

# FCC Radio Test Report

## FCC ID: BPJ-YF-B01U-GRT

**Report No.** : TB-FCC123193  
**Applicant** : Growatt New Energy Co., Ltd.  
**Equipment Under Test (EUT)**  
**EUT Name** : Long-Range Bluetooth Serial Adapter  
**Model No.** : YF-B01U-GRT  
**Serial No.** : YF-B01U-MS-GRT, YF-B01U-SL-GRT  
**Brand Name** : YuangFang MyAid  
**Receipt Date** : 2012-02-13  
**Test Date** : 2012-12-14 to 2012-02-24  
**Issue Date** : 2012-02-28  
**Standards** : FCC Part 15, Subpart C  
**Test Method** : ANSI C63.4:2003  
**Conclusions** : **PASS**

In the configuration tested, the EUT complied with the standards specified above,  
The EUT technically complies with the FCC requirements

**Test/Witness Engineer** : 

**Approved & Authorized** : 

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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# 1. General Information About EUT

## 1.1 Client Information

|                     |   |                                                                                                      |
|---------------------|---|------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>    | : | Growatt New Energy Co., Ltd.                                                                         |
| <b>Address</b>      | : | No. 12 Building, Xicheng Industrial Zone, Bao'an District, Shenzhen 518102, China                    |
| <b>Manufacturer</b> | : | YuanFang MyAid Tech(BeiJing) Co., Ltd.                                                               |
| <b>Address</b>      | : | No. 3, Building 3 West Wells Road, Badachu Hi-tech Park, Shijingshan District, Beijing 100041, China |

## 1.2 General Description of EUT (Equipment Under Test)

|                        |   |                                                                                                                          |                                |
|------------------------|---|--------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| EUT Name               | : | Long-Range Bluetooth Serial Adapter                                                                                      |                                |
| Models No.             | : | YF-B01U-GRT, YF-B01U-MS-GRT, YF-B01U-SL-GRT                                                                              |                                |
| Model Difference       | : | The different models are identical in schematic, structure and critical component, the only different is the appearance. |                                |
| Product Description    | : | Operation Frequency:<br>2402MHz~2480MHz                                                                                  |                                |
|                        |   | Number of Channel:                                                                                                       | 79Channels see note (2)        |
|                        |   | Out Power                                                                                                                | 1.841 mW (max) conducted power |
|                        |   | Antenna Gain:                                                                                                            | 2.0 dBi                        |
|                        |   | Modulation Type:                                                                                                         | GFSK 1Mbps                     |
| Power Supply           | : | DC Voltage supplied from Host System                                                                                     |                                |
| Power Rating           | : | DC 7~32V from Host System                                                                                                |                                |
| Connecting I/O Port(S) | : | Please refer to the User's Manual                                                                                        |                                |

### Note:

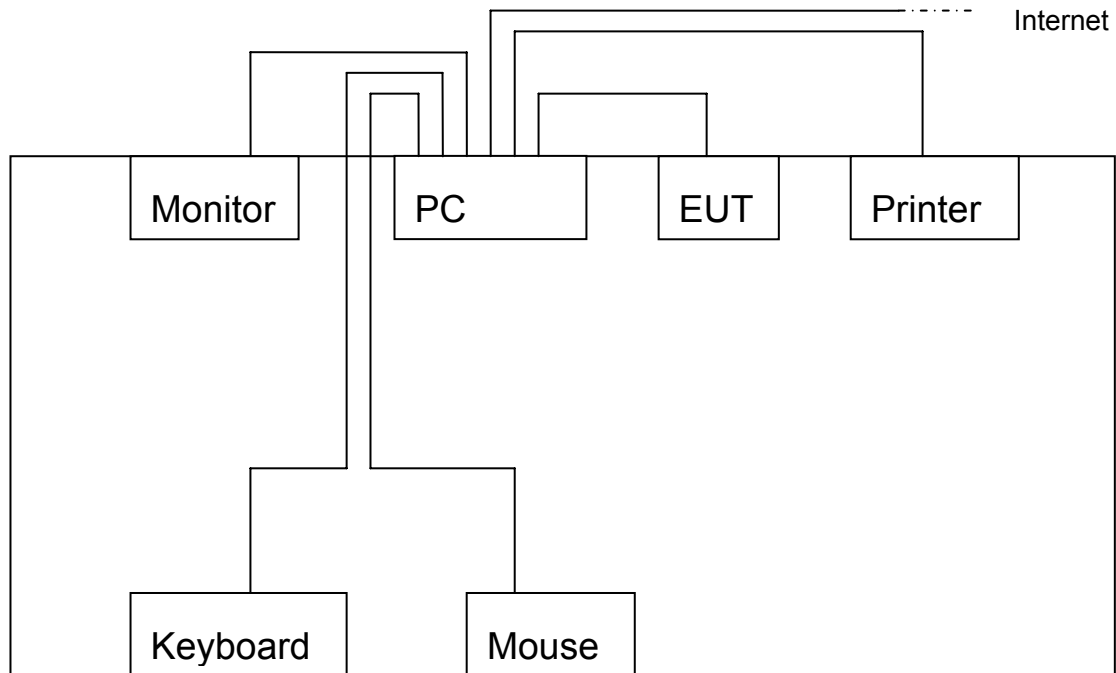
- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (2) Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 27      | 2429            | 54      | 2456            |
| 01      | 2403            | 28      | 2430            | 55      | 2457            |
| 02      | 2404            | 29      | 2431            | 56      | 2458            |
| 03      | 2405            | 30      | 2432            | 57      | 2459            |
| 04      | 2406            | 31      | 2433            | 58      | 2460            |
| 05      | 2407            | 32      | 2434            | 59      | 2461            |

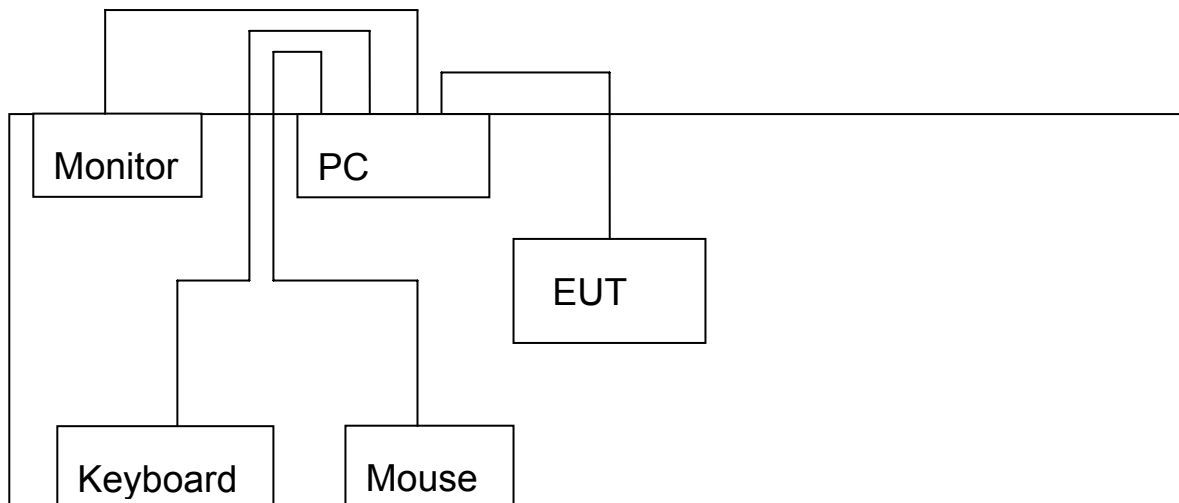
|    |      |    |      |    |      |
|----|------|----|------|----|------|
| 06 | 2408 | 33 | 2435 | 60 | 2462 |
| 07 | 2409 | 34 | 2436 | 61 | 2463 |
| 08 | 2410 | 35 | 2437 | 62 | 2464 |
| 09 | 2411 | 36 | 2438 | 63 | 2465 |
| 10 | 2412 | 37 | 2439 | 64 | 2466 |
| 11 | 2413 | 38 | 2440 | 65 | 2467 |
| 12 | 2414 | 39 | 2441 | 66 | 2468 |
| 13 | 2415 | 40 | 2442 | 67 | 2469 |
| 14 | 2416 | 41 | 2443 | 68 | 2470 |
| 15 | 2417 | 42 | 2444 | 69 | 2471 |
| 16 | 2418 | 43 | 2445 | 70 | 2472 |
| 17 | 2419 | 44 | 2446 | 71 | 2473 |
| 18 | 2420 | 45 | 2447 | 72 | 2474 |
| 19 | 2421 | 46 | 2448 | 73 | 2475 |
| 20 | 2422 | 47 | 2449 | 74 | 2476 |
| 21 | 2423 | 48 | 2450 | 75 | 2477 |
| 22 | 2424 | 49 | 2451 | 76 | 2478 |
| 23 | 2425 | 50 | 2452 | 77 | 2479 |
| 24 | 2426 | 51 | 2453 | 78 | 2480 |
| 25 | 2427 | 52 | 2454 |    |      |
| 26 | 2428 | 53 | 2455 |    |      |

### 1.3 Block Diagram Showing the Configuration of System Tested

#### Mode 1: Normal Mode



#### Mode 2: TX Mode and



### 1.4 Description of Support Units

| Name        | Model       | S/N        | Manufacturer | Used “√” |
|-------------|-------------|------------|--------------|----------|
| Printer     | HP1505n     | VNF3G06957 | HP           | √        |
| LCD Monitor | E170Sc      | ----       | DELL         | √        |
| PC          | OPTIPLEX380 | ----       | DELL         | √        |

|          |           |      |      |   |
|----------|-----------|------|------|---|
| Keyboard | L100      | U01C | DELL | √ |
| Mouse    | M-UARDEL7 | ---- | DELL | √ |

### 1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

| For Conducted Test |             |
|--------------------|-------------|
| Final Test Mode    | Description |
| Mode 1             | Normal Mode |

| For Radiated Test |                          |
|-------------------|--------------------------|
| Final Test Mode   | Description              |
| Mode 2            | TX Mode Channel 00/39/78 |

**Note:**

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) During the testing procedure, the continuously transmitting mode was programmed by the customer.

### 1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of Bluetooth mode.

| Test Software Version | Test Program: BlueSuite2.2 |         |          |
|-----------------------|----------------------------|---------|----------|
| Frequency             | 2402 MHz                   | 2441MHz | 2480 MHz |
| 1 Mbps                | 40                         | 40      | 40       |

## 1.7 Test Facility

The tests were performed at:

Bontek Compliance Testing Laboratory Ltd

1/F., Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, 518055 China

Tel: 86-755-86337020 Fax: 86-755-86337028

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 338263.

The test report was fulfilled by Shenzhen Meihua Electronic Co., Ltd. Shenzhen Meihua Electronic Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements results.



## 2. Test Summary

| FCC Part 15 Subpart C(15.247)                           |                                     |          |        |
|---------------------------------------------------------|-------------------------------------|----------|--------|
| Standard Section                                        | Test Item                           | Judgment | Remark |
| 15.203                                                  | Antenna Requirement                 | PASS     | N/A    |
| 15.207                                                  | Conducted Emission                  | PASS     | N/A    |
| 15.205                                                  | Restricted Bands                    | PASS     | N/A    |
| 15.247(a)(1)                                            | Hopping Channel Separation          | PASS     | N/A    |
| 15.247(a)(1)                                            | Dwell Time                          | PASS     | N/A    |
| 15.247(b)(1)                                            | Peak Output Power                   | PASS     | N/A    |
| 15.247(b)(1)                                            | Number of Hopping Frequency         | PASS     | N/A    |
| 15.247(c)                                               | Radiated Spurious Emission          | PASS     | N/A    |
| 15.247(c)                                               | Antenna Conducted Spurious Emission | PASS     | N/A    |
| 15.247(a)                                               | 20dB Bandwidth                      | PASS     | N/A    |
| <b>Note:</b> N/A is an abbreviation for Not Applicable. |                                     |          |        |

