

# FCC Test Report

Client Name : Cruise Cloud Technology (Shenzhen) Corporation Limited

Address : West 3F Block 2, Vision Business Park, Tech. South Road,  
High-tech industrial Park, Shenzhen, China

Product Name : tachograph

Date : Sept. 28, 2021



**Shenzhen Anbotech Compliance Laboratory Limited**



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# TEST REPORT

Applicant : Cruise Cloud Technology (Shenzhen) Corporation Limited  
Manufacturer : Cruise Cloud Technology (Shenzhen) Corporation Limited  
Product Name : tachograph  
Model No. : MF01  
Trade Mark : MIOFIVE  
Rating(s) : Input: DC 12V, 550mA(with DC 3.7V, 500mAh battery inside)

**Test Standard(s) : FCC Part15 Subpart E, Paragraph 15.407**

**ANSI C63.10: 2020,**

**Test Method(s) : KDB 789033 D02 General UNII Test Procedures New Rules v02r01  
KDB662911 D01 Multiple Transmitter Output v02r01**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart E requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt

Aug. 26, 2021

Date of Test

Aug. 26,~Sept. 24, 2021

Prepared By

*Ella Liang*

(Ella Liang)

Approved & Authorized Signer

*Kingkong Jin*

(Kingkong Jin)

## 1. General Information

### 1.1. Client Information

|              |   |                                                                                                 |
|--------------|---|-------------------------------------------------------------------------------------------------|
| Applicant    | : | Cruise Cloud Technology (Shenzhen) Corporation Limited                                          |
| Address      | : | West 3F Block 2,Vision Business Park,Tech.South Road, High-tech industrial Park, Shenzhen,China |
| Manufacturer | : | Cruise Cloud Technology (Shenzhen) Corporation Limited                                          |
| Address      | : | West 3F Block 2,Vision Business Park,Tech.South Road, High-tech industrial Park, Shenzhen,China |
| Factory      | : | Cruise Cloud Technology (Shenzhen) Corporation Limited                                          |
| Address      | : | West 3F Block 2,Vision Business Park,Tech.South Road, High-tech industrial Park, Shenzhen,China |

### 1.2. Description of Device (EUT)

|                     |                      |                                                                                                                                                                                                                                                                                                                    |
|---------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name        | :                    | tachograph                                                                                                                                                                                                                                                                                                         |
| Model No.           | :                    | MF01                                                                                                                                                                                                                                                                                                               |
| Trade Mark          | :                    | MIOFIVE                                                                                                                                                                                                                                                                                                            |
| Test Power Supply   | :                    | DC 3.7V battery inside                                                                                                                                                                                                                                                                                             |
| Test Sample No.     | :                    | 1-2-1(Normal Sample), 1-2-2(Engineering Sample)                                                                                                                                                                                                                                                                    |
| Product Description | Operation Frequency: | WiFi 2.4G: 2412~2462MHz for 802.11b/g/n(HT20)<br>WiFi 5.2G: 5180~5240MHz<br>WiFi 5.8G: 5745~5825MHz                                                                                                                                                                                                                |
|                     | Number of Channel:   | WiFi 2.4G: 11 Channels for 802.11b/g/n(HT20)<br>WiFi 5.2G:<br>4 Channels for 802.11a/n(HT20)/ac(HT20)<br>2 Channels for 802.11n(HT40)/ac(HT40)<br>1 Channels for 802.11ac(HT80)<br>WiFi 5.8G:<br>5 Channels for 802.11a/n(HT20)/ac(HT20)<br>2 Channels for 802.11n(HT40)/ac(HT40)<br>1 Channels for 802.11ac(HT80) |
|                     | Modulation Type:     | WiFi 2.4G: CCK, DQPSK, DBPSK for DSSS;<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br>WiFi 5G: OFDM with<br>BPSK/QPSK/16QAM/64QAM/256QAM                                                                                                                                                                                  |
|                     | Antenna Type:        | WiFi 2.4G&WiFi 5G: Internal antenna                                                                                                                                                                                                                                                                                |
|                     | Antenna Gain(Peak):  | WiFi 2.4G: 0.81 dBi<br>WiFi 5.2G/ 5.8G: 1.89 dBi                                                                                                                                                                                                                                                                   |
|                     | Adapter:             | N/A                                                                                                                                                                                                                                                                                                                |
|                     |                      |                                                                                                                                                                                                                                                                                                                    |

**Remark:** 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2) This report is for 5G module.

### 1.3. Auxiliary Equipment Used During Test

|     |   |  |
|-----|---|--|
| N/A | : |  |
|-----|---|--|

### 1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

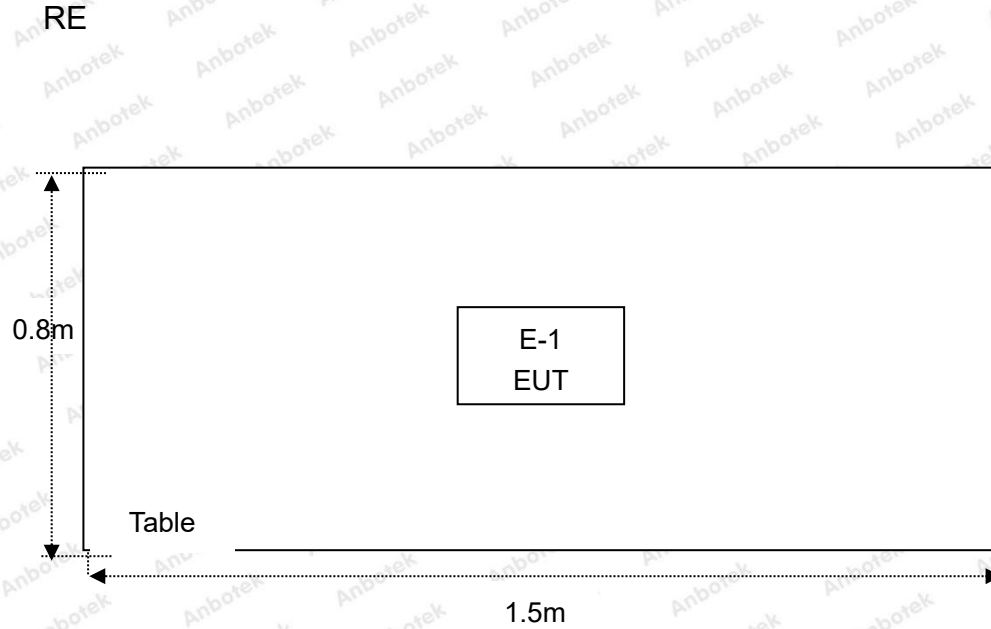
| Frequency Band | Mode                   | Test channel | Frequency (MHz) |
|----------------|------------------------|--------------|-----------------|
| 5.2GHz         | OFDM(802.11a/n20/ac20) | CH 36        | 5180MHz         |
|                |                        | CH 40        | 5200MHz         |
|                |                        | CH 48        | 5240MHz         |
|                | OFDM(802.11n40/ac40)   | CH 38        | 5190MHz         |
|                |                        | CH 46        | 5230MHz         |
|                | OFDM(802.11ac80)       | CH 42        | 5210MHz         |
| 5.8GHz         | OFDM(802.11a/n20/ac20) | CH 149       | 5745MHz         |
|                |                        | CH 157       | 5785MHz         |
|                |                        | CH 165       | 5825MHz         |
|                | OFDM(802.11n40/ac40)   | CH 151       | 5755MHz         |
|                |                        | CH 159       | 5795MHz         |
|                | OFDM(802.11ac80)       | CH 155       | 5775MHz         |

**Note:**

1. The measurements are performed at the highest, middle, lowest available channels.
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω, Cable Loss: 1.0 dB
4. The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is more than 98%



## 1.5. Description Of Test Setup



## 1.6. Test Equipment List

| Item | Equipment                                         | Manufacturer               | Model No.        | Serial No.    | Last Cal.     | Cal. Interval |
|------|---------------------------------------------------|----------------------------|------------------|---------------|---------------|---------------|
| 1.   | L.I.S.N.<br>Artificial Mains<br>Network           | Rohde & Schwarz            | ENV216           | 100055        | Oct. 26, 2020 | 1 Year        |
| 2.   | Three Phase V-type<br>Artificial Power<br>Network | CYBERTEK                   | EM5040DT         | E215040DT001  | Jul 05, 2021  | 1 Year        |
| 3.   | EMI Test Receiver                                 | Rohde & Schwarz            | ESCI             | 100627        | Oct. 26, 2020 | 1 Year        |
| 4.   | EMI Test Receiver                                 | Rohde & Schwarz            | ESR26            | 101481        | Oct. 26, 2020 | 1 Year        |
| 5.   | RF Switching Unit                                 | Compliance<br>Direction    | RSU-M2           | 38303         | Oct. 26, 2020 | 1 Year        |
| 6.   | MAX Spectrum<br>Analysis                          | Agilent                    | N9020A           | MY51170037    | Oct. 26, 2020 | 1 Year        |
| 7.   | Preamplifier                                      | SKET Electronic            | BK1G18G30<br>D   | KD17503       | Oct. 26, 2020 | 1 Year        |
| 8.   | Double Ridged Horn<br>Antenna                     | Instruments<br>corporation | GTH-0118         | 351600        | Nov. 02, 2020 | 2 Year        |
| 9.   | Bilog Broadband<br>Antenna                        | Schwarzbeck                | VULB9163         | VULB 9163-289 | Nov. 02, 2020 | 2 Year        |
| 10.  | Loop Antenna                                      | Schwarzbeck                | FMZB1519B        | 00053         | Nov. 02, 2020 | 2 Year        |
| 11.  | Horn Antenna                                      | A-INFO                     | LB-180400-<br>KF | J211060628    | Nov. 02, 2020 | 2 Year        |
| 12.  | Pre-amplifier                                     | SONOMA                     | 310N             | 186860        | Oct. 26, 2020 | 1 Year        |
| 13.  | EMI Test Software<br>EZ-EMC                       | SHURPLE                    | N/A              | N/A           | N/A           | N/A           |
| 14.  | RF Test Control<br>System                         | YIHENG                     | YH3000           | 2017430       | Oct. 26, 2020 | 1 Year        |
| 15.  | Power Sensor                                      | DAER                       | RPR3006W         | 15I00041SN045 | Oct. 26, 2020 | 1 Year        |
| 16.  | Power Sensor                                      | DAER                       | RPR3006W         | 15I00041SN046 | Oct. 26, 2020 | 1 Year        |
| 17.  | MXA Spectrum<br>Analysis                          | Agilent                    | N9020A           | MY51170037    | Oct. 26, 2020 | 1 Year        |
| 18.  | MXG RF Vector<br>Signal Generator                 | Agilent                    | N5182A           | MY48180656    | Oct. 26, 2020 | 1 Year        |
| 19.  | Signal Generator                                  | Agilent                    | E4421B           | MY41000743    | Oct. 26, 2020 | 1 Year        |
| 20.  | DC Power Supply                                   | IVYTECH                    | IV3605           | 1804D360510   | Oct. 26, 2020 | 1 Year        |
| 21   | Constant<br>Temperature<br>Humidity Chamber       | ZHONGJIAN                  | ZJ-KHWS80<br>B   | N/A           | Oct. 26, 2020 | 1 Year        |



### 1.7. Measurement Uncertainty

|                        |   |                          |
|------------------------|---|--------------------------|
| Radiation Uncertainty  | : | Ur = 3.9 dB (Horizontal) |
|                        |   | Ur = 3.8 dB (Vertical)   |
| Conduction Uncertainty | : | Uc = 3.4 dB              |

### 1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, September 30, 2020.

#### ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A, September 30, 2020.

#### Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

## 2. Summary of Test Results

| Standard         | Test Type                        | Result |
|------------------|----------------------------------|--------|
| 15.207 & 15.407  | Conducted Emission               | N/A    |
| 15.205/15.209    | Spurious Emission                | PASS   |
| 15.407(b)        | Band Edge                        | PASS   |
| 15.407(a)(5)     | Occupy Bandwidth                 | PASS   |
| 15.407(a)(1)(ii) | Maximum Conducted Output Power   | PASS   |
| 15.407(a)(1)     | Peak Power Spectral Density      | PASS   |
| 15.203           | Antenna Requirement              | PASS   |
| 15.407(g)        | Frequency Stability              | PASS   |
| 15.407(i)        | DFS(Dynamic Frequency Selection) | N/A    |

