FCC RADIO TEST REPORT

FCC ID:2AVLC-RC66970

Product: RC Lighter
Trade Name: N/A
Model Name: RC66970
Serial Model: N/A
Report No.: UNIA20010804ER-01

Prepared for

Spiritexe Design Inc

8438 171A St. Surrey, BC, V4N 0A9, Canada

Prepared by

Shenzhen United Testing Technology Co., Ltd.

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

TEST RESULT CERTIFICATION

Applicant's name..... : Spiritexe Design Inc

Address..... : 8438 171A St. Surrey, BC, V4N 0A9, Canada

Manufacture's Name..... : AudioTronic Tech Co., Ltd

Address..... : 3F, Bldg A, No. 376, Zhen An Chung Rd., Shang Sha South Dist. Chang An Zhen, Dong Guan City, Guan Dong Prov. China, Zip: 523867

Product description

Product name..... : RC Lighter

Trade Mark..... : N/A

Model and/or type reference . : RC66970

Standards..... : FCC Rules and Regulations Part 15 Subpart C Section 15.249, ANSI C63.10: 2013

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.

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Date of Test..... :

Date (s) of performance of tests..... : Dec. 03, 2019 ~ Dec. 18, 2019

Date of Issue..... : Dec. 18, 2019

Test Result..... : Pass

Prepared by: Bob Liao

Bob liao/Editor

Reviewer: Kahn Yang

Kahn yang/Supervisor

Approved & Authorized Signer: Liuze

Liuze/Manager

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1. TEST SUMMARY

TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT	STANGARD
CONDUCTED EMISSIONS TEST	N/A	FCC Part 15.207
RADIATED EMISSION TEST	COMPLIANT	FCC Part 15.209/15.249
BAND EDGE	COMPLIANT	FCC Part 15.249(d)
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT	FCC Part 15.215
ANTENNA REQUIREMENT	COMPLIANT	FCC Part 15.203

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. This approval result is accepted by MRA of APLAC.

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

A2LA Certificate Number: 4747.01

The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 21947

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

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

2.1GENERAL DESCRIPTION OF EUT

Equipment	RC Lighter
Trade Mark	N/A
Model Name	RC66970
Serial No.	N/A
Model Difference	N/A
FCC ID	2AVLC-RC66970
Antenna Type	Internet Antenna
Antenna Gain	1dBi
Frequency Range	2450MHz
Number of Channels	1CH
Modulation Type	GFSK
Battery	12V 27A

2.2 Carrier Frequency of Channels

Channel List	
Channel	Frequency (MHz)
01	2450

2.3 Operation of EUT during testing

Operating Mode
The mode is used: Transmitting mode
Channel: 2450MHz

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:

EUT

Operation of EUT duringRadiation testing:

EUT

Table forauxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
N/A	N/A	N/A	N/A

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2020.10.18
2	Broadband Hybrid Antenna	Sunol	JB1	A090215	2020.11.15
3	PREAMP	HP	8449B	3008A00160	2020.10.21
4	PREAMP	HP	8447D	2944A07999	2020.05.26
5	EMI Test Receiver	Rohde&Schwarz	ESR3	101891	2020.10.15
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2020.10.15
7	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2020.10.15
8	RF Power Sensor	DARE	RPR3006W	15I00041SNO88	2020.06.09
9	RF Power Sensor	DARE	RPR3006W	15I00041SNO89	2020.06.09
10	RF Power Divider	Anritsu	K241B	992289	2020.10.28
11	Signal Generator	Agilent	E4421B	MY4335105	2020.11.19
12	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2020.10.15
13	Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	154987	2020.11.19
14	Active Loop Antenna	Com-Power	AL-130R	10160009	2020.05.28
15	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2020.05.28
16	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2020.10.23
17	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2020.05.28
18	Signal Generator	Agilent	N5183A	MY47420153	2020.05.28
19	Spctrum Analyzer	Rohde&Schwarz	FSP 40	100501	2020.05.28
20	Power Meter	KEYSIGHT	N1911A	MY50520168	2020.05.28
21	Frequency Meter	VICTOR	VC2000	997406086	2020.05.28
22	DC Power Source	HYELEC	HY5020E	055161818	2020.05.28

