

TEST REPORT

FCC ID : XBADSC24
Applicant : Aeon Labs LLC.
Address : 121 Buckingham Drive, Unit 36, Santa Claras, California, United States, 95051
Manufacturer : The same as above
Address : The same as above

Equipment Under Test (EUT) :

Product Name : Smart Switch (2nd Edition)
Model No. : DSC24- ZWUS
Rules : FCC CFR47 Part 15 Section 15.249: 2012

Date of Test : August 10~11, 2013
Date of Issue : August 21, 2013

Test Result	: PASS*
Remark:	
* The sample described above has been tested to be in compliance with the requirements of the rules listed above.	
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.	

PERPARED BY:
Waltek Services (Shenzhen) Co., Ltd.
 1/F, Fukangtai Building, West of Baima Road., Songgang Street, Bao'an District,
 Shenzhen, China
 Tel: +86-755-83551033 Fax: +86-755-83552400

Compiled by:

Maikou Zhang

Maikou Zhang / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Restricted Band	15.205	N/A
Conducted Emissions	15.207	PASS
Radiated Emission	15.205(a)	PASS
	15.209	
	15.249(a)	
Antenna Requirement	15.203	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: Smart Switch (2nd Edition)
Model No.	: DSC24- ZWUS
Type of Modulation	: FSK
Frequency Range	: 908.42Mhz
Oscillator	: 4.096MHz, 32MHz for RF Module
Antenna installation	: Integrated Antenna

4.2 Details of E.U.T.

Technical Data	: AC 125V, 60Hz, 15A Max.
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 testswere performed at:-

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

4.5 General condition

Ambient Condition: 25.5 °C 58 %RH

4.5.1 Environmental condition of test site

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

The follow condition is applicable

Test Voltage	Input voltage
Rated voltage-15%	AC 102V
normal	AC 120V
Rated voltage+15%	AC 138V

The follow condition is not applicable.

Test voltage	Test Voltage
Rated voltage	New Battery

4.5.2 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	908.42MHz	MHz
Receiving	MHz	MHz	MHz

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	100947	Aug. 13,2012	Aug. 12,2013
2.	LISN	R&S	ENV216	101215	Aug. 13,2012	Aug. 12,2013
3.	Cable	Top	TYPE16(3.5M)	-	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	Apr. 20,2013	Apr. 19,2014
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr. 20,2013	Apr. 19,2014
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 12,2013
6.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.07,2013	Apr.06,2014
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 12,2013
8.	Cable	Top	EWO2014-7	-	Apr. 20,2013	Apr. 19,2014
9.	Cable	Top	TYPE16(13M)	-	Aug. 13,2012	Aug. 12,2013

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)
Limit	Quasi-Peak & Average if maximised peak within 6dB of Average

6.1 E.U.T. Test Condition

Operating Environment:

Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	1011 mbar

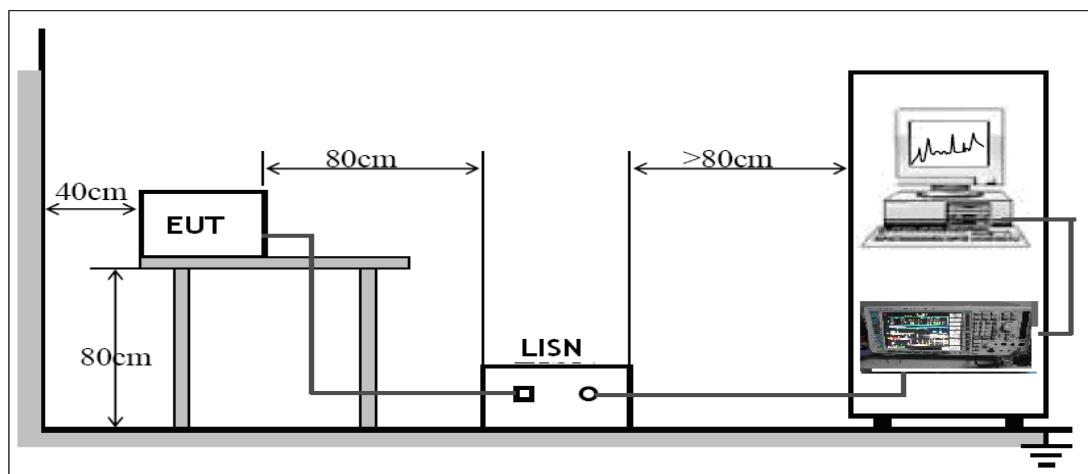
EUT Operation :

The pre-test was performance in continuous transmitting and normal working mode. The worst 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.



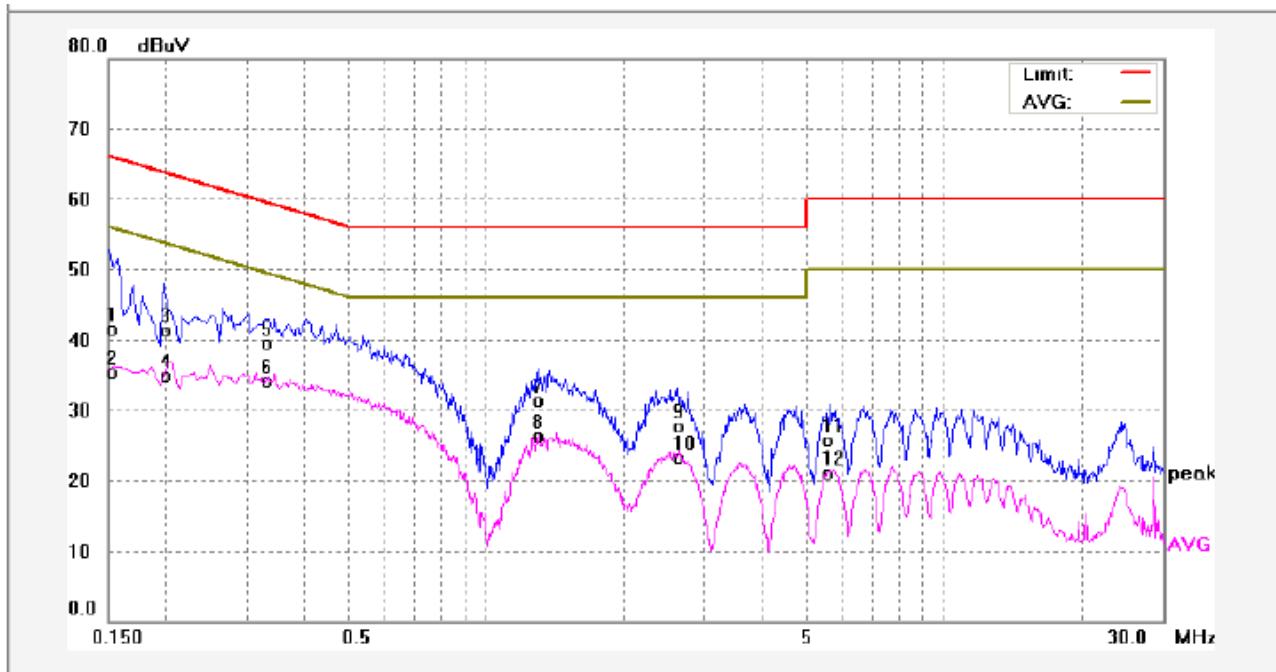
The EUT was placed on the test table in shielding room

