# FCC COMPLIANCE TEST REPORT

Report No.: HA190467-RA

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

# The product

**Equipment Under Test** : Bluetooth Dongle

Model Number : BT-501
Product Series : BTD-3K1

Report Number : HA190467-RA
Issue Date : 21-June-2019
Test Result : Compliance

is produced by

Mobility Sound Technology LTD.

5F, No.100, Jian 1st Road, ZhongHe Dist., New Taipei City #23585, Taiwan



# HongAn TECHNOLOGY CO., LTD.

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BSMI Registration No.: SL2-IN-E-0023, SL2-A1-E-0023, FCC Designation No.: TW1071, TW1163

SL2-IS-E-0023, SL2-R1-E-0023, TAF Accreditation No.: 1163

SL2-R2-E-0023, SL2-L1-E-0023 **VCCI Registration No.:** R-2156, C-2329, T-219

FCC Test Report Page 1 of 78

# **Contents**

1	General Description	6
1.1	Description of EUT	6
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	10
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	12
2	Power line Conducted Emission Measurement	13
2.1	Test Instruments	13
2.2	Test Arrangement and Procedure	13
2.3	Limit (§ 15.207)	13
2.4	Test Result	13
3	Radiated Emission Test	16
3.1	Test Instruments	16
3.2	Test Arrangement and Procedure	16
3.3	Limit of Field Strength of Fundamental (§ 15.249)	17
3.4	Limit of Spurious Emission (§ 15.209)	17
3.5	Test Result	17
4	Out of Band Emission Test	44
4.1	Test Instruments	44
4.2	Test Arrangement and Procedure	44
4.3	Limit of Field Strength of Fundamental (§ 15.249(d))	44
4.4	Test Result	44
5	20 dB Bandwidth	57
5.1	Test Instruments	57
5.2	Test Arrangement and Procedure	57
5.3	Limit	57
5.4	Test Result	57

FCC Test Report

6	Antenna requirement	67
6.1	Limit (§ 15.203)	67
6.2	Test Result	67
7	Photographs of the Tests	68
7.1	Power line Conducted Emission Test (at Mains Terminals)	68
7.2	Radiated Disturbances Emission Test	69
Q	Photographs of the FLIT	70

Report No.: HA190467-RA

FCC Test Report Page 3 of 78

# **Test Result Certification**

Report No.: HA190467-RA

Applicant	Applicant : Mobility Sound Technology LTD.			
Address of Applicant	. 5F, No.100, Jian 1 <sup>st</sup> Road, ZhongHe Dist., New Taipei City			
Address of Applicant	#23585, Taiwan			
Manufacturer : Mobility Sound Technology LTD.				
Address of Manufacturer	. 5F, No.100, Jian 1 <sup>st</sup> Road, ZhongHe Dist., New Taipei City			
	#23585, Taiwan			
Frade Name : MobilitySound				
<b>Equipment Under Test</b>	: Bluetooth Dongle			
Model Number	: BT-501			
Product Series	: BTD-3K1			
FCC ID	: XTS-BT-WADP			
Filing Type	: Certification			
Sample Received Date	: 16-May-2019			
Test Standard :				
☐ FCC Part 15 Subpart C §15.249				
2 . 00 . a.t .0 000pa.t 0 3.0.2 .0				

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, 15.247.
- 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.

Tested by:	Andrew Lin		2019-06-06	
	Andrew Lin / ENG. Dept. Staff			
Approved by:	Basan . Hsieh	Date:	2019-06-21	_
	Essan Usiah / Sastian Managar			

FCC Test Report Page 4 of 78



# **Summary of Test Result**

Report No.: HA190467-RA

	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	Compliance	
3	Restricted Band of	FCC next 15 cubpart C \$205	Compliance	
3	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	

FCC Test Report Page 5 of 78



# 1 General Description

# 1.1 Description of EUT

Equipment Under Test	:	Bluetoot	Bluetooth Dongle						
Model Number of EUT	:	BT-501	BT-501						
Product Series	:	BTD-3K	BTD-3K1						
Power Supply	:		Input: Charging from USB DC 5 V Output: Li-ion Battery DC 3.7 V; 330mAh						
Frequency Range	:	2402~24	180 MHz						
Number of Channels	:	79 Chan	nels						
Carrier Frequency of Each Channel		00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19	2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421	20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39	2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440	40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59	2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461	60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480
Antenna Specification  Modulation Technique	:	Chip Antenna/ Gain: 1.3 dBi  FHSS  Bluetooth : GFSK  Bluetooth EDR : π/4-DQPSK, 8-DPSK							
Transmit Data Rate	:	Bluetooth : 1Mbps, 2Mbps, 3Mbps							
Specification	:	Dimens	ions : 6.	5 cm (L)	X 2.8 cm	(W) X 1	I.5 cm (H	)	

FCC Test Report Page 6 of 78

Weight: 35 g
Intended Function: The EUT is a Bluetooth Dongle.
Product Variance : N/A.

Report No.: HA190467-RA

FCC Test Report Page 7 of 78

# 1.2 Test Instruments

Instrument	Manufacturer	Model	Serial	Last Cal.	Next Cal.
Name	Mode	Number	Number	Date	Date
Spectrum Analyzer	R&S	FSV 30	101629	25-Dec-2018	24-Dec-2019
ESCI7 EMI Test Receiver	R&S	ESCI7	100931	09-Aug-2018	08-Aug-2019
Pre-Amplifier	Schaffner	CPA9231A	0405	24-Dec-2018	23-Dec-2019
Pre-Amplifier	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
Horn Antenna	EMCO	3115	9912-5992	15-May-2019	14-May-2020
Horn Antenna	Com-Power	AH-840	101042	21-May-2019	20-May-2020
Four-Phase-V- Network	Rolf Heine Hochfrequenzt echnik	NNB-4/32T	00001	10-Mar-2019	09-Mar-2020
LISN	EMCO	3810/2NM	9702-1819	09-Jul-2018	08-Jul-2019
Active Loop Antenna	EMCO	6502	9202-2717	21-Aug-2018	20-Aug-2019
Coaxial Cable	n/a	8D-FB	HA2-10MSI TE-01	24-Aug-2018	23-Aug-2019
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
Coaxial Cable	n/a	RG 223/U	HA2-CE-01	24-Aug-2018	23-Aug-2019

FCC Test Report Page 8 of 78

# 6.00

# 1.3 Auxiliary Equipments

### 1.3.1. Provided by HongAn Technology Co., Ltd. for Test.

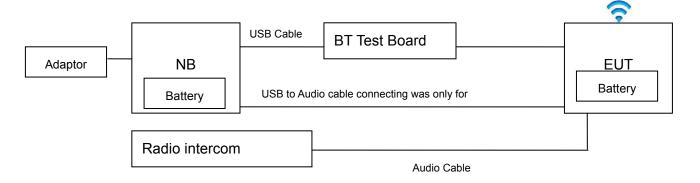
No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Power Cord
01	NoteBook	X1 Carbon	PF-0QGYKK	CE,FCC,	LENOVO	Adapter to Notebook
						Unshielded*1.95m
02	USB Cable	N/A	N/A	N/A	N/A	Non-Shielded; Detachable, 0.2m
Ŭ-	332 34510					w/o core

Report No.: HA190467-RA

#### 1.3.2. Provided by the Manufacturer

No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Specification
01	BT Test Board	N/A	N/A	N/A	N/A	N/A
02	USB to Audio Cable	N/A	N/A	N/A	N/A	Non-Shielded; Detachable, 1.5m w/o core
03	Audio Cable	N/A	N/A	N/A	N/A	Non-Shielded; Un-Detachable, 0.25m w/o core
04	Radio Intercom	N/A	N/A	N/A	N/A	N/A

#### 1.4 EUT SETUP



Note: Main Test Sample: BT-501

# 1.5 Identifying the Final Test Mode

- 1. Mode 1: TX BT mode (1Mbps) CH 00.
- 2. Mode 2: TX BT mode (1Mbps) CH 39.
- 3. Mode 3: TX BT mode (1Mbps) CH 78.
- 4. Mode 4: TX BT mode EDR (2Mbps) CH 00.
- 5. Mode 5: TX BT mode EDR (2Mbps) CH 39.
- 6. Mode 6: TX BT mode EDR (2Mbps) CH 78.
- 7. Mode 7: TX BT mode EDR (3Mbps) CH 00.
- 8. Mode 8: TX BT mode EDR (3Mbps) CH 39.
- 9. Mode 9: TX BT mode EDR (3Mbps) CH 78.

