



TEST REPORT

FCC ID: 2AAYMCS-013

Applicant : Shenzhen Minsuo Import & Export Co., Ltd.
Address : Room 532-533, Block B, Baoyuan Huafeng Headquarter Economy Building, No.288 Xixiang Road, Baoan District, Shenzhen, Guangdong, China

Equipment under Test (EUT):

Name : Universal FM transmitter
Model : CS-013

Standards : FCC PART 15, SUBPART C : 2014 (Section 15.239)

Report No. : A1840933 01

Date of Test : November 14 - May 08, 2015

Date of Issue : May 09, 2015

Test Result :	PASS *
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* In the configuration tested, the EUT complied with the standards specified above

Authorized Signature

(Mark Zhu)
General Manager

The manufacture should ensure that all the products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of Shenzhen Alpha Product Testing Co., Ltd. Or test done by Shenzhen Alpha Product Testing Co., Ltd. Approvals in connection with, distribution or use of the product described in this report must be approved by Shenzhen Alpha Product Testing Co., Ltd. Approvals in writing.

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1 General Information

1.1 Description of Device (EUT)

Trade Name : N/A

EUT : Universal FM transmitter

Model No. : CS-013

DIFF. : N/A

Type of Antenna : Integrated Antenna, Max. Gain: 0dBi

Operation Frequency : 88.1-107.9MHz

Channel number : 199

Modulation type : FM

Power Supply : DC 12V Supply by battery of Car power supply system

Applicant : Shenzhen Minsuo Import & Export Co., Ltd.

Address : Room 532-533, Block B, Baoyuan Huafeng Headquarter Economy Building, No. 288 Xixiang Road, Baoan District, Shenzhen, Guangdong, China

Manufacturer : Shenzhen Tilv Technology Co., Ltd.

Address : 4/F-B, Building B, 2nd Xianshun Industrial Area, No. 6, Qinhui Rd., Gushu Community, Xixiang St., Baoan District, Shenzhen, China

1.2 Description of Test Facility

Shenzhen Alpha Product Testing Co., Ltd.

2F, Building B, East Area of Nanchang Second Industrial Zone,
Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China
FCC Registered No.: 203110

2 EMC Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2015.01.19	1 Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2015.01.19	1 Year
Receiver	R&S	ESCI	1166.5950K03-1011	2015.01.19	1 Year
Receiver	R&S	ESCI	101202	2015.01.19	1 Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2015.01.21	1 Year
Horn Antenna	EMCO	3115	640201028-06	2015.01.21	1 Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2015.01.21	1 Year
Cable	Resenberger	N/A	No.1	2015.01.19	1 Year
Cable	SCHWARZBECK	N/A	No.2	2015.01.19	1 Year
Cable	SCHWARZBECK	N/A	No.3	2015.01.19	1 Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2015.01.19	1 Year
Pre-amplifier	R&S	AFS33-18002 650-30-8P-44	SEL0080	2015.01.19	1 Year

3 Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The test procedure used was ANSI Standard C63.4-2014 using a 50 u H LISN. Both Lines were observed. The bandwidth of the receiver was 10kHz with an appropriate sweep speed. The ambient temperature of the EUT was 25°C with a humidity of 58%.

RADIATION INTERFERENCE: The test procedure used was ANSI Standard C63.4-2014 using a ANRITSU spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a micro volt at the output of the antenna. The resolution bandwidth was 100kHz and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3MHz above 1 GHz. The ambient temperature of the EUT was 25°C with a humidity of 58%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer and cable loss. The antenna correction factors and cable loss are stated in terms of dB. The gain of the Pre-selector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF + CABLE = FS

33.20 dBuV + 10.36 dB + 0.9 dB= 44.46 dBuV/m @ 3m

ANSI STANDARD C63.4-2014 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation. When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSI Standard C63.4-2014 10.1.7 with the EUT 40 cm from the vertical ground wall.

4.2 Test mode and Channel list

4.3 Block Diagram

For Radiated Emission:



4.4 Assistant equipment used for test

Description : iPod
 Manufacturer : Apple
 Model No. : iPod classic 3
 FCC DOC approved

4.5 Test Conditions

Temperature range	21-25°C
Humidity range	40-75%
Pressure range	86-106kPa

4.6 Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	2.50dB	
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB	Polarize: V
	2.57dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.04dB	Polarize: V
	3.02dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.84dB	Polarize: H
	3.56dB	Polarize: V
Uncertainty for radio frequency	1×10^{-9}	
Uncertainty for temperature	0.2°C	
Uncertainty for humidity	3%	
Uncertainty for DC and low frequency voltages	0.06%	

