

TEST REPORT

Reference No..... : WTS13S1109471E
FCC ID : QCVS0811011
Applicant..... : Budderfly LLC
Address..... : 2 Trap Falls Road, Suite 507 Shelton, CT 06484 USA
Manufacturer : CME Electronics Technology Co., LTD
Address..... : Suite B, 18th Floor, Jingwangem No. 303, Qinglv Road South ,
Gongbei, Zhuhai 519020, Guangdong Province, China
Product Name..... : Budderfly Multi-Way Switch
Model No. : S0811011
Standards..... : FCC CFR47 Part 15 Section 15.249: 2012
Date of Receipt sample : Dec.01,2013
Date of Test..... : Dec.02~06,2013
Date of Issue..... : Dec.23,2013
Test Result..... : Pass *

***Remarks:**

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.
The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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2 Test Summary

Test Items	Test Requirement	Result
Outside of Band Emission	15.249	PASS
	15.205	
	15.209	
20dB Bandwidth	15:215(c)	PASS
Conducted Emissions	15.207	PASS
Radiated Emission	15.249(a)	PASS
	15.209	
	15.205(a)	
Antenna Requirement	15.203	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: Budderfly Multi-Way Switch
Model No.	: S0811011
Type of Modulation	: 2FSK
Frequency Range	: 915.00
Oscillator	: 32.768kHz
Antenna installation	: Dipole Antenna

4.2 Details of E.U.T.

Technical Data	: 120V~277V, 60Hz
Adapter	: N/A

4.3 Test Facility

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

- **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.

- **IC – Registration No.:7760A**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory 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 number 7760A, July 12, 2012.

4.4 Test Location

All Emissions tests were performed at:-

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

4.5 General condition

Ambient Condition: 23.5 °C 54 %RH

4.5.1 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Lower channel	Middle channel	Upper channel
Transmitting	MHz	915.00MHz	MHz

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions at Mains Terminals Disturbance Voltage (Conducted Emission)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	Sep.18,2013	Sep.17,2014
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.18,2013	Sep.17,2014
3.	Limiter	York	MTS-IMP-136	261115-001-0024	Sep.18,2013	Sep.17,2014
4.	Cable	LARGE	RF300	-	Sep.18,2013	Sep.17,2014
3m Semi-anechoic Chamber for Radiation						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.18,2013	Sep.17,2014
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.18,2013	Sep.17,2014
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.20,2013	Apr.19,2014
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.18,2013	Sep.17,2014
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.20,2013	Apr.19,2014
6	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.07,2013	Apr.06,2014
7	Coaxial Cable (above 1GHz)	Top	25MHz-18GHz	EW02014-7	Apr.20,2013	Apr.19,2014

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious 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 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	ANSI C63.4: 2003
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average

Limit

6.1 E.U.T. Test Condition

Operating Environment:

Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	101.1 kPa

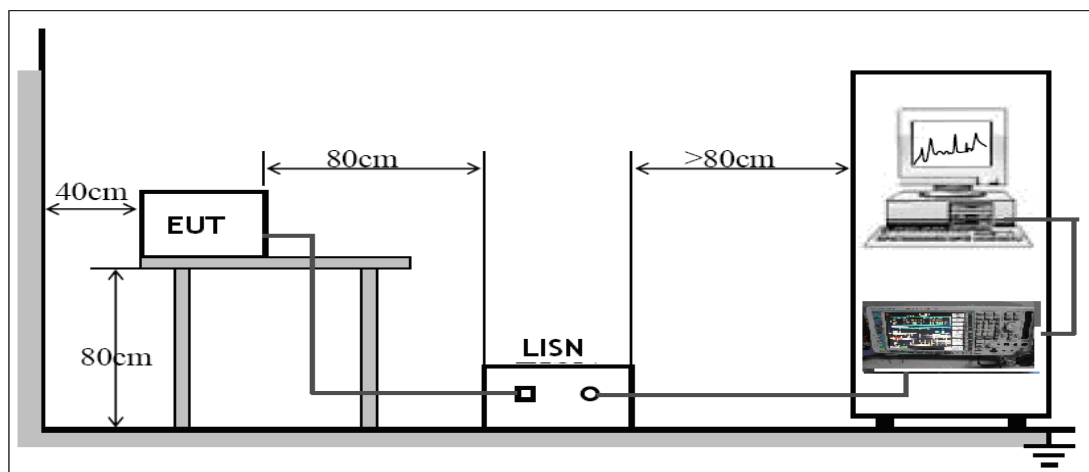
EUT Operation :

The pre-test was performance in normal working mode, and the test data were shown as follow.

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003.



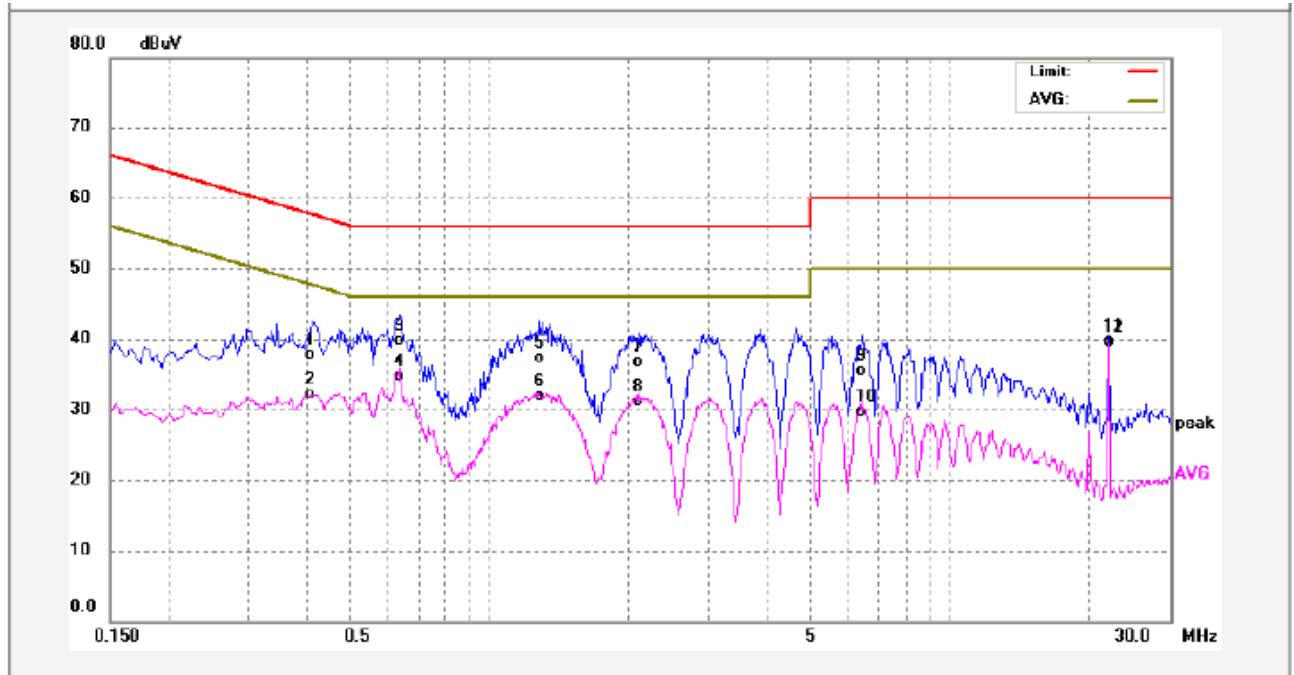
The EUT was placed on the test table in shielding room

