

FCC TEST REPORT  
for  
ShenZhen YuYuanXin Electronic Technology Co., LTD.

Bluetooth Keyboard  
Model No.: TP4-008

Prepared for : ShenZhen YuYuanXin Electronic Technology Co., LTD.  
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Guangdong, 518110 China

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## TEST REPORT

Applicant : ShenZhen YuYuanXin Electronic Technology Co., LTD.  
Manufacturer : ShenZhen YuYuanXin Electronic Technology Co., LTD.  
EUT : Bluetooth Keyboard  
Model No. : TP4-008  
Serial No. : N.A.  
Trade Mark : N.A.  
Rating : DC 3.7V, 200mAh

Measurement Procedure Used:

FCC Part15 Subpart C 2015, Paragraph 15.207, 15.247 & 15.209

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Aug. 08~19, 2016

*Baron Wen*

Prepared by :

(Tested Engineer / Baron Wen)

*Dolly mo*

Reviewer :

(Project Manager / Dolly Mo)

*Tom Chen*

Approved & Authorized Signer :

(Manager / Tom Chen)

## 1. GENERAL INFORMATION

### 1.1 Description of Device (EUT)

EUT : Bluetooth Keyboard

Model Number : TP4-008

Test Power Supply : AC 120V, 60Hz for adapter/  
AC 240V, 60Hz for adapter/  
DC 3.7V Battery inside

Frequency : 2402~2480MHz

Antenna Specification : PCB Antenna: 0.944dBi

Modulation : GFSK,  $\pi/4$ DQPSK, 8DPSK

Applicant Address : ShenZhen YuYuanXin Electronic Technology Co., LTD.  
Building 11, Tianluohu Industry Park, Guihua Industry Area,  
Guanguang Road, Guanlan Town, Longhua District, Shenzhen,  
Guangdong, 518110 China

Manufacturer Address : ShenZhen YuYuanXin Electronic Technology Co., LTD.  
Building 11, Tianluohu Industry Park, Guihua Industry Area,  
Guanguang Road, Guanlan Town, Longhua District, Shenzhen,  
Guangdong, 518110 China

Factory Address : ShenZhen YuYuanXin Electronic Technology Co., LTD.  
Building 11, Tianluohu Industry Park, Guihua Industry Area,  
Guanguang Road, Guanlan Town, Longhua District, Shenzhen,  
Guangdong, 518110 China

Date of receipt : Aug. 08, 2016

Date of Test : Aug. 08~19, 2016

## 1.2 Auxiliary Equipment Used during Test

Adapter : Manufacturer: ZTE  
M/N: STC-A2050I1000USBA-C  
S/N: 201202102100876  
Input: 100-240V~50/60Hz 0.3A  
Output: DC 5V, 1000mA

## 1.3 Description of Test Facility

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

### **FCC-Registration No.: 752021**

Shenzhen Anbotek Compliance Laboratory Limited, 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 752021, July 06, 2016.

### **IC-Registration No.: 8058A-1**

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, June 13, 2016.

### **Test Location**

All Emissions tests were performed at  
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC  
Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong,  
China

## 1.4 Measurement Uncertainty

Radiation Uncertainty : Ur = 4.1 dB (Horizontal)  
Ur = 4.3 dB (Vertical)  
Conduction Uncertainty : Uc = 3.4dB

## 2. Test Procedure

**GENERAL:** This report shall NOT be reproduced except in full without the written approval of Shenzhen Anbotek Compliance Laboratory Limited. The EUT was transmitting a test signal during the testing.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.10-2013 using a spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the EUT was 74.3oF with a humidity of 69%.

**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. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

**Example:**

Freq (MHz) METER READING + ACF = FS  
20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

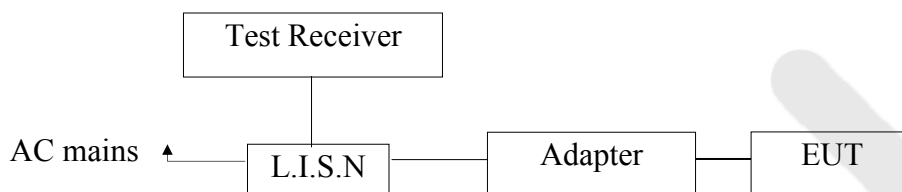
**ANSI STANDARD C63.10-2013 10.1.7 MEASUREMENT PROCEDURES:** The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

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.

### 3. Conducted Emission

#### 3.1 Block Diagram of Test Setup

##### 3.1.1. Block diagram of connection between the EUT and simulators



#### 3.2 Power Line Conducted Emission Measurement Limits (15.207)

| Frequency<br>MHz | Limits dB(μV)    |               |
|------------------|------------------|---------------|
|                  | 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.

#### 3.3 Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

#### 3.4 Operating Condition of EUT

3.4.1. Setup the EUT and simulator as shown as Section 3.1.

3.4.2. Turn on the power of all equipment.

3.4.3. Let the EUT work in test mode (Charging, BT Mode) and measure it.

### 3.5 Test Procedure

The EUT system 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 line 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 FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

The test results are reported on Section 3.6.

#### Test Equipment

| Item | Equipment          | Manufacturer         | Model No. | Serial No. | Last Cal.     | Cal. Interval |
|------|--------------------|----------------------|-----------|------------|---------------|---------------|
| 1.   | Two-Line V-network | Rohde & Schwarz      | ENV216    | 100055     | Apr. 16, 2016 | 1 Year        |
| 2.   | EMI Test Receiver  | Rohde & Schwarz      | ESCI      | 100627     | Apr. 16, 2016 | 1 Year        |
| 3.   | RF Switching Unit  | Compliance Direction | RSU-M2    | 38303      | Apr. 16, 2016 | 1 Year        |

### 3.6 Power Line Conducted Emission Measurement Results

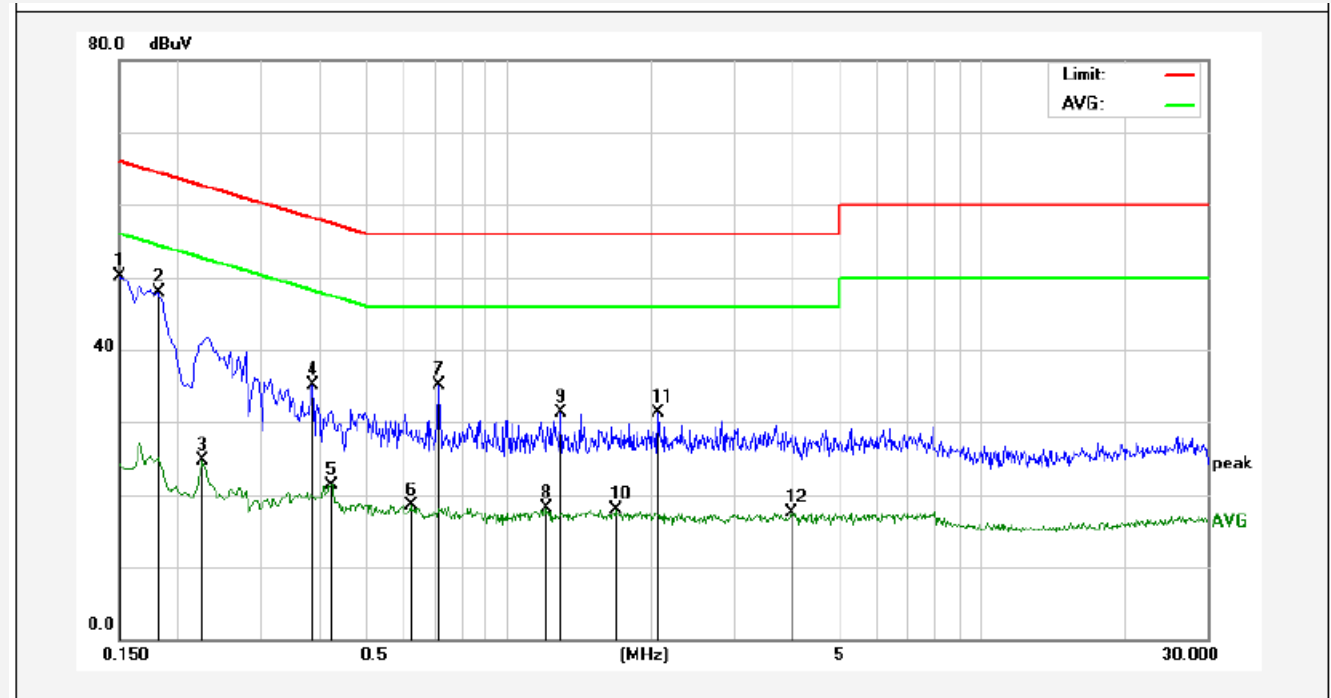
**PASS.**

The frequency range from 150KHz to 30 MHz is investigated.

The EUT was tested on (Charging, BT Mode) modes, only the worst data of (Charging) is attached in the following pages.

### CONDUCTED EMISSION TEST DATA

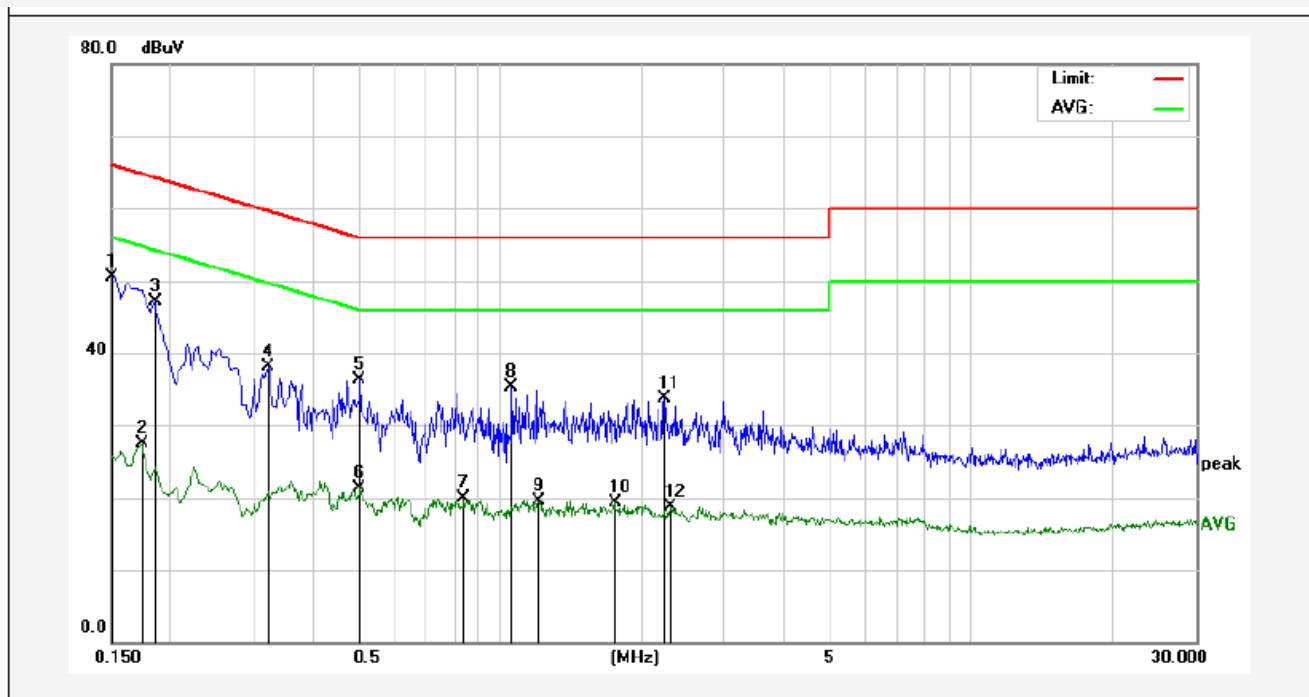
Test Site: 1# Shielded Room  
Operating Condition: Charging  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Live Line  
Tem.:25°C Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.1500      | 30.04          | 20.00       | 50.04         | 65.99      | -15.95          | QP       |        |
| 2   | 0.1819      | 27.87          | 20.00       | 47.87         | 64.39      | -16.52          | QP       |        |
| 3   | 0.2260      | 4.73           | 20.00       | 24.73         | 52.59      | -27.86          | AVG      |        |
| 4   | 0.3860      | 15.18          | 20.00       | 35.18         | 58.15      | -22.97          | QP       |        |
| 5   | 0.4220      | 1.38           | 20.00       | 21.38         | 47.41      | -26.03          | AVG      |        |
| 6   | 0.6220      | -1.52          | 20.00       | 18.48         | 46.00      | -27.52          | AVG      |        |
| 7   | 0.7140      | 15.18          | 20.00       | 35.18         | 56.00      | -20.82          | QP       |        |
| 8   | 1.2059      | -1.95          | 20.00       | 18.05         | 46.00      | -27.95          | AVG      |        |
| 9   | 1.2940      | 11.32          | 20.00       | 31.32         | 56.00      | -24.68          | QP       |        |
| 10  | 1.6860      | -2.02          | 20.00       | 17.98         | 46.00      | -28.02          | AVG      |        |
| 11  | 2.0700      | 11.36          | 20.00       | 31.36         | 56.00      | -24.64          | QP       |        |
| 12  | 3.9700      | -2.42          | 20.00       | 17.58         | 46.00      | -28.42          | AVG      |        |

