FCC RADIO TEST REPORT

FCC ID: 2ARUJ-O2

Product: 2.4G Wireless Guitar System

Trade Name: B-BIRD /

Model Name: O2

Serial Model: X2

Report No.: UNIA2018111904-FR-01

Prepared for

SHENZHEN BESTMUSIC CO.,LIMITED

3F XINGYUAN SCIENCE AND TECHNOLOGY PARK, TONGDA ROAD, BAOAN AVENUE, XIXIANG OFFICE, BAOAN DISTRICT, SHENZHEN CITY, CHINA

Prepared by

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TEST RESULT CERTIFICATION

Kahn.Yang

Applicant's name .....: SHENZHEN BESTMUSIC CO.,LIMITED

Address .....: 3F XINGYUAN SCIENCE AND TECHNOLOGY PARK, TONGDA ROAD, BAOAN AVENUE, XIXIANG OFFICE, BAOAN DISTRICT, SHENZHEN CITY, CHINA

Manufacture's Name .....: SHENZHEN BESTMUSIC CO.,LIMITED

Address .....: 3F XINGYUAN SCIENCE AND TECHNOLOGY PARK, TONGDA ROAD, BAOAN AVENUE, XIXIANG OFFICE, BAOAN DISTRICT, SHENZHEN CITY, CHINA

Product description

Product name ..... : 2.4G Wireless Guitar System

Trade Mark .....: B-BIRD /

Model and/or type reference .: O2, X2

Standards.....: FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013
KDB558074 D01 V05: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report. This report shall not be reproduced except in full, without the written approval of UNI, this document may be altered or revised by Shenzhen United Testing Technology Co., Ltd., personnel only, and shall be noted in the revision of the document.

Date of Receive.....: Nov. 07, 2018

Date (s) of performance of tests .....: Nov. 07, 2018 - Nov. 20, 2018

Date of Issue .....: Nov. 20, 2018

Test Result.....: Pass

Prepared by: _____
Kahn Yang/Editor

Reviewer: _____
Sherwin Qian/Supervisor

Approved & Authorized Signer: _____
Liuze/Manager

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1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

FCC Part 15.247, Subpart C			
Standard section	Test Item	Judgment	Remark
15.207	Conducted emission	PASS	--
15.247(a)(2)	6dB Bandwidth	PASS	--
15.247(b)(3)	Output Power	PASS	--
15.109/15.205/ 15.209	Radiated Spurious Emission	PASS	--
15.247(d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247(e)	Power Spectral Density	PASS	--
15.247(d)	Band Edge Emission	PASS	--
15.203	Antenna requirement	PASS	--

Note: 1."N/A"denotes test is not applicable in this Test report

2.all tests are according to ANSI C63.10-2013

1.2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files.

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2 GENERAL INFORMATION

2.1 ENVIRONMENTAL CONDITIONS

Temperature	Normal Temperature:	25℃
Voltage	Normal Voltage	DC 3.7V
Other	Relative Humidity	55 %
	Air Pressure	101 kPa

2.2 GENERAL DESCRIPTION OF EUT

Equipment	2.4G Wireless Guitar System
Trade Mark	B-BIRD /
Model Name	O2
Serial No.	X2
Model Difference	All models have the same functionality, software and electronics, only the color, front frame shape and model names may differ. Test sample model: O2
FCC ID	2ARUJ-O2
Antenna Type	PCB Antenna
Antenna Gain	0dBm
Frequency Range	2402MHz - 2475MHz
Number of Channels	8
Modulation Type	GFSK
Battery	3.7V from battery
Adapter Model	N/A

2.3 Carrier Frequency of Channels

Channel	Frequency (MHz)
00	2402.0
01	2417.5
02	2427.5
03	2435.0
04	2442.0
05	2453.0
06	2457.5
07	2475.0

2.4 Operation of EUT during testing

Operating Mode: Transmitting mode
Channel: 2402MHz(CH00),2442MHz (CH04),2475MHz (CH07)

2.5 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing: N/A

Operation of EUT during Radiation and Above1GHz Radiation testing:

EUT

2.6 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
CONDUCTED EMISSIONS TEST					
1	AMN	Schwarzbeck	NNLK8121	8121370	2019.9.9
2	AMN	ETS	3810/2	00020199	2019.9.9
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2019.9.9
4	AAN	TESEQ	T8-Cat6	38888	2019.9.9
RADIATED EMISSION TEST					
1	Horn Antenna	Sunol	DRH-118	A101415	2019.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2019.9.29
3	PREAMP	HP	8449B	3008A00160	2019.9.9
4	PREAMP	HP	8447D	2944A07999	2019.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2019.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2019.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2019.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2019.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2019.9.9

12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2019.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2019.3.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2019.3.14
15	RF power divider	Anritsu	K241B	992289	2019.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2019.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2019.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2019.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2019.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2019.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2019.05.10

3 TEST CONDITIONS AND RESULTS

3.1 CONDUCTED EMISSIONS TEST

Limit

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

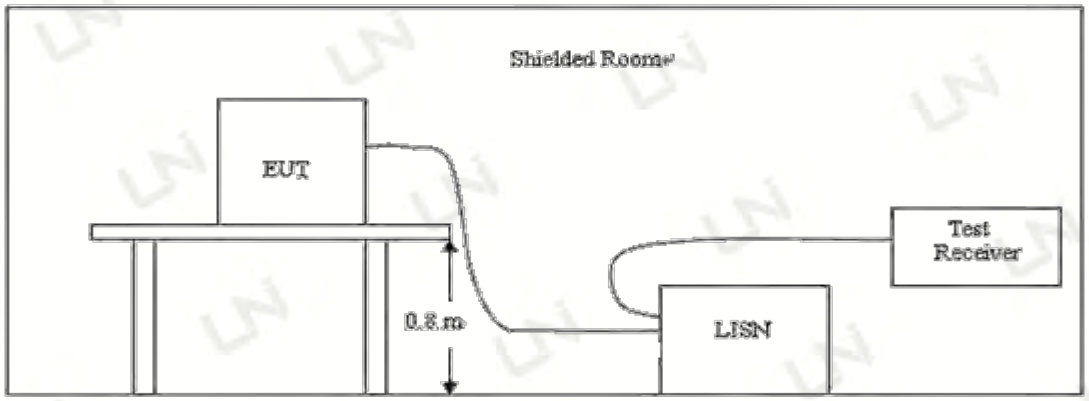
Frequency (MHz)	Maximum RF Line Voltage(dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56*	56~46*
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

*

Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

Test Setup



Test Procedure

1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2, Support equipment, if needed, was placed as per ANSI C63.10.
3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5, All support equipments received AC power from a second LISN, if any.
6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