6.3 Conducted Emission Test Result

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

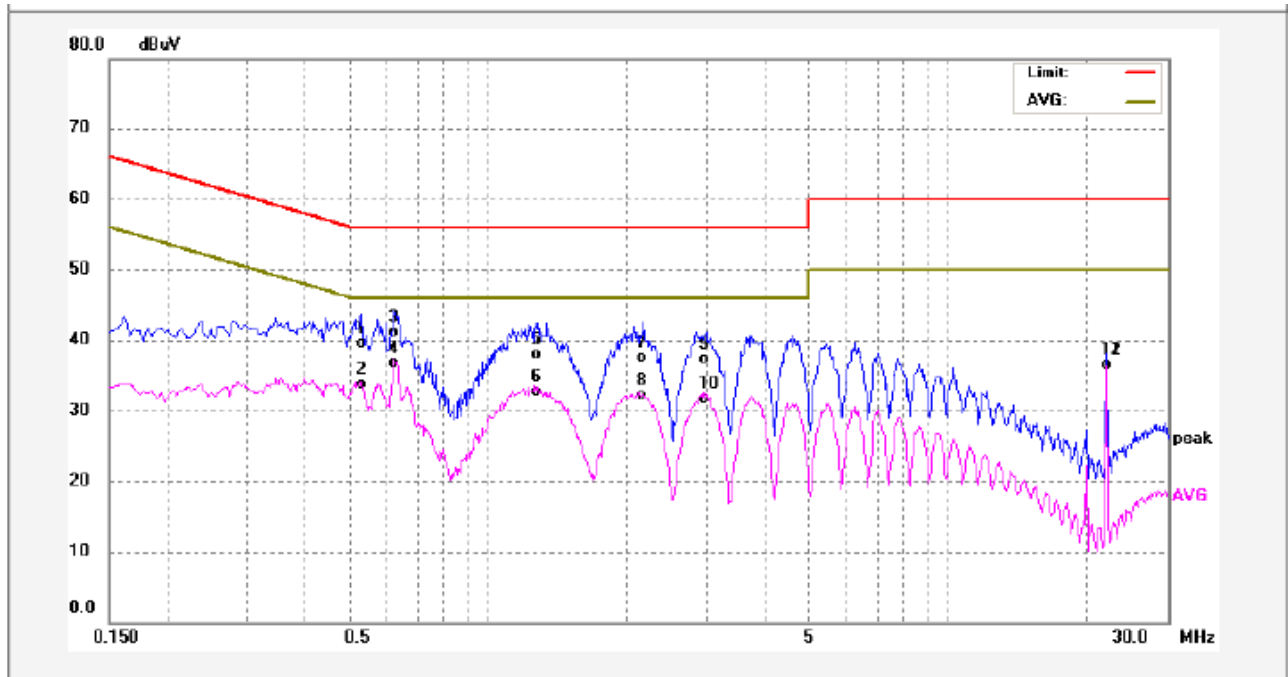
Test Mode: Normal working mode

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.4140	26.44	11.31	37.75	57.57	-19.82	QP	
2	0.4140	20.88	11.31	32.19	47.57	-15.38	AVG	
3	0.6380	28.36	11.33	39.69	56.00	-16.31	QP	
4	0.6380	23.35	11.33	34.68	46.00	-11.32	AVG	
5	1.2780	26.18	11.19	37.37	56.00	-18.63	QP	
6	1.2780	20.69	11.19	31.88	46.00	-14.12	AVG	
7	2.1140	25.42	11.20	36.62	56.00	-19.38	QP	
8	2.1140	19.98	11.20	31.18	46.00	-14.82	AVG	
9	6.4699	24.16	11.25	35.41	60.00	-24.59	QP	
10	6.4699	18.46	11.25	29.71	50.00	-20.29	AVG	
11	22.1180	28.24	11.52	39.76	60.00	-20.24	QP	
12	22.1180	27.93	11.52	39.45	50.00	-10.55	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.5299	28.22	11.31	39.53	56.00	-16.47	QP	
2	0.5299	22.34	11.31	33.65	46.00	-12.35	AVG	
3	0.6260	29.72	11.33	41.05	56.00	-14.95	QP	
4	0.6260	25.28	11.33	36.61	46.00	-9.39	AVG	
5	1.2860	26.76	11.19	37.95	56.00	-18.05	QP	
6	1.2860	21.42	11.19	32.61	46.00	-13.39	AVG	
7	2.1860	26.36	11.20	37.56	56.00	-18.44	QP	
8	2.1860	20.81	11.20	32.01	46.00	-13.99	AVG	
9	2.9780	26.05	11.21	37.26	56.00	-18.74	QP	
10	2.9780	20.49	11.21	31.70	46.00	-14.30	AVG	
11	22.1180	24.91	11.52	36.43	60.00	-23.57	QP	
12	22.1180	24.90	11.52	36.42	50.00	-13.58	AVG	

7 Radiation Emission Test

Test Requirement: FCC Part15 Paragraph 15.249
 Test Method: ANSI 63.4: 2003
 Measurement Distance: 3m
 Detector: Peak for pre-scan (120kHz resolution bandwidth)
 Quasi-Peak if maximised peak within 6dB of limit
 Test Result: PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note: RF Voltage(dBuV)= $20 \log_{10}$ RF Voltage(uV)

7.1 EUT Operation:

Operating Environment:

Temperature: 25.5 °C
 Humidity: 51 % RH
 Atmospheric Pressure: 101.0 kPa

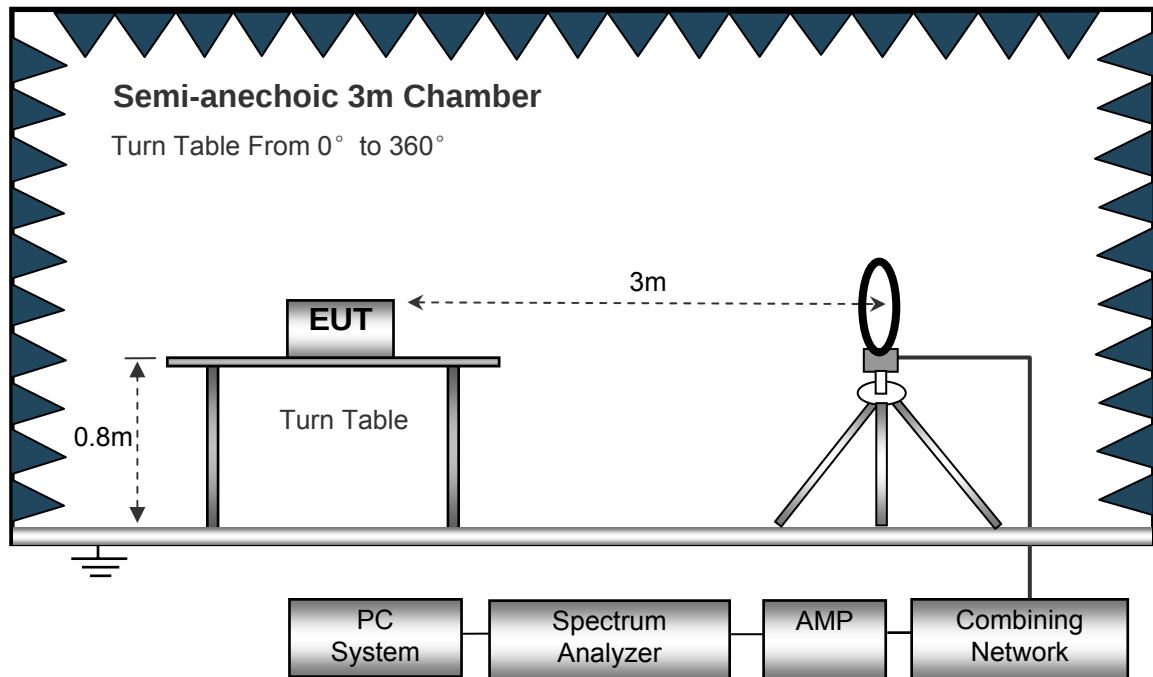
Operation Mode:

The EUT was tested in transmitting mode, and the test data were shown as follow.