## 3. Conducted Emission Test

### 3.1 Test Standard and Limit

3.1.1 Test Standard  
FCC Part 15.207

3.1.2 Test Limit

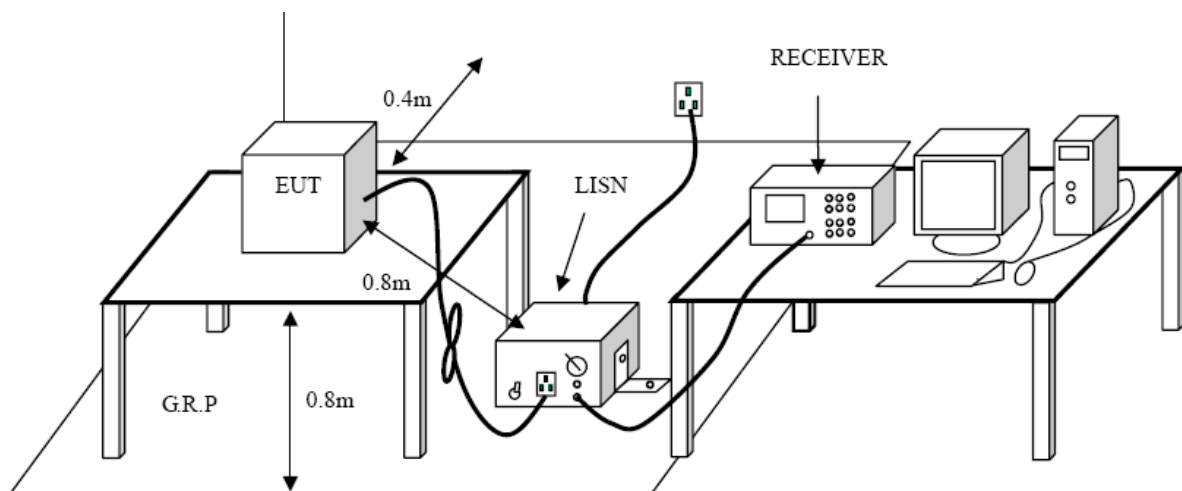
**Conducted Emission Test Limit**

| Frequency     | Maximum RF Line Voltage (dB $\mu$ V) |               |
|---------------|--------------------------------------|---------------|
|               | Quasi-peak Level                     | Average Level |
| 150kHz~500kHz | 66 ~ 56 *                            | 56 ~ 46 *     |
| 500kHz~5MHz   | 56                                   | 46            |
| 5MHz~30MHz    | 60                                   | 50            |

Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 3.2 Test Setup



### 3.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

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I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

### 3.4 Test Equipment Used

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| EMI Test Receiver | ROHDE& SCHWARZ | ESC30     | DE25181    | 2011-08-11 | 2012-08-11 |
| 50ΩCoaxial Switch | Anritsu        | MP59B     | X10321     | 2011-08-11 | 2012-08-11 |
| L.I.S.N           | EMCO           | 3624/1    | 00063417   | 2011-08-11 | 2012-08-11 |
| L.I.S.N           | EMCO           | 3624/1    | 00063417   | 2011-08-11 | 2012-08-11 |

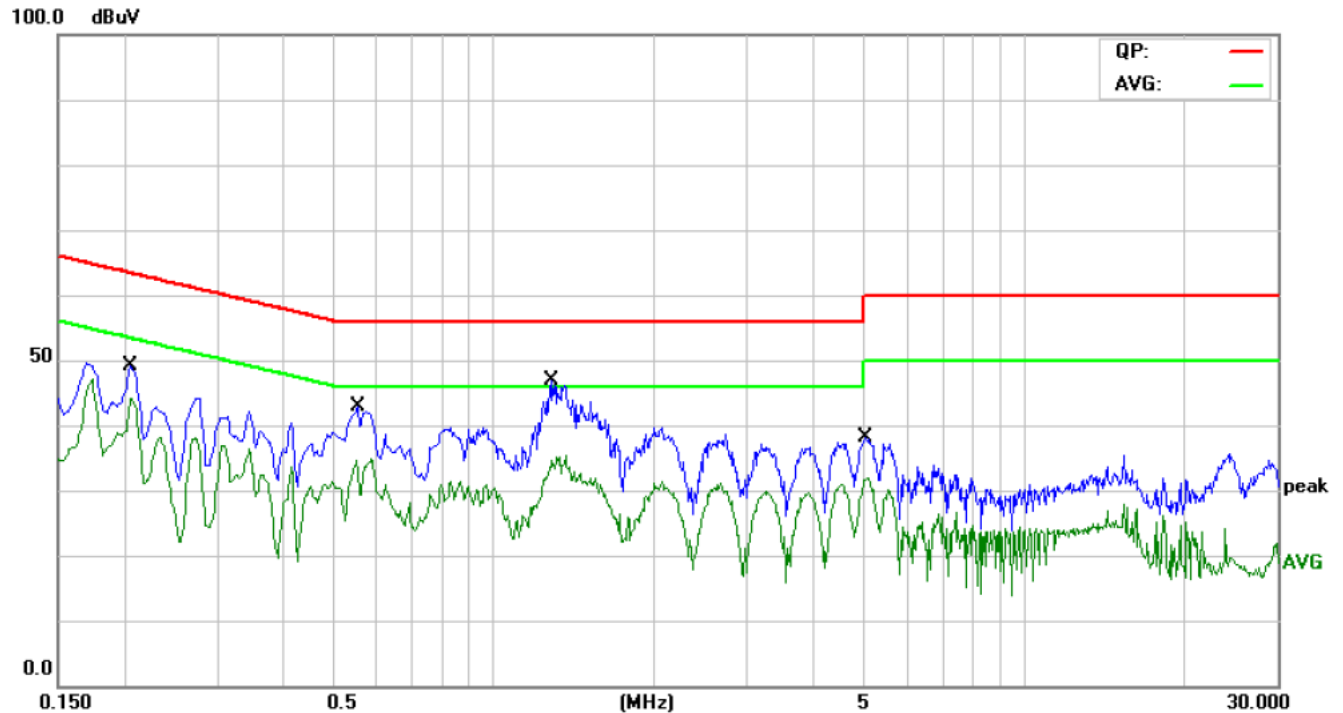
### 3.5 EUT Operating Mode

Please refer to the description of test mode.

### 3.6 Test Data

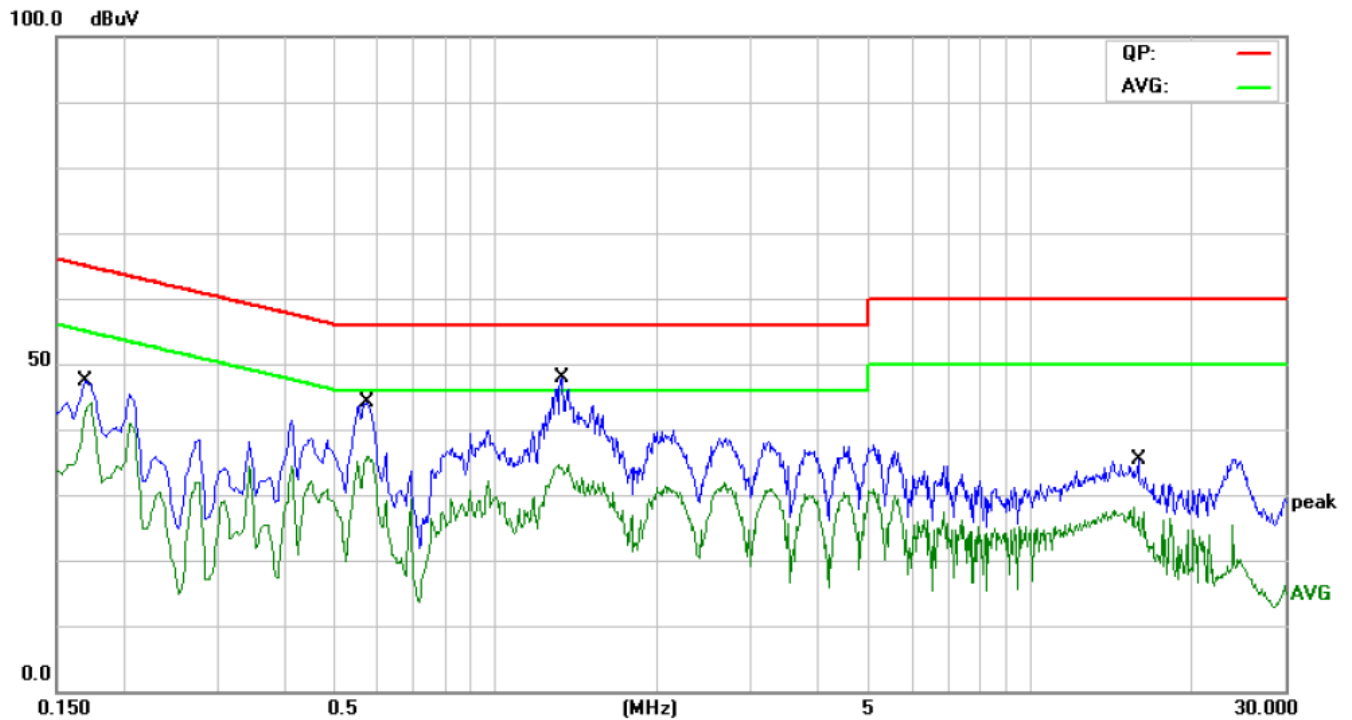
Please see the next page.

|                |                                        |                     |             |
|----------------|----------------------------------------|---------------------|-------------|
| E.U.T :        | Long-Range Bluetooth<br>Serial Adapter | Model Name :        | YF-B01U-GRT |
| Temperature :  | 23°C                                   | Relative Humidity : | 51 %        |
| Terminal       | Line                                   |                     |             |
| Test Voltage : | AC 120 V / 60Hz                        |                     |             |
| Test Mode :    | Charging Mode                          |                     |             |



| No. | Mk. | Freq.  | Reading<br>Level | Correct<br>Factor | Measure-<br>ment | Limit | Over   | Detector | Comment |
|-----|-----|--------|------------------|-------------------|------------------|-------|--------|----------|---------|
|     |     | MHz    | dBuV             | dB                | dBuV             | dBuV  | dB     |          |         |
| 1   |     | 0.2060 | 37.22            | 10.28             | 47.50            | 63.36 | -15.86 | QP       |         |
| 2   | *   | 0.2060 | 34.08            | 10.28             | 44.36            | 53.36 | -9.00  | AVG      |         |
| 3   |     | 0.5540 | 31.75            | 9.43              | 41.18            | 56.00 | -14.82 | QP       |         |
| 4   |     | 0.5540 | 23.41            | 9.43              | 32.84            | 46.00 | -13.16 | AVG      |         |
| 5   |     | 1.2860 | 31.60            | 9.32              | 40.92            | 56.00 | -15.08 | QP       |         |
| 6   |     | 1.2860 | 24.84            | 9.32              | 34.16            | 46.00 | -11.84 | AVG      |         |
| 7   |     | 5.0300 | 25.63            | 9.45              | 35.08            | 60.00 | -24.92 | QP       |         |
| 8   |     | 5.0300 | 22.03            | 9.45              | 31.48            | 50.00 | -18.52 | AVG      |         |

|                |                                        |                     |             |
|----------------|----------------------------------------|---------------------|-------------|
| E.U.T :        | Long-Range Bluetooth<br>Serial Adapter | Model Name :        | YF-B01U-GRT |
| Temperature :  | 23°C                                   | Relative Humidity : | 51 %        |
| Terminal       | Neutral                                |                     |             |
| Test Voltage : | AC 120 V / 60Hz                        |                     |             |
| Test Mode :    | Charging Mode                          |                     |             |



| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measure-ment | Limit | Over   |          |         |
|-----|-----|---------|---------------|----------------|--------------|-------|--------|----------|---------|
|     |     | MHz     | dBuV          | dB             | dBuV         | dBuV  | dB     | Detector | Comment |
| 1   |     | 0.1700  | 35.51         | 10.70          | 46.21        | 64.96 | -18.75 | QP       |         |
| 2   |     | 0.1700  | 32.91         | 10.70          | 43.61        | 54.96 | -11.35 | AVG      |         |
| 3   |     | 0.5740  | 33.32         | 9.45           | 42.77        | 56.00 | -13.23 | QP       |         |
| 4   | *   | 0.5740  | 26.10         | 9.45           | 35.55        | 46.00 | -10.45 | AVG      |         |
| 5   |     | 1.3300  | 32.14         | 9.34           | 41.48        | 56.00 | -14.52 | QP       |         |
| 6   |     | 1.3300  | 24.61         | 9.34           | 33.95        | 46.00 | -12.05 | AVG      |         |
| 7   |     | 15.9220 | 20.19         | 10.01          | 30.20        | 60.00 | -29.80 | QP       |         |
| 8   |     | 15.9220 | 14.79         | 10.01          | 24.80        | 50.00 | -25.20 | AVG      |         |

## 4. Radiated Emission Test

### 4.1 Test Standard and Limit

#### 4.1.1 Test Standard

FCC Part 15.209

#### 4.1.2 Test Limit

**Radiated Emission Limit(9kHz~1000MHz)**

| Frequency<br>(MHz) | Field Strength<br>(microvolt/meter) | Measurement Distance<br>(meters) |
|--------------------|-------------------------------------|----------------------------------|
| 0.009~0.490        | 2400/F(KHz)                         | 300                              |
| 0.490~1.705        | 24000/F(KHz)                        | 30                               |
| 1.705~30.0         | 30                                  | 30                               |
| 30~88              | 100                                 | 3                                |
| 88~216             | 150                                 | 3                                |
| 216~960            | 200                                 | 3                                |
| Above 960          | 500                                 | 3                                |