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.

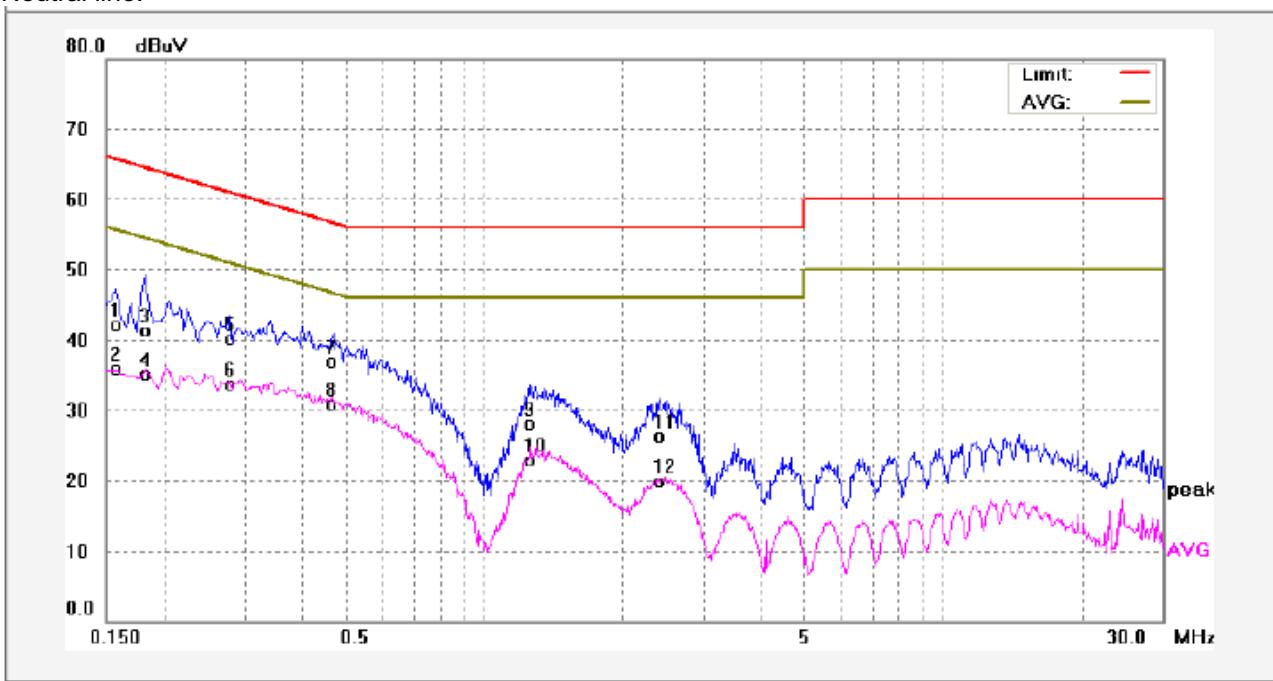
Test Mode: continuous transmitting mode

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	31.75	9.80	41.55	65.99	-24.44	QP	
2	0.1500	25.58	9.80	35.38	55.99	-20.61	AVG	
3	0.1980	31.53	9.84	41.37	63.69	-22.32	QP	
4	0.1980	25.09	9.84	34.93	53.69	-18.76	AVG	
5	0.3300	29.63	9.88	39.51	59.45	-19.94	QP	
6	0.3300	24.15	9.88	34.03	49.45	-15.42	AVG	
7	1.2980	21.31	10.00	31.31	56.00	-24.69	QP	
8	1.2980	16.38	10.00	26.38	46.00	-19.62	AVG	
9	2.6099	17.71	10.02	27.73	56.00	-28.27	QP	
10	2.6099	13.32	10.02	23.34	46.00	-22.66	AVG	
11	5.6779	15.45	10.17	25.62	60.00	-34.38	QP	
12	5.6779	10.97	10.17	21.14	50.00	-28.86	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	32.35	9.81	42.16	65.56	-23.40	QP	
2	0.1580	26.01	9.81	35.82	55.56	-19.74	AVG	
3	0.1819	31.50	9.83	41.33	64.39	-23.06	QP	
4	0.1819	25.32	9.83	35.15	54.39	-19.24	AVG	
5	0.2779	30.29	9.86	40.15	60.88	-20.73	QP	
6	0.2779	23.86	9.86	33.72	50.88	-17.16	AVG	
7	0.4700	26.92	9.92	36.84	56.51	-19.67	QP	
8	0.4700	20.93	9.92	30.85	46.51	-15.66	AVG	
9	1.2500	18.13	10.00	28.13	56.00	-27.87	QP	
10	1.2500	12.81	10.00	22.81	46.00	-23.19	AVG	
11	2.4020	16.29	10.01	26.30	56.00	-29.70	QP	
12	2.4020	9.88	10.01	19.89	46.00	-26.11	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

15.247(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(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
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: 1010 mbar