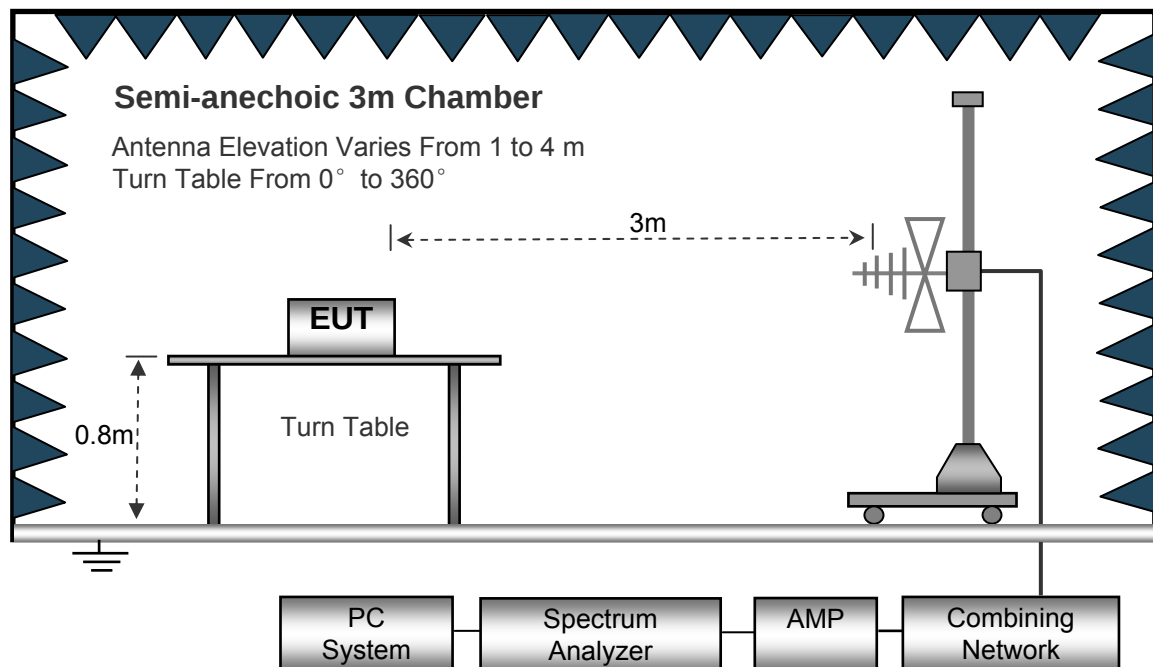
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

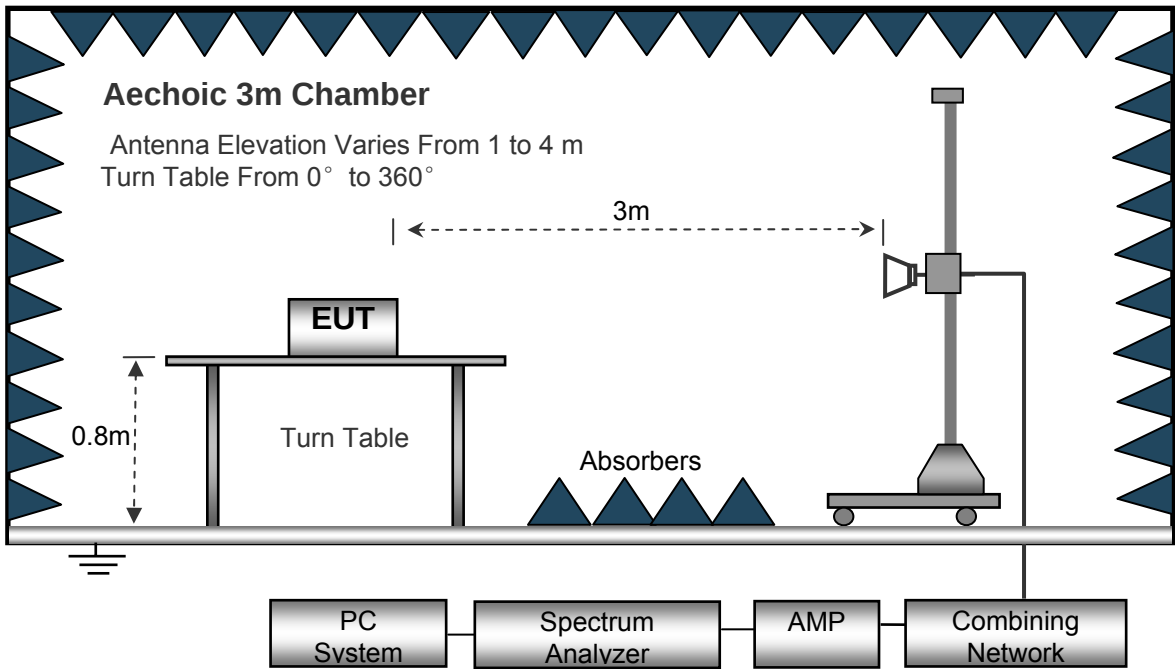
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested from 32.768kHz to 10GHz.

Below 30MHz

Sweep SpeedAuto
IF Bandwidth10kHz
Video Bandwidth10kHz
Resolution Bandwidth10kHz

30MHz ~ 1GHz

Sweep Speed Auto
IF Bandwidth120 KHz
Video Bandwidth100KHz
Quasi-Peak Adapter Bandwidth120 KHz
Quasi-Peak Adapter ModeNormal
Resolution Bandwidth100KHz

Above 1GHz

Sweep SpeedAuto
DetectorPK
Resolution Bandwidth1MHz
Video Bandwidth3MHz
DetectorAve.
Resolution Bandwidth1MHz
Video Bandwidth10Hz

7.4 Test Procedure

1. 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.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
3. All data was recorded in the peak and average detection mode.
4. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude 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:

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

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

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

7.6 Radiated Emissions Test Result

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/m)
To the antenna correction factor supplied by the antenna manufacturer. The antenna
Correction factors are stated in terms of dB. The gain of the pressletor was accounted
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

7.7 Radiated Emission Data

Test Frequency :Below 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 10GHz

Test Mode: Transmitting

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.249/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Channel 915.00MHz									
915.00	50.24	PK	115	1.3	H	30.98	81.22	114.00	-32.78
915.00	47.43	Ave	115	1.3	H	30.98	78.41	94.00	-15.59
915.00	52.40	PK	104	1.8	V	30.98	83.38	114.00	-30.62
915.00	49.06	Ave	104	1.8	V	30.98	80.04	94.00	-13.96
900.09	29.69	QP	153	1.6	H	11.98	41.67	46.00	-4.33
900.09	26.58	QP	70	1.5	V	11.98	38.56	46.00	-7.44
1830.00	68.23	PK	113.00	1.90	V	-14.34	53.89	74.00	-20.11
1830.00	61.57	Ave	113.00	1.90	V	-14.34	47.23	54.00	-6.77
2745.00	49.80	PK	302	1.4	H	-12.87	36.93	74.00	-37.07
2745.00	44.23	Ave	302	1.4	H	-12.87	31.36	54.00	-22.64
5198.30	46.03	PK	241	1.8	H	-11.77	34.26	74.00	-39.74
5198.30	42.84	Ave	241	1.8	H	-11.77	31.07	54.00	-22.93
6003.10	45.36	PK	141	1.8	V	-10.74	34.62	74.00	-39.38
6003.10	39.62	Ave	141	1.8	V	-10.74	28.88	54.00	-25.12

