# TEST REPORT

## FCC PART 15 SUBPART E 15.407

| | |
|---|---|
| **Report Reference No. .....:** | **CTA24111901704** |
| **FCC ID. ..... :** | **2BFQVSA01A** |
| Compiled by ( position+printed name+signature) . : | File administrators Xudong Zhang |
| Supervised by ( position+printed name+signature) . : | Project Engineer Zoey Cao |
| Approved by ( position+printed name+signature) . : | RF Manager Eric Wang |
| Date of issue .....: | Nov. 29, 2024 |
| **Testing Laboratory Name.....:** | **Shenzhen CTA Testing Technology Co., Ltd.** |
| Address .....: | Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China |
| **Applicant's name .....:** | **Longan Vision Corp.** |
| Address .....: | 215A, 175 Longwood Rd S, Hamilton, ON, Canada, L8P 0A1 |
| **Test specification.....:** | |
| Standard.....: | **FCC Part 15 Subpart E 15.407** |
| TRF Originator .....: | Shenzhen CTA Testing Technology Co., Ltd. |

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| | |
|---|---|
| **Test item description.....:** | **FVSF-ES4-SA01A** |
| Trade Mark.....: | N/A |
| Manufacturer .....: | Longan Vision Corp. |
| Model/Type reference .....: | SA01A |
| Modulation .....: | OFDM |
| Frequency ..... | From 5180MHz-5240MHz, 5745MHz-5825MHz |
| Ratings .....: | DC 6.4V From battery and DC 5.0V From external circuit |
| Result .....: | **PASS** |

# TEST REPORT

| | | |
|---|---|---|
| Equipment under Test | : | FVSF-ES4-SA01A |
| Model /Type | : | SA01A |
| Listed Models | : | SA01xx(x stands for A-Z) |
| **Applicant** | : | **Longan Vision Corp.** |
| Address | : | 215A, 175 Longwood Rd S, Hamilton, ON, Canada, L8P 0A1 |
| **Manufacturer** | : | **Longan Vision Corp.** |
| Address | : | 215A, 175 Longwood Rd S, Hamilton, ON, Canada, L8P 0A1 |

| | |
|---|---|
| **Test Result**: | **PASS** |

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15 Subpart E—Unlicensed National Information Infrastructure Devices
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB789033 D02: General UNII Test Procedures New Rules v01r02

# 2 SUMMARY

## 2.1 General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Nov. 19, 2024 |
| | | |
| Testing commenced on | : | Nov. 19, 2024 |
| | | |
| Testing concluded on | : | Nov. 29, 2024 |

## 2.2 Product Description

| | | | | |
|---|---|---|---|---|
| Product Description: | FVSF-ES4-SA01A | | | |
| Model/Type reference: | SA01A | | | |
| Power supply: | DC 6.4V From battery and DC 5.0V From external circuit | | | |
| Adapter information: | Model: GS-552<br>Input: AC 100-240V 50/60Hz 0.6A<br>Output: DC 5V 3A or 9V 2A or 12V 1.5A | | | |
| testing sample ID： | CTA241119017-1# (Engineer sample)<br>CTA241119017-2# (Normal sample) | | | |
| Hardware version: | V1.0 | | | |
| Software version: | V1.0 | | | |
| **WIFI** | | | | |
| Supported type: | 20MHz system | 40MHz system | 80MHz system | 160MHz system |
| | 802.11a<br>802.11n<br>802.11ac | 802.11n<br>802.11ac | N/A | N/A |
| Operation frequency: | 5180MHz-5240MHz<br>5745MHz-5825MHz | 5190MHz-5230MHz<br>5755MHz-5795MHz | N/A | N/A |
| Modulation: | OFDM | OFDM | N/A | N/A |
| Channel number: | 9 | 4 | N/A | N/A |
| Channel separation: | 20MHz | 40MHz | N/A | N/A |
| Antenna type: | PIFA antenna | | | |
| Antenna gain: | 5.1GWIFI: 3.4 dBi<br>5.8GWIFI: 3.4 dBi | | | |

## 2.3 Equipment Under Test

### Power supply system utilised

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 230V / 50 Hz | ○ | 120V / 60Hz |
| | | ○ | 12 V DC | ○ | 24 V DC |
| | | ● | Other (specified in blank below) | | |

DC 6.4V From battery and DC 5.0V From external circuit

## 2.4 Short description of the Equipment under Test (EUT)

This is a FVSF-ES4-SA01A.
For more details, refer to the user's manual of the EUT.

## 2.5 EUT operation mode

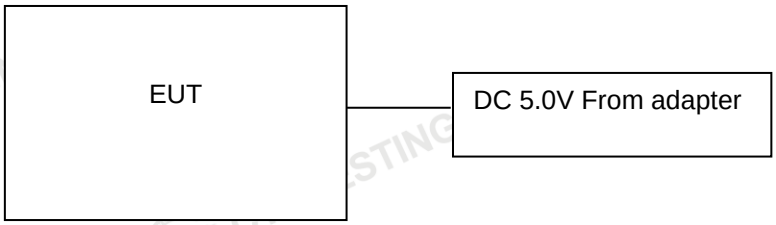
The Applicant provides communication tools software (AT command) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.
All test performed at the low, middle and high of operational frequency range of each mode.

Operation Frequency List WIFI on 5G Band：

| Operating band | 20MHz | | 40MHz | |
|---|---|---|---|---|
| | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| U-NII 1 (5150MHz-5250MHz) | 36 | 5180 | 38 | 5190 |
| | 40 | 5200 | | |
| | 44 | 5220 | 46 | 5230 |
| | 48 | 5240 | | |
| U-NII 3 (5725MHz-5850MHz) | 149 | 5745 | 151 | 5755 |
| | 153 | 5765 | | |
| | 157 | 5785 | 159 | 5795 |
| | 161 | 5805 | | |
| | 165 | 5825 | -- | -- |

Note: The line display in grey is those Channels/Frequencies select to test in this report for each operation mode.

## 2.6 Block Diagram of Test Setup




## 2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

## 2.8 Modifications

No modifications were implemented to meet testing criteria.

# 3 TEST ENVIRONMENT

## 3.1 Address of the test laboratory

**Shenzhen CTA Testing Technology Co., Ltd.**
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

## 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
**FCC-Registration No.: 517856 Designation Number: CN1318**

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA-Lab Cert. No.: 6534.01**

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

## 3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:
Radiated Emission:

| | |
|---|---|
| Temperature: | 25 ° C |
| | |
| Humidity: | 45 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

Conducted testing：

| | |
|---|---|
| Temperature: | 25 ° C |
| | |
| Humidity: | 44 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

AC Power Conducted Emission

| | |
|---|---|
| Temperature: | 24 ° C |
| | |
| Humidity: | 44 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

## 3.4 Test Description

| FCC Requirement | | |
|---|---|---|
| FCC Part 15.207 | AC Power Conducted Emission | PASS |
| FCC Part 15.407(a) | Emission Bandwidth(26dBm Bandwidth) | PASS Note1 |
| FCC Part 15.407(e) | Minimum Emission Bandwidth(6dBm Bandwidth) | PASS Note2 |
| FCC Part 15.407(a) | Maximum Conducted Output Power | PASS |
| FCC Part 15.407(a) | Peak Power Spectral Density | PASS |
| FCC Part 15.407(g) | Frequency Stability | PASS |
| FCC Part 15.407(b) | Undesirable emission | PASS |
| FCC Part 15.407(b)/15.205/15.209 | Radiated Emissions | PASS |
| FCC Part 15.407(h) | Dynamic Frequency Selection | N/A Note 3 |
| FCC Part 15.203/15.247(b) | Antenna Requirement | PASS |

Note 1: Apply to U-NII 1 band.
Note 2: Apply to U-NII 3 band only.
Note 3: This device not work in DFS band.

**Data Rate Used:**
Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items | Mode | Data Rate |
|---|---|---|
| Maximum Conducted Output Power<br>Power Spectral Density<br>Emission Bandwidth(26dBm Bandwidth)<br>Minimum Emission Bandwidth(6dBm Bandwidth)<br>Undesirable emission<br>Frequency Stability | 11a/OFDM | 6 Mbps |
| | 11n(20MHz),11ac(20MHz)/OFDM | 7.2 Mbps |
| | 11n(40MHz),11ac(40MHz)/OFDM | 15.0Mbps |

## 3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 9KHz~30MHz | 3.02 dB | (1) |
| Radiated Emission | 30~1000MHz | 4.06 dB | (1) |
| Radiated Emission | 1~18GHz | 5.14 dB | (1) |
| Radiated Emission | 18-40GHz | 5.38 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 2.14 dB | (1) |
| Output Peak power | 30MHz~18GHz | 0.55 dB | (1) |

| | | | |
|---|---|---|---|
| Power spectral density | / | 0.57 dB | (1) |
| Spectrum bandwidth | / | 1.1% | (1) |
| Radiated spurious emission (30MHz-1GHz) | 30~1000MHz | 4.10 dB | (1) |
| Radiated spurious emission (1GHz-18GHz) | 1~18GHz | 4.32 dB | (1) |
| Radiated spurious emission (18GHz-40GHz) | 18-40GHz | 5.54 dB | (1) |

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 3.6 Equipments Used during the Test