5 POWER LINE CONDUCTED EMISSION

5.1 Conducted Emission Limits(15.209)

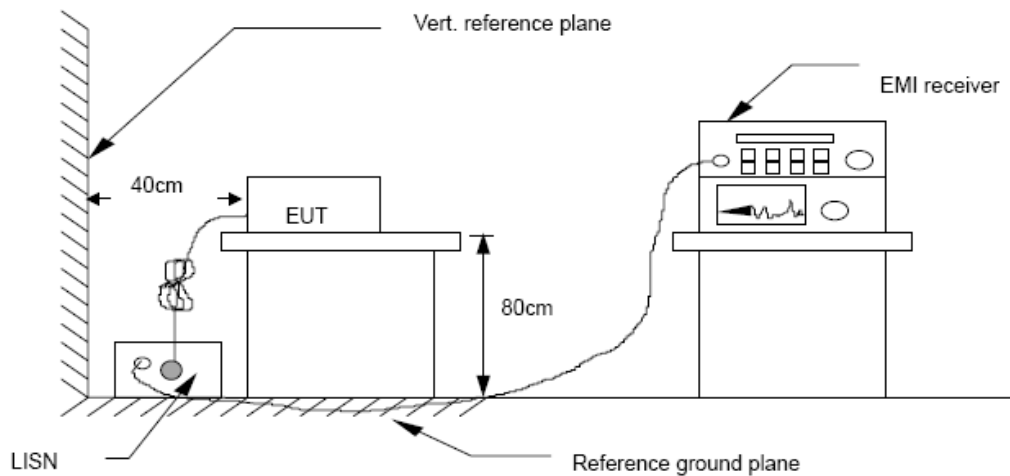
Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3. The limit decreases in line with the logarithm of the frequency in the rang of 0.15 to 0.50 MHz.

5.2 Test Setup



5.3 Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4-2014 on Conducted Emission Measurement. The bandwidth of test receiver (R & S ESCS30) is set at 9 kHz.

5.4 Test Results

N/A.

Not apply for products powered by Car DC systems.

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6 Radiation Emission

6.1 Radiation Emission Limits(15.209&239(b) (c))

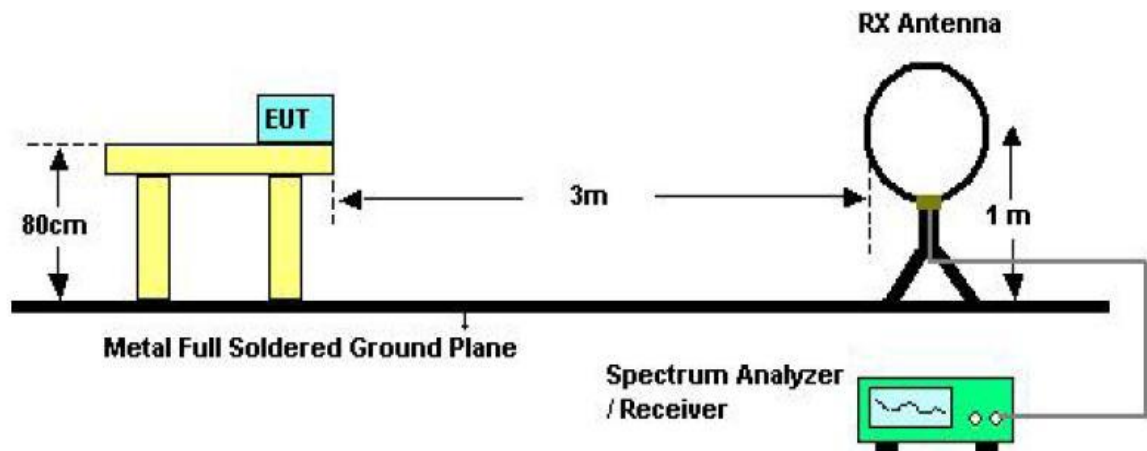
Frequency (MHz)	Field Strength Limits at 3 metres (watts,e.i.r.p.)		
	uV/m	dB uV/m	Measurement distance(m)
0.009-0.490	2400/F(kHz)	XX	300
0.490-1.705	24000/F(kHz)	XX	30
1.705-30	30	29.5	30
30~88	100(3nW)	40	3
88~216	150(6.8nW)	43.5	3
216~960	200(12nW)	46	3
Above960	500(75nW)	54	3
Carrier frequency		93.97(AV)	3
Carrier frequency		113.97(PK)	3

NOTE:

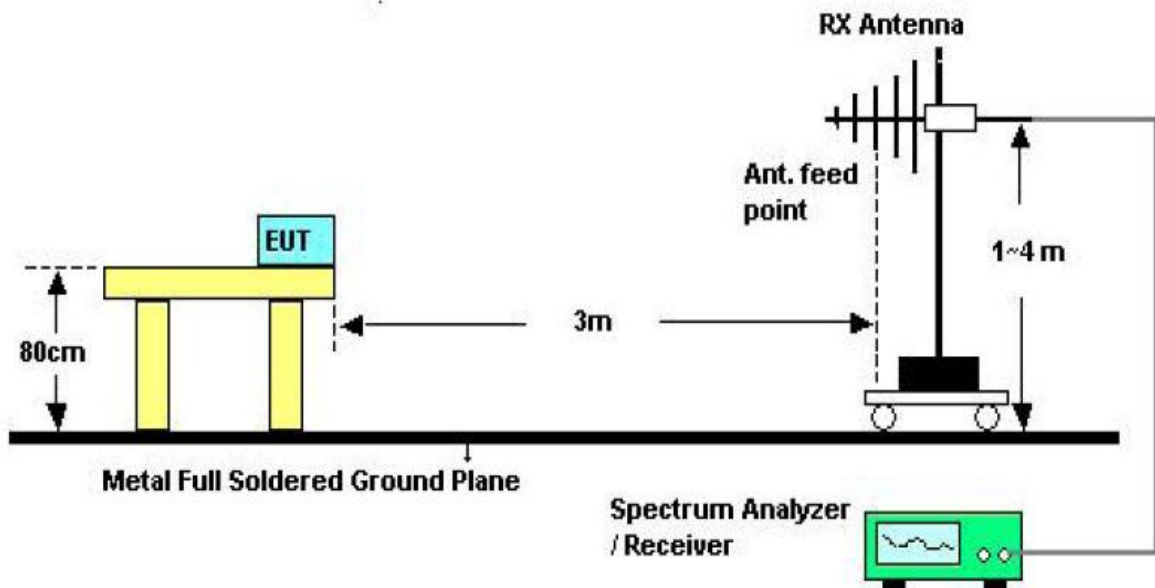
- The tighter limit applies at the band edges.
- Emission Level(dB uV/m)=20log Emission Level(Uv/m)

6.2 Test Setup

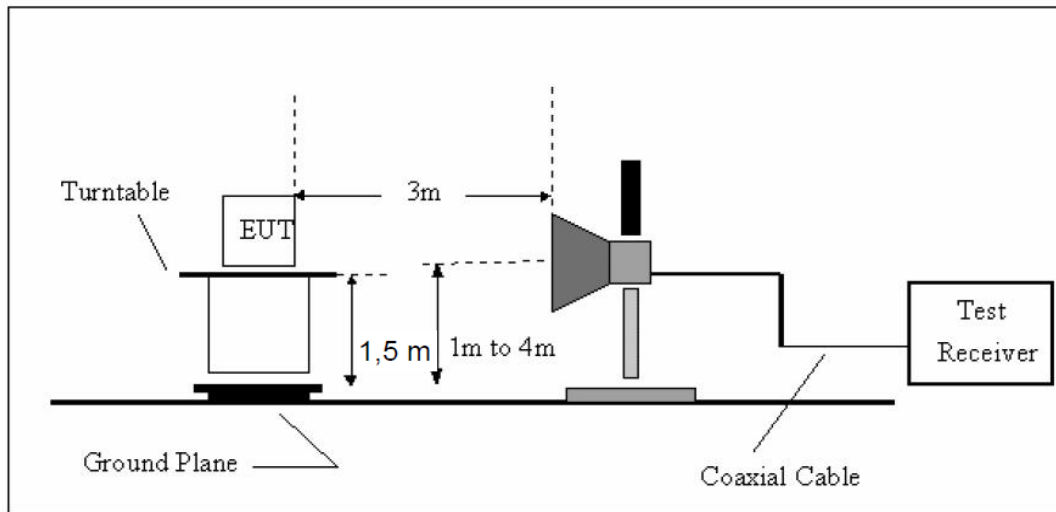
See the next page



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

6.3 Test Procedure

- The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground, The table was rotated 360 degrees to determine the position of the highest radiation
- The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked, and then Quasi Peak Detector mode remeasured
- If Peak value comply with QP limit Below 1GHz. The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.
- Rotated EUT through three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.
- For the actual test configuration, please see the test setup photo.

6.4 Test Equipment Setting For emission test.

9KHz~150KHz	RBW 200Hz	VBW1KHz
150KHz~30MHz	RBW 9KHz	VBW 30KHz
30MHz~1GHz	RBW 120KHz	VBW 300KHz
Above 1GHz	RBW 1MHz	VBW 3MHz

6.5 Test Condition

Continual Transmitting in maximum power.

6.6 Test Result

PASS.

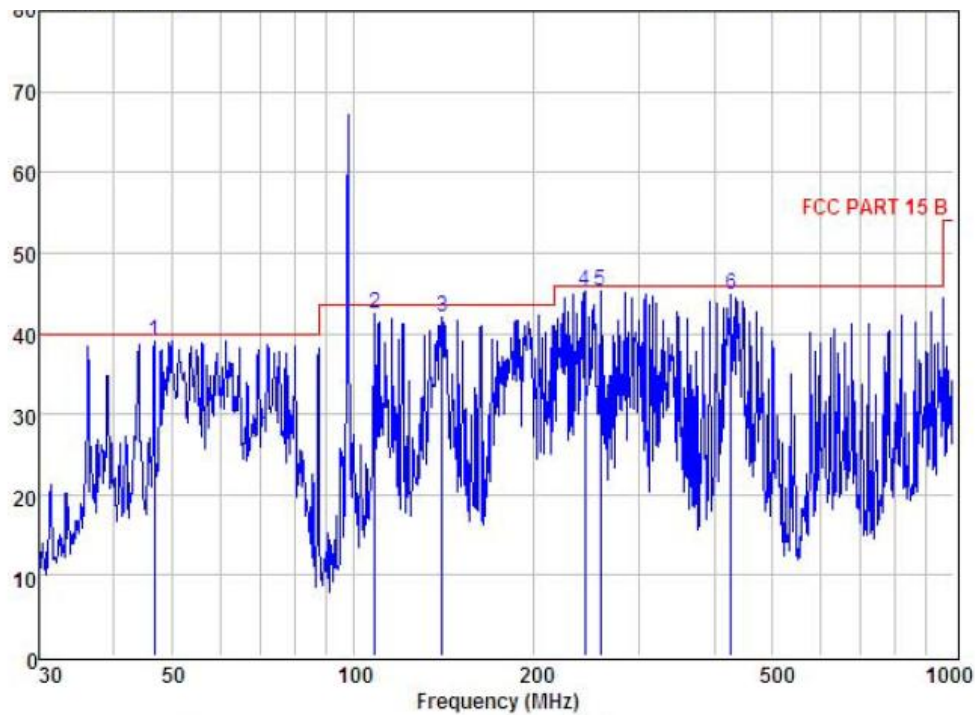
We have scanned the 10th harmonic from 9KHz to 1080MHz.