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

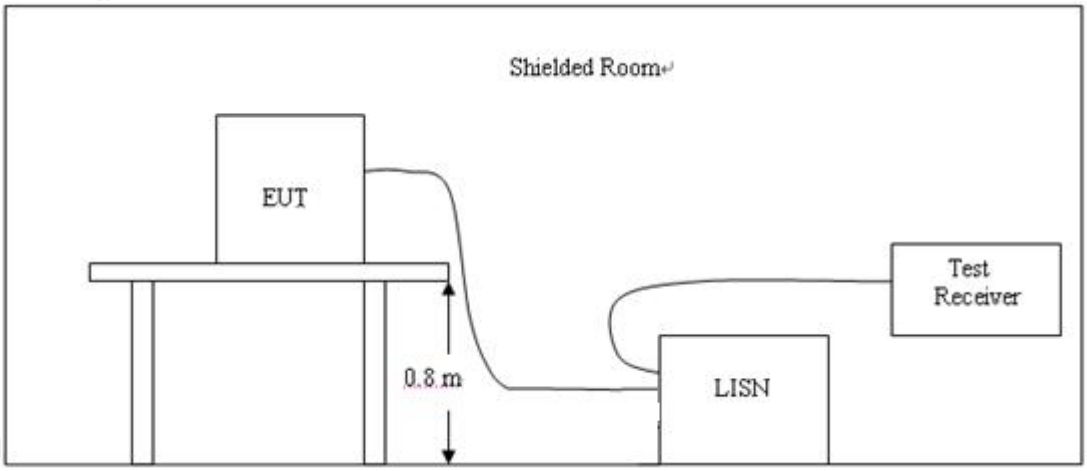
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

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.

3.2 Test Setup



3.3 Test Procedure

1,The equipment was set up as per the test configuration to simulate typical actual usage per the user'smanual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed onthe 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/60Hzpower through a Line Impedance Stabilization Network (LISN) which supplied power source and wasgrounded 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 EUTusing a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has twomonitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1connected 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.

3.4 Test Result

N/A

Remark:

Prototype is powered by lithium battery, no need to test conduction

4 RADIATED EMISSION TEST

4.1 Radiation Limit

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength ofradiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the followingvalues：

Limit calculation and transfer to 3m distance as showed in the following table:

Frequency (MHz)	Limit (dBuV/m)	Distance (m)
0.009-0.490	20log(2400/F(KHz))+40log(300/3)	3
0.490-1.705	20log(24000/F(KHz))+40log(30/3)	3
1.705-30.0	69.5	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

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

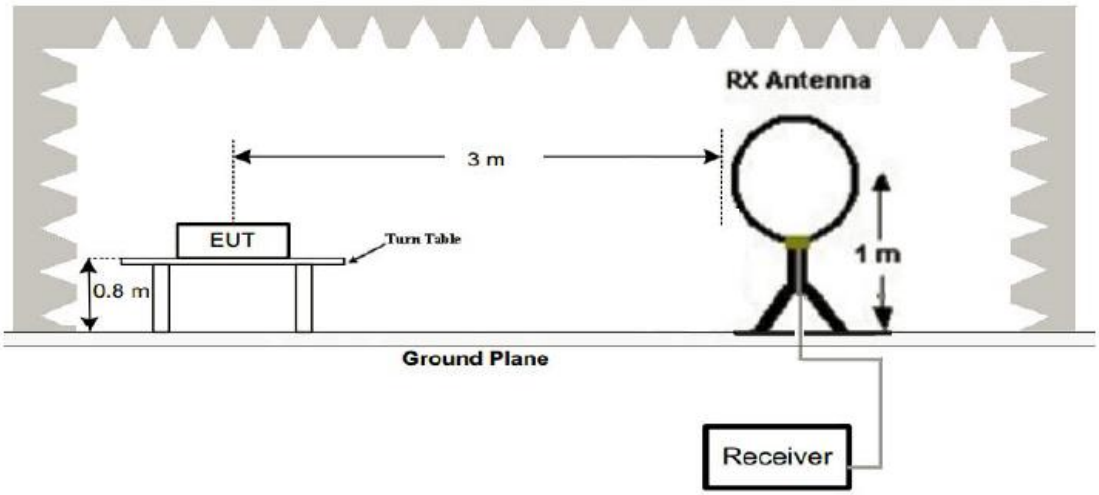
(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

