

**FCC TEST REPORT**  
**For**  
**Shenzhen Eastech Co., Ltd.**  
**BLUETOOTH HEADSET**

|                   |  |
|-------------------|--|
| Model No.         | : EH-03C   |
| FCC ID            | : ZPF- EH-03C  |
| Frequency range   | : 2402-2480MHz   |
| Number of Channel | : 40CH   |
| Type of antenna   | : Internal monopole Antenna  |
| Applicant         | : Shenzhen Eastech Co., Ltd.<br>Block A, Baizhushan Industrial Park, Shajing Street, Bao'an District, Shenzhen City, China |
| Regulation        | : FCC Rules and Regulations Part 15 Subpart C Section 15.247   |
| Prepared by       | : WST Certification & Testing (HK) Limited   |
| Address           | : 12/F., San Toi Building, 137-139 Connaught Road Central, Hong Kong, China  |
| Report No.:       | : WST20140921006   |
| Test Date         | : September 21-26, 2014  |
| Date of Report    | : September 26, 2014   |

**TABLE OF CONTENT**

| Description  | Page      |
|--|-----------|
| Test Report Declaration  |           |
| <b>1. TEST PROCEDURES AND RESULTS .....</b>                                    | <b>3</b>  |
| <b>2. GENERAL INFORMATION .....</b>  | <b>4</b>  |
| 1.1. General Information.....  | 4         |
| 1.2. Test Facility .....   | 5         |
| <b>1. TEST INSTRUMENT USED .....</b>   | <b>7</b>  |
| <b>2. OPERATION OF EUT DURING TESTING .....</b>                                | <b>8</b>  |
| <b>3. 6DB BANDWIDTH MEASUREMENT .....</b>                                      | <b>10</b> |
| 3.1. Block Diagram of Test Setup .....   | 10        |
| 3.2. Limits.....   | 10        |
| 3.3. Test Procedure.....   | 10        |
| 3.4. Test Result.....  | 10        |
| <b>4. MAXIMUM PEAK OUTPUT POWER .....</b>                                      | <b>13</b> |
| 4.1. Block Diagram of Test Setup .....   | 13        |
| 4.2. Limits.....   | 13        |
| 4.3. Test Procedure.....   | 13        |
| 4.4. Test Result.....  | 13        |
| <b>5. POWER SPECTRAL DENSITY MEASUREMENT .....</b>                             | <b>16</b> |
| 5.1. Block Diagram of Test Setup .....   | 16        |
| 5.2. Limits.....   | 16        |
| 5.3. Test Procedure.....   | 16        |
| 5.4. Test Result.....  | 16        |
| <b>6. BAND EDGE COMPLIANCE TEST .....</b>                                      | <b>19</b> |
| 6.1. Block Diagram of Test Setup .....   | 19        |
| 6.2. Limits.....   | 19        |
| 6.3. Test Procedure.....   | 19        |
| 6.4. Test Result.....  | 20        |
| <b>7. RADIATED SPURIOUS EMISSION TEST .....</b>                                | <b>24</b> |
| 7.1. Block Diagram of Test Setup .....   | 24        |
| 7.2. Limits.....   | 25        |
| 7.3. Restricted bands of operation .....                                       | 25        |
| 7.4. Test Procedure.....   | 26        |
| 7.5. Test Result.....  | 27        |
| <b>8. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST.....</b>                     | <b>30</b> |
| 8.1. Block Diagram of Test Setup .....   | 30        |
| 8.2. Limits.....   | 30        |
| 8.3. Test Procedure.....   | 30        |
| 8.4. Test Result.....  | 30        |
| <b>9. AC POWER LINE CONDUCTED EMISSION FOR PART 15 SECTION 15.207(A) .....</b> | <b>34</b> |
| 9.1. Block Diagram of Test Setup .....   | 34        |
| 9.2. Limits.....   | 34        |
| 9.3. Test Procedure.....   | 34        |
| 9.4. Test Result.....  | 35        |
| <b>10. ANTENNA REQUIREMENT.....</b>  | <b>36</b> |
| <b>11. PHOTOGRAPH OF TEST .....</b>  | <b>37</b> |

## TEST REPORT DECLARATION

Applicant : Shenzhen Eastech Co., Ltd.  
Manufacturer : Shenzhen Eastech Co., Ltd.  
EUT Description : BLUETOOTH HEADSET

Model NO. : EH-03C  
Serial NO. : N/A  
Power Supply : DC 3.7V From Battery

**Measurement Procedure Used:**

FCC Rules and Regulations Part 15 Subpart C Section 15.247

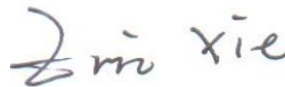
**ANSI C63.4:2003**

The device described above is tested by WST Certification & Testing (HK) Limited to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and WST Certification & Testing (HK) Limited. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of WST Certification & Testing (HK) Limited.

Date of Test: September 21-26, 2014

Prepared by:



Project Engineer(Eric Xie)

Reviewed by:



Project Supervisor(Nico Lee)

Approved by:



Technical Director (Kait Chen)

**1. TEST PROCEDURES AND RESULTS**

| FCC Rules | Description of Test | Result    |
|-----------|---------------------|-----------|
|           | 6dB Bandwidth Test  | Compliant |

|                                      |                                       |           |
|--------------------------------------|---------------------------------------|-----------|
| Section 15.247(a)2)                  |                                       |           |
| Section 15.247(e)                    | Power Spectral Density Test           | Compliant |
| Section 15.247(b)(3)                 | Maximum Peak Output Power Test        | Compliant |
| Section 15.247(d)                    | Band Edge Compliance Test             | Compliant |
| Section 15.247(d)<br>Section 15.209) | Radiated Spurious Emission Test       | Compliant |
| Section 15.247(d)                    | Conducted Spurious Emission Test      | Compliant |
| Section 15.207                       | AC Power Line Conducted Emission Test | Compliant |
| Section 15.203                       | Antenna Requirement                   | Compliant |

## 2. GENERAL INFORMATION

### 1.1. General Information

EUT : BLUETOOTH HEADSET

Model :  
Number EH-03C

Frequency :  
Range 2402-2480MHz

Number of :  
Channels 40CH

Antenna Gain : 0dBi

Modulation :  
mode GFSK

Applicant : Shenzhen Eastech Co., Ltd.  
Block A, Baizhushan Industrial Park, Shajing Street, Bao'an  
District, Shenzhen City, China

Manufacturer : Shenzhen Eastech Co., Ltd.  
Block A, Baizhushan Industrial Park, Shajing Street, Bao'an  
District, Shenzhen City, China

Test Date : September 21-26, 2014

## 1.2. Test Facility

Test Firm : Shenzhen CTL Testing Technology Co., Ltd.  
Certificated by FCC, Registration No.: 970318

Address : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road.  
Nanshan, Shenzhen, China

Tel : 86-755-89486194

Fax : 86-755-89486194

Measurement Uncertainty

|   |               |
|---|---------------|
| Conducted Emission Expanded Uncertainty               | = 3.20dB, k=2 |
| Radiated emission expanded uncertainty(9kHz-30MHz)    | = 3.08dB, k=2 |
| Radiated emission expanded uncertainty(30MHz-1000MHz) | = 4.10dB, k=2 |
| Radiated emission expanded uncertainty(Above 1GHz)    | = 4.32dB, k=2 |

## 1. TEST INSTRUMENT USED

| Test Equipment             | Manufacturer         | Model No.             | Serial No. | Calibration Date | Calibration Due Date |
|----------------------------|----------------------|-----------------------|------------|------------------|----------------------|
| Bilog Antenna              | Sunol Sciences Corp. | JB1                   | A061713    | 2014/07/12       | 2015/07/11           |
| EMI Test Receiver          | R&S                  | ESCI                  | 103710     | 2014/07/12       | 2015/07/11           |
| Spectrum Analyzer          | Agilent              | E4407B                | MY45108355 | 2014/07/12       | 2015/07/11           |
| Controller                 | EM Electronics       | Controller EM 1000    | N/A        | 2014/07/12       | 2015/07/11           |
| Horn Antenna               | Sunol Sciences Corp. | DRH-118               | A062013    | 2014/07/12       | 2015/07/11           |
| Horn Antenna               | SCHWARZBECK          | BBHA9170              | 1562       | 2014/07/12       | 2015/07/11           |
| Active Loop Antenna        | SCHWARZBECK          | FMZB1519              | 1519-037   | 2014/07/12       | 2015/07/11           |
| LISN                       | R&S                  | ENV216                | 101316     | 2014/07/12       | 2015/07/11           |
| LISN                       | SCHWARZBECK          | NSLK8127              | 8127687    | 2014/07/12       | 2015/07/11           |
| Microwave Preamplifier     | HP                   | 8349B                 | 3155A00882 | 2014/07/12       | 2015/07/11           |
| Amplifier                  | HP                   | 8447D                 | 3113A07663 | 2014/07/12       | 2015/07/11           |
| Transient Limiter          | Com-Power            | LIT-153               | 532226     | 2014/07/12       | 2015/07/11           |
| Radio Communication Tester | R&S                  | CMU200                | 3655A03522 | 2014/07/12       | 2015/07/11           |
| Temperature/Humidity Meter | zhicheng             | ZC1-2                 | 22522      | 2014/07/12       | 2015/07/11           |
| SIGNAL GENERATOR           | HP                   | 8647A                 | 3200A00852 | 2014/07/12       | 2015/07/11           |
| Wideband Peak Power Meter  | Anritsu              | ML2495A               | 220.23.35  | 2014/07/12       | 2015/07/11           |
| Climate Chamber            | ESPEC                | EL-10KA               | A20120523  | 2014/07/12       | 2015/07/11           |
| High-Pass Filter           | K&L                  | 9SH10-2700/X12750-O/O | /          | 2014/07/12       | 2015/07/11           |
| High-Pass Filter           | K&L                  | 41H10-1375/U12750-O/O | /          | 2014/07/12       | 2015/07/11           |

