8.3 MAXIMUM PEAK POWER DENSITY

8.3.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to 789033 D02 Section II(F)

8.3.2 Conformance Limit

■ For the band 5.15-5.25 GHz,
(a) (1) (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
(a) (1) (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(a) (1) (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(a) (1) (iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

■ For the 5.25-5.35 GHz and 5.47-5.725 GHz bands
(b) (2) the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

■ For the band 5.725-5.85 GHz
(a) (3)For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.3.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.3.4 Test Procedure

Methods refer to FCC KDB 789033

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.l.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections

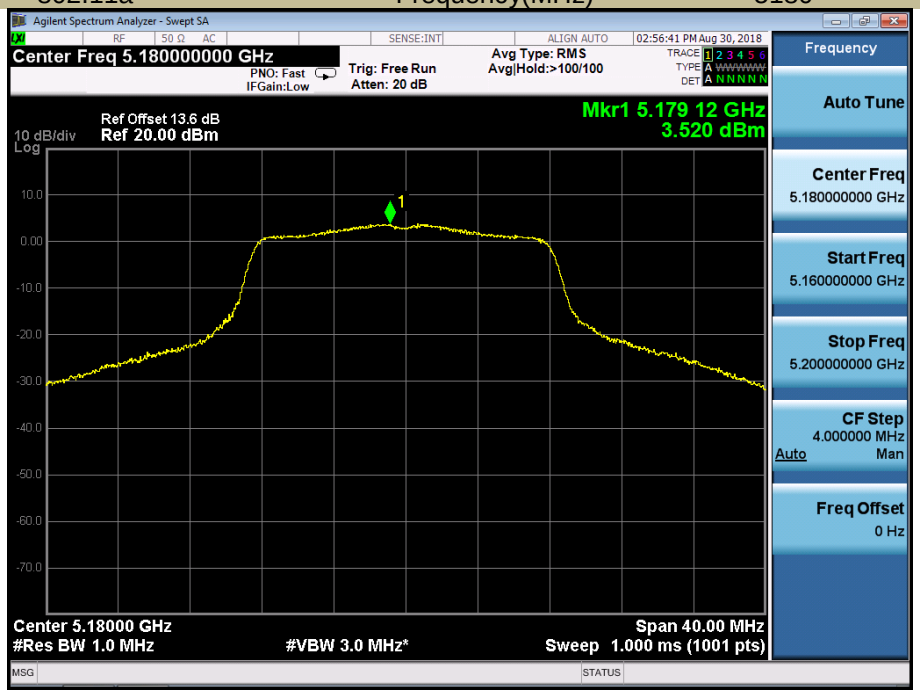
5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

8.3.5 Test Results

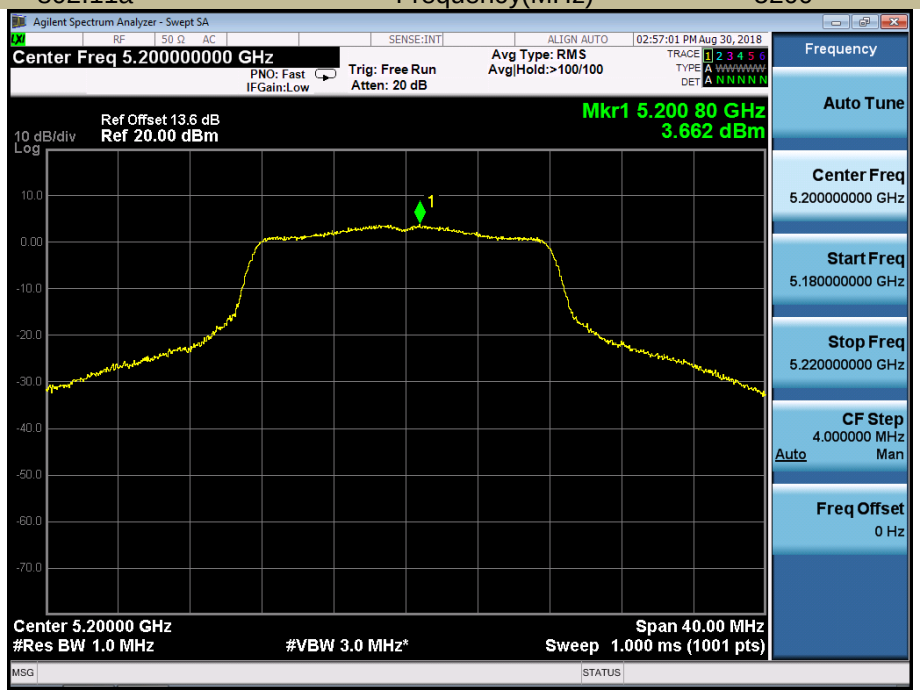
5150-5250MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	3.520	11
	5200	3.662	11
	5240	1.730	11
802.11n-HT20	5180	3.287	11
	5200	3.003	11
	5240	1.522	11
802.11ac(HT20)	5180	3.446	11
	5200	3.187	11
	5240	1.550	11
802.11n-HT40	5190	0.080	11
	5230	-1.013	11
802.11ac(HT40)	5190	-0.220	11
	5230	-1.302	11
802.11ac(HT80)	5210	-3.304	11

