



## FCC PART 15.407

### TEST REPORT

For

## Vuzix Corporation

25 Hendrix Rd, West Henrietta, New York, United States 14586

**FCC ID: 2AA9D-472**

|                                                                                                                                                                                                                                                                                                              |                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Class II Permissive Change                                                                                                                                                                                                                                                            | <b>Product Type:</b><br>M400                                                                  |
| <b>Report Number:</b> SZ1210802-52717E-RF-00A1                                                                                                                                                                                                                                                               |                                                                                               |
| <b>Report Date:</b> 2021-11-01                                                                                                                                                                                                                                                                               |                                                                                               |
| <b>Reviewed By:</b> RF Engineer                                                                                                                                                                                                                                                                              | Candy Li  |
| <b>Prepared By:</b> Shenzhen Accurate Technology Co., Ltd.<br>1/F., Building A, Changyuan New Material Port, Science<br>& Industry Park, Nanshan District, Shenzhen,<br>Guangdong, P.R. China<br>Tel: (0755) 26503290<br>Fax: (0755) 26503396<br><a href="http://www.atc-lab.com">Http://www.atc-lab.com</a> |                                                                                               |

**Note:** This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “★”.

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk ‘\*’. Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

## **TABLE OF CONTENTS**

|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| <b>GENERAL INFORMATION.....</b>                                           | <b>4</b>  |
| PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....                  | 4         |
| OBJECTIVE .....                                                           | 4         |
| TEST METHODOLOGY .....                                                    | 4         |
| MEASUREMENT UNCERTAINTY.....                                              | 5         |
| TEST FACILITY .....                                                       | 5         |
| <b>SYSTEM TEST CONFIGURATION.....</b>                                     | <b>6</b>  |
| DESCRIPTION OF TEST CONFIGURATION .....                                   | 6         |
| EUT EXERCISE SOFTWARE .....                                               | 7         |
| DUTY CYCLE .....                                                          | 8         |
| EQUIPMENT MODIFICATIONS .....                                             | 8         |
| SUPPORT EQUIPMENT LIST AND DETAILS .....                                  | 8         |
| EXTERNAL I/O CABLE.....                                                   | 8         |
| BLOCK DIAGRAM OF TEST SETUP .....                                         | 9         |
| <b>SUMMARY OF TEST RESULTS.....</b>                                       | <b>11</b> |
| <b>TEST EQUIPMENT LIST .....</b>                                          | <b>12</b> |
| <b>FCC§1.1307 (b) (1) &amp; §2.1093 – RF EXPOSURE.....</b>                | <b>14</b> |
| APPLICABLE STANDARD .....                                                 | 14        |
| <b>FCC §15.203 – ANTENNA REQUIREMENT.....</b>                             | <b>15</b> |
| APPLICABLE STANDARD .....                                                 | 15        |
| ANTENNA CONNECTOR CONSTRUCTION .....                                      | 15        |
| <b>FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS .....</b>        | <b>16</b> |
| APPLICABLE STANDARD .....                                                 | 16        |
| EUT SETUP .....                                                           | 16        |
| EMI TEST RECEIVER SETUP.....                                              | 16        |
| TEST PROCEDURE .....                                                      | 16        |
| TEST DATA .....                                                           | 17        |
| <b>§15.205 &amp; §15.209 &amp; §15.407(B)– UNDESIRABLE EMISSION .....</b> | <b>20</b> |
| APPLICABLE STANDARD .....                                                 | 20        |
| EUT SETUP .....                                                           | 20        |
| EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....                         | 21        |
| TEST PROCEDURE .....                                                      | 21        |
| CORRECTED AMPLITUDE & MARGIN CALCULATION .....                            | 22        |
| TEST DATA .....                                                           | 22        |
| <b>FCC §15.407(a),(e) – 26 dB &amp; 6dB EMISSION BANDWIDTH.....</b>       | <b>34</b> |
| APPLICABLE STANDARD .....                                                 | 34        |
| TEST PROCEDURE .....                                                      | 34        |
| TEST DATA .....                                                           | 35        |
| <b>FCC §15.407(a) – CONDUCTED TRANSMITTER OUTPUT POWER.....</b>           | <b>36</b> |
| APPLICABLE STANDARD .....                                                 | 36        |
| TEST PROCEDURE .....                                                      | 36        |
| TEST DATA .....                                                           | 37        |

|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| <b>FCC §15.407(a) - POWER SPECTRAL DENSITY .....</b>                      | <b>38</b> |
| TEST PROCEDURE .....                                                      | 38        |
| TEST DATA .....                                                           | 39        |
| <b>FCC §15.407(h) - DYNAMIC FREQUENCY SELECTION (DFS).....</b>            | <b>40</b> |
| APPLICABLE STANDARD .....                                                 | 40        |
| TEST PROCEDURE .....                                                      | 47        |
| TEST DATA .....                                                           | 48        |
| <b>APPENDIX .....</b>                                                     | <b>49</b> |
| APPENDIX A1: EMISSION BANDWIDTH .....                                     | 49        |
| APPENDIX A2: OCCUPIED CHANNEL BANDWIDTH .....                             | 61        |
| APPENDIX B: MAXIMUM CONDUCTED OUTPUT POWER .....                          | 73        |
| APPENDIX C: MAXIMUM POWER SPECTRAL DENSITY .....                          | 78        |
| APPENDIX D: DUTY CYCLE.....                                               | 92        |
| <b>APPENDIX DFS .....</b>                                                 | <b>97</b> |
| APPENDIX A: DFS DETECTION THRESHOLDS .....                                | 97        |
| APPENDIX B: CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME ..... | 99        |
| APPENDIX C: NON-OCCUPANCY PERIOD .....                                    | 101       |

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|                                        |                                                                                             |
|----------------------------------------|---------------------------------------------------------------------------------------------|
| Product                                | M400                                                                                        |
| Tested Model                           | 472                                                                                         |
| Frequency Range                        | 5G Wi-Fi: 5250-5350MHz; 5470-5725MHz                                                        |
| Mode                                   | 802.11a/n20/n40/ac20/ac40/ac80                                                              |
| Maximum Conducted Average Output Power | 5250-5350MHz: 12.96dBm<br>5470-5725MHz: 13.36dBm                                            |
| Modulation Technique                   | OFDM                                                                                        |
| Antenna Specification*                 | Antenna gain:3.0dBi (It is provided by the manufacturer)                                    |
| Voltage Range                          | DC 3.7V from battery or DC 5V from USB-C port                                               |
| Sample serial number                   | RF conducted: SZ1210802-52717E-RFA1-S1<br>CE&RE: SZ1210802-52717E-RFA1-S2 (Assigned by ATC) |
| Received date                          | 2021-08-02                                                                                  |
| Sample/EUT Status                      | Good condition                                                                              |

### Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

- (1) Adding DFS bands (5250-5350MHz & 5470-5725MHz) by software.

Based on above differences, it will affected partial test data, so the changed items were performed.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices; KDB789033 D02 General U-NII Test Procedures New Rules v02r01 and KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

## Measurement Uncertainty

| Parameter                    |                | Uncertainty |
|------------------------------|----------------|-------------|
| Occupied Channel Bandwidth   |                | 5%          |
| RF output power, conducted   |                | 0.73dB      |
| Unwanted Emission, conducted |                | 1.6dB       |
| Emissions,<br>Radiated       | 30MHz - 1GHz   | 4.28dB      |
|                              | 1GHz- 18GHz    | 4.98dB      |
|                              | 18GHz- 26.5GHz | 5.06dB      |
|                              | 26.5GHz- 40GHz | 4.72dB      |
| Temperature                  |                | 1 °C        |
| Humidity                     |                | 6%          |
| Supply voltages              |                | 0.4%        |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A-2.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

The device only supports 802.11a/n20/n40/ac20/ac40/ac80 modes, which was declared by manufacturer.

For 5250-5350MHz Band, 7 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 52      | 5260            | 60      | 5300            |
| 54      | 5270            | 62      | 5310            |
| 56      | 5280            | 64      | 5320            |
| 58      | 5290            | /       | /               |

For 802.11a/n20/ac20 mode: channel 52, 56, 64 were tested;

For 802.11n40/ac40 mode: channel 54, 62 were tested;

For 802.11ac80 mode, channel 58 was tested.

For 5470-5725MHz Band, 21 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 100     | 5500            | 124     | 5620            |
| 102     | 5510            | 126     | 5630            |
| 104     | 5520            | 128     | 5640            |
| 106     | 5530            | 132     | 5660            |
| 108     | 5540            | 134     | 5670            |
| 110     | 5550            | 136     | 5680            |
| 112     | 5560            | 138     | 5690            |
| 116     | 5580            | 140     | 5700            |
| 118     | 5590            | 142     | 5710            |
| 120     | 5600            | 144     | 5720            |
| 122     | 5610            | /       | /               |

For 802.11a/n20/ac20 mode: channel 100, 116, 144 were tested;

For 802.11n40/ac40 mode: channel 102, 110, 142 were tested.

For 802.11ac80/ax80 mode, channel 106, 122, 138 was tested.

**EUT Exercise Software**

“QRCT”\* exercise software was used. The software and power level was provided by the applicant.

The worst case was performed under:

| U-NII          | Mode        | Frequency (MHz) | Data Rate | Power Level* |
|----------------|-------------|-----------------|-----------|--------------|
| 5250 – 5350MHz | 802.11 a    | 5260            | 6Mbps     | 15           |
|                |             | 5280            | 6Mbps     | 15           |
|                |             | 5320            | 6Mbps     | 15           |
|                | 802.11 n20  | 5260            | MCS0      | 15           |
|                |             | 5280            | MCS0      | 15           |
|                |             | 5320            | MCS0      | 15           |
|                | 802.11 n40  | 5270            | MCS0      | 15           |
|                |             | 5310            | MCS0      | 15           |
|                | 802.11 ac20 | 5260            | MCS0      | 15           |
|                |             | 5280            | MCS0      | 15           |
|                |             | 5320            | MCS0      | 15           |
|                | 802.11 ac40 | 5270            | MCS0      | 15           |
|                |             | 5310            | MCS0      | 15           |
|                | 802.11 ac80 | 5290            | MCS0      | 15           |
| 5470 – 5725MHz | 802.11 a    | 5500            | 6Mbps     | 15           |
|                |             | 5580            | 6Mbps     | 15           |
|                |             | 5720            | 6Mbps     | 15           |
|                | 802.11 n20  | 5500            | MCS0      | 15           |
|                |             | 5580            | MCS0      | 15           |
|                |             | 5720            | MCS0      | 15           |
|                | 802.11 n40  | 5510            | MCS0      | 15           |
|                |             | 5550            | MCS0      | 15           |
|                |             | 5710            | MCS0      | 15           |
|                | 802.11 ac20 | 5500            | MCS0      | 15           |
|                |             | 5580            | MCS0      | 15           |
|                |             | 5720            | MCS0      | 15           |
|                | 802.11 ac40 | 5510            | MCS0      | 15           |
|                |             | 5550            | MCS0      | 15           |
|                |             | 5710            | MCS0      | 15           |
|                | 802.11 ac80 | 5530            | MCS0      | 15           |
|                |             | 5610            | MCS0      | 15           |
|                |             | 5690            | MCS0      | 15           |

The worse-case data rates are determined to be as follows for each mode based upon investigations by measuring the output power and PSD across all data rated bandwidths, and modulations.