# **CONDUCTED EMISSION TEST DATA**

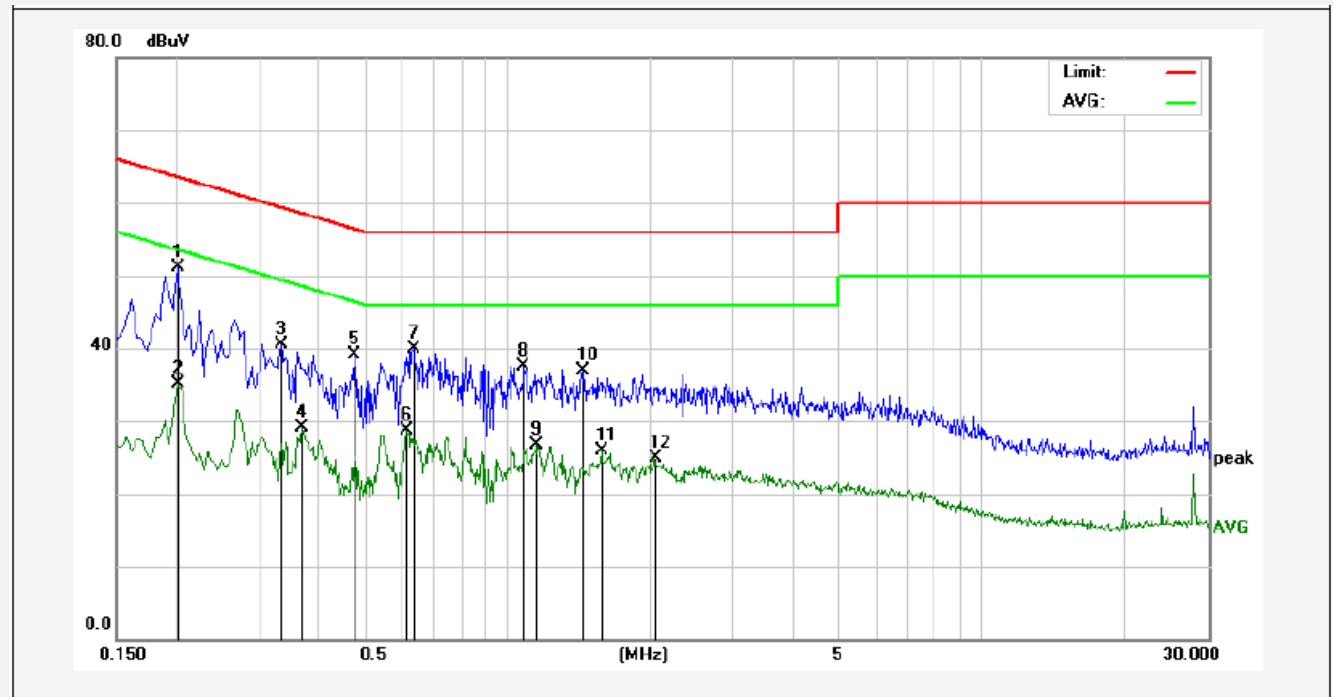
Test Site: 1# Shielded Room  
Operating Condition: Charging  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Neutral Line  
Tem.:25°C Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.1500      | 30.59          | 20.00       | 50.59         | 65.99      | -15.40          | QP       |        |
| 2   | 0.1740      | 7.44           | 20.00       | 27.44         | 54.76      | -27.32          | AVG      |        |
| 3   | 0.1860      | 27.08          | 20.00       | 47.08         | 64.21      | -17.13          | QP       |        |
| 4   | 0.3220      | 18.12          | 20.00       | 38.12         | 59.65      | -21.53          | QP       |        |
| 5   | 0.5060      | 16.27          | 20.00       | 36.27         | 56.00      | -19.73          | QP       |        |
| 6   | 0.5060      | 1.40           | 20.00       | 21.40         | 46.00      | -24.60          | AVG      |        |
| 7   | 0.8420      | -0.14          | 20.00       | 19.86         | 46.00      | -26.14          | AVG      |        |
| 8   | 1.0620      | 15.37          | 20.00       | 35.37         | 56.00      | -20.63          | QP       |        |
| 9   | 1.2100      | -0.56          | 20.00       | 19.44         | 46.00      | -26.56          | AVG      |        |
| 10  | 1.7580      | -0.77          | 20.00       | 19.23         | 46.00      | -26.77          | AVG      |        |
| 11  | 2.2380      | 13.69          | 20.00       | 33.69         | 56.00      | -22.31          | QP       |        |
| 12  | 2.2980      | -1.31          | 20.00       | 18.69         | 46.00      | -27.31          | AVG      |        |

### CONDUCTED EMISSION TEST DATA

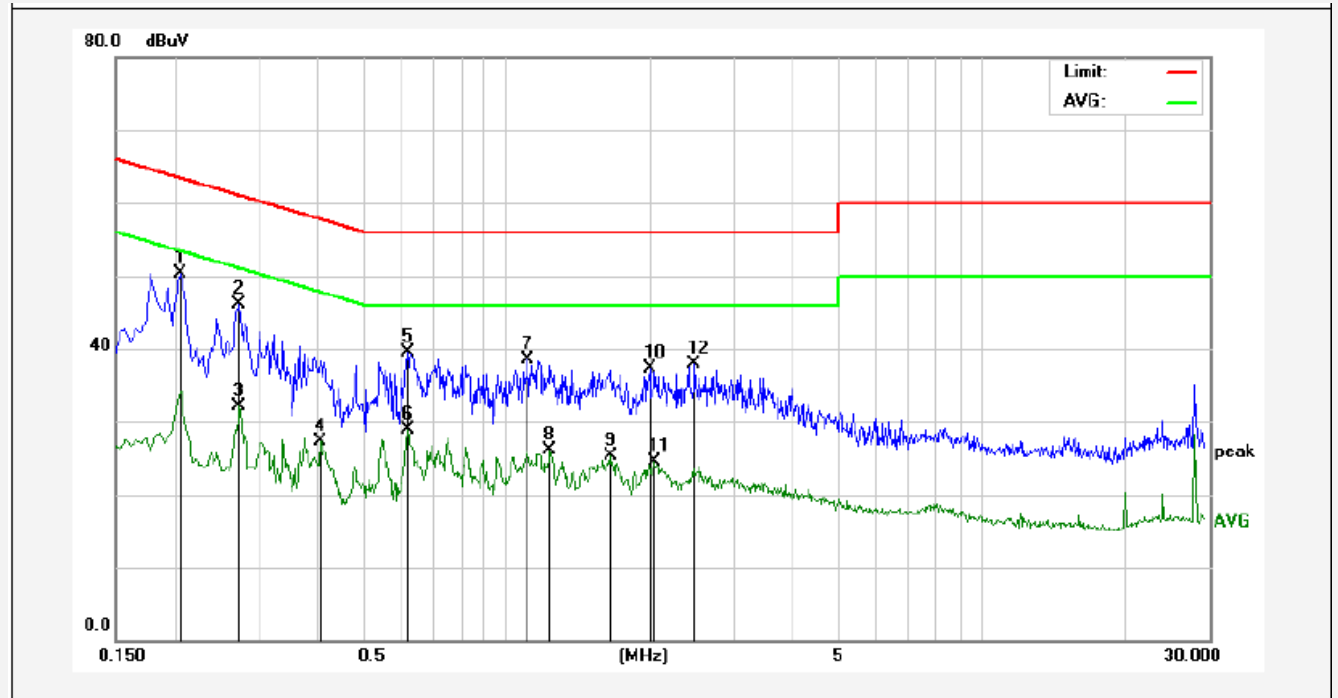
Test Site: 1# Shielded Room  
Operating Condition: Charging  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Live Line  
Tem.:25°C Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.2020      | 31.10          | 20.00       | 51.10         | 63.52      | -12.42          | QP       |        |
| 2   | 0.2020      | 15.10          | 20.00       | 35.10         | 53.52      | -18.42          | AVG      |        |
| 3   | 0.3339      | 20.49          | 20.00       | 40.49         | 59.35      | -18.86          | QP       |        |
| 4   | 0.3700      | 9.03           | 20.00       | 29.03         | 48.50      | -19.47          | AVG      |        |
| 5   | 0.4780      | 19.01          | 20.00       | 39.01         | 56.37      | -17.36          | QP       |        |
| 6   | 0.6140      | 8.75           | 20.00       | 28.75         | 46.00      | -17.25          | AVG      |        |
| 7   | 0.6340      | 19.93          | 20.00       | 39.93         | 56.00      | -16.07          | QP       |        |
| 8   | 1.0859      | 17.51          | 20.00       | 37.51         | 56.00      | -18.49          | QP       |        |
| 9   | 1.1539      | 6.76           | 20.00       | 26.76         | 46.00      | -19.24          | AVG      |        |
| 10  | 1.4460      | 16.93          | 20.00       | 36.93         | 56.00      | -19.07          | QP       |        |
| 11  | 1.5780      | 5.84           | 20.00       | 25.84         | 46.00      | -20.16          | AVG      |        |
| 12  | 2.0460      | 4.90           | 20.00       | 24.90         | 46.00      | -21.10          | AVG      |        |

### CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room  
Operating Condition: Charging  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Neutral Line  
Tem.:25°C Hum.:50%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1   | 0.2060      | 30.21          | 20.00       | 50.21         | 63.36      | -13.15          | QP       |        |
| 2   | 0.2740      | 26.11          | 20.00       | 46.11         | 60.99      | -14.88          | QP       |        |
| 3   | 0.2740      | 12.05          | 20.00       | 32.05         | 50.99      | -18.94          | AVG      |        |
| 4   | 0.4060      | 7.35           | 20.00       | 27.35         | 47.73      | -20.38          | AVG      |        |
| 5   | 0.6180      | 19.41          | 20.00       | 39.41         | 56.00      | -16.59          | QP       |        |
| 6   | 0.6180      | 8.86           | 20.00       | 28.86         | 46.00      | -17.14          | AVG      |        |
| 7   | 1.1100      | 18.47          | 20.00       | 38.47         | 56.00      | -17.53          | QP       |        |
| 8   | 1.2340      | 6.12           | 20.00       | 26.12         | 46.00      | -19.88          | AVG      |        |
| 9   | 1.6500      | 5.33           | 20.00       | 25.33         | 46.00      | -20.67          | AVG      |        |
| 10  | 1.9940      | 17.37          | 20.00       | 37.37         | 56.00      | -18.63          | QP       |        |
| 11  | 2.0420      | 4.44           | 20.00       | 24.44         | 46.00      | -21.56          | AVG      |        |
| 12  | 2.4820      | 17.88          | 20.00       | 37.88         | 56.00      | -18.12          | QP       |        |

## 4. Radiation Interference

### 4.1 Requirements (15.247, 15.209):

#### 4.1.1. Test Limits (< 30 MHz)

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meter) |
|-----------------|-----------------------------------|------------------------------|
| 0.009-0.490     | 2400/F(kHz)                       | 300                          |
| 0.490-1.705     | 24000/F(kHz)                      | 30                           |
| 1.705-30.0      | 30                                | 30                           |

#### 4.1.2. Test Limits (≥ 30 MHz)

| FIELD STRENGTH of Fundamental:<br>@3M | FIELD STRENGTH of Harmonics | S15.209<br>30 - 88 MHz | 40 dBuV/m |
|---------------------------------------|-----------------------------|------------------------|-----------|
| 902-928 MHz                           |                             | 88 - 216 MHz           | 43.5      |
| 2.4-2.4835 GHz                        |                             | 216 - 960 MHz          | 46        |
| 94 dBuV/m @3m                         | 54 dBuV/m @3m               | ABOVE 960 MHz          | 54dBuV/m  |

For range 9KHz~30MHz, The measured value is really too low to be recorded.

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.

### 4.2 Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.  
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.  
The turn table can rotate 360 degrees to determine the position of the maximum emission level.  
The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower.  
The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9\*6\*6 Chamber. The device is evaluated in xyz orientation.

#### For 30MHz to 1000MHz:

Set the spectrum analyzer as:  
RBW = 100kHz, VBW =300kHz,  
Detector= Quasi-Peak  
Trace mode= Max hold.  
Sweep- auto couple.