## 2. OPERATION OF EUT DURING TESTING

Operating Mode

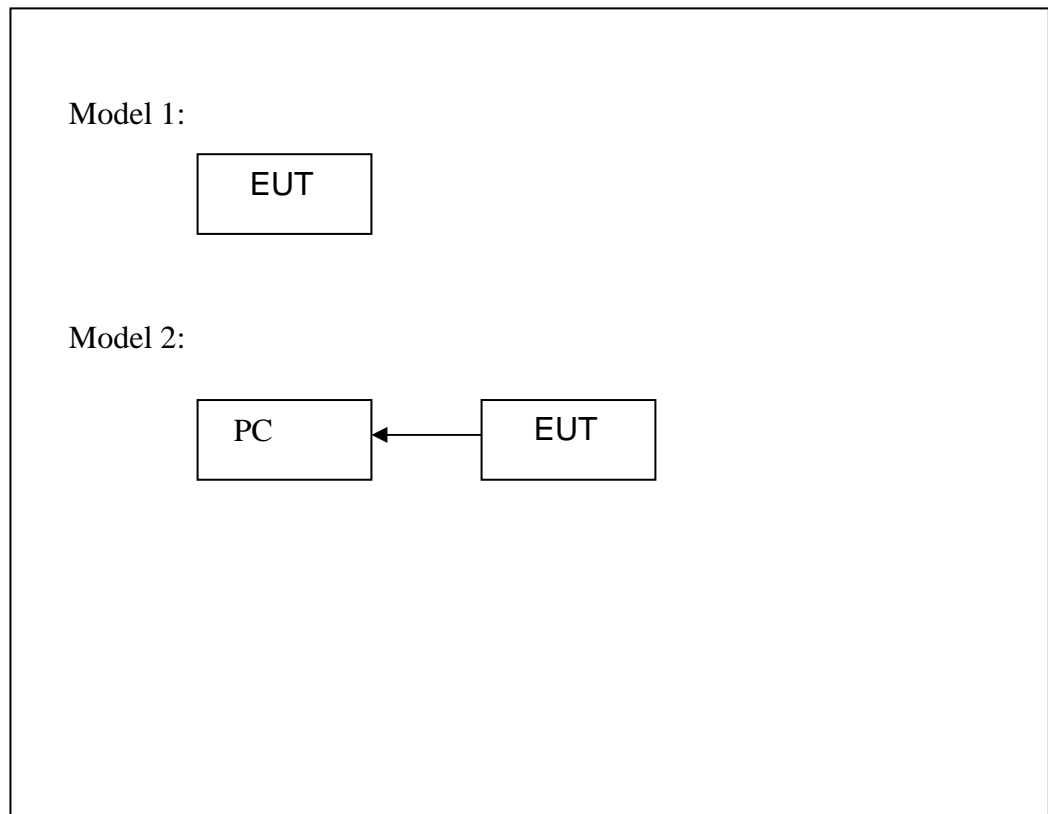
The mode is used: **Transmitting mode**

Low Channel: 2402MHz

Middle Channel: 2440MHz

High Channel: 2480MHz

Test Setup





## Channel list for Bluetooth

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|
| 1           | 2402            | 2           | 2404            |
| 3           | 2406            | 4           | 2408            |
| 5           | 2410            | 6           | 2412            |
| 7           | 2414            | 8           | 2416            |
| 9           | 2418            | 10          | 2420            |
| 11          | 2422            | 12          | 2424            |
| 13          | 2426            | 14          | 2428            |
| 15          | 2430            | 16          | 2432            |
| 17          | 2434            | 18          | 2436            |
| 19          | 2438            | 20          | 2440            |
| 21          | 2442            | 22          | 2444            |
| 23          | 2446            | 24          | 2448            |
| 25          | 2450            | 26          | 2452            |
| 27          | 2454            | 28          | 2456            |
| 29          | 2458            | 30          | 2460            |
| 31          | 2462            | 32          | 2464            |
| 33          | 2466            | 34          | 2468            |
| 35          | 2470            | 36          | 2472            |
| 37          | 2474            | 38          | 2476            |
| 39          | 2478            | 40          | 2480            |

### 3. 6DB BANDWIDTH MEASUREMENT

#### 3.1. Block Diagram of Test Setup



#### 3.2. Limits

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

#### 3.3. Test Procedure

- 5.3.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 5.3.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz
- 5.3.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

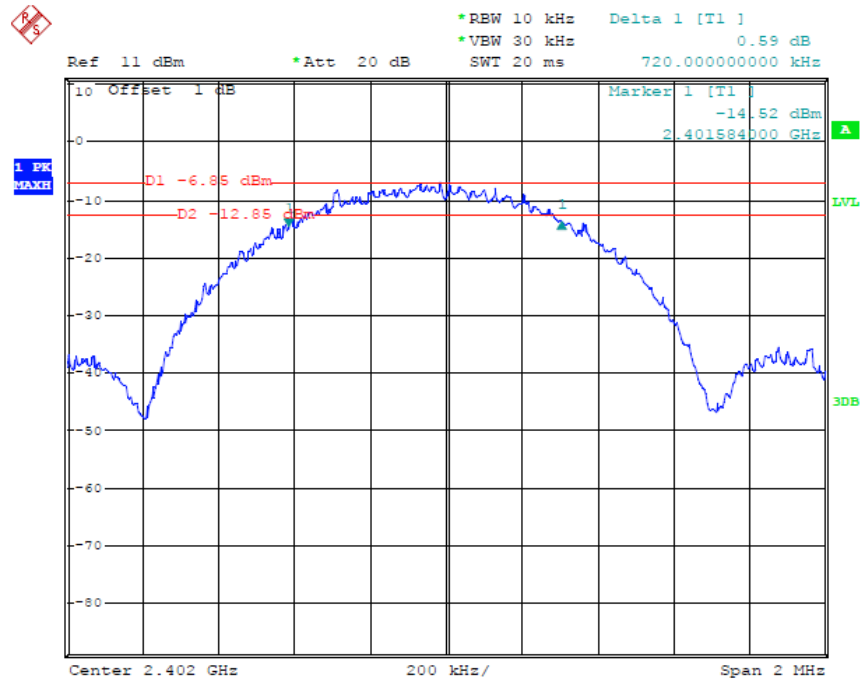
#### 3.4. Test Result

**PASS**

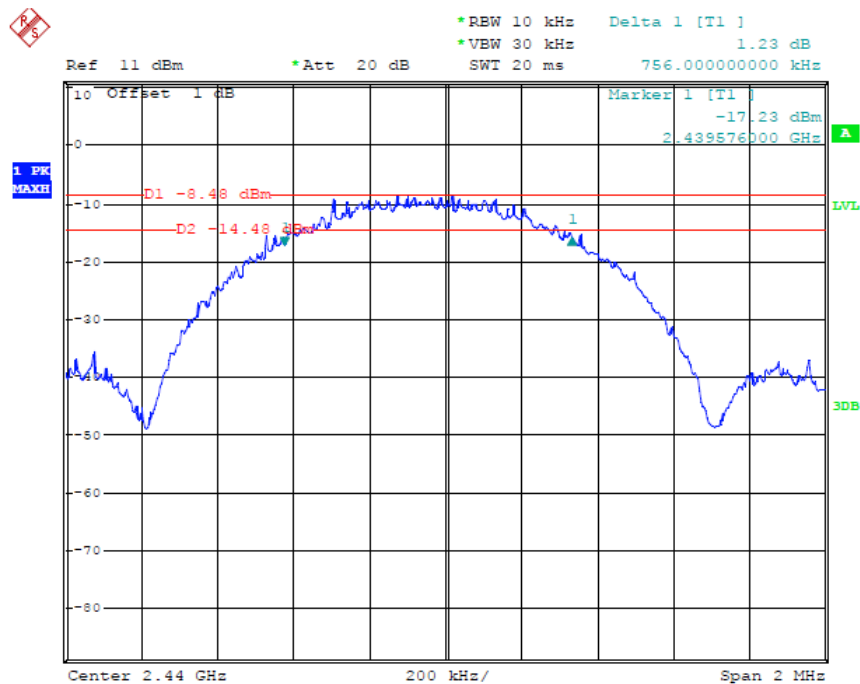
| <b>Bt 4.0</b>  |                        |                            |                    |
|----------------|------------------------|----------------------------|--------------------|
| <b>Channel</b> | <b>Frequency (MHz)</b> | <b>6dB Bandwidth (MHz)</b> | <b>Limit (MHz)</b> |
| Low            | 2402                   | 0.720                      | >0.5MHz            |
| Middle         | 2440                   | 0.756                      | >0.5MHz            |
| High           | 2480                   | 0.752                      | >0.5MHz            |

The spectrum analyzer plots are attached as below.