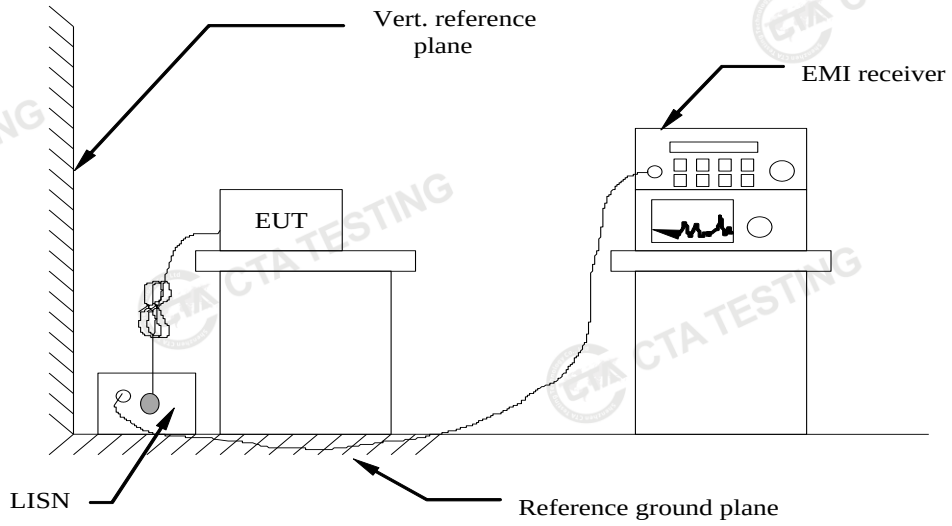
| Test Equipment | Manufacturer | Model No. | Equipment No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| LISN | R&S | ENV216 | CTA-308 | 2024/08/03 | 2025/08/02 |
| LISN | R&S | ENV216 | CTA-314 | 2024/08/03 | 2025/08/02 |
| EMI Test Receiver | R&S | ESPI | CTA-307 | 2024/08/03 | 2025/08/02 |
| EMI Test Receiver | R&S | ESCI | CTA-306 | 2024/08/03 | 2025/08/02 |
| Spectrum Analyzer | Agilent | N9020A | CTA-301 | 2024/08/03 | 2025/08/02 |
| Spectrum Analyzer | R&S | FSP | CTA-337 | 2024/08/03 | 2025/08/02 |
| Vector Signal generator | Agilent | N5182A | CTA-305 | 2024/08/03 | 2025/08/02 |
| Analog Signal Generator | R&S | SML03 | CTA-304 | 2024/08/03 | 2025/08/02 |
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | R&S | CTA-302 | 2024/08/03 | 2025/08/02 |
| Temperature and humidity meter | Chigo | ZG-7020 | CTA-326 | 2024/08/03 | 2025/08/02 |
| Ultra-Broadband Antenna | Schwarzbeck | VULB9163 | CTA-310 | 2023/10/17 | 2026/10/16 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | CTA-309 | 2023/10/13 | 2026/10/12 |
| Loop Antenna | Zhinan | ZN30900C | CTA-311 | 2023/10/17 | 2026/10/16 |
| Horn Antenna | Beijing Hangwei Dayang | OBH100400 | CTA-336 | 2023/10/17 | 2026/10/16 |
| Amplifier | Schwarzbeck | BBV 9745 | CTA-312 | 2024/08/03 | 2025/08/02 |
| Amplifier | Taiwan chengyi | EMC051845B | CTA-313 | 2024/08/03 | 2025/08/02 |
| Directional coupler | NARDA | 4226-10 | CTA-303 | 2024/08/03 | 2025/08/02 |
| High-Pass Filter | XingBo | XBLBQ-GTA18 | CTA-402 | 2024/08/03 | 2025/08/02 |
| High-Pass Filter | XingBo | XBLBQ-GTA27 | CTA-403 | 2024/08/03 | 2025/08/02 |
| Automated filter bank | Tonscend | JS0806-F | CTA-404 | 2024/08/03 | 2025/08/02 |
| Power Sensor | Agilent | U2021XA | CTA-405 | 2024/08/03 | 2025/08/02 |
| Amplifier | Schwarzbeck | BBV9719 | CTA-406 | 2024/08/03 | 2025/08/02 |

| Test Equipment | Manufacturer | Model No. | Version number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| EMI Test Software | Tonscend | TS®JS32-RE | 5.0.0.2 | N/A | N/A |
| EMI Test Software | Tonscend | TS®JS32-CE | 5.0.0.1 | N/A | N/A |
| RF Test Software | Tonscend | TS®JS1120-3 | 3.1.65 | N/A | N/A |
| RF Test Software | Tonscend | TS®JS1120 | 3.1.46 | N/A | N/A |

# 4 TEST CONDITIONS AND RESULTS

## 4.1 AC Power Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | |

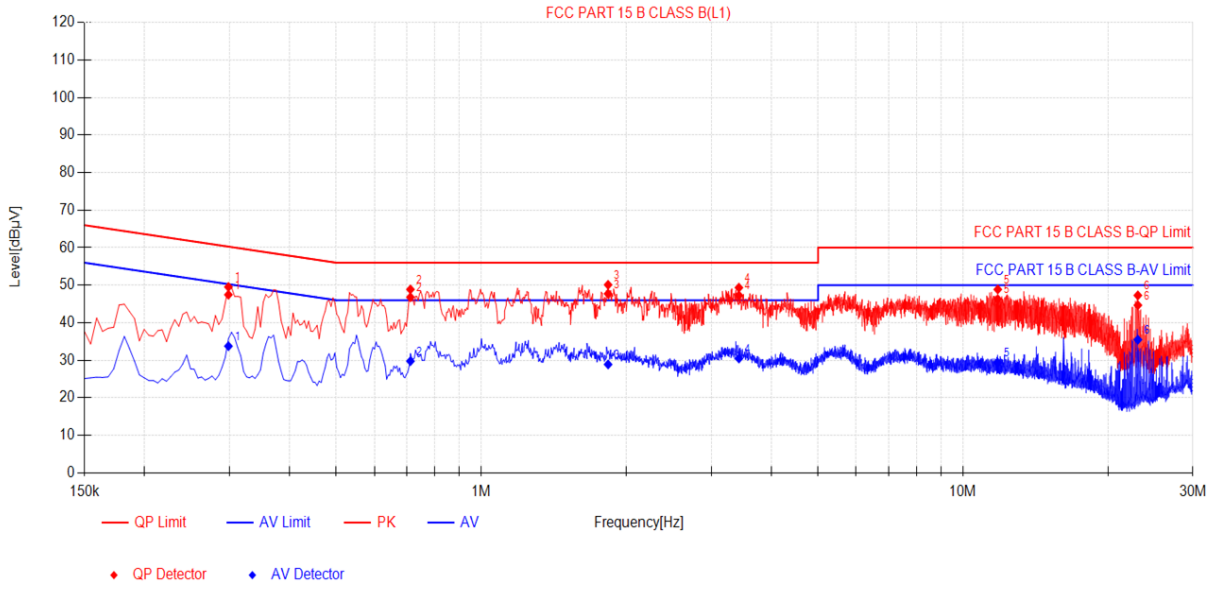
**TEST RESULTS**

Remark:

1. All modes of 802.11a/n/ac were tested at Low, Middle, and High channel; only the worst result of 802.11a CH36 was reported as below:

2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

| Power supply: | DC 5.0V from adapter AC 120V/60Hz | Polarization | L |
|---|---|---|---|

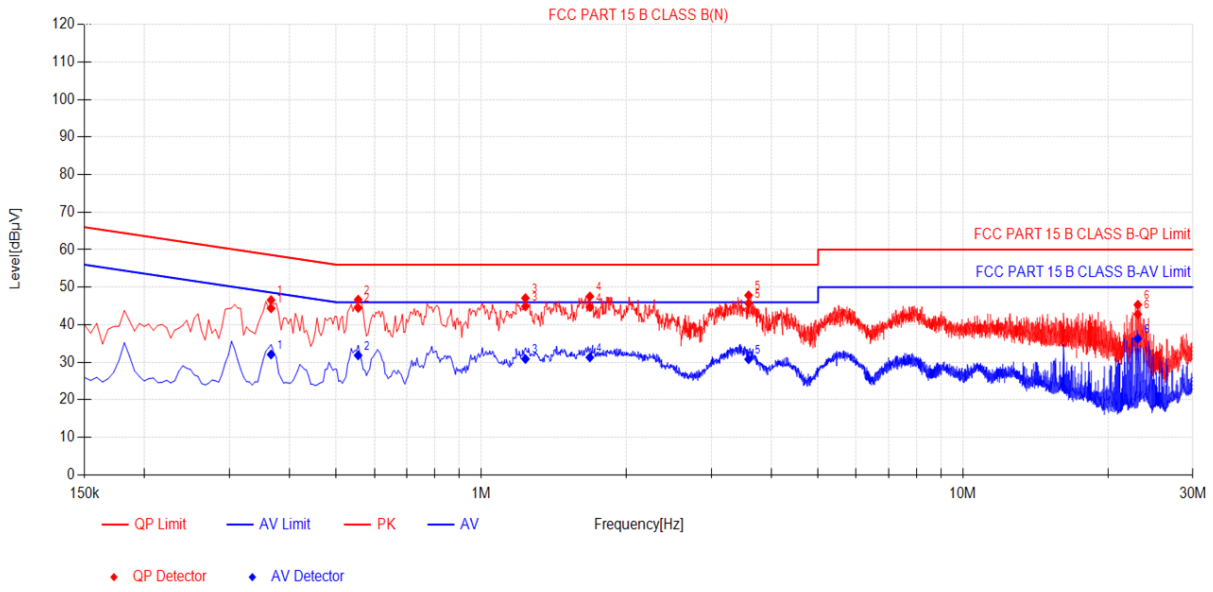



**Final Data List**

| NO. | Freq. [MHz] | Factor [dB] | QP Reading[dBµV] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Reading [dBµV] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.2985 | 9.95 | 37.52 | 47.47 | 60.28 | 12.81 | 23.81 | 33.76 | 50.28 | 16.52 | PASS |
| 2 | 0.7125 | 9.92 | 36.89 | 46.81 | 56.00 | 9.19 | 19.84 | 29.76 | 46.00 | 16.24 | PASS |
| 3 | 1.833 | 9.92 | 37.81 | 47.73 | 56.00 | 8.27 | 18.98 | 28.90 | 46.00 | 17.10 | PASS |
| 4 | 3.426 | 9.97 | 37.32 | 47.29 | 56.00 | 8.71 | 20.50 | 30.47 | 46.00 | 15.53 | PASS |
| 5 | 11.8095 | 10.27 | 36.02 | 46.29 | 60.00 | 13.71 | 19.12 | 29.39 | 50.00 | 20.61 | PASS |
| 6 | 23.0685 | 10.48 | 34.20 | 44.68 | 60.00 | 15.32 | 25.00 | 35.48 | 50.00 | 14.52 | PASS |

Note:1).QP Value (dBµV)= QP Reading (dBµV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBµV) - QP Value (dBµV)
4). AVMargin(dB) = AV Limit (dBµV) - AV Value (dBµV)

| Power supply: | DC 5.0V from adapter AC 120V/60Hz | Polarization | N |
|---|---|---|---|




## Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Reading[dBμV] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | AV Reading [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.366 | 9.88 | 34.49 | 44.37 | 58.59 | 14.22 | 22.20 | 32.08 | 48.59 | 16.51 | PASS |
| 2 | 0.555 | 10.09 | 34.39 | 44.48 | 56.00 | 11.52 | 21.76 | 31.85 | 46.00 | 14.15 | PASS |
| 3 | 1.2345 | 10.17 | 34.71 | 44.88 | 56.00 | 11.12 | 20.72 | 30.89 | 46.00 | 15.11 | PASS |
| 4 | 1.68 | 10.15 | 34.56 | 44.71 | 56.00 | 11.29 | 21.14 | 31.29 | 46.00 | 14.71 | PASS |
| 5 | 3.588 | 10.17 | 35.55 | 45.72 | 56.00 | 10.28 | 20.64 | 30.81 | 46.00 | 15.19 | PASS |
| 6 | 23.0685 | 10.65 | 32.15 | 42.80 | 60.00 | 17.20 | 25.63 | 36.28 | 50.00 | 13.72 | PASS |

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)
4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

## 4.2 Radiated Emissions

**Limit**

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: 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.

