

8.4 UNDESIRABLE RADIATED SPURIOUS EMISSION

8.4.1 Applicable Standard

According to FCC Part 15.407 (b)
According to 789033 D02 Section II(G)

8.4.2 Conformance Limit

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

| Restricted Frequency(MHz) | Field Strength (μV/m) | Field Strength (dBμV/m) | Measurement Distance |
|---------------------------|-----------------------|-------------------------|----------------------|
| 0.009-0.490 | 2400/F(KHz) | 20 log (uV/m) | 300 |
| 0.490-1.705 | 24000/F(KHz) | 20 log (uV/m) | 30 |
| 1.705-30 | 30 | 29.5 | 30 |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

The provisions of §15.205 apply to intentional radiators operating under this section, 15.205 Restricted bands of operation

| MHz | MHz | MHz | GHz |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 10.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | (2) |
| 13.36-13.41 | | | |

Remark: 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

8.4.3 Test Configuration

Test according to clause 6.2 radio frequency test setup

8.4.4 Test Procedure

■ Unwanted Emissions Measurements below 1000 MHz

Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

The EUT was placed on a turn table which is 0.8m above ground plane.

And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

Repeat above procedures until all frequency measured was complete.

We use software control the EUT, Let EUT hopping on and transmit with highest power, All the modes have been tested and the worst result was reported.

Use the following spectrum analyzer settings:

Set RBW=120kHz for $f < 1$ GHz(30MHz to 1GHz), 200Hz for $f < 150$ KHz(9KHz to 150KHz), 9KHz for < 30 MHz

(150KHz to 30KHz).

Set the VBW > RBW.

Detector = Peak.

Trace mode = max hold.

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Repeat above procedures until all frequency measured was complete.

■ Unwanted Maximum peak Emissions Measurements above 1000 MHz

Maximum emission levels are measured by setting the analyzer as follows:

RBW = 1 MHz.

VBW \geq 3 MHz.

Detector = Peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately $1/x$, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

■ Unwanted Average Emissions Measurements above 1000 MHz

Method VB (Averaging using reduced video bandwidth): Alternative method.

RBW = 1 MHz.

Video bandwidth. • If the EUT is configured to transmit with duty cycle \geq 98 percent, set $VBW \leq RBW/100$ (i.e., 10 kHz) but not less than 10 Hz.

• If the EUT duty cycle is < 98 percent, set $VBW \geq 1/T$, where T is defined in section II.B.1.a).

Video bandwidth mode or display mode • The instrument shall be set to ensure that video filtering is applied in the power domain. Typically, this requires setting the detector mode to RMS and setting the Average-VBW Type to Power (RMS).

• As an alternative, the analyzer may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some analyzers require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode.

Detector = Peak.

Sweep time = auto.

Trace mode = max hold.

Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of $1/x$, where x is the duty cycle. For example, use at least 200 traces if the duty cycle is 25 percent. (If a specific emission is demonstrated to be continuous—i.e., 100 percent duty cycle—rather than turning on and off with the transmit cycle, at least 50 traces shall be averaged.)

■ Band edge measurements.

Unwanted band-edge emissions may be measured using either of the special band-edge measurement techniques (the marker-delta or integration methods) described below. Note that the marker-delta method is primarily a radiated measurement technique that requires the 99% occupied bandwidth edge to be within 2 MHz of the authorized band edge, whereas the integration method can be used in either a radiated or conducted measurement without any special requirement with regards to the displacement of the unwanted emission(s) relative to the authorized bandwidth.

Marker-Delta Method.

The marker-delta method, as described in ANSI C63.10, can be used to perform measurements of the radiated unwanted emissions level of emissions provided that the 99% occupied bandwidth of the fundamental is within 2 MHz of the authorized band-edge.

8.4.5 Test Results

| | |
|--------------------|-----------|
| Temperature: | 26° C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

■ Spurious Emission below 30MHz(9KHz to 30MHz)

| Freq. (MHz) | Ant.Pol. H/V | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|-----------------|---------------------------|----|------------------|----|----------|----|
| | | PK | AV | PK | AV | PK | AV |
| -- | -- | -- | -- | -- | -- | -- | -- |

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40 \log(\text{Specific distance} / \text{test distance})$ (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

- ☒ For Undesirable radiated Spurious Emission in U-NII – 1
All the modes 802.11a/n/ac/ax has been tested and the worst result antenna 1 802.11ac recorded as below:
- : ☒ Undesirable radiated Spurious Emission Above 1GHz (1GHz to 40GHz)

Test mode: 802.11ac Frequency(MHz): 5180

| Freq. (MHz) | Ant.Pol. | Field Strength (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Over(dB) |
|-------------|----------|-------------------------|---------------|-------------|----------|
| 5812.971 | V | 43.83 | -51.4 | -27 | -24.4 |
| 10366.71 | V | 58.80 | -36.43 | -27 | -9.43 |
| 17896.24 | V | 64.63 | -30.6 | -27 | -3.6 |
| 5468.260 | H | 44.37 | -50.86 | -27 | -23.86 |
| 9648.226 | H | 55.78 | -39.45 | -27 | -12.45 |
| 17935.08 | H | 63.73 | -31.5 | -27 | -4.5 |

Test mode: 802.11ac Frequency(MHz): 5200

| Freq. (MHz) | Ant.Pol. | Field Strength (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Over(dB) |
|-------------|----------|-------------------------|---------------|-------------|----------|
| 5454.054 | V | 43.67 | -51.56 | -27 | -24.56 |
| 10402.73 | V | 58.59 | -36.64 | -27 | -9.64 |
| 17875.56 | V | 63.52 | -31.71 | -27 | -4.71 |
| 6126.062 | H | 44.92 | -50.31 | -27 | -23.31 |
| 10125.36 | H | 54.49 | -40.74 | -27 | -13.74 |
| 17927.31 | H | 63.55 | -31.68 | -27 | -4.68 |

Test mode: 802.11ac Frequency(MHz): 5240

| Freq. (MHz) | Ant.Pol. | Field Strength (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Over(dB) |
|-------------|----------|-------------------------|---------------|-------------|----------|
| 7468.447 | V | 51.84 | -43.39 | -27 | -16.39 |
| 10478.17 | V | 60.69 | -34.54 | -27 | -7.54 |
| 17883.32 | V | 63.80 | -31.43 | -27 | -4.43 |
| 7115.485 | H | 49.47 | -45.76 | -27 | -18.76 |
| 11255.20 | H | 56.49 | -38.74 | -27 | -11.74 |
| 17940.26 | H | 63.91 | -31.32 | -27 | -4.32 |

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

Test mode: 802.11ac

Frequency(MHz): 5180

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|-------|----------|--------|
| | H/V | PK | AV | PK | AV | PK | AV |
| 5812.971 | V | 43.83 | 25.19 | 74.00 | 54.00 | -30.17 | -28.81 |
| 10366.71 | V | 58.80 | 42.66 | 74.00 | 54.00 | -15.20 | -11.34 |
| 17896.24 | V | 64.63 | 46.83 | 74.00 | 54.00 | -9.37 | -7.17 |
| 5468.260 | H | 44.37 | 26.49 | 74.00 | 54.00 | -29.63 | -27.51 |
| 9648.226 | H | 55.78 | 38.63 | 74.00 | 54.00 | -18.22 | -15.37 |
| 17935.08 | H | 63.73 | 45.71 | 74.00 | 54.00 | -10.27 | -8.29 |

Test mode: 802.11ac

Frequency(MHz): 5200

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|-------|----------|--------|
| | H/V | PK | AV | PK | AV | PK | AV |
| 5454.054 | V | 43.67 | 25.63 | 74.00 | 54.00 | -30.33 | -28.37 |
| 10402.73 | V | 58.59 | 40.49 | 74.00 | 54.00 | -15.41 | -13.51 |
| 17875.56 | V | 63.52 | 45.72 | 74.00 | 54.00 | -10.48 | -8.28 |
| 6126.062 | H | 44.92 | 26.82 | 74.00 | 54.00 | -29.08 | -27.18 |
| 10125.36 | H | 54.49 | 36.77 | 74.00 | 54.00 | -19.51 | -17.23 |
| 17927.31 | H | 63.55 | 45.33 | 74.00 | 54.00 | -10.45 | -8.67 |

Test mode: 802.11ac

Frequency(MHz): 5240

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|-------|----------|--------|
| | H/V | PK | AV | PK | AV | PK | AV |
| 7468.447 | V | 51.84 | 33.92 | 74.00 | 54.00 | -22.16 | -20.08 |
| 10478.17 | V | 60.69 | 42.77 | 74.00 | 54.00 | -13.31 | -11.23 |
| 17883.32 | V | 63.80 | 45.63 | 74.00 | 54.00 | -10.20 | -8.37 |
| 7115.485 | H | 49.47 | 32.02 | 74.00 | 54.00 | 49.47 | -21.98 |
| 11255.20 | H | 56.49 | 38.43 | 74.00 | 54.00 | 56.49 | -15.57 |
| 17940.26 | H | 63.91 | 45.31 | 74.00 | 54.00 | 63.91 | -8.69 |

- Note:**
- (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
 - (2) Emission Level= Reading Level+Correct Factor.
 - (3) Correct Factor= Ant_F + Cab_L - Preamp
 - (4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

● ☒ Undesirable radiated Undesirable radiated Spurious Emission in Band Edge

Test mode: 802.11ac Frequency(MHz): 5180

| Freq. (MHz) | Ant.Pol. | Field Strength (RBW=100KHz) (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Verdict |
|-------------|----------|--------------------------------------|---------------|-------------|---------|
| 5144.150 | H | 57.71 | -37.52 | -27 | Pass |
| 5148.050 | V | 67.82 | -27.41 | -27 | Pass |

Test mode: 802.11ac Frequency(MHz): 5240

| Freq. (MHz) | Ant.Pol. | Field Strength (RBW=100KHz) (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Verdict |
|-------------|----------|--------------------------------------|---------------|-------------|---------|
| 5354.510 | H | 55.85 | -39.38 | -27 | Pass |
| 5360.560 | V | 54.91 | -40.32 | -27 | Pass |

Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).

