# TEST REPORT

| | |
|---|---|
| **FCC ID** | : XBADSC25 |
| **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 Dimmer (2nd Edition) |
| Model No. | : DSC25-ZWUS |
| **Rules** | : FCC CFR47 Part 15 Section 15.249: 2012 |

| | |
|---|---|
| **Date of Test** | : August 10~11, 2013 |
| **Date of Issue** | : August 26, 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: Approved by:

Maikou Zhang

Maikou Zhang / Project Engineer 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)<br>15.209<br>15.249(a) | PASS |
| Antenna Requirement | 15.203 | PASS |

# 3 Contents

# 4 General Information

## 4.1 General Description of E.U.T.

| | |
|---|---|
| **Product Name** | : Smart Dimmer (2nd Edition) |
| **Model No.** | : DSC25-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, 3.15A 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 ℃ 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 | ± 1 x $10^{-6}$ |
| RF Power | ± 1.0 dB |
| RF Power Density | ± 2.2 dB |
| Radiated Spurious Emissions test | ± 5.03 dB<br>(Bilog antenna 30M~1000MHz) |
| | ± 4.74 dB<br>(Horn antenna 1000M~25000MHz) |
| Conducted Spurious Emissions test | ± 3.64 dB<br>(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: | 1011 mbar |

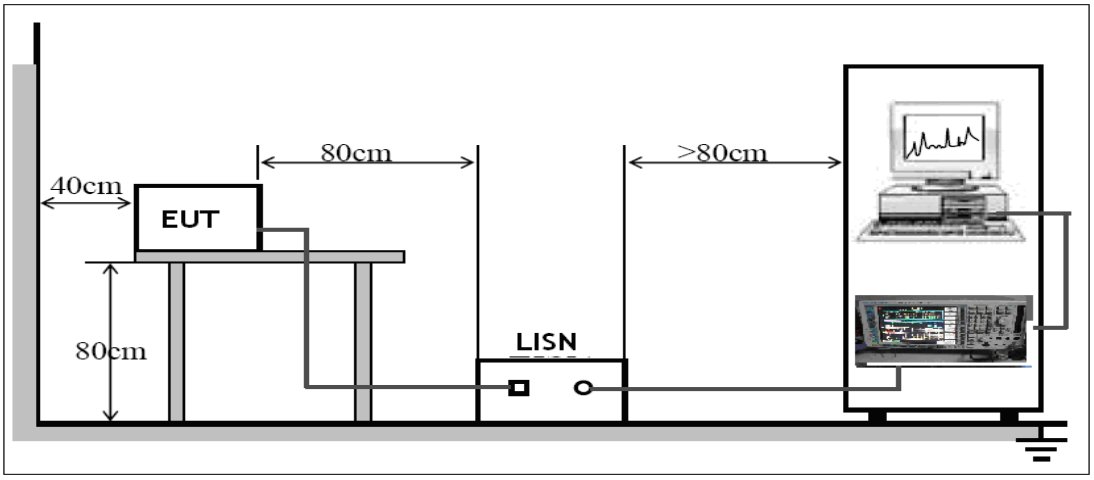
**EUT Operation :**

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.



