Test Report

Applicant：	Apogee Inc.
Address of Applicant：	1405 Pioneer Street Brea, CA 92821-1405 United States
Equipment Under Test：	Bluetooth Keyboard
Model Number：	K166-1102
Series：	BT-7301B, K166-1141-SP, K166-1146-GR, K166-1145-FR, K166-1144-SW

Matrix Test Laboratory
2F, No.146, Jian Yi Rd., Chung-Ho District,
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Contents

Test Result Certification

Applicant	:	Apogee Inc.
Address of Applicant	:	1405 Pioneer Street Brea, CA 92821-1405 United States
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	:	Kanex / LEXKING
Equipment Under Test	:	Bluetooth Keyboard
Model Number	:	K166-1102
Product Series	:	BT-7301B, K166-1141-SP, K166-1146-GR, K166-1145-FR, K166-1144-SW
FCC ID	:	PYWK1661102
Filing Type	:	Certification
Sample Received Date	:	28-October-2016
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 Matrix Test Laboratory
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.

Documented by: Kay Wang 2016-11-17

Kay Wang/ ADM. Dept Staff

Tested by: Eason Hsieh 2016-11-03

Eason Hsieh / ENG. Dept. Staff

Approved by: Peter Chin **Date:** 2016-11-18

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	**:**	Bluetooth Keyboard
Model Number of EUT	**:**	K166-1102
Product Series	**:**	BT-7301B, K166-1141-SP, K166-1146-GR, K166-1145-FR, K166-1144-SW
Power Supply	**:**	Lithium Battery DC 3.7 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: 1.87 dBi*
Modulation Technique	**:**	Bluetooth 3.0 FHSS Bluetooth : GFSK
Transmit Data Rate	**:**	Bluetooth : 1Mbps
Specification	**:**	**Dimensions :** 44 cm (L) X 12 cm (W) X 2 cm (H)

		Weight : 420 g **Intended Function :** The EUT is a Bluetooth interface connected keyboard. **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. Matrix 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
RF Amplifier	Schaffner	CPA9231A	0405	01-JUN-2016	31-MAY-2017
EMI Receiver	R&S	ESCI	100931	25-JUL-2016	24-JUL-2017
Spectrum Analyzer	R&S	FSV	101629	27-JAN-2016	26-JAN-2017
Preamplifier	HD	HD17187	004	01-JUN-2016	31-MAY-2017
Bilog Antenna	TESEQ	CBL6111D	38521	04-JUN-2016	03-JUN-2017
Double-Ridged Waveguide Horn	EMCO	3115	9912-5992	01-JUN-2016	31-MAY-2017
Horn Antenna (18-40GHz)	Com -Power	AH-840	101042	02-JUN-2016	01-JUN-2017
Microwave Preamplifier	Com -Power	PAM-840	461269	04-JUN-2016	03-JUN-2017
LOOP Antenna	EMCO	6512	00035867	01-OCT-2016	30-SEP-2017
Spectrum Analyzer	Rohde & Schwarz	FSP40	13054416-001	07-OCT-2016	06-OCT-2017
Temperature Chamber	MALLIER	MCT-2X-M	13490413-001	15-DEC-2016	14-DEC-2017

※ 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 Matrix Test Laboratory for Emission Test.

N/A

1.3.2. Provided by the Manufacturer

N/A

1.4 EUT SETUP

Note: Main Test Sample: K166-1102

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.

Note:

1. After pre-test, we identified that the TX (Packet type DH5 and X axis) 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.
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: All Mode.

Radiated Emission (30~1000 MHz): Mode 2.

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

1.7 Condition of Power Supply

DC 3.7 V, Lithium battery.

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
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 a Lithium battery as its power source. Further more, when charging the device's battery through USB connection, the device can not be operated.

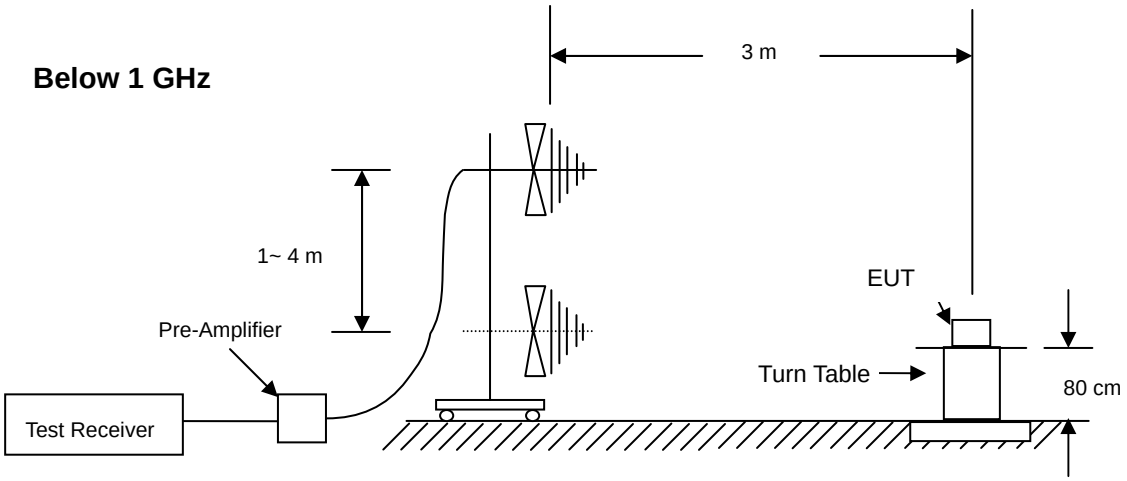
3 Radiated Emission Test

3.1 Test Instruments

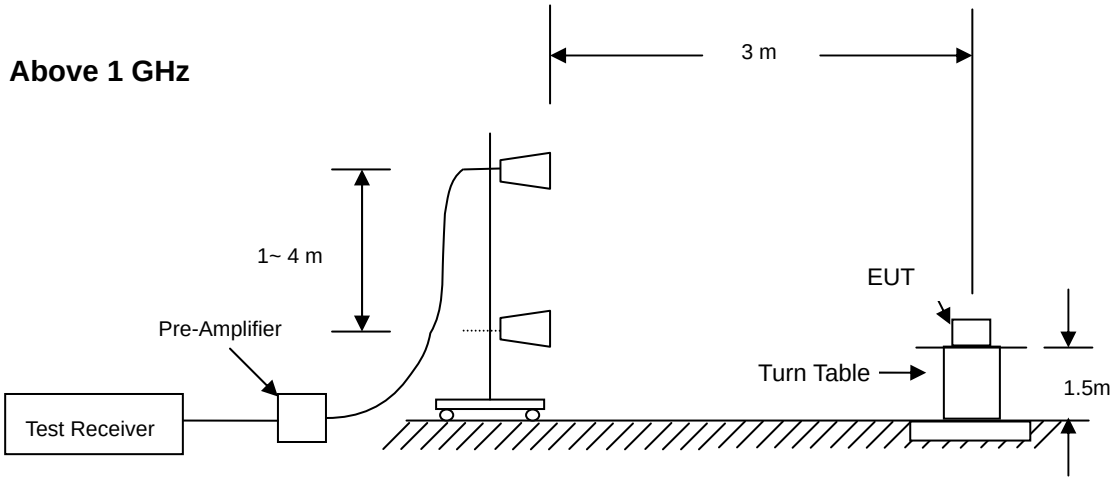
Refer to Sec. 1.2 Test Instruments.

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.