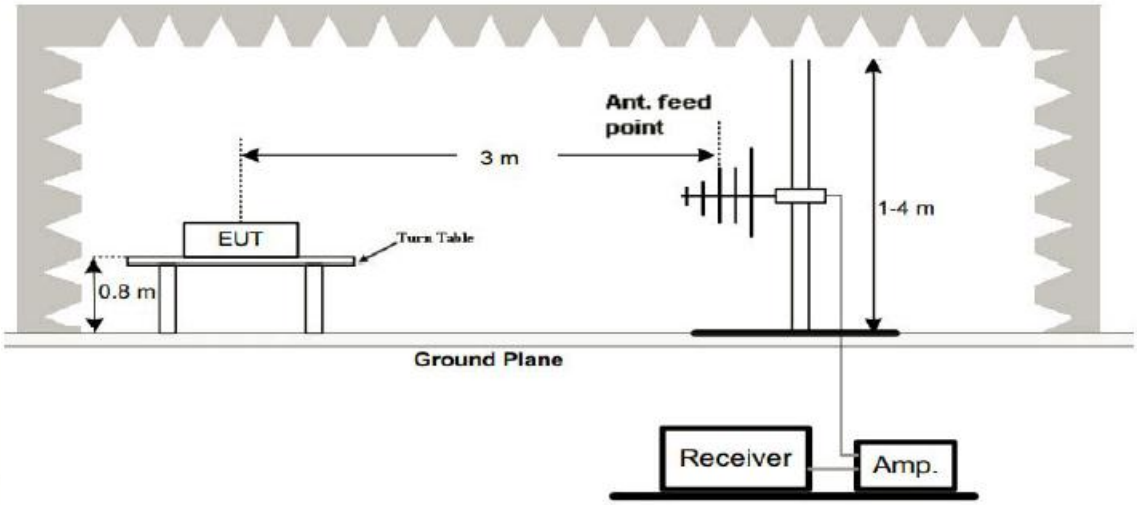
For intentionally used equipment, the general requirements for the magnetic field strength limits of the fundamental and harmonic radiation from the intentional radiator at a distance of 3 meters shall not exceed the above table, as specified in § 15.249(a).

4.2 Test Setup

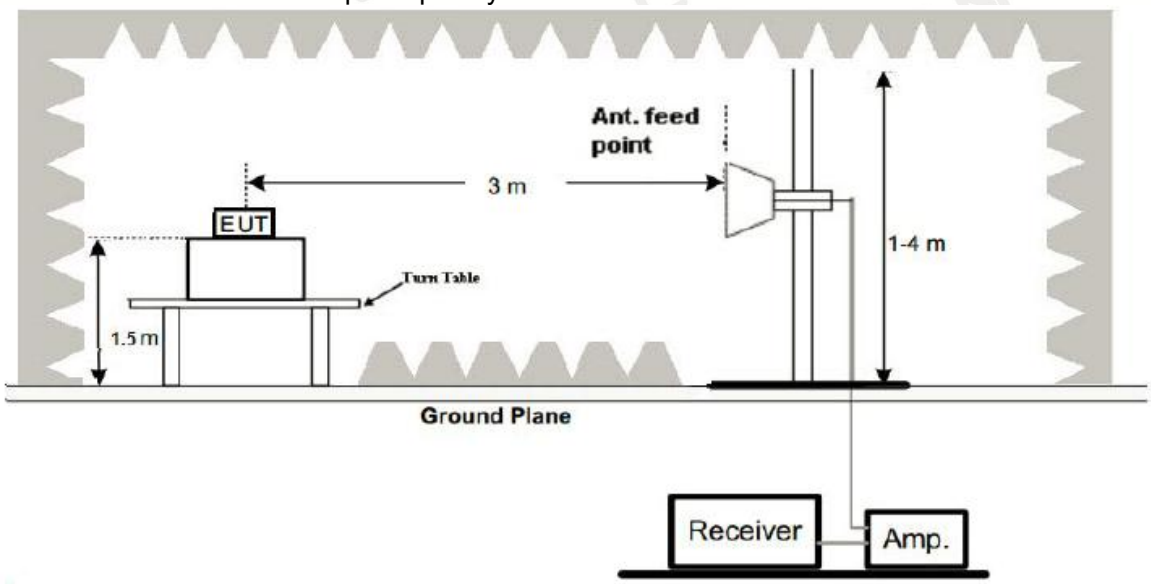
1. Radiated Emission Test-Up Frequency Below 30MHz



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



3. Radiated Emission Test-Up Frequency Above 1GHz



4.3 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 highestemissions.
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 bothhorizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9KHz to25GHz per FCC PART 15.33(a).