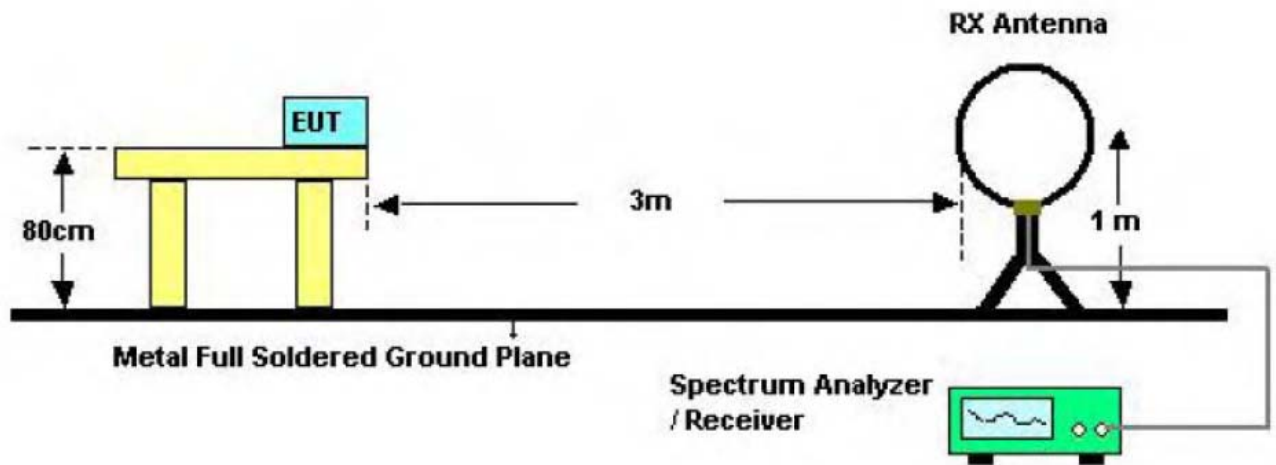
**Radiated Emission Limit (Above 1000MHz)**

| Frequency<br>(MHz) | Class A (dBuV/m)(at 3 M) |         | Class B (dBuV/m)(at 3 M) |         |
|--------------------|--------------------------|---------|--------------------------|---------|
|                    | Peak                     | Average | Peak                     | Average |
| Above 1000         | 80                       | 60      | 74                       | 54      |

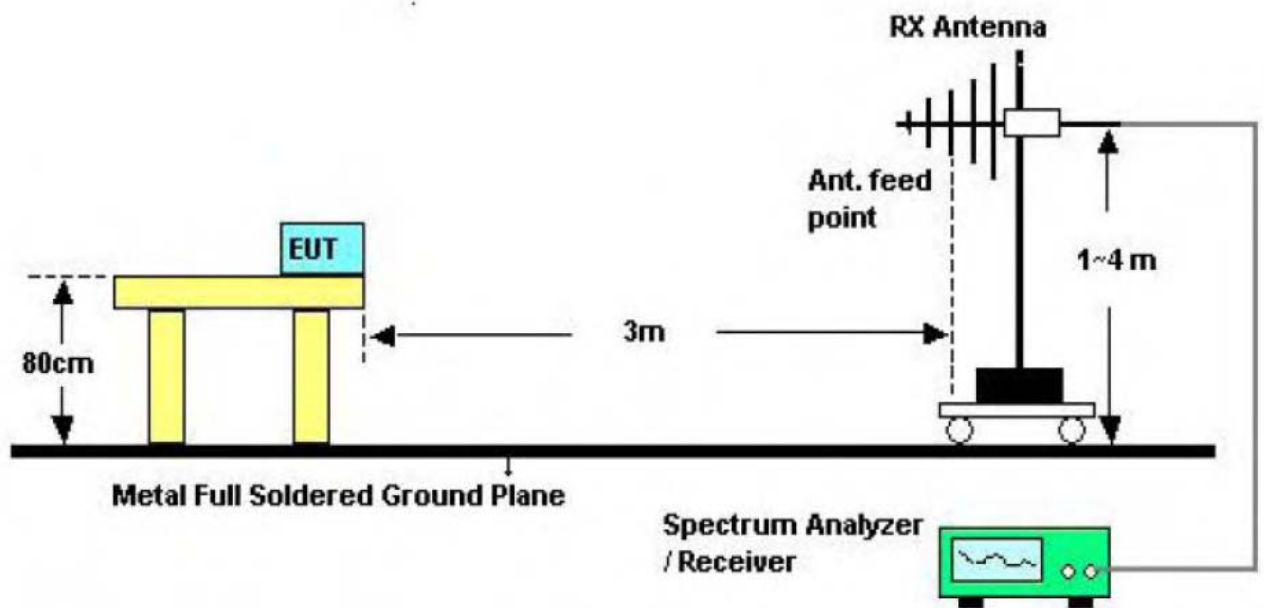
**Note:**

- (1) The tighter limit applies at the band edges.
- (2) Emission Level(dBuV/m)=20log Emission Level(Uv/m)

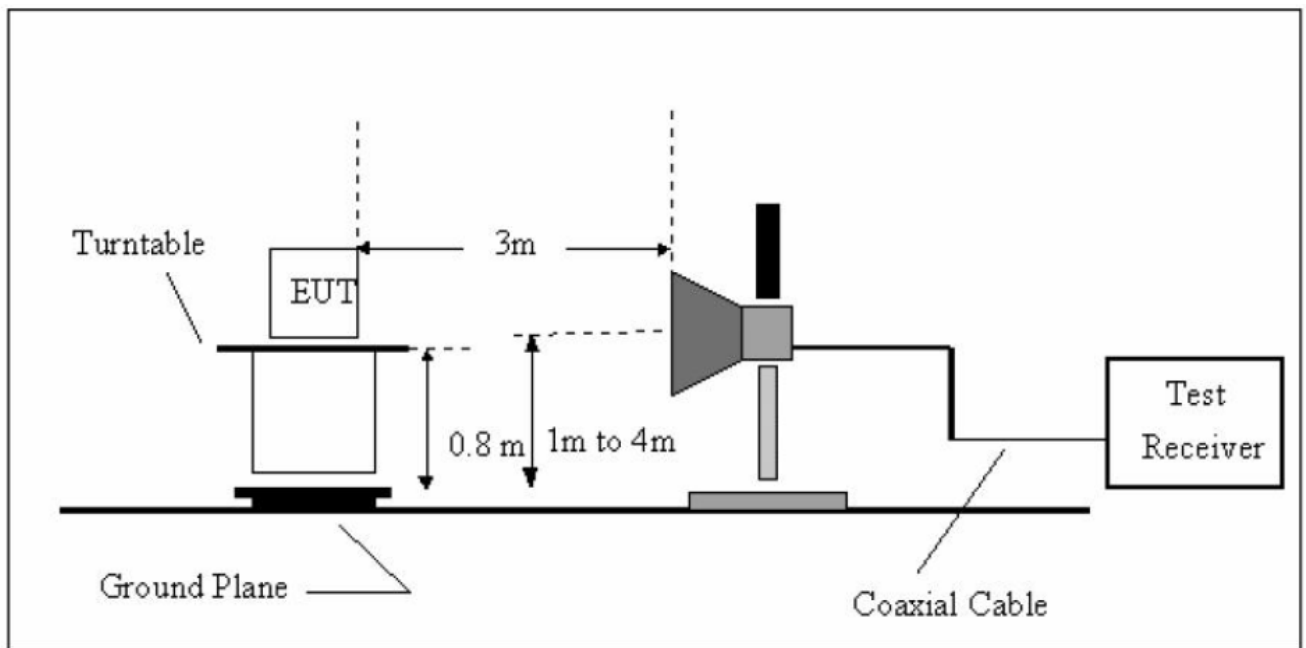
## 4.2 Test Setup



Bellow 30MHz Test Setup



Bellow 1000MHz Test Setup



Above 1GHz Test Setup

#### 4.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (5) For the actual test configuration, please see the test setup photo.

#### 4.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.



#### 4.5 Test Equipment

| Description              | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|--------------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer        | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |
| Positioning Controller   | C&C            | CC-C-1F   | N/A        | 2011-08-12 | 2012-08-11 |
| Trilog Broadband Antenna | SCHWARZBEC K   | VULB9163  | 9163-333   | 2011-07-21 | 2012-07-20 |
| Horn Antenna             | SCHWARZBEC K   | BBHX 9120 | 9120-426   | 2011-07-21 | 2012-07-20 |
| RF Switch                | EM             | EMSW18    | SW060023   | 2011-08-12 | 2012-08-11 |
| Amplifier                | Agilent        | 8447F     | 3113A06717 | 2011-08-12 | 2012-08-11 |
| Coaxial Cable            | SCHWARZBEC K   | AK9513    | 9513-10    | 2011-08-12 | 2012-08-11 |
| EMI Test Receiver        | ROHDE& SCHWARZ | ESPI      | 25498514   | 2011-08-12 | 2012-08-11 |
| EMI Test Receiver        | ROHDE& SCHWARZ | ESI26     | 838786/103 | 2011-08-12 | 2012-08-11 |
| Receiver Horn Antenna    | ROHDE& SCHWARZ | HF906     | 100013     | 2011-08-12 | 2012-08-11 |

#### 4.6 Test Data

Please see the next page.

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Operation Mode: TX 2402MHz      Test Date : February 20, 2012  
 Frequency Range: 30~1000MHz      Temperature : 28 °C  
 Measured Distance: 3m      Humidity : 65 %  
 Test Voltage: AC 120V/60 Hz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) | Limit (3m)<br>(dBuV/m) | Margin<br>(dB) | Note |
|----------------|-----------------|----------------------------|------------------------|----------------|------|
| 388.90         | H               | 30.19                      | 46.00                  | 15.81          | PK   |
| 485.90         | H               | 39.31                      | 46.00                  | 6.69           | PK   |
| 534.40         | H               | 30.51                      | 46.00                  | 15.49          | PK   |
| 582.90         | H               | 37.66                      | 46.00                  | 8.34           | PK   |
| 776.90         | H               | 31.08                      | 46.00                  | 14.92          | PK   |
| 973.30         | H               | 40.40                      | 54.00                  | 13.60          | PK   |
| 211.87         | V               | 35.44                      | 43.50                  | 8.06           | PK   |
| 388.90         | V               | 32.97                      | 46.00                  | 13.03          | PK   |
| 485.90         | V               | 40.16                      | 46.00                  | 5.84           | PK   |
| 534.40         | V               | 32.63                      | 46.00                  | 13.37          | PK   |
| 582.90         | V               | 36.82                      | 46.00                  | 9.18           | PK   |
| 973.30         | V               | 41.22                      | 54.00                  | 12.78          | PK   |

**Note:**

- (1) All Readings are Peak Value.
- (2) Emission Level= Reading Level+ Probe Factor +Cable Loss
- (3) The average measurement was not performed when the peak measured data under the limit of average detection.

---

Operation Mode: TX 2441MHz      Test Date : February 20, 2012  
 Frequency Range: 30~1000MHz      Temperature : 28 °C  
 Measured Distance: 3m      Humidity : 65 %  
 Test Voltage: AC 120V/60 Hz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) | Limit (3m)<br>(dBuV/m) | Margin<br>(dB) | Note |
|----------------|-----------------|----------------------------|------------------------|----------------|------|
| 386.80         | H               | 31.35                      | 46.00                  | 14.65          | PK   |
| 490.20         | H               | 40.02                      | 46.00                  | 5.98           | PK   |
| 540.50         | H               | 30.24                      | 46.00                  | 15.76          | PK   |
| 582.40         | H               | 38.20                      | 46.00                  | 7.80           | PK   |
| 776.10         | H               | 31.85                      | 46.00                  | 14.15          | PK   |
| 974.10         | H               | 41.32                      | 54.00                  | 12.68          | PK   |
| 212.10         | V               | 34.80                      | 43.50                  | 8.70           | PK   |
| 389.50         | V               | 33.04                      | 46.00                  | 12.96          | PK   |
| 486.20         | V               | 41.30                      | 46.00                  | 4.70           | PK   |
| 535.40         | V               | 33.40                      | 46.00                  | 12.60          | PK   |
| 583.70         | V               | 37.90                      | 46.00                  | 8.10           | PK   |
| 973.10         | V               | 40.72                      | 54.00                  | 13.28          | PK   |

**Note:**

- (1) All Readings are Peak Value.
- (2) Emission Level= Reading Level+ Probe Factor +Cable Loss
- (3) The average measurement was not performed when the peak measured data under the limit of average detection.

---



---

Operation Mode: TX 2480MHz      Test Date : February 20, 2012  
 Frequency Range: 30~1000MHz      Temperature : 28 °C  
 Measured Distance: 3m      Humidity : 65 %  
 Test Voltage: AC 120V/60 Hz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) | Limit (3m)<br>(dBuV/m) | Margin<br>(dB) | Note |
|----------------|-----------------|----------------------------|------------------------|----------------|------|
| 387.20         | H               | 30.85                      | 46.00                  | 15.15          | PK   |
| 489.70         | H               | 39.45                      | 46.00                  | 6.55           | PK   |
| 541.10         | H               | 31.04                      | 46.00                  | 14.96          | PK   |
| 581.80         | H               | 38.53                      | 46.00                  | 7.47           | PK   |
| 775.80         | H               | 32.05                      | 46.00                  | 13.95          | PK   |
| 973.90         | H               | 40.85                      | 54.00                  | 13.15          | PK   |
| 211.60         | V               | 33.70                      | 43.50                  | 9.80           | PK   |
| 384.70         | V               | 34.05                      | 46.00                  | 11.95          | PK   |
| 485.30         | V               | 40.21                      | 46.00                  | 5.79           | PK   |
| 534.90         | V               | 33.60                      | 46.00                  | 12.40          | PK   |
| 584.20         | V               | 38.70                      | 46.00                  | 7.30           | PK   |
| 973.50         | V               | 41.64                      | 54.00                  | 12.36          | PK   |

**Note:**

- (1) All Readings are Peak Value.
- (2) Emission Level= Reading Level+ Probe Factor +Cable Loss
- (3) The average measurement was not performed when the peak measured data under the limit of average detection.