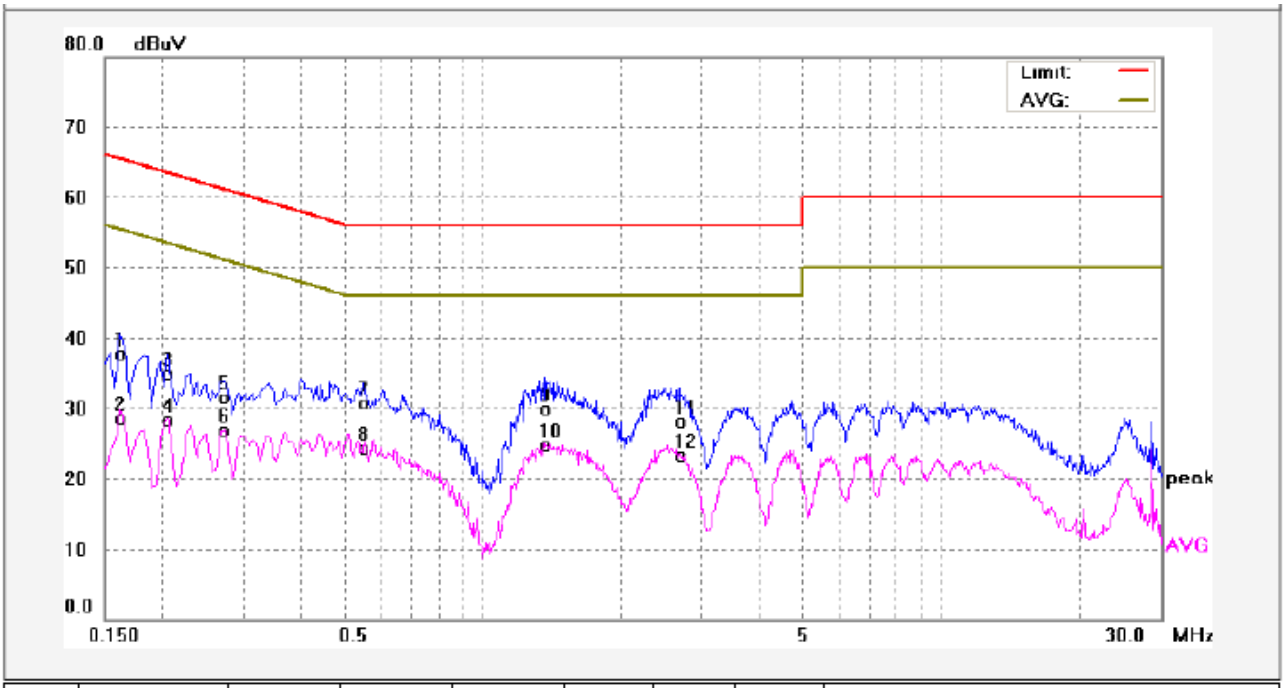

The EUT was placed on the test table in shielding room

## 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.

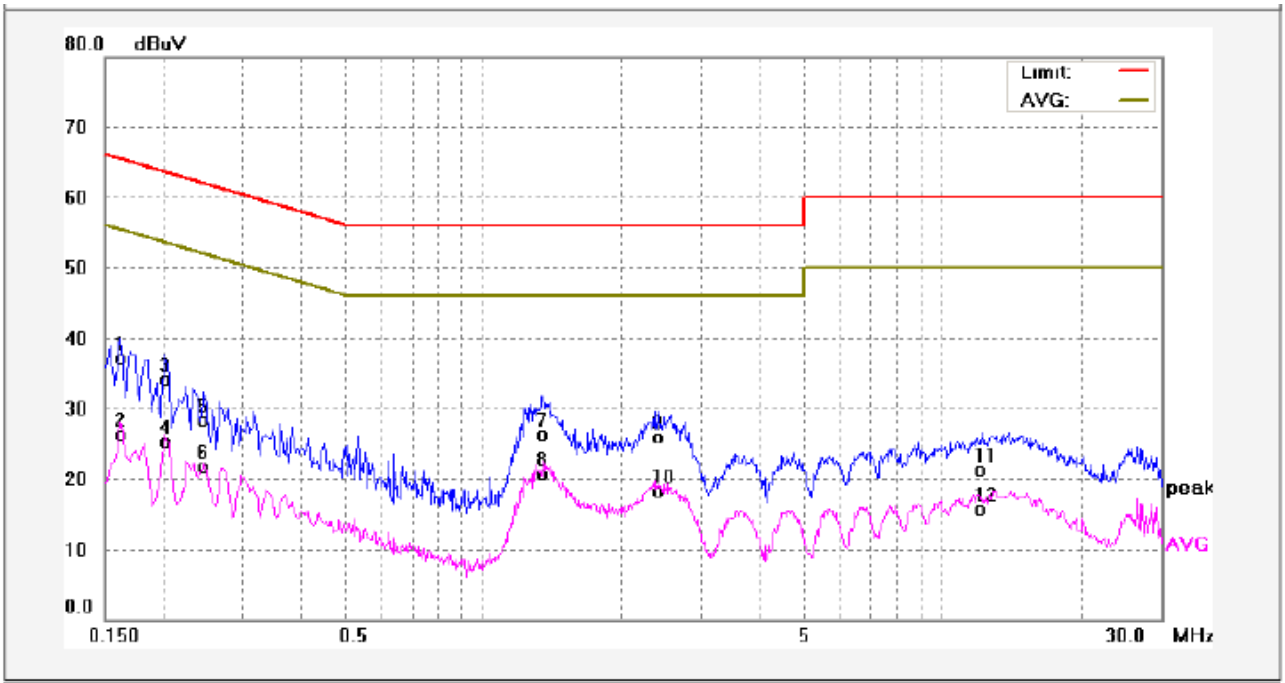
Test Mode: continuous transmitting mode

Live line:




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1620 | 27.93 | 9.81 | 37.74 | 65.36 | -27.62 | QP | |
| 2 | 0.1620 | 18.72 | 9.81 | 28.53 | 55.36 | -26.83 | AVG | |
| 3 | 0.2060 | 25.04 | 9.84 | 34.88 | 63.36 | -28.48 | QP | |
| 4 | 0.2060 | 18.54 | 9.84 | 28.38 | 53.36 | -24.98 | AVG | |
| 5 | 0.2740 | 21.70 | 9.86 | 31.56 | 60.99 | -29.43 | QP | |
| 6 | 0.2740 | 17.11 | 9.86 | 26.97 | 50.99 | -24.02 | AVG | |
| 7 | 0.5500 | 20.76 | 9.93 | 30.69 | 56.00 | -25.31 | QP | |
| 8 | 0.5500 | 14.42 | 9.93 | 24.35 | 46.00 | -21.65 | AVG | |
| 9 | 1.3660 | 19.90 | 10.00 | 29.90 | 56.00 | -26.10 | QP | |
| 10 | 1.3660 | 14.70 | 10.00 | 24.70 | 46.00 | -21.30 | AVG | |
| 11 | 2.6820 | 18.08 | 10.02 | 28.10 | 56.00 | -27.90 | QP | |
| 12 | 2.6820 | 13.20 | 10.02 | 23.22 | 46.00 | -22.78 | AVG | |

Neutral line:




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1620 | 27.32 | 9.81 | 37.13 | 65.36 | -28.23 | QP | |
| 2 | 0.1620 | 16.48 | 9.81 | 26.29 | 55.36 | -29.07 | AVG | |
| 3 | 0.2020 | 24.19 | 9.84 | 34.03 | 63.52 | -29.49 | QP | |
| 4 | 0.2020 | 15.40 | 9.84 | 25.24 | 53.52 | -28.28 | AVG | |
| 5 | 0.2460 | 18.55 | 9.85 | 28.40 | 61.89 | -33.49 | QP | |
| 6 | 0.2460 | 11.79 | 9.85 | 21.64 | 51.89 | -30.25 | AVG | |
| 7 | 1.3420 | 16.38 | 10.00 | 26.38 | 56.00 | -29.62 | QP | |
| 8 | 1.3420 | 10.74 | 10.00 | 20.74 | 46.00 | -25.26 | AVG | |
| 9 | 2.4140 | 15.83 | 10.01 | 25.84 | 56.00 | -30.16 | QP | |
| 10 | 2.4140 | 8.37 | 10.01 | 18.38 | 46.00 | -27.62 | AVG | |
| 11 | 12.2900 | 10.66 | 10.68 | 21.34 | 60.00 | -38.66 | QP | |
| 12 | 12.2900 | 4.95 | 10.68 | 15.63 | 50.00 | -34.37 | 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:**

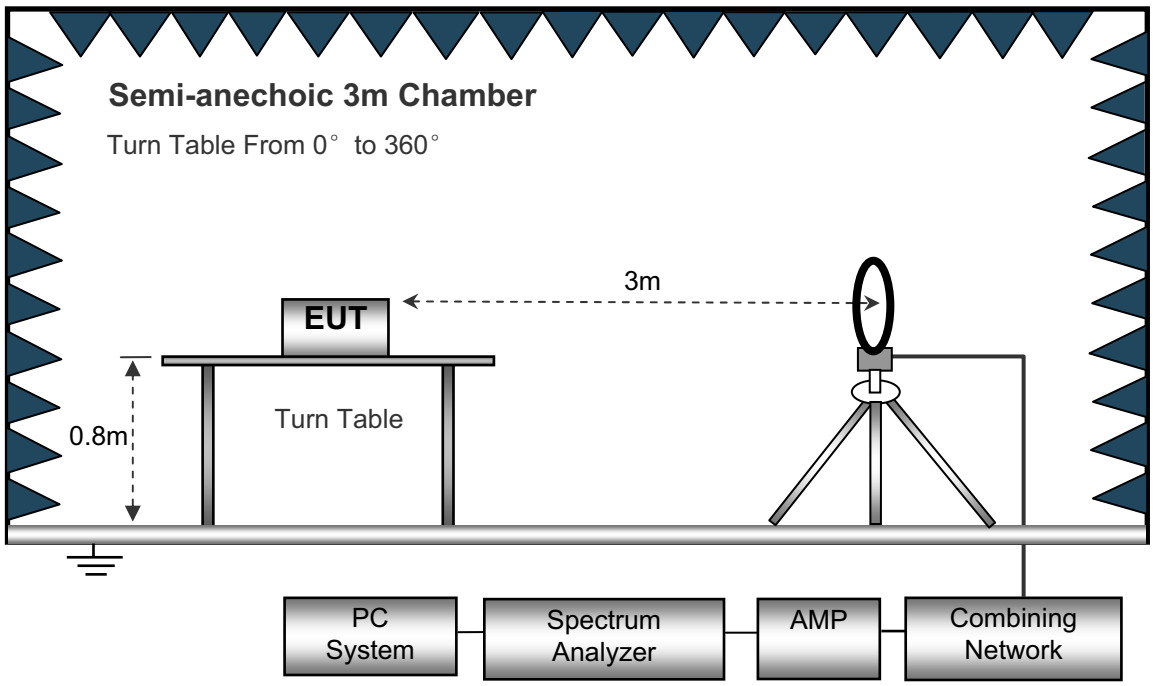
Temperature: 25.5 °C
Humidity: 51 % RH
Atmospheric Pressure: 1010 mbar