For DFS test, “Lantest.exe” software was used

**Duty cycle**

Test Result: Pass. Please refer to the Appendix.

**Equipment Modifications**

No modification was made to the EUT tested.

**Support Equipment List and Details**

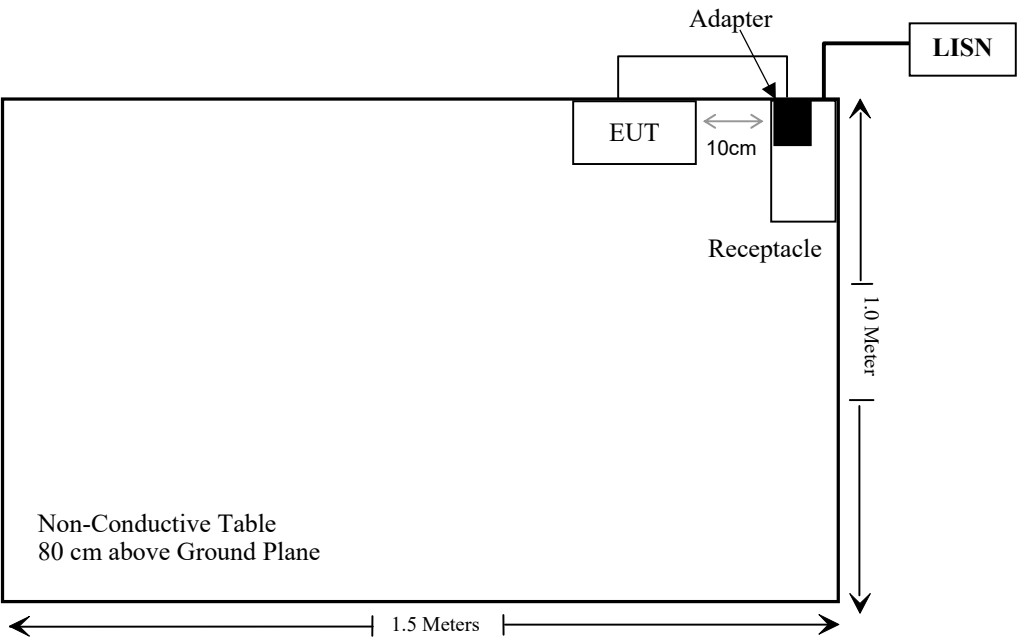
| Manufacturer | Description                    | Model           | Serial Number            |
|--------------|--------------------------------|-----------------|--------------------------|
| HuaJin       | Adapter                        | HJ-0502000W2-US | 10294410                 |
| DELL         | PC                             | 67CTQ12         | 1350545499398            |
| DELL         | Monitor                        | REV A00         | CN-0JH6ND-74445-45E-D0GL |
| Lenovo       | Mouse                          | M120Pro         | 31099145JK049889         |
| DELL         | KeyBoard                       | L100            | CN0RH6565890855000E      |
| GOSPELL      | POE                            | G0720-480-050   | 212701319                |
| DELL         | NoteBook                       | Latitude E4710  | PC201911252059           |
| Grandstream  | Router<br>(FCC ID: YZZGWN7660) | GWN7660         | 259LAT9M123E850C         |

**External I/O Cable**

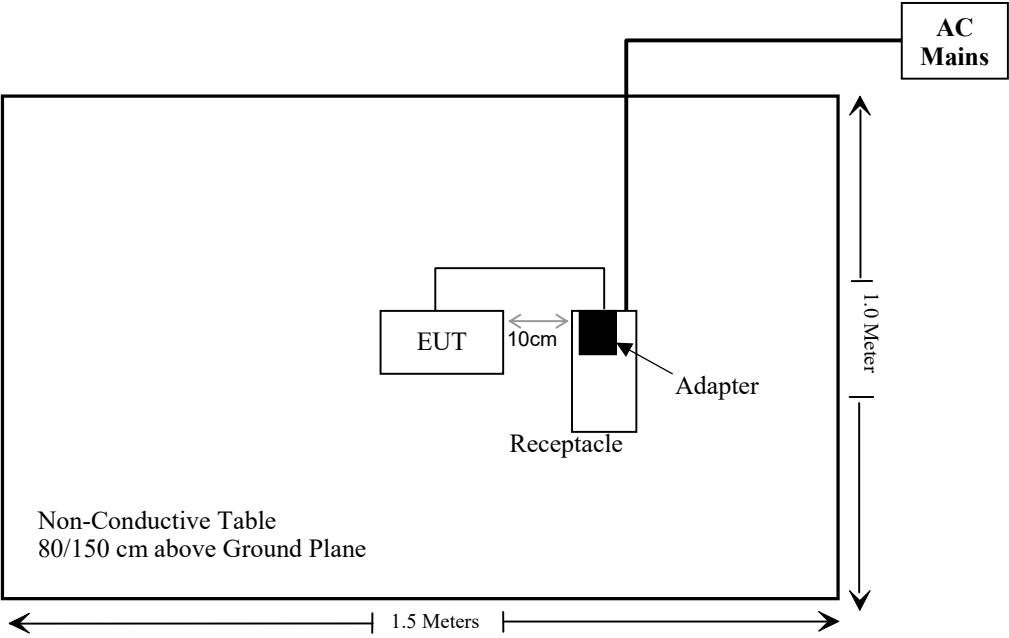
| Cable Description                  | Length (m) | From Port       | To       |
|------------------------------------|------------|-----------------|----------|
| Un-shielding Detachable USB Cable  | 1.2        | Adapter         | EUT      |
| Un-shielding Detachable RJ45 Cable | 1.5        | POE             | Router   |
| Un-shielding Detachable RJ45 Cable | 1.5        | POE             | PC       |
| Un-shielding Detachable USB Cable  | 0.5        | EUT             | NoteBook |
| Shielding Detachable RF Cable      | 0.5        | RF Contorl unit | Router   |
| Shielding Detachable RF Cable      | 0.5        | RF Contorl unit | EUT      |
| Un-shielding Detachable VGA Cable  | 1.2        | Monitor         | PC       |
| Un-shielding Detachable USB Cable  | 1.2        | Mouse           | PC       |
| Un-shielding Detachable USB Cable  | 1.2        | KeyBoard        | PC       |

**Block Diagram of Test Setup**

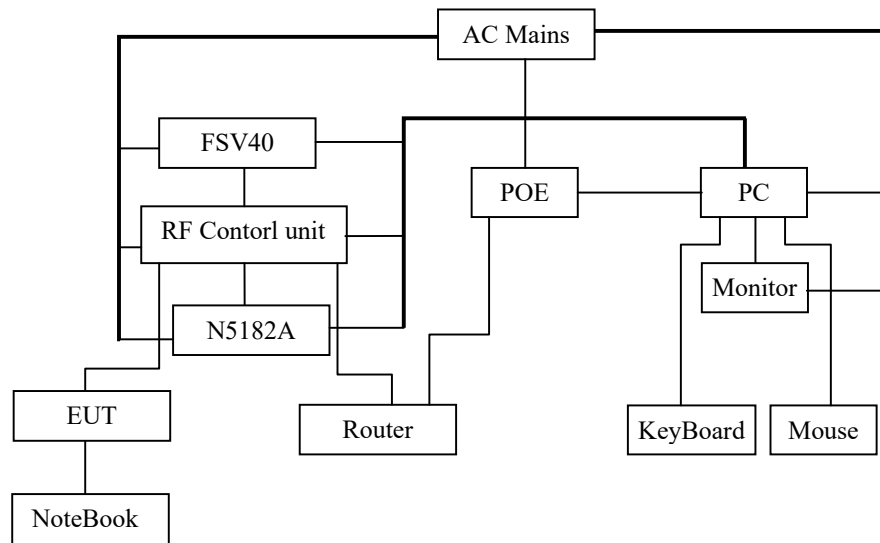
For conducted emission:



For Radiated emission:



For DFS:



**SUMMARY OF TEST RESULTS**

| FCC Rules                       | Description of Test                      | Result         |
|---------------------------------|------------------------------------------|----------------|
| §1.1307 (b) (1) & §2.1093       | RF EXPOSURE                              | Compliant      |
| §15.203                         | Antenna Requirement                      | Compliant      |
| §15.407(b)(9)& §15.207(a)       | Conducted Emissions                      | Compliant      |
| §15.205& §15.209<br>&§15.407(b) | Undesirable Emission& Restricted Bands   | Compliant      |
| §15.407(a) (e)                  | 26 dB Emission Bandwidth & 6dB Bandwidth | Compliant      |
| §15.407(a)                      | Conducted Transmitter Output Power       | Compliant      |
| §15.407 (a)                     | Power Spectral Density                   | Compliant      |
| §15.407 (h)                     | Transmit Power Control (TPC)             | Not Applicable |
| §15.407 (h)                     | Dynamic Frequency Selection (DFS)        | Compliant      |

Not Applicable: the EUT has no TPC function which was declared by the applicant.

