# TEST REPORT

| | |
|---|---|
| **Applicant:** | Megatronix (Beijing) Technology Co., Ltd. |
| **Address of Applicant:** | 12F, Tower C, Rongxin Center, No.34 Chuangyuan Rd., Chaoyang District, Beijing, China |
| **Manufacturer:** | Megatronix (Beijing) Technology Co., Ltd. |
| **Address of Manufacturer:** | 12F, Tower C, Rongxin Center, No.34 Chuangyuan Rd., Chaoyang District, Beijing, China |
| **Factory:** | XTRONICS (Kunshan) Electronics Technology Co. Ltd. |
| **Address of Factory:** | 88 Hongyan Road, Economic and Technological Development Zone, Kunshan City, Jiangsu Province, China |
| **Equipment Under Test (EUT)** | |
| Product Name: | Central Infotainment Module |
| Model No.: | AKFD-003-AB |
| **FCC ID:** | 2A9CU-AKFD003AB |
| **Applicable standards:** | FCC CFR Title 47 Part 15 Subpart E Section 15.407 |
| **Date of sample receipt:** | November 07, 2022 |
| **Date of Test:** | November 07-14, 2022 |
| **Date of report issue:** | November 14, 2022 |
| **Test Result :** | PASS * |

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

**Robinson Luo**
**Laboratory Manager**

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *November 14, 2022* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Prepared By:*** *Tiger Chen* ***Date:*** *November 14, 2022*

***Project Engineer***

***Check By:*** ***Date:*** *November 14, 2022*

***Reviewer***

# 3 Contents

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# 4 Test Summary

| Test Item | Section | Result |
|---|---|---|
| Antenna requirement | FCC part 15.203 | PASS |
| AC Power Line Conducted Emission | FCC part 15.207 | N/A |
| Emission Bandwidth | FCC part 15.407 | PASS |
| Maximum Conducted Output Power | FCC part 15.407(a)(1) | PASS |
| Power Spectral Density | FCC part 15.407(a)(1) | PASS |
| Undesirable Emission | FCC part 15.407(b), 15.205/15.209 | PASS |
| Radiated Emission | FCC part 15.205/15.209 | PASS |
| Band Edge | FCC part 15.407(b)(1) | PASS |
| Frequency Stability | FCC part 15.407(g) | PASS |

*Remark:*

*Pass: The EUT complies with the essential requirements in the standard.*

## 4.1 Measurement Uncertainty

| Test Item | Frequency Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 9kHz-30MHz | 3.1dB | (1) |
| Radiated Emission | 30MHz-200MHz | 3.8039dB | (1) |
| Radiated Emission | 200MHz-1GHz | 3.9679dB | (1) |
| Radiated Emission | 1GHz-18GHz | 4.29dB | (1) |
| Radiated Emission | 18GHz-40GHz | 3.30dB | (1) |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | 3.44dB | (1) |
| Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%. | | | |

# 5 General Information

## 5.1 General Description of EUT

| | |
|---|---|
| Product Name: | Central Infotainment Module |
| Model No.: | AKFD-003-AB |
| Test sample(s) ID: | GTS202211000045-1 |
| Sample(s) Status: | Engineer sample |
| S/N: | M8100H2700032201130005 |
| Hardware Version: | CIM-HW0400.01.01 |
| Software Version: | HW Rev No.:CIM-HW0400.01.01 |
| Operation Frequency: | Band: U-NII Band I<br>IEEE 802.11a: 5180-5240, 4<br>IEEE 802.11n/ac 20MHz: 5180-5240, 4<br>IEEE 802.11n/ac 40MHz: 5190-5230, 2<br>IEEE 802.11ac 80MHz: 5210, 1 |
| Modulation technology: | OFDM |
| Antenna Type: | Integral Antenna |
| Antenna gain: | 3.17dBi(declare by applicant) |
| Power supply: | DC 12V |

**Channel list for 802.11a/n/ac(HT20)**

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|---|---|
| 36 | 5180MHz | 40 | 5200MHz | 44 | 5220MHz | 48 | 5240MHz |

**Channel list for 802.11n(HT40)/ac(HT40)**

| Channel | Frequency | Channel | Frequency |
|---|---|---|---|
| 38 | 5190MHz | 46 | 5230MHz |

**Channel list for 802.11ac(HT80)**

| Channel | Frequency |
|---|---|
| 42 | 5210MHz |

## 5.2 Test mode

| | |
|---|---|
| Transmitting mode | Keep the EUT in transmitting with modulation.. |

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

| Mode | Data rate |
|---|---|
| 802.11a/n/ac(HT20) | 6/6.5 Mbps |
| 802.11n/ac(HT40) | 13.5 Mbps |
| 802.11ac(HT80) | 29.3 Mbps |

## 5.3 Test Facility

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

● **FCC —Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

● **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing .

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

## 5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

## 5.5 Description of Support Units

None.

## 5.6 Deviation from Standards

None.

