FCC COMPLIANCE TEST REPORT

Technical Statement of Conformity

in accordance with 47 CFR Part 15 Subpart C

The product

Equipment Under Test	: Wireless RF2.4 Keyboard w/Trackball
Model Number	: GKB635W
Product Series	: N/A
Report Number	: HA171137-RA
Issue Date	: 07-Dec-2017
Test Result	: Compliance

is produced by

ATHEN Technology Inc., DBAIOGEAR

15365 Barranca Parkway, Irvine, CA. 92618

HongAn TECHNOLOGY CO., LTD.

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

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

BSMI Registration No.: SL2-IN-E-0023, SL2-A1-E-0023, SL2-IS-E-0023, SL2-R1-E-0023, SL2-R2-E-0023, SL2-L1-E-0023

FCC Designation No.: TW1071, TW1163
TAF Accreditation No.: 1163
VCCI Registration No.: R-2156, C-2329, T-219

Contents

Test Result Certification

Applicant	: ATHEN Technology Inc., DBAIOGEAR
Address of Applicant	: 15365 Barranca Parkway, Irvine, CA. 92618
Manufacturer	: Lexking Technology Co., Ltd.
Address of Manufacturer	: 7F-5 No.155, Zhongyang Road, Xindian Dist. New Taipei City, Taiwan 23150(R.O.C)
Trade Name	: Iogear
Equipment Under Test	: Wireless RF2.4 Keyboard w/Trackball
Model Number	: GKB635W
Product Series	: N/A
FCC ID	: QLEGKB635W
Filing Type	: Certification
Sample Received Date	: 23-Oct-2017
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: Kay Wang 2017-12-05

Kay Wang/ ADM. Dept Staff

Tested by: Eason Hsieh 2017-11-28

Eason Hsieh / ENG. Dept. Staff

Approved by: Peter Chin **Date:** 2017-12-06

Peter Chin / Section 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	**:**	Wireless RF2.4 Keyboard w/Trackball
Model Number of EUT	**:**	GKB635W
Product Series	**:**	N/A
Power Supply	**:**	AA Battery*2 DC 3 V
Frequency Range	**:**	2402~2480 MHz
Number of Channels	**:**	79 Channels
Carrier Frequency of Each Channel	**:**	00 2402 20 2422 40 2442 60 2462 01 2403 21 2423 41 2443 61 2463 02 2404 22 2424 42 2444 62 2464 03 2405 23 2425 43 2445 63 2465 04 2406 24 2426 44 2446 64 2466 05 2407 25 2427 45 2447 65 2467 06 2408 26 2428 46 2448 66 2468 07 2409 27 2429 47 2449 67 2469 08 2410 28 2430 48 2450 68 2470 09 2411 29 2431 49 2451 69 2471 10 2412 30 2432 50 2452 70 2472 11 2413 31 2433 51 2453 71 2473 12 2414 32 2434 52 2454 72 2474 13 2415 33 2435 53 2455 73 2475 14 2416 34 2436 54 2456 74 2476 15 2417 35 2437 55 2457 75 2477 16 2418 36 2438 56 2458 76 2478 17 2419 37 2439 57 2459 77 2479 18 2420 38 2440 58 2460 78 2480 19 2421 39 2441 59 2461 - -
Antenna Specification	**:**	PCB Antenna/ Gain: 1.5 dBi*
Modulation Technique	**:**	GFSK
Transmit Data Rate	**:**	N/A
Specification	**:**	**Dimensions :** 31 cm (L) X 17 cm (W) X 4 cm (H) **Weight :** 450 g **Intended Function :** Wireless Keyboard combine a trackball module

		which can easy typing and surf internet during input process. **Product Variance :** The manufacturer declares that the series products are identical to the main test sample. For marketing reason and different language versions, there are different series numbers. HongAn Technology Co., Ltd. only takes the responsibility to the test result of the main test sample.

1.2 Test Instruments

Instrument Name	Manufacturer Mode	Model Number	Serial Number	Last Cal. Date	Next Cal. Date	Instrument Uncertainty
RF Amplifier	Schaffner	CPA9231A	0405	24-Aug-2017	23-Aug-2018	1.42dB
EMI Receiver	R&S	ESCI	100931	17-Aug-2017	16-Aug-2018	0.87dB
Spectrum Analyzer	R&S	FSV	101629	11-Jan-2017	10-Jan-2018	0.62dB
Preamplifier	HD	HD17187	004	22-May-2017	21-May-2018	0.33dB
Bilog Antenna	TESEQ	CBL6111D	38521	11-Oct-2017	10-Oct-2018	1.0dB
Double-Ridged Waveguide Horn	EMCO	3115	9912-5992	22-May-2017	21-May-2018	0.9dB
Horn Antenna (18-40GHz)	Com -Power	AH-840	101042	25-May-2017	24-May-2018	2.0dB
Microwave Preamplifier	Com -Power	PAM-840	461269	24-May-2017	23-May-2018	0.49dB
LISN	Rolf Heine Hochfrequenztechnik	NNB-4/32T	00001	08-Mar-2017	07-Mar-2018	0.3dB
Active Loop Antenna	EMCO	6502	9202-2717	21-Aug-2017	20-Aug-2018	1.5dB
Coaxial Cable	n/a	8D-FB	HA2-10MSITE-01	24-Aug-2017	23-Aug-2018	0.92dB
Microflex Cable	HUBER SUHNER	SUCOFLEX 104	MY3368/2	23-May-2017	22-May-2018	0.46dB
Microflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3367/2	24-May-2017	23-May-2018	0.46dB
Coaxial Cable	n/a	RG 223/U	HA2-CE-01	24-Aug-2017	23-Aug-2018	0.46dB

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

1.3 Auxiliary Equipments

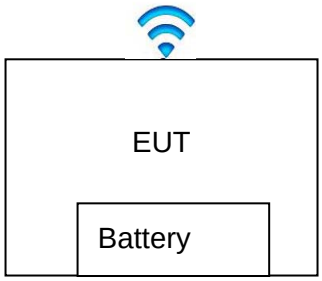
1.3.1. Provided by HongAn Technology Co., Ltd. for Test.

N/A

1.3.2. Provided by the Manufacturer

N/A

1.4 EUT SETUP



Note: Main Test Sample: GKB635W

1.5 Identifying the Final Test Mode

1. Mode 1: TX mode CH 00.
2. Mode 2: TX mode CH 39.
3. Mode 3: TX mode CH 78.

Note:

1. After pre-test, we identified that the TX mode was most likely to cause maximum disturbance and most likely to be susceptible to disturbance. Therefore, the Final Assessment was performed for the worst case.
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 (2441 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 15.249 under the FCC Rules Part 15 Subpart C.