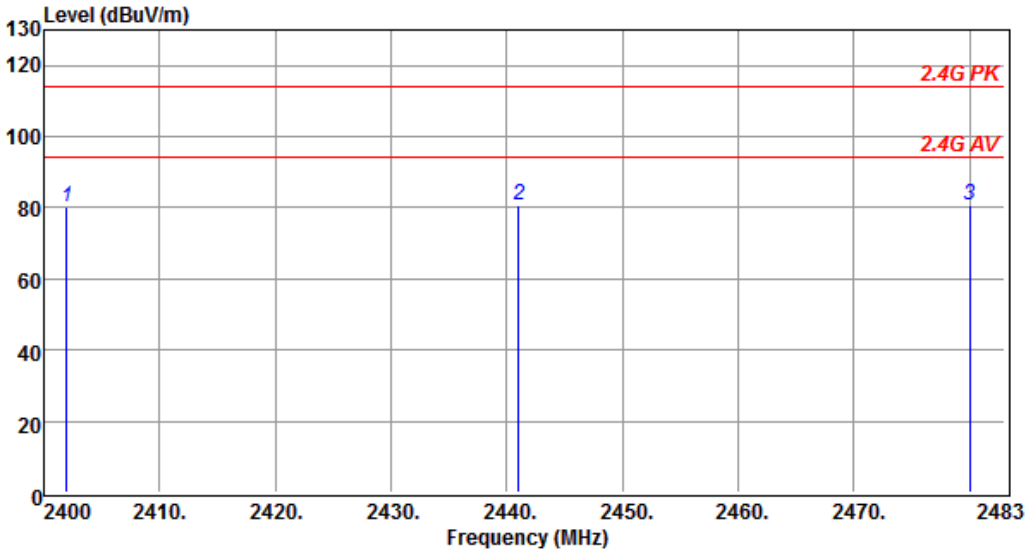
3.5 Test Result

Compliance

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

Radiated Emission Test Data (Field Strength of Fundamental)

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	87.84	-7.63	80.21	94.00	-13.79			VERTICAL	Peak
2441.000	88.44	-7.49	80.95	94.00	-13.05			VERTICAL	Peak
2480.000	88.12	-7.39	80.73	94.00	-13.27			VERTICAL	Peak

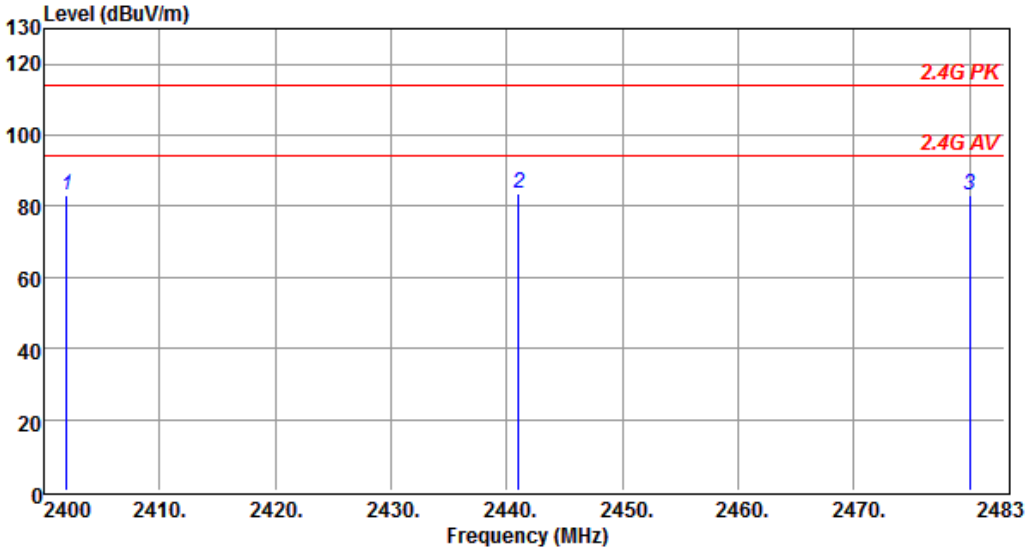
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	90.83	-7.63	83.20	94.00	-10.80			HORIZONTAL	Peak
2441.000	91.19	-7.49	83.70	94.00	-10.30			HORIZONTAL	Peak
2480.000	90.71	-7.39	83.32	94.00	-10.68			HORIZONTAL	Peak

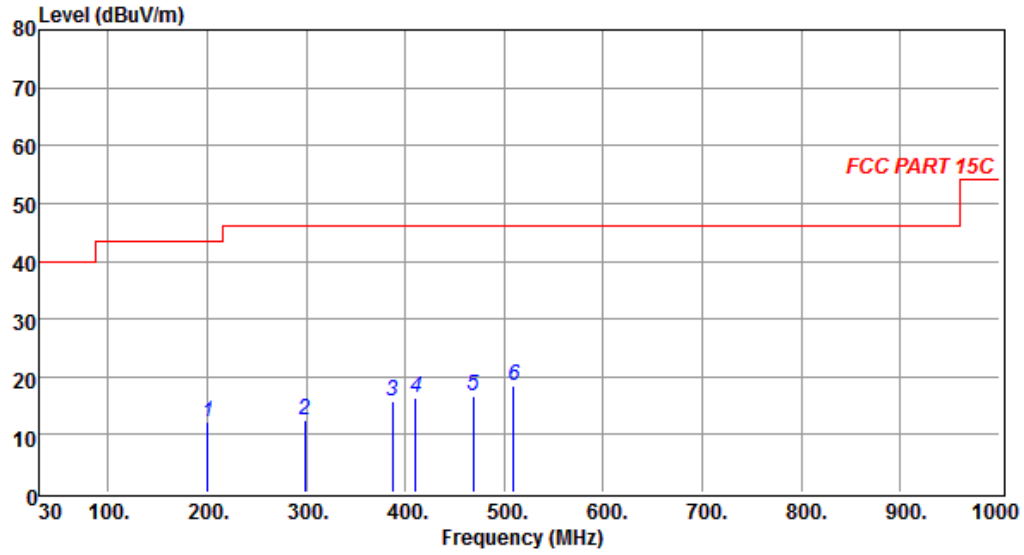
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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		
200.720	32.37	-20.13	12.24	43.50	-31.26	----------		VERTICAL	Peak
298.690	32.97	-20.57	12.40	46.00	-33.60	----------		VERTICAL	Peak
386.960	33.09	-17.32	15.77	46.00	-30.23	----------		VERTICAL	Peak
410.240	34.92	-18.53	16.39	46.00	-29.61	----------		VERTICAL	Peak
468.440	33.20	-16.65	16.55	46.00	-29.45	----------		VERTICAL	Peak
509.180	33.35	-14.94	18.41	46.00	-27.59	----------		VERTICAL	Peak

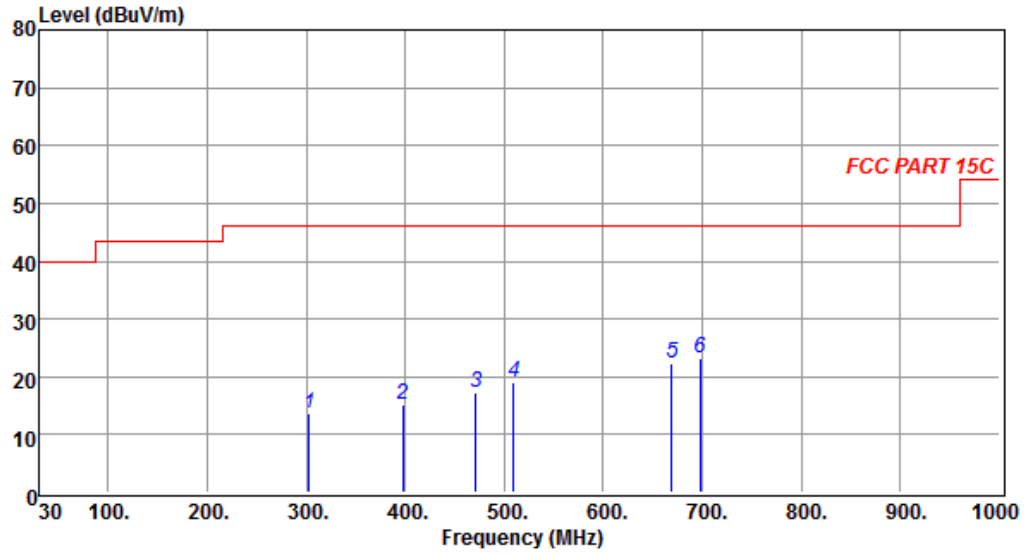
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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		
302.570	34.20	-20.38	13.82	46.00	-32.18			HORIZONTAL	Peak
397.630	32.36	-17.27	15.09	46.00	-30.91			HORIZONTAL	Peak
471.350	33.94	-16.62	17.32	46.00	-28.68			HORIZONTAL	Peak
509.180	33.89	-14.94	18.95	46.00	-27.05			HORIZONTAL	Peak
669.230	34.12	-11.95	22.17	46.00	-23.83			HORIZONTAL	Peak
697.360	34.66	-11.49	23.17	46.00	-22.83			HORIZONTAL	Peak