## 5.7 Additional Instructions

| | |
|---|---|
| Test Software | test command provided by manufacturer |
| Power level setup | Default |

# 6 Test Instruments list

| Radiated Emission: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.2(L)*6.2(W)* 6.4(H) | GTS250 | July 02, 2020 | July 01, 2025 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | GTS251 | N/A | N/A |
| 3 | EMI Test Receiver | Rohde & Schwarz | ESU26 | GTS203 | April 22, 2022 | April 21, 2023 |
| 4 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9168 | GTS640 | March 21, 2022 | March 20, 2023 |
| 5 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120 D | GTS208 | June 12, 2022 | June 11, 2023 |
| 6 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | June 23, 2022 | June 22, 2023 |
| 7 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 8 | Coaxial Cable | GTS | N/A | GTS213 | April 22, 2022 | April 21, 2023 |
| 9 | Coaxial Cable | GTS | N/A | GTS211 | April 22, 2022 | April 21, 2023 |
| 10 | Coaxial cable | GTS | N/A | GTS210 | April 22, 2022 | April 21, 2023 |
| 11 | Coaxial Cable | GTS | N/A | GTS212 | April 22, 2022 | April 21, 2023 |
| 12 | Amplifier(100kHz-3GHz) | HP | 8347A | GTS204 | April 22, 2022 | April 21, 2023 |
| 13 | Amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | June 23, 2022 | June 22, 2023 |
| 14 | Band filter | Amindeon | 82346 | GTS219 | June 23, 2022 | June 22, 2023 |
| 15 | Power Meter | Anritsu | ML2495A | GTS540 | June 23, 2022 | June 22, 2023 |
| 16 | Power Sensor | Anritsu | MA2411B | GTS541 | June 23, 2022 | June 22, 2023 |
| 17 | Wideband Radio Communication Tester | Rohde & Schwarz | CMW500 | GTS575 | April 22, 2022 | April 21, 2023 |
| 18 | Splitter | Agilent | 11636B | GTS237 | June 23, 2022 | June 22, 2023 |
| 19 | Loop Antenna | ZHINAN | ZN30900A | GTS534 | Nov. 30, 2021 | Nov. 29, 2022 |
| 20 | Broadband Preamplifier | SCHWARZBECK | BBV9718 | GTS535 | April 22, 2022 | April 21, 2023 |
| 21 | Breitband hornantenna | SCHWARZBECK | BBHA 9170 | GTS579 | Oct. 16, 2022 | Oct. 15, 2023 |
| 22 | Amplifier | TDK | PA-02-02 | GTS574 | Oct. 16, 2022 | Oct. 15, 2023 |
| 23 | Amplifier | TDK | PA-02-03 | GTS576 | Oct. 16, 2022 | Oct. 15, 2023 |
| 24 | PSA Series Spectrum Analyzer | Rohde & Schwarz | FSP | GTS578 | June 23, 2022 | June 22, 2023 |
| 25 | Amplifier(1GHz-26.5GHz) | HP | 8449B | GTS601 | April 22, 2022 | April 21, 2023 |

| RF Conducted Test: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | MXA Signal Analyzer | Agilent | N9020A | GTS566 | April 22, 2022 | April 21, 2023 |
| 2 | EMI Test Receiver | R&S | ESCI 7 | GTS552 | April 22, 2022 | April 21, 2023 |
| 3 | Spectrum Analyzer | Agilent | E4440A | GTS536 | April 22, 2022 | April 21, 2023 |
| 4 | MXG vector Signal Generator | Agilent | N5182A | GTS567 | April 22, 2022 | April 21, 2023 |
| 5 | ESG Analog Signal Generator | Agilent | E4428C | GTS568 | April 22, 2022 | April 21, 2023 |
| 6 | USB RF Power Sensor | DARE | RPR3006W | GTS569 | April 22, 2022 | April 21, 2023 |
| 7 | RF Switch Box | Shongyi | RFSW3003328 | GTS571 | April 22, 2022 | April 21, 2023 |
| 8 | Programmable Constant Temp & Humi Test Chamber | WEWON | WHTH-150L-40-880 | GTS572 | April 22, 2022 | April 21, 2023 |

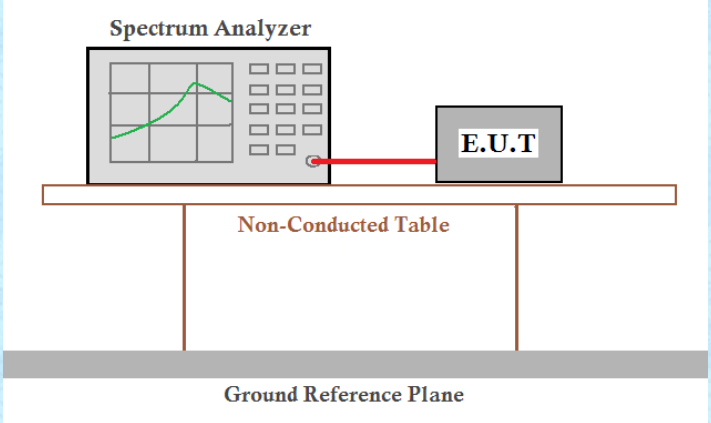
| General used equipment: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (mm-dd-yy)** | **Cal.Due date (mm-dd-yy)** |
| 1 | Humidity/ Temperature Indicator | KTJ | TA328 | GTS243 | April 25, 2022 | April 24, 2023 |
| 2 | Barometer | KUMAO | SF132 | GTS647 | July 26, 2022 | July 25, 2023 |

