



# FCC RADIO TEST REPORT

**FCC ID** : S9GR550  
**Equipment** : Wireless Access Point  
**Brand Name** : Ruckus  
**Model Name** : R550  
**Applicant** : Ruckus Wireless Inc.  
350 W. Java Dr., Sunnyvale CA 94089 USA  
**Manufacturer** : Ruckus Wireless Inc.  
350 W. Java Dr., Sunnyvale CA 94089 USA  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Jan. 22, 2020 and testing was started from Feb. 06, 2020 and completed on Mar. 10, 2020. We, Sporton International (USA) Inc., 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 report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of government.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of Sporton International (USA) Inc, the test report shall not be reproduced except in full.

Approved by: Ken Chen

**Sporton International (USA) Inc.**  
**1175 Montague Expressway, Milpitas, CA 95035**



## 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 Modification of EUT .....                                   | 5         |
| 1.3 Testing Location .....                                      | 5         |
| 1.4 Applicable Standards.....                                   | 5         |
| <b>2 Test Configuration of Equipment Under Test .....</b>       | <b>6</b>  |
| 2.1 Carrier Frequency Channel .....                             | 6         |
| 2.2 Test Mode.....                                              | 6         |
| 2.3 Connection Diagram of Test System.....                      | 7         |
| 2.4 Support Unit used in test configuration and system .....    | 7         |
| 2.5 EUT Operation Test Setup .....                              | 7         |
| <b>3 Test Result.....</b>                                       | <b>8</b>  |
| 3.1 Radiated Band Edges and Spurious Emission Measurement ..... | 8         |
| 3.2 AC Conducted Emission Measurement.....                      | 12        |
| 3.3 Antenna Requirements.....                                   | 14        |
| <b>4 List of Measuring Equipment .....</b>                      | <b>15</b> |
| <b>5 Uncertainty of Evaluation.....</b>                         | <b>16</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>                            |           |



## History of this test report

| Report No.   | Version | Description                               | Issued Date   |
|--------------|---------|-------------------------------------------|---------------|
| FR200117001B | 01      | Initial issue of report                   | Apr. 01, 2020 |
| FR200117001B | 02      | Revise Antenna information in section 1.1 | Apr. 16, 2020 |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
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|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |
|              |         |                                           |               |

## Summary of Test Result

| Report Clause | Ref Std. Clause    | Test Items                                | Result (PASS/FAIL) | Remark                              |
|---------------|--------------------|-------------------------------------------|--------------------|-------------------------------------|
| 3.1           | 15.247(d)          | Radiated Band Edges and Spurious Emission | Pass               | Under limit 0.37 dB at 7425.000 MHz |
| 3.2           | 15.207             | AC Conducted Emission                     | Pass               | Under limit 2.48 dB at 0.461 MHz    |
| 3.3           | 15.203 & 15.247(b) | Antenna Requirement                       | Pass               | -                                   |

**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.



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax and Zigbee

| Product Specification subjective to this standard |                                                                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Antenna Type                                      | WLAN:<br><Ant. 1> Internal Antenna<br><Ant. 2> Internal Antenna<br>Bluetooth: Metal Antenna<br>Zigbee: Metal Antenna |

## 1.2 Modification of EUT

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

## 1.3 Testing Location

|                    |                                                                   |           |
|--------------------|-------------------------------------------------------------------|-----------|
| Test Site          | Sporton International (USA) Inc.                                  |           |
| Test Site Location | 1175 Montague Expressway, Milpitas, CA 95035<br>TEL : 408 9043300 |           |
| Test Site No.      | Sporton Site No.                                                  |           |
|                    | CO01-CA                                                           | 03CH02-CA |

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

## 1.4 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. 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

### 2.1 Carrier Frequency Channel

| Frequency Band  | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|-------------|---------|-------------|
| 2400-2483.5 MHz | 11      | 2405        | 19      | 2445        |
|                 | 12      | 2410        | 20      | 2450        |
|                 | 13      | 2415        | 21      | 2455        |
|                 | 14      | 2420        | 22      | 2460        |
|                 | 15      | 2425        | 23      | 2465        |
|                 | 16      | 2430        | 24      | 2470        |
|                 | 17      | 2435        | 25      | 2475        |
|                 | 18      | 2440        | 26      | 2480        |

### 2.2 Test Mode

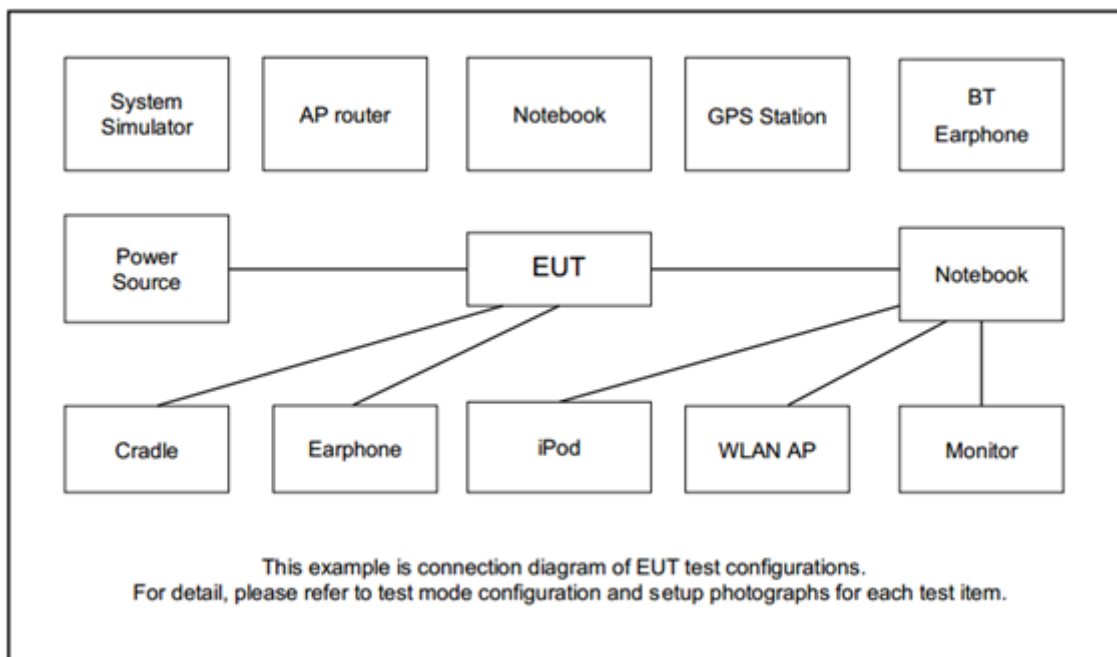
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental 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.