(2) Emission Level= Reading Level+Probe Factor +Cable Loss.

(3) EIRP[dBm] = E[dBuV/m] + 20 log(d[meters]) - 104.77

d is the measurement distance in 3 meters

Test mode: 802.11ac Frequency(MHz): 5180

| Frequency (MHz) | Polarity | PK(dBuV/m) (VBW=3MHz) | Limit 3m (dBuV/m) | AV(dBuV/m) (VBW=10Hz) | Limit 3m (dBuV/m) |
|-----------------|----------|-----------------------|-------------------|-----------------------|-------------------|
| 5144.150 | H | 57.71 | 74 | 40.15 | 54 |
| 5148.050 | V | 67.82 | 74 | 43.11 | 54 |

Test mode: 802.11ac Frequency(MHz): 5240

| Frequency (MHz) | Polarity | PK(dBuV/m) (VBW=3MHz) | Limit 3m (dBuV/m) | AV(dBuV/m) (VBW=10Hz) | Limit 3m (dBuV/m) |
|-----------------|----------|-----------------------|-------------------|-----------------------|-------------------|
| 5354.510 | H | 55.85 | 74 | 38.72 | 54 |
| 5360.560 | V | 54.91 | 74 | 36.93 | 54 |

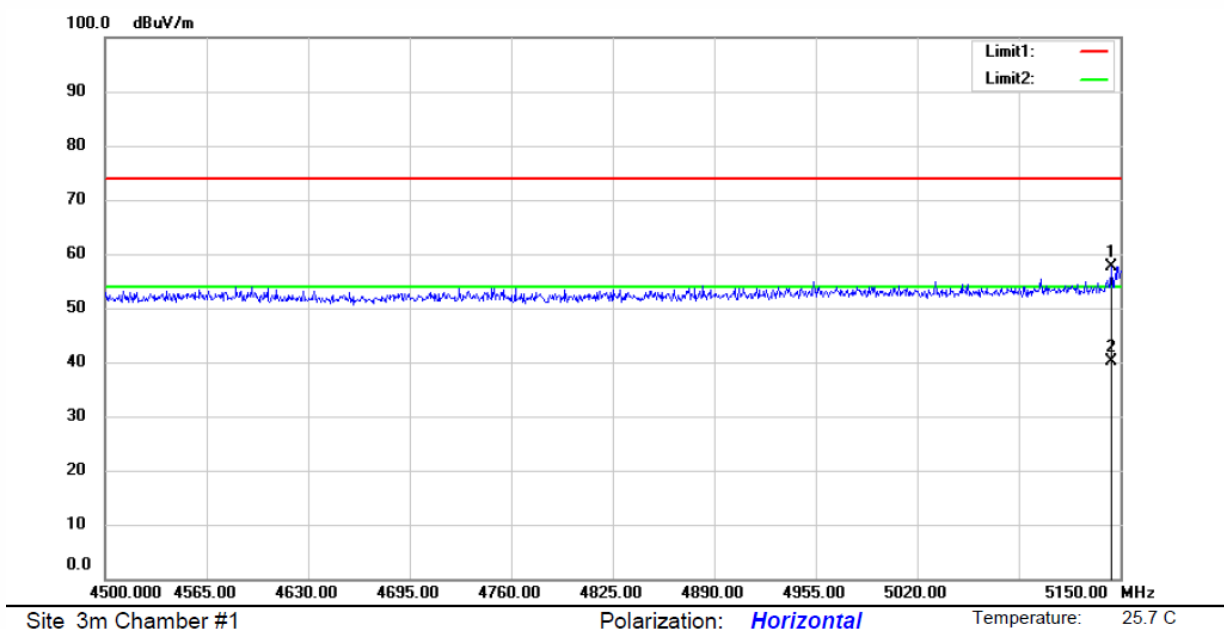
Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).

(2) Emission Level= Reading Level+Correct Factor.

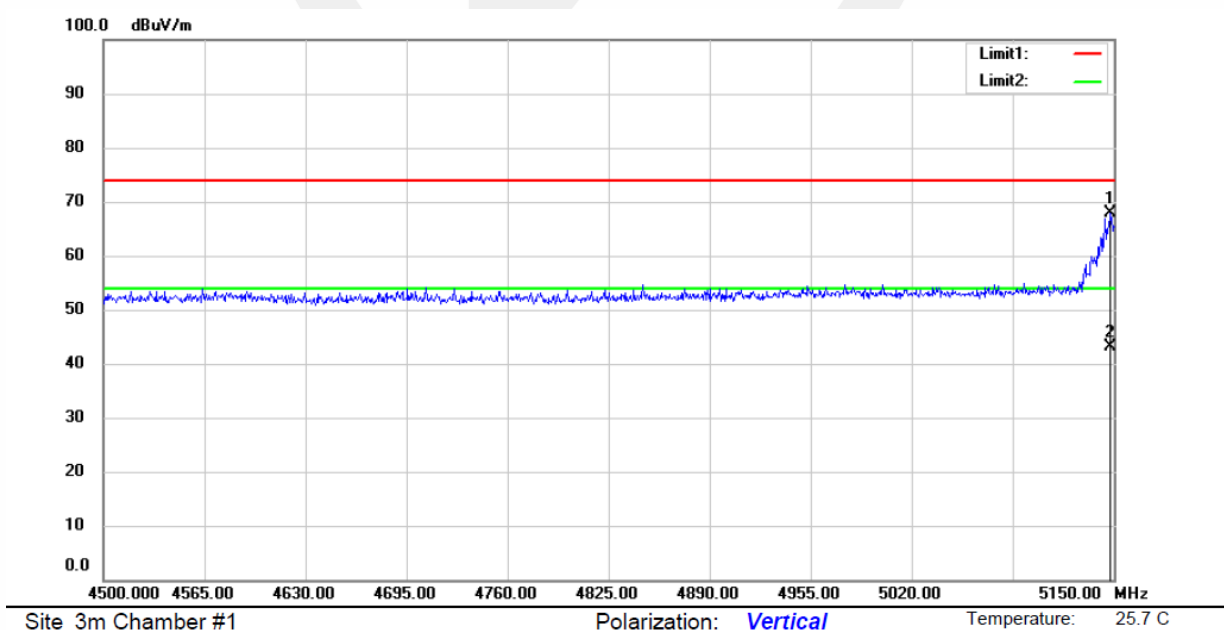
(3) Correct Factor= Ant_F + Cab_L - Preamp

(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

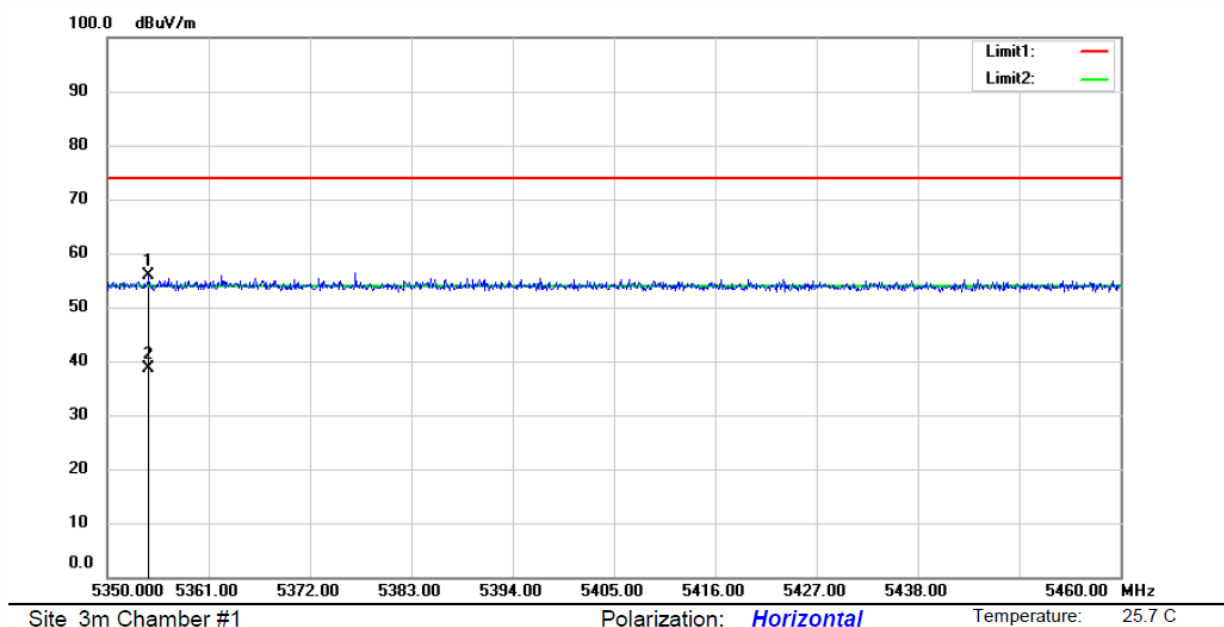
| | | | | |
|------------|--|--|--|-----------|
| U-NII - 1 | | | | |
| Test Model | Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) | | | |
| | <input checked="" type="checkbox"/> 802.11ac | <input type="checkbox"/> 802.11n(HT20) | <input type="checkbox"/> 802.11n(HT40) | |
| | <input checked="" type="checkbox"/> 5180 | <input type="checkbox"/> 5200 | <input type="checkbox"/> 5240 | Ant.Pol H |



