

# FCC Radio Test Report

**FCC ID: R36-SB65H****Report No.** : TB-FCC125548**Applicant** : CURRENT AUDIO**Equipment Under Test (EUT)****EUT Name** : Soundbar**Model No.** : SB65**Serial No.** : SB80, SB90, SB100, SP-601, SP-602, SP-603, SP-604, SP-605,  
SP-606, SP-607, SP-608, SP-609**Brand Name** : N/A**Receipt Date** : 2012-10-29**Test Date** : 2012-10-30 to 2012-11-08**Issue Date** : 2012-11-09**Standards** : FCC Part 15, Subpart C(15.247)**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>    | : | CURRENT AUDIO                                                                                                |
| <b>Address</b>      | : | 1830 John Towers Ave., El Cajon, San Diego City, CA 92020, USA                                               |
| <b>Manufacturer</b> | : | ShenZhen Ailipu Electronic Co., Ltd.                                                                         |
| <b>Address</b>      | : | Block A2, Lanbao Industrial Park, Ditang Road, Shasan Village, Shajing Town, Baoan District, Shenzhen, China |

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

|                               |   |                                                                                                                          |
|-------------------------------|---|--------------------------------------------------------------------------------------------------------------------------|
| <b>EUT Name</b>               | : | Soundbar                                                                                                                 |
| <b>Models No.</b>             | : | SB65, SB80, SB90, SB100, SP-601, SP-602, SP-603, SP-604, SP-605, SP-606, SP-607, SP-608, SP-609                          |
| <b>Model Difference</b>       | : | The different models are identical in schematic, structure and critical component, the only different is the appearance. |
| <b>Product Description</b>    | : | Operation Frequency:<br>RF(2.4G):2404~2479MHz<br>Bluetooth:2402~2480MHz                                                  |
|                               | : | Number of Channel: RF(2.4G): 16 channels <small>Note (3)</small><br>Bluetooth:79Channels <small>see note (3)</small>     |
|                               | : | Out Power 2.547mW Conducted Power                                                                                        |
|                               | : | Antenna Gain: 2 dBi PIFA Antenna <small>Note(4)</small>                                                                  |
|                               | : | Modulation Type: FHSS(FSK)                                                                                               |
| <b>Power Supply</b>           | : | DC Voltage supplied by AC/DC Adapter.                                                                                    |
| <b>Power Rating</b>           | : | Input: AC 100~240V 50/60Hz 1.5A max<br>Output: 12V 7A                                                                    |
| <b>Connecting I/O Port(S)</b> | : | 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) This Test Report is FCC Part 15.247 for FHSS RF 2.4G, and more test information about Bluetooth please refer Test Report TB-FCC124947.
- (3) Channel List:

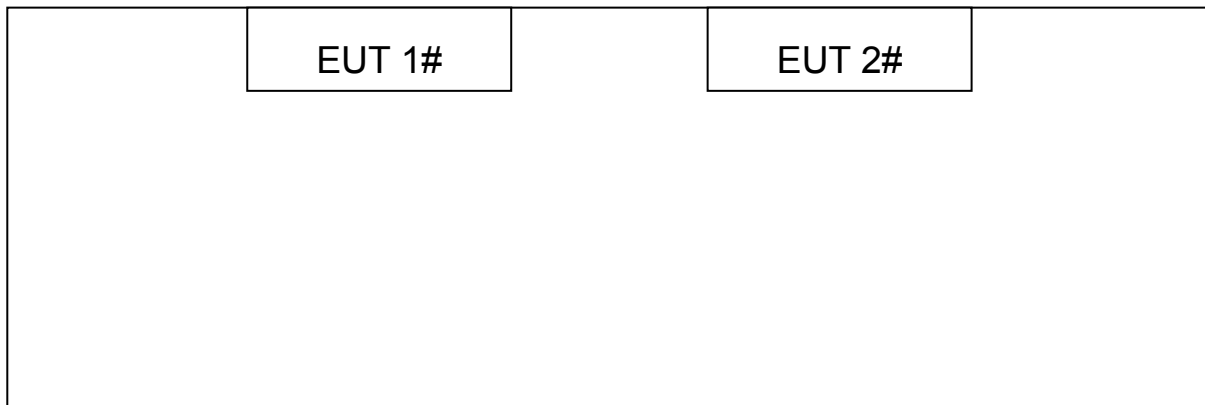
| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 00      | 2404           | 08      | 2444           |
| 01      | 2409           | 09      | 2449           |

|    |      |    |      |
|----|------|----|------|
| 02 | 2414 | 10 | 2454 |
| 03 | 2419 | 11 | 2459 |
| 04 | 2424 | 12 | 2464 |
| 05 | 2429 | 13 | 2469 |
| 06 | 2434 | 14 | 2474 |
| 07 | 2439 | 15 | 2479 |

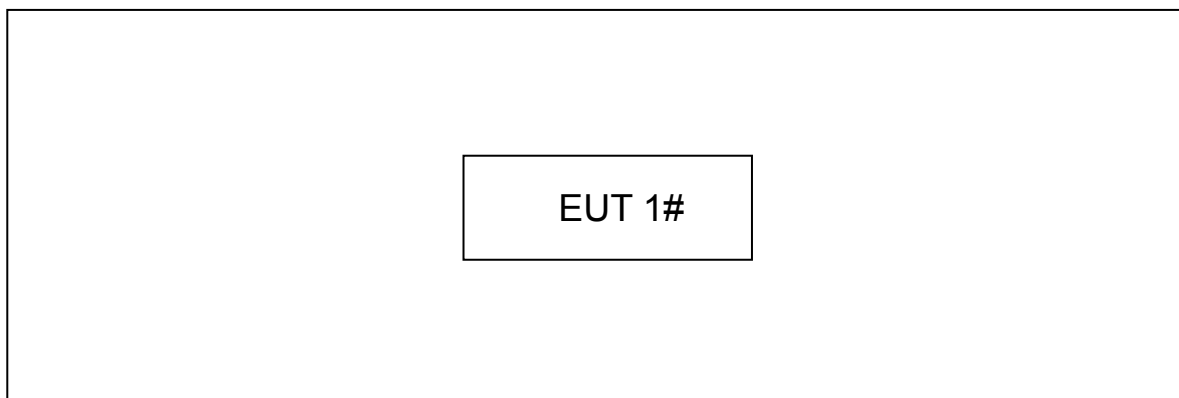
(4) The antenna information provided by the manufacturer.

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

Mode 1: RF Link



Mode 2: TX Mode



EUT 1#: Soundbar (Host system) FCC ID: R36-SB65H

EUT 2#: Soundbar (Subwoofer) FCC ID: R36-SB65S

## 1.4 Description of Support Units

No support unit have used during testing.

| Name | Model | S/N | Manufacturer | Used “√” |
|------|-------|-----|--------------|----------|
| /    | /     | /   | /            | /        |

## 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             | RF Link Mode |
| Mode 2             | TX Mode      |

| For Radiated Test |                                 |
|-------------------|---------------------------------|
| Final Test Mode   | Description                     |
| Mode 2            | TX Mode(1Mbps) Channel 00/08/15 |

### Note:

- (1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.4 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

TX Mode: FSK Channel 00/08/15

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a mobile unit; it was pre-tested on the positioned of normal use. Therefore only the test data of this X-plane was used for radiated emission measurement test.

## 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 transmitting.

## 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 Toby Technology Co., Ltd. Shenzhen Toby 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            |

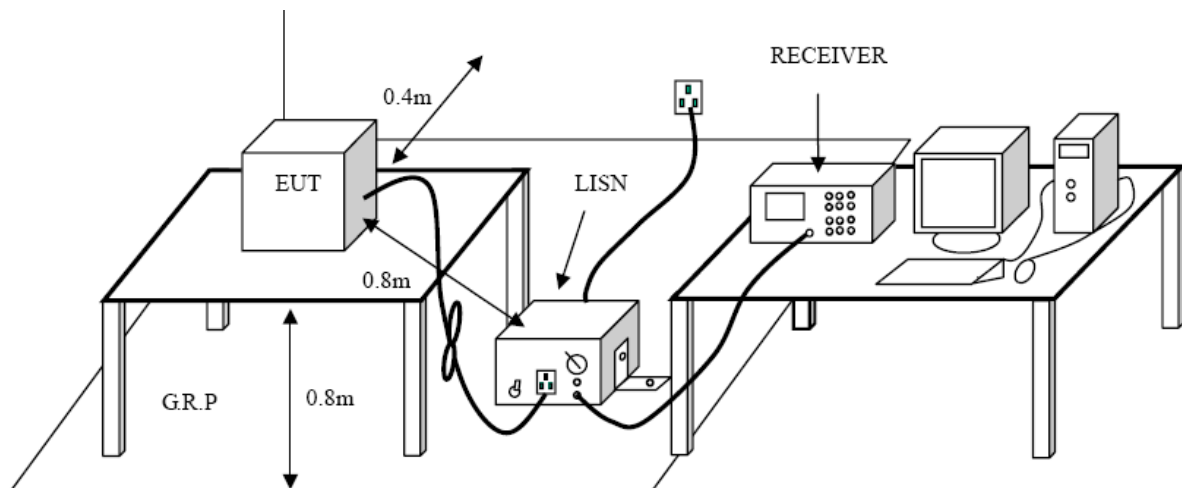
Notes:

(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.