1.6 Final Test Mode

Conducted Emission: N/A.

Field Strength: Mode 1 All Mode.

Radiated Emission (30~1000 MHz): Mode 1.

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

1.7 Condition of Power Supply

DC 3 V, AA battery*2.

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
Address of Test Facility	:	No. 15-1, Cweishuh Keng, Cweipin Village, Linkou, 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 Device uses two AA battery as its power source.

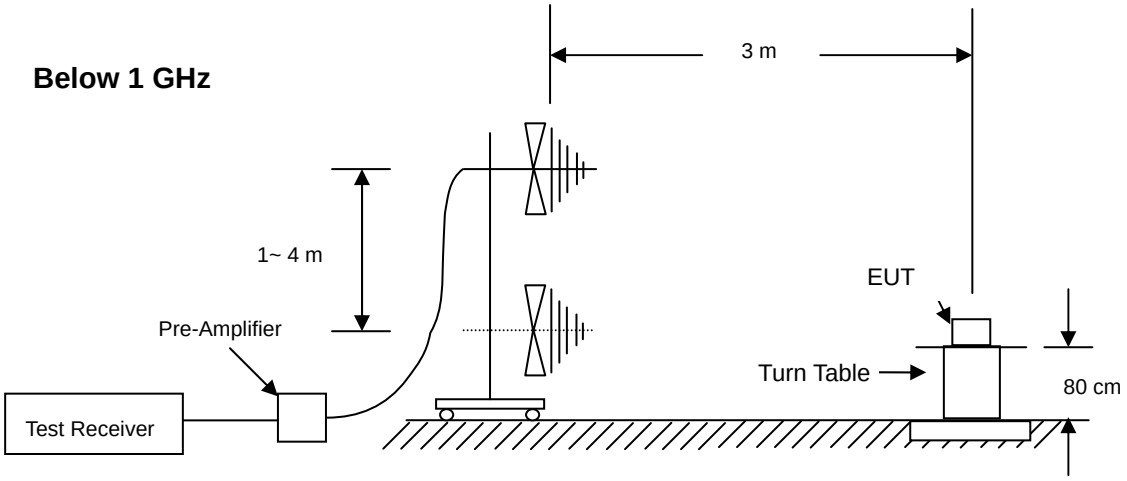
3 Radiated Emission Test

3.1 Test Instruments

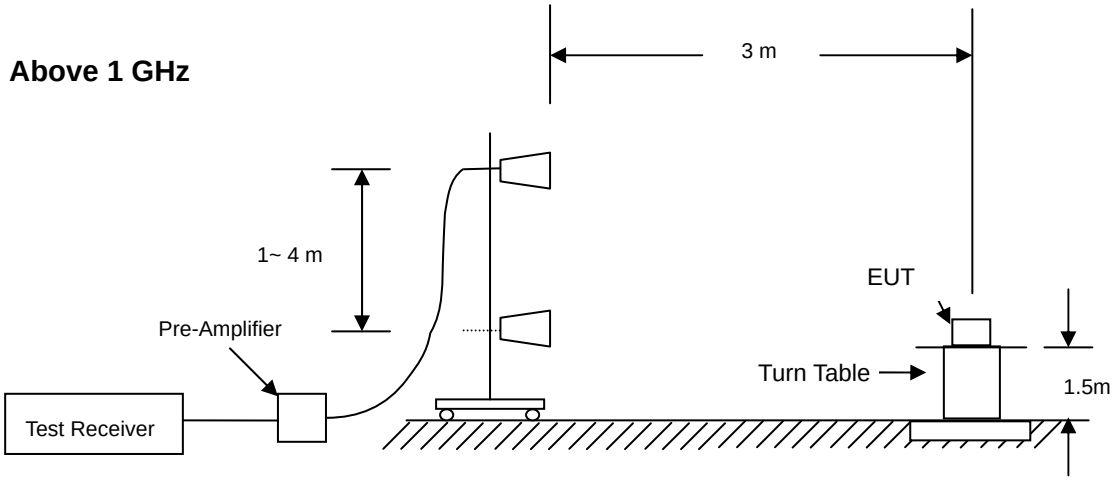
Refer to Sec. 1.2 Test Instruments.

3.2 Test Arrangement and Procedure

Below 1 GHz



Above 1 GHz



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 (microvolts/ meter)	Field strength of harmonics (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 (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.

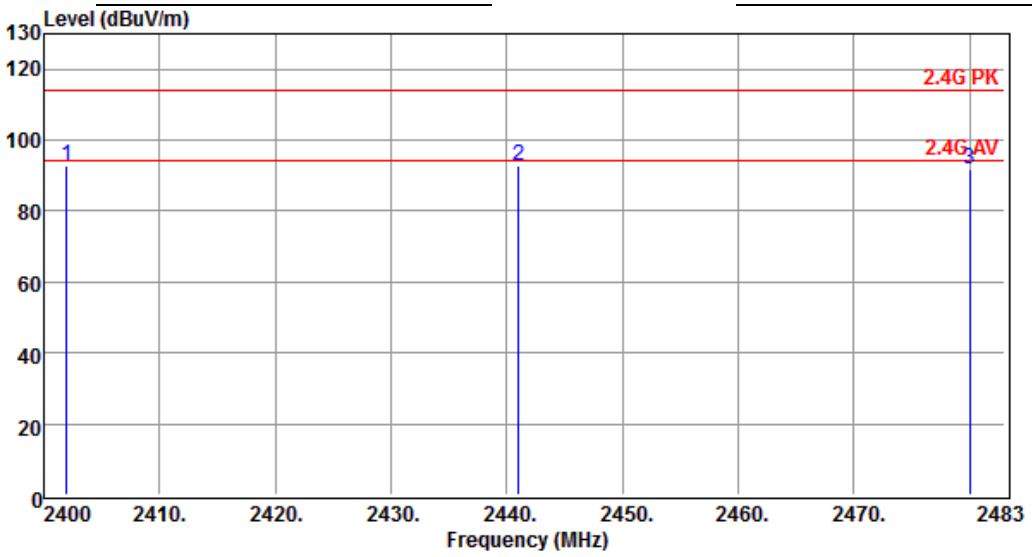
3.5 Test Result

Compliance

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

Radiated Emission Test Data (Field Strength of Fundamental)

Temperature	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH00, 39, 78
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
2402.000	98.46	-5.85	92.61	94.00	-1.39			VERTICAL	Peak
2441.000	98.25	-5.69	92.56	94.00	-1.44			VERTICAL	Peak
2480.000	97.64	-5.58	92.06	94.00	-1.94			VERTICAL	Peak

