8.3.5 Test Results

5150-5250MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	3.905	11
	5200	3.073	11
	5240	3.776	11
802.11n-HT20	5180	2.970	11
	5200	2.857	11
	5240	3.327	11
802.11ac(HT20)	5180	3.171	11
	5200	2.961	11
	5240	3.663	11
802.11n-HT40	5190	-0.146	11
	5230	0.123	11
802.11ac(HT40)	5190	-0.196	11
	5230	0.389	11
802.11ac(HT80)	5210	-3.810	11

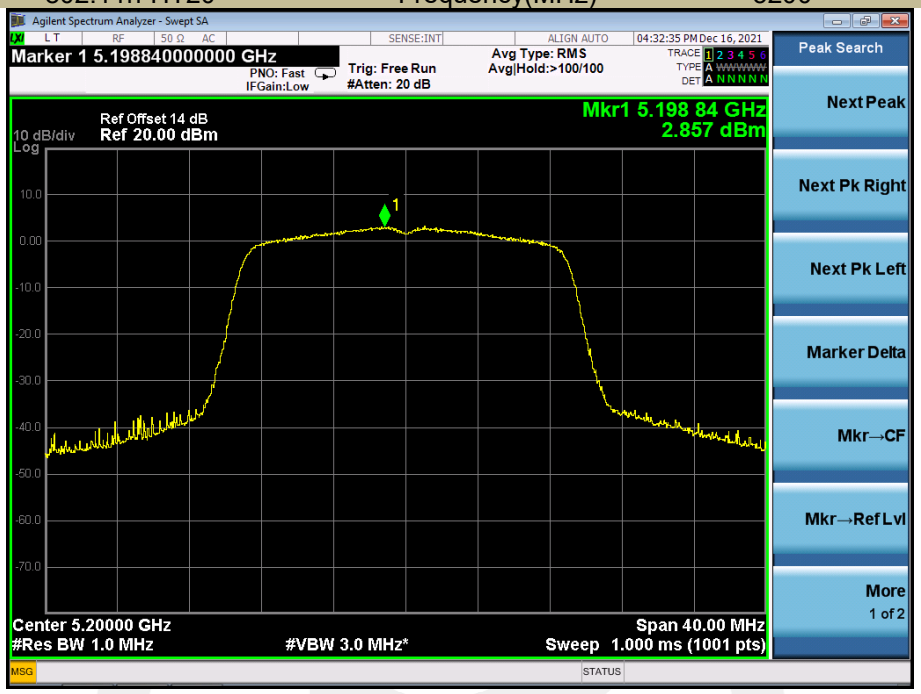
Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5180

Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5200

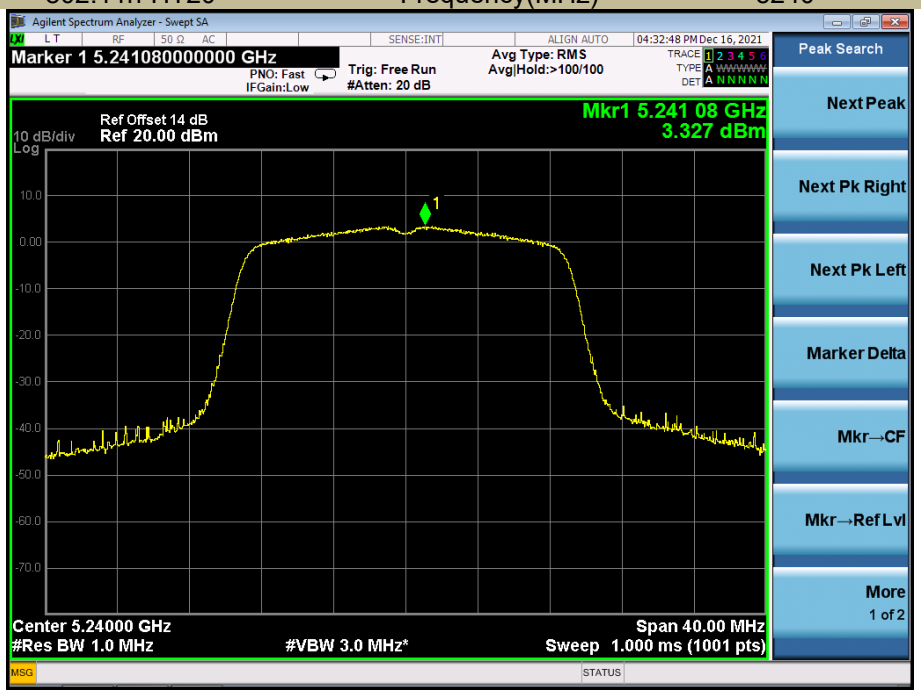
Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5240

Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5180

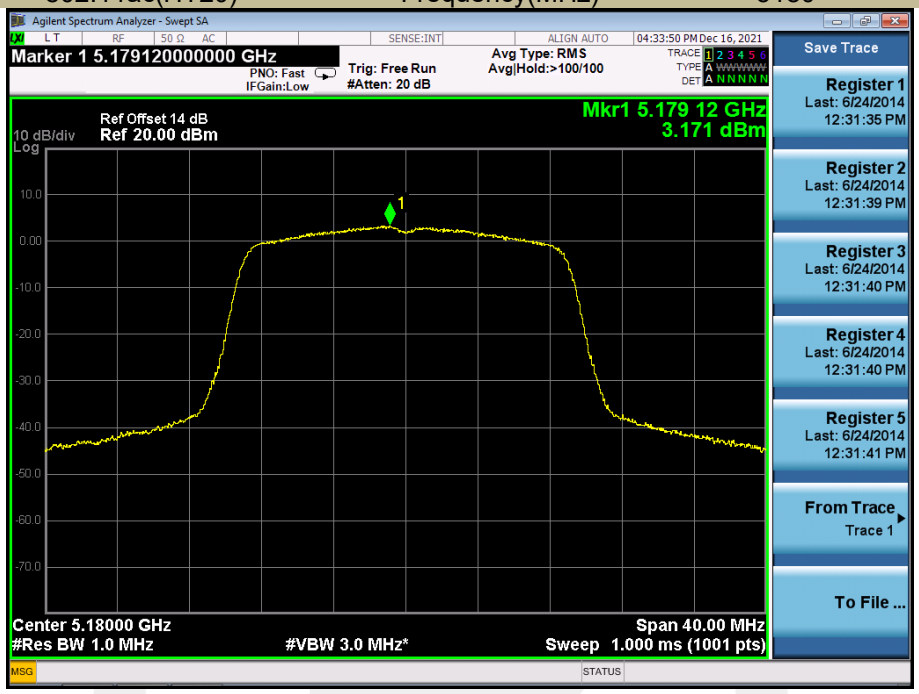
Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5200



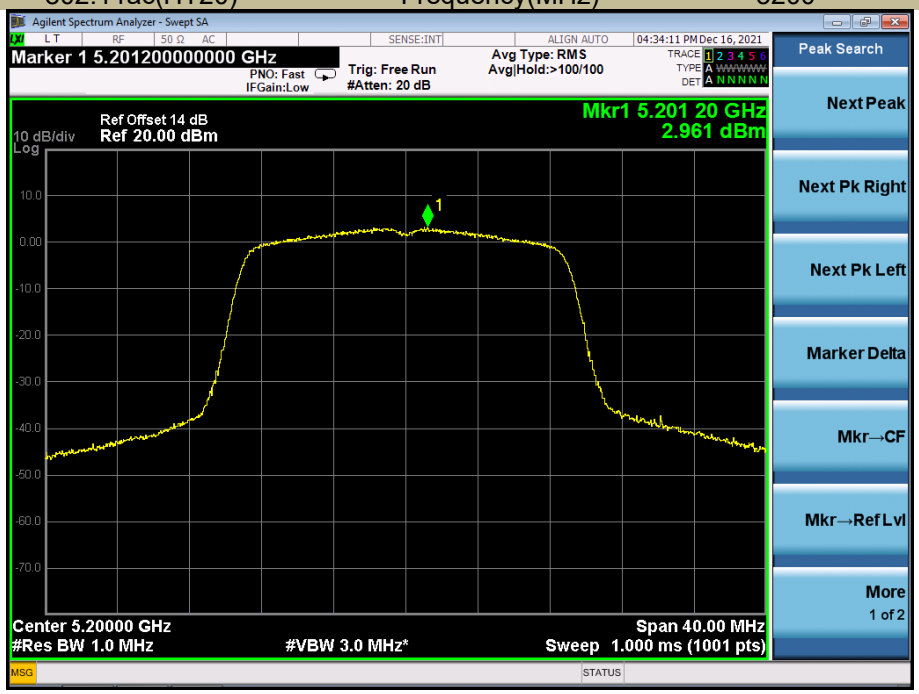
Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5240



Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT20)	Frequency(MHz)	5180



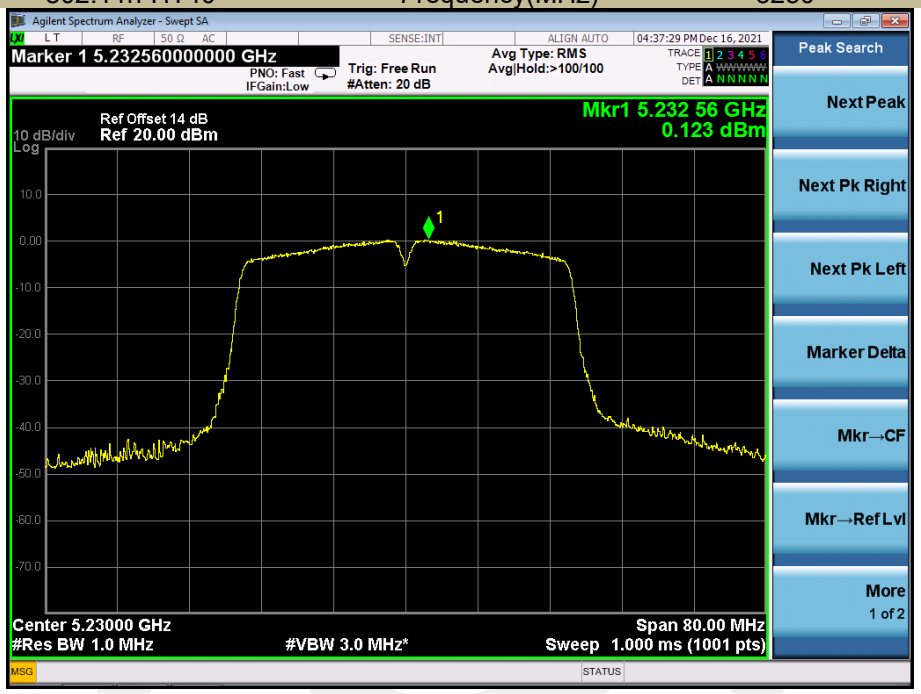
Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT20)	Frequency(MHz)	5200