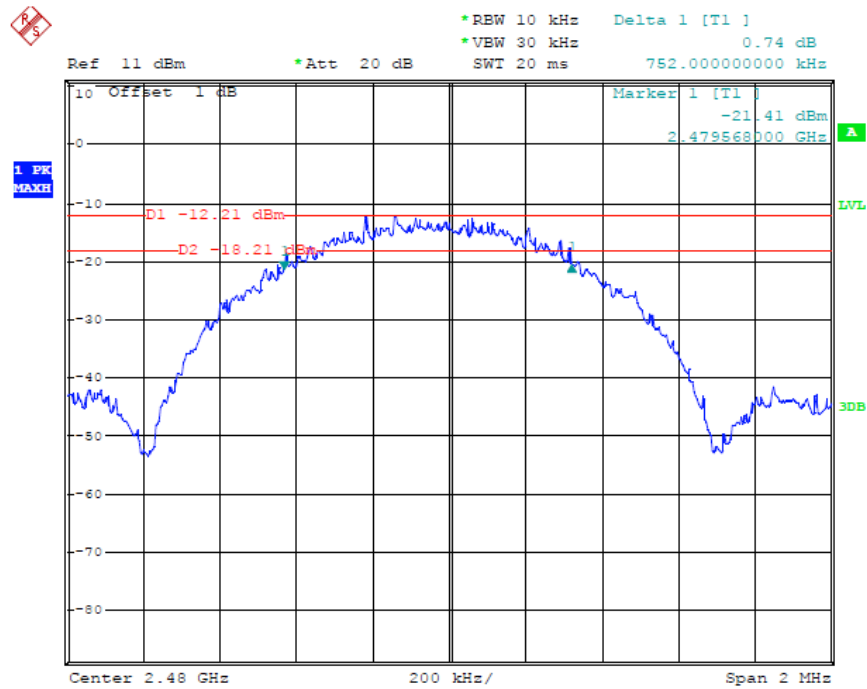
#### Channel Low 2402MHz



#### Channel Middle 2440MHz

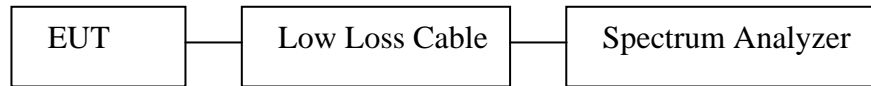


## Channel High 2480MHz



## 4. MAXIMUM PEAK OUTPUT POWER

### 4.1. Block Diagram of Test Setup



### 4.2. Limits

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

### 4.3. Test Procedure

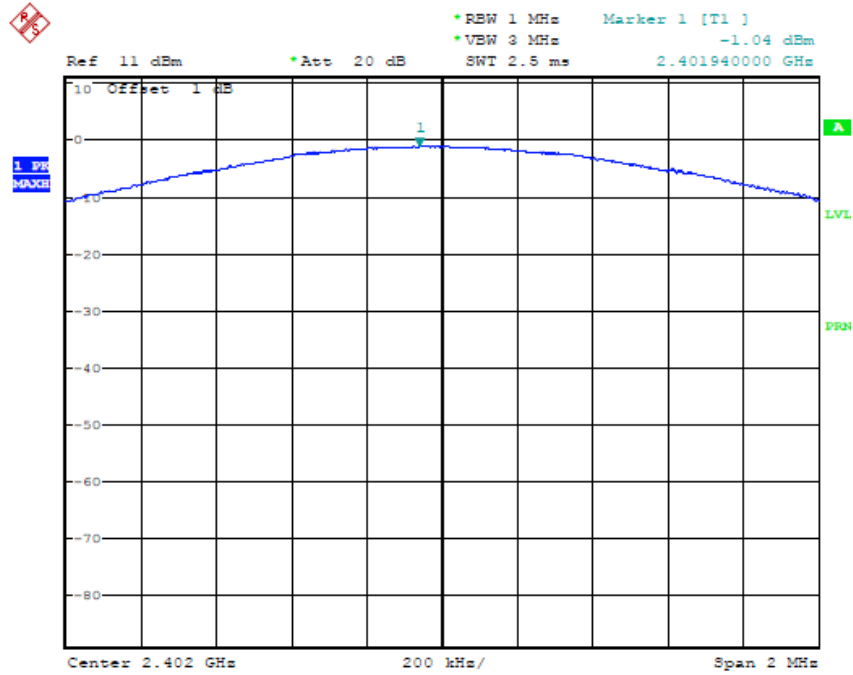
- 6.3.1. The transmitter output was connected to the spectrum analyzer through a low
- 6.3.2. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.
- 6.3.3. Measurement the maximum peak output power.

### 4.4. Test Result

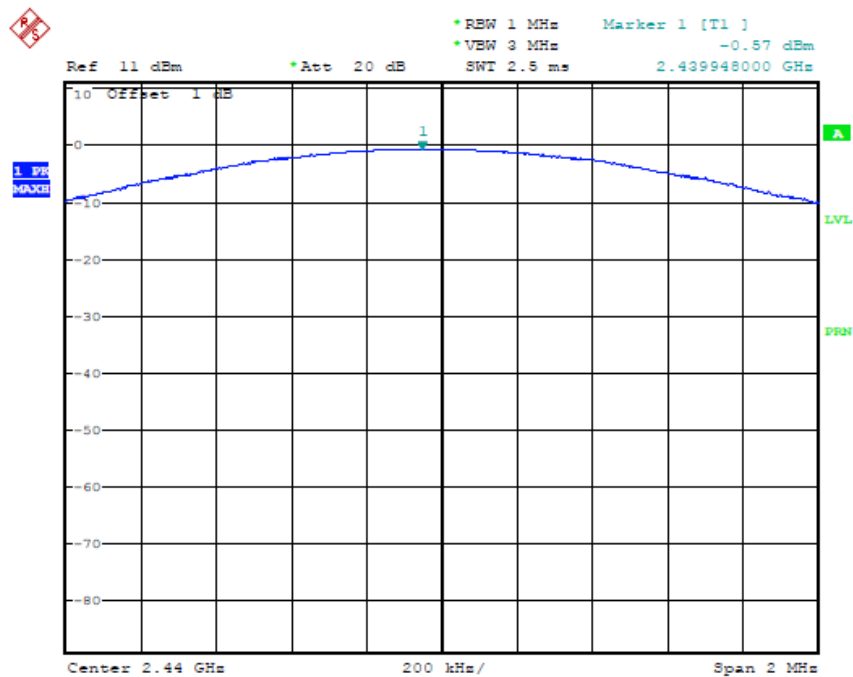
**PASS**

| Bt 4.0(Maximum Average Conducted Output Power) |                 |                         |             |
|--|-----------------|-------------------------|-------------|
| Channel  | Frequency (MHz) | Peak output power (dBm) | Limit (dBm) |
| Low  | 2402            | -1.04                   | 30          |
| Middle   | 2440            | -0.57                   | 30          |
| High   | 2480            | -0.40                   | 30          |

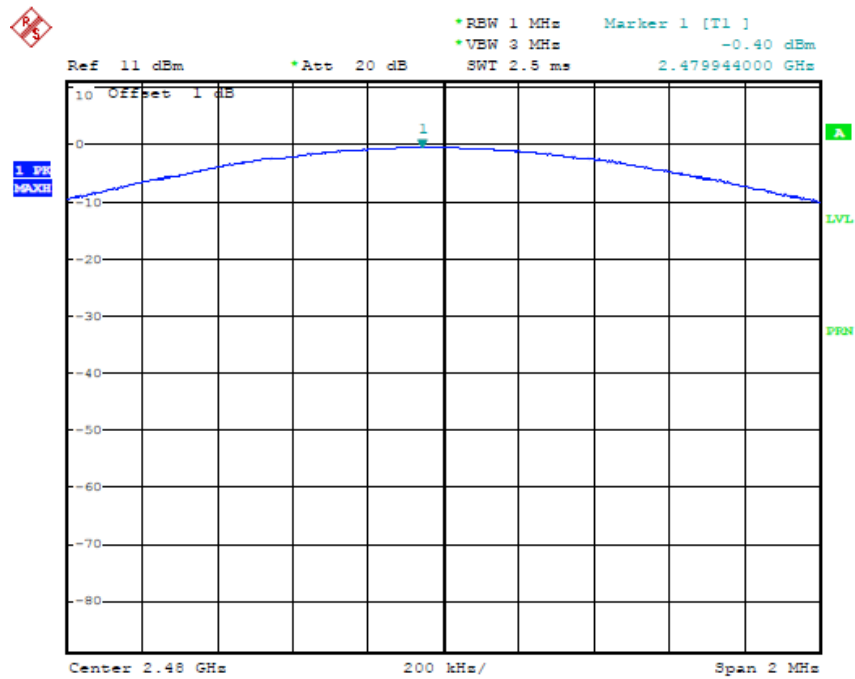
The spectrum analyzer plots are attached as below.  
Channel Low 2402MHz



Channel Middle 2440MHz

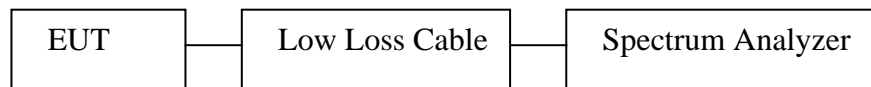


## Channel High 2480MHz



## 5. POWER SPECTRAL DENSITY MEASUREMENT

### 5.1. Block Diagram of Test Setup



### 5.2. Limits

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.3. Test Procedure

- 7.3.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.
- 7.3.2. Set RBW of spectrum analyzer to 3kHz and VBW to 10kHz, sweep time = Span/30kHz
- 7.3.2. Measurement the maximum power spectral density.

### 5.4. Test Result

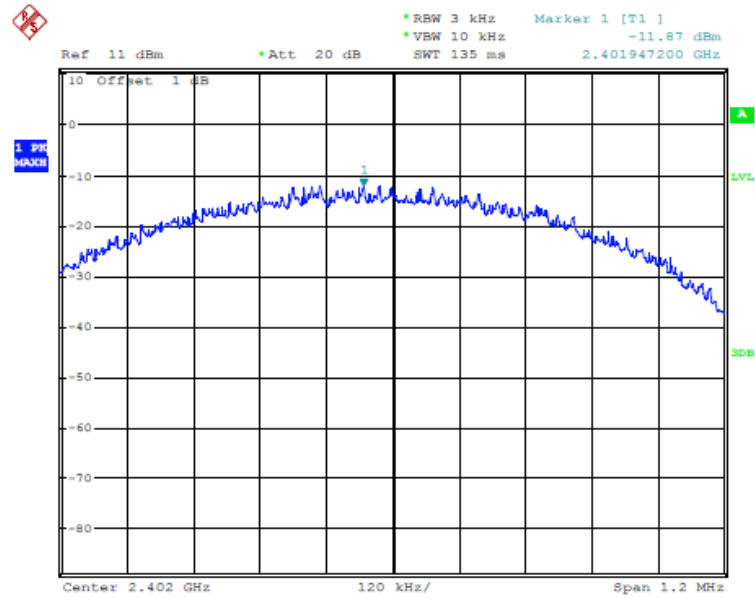
**PASS**

| Channel | Frequency (MHz) | Power Spectral Density (dBm) | Limit (dBm) |
|---------|-----------------|------------------------------|-------------|
| Low     | 2402            | -11.87                       | 8           |
| Middle  | 2440            | -17.01                       | 8           |
| High    | 2480            | -14.61                       | 8           |

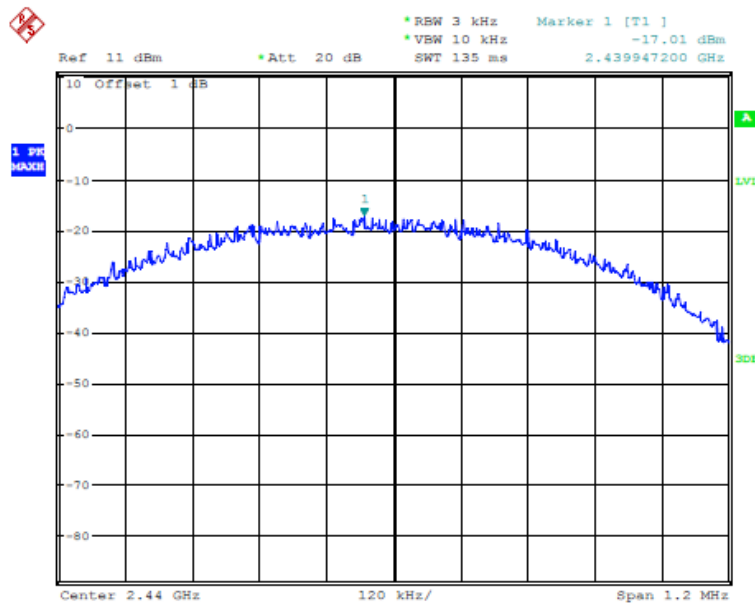


The spectrum analyzer plots are attached as below.

