# FCC Test Report

**Test report**
**On Behalf of**
**Shenzhen Yunlink Technology Co., Ltd**
**For**
**Access Point**
**Model No.: HWAP-AX880, AX880, AX-HQ880**

**FCC ID: 2ADUG-HWAP-AX880**

| | |
|---|---|
| **Prepared For :** | **Shenzhen Yunlink Technology Co., Ltd**<br>**B3 Building, An'le Industrial Zone, Hangcheng Road, gushu, xixiang town, Baoan, Shenzhen Guangdong Province, China** |
| **Prepared By :** | **Shenzhen HUAK Testing Technology Co., Ltd.**<br>**1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China** |

| | |
|---|---|
| **Date of Test:** | **Jun. 05, 2023 ~ Jun. 14, 2023** |
| **Date of Report:** | **Jun. 14, 2023** |
| **Report Number:** | **HK2306052297-3E** |

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# Test Result Certification

**Applicant's name** .....: Shenzhen Yunlink Technology Co., Ltd

Address .....: B3 Building, An'le Industrial Zone, Hangcheng Road, gushu, xixiang town, Baoan, Shenzhen Guangdong Province, China

**Manufacture's Name**.....: Shenzhen Yunlink Technology Co., Ltd

Address .....: B3 Building, An'le Industrial Zone, Hangcheng Road, gushu, xixiang town, Baoan, Shenzhen Guangdong Province, China

**Product description**

Trade Mark: N/A

Product name ..... : Access Point

Model and/or type reference .: HWAP-AX880, AX880, AX-HQ880

**Standards** .....: FCC Rules and Regulations Part 15 Subpart E Section 15.407
ANSI C63.10: 2013

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**Date of Test**.....:

Date (s) of performance of tests .....: **Jun. 05, 2023 ~ Jun. 14, 2023**

Date of Issue.....: **Jun. 14, 2023**

Test Result .....: Pass

Testing Engineer : Gary Qian

(Gary Qian)

Technical Manager : Eden Hu

(Eden Hu)

Authorized Signatory : Jason Zhou

(Jason Zhou)

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# Table of Contents


1. Test Result Summary ..... 5
   1.1. Test Procedures and Results ..... 5
   1.2. Information of the Test Laboratory ..... 5
   1.3. Measurement Uncertainty ..... 6
2. EUT Description ..... 7
   2.1. General Description of EUT ..... 7
   2.2. Operation Frequency each of channel ..... 8
   2.3. Operation of EUT during testing ..... 8
   2.4. Description of Test Setup ..... 9
3. Genera Information ..... 10
   3.1. Test environment and mode ..... 10
   3.2. Description of Support Units ..... 11
4. Test Results and Measurement Data ..... 12
   4.1. Conducted Emission ..... 12
   4.2. Maximum Conducted Output Power ..... 16
   4.3. 6dB Emission Bandwidth ..... 20
   4.4. 26dB Bandwidth and 99% Occupied Bandwidth ..... 53
   4.5. Power Spectral Density ..... 54
   4.6. Band edge ..... 88
   4.7. Spurious Emission ..... 109
   4.8. Frequency Stability Measurement ..... 134
   4.9. Antenna Requirement ..... 136
5. Photographs of Test Setup ..... 137
6. Photos of the EUT ..... 139


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## ** Modified History **

| Revision | Description | Issued Data | Remark |
|---|---|---|---|
| Revision 1.0 | Initial Test Report Release | Jun. 14, 2023 | Jason Zhou |
| | | | |
| | | | |

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# 1. Test Result Summary

## 1.1. Test Procedures and Results

| Requirement | CFR 47 Section | Result |
|---|---|---|
| Antenna requirement | §15.203 | PASS |
| AC Power Line Conducted Emission | §15.207 | PASS |
| Maximum Conducted Output Power | §15.407(a) | PASS |
| 6dB Emission Bandwidth | §15.407(e) | PASS |
| 26dB Emission Bandwidth& 99% Occupied Bandwidth | §15.407(a) | N/A |
| Power Spectral Density | §15.407(a) | PASS |
| Band edge | §15.407(b)/15.209/15.205 | PASS |
| Radiated Emission | §15.407(b)/15.209/15.205 | PASS |
| Frequency Stability | §15.407(g) | PASS |

***Note:***

*1. PASS: Test item meets the requirement.*

*2. Fail: Test item does not meet the requirement.*

*3. N/A: Test case does not apply to the test object.*

*4. The test result judgment is decided by the limit of test standard.*

## 1.2. Information of the Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization：

A2LA Accreditation Code is 4781.01.
FCC Designation Number is CN1229.
Canada IC CAB identifier is CN0045.
CNAS Registration Number is L9589.

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## 1.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

| No. | Item | MU |
|---|---|---|
| 1 | Conducted Emission | ±0.37dB |
| 2 | RF power, conducted | ±3.35dB |
| 3 | Spurious emissions, conducted | ±2.20dB |
| 4 | All emissions, radiated(<1G) | ±3.90dB |
| 5 | All emissions, radiated(>1G) | ±4.28dB |
| 6 | Temperature | ±0.1°C |
| 7 | Humidity | ±1.0% |

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# 2. EUT Description

## 2.1. General Description of EUT

| | |
|---|---|
| Equipment | Access Point |
| Model Name | HWAP-AX880 |
| Serial No. | AX880, AX-HQ880 |
| Trade Mark | N/A |
| Model Difference | All model's the function, software and electric circuit are the same, only with a product model named different. Test sample model: HWAP-AX880. |
| FCC ID | 2ADUG-HWAP-AX880 |
| Operation Frequency: | IEEE 802.11a/n/ac/ax(HT20)5.745GHz-5.825GHz<br>IEEE 802.11n/ac/ax(HT40)5.755GHz-5.795GHz<br>IEEE 802.11ac/ax(HT80) 5.775GHz |
| Modulation Technology: | IEEE 802.11a/n/ac/ax |
| Modulation Type | OFDM, OFDMA |
| Antenna Type | External Antenna |
| Antenna Gain | Antenna 1:7.71dBi<br>Antenna 2:7.71dBi<br>Antenna 3:7.71dBi<br>Antenna 4:7.71dBi<br>MIMO: 13.73dBi |
| Power Source | DC 48V from Adapter |
| Power Supply: | DC 48V from Adapter |
| Hardware Version | V5.6 |
| Software Version | V5.6 |
| Note: The EUT incorporates a MIMO function. Physically, it provides two completed transmitt ers and receivers(4T4R), two transmit signals are completely correlated, then, Direction gain= GANT + Array Gain(Array Gain=10 log(4) dB for power spectral density; Array Gain=0 for power measurement) | |

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## 2.2. Operation Frequency each of channel

| 802.11a/802.11n(HT20)<br>802.11ac(HT20)<br>802.11ax(HT20) | | 802.11n(HT40)/<br>802.11ac(HT40)<br>802.11ax(HT40) | | 802.11ac(HT80)<br>802.11ax(HT80) | |
|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 149 | 5745 | 151 | 5755 | 155 | 5775 |
| 153 | 5765 | 159 | 5790 | | |
| 157 | 5785 | | | | |
| 161 | 5805 | | | | |
| 165 | 5825 | | | | |

***Note:***

*In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:*

## 2.3. Operation of EUT during testing

| Band IV (5725 - 5850 MHz) | | |
|---|---|---|
| For 802.11a/n (HT20)/ac(HT20)/axHT20) | | |
| Channel Number | Channel | Frequency (MHz） |
| 149 | Low | 5745 |
| 157 | Mid | 5785 |
| 165 | High | 5825 |

| For 802.11n (HT40)/ ac(HT40)/axHT40) | | |
|---|---|---|
| Channel Number | Channel | Frequency (MHz） |
| 151 | Low | 5755 |
| 159 | High | 5795 |

| For 802.11ac(HT80)/ax(HT80) | | |
|---|---|---|
| Channel Number | Channel | Frequency (MHz） |
| 155 | / | 5775 |

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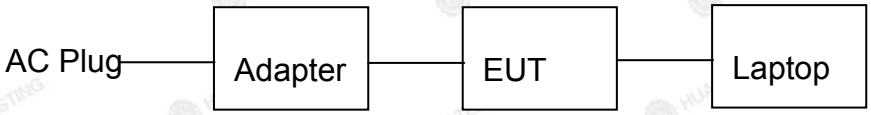
## 2.4. Description of Test Setup

Operation of EUT during testing:




Laptop information
Model: TP00096A
Input: DC 20V, 2.25A/3.25A

Adapter information
Model: GRT-POE20-480050A
Input: AC100-240V~50-60Hz 0.8A max
Output: 48V 500mA

The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position.

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# 3. Genera Information

## 3.1. Test environment and mode

| **Operating Environment:** | |
|---|---|
| Temperature: | 25.0 °C |
| Humidity: | 56 % RH |
| Atmospheric Pressure: | 1010 mbar |
| **Test Mode:** | |
| Engineering mode: | Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%) |
| The sample was placed 0.8m/1.5m for blow/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. | |

| 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: | |
|---|---|
| **Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.** | |
| Mode | Data rate |
| 802.11a | 6 Mbps |
| 802.11n(HT20) | MCS0 |
| 802.11n(HT40) | MCS0 |
| 802.11ac(HT20)/ac(HT40)/ac(HT80) | MCS0 |
| 802.11ax(HT20)/ax(HT40)/ax(HT80) | MCS0 |
| **Final Test Mode:** | |
| Operation mode: | Keep the EUT in continuous transmitting with modulation |

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## 3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|---|---|---|---|---|
| / | / | / | / | / |

***Note:***

*1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*

*2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

*3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.*

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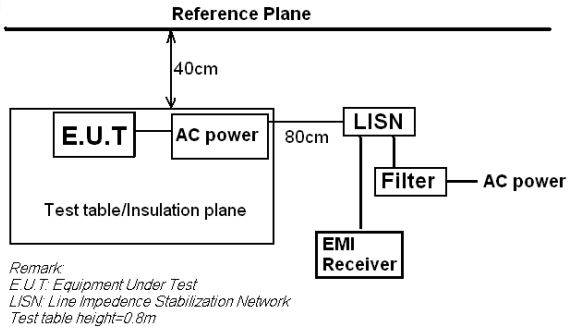
# 4. Test Results and Measurement Data

## 4.1. Conducted Emission

### 4.1.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td>


</td></tr>
<tr><td>Test Mode:</td><td>Tx Mode</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.<br>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).<br>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>Pass</td></tr>
</table>

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### 4.1.2. Test Instruments

| Conducted Emission Shielding Room Test Site (843) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Receiver | R&S | ESR-7 | HKE-005 | Feb. 17, 2023 | Feb. 16, 2024 |
| LISN | R&S | ENV216 | HKE-002 | Feb. 17, 2023 | Feb. 16, 2024 |
| Coax cable (9KHz-30MHz) | Times | 381806-002 | N/A | Feb. 17, 2023 | Feb. 16, 2024 |
| Conducted test software | Tonscend | TS+ Rev 2.5.0.0 | HKE-081 | N/A | N/A |

