

## FCC PART 15C

## TEST REPORT

For

### XIAMEN INTERACTIVE TECHNOLOGY CO.,LTD.

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**FCC ID: 2AOQT-WT01-02A**

<b>Report Type:</b> Original Report	<b>Product Name:</b> SMART MINI LIBRARY
<b>Report Number:</b> RXM180102052-00A	
<b>Report Date:</b> 2018-05-30	
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## GENERAL INFORMATION

### Product Description for Equipment Under Test (EUT)

<b>EUT Name:</b>	SMART MINI LIBRARY
<b>EUT Model:</b>	WT01-02A
<b>Multiple Models:</b>	WT01-01A, WT01-01B, WT01-01C, WT01-02B, WT01-02C, WT02-01A, WT02-01B, WT02-01C, WT02-02A, WT02-02B, WT02-02C, WT-1000, WT-2000, WT-3000, WT-4000, WT-5000, ST01-05A, ST01-05B, ST02-05A, ST02-05B, ST01-10A, ST01-10B, ST02-10A, ST02-10B
<b>FCC ID:</b>	2AOQT-WT01-02A
<b>Rated Input Voltage:</b>	AC 120V/60Hz
<b>External Dimension:</b>	Length (153.5cm)*Width (45.2cm)*High (188.5cm)
<b>Serial Number:</b>	180102052
<b>EUT Received Date:</b>	2018.01.03

*Note: The series product models WT01-01A, WT01-01B, WT01-01C, WT01-02B, WT01-02C, WT02-01A, WT02-01B, WT02-01C, WT02-02A, WT02-02B, WT02-02C, WT-1000, WT-2000, WT-3000, WT-4000, WT-5000, ST01-05A, ST01-05B, ST02-05A, ST02-05B, ST01-10A, ST01-10B, ST02-10A, ST02-10B are electrically identical with the tested model WT01-02A, we selected WT01-02A for fully testing. The differences between them were explained in the attached declaration letter.*

### Objective

This type approval report is prepared on behalf of XIAMEN INTERACTIVE TECHNOLOGY CO.,LTD. in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communications Commission's rules.

The objective is to determine the compliance of the EUT with FCC rules, sec 15.203, 15.205, 15.207, 15.209 and 15.225.

### Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AOQT-WT01-02A.

## Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
radiated Emissions	9kHz~30MHz: 4.12dB 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in a test mode.

The device was operating on 13.56MHz

### EUT Exercise Software

No software used in test.

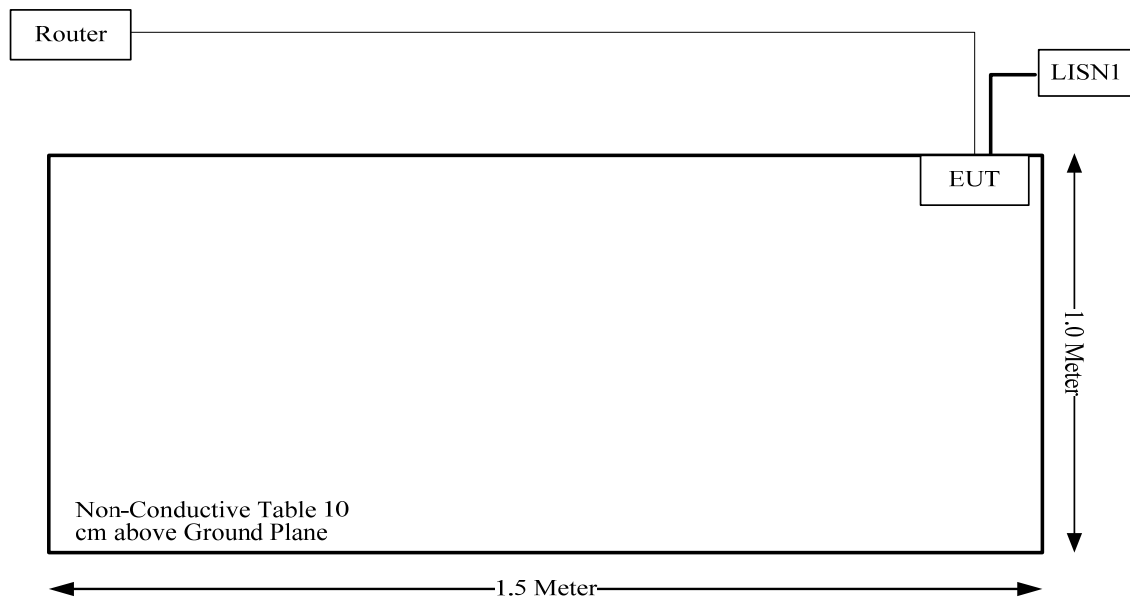
### Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Tenda	Router	W311R	/

### Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	No	No	10	Router	EUT

### Block Diagram of Test Setup



**Test Equipment List**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
EMCO	Passive Loop	6512	9706-1206	2017-03-05	2020-03-04
Dongzhixu	High Temperature Test Chamber	DP1000	201105083-4	2017-09-10	2018-09-10
UNI-T	Multimeter	UT39A	M130199938	2017-05-09	2018-05-09

\* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emission	Compliance
§15.225 §15.209 §15.205	Radiated Emission Test	Compliance
§15.225(e)	Frequency Stability	Compliance
§15.215(c)	20 dB Emission Bandwidth	Compliance

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## **FCC§15.203- ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to FCC § 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.

### **Antenna Connected Construction**

The EUT has one integral antenna arrangement, which was permanently attached and fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.



## FCC §15.207 – AC LINE CONDUCTED EMISSION

### Applicable Standard

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 3 below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured in accordance with the reference publication mentioned in Section 3.

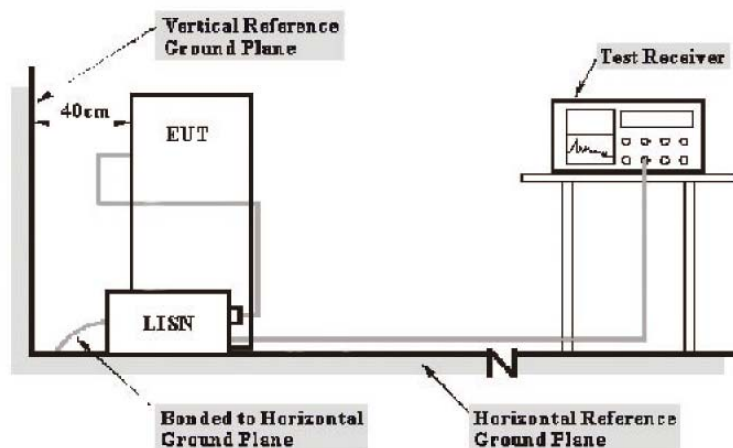
Table 3 - AC Power Lines Conducted Emission Limits		
Frequency range (MHz)	Conducted limit (dBμV)	
	Quasi-Peak	Average**
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Note:

\* The level decreases linearly with the logarithm of the frequency.

\*\* A linear average detector is required.

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 30 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with an AC 120V/60Hz power source.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### Test Procedure

During the conducted emission test, the EUT was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

According FCC publication number 174176, for a device with a permanent antenna operating at or below 30 MHz, the measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) perform the AC line conducted tests with the permanent antenna to determine compliance with the Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the permanent antenna to determine compliance with the Section 15.207 limits within the transmitter's fundamental emission band.

### Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

$V_C$ : corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_C$ : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

### Test Data

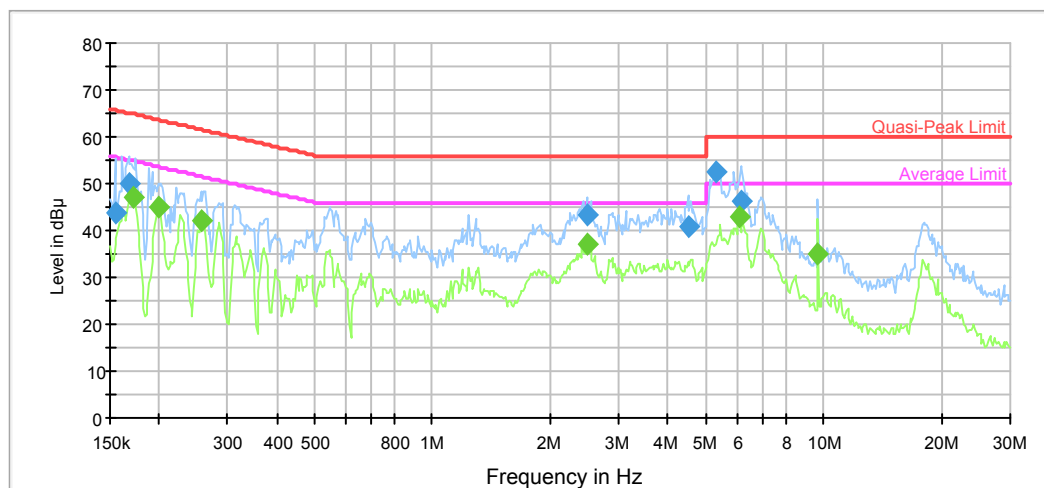
#### Environmental Conditions

<b>Temperature:</b>	29.7 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	102.5 kPa

