

FCC TEST REPORT

FCC ID : 2AALB-201761-01

Applicant : Camelot SI. LLC

Address : 27725 Stansbury Blvd., Ste. 175, Farmington Hills, Michigan, 48334, USA

Equipment Under Test (EUT) :

Product description : FM Transmitter

Model No. : T11, 201761-01

Standards : FCC 15 Paragraph 15.239

Date of Test : July 02~15, 2013

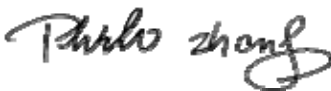
Date of Issue : July 15, 2013

Test Result : PASS

Project Engineer : Olic huang



Reviewed By : Philo zhong



Prepared By:

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3 Test Summary

Test Items	Test Requirement	Standard Paragraph	Result
Radiated Emission (0.009MHz to 1080MHZ)	FCC PART 15: 2008	FCC PART 15.209&15.239	Compliance
Conducted Emission (150KHz to 30MHz)	FCC PART 15: 2008	FCC PART 15.207	Not applicable
Bandwidth requirement	FCC PART 15: 2008	FCC PART 15.239a	Compliance
Band edge requirement	FCC PART 15: 2008	FCC PART 15.239a	Compliance
Antenna requirement	FCC PART15:2008	FCC PART 15.203	Compliance

Note : denote that for more details of the EUT , please refer to the relating test items as below .

Remark : the methods of measurement in all the test items were according to the ANSI C63.4: 2009.

In this whole report, TX(or tx) means Transmitter

4 General Information

4.1 Client Information

Applicant: Camelot SI. LLC
Address of Applicant: 27725 Stansbury Blvd., Ste. 175, Farmington Hills,
Michigan, 48334, USA

Manufacturer: SAGE HUMAN ELECT INTL CO., LTD.
Address: 3/F, Building NO. A15, Qinghu Industry Park, Silicon Valley
Power, Longhua Town, Bao'an District, Shenzhen, China

4.2 General Description of E.U.T.

Product description: FM Transmitter
Modulation: FM
Frequency range: 88.1~107.9MHZ
Maximum power: 48.98dBuV/m
Brand Name: Sharper Image
Model No.: T11,201761-01
Model difference: The models have same schematic ,PCB layout and structure.
As a matter of fact, the models only an one product and for
different client.

4.3 Details of E.U.T.

Power Supply: DC12.0-24.0V
Remark: the EUT was tested the two voltages of DC12.0V and
DC24.0V, and the worse case was the DC24.0V, so the data
show was the worse case only in the report.

4.4 Description of Support Units

iPod is a only support unit during test.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a FM Transmitter. The standards used were
FCC Part 15 Paragraph 15.239, Paragraph 15.209, Paragraph 15.203, Paragraph 15.33,
Paragraph 15.35.

4.6 Test Facility

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

- **IC – Registration No.: 7760A**

Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.

Registration 7760A, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. 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. Registration 880581, May 26, 2011.

4.7 Test Location

All Emissions tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Bao'an District, Shenzhen 518105, Guangdong, China.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101178	Aug. 13,2012	Aug. 12,2013
2.	LISN	R&S	ENV216	101215	Aug. 13,2012	Aug. 12,2013
3.	Cable	HUBER+SUHNER	CBL2-NN-3M	2230300	Aug. 13,2012	Aug. 12,2013
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Aug. 13,2012	Aug. 12,2013
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Aug. 13,2012	Aug. 12,2013
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Aug. 13,2012	Aug. 12,2013
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Aug. 13,2012	Aug. 12,2013
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 12,2013
6.	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-254	Aug. 13,2012	Aug. 12,2013
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 12,2013
8.	10m Coaxial Cable with N- plug	SCHWARZBECK	AK 9515 H	-	Aug. 13,2012	Aug. 12,2013
9.	10m 50 Ohm Coaxial Cable with N-plug	SCHWARZBECK	AK 9513	-	Aug. 13,2012	Aug. 12,2013
10.	Positioning Controller	C&C LAB	CC-C-IF	-	Aug. 13,2012	Aug. 12,2013
11.	Color Monitor	SUNSPO	SP-14C	-	Aug. 13,2012	Aug. 12,2013

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Temperature	± 1 °C
DC Source	$\pm 0.05\%$
Radiated Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	± 0.5 dB (9KHz~1000MHz)
	± 1 dB(1000M~26500MHz)
Conducted Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Radiation Emission Test

Product Name:	FM Transmitter
Test Requirement:	FCC Part15 Paragraph 15.209&15.239
Test Method:	ANSI C63.4:2009
Frequency Range:	0.009MHZ to 1080MHZ
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

6.1 Test Equipment

Please refer to Section 5 this report.