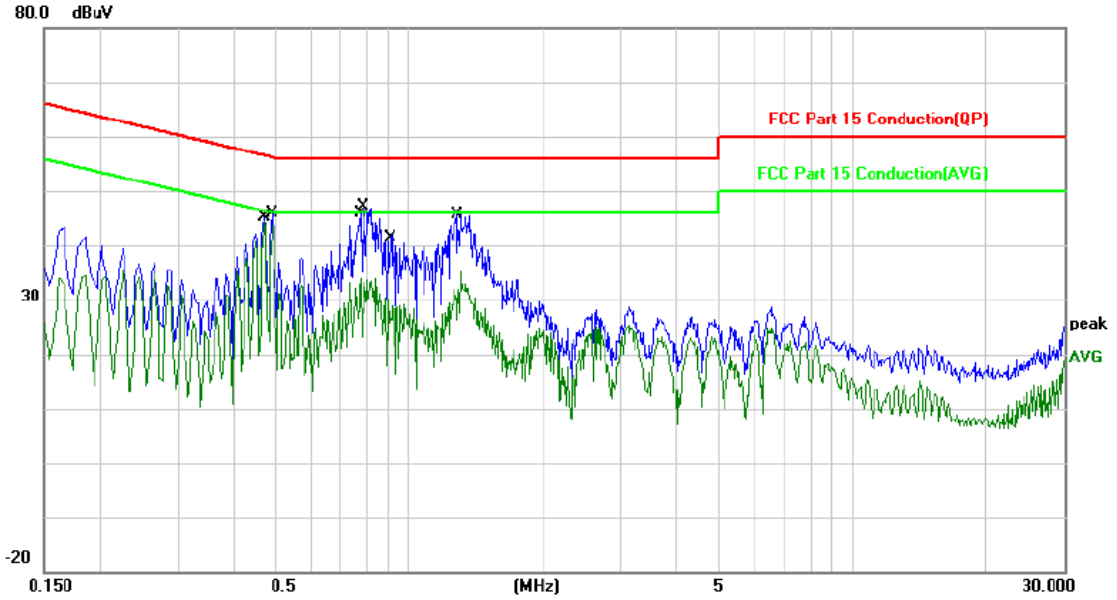
Test Result

---PASS---

Temperature:	25℃	Relative Humidity:	48%
Test Date:	Nov. 15, 2018	Pressure:	1030hPa
Test Voltage:	AC 120V 50Hz	Polarization:	
Test mode is charging mode			

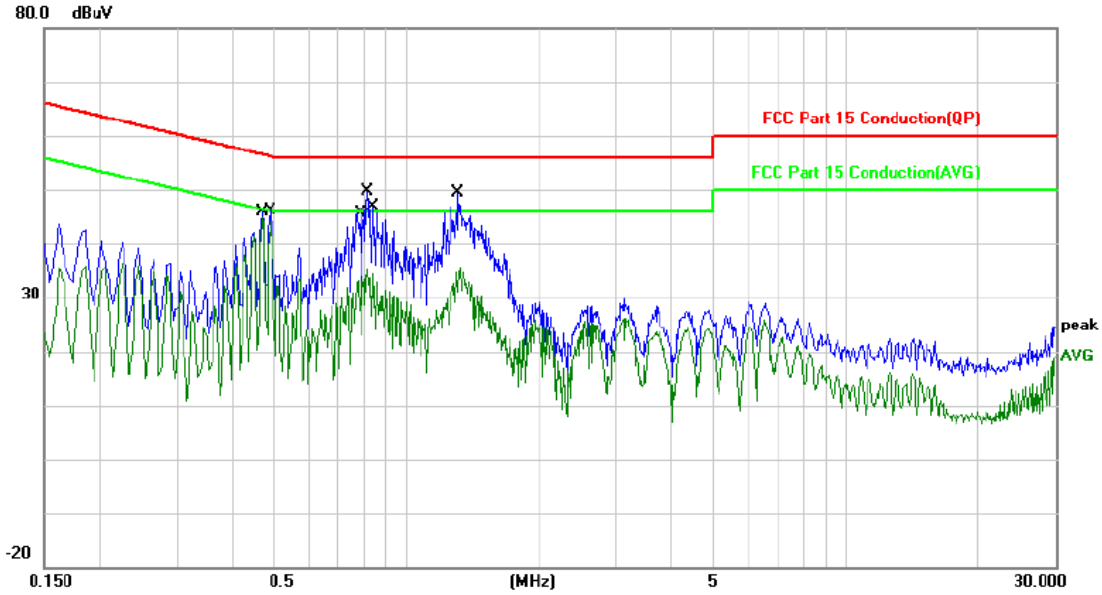
Please refer to test data as follows:

Line	L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4702	44.33	-0.02	44.31	56.51	-12.20	QP	
2	*	0.4702	43.95	-0.02	43.93	46.51	-2.58	AVG	
3		0.4901	44.65	-0.03	44.62	56.17	-11.55	QP	
4		0.4901	43.13	-0.03	43.10	46.17	-3.07	AVG	
5		0.7736	41.58	-0.07	41.51	56.00	-14.49	QP	
6		0.7736	31.68	-0.07	31.61	46.00	-14.39	AVG	
7		0.7841	41.15	-0.07	41.08	56.00	-14.92	QP	
8		0.7841	28.83	-0.07	28.76	46.00	-17.24	AVG	
9		0.8920	36.32	-0.10	36.22	56.00	-19.78	QP	
10		0.8920	25.22	-0.10	25.12	46.00	-20.88	AVG	
11		1.2820	39.75	-0.16	39.59	56.00	-16.41	QP	
12		1.2820	29.36	-0.16	29.20	46.00	-16.80	AVG	

Line	N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4701	45.03	-0.02	45.01	56.51	-11.50	QP	
2	*	0.4701	44.69	-0.02	44.67	46.51	-1.84	AVG	
3		0.4900	45.43	-0.03	45.40	56.17	-10.77	QP	
4		0.4900	43.91	-0.03	43.88	46.17	-2.29	AVG	
5		0.7836	41.02	-0.07	40.95	56.00	-15.05	QP	
6		0.7836	29.28	-0.07	29.21	46.00	-16.79	AVG	
7		0.8121	44.21	-0.07	44.14	56.00	-11.86	QP	
8		0.8121	32.48	-0.07	32.41	46.00	-13.59	AVG	
9		0.8438	40.97	-0.08	40.89	56.00	-15.11	QP	
10		0.8438	30.05	-0.08	29.97	46.00	-16.03	AVG	
11		1.3117	41.48	-0.16	41.32	56.00	-14.68	QP	
12		1.3117	31.30	-0.16	31.14	46.00	-14.86	AVG	

3.2 RADIATED EMISSION TEST

Limit

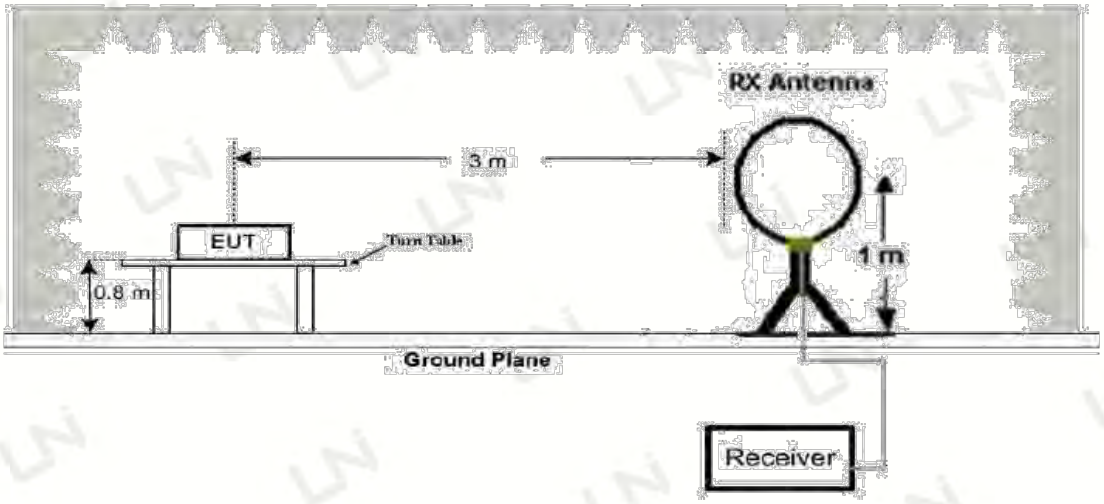
For unintentional device, according to § 15.209(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

