

# Partial FCC RF Test Report

APPLICANT : Qualcomm Atheros, Inc.  
EQUIPMENT : PCIE 802.11a/b/g/n 2.4GHz/5GHz + USB BT 4.0 card  
BRAND NAME : Atheros  
MODEL NAME : AR5B22  
FCC ID : PPD-AR5B22  
STANDARD : FCC Part 15 Subpart C §15.247  
CLASSIFICATION : (DTS) Digital Transmission System

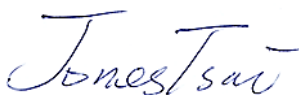
This is a partial report which is included the Conducted Power and Radiated Band Edges and Spurious Emission Measurement items. The product was received on Dec. 14, 2013 and testing was completed on Dec. 30, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown to be compliant 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.



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Reviewed by: Joseph Lin / Supervisor



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Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL INC.**

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FCC ID : PPD-AR5B22

Page Number : 1 of 22

Report Issued Date : Feb. 25, 2014

Report Version : Rev. 02



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## REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION   | ISSUED DATE   |
|------------|---------|---|---------------|
| FR3D1404B  | Rev. 01 | Initial issue of report                                       | Feb. 11, 2014 |
| FR3D1404B  | Rev. 02 | Revising applicant information in cover page and section 1.1. | Feb. 25, 2014 |
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## SUMMARY OF TEST RESULT

| Report Section | FCC Rule              | IC Rule         | Description                                  | Limit                    | Result | Remark                                    |
|----------------|-----------------------|-----------------|--|--------------------------|--------|---|
| 3.1            | 15.247(d)             | RSS-210<br>A8.5 | Radiated Band Edges<br>and Spurious Emission | 15.209(a) &<br>15.247(d) | Pass   | Under limit<br>6.31 dB at<br>2321.970 MHz |
| 3.2            | 15.203 &<br>15.247(b) | RSS-210<br>A8.4 | Antenna Requirement                          | N/A                      | Pass   | -   |

# 1 General Description

## 1.1 Applicant

**Qualcomm Atheros, Inc.**

1700 Technology Drive, San Jose, CA 95110

## 1.2 Manufacturer

**Qualcomm Atheros, Inc.**

1700 Technology Drive, San Jose, CA 95110

## 1.3 Feature of Equipment Under Test

| Product Feature                        |   |
|--|---|
| <b>Equipment</b>                       | PCIE 802.11a/b/g/n 2.4GHz/5GHz + USB BT 4.0 card                                    |
| <b>Brand Name</b>                      | Atheros   |
| <b>Model Name</b>                      | AR5B22  |
| <b>Sample 1</b>                        | EUT with Antenna 1  |
| <b>Sample 2</b>                        | EUT with Antenna 2  |
| <b>FCC ID</b>                          | PPD-AR5B22  |
| <b>Installed into host</b>             | Equipment Name: Tablet PC<br>Brand Name: Lenovo<br>Marketing Name: Lenovo Miix 2 11 |
| <b>EUT supports Radios application</b> | WLAN 11a/b/g/n HT20/HT40<br>Bluetooth v2.1 + EDR<br>Bluetooth v4.0 + LE             |
| <b>EUT Stage</b>                       | Production Unit   |

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

## 1.4 Product Specification of Equipment Under Test

| Product Specification subjective to this standard |  |
|---|--|
| <b>Tx/Rx Frequency Range</b>                      | 2402 MHz ~ 2480 MHz                            |
| <b>Number of Channels</b>                         | 40   |
| <b>Carrier Frequency of Each Channel</b>          | 40 Channel(37 hopping + 3 advertising channel) |
| <b>Maximum Output Power to Antenna</b>            | 4.00 dBm (0.0025 W)                            |
| <b>Antenna Type</b>                               | PIFA Antenna type with gain 1.87 dBi           |
| <b>Type of Modulation</b>                         | Bluetooth 4.0 - LE : GFSK                      |