*The testing was performed by Vern Shen on 2018-04-28.*

**Result:** Compliance.

Model Number: WT01-02A  
Port: L  
Test Mode: Operating  
Power Source: AC 120V/60Hz



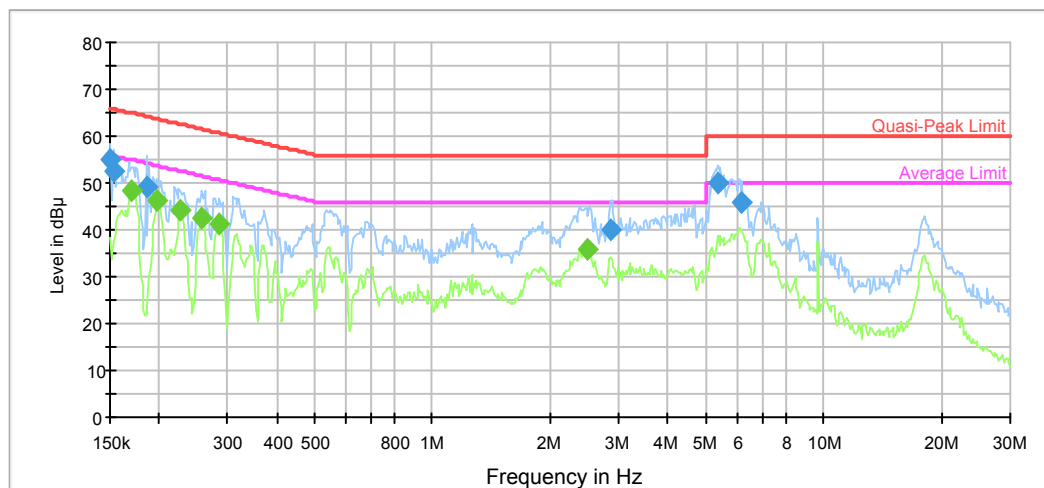
## Final Result 1

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.154858	43.6	9.000	L1	11.1	22.1	65.7
0.167702	50.2	9.000	L1	10.9	14.9	65.1
2.478557	43.3	9.000	L1	9.8	12.7	56.0
4.505456	40.9	9.000	L1	9.8	15.1	56.0
5.326108	52.5	9.000	L1	9.8	7.5	60.0
6.147514	46.1	9.000	L1	9.8	13.9	60.0

## Final Result 2

Frequency (MHz)	Average (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.171759	47.2	9.000	L1	10.9	7.7	54.9
0.199835	45.1	9.000	L1	10.6	8.5	53.6
0.257874	42.2	9.000	L1	10.3	9.3	51.5
2.478557	37.1	9.000	L1	9.8	8.9	46.0
6.098724	42.9	9.000	L1	9.8	7.1	50.0
9.681660	35.1	9.000	L1	9.9	14.9	50.0

Model Number: WT01-02A  
Port: N  
Test Mode: Operating  
Power Source: AC 120V/60Hz



### Final Result 1

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.150000	54.9	9.000	N	11.2	11.1	66.0
0.153629	52.6	9.000	N	11.1	13.2	65.8
0.186006	49.3	9.000	N	10.7	14.9	64.2
2.860806	40.2	9.000	N	9.8	15.8	56.0
5.368716	50.2	9.000	N	9.8	9.8	60.0
6.196694	45.7	9.000	N	9.8	14.3	60.0

### Final Result 2

Frequency (MHz)	Average (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.170396	48.5	9.000	N	10.9	6.4	54.9
0.198249	46.1	9.000	N	10.6	7.6	53.7
0.227007	44.1	9.000	N	10.5	8.4	52.6
0.255827	42.3	9.000	N	10.3	9.2	51.6
0.283749	41.1	9.000	N	10.2	9.6	50.7
2.478557	35.8	9.000	N	9.8	10.2	46.0