#### For Above 1GHz:

Set the spectrum analyzer as:  
RBW = 1MHz, VBW =3MHz,  
Detector= Peak  
Trace mode= Max hold.  
Sweep- auto couple.

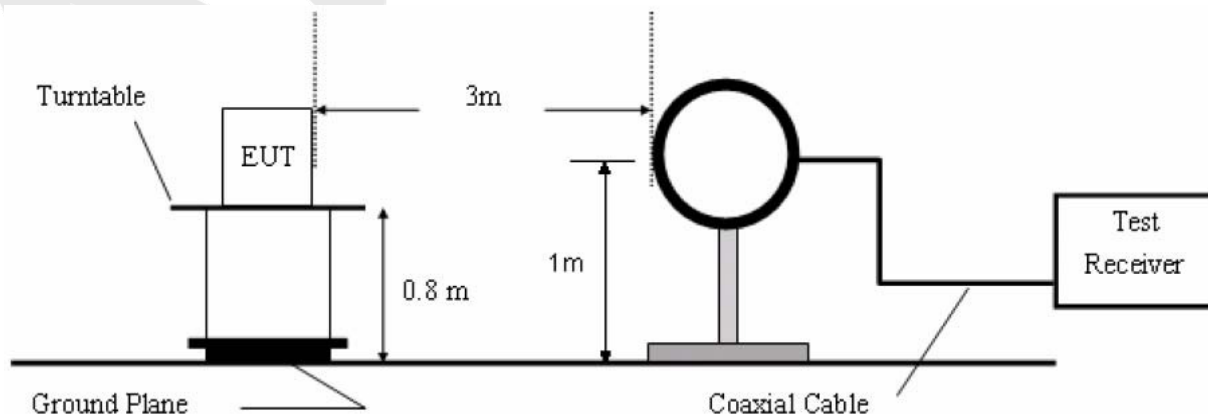
Set the spectrum analyzer as:  
RBW =1MHz, VBW =10Hz  
Detector= Average  
Trace mode= Max hold.  
Sweep- auto couple.

#### Test Equipment

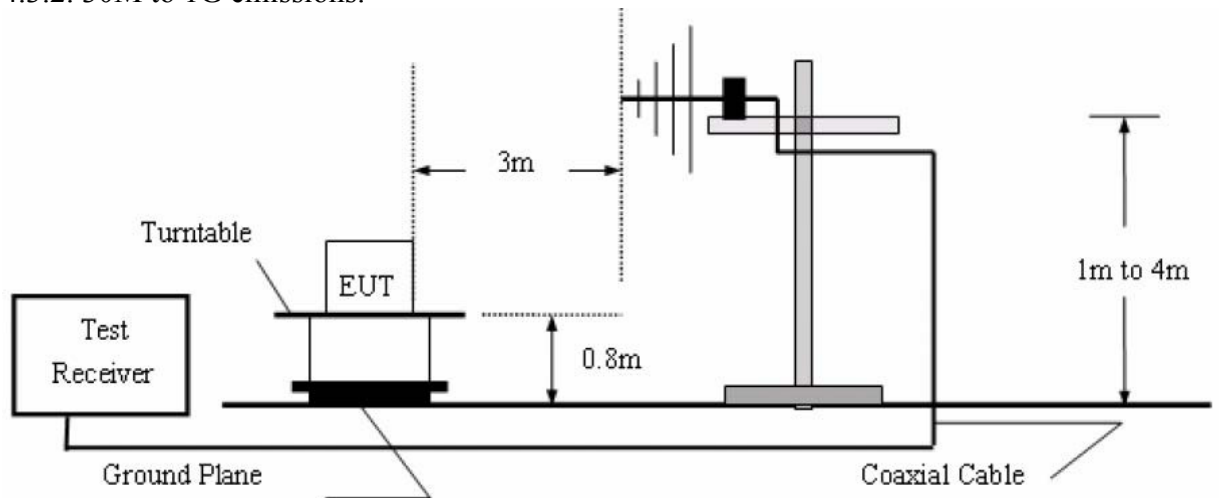
| Item | Equipment                      | Manufacturer            | Model No.    | Serial No.    | Last Cal.     | Cal. Interval |
|------|--------------------------------|-------------------------|--------------|---------------|---------------|---------------|
| 1.   | Spectrum Analysis              | Agilent                 | E4407B       | US39390582    | Apr. 17, 2016 | 1 Year        |
| 2.   | Preamplifier                   | Instruments corporation | EMC011830    | 980100        | Apr. 17, 2016 | 1 Year        |
| 3.   | EMI Test Receiver              | Rohde & Schwarz         | ESPI         | 101604        | Apr. 17, 2016 | 1 Year        |
| 4.   | Double Ridged Horn Antenna     | Instruments corporation | GTH-0118     | 351600        | Apr. 20, 2016 | 1 Year        |
| 5.   | Bilog Broadband Antenna        | Schwarzbeck             | VULB9163     | VULB 9163-289 | Apr. 20, 2016 | 1 Year        |
| 6.   | Pre-amplifier                  | SONOMA                  | 310N         | 186860        | Apr. 17, 2016 | 1 Year        |
| 7.   | EMI Test Software EZ-EMC       | SHURPLE                 | N/A          | N/A           | N/A           | N/A           |
| 8    | Power Sensor                   | DAER                    | RPR3006W     | 15I00041SN046 | Jun 30, 2016  | 1 Year        |
| 9    | MXA Spectrum Analysis          | Agilent                 | N9020A       | MY51170037    | Jun 30, 2016  | 1 Year        |
| 10   | MXG RF Vector Signal Generator | Agilent                 | N5182A       | MY48180656    | Jun 30, 2016  | 1 Year        |
| 11   | Signal Generator               | Agilent                 | E4421B       | MY41000743    | Jun 30, 2016  | 1 Year        |
| 12   | DC Power supply                | IV                      | IV-8080      | YQSB0096      | Jun 30, 2016  | 1 Year        |
| 13   | TEMP&HUMI PROGRAMMABLE CHAMBER | Bell Group              | BE-THK-150M8 | SE-0137       | Mar 16, 2016  | 1 Year        |

### 4.3 Test Configuration

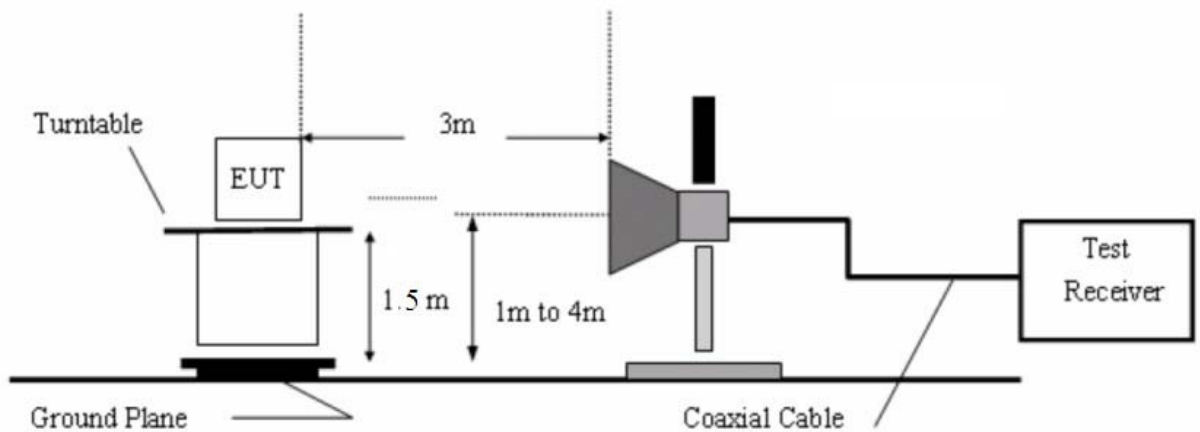
#### 4.3.1. 9k to 30MHz emissions:



#### 4.3.2. 30M to 1G emissions:



#### 4.3.3. 1G to 40G emissions:



### 4.4 Test Results

PASS.

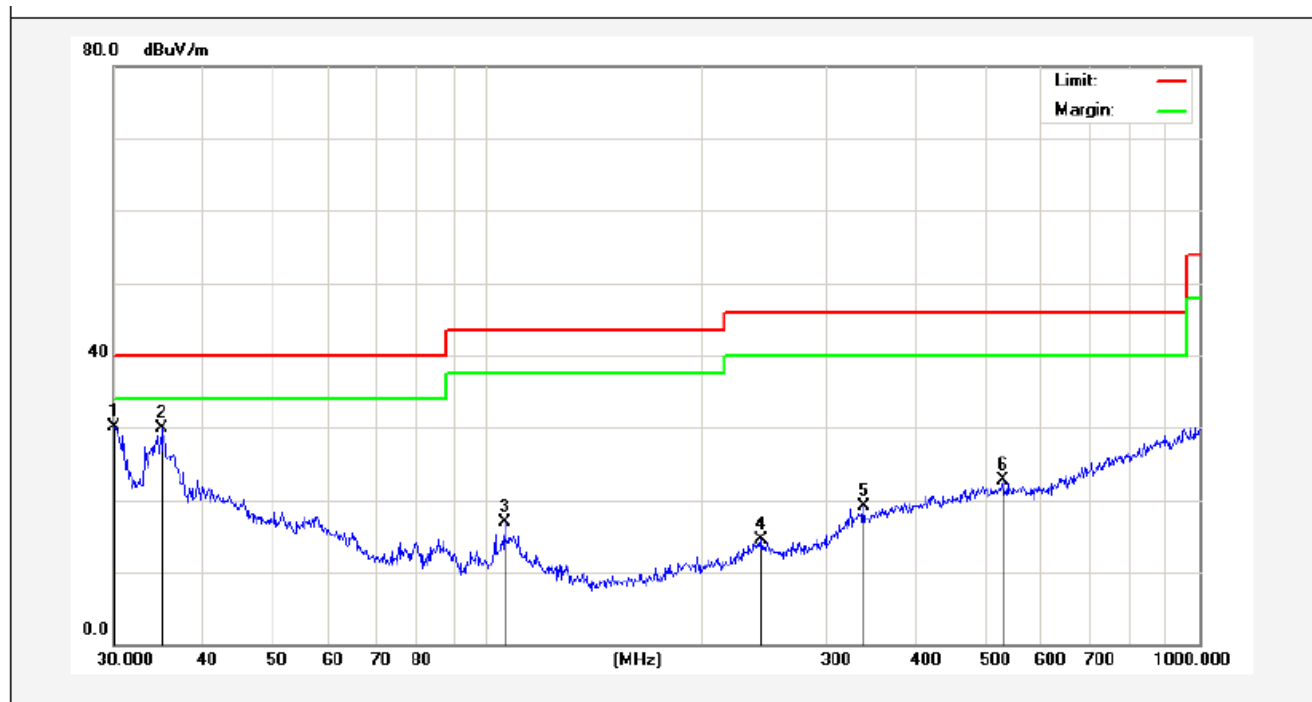
The EUT was tested on (Charging, BT Mode) modes, only the worst data of (Charging) is attached in the following pages.

Only the worst case (x orientation).

The EDR was tested on ( $\pi/4$ DQPSK, 8DPSK) modes, only the worst data of ( $\pi/4$ DQPSK) is attached in the following pages.