**TEST EQUIPMENT LIST**

| Manufacturer                                      | Description                  | Model              | Serial Number | Calibration Date | Calibration Due Date |
|---------------------------------------------------|------------------------------|--------------------|---------------|------------------|----------------------|
| Conducted emission test                           |                              |                    |               |                  |                      |
| Rohde& Schwarz                                    | Test Receiver                | ESPI3              | 100396        | 2020/12/24       | 2021/12/23           |
| R & S                                             | L.I.S.N.                     | ENV216             | 101314        | 2020/12/25       | 2021/12/24           |
| Anritsu Corp                                      | 50ΩCoaxial Switch            | MP59B              | 6200506474    | 2020/12/25       | 2021/12/24           |
| Unknown                                           | RF Coaxial Cable             | N-2m               | No.2          | 2020/12/25       | 2021/12/24           |
| Conducted Emission Test Software: ES-K1 V1.71     |                              |                    |               |                  |                      |
| Radiated emission test                            |                              |                    |               |                  |                      |
| Rohde& Schwarz                                    | Test Receiver                | ESR                | 101817        | 2020/12/24       | 2021/12/23           |
| Rohde&Schwarz                                     | Spectrum Analyzer            | FSV40              | 101495        | 2020/12/24       | 2021/12/23           |
| SONOMA INSTRUMENT                                 | Amplifier                    | 310 N              | 186131        | 2020/12/25       | 2021/12/24           |
| A.H. Systems, inc.                                | Preamplifier                 | PAM-0118P          | 531           | 2021/07/08       | 2022/07/07           |
| Quinstar                                          | Amplifier                    | QLW-18405536-J0    | 15964001002   | 2020/11/28       | 2021/11/27           |
| Anritsu Corp                                      | 50 Coaxial Switch            | MP59B              | 6100237248    | 2020/12/25       | 2021/12/24           |
| Schwarzbeck                                       | Bilog Antenna                | VULB9163           | 9163-323      | 2020/01/05       | 2023/01/04           |
| Schwarzbeck                                       | Horn Antenna                 | BBHA9120D          | 9120D-1067    | 2020/01/05       | 2023/01/04           |
| Schwarzbeck                                       | HORN ANTENNA                 | BBHA9170           | 9170-359      | 2020/01/05       | 2023/01/04           |
| OREGON SCIENTIFIC                                 | Temperature & Humidity Meter | JB913R             | GZ-WS004      | 2020/01/02       | 2023/01/01           |
| Radiated Emission Test Software: EZ EMC V 1.1.4.2 |                              |                    |               |                  |                      |
| Unknown                                           | RF Coaxial Cable             | N-5m               | No.3          | 2020/12/25       | 2021/12/24           |
| Unknown                                           | RF Coaxial Cable             | N-5m               | No.4          | 2020/12/25       | 2021/12/24           |
| Unknown                                           | RF Coaxial Cable             | N-1m               | No.5          | 2020/12/25       | 2021/12/24           |
| Unknown                                           | RF Coaxial Cable             | N-1m               | No.6          | 2020/12/25       | 2021/12/24           |
| CD                                                | Band Reject Filter           | BRM-5.15/5.35g-45  | 075           | 2020/12/25       | 2021/12/24           |
| CD                                                | Band Reject Filter           | BRM-5.47/5.725G-45 | 075           | 2020/12/25       | 2021/12/24           |

| Manufacturer      | Description                  | Model             | Serial Number   | Calibration Date | Calibration Due Date |
|-------------------|------------------------------|-------------------|-----------------|------------------|----------------------|
| RF conducted test |                              |                   |                 |                  |                      |
| Rohde & Schwarz   | Spectrum Analyzer            | FSV-40            | 101495          | 2020/12/24       | 2021/12/23           |
| Tonscend          | RF Control Unit              | JS0806-2          | 19G8060182      | 2021/07/06       | 2022/07/05           |
| Rohde & Schwarz   | Open Switch and Control Unit | OSP120 + OSP-B157 | 101244 + 100866 | 2020/12/24       | 2021/12/23           |
| AGILENT           | Vector Signal Generator      | N5182A            | MY50143401      | 2021/01/04       | 2022/01/03           |

\* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

---

## **FCC§1.1307 (b) (1) & §2.1093 – RF EXPOSURE**

---

### **Applicable Standard**

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

### **Measurement Result**

Please refer to SAR test report: SZ1210802-32217E-SACA1.

## **FCC §15.203 – ANTENNA REQUIREMENT**

---

### **Applicable Standard**

According to § 15.203, 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has one internal antenna which was permanently attached, and the maximum antenna gain is 3.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

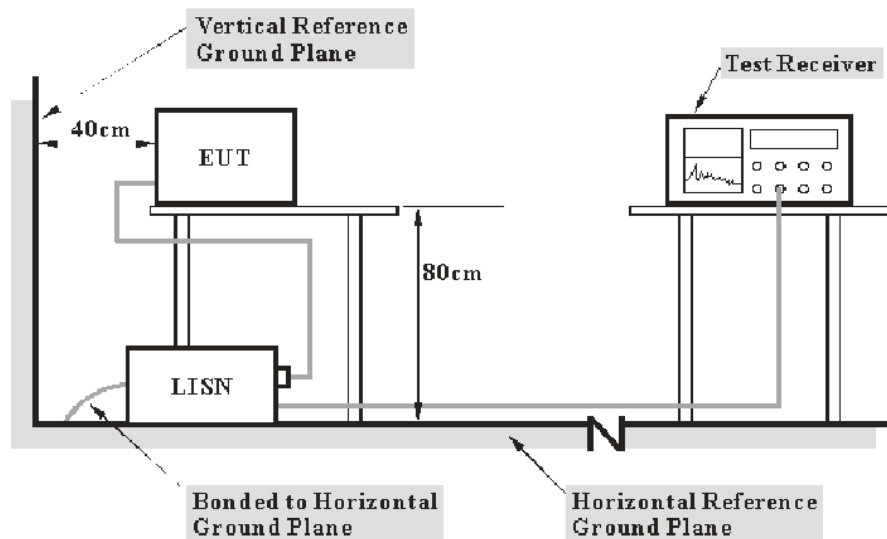
**Result:** Compliance.

## FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207, §15.407(b) (6)

### EUT Setup



Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range  | IF B/W |
|------------------|--------|
| 150 kHz – 30 MHz | 9 kHz  |

### Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

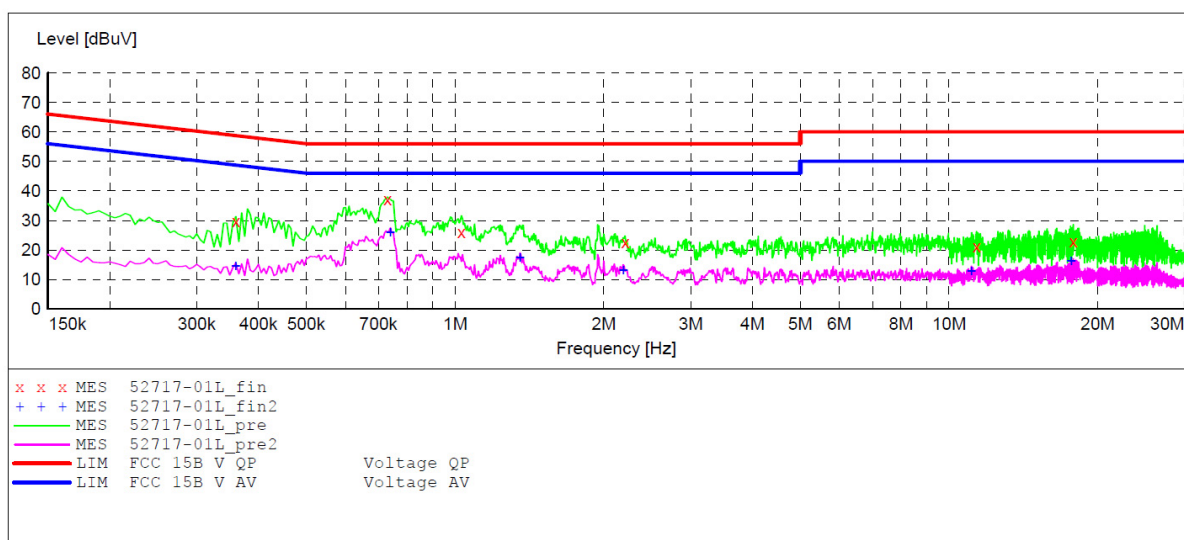
All data was recorded in the Quasi-peak and Average detection mode.

**Test Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 25 °C     |
| <b>Relative Humidity:</b> | 65 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Anny on 2021-10-19.*

*EUT operation mode: Transmitting (worst case is 802.11n40 5710MHz)*

**AC 120V/60 Hz, Line:****MEASUREMENT RESULT: "52717-01L\_fin"**

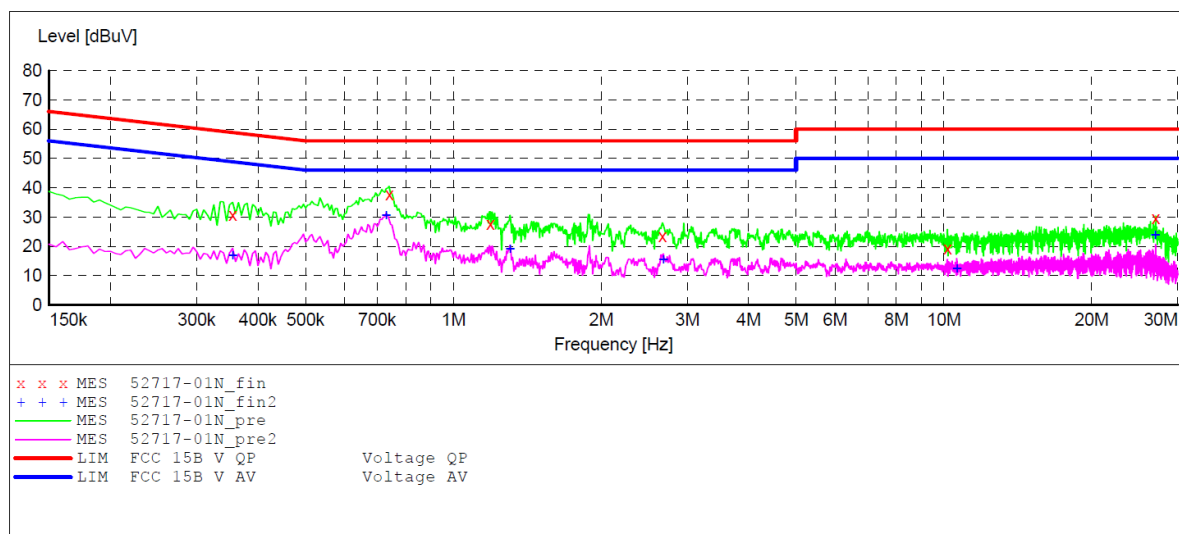
2021-10-19 11:17

| Frequency<br>MHz | Level<br>dBuV | Transd<br>dB | Limit<br>dBuV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.360000         | 29.60         | 10.9         | 59            | 29.4         | QP       | L1   | GND |
| 0.730000         | 37.20         | 11.1         | 56            | 18.8         | QP       | L1   | GND |
| 1.030000         | 26.10         | 11.1         | 56            | 29.9         | QP       | L1   | GND |
| 2.210000         | 22.70         | 11.3         | 56            | 33.3         | QP       | L1   | GND |
| 11.375000        | 21.20         | 11.6         | 60            | 38.8         | QP       | L1   | GND |
| 17.850000        | 22.90         | 11.7         | 60            | 37.1         | QP       | L1   | GND |

**MEASUREMENT RESULT: "52717-01L\_fin2"**

2021-10-19 11:19

| Frequency<br>MHz | Level<br>dBuV | Transd<br>dB | Limit<br>dBuV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.360000         | 14.70         | 10.9         | 49            | 35.3         | AV       | L1   | GND |
| 0.740000         | 26.10         | 11.1         | 46            | 19.9         | AV       | L1   | GND |
| 1.355000         | 17.40         | 11.2         | 46            | 32.6         | AV       | L1   | GND |
| 2.190000         | 13.30         | 11.3         | 46            | 36.7         | AV       | L1   | GND |
| 11.100000        | 12.90         | 11.6         | 50            | 39.1         | AV       | L1   | GND |
| 17.700000        | 16.40         | 11.7         | 50            | 37.6         | AV       | L1   | GND |

