

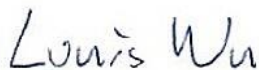


# FCC RADIO TEST REPORT

FCC ID : UZ7MC220J  
Equipment : Mobile computer  
Brand Name : Zebra  
Model Name : MC220J  
Applicant : Zebra Technologies Corporation  
1 Zebra Plaza, Holtsville, NY 11742  
Manufacturer : Zebra Technologies Corporation  
1 Zebra Plaza, Holtsville, NY 11742  
Standard : FCC Part 15 Subpart C §15.247

The product was received on Jun. 12, 2020 and testing was started from Jun. 30, 2020 and completed on Aug. 08, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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



Approved by: Louis Wu

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



## Table of Contents

|                                                                 |           |
|-----------------------------------------------------------------|-----------|
| <b>History of this test report.....</b>                         | <b>3</b>  |
| <b>Summary of Test Result.....</b>                              | <b>4</b>  |
| <b>1 General Description .....</b>                              | <b>5</b>  |
| 1.1 Product Feature of Equipment Under Test.....                | 5         |
| 1.2 Product Specification of Equipment Under Test.....          | 5         |
| 1.3 Modification of EUT .....                                   | 5         |
| 1.4 Testing Location .....                                      | 6         |
| 1.5 Applicable Standards.....                                   | 6         |
| <b>2 Test Configuration of Equipment Under Test .....</b>       | <b>7</b>  |
| 2.1 Carrier Frequency and Channel .....                         | 7         |
| 2.2 Test Mode.....                                              | 7         |
| 2.3 Connection Diagram of Test System.....                      | 9         |
| 2.4 Support Unit used in test configuration and system .....    | 10        |
| 2.5 EUT Operation Test Setup .....                              | 10        |
| <b>3 Test Result .....</b>                                      | <b>11</b> |
| 3.1 Output Power Measurement.....                               | 11        |
| 3.2 Radiated Band Edges and Spurious Emission Measurement ..... | 13        |
| 3.3 AC Conducted Emission Measurement.....                      | 17        |
| 3.4 Antenna Requirements.....                                   | 19        |
| <b>4 List of Measuring Equipment.....</b>                       | <b>20</b> |
| <b>5 Uncertainty of Evaluation .....</b>                        | <b>22</b> |
| <b>Appendix A. AC Conducted Emission Test Result</b>            |           |
| <b>Appendix B. Radiated Spurious Emission</b>                   |           |
| <b>Appendix C. Radiated Spurious Emission Plots</b>             |           |
| <b>Appendix D. Duty Cycle Plots</b>                             |           |
| <b>Appendix E. Setup Photographs</b>                            |           |
| <b>Appendix F. Original Report</b>                              |           |



## History of this test report

| Report No.   | Version | Description                                                                                                                                                    | Issued Date   |            |        |        |        |   |   |     |   |   |
|--------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|--------|--------|--------|---|---|-----|---|---|
| FR040803-03C | 01      | This is a variant report for MC220J (FCC ID: UZ7MC220J), and the differences between this model name and MC220K (FCC ID: UZ7MC220K) are as listed below:       | Aug. 28, 2020 |            |        |        |        |   |   |     |   |   |
|              |         | <table><tr><td>Item/Model</td><td>MC220K</td><td>MC220J</td></tr><tr><td>Camera</td><td>O</td><td>X</td></tr><tr><td>NFC</td><td>O</td><td>X</td></tr></table> |               | Item/Model | MC220K | MC220J | Camera | O | X | NFC | O | X |
|              |         | Item/Model                                                                                                                                                     |               | MC220K     | MC220J |        |        |   |   |     |   |   |
|              |         | Camera                                                                                                                                                         |               | O          | X      |        |        |   |   |     |   |   |
|              |         | NFC                                                                                                                                                            |               | O          | X      |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
| FR040803-03C | 02      | Revising history description.                                                                                                                                  | Sep. 02, 2020 |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |
|              |         |                                                                                                                                                                |               |            |        |        |        |   |   |     |   |   |

## Summary of Test Result

| Report Clause | Ref Std. Clause    | Test Items                                         | Result (PASS/FAIL) | Remark                              |
|---------------|--------------------|----------------------------------------------------|--------------------|-------------------------------------|
| -             | 15.247(a)(2)       | 6dB Bandwidth                                      | Not Required       | -                                   |
| -             | 2.1049             | 99% Occupied Bandwidth                             | Not Required       | -                                   |
| 3.1           | 15.247(b)          | Power Output Measurement                           | Pass               | -                                   |
| -             | 15.247(e)          | Power Spectral Density                             | Not Required       | -                                   |
| -             | 15.247(d)          | Conducted Band Edges                               | Not Required       | -                                   |
|               |                    | Conducted Spurious Emission                        | Not Required       | -                                   |
| 3.2           | 15.247(d)          | Radiated Band Edges and Radiated Spurious Emission | Pass               | Under limit 1.19 dB at 2483.530 MHz |
| 3.3           | 15.207             | AC Conducted Emission                              | Pass               | Under limit 15.19 dB at 0.162 MHz   |
| 3.4           | 15.203 & 15.247(b) | Antenna Requirement                                | Pass               | -                                   |

**Note:** Not required means after assessing, test items are not necessary to carry out.

### Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Wii Chang**

**Report Producer: Yimin Ho**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Specification subjective to this standard |                                                                                |
|---------------------------------------------------|--------------------------------------------------------------------------------|
| Equipment                                         | Mobile computer                                                                |
| Brand Name                                        | Zebra                                                                          |
| Model Name                                        | MC220J                                                                         |
| FCC ID                                            | UZ7MC220J                                                                      |
| EUT supports Radios application                   | WLAN 11a/b/g/n HT20/HT40<br>WLAN 11ac VHT20/VHT40/VHT80<br>Bluetooth BR/EDR/LE |
| HW Version                                        | EV1                                                                            |
| SW Version                                        | 10-11-31.00-QG-U00-PRD-HEL-04                                                  |
| OS Version                                        | Android 10                                                                     |
| MFD                                               | 02JUN20                                                                        |
| EUT Stage                                         | Engineering Sample                                                             |

**Remark:** The above EUT's information was declared by manufacturer.

| Specification of Accessories            |            |       |             |                  |
|-----------------------------------------|------------|-------|-------------|------------------|
| AC Adapter                              | Brand Name | Zebra | Part Number | PWR-WUA5V12W0US  |
| Battery                                 | Brand Name | Zebra | Part Number | BT-000418-10     |
| USB Cable<br>(TypeA plug to TypeC plug) | Brand Name | Zebra | Part Number | CBL-TC2X-USBC-01 |
| Trigger Handle                          | Brand Name | Zebra | Part Number | TRG-MC2X-SNP1-01 |
| Holster 1                               | Brand Name | Zebra | Part Number | SG-MC2X-HLSTR-01 |
| Holster 2                               | Brand Name | Zebra | Part Number | SG-MC3021212-01R |

## 1.2 Product Specification of Equipment Under Test

| Standards-related Product Specification   |                                                                                                                                                                                                                                  |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tx/Rx Channel Frequency Range             | 2412 MHz ~ 2462 MHz                                                                                                                                                                                                              |
| Maximum (Average) Output Power to antenna | 802.11b : 20.30 dBm (0.1072 W)<br>802.11g : 19.90 dBm (0.0977 W)<br>802.11n HT20 : 20.10 dBm (0.1023 W)<br>802.11n HT40 : 16.80 dBm (0.0479 W)<br>802.11ac VHT20 : 20.20 dBm (0.1047 W)<br>802.11ac VHT40 : 16.90 dBm (0.0490 W) |
| Antenna Type / Gain                       | Monopole Antenna with gain 1.96 dBi                                                                                                                                                                                              |
| Type of Modulation                        | 802.11b : DSSS (DBPSK / DQPSK / CCK)<br>802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)<br>802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)                                                                                  |

## 1.3 Modification of EUT

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



## 1.4 Testing Location

|                           |                                                                                                                       |         |           |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------|---------|-----------|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory                                                   |         |           |
| <b>Test Site Location</b> | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |         |           |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                               |         |           |
|                           | TH05-HY                                                                                                               | CO05-HY | 03CH07-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

## 1.5 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

## 2 Test Configuration of Equipment Under Test

- 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: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

| Frequency Band  | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|-------------|---------|-------------|
| 2400-2483.5 MHz | 1       | 2412        | 7       | 2442        |
|                 | 2       | 2417        | 8       | 2447        |
|                 | 3       | 2422        | 9       | 2452        |
|                 | 4       | 2427        | 10      | 2457        |
|                 | 5       | 2432        | 11      | 2462        |
|                 | 6       | 2437        |         |             |

### 2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

| Modulation     | Data Rate |
|----------------|-----------|
| 802.11b        | 1 Mbps    |
| 802.11g        | 6 Mbps    |
| 802.11n HT20   | MCS0      |
| 802.11n HT40   | MCS0      |
| 802.11ac VHT20 | MCS0      |
| 802.11ac VHT40 | MCS0      |

| Test Cases            |                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------|
| AC Conducted Emission | Mode 1: WLAN (2.4GHz) Link + Bluetooth Link + USB Cable (Charging from AC Adapter) + Battery |

| Ch. #  | 2400-2483.5 MHz |         |                |
|--------|-----------------|---------|----------------|
|        | 802.11b         | 802.11g | 802.11ac VHT40 |
| Low    | -               | -       | -              |
| Middle | -               | -       | 06             |
| High   | 11              | 11      | -              |

**Remark:** For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

| 802.11b RF Avg Output Power (dBm) |                 |                 |
|-----------------------------------|-----------------|-----------------|
| Power vs. Channel                 |                 |                 |
| Channel                           | Frequency (MHz) | Data Rate (bps) |
|                                   |                 | 1M              |
| CH 01                             | 2412            | 19.90           |
| CH 06                             | 2437            | 20.30           |
| CH 11                             | 2462            | 19.90           |

| 802.11g RF Avg Output Power (dBm) |                 |                 |
|-----------------------------------|-----------------|-----------------|
| Power vs. Channel                 |                 |                 |
| Channel                           | Frequency (MHz) | Data Rate (bps) |
|                                   |                 | 6M              |
| CH 01                             | 2412            | 18.50           |
| CH 06                             | 2437            | 19.90           |
| CH 11                             | 2462            | 18.00           |

| 802.11n HT20 RF Avg Output Power (dBm) |                 |           |
|----------------------------------------|-----------------|-----------|
| Power vs. Channel                      |                 |           |
| Channel                                | Frequency (MHz) | MCS Index |
|                                        |                 | MCS 0     |
| CH 01                                  | 2412            | 17.30     |
| CH 06                                  | 2437            | 20.10     |
| CH 11                                  | 2462            | 16.80     |