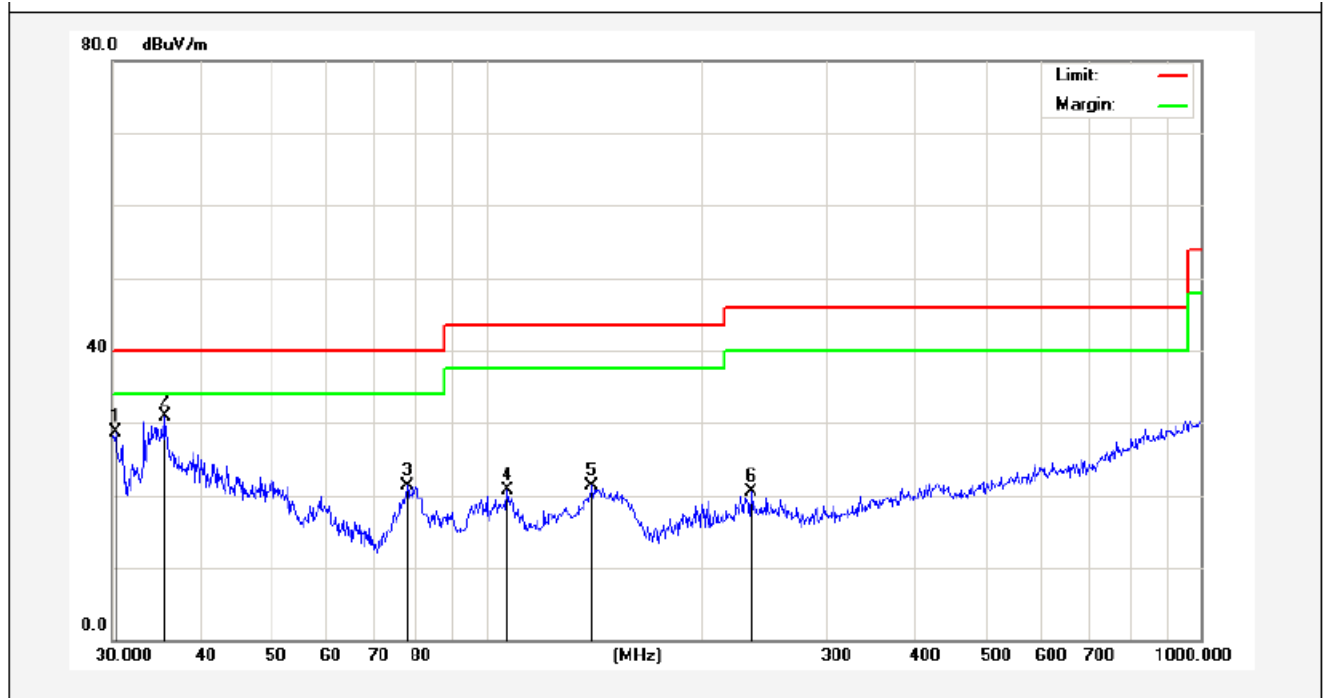
The test results of above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

|            |                             |                     |                           |
|------------|-----------------------------|---------------------|---------------------------|
| Job No.:   | 011608181I                  | Polarization:       | Horizontal                |
| Standard:  | (RE)FCC PART 15C _3m        | Power Source:       | AC 120V, 60Hz for adapter |
| Test item: | Radiation Test (30~1000MHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH            |
| Test Mode: | Charging                    | Distance:           | 3m                        |



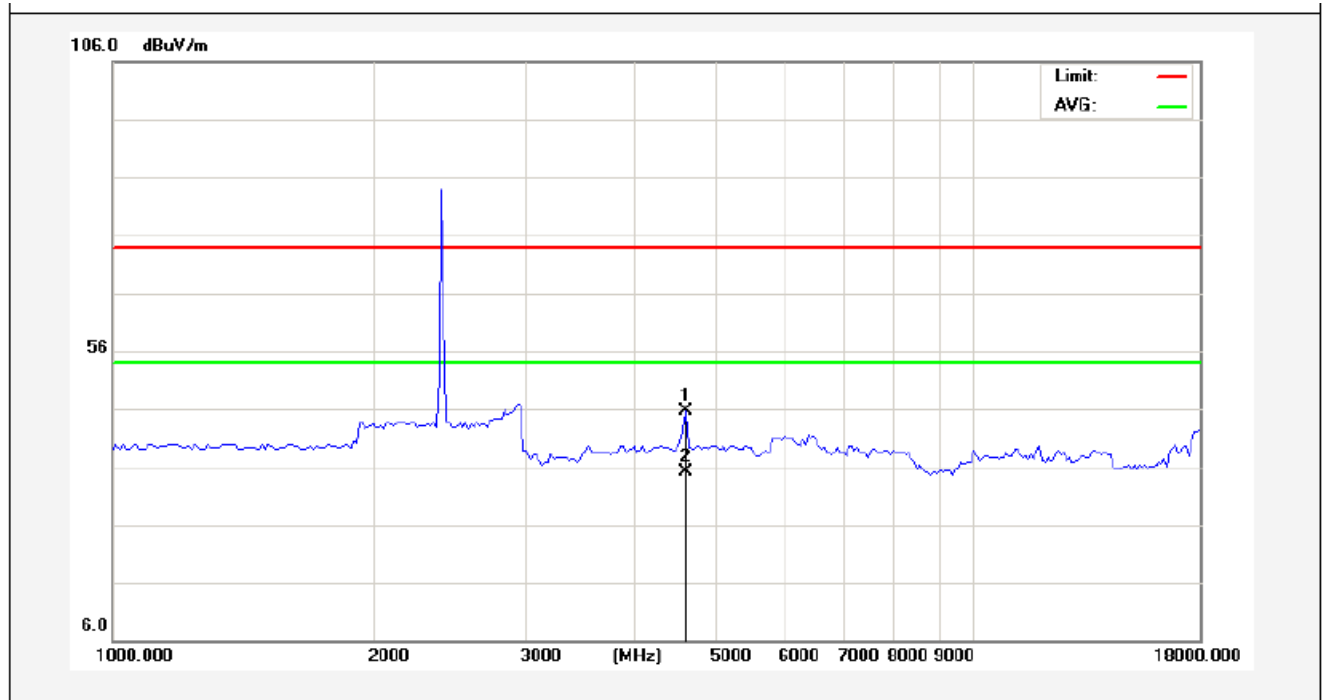
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 30.1054     | 47.04            | -16.89        | 30.15           | 40.00         | -9.85           | peak     |             |              |        |
| 2   | 35.1278     | 44.06            | -14.19        | 29.87           | 40.00         | -10.13          | peak     |             |              |        |
| 3   | 106.0126    | 37.68            | -20.69        | 16.99           | 43.50         | -26.51          | peak     |             |              |        |
| 4   | 243.3772    | 32.68            | -18.24        | 14.44           | 46.00         | -31.56          | peak     |             |              |        |
| 5   | 338.4001    | 33.56            | -14.37        | 19.19           | 46.00         | -26.81          | peak     |             |              |        |
| 6   | 530.1014    | 33.76            | -11.04        | 22.72           | 46.00         | -23.28          | peak     |             |              |        |

|            |                             |                     |                           |
|------------|-----------------------------|---------------------|---------------------------|
| Job No.:   | 011608181I                  | Polarization:       | Vertical                  |
| Standard:  | (RE)FCC PART 15C _3m        | Power Source:       | AC 120V, 60Hz for adapter |
| Test item: | Radiation Test (30~1000MHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55% RH           |
| Test Mode: | Charging                    | Distance:           | 3m                        |



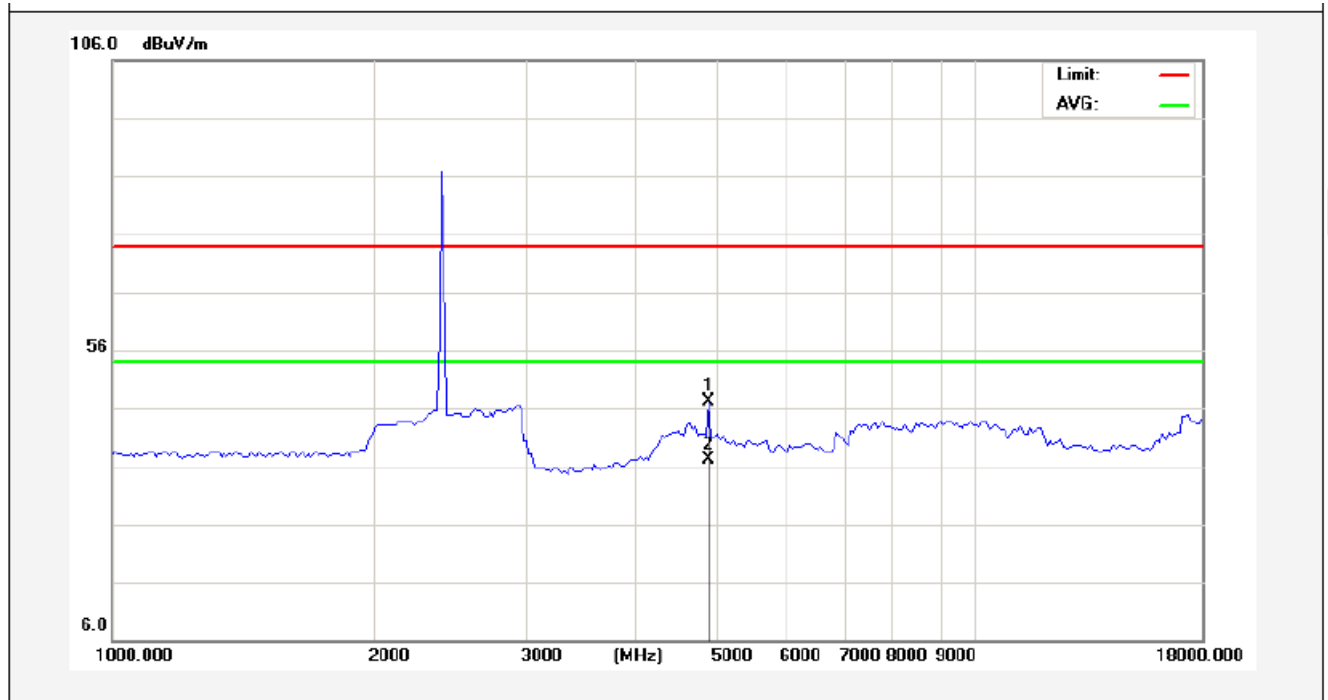
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 30.3173     | 45.49            | -16.77        | 28.72           | 40.00         | -11.28          | peak     |             |              |        |
| 2   | 35.4993     | 44.80            | -13.90        | 30.90           | 40.00         | -9.10           | peak     |             |              |        |
| 3   | 77.5928     | 41.50            | -20.28        | 21.22           | 40.00         | -18.78          | peak     |             |              |        |
| 4   | 107.1337    | 36.39            | -15.67        | 20.72           | 43.50         | -22.78          | peak     |             |              |        |
| 5   | 140.8351    | 39.85            | -18.46        | 21.39           | 43.50         | -22.11          | peak     |             |              |        |
| 6   | 234.9909    | 34.93            | -14.35        | 20.58           | 46.00         | -25.42          | peak     |             |              |        |

|            |                             |                     |                |
|------------|-----------------------------|---------------------|----------------|
| Job No.:   | 011608181I                  | Polarization:       | Horizontal     |
| Standard:  | (RE)FCC PART 15C_Class B_3m | Power Source:       | DC 3.7V        |
| Test item: | Radiation Test (Above 1GHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH |
| Test Mode: | TX(2402 MHz)                | Distance:           | 3m             |



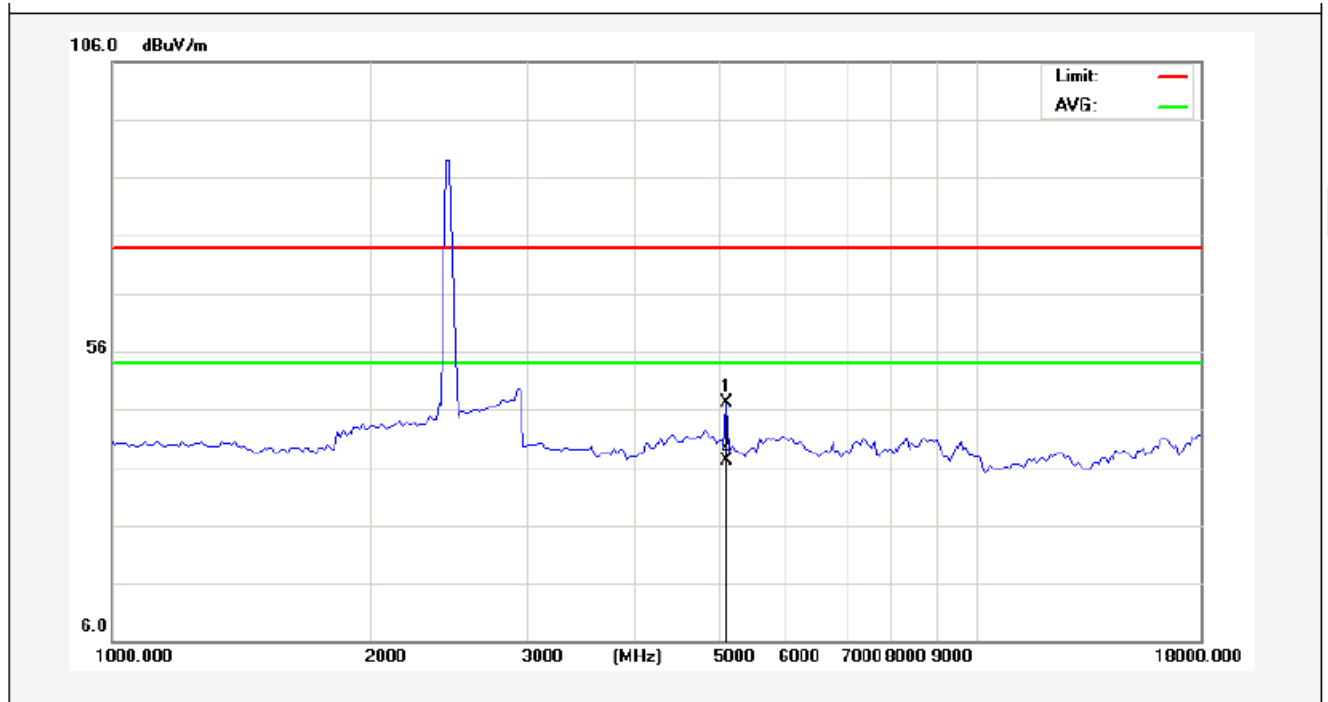
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 4612.500    | 42.72            | 2.96          | 45.68           | 74.00         | -28.32          | peak     |             |              |        |
| 2   | 4612.500    | 32.27            | 2.96          | 35.23           | 54.00         | -18.77          | AVG      |             |              |        |

|            |                             |                     |                |
|------------|-----------------------------|---------------------|----------------|
| Job No.:   | 011608181I                  | Polarization:       | Vertical       |
| Standard:  | (RE)FCC PART 15C_Class B_3m | Power Source:       | DC 3.7V        |
| Test item: | Radiation Test (Above 1GHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH |
| Test Mode: | TX(2402 MHz)                | Distance:           | 3m             |



