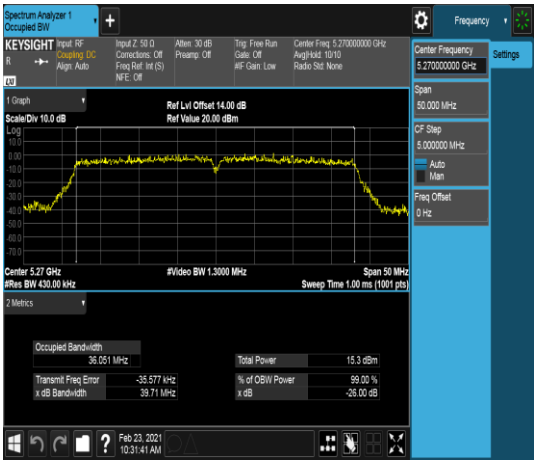
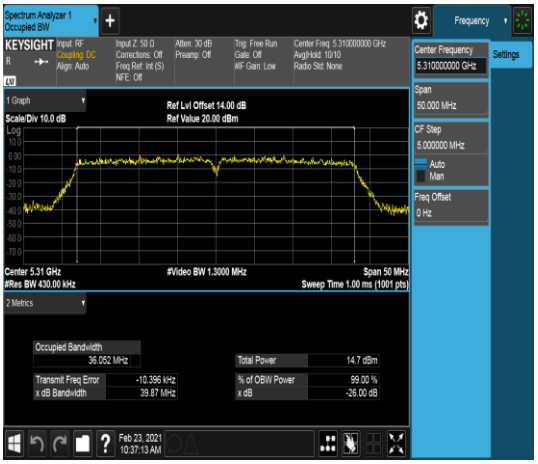
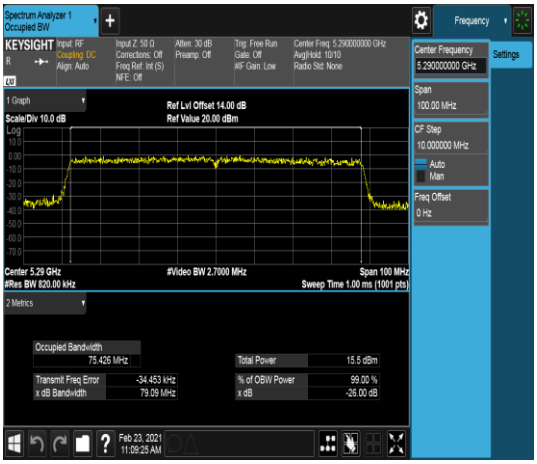
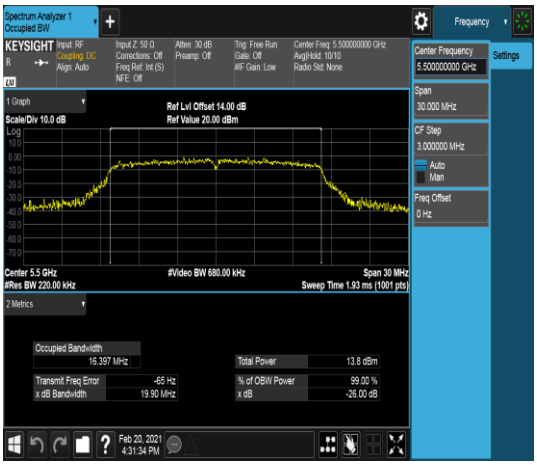
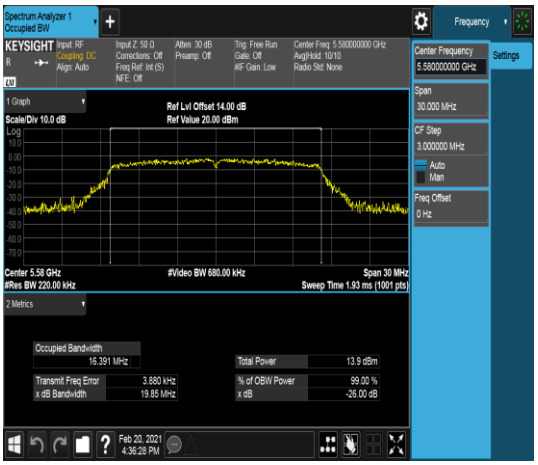
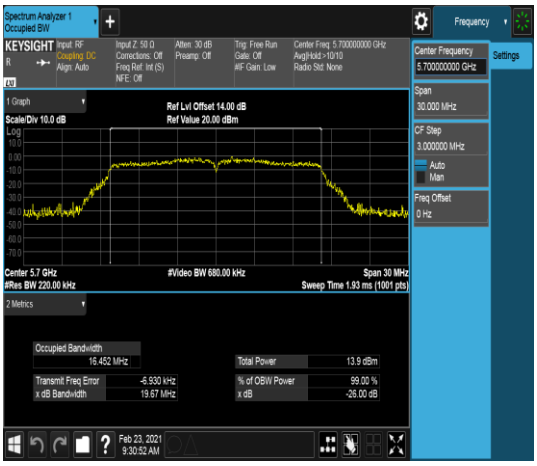
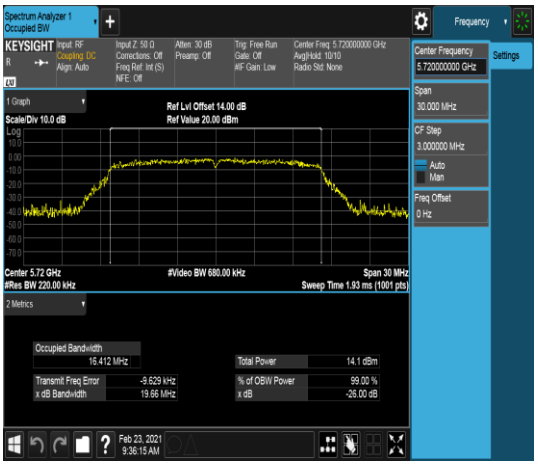
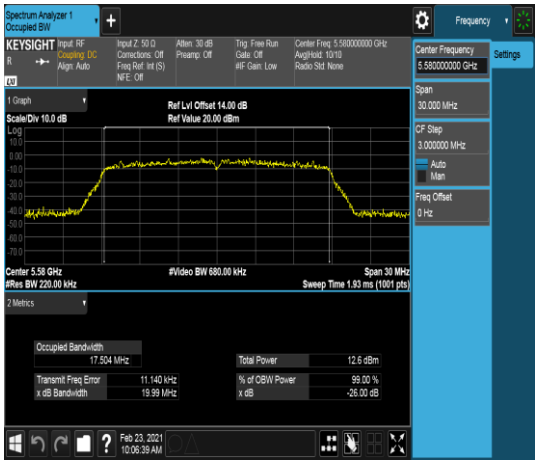
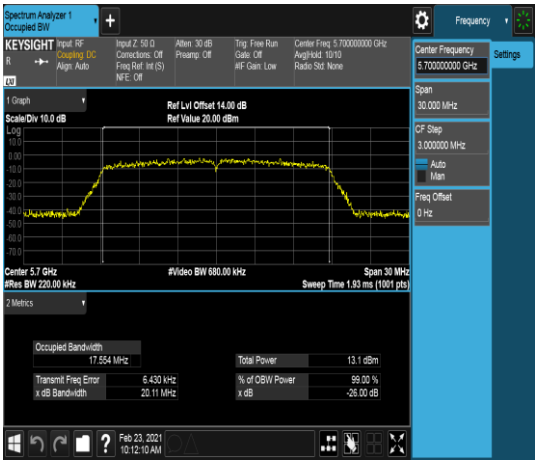
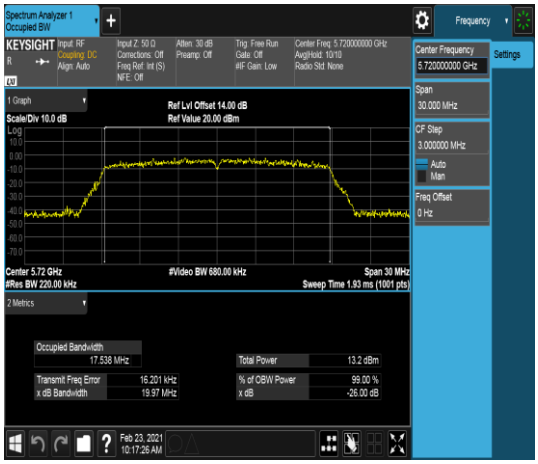
| UNII-2a IEEE 802.11n HT40 mode- chain 1 | |
|---|---|
| **Low CH** | **High CH** |
|  |  |
| **UNII-2a IEEE 802.11ac VHT80 mode- chain 1** | |
| **Low CH** | |
|  | |