**Operation Mode:**

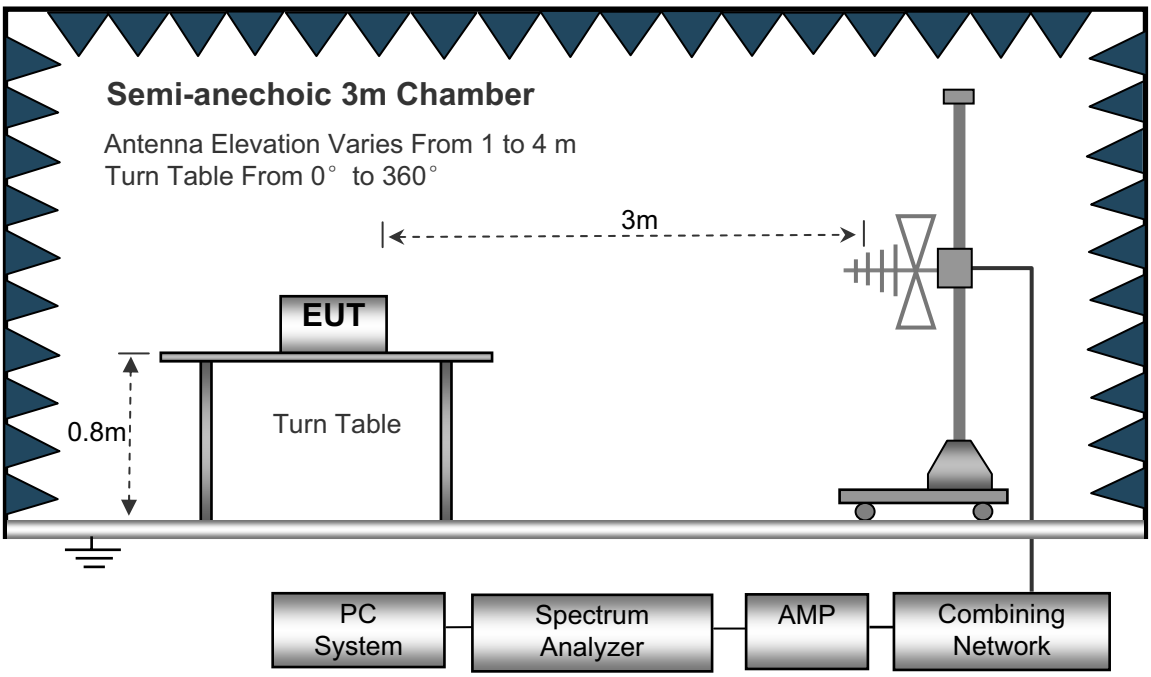
The EUT was tested in continuous transmitting and normal working mode. The worst data were shown as follow.

## 7.2 Test Setup

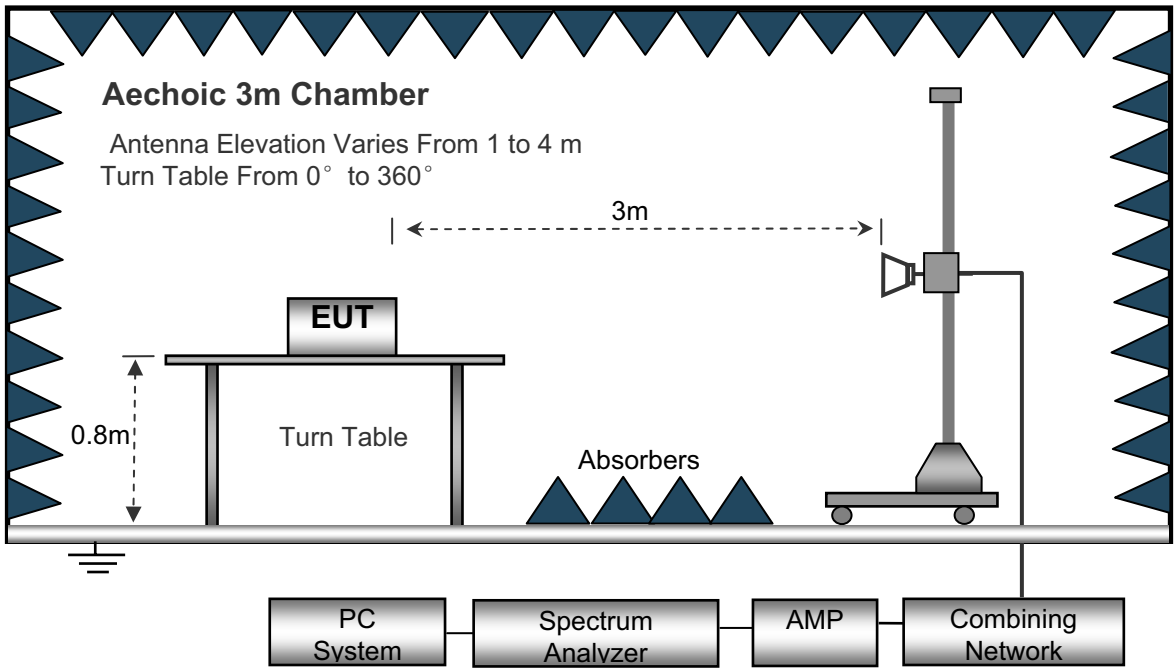
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.
The test setup for emission measurement below 30MHz.




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 handhold 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:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor – 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:

Margin = Corr. Ampl. – Class B Limit

## 7.6 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was egtablished 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 stared 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