**Remark:** "N/A" is an abbreviation for Not Applicable.

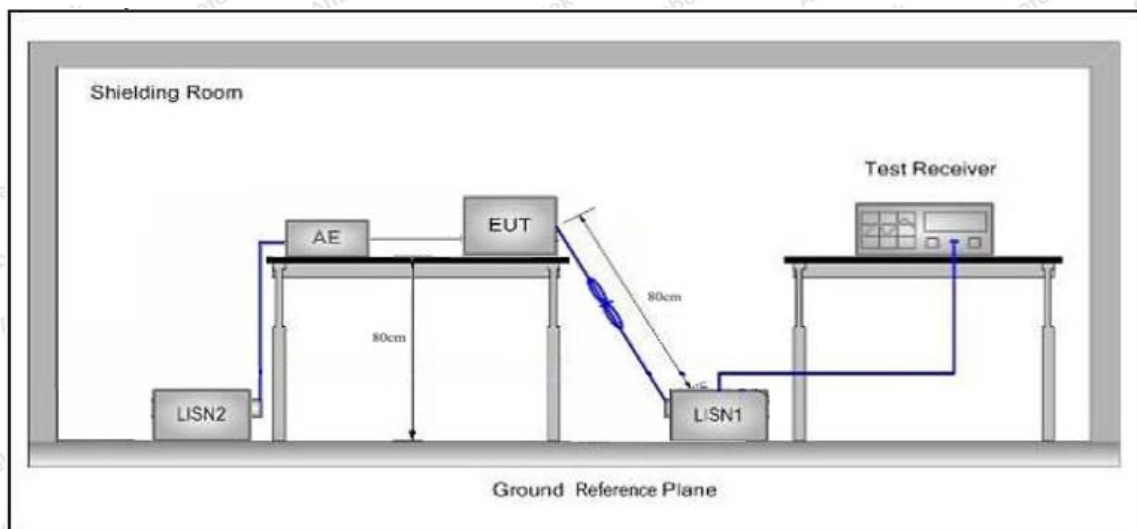
### 3. Conducted Emission Test

#### 3.1. Test Standard and Limit

| Test Standard | FCC Part15 Section 15.207&15.407 |                                |               |
|---------------|----------------------------------|--------------------------------|---------------|
| Test Limit    | Frequency                        | Maximum RF Line Voltage (dBuV) |               |
|               |                                  | Quasi-peak Level               | Average Level |
|               | 150kHz~500kHz                    | 66 ~ 56 *                      | 56 ~ 46 *     |
|               | 500kHz~5MHz                      | 56                             | 46            |
|               | 5MHz~30MHz                       | 60                             | 50            |

**Remark:** (1) \*Decreasing linearly with logarithm of the frequency.  
(2) The lower limit shall apply at the transition frequency.

#### 3.2. Test Setup



#### 3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

#### 3.4. Test Data

Not applicable.

This is a Car Mcar device, which is intended to be installed on a vehicle only, not connet to the public utility under normal use.15.207 test is exempted.



## 4. Radiation Spurious Emission and Band Edge

### 4.1. Test Standard and Limit

| Radiated Spurious Emission |                                                |                                  |                                                             |            |                          |
|----------------------------|------------------------------------------------|----------------------------------|-------------------------------------------------------------|------------|--------------------------|
| Test Standard              | FCC Part15 C Section 15.209, 15.205 and 15.407 |                                  |                                                             |            |                          |
| Test Limit                 | Frequency (MHz)                                | Field strength (microvolt/meter) | Limit (dBuV/m)                                              | Remark     | Measurement distance (m) |
|                            | 0.009MHz~0.490MHz                              | 2400/F(kHz)                      | -                                                           | -          | 300                      |
|                            | 0.490MHz-1.705MHz                              | 24000/F(kHz)                     | -                                                           | -          | 30                       |
|                            | 1.705MHz-30MHz                                 | 30                               | -                                                           | -          | 30                       |
|                            | 30MHz~88MHz                                    | 100                              | 40.0                                                        | Quasi-peak | 3                        |
|                            | 88MHz~216MHz                                   | 150                              | 43.5                                                        | Quasi-peak | 3                        |
|                            | 216MHz~960MHz                                  | 200                              | 46.0                                                        | Quasi-peak | 3                        |
|                            | 960MHz~1000MHz                                 | 500                              | 54.0                                                        | Quasi-peak | 3                        |
|                            | Above 1000MHz                                  | 500                              | 54.0                                                        | Average    | 3                        |
|                            |                                                | -                                | 68.2                                                        | Peak       | 3                        |
| Band Edge                  |                                                |                                  |                                                             |            |                          |
| Test Standard              | 15.407(b)                                      |                                  |                                                             |            |                          |
| Test Limit                 | Operating Band                                 | Frequency                        | EIRP Limit                                                  | Remark     |                          |
|                            | 5150-5250MHz                                   | Above 1GHz                       | -27dBm/MHz(68.2dBuV/m)@3m                                   | Peak       |                          |
|                            | 5250-5350MHz                                   | Above 1GHz                       | -27dBm/MHz(68.2dBuV/m)@3m                                   | Peak       |                          |
|                            | 5470-5725MHz                                   | Above 1GHz                       | -27dBm/MHz(68.2dBuV/m)@3m                                   | Peak       |                          |
|                            | 5725-5850 MHz                                  | Above 1GHz                       | -27dBm/MHz(68.2dBuV/m)@3m                                   | Peak       |                          |
|                            |                                                | 1GHz-5.65GHz                     | -27*dBm/MHz to 10dBm/MHz<br>(68.2* dBuV/m to 105.6dBuV/m)   | Peak       |                          |
|                            |                                                | 5.65GHz-5.7GHz                   | 10*dBm/MHz to 15.6dBm/MHz<br>(105.6*dBuV/m to 110.8dBuV/m)  | Peak       |                          |
|                            |                                                | 5.7GHz-5.72GHz                   | 15.6*dBm/MHz to 27dBm/MHz<br>(110.8dBuV/m to* 122.2dBuV/m)  | Peak       |                          |
|                            |                                                | 5.72GHz-5.725GHz                 | 27dBm/MHz to 15.6*dBm/MHz<br>(122.2dBuV/m to110.8* dBuV/m)  | Peak       |                          |
|                            |                                                | 5.85GHz-5.855GHz                 | 15.6dBm/MHz to 10*dBm/MHz<br>(110.8dBuV/m to 105.6* dBuV/m) | Peak       |                          |

|  |                   |                                                           |      |
|--|-------------------|-----------------------------------------------------------|------|
|  | 5.855GHz-5.875GHz | 10dBm/MHz to -27*dBm/MHz<br>(105.6dBuV/m to 68.2* dBuV/m) | Peak |
|  | 5.875GHz-5.925GHz | -27 dBm/MHz(68.2dBuV/m)@3m                                | Peak |

**Remark:**

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

(3)Above 1GHz limit: $E[dBuV/m] = EIRP[dBm] + 95.2 = 68.2 \text{ dBuV/m}$ , for  $EIPR[dBm] = -27 \text{ dBm}$ .

## 4.2. Test Setup

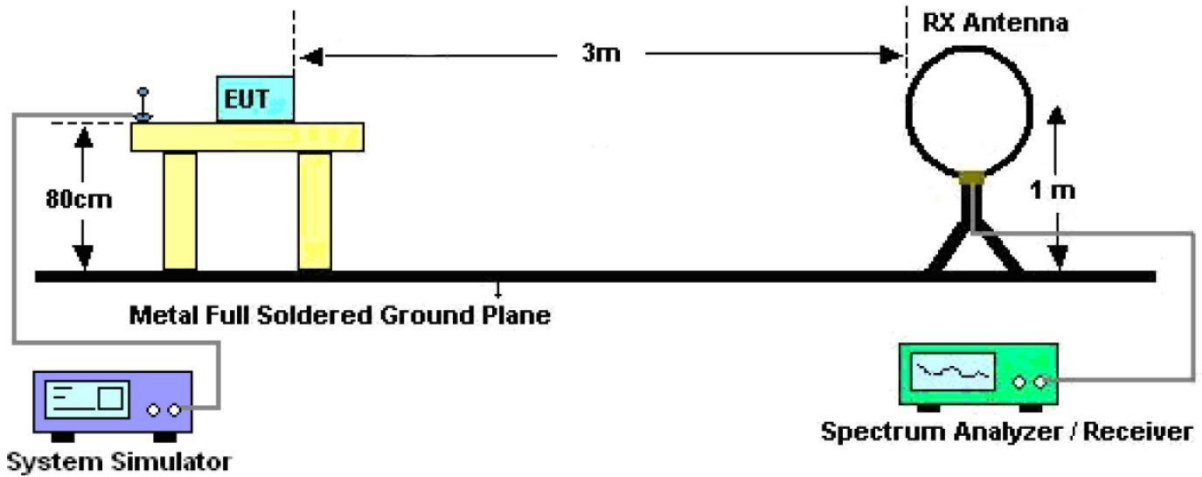


Figure 1. Below 30MHz

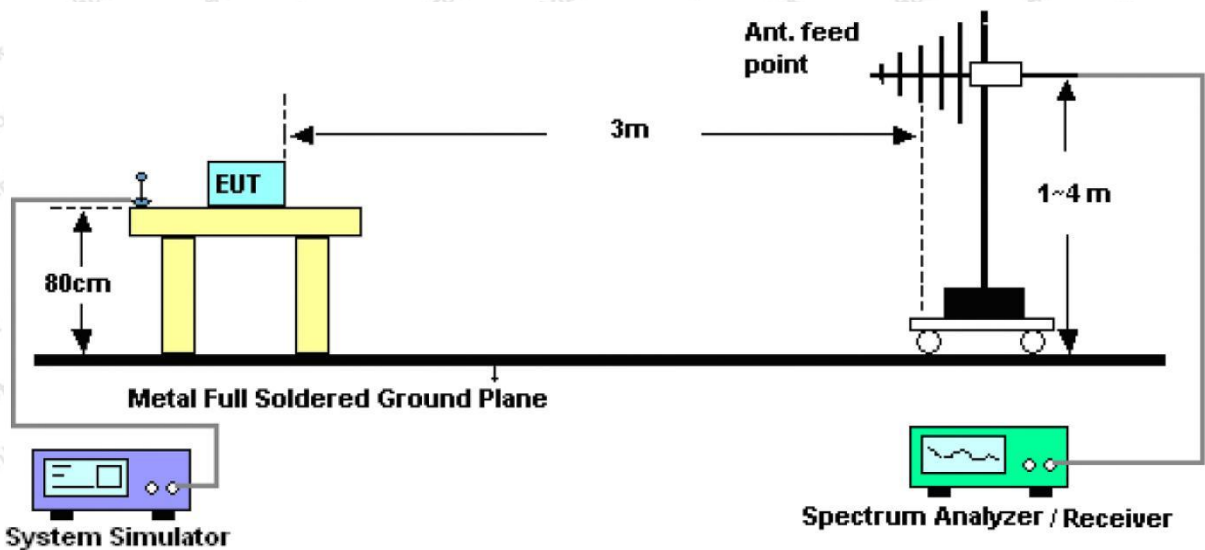


Figure 2. 30MHz to 1GHz

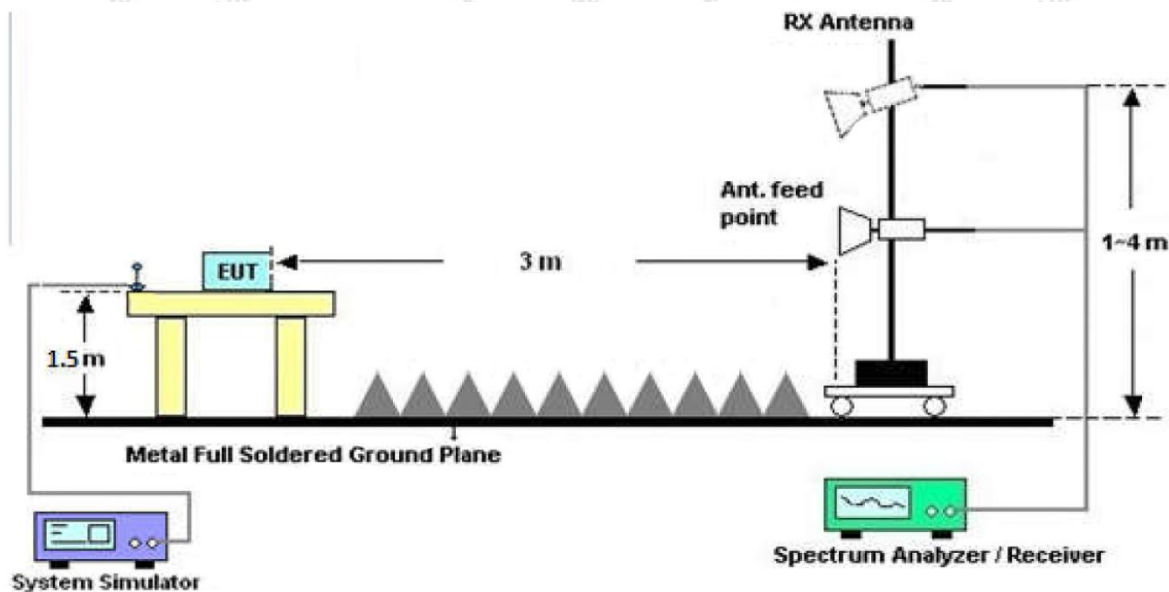


Figure 3. Above 1 GHz

### 4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9\*6\*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.



For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW = 300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

RBW = 1MHz, VBW = 10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

#### 4.4. Test Data

##### PASS

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Note: During the test, pre-scan all modes, and found the 802.11ac (HT20) CH157 which is the worst case, only the worst case is recorded in the report.