Note: The Radiated emissions is showed the maximum power data of TX test mode and showed worst orthogonal axes with X orthogonal axes.

Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: **PASS**

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

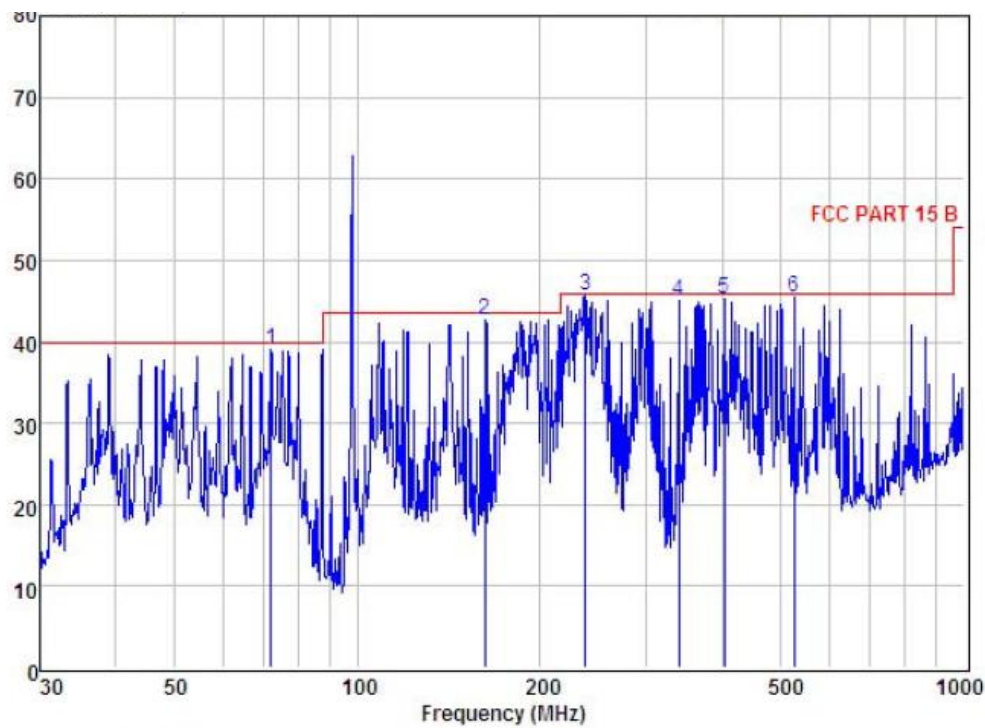


Condition : FCC PART 15 B 3m POL: HORIZONTAL
 EUT : Universal FM transmitter
 Model No : CS-013
 Test Mode : FM transmitting
 Power : DC 12V From battery
 Test Engineer :
 Remark :
 Temp : 24.2°C
 Hum : 54%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	46.67	52.49	13.65	31.21	0.06	39.02	40.00	-0.98	QP
2	108.65	60.67	11.13	31.44	0.41	42.51	43.50	-0.99	QP
3	140.84	58.37	13.51	31.54	0.27	42.09	43.50	-1.41	QP
4	243.38	58.87	11.50	30.97	0.45	45.27	46.00	-0.73	QP
5	258.33	59.43	11.73	31.19	0.58	45.31	46.00	-0.69	QP
6	426.52	55.92	15.38	30.85	0.67	44.75	46.00	-1.25	QP

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Note: Low mid high channels all have been tested only worst case TX 98.1MHz mode is reported And no emission found above 1GHz and from 9KHz to 30MHz ,so only listed worse case of 30MHz to 1GHz