# 7 Test results and Measurement Data

## 7.1 Antenna requirement:

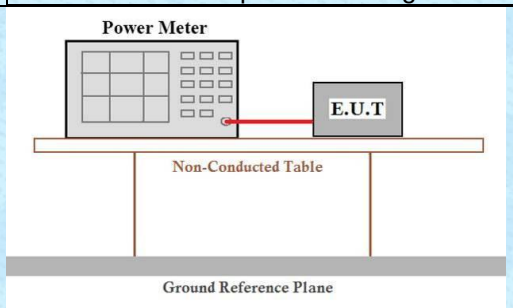
| | |
|---|---|
| **Standard requirement:** | FCC Part15 C Section 15.203 |
| *15.203 requirement:*<br>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. | |
| **E.U.T Antenna:** | |
| The antenna is integral antenna, reference to the appendix II for details | |

## 7.2 Emission Bandwidth

| | |
|---|---|
| Test Requirement : | FCC Part15 E Section 15.407 |
| Test Method : | ANSI C63.10:2013 & KDB 789033 D02 v02r01 |
| Limit: | N/A |
| Test setup: |  |
| Test procedure: | According to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01. |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

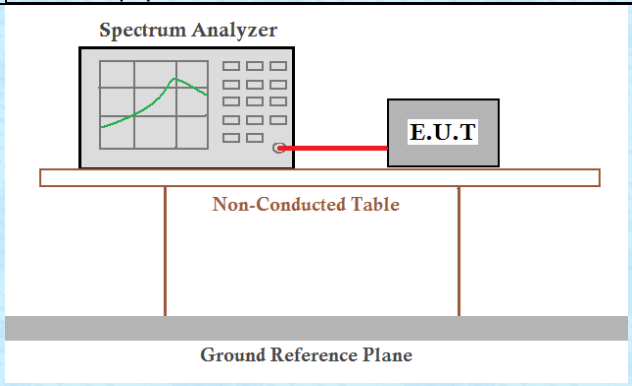
**Measurement Data:** The detailed test data see Appendix.

## 7.3 Maximum Conducted Output Power

| | |
|---|---|
| Test Requirement | FCC Part15 E Section 15.407 |
| Test Method : | ANSI C63.10:2013 & KDB 789033 D02 v02r01 |
| Limit: | <table><tr><th>Frequency band (MHz)</th><th>Limit</th></tr><tr><td rowspan="2">5150-5250</td><td>≤1W(30dBm) for master device</td></tr><tr><td>≤250Mw(23.98dBm) for client device</td></tr><tr><td>5250-5350</td><td>≤250Mw(23.98dBm) for client device or 11dBm+10logB*</td></tr><tr><td>5470-5725</td><td>≤250Mw(23.98dBm) for client device or 11dBm+10logB*</td></tr><tr><td colspan="2">Remark: *Where B is the 26Db emission bandwidth in MHz.<br>The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.</td></tr></table> |
| Test setup: |  |
| Duty Cycle set up: | RBW=VBW=8MHz |
| Test procedure: | **Measurement using an RF average power meter**<br>(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied<br>a) The EUT is configured to transmit continuously or to transmit with a constant duty cycle.<br>b) At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.<br>c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.<br>(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section B).<br>(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.<br>(iv) Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10log(1/0.25) if the duty cycle is 25 percent). |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

**Measurement Data:** The detailed test data see Appendix.

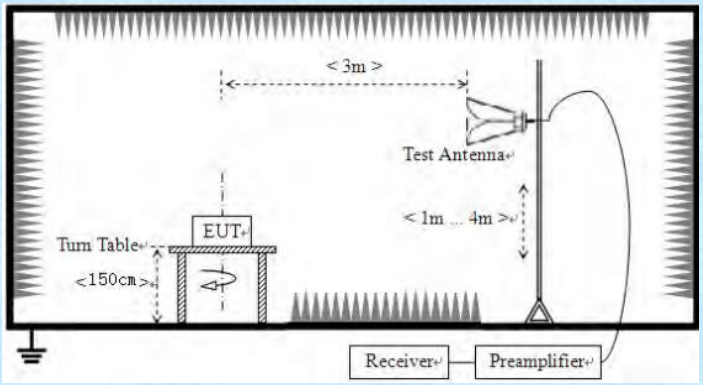
## 7.4 Power Spectral Density

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 E Section 15.407</td></tr>
<tr><td>Test Method :</td><td>ANSI C63.10:2013 & KDB 789033 D02 v02r01</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency band (MHz)</td><td>Limit</td></tr>
<tr><td rowspan="2">5150-5250</td><td>≤17dBm in 1MHz for master device</td></tr>
<tr><td>≤11dBm in 1MHz for client device</td></tr>
<tr><td>5250-5350</td><td>≤11dBm in 1MHz for client device</td></tr>
<tr><td>5470-5725</td><td>≤11dBm in 1MHz for client device</td></tr>
<tr><td colspan="2">Remark: The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td> 
</td></tr>
<tr><td>Test procedure:</td><td>1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”.<br>2) Use the peak search function on the instrument to find the peak of the spectrum.<br>3) Make the following adjustments to the peak value of the spectrum, if applicable:<br>a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.<br>b) If Method SA-3 Alternative was used and the linear mode was used in step E)2)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.<br>4) The result is the PSD.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 6.0 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 5.2 for details</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