***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

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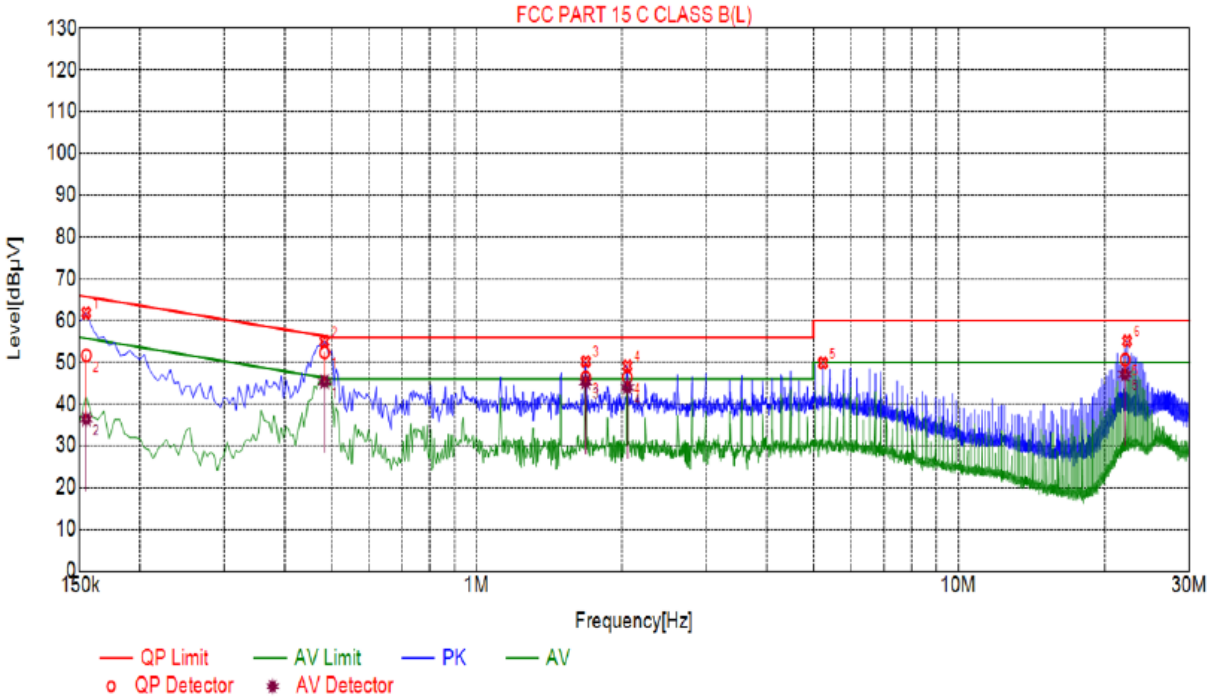
### 4.1.3. Test data

Test Specification: Line




## Suspected List

| NO. | Freq. [MHz] | Level [dBμV] | Factor [dB] | Limit [dBμV] | Margin [dB] | Reading [dBμV] | Detector | Type |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1545 | 61.86 | 20.03 | 65.75 | 3.89 | 41.33 | PK | L |
| 2 | 0.4830 | 54.98 | 20.04 | 56.29 | 1.31 | 34.94 | PK | L |
| 3 | 1.6845 | 50.20 | 20.13 | 56.00 | 5.80 | 29.57 | PK | L |
| 4 | 2.0580 | 49.15 | 20.15 | 56.00 | 6.85 | 28.50 | PK | L |
| 5 | 5.2395 | 49.84 | 20.26 | 60.00 | 10.16 | 29.08 | PK | L |
| 6 | 22.2765 | 55.12 | 20.16 | 60.00 | 4.88 | 35.46 | PK | L |

## Final Data List

| NO. | Freq. [MHz] | Correction factor[dB] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | QP Reading [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | AV Reading [dBμV] | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.4835 | 20.04 | 52.36 | 56.28 | 3.92 | 32.32 | 45.34 | 46.28 | 0.94 | 25.30 | L |
| 2 | 0.1546 | 20.01 | 51.67 | 65.75 | 14.08 | 31.64 | 36.38 | 55.75 | 19.37 | 16.35 | L |
| 3 | 1.6832 | 20.13 | 46.36 | 56.00 | 9.64 | 26.23 | 45.27 | 46.00 | 0.73 | 25.14 | L |
| 4 | 2.0567 | 20.15 | 46.37 | 56.00 | 9.63 | 26.22 | 43.98 | 46.00 | 2.02 | 23.83 | L |
| 5 | 22.0649 | 20.16 | 50.65 | 60.00 | 9.35 | 30.49 | 47.14 | 50.00 | 2.86 | 26.98 | L |

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

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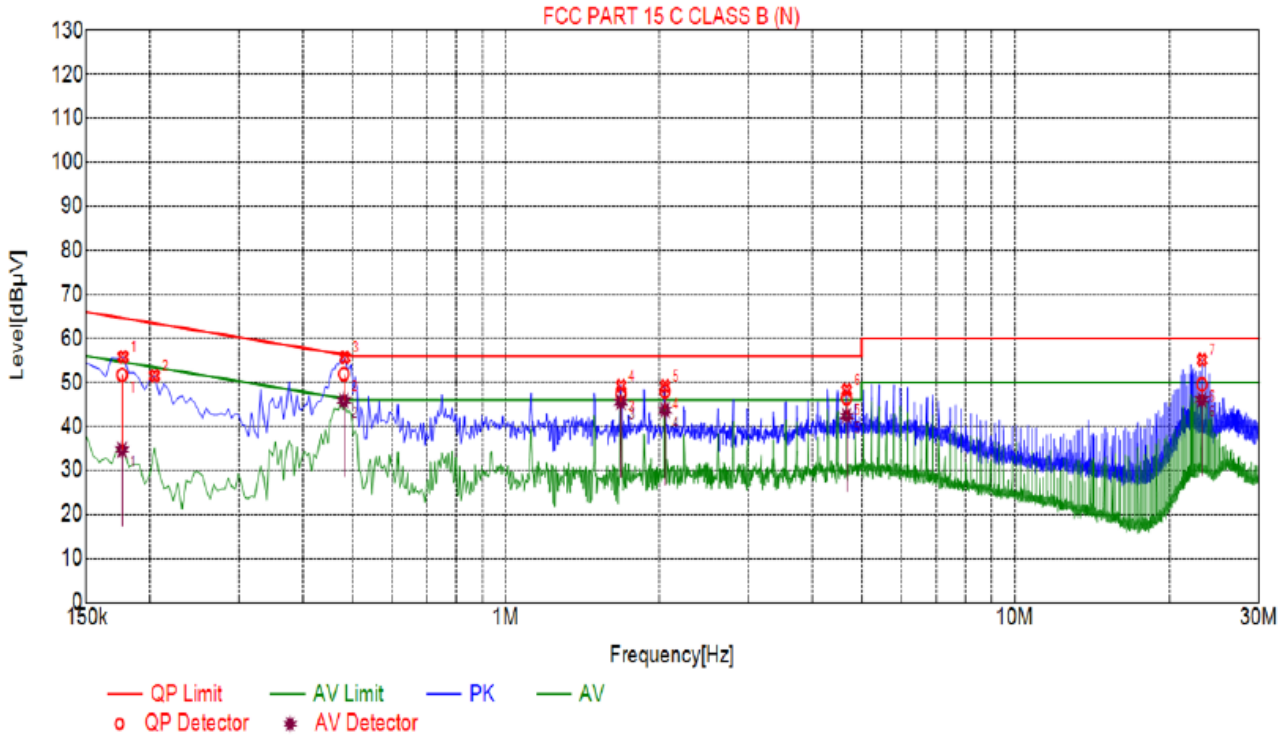
Test Specification: Neutral




## Suspected List

| NO. | Freq. [MHz] | Level [dBμV] | Factor [dB] | Limit [dBμV] | Margin [dB] | Reading [dBμV] | Detector | Type |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1770 | 55.82 | 20.05 | 64.63 | 8.81 | 35.27 | PK | N |
| 2 | 0.2040 | 51.52 | 20.04 | 63.45 | 11.93 | 31.48 | PK | N |
| 3 | 0.4830 | 55.69 | 20.04 | 56.29 | 0.60 | 35.15 | PK | N |
| 4 | 1.6845 | 49.25 | 20.13 | 56.00 | 6.75 | 29.12 | PK | N |
| 5 | 2.0580 | 49.18 | 20.15 | 56.00 | 6.82 | 29.53 | PK | N |
| 6 | 4.6770 | 48.24 | 20.26 | 56.00 | 7.76 | 27.98 | PK | N |
| 7 | 23.1990 | 55.13 | 20.20 | 60.00 | 4.87 | 34.43 | PK | N |

## Final Data List

| NO. | Freq. [MHz] | Correction factor[dB] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | QP Reading [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | AV Reading [dBμV] | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1762 | 20.05 | 51.72 | 64.66 | 12.94 | 31.67 | 34.67 | 54.66 | 19.99 | 14.62 | N |
| 2 | 0.4806 | 20.04 | 51.90 | 56.33 | 4.43 | 31.86 | 45.86 | 46.33 | 0.47 | 25.82 | N |
| 3 | 1.6827 | 20.13 | 47.32 | 56.00 | 8.68 | 27.19 | 45.49 | 46.00 | 0.51 | 25.36 | N |
| 4 | 2.0564 | 20.15 | 47.98 | 56.00 | 8.02 | 27.83 | 43.69 | 46.00 | 2.31 | 23.54 | N |
| 5 | 4.6736 | 20.26 | 46.41 | 56.00 | 9.59 | 26.15 | 42.39 | 46.00 | 3.61 | 22.13 | N |
| 6 | 23.1797 | 20.19 | 49.55 | 60.00 | 10.45 | 29.36 | 46.07 | 50.00 | 3.93 | 25.88 | N |

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

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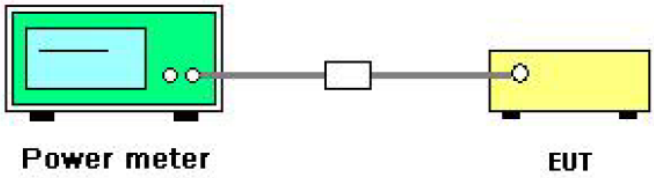
## 4.2. Maximum Conducted Output Power

### 4.2.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 E Section 15.407(a) |
| **Test Method:** | KDB789033 D02 General UNII Test Procedures New Rules v02.r01 Section E |
| **Limit:** | Frequency Band (MHz): Limit<br>5725-5850: 1 W |
| **Test Setup:** |  |
| **Test Mode:** | Transmitting mode with modulation |
| **Test Procedure:** | 1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E, 3, a<br>2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.<br>3. Set to the maximum power setting and enable the EUT transmit continuously.<br>4. Measure the conducted output power and record the results in the test report. |
| **Test Result:** | PASS |
| **Remark:** | Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0<br>Conducted output power= measurement power |

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### 4.2.2. Test Instruments

| RF Test Room | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Spectrum analyzer | Agilent | N9020A | HKE-048 | Feb. 17, 2023 | Feb. 16, 2024 |
| Power meter | Agilent | E4419B | HKE-085 | Feb. 17, 2023 | Feb. 16, 2024 |
| Power Sensor | Agilent | E9300A | HKE-086 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF cable | Times | 1-40G | HKE-034 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF automatic control unit | Tonscend | JS0806-2 | HKE-060 | Feb. 17, 2023 | Feb. 16, 2024 |

***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

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## Test Data

| Configuration Band IV (5725 - 5850 MHz ) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mode | Test channel | Reading Conducted Output Power (dBm) | | | | Cable loss | Maximum Conducted Output Power (dBm) | | | | Limit (dBm) | Result |
| | | Antenna port 1 | Antenna port 2 | Antenna port 3 | Antenna port 4 | | Antenna port 1 | Antenna port 2 | Antenna port 3 | Antenna port 4 | | |
| 11a | CH149 | 4.16 | 4.17 | 2.54 | 4.17 | 1 | 5.16 | 5.17 | 3.54 | 5.17 | 30 | PASS |
| 11a | CH157 | 2.98 | 2.94 | 3.24 | 2.76 | 1 | 3.98 | 3.94 | 4.24 | 3.76 | 30 | PASS |
| 11a | CH165 | 4.19 | 4.09 | 4.79 | 4.06 | 1 | 5.19 | 5.09 | 5.79 | 5.06 | 30 | PASS |
| 11n(HT20) | CH149 | 3.00 | 3.01 | 2.76 | 2.48 | 1 | 4.00 | 4.01 | 3.76 | 3.48 | 30 | PASS |
| 11n(HT20) | CH157 | 3.30 | 2.68 | 3.08 | 3.90 | 1 | 4.30 | 3.68 | 4.08 | 4.90 | 30 | PASS |
| 11n(HT20) | CH165 | 2.87 | 3.94 | 3.46 | 2.88 | 1 | 3.87 | 4.94 | 4.46 | 3.88 | 30 | PASS |
| 11n(HT40) | CH151 | 3.43 | 3.50 | 3.26 | 2.82 | 1 | 4.43 | 4.50 | 4.26 | 3.82 | 30 | PASS |
| 11n(HT40) | CH159 | 3.35 | 3.58 | 2.20 | 3.08 | 1 | 4.35 | 4.58 | 3.20 | 4.08 | 30 | PASS |
| 11ac(HT20) | CH149 | 3.01 | 2.90 | 2.56 | 1.96 | 1 | 4.01 | 3.90 | 3.56 | 2.96 | 30 | PASS |
| 11ac(HT20) | CH157 | 2.61 | 3.22 | 3.47 | 1.31 | 1 | 3.61 | 4.22 | 4.47 | 2.31 | 30 | PASS |
| 11ac(HT20) | CH165 | 3.81 | 2.84 | 2.45 | 2.82 | 1 | 4.81 | 3.84 | 3.45 | 3.82 | 30 | PASS |
| 11ac(HT40) | CH151 | 3.41 | 2.81 | 2.89 | 3.22 | 1 | 4.41 | 3.81 | 3.89 | 4.22 | 30 | PASS |
| 11ac(HT40) | CH159 | 3.24 | 3.32 | 3.98 | 3.95 | 1 | 4.24 | 4.32 | 4.98 | 4.95 | 30 | PASS |
| 11ac(HT80) | CH155 | 3.21 | 2.28 | 3.66 | 3.52 | 1 | 4.21 | 3.28 | 4.66 | 4.52 | 30 | PASS |
| 11ax(HT20) | CH149 | 3.59 | 2.10 | 2.63 | 2.96 | 1 | 4.59 | 3.10 | 3.63 | 3.96 | 30 | PASS |
| 11ax(HT20) | CH157 | 2.58 | 2.03 | 3.55 | 3.35 | 1 | 3.58 | 3.03 | 4.55 | 4.35 | 30 | PASS |
| 11ax(HT20) | CH165 | 2.99 | 2.93 | 3.81 | 2.65 | 1 | 3.99 | 3.93 | 4.81 | 3.65 | 30 | PASS |
| 11ax(HT40) | CH151 | 2.60 | 2.43 | 3.47 | 2.36 | 1 | 3.60 | 3.43 | 4.47 | 3.36 | 30 | PASS |
| 11ax(HT40) | CH159 | 2.46 | 3.10 | 4.08 | 3.06 | 1 | 3.46 | 4.10 | 5.08 | 4.06 | 30 | PASS |
| 11ax(HT80) | CH155 | 2.52 | 2.29 | 3.83 | 2.65 | 1 | 3.52 | 3.29 | 4.83 | 3.65 | 30 | PASS |
| Note: Maximum Conducted Output Power(dBm)= Reading Conducted Output Power(dBm)+ Cable loss | | | | | | | | | | | | |