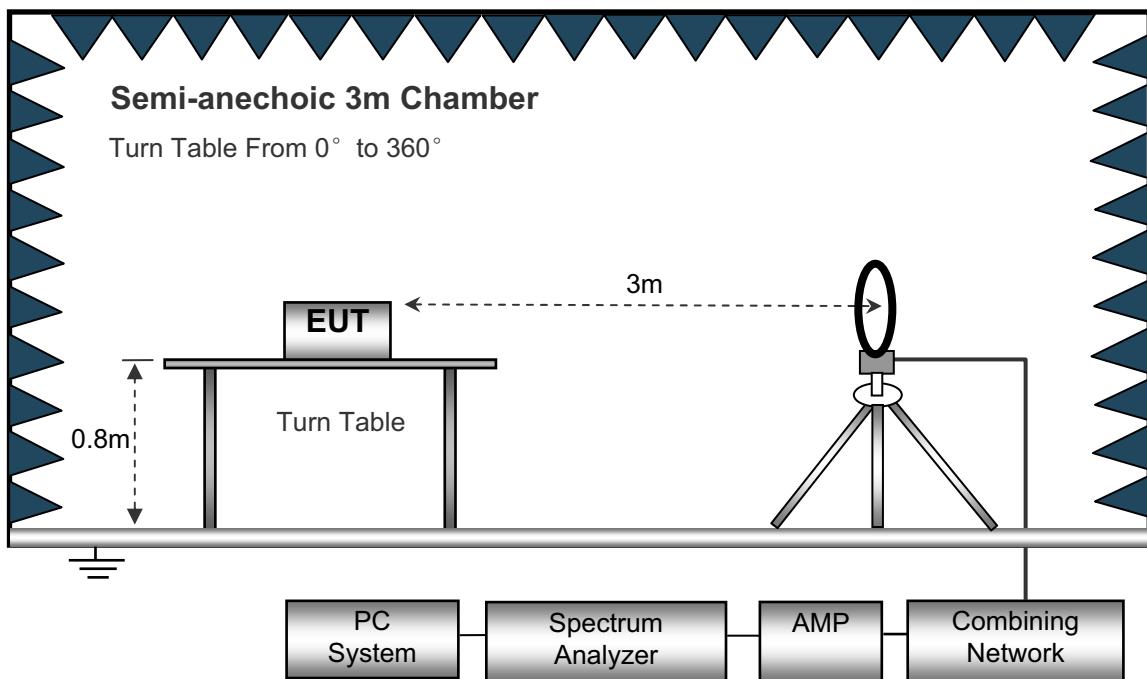
Operation Mode:

The EUT was tested in continuous transmitting and normal working mode. The worst data were shown as follow.

