# 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 | : | (DSS) Spread Spectrum Transmitter |

**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.**

**Reviewed by: Joseph Lin / Supervisor**

**Approved by: Jones Tsai / Manager**

Testing Laboratory 1190

***SPORTON INTERNATIONAL INC.***
***No. 52, Hwa Ya 1st 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 |
|---|---|---|---|
| FR3D1404A | Rev. 01 | Initial issue of report | Feb. 11, 2014 |
| FR3D1404A | 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 A8.5 | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d) | Pass | Under limit 8.92 dB at 40.800 MHz |
| 3.2 | 15.203 & 15.247(b) | RSS-210 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 | |
|---|---|
| **Equipment** | PCIE 802.11a/b/g/n 2.4GHz/5GHz + USB BT 4.0 card |
| **Brand Name** | Atheros |
| **Model Name** | AR5B22 |
| **Sample 1** | EUT with Antenna 1 |
| **Sample 2** | EUT with Antenna 2 |
| **FCC ID** | PPD-AR5B22 |
| **Installed into host** | Equipment Name: Tablet PC<br>Brand Name: Lenovo<br>Marketing Name: Lenovo Miix 2 11 |
| **EUT supports Radios application** | WLAN 11a/b/g/n HT20/HT40<br>Bluetooth v2.1 + EDR<br>Bluetooth v4.0 + LE |
| **EUT Stage** | 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 | |
|---|---|
| **Tx/Rx Frequency Range** | 2402 MHz ~ 2480 MHz |
| **Number of Channels** | 79 |
| **Carrier Frequency of Each Channel** | 2402+n*1 MHz; n=0~78 |
| **Maximum Output Power to Antenna** | Bluetooth BR(1Mbps) : 4.79 dBm (0.0030 W)<br>Bluetooth EDR (2Mbps) : 6.72 dBm (0.0047 W)<br>Bluetooth EDR (3Mbps) : 6.80 dBm (0.0048 W) |
| **Antenna Type** | PIFA Antenna type with gain 1.87 dBi |
| **Type of Modulation** | Bluetooth BR (1Mbps) : GFSK<br>Bluetooth EDR (2Mbps) : $\pi$/4-DQPSK<br>Bluetooth EDR (3Mbps) : 8-DPSK |

| 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 1st 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 Public Notice DA 00-705
- 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

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

**<Ant. Port 1>**

| Channel | Frequency | Bluetooth RF Output Power | | |
|---|---|---|---|---|
| | | Data Rate / Modulation | | |
| | | GFSK | $\pi$ /4-DQPSK | 8-DPSK |
| | | 1Mbps | 2Mbps | 3Mbps |
| Ch00 | 2402MHz | 4.18 dBm | 6.16 dBm | 6.51 dBm |
| Ch39 | 2441MHz | 4.57 dBm | 6.65 dBm | 6.65 dBm |
| Ch78 | 2480MHz | 4.79 dBm | 6.72 dBm | **6.80** dBm |

**Remark:**

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 3Mbps for all the test items due to the highest RF output power.

| Channel | Frequency | Average Bluetooth RF Output Power | | |
|---|---|---|---|---|
| | | Data Rate | | |
| | | 1Mbps | 2Mbps | 3Mbps |
| Ch00 | 2402MHz | 3.27 dBm | 3.37 dBm | 3.36 dBm |
| Ch39 | 2441MHz | 3.79 dBm | 3.93 dBm | 3.94 dBm |
| Ch78 | 2480MHz | 4.03 dBm | 4.18 dBm | 4.18 dBm |
| Duty Cycle (%) | | 65.61 | 66.24 | 66.24 |

a. 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, and different data rates were conducted to determine the final configuration (X plane as worst plane) from all possible combinations, and the worst mode of radiated spurious emissions is Bluetooth 3Mbps mode, and recorded in this report.