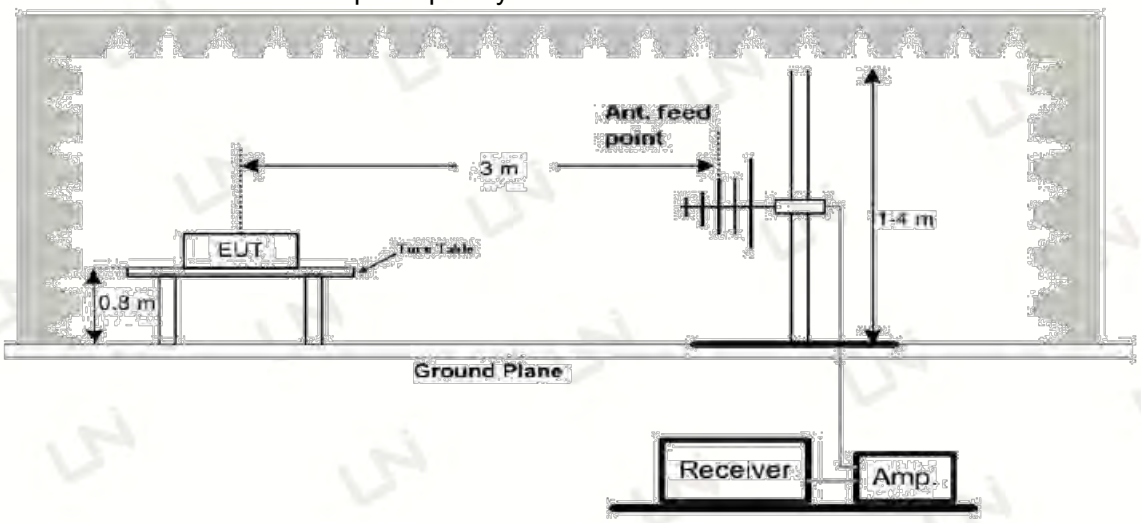
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

Test Setup

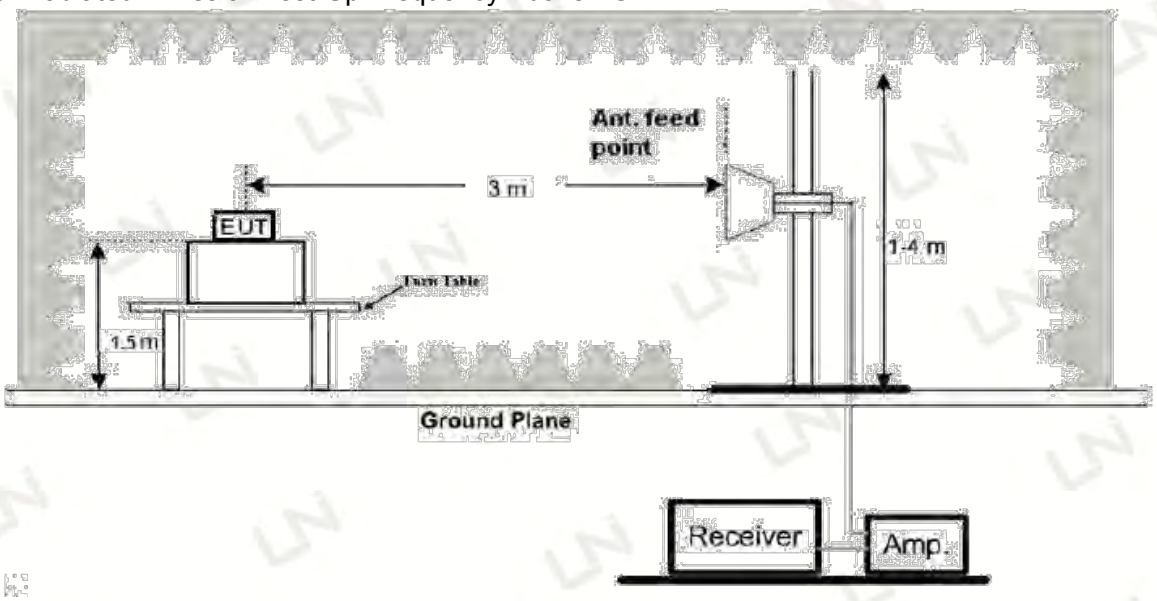
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum 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. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:
For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Result

---PASS---

Remark:
1. All modes of GFSK were test at Low, Middle, and High channel, only the worst result of GFSK High Channel was reported for below 1GHz test.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.
3. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.

Below 1GHz Test Results:

Temperature:	24℃	Relative Humidity:	45%
Test Date:	Nov. 15, 2018	Pressure:	1030hPa
Test Voltage:	DC 3.7V from battery	Phase:	Horizontal
Test Mode:	Normal working mode/ Antenna height : 1M / table degree: 360°		

Polarization	Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		30.2111	23.17	-5.49	17.68	40.00	-22.32	QP	100	0	
2	*	48.1626	38.24	-18.33	19.91	40.00	-20.09	QP	100	21	
3		345.5952	36.95	-11.74	25.21	46.00	-20.79	QP	100	39	
4		807.4291	25.41	-2.19	23.22	46.00	-22.78	QP	100	188	
5		851.0353	25.19	-1.51	23.68	46.00	-22.32	QP	100	252	
6		942.1305	23.49	-0.19	23.30	46.00	-22.70	QP	100	330	

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24℃	Relative Humidity:	45%
Test Date:	Nov. 15, 2018	Pressure:	1030hPa
Test Voltage:	DC 3.7V from battery	Phase:	
Test Mode:	Normal working mode/ Antenna height : 1M / table degree: 360°		

Polarization	Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	30.6379	37.05	-7.25	29.80	40.00	-10.20	QP	100	0	
2		40.7016	44.16	-15.54	28.62	40.00	-11.38	QP	100	21	
3		53.8818	48.71	-20.41	28.30	40.00	-11.70	QP	100	119	
4		67.6751	43.57	-20.28	23.29	40.00	-16.71	QP	100	168	
5		150.0108	41.32	-14.47	26.85	43.50	-16.65	QP	100	286	
6		187.0958	40.30	-15.94	24.36	43.50	-19.14	QP	100	353	

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Remark：
(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results (CH00):

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804.00	58.41	-3.43	54.98	74	19.02	PK
4804.00	43.25	-3.43	39.82	54	14.18	AV
5740.50	57.11	-2.34	54.77	74	19.23	PK
5740.50	44.21	-2.34	41.87	54	12.13	AV
7206.00	54.67	-0.75	53.92	74	20.08	PK
7206.00	40.82	-0.75	40.07	54	13.93	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4804.00	57.14	-3.43	53.71	74	20.29	PK
4804.00	44.23	-3.43	40.80	54	13.20	AV
5740.50	55.56	-2.34	53.22	74	20.78	PK
5740.50	45.01	-2.34	42.67	54	11.33	AV
7206.00	55.39	-0.75	54.64	74	19.36	PK
7206.00	41.62	-0.75	40.87	54	13.13	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Remark：
(1) Measuring frequencies from 1 GHz to the 25 GHz。
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak
detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7)All modes of operation were investigated and the worst-case emissions are reported.