**AC 120V/60 Hz, Neutral:****MEASUREMENT RESULT: "52717-01N\_fin"**

2021-10-19 11:17

| Frequency<br>MHz | Level<br>dBuV | Transd<br>dB | Limit<br>dBuV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.355000         | 30.70         | 10.9         | 59            | 28.3         | QP       | N    | GND |
| 0.740000         | 37.80         | 11.1         | 56            | 18.2         | QP       | N    | GND |
| 1.190000         | 27.60         | 11.2         | 56            | 28.4         | QP       | N    | GND |
| 2.670000         | 23.50         | 11.3         | 56            | 32.5         | QP       | N    | GND |
| 10.175000        | 19.30         | 11.6         | 60            | 40.7         | QP       | N    | GND |
| 27.025000        | 29.50         | 11.8         | 60            | 30.5         | QP       | N    | GND |

**MEASUREMENT RESULT: "52717-01N\_fin2"**

2021-10-19 11:16

| Frequency<br>MHz | Level<br>dBuV | Transd<br>dB | Limit<br>dBuV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.355000         | 16.70         | 10.9         | 49            | 32.3         | AV       | N    | GND |
| 0.730000         | 30.60         | 11.1         | 46            | 15.4         | AV       | N    | GND |
| 1.305000         | 18.90         | 11.2         | 46            | 27.1         | AV       | N    | GND |
| 2.680000         | 15.40         | 11.3         | 46            | 30.6         | AV       | N    | GND |
| 10.625000        | 12.40         | 11.6         | 50            | 37.6         | AV       | N    | GND |
| 27.025000        | 23.80         | 11.8         | 50            | 26.2         | AV       | N    | GND |

## §15.205 & §15.209 & §15.407(B)– UNDESIRABLE EMISSION

### Applicable Standard

FCC §15.407 (b); §15.209; §15.205;

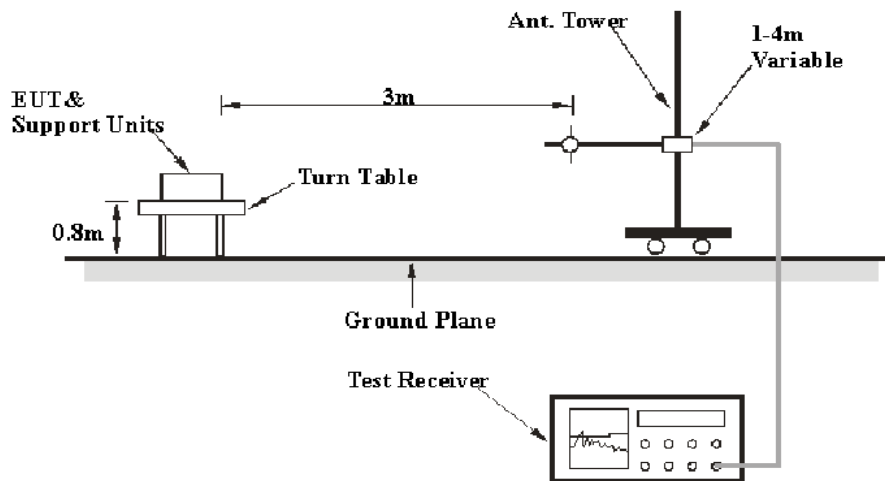
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

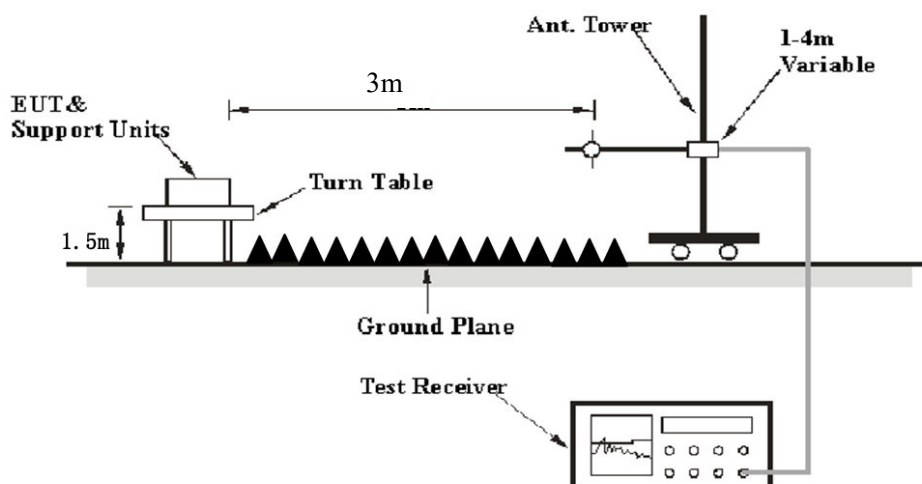
- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
  - (i) All emissions shall be limited to a level of  $-27$  dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

### EUT Setup

Below 1 GHz:



**Above 1 GHz:**

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range   | RBW     | Video B/W               | IF B/W  | Measurement |
|-------------------|---------|-------------------------|---------|-------------|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz                 | 120 kHz | QP          |
| Above 1 GHz       | 1 MHz   | 3 MHz                   | /       | PK          |
|                   | 1MHz    | 10 Hz <sup>Note 1</sup> | /       | Average     |
|                   | 1MHz    | > 1/T <sup>Note 2</sup> | /       | Average     |

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

**Test Procedure****Radiated Spurious Emission**

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Average detection modes for frequencies above 1GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

## Test Data

### Environmental Conditions

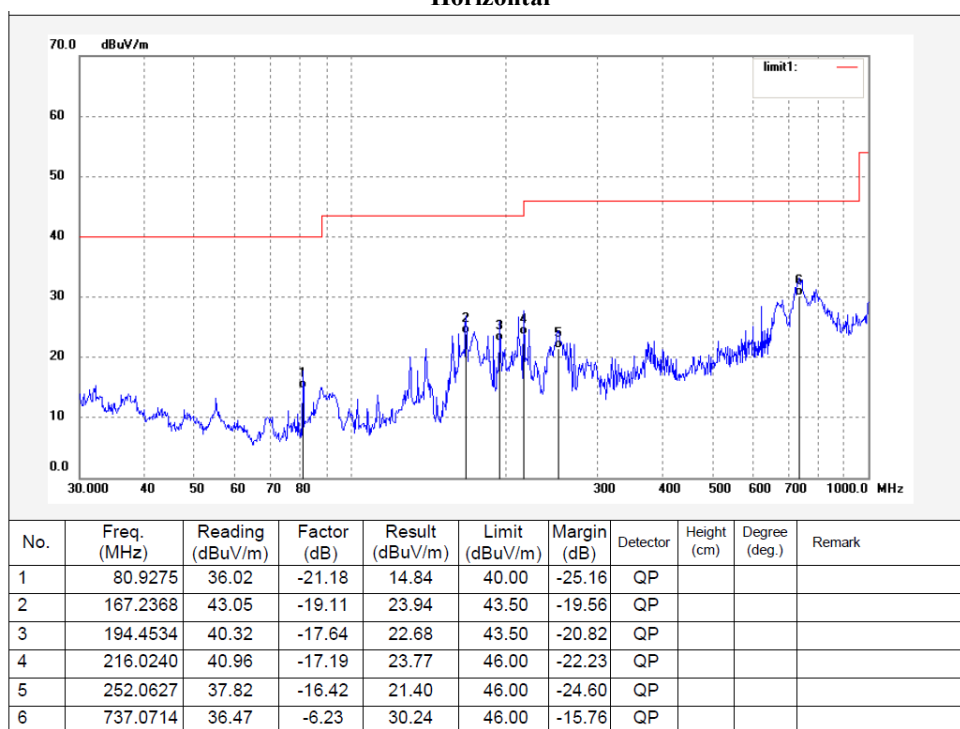
|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 23 °C     |
| <b>Relative Humidity:</b> | 48 %      |
| <b>ATM Pressure:</b>      | 101.1 kPa |

*The testing was performed by Chao Mo on 2021-10-19 for below 1GHz and 2021-10-16, 2021-10-22 for above 1GHz.*