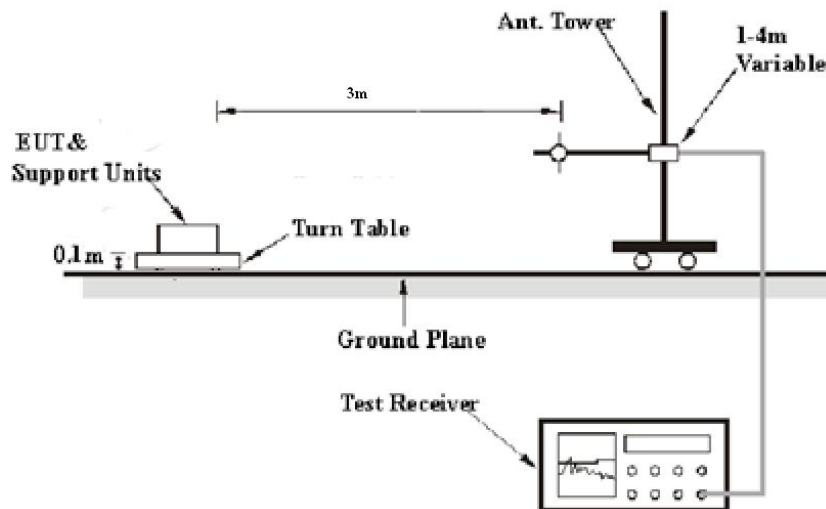
## FCC§15.225, §15.205 & §15.209- RADIATED EMISSIONS

### Applicable Standard

As per FCC Part 15.225:

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

### EUT Setup



The radiated emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The system was investigated from 9 kHz to 1 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Measurement
9 kHz – 150 kHz	200 Hz	1 kHz	QP
150 kHz – 30 MHz	9 kHz	30 kHz	QP
30 MHz – 1000 MHz	120 kHz	300 kHz	QP

If the maximized peak measured value complies with the limit, then it is unnecessary to perform an QP measurement

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209&15.225.

### Test Data

#### Environmental Conditions

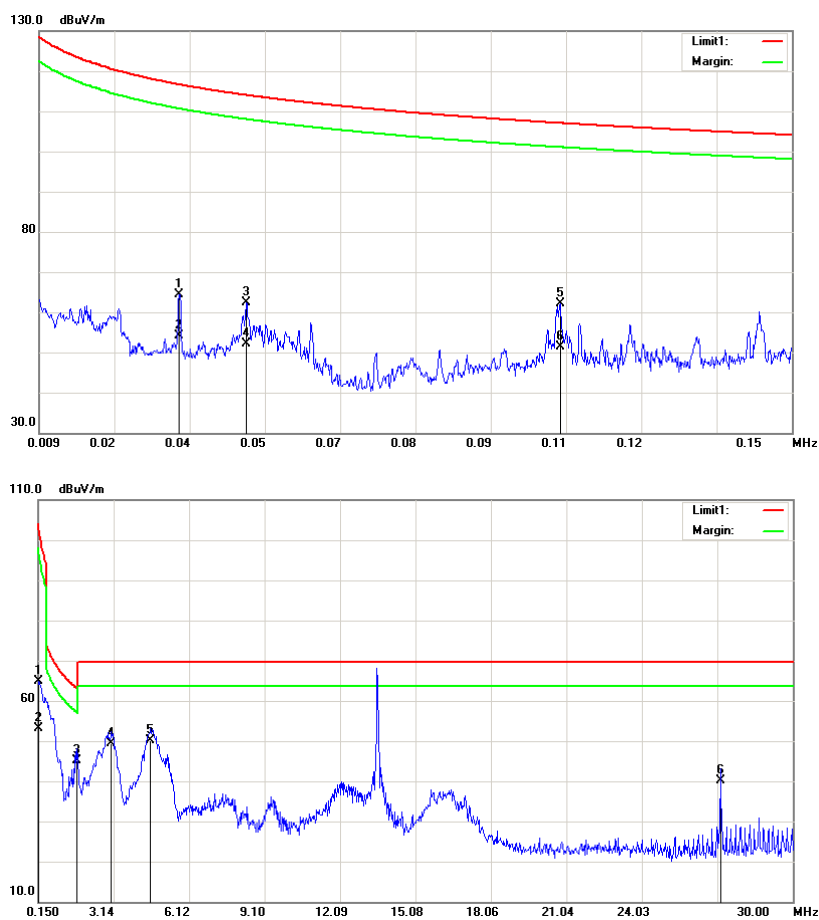
Temperature:	25.1 °C
Relative Humidity:	42 %
ATM Pressure:	101.1 kPa