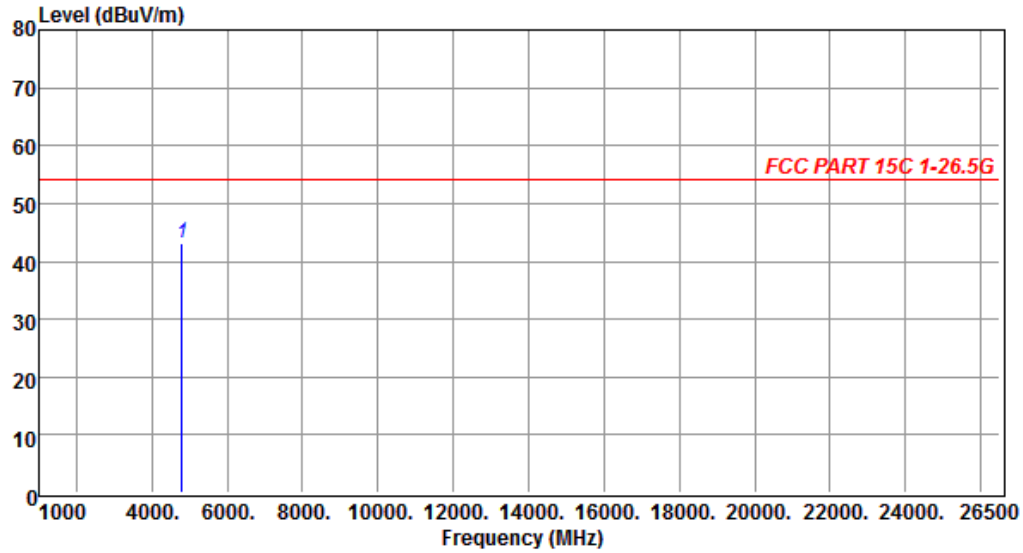
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	42.77	0.49	43.26	54.00	-10.74			VERTICAL	Peak

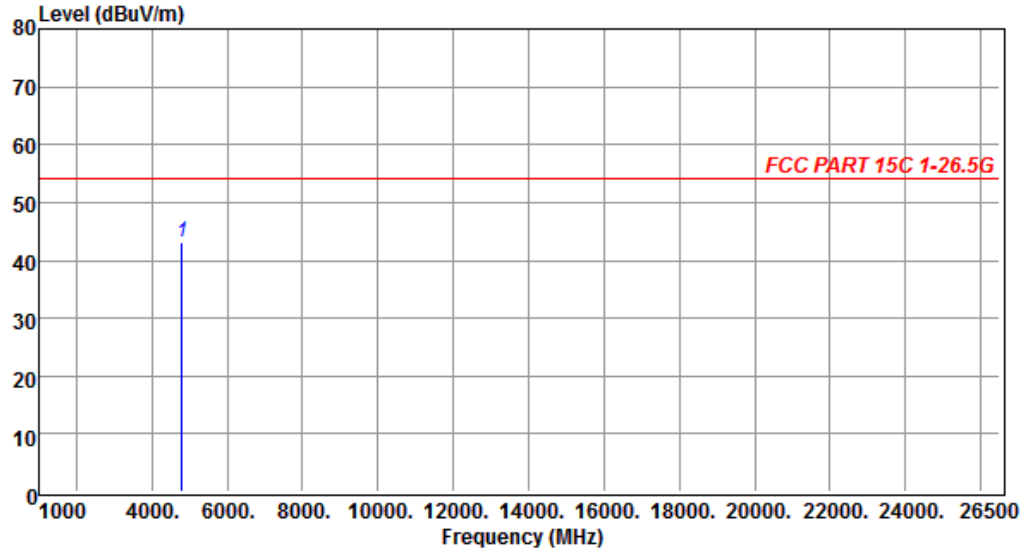
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO. Use Peak detector.

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

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	42.65	0.49	43.14	54.00	-10.86			HORIZONTAL	Peak

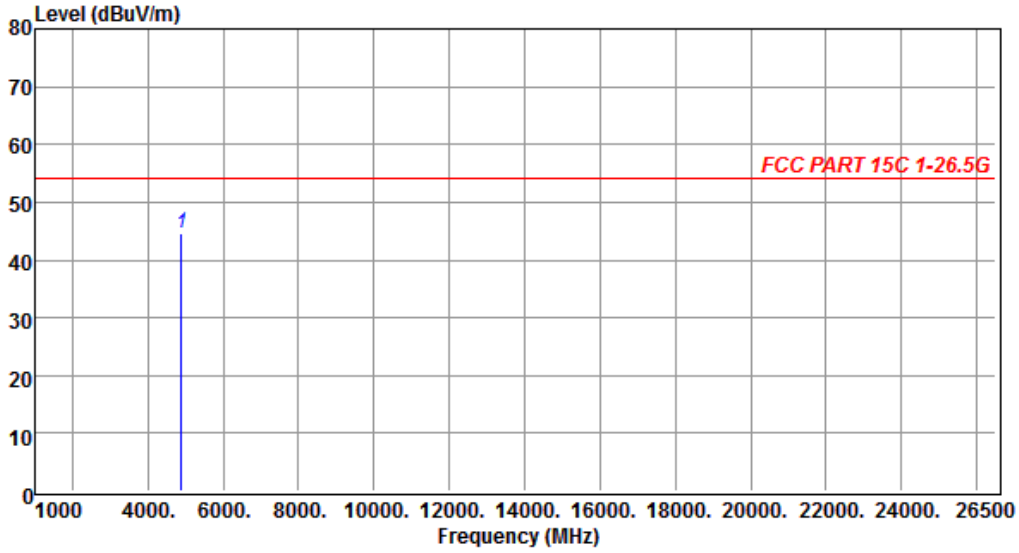
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO. Use Peak detector.

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

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	43.83	0.80	44.63	54.00	-9.37			VERTICAL	Peak

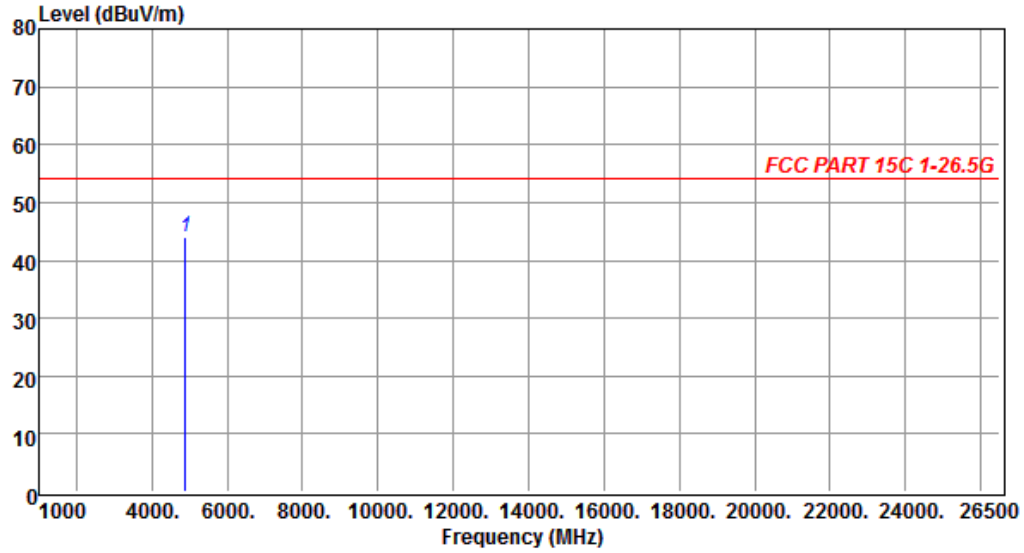
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO. Use Peak detector.