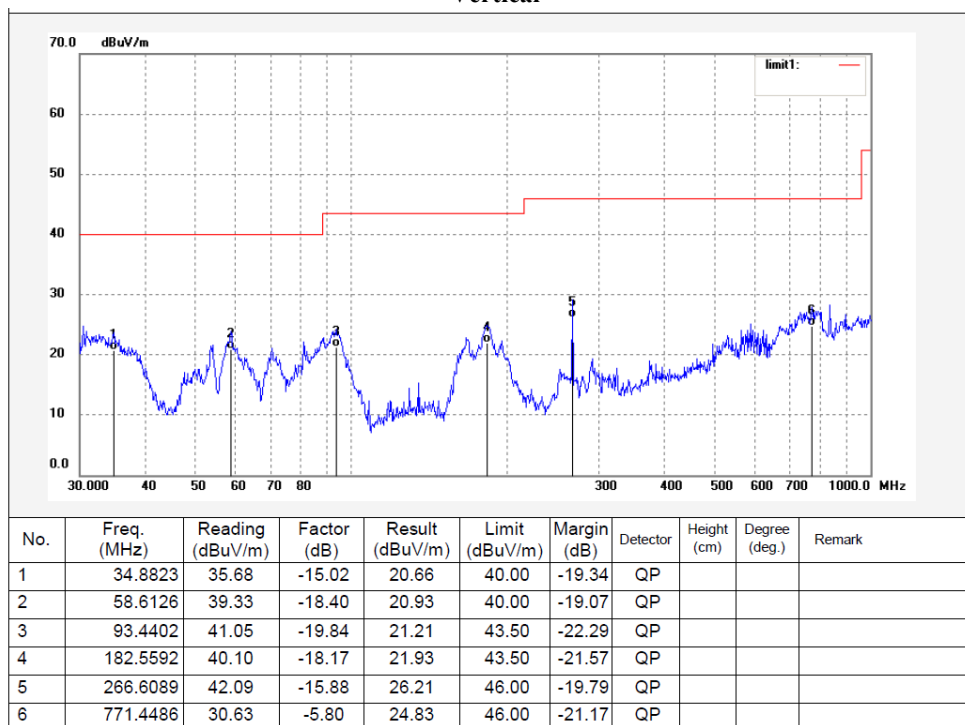
*EUT operation mode: Transmitting*

**30 MHz – 1 GHz:** (worst case is 802.11n 40 5710MHz)

### Horizontal



### Vertical



**5250-5350 MHz:**

| Frequency<br>(MHz) | Receiver          |            | Turn-<br>Table  | Rx Antenna        |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBµV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|------------|-----------------|-------------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBµV) | PK/QP/Ave. | Angle<br>Degree | Heigh<br>t<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBµV/m) | Margin<br>(dB) |
| 5250-5350MHz       |                   |            |                 |                   |                  |                               |                                    |                   |                |
| 802.11a ,5260 MHz  |                   |            |                 |                   |                  |                               |                                    |                   |                |
| 4500               | 58.12             | PK         | 297             | 1.1               | H                | 1.89                          | 60.01                              | 74                | -13.99         |
| 4500               | 43.84             | Ave.       | 297             | 1.1               | H                | 1.89                          | 45.73                              | 54                | -8.27          |
| 4500               | 50.88             | PK         | 356             | 1.6               | V                | 1.89                          | 52.77                              | 74                | -21.23         |
| 5150               | 57.88             | PK         | 205             | 1.5               | H                | 3.37                          | 61.25                              | 74                | -12.75         |
| 5150               | 43.40             | Ave.       | 205             | 1.5               | H                | 3.37                          | 46.77                              | 54                | -7.23          |
| 5150               | 50.60             | PK         | 27              | 1.5               | V                | 3.37                          | 53.97                              | 74                | -20.03         |
| 10520              | 37.68             | PK         | 159             | 2.3               | H                | 14.63                         | 52.31                              | 68.2              | -15.89         |
| 10520              | 37.24             | PK         | 74              | 1.3               | V                | 14.63                         | 51.87                              | 68.2              | -16.33         |
| 802.11a ,5280 MHz  |                   |            |                 |                   |                  |                               |                                    |                   |                |
| 10560              | 38.09             | PK         | 201             | 1.6               | H                | 14.75                         | 52.84                              | 68.2              | -15.36         |
| 10560              | 37.43             | PK         | 57              | 2.1               | V                | 14.75                         | 52.18                              | 68.2              | -16.02         |
| 802.11a ,5320MHz   |                   |            |                 |                   |                  |                               |                                    |                   |                |
| 5350               | 58.13             | PK         | 300             | 1.1               | H                | 3.33                          | 61.46                              | 74                | -12.54         |
| 5350               | 43.55             | Ave.       | 300             | 1.1               | H                | 3.33                          | 46.88                              | 54                | -7.12          |
| 5350               | 50.34             | PK         | 140             | 1.7               | V                | 3.33                          | 53.67                              | 74                | -20.33         |
| 5460               | 56.68             | PK         | 299             | 1.9               | H                | 3.31                          | 59.99                              | 74                | -14.01         |
| 5460               | 42.31             | Ave.       | 299             | 1.9               | H                | 3.31                          | 45.62                              | 54                | -8.38          |
| 5460               | 47.42             | PK         | 154             | 2.1               | V                | 3.31                          | 50.73                              | 74                | -23.27         |
| 10640              | 37.55             | PK         | 239             | 1.4               | H                | 15.05                         | 52.60                              | 74                | -21.40         |
| 10640              | 36.61             | PK         | 30              | 2.2               | V                | 15.05                         | 51.66                              | 74                | -22.34         |

| Frequency<br>(MHz) | Receiver          |            | Turn-<br>Table<br><br>Angle<br>Degree | Rx Antenna        |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part15.407    |                |
|--------------------|-------------------|------------|---------------------------------------|-------------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | PK/QP/Ave. |                                       | Heigh<br>t<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11n20,5260 MHz |                   |            |                                       |                   |                  |                               |                                    |                   |                |
| 4500               | 57.17             | PK         | 282                                   | 1.4               | H                | 1.89                          | 59.06                              | 74                | -14.94         |
| 4500               | 43.29             | Ave.       | 282                                   | 1.4               | H                | 1.89                          | 45.18                              | 54                | -8.82          |
| 4500               | 49.80             | PK         | 243                                   | 1.3               | V                | 1.89                          | 51.69                              | 74                | -22.31         |
| 5150               | 58.04             | PK         | 73                                    | 1.7               | H                | 3.37                          | 61.41                              | 74                | -12.59         |
| 5150               | 43.43             | Ave.       | 73                                    | 1.7               | H                | 3.37                          | 46.8                               | 54                | -7.20          |
| 5150               | 49.47             | PK         | 301                                   | 2.4               | V                | 3.37                          | 52.84                              | 74                | -21.16         |
| 10520              | 36.40             | PK         | 128                                   | 1.8               | H                | 14.63                         | 51.03                              | 68.2              | -17.17         |
| 10520              | 35.69             | PK         | 150                                   | 2                 | V                | 14.63                         | 50.32                              | 68.2              | -17.88         |
| 802.11n20,5280 MHz |                   |            |                                       |                   |                  |                               |                                    |                   |                |
| 10560              | 37.00             | PK         | 356                                   | 2.4               | H                | 14.75                         | 51.75                              | 68.2              | -16.45         |
| 10560              | 36.24             | PK         | 120                                   | 1.9               | V                | 14.75                         | 50.99                              | 68.2              | -17.21         |
| 802.11n20,5320MHz  |                   |            |                                       |                   |                  |                               |                                    |                   |                |
| 5350               | 57.33             | PK         | 350                                   | 1.4               | H                | 3.33                          | 60.66                              | 74                | -13.34         |
| 5350               | 43.38             | Ave.       | 350                                   | 1.4               | H                | 3.33                          | 46.71                              | 54                | -7.29          |
| 5350               | 49.49             | PK         | 266                                   | 2.1               | V                | 3.33                          | 52.82                              | 74                | -21.18         |
| 5460               | 56.36             | PK         | 279                                   | 1.1               | H                | 3.31                          | 59.67                              | 74                | -14.33         |
| 5460               | 42.45             | Ave.       | 279                                   | 1.1               | H                | 3.31                          | 45.76                              | 54                | -8.24          |
| 5460               | 48.06             | PK         | 222                                   | 1.4               | V                | 3.31                          | 51.37                              | 74                | -22.63         |
| 10640              | 36.94             | PK         | 284                                   | 1.6               | H                | 15.05                         | 51.99                              | 74                | -22.01         |
| 10640              | 36.24             | PK         | 112                                   | 2.3               | V                | 15.05                         | 51.29                              | 74                | -22.71         |
| 802.11n40,5270 MHz |                   |            |                                       |                   |                  |                               |                                    |                   |                |
| 5270 MHz           |                   |            |                                       |                   |                  |                               |                                    |                   |                |
| 4500               | 57.28             | PK         | 0                                     | 1                 | H                | 1.89                          | 59.17                              | 74                | -14.83         |
| 4500               | 45.07             | Ave.       | 0                                     | 1                 | H                | 1.89                          | 46.96                              | 54                | -7.04          |
| 4500               | 49.75             | PK         | 105                                   | 2.3               | V                | 1.89                          | 51.64                              | 74                | -22.36         |
| 5150               | 58.35             | PK         | 219                                   | 1.7               | H                | 3.37                          | 61.72                              | 74                | -12.28         |
| 5150               | 44.67             | Ave.       | 219                                   | 1.7               | H                | 3.37                          | 48.04                              | 54                | -5.96          |
| 5150               | 50.56             | PK         | 75                                    | 2                 | V                | 3.37                          | 53.93                              | 74                | -20.07         |
| 10540              | 36.28             | PK         | 323                                   | 1.1               | H                | 14.72                         | 51.00                              | 68.2              | -17.20         |
| 10540              | 35.52             | PK         | 338                                   | 2.4               | V                | 14.72                         | 50.24                              | 68.2              | -17.96         |
| 802.11n40,5310 MHz |                   |            |                                       |                   |                  |                               |                                    |                   |                |
| 5350               | 57.97             | PK         | 102                                   | 2.1               | H                | 3.33                          | 61.30                              | 74                | -12.70         |
| 5350               | 44.74             | Ave.       | 102                                   | 2.1               | H                | 3.33                          | 48.07                              | 54                | -5.93          |
| 5350               | 50.31             | PK         | 358                                   | 1.6               | V                | 3.33                          | 53.64                              | 74                | -20.36         |
| 5460               | 57.28             | PK         | 281                                   | 2.4               | H                | 3.31                          | 60.59                              | 74                | -13.41         |
| 5460               | 43.38             | Ave.       | 281                                   | 2.4               | H                | 3.31                          | 46.69                              | 54                | -7.31          |
| 5460               | 49.26             | PK         | 171                                   | 1.5               | V                | 3.31                          | 52.57                              | 74                | -21.43         |
| 10620              | 36.62             | PK         | 102                                   | 1                 | H                | 15.05                         | 51.67                              | 74                | -22.33         |
| 10620              | 35.49             | PK         | 9                                     | 2.4               | V                | 15.05                         | 50.54                              | 74                | -23.46         |

| Frequency<br>(MHz)  | Receiver          |            | Turn-<br>Table  | Rx Antenna        |                  | Correcte<br>d Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part15.407    |                |
|---------------------|-------------------|------------|-----------------|-------------------|------------------|--------------------------------|------------------------------------|-------------------|----------------|
|                     | Reading<br>(dBμV) | PK/QP/Ave. | Angle<br>Degree | Heigh<br>t<br>(m) | Polar<br>(H / V) |                                |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11ac20,5260 MHz |                   |            |                 |                   |                  |                                |                                    |                   |                |
| 5260 MHz            |                   |            |                 |                   |                  |                                |                                    |                   |                |
| 4500                | 57.45             | PK         | 143             | 2                 | H                | 1.89                           | 59.34                              | 74                | -14.66         |
| 4500                | 44.89             | Ave.       | 143             | 2                 | H                | 1.89                           | 46.78                              | 54                | -7.22          |
| 4500                | 49.75             | PK         | 165             | 2.1               | V                | 1.89                           | 51.64                              | 74                | -22.36         |
| 5150                | 58.64             | PK         | 272             | 1.9               | H                | 3.37                           | 62.01                              | 74                | -11.99         |
| 5150                | 44.47             | Ave.       | 272             | 1.9               | H                | 3.37                           | 47.84                              | 54                | -6.16          |
| 5150                | 50.25             | PK         | 147             | 2.5               | V                | 3.37                           | 53.62                              | 74                | -20.38         |
| 10520               | 36.75             | PK         | 336             | 1.5               | H                | 14.63                          | 51.38                              | 68.2              | -16.82         |
| 10520               | 36.03             | PK         | 95              | 2.4               | V                | 14.63                          | 50.66                              | 68.2              | -17.54         |
| 802.11ac20,5280 MHz |                   |            |                 |                   |                  |                                |                                    |                   |                |
| 10560               | 36.79             | PK         | 204             | 1.4               | H                | 14.75                          | 51.54                              | 68.2              | -16.66         |
| 10560               | 35.43             | PK         | 198             | 2.5               | V                | 14.75                          | 50.18                              | 68.2              | -18.02         |
| 802.11ac20,5320 MHz |                   |            |                 |                   |                  |                                |                                    |                   |                |
| 5350                | 57.9              | PK         | 18              | 2.4               | H                | 3.33                           | 61.23                              | 74                | -12.77         |
| 5350                | 44.66             | Ave.       | 18              | 2.4               | H                | 3.33                           | 47.99                              | 54                | -6.01          |
| 5350                | 49.33             | PK         | 57              | 2.3               | V                | 3.33                           | 52.66                              | 74                | -21.34         |
| 5460                | 55.78             | PK         | 123             | 2.3               | H                | 3.31                           | 59.09                              | 74                | -14.91         |
| 5460                | 43.16             | Ave.       | 123             | 2.3               | H                | 3.31                           | 46.47                              | 54                | -7.53          |
| 5460                | 48.25             | PK         | 259             | 1.2               | V                | 3.31                           | 51.56                              | 74                | -22.44         |
| 10640               | 36.68             | PK         | 355             | 2.4               | H                | 15.05                          | 51.73                              | 74                | -22.27         |
| 10640               | 35.44             | PK         | 167             | 1.6               | V                | 15.05                          | 50.49                              | 74                | -23.51         |