**Measurement Data:** The detailed test data see Appendix.

## 7.5 Band Edge

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 E Section 15.407 and 5.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>AV</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>68.2</td><td>Peak Value</td></tr>
</table>
Undesirable emission limits:<br>
(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 EIRP of -27 dBm/MHz.<br>
(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 EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.<br>
(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 EIRP of −27 dBm/MHz.
</td></tr>
<tr><td>Test Procedure:</td><td>
a. The EUT was placed on the top of a rotating table 1.5 m above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data
</td></tr>
</table>

| | |
|---|---|
| | sheet. |
| Test setup: | For radiated emissions above 1GHz<br>  |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

*Remarks:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
4. *According to KDB 789033 D02 v02r01 section G) 1) (d), for For measurements above 1000 MHz @ 3m distance, the limit of field strength is computed as follows:*
   *E[dBuV/m] = EIRP[dBm] + 95.2;*
   *For example, if EIRP = -27dBm*
   *E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.*

**Measurement Data:**

| Worse case mode: | | 802.11a | | Test Frequency: | | 5180MHz | |
|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Factor | Emission Level | Limits | Over | Detector Type | Ant. Pol. |
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | H/V |
| 5150 | 47.76 | -3.63 | 44.13 | 68.2 | -24.07 | peak | H |
| 5150 | 36.22 | -3.63 | 32.59 | 54 | -21.41 | AVG | H |
| 5150 | 47.89 | -3.63 | 44.26 | 68.2 | -23.94 | peak | V |
| 5150 | 42.15 | -3.63 | 38.52 | 54 | -15.48 | AVG | V |
| Worse case mode: | | 802.11n(HT20) | | Test Frequency: | | 5180MHz | |
| Frequency | Meter Reading | Factor | Emission Level | Limits | Over | Detector Type | Ant. Pol. |
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | H/V |
| 5150 | 49.34 | -3.63 | 45.71 | 68.2 | -22.49 | peak | H |
| 5150 | 36.02 | -3.63 | 32.39 | 54 | -21.61 | AVG | H |
| 5150 | 48.61 | -3.63 | 44.98 | 68.2 | -23.22 | peak | V |
| 5150 | 39.19 | -3.63 | 35.56 | 54 | -18.44 | AVG | V |
| Worse case mode: | | 802.11n(HT40) | | Test Frequency: | | 5190MHz | |
| Frequency | Meter Reading | Factor | Emission Level | Limits | Over | Detector Type | Ant. Pol. |
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | H/V |
| 5150 | 48.92 | -3.63 | 45.29 | 68.2 | -22.91 | peak | H |
| 5150 | 38.94 | -3.63 | 35.31 | 54 | -18.69 | AVG | H |
| 5150 | 48.65 | -3.63 | 45.02 | 68.2 | -23.18 | peak | V |
| 5150 | 40.2 | -3.63 | 36.57 | 54 | -17.43 | AVG | V |
| Worse case mode: | | 802.11ac(HT20) | | Test Frequency: | | 5180MHz | |
| Frequency | Meter Reading | Factor | Emission Level | Limits | Over | Detector Type | Ant. Pol. |
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | H/V |
| 5150 | 49 | -3.63 | 45.37 | 68.2 | -22.83 | peak | H |
| 5150 | 36.87 | -3.63 | 33.24 | 54 | -20.76 | AVG | H |
| 5150 | 50.05 | -3.63 | 46.42 | 68.2 | -21.78 | peak | V |
| 5150 | 36.21 | -3.63 | 32.58 | 54 | -21.42 | AVG | V |

| Worse case mode: | | 802.11ac(VHT40) | | Test Frequency: | | 5190MHz | |
|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Factor | Emission Level | Limits | Over | Detector Type | Ant. Pol. |
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | H/V |
| 5150 | 46.53 | -3.63 | 42.9 | 68.2 | -25.3 | peak | H |
| 5150 | 39.72 | -3.63 | 36.09 | 54 | -17.91 | AVG | H |
| 5150 | 49.6 | -3.63 | 45.97 | 68.2 | -22.23 | peak | V |
| 5150 | 40.07 | -3.63 | 36.44 | 54 | -17.56 | AVG | V |
| Worse case mode: | | 802.11ac(VHT80) | | Test Frequency: | | 5210MHz | |
| Frequency | Meter Reading | Factor | Emission Level | Limits | Over | Detector Type | Ant. Pol. |
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | H/V |
| 5150 | 47.38 | -3.63 | 43.75 | 68.2 | -24.45 | peak | H |
| 5150 | 37.08 | -3.63 | 33.45 | 54 | -20.55 | AVG | H |
| 5150 | 48.41 | -3.63 | 44.78 | 68.2 | -23.42 | peak | V |
| 5150 | 38.85 | -3.63 | 35.22 | 54 | -18.78 | AVG | V |
| 5350 | 51.31 | -3.59 | 47.72 | 68.2 | -20.48 | peak | H |
| 5350 | 41.89 | -3.59 | 38.3 | 54 | -15.7 | AVG | H |
| 5350 | 46.01 | -3.59 | 42.42 | 68.2 | -25.78 | peak | V |
| 5350 | 41.85 | -3.59 | 38.26 | 54 | -15.74 | AVG | V |