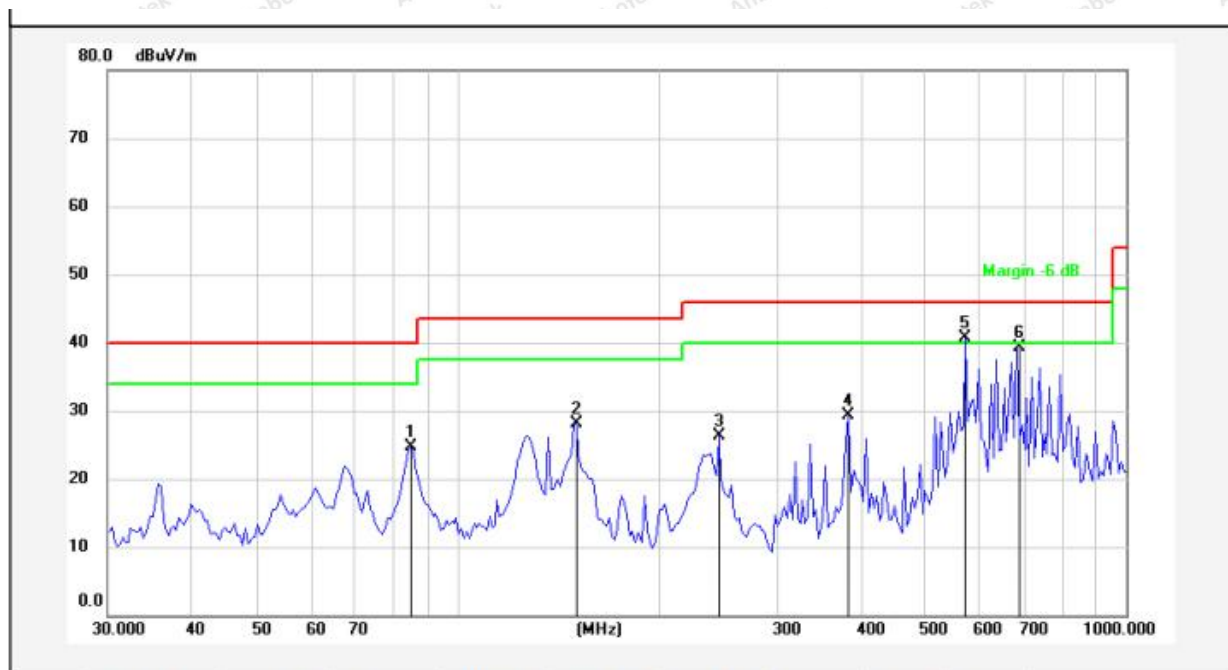
**Test Results (30~1000MHz)**

Test Mode: 802.11ac (HT20) CH157

Power Source: DC 3.7V battery inside

Polarization: Vertical

Temp.(°C)/Hum.(%RH): 24.2°C/57%RH



| No. | Freq. (MHz) | Reading (dBuV) | Factor ( ) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|----------------|------------|-----------------|----------------|-----------------|----------|-------------|--------------|--------|
| 1   | 85.1486     | 43.24          | -18.62     | 24.62           | 40.00          | -15.38          | QP       | 100         | 0            |        |
| 2   | 149.2239    | 48.41          | -20.37     | 28.04           | 43.50          | -15.46          | QP       | 100         | 360          |        |
| 3   | 245.9509    | 42.60          | -16.20     | 26.40           | 46.00          | -19.60          | QP       | 100         | 0            |        |
| 4   | 384.6055    | 44.45          | -15.16     | 29.29           | 46.00          | -16.71          | QP       | 100         | 360          |        |
| 5   | 575.6342    | 53.34          | -12.64     | 40.70           | 46.00          | -5.30           | QP       | 100         | 0            |        |
| 6   | 685.9470    | 50.87          | -11.49     | 39.38           | 46.00          | -6.62           | QP       | 100         | 360          |        |

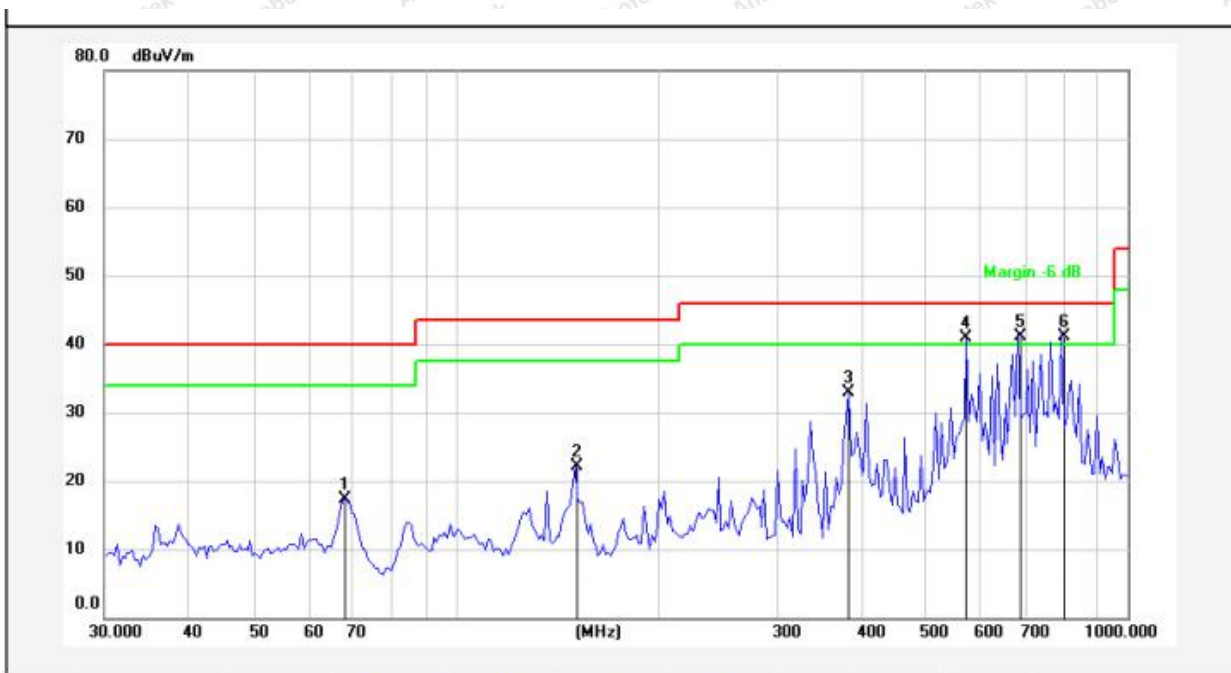
## Test Results (30~1000MHz)

Test Mode: 802.11ac (HT20) CH157

Power Source: DC 3.7V battery inside

Polarization: Horizontal

Temp.(°C)/Hum.(%RH): 24.2°C/57%RH



| No. | Freq. (MHz) | Reading (dBuV) | Factor (°) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|----------------|------------|-----------------|----------------|-----------------|----------|-------------|--------------|--------|
| 1   | 68.3908     | 37.03          | -19.75     | 17.28           | 40.00          | -22.72          | QP       | 100         | 0            |        |
| 2   | 150.5378    | 42.52          | -20.33     | 22.19           | 43.50          | -21.31          | QP       | 100         | 360          |        |
| 3   | 384.6055    | 48.05          | -15.16     | 32.89           | 46.00          | -13.11          | QP       | 100         | 0            |        |
| 4   | 575.6342    | 53.57          | -12.64     | 40.93           | 46.00          | -5.07           | QP       | 100         | 360          |        |
| 5   | 685.9470    | 52.56          | -11.49     | 41.07           | 46.00          | -4.93           | QP       | 100         | 0            |        |
| 6   | 796.1830    | 50.09          | -9.04      | 41.05           | 46.00          | -4.95           | QP       | 100         | 360          |        |



## Test Results (Above 1000MHz)

| Test Mode: IEEE 802.11ac (HT20) |                |               |                 | Test channel: Low CH |                 |              |
|---------------------------------|----------------|---------------|-----------------|----------------------|-----------------|--------------|
| Peak value:                     |                |               |                 |                      |                 |              |
| Frequency (MHz)                 | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)  | Over Limit (dB) | polarization |
| 11490.000                       | 28.39          | 23.36         | 51.75           | 68.20                | -16.45          | V            |
| 17235.000                       | 29.63          | 31.97         | 61.60           | 68.20                | -6.60           | V            |
| 11490.000                       | 28.69          | 23.36         | 52.05           | 68.20                | -16.15          | H            |
| 17235.000                       | 29.91          | 31.97         | 61.88           | 68.20                | -6.32           | H            |
| Average value:                  |                |               |                 |                      |                 |              |
| Frequency (MHz)                 | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)       | Over limit(dB)  | polarization |
| 11490.000                       | 17.58          | 23.36         | 40.94           | 54.00                | -13.06          | V            |
| 17235.000                       | 18.24          | 31.97         | 50.21           | 54.00                | -3.79           | V            |
| 11490.000                       | 17.72          | 23.36         | 41.08           | 54.00                | -12.92          | H            |
| 17235.000                       | 17.92          | 31.97         | 49.89           | 54.00                | -4.11           | H            |

| Test Mode: IEEE 802.11ac (HT20) |                |               |                 | Test channel: Middle CH |                 |              |
|---------------------------------|----------------|---------------|-----------------|-------------------------|-----------------|--------------|
| Peak value:                     |                |               |                 |                         |                 |              |
| Frequency (MHz)                 | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)     | Over Limit (dB) | polarization |
| 11570.000                       | 28.97          | 23.42         | 52.39           | 68.20                   | -15.81          | V            |
| 17355.000                       | 29.51          | 32.18         | 61.69           | 68.20                   | -6.51           | V            |
| 11570.000                       | 28.89          | 23.42         | 52.31           | 68.20                   | -15.89          | H            |
| 17355.000                       | 30.00          | 32.18         | 62.18           | 68.20                   | -6.02           | H            |
| Average value:                  |                |               |                 |                         |                 |              |
| Frequency (MHz)                 | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)          | Over limit(dB)  | polarization |
| 11570.000                       | 18.853         | 23.42         | 42.27           | 54.00                   | -11.73          | V            |
| 17355.000                       | 18.563         | 32.18         | 50.74           | 54.00                   | -3.26           | V            |
| 11570.000                       | 18.708         | 23.42         | 42.13           | 54.00                   | -11.87          | H            |
| 17355.000                       | 18.303         | 32.18         | 50.48           | 54.00                   | -3.52           | H            |

Test Mode: IEEE 802.11ac (HT20)

Test channel: High CH

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 11650.000       | 28.48          | 23.49         | 51.97           | 68.20               | -16.23          | V            |
| 17475.000       | 29.75          | 32.39         | 62.14           | 68.20               | -6.06           | V            |
| 11650.000       | 28.63          | 23.49         | 52.12           | 68.20               | -16.08          | H            |
| 17475.000       | 29.61          | 32.39         | 62.00           | 68.20               | -6.20           | H            |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over limit(dB) | polarization |
|-----------------|----------------|---------------|-----------------|----------------|----------------|--------------|
| 11650.000       | 17.92          | 23.49         | 41.41           | 54.00          | -12.59         | V            |
| 17475.000       | 18.36          | 32.39         | 50.75           | 54.00          | -3.25          | V            |
| 11650.000       | 17.89          | 23.49         | 41.38           | 54.00          | -12.62         | H            |
| 17475.000       | 18.27          | 32.39         | 50.66           | 54.00          | -3.34          | H            |

Remark:

1. During the test, pre-scan the 802.11a, 802.11n(HT20), ac(HT20), n(HT40), ac(HT40), ac(HT80) mode, and found the 802.11ac (HT20) mode is worse case , the report only record this mode.
2. Result = Reading + Factor