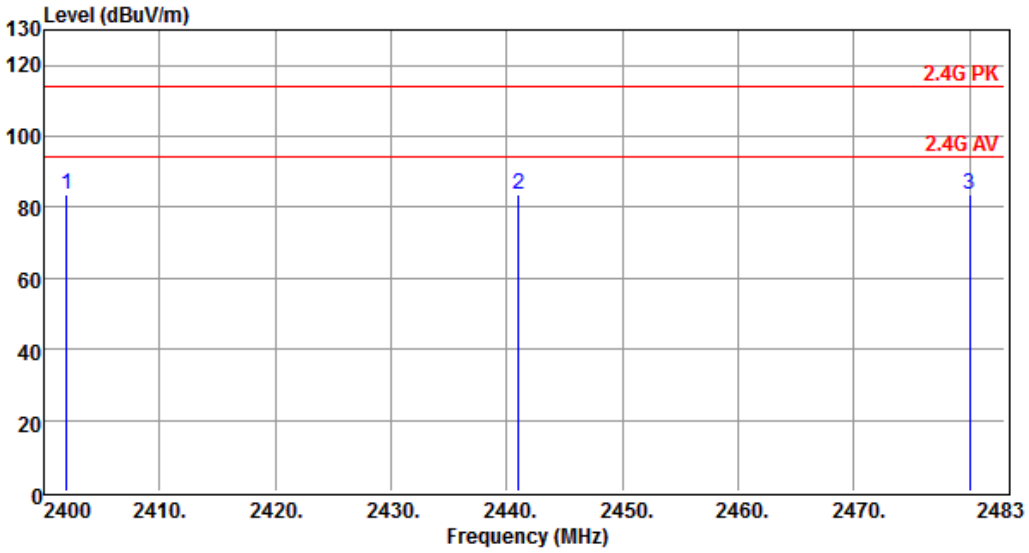
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH00, 39, 78
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
2402.000	89.61	-5.85	83.76	94.00	-10.24			HORIZONTAL	Peak
2441.000	89.36	-5.69	83.67	94.00	-10.33			HORIZONTAL	Peak
2480.000	89.01	-5.58	83.43	94.00	-10.57			HORIZONTAL	Peak

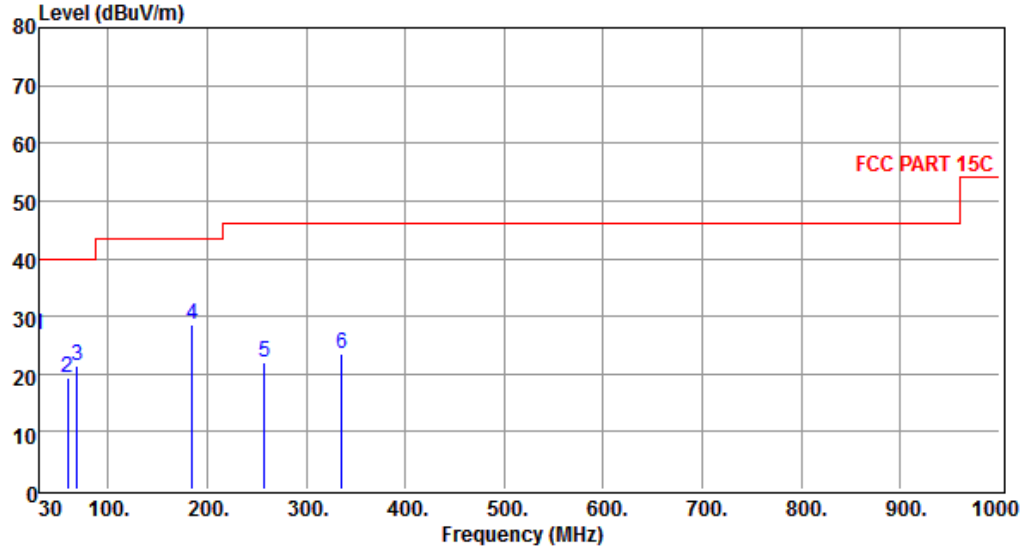
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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 (Below 1 GHz)

Temperature	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH00
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
30.000	30.94	-4.12	26.82	40.00	-13.18	---	---	VERTICAL	Peak
59.100	36.23	-16.85	19.38	40.00	-20.62	---	---	VERTICAL	Peak
68.800	38.31	-16.75	21.56	40.00	-18.44	---	---	VERTICAL	Peak
185.200	42.32	-13.73	28.59	43.50	-14.91	---	---	VERTICAL	Peak
257.950	30.50	-8.55	21.95	46.00	-24.05	---	---	VERTICAL	Peak
335.550	31.74	-8.11	23.63	46.00	-22.37	---	---	VERTICAL	Peak

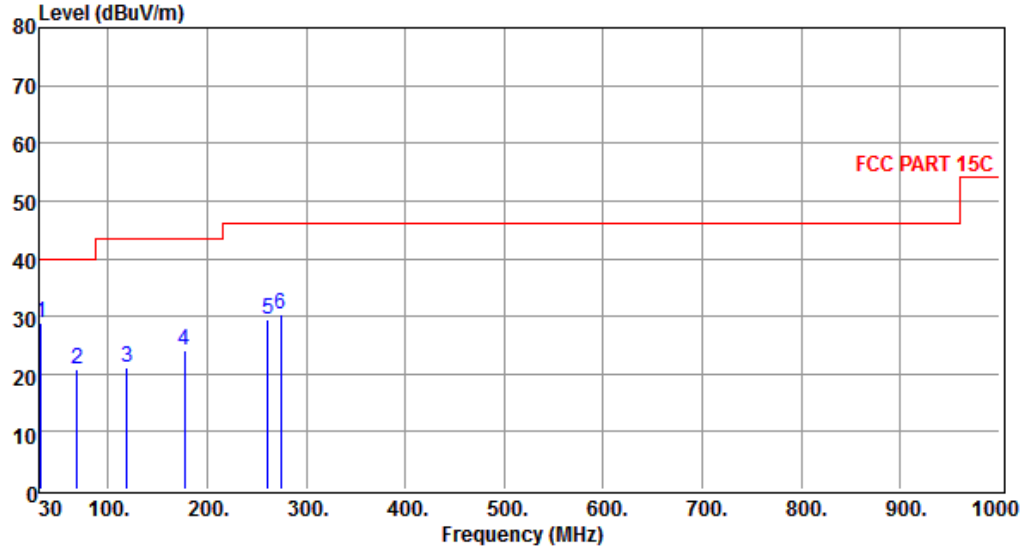
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH00
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
31.940	34.08	-5.22	28.86	40.00	-11.14	---	---	HORIZONTAL	Peak
68.800	37.57	-16.75	20.82	40.00	-19.18	---	---	HORIZONTAL	Peak
119.240	32.64	-11.44	21.20	43.50	-22.30	---	---	HORIZONTAL	Peak
177.440	37.52	-13.49	24.03	43.50	-19.47	---	---	HORIZONTAL	Peak
260.860	37.87	-8.36	29.51	46.00	-16.49	---	---	HORIZONTAL	Peak
274.440	39.68	-9.39	30.29	46.00	-15.71	---	---	HORIZONTAL	Peak

