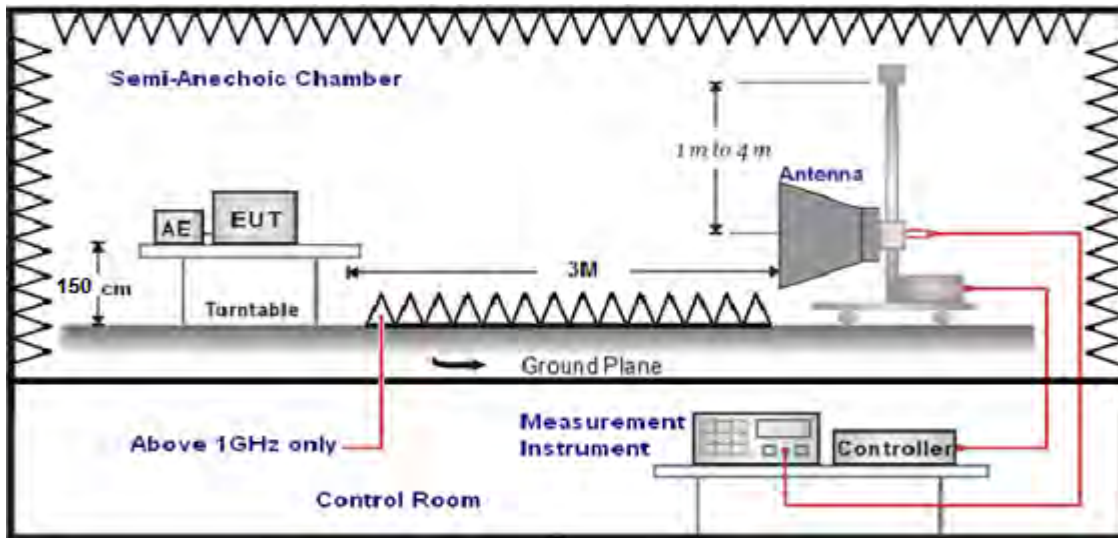


4.8. Band Edge Compliance

TEST CONFIGURATION



LIMIT

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequency (MHz) | Distance (Meters) | Radiated (dBµV/m) | Radiated (µV/m) |
|-----------------|-------------------|--------------------------------------|-----------------|
| 0.009-0.49 | 3 | $20\log(2400/F(KHz))+40\log(300/3)$ | $2400/F(KHz)$ |
| 0.49-1.705 | 3 | $20\log(24000/F(KHz))+ 40\log(30/3)$ | $24000/F(KHz)$ |
| 1.705-30 | 3 | $20\log(30)+ 40\log(30/3)$ | 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 |

According to §15.407 (b): Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits

| Frequency (MHz) | EIRP Limit (dBm) | Equivalent Field Strength at 3m (dBµV/m) |
|-----------------|------------------------------------|--|
| 5150-5250 | -27 | 68.2 |
| 5250-5350 | -27 | 68.2 |
| 5470-5725 | -27 | 68.2 |
| 5725-5850 | -27 (beyond 10MHz of the bandedge) | 68.2 |
| | -17 (within 10 MHz of band edge) | 78.2 |

TEST PROCEDURE

1. The EUT was placed on a turn table which is 1.5m above 1GHz.
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. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|----------------------|----------------------------|---------------|
| 1GHz-18GHz | Double Ridged Horn Antenna | 3 |

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

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|----------------------|---|----------|
| 1GHz-18GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

| | |
|---------------------------|--|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

TEST RESULTS

Remark:For radiated bandedge We measured at both mode, recorded worst case in antenna 0's 802.11 ac20 mode;

For Radiated Bandedge Measurement

| | | | |
|---------------|----------|----------------|-------------------|
| Temperature | 23.4°C | Humidity | 54.5% |
| Test Engineer | Moon Tan | Configurations | IEEE 802.11a/n/ac |

NOTE: All the modes have been tested and recorded worst mode in the report.(MT7668BU Antenna 0)

802.11 ac20/ Channel 36 :5180 MHz

| Freq (MHz) | Read Level (dBμV) | Antenna Factor (dB/m) | PRM Factor (dB) | Cable Loss (dB) | Result Level (dBμV/m) | Limit Line (dBμV/m) | Margin (dB) | Detector | Polarization |
|------------|-------------------|-----------------------|-----------------|-----------------|-----------------------|---------------------|-------------|----------|--------------|
| 4500.0 | 35.03 | 35.58 | 29.04 | 8.28 | 49.85 | 74.00 | -24.15 | Peak | Horizontal |
| 4500.0 | 30.12 | 35.58 | 29.04 | 8.28 | 44.94 | 54.00 | -9.06 | AV | Horizontal |
| 5150.0 | 39.15 | 35.58 | 29.04 | 8.28 | 53.97 | 74.00 | -20.03 | Peak | Horizontal |
| 5150.0 | 30.66 | 35.58 | 29.04 | 8.28 | 45.48 | 54.00 | -8.52 | AV | Horizontal |

802.11 ac20/ Channel 48 :5240 MHz

| Freq (MHz) | Read Level (dBμV) | Antenna Factor (dB/m) | PRM Factor (dB) | Cable Loss (dB) | Result Level (dBμV/m) | Limit Line (dBμV/m) | Margin (dB) | Detector | Polarization |
|------------|-------------------|-----------------------|-----------------|-----------------|-----------------------|---------------------|-------------|----------|--------------|
| 5350.0 | 35.06 | 35.42 | 29.06 | 8.39 | 49.81 | 74.00 | -24.19 | Peak | Horizontal |
| 5350.0 | 30.23 | 35.42 | 29.06 | 8.39 | 44.98 | 54.00 | -9.02 | AV | Horizontal |
| 5460.0 | 39.17 | 35.42 | 29.06 | 8.39 | 53.92 | 74.00 | -20.08 | Peak | Horizontal |
| 5460.0 | 30.68 | 35.42 | 29.06 | 8.39 | 45.43 | 54.00 | -8.57 | AV | Horizontal |

802.11 ac20/ Channel 149 :5745 MHz

| Freq (MHz) | Read Level (dBμV) | Antenna Factor (dB/m) | PRM Factor (dB) | Cable Loss (dB) | Result Level (dBμV/m) | Limit Line (dBμV/m) | Margin (dB) | Detector | Polarization |
|------------|-------------------|-----------------------|-----------------|-----------------|-----------------------|---------------------|-------------|----------|--------------|
| 5650.0 | 30.29 | 35.35 | 29.07 | 8.43 | 45.00 | 68.20 | -23.20 | Peak | Horizontal |
| 5700.0 | 30.18 | 35.35 | 29.07 | 8.43 | 44.89 | 68.20 | -23.31 | Peak | Horizontal |
| 5720.0 | 32.23 | 35.35 | 29.07 | 8.43 | 46.94 | 68.20 | -21.26 | Peak | Horizontal |
| 5725.0 | 30.53 | 35.35 | 29.07 | 8.43 | 45.24 | 68.20 | -22.96 | Peak | Horizontal |

802.11 ac20/ Channel 165 :5825 MHz

| Freq (MHz) | Read Level (dBμV) | Antenna Factor (dB/m) | PRM Factor (dB) | Cable Loss (dB) | Result Level (dBμV/m) | Limit Line (dBμV/m) | Margin (dB) | Detector | Polarization |
|------------|-------------------|-----------------------|-----------------|-----------------|-----------------------|---------------------|-------------|----------|--------------|
| 5850.0 | 30.22 | 35.3 | 29.11 | 8.51 | 44.92 | 68.20 | -23.28 | Peak | Horizontal |
| 5855.0 | 30.18 | 35.3 | 29.11 | 8.51 | 44.88 | 68.20 | -23.32 | Peak | Horizontal |
| 5875.0 | 32.27 | 35.3 | 29.11 | 8.51 | 46.97 | 68.20 | -21.23 | Peak | Horizontal |
| 5925.0 | 30.66 | 35.3 | 29.11 | 8.51 | 45.36 | 68.20 | -22.84 | Peak | Horizontal |

REMARKS:

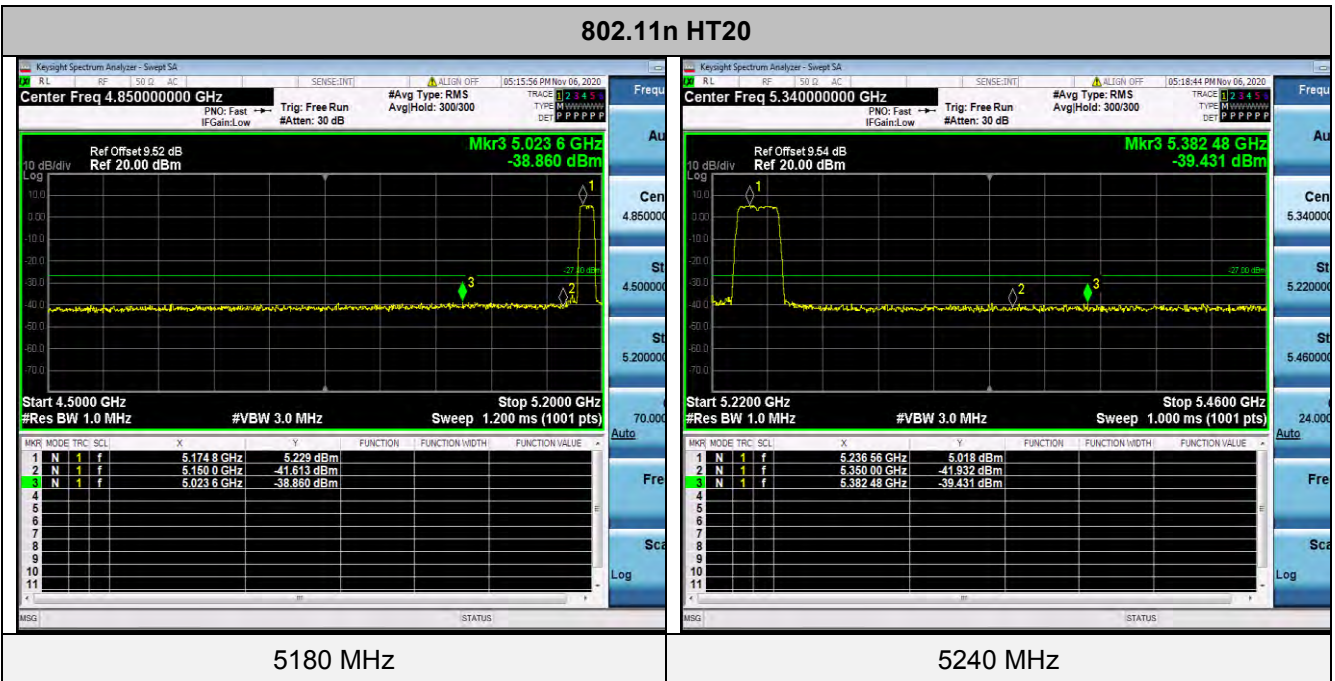
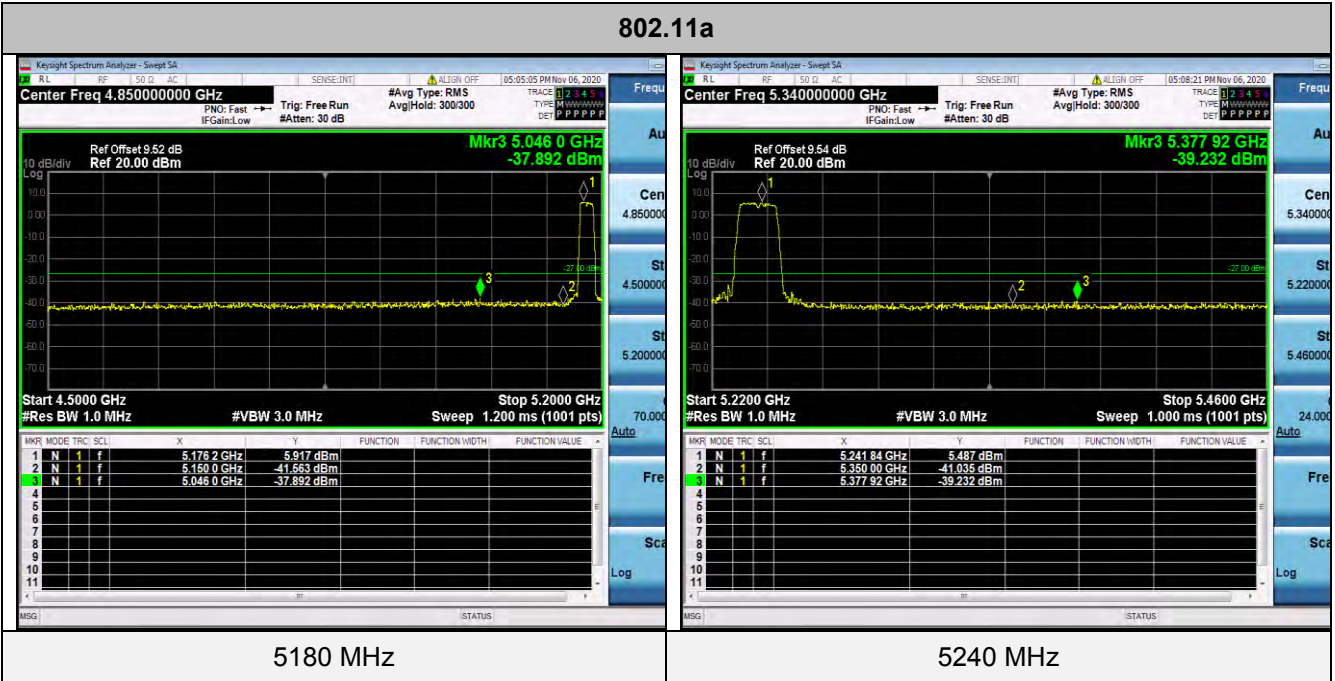
1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. Margin value = Result Level-Limit value.
2. The other emission levels were very low against the limit.
3. The average measurement was not performed when the peak measured data under the limit of average detection.
4. Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=10Hz/Sweep time=Auto/Detector=Peak;