| Antenna Information |                   |   |   |
|---------------------|-------------------|---|---|
| Antenna 1           | Manufacturer      | WNC   |   |
|                     | P/N               | Main: 025.9000X.0001  | Aux:025.9000Y.0001  |
|                     | Antenna Type      | Main: PIFA Antenna  | Aux.: PIFA Antenna  |
|                     | Antenna connector | RF  |   |
|                     | Peak gain         | Main Antenna :<br>WLAN (2.4G) : 1.87 dBi<br>WLAN (5G) : -0.16 dBi<br>Bluetooth: 1.87 dBi  | Aux. Antenna :<br>WLAN (2.4G) : 0.69 dBi<br>WLAN (5G) : 2.73 dBi  |
| Antenna 2           | Manufacturer      | HT  |   |
|                     | P/N               | Main: 025.9000X.0011  | Aux.: 025.9000Y.0011  |
|                     | Antenna Type      | Main: PIFA Antenna  | Aux.: PIFA Antenna  |
|                     | Antenna connector | IPEX  |   |
|                     | Peak gain         | Main Antenna :<br>WLAN (2.4G) : -1.63 dBi<br>WLAN (5G) : 1.84 dBi<br>Bluetooth: -1.63 dBi | Aux. Antenna :<br>WLAN (2.4G) : -0.35 dBi<br>WLAN (5G) : 1.07 dBi |

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6 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  | 03CH06-HY | 722060/4086B-1          |

**Note:** The test site complies with ANSI C63.4 2003 requirement.

## 1.7 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 v03r01
- ♦ ANSI C63.4-2003

**Remark:** All test items were verified and recorded according to the standards and without any deviation during the test.

## 2 Test Configuration of Equipment Under Test

### 2.1 Descriptions of Test Mode

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   | 3.58 dBm                           |
| Ch19    | 2440MHz   | 3.98 dBm                           |
| Ch39    | 2480MHz   | <b>4.00</b> dBm                    |

| Channel        | Frequency | Average Bluetooth 4.0 – LE RF Output Power |
|----------------|-----------|--|
|                |           | Data Rate                                  |
|                |           | 1Mbps                                      |
| Ch00           | 2402MHz   | 3.07 dBm                                   |
| Ch19           | 2440MHz   | 3.61 dBm                                   |
| Ch39           | 2480MHz   | 3.89 dBm                                   |
| Duty Cycle (%) |           | 70.70                                      |

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (X plane as worst plane) from all possible combinations.

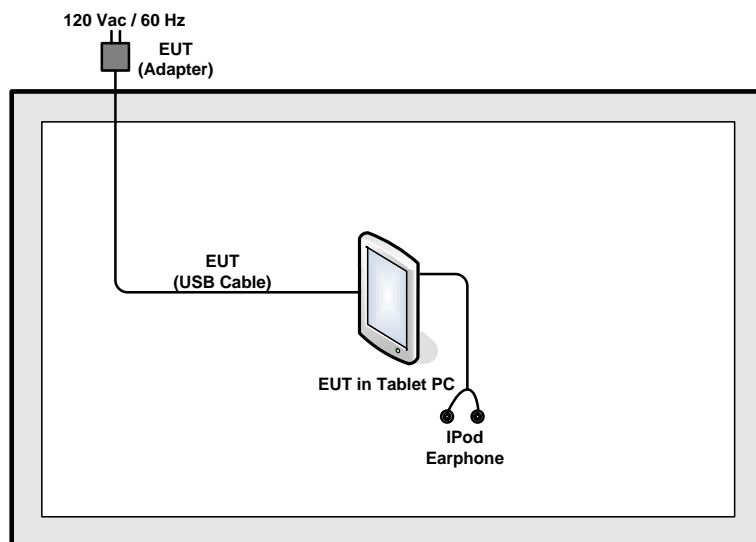


## 2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases  |  |
|--|--|
| Test Item  | Data Rate / Modulation                   |
|  | Bluetooth 4.0 – LE / GFSK                |
| Conducted TCs  | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps |
|  | Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps |
|  | Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps |
| Radiated TCs   | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps |
|  | Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps |
|  | Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps |
| <b>Remark:</b> All test items were performed with Sample1, Battery 1, and Ant. Port 1. |  |