6.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase centre variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

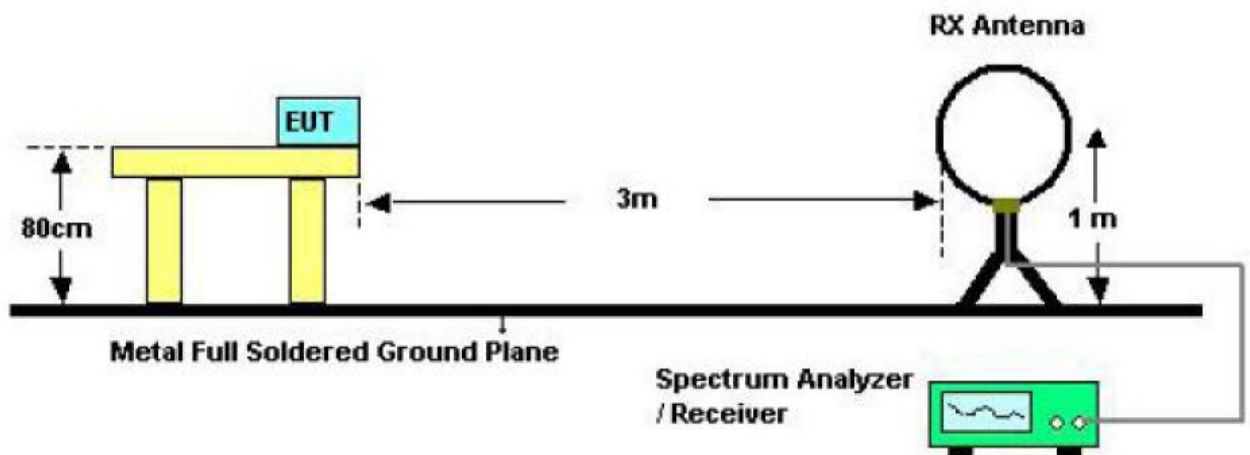
Based on ANSI C63.4: 2009, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is $\pm 5.03\text{dB}$.

6.3 Test Procedure

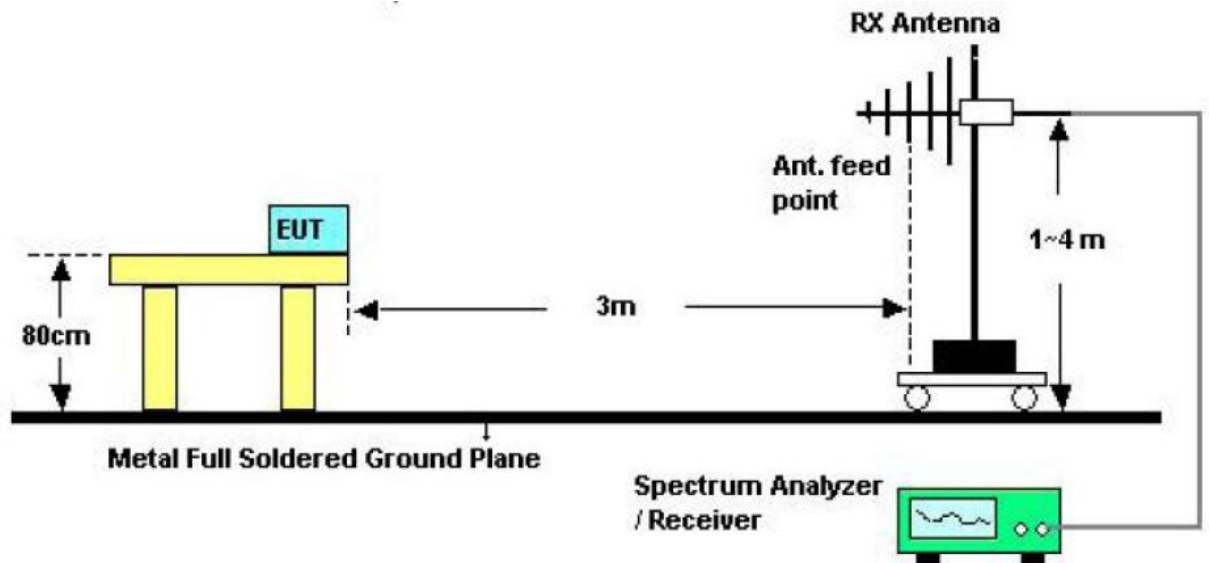
1. New battery were installed in the equipment under test for radiated emissions test.
2. This is a handheld device, The radiation emission should be tested under 3-axes (X, Y, Z) position (X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
3. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
4. All data was recorded in the peak and average detection mode for fundamental frequencies and Quasi-peak detection mode for other frequencies.
5. The EUT was under FM Transmit modulation with signals mode during the final qualification test and the configuration was used to represent the worst case results.