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| Configuration Band IV (5725 - 5850 MHz ) | | | | |
|---|---|---|---|---|
| Mode | Test channel | Maximum Conducted Output Power (dBm) | FCC Limit (dBm) | Result |
| | | MIMO | | |
| 11n(HT20) | CH149 | 9.84 | 30 | PASS |
| 11n(HT20) | CH157 | 10.28 | 30 | PASS |
| 11n(HT20) | CH165 | 10.33 | 30 | PASS |
| 11n(HT40) | CH151 | 10.28 | 30 | PASS |
| 11n(HT40) | CH159 | 10.10 | 30 | PASS |
| 11ac(HT20) | CH149 | 9.65 | 30 | PASS |
| 11ac(HT20) | CH157 | 9.75 | 30 | PASS |
| 11ac(HT20) | CH165 | 10.03 | 30 | PASS |
| 11ac(HT40) | CH151 | 10.11 | 30 | PASS |
| 11ac(HT40) | CH159 | 10.66 | 30 | PASS |
| 11ac(HT80) | CH155 | 10.22 | 30 | PASS |
| 11ax(HT20) | CH149 | 9.87 | 30 | PASS |
| 11ax(HT20) | CH157 | 9.94 | 30 | PASS |
| 11ax(HT20) | CH165 | 10.14 | 30 | PASS |
| 11ax(HT40) | CH151 | 9.76 | 30 | PASS |
| 11ax(HT40) | CH159 | 10.24 | 30 | PASS |
| 11ax(HT80) | CH155 | 9.89 | 30 | PASS |

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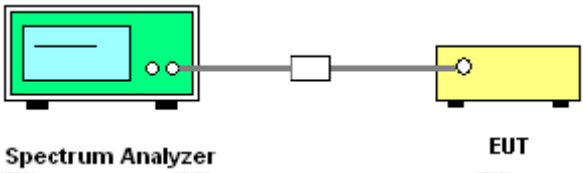
## 4.3. 6dB Emission Bandwidth

### 4.3.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC CFR47 Part 15 Section 15.407(e) |
| **Test Method:** | KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C |
| **Limit:** | >500kHz |
| **Test Setup:** |  |
| **Test Mode:** | Transmitting mode with modulation |
| **Test Procedure:** | 1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C<br>2. Set to the maximum power setting and enable the EUT transmit continuously.<br>3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.<br>4. Measure and record the results in the test report. |
| **Test Result:** | PASS |

### 4.3.2. Test Instruments

| RF Test Room | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Spectrum analyzer | Agilent | N9020A | HKE-048 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF cable | Times | 1-40G | HKE-034 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF automatic control unit | Tonscend | JS0806-2 | HKE-060 | Feb. 17, 2023 | Feb. 16, 2024 |

***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

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### 4.3.3. Test data

**ANT. 1**

| Band IV (5725 - 5850 MHz ) | | | | | |
|---|---|---|---|---|---|
| Mode | Test channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) | Result |
| 11a | CH149 | 5745 | 16.28 | 0.5 | PASS |
| 11a | CH157 | 5785 | 16.32 | 0.5 | PASS |
| 11a | CH165 | 5825 | 16.32 | 0.5 | PASS |
| 11n(HT20) | CH149 | 5745 | 17.08 | 0.5 | PASS |
| 11n(HT20) | CH157 | 5785 | 17.56 | 0.5 | PASS |
| 11n(HT20) | CH165 | 5825 | 17.08 | 0.5 | PASS |
| 11n(HT40) | CH151 | 5755 | 36.08 | 0.5 | PASS |
| 11n(HT40) | CH159 | 5795 | 36.08 | 0.5 | PASS |
| 11ac(HT20) | CH149 | 5745 | 17.52 | 0.5 | PASS |
| 11ac(HT20) | CH157 | 5785 | 17.56 | 0.5 | PASS |
| 11ac(HT20) | CH165 | 5825 | 17.28 | 0.5 | PASS |
| 11ac(HT40) | CH151 | 5755 | 35.84 | 0.5 | PASS |
| 11ac(HT40) | CH159 | 5795 | 36.32 | 0.5 | PASS |
| 11ac(HT80) | CH155 | 5775 | 75.04 | 0.5 | PASS |
| 11ax(HT20) | CH149 | 5745 | 18.84 | 0.5 | PASS |
| 11ax(HT20) | CH157 | 5785 | 18.96 | 0.5 | PASS |
| 11ax(HT20) | CH165 | 5825 | 18.84 | 0.5 | PASS |
| 11ax(HT40) | CH151 | 5755 | 37.92 | 0.5 | PASS |
| 11ax(HT40) | CH159 | 5795 | 37.84 | 0.5 | PASS |
| 11ax(HT80) | CH155 | 5775 | 77.44 | 0.5 | PASS |

**Test plots as follows:**

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**Band IV (5725 – 5850 MHz)**

802.11a

Low

Mid

High

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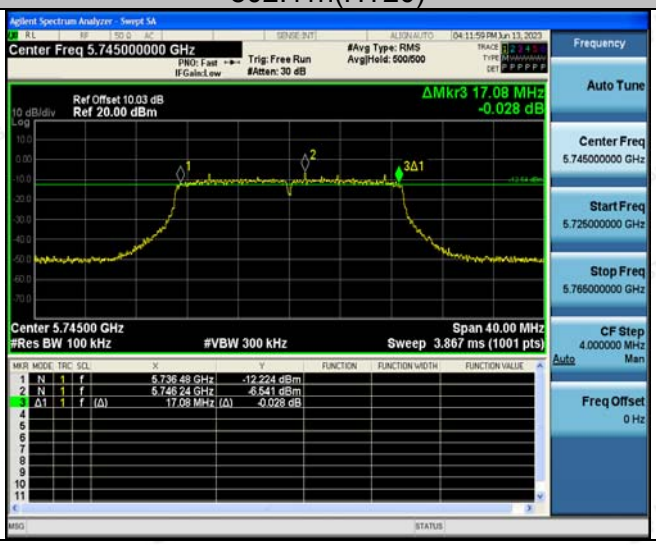
802.11n(HT20)




Low

Mid

High

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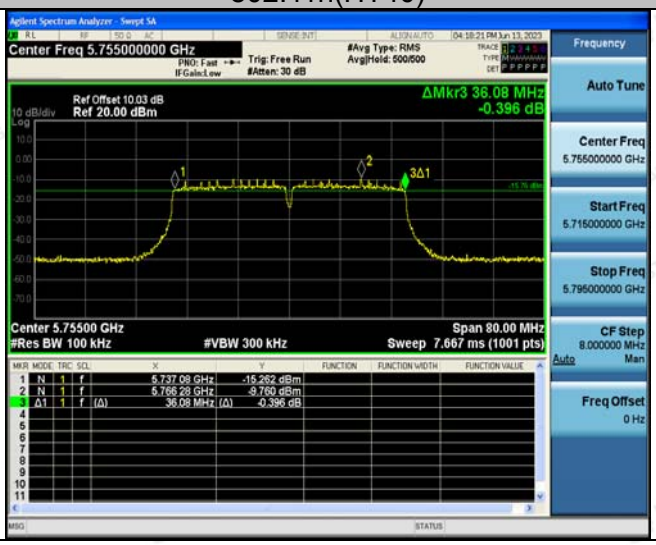
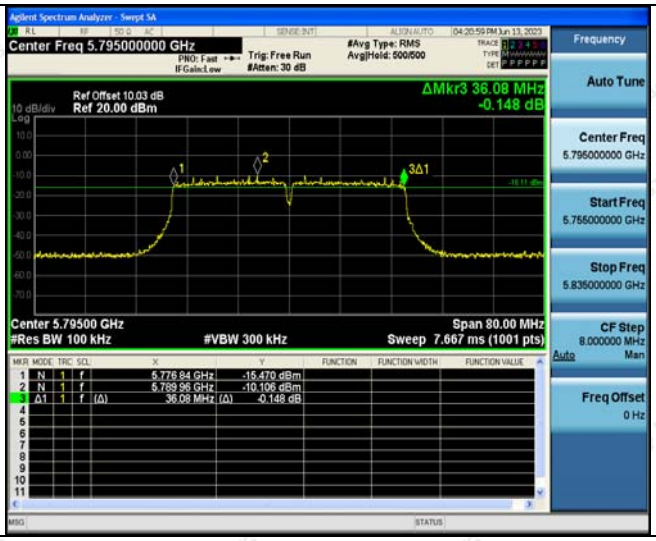
802.11n(HT40)




Low




High

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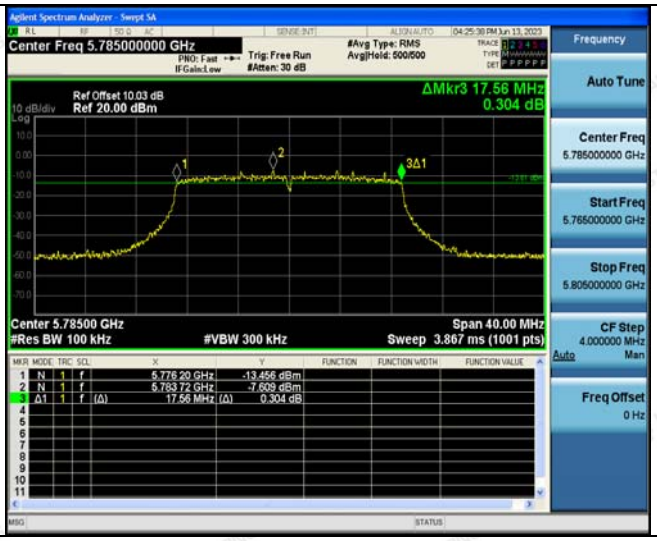
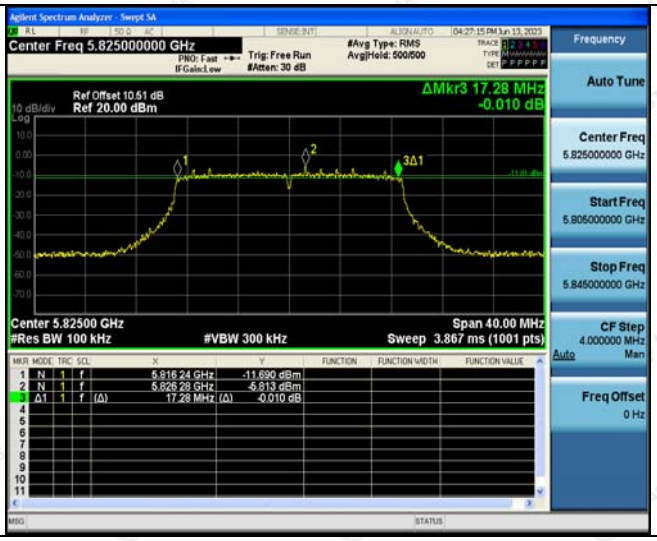
802.11ac(HT20)

