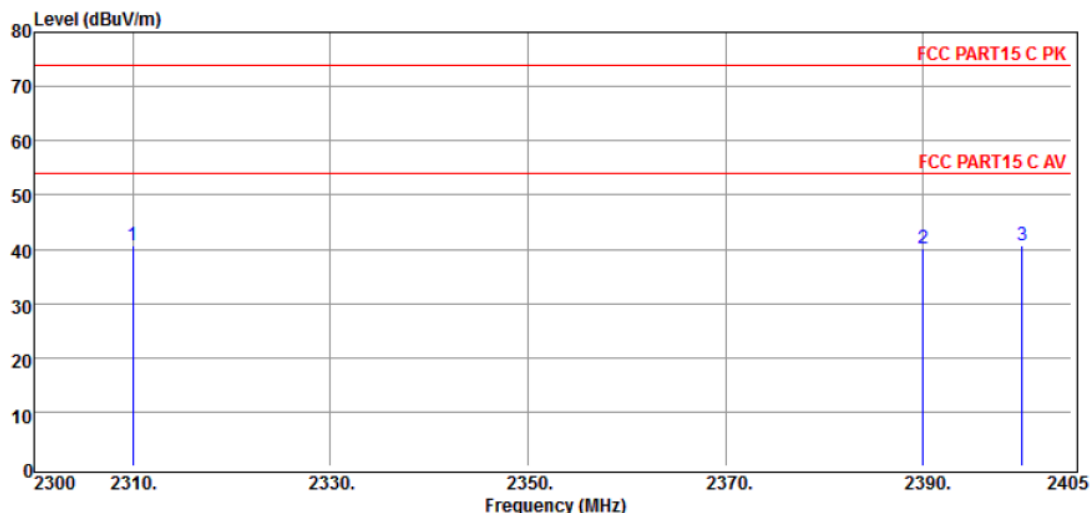
No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV/m	Limit dBuV/m	Margin dB	Antenna Pol.	Remark
1	2310.000	46.82	-6.93	39.89	74.00	-34.11	HORIZONTAL	Peak
2	2390.000	47.14	-6.67	40.47	74.00	-33.53	HORIZONTAL	Peak
3	2400.000	47.46	-6.64	40.82	74.00	-33.18	HORIZONTAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Band-Edge Test Data (Lower Edge)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH00
EUT Position	: X axis	Data Rate	: 1Mbps



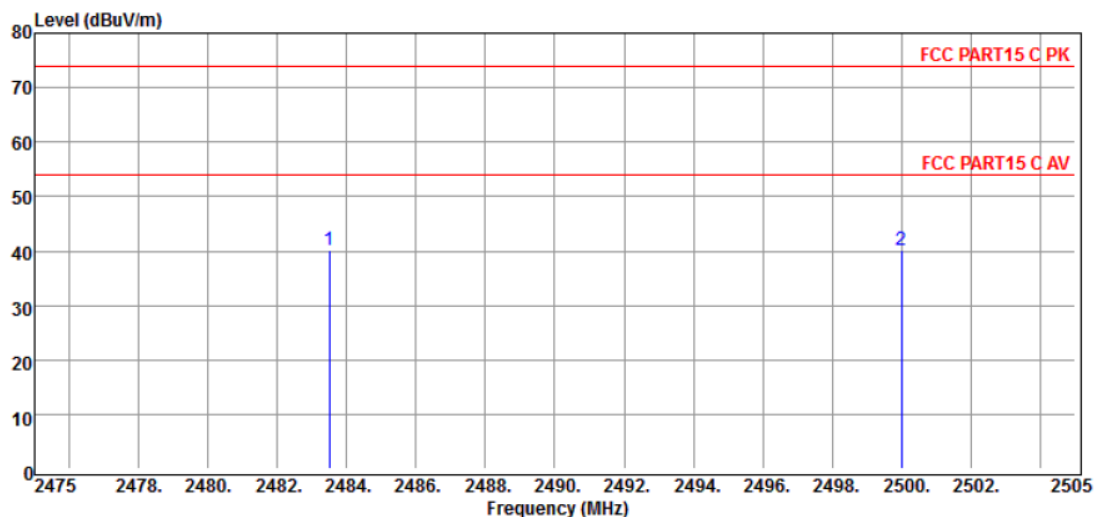
No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV/m	Limit dBμV/m	Margin dB	Antenna Pol.	Remark
1	2310.000	47.54	-6.93	40.61	74.00	-33.39	VERTICAL	Peak
2	2390.000	46.92	-6.67	40.25	74.00	-33.75	VERTICAL	Peak
3	2400.000	47.31	-6.64	40.67	74.00	-33.33	VERTICAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