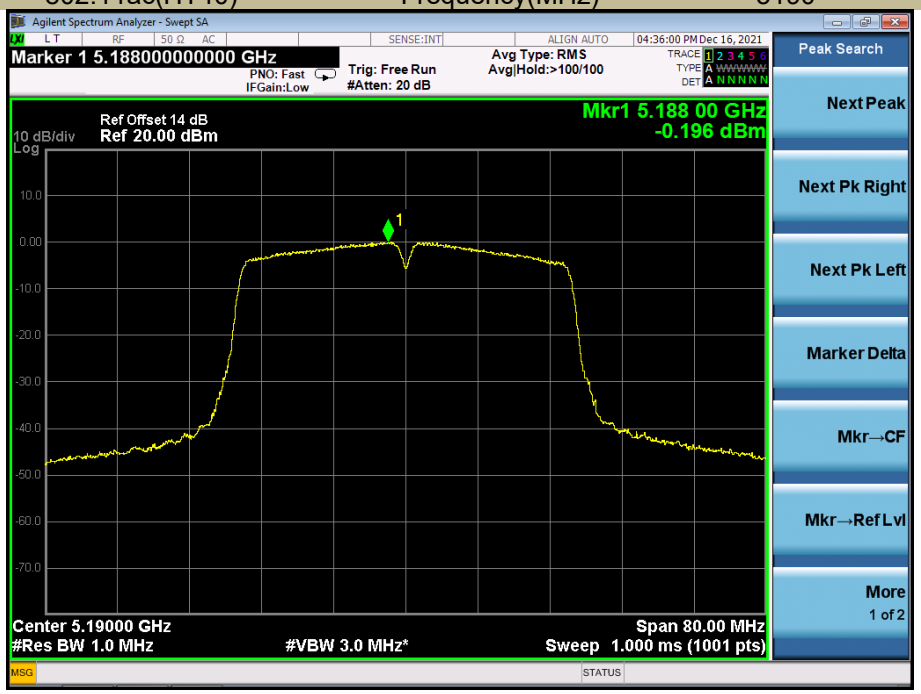
Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT20)	Frequency(MHz)	5240

Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT40	Frequency(MHz)	5190

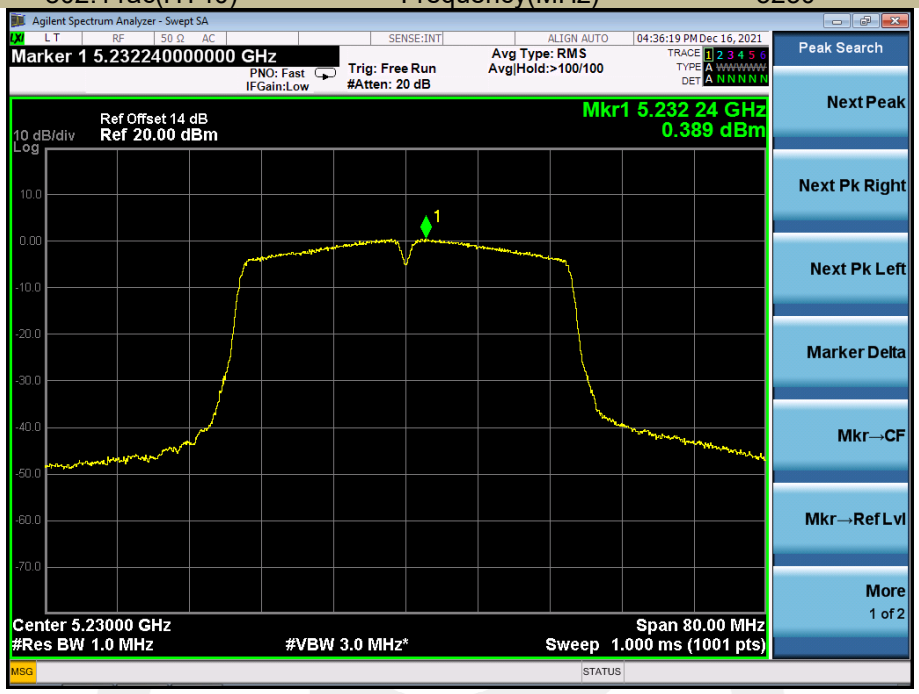
Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT40	Frequency(MHz)	5230



Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT40)	Frequency(MHz)	5190



Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT40)	Frequency(MHz)	5230



Power Spectral Density		U-NII - 1	
Test Model	802.11ac 80	Frequency(MHz)	5210

5725-5850MHz

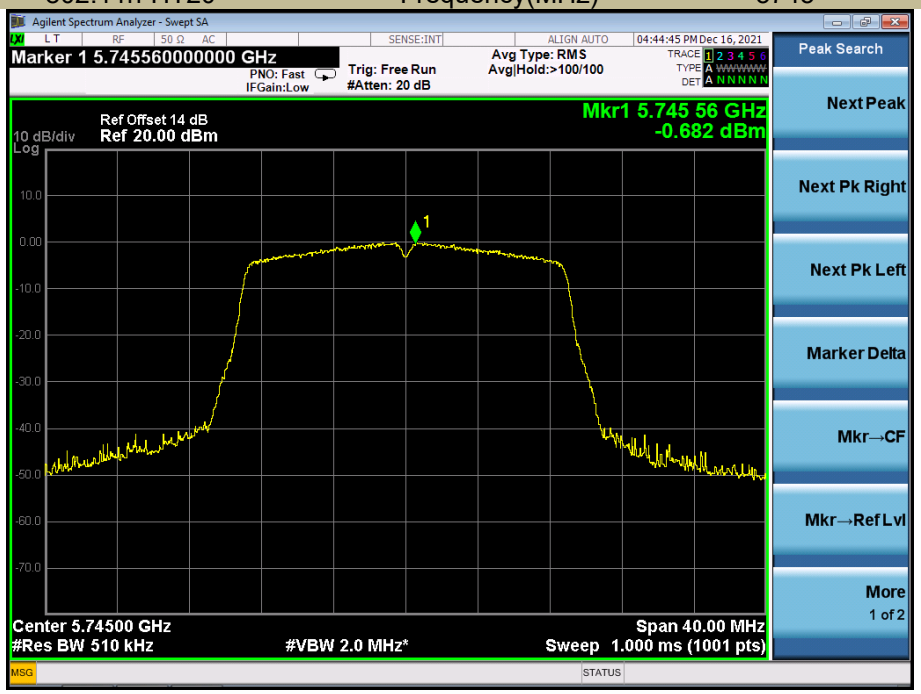
Operating mode	Test Channel	Power Spectral Density dBm/500kHz	Limit (dBm/500kHz)
802.11a	5745	0.567	32.76
	5785	0.262	32.76
	5825	0.377	32.76
802.11n-HT20	5745	-0.682	32.76
	5785	-0.490	32.76
	5825	0.339	32.76
802.11ac(HT20)	5745	-0.201	32.76
	5785	-0.733	32.76
	5825	0.080	32.76
802.11n-HT40	5755	-3.506	32.76
	5795	-3.328	32.76
802.11ac(HT40)	5755	-3.827	32.76
	5795	-3.283	32.76
802.11ac(HT80)	5775	-6.997	32.76

Power Spectral Density		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5745

Power Spectral Density		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5785

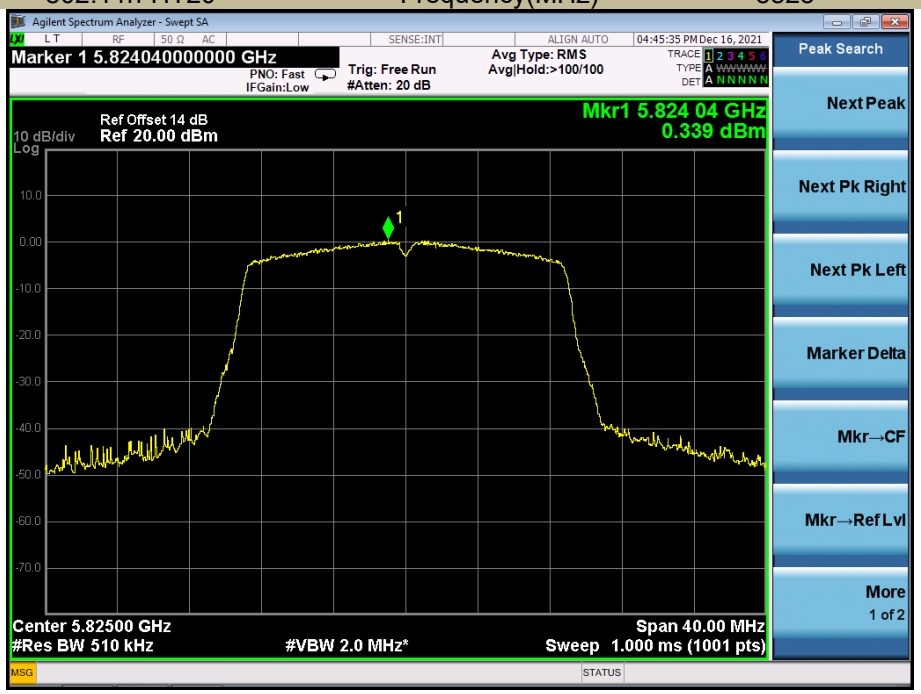
Power Spectral Density		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5825

Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5745

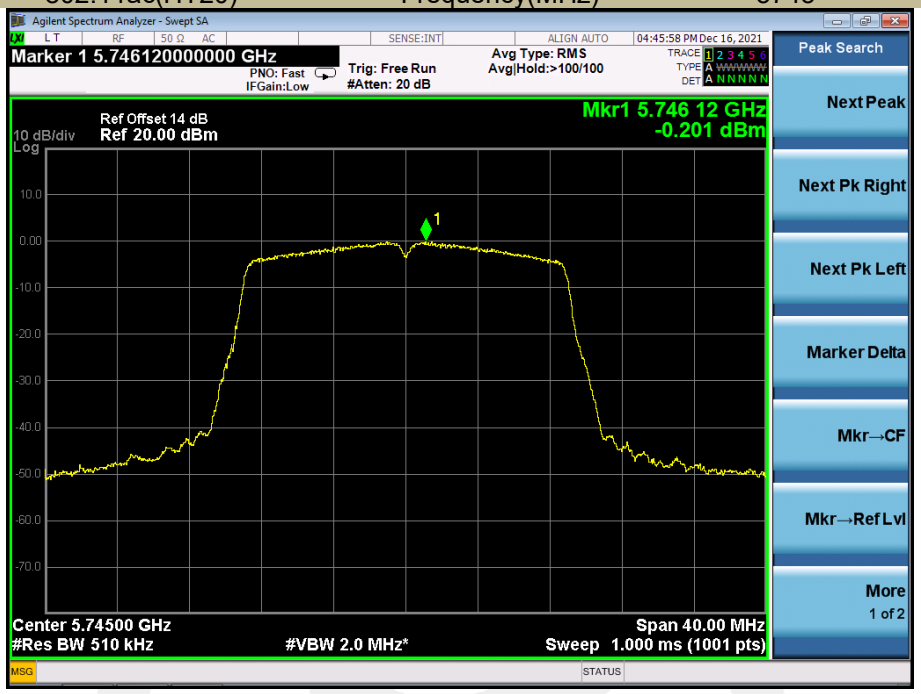


Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5785

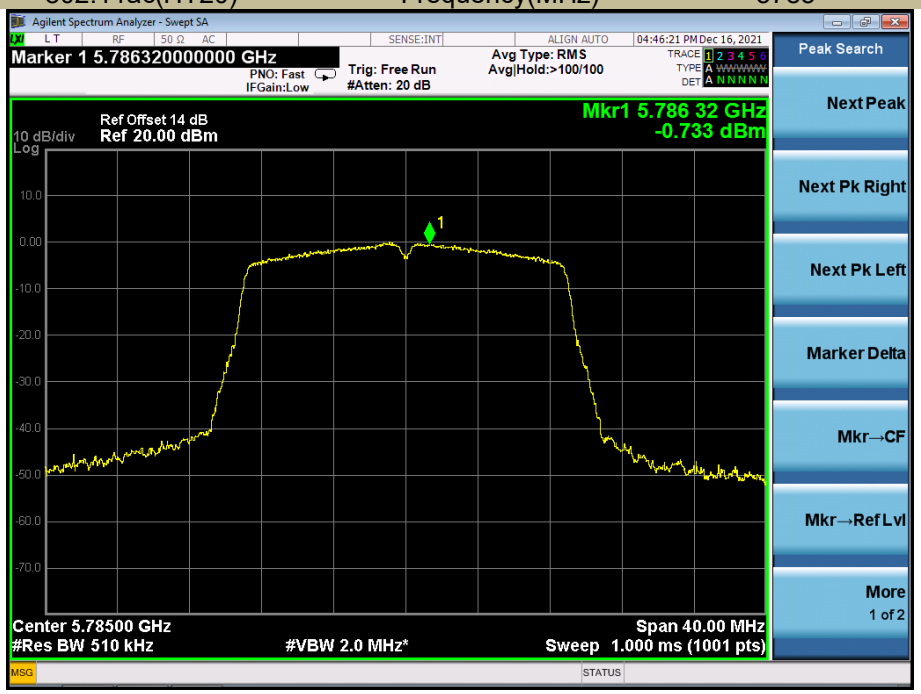
Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5825