Low




Mid




High

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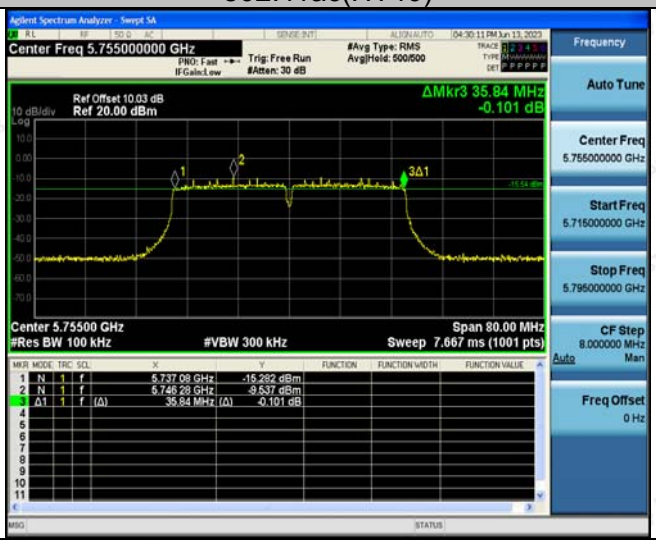
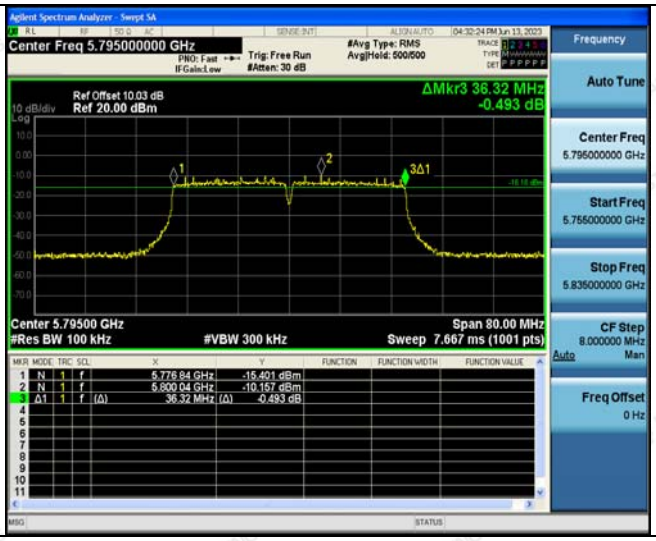
802.11ac(HT40)

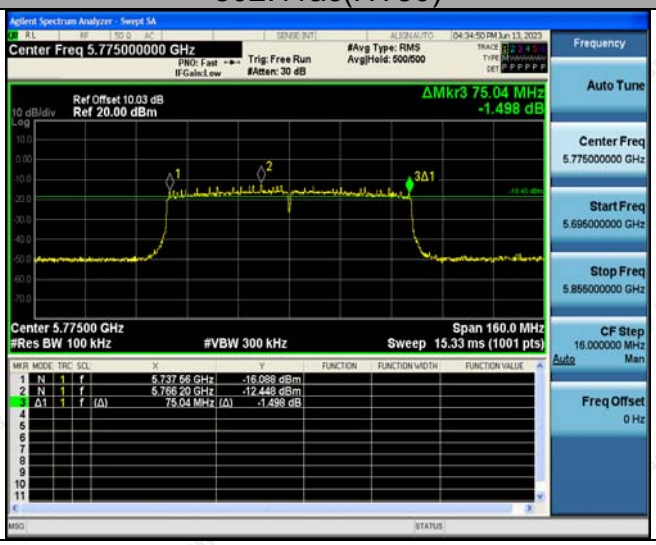



Low




High

802.11ac(HT80)

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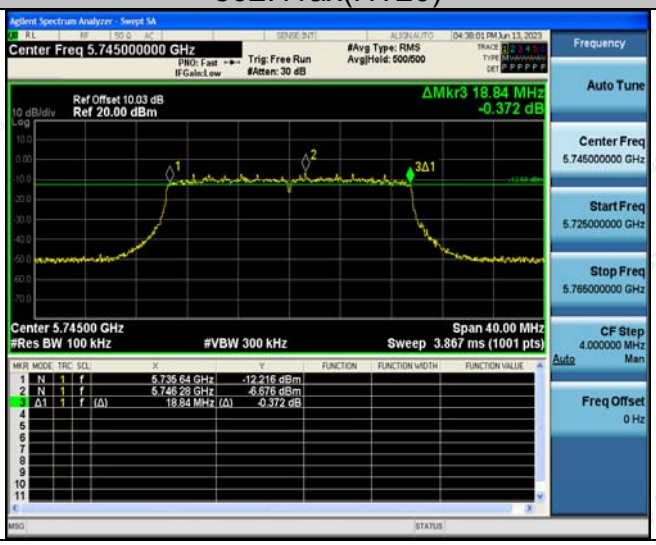
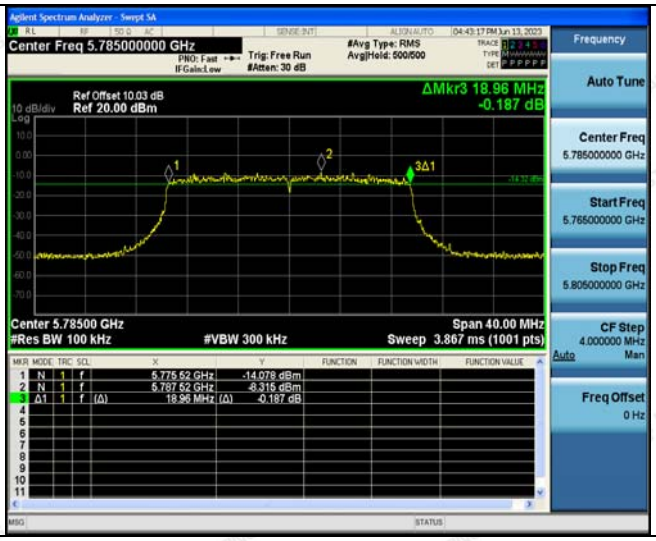
802.11ax(HT20)




Low




Mid

High

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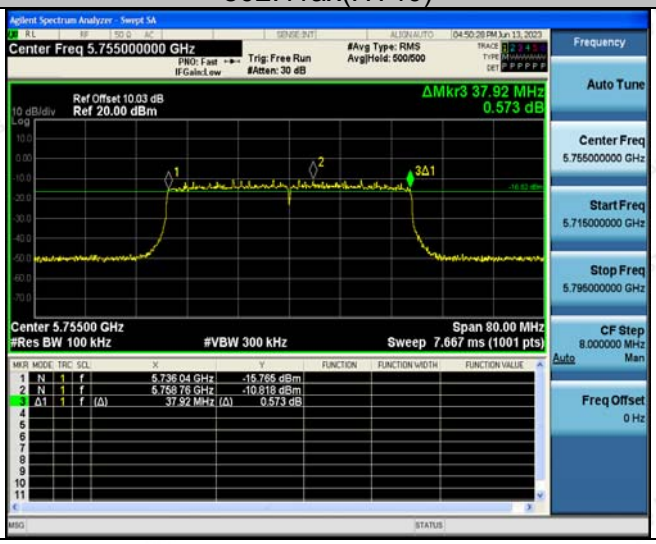
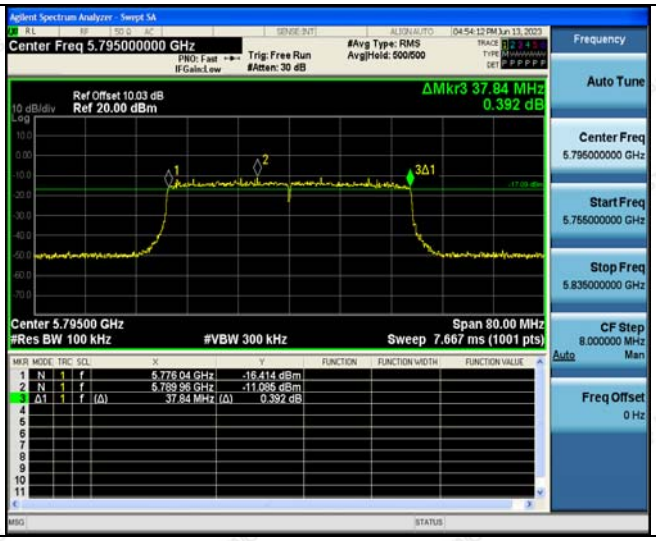
802.11ax(HT40)

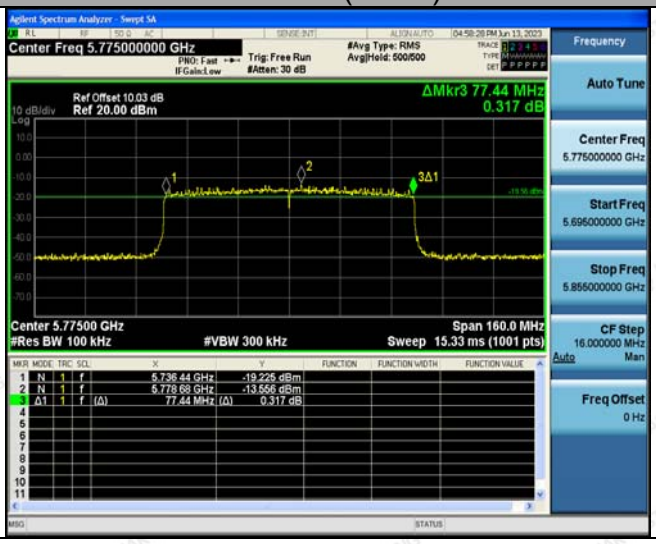



Low




High

802.11ax(HT80)

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**ANT. 2**

| Band IV (5725 - 5850 MHz ) | | | | | |
|---|---|---|---|---|---|
| Mode | Test channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) | Result |
| 11a | CH149 | 5745 | 16.32 | 0.5 | PASS |
| 11a | CH157 | 5785 | 16.28 | 0.5 | PASS |
| 11a | CH161 | 5825 | 16.32 | 0.5 | PASS |
| 11n(HT20) | CH149 | 5745 | 17.52 | 0.5 | PASS |
| 11n(HT20) | CH157 | 5785 | 17.12 | 0.5 | PASS |
| 11n(HT20) | CH161 | 5825 | 17.52 | 0.5 | PASS |
| 11n(HT40) | CH151 | 5755 | 36.32 | 0.5 | PASS |
| 11n(HT40) | CH159 | 5795 | 36.32 | 0.5 | PASS |
| 11ac(HT20) | CH149 | 5745 | 17.56 | 0.5 | PASS |
| 11ac(HT20) | CH157 | 5785 | 17.52 | 0.5 | PASS |
| 11ac(HT20) | CH165 | 5825 | 17.52 | 0.5 | PASS |
| 11ac(HT40) | CH151 | 5755 | 36.32 | 0.5 | PASS |
| 11ac(HT40) | CH159 | 5795 | 35.76 | 0.5 | PASS |
| 11ac(HT80) | CH155 | 5775 | 75.04 | 0.5 | PASS |
| 11ax(HT20) | CH149 | 5745 | 18.92 | 0.5 | PASS |
| 11ax(HT20) | CH157 | 5785 | 18.92 | 0.5 | PASS |
| 11ax(HT20) | CH165 | 5825 | 18.88 | 0.5 | PASS |
| 11ax(HT40) | CH151 | 5755 | 37.84 | 0.5 | PASS |
| 11ax(HT40) | CH159 | 5795 | 37.84 | 0.5 | PASS |
| 11ax(HT80) | CH155 | 5775 | 77.28 | 0.5 | PASS |