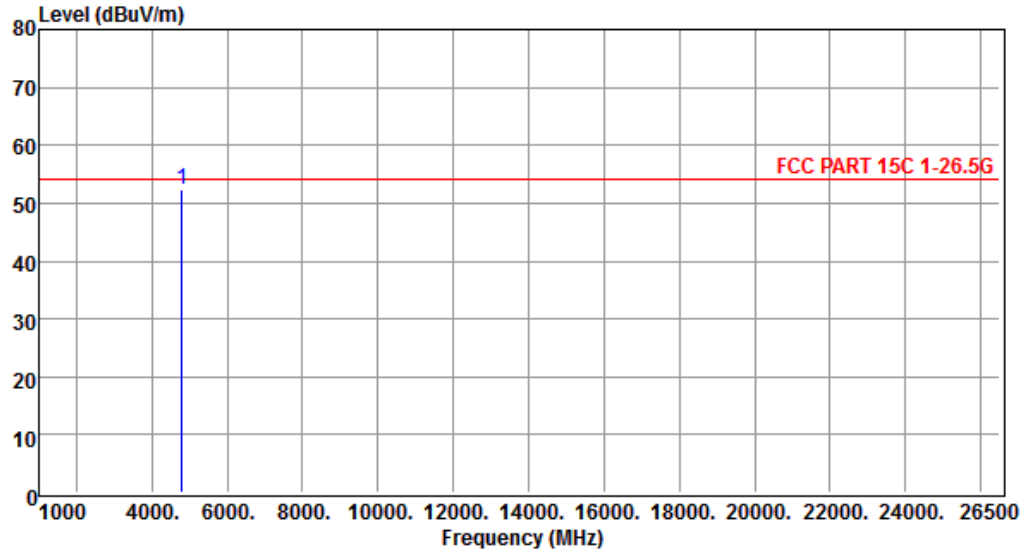
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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 (Above and Field Strength to 10th Harmonic)

Temperature	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH00
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
4804.000	49.60	2.77	52.37	54.00	-1.63			VERTICAL	Peak

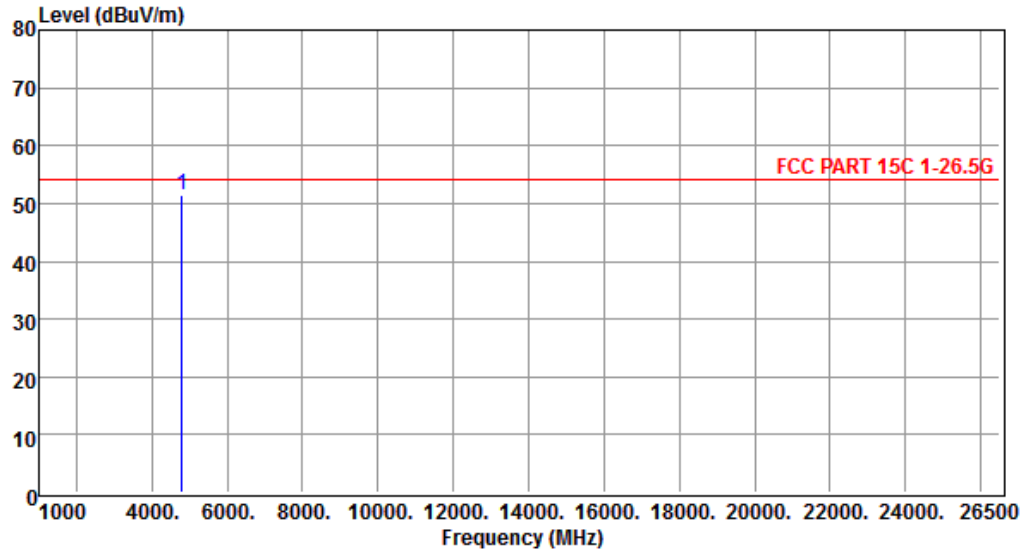
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH00
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
4804.000	48.61	2.77	51.38	54.00	-2.62			HORIZONTAL	Peak

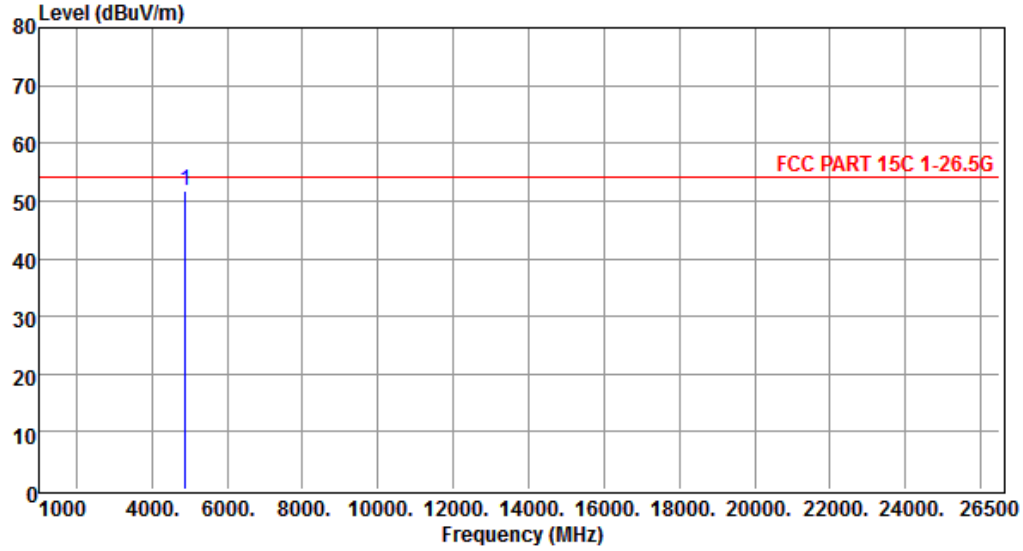
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH39
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
4882.000	48.88	2.94	51.82	54.00	-2.18			VERTICAL	Peak