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

| Summary table of Test Cases  |                                                                                                       |
|------------------------------|-------------------------------------------------------------------------------------------------------|
| Test Item                    | Data Rate / Modulation                                                                                |
|                              | 250 kbps / OQPSK                                                                                      |
| <b>Radiated Test Cases</b>   | Mode 1: Zigbee Tx CH11_2405 MHz<br>Mode 2: Zigbee Tx CH18_2440 MHz<br>Mode 3: Zigbee Tx CH25_2475 MHz |
| <b>AC Conducted Emission</b> | Mode 1: WLAN (2.4GHz) Link + WLAN (5GHz) Idle + Zigbee Idle + PoE + LAN Link                          |

## 2.3 Connection Diagram of Test System



## 2.4 Support Unit used in test configuration and system

| Item | Equipment       | Trade Name              | Model Name | FCC ID    | Data Cable | Power Cord                                                 |
|------|-----------------|-------------------------|------------|-----------|------------|------------------------------------------------------------|
| 1.   | Laptop          | DELL                    | P79G       | FCC DoC   | N/A        | N/A                                                        |
| 2.   | Laptop          | DELL                    | E6430      | N/A       | N/A        | N/A                                                        |
| 3.   | Notebook        | HP                      | 15t-cu000  | PD97265NG | N/A        | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |
| 4.   | USB Flash drive | SanDisk                 | N/A        | N/A       | N/A        | N/A                                                        |
| 5.   | PoE Adapter     | Ruckus<br>Wireless Inc. | N/A        | N/A       | N/A        | N/A                                                        |
| 6.   | Adapter         | Ruckus<br>Wireless Inc. | APH-5020   | N/A       | N/A        | N/A                                                        |

## 2.5 EUT Operation Test Setup

The RF test items, utility “Putty” 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 Radiated Band Edges and Spurious Emission Measurement

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

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

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

##### 3.1.2 Measuring Instruments

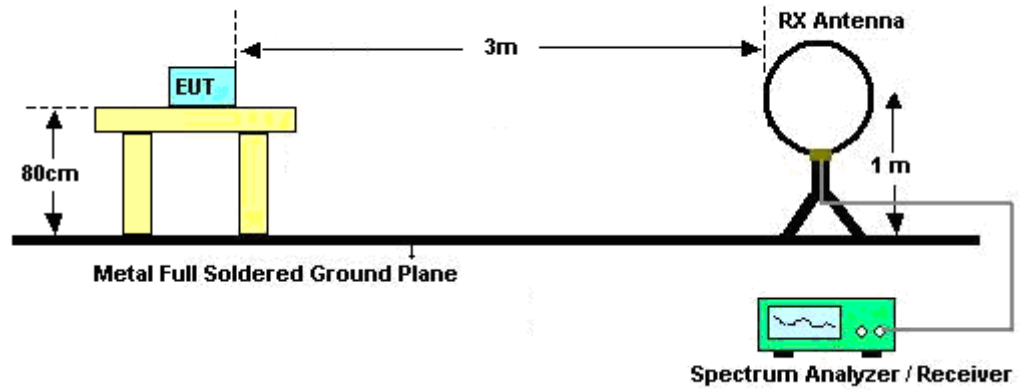
See list of measuring equipment of this test report.

### 3.1.3 Test Procedures

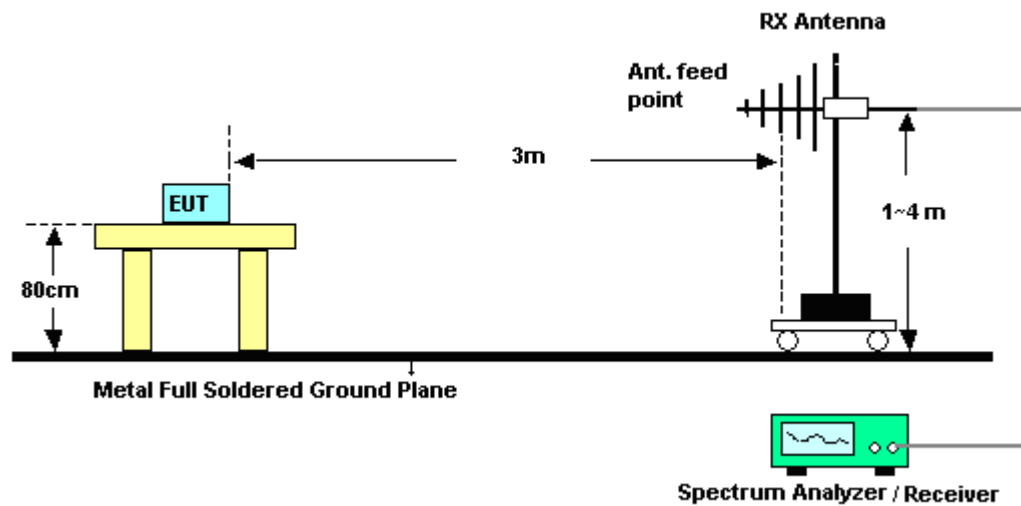
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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.

### 3.1.4 Test Setup

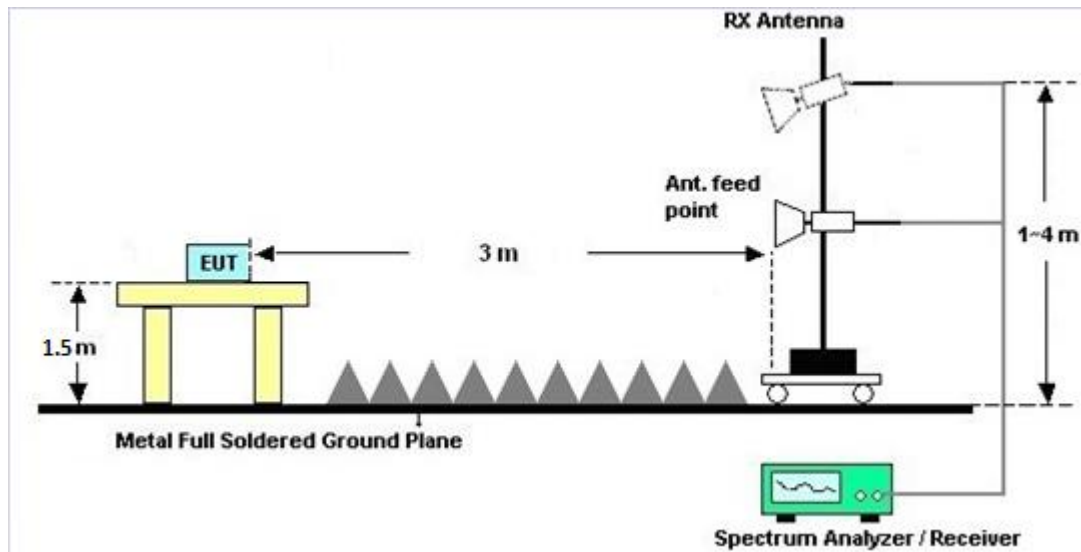
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line 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.

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

Please refer to Appendix B and C.

### 3.1.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

## 3.2 AC Conducted Emission Measurement

### 3.2.1 Limit of AC Conducted Emission

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

| Frequency of emission (MHz) | Conducted limit (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.