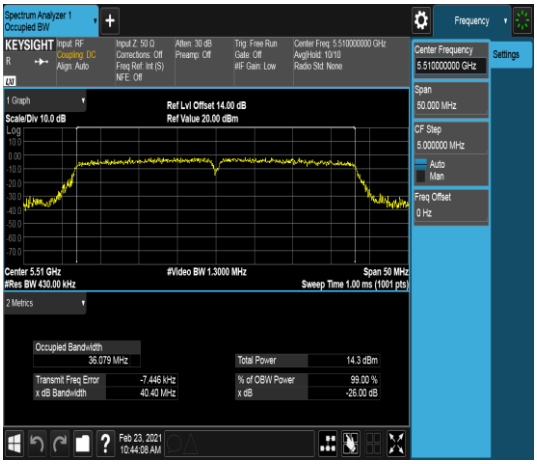
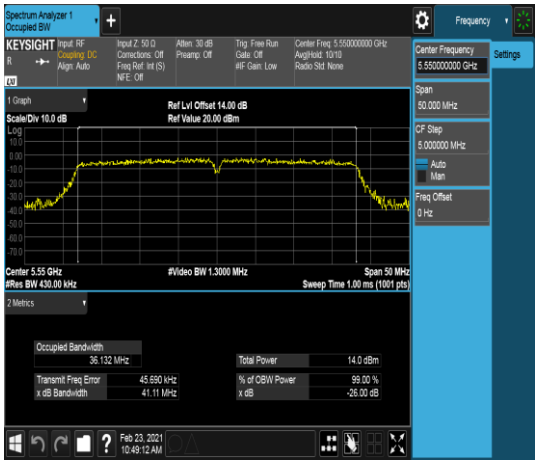
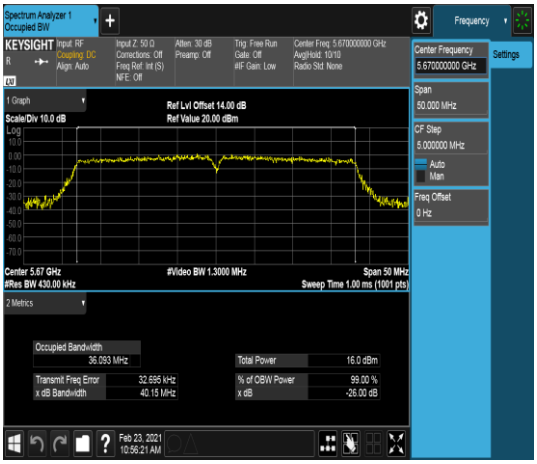
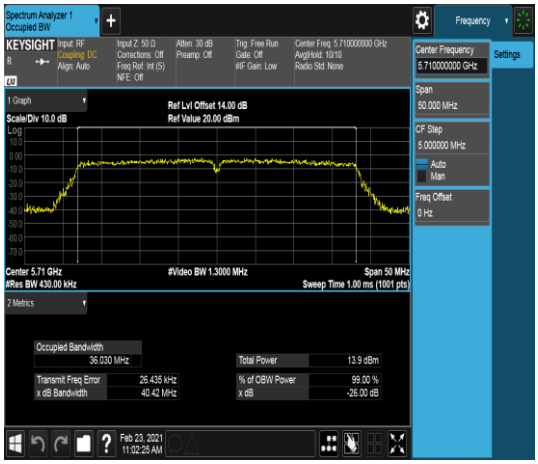
## BANDWIDTH 99%