## 2.3 Connection Diagram of Test System



## 2.4 Support Unit used in test configuration and system

| Item | Equipment     | Trade Name | Model Name | FCC ID       | Data Cable        | Power Cord |
|------|---------------|------------|------------|--------------|-------------------|------------|
| 1.   | iPod Earphone | Apple      | N/A        | Verification | Unshielded, 1.0 m | N/A        |

## 2.5 EUT Operation Test Setup

For Bluetooth function, the RF utility, "BtUSBTool" was installed in Tablet PC which was programmed in order to make the Tablet PC get into the engineering modes to continuous transmitting and receiving signals.

### 3 Test Result

#### 3.1 Radiated Band Edges and Spurious Emission Measurement

##### 3.1.1 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. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. 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                                |

##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
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 - Preamp 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.

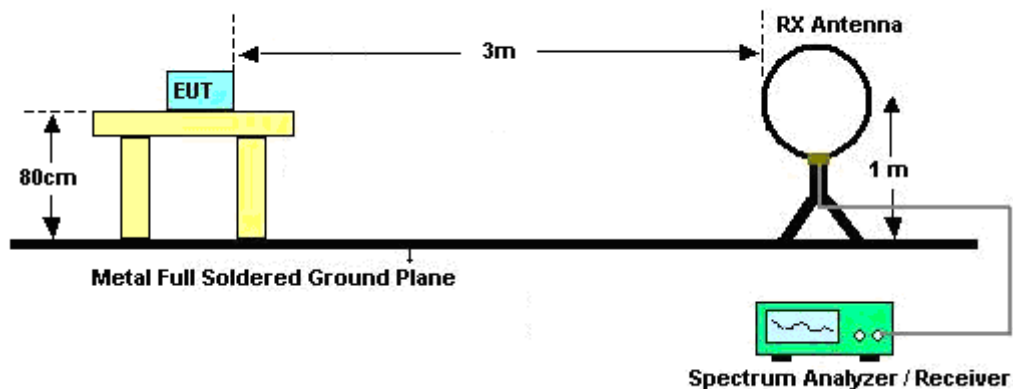
For average measurement:

  - $VBW = 10$  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.

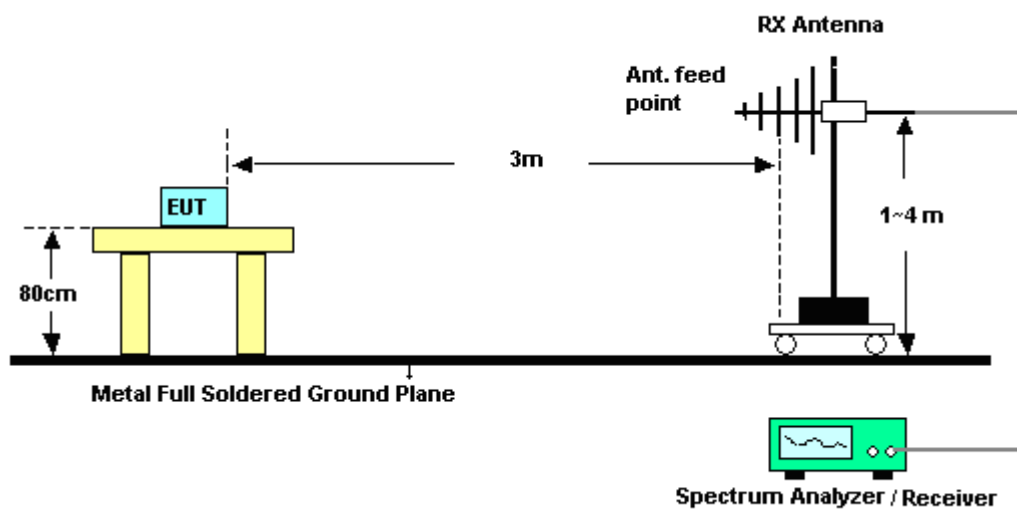
| Band               | Duty Cycle(%) | T( $\mu$ s) | 1/T(kHz) | VBW Setting |
|--------------------|---------------|-------------|----------|-------------|
| Bluetooth 4.0 - LE | 70.70         | 444.00      | 2.252    | 3kHz        |