6.4 Radiated Test Setup

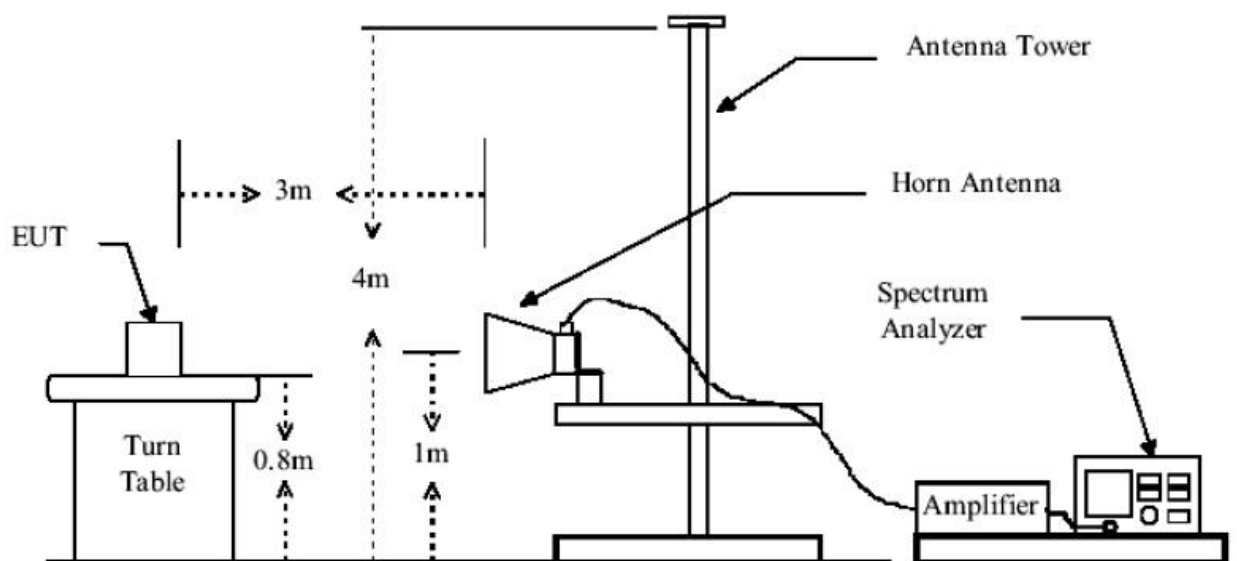
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2009, The specification used in this report was the FCC Part15 Paragraph 15.239 and Paragraph 15.209 limits.



Below 30MHZ Test Setup



Above 30MHZ Test Setup



Above 1GHZ Test Setup

6.5 Test Result & Margin Calculation

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

Correct Factor = Antenna Factor + Cable Factor - Amplifier Gain

Test Result = Indicated Reading + Correct Factor

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

$$\text{Margin} = \text{Test Result} - \text{Limit}$$

6.6 Radiated Emissions Limit

At Frequency Range of 9kHz-1000MHz, 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80	60	74	54

Note: Emission level (dBuV/m)=20log Emission level (uV/m).

Test Frequency :Below 30MHz

Rmark: the test frequency below 30MHz was lower 20dB than the limit, So the data was not showing in the report.

6.7 Radiated Emissions Test Result

1.Fundamental emission

Peak Detector

Test Frequency	Peak(dBuV/m)		Limits dBuV/m	Margin(dB)	
	Vertical	Horizontal		Vertical	Horizontal
88.1	35.52	44.83	68	-32.48	-23.17
98.1	45.58	48.4	68	-22.42	-19.6
107.9	45.64	48.98	68	-22.36	-19.02

Average Detector

Test Frequency	Peak(dBuV/m)		Limits dBuV/m	Margin(dB)	
	Vertical	Horizontal		Vertical	Horizontal
88.1	26.49	41.86	48	-21.51	-6.41
98.1	39.17	43.82	48	-8.83	-4.18
107.9	43.17	44.29	48	-4.83	-3.71