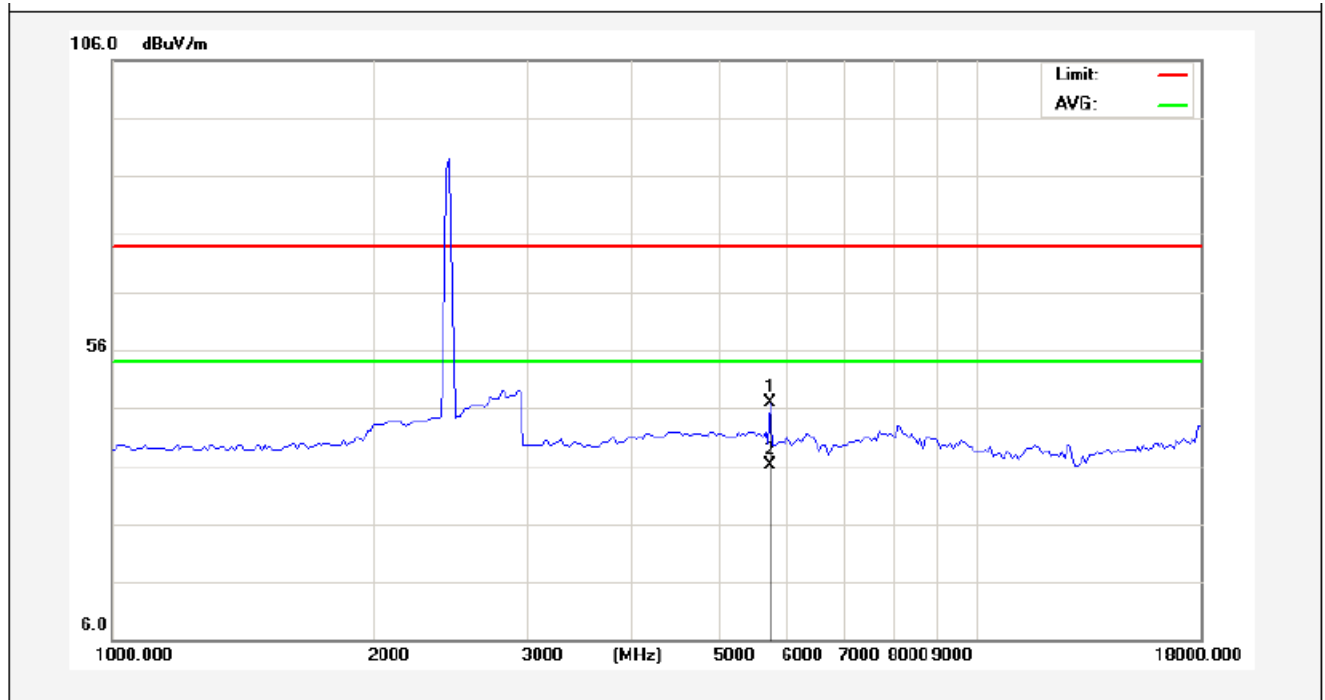
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 4867.500    | 43.70            | 3.41          | 47.11           | 74.00         | -26.89          | peak     |             |              |        |
| 2   | 4867.500    | 33.80            | 3.41          | 37.21           | 54.00         | -16.79          | AVG      |             |              |        |

|            |                             |                     |                |
|------------|-----------------------------|---------------------|----------------|
| Job No.:   | 011608181I                  | Polarization:       | Horizontal     |
| Standard:  | (RE)FCC PART 15C_Class B_3m | Power Source:       | DC 3.7V        |
| Test item: | Radiation Test (Above 1GHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH |
| Test Mode: | TX(2441 MHz)                | Distance:           | 3m             |



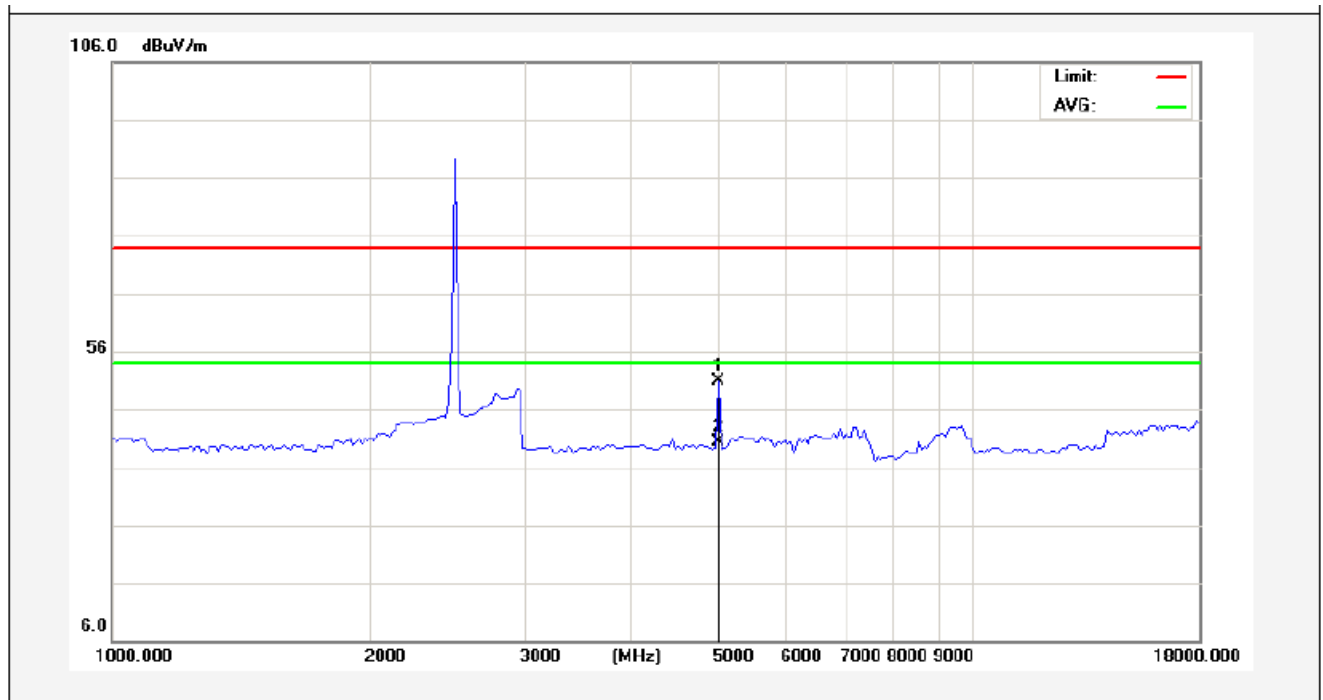
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 5122.500    | 43.52            | 3.73          | 47.25           | 74.00         | -26.75          | peak     |             |              |        |
| 2   | 5122.500    | 33.48            | 3.73          | 37.21           | 54.00         | -16.79          | AVG      |             |              |        |

|            |                             |                     |                |
|------------|-----------------------------|---------------------|----------------|
| Job No.:   | 011608181I                  | Polarization:       | Vertical       |
| Standard:  | (RE)FCC PART 15C_Class B_3m | Power Source:       | DC 3.7V        |
| Test item: | Radiation Test (Above 1GHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH |
| Test Mode: | TX(2441 MHz)                | Distance:           | 3m             |



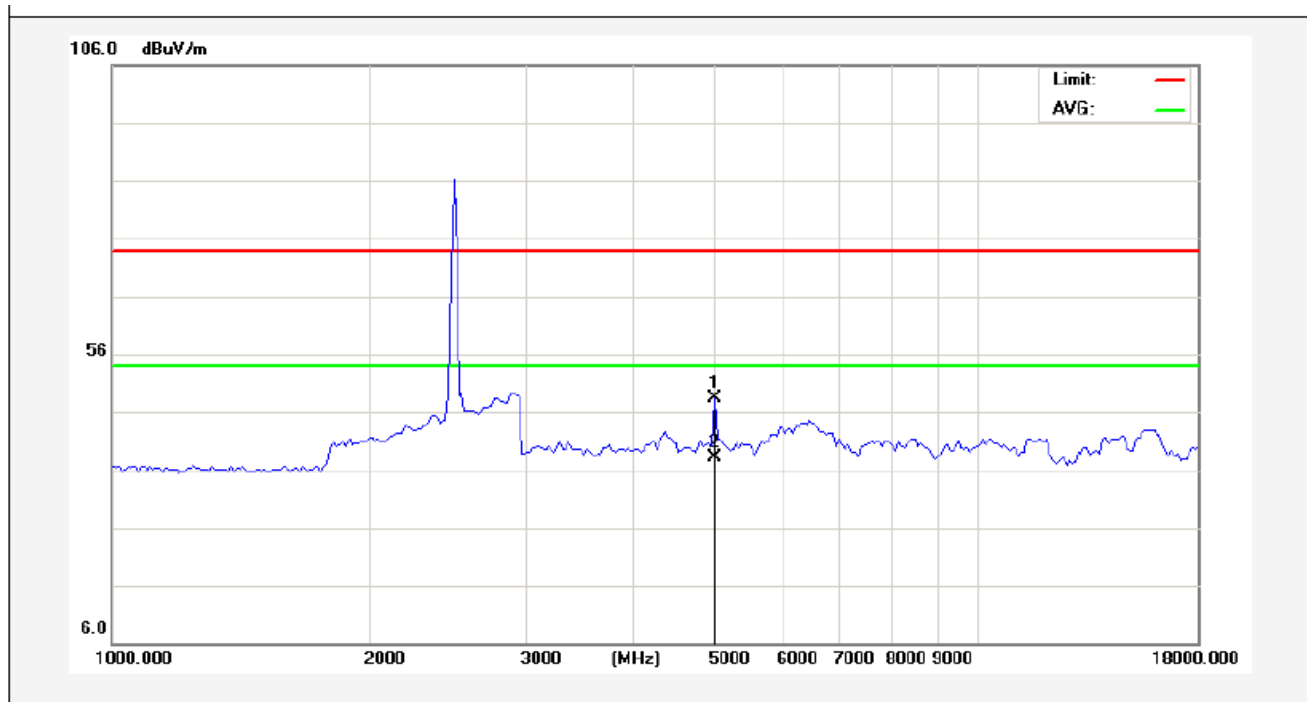
| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 5760.000    | 41.23            | 5.61          | 46.84           | 74.00         | -27.16          | peak     |             |              |        |
| 2   | 5760.000    | 30.60            | 5.61          | 36.21           | 54.00         | -17.79          | AVG      |             |              |        |

|            |                             |                     |                |
|------------|-----------------------------|---------------------|----------------|
| Job No.:   | 011608181I                  | Polarization:       | Horizontal     |
| Standard:  | (RE)FCC PART 15C_Class B_3m | Power Source:       | DC 3.7V        |
| Test item: | Radiation Test (Above 1GHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH |
| Test Mode: | TX(2480 MHz)                | Distance:           | 3m             |



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 5037.500    | 47.20            | 3.67          | 50.87           | 74.00         | -23.13          | peak     |             |              |        |
| 2   | 5037.500    | 36.67            | 3.67          | 40.34           | 54.00         | -13.66          | AVG      |             |              |        |

|            |                             |                     |                |
|------------|-----------------------------|---------------------|----------------|
| Job No.:   | 011608181I                  | Polarization:       | Vertical       |
| Standard:  | (RE)FCC PART 15C_Class B_3m | Power Source:       | DC 3.7V        |
| Test item: | Radiation Test (Above 1GHz) | Temp.(C)/Hum.(%RH): | 24.3( C)/55%RH |
| Test Mode: | TX(2480 MHz)                | Distance:           | 3m             |