### 3.1.4 Test Setup

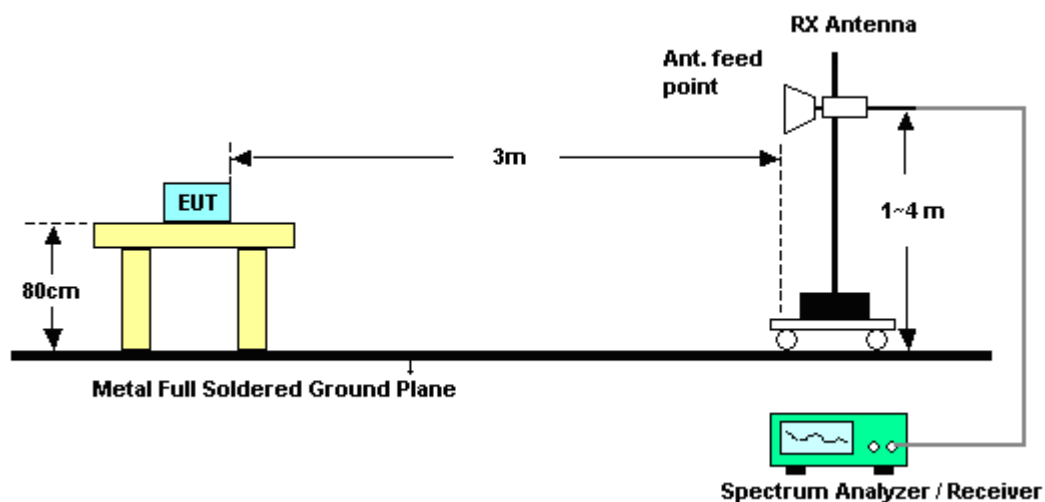
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.1.5 Test Results of Radiated Spurious 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.

**3.1.6 Test Result of Radiated Spurious at Band Edges**

|                       |        |                            |              |
|-----------------------|--------|----------------------------|--------------|
| <b>Test Mode :</b>    | Mode 1 | <b>Temperature :</b>       | 22~24°C      |
| <b>Test Channel :</b> | 00     | <b>Relative Humidity :</b> | 47~49%       |
|                       |        | <b>Test Engineer :</b>     | Marlboro Hsu |

| 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  |
| 2322.060                      | 51.85               | -22.15                  | 74.00                       | 47.99                   | 31.86                       | 6.35                    | 34.35                      | 100                  | 262                     | Peak    |
| 2321.970                      | 47.69               | -6.31                   | 54.00                       | 43.83                   | 31.86                       | 6.35                    | 34.35                      | 100                  | 262                     | Average |

| 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  |
| 2322.060                    | 48.50               | -25.50                  | 74.00                       | 44.64                   | 31.86                       | 6.35                    | 34.35                      | 101                  | 45                      | Peak    |
| 2321.970                    | 41.93               | -12.07                  | 54.00                       | 38.07                   | 31.86                       | 6.35                    | 34.35                      | 101                  | 45                      | Average |

|                       |        |                            |              |
|-----------------------|--------|----------------------------|--------------|
| <b>Test Mode :</b>    | Mode 3 | <b>Temperature :</b>       | 22~24°C      |
| <b>Test Channel :</b> | 39     | <b>Relative Humidity :</b> | 47~49%       |
|                       |        | <b>Test Engineer :</b>     | Marlboro Hsu |

| 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  |
| 2483.65                       | 51.5                | -22.5                   | 74                          | 47.22                   | 31.99                       | 6.59                    | 34.3                       | 169                  | 6                       | Peak    |
| 2483.5                        | 43.58               | -10.42                  | 54                          | 39.3                    | 31.99                       | 6.59                    | 34.3                       | 169                  | 6                       | Average |

| 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  |
| 2483.62                     | 47.91               | -26.09                  | 74                          | 43.63                   | 31.99                       | 6.59                    | 34.3                       | 177                  | 242                     | Peak    |
| 2483.5                      | 40.01               | -13.99                  | 54                          | 35.73                   | 31.99                       | 6.59                    | 34.3                       | 177                  | 242                     | Average |