2.Harmonics&Spurious Emissions

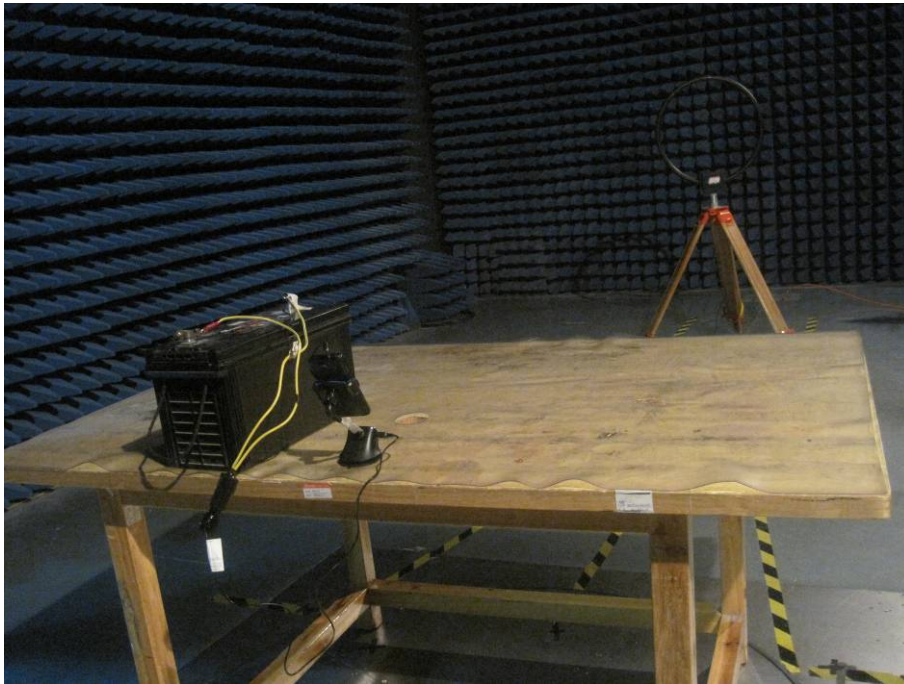
Frequency (MHZ)	Detector	Antenna Polarity	Result dBuV/m	Limit dBuV/m	Margin (dB)	Antenna Height(m)	Turntable Angle (°)
Lowest Channel:88.1MHZ							
176.2	QP	Vertical	32.87	43.5	-10.63	1.1	120
264.3	QP	Vertical	25.99	46	-20.01	1.2	110
352.4	QP	Vertical	23.15	46	-22.85	1.2	45
440.5	QP	Vertical	20.18	46	-25.82	1	60
528.6	QP	Vertical	17.34	46	-28.66	1.1	90
616.7	QP	Vertical	16.19	46	-29.81	1.1	75
704.8	QP	Vertical	13.27	46	-32.73	1.3	120
792.9	QP	Vertical	10.58	46	-35.42	1.1	110
881	QP	Vertical	10.06	46	-35.94	1	78
176.2	QP	Horizontal	36.41	43.5	-7.09	1.2	60
264.3	QP	Horizontal	27.62	46	-18.38	1.5	45
352.4	QP	Horizontal	22.08	46	-23.92	1.2	110
440.5	QP	Horizontal	21.56	46	-24.44	1.1	85

528.6	QP	Horizontal	18.16	46	-27.84	1.2	110
616.7	QP	Horizontal	15.48	46	-30.52	1.2	220
704.8	QP	Horizontal	15.24	46	-30.76	1.3	110
792.9	QP	Horizontal	11.29	46	-34.71	1.2	90
881	QP	Horizontal	10.13	46	-35.87	1.2	65
Middle Channel:98.1MHZ							
196.2	QP	Vertical	33.14	43.5	-10.36	1.1	46.2
294.3	QP	Vertical	26.02	46	-19.98	1.2	75
392.4	QP	Vertical	22.19	46	-23.81	1.1	101
490.5	QP	Vertical	18.64	46	-27.36	1.1	133
588.6	QP	Vertical	15.20	46	-30.8	1.2	124
686.7	QP	Vertical	13.24	46	-32.76	1.1	75
784.8	QP	Vertical	11.58	46	-34.42	1.2	45
882.9	QP	Vertical	10.38	46	-35.62	1.1	72
981	QP	Vertical	10.13	46	-35.87	1.1	120
196.2	QP	Horizontal	37.21	43.5	-6.29	1.3	133
294.3	QP	Horizontal	27.48	46	-18.52	1.5	65
392.4	QP	Horizontal	23.28	46	-22.72	1.2	42
490.5	QP	Horizontal	19.05	46	-26.95	1.5	43
588.6	QP	Horizontal	16.57	46	-29.43	1.35	105
686.7	QP	Horizontal	13.34	46	-32.66	1.2	120
784.8	QP	Horizontal	12.35	46	-33.65	1.2	130
882.9	QP	Horizontal	11.42	46	-34.58	1.2	45
981	QP	Horizontal	10.24	46	-35.76	1.3	46
Highest Channel:107.9MHZ							
215.8	QP	Vertical	34.21	43.5	-9.29	1.1	132
323.7	QP	Vertical	28.44	46	-17.56	1.2	45
431.6	QP	Vertical	21.16	46	-24.84	1.2	110
539.5	QP	Vertical	16.26	46	-29.74	1.1	46
647.4	QP	Vertical	12.01	46	-33.99	1.1	65
755.3	QP	Vertical	11.24	46	-34.76	1.3	72
863.2	QP	Vertical	10.97	46	-35.03	1.1	42