| Frequency<br>(MHz)  | Receiver          |                        | Turn-<br>Table  | Rx Antenna        |                  | Correcte<br>d Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part15.407    |                |
|---------------------|-------------------|------------------------|-----------------|-------------------|------------------|--------------------------------|------------------------------------|-------------------|----------------|
|                     | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Angle<br>Degree | Heigh<br>t<br>(m) | Polar<br>(H / V) |                                |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11ac40,5270 MHz |                   |                        |                 |                   |                  |                                |                                    |                   |                |
| 5270 MHz            |                   |                        |                 |                   |                  |                                |                                    |                   |                |
| 4500                | 57.41             | PK                     | 269             | 1.1               | H                | 1.89                           | 59.30                              | 74                | -14.70         |
| 4500                | 44.72             | Ave.                   | 269             | 1.1               | H                | 1.89                           | 46.61                              | 54                | -7.39          |
| 4500                | 50.73             | PK                     | 232             | 2                 | V                | 1.89                           | 52.62                              | 74                | -21.38         |
| 5150                | 57.79             | PK                     | 39              | 1.7               | H                | 3.37                           | 61.16                              | 74                | -12.84         |
| 5150                | 44.49             | Ave.                   | 39              | 1.7               | H                | 3.37                           | 47.86                              | 54                | -6.14          |
| 5150                | 50.46             | PK                     | 321             | 1.9               | V                | 3.37                           | 53.83                              | 74                | -20.17         |
| 10540               | 36.69             | PK                     | 125             | 1.3               | H                | 14.72                          | 51.41                              | 68.2              | -16.79         |
| 10540               | 35.67             | PK                     | 124             | 2.1               | V                | 14.72                          | 50.39                              | 68.2              | -17.81         |
| 802.11ac40,5310 MHz |                   |                        |                 |                   |                  |                                |                                    |                   |                |
| 5350                | 57.83             | PK                     | 65              | 1                 | H                | 3.33                           | 61.16                              | 74                | -12.84         |
| 5350                | 44.49             | Ave.                   | 65              | 1                 | H                | 3.33                           | 47.82                              | 54                | -6.18          |
| 5350                | 50.52             | PK                     | 196             | 1.5               | V                | 3.33                           | 53.85                              | 74                | -20.15         |
| 5460                | 55.92             | PK                     | 175             | 2.2               | H                | 3.31                           | 59.23                              | 74                | -14.77         |
| 5460                | 43.56             | Ave.                   | 175             | 2.2               | H                | 3.31                           | 46.87                              | 54                | -7.13          |
| 5460                | 47.97             | PK                     | 162             | 1.6               | V                | 3.31                           | 51.28                              | 74                | -22.72         |
| 10620               | 35.37             | PK                     | 190             | 1.8               | V                | 15.05                          | 50.42                              | 74                | -23.58         |
| 10620               | 30.78             | PK                     | 136             | 1.8               | V                | 15.05                          | 45.83                              | 74                | -28.17         |
| 802.11ac80,5290 MHz |                   |                        |                 |                   |                  |                                |                                    |                   |                |
| 4500                | 56.31             | PK                     | 43              | 1.7               | H                | 1.89                           | 58.20                              | 74                | -15.80         |
| 4500                | 43.90             | Ave.                   | 43              | 1.7               | H                | 1.89                           | 45.79                              | 54                | -8.21          |
| 4500                | 48.85             | PK                     | 166             | 1.9               | V                | 1.89                           | 50.74                              | 74                | -23.26         |
| 5150                | 55.93             | PK                     | 95              | 1.2               | H                | 3.37                           | 59.30                              | 74                | -14.70         |
| 5150                | 43.50             | Ave.                   | 95              | 1.2               | H                | 3.37                           | 46.87                              | 54                | -7.13          |
| 5150                | 49.12             | PK                     | 210             | 2.3               | V                | 3.37                           | 52.49                              | 74                | -21.51         |
| 5350                | 57.74             | PK                     | 19              | 1.1               | H                | 3.33                           | 61.07                              | 74                | -12.93         |
| 5350                | 45.91             | Ave.                   | 19              | 1.1               | H                | 3.33                           | 49.24                              | 54                | -4.76          |
| 5350                | 50.56             | PK                     | 316             | 2.5               | V                | 3.33                           | 53.89                              | 74                | -20.11         |
| 5460                | 56.33             | PK                     | 353             | 1.6               | H                | 3.31                           | 59.64                              | 74                | -14.36         |
| 5460                | 43.15             | Ave.                   | 353             | 1.6               | H                | 3.31                           | 46.46                              | 54                | -7.54          |
| 5460                | 48.97             | PK                     | 156             | 1.1               | V                | 3.31                           | 52.28                              | 74                | -21.72         |
| 10580               | 35.73             | PK                     | 127             | 2.1               | H                | 14.80                          | 50.53                              | 68.2              | -17.67         |
| 10580               | 34.71             | PK                     | 34              | 2.1               | V                | 14.80                          | 49.51                              | 68.2              | -18.69         |

**5470-5725MHz:**

| Frequency (MHz)     | Receiver       |                     | Turn-Table | Rx Antenna   |            | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | FCC Part15.407 |                |
|---------------------|----------------|---------------------|------------|--------------|------------|-------------------------|------------------------------|----------------|----------------|
|                     | Reading (dBμV) | Detector (PK/QP/AV) |            | Angle Degree | Height (m) |                         |                              | Polar (H / V)  | Limit (dBμV/m) |
| 802.11a             |                |                     |            |              |            |                         |                              |                |                |
| 802.11a ,5500 MHz   |                |                     |            |              |            |                         |                              |                |                |
| 5400                | 55.02          | PK                  | 336        | 2.3          | H          | 3.33                    | 58.35                        | 74             | -15.65         |
| 5400                | 40.45          | Ave.                | 336        | 2.3          | H          | 3.33                    | 43.78                        | 54             | -10.22         |
| 5400                | 53.45          | PK                  | 104        | 1.6          | V          | 3.33                    | 56.78                        | 74             | -17.22         |
| 5400                | 38.52          | Ave.                | 104        | 1.6          | V          | 3.33                    | 41.85                        | 54             | -12.15         |
| 5470                | 59.72          | PK                  | 158        | 1.3          | H          | 3.31                    | 63.03                        | 68.2           | -5.17          |
| 5470                | 58.67          | PK                  | 248        | 1.1          | V          | 3.31                    | 61.98                        | 68.2           | -6.22          |
| 11000               | 35.08          | PK                  | 14         | 2.3          | H          | 16.30                   | 51.38                        | 74             | -22.62         |
| 11000               | 33.07          | PK                  | 266        | 1.2          | V          | 16.30                   | 49.37                        | 74             | -24.63         |
| 802.11a ,5580 MHz   |                |                     |            |              |            |                         |                              |                |                |
| 11160               | 35.60          | PK                  | 72         | 2.4          | H          | 15.84                   | 51.44                        | 74             | -22.56         |
| 11160               | 33.75          | PK                  | 286        | 2.2          | V          | 15.84                   | 49.59                        | 74             | -24.41         |
| 802.11a ,5720 MHz   |                |                     |            |              |            |                         |                              |                |                |
| 5850                | 59.92          | PK                  | 145        | 1.1          | H          | 3.96                    | 63.88                        | 68.2           | -4.32          |
| 5850                | 59.05          | PK                  | 145        | 1.1          | V          | 3.96                    | 63.01                        | 68.2           | -5.19          |
| 5925                | 56.51          | PK                  | 293        | 2.4          | H          | 4.03                    | 60.54                        | 68.2           | -7.66          |
| 5925                | 55.92          | PK                  | 293        | 2.4          | V          | 4.03                    | 59.95                        | 68.2           | -8.25          |
| 11440               | 37.17          | PK                  | 150        | 1.1          | H          | 14.90                   | 52.07                        | 74             | -21.93         |
| 11440               | 35.41          | PK                  | 150        | 1.1          | V          | 14.90                   | 50.31                        | 74             | -23.69         |
| 802.11n20 ,5500 MHz |                |                     |            |              |            |                         |                              |                |                |
| 5400                | 55.41          | PK                  | 308        | 2            | H          | 3.33                    | 58.74                        | 74             | -15.26         |
| 5400                | 40.49          | Ave.                | 308        | 2            | H          | 3.33                    | 43.82                        | 54             | -10.18         |
| 5400                | 53.94          | PK                  | 156        | 1.1          | V          | 3.33                    | 57.27                        | 74             | -16.73         |
| 5400                | 39.39          | Ave.                | 156        | 1.1          | V          | 3.33                    | 42.72                        | 54             | -11.28         |
| 5470                | 57.98          | PK                  | 335        | 1.5          | H          | 3.31                    | 61.29                        | 68.2           | -6.91          |
| 5470                | 57.56          | PK                  | 106        | 1.5          | V          | 3.31                    | 60.87                        | 68.2           | -7.33          |
| 11000               | 35.23          | PK                  | 70         | 1.7          | H          | 16.30                   | 51.53                        | 74             | -22.47         |
| 11000               | 33.73          | PK                  | 315        | 1            | V          | 16.30                   | 50.03                        | 74             | -23.97         |
| 802.11n20 ,5580 MHz |                |                     |            |              |            |                         |                              |                |                |
| 11160               | 35.47          | PK                  | 162        | 2.3          | H          | 15.84                   | 51.31                        | 74             | -22.69         |
| 11160               | 34.01          | PK                  | 36         | 1.4          | V          | 15.84                   | 49.85                        | 74             | -24.15         |
| 802.11n20 ,5720 MHz |                |                     |            |              |            |                         |                              |                |                |
| 5850                | 60.02          | PK                  | 285        | 1.5          | H          | 3.96                    | 63.98                        | 68.2           | -4.22          |
| 5850                | 59.08          | PK                  | 285        | 1.5          | V          | 3.96                    | 63.04                        | 68.2           | -5.16          |
| 5925                | 58.04          | PK                  | 213        | 1            | H          | 4.03                    | 62.07                        | 68.2           | -6.13          |
| 5925                | 56.65          | PK                  | 213        | 1            | V          | 4.03                    | 60.68                        | 68.2           | -7.52          |
| 11440               | 37.19          | PK                  | 121        | 1            | H          | 14.90                   | 52.09                        | 74             | -21.91         |
| 11440               | 35.44          | PK                  | 121        | 1            | V          | 14.90                   | 50.34                        | 74             | -23.66         |