Note:

1. After pre-test, we identified that the Test Mode 1 was most likely to produce the maximum

FCC Test Report Page 9 of 78



transmitting power and cause maximum disturbance. Therefore, the Final Assessment was performed for the worst case.

Report No.: HA190467-RA

- 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 Low (2402 MHz), Mid (2442 MHz) and High (2480 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 15.247 under the FCC Rules Part 15 Subpart C.
- 5. Test Software: BlueTest3 V2.5.8; RF parameter setting: Channel: 00, 39, 78/ Data Rate: 1Mbps, 2Mbps, 3Mbps/ Packet: DH1, DH3, DH5, 2DH1, 2DH3, 2DH5, 3DH1, 3DH3, 3DH5/ TX POWER: 50.

#### 1.6 Final Test Mode

Conducted Emission: Mode 1.

Radiated Emission (30~1000 MHz): Mode 1. Radiated Emission (1~26.5GHz): All Modes.

## 1.7 Condition of Power Supply

DC 5V through USB port

#### 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

FCC Test Report Page 10 of 78



# 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:

Report No.: HA190467-RA

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 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	( <sup>2</sup> )
13.36-13.41			

<sup>&</sup>lt;sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

FCC Test Report Page 11 of 78

<sup>&</sup>lt;sup>2</sup> Above 38.6

<sup>(</sup>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

Address of Test Facility

No. 15-1, Cweishuh Keng, Cweipin Village, Linkou, New Taipei City,

Report No.: HA190467-RA

Taiwan, R.O.C

FCC Designation No. : TW1071, TW1163

**TAF Accreditation No.** : 1163

FCC Test Report Page 12 of 78

## 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.

Report No.: HA190467-RA

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:

Fraguency (MHz)	Limits (dBuV)			
Frequency (MHz)	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

#### Compliance

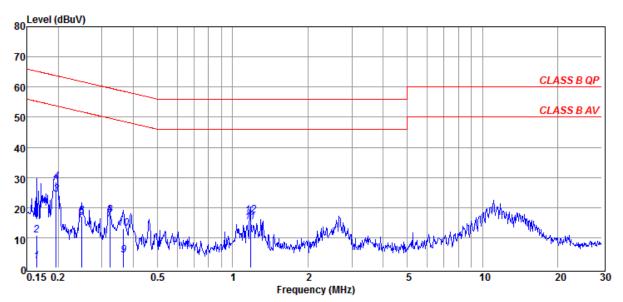
The final test data are shown on the following page(s).

FCC Test Report Page 13 of 78



#### **Conducted Emission Test Data**

Test Date : 2019-06-06 Power Line : Line Temperature :  $23.3^{\circ}$  Humidity : 43%



	Freq	Reading	C.F	Result	Limit	Margin	Power	
No.	MHz	dΒμV	dB	dΒμV	dΒμV	dB	Line	Remark
1	0.164	2.05	0.15	2.20	55.25	-53.05	LINE	Average
2	0.164	10.67	0.15	10.82	65.25	-54.43	LINE	QP
3	0.197	24.09	0.15	24.24	53.76	-29.52	LINE	Average
4	0.197	28.46	0.15	28.61	63.76	-35.15	LINE	QP
5	0.248	16.38	0.16	16.54	51.82	-35.28	LINE	Average
6	0.248	17.14	0.16	17.30	61.82	-44.52	LINE	QP
7	0.322	15.77	0.17	15.94	49.66	-33.72	LINE	Average
8	0.322	17.26	0.17	17.43	59.66	-42.23	LINE	QP
9	0.365	4.05	0.18	4.23	48.61	-44.38	LINE	Average
10	0.365	12.80	0.18	12.98	58.61	-45.63	LINE	QP
11	1.178	14.88	0.26	15.14	46.00	-30.86	LINE	Average
12	1.178	17.05	0.26	17.31	56.00	-38.69	LINE	QP

Note 1. C.F (Correction Factor) = LISN Factor + Cable loss  $\circ$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F •

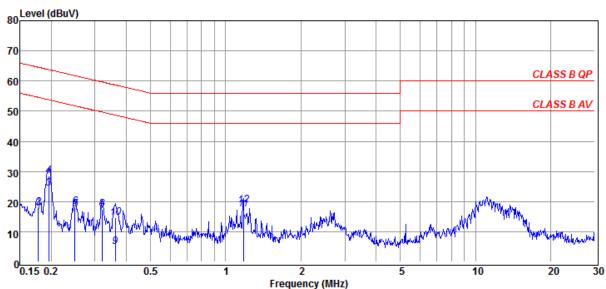
FCC Test Report Page 14 of 78



#### **Conducted Emission Test Data**

Test Date : 2019-06-06 Power Line : Neutral

Temperature :  $23.3^{\circ}$ C Humidity : 43%



				, , , , , , , , , , , , , , , , , , , ,	-,			
	Freq	Reading	C.F	Result	Limit	Margin	Power	
No.	MHz	dΒμV	dB	dΒμV	dΒμV	dB	Line	Remark
1	0.178	16.07	0.14	16.21	54.59	-38.38	NEUTRAL	Average
2	0.178	17.74	0.14	17.88	64.59	-46.71	NEUTRAL	QP
3	0.196	24.25	0.14	24.39	53.80	-29.41	NEUTRAL	Average
4	0.196	28.25	0.14	28.39	63.80	-35.41	NEUTRAL	QP
5	0.249	17.38	0.14	17.52	51.78	-34.26	NEUTRAL	Average
6	0.249	18.19	0.14	18.33	61.78	-43.45	NEUTRAL	QP
7	0.320	15.85	0.15	16.00	49.71	-33.71	NEUTRAL	Average
8	0.320	17.20	0.15	17.35	59.71	-42.36	NEUTRAL	QP
9	0.361	4.80	0.15	4.95	48.69	-43.74	NEUTRAL	Average
10	0.361	14.54	0.15	14.69	58.69	-44.00	NEUTRAL	QP
11	1.178	17.09	0.23	17.32	46.00	-28.68	NEUTRAL	Average
12	1.178	18.71	0.23	18.94	56.00	-37.06	NEUTRAL	QP

Note 1. C.F (Correction Factor) = LISN Factor + Cable loss •

Note 2. Margin = Result - Limit ; Result = Reading + C.F •

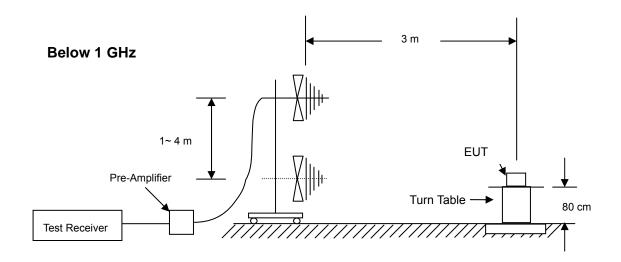
FCC Test Report Page 15 of 78

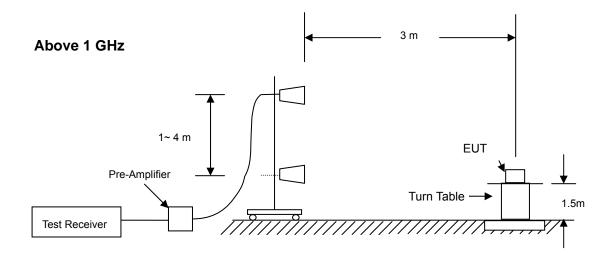
#### 3 Radiated Emission Test

#### 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.

FCC Test Report Page 16 of 78



# 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:

Report No.: HA190467-RA

Fundamental Frequency	Field strength of fundamental	Field strength of harmonics
(MHz)	(microvolts/ meter)	(meters)
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	Field strength	Measurement distance
(MHz)	(microvolts/ meter)	(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

<sup>\*\*</sup> 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).