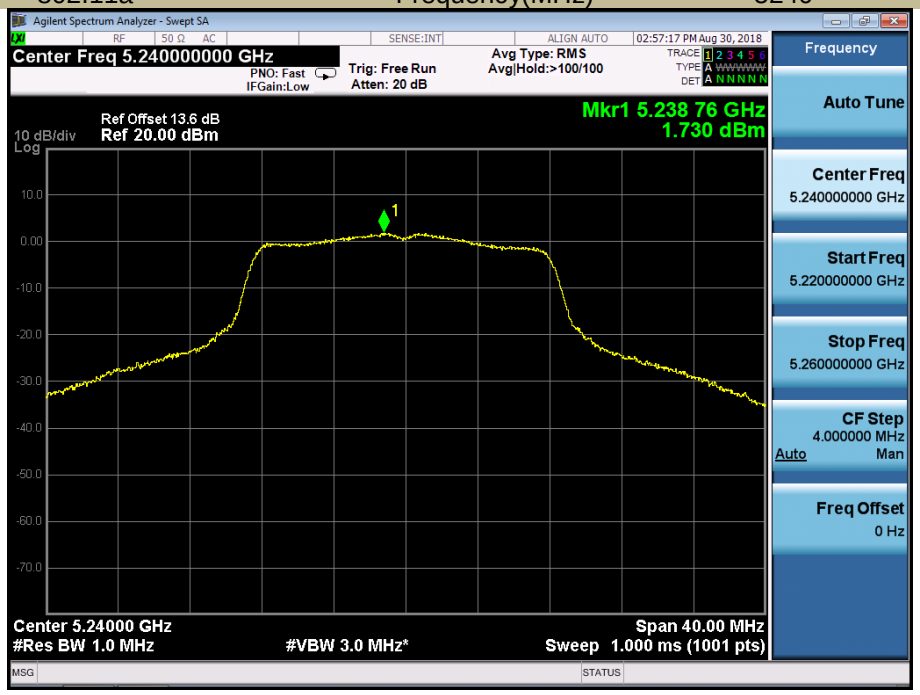
Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5180



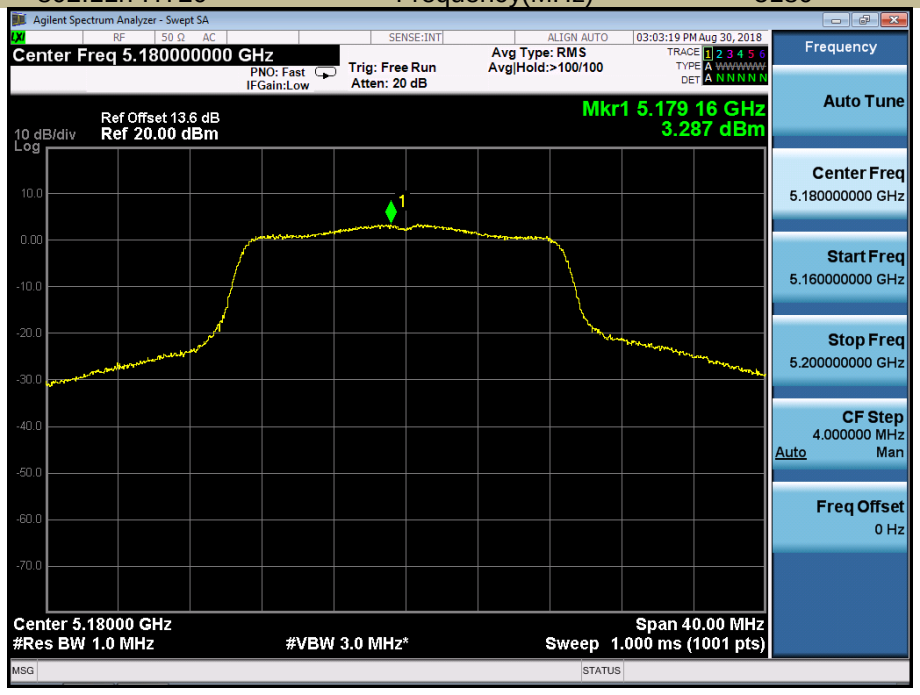
Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5200