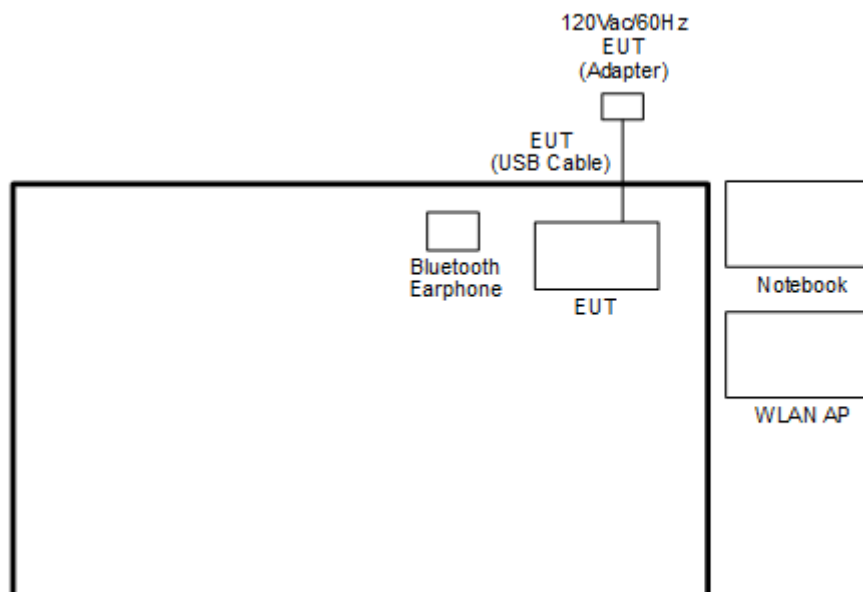
| 802.11n HT40 RF Avg Output Power (dBm) |                 |           |
|----------------------------------------|-----------------|-----------|
| Power vs. Channel                      |                 |           |
| Channel                                | Frequency (MHz) | MCS Index |
|                                        |                 | MCS 0     |
| CH 03                                  | 2422            | 14.10     |
| CH 06                                  | 2437            | 16.80     |
| CH 09                                  | 2452            | 13.80     |

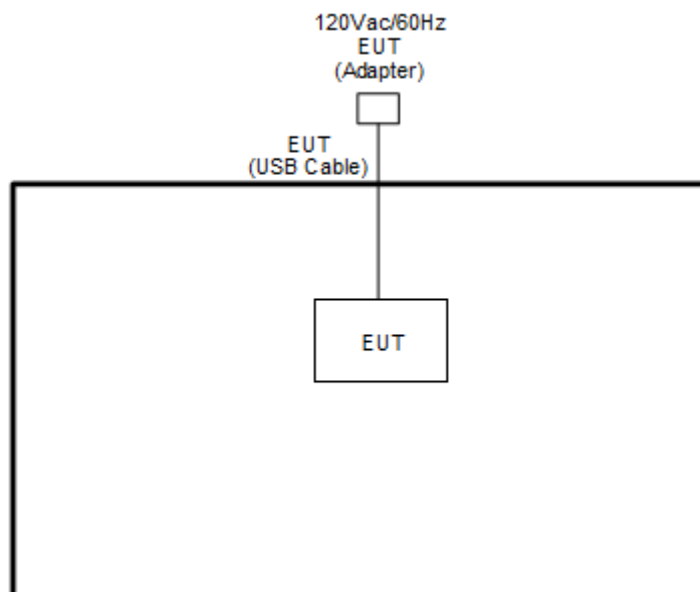
| 802.11ac VHT20 RF Avg Output Power (dBm) |                 |              |
|------------------------------------------|-----------------|--------------|
| Power vs. Channel                        |                 |              |
| Channel                                  | Frequency (MHz) | MCS Index    |
|                                          |                 | MCS 0        |
| CH 01                                    | 2412            | 17.40        |
| CH 06                                    | 2437            | <b>20.20</b> |
| CH 11                                    | 2462            | 16.90        |

| 802.11ac VHT40 RF Avg Output Power (dBm) |                 |              |
|------------------------------------------|-----------------|--------------|
| Power vs. Channel                        |                 |              |
| Channel                                  | Frequency (MHz) | MCS Index    |
|                                          |                 | MCS 0        |
| CH 03                                    | 2422            | 14.20        |
| CH 06                                    | 2437            | <b>16.90</b> |
| CH 09                                    | 2452            | 13.90        |

## 2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



**<WLAN 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.   | Bluetooth Earphone | Sony Ericsson | MW600         | PY7DDA-2029 | N/A        | N/A                                                  |
| 2.   | WLAN AP            | ASUS          | RT-AC66U      | MSQ-RTAC66U | N/A        | Unshielded, 1.8 m                                    |
| 3.   | Notebook           | DELL          | Latitude 3400 | FCC DoC     | N/A        | AC I/P: Unshielded, 1.2 m<br>DC O/P: Shielded, 1.8 m |
| 4.   | SD Card            | SanDisk       | MicroSD HC    | FCC DoC     | N/A        | N/A                                                  |

**2.5 EUT Operation Test Setup**

The RF test items, utility “QRCT v4.0.00142.0” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

### 3 Test Result

#### 3.1 Output Power Measurement

##### 3.1.1 Limit of Output Power

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

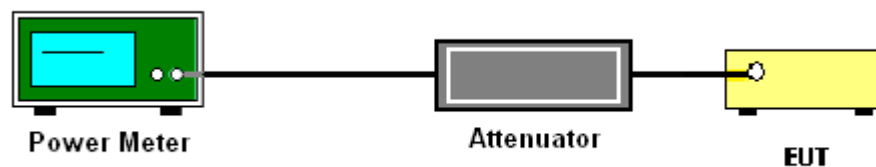
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

##### 3.1.4 Test Setup





## 3.1.5 Test Result of Average Output Power

|                 |           |                     |         |
|-----------------|-----------|---------------------|---------|
| Test Engineer : | Tommy Lee | Temperature :       | 21~25°C |
|                 |           | Relative Humidity : | 51~54%  |

| 2.4GHz Band Single Antenna |           |     |     |             |                               |      |     |                             |      |          |      |                  |      |                        |      |            |
|----------------------------|-----------|-----|-----|-------------|-------------------------------|------|-----|-----------------------------|------|----------|------|------------------|------|------------------------|------|------------|
| Mod.                       | Data Rate | NTX | CH. | Freq. (MHz) | Average Conducted Power (dBm) |      |     | Conducted Power Limit (dBm) |      | DG (dBi) |      | EIRP Power (dBm) |      | EIRP Power Limit (dBm) |      | Pass /Fail |
|                            |           |     |     |             | Ant1                          | Ant2 | SUM | Ant1                        | Ant2 | Ant1     | Ant2 | Ant1             | Ant2 | Ant1                   | Ant2 |            |
| 11b                        | 1Mbps     | 1   | 1   | 2412        | 19.90                         | -    | -   | 30.00                       | -    | 1.96     | -    | 21.86            | -    | 36.00                  | -    | Pass       |
| 11b                        | 1Mbps     | 1   | 6   | 2437        | 20.30                         | -    |     | 30.00                       | -    | 1.96     | -    | 22.26            | -    | 36.00                  | -    | Pass       |
| 11b                        | 1Mbps     | 1   | 11  | 2462        | 19.90                         | -    |     | 30.00                       | -    | 1.96     | -    | 21.86            | -    | 36.00                  | -    | Pass       |
| 11g                        | 6Mbps     | 1   | 1   | 2412        | 18.50                         | -    |     | 30.00                       | -    | 1.96     | -    | 20.46            | -    | 36.00                  | -    | Pass       |
| 11g                        | 6Mbps     | 1   | 6   | 2437        | 19.90                         | -    |     | 30.00                       | -    | 1.96     | -    | 21.86            | -    | 36.00                  | -    | Pass       |
| 11g                        | 6Mbps     | 1   | 11  | 2462        | 18.00                         | -    |     | 30.00                       | -    | 1.96     | -    | 19.96            | -    | 36.00                  | -    | Pass       |
| HT20                       | MCS0      | 1   | 1   | 2412        | 17.30                         | -    |     | 30.00                       | -    | 1.96     | -    | 19.26            | -    | 36.00                  | -    | Pass       |
| HT20                       | MCS0      | 1   | 6   | 2437        | 20.10                         | -    |     | 30.00                       | -    | 1.96     | -    | 22.06            | -    | 36.00                  | -    | Pass       |
| HT20                       | MCS0      | 1   | 11  | 2462        | 16.80                         | -    |     | 30.00                       | -    | 1.96     | -    | 18.76            | -    | 36.00                  | -    | Pass       |
| HT40                       | MCS0      | 1   | 3   | 2422        | 14.10                         | -    |     | 30.00                       | -    | 1.96     | -    | 16.06            | -    | 36.00                  | -    | Pass       |
| HT40                       | MCS0      | 1   | 6   | 2437        | 16.80                         | -    |     | 30.00                       | -    | 1.96     | -    | 18.76            | -    | 36.00                  | -    | Pass       |
| HT40                       | MCS0      | 1   | 9   | 2452        | 13.80                         | -    |     | 30.00                       | -    | 1.96     | -    | 15.76            | -    | 36.00                  | -    | Pass       |
| VHT20                      | MCS0      | 1   | 1   | 2412        | 17.40                         | -    |     | 30.00                       | -    | 1.96     | -    | 19.36            | -    | 36.00                  | -    | Pass       |
| VHT20                      | MCS0      | 1   | 6   | 2437        | 20.20                         | -    |     | 30.00                       | -    | 1.96     | -    | 22.16            | -    | 36.00                  | -    | Pass       |
| VHT20                      | MCS0      | 1   | 11  | 2462        | 16.90                         | -    |     | 30.00                       | -    | 1.96     | -    | 18.86            | -    | 36.00                  | -    | Pass       |
| VHT40                      | MCS0      | 1   | 3   | 2422        | 14.20                         | -    |     | 30.00                       | -    | 1.96     | -    | 16.16            | -    | 36.00                  | -    | Pass       |
| VHT40                      | MCS0      | 1   | 6   | 2437        | 16.90                         | -    |     | 30.00                       | -    | 1.96     | -    | 18.86            | -    | 36.00                  | -    | Pass       |
| VHT40                      | MCS0      | 1   | 9   | 2452        | 13.90                         | -    |     | 30.00                       | -    | 1.96     | -    | 15.86            | -    | 36.00                  | -    | Pass       |

## 3.2 Radiated Band Edges and Spurious Emission Measurement

### 3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the 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                                |