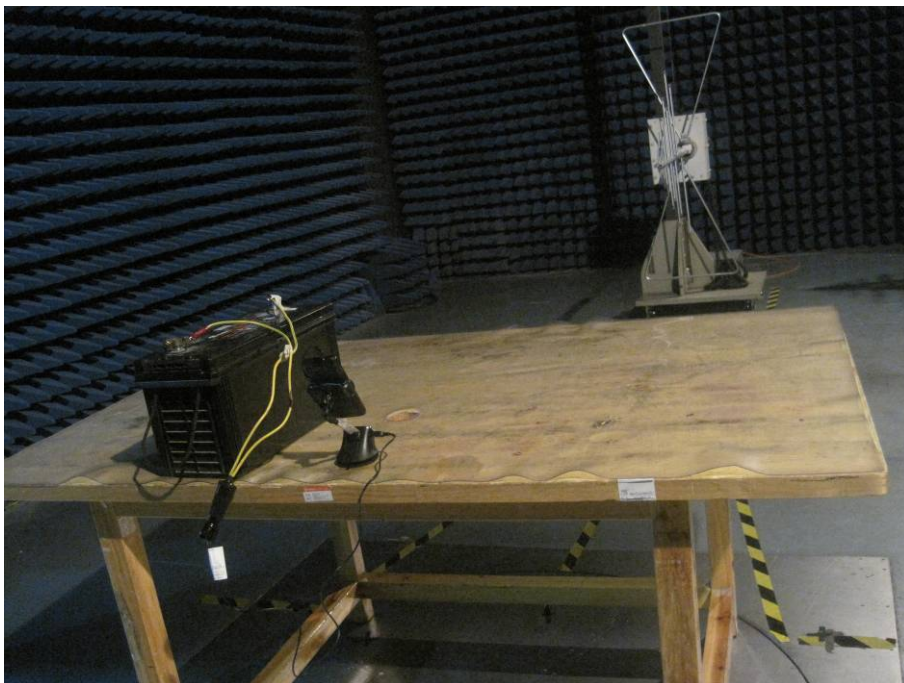
971.1	QP	Vertical	10.26	46	-35.74	1.2	43
1079	PK	Vertical	20.35	74	-53.65	1.3	133
1079	AV	Vertical	9.58	54	-44.42	1.1	90
215.8	QP	Horizontal	37.29	43.5	-6.21	1.4	120
323.7	QP	Horizontal	27.71	46	-18.29	1.2	44
431.6	QP	Horizontal	25.23	46	-20.77	1.5	70
539.5	QP	Horizontal	20.33	46	-25.67	1.3	50
647.4	QP	Horizontal	18.41	46	-27.59	1.5	70
755.3	QP	Horizontal	16.09	46	-29.91	1.3	75
863.2	QP	Horizontal	15.47	46	-30.53	1.4	45
971.1	QP	Horizontal	11.68	46	-34.32	1.3	45
1079	PK	Horizontal	22.79	74	-51.21	1.3	150
1079	AV	Horizontal	10.21	54	-43.79	1.4	110

6.8 Radiated Emissions Test Setup View

Frequency Band: Below 30MHz.



Frequency Band: 30MHz to 1GHz.



Frequency Band: Above 1GHz.



7 Bandwidth Test

Test Requirement: FCC Part15 C
Test Method: ANSI C63.4:2009
Receiver setup: RBW10KHZ,VBW10KHZ,Span500KHZ,Sweep time 300ms
Limit: 200kHZ