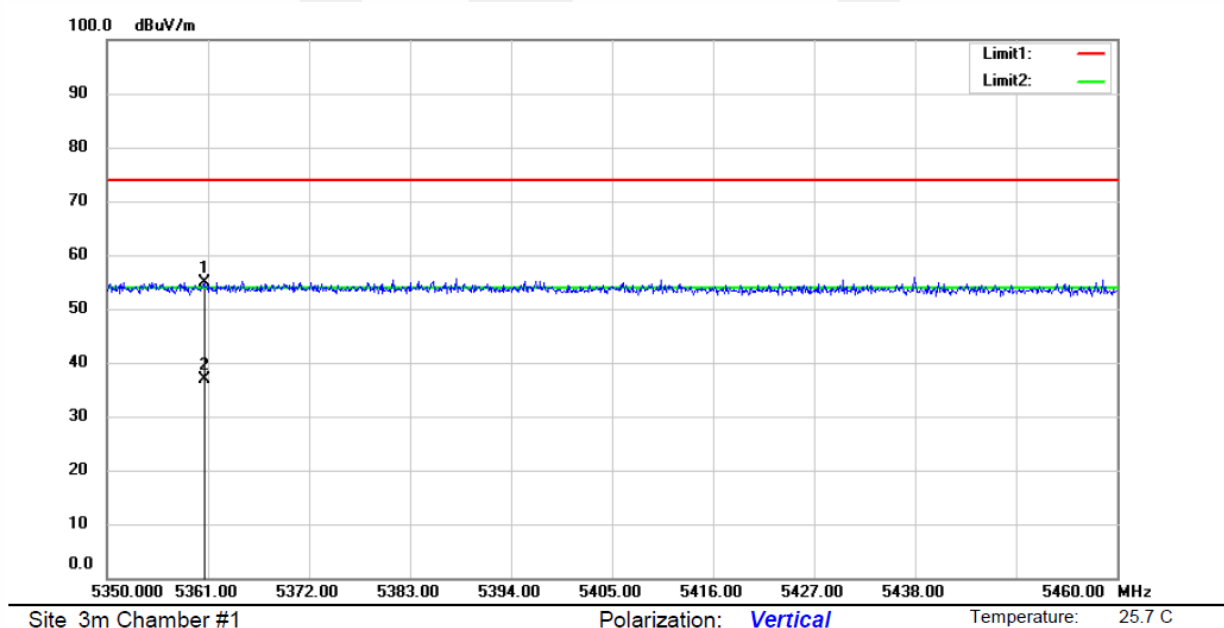
| | | | | |
|------------|--|--|--|-----------|
| U-NII - 1 | | | | |
| Test Model | Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) | | | |
| | <input checked="" type="checkbox"/> 802.11ac | <input type="checkbox"/> 802.11n(HT20) | <input type="checkbox"/> 802.11n(HT40) | |
| | <input checked="" type="checkbox"/> 5180 | <input type="checkbox"/> 5200 | <input type="checkbox"/> 5240 | Ant.Pol V |



| | | | |
|------------|---|--|--|
| U-NII - 1 | | | |
| Test Model | Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) | | |
| | <input checked="" type="checkbox"/> 802.11ac | <input type="checkbox"/> 802.11n(HT20) | <input type="checkbox"/> 802.11n(HT40) |
| | <input type="checkbox"/> 5180 | <input type="checkbox"/> 5200 | <input checked="" type="checkbox"/> 5240 |
| | Ant.Pol | | H |



| | | | |
|------------|---|--|--|
| U-NII - 1 | | | |
| Test Model | Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) | | |
| | <input checked="" type="checkbox"/> 802.11ac | <input type="checkbox"/> 802.11n(HT20) | <input type="checkbox"/> 802.11n(HT40) |
| | <input type="checkbox"/> 5180 | <input type="checkbox"/> 5200 | <input checked="" type="checkbox"/> 5240 |
| | Ant.Pol | | V |



☒ For Undesirable radiated Spurious Emission in U-NII -3

■ All the modes 802.11a/n/ac/ax has been tested and the worst result antenna 1 802.11ac recorded as below:

● ☒ Undesirable radiated Spurious Emission Above 1GHz (1GHz to 40GHz)

Test mode: 802.11ac Frequency(MHz): 5745

| Freq. (MHz) | Ant.Pol. | Field Strength (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Over(dB) |
|-------------|----------|-------------------------|---------------|-------------|----------|
| 7659.739 | V | 59.10 | -36.13 | -27 | -9.13 |
| 11491.89 | V | 62.18 | -33.05 | -27 | -6.05 |
| 17880.73 | V | 64.05 | -31.18 | -27 | -4.18 |
| 6989.109 | H | 48.19 | -47.04 | -27 | -20.04 |
| 11495.21 | H | 58.83 | -36.4 | -27 | -9.4 |
| 17909.18 | H | 63.44 | -31.79 | -27 | -4.79 |

Test mode: 802.11ac Frequency(MHz): 5785

| Freq. (MHz) | Ant.Pol. | Field Strength (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Over(dB) |
|-------------|----------|-------------------------|---------------|-------------|----------|
| 7713.058 | V | 57.36 | -37.87 | -27 | -10.87 |
| 11568.54 | V | 60.30 | -34.93 | -27 | -7.93 |
| 17914.36 | V | 64.53 | -30.7 | -27 | -3.7 |
| 6134.922 | H | 43.61 | -51.62 | -27 | -24.62 |
| 9747.734 | H | 55.72 | -39.51 | -27 | -12.51 |
| 17878.15 | H | 63.20 | -32.03 | -27 | -5.03 |

Test mode: 802.11ac Frequency(MHz): 5825

| Freq. (MHz) | Ant.Pol. | Field Strength (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Over(dB) |
|-------------|----------|-------------------------|---------------|-------------|----------|
| 7766.749 | V | 55.85 | -39.38 | -27 | -12.38 |
| 11650.75 | V | 63.19 | -32.04 | -27 | -5.04 |
| 17940.26 | V | 63.71 | -31.52 | -27 | -4.52 |
| 7260.916 | H | 49.74 | -45.49 | -27 | -18.49 |
| 11655.80 | H | 58.27 | -36.96 | -27 | -9.96 |
| 17888.48 | H | 64.43 | -30.8 | -27 | -3.8 |

Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).

(2) Emission Level= Reading Level+Probe Factor +Cable Loss.

(3) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77

d is the measurement distance in 3 meters

Frequency: 802.11ac

Frequency(MHz): 5745

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|-------|----------|--------|
| | H/V | PK | AV | PK | AV | PK | AV |
| 7659.739 | V | 59.10 | 41.33 | 74.00 | 54.00 | -14.90 | -12.67 |
| 11491.89 | V | 62.18 | 45.19 | 74.00 | 54.00 | -11.82 | -8.81 |
| 17880.73 | V | 64.05 | 46.72 | 74.00 | 54.00 | -9.95 | -7.28 |
| 6989.109 | H | 48.19 | 31.89 | 74.00 | 54.00 | -25.81 | -22.11 |
| 11495.21 | H | 58.83 | 41.33 | 74.00 | 54.00 | -15.17 | -12.67 |
| 17909.18 | H | 63.44 | 45.26 | 74.00 | 54.00 | -10.56 | -8.74 |

Frequency: 802.11ac

Frequency(MHz): 5785

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|-------|----------|--------|
| | H/V | PK | AV | PK | AV | PK | AV |
| 7713.058 | V | 57.36 | 40.27 | 74.00 | 54.00 | -16.64 | -13.73 |
| 11568.54 | V | 60.30 | 42.37 | 74.00 | 54.00 | -13.70 | -11.63 |
| 17914.36 | V | 64.53 | 46.35 | 74.00 | 54.00 | -9.47 | -7.65 |
| 6134.922 | H | 43.61 | 25.63 | 74.00 | 54.00 | -30.39 | -28.37 |
| 9747.734 | H | 55.72 | 38.66 | 74.00 | 54.00 | -18.28 | -15.34 |
| 17878.15 | H | 63.20 | 45.13 | 74.00 | 54.00 | -10.80 | -8.87 |