CH Middle (2442MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4884.00	58.42	-3.51	54.91	74	19.09	PK
4884.00	44.37	-3.51	40.86	54	13.14	AV
5360.00	57.15	-2.41	54.74	74	19.26	PK
5360.00	45.68	-2.41	43.27	54	10.73	AV
7326.00	55.25	-0.82	54.43	74	19.57	PK
7326.00	40.92	-0.82	40.10	54	13.90	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4884.00	58.07	-3.51	54.56	74	19.44	PK
4884.00	43.85	-3.51	40.34	54	13.66	AV
5360.00	56.54	-2.41	54.13	74	19.87	PK
5360.00	44.41	-2.41	42.00	54	12.00	AV
7326.00	54.49	-0.82	53.67	74	20.33	PK
7326.00	43.47	-0.82	42.65	54	11.35	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Remark:
(1) Measuring frequencies from 1 GHz to the 25 GHz。
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak
detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7)All modes of operation were investigated and the worst-case emissions are reported.

CH High (2475MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4950.00	56.72	-3.43	53.29	74	20.71	PK
4950.00	43.50	-3.43	40.07	54	13.93	AV
5770.00	56.26	-2.33	53.93	74	20.07	PK
5770.00	45.26	-2.33	42.93	54	11.07	AV
7425.00	54.59	-0.75	53.84	74	20.16	PK
7425.00	40.72	-0.75	39.97	54	14.03	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4950.00	57.79	-3.43	54.36	74	19.64	PK
4950.00	46.17	-3.43	42.74	54	11.26	AV
5770.00	55.96	-2.33	53.63	74	20.37	PK
5770.00	45.59	-2.33	43.26	54	10.74	AV
7425.00	55.07	-0.75	54.32	74	19.68	PK
7425.00	42.92	-0.75	42.17	54	11.83	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Remark：
(1) Measuring frequencies from 1 GHz to the 25 GHz。
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak
detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7) All modes of operation were investigated and the worst-case emissions are reported.

3.3 BAND EDGE

Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength
and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength. The conducted
RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz, to measure the conducted peak band edge.

Test Result

---PASS---

Radiated Band Edge Test:

Operation Mode: Transmitting mode of GFSK

CH LOW: 2402MHz

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2365.00	59.90	-5.81	54.09	74	19.91	PK
2365.00	38.87	-5.81	33.06	54	20.94	AV
2390.00	56.78	-5.84	50.94	74	23.06	PK
2390.00	39.49	-5.84	33.65	54	20.35	AV
2400.00	67.48	-5.84	61.64	74	12.36	PK
2400.00	44.27	-5.84	38.43	54	15.57	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2365.00	59.85	-5.81	54.04	74	19.96	PK
2365.00	37.97	-5.81	32.16	54	21.84	AV
2390.00	58.75	-5.84	52.91	74	21.09	PK
2390.00	41.61	-5.84	35.77	54	18.23	AV
2400.00	66.57	-5.84	60.73	74	13.27	PK
2400.00	43.21	-5.84	37.37	54	16.63	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH HIGH : 2475MHz

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	58.48	-5.65	52.83	74	21.17	PK
2483.50	37.19	-5.65	31.54	54	22.46	AV
2495.00	58.20	-5.68	52.52	74	21.48	PK
2495.00	41.89	-5.68	36.21	54	17.79	AV
2500.00	68.66	-5.72	62.94	74	11.06	PK
2500.00	44.41	-5.72	38.69	54	15.31	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	59.03	-5.65	53.38	74	20.62	PK
2483.50	37.74	-5.65	32.09	54	21.91	AV
2495.00	56.50	-5.68	50.82	74	23.18	PK
2495.00	39.40	-5.68	33.72	54	20.28	AV
2500.00	66.63	-5.72	60.91	74	13.09	PK
2500.00	45.60	-5.72	39.88	54	14.12	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

3.4 Maximum Peak Output Power

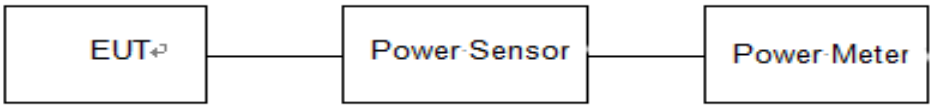
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Result

---PASS---

Type	Channel	Output power (dBm)	Antenna Gain (dbi)	EIRP (dBm)	Limit (dBm)	Result
GFSK	00	-7.425	0.00	-7.425	30.00	Pass
	04	-8.624	0.00	-8.624		
	07	-10.120	0.00	-10.120		

3.5 Power Spectral Density

Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

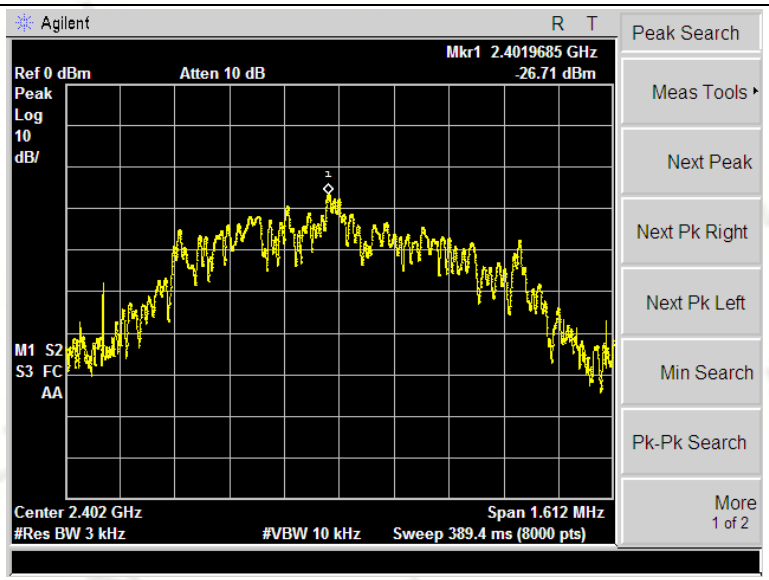
Test Procedure

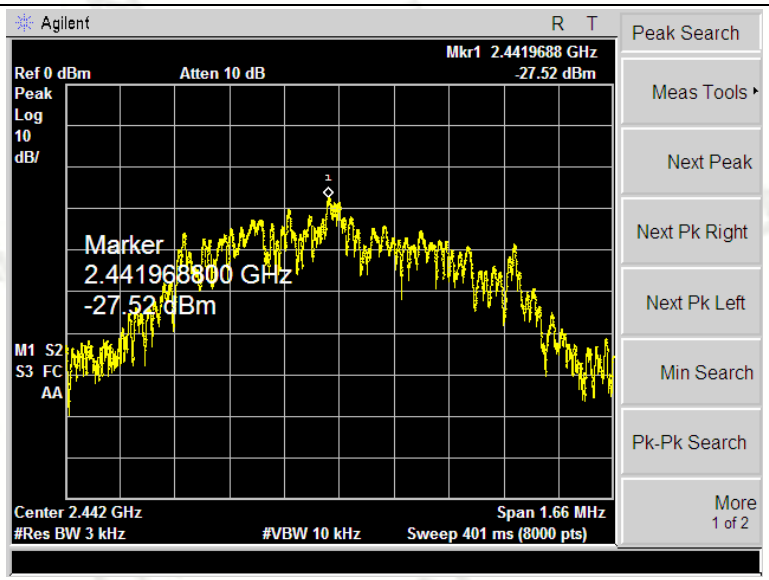
1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW ≥ 3× RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

