

# Partial FCC RF Test Report

APPLICANT : Motion Computing Incorporated  
EQUIPMENT : N6230 mini PCI-E WiFi a/b/g/n + BT module  
BRAND NAME : Motion Computing Incorporated  
MODEL NAME : 62230ANHMW  
FCC ID : Q3QIHW62230ANH  
STANDARD : FCC Part 15 Subpart C §15.247  
CLASSIFICATION : (DSS) Spread Spectrum Transmitter

The product was installed into Host (Brand Name: Motion Computing Incorporated, Model Name: CFT-003) during test.

This is a partial report which is included the Radiation Emission and Conducted Emission tests item. The product was received on Nov. 09, 2011 and completely tested on Nov. 29, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 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.

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SPORTON INTERNATIONAL INC.

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FCC ID : Q3QIHW62230ANH

Page Number : 1 of 37

Report Issued Date : Jan. 03, 2012

Report Version : Rev. 01



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## REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION                                        | ISSUED DATE   |
|------------|---------|----------------------------------------------------|---------------|
| FR1N0901A  | Rev. 01 | Conducted data refer to Intel 6230 Module Reports. | Jan. 03, 2012 |
|            |         |                                                    |               |
|            |         |                                                    |               |
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|            |         |                                                    |               |
|            |         |                                                    |               |
|            |         |                                                    |               |

## SUMMARY OF TEST RESULT

| Report Section | FCC Rule              | IC Rule   | Description                   | Limit                    | Result | Remark                                    |
|----------------|-----------------------|-----------|-------------------------------|--------------------------|--------|-------------------------------------------|
| 3.1            | 15.247(d)             | A8.5      | Frequency Band Edges          | $\leq 20\text{dBc}$      | Pass   | -                                         |
| 3.2            | 15.207                | Gen 7.2.4 | AC Conducted Emission         | 15.207(a)                | Pass   | Under limit<br>11.10 dB at<br>2.910 MHz   |
| 3.3            | 15.247(d)             | A8.5      | Transmitter Radiated Emission | 15.209(a) &<br>15.247(d) | Pass   | Under limit<br>4.67 dB at<br>2360.000 MHz |
| 3.4            | 15.203 &<br>15.247(b) | A8.4      | Antenna Requirement           | N/A                      | Pass   | -                                         |

# **1 General Description**

## **1.1 Applicant**

**Motion Computing Incorporated**

8601 Ranch Road 2222; Building #2 Austin, Texas 78730 USA

## **1.2 Manufacturer**

**Motion Computing Incorporated**

8601 Ranch Road 2222; Building #2 Austin, Texas 78730 USA

## **1.3 Factory**

**Pegatron Corporation**

5F. No. 76, Li-Gong St., Beitou District, Taipei City 112, Taiwan, R.O.C.

## 1.4 Feature of Equipment Under Test

| Product Feature & Specification   |                                                                                                                                       |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Equipment                         | N6230 mini PCI-E WiFi a/b/g/n + BT module                                                                                             |
| Brand Name                        | Motion Computing Incorporated                                                                                                         |
| Model Name                        | 62230ANHMW                                                                                                                            |
| FCC ID                            | Q3QIHW62230ANH                                                                                                                        |
| Tx/Rx Frequency Range             | 2400 MHz ~ 2483.5 MHz                                                                                                                 |
| Number of Channels                | 79                                                                                                                                    |
| Carrier Frequency of Each Channel | 2402+n*1 MHz; n=0~78                                                                                                                  |
| Channel Spacing                   | 1 MHz                                                                                                                                 |
| Maximum Output Power to Antenna   | Bluetooth (1Mbps) : 5.70 dBm (0.0037 W)<br>Bluetooth EDR (2Mbps) : 1.24 dBm (0.0013 W)<br>Bluetooth EDR (3Mbps) : 1.71 dBm (0.0015 W) |
| Antenna Type                      | PIFA Antenna                                                                                                                          |
| Type of Modulation                | Bluetooth (1Mbps) : GFSK<br>Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK<br>Bluetooth EDR (3Mbps) : 8-DPSK                                  |
| EUT Stage                         | Production Unit                                                                                                                       |

| Host Information      |                               |
|-----------------------|-------------------------------|
| Brand Name            | Motion Computing Incorporated |
| Model Name            | CFT-003                       |
| FCC ID                | Q3QTIRFID7960                 |
| Tx/Rx Frequency Range | 13.56 MHz                     |
| Antenna Type          | PCB Antenna                   |
| Type of Modulation    | ASK                           |

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

## 1.5 Testing Site

|                           |                                                                                                                                                              |           |                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC.                                                                                                                                   |           |                                |
| <b>Test Site Location</b> | 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 |           |                                |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                                                                      |           | <b>FCC/IC Registration No.</b> |
|                           | CO05-HY                                                                                                                                                      | 03CH05-HY | 722060/4086B-1                 |

## 1.6 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
- ♦ 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.

## 1.7 Ancillary Equipment List

| Item | Equipment          | Trade Name | Model Name | FCC ID      | Data Cable      | Power Cord                                                 |
|------|--------------------|------------|------------|-------------|-----------------|------------------------------------------------------------|
| 1.   | WLAN AP            | D-Link     | DIR-628    | KA2DIR628A2 | N/A             | Unshielded, 1.8 m                                          |
| 2.   | Notebook           | DELL       | P20G       | FCC DoC     | N/A             | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |
| 3.   | Bluetooth Earphone | Nokia      | BH-102     | PYAHS-107W  | N/A             | N/A                                                        |
| 4.   | iPod               | Apple      | A1285      | FCC DoC     | Shielded, 1.0 m | N/A                                                        |

## 2 Test Configuration of Equipment Under Test

### 2.1 RF Output Power

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

| Band       | Bluetooth RF Output Power |      |      |
|------------|---------------------------|------|------|
| Channel    | 00                        | 39   | 78   |
| Frequency  | 2402                      | 2441 | 2480 |
| Peak Power | 5.44                      | 5.70 | 5.65 |

**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 1Mbps for all the test items due to the highest RF output power.
3. The EUT is programmed to transmit signals continuously for all testing.



## 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).

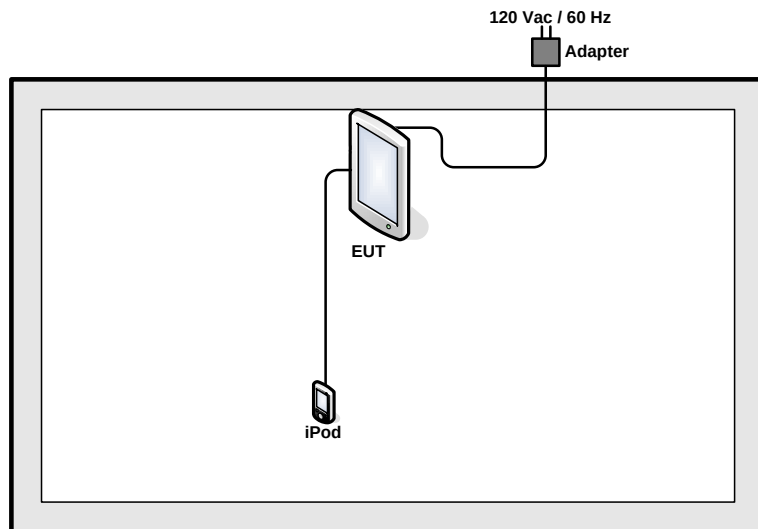
Pre-scanned tests, X, Y, Z in three orthogonal panels, were conducted to determine the final configuration from all possible combinations, laptop / tablet modes.

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

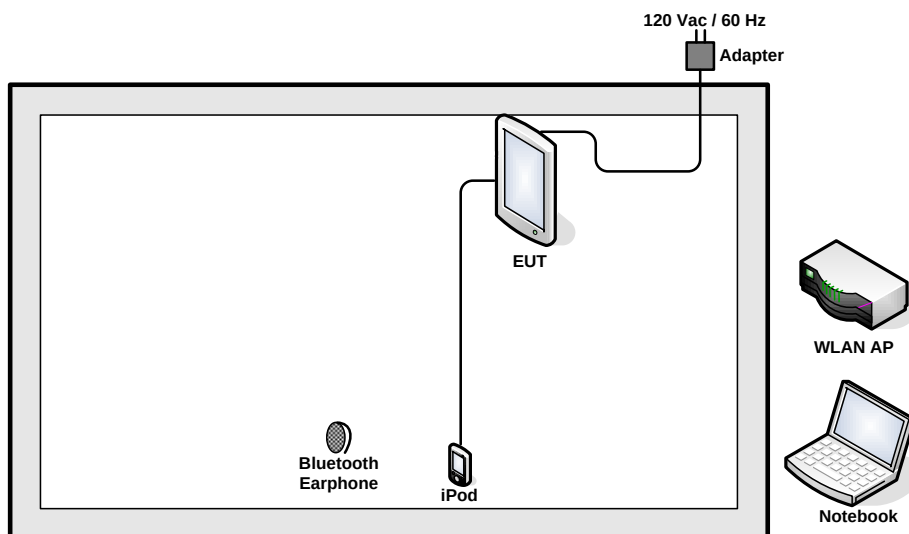
| Test Cases                                                                                                                         |                                                                                                                                                  |                                       |                               |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------|
| Test Item                                                                                                                          | Data Rate / Modulation                                                                                                                           |                                       |                               |
|                                                                                                                                    | Bluetooth 1Mbps<br>GFSK                                                                                                                          | Bluetooth EDR 2Mbps<br>$\pi$ /4-DQPSK | Bluetooth EDR 3Mbps<br>8-DPSK |
| Radiated<br>TCs                                                                                                                    | Mode 1: CH00_2402 MHz<br>Mode 2: CH39_2441 MHz<br>Mode 3: CH78_2480 MHz                                                                          | N/A                                   | N/A                           |
| AC<br>Conducted<br>Emission                                                                                                        | Mode 1 : WLAN (2.4G) Link + Bluetooth Link + I- Pod + Adapter + Battery<br>Mode 2 : WLAN (5G) Link + Bluetooth Link + I- Pod + Adapter + Battery |                                       |                               |
| Remark:                                                                                                                            |                                                                                                                                                  |                                       |                               |
| 1. For radiated TCs, the data rate was set in 1Mbps due to the highest RF output power; only the data of these modes was reported. |                                                                                                                                                  |                                       |                               |
| 2. For conducted emission, the worst case is mode 2; only the test data of this mode was reported.                                 |                                                                                                                                                  |                                       |                               |

## 2.3 Connection Diagram of Test System

### <Bluetooth Tx Mode>



### <AC Conducted Emission Mode>



## 2.4 RF Utility

For Bluetooth function, the RF utility, "DRTU" was installed in EUT which was programmed in order to make the EUT for transmitting and receiving signals continuously.