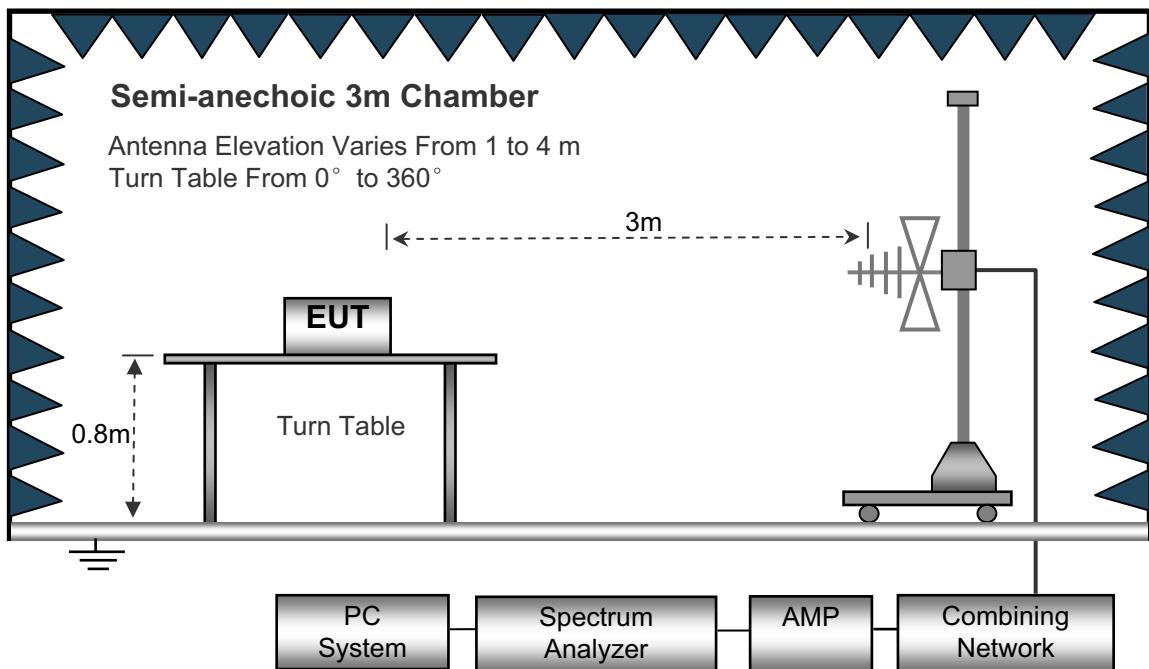
7.2 Test Setup

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

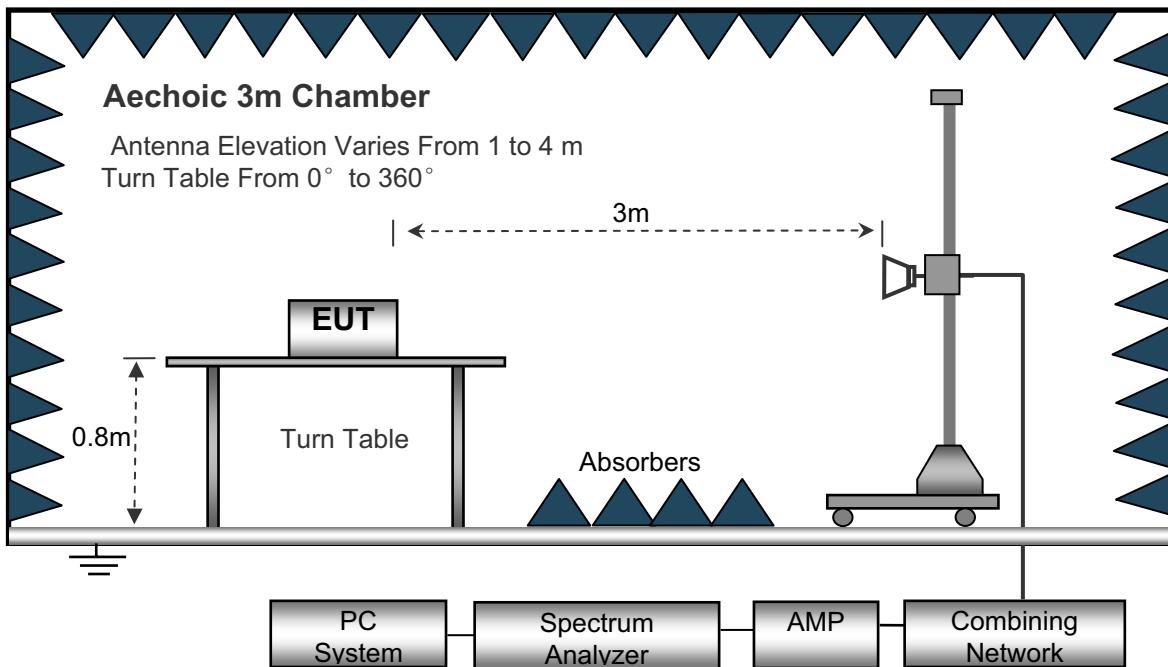
The test setup for emission measurement below 30MHz.



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 9kHz to 10GHz.

Below 30MHz

Sweep Speed	Auto
IF Bandwidth	10 KHz
Video Bandwidth	10KHz
Resolution Bandwidth	10 KHz

30MHz ~ 1GHz

Sweep Speed	Auto
IF Bandwidth	120 KHz
Video Bandwidth	100Khz
Quasi-Peak Adapter Bandwidth.....	120 KHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth	100Khz

Above 1GHz

Sweep Speed	Auto
IF Bandwidth	120 KHz
Video Bandwidth	3MHz
Quasi-Peak Adapter Bandwidth.....	120 KHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth	1MHz

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 -7dB μ V means the emission is 7dB μ V 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 dB μ V/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 preselector was accounted for in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dB μ V+10.36dB=30.36dB μ V/m @3m