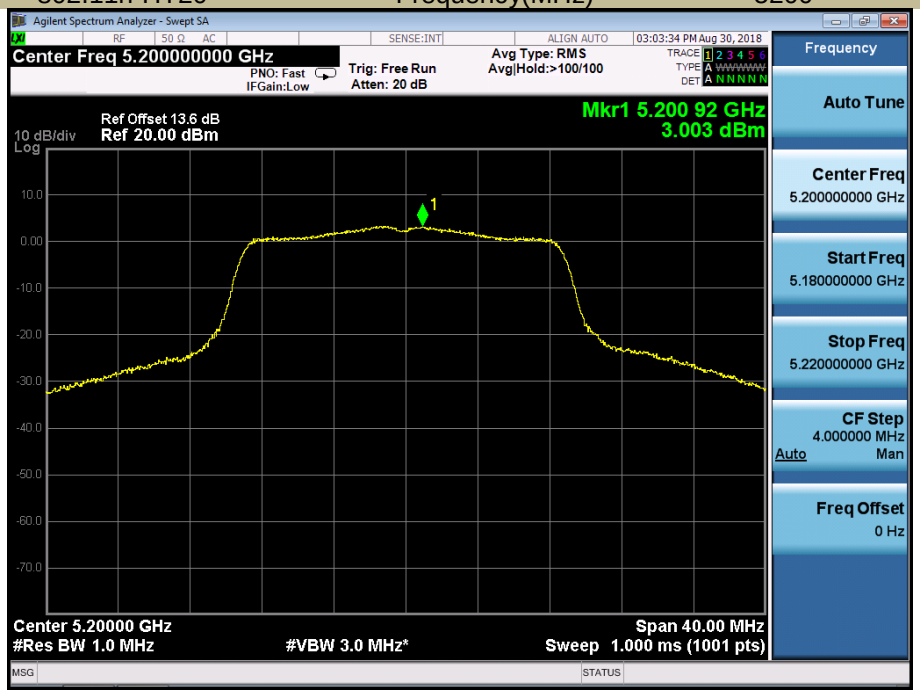
Power Spectral Density		U-NII - 1	
Test Model	802.11a	Frequency(MHz)	5240



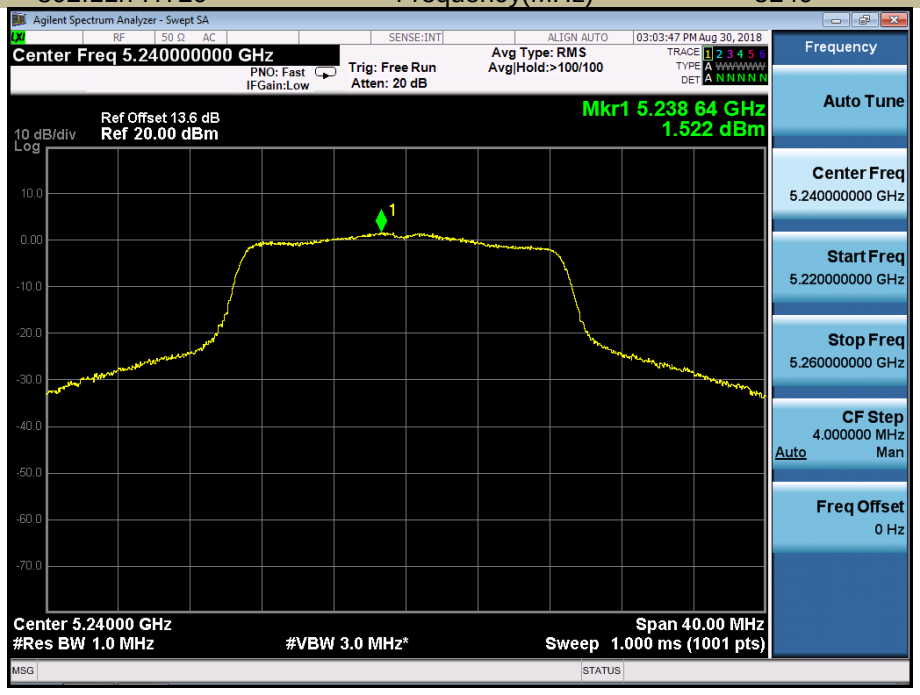
Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5180