## 7.6 Radiated Emission

| | |
|---|---|
| Test Requirement : | FCC Part15 C Section 15.209 and 15.205 |
| Test Method : | ANSI C63.10: 2013 |
| Test Frequency Range: | 9kHz to 40GHz |
| Test site: | Measurement Distance: 3m (Semi-Anechoic Chamber) |

Receiver setup:

| Frequency | Detector | RBW | VBW | Value |
|---|---|---|---|---|
| 9kHz-150KHz | Quasi-peak | 200Hz | 1kHz | Quasi-peak Value |
| 150kHz-30MHz | Quasi-peak | 9kHz | 30kHz | Quasi-peak Value |
| 30MHz-1GHz | Quasi-peak | 120KHz | 300KHz | Quasi-peak Value |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak Value |
| | AV | 1MHz | 3MHz | Average Value |

Limit:

| Frequency (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

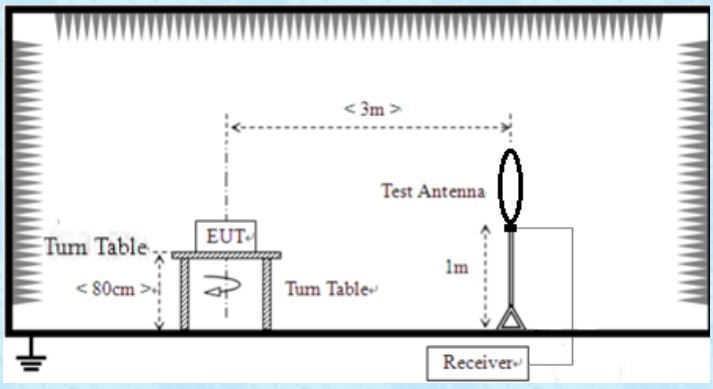
Test Procedure:

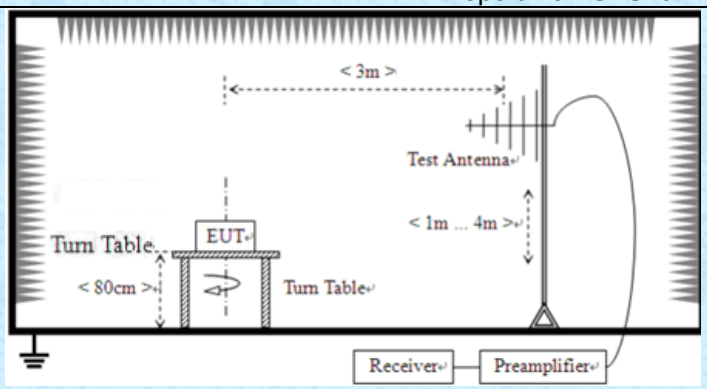
Substitution method was performed to determine the actual ERP emission levels of the EUT.
The following test procedure as below:
1>.Below 1GHz test procedure:

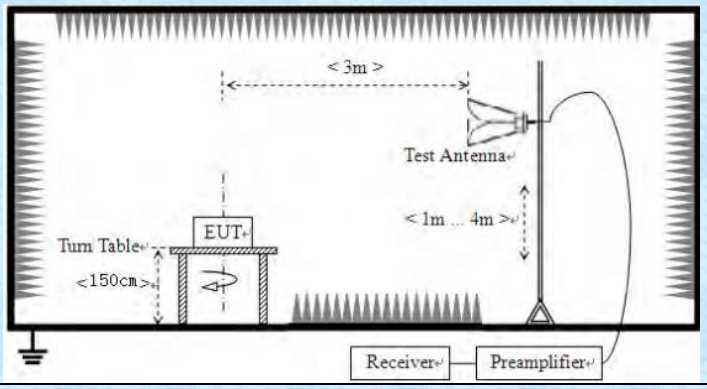
1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2>.Above 1GHz test procedure:

1. On the test site as test setup graph above,the EUT shall be placed at

| | |
|---|---|
| | the 0.8m support on the turntable and in the position closest to normal use as declared by the provider.<br>2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.The output of the test antenna shall be connected to the measuring receiver.<br>3. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.<br>4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.<br>5. Repeat step 4 for test frequency with the test antenna polarized horizontally.<br>6. Remove the transmitter and replace it with a substitution antenna<br>7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.<br>8. Repeat step 7 with both antennas horizontally polarized for each test frequency.<br>9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:<br>EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)<br>where:<br>Pg is the generator output power into the substitution antenna. |
| Test setup: | For radiated emissions from 9kHz to 30MHz<br>  <br><br>For radiated emissions from 30MHz to1GHz |

<table>
<tr><td></td><td colspan="6"> 

For radiated emissions above 1GHz

</td></tr>
<tr><td>Test Instruments:</td><td colspan="6">Refer to section 6.0 for details</td></tr>
<tr><td>Test mode:</td><td colspan="6">Refer to section 5.2 for details</td></tr>
<tr><td>Test environment:</td><td>Temp.:</td><td>25 °C</td><td>Humid.:</td><td>52%</td><td>Press.:</td><td>1012mbar</td></tr>
<tr><td>Test voltage:</td><td colspan="6">DC 12V</td></tr>
<tr><td>Test results:</td><td colspan="6">Pass</td></tr>
</table>