**Radiated Band Edge:****5.2G:**

| Test Mode: 802.11a |                |               |                 | Test channel: Lowest |                 |              |
|--------------------|----------------|---------------|-----------------|----------------------|-----------------|--------------|
| Peak value:        |                |               |                 |                      |                 |              |
| Frequency (MHz)    | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)  | Over Limit (dB) | Polarization |
| 5150.00            | 36.73          | 15.99         | 52.72           | 68.20                | -15.48          | Horizontal   |
| 5150.00            | 38.76          | 15.99         | 54.75           | 68.20                | -13.45          | Vertical     |
| Average value:     |                |               |                 |                      |                 |              |
| Frequency (MHz)    | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)       | Over Limit (dB) | Polarization |
| 5150.00            | 26.74          | 15.99         | 42.73           | 54.00                | -11.27          | Horizontal   |
| 5150.00            | 28.72          | 15.99         | 44.71           | 54.00                | -9.29           | Vertical     |

| Test Mode: 802.11a |                |               |                 | Test channel: Highest |                 |              |
|--------------------|----------------|---------------|-----------------|-----------------------|-----------------|--------------|
| Peak value:        |                |               |                 |                       |                 |              |
| Frequency (MHz)    | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)   | Over Limit (dB) | Polarization |
| 5350.00            | 37.25          | 16.43         | 53.68           | 68.20                 | -14.52          | Horizontal   |
| 5350.00            | 40.03          | 16.43         | 56.46           | 68.20                 | -11.74          | Vertical     |
| Average value:     |                |               |                 |                       |                 |              |
| Frequency (MHz)    | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)        | Over Limit (dB) | Polarization |
| 5350.00            | 28.48          | 16.43         | 44.91           | 54.00                 | -9.09           | Horizontal   |
| 5350.00            | 29.47          | 16.43         | 45.90           | 54.00                 | -8.10           | Vertical     |

Remark: 1. Result = Reading + Factor



| Test Mode: 802.11n20 |                |               |                 | Test channel: Lowest |                 |              |
|----------------------|----------------|---------------|-----------------|----------------------|-----------------|--------------|
| Peak value:          |                |               |                 |                      |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)  | Over Limit (dB) | Polarization |
| 5150.00              | 35.77          | 15.99         | 51.76           | 68.20                | -16.44          | Horizontal   |
| 5150.00              | 37.09          | 15.99         | 53.08           | 68.20                | -15.12          | Vertical     |
| Average value:       |                |               |                 |                      |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)       | Over Limit (dB) | Polarization |
| 5150.00              | 26.49          | 15.99         | 42.48           | 54.00                | -11.52          | Horizontal   |
| 5150.00              | 27.50          | 15.99         | 43.49           | 54.00                | -10.51          | Vertical     |

| Test Mode: 802.11n20 |                |               |                 | Test channel: Highest |                 |              |
|----------------------|----------------|---------------|-----------------|-----------------------|-----------------|--------------|
| Peak value:          |                |               |                 |                       |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)   | Over Limit (dB) | Polarization |
| 5350.00              | 37.54          | 16.43         | 53.97           | 68.20                 | -14.23          | Horizontal   |
| 5350.00              | 38.63          | 16.43         | 55.06           | 68.20                 | -13.14          | Vertical     |
| Average value:       |                |               |                 |                       |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)        | Over Limit (dB) | Polarization |
| 5350.00              | 27.55          | 16.43         | 43.98           | 54.00                 | -10.02          | Horizontal   |
| 5350.00              | 28.94          | 16.43         | 45.37           | 54.00                 | -8.63           | Vertical     |

Remark: 1. Result = Reading + Factor

| Test Mode: 802.11n40 |                |               |                 | Test channel: Lowest |                 |              |
|----------------------|----------------|---------------|-----------------|----------------------|-----------------|--------------|
| Peak value:          |                |               |                 |                      |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)  | Over Limit (dB) | Polarization |
| 5150.00              | 36.20          | 15.99         | 52.19           | 68.20                | -16.01          | Horizontal   |
| 5150.00              | 38.07          | 15.99         | 54.06           | 68.20                | -14.14          | Vertical     |
| Average value:       |                |               |                 |                      |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)       | Over Limit (dB) | Polarization |
| 5150.00              | 26.75          | 15.99         | 42.74           | 54.00                | -11.26          | Horizontal   |
| 5150.00              | 28.63          | 15.99         | 44.62           | 54.00                | -9.38           | Vertical     |

| Test Mode: 802.11n40 |                |               |                 | Test channel: Highest |                 |              |
|----------------------|----------------|---------------|-----------------|-----------------------|-----------------|--------------|
| Peak value:          |                |               |                 |                       |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)   | Over Limit (dB) | Polarization |
| 5350.00              | 37.90          | 16.43         | 54.33           | 68.20                 | -13.87          | Horizontal   |
| 5350.00              | 36.83          | 16.43         | 53.26           | 68.20                 | -14.94          | Vertical     |
| Average value:       |                |               |                 |                       |                 |              |
| Frequency (MHz)      | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)        | Over Limit (dB) | Polarization |
| 5350.00              | 28.00          | 16.43         | 44.43           | 54.00                 | -9.57           | Horizontal   |
| 5350.00              | 29.15          | 16.43         | 45.58           | 54.00                 | -8.42           | Vertical     |

Remark: 1. Result = Reading + Factor

| Test Mode: 802.11ac(HT20) |                |               |                 | Test channel: Lowest |                 |              |
|---------------------------|----------------|---------------|-----------------|----------------------|-----------------|--------------|
| Peak value:               |                |               |                 |                      |                 |              |
| Frequency (MHz)           | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m)  | Over Limit (dB) | Polarization |
| 5150.00                   | 36.64          | 15.99         | 52.63           | 68.20                | -15.57          | Horizontal   |
| 5150.00                   | 38.34          | 15.99         | 54.33           | 68.20                | -13.87          | Vertical     |
| Average value:            |                |               |                 |                      |                 |              |
| Frequency (MHz)           | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)       | Over Limit (dB) | Polarization |
| 5150.00                   | 26.40          | 15.99         | 42.39           | 54.00                | -11.61          | Horizontal   |
| 5150.00                   | 28.50          | 15.99         | 44.49           | 54.00                | -9.51           | Vertical     |

| Test Mode: 802.11ac(HT20) |                   |                  |                    | Test channel: Highest  |                 |              |
|---------------------------|-------------------|------------------|--------------------|------------------------|-----------------|--------------|
| Peak value:               |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit (dB) | Polarization |
| 5350.00                   | 37.72             | 16.43            | 54.15              | 68.20                  | -14.05          | Horizontal   |
| 5350.00                   | 37.99             | 16.43            | 54.42              | 68.20                  | -13.78          | Vertical     |
| Average value:            |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)         | Over Limit (dB) | Polarization |
| 5350.00                   | 27.58             | 16.43            | 44.01              | 54.00                  | -9.99           | Horizontal   |
| 5350.00                   | 28.06             | 16.43            | 44.49              | 54.00                  | -9.51           | Vertical     |

Remark: 1. Result = Reading + Factor



Test Mode: 802.11ac(HT40)

Test channel: Lowest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 5150.00         | 35.61          | 15.99         | 51.60           | 68.20               | -16.60          | Horizontal   |
| 5150.00         | 36.15          | 15.99         | 52.14           | 68.20               | -16.06          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5150.00         | 25.68          | 15.99         | 41.67           | 54.00          | -12.33          | Horizontal   |
| 5150.00         | 26.53          | 15.99         | 42.52           | 54.00          | -11.48          | Vertical     |

Test Mode: 802.11ac(HT40)

Test channel: Highest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 5350.00         | 37.80          | 16.43         | 54.23           | 68.20               | -13.97          | Horizontal   |
| 5350.00         | 37.02          | 16.43         | 53.45           | 68.20               | -14.75          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5350.00         | 27.33          | 16.43         | 43.76           | 54.00          | -10.24          | Horizontal   |
| 5350.00         | 27.10          | 16.43         | 43.53           | 54.00          | -10.47          | Vertical     |



|                           |                   |                  |                    |                        |                 |              |
|---------------------------|-------------------|------------------|--------------------|------------------------|-----------------|--------------|
| Test Mode: 802.11ac(HT80) |                   |                  |                    | Test channel: Lowest   |                 |              |
| Peak value:               |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit (dB) | Polarization |
| 5150.00                   | 35.86             | 15.99            | 51.85              | 68.20                  | -16.35          | Horizontal   |
| 5150.00                   | 36.08             | 15.99            | 52.07              | 68.20                  | -16.13          | Vertical     |
| Average value:            |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)         | Over Limit (dB) | Polarization |
| 5150.00                   | 26.20             | 15.99            | 42.19              | 54.00                  | -11.81          | Horizontal   |
| 5150.00                   | 26.58             | 15.99            | 42.57              | 54.00                  | -11.43          | Vertical     |

|                           |                   |                  |                    |                        |                 |              |
|---------------------------|-------------------|------------------|--------------------|------------------------|-----------------|--------------|
| Test Mode: 802.11ac(HT80) |                   |                  |                    | Test channel: Highest  |                 |              |
| Peak value:               |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit (dB) | Polarization |
| 5350.00                   | 37.94             | 16.43            | 54.37              | 68.20                  | -13.83          | Horizontal   |
| 5350.00                   | 37.16             | 16.43            | 53.59              | 68.20                  | -14.61          | Vertical     |
| Average value:            |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)         | Over Limit (dB) | Polarization |
| 5350.00                   | 28.37             | 16.43            | 44.80              | 54.00                  | -9.20           | Horizontal   |
| 5350.00                   | 27.85             | 16.43            | 44.28              | 54.00                  | -9.72           | Vertical     |

Remark: 1. Result = Reading + Factor

**5.8G:**

|                    |                   |                  |                    |                        |                 |              |
|--------------------|-------------------|------------------|--------------------|------------------------|-----------------|--------------|
| Test Mode: 802.11a |                   |                  |                    | Test channel: Lowest   |                 |              |
| Peak value:        |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit (dB) | Polarization |
| 5725.00            | 36.70             | 17.21            | 53.91              | 68.20                  | -14.30          | Horizontal   |
| 5725.00            | 38.72             | 17.21            | 55.93              | 68.20                  | -12.28          | Vertical     |
| Average value:     |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)         | Over Limit (dB) | Polarization |
| 5725.00            | 26.71             | 17.21            | 43.92              | 54.00                  | -10.08          | Horizontal   |
| 5725.00            | 28.69             | 17.21            | 45.90              | 54.00                  | -8.11           | Vertical     |

|                    |                   |                  |                    |                        |                 |              |
|--------------------|-------------------|------------------|--------------------|------------------------|-----------------|--------------|
| Test Mode: 802.11a |                   |                  |                    | Test channel: Highest  |                 |              |
| Peak value:        |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit (dB) | Polarization |
| 5850.00            | 37.22             | 16.43            | 53.65              | 68.20                  | -14.55          | Horizontal   |
| 5850.00            | 39.99             | 16.43            | 56.42              | 68.20                  | -11.79          | Vertical     |
| Average value:     |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)         | Over Limit (dB) | Polarization |
| 5850.00            | 28.44             | 16.43            | 44.87              | 54.00                  | -9.13           | Horizontal   |
| 5850.00            | 29.44             | 16.43            | 45.87              | 54.00                  | -8.13           | Vertical     |

Remark: 1. Result = Reading + Factor



|                      |                   |                  |                    |                        |                 |              |
|----------------------|-------------------|------------------|--------------------|------------------------|-----------------|--------------|
| Test Mode: 802.11n20 |                   |                  |                    | Test channel: Lowest   |                 |              |
| Peak value:          |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)   | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit (dB) | Polarization |
| 5725.00              | 35.75             | 15.99            | 51.74              | 68.20                  | -16.47          | Horizontal   |
| 5725.00              | 37.06             | 15.99            | 53.05              | 68.20                  | -15.15          | Vertical     |
| Average value:       |                   |                  |                    |                        |                 |              |
| Frequency<br>(MHz)   | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)         | Over Limit (dB) | Polarization |
| 5725.00              | 26.47             | 15.99            | 42.46              | 54.00                  | -11.55          | Horizontal   |
| 5725.00              | 27.48             | 15.99            | 43.47              | 54.00                  | -10.53          | Vertical     |

|                      |                   |                  |                    |                       |                 |              |
|----------------------|-------------------|------------------|--------------------|-----------------------|-----------------|--------------|
| Test Mode: 802.11n20 |                   |                  |                    | Test channel: Highest |                 |              |
| Peak value:          |                   |                  |                    |                       |                 |              |
| Frequency<br>(MHz)   | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)     | Over Limit (dB) | Polarization |
| 5850.00              | 37.52             | 16.43            | 53.95              | 68.20                 | -14.26          | Horizontal   |
| 5850.00              | 38.61             | 16.43            | 55.04              | 68.20                 | -13.17          | Vertical     |
| Average value:       |                   |                  |                    |                       |                 |              |
| Frequency<br>(MHz)   | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)     | Over Limit (dB) | Polarization |
| 5850.00              | 27.52             | 16.43            | 43.95              | 54.00                 | -10.05          | Horizontal   |
| 5850.00              | 28.90             | 16.43            | 45.33              | 54.00                 | -8.68           | Vertical     |