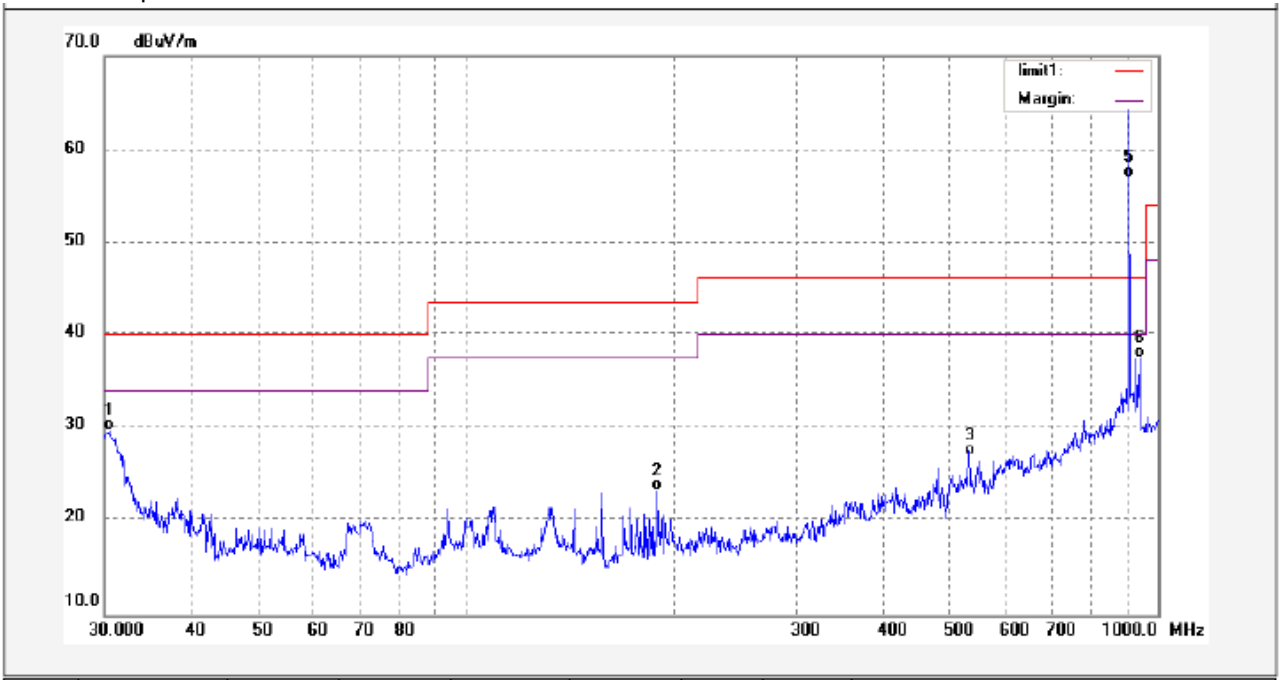
Test Frequency :Below 30MHz

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

Test Frequency: 30MHz ~ 1000MHz

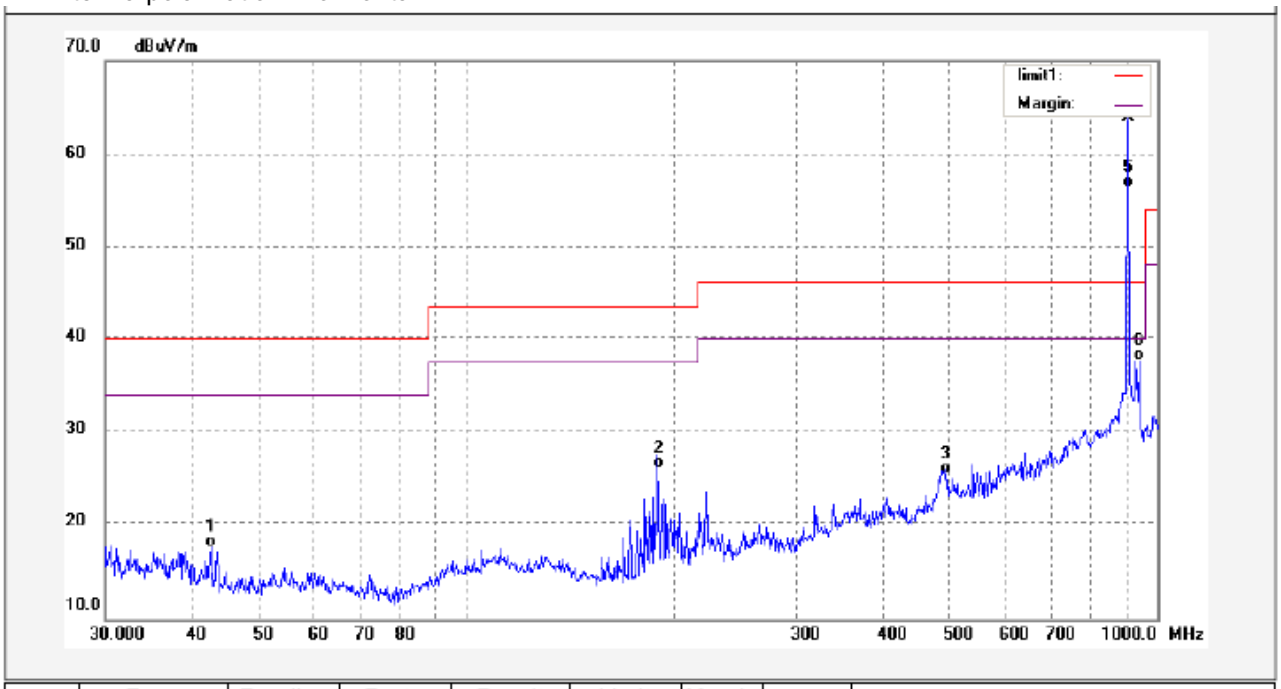
Test Mode: Continuous transmitting

Antenna polarization: Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 30.4246 | 13.50 | 16.29 | 29.79 | 40.00 | -10.21 | QP | |
| 2 | 189.1075 | 9.61 | 13.60 | 23.21 | 43.50 | -20.29 | QP | |
| 3 | 533.1611 | 3.87 | 23.21 | 27.08 | 46.00 | -18.92 | QP | |
| 4 | 908.4200 | 33.54 | 30.77 | 64.31 | 114.00 | -49.69 | peak | fundamental |
| 5 | 908.4200 | 26.23 | 30.77 | 57.00 | 94.00 | -37.00 | AVG | fundamental |
| 6 | 942.0179 | 6.61 | 30.85 | 37.46 | 46.00 | -8.54 | QP | |