7.7 Radiated Emission Data

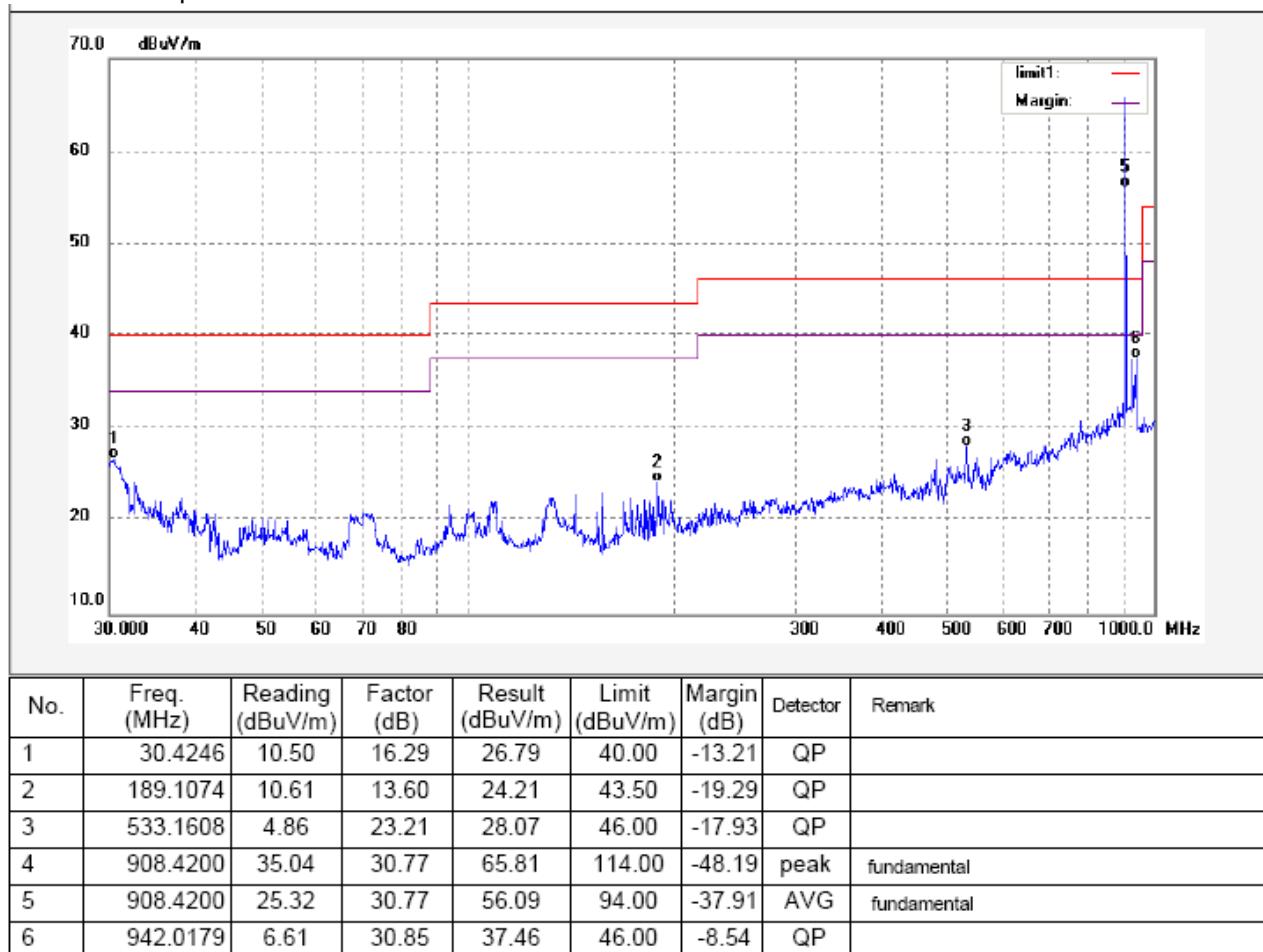
Test Frequency :Below 30MHz

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

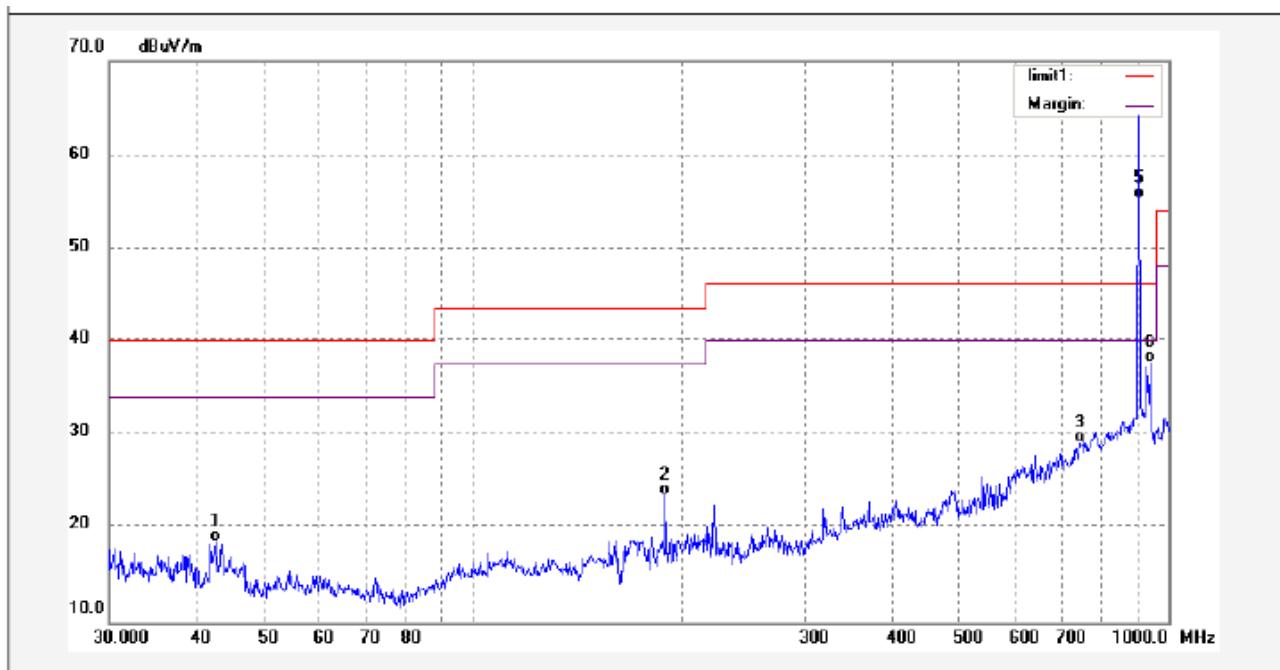
Test Frequency: 30MHz ~ 1000MHz

Test Mode: Continuous transmitting

Antenna polarization: Vertical



Antenna polarization: Horizontal

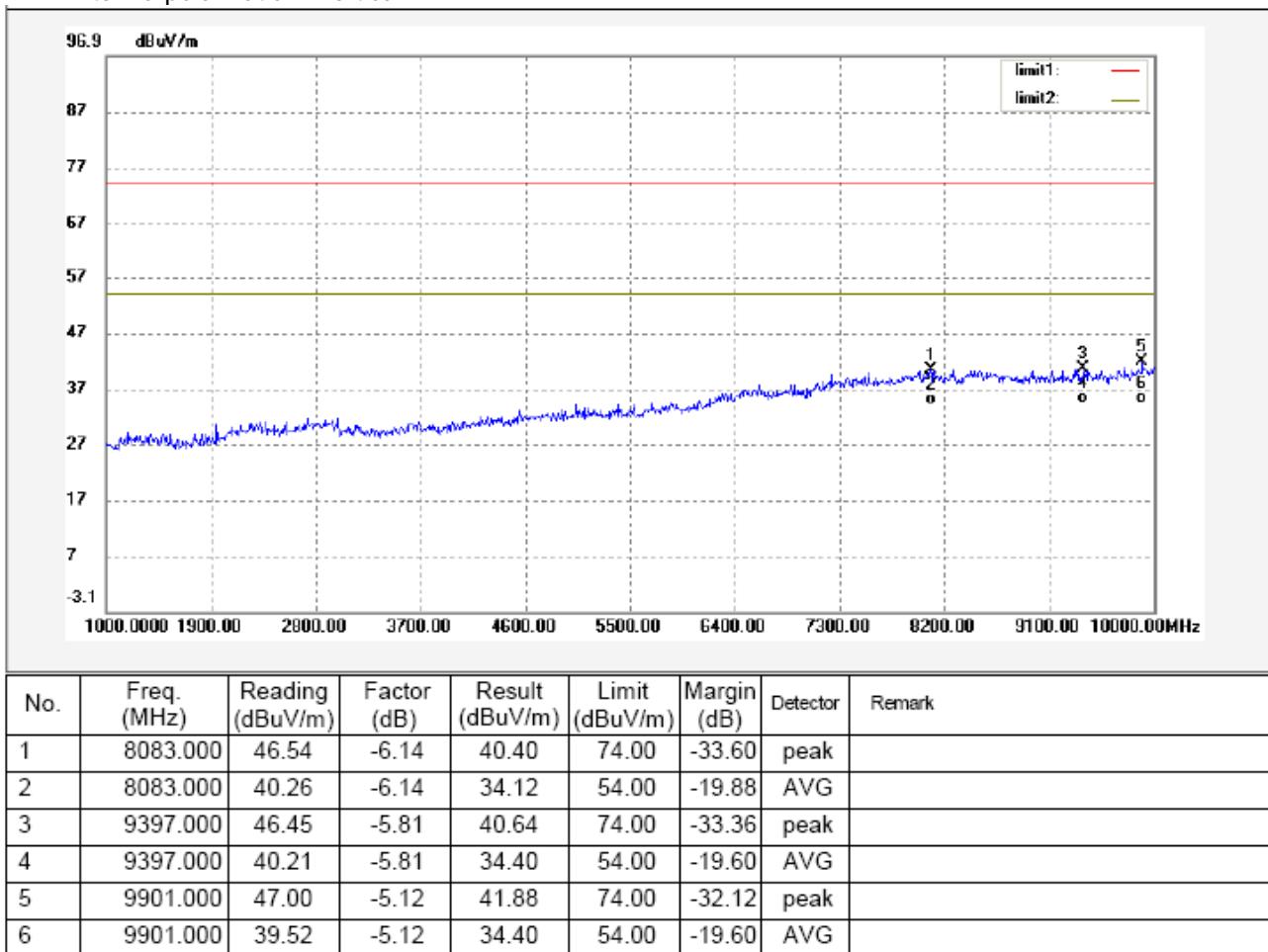


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	42.6298	3.26	15.44	18.70	40.00	-21.30	QP	
2	189.1074	9.97	13.60	23.57	43.50	-19.93	QP	
3	747.0465	1.97	27.19	29.16	46.00	-16.84	QP	
4	908.4200	33.68	30.77	64.45	114.00	-49.55	peak	fundamental
5	908.4200	24.65	30.77	55.42	94.00	-38.58	AVG	fundamental
6	942.0180	6.85	30.85	37.70	46.00	-8.30	QP	

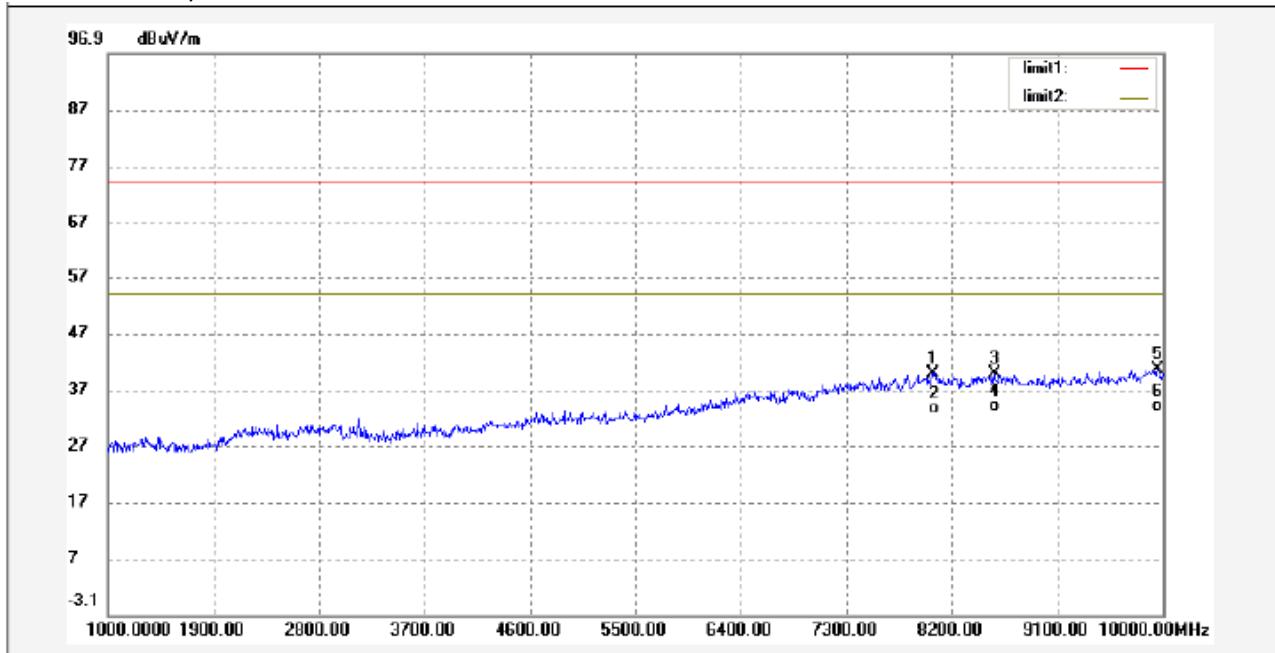
Test Frequency: 1GHz ~ 10GHz

Test Mode: Continuous transmitting

Antenna polarization: Vertical



Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	8038.000	45.87	-6.05	39.82	74.00	-34.18	peak	
2	8047.000	38.54	-6.04	32.50	54.00	-21.50	AVG	
3	8560.000	46.51	-6.72	39.79	74.00	-34.21	peak	
4	8560.000	39.65	-6.72	32.93	54.00	-21.07	AVG	
5	9955.000	45.65	-5.19	40.46	74.00	-33.54	peak	
6	9955.000	38.25	-5.19	33.06	54.00	-20.94	AVG	

8 Restricted band

Test Requirement: FCC Part15 Paragraph 15.205

Test Method: ANSI C63.4:2003

Test Result: N/A

Requirements:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35apply to these measurements.

Remark:Transmitter operates only at 908MHz,center of band.

9 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 integrated antenna, fulfil the requirement of this section.