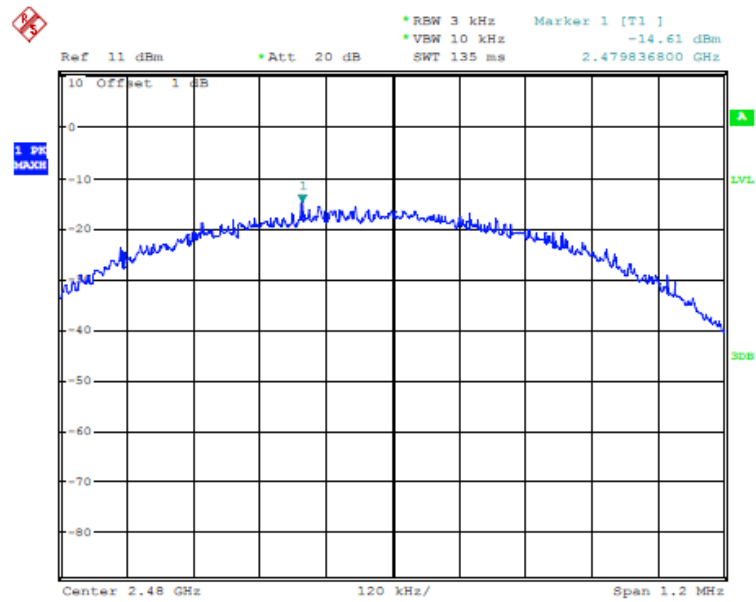
#### Channel Low 2402MHz



#### Channel Middle 2440MHz

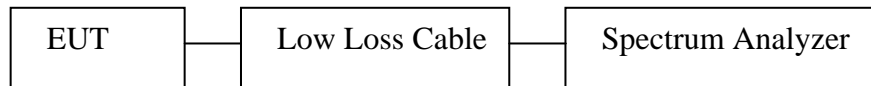


## Channel High 2480MHz



## 6. BAND EDGE COMPLIANCE TEST

### 6.1. Block Diagram of Test Setup



### 6.2. Limits

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

### 6.3. Test Procedure

#### Conducted Band Edge:

8.3.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

8.5.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

#### Radiate Band Edge:

8.5.3. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.

8.3.4. The turntable was rotated for 360 degrees to determine the position of maximum emission level.

8.3.5. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

8.3.6. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: RBW=1MHz, VBW=1MHz

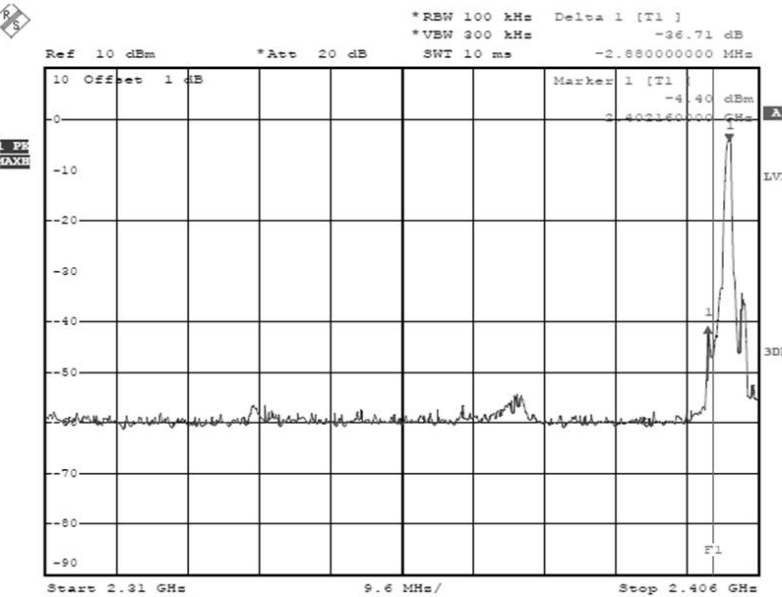
8.3.7. The band edges was measured and recorded.

## 6.4.Test Result

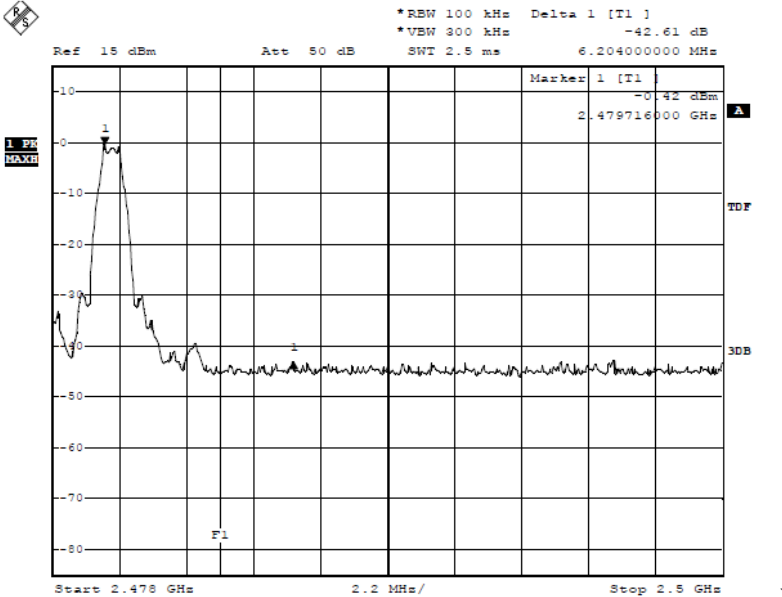
**PASS**

| Frequency(MHz) | Result of Band Edge(dBc) | Limit of Band Edge(dBc) |
|----------------|--------------------------|-------------------------|
| 2402           | 36.71                    | >20 dBc                 |
| 2480           | 42.61                    | >20 dBc                 |

Channel Low 2402MHz

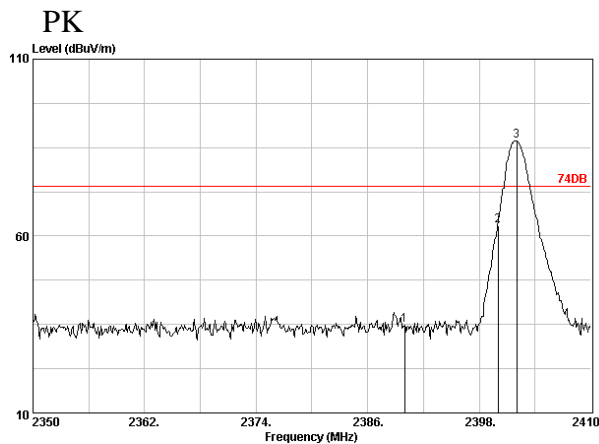


Channel High 2480MHz

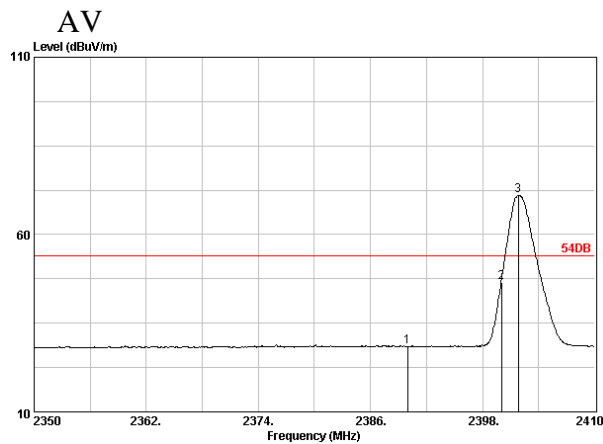


Radiated Band Edge Result

Low 2402MHz  
Horizontal

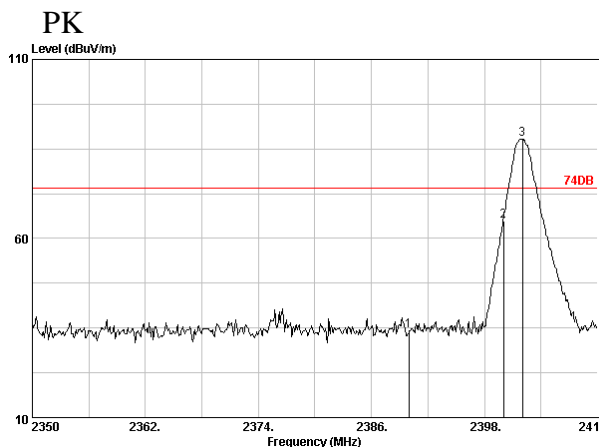


|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2390.00        | 28.78                  | 4.61                  | 36.89             | 34.92                         | 74.00              | 39.08          | Peak   |
| 2 | 2400.00        | 28.78                  | 4.61                  | 64.88             | 62.91                         | 74.00              | 11.09          | Peak   |
| 3 | 2402.02        | 28.78                  | 4.61                  | 88.84             | 86.87                         | 74.00              | -12.87         | Peak   |