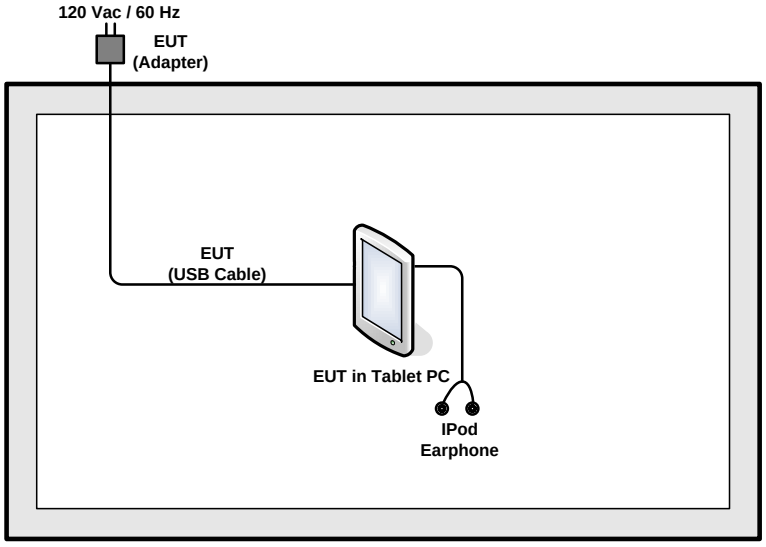
## 2.2 Test Mode

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

| Summary table of Test Cases | |
|---|---|
| | **Bluetooth EDR 3Mbps 8-DPSK** |
| **Radiated Test Cases** | Mode 1: CH00_2402 MHz<br>Mode 2: CH39_2441 MHz<br>Mode 3: CH78_2480 MHz |
| **Remark:**<br>1. For radiated test cases, the worst mode data rate 3Mbps was reported only, because this data rate has the highest RF output power at preliminary tests.<br>2. All test items were performed with Sample1, Battery 1, and Ant. Port 1. | |

## 2.3 Connection Diagram of Test System

**<Bluetooth Tx Mode>**




## 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. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

### 3.1.2 Measuring Instruments

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

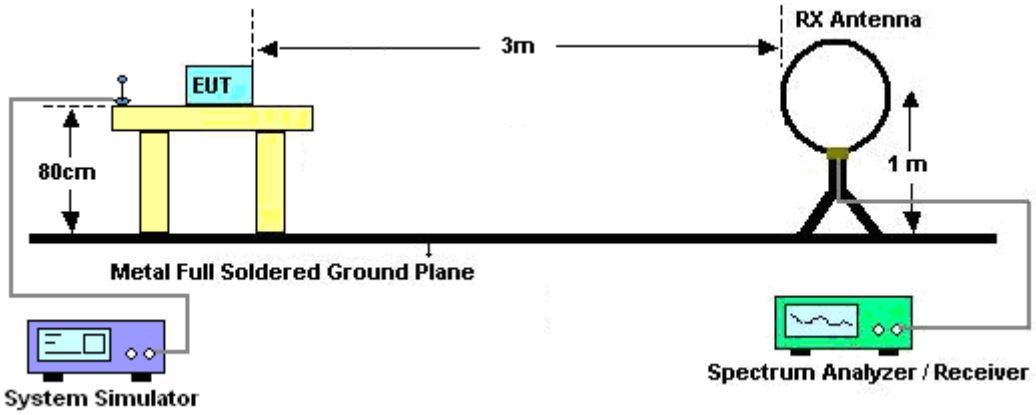
### 3.1.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, 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 to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. 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, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where $N_1$ is number of type 1 pulses, $L_1$ is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

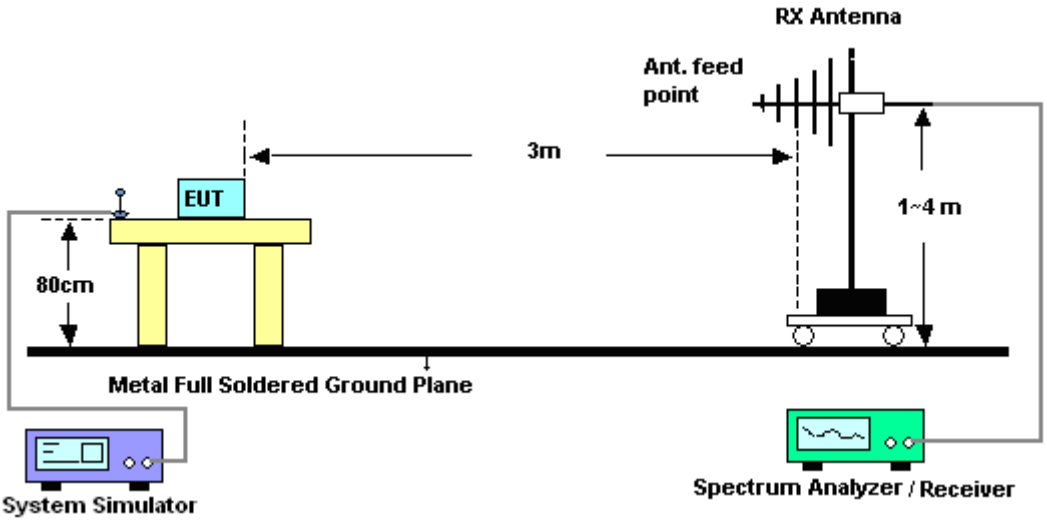
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.67dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