### 3.2.2 Measuring Instruments

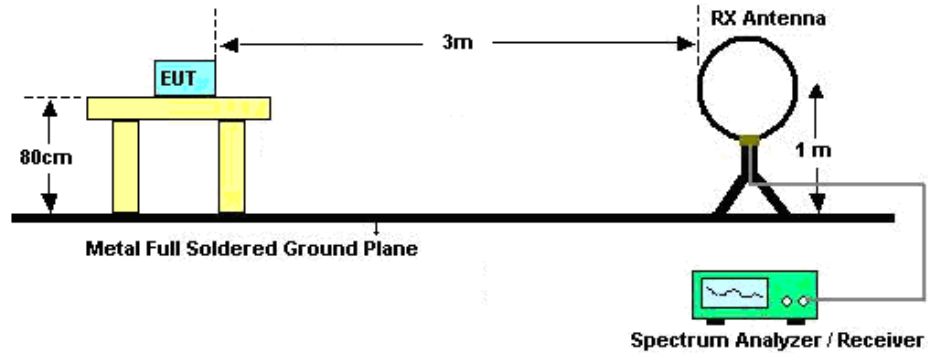
See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

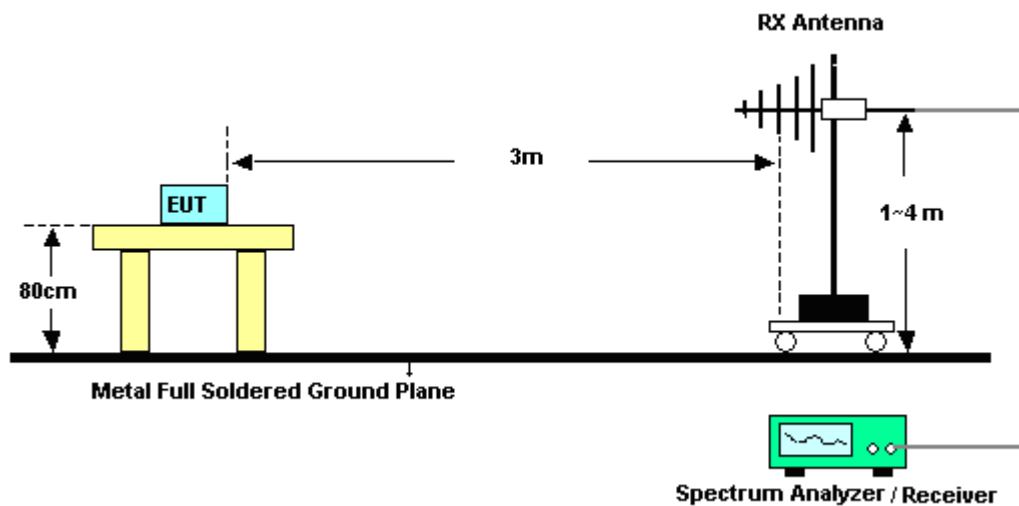
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz;  $VBW \geq RBW$ ; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1$  GHz for peak measurement.  
For average measurement:
    - $VBW = 10$  Hz, when duty cycle is no less than 98 percent.
    - $VBW \geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.2.4 Test Setup

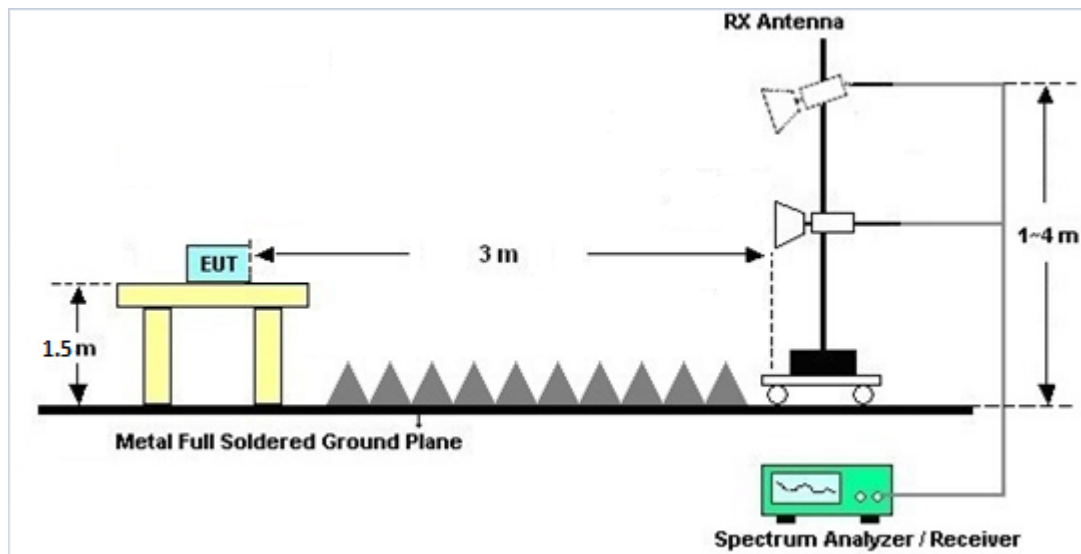
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

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

Please refer to Appendix B and C.

### 3.2.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

### 3.3 AC Conducted Emission Measurement

#### 3.3.1 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<br>(MHz) | Conducted Limit (dB $\mu$ V) |           |
|--------------------------------|------------------------------|-----------|
|                                | 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.

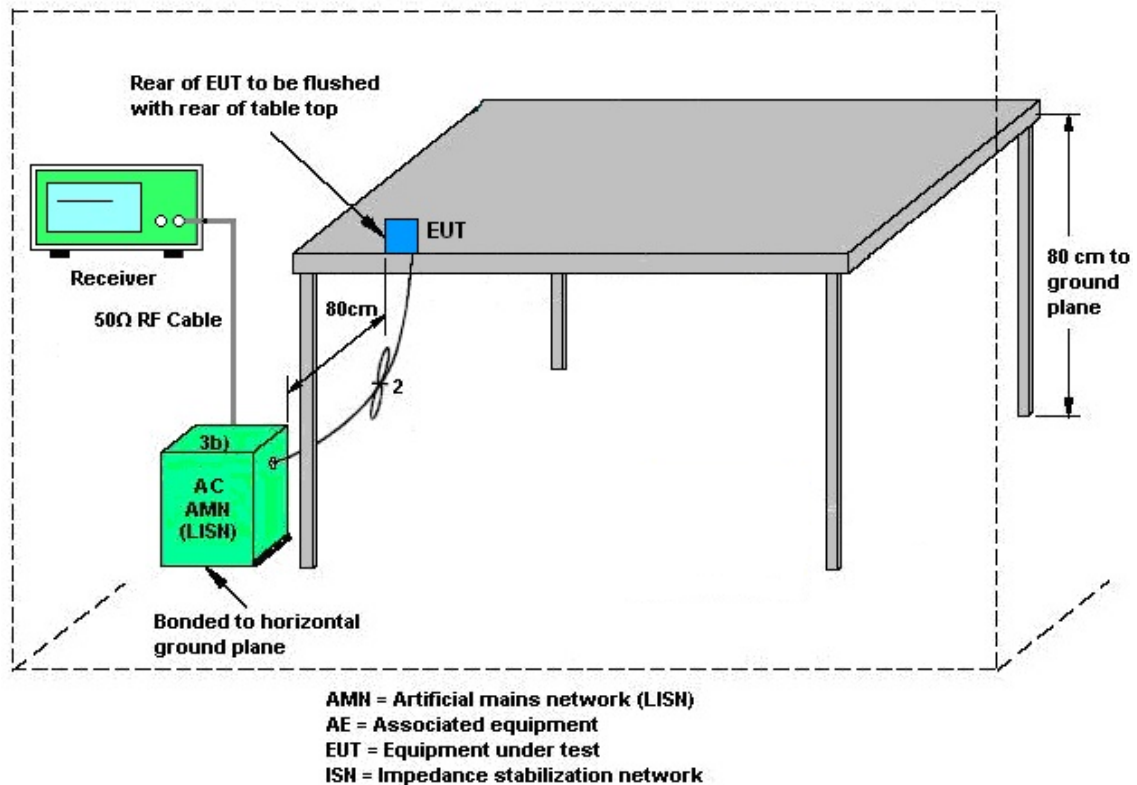
#### 3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