*\* The testing was performed by Vern Shen on 2018-03-30.*

**Result:** Compliance.

*Test mode: Transmitting*

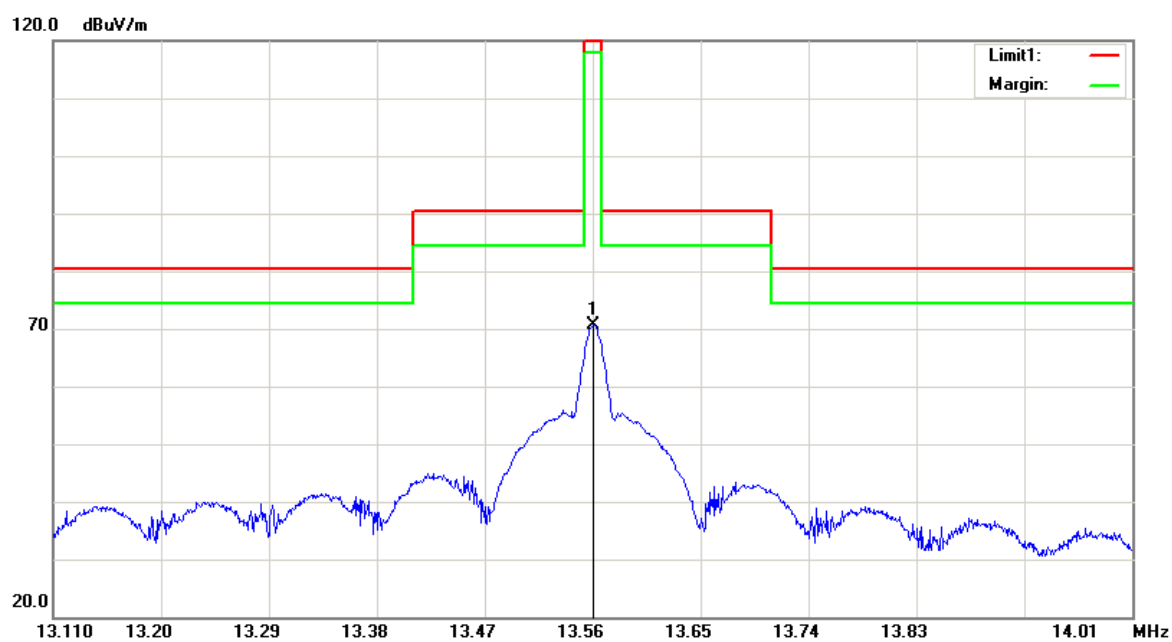
1) 9 kHz~30MHz:



Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
0.0352	-11.52	peak	75.94	64.42	116.67	52.25
0.0478	-11.71	peak	74.02	62.31	114.01	51.70
0.1066	-4.32	peak	66.35	62.03	107.05	45.02
0.1797	28.34	peak	36.57	64.91	102.51	37.60
1.6724	27.07	peak	18.03	45.10	63.13	18.03
3.0455	36.07	peak	13.23	49.30	69.54	20.24
4.5976	39.16	peak	11.04	50.20	69.54	19.34
27.1343	31.39	peak	8.71	40.10	69.54	29.44