| UNII-2c IEEE 802.11a mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **Cross CH** |
|  |  |

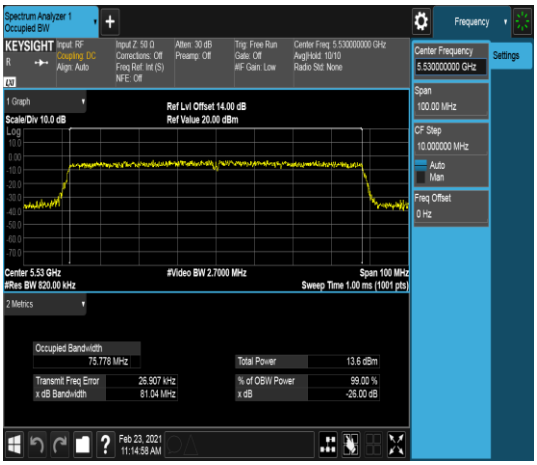
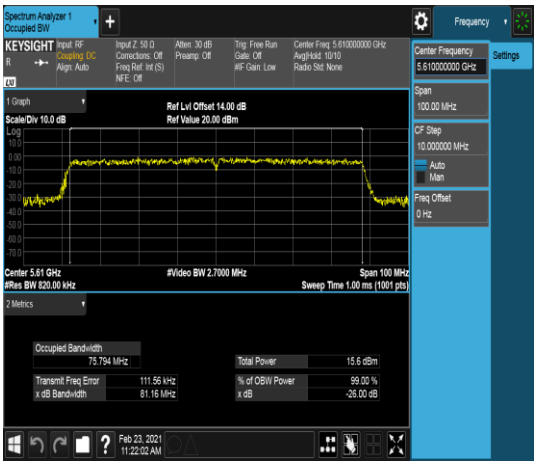
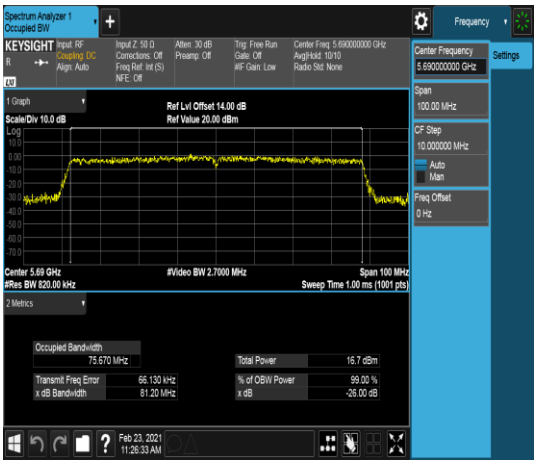
**Report No.:** T201222W02-RP5

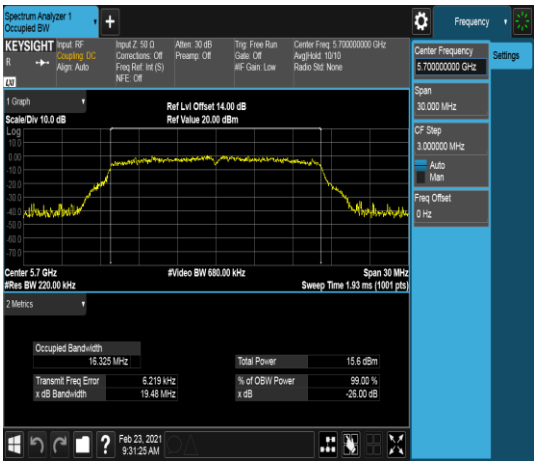
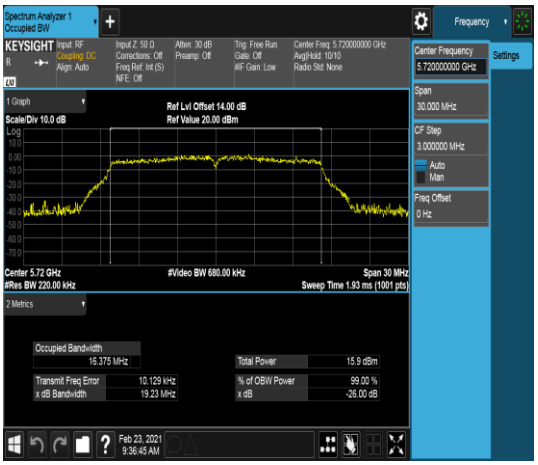
| UNII-2c IEEE 802.11n HT20 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **Cross CH** |
|  |  |