For Conducted Band edge Measurement

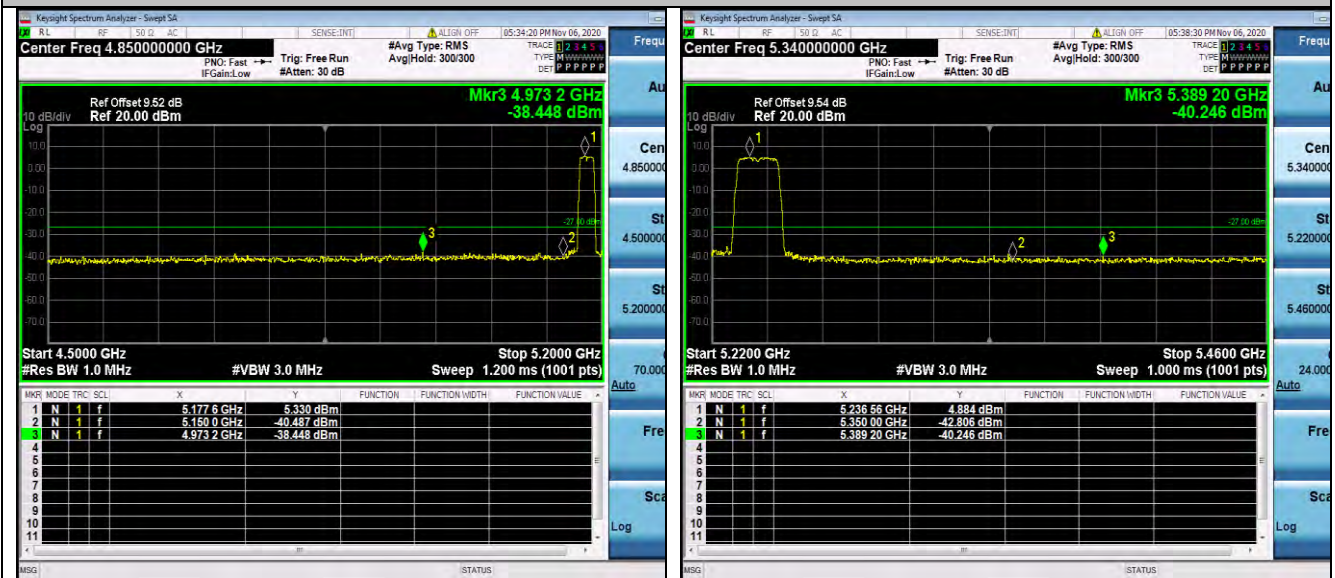
| | | | |
|---------------|----------|----------------|-------------------|
| Temperature | 23.6°C | Humidity | 55.7% |
| Test Engineer | Moon Tan | Configurations | IEEE 802.11a/n/ac |

The test results have included the antenna gain

RTL8822CU:
Antenna 0:
5150-5250MHz:



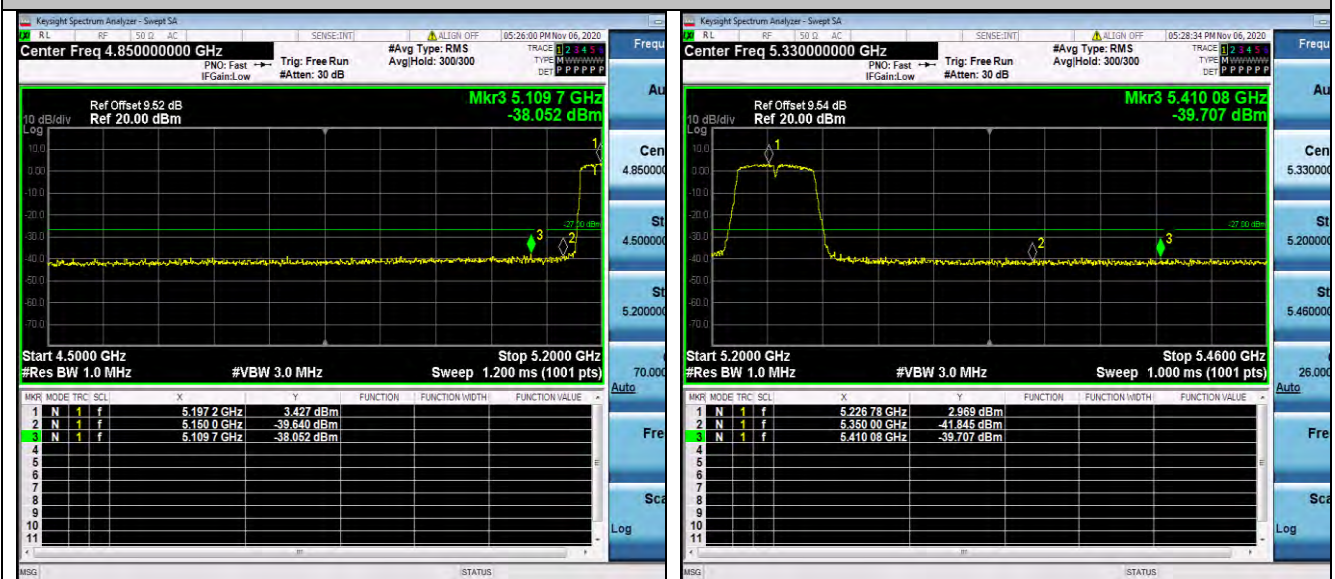
802.11ac20



5180 MHz

5240 MHz

802.11n HT40



5190 MHz

5230 MHz

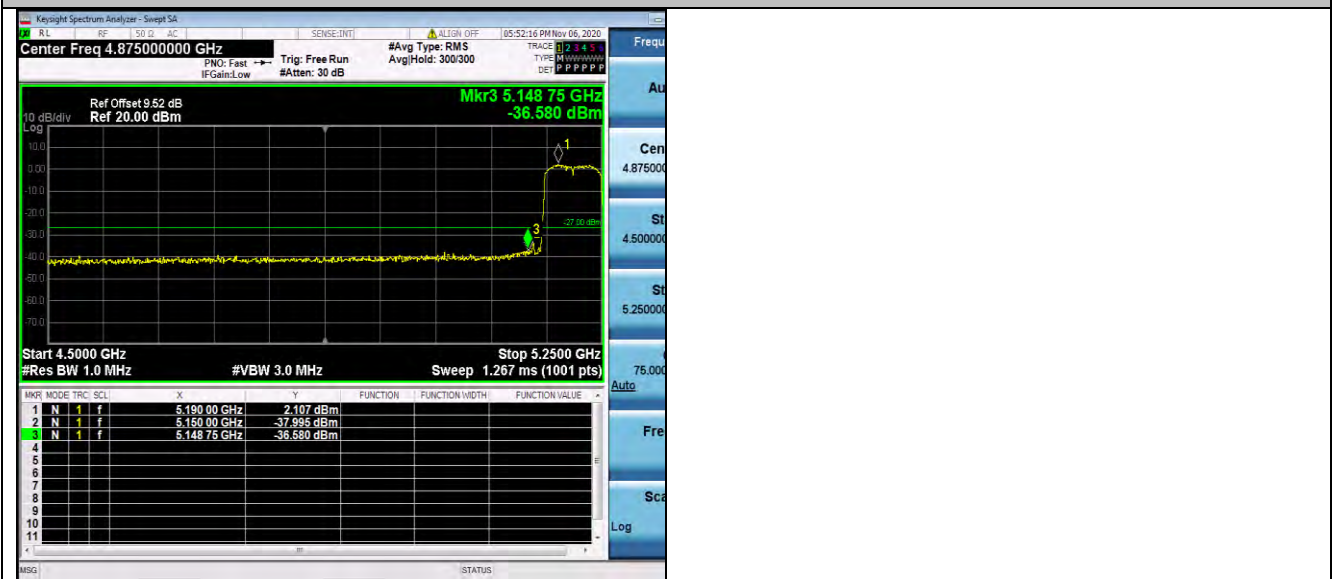
802.11ac40



5190 MHz

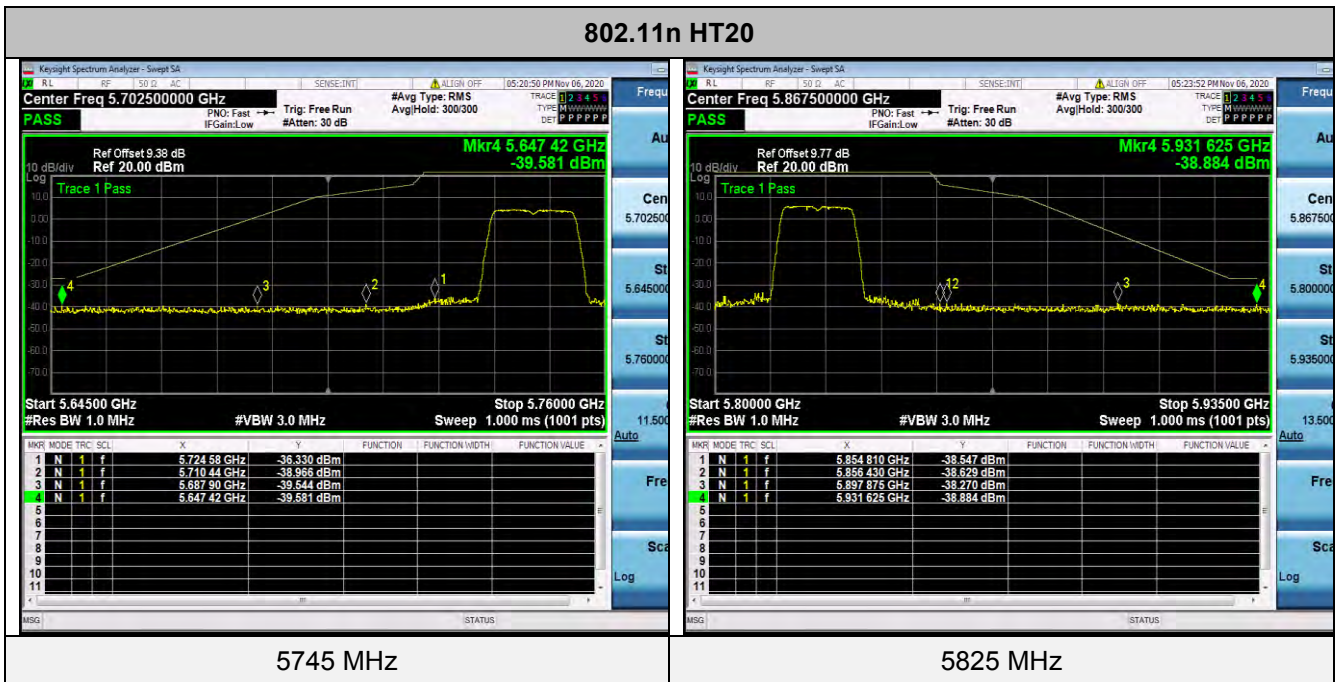
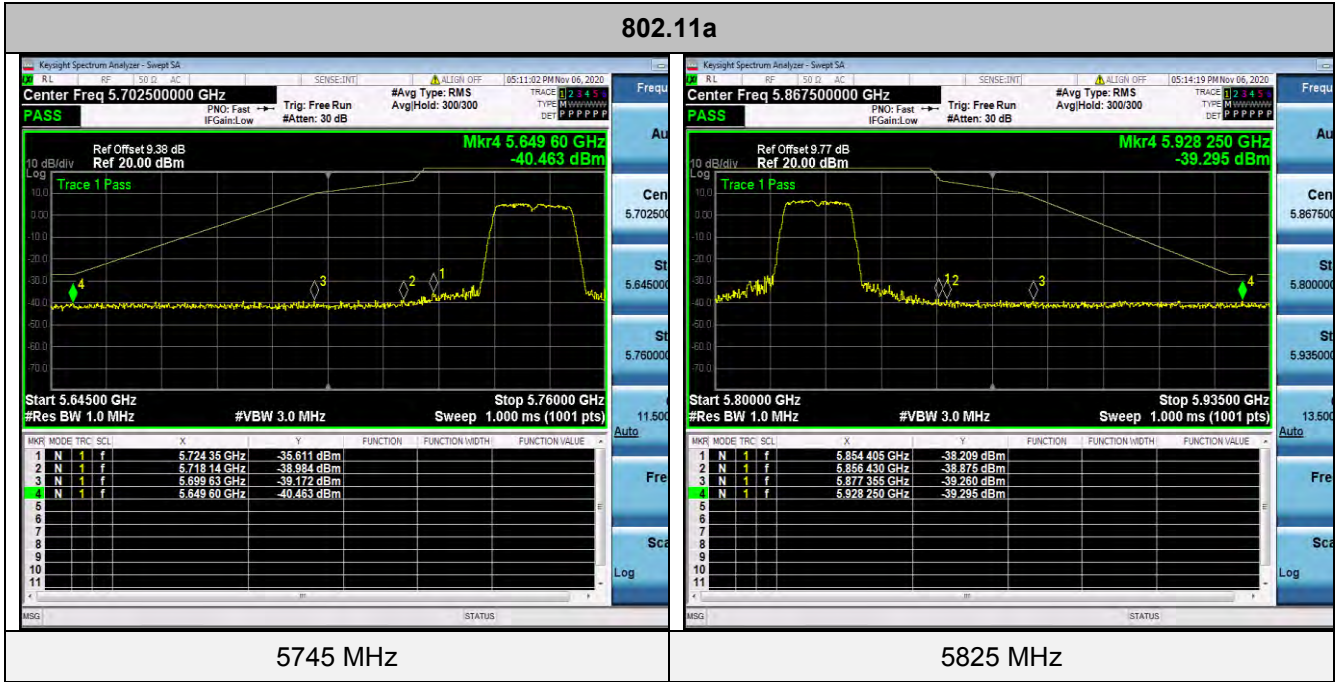
5230 MHz