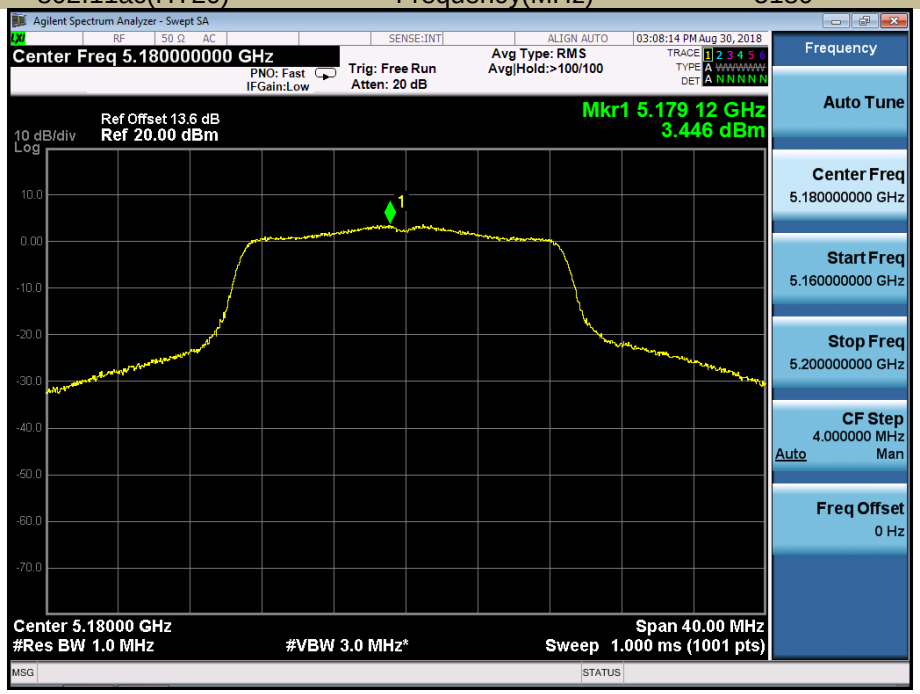
Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5200



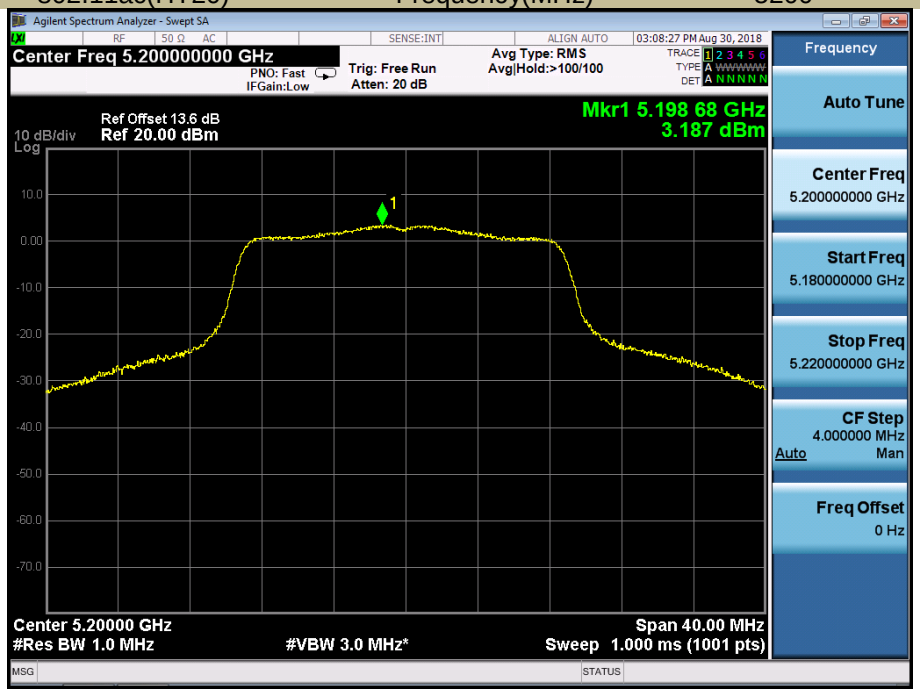
Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT20	Frequency(MHz)	5240