**Test plots as follows:**

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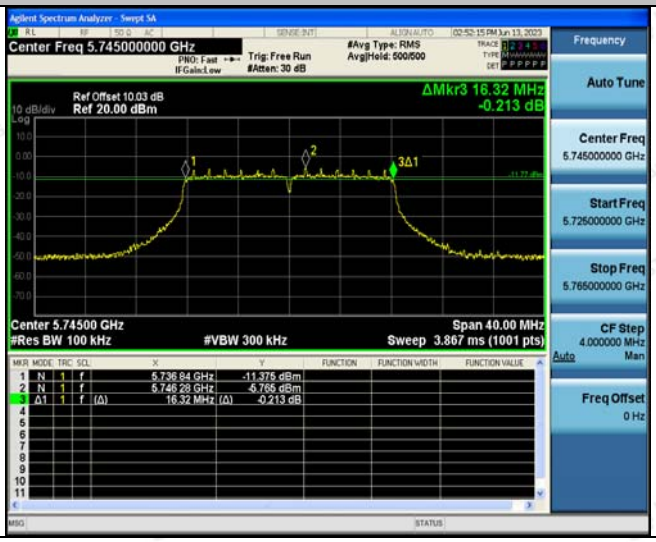
**Band IV (5725 – 5850 MHz)**

802.11a




Low

Mid

High

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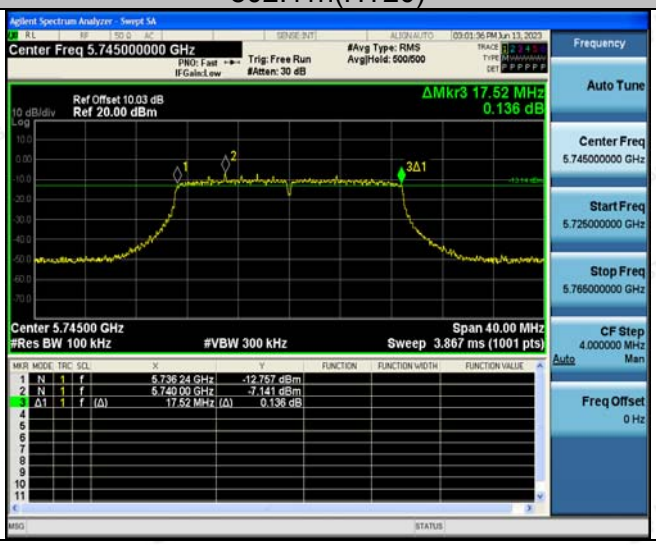
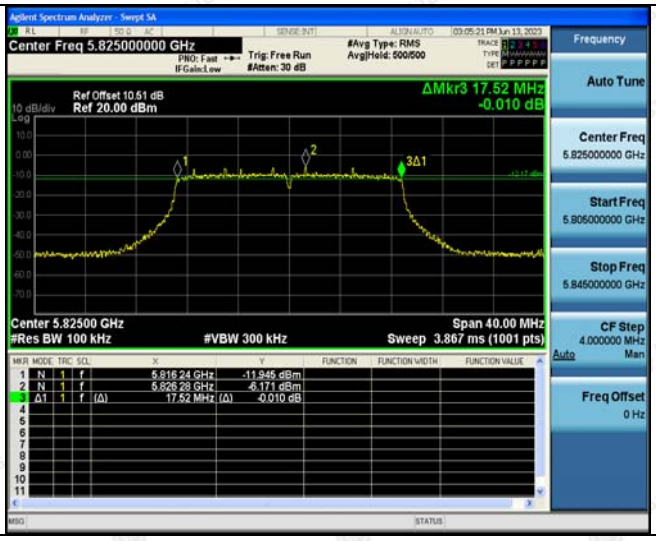
802.11n(HT20)




Low

Mid




High

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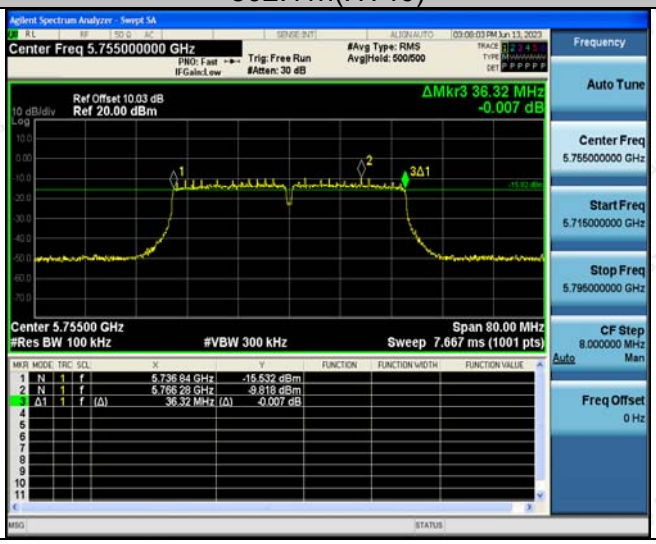
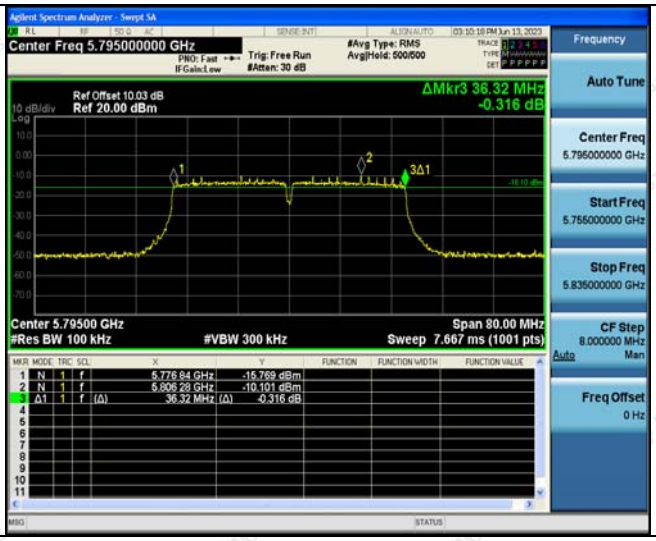
802.11n(HT40)




Low




High

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802.11ac(HT20)

Low

Mid

High

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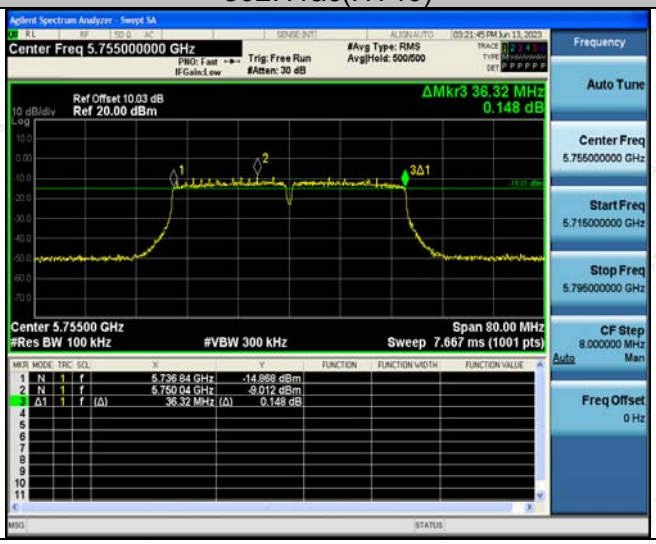
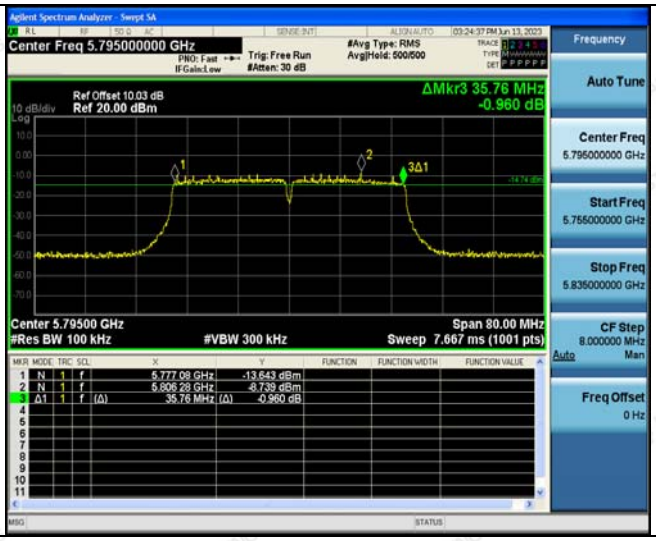
802.11ac(HT40)

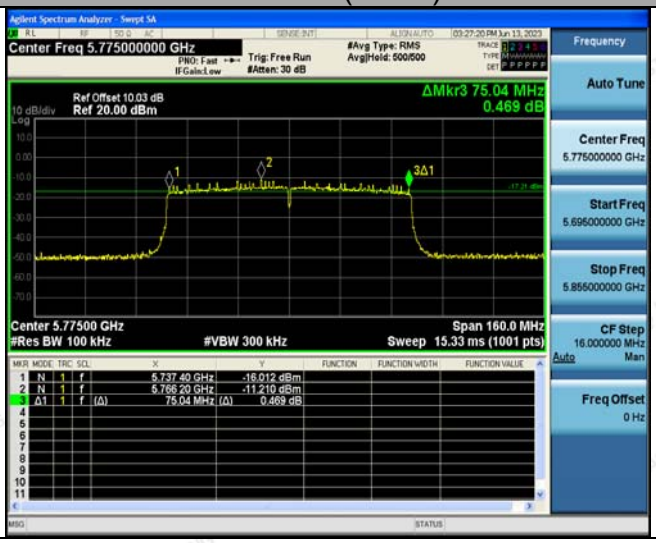



Low




High

802.11ac(HT80)

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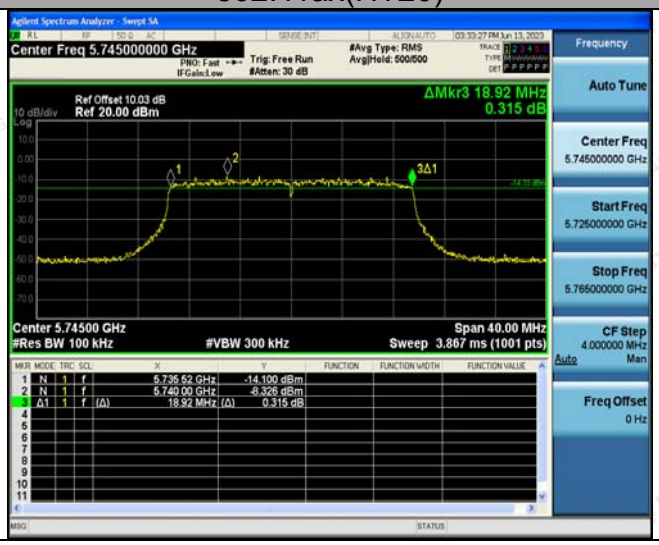
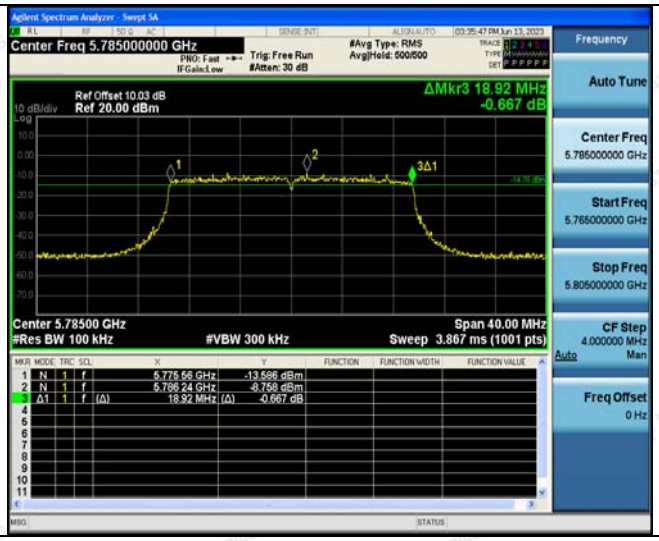
802.11ax(HT20)