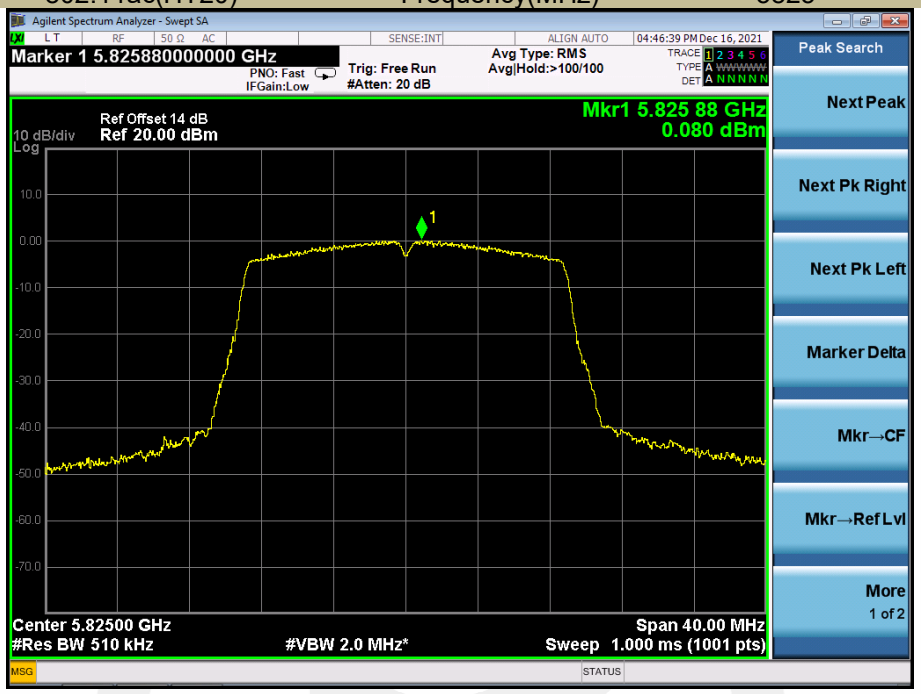
Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT20)	Frequency(MHz)	5745



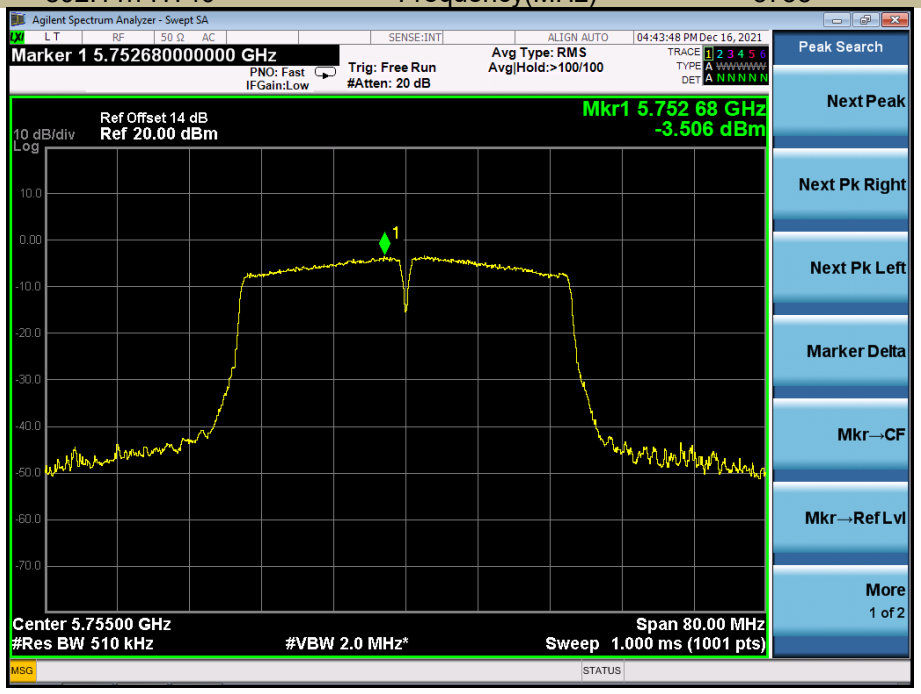
Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT20)	Frequency(MHz)	5785



Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT20)	Frequency(MHz)	5825

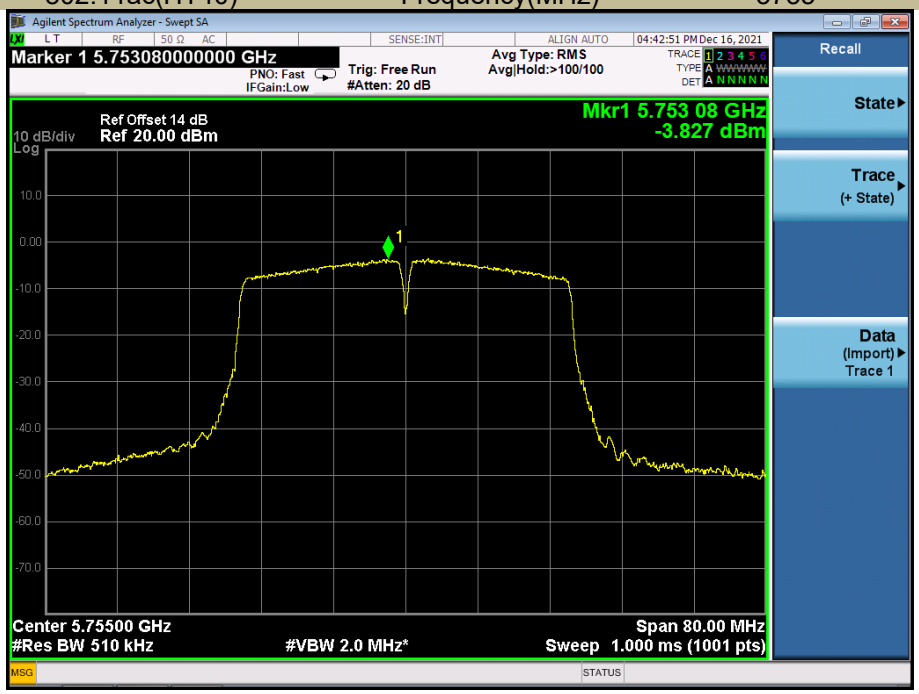


Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5755



Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5795

Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT40)	Frequency(MHz)	5755



Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT40)	Frequency(MHz)	5795

Power Spectral Density		U-NII - 3	
Test Model	802.11ac 80	Frequency(MHz)	5775

8.4 FREQUENCY STABILITY

8.4.1 Applicable Standard

According to FCC Part 15.407(g)
ANSI C63.10 Section 6.8

8.4.2 Conformance Limit

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 users manual.

8.4.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.4.4 Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously
Set RBW = 10 kHz.
Set Span= Entire absence of modulation emissions band
Set the video bandwidth (VBW) =30 kHz. width
Set Detector = Peak.
Set Trace mode = max hold.
Set Sweep = auto couple.
Allow the trace to stabilize.
The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
Beginning at each temperature level specified in user manual , the frequency shall be measured within one minute after application of primary power to the transmitter and at intervals of no more than one minute thereafter until ten minutes have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance, whichever time period is greater. During each test, the ambient temperature shall not be allowed to rise more than 10° centigrade above the respective beginning ambient temperature level
Measure and record the results in the test report.

8.4.5 Test Results

5180				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5180.002	2	Pass
	10	5180.002	2	Pass
	20	5180.001	1	Pass
	30	5180.005	5	Pass
	40	5180.000	0	Pass
	50	5180.008	8	Pass
85% Vnom	25	5179.995	-5	Pass
115% Vnom	25	5179.997	-3	Pass

5200				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5200.001	1	Pass
	10	5200.007	7	Pass
	20	5199.998	-2	Pass
	30	5200.009	9	Pass
	40	5199.997	-3	Pass
	50	5200.011	11	Pass
85% Vnom	25	5199.999	-1	Pass
115% Vnom	25	5200.000	0	Pass

5240				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5240.001	1	Pass
	10	5240.011	11	Pass
	20	5239.994	-6	Pass
	30	5240.002	2	Pass
	40	5239.995	-5	Pass
	50	5240.001	1	Pass
85% Vnom	25	5239.993	-7	Pass
115% Vnom	25	5240.003	3	Pass

5190

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5190.001	1	Pass
	10	5190.013	13	Pass
	20	5189.996	-4	Pass
	30	5190.001	1	Pass
	40	5190.000	0	Pass
	50	5190.008	8	Pass
85% Vnom	25	5189.996	-4	Pass
115% Vnom	25	5190.010	10	Pass

5230

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5230.001	1	Pass
	10	5230.011	11	Pass
	20	5229.995	-5	Pass
	30	5230.001	1	Pass
	40	5229.998	-2	Pass
	50	5230.005	5	Pass
85% Vnom	25	5229.997	-3	Pass
115% Vnom	25	5230.008	8	Pass

5210

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5210.001	1	Pass
	10	5210.005	5	Pass
	20	5209.995	-5	Pass
	30	5210.001	1	Pass
	40	5209.998	-2	Pass
	50	5210.003	3	Pass
85% Vnom	25	5210.000	0	Pass
115% Vnom	25	5210.004	4	Pass

5745

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5745.001	1	Pass
	10	5745.005	5	Pass
	20	5745.001	1	Pass
	30	5745.001	1	Pass
	40	5744.997	-3	Pass
	50	5745.009	9	Pass
85% Vnom	25	5744.997	-3	Pass
115% Vnom	25	5744.996	-4	Pass

5785

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5785.001	1	Pass
	10	5785.004	4	Pass
	20	5784.999	-1	Pass
	30	5785.002	2	Pass
	40	5784.999	-1	Pass
	50	5785.009	9	Pass
85% Vnom	25	5784.997	-3	Pass
115% Vnom	25	5784.998	-2	Pass

5825

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5825.001	1	Pass
	10	5825.005	5	Pass
	20	5824.997	-3	Pass
	30	5825.001	1	Pass
	40	5824.996	-4	Pass
	50	5825.001	1	Pass
85% Vnom	25	5824.998	-2	Pass
115% Vnom	25	5824.999	-1	Pass

5755

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5755.001	1	Pass
	10	5755.005	5	Pass
	20	5754.997	-3	Pass
	30	5755.001	1	Pass
	40	5754.997	-3	Pass
	50	5755.006	6	Pass
85% Vnom	25	5754.999	-1	Pass
115% Vnom	25	5755.004	4	Pass

5795

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5795.001	1	Pass
	10	5795.003	3	Pass
	20	5794.998	-2	Pass
	30	5795.002	2	Pass
	40	5794.995	-5	Pass
	50	5795.009	9	Pass
85% Vnom	25	5794.999	-1	Pass
115% Vnom	25	5794.998	-2	Pass

5775

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	0	5775.001	1	Pass
	10	5775.004	4	Pass
	20	5774.996	-4	Pass
	30	5775.002	2	Pass
	40	5774.999	-1	Pass
	50	5775.007	7	Pass
85% Vnom	25	5775.000	0	Pass
115% Vnom	25	5774.996	-4	Pass

8.5 UNDESIRABLE RADIATED SPURIOUS EMISSION

8.5.1 Applicable Standard

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

8.5.2 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.