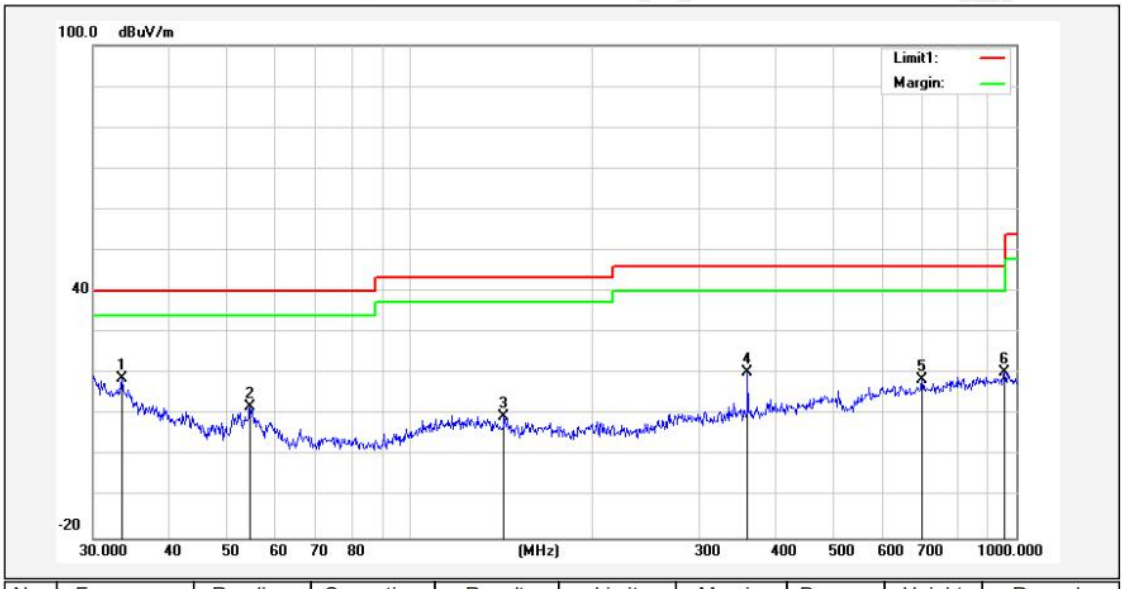
Note:
For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 Test Result

PASS
Remark:
1. All the test modes completed for test. The worst case of Radiated Emissionis High channel, the test data of this mode was reported.
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:

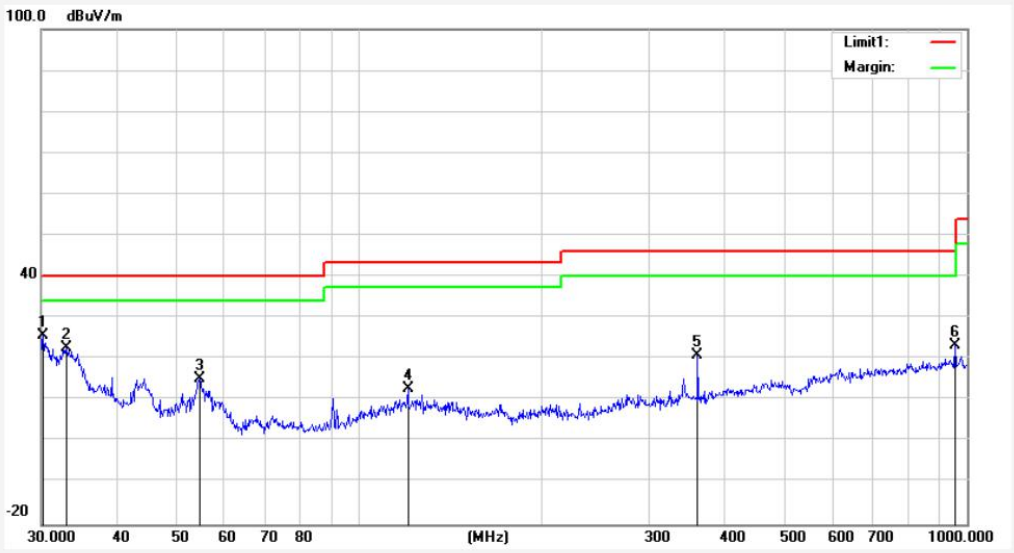
Temperature:	24℃	Relative Humidity:	45%
Test Date:	Mar. 02, 2020	Pressure:	1010hPa
Test Voltage:	DC 12V	Polarization:	Horizontal
Test Mode:	Transmitting mode of GFSK 2450MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	33.4450	28.68	-9.85	18.83	40.00	-21.17	120	100	peak
2	54.4516	32.94	-21.12	11.82	40.00	-28.18	180	100	peak
3	142.8243	26.28	-16.75	9.53	43.50	-33.97	60	100	peak
4	360.4476	34.36	-14.05	20.31	46.00	-25.69	240	100	peak
5	699.3046	27.31	-8.88	18.43	46.00	-27.57	30	100	peak
6	955.4381	26.48	-6.10	20.38	46.00	-25.62	240	100	peak