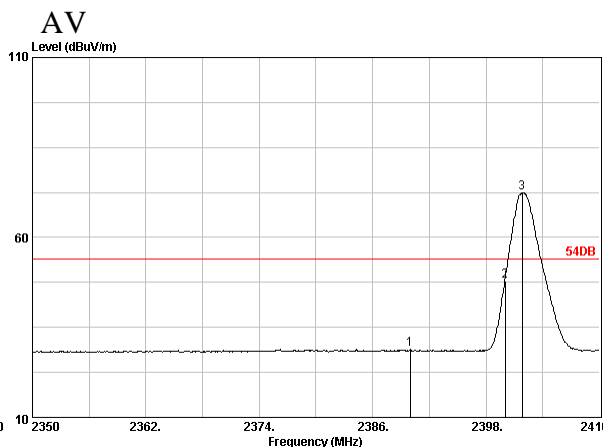


|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2390.00        | 28.78                  | 4.61                  | 30.35             | 28.38                         | 54.00              | 25.62          | Average |
| 2 | 2400.00        | 28.78                  | 4.61                  | 48.49             | 46.52                         | 54.00              | 7.48           | Average |
| 3 | 2401.84        | 28.78                  | 4.61                  | 72.95             | 70.98                         | 54.00              | -16.98         | Average |

Vertical



|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2390.00        | 28.78                  | 4.61                  | 36.13             | 34.16                         | 74.00              | 39.84          | Peak   |
| 2 | 2400.00        | 28.78                  | 4.61                  | 66.95             | 64.98                         | 74.00              | 9.02           | Peak   |
| 3 | 2402.02        | 28.78                  | 4.61                  | 89.77             | 87.80                         | 74.00              | -13.80         | Peak   |



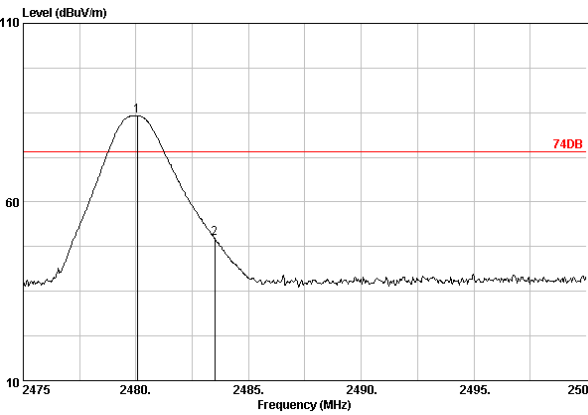
|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2390.00        | 28.78                  | 4.61                  | 30.77             | 28.80                         | 54.00              | 25.20          | Average |
| 2 | 2400.00        | 28.78                  | 4.61                  | 49.94             | 47.97                         | 54.00              | 6.03           | Average |
| 3 | 2401.84        | 28.78                  | 4.61                  | 74.32             | 72.35                         | 54.00              | -18.35         | Average |

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:  
Result = Reading + Corrected Factor

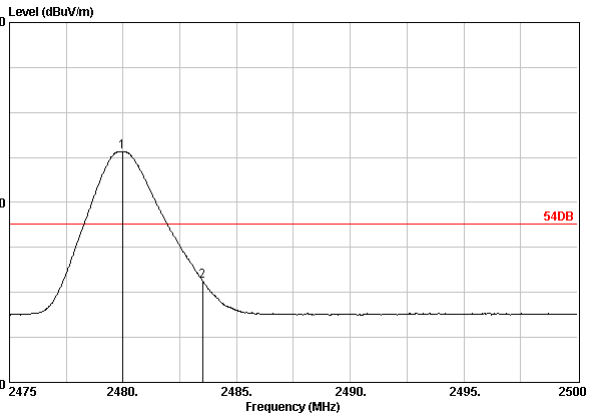
Channel High 2480MHz  
Horizontal

PK



|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2480.05        | 28.93                  | 4.70                  | 85.88             | 84.13                         | 74.00              | -10.13         | Peak   |
| 2 | 2483.50        | 28.93                  | 4.70                  | 51.45             | 49.70                         | 74.00              | 24.30          | Peak   |

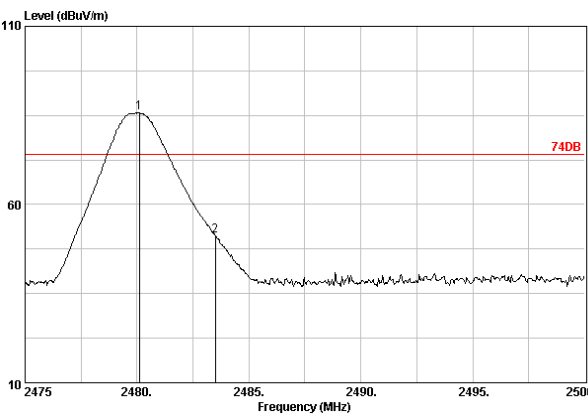
AV



|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2479.98        | 28.93                  | 4.70                  | 75.96             | 74.21                         | 54.00              | -20.21         | Average |
| 2 | 2483.50        | 28.93                  | 4.70                  | 39.97             | 38.22                         | 54.00              | 15.78          | Average |

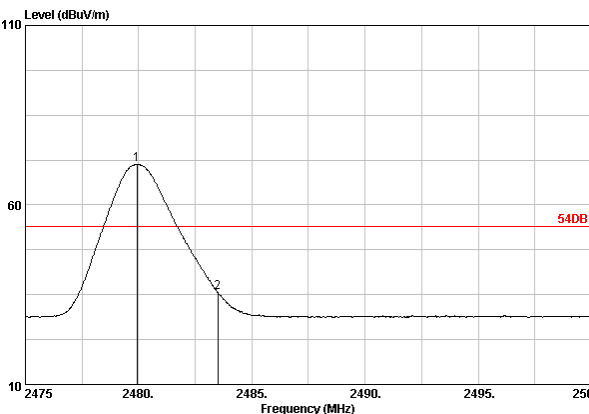
Vertical

PK



|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2480.10        | 28.93                  | 4.70                  | 87.43             | 85.68                         | 74.00              | -11.68         | Peak   |
| 2 | 2483.50        | 28.93                  | 4.70                  | 53.04             | 51.29                         | 74.00              | 22.71          | Peak   |

AV



|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2479.93        | 28.93                  | 4.70                  | 72.98             | 71.23                         | 54.00              | -17.23         | Average |
| 2 | 2483.50        | 28.93                  | 4.70                  | 37.27             | 35.52                         | 54.00              | 18.48          | Average |

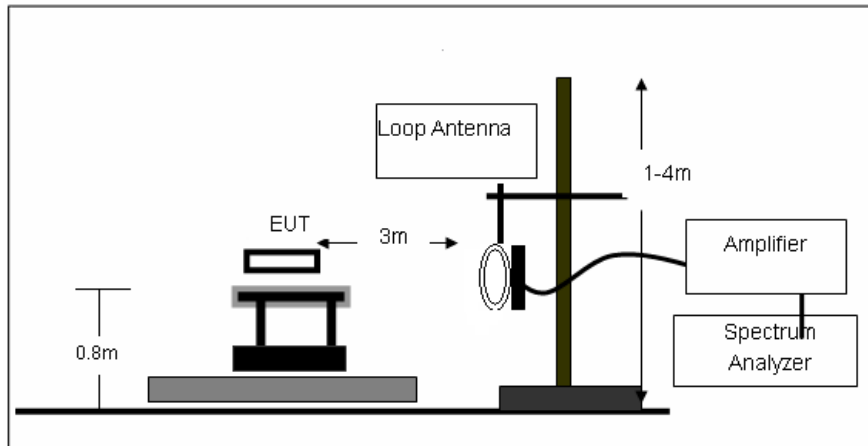
Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:  
Result = Reading + Corrected Factor

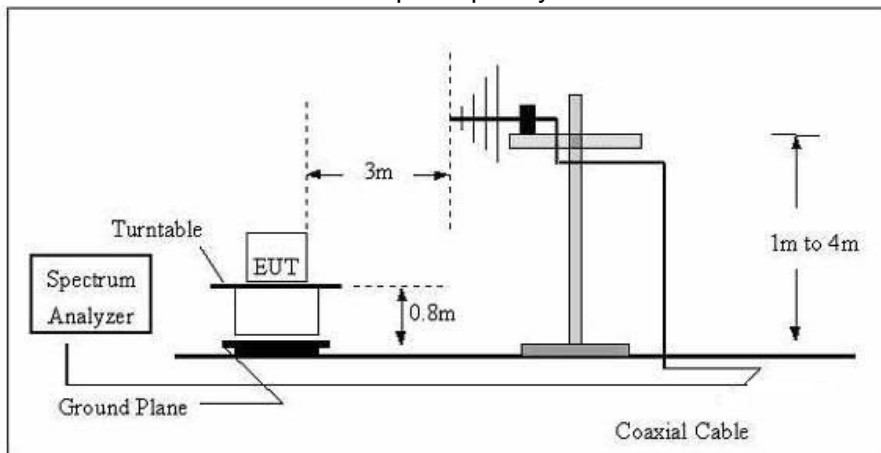
## 7. RADIATED SPURIOUS EMISSION TEST

### 7.1. Block Diagram of Test Setup

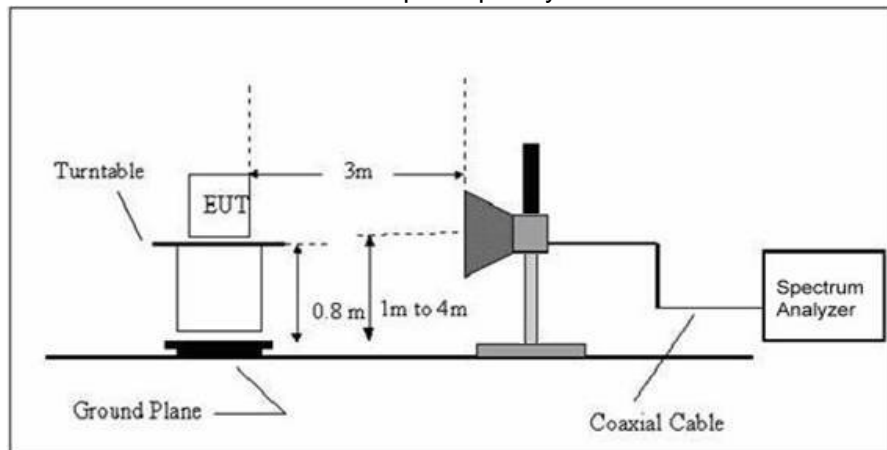
#### (1) Radiated Emission Test-Up Frequency Below 30MHz