802.11ac80

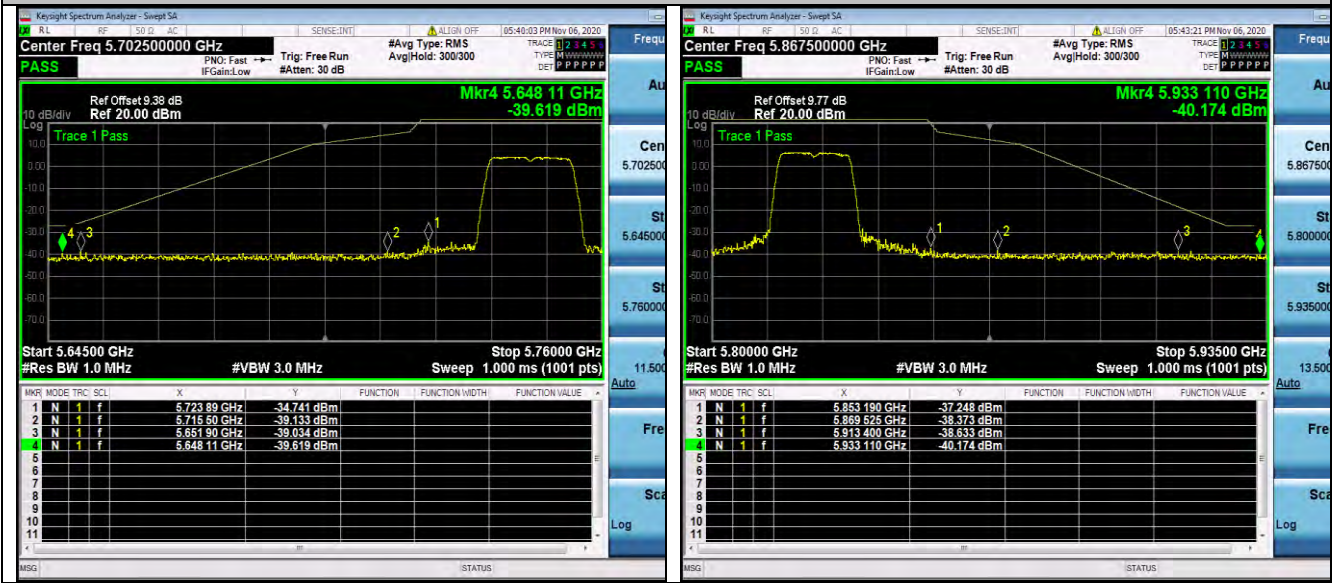


5210 MHz

5725-5850MHz:



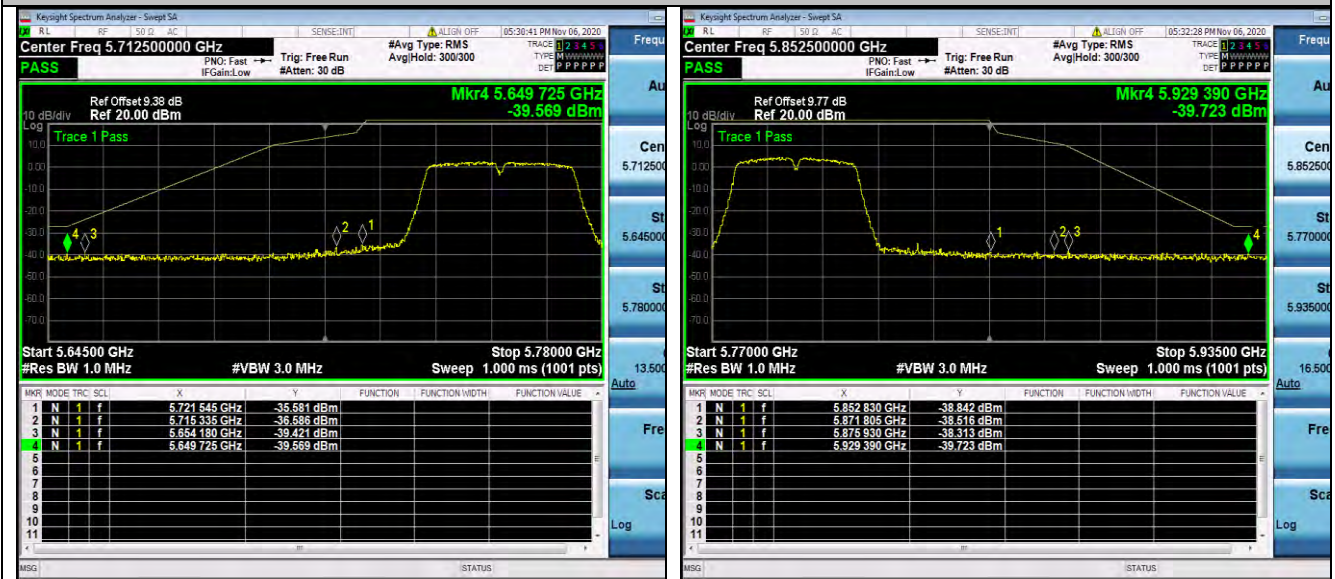
802.11ac20



5745 MHz

5825 MHz

802.11n HT40



5755 MHz

5795 MHz

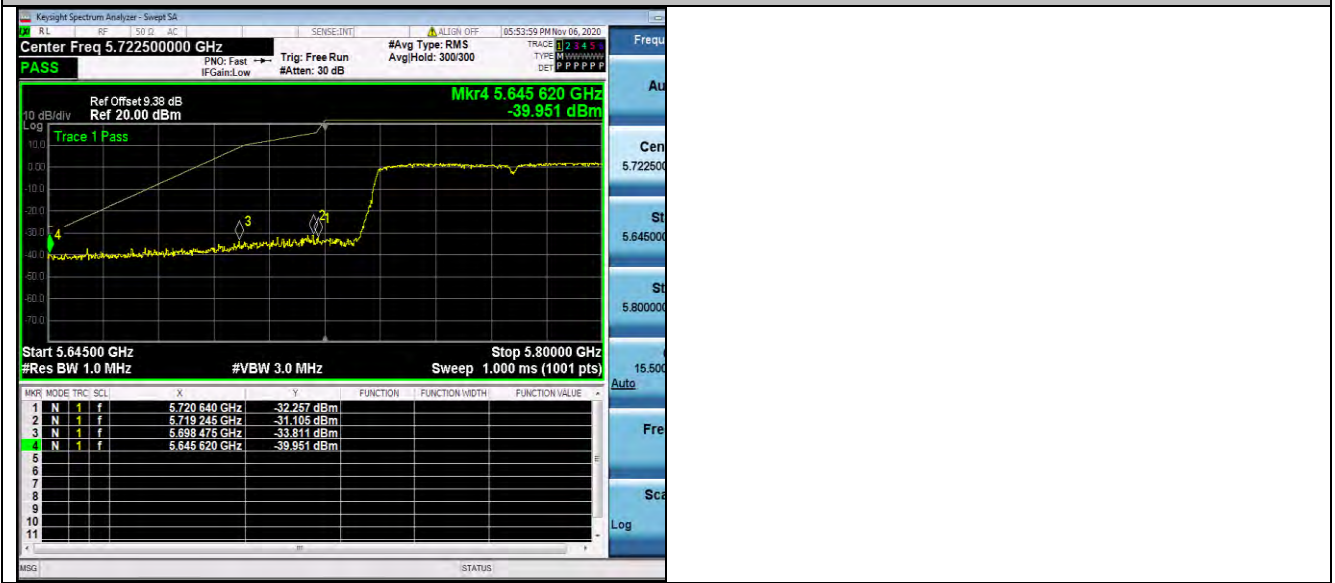
802.11ac40



5755 MHz

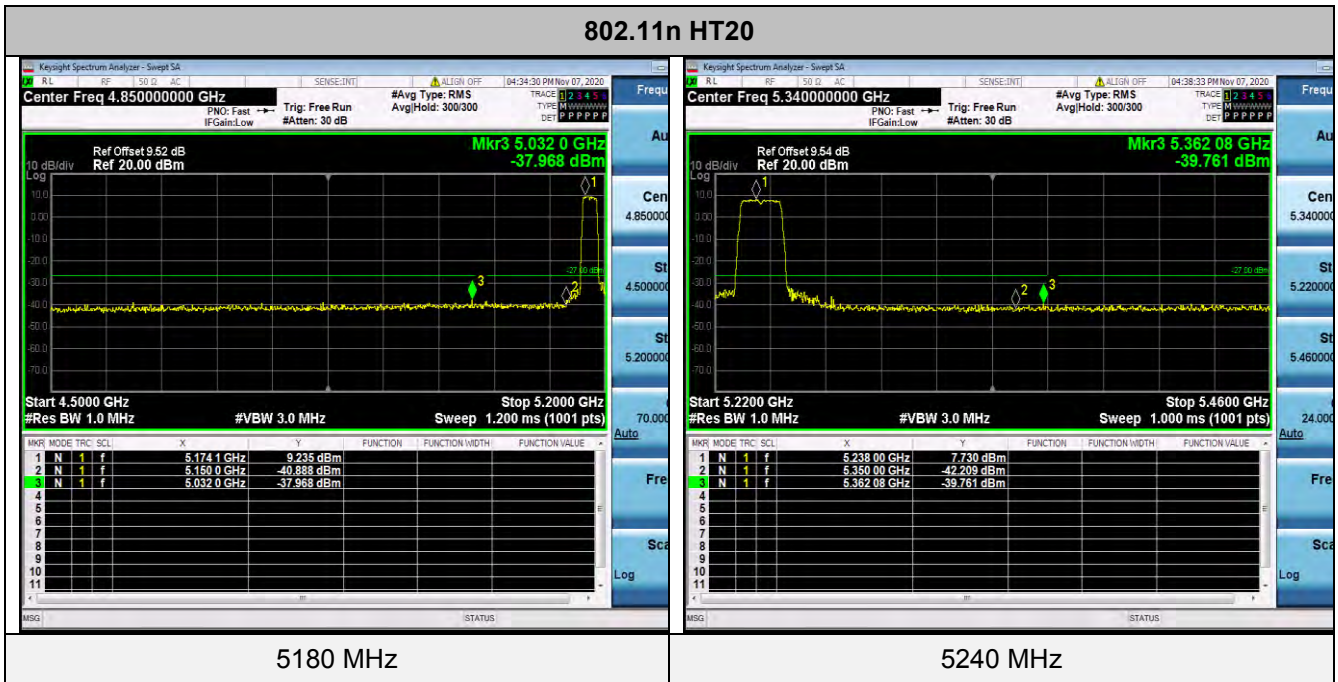
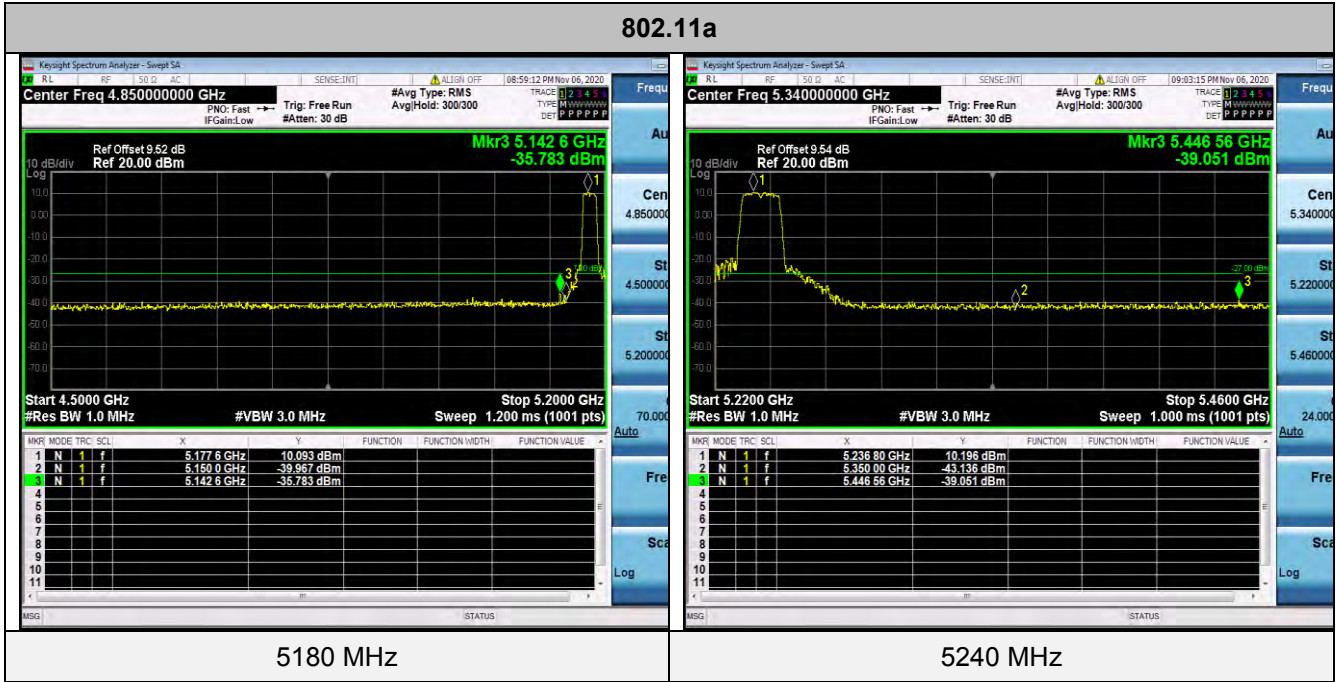
5795 MHz