*Remarks:*

*1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

**Measurement Data:**

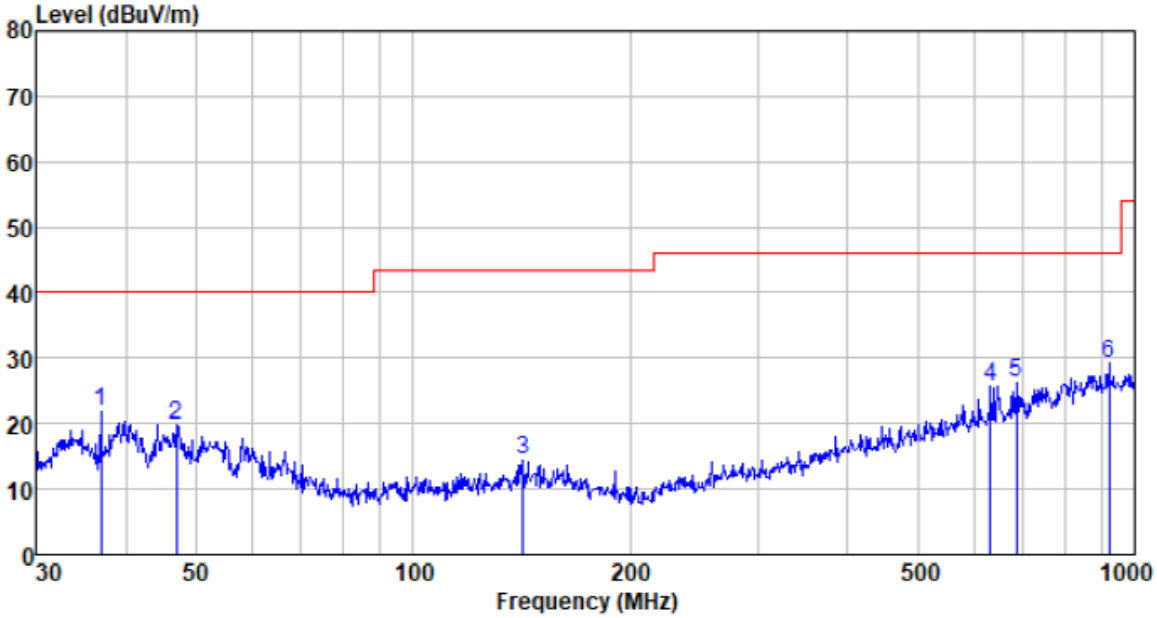
**9 kHz ~ 30 MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

**30MHz~ 1GHz**

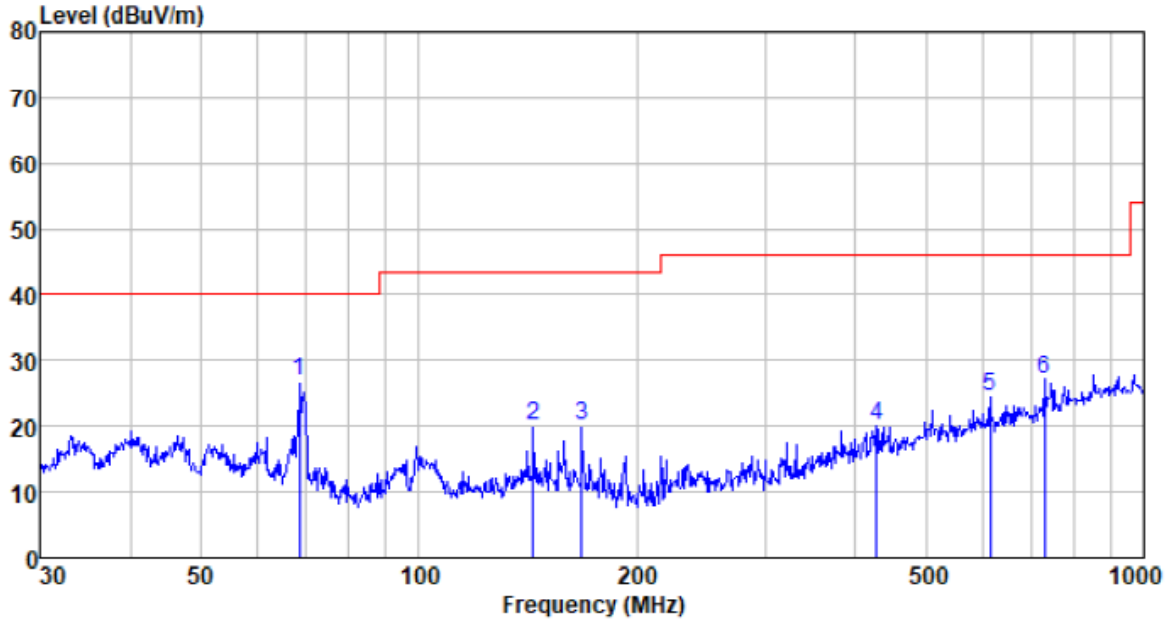
Pre-scan all test modes, found worst case at 802.11ac(VHT80) 5210MHz, and so only show the test result of 802.11ac(VHT80) 5210MHz