Frequency: 802.11ac

Frequency(MHz): 5825

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|-------|----------|--------|
| | H/V | PK | AV | PK | AV | PK | AV |
| 7766.749 | V | 55.85 | 38.52 | 74.00 | 54.00 | -18.15 | -15.48 |
| 11650.75 | V | 63.19 | 46.24 | 74.00 | 54.00 | -10.81 | -7.76 |
| 17940.26 | V | 63.71 | 45.28 | 74.00 | 54.00 | -10.29 | -8.72 |
| 7260.916 | H | 49.74 | 31.29 | 74.00 | 54.00 | -24.26 | -22.71 |
| 11655.80 | H | 58.27 | 40.15 | 74.00 | 54.00 | -15.73 | -13.85 |
| 17888.48 | H | 64.43 | 46.11 | 74.00 | 54.00 | -9.57 | -7.89 |

- Note:**
- (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
 - (2) Emission Level= Reading Level+Correct Factor.
 - (3) Correct Factor= Ant_F + Cab_L - Preamp
 - (4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

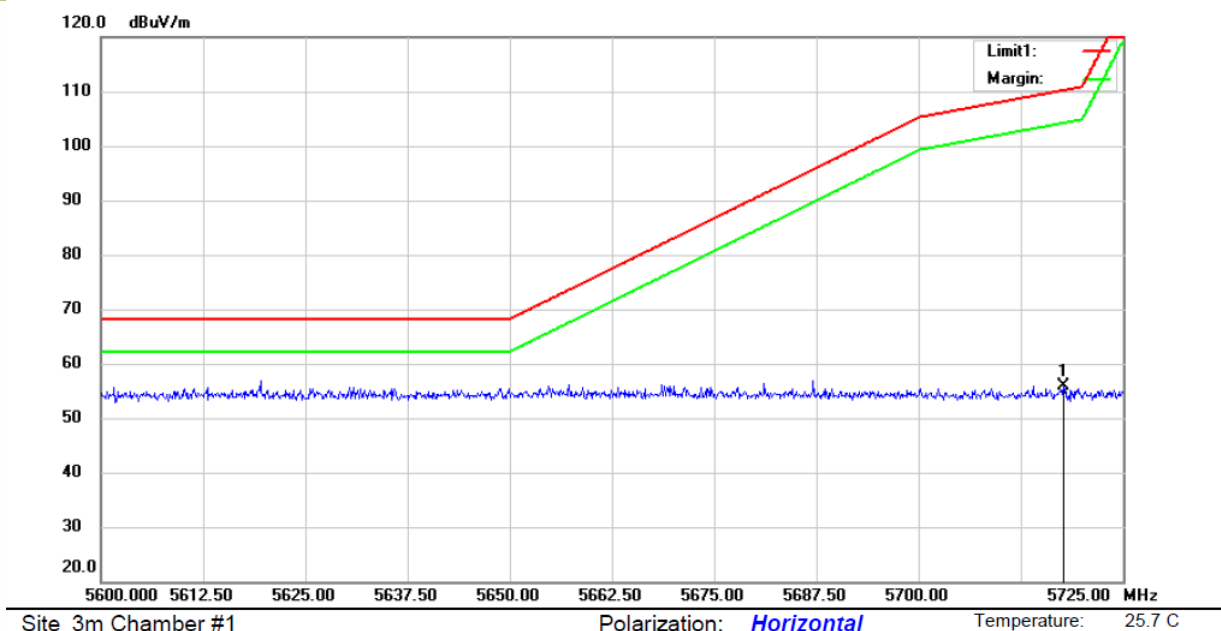
● ☒ Undesirable radiated Spurious Emission in band edge

| Test mode: | | Frequency: | | | |
|-------------|----------|--------------------------------------|---------------|-------------|---------|
| 802.11ac | | 5745 | | | |
| Freq. (MHz) | Ant.Pol. | Field Strength (RBW=100KHz) (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Verdict |
| 5717.750 | H | 55.90 | -39.33 | 14.97 | Pass |
| 5714.500 | V | 55.76 | -39.47 | 14.06 | Pass |

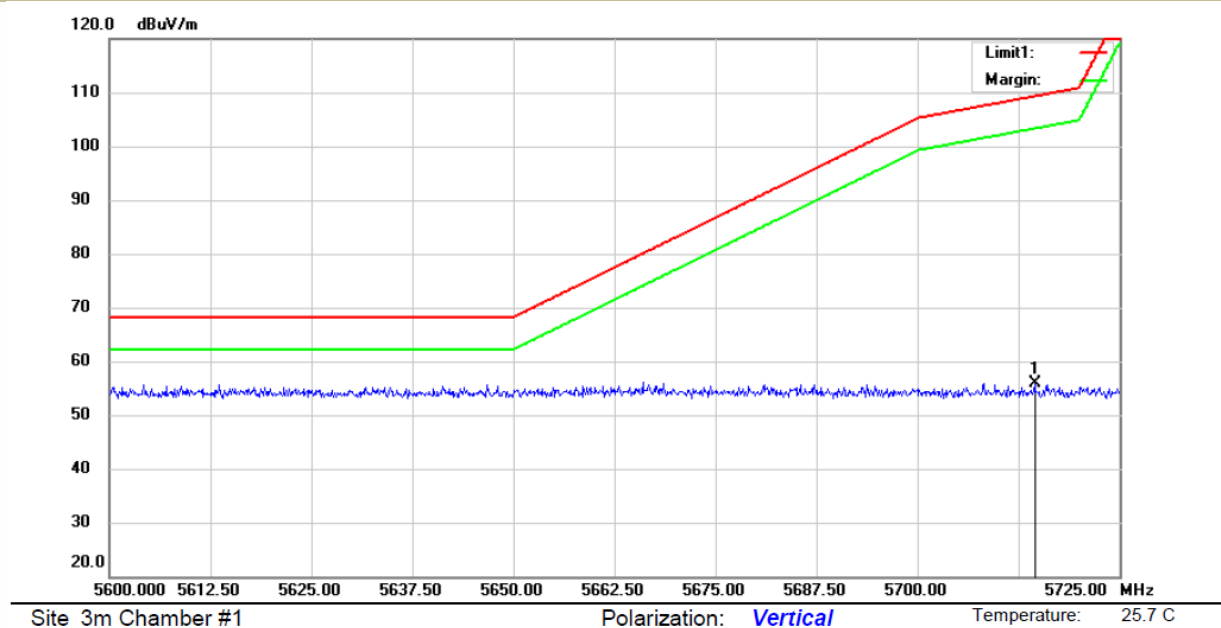
| Test mode: | | Frequency: | | | |
|-------------|----------|--------------------------------------|---------------|-------------|---------|
| 802.11ac | | 5825 | | | |
| Freq. (MHz) | Ant.Pol. | Field Strength (RBW=100KHz) (dBuV/m) | E.I.R.P (dBm) | Limit (dBm) | Verdict |
| 5850.625 | H | 62.79 | -32.44 | 27 | Pass |
| 5850.750 | V | 73.49 | -21.74 | 27 | Pass |

Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
 (2) Emission Level= Reading Level+Probe Factor +Cable Loss.
 (3) EIRP[dBm] = E[dBuV/m] + 20 log(d[meters]) - 104.77
 d is the measurement distance in 3 meters

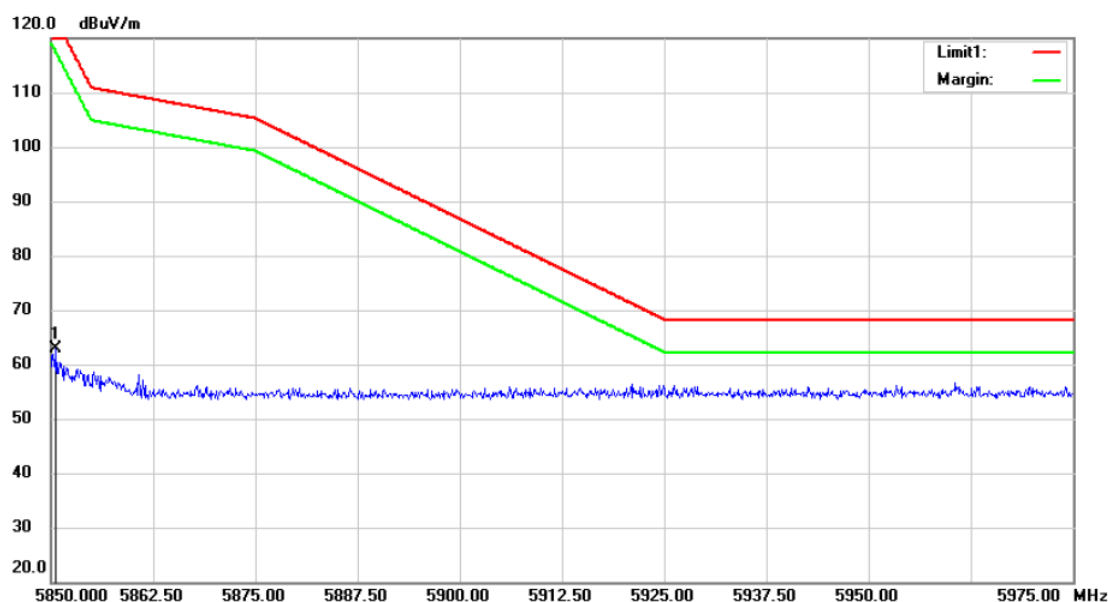
Test Model U-NII -3
 Undesirable radiated ☒ 802.11ac Undesirable radiated ☐ 802.11n(HT20) Spurious Emission in Band Edge ☐ 802.11n(HT40)
☒ 5745 Ant.Pol H



