

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C  
REQUIREMENT T**

*OF*

LED lamp

MODEL No.: GTB8R

Trademark: N/A

FCC ID: 2ACNS-GTB8R

REPORT NO: KAN150318069E

ISSUE DATE: May 17, 2015

*Prepared for*

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## VERIFICATION OF COMPLIANCE

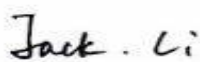
|                     |   |                                                                                                                                     |
|---------------------|---|-------------------------------------------------------------------------------------------------------------------------------------|
| Applicant           | : | NINGBO JINGHUI OPTO-ELECTRONIC CO., LTD<br>No.616 Qingqing Road, The District B, Zhenhai Economic Development Zone,<br>Ningbo China |
| Manufacturer        | : | NINGBO JINGHUI OPTO-ELECTRONIC CO., LTD<br>No.616 Qingqing Road, The District B, Zhenhai Economic Development Zone,<br>Ningbo China |
| Product Description | : | LED lamp                                                                                                                            |
| Brand Name          | : | N/A                                                                                                                                 |
| Model Number        | : | GTB8R                                                                                                                               |
| File Number         | : | KAN150318069E                                                                                                                       |
| Date of Test:       | : | April 06, 2015 to May 08, 2015                                                                                                      |

**We hereby certify that:**

The above equipment was tested by SHENZHEN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : April 06, 2015 to May 08, 2015

Prepared by :   
 Jack Li/Editor

Reviewer :   
 Joe Xia/Supervisor

Approve & Authorized Signer :   
 Lisa Wang/Manager

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## 1. GENERAL INFORMATION

### 1.1 Product Description

The NINGBO JINGHUI OPTO-ELECTRONIC CO., LTD, Model: GTB8R (referred to as the EUT in this report)  
The EUT is an short range, lower power transmitter. It is designed by way of utilizing the following modulation achieves the system operating.

- A). Operation Frequency: 2402-2480MHz
- B). Kind of device: Bluetooth 4.0(Only BLE)
- C). Modulation: GFSK
- D). Number of Channel: 40
- E). Channel space: 2MHz
- F). Measured RF Output Power: -1.19dBm (0.76mW)
- G). Antenna Type: Internal antenna
- H). Antenna GAIN: 4 dBi
- I). Input Rating: AC 100V-264V, 50/60Hz

#### Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 14      | 2430            | 28      | 2458            |
| 01      | 2404            | 15      | 2432            | 29      | 2460            |
| 02      | 2406            | 16      | 2434            | 30      | 2462            |
| 03      | 2408            | 17      | 2436            | 31      | 2464            |
| 04      | 2410            | 18      | 2438            | 32      | 2466            |
| 05      | 2412            | 19      | 2440            | 33      | 2468            |
| 06      | 2414            | 20      | 2442            | 34      | 2470            |
| 07      | 2416            | 21      | 2444            | 35      | 2472            |
| 08      | 2418            | 22      | 2446            | 36      | 2474            |
| 09      | 2420            | 23      | 2448            | 37      | 2476            |
| 10      | 2422            | 24      | 2450            | 38      | 2478            |
| 11      | 2424            | 25      | 2452            |         |                 |
| 12      | 2426            | 26      | 2454            |         |                 |

Note:

1. Test of channel was included the lowest 2402MHz, middle 2442MHz and highest frequency 2480MHz in highest data rate and to perform the test, then record on this report.

### 1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10-2013.  
Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02 for compliance to FCC 47CFR 15.247 requirements.

### 1.3 Special Accessories

Not available for this EUT intended for grant.

### 1.4 Equipment Modifications

Not available for this EUT intended for grant.

## 1.5 Test Facility

Site Description  
EMC Lab.

- : Accredited by CNAS, 2013.10.29  
The certificate is valid until 2016.10.28  
The Laboratory has been assessed and proved to be in compliance with  
CNAS/CL01:2006(identical to ISO/IEC17025: 2005)  
The Certificate Registration Number is L2291
  
- Accredited by TUV Rheinland Shenzhen 2010.5.25  
The Laboratory has been assessed according to the requirements ISO/IEC  
17025
  
- Accredited by FCC, April 17, 2014  
The Certificate Registration Number is 406365.
  
- Accredited by Industry Canada, March 5, 2010  
The Certificate Registration Number is 4480A-2.

Name of Firm  
Site Location

- : SHENZHEN EMTEK CO., LTD
- : Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen,  
Guangdong, China

## 2. System Test Configuration

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous transmission application.

### 2.2 EUT Exercise

The Transmitter was operated in the transmission operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

### 2.3 Test Procedure

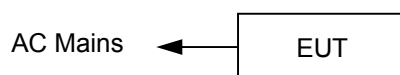
#### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

#### 2.3.2 Radiated Emissions

The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this LED lamp (EUT) was rotated through three orthogonal axes according to the requirements in section 6.4, section 6.5 and section 6.6 of ANSI C63.10-2013

### 2.4 Configuration of Tested System



### 2.5 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/Type No. | FCC ID      | Series No. | Note |
|------|-----------|-----------|----------------|-------------|------------|------|
| 1.   | LED lamp  | JINGHUI   | GTB8R          | 2ACNS-GTB8R | N/A        | EUT  |
| \    | \         | \         | \              | \           | \          | \    |

**Note:**

1. Unless otherwise denoted as EUT in 『Remark』 column, device(s) used in tested system is a support equipment.

### 3. Description of Test Modes

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

For Radiated: The EUT's antenna was pre-tested under the following modes:

| Test Mode | Description |
|-----------|-------------|
| Mode A    | X-Y axis    |
| Mode B    | Y-Z axis    |
| Mode C    | X-Z axis    |

From the above modes, the worst case was found in Mode A. Therefore only the test data of the mode was recorded in this report.

The details of test channels and bandwidth were for RF conductive measurement.

1. For lowest channel : 2402MHz(Channel 00)
2. For middle channel : 2442MHz(Channel 20)
3. For highest channel: 2480MHz(Channel 39)

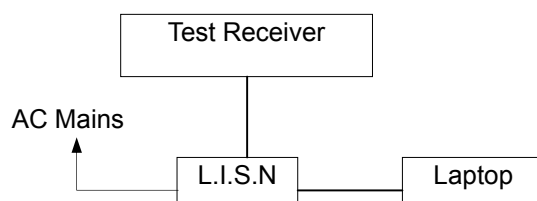


## 4. Conducted Emissions Test

### 4.1 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the three highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### 4.2 Test SET-UP (Block Diagram of Configuration)



### 4.3 Measurement Equipment Used

| Conducted Emission Test Site |                 |              |               |            |            |
|------------------------------|-----------------|--------------|---------------|------------|------------|
| Equipment Type               | MFR             | Model Number | Serial Number | Last Cal.  | Cal due.   |
| Test Receiver                | Rohde & Schwarz | ESCS30       | 828985/018    | 05/17/2014 | 05/16/2015 |
| L.I.S.N.                     | Rohde & Schwarz | ENV216       | 101161        | 05/17/2014 | 05/16/2015 |
| L.I.S.N.                     | Schwarzbeck     | NNLK8129     | 8129203       | 05/17/2014 | 05/17/2015 |
| 50Ω Coaxial Switch           | Anritsu         | MP59B        | M20531        | N/A        | N/A        |
| Pulse Limiter                | Rohde & Schwarz | ESH3-Z2      | 100006        | 05/17/2014 | 05/17/2015 |