Low




Mid

High

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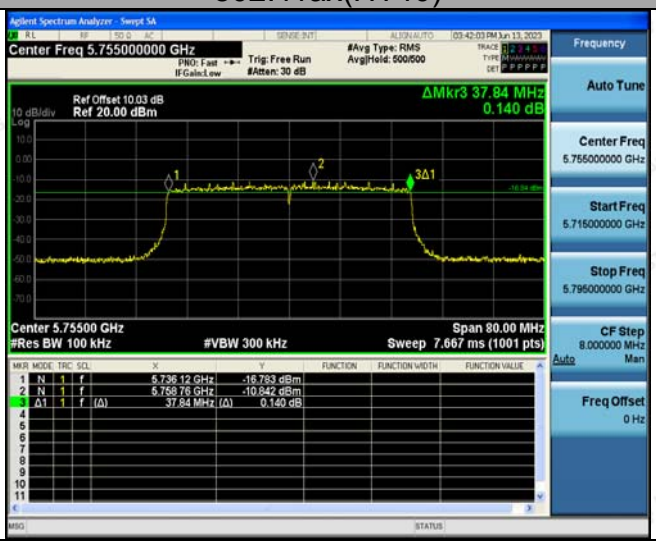
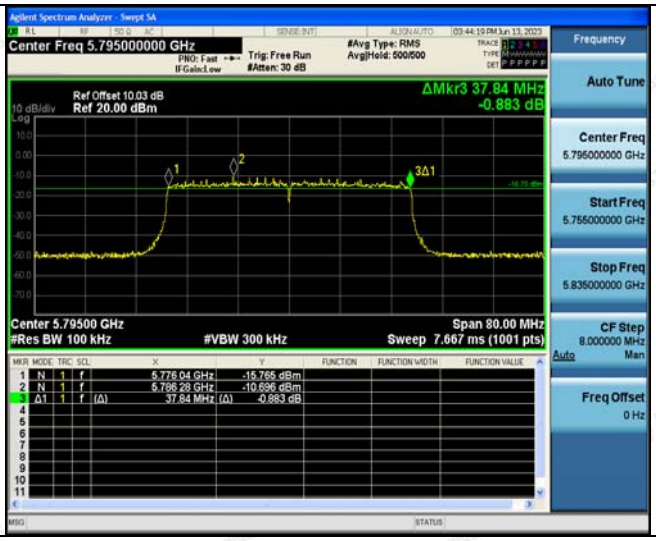
802.11ax(HT40)




Low




High

802.11ax(HT80)

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**ANT. 3**

| Band IV (5725 - 5850 MHz ) | | | | | |
|---|---|---|---|---|---|
| Mode | Test channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) | Result |
| 11a | CH149 | 5745 | 16.32 | 0.5 | PASS |
| 11a | CH157 | 5785 | 16.28 | 0.5 | PASS |
| 11a | CH165 | 5825 | 16.32 | 0.5 | PASS |
| 11n(HT20) | CH149 | 5745 | 17.08 | 0.5 | PASS |
| 11n(HT20) | CH157 | 5785 | 17.56 | 0.5 | PASS |
| 11n(HT20) | CH165 | 5825 | 16.96 | 0.5 | PASS |
| 11n(HT40) | CH151 | 5755 | 36.32 | 0.5 | PASS |
| 11n(HT40) | CH159 | 5795 | 36.32 | 0.5 | PASS |
| 11ac(HT20) | CH149 | 5745 | 17.08 | 0.5 | PASS |
| 11ac(HT20) | CH157 | 5785 | 17.52 | 0.5 | PASS |
| 11ac(HT20) | CH165 | 5825 | 17.56 | 0.5 | PASS |
| 11ac(HT40) | CH151 | 5755 | 35.76 | 0.5 | PASS |
| 11ac(HT40) | CH159 | 5795 | 36.32 | 0.5 | PASS |
| 11ac(HT80) | CH155 | 5775 | 75.36 | 0.5 | PASS |
| 11ax(HT20) | CH149 | 5745 | 18.80 | 0.5 | PASS |
| 11ax(HT20) | CH157 | 5785 | 18.92 | 0.5 | PASS |
| 11ax(HT20) | CH165 | 5825 | 18.84 | 0.5 | PASS |
| 11ax(HT40) | CH151 | 5755 | 37.84 | 0.5 | PASS |
| 11ax(HT40) | CH159 | 5795 | 37.92 | 0.5 | PASS |
| 11ax(HT80) | CH155 | 5775 | 77.44 | 0.5 | PASS |

**Test plots as follows:**

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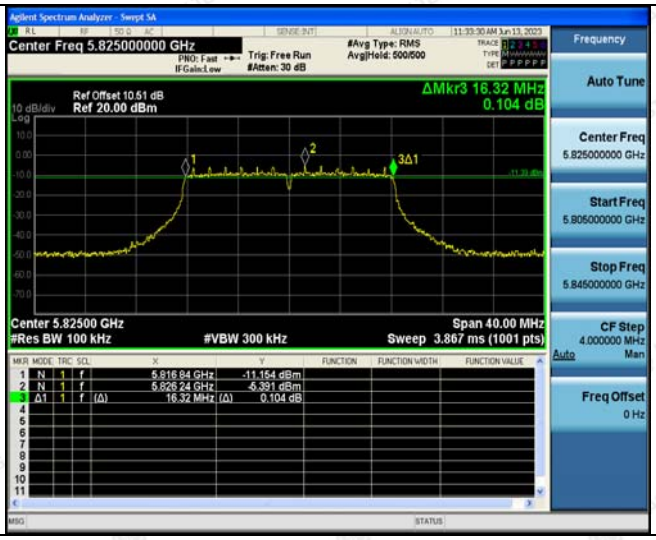
**Band IV (5725 – 5850 MHz)**

802.11a

Low

Mid




High

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802.11n(HT20)

Low

Mid

High

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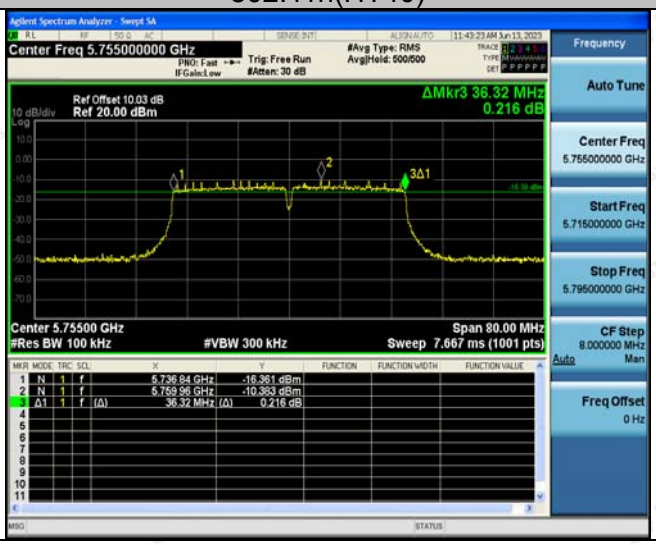
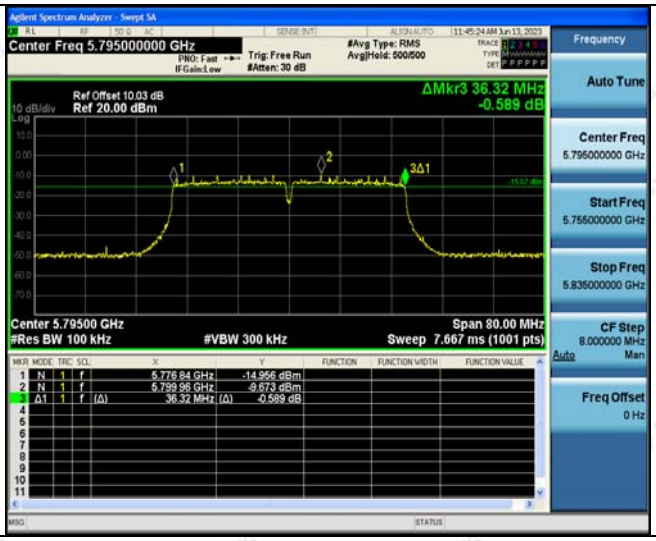
| 802.11n(HT40) |
|---|
|  |
| Low |
|  |
| High |

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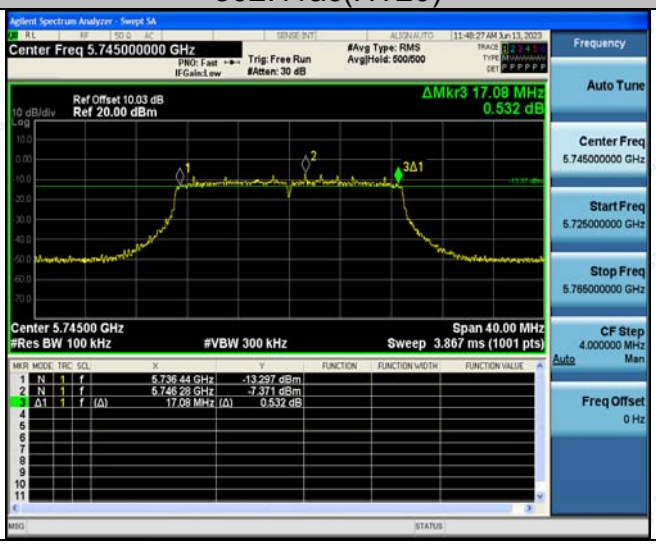
802.11ac(HT20)




Low

Mid

High

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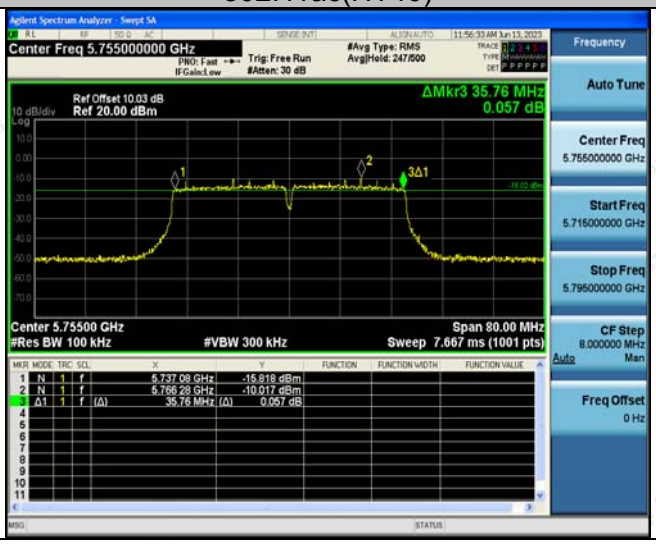
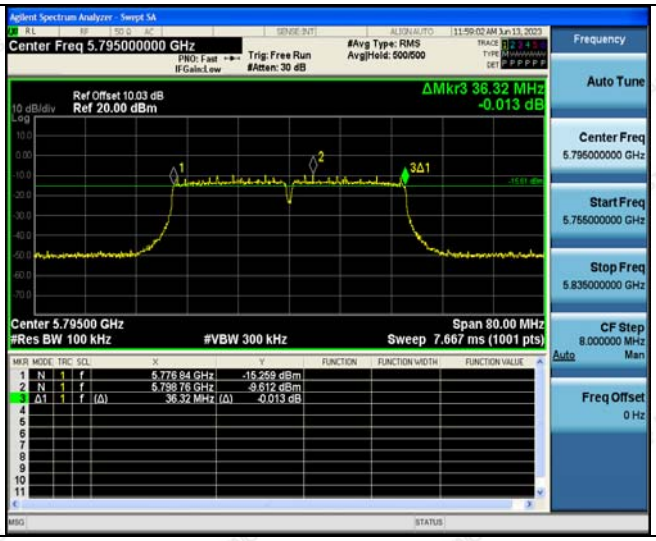
802.11ac(HT40)




Low




High

802.11ac(HT80)