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    | 2012-08-07 | 2013-08-06 |
| 50ΩCoaxial Switch | Anritsu        | MP59B     | X10321     | 2012-08-07 | 2013-08-06 |
| L.I.S.N           | EMCO           | 3624/1    | 00063417   | 2012-08-07 | 2013-08-06 |
| L.I.S.N           | EMCO           | 3624/1    | 00063417   | 2012-08-07 | 2013-08-06 |

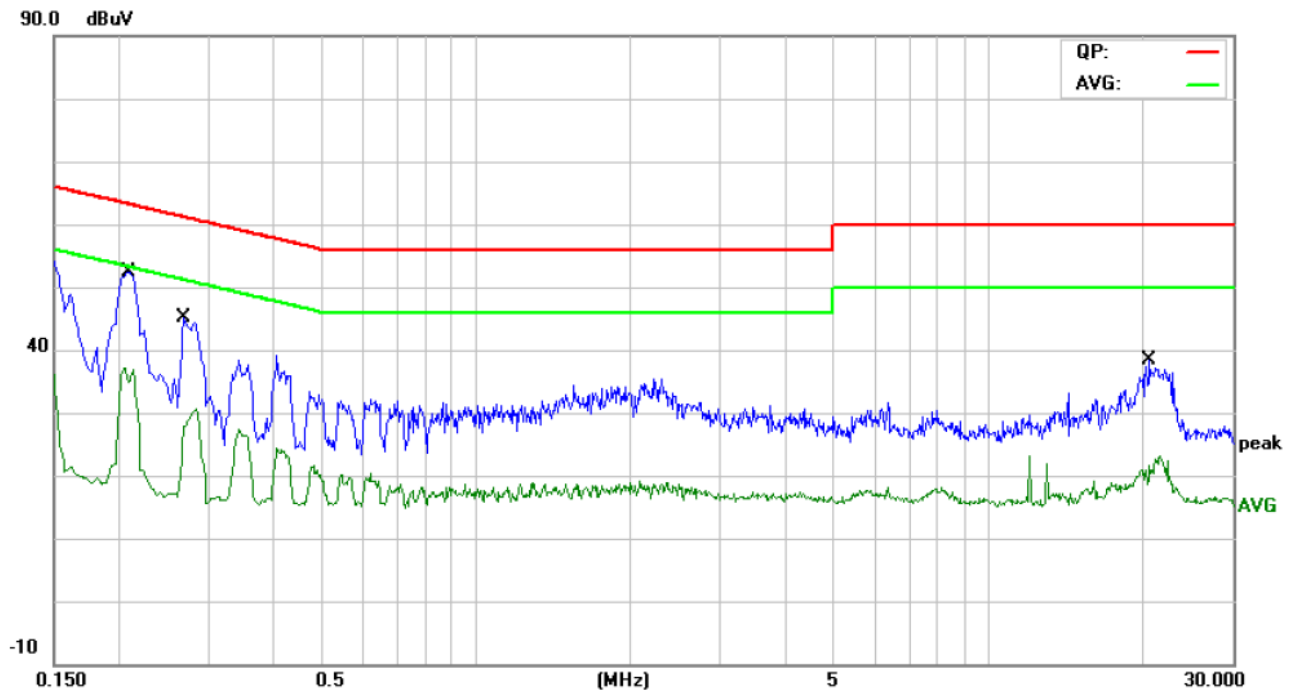
### 3.5 EUT Operating Mode

Please refer to the description of test mode.

### 3.6 Test Data

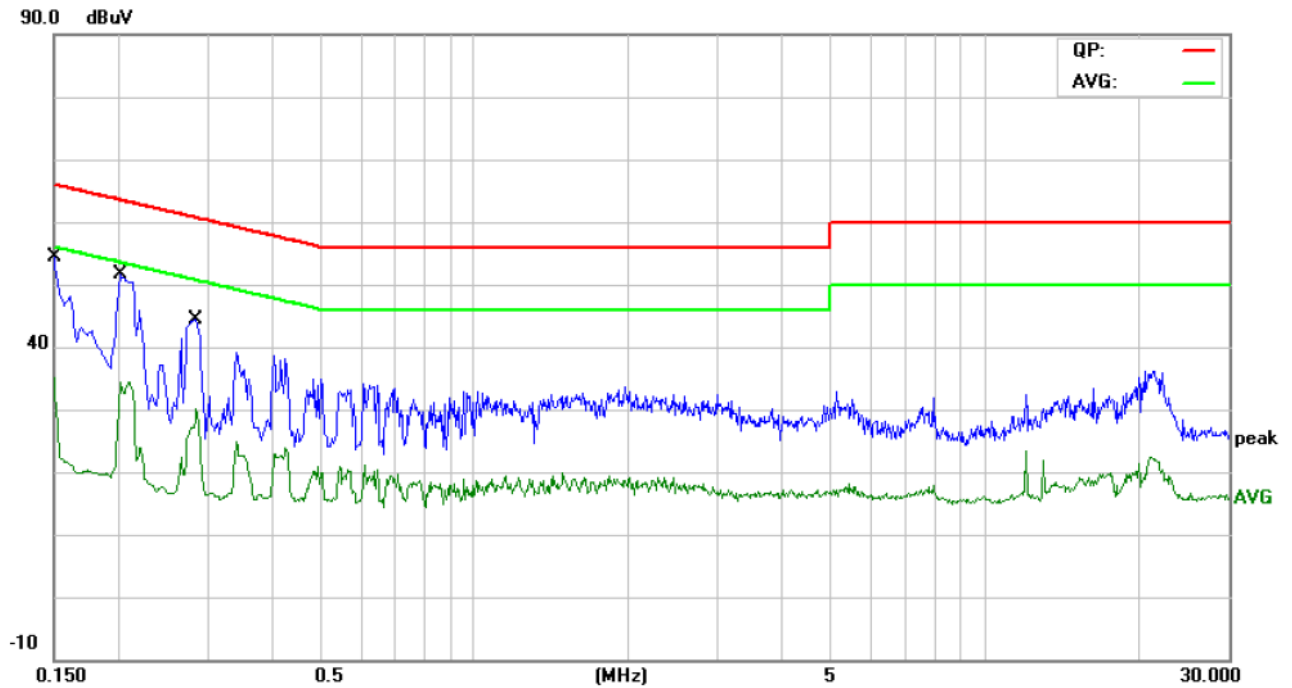
Please see the next page.

|                |                 |                     |      |
|----------------|-----------------|---------------------|------|
| E.U.T :        | Soundbar        | Model Name :        | SB65 |
| Temperature :  | 25°C            | Relative Humidity : | 52 % |
| Terminal       | Line            |                     |      |
| Test Voltage : | AC 120 V / 60Hz |                     |      |
| Test Mode :    | RF Link Mode    |                     |      |



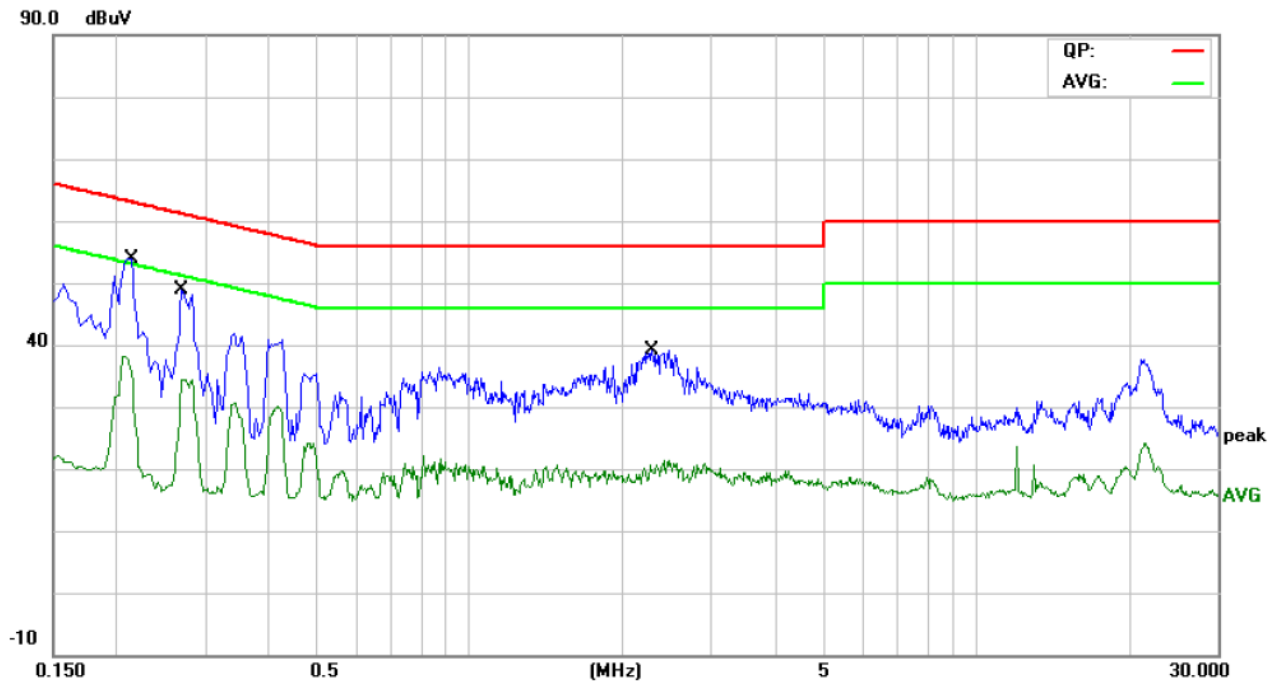
| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measure-ment | Limit | Over   |          |         |
|-----|-----|---------|---------------|----------------|--------------|-------|--------|----------|---------|
|     |     | MHz     | dBuV          | dB             | dBuV         | dBuV  | dB     | Detector | Comment |
| 1   | *   | 0.2100  | 39.37         | 10.28          | 49.65        | 63.20 | -13.55 | QP       |         |
| 2   |     | 0.2100  | 24.97         | 10.28          | 35.25        | 53.20 | -17.95 | AVG      |         |
| 3   |     | 0.2700  | 31.68         | 9.90           | 41.58        | 61.12 | -19.54 | QP       |         |
| 4   |     | 0.2700  | 15.64         | 9.90           | 25.54        | 51.12 | -25.58 | AVG      |         |
| 5   |     | 20.6100 | 17.51         | 10.28          | 27.79        | 60.00 | -32.21 | QP       |         |
| 6   |     | 20.6100 | 8.37          | 10.28          | 18.65        | 50.00 | -31.35 | AVG      |         |

|                |                 |                     |      |
|----------------|-----------------|---------------------|------|
| E.U.T :        | Soundbar        | Model Name :        | SB65 |
| Temperature :  | 25°C            | Relative Humidity : | 52 % |
| Terminal       | Neutral         |                     |      |
| Test Voltage : | AC 120 V / 60Hz |                     |      |
| Test Mode :    | RF Link Mode    |                     |      |