FCC Test Report Page 17 of 78

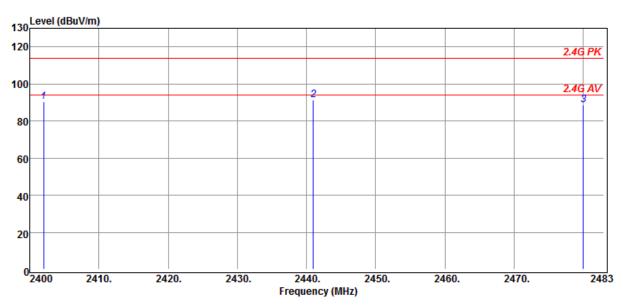
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical : CH00, 39, 78 (1Mbps)

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2402.00	97.12	-6.65	90.47	94.00	-3.53	VERTICAL	Peak
2	2441.00	98.24	-6.72	91.52	94.00	-2.48	VERTICAL	Peak
3	2480.00	95.24	-6.48	88.76	94.00	-5.24	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> 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.

FCC Test Report Page 18 of 78

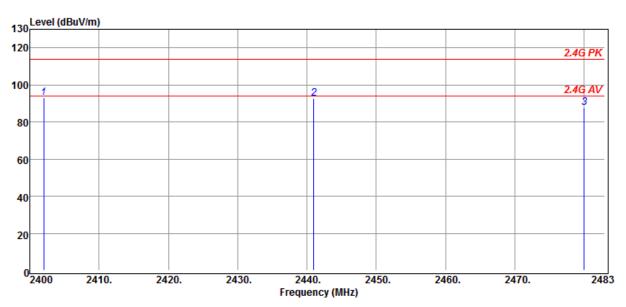
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal : CH00, 39, 78 (1Mbps)

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2402.00	99.61	-6.65	92.96	94.00	-1.04	HORIZONTAL	Peak
2	2441.00	99.58	-6.72	92.86	94.00	-1.14	HORIZONTAL	Peak
3	2480.00	94.05	-6.48	87.57	94.00	-6.43	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> 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.

FCC Test Report Page 19 of 78

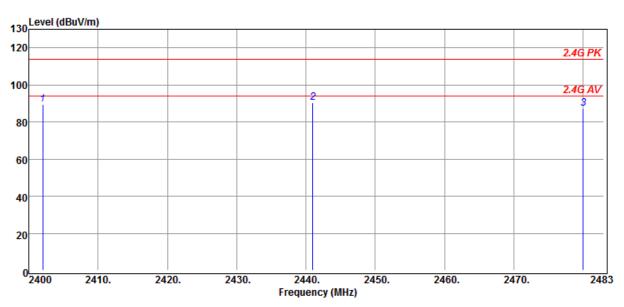
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical : CH00, 39, 78 (2Mbps)

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2402.00	96.08	-6.65	89.43	94.00	-4.57	VERTICAL	Peak
2	2441.00	97.13	-6.72	90.41	94.00	-3.59	VERTICAL	Peak
3	2480.00	93.80	-6.48	87.32	94.00	-6.68	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> 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.

FCC Test Report Page 20 of 78

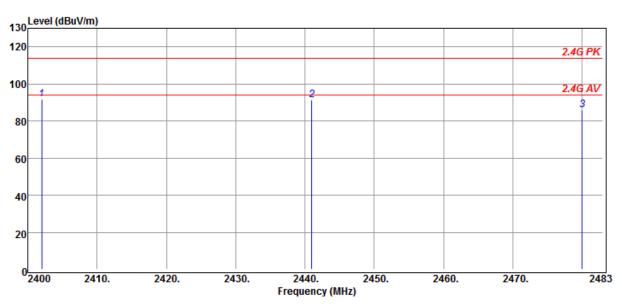
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal : CH00, 39, 78 (2Mbps)

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2402.00	98.35	-6.65	91.70	94.00	-2.30	HORIZONTAL	Peak
2	2441.00	97.87	-6.72	91.15	94.00	-2.85	HORIZONTAL	Peak
3	2480.00	92.51	-6.48	86.03	94.00	-7.97	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> 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.

FCC Test Report Page 21 of 78

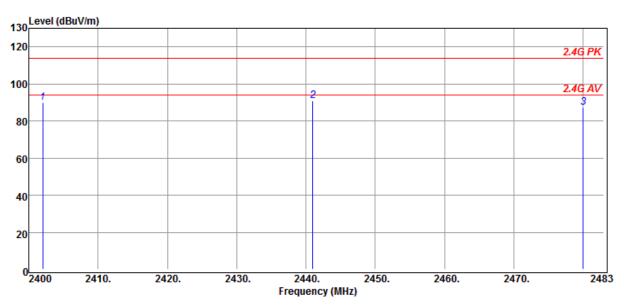
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical : CH00, 39, 78 (3Mbps)

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2402.00	96.49	-6.65	89.84	94.00	-4.16	VERTICAL	Peak
2	2441.00	97.37	-6.72	90.65	94.00	-3.35	VERTICAL	Peak
3	2480.00	93.76	-6.48	87.28	94.00	-6.72	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> 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.

FCC Test Report Page 22 of 78

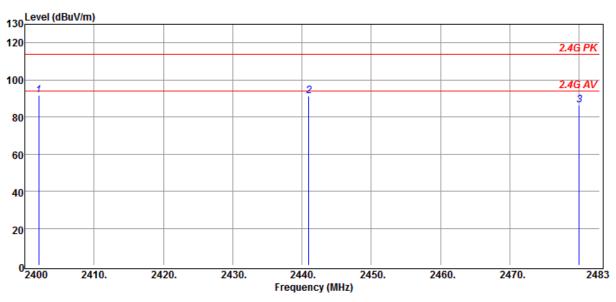
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal : CH00, 39, 78 (3Mbps)

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2402.00	98.48	-6.65	91.83	94.00	-2.17	HORIZONTAL	Peak
2	2441.00	97.96	-6.72	91.24	94.00	-2.76	HORIZONTAL	Peak
3	2480.00	92.81	-6.48	86.33	94.00	-7.67	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> 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.

FCC Test Report Page 23 of 78



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

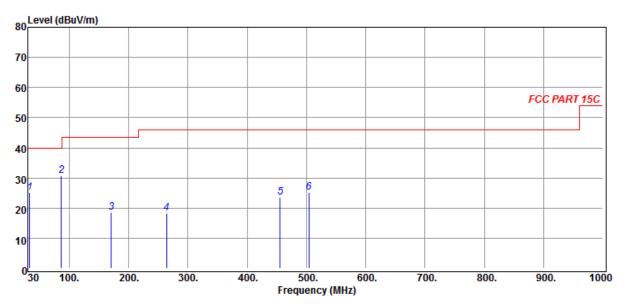
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$  Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH78

EUT Position : X axis



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	32.91	30.25	-5.08	25.17	40.00	-14.83	VERTICAL	Peak
2	86.26	45.59	-14.73	30.86	40.00	-9.14	VERTICAL	Peak
3	170.65	31.53	-12.88	18.65	43.50	-24.85	VERTICAL	Peak
4	263.77	27.68	-9.31	18.37	46.00	-27.63	VERTICAL	Peak
5	455.83	28.76	-5.11	23.65	46.00	-22.35	VERTICAL	Peak
6	504.33	28.94	-3.74	25.20	46.00	-20.80	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### 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.