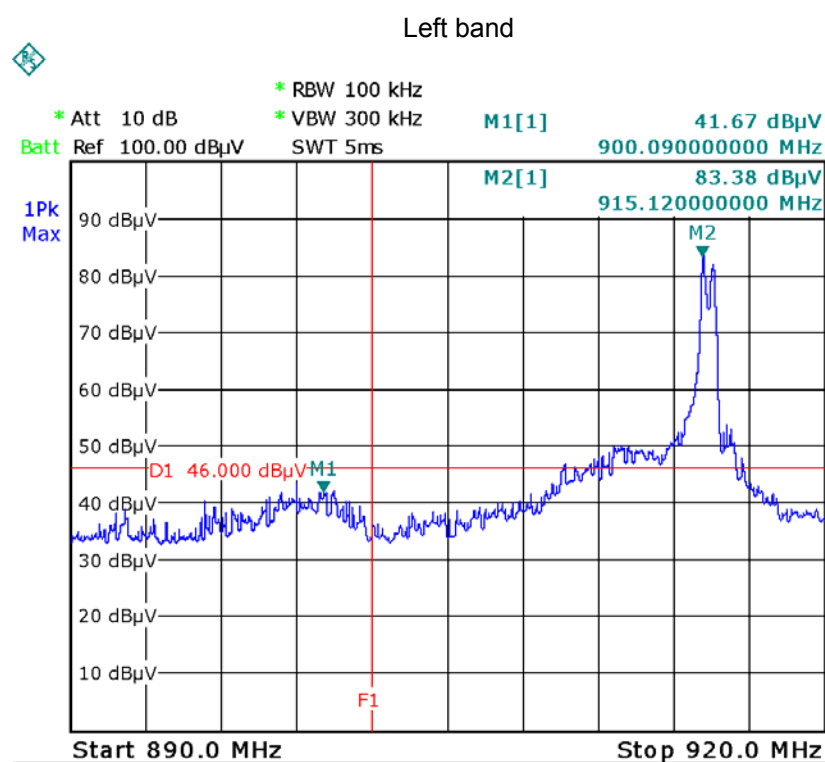
8 Outside of Band Emission

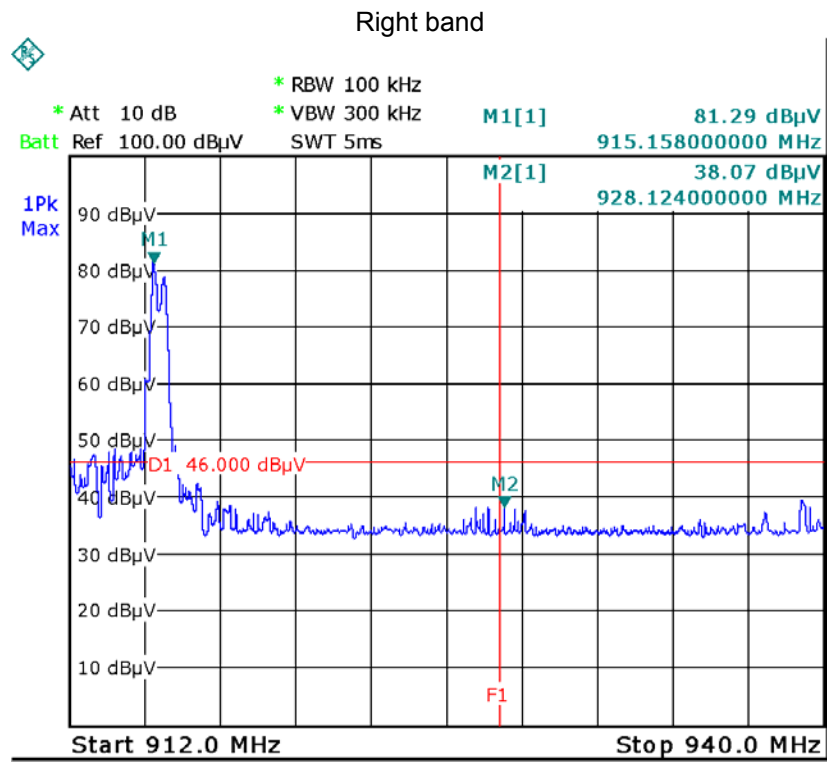
Test Requirement: 15.249(d):Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Test Method: ANSI C63.4:2003

Test Result: PASS

Test result plots shown as follows:





9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215(c)
Test Method: ANSI C63.4:2003
Test Mode: Transmitting

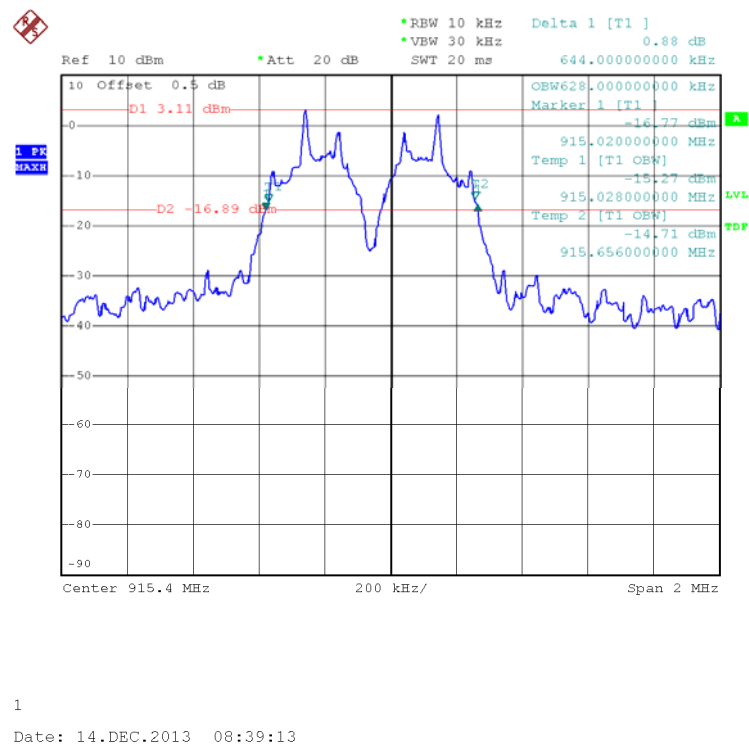
9.1 Test Procedure:

- 1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
- 2. Set the spectrum analyzer: RBW = 10kHz, VBW = 30kHz

9.2 Test Result:

Test Channel	Bandwidth
915.00MHz	644kHz

Test result plot as follows:



10 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a Dipole Antenna antenna, fulfil the requirement of this section.