#### (2) Radiated Emission Test-Up Frequency 30MHz~1GHz



#### (3) Radiated Emission Test-Up Frequency Above 1GHz





## 7.2.Limits

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

## 7.3.Restricted bands of operation

### 9.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.17725-4.17775          | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.20725-4.20775          | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0        |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41              |                     |               |                  |

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510

<sup>2</sup>Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

#### 7.4. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The worst-case data rate for this channel to be 1Mbps for 802.11b mode and 6Mbps for 802.11g mode and 300Mbps for 802.11n mode, based on previous with 802.11 WLAN product design architectures.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 9kHz to 25GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

## 7.5. Test Result

PASS

Channel Low 2402MHz

For Below 30MHz

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) | Factor(dB)<br>Corr. | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin(dB) |
|------------|-----------------------------|---------------------|--------------------|-------------------|------------|
| /          | /                           | /                   | /                  | /                 | /          |
| /          | /                           | /                   | /                  | /                 | /          |
| /          | /                           | /                   | /                  | /                 | /          |

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) | Factor(dB)<br>Corr. | Result<br>(dBuV/m)<br>(QP) | Limit<br>(dBuV/m)<br>(QP) | Margin(dB)<br>(QP) | Polarization |
|------------|-----------------------------|---------------------|----------------------------|---------------------------|--------------------|--------------|
| 446.4141   | 51.44                       | -14.75              | 36.69                      | 46.00                     | -9.31              | Vertical     |
| 593.0497   | 49.57                       | -11.83              | 37.74                      | 46.00                     | -8.26              |              |
| 965.5421   | 44.82                       | -5.18               | 39.64                      | 54.00                     | -14.36             |              |
| 73.8756    | 56.64                       | -21.57              | 35.07                      | 40.00                     | -4.93              | Horizontal   |
| 161.4739   | 58.48                       | -22.69              | 35.79                      | 43.50                     | -7.71              |              |
| 593.0497   | 51.54                       | -11.83              | 39.71                      | 46.00                     | -6.29              |              |

For 1GHz-25GHz

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) |       | Factor<br>(dB)<br>Corr. | Result<br>(dBuV/m)<br>(QP) |       | Limit<br>(dBuV/m)<br>(QP) |      | Margin(dB)<br>(QP) |        | Polarization |
|------------|-----------------------------|-------|-------------------------|----------------------------|-------|---------------------------|------|--------------------|--------|--------------|
|            | AV                          | PEAK  |                         | AV                         | PEAK  | AV                        | PEAK | AV                 | PEAK   |              |
| 4804.086   | 50.62                       | 61.74 | -3.41                   | 47.21                      | 58.33 | 54                        | 74   | -6.79              | -15.67 | Vertical     |
| 7602.052   | 48.35                       | 61.24 | -2.62                   | 45.73                      | 58.62 | 54                        | 74   | -8.27              | -15.38 |              |
| 4804.086   | 45.68                       | 54.79 | -3.41                   | 42.27                      | 51.38 | 54                        | 74   | -11.73             | -22.62 | Horizontal   |
| 7602.052   | 48.95                       | 61.89 | -2.62                   | 46.33                      | 59.27 | 54                        | 74   | -7.67              | -14.73 |              |

**Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.**

Channel Middle 2440MHz

For Below 30MHz

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) | Factor(dB)<br>Corr. | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin(dB) |
|------------|-----------------------------|---------------------|--------------------|-------------------|------------|
| /          | /                           | /                   | /                  | /                 | /          |
| /          | /                           | /                   | /                  | /                 | /          |
| /          | /                           | /                   | /                  | /                 | /          |

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) | Factor(dB)<br>Corr. | Result<br>(dBuV/m)<br>(QP) | Limit<br>(dBuV/m)<br>(QP) | Margin(dB)<br>(QP) | Polarization |
|------------|-----------------------------|---------------------|----------------------------|---------------------------|--------------------|--------------|
| 172.5988   | 51.21                       | -22.07              | 29.14                      | 43.50                     | -14.36             | Vertical     |
| 247.6819   | 61.50                       | -19.75              | 41.75                      | 46.00                     | -4.25              |              |
| 316.5889   | 58.35                       | -17.49              | 40.86                      | 46.00                     | -5.14              |              |
| 181.2834   | 50.26                       | -21.73              | 28.53                      | 43.50                     | -14.97             | Horizontal   |
| 267.5455   | 57.36                       | -18.78              | 38.58                      | 46.00                     | -7.42              |              |
| 356.6758   | 57.11                       | -16.03              | 41.08                      | 46.00                     | -4.92              |              |

For 1GHz-25GHz

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) |       | Factor<br>(dB)<br>Corr. | Result<br>(dBuV/m)<br>(QP) |       | Limit<br>(dBuV/m)<br>(QP) |      | Margin(dB)<br>(QP) |        | Polarization |
|------------|-----------------------------|-------|-------------------------|----------------------------|-------|---------------------------|------|--------------------|--------|--------------|
|            | AV                          | PEAK  |                         | AV                         | PEAK  | AV                        | PEAK | AV                 | PEAK   |              |
| 4880.083   | 44.9                        | 56.16 | -4.40                   | 40.50                      | 51.76 | 54                        | 74   | -13.50             | -22.24 | Vertical     |
| 7320.026   | 49.83                       | 62.57 | -3.61                   | 46.22                      | 58.96 | 54                        | 74   | -7.78              | -15.04 |              |
| 4880.083   | 45.73                       | 60.52 | -4.40                   | 41.33                      | 56.12 | 54                        | 74   | -12.67             | -17.88 | Horizontal   |
| 7320.026   | 49.73                       | 61.94 | -3.61                   | 46.12                      | 58.33 | 54                        | 74   | -7.88              | -15.67 |              |

**Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.**

Channel Middle 2480MHz

For Below 30MHz

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) | Factor(dB)<br>Corr. | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin(dB) |
|------------|-----------------------------|---------------------|--------------------|-------------------|------------|
| /          | /                           | /                   | /                  | /                 | /          |
| /          | /                           | /                   | /                  | /                 | /          |
| /          | /                           | /                   | /                  | /                 | /          |

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) | Factor(dB)<br>Corr. | Result<br>(dBuV/m)<br>(QP) | Limit<br>(dBuV/m)<br>(QP) | Margin(dB)<br>(QP) | Polarization |
|------------|-----------------------------|---------------------|----------------------------|---------------------------|--------------------|--------------|
| 71.8319    | 55.00                       | -21.45              | 33.55                      | 40.00                     | -6.45              | Vertical     |
| 119.8555   | 51.41                       | -22.52              | 28.89                      | 43.50                     | -14.61             |              |
| 965.5421   | 44.82                       | -5.18               | 39.64                      | 54.00                     | -14.36             |              |
| 73.8756    | 56.64                       | -21.57              | 35.07                      | 40.00                     | -4.93              | Horizontal   |
| 161.4740   | 58.48                       | -22.69              | 35.79                      | 43.50                     | -7.53              |              |
| 593.0497   | 51.54                       | -11.83              | 39.71                      | 46.00                     | -6.29              |              |

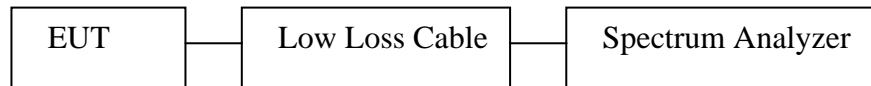
For 1GHz-25GHz

| Freq.(MHz) | Reading<br>(dBuV/m)<br>(QP) |       | Factor<br>(dB)<br>Corr. | Result<br>(dBuV/m)<br>(QP) |       | Limit<br>(dBuV/m)<br>(QP) |      | Margin(dB)<br>(QP) |        | Polarization |
|------------|-----------------------------|-------|-------------------------|----------------------------|-------|---------------------------|------|--------------------|--------|--------------|
|            | AV                          | PEAK  |                         | AV                         | PEAK  | AV                        | PEAK | AV                 | PEAK   |              |
| 4960       | 45.70                       | 57.18 | -3.30                   | 42.40                      | 53.88 | 54                        | 74   | -11.60             | -20.12 | Vertical     |
| 7440       | 46.77                       | 58.87 | 0.34                    | 47.11                      | 59.21 | 54                        | 74   | -6.89              | -14.79 |              |
| 4960       | 42.06                       | 52.51 | -3.30                   | 38.76                      | 49.21 | 54                        | 74   | -15.24             | -24.79 | Horizontal   |
| 7440       | 47.05                       | 58.99 | 0.34                    | 47.39                      | 59.33 | 54                        | 74   | -6.61              | -14.67 |              |

**Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.**

## 8. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

### 8.1. Block Diagram of Test Setup



### 8.2. Limits

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

### 8.3. Test Procedure

8.3.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

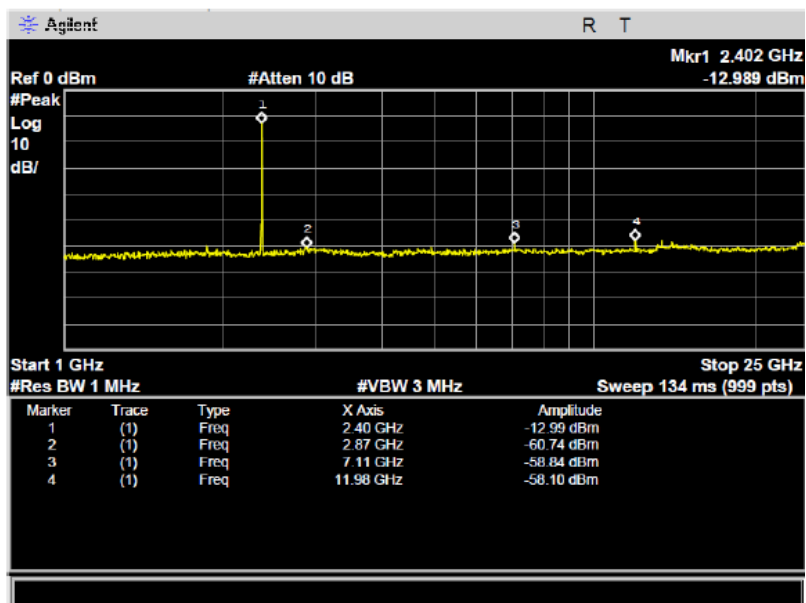
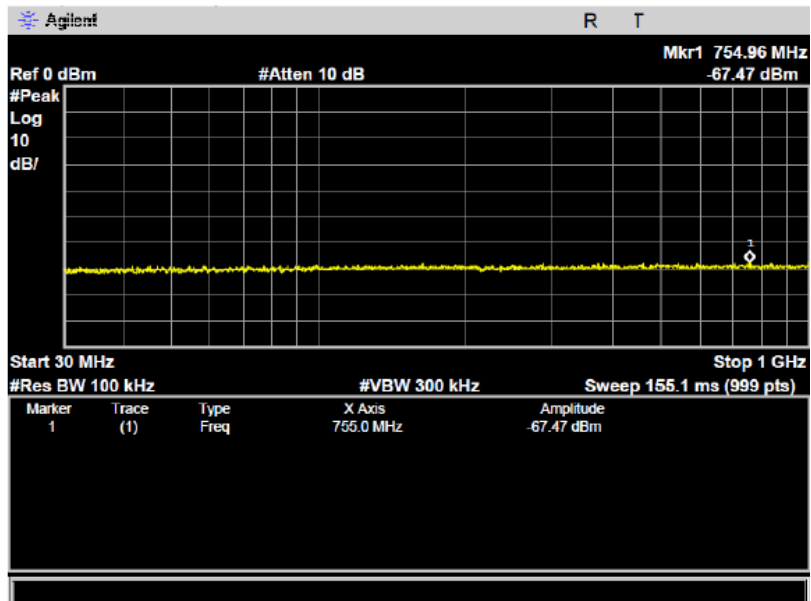
10.3.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

10.3.3. The Conducted Spurious Emission was measured and recorded.

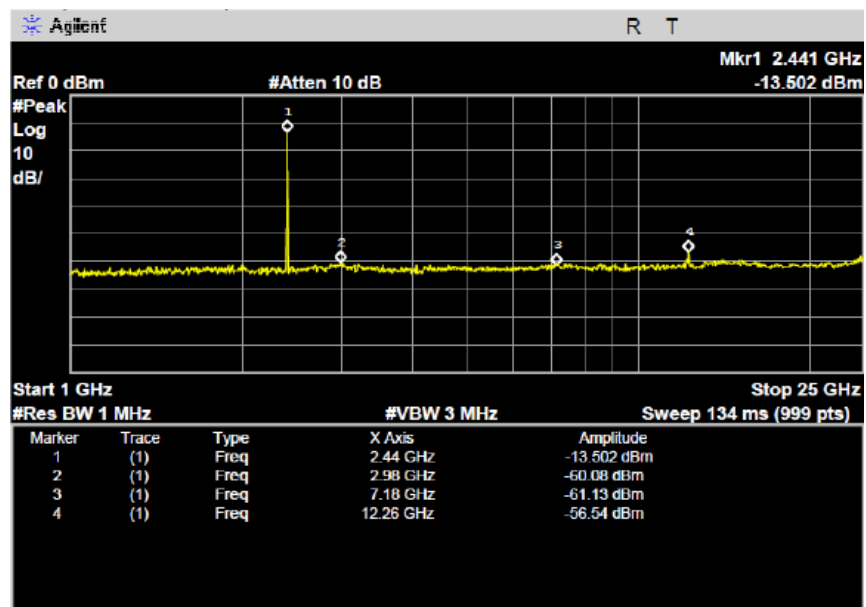
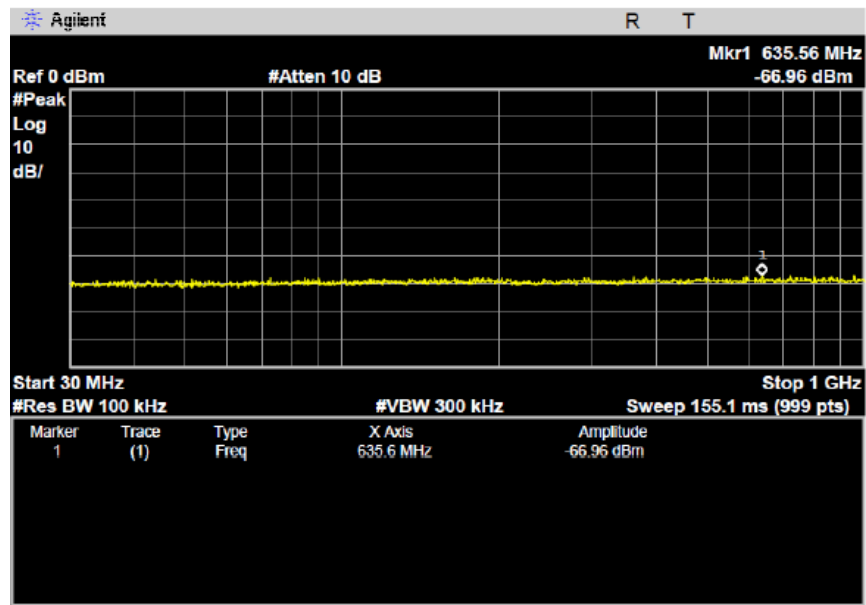
### 8.4. Test Result

#### **PASS**

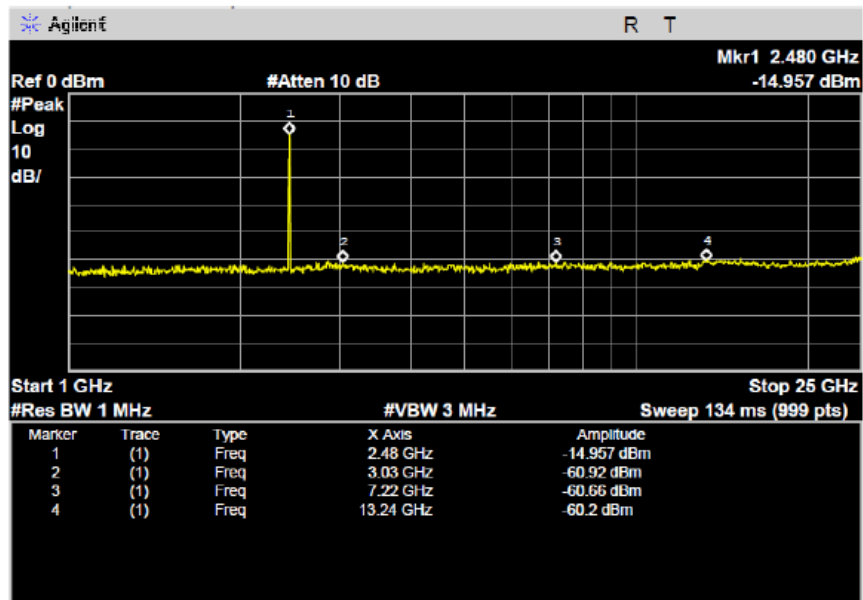
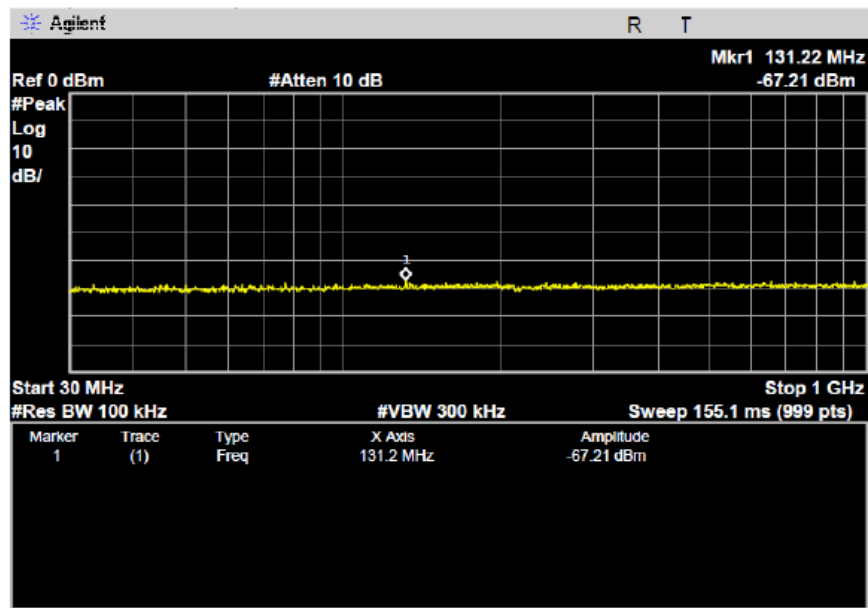
The spectrum analyzer plots are attached as below.

**Channel Low 2402MHz**

## Channel Middle 2440MHz

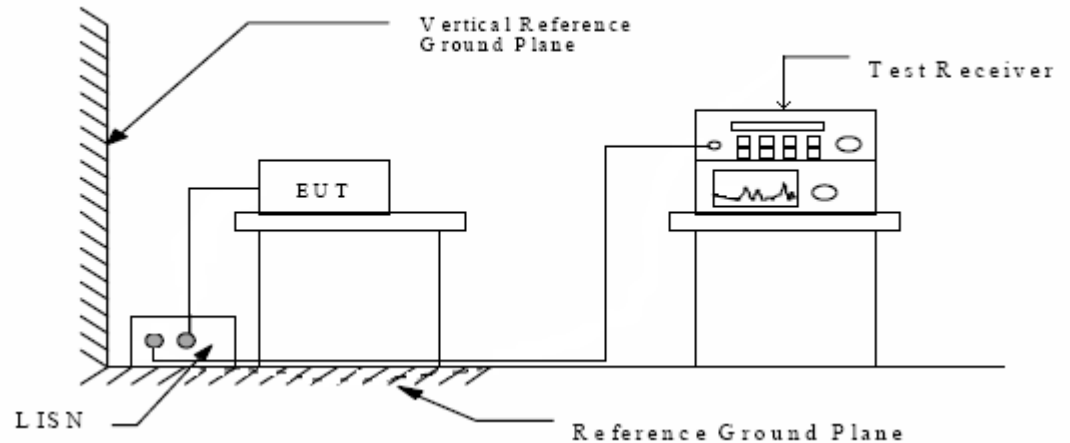




**Channel High 2480MHz**

## 9. AC POWER LINE CONDUCTED EMISSION FOR PART 15 SECTION 15.207(A)

### 9.1. Block Diagram of Test Setup



### 9.2. Limits

Conducted Emission Measurement Limits According to Section 15.207(a)

| Frequency<br>MHz | Limits (dB $\mu$ V) |               |
|------------------|---------------------|---------------|
|                  | Quasi-peak Level    | Average Level |
| 0.15 ~ 0.50      | 66 ~ 56*            | 56 ~ 46*      |
| 0.50 ~ 5.00      | 56                  | 46            |
| 5.00 ~ 30.00     | 60                  | 50            |

\* Decreases with the logarithm of the frequency.