### 3 Test Result

#### 3.1 Band Edges Measurement

##### 3.1.1 Limit of Band Edges

In any 100 KHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

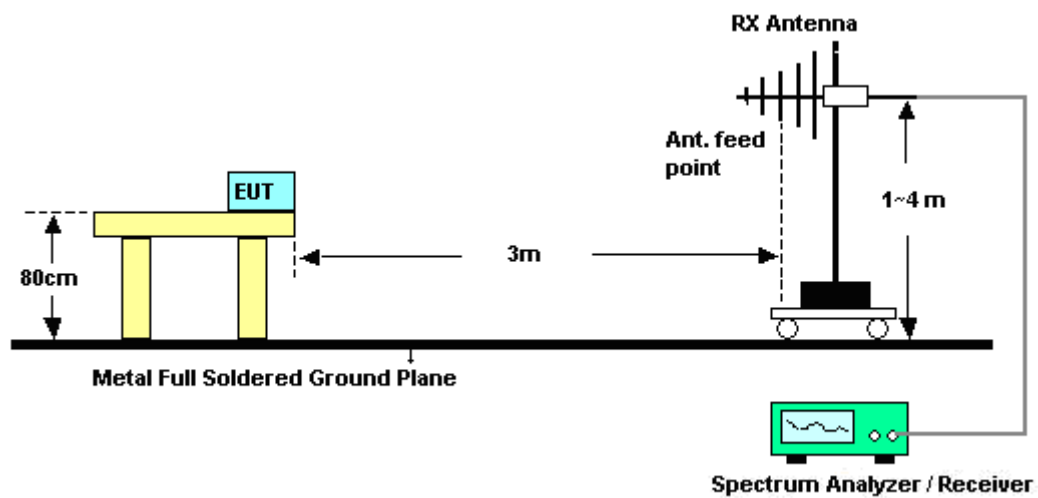
##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300KHz, Video bandwidth (VBW)  $\geq$  RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300k Hz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Applies to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 1MHz, Sweep: Auto for Peak; set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto for Average. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See FCC Section 15.35(b) and (c).
4. In case the emission is fail due to the used RBW / VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

### 3.1.4 Test Setup



**3.1.5 Test Result of Radiated Band Edges**

|                       |        |                            |           |
|-----------------------|--------|----------------------------|-----------|
| <b>Test Mode :</b>    | Mode 1 | <b>Temperature :</b>       | 21~24°C   |
| <b>Test Channel :</b> | 00     | <b>Relative Humidity :</b> | 52~58%    |
|                       |        | <b>Test Engineer :</b>     | Wii Chang |

| 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  |
| 2362.06                       | 47.45               | -26.55                  | 74                          | 44.97                     | 31.99                       | 4.57                    | 34.08                      | 149                  | 232                     | Peak    |
| 2362.06                       | 36.47               | -17.53                  | 54                          | 33.99                     | 31.99                       | 4.57                    | 34.08                      | 149                  | 232                     | 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  |
| 2321.97                     | 46.44               | -27.56                  | 74                          | 44.04                     | 31.96                       | 4.53                    | 34.09                      | 100                  | 274                     | Peak    |
| 2321.97                     | 36.24               | -17.76                  | 54                          | 33.84                     | 31.96                       | 4.53                    | 34.09                      | 100                  | 274                     | Average |

|                       |        |                            |           |
|-----------------------|--------|----------------------------|-----------|
| <b>Test Mode :</b>    | Mode 3 | <b>Temperature :</b>       | 21~24°C   |
| <b>Test Channel :</b> | 78     | <b>Relative Humidity :</b> | 52~58%    |
|                       |        | <b>Test Engineer :</b>     | Wii Chang |

| 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  |
| 2483.5                        | 67.93               | -6.07                   | 74                          | 65.1                      | 32.09                       | 4.64                    | 33.9                       | 100                  | 224                     | Peak    |
| 2483.5                        | 48.92               | -5.08                   | 54                          | 46.09                     | 32.09                       | 4.64                    | 33.9                       | 100                  | 224                     | Average |

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

| Test mode           | Maximum field<br>strength of the<br>fundamental emission<br>(dBμV/m) | Delta<br>Result<br>(dB) | Average<br>Result<br>(dBμV/m) | Average<br>Limit<br>(dBμV/m) | Margin<br>(dB) | Result |
|---------------------|----------------------------------------------------------------------|-------------------------|-------------------------------|------------------------------|----------------|--------|
| Single Carrier Mode | 104.42                                                               | 55.62                   | 48.8                          | 54                           | -5.2           | Pass   |
| Hopping Mode        | 104.42                                                               | 55.5                    | 48.92                         | 54                           | -5.08          | Pass   |

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

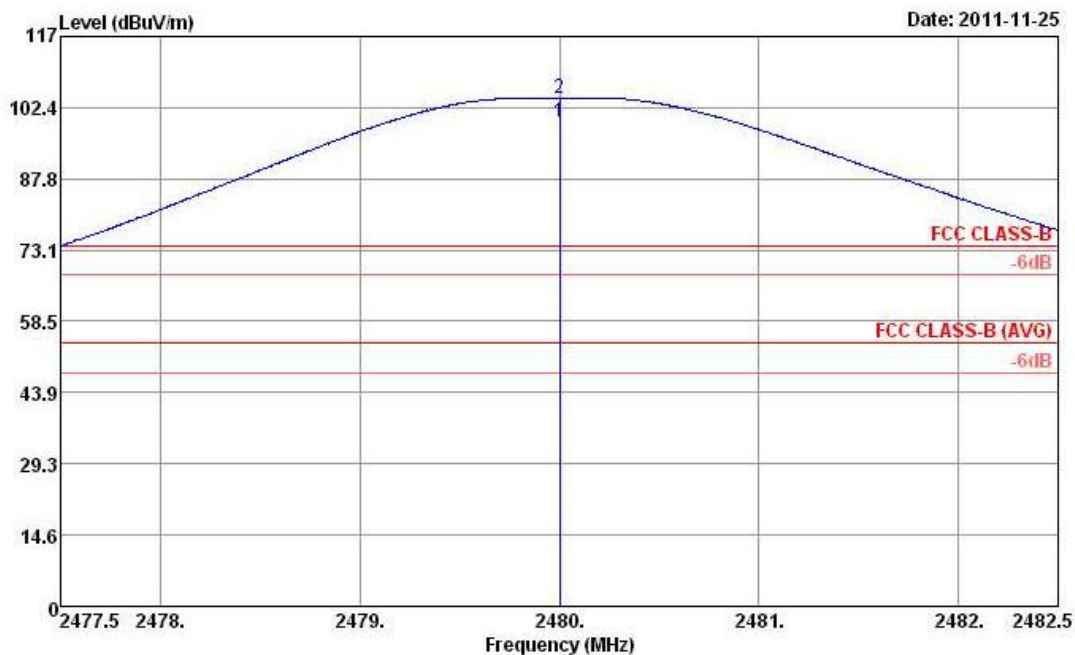
| ANTENNA POLARITY : VERTICAL |                     |                         |                             |                           |                             |                         |                            |                      |                         |         |
|-----------------------------|---------------------|-------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 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  |
| 2483.5                      | 61.78               | -12.22                  | 74                          | 58.95                     | 32.09                       | 4.64                    | 33.9                       | 100                  | 277                     | Peak    |
| 2483.5                      | 45.11               | -8.89                   | 54                          | 42.28                     | 32.09                       | 4.64                    | 33.9                       | 100                  | 277                     | Average |

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

| Test mode           | Maximum field<br>strength of the<br>fundamental emission<br>(dBμV/m) | Delta<br>Result<br>(dB) | Average<br>Result<br>(dBμV/m) | Average<br>Limit<br>(dBμV/m) | Margin<br>(dB) | Result |
|---------------------|----------------------------------------------------------------------|-------------------------|-------------------------------|------------------------------|----------------|--------|
| Single Carrier Mode | 98.19                                                                | 54.7                    | 43.49                         | 54                           | -10.51         | Pass   |
| Hopping Mode        | 98.19                                                                | 53.08                   | 45.11                         | 54                           | -8.89          | Pass   |

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

|                        |           |                            |            |
|------------------------|-----------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 3    | <b>Temperature :</b>       | 21~24°C    |
| <b>Test Channel :</b>  | 78        | <b>Relative Humidity :</b> | 52~58%     |
| <b>Test Engineer :</b> | Wii Chang | <b>Polarization :</b>      | Horizontal |