| Frequency (MHz)      | Receiver       |                     | Turn-Table<br>Angle Degree | Rx Antenna |               | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | FCC Part15.407 |             |
|----------------------|----------------|---------------------|----------------------------|------------|---------------|-------------------------|------------------------------|----------------|-------------|
|                      | Reading (dBμV) | Detector (PK/QP/AV) |                            | Height (m) | Polar (H / V) |                         |                              | Limit (dBμV/m) | Margin (dB) |
| 802.11n40            |                |                     |                            |            |               |                         |                              |                |             |
| 802.11n40 ,5510 MHz  |                |                     |                            |            |               |                         |                              |                |             |
| 5400                 | 55.23          | PK                  | 313                        | 1.4        | H             | 3.33                    | 58.56                        | 74             | -15.44      |
| 5400                 | 40.44          | Ave.                | 313                        | 1.4        | H             | 3.33                    | 43.77                        | 54             | -10.23      |
| 5400                 | 53.46          | PK                  | 114                        | 1.9        | V             | 3.33                    | 56.79                        | 74             | -17.21      |
| 5400                 | 38.74          | Ave.                | 114                        | 1.9        | V             | 3.33                    | 42.07                        | 54             | -11.93      |
| 5470                 | 58.76          | PK                  | 99                         | 2.4        | H             | 3.31                    | 62.07                        | 68.2           | -6.13       |
| 5470                 | 57.97          | PK                  | 158                        | 2.2        | V             | 3.31                    | 61.28                        | 68.2           | -6.92       |
| 11020                | 35.14          | PK                  | 272                        | 1.2        | H             | 16.30                   | 51.44                        | 74             | -22.56      |
| 11020                | 32.93          | PK                  | 127                        | 1.5        | V             | 16.30                   | 49.23                        | 74             | -24.77      |
| 802.11n40 ,5550 MHz  |                |                     |                            |            |               |                         |                              |                |             |
| 11100                | 35.05          | PK                  | 189                        | 1.7        | H             | 15.99                   | 51.04                        | 74             | -22.96      |
| 11100                | 33.64          | PK                  | 80                         | 1          | V             | 15.99                   | 49.63                        | 74             | -24.37      |
| 802.11n40 ,5710 MHz  |                |                     |                            |            |               |                         |                              |                |             |
| 5850                 | 60.19          | PK                  | 94                         | 2.4        | H             | 3.96                    | 64.15                        | 68.2           | -4.05       |
| 5850                 | 59.11          | PK                  | 94                         | 2.4        | V             | 3.96                    | 63.07                        | 68.2           | -5.13       |
| 5925                 | 57.24          | PK                  | 9                          | 2.1        | H             | 4.03                    | 61.27                        | 68.2           | -6.93       |
| 5925                 | 56.90          | PK                  | 9                          | 2.1        | V             | 4.03                    | 60.93                        | 68.2           | -7.27       |
| 11420                | 37.10          | PK                  | 66                         | 2.5        | H             | 14.98                   | 52.08                        | 74             | -21.92      |
| 11420                | 35.90          | PK                  | 66                         | 2.5        | V             | 14.98                   | 50.88                        | 74             | -23.12      |
| 802.11ac20 ,5500 MHz |                |                     |                            |            |               |                         |                              |                |             |
| 5400                 | 55.49          | PK                  | 197                        | 1.2        | H             | 3.33                    | 58.82                        | 74             | -15.18      |
| 5400                 | 40.60          | Ave.                | 197                        | 1.2        | H             | 3.33                    | 43.93                        | 54             | -10.07      |
| 5400                 | 53.78          | PK                  | 178                        | 1.3        | V             | 3.33                    | 57.11                        | 74             | -16.89      |
| 5400                 | 39.03          | Ave.                | 178                        | 1.3        | V             | 3.33                    | 42.36                        | 54             | -11.64      |
| 5470                 | 59.28          | PK                  | 354                        | 1.1        | H             | 3.31                    | 62.59                        | 68.2           | -5.61       |
| 5470                 | 58.15          | PK                  | 231                        | 1.2        | V             | 3.31                    | 61.46                        | 68.2           | -6.74       |
| 11000                | 35.23          | PK                  | 190                        | 2.2        | H             | 16.30                   | 51.53                        | 74             | -22.47      |
| 11000                | 33.55          | PK                  | 260                        | 2          | V             | 16.30                   | 49.85                        | 74             | -24.15      |
| 802.11ac20 ,5580 MHz |                |                     |                            |            |               |                         |                              |                |             |
| 11160                | 35.69          | PK                  | 168                        | 1.4        | H             | 15.84                   | 51.53                        | 74             | -22.47      |
| 11160                | 33.85          | PK                  | 54                         | 1.2        | V             | 15.84                   | 49.69                        | 74             | -24.31      |
| 802.11ac20 ,5720 MHz |                |                     |                            |            |               |                         |                              |                |             |
| 5850                 | 59.55          | PK                  | 69                         | 1.8        | H             | 3.96                    | 63.51                        | 68.2           | -4.69       |
| 5850                 | 58.91          | PK                  | 69                         | 1.8        | V             | 3.96                    | 62.87                        | 68.2           | -5.33       |
| 5925                 | 57.28          | PK                  | 120                        | 1.2        | H             | 4.03                    | 61.31                        | 68.2           | -6.89       |
| 5925                 | 56.63          | PK                  | 120                        | 1.2        | V             | 4.03                    | 60.66                        | 68.2           | -7.54       |
| 11440                | 36.94          | PK                  | 312                        | 1          | H             | 14.90                   | 51.84                        | 74             | -22.16      |
| 11440                | 35.29          | PK                  | 312                        | 1          | V             | 14.90                   | 50.19                        | 74             | -23.81      |

| Frequency (MHz)      | Receiver       |                     | Turn-Table   | Rx Antenna |               | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | FCC Part15.407 |             |
|----------------------|----------------|---------------------|--------------|------------|---------------|-------------------------|------------------------------|----------------|-------------|
|                      | Reading (dBμV) | Detector (PK/QP/AV) | Angle Degree | Height (m) | Polar (H / V) |                         |                              | Limit (dBμV/m) | Margin (dB) |
| 802.11ac40           |                |                     |              |            |               |                         |                              |                |             |
| 802.11ac40 ,5510 MHz |                |                     |              |            |               |                         |                              |                |             |
| 5400                 | 55.04          | PK                  | 32           | 1.4        | H             | 3.33                    | 58.37                        | 74             | -15.63      |
| 5400                 | 40.09          | Ave.                | 32           | 1.4        | H             | 3.33                    | 43.42                        | 54             | -10.58      |
| 5400                 | 53.29          | PK                  | 255          | 1.1        | V             | 3.33                    | 56.62                        | 74             | -17.38      |
| 5400                 | 38.49          | Ave.                | 255          | 1.1        | V             | 3.33                    | 41.82                        | 54             | -12.18      |
| 5470                 | 58.46          | PK                  | 305          | 1.6        | H             | 3.31                    | 61.77                        | 68.2           | -6.43       |
| 5470                 | 57.20          | PK                  | 194          | 1.5        | V             | 3.31                    | 60.51                        | 68.2           | -7.69       |
| 11020                | 35.41          | PK                  | 149          | 1.3        | H             | 16.30                   | 51.71                        | 74             | -22.29      |
| 11020                | 33.57          | PK                  | 213          | 1.4        | V             | 16.30                   | 49.87                        | 74             | -24.13      |
| 802.11ac40 ,5550 MHz |                |                     |              |            |               |                         |                              |                |             |
| 11100                | 34.44          | PK                  | 220          | 1.2        | H             | 15.99                   | 50.43                        | 74             | -23.57      |
| 11100                | 32.83          | PK                  | 357          | 2.2        | V             | 15.99                   | 48.82                        | 74             | -25.18      |
| 802.11ac40 ,5710 MHz |                |                     |              |            |               |                         |                              |                |             |
| 5850                 | 59.83          | PK                  | 304          | 1.6        | H             | 3.96                    | 63.79                        | 68.2           | -4.41       |
| 5850                 | 58.67          | PK                  | 304          | 1.6        | V             | 3.96                    | 62.63                        | 68.2           | -5.57       |
| 5925                 | 57.03          | PK                  | 282          | 1.6        | H             | 4.03                    | 61.06                        | 68.2           | -7.14       |
| 5925                 | 56.54          | PK                  | 282          | 1.6        | V             | 4.03                    | 60.57                        | 68.2           | -7.63       |
| 11420                | 36.59          | PK                  | 201          | 1.3        | H             | 14.98                   | 51.57                        | 74             | -22.43      |
| 11420                | 34.76          | PK                  | 201          | 1.3        | V             | 14.98                   | 49.74                        | 74             | -24.26      |
| 802.11ac80 ,5530 MHz |                |                     |              |            |               |                         |                              |                |             |
| 5400                 | 54.44          | PK                  | 73           | 2          | H             | 3.33                    | 57.77                        | 74             | -16.23      |
| 5400                 | 39.52          | Ave.                | 73           | 2          | H             | 3.33                    | 42.85                        | 54             | -11.15      |
| 5400                 | 52.99          | PK                  | 296          | 1.8        | V             | 3.33                    | 56.32                        | 74             | -17.68      |
| 5400                 | 38.34          | Ave.                | 296          | 1.8        | V             | 3.33                    | 41.67                        | 54             | -12.33      |
| 5470                 | 60.07          | PK                  | 330          | 2.1        | H             | 3.31                    | 63.38                        | 68.2           | -4.82       |
| 5470                 | 59.63          | PK                  | 34           | 1.2        | V             | 3.31                    | 62.94                        | 68.2           | -5.26       |
| 11060                | 35.50          | PK                  | 135          | 1.6        | H             | 16.15                   | 51.65                        | 74             | -22.35      |
| 11060                | 33.57          | PK                  | 151          | 2.4        | V             | 16.15                   | 49.72                        | 74             | -24.28      |
| 802.11ac80 ,5610 MHz |                |                     |              |            |               |                         |                              |                |             |
| 11220                | 35.56          | PK                  | 99           | 1.8        | H             | 15.60                   | 51.16                        | 74             | -22.84      |
| 11220                | 33.38          | PK                  | 73           | 1.6        | V             | 15.60                   | 48.98                        | 74             | -25.02      |
| 802.11ac80 ,5690 MHz |                |                     |              |            |               |                         |                              |                |             |
| 5850                 | 60.08          | PK                  | 62           | 2          | H             | 3.96                    | 64.04                        | 68.2           | -4.16       |
| 5850                 | 58.97          | PK                  | 62           | 2          | V             | 3.96                    | 62.93                        | 68.2           | -5.27       |
| 5925                 | 57.35          | PK                  | 123          | 1.5        | H             | 4.03                    | 61.38                        | 68.2           | -6.82       |
| 5925                 | 56.64          | PK                  | 123          | 1.5        | V             | 4.03                    | 60.67                        | 68.2           | -7.53       |
| 11380                | 36.71          | PK                  | 174          | 2.3        | H             | 15.13                   | 51.84                        | 74             | -22.16      |
| 11380                | 34.76          | PK                  | 174          | 2.3        | V             | 15.13                   | 49.89                        | 74             | -24.11      |