Antenna polarization: Horizontal

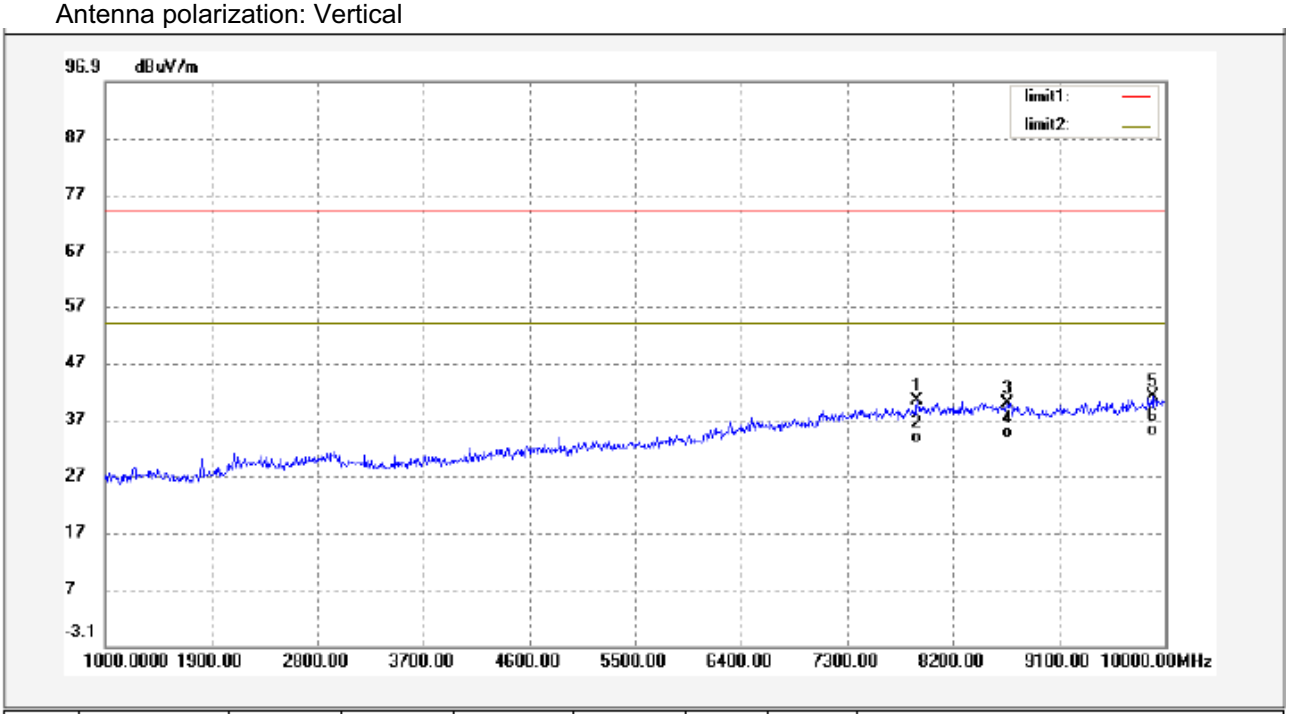



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 42.6299 | 2.26 | 15.44 | 17.70 | 40.00 | -22.30 | QP | |
| 2 | 189.1076 | 12.47 | 13.60 | 26.07 | 43.50 | -17.43 | QP | |
| 3 | 495.2379 | 1.70 | 23.87 | 25.57 | 46.00 | -20.43 | QP | |
| 4 | 908.4200 | 33.18 | 30.77 | 63.95 | 114.00 | -50.05 | peak | fundamental |
| 5 | 908.4200 | 25.62 | 30.77 | 56.39 | 94.00 | -37.61 | AVG | fundamental |
| 6 | 942.0180 | 6.85 | 30.85 | 37.70 | 46.00 | -8.30 | QP | |

**Test Frequency: 1GHz ~ 10GHz**

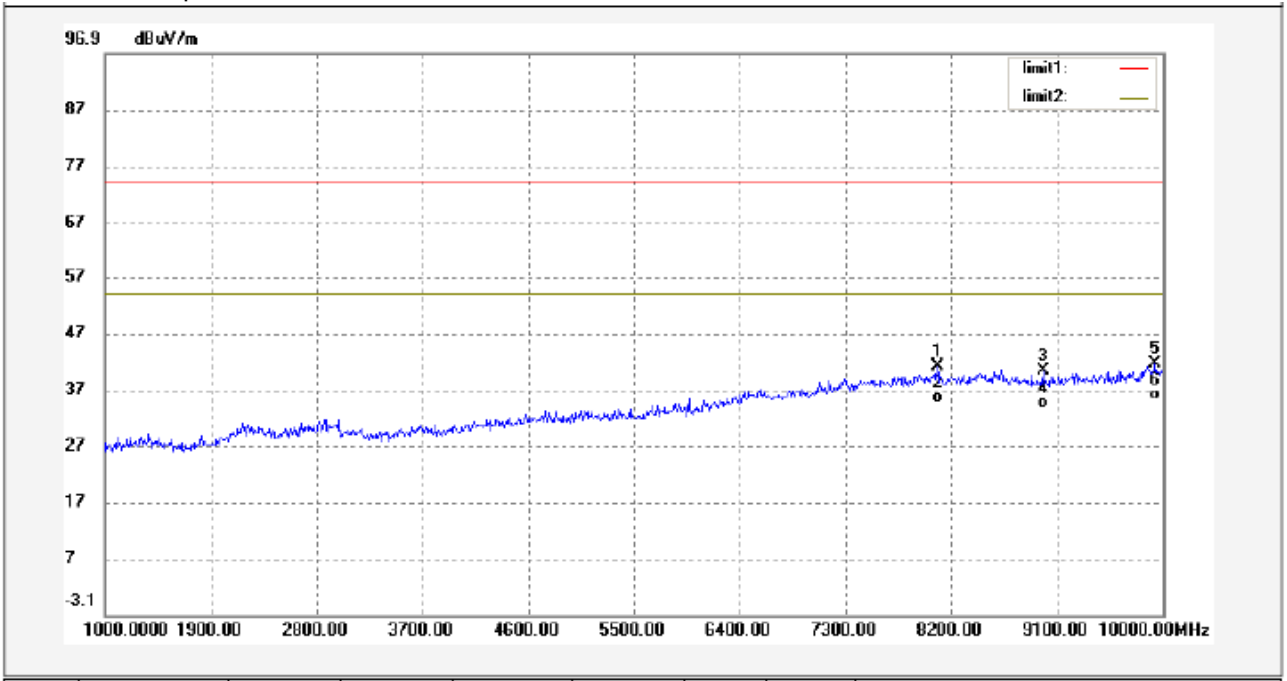
Test Mode:Continuous transmitting

Antenna polarization: Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 7894.000 | 46.63 | -6.36 | 40.27 | 74.00 | -33.73 | peak | |
| 2 | 7894.000 | 39.25 | -6.36 | 32.89 | 54.00 | -21.11 | AVG | |
| 3 | 8659.000 | 46.53 | -6.75 | 39.78 | 74.00 | -34.22 | peak | |
| 4 | 8659.000 | 40.20 | -6.75 | 33.45 | 54.00 | -20.55 | AVG | |
| 5 | 9901.000 | 46.21 | -5.12 | 41.09 | 74.00 | -32.91 | peak | |
| 6 | 9901.000 | 39.21 | -5.12 | 34.09 | 54.00 | -19.91 | AVG | |

Antenna polarization: Horizontal




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 8083.000 | 47.23 | -6.14 | 41.09 | 74.00 | -32.91 | peak | |
| 2 | 8083.000 | 40.65 | -6.14 | 34.51 | 54.00 | -19.49 | AVG | |
| 3 | 8983.000 | 46.99 | -6.68 | 40.31 | 74.00 | -33.69 | peak | |
| 4 | 8983.000 | 40.25 | -6.68 | 33.57 | 54.00 | -20.43 | AVG | |
| 5 | 9937.000 | 46.66 | -5.16 | 41.50 | 74.00 | -32.50 | peak | |
| 6 | 9937.000 | 40.26 | -5.16 | 35.10 | 54.00 | -18.90 | AVG | |

# 8 Restricted band

| | |
|---|---|
| Test Requirement: | FCC Part15 Paragraph 15.205 |
| Test Method: | ANSI C63.4:2003 |
| Test Result: | N/A |

