

# FCC RF Test Report

APPLICANT : VERTU Corporation Limited  
EQUIPMENT : GSM/WCDMA Cellular Telephone with BT and WLAN  
BRAND NAME : VERTU  
MODEL NAME : RM-828V  
MARKETING NAME : VERTU Ti  
FCC ID : P7QRM-828V  
STANDARD : FCC Part 15 Subpart C §15.247  
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Sep. 19, 2012 and completely tested on Oct. 21, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



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Jones Tsai / Manager



## SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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## REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION             | ISSUED DATE   |
|------------|---------|-------------------------|---------------|
| FR291928B  | Rev. 01 | Initial issue of report | Nov. 12, 2012 |
|            |         |                         |               |
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|            |         |                         |               |

## SUMMARY OF TEST RESULT

| Report Section | FCC Rule           | IC Rule   | Description                                | Limit                 | Result | Remark                                  |
|----------------|--------------------|-----------|--------------------------------------------|-----------------------|--------|-----------------------------------------|
| 3.1            | 15.247(a)(2)       | A8.2(a)   | 6dB Bandwidth                              | $\geq 0.5\text{MHz}$  | Pass   | -                                       |
| 3.2            | 15.247(b)(1)       | A8.1(b)   | Peak Output Power                          | $\leq 30\text{dBm}$   | Pass   | -                                       |
| 3.5            | 15.247(e)          | A8.2(b)   | Power Spectral Density                     | $\leq 8\text{dBm}$    | Pass   | -                                       |
| 3.4            | 15.247(d)          | A8.5      | Conducted Band Edges and Spurious Emission | $\leq 20\text{dBc}$   | Pass   | -                                       |
| 3.5            | 15.247(d)          | A8.5      | Radiated Band Edges and Spurious Emission  | 15.209(a) & 15.247(d) | Pass   | Under limit<br>9.98 dB at<br>49.440 MHz |
| 3.6            | 15.207             | Gen 7.2.2 | AC Conducted Emission                      | 15.207(a)             | Pass   | Under limit<br>12.40 dB at<br>0.198 MHz |
| 3.7            | 15.203 & 15.247(b) | A8.4      | Antenna Requirement                        | N/A                   | Pass   | -                                       |

# 1 General Description

## 1.1 Applicant

**VERTU Corporation Limited**

Beacon Hill Road, Church Crookham, Hampshire GU52 8DY, United Kingdom

## 1.2 Manufacturer

**VERTU Corporation Limited**

Beacon Hill Road, Church Crookham, Hampshire GU52 8DY, United Kingdom

## 1.3 Feature of Equipment Under Test

| Product Feature                 |                                                         |
|---------------------------------|---------------------------------------------------------|
| Equipment                       | GSM/WCDMA Cellular Telephone with BT and WLAN           |
| Brand Name                      | VERTU                                                   |
| Model Name                      | RM-828V                                                 |
| Marketing Name                  | VERTU Ti                                                |
| FCC ID                          | P7QRM-828V                                              |
| EUT supports Radios application | GSM/EGPRS/WCDMA/HSDPA/<br>WLAN 11abgn / Bluetooth / NFC |
| HW Version                      | F2.0                                                    |
| SW Version                      | 4.0.4.A.0.1.30                                          |
| EUT Stage                       | Identical Prototype                                     |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

| Product Specification subjective to this standard |                                                       |
|---------------------------------------------------|-------------------------------------------------------|
| Tx/Rx Frequency Range                             | 2402 MHz ~ 2480 MHz                                   |
| Number of Channels                                | 40                                                    |
| Carrier Frequency of Each Channel                 | 40 Channel(37 hopping + 3 advertising channel)        |
| Maximum Output Power to Antenna                   | Bluetooth 4.0 - LE : 0.58 dBm (0.0011 W)              |
| Antenna Type                                      | Monopole with couple Antenna type with gain -0.50 dBi |
| Type of Modulation                                | Bluetooth 4.0 - LE : GFSK                             |

| Specification of Accessories complied with Test |             |                                                |
|-------------------------------------------------|-------------|------------------------------------------------|
| AC Adapter                                      | Brand Name  | VERTU                                          |
|                                                 | Model Name  | AC-31                                          |
| Car Charger                                     | Brand Name  | VERTU                                          |
|                                                 | Model Name  | DC-30V                                         |
| Portable Power Charger                          | Brand Name  | VERTU                                          |
|                                                 | Model Name  | DC-15V                                         |
| Battery                                         | Brand Name  | NOKIA                                          |
|                                                 | Model Name  | BL-5K                                          |
| Earphone                                        | Brand Name  | VERTU                                          |
|                                                 | Model Name  | WH-3V                                          |
| USB Cable 1                                     | Brand Name  | VERTU                                          |
|                                                 | Model Name  | CA-209DV                                       |
|                                                 | Signal Line | 1.2 meter shielded cable without ferrite core  |
| USB Cable 2                                     | Brand Name  | VERTU                                          |
|                                                 | Model Name  | CA-210DV                                       |
|                                                 | Signal Line | 0.25 meter shielded cable without ferrite core |
| LCD Panel                                       | Brand Name  | CMI                                            |
|                                                 | Model Name  | Cleo                                           |
| Camera (Main)                                   | Brand Name  | Toshiba                                        |
|                                                 | Model Name  | TCM8615MD                                      |
| Camera (Front)                                  | Brand Name  | Sharp                                          |
|                                                 | Model Name  | RJ66HA101                                      |

## 1.4 Testing Site

|                    |                                                                                                                                                              |         |           |                         |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|-------------------------|
| Test Site          | SPORTON INTERNATIONAL INC.                                                                                                                                   |         |           |                         |
| Test Site Location | No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park,<br>Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.<br>TEL: +886-3-3273456 / FAX: +886-3-3284978 |         |           |                         |
| Test Site No.      | Sporton Site No.                                                                                                                                             |         |           | FCC/IC Registration No. |
|                    | TH02-HY                                                                                                                                                      | CO05-HY | 03CH07-HY | 722060/4086B-1          |

## 1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02
- ♦ ANSI C63.4-2003 and ANSI C63.10-2009
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 3

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

## 1.6 Ancillary Equipment List

| Item | Equipment          | Trade Name    | Model Name     | FCC ID      | Data Cable      | Power Cord                                                 |
|------|--------------------|---------------|----------------|-------------|-----------------|------------------------------------------------------------|
| 1.   | System Simulator   | R&S           | CMU 200        | N/A         | N/A             | Unshielded, 1.8 m                                          |
| 2.   | GPS Station        | Pendulum      | GSG-54         | N/A         | N/A             | Unshielded, 1.8 m                                          |
| 3.   | WLAN AP            | D-Link        | DIR-628        | KA2DIR628A2 | N/A             | Unshielded, 1.8 m                                          |
| 4.   | Notebook           | DELL          | Latitude E6320 | FCC DoC     | N/A             | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |
| 5.   | LCD Monitor        | Dell          | U2410          | FCC DoC     | Shielded, 1.6 m | Unshielded, 1.8 m                                          |
| 6.   | Bluetooth Earphone | Sony Ericsson | MW600          | PY7DDA-2029 | N/A             | N/A                                                        |
| 7.   | iPod               | Apple         | A1285          | FCC DoC     | Shielded, 1.0 m | N/A                                                        |

## 2 Test Configuration of Equipment Under Test

### 2.1 RF Output Power

The RF output power was recorded in the following table:

| Channel | Frequency | Bluetooth 4.0 – LE RF Output Power |
|---------|-----------|------------------------------------|
|         |           | Data Rate / Modulation             |
|         |           | GFSK                               |
|         |           | 1Mbps                              |
| Ch00    | 2402MHz   | 0.58 dBm                           |
| Ch19    | 2440MHz   | 0.23 dBm                           |
| Ch39    | 2480MHz   | -0.19 dBm                          |



## 2.2 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Pre-scanned tests, X, Y, Z in three orthogonal panels, were conducted to determine the final configuration from all possible combinations.

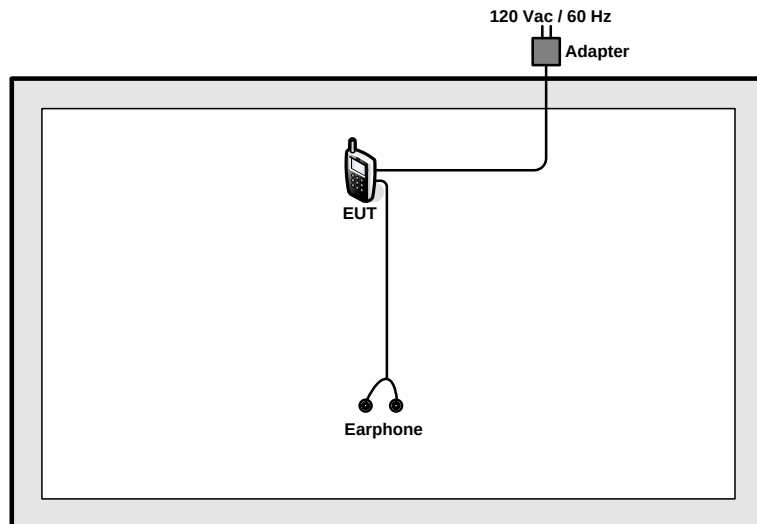
The following tables are showing the test modes as the worst cases (Y plane) and recorded in this report.

The following tables are showing the test modes as the worst cases and recorded in this report.

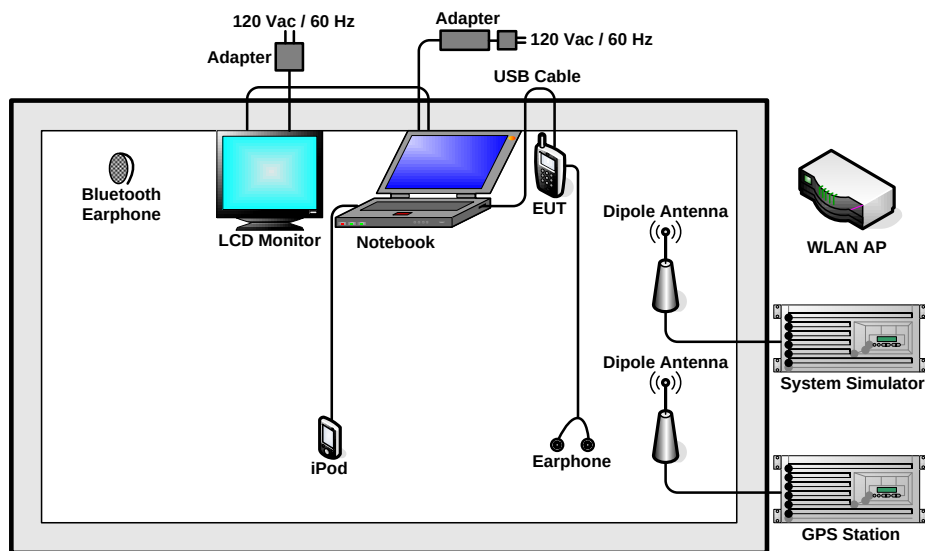
| Test Cases                                                                                                                                                                                             |                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Item                                                                                                                                                                                              | Data Rate / Modulation                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                        | Bluetooth 4.0 – LE / GFSK                                                                                                                                                                                                                                                  |
| Conducted TCs                                                                                                                                                                                          | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps<br>Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps<br>Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps                                                                                                                                           |
| Radiated TCs                                                                                                                                                                                           | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps<br>Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps<br>Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps                                                                                                                                           |
| AC Conducted Emission                                                                                                                                                                                  | Mode 1 :WCDMA Band IV Idle + Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Earphone + Battery + USB Cable 1 (Data Link with Notebook)<br>Mode 2 :WCDMA Band IV Idle + Bluetooth Link + WLAN (5G) Link + GPS Rx + Earphone + Battery + USB Cable 1 (Data Link with Notebook) |
| <b>Remark:</b><br>1. The worst case of conducted emission is mode 1; only the test data of it was reported.<br>2. Link with Notebook means data application transferred mode between EUT and Notebook. |                                                                                                                                                                                                                                                                            |

## 2.3 Connection Diagram of Test System

<Bluetooth 4.0 – LE Tx Mode>



<AC Conducted Emission Mode>



## 2.4 RF Utility

For Bluetooth function, programmed RF utility, "QPST.exe" installed in the notebook make the EUT provides functions like channel selection and power level for continuous transmitting and receiving signals.