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

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	43.12	0.80	43.92	54.00	-10.08			HORIZONTAL	Peak

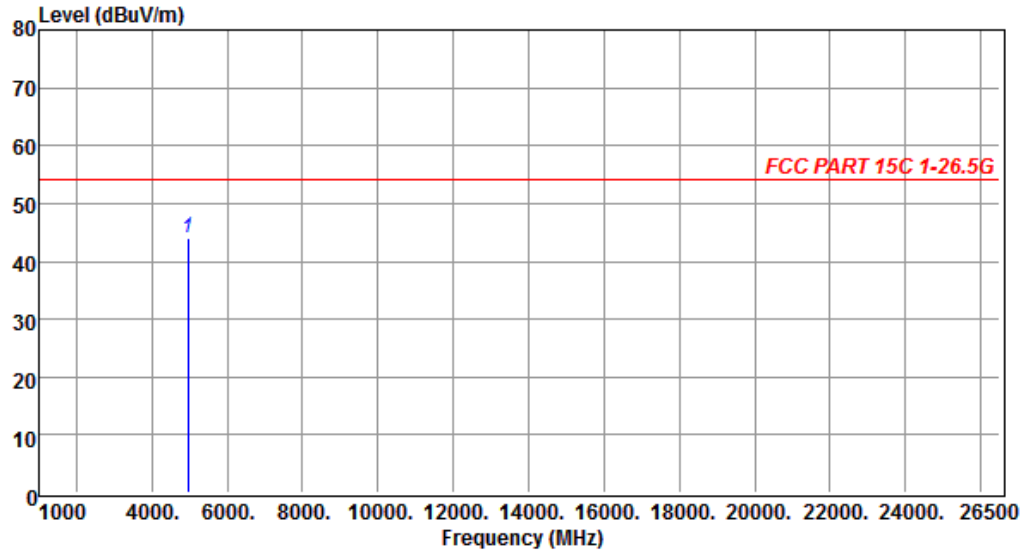
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO. Use Peak detector.

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

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	42.78	1.15	43.93	54.00	-10.07			VERTICAL	Peak

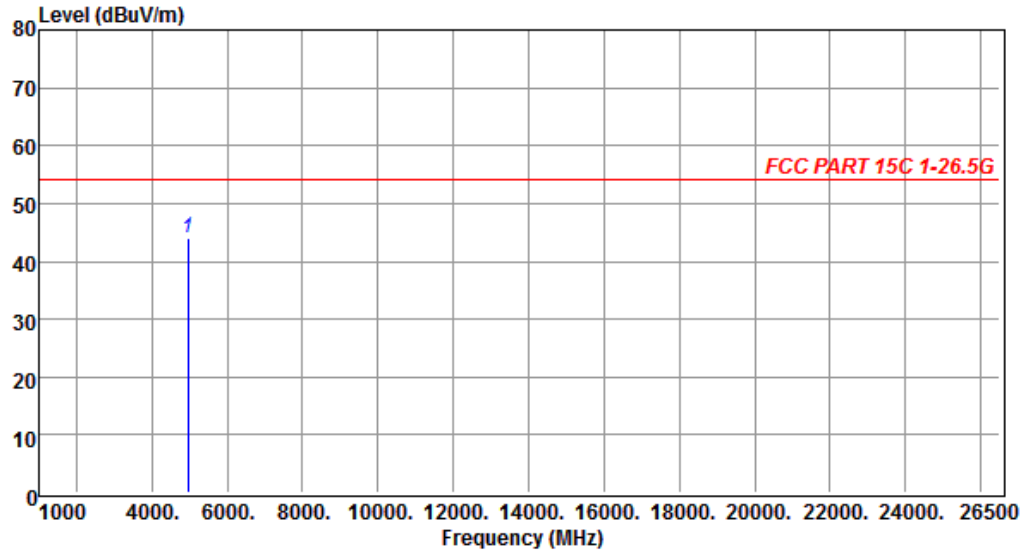
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO. Use Peak detector.

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

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	42.99	1.15	44.14	54.00	-9.86			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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO. Use Peak detector.

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.

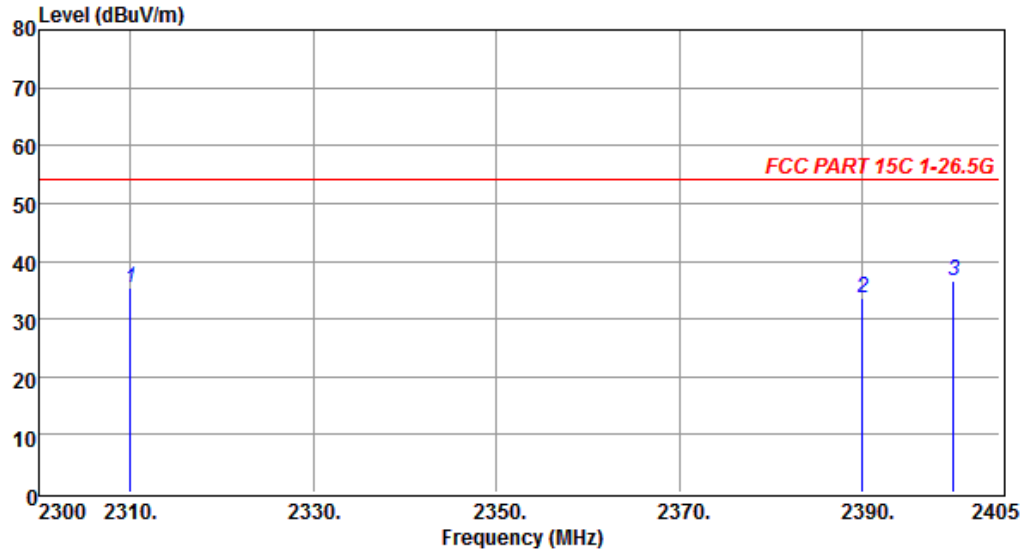
4.4 Test Result

Compliance

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

Band-Edge Test Data (Lower Edge)

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	43.22	-7.88	35.34	54.00	-18.66			VERTICAL	Peak
2390.000	41.20	-7.63	33.57	54.00	-20.43			VERTICAL	Peak
2399.960	44.23	-7.63	36.60	54.00	-17.40			VERTICAL	Peak

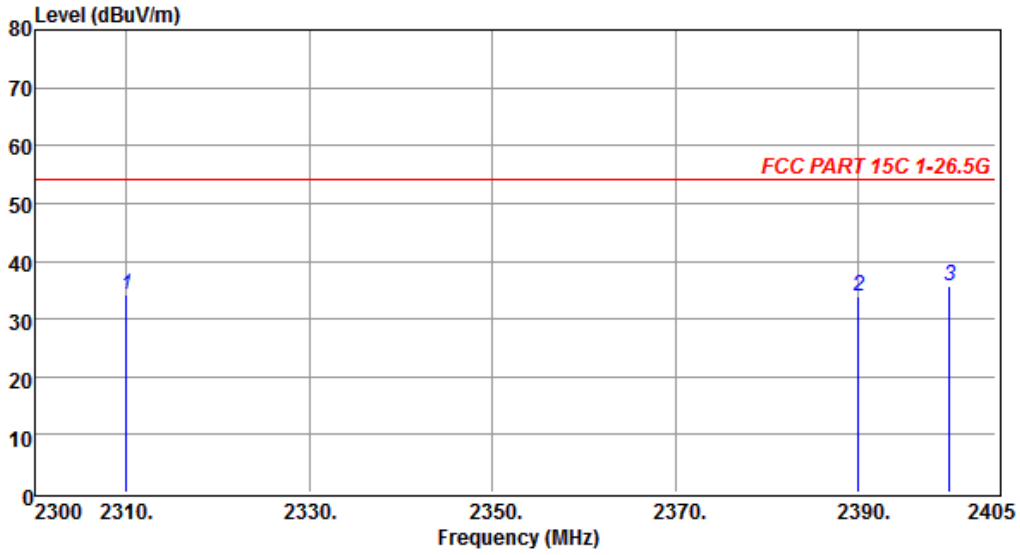
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO.

Band-Edge Test Data (Lower Edge)

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	42.23	-7.88	34.35	54.00	-19.65			HORIZONTAL	Peak
2390.000	41.59	-7.63	33.96	54.00	-20.04			HORIZONTAL	Peak
2400.000	43.25	-7.63	35.62	54.00	-18.38			HORIZONTAL	Peak

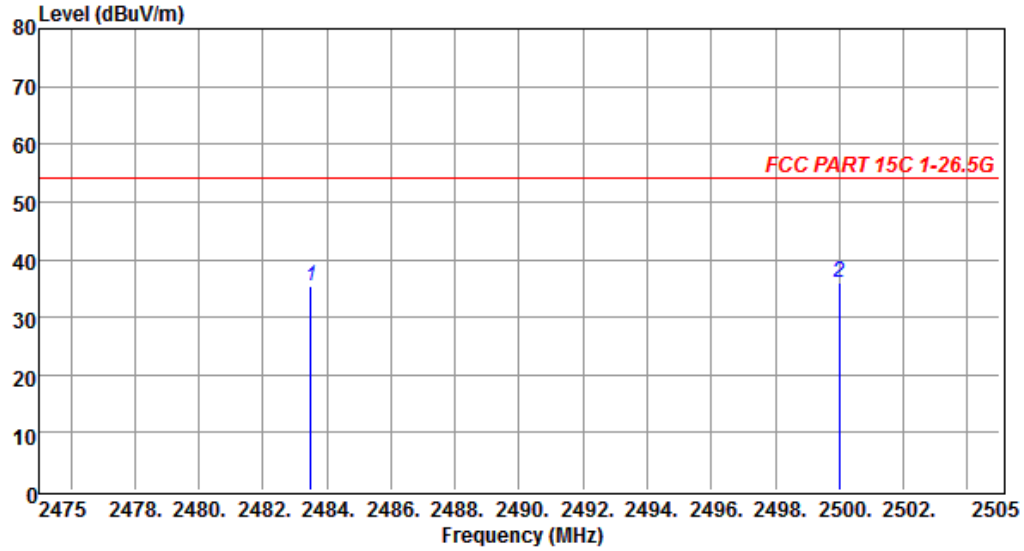
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO.