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1   | 4995.000    | 44.82            | 3.64          | 48.46           | 74.00         | -25.54          | peak     |             |              |        |
| 2   | 4995.000    | 34.57            | 3.64          | 38.21           | 54.00         | -15.79          | AVG      |             |              |        |

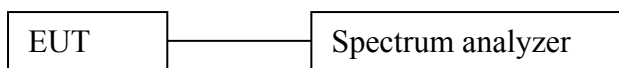
## 5. CHANNEL SEPARATION TEST

### 5.1 Measurement Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

### 5.2 Test SET-UP



### 5.3 Test Equipment

| Item | Equipment                      | Manufacturer            | Model No.    | Serial No.    | Last Cal.     | Cal. Interval |
|------|--------------------------------|-------------------------|--------------|---------------|---------------|---------------|
| 1.   | Spectrum Analysis              | Agilent                 | E4407B       | US39390582    | Apr. 17, 2016 | 1 Year        |
| 2.   | Preamplifier                   | Instruments corporation | EMC011830    | 980100        | Apr. 17, 2016 | 1 Year        |
| 3.   | EMI Test Receiver              | Rohde & Schwarz         | ESPI         | 101604        | Apr. 17, 2016 | 1 Year        |
| 4.   | Double Ridged Horn Antenna     | Instruments corporation | GTH-0118     | 351600        | Apr. 20, 2016 | 1 Year        |
| 5.   | Bilog Broadband Antenna        | Schwarzbeck             | VULB9163     | VULB 9163-289 | Apr. 20, 2016 | 1 Year        |
| 6.   | Pre-amplifier                  | SONOMA                  | 310N         | 186860        | Apr. 17, 2016 | 1 Year        |
| 7.   | EMI Test Software EZ-EMC       | SHURPLE                 | N/A          | N/A           | N/A           | N/A           |
| 8    | Power Sensor                   | DAER                    | RPR3006W     | 15I00041SN046 | Jun 30, 2016  | 1 Year        |
| 9    | MXA Spectrum Analysis          | Agilent                 | N9020A       | MY51170037    | Jun 30, 2016  | 1 Year        |
| 10   | MXG RF Vector Signal Generator | Agilent                 | N5182A       | MY48180656    | Jun 30, 2016  | 1 Year        |
| 11   | Signal Generator               | Agilent                 | E4421B       | MY41000743    | Jun 30, 2016  | 1 Year        |
| 12   | DC Power supply                | IV                      | IV-8080      | YQSB0096      | Jun 30, 2016  | 1 Year        |
| 13   | TEMP&HUMI PROGRAMMABLE CHAMBER | Bell Group              | BE-THK-150M8 | SE-0137       | Mar 16, 2016  | 1 Year        |

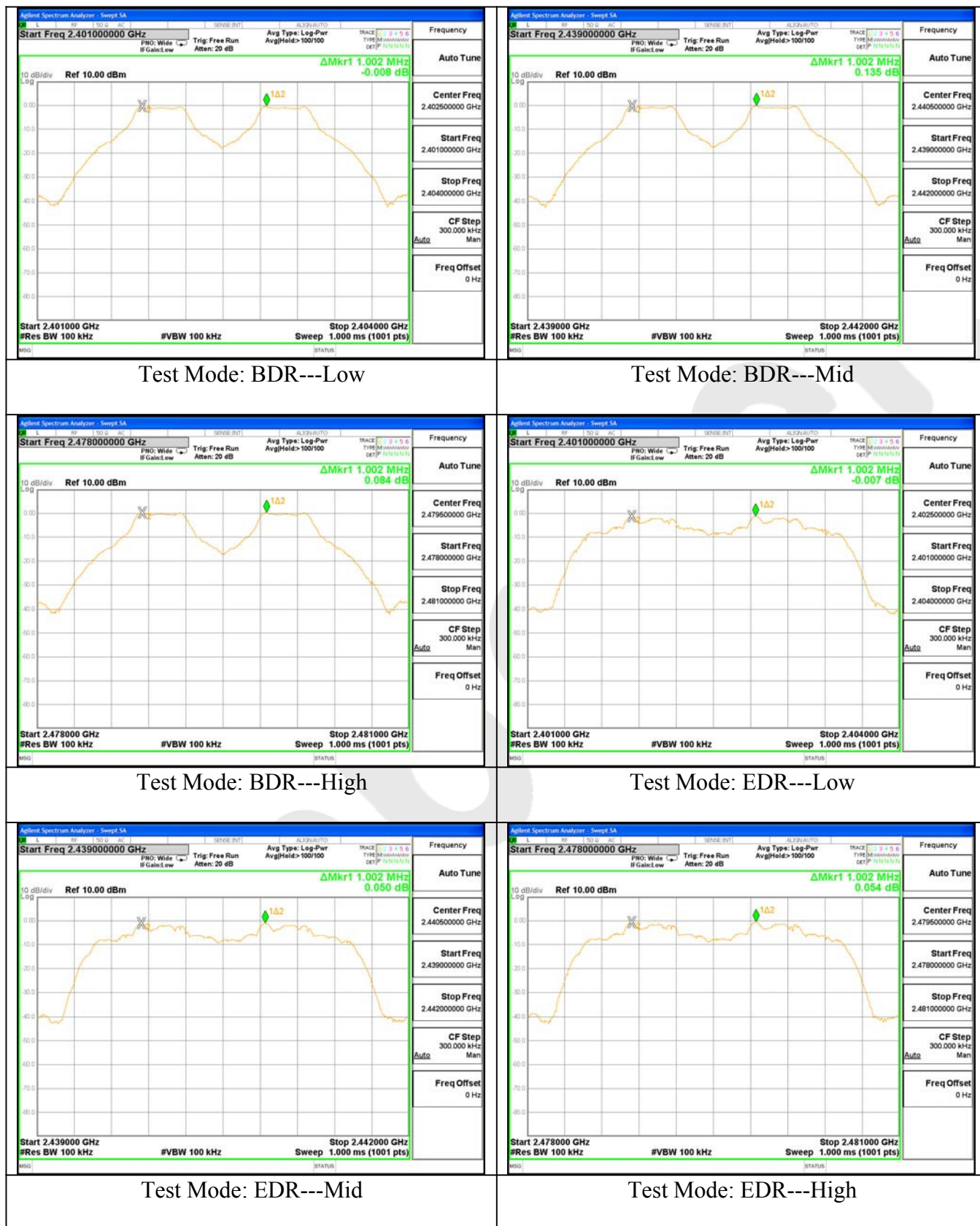
#### 5.4 Test Results

Test Item : Frequency Separation      Test Mode : CH Low ~ CH High  
Test Voltage : DC 3.7V      Temperature : 24°C  
Test Result : PASS      Humidity : 55%RH

| Channel | Frequency (MHz) | Separation Read Value (kHz) | Limit (kHz) | Modulation Mode |
|---------|-----------------|-----------------------------|-------------|-----------------|
| Low     | 2401            | 1002                        | 929.6       | BDR             |
| Mid     | 2441            | 1002                        | 929.0       | BDR             |
| High    | 2480            | 1002                        | 927.6       | BDR             |
| Low     | 2401            | 1002                        | 844.0       | EDR             |
| Mid     | 2441            | 1002                        | 841.3       | EDR             |
| High    | 2480            | 1002                        | 838.7       | EDR             |

Remark:

1. The limit of mode (EDR) is 2/3 of 20dB BW;
2. The EDR was tested on ( $\pi/4$ DQPSK, 8DPSK) modes, only the worst data of ( $\pi/4$ DQPSK) is attached in the following pages.



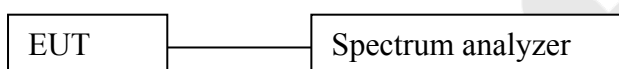
## 6. 20DB BANDWIDTH TEST

### 6.1 Measurement Procedure

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

### 6.2 Test SET-UP



### 6.3 Test Equipment

Same as the equipment listed in 5.3.

### 6.4 Test Results

|              |           |             |                    |
|--------------|-----------|-------------|--------------------|
| Test Item    | : 20dB BW | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : DC 3.7V | Temperature | : 24°C             |
| Test Result  | : PASS    | Humidity    | : 55%RH            |

| Channel | Frequency (MHz) | 20dB Down BW(kHz) | Modulation Mode |
|---------|-----------------|-------------------|-----------------|
| Low     | 2401            | 929.6             | BDR             |
| Mid     | 2441            | 929.0             | BDR             |
| High    | 2480            | 927.6             | BDR             |
| Low     | 2401            | 1266.0            | EDR             |
| Mid     | 2441            | 1262.0            | EDR             |
| High    | 2480            | 1258.0            | EDR             |

Remark: The EDR was tested on (  $\pi$  /4DQPSK, 8DPSK) modes, only the worst data of (  $\pi$  /4DQPSK) is attached in the following pages.



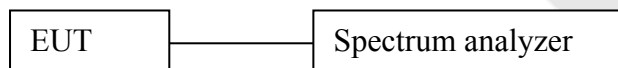
## 7. QUANTITY OF HOPPING CHANNEL TEST

### 7.1 Measurement Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

1. Span= the frequency band of operation
2. Set the RBW = 1 MHz.
3. Set the VBW = 1 MHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

### 7.2 Test SET-UP



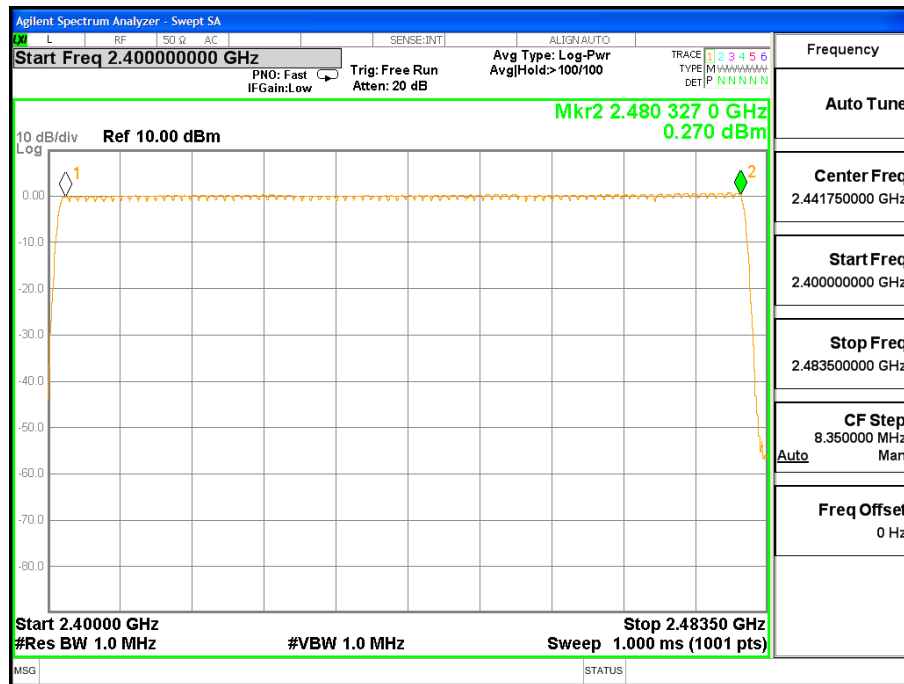
### 7.3 Test Equipment

Same as the equipment listed in 5.3.

### 7.4 Test Results

|              |                               |             |                    |
|--------------|-------------------------------|-------------|--------------------|
| Test Item    | : Number of Hopping Frequency | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : DC 3.7V                     | Temperature | : 24℃              |
| Test Result  | : PASS                        | Humidity    | : 55%RH            |

| Hopping Channel Frequency Range | Quantity of Hopping Channel | Quantity of Hopping Channel |
|---------------------------------|-----------------------------|-----------------------------|
| 2402-2480                       | 79                          | > 15                        |



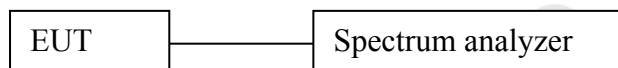
## 8. DWELL TIME TEST

### 8.1 Measurement Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 1 MHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

### 8.2 Test SET-UP



### 8.3 Test Equipment

Same as the equipment listed in 5.3.