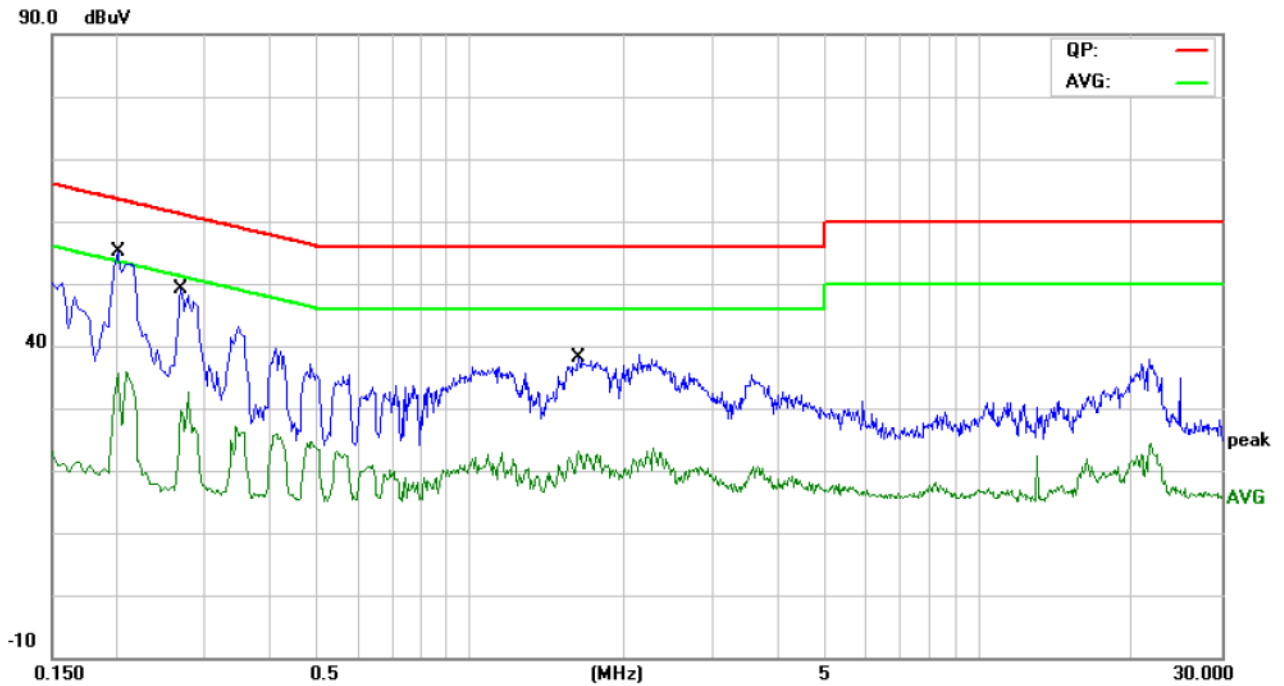
| No. Mk. | Freq.  | Reading Level | Correct Factor | Measure-ment | Limit | Over   | Detector | Comment |
|---------|--------|---------------|----------------|--------------|-------|--------|----------|---------|
|         | MHz    | dBuV          | dB             | dBuV         | dBuV  | dB     |          |         |
| 1       | 0.1500 | 37.80         | 10.93          | 48.73        | 65.99 | -17.26 | QP       |         |
| 2       | 0.1500 | 18.25         | 10.93          | 29.18        | 55.99 | -26.81 | AVG      |         |
| 3 *     | 0.2020 | 38.82         | 10.34          | 49.16        | 63.52 | -14.36 | QP       |         |
| 4       | 0.2020 | 20.36         | 10.34          | 30.70        | 53.52 | -22.82 | AVG      |         |
| 5       | 0.2860 | 30.98         | 9.84           | 40.82        | 60.64 | -19.82 | QP       |         |
| 6       | 0.2860 | 15.74         | 9.84           | 25.58        | 50.64 | -25.06 | AVG      |         |

|                |                 |                     |      |
|----------------|-----------------|---------------------|------|
| E.U.T :        | Soundbar        | Model Name :        | SB65 |
| Temperature :  | 25°C            | Relative Humidity : | 52 % |
| Terminal       | Line            |                     |      |
| Test Voltage : | AC 120 V / 60Hz |                     |      |
| Test Mode :    | TX Mode         |                     |      |



| No. | Mk. | Freq.  | Reading Level | Correct Factor | Measurement | Limit | Over   |          |         |
|-----|-----|--------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz    | dBuV          | dB             | dBuV        | dBuV  | dB     | Detector | Comment |
| 1   | *   | 0.2140 | 35.34         | 10.25          | 45.59       | 63.04 | -17.45 | QP       |         |
| 2   |     | 0.2140 | 19.45         | 10.25          | 29.70       | 53.04 | -23.34 | AVG      |         |
| 3   |     | 0.2700 | 32.57         | 9.90           | 42.47       | 61.12 | -18.65 | QP       |         |
| 4   |     | 0.2700 | 21.53         | 9.90           | 31.43       | 51.12 | -19.69 | AVG      |         |
| 5   |     | 2.2940 | 22.40         | 9.37           | 31.77       | 56.00 | -24.23 | QP       |         |
| 6   |     | 2.2940 | 8.67          | 9.37           | 18.04       | 46.00 | -27.96 | AVG      |         |

|                |                 |                     |      |
|----------------|-----------------|---------------------|------|
| E.U.T :        | Soundbar        | Model Name :        | SB65 |
| Temperature :  | 25°C            | Relative Humidity : | 52 % |
| Terminal       | Neutral         |                     |      |
| Test Voltage : | AC 120 V / 60Hz |                     |      |
| Test Mode :    | TX Mode         |                     |      |



| No. | Mk. | Freq.  | Reading | Correct | Measure- | Limit | Over   |          |         |
|-----|-----|--------|---------|---------|----------|-------|--------|----------|---------|
|     |     | MHz    | Level   | Factor  | ment     |       |        | Detector | Comment |
|     |     |        | dBuV    | dB      | dBuV     | dBuV  | dB     |          |         |
| 1   | *   | 0.2020 | 41.64   | 10.34   | 51.98    | 63.52 | -11.54 | QP       |         |
| 2   |     | 0.2020 | 21.26   | 10.34   | 31.60    | 53.52 | -21.92 | AVG      |         |
| 3   |     | 0.2700 | 35.49   | 9.90    | 45.39    | 61.12 | -15.73 | QP       |         |
| 4   |     | 0.2700 | 16.45   | 9.90    | 26.35    | 51.12 | -24.77 | AVG      |         |
| 5   |     | 1.6340 | 23.26   | 9.35    | 32.61    | 56.00 | -23.39 | QP       |         |
| 6   |     | 1.6340 | 11.15   | 9.35    | 20.50    | 46.00 | -25.50 | 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 (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                             |

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

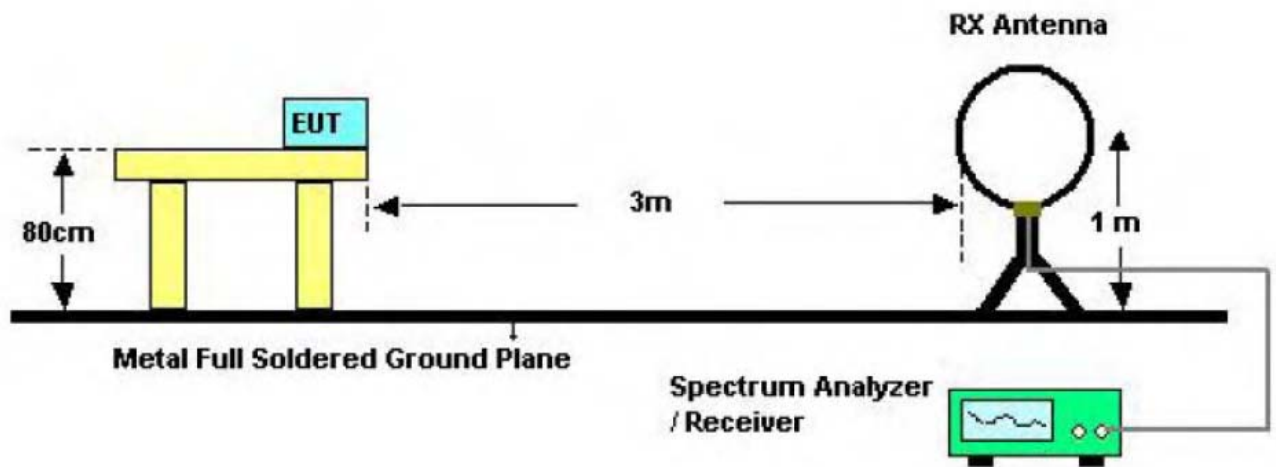
| Frequency (MHz) | Class A (dBuV/m)(at 3m) |         | Class B (dBuV/m)(at 3m) |         |
|-----------------|-------------------------|---------|-------------------------|---------|
|                 | Peak                    | Average | Peak                    | Average |
| Above 1000      | 80  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

**Note:**

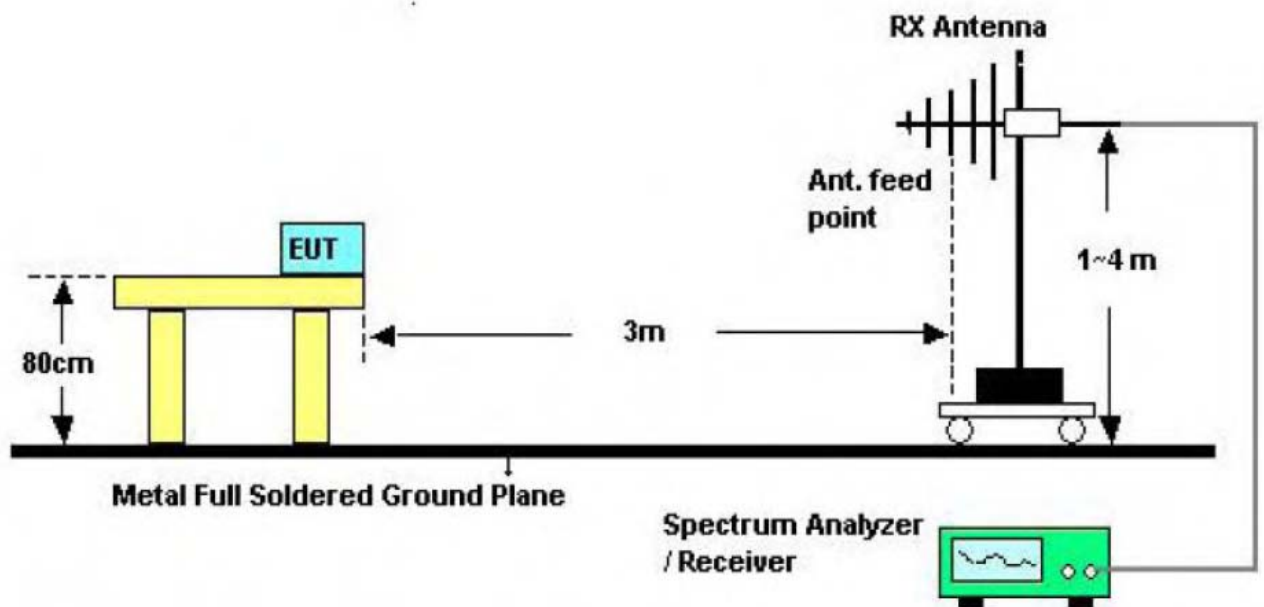
(1) The tighter limit applies at the band edges.