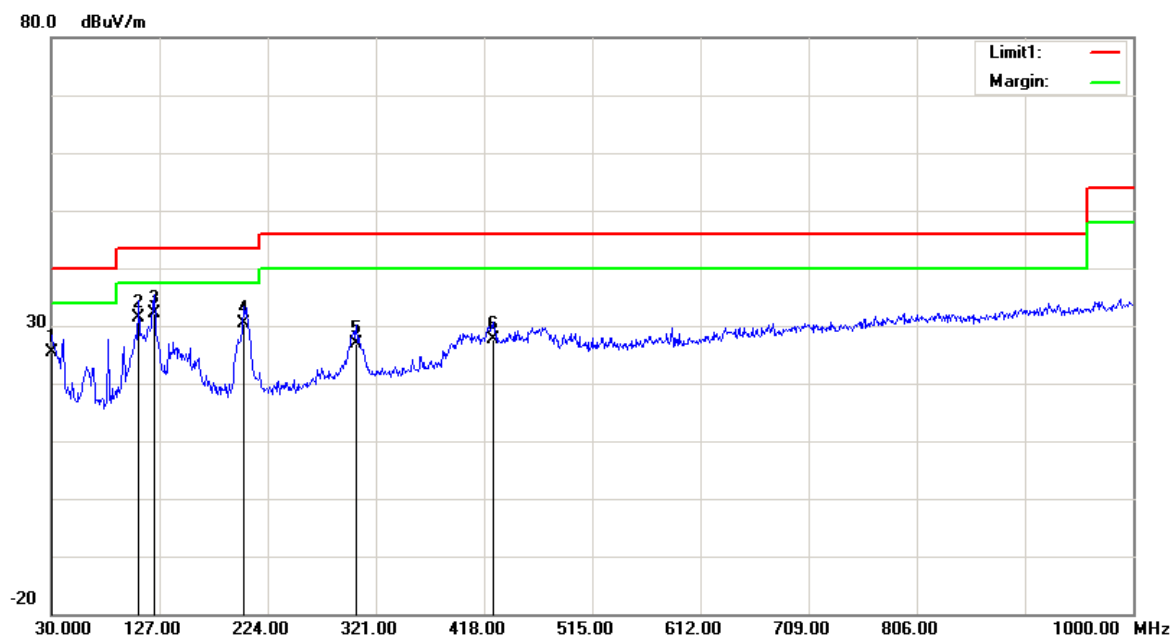


Fundamental:

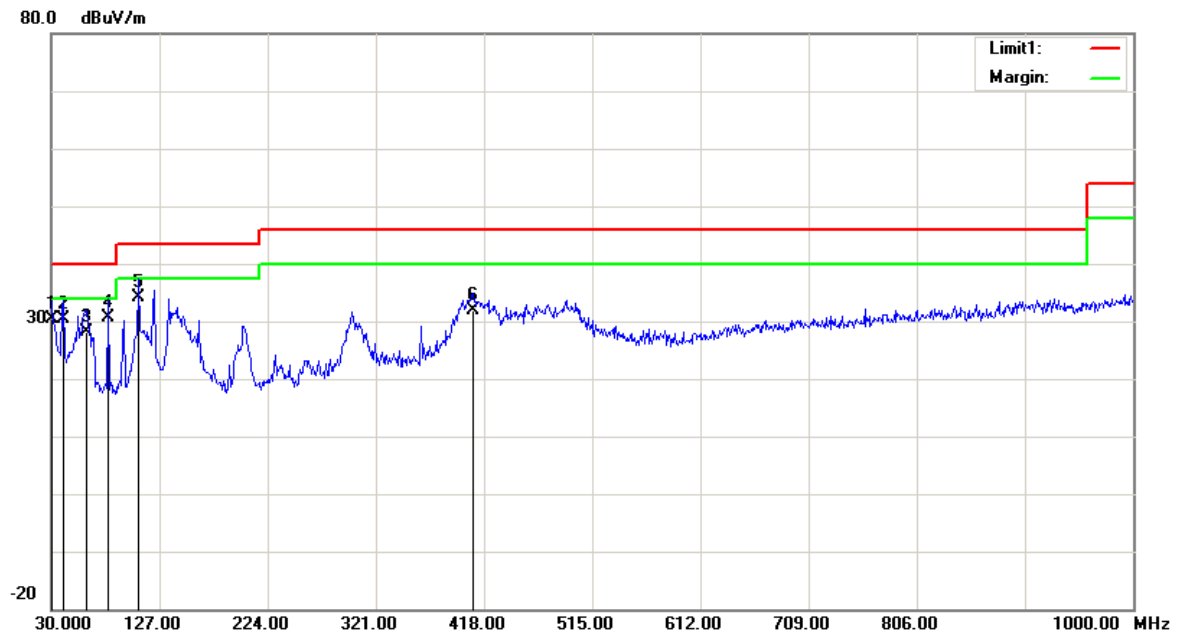


No.	Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1	13.5610	61.36	peak	9.29	70.65	124.00	53.35