Remark: 1. Result = Reading + Factor

Test Mode: 802.11n40

Test channel: Lowest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 5725.00         | 36.16          | 15.99         | 52.15           | 68.20               | -16.05          | Horizontal   |
| 5725.00         | 38.04          | 15.99         | 54.03           | 68.20               | -14.18          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 5725.00         | 26.71          | 15.99         | 42.70           | 54.00               | -11.31          | Horizontal   |
| 5725.00         | 28.62          | 15.99         | 44.61           | 54.00               | -9.40           | Vertical     |

Test Mode: 802.11n40

Test channel: Highest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 5850.00         | 37.87          | 16.43         | 54.30           | 68.20               | -13.90          | Horizontal   |
| 5850.00         | 36.82          | 16.43         | 53.25           | 68.20               | -14.96          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|---------------------|-----------------|--------------|
| 5850.00         | 27.96          | 16.43         | 44.39           | 54.00               | -9.62           | Horizontal   |
| 5850.00         | 29.11          | 16.43         | 45.54           | 54.00               | -8.47           | Vertical     |

Remark: 1. Result = Reading + Factor

Test Mode: 802.11ac(HT20)

Test channel: Lowest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5725.00         | 36.60          | 15.99         | 52.59           | 68.20          | -15.62          | Horizontal   |
| 5725.00         | 38.30          | 15.99         | 54.29           | 68.20          | -13.92          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5725.00         | 26.38          | 15.99         | 42.37           | 54.00          | -11.64          | Horizontal   |
| 5725.00         | 28.47          | 15.99         | 44.46           | 54.00          | -9.55           | Vertical     |

Test Mode: 802.11ac(HT20)

Test channel: Highest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5850.00         | 37.70          | 16.43         | 54.13           | 68.20          | -14.08          | Horizontal   |
| 5850.00         | 37.97          | 16.43         | 54.40           | 68.20          | -13.80          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5850.00         | 27.56          | 16.43         | 43.99           | 54.00          | -10.02          | Horizontal   |
| 5850.00         | 28.02          | 16.43         | 44.45           | 54.00          | -9.56           | Vertical     |

Remark: 1. Result = Reading + Factor



|                           |                   |                  |                    |                      |                 |              |
|---------------------------|-------------------|------------------|--------------------|----------------------|-----------------|--------------|
| Test Mode: 802.11ac(HT40) |                   |                  |                    | Test channel: Lowest |                 |              |
| Peak value:               |                   |                  |                    |                      |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)       | Over Limit (dB) | Polarization |
| 5725.00                   | 35.57             | 15.99            | 51.56              | 68.20                | -16.64          | Horizontal   |
| 5725.00                   | 36.12             | 15.99            | 52.11              | 68.20                | -16.09          | Vertical     |
| Average value:            |                   |                  |                    |                      |                 |              |
| Frequency<br>(MHz)        | Reading<br>(dBuV) | Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit (dBuV/m)       | Over Limit (dB) | Polarization |
| 5725.00                   | 25.63             | 15.99            | 41.62              | 54.00                | -12.39          | Horizontal   |
| 5725.00                   | 26.49             | 15.99            | 42.48              | 54.00                | -11.52          | Vertical     |

| Test Mode: 802.11ac(HT40) |                |               |                 | Test channel: Highest |                 |              |
|---------------------------|----------------|---------------|-----------------|-----------------------|-----------------|--------------|
| Peak value:               |                |               |                 |                       |                 |              |
| Frequency (MHz)           | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)        | Over Limit (dB) | Polarization |
| 5850.00                   | 37.77          | 16.43         | 54.20           | 68.20                 | -14.00          | Horizontal   |
| 5850.00                   | 37.00          | 16.43         | 53.43           | 68.20                 | -14.78          | Vertical     |
| Average value:            |                |               |                 |                       |                 |              |
| Frequency (MHz)           | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m)        | Over Limit (dB) | Polarization |
| 5850.00                   | 27.31          | 16.43         | 43.74           | 54.00                 | -10.27          | Horizontal   |
| 5850.00                   | 27.05          | 16.43         | 43.48           | 54.00                 | -10.52          | Vertical     |

Remark: 1. Result = Reading + Factor

Test Mode: 802.11ac(HT80)

Test channel: Lowest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5725.00         | 35.84          | 15.99         | 51.83           | 68.20          | -16.38          | Horizontal   |
| 5725.00         | 36.04          | 15.99         | 52.03           | 68.20          | -16.18          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5725.00         | 26.15          | 15.99         | 42.14           | 54.00          | -11.86          | Horizontal   |
| 5725.00         | 26.55          | 15.99         | 42.54           | 54.00          | -11.47          | Vertical     |

Test Mode: 802.11ac(HT80)

Test channel: Highest

Peak value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5850.00         | 37.90          | 16.43         | 54.33           | 68.20          | -13.88          | Horizontal   |
| 5850.00         | 37.12          | 16.43         | 53.55           | 68.20          | -14.65          | Vertical     |

Average value:

| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------|-----------------|----------------|-----------------|--------------|
| 5850.00         | 28.31          | 16.43         | 44.74           | 54.00          | -9.26           | Horizontal   |
| 5850.00         | 27.82          | 16.43         | 44.25           | 54.00          | -9.76           | Vertical     |

Remark: 1. Result = Reading + Factor

Conducted Measurement:

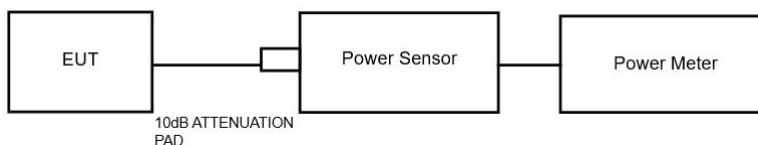
Please refer to Appendix D of the Appendix Test Data.

## 5. Maximum Peak Output Power Test

### 5.1. Test Standard and Limit

| Test Standard | FCC Part15 C Section 15.407(a) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Limit    | 5.15 - 5.25GHz                 | 1) Outdoor AP<br>The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if $GT_x > 6\text{dBi}$ , then $P_{out} = 30 - (GT_x - 6)$ . e.i.r.p. at any elevation angle above 30 degrees $\leq 125\text{mW}$ (21dBm)<br>2) Indoor AP<br>The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if $GT_x > 6\text{dBi}$ , then $P_{out} = 30 - (GT_x - 6)$ .<br>3) Point-to-point AP<br>The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if $GT_x > 23\text{dBi}$ , then $P_{out} = 30 - (GT_x - 23)$ .<br>4) Client devices<br>The maximum conducted output power (Pout) shall not exceed the lesser of 250W (24dBm). if $GT_x > 6\text{dBi}$ , then $P_{out} = 24 - (GT_x - 6)$ . |
|               | 5.25 - 5.35GHz                 | The maximum conducted output power (Pout) shall not exceed the lesser of 250mW (24dBm) or $11\text{dBm} + 10 \log B$ , where B is the 26dB emission bandwidth in MHz. if $GT_x > 6\text{dBi}$ , then $P_{out} = 24 - (GT_x - 6)$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|               | 5.47- 5.725GHz                 | The maximum conducted output power (Pout) shall not exceed the lesser of 250mW (24dBm) or $11\text{dBm} + 10 \log B$ , where B is the 26dB emission bandwidth in MHz. if $GT_x > 6\text{dBi}$ , then $P_{out} = 24 - (GT_x - 6)$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|               | 5.725 - 5.85GHz                | 1) Point-to-multipoint systems (P2M)<br>The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if $GT_x > 6\text{dBi}$ , then $P_{out} = 30 - (GT_x - 6)$ .<br>2) Point-to-point systems (P2P)<br>The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm).                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### 5.2. Test Setup





### 5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

### 5.4. Test Data

Pass

Please refer to Appendix B of the Appendix Test Data.

#### Additional test for duty cycle.

Please refer to Appendix E of the Appendix Test Data.

Note: The EUT does not support the TPC function.

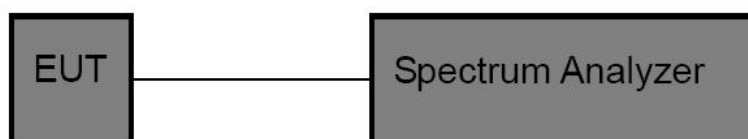


## 6. Occupy Bandwidth Test

### 6.1. Test Standard

|               |                                    |
|---------------|------------------------------------|
| Test Standard | FCC Part15 C Section 15.407 (a)(5) |
|---------------|------------------------------------|

### 6.2. Test Setup



### 6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as:

#### 26 dB & 99% bandwidth

RBW = approximately 1% of the emission bandwidth;

Set the VBW > RBW;

Detector= Peak

Trace mode= Max hold.

Sweep- auto couple.

#### 6 dB bandwidth

RBW = approximately 1% of the emission bandwidth;

Set the VBW > RBW;

Detector= Peak

Trace mode= Max hold.

Sweep- auto couple.

4. Measure the maximum width of the emission that is 26dB /6dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer.

5. Repeat until all the rest channels are investigated.

### 6.4. Test Data

Pass

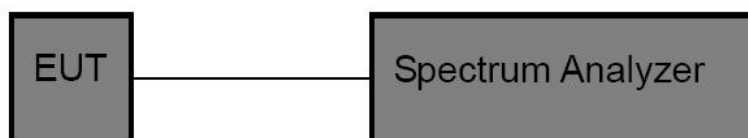
Please refer to Appendix A1&A2&A3 of the Appendix Test Data.

## 7. Power Spectral Density Test

### 7.1. Test Standard and Limit

| Test Standard | FCC Part15 C Section 15.407(a) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Limit    | 5.15 - 5.25GHz                 | 1) Outdoor AP<br>The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz. if $GT_x > 6\text{dBi}$ , then $PSD = 17 - (GT_x - 6)$ .<br>2) Indoor AP<br>The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz. if $GT_x > 6\text{dBi}$ , then $PSD = 17 - (GT_x - 6)$ .<br>3) Point-to-point AP<br>The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz. if $GT_x > 23\text{dBi}$ , then $PSD = 17 - (GT_x - 23)$ .<br>4) Client devices<br>The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz. if $GT_x > 6\text{dBi}$ , then $PSD = 11 - (GT_x - 6)$ . |
|               | 5.25 - 5.35GHz                 | The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz. if $GT_x > 6\text{dBi}$ , then $PSD = 11 - (GT_x - 6)$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|               | 5.47- 5.725GHz                 | The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz. if $GT_x > 6\text{dBi}$ , then $PSD = 11 - (GT_x - 6)$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|               | 5.725 - 5.85GHz                | 1) Point-to-multipoint systems (P2M)<br>The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz. if $GT_x > 6\text{dBi}$ , then $PSD = 30 - (GT_x - 6)$ .<br>2) Point-to-point systems (P2P)<br>The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.                                                                                                                                                                                                                                                                                                                                                 |

### 7.2. Test Setup



### 7.3. Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided



that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz).

1. The EUT is directly connected to the spectrum analyzer;
2. Set RBW =1MHz(for WIFI 5.2G&5.3G&5.6G) or Set RBW =300kHz(for WIFI 5.8G);
3. Set VBW  $\geq$  3 RBW=3MHz(for WIFI 5.2G&5.3G&5.6G) or Set VBW  $\geq$  3 RBW=1MHz (for WIFI 5.8G);
3. Set the span to encompass the entire emissions bandwidth (EBW) of the signal;
5. Detector=RMS;
6. Sweep time= auto couple;
7. Trace mode=max. hold;

#### 7.4. Test Data

Pass

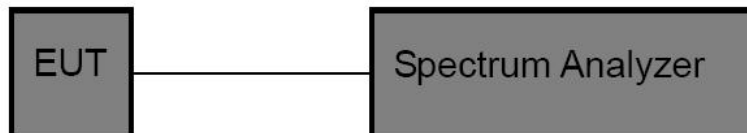
Please refer to Appendix C of the Appendix Test Data.