8.5.3 Test Configuration

Test according to clause 6.2 radio frequency test setup

8.5.4 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<150KHz(9KHz to 150KHz), 9KHz for <30MHz
(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 ≥ 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 ≥ 98 percent, set VBW ≤ RBW/100 (i.e., 10 kHz) but not less than 10 Hz.
• If the EUT duty cycle is < 98 percent, set VBW ≥ 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.

8.5.5 Test Results

The voltage AC120V and the modes 802.11a/n/ac has been tested and the worst result recorded as below

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

Test mode: 802.11a Frequency(MHz): 5180

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
11975.09	V	58.15	-37.08	-27	-10.08
15003.42	V	57.91	-37.32	-27	-10.32
18000.00	V	64.28	-30.95	-27	-3.95
11975.09	H	58.15	-37.08	-27	-10.08
14366.84	H	58.27	-36.96	-27	-9.96
18000.00	H	64.33	-30.9	-27	-3.9

Test mode: 802.11a Frequency(MHz): 5200

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
12079.38	V	57.94	-37.29	-27	-10.29
14491.95	V	58.34	-36.89	-27	-9.89
18000.00	V	64.47	-30.76	-27	-3.76
11975.09	H	58.15	-37.08	-27	-10.08
14366.84	H	58.27	-36.96	-27	-9.96
18000.00	H	64.61	-30.62	-27	-3.62

Test mode: 802.11a Frequency(MHz): 5240

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
12079.38	V	57.94	-37.29	-27	-10.29
14491.95	V	58.34	-36.89	-27	-9.89
18000.00	V	64.47	-30.76	-27	-3.76
12079.38	H	57.94	-37.29	-27	-10.29
14491.95	H	58.34	-36.89	-27	-9.89
18000.00	H	64.63	-30.6	-27	-3.6

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: 5180							
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin (dB)	
		PK	AV	PK	AV	PK	AV
11975.09	V	58.15	42.30	74	54	-15.85	-11.70
15003.42	V	57.91	41.50	74	54	-16.09	-12.50
18000.00	V	64.28	48.60	74	54	-9.72	-5.40
11975.09	H	58.15	42.30	74	54	-15.85	-11.70
14366.84	H	58.27	41.80	74	54	-15.73	-12.20
18000.00	H	64.33	48.30	74	54	-9.67	-5.70

Frequency: 5200							
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin (dB)	
		PK	AV	PK	AV	PK	AV
12079.38	V	57.94	40.60	74	54	-16.06	-13.40
14491.95	V	58.34	41.80	74	54	-15.66	-12.20
18000.00	V	64.47	48.60	74	54	-9.53	-5.40
11975.09	H	58.15	41.30	74	54	-15.85	-12.70
14366.84	H	58.27	41.50	74	54	-15.73	-12.50
18000.00	H	64.61	47.90	74	54	-9.39	-6.10

Frequency: 5240							
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin (dB)	
		PK	AV	PK	AV	PK	AV
12079.38	V	57.94	40.60	74	54	-16.06	-13.40
14491.95	V	58.34	41.80	74	54	-15.66	-12.20
18000.00	V	64.47	47.90	74	54	-9.53	-6.10
12079.38	H	57.94	41.50	74	54	-16.06	-12.50
14491.95	H	58.34	42.30	74	54	-15.66	-11.70
18000.00	H	64.63	47.80	74	54	-9.37	-6.20

Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(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: 802.11a Frequency(MHz): 5180

Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5147.725	H	61.89	-33.31	-27	Pass
5121.465	V	61.47	-33.73	-27	Pass

Test mode: 802.11a Frequency(MHz): 5240

Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5352.299	H	64.36	-30.84	-27	Pass
5353.086	V	62.59	-32.61	-27	Pass

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

Test mode: 802.11a Frequency(MHz): 5180

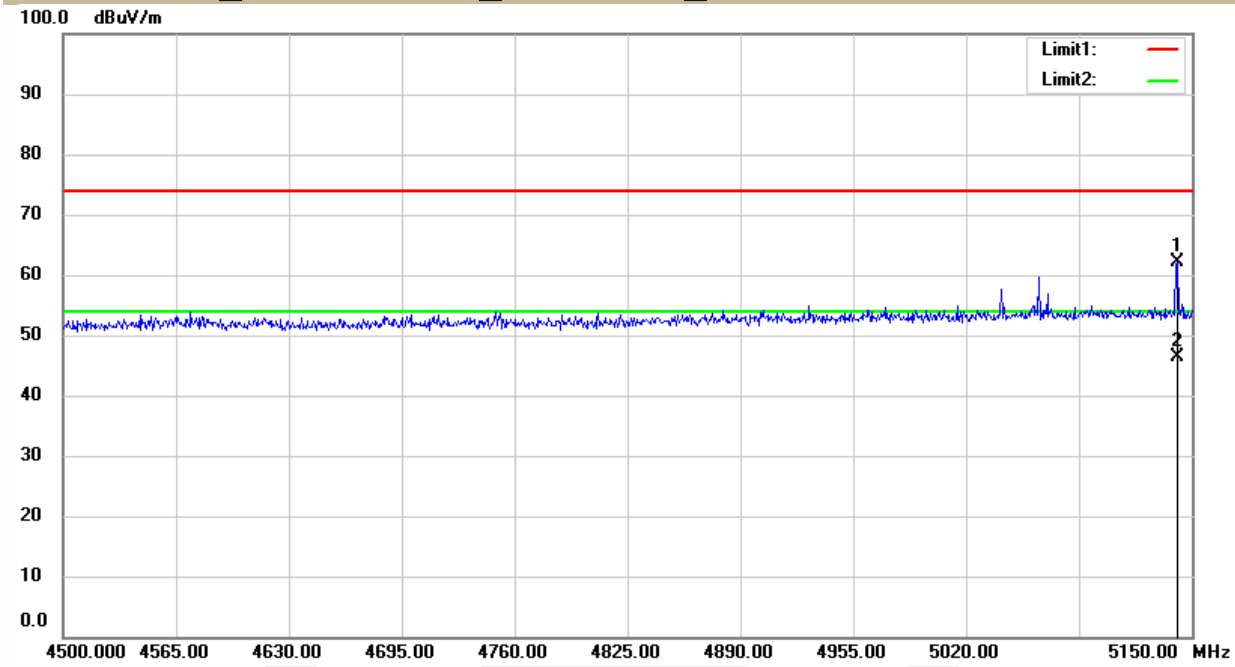
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
5096.050	V	58.52	74	42.30	54
5141.550	H	62.01	74	46.50	54

Test mode: 802.11a Frequency(MHz): 5240

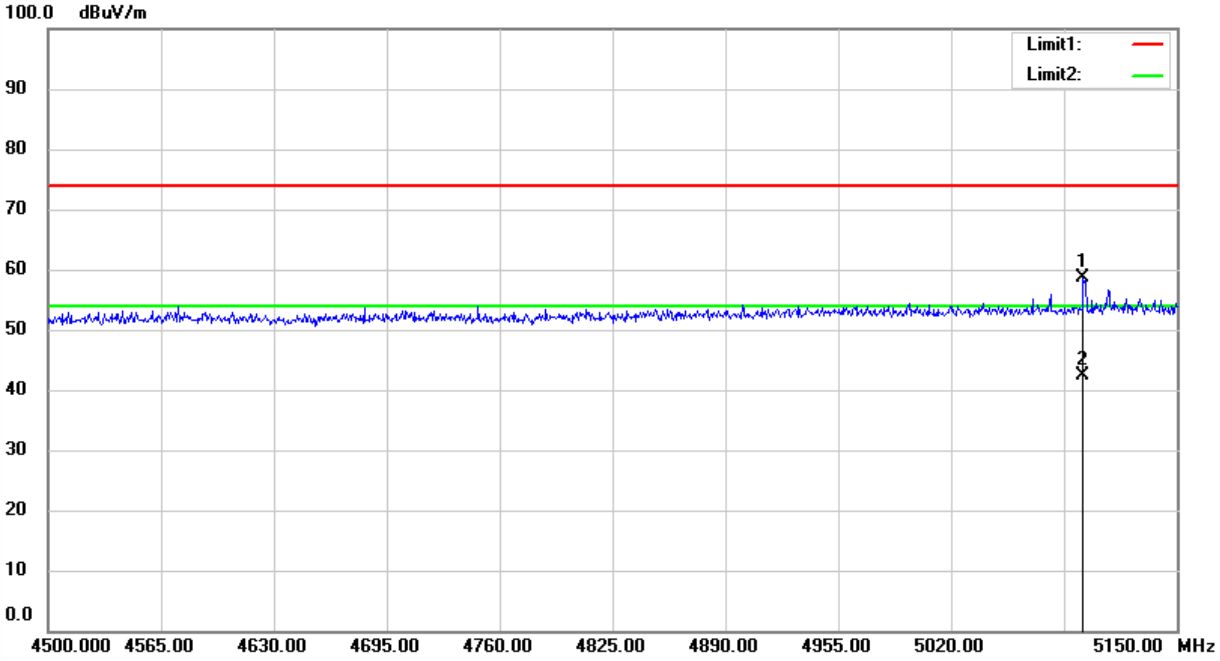
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
5355.390	V	55.54	74	38.60	54
5356.710	H	55.49	74	38.70	54

Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4)Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