FCC Test Report Page 24 of 78

Polarization

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

Channel

**CH78** 

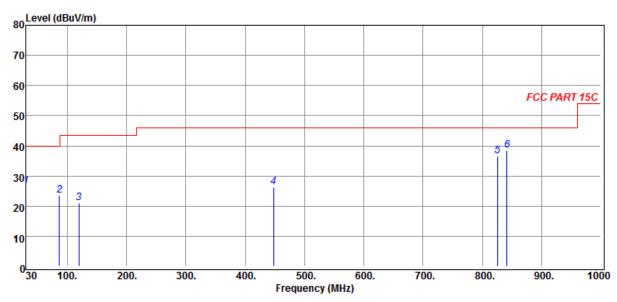
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$  Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

EUT Position : X axis Data rate : 1Mbps

Horizontal



NI-	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	30.00	29.95	-3.45	26.50	40.00	-13.50	HORIZONTAL	Peak
2	86.26	38.16	-14.73	23.43	40.00	-16.57	HORIZONTAL	Peak
3	119.24	32.24	-11.31	20.93	43.50	-22.57	HORIZONTAL	Peak
4	448.07	31.60	-5.31	26.29	46.00	-19.71	HORIZONTAL	Peak
5	825.40	34.21	2.25	36.46	46.00	-9.54	HORIZONTAL	Peak
6	841.89	35.71	2.65	38.36	46.00	-7.64	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  ${\scriptstyle \circ}$ 

Note 2. Margin = Result - Limit; Result = Reading + C.F -

#### 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.

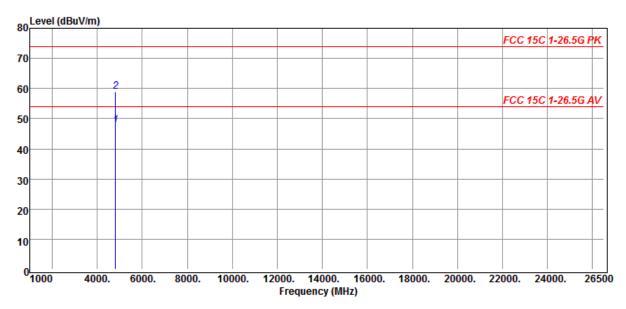
FCC Test Report Page 25 of 78

Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH00

EUT Position : X axis Data rate : 1Mbps



MHz         dBµV         dB         dBµV/m         dBµV/m         dB         Pol.           1         4804.00         47.27         0.74         48.01         54.00         -5.99         VERTICAL         Average		Freq	Reading	C.F	Result	Limit	Margin	Antenna	- ·
	No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
2 4804 00 58 14 0 74 58 88 74 00 -15 12 VERTICAL Peak	1	4804.00	47.27	0.74	48.01	54.00	-5.99	VERTICAL	Average
2 4004.00 00.14 0.74 00.00 74.00 10.12 VERTICAL 1 00.10	2	4804.00	58.14	0.74	58.88	74.00	-15.12	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain -

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 26 of 78

Polarization

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

Channel

CH00

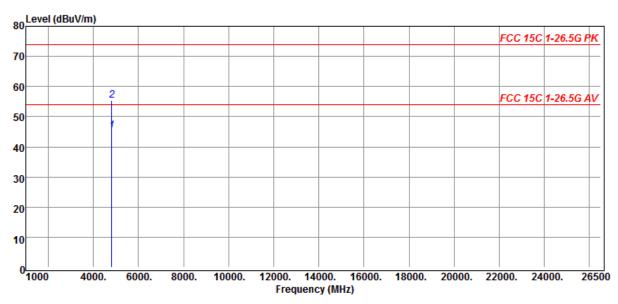
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

EUT Position : X axis Data rate : 1Mbps

Horizontal



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4804.00	44.74	0.74	45.48	54.00	-8.52	HORIZONTAL	Average
2	4804.00	54.57	0.74	55.31	74.00	-18.69	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 27 of 78

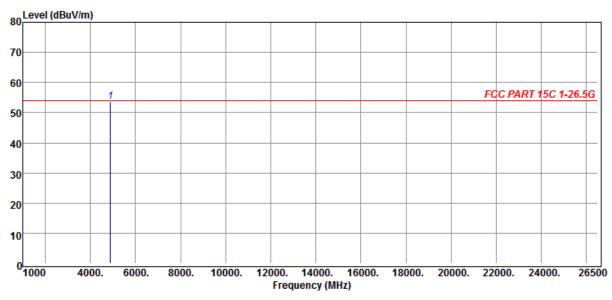
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH39

EUT Position : X axis Data rate : 1Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4882.00	52.62	1.01	53.63	54.00	-0.37	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F •

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 28 of 78

Polarization

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

Channel

**CH39** 

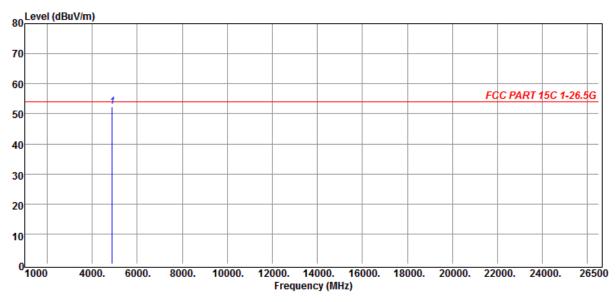
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

EUT Position : X axis Data rate : 1Mbps

Horizontal



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4882.00	51.41	1.01	52.42	54.00	-1.58	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

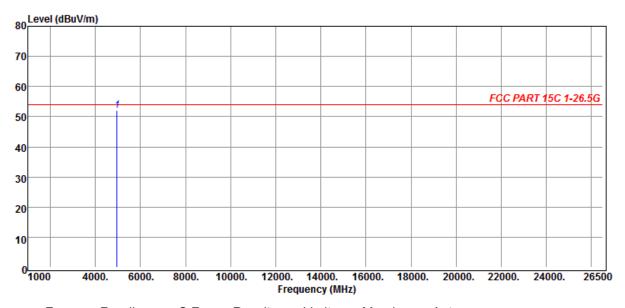
FCC Test Report Page 29 of 78

Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH78

EUT Position : X axis Data rate : 1Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4960.00	50.69	1.41	52.10	54.00	-1.90	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit; Result = Reading + C.F -

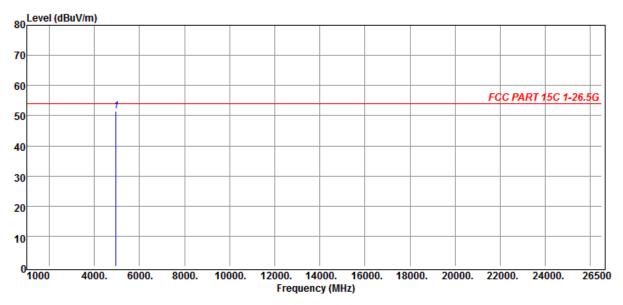
#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 30 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** 2019-06-06 Tested by Andrew Lin Polarization Horizontal Channel **CH78 EUT Position** X axis 1Mbps Data rate



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	_
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4960.00	50.17	1.41	51.58	54.00	-2.42	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  ${\scriptstyle \circ}$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $\circ$ 

#### Remark:

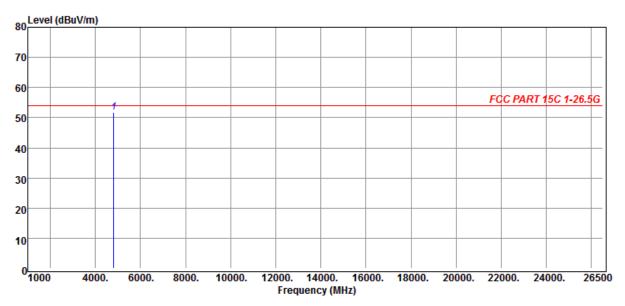
- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 31 of 78



Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** 2019-06-06 Tested by Andrew Lin Polarization Channel CH00 Vertical **EUT Position** X axis Data rate 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4804.00	50.93	0.74	51.67	54.00	-2.33	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 32 of 78

Polarization

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

Channel

CH00

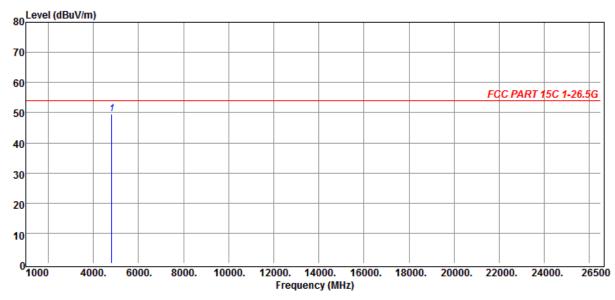
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

EUT Position : X axis Data rate : 2Mbps

Horizontal



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	_
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4804.00	48.89	0.74	49.63	54.00	-4.37	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F •

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 33 of 78

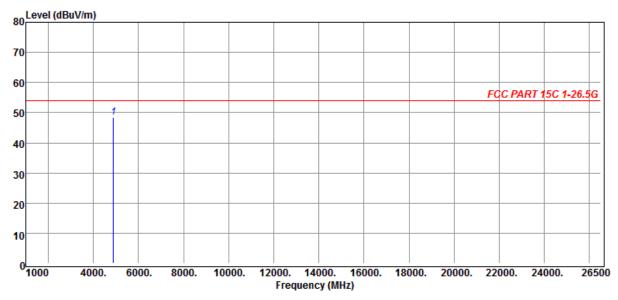
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH39