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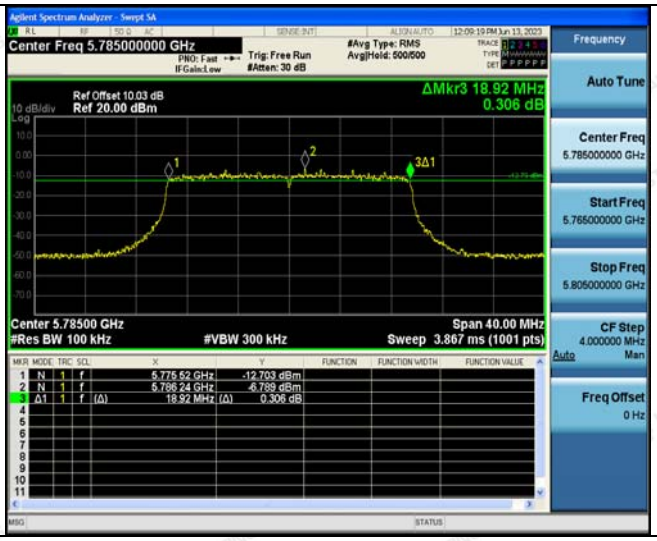
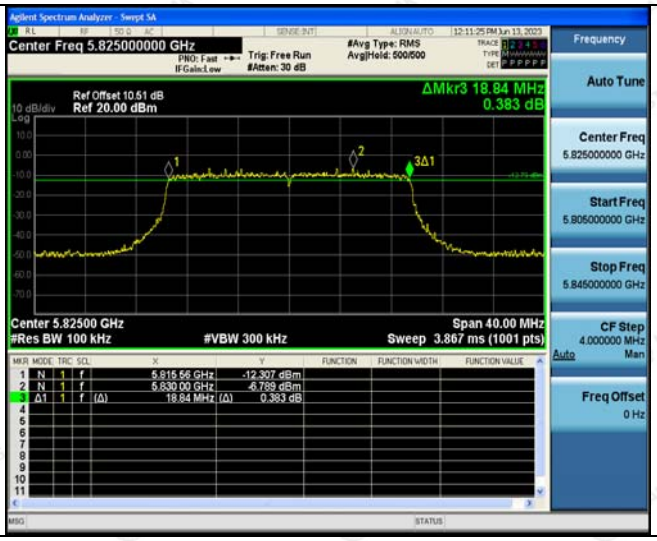
802.11ax(HT20)

Low




Mid




High

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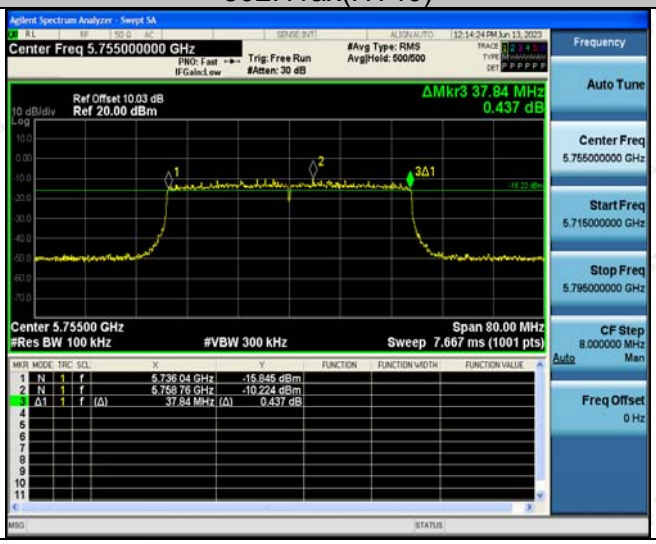
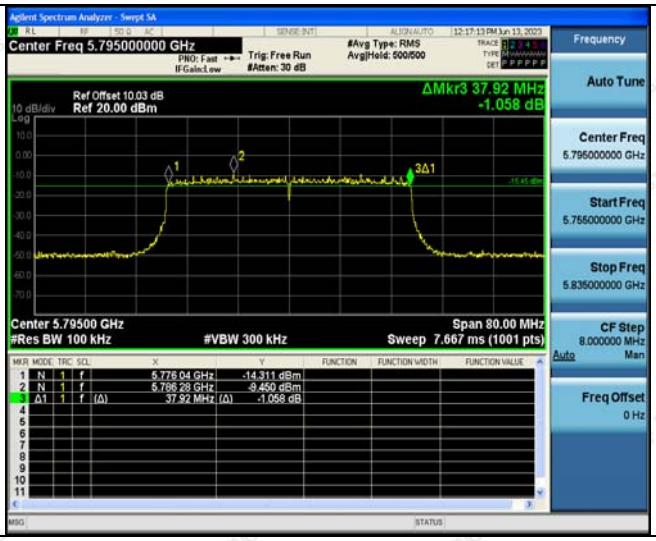
802.11ax(HT40)

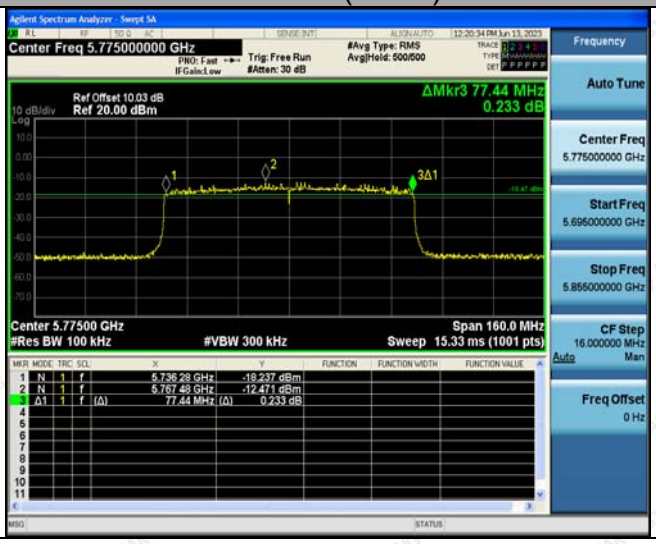



Low




High

802.11ax(HT80)

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**ANT. 4**

| Band IV (5725 - 5850 MHz ) | | | | | |
|---|---|---|---|---|---|
| Mode | Test channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) | Result |
| 11a | CH149 | 5745 | 16.32 | 0.5 | PASS |
| 11a | CH157 | 5785 | 16.32 | 0.5 | PASS |
| 11a | CH161 | 5825 | 16.32 | 0.5 | PASS |
| 11n(HT20) | CH149 | 5745 | 17.56 | 0.5 | PASS |
| 11n(HT20) | CH157 | 5785 | 17.04 | 0.5 | PASS |
| 11n(HT20) | CH161 | 5825 | 17.52 | 0.5 | PASS |
| 11n(HT40) | CH151 | 5755 | 36.32 | 0.5 | PASS |
| 11n(HT40) | CH159 | 5795 | 36.32 | 0.5 | PASS |
| 11ac(HT20) | CH149 | 5745 | 17.52 | 0.5 | PASS |
| 11ac(HT20) | CH157 | 5785 | 17.04 | 0.5 | PASS |
| 11ac(HT20) | CH165 | 5825 | 17.04 | 0.5 | PASS |
| 11ac(HT40) | CH151 | 5755 | 35.84 | 0.5 | PASS |
| 11ac(HT40) | CH159 | 5795 | 36.32 | 0.5 | PASS |
| 11ac(HT80) | CH155 | 5775 | 75.04 | 0.5 | PASS |
| 11ax(HT20) | CH149 | 5745 | 18.96 | 0.5 | PASS |
| 11ax(HT20) | CH157 | 5785 | 18.88 | 0.5 | PASS |
| 11ax(HT20) | CH165 | 5825 | 18.80 | 0.5 | PASS |
| 11ax(HT40) | CH151 | 5755 | 37.84 | 0.5 | PASS |
| 11ax(HT40) | CH159 | 5795 | 38.00 | 0.5 | PASS |
| 11ax(HT80) | CH155 | 5775 | 77.60 | 0.5 | PASS |

**Test plots as follows:**

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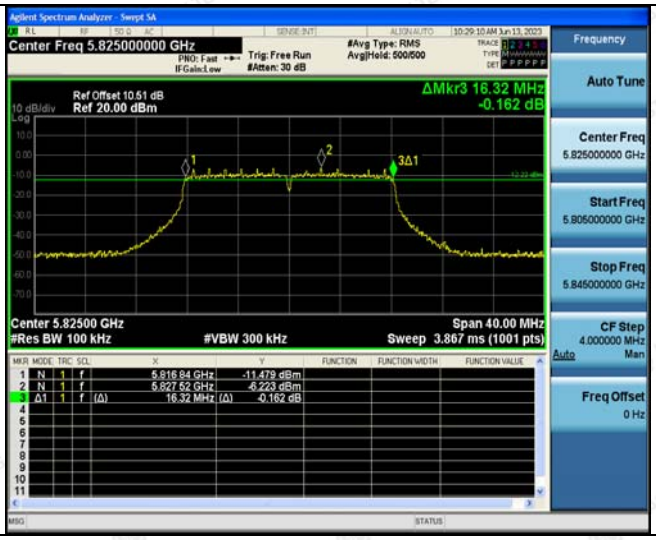
**Band IV (5725 – 5850 MHz)**

802.11a

Low

Mid




High

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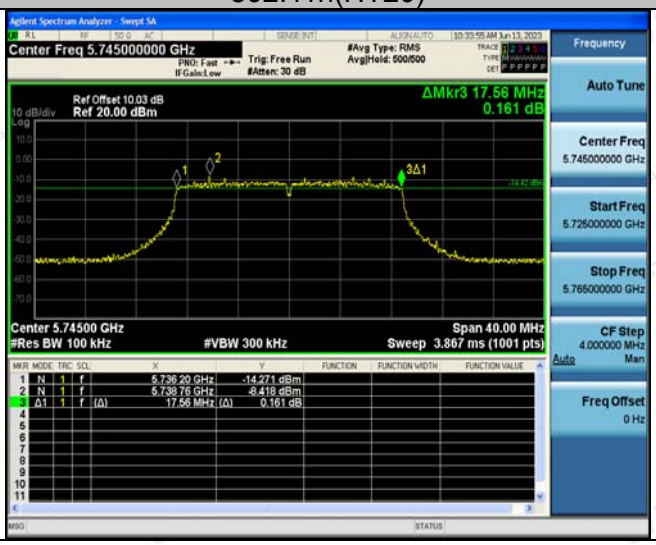
802.11n(HT20)




Low

Mid

High

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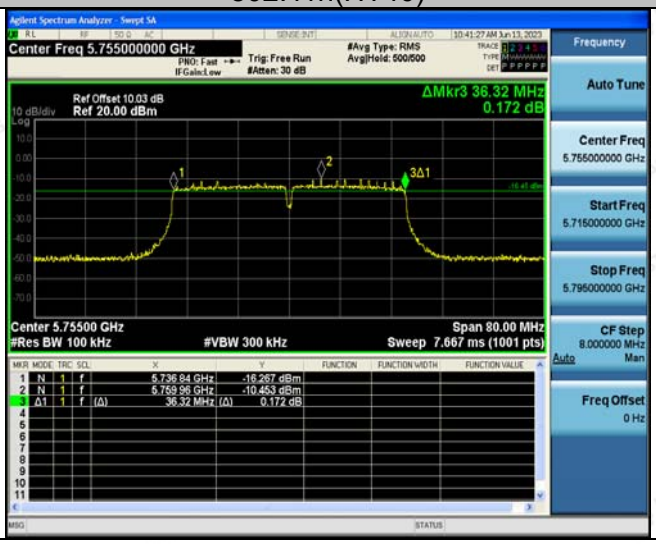
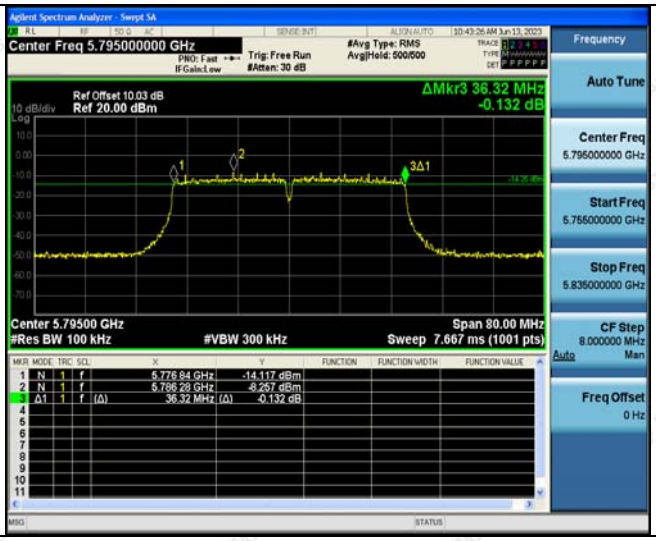
802.11n(HT40)