**Report No.:** T201222W02-RP5

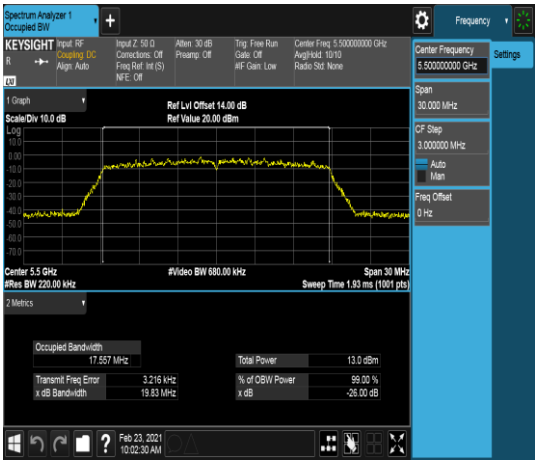
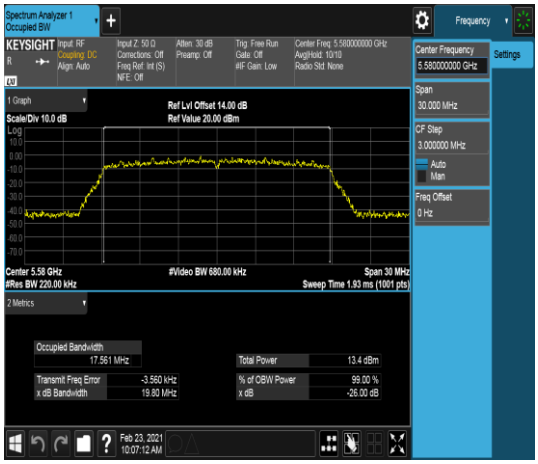
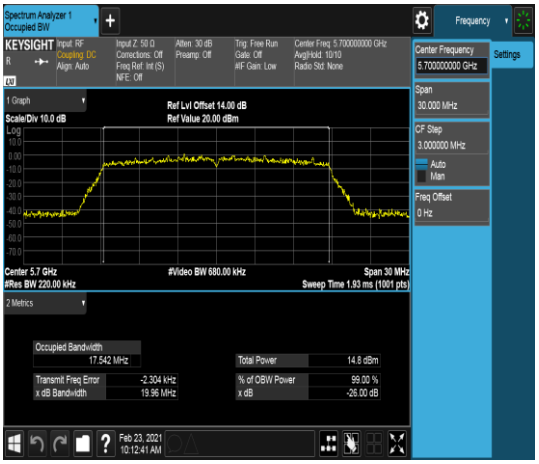
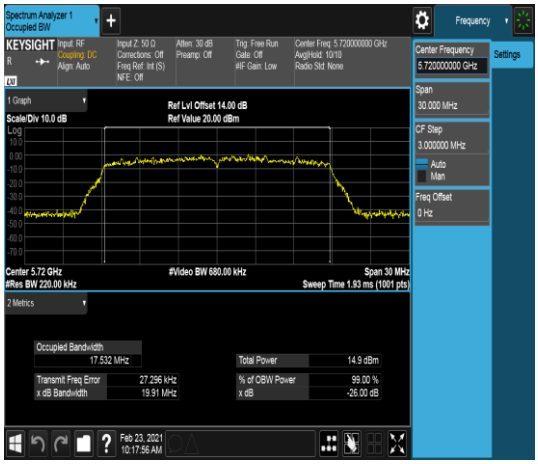
| UNII-2c IEEE 802.11n HT40 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **Cross CH** |
|  |  |

**Report No.:** T201222W02-RP5

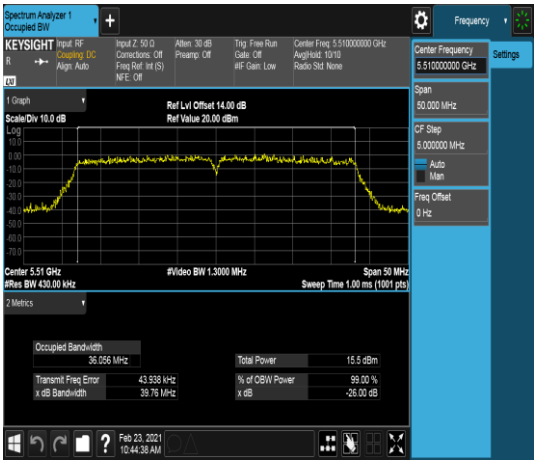
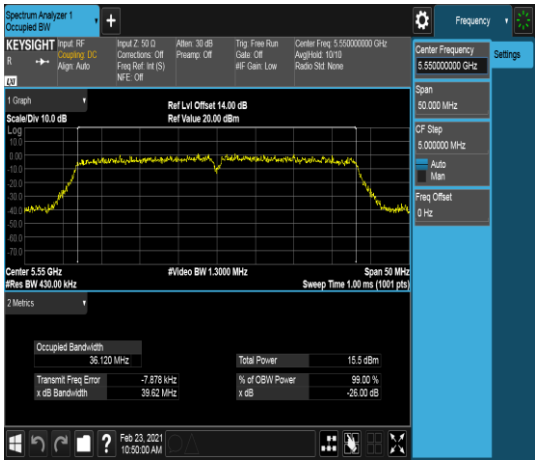
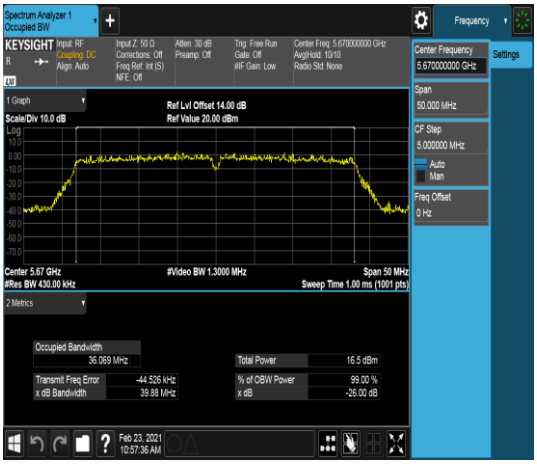
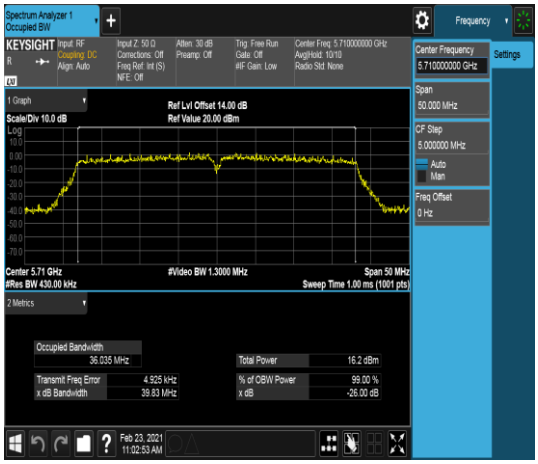
| UNII-2c IEEE 802.11ac VHT80 mode- chain 0 | |
|---|---|
| **Low CH** | **High CH** |
|  |  |
| **Cross CH** | |
|  | |