**Band-Edge Test Data (Upper Edge)**

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Horizontal	Channel	: CH01
EUT Position	: X axis	Data Rate	: 1Mbps



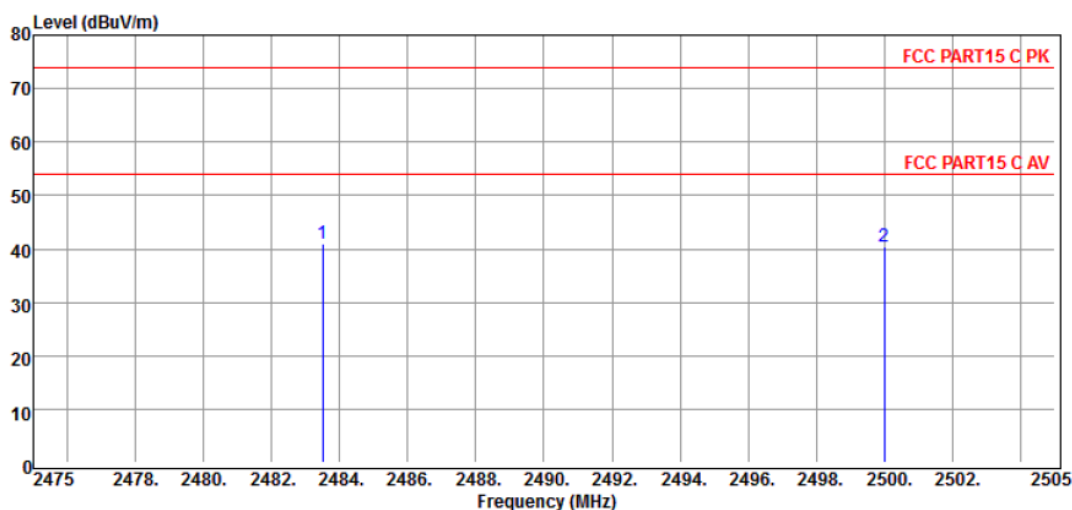
No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV/m	Limit dBμV/m	Margin dB	Antenna Pol.	Remark
1	2483.500	46.46	-6.44	40.02	74.00	-33.98	HORIZONTAL	Peak
2	2500.000	46.54	-6.31	40.23	74.00	-33.77	HORIZONTAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Band-Edge Test Data (Upper Edge)

Temperature	: 20°C	Humidity	: 50%RH
Test Date	: 03-Dec-2019	Tested by	: Andrew Lin
Polarization	: Vertical	Channel	: CH01
EUT Position	: X axis	Data Rate	: 1Mbps



No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV/m	Limit dBμV/m	Margin dB	Antenna Pol.	Remark
1	2483.500	47.52	-6.44	41.08	74.00	-32.92	VERTICAL	Peak
2	2500.000	46.75	-6.31	40.44	74.00	-33.56	VERTICAL	Peak

Remark :

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:
 - (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

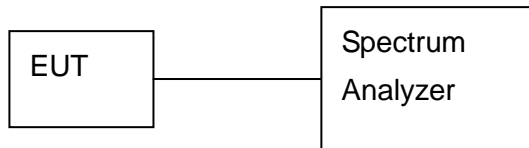


5 20 dB Bandwidth

5.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

5.2 Test Arrangement and Procedure



1. The transmitter output was connected to a spectrum analyzer (through an attenuator, if it's necessary).
2. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW. Measured the -20 dB bandwidth and plotted the graph.

5.3 Limit

None; For report purpose only.