#### 3.3.3 Test Procedures

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

### 3.3.4 Test Setup



### 3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



## **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 rule.

### **3.4.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **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                | Brand Name      | Model No.                          | Serial No.                      | Characteristics       | Calibration Date | Test Date                    | Due Date      | Remark                |
|---------------------------|-----------------|------------------------------------|---------------------------------|-----------------------|------------------|------------------------------|---------------|-----------------------|
| Bilog Antenna             | TESEQ           | CBL 6111D & 00800N1D01 N-06        | 35419 & 03                      | 30MHz~1GHz            | Apr. 29, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Apr. 28, 2021 | Radiation (03CH07-HY) |
| Double Ridge Horn Antenna | ESCO            | 3117                               | 00075962                        | 1GHz ~ 18GHz          | Dec. 06, 2019    | Jul. 24, 2020~ Aug. 08, 2020 | Dec. 05, 2020 | Radiation (03CH07-HY) |
| EMI Test Receiver         | Agilent         | N9038A (MXE)                       | MY5329005 3                     | 20Hz~26.5GHz          | May 21, 2020     | Jul. 24, 2020~ Aug. 08, 2020 | May 20, 2021  | Radiation (03CH07-HY) |
| Loop Antenna              | Rohde & Schwarz | HFH2-Z2                            | 100315                          | 9 kHz~30 MHz          | Dec. 26, 2019    | Jul. 24, 2020~ Aug. 08, 2020 | Dec. 25, 2020 | Radiation (03CH07-HY) |
| Preamplifier              | MITEQ           | AMF-7D-0010 1800-30-10P            | 1590075                         | 1GHz~18GHz            | Apr. 23, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Apr. 22, 2021 | Radiation (03CH07-HY) |
| Preamplifier              | COM-POWER       | PA-103A                            | 161241                          | 10MHz~1GHz            | May 19, 2020     | Jul. 24, 2020~ Aug. 08, 2020 | May 18, 2021  | Radiation (03CH07-HY) |
| Preamplifier              | Agilent         | 8449B                              | 3008A0236 2                     | 1GHz~26.5GHz          | Nov. 01, 2019    | Jul. 24, 2020~ Aug. 08, 2020 | Oct. 31, 2020 | Radiation (03CH07-HY) |
| Notch Filter              | Wainwright      | WRCJV12-56 95-5725-5850 -5880-40SS | SN1                             | 5G Band 4             | Mar. 15, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Mar. 14, 2021 | Radiation (03CH07-HY) |
| Filter                    | Microwave       | H3G018G1                           | SN477220                        | 3GHz High Pass Filter | Nov. 11, 2019    | Jul. 24, 2020~ Aug. 08, 2020 | Nov. 11, 2020 | Radiation (03CH07-HY) |
| RF Cable                  | HUBER + SUHNER  | SUCOFLEX 102                       | MY2858/2,8 01606/2              | 18GHz~40GHz           | Feb. 25, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Feb. 24, 2021 | Radiation (03CH07-HY) |
| RF Cable                  | HUBER + SUHNER  | SUCOFLEX 104                       | MY24971/4, MY28655/4            | 9kHz~30MHz            | Feb. 25, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Feb. 24, 2021 | Radiation (03CH07-HY) |
| RF Cable                  | HUBER + SUHNER  | SUCOFLEX 104                       | MY28655/4, MY24971/4, MY15682/4 | 30MHz~1GHz            | Feb. 25, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Feb. 24, 2021 | Radiation (03CH07-HY) |
| RF Cable                  | HUBER + SUHNER  | SUCOFLEX 104                       | MY28655/4, MY24971/4, MY15682/4 | 1GHz~18GHz            | Feb. 25, 2020    | Jul. 24, 2020~ Aug. 08, 2020 | Feb. 24, 2021 | Radiation (03CH07-HY) |
| Controller                | ChainTek        | Chaintek 3000                      | N/A                             | Control Turn table    | N/A              | Jul. 24, 2020~ Aug. 08, 2020 | N/A           | Radiation (03CH07-HY) |
| Controller                | Max-Full        | MF7802                             | MF7802083 68                    | Control Ant Mast      | N/A              | Jul. 24, 2020~ Aug. 08, 2020 | N/A           | Radiation (03CH07-HY) |
| Antenna Mast              | Max-Full        | MFA520BS                           | N/A                             | 1m~4m                 | N/A              | Jul. 24, 2020~ Aug. 08, 2020 | N/A           | Radiation (03CH07-HY) |
| Turn Table                | ChainTek        | Chaintek 3000                      | N/A                             | 0~360 Degree          | N/A              | Jul. 24, 2020~ Aug. 08, 2020 | N/A           | Radiation (03CH07-HY) |
| USB Data Logger           | TECPEL          | TR-32                              | HE17XB249 5                     | N/A                   | N/A              | Jul. 24, 2020~ Aug. 08, 2020 | N/A           | Radiation (03CH07-HY) |
| SHF-EHF Horn Antenna      | SCHWARZBECK     | BBHA 9170                          | BBHA91702 51                    | 18GHz~40GHz           | Nov. 26, 2019    | Jul. 24, 2020~ Aug. 08, 2020 | Nov. 25, 2020 | Radiation (03CH07-HY) |
| Software                  | Audix           | E3 6.2009-8-24                     | N/A                             | N/A                   | N/A              | Jul. 24, 2020~ Aug. 08, 2020 | N/A           | Radiation (03CH07-HY) |
| Preamplifier              | EMEC            | EM18G40G                           | 060715                          | 18GHz~40GHz           | Dec. 13, 2019    | Jul. 24, 2020~ Aug. 08, 2020 | Dec. 12, 2020 | Radiation (03CH07-HY) |



| Instrument              | Brand Name      | Model No.       | Serial No.        | Characteristics | Calibration Date | Test Date     | Due Date      | Remark               |
|-------------------------|-----------------|-----------------|-------------------|-----------------|------------------|---------------|---------------|----------------------|
| Hygrometer              | Testo           | 608-H1          | 34893241          | N/A             | Mar. 02, 2020    | Jul. 28, 2020 | Mar. 01, 2021 | Conducted (TH05-HY)  |
| Power Sensor            | DARE            | RPR3006W        | 16I00054S<br>NO10 | 10MHz~6GHz      | Dec. 23, 2019    | Jul. 28, 2020 | Dec. 22, 2020 | Conducted (TH05-HY)  |
| Signal Analyzer         | Rohde & Schwarz | FSV40           | 101397            | 10Hz~40GHz      | Nov. 15, 2019    | Jul. 28, 2020 | Nov. 14, 2020 | Conducted (TH05-HY)  |
| Switch Control Manframe | Burgeon         | ETF-058         | EC1300484         | N/A             | Aug. 22, 2019    | Jul. 28, 2020 | Aug. 21, 2020 | Conducted (TH05-HY)  |
| AC Power Source         | ChainTek        | APC-1000W       | N/A               | N/A             | N/A              | Jun. 30, 2020 | N/A           | Conduction (CO05-HY) |
| EMI Test Receiver       | Rohde & Schwarz | ESR3            | 102388            | 9kHz~3.6GHz     | Nov. 15, 2019    | Jun. 30, 2020 | Nov. 14, 2020 | Conduction (CO05-HY) |
| Hygrometer              | Testo           | 608-H1          | 34913912          | N/A             | Nov. 07, 2019    | Jun. 30, 2020 | Nov. 06, 2020 | Conduction (CO05-HY) |
| LISN                    | Rohde & Schwarz | ENV216          | 100081            | 9kHz~30MHz      | Nov. 15, 2019    | Jun. 30, 2020 | Nov. 14, 2020 | Conduction (CO05-HY) |
| Software                | Rohde & Schwarz | EMC32<br>V10.30 | N/A               | N/A             | N/A              | Jun. 30, 2020 | N/A           | Conduction (CO05-HY) |
| LF Cable                | HUBER + SUHNER  | RG-214/U        | LF01              | N/A             | Jan. 02, 2020    | Jun. 30, 2020 | Jan. 01, 2021 | Conduction (CO05-HY) |
| Pulse Limiter           | Rohde & Schwarz | ESH3-Z2         | 100851            | N/A             | Jan. 02, 2020    | Jun. 30, 2020 | Jan. 01, 2021 | Conduction (CO05-HY) |

## 5 Uncertainty of Evaluation

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

|                                                                         |     |
|-------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 2.3 |
|-------------------------------------------------------------------------|-----|

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

|                                                                         |     |
|-------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 4.6 |
|-------------------------------------------------------------------------|-----|

### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

|                                                                         |     |
|-------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.2 |
|-------------------------------------------------------------------------|-----|

### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

|                                                                         |     |
|-------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.3 |
|-------------------------------------------------------------------------|-----|



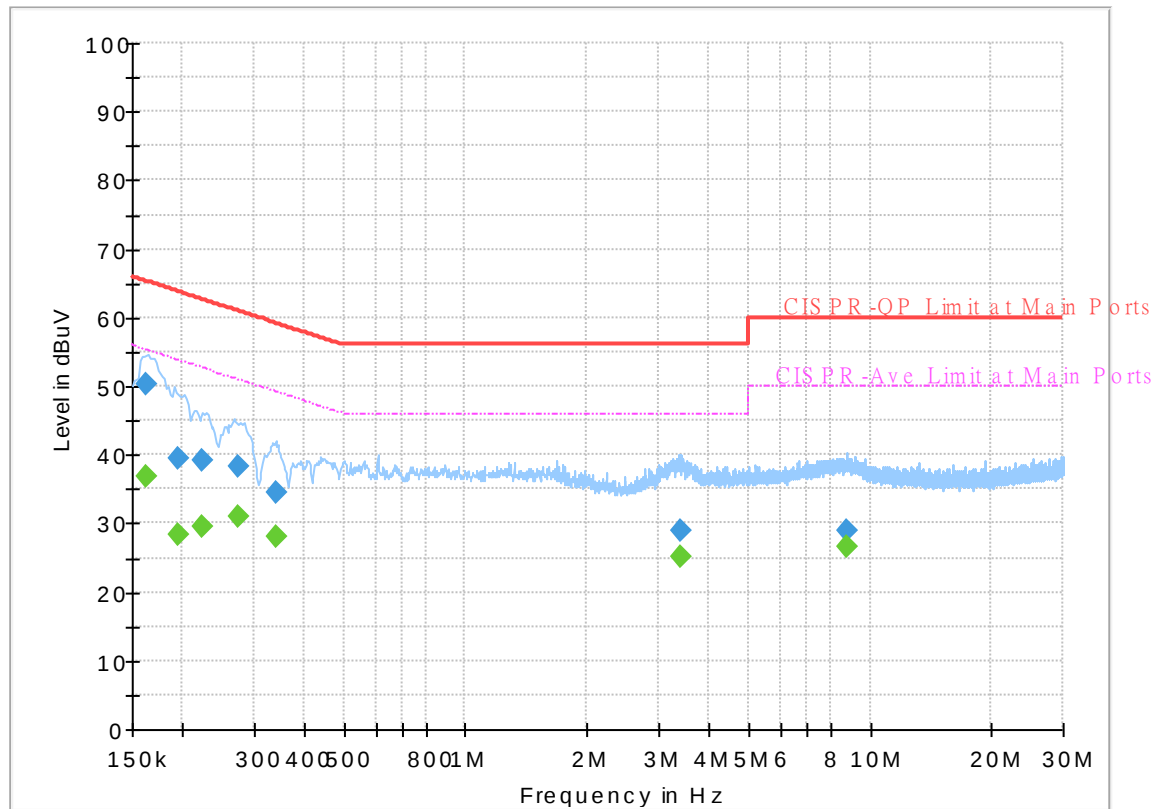
## Appendix A. AC Conducted Emission Test Results

|                 |         |                     |        |
|-----------------|---------|---------------------|--------|
| Test Engineer : | Tom Lee | Temperature :       | 23~25℃ |
|                 |         | Relative Humidity : | 42~50% |

## EUT Information

Report NO : 040803-03  
Test Mode : Mode 1  
Test Voltage : 120Vac/60Hz  
Phase : Line