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

Temperature:	24℃	Relative Humidity:	45%
Test Date:	Mar. 02, 2020	Pressure:	1010hPa
Test Voltage:	DC 12V	Polarization:	Vertical
Test Mode:	Transmitting mode of GFSK 2450MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	30.2111	32.93	-7.31	25.62	40.00	-14.38	150	100	peak
2	32.9791	32.23	-9.48	22.75	40.00	-17.25	120	100	peak
3	54.6430	36.49	-21.14	15.35	40.00	-24.65	300	100	peak
4	120.2766	29.45	-16.69	12.76	43.50	-30.74	180	100	peak
5	360.4476	35.04	-14.05	20.99	46.00	-25.01	120	100	peak
6	955.4381	29.55	-6.10	23.45	46.00	-22.55	150	100	peak

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 30MHzwas 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.

CH Middle (2450MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2450	106.45	-5.71	100.74	114	-13.26	PK
2450	79.35	-5.71	73.64	94	-20.36	AV
4900	61.51	-3.51	58.00	74	-16.00	PK
4900	49.58	-3.51	46.07	54	-7.93	AV
7350	57.63	-0.82	56.81	74	-17.19	PK
7350	46.89	-0.82	46.07	54	-7.93	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
2450	107.45	-5.71	101.74	114	-12.26	PK
2450	80.36	-5.71	74.65	94	-19.35	AV
4900	61.25	-3.51	57.74	74	-16.26	PK
4900	49.67	-3.51	46.16	54	-7.84	AV
7350	57.16	-0.82	56.34	74	-17.66	PK
7350	46.32	-0.82	45.50	54	-8.50	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Note:For fundamental frequency，RBW and VBW set to be 1.5MHz，PK detector for PK value， RMS detector for AV value

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 ,that the value more than 20dB below limit is not record in the form.
(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 1MHzand video bandwidth is 3MHz for peak measurement with peak detectorat frequency above 1GHz.The resolution bandwidth of test receiver/spectrum analyzer is 1MHzand 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 emissionsare reported.

5 BAND EDGE

5.1 Limits

FCC PART 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 emissionlimits in §15.209, whichever is the lesser attenuation.

5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSIC63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT issituated in three orthogonal planes (if appropriate), adjusting the measurement antenna height andpolarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and setRBW 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.

5.3 Test Result

PASS

Radiated Band Edge Test:

Operation Mode: TX (2450MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	54.25	-5.81	48.43	74	-25.57	PK
2310	/	-5.81	/	54	/	AV
2390	56.34	-5.84	50.50	74	-23.50	PK
2390	/	-5.84	/	54	/	AV
2400	57.42	-5.84	51.58	74	-22.42	PK
2400	/	-5.84	/	54	/	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
2310	54.30	-5.81	48.49	74	-25.51	PK
2310	/	-5.81	/	54	/	AV
2390	56.25	-5.84	50.41	74	-23.59	PK
2390	/	-5.84	/	54	/	AV
2400	57.57	-5.84	51.73	74	-22.27	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX (2450MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	58.02	-5.65	52.37	74	-21.63	PK
2483.5	/	-5.65	/	54	/	AV
2500	57.02	-5.72	51.30	74	-22.70	PK
2500	/	-5.72	/	54	/	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
2483.5	57.64	-5.65	51.99	74	-22.01	PK
2483.5	/	-5.65	/	54	/	AV
2500	55.89	-5.72	50.17	74	-23.83	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same asRadiated Emission Measurement

6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on ANSI C63.10 section 6.9.2: RBW=30KHz. VBW=100KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