(2) Emission Level(dBuV/m)=20log Emission Level(uV/m)

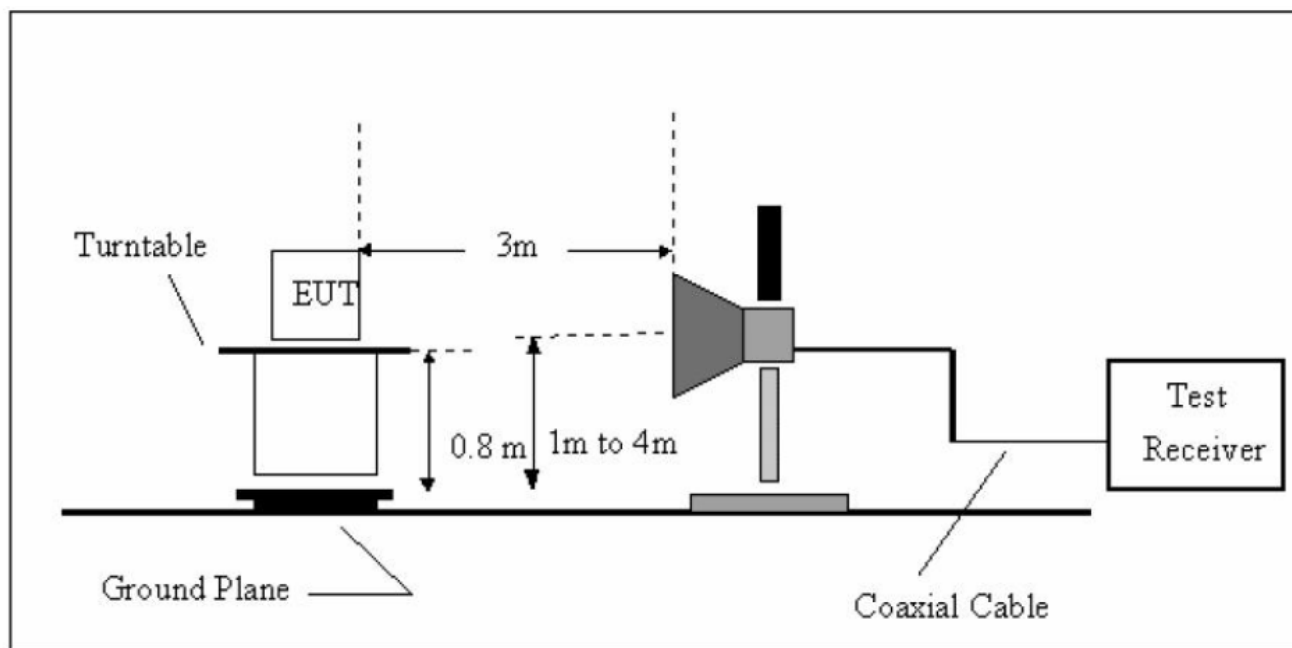
## 4.2 Test Setup



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 in TX mode.

### 4.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2012-08-07 | 2013-08-06 |
| Positioning       | C&C            | CC-C-1F   | N/A        | 2012-08-07 | 2013-08-06 |

| Controller                     |                   |              |            |            |            |
|--------------------------------|-------------------|--------------|------------|------------|------------|
| Trilog<br>Broadband<br>Antenna | SCHWARZBEC<br>K   | VULB9163     | 9163-333   | 2012-07-13 | 2013-07-12 |
| Horn<br>Antenna                | SCHWARZBEC<br>K   | BBHX<br>9120 | 9120-426   | 2012-07-13 | 2013-07-12 |
| RF Switch                      | EM                | EMSW18       | SW060023   | 2012-08-07 | 2013-08-06 |
| Amplifier                      | Agilent           | 8447F        | 3113A06717 | 2012-08-07 | 2013-08-06 |
| Coaxial<br>Cable               | SCHWARZBEC<br>K   | AK9513       | 9513-10    | 2012-08-07 | 2013-08-06 |
| EMI Test<br>Receiver           | ROHDE&<br>SCHWARZ | ESPI         | 25498514   | 2012-08-07 | 2013-08-06 |
| EMI Test<br>Receiver           | ROHDE&<br>SCHWARZ | ESI26        | 838786/103 | 2012-08-07 | 2013-08-06 |
| Receiver<br>Horn<br>Antenna    | ROHDE&<br>SCHWARZ | HF906        | 100013     | 2012-08-07 | 2013-08-06 |

## 4.6 Test Data

Please see the next page.

Operation Mode: TX 2404MHz      Test Date : November 06, 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 |
|----------------|-----------------|----------------------------|------------------------|----------------|------|
| 30.000         | H               | 36.21                      | 40.00                  | 3.79           | PK   |
| 45.260         | H               | 36.29                      | 40.00                  | 3.71           | PK   |
| 62.920         | H               | 35.93                      | 40.00                  | 4.07           | PK   |
| 90.450         | H               | 39.66                      | 43.50                  | 3.84           | PK   |
| 128.750        | H               | 38.76                      | 43.50                  | 4.74           | PK   |
| 216.320        | H               | 40.22                      | 46.00                  | 5.78           | PK   |
| 30.000         | V               | 35.63                      | 40.00                  | 4.37           | PK   |
| 78.450         | V               | 35.60                      | 40.00                  | 4.40           | PK   |
| 99.020         | V               | 38.37                      | 43.50                  | 8.13           | PK   |
| 171.530        | V               | 39.28                      | 43.50                  | 4.22           | PK   |
| 173.620        | V               | 37.06                      | 43.50                  | 6.44           | PK   |
| 392.690        | V               | 41.38                      | 46.00                  | 4.62           | 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 2404MHz    | Test Date :   | November 06, 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    |
| 4808.920       | V               | 48.66                      | 41.02 | 74.00               | 54.00 | 25.34      | 12.98 |
| 7213.340       | V               | 43.05                      | 36.14 | 74.00               | 54.00 | 30.95      | 17.86 |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| 4804.910       | H               | 49.87                      | 44.25 | 74.00               | 54.00 | 24.13      | 9.75  |
| 7213.340       | H               | 42.20                      | 36.82 | 74.00               | 54.00 | 31.80      | 17.18 |
| --             | 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.

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|                    |               |               |                   |
|--------------------|---------------|---------------|-------------------|
| Operation Mode:    | TX 2444MHz    | Test Date :   | November 06, 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    |
| 4888.920       | V               | 48.10                      | 41.67 | 74.00               | 54.00 | 25.90      | 12.33 |
| 7333.480       | V               | 40.15                      | 33.22 | 74.00               | 54.00 | 33.85      | 20.78 |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| 4888.930       | H               | 49.45                      | 43.31 | 74.00               | 54.00 | 24.55      | 10.69 |
| 7333.470       | H               | 43.06                      | 36.84 | 74.00               | 54.00 | 30.94      | 17.16 |
| --             | 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 2479MHz    | Test Date :   | November 06, 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    |
| 4959.020       | V               | 48.06                      | 42.23 | 74.00               | 54.00 | 25.94      | 11.77 |
| 7438.110       | V               | 39.55                      | 33.26 | 74.00               | 54.00 | 34.45      | 20.74 |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| --             | V               | --                         | --    | 74.00               | 54.00 | --         | --    |
| 4959.040       | H               | 47.24                      | 41.52 | 74.00               | 54.00 | 26.76      | 12.48 |
| 7438.110       | H               | 41.06                      | 35.11 | 74.00               | 54.00 | 32.94      | 18.89 |
| --             | 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

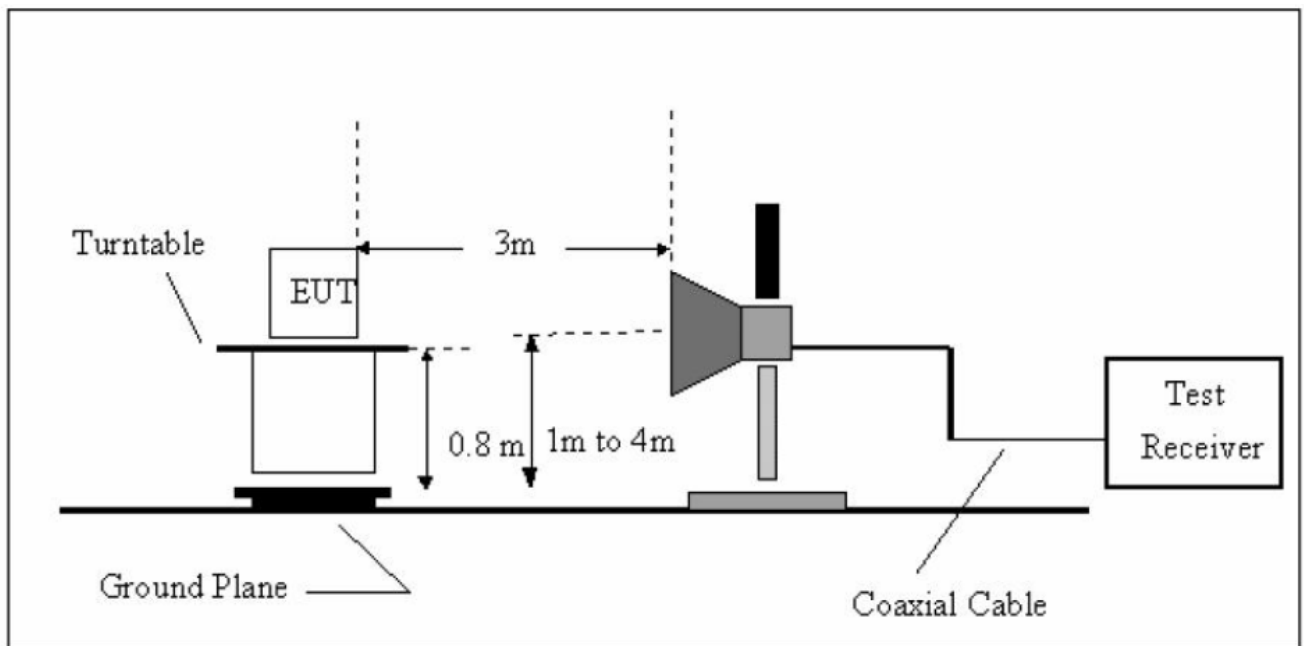
FCC Part 15.209

FCC Part 15.205

#### 5.1.2 Test Limit

| Restricted Frequency Band (MHz) | Class B (dBuV/m)(at 3m) |         |
|---------------------------------|-------------------------|---------|
|                                 | 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    | 2012-08-07 | 2013-08-06 |
| Positioning Controller   | C&C            | CC-C-1F   | N/A        | 2012-08-07 | 2013-08-06 |
| Trilog Broadband Antenna | SCHWARZBECK    | VULB9163  | 9163-333   | 2012-07-13 | 2013-07-12 |
| Horn Antenna             | SCHWARZBECK    | BBHX 9120 | 9120-426   | 2012-07-13 | 2013-07-12 |
| RF Switch                | EM             | EMSW18    | SW060023   | 2012-08-07 | 2013-08-06 |
| Amplifier                | Agilent        | 8447F     | 3113A06717 | 2012-08-07 | 2013-08-06 |
| Coaxial Cable            | SCHWARZBECK    | AK9513    | 9513-10    | 2012-08-07 | 2013-08-06 |
| EMI Test Receiver        | ROHDE& SCHWARZ | ESPI      | 25498514   | 2012-08-07 | 2013-08-06 |
| EMI Test Receiver        | ROHDE& SCHWARZ | ESI26     | 838786/103 | 2012-08-07 | 2013-08-06 |
| Receiver Horn Antenna    | ROHDE& SCHWARZ | HF906     | 100013     | 2012-08-07 | 2013-08-06 |