10 Photographs of Testing

10.1 Conducted Emissions Test View



10.2 Radiation Emission From 30MHz-1GHz



10.3 Radiation Emission From 30MHz-1GHz



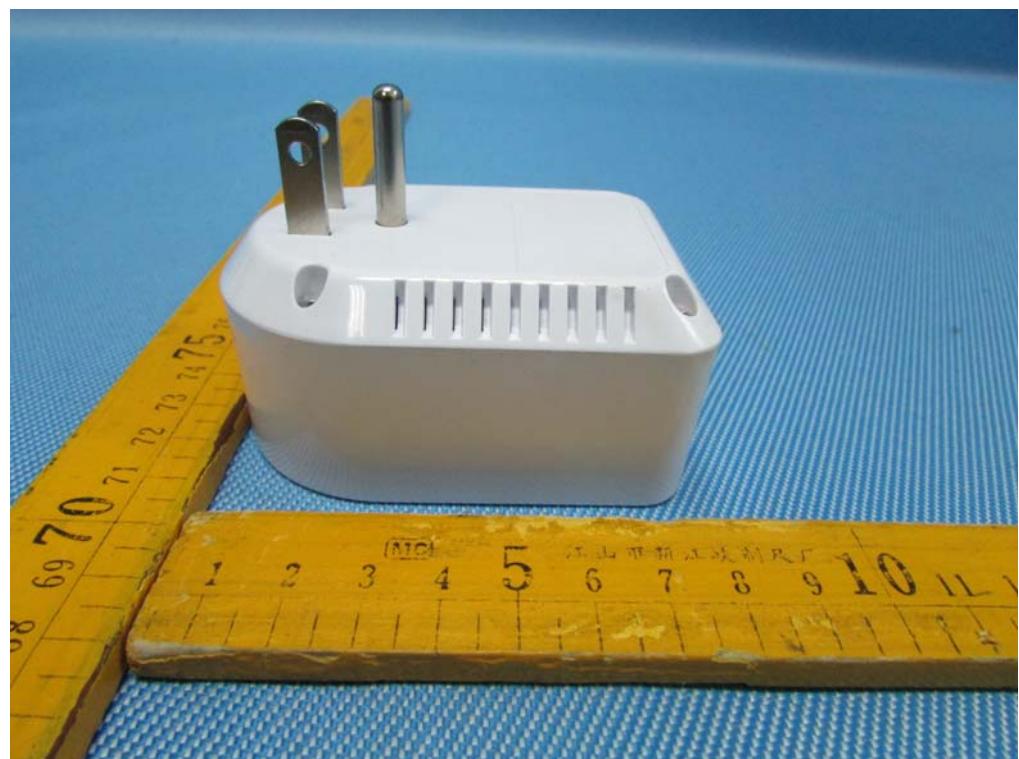
10.4 Radiation Emission Above 1GHz



11 Photographs - Constructional Details