## 8. Frequency Stability

### 8.1. Test Standard and Limit

|               |                                                                                                                                                                                                                                                                                                         |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Standard | FCC Part15 Section 15.407(g) &Part2 J Section 2.1055                                                                                                                                                                                                                                                    |
| Test Limit    | The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. |

### 8.2. Test Setup



### 8.3. Test Procedure

The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage.

b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

### 8.4. Test Data

Pass

Please to see the following pages.

| Test Mode: 5.2G |         |                 |                  |               |                          |              |         |
|-----------------|---------|-----------------|------------------|---------------|--------------------------|--------------|---------|
| Mode            | TX Type | Frequency (MHz) | Temperature (°C) | Voltage (VDC) | Measured Frequency (MHz) | Limit        | Verdict |
| 802.11a         | SISO    | 5180            | 20               | 4.07          | 5180.11                  | 5172 to 5188 | Pass    |
|                 |         |                 |                  | 3.70          | 5180.06                  | 5172 to 5188 | Pass    |
|                 |         |                 |                  | 3.33          | 5180.11                  | 5172 to 5188 | Pass    |
|                 |         |                 | -30              | 3.70          | 5180.13                  | 5172 to 5188 | Pass    |
|                 |         |                 | -20              | 3.70          | 5180.03                  | 5150 to 5250 | Pass    |
|                 |         |                 | -10              | 3.70          | 5180.04                  | 5150 to 5250 | Pass    |
|                 |         |                 | 0                | 3.70          | 5180.06                  | 5150 to 5250 | Pass    |
|                 |         |                 | 10               | 3.70          | 5180.08                  | 5150 to 5250 | Pass    |
|                 |         |                 | 30               | 3.70          | 5180.12                  | 5150 to 5250 | Pass    |
|                 |         |                 | 40               | 3.70          | 5180.13                  | 5150 to 5250 | Pass    |
|                 |         |                 | 50               | 3.70          | 5180.08                  | 5172 to 5188 | Pass    |
|                 |         | 5200            | 20               | 4.07          | 5200.10                  | 5192 to 5208 | Pass    |
|                 |         |                 |                  | 3.70          | 5200.13                  | 5192 to 5208 | Pass    |
|                 |         |                 |                  | 3.33          | 5200.11                  | 5192 to 5208 | Pass    |
|                 |         |                 | -30              | 3.70          | 5200.07                  | 5192 to 5208 | Pass    |
|                 |         |                 | -20              | 3.70          | 5200.01                  | 5150 to 5250 | Pass    |
|                 |         |                 | -10              | 3.70          | 5200.04                  | 5150 to 5250 | Pass    |
|                 |         |                 | 0                | 3.70          | 5200.03                  | 5150 to 5250 | Pass    |
|                 |         |                 | 10               | 3.70          | 5200.12                  | 5150 to 5250 | Pass    |
|                 |         |                 | 30               | 3.70          | 5200.02                  | 5150 to 5250 | Pass    |
|                 |         |                 | 40               | 3.70          | 5200.08                  | 5150 to 5250 | Pass    |
|                 |         |                 | 50               | 3.70          | 5200.13                  | 5192 to 5208 | Pass    |
|                 |         | 5240            | 20               | 4.07          | 5240.13                  | 5232 to 5248 | Pass    |
|                 |         |                 |                  | 3.70          | 5240.02                  | 5232 to 5248 | Pass    |
|                 |         |                 |                  | 3.33          | 5240.01                  | 5232 to 5248 | Pass    |
|                 |         |                 | -30              | 3.70          | 5240.08                  | 5232 to 5248 | Pass    |
|                 |         |                 | -20              | 3.70          | 5240.09                  | 5150 to 5250 | Pass    |
|                 |         |                 | -10              | 3.70          | 5240.09                  | 5150 to 5250 | Pass    |
|                 |         |                 | 0                | 3.70          | 5240.11                  | 5150 to 5250 | Pass    |
|                 |         |                 | 10               | 3.70          | 5240.09                  | 5150 to 5250 | Pass    |
|                 |         |                 | 30               | 3.70          | 5240.02                  | 5150 to 5250 | Pass    |
|                 |         |                 | 40               | 3.70          | 5240.05                  | 5150 to 5250 | Pass    |
|                 |         |                 | 50               | 3.70          | 5240.08                  | 5232 to 5248 | Pass    |
| 802.11n (HT20)  | MIMO    | 5180            | 20               | 4.07          | 5180.04                  | 5172 to 5188 | Pass    |
|                 |         |                 |                  | 3.70          | 5180.03                  | 5172 to 5188 | Pass    |
|                 |         |                 |                  | 3.33          | 5180.04                  | 5172 to 5188 | Pass    |
|                 |         |                 | -30              | 3.70          | 5180.02                  | 5172 to 5188 | Pass    |
|                 |         |                 | -20              | 3.70          | 5180.09                  | 5150 to 5250 | Pass    |



|  |  |      |     |      |         |              |      |
|--|--|------|-----|------|---------|--------------|------|
|  |  |      | -10 | 3.70 | 5180.12 | 5150 to 5250 | Pass |
|  |  |      | 0   | 3.70 | 5180.04 | 5150 to 5250 | Pass |
|  |  |      | 10  | 3.70 | 5180.03 | 5150 to 5250 | Pass |
|  |  |      | 30  | 3.70 | 5180.06 | 5150 to 5250 | Pass |
|  |  |      | 40  | 3.70 | 5180.11 | 5150 to 5250 | Pass |
|  |  |      | 50  | 3.70 | 5180.09 | 5172 to 5188 | Pass |
|  |  | 5200 | 20  | 4.07 | 5200.02 | 5192 to 5208 | Pass |
|  |  |      |     | 3.70 | 5200.09 | 5192 to 5208 | Pass |
|  |  |      |     | 3.33 | 5200.04 | 5192 to 5208 | Pass |
|  |  |      | -30 | 3.70 | 5200.12 | 5192 to 5208 | Pass |
|  |  |      | -20 | 3.70 | 5200.03 | 5150 to 5250 | Pass |
|  |  |      | -10 | 3.70 | 5200.09 | 5150 to 5250 | Pass |
|  |  |      | 0   | 3.70 | 5200.02 | 5150 to 5250 | Pass |
|  |  |      | 10  | 3.70 | 5200.05 | 5150 to 5250 | Pass |
|  |  |      | 30  | 3.70 | 5200.13 | 5150 to 5250 | Pass |
|  |  |      | 40  | 3.70 | 5200.11 | 5150 to 5250 | Pass |
|  |  |      | 50  | 3.70 | 5200.06 | 5192 to 5208 | Pass |
|  |  | 5240 | 20  | 4.07 | 5240.00 | 5232 to 5248 | Pass |
|  |  |      |     | 3.70 | 5240.02 | 5232 to 5248 | Pass |
|  |  |      |     | 3.33 | 5240.02 | 5232 to 5248 | Pass |
|  |  |      | -30 | 3.70 | 5240.03 | 5232 to 5248 | Pass |
|  |  |      | -20 | 3.70 | 5240.09 | 5150 to 5250 | Pass |
|  |  |      | -10 | 3.70 | 5240.00 | 5150 to 5250 | Pass |
|  |  |      | 0   | 3.70 | 5240.11 | 5150 to 5250 | Pass |
|  |  |      | 10  | 3.70 | 5240.02 | 5150 to 5250 | Pass |
|  |  |      | 30  | 3.70 | 5240.10 | 5150 to 5250 | Pass |
|  |  |      | 40  | 3.70 | 5240.10 | 5150 to 5250 | Pass |
|  |  |      | 50  | 3.70 | 5240.06 | 5232 to 5248 | Pass |
|  |  | 5190 | 20  | 4.07 | 5190.08 | 5174 to 5206 | Pass |
|  |  |      |     | 3.70 | 5190.03 | 5174 to 5206 | Pass |
|  |  |      |     | 3.33 | 5190.04 | 5174 to 5206 | Pass |
|  |  |      | -30 | 3.70 | 5190.03 | 5174 to 5206 | Pass |
|  |  |      | -20 | 3.70 | 5190.03 | 5150 to 5250 | Pass |
|  |  |      | -10 | 3.70 | 5190.01 | 5150 to 5250 | Pass |
|  |  |      | 0   | 3.70 | 5190.02 | 5150 to 5250 | Pass |
|  |  |      | 10  | 3.70 | 5190.03 | 5150 to 5250 | Pass |
|  |  |      | 30  | 3.70 | 5190.09 | 5150 to 5250 | Pass |
|  |  |      | 40  | 3.70 | 5190.11 | 5150 to 5250 | Pass |
|  |  |      | 50  | 3.70 | 5190.04 | 5174 to 5206 | Pass |
|  |  | 5230 | 20  | 4.07 | 5230.03 | 5214 to 5246 | Pass |
|  |  |      |     | 3.70 | 5230.08 | 5214 to 5246 | Pass |

802.11n  
(HT40)

MIMO



|                     |      |      |     |      |         |              |      |
|---------------------|------|------|-----|------|---------|--------------|------|
|                     |      |      |     | 3.33 | 5230.05 | 5214 to 5246 | Pass |
|                     |      |      | -30 | 3.70 | 5230.02 | 5214 to 5246 | Pass |
|                     |      |      | -20 | 3.70 | 5230.05 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.70 | 5230.06 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5230.02 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5230.12 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5230.09 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5230.09 | 5150 to 5250 | Pass |
| 802.11ac<br>(VHT20) | MIMO | 5180 | 20  | 4.07 | 5180.12 | 5172 to 5188 | Pass |
|                     |      |      |     | 3.70 | 5180.03 | 5172 to 5188 | Pass |
|                     |      |      |     | 3.33 | 5180.12 | 5172 to 5188 | Pass |
|                     |      |      | -30 | 3.70 | 5180.09 | 5172 to 5188 | Pass |
|                     |      |      | -20 | 3.70 | 5180.04 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.70 | 5180.08 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5180.10 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5180.00 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5180.05 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5180.10 | 5150 to 5250 | Pass |
|                     |      |      | 50  | 3.70 | 5180.03 | 5172 to 5188 | Pass |
|                     |      | 5200 | 20  | 4.07 | 5200.02 | 5192 to 5208 | Pass |
|                     |      |      |     | 3.70 | 5200.13 | 5192 to 5208 | Pass |
|                     |      |      |     | 3.33 | 5200.09 | 5192 to 5208 | Pass |
|                     |      |      | -30 | 3.70 | 5200.12 | 5192 to 5208 | Pass |
|                     |      |      | -20 | 3.70 | 5200.09 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.70 | 5200.04 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5200.04 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5200.00 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5200.09 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5200.08 | 5150 to 5250 | Pass |
|                     |      |      | 50  | 3.70 | 5200.09 | 5192 to 5208 | Pass |
|                     |      | 5240 | 20  | 4.25 | 5240.03 | 5232 to 5248 | Pass |
|                     |      |      |     | 5.00 | 5240.13 | 5232 to 5248 | Pass |
|                     |      |      |     | 5.75 | 5240.07 | 5232 to 5248 | Pass |
|                     |      |      | -30 | 4.07 | 5240.10 | 5232 to 5248 | Pass |
|                     |      |      | -20 | 3.70 | 5240.04 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.33 | 5240.06 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5240.11 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5240.06 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5240.08 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5240.03 | 5150 to 5250 | Pass |





|                     |      |      |     |      |         |              |      |
|---------------------|------|------|-----|------|---------|--------------|------|
|                     |      |      | 50  | 3.70 | 5240.10 | 5232 to 5248 | Pass |
| 802.11ac<br>(VHT40) | MIMO | 5190 | 20  | 4.07 | 5190.11 | 5174 to 5206 | Pass |
|                     |      |      |     | 3.70 | 5190.12 | 5174 to 5206 | Pass |
|                     |      |      | 20  | 3.33 | 5190.02 | 5174 to 5206 | Pass |
|                     |      |      |     | 3.70 | 5190.04 | 5174 to 5206 | Pass |
|                     |      |      | -30 | 3.70 | 5190.04 | 5174 to 5206 | Pass |
|                     |      |      | -20 | 3.70 | 5190.10 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.70 | 5190.10 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5190.04 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5190.07 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5190.07 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5190.04 | 5150 to 5250 | Pass |
|                     |      |      | 50  | 3.70 | 5190.07 | 5174 to 5206 | Pass |
|                     |      | 5230 | 20  | 4.07 | 5230.07 | 5214 to 5246 | Pass |
|                     |      |      |     | 3.70 | 5230.07 | 5214 to 5246 | Pass |
|                     |      |      | 20  | 3.33 | 5230.12 | 5214 to 5246 | Pass |
|                     |      |      |     | 3.70 | 5230.05 | 5214 to 5246 | Pass |
|                     |      |      | -30 | 3.70 | 5230.05 | 5214 to 5246 | Pass |
|                     |      |      | -20 | 3.70 | 5230.09 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.70 | 5230.04 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5230.05 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5230.09 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5230.10 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5230.08 | 5150 to 5250 | Pass |
|                     |      |      | 50  | 3.70 | 5230.07 | 5214 to 5246 | Pass |
| 802.11ac<br>(VHT80) | MIMO | 5210 | 20  | 4.07 | 5210.10 | 5178 to 5242 | Pass |
|                     |      |      |     | 3.70 | 5210.04 | 5178 to 5242 | Pass |
|                     |      |      | 20  | 3.33 | 5210.05 | 5178 to 5242 | Pass |
|                     |      |      |     | 3.70 | 5210.13 | 5178 to 5242 | Pass |
|                     |      |      | -30 | 3.70 | 5210.13 | 5178 to 5242 | Pass |
|                     |      |      | -20 | 3.70 | 5210.12 | 5150 to 5250 | Pass |
|                     |      |      | -10 | 3.70 | 5210.00 | 5150 to 5250 | Pass |
|                     |      |      | 0   | 3.70 | 5210.13 | 5150 to 5250 | Pass |
|                     |      |      | 10  | 3.70 | 5210.01 | 5150 to 5250 | Pass |
|                     |      |      | 30  | 3.70 | 5210.03 | 5150 to 5250 | Pass |
|                     |      |      | 40  | 3.70 | 5210.00 | 5150 to 5250 | Pass |
|                     |      |      | 50  | 3.70 | 5210.10 | 5178 to 5242 | Pass |