### 9.3. Test Procedure

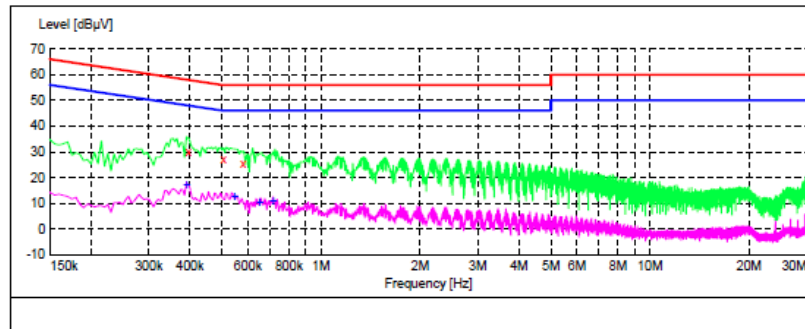
The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2003 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESPI) is set at 9kHz.

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

## 9.4. Test Result

L



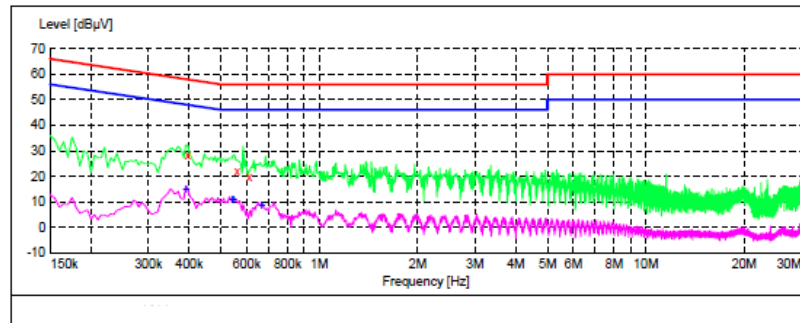
### MEASUREMENT RESULT:

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.395000         | 30.20         | 10.7         | 58            | 27.8         | QP       | L1   | GND |
| 0.505000         | 27.20         | 10.5         | 56            | 28.8         | QP       | L1   | GND |
| 0.580000         | 25.20         | 10.4         | 56            | 30.8         | QP       | L1   | GND |

### MEASUREMENT RESULT:

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.390000         | 17.50         | 10.7         | 48            | 30.6         | AV       | L1   | GND |
| 0.545000         | 12.70         | 10.5         | 46            | 33.3         | AV       | L1   | GND |
| 0.650000         | 10.60         | 10.4         | 46            | 35.4         | AV       | L1   | GND |
| 0.715000         | 11.00         | 10.4         | 46            | 35.0         | AV       | L1   | GND |

N



### MEASUREMENT RESULT:

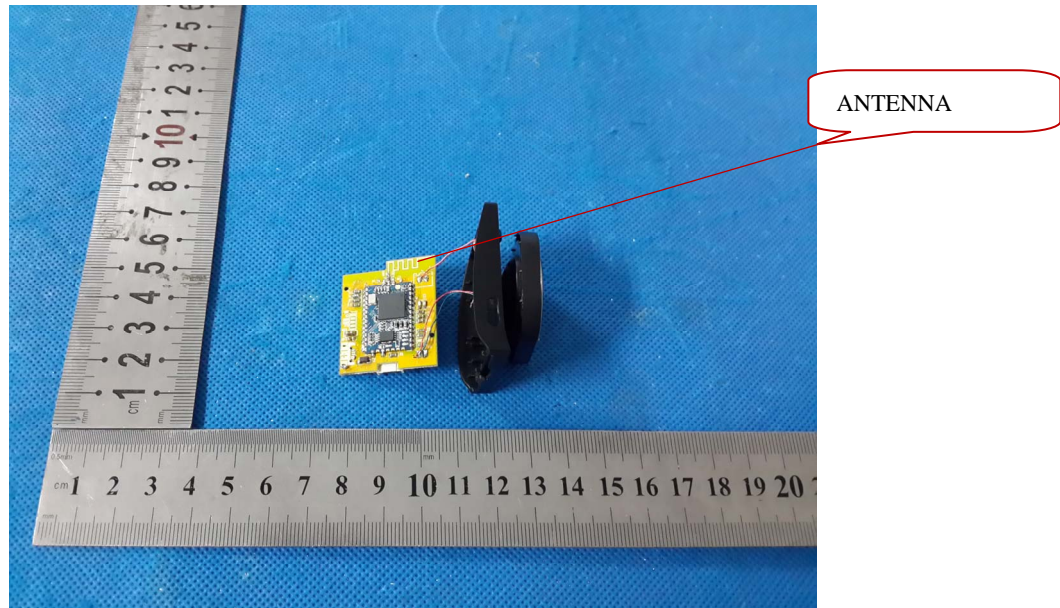
| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.395000         | 28.10         | 10.7         | 58            | 29.9         | QP       | N    | GND |
| 0.560000         | 22.30         | 10.5         | 56            | 33.7         | QP       | N    | GND |
| 0.610000         | 19.50         | 10.4         | 56            | 36.5         | QP       | N    | GND |

### MEASUREMENT RESULT:

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.390000         | 15.10         | 10.7         | 48            | 33.0         | AV       | N    | GND |
| 0.540000         | 11.00         | 10.5         | 46            | 35.0         | AV       | N    | GND |
| 0.545000         | 11.00         | 10.5         | 46            | 35.0         | AV       | N    | GND |
| 0.665000         | 9.20          | 10.4         | 46            | 36.8         | AV       | N    | GND |

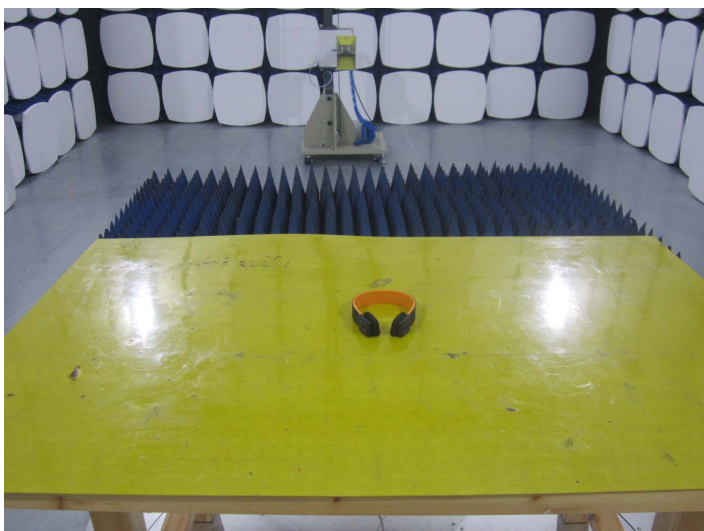
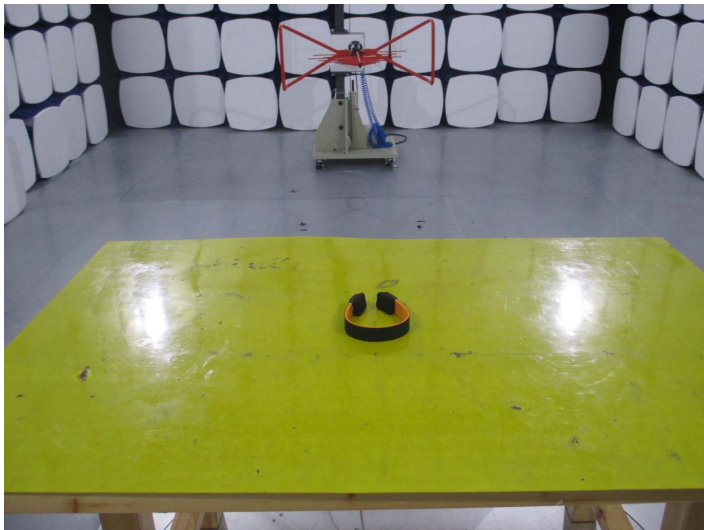
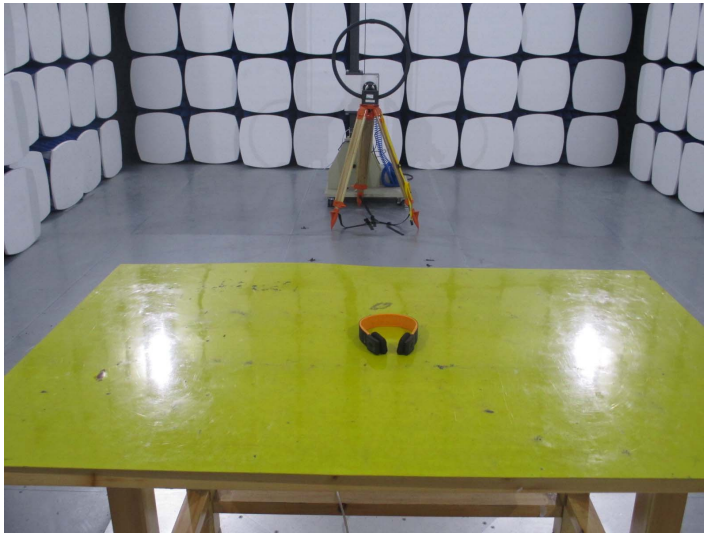
## 10. ANTENNA REQUIREMENT

According to Section 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. Antenna is fixed by enclosure, can not be changed except take apart the product.



## 11. PHOTOGRAPH OF TEST

### Radiated Emission





### Ac power line conducted emission