EUT Position : X axis Data rate : 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4882.00	47.56	1.01	48.57	54.00	-5.43	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 34 of 78

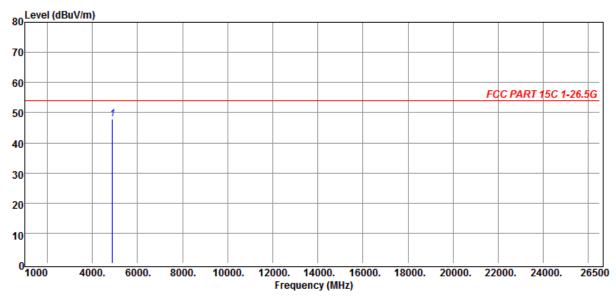
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal Channel : CH39

EUT Position : X axis Data rate : 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	_
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4882.00	46.95	1.01	47.96	54.00	-6.04	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 35 of 78

X axis

**EUT Position** 

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

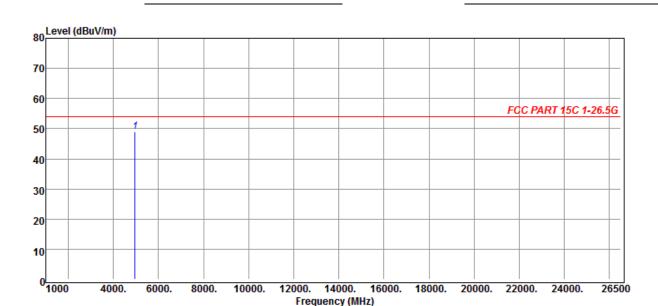
Data rate

2Mbps

Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$  Humidity : 53% Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH78



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBμV/m	dB	Pol.	Remark
1	4960.00	47.71	1.41	49.12	54.00	-4.88	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit; Result = Reading + C.F -

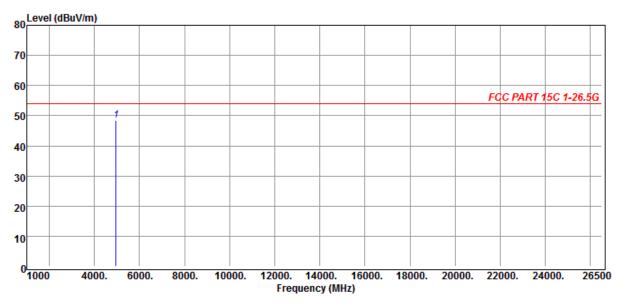
#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 36 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** 2019-06-06 Tested by Andrew Lin Polarization Horizontal Channel **CH78 EUT Position** X axis 2Mbps Data rate



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4960.00	46.99	1.41	48.40	54.00	-5.60	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  ${\scriptstyle \circ}$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $\circ$ 

### Remark:

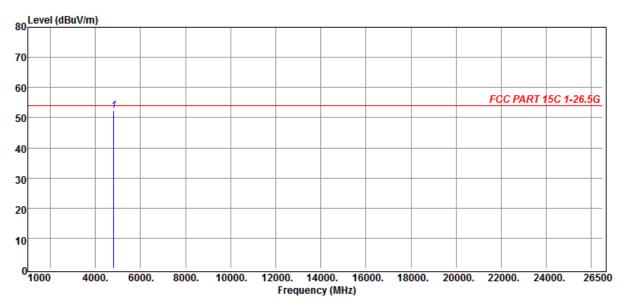
- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 37 of 78



Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** 2019-06-06 Tested by Andrew Lin Polarization Channel CH00 Vertical **EUT Position** X axis Data rate 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4804.00	51.46	0.74	52.20	54.00	-1.80	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 38 of 78

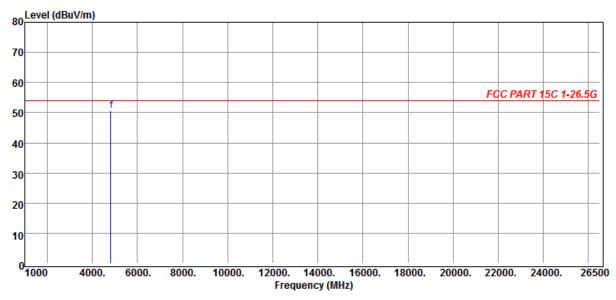
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal : CH00

EUT Position : X axis Data rate : 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	_
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4804.00	49.82	0.74	50.56	54.00	-3.44	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F •

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 39 of 78

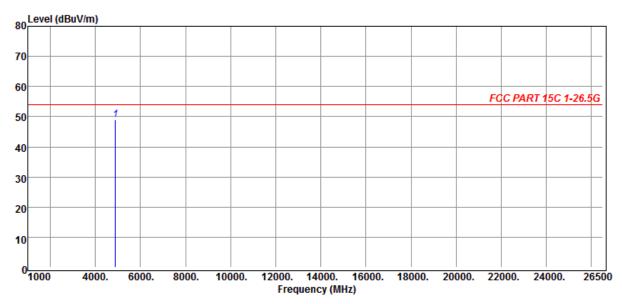
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : <u>Vertical</u> Channel : <u>CH39</u>

EUT Position : X axis Data rate : 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4882.00	47.96	1.01	48.97	54.00	-5.03	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F •

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 40 of 78

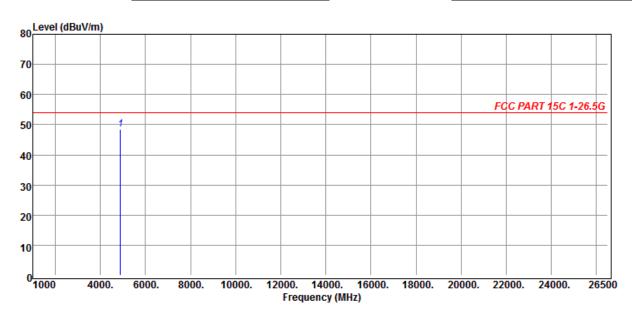
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$  Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal Channel : CH39

EUT Position : X axis Data rate : 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4882.00	47.47	1.01	48.48	54.00	-5.52	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

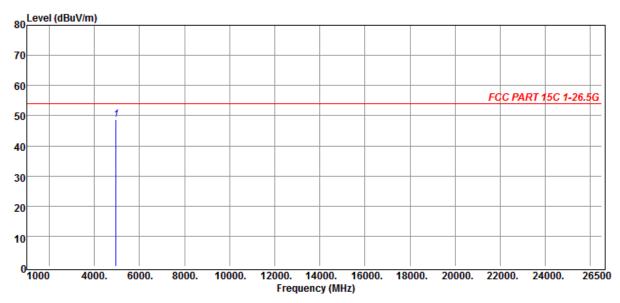
FCC Test Report Page 41 of 78

Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH78

EUT Position : X axis Data rate : 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4960 00	47 20	1 41	48 61	54 00	-5 39	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit; Result = Reading + C.F -

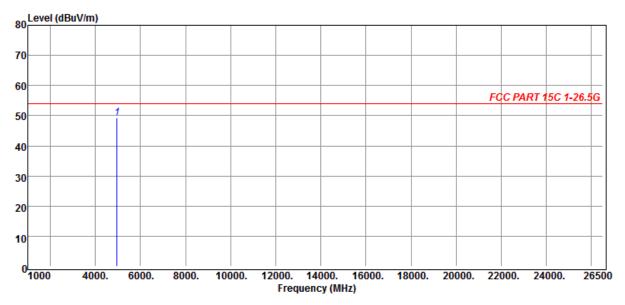
### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 42 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** 2019-06-06 Tested by Andrew Lin Polarization Horizontal Channel **CH78 EUT Position** X axis 3Mbps Data rate



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	_
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	4960.00	47.99	1.41	49.40	54.00	-4.60	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  ${\scriptstyle \circ}$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $\circ$ 

### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 43 of 78

## 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.

Report No.: HA190467-RA

### 4.4 Test Result

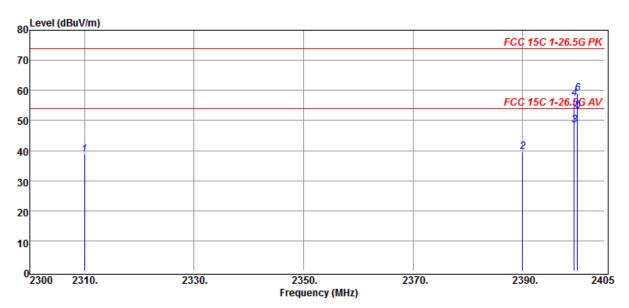
## Compliance

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

FCC Test Report Page 44 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** Tested by 2019-06-06 Andrew Lin Polarization Vertical Channel CH00 **EUT Position** Data Rate X axis 1Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2310.00	45.65	-6.93	38.72	74.00	-35.28	VERTICAL	Peak
2	2390.00	46.15	-6.67	39.48	74.00	-34.52	VERTICAL	Peak
3	2399.44	55.19	-6.64	48.55	54.00	-5.45	VERTICAL	Average
4	2399.44	64.01	-6.64	57.37	74.00	-16.63	VERTICAL	Peak
5	2400.00	59.75	-6.64	53.11	54.00	-0.89	VERTICAL	Average
6	2400.00	65.73	-6.64	59.09	74.00	-14.91	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

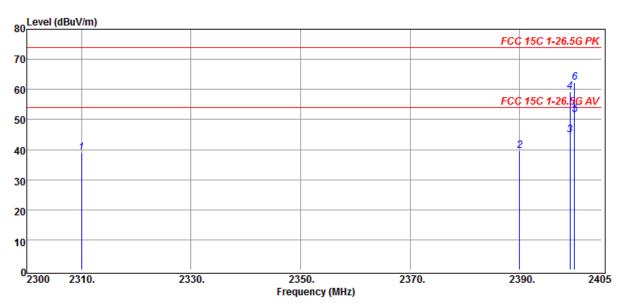
### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 45 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** Tested by 2019-06-06 Andrew Lin Polarization Horizontal Channel CH00 **EUT Position** Data Rate X axis 1Mbps



NI.	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2310.00	46.05	-6.93	39.12	74.00	-34.88	HORIZONTAL	Peak
2	2390.00	46.28	-6.67	39.61	74.00	-34.39	HORIZONTAL	Peak
3	2399.23	51.39	-6.64	44.75	54.00	-9.25	HORIZONTAL	Average
4	2399.23	65.97	-6.64	59.33	74.00	-14.67	HORIZONTAL	Peak
5	2400.00	57.99	-6.64	51.35	54.00	-2.65	HORIZONTAL	Average
6	2400.00	69.04	-6.64	62.40	74.00	-11.60	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

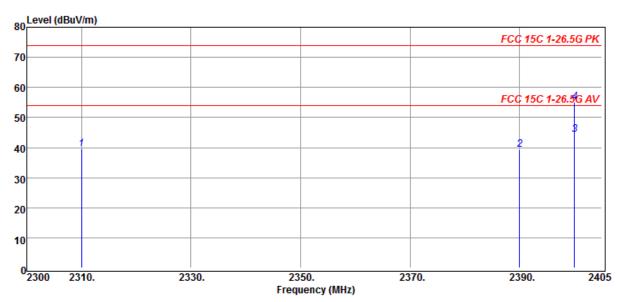
### Remark:

- Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 46 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** Tested by 2019-06-06 Andrew Lin Polarization Vertical Channel CH00 **EUT Position** Data Rate X axis 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2310.00	46.40	-6.93	39.47	74.00	-34.53	VERTICAL	Peak
2	2390.00	45.88	-6.67	39.21	74.00	-34.79	VERTICAL	Peak
3	2400.00	51.02	-6.64	44.38	54.00	-9.62	VERTICAL	Average
4	2400.00	61.84	-6.64	55.20	74.00	-18.80	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

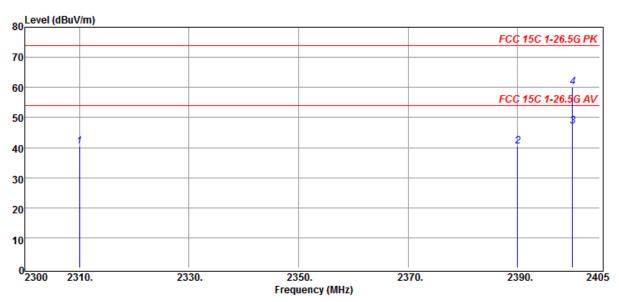
### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 47 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** Tested by 2019-06-06 Andrew Lin Polarization Horizontal Channel CH00 **EUT Position** Data Rate X axis 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2310.00	47.33	-6.93	40.40	74.00	-33.60	HORIZONTAL	Peak
2	2390.00	47.12	-6.67	40.45	74.00	-33.55	HORIZONTAL	Peak
3	2400.00	53.72	-6.64	47.08	54.00	-6.92	HORIZONTAL	Average
4	2400.00	66.65	-6.64	60.01	74.00	-13.99	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

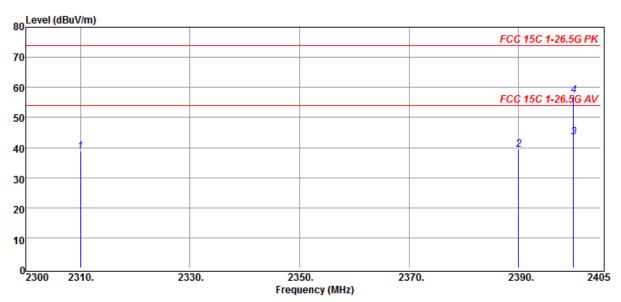
### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 48 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** Tested by 2019-06-06 Andrew Lin Polarization Vertical Channel CH00 **EUT Position** Data Rate X axis 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2310.00	45.81	-6.93	38.88	74.00	-35.12	VERTICAL	Peak
2	2390.00	46.08	-6.67	39.41	74.00	-34.59	VERTICAL	Peak
3	2400.00	50.17	-6.64	43.53	54.00	-10.47	VERTICAL	Average
4	2400.00	63.92	-6.64	57.28	74.00	-16.72	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

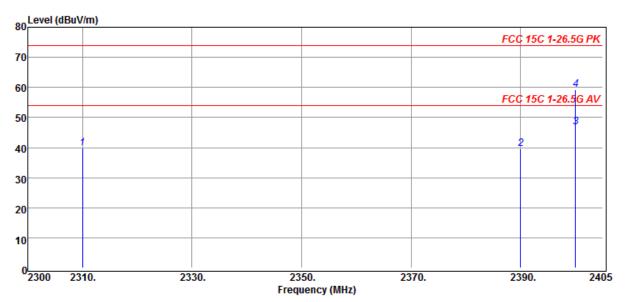
### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 49 of 78

Report No.: HA190467-RA

Temperature **27.9**℃ Humidity 53% **Test Date** Tested by 2019-06-06 Andrew Lin Polarization Horizontal Channel CH00 **EUT Position** Data Rate X axis 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2310.00	46.86	-6.93	39.93	74.00	-34.07	HORIZONTAL	Peak
2	2390.00	46.17	-6.67	39.50	74.00	-34.50	HORIZONTAL	Peak
3	2400.00	53.45	-6.64	46.81	54.00	-7.19	HORIZONTAL	Average
4	2400.00	66.01	-6.64	59.37	74.00	-14.63	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F  $_{\circ}$ 

### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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:
  - (b) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 50 of 78



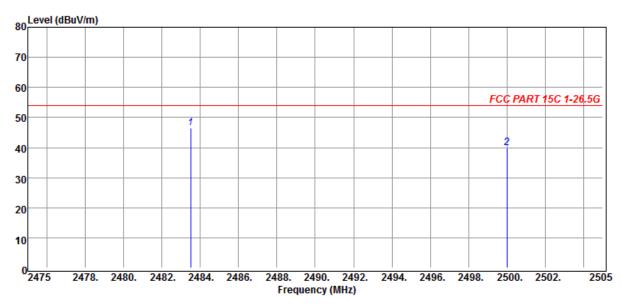
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical Channel : CH78

EUT Position : X axis Data Rate : 1Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2483.50	52.98	-6.44	46.54	54.00	-7.46	VERTICAL	Peak
2	2500.00	46.14	-6.31	39.83	54.00	-14.17	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 51 of 78