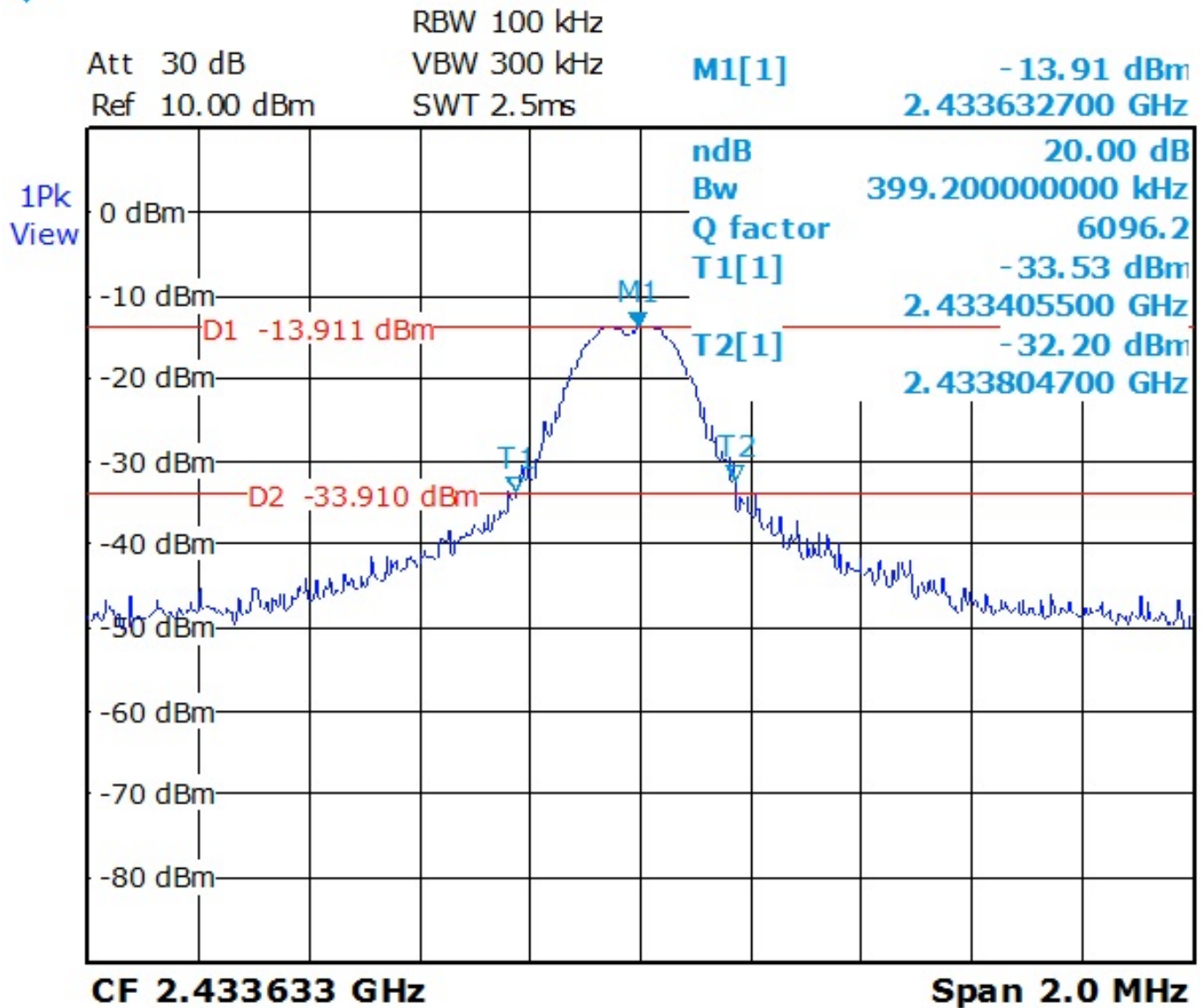
5.4 Test Result

No non-compliance noted.

The final test data are shown on the following page(s).