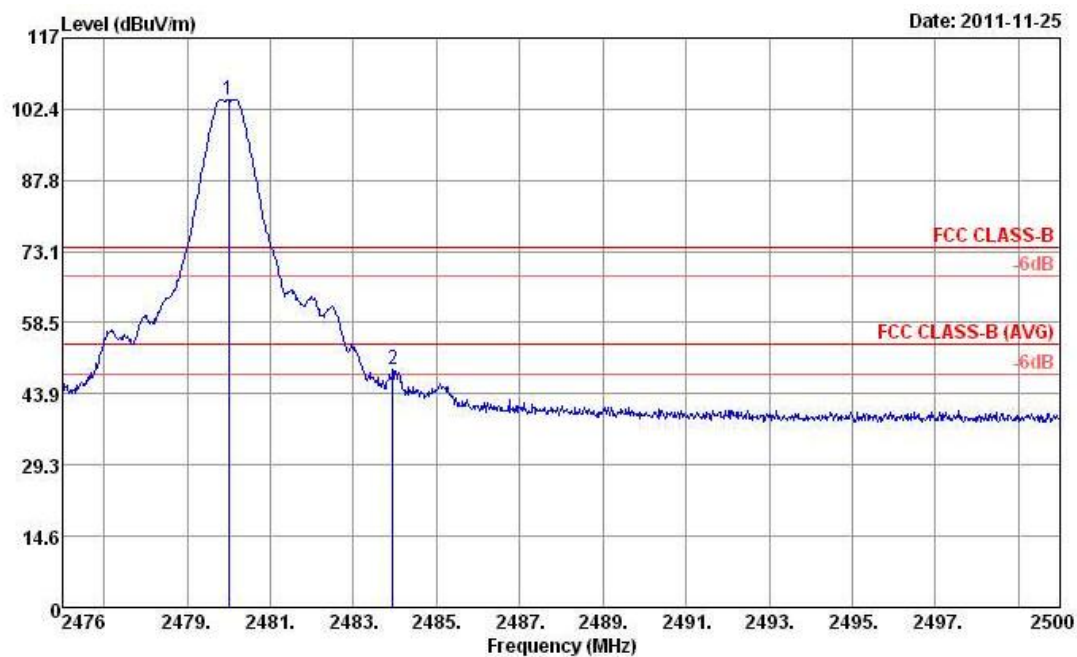


Site : 03CH05-HY  
 Condition : FCC CLASS-B 3m HF\_ANT\_110810 HORIZONTAL  
 Project : FR 1N0901  
 Mode : Mode 3

|     | Freq    | Level  | Over  | Limit | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Remark      |
|-----|---------|--------|-------|-------|-------------|-------|--------|-------|-------|-------------|
|     | MHz     | dBuV/m | Limit | Line  | Level       | Loss  | Factor | cm    | deg   |             |
| 1 * | 2480.00 | 99.37  | 45.37 | 54.00 | 96.54       | 32.09 | 4.64   | 33.90 | 100   | 224 Average |
| 2 * | 2480.00 | 104.42 | 30.42 | 74.00 | 101.59      | 32.09 | 4.64   | 33.90 | 100   | 224 Peak    |

\* Maximum field strength of the fundamental emission

|                 |           |                     |            |
|-----------------|-----------|---------------------|------------|
| Test Mode :     | Mode 3    | Temperature :       | 21~24°C    |
| Test Channel :  | 78        | Relative Humidity : | 52~58%     |
| Test Engineer : | Wii Chang | Polarization :      | Horizontal |



Site : 03CH05-HY  
Condition : FCC CLASS-B 3m HF\_ANT\_110810 HORIZONTAL  
Project : FR 1N0901  
Mode : Mode 3

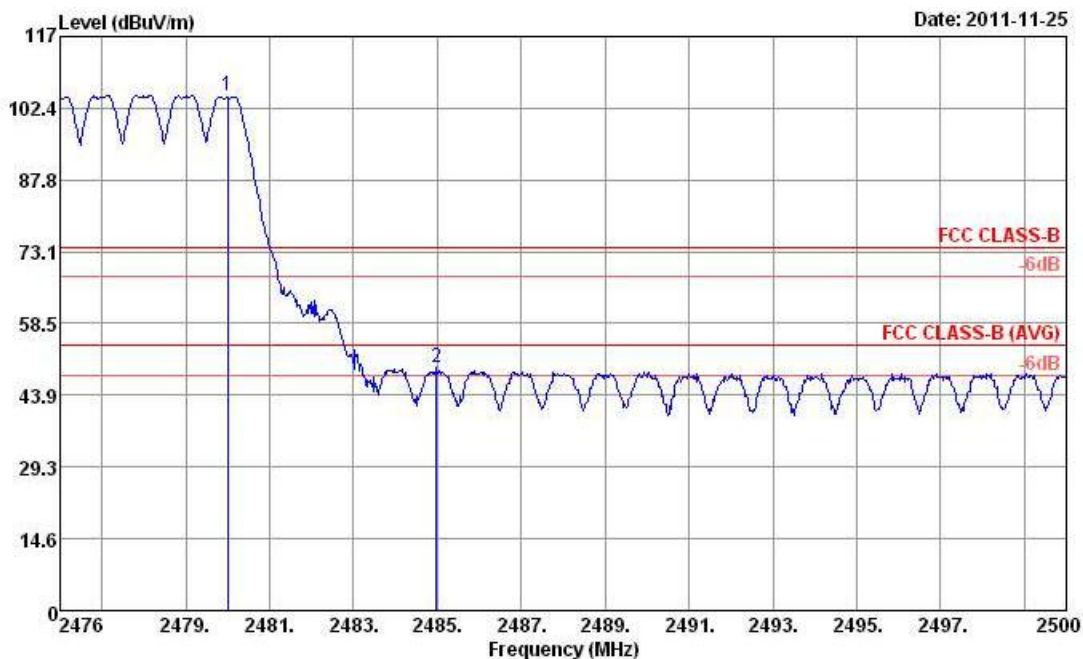
|     | Freq    | Level  | Over   | Limit  | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Remark   |
|-----|---------|--------|--------|--------|-------------|-------|--------|-------|-------|----------|
|     | MHz     | dBuV/m | dB     | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg      |
| 1 * | 2480.00 | 104.43 | 30.43  | 74.00  | 101.60      | 32.09 | 4.64   | 33.90 | 100   | 224 Peak |
| 2   | 2483.94 | 48.81  | -25.19 | 74.00  | 45.98       | 32.09 | 4.64   | 33.90 | 100   | 224 Peak |

\* Marker-Delta Method (RBW/VBW=100KHz): 55.62 dB , single carrier Mode





|                 |           |                     |            |
|-----------------|-----------|---------------------|------------|
| Test Mode :     | Mode 3    | Temperature :       | 21~24°C    |
| Test Channel :  | 78        | Relative Humidity : | 52~58%     |
| Test Engineer : | Wii Chang | Polarization :      | Horizontal |

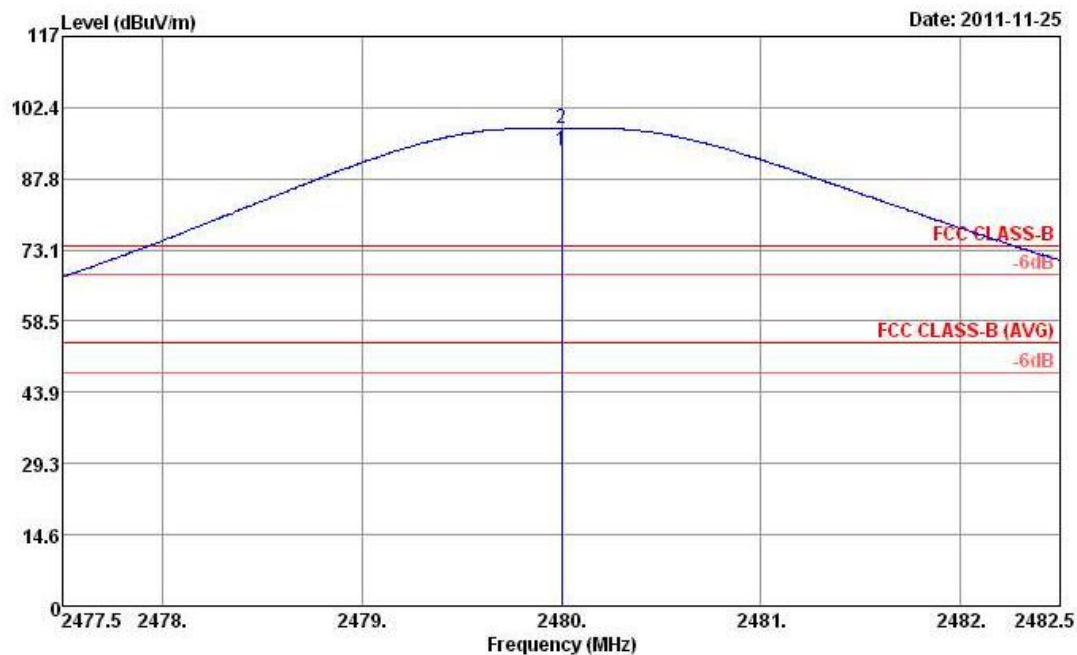


Site : 03CH05-HY  
Condition : FCC CLASS-B 3m HF\_ANT\_110810 HORIZONTAL  
Project : FR 1N0901  
Mode : Mode 3

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Factor | Cable Loss | Preamp Factor | A/Pos | T/Pos | Remark |
|-----|---------|--------|------------|------------|-------------------|--------|------------|---------------|-------|-------|--------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m   | dB         | dB            | cm    | deg   |        |
| 1 * | 2480.00 | 104.91 | 30.91      | 74.00      | 102.08            | 32.09  | 4.64       | 33.90         | 100   | 224   | Peak   |
| 2   | 2484.98 | 49.41  | -24.59     | 74.00      | 46.58             | 32.09  | 4.64       | 33.90         | 100   | 224   | Peak   |