**Undesirable emission limits**

| Requirement | Limit(EIRP) | Limit (Field strength at 3m) Note1 |
|---|---|---|
| 15.407(b)(1) | PK:-27(dBm/MHz) | PK:68.2(dBμV/m) |
| 15.407(b)(2) | | |
| 15.407(b)(3) | | |
| 15.407(b)(4) | | |

Note1: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

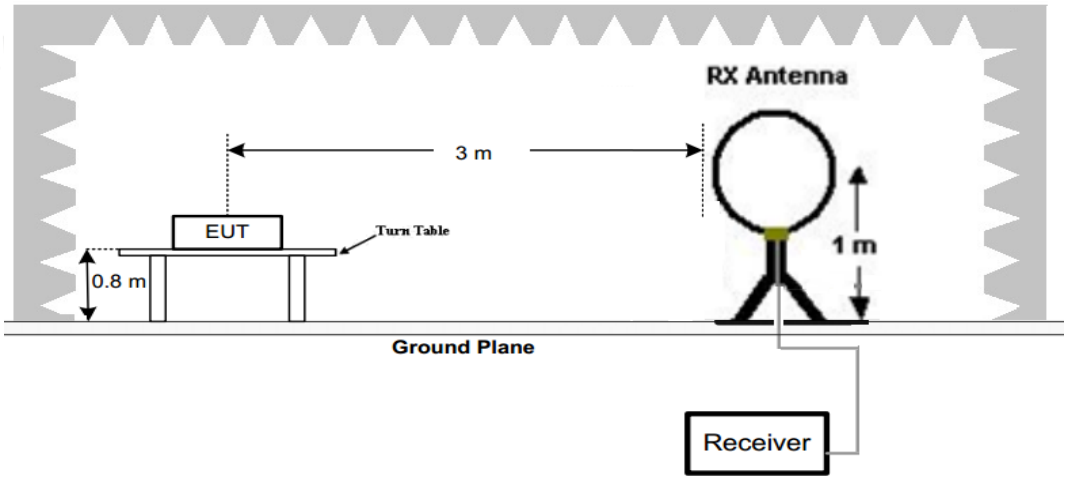
(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209
(6)In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

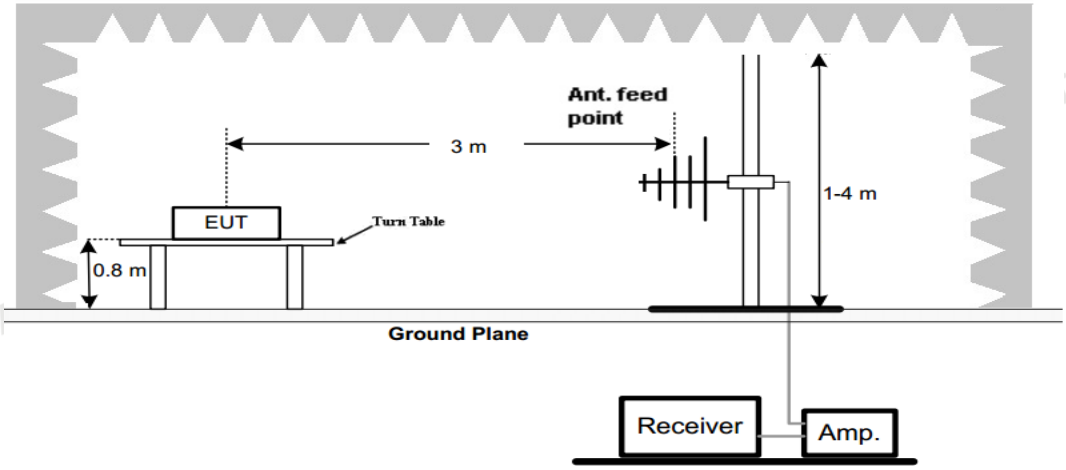
| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

**TEST CONFIGURATION**

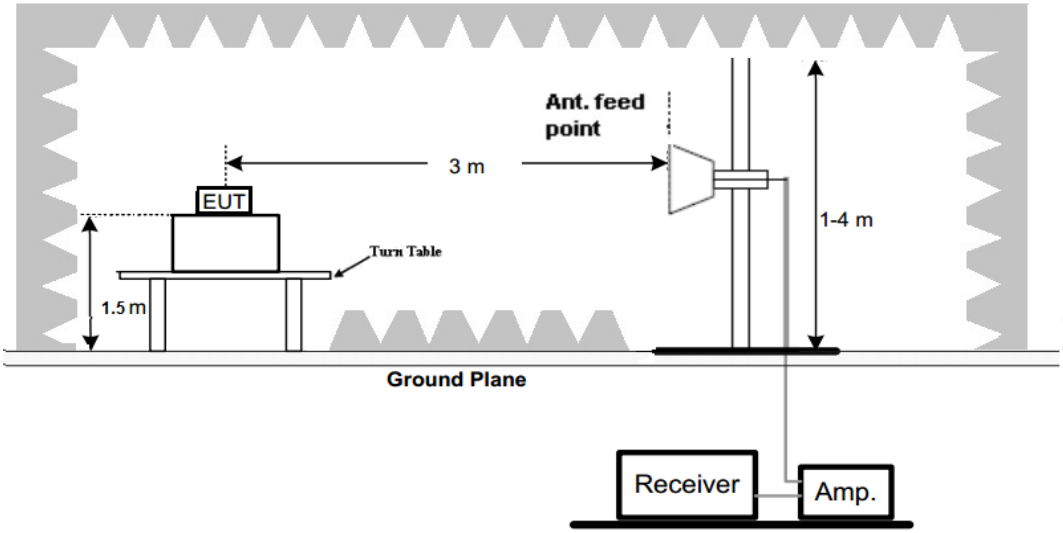
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz




(B) Radiated Emission Test Set-Up, Frequency below 1000MHz




(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



**Test Procedure**

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 40GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Bilog Antenna | 3 |
| 1GHz-18GHz | Horn Antenna | 3 |
| 18GHz-25GHz | Horn Anternna | 1 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

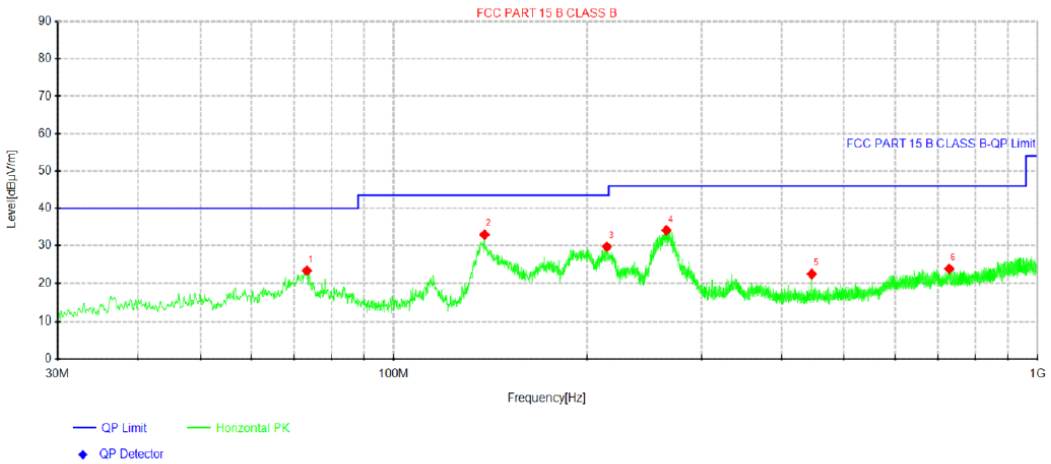
**TEST RESULTS**

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
1. All 802.11a / 802.11n (HT20) / 802.11n (HT40)/ 802.11ac (HT20)/ 802.11ac (HT40) modes have been tested for below 1GHz test, only the worst case 802.11a low channel of U-NII 1 band was recorded.
2. All 802.11a / 802.11n (HT20) / 802.11n (HT40) / 802.11ac (HT20)/ 802.11ac (HT40) modes have been tested for above 1GHz test, only the worst case 802.11a was recorded.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

**For 30MHz-1GHz**

Horizontal



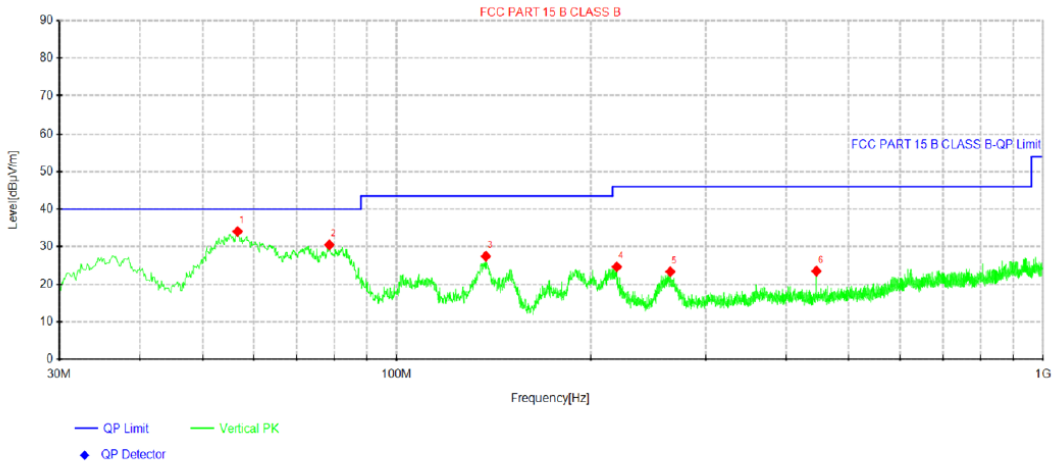

| Suspected Data List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Reading [dBµV] | Level [dBµV/m] | Factor [dB/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 73.2862 | 38.92 | 23.32 | -15.60 | 40.00 | 16.68 | 100 | 359 | Horizontal |
| 2 | 138.397 | 48.73 | 32.96 | -15.77 | 43.50 | 10.54 | 100 | 126 | Horizontal |
| 3 | 214.542 | 42.37 | 29.75 | -12.62 | 43.50 | 13.75 | 100 | 11 | Horizontal |
| 4 | 265.588 | 45.89 | 34.12 | -11.77 | 46.00 | 11.88 | 100 | 90 | Horizontal |
| 5 | 445.523 | 32.23 | 22.43 | -9.80 | 46.00 | 23.57 | 100 | 333 | Horizontal |
| 6 | 728.885 | 28.71 | 23.83 | -4.88 | 46.00 | 22.17 | 100 | 90 | Horizontal |