**Horizontal:**




| Freq | Reading level | Antenna factor | Cable loss | Preamp factor | level | Limit level | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 36.895 | 43.32 | 13.02 | 0.64 | 35.13 | 21.85 | 40.00 | -18.15 | QP |
| 46.995 | 41.40 | 13.28 | 0.74 | 35.52 | 19.90 | 40.00 | -20.10 | QP |
| 141.826 | 36.92 | 12.42 | 1.52 | 36.35 | 14.51 | 43.50 | -28.99 | QP |
| 631.688 | 39.21 | 19.80 | 3.84 | 37.20 | 25.65 | 46.00 | -20.35 | QP |
| 684.745 | 38.80 | 20.59 | 4.03 | 37.24 | 26.18 | 46.00 | -19.82 | QP |
| 922.516 | 37.65 | 24.09 | 4.94 | 37.37 | 29.31 | 46.00 | -16.69 | QP |

**Vertical:**




| Freq | Reading level | Antenna factor | Cable loss | Preamp factor | level | Limit level | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 68.391 | 50.84 | 10.82 | 0.93 | 35.83 | 26.76 | 40.00 | -13.24 | QP |
| 143.830 | 42.48 | 12.44 | 1.53 | 36.36 | 20.09 | 43.50 | -23.41 | QP |
| 167.824 | 43.28 | 11.67 | 1.68 | 36.48 | 20.15 | 43.50 | -23.35 | QP |
| 428.019 | 37.93 | 16.28 | 2.99 | 37.04 | 20.16 | 46.00 | -25.84 | QP |
| 614.214 | 38.26 | 19.53 | 3.77 | 37.19 | 24.37 | 46.00 | -21.63 | QP |
| 729.358 | 38.76 | 21.38 | 4.20 | 37.26 | 27.08 | 46.00 | -18.92 | QP |

**Above 1GHz:**

| 802.11ac(HT20) | | | | Test Frequency: 5180MHz | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 10360 | 36.35 | 38.96 | 8.27 | 35.64 | 47.94 | 68.2 | -20.26 | Vertical |
| 15540 | 34.96 | 38.4 | 10.57 | 35.35 | 48.58 | 68.2 | -19.62 | Vertical |
| 10360 | 35 | 38.96 | 8.27 | 35.64 | 46.59 | 68.2 | -21.61 | Horizontal |
| 15540 | 30.86 | 38.4 | 10.57 | 35.35 | 44.48 | 68.2 | -23.72 | Horizontal |
| 10360 | 28.46 | 38.96 | 8.27 | 35.64 | 40.05 | 54 | -13.95 | Vertical |
| 15540 | 24.56 | 38.4 | 10.57 | 35.35 | 38.18 | 54 | -15.82 | Vertical |
| 10360 | 25.99 | 38.96 | 8.27 | 35.64 | 37.58 | 54 | -16.42 | Horizontal |
| 15540 | 24.98 | 38.4 | 10.57 | 35.35 | 38.6 | 54 | -15.4 | Horizontal |

| 802.11ac(HT20) | | | | Test Frequency: 5200MHz | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 10400 | 32.46 | 39.01 | 8.29 | 35.67 | 44.09 | 68.2 | -24.11 | Vertical |
| 15600 | 33.84 | 38.3 | 10.62 | 35.36 | 47.4 | 68.2 | -20.8 | Vertical |
| 10400 | 33.01 | 39.01 | 8.29 | 35.67 | 44.64 | 68.2 | -23.56 | Horizontal |
| 15600 | 32.82 | 38.3 | 10.62 | 35.36 | 46.38 | 68.2 | -21.82 | Horizontal |
| 10400 | 28.67 | 39.01 | 8.29 | 35.67 | 40.3 | 54 | -13.7 | Vertical |
| 15600 | 28.32 | 38.3 | 10.62 | 35.36 | 41.88 | 54 | -12.12 | Vertical |
| 10400 | 27.9 | 39.01 | 8.29 | 35.67 | 39.53 | 54 | -14.47 | Horizontal |
| 15600 | 24.16 | 38.3 | 10.62 | 35.36 | 37.72 | 54 | -16.28 | Horizontal |

| 802.11ac(HT20) | | | | Test Frequency: 5240MHz | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 10480 | 35.6 | 39.15 | 8.32 | 35.78 | 47.29 | 68.2 | -20.91 | Vertical |
| 15720 | 31.31 | 38 | 10.72 | 35.37 | 44.66 | 68.2 | -23.54 | Vertical |
| 10480 | 32.95 | 39.15 | 8.32 | 35.78 | 44.64 | 68.2 | -23.56 | Horizontal |
| 15720 | 33.66 | 38 | 10.72 | 35.37 | 47.01 | 68.2 | -21.19 | Horizontal |
| 10480 | 27.2 | 39.15 | 8.32 | 35.78 | 38.89 | 54 | -15.11 | Vertical |
| 15720 | 24.92 | 38 | 10.72 | 35.37 | 38.27 | 54 | -15.73 | Vertical |
| 10480 | 26.07 | 39.15 | 8.32 | 35.78 | 37.76 | 54 | -16.24 | Horizontal |
| 15720 | 26.26 | 38 | 10.72 | 35.37 | 39.61 | 54 | -14.39 | Horizontal |