**Requiments:**

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

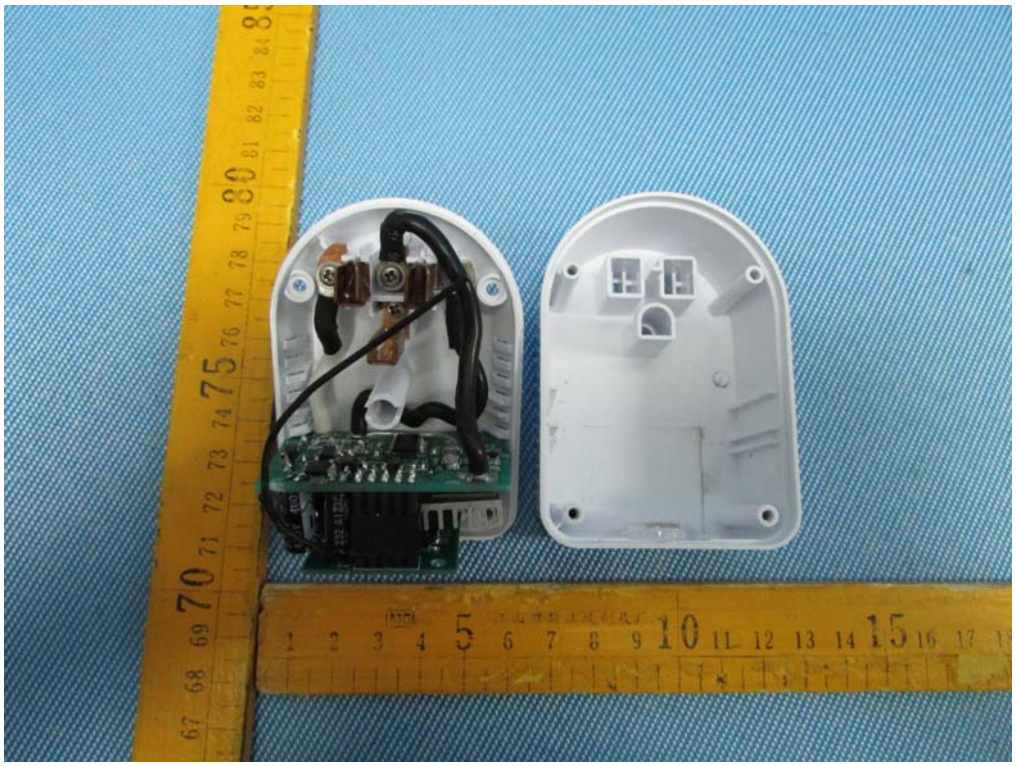
## 10.3 Radiation Emission From 30MHz-1GHz

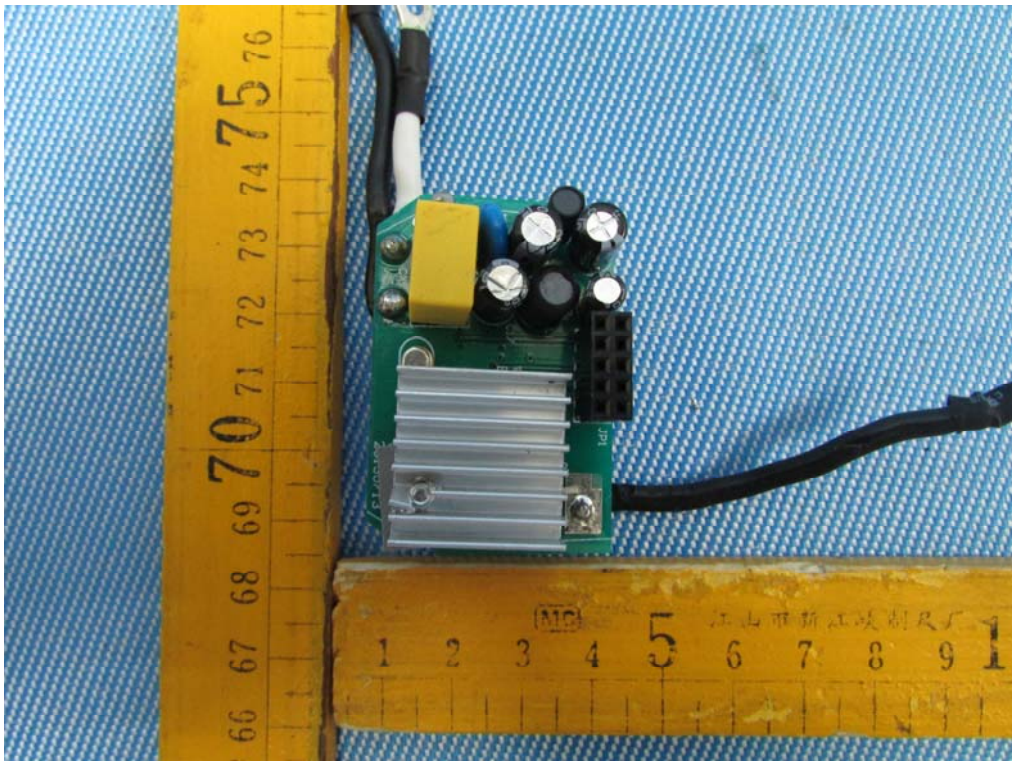
## 10.4 Radiation Emission Above 1GHz

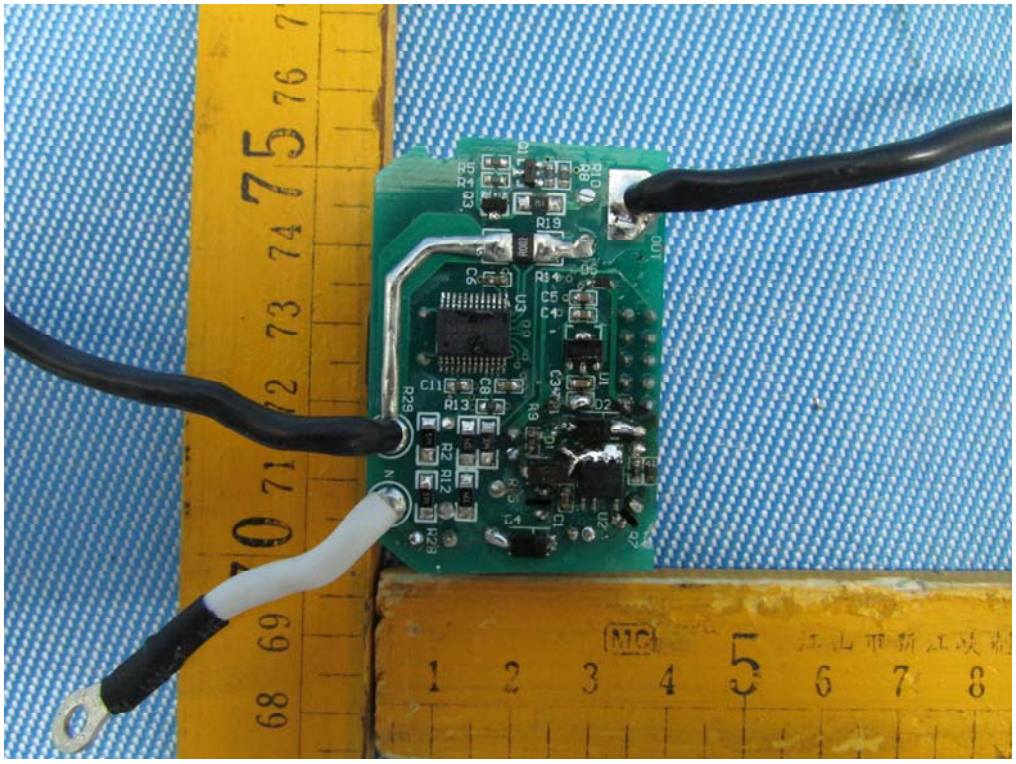
# 11 Photographs - Constructional Details