7.1 Test Setup

Same as 6.4

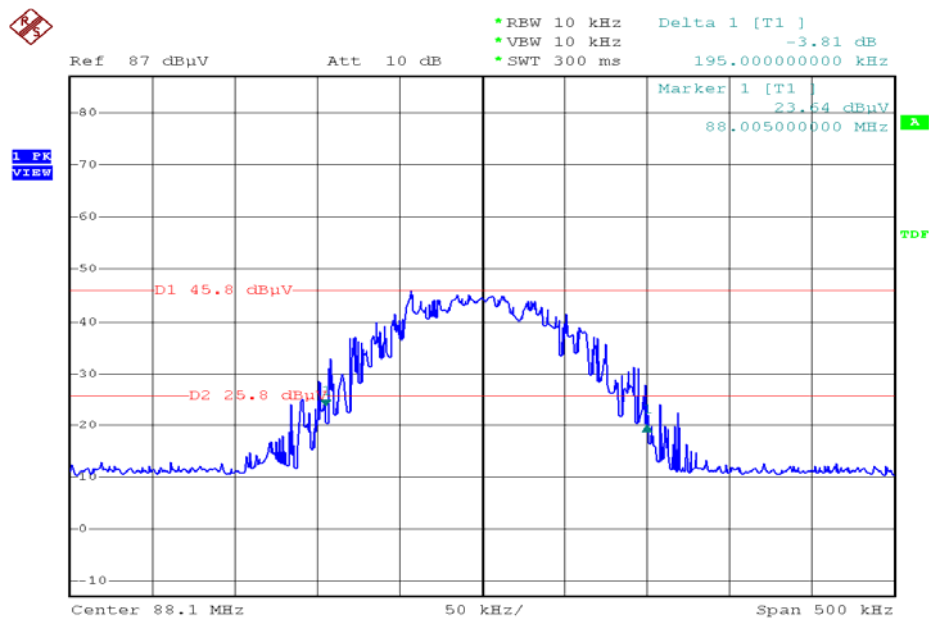
7.2 Method of Measurement

- a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

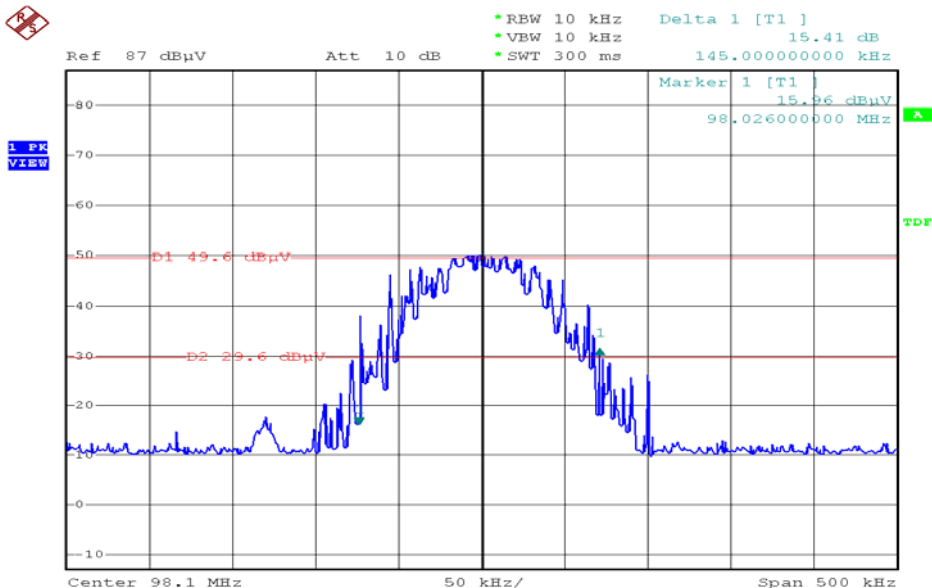
7.3 Test Results

Channel Frequency (MHZ)	20dB bandwidth (KHZ)	Limit (KHZ)
88.1	195	200
98.1	145	200
107.9	155	200