### 3.1.4 Test Setup

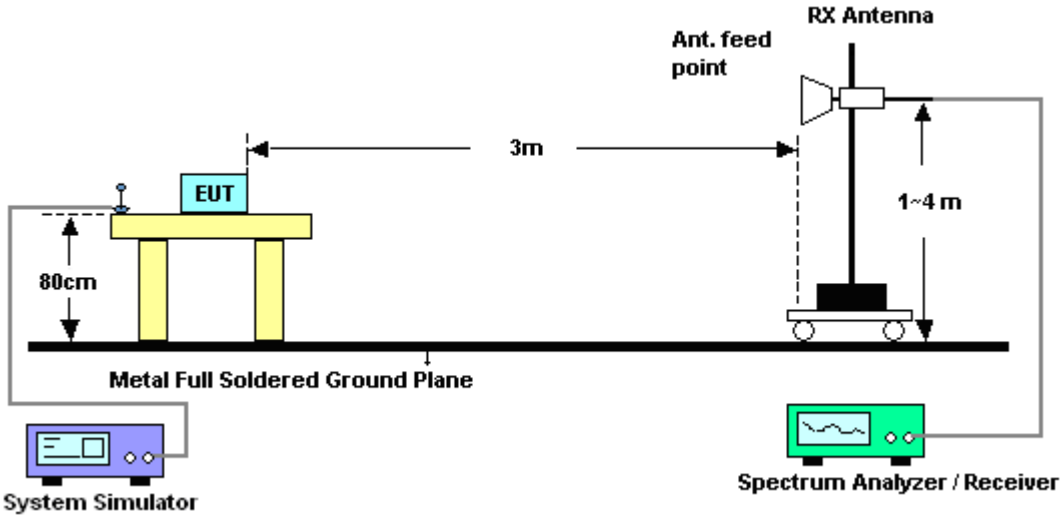
**For radiated emissions below 30MHz**




**For radiated emissions from 30MHz to 1GHz**



**For radiated emissions above 1GHz**

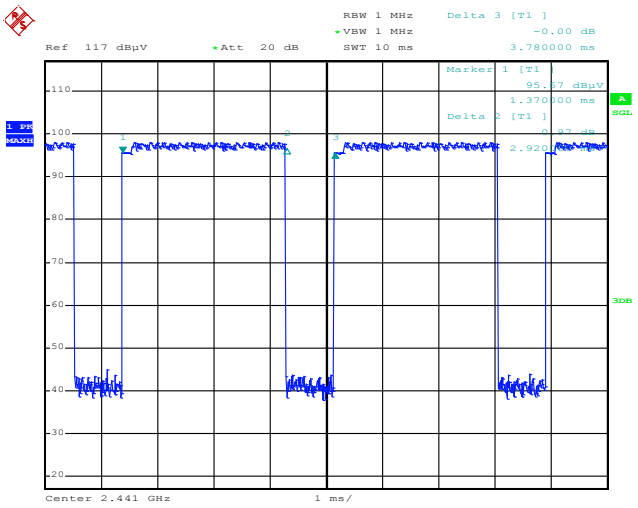



## 3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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.

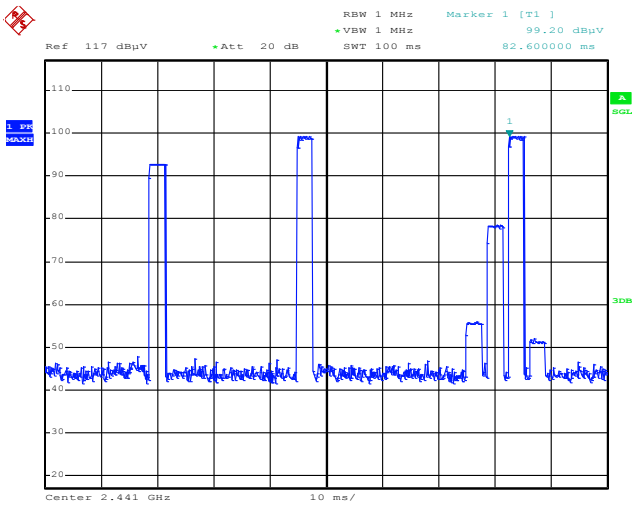
### 3.1.6 Duty cycle correction factor for average measurement

**3DH5 on time (One Pulse) Plot on Channel 39**




Date: 30.DEC.2013 04:51:19

**3DH5 on time (Count Pulses) Plot on Channel 39**




Date: 30.DEC.2013 04:55:02

**Note:**

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.92 / 100 = 5.84 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.67 dB
3. 3DH5 has the highest duty cycle worst case and is reported.