| 802.11ac(HT40) | | | | Test Frequency: 5190MHz | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 10380 | 35.88 | 39.01 | 8.28 | 35.67 | 47.5 | 68.2 | -20.7 | Vertical |
| 15570 | 32.05 | 38.3 | 10.6 | 35.36 | 45.59 | 68.2 | -22.61 | Vertical |
| 10380 | 31.31 | 39.01 | 8.28 | 35.67 | 42.93 | 68.2 | -25.27 | Horizontal |
| 15570 | 32.46 | 38.3 | 10.6 | 35.36 | 46 | 68.2 | -22.2 | Horizontal |
| 10380 | 26.4 | 39.01 | 8.28 | 35.67 | 38.02 | 54 | -15.98 | Vertical |
| 15570 | 25.5 | 38.3 | 10.6 | 35.36 | 39.04 | 54 | -14.96 | Vertical |
| 10380 | 24.07 | 39.01 | 8.28 | 35.67 | 35.69 | 54 | -18.31 | Horizontal |
| 15570 | 22.29 | 38.3 | 10.6 | 35.36 | 35.83 | 54 | -18.17 | Horizontal |

| 802.11ac(HT40) | | | | | Test Frequency: 5230MHz | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 10460 | 33.17 | 39.11 | 8.31 | 35.75 | 44.84 | 68.2 | -23.36 | Vertical |
| 15690 | 31.71 | 38.1 | 10.7 | 35.37 | 45.14 | 68.2 | -23.06 | Vertical |
| 10460 | 33.56 | 39.11 | 8.31 | 35.75 | 45.23 | 68.2 | -22.97 | Horizontal |
| 15690 | 33.34 | 38.1 | 10.7 | 35.37 | 46.77 | 68.2 | -21.43 | Horizontal |
| 10460 | 27.28 | 39.11 | 8.31 | 35.75 | 38.95 | 54 | -15.05 | Vertical |
| 15690 | 27.13 | 38.1 | 10.7 | 35.37 | 40.56 | 54 | -13.44 | Vertical |
| 10460 | 27.63 | 39.11 | 8.31 | 35.75 | 39.3 | 54 | -14.7 | Horizontal |
| 15690 | 26.19 | 38.1 | 10.7 | 35.37 | 39.62 | 54 | -14.38 | Horizontal |

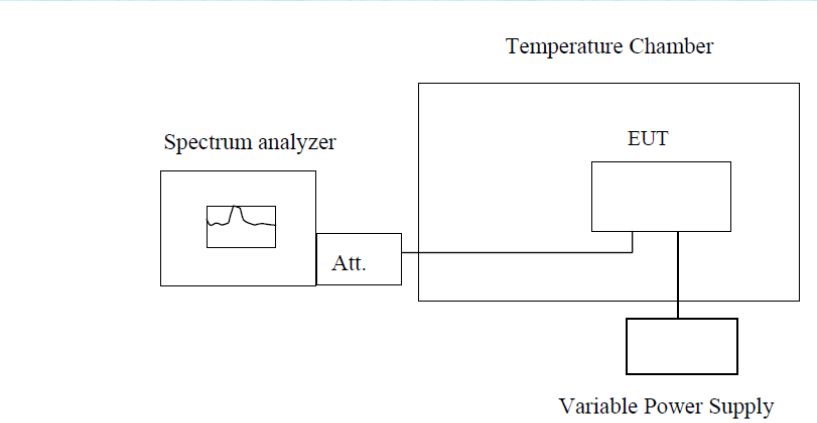
| 802.11ac(HT80) | | | | | Test Frequency: 5210MHz | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 10420 | 32.41 | 39.06 | 8.29 | 35.71 | 44.05 | 68.2 | -24.15 | Vertical |
| 15630 | 34.58 | 38.2 | 10.65 | 35.36 | 48.07 | 68.2 | -20.13 | Vertical |
| 10420 | 35.18 | 39.06 | 8.29 | 35.71 | 46.82 | 68.2 | -21.38 | Horizontal |
| 15630 | 29.07 | 38.2 | 10.65 | 35.36 | 42.56 | 68.2 | -25.64 | Horizontal |
| 10420 | 27.59 | 39.06 | 8.29 | 35.71 | 39.23 | 54 | -14.77 | Vertical |
| 15630 | 27.57 | 38.2 | 10.65 | 35.36 | 41.06 | 54 | -12.94 | Vertical |
| 10420 | 23.9 | 39.06 | 8.29 | 35.71 | 35.54 | 54 | -18.46 | Horizontal |
| 15630 | 25.2 | 38.2 | 10.65 | 35.36 | 38.69 | 54 | -15.31 | Horizontal |

Notes:

1. Level = Read Level + Antenna Factor+ Cable loss- Preamp Factor.

2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.

## 7.7 Frequency stability

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.407(g) |
| Test Method: | ANSI C63.10:2013, FCC Part 2.1055, |
| Limit: | Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified |
| Test Procedure: | The EUT was setup to ANSI C63.4, 2003; tested to 2.1055 for compliance to FCC Part 15.407(g) requirements. |
| Test setup: |  <br>**Note :** Measurement setup for testing on Antenna connector |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

**Measurement Data:** The detailed test data see Appendix.

# 8 Test Setup Photo

Reference to the **appendix I** for details.

# 9 EUT Constructional Details

Reference to the **appendix II** for details.

---END---