Band-Edge Test Data (Upper Edge)

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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		
2483.490	42.71	-7.39	35.32	54.00	-18.68			VERTICAL	Peak
2500.000	43.21	-7.33	35.88	54.00	-18.12			VERTICAL	Peak

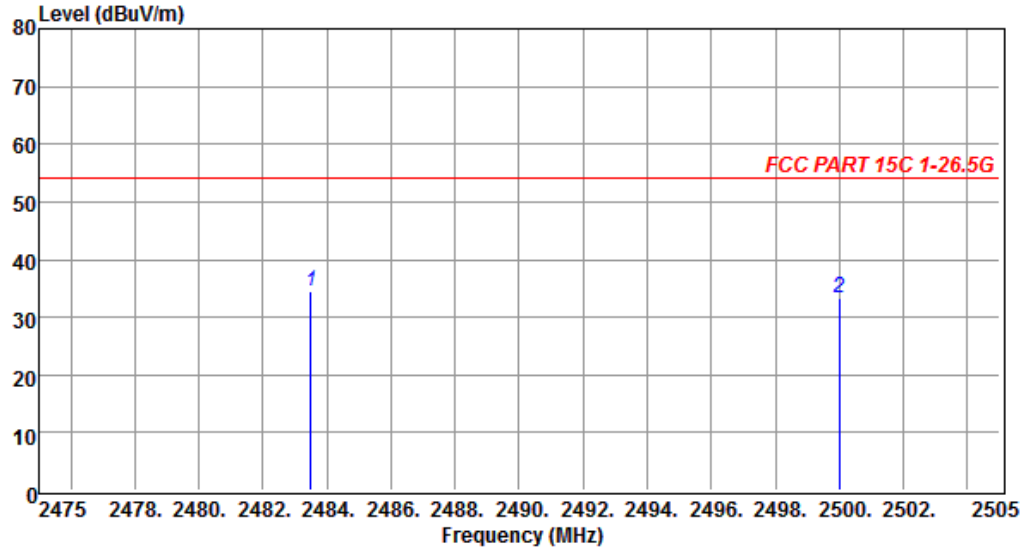
Note1: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Note2: Margin = Result - Limit

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.
   (b) Average Setting 1GHz to 10th harmonics of fundamental,: RBW = 1MHz, VBW = 10Hz, Sweep = AUTO.

Band-Edge Test Data (Upper Edge)

Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	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	41.79	-7.39	34.40	54.00	-19.60			HORIZONTAL	Peak
2500.000	40.49	-7.33	33.16	54.00	-20.84			HORIZONTAL	Peak

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

Remark：

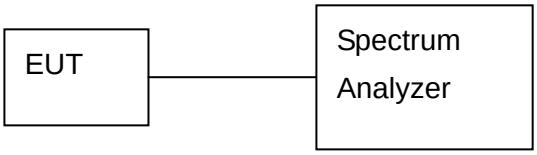
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already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

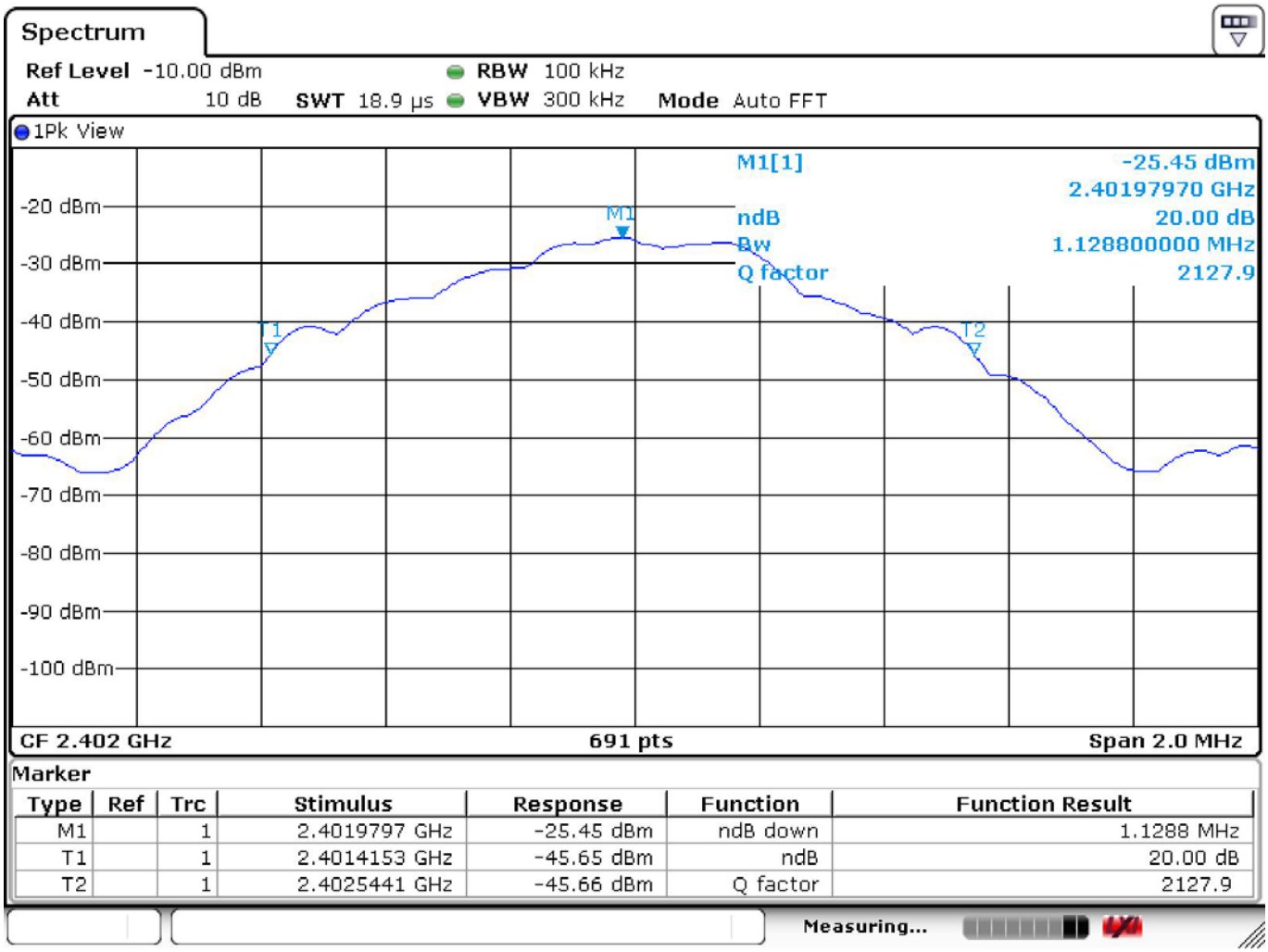
None; For report purpose only.