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

Vertical




**Suspected Data List**

| NO. | Freq. [MHz] | Reading [dBµV] | Level [dBµV/m] | Factor [dB/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 56.675 | 46.04 | 34.09 | -11.95 | 40.00 | 5.91 | 100 | 0 | Vertical |
| 2 | 78.6212 | 47.11 | 30.52 | -16.59 | 40.00 | 9.48 | 100 | 17 | Vertical |
| 3 | 137.427 | 43.34 | 27.47 | -15.87 | 43.50 | 16.03 | 100 | 49 | Vertical |
| 4 | 219.271 | 37.17 | 24.67 | -12.50 | 46.00 | 21.33 | 100 | 165 | Vertical |
| 5 | 265.467 | 35.14 | 23.36 | -11.78 | 46.00 | 22.64 | 100 | 316 | Vertical |
| 6 | 445.523 | 33.31 | 23.51 | -9.80 | 46.00 | 22.49 | 100 | 291 | Vertical |

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

***For 1GHz to 40GHz***

Note: All 802.11a / 802.11n/ac (HT20) 802.11n/ac (HT40) modes have been tested for above 1GHz test, only the worst case 802.11a was recorded.

***U-NII 1 & 802.11a Mode (above 1GHz)***

| Tested Channel | Frequency (MHz) | Emission Level (dBuV/m) | Detector Mode | ANT Pol | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre amplifier (dB) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5150.00 | 57.32 | PK | H | 68.20 | 10.88 | 60.75 | 33.04 | 5.45 | 41.92 | -3.43 |
| 36.00 | 5150.00 | 47.87 | AV | H | 54.00 | 6.13 | 51.30 | 33.04 | 5.45 | 41.92 | -3.43 |
| (5180MHz) | 10360.00 | 52.21 | PK | H | 68.20 | 15.99 | 38.83 | 38.83 | 10.12 | 45.28 | 3.67 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 44.00 | 10440.00 | 52.41 | PK | H | 68.20 | 15.79 | 48.73 | 38.85 | 10.13 | 45.3 | 3.68 |
| (5220MHz) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 48.00 | 5350.50 | 48.28 | PK | H | 68.20 | 19.92 | 51.55 | 32.84 | 5.97 | 42.08 | -3.27 |
| (5240MHz) | 10480.00 | 51.76 | PK | H | 68.20 | 16.44 | 48.02 | 38.89 | 10.19 | 45.34 | 3.74 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tested Channel | Frequency (MHz) | Emission Level (dBuV/m) | Detector Mode | ANT Pol | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre amplifier (dB) | Correction Factor (dB/m) |
| | 5150.00 | 55.75 | PK | V | 68.20 | 12.45 | 59.18 | 33.04 | 5.45 | 41.92 | -3.43 |
| 36.00 | 5150.00 | 48.11 | AV | V | 54.00 | 5.89 | 51.54 | 33.04 | 5.45 | 41.92 | -3.43 |
| (5180MHz) | 10360.00 | 51.87 | PK | V | 68.20 | 16.33 | 48.20 | 38.83 | 10.12 | 45.28 | 3.67 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 44.00 | 10440.00 | 51.79 | PK | V | 68.20 | 16.41 | 48.11 | 38.85 | 10.13 | 45.3 | 3.68 |
| (5220MHz) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 48.00 | 5350.50 | 51.63 | PK | V | 68.20 | 16.57 | 54.90 | 32.84 | 5.97 | 42.08 | -3.27 |
| (5240MHz) | 10480.00 | 52.32 | PK | V | 68.20 | 15.88 | 48.58 | 38.89 | 10.19 | 45.34 | 3.74 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

***U-NII 3 & 802.11a Mode (above 1GHz)***

| Tested Channel | Frequency (MHz) | Emission Level (dBuV/m) | Detector Mode | ANT Pol | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre amplifier (dB) | Correction Factor (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5720.00 | 55.65 | PK | H | 68.20 | 12.55 | 58.43 | 33.42 | 6.04 | 42.24 | -2.78 |
| 149.00 | 5720.00 | 48.14 | AV | H | 54.00 | 5.86 | 50.92 | 33.42 | 6.04 | 42.24 | -2.78 |
| (5745MHz) | 11490.00 | 50.52 | PK | H | 68.20 | 17.68 | 46.04 | 39.02 | 10.91 | 45.45 | 4.48 |
| | -- | -- | -- | -- | -- | -- | | -- | -- | -- | -- |
| 157.00 | 11570.00 | 52.32 | PK | H | 68.20 | 15.88 | 47.87 | 38.93 | 10.95 | 45.43 | 4.45 |
| (5785MHz) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 165.00 | 5855.00 | 52.13 | PK | H | 68.20 | 16.07 | 54.32 | 33.91 | 6.17 | 42.27 | -2.19 |
| (5825MHz) | 11650.00 | 52.54 | PK | H | 68.20 | 15.66 | 47.96 | 38.83 | 11.16 | 45.41 | 4.58 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tested Channel | Frequency (MHz) | Emission Level (dBuV/m) | Detector Mode | ANT Pol | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre amplifier (dB) | Correction Factor (dB/m) |
| | 5720.00 | 56.66 | PK | V | 68.20 | 11.54 | 59.44 | 33.42 | 6.04 | 42.24 | -2.78 |
| 149.00 | 5720.00 | 48.42 | AV | V | 54.00 | 5.58 | 51.20 | 33.42 | 6.04 | 42.24 | -2.78 |
| (5745MHz) | 11490.00 | 49.86 | PK | V | 68.20 | 18.34 | 45.38 | 39.02 | 10.91 | 45.45 | 4.48 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 157.00 | 11570.00 | 51.75 | PK | V | 68.20 | 16.45 | 47.30 | 38.93 | 10.95 | 45.43 | 4.45 |
| (5785MHz) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 165.00 | 5855.00 | 51.56 | PK | V | 68.20 | 16.64 | 53.75 | 33.91 | 6.17 | 42.27 | -2.19 |
| (5825MHz) | 11650.00 | 52.73 | PK | V | 68.20 | 15.47 | 48.15 | 38.83 | 11.16 | 45.41 | 4.58 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the other emission levels were very low against the limit.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
6. Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11ac VHT20 ,IEEE 802.11ac VHT40;

## 4.3 Maximum Conducted Average Output Power

**Limit**

**For the band 5.15-5.25 GHz.**
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

**For the 5.25-5.35 GHz and 5.47-5.725 GHz bands**, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

**For the band 5.725-5.85 GHz**, the maximum conducted output power over the frequency band of operation shall not exceed 1 W

**Test Procedure**

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

**Test Configuration**

**Test Results**

**U-NII 1**

| Type | Channel | Output power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 802.11a | 36 | 6.18 | 24.0 | Pass |
| | 44 | 5.90 | | |
| | 48 | 6.05 | | |
| 802.11n(HT20) | 36 | 5.69 | 24.0 | Pass |
| | 44 | 5.90 | | |
| | 48 | 5.56 | | |
| 802.11n(HT40) | 38 | 4.87 | 24.0 | Pass |
| | 46 | 4.49 | | |
| 802.11ac(HT20) | 36 | 5.95 | 24.0 | Pass |
| | 44 | 6.04 | | |
| | 48 | 6.21 | | |
| 802.11ac(HT40) | 38 | 4.24 | 24.0 | Pass |
| | 46 | 4.13 | | |

**U-NII 3**

| Type | Channel | Output power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 802.11a | 149 | 5.62 | 30.00 | Pass |
| | 157 | 4.66 | | |
| | 165 | 4.82 | | |
| 802.11n(HT20) | 149 | 5.21 | 30.00 | Pass |
| | 157 | 3.89 | | |
| | 165 | 3.96 | | |
| 802.11n(HT40) | 151 | 3.97 | 30.00 | Pass |
| | 159 | 3.62 | | |
| 802.11ac(HT20) | 149 | 4.22 | 30.00 | Pass |
| | 157 | 2.82 | | |
| | 165 | 3.17 | | |
| 802.11ac(HT40) | 151 | 4.18 | 30.00 | Pass |
| | 159 | 3.81 | | |

## 4.4 Power Spectral Density

**Limit**

(1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. [note1]

(2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. [note1]

(3) For the band 5.725 - 5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. [note1, note2]

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

**Test Procedure**

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 1MHz for U-NII 1, U-NII 2A, U-NII C band and 510KHz for U-NII 3 band.
3. Set the VBW ≥ 3× RBW.
4. Set the span to encompass the entire EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.