Full Spectrum



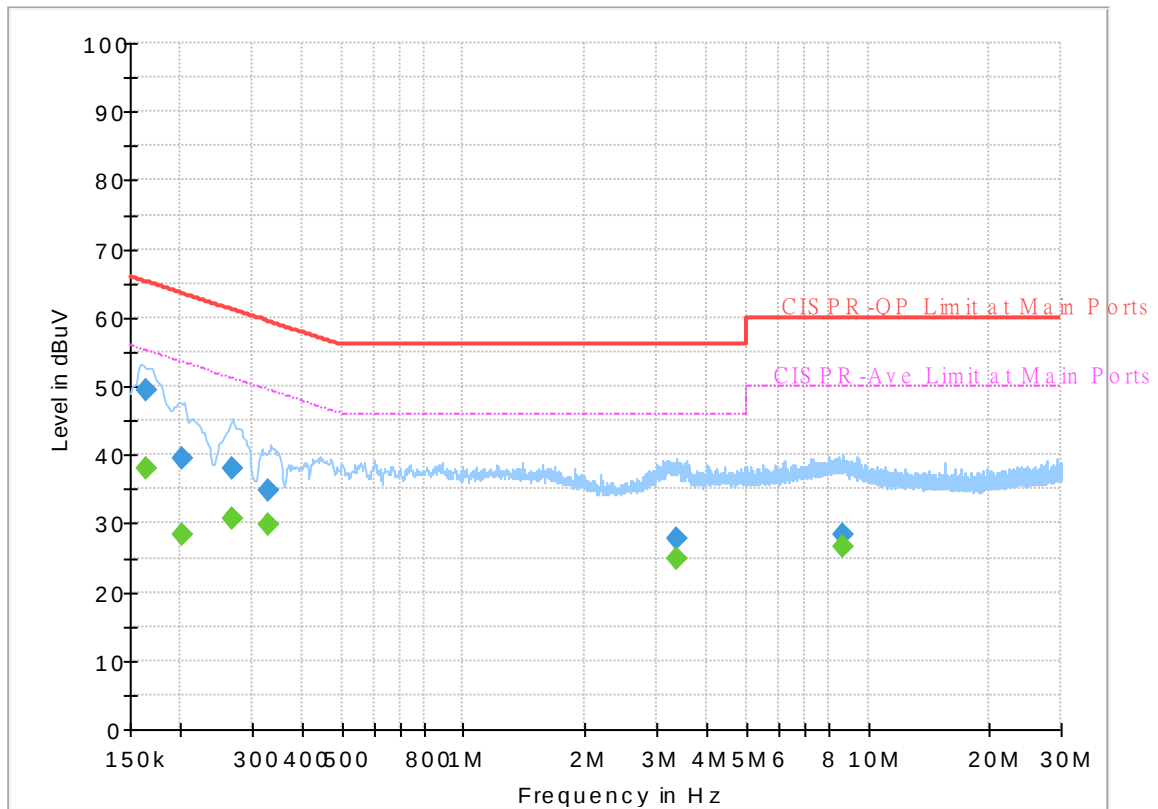
## Final\_Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.161790        | ---              | 36.88           | 55.37        | 18.49       | L1   | OFF    | 19.6       |
| 0.161790        | 50.18            | ---             | 65.37        | 15.19       | L1   | OFF    | 19.6       |
| 0.195000        | ---              | 28.27           | 53.82        | 25.55       | L1   | OFF    | 19.6       |
| 0.195000        | 39.36            | ---             | 63.82        | 24.46       | L1   | OFF    | 19.6       |
| 0.223350        | ---              | 29.63           | 52.69        | 23.06       | L1   | OFF    | 19.6       |
| 0.223350        | 39.29            | ---             | 62.69        | 23.40       | L1   | OFF    | 19.6       |
| 0.273300        | ---              | 30.90           | 51.02        | 20.12       | L1   | OFF    | 19.6       |
| 0.273300        | 38.20            | ---             | 61.02        | 22.82       | L1   | OFF    | 19.6       |
| 0.342600        | ---              | 28.15           | 49.14        | 20.99       | L1   | OFF    | 19.6       |
| 0.342600        | 34.48            | ---             | 59.14        | 24.66       | L1   | OFF    | 19.6       |
| 3.419610        | ---              | 25.18           | 46.00        | 20.82       | L1   | OFF    | 19.7       |
| 3.419610        | 28.81            | ---             | 56.00        | 27.19       | L1   | OFF    | 19.7       |
| 8.749140        | ---              | 26.68           | 50.00        | 23.32       | L1   | OFF    | 20.0       |
| 8.749140        | 29.02            | ---             | 60.00        | 30.98       | L1   | OFF    | 20.0       |

## EUT Information

Report NO : 040803-03  
Test Mode : Mode 1  
Test Voltage : 120Vac/60Hz  
Phase : Neutral

Full Spectrum



## Final\_Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.163500        | 49.28            | ---             | 65.28        | 16.00       | N    | OFF    | 19.5       |
| 0.163500        | ---              | 38.16           | 55.28        | 17.12       | N    | OFF    | 19.5       |
| 0.201480        | 39.49            | ---             | 63.55        | 24.06       | N    | OFF    | 19.5       |
| 0.201480        | ---              | 28.28           | 53.55        | 25.27       | N    | OFF    | 19.5       |
| 0.268710        | 38.10            | ---             | 61.16        | 23.06       | N    | OFF    | 19.5       |
| 0.268710        | ---              | 30.61           | 51.16        | 20.55       | N    | OFF    | 19.5       |
| 0.330000        | ---              | 29.72           | 49.45        | 19.73       | N    | OFF    | 19.5       |
| 0.330000        | 34.75            | ---             | 59.45        | 24.70       | N    | OFF    | 19.5       |
| 3.354000        | ---              | 24.98           | 46.00        | 21.02       | N    | OFF    | 19.6       |
| 3.354000        | 27.84            | ---             | 56.00        | 28.16       | N    | OFF    | 19.6       |
| 8.643750        | ---              | 26.50           | 50.00        | 23.50       | N    | OFF    | 19.8       |
| 8.643750        | 28.36            | ---             | 60.00        | 31.64       | N    | OFF    | 19.8       |



## Appendix B. Radiated Spurious Emission

|                 |                                   |                     |         |
|-----------------|-----------------------------------|---------------------|---------|
| Test Engineer : | Jesse Wang, Stan Hsieh and Ken Wu | Temperature :       | 23~25°C |
|                 |                                   | Relative Humidity : | 51~53%  |

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

| WIFI Ant.                   | Note                                                                                        | Frequency | Level      | Over Limit | Limit Line | Read Level | Antenna Factor | Path Loss | Preampl Factor | Ant Pos | Table Pos | Peak Avg. | Pol.    |
|-----------------------------|---------------------------------------------------------------------------------------------|-----------|------------|------------|------------|------------|----------------|-----------|----------------|---------|-----------|-----------|---------|
| 1                           |                                                                                             | ( MHz )   | ( dBμV/m ) | ( dB )     | ( dBμV/m ) | ( dBμV )   | ( dB/m )       | ( dB )    | ( dB )         | ( cm )  | ( deg )   | ( P/A )   | ( H/V ) |
| 802.11b<br>CH 11<br>2462MHz | *                                                                                           | 2462      | 107.35     | -          | -          | 92.51      | 32.03          | 18.09     | 35.28          | 183     | 0         | P         | H       |
|                             | *                                                                                           | 2462      | 104.07     | -          | -          | 89.23      | 32.03          | 18.09     | 35.28          | 183     | 0         | A         | H       |
|                             |                                                                                             | 2483.64   | 53.77      | -20.23     | 74         | 38.87      | 32.07          | 18.12     | 35.29          | 183     | 0         | P         | H       |
|                             |                                                                                             | 2483.52   | 44.73      | -9.27      | 54         | 29.83      | 32.07          | 18.12     | 35.29          | 183     | 0         | A         | H       |
|                             |                                                                                             |           |            |            |            |            |                |           |                |         |           |           | H       |
|                             |                                                                                             |           |            |            |            |            |                |           |                |         |           |           | H       |
|                             | *                                                                                           | 2462      | 112.26     | -          | -          | 97.42      | 32.03          | 18.09     | 35.28          | 331     | 8         | P         | V       |
|                             | *                                                                                           | 2462      | 109.21     | -          | -          | 94.37      | 32.03          | 18.09     | 35.28          | 331     | 8         | A         | V       |
|                             |                                                                                             | 2483.6    | 55.05      | -18.95     | 74         | 40.15      | 32.07          | 18.12     | 35.29          | 331     | 8         | P         | V       |
|                             |                                                                                             | 2483.52   | 47.49      | -6.51      | 54         | 32.59      | 32.07          | 18.12     | 35.29          | 331     | 8         | A         | V       |
|                             |                                                                                             |           |            |            |            |            |                |           |                |         |           |           | V       |
|                             |                                                                                             |           |            |            |            |            |                |           |                |         |           |           | V       |
| Remark                      | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |           |            |            |            |            |                |           |                |         |           |           |         |

**2.4GHz 2400~2483.5MHz****WIFI 802.11b (Harmonic @ 3m)**

| WIFI<br>Ant.<br>1                    | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|--------------------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| <b>802.11b<br/>CH 11<br/>2462MHz</b> |                                                                                             | 4924                 | 41.11               | -32.89                  | 74                          | 53.39                     | 34.23                         | 12.13                  | 58.64                      | 100                  | 0                       | P                       | H               |
|                                      |                                                                                             | 7386                 | 41.13               | -32.87                  | 74                          | 48.43                     | 35.6                          | 14.64                  | 57.54                      | 100                  | 0                       | P                       | H               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                      |                                                                                             | 4924                 | 43.25               | -30.75                  | 74                          | 55.53                     | 34.23                         | 12.13                  | 58.64                      | 100                  | 0                       | P                       | V               |
|                                      |                                                                                             | 7386                 | 41.47               | -32.53                  | 74                          | 48.77                     | 35.6                          | 14.64                  | 57.54                      | 100                  | 0                       | P                       | V               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
| <b>Remark</b>                        | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         |                 |

**2.4GHz 2400~2483.5MHz****WIFI 802.11g (Band Edge @ 3m)**

| WIFI<br>Ant.<br>1                    | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|--------------------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| <b>802.11g<br/>CH 11<br/>2462MHz</b> | *                                                                                           | 2462                 | 108.21              | -                       | -                           | 93.37                     | 32.03                         | 18.09                  | 35.28                      | 183                  | 0                       | P                       | H               |
|                                      | *                                                                                           | 2462                 | 99.33               | -                       | -                           | 84.49                     | 32.03                         | 18.09                  | 35.28                      | 183                  | 0                       | A                       | H               |
|                                      |                                                                                             | 2483.52              | 57.87               | -16.13                  | 74                          | 42.97                     | 32.07                         | 18.12                  | 35.29                      | 183                  | 0                       | P                       | H               |
|                                      |                                                                                             | 2483.52              | 48.33               | -5.67                   | 54                          | 33.43                     | 32.07                         | 18.12                  | 35.29                      | 183                  | 0                       | A                       | H               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                      | *                                                                                           | 2462                 | 112.59              | -                       | -                           | 97.75                     | 32.03                         | 18.09                  | 35.28                      | 327                  | 6                       | P                       | V               |
|                                      | *                                                                                           | 2462                 | 104.98              | -                       | -                           | 90.14                     | 32.03                         | 18.09                  | 35.28                      | 327                  | 6                       | A                       | V               |
|                                      |                                                                                             | 2483.72              | 61.84               | -12.16                  | 74                          | 46.94                     | 32.07                         | 18.12                  | 35.29                      | 327                  | 6                       | P                       | V               |
|                                      |                                                                                             | 2483.52              | 52.19               | -1.81                   | 54                          | 37.29                     | 32.07                         | 18.12                  | 35.29                      | 327                  | 6                       | A                       | V               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
| <b>Remark</b>                        | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         |                 |