### 3 Test Result

#### 3.1 6dB Bandwidth Measurement

##### 3.1.1 Limit of 6dB Bandwidth

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

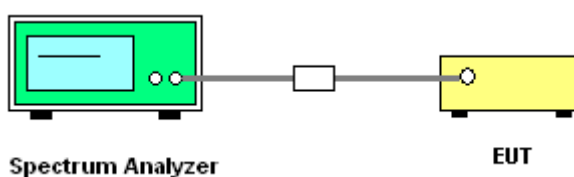
##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 KHz.
5. Measure and record the results in the test report.

##### 3.1.4 Test Setup

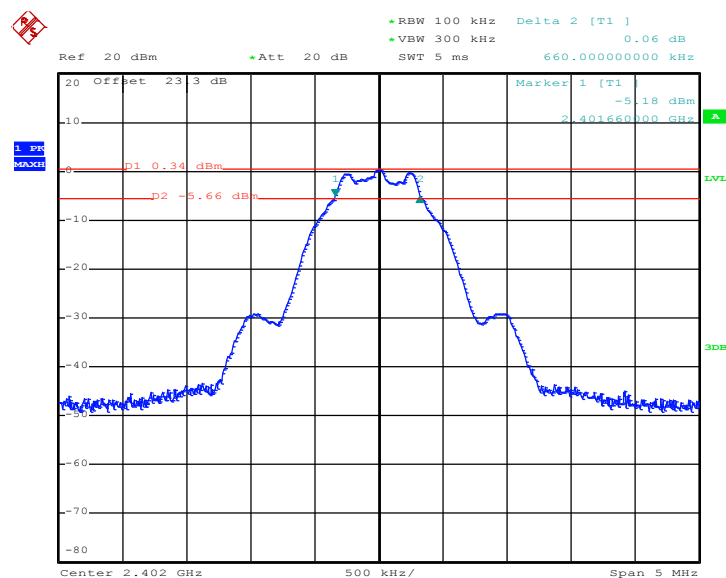


### 3.1.5 Test Result of 6dB Bandwidth

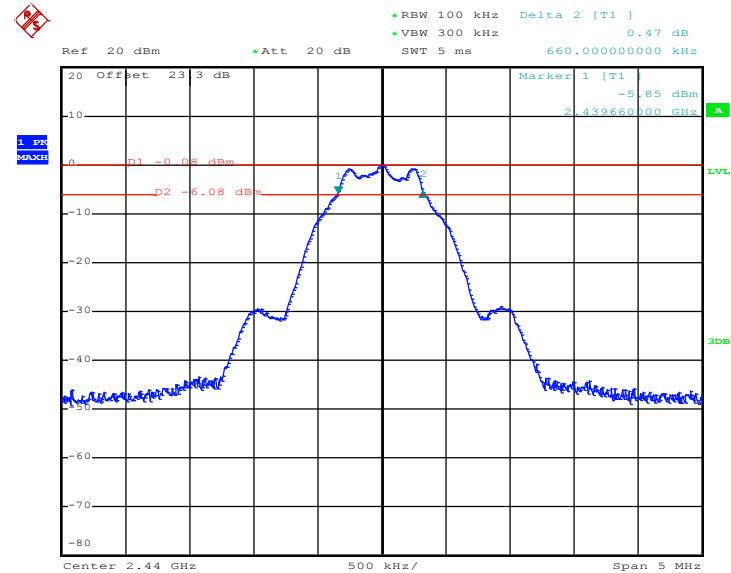
|                 |                    |                     |        |
|-----------------|--------------------|---------------------|--------|
| Test Mode :     | Bluetooth 4.0 - LE | Temperature :       | 24~26℃ |
| Test Engineer : | Kenny Chen         | Relative Humidity : | 58~61% |

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) |
|---------|-----------------|---------------------|
| 00      | 2402            | 0.66                |
| 19      | 2440            | 0.66                |
| 39      | 2480            | 0.67                |

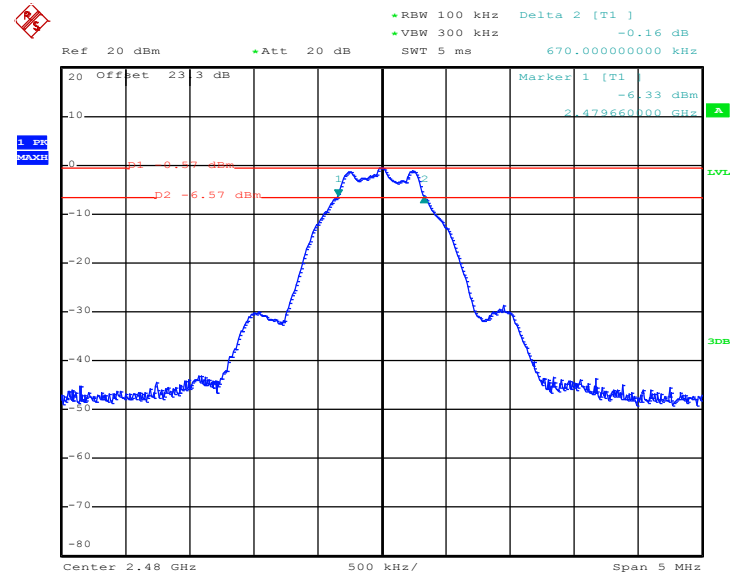
**6 dB Bandwidth Plot on Channel 00**



Date: 12.OCT.2012 09:30:19

**6 dB Bandwidth Plot on Channel 19**


Date: 12.OCT.2012 09:36:14

**6 dB Bandwidth Plot on Channel 39**


Date: 12.OCT.2012 09:41:33

## 3.2 Peak Output Power Measurement

### 3.2.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

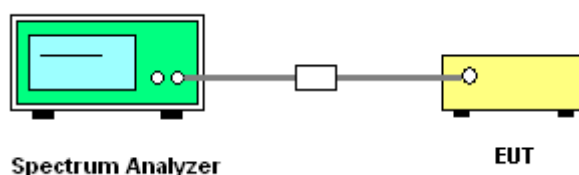
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup

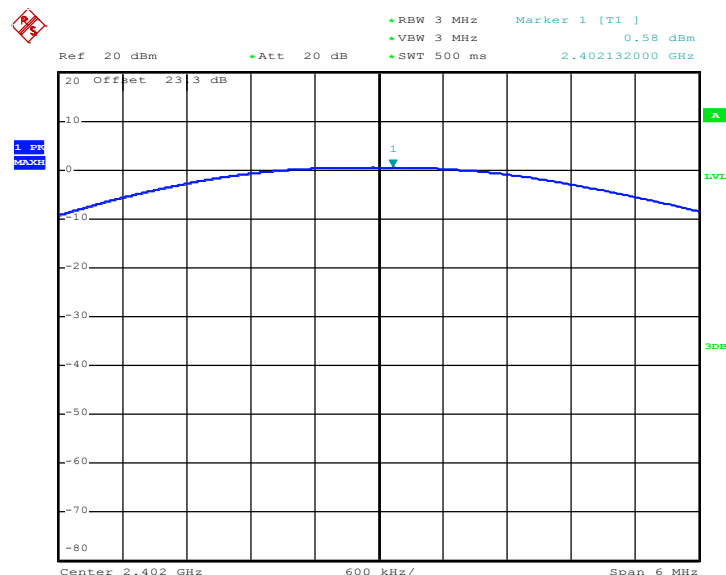


### 3.2.5 Test Result of Peak Output Power

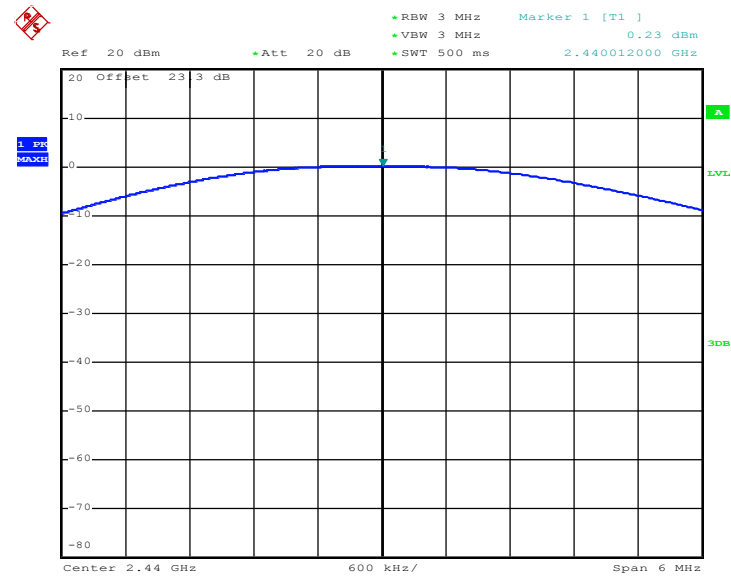
|                        |                    |                            |        |
|------------------------|--------------------|----------------------------|--------|
| <b>Test Mode :</b>     | Bluetooth 4.0 - LE | <b>Temperature :</b>       | 24~26℃ |
| <b>Test Engineer :</b> | Kenny Chen         | <b>Relative Humidity :</b> | 58~61% |

| Channel | Frequency (MHz) | RF Power (dBm) |                   |           |
|---------|-----------------|----------------|-------------------|-----------|
|         |                 | GFSK           | Max. Limits (dBm) | Pass/Fail |
|         |                 | 1 Mbps         |                   |           |
| 00      | 2402            | 0.58           | 30.00             | Pass      |
| 19      | 2440            | 0.23           | 30.00             | Pass      |
| 39      | 2480            | -0.19          | 30.00             | Pass      |

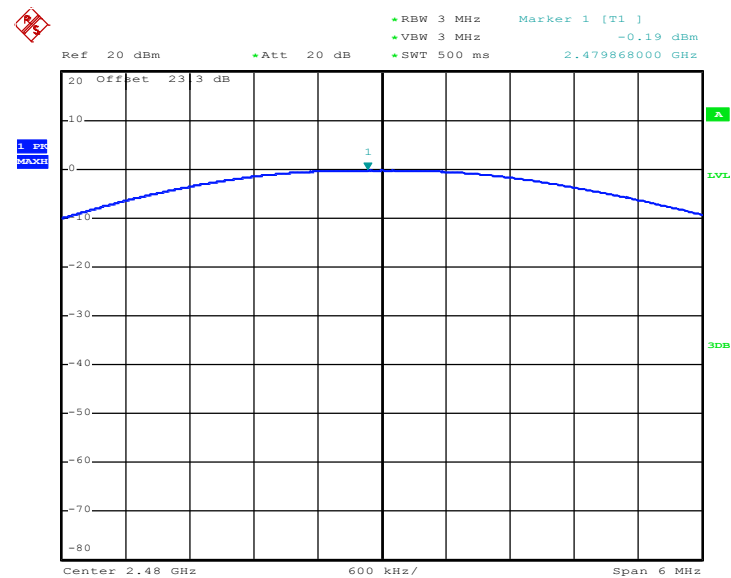
**Peak Output Power Plot on Channel 00**



Date: 12.OCT.2012 09:26:26

**Peak Output Power Plot on Channel 19**


Date: 12.OCT.2012 09:27:16

**Peak Output Power Plot on Channel 39**


Date: 12.OCT.2012 09:27:36



### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3KHz band at any time interval of continuous transmission.