| Test Mode: 5.8G   |         |                 |                  |               |                          |              |         |
|-------------------|---------|-----------------|------------------|---------------|--------------------------|--------------|---------|
| Mode              | Tx Type | Frequency (MHz) | Temperature (°C) | Voltage (VDC) | Measured Frequency (MHz) | Limit        | Verdict |
| 802.11a           | SISO    | 5745            | 20               | 4.07          | 5745.04                  | 5737 to 5753 | Pass    |
|                   |         |                 |                  | 3.70          | 5745.02                  | 5737 to 5753 | Pass    |
|                   |         |                 |                  | 3.33          | 5745.09                  | 5737 to 5753 | Pass    |
|                   |         |                 | -30              | 3.70          | 5745.03                  | 5737 to 5753 | Pass    |
|                   |         |                 | -20              | 3.70          | 5745.01                  | 5725 to 5850 | Pass    |
|                   |         |                 | -10              | 3.70          | 5745.12                  | 5725 to 5850 | Pass    |
|                   |         |                 | 0                | 3.70          | 5745.12                  | 5725 to 5850 | Pass    |
|                   |         |                 | 10               | 3.70          | 5745.03                  | 5725 to 5850 | Pass    |
|                   |         |                 | 30               | 3.70          | 5745.00                  | 5725 to 5850 | Pass    |
|                   |         |                 | 40               | 3.70          | 5745.08                  | 5725 to 5850 | Pass    |
|                   |         |                 | 50               | 3.70          | 5745.11                  | 5737 to 5753 | Pass    |
|                   |         | 5785            | 20               | 4.07          | 5785.05                  | 5777 to 5793 | Pass    |
|                   |         |                 |                  | 3.70          | 5785.12                  | 5777 to 5793 | Pass    |
|                   |         |                 |                  | 3.33          | 5785.09                  | 5777 to 5793 | Pass    |
|                   |         |                 | -30              | 3.70          | 5785.03                  | 5777 to 5793 | Pass    |
|                   |         |                 | -20              | 3.70          | 5785.06                  | 5725 to 5850 | Pass    |
|                   |         |                 | -10              | 3.70          | 5785.03                  | 5725 to 5850 | Pass    |
|                   |         |                 | 0                | 3.70          | 5785.02                  | 5725 to 5850 | Pass    |
|                   |         |                 | 10               | 3.70          | 5785.05                  | 5725 to 5850 | Pass    |
|                   |         |                 | 30               | 3.70          | 5785.01                  | 5725 to 5850 | Pass    |
|                   |         |                 | 40               | 3.70          | 5785.10                  | 5725 to 5850 | Pass    |
|                   |         |                 | 50               | 3.70          | 5785.07                  | 5777 to 5793 | Pass    |
|                   |         | 5825            | 20               | 4.07          | 5825.08                  | 5817 to 5833 | Pass    |
|                   |         |                 |                  | 3.70          | 5825.07                  | 5817 to 5833 | Pass    |
|                   |         |                 |                  | 3.33          | 5825.02                  | 5817 to 5833 | Pass    |
|                   |         |                 | -30              | 3.70          | 5825.05                  | 5817 to 5833 | Pass    |
|                   |         |                 | -20              | 3.70          | 5825.03                  | 5725 to 5850 | Pass    |
|                   |         |                 | -10              | 3.70          | 5825.02                  | 5725 to 5850 | Pass    |
|                   |         |                 | 0                | 3.70          | 5825.05                  | 5725 to 5850 | Pass    |
|                   |         |                 | 10               | 3.70          | 5825.05                  | 5725 to 5850 | Pass    |
|                   |         |                 | 30               | 3.70          | 5825.11                  | 5725 to 5850 | Pass    |
|                   |         |                 | 40               | 3.70          | 5825.10                  | 5725 to 5850 | Pass    |
|                   |         |                 | 50               | 3.70          | 5825.03                  | 5817 to 5833 | Pass    |
| 802.11n<br>(HT20) | MIMO    | 5745            | 20               | 4.07          | 5745.10                  | 5737 to 5753 | Pass    |
|                   |         |                 |                  | 3.70          | 5745.12                  | 5737 to 5753 | Pass    |
|                   |         |                 |                  | 3.33          | 5745.02                  | 5737 to 5753 | Pass    |
|                   |         |                 | -30              | 3.70          | 5745.12                  | 5737 to 5753 | Pass    |
|                   |         |                 | -20              | 3.70          | 5745.07                  | 5725 to 5850 | Pass    |

|  |  |                   |     |      |         |              |      |
|--|--|-------------------|-----|------|---------|--------------|------|
|  |  |                   | -10 | 3.70 | 5745.10 | 5725 to 5850 | Pass |
|  |  |                   | 0   | 3.70 | 5745.02 | 5725 to 5850 | Pass |
|  |  |                   | 10  | 3.70 | 5745.02 | 5725 to 5850 | Pass |
|  |  |                   | 30  | 3.70 | 5745.09 | 5725 to 5850 | Pass |
|  |  |                   | 40  | 3.70 | 5745.10 | 5725 to 5850 | Pass |
|  |  |                   | 50  | 3.70 | 5745.00 | 5737 to 5753 | Pass |
|  |  | 5785              | 20  | 4.07 | 5785.11 | 5777 to 5793 | Pass |
|  |  |                   |     | 3.70 | 5785.02 | 5777 to 5793 | Pass |
|  |  |                   |     | 3.33 | 5785.13 | 5777 to 5793 | Pass |
|  |  |                   | -30 | 3.70 | 5785.03 | 5777 to 5793 | Pass |
|  |  |                   | -20 | 3.70 | 5785.11 | 5725 to 5850 | Pass |
|  |  |                   | -10 | 3.70 | 5785.07 | 5725 to 5850 | Pass |
|  |  |                   | 0   | 3.70 | 5785.01 | 5725 to 5850 | Pass |
|  |  |                   | 10  | 3.70 | 5785.02 | 5725 to 5850 | Pass |
|  |  |                   | 30  | 3.70 | 5785.12 | 5725 to 5850 | Pass |
|  |  |                   | 40  | 3.70 | 5785.07 | 5725 to 5850 | Pass |
|  |  |                   | 50  | 3.70 | 5785.09 | 5777 to 5793 | Pass |
|  |  | 5825              | 20  | 4.07 | 5825.02 | 5817 to 5833 | Pass |
|  |  |                   |     | 3.70 | 5825.09 | 5817 to 5833 | Pass |
|  |  |                   |     | 3.33 | 5825.04 | 5817 to 5833 | Pass |
|  |  |                   | -30 | 3.70 | 5825.03 | 5817 to 5833 | Pass |
|  |  |                   | -20 | 3.70 | 5825.03 | 5725 to 5850 | Pass |
|  |  |                   | -10 | 3.70 | 5825.10 | 5725 to 5850 | Pass |
|  |  |                   | 0   | 3.70 | 5825.09 | 5725 to 5850 | Pass |
|  |  |                   | 10  | 3.70 | 5825.04 | 5725 to 5850 | Pass |
|  |  |                   | 30  | 3.70 | 5825.02 | 5725 to 5850 | Pass |
|  |  |                   | 40  | 3.70 | 5825.06 | 5725 to 5850 | Pass |
|  |  |                   | 50  | 3.70 | 5825.06 | 5817 to 5833 | Pass |
|  |  | 802.11n<br>(HT40) | 20  | 4.07 | 5755.01 | 5739 to 5771 | Pass |
|  |  |                   |     | 3.70 | 5755.04 | 5739 to 5771 | Pass |
|  |  |                   |     | 3.33 | 5755.11 | 5739 to 5771 | Pass |
|  |  |                   | -30 | 3.70 | 5755.08 | 5739 to 5771 | Pass |
|  |  |                   | -20 | 3.70 | 5755.03 | 5725 to 5850 | Pass |
|  |  |                   | -10 | 3.70 | 5755.07 | 5725 to 5850 | Pass |
|  |  |                   | 0   | 3.70 | 5755.00 | 5725 to 5850 | Pass |
|  |  |                   | 10  | 3.70 | 5755.04 | 5725 to 5850 | Pass |
|  |  |                   | 30  | 3.70 | 5755.00 | 5725 to 5850 | Pass |
|  |  |                   | 40  | 3.70 | 5755.10 | 5725 to 5850 | Pass |
|  |  |                   | 50  | 3.70 | 5755.07 | 5739 to 5771 | Pass |
|  |  | 5795              | 20  | 4.07 | 5795.07 | 5779 to 5811 | Pass |
|  |  |                   |     | 3.70 | 5795.10 | 5779 to 5811 | Pass |





|                     |      |      |     |      |         |              |      |
|---------------------|------|------|-----|------|---------|--------------|------|
|                     |      |      |     | 3.33 | 5795.13 | 5779 to 5811 | Pass |
|                     |      |      | -30 | 3.70 | 5795.13 | 5779 to 5811 | Pass |
|                     |      |      | -20 | 3.70 | 5795.09 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5795.10 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5795.02 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5795.02 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5795.01 | 5725 to 5850 | Pass |
|                     |      |      | 40  | 3.70 | 5795.10 | 5725 to 5850 | Pass |
| 802.11ac<br>(VHT20) | MIMO | 5745 | 50  | 3.70 | 5795.04 | 5779 to 5811 | Pass |
|                     |      |      | 20  | 4.07 | 5745.05 | 5737 to 5753 | Pass |
|                     |      |      |     | 3.70 | 5745.05 | 5737 to 5753 | Pass |
|                     |      |      |     | 3.33 | 5745.10 | 5737 to 5753 | Pass |
|                     |      |      | -30 | 3.70 | 5745.06 | 5737 to 5753 | Pass |
|                     |      |      | -20 | 3.70 | 5745.09 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5745.01 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5745.04 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5745.01 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5745.05 | 5725 to 5850 | Pass |
|                     |      |      | 40  | 3.70 | 5745.09 | 5725 to 5850 | Pass |
|                     |      |      | 50  | 3.70 | 5745.10 | 5737 to 5753 | Pass |
|                     |      | 5785 | 20  | 4.07 | 5785.01 | 5777 to 5793 | Pass |
|                     |      |      |     | 3.70 | 5785.04 | 5777 to 5793 | Pass |
|                     |      |      |     | 3.33 | 5785.06 | 5777 to 5793 | Pass |
|                     |      |      | -30 | 3.70 | 5785.08 | 5777 to 5793 | Pass |
|                     |      |      | -20 | 3.70 | 5785.07 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5785.09 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5785.11 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5785.01 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5785.08 | 5725 to 5850 | Pass |
|                     |      |      | 40  | 3.70 | 5785.03 | 5725 to 5850 | Pass |
|                     |      |      | 50  | 3.70 | 5785.01 | 5777 to 5793 | Pass |
|                     |      | 5825 | 20  | 4.07 | 5825.03 | 5817 to 5833 | Pass |
|                     |      |      |     | 3.70 | 5825.10 | 5817 to 5833 | Pass |
|                     |      |      |     | 3.33 | 5825.07 | 5817 to 5833 | Pass |
|                     |      |      | -30 | 3.70 | 5825.06 | 5817 to 5833 | Pass |
|                     |      |      | -20 | 3.70 | 5825.07 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5825.05 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5825.01 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5825.12 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5825.05 | 5725 to 5850 | Pass |
|                     |      |      | 40  | 3.70 | 5825.00 | 5725 to 5850 | Pass |