**Duty Cycle Correction Factor Consideration for AFH mode:**

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

*2.92 ms x 20 channels = 58.4 ms*

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100ms / 57.6ms ] = 2 hops

Thus, the maximum possible ON time:

*2.92 ms x 2 = 5.84 ms*

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

*20 x log(5.84 ms/100ms) = -24.67 dB*

### 3.1.7 Test Result of Radiated Spurious at Band Edges

| Test Mode : | 3Mbps | Temperature : | 22~24°C |
|---|---|---|---|
| Test Channel : | 00 | Relative Humidity : | 47~49% |
| | | Test Engineer : | Marlboro Hsu |

| ANTENNA POLARITY : HORIZONTAL | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
| 2322.15 | 56.29 | -17.71 | 74 | 52.43 | 31.86 | 6.35 | 34.35 | 119 | 292 | Peak |
| 2322.15 | 31.62 | -22.38 | 54 | - | - | - | - | - | - | Average |

| ANTENNA POLARITY : VERTICAL | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
| 2321.97 | 50.25 | -23.75 | 74 | 46.39 | 31.86 | 6.35 | 34.35 | 100 | 38 | Peak |
| 2321.97 | 25.58 | -28.42 | 54 | - | - | - | - | - | - | Average |

| Test Mode : | 3Mbps | Temperature : | 22~24°C |
|---|---|---|---|
| Test Channel : | 78 | Relative Humidity : | 47~49% |
| | | Test Engineer : | Marlboro Hsu |

| ANTENNA POLARITY : HORIZONTAL | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
| 2483.5 | 63.36 | -10.64 | 74 | 59.08 | 31.99 | 6.59 | 34.3 | 109 | 18 | Peak |
| 2483.5 | 38.69 | -15.31 | 54 | - | - | - | - | - | - | Average |

| ANTENNA POLARITY : VERTICAL | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
| 2483.5 | 58.86 | -15.14 | 74 | 54.58 | 31.99 | 6.59 | 34.3 | 169 | 248 | Peak |
| 2483.5 | 34.19 | -19.81 | 54 | - | - | - | - | - | - | Average |

**Note:** Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.67dB)

### 3.1.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th 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.

| | | | |
|---|---|---|---|
| **Test Mode :** | 3Mbps | **Temperature :** | 22~24°C |
| **Test Channel :** | 00 | **Relative Humidity :** | 47~49% |
| **Test Engineer :** | Marlboro Hsu | **Polarization :** | Horizontal |
| **Remark :** | 2403 MHz is fundamental signal which can be ignored. | | |

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 2403 | 102.45 | - | - | 98.4 | 31.93 | 6.45 | 34.33 | 119 | 292 | Peak |
| 2403 | 77.78 | - | - | - | - | - | - | - | - | Average |
| 4803 | 48.27 | -25.73 | 74 | 59.26 | 34.41 | 10.16 | 55.56 | 100 | 0 | Peak |
| 4803 | 23.6 | -30.4 | 54 | - | - | - | - | - | - | Average |

**Note:** 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor( -24.67)

| | | | |
|---|---|---|---|
| **Test Mode :** | 3Mbps | **Temperature :** | 22~24°C |
| **Test Channel :** | 00 | **Relative Humidity :** | 47~49% |
| **Test Engineer :** | Marlboro Hsu | **Polarization :** | Vertical |
| **Remark :** | 2402 MHz is fundamental signal which can be ignored. | | |

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 2402 | 94.8 | - | - | 90.76 | 31.92 | 6.45 | 34.33 | 100 | 38 | Peak |
| 2402 | 70.13 | - | - | - | - | - | - | - | - | Average |
| 4803 | 47.53 | -26.47 | 74 | 58.52 | 34.41 | 10.16 | 55.56 | 100 | 0 | Peak |
| 4803 | 22.86 | -31.14 | 54 | - | - | - | - | - | - | Average |