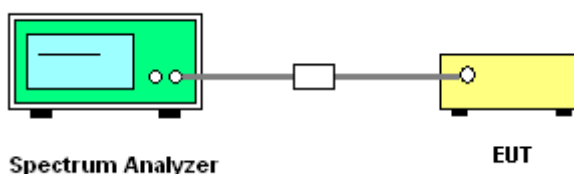
#### 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.3.3 Test Procedures

1. The testing follows Measurement Procedure 9.1 Option 1 of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Record the measurement data derived from spectrum analyzer.

#### 3.3.4 Test Setup



### 3.3.5 Test Result of Power Spectral Density

|                        |                    |                            |        |
|------------------------|--------------------|----------------------------|--------|
| <b>Test Mode :</b>     | Bluetooth 4.0 - LE | <b>Temperature :</b>       | 24~26℃ |
| <b>Test Engineer :</b> | Kenny Chen         | <b>Relative Humidity :</b> | 58~61% |

| Channel | Frequency<br>(MHz) | Power Density    |                | Max. Limits<br>(dBm/3KHz) | Pass/Fail |
|---------|--------------------|------------------|----------------|---------------------------|-----------|
|         |                    | PSD/100KHz (dBm) | PSD/3KHz (dBm) |                           |           |
| 00      | 2402               | 0.25             | -14.88         | 8                         | Pass      |
| 19      | 2440               | -0.11            | -15.29         | 8                         | Pass      |
| 39      | 2480               | -0.58            | -15.71         | 8                         | Pass      |

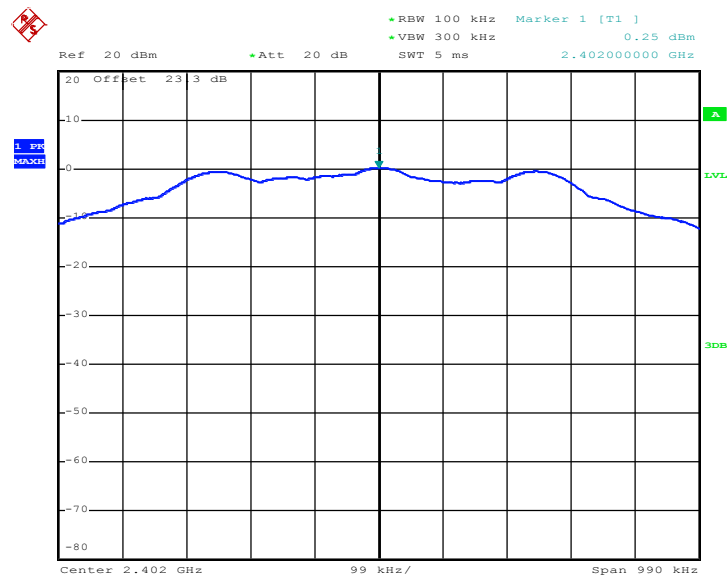
**Note:**

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



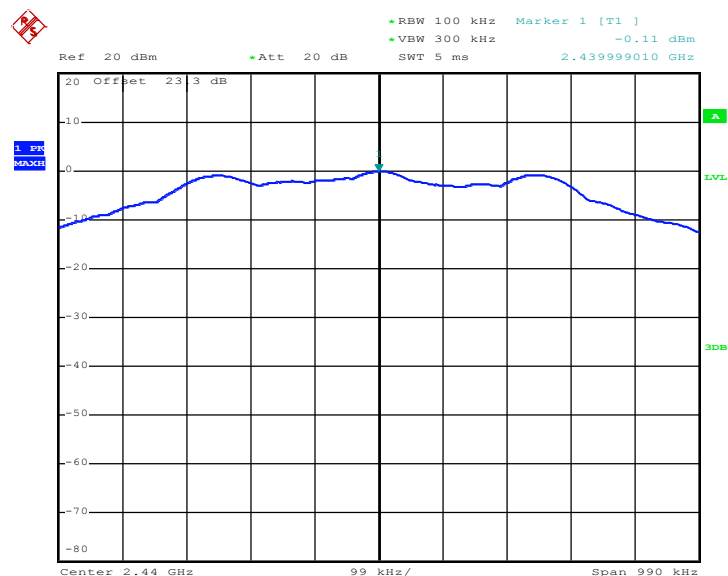
### 3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on Channel 00



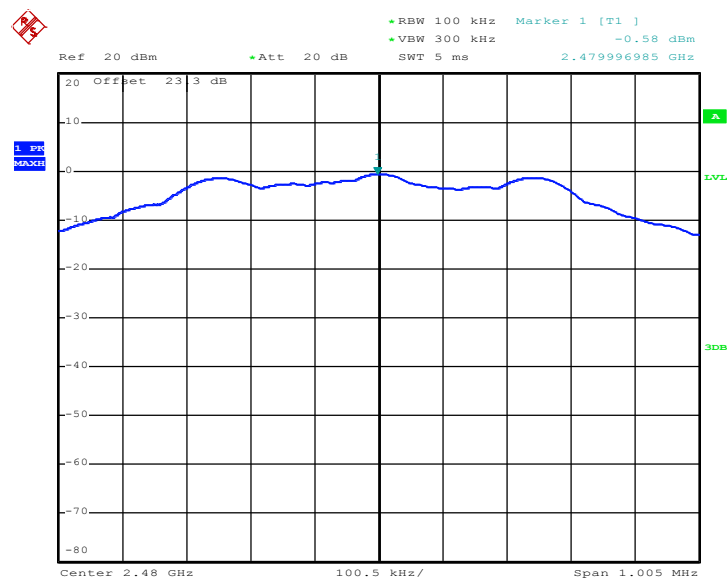
Date: 12.OCT.2012 09:33:53

**PSD 100kHz Plot on Channel 19**



Date: 12.OCT.2012 09:37:05

**PSD 100kHz Plot on Channel 39**

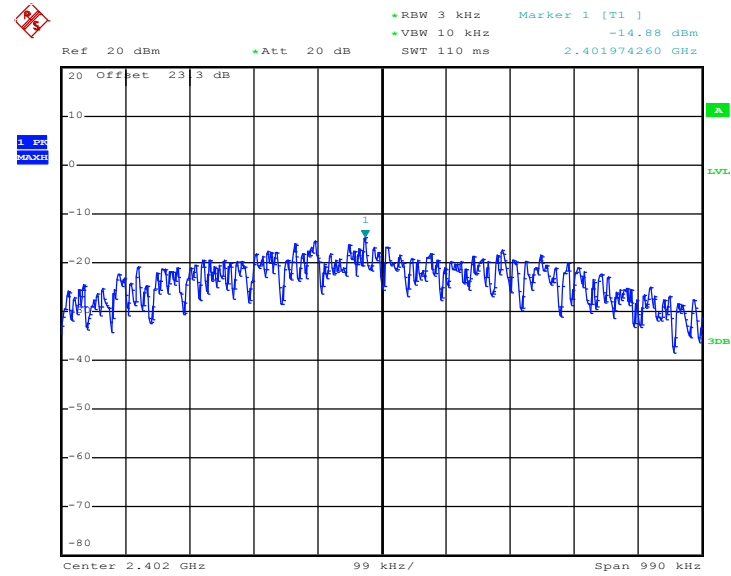


Date: 12.OCT.2012 09:42:20

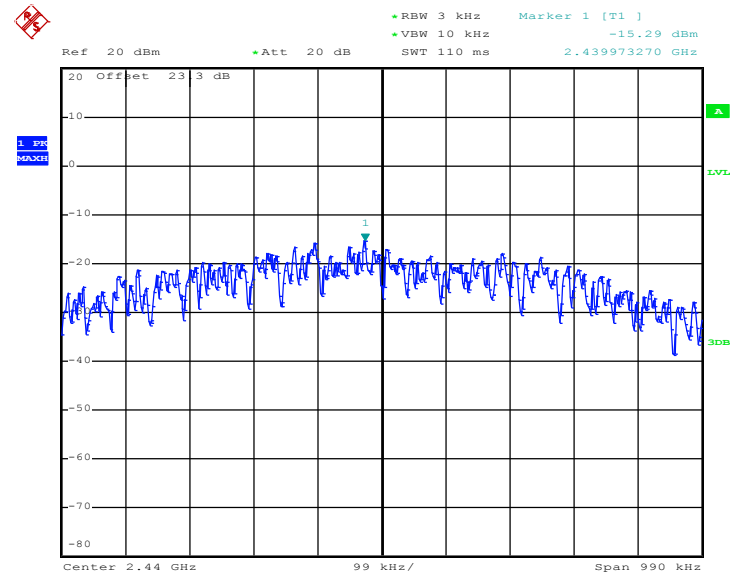


### 3.3.7 Test Result of Power Spectral Density Plots (3kHz)

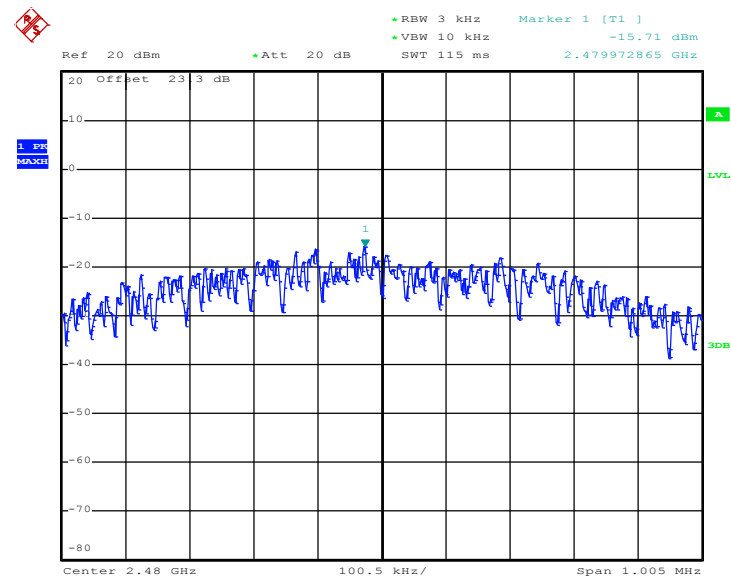
#### PSD 3kHz Plot on Channel 00



Date: 12.OCT.2012 09:33:25

**PSD 3kHz Plot on Channel 19**


Date: 12.OCT.2012 09:36:38

**PSD 3kHz Plot on Channel 39**


Date: 12.OCT.2012 09:42:01

### 3.4 Conducted Band Edges and Spurious Emission Measurement

#### 3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

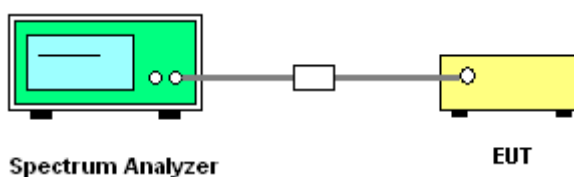
#### 3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.4.3 Test Procedure

1. The testing follows the guidelines in ANSI C63.4-2003 and the Measurement Procedure of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 KHz, Video bandwidth (VBW)  $\geq$  RBW. Out of the authorized frequency band emissions must be at least 20 dB lower than the highest emission level within the authorized band as measured with a 100 KHz RBW. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.