5.4 Test Result

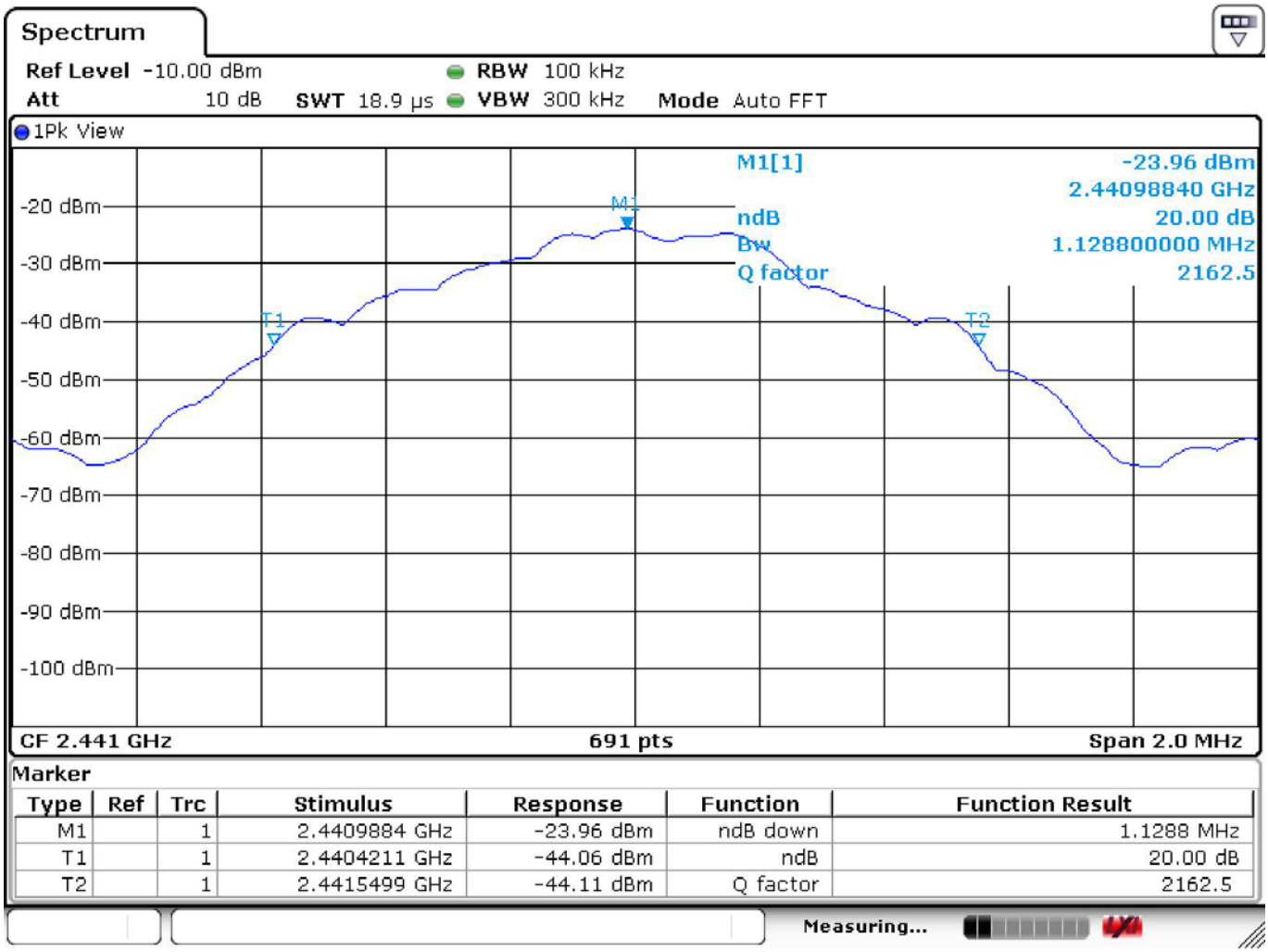
No non-compliance noted.

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

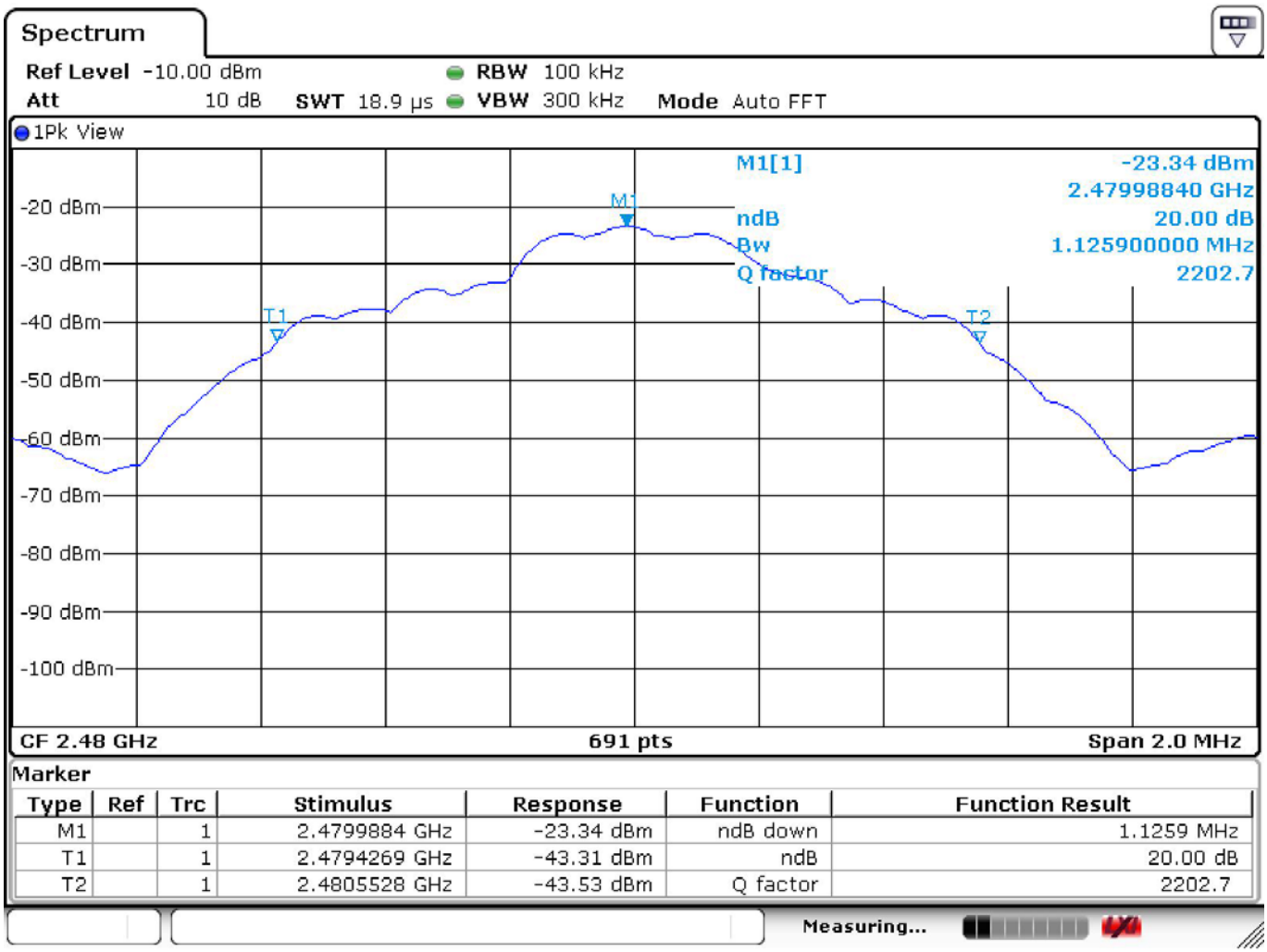
Temperature	:	27.4℃	Humidity	:	46%
Test Date	:	03-Nov-2016	Tested by	:	Eason Hsieh
Test Mode	:	BT (1 Mbps) DH5	Channel	:	00



Test Mode : BT (1 Mbps) DH5 Channel : 39



Test Mode : BT (1 Mbps) DH5 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

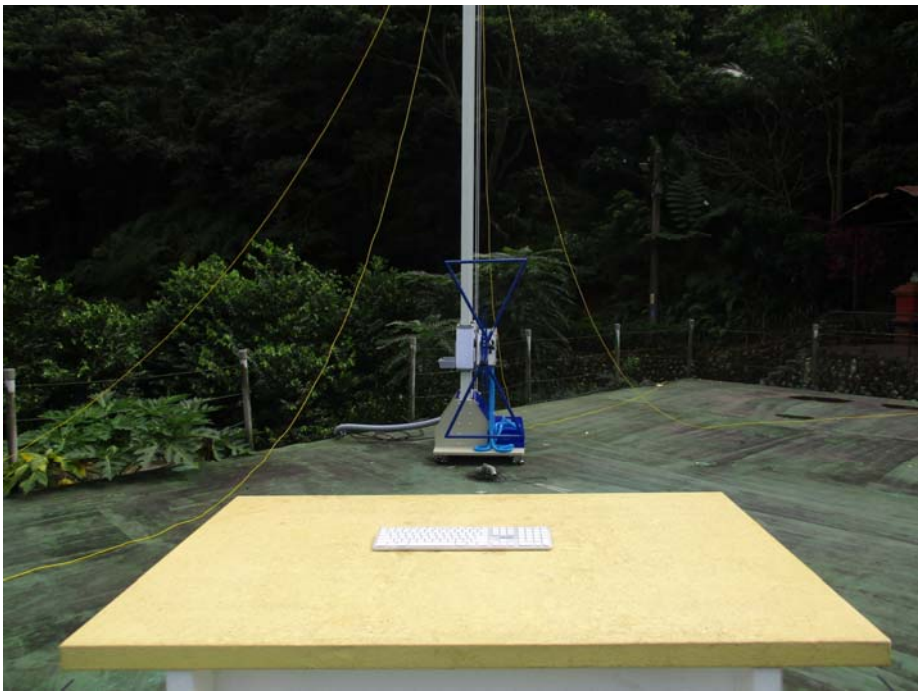
Compliance.