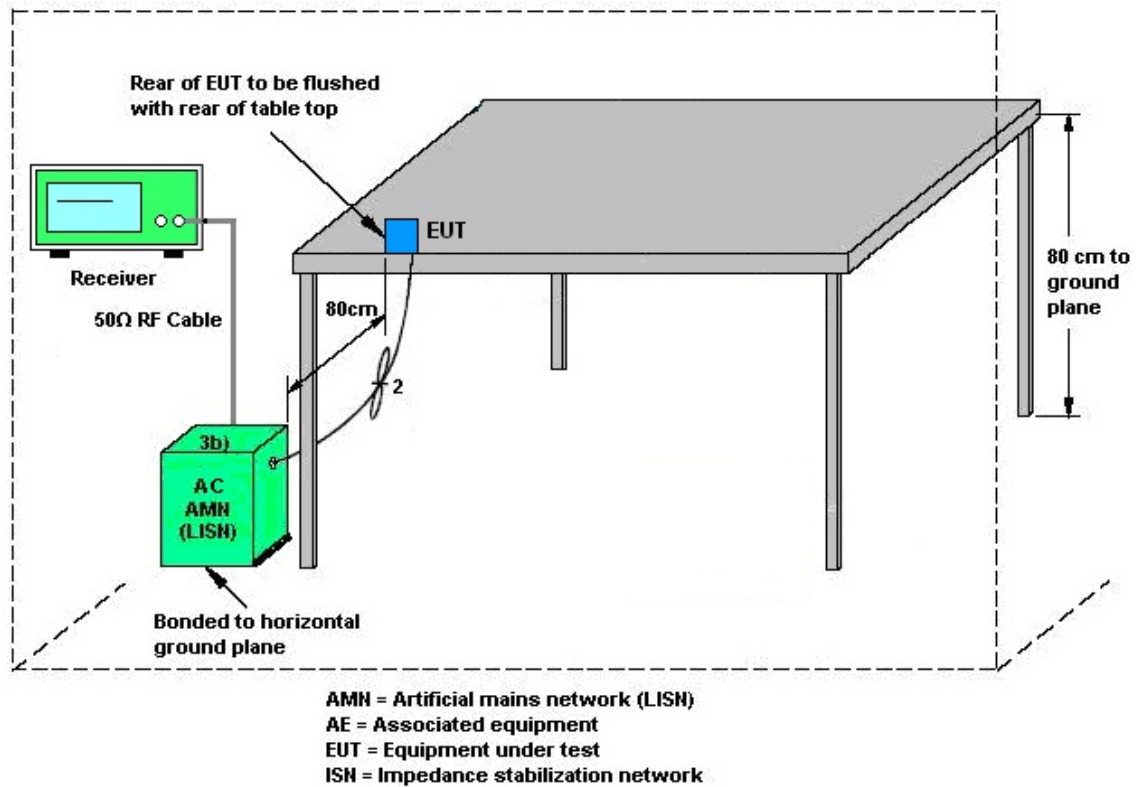
### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
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. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.2.4 Test Setup



### 3.2.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



### **3.3 Antenna Requirements**

#### **3.3.1 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.

#### **3.3.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

#### **3.3.3 Antenna Gain**

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



## 4 List of Measuring Equipment

| Instrument                          | Manufacturer | Model No.                   | Serial No.       | Characteristics               | Calibration Date | Test Date                   | Due Date      | Remark                |
|-------------------------------------|--------------|-----------------------------|------------------|-------------------------------|------------------|-----------------------------|---------------|-----------------------|
| LISN                                | TESEQ        | NNB51                       | 47407            | N/A                           | Jun. 26, 2019    | Feb. 25, 2020               | Jun. 25, 2020 | Conduction (CO01-CA)  |
| EMI Test Receiver                   | R&S          | ESR7                        | 102177           | 9KHz~7GHz                     | Jun. 27, 2019    | Feb. 25, 2020               | Jun. 26, 2020 | Conduction (CO01-CA)  |
| Pulse limiter with 10dB attenuation | R&S          | VTSD 9561-FN                | 9561-F-N00412    | N/A                           | Jun. 11, 2019    | Feb. 25, 2020               | Jun. 10, 2020 | Conduction (CO01-CA)  |
| Test Software                       | EMC32        | N/A                         | N/A              | N/A                           | N/A              | Feb. 25, 2020               | N/A           | Conduction (CO01-CA)  |
| Bilog Antenna                       | TESEQ        | 6111D                       | 50392            | 30MHz~1GHz                    | May 15, 2019     | Feb. 06, 2020~Mar. 10, 2020 | May 14, 2020  | Radiation (03CH02-CA) |
| Horn Antenna                        | SCHWARZBECK  | BBHA 9120D                  | 01894            | 1GHz~18GHz                    | Jul. 22, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Jul. 21, 2020 | Radiation (03CH02-CA) |
| Amplifier                           | SONOMA       | 310N                        | 372241           | N/A                           | Jul. 26, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Jul. 25, 2020 | Radiation (03CH02-CA) |
| Preamplifier                        | Keysight     | 83017A                      | MY53270321       | 1GHz~26.5GHz                  | Jul. 26, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Jul. 25, 2020 | Radiation (03CH02-CA) |
| Preamplifier                        | Jet-Power    | JPA0118-55-303              | 1710001800055007 | 1GHz~18GHz                    | Apr. 01, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Mar. 31, 2020 | Radiation (03CH02-CA) |
| Spectrum Analyzer                   | Keysight     | N9010A                      | MY57420221       | 10Hz~44GHz                    | Sep. 11, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Sep. 10, 2020 | Radiation (03CH02-CA) |
| Filter                              | Wainwright   | WLK12-1200-1272-11000-40SS  | SN2              | 1.2G Low Pass                 | Aug. 02, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Aug. 01, 2020 | Radiation (03CH02-CA) |
| Filter                              | Wainwright   | WHKX12-2700-3000-18000-60ST | SN10             | 3G Highpass                   | Aug. 02, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Aug. 01, 2020 | Radiation (03CH02-CA) |
| Hygrometer                          | TESEO        | 608-H1                      | 45142602         | N/A                           | Jul. 25, 2019    | Feb. 06, 2020~Mar. 10, 2020 | Jul. 24, 2020 | Radiation (03CH02-CA) |
| Controller                          | ChainTek     | 3000-1                      | N/A              | Control Turn table & Ant Mast | N/A              | Feb. 06, 2020~Mar. 10, 2020 | N/A           | Radiation (03CH02-CA) |
| Antenna Mast                        | ChainTek     | MBS-520-1                   | N/A              | 1m~4m                         | N/A              | Feb. 06, 2020~Mar. 10, 2020 | N/A           | Radiation (03CH02-CA) |
| Turn Table                          | ChainTek     | T-200-S-1                   | N/A              | 0~360 Degree                  | N/A              | Feb. 06, 2020~Mar. 10, 2020 | N/A           | Radiation (03CH02-CA) |

## 5 Uncertainty of Evaluation

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

|                                                                          |     |
|--------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) | 1.7 |
|--------------------------------------------------------------------------|-----|

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

|                                                                          |     |
|--------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) | 4.4 |
|--------------------------------------------------------------------------|-----|

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

|                                                                          |     |
|--------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) | 6.5 |
|--------------------------------------------------------------------------|-----|

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

|                                                                          |     |
|--------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) | 6.3 |
|--------------------------------------------------------------------------|-----|