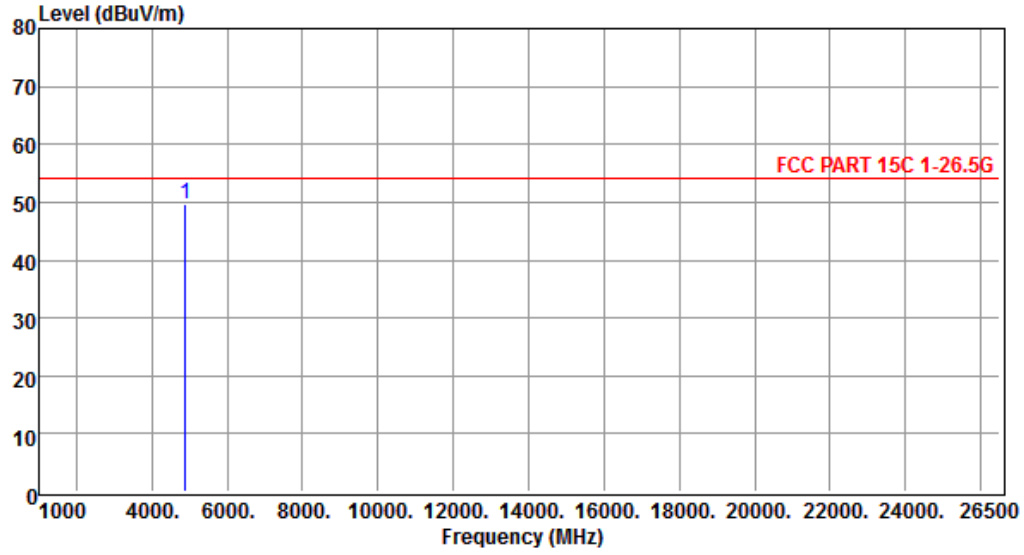
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH39
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
4882.000	46.61	2.94	49.55	54.00	-4.45			HORIZONTAL	Peak

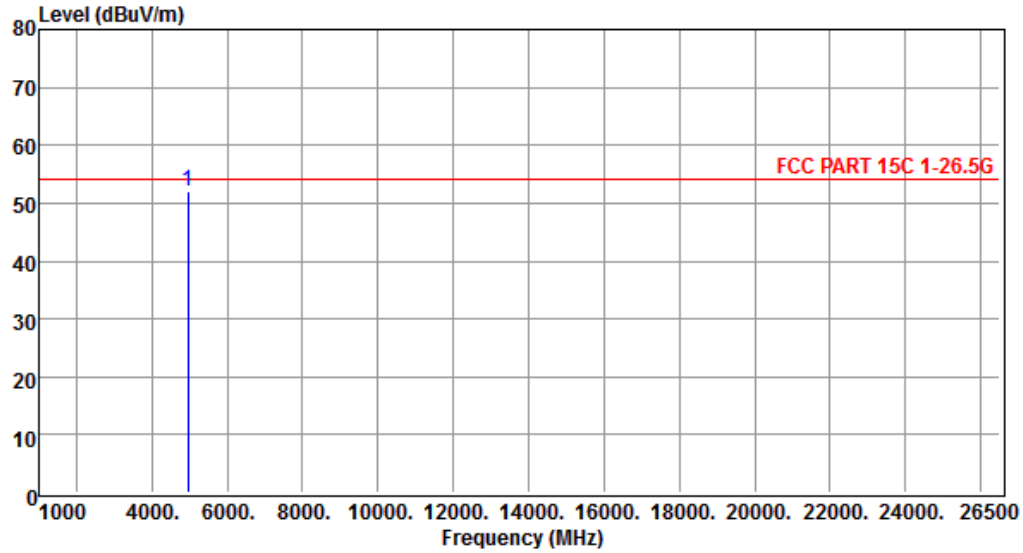
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH78
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
4960.000	49.02	3.15	52.17	54.00	-1.83			VERTICAL	Peak

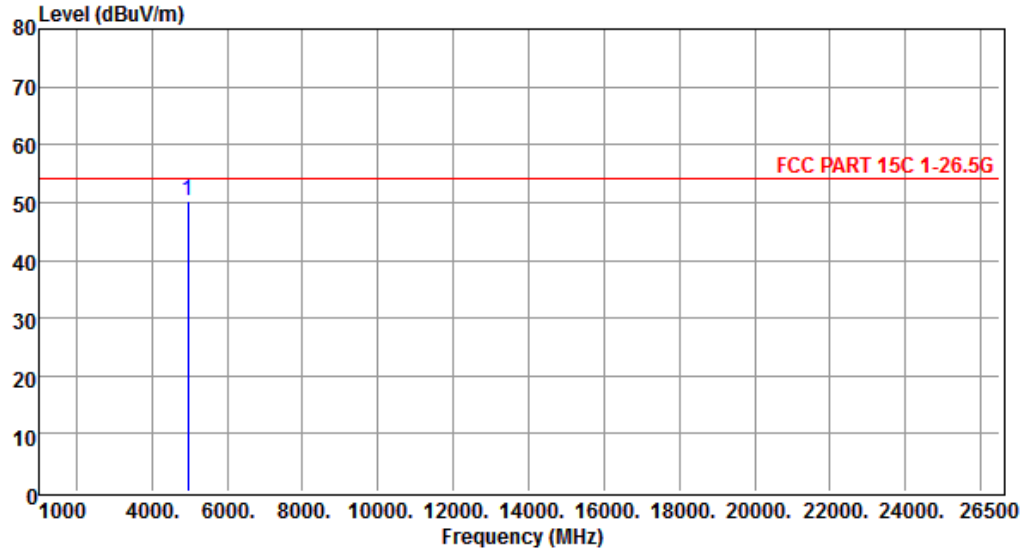
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH78
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
4960.000	47.20	3.15	50.35	54.00	-3.65			HORIZONTAL	Peak

Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.

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.

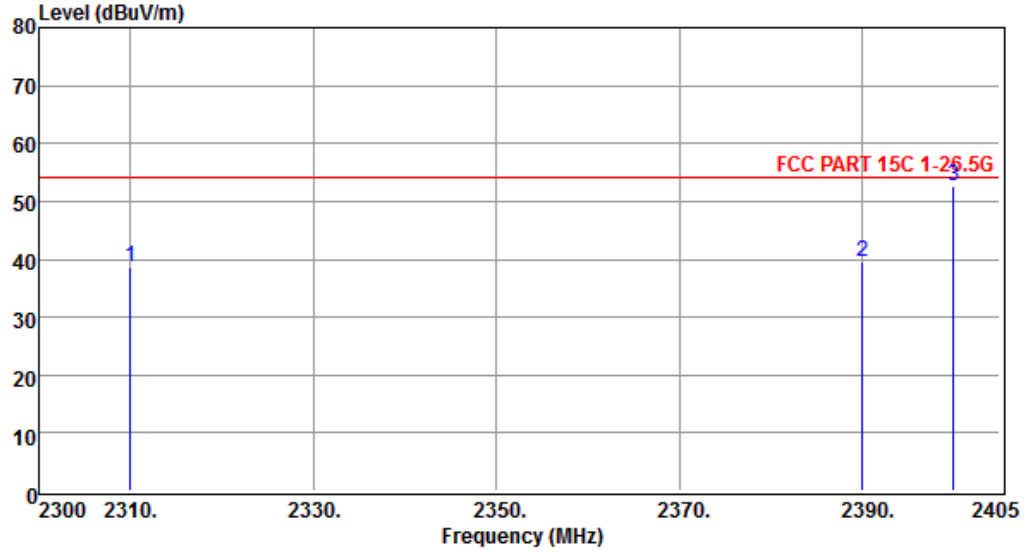
4.4 Test Result

Compliance

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

Band-Edge Test Data (Lower Edge)