**Note:** 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor( -24.67)

| Test Mode : | 3Mbps | Temperature : | 22~24°C |
|---|---|---|---|
| Test Channel : | 39 | Relative Humidity : | 47~49% |
| Test Engineer : | Marlboro Hsu | Polarization : | Horizontal |
| Remark : | 2442 MHz is fundamental signal which can be ignored. | | |

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 2442 | 102.16 | - | - | 97.99 | 31.96 | 6.52 | 34.31 | 116 | 0 | Peak |
| 2442 | 77.49 | - | - | - | - | - | - | - | - | Average |
| 4881 | 47.53 | -26.47 | 74 | 58.65 | 34.37 | 10.19 | 55.68 | 100 | 0 | Peak |
| 4881 | 22.86 | -31.14 | 54 | - | - | - | - | - | - | Average |
| 7323 | 49.17 | -24.83 | 74 | 58.87 | 35.6 | 10.94 | 56.24 | 100 | 0 | Peak |
| 7323 | 24.5 | -29.5 | 54 | - | - | - | - | - | - | Average |

**Note:** 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor( -24.67)

| Test Mode : | 3Mbps | Temperature : | 22~24°C |
|---|---|---|---|
| Test Channel : | 39 | Relative Humidity : | 47~49% |
| Test Engineer : | Marlboro Hsu | Polarization : | Vertical |
| Remark : | 2442 MHz is fundamental signal which can be ignored. | | |

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 2442 | 99.29 | - | - | 95.12 | 31.96 | 6.52 | 34.31 | 177 | 259 | Peak |
| 2442 | 74.62 | - | - | - | - | - | - | - | - | Average |
| 4881 | 45.94 | -28.06 | 74 | 57.06 | 34.37 | 10.19 | 55.68 | 100 | 0 | Peak |
| 4881 | 21.27 | -32.73 | 54 | - | - | - | - | - | - | Average |
| 7323 | 48.93 | -25.07 | 74 | 58.63 | 35.6 | 10.94 | 56.24 | 100 | 0 | Peak |
| 7323 | 24.26 | -29.74 | 54 | - | - | - | - | - | - | Average |

**Note:** 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor( -24.67)

| Test Mode : | 3Mbps | Temperature : | 22~24°C |
|---|---|---|---|
| Test Channel : | 78 | Relative Humidity : | 47~49% |
| Test Engineer : | Marlboro Hsu | Polarization : | Horizontal |
| Remark : | 2481 MHz is fundamental signal which can be ignored. | | |

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 91.56 | 20.23 | -23.27 | 43.5 | 42.03 | 8.9 | 1.06 | 31.76 | - | - | Peak |
| 154.2 | 24.6 | -18.9 | 43.5 | 44.66 | 10.3 | 1.39 | 31.75 | - | - | Peak |
| 268.14 | 26.8 | -19.2 | 46 | 43.63 | 13.09 | 1.81 | 31.73 | - | - | Peak |
| 480.6 | 27.55 | -18.45 | 46 | 39.54 | 17.61 | 2.31 | 31.91 | - | - | Peak |
| 800.5 | 34.28 | -11.72 | 46 | 43.17 | 20 | 3.06 | 31.95 | 100 | 25 | Peak |
| 923 | 32.66 | -13.34 | 46 | 39.49 | 21.13 | 3.36 | 31.32 | - | - | Peak |
| 2481 | 101.79 | - | - | 97.51 | 31.99 | 6.59 | 34.3 | 109 | 18 | Peak |
| 2481 | 77.12 | - | - | - | - | - | - | - | - | Average |
| 4959 | 46.82 | -27.18 | 74 | 58.13 | 34.32 | 10.21 | 55.84 | 100 | 0 | Peak |
| 4959 | 22.15 | -31.85 | 54 | - | - | - | - | - | - | Average |
| 7440 | 49.42 | -24.58 | 74 | 58.99 | 35.53 | 10.9 | 56 | 100 | 0 | Peak |
| 7440 | 24.75 | -29.25 | 54 | - | - | - | - | - | - | Average |

**Note:** 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor( -24.67)

| Test Mode : | 3Mbps | Temperature : | 22~24°C |
|---|---|---|---|
| Test Channel : | 78 | Relative Humidity : | 47~49% |
| Test Engineer : | Marlboro Hsu | Polarization : | Vertical |
| Remark : | 2481 MHz is fundamental signal which can be ignored. | | |