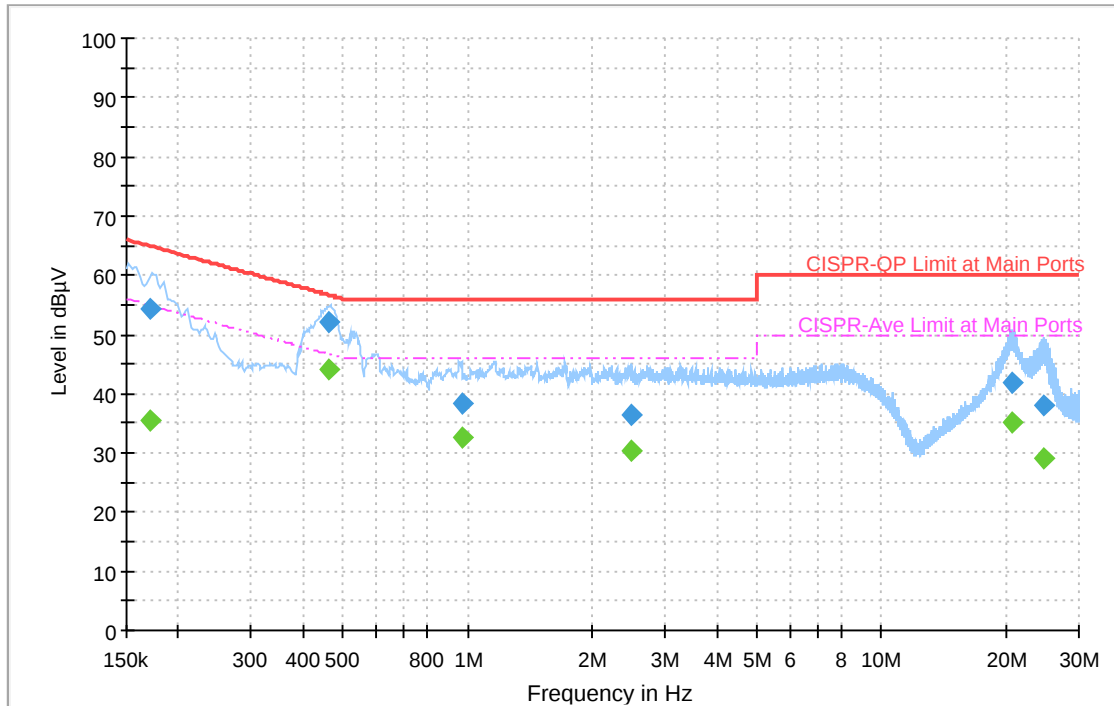
## **Appendix A. AC Conducted Emission Test Results**

|                        |          |                            |        |
|------------------------|----------|----------------------------|--------|
| <b>Test Engineer :</b> | JC Liang | <b>Temperature :</b>       | 24~26℃ |
|                        |          | <b>Relative Humidity :</b> | 22~25% |

## EUT Information

Site: CO01-CA  
Project: 200117001  
Power: 120Vac/60Hz  
Mode: 1

Full Spectrum



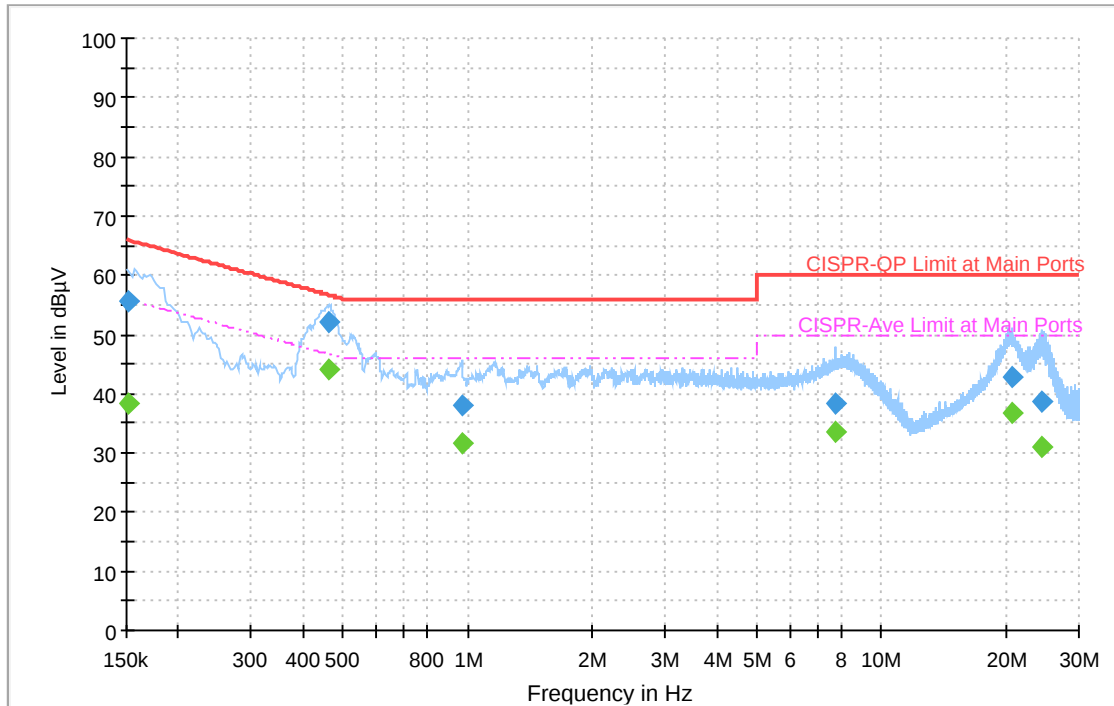
## Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.170250        | ---              | 35.62           | 54.95        | 19.33       | L1   | OFF    | 20.3       |
| 0.170250        | 54.31            | ---             | 64.95        | 10.64       | L1   | OFF    | 20.3       |
| 0.460500        | ---              | 44.12           | 46.68        | 2.56        | L1   | OFF    | 20.4       |
| 0.460500        | 51.95            | ---             | 56.68        | 4.73        | L1   | OFF    | 20.4       |
| 0.971250        | ---              | 32.49           | 46.00        | 13.51       | L1   | OFF    | 20.4       |
| 0.971250        | 38.47            | ---             | 56.00        | 17.53       | L1   | OFF    | 20.4       |
| 2.484330        | ---              | 30.21           | 46.00        | 15.79       | L1   | OFF    | 20.4       |
| 2.484330        | 36.36            | ---             | 56.00        | 19.64       | L1   | OFF    | 20.4       |
| 20.640750       | ---              | 35.14           | 50.00        | 14.86       | L1   | OFF    | 20.7       |
| 20.640750       | 41.76            | ---             | 60.00        | 18.24       | L1   | OFF    | 20.7       |
| 24.702000       | ---              | 29.18           | 50.00        | 20.82       | L1   | OFF    | 20.8       |
| 24.702000       | 37.87            | ---             | 60.00        | 22.13       | L1   | OFF    | 20.8       |

## EUT Information

Site: CO01-CA  
Project: 200117001  
Power: 120Vac/60Hz  
Mode: 1

Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.152250        | ---              | 38.43           | 55.88        | 17.45       | N    | OFF    | 20.3       |
| 0.152250        | 55.63            | ---             | 65.88        | 10.25       | N    | OFF    | 20.3       |
| 0.460500        | ---              | 44.20           | 46.68        | 2.48        | N    | OFF    | 20.4       |
| 0.460500        | 51.93            | ---             | 56.68        | 4.75        | N    | OFF    | 20.4       |
| 0.971250        | ---              | 31.73           | 46.00        | 14.27       | N    | OFF    | 20.4       |
| 0.971250        | 37.90            | ---             | 56.00        | 18.10       | N    | OFF    | 20.4       |
| 7.741500        | ---              | 33.48           | 50.00        | 16.52       | N    | OFF    | 20.5       |
| 7.741500        | 38.49            | ---             | 60.00        | 21.51       | N    | OFF    | 20.5       |
| 20.715000       | ---              | 36.76           | 50.00        | 13.24       | N    | OFF    | 20.7       |
| 20.715000       | 42.79            | ---             | 60.00        | 17.21       | N    | OFF    | 20.7       |
| 24.384750       | ---              | 30.98           | 50.00        | 19.02       | N    | OFF    | 20.8       |
| 24.384750       | 38.52            | ---             | 60.00        | 21.48       | N    | OFF    | 20.8       |