---

Operation Mode: TX 2402MHz      Test Date : February 20, 2012  
 Frequency Range: 1-25GHz      Temperature : 28 °C  
 Measured Distance: 3m      Humidity : 65 %  
 Test Voltage: AC 120V/60 Hz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) |       | Limit3m<br>(dBuV/m) |       | Margin(dB) |       |
|----------------|-----------------|----------------------------|-------|---------------------|-------|------------|-------|
|                |                 | PK                         | AV    | PK                  | AV    | PK         | AV    |
| 3204.370       | V               | 57.95                      | 40.81 | 74.00               | 54.00 | 16.05      | 13.19 |
| 4804.030       | V               | 58.87                      | 41.31 | 74.00               | 54.00 | 15.13      | 12.69 |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| 4804.140       | H               | 51.26                      | 41.24 | 74.00               | 54.00 | 22.74      | 12.76 |
| 7206.300       | H               | 43.93                      | 33.40 | 74.00               | 54.00 | 30.07      | 20.60 |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |

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

**Note:**

- (1) All Readings are Peak Value and AV.
- (2) Emission Level= Reading Level + Probe Factor +Cable Loss
- (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

---

Operation Mode: TX 2441MHz      Test Date : February 20, 2012  
 Frequency Range: 1-25GHz      Temperature : 28 °C  
 Measured Distance: 3m      Humidity : 65 %  
 Test Voltage: AC 120V/60 Hz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) |       | Limit3m<br>(dBuV/m) |       | Margin(dB) |       |
|----------------|-----------------|----------------------------|-------|---------------------|-------|------------|-------|
|                |                 | PK                         | AV    | PK                  | AV    | PK         | AV    |
| 3256.010       | V               | 56.84                      | 39.72 | 74.00               | 54.00 | 17.16      | 14.28 |
| 4881.990       | V               | 57.69                      | 39.66 | 74.00               | 54.00 | 16.31      | 14.34 |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| 3256.010       | H               | 57.38                      | 39.59 | 74.00               | 54.00 | 16.62      | 14.41 |
| 4881.970       | H               | 55.24                      | 39.13 | 74.00               | 54.00 | 18.76      | 14.87 |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |

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

**Note:**

- (1) All Readings are Peak Value and AV.
- (2) Emission Level= Reading Level + Probe Factor +Cable Loss
- (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

---

Operation Mode: TX 2480MHz      Test Date : February 20, 2012  
 Frequency Range: 1-25GHz      Temperature : 28 °C  
 Measured Distance: 3m      Humidity : 65 %  
 Test Voltage: AC 120V/60 Hz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) |       | Limit3m<br>(dBuV/m) |       | Margin(dB) |       |
|----------------|-----------------|----------------------------|-------|---------------------|-------|------------|-------|
|                |                 | PK                         | AV    | PK                  | AV    | PK         | AV    |
| 3308.160       | V               | 57.83                      | 40.06 | 74.00               | 54.00 | 16.17      | 13.94 |
| 4960.010       | V               | 57.51                      | 40.61 | 74.00               | 54.00 | 16.49      | 13.39 |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| 3308.160       | H               | 58.81                      | 40.69 | 74.00               | 54.00 | 15.19      | 13.31 |
| 4960.130       | H               | 55.62                      | 39.49 | 74.00               | 54.00 | 18.38      | 14.51 |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | H               | --                         | --    | 74.00               | 54.00 | --         | --    |

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

**Note:**

- (1) All Readings are Peak Value and AV.
- (2) Emission Level= Reading Level + Probe Factor +Cable Loss
- (3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 5. Restricted Bands Requirement

### 5.1 Test Standard and Limit

#### 5.1.1 Test Standard

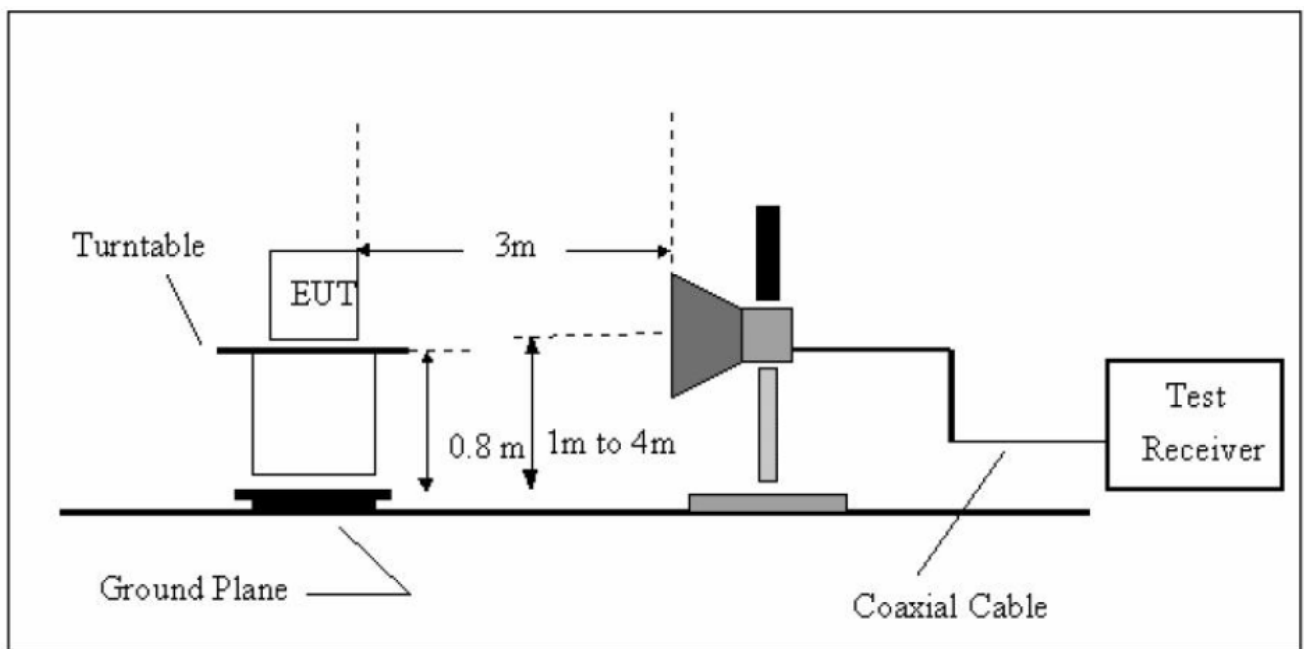
FCC Part 15.209

FCC Part 15.205

#### 5.1.2 Test Limit

| Restricted Frequency<br>Band<br>(MHz) | Class B (dBuV/m)(at 3 M) |         |
|---------------------------------------|--------------------------|---------|
|                                       | Peak                     | Average |
| 2310 ~2390                            | 74                       | 54      |
| 2483.5 ~2500                          | 74                       | 54      |

### 5.2 Test Setup



### 5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.



- (4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (5) For the actual test configuration, please see the test setup photo.

#### 5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

#### 5.5 Test Equipment

| Description              | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|--------------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer        | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |
| Positioning Controller   | C&C            | CC-C-1F   | N/A        | 2011-08-12 | 2012-08-11 |
| Trilog Broadband Antenna | SCHWARZBEC K   | VULB9163  | 9163-333   | 2011-07-21 | 2012-07-20 |
| Horn Antenna             | SCHWARZBEC K   | BBHX 9120 | 9120-426   | 2011-07-21 | 2012-07-20 |
| RF Switch                | EM             | EMSW18    | SW060023   | 2011-08-12 | 2012-08-11 |
| Amplifier                | Agilent        | 8447F     | 3113A06717 | 2011-08-12 | 2012-08-11 |
| Coaxial Cable            | SCHWARZBEC K   | AK9513    | 9513-10    | 2011-08-12 | 2012-08-11 |
| EMI Test Receiver        | ROHDE& SCHWARZ | ESPI      | 25498514   | 2011-08-12 | 2012-08-11 |
| EMI Test Receiver        | ROHDE& SCHWARZ | ESI26     | 838786/103 | 2011-08-12 | 2012-08-11 |
| Receiver Horn Antenna    | ROHDE& SCHWARZ | HF906     | 100013     | 2011-08-12 | 2012-08-11 |

## 5.6 Test Data

Spectrum Detector: PK  
Temperature : 28 °C

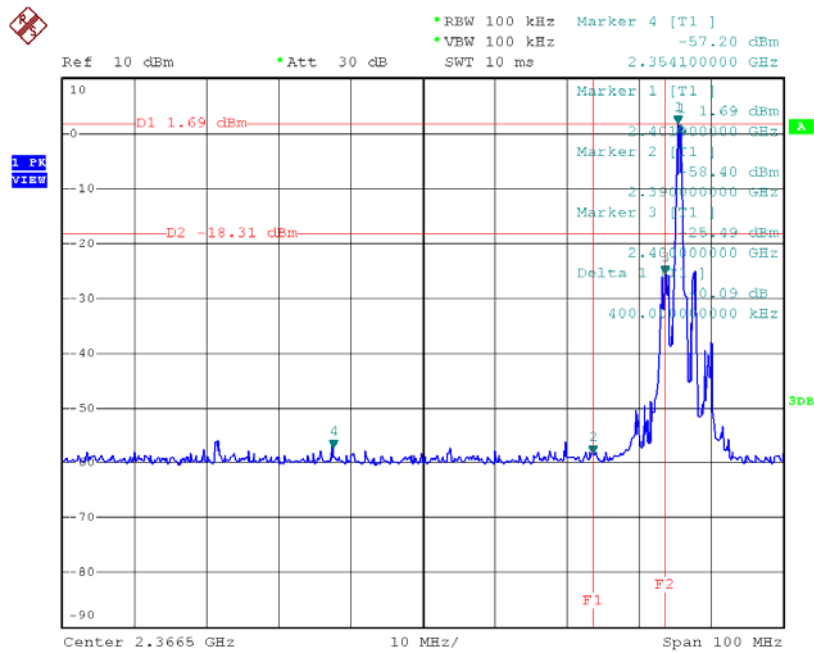
Test Date : February 20, 2012  
Humidity : 65 %

### 1. Conducted Test

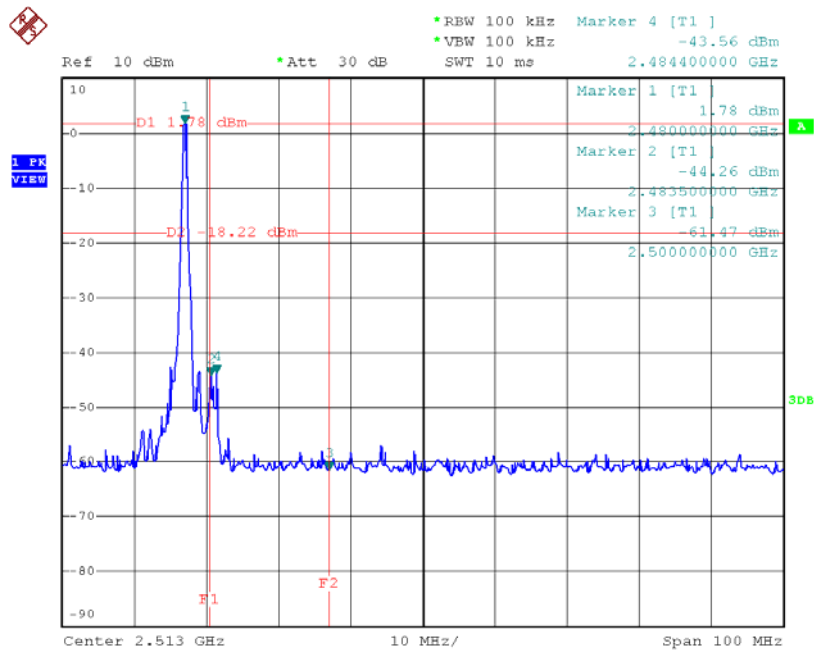
| Frequency (MHz) | Peak Power Output(dBm) | Emission Read Value(dBm) | Result of Band edge(dBc) | Band edge Limit(dBc) |
|-----------------|------------------------|--------------------------|--------------------------|----------------------|
| <2400           | 1.69                   | -57.20                   | 58.89                    | >20dBc               |
| >2483.5         | 1.78                   | -43.56                   | 45.34                    | >20dBc               |

### 2. Radiated emission test

| Frequency (MHz) | Antenna polarization (H/V) | Emission (dBuV/m) |       | Band edge Limit (dBuV/m) |       |
|-----------------|----------------------------|-------------------|-------|--------------------------|-------|
|                 |                            | PEAK              | AV    | PEAK                     | AV    |
| 2390.0          | H                          | 53.88             | 42.40 | 74.00                    | 54.00 |
| 2390.0          | V                          | 50.60             | 42.58 | 74.00                    | 54.00 |
| 2483.5          | H                          | 62.01             | 47.73 | 74.00                    | 54.00 |
| 2483.5          | V                          | 57.78             | 46.17 | 74.00                    | 54.00 |