**2.4GHz 2400~2483.5MHz****WIFI 802.11g (Harmonic @ 3m)**

| WIFI<br>Ant.<br>1                    | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|--------------------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| <b>802.11g<br/>CH 11<br/>2462MHz</b> |                                                                                             | 4924                 | 39.74               | -34.26                  | 74                          | 52.02                     | 34.23                         | 12.13                  | 58.64                      | 100                  | 0                       | P                       | H               |
|                                      |                                                                                             | 7386                 | 41.19               | -32.81                  | 74                          | 48.49                     | 35.6                          | 14.64                  | 57.54                      | 100                  | 0                       | P                       | H               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                      |                                                                                             | 4924                 | 41.06               | -32.94                  | 74                          | 53.34                     | 34.23                         | 12.13                  | 58.64                      | 100                  | 0                       | P                       | V               |
|                                      |                                                                                             | 7386                 | 40.89               | -33.11                  | 74                          | 48.19                     | 35.6                          | 14.64                  | 57.54                      | 100                  | 0                       | P                       | V               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
|                                      |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
| <b>Remark</b>                        | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         |                 |

**2.4GHz 2400~2483.5MHz****WIFI 802.11ac VHT40 (Band Edge @ 3m)**

| WIFI<br>Ant.<br>1                               | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|-------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| <b>802.11ac<br/>VHT40<br/>CH 06<br/>2437MHz</b> |                                                                                             | 2315.7               | 54.09               | -19.91                  | 74                          | 39.61                     | 31.83                         | 17.84                  | 35.19                      | 188                  | 0                       | P                       | H               |
|                                                 |                                                                                             | 2388.6               | 44.86               | -9.14                   | 54                          | 30.31                     | 31.8                          | 17.98                  | 35.23                      | 188                  | 0                       | A                       | H               |
|                                                 | *                                                                                           | 2437                 | 103.1               | -                       | -                           | 88.31                     | 32                            | 18.05                  | 35.26                      | 188                  | 0                       | P                       | H               |
|                                                 | *                                                                                           | 2437                 | 95.34               | -                       | -                           | 80.55                     | 32                            | 18.05                  | 35.26                      | 188                  | 0                       | A                       | H               |
|                                                 |                                                                                             | 2484.34              | 58.6                | -15.4                   | 74                          | 43.7                      | 32.07                         | 18.12                  | 35.29                      | 188                  | 0                       | P                       | H               |
|                                                 |                                                                                             | 2483.62              | 49.63               | -4.37                   | 54                          | 34.73                     | 32.07                         | 18.12                  | 35.29                      | 188                  | 0                       | A                       | H               |
|                                                 |                                                                                             | 2389.95              | 58.43               | -15.57                  | 74                          | 43.88                     | 31.8                          | 17.98                  | 35.23                      | 354                  | 6                       | P                       | V               |
|                                                 |                                                                                             | 2389.95              | 49.32               | -4.68                   | 54                          | 34.77                     | 31.8                          | 17.98                  | 35.23                      | 354                  | 6                       | A                       | V               |
|                                                 | *                                                                                           | 2437                 | 108.24              | -                       | -                           | 93.45                     | 32                            | 18.05                  | 35.26                      | 354                  | 6                       | P                       | V               |
|                                                 | *                                                                                           | 2437                 | 100.25              | -                       | -                           | 85.46                     | 32                            | 18.05                  | 35.26                      | 354                  | 6                       | A                       | V               |
|                                                 |                                                                                             | 2483.53              | 63.17               | -10.83                  | 74                          | 48.27                     | 32.07                         | 18.12                  | 35.29                      | 354                  | 6                       | P                       | V               |
|                                                 |                                                                                             | 2483.53              | 52.81               | -1.19                   | 54                          | 37.91                     | 32.07                         | 18.12                  | 35.29                      | 354                  | 6                       | A                       | V               |
| <b>Remark</b>                                   | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         |                 |

**2.4GHz 2400~2483.5MHz****WIFI 802.11ac VHT40 (Harmonic @ 3m)**

| WIFI<br>Ant.<br>1                               | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|-------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| <b>802.11ac<br/>VHT40<br/>CH 06<br/>2437MHz</b> |                                                                                             | 4874                 | 40.43               | -33.57                  | 74                          | 53.03                     | 34.1                          | 12.06                  | 58.76                      | 100                  | 0                       | P                       | H               |
|                                                 |                                                                                             | 7311                 | 41.4                | -32.6                   | 74                          | 48.69                     | 35.6                          | 14.58                  | 57.47                      | 100                  | 0                       | P                       | H               |
|                                                 |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                                 |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                                 |                                                                                             | 4874                 | 40.39               | -33.61                  | 74                          | 52.99                     | 34.1                          | 12.06                  | 58.76                      | 100                  | 0                       | P                       | V               |
|                                                 |                                                                                             | 7311                 | 41.38               | -32.62                  | 74                          | 48.67                     | 35.6                          | 14.58                  | 57.47                      | 100                  | 0                       | P                       | V               |
|                                                 |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
|                                                 |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
| <b>Remark</b>                                   | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         |                 |

## Emission below 1GHz

**2.4GHz WIFI 802.11ac VHT40 (LF)**

| WIFI                                  | Note                                                                       | Frequency | Level      | Over   | Limit      | Read   | Antenna  | Path   | Preamp | Ant    | Table   | Peak  | Pol.  |
|---------------------------------------|----------------------------------------------------------------------------|-----------|------------|--------|------------|--------|----------|--------|--------|--------|---------|-------|-------|
| Ant.                                  |                                                                            |           |            | Limit  | Line       | Level  | Factor   | Loss   | Factor | Pos    | Pos     | Avg.  |       |
| 1                                     |                                                                            | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 2.4GHz<br>802.11ac<br><br>VHT40<br>LF |                                                                            | 30        | 30.47      | -9.53  | 40         | 35.22  | 24.32    | 0.94   | 30.01  | 100    | 0       | P     | H     |
|                                       |                                                                            | 47.01     | 25.38      | -14.62 | 40         | 38.57  | 15.63    | 1.17   | 29.99  | -      | -       | P     | H     |
|                                       |                                                                            | 124.77    | 25.72      | -17.78 | 43.5       | 36.21  | 17.46    | 2.01   | 29.96  | -      | -       | P     | H     |
|                                       |                                                                            | 798.4     | 30.64      | -15.36 | 46         | 27.3   | 27.74    | 5.05   | 29.45  | -      | -       | P     | H     |
|                                       |                                                                            | 888       | 32.36      | -13.64 | 46         | 27.32  | 28.72    | 5.36   | 29.04  | -      | -       | P     | H     |
|                                       |                                                                            | 959.4     | 34.33      | -11.67 | 46         | 26.96  | 30.41    | 5.61   | 28.65  | -      | -       | P     | H     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                                       |                                                                            | 30        | 32.95      | -7.05  | 40         | 37.7   | 24.32    | 0.94   | 30.01  | 100    | 0       | P     | V     |
|                                       |                                                                            | 59.97     | 29.55      | -10.45 | 40         | 46.31  | 11.91    | 1.32   | 29.99  | -      | -       | P     | V     |
|                                       |                                                                            | 81.03     | 27.46      | -12.54 | 40         | 42.39  | 13.46    | 1.59   | 29.98  | -      | -       | P     | V     |
|                                       |                                                                            | 818       | 30.9       | -15.1  | 46         | 27.56  | 27.6     | 5.11   | 29.37  | -      | -       | P     | V     |
|                                       |                                                                            | 888.7     | 35.96      | -10.04 | 46         | 30.92  | 28.72    | 5.36   | 29.04  | -      | -       | P     | V     |
|                                       |                                                                            | 956.6     | 34.32      | -11.68 | 46         | 26.88  | 30.5     | 5.6    | 28.66  | -      | -       | P     | V     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         | V     |       |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         | V     |       |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         | V     |       |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         | V     |       |
|                                       |                                                                            |           |            |        |            |        |          |        |        |        |         | V     |       |
| Remark                                | 1. No other spurious found.<br>2. All results are PASS against limit line. |           |            |        |            |        |          |        |        |        |         |       |       |



**Note symbol**

|     |                                                                                                                                                          |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| *   | <b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| !   | Test result is <b>over limit</b> line.                                                                                                                   |
| P/A | <b>Peak</b> or <b>Average</b>                                                                                                                            |
| H/V | <b>H</b> orizontal or <b>V</b> ertical                                                                                                                   |



A calculation example for radiated spurious emission is shown as below:

| WIFI    | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak    | Pol.    |
|---------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant.    |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
| 1       |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| 802.11b |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
| CH 01   |      |           |            |        |            |          |          |        |        |        |         |         |         |
| 2412MHz |      | 2390      | 43.54      | -10.46 | 54         | 42.6     | 32.22    | 4.58   | 35.86  | 103    | 308     | A       | H       |

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =  
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
2. Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
2. Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



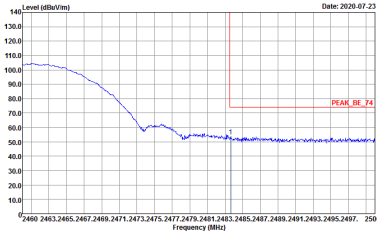
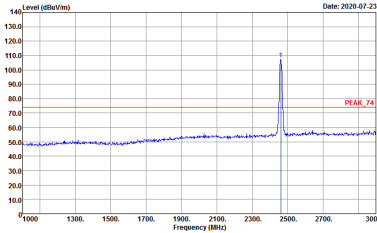
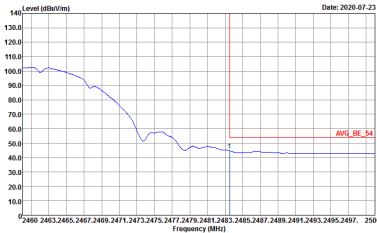
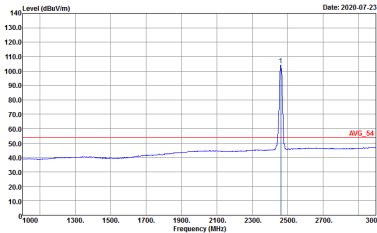
## Appendix C. Radiated Spurious Emission Plots

|                 |                                   |                     |         |
|-----------------|-----------------------------------|---------------------|---------|
| Test Engineer : | Jesse Wang, Stan Hsieh and Ken Wu | Temperature :       | 23~25°C |
|                 |                                   | Relative Humidity : | 51~53%  |

### Note symbol

|    |                       |
|----|-----------------------|
| -L | Low channel location  |
| -R | High channel location |