Condition : FCC PART 15 B 3m POL: VERTICAL
 EUT : Universal FM transmitter
 Model No : CS-013
 Test Mode : FM transmitting
 Power : DC 12V From battery
 Test Engineer :
 Remark :
 Temp : 24.2°C
 Hum : 54%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamplifier Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	72.08	57.80	10.51	31.41	0.19	39.12	40.00	-0.88	QP
2	162.61	55.69	13.95	31.28	0.45	42.75	43.50	-0.75	QP
3	237.48	58.96	11.40	30.98	0.50	45.61	46.00	-0.39	QP
4	338.40	58.71	13.65	30.93	0.65	45.06	46.00	-0.94	QP
5	403.25	58.90	14.84	30.76	0.72	45.31	46.00	-0.69	QP
6	524.55	55.62	16.96	30.33	1.10	45.40	46.00	-0.60	QP

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Note: Low mid high channels all have been tested only worst case TX 98.1MHz mode is reported And no emission found above 1GHz and from 9KHz to 30MHz ,so only listed worse case of 30MHz to 1GHz

Radiated Emission Test Data of Fundamental Signal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Level
88.10	82.18	9.41	0.32	31.61	60.30	68	7.70	V	PEAK
88.10	83.89	9.41	0.32	31.61	62.01	68	5.99	H	PEAK
98.10	84.93	10.01	0.29	31.56	64.67	68	4.33	V	PEAK
98.10	86.63	10.01	0.29	31.56	65.37	68	2.63	H	PEAK
107.90	80.29	10.93	0.44	31.46	60.20	68	7.80	V	PEAK
107.90	81.61	10.93	0.44	31.46	61.52	68	6.48	H	PEAK
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Level
88.10	62.69	9.41	0.32	31.61	40.81	48	7.19	V	AVG.
88.10	61.72	9.41	0.32	31.61	39.84	48	8.16	H	AVG.
98.10	63.53	10.01	0.29	31.56	42.27	48	5.73	V	AVG.
98.10	64.06	10.01	0.29	31.56	42.80	48	5.20	H	AVG.
107.90	62.64	10.93	0.44	31.46	42.55	48	5.45	V	AVG.
107.90	61.26	10.93	0.44	31.46	41.17	48	6.83	H	AVG.

7 Occupied bandwidth

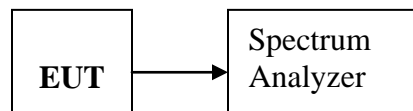
7.1 Test limit

Please refer section 15.239(a)

7.2 Method of measurement

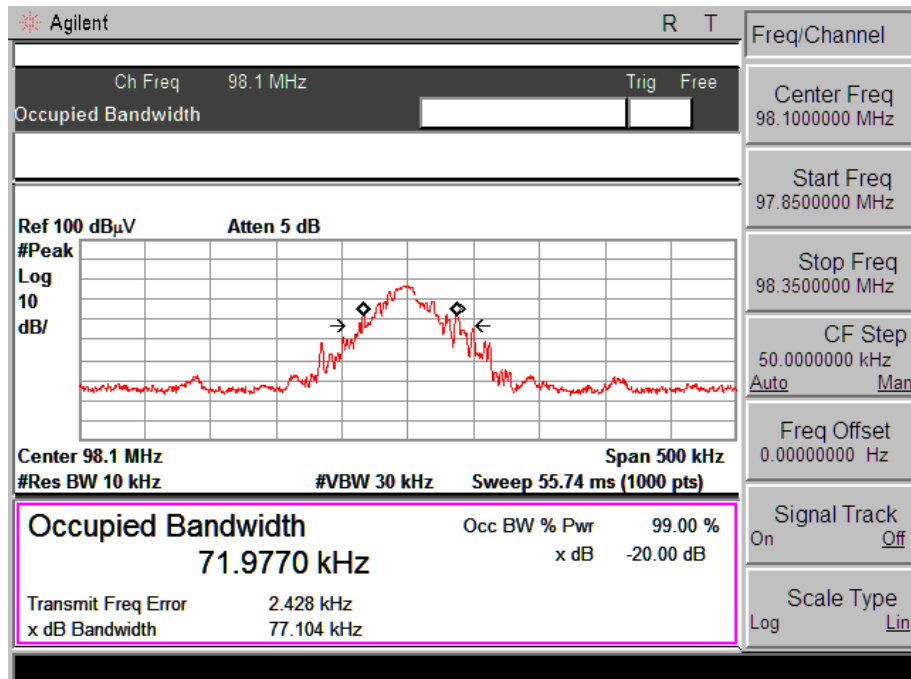
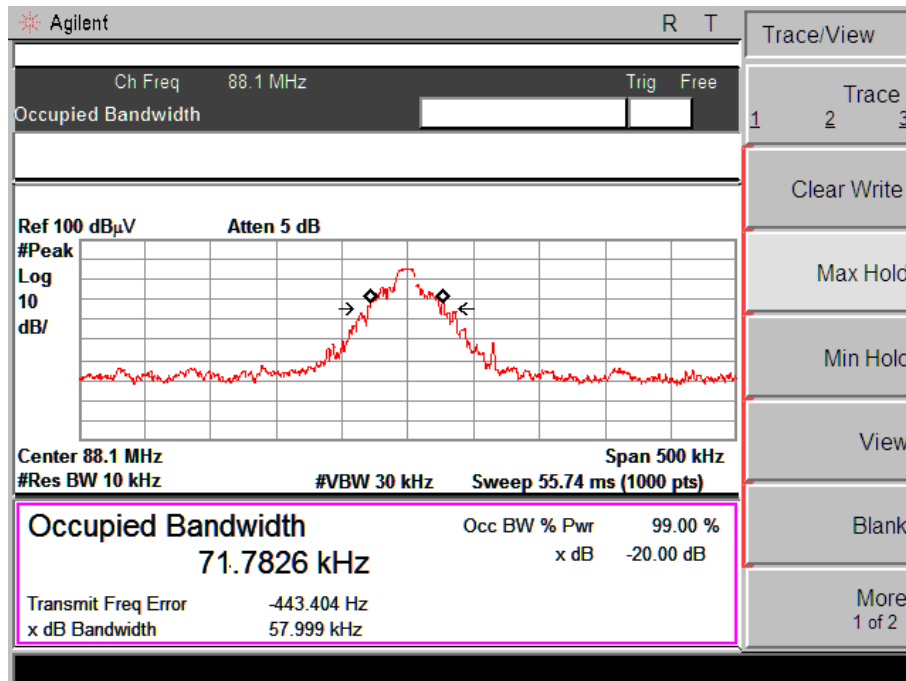
- a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- b) The test receiver RBW set 10KHz, VBW set 30KHz, Sweep time set auto.