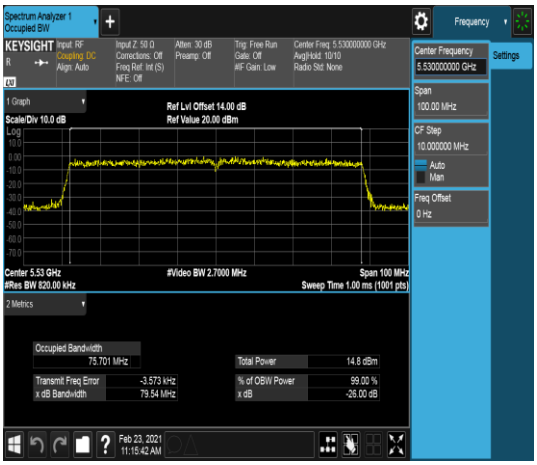
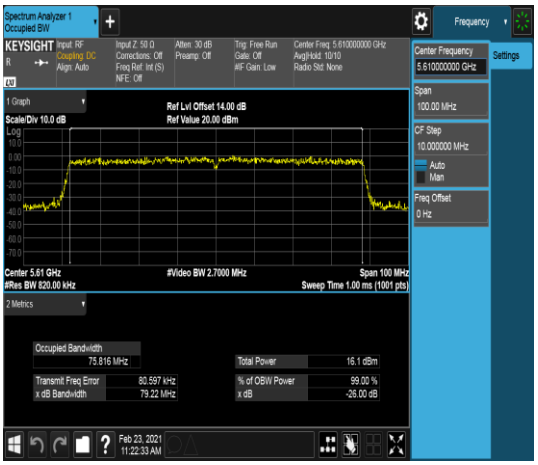
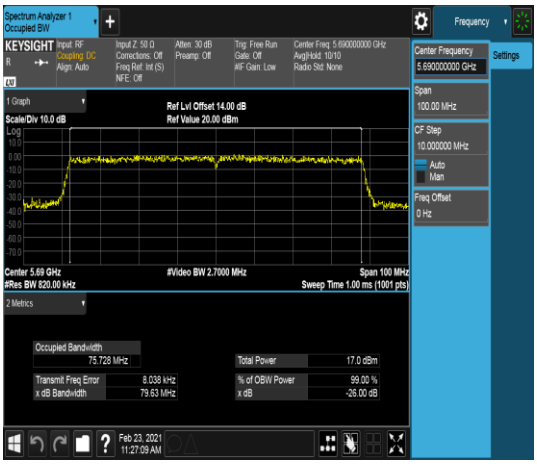
| UNII-2c IEEE 802.11a mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **Cross CH** |
|  |  |

**Report No.:** T201222W02-RP5

| UNII-2c IEEE 802.11n HT20 mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **Cross CH** |
|  |  |

**Report No.:** T201222W02-RP5

| UNII-2c IEEE 802.11n HT40 mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **Cross CH** |
|  |  |

| UNII-2c IEEE 802.11ac VHT80 mode- chain 1 | |
|---|---|
| **Low CH** | **High CH** |
|  |  |
| **Cross CH** | |
|  | |

# 4.3 OUTPUT POWER MEASUREMENT

## 4.3.1 Test Limit

According to §15.407 (a)(1), 15.407(a)(2) and 15.407(a)(3), and RSS-247 section 6.2.1.1, section 6.2.2.1, section 6.2.3.1 and section 6.2.4.1

**FCC:**

**UNII-2a and 2c:**

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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. and The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 Log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**IC:**

**UNII-2a and 2c:**

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 log10B, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

**UNII-2c (5470-5600 MHz and 5650-5725 MHz)**

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

| | |
|---|---|
| UNII-2a/2c Limit | ☒ Antenna not exceed 6 dBi：24dBm<br>☐ Antenna with DG greater than 6 dBi：<br>[Limit = 24 – (DG – 6)] |

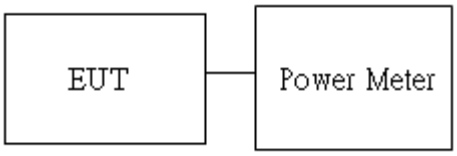
## 4.3.2 Test Procedure

Test method Refer as KDB 789033 D02, Section E.3.b for BW 20MHz and 40MHz, E.2.b for BW 80MHz.