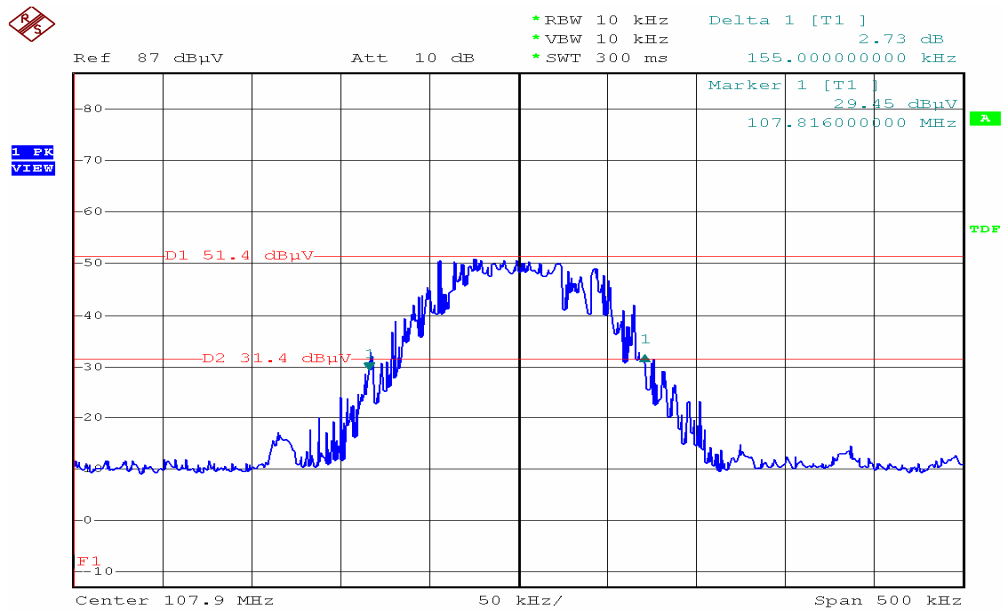
88.1MHz Test plot



98.1MHz Test plot



107.9MHz Test plot



8 Band Edge Test

8.1 Test Limit

Please see the Part15.239a

8.2 Test Setup

Same as 6.4

8.3 Method of measurement

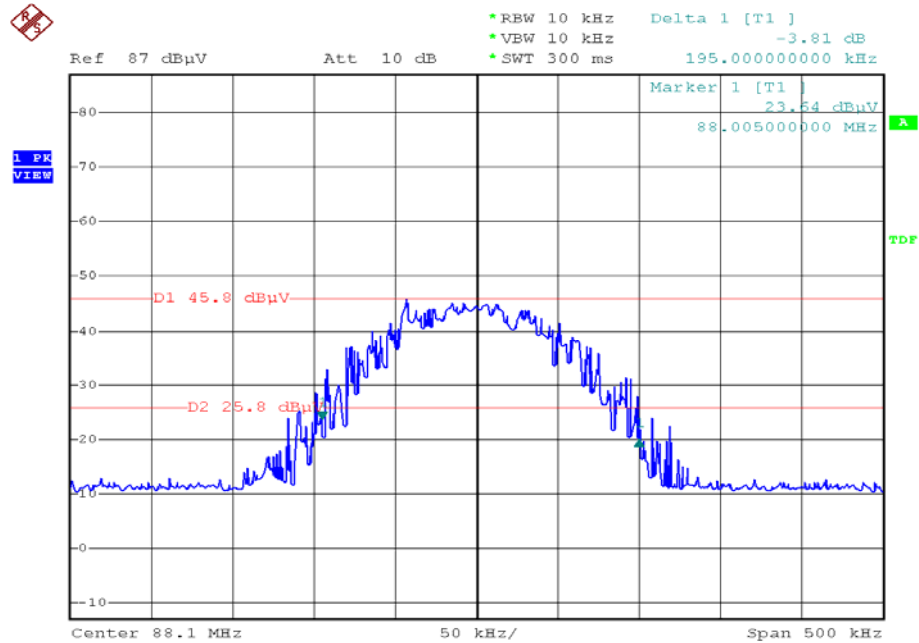
- a) Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission
- b) Turning to Low and High frequency, then reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.
- c) Check the spurious emissions out of band.
- d) RBW, VBW Setting, please see the following test plot.

8.4 Test Results

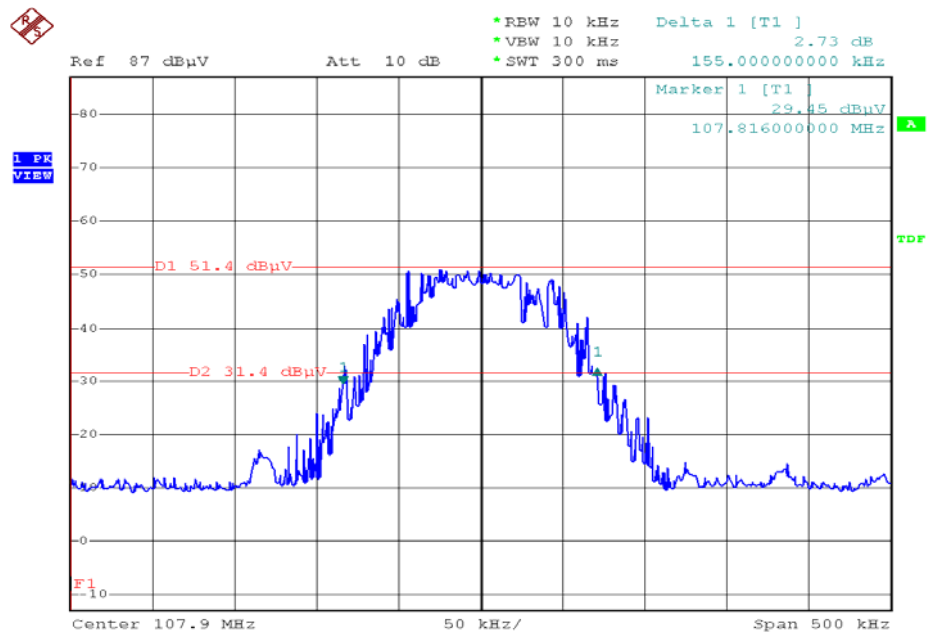
Compliance

For more details, please see the following page.