11 Photographs of Testing

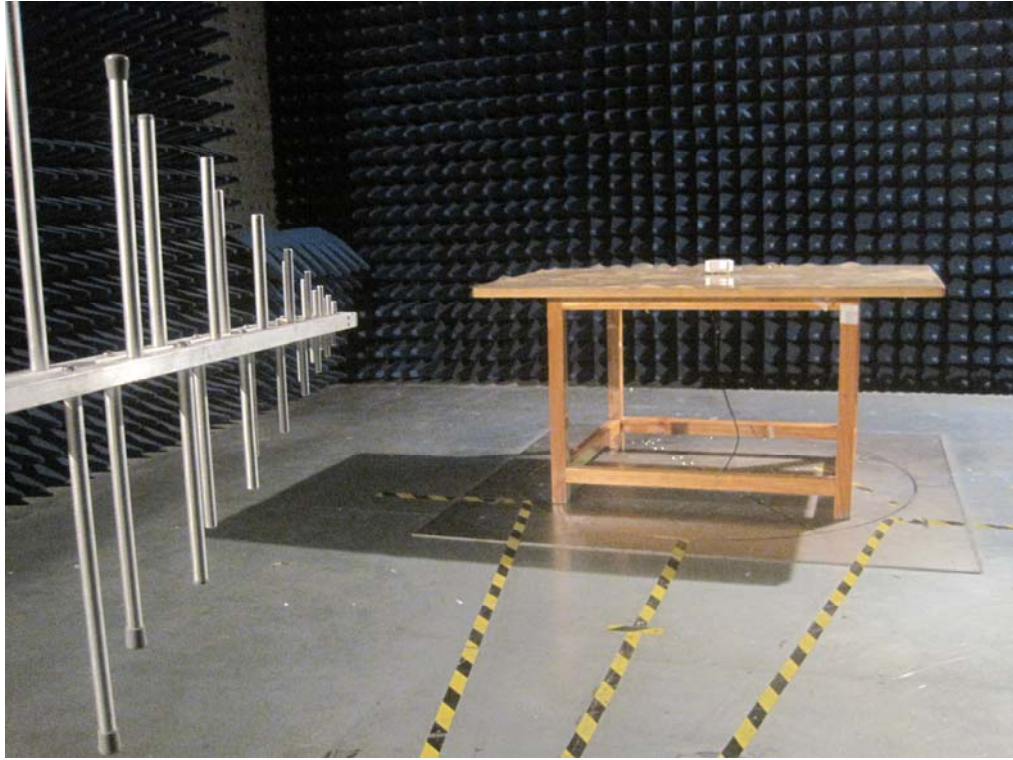
11.1 Conducted Emissions Test View



11.2 Radiation Emission From 30MHz-1GHz



11.3 Radiation Emission From 30MHz-1GHz

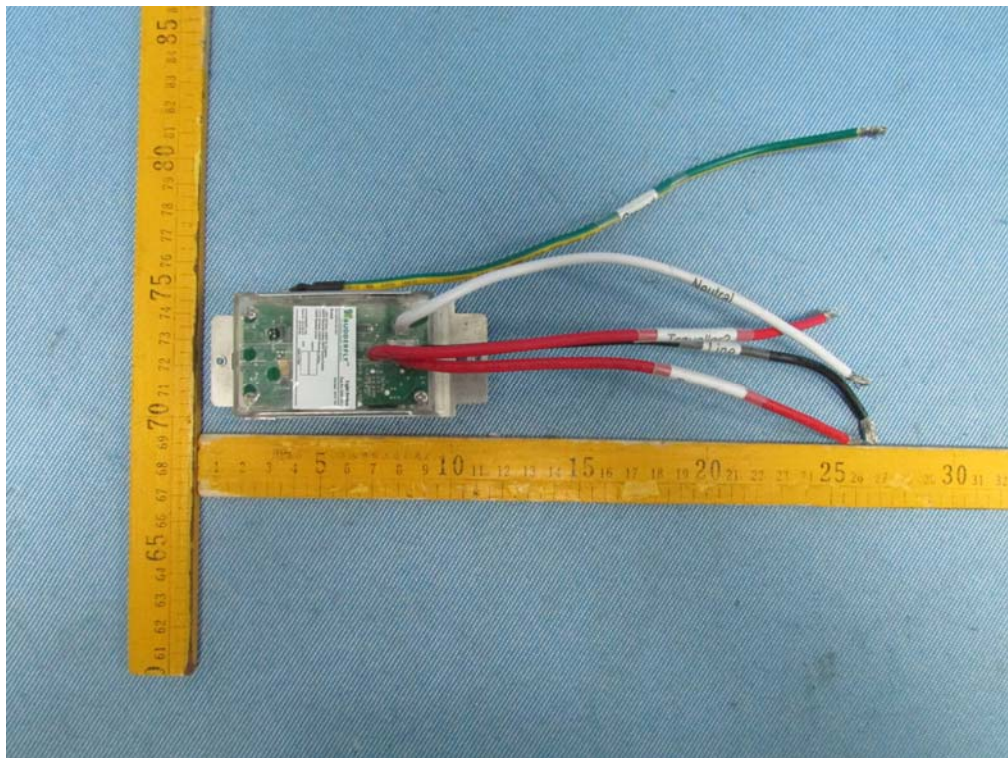
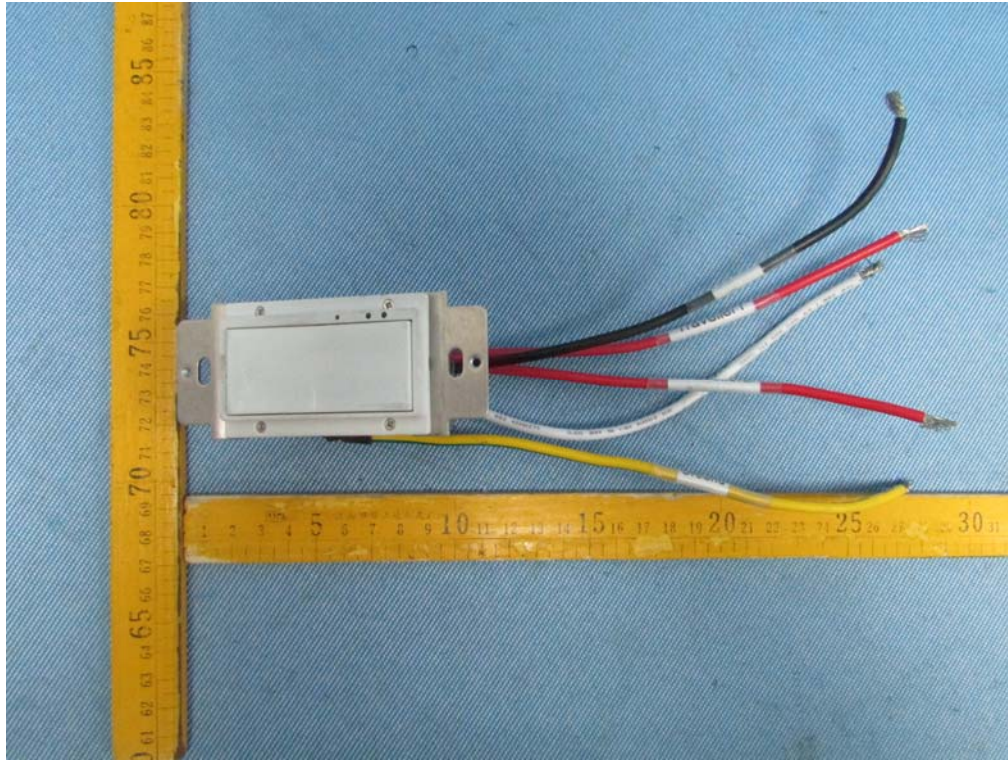