**Test Configuration**

**Test Results**

U-NII 1

| Type | Bands | Channel | Power Spectral Density (dBm/MHz) | Limit (dBm/MHz) | Result |
|---|---|---|---|---|---|
| 802.11a | U-NII 1 | 36 | -4.47 | 11.0 | Pass |
| | | 44 | -4.80 | | |
| | | 48 | -4.73 | | |
| 802.11n (HT20) | U-NII 1 | 36 | -5.34 | | |
| | | 44 | -5.07 | | |
| | | 48 | -5.11 | | |
| 802.11n (HT40) | U-NII 1 | 38 | -8.82 | | |
| | | 46 | -8.90 | | |
| 802.11ac (HT20) | U-NII 1 | 36 | -5.24 | | |
| | | 44 | -4.94 | | |
| | | 48 | -4.98 | | |
| 802.11ac (HT40) | U-NII 1 | 38 | -9.73 | | |
| | | 46 | -9.32 | | |

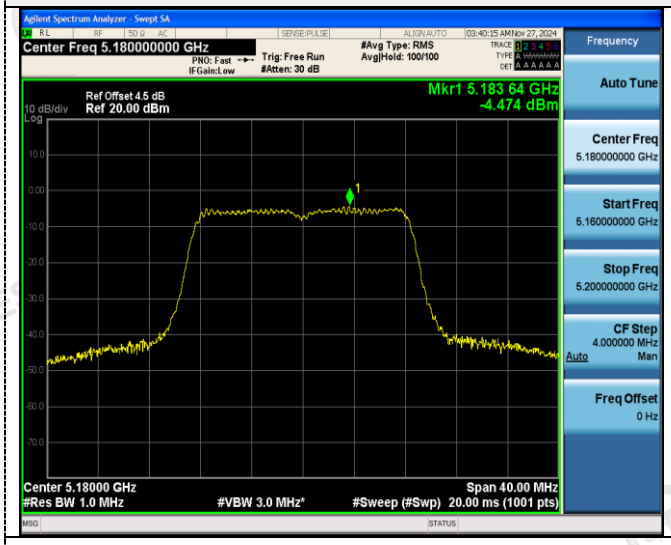
U-NII 3

| Type | Bands | Channel | Power Spectral Density (dBm/300KHz) | Power Spectral Density (dBm/500KHz) | Limit (dBm/500KHz) | Result |
|---|---|---|---|---|---|---|
| 802.11a | U-NII 3 | 149 | -7.65 | -5.43 | 30.0 | Pass |
| | | 157 | -8.31 | -6.09 | | |
| | | 165 | -8.37 | -6.15 | | |
| 802.11n (HT20) | U-NII 3 | 149 | -7.76 | -5.54 | | |
| | | 157 | -9.17 | -6.95 | | |
| | | 165 | -9.03 | -6.81 | | |
| 802.11n (HT40) | U-NII 3 | 151 | -10.87 | -8.65 | | |
| | | 159 | -11.36 | -9.14 | | |
| 802.11ac (HT20) | U-NII 3 | 149 | -8.88 | -6.66 | | |
| | | 157 | -10.12 | -7.90 | | |
| | | 165 | -9.38 | -7.16 | | |
| 802.11ac (HT40) | U-NII 3 | 151 | -11.13 | -8.91 | | |
| | | 159 | -11.78 | -9.56 | | |