### 4.4 Conducted Emission Limit

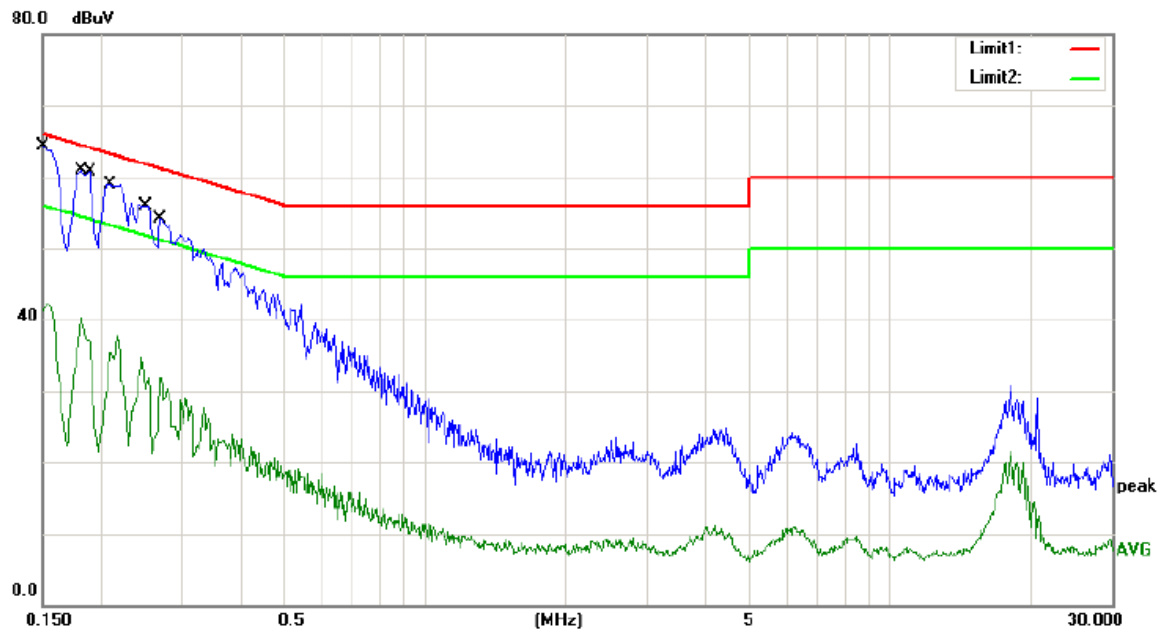
| Frequency (MHz) | Limit (dBμV)     |               |
|-----------------|------------------|---------------|
|                 | Quasi-peak Level | Average Level |
| 0.15 ~ 0.50     | 66.0 ~ 56.0 *    | 56.0 ~ 46.0 * |
| 0.50 ~ 5.00     | 56.0             | 46.0          |
| 5.00 ~ 30.00    | 60.0             | 50.0          |

NOTE1-The lower limit shall apply at the transition frequencies.  
 NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

### 4.5 Measurement Result

Pass.  
 Please refer to the following data.

**Worst Case Operating Mode: TX(2402MHz)**

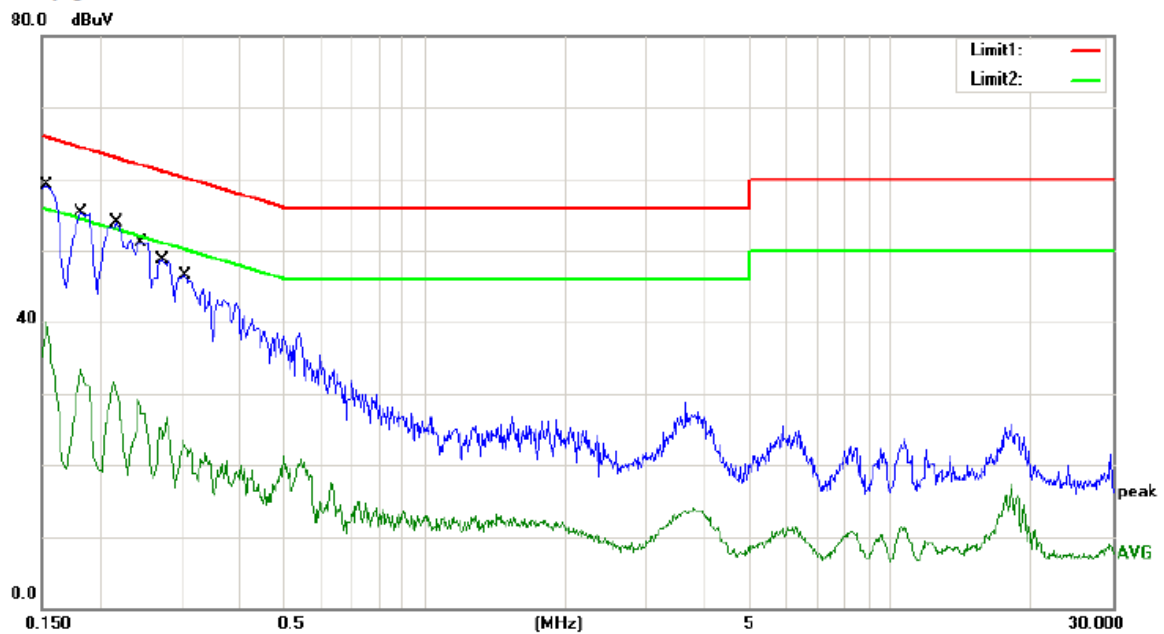


Site site #1  
Limit: (CE)FCC PART 15  
EUT: LED Lamp  
M/N: GTB8R  
Mode: TX (2402MHz)  
Note:

Phase: **L1**  
Power: AC 120V/60Hz

Temperature: 20  
Humidity: 51 %

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.1500       | 45.40                    | 11.00                   | 56.40                    | 66.00         | -9.60      | QP       |         |
| 2   |     | 0.1500       | 30.30                    | 11.00                   | 41.30                    | 56.00         | -14.70     | AVG      |         |
| 3   |     | 0.1820       | 39.80                    | 11.00                   | 50.80                    | 64.39         | -13.59     | QP       |         |
| 4   |     | 0.1820       | 28.80                    | 11.00                   | 39.80                    | 54.39         | -14.59     | AVG      |         |
| 5   |     | 0.1900       | 39.70                    | 11.00                   | 50.70                    | 64.04         | -13.34     | QP       |         |
| 6   |     | 0.1900       | 24.80                    | 11.00                   | 35.80                    | 54.04         | -18.24     | AVG      |         |
| 7   |     | 0.2100       | 37.90                    | 11.00                   | 48.90                    | 63.21         | -14.31     | QP       |         |
| 8   |     | 0.2100       | 24.30                    | 11.00                   | 35.30                    | 53.21         | -17.91     | AVG      |         |
| 9   |     | 0.2507       | 34.90                    | 11.00                   | 45.90                    | 61.73         | -15.83     | QP       |         |
| 10  |     | 0.2507       | 19.60                    | 11.00                   | 30.60                    | 51.73         | -21.13     | AVG      |         |
| 11  |     | 0.2700       | 33.10                    | 11.00                   | 44.10                    | 61.12         | -17.02     | QP       |         |
| 12  |     | 0.2700       | 20.90                    | 11.00                   | 31.90                    | 51.12         | -19.22     | AVG      |         |



Site site #1

Phase: **N**

Temperature: 20

Limit: (CE)FCC PART 15

Power: AC 120V/60Hz

Humidity: 51 %

EUT: LED Lamp

M/N: GTB8R

Mode: TX (2402MHz)

Note:

| No. | Mk. | Freq.  | Reading Level | Correct Factor | Measurement | Limit | Over   |          |         |
|-----|-----|--------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz    | dBuV          | dB             | dBuV        | dBuV  | dB     | Detector | Comment |
| 1   |     | 0.1540 | 41.60         | 11.00          | 52.60       | 65.78 | -13.18 | QP       |         |
| 2   |     | 0.1540 | 29.10         | 11.00          | 40.10       | 55.78 | -15.68 | AVG      |         |
| 3   |     | 0.1820 | 38.30         | 11.00          | 49.30       | 64.39 | -15.09 | QP       |         |
| 4   |     | 0.1820 | 22.10         | 11.00          | 33.10       | 54.39 | -21.29 | AVG      |         |
| 5   |     | 0.2180 | 42.80         | 11.00          | 53.80       | 62.89 | -9.09  | QP       |         |
| 6   |     | 0.2180 | 19.10         | 11.00          | 30.10       | 52.89 | -22.79 | AVG      |         |
| 7   |     | 0.2468 | 40.00         | 11.00          | 51.00       | 61.86 | -10.86 | QP       |         |
| 8   |     | 0.2468 | 16.30         | 11.00          | 27.30       | 51.86 | -24.56 | AVG      |         |
| 9   |     | 0.2740 | 37.60         | 11.00          | 48.60       | 61.00 | -12.40 | QP       |         |
| 10  |     | 0.2740 | 12.70         | 11.00          | 23.70       | 51.00 | -27.30 | AVG      |         |
| 11  |     | 0.3060 | 35.50         | 11.00          | 46.50       | 60.08 | -13.58 | QP       |         |
| 12  |     | 0.3060 | 11.70         | 11.00          | 22.70       | 50.08 | -27.38 | AVG      |         |

## 5. Radiated Emission Test

### 5.1 Measurement Procedure

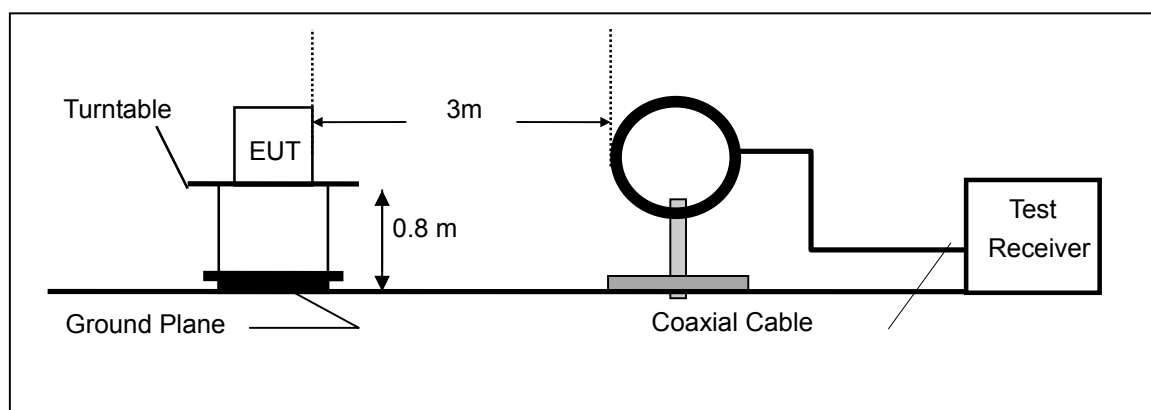
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector (RBW=100kHz, VBW=300kHz) and all final readings of measurement from Test Receiver are Quasi-Peak values(Quasi Peak detector used with a bandwidth of 120 kHz).