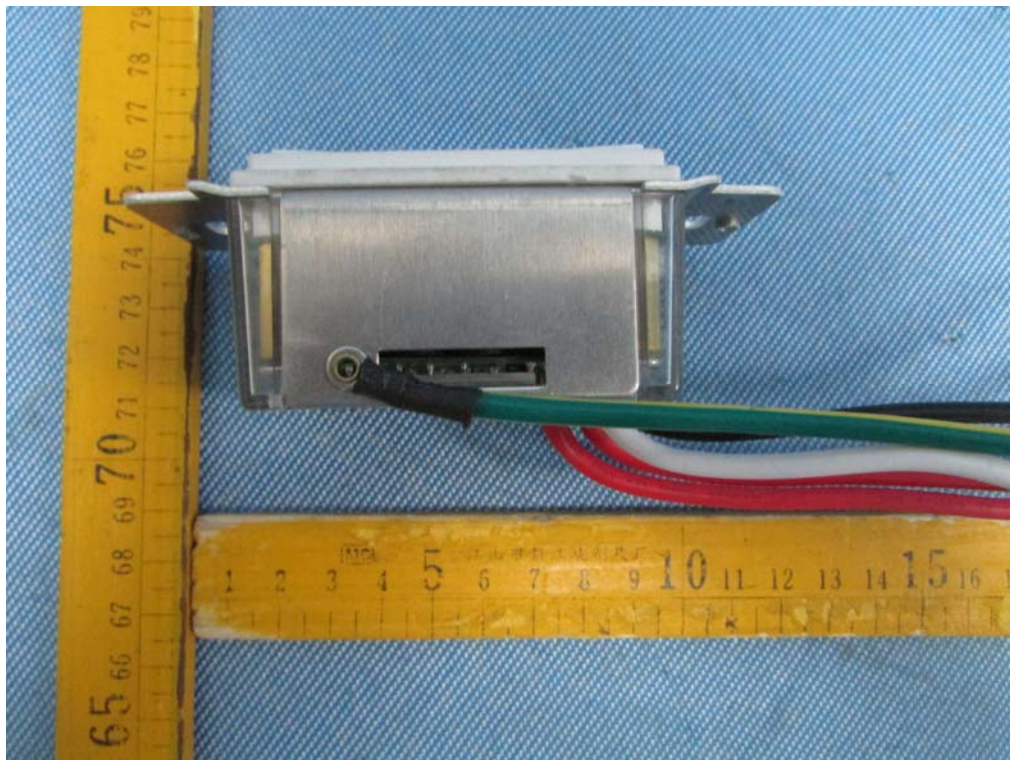
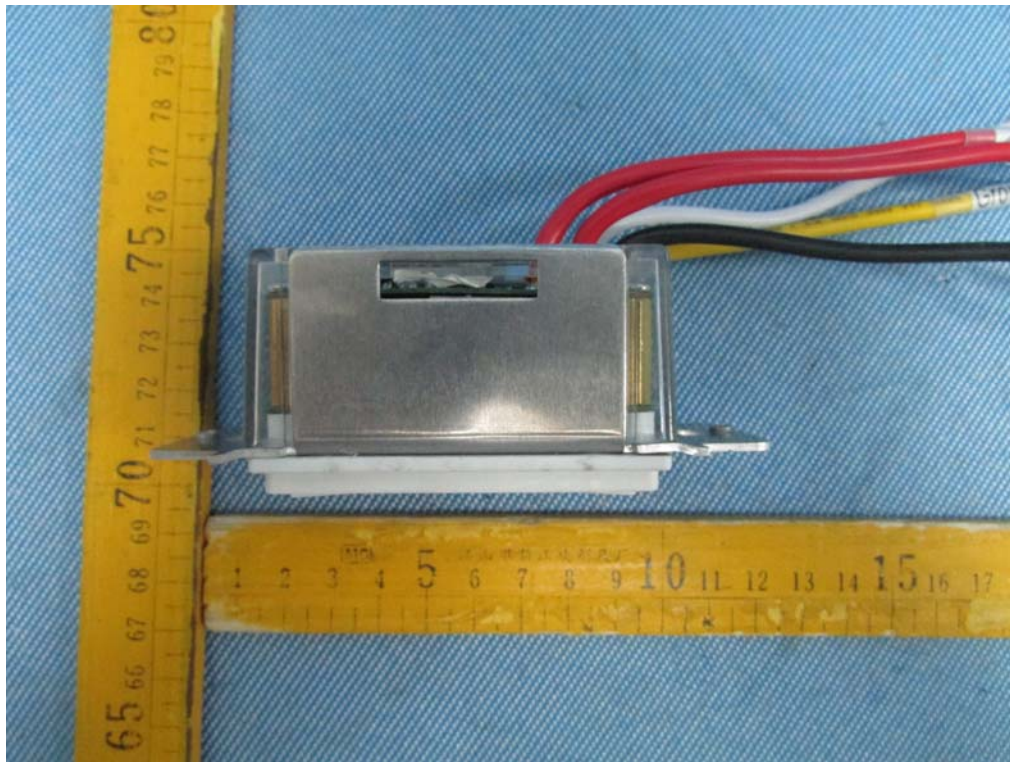
11.4 Radiation Emission Above 1GHz

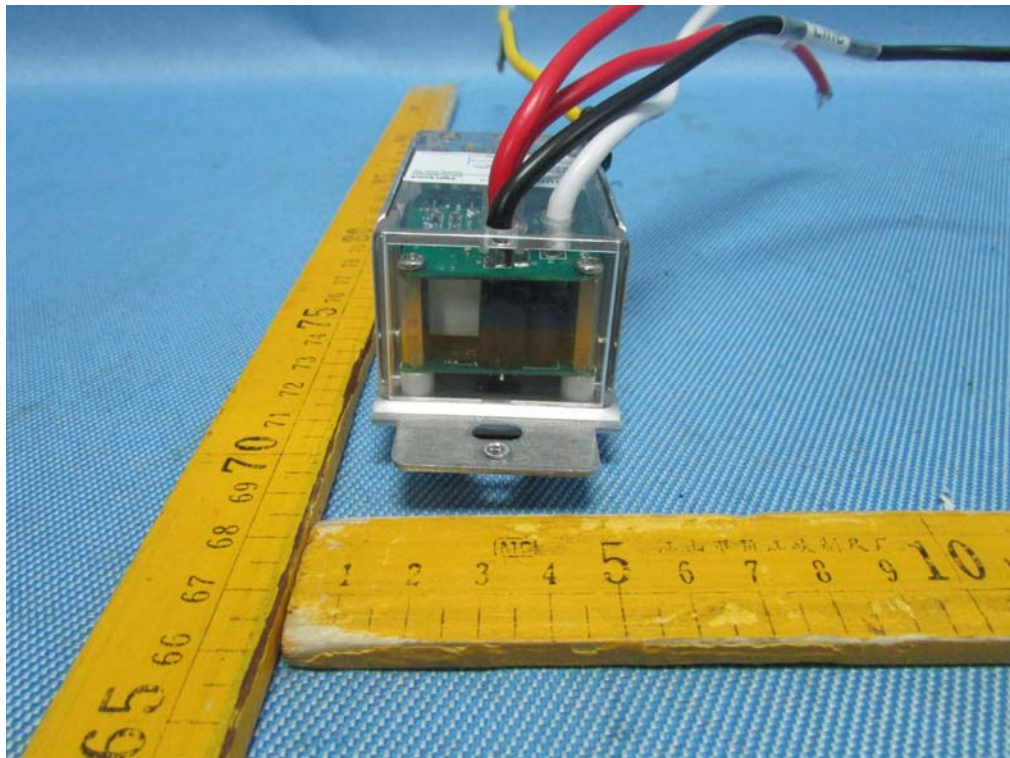
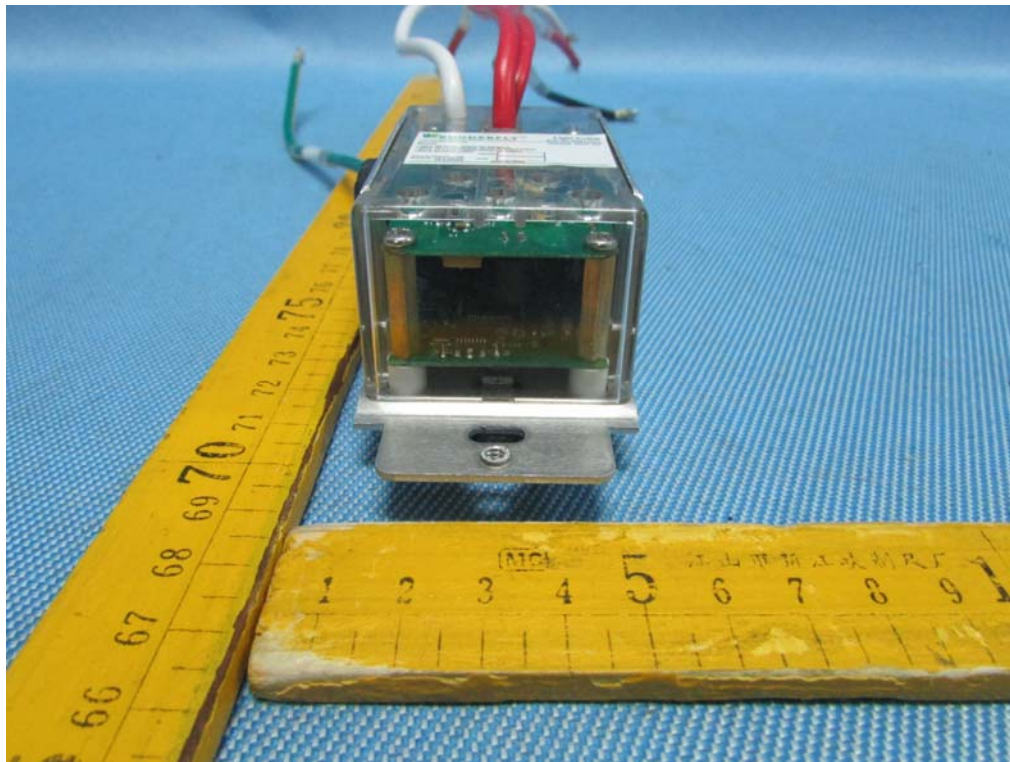