Test plot as follows

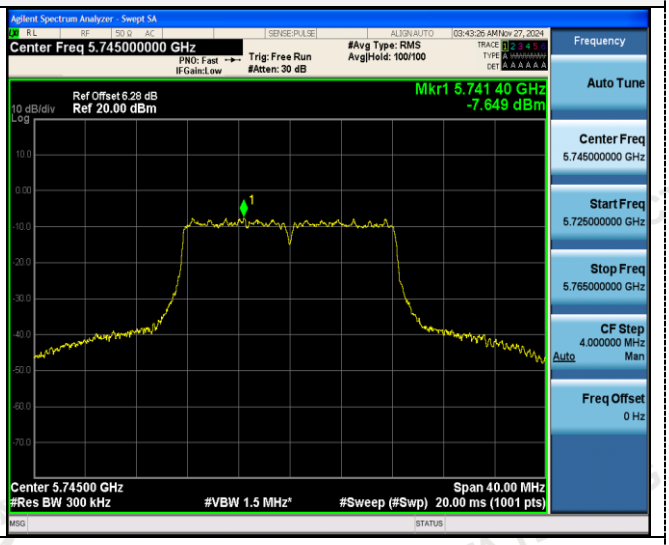
*802.11a*

*U-NII 1*

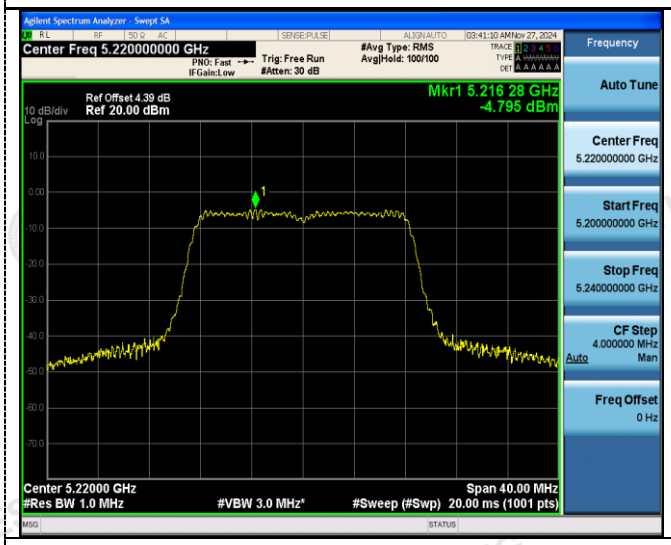



*CH36*

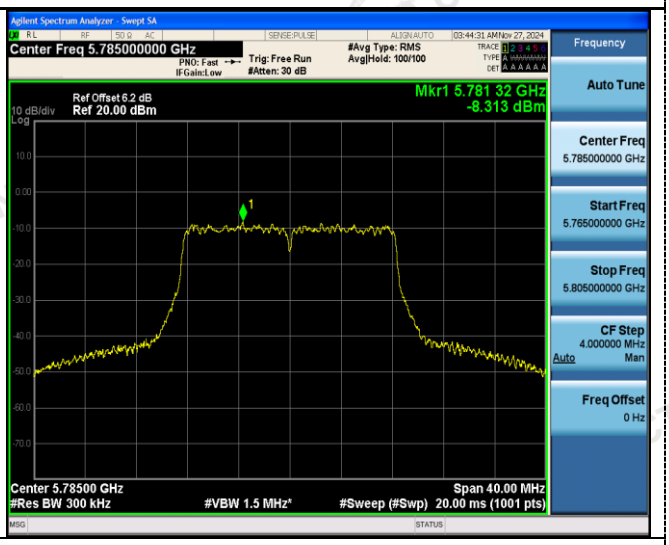
*U-NII 3*



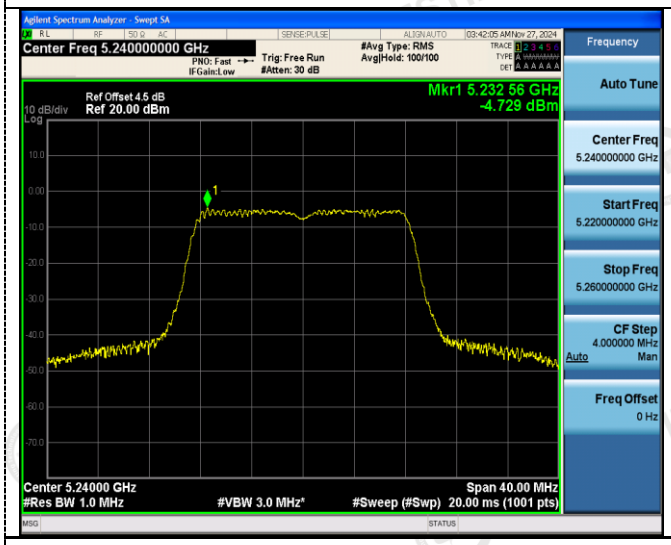

*CH149*



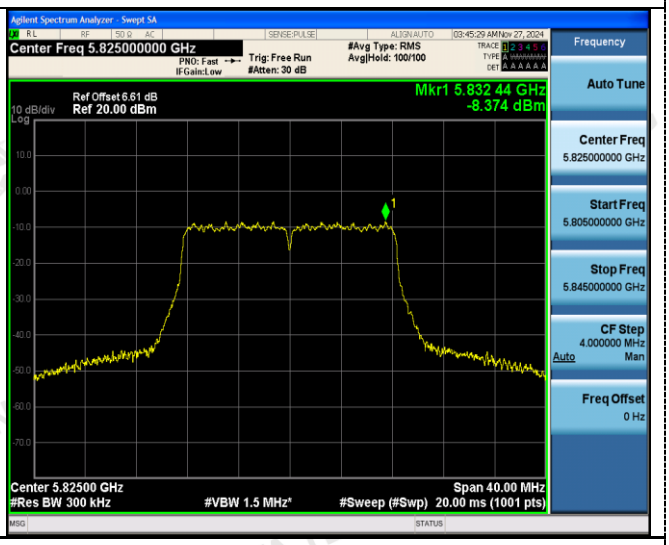

*CH40*



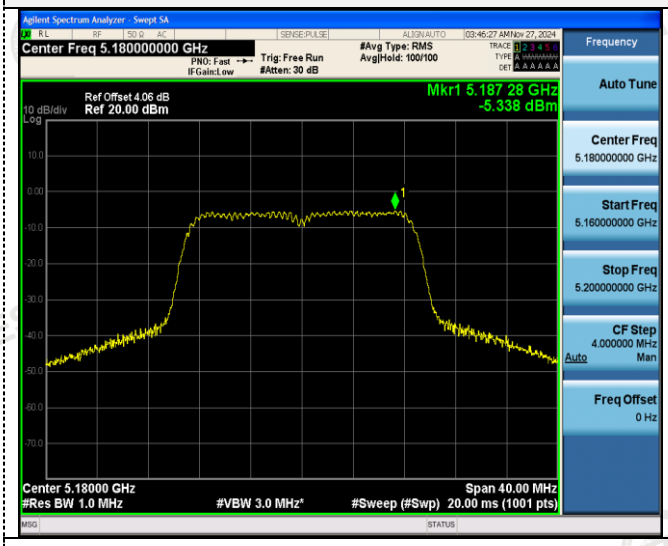
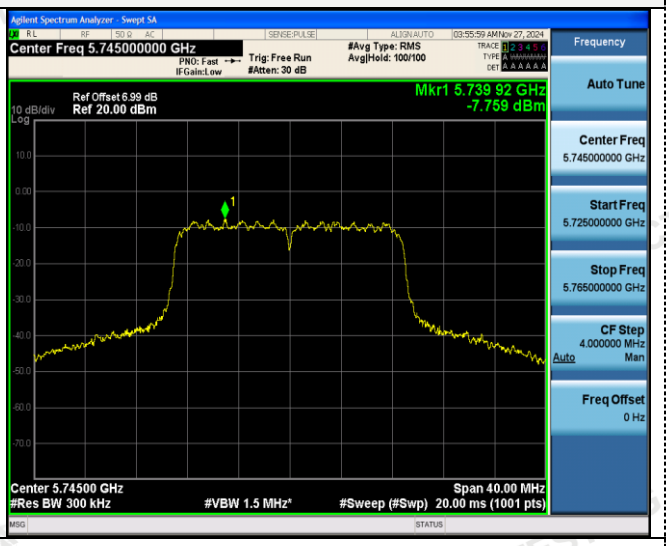
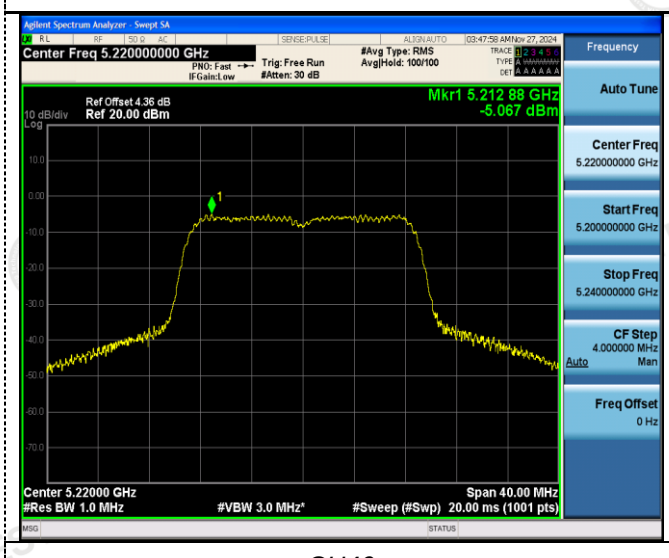
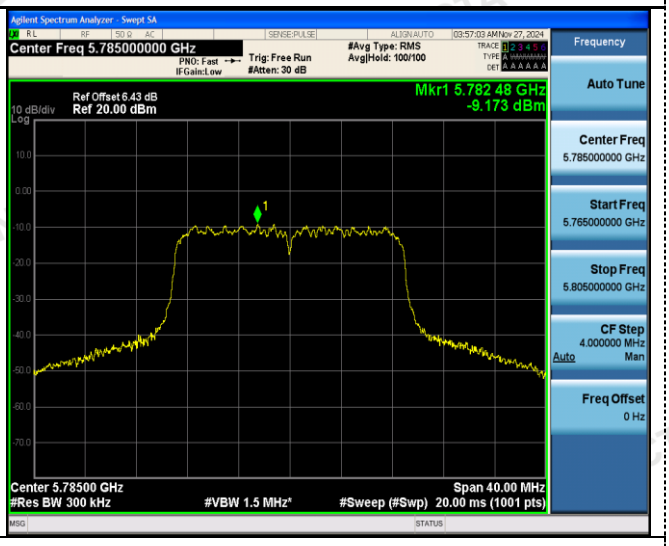
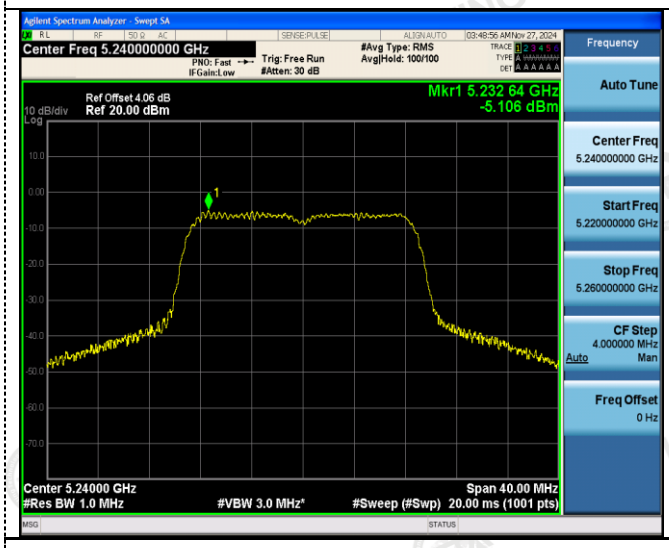
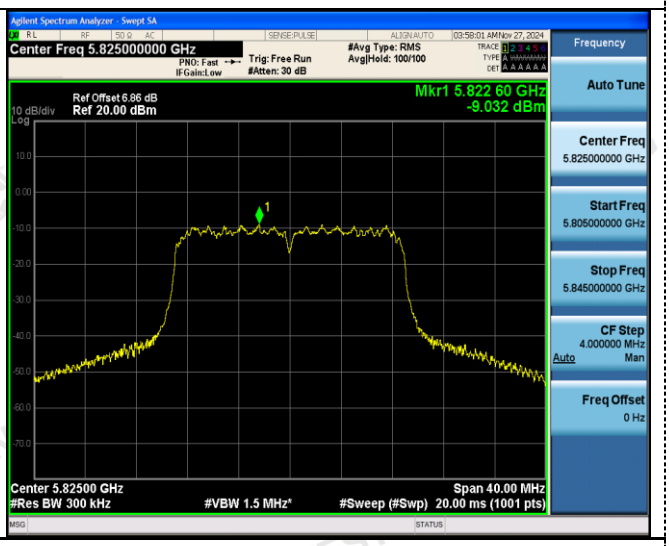

*CH157*

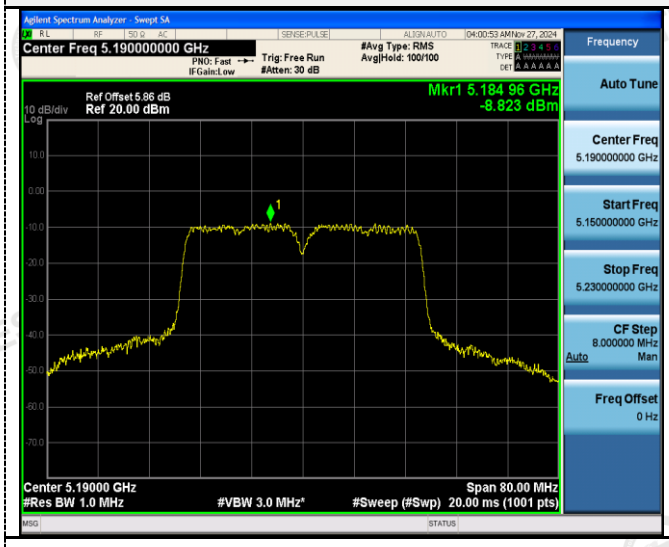
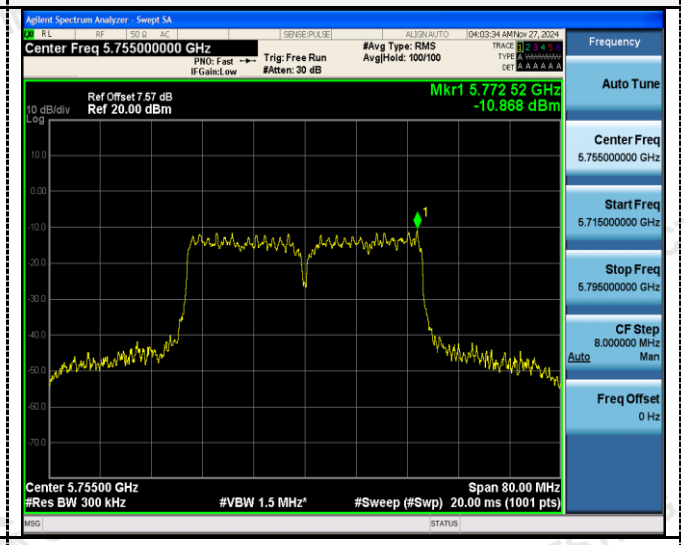
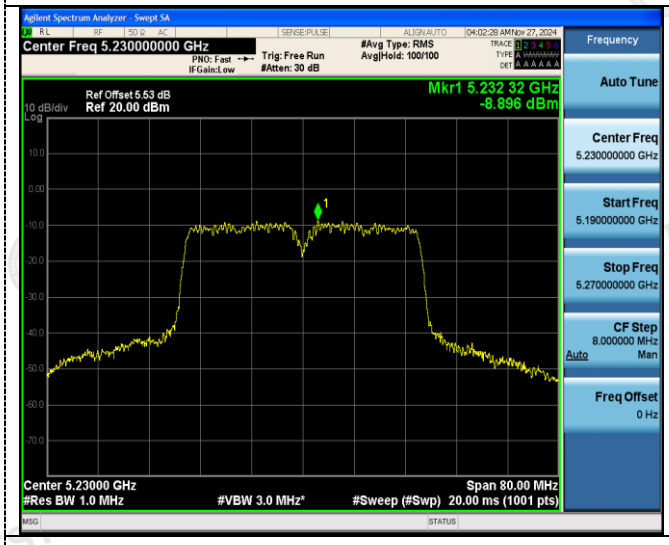
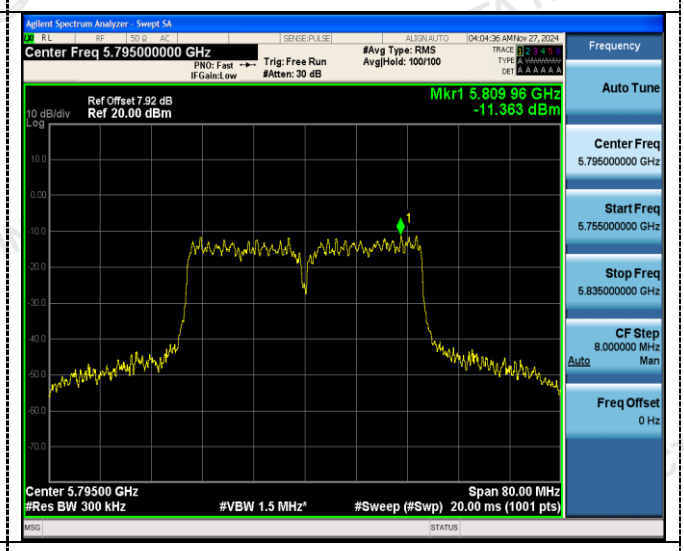