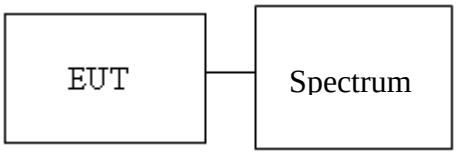
1. The EUT RF output connected to the power meter or spectrum by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Average output power. in the test report.

## 4.3.3 Test Setup

For BW 20MHz and 40MHz




For BW 80MHz



## 4.3.4 Test Result

**Conducted output power：**

| | | | |
|---|---|---|---|
| **Temperature:** | 22.6℃ | **Humidity:** | 52% RH |
| **Tested by:** | Lance Chen | **Test date:** | February 20, 2021 |

### 802.11a_2TX

| CH | Frequency (MHz) | Data Rate | Power set | Avg. Power (dBm) CH 0 | Avg. Power (dBm) CH 1 | Total Power (dBm) | Total power (mW) | Required Limit (dBm) | | | IC Required Limit (dBm) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | 5260 | 6 | 8 | 6.87 | 7.95 | 10.77 | 11.937 | 23.98 | or 11+10log(B) = | 23.88 | 23.98 | or 11+10log(B) = | 23.14 |
| 60 | 5300 | 6 | 8 | 6.88 | 8.02 | **10.81** | 12.058 | 23.98 | or 11+10log(B) = | 23.92 | 23.98 | or 11+10log(B) = | 23.14 |
| 64 | 5320 | 6 | 8 | 6.75 | 7.92 | 10.70 | 11.748 | 23.98 | or 11+10log(B) = | 23.90 | 23.98 | or 11+10log(B) = | 23.15 |
| 100 | 5500 | 6 | 8 | 6.3 | 6.75 | 9.86 | 9.675 | 23.98 | or 11+10log(B) = | 23.87 | 23.98 | or 11+10log(B) = | 23.14 |
| 116 | 5580 | 6 | 8 | 6.38 | 7.06 | 10.06 | 10.136 | 23.98 | or 11+10log(B) = | 23.85 | 23.98 | or 11+10log(B) = | 23.14 |
| 140 | 5700 | 6 | 8 | 6.48 | 8.73 | **11.07** | 12.807 | 23.98 | or 11+10log(B) = | 23.84 | 23.98 | or 11+10log(B) = | 23.13 |
| 144 | 5720(U-NII 2C) | 6 | 8 | 5.46 | 7.60 | 9.99 | 9.984 | 23.98 | or 11+10log(B) = | 22.69 | 23.98 | or 11+10log(B) = | 22.2 |
| 144 | 5720 (U-NII 3) | 6 | 8 | 0.53 | 2.70 | **5.08** | 3.220 | 30.00 | | | | | |

### 802.11n_HT20_MIMO

| CH | Frequency (MHz) | Data Rate | Power set | Avg. Power (dBm) CH 0 | Avg. Power (dBm) CH 1 | Total Power (dBm) | Total power (mW) | Required Limit (dBm) | | | IC Required Limit (dBm) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | 5260 | MCS8 | 8 | 5.48 | 6.71 | **9.75** | 9.448 | 23.98 | or 11+10log(B) = | 23.96 | 23.98 | or 11+10log(B) = | 23.44 |
| 60 | 5300 | MCS8 | 8 | 5.43 | 6.47 | 9.60 | 9.112 | 23.98 | or 11+10log(B) = | 23.98 | 23.98 | or 11+10log(B) = | 23.45 |
| 64 | 5320 | MCS8 | 8 | 5.39 | 6.51 | 9.60 | 9.122 | 23.98 | or 11+10log(B) = | 23.99 | 23.98 | or 11+10log(B) = | 23.44 |
| 100 | 5500 | MCS8 | 8 | 4.82 | 5.27 | 8.67 | 7.355 | 23.98 | or 11+10log(B) = | 23.97 | 23.98 | or 11+10log(B) = | 23.43 |
| 116 | 5580 | MCS8 | 8 | 4.91 | 5.59 | 8.88 | 7.724 | 23.98 | or 11+10log(B) = | 23.92 | 23.98 | or 11+10log(B) = | 23.43 |
| 140 | 5700 | MCS8 | 8 | 5.27 | 7.32 | **10.03** | 10.069 | 23.98 | or 11+10log(B) = | 23.97 | 23.98 | or 11+10log(B) = | 23.44 |
| 144 | 5720(U-NII 2C) | MCS8 | 8 | 4.00 | 6.01 | 8.73 | 7.458 | 23.98 | or 11+10log(B) = | 22.73 | 23.98 | or 11+10log(B) = | 22.39 |
| 144 | 5720 (U-NII 3) | MCS8 | 8 | -0.83 | 1.21 | **3.92** | 2.465 | 30.00 | | | | | |