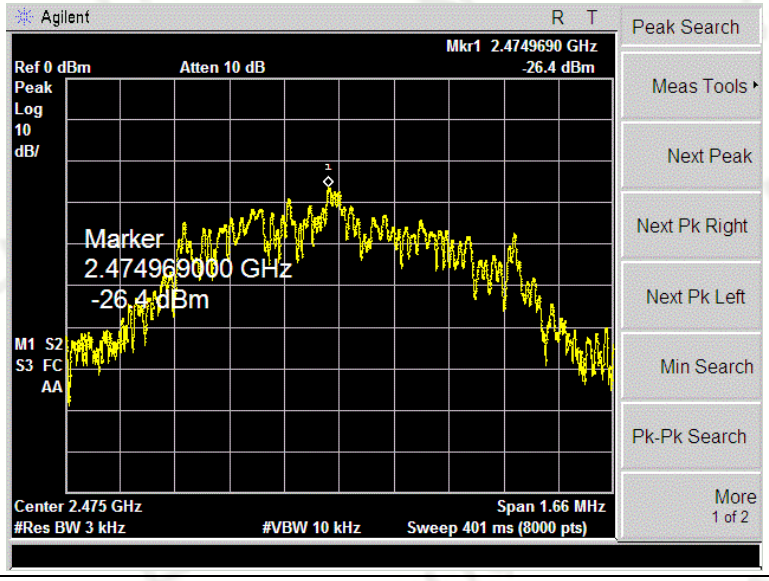
Test Results

---PASS---

Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
GFSK	00	-26.71	8.00	Pass
	04	-27.52		
	07	-26.40		


Agilent
R T
Mkr1 2.4019685 GHz
Ref 0 dBm
Atten 10 dB
-26.71 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center 2.402 GHz
Span 1.612 MHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 389.4 ms (8000 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
R T
Mkr1 2.4419688 GHz
Ref 0 dBm
Atten 10 dB
-27.52 dBm
Peak
Log
10
dB/
Marker
2.441968800 GHz
-27.52 dBm
M1 S2
S3 FC
AA
Center 2.442 GHz
Span 1.66 MHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 401 ms (8000 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
R T
Mkr1 2.4749690 GHz
Ref 0 dBm
Atten 10 dB
-26.4 dBm
Peak
Log
10
dB/
Marker
2.474969000 GHz
-26.4 dBm
M1 S2
S3 FC
AA
Center 2.475 GHz
Span 1.66 MHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 401 ms (8000 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

3.6 OCCUPIED BANDWIDTH MEASUREMENT

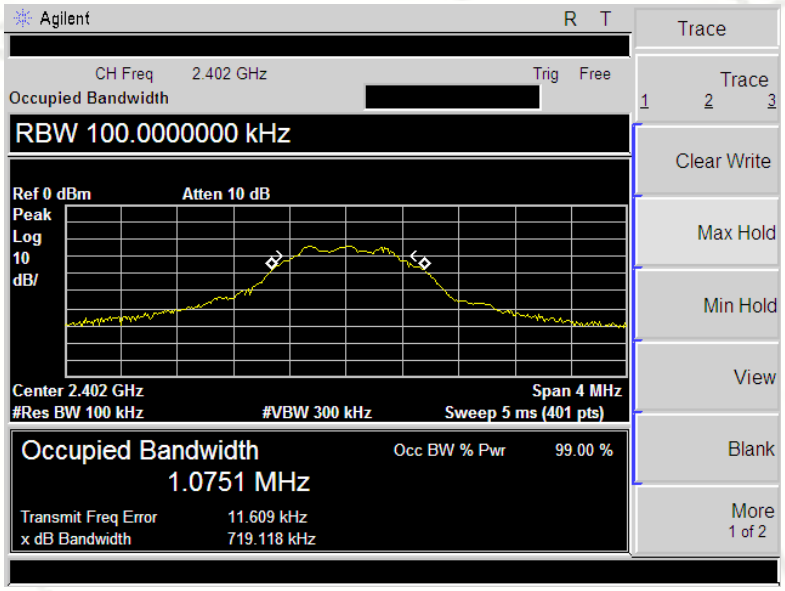
Limit

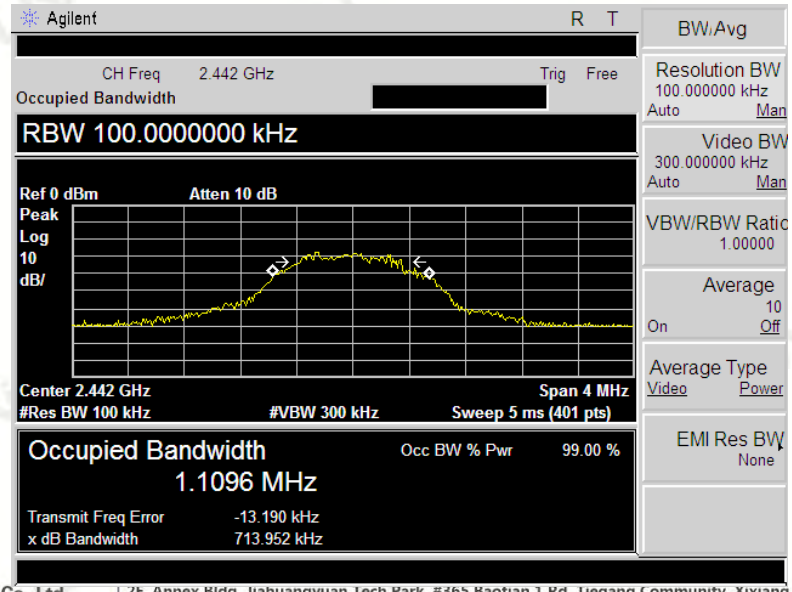
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