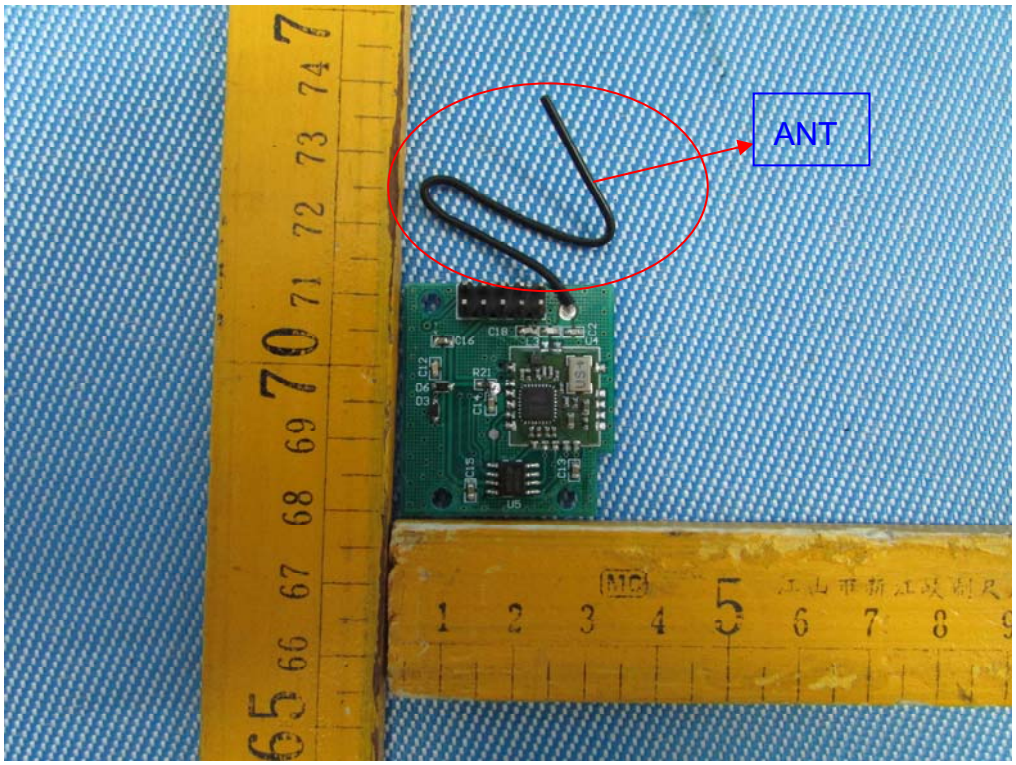
## 11.1 EUT - Appearance View


## 11.2 EUT - Open View





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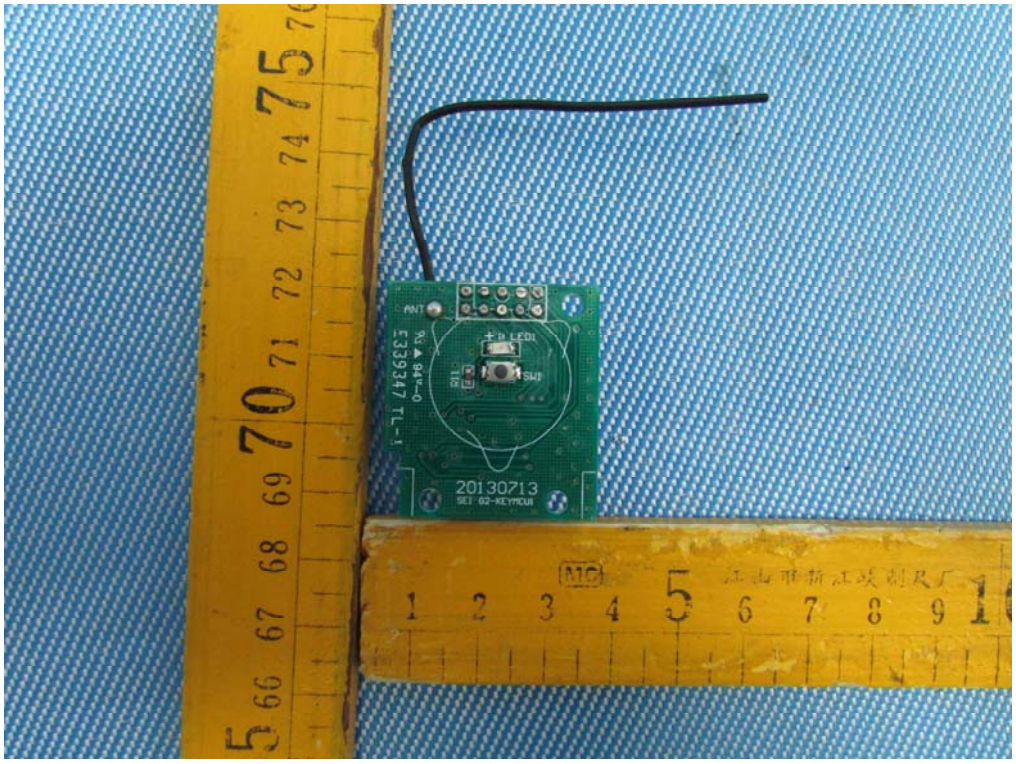