## 5.6 Test Data

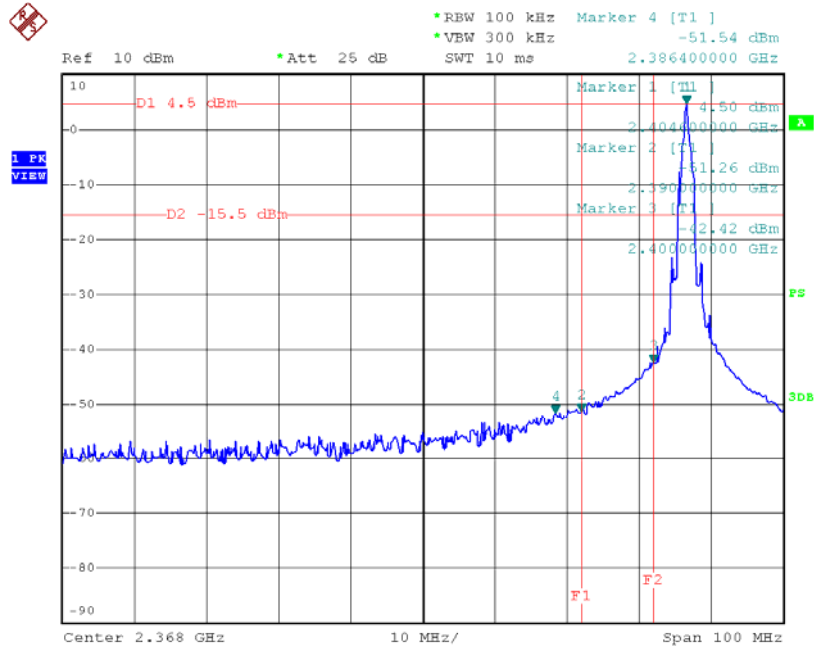
Spectrum Detector: PK                      Test Date : November 07, 2012  
Temperature : 28 °C                      Humidity : 65 %

### 1. Conducted Test

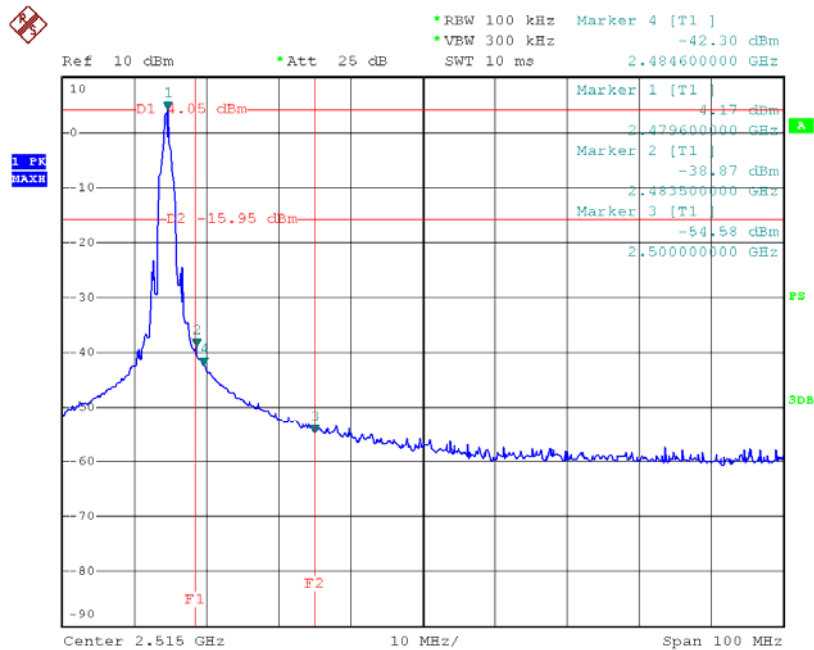
| Frequency (MHz) | Peak Power Output(dBm) | Emission Read Value(dBm) | Result of Band edge(dBc) | Band edge Limit(dBc) |
|-----------------|------------------------|--------------------------|--------------------------|----------------------|
| <2400           | 4.50                   | -51.54                   | 47.04                    | >20dBc               |
| >2483.5         | 4.05                   | -42.30                   | 38.25                    | >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                          | 53.76             | 44.29 | 74.00                    | 54.00 |
| 2390.0          | V                          | 52.06             | 43.51 | 74.00                    | 54.00 |
| 2483.5          | H                          | 58.63             | 47.74 | 74.00                    | 54.00 |
| 2483.5          | V                          | 56.52             | 45.85 | 74.00                    | 54.00 |



Date: 7.NOV.2012 15:25:34



Date: 7.NOV.2012 15:17:48

## 6. Number of Hopping Channel

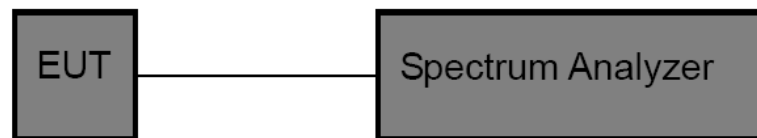
### 6.1 Test Standard and Limit

5.1.1 Test Standard  
FCC Part 15.247 (a)(1)

5.1.2 Test Limit

| 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

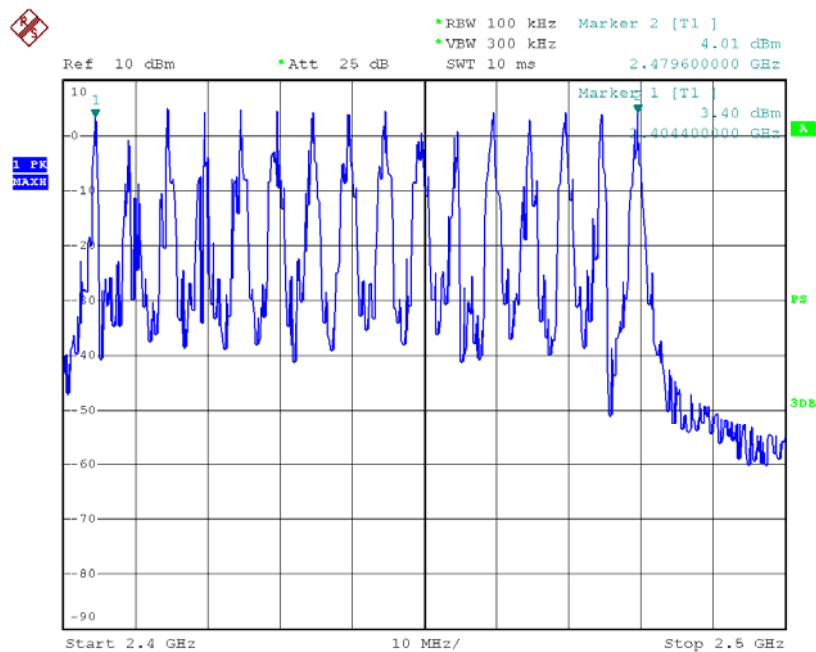
The EUT was set to the Hopping Mode by the Customer.

### 6.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2012-08-07 | 2013-08-06 |

### 6.6 Test Data

| Hopping Mode                    |                             |       |
|---------------------------------|-----------------------------|-------|
| Hopping Channel Frequency Range | Quantity of Hopping Channel | Limit |
| 2404~2479                       | 16                          | >15   |



Date: 7.NOV.2012 15:10:35

## 7. Average Time of Occupancy

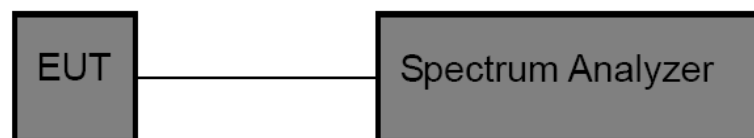
### 7.1 Test Standard and Limit

5.1.1 Test Standard  
FCC Part 15.247 (a)(1)

5.1.2 Test Limit

| 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    | 2012-08-07 | 2013-08-06 |

## 7.6 Test Data

### Mode: Hopping Mode

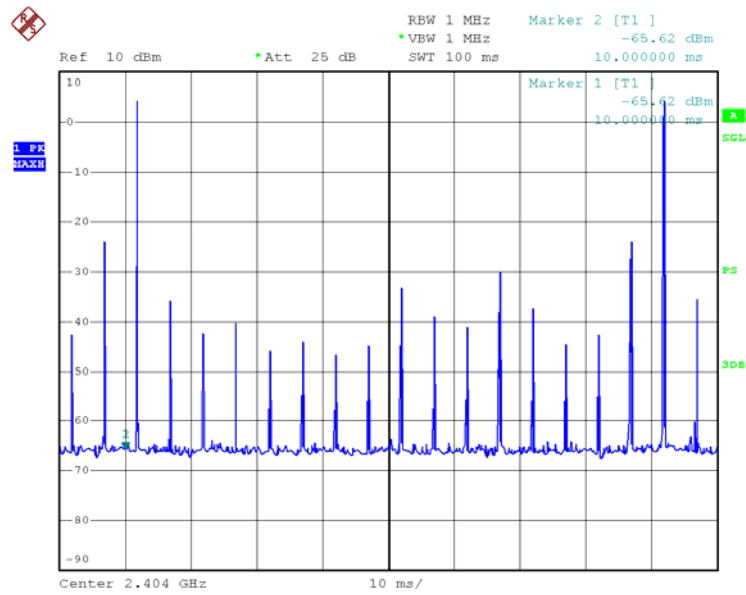
| Mode     | Number of transmission in a cycle | Length of transmission time (ms) | Result (msec) | Limit (ms) |
|----------|-----------------------------------|----------------------------------|---------------|------------|
| 2404 MHz | $(2/0.1)*6.4=128$ times           | 0.16                             | 20.48         | 400        |