Date: 23.FEB.2012 11:46:11



Date: 23.FEB.2012 11:48:21

## 6. Number of Hopping Channel

### 6.1 Test Standard and Limit

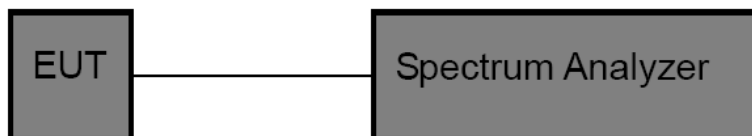
#### 5.1.1 Test Standard

FCC Part 15.247 (a)(1)

#### 5.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |                           |       |
|-------------------------------|---------------------------|-------|
| Section                       | Test Item                 | Limit |
| 15.247                        | Number of Hopping Channel | >15   |

### 6.2 Test Setup



### 6.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:RBW=100 KHz, VBW=100 KHz, Sweep time= Auto.

### 6.4 EUT Operating Condition

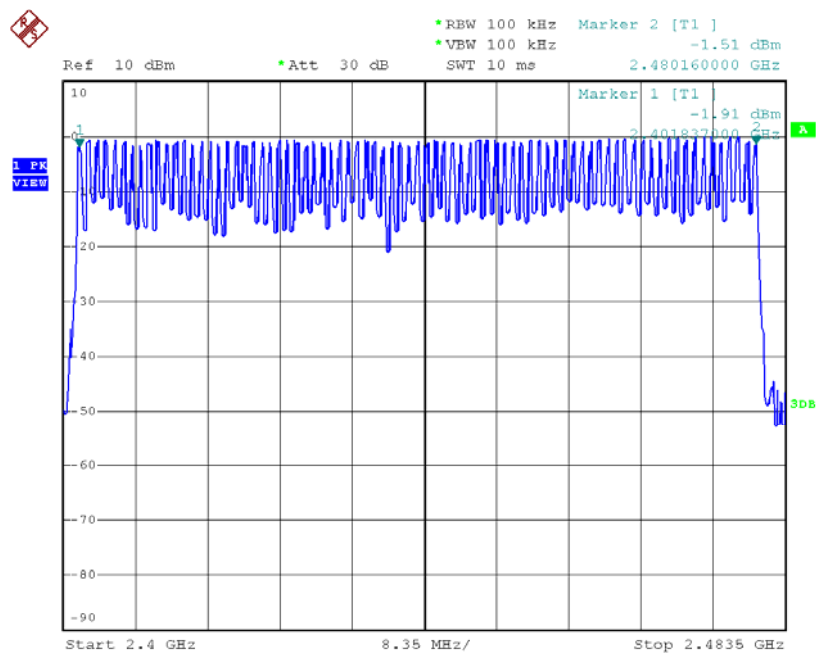
The EUT was set to the Hopping Mode by the Customer.

### 6.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |

### 6.6 Test Data

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



Date: 23.FEB.2012 13:52:47

## 7. Average Time of Occupancy

### 7.1 Test Standard and Limit

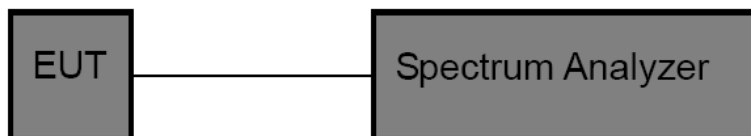
#### 5.1.1 Test Standard

FCC Part 15.247 (a)(1)

#### 5.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |                           |         |
|-------------------------------|---------------------------|---------|
| Section                       | Test Item                 | Limit   |
| 15.247(a)(1)                  | Average Time of Occupancy | 0.4 sec |

### 7.2 Test Setup



### 7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=1MHz.
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.

### 7.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

### 7.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |

## 7.6 Test Data

### DH1

CH Low:  $0.552 \times (1600/2) / 79 \times 31.60 = 176.64(\text{ms})$

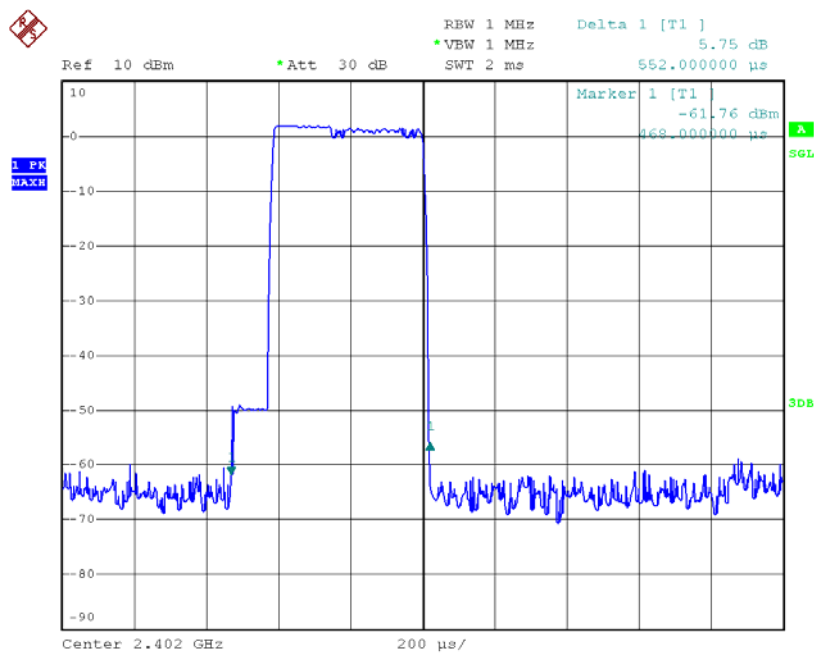
CH Mid:  $0.548 \times (1600/2) / 79 \times 31.60 = 175.36(\text{ms})$

CH High:  $0.556 \times (1600/2) / 79 \times 31.60 = 177.92(\text{ms})$

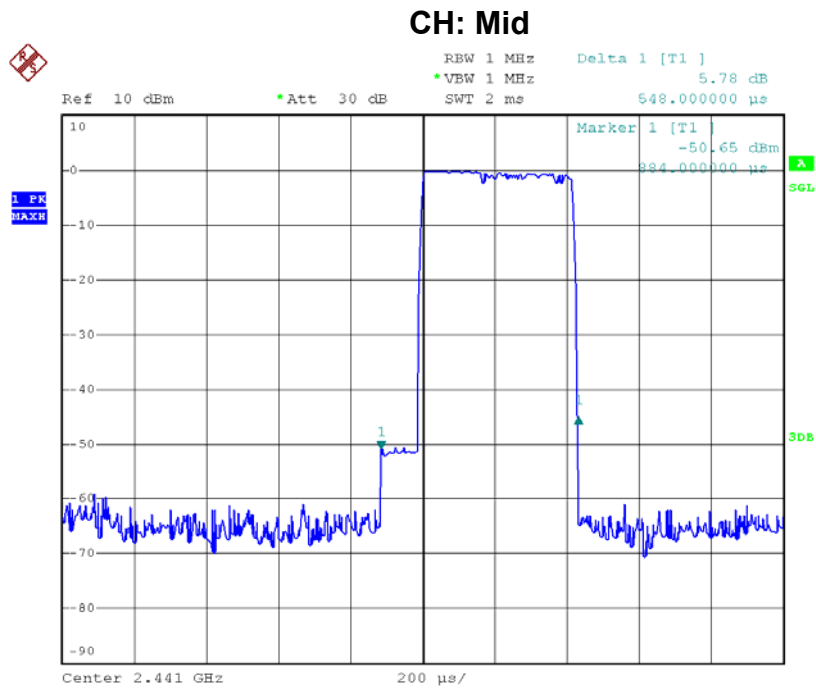
| CH   | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|------|-----------------|---------------------|-----------------|------------|--------|
| Low  | 0.552           | 176.64              | 31.60           | 400        | PASS   |
| Mid  | 0.548           | 175.36              | 31.60           |            | PASS   |
| High | 0.556           | 177.92              | 31.60           |            | PASS   |

Please refer to the following data:

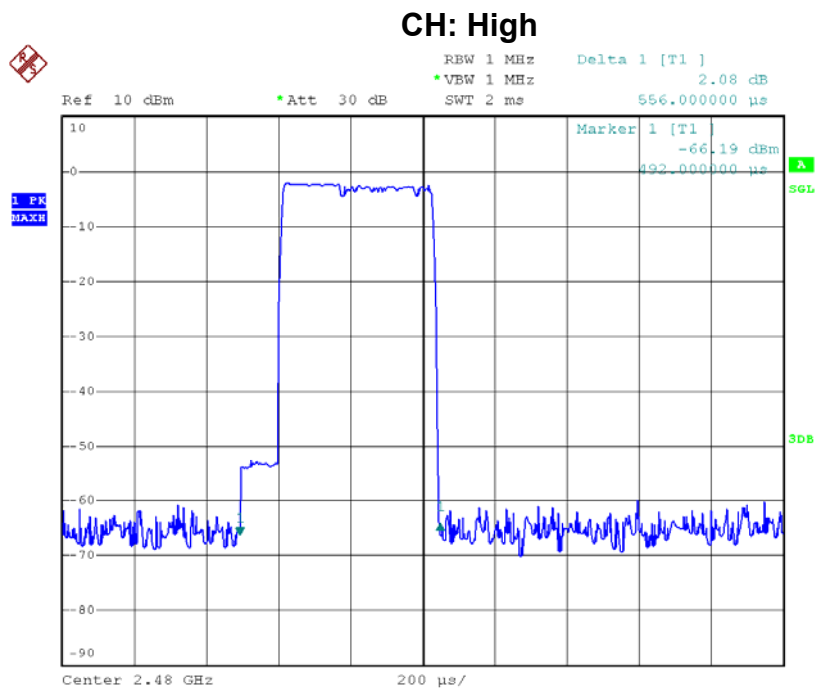
### CH: Low



Date: 23.FEB.2012 14:11:06



Date: 23.FEB.2012 14:09:47



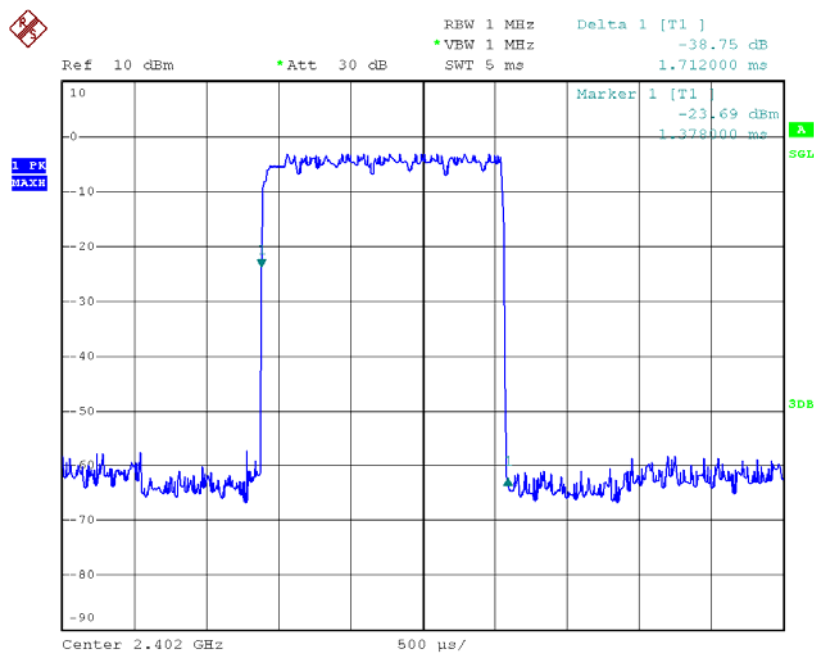
Date: 23.FEB.2012 14:09:00



**DH3**CH Low:  $1.712 \times (1600/4) / 79 \times 31.60 = 273.92(\text{ms})$ CH Mid:  $1.792 \times (1600/4) / 79 \times 31.60 = 286.72(\text{ms})$ CH High:  $1.702 \times (1600/4) / 79 \times 31.60 = 272.32(\text{ms})$ 