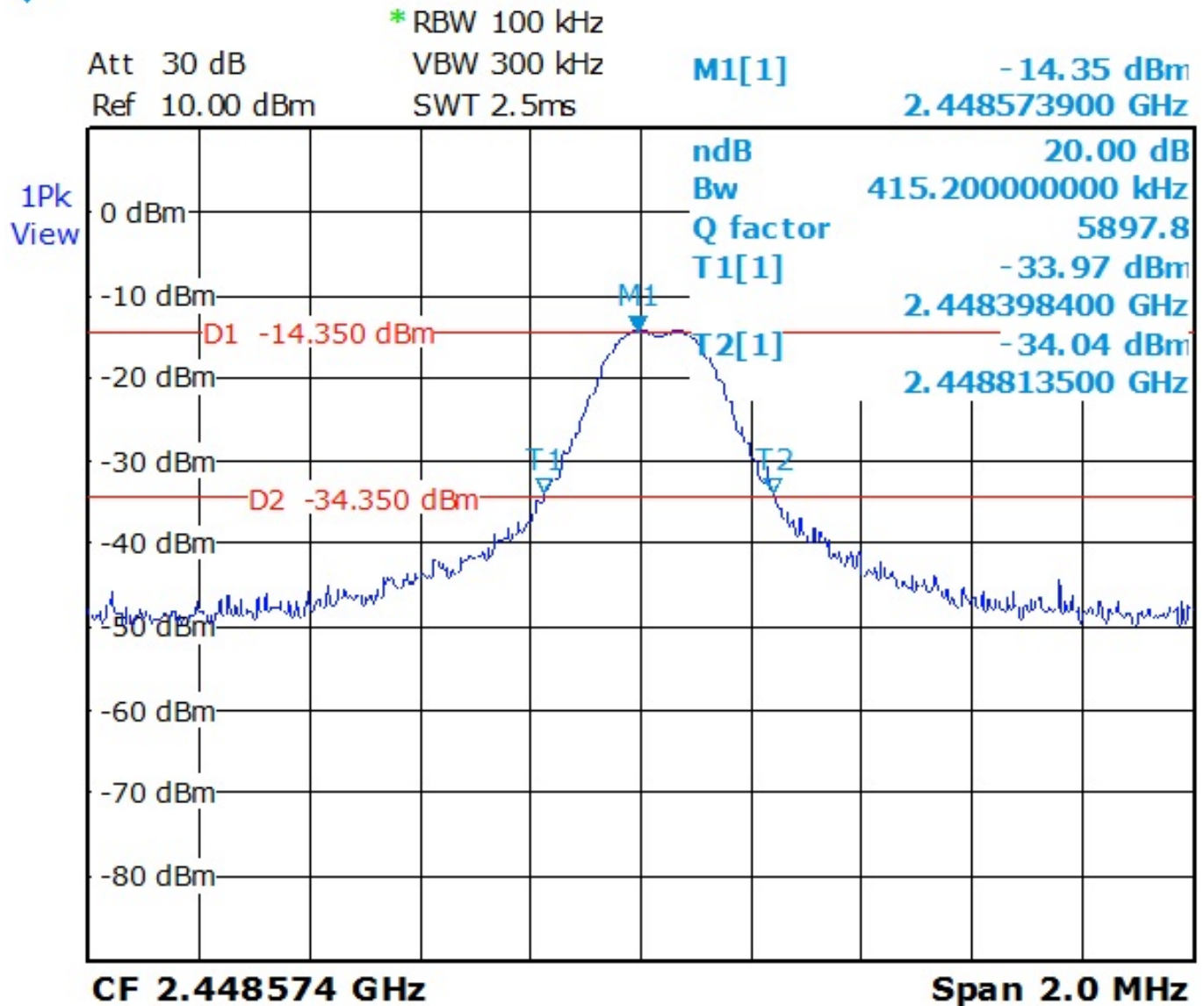


Temperature	: 20°C	Humidity	: 52%RH
Test Date	: 02-Dec-2019	Tested by	: Andrew Lin
Data Rate	: 1 Mbps	Channel	: 00





Temperature	: 20°C	Humidity	: 52%RH
Test Date	: 02-Dec-2019	Tested by	: Andrew Lin
Data Rate	: 1 Mbps	Channel	: 01





6 Antenna requirement

6.1 Limit (§ 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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

6.2 Test Result

Compliance.

The EUT applies PCB antenna.

-----End Of Test Report-----