## Appendix B. Radiated Spurious Emission

|                        |                                   |                            |         |
|------------------------|-----------------------------------|----------------------------|---------|
| <b>Test Engineer :</b> | Calvin Wu, Leo Liu and Jacky Hong | <b>Temperature :</b>       | 19~22°C |
|                        |                                   | <b>Relative Humidity :</b> | 36~45%  |

### 2.4GHz 2400~2483.5MHz

#### ZigBee (Band Edge @ 3m)

| Zigbee                              | 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>ZigBee<br/>CH 11<br/>2405MHz</b> |      | 2366.175             | 59.14               | -14.86                  | 74                          | 45.3                      | 27.73                         | 17.29                  | 31.18                      | 100                  | 185                     | P                       | H               |
|                                     |      | 2366.49              | 52.35               | -1.65                   | 54                          | 38.51                     | 27.73                         | 17.29                  | 31.18                      | 100                  | 185                     | A                       | H               |
|                                     | *    | 2405                 | 116.91              | -                       | -                           | 103.19                    | 27.53                         | 17.35                  | 31.16                      | 100                  | 185                     | P                       | H               |
|                                     | *    | 2405                 | 115.06              | -                       | -                           | 101.34                    | 27.53                         | 17.35                  | 31.16                      | 100                  | 185                     | A                       | H               |
|                                     |      |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                                     |      | 2366.595             | 57.9                | -16.1                   | 74                          | 43.93                     | 27.86                         | 17.29                  | 31.18                      | 348                  | 138                     | P                       | V               |
|                                     |      | 2366.49              | 49.68               | -4.32                   | 54                          | 35.71                     | 27.86                         | 17.29                  | 31.18                      | 348                  | 138                     | A                       | V               |
|                                     | *    | 2405                 | 114.41              | -                       | -                           | 100.66                    | 27.56                         | 17.35                  | 31.16                      | 348                  | 138                     | P                       | V               |
|                                     | *    | 2405                 | 112.58              | -                       | -                           | 98.83                     | 27.56                         | 17.35                  | 31.16                      | 348                  | 138                     | A                       | V               |
|                                     |      |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
| <b>ZigBee<br/>CH 18<br/>2440MHz</b> |      | 2344.56              | 55.13               | -18.87                  | 74                          | 41.21                     | 27.85                         | 17.26                  | 31.19                      | 166                  | 181                     | P                       | H               |
|                                     |      | 2310.96              | 43.89               | -10.11                  | 54                          | 29.88                     | 28.01                         | 17.21                  | 31.21                      | 166                  | 181                     | A                       | H               |
|                                     | *    | 2440                 | 114.15              | -                       | -                           | 100.4                     | 27.48                         | 17.41                  | 31.14                      | 166                  | 181                     | P                       | H               |
|                                     | *    | 2440                 | 112.29              | -                       | -                           | 98.54                     | 27.48                         | 17.41                  | 31.14                      | 166                  | 181                     | A                       | H               |
|                                     |      | 2494.72              | 54.87               | -19.13                  | 74                          | 40.95                     | 27.53                         | 17.5                   | 31.11                      | 166                  | 181                     | P                       | H               |
|                                     |      | 2495.52              | 43.91               | -10.09                  | 54                          | 29.99                     | 27.53                         | 17.5                   | 31.11                      | 166                  | 181                     | A                       | H               |
|                                     |      | 2350.32              | 55.19               | -18.81                  | 74                          | 41.11                     | 28                            | 17.27                  | 31.19                      | 335                  | 129                     | P                       | V               |
|                                     |      | 2351.28              | 44.06               | -9.94                   | 54                          | 29.99                     | 27.99                         | 17.27                  | 31.19                      | 335                  | 129                     | A                       | V               |
|                                     | *    | 2440                 | 111.72              | -                       | -                           | 98.02                     | 27.43                         | 17.41                  | 31.14                      | 335                  | 129                     | P                       | V               |
|                                     | *    | 2440                 | 109.78              | -                       | -                           | 96.08                     | 27.43                         | 17.41                  | 31.14                      | 335                  | 129                     | A                       | V               |
|                                     |      | 2490.16              | 54.45               | -19.55                  | 74                          | 40.58                     | 27.5                          | 17.49                  | 31.12                      | 335                  | 129                     | P                       | V               |
|                                     |      | 2494.96              | 43.82               | -10.18                  | 54                          | 29.91                     | 27.52                         | 17.5                   | 31.11                      | 335                  | 129                     | A                       | V               |



|                                     |                                                                                             |         |        |        |    |        |       |       |       |     |     |   |   |
|-------------------------------------|---------------------------------------------------------------------------------------------|---------|--------|--------|----|--------|-------|-------|-------|-----|-----|---|---|
| <b>ZigBee<br/>CH 25<br/>2475MHz</b> | *                                                                                           | 2475    | 117.43 | -      | -  | 103.59 | 27.5  | 17.46 | 31.12 | 117 | 175 | P | H |
|                                     | *                                                                                           | 2475    | 115.58 | -      | -  | 101.74 | 27.5  | 17.46 | 31.12 | 117 | 175 | A | H |
|                                     |                                                                                             | 2483.84 | 62.39  | -11.61 | 74 | 48.52  | 27.51 | 17.48 | 31.12 | 117 | 175 | P | H |
|                                     |                                                                                             | 2483.52 | 51.51  | -2.49  | 54 | 37.64  | 27.51 | 17.48 | 31.12 | 117 | 175 | A | H |
|                                     |                                                                                             |         |        |        |    |        |       |       |       |     |     |   | H |
|                                     |                                                                                             |         |        |        |    |        |       |       |       |     |     |   | H |
|                                     | *                                                                                           | 2475    | 114.51 | -      | -  | 100.71 | 27.46 | 17.46 | 31.12 | 264 | 124 | P | V |
|                                     | *                                                                                           | 2475    | 112.62 | -      | -  | 98.82  | 27.46 | 17.46 | 31.12 | 264 | 124 | A | V |
|                                     |                                                                                             | 2483.72 | 59.79  | -14.21 | 74 | 45.95  | 27.48 | 17.48 | 31.12 | 264 | 124 | P | V |
|                                     |                                                                                             | 2483.52 | 49.41  | -4.59  | 54 | 35.57  | 27.48 | 17.48 | 31.12 | 264 | 124 | 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**
**ZigBee (Harmonic @ 3m)**