\* Marker-Delta Method (RBW/VBW=100KHz): 55.50 dB , Hopping Mode

|                        |           |                            |          |
|------------------------|-----------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 3    | <b>Temperature :</b>       | 21~24°C  |
| <b>Test Channel :</b>  | 78        | <b>Relative Humidity :</b> | 52~58%   |
| <b>Test Engineer :</b> | Wii Chang | <b>Polarization :</b>      | Vertical |

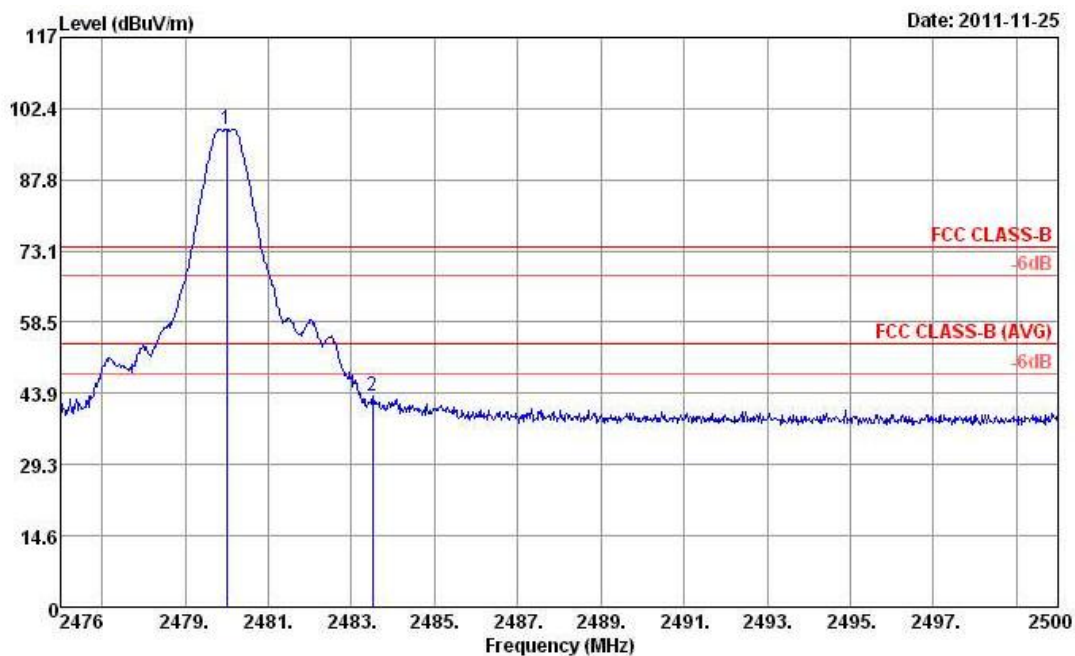


Site : 03CH05-HY  
 Condition : FCC CLASS-B 3m HF\_ANT\_110810 VERTICAL  
 Project : FR 1N0901  
 Mode : Mode 3

|     | Freq    | Level  | Over  | Limit  | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Remark      |
|-----|---------|--------|-------|--------|-------------|-------|--------|-------|-------|-------------|
|     | MHz     | dBuV/m | Limit | Line   | Level       | Loss  | Factor |       |       |             |
|     |         |        | dB    | dBuV/m | dBuV        | dB/m  | dB     | dB    | cm    | deg         |
| 1 * | 2480.00 | 93.44  | 39.44 | 54.00  | 90.61       | 32.09 | 4.64   | 33.90 | 100   | 277 Average |
| 2 * | 2480.00 | 98.19  | 24.19 | 74.00  | 95.36       | 32.09 | 4.64   | 33.90 | 100   | 277 Peak    |

\* Maximum field strength of the fundamental emission

|                        |           |                            |          |
|------------------------|-----------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 3    | <b>Temperature :</b>       | 21~24°C  |
| <b>Test Channel :</b>  | 78        | <b>Relative Humidity :</b> | 52~58%   |
| <b>Test Engineer :</b> | Wii Chang | <b>Polarization :</b>      | Vertical |

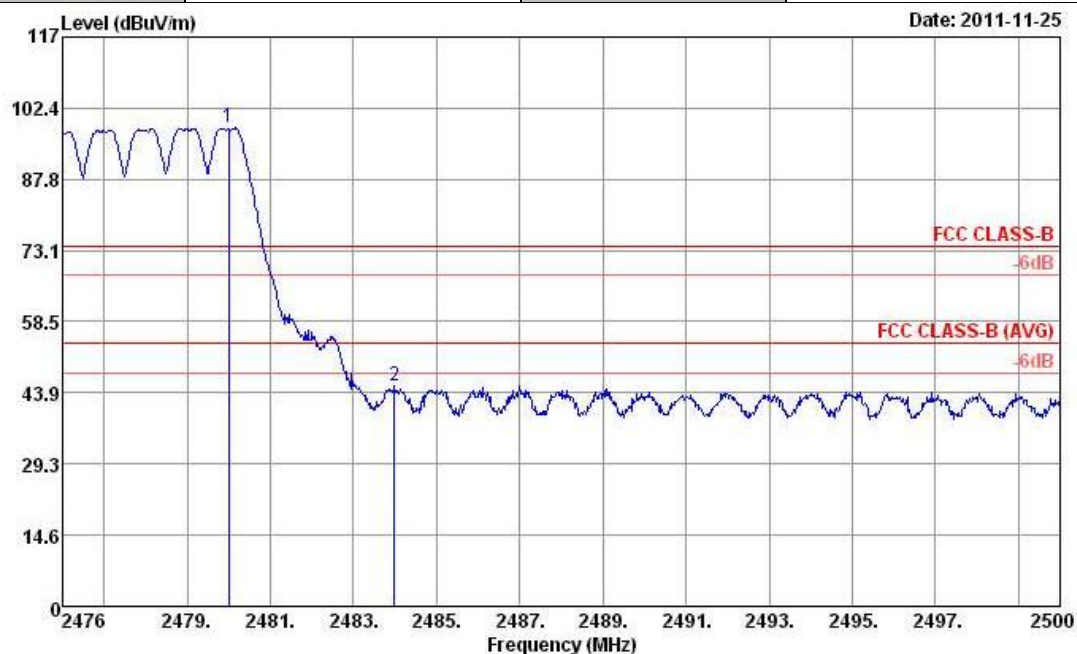


Site : 03CH05-HY  
 Condition : FCC CLASS-B 3m HF\_ANT\_110810 VERTICAL  
 Project : FR 1N0901  
 Mode : Mode 3

|     | 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 | 98.16  | 24.16  | 74.00  | 95.33       | 32.09 | 4.64   | 33.90 | 100   | 277 Peak |
| 2   | 2483.51 | 43.46  | -30.54 | 74.00  | 40.63       | 32.09 | 4.64   | 33.90 | 100   | 277 Peak |

\* Marker-Delta Method (RBW/VBW=100KHz): 54.70 dB , single carrier Mode

|                 |           |                     |          |
|-----------------|-----------|---------------------|----------|
| Test Mode :     | Mode 3    | Temperature :       | 21~24°C  |
| Test Channel :  | 78        | Relative Humidity : | 52~58%   |
| Test Engineer : | Wii Chang | Polarization :      | Vertical |



Site : 03CH05-HY  
Condition : FCC CLASS-B 3m HF\_ANT\_110810 VERTICAL  
Project : FR 1N0901  
Mode : Mode 3

|     | Freq    | Level  | Over   | Limit | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Remark   |
|-----|---------|--------|--------|-------|-------------|-------|--------|-------|-------|----------|
|     | MHz     | dBuV/m | Limit  | Line  | Level       | Loss  | Factor | cm    | deg   |          |
| 1 * | 2480.00 | 98.27  | 24.27  | 74.00 | 95.44       | 32.09 | 4.64   | 33.90 | 100   | 277 Peak |
| 2   | 2483.99 | 45.19  | -28.81 | 74.00 | 42.36       | 32.09 | 4.64   | 33.90 | 100   | 277 Peak |

\* Marker-Delta Method (RBW/VBW=100KHz): 53.08 dB , Hopping Mode

## 3.2 AC Conducted Emission Measurement

### 3.2.1 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.

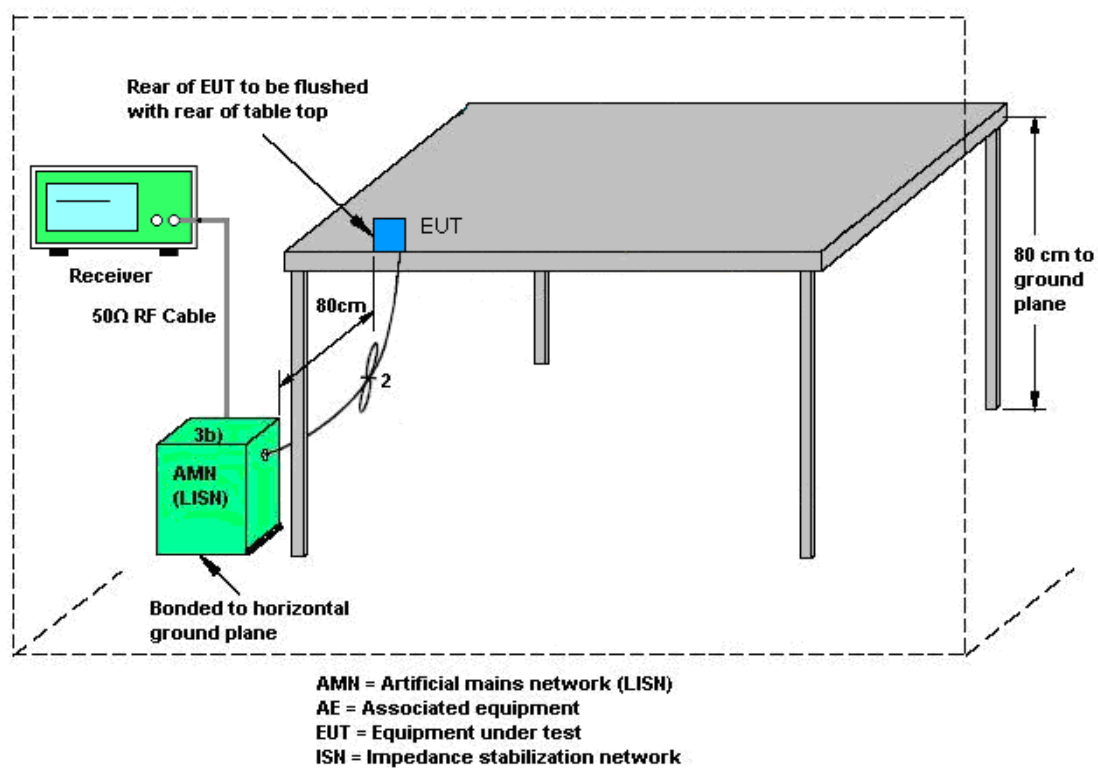
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3 Test Procedures