### 3.1.7 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)

**Note:** Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

|                        |  |                            |            |
|------------------------|--|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 1   | <b>Temperature :</b>       | 22~24°C    |
| <b>Test Channel :</b>  | 00   | <b>Relative Humidity :</b> | 47~49%     |
| <b>Test Engineer :</b> | Marlboro Hsu   | <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>( 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  |
|----------------------|---------------------|-------------------------|----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 154.74               | 24.16               | -19.34                  | 43.5                       | 44.31                   | 10.2                        | 1.4                     | 31.75                      | -                    | -                       | Peak    |
| 196.86               | 23.68               | -19.82                  | 43.5                       | 44.77                   | 9.14                        | 1.52                    | 31.75                      | -                    | -                       | Peak    |
| 268.14               | 26.2                | -19.8                   | 46                         | 43.03                   | 13.09                       | 1.81                    | 31.73                      | -                    | -                       | Peak    |
| 480.6                | 27.69               | -18.31                  | 46                         | 39.68                   | 17.61                       | 2.31                    | 31.91                      | -                    | -                       | Peak    |
| 797                  | 33.66               | -12.34                  | 46                         | 42.52                   | 20.03                       | 3.06                    | 31.95                      | -                    | -                       | Peak    |
| 907.6                | 34.18               | -11.82                  | 46                         | 41.25                   | 21.02                       | 3.37                    | 31.46                      | 100                  | 18                      | Peak    |
| 2402                 | 94.74               | -                       | -                          | 90.7                    | 31.92                       | 6.45                    | 34.33                      | 100                  | 262                     | Average |
| 2402                 | 96.44               | -                       | -                          | 92.4                    | 31.92                       | 6.45                    | 34.33                      | 100                  | 262                     | Peak    |
| 4803                 | 47.08               | -26.92                  | 74                         | 58.07                   | 34.41                       | 10.16                   | 55.56                      | 100                  | 0                       | Peak    |

**Note:** Other harmonics are lower than background noise.



|                        |  |                            |          |
|------------------------|--|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 1   | <b>Temperature :</b>       | 22~24°C  |
| <b>Test Channel :</b>  | 00   | <b>Relative Humidity :</b> | 47~49%   |
| <b>Test Engineer :</b> | Marlboro Hsu   | <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>( 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  |
|----------------------|---------------------|-------------------------|----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 40.8                 | 31.16               | -8.84                   | 40                         | 49.97                   | 12.24                       | 0.74                    | 31.79                      | 100                  | 163                     | Peak    |
| 91.56                | 26                  | -17.5                   | 43.5                       | 47.8                    | 8.9                         | 1.06                    | 31.76                      | -                    | -                       | Peak    |
| 157.44               | 22.44               | -21.06                  | 43.5                       | 42.6                    | 10.16                       | 1.43                    | 31.75                      | -                    | -                       | Peak    |
| 480.6                | 27.09               | -18.91                  | 46                         | 39.08                   | 17.61                       | 2.31                    | 31.91                      | -                    | -                       | Peak    |
| 601                  | 24.09               | -21.91                  | 46                         | 33.97                   | 19.41                       | 2.77                    | 32.06                      | -                    | -                       | Peak    |
| 798.4                | 26.78               | -19.22                  | 46                         | 35.65                   | 20.02                       | 3.06                    | 31.95                      | -                    | -                       | Peak    |
| 2402                 | 91.01               | -                       | -                          | 86.97                   | 31.92                       | 6.45                    | 34.33                      | 101                  | 45                      | Average |
| 2402                 | 92.86               | -                       | -                          | 88.82                   | 31.92                       | 6.45                    | 34.33                      | 101                  | 45                      | Peak    |
| 4803                 | 46.68               | -27.32                  | 74                         | 57.67                   | 34.41                       | 10.16                   | 55.56                      | 100                  | 0                       | Peak    |