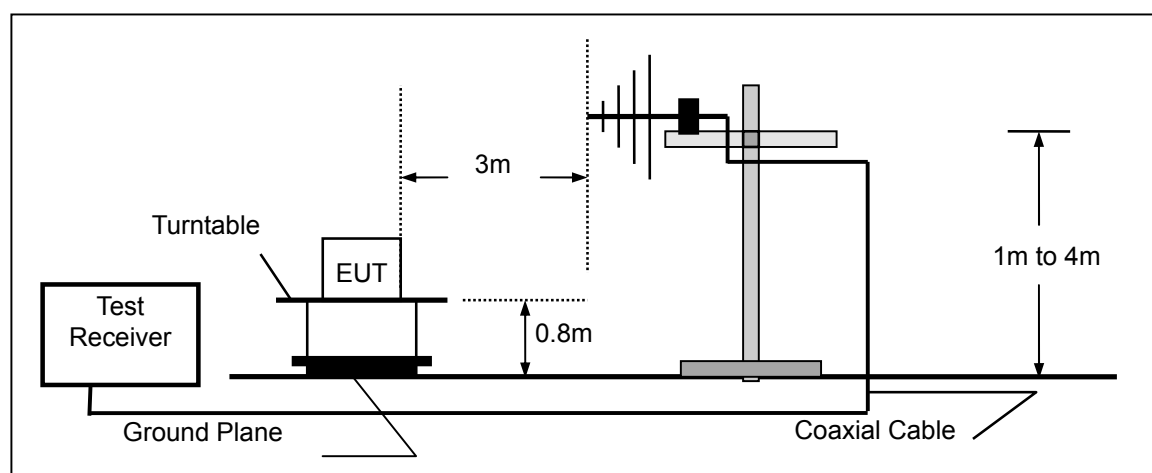
The frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

### 5.2 Test SET-UP (Block Diagram of Configuration)

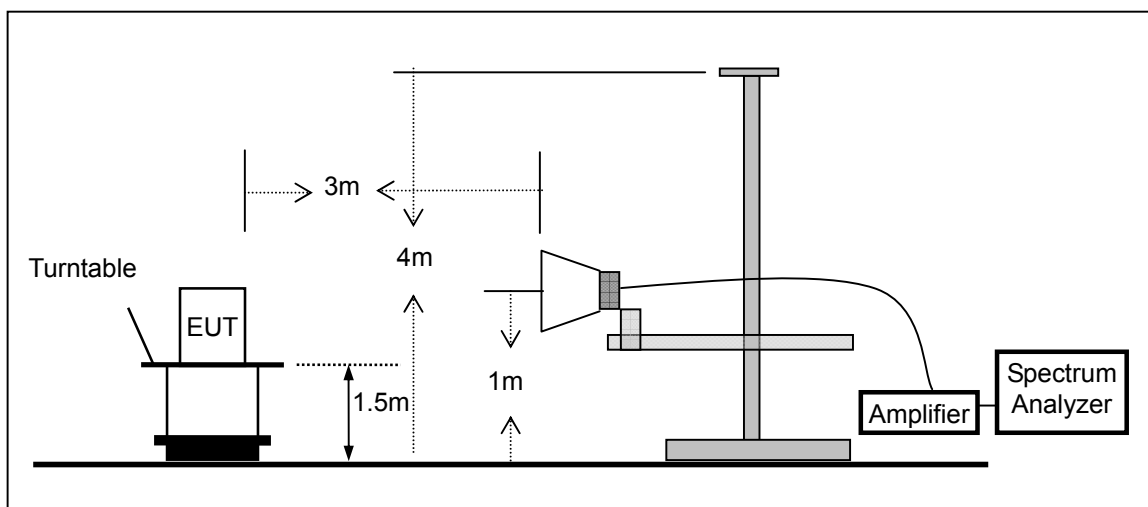
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



### 5.3 Measurement Equipment Used

| Item | Equipment         | Manufacturer    | Model No. | Serial No.   | Last Cal.  | Cal. Interval |
|------|-------------------|-----------------|-----------|--------------|------------|---------------|
| 1.   | EMI Test Receiver | Rohde & Schwarz | ESU       | 1302.6005.26 | 05/17/2014 | 1 Year        |
| 2.   | Pre-Amplifier     | HP              | 8447D     | 2944A07999   | 05/17/2014 | 1 Year        |
| 3.   | Pre-Amplifier     | A.H.            | PAM-0126  | 1415261      | 05/17/2014 | 1 Year        |
| 4.   | Bilog Antenna     | Schwarzbeck     | VULB9163  | 142          | 05/17/2014 | 1 Year        |
| 5.   | Loop Antenna      | Schwarzbeck     | FMZB 1519 | 1519-012     | 05/17/2014 | 1 Year        |
| 6.   | Horn Antenna      | Schwarzbeck     | BBHA 9170 | BBHA9170399  | 05/17/2014 | 1 Year        |
| 7.   | Horn Antenna      | Schwarzbeck     | BBHA 9120 | D143         | 05/17/2014 | 1 Year        |
| 8.   | Cable             | Schwarzbeck     | AK9513    | ACRX1        | 05/17/2014 | 1 Year        |
| 9.   | Cable             | Rosenberger     | N/A       | FP2RX2       | 05/17/2014 | 1 Year        |
| 10.  | Cable             | Schwarzbeck     | AK9513    | CRPX1        | 05/17/2014 | 1 Year        |
| 11.  | Cable             | Schwarzbeck     | AK9513    | CRRX2        | 05/17/2014 | 1 Year        |

#### 5.4 Radiated emission limit

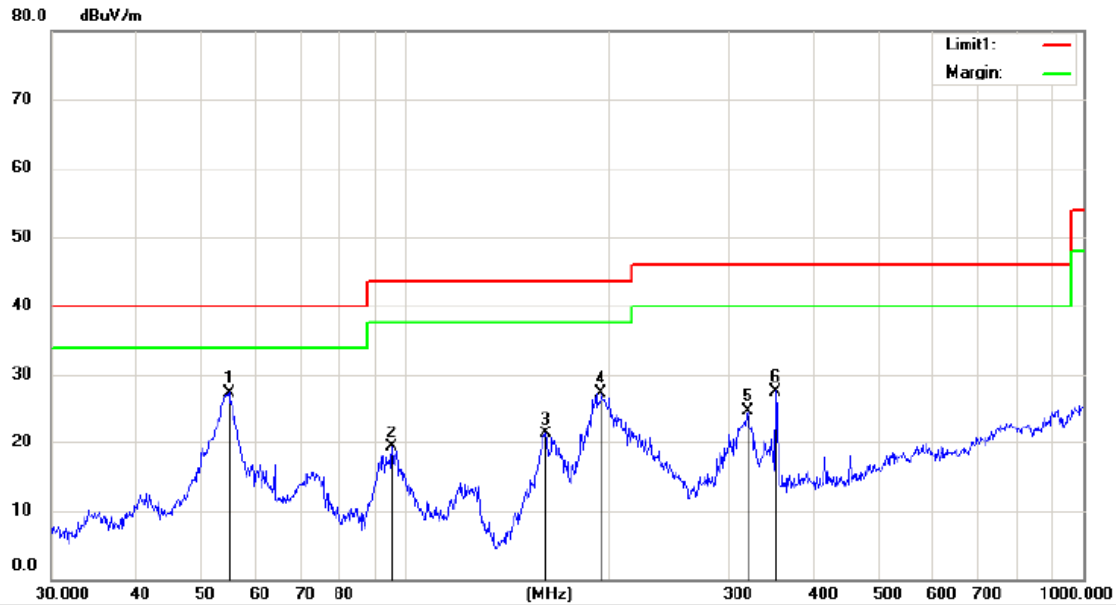
| Frequency (MHz) | Field strength $\mu\text{V/m}$ | Distance(m) | Field strength at 3m $\text{dB}\mu\text{V/m}$ |
|-----------------|--------------------------------|-------------|-----------------------------------------------|
| 0.009~0.490     | 2400/F(KHz)                    | 300         | /                                             |
| 0.490~1.705     | 2400/F(KHz)                    | 30          | /                                             |
| 1.705~30.0      | 30                             | 30          | /                                             |
| 30-88           | 100                            | 3           | 40                                            |
| 88-216          | 150                            | 3           | 43.5                                          |
| 216-960         | 200                            | 3           | 46                                            |
| Above 960       | 500                            | 3           | 54                                            |