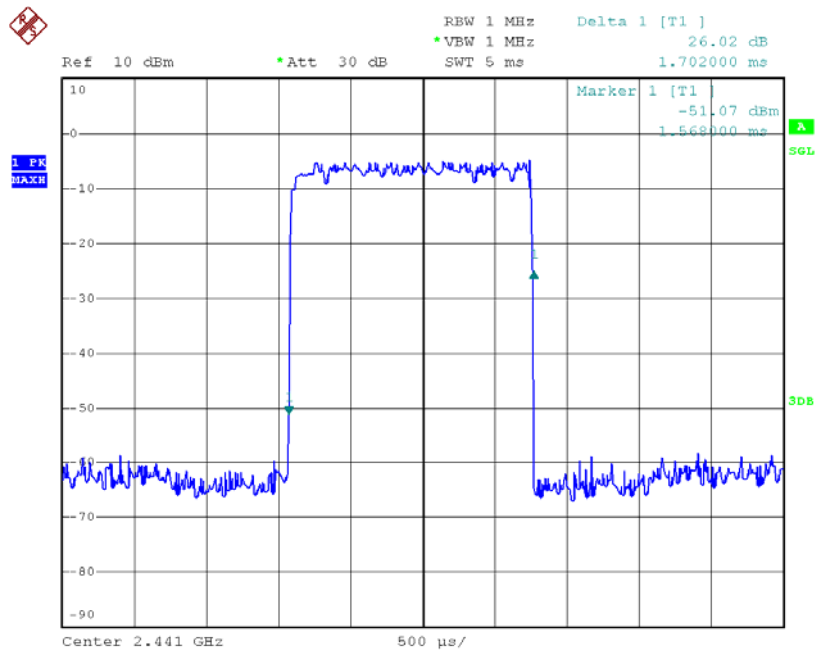
| CH   | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|------|-----------------|---------------------|-----------------|------------|--------|
| Low  | 1.712           | 273.92              | 31.60           | 400        | PASS   |
| Mid  | 1.792           | 286.72              | 31.60           |            | PASS   |
| High | 1.702           | 272.32              | 31.60           |            | PASS   |

Please refer to the following data:

**CH: Low**

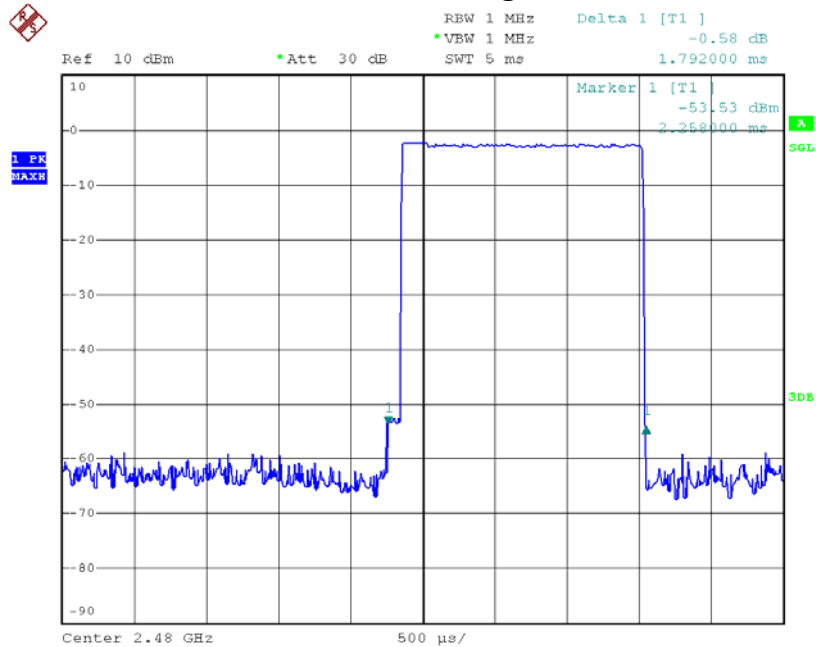
Date: 23.FEB.2012 14:12:27

### CH: Mid



Date: 23.FEB.2012 14:13:14

### CH: High

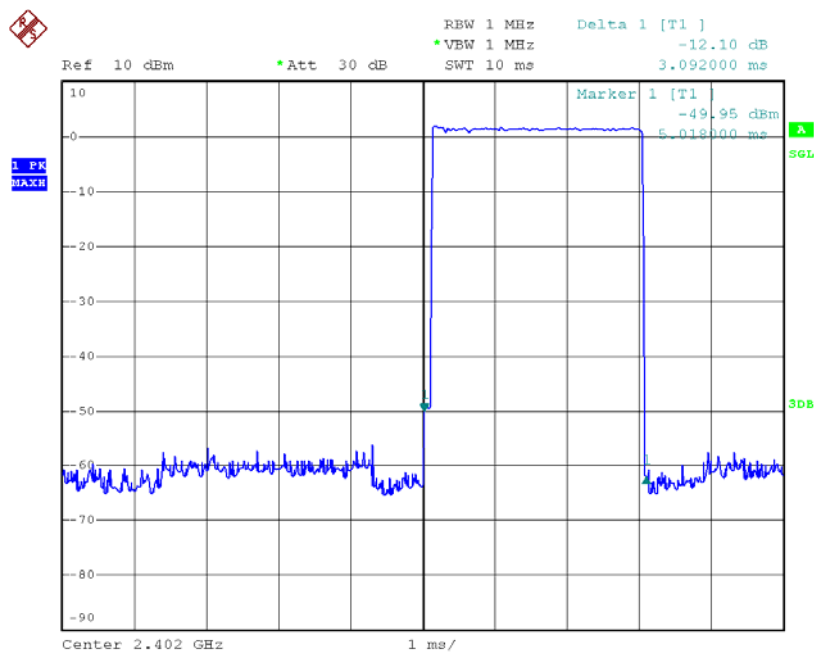


Date: 23.FEB.2012 14:14:06

**DH5**CH Low:  $3.092 \times (1600/6) / 79 \times 31.60 = 329.81(\text{ms})$ CH Mid:  $3.092 \times (1600/6) / 79 \times 31.60 = 329.81(\text{ms})$ CH High:  $3.072 \times (1600/6) / 79 \times 31.60 = 327.68(\text{ms})$ 

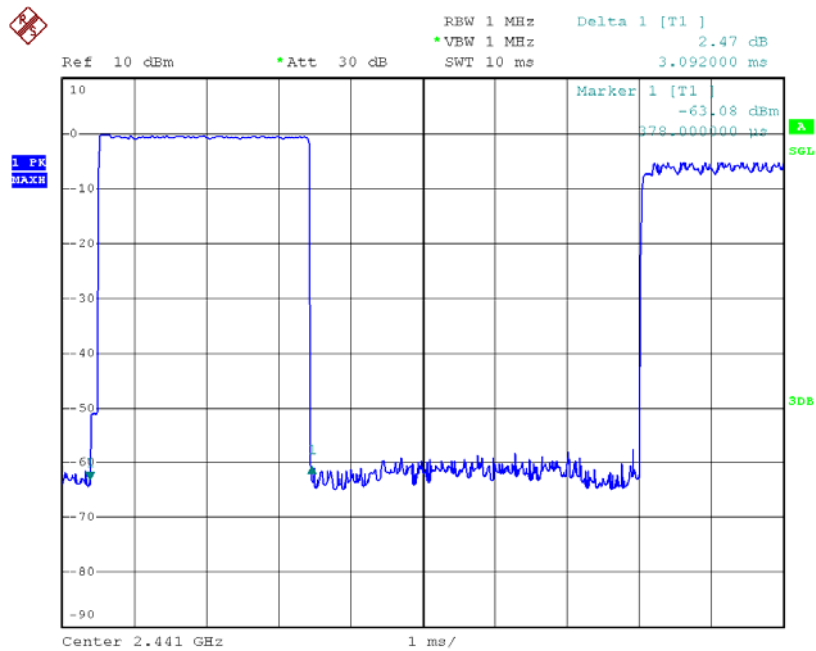
| CH   | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|------|-----------------|---------------------|-----------------|------------|--------|
| Low  | 3.092           | 329.81              | 31.60           | 400        | PASS   |
| Mid  | 3.092           | 329.81              | 31.60           |            | PASS   |
| High | 3.072           | 327.68              | 31.60           |            | PASS   |

Please refer to the following data:

**CH: Low**

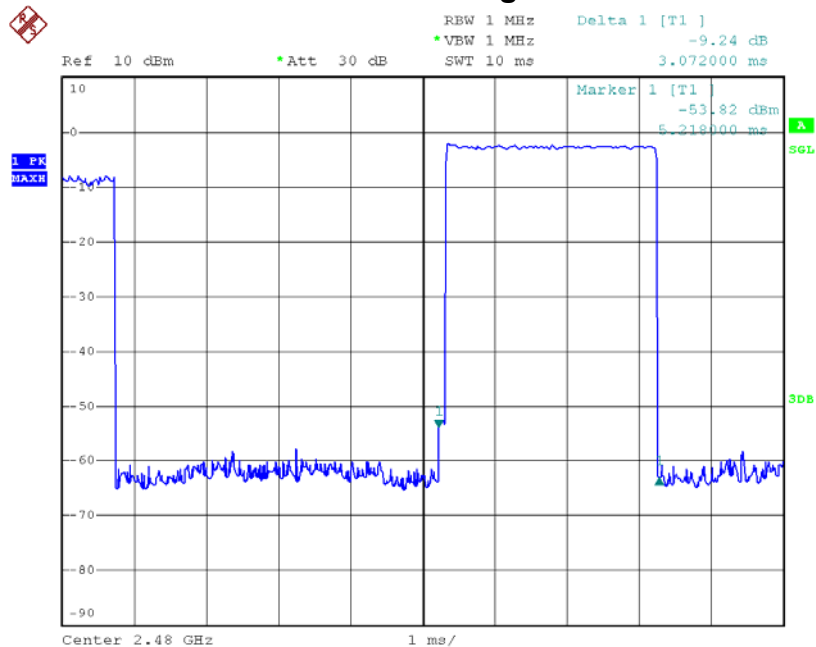
Date: 23.FEB.2012 14:17:12

### CH: Mid



Date: 23.FEB.2012 14:16:27

### CH: High



Date: 23.FEB.2012 14:15:44

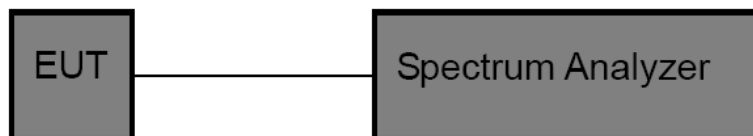
## 8. Channel Separation and Bandwidth Test

### 8.1 Test Standard and Limit

- 8.1.1 Test Standard  
FCC Part 15.247
- 8.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |                                                                                       |                      |
|-------------------------------|---------------------------------------------------------------------------------------|----------------------|
| Test Item                     | Limit                                                                                 | Frequency Range(MHz) |
| Bandwidth                     | $\leq 1$ MHz<br>(20dB bandwidth)                                                      | 2400~2483.5          |
| Channel Separation            | $>25\text{KHz}$ or $>\text{two-thirds}$ of<br>the 20 dB bandwidth<br>Which is greater | 2400~2483.5          |

### 8.2 Test Setup



### 8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:  
Channel Separation: RBW=30 kHz, VBW=100 kHz.  
Bandwidth: RBW=10 kHz, VBW=30 kHz.
- (3) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
- (4) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:30 kHz, and Video Bandwidth:100 kHz. Sweep Time set auto.

### 8.4 EUT Operating Condition

The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Bandwidth Test.

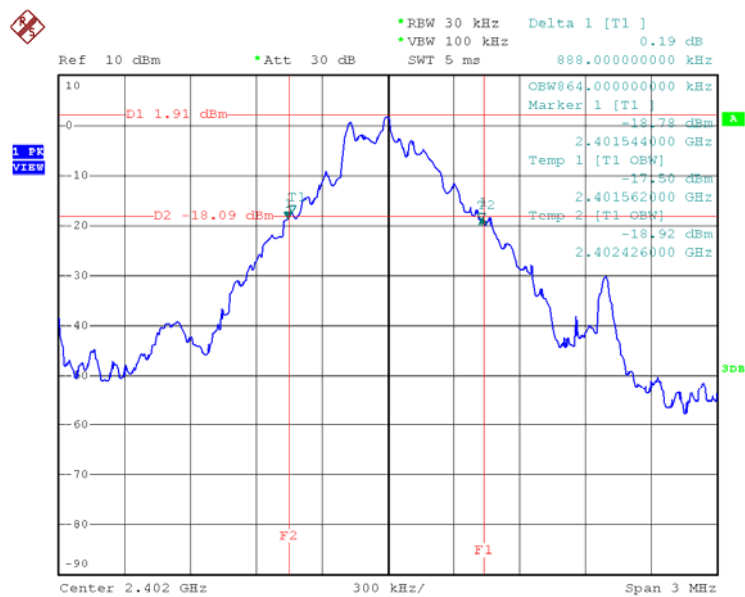
## 8.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |

## 8.6 Test Data

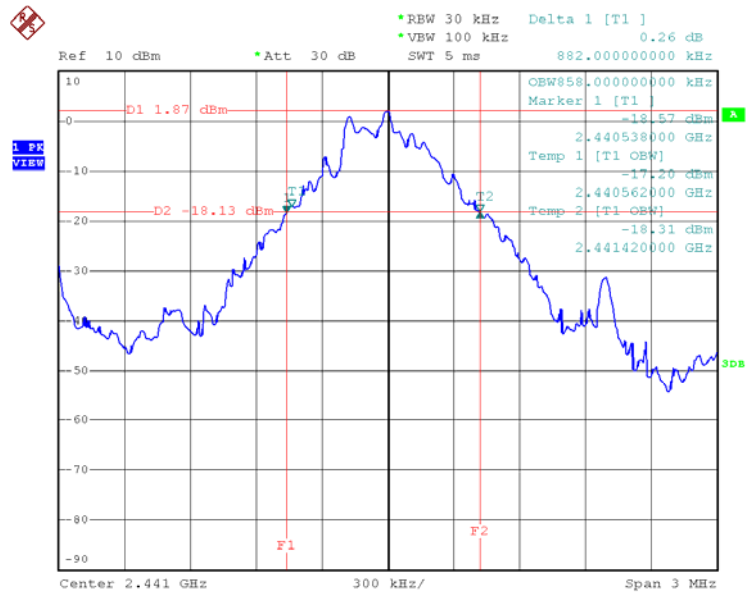
| Channel number | Channel frequency (MHz) | 20dB Bandwidth (kHz) | Read Value*2/3 (kHz) |
|----------------|-------------------------|----------------------|----------------------|
| CH 00          | 2402                    | 888.00               | 592.00               |
| CH 39          | 2441                    | 882.00               | 588.00               |
| CH 78          | 2480                    | 930.00               | 620.00               |