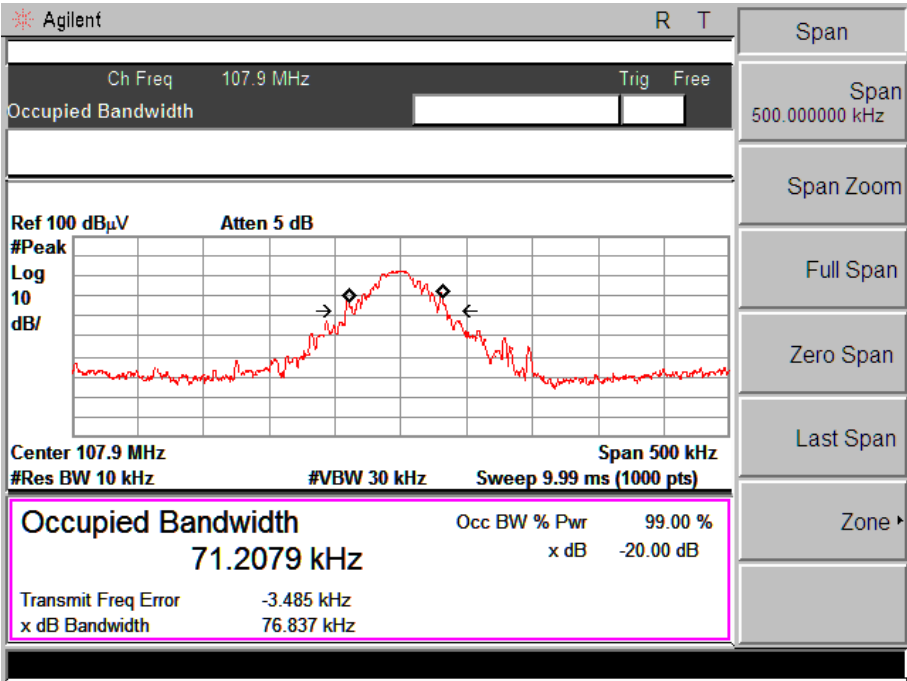
7.3 Test Setup



7.4 Test Results

Mode	Freq (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (kHz)	Conclusion
FM	88.1	57.999	71.78	/	PASS
	98.1	77.104	71.98	/	PASS
	107.9	76.837	71.21	/	PASS
Note: Detailed information please see the following page.					





Span

Span 500.000000 kHz

Span Zoom

Full Span

Zero Span

Last Span

Zone ▾

8 Band Edge Check

8.1 Test limit

Please refer section 15.239(c).

8.2 Test Procedure

8.2.1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

8.2.2. Set spectrum analyzer please see the following test plot.

8.2.3. Set the spectrum analyzer as RBW, VBW=100 KHz,

8.2.4. Max hold, view and count how many channel in the band.

8.3 Test Setup

Please see the section 6.2.

8.4 Test Result

Pass.

Detailed information please see the following page.

Radiated emission Test result									
EUT: Universal FM transmitter					M/N: CS-013				
Power: DC 12.0V From battery									
Test date: 2015-05-04 Test site: 3m Chamber Tested by: Peter									
Test mode: FM Transmitting 88.1MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	88.0	58.69	9.41	0.32	31.61	36.81	40	3.19	PK
2									
3	/	/	/	/	/	/	/	/	/
4	/	/	/	/	/	/	/	/	/
5	/	/	/	/	/	/	/	/	/
Antenna Polarity: Horizontal									
1	88.0	58.16	9.41	0.32	31.61	36.28	40	3.72	PK
2	/	/	/	/	/	/	/	/	/
3	/	/	/	/	/	/	/	/	/
4	/	/	/	/	/	/	/	/	/
5	/	/	/	/	/	/	/	/	/
Note:									
1, Spectrum Set for PK measure: RBW=100KHz, VBW=300Hz, Sweep time=Auto, Detector: PK									
2, Result = Read level + Antenna factor + cable loss-Amp factor									
3, All the other emissions not reported were too low to read and deemed to comply with limit.									