#### 5.5 Measurement Result

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

**30M-1GHz:**

**Worst Case Operating Mode: TX(2402MHz)**

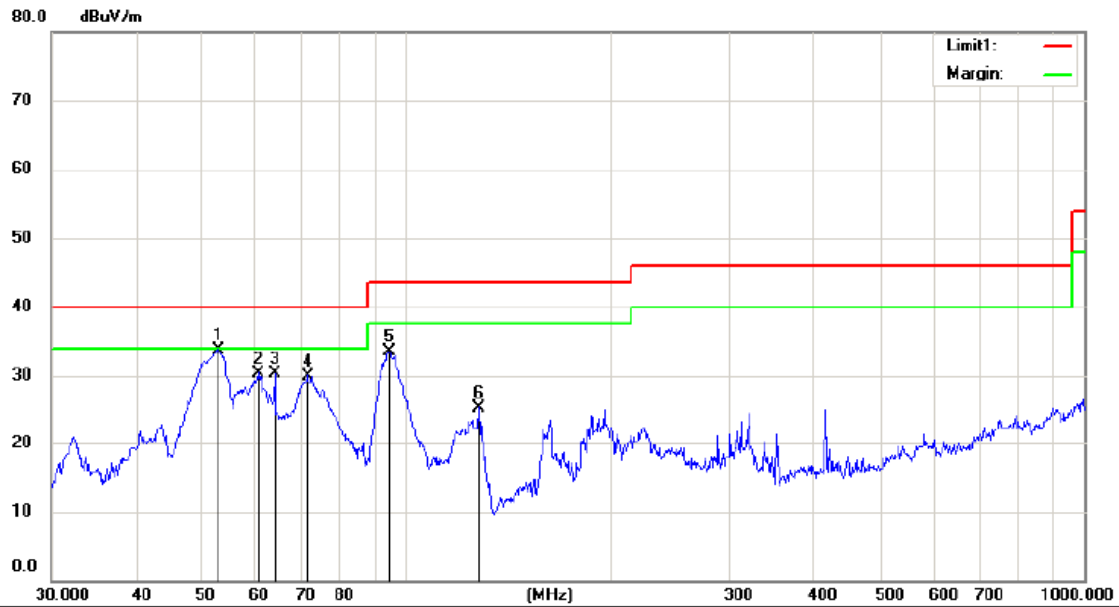


Site site #1  
 Limit: FCC Part15 Class B 3M Radiation  
 EUT: LED Lamp  
 M/N: GTB8R  
 Mode:TX(2402MHz)  
 Note:

Polarization: **Horizontal**  
 Power: AC 120V/60Hz

Temperature: 20 C  
 Humidity: 52 %

| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dBuV/m | dB     | cm             | degree       | Comment |
| 1   |     | 54.8348  | 47.16         | -19.76         | 27.40        | 40.00  | -12.60 | QP             |              |         |
| 2   |     | 95.4270  | 42.31         | -23.01         | 19.30        | 43.50  | -24.20 | QP             |              |         |
| 3   |     | 160.9090 | 46.84         | -25.54         | 21.30        | 43.50  | -22.20 | QP             |              |         |
| 4   |     | 194.4534 | 49.03         | -21.73         | 27.30        | 43.50  | -16.20 | QP             |              |         |
| 5   |     | 319.9370 | 42.75         | -18.05         | 24.70        | 46.00  | -21.30 | QP             |              |         |
| 6   |     | 351.7080 | 45.86         | -18.26         | 27.60        | 46.00  | -18.40 | QP             |              |         |



Site site #1 Polarization: **Vertical** Temperature: 20 C  
Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 52 %  
EUT: LED Lamp  
M/N: GTB8R  
Mode:TX(2402MHz)  
Note:

| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit  | Over   | Antenna  | Table  |        |
|-----|-----|----------|---------|---------|----------|--------|--------|----------|--------|--------|
|     |     | MHz      | Level   | Factor  | ment     |        |        | Height   | Degree |        |
|     |     |          | dBuV    | dB      | dBuV/m   | dBuV/m | dB     | Detector | cm     | degree |
| 1   |     | 52.9453  | 53.37   | -19.57  | 33.80    | 40.00  | -6.20  | QP       |        |        |
| 2   |     | 60.7043  | 52.36   | -21.96  | 30.40    | 40.00  | -9.60  | QP       |        |        |
| 3   |     | 63.9827  | 52.90   | -22.60  | 30.30    | 40.00  | -9.70  | QP       |        |        |
| 4   |     | 71.5805  | 54.59   | -24.59  | 30.00    | 40.00  | -10.00 | QP       |        |        |
| 5   |     | 94.4283  | 56.72   | -23.22  | 33.50    | 43.50  | -10.00 | QP       |        |        |
| 6   |     | 128.1130 | 50.12   | -24.72  | 25.40    | 43.50  | -18.10 | QP       |        |        |



**Above 1000MHz:**

Test Date : 05/04/2015      Temperature : 24 °C  
 Test Result: Pass      Humidity : 56 %  
 Test By: KY

| TX Mode (CH00: 2402MHz) |                   |                        |       |                  |       |            |        |
|-------------------------|-------------------|------------------------|-------|------------------|-------|------------|--------|
| Freq.<br>(MHz)          | Ant.Pol.<br>(H/V) | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |       | Margin(dB) |        |
|                         |                   | PK                     | AV    | PK               | AV    | PK         | AV     |
| 4804                    | H                 | 63.92                  | 45.49 | 74.00            | 54.00 | -10.08     | -8.51  |
| 7206                    | H                 | 62.33                  | 44.59 | 74.00            | 54.00 | -11.67     | -9.41  |
| 9608                    | H                 | 62.12                  | 43.69 | 74.00            | 54.00 | -11.88     | -10.31 |
| 12010                   | H                 | 60.38                  | 42.55 | 74.00            | 54.00 | -13.62     | -11.45 |
| 14412                   | H                 | 59.23                  | 40.93 | 74.00            | 54.00 | -14.77     | -13.07 |
| 4804                    | V                 | 62.92                  | 46.72 | 74.00            | 54.00 | -11.08     | -7.28  |
| 7206                    | V                 | 62.12                  | 45.49 | 74.00            | 54.00 | -11.88     | -8.51  |
| 9608                    | V                 | 61.05                  | 43.92 | 74.00            | 54.00 | -12.95     | -10.08 |
| 12010                   | V                 | 59.38                  | 43.62 | 74.00            | 54.00 | -14.62     | -10.38 |
| 14412                   | V                 | 59.09                  | 42.32 | 74.00            | 54.00 | -14.91     | -11.68 |

| TX Mode (CH20: 2442MHz) |                   |                        |       |                  |       |            |        |
|-------------------------|-------------------|------------------------|-------|------------------|-------|------------|--------|
| Freq.<br>(MHz)          | Ant.Pol.<br>(H/V) | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |       | Margin(dB) |        |
|                         |                   | PK                     | AV    | PK               | AV    | PK         | AV     |
| 4884                    | H                 | 63.48                  | 44.69 | 74.00            | 54.00 | -10.52     | -9.31  |
| 7326                    | H                 | 62.33                  | 44.31 | 74.00            | 54.00 | -11.67     | -9.69  |
| 9768                    | H                 | 61.97                  | 43.08 | 74.00            | 54.00 | -12.03     | -10.92 |
| 12210                   | H                 | 61.10                  | 42.05 | 74.00            | 54.00 | -12.90     | -11.95 |
| 14652                   | H                 | 59.87                  | 40.61 | 74.00            | 54.00 | -14.13     | -13.39 |
| 4884                    | V                 | 64.48                  | 46.08 | 74.00            | 54.00 | -9.52      | -7.92  |
| 7326                    | V                 | 63.97                  | 45.05 | 74.00            | 54.00 | -10.03     | -8.95  |
| 9768                    | V                 | 62.94                  | 43.51 | 74.00            | 54.00 | -11.06     | -10.49 |
| 12210                   | V                 | 61.74                  | 43.21 | 74.00            | 54.00 | -12.26     | -10.79 |
| 14652                   | V                 | 60.17                  | 42.05 | 74.00            | 54.00 | -13.83     | -11.95 |