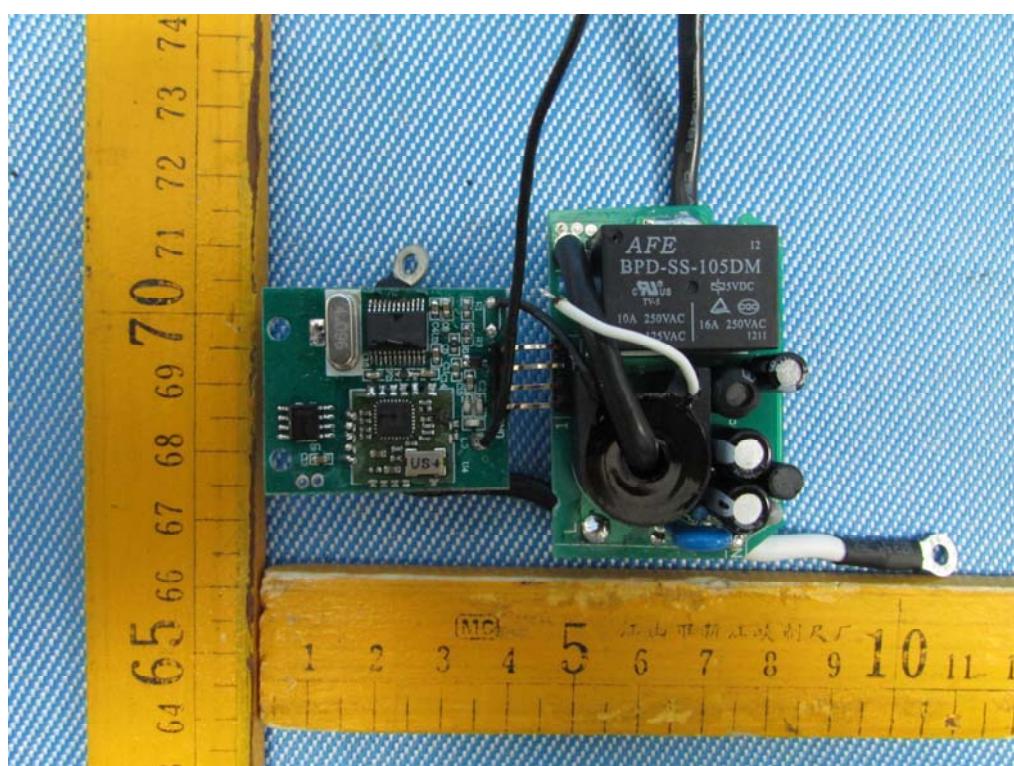
11.1 EUT - Appearance View

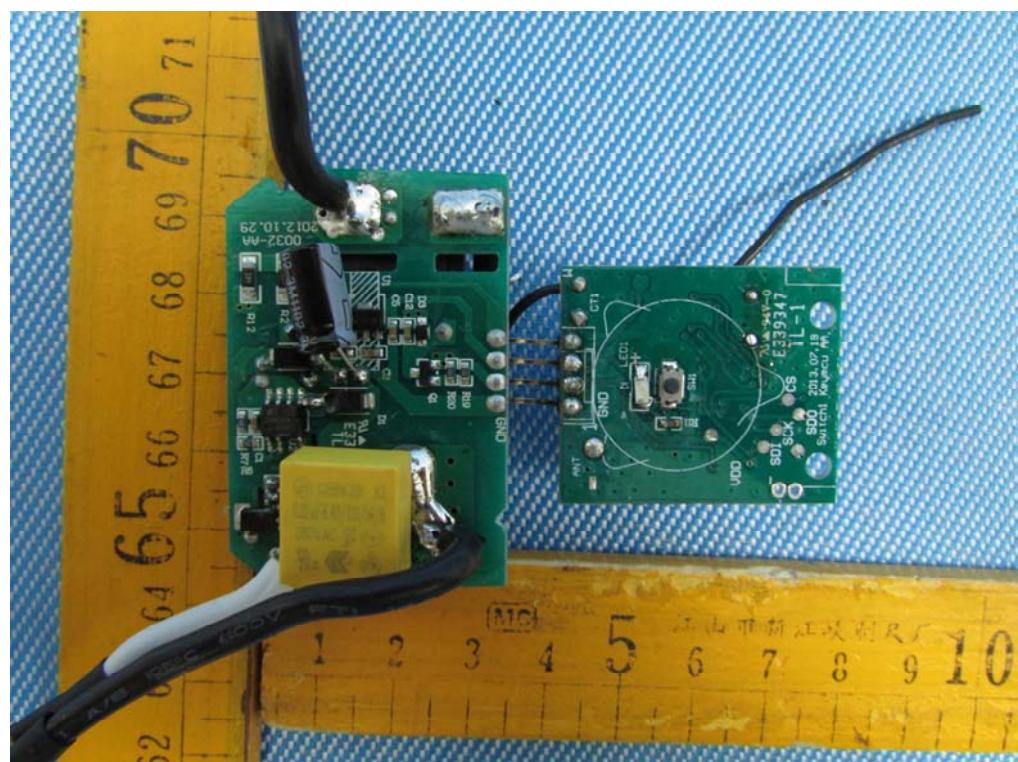




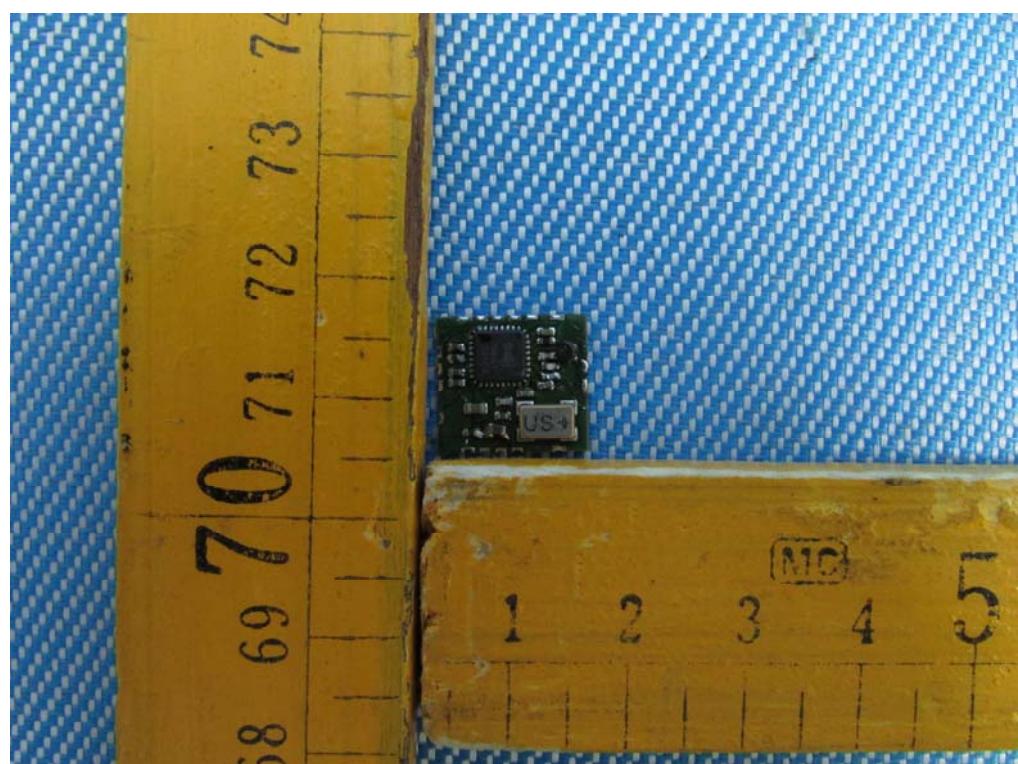


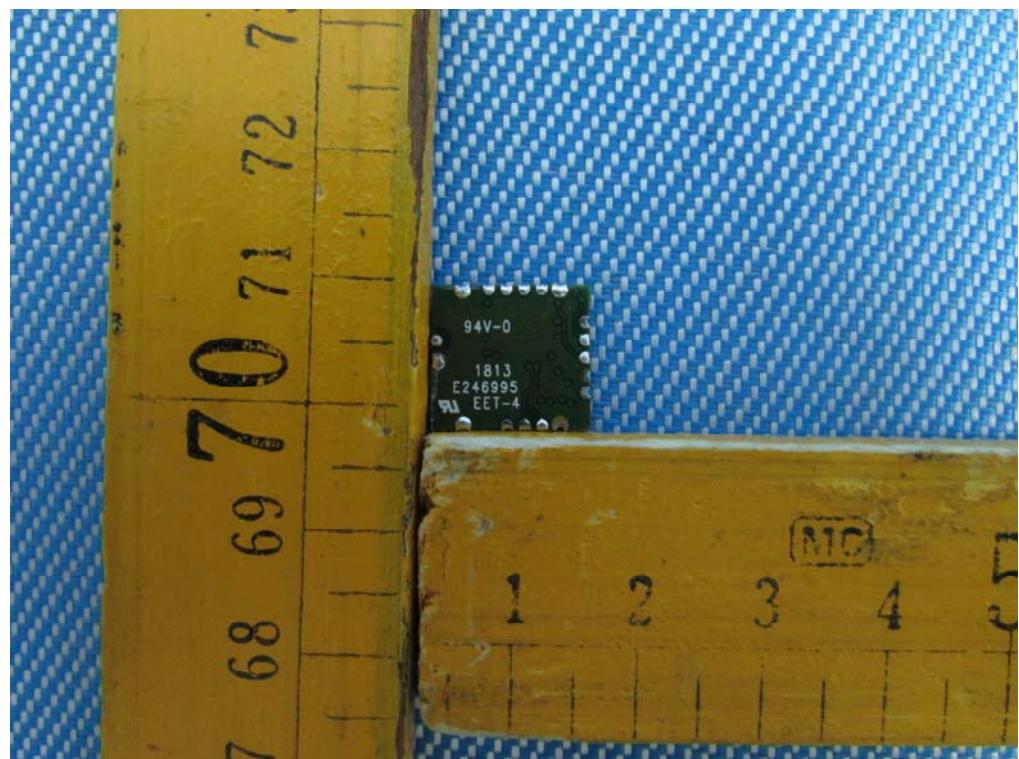
11.2 EUT - Open View





11.3 EUT – RF Module





==END==