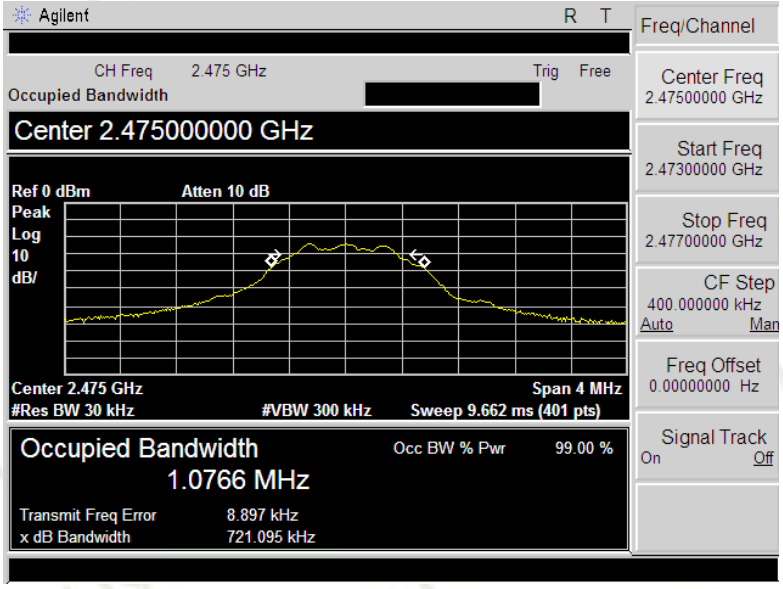
Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Frequency	6dB Bandwidth (MHz)	99% OBW (MHz)	Limit (KHz)	Result
2402	0.719118	1.0751	≥500	PASS
2442	0.713952	1.1096		
2475	0.721095	1.0766		






Agilent
R T
Freq/Channel
CH Freq 2.475 GHz
Trig Free
Occupied Bandwidth
Center 2.475000000 GHz
Ref 0 dBm
Atten 10 dB
Peak
Log
10
dB/
Center 2.475 GHz
Span 4 MHz
#Res BW 30 kHz
#VBW 300 kHz
Sweep 9.662 ms (401 pts)
Occupied Bandwidth
1.0766 MHz
Occ BW % Pwr 99.00 %
Transmit Freq Error 8.897 kHz
x dB Bandwidth 721.095 kHz
Center Freq
2.47500000 GHz
Start Freq
2.47300000 GHz
Stop Freq
2.47700000 GHz
CF Step
400.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off

3.7 Out-of-band Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

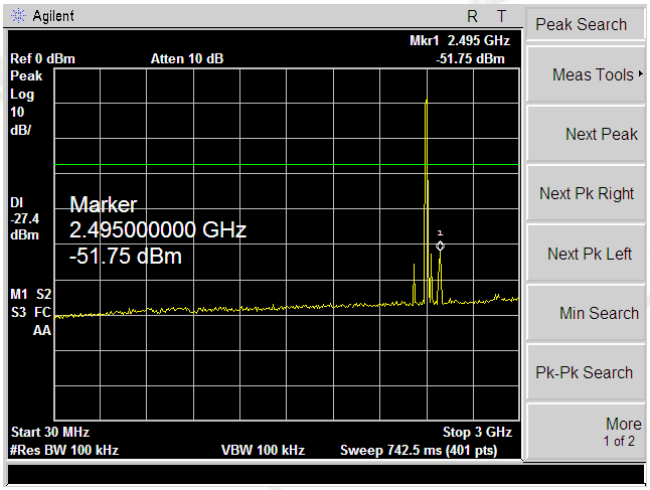
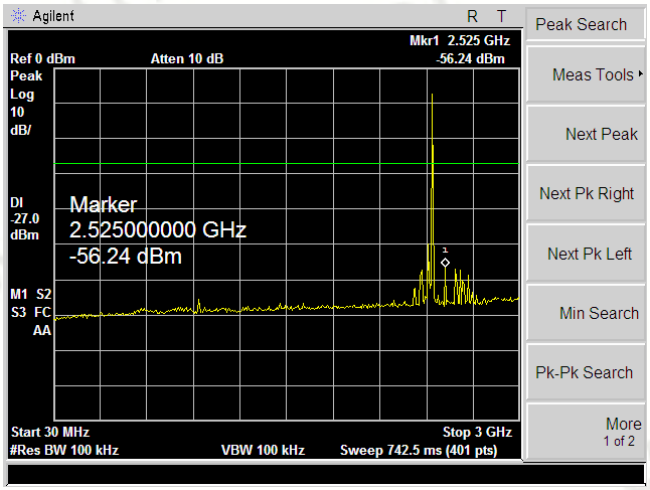
Test Procedure

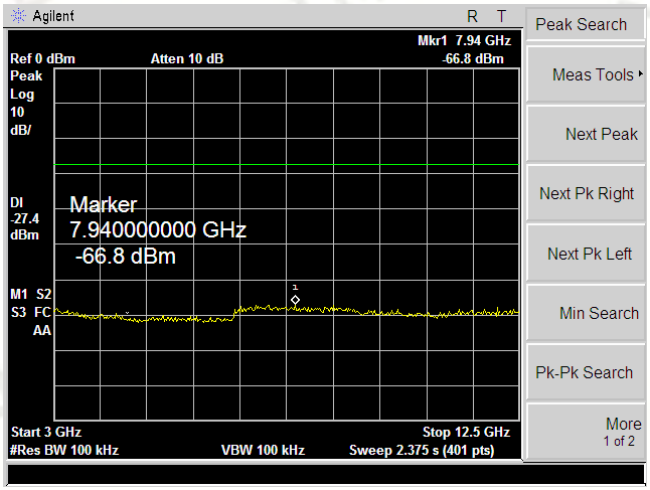
Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Results

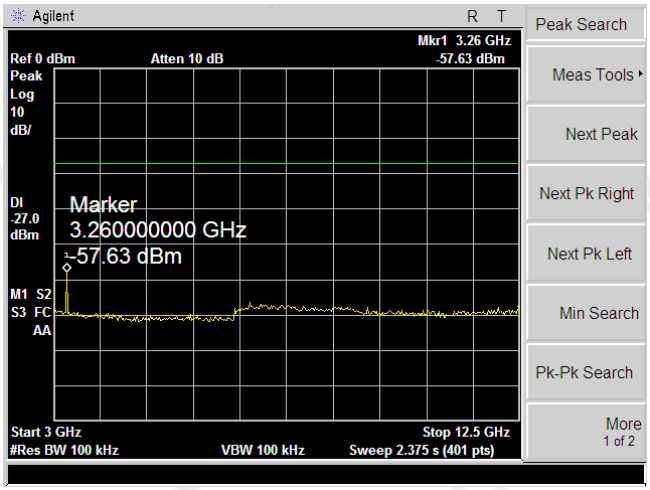
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Test plot as follows:

CH00	CH04
	
30MHz-3GHz	30MHz-3GHz

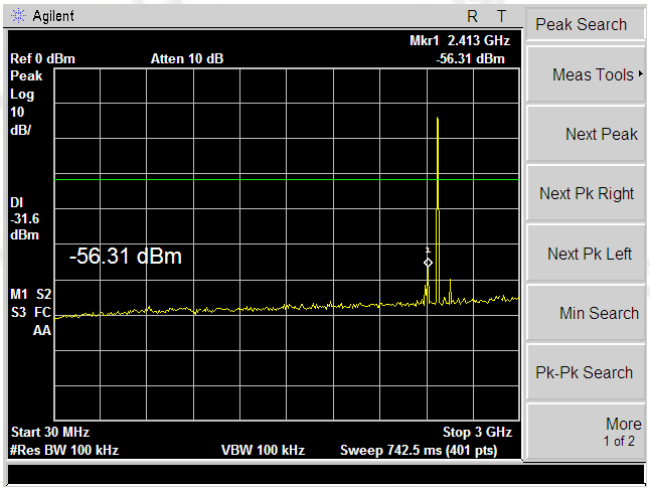


3GHz-15GHz

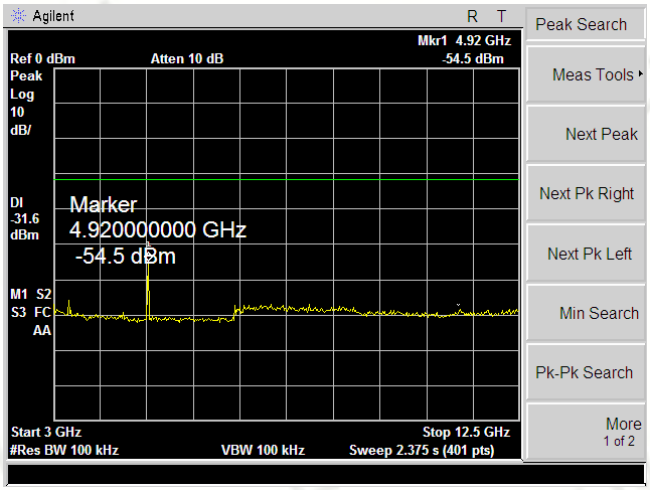


3GHz-15GHz

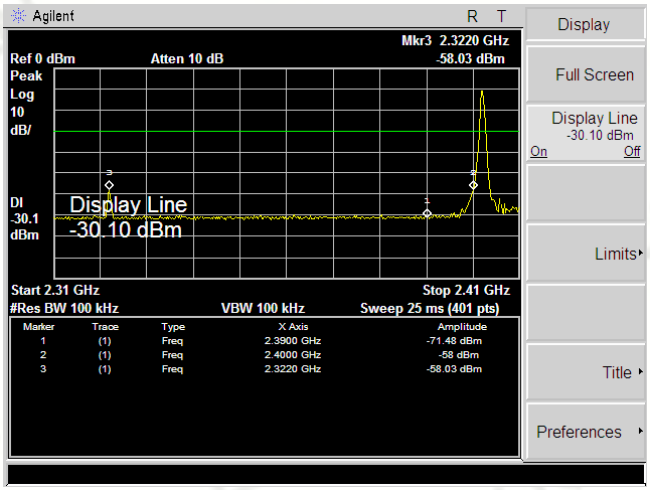
CH07



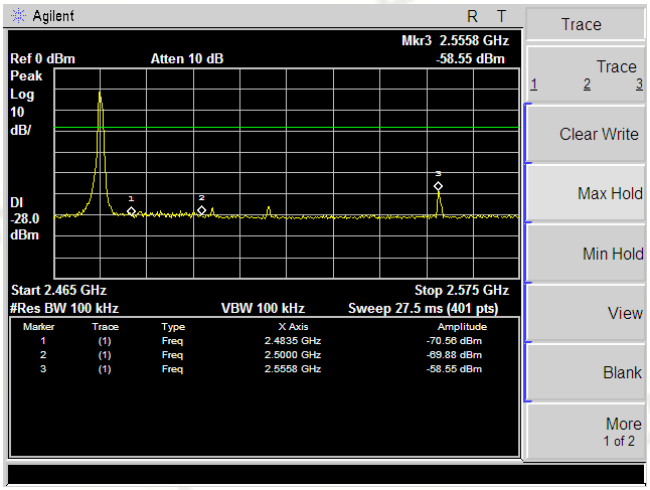
30MHz-3GHz



3GHz-15GHz



Left Band edge

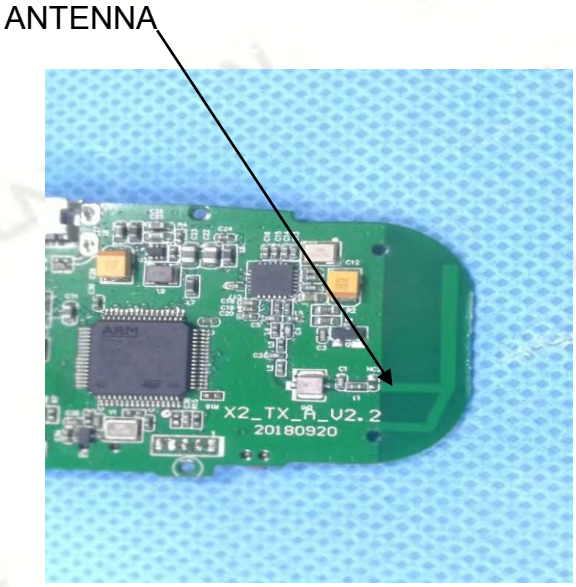


Right Band edge

4 ANTENNA REQUIREMENT

Standard Applicable:
For intentional device, according to FCC 47 CFR Section 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.

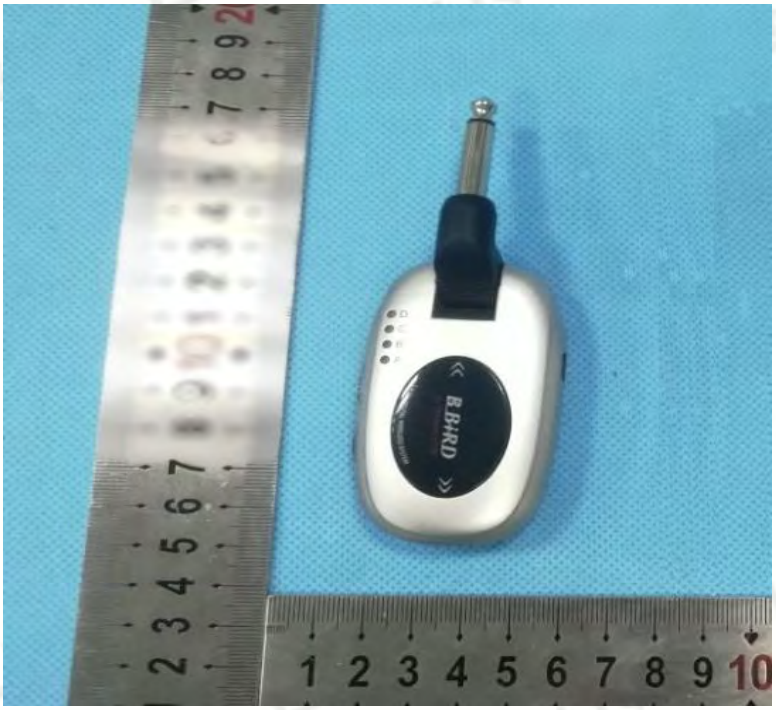
Antenna Connected Construction
The antenna used in this product is a pcb Antenna, The directional gains of antenna used for transmitting is 0.0dBi.