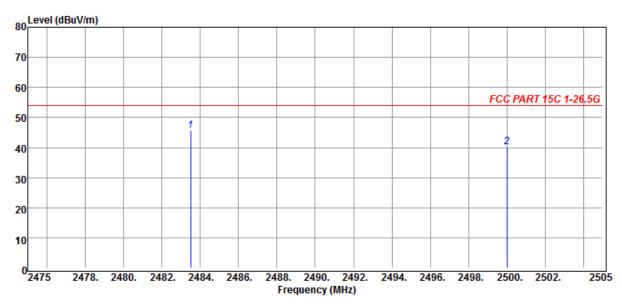
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal Channel : CH78

EUT Position : X axis Data Rate : 1Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBμV/m	dB	Pol.	Remark
1	2483.50	52.16	-6.44	45.72	54.00	-8.28	HORIZONTAL	Peak
2	2500.00	46.51	-6.31	40.20	54.00	-13.80	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain •

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 52 of 78



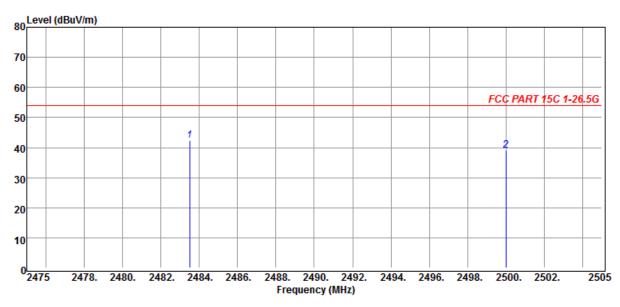
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$  Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical : CH78

EUT Position : X axis Data Rate : 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2483.50	48.82	-6.44	42.38	54.00	-11.62	VERTICAL	Peak
2	2500.00	45.40	-6.31	39.09	54.00	-14.91	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  ${\scriptstyle \circ}$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 53 of 78



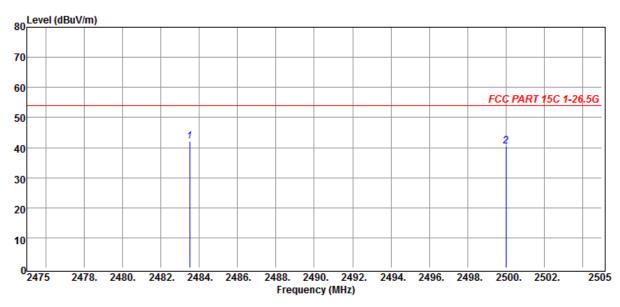
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal : CH78

EUT Position : X axis Data Rate : 2Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBμV/m	dB	Pol.	Remark
1	2483.50	48.47	-6.44	42.03	54.00	-11.97	HORIZONTAL	Peak
2	2500.00	46.76	-6.31	40.45	54.00	-13.55	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  ${\scriptstyle \circ}$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 54 of 78



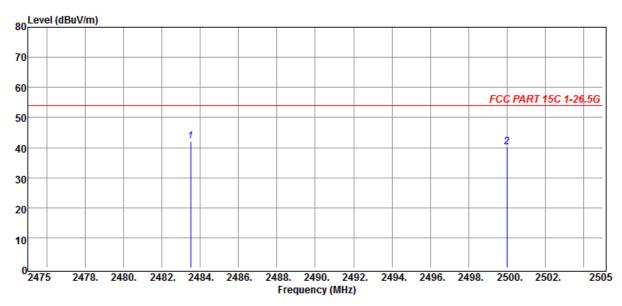
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$  Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Vertical : CH78

EUT Position : X axis Data Rate : 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2483.50	48.46	-6.44	42.02	54.00	-11.98	VERTICAL	Peak
2	2500.00	46.43	-6.31	40.12	54.00	-13.88	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

FCC Test Report Page 55 of 78



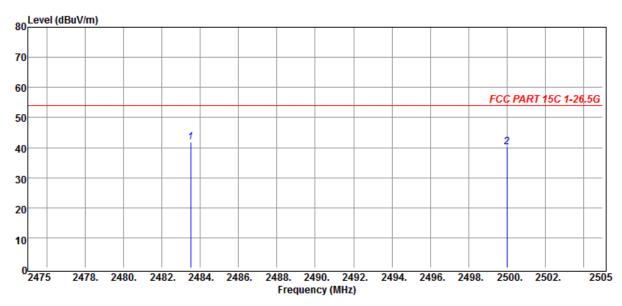
Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

Polarization : Horizontal : CH78

EUT Position : X axis Data Rate : 3Mbps



	Freq	Reading	C.F	Result	Limit	Margin	Antenna	
No.	MHz	dΒμV	dB	dBµV/m	dBµV/m	dB	Pol.	Remark
1	2483.50	48.23	-6.44	41.79	54.00	-12.21	HORIZONTAL	Peak
2	2500.00	46.47	-6.31	40.16	54.00	-13.84	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain  $\circ$ 

Note 2. Margin = Result - Limit ; Result = Reading + C.F -

#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
- 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.
- Spectrum setting:
  - (a) Peak Setting 1GHz to 10<sup>th</sup> harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

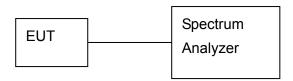
FCC Test Report Page 56 of 78

## 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).

Report No.: HA190467-RA

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).

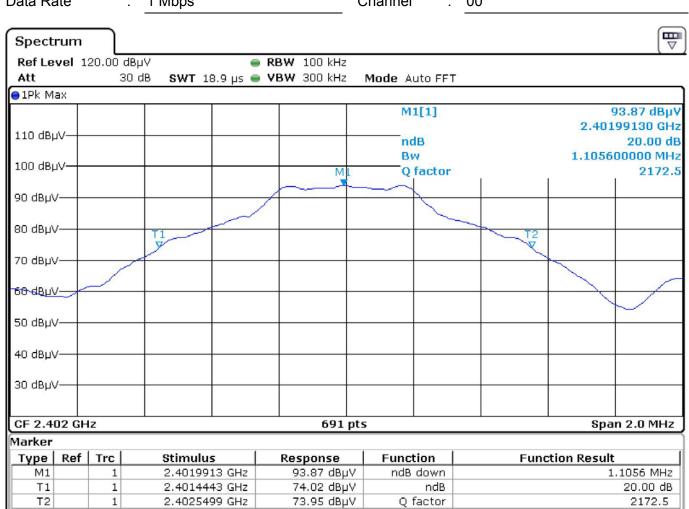
FCC Test Report Page 57 of 78

Report No.: HA190467-RA

Temperature :  $27.9^{\circ}$ C Humidity : 53%

Test Date : 2019-06-06 Tested by : Andrew Lin

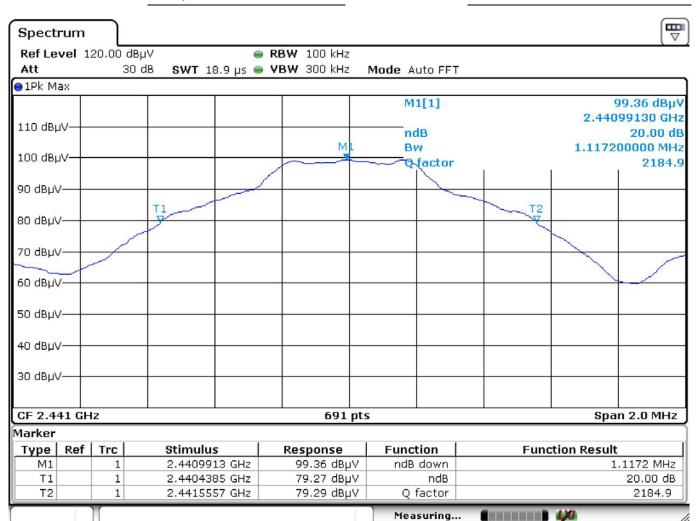
Data Rate : 1 Mbps Channel : 00



Measuring...