Radiated emission Test result									
EUT: Universal FM transmitter					M/N: CS-013				
Power: DC 12.0V From battery									
Test date: 2015-05-04 Test site: 3m Chamber Tested by: Peter									
Test mode: FM Transmitting 107.9MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	108.0	61.23	10.93	0.44	31.46	41.14	43.5	2.36	PK
2	/	/	/	/	/	/	/	/	/
3	/	/	/	/	/	/	/	/	/
4	/	/	/	/	/	/	/	/	/
5	/	/	/	/	/	/	/	/	/
Antenna Polarity: Horizontal									
1	108.0	61.39	10.93	0.44	31.46	41.3	43.5	2.2	PK
2	/	/	/	/	/	/	/	/	/
3	/	/	/	/	/	/	/	/	/
4	/	/	/	/	/	/	/	/	/
5	/	/	/	/	/	/	/	/	/
Note:									
1, Spectrum Set for PK measure: RBW=100KHz, VBW=300Hz, Sweep time=Auto, Detector: PK									
2, Result = Read level + Antenna factor + cable loss-Amp factor									
3, All the other emissions not reported were too low to read and deemed to comply with limit.									

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 Antenna Connected Construction

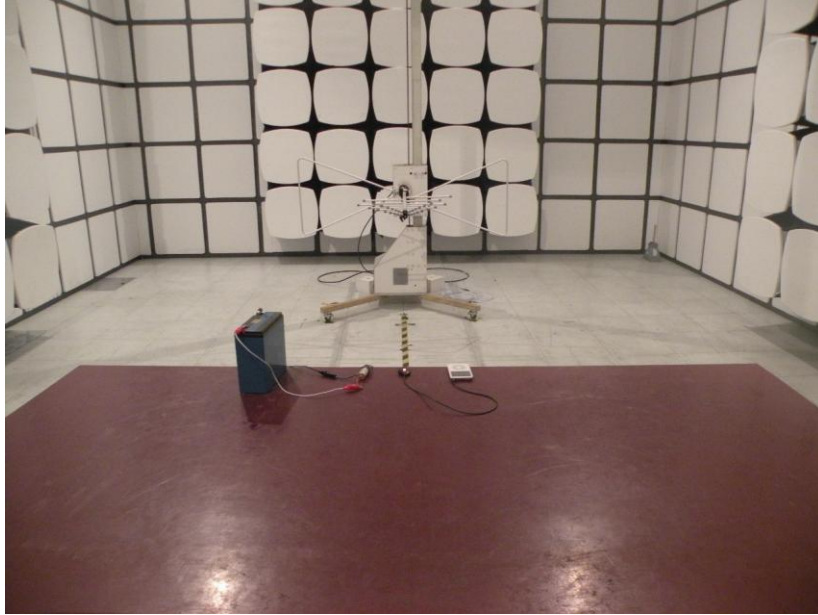
The directional gains of antenna used for transmitting is 0 dBi, and the antenna is integrated Antenna. Please see EUT photo for details.

9.3 Result

The EUT antenna is integrated Antenna. It complies with the standard requirement.

10 Photographs of Test Setup

10.1 Photographs-Radiated Emission Test Setup in Chamber



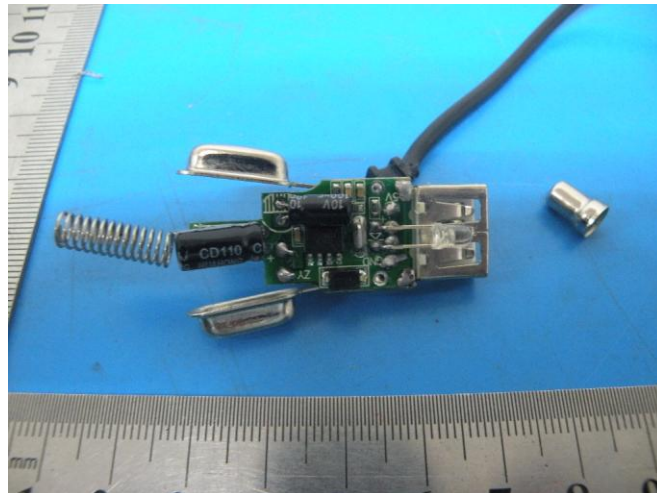
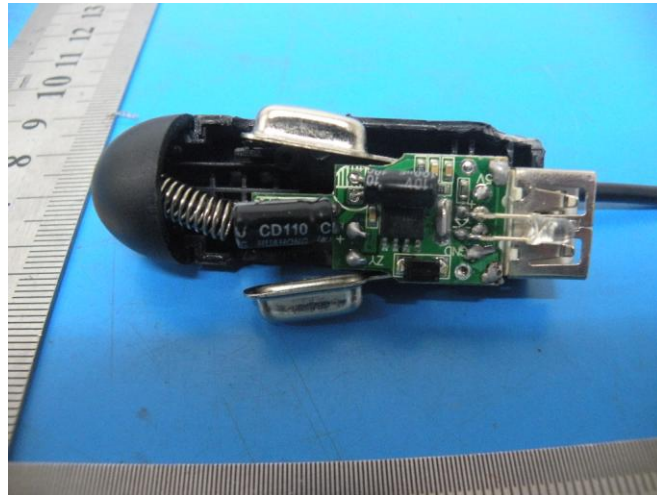
11 Photographs of EUT