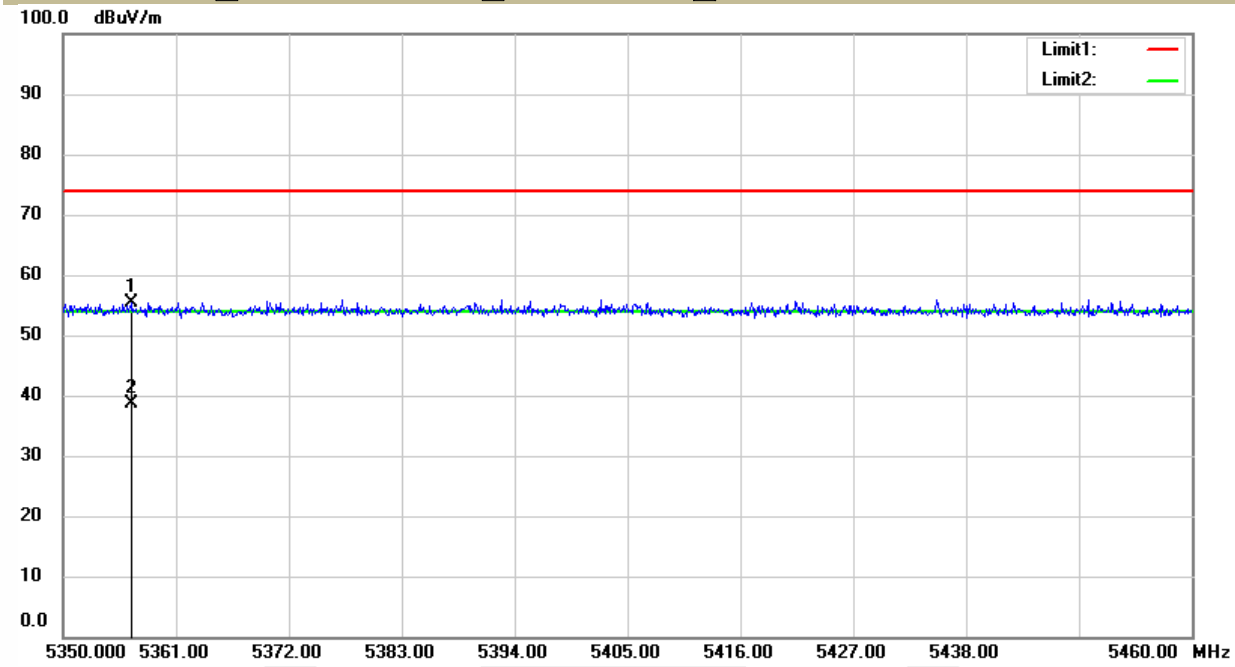
Test Model	U-NII - 1 Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5180 ☐5200 ☐5240 Ant.Pol H



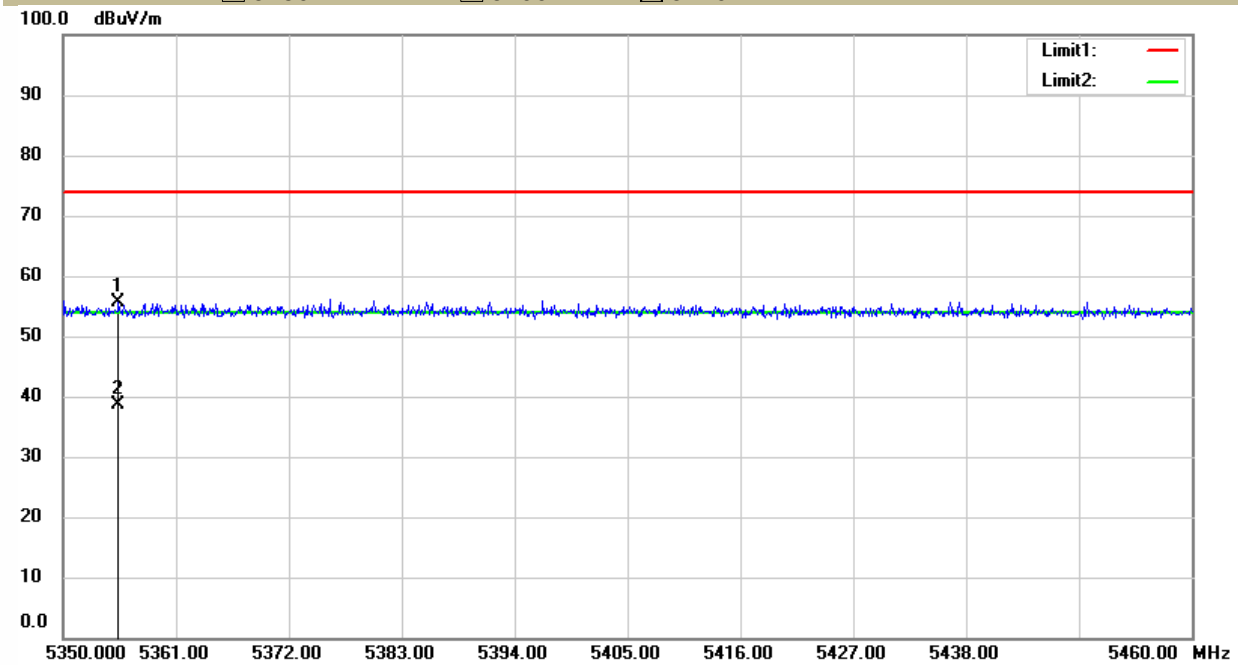
Test Model	U-NII - 1 Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5180 ☐5200 ☐5240 Ant.Pol V



Test Model	U-NII - 1 Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☐5180 ☐5200 ☒5240 Ant.Pol H



Test Model	U-NII - 1 Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☐5180 ☐5200 ☒5240 Ant.Pol V



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

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

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

Test mode: 802.11a Frequency(MHz): 5745

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
12184.58	V	57.64	-37.59	-27	-10.59
14408.42	V	58.83	-36.4	-27	-9.4
17948.04	V	64.17	-31.06	-27	-4.06
12079.38	H	57.94	-37.29	-27	-10.29
14491.95	H	58.34	-36.89	-27	-9.89
18000.00	H	64.63	-30.6	-27	-3.6

Test mode: 802.11a Frequency(MHz): 5785

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
11975.09	V	57.95	-37.28	-27	-10.28
14491.95	V	58.49	-36.74	-27	-9.74
18000.00	V	64.92	-30.31	-27	-3.31
11975.09	H	57.40	-37.83	-27	-10.83
14491.95	H	57.93	-37.3	-27	-10.3
17948.04	H	64.47	-30.76	-27	-3.76

Test mode: 802.11a Frequency(MHz): 5825

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
12114.35	V	57.27	-37.96	-27	-10.96
13757.26	V	58.02	-37.21	-27	-10.21
18000.00	V	64.05	-31.18	-27	-4.18
12044.52	H	57.51	-37.72	-27	-10.72
14960.12	H	58.63	-36.6	-27	-9.6
17948.04	H	64.51	-30.72	-27	-3.72

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: 802.11a				Frequency(MHz): 5745			
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	AV	Limit 3m(dBuV/m) PK	AV	Margin (dB) PK	AV
12184.58	V	57.64	40.60	74	54	-16.36	-13.40
14408.42	V	58.83	41.50	74	54	-15.17	-12.50
17948.04	V	64.17	47.60	74	54	-9.83	-6.40
12079.38	H	57.94	40.70	74	54	-16.06	-13.30
14491.95	H	58.34	41.20	74	54	-15.66	-12.80
18000.00	H	64.63	48.10	74	54	-9.37	-5.90

Frequency: 802.11a				Frequency(MHz): 5785			
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	AV	Limit 3m(dBuV/m) PK	AV	Margin (dB) PK	AV
11975.09	V	57.95	41.30	74	54	-16.05	-12.70
14491.95	V	58.49	42.30	74	54	-15.51	-11.70
18000.00	V	64.92	48.20	74	54	-9.08	-5.80
11975.09	H	57.40	40.50	74	54	-16.60	-13.50
14491.95	H	57.93	41.70	74	54	-16.07	-12.30
17948.04	H	64.47	47.50	74	54	-9.53	-6.50

Frequency: 802.11a				Frequency(MHz): 5825			
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	AV	Limit 3m(dBuV/m) PK	AV	Margin (dB) PK	AV
12114.35	V	57.27	40.60	74	54	-16.73	-13.40
13757.26	V	58.02	41.70	74	54	-15.98	-12.30
18000.00	V	64.05	48.50	74	54	-9.95	-5.50
12044.52	H	57.51	40.20	74	54	-16.49	-13.80
14960.12	H	58.63	41.30	74	54	-15.37	-12.70
17948.04	H	64.51	48.30	74	54	-9.49	-5.70

Note: (1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(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.

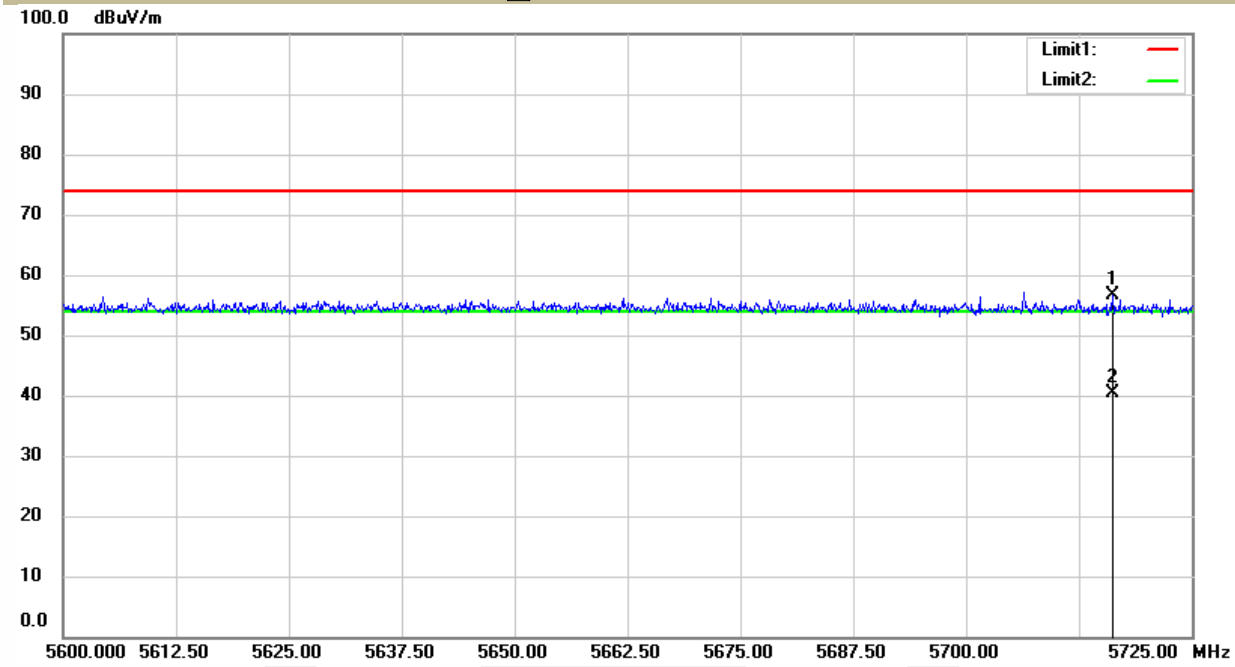
- ☒ Undesirable radiated Spurious Emission in band edge

Test mode:	802.11a	Frequency:	5745		
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5714.625	V	56.19	-39.04	-27	PASS
5716.250	H	56.52	-38.71	-27	PASS