Test Model U-NII -3
 Undesirable radiated ☒ 802.11ac Undesirable radiated ☐ 802.11n(HT20) Spurious Emission in Band Edge ☐ 802.11n(HT40)
☒ 5745 Ant.Pol V

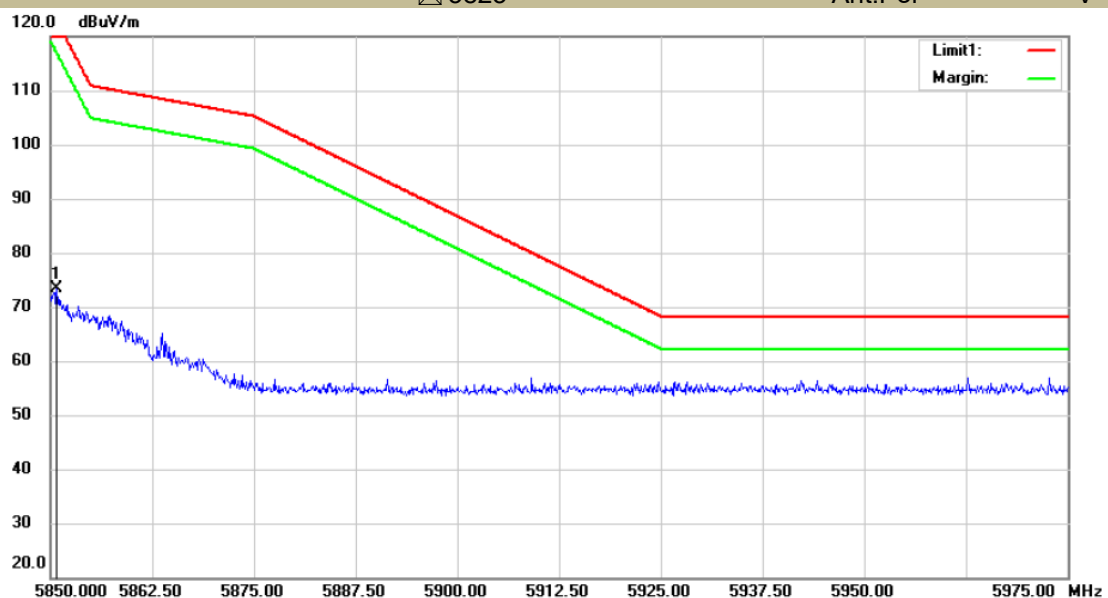


U-NII -3
 Test Model Undesirable radiated Undesirable radiated Spurious Emission in Band Edge
☒ 802.11ac ☐ 802.11n(HT20) ☐ 802.11n(HT40)
☒ 5825 Ant.Pol H



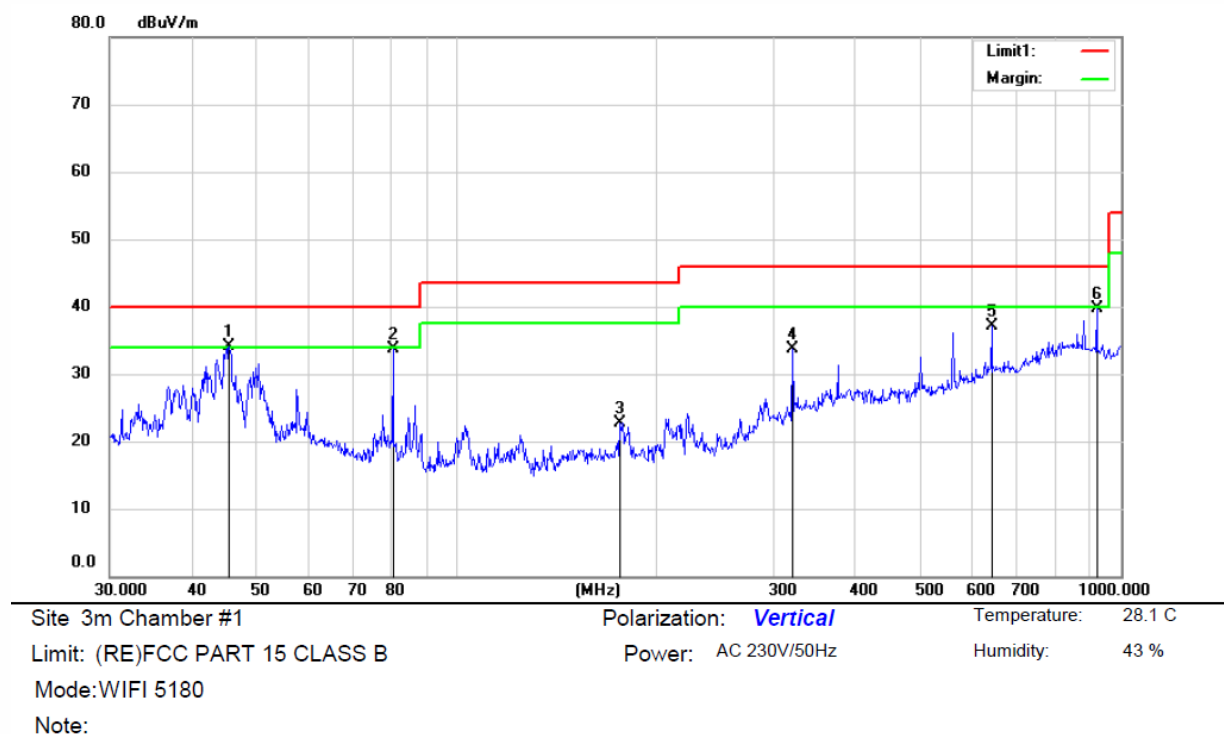
Site 3m Chamber #1 Polarization: **Horizontal** Temperature: 25.7 C

U-NII -3
 Test Model Undesirable radiated Undesirable radiated Spurious Emission in Band Edge
☒ 802.11ac ☐ 802.11n(HT20) ☐ 802.11n(HT40)
☒ 5825 Ant.Pol V