## 802.11n_HT40_MIMO

| CH | Frequency | Data | Power | Avg. Power (dBm) | | Total Power | Total power | Required Limit | | | IC Required Limit | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | Rate | set | CH 0 | CH 1 | (dBm) | (mW) | (dBm) | | | (dBm) | | |
| 54 | 5270 | MCS8 | 9 | 5.47 | 6.5 | **10.10** | 10.244 | 23.98 | or 11+10log(B) = | 27.00 | 23.98 | or 11+10log(B) = | 26.57 |
| 62 | 5310 | MCS8 | 9 | 5.32 | 6.2 | 9.87 | 9.709 | 23.98 | or 11+10log(B) = | 27.01 | 23.98 | or 11+10log(B) = | 26.57 |
| 102 | 5510 | MCS8 | 10 | 5.71 | 6.13 | **10.01** | 10.033 | 23.98 | or 11+10log(B) = | 27.06 | 23.98 | or 11+10log(B) = | 26.57 |
| 110 | 5550 | MCS8 | 10 | 5.49 | 6.25 | 9.98 | 9.945 | 23.98 | or 11+10log(B) = | 27.00 | 23.98 | or 11+10log(B) = | 26.58 |
| 134 | 5670 | MCS8 | 9 | 5.54 | 6.09 | 9.91 | 9.802 | 23.98 | or 11+10log(B) = | 27.02 | 23.98 | or 11+10log(B) = | 26.57 |
| 142 | 5710(U-NII 2C) | MCS8 | 9 | 4.52 | 6.11 | 9.48 | 8.862 | 23.98 | or 11+10log(B) = | 26.44 | 23.98 | or 11+10log(B) = | 26.19 |
| 142 | 5710 (U-NII 3) | MCS8 | 9 | -3.93 | -2.31 | 1.04 | 1.272 | 30.00 | | | | | |

## 802.11ac_VHT80_MIMO

| CH | Frequency | Data | Power | Avg. Power (dBm) | | Total Power | Total power | Required Limit | | | IC Required Limit | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | Rate | set | CH 0 | CH 1 | (dBm) | (mW) | (dBm) | | | (dBm) | | |
| 58 | 5290 | MCS0 | 9 | 5.12 | 6.23 | **9.86** | 9.673 | 23.98 | or 11+10log(B) = | 30.03 | 23.98 | or 11+10log(B) = | 29.78 |
| 106 | 5530 | MCS0 | 9 | 4.55 | 5.32 | 9.10 | 8.124 | 23.98 | or 11+10log(B) = | 30.01 | 23.98 | or 11+10log(B) = | 29.79 |
| 122 | 5610 | MCS0 | 9 | 5.94 | 6.29 | 10.26 | 10.627 | 23.98 | or 11+10log(B) = | 30.02 | 23.98 | or 11+10log(B) = | 29.8 |
| 138 | 5690(U-NII 2C) | MCS0 | 9 | 6.12 | 6.83 | **10.64** | 11.580 | 23.98 | or 11+10log(B) = | 29.74 | 23.98 | or 11+10log(B) = | 29.62 |
| 138 | 5690 (U-NII 3) | MCS0 | 9 | -5.18 | -5.02 | -0.95 | 0.803 | 30.00 | | | | | |

# 4.4 POWER SPECTRAL DENSITY

## 4.4.1 Test Limit

According to §15.407 (a)(1), 15.407(a)(2) and 15.407(a)(3)

According to RSS-247 section 6.2.1.1, section 6.2.2.1, section 6.2.3.1 and section 6.2.4.1

**UNII-2a and 2c:**

The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

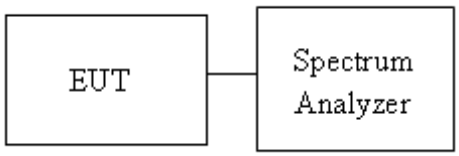
| | |
|---|---|
| UNII-2a Limit | ☒ Antenna not exceed 6 dBi：11 dBm<br>☐ Antenna with DG greater than 6 dBi：<br>[Limit = 11 – (DG – 6)] |
| UNII-2c Limit | ☒ Antenna not exceed 6 dBi：11 dBm<br>☐ Antenna with DG greater than 6 dBi：<br>[Limit = 11 – (DG – 6)] |

### 4.4.2 Test Procedure

Test method Refer as KDB 789033 D02

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. UNII-1, UNII-2a and UNII-2c, SA set RBW = 1MHz, VBW = 3MHz and Detector = RMS, to measurement Power Density.
4. UNII-3, SA set RBW = 500kHz, VBW = 2MHz and Detector = RMS, to measurement Power Density
5. The path loss and Duty Factor were compensated to the results for each measurement by SA.
6. Mark the maximum level.
7. Measure and record the result of power spectral density. in the test report.

### 4.4.3 Test Setup



### 4.4.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 22.6℃ | **Humidity:** | 52% RH |
| **Tested by:** | Lance Chen | **Test date:** | February 20, 2021 |
| **Temperature:** | 22.4℃ | **Humidity:** | 53% RH |
| **Tested by:** | Lance Chen | **Test date:** | February 23, 2021 |

| UNII-2a 5250-5350 MHz | | | | | |
|---|---|---|---|---|---|
| **Test mode: IEEE 802.11a mode** | | | | | |
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5260 | -0.69 | 0.93 | 3.53 | 11 |
| Mid | 5300 | -0.94 | 0.51 | 3.18 | |
| High | 5320 | -0.99 | 0.34 | 3.06 | |
| **Test mode: IEEE 802.11n HT20 mode** | | | | | |
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5260 | -3.05 | -1.06 | 1.67 | 11 |
| Mid | 5300 | -2.85 | -1.80 | 1.32 | |
| High | 5320 | -2.99 | -1.81 | 1.25 | |
| **Test mode: IEEE 802.11n HT40 mode** | | | | | |
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5270 | -5.56 | -4.86 | -1.11 | 11 |
| High | 5310 | -6.48 | -4.81 | -1.47 | |
| **Test mode: IEEE 802.11ac VHT80 mode** | | | | | |
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Mid | 5290 | -9.35 | -7.99 | -4.47 | 11 |