#### 3.4.4 Test Setup





|                       |                    |                            |            |
|-----------------------|--------------------|----------------------------|------------|
| <b>Test Mode :</b>    | Bluetooth 4.0 - LE | <b>Temperature :</b>       | 24~26℃     |
| <b>Test Channel :</b> | 00 and 39          | <b>Relative Humidity :</b> | 58~61%     |
|                       |                    | <b>Test Engineer :</b>     | Kenny Chen |

1 9% 50000

Ref 20 dBm Att 20 dB SWT 5 ms 2.385710000 GHz

20 Offset 23 3 dB

19.75 dBm

1

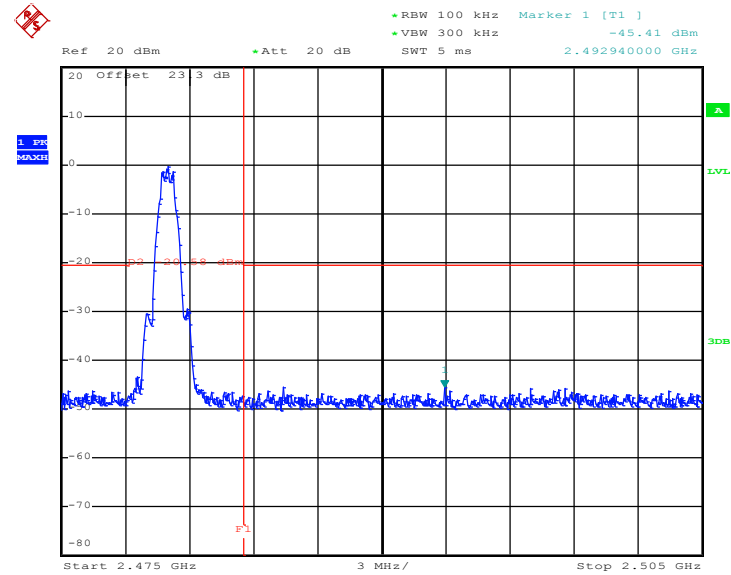
2

Start 2.375 GHz 3 MHz/ Stop 2.405 GHz

Date: 12.OCT.2012 09:34:10



### High Band Edge Plot on Channel 39

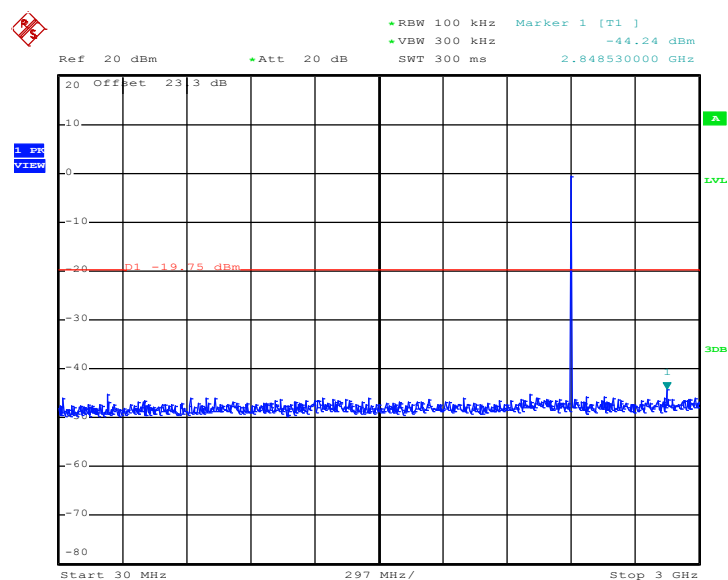


Date: 12.OCT.2012 09:42:39

### 3.4.6 Test Result of Conducted Spurious Emission

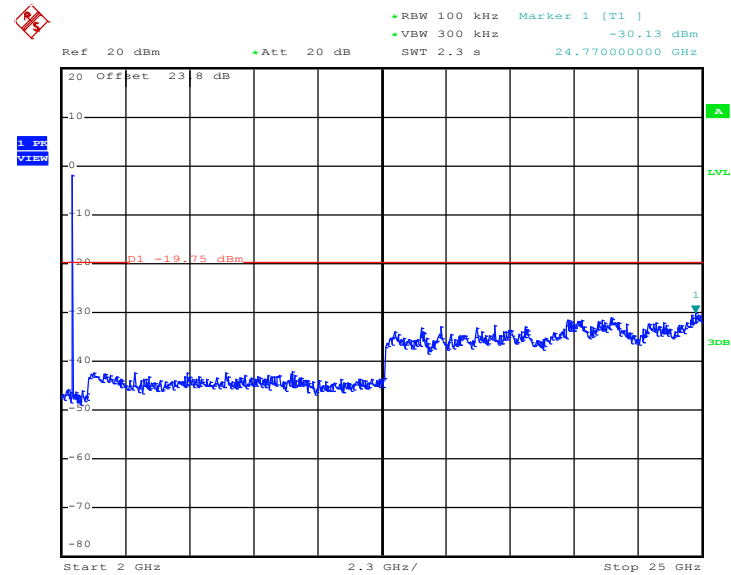
|                |                    |                     |            |
|----------------|--------------------|---------------------|------------|
| Test Mode :    | Bluetooth 4.0 - LE | Temperature :       | 24~26℃     |
| Test Channel : | 00                 | Relative Humidity : | 58~61%     |
|                |                    | Test Engineer :     | Kenny Chen |

#### Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 12.OCT.2012 09:39:56

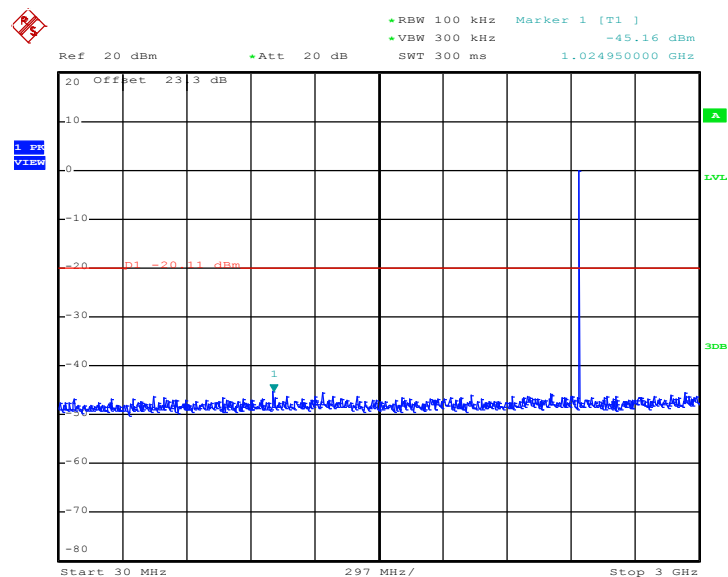
## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 12.OCT.2012 09:40:14

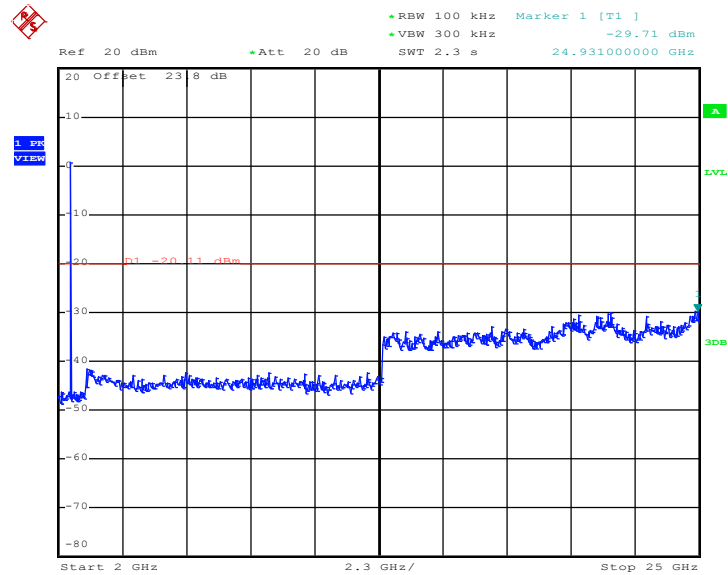
|                |                    |                     |            |
|----------------|--------------------|---------------------|------------|
| Test Mode :    | Bluetooth 4.0 - LE | Temperature :       | 24~26°C    |
| Test Channel : | 19                 | Relative Humidity : | 58~61%     |
|                |                    | Test Engineer :     | Kenny Chen |

**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps  
GFSK Channel 19**



Date: 12.OCT.2012 09:38:13

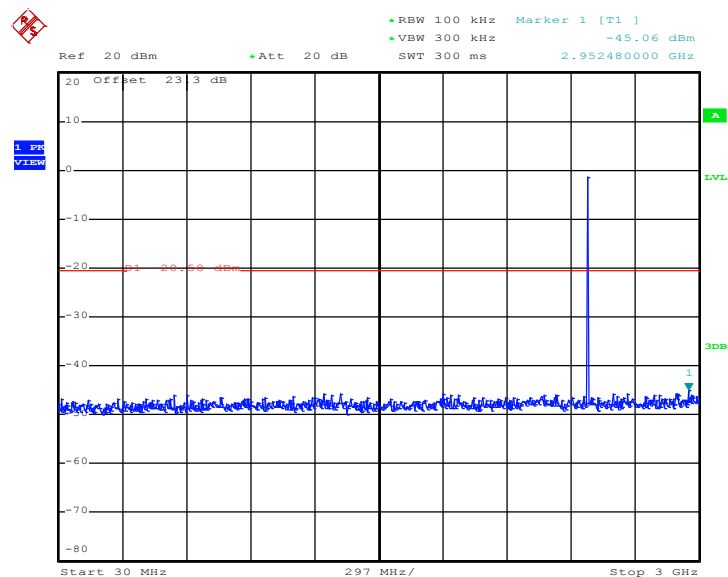
## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



Date: 12.OCT.2012 09:38:31

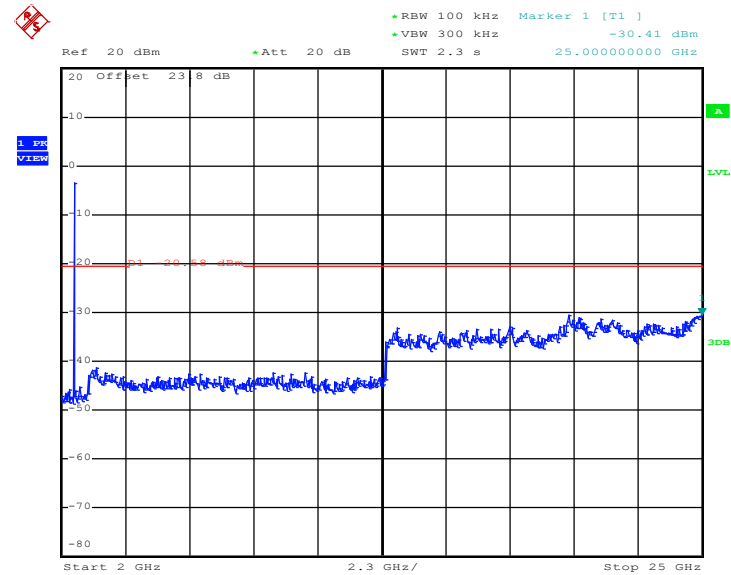
|                       |                    |                            |            |
|-----------------------|--------------------|----------------------------|------------|
| <b>Test Mode :</b>    | Bluetooth 4.0 - LE | <b>Temperature :</b>       | 24~26°C    |
| <b>Test Channel :</b> | 39                 | <b>Relative Humidity :</b> | 58~61%     |
|                       |                    | <b>Test Engineer :</b>     | Kenny Chen |

**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps  
GFSK Channel 39**



Date: 12.OCT.2012 09:43:12

## Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 12.OCT.2012 09:43:30

### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

| Frequency<br>(MHz) | Field Strength<br>(microvolts/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                                |

#### 3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.5.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.10-2009 and ANSI C63.4-2003 test site requirement.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamplifier Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;



(2) Set RBW=100 KHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak;  
Trace = max hold;

(3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1$  GHz for peak measurement.

For average measurement:

- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

| Band               | Duty Cycle(%) | T(us)  | 1/T(KHz) | VBW Setting |
|--------------------|---------------|--------|----------|-------------|
| Bluetooth 4.0 - LE | 66.46         | 420.00 | 2.381    | 3KHz        |

**Note:** For average measurement with duty cycle  $< 98\%$ , use reduced VBW measurement method 4.2.3.2.3 in ANSI C63.10.

#### Marker-Delta method :

(1) Set RBW = 1 MHz, VBW = 3 MHz, peak detector.