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 40.8 | 31.08 | -8.92 | 40 | 49.89 | 12.24 | 0.74 | 31.79 | 100 | 163 | Peak |
| 91.56 | 24.78 | -18.72 | 43.5 | 46.58 | 8.9 | 1.06 | 31.76 | - | - | Peak |
| 158.25 | 22.57 | -20.93 | 43.5 | 42.74 | 10.14 | 1.44 | 31.75 | - | - | Peak |
| 480.6 | 27.69 | -18.31 | 46 | 39.68 | 17.61 | 2.31 | 31.91 | - | - | Peak |
| 599.6 | 24.74 | -21.26 | 46 | 34.64 | 19.39 | 2.77 | 32.06 | - | - | Peak |
| 797 | 27.58 | -18.42 | 46 | 36.44 | 20.03 | 3.06 | 31.95 | - | - | Peak |
| 2481 | 96.93 | - | - | 92.65 | 31.99 | 6.59 | 34.3 | 169 | 248 | Peak |
| 2481 | 72.26 | - | - | - | - | - | - | - | - | Average |
| 4959 | 47.32 | -26.68 | 74 | 58.63 | 34.32 | 10.21 | 55.84 | 100 | 0 | Peak |
| 4959 | 22.65 | -31.35 | 54 | - | - | - | - | - | - | Average |
| 7440 | 49.14 | -24.86 | 74 | 58.71 | 35.53 | 10.9 | 56 | 100 | 0 | Peak |
| 7440 | 24.47 | -29.53 | 54 | - | - | - | - | - | - | Average |

**Note:** 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor( -24.67)

## 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 | GB41292344 | 300MHz~40GHz | Feb. 05, 2013 | Dec. 25, 2013 | Feb. 04, 2014 | Conducted (TH02-HY) |
| Power Sensor | Agilent | E9327A | US40441548 | 300MHz~40GHz | Feb. 05, 2013 | Dec. 25, 2013 | Feb. 04, 2014 | Conducted (TH02-HY) |
| Spectrum Analyzer | R&S | FSP30 | 101067 | 9kHz ~ 30GHz | Nov. 20, 2013 | Dec. 30, 2013 | Nov. 19, 2014 | Radiation (03CH06-HY) |
| Spectrum Analyzer | Agilent | E4408B | MY44211030 | 9kHz ~ 26.5GHz | Dec. 02, 2013 | Dec. 30, 2013 | Dec. 01, 2014 | Radiation (03CH06-HY) |
| EMI Test Receiver | R&S | ESVS10 | 834468/0003 | 20MHz ~ 1000MHz | May 06, 2013 | Dec. 30, 2013 | May 05, 2014 | Radiation (03CH06-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 860004/001 | 9kHz ~ 30MhZ | Jul. 03, 2012 | Dec. 30, 2013 | Jul. 02, 2014 | Radiation (03CH06-HY) |
| Bilog Antenna | Schaffner | CBL6112B | 2885 | 30MHz ~ 2GHz | Oct. 10, 2013 | Dec. 30, 2013 | Oct. 09, 2014 | Radiation (03CH06-HY) |
| Double Ridge Horn Antenna | EMCO | 3117 | 00066583 | 1GHz ~ 18GHz | Aug. 02, 2013 | Dec. 30, 2013 | Aug. 01, 2014 | Radiation (03CH06-HY) |
| Amplifier | Agilent | 310N | 186713 | 9kHz ~ 1GHz | Apr. 12, 2013 | Dec. 30, 2013 | Apr. 11, 2014 | Radiation (03CH06-HY) |
| Pre Amplifier | EMCI | EMC051845 | SN980048 | 1GHz ~ 18GHz | Jul. 18, 2013 | Dec. 30, 2013 | Jul. 17, 2014 | Radiation (03CH06-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170251 | 15GHz ~ 40GHz | Oct. 03, 2013 | Dec. 30, 2013 | Oct. 02, 2014 | Radiation (03CH06-HY) |
| Preamplifier | Agilent | 8449B | 3008A01917 | 1GHz ~ 26.5GHz | Apr. 12, 2013 | Dec. 30, 2013 | Apr. 11, 2014 | Radiation (03CH06-HY) |
| Turn Table | INN-CO | DS2000 | 420/650/00 | 0 ~ 360 degree | N/A | Dec. 30, 2013 | N/A | Radiation (03CH06-HY) |
| Antenna Mast | MF | MF-7802 | MF780208212 | 1 m ~ 4 m | N/A | Dec. 30, 2013 | N/A | Radiation (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 = 2Uc(y))** | **4.50** |