Remark:
Total PPSD = Chain0 PPSD + Chain1 PPSD + Duty factor

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| UNII-2c 5470-5725 MHz | | | | | |
|---|---|---|---|---|---|
| **Test mode: IEEE 802.11a mode** | | | | | |
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5500 | -1.17 | 0.12 | 2.85 | 11 |
| Mid | 5580 | -0.50 | 0.15 | 3.17 | |
| High | 5700 | -0.92 | 0.63 | 3.25 | |
| 144 | 5720 (U-NII 2C) | -0.36 | 1.36 | 3.91 | |

| Test mode: IEEE 802.11a mode | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **10log (500kHz/RBW) Factor(dB)** | **Total Corr'd PSD (dBm/500kHz)** | **Limit (dBm)** |
| | 5720 (U-NII 3) | -7.14 | -6.32 | 2.22 | -1.16 | 30 |

| Test mode: IEEE 802.11n HT20 mode | | | | | |
|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5500 | -3.24 | -2.09 | 0.98 | 11 |
| Mid | 5580 | -2.40 | -2.15 | 1.34 | |
| High | 5700 | -2.74 | -0.39 | 2.20 | |
| 144 | 5720 (U-NII 2C) | -1.72 | -0.06 | 2.80 | |

| Test mode: IEEE 802.11n HT20 mode | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **10log (500kHz/RBW) Factor(dB)** | **Total Corr'd PSD (dBm/500kHz)** | **Limit (dBm)** |
| | 5720 (U-NII 3) | -8.88 | -6.50 | 2.22 | -1.70 | 30 |

Remark:
Total PPSD = Chain0 PPSD + Chain1 PPSD + Duty factor

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| Test mode: IEEE 802.11n HT40 mode | | | | | |
|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5510 | -5.26 | -3.69 | -0.31 | 11 |
| Mid | 5550 | -5.35 | -4.45 | -0.79 | |
| High | 5670 | -3.42 | -3.39 | 0.69 | |
| 142 | 5710 (U-NII 2C) | -6.14 | -4.13 | -0.93 | |

| Test mode: IEEE 802.11n HT40 mode | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **10log (500kHz/RBW) Factor(dB)** | **Total Corr'd PSD (dBm/500kHz)** | **Limit (dBm)** |
| | 5710 (U-NII 3) | -12.63 | -11.41 | 2.22 | -5.67 | 30 |

| Test mode: IEEE 802.11ac VHT80 mode | | | | | |
|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **Total PPSD (dBm)** | **Limit (dBm)** |
| Low | 5530 | -9.86 | -9.14 | -5.33 | 11 |
| High | 5610 | -7.70 | -7.94 | -3.67 | |
| 138 | 5690 (U-NII 2C) | -7.16 | -7.34 | -3.10 | |

| Test mode: IEEE 802.11ac VHT80 mode | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PPSD (dBm)** | **Chain 1 PPSD (dBm)** | **10log (500kHz/RBW) Factor(dB)** | **Total Corr'd PSD (dBm/500kHz)** | **Limit (dBm)** |
| | 5690 (U-NII 3) | -13.42 | -13.37 | 2.22 | -7.02 | 30 |

Remark:
Total PPSD = Chain0 PPSD + Chain1 PPSD + Duty factor

## Test Data

| UNII-2a IEEE 802.11a mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

| UNII-2a IEEE 802.11n HT20 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

| UNII-2a IEEE 802.11n HT40 mode- chain 0 | |
|---|---|
| **Low CH** | **High CH** |
|  |  |
| **UNII-2a IEEE 802.11ac VHT80 mode- chain 0** | |
| **Low CH** | |
|  | |

| UNII-2a IEEE 802.11a mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

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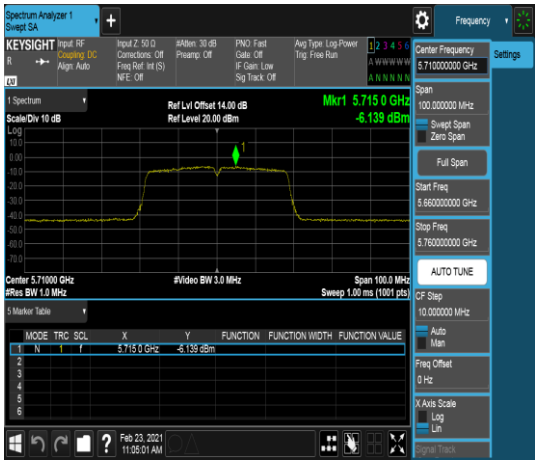
| UNII-2a IEEE 802.11n HT20 mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

| UNII-2a IEEE 802.11n HT40 mode- chain 1 | |
|---|---|
| **Low CH** | **High CH** |
|  |  |
| **UNII-2a IEEE 802.11ac VHT80 mode- chain 1** | |
| **Low CH** | |
|  | |

## Test Data

| UNII-2c IEEE 802.11a mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **144 CH (U-NII 2C)** |
|  |  |
| **144 CH (U-NII 3)** | |
|  | |

| UNII-2c IEEE 802.11n HT20 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **144 CH (U-NII 2C)** |
|  |  |
| **144 CH (U-NII 3)** | |
|  | |

| UNII-2c IEEE 802.11n HT40 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | **142 CH (U-NII 2C)** |
|  |  |
| **142 CH (U-NII 3)** | |
|  | |