802.11ac80

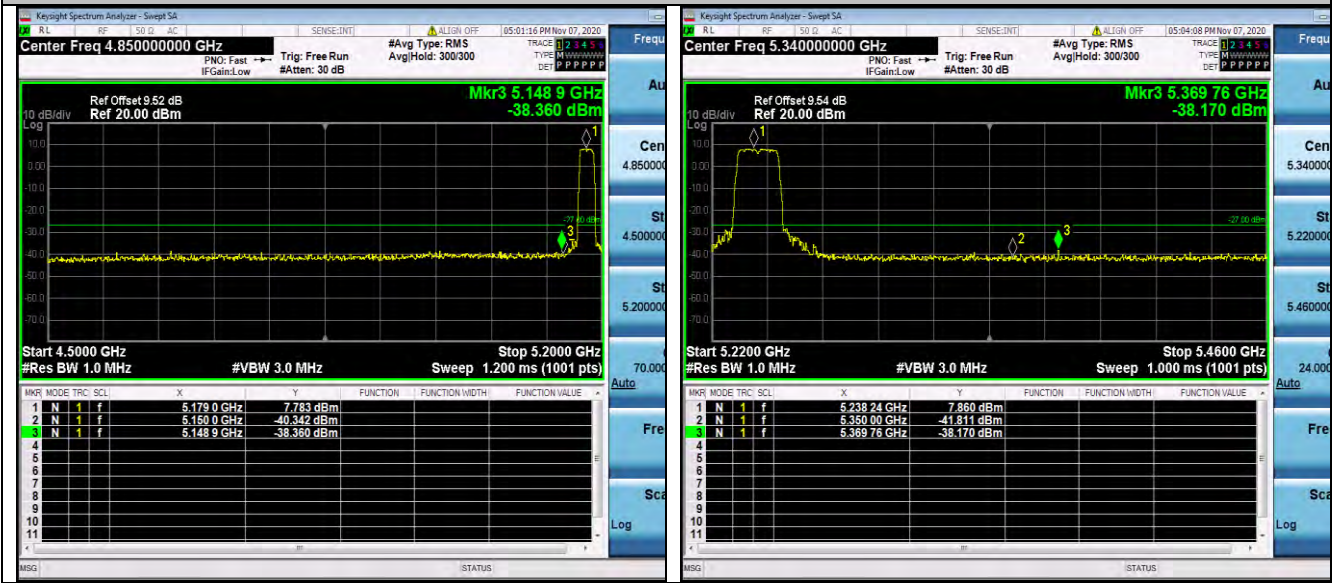


5775 MHz

Antenna 1:
5150-5250MHz:



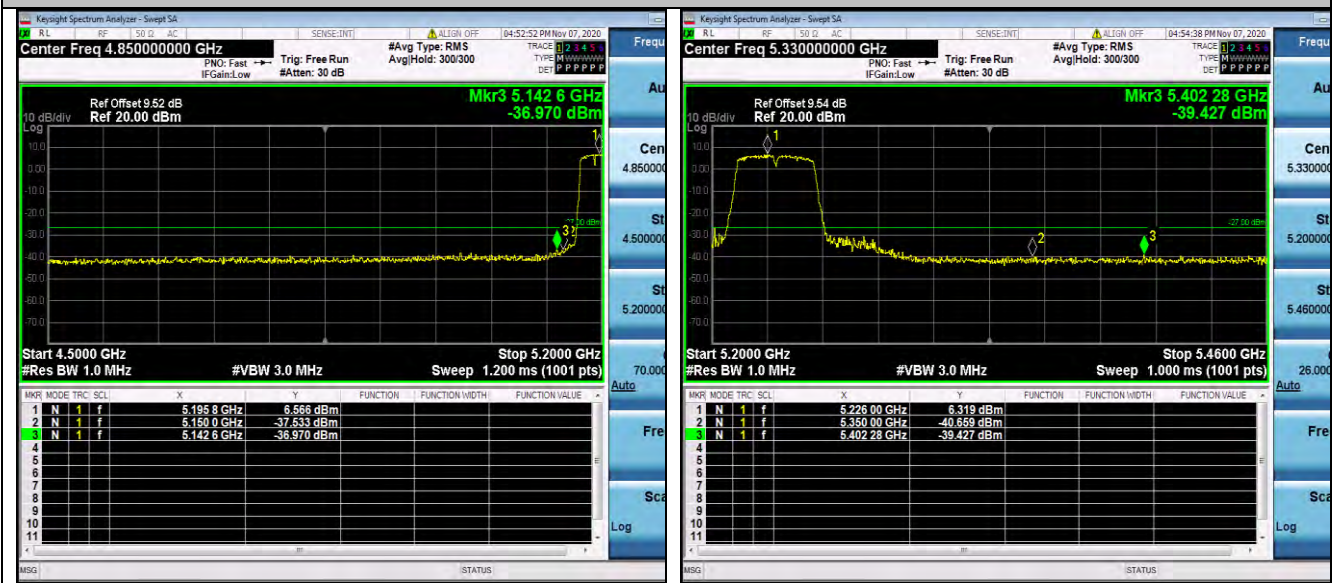
802.11ac20



5180 MHz

5240 MHz

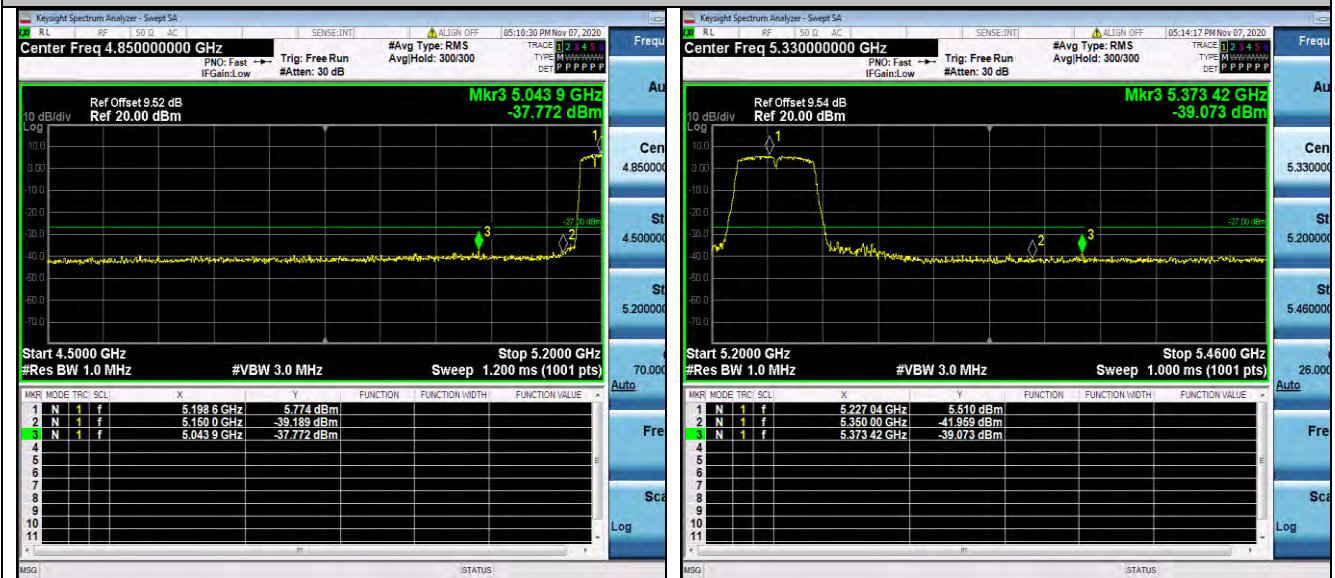
802.11n HT40



5190 MHz

5230 MHz

802.11ac40



5190 MHz

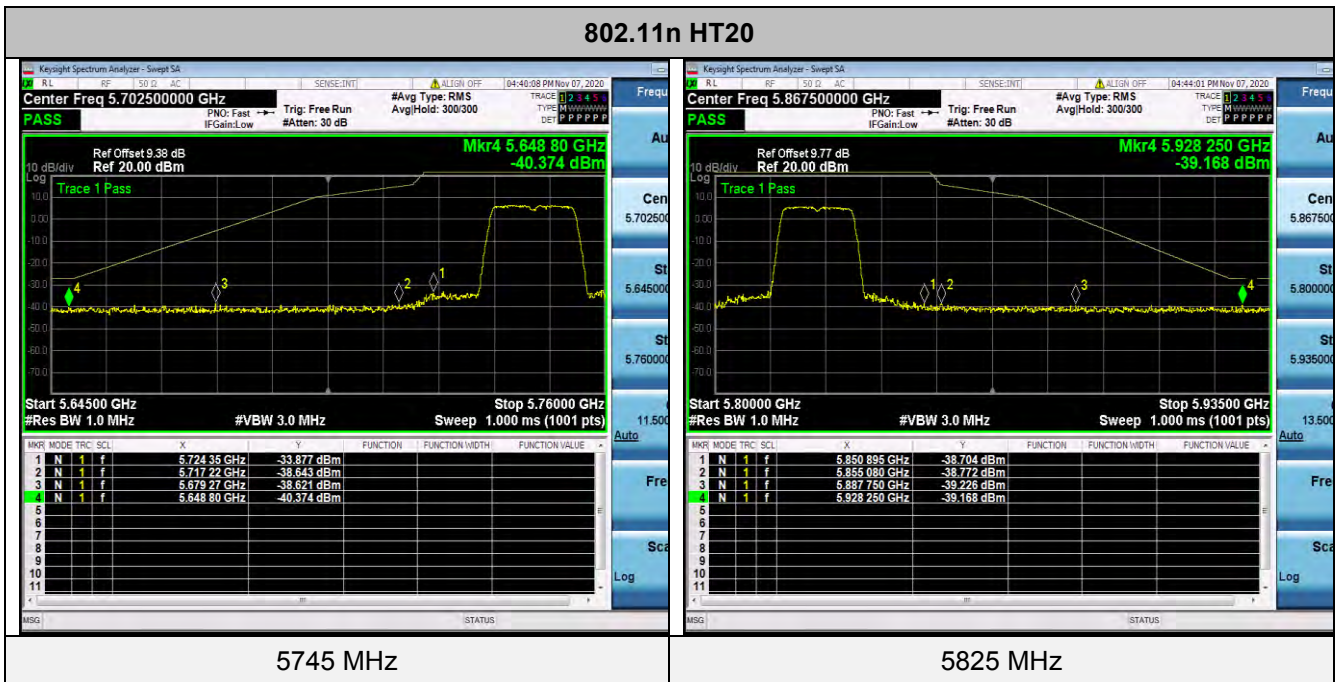
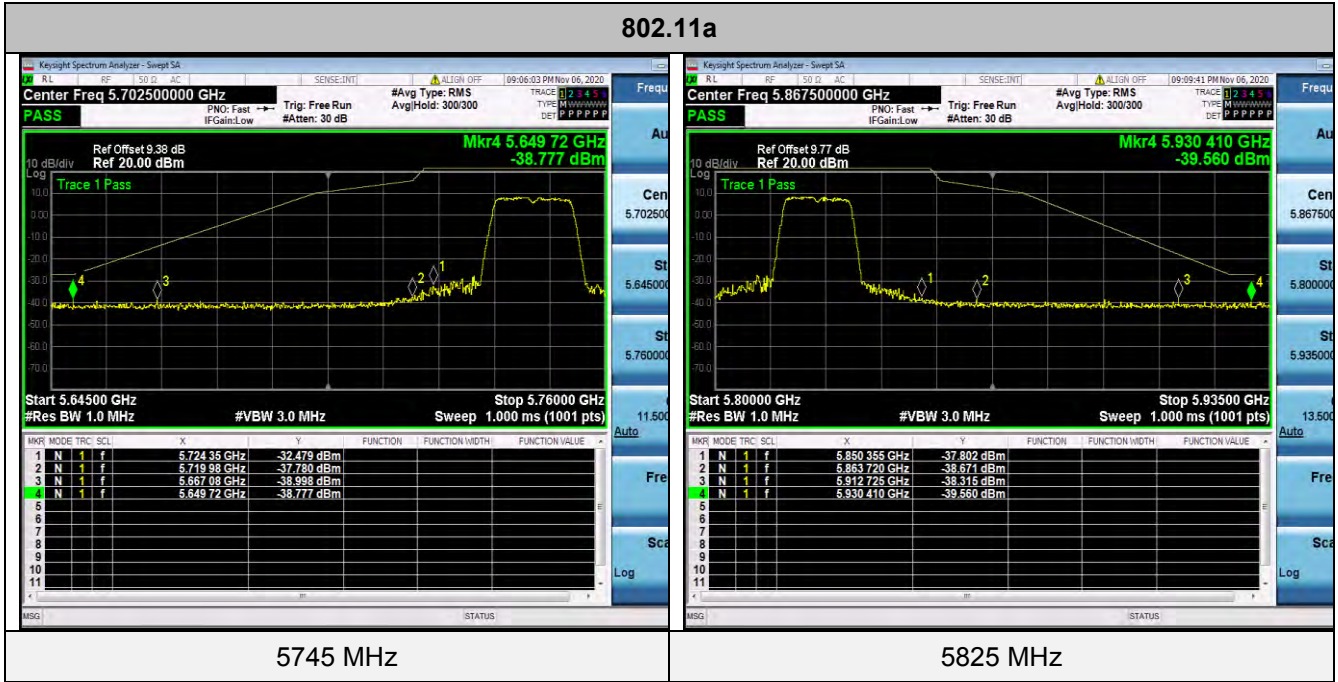
5230 MHz