**Note:** Other harmonics are lower than background noise.

|                        |  |                            |            |
|------------------------|--|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 2   | <b>Temperature :</b>       | 22~24°C    |
| <b>Test Channel :</b>  | 19   | <b>Relative Humidity :</b> | 47~49%     |
| <b>Test Engineer :</b> | Marlboro Hsu   | <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>( 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  |
|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2440                 | 96.74               | -                       | -                           | 92.58                     | 31.96                       | 6.52                    | 34.32                      | 184                  | 293                     | Average |
| 2440                 | 98.36               | -                       | -                           | 94.2                      | 31.96                       | 6.52                    | 34.32                      | 184                  | 293                     | Peak    |
| 4881                 | 46.8                | -27.2                   | 74                          | 57.92                     | 34.37                       | 10.19                   | 55.68                      | 100                  | 0                       | Peak    |
| 7320                 | 48.47               | -25.53                  | 74                          | 58.17                     | 35.6                        | 10.94                   | 56.24                      | 100                  | 0                       | Peak    |

**Note:** Other harmonics are lower than background noise.

|                        |  |                            |          |
|------------------------|--|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 2   | <b>Temperature :</b>       | 22~24°C  |
| <b>Test Channel :</b>  | 19   | <b>Relative Humidity :</b> | 47~49%   |
| <b>Test Engineer :</b> | Marlboro Hsu   | <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>( 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  |
|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2440                 | 96.13               | -                       | -                           | 91.97                     | 31.96                       | 6.52                    | 34.32                      | 176                  | 248                     | Average |
| 2440                 | 97.8                | -                       | -                           | 93.64                     | 31.96                       | 6.52                    | 34.32                      | 176                  | 248                     | Peak    |
| 4881                 | 47.41               | -26.59                  | 74                          | 58.53                     | 34.37                       | 10.19                   | 55.68                      | 100                  | 0                       | Peak    |
| 7320                 | 49.05               | -24.95                  | 74                          | 58.75                     | 35.6                        | 10.94                   | 56.24                      | 100                  | 0                       | Peak    |

**Note:** Other harmonics are lower than background noise.

|                        |  |                            |            |
|------------------------|--|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 3   | <b>Temperature :</b>       | 22~24°C    |
| <b>Test Channel :</b>  | 39   | <b>Relative Humidity :</b> | 47~49%     |
| <b>Test Engineer :</b> | Marlboro Hsu   | <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>( 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  |
|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2480                 | 98.35               | -                       | -                           | 94.07                     | 31.99                       | 6.59                    | 34.30                      | 169                  | 6                       | Average |
| 2480                 | 99.83               | -                       | -                           | 95.55                     | 31.99                       | 6.59                    | 34.30                      | 169                  | 6                       | Peak    |
| 4959                 | 47.54               | -26.46                  | 74                          | 58.85                     | 34.32                       | 10.21                   | 55.84                      | 100                  | 0                       | Peak    |
| 7440                 | 49.41               | -24.59                  | 74                          | 58.98                     | 35.53                       | 10.90                   | 56.00                      | 100                  | 0                       | Peak    |

**Note:** Other harmonics are lower than background noise.

|                        |  |                            |          |
|------------------------|--|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 3   | <b>Temperature :</b>       | 22~24°C  |
| <b>Test Channel :</b>  | 39   | <b>Relative Humidity :</b> | 47~49%   |
| <b>Test Engineer :</b> | Marlboro Hsu   | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 1. 2481 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>( 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  |
|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 2481                 | 94.35               | -                       | -                           | 90.07                     | 31.99                       | 6.59                    | 34.30                      | 177                  | 242                     | Average |
| 2481                 | 95.84               | -                       | -                           | 91.56                     | 31.99                       | 6.59                    | 34.30                      | 177                  | 242                     | Peak    |
| 4959                 | 47.34               | -26.66                  | 74                          | 58.65                     | 34.32                       | 10.21                   | 55.84                      | 100                  | 0                       | Peak    |
| 7440                 | 49.13               | -24.87                  | 74                          | 58.70                     | 35.53                       | 10.90                   | 56.00                      | 100                  | 0                       | Peak    |