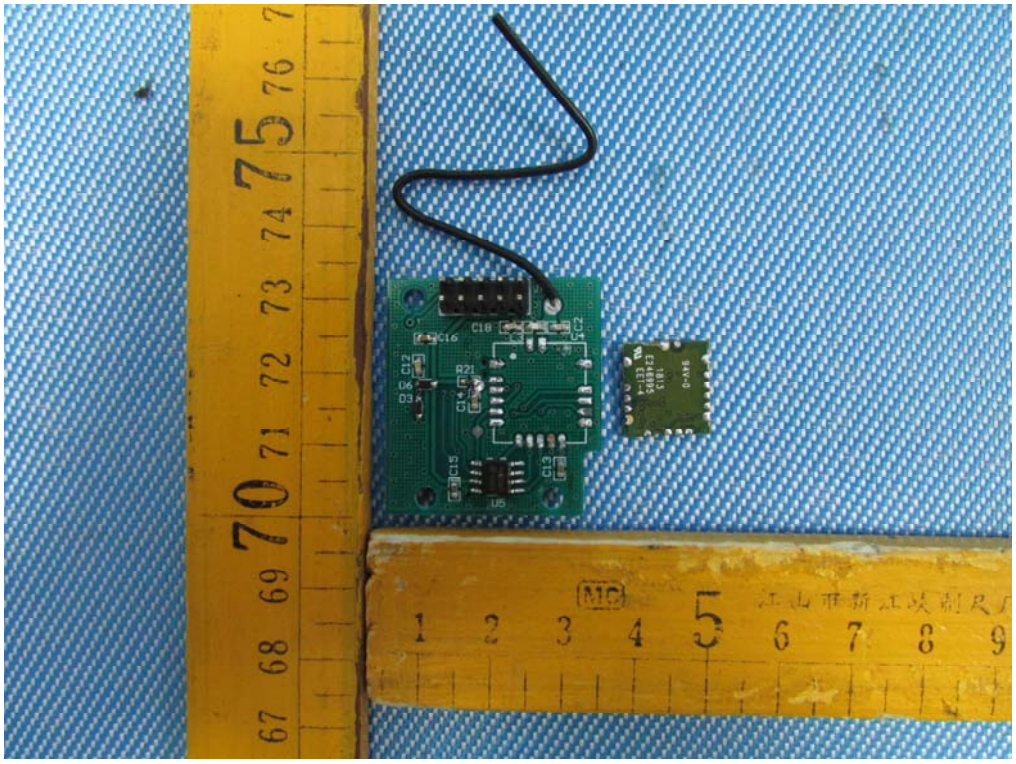
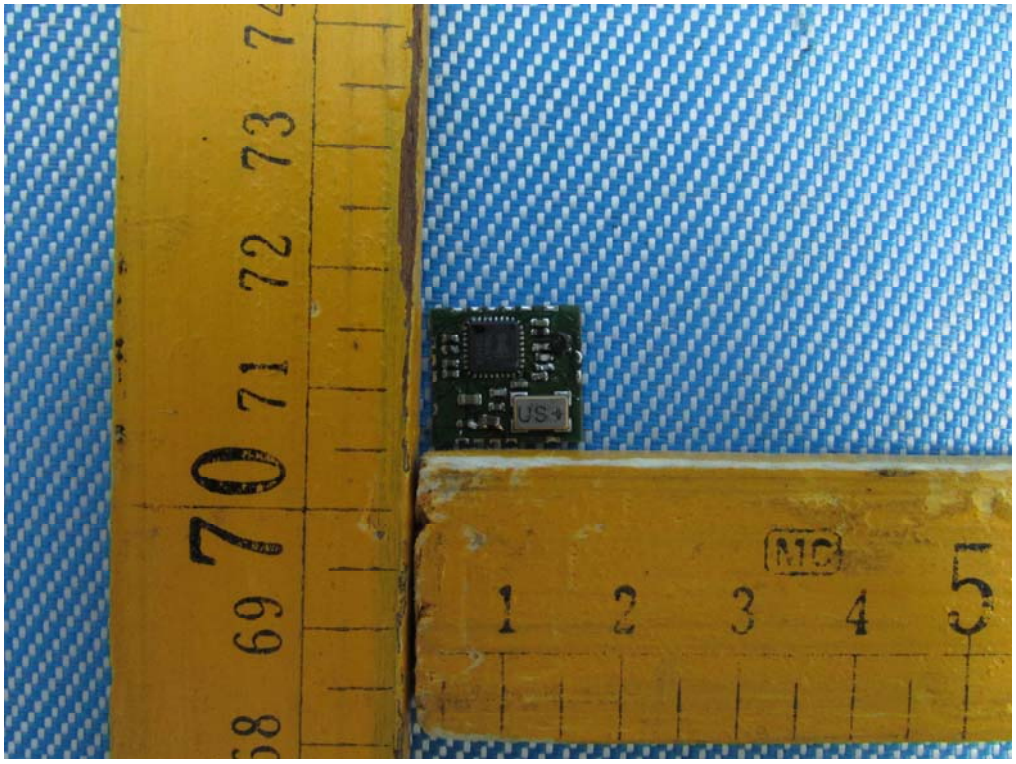
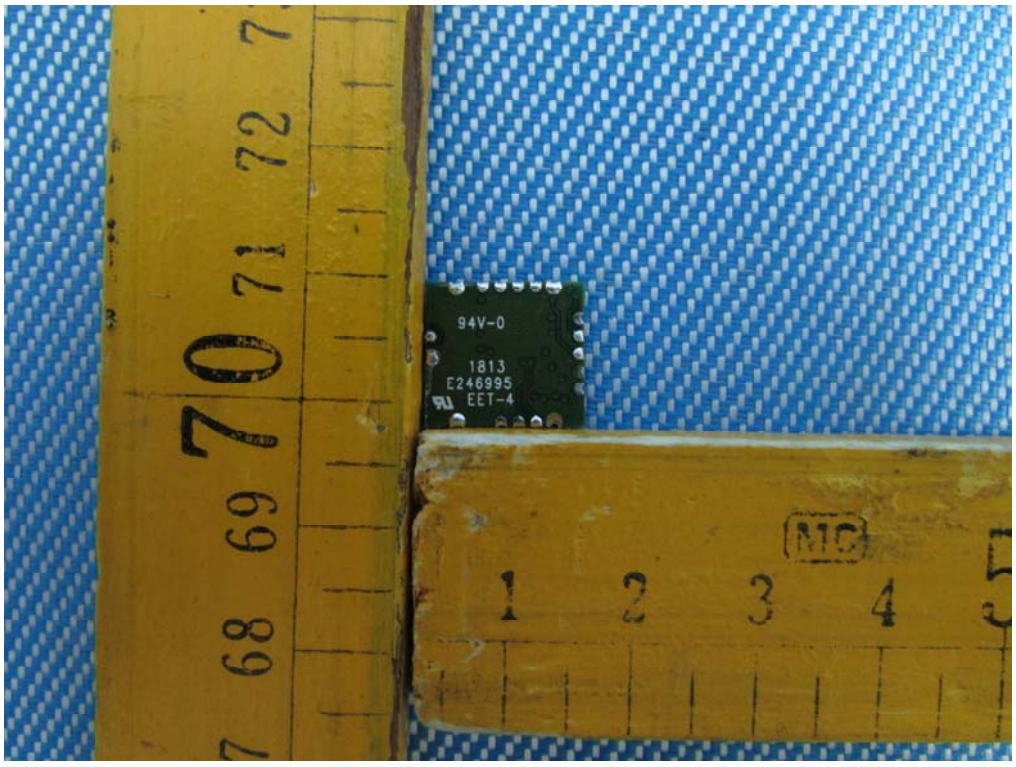



## 11.3 EUT – RF Module





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