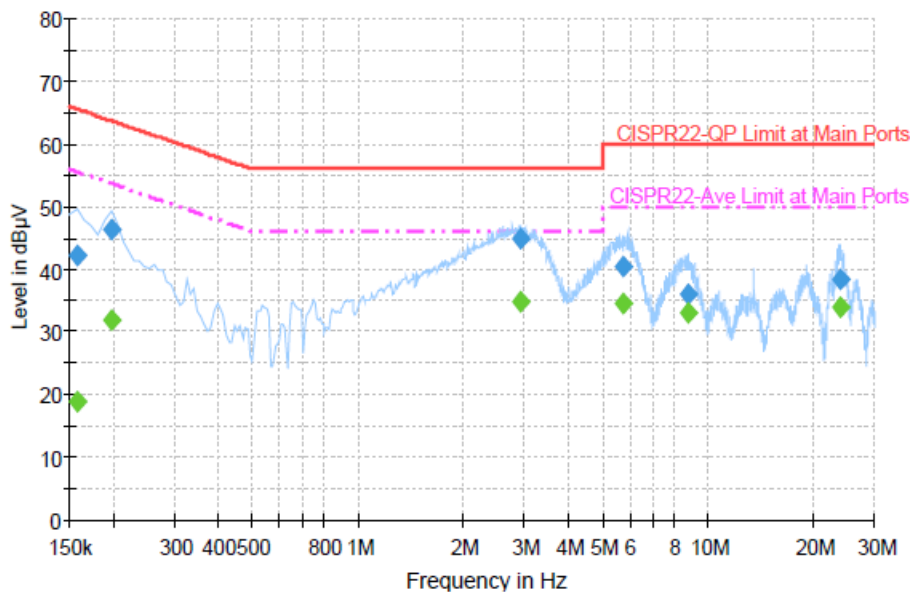
1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
1. Connect EUT to the power mains through a line impedance stabilization network (LISN).
2. All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

### 3.2.4 Test Setup



### 3.2.5 Test Result of AC Conducted Emission

|                        |                                                                                 |                            |         |
|------------------------|---------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Mode :</b>     | Mode 2                                                                          | <b>Temperature :</b>       | 20~22°C |
| <b>Test Engineer :</b> | Novic Chiang                                                                    | <b>Relative Humidity :</b> | 40~42%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                   | <b>Phase :</b>             | Line    |
| <b>Function Type :</b> | WLAN (5G) Link + Bluetooth Link + I- Pod + Adapter + Battery                    |                            |         |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit. |                            |         |



#### Final Result 1

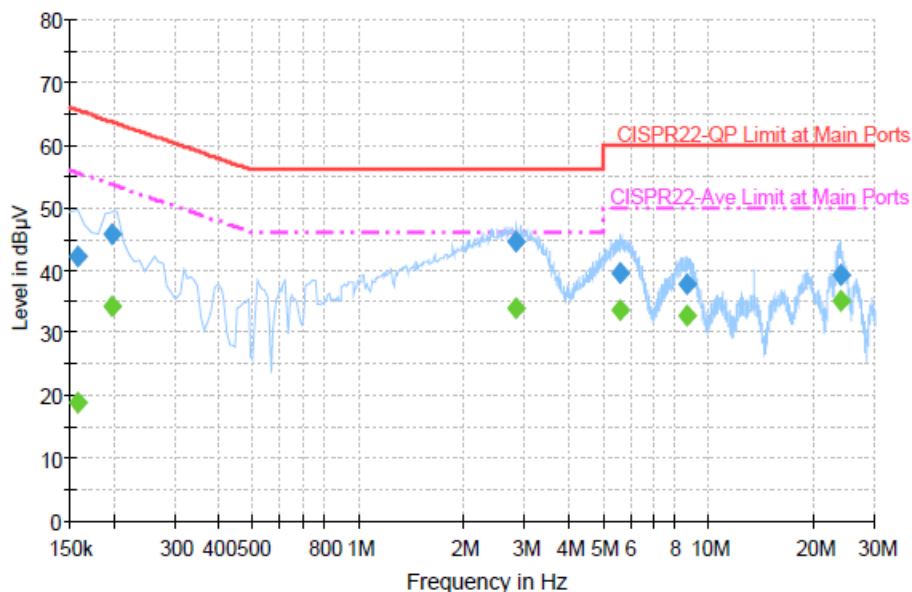
| Frequency (MHz) | QuasiPeak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|------------------|--------|------|------------|-------------|--------------|
| 0.158000        | 42.2             | Off    | L1   | 19.4       | 23.4        | 65.6         |
| 0.198000        | 46.3             | Off    | L1   | 19.4       | 17.4        | 63.7         |
| 2.910000        | 44.9             | Off    | L1   | 19.4       | 11.1        | 56.0         |
| 5.750000        | 40.4             | Off    | L1   | 19.5       | 19.6        | 60.0         |
| 8.806000        | 36.1             | Off    | L1   | 19.6       | 23.9        | 60.0         |
| 24.062000       | 38.3             | Off    | L1   | 19.7       | 21.7        | 60.0         |

#### Final Result 2

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.158000        | 18.8           | Off    | L1   | 19.4       | 36.8        | 55.6         |
| 0.198000        | 31.8           | Off    | L1   | 19.4       | 21.9        | 53.7         |
| 2.910000        | 34.7           | Off    | L1   | 19.4       | 11.3        | 46.0         |
| 5.750000        | 34.6           | Off    | L1   | 19.5       | 15.4        | 50.0         |
| 8.806000        | 32.9           | Off    | L1   | 19.6       | 17.1        | 50.0         |
| 24.062000       | 33.9           | Off    | L1   | 19.7       | 16.1        | 50.0         |



|                        |                                                                                 |                            |         |
|------------------------|---------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Mode :</b>     | Mode 2                                                                          | <b>Temperature :</b>       | 20~22°C |
| <b>Test Engineer :</b> | Novic Chiang                                                                    | <b>Relative Humidity :</b> | 40~42%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                   | <b>Phase :</b>             | Neutral |
| <b>Function Type :</b> | WLAN (5G) Link + Bluetooth Link + I- Pod + Adapter + Battery                    |                            |         |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit. |                            |         |


**Final Result 1**

| Frequency (MHz) | QuasiPeak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|------------------|--------|------|------------|-------------|--------------|
| 0.158000        | 42.1             | Off    | N    | 19.4       | 23.5        | 65.6         |
| 0.198000        | 45.9             | Off    | N    | 19.4       | 17.8        | 63.7         |
| 2.822000        | 44.6             | Off    | N    | 19.5       | 11.4        | 56.0         |
| 5.614000        | 39.6             | Off    | N    | 19.5       | 20.4        | 60.0         |
| 8.670000        | 37.8             | Off    | N    | 19.6       | 22.2        | 60.0         |
| 23.822000       | 39.2             | Off    | N    | 19.8       | 20.8        | 60.0         |

**Final Result 2**

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.158000        | 18.8           | Off    | N    | 19.4       | 36.8        | 55.6         |
| 0.198000        | 34.2           | Off    | N    | 19.4       | 19.5        | 53.7         |
| 2.822000        | 34.0           | Off    | N    | 19.5       | 12.0        | 46.0         |
| 5.614000        | 33.6           | Off    | N    | 19.5       | 16.4        | 50.0         |
| 8.670000        | 32.7           | Off    | N    | 19.6       | 17.3        | 50.0         |
| 23.822000       | 35.0           | Off    | N    | 19.8       | 15.0        | 50.0         |



### 3.3 Radiated Emission Measurement

#### 3.3.1 Limit of Radiated 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                                |

#### 3.3.2 Measuring Instruments

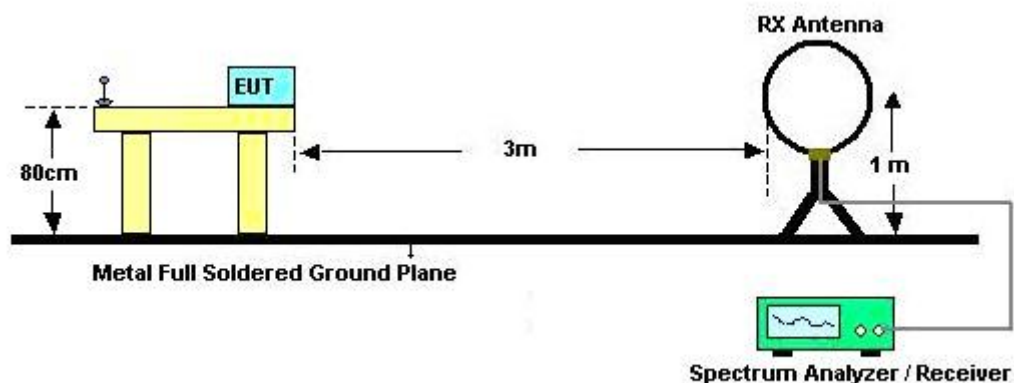
See list of measuring instruments of this test report.