**Note:** More detailed information please see following:

|                                                           | Result                         |
|-----------------------------------------------------------|--------------------------------|
| One cycle time (Seconds)                                  | $16 \text{ CH} * 0.4 = 6.4$    |
| The total number of frequency-hopping per second          | $(2/0.1) * 16 = 320$           |
| The number of occupied channels per second                | $320/16 = 20$ (number per sec) |
| Occupied time for each channel (A)                        | 0.16 ms                        |
| The total number of channels occupied within on cycle (B) | $(2/0.1) * 6.4 = 128$ times    |
| The average time of occupancy within one cycle (A)*(B)    | 20.48 ms                       |
| Limit                                                     | 400 ms                         |

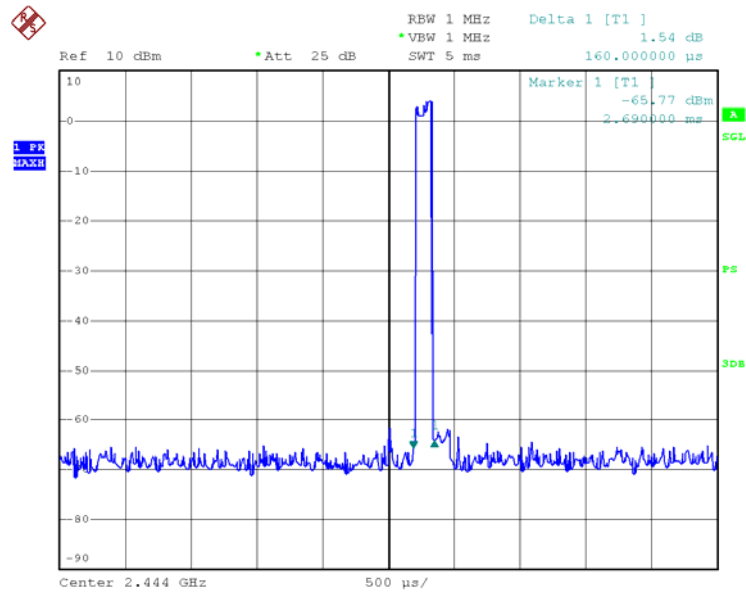
Please refer to the following data:

## Hopping Mode(2 times per 100ms)



Date: 7.NOV.2012 15:12:30

## Occupied time of each pulse



Date: 7.NOV.2012 15:13:57

## 8. Channel Separation and Bandwidth Test

### 8.1 Test Standard and Limit

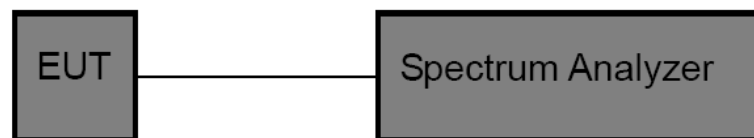
#### 8.1.1 Test Standard

FCC Part 15.247

#### 8.1.2 Test Limit

| Test Item          | Limit                                                            | Frequency Range(MHz) |
|--------------------|------------------------------------------------------------------|----------------------|
| Channel Separation | >25KHz or >two-thirds of 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

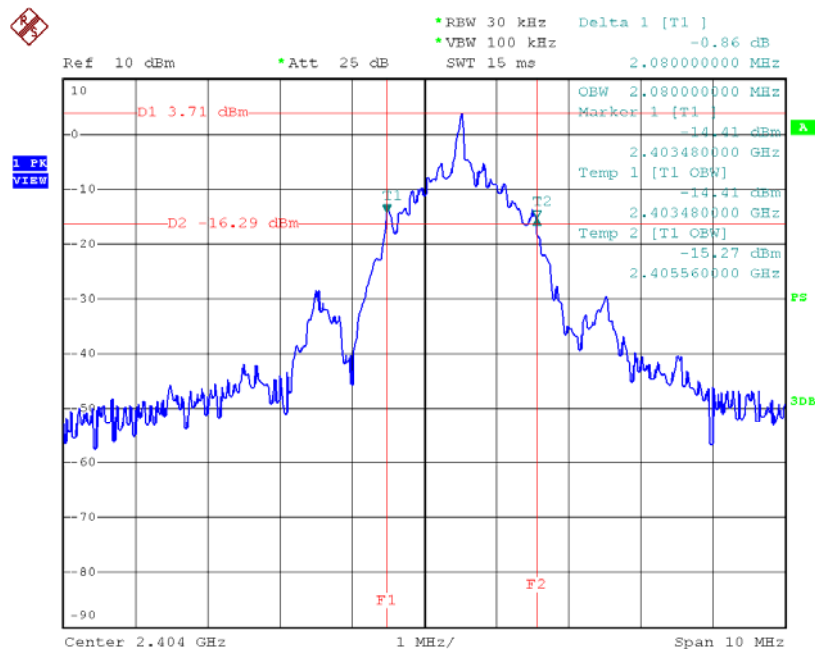
| Description | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Date |
|-------------|--------------|-----------|------------|-----------|-----------|
|-------------|--------------|-----------|------------|-----------|-----------|

|                   |                |        |         |            |            |
|-------------------|----------------|--------|---------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20 | DE25181 | 2012-08-07 | 2013-08-06 |
|-------------------|----------------|--------|---------|------------|------------|

## 8.6 Test Data

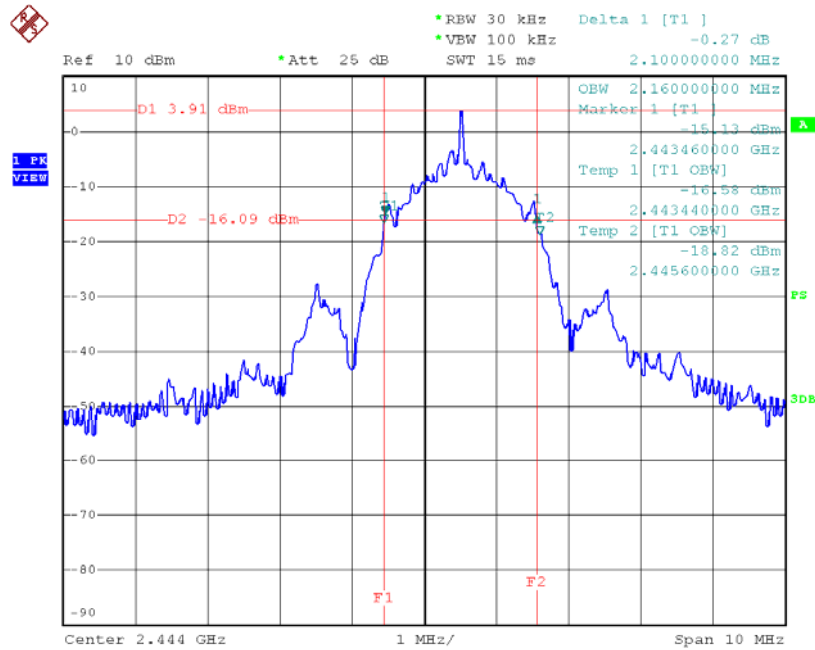
| TX Mode                 |               |                      |                      |
|-------------------------|---------------|----------------------|----------------------|
| Channel frequency (MHz) | 99% OBW (kHz) | 20dB Bandwidth (kHz) | Read Value*2/3 (kHz) |
| 2404                    | 2080.00       | 2080.00              | 1386.67              |
| 2444                    | 2160.00       | 2100.00              | 1400.00              |
| 2479                    | 2120.00       | 2100.00              | 1400.00              |