Temperature	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH00
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
2310.000	44.68	-6.13	38.55	54.00	-15.45			VERTICAL	Peak
2390.000	45.29	-5.85	39.44	54.00	-14.56			VERTICAL	Peak
2400.000	58.44	-5.85	52.59	54.00	-1.41			VERTICAL	Peak

Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

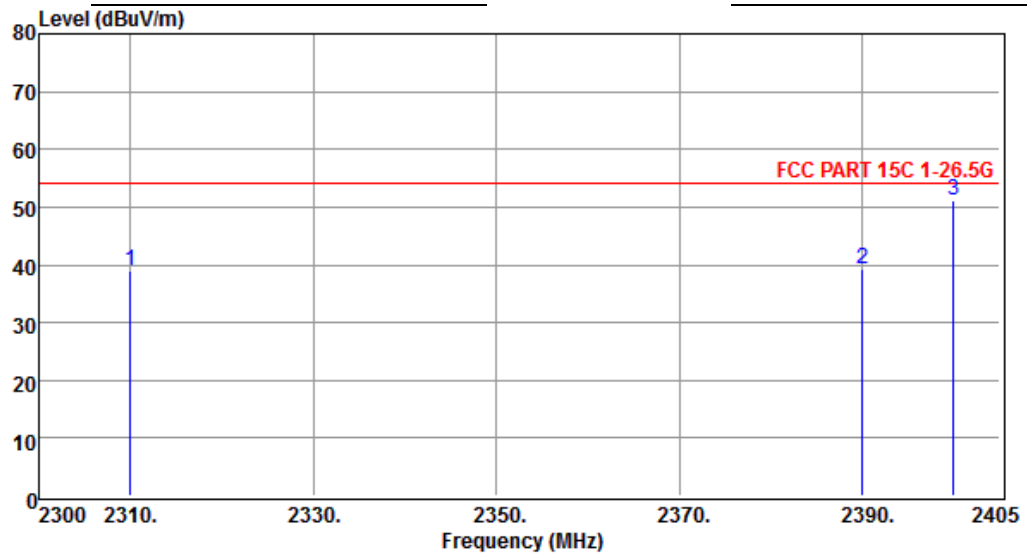
Remark：

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH00
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
2310.000	45.21	-6.13	39.08	54.00	-14.92			HORIZONTAL	Peak
2390.000	44.96	-5.85	39.11	54.00	-14.89			HORIZONTAL	Peak
2400.000	56.95	-5.85	51.10	54.00	-2.90			HORIZONTAL	Peak

Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

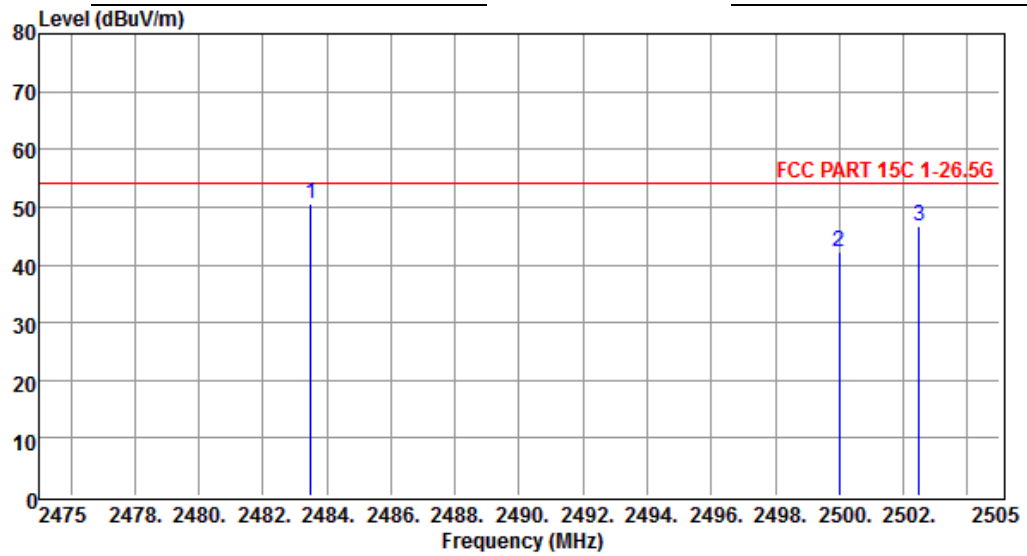
Remark：

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Vertical	Channel	:	CH78
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
2483.500	56.18	-5.58	50.60	54.00	-3.40			VERTICAL	Peak
2500.000	47.81	-5.53	42.28	54.00	-11.72			VERTICAL	Peak
2502.480	52.13	-5.53	46.60	54.00	-7.40			VERTICAL	Peak

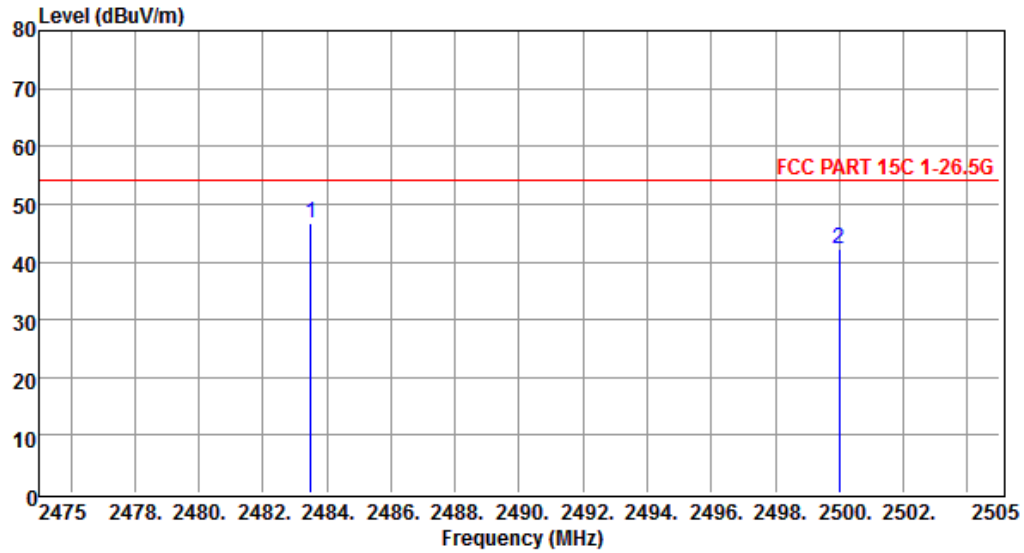
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Polarization	:	Horizontal	Channel	:	CH78
EUT Position	:	X axis			