| Zigbee                              | Note                                                                                        | Frequency | Level      | Over Limit | Limit Line | Read Level | Antenna Factor | Path Loss | Preamp Factor | Ant Pos | Table Pos | Peak Avg. | Pol.    |
|-------------------------------------|---------------------------------------------------------------------------------------------|-----------|------------|------------|------------|------------|----------------|-----------|---------------|---------|-----------|-----------|---------|
|                                     |                                                                                             | ( MHz )   | ( dBμV/m ) | ( dB )     | ( dBμV/m ) | ( dBμV )   | ( dB/m )       | ( dB )    | ( dB )        | ( cm )  | ( deg )   | ( P/A )   | ( H/V ) |
| <b>ZigBee<br/>CH 11<br/>2405MHz</b> |                                                                                             | 4810      | 44.92      | -29.08     | 74         | 68.27      | 31.38          | 11.55     | 66.28         | 100     | 0         | P         | H       |
|                                     |                                                                                             | 12025     | 57.43      | -16.57     | 74         | 67.14      | 39.28          | 17.67     | 66.66         | 178     | 24        | A         | H       |
|                                     |                                                                                             | 12025     | 50.37      | -3.63      | 54         | 60.08      | 39.28          | 17.67     | 66.66         | 178     | 24        | A         | H       |
|                                     |                                                                                             |           |            |            |            |            |                |           |               |         |           |           | H       |
|                                     |                                                                                             | 4810      | 44.25      | -29.75     | 74         | 67.58      | 31.4           | 11.55     | 66.28         | 100     | 0         | P         | V       |
|                                     |                                                                                             | 12025     | 52.67      | -21.33     | 74         | 62.31      | 39.35          | 17.67     | 66.66         | 111     | 341       | P         | V       |
|                                     |                                                                                             | 12025     | 44.05      | -9.95      | 54         | 53.69      | 39.35          | 17.67     | 66.66         | 111     | 341       | A         | V       |
|                                     |                                                                                             |           |            |            |            |            |                |           |               |         |           |           | V       |
| <b>ZigBee<br/>CH 18<br/>2440MHz</b> |                                                                                             | 4880      | 47.81      | -26.19     | 74         | 71.25      | 31.31          | 11.39     | 66.14         | 100     | 0         | P         | H       |
|                                     |                                                                                             | 7320      | 57.68      | -16.32     | 74         | 73.61      | 36.35          | 13.58     | 65.86         | 252     | 279       | P         | H       |
|                                     |                                                                                             | 7320      | 51.81      | -2.19      | 54         | 67.74      | 36.35          | 13.58     | 65.86         | 252     | 279       | A         | H       |
|                                     |                                                                                             |           |            |            |            |            |                |           |               |         |           |           | H       |
|                                     |                                                                                             | 4880      | 46.15      | -27.85     | 74         | 69.65      | 31.25          | 11.39     | 66.14         | 100     | 0         | P         | V       |
|                                     |                                                                                             | 7320      | 59.1       | -14.9      | 74         | 75.04      | 36.34          | 13.58     | 65.86         | 240     | 170       | P         | V       |
|                                     |                                                                                             | 7320      | 53.62      | -0.38      | 54         | 69.56      | 36.34          | 13.58     | 65.86         | 240     | 170       | A         | V       |
|                                     |                                                                                             |           |            |            |            |            |                |           |               |         |           |           | V       |
| <b>ZigBee<br/>CH 25<br/>2475MHz</b> |                                                                                             | 4950      | 49.81      | -24.19     | 74         | 73.19      | 31.38          | 11.24     | 66            | 100     | 0         | P         | H       |
|                                     |                                                                                             | 7425      | 59.14      | -14.86     | 74         | 74.93      | 36.45          | 13.65     | 65.89         | 245     | 310       | P         | H       |
|                                     |                                                                                             | 7425      | 53.63      | -0.37      | 54         | 69.42      | 36.45          | 13.65     | 65.89         | 245     | 310       | A         | H       |
|                                     |                                                                                             | 12375     | 59.8       | -14.2      | 74         | 68.78      | 39.26          | 17.86     | 66.1          | 316     | 0         | P         | H       |
|                                     |                                                                                             | 12375     | 52.51      | -1.49      | 54         | 61.49      | 39.26          | 17.86     | 66.1          | 316     | 0         | A         | H       |
|                                     |                                                                                             | 4950      | 48.78      | -25.22     | 74         | 72.16      | 31.38          | 11.24     | 66            | 100     | 0         | P         | V       |
|                                     |                                                                                             | 7425      | 58.22      | -15.78     | 74         | 74.02      | 36.44          | 13.65     | 65.89         | 112     | 301       | P         | V       |
|                                     |                                                                                             | 7425      | 52.13      | -1.87      | 54         | 67.93      | 36.44          | 13.65     | 65.89         | 112     | 301       | A         | V       |
|                                     |                                                                                             | 12375     | 51.76      | -22.24     | 74         | 61.28      | 38.72          | 17.86     | 66.1          | 100     | 0         | P         | V       |
| <b>Remark</b>                       | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |           |            |            |            |            |                |           |               |         |           |           |         |



**Emission below 1GHz**

**ZigBee (LF)**

| Zigbee    | Note                                                                       | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak    | Pol.    |
|-----------|----------------------------------------------------------------------------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|           |                                                                            |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
|           |                                                                            | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| ZigBee LF |                                                                            | 30        | 22.18      | -17.82 | 40         | 29.03    | 24.7     | 0.93   | 32.48  | -      | -       | P       | H       |
|           |                                                                            | 105.66    | 22.11      | -21.39 | 43.5       | 36.17    | 16.67    | 1.69   | 32.42  | -      | -       | P       | H       |
|           |                                                                            | 132.82    | 25.64      | -17.86 | 43.5       | 38.42    | 17.7     | 1.95   | 32.43  | -      | -       | P       | H       |
|           |                                                                            | 186.17    | 20.11      | -23.39 | 43.5       | 35.5     | 14.8     | 2.22   | 32.41  | -      | -       | P       | H       |
|           |                                                                            | 782.72    | 30.54      | -15.46 | 46         | 30.13    | 28.1     | 4.56   | 32.25  | -      | -       | P       | H       |
|           |                                                                            | 915.61    | 32.51      | -13.49 | 46         | 29.76    | 29.31    | 4.94   | 31.5   | 100    | 0       | P       | H       |
|           |                                                                            |           |            |        |            |          |          |        |        |        |         |         | H       |
|           |                                                                            |           |            |        |            |          |          |        |        |        |         |         | H       |
|           |                                                                            |           |            |        |            |          |          |        |        |        |         |         | H       |
|           |                                                                            |           |            |        |            |          |          |        |        |        |         |         | H       |
|           |                                                                            |           |            |        |            |          |          |        |        |        |         |         | H       |
|           |                                                                            | 30        | 25.68      | -14.32 | 40         | 32.53    | 24.7     | 0.93   | 32.48  | -      | -       | P       | V       |
|           |                                                                            | 37.76     | 25.48      | -14.52 | 40         | 35.86    | 21.02    | 1.06   | 32.46  | -      | -       | P       | V       |
|           |                                                                            | 57.16     | 26.97      | -13.03 | 40         | 45.99    | 11.88    | 1.54   | 32.44  | -      | -       | P       | V       |
|           |                                                                            | 124.09    | 28.88      | -14.62 | 43.5       | 41.89    | 17.6     | 1.81   | 32.42  | -      | -       | P       | V       |
|           |                                                                            | 703.18    | 28.06      | -17.94 | 46         | 29.46    | 26.66    | 4.45   | 32.51  | -      | -       | P       | V       |
|           |                                                                            | 959.26    | 34.19      | -11.81 | 46         | 29.21    | 30.99    | 5.08   | 31.09  | 100    | 0       | P       | V       |
|           |                                                                            |           |            |        |            |          |          |        |        |        |         |         | 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:

| BLE                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
|                         |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BLE<br>CH 00<br>2402MHz |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
|                         |      | 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”.**