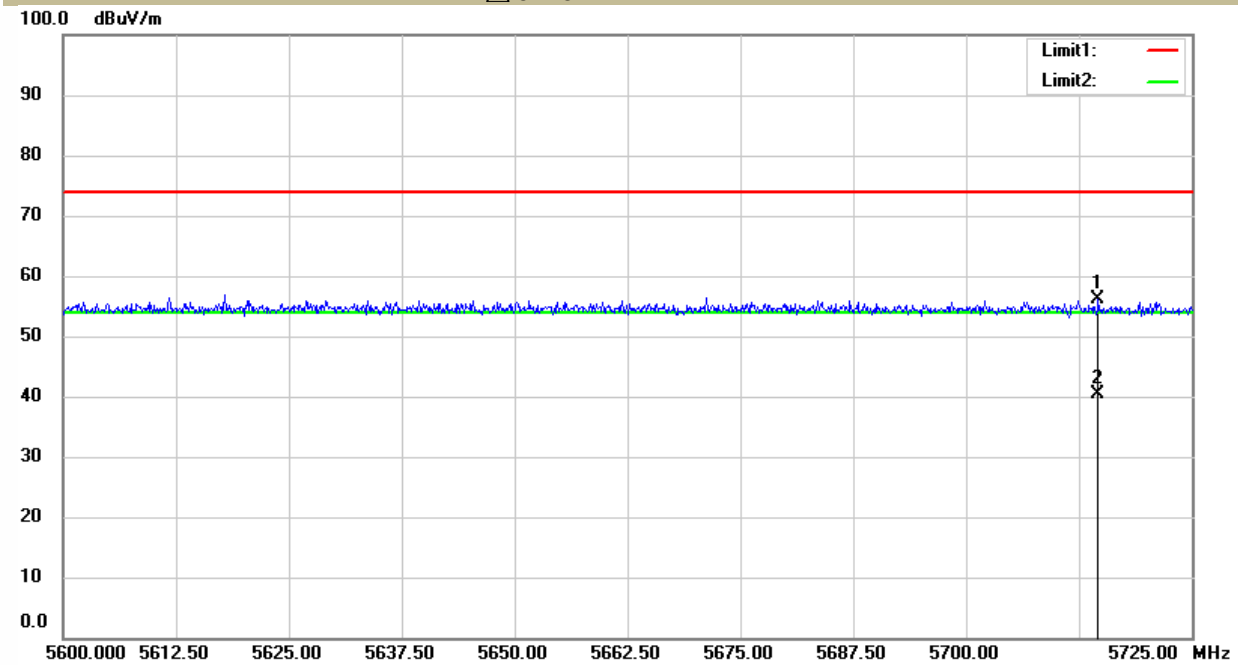
Test mode:	802.11a	Frequency:	5825		
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5858.375	V	55.87	-39.36	-27	PASS
5854.500	H	55.76	-39.47	-27	PASS

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

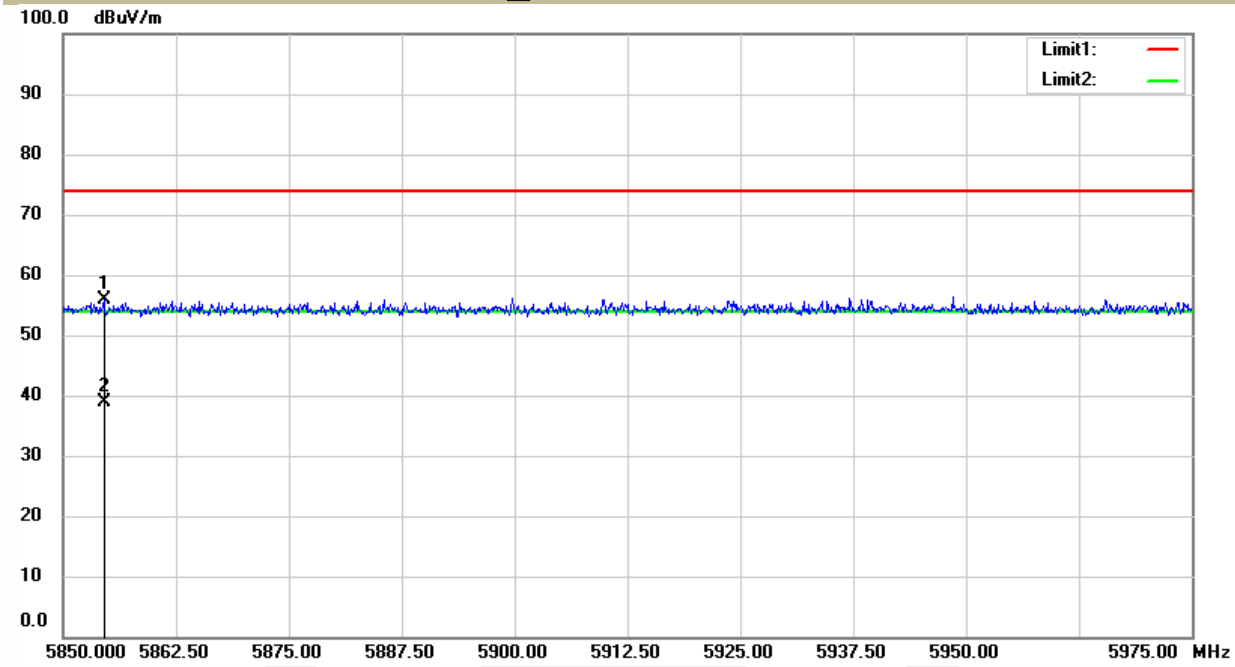
Test Model	U-NII -3 Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5745 Ant.Pol H



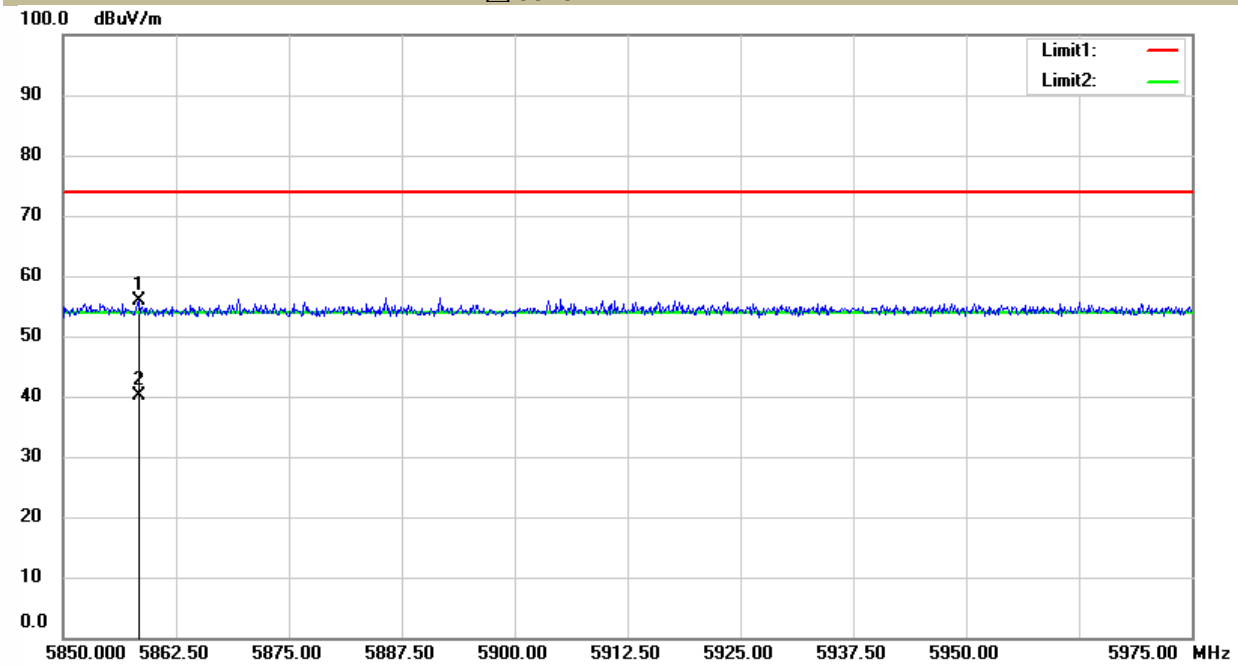
Test Model	U-NII -3 Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5745 Ant.Pol V



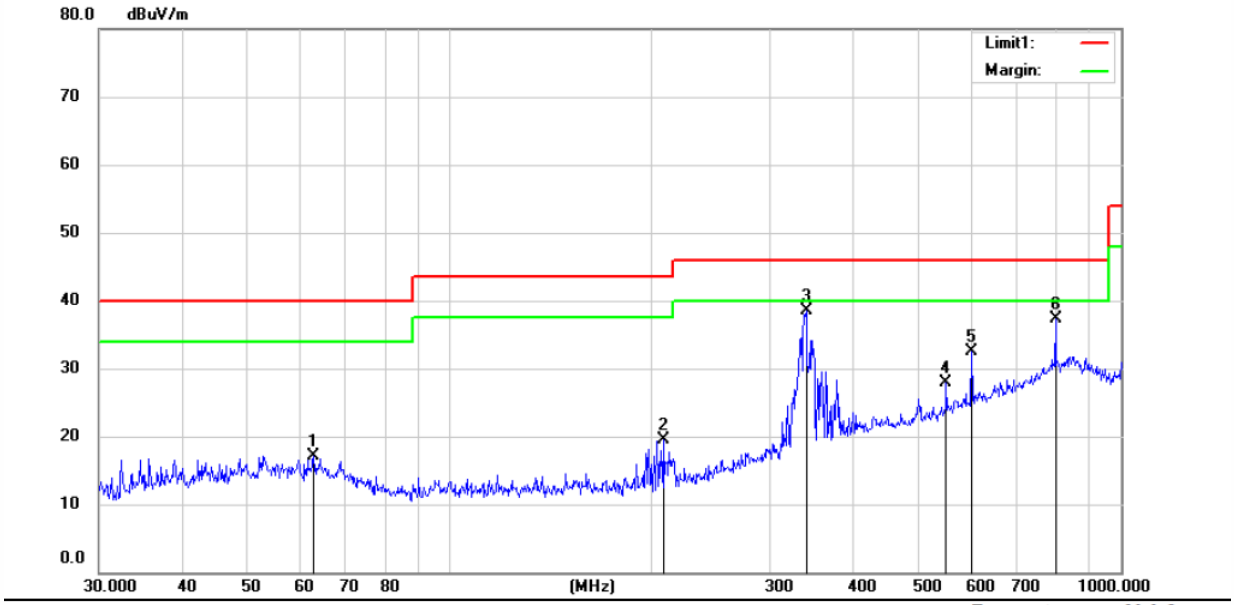
Test Model	U-NII -3 Undesirable radiated Undesirable radiated Spurious Emission in Band Edge ☒802.11a ☐802.11n(HT20) ☐802.11n(HT40) ☒5825 Ant.Pol H