### 8.4 Test Results

|              |   |                   |             |   |                  |
|--------------|---|-------------------|-------------|---|------------------|
| Test Item    | : | Time of Occupancy | Test Mode   | : | CH Low ~ CH High |
| Test Voltage | : | DC 3.7V           | Temperature | : | 24°C             |
| Test Result  | : | PASS              | Humidity    | : | 55%RH            |

| Package Type | Pulse width (ms) | Time slot length(ms)                | Dwell time (ms) | Limit (s) | Modulation |
|--------------|------------------|-------------------------------------|-----------------|-----------|------------|
| DH1          | 0.364            | time slot length *1600/2 /79 * 31.6 | 116.48          | 0.4       | BDR        |
| DH3          | 1.620            | time slot length *1600/4 /79 * 31.6 | 259.20          | 0.4       | BDR        |
| DH5          | 2.863            | time slot length *1600/6 /79 * 31.6 | 305.39          | 0.4       | BDR        |
| DH1          | 0.376            | time slot length *1600/2 /79 * 31.6 | 120.32          | 0.4       | EDR        |
| DH3          | 1.620            | time slot length *1600/4 /79 * 31.6 | 259.20          | 0.4       | EDR        |
| DH5          | 2.863            | time slot length *1600/6 /79 * 31.6 | 305.39          | 0.4       | EDR        |



Test Mode: BDR---DH1



Test Mode: BDR---DH3



Test Mode: BDR---DH5



Test Mode: EDR---DH1



Test Mode: EDR---DH3



Test Mode: EDR---DH5

## 9. MAXIMUM PEAK OUTPUT POWER TEST

### 9.1 Measurement Procedure

- Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

Using the following spectrum analyzer settings:

- Span= approximately 5 times the 20dB bandwidth, centered on a hopping channel
- Set the RBW = 3 MHz.
- Set the VBW = 3 MHz.
- Sweep time = auto couple.
- Detector function = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.

### 9.2 Test SET-UP



### 9.3 Test Equipment

Same as the equipment listed in 5.3.

## 9.4 Test Results

Test Item : Max. peak output power      Test Mode : CH Low ~ CH High  
Test Voltage : DC 3.7V                      Temperature : 24°C  
Test Result : PASS                              Humidity : 55%RH

| Channel Frequency (MHz) | Peak Power output(mW) | Peak Power output(dBm) | Peak Power Limit(mW) | Results | Modulation |
|-------------------------|-----------------------|------------------------|----------------------|---------|------------|
| 2402                    | 0.992                 | -0.034                 | 1000                 | PASS    | BDR        |
| 2441                    | 1.035                 | 0.149                  | 1000                 | PASS    | BDR        |
| 2480                    | 1.162                 | <b>0.653</b>           | 1000                 | PASS    | BDR        |
| 2402                    | 0.980                 | -0.089                 | 125                  | PASS    | EDR        |
| 2441                    | 1.018                 | 0.078                  | 125                  | PASS    | EDR        |
| 2480                    | 1.149                 | 0.604                  | 125                  | PASS    | EDR        |

Remark: The EDR was tested on ( $\pi/4$ DQPSK, 8DPSK) modes, only the worst data of ( $\pi/4$ DQPSK) is attached in the following pages.



## 10. BAND EDGE TEST

### 10.1 Measurement Procedure

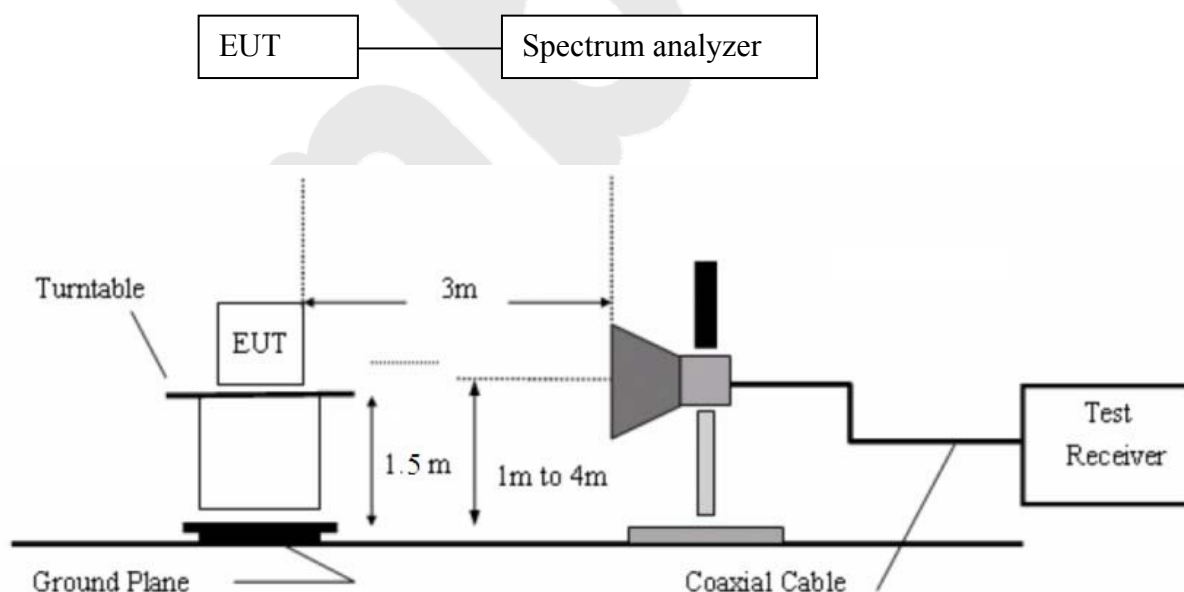
#### A) Conducted Emission method:

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100kHz with a convenient frequency span including 100kHz bandwidth from band edge,
4. Measurement the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Report above procedures until all measured frequencies were complete.

#### B) Radiated Emission method:

The EUT is placed on a turn table which is 1.5 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9\*6\*6 Chamber. for Radiated emissions restricted band RBW= 1 MHz, VBW= 3 MHz.

### 10.2 Test SET-UP



### 10.3 Test Equipment

Same as the equipment listed in 5.3.

### 10.4 Test Results

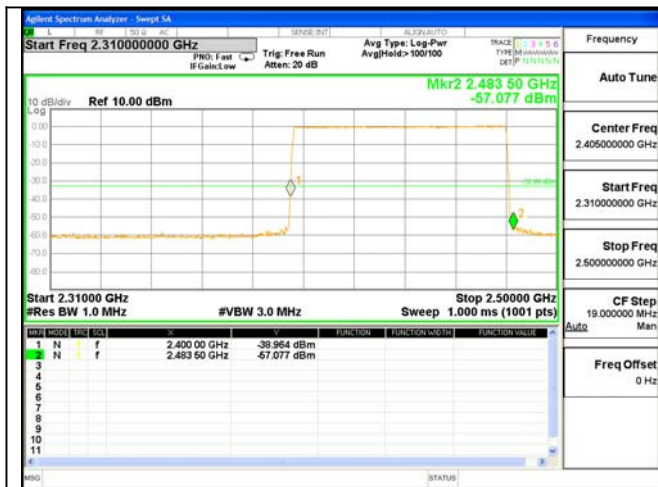
Pass.

Please refer the following data.

|              |              |             |                    |
|--------------|--------------|-------------|--------------------|
| Test Item    | : Band eadge | Test Mode   | : CH Low ~ CH High |
| Test Voltage | : DC 3.7V    | Temperature | : 24℃              |
| Test Result  | : PASS       | Humidity    | : 55%RH            |

#### For Hopping Mode:

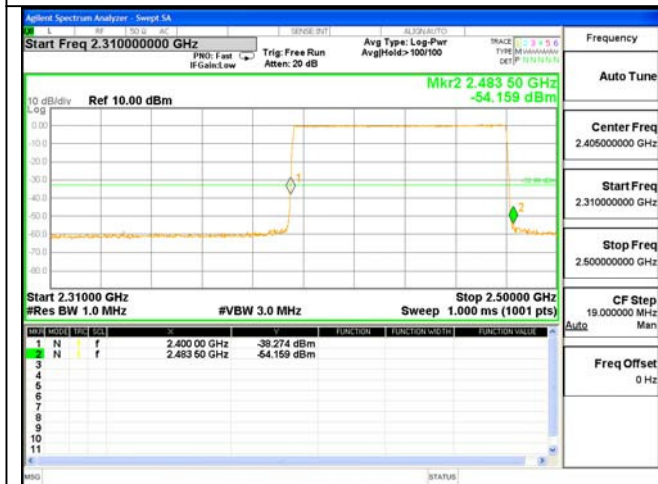
Remark: The EDR was tested on ( $\pi/4$ DQPSK, 8DPSK) modes, only the worst data of ( $\pi/4$ DQPSK) is attached in the following pages.



Test Mode: BDR



Test Mode: BDR



Test Mode: EDR



Test Mode: EDR

|                        |                              |
|------------------------|------------------------------|
| Test Item : Band eadge | Test Mode : CH Low ~ CH High |
| Test Voltage : DC 3.7V | Temperature : 24℃            |
| Test Result : PASS     | Humidity : 55%RH             |

**For Non-Hopping Mode:**

**1. Conducted Test**

| Frequency (MHz) | Peak Power Output(dBm) | Emission read Value(dBm) | Result of Band edge(dBc) | Band edge Limit(dBc) | Modulation |
|-----------------|------------------------|--------------------------|--------------------------|----------------------|------------|
| <2400           | 1.914                  | -43.345                  | 45.289                   | >20dBc               | BDR        |
|                 | 2.289                  | -34.326                  | 32.037                   | >20dBc               | EDR        |
| >2483.5         | 0.087                  | -56.703                  | 56.790                   | >20dBc               | BDR        |
|                 | 0.748                  | -53.925                  | 64.673                   | >20dBc               | EDR        |

**2. Radiated emission Test**

| Frequency (MHz) | Antenna polarization (H/V) | Emission (dBuV/m) |       | Band edge Limit (dBuV/m) |       | Modulation |
|-----------------|----------------------------|-------------------|-------|--------------------------|-------|------------|
|                 |                            | PK                | AV    | PK                       | AV    |            |
| <2400           | V                          | 53.15             | 39.51 | 74.00                    | 54.00 | BDR        |
|                 | V                          | 51.74             | 38.16 | 74.00                    | 54.00 | EDR        |
| >2483.5         | V                          | 50.29             | 37.69 | 74.00                    | 54.00 | BDR        |
|                 | V                          | 48.88             | 35.93 | 74.00                    | 54.00 | EDR        |

Remark: The EDR was tested on ( $\pi/4$ DQPSK, 8DPSK) modes, only the worst data of ( $\pi/4$ DQPSK) is attached in the following pages.



Test Mode: BDR



Test Mode: BDR



Test Mode: EDR



Test Mode: EDR

## 11. ANTENNA APPLICATION

### 11.1 Antenna requirement

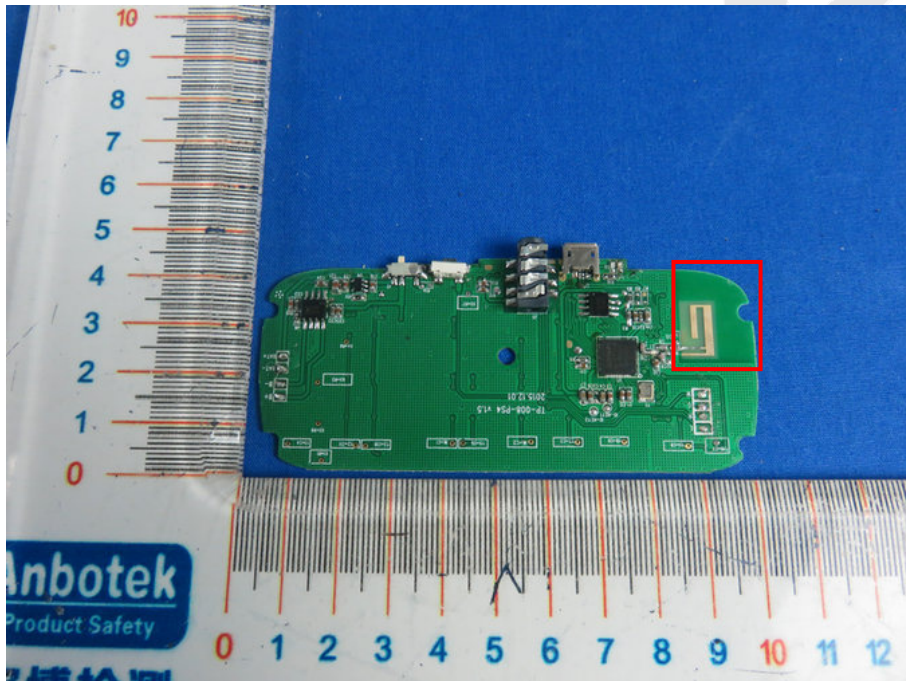
The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247.

FCC part 15C section 15.247 requirements:

Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

### 11.2 Result

The EUT's antenna used a PCB Antenna, The antenna's gain is 0.944dBi and meets the requirement.