*CH48*



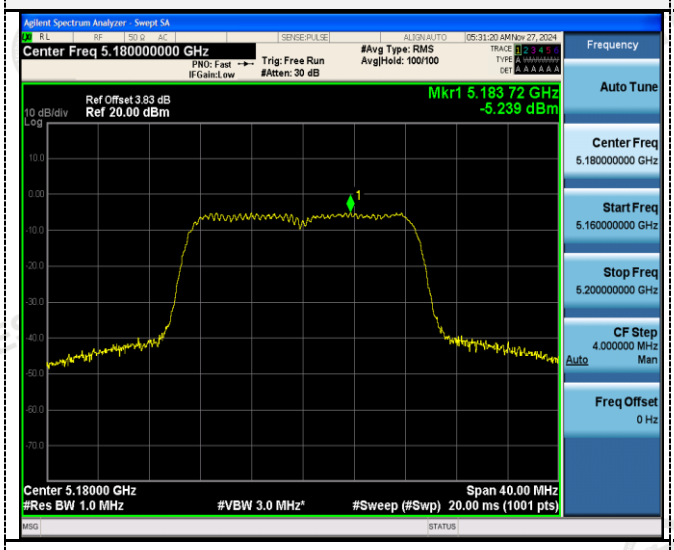

*CH165*

| 802.11n(HT20) | |
|---|---|
| U-NII 1 | U-NII 3 |
|  |  |
| CH36 | CH149 |
|  |  |
| CH40 | CH157 |
|  |  |
| CH48 | CH165 |

| 802.11n(HT40) | |
|---|---|
| U-NII 1 | U-NII 3 |
|  |  |
| CH38 | CH151 |
|  |  |
| CH46 | CH159 |

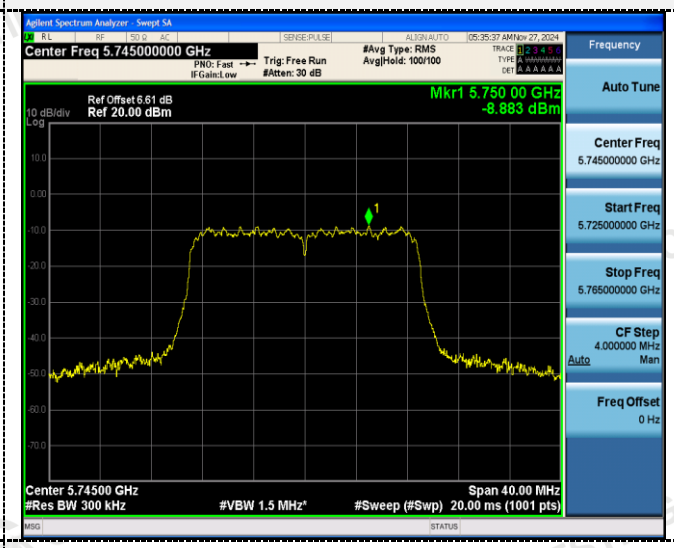
*802.11ac(HT20)*

*U-NII 1*

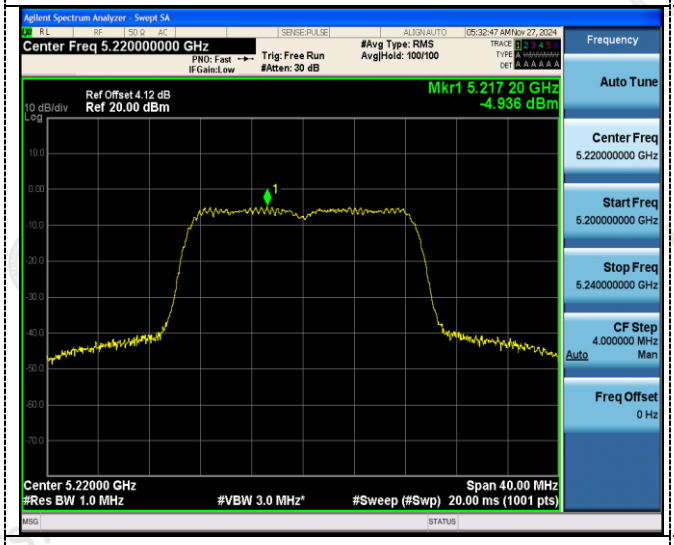



*CH36*

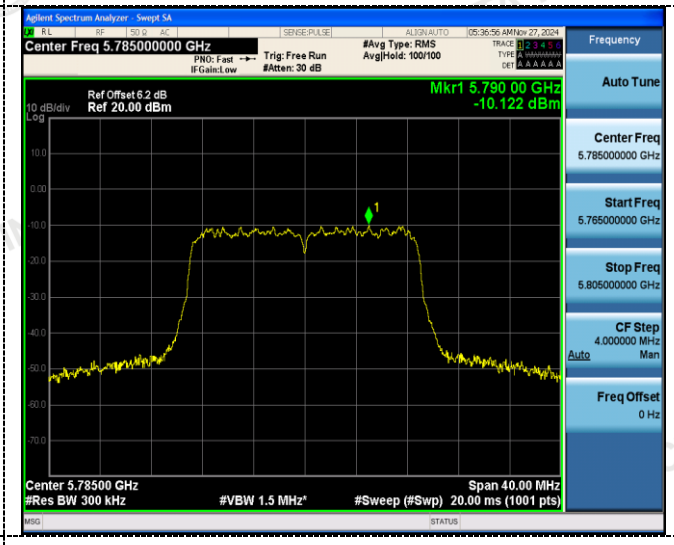
*U-NII 3*



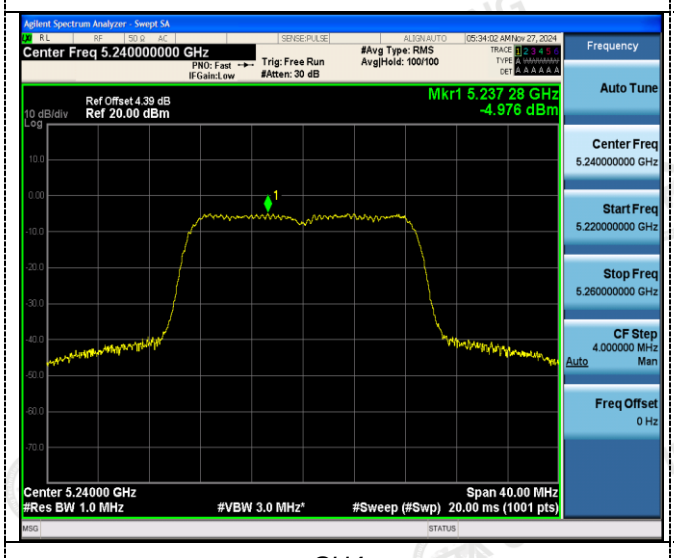

*CH149*



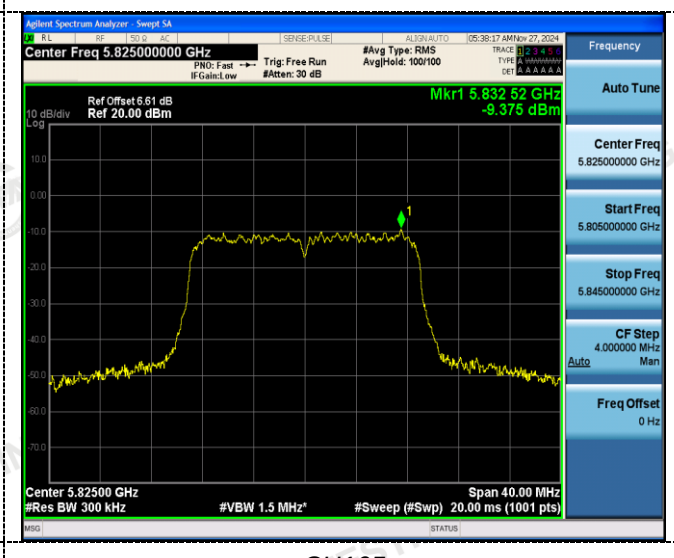

*CH40*



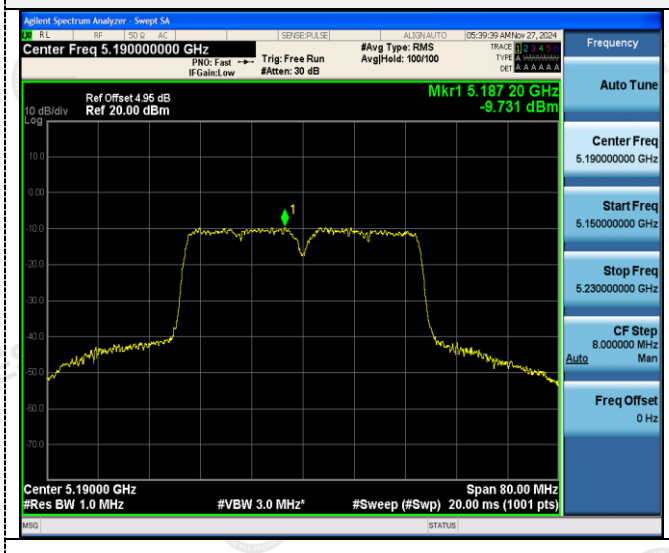
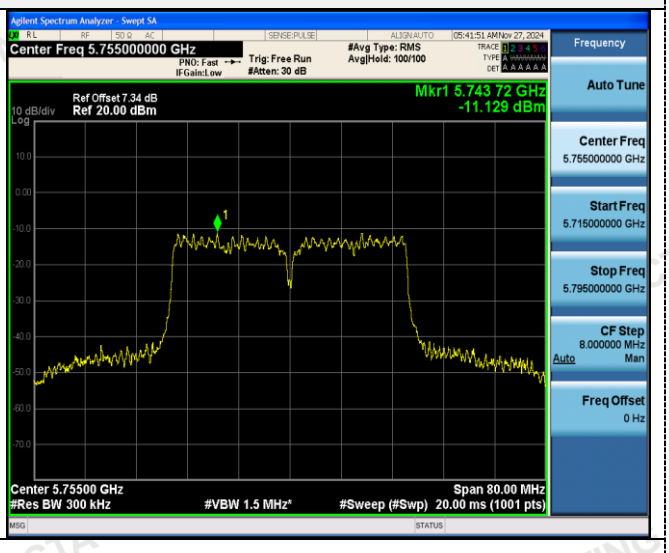
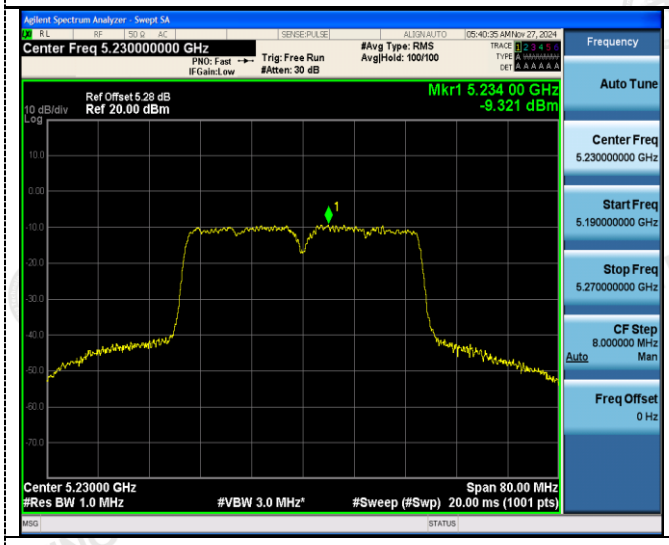
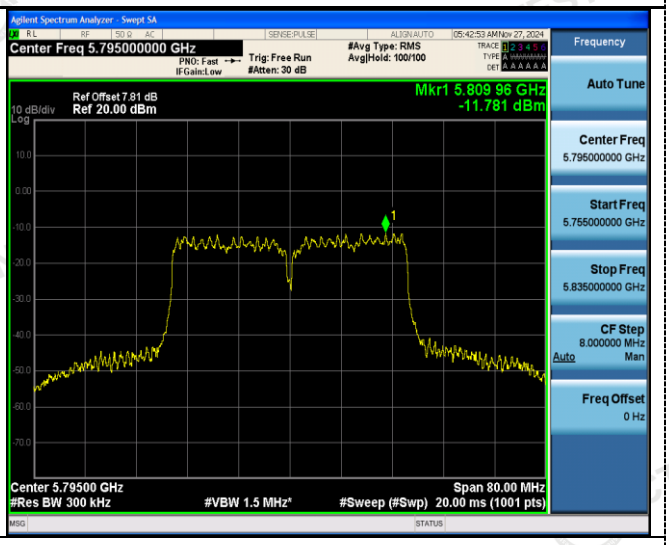