FCC Test Report Page 58 of 78

Data Rate 1 Mbps Channel : 39



**FCC Test Report** Page 59 of 78 Type | Ref | Trc

1

1

M1

Τ1

T2

Stimulus

2.4801563 GHz

2.4794385 GHz

2.4805528 GHz

**Function Result** 

1.1143 MHz

20.00 dB

2225.7

Response

94.72 dBµV

74.79 dBµV

74.83 dBµV

Function

ndB down

Q factor

Measuring...

ndB

FCC Test Report Page 60 of 78

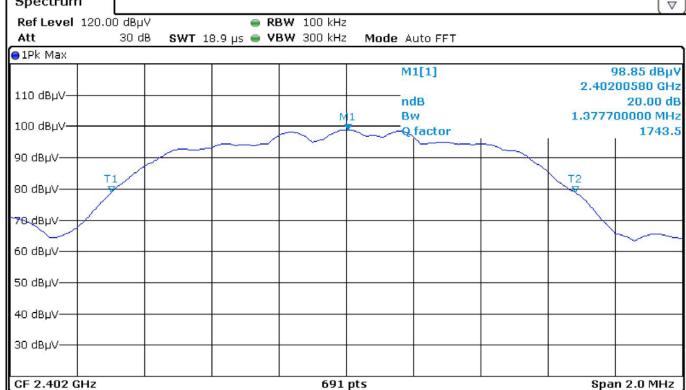
Report No.: HA190467-RA

 Temperature
 : 27.9°C
 Humidity
 : 53%

 Test Date
 : 2019-06-06
 Tested by
 : Andrew Lin

 Data Rate
 : 2 Mbps
 Channel
 : 00

 Spectrum



Marker							
Туре	Ref	Trc	Stimulus	Response	Function	Function Result	
M1		1	2.4020058 GHz	98.85 dBμV	ndB down	1.	.3777 MHz
T1		1	2.4013025 GHz	78.84 dBµV	ndB		20.00 dB
T2		1	2.4026802 GHz	78.82 dBµV	Q factor		1743.5
					Measuring	<b>1</b>	/

FCC Test Report Page 61 of 78

Τ1

T2

1

1

2.4403082 GHz

2.4416831 GHz

Data Rate 2 Mbps Channel : 39 Spectrum Ref Level 120.00 dBµV RBW 100 kHz 30 dB SWT 18.9 µs • VBW 300 kHz Mode Auto FFT ●1Pk Max M1[1]97.47 dBµV 2.44115920 GHz 110 dBµVndB 20.00 dB 1.374800000 MHz 100 dBμV-Q factor 1775.6 90 dBµV-80 dBµV-70 dBµV-60 dBµV-50 dBµV-40 dBµV-30 dBµV-CF 2.441 GHz 691 pts Span 2.0 MHz Marker Type | Ref | Trc Function Stimulus Response **Function Result** 2.4411592 GHz 97.47 dBµV ndB down 1.3748 MHz M1 77.60 dBµV

77.44 dBµV

ndB

Q factor

Measuring...

20.00 dB

1775.6

**FCC Test Report** Page 62 of 78

T2

1

2.4806686 GHz

Data Rate 2 Mbps Channel : 78 Spectrum Ref Level 120.00 dBµV RBW 100 kHz 30 dB SWT 18.9 µs • VBW 300 kHz Mode Auto FFT ●1Pk Max M1[1]92.47 dBµV 2.48000290 GHz 110 dBµVndB 20.00 dB 1.366100000 MHz BW 100 dBμV-Q factor 1815.3 M1 90 dBµV-80 dBµV-T2 T1 70 dBµV-60 dBµV-50 dBµV-40 dBµV-30 dBµV-CF 2.48 GHz 691 pts Span 2.0 MHz Marker Type | Ref | Trc Function Stimulus Response **Function Result** 2.4800029 GHz 92.47 dBµV ndB down 1.3661 MHz M1 72.63 dBµV Τ1 1 2.4793025 GHz ndB 20.00 dB

72.49 dBµV

Q factor

Measuring...

1815.3

**FCC Test Report** Page 63 of 78

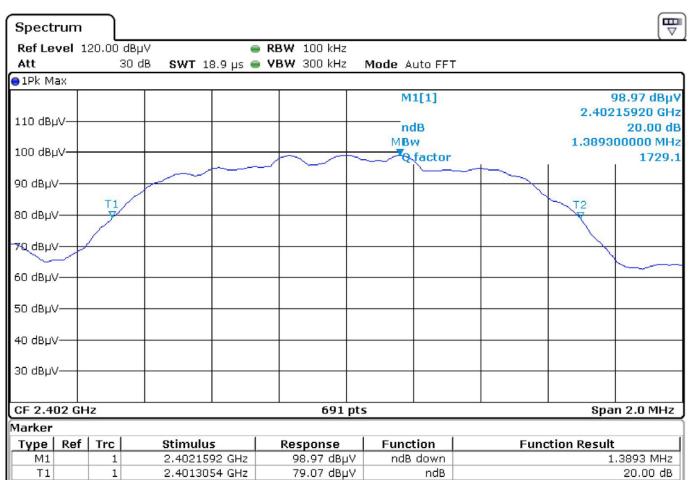
Report No.: HA190467-RA

1729.1

 Temperature
 : 27.9°C
 Humidity
 : 53%

 Test Date
 : 2019-06-06
 Tested by
 : Andrew Lin

 Data Rate
 : 3 Mbps
 Channel
 : 00



78.85 dBµV

Q factor

Measuring...

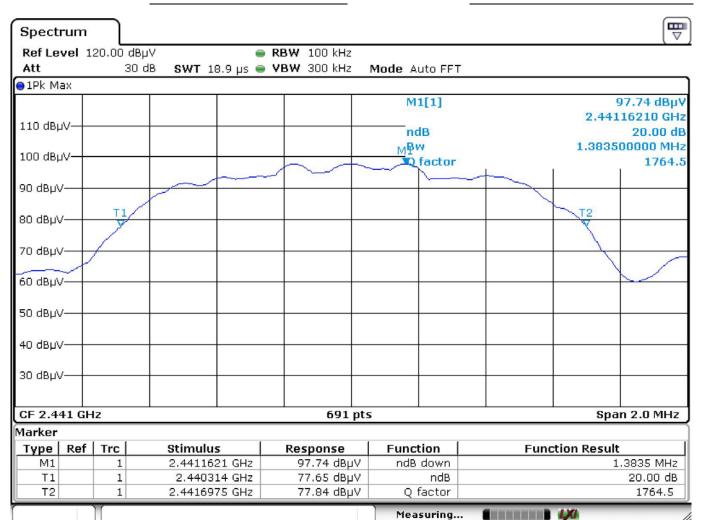
2.4026946 GHz

T2

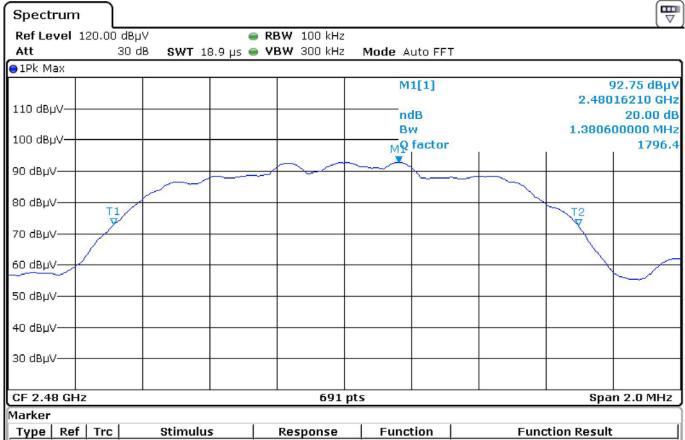
1

FCC Test Report Page 64 of 78

Data Rate 3 Mbps Channel : 39



**FCC Test Report** Page 65 of 78



Marker	•					
Type	Ref	Trc	Stimulus	Response	Function	Function Result
M1		1	2.4801621 GHz	92.75 dBµV	ndB down	1.3806 MHz
T1		1	2.479314 GHz	72.78 dBµV	ndB	20.00 dB
T2		1	2.4806946 GHz	72.57 dBµV	Q factor	1796.4

Measuring...

4,0

FCC Test Report Page 66 of 78

# 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 uniue 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.

Report No.: HA190467-RA

### 6.2 Test Result

Compliance.
The EUT applies a Chip Ceramic antenna.
End Of Test Report

FCC Test Report Page 67 of 78