Low




High

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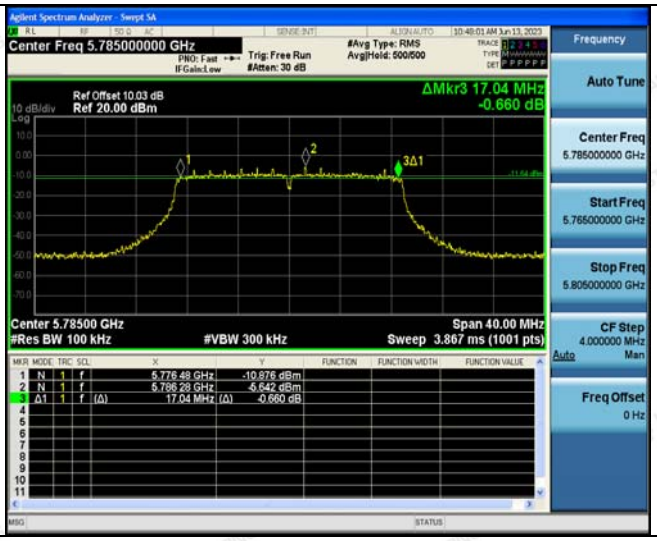
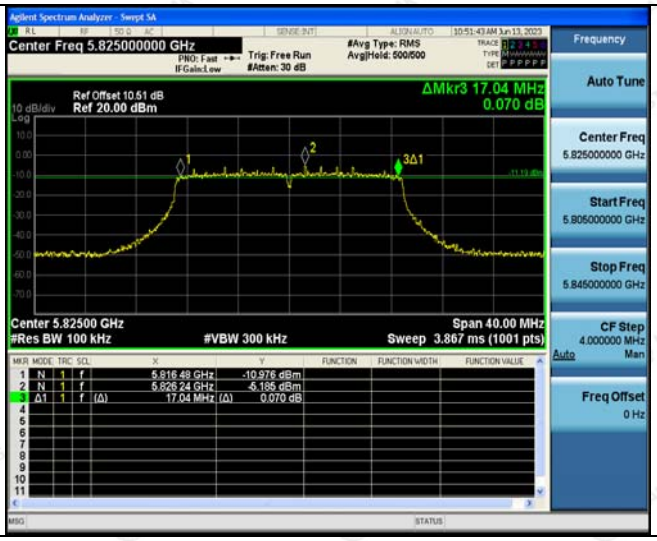
802.11ac(HT20)

Low




Mid




High

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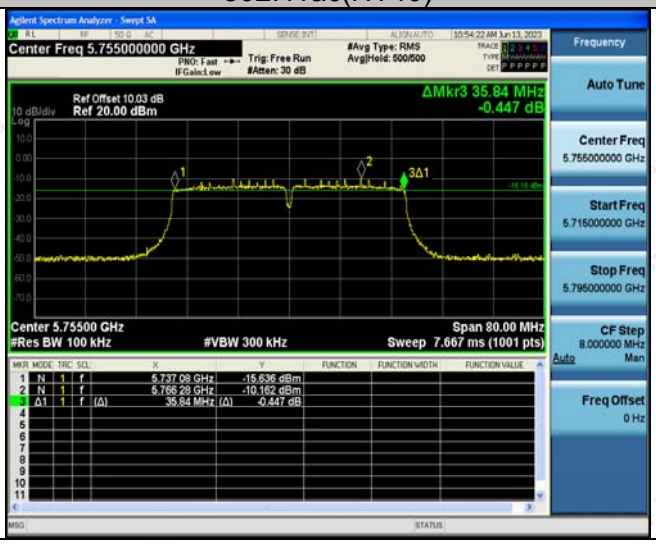
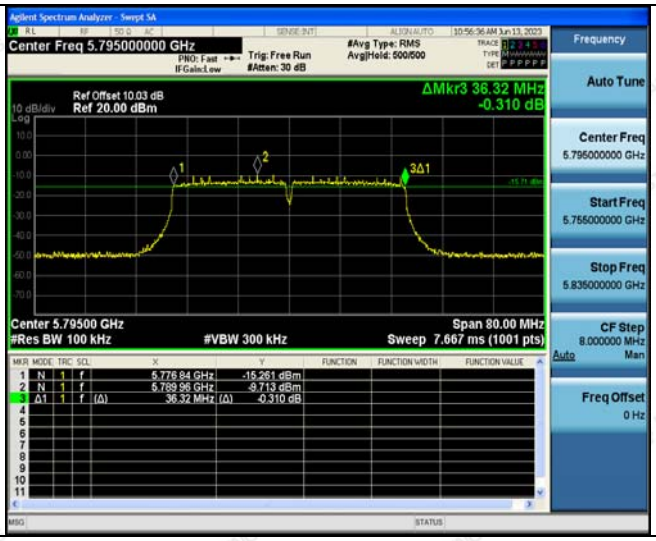
802.11ac(HT40)




Low




High

802.11ac(HT80)

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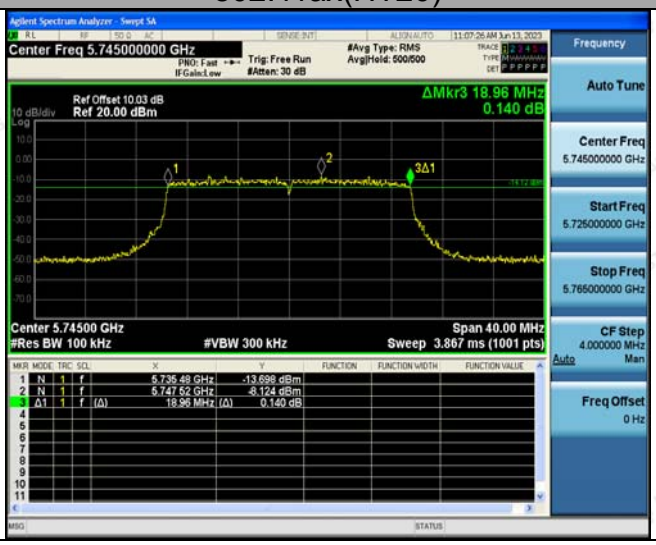
802.11ax(HT20)




Low

Mid

High

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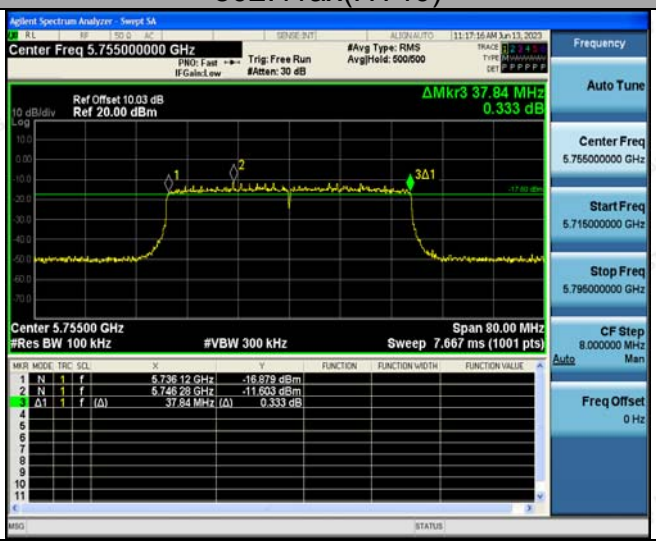
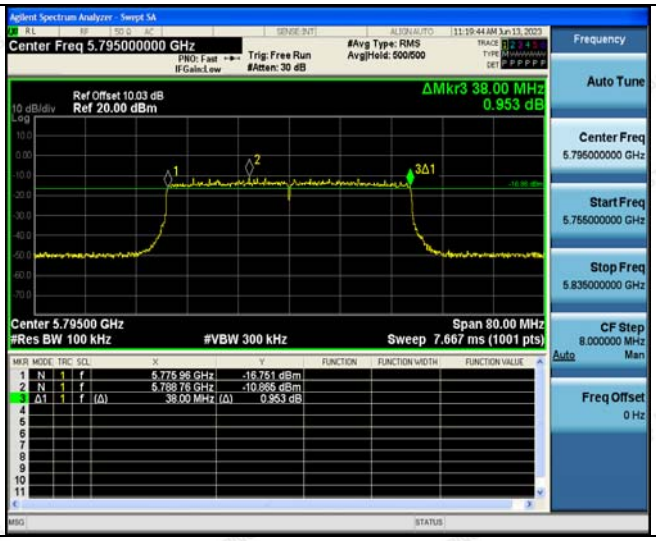
802.11ax(HT40)

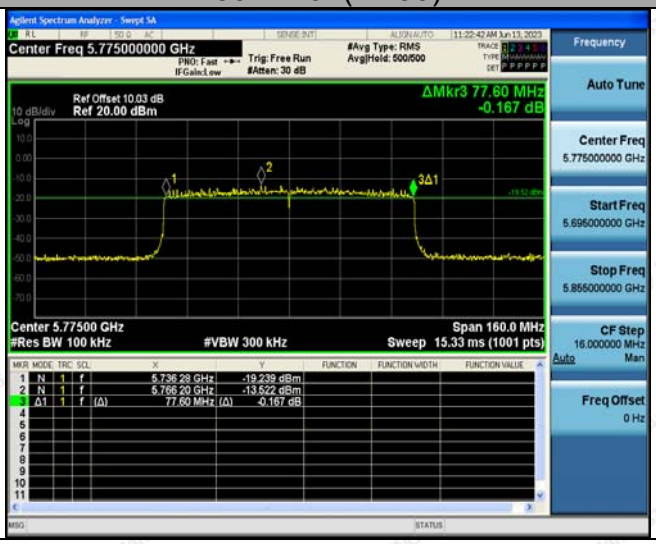



Low




High

802.11ax(HT80)

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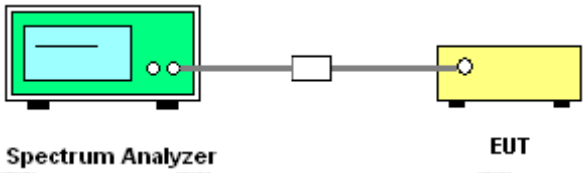
## 4.4. 26dB Bandwidth and 99% Occupied Bandwidth

### 4.4.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | 47 CFR Part 15C Section 15.407 (a) |
| **Test Method:** | KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C |
| **Limit:** | No restriction limits |
| **Test Setup:** |  |
| **Test Mode:** | Transmitting mode with modulation |
| **Test Procedure:** | 1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C<br>2. Set to the maximum power setting and enable the EUT transmit continuously.<br>3. Make the measurement with the spectrum analyzer's resolution bandwidth RBW = 1% EBW, VBW≥3RBW, In order to make an accurate measurement.<br>4. Measure and record the results in the test report. |
| **Test Result:** | N/A |

### 4.4.2. Test Instruments

| RF Test Room | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Spectrum analyzer | Agilent | N9020A | HKE-048 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF cable | Times | 1-40G | HKE-034 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF automatic control unit | Tonscend | JS0806-2 | HKE-060 | Feb. 17, 2023 | Feb. 16, 2024 |

***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

### 4.4.3. Test Result

**N/A**

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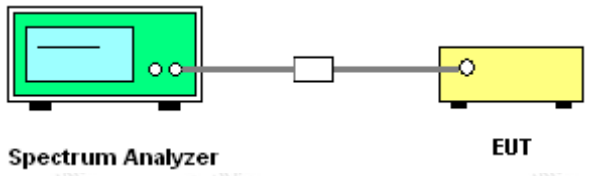
## 4.5. Power Spectral Density

### 4.5.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 E Section 15.407 (a) |
| **Test Method:** | KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F |
| **Limit:** | ≤30.00dBm/500KHz for Band IV 5725MHz-5850MHz |
| **Test Setup:** |  |
| **Test Mode:** | Transmitting mode with modulation |
| **Test Procedure:** | 1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth.<br>2. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS.<br>3. Allow the sweeps to continue until the trace stabilizes.<br>4. Use the peak marker function to determine the maximum amplitude level.<br>5. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment. |
| **Test Result:** | PASS |

### 4.5.2. Test Instruments

| RF Test Room | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Spectrum analyzer | Agilent | N9020A | HKE-048 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF cable | Times | 1-40G | HKE-034 | Feb. 17, 2023 | Feb. 16, 2024 |
| RF automatic control unit | Tonscend | JS0806-2 | HKE-060 | Feb. 17, 2023 | Feb. 16, 2024 |

***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

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