12 Photographs - Constructional Details

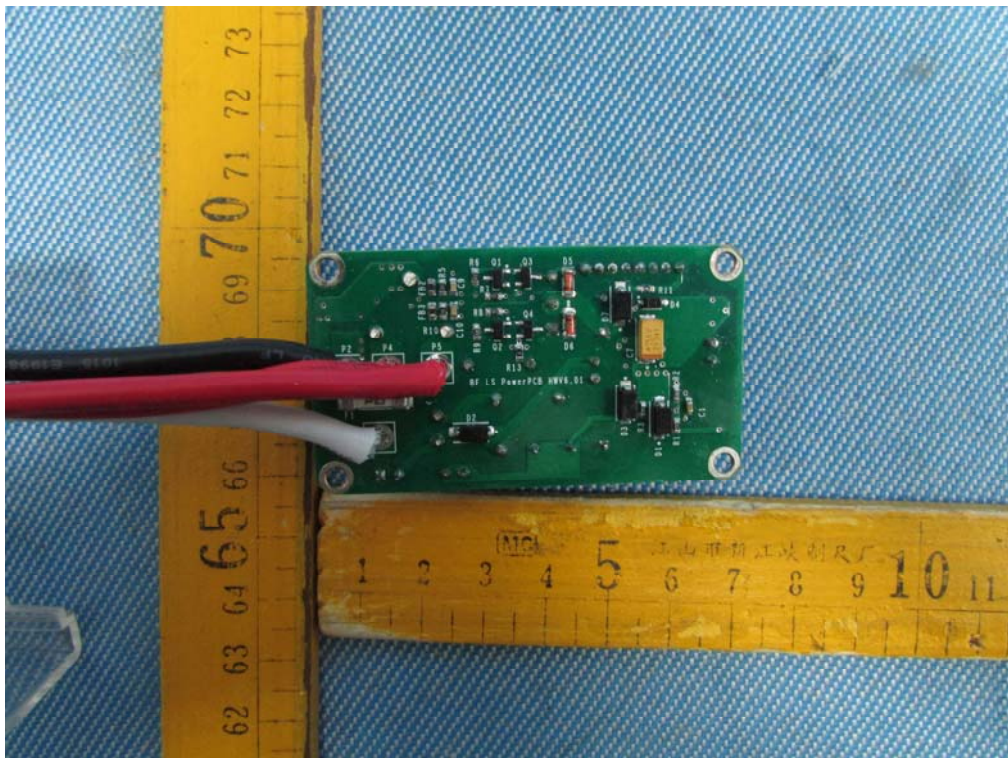
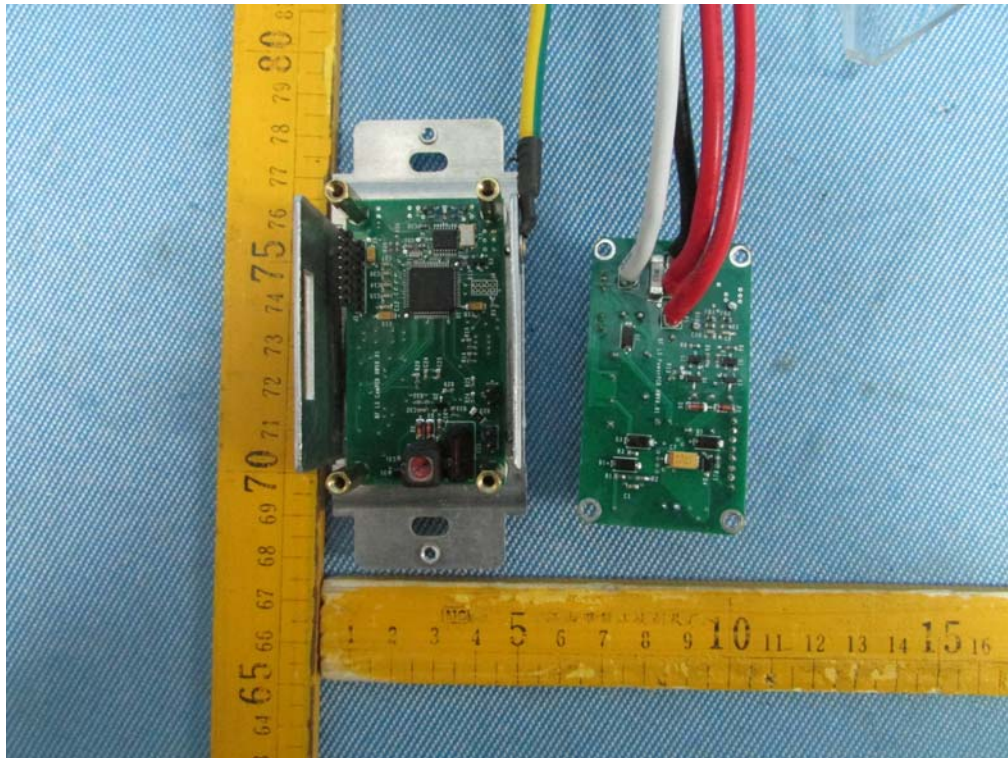
12.1 EUT - Appearance View