Freq	Reading	C.F	Result	Limit	Margin	A/H	T/P	Polarity	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg		
2483.500	52.14	-5.58	46.56	54.00	-7.44			HORIZONTAL	Peak
2500.000	47.83	-5.53	42.30	54.00	-11.70			HORIZONTAL	Peak

Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

Remark：

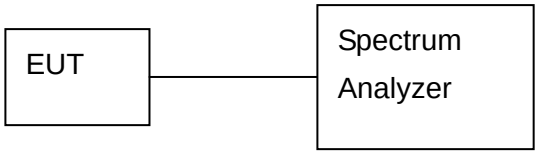
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already 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

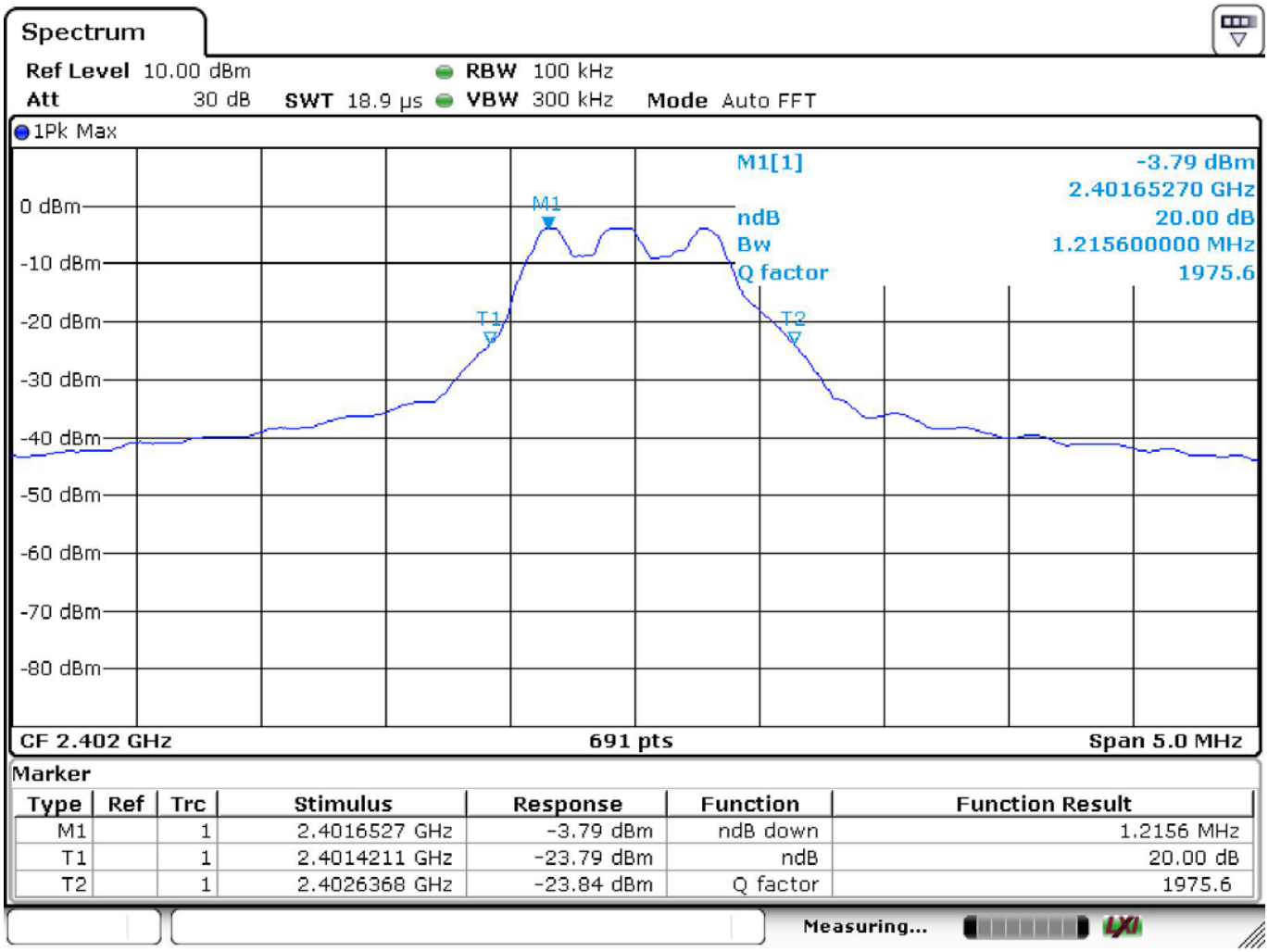
None; For report purpose only.