### 2402 MHz



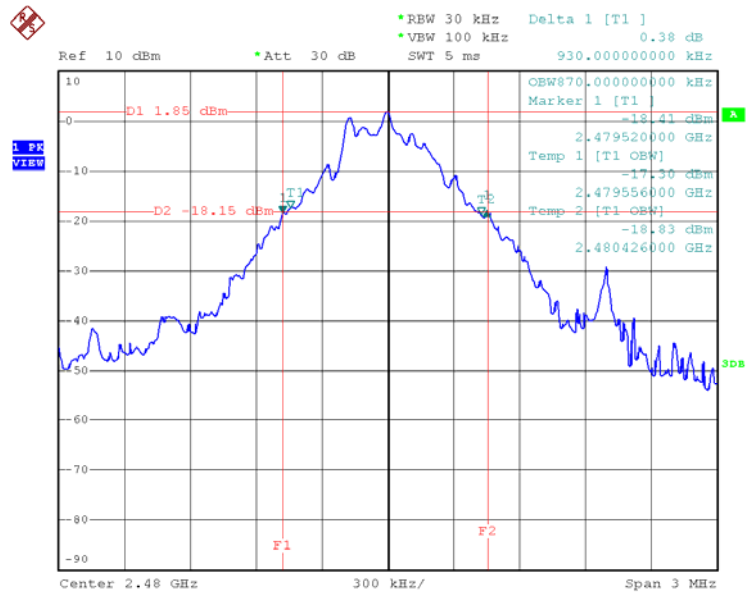
Date: 23.FEB.2012 11:32:18

## 2441 MHz



Date: 23.FEB.2012 11:28:08

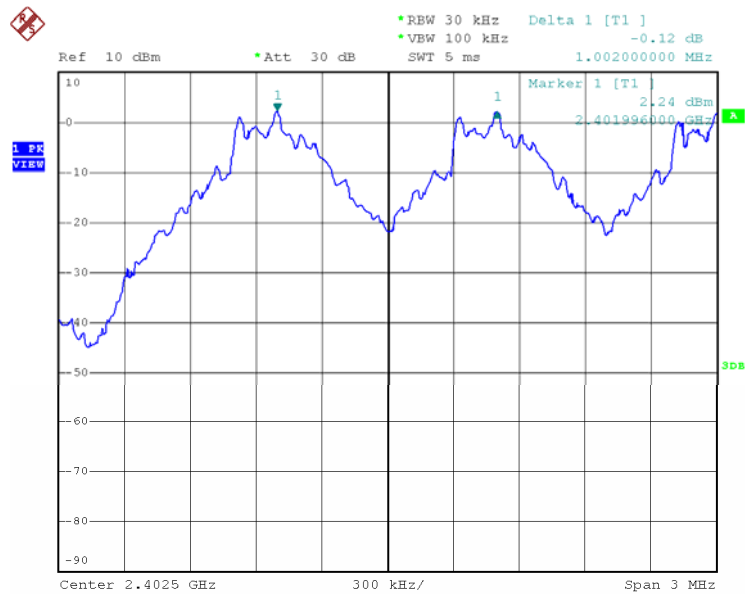
## 2480 MHz



Date: 23.FEB.2012 11:37:18

| Channel number | Channel frequency (MHz) | Separation Read Value (kHz) | Separation Limit (kHz) |
|----------------|-------------------------|-----------------------------|------------------------|
| CH 00          | 2402                    | 1002.00                     | >592.00 kHz            |
| CH 39          | 2441                    | 1008.00                     | >588.00 kHz            |
| CH 78          | 2480                    | 1008.00                     | >620.00 kHz            |

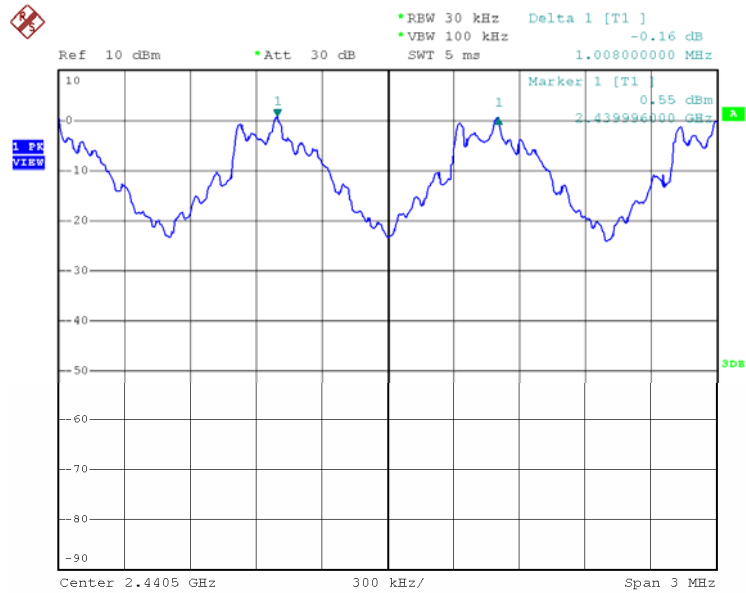
## 2402 MHz



Date: 23.FEB.2012 11:42:21

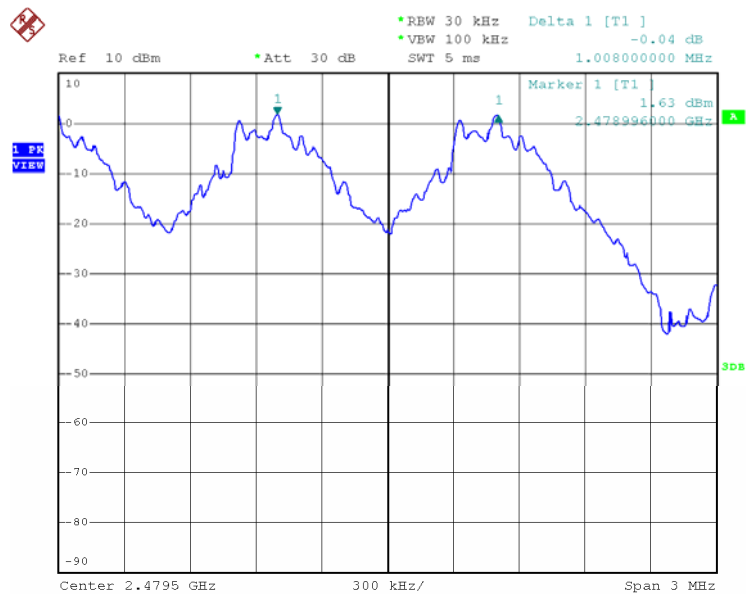


## 2441 MHz



Date: 23.FEB.2012 11:40:51

## 2480 MHz



Date: 23.FEB.2012 11:38:54

## 9. Peak Output Power Test

### 9.1 Test Standard and Limit

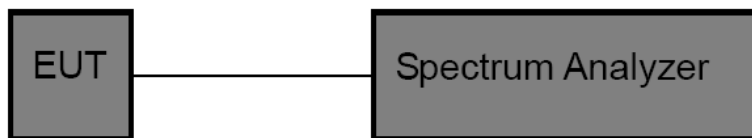
#### 9.1.1 Test Standard

FCC Part 15.247 (b) (1)

#### 9.1.2 Test Limit

| FCC Part 15 Subpart C(15.247) |                                                                |                      |
|-------------------------------|----------------------------------------------------------------|----------------------|
| Test Item                     | Limit                                                          | Frequency Range(MHz) |
| Peak Output Power             | Hopping Channels>75<br>Power<1W(30dBm)<br>Other <125 mW(21dBm) | 2400~2483.5          |

### 9.2 Test Setup



### 9.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:  
Channel Separation: RBW=1 MHz, VBW=1 MHz.

### 9.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

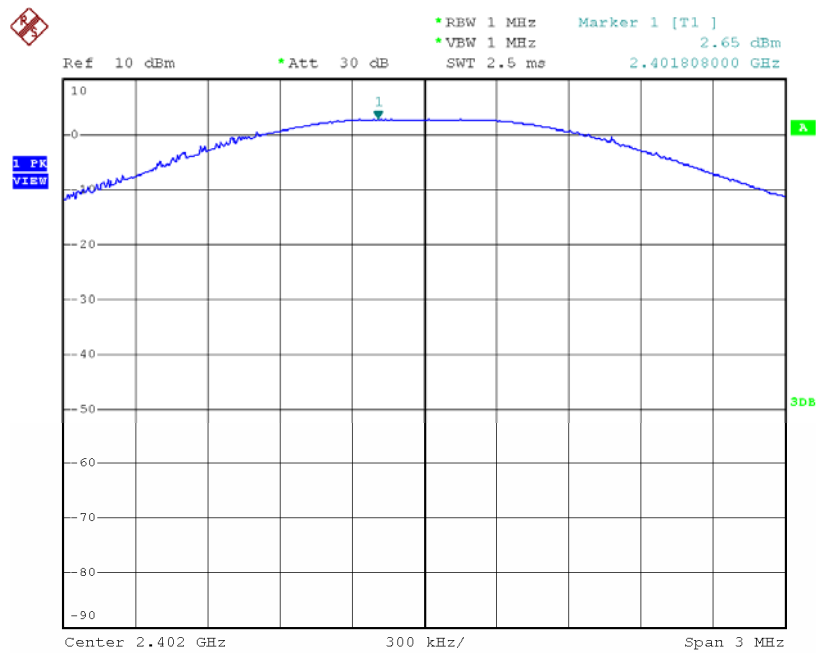
### 9.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |

### 8.6 Test Data

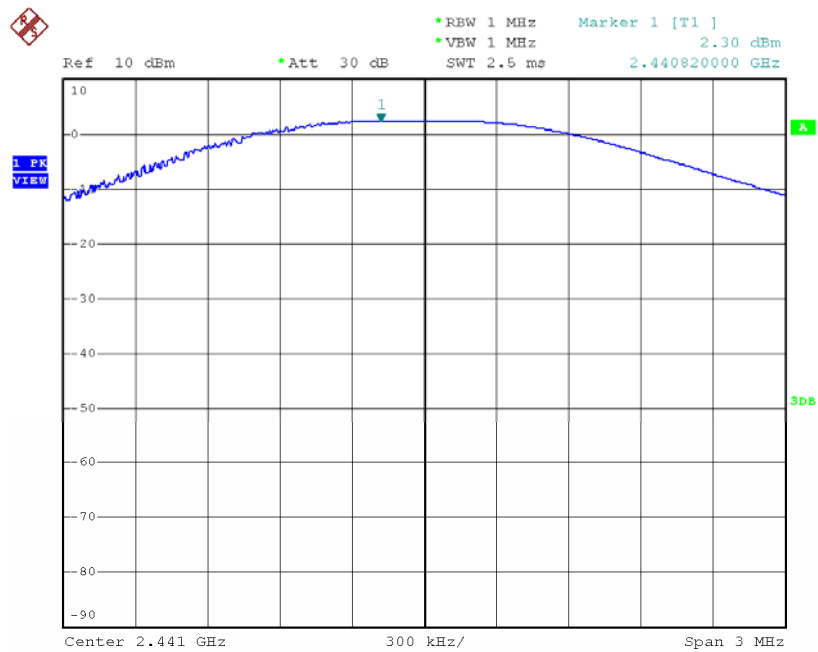
| Channel number | Channel frequency (MHz) | Test Result (dBm) | Limit      |
|----------------|-------------------------|-------------------|------------|
| CH 00          | 2402                    | 2.65              | 1W(30dBm)  |
| CH 39          | 2441                    | 2.30              | 1W(30dBm)  |
| CH 78          | 2480                    | 2.02              | 1W(30dBm)) |