**Note:** Other harmonics are lower than background noise.

## **3.2 Antenna Requirements**

### **3.2.1 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.

### **3.2.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.2.3 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                   |
|------------------------------|--------------------|-----------|-----------------|--------------------|------------------|---------------|---------------|--------------------------|
| Power Meter                  | Agilent            | E4416A    | GB412923<br>44  | 300MHz~40GHz       | Feb. 05, 2013    | Jan. 25, 2013 | Feb. 04, 2014 | Conducted<br>(TH02-HY)   |
| Power Sensor                 | Agilent            | E9327A    | US404415<br>48  | 300MHz~40GHz       | Feb. 05, 2013    | Dec. 25, 2013 | Feb. 04, 2014 | Conducted<br>(TH02-HY)   |
| Spectrum Analyzer            | R&S                | FSP30     | 101067          | 9kHz ~ 30GHz       | Nov. 20, 2013    | Dec. 30, 2013 | Nov. 19, 2014 | Radiation<br>(03CH06-HY) |
| Spectrum Analyzer            | Agilent            | E4408B    | MY442110<br>30  | 9kHz ~ 26.5GHz     | Dec. 02, 2013    | Dec. 30, 2013 | Dec. 01, 2014 | Radiation<br>(03CH06-HY) |
| EMI Test Receiver            | R&S                | ESVS10    | 834468/00<br>03 | 20MHz ~<br>1000MHz | May 06, 2013     | Dec. 30, 2013 | May 05, 2014  | Radiation<br>(03CH06-HY) |
| Loop Antenna                 | Rohde &<br>Schwarz | HFH2-Z2   | 860004/00<br>01 | 9kHz ~ 30MHz       | Jul. 03, 2012    | Dec. 30, 2013 | Jul. 02, 2014 | Radiation<br>(03CH06-HY) |
| Bilog Antenna                | Schaffner          | CBL6112B  | 2885            | 30MHz ~ 2GHz       | Oct. 10, 2013    | Dec. 30, 2013 | Oct. 09, 2014 | Radiation<br>(03CH06-HY) |
| Double Ridge<br>Horn Antenna | EMCO               | 3117      | 00066583        | 1GHz ~ 18GHz       | Aug. 02, 2013    | Dec. 30, 2013 | Aug. 01, 2014 | Radiation<br>(03CH06-HY) |
| Amplifier                    | Agilent            | 310N      | 186713          | 9kHz ~ 1GHz        | Apr. 12, 2013    | Dec. 30, 2013 | Apr. 11, 2014 | Radiation<br>(03CH06-HY) |
| Pre Amplifier                | EMCI               | EMC051845 | SN980048        | 1GHz ~ 18GHz       | Jul. 18, 2013    | Dec. 30, 2013 | Jul. 17, 2014 | Radiation<br>(03CH06-HY) |
| SHF-EHF Horn<br>Antenna      | SCHWARZBE<br>CK    | BBHA 9170 | BBHA9170<br>251 | 15GHz ~ 40GHz      | Oct. 03, 2013    | Dec. 30, 2013 | Oct. 02, 2014 | Radiation<br>(03CH06-HY) |
| Preamplifier                 | Agilent            | 8449B     | 3008A019<br>17  | 1GHz ~ 26.5GHz     | Apr. 12, 2013    | Dec. 30, 2013 | Apr. 11, 2014 | Radiation<br>(03CH06-HY) |
| Turn Table                   | INN-CO             | DS2000    | 420/650/00      | 0 ~ 360 degree     | N/A              | Dec. 30, 2013 | N/A           | Radiation<br>(03CH06-HY) |
| Antenna Mast                 | MF                 | MF-7802   | MF780208<br>212 | 1 m ~ 4 m          | N/A              | Dec. 30, 2013 | N/A           | Radiation<br>(03CH06-HY) |

## 5 Uncertainty of Evaluation

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

|  |      |
|--|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) | 4.50 |
|--|------|