5.4 Test Result

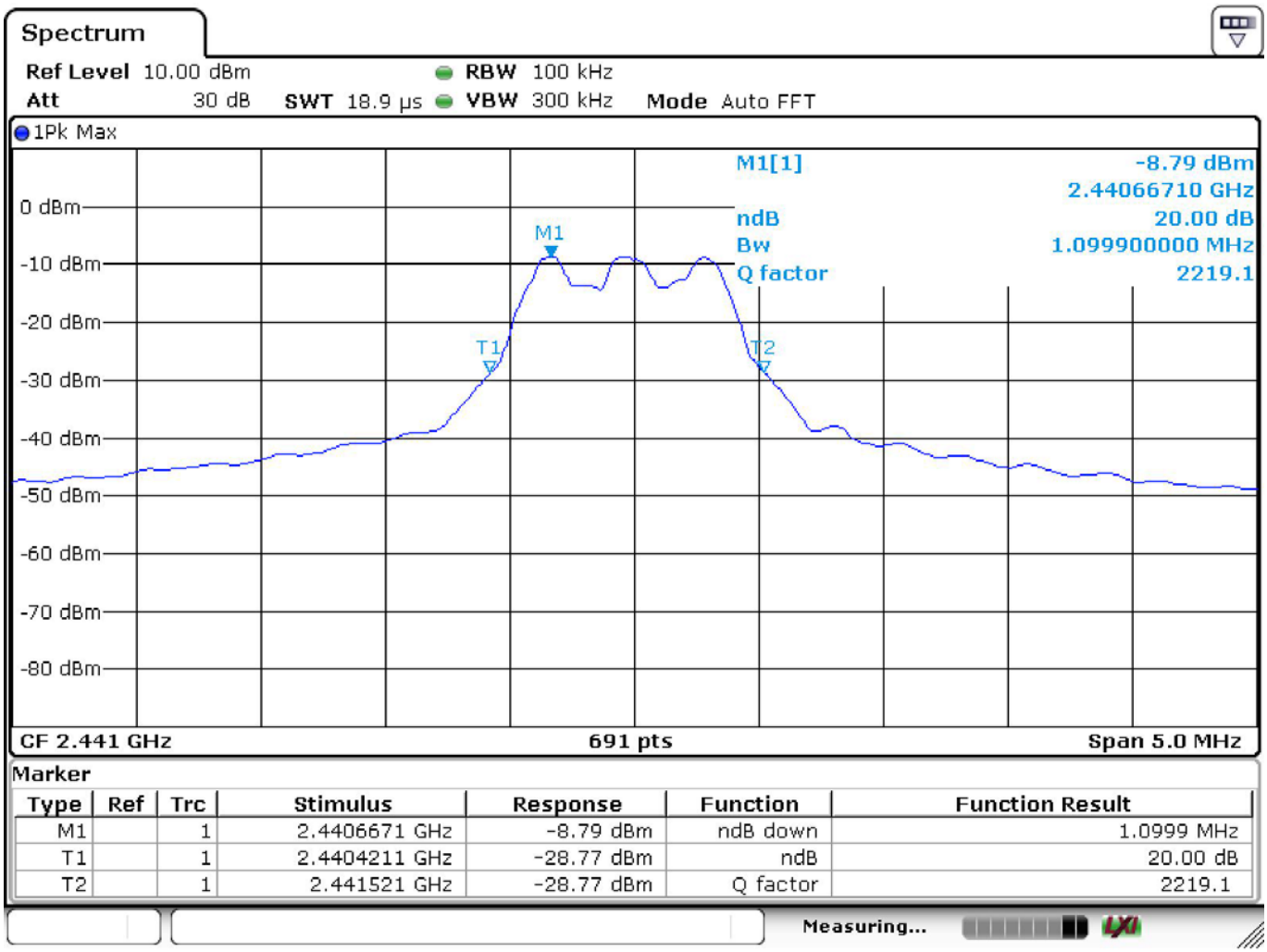
No non-compliance noted.

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

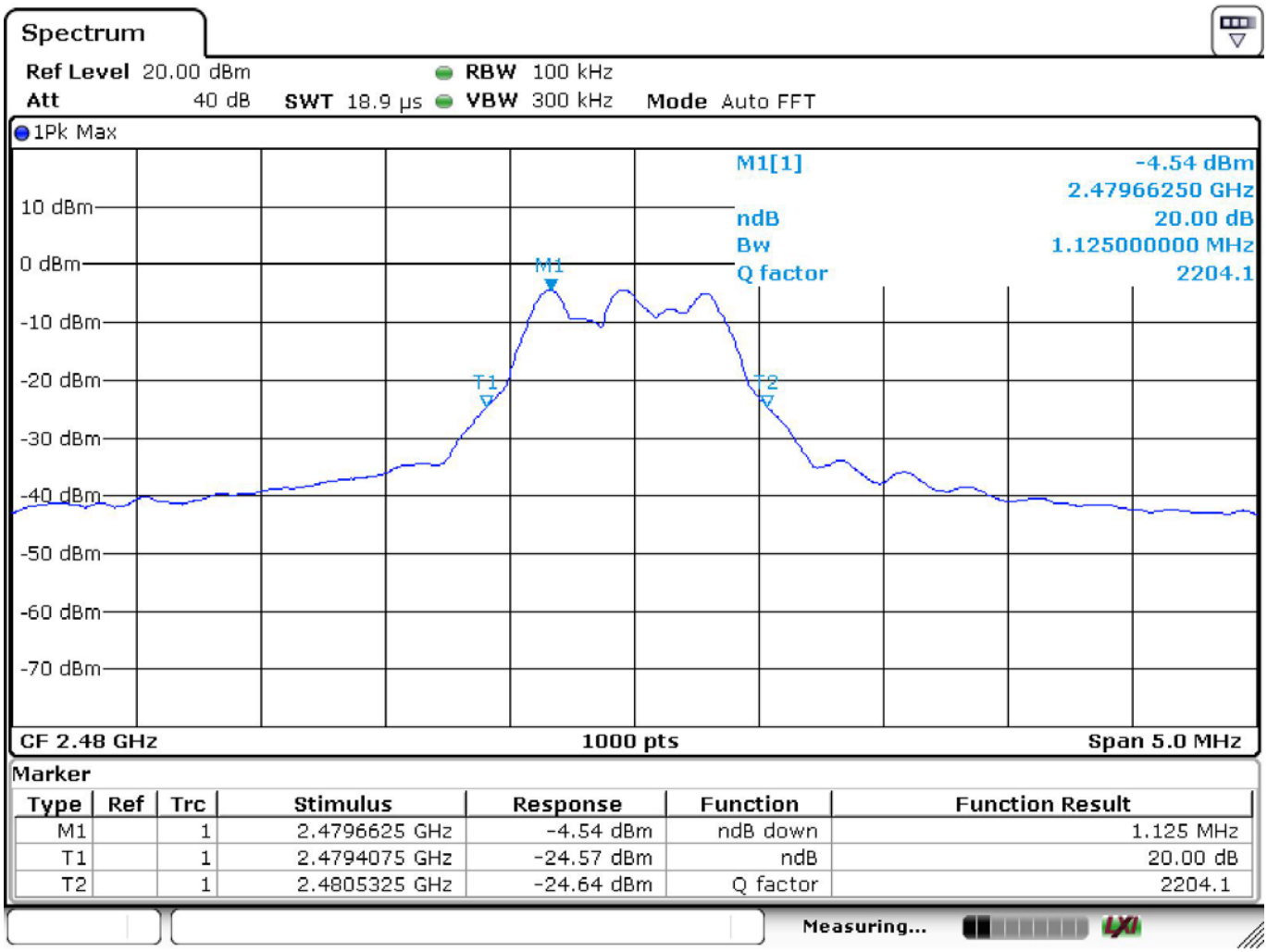
Temperature	:	24.3℃	Humidity	:	43%
Test Date	:	28-Nov-2017	Tested by	:	Eason Hsieh
Test Mode	:	TX mode	Channel	:	00



Test Mode : TX mode Channel : 39



Test Mode : TX mode Channel : 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 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 a PCB antenna.

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