| TX Mode (CH39: 2480MHz) |                   |                        |       |                  |       |            |        |
|-------------------------|-------------------|------------------------|-------|------------------|-------|------------|--------|
| Freq.<br>(MHz)          | Ant.Pol.<br>(H/V) | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |       | Margin(dB) |        |
|                         |                   | PK                     | AV    | PK               | AV    | PK         | AV     |
| 4960                    | H                 | 63.83                  | 46.05 | 74.00            | 54.00 | -10.17     | -7.95  |
| 7440                    | H                 | 62.37                  | 44.46 | 74.00            | 54.00 | -11.63     | -9.54  |
| 9920                    | H                 | 61.89                  | 43.38 | 74.00            | 54.00 | -12.11     | -10.62 |
| 12400                   | H                 | 60.83                  | 42.46 | 74.00            | 54.00 | -13.17     | -11.54 |
| 14880                   | H                 | 59.07                  | 41.41 | 74.00            | 54.00 | -14.93     | -12.59 |
| 4960                    | V                 | 64.99                  | 45.06 | 74.00            | 54.00 | -9.01      | -8.94  |
| 7440                    | V                 | 63.79                  | 43.49 | 74.00            | 54.00 | -10.21     | -10.51 |
| 9920                    | V                 | 62.77                  | 43.18 | 74.00            | 54.00 | -11.23     | -10.82 |
| 12400                   | V                 | 61.96                  | 42.05 | 74.00            | 54.00 | -12.04     | -11.95 |
| 14880                   | V                 | 60.39                  | 40.66 | 74.00            | 54.00 | -13.61     | -13.34 |

Other harmonics emissions are lower than 20dB below the allowable limit.

## 6. 6dB Bandwidth Measurement

### 6.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Print out the test result from the spectrum by hard copy function.

### 6.2 Test SET-UP (Block Diagram of Configuration)



### 6.3 Measurement Equipment Used

| Name of Equipment | Manufacturer    | Model | Serial Number | Last Cal.  | CAL DUE.   |
|-------------------|-----------------|-------|---------------|------------|------------|
| Spectrum Analyzer | Rohde & Schwarz | ESCI  | 10017         | 08/01/2014 | 08/01/2015 |

### 6.4 Limit

The minimum 6dB bandwidth shall be at least 500kHz.

### 6.5 Measurement Results

The following table is the setting of spectrum analyzer.

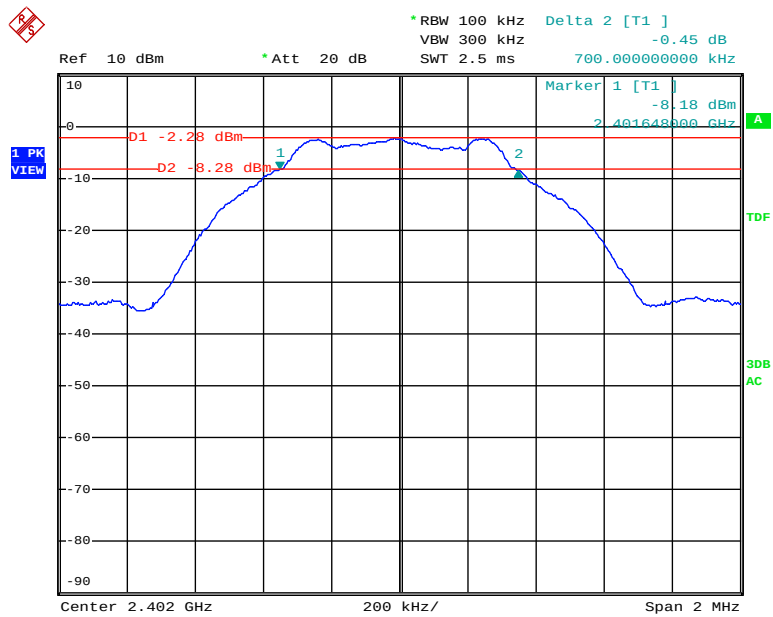
|             |          |
|-------------|----------|
| Attenuation | Auto     |
| RB          | 100KHz   |
| VB          | 300KHz   |
| Detector    | Peak     |
| Trace       | Max hold |

Refer to attached data chart.

|                    |      |               |            |
|--------------------|------|---------------|------------|
| Spectrum Detector: | PK   | Test Date :   | 04/25/2015 |
| Test By:           | Kuki | Temperature : | 20 °C      |
| Test Result:       | Pass | Humidity :    | 54 %       |

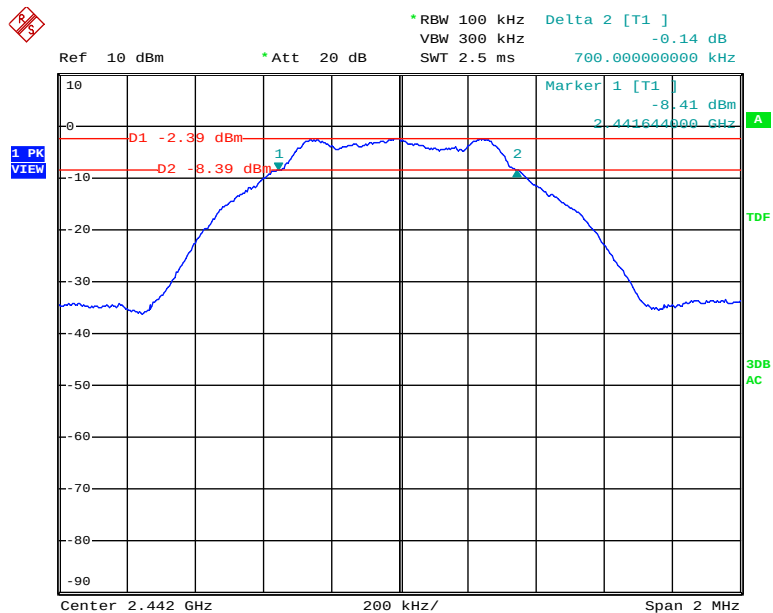
| Channel number | Channel frequency (MHz) | Measurement level (KHz) | Required Limit (KHz) |
|----------------|-------------------------|-------------------------|----------------------|
| 00             | 2402                    | 700                     | >500                 |
| 20             | 2442                    | 700                     | >500                 |
| 39             | 2480                    | 700                     | >500                 |

### Channel 00:



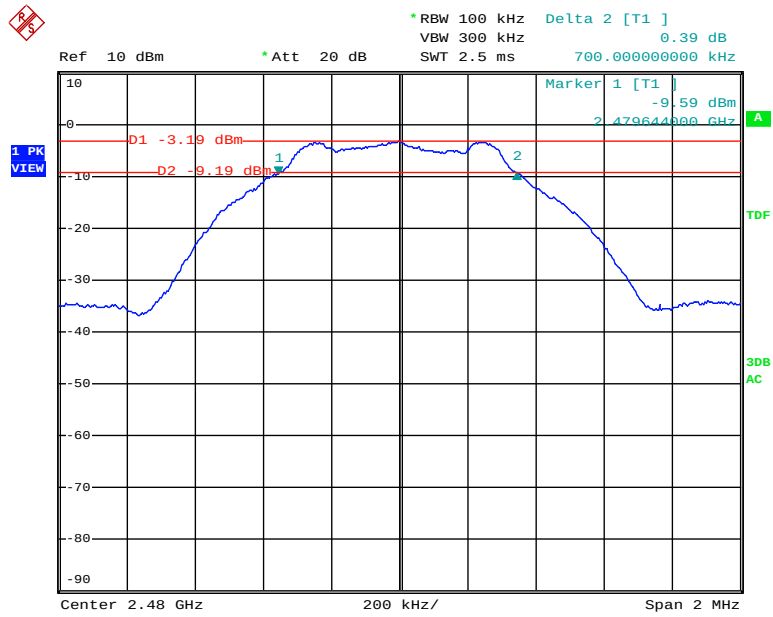
Date: 25.APR.2015 10:45:20

### Channel 20:



Date: 25.APR.2015 10:41:54

**Channel 39:**



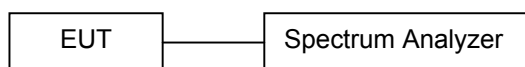
Date: 25.APR.2015 10:40:00

## 7. Maximum Peak Output Power Test

### 7.1 Measurement Procedure

- The Transmitter output (antenna port) was connected to the spectrum Analyzer.
- Turn on the EUT and then record the peak power value.
- Repeat above procedures on all channels needed to be tested.

### 7.2 Test SET-UP (Block Diagram of Configuration)



### 7.3 Measurement Equipment Used

| Name of Equipment | Manufacturer    | Model | Serial Number | Last Cal.  | CAL DUE.   |
|-------------------|-----------------|-------|---------------|------------|------------|
| Spectrum Analyzer | Rohde & Schwarz | ESCI  | 10017         | 08/01/2014 | 08/01/2015 |

### 7.4 Peak Power output limit

The maximum peak power shall be less 1Watt.