Repeat the measurement with an average detector, use RBW = 1MHz

VBW = 10 Hz, when duty cycle is no less than 98 percent.

VBW  $\geq 1/T$ , when duty cycle is less than 98 percent

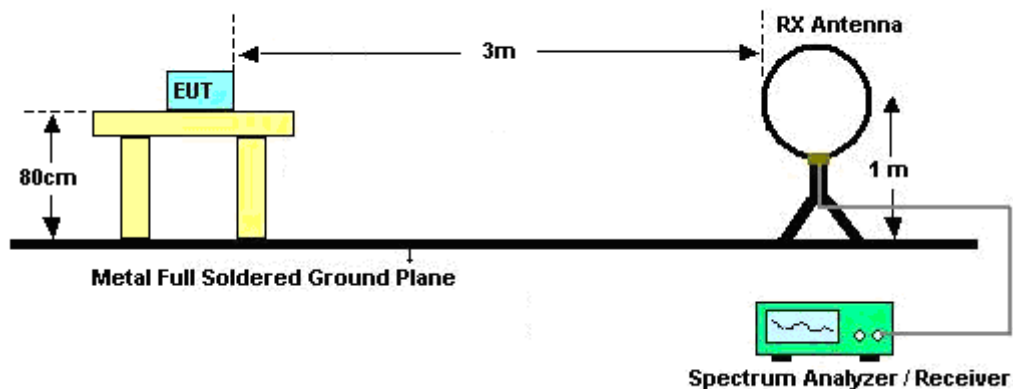
(2) Set span = 10MHz, that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set RBW = 100KHz, 1% of the total span. Set VBW = 100KHz  $\geq$  RBW.

(3) Subtract the delta measured in step (2) from the field strengths measured in step (1).

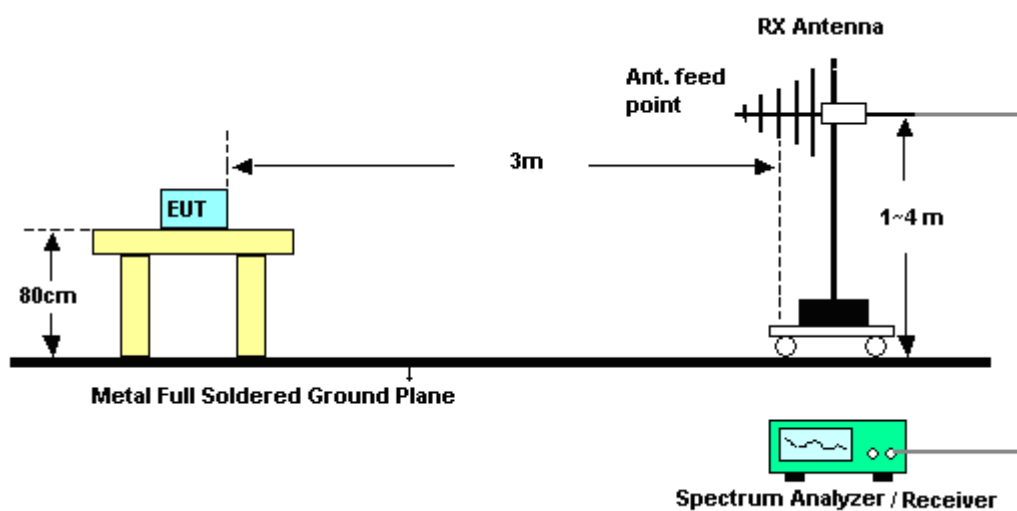
The resultant field strengths (peak/average) are then used to determine band-edge compliance as required by Section 15.205.

### 3.5.4 Test Setup

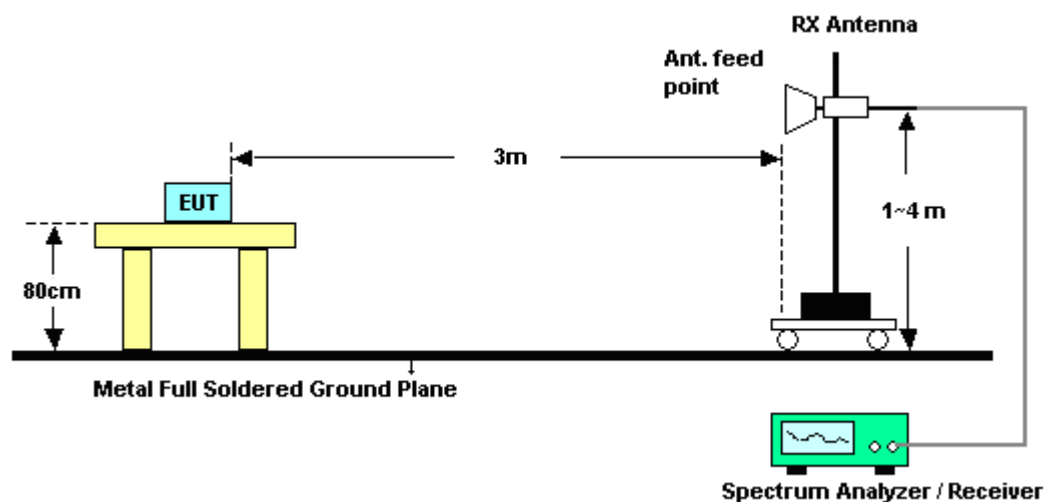
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.5.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

**3.5.6 Test Result of Radiated Band Edges**

|                       |        |                            |            |
|-----------------------|--------|----------------------------|------------|
| <b>Test Mode :</b>    | Mode 1 | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b> | 00     | <b>Relative Humidity :</b> | 41~42%     |
|                       |        | <b>Test Engineer :</b>     | Elvis Chen |

| ANTENNA POLARITY : HORIZONTAL |                     |                         |                             |                           |                             |                         |                            |                      |                         |         |
|-------------------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| Frequency<br>( MHz )          | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>( dBuV ) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
| 2320.17                       | 45.98               | -28.02                  | 74                          | 41.76                     | 32.23                       | 5.92                    | 33.93                      | 127                  | 354                     | Peak    |
| 2385.24                       | 34.4                | -19.6                   | 54                          | 30.05                     | 32.28                       | 6.03                    | 33.96                      | 127                  | 354                     | Average |

| ANTENNA POLARITY : VERTICAL |                     |                         |                             |                           |                             |                         |                            |                      |                         |         |
|-----------------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| Frequency<br>( MHz )        | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>( dBuV ) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
| 2339.34                     | 46.47               | -27.53                  | 74                          | 42.22                     | 32.24                       | 5.95                    | 33.94                      | 163                  | 318                     | Peak    |
| 2356.8                      | 34.5                | -19.5                   | 54                          | 30.2                      | 32.26                       | 5.99                    | 33.95                      | 163                  | 318                     | Average |

|                       |        |                            |            |
|-----------------------|--------|----------------------------|------------|
| <b>Test Mode :</b>    | Mode 3 | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b> | 39     | <b>Relative Humidity :</b> | 41~42%     |
|                       |        | <b>Test Engineer :</b>     | Elvis Chen |

| ANTENNA POLARITY : HORIZONTAL |                     |                         |                             |                           |                             |                         |                            |                      |                         |         |
|-------------------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| Frequency<br>( MHz )          | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
| 2483.5                        | 58.48               | -15.52                  | 74                          | 53.92                     | 32.38                       | 6.18                    | 34                         | 100                  | 11                      | Peak    |
| 2483.5                        | 55.03               | 1.03                    | 54                          | 50.47                     | 32.38                       | 6.18                    | 34                         | 100                  | 11                      | Average |
| 2483.5                        | 42.9                | -31.1                   | 74                          | -                         | -                           | -                       | -                          | -                    | -                       | Peak    |
| 2483.5                        | 42.01               | -11.99                  | 54                          | -                         | -                           | -                       | -                          | -                    | -                       | Average |

**Summary results of marker-delta method:**

| Test mode | Maximum field strength of<br>the fundamental emission<br>(dBμV/m) | Delta<br>Result<br>(dB) | Measurement<br>Result<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) | Result |
|-----------|-------------------------------------------------------------------|-------------------------|-----------------------------------|-------------------|----------------|--------|
| Peak      | 96.16                                                             | 53.26                   | 42.9                              | 74                | -31.1          | Pass   |
| Average   | 95.27                                                             | 53.26                   | 42.01                             | 54                | -11.99         | Pass   |

**Note:** Measurement result = Maximum field strength – Delta result

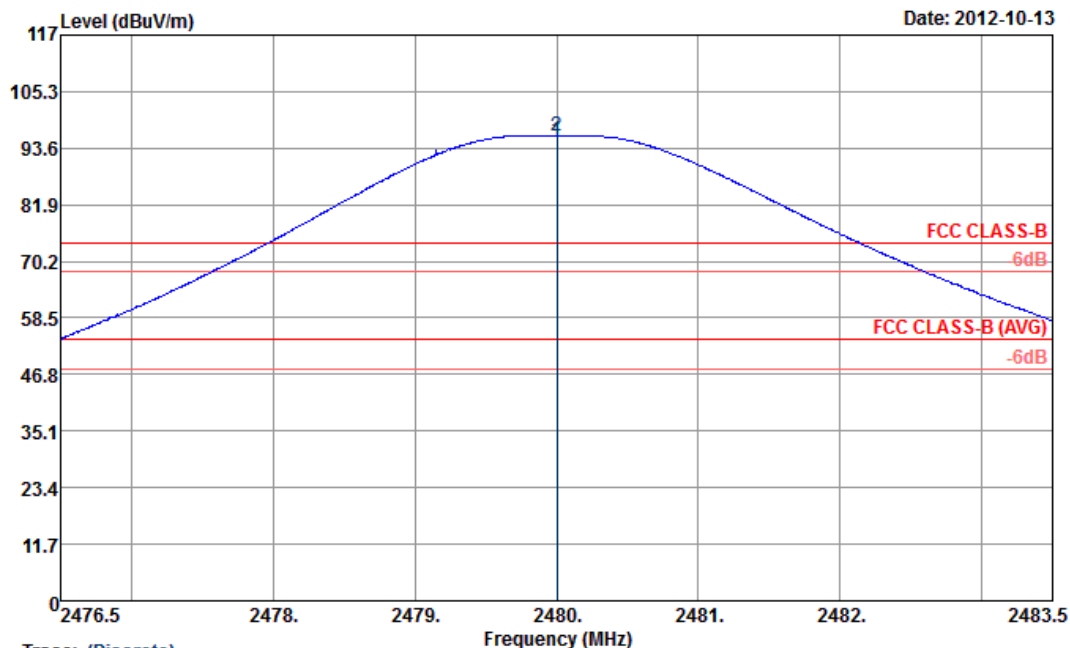
| ANTENNA POLARITY : VERTICAL |                     |                         |                             |                           |                             |                         |                            |                      |                         |         |
|-----------------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| Frequency<br>( MHz )        | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
| 2483.5                      | 53.39               | -20.61                  | 74                          | 48.83                     | 32.38                       | 6.18                    | 34                         | 107                  | 170                     | Peak    |
| 2483.5                      | 49.17               | -4.83                   | 54                          | 44.61                     | 32.38                       | 6.18                    | 34                         | 107                  | 170                     | Average |
| 2483.5                      | 42.51               | -31.49                  | 74                          | -                         | -                           | -                       | -                          | -                    | -                       | Peak    |
| 2483.5                      | 41.96               | -12.04                  | 54                          | -                         | -                           | -                       | -                          | -                    | -                       | Average |

**Summary results of marker-delta method:**

| Test mode | Maximum field strength of<br>the fundamental emission<br>(dBμV/m) | Delta<br>Result<br>(dB) | Measurement<br>Result<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) | Result |
|-----------|-------------------------------------------------------------------|-------------------------|-----------------------------------|-------------------|----------------|--------|
| Peak      | 90.23                                                             | 47.72                   | 42.51                             | 74                | -31.49         | Pass   |
| Average   | 89.68                                                             | 47.72                   | 41.96                             | 54                | -12.04         | Pass   |