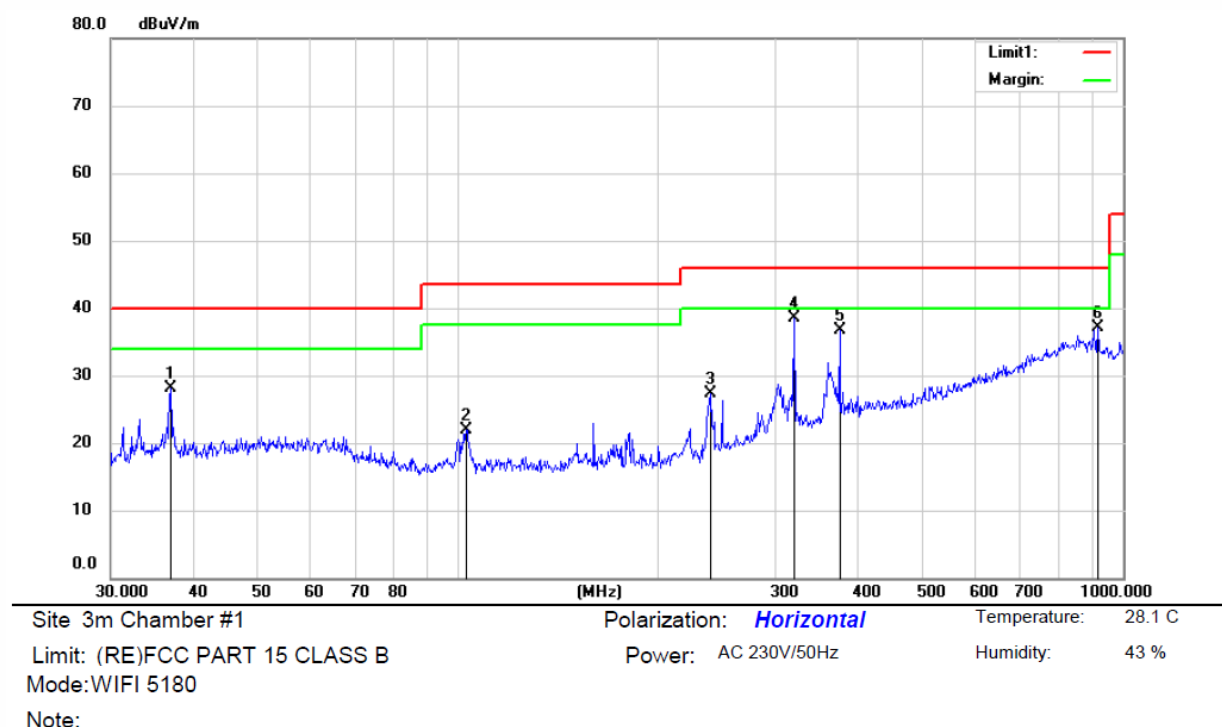


Site 3m Chamber #1 Polarization: **Vertical** Temperature: 25.7 C

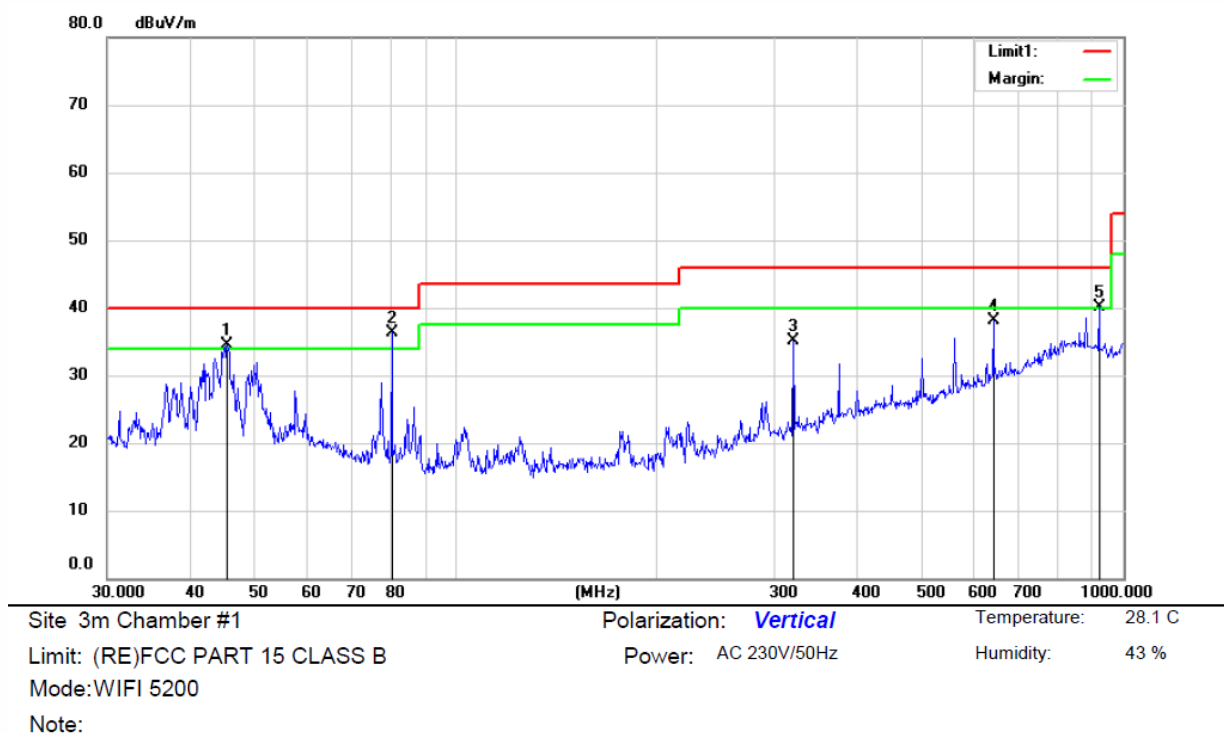
- Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)
All the modes 802.11a/n/ac/ax has been tested and the worst result 802.11a recorded as below:



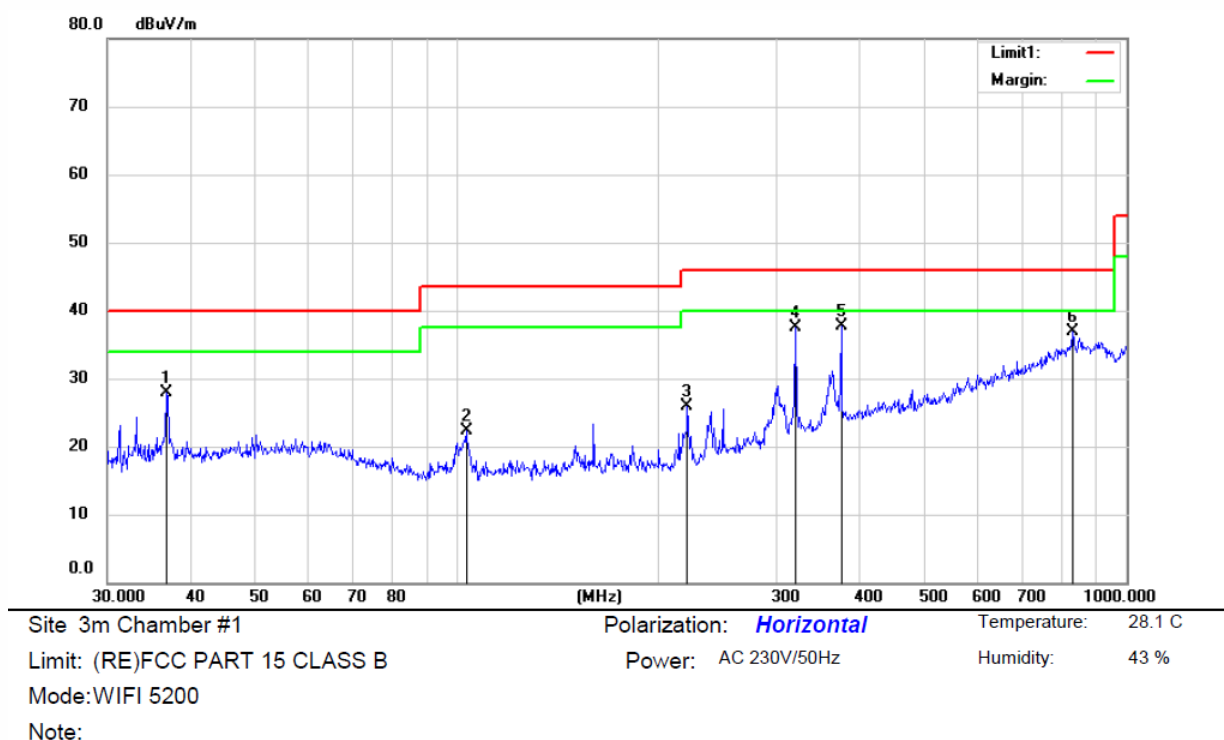
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 45.3753 | 41.79 | -7.77 | 34.02 | 40.00 | -5.98 | QP | | |
| 2 | | 80.0805 | 44.22 | -10.44 | 33.78 | 40.00 | -6.22 | QP | | |
| 3 | | 176.8102 | 32.44 | -9.71 | 22.73 | 43.50 | -20.77 | QP | | |
| 4 | | 320.0772 | 38.29 | -4.65 | 33.64 | 46.00 | -12.36 | QP | | |
| 5 | | 640.0496 | 35.51 | 1.65 | 37.16 | 46.00 | -8.84 | QP | | |
| 6 | | 920.0927 | 34.48 | 5.21 | 39.69 | 46.00 | -6.31 | QP | | |



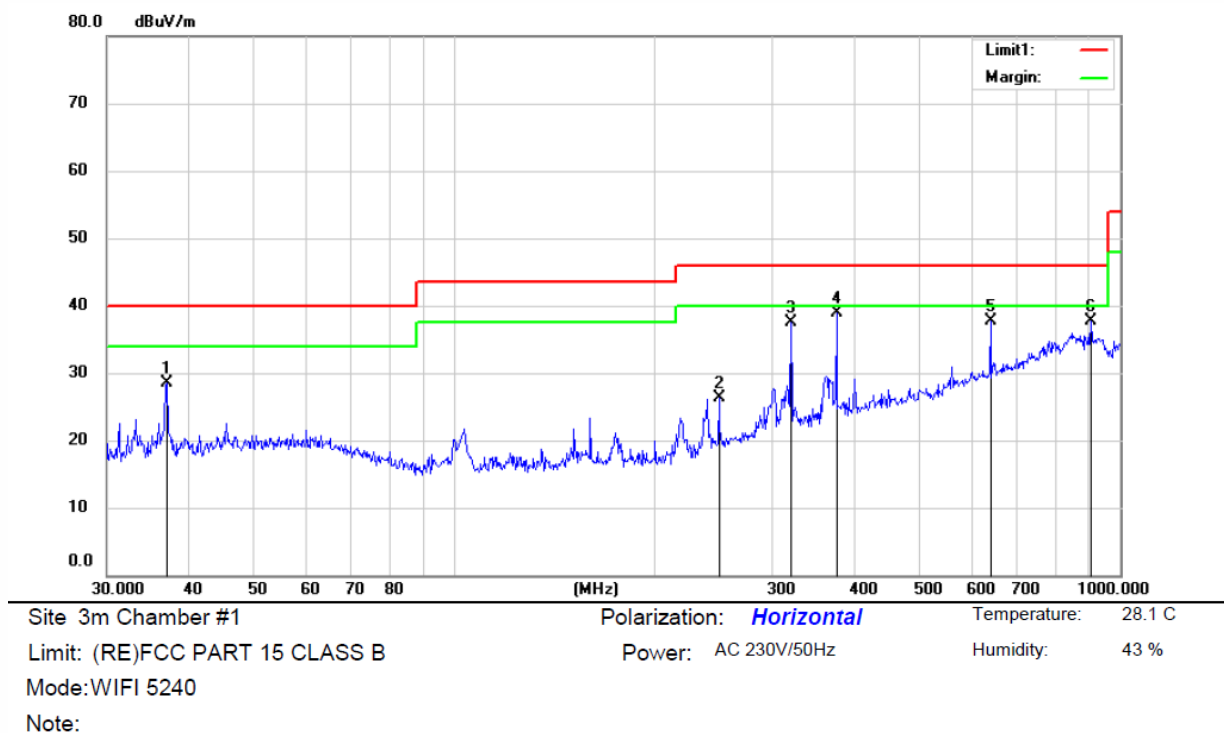
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|--------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree |
| 1 | | 36.9115 | 36.88 | -8.84 | 28.04 | 40.00 | -11.96 | QP | | |
| 2 | | 102.9897 | 32.19 | -10.29 | 21.90 | 43.50 | -21.60 | QP | | |
| 3 | | 240.0926 | 35.37 | -8.01 | 27.36 | 46.00 | -18.64 | QP | | |
| 4 | * | 320.0772 | 43.13 | -4.65 | 38.48 | 46.00 | -7.52 | QP | | |
| 5 | | 374.9511 | 40.02 | -3.34 | 36.68 | 46.00 | -9.32 | QP | | |
| 6 | | 918.4810 | 31.82 | 5.24 | 37.06 | 46.00 | -8.94 | QP | | |