The EUT applies a PCB antenna.

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

7 Photographs of the Tests

7.1 Radiated Disturbances Emission Test



Below 1 GHz

Above 1 GHz

8 Photographs of the EUT

Front View of the EUT

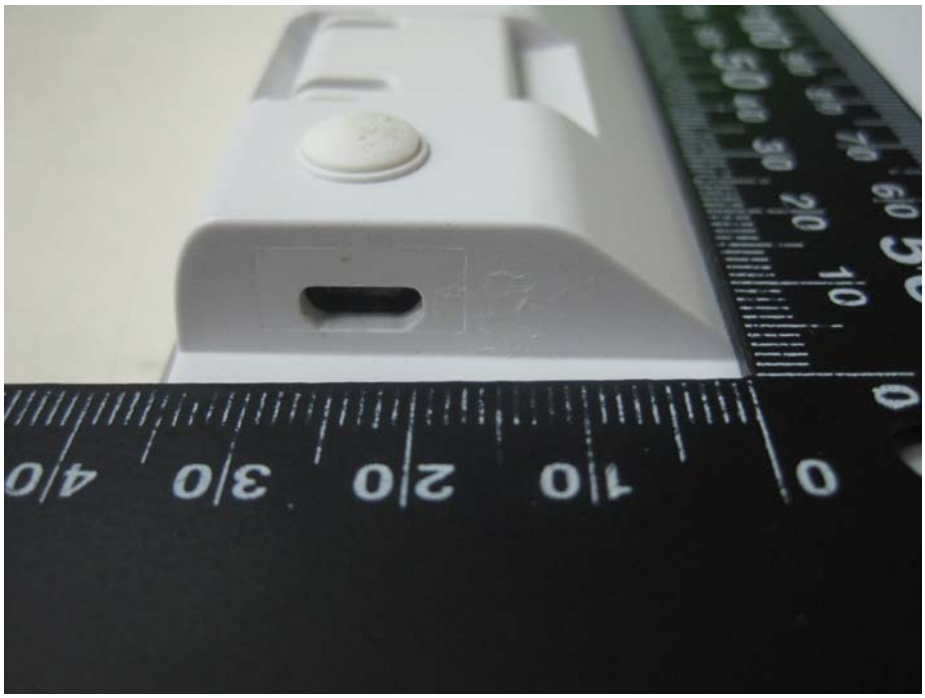
Rear View of the EUT

Side View of the EUT

Side View of the EUT

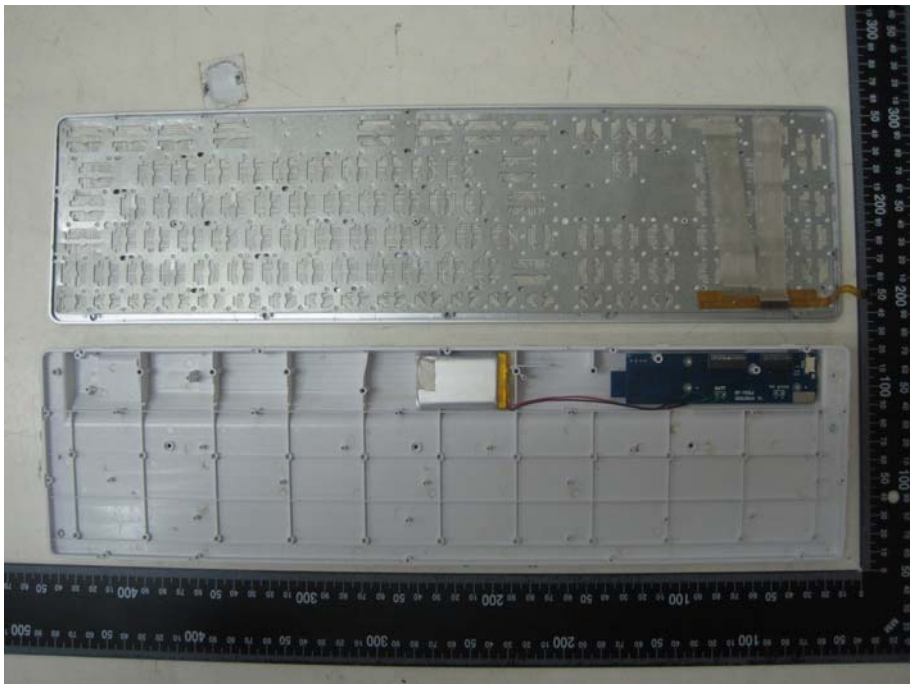
Front View of the EUT

Rear View of the EUT