**Note:** Measurement result = Maximum field strength – Delta result

|                        |            |                            |            |
|------------------------|------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 3     | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b>  | 39         | <b>Relative Humidity :</b> | 41~42%     |
| <b>Test Engineer :</b> | Elvis Chen | <b>Polarization :</b>      | Horizontal |



Trace: (Discrete)

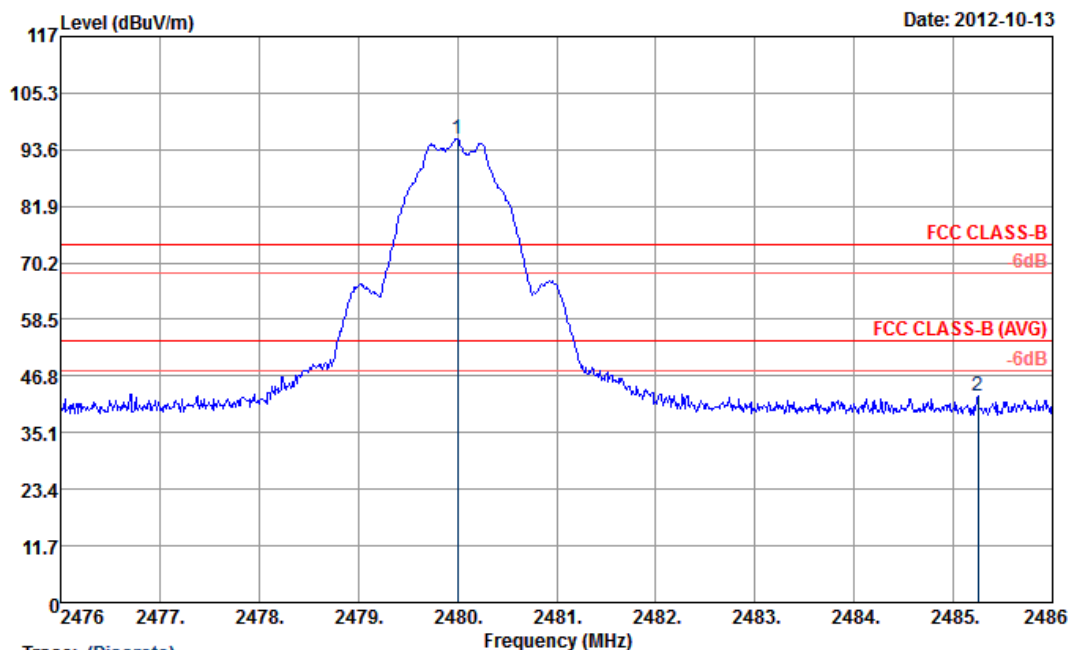
Site : 03CH07-HY

Condition : FCC CLASS-B 3m HF-ANT\_120823 HORIZONTAL

|     | Freq    | Level  | Over  | Limit  | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Remark     |
|-----|---------|--------|-------|--------|-------------|-------|--------|-------|-------|------------|
|     | MHz     | dBuV/m | dB    | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg        |
| 1 * | 2480.00 | 95.27  | 41.27 | 54.00  | 90.71       | 32.38 | 6.18   | 34.00 | 100   | 11 Average |
| 2 * | 2480.00 | 96.16  | 22.16 | 74.00  | 91.60       | 32.38 | 6.18   | 34.00 | 100   | 11 Peak    |

\* Maximum field strength of the fundamental emission

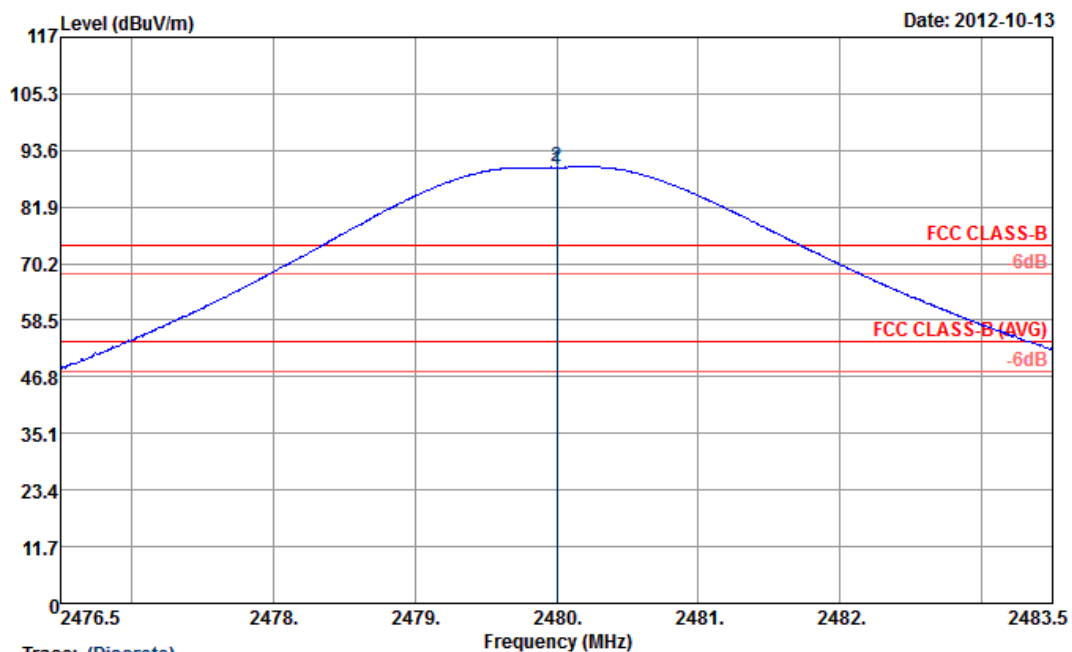
|                        |            |                            |            |
|------------------------|------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 3     | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b>  | 39         | <b>Relative Humidity :</b> | 41~42%     |
| <b>Test Engineer :</b> | Elvis Chen | <b>Polarization :</b>      | Horizontal |



|     | Freq    | Level  | Over   | Limit  | Read  | Antenna | Cable | Preamp | A/Pos | T/Pos | Remark |
|-----|---------|--------|--------|--------|-------|---------|-------|--------|-------|-------|--------|
|     | MHz     | dBuV/m | dB     | dBuV/m | dBuV  | dB/m    | dB    | dB     | cm    | deg   |        |
| 1 * | 2480.00 | 95.93  | 21.93  | 74.00  | 91.37 | 32.38   | 6.18  | 34.00  | 100   | 11    | Peak   |
| 2   | 2485.25 | 42.67  | -31.33 | 74.00  | 38.11 | 32.38   | 6.18  | 34.00  | 100   | 11    | Peak   |

\* Marker-Delta Method (RBW/VBW=100KHz): 53.26 dB , single carrier Mode

|                 |            |                     |          |
|-----------------|------------|---------------------|----------|
| Test Mode :     | Mode 3     | Temperature :       | 21~23°C  |
| Test Channel :  | 39         | Relative Humidity : | 41~42%   |
| Test Engineer : | Elvis Chen | Polarization :      | Vertical |

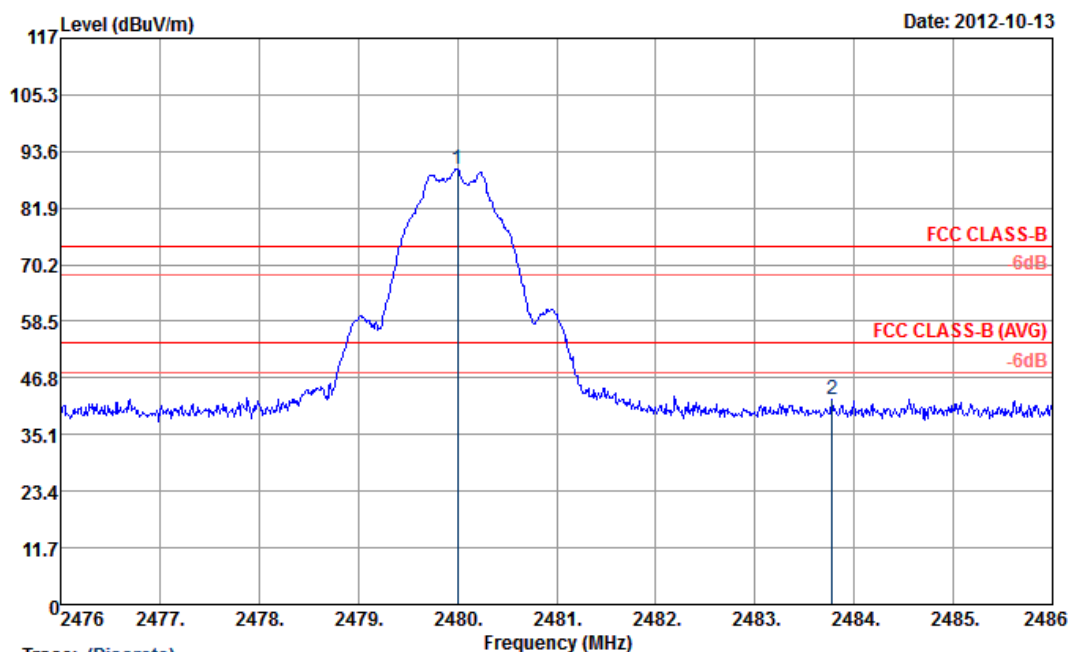


|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Cable Factor | Preamp Loss | A/Pos | T/Pos | Remark      |
|-----|---------|--------|------------|------------|-------------------|--------------|-------------|-------|-------|-------------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m         | dB          | dB    | cm    | deg         |
| 1 * | 2480.00 | 89.68  | 35.68      | 54.00      | 85.12             | 32.38        | 6.18        | 34.00 | 107   | 170 Average |
| 2 * | 2480.00 | 90.23  | 16.23      | 74.00      | 85.67             | 32.38        | 6.18        | 34.00 | 107   | 170 Peak    |

\* Maximum field strength of the fundamental emission



|                        |            |                            |          |
|------------------------|------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 3     | <b>Temperature :</b>       | 21~23°C  |
| <b>Test Channel :</b>  | 39         | <b>Relative Humidity :</b> | 41~42%   |
| <b>Test Engineer :</b> | Elvis Chen | <b>Polarization :</b>      | Vertical |



|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamplifier | A/Pos | T/Pos | Remark |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|--------------|-------|-------|--------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB           | cm    | deg   |        |
| 1 * | 2480.00 | 90.04  | 16.04      | 74.00      | 85.48             | 32.38          | 6.18       | 34.00        | 107   | 170   | Peak   |
| 2   | 2483.78 | 42.32  | -31.68     | 74.00      | 37.76             | 32.38          | 6.18       | 34.00        | 107   | 170   | Peak   |