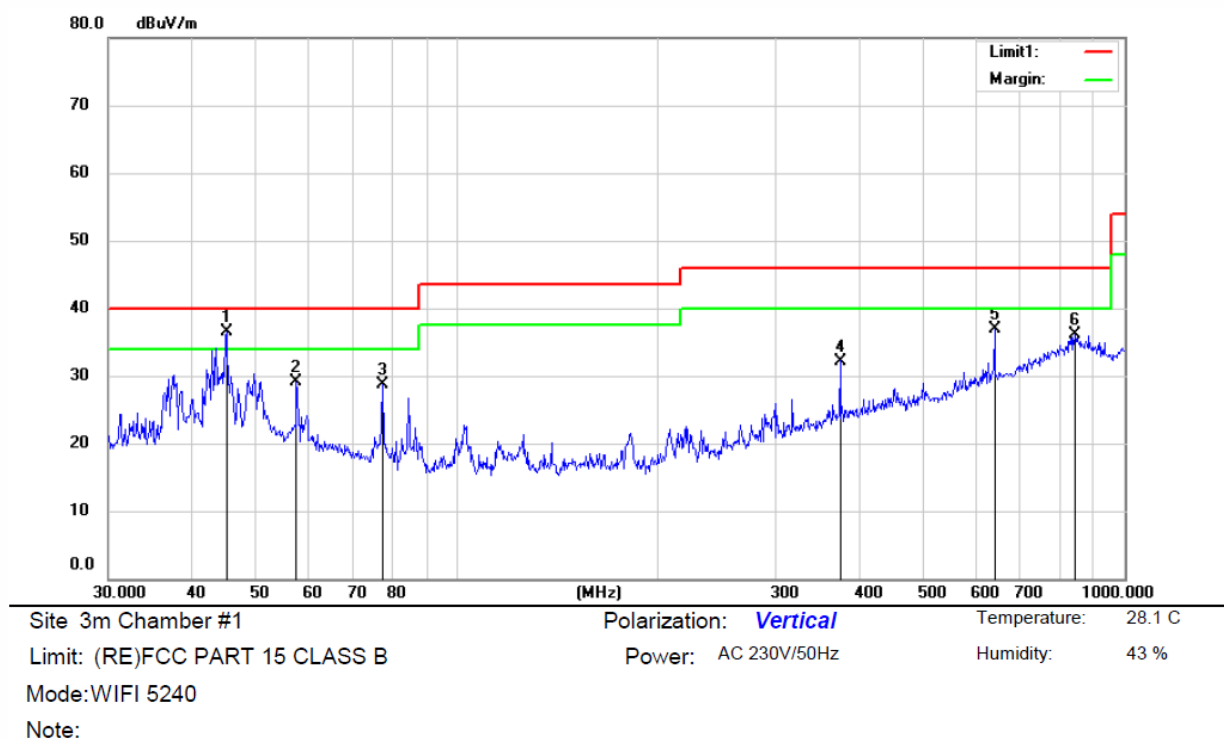
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|--------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree |
| 1 | ! | 45.3755 | 42.29 | -7.77 | 34.52 | 40.00 | -5.48 | QP | | |
| 2 | * | 80.0806 | 46.72 | -10.44 | 36.28 | 40.00 | -3.72 | QP | | |
| 3 | | 320.0772 | 39.79 | -4.65 | 35.14 | 46.00 | -10.86 | QP | | |
| 4 | | 640.0497 | 36.51 | 1.65 | 38.16 | 46.00 | -7.84 | QP | | |
| 5 | ! | 920.0928 | 34.98 | 5.21 | 40.19 | 46.00 | -5.81 | QP | | |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|--------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree |
| 1 | | 36.8630 | 36.66 | -8.85 | 27.81 | 40.00 | -12.19 | QP | | |
| 2 | | 103.2157 | 32.56 | -10.27 | 22.29 | 43.50 | -21.21 | QP | | |
| 3 | | 220.7140 | 34.89 | -9.08 | 25.81 | 46.00 | -20.19 | QP | | |
| 4 | | 320.0772 | 42.19 | -4.65 | 37.54 | 46.00 | -8.46 | QP | | |
| 5 | * | 375.1155 | 41.12 | -3.34 | 37.78 | 46.00 | -8.22 | QP | | |
| 6 | | 831.8574 | 30.45 | 6.40 | 36.85 | 46.00 | -9.15 | QP | | |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | | 36.8953 | 37.43 | -8.85 | 28.58 | 40.00 | -11.42 | QP | | |
| 2 | | 250.0820 | 33.43 | -7.03 | 26.40 | 46.00 | -19.60 | QP | | |
| 3 | | 320.0772 | 42.20 | -4.65 | 37.55 | 46.00 | -8.45 | QP | | |
| 4 | * | 374.9511 | 42.31 | -3.34 | 38.97 | 46.00 | -7.03 | QP | | |
| 5 | | 640.0497 | 36.01 | 1.65 | 37.66 | 46.00 | -8.34 | QP | | |
| 6 | | 904.8945 | 32.26 | 5.45 | 37.71 | 46.00 | -8.29 | QP | | |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 45.0781 | 44.39 | -7.80 | 36.59 | 40.00 | -3.41 | QP | | |
| 2 | | 57.5687 | 36.73 | -7.58 | 29.15 | 40.00 | -10.85 | QP | | |
| 3 | | 77.4230 | 38.71 | -10.05 | 28.66 | 40.00 | -11.34 | QP | | |
| 4 | | 374.9511 | 35.54 | -3.34 | 32.20 | 46.00 | -13.80 | QP | | |
| 5 | | 640.0497 | 35.25 | 1.65 | 36.90 | 46.00 | -9.10 | QP | | |
| 6 | | 842.8682 | 29.57 | 6.59 | 36.16 | 46.00 | -9.84 | QP | | |

8.5 POWER LINE CONDUCTED EMISSIONS

8.5.1 Applicable Standard

According to FCC Part 15.207(a)

8.5.2 Conformance Limit

| Frequency(MHz) | Conducted Emission Limit | |
|----------------|--------------------------|---------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

Note: 1. The lower limit shall apply at the transition frequencies

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.5.3 Test Configuration

Test according to clause 6.3 conducted emission test setup

8.5.4 Test Procedure

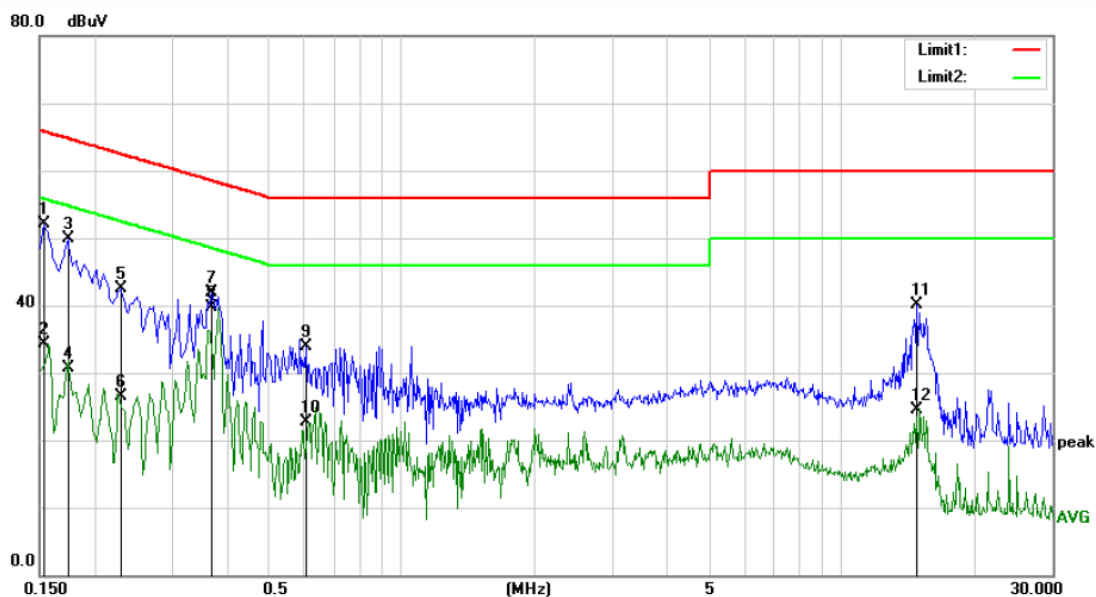
The EUT was placed on a table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