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

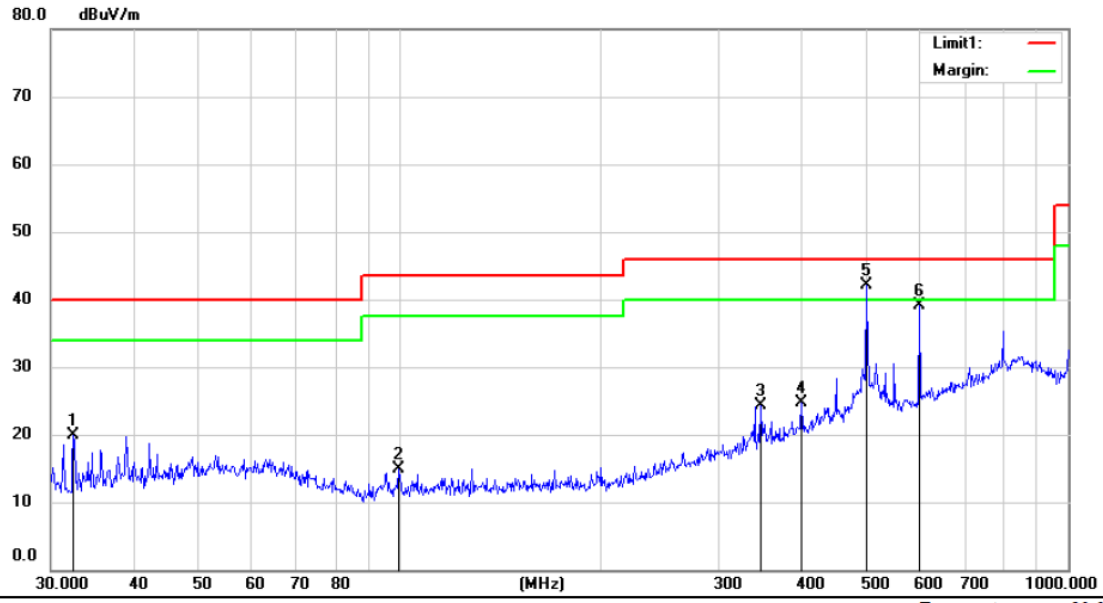


- Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)
  All the modes 802.11a/n/ac has been tested and the worst result 802.11ac recorded as below:



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 23.8 C
Limit: (RE)FCC PART 15 CLASS B Power: DC 5V Humidity: 39 %
Mode:WIFI5G 5180
Note:

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	Comment
1		62.8157	29.09	-12.05	17.04	40.00	-22.96	QP			
2		208.3062	33.02	-13.53	19.49	43.50	-24.01	QP			
3	*	340.0356	46.28	-7.79	38.49	46.00	-7.51	QP			
4		549.9830	31.93	-4.03	27.90	46.00	-18.10	QP			
5		600.1100	35.26	-2.84	32.42	46.00	-13.58	QP			
6		800.0310	35.35	1.97	37.32	46.00	-8.68	QP			

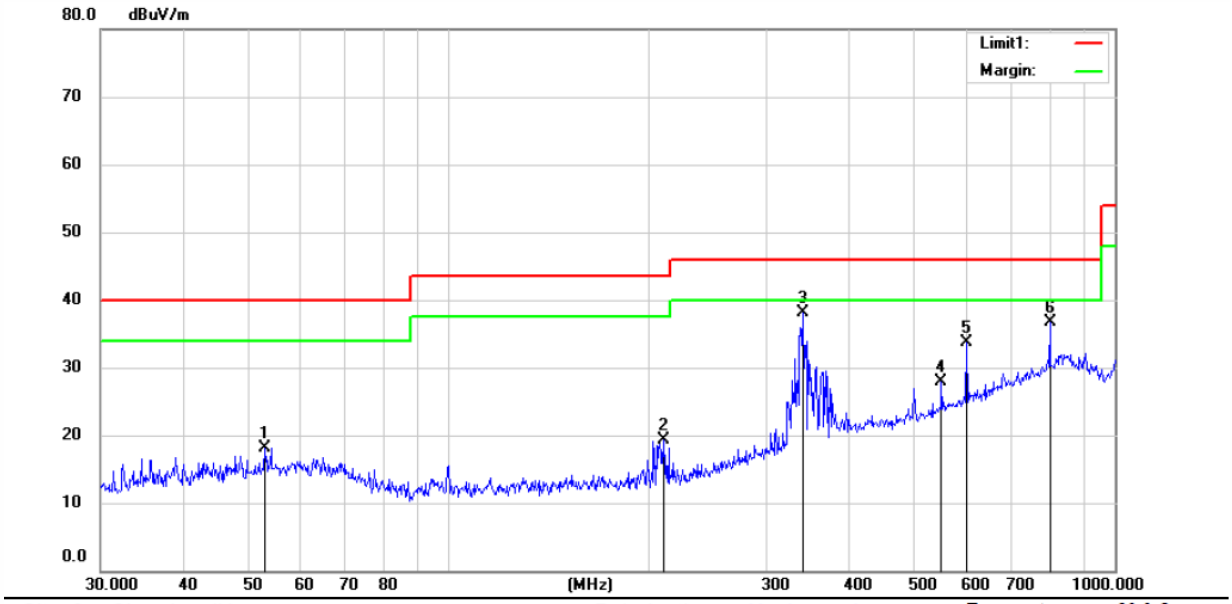


Site 3m Chamber #1
Limit: (RE)FCC PART 15 CLASS B
Mode:WIFI5G 5180
Note:

Polarization: *Vertical*
Power: DC 5V

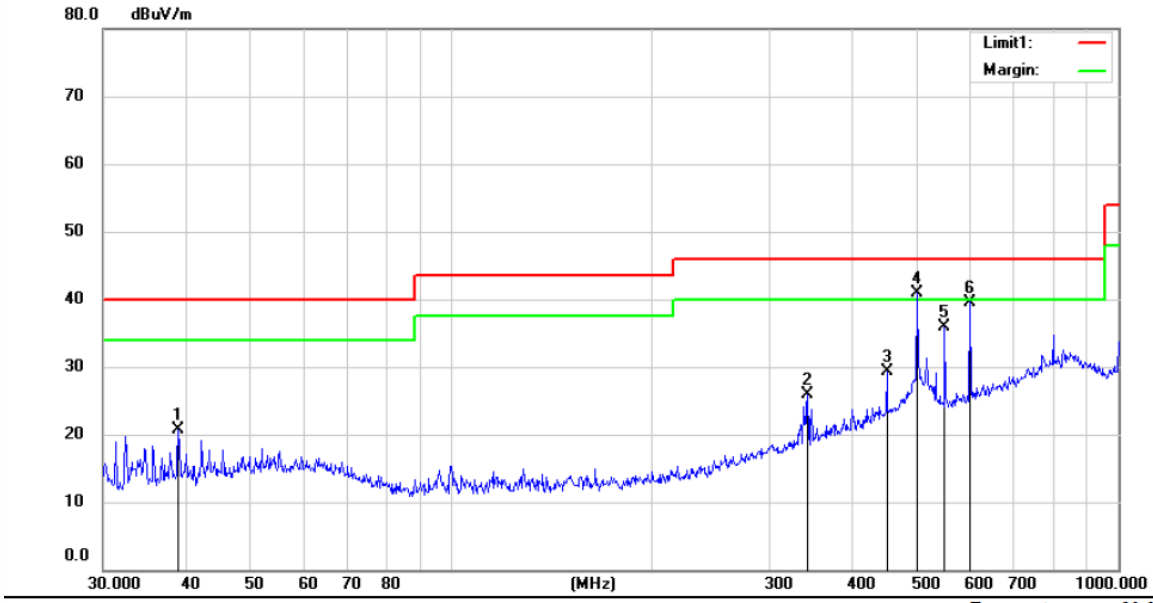
Temperature: 23.8 C
Humidity: 39 %

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	Comment
1		32.4628	34.32	-14.39	19.93	40.00	-20.07	QP			
2		99.7902	29.66	-14.76	14.90	43.50	-28.60	QP			
3		346.9612	31.99	-7.70	24.29	46.00	-21.71	QP			
4		400.0810	31.09	-6.35	24.74	46.00	-21.26	QP			
5	*	500.0818	46.95	-4.93	42.02	46.00	-3.98	QP			
6		600.1100	41.92	-2.84	39.08	46.00	-6.92	QP			



Site 3m Chamber #1
Polarization: *Horizontal*
Temperature: 23.8 C
Limit: (RE)FCC PART 15 CLASS B
Power: DC 5V
Humidity: 39 %
Mode:WIFI5G 5200
Note:

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	Comment
1		53.0382	29.97	-11.86	18.11	40.00	-21.89	QP			
2		210.6013	32.77	-13.43	19.34	43.50	-24.16	QP			
3	*	339.5888	45.92	-7.81	38.11	46.00	-7.89	QP			
4		549.9830	31.84	-4.03	27.81	46.00	-18.19	QP			
5		600.1100	36.48	-2.84	33.64	46.00	-12.36	QP			
6		800.0310	34.81	1.97	36.78	46.00	-9.22	QP			



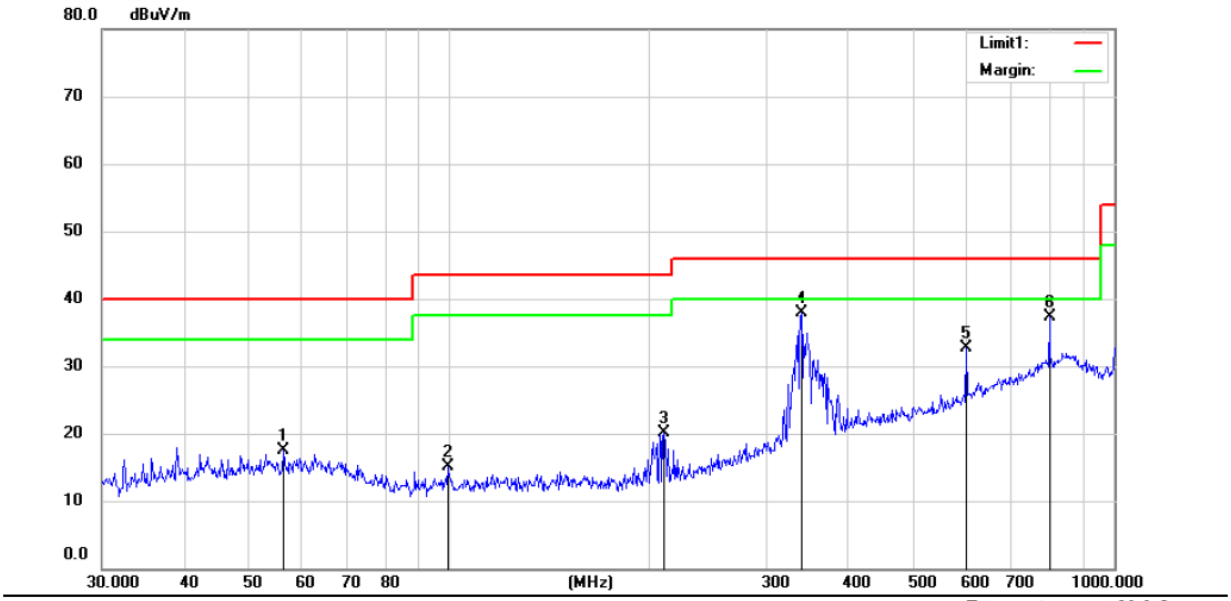
Site 3m Chamber #1 Polarization: *Vertical* Temperature: 23.8 C

Limit: (RE)FCC PART 15 CLASS B Power: DC 5V Humidity: 39 %

Mode:WIFI5G 5200

Note:

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	Comment
1		38.9903	33.78	-13.10	20.68	40.00	-19.32	QP			
2		342.4287	33.74	-7.76	25.98	46.00	-20.02	QP			
3		449.9501	35.14	-5.75	29.39	46.00	-16.61	QP			
4	*	500.0818	45.77	-4.93	40.84	46.00	-5.16	QP			
5		549.9830	39.96	-4.03	35.93	46.00	-10.07	QP			
6		600.1100	42.44	-2.84	39.60	46.00	-6.40	QP			

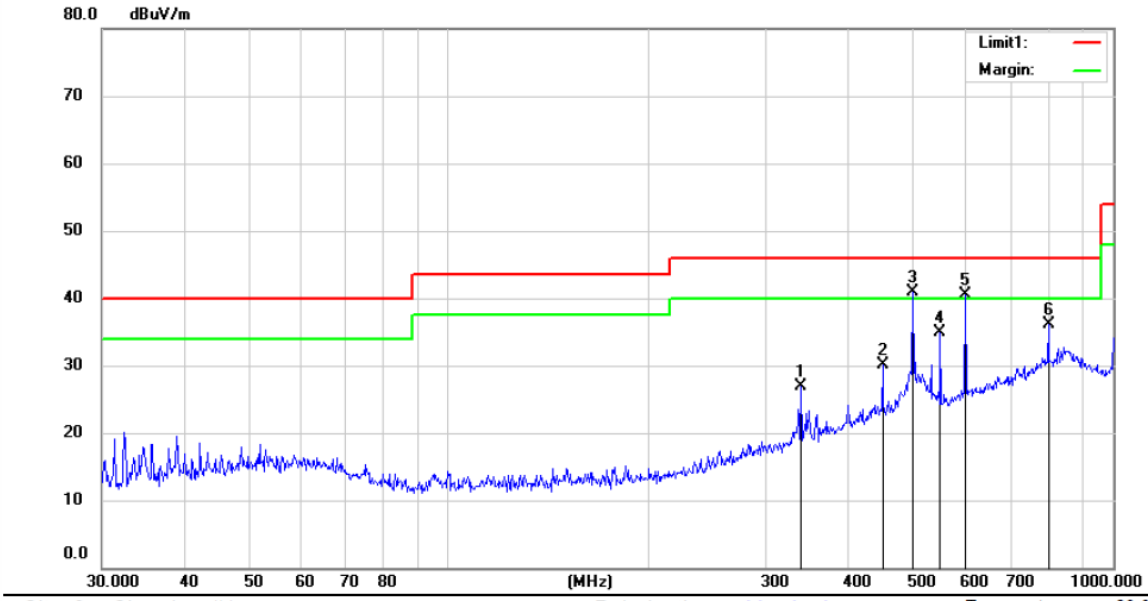


Site 3m Chamber #1
Limit: (RE)FCC PART 15 CLASS B
Mode:WIFI5G 5240
Note:

Polarization: *Horizontal*
Power: DC 5V

Temperature: 23.8 C
Humidity: 39 %

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	Comment
1		56.2467	29.59	-12.03	17.56	40.00	-22.44	QP			
2		99.7464	29.95	-14.76	15.19	43.50	-28.31	QP			
3		210.6937	33.54	-13.43	20.11	43.50	-23.39	QP			
4	*	339.2911	45.70	-7.82	37.88	46.00	-8.12	QP			
5		600.1100	35.48	-2.84	32.64	46.00	-13.36	QP			
6		800.0310	35.37	1.97	37.34	46.00	-8.66	QP			



Site 3m Chamber #1 Polarization: *Vertical* Temperature: 23.8 C

Limit: (RE)FCC PART 15 CLASS B Power: DC 5V Humidity: 39 %

Mode:WIFI5G 5240

Note:

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	Comment
1		338.9940	34.75	-7.84	26.91	46.00	-19.09	QP			
2		450.1474	35.82	-5.75	30.07	46.00	-15.93	QP			
3	*	500.0818	45.89	-4.93	40.96	46.00	-5.04	QP			
4		549.9830	38.90	-4.03	34.87	46.00	-11.13	QP			
5	!	600.1100	43.43	-2.84	40.59	46.00	-5.41	QP			
6		800.0310	34.16	1.97	36.13	46.00	-9.87	QP			

8.6 POWER LINE CONDUCTED EMISSIONS

8.6.1 Applicable Standard

According to FCC Part 15.207(a)

8.6.2 Conformance Limit

Conducted Emission Limit		
Frequency(MHz)	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.

8.6.3 Test Configuration

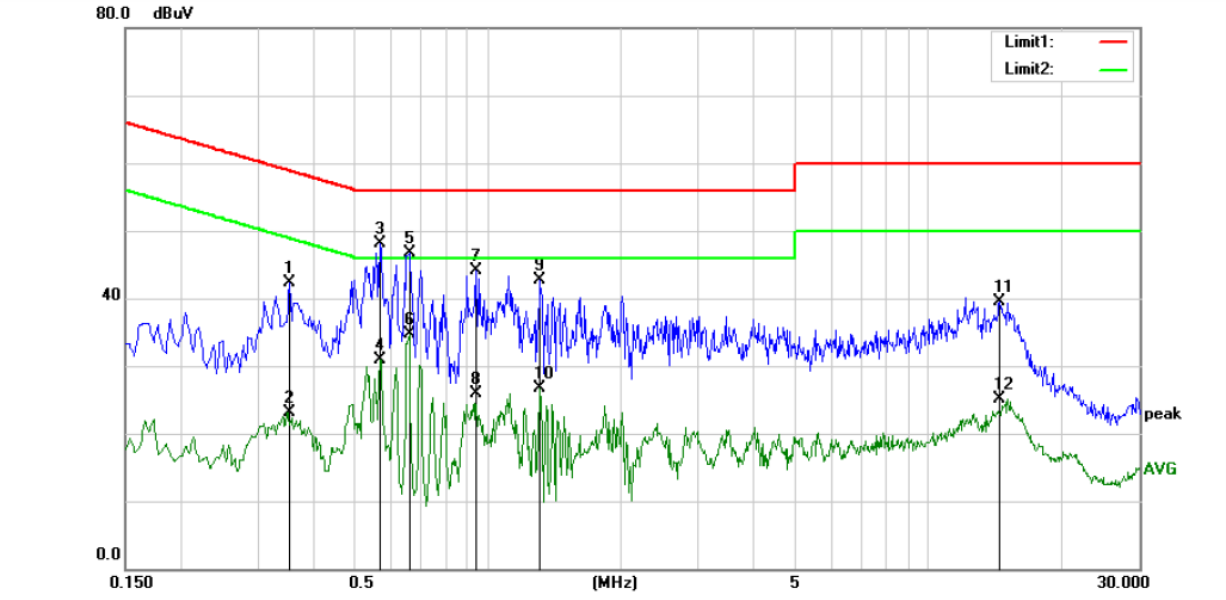
Test according to clause 6.3 conducted emission test setup

8.6.4 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.

8.6.5 Test Results

PASS



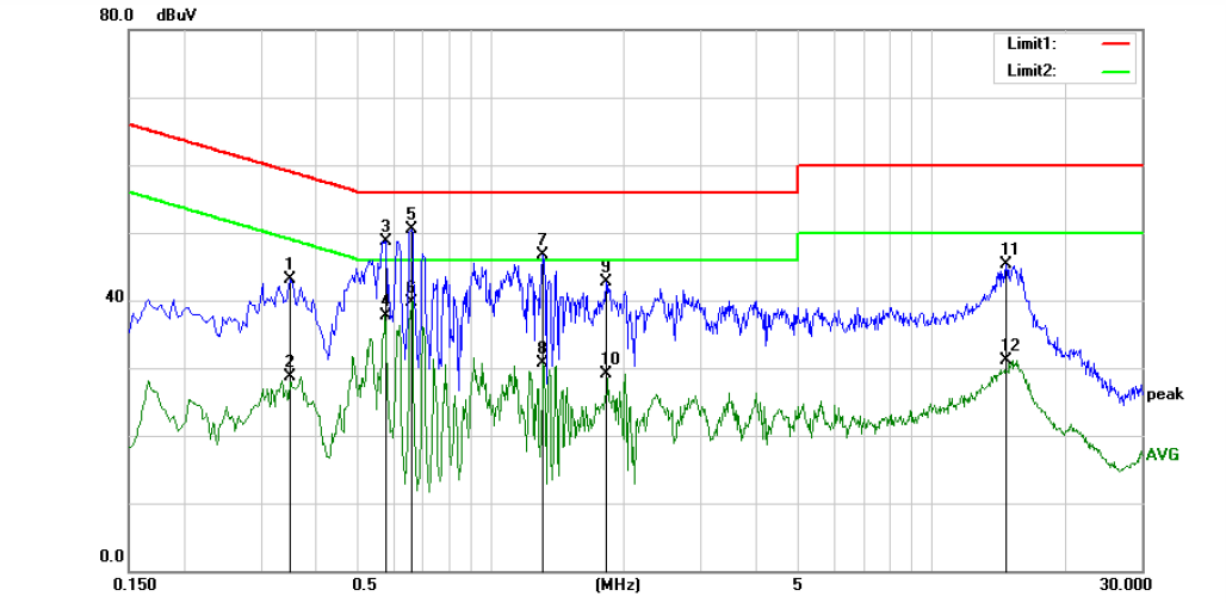
Site Conduction #2 Phase: *N* Temperature: 25.1

Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 45 %

Mode: WIFI mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3540	31.87	10.38	42.25	58.87	-16.62	QP	
2		0.3540	12.79	10.38	23.17	48.87	-25.70	AVG	
3	*	0.5700	37.71	10.35	48.06	56.00	-7.94	QP	
4		0.5700	20.48	10.35	30.83	46.00	-15.17	AVG	
5		0.6620	36.29	10.35	46.64	56.00	-9.36	QP	
6		0.6620	24.30	10.35	34.65	46.00	-11.35	AVG	
7		0.9420	33.80	10.40	44.20	56.00	-11.80	QP	
8		0.9420	15.45	10.40	25.85	46.00	-20.15	AVG	
9		1.3140	32.42	10.38	42.80	56.00	-13.20	QP	
10		1.3140	16.29	10.38	26.67	46.00	-19.33	AVG	
11		14.4580	28.77	10.71	39.48	60.00	-20.52	QP	
12		14.4580	14.34	10.71	25.05	50.00	-24.95	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 mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3500	32.73	10.39	43.12	58.96	-15.84	QP	
2		0.3500	18.31	10.39	28.70	48.96	-20.26	AVG	
3		0.5780	38.43	10.35	48.78	56.00	-7.22	QP	
4		0.5780	27.44	10.35	37.79	46.00	-8.21	AVG	
5	*	0.6580	40.21	10.35	50.56	56.00	-5.44	QP	
6		0.6580	29.45	10.35	39.80	46.00	-6.20	AVG	
7		1.3140	36.35	10.38	46.73	56.00	-9.27	QP	
8		1.3140	20.39	10.38	30.77	46.00	-15.23	AVG	
9		1.8260	32.41	10.34	42.75	56.00	-13.25	QP	
10		1.8260	18.70	10.34	29.04	46.00	-16.96	AVG	
11		14.8180	34.57	10.70	45.27	60.00	-14.73	QP	
12		14.8180	20.41	10.70	31.11	50.00	-18.89	AVG	

8.7 ANTENNA APPLICATION

8.7.1 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.

8.7.2 Result

PASS.

- The EUT has antennas: an Internal Antenna for WIFI 5G, the antenna gain is 3.24 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 --------