30 MHz-1GHz:

**Horizontal**

No.	Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1	30.0000	23.86	QP	1.54	25.40	40.00	14.60
2	108.5700	38.17	QP	-6.77	31.40	43.50	12.10
3	122.1500	37.02	QP	-4.82	32.20	43.50	11.30
4	202.6600	36.45	QP	-6.15	30.30	43.50	13.20
5	303.5400	30.96	QP	-3.96	27.00	46.00	19.00
6	425.7600	29.09	QP	-1.49	27.60	46.00	18.40

**Vertical**

No.	Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1	30.0000	28.96	QP	1.54	30.50	40.00	9.50
2	40.6700	36.85	QP	-6.35	30.50	40.00	9.50
3	62.0100	40.29	QP	-12.19	28.10	40.00	11.90
4	81.4100	42.08	QP	-11.38	30.70	40.00	9.30
5	108.5700	40.97	QP	-6.77	34.20	43.50	9.30
6	408.3000	33.66	QP	-1.86	31.80	46.00	14.20

**FCC§15.225(e) - FREQUENCY STABILITY**

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**Applicable Standard**

As per FCC Part 15.225:

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**Test Procedure**

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC power.

The RF part was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to the end point of the battery. The output frequency was recorded for each voltage.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	24.3 °C
<b>Relative Humidity:</b>	46 %
<b>ATM Pressure:</b>	101.4 kPa

*\* The testing was performed by Vern Shen on 2018-03-31.*

**Result:** Compliance.

*Test Mode: Transmitting*

$f_o = 13.56 \text{ MHz}$				
Temperature	Voltage	Measured frequency	Frequency Error	Limit
°C	V <sub>DC</sub>	MHz	Hz	Hz
-20	12	13.5602	200	±1356
-10		13.5601	100	±1356
0		13.5602	200	±1356
10		13.5603	300	±1356
20		13.5605	500	±1356
25		13.5605	500	±1356
30		13.5605	500	±1356
40		13.5605	500	±1356
50		13.5606	600	±1356

Note: the 13.56MHz RF Part was place into the temperature chamber, the RF part powered by 12V dc from system.

## **FCC §15.215(c) – 20 dB EMISSION BANDWIDTH & 99% Occupied Bandwidth**

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### **Applicable Standard**

As per FCC Part 15.21(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through § 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of band operation.

### **Test Procedure**

Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

### **Test Data**

#### **Environmental Conditions**

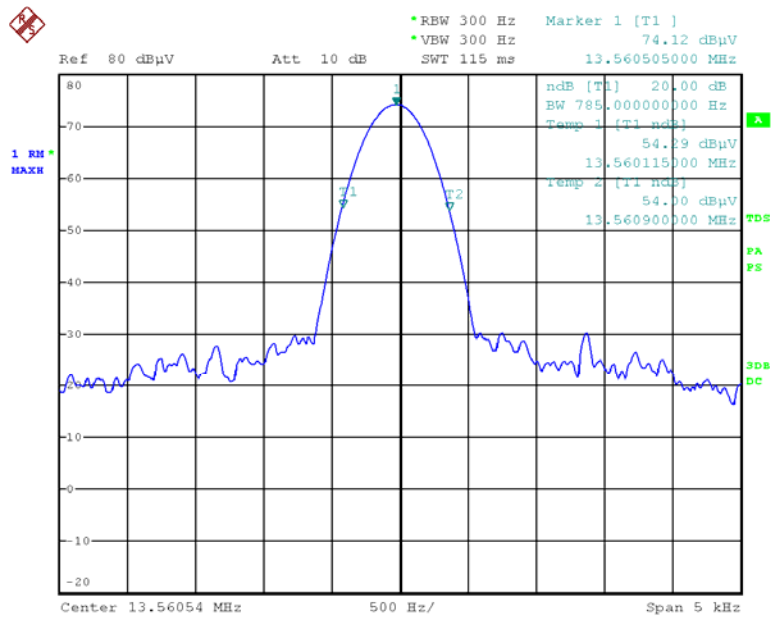
<b>Temperature:</b>	24.3 °C
<b>Relative Humidity:</b>	46 %
<b>ATM Pressure:</b>	101.4 kPa

*\* The testing was performed by Vern Shen on 2018-03-31.*

**Result:** Compliance.

*Test Mode: Transmitting*

### 20 dB Emission Bandwidth(0.785 kHz)



Date: 31.MAR.2018 00:54:07

\*\*\*\*\* END OF REPORT \*\*\*\*\*