### 2404 MHz



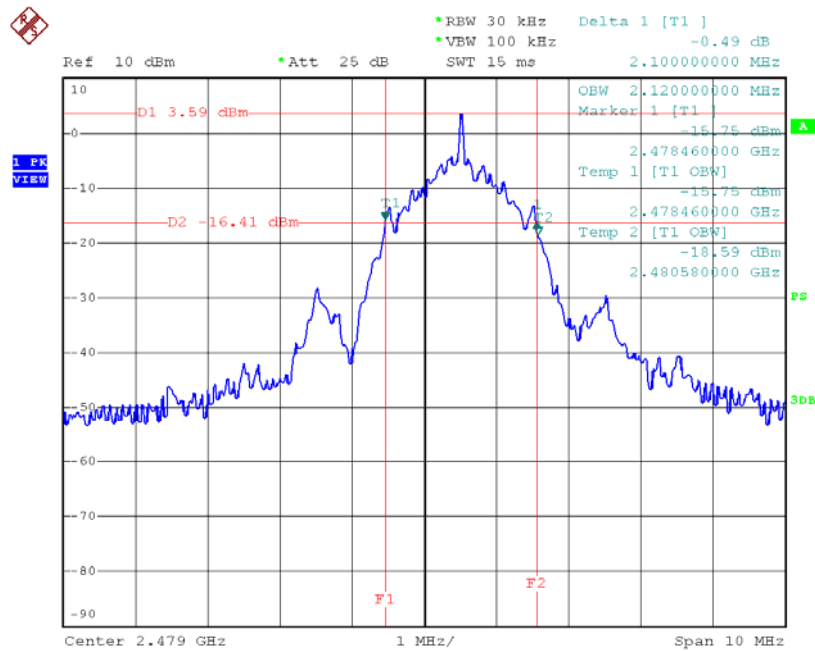
Date: 7.NOV.2012 15:23:57

## 2444 MHz



Date: 7.NOV.2012 15:22:35

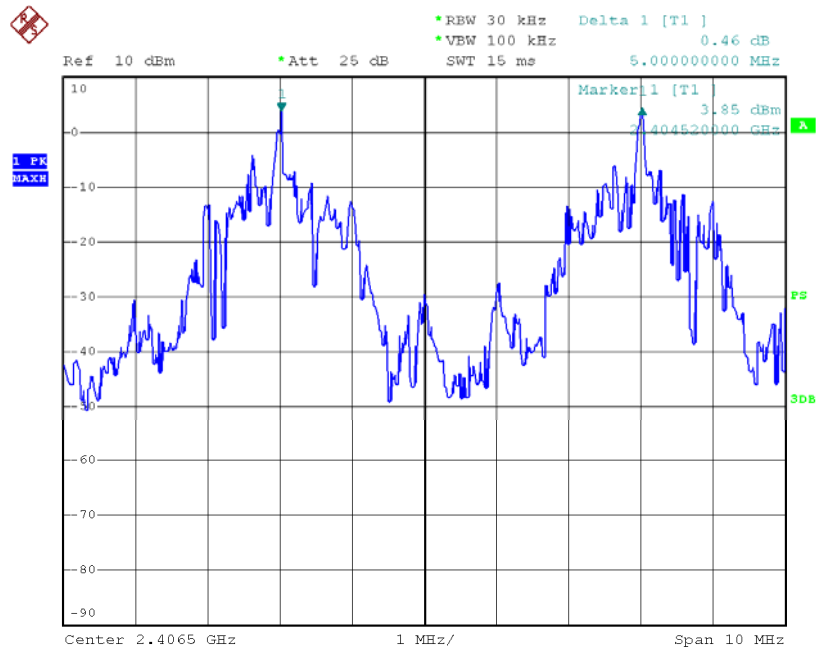
## 2479 MHz



Date: 7.NOV.2012 15:20:01

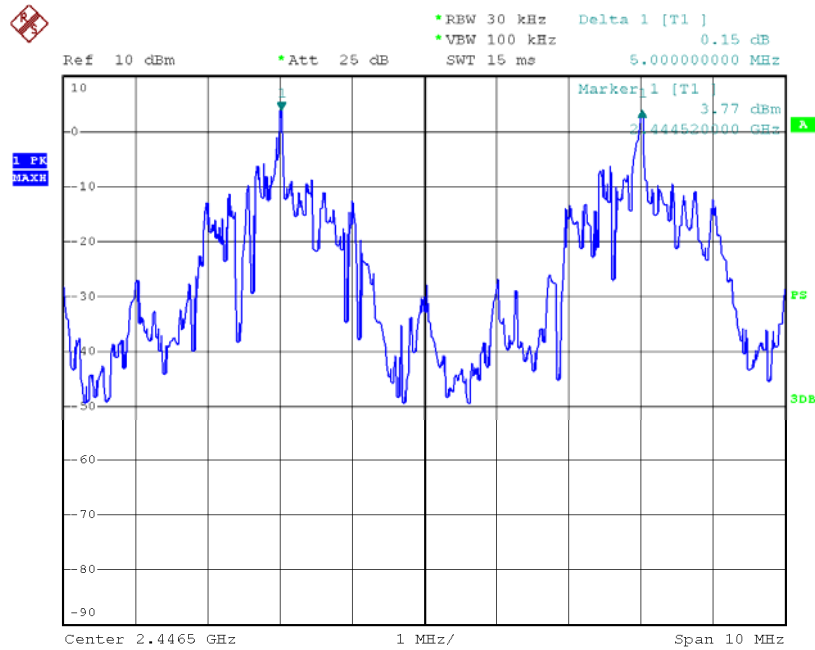
| Hopping Mode   |                         |                             |                        |
|----------------|-------------------------|-----------------------------|------------------------|
| Channel number | Channel frequency (MHz) | Separation Read Value (kHz) | Separation Limit (kHz) |
| CH 00          | 2404                    | 5000.00                     | >1386.67               |
| CH 08          | 2444                    | 5000.00                     | >1400.00               |
| CH 15          | 2479                    | 5020.00                     | >1400.00               |

## 2404 MHz



Date: 7.NOV.2012 15:29:39

## 2444 MHz



Date: 7.NOV.2012 15:31:46

## 2479 MHz



Date: 7.NOV.2012 15:33:52

## 9. Peak Output Power Test

### 9.1 Test Standard and Limit

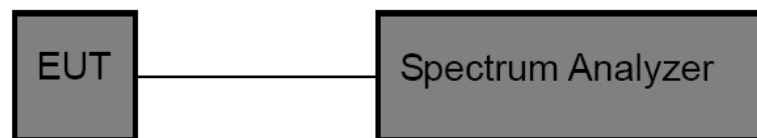
#### 9.1.1 Test Standard

FCC Part 15.247 (b) (1)

#### 9.1.2 Test Limit

| 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.

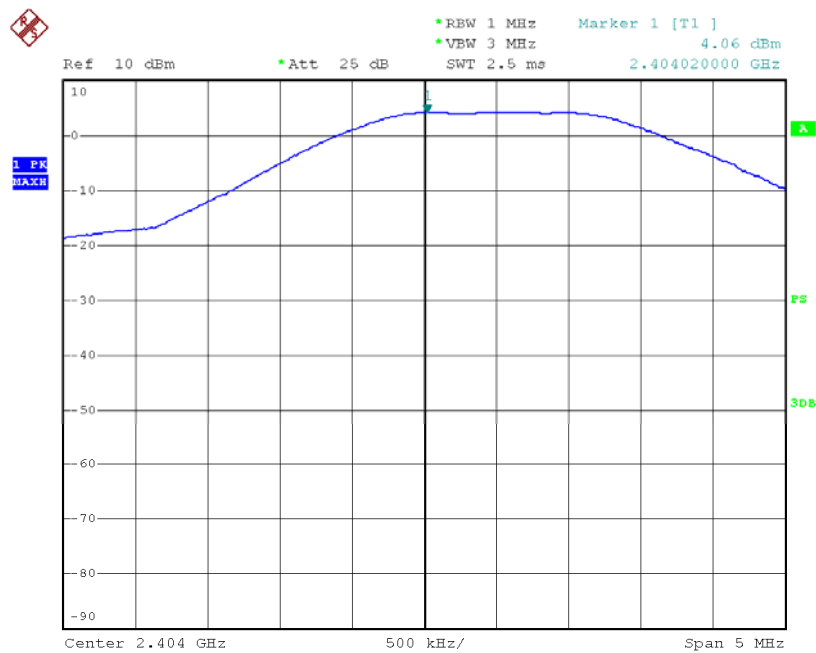
### 9.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2012-08-07 | 2013-08-06 |

### 8.6 Test Data

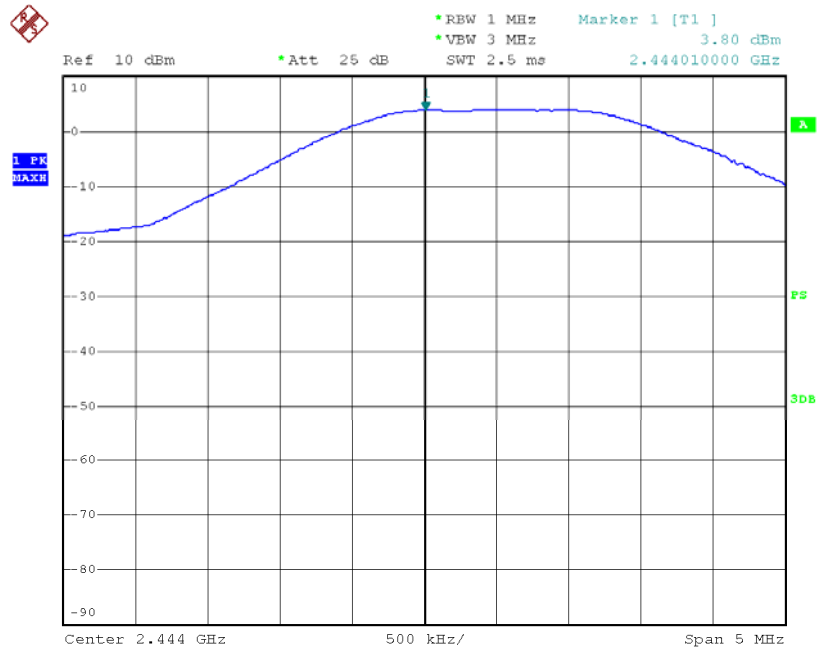
| TX Mode        |                         |                   |                |
|----------------|-------------------------|-------------------|----------------|
| Channel number | Channel frequency (MHz) | Test Result (dBm) | Limit          |
| CH 00          | 2404                    | 4.06              | 0.125W(21dBm)  |
| CH 08          | 2444                    | 3.80              | 0.125W(21dBm)  |
| CH 15          | 2479                    | 3.43              | 0.125W(21dBm)) |

### 2404 Power



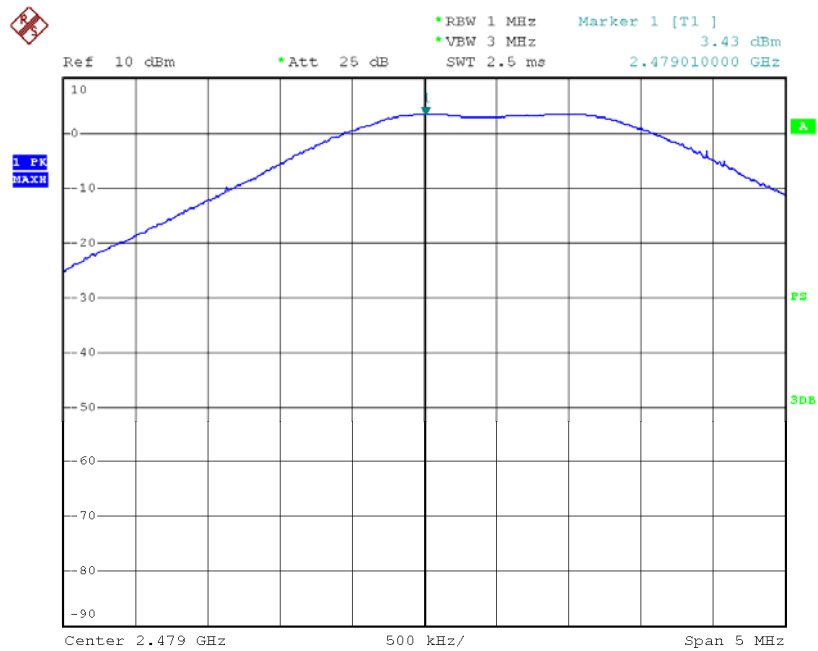
Date: 7.NOV.2012 15:35:37

## 2444 Power



Date: 7.NOV.2012 15:36:11

## 2479 Power



Date: 7.NOV.2012 15:36:33

## 10. Antenna Conducted Spurious Emission

### 10.1 Test Standard and Limit

#### 10.1.1 Test Standard

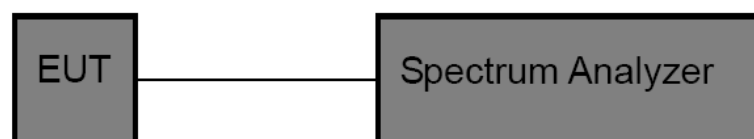
FCC Part 15.247 (d)

#### 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<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                                |