88.1MHz Test plot



107.9MHz Test plot



9 Antenna Requirement

9.1 Standard requirement

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.

9.2 Result

The device is integral antenna, it's comply with the standard requirement.

10 Photographs - Constructional Details

10.1 EUT-Full View



10.2 EUT-Side View



10.3 EUT-Back View



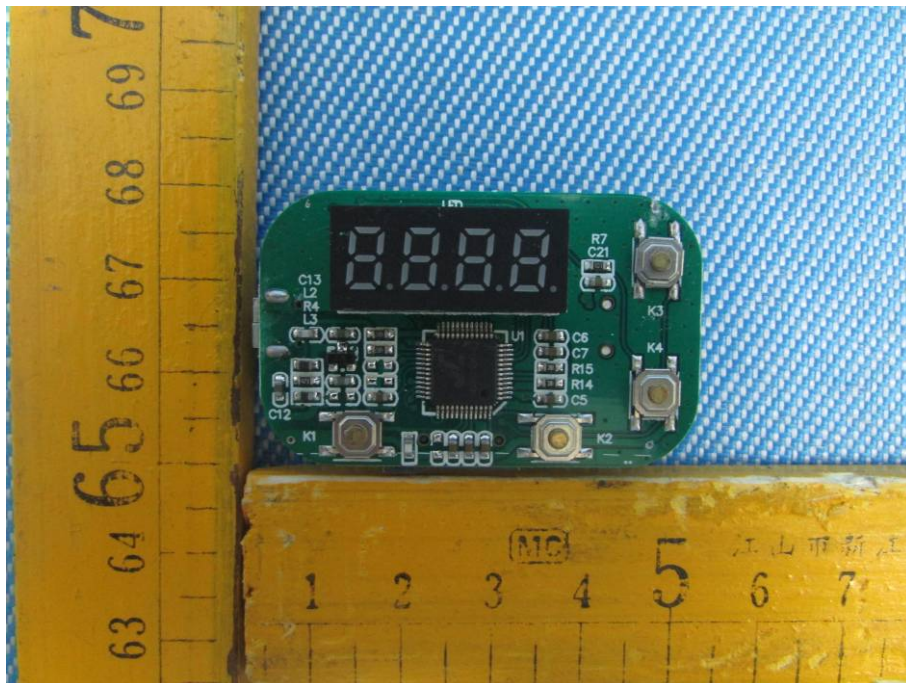
10.4 EUT-Side View



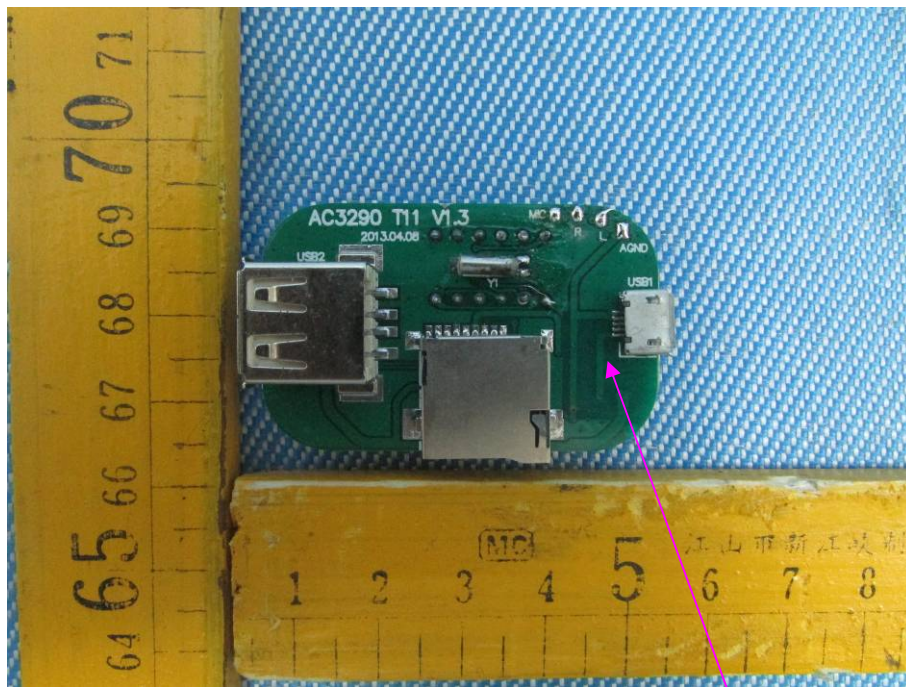
10.5 EUT –Open View



10.6 PCB-Top View



10.7 PCB-Bottom View



Ant. Location

-----End of Report-----