#### 3.3.3 Test Procedures

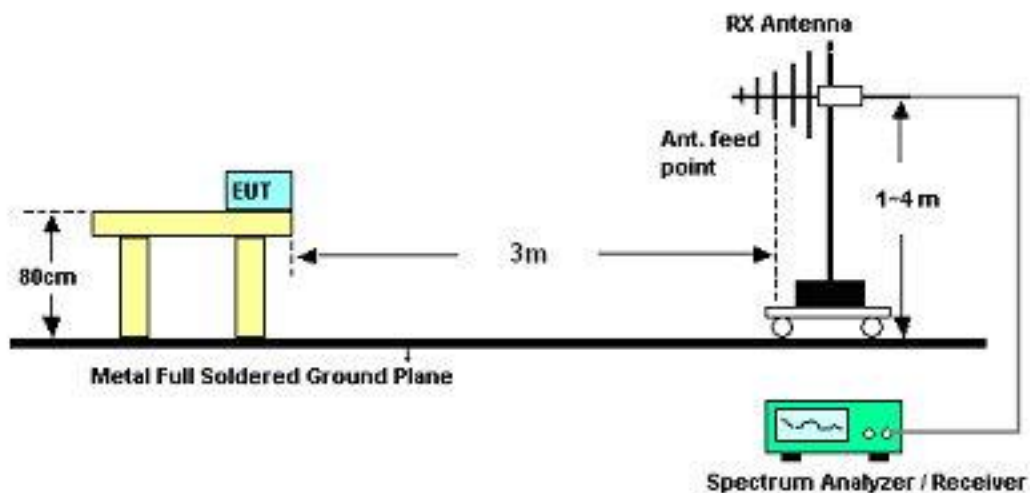
- The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
- Use the following spectrum analyzer settings:
  - Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for  $f \geq 1$  GHz, 100 KHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold.
  - Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.  
Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$  (dB)
- Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.
- Measured average value for the peak value is greater than 54 dBuV/m

### 3.3.4 Test Setup

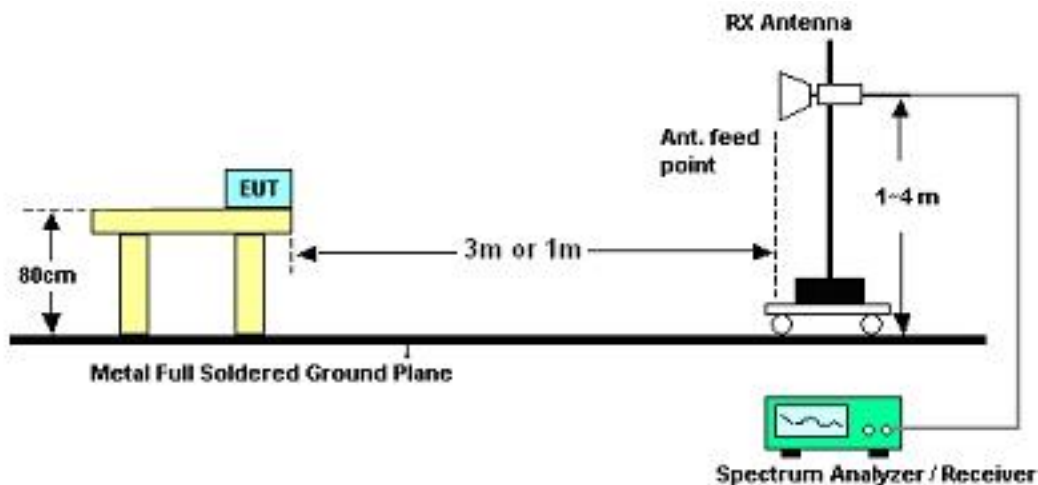
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.3.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

|                 |           |                     |         |  |
|-----------------|-----------|---------------------|---------|--|
| Test Engineer : | Wii Chang | Temperature :       | 21~24°C |  |
|                 |           | Relative Humidity : | 52~58%  |  |

| Frequency (MHz) | Level (dBuV) | Over Limit (dB) | Limit Line (dBuV) | Remark   |
|-----------------|--------------|-----------------|-------------------|----------|
| -               | -            | -               | -                 | See Note |

**Note:**

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

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

|                        |                                                                                                                                                                                                                         |                            |            |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 1                                                                                                                                                                                                                  | <b>Temperature :</b>       | 21~24°C    |
| <b>Test Channel :</b>  | 00                                                                                                                                                                                                                      | <b>Relative Humidity :</b> | 52~58%     |
| <b>Test Engineer :</b> | Wii Chang                                                                                                                                                                                                               | <b>Polarization :</b>      | Horizontal |
| <b>Remark :</b>        | 1. 2402 MHz is Fundamental Signals which can be ignored.<br>2. 7260 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 103.14 dBuV/m - 20dB = 83.14 dBuV/m. |                            |            |

| 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                   | 22.26               | -17.74                  | 40                          | 33.32                   | 19.8                        | 0.7                     | 31.56                      | -                    | -                       | Peak    |
| 199.83               | 22.7                | -20.8                   | 43.5                        | 43.59                   | 9.1                         | 1.46                    | 31.45                      | -                    | -                       | Peak    |
| 233.31               | 26.31               | -19.69                  | 46                          | 45.54                   | 10.68                       | 1.59                    | 31.5                       | -                    | -                       | Peak    |
| 335.7                | 28.23               | -17.77                  | 46                          | 43.7                    | 13.96                       | 1.87                    | 31.3                       | -                    | -                       | Peak    |
| 384                  | 28.91               | -17.09                  | 46                          | 42.83                   | 15.32                       | 1.98                    | 31.22                      | 100                  | 32                      | Peak    |
| 479.9                | 23.22               | -22.78                  | 46                          | 34.44                   | 17.7                        | 2.19                    | 31.11                      | -                    | -                       | Peak    |
| 2362.06              | 36.47               | -17.53                  | 54                          | 33.99                   | 31.99                       | 4.57                    | 34.08                      | 149                  | 232                     | Average |
| 2362.06              | 47.45               | -26.55                  | 74                          | 44.97                   | 31.99                       | 4.57                    | 34.08                      | 149                  | 232                     | Peak    |
| 2402                 | 97.99               | -                       | -                           | 95.47                   | 32.02                       | 4.58                    | 34.08                      | 149                  | 232                     | Average |
| 2402                 | 103.14              | -                       | -                           | 100.62                  | 32.02                       | 4.58                    | 34.08                      | 149                  | 232                     | Peak    |
| 2484                 | 34.77               | -19.23                  | 54                          | 32.12                   | 32.09                       | 4.64                    | 34.08                      | 149                  | 232                     | Average |
| 2484                 | 47.14               | -26.86                  | 74                          | 44.49                   | 32.09                       | 4.64                    | 34.08                      | 149                  | 232                     | Peak    |
| 2522                 | 54.75               | -28.39                  | 83.14                       | 51.98                   | 32.15                       | 4.68                    | 34.06                      | 149                  | 232                     | Peak    |
| 4804                 | 49.18               | -24.82                  | 74                          | 67.33                   | 33.84                       | 6.5                     | 58.49                      | 100                  | 0                       | Peak    |
| 7206                 | 45.87               | -37.27                  | 83.14                       | 59.66                   | 35.6                        | 8.25                    | 57.64                      | 100                  | 0                       | Peak    |

|                        |                                                       |                            |          |
|------------------------|-------------------------------------------------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 1                                                | <b>Temperature :</b>       | 21~24°C  |
| <b>Test Channel :</b>  | 00                                                    | <b>Relative Humidity :</b> | 52~58%   |
| <b>Test Engineer :</b> | Wii Chang                                             | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 2402 MHz is Fundamental Signals which can be ignored. |                            |          |

| 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  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 32.7                 | 30.44               | -9.56                   | 40                          | 43.5                    | 17.76                       | 0.72                    | 31.54                      | 100                  | 51                      | Peak    |
| 84                   | 25.14               | -14.86                  | 40                          | 47.64                   | 8.02                        | 1.03                    | 31.55                      | -                    | -                       | Peak    |
| 131.25               | 29.28               | -14.22                  | 43.5                        | 48.17                   | 11.4                        | 1.23                    | 31.52                      | -                    | -                       | Peak    |
| 307.7                | 21.78               | -24.22                  | 46                          | 37.93                   | 13.33                       | 1.8                     | 31.28                      | -                    | -                       | Peak    |
| 335.7                | 21.06               | -24.94                  | 46                          | 36.53                   | 13.96                       | 1.87                    | 31.3                       | -                    | -                       | Peak    |
| 384                  | 24.82               | -21.18                  | 46                          | 38.74                   | 15.32                       | 1.98                    | 31.22                      | -                    | -                       | Peak    |
| 2321.97              | 36.24               | -17.76                  | 54                          | 33.84                   | 31.96                       | 4.53                    | 34.09                      | 100                  | 274                     | Average |
| 2321.97              | 46.44               | -27.56                  | 74                          | 44.04                   | 31.96                       | 4.53                    | 34.09                      | 100                  | 274                     | Peak    |
| 2402                 | 92.64               | -                       | -                           | 90.12                   | 32.02                       | 4.58                    | 34.08                      | 100                  | 274                     | Average |
| 2402                 | 98.65               | -                       | -                           | 96.13                   | 32.02                       | 4.58                    | 34.08                      | 100                  | 274                     | Peak    |
| 2484                 | 32.87               | -21.13                  | 54                          | 30.22                   | 32.09                       | 4.64                    | 34.08                      | 100                  | 274                     | Average |
| 2484                 | 45.69               | -28.31                  | 74                          | 43.04                   | 32.09                       | 4.64                    | 34.08                      | 100                  | 274                     | Peak    |
| 4804                 | 44.98               | -29.02                  | 74                          | 63.13                   | 33.84                       | 6.5                     | 58.49                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                                       |                            |            |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 2                                                                                                                                                                | <b>Temperature :</b>       | 21~24°C    |
| <b>Test Channel :</b>  | 39                                                                                                                                                                    | <b>Relative Humidity :</b> | 52~58%     |
| <b>Test Engineer :</b> | Wii Chang                                                                                                                                                             | <b>Polarization :</b>      | Horizontal |
| <b>Remark :</b>        | 1. 2441 MHz is Fundamental Signals which can be ignored.<br>2. 2562 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. |                            |            |