*CH157*




*CH4*




*CH165*

| 802.11ac(HT40) | |
|---|---|
| U-NII 1 | U-NII 3 |
|  |  |
| CH38 | CH151 |
|  |  |
| CH46 | CH159 |

## 4.5 Emission Bandwidth (26dB Bandwidth)

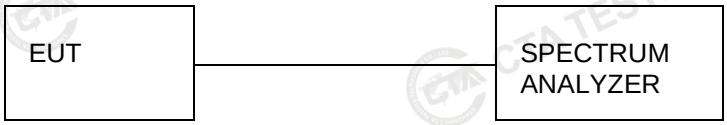
**Limit**

N/A

**Test Procedure**

1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (VBW) > RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak 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 %.

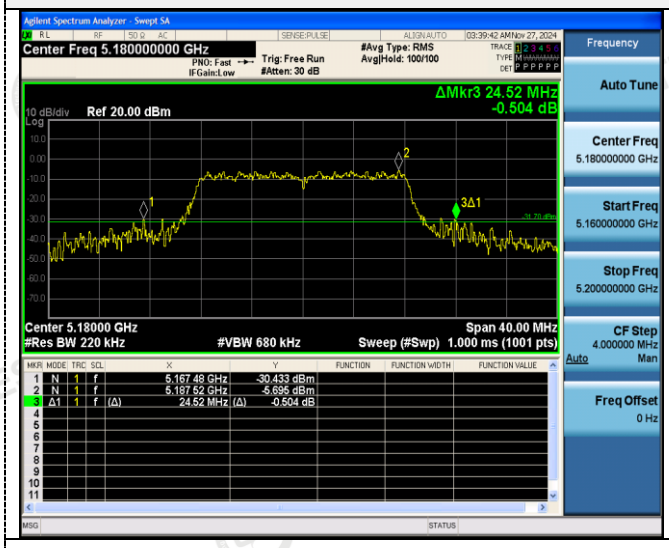
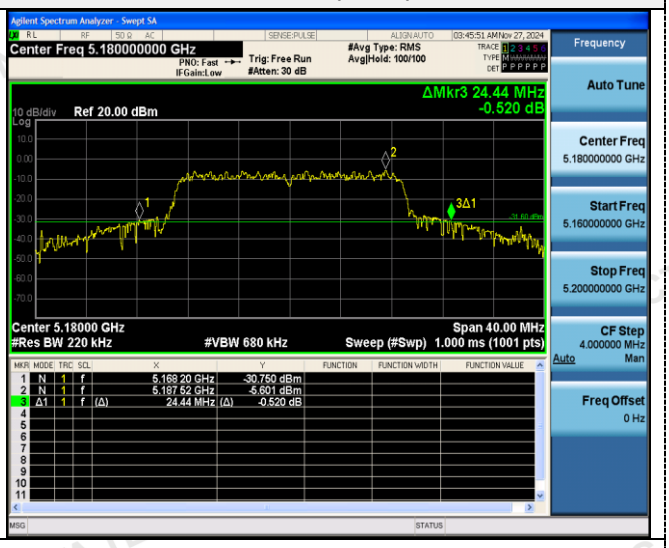
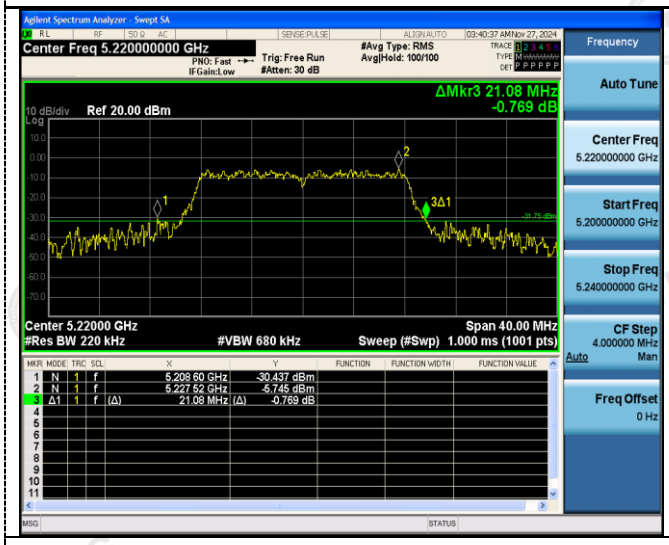
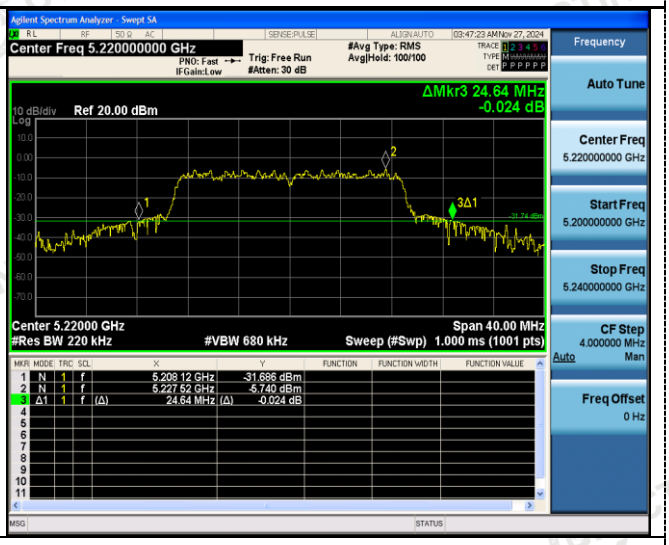
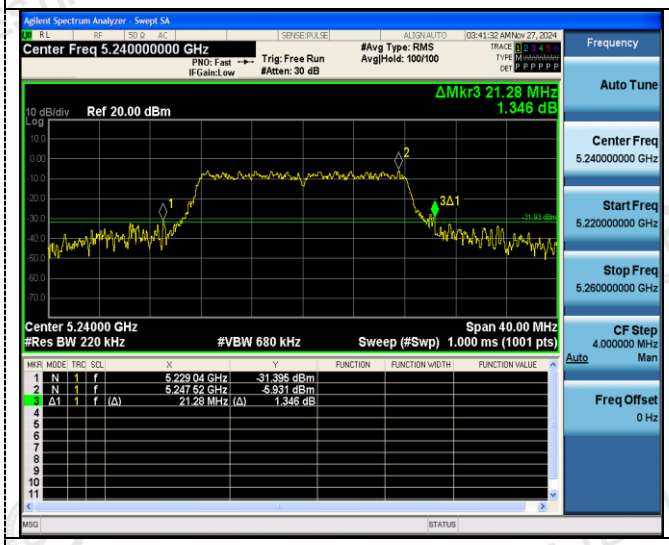
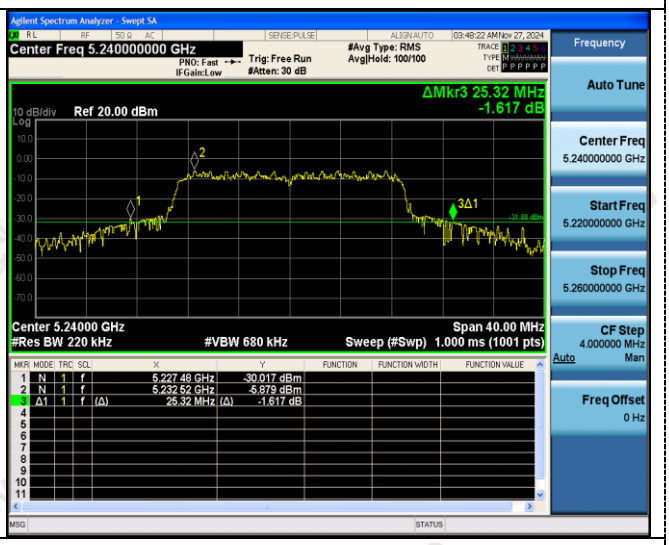
**Test Configuration**




**Test Results**

| Type | Bands | Channel | 26dB Bandwidth (MHz) | Limit (MHz) | Result |
|---|---|---|---|---|---|
| 802.11a | U-NII 1 | 36 | 24.520 | N/A | Pass |
| | | 40 | 21.080 | | |
| | | 48 | 21.280 | | |
| 802.11n(HT20) | U-NII 1 | 36 | 24.440 | | |
| | | 40 | 24.640 | | |
| | | 48 | 25.320 | | |
| 802.11n(HT40) | U-NII 1 | 38 | 42.640 | | |
| | | 46 | 42.960 | | |
| 802.11ac(HT20) | U-NII 1 | 36 | 22.800 | | |
| | | 40 | 22.960 | | |
| | | 48 | 26.840 | | |
| 802.11ac(HT40) | U-NII 1 | 38 | 42.160 | | |
| | | 46 | 41.440 | | |

Test plot as follows:

| 802.11a | 802.11n(HT20) |
|---|---|
|  |  |
| CH36 | CH36 |
|  |  |
| CH40 | CH40 |
|  |  |
| CH48 | CH48 |