5 PHOTOGRAPH OF TEST

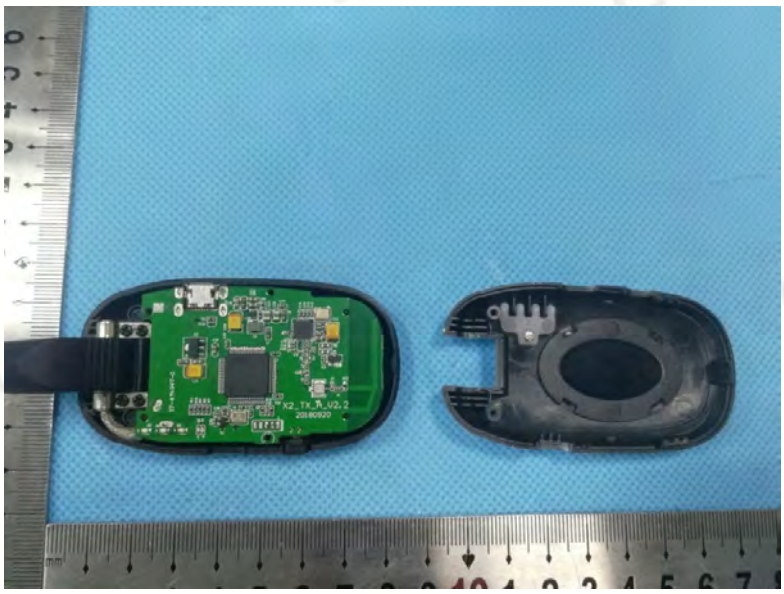
6 PHOTOGRAPH OF EUT

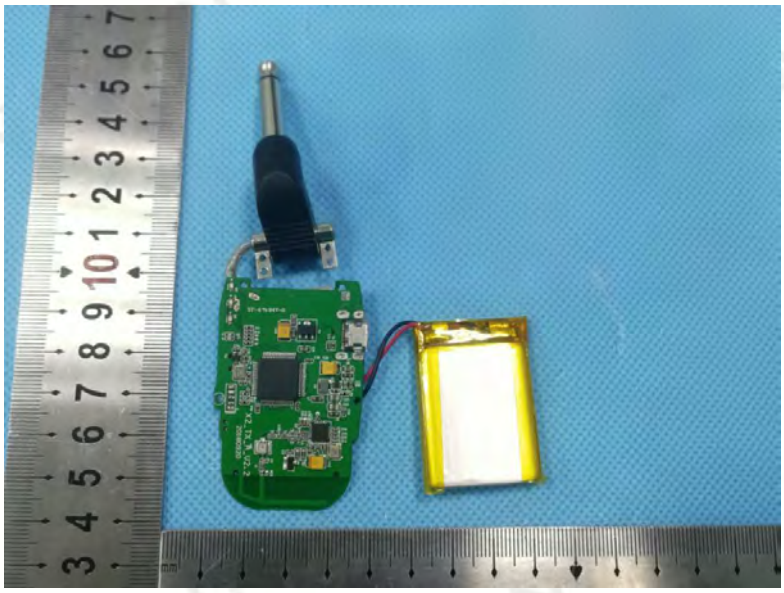
External Photos of EUT

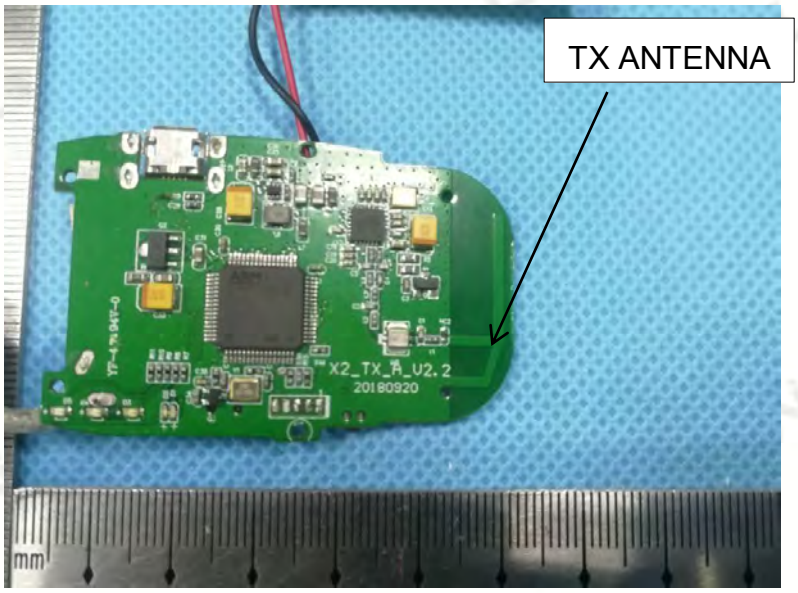


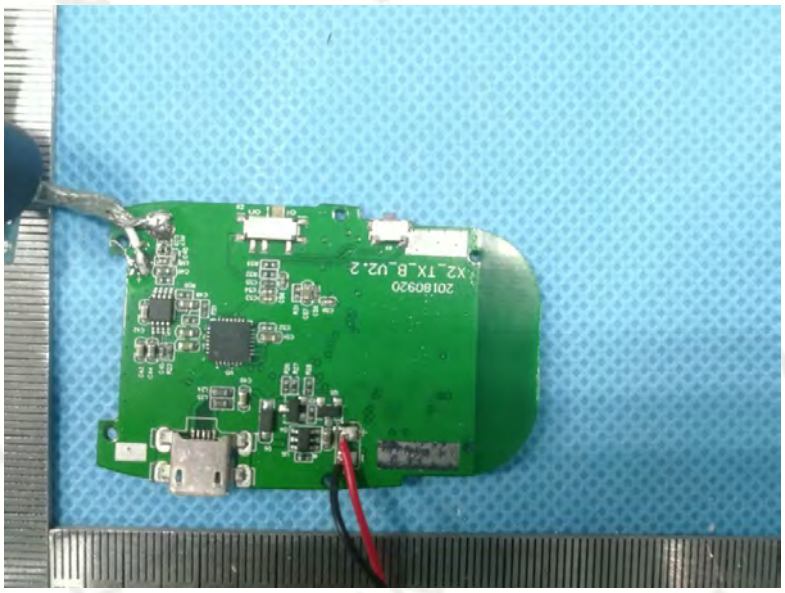
R.BARD

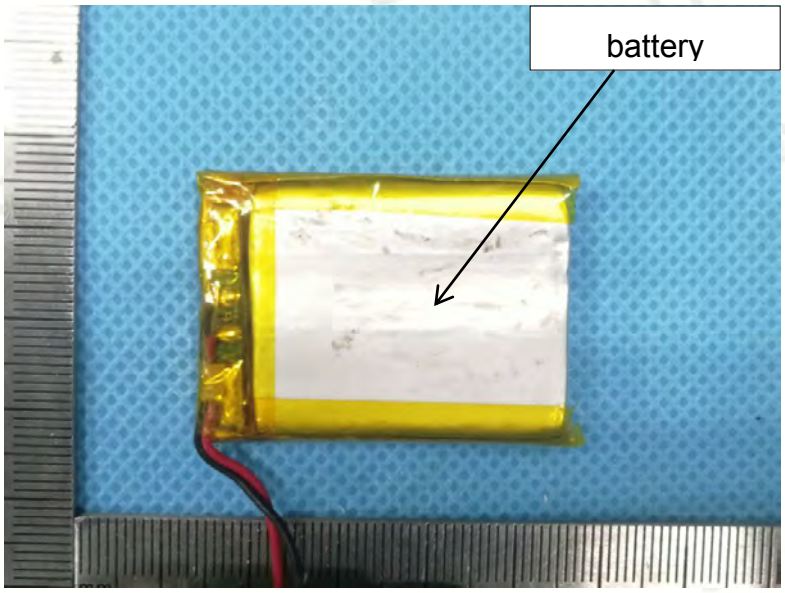
Internal Photos of EUT











**********End of Report**********