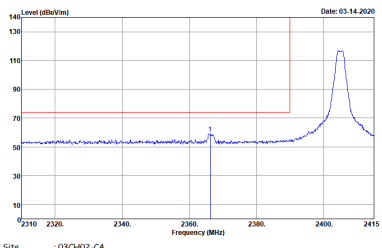
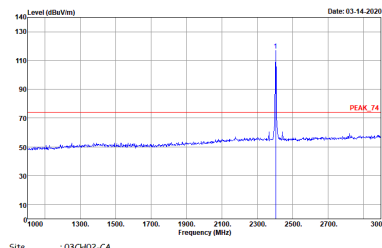
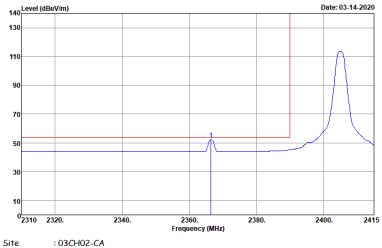
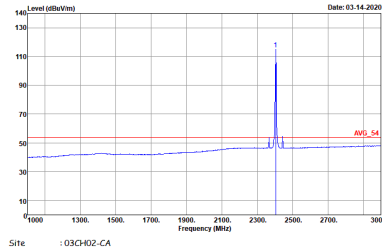
## Appendix C. Radiated Spurious Emission Plots

|                        |                                   |                            |         |
|------------------------|-----------------------------------|----------------------------|---------|
| <b>Test Engineer :</b> | Calvin Wu, Leo Liu and Jacky Hong | <b>Temperature :</b>       | 19~22°C |
|                        |                                   | <b>Relative Humidity :</b> | 36~45%  |

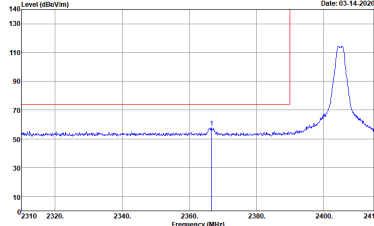
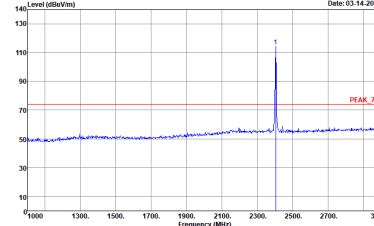
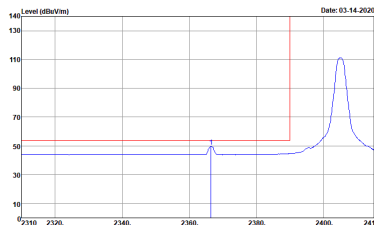
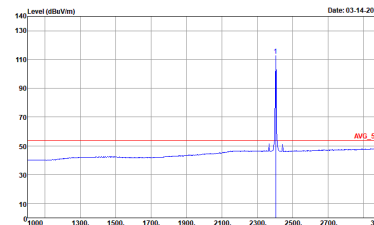
### Note symbol

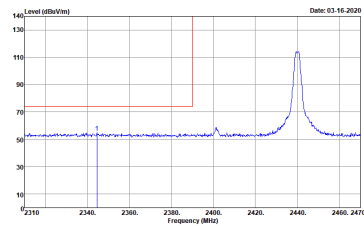
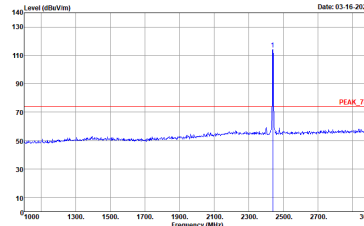
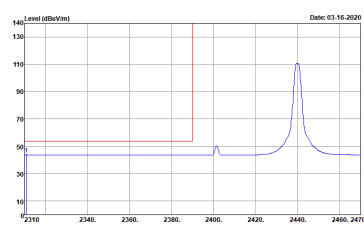
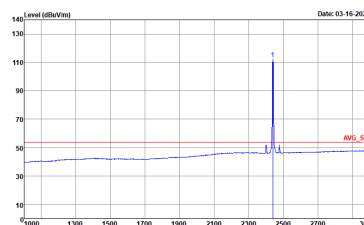
|    |                       |
|----|-----------------------|
| -L | Low channel location  |
| -R | High channel location |

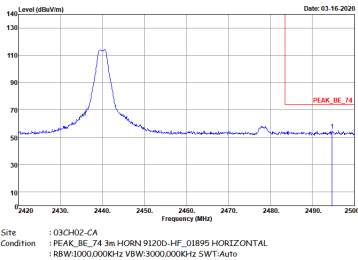
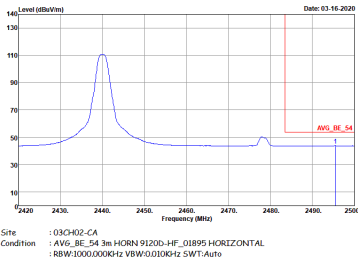
**2.4GHz 2400~2483.5MHz**  
**ZIGBEE (Band Edge @ 3m)**

| ZIGBEE      | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                    |                                                                                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | ZIGBEE CH11 2405MHz                                                                                                                                                                                                     |                                                                                                                                                                                                                       |
|             | Horizontal                                                                                                                                                                                                              | Fundamental                                                                                                                                                                                                           |
| <b>Peak</b> |  <p>Site : 03CH02-CA<br/> Condition : PEAK_BE_74 3m HORN 91200-HF_01895 HORIZONTAL<br/> : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH02-CA<br/> Condition : PEAK_74 3m HORN 91200-HF_01895 HORIZONTAL<br/> : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| <b>Avg.</b> |  <p>Site : 03CH02-CA<br/> Condition : AVG_BE_54 3m HORN 91200-HF_01895 HORIZONTAL<br/> : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   |  <p>Site : 03CH02-CA<br/> Condition : AVG_54 3m HORN 91200-HF_01895 HORIZONTAL<br/> : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   |



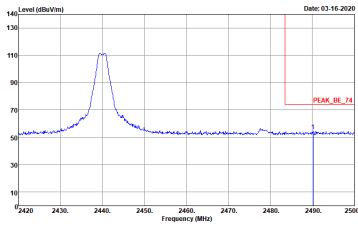
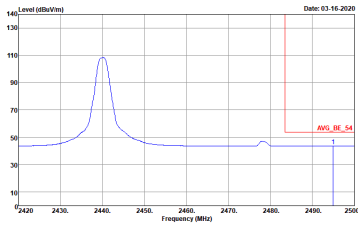
| ZIGBEE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                |                                                                                                                                                                                                                   |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | ZIGBEE CH11 2405MHz                                                                                                                                                                                                 |                                                                                                                                                                                                                   |
|        | Vertical                                                                                                                                                                                                            | Fundamental                                                                                                                                                                                                       |
| Peak   |  <p>Site : 03CH02-CA<br/>Condition : PEAK_BE_74 3m HORN 91200-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Avg    |  <p>Site : 03CH02-CA<br/>Condition : AVG_BE_54 3m HORN 91200-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   |  <p>Site : 03CH02-CA<br/>Condition : AVG_54 3m HORN 91200-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   |

| ZIGBEE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                                  |                                                                                                                                                                                                                     |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | ZIGBEE CH18 2440MHz - L                                                                                                                                                                                               |                                                                                                                                                                                                                     |
|        | Horizontal                                                                                                                                                                                                            | Fundamental                                                                                                                                                                                                         |
| Peak   |  <p>Site : 03CH02-CA<br/>Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Avg.   |  <p>Site : 03CH02-CA<br/>Condition : AVG_BE_54 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   |  <p>Site : 03CH02-CA<br/>Condition : AVG_54 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   |

| ZIGBEE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                |             |
|--------|-------------------------------------------------------------------------------------|-------------|
|        | ZIGBEE CH18 2440MHz - R                                                             |             |
|        | Horizontal                                                                          | Fundamental |
| Peak   |    | Left blank  |
| Avg.   |  | Left blank  |



| ZIGBEE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                              |                                                                                                                                |
|--------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|        | ZIGBEE CH18 2440MHz - L                                                                                                           |                                                                                                                                |
|        | Vertical                                                                                                                          | Fundamental                                                                                                                    |
| Peak   | <p>Site : 03CH02-CA<br/>Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Avg.   | <p>Site : 03CH02-CA<br/>Condition : AVG_BE_54 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>     | <p>Site : 03CH02-CA<br/>Condition : AVG_54 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>     |

| ZIGBEE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                              |             |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|        | ZIGBEE CH18 2440MHz - R                                                                                                                                                                                           |             |
|        | Vertical                                                                                                                                                                                                          | Fundamental |
| Peak   |  <p>Site : 03CH02-CA<br/>Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 VERTICAL<br/>RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | Left blank  |
| Avg.   |  <p>Site : 03CH02-CA<br/>Condition : AVG_BE_54 3m HORN 9120D-HF_01895 VERTICAL<br/>RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>   | Left blank  |