|                     |      |      |     |      |         |              |      |
|---------------------|------|------|-----|------|---------|--------------|------|
|                     |      |      | 50  | 3.70 | 5825.09 | 5817 to 5833 | Pass |
| 802.11ac<br>(VHT40) | MIMO | 5755 | 20  | 4.07 | 5755.06 | 5739 to 5771 | Pass |
|                     |      |      |     | 3.70 | 5755.10 | 5739 to 5771 | Pass |
|                     |      |      | 20  | 3.33 | 5755.06 | 5739 to 5771 | Pass |
|                     |      |      |     | 3.70 | 5755.04 | 5739 to 5771 | Pass |
|                     |      |      | -30 | 3.70 | 5755.04 | 5739 to 5771 | Pass |
|                     |      |      | -20 | 3.70 | 5755.11 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5755.09 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5755.00 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5755.07 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5755.13 | 5725 to 5850 | Pass |
|                     |      |      | 40  | 3.70 | 5755.12 | 5725 to 5850 | Pass |
|                     |      |      | 50  | 3.70 | 5755.01 | 5739 to 5771 | Pass |
|                     |      | 5795 | 20  | 4.07 | 5795.08 | 5779 to 5811 | Pass |
|                     |      |      |     | 3.70 | 5795.11 | 5779 to 5811 | Pass |
|                     |      |      | 20  | 3.33 | 5795.04 | 5779 to 5811 | Pass |
|                     |      |      |     | 3.70 | 5795.07 | 5779 to 5811 | Pass |
|                     |      |      | -30 | 3.70 | 5795.07 | 5779 to 5811 | Pass |
|                     |      |      | -20 | 3.70 | 5795.12 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5795.08 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5795.01 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5795.04 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5795.10 | 5725 to 5850 | Pass |
| 802.11ac<br>(VHT80) | MIMO | 5775 | 20  | 3.70 | 5795.01 | 5725 to 5850 | Pass |
|                     |      |      |     | 3.70 | 5795.13 | 5779 to 5811 | Pass |
|                     |      |      | 20  | 4.07 | 5775.08 | 5743 to 5807 | Pass |
|                     |      |      |     | 3.70 | 5775.06 | 5743 to 5807 | Pass |
|                     |      |      | 20  | 3.33 | 5775.05 | 5743 to 5807 | Pass |
|                     |      |      |     | 3.70 | 5775.08 | 5743 to 5807 | Pass |
|                     |      |      | -30 | 3.70 | 5775.08 | 5743 to 5807 | Pass |
|                     |      |      | -20 | 3.70 | 5775.03 | 5725 to 5850 | Pass |
|                     |      |      | -10 | 3.70 | 5775.03 | 5725 to 5850 | Pass |
|                     |      |      | 0   | 3.70 | 5775.12 | 5725 to 5850 | Pass |
|                     |      |      | 10  | 3.70 | 5775.09 | 5725 to 5850 | Pass |
|                     |      |      | 30  | 3.70 | 5775.04 | 5725 to 5850 | Pass |
|                     |      |      | 40  | 3.70 | 5775.07 | 5725 to 5850 | Pass |
|                     |      |      | 50  | 3.70 | 5775.21 | 5743 to 5807 | Pass |



## 9. Antenna Requirement

### 9.1. Test Standard and Requirement

| Test Standard | FCC Part15 Section 15.203 /15.407                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Requirement   | <p>1) 15.203 requirement:<br/>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>2) 15.407 requirement:<br/>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</p> |

### 9.2. Antenna Connected Construction

The antenna is a Internal antenna which permanently attached, and the best case gain of the wifi5G:1.89 dBi (ANT1/2) & WiFi 5.8G: 5.91dBi (ANT1/2). It complies with the standard requirement.



## 10. DFS(Dynamic Frequency Selection)

### 10.1. Test Standard and Requirement

The following table from FCC KDB905462 D02 UNII DFS Compliance procedures new rules list the applicable requirements for the DFS testing.

**Table 1: Applicability of DFS Requirements Prior to Use of a Channel**

| Requirement                     | Operational Mode |                                |                             |
|---------------------------------|------------------|--------------------------------|-----------------------------|
|                                 | Master           | Client Without Radar Detection | Client With Radar Detection |
| Non-Occupancy Period            | Yes              | Not required                   | Yes                         |
| DFS Detection Threshold         | Yes              | Not required                   | Yes                         |
| Channel Availability Check Time | Yes              | Not required                   | Not required                |
| U-NII Detection Bandwidth       | Yes              | Not required                   | Yes                         |

**Table 2: Applicability of DFS requirements during normal operation**

| Requirement                       | Operational Mode                             |                                |
|-----------------------------------|----------------------------------------------|--------------------------------|
|                                   | Master Device or Client with Radar Detection | Client Without Radar Detection |
| DFS Detection Threshold           | Yes                                          | Not required                   |
| Channel Closing Transmission Time | Yes                                          | Yes                            |
| Channel Move Time                 | Yes                                          | Yes                            |
| U-NII Detection Bandwidth         | Yes                                          | Not required                   |

| Additional requirements for devices with multiple bandwidth modes | Master Device or Client with Radar Detection | Client Without Radar Detection                       |
|-------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|
| U-NII Detection Bandwidth and Statistical Performance Check       | All BW modes must be tested                  | Not required                                         |
| Channel Move Time and Channel Closing Transmission Time           | Test using widest BW mode available          | Test using the widest BW mode available for the link |
| All other tests                                                   | Any single BW mode                           | Not required                                         |

Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.

#### Master Devices:

- The Master Device will use DFS in order to detect Radar Waveforms with received signal strength above the DFS Detection Threshold in the 5250~5350 MHz and 5470~5725 MHz bands. DFS is not required in the 5150~5250 MHz or 5725~5825 MHz bands.



- b) Before initiating a network on a Channel, the Master Device will perform a Channel Availability Check for a specified time duration (Channel Availability Check Time) to ensure that there is no radar system operating on the Channel, using DFS described under subsection a) above.
- c) The Master Device initiates a U-NII network by transmitting control signals that will enable other U-NII devices to Associate with the Master Device.
- d) During normal operation, the Master Device will monitor the Channel (In-Service Monitoring) to ensure that there is no radar system operating on the Channel, using DFS described under a).
- e) If the Master Device has detected a Radar Waveform during In-Service Monitoring as described under d), the Operating Channel of the U-NII network is no longer an Available Channel. The Master Device will instruct all associated Client Device(s) to stop transmitting on this Channel within the Channel Move Time. The transmissions during the Channel Move Time will be limited to the Channel Closing Transmission Time.
- f) Once the Master Device has detected a Radar Waveform it will not utilize the Channel for the duration of the Non-Occupancy Period.
- g) If the Master Device delegates the In-Service Monitoring to a Client Device, then the combination will be tested to the requirements described under d) through f) above.

#### Client Devices:

- a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
- b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.
- c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.
- d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

**Table 4: DFS Response Requirement Values**

| Parameter                         | Value                                                                                                  |
|-----------------------------------|--------------------------------------------------------------------------------------------------------|
| Non-occupancy period              | Minimum 30 minutes                                                                                     |
| Channel Availability Check Time   | 60 seconds                                                                                             |
| Channel Move Time                 | 10 seconds See Note 1.                                                                                 |
| Channel Closing Transmission Time | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2. |
| U-NII Detection Bandwidth         | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.                                |

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.



## 10.2. DFS Detection Thresholds

**Table 5: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection**

| Maximum Transmit Power                                                          | Value (See Notes 1, 2, and 3) |
|---------------------------------------------------------------------------------|-------------------------------|
| EIRP ≥ 200 milliwatt                                                            | -64 dBm                       |
| EIRP < 200 milliwatt and<br>power spectral density < 10 dBm/MHz                 | -62 dBm                       |
| EIRP < 200 milliwatt that do not meet the power<br>spectral density requirement | -64 dBm                       |

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

## 10.3. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

**Table 5 Short Pulse Radar Test Waveforms**

| Radar Type | Pulse Width (μsec) | PRI (μsec)                                                                                                                                                                                                                                                     | Number of Pulses                                                                                                              | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------|
| 0          | 1                  | 1428                                                                                                                                                                                                                                                           | Roundup $\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$ | See Note 1                                 | See Note 1               |
| 1          | 1                  | Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a<br><br>Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A |                                                                                                                               | 60%                                        | 30                       |
| 2          | 1-5                | 150-230                                                                                                                                                                                                                                                        | 23-29                                                                                                                         | 60%                                        | 30                       |
| 3          | 6-1                | 200-500                                                                                                                                                                                                                                                        | 16-18                                                                                                                         | 60%                                        | 30                       |
| 4          | 11-                | 200-500                                                                                                                                                                                                                                                        | 12-16                                                                                                                         | 60%                                        | 30                       |



|                                                                                                                                      |     |     |
|--------------------------------------------------------------------------------------------------------------------------------------|-----|-----|
| Aggregate (Radar Types 1-4)                                                                                                          | 80% | 120 |
| Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. |     |     |

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example if in Short Pulse Radar Type 1 Test B a PRI of 3066  $\mu$ sec is selected, the number of pulses would

be Round up  $\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{3066} \right) \right\} = \text{Round up } \{17.2\} = 18.$



**Table 5a - Pulse Repetition Intervals Values for Test A**

| Pulse Repetition Frequency Number | Pulse Repetition Frequency (Pulses Per Second) | Pulse Repetition Interval (Microseconds) |
|-----------------------------------|------------------------------------------------|------------------------------------------|
| 1                                 | 1930.5                                         | 518                                      |
| 2                                 | 1858.7                                         | 538                                      |
| 3                                 | 1792.1                                         | 558                                      |
| 4                                 | 1730.1                                         | 578                                      |
| 5                                 | 1672.2                                         | 598                                      |
| 6                                 | 1618.1                                         | 618                                      |
| 7                                 | 1567.4                                         | 638                                      |
| 8                                 | 1519.8                                         | 658                                      |
| 9                                 | 1474.9                                         | 678                                      |
| 10                                | 1432.7                                         | 698                                      |
| 11                                | 1392.8                                         | 718                                      |
| 12                                | 1355                                           | 738                                      |
| 13                                | 1319.3                                         | 758                                      |
| 14                                | 1285.3                                         | 778                                      |
| 15                                | 1253.1                                         | 798                                      |
| 16                                | 1222.5                                         | 818                                      |
| 17                                | 1193.3                                         | 838                                      |
| 18                                | 1165.6                                         | 858                                      |
| 19                                | 1139                                           | 878                                      |
| 20                                | 1113.6                                         | 898                                      |
| 21                                | 1089.3                                         | 918                                      |
| 22                                | 1066.1                                         | 938                                      |
| 23                                | 326.2                                          | 3066                                     |

**Table 6 – Long Pulse Radar Test Waveform**

| Radar Type | Pulse Width (μsec) | Chirp Width (MHz) | PRI (μsec) | Number of Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|-------------------|------------|----------------------------|------------------|--------------------------------------------|--------------------------|
| 5          | 50-100             | 5-20              | 1000-2000  | 1-3                        | 8-20             | 80%                                        | 30                       |

The parameters for this waveforms are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type wave forms, then each additional waveform must also be unique and not repeated from the previous waveforms.

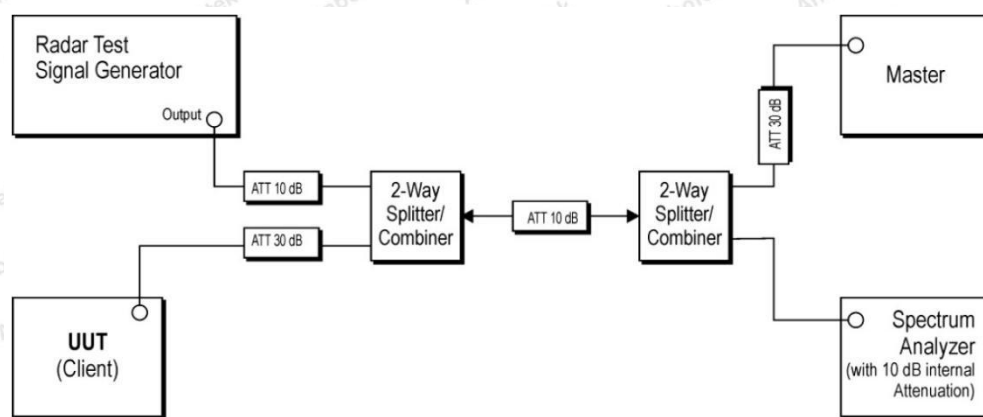
Table 7 – Frequency Hopping Radar Test Waveform

| Radar Type | Pulse Width (µsec) | PRI (µsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|------------|----------------|--------------------|--------------------------------|--------------------------------------------|--------------------------|
| 6          | 1                  | 333        | 9              | 0.333              | 300                            | 70%                                        | 30                       |

For the Frequency Hopping Radar Type, the same Burst parameters are used for each wave form. The hopping sequence is different for each wave form and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250–5724MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

#### 10.4. Test Configuration



#### 10.5. Test Procedure

- A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
- The interference Radar Detection Threshold Level is  $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$  that had been taken into account the output power range and antenna gain.
- The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
- The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was  $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$ . Capture the spectrum analyzer plots on short pulse radar waveform.
- When testing DFS, first set up the test channel in the router background, and then install iPerf software on EUT, so that EUT and router can communicate.  
The time for the device to fully start up is 65s.

**10.6. Test Data**

Not applicable.





## APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test



## **APPENDIX II -- EXTERNAL PHOTOGRAPH**

Reference to the test report 18220WC10196001.

## **APPENDIX III -- INTERNAL PHOTOGRAPH**

Reference to the test report 18220WC10196001.





## APPENDIX IV – Appendix Test Data