802.11ac80

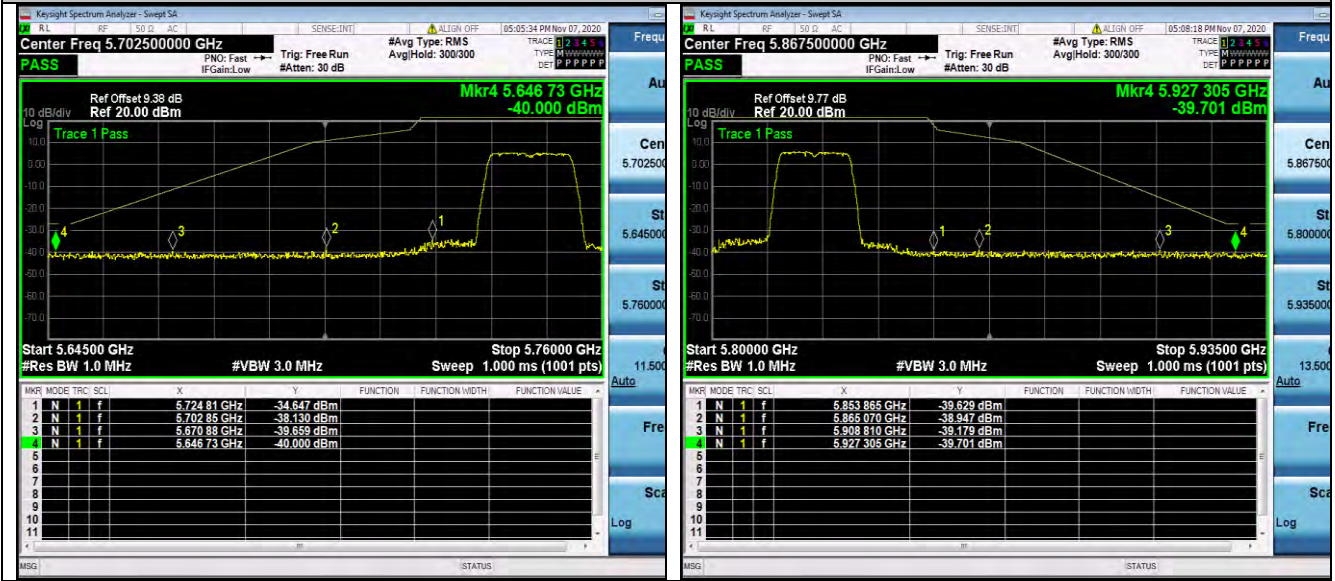


5210 MHz

5725-5850MHz:



802.11ac20



5745 MHz

5825 MHz

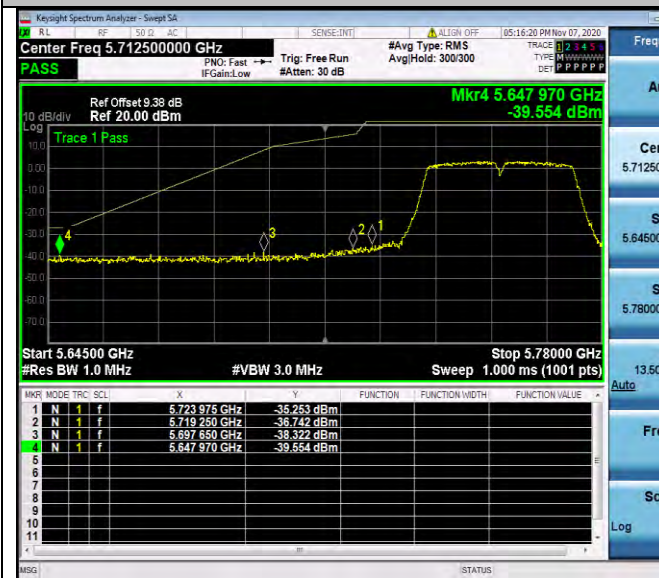
802.11n HT40



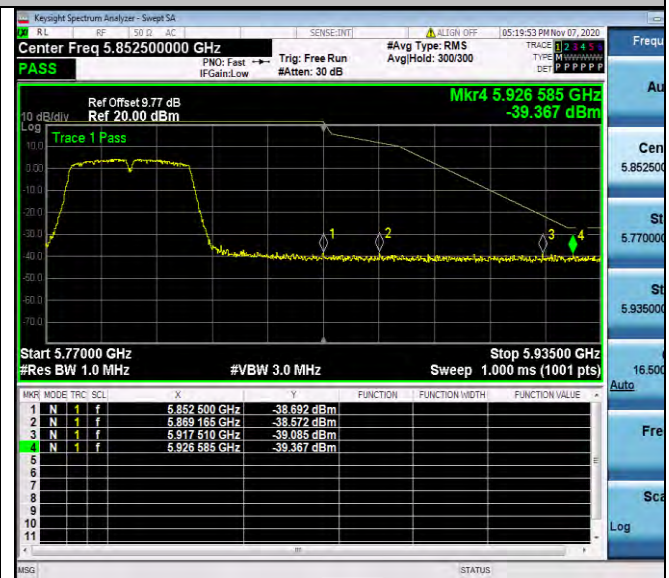
5755 MHz

5795 MHz

802.11ac40



5755 MHz



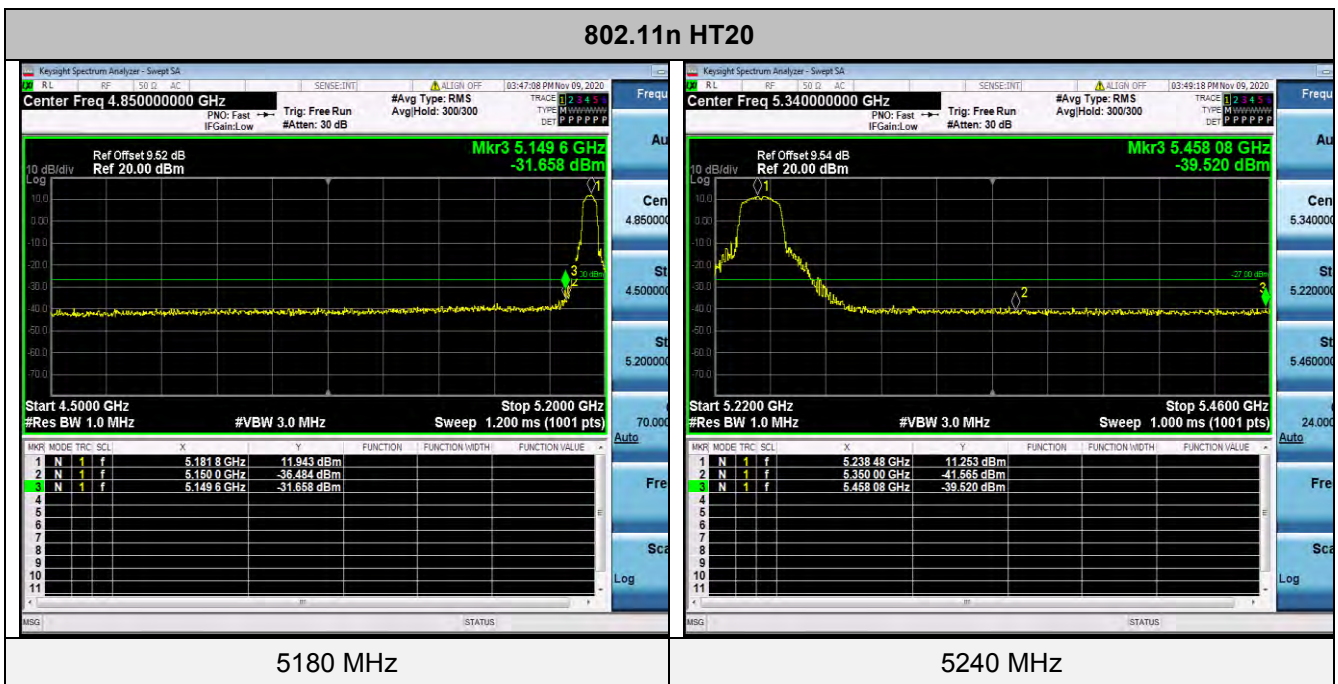
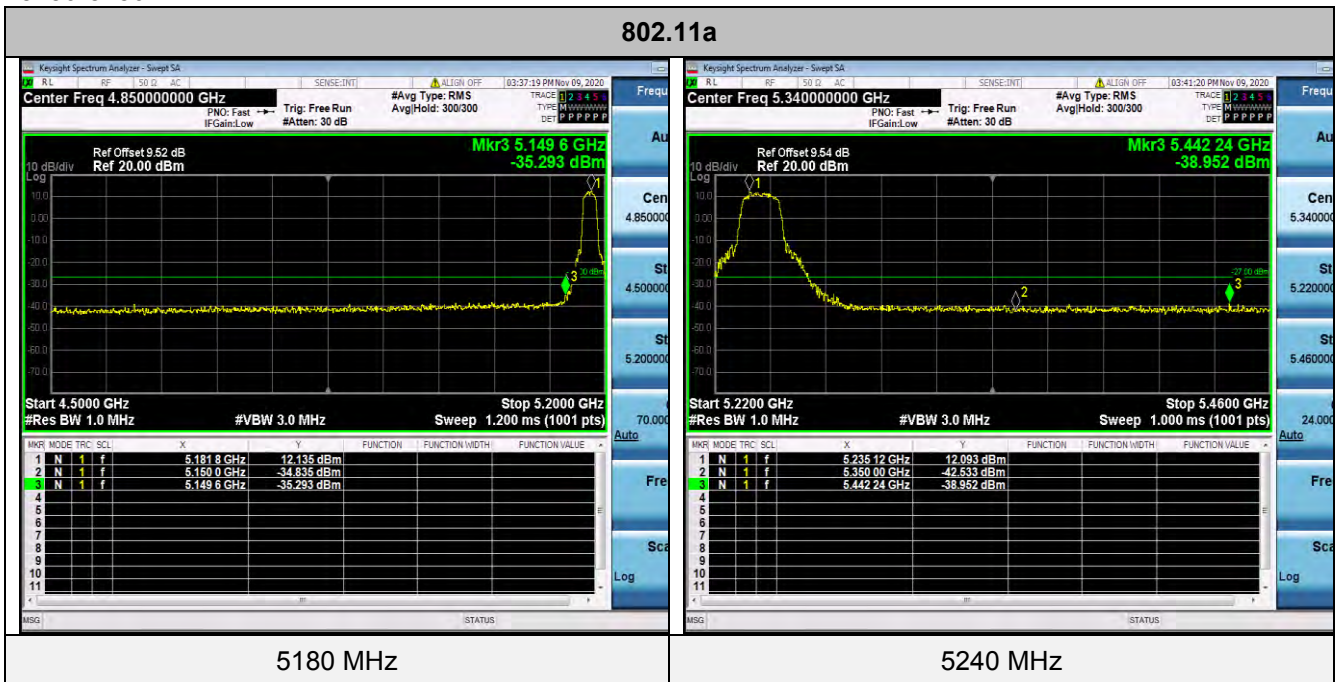
5795 MHz

802.11ac80

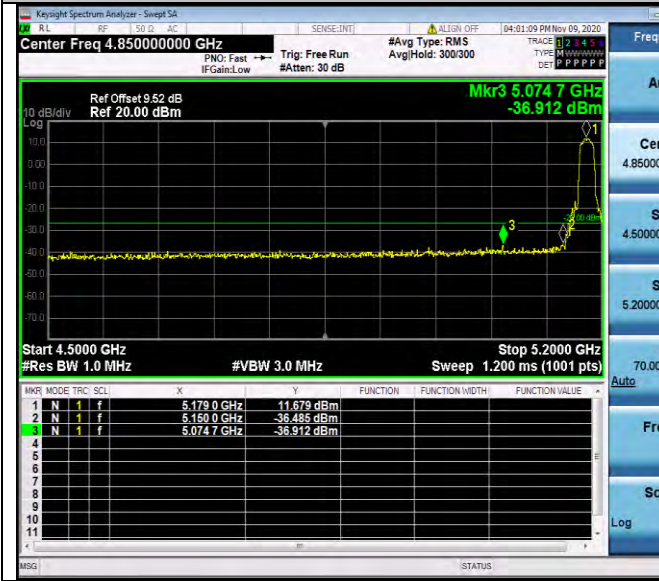


5775 MHz

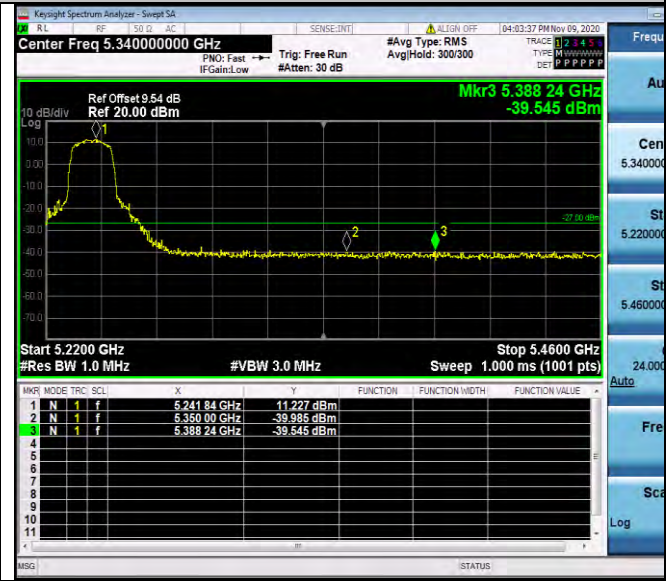
MT7668BU:
Antenna 0:
5150-5250MHz:



802.11ac20

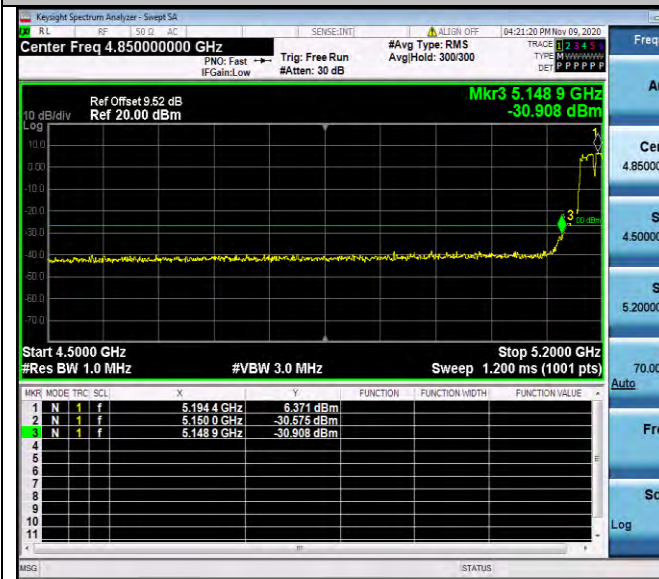


5180 MHz



5240 MHz

802.11n HT40



5190 MHz



5230 MHz

802.11ac40



5190 MHz

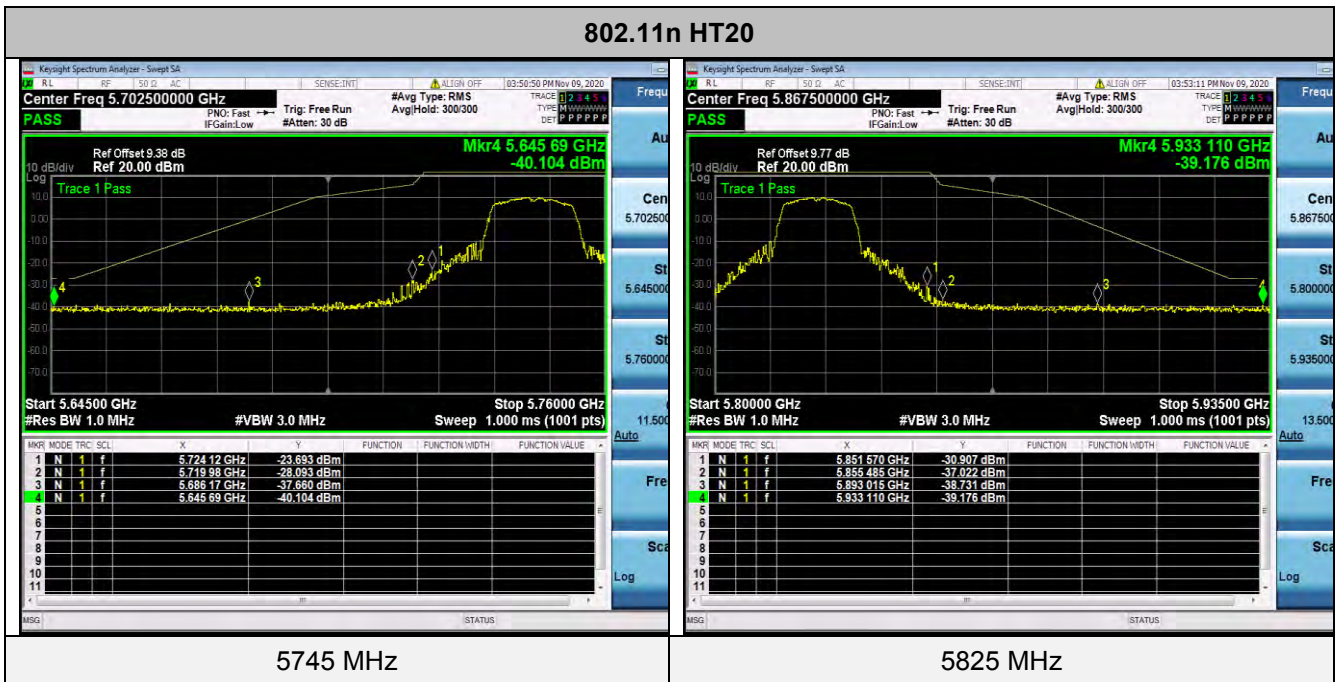
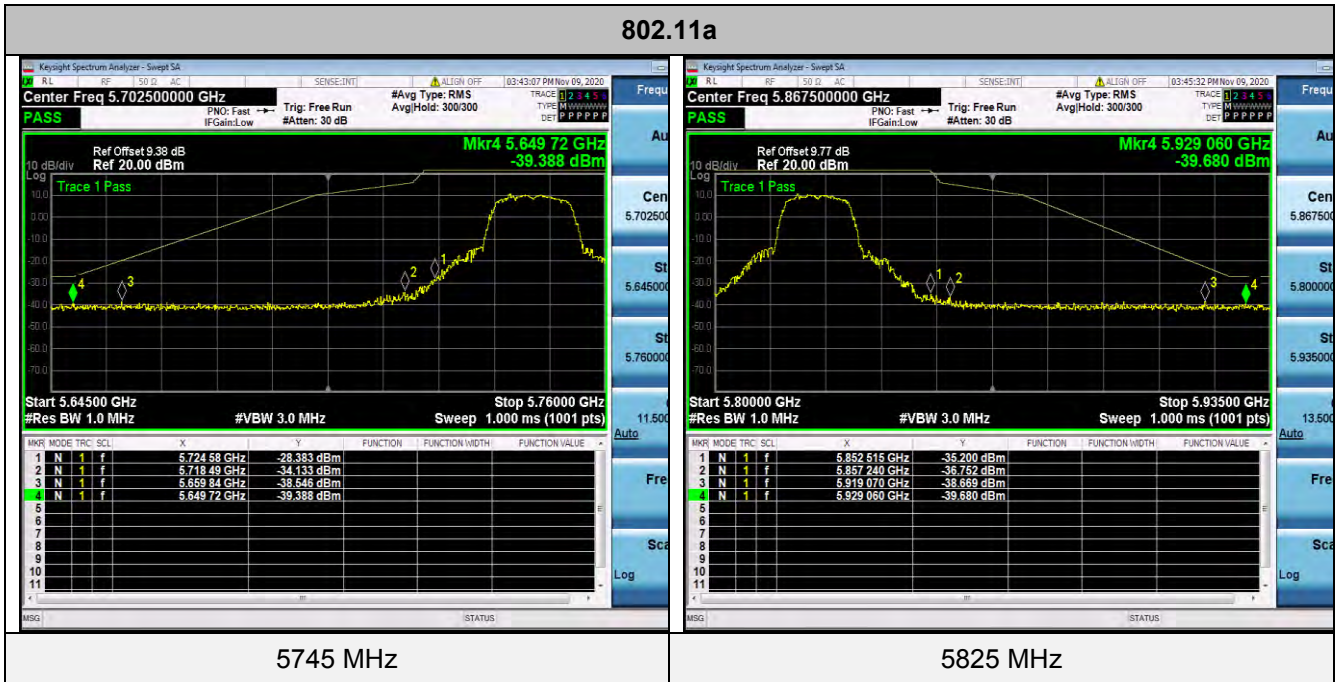
5230 MHz

802.11ac80

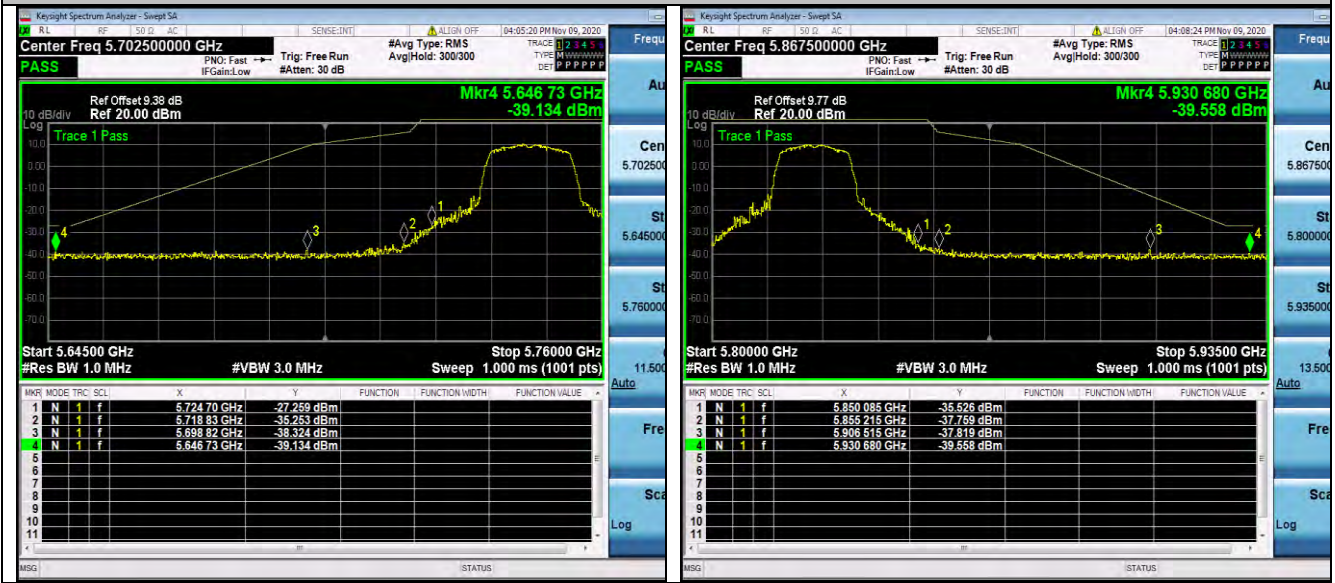


5210 MHz

5725-5850MHz:



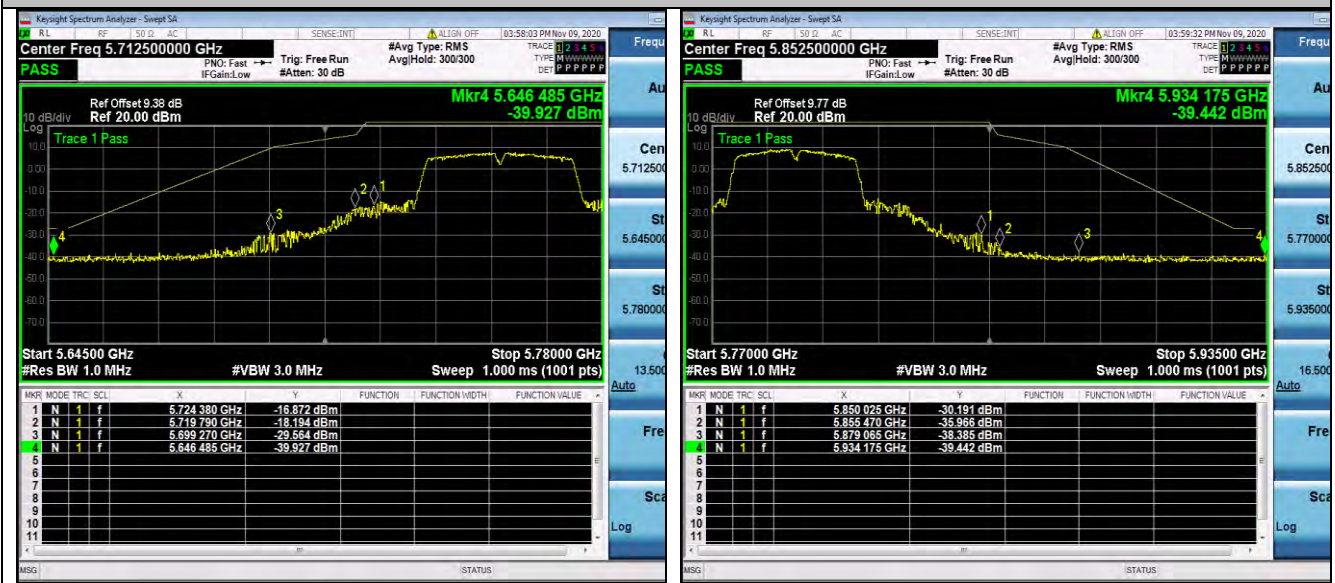
802.11ac20



5745 MHz

5825 MHz

802.11n HT40



5755 MHz

5795 MHz

802.11ac40

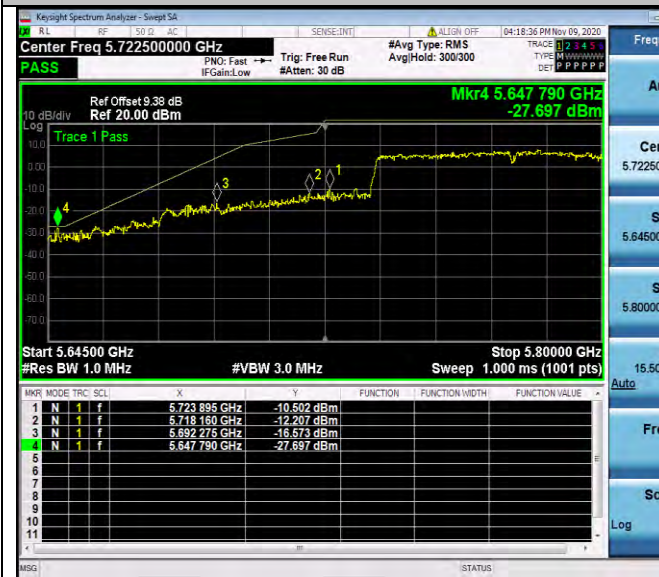


5755 MHz



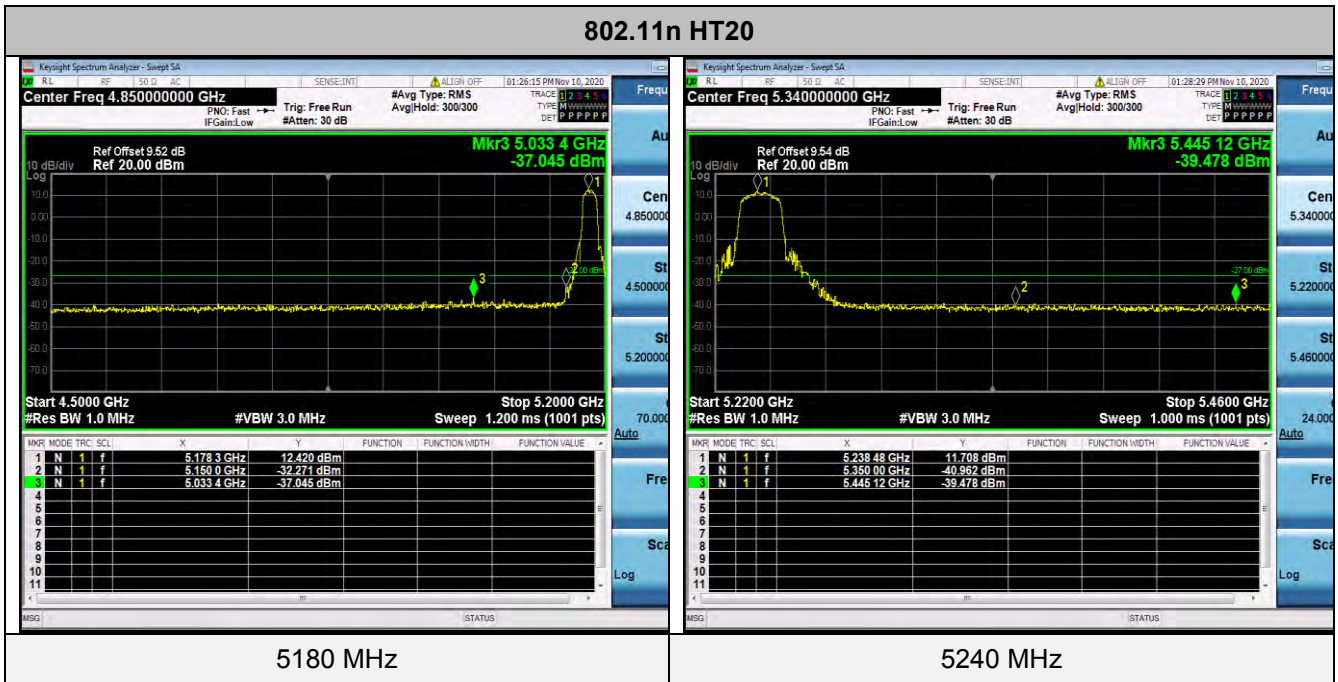
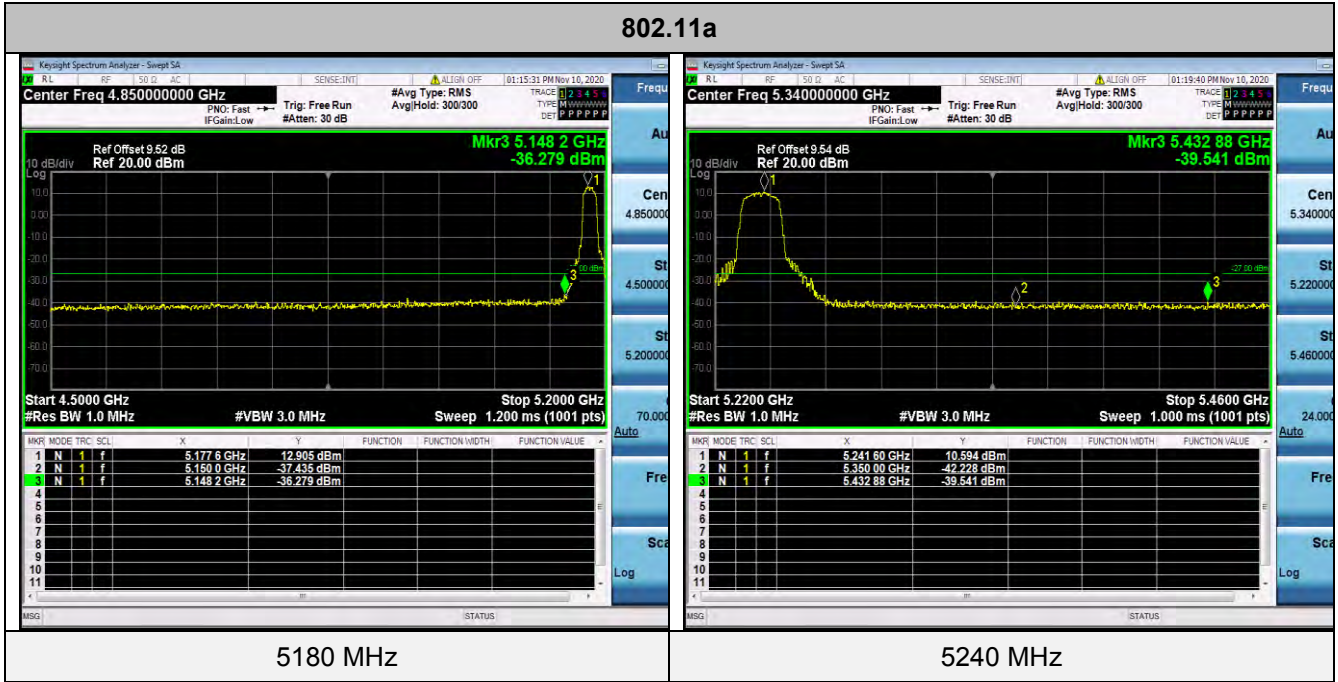
5795 MHz

802.11ac80

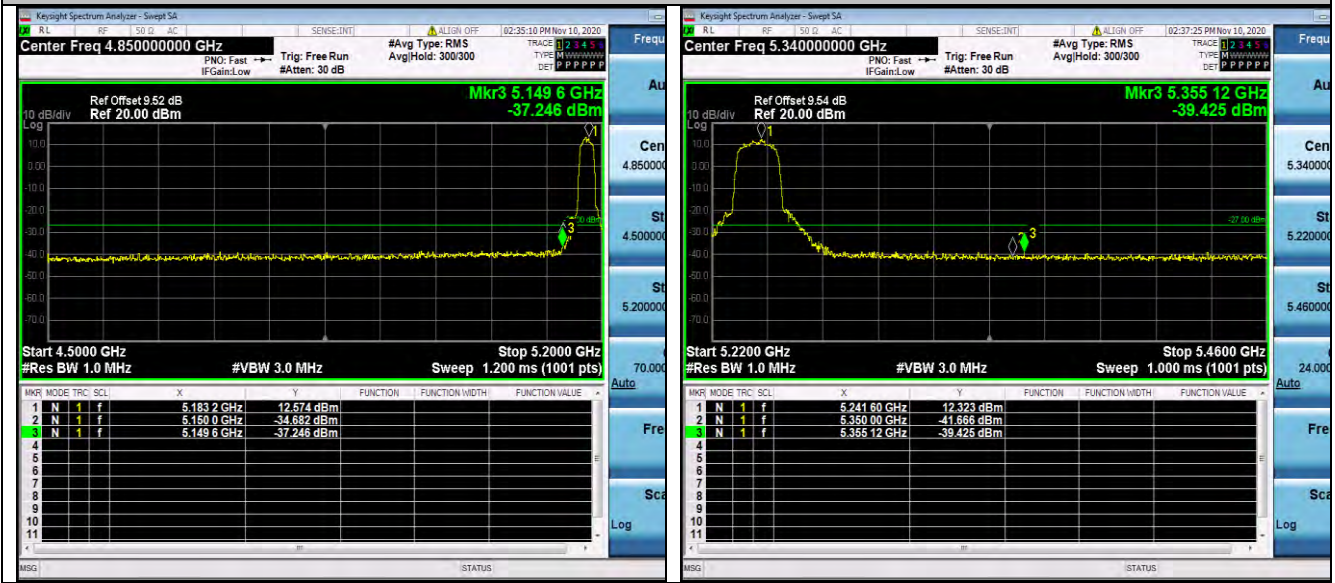


5775 MHz

Antenna 1:
5150-5250MHz:



802.11ac20



5180 MHz

5240 MHz

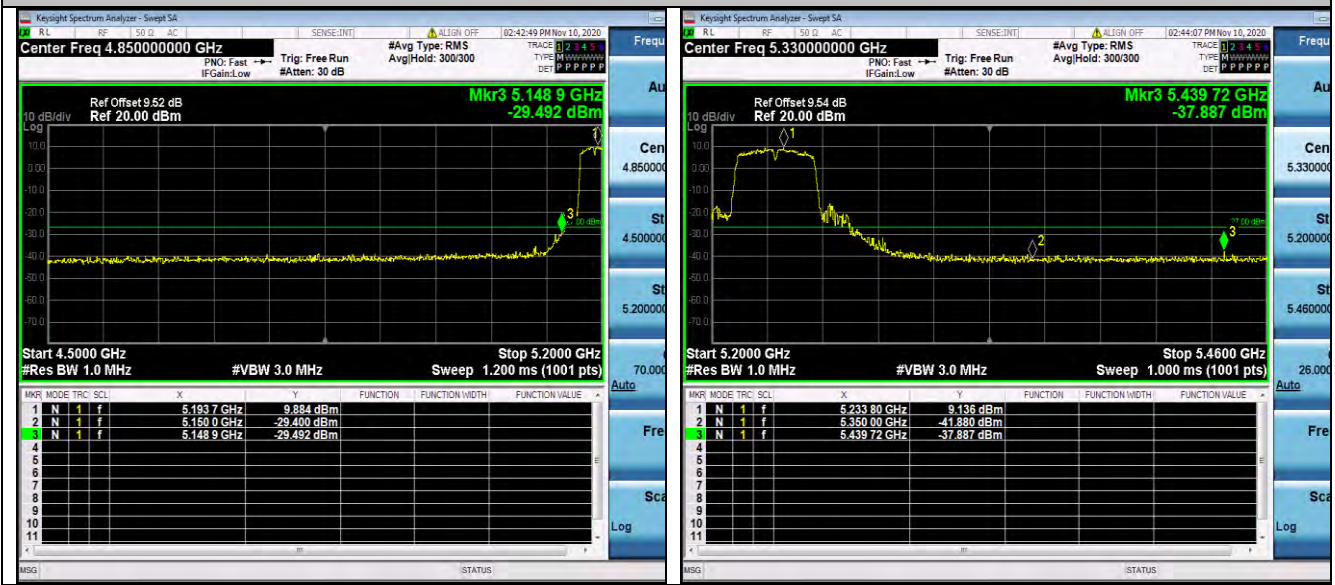
802.11n HT40



5190 MHz

5230 MHz

802.11ac40



5190 MHz

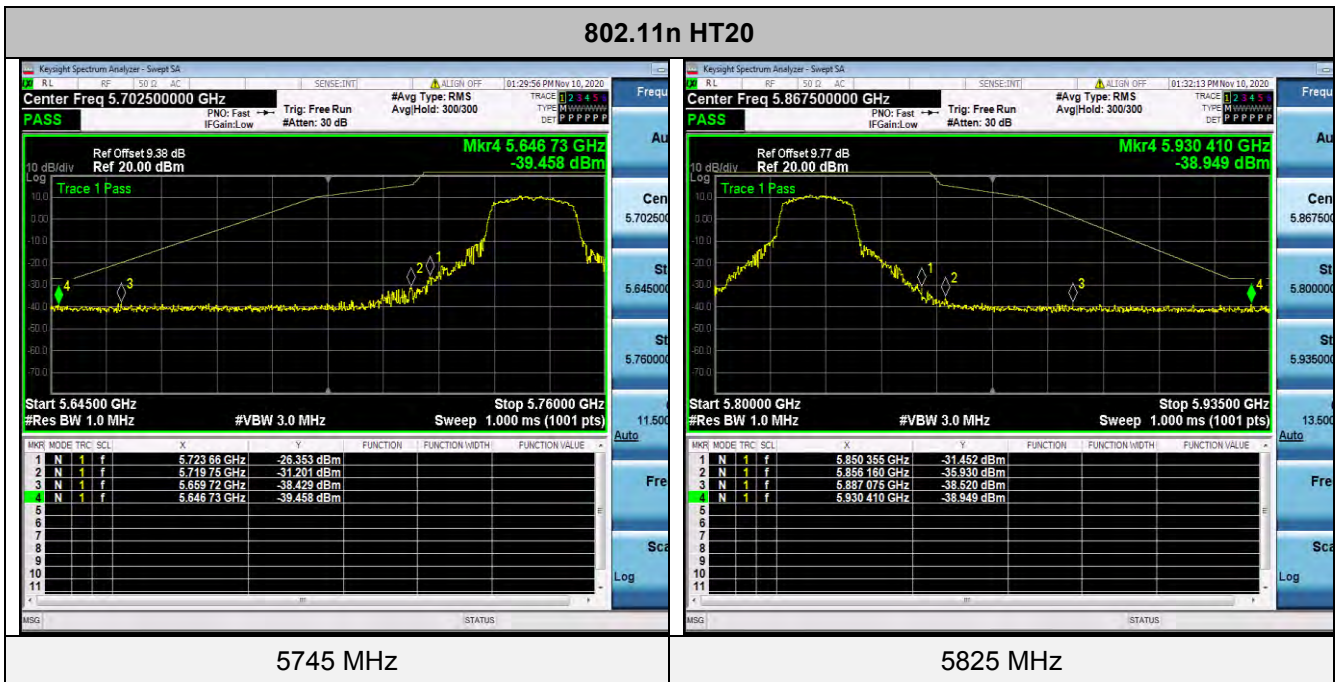
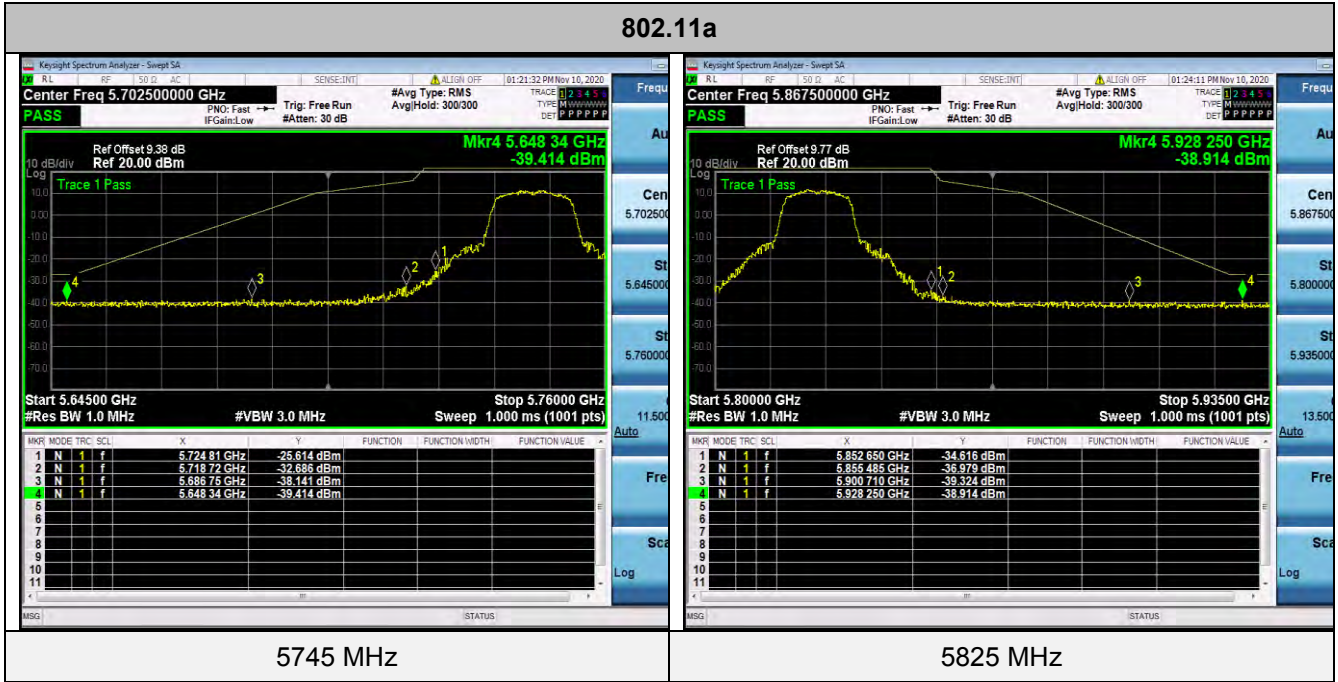
5230 MHz

802.11ac80

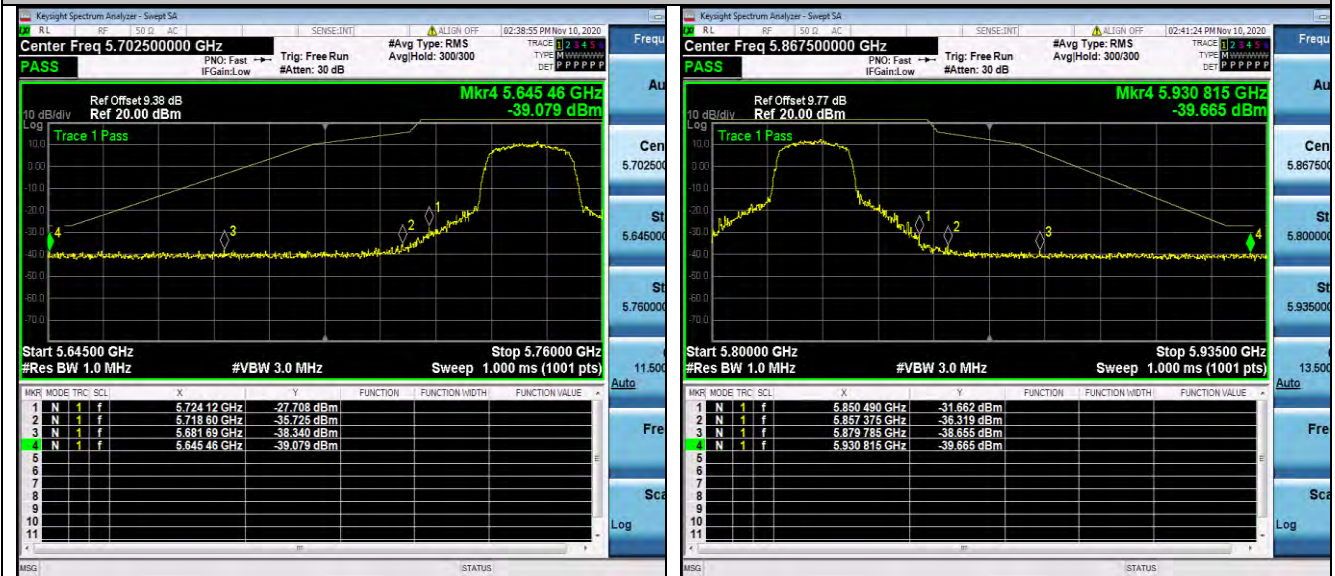


5210 MHz

5725-5850MHz:



802.11ac20



5745 MHz

5825 MHz

802.11n HT40



5755 MHz

5795 MHz

802.11ac40



5755 MHz



5795 MHz

802.11ac80



5775 MHz

4.9. Frequency Stability

Standard Applicable

According to FCC §15.407(g) “Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.”

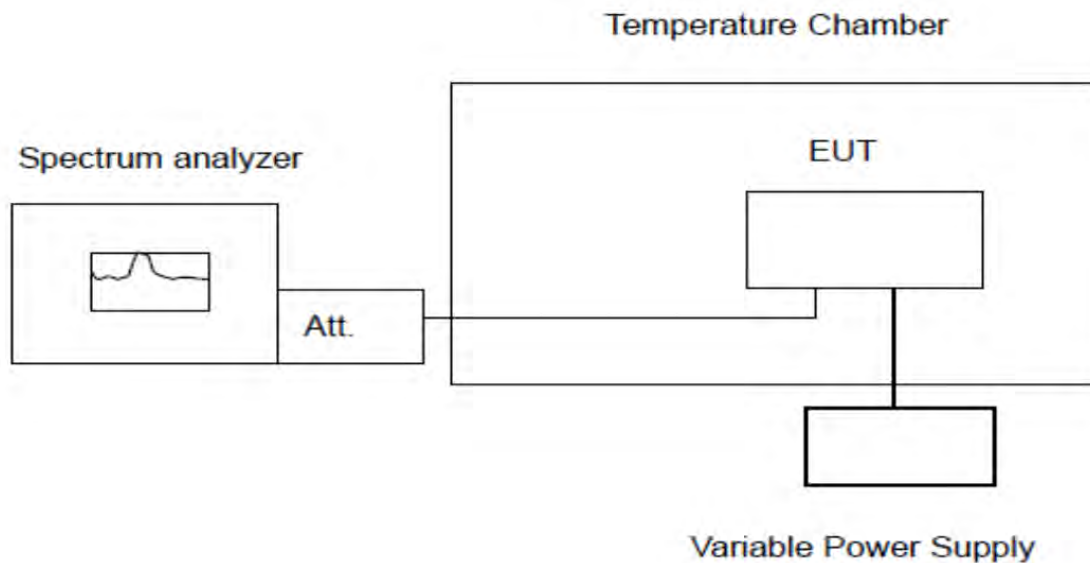
According to FCC §2.1055(a) “The frequency stability shall be measured with variation of ambient temperature as follows:”

(1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(2) From -20° to $+50^{\circ}$ centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.

(3) From 0° to $+50^{\circ}$ centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

Test Configuration



Test Procedure

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20 degree operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30 degree. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10 degree increased per stage until the highest temperature of $+50$ degree reached.

Test Results

PASS

Remark:

1. Measured all conditions and recorded worst case.

IEEE 802.11a Mode / 5180 – 5240 MHz / 5180 MHz

| Environment Temperature (Degree) | Voltage (V) | Measured Frequency (MHz) | Limit Range (MHz) | Test Results |
|----------------------------------|-------------|--------------------------|-------------------|--------------|
| 20 | DC 5.5V | 5179.982 | 5150 – 5250 | PASS |
| 20 | DC 4.5V | 5179.974 | 5150 – 5250 | PASS |
| 50 | DC 5V | 5180.021 | 5150 – 5250 | PASS |
| 40 | DC 5V | 5180.004 | 5150 – 5250 | PASS |
| 30 | DC 5V | 5180.001 | 5150 – 5250 | PASS |
| 20 | DC 5V | 5179.972 | 5150 – 5250 | PASS |
| 10 | DC 5V | 5179.984 | 5150 – 5250 | PASS |
| 0 | DC 5V | 5180.015 | 5150 – 5250 | PASS |
| -10 | DC 5V | 5180.021 | 5150 – 5250 | PASS |
| -20 | DC 5V | 5180.017 | 5150 – 5250 | PASS |
| -30 | DC 5V | 5180.013 | 5150 – 5250 | PASS |

IEEE 802.11a Mode / 5180 – 5240 MHz / 5240 MHz

| Environment Temperature (Degree) | Voltage (V) | Measured Frequency (MHz) | Limit Range (MHz) | Test Results |
|----------------------------------|-------------|--------------------------|-------------------|--------------|
| 20 | DC 5.5V | 5239.975 | 5150 – 5250 | PASS |
| 20 | DC 4.5V | 5240.020 | 5150 – 5250 | PASS |
| 50 | DC 5V | 5240.020 | 5150 – 5250 | PASS |
| 40 | DC 5V | 5239.978 | 5150 – 5250 | PASS |
| 30 | DC 5V | 5239.994 | 5150 – 5250 | PASS |
| 20 | DC 5V | 5239.997 | 5150 – 5250 | PASS |
| 10 | DC 5V | 5240.021 | 5150 – 5250 | PASS |
| 0 | DC 5V | 5240.017 | 5150 – 5250 | PASS |
| -10 | DC 5V | 5240.006 | 5150 – 5250 | PASS |
| -20 | DC 5V | 5239.976 | 5150 – 5250 | PASS |
| -30 | DC 5V | 5240.024 | 5150 – 5250 | PASS |

IEEE 802.11a Mode / 5745 – 5825 MHz / 5745 MHz

| Environment Temperature (Degree) | Voltage (V) | Measured Frequency (MHz) | Limit Range (MHz) | Test Results |
|----------------------------------|-------------|--------------------------|-------------------|--------------|
| 20 | DC 5.5V | 5744.985 | 5725 – 5850 | PASS |
| 20 | DC 4.5V | 5745.016 | 5725 – 5850 | PASS |
| 50 | DC 5V | 5745.015 | 5725 – 5850 | PASS |
| 40 | DC 5V | 5744.989 | 5725 – 5850 | PASS |
| 30 | DC 5V | 5744.995 | 5725 – 5850 | PASS |
| 20 | DC 5V | 5744.975 | 5725 – 5850 | PASS |
| 10 | DC 5V | 5745.012 | 5725 – 5850 | PASS |
| 0 | DC 5V | 5745.015 | 5725 – 5850 | PASS |
| -10 | DC 5V | 5744.979 | 5725 – 5850 | PASS |
| -20 | DC 5V | 5745.015 | 5725 – 5850 | PASS |
| -30 | DC 5V | 5745.005 | 5725 – 5850 | PASS |

IEEE 802.11a Mode / 5745 – 5825 MHz / 5825 MHz

| Environment Temperature (Degree) | Voltage (V) | Measured Frequency (MHz) | Limit Range (MHz) | Test Results |
|----------------------------------|-------------|--------------------------|-------------------|--------------|
| 20 | DC 5.5V | 5825.021 | 5725 – 5850 | PASS |
| 20 | DC 4.5V | 5824.976 | 5725 – 5850 | PASS |
| 50 | DC 5V | 5825.024 | 5725 – 5850 | PASS |
| 40 | DC 5V | 5825.028 | 5725 – 5850 | PASS |
| 30 | DC 5V | 5825.029 | 5725 – 5850 | PASS |
| 20 | DC 5V | 5824.985 | 5725 – 5850 | PASS |
| 10 | DC 5V | 5824.973 | 5725 – 5850 | PASS |
| 0 | DC 5V | 5824.979 | 5725 – 5850 | PASS |
| -10 | DC 5V | 5825.028 | 5725 – 5850 | PASS |
| -20 | DC 5V | 5825.019 | 5725 – 5850 | PASS |
| -30 | DC 5V | 5824.985 | 5725 – 5850 | PASS |

4.10. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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

Antenna Information

The antenna is External Aantenna, through the buckle stretched out, The directional gains of antenna used for transmitting is 2dBi.

Reference to the Test Report: **GTS20201022021-1-8.**

5. TEST SETUP PHOTOS OF THE EUT

Reference to the test report No. GTS20201022021-1-8.

6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No. GTS20201022021-1-8.

.....**End of Report**.....