\* Marker-Delta Method (RBW/VBW=100KHz): 47.72 dB , single carrier Mode

**3.5.7 Test Result of Radiated Emission (30 MHz ~ 10<sup>th</sup> Harmonic)**

|                        |                                                                                                                                                      |                            |            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 1                                                                                                                                               | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b>  | 00                                                                                                                                                   | <b>Relative Humidity :</b> | 41~42%     |
| <b>Test Engineer :</b> | Elvis Chen                                                                                                                                           | <b>Polarization :</b>      | Horizontal |
| <b>Remark :</b>        | 1. 2402 MHz is fundamental signal which can be ignored.<br>2. Average measurement was not performed if peak level went lower than the average limit. |                            |            |

| Frequency<br>( MHz ) | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2402                 | 96.83               | -                       | -                           | 92.46                   | 32.3                        | 6.03                    | 33.96                      | 127                  | 354                     | Average |
| 2402                 | 97.74               | -                       | -                           | 93.37                   | 32.3                        | 6.03                    | 33.96                      | 127                  | 354                     | Peak    |
| 4803                 | 40.98               | -33.02                  | 74                          | 55.36                   | 33.98                       | 9.11                    | 57.47                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                      |                            |          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 1                                                                                                                                               | <b>Temperature :</b>       | 21~23°C  |
| <b>Test Channel :</b>  | 00                                                                                                                                                   | <b>Relative Humidity :</b> | 41~42%   |
| <b>Test Engineer :</b> | Elvis Chen                                                                                                                                           | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 1. 2402 MHz is fundamental signal which can be ignored.<br>2. Average measurement was not performed if peak level went lower than the average limit. |                            |          |

| Frequency<br>( MHz ) | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2402                 | 91.96               | -                       | -                           | 87.59                   | 32.3                        | 6.03                    | 33.96                      | 163                  | 318                     | Average |
| 2402                 | 92.87               | -                       | -                           | 88.5                    | 32.3                        | 6.03                    | 33.96                      | 163                  | 318                     | Peak    |
| 4803                 | 41.6                | -32.4                   | 74                          | 55.98                   | 33.98                       | 9.11                    | 57.47                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                      |                            |            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 2                                                                                                                                               | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b>  | 19                                                                                                                                                   | <b>Relative Humidity :</b> | 41~42%     |
| <b>Test Engineer :</b> | Elvis Chen                                                                                                                                           | <b>Polarization :</b>      | Horizontal |
| <b>Remark :</b>        | 1. 2440 MHz is fundamental signal which can be ignored.<br>2. Average measurement was not performed if peak level went lower than the average limit. |                            |            |

| Frequency<br>( MHz ) | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2440                 | 97.77               | -                       | -                           | 93.29                   | 32.35                       | 6.11                    | 33.98                      | 104                  | 333                     | Average |
| 2440                 | 97.79               | -                       | -                           | 93.31                   | 32.35                       | 6.11                    | 33.98                      | 104                  | 333                     | Peak    |
| 4881                 | 43.15               | -30.85                  | 74                          | 57.54                   | 33.95                       | 9.14                    | 57.48                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                      |                            |          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 2                                                                                                                                               | <b>Temperature :</b>       | 21~23°C  |
| <b>Test Channel :</b>  | 19                                                                                                                                                   | <b>Relative Humidity :</b> | 41~42%   |
| <b>Test Engineer :</b> | Elvis Chen                                                                                                                                           | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 1. 2440 MHz is fundamental signal which can be ignored.<br>2. Average measurement was not performed if peak level went lower than the average limit. |                            |          |

| Frequency<br>( MHz ) | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2440                 | 95.09               | -                       | -                           | 90.61                   | 32.35                       | 6.11                    | 33.98                      | 134                  | 251                     | Average |
| 2440                 | 95.11               | -                       | -                           | 90.63                   | 32.35                       | 6.11                    | 33.98                      | 134                  | 251                     | Peak    |
| 4881                 | 43.3                | -30.7                   | 74                          | 57.69                   | 33.95                       | 9.14                    | 57.48                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                      |                            |            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 3                                                                                                                                               | <b>Temperature :</b>       | 21~23°C    |
| <b>Test Channel :</b>  | 39                                                                                                                                                   | <b>Relative Humidity :</b> | 41~42%     |
| <b>Test Engineer :</b> | Elvis Chen                                                                                                                                           | <b>Polarization :</b>      | Horizontal |
| <b>Remark :</b>        | 1. 2480 MHz is fundamental signal which can be ignored.<br>2. Average measurement was not performed if peak level went lower than the average limit. |                            |            |

| Frequency<br>( MHz ) | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 30.27                | 19.61               | -20.39                  | 40                          | 30.95                   | 20                          | 0.53                    | 31.87                      | 102                  | 167                     | Peak    |
| 33.78                | 19.39               | -20.61                  | 40                          | 33.58                   | 17.12                       | 0.57                    | 31.88                      | -                    | -                       | Peak    |
| 49.98                | 15.88               | -24.12                  | 40                          | 38.69                   | 8.1                         | 0.7                     | 31.61                      | -                    | -                       | Peak    |
| 691.3                | 22.83               | -23.17                  | 46                          | 29.84                   | 20.53                       | 2.92                    | 30.46                      | -                    | -                       | Peak    |
| 779.5                | 23.68               | -22.32                  | 46                          | 29.1                    | 21.79                       | 3.11                    | 30.32                      | -                    | -                       | Peak    |
| 850.9                | 24.77               | -21.23                  | 46                          | 29.45                   | 22.6                        | 3.27                    | 30.55                      | -                    | -                       | Peak    |
| 2480                 | 95.27               | -                       | -                           | 90.71                   | 32.38                       | 6.18                    | 34                         | 100                  | 11                      | Average |
| 2480                 | 95.83               | -                       | -                           | 91.27                   | 32.38                       | 6.18                    | 34                         | 100                  | 11                      | Peak    |
| 4959                 | 42.92               | -31.08                  | 74                          | 57.34                   | 33.91                       | 9.16                    | 57.49                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                      |                            |          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 3                                                                                                                                               | <b>Temperature :</b>       | 21~23°C  |
| <b>Test Channel :</b>  | 39                                                                                                                                                   | <b>Relative Humidity :</b> | 41~42%   |
| <b>Test Engineer :</b> | Elvis Chen                                                                                                                                           | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 1. 2480 MHz is fundamental signal which can be ignored.<br>2. Average measurement was not performed if peak level went lower than the average limit. |                            |          |

| Frequency<br>( MHz ) | Level<br>( dBuV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBuV/m ) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>( dB ) | Cable<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Remark  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 30.27                | 21.91               | -18.09                  | 40                          | 33.25                   | 20                          | 0.53                    | 31.87                      | -                    | -                       | Peak    |
| 49.44                | 30.02               | -9.98                   | 40                          | 52.46                   | 8.5                         | 0.69                    | 31.63                      | 105                  | 237                     | Peak    |
| 52.41                | 28.01               | -11.99                  | 40                          | 51.25                   | 7.7                         | 0.71                    | 31.65                      | -                    | -                       | Peak    |
| 710.2                | 22.58               | -23.42                  | 46                          | 29.37                   | 20.75                       | 2.96                    | 30.5                       | -                    | -                       | Peak    |
| 755                  | 23.17               | -22.83                  | 46                          | 29.17                   | 21.42                       | 3.07                    | 30.49                      | -                    | -                       | Peak    |
| 827.1                | 24.49               | -21.51                  | 46                          | 29.28                   | 22.37                       | 3.21                    | 30.37                      | -                    | -                       | Peak    |
| 2480                 | 89.68               | -                       | -                           | 85.12                   | 32.38                       | 6.18                    | 34                         | 107                  | 170                     | Average |
| 2480                 | 89.97               | -                       | -                           | 85.41                   | 32.38                       | 6.18                    | 34                         | 107                  | 170                     | Peak    |
| 4959                 | 41.97               | -32.03                  | 74                          | 56.39                   | 33.91                       | 9.16                    | 57.49                      | 100                  | 0                       | Peak    |

### 3.6 AC Conducted Emission Measurement

#### 3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of emission (MHz) | Conducted limit (dBuV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-peak             | Average   |
| 0.15-0.5                    | 66 to 56*              | 56 to 46* |
| 0.5-5                       | 56                     | 46        |
| 5-30                        | 60                     | 50        |

\*Decreases with the logarithm of the frequency.

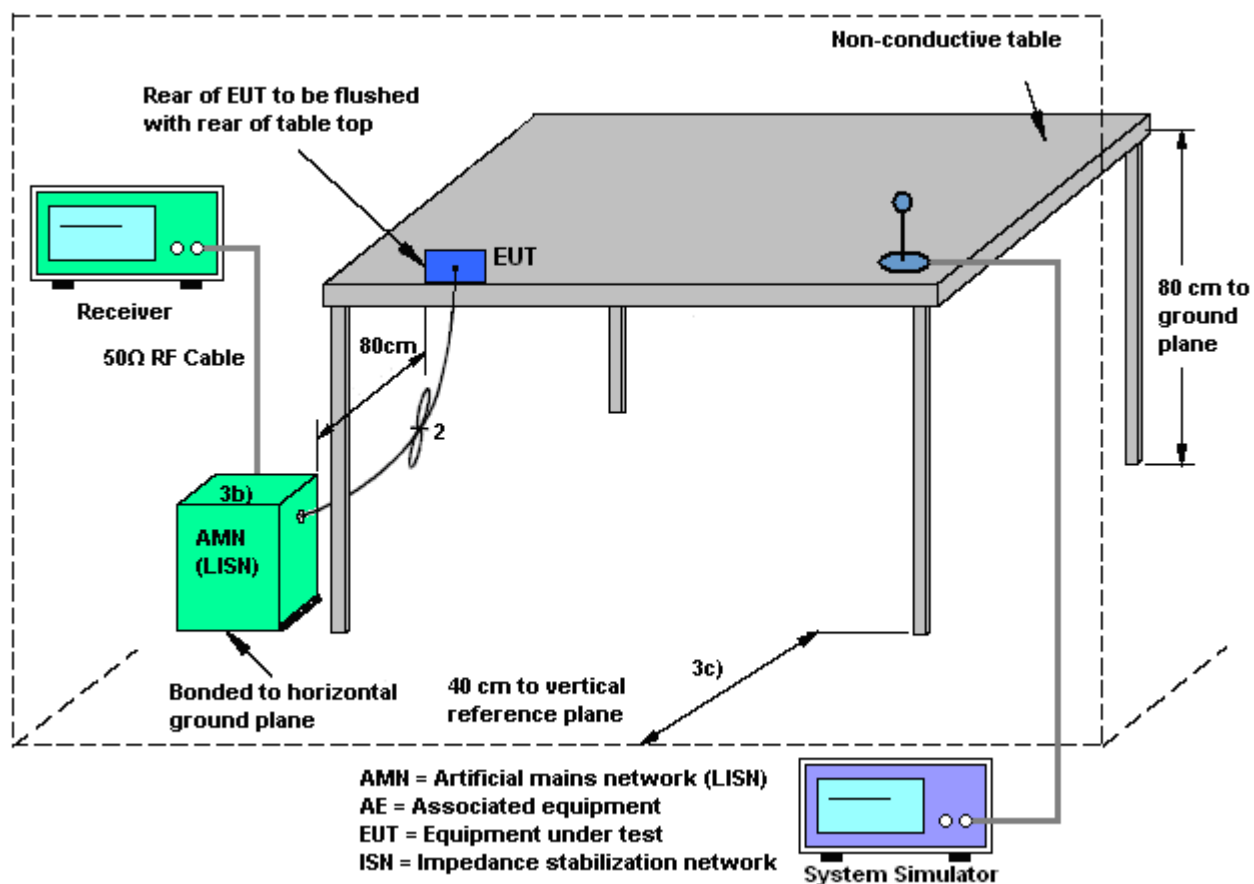
#### 3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.6.3 Test Procedures

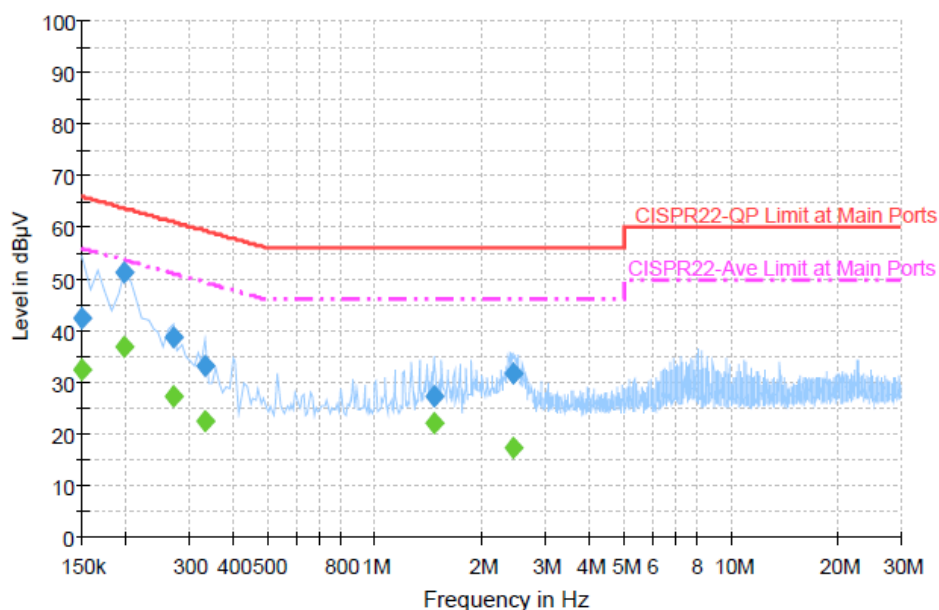
1. The testing follows the guidelines in ANSI C63.10-2009 and ANSI C63.4-2003 test site requirement.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