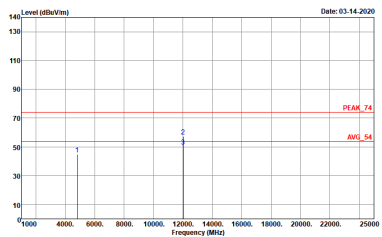
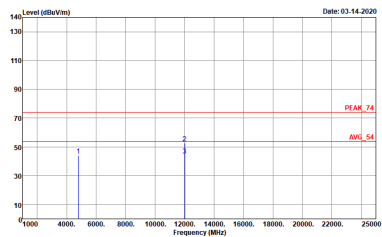


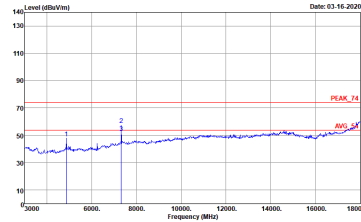
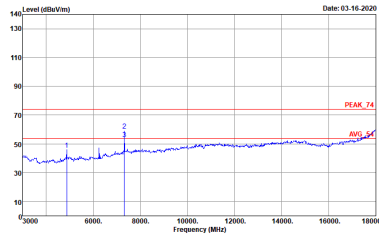
| ZIGBEE |                                                                                                                                     | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                             |  |
|--------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--|
|        |                                                                                                                                     | ZIGBEE CH25 2475MHz                                                                                                              |  |
|        | Horizontal                                                                                                                          | Fundamental                                                                                                                      |  |
| Peak   | <p>Site : 03CH02-CA<br/>Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  |
| Avg.   | <p>Site : 03CH02-CA<br/>Condition : AVG_BE_54 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>     | <p>Site : 03CH02-CA<br/>Condition : AVG_54 3m HORN 9120D-HF_01895 HORIZONTAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>     |  |

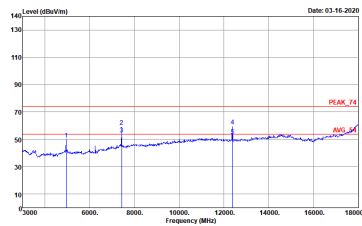
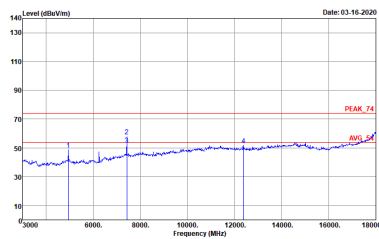


| ZIGBEE |                                                                                                                                   | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                           |  |
|--------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--|
|        |                                                                                                                                   | ZIGBEE CH25 2475MHz                                                                                                            |  |
|        | Vertical                                                                                                                          | Fundamental                                                                                                                    |  |
| Peak   | <p>Site : 03CH02-CA<br/>Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  |
| Avg.   | <p>Site : 03CH02-CA<br/>Condition : AVG_BE_54 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>     | <p>Site : 03CH02-CA<br/>Condition : AVG_54 3m HORN 9120D-HF_01895 VERTICAL<br/>: RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>     |  |

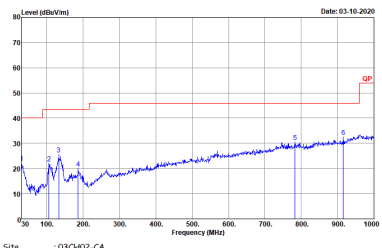
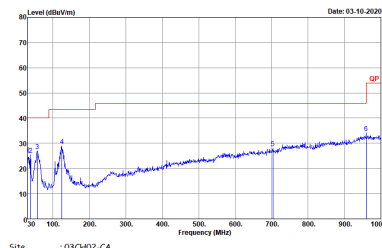
**2.4GHz 2400~2483.5MHz**
**ZIGBEE (Harmonic @ 3m)**

| ZIGBEE                         | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                                                                                                     |                                                                                                                                                                                        |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | ZIGBEE CH11 2405MHz                                                                                                                                                                     |                                                                                                                                                                                        |
|                                | Horizontal                                                                                                                                                                              | Vertical                                                                                                                                                                               |
| <b>Peak</b><br><br><b>Avg.</b> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 HORIZONTAL<br/>Detector : Peak</p> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 VERTICAL<br/>Detector : Peak</p> |

| ZIGBEE                         | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                                                                                                     |                                                                                                                                                                                        |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | ZIGBEE CH18 2440MHz                                                                                                                                                                     |                                                                                                                                                                                        |
|                                | Horizontal                                                                                                                                                                              | Vertical                                                                                                                                                                               |
| <b>Peak</b><br><br><b>Avg.</b> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 HORIZONTAL<br/>Detector : Peak</p> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 VERTICAL<br/>Detector : Peak</p> |

| ZIGBEE | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                                                                                                     |                                                                                                                                                                                        |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | ZIGBEE CH25 2475MHz                                                                                                                                                                     |                                                                                                                                                                                        |
|        | Horizontal                                                                                                                                                                              | Vertical                                                                                                                                                                               |
| Peak   |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 HORIZONTAL<br/>Detector : Peak</p> |  <p>Site : 03CH02-CA<br/>Condition : PEAK_74 3m HORN 91200-HF_01895 VERTICAL<br/>Detector : Peak</p> |

**Emission below 1GHz**
**2.4GHz ZIGBEE (LF)**

| ZIGBEE               | 2.4GHz 2400~2483.5MHz                                                                                                                                                                                            |                                                                                                                                                                                                                 |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | ZIGBEE LF                                                                                                                                                                                                        |                                                                                                                                                                                                                 |
|                      | Horizontal                                                                                                                                                                                                       | Vertical                                                                                                                                                                                                        |
| <b>QP /<br/>Peak</b> |  <p>Site : 03CH02-CA<br/>Condition : QP 3m 81LO6 6111D-LF_50392 HORIZONTAL<br/>: RBW:120.000KHz VBW:300.000KHz SWT:0.500sec</p> |  <p>Site : 03CH02-CA<br/>Condition : QP 3m 81LO6 6111D-LF_50392 VERTICAL<br/>: RBW:120.000KHz VBW:300.000KHz SWT:0.500sec</p> |
|                      |                                                                                                                                                                                                                  |                                                                                                                                                                                                                 |

## Appendix D. Duty Cycle Plots

| Band   | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting | Duty Factor(dB) |
|--------|---------------|-------|----------|-------------|-----------------|
| Zigbee | 100           | -     | -        | 10Hz        | 0.00            |

### Zigbee