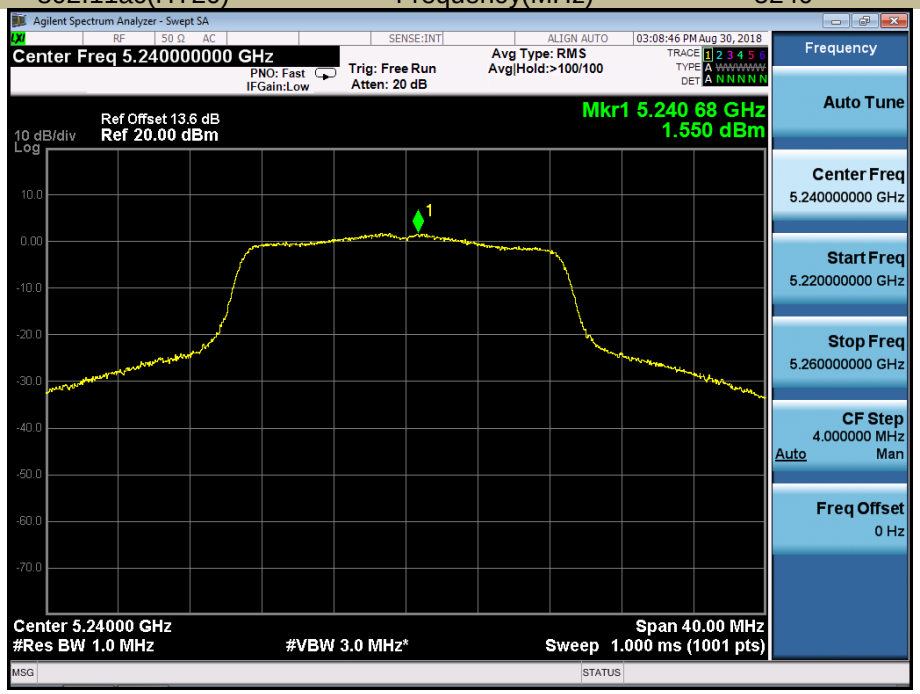
Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT20)	Frequency(MHz)	5180



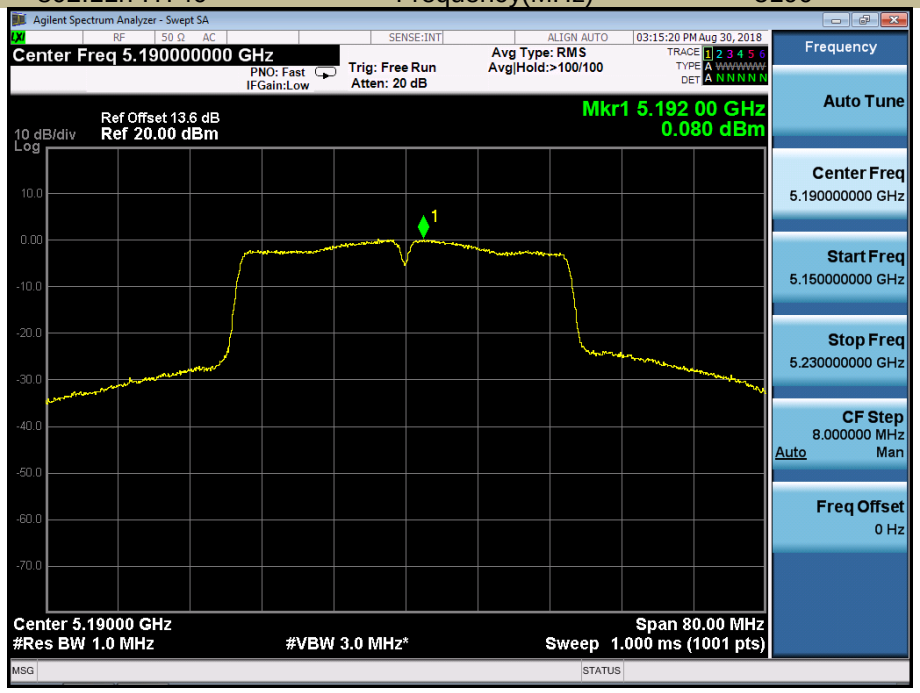
Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT20)	Frequency(MHz)	5200