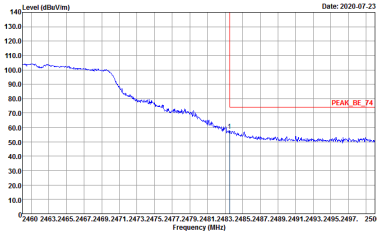
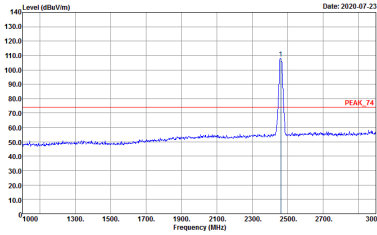
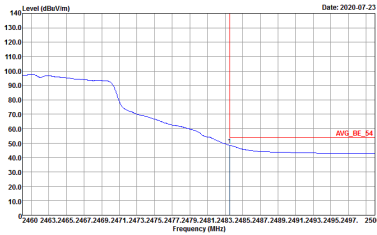
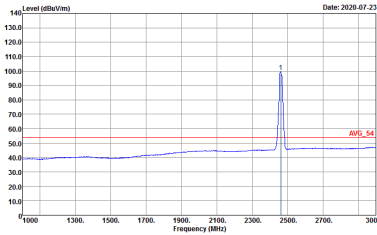
**2.4GHz 2400~2483.5MHz**
**WIFI 802.11b (Band Edge @ 3m)**

| WIFI        | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                          |                                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT         | 802.11b CH11 2462MHz                                                                                                                                                                                                          |                                                                                                                                                                                                                             |
| 1           | Horizontal                                                                                                                                                                                                                    | Fundamental                                                                                                                                                                                                                 |
| <b>Peak</b> |  <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 12</p>  |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 12</p>  |
|             |  <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 12</p> |  <p>Site : 03CH07-HY<br/>Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 12</p> |

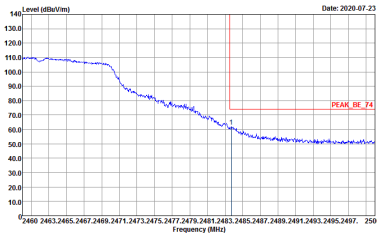
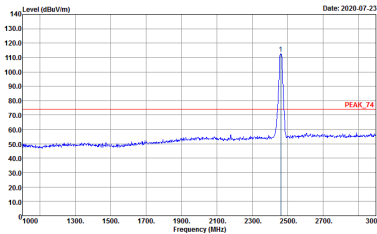
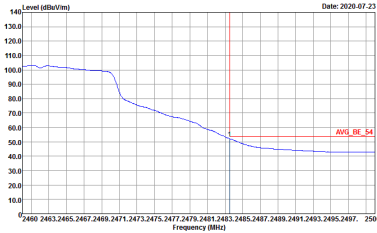
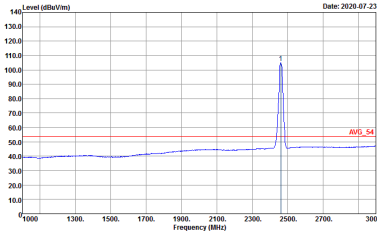


| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                    |                                                                                                                                                                                      |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT  | 802.11b CH11 2462MHz                                                                                                                                                                    |                                                                                                                                                                                      |
| 1    | Vertical                                                                                                                                                                                | Fundamental                                                                                                                                                                          |
| Peak | <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>: 12</p> | <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>: 12</p> |
|      | <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>: 12</p>  | <p>Site : 03CH07-HY<br/>Condition : AVG_54 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>: 12</p>  |

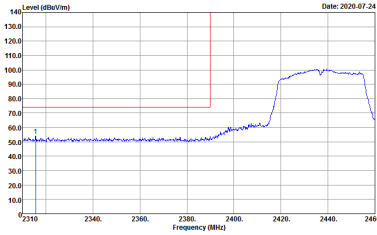
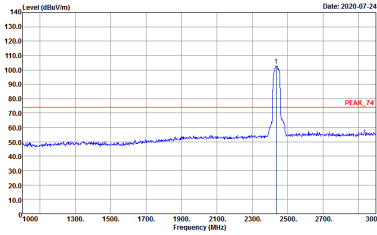
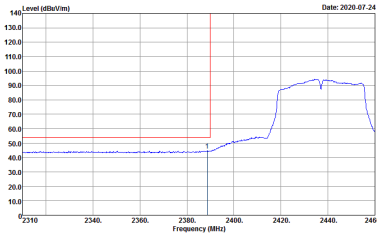
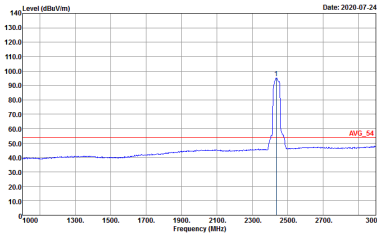
**2.4GHz 2400~2483.5MHz**
**WIFI 802.11g (Band Edge @ 3m)**

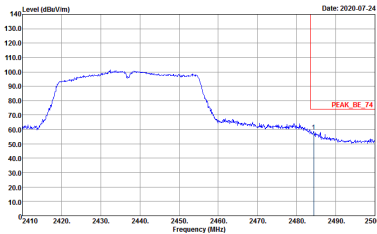
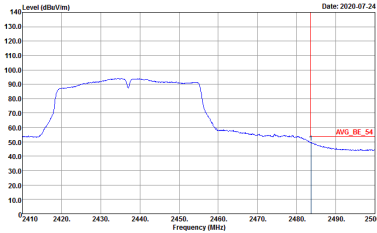
| WIFI        | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                          |                                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT         | 802.11g CH11 2462MHz                                                                                                                                                                                                          |                                                                                                                                                                                                                             |
| 1           | Horizontal                                                                                                                                                                                                                    | Fundamental                                                                                                                                                                                                                 |
| <b>Peak</b> |  <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 15</p>  |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 15</p>  |
|             |  <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 15</p> |  <p>Site : 03CH07-HY<br/>Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 15</p> |

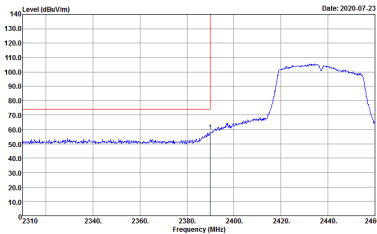
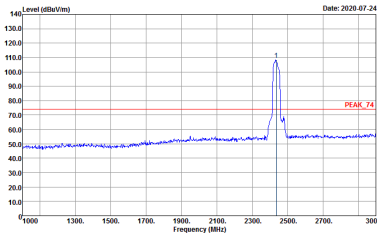
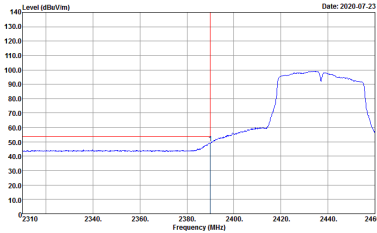
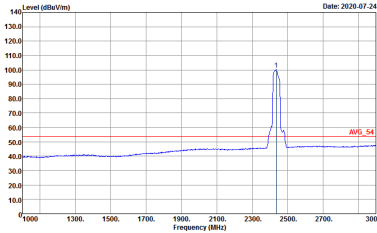


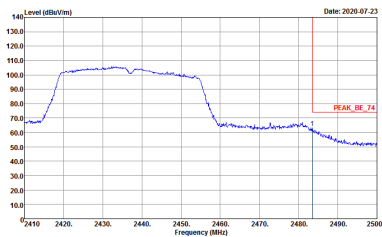
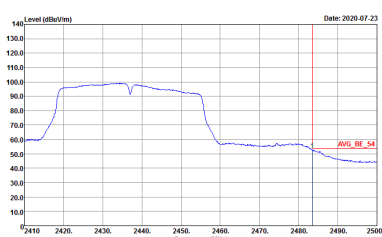
| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                      |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT  | 802.11g CH11 2462MHz                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                      |
| 1    | Vertical                                                                                                                                                                                                                                                                               | Fundamental                                                                                                                                                                                                                                                                          |
| Peak |  <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>Date: 2020-07-23</p>  |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>Date: 2020-07-23</p>  |
|      |  <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>Date: 2020-07-23</p> |  <p>Site : 03CH07-HY<br/>Condition : AVG_54 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>Project : Peak<br/>Mode : 040803-03<br/>Date: 2020-07-23</p> |
| Avg. |                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                      |

**2.4GHz 2400~2483.5MHz**
**WIFI 802.11ac VHT40 (Band Edge @ 3m)**

| WIFI        | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                          |                                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT         | 802.11ac VH40 CH06 2437MHz - L                                                                                                                                                                                                |                                                                                                                                                                                                                             |
| 1           | Horizontal                                                                                                                                                                                                                    | Fundamental                                                                                                                                                                                                                 |
| <b>Peak</b> |  <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p>  |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p>  |
|             |  <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p> |  <p>Site : 03CH07-HY<br/>Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p> |

| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                                                             |             |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| ANT  | 802.11ac VH40 CH06 2437MHz - R                                                                                                                                                                                                                                   |             |
| 1    | Horizontal                                                                                                                                                                                                                                                       | Fundamental |
| Peak |  <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br/>Project : 040803-03<br/>Mode : 20</p> | Left blank  |
| Avg. |  <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : RBW:1000.000kHz VBW:3.000kHz SWT:Auto<br/>Project : 040803-03<br/>Mode : 20</p>   | Left blank  |

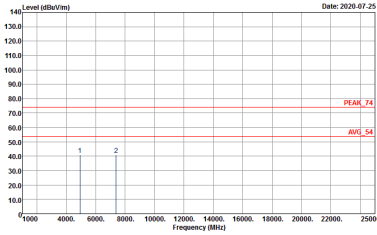
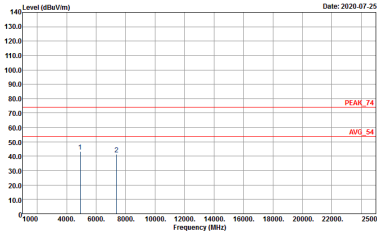
| WIFI        | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT         | 802.11ac VH40 CH06 2437MHz - L                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                         |
| 1           | Vertical                                                                                                                                                                                                                                                                  | Fundamental                                                                                                                                                                                                                                                             |
| <b>Peak</b> |  <p>Site Condition : 03CH07-HY<br/>: PEAK_BE_74 3m HF_ANT_00075962 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p> |  <p>Site Condition : 03CH07-HY<br/>: PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p> |
|             |  <p>Site Condition : 03CH07-HY<br/>: AVG_BE_54 3m HF_ANT_00075962 VERTICAL<br/>: RBW:1000.000KHz VBW:3.000KHz SWT:Auto<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p>   |  <p>Site Condition : 03CH07-HY<br/>: AVG_54 3m HF_ANT_00075962 VERTICAL<br/>: RBW:1000.000KHz VBW:3.000KHz SWT:Auto<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p>   |

| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                                                           |             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| ANT  | 802.11ac VH40 CH06 2437MHz - R                                                                                                                                                                                                                                 |             |
| 1    | Vertical                                                                                                                                                                                                                                                       | Fundamental |
| Peak |  <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br/>Project : 040803-03<br/>Mode : 20</p> | Left blank  |
| Avg. |  <p>Site : 03CH07-HY<br/>Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL<br/>Detector : RBW:1000.000kHz VBW:3.000kHz SWT:Auto<br/>Project : 040803-03<br/>Mode : 20</p>   | Left blank  |