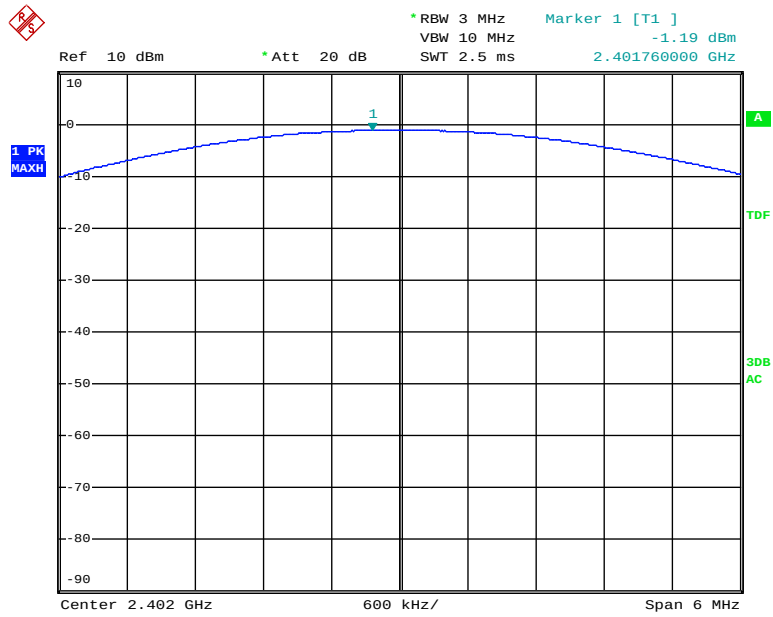
### 7.5 Measurement Results

Refer to attached data chart.

|                    |      |              |            |
|--------------------|------|--------------|------------|
| Spectrum Detector: | PK   | Test Date:   | 04/25/2015 |
| Test By:           | Kuki | Temperature: | 20 °C      |
| Test Result:       | Pass | Humidity:    | 54 %       |

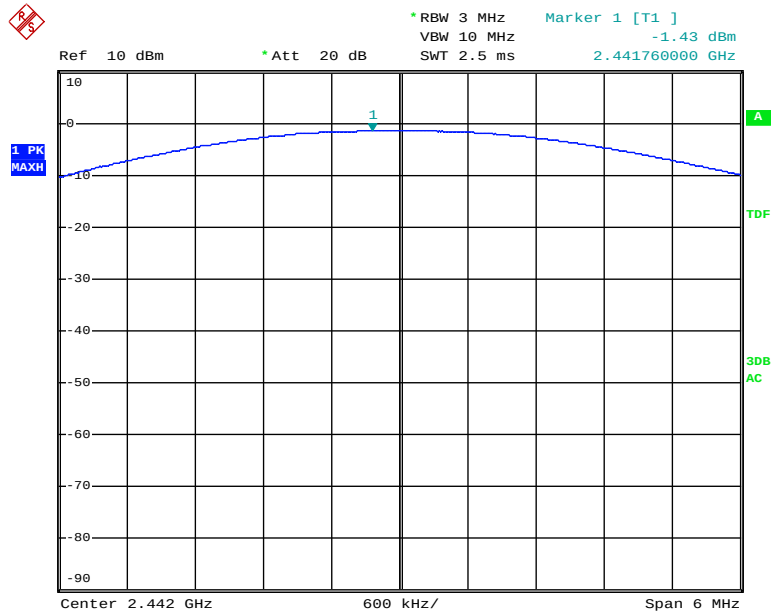
| Channel number | Channel Frequency (MHz) | Peak Power output(dBm) | Peak Power output(mW) | Peak Power Limit(W) | Pass/Fail |
|----------------|-------------------------|------------------------|-----------------------|---------------------|-----------|
| 00             | 2402                    | -1.19                  | 0.76                  | 1W(30dBm)           | Pass      |
| 20             | 2442                    | -1.43                  | 0.72                  | 1W(30dBm)           | Pass      |
| 39             | 2480                    | -1.80                  | 0.66                  | 1W(30dBm)           | Pass      |

**Channel 00:**



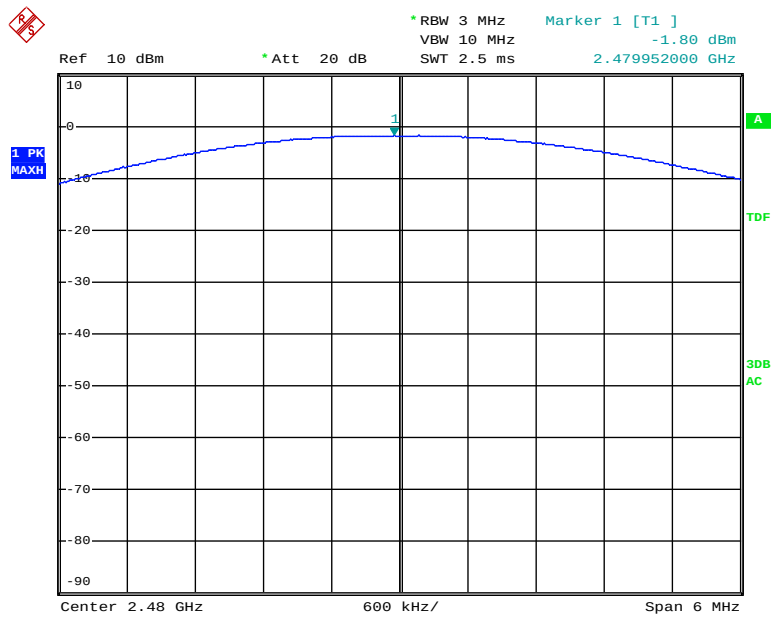
Date: 25.APR.2015 10:34:01

**Channel 20:**



Date: 25.APR.2015 10:34:49

**Channel 39:**



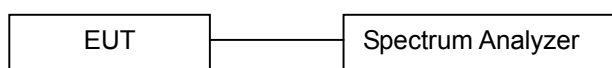
Date: 25.APR.2015 10:35:39

## 8. Power Spectral Density Measurement

### 8.1 Measurement Procedure

The EUT was operating in Bluetooth mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

### 8.2 Test SET-UP (Block Diagram of Configuration)



### 8.3 Measurement Equipment Used

| Name of Equipment | Manufacturer    | Model | Serial Number | Last Cal.  | CAL DUE.   |
|-------------------|-----------------|-------|---------------|------------|------------|
| Spectrum Analyzer | Rohde & Schwarz | ESCI  | 10017         | 08/01/2014 | 08/01/2015 |

### 8.4 Measurement Procedure

- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- Set to the maximum power setting and enable the EUT transmit continuously.
- Make the measurement with the spectrum analyzer's resolution bandwidth (RBW)=3 kHz. Video bandwidth VBW =10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
- Detector =Peak, Sweep time =Auto couple, Trace mode =Max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
- Measure and record the results in the test report.
- The Measured power density (dBm)/ 100KHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

### 8.5 Measurement Results

The following table is the setting of spectrum analyzer.

| Spectrum analyzer | Setting                                      |
|-------------------|----------------------------------------------|
| Attenuation       | Auto                                         |
| Span Frequency    | Set the span to 1.5 times the DTS bandwidth. |
| RB                | 3KHz                                         |
| VB                | 10KHz                                        |
| Detector          | Peak                                         |
| Trace             | Max hold                                     |
| Sweep Time        | Automatic                                    |



Refer to attached data chart.

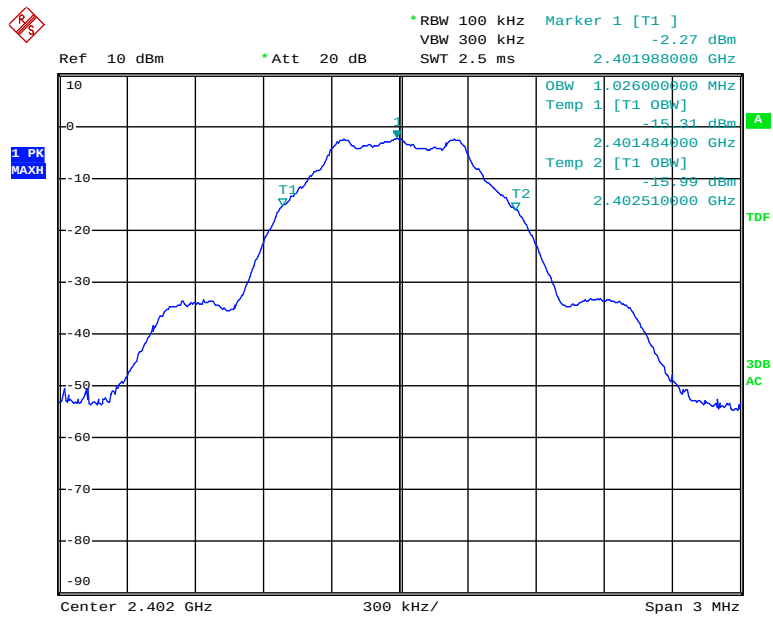
|                    |      |               |            |
|--------------------|------|---------------|------------|
| Spectrum Detector: | PK   | Test Date :   | 04/25/2015 |
| Test By:           | Kuki | Temperature : | 20 °C      |
| Test Result:       | Pass | Humidity :    | 54 %       |

| Channel number | Channel frequency (MHz) | Measurement level (dBm) |          | Required Limit (dBm/3kHz) | Pass/Fail |
|----------------|-------------------------|-------------------------|----------|---------------------------|-----------|
|                |                         | PSD/100kHz              | PSD/3kHz |                           |           |
| 00             | 2402                    | -2.27                   | -16.84   | 8                         | Pass      |
| 20             | 2440                    | -2.34                   | -17.02   | 8                         | Pass      |
| 39             | 2480                    | -3.13                   | -18.05   | 8                         | Pass      |