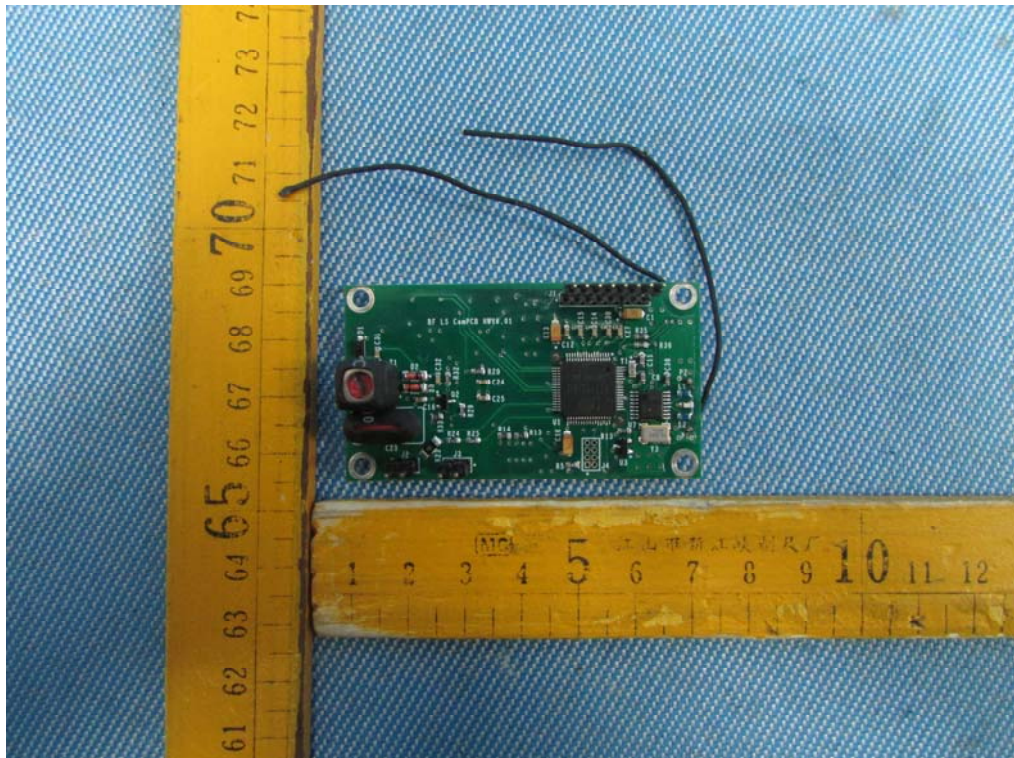
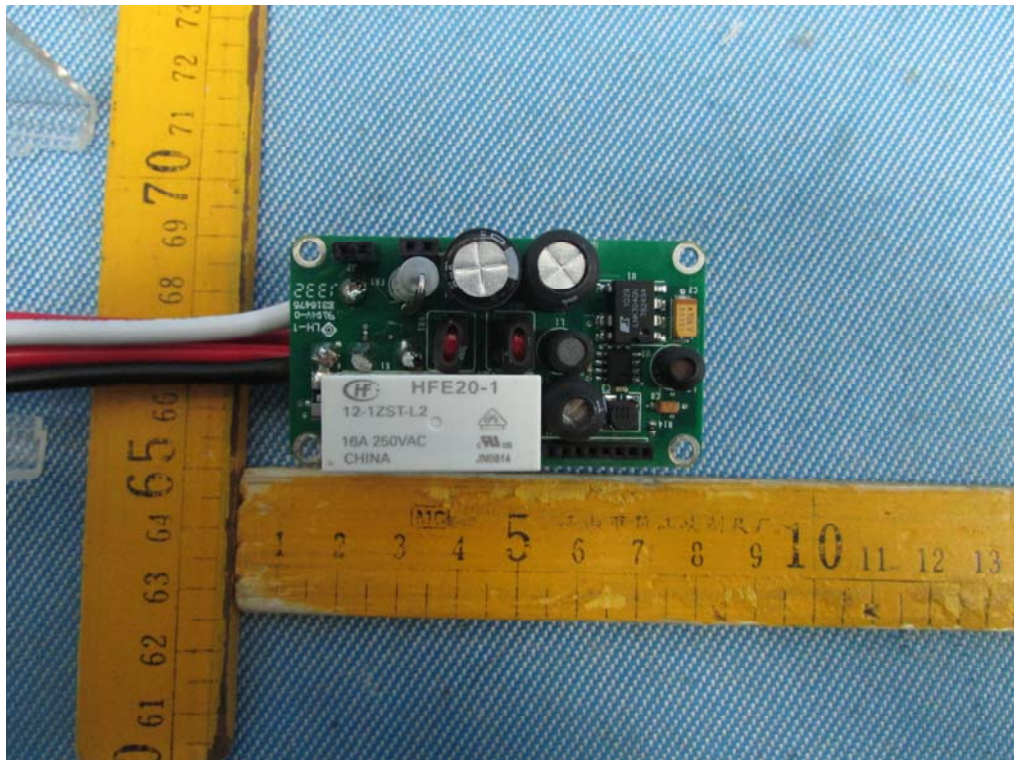


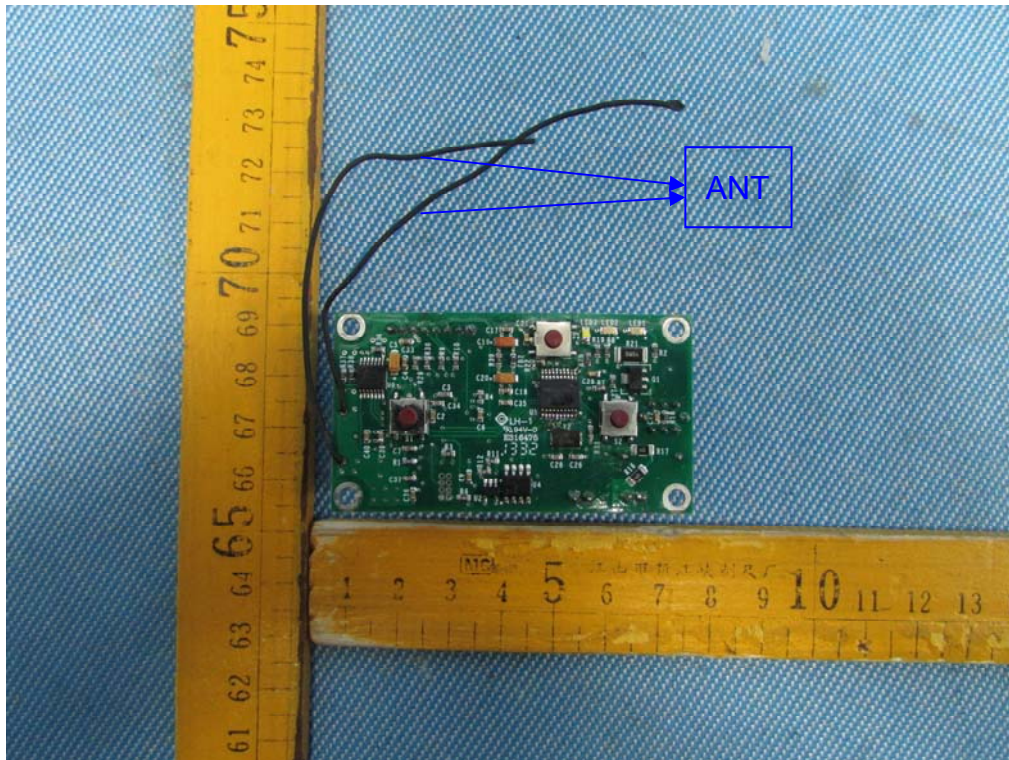




12.2 EUT - Open View







==End of Test Report==