## 2.4GHz 2400~2483.5MHz

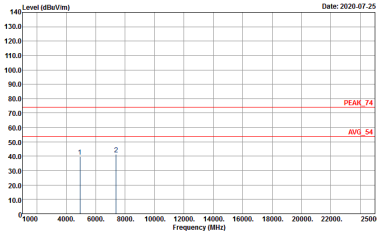
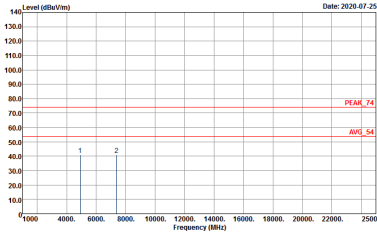
## WIFI 802.11b (Harmonic @ 3m)

| WIFI         | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT          | 802.11b CH11 2462MHz                                                                                                                                                                                                      |                                                                                                                                                                                                                          |
| 1            | Horizontal                                                                                                                                                                                                                | Vertical                                                                                                                                                                                                                 |
| Peak<br>Avg. |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 12</p> |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 12</p> |
|              |                                                                                                                                                                                                                           |                                                                                                                                                                                                                          |



## 2.4GHz 2400~2483.5MHz

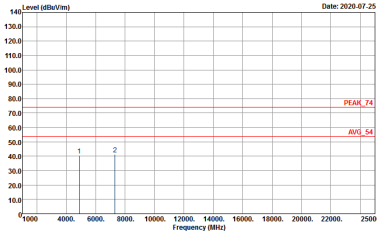
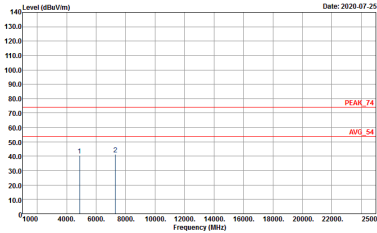
## WIFI 802.11g (Harmonic @ 3m)

| WIFI         | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT          | 802.11g CH11 2462MHz                                                                                                                                                                                                      |                                                                                                                                                                                                                          |
| 1            | Horizontal                                                                                                                                                                                                                | Vertical                                                                                                                                                                                                                 |
| Peak<br>Avg. |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 15</p> |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 15</p> |
|              |                                                                                                                                                                                                                           |                                                                                                                                                                                                                          |

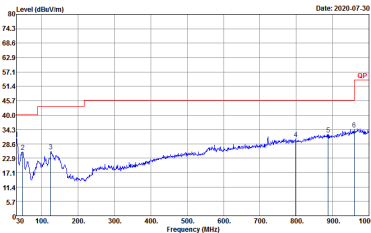
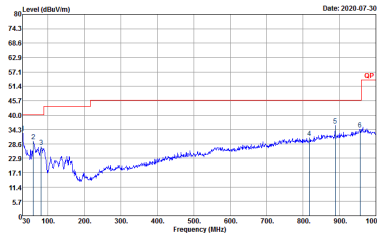


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11ac VHT40 (Harmonic @ 3m)

| WIFI         | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                                                                                                                                       |                                                                                                                                                                                                                          |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT          | 802.11ac VHT40 CH06 2437MHz                                                                                                                                                                                               |                                                                                                                                                                                                                          |
| 1            | Horizontal                                                                                                                                                                                                                | Vertical                                                                                                                                                                                                                 |
| Peak<br>Avg. |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p> |  <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>Detector : Peak<br/>Project : 040803-03<br/>Mode : 20</p> |
|              |                                                                                                                                                                                                                           |                                                                                                                                                                                                                          |

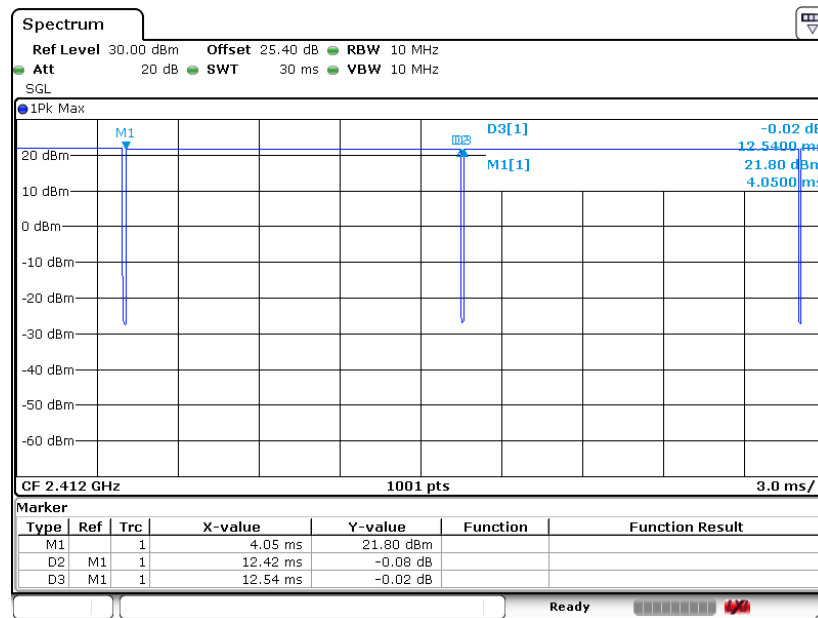
**Emission below 1GHz**
**2.4GHz WIFI 802.11ac VHT40 (LF)**

| WIFI                 | 2.4GHz 2400~2483.5MHz                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                     |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT                  | 802.11ac VHT40 LF                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                     |
| 1                    | Horizontal                                                                                                                                                                                                                                                                           | Vertical                                                                                                                                                                                                                                                                            |
| <b>QP /<br/>Peak</b> |  <p>           Site : 03CH07-HY<br/>           Condition : QP 3m LF-ANT-35419(G) HORIZONTAL<br/>           Detector : Peak<br/>           Project : 040803-03<br/>           Mode : 22         </p> |  <p>           Site : 03CH07-HY<br/>           Condition : QP 3m LF-ANT-35419(G) VERTICAL<br/>           Detector : Peak<br/>           Project : 040803-03<br/>           Mode : 22         </p> |
|                      |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                     |

## Appendix D. Duty Cycle Plots

| Band                  | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting | Duty Factor(dB) |
|-----------------------|---------------|-------|----------|-------------|-----------------|
| 802.11b               | 99.04         | -     | -        | 10Hz        | 0.04            |
| 802.11g               | 98.33         | -     | -        | 10Hz        | 0.07            |
| 2.4GHz 802.11ac VHT40 | 95.02         | 955   | 1.05     | 3kHz        | 0.22            |

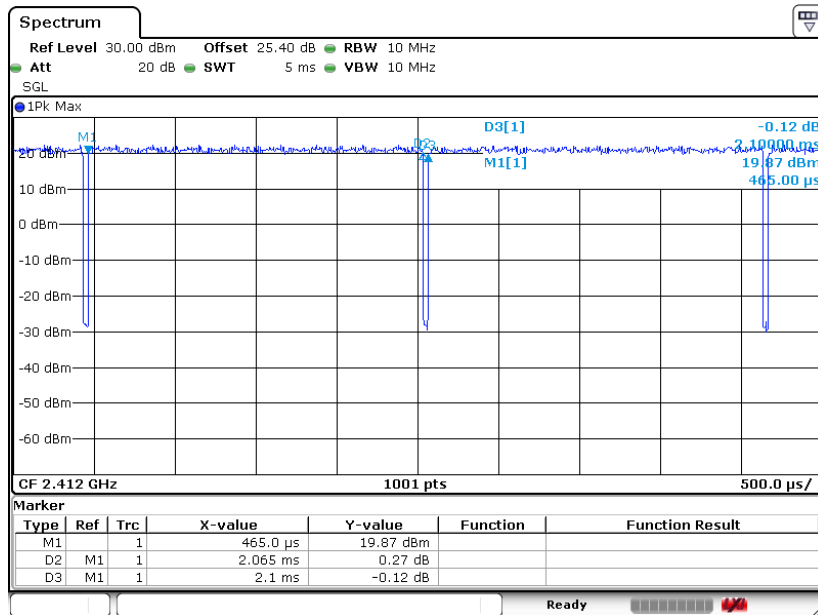
### 802.11b



Date: 28.JUL.2020 12:03:56

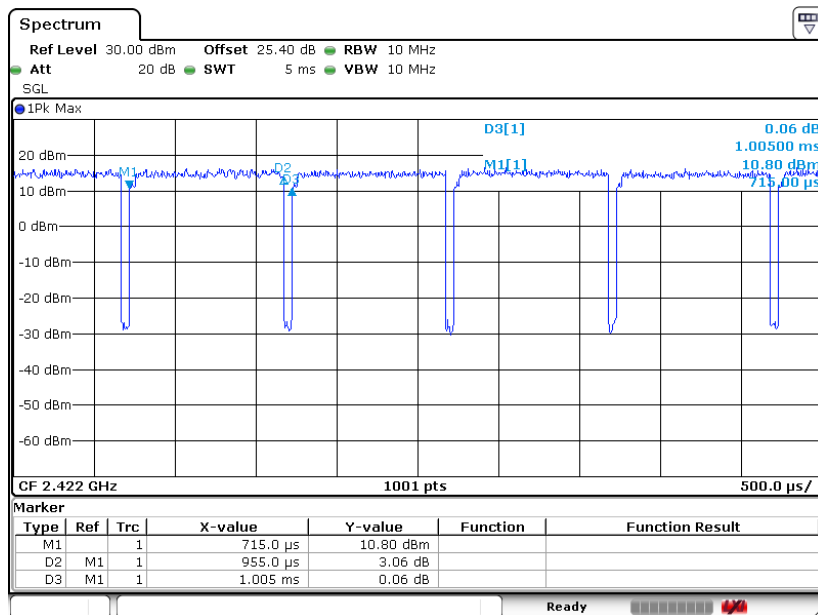


## 802.11g



Date: 28.JUL.2020 15:46:33

## 802.11ac VHT40



Date: 28.JUL.2020 15:49:17