### 3.6.4 Test Setup



### 3.6.5 Test Result of AC Conducted Emission

|                        |                                                                                                                              |                            |         |
|------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Mode :</b>     | Mode 1                                                                                                                       | <b>Temperature :</b>       | 20~22°C |
| <b>Test Engineer :</b> | Slash Huang                                                                                                                  | <b>Relative Humidity :</b> | 45~47%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                                                                | <b>Phase :</b>             | Line    |
| <b>Function Type :</b> | WCDMA Band IV Idle + Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Earphone + Battery + USB Cable 1 (Data Link with Notebook) |                            |         |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit.                                              |                            |         |



#### Final Result : Quasi-Peak

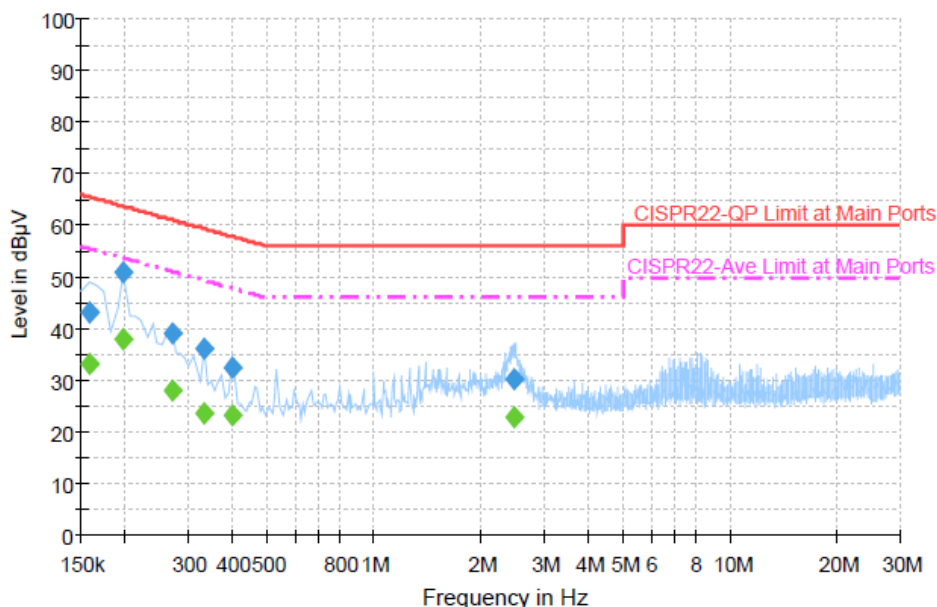
| Frequency (MHz) | Quasi-Peak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|--------|------|------------|-------------|--------------|
| 0.150000        | 42.3              | Off    | L1   | 19.4       | 23.7        | 66.0         |
| 0.198000        | 51.3              | Off    | L1   | 19.3       | 12.4        | 63.7         |
| 0.270000        | 38.6              | Off    | L1   | 19.3       | 22.5        | 61.1         |
| 0.334000        | 33.2              | Off    | L1   | 19.4       | 26.2        | 59.4         |
| 1.462000        | 27.4              | Off    | L1   | 19.5       | 28.6        | 56.0         |
| 2.438000        | 31.8              | Off    | L1   | 19.6       | 24.2        | 56.0         |

#### Final Result : Average

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.150000        | 32.3           | Off    | L1   | 19.4       | 23.7        | 56.0         |
| 0.198000        | 36.9           | Off    | L1   | 19.3       | 16.8        | 53.7         |
| 0.270000        | 27.4           | Off    | L1   | 19.3       | 23.7        | 51.1         |
| 0.334000        | 22.5           | Off    | L1   | 19.4       | 26.9        | 49.4         |
| 1.462000        | 22.1           | Off    | L1   | 19.5       | 23.9        | 46.0         |
| 2.438000        | 17.3           | Off    | L1   | 19.6       | 28.7        | 46.0         |



|                        |                                                                                                                              |                            |         |
|------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Mode :</b>     | Mode 1                                                                                                                       | <b>Temperature :</b>       | 20~22°C |
| <b>Test Engineer :</b> | Slash Huang                                                                                                                  | <b>Relative Humidity :</b> | 45~47%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                                                                | <b>Phase :</b>             | Neutral |
| <b>Function Type :</b> | WCDMA Band IV Idle + Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Earphone + Battery + USB Cable 1 (Data Link with Notebook) |                            |         |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit.                                              |                            |         |


**Final Result : Quasi-Peak**

| Frequency (MHz) | Quasi-Peak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|--------|------|------------|-------------|--------------|
| 0.158000        | 43.3              | Off    | N    | 19.3       | 22.3        | 65.6         |
| 0.198000        | 51.1              | Off    | N    | 19.3       | 12.6        | 63.7         |
| 0.270000        | 39.2              | Off    | N    | 19.4       | 21.9        | 61.1         |
| 0.334000        | 36.0              | Off    | N    | 19.4       | 23.4        | 59.4         |
| 0.398000        | 32.5              | Off    | N    | 19.5       | 25.4        | 57.9         |
| 2.470000        | 30.1              | Off    | N    | 19.6       | 25.9        | 56.0         |

**Final Result : Average**

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.158000        | 33.3           | Off    | N    | 19.3       | 22.3        | 55.6         |
| 0.198000        | 38.1           | Off    | N    | 19.3       | 15.6        | 53.7         |
| 0.270000        | 28.1           | Off    | N    | 19.4       | 23.0        | 51.1         |
| 0.334000        | 23.6           | Off    | N    | 19.4       | 25.8        | 49.4         |
| 0.398000        | 23.1           | Off    | N    | 19.5       | 24.8        | 47.9         |
| 2.470000        | 22.8           | Off    | N    | 19.6       | 23.2        | 46.0         |

### **3.7 Antenna Requirements**

#### **3.7.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 FCC rule.

#### **3.7.2 Antenna Connected Construction**

Non-standard connector used.

#### **3.7.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

## 4 List of Measuring Equipment

| Instrument                | Manufacturer    | Model No.               | Serial No.   | Characteristics       | Calibration Date | Test Date                     | Due Date      | Remark                |
|---------------------------|-----------------|-------------------------|--------------|-----------------------|------------------|-------------------------------|---------------|-----------------------|
| Spectrum Analyzer         | R&S             | FSP40                   | 100055       | 9kHz~40GHz            | Jun. 06, 2012    | Oct. 12, 2012                 | Jun. 05, 2013 | Conducted (TH02-HY)   |
| Power Meter               | Anritsu         | ML2495A                 | 1036004      | 300MHz~40GHz          | Sep. 08, 2012    | Oct. 12, 2012                 | Sep. 07, 2013 | Conducted (TH02-HY)   |
| Power Sensor              | Anritsu         | MA2411B                 | 1027253      | 300MHz~40GHz          | Sep. 08, 2012    | Oct. 12, 2012                 | Sep. 07, 2013 | Conducted (TH02-HY)   |
| Bilog Antenna             | SCHAFFNER       | CBL6111C                | 2726         | 30MHz ~ 1GHz          | Oct. 22, 2011    | Oct. 12, 2012 ~ Oct. 21, 2012 | Oct. 21, 2012 | Radiation (03CH07-HY) |
| Spectrum Analyzer         | R&S             | FSP30                   | 101067       | 9KHz ~ 30GHz          | Dec. 06, 2011    | Oct. 12, 2012 ~ Oct. 21, 2012 | Dec. 05, 2012 | Radiation (03CH07-HY) |
| Double Ridge Horn Antenna | EMCO            | 3117                    | 00066583     | 1GHz ~ 18GHz          | Aug. 01, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Jul. 31, 2013 | Radiation (03CH07-HY) |
| Pre Amplifier             | Agilent         | 8449B                   | 3008A02362   | 1GHz ~ 26.5GHz        | Dec. 05, 2011    | Oct. 12, 2012 ~ Oct. 21, 2012 | Dec. 04, 2012 | Radiation (03CH07-HY) |
| Pre Amplifier             | COM-POWER       | PA-103A                 | 161241       | 10-1000MHz.32 dB.GAIN | Feb. 27, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Feb. 26, 2013 | Radiation (03CH07-HY) |
| Signal Analyzer           | Rohde & Schwarz | FSQ                     | 200578/026   | 20Hz~26.5GHz          | Feb. 06, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Feb. 05, 2013 | Radiation (03CH07-HY) |
| Pre Amplifier             | MITEQ           | AMF-7D-0010 1800-30-10P | 159088       | 1GHz ~ 18GHz          | Mar. 10, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Mar. 09, 2013 | Radiation (03CH07-HY) |
| SHF-EHF Horn Antenna      | SCHWARZBECK     | BBHA 9170               | BBHA91702 51 | 15GHz ~ 40GHz         | Sep. 28, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Sep. 27, 2013 | Radiation (03CH07-HY) |
| Loop Antenna              | R&S             | HFH2-Z2                 | 860004/001   | 9KHz ~ 30MHz          | Jul. 03, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Jul. 02, 2014 | Radiation (03CH07-HY) |
| Bluetooth Base Station    | R&S             | CBT32                   | 100519       | N/A                   | Jun. 05, 2012    | Oct. 12, 2012 ~ Oct. 21, 2012 | Jun. 04, 2013 | Radiation (03CH07-HY) |
| EMI Test Receiver         | R&S             | ESCS 30                 | 100356       | 9KHz ~ 2.75GHz        | Oct. 27, 2011    | Oct. 20, 2012                 | Oct. 26, 2012 | Conduction (CO05-HY)  |
| Two-LISN                  | R&S             | ENV216                  | 11-100081    | 9KHz ~ 30MHz          | Dec. 09, 2011    | Oct. 20, 2012                 | Dec. 08, 2012 | Conduction (CO05-HY)  |
| Two-LISN                  | R&S             | ENV216                  | 11-100080    | 9KHz ~ 30MHz          | Dec. 06, 2011    | Oct. 20, 2012                 | Dec. 05, 2012 | Conduction (CO05-HY)  |
| AC Power Source           | APC             | APC-1000W               | N/A          | N/A                   | N/A              | Oct. 20, 2012                 | N/A           | Conduction (CO05-HY)  |
| GPS Station               | Pendulum        | GSG-54                  | N/A          | N/A                   | N/A              | Oct. 20, 2012                 | N/A           | Conduction (CO05-HY)  |
| System Simulator          | R&S             | CMU200                  | 117997       | N/A                   | Aug. 22, 2011    | Oct. 20, 2012                 | Aug. 21, 2013 | Conduction (CO05-HY)  |

## 5 Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

|                                                                            |      |
|----------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence<br>of 95% ( $U = 2Uc(y)$ ) | 2.26 |
|----------------------------------------------------------------------------|------|

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

|                                                                            |      |
|----------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence<br>of 95% ( $U = 2Uc(y)$ ) | 2.54 |
|----------------------------------------------------------------------------|------|

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

|                                                                            |      |
|----------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence<br>of 95% ( $U = 2Uc(y)$ ) | 4.72 |
|----------------------------------------------------------------------------|------|



## **Appendix A. Photographs of EUT**

Please refer to Sporton report number EP291928 as below.