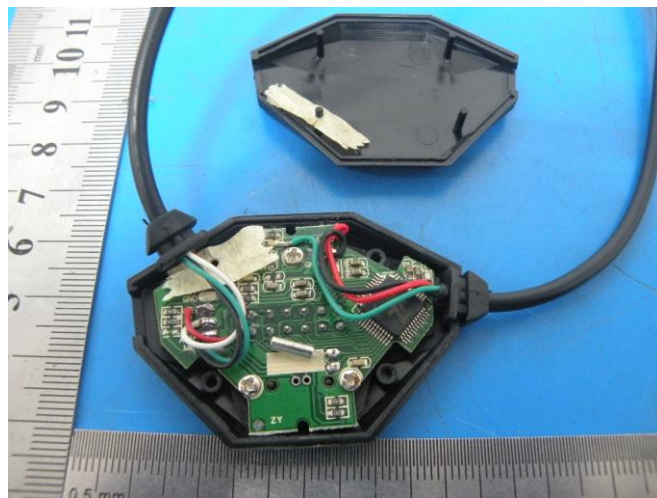
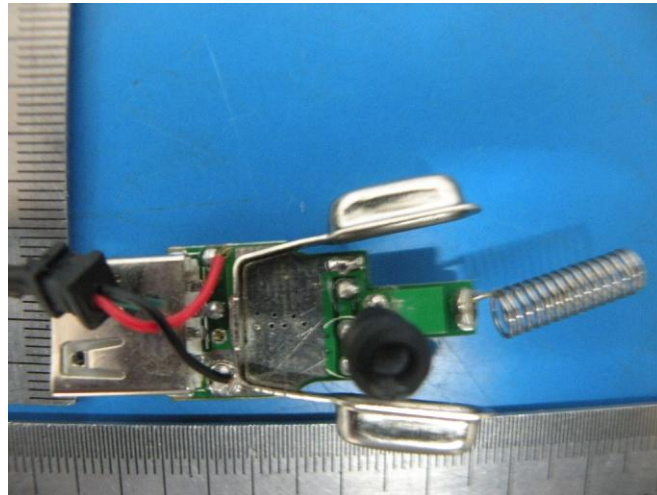


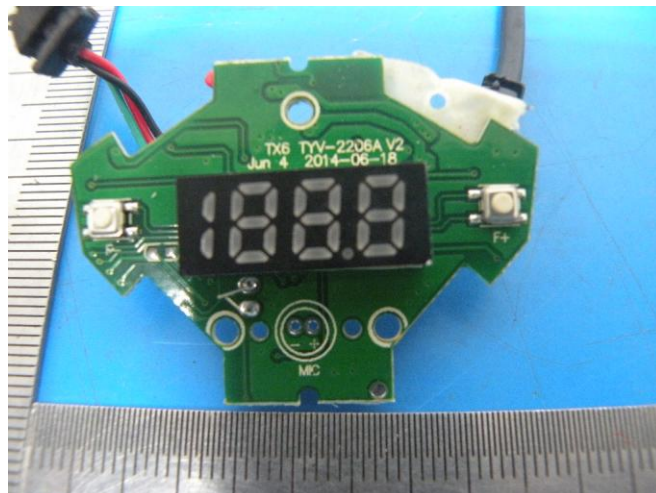
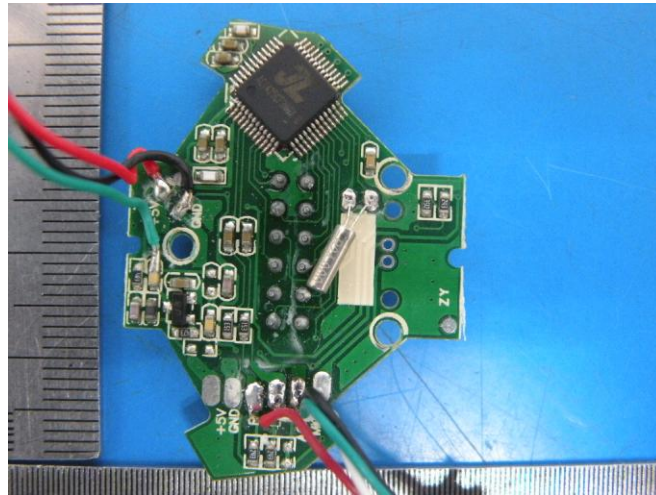












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