Note:

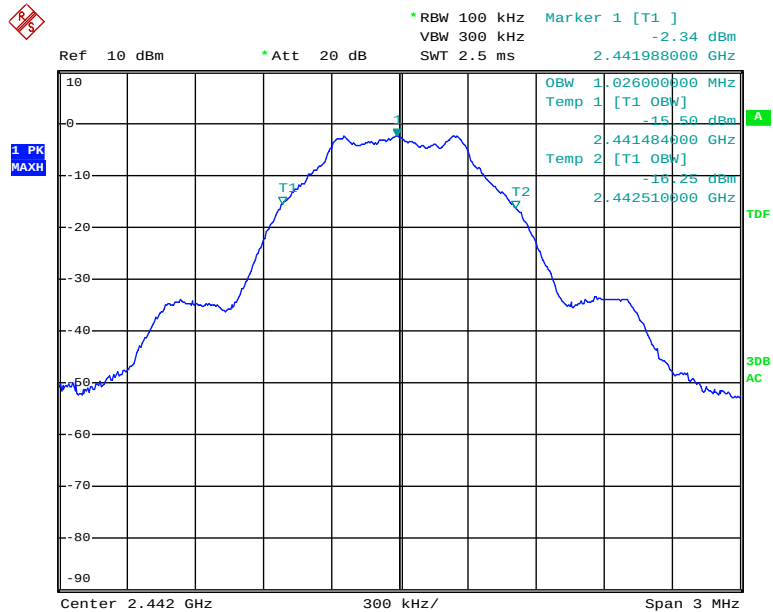
1. Measured power density(dBm) has offset with cable loss.
2. The measured power density(dBm)/100KHz is reference level and used as 20dBc down for Conducted Band Edges and Conducted Spurious Emission limit line.

**PSD 100kHz Plot: Channel 00**



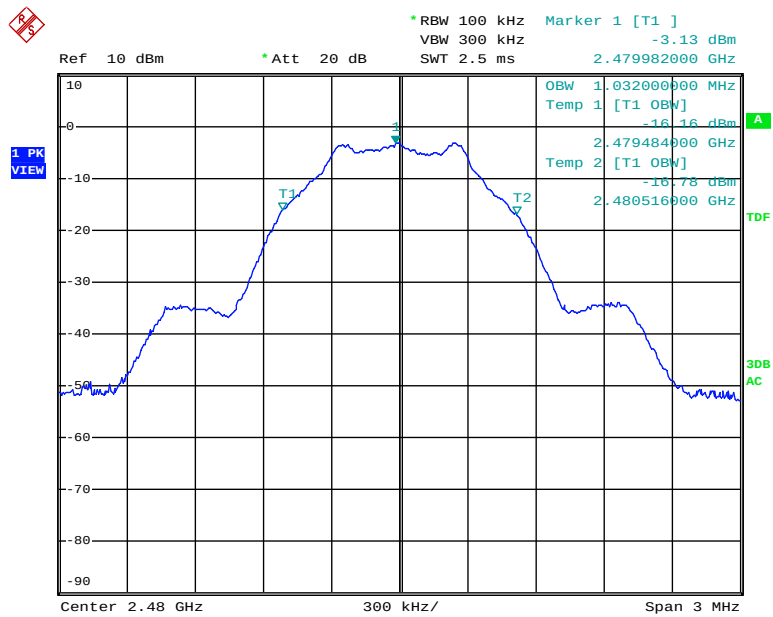
Date: 25.APR.2015 10:53:42

**PSD 100kHz Plot: Channel 20**



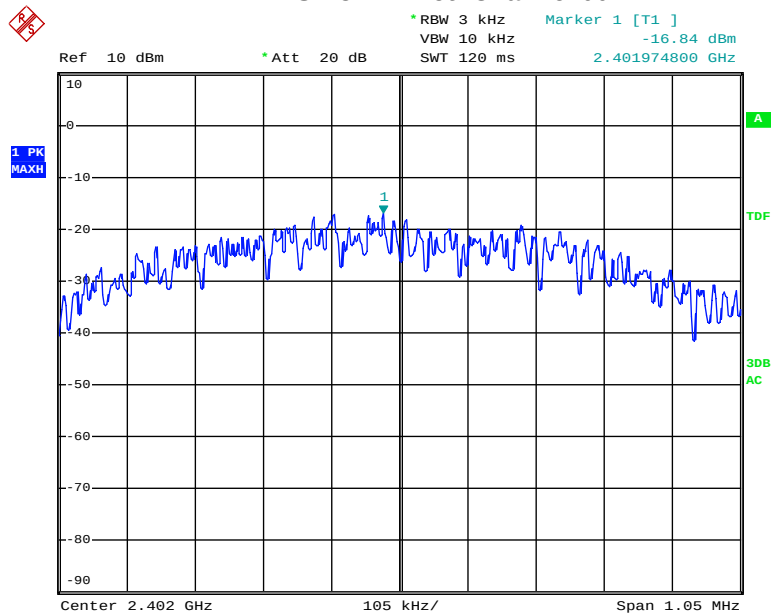
Date: 25.APR.2015 10:54:43

### PSD 100kHz Plot: Channel 39



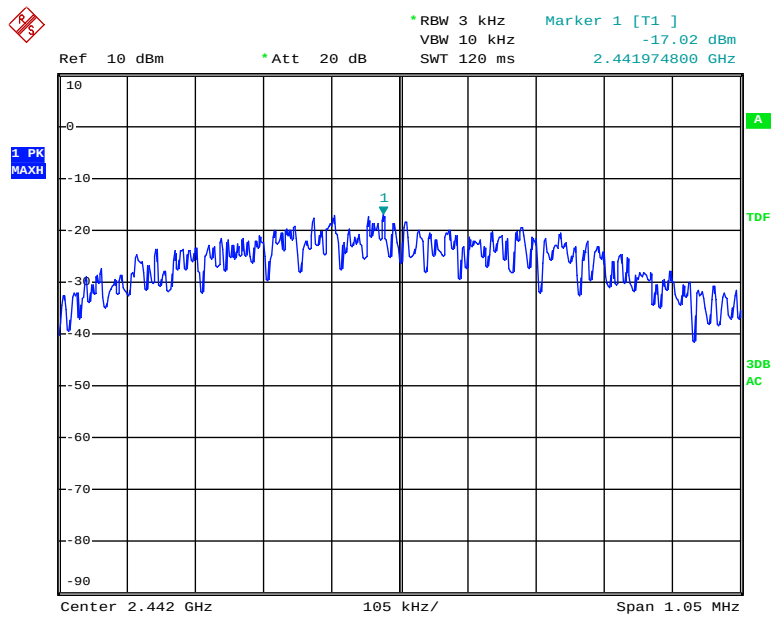
Date: 25.APR.2015 10:56:12

### PSD 3kHz Plot: Channel 00



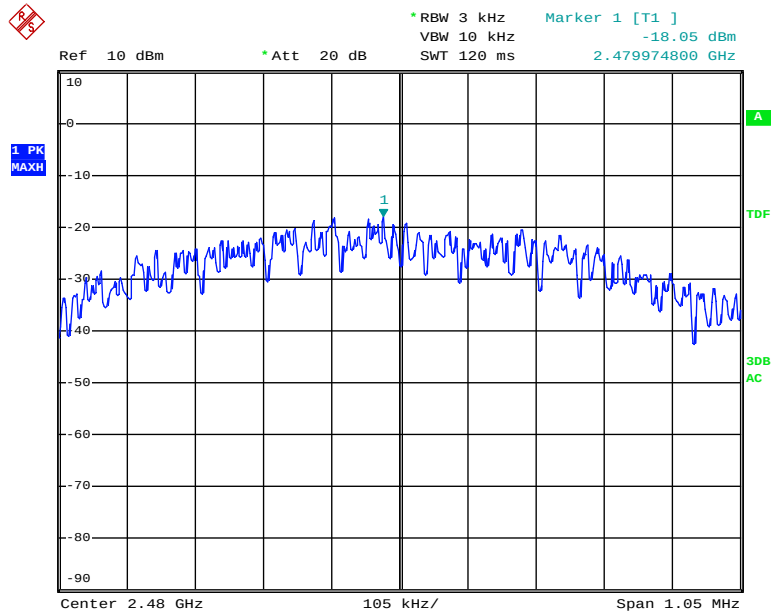
Date: 25.APR.2015 11:00:57

### PSD 3kHz Plot: Channel 20



Date: 25.APR.2015 10:59:47

### PSD 3kHz Plot: Channel 39



Date: 25.APR.2015 10:58:47

## 9. Band Edge Test

### 9.1 Measurement Procedure

(A) Conducted method:

- The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
- The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.
- Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were preformed with all chains feeding a combiner.