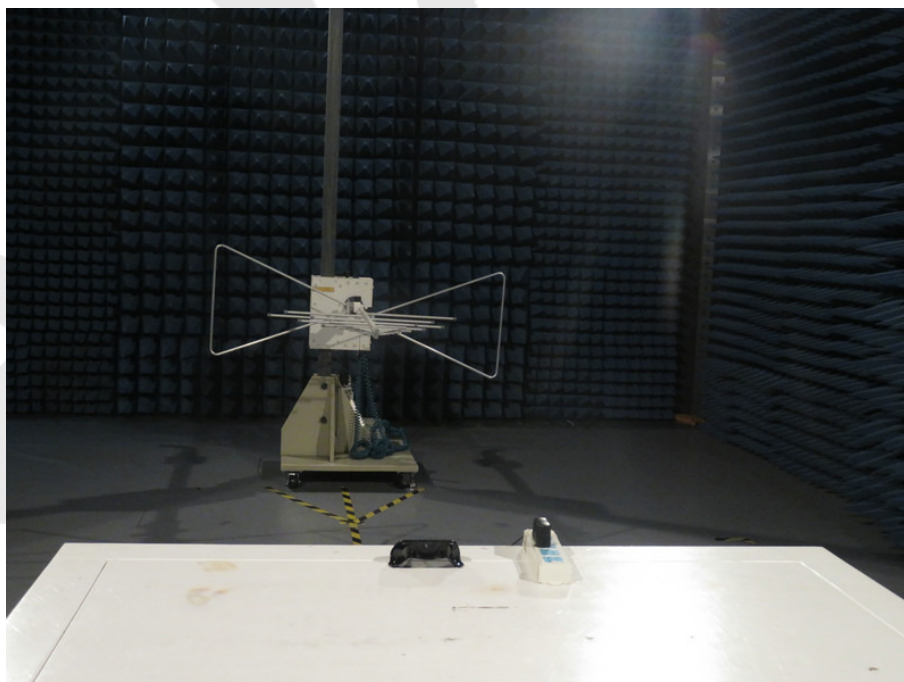


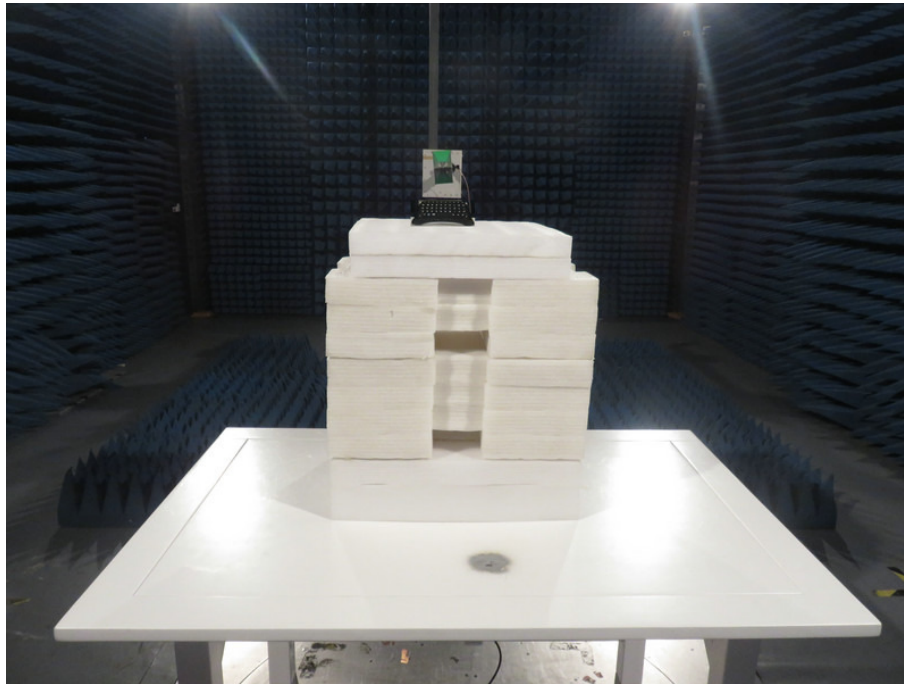
## 12. PHOTOGRAPH

### 12.1 Photo of Power Line Conducted Emission Measurement



### 12.2 Photo of Radiation Emission Test





## APPENDIX I (EXTERNAL PHOTOS)

1. Figure  
The EUT-Overall View



2. Figure  
The EUT-Top View



3. Figure  
The EUT-Bottom View



4. Figure  
The EUT-Front View



5. Figure  
The EUT-Back View



6. Figure  
The EUT-Right View

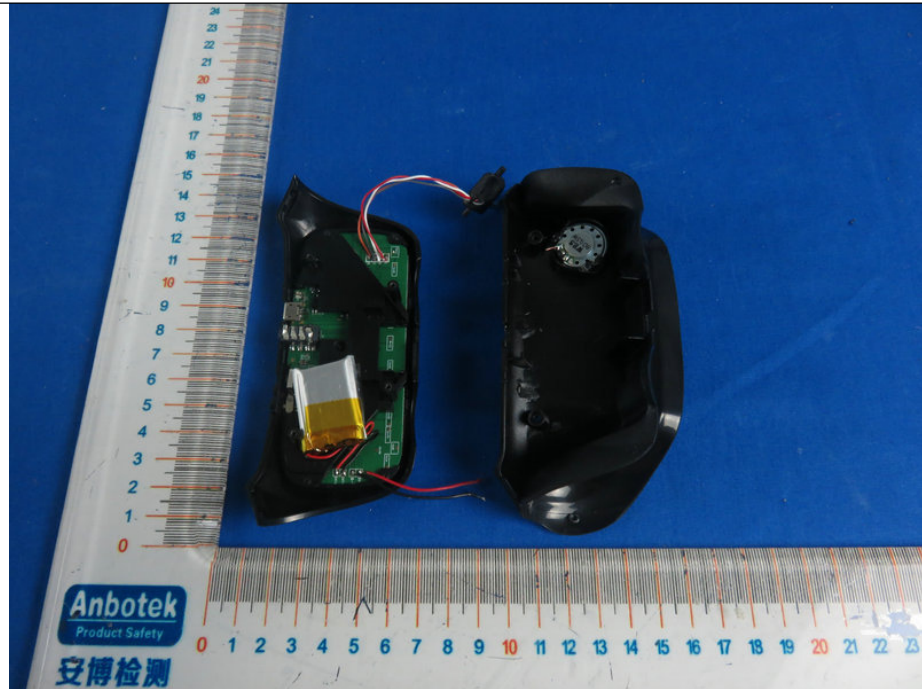


7. Figure  
The EUT-Left View



## APPENDIX II (INTERNAL PHOTOS)

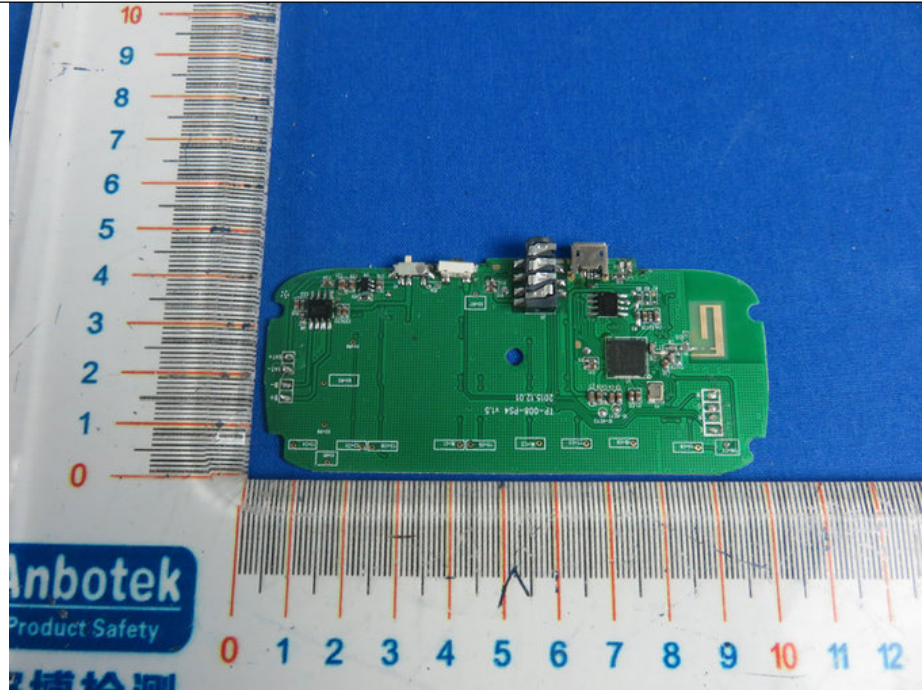
1. Figure  
The EUT-Inside View



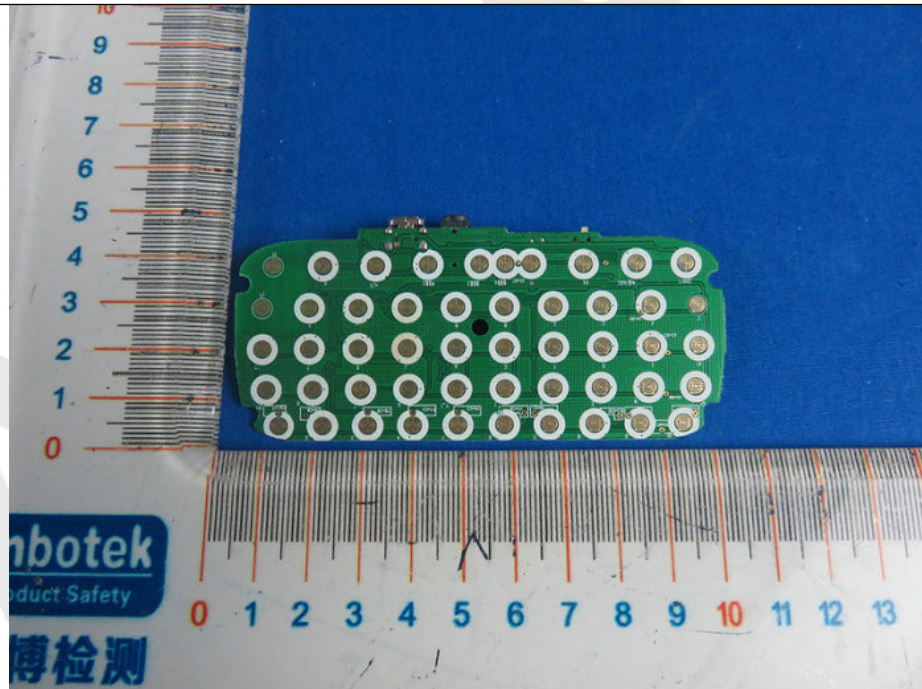
2. Figure  
The EUT-Inside View



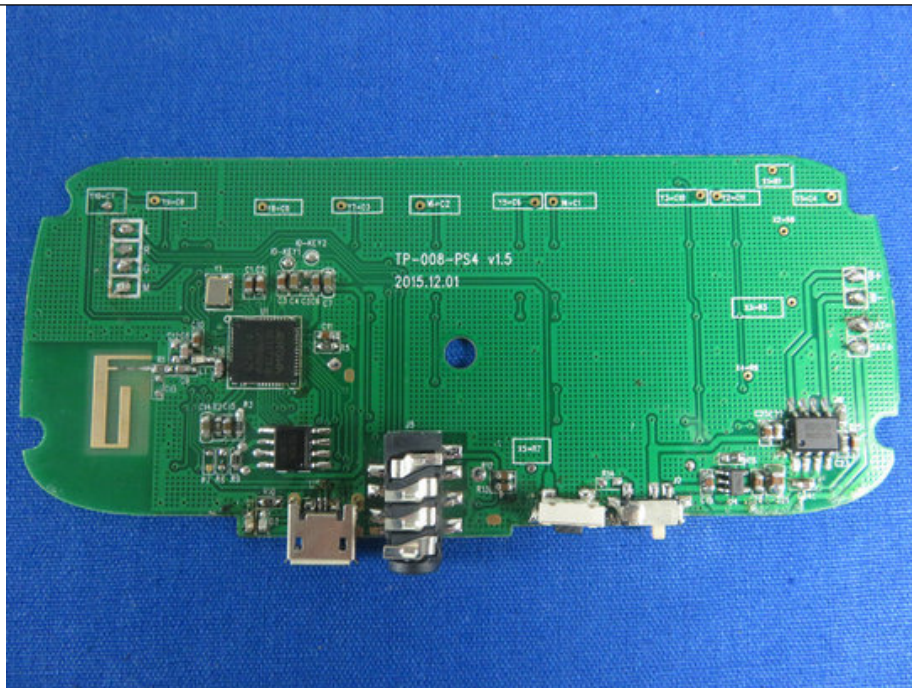
3. Figure  
PCB of the EUT-Front View



4. Figure  
PCB of the EUT-Back View



5. Figure  
PCB of the EUT-Front View



6. Figure  
PCB of the EUT-Back View