6.3 Measurement Equipment Used

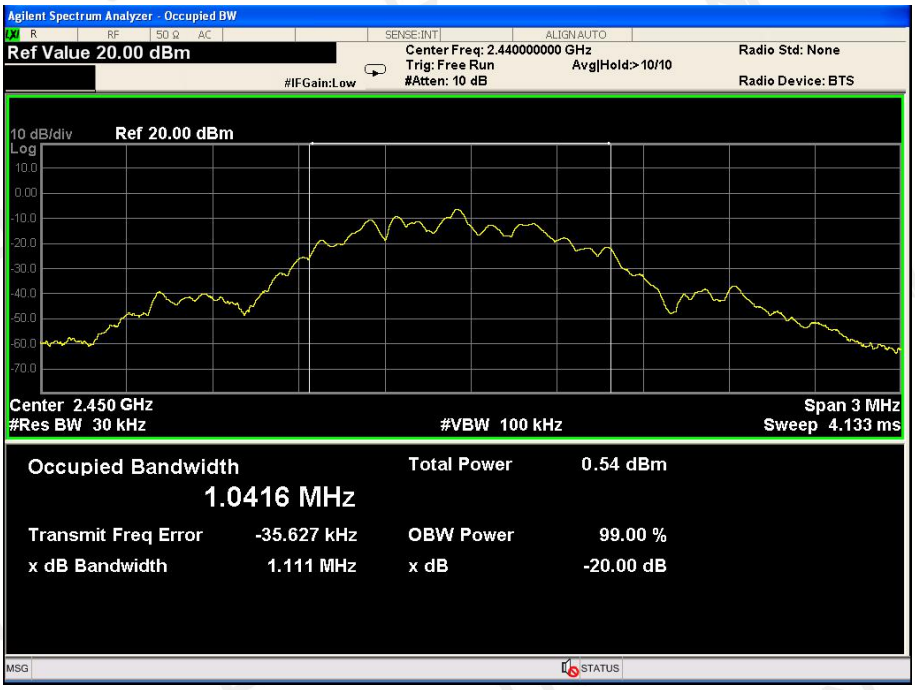
Same asRadiated Emission Measurement

6.4 Test Result

PASS

Frequency (MHz)	20dB Bandwidth (MHz)	Result
2450	1.111	PASS

CH:2450MHz

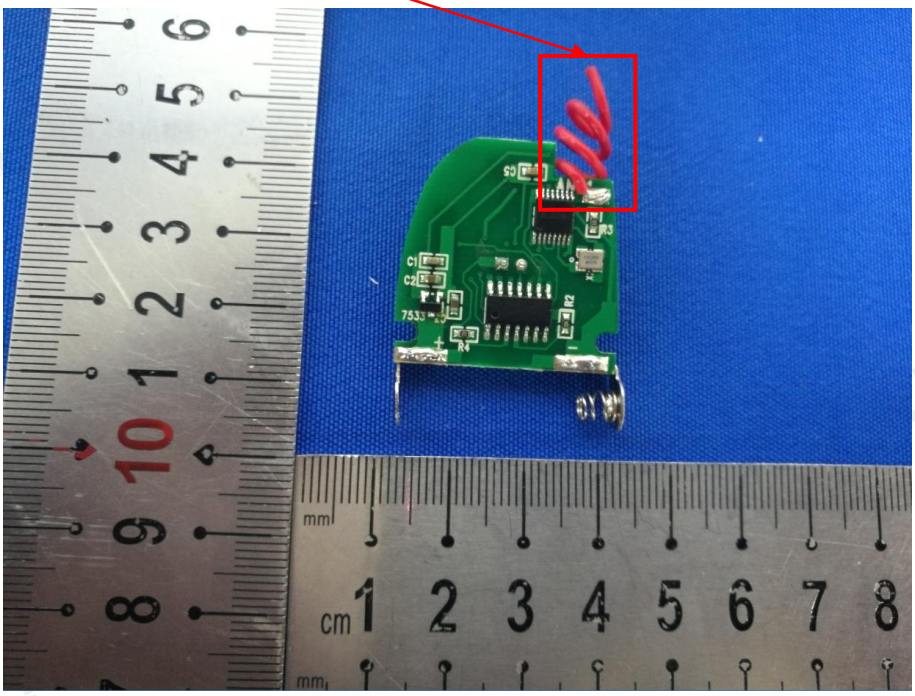


7 ANTENNA REQUIREMENT

Standard Applicable:
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed toensure 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 Internet Antenna, The directional gains of antenna used for transmitting is 1dBi.

ANTENNA:



8 PHOTOGRAPH OF TEST

8.1Radiated Emission

End of Report