(B) Radiated method:

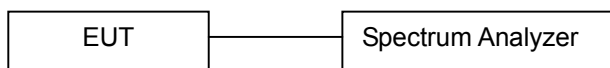
- The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
- The EUT was placed on a turn table which is 0.8m above ground plane.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measured were complete.

(Peak measurement: Peak detector, RBW=1MHz, VBW=3MHz, Sweep=Auto)

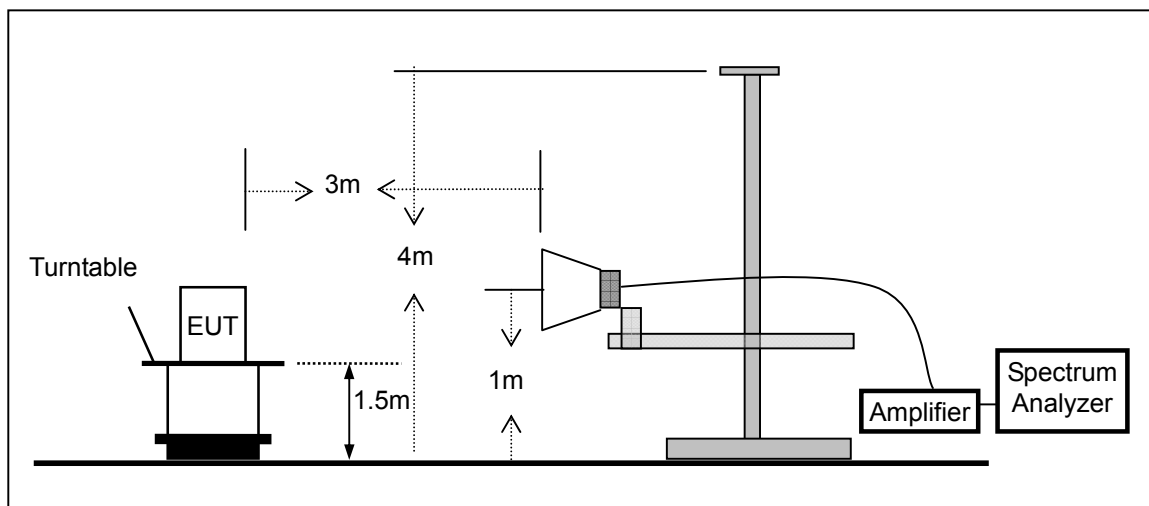
(Average measurement: Peak detector, RBW=1MHz, VBW=10Hz, Sweep=Auto)

### 9.2 Test SET-UP (Block Diagram of Configuration)

Conducted method:



Radiated method:



### 9.3 Measurement Equipment Used

Conducted method: Same as 6.3 Channel Separation Measurement.  
Radiated method: Same as 5.3 Radiated Emission Measurement.

### 9.4 Measurement Results

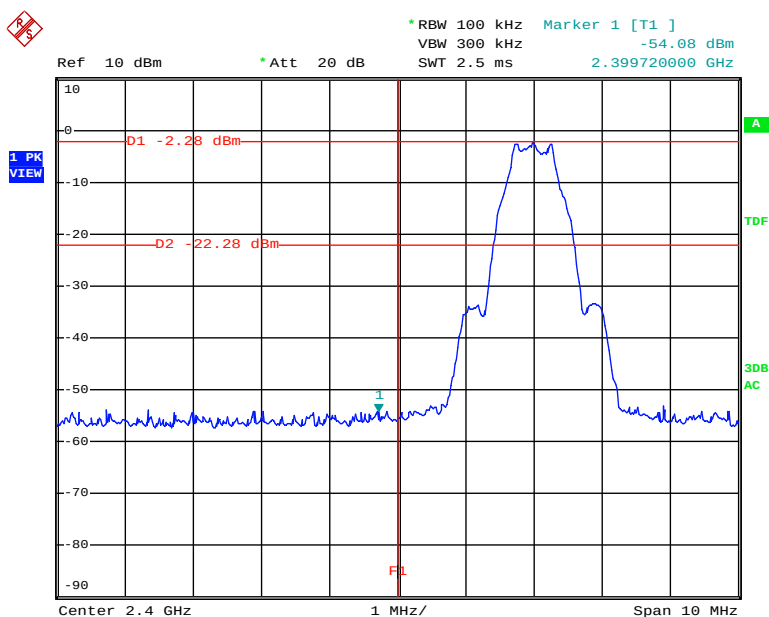
Pass  
Refer to attached data chart.

#### (A) Conducted method:

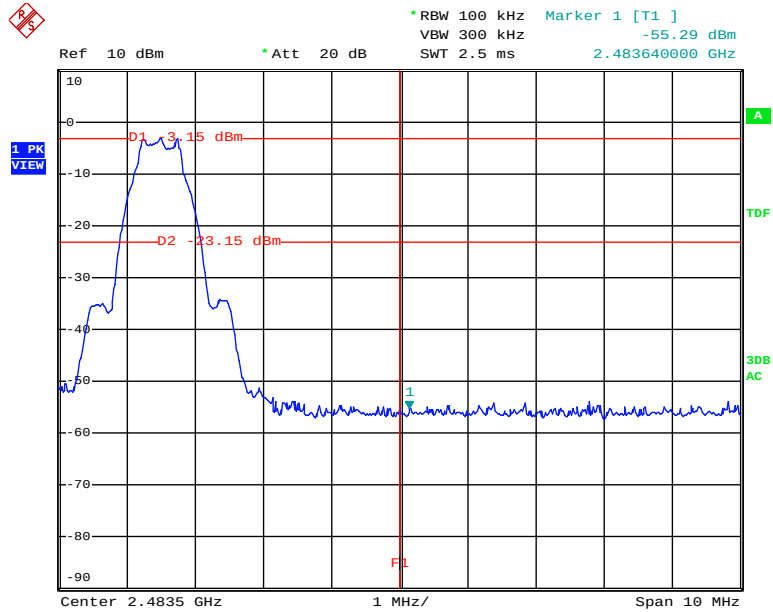
|                    |      |               |            |
|--------------------|------|---------------|------------|
| Spectrum Detector: | PK   | Test Date :   | 04/25/2015 |
| Test By:           | Kuki | Temperature : | 20 °C      |
| Test Result:       | Pass | Humidity :    | 54 %       |

| Frequency (MHz) | Peak Power Output(dBm) | Emission read Value(dBm) | Result of Band edge(dBc) | Band edge Limit(dBc) |
|-----------------|------------------------|--------------------------|--------------------------|----------------------|
| 2399.72         | -2.28                  | -54.08                   | 51.8                     | >20dBc               |
| 2483.64         | -3.15                  | -55.29                   | 52.14                    | >20dBc               |

Test Plot:



Date: 25.APR.2015 11:06:49



Date: 25.APR.2015 11:10:18

**(B) Radiated method:**

| Frequency<br>(MHz) | Antenna<br>polarization<br>(H/V) | Emission<br>(dBuV/m) |      | Band edge Limit<br>(dBuV/m) |      | Margin<br>(dB) |       |
|--------------------|----------------------------------|----------------------|------|-----------------------------|------|----------------|-------|
|                    |                                  | PK                   | AV   | PK                          | AV   | PK             | AV    |
| 2400.00            | H                                | 54.8                 | 46.7 | 74.0                        | 54.0 | -19.2          | -7.3  |
| 2400.00            | V                                | 55.5                 | 47.6 | 74.0                        | 54.0 | -18.5          | -6.4  |
| 2483.50            | H                                | 47.4                 | 36.0 | 74.0                        | 54.0 | -26.6          | -18.0 |
| 2483.50            | V                                | 48.7                 | 36.8 | 74.0                        | 54.0 | -25.3          | -17.2 |

## **10. Antenna Application**

### **10.1 Antenna requirement**

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.240.

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.

### **10.2 Result**

The EUT's antenna used a Internal antenna, The antenna's gain is 4 dBi and meets the requirement

**---The End---**