## 2402 Power



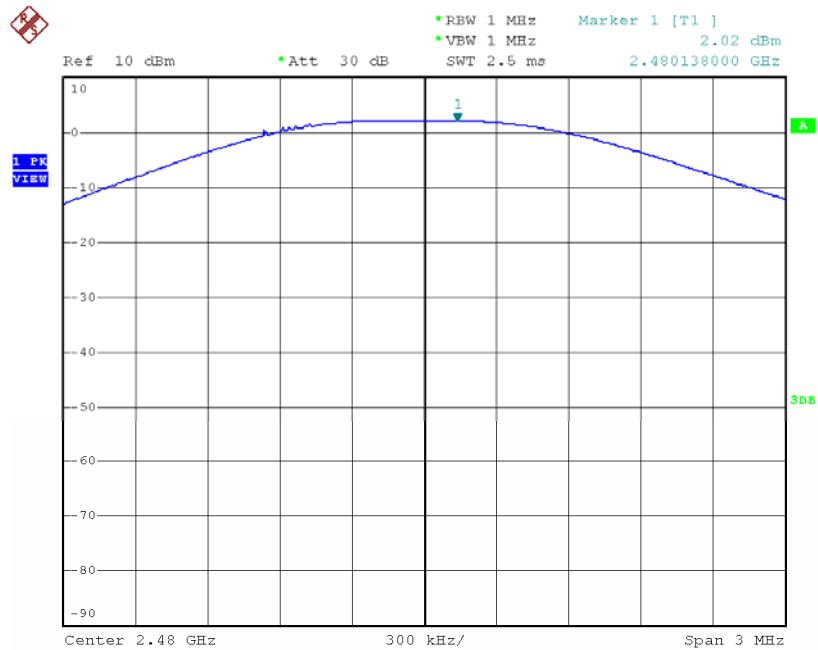
Date: 23.FEB.2012 11:33:35

## 2441 Power



Date: 23.FEB.2012 11:25:03

## 2480 Power



Date: 23.FEB.2012 11:35:02

## 10. Antenna Conducted Spurious Emission

### 10.1 Test Standard and Limit

#### 10.1.1 Test Standard

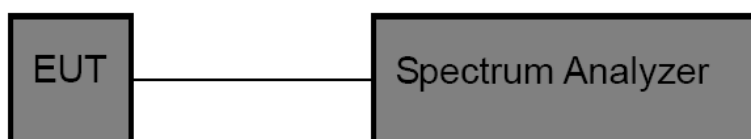
FCC Part 15.247 (c)

#### 10.1.2 Test Limit

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. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (microvolt/meter) | Measurement Distance (meters) |
|-------------------|----------------------------------|-------------------------------|
| 0.009~0.490       | 2400/F(KHz)                      | 300                           |
| 0.490~1.705       | 24000/F(KHz)                     | 30                            |
| 1.705~30.0        | 30                               | 30                            |
| 30~88             | 100                              | 3                             |
| 88~216            | 150                              | 3                             |
| 216~960           | 200                              | 3                             |
| Above~960         | 500                              | 3                             |

### 10.2 Test Setup



### 10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:  
 RBW=100 KHz, VBW=100 KHz.  
 Frequency range: from 30MHz to 25 GHz.

#### 10.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

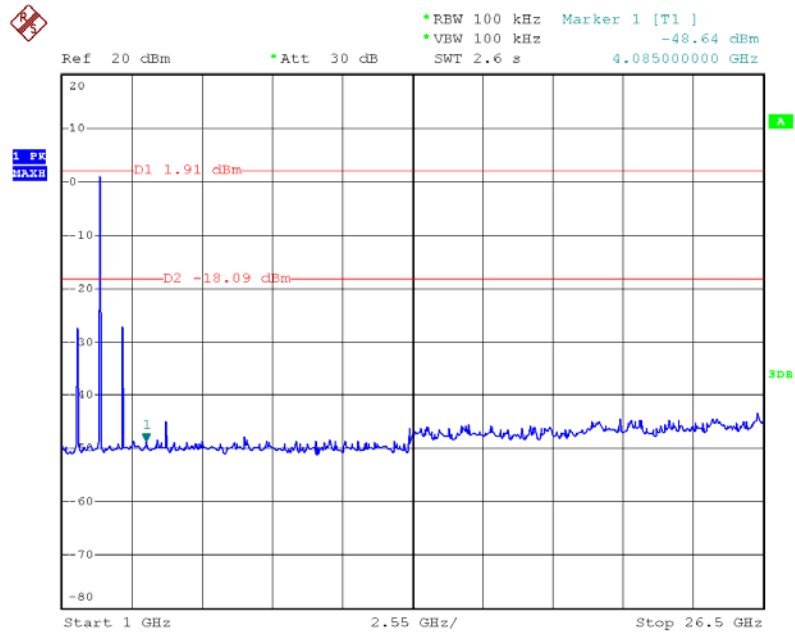
#### 10.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2011-08-12 | 2012-08-11 |

#### 10.6 Test Data

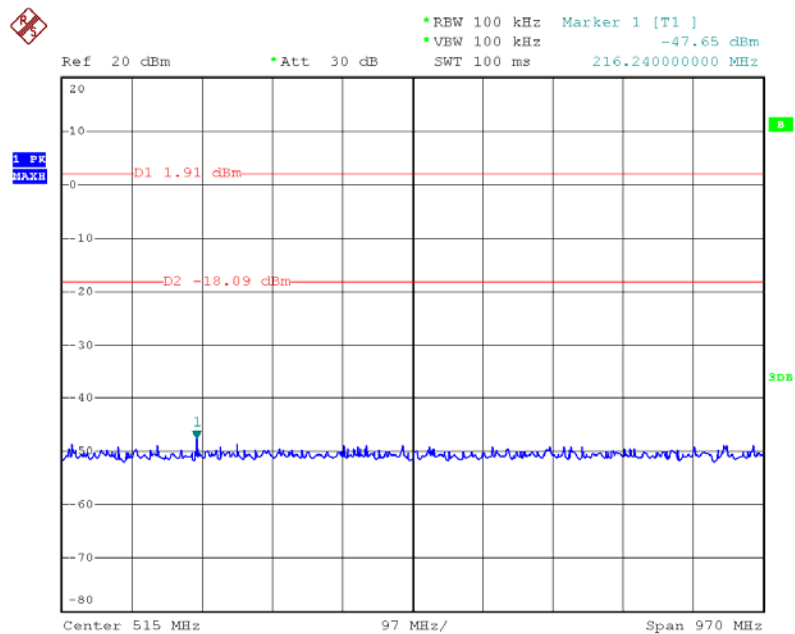
## TX CH 00 2402MHz

### Above 1 GHz



Date: 23.FEB.2012 19:56:39

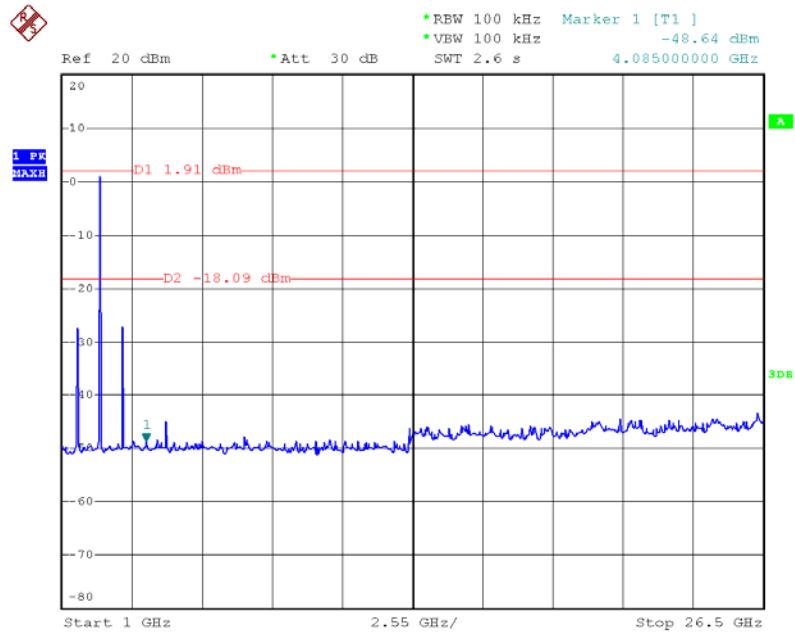
### Bellow 1 GHz



Date: 23.FEB.2012 19:57:00

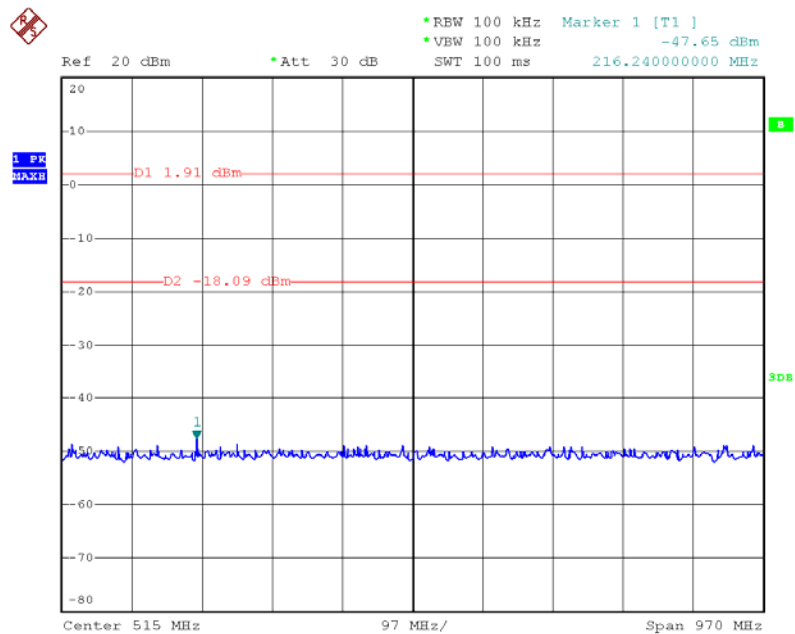
## TX CH 39 2441MHz

### Above 1 GHz



Date: 23.FEB.2012 19:56:39

### Bellow 1 GHz

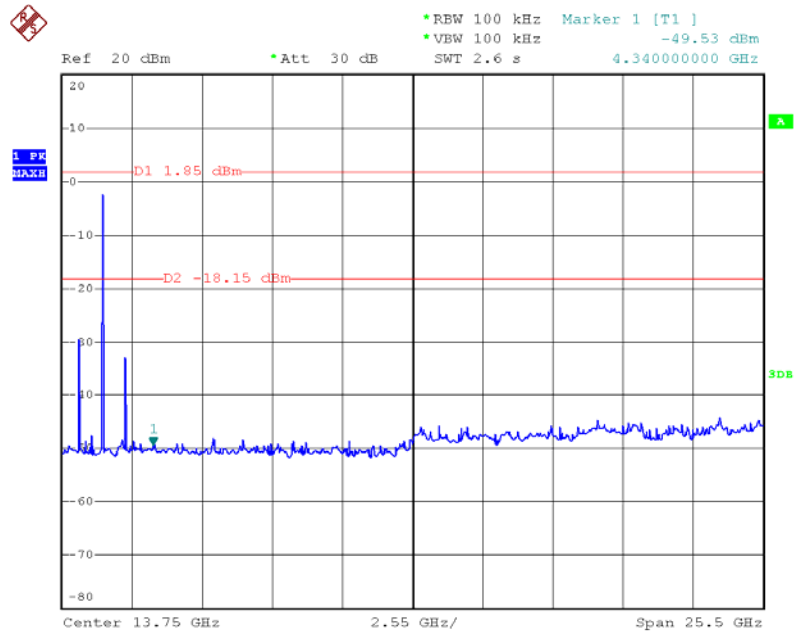


Date: 23.FEB.2012 19:57:00



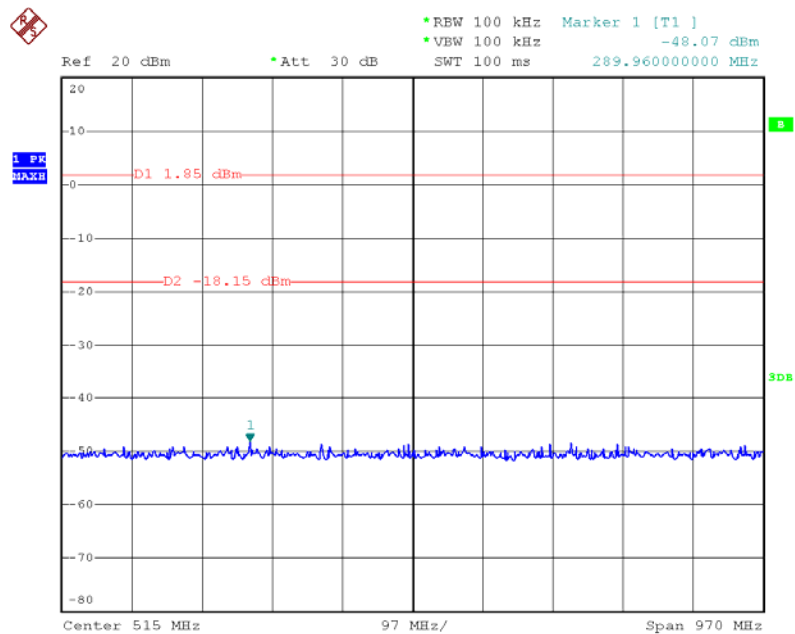
## TX CH 79 2480MHz

### Above 1 GHz



Date: 23.FEB.2012 19:58:29

### Bellow 1 GHz



Date: 23.FEB.2012 19:58:53

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## 11. Antenna Requirement

### 11.1 Standard Requirement

#### 11.1.1 Standard

FCC Part 15.203

#### 11.1.2 Requirement

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 11.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 2.0Bi, and the antenna with a U.FL connector and de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

### 11.2 Result

The EUT antenna is a Dipole Antenna. It complies with the standard requirement.