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

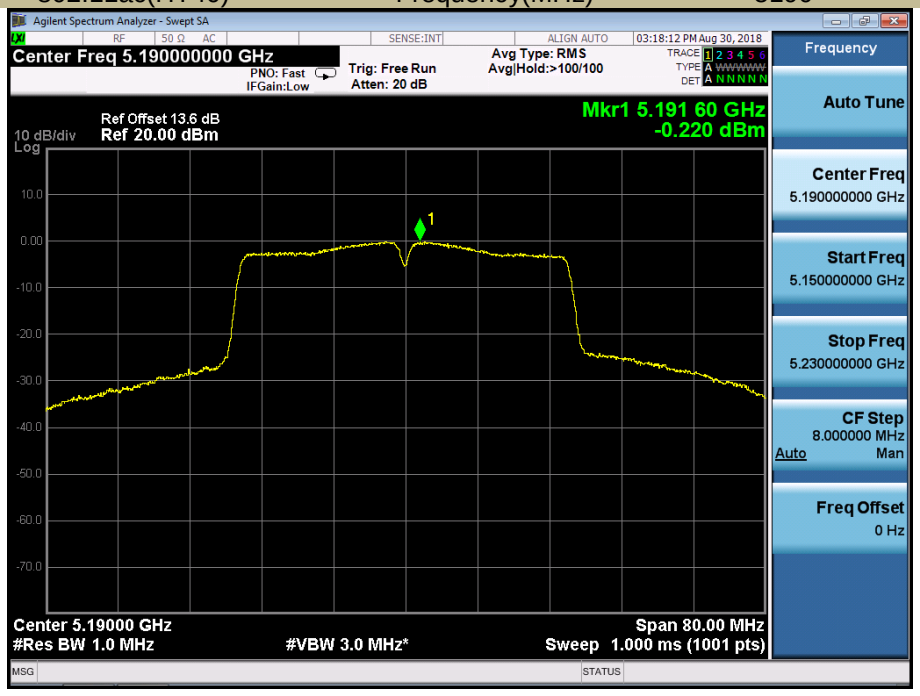


Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT40	Frequency(MHz)	5190

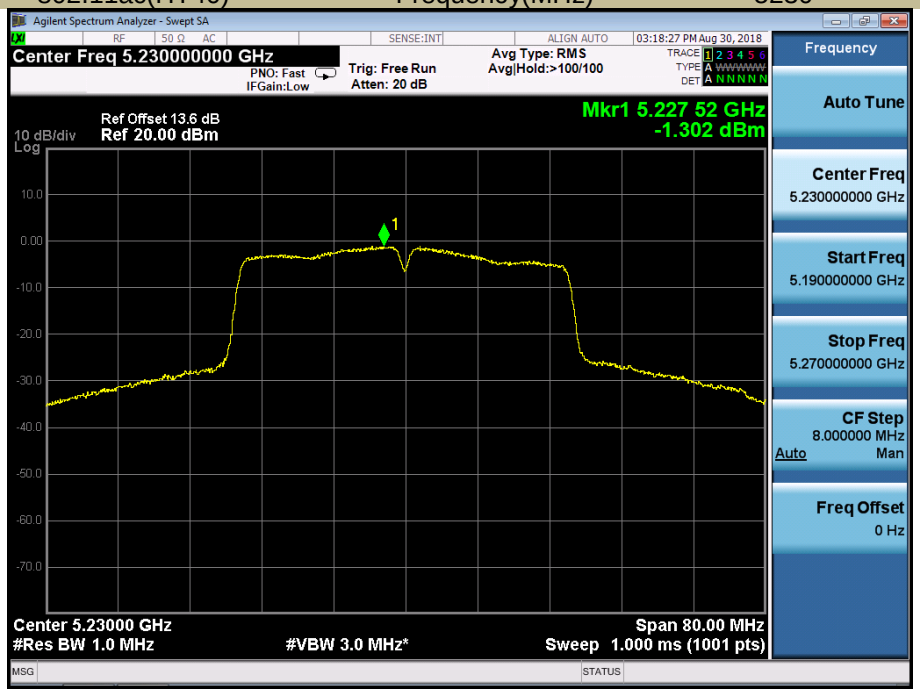


Power Spectral Density		U-NII - 1	
Test Model	802.11n-HT40	Frequency(MHz)	5230