| 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                   | 21.83               | -18.17                  | 40                          | 32.89                   | 19.8                        | 0.7                     | 31.56                      | -                    | -                       | Peak    |
| 167.7                | 19.02               | -24.48                  | 43.5                        | 39.46                   | 9.74                        | 1.36                    | 31.54                      | -                    | -                       | Peak    |
| 195.51               | 23.51               | -19.99                  | 43.5                        | 44.66                   | 8.86                        | 1.45                    | 31.46                      | -                    | -                       | Peak    |
| 335.7                | 25.54               | -20.46                  | 46                          | 41.01                   | 13.96                       | 1.87                    | 31.3                       | -                    | -                       | Peak    |
| 384                  | 28.13               | -17.87                  | 46                          | 42.05                   | 15.32                       | 1.98                    | 31.22                      | 100                  | 22                      | Peak    |
| 479.9                | 24.28               | -21.72                  | 46                          | 35.5                    | 17.7                        | 2.19                    | 31.11                      | -                    | -                       | Peak    |
| 2322                 | 42.35               | -11.65                  | 54                          | 39.95                   | 31.96                       | 4.53                    | 34.09                      | 100                  | 227                     | Average |
| 2322                 | 50.51               | -23.49                  | 74                          | 48.11                   | 31.96                       | 4.53                    | 34.09                      | 100                  | 227                     | Peak    |
| 2441                 | 98.08               | -                       | -                           | 95.49                   | 32.06                       | 4.61                    | 34.08                      | 100                  | 227                     | Average |
| 2441                 | 103.9               | -                       | -                           | 101.31                  | 32.06                       | 4.61                    | 34.08                      | 100                  | 227                     | Peak    |
| 2492                 | 32.45               | -21.55                  | 54                          | 29.79                   | 32.1                        | 4.64                    | 34.08                      | 100                  | 227                     | Average |
| 2492                 | 43.8                | -30.2                   | 74                          | 41.14                   | 32.1                        | 4.64                    | 34.08                      | 100                  | 227                     | Peak    |
| 2562                 | 52.54               | -31.36                  | 83.9                        | 49.62                   | 32.19                       | 4.76                    | 34.03                      | 100                  | 227                     | Peak    |
| 4882                 | 50.85               | -23.15                  | 74                          | 68.85                   | 33.82                       | 6.54                    | 58.36                      | 100                  | 0                       | Peak    |
| 7323                 | 45.88               | -28.12                  | 74                          | 59.57                   | 35.6                        | 8.42                    | 57.71                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                                       |                            |          |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 2                                                                                                                                                                | <b>Temperature :</b>       | 21~24°C  |
| <b>Test Channel :</b>  | 39                                                                                                                                                                    | <b>Relative Humidity :</b> | 52~58%   |
| <b>Test Engineer :</b> | Wii Chang                                                                                                                                                             | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 1. 2441 MHz is Fundamental Signals which can be ignored.<br>2. 2562 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. |                            |          |

| 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  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 32.16                | 30.82               | -9.18                   | 40                          | 43.2                    | 18.44                       | 0.72                    | 31.54                      | 100                  | 62                      | Peak    |
| 87.78                | 25.62               | -14.38                  | 40                          | 47.64                   | 8.46                        | 1.06                    | 31.54                      | -                    | -                       | Peak    |
| 133.95               | 28.71               | -14.79                  | 43.5                        | 47.59                   | 11.4                        | 1.24                    | 31.52                      | -                    | -                       | Peak    |
| 306.3                | 21.56               | -24.44                  | 46                          | 37.7                    | 13.34                       | 1.8                     | 31.28                      | -                    | -                       | Peak    |
| 335.7                | 21.11               | -24.89                  | 46                          | 36.58                   | 13.96                       | 1.87                    | 31.3                       | -                    | -                       | Peak    |
| 384                  | 26.16               | -19.84                  | 46                          | 40.08                   | 15.32                       | 1.98                    | 31.22                      | -                    | -                       | Peak    |
| 2322                 | 42.66               | -11.34                  | 54                          | 40.26                   | 31.96                       | 4.53                    | 34.09                      | 100                  | 269                     | Average |
| 2322                 | 48.45               | -25.55                  | 74                          | 46.05                   | 31.96                       | 4.53                    | 34.09                      | 100                  | 269                     | Peak    |
| 2441                 | 92.86               | -                       | -                           | 90.27                   | 32.06                       | 4.61                    | 34.08                      | 100                  | 269                     | Average |
| 2441                 | 98.05               | -                       | -                           | 95.46                   | 32.06                       | 4.61                    | 34.08                      | 100                  | 269                     | Peak    |
| 2496                 | 32.47               | -21.53                  | 54                          | 29.81                   | 32.1                        | 4.64                    | 34.08                      | 100                  | 269                     | Average |
| 2496                 | 44.71               | -29.29                  | 74                          | 42.05                   | 32.1                        | 4.64                    | 34.08                      | 100                  | 269                     | Peak    |
| 2562                 | 48.63               | -29.42                  | 78.05                       | 45.71                   | 32.19                       | 4.76                    | 34.03                      | 100                  | 269                     | Peak    |
| 4882                 | 46.26               | -27.74                  | 74                          | 64.26                   | 33.82                       | 6.54                    | 58.36                      | 100                  | 0                       | Peak    |

|                        |                                                                                                                                                                       |                            |            |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
| <b>Test Mode :</b>     | Mode 3                                                                                                                                                                | <b>Temperature :</b>       | 21~24°C    |
| <b>Test Channel :</b>  | 78                                                                                                                                                                    | <b>Relative Humidity :</b> | 52~58%     |
| <b>Test Engineer :</b> | Wii Chang                                                                                                                                                             | <b>Polarization :</b>      | Horizontal |
| <b>Remark :</b>        | 1. 2480 MHz is Fundamental Signals which can be ignored.<br>2. 2600 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. |                            |            |

| 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  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 30.54                | 21.91               | -18.09                  | 40                          | 33.63                   | 19.12                       | 0.71                    | 31.55                      | -                    | -                       | Peak    |
| 196.86               | 23.6                | -19.9                   | 43.5                        | 44.69                   | 8.92                        | 1.45                    | 31.46                      | -                    | -                       | Peak    |
| 232.5                | 27.05               | -18.95                  | 46                          | 46.4                    | 10.56                       | 1.59                    | 31.5                       | -                    | -                       | Peak    |
| 335.7                | 25.4                | -20.6                   | 46                          | 40.87                   | 13.96                       | 1.87                    | 31.3                       | -                    | -                       | Peak    |
| 384                  | 28.63               | -17.37                  | 46                          | 42.55                   | 15.32                       | 1.98                    | 31.22                      | 100                  | 11                      | Peak    |
| 479.9                | 24.15               | -21.85                  | 46                          | 35.37                   | 17.7                        | 2.19                    | 31.11                      | -                    | -                       | Peak    |
| 2360                 | 49.33               | -4.67                   | 54                          | 46.61                   | 31.99                       | 4.57                    | 33.84                      | 100                  | 224                     | Average |
| 2360                 | 53.61               | -20.39                  | 74                          | 50.89                   | 31.99                       | 4.57                    | 33.84                      | 100                  | 224                     | Peak    |
| 2480                 | 99.35               | -                       | -                           | 96.52                   | 32.09                       | 4.64                    | 33.9                       | 100                  | 224                     | Average |
| 2480                 | 104.87              | -                       | -                           | 102.04                  | 32.09                       | 4.64                    | 33.9                       | 100                  | 224                     | Peak    |
| 2483.5               | 48.92               | -5.08                   | 54                          | 46.09                   | 32.09                       | 4.64                    | 33.9                       | 100                  | 224                     | Average |
| 2483.5               | 67.93               | -6.07                   | 74                          | 65.1                    | 32.09                       | 4.64                    | 33.9                       | 100                  | 224                     | Peak    |
| 2600                 | 53.88               | -30.99                  | 84.87                       | 50.88                   | 32.24                       | 4.84                    | 34.08                      | 100                  | 224                     | Peak    |
| 4960                 | 50.33               | -23.67                  | 74                          | 68.14                   | 33.81                       | 6.57                    | 58.19                      | 100                  | 0                       | Peak    |
| 7440                 | 45.78               | -28.22                  | 74                          | 59.34                   | 35.6                        | 8.63                    | 57.79                      | 100                  | 0                       | Peak    |



|                        |                                                       |                            |          |
|------------------------|-------------------------------------------------------|----------------------------|----------|
| <b>Test Mode :</b>     | Mode 3                                                | <b>Temperature :</b>       | 21~24°C  |
| <b>Test Channel :</b>  | 78                                                    | <b>Relative Humidity :</b> | 52~58%   |
| <b>Test Engineer :</b> | Wii Chang                                             | <b>Polarization :</b>      | Vertical |
| <b>Remark :</b>        | 2480 MHz is Fundamental Signals which can be ignored. |                            |          |