### 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.

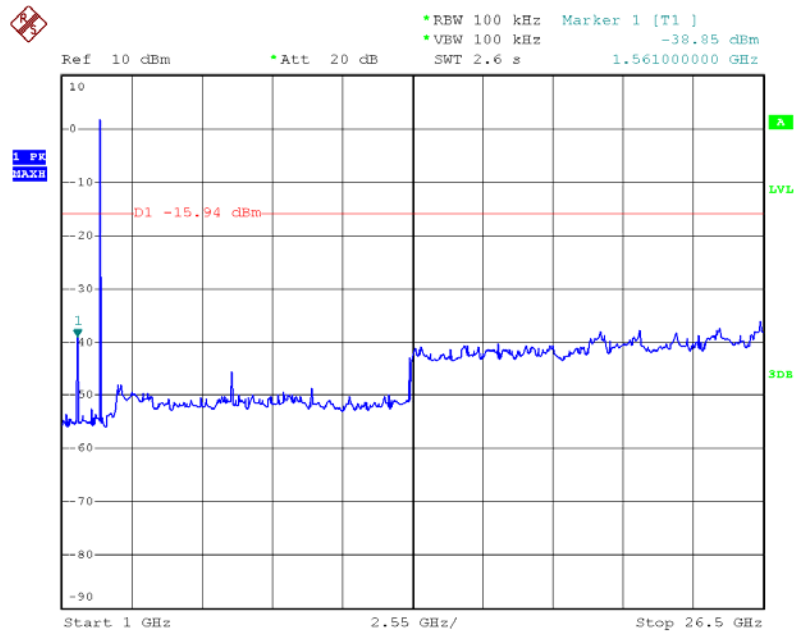
## 10.5 Test Equipment

| Description       | Manufacturer   | Model No. | Serial No. | Cal. Date  | Cal. Date  |
|-------------------|----------------|-----------|------------|------------|------------|
| Spectrum Analyzer | ROHDE& SCHWARZ | FSEA20    | DE25181    | 2012-08-07 | 2013-08-06 |

## 10.6 Test Data

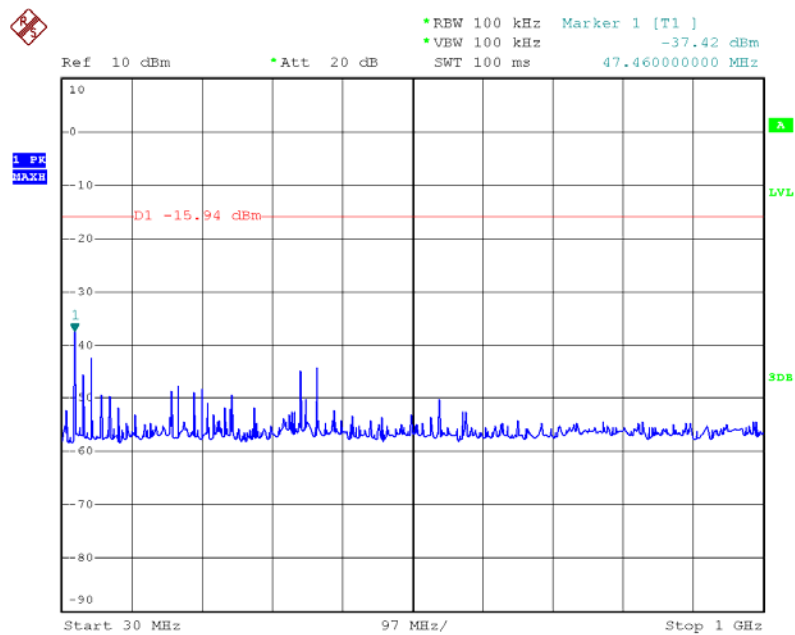
TX CH 00 2404MHz

Above 1 GHz



Date: 7.NOV.2012 13:32:20

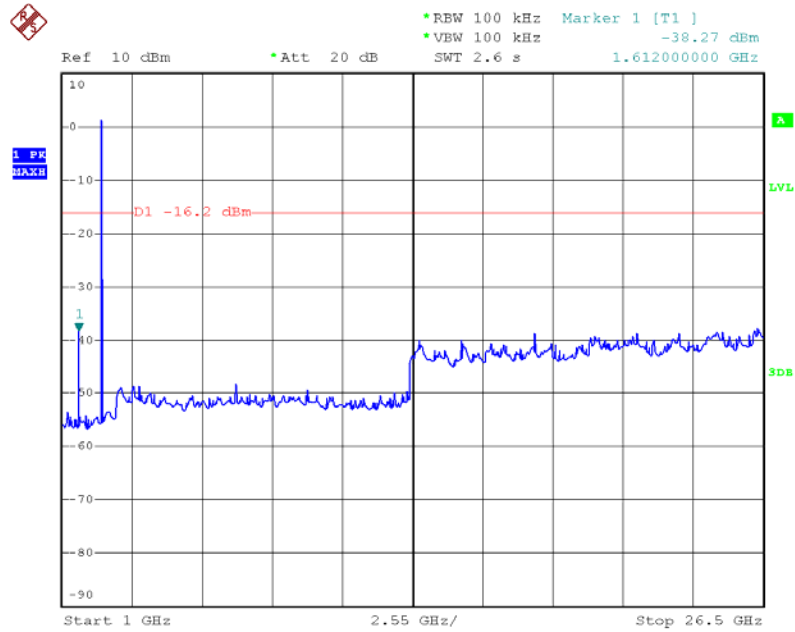
Bellow 1 GHz



Date: 7.NOV.2012 13:31:53

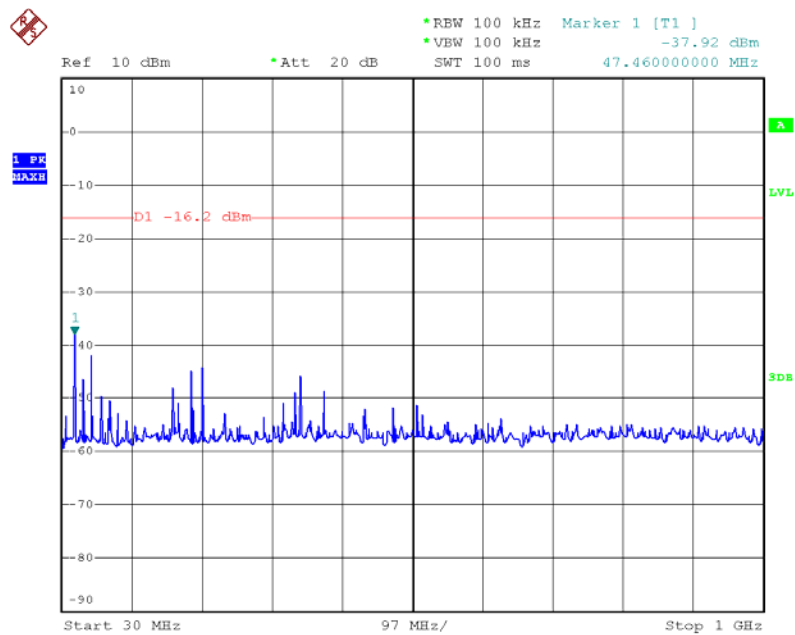
## TX CH 08 2444MHz

### Above 1 GHz



Date: 7.NOV.2012 13:51:57

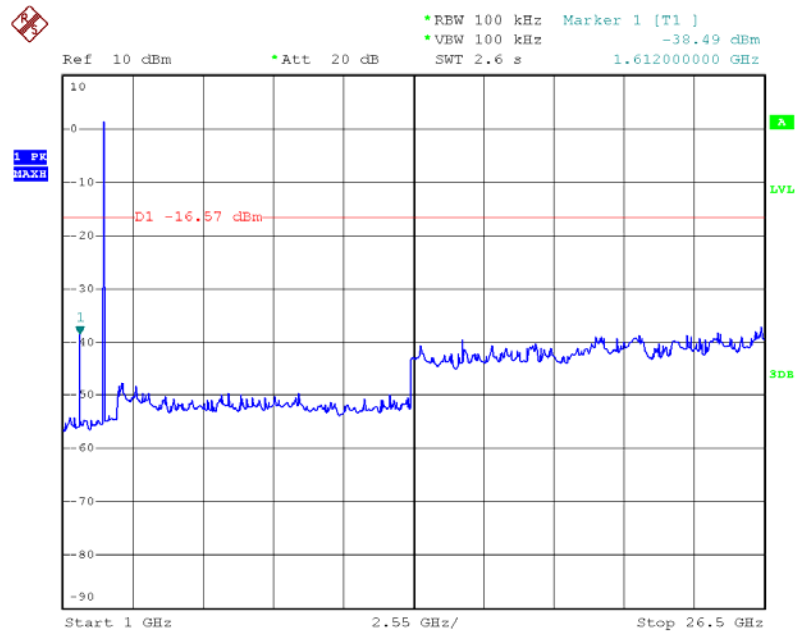
### Bellow 1 GHz



Date: 7.NOV.2012 13:51:40

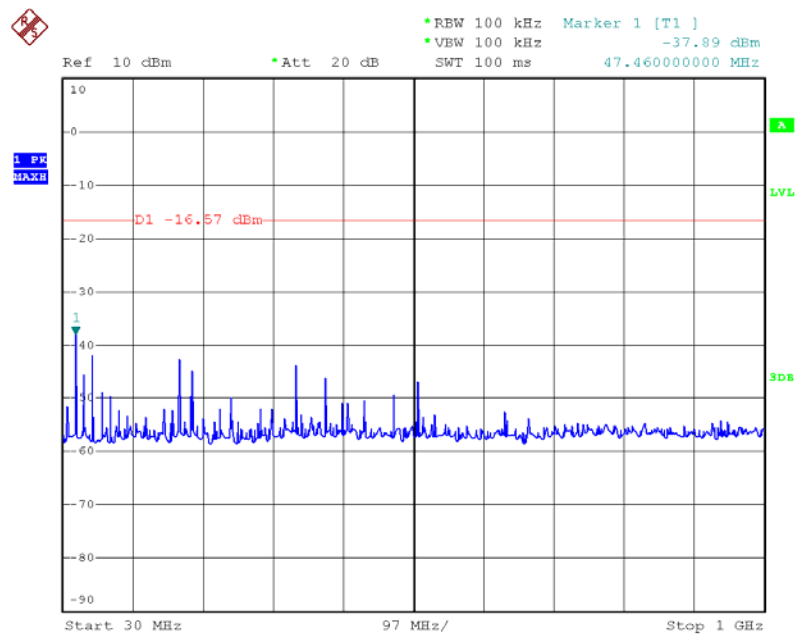
## TX CH 16 2479MHz

### Above 1 GHz



Date: 7.NOV.2012 14:14:29

### Bellow 1 GHz



Date: 7.NOV.2012 14:14:13

## **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 dBi, and the antenna connector is 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 PIFA Antenna. It complies with the standard requirement.