**Note:**

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

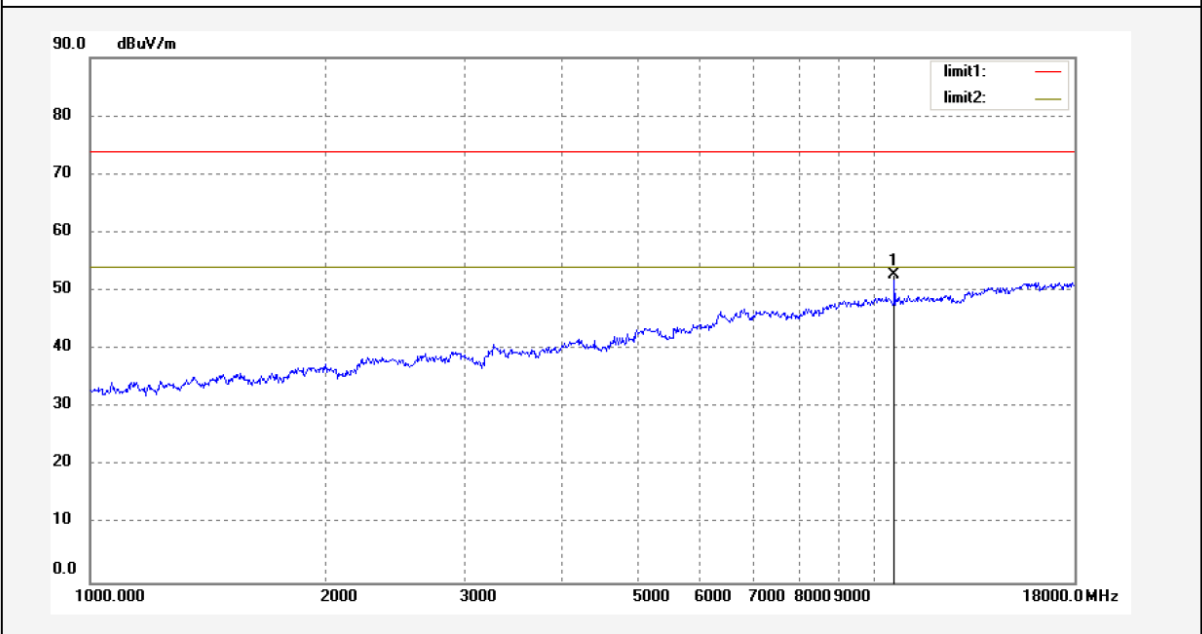
Margin = Corrected. Amplitude - Limit

The other spurious emission which is in the noise floor level was not recorded.

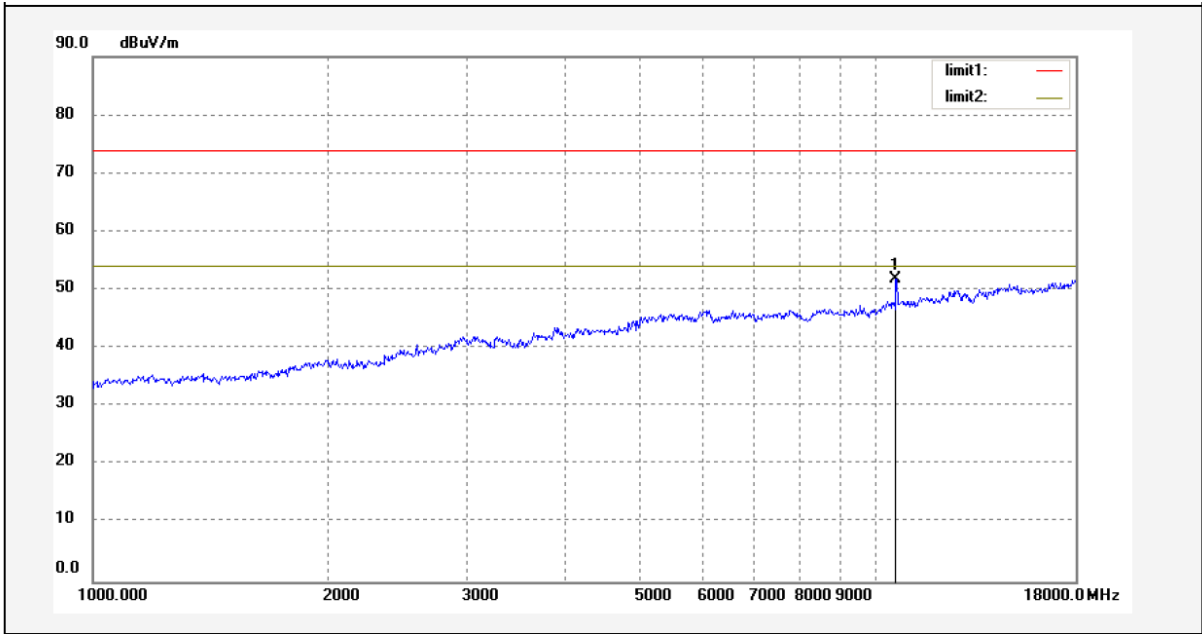
The test result of peak was less than the limit of average, so just peak values were recorded.

1-18 GHz:  
Pre-scan Plots:

Peak  
Pre-scan with 802.11a, 5280MHz  
Horizontal



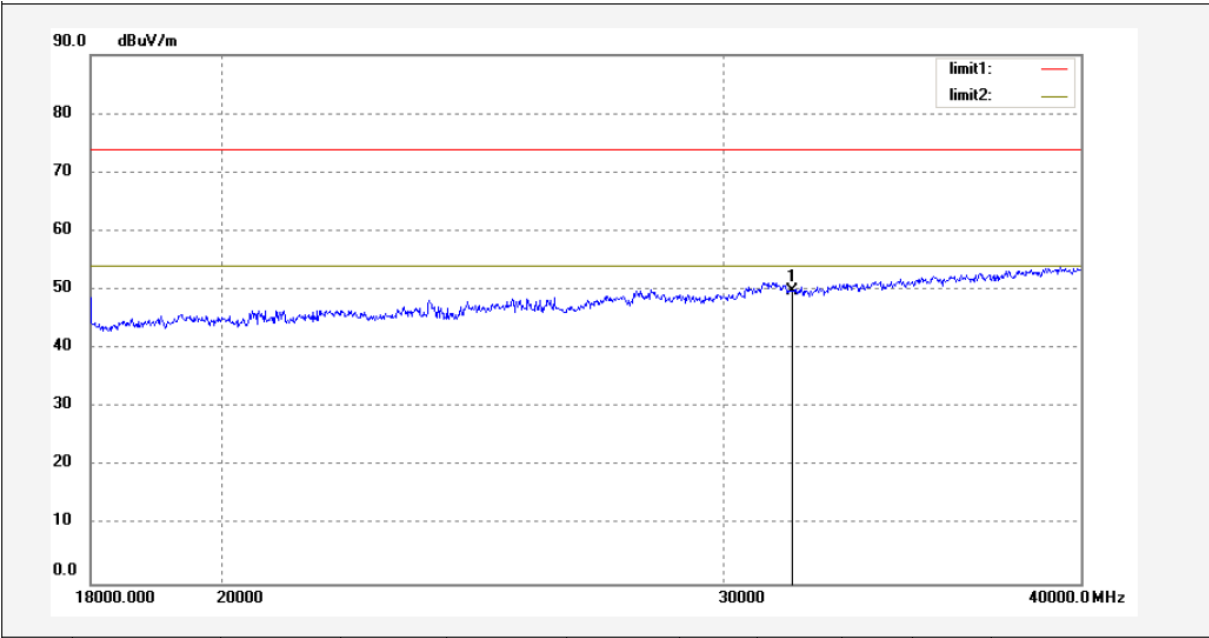
Vertical



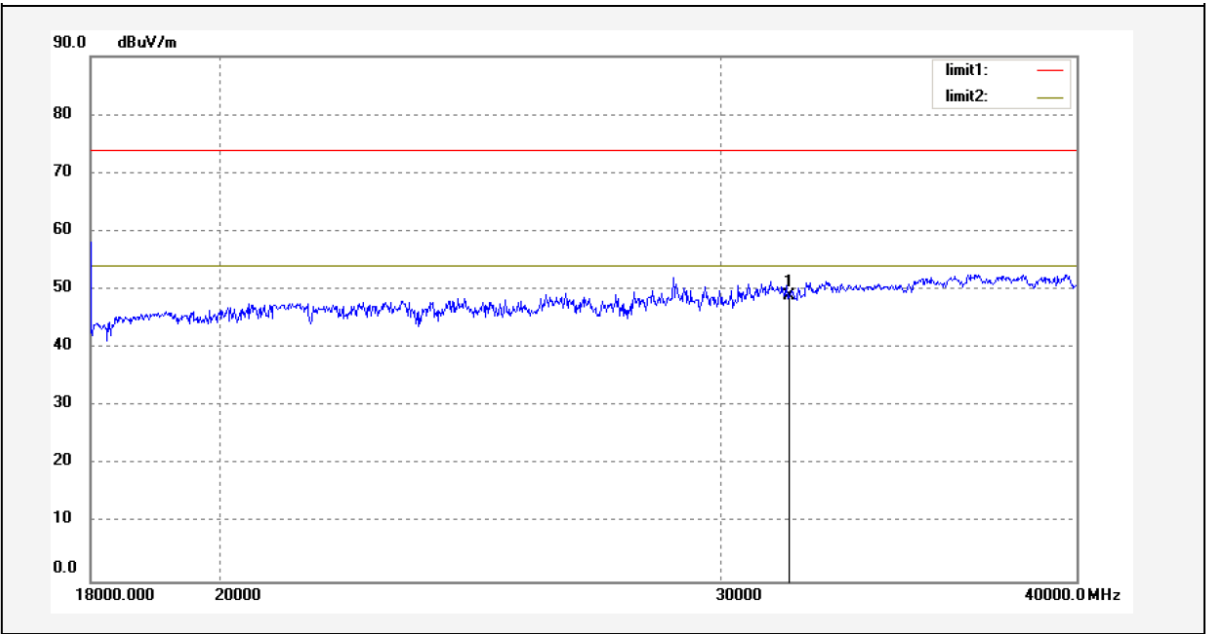
18 -40GHz:

Pre-scan Plots:

Horizontal



Vertical



## **FCC §15.407(a),(e) – 26 dB & 6dB EMISSION BANDWIDTH**

### **Applicable Standard**

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### **Test Procedure**

#### **1. Emission Bandwidth (EBW)**

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### **2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz**

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