| 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  |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 32.16                | 30.15               | -9.85                   | 40                          | 42.53                   | 18.44                       | 0.72                    | 31.54                      | 100                  | 31                      | Peak    |
| 86.43                | 24.97               | -15.03                  | 40                          | 47.25                   | 8.22                        | 1.05                    | 31.55                      | -                    | -                       | Peak    |
| 131.52               | 29                  | -14.5                   | 43.5                        | 47.89                   | 11.4                        | 1.23                    | 31.52                      | -                    | -                       | Peak    |
| 306.3                | 21.94               | -24.06                  | 46                          | 38.08                   | 13.34                       | 1.8                     | 31.28                      | -                    | -                       | Peak    |
| 384                  | 26.37               | -19.63                  | 46                          | 40.29                   | 15.32                       | 1.98                    | 31.22                      | -                    | -                       | Peak    |
| 599.6                | 27.97               | -18.03                  | 46                          | 36.53                   | 19.89                       | 2.42                    | 30.87                      | -                    | -                       | Peak    |
| 2360                 | 45.79               | -8.21                   | 54                          | 43.07                   | 31.99                       | 4.57                    | 33.84                      | 100                  | 277                     | Average |
| 2360                 | 50.74               | -23.26                  | 74                          | 48.02                   | 31.99                       | 4.57                    | 33.84                      | 100                  | 277                     | Peak    |
| 2480                 | 93.52               | -                       | -                           | 90.69                   | 32.09                       | 4.64                    | 33.9                       | 100                  | 277                     | Average |
| 2480                 | 98.21               | -                       | -                           | 95.38                   | 32.09                       | 4.64                    | 33.9                       | 100                  | 277                     | Peak    |
| 2483.5               | 45.11               | -8.89                   | 54                          | 42.28                   | 32.09                       | 4.64                    | 33.9                       | 100                  | 277                     | Average |
| 2483.5               | 61.78               | -12.22                  | 74                          | 58.95                   | 32.09                       | 4.64                    | 33.9                       | 100                  | 277                     | Peak    |
| 4960                 | 45.99               | -28.01                  | 74                          | 63.8                    | 33.81                       | 6.57                    | 58.19                      | 200                  | 0                       | Peak    |



## **3.4 Antenna Requirements**

### **3.4.1 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.

### **3.4.2 Antenna Connected Construction**

The antennas type used in this product is PIFA Antenna without connector and it is considered to meet antenna requirement.

### **3.4.3 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       | Anritsu           | ML2495A                    | 0932001        | N/A             | Sep. 18, 2011    | Nov. 25, 2011 | Sep. 17, 2012 | Conducted (TH02-HY)   |
| Power Sensor      | Anritsu           | MA2411B                    | 0846202        | N/A             | Sep. 18, 2011    | Nov. 29, 2011 | Sep. 17, 2012 | Conducted (TH02-HY)   |
| Power Meter       | Agilent           | E4416A                     | GB41292344     | N/A             | Feb. 18, 2011    | Nov. 29, 2011 | Feb. 17, 2012 | Conducted (TH02-HY)   |
| Power Sensor      | Agilent           | E9327A                     | US40441548     | N/A             | Feb. 18, 2011    | Nov. 29, 2011 | Feb. 17, 2012 | Conducted (TH02-HY)   |
| EMI Test Receive  | R&S               | ESCI 7                     | 100724         | 9kHz~7GHz       | Aug. 22, 2011    | Nov. 29, 2011 | Aug. 21, 2012 | Conduction (CO05-HY)  |
| Two-LISN          | R&S               | ENV216                     | 11-100081      | 9KHz – 30MHz    | Dec. 03, 2010    | Nov. 29, 2011 | Dec. 02, 2011 | Conduction (CO05-HY)  |
| Two-LISN          | R&S               | ENV216                     | 11-100080      | 9KHz – 30MHz    | Dec. 01, 2010    | Nov. 29, 2011 | Nov. 30, 2011 | Conduction (CO05-HY)  |
| AC Power Source   | APC               | APC-1000W                  | N/A            | N/A             | N/A              | Nov. 29, 2011 | N/A           | Conduction (CO05-HY)  |
| Spectrum Analyzer | R&S               | FSP30                      | 101352         | 9KHz-30GHz      | Nov. 03, 2011    | Nov. 25, 2011 | Nov. 02, 2012 | Radiation (03CH05-HY) |
| COM-POWER         | Double Ridge Horn | AH-118                     | 701030         | 1GHz~18GHz      | N/A              | Nov. 25, 2011 | N/A           | Radiation (03CH05-HY) |
| Bilog Antenna     | SCHAFFNER         | CBL6111C                   | 2725           | 30MHz ~ 1GHz    | Oct. 22, 2011    | Nov. 25, 2011 | Oct. 21, 2012 | Radiation (03CH05-HY) |
| Turn Table        | HD                | Deis HD 2000               | 420/611        | 0 - 360 degree  | N/A              | Nov. 25, 2011 | N/A           | Radiation (03CH05-HY) |
| Antenna Mast      | HD                | MA 240                     | 240/666        | 1 m - 4 m       | N/A              | Nov. 25, 2011 | N/A           | Radiation (03CH05-HY) |
| Horn Antenna      | ESCO              | 3117                       | 66584          | 1GHz ~ 18GHz    | Aug. 04, 2011    | Nov. 25, 2011 | Aug. 03, 2012 | Radiation (03CH05-HY) |
| COM-POWER         | COM-POWER         | PA-103                     | 161075         | 1KHz - 1GHz     | Mar. 29, 2011    | Nov. 25, 2011 | Mar. 28, 2012 | Radiation (03CH05-HY) |
| Pre Amplifier     | EMCI              | EMC051845                  | SN980048       | 1GHz~18GHz      | Jul. 19, 2011    | Nov. 25, 2011 | Jul. 18, 2012 | Radiation (03CH05-HY) |
| Preamplifier      | MITEQ             | AMF-7D-0010<br>1800-30-10P | 159087         | 1GHz~18GHz      | Feb. 21, 2011    | Nov. 25, 2011 | Feb. 20, 2012 | Radiation (03CH05-HY) |
| Pre Amplifier     | Agilent           | 8449B                      | 3008A019<br>17 | 1GHz- 26.5GHz   | Apr. 14, 2011    | Nov. 25, 2011 | Apr. 13, 2012 | Radiation (03CH05-HY) |

## 5 Uncertainty of Evaluation

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

| Contribution                                                                             | Uncertainty of $X_i$ |                          | $u(X_i)$ |
|------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|
|                                                                                          | dB                   | Probability Distribution |          |
| Receiver Reading                                                                         | 0.10                 | Normal (k=2)             | 0.05     |
| Cable Loss                                                                               | 0.10                 | Normal (k=2)             | 0.05     |
| AMN Insertion Loss                                                                       | 2.50                 | Rectangular              | 0.63     |
| Receiver Specification                                                                   | 1.50                 | Rectangular              | 0.43     |
| Site Imperfection                                                                        | 1.39                 | Rectangular              | 0.80     |
| Mismatch                                                                                 | +0.34 / -0.35        | U-Shape                  | 0.24     |
| <b>Combined Standard Uncertainty <math>U_c(y)</math></b>                                 | <b>1.13</b>          |                          |          |
| <b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b> | <b>2.26</b>          |                          |          |

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

| Contribution                                                                             | Uncertainty of $X_i$ |                          | $u(X_i)$ |
|------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|
|                                                                                          | dB                   | Probability Distribution |          |
| Receiver Reading                                                                         | 0.41                 | Normal (k=2)             | 0.21     |
| Antenna Factor Calibration                                                               | 0.83                 | Normal (k=2)             | 0.42     |
| Cable Loss Calibration                                                                   | 0.25                 | Normal (k=2)             | 0.13     |
| Pre-Amplifier Gain Calibration                                                           | 0.27                 | Normal (k=2)             | 0.14     |
| RCV/SPA Specification                                                                    | 2.50                 | Rectangular              | 0.72     |
| Antenna Factor Interpolation for Frequency                                               | 1.00                 | Rectangular              | 0.29     |
| Site Imperfection                                                                        | 1.43                 | Rectangular              | 0.83     |
| Mismatch                                                                                 | +0.39 / -0.41        | U-Shape                  | 0.28     |
| <b>Combined Standard Uncertainty <math>U_c(y)</math></b>                                 | <b>1.27</b>          |                          |          |
| <b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b> | <b>2.54</b>          |                          |          |

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

| Contribution                                                                                                                         | Uncertainty of $X_i$ |                          | $u(X_i)$ | $C_i$ | $C_i * u(X_i)$ |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|-------|----------------|
|                                                                                                                                      | dB                   | Probability Distribution |          |       |                |
| Receiver Reading                                                                                                                     | $\pm 0.10$           | Normal (k=2)             | 0.10     | 1     | 0.10           |
| Antenna Factor Calibration                                                                                                           | $\pm 1.70$           | Normal (k=2)             | 0.85     | 1     | 0.85           |
| Cable Loss Calibration                                                                                                               | $\pm 0.50$           | Normal (k=2)             | 0.25     | 1     | 0.25           |
| Receiver Correction                                                                                                                  | $\pm 2.00$           | Rectangular              | 1.15     | 1     | 1.15           |
| Antenna Factor Directional                                                                                                           | $\pm 1.50$           | Rectangular              | 0.87     | 1     | 0.87           |
| Site Imperfection                                                                                                                    | $\pm 2.80$           | Triangular               | 1.14     | 1     | 1.14           |
| Mismatch<br>Receiver VSWR $\Gamma_1 = 0.197$<br>Antenna VSWR $\Gamma_2 = 0.194$<br>Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$ | +0.34 / -0.35        | U-Shape                  | 0.244    | 1     | 0.244          |
| <b>Combined Standard Uncertainty<br/><math>U_c(y)</math></b>                                                                         | <b>2.36</b>          |                          |          |       |                |
| <b>Measuring Uncertainty for a<br/>Level of Confidence of 95%<br/>(<math>U = 2U_c(y)</math>)</b>                                     | <b>4.72</b>          |                          |          |       |                |



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

Please refer to Sporton report number EP1N0901 as below.