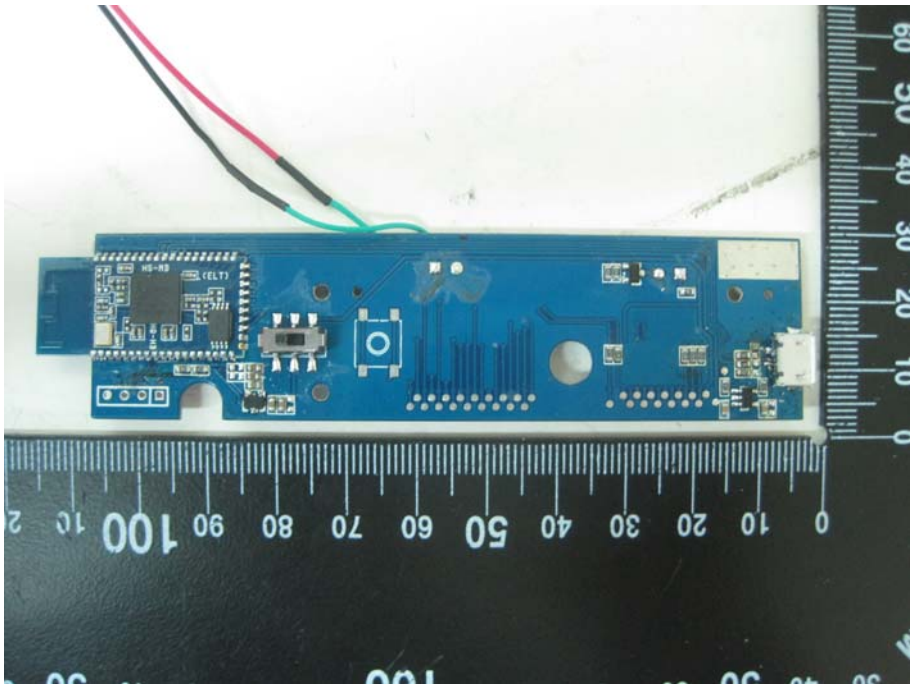


Closer View of the USB port

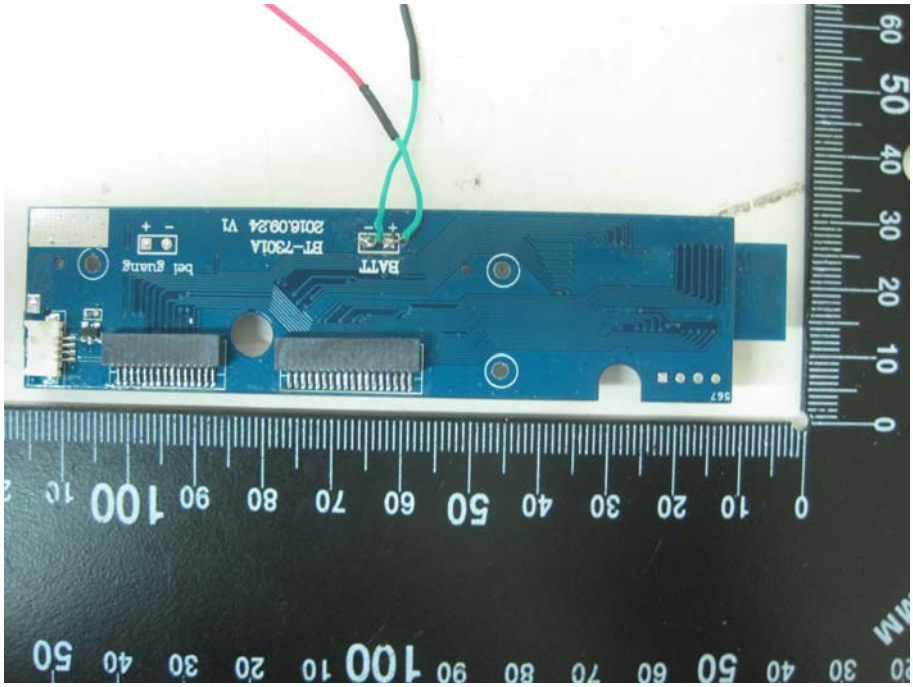
View of the USB Cable



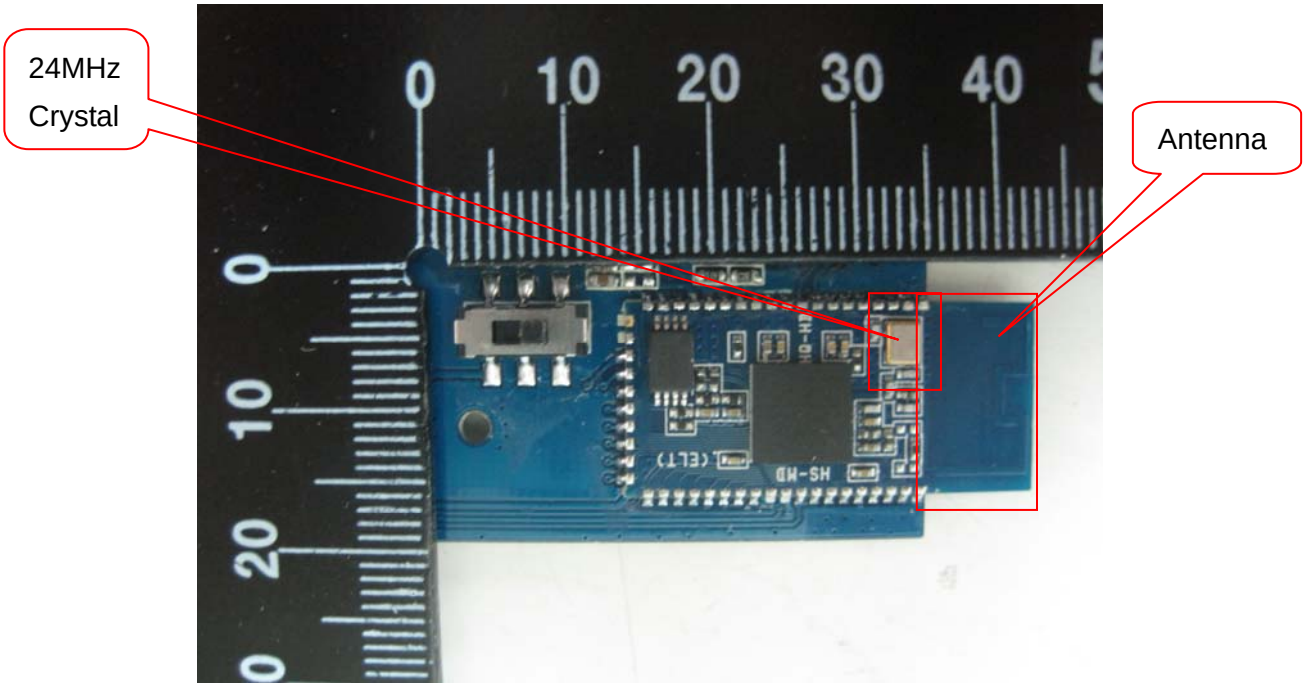
Inside View of the PCB



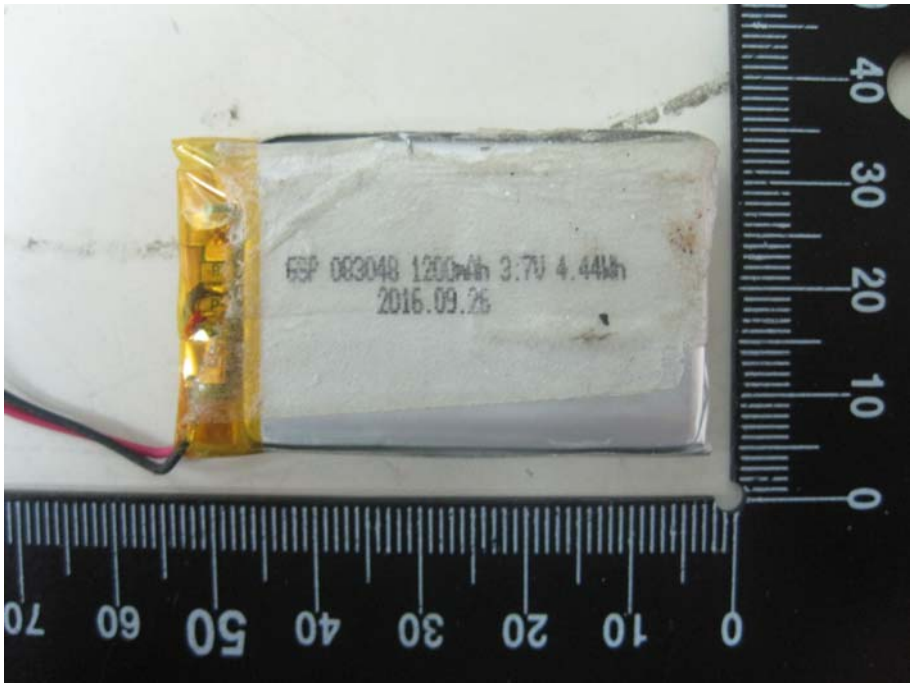
Front View of the PCB



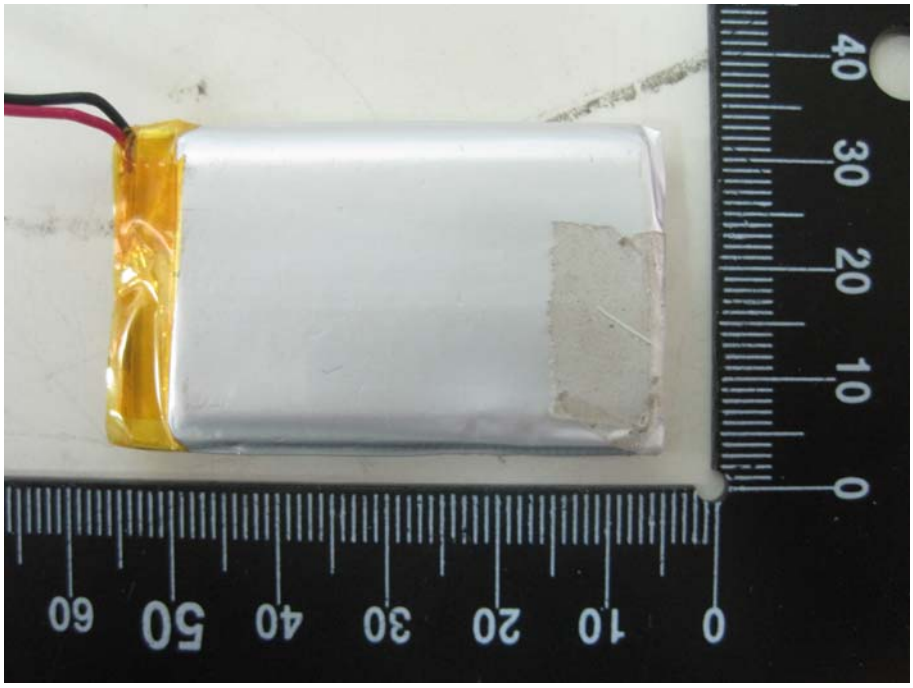
Rear View of the PCB



Front View of the Bluetooth module



Front View of Battery



Rear View of Battery