8.5.5 Test Results

Pass



Site Conduction #2

Phase: **L1**

Temperature: 25.1

Limit: (CE)FCC PART 15 class B_QP

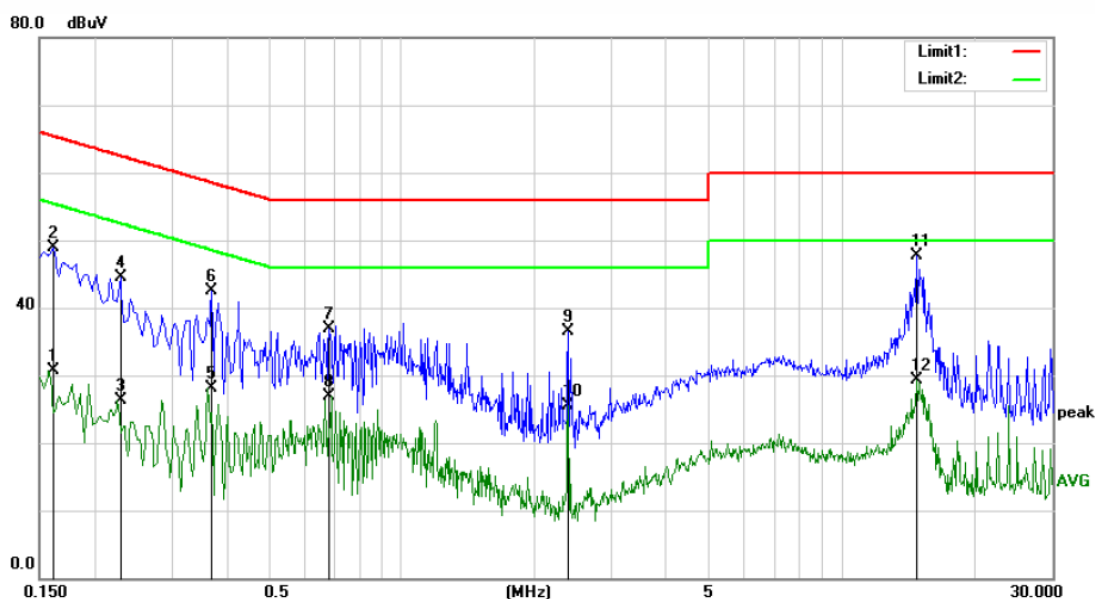
Power: AC 120V/60Hz

Humidity: 45 %

Mode: WIFI

Note:

| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Over dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1 | | 0.1540 | 42.00 | 10.09 | 52.09 | 65.78 | -13.69 | QP | |
| 2 | | 0.1540 | 24.19 | 10.09 | 34.28 | 55.78 | -21.50 | AVG | |
| 3 | | 0.1740 | 39.74 | 10.09 | 49.83 | 64.77 | -14.94 | QP | |
| 4 | | 0.1740 | 20.67 | 10.09 | 30.76 | 54.77 | -24.01 | AVG | |
| 5 | | 0.2300 | 32.47 | 10.10 | 42.57 | 62.45 | -19.88 | QP | |
| 6 | | 0.2300 | 16.34 | 10.10 | 26.44 | 52.45 | -26.01 | AVG | |
| 7 | | 0.3700 | 31.72 | 10.10 | 41.82 | 58.50 | -16.68 | QP | |
| 8 | * | 0.3700 | 29.67 | 10.10 | 39.77 | 48.50 | -8.73 | AVG | |
| 9 | | 0.6060 | 23.73 | 10.12 | 33.85 | 56.00 | -22.15 | QP | |
| 10 | | 0.6060 | 12.60 | 10.12 | 22.72 | 46.00 | -23.28 | AVG | |
| 11 | | 14.7660 | 29.56 | 10.53 | 40.09 | 60.00 | -19.91 | QP | |
| 12 | | 14.7660 | 14.07 | 10.53 | 24.60 | 50.00 | -25.40 | AVG | |



Site Conduction #2

Phase: **L1**

Temperature: 25.1

Limit: (CE)FCC PART 15 class B_QP

Power: AC 120V/60Hz

Humidity: 45 %

Mode: WIFI

Note:

| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Over dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1 | | 0.1620 | 20.70 | 10.09 | 30.79 | 55.36 | -24.57 | AVG | |
| 2 | | 0.1620 | 38.82 | 10.09 | 48.91 | 65.36 | -16.45 | QP | |
| 3 | | 0.2300 | 16.11 | 10.10 | 26.21 | 52.45 | -26.24 | AVG | |
| 4 | | 0.2300 | 34.40 | 10.10 | 44.50 | 62.45 | -17.95 | QP | |
| 5 | | 0.3700 | 17.94 | 10.10 | 28.04 | 48.50 | -20.46 | AVG | |
| 6 | | 0.3700 | 32.36 | 10.10 | 42.46 | 58.50 | -16.04 | QP | |
| 7 | | 0.6860 | 26.81 | 10.14 | 36.95 | 56.00 | -19.05 | QP | |
| 8 | | 0.6860 | 16.73 | 10.14 | 26.87 | 46.00 | -19.13 | AVG | |
| 9 | | 2.3860 | 26.41 | 10.14 | 36.55 | 56.00 | -19.45 | QP | |
| 10 | | 2.3860 | 15.30 | 10.14 | 25.44 | 46.00 | -20.56 | AVG | |
| 11 | * | 14.7900 | 37.15 | 10.53 | 47.68 | 60.00 | -12.32 | QP | |
| 12 | | 14.7900 | 18.84 | 10.53 | 29.37 | 50.00 | -20.63 | AVG | |

8.6 ANTENNA APPLICATION

8.6.1 Antenna Requirement

| Standard | Requirement |
|---------------------|--|
| FCC CRF Part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. |

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.

8.6.2 Result

PASS.

- The EUT has 2 External Antennas for WiFi 5G: The two antennas are 5 dBi
- Note:
- ☒ Antennas use a permanently attached antenna which is not replaceable.
 - ☐ Not using a standard antenna jack or electrical connector for antenna replacement
 - ☐ The antenna has to be professionally installed (please provide method of installation)

Which in accordance to section 15.203, please refer to the internal photos.

Detail of factor for radiated emission

| Frequency(MHz) | Ant_F(dB) | Cab_L(dB) | Preamp(dB) | Correct Factor(dB) |
|----------------|-----------|-----------|------------|--------------------|
| 0.009 | 20.6 | 0.03 | \ | 20.63 |
| 0.15 | 20.7 | 0.1 | \ | 20.8 |
| 1 | 20.9 | 0.15 | \ | 21.05 |
| 10 | 20.1 | 0.28 | \ | 20.38 |
| 30 | 18.8 | 0.45 | \ | 19.25 |
| 30 | 11.7 | 0.62 | 27.9 | -15.58 |
| 100 | 12.5 | 1.02 | 27.8 | -14.28 |
| 300 | 12.9 | 1.91 | 27.5 | -12.69 |
| 600 | 19.2 | 2.92 | 27 | -4.88 |
| 800 | 21.1 | 3.54 | 26.6 | -1.96 |
| 1000 | 22.3 | 4.17 | 26.2 | 0.27 |
| 1000 | 25.6 | 1.76 | 41.4 | -14.04 |
| 3000 | 28.9 | 3.27 | 43.2 | -11.03 |
| 5000 | 31.1 | 4.2 | 44.6 | -9.3 |
| 8000 | 36.2 | 5.95 | 44.7 | -2.55 |
| 10000 | 38.4 | 6.3 | 43.9 | 0.8 |
| 12000 | 38.5 | 7.14 | 42.3 | 3.34 |
| 15000 | 40.2 | 8.15 | 41.4 | 6.95 |
| 18000 | 45.4 | 9.02 | 41.3 | 13.12 |
| 18000 | 37.9 | 1.81 | 47.9 | -8.19 |
| 21000 | 37.9 | 1.95 | 48.7 | -8.85 |
| 25000 | 39.3 | 2.01 | 42.8 | -1.49 |
| 28000 | 39.6 | 2.16 | 46.0 | -4.24 |
| 31000 | 41.2 | 2.24 | 44.5 | -1.06 |
| 34000 | 41.5 | 2.29 | 46.6 | -2.81 |
| 37000 | 43.8 | 2.30 | 46.4 | -0.3 |
| 40000 | 43.2 | 2.50 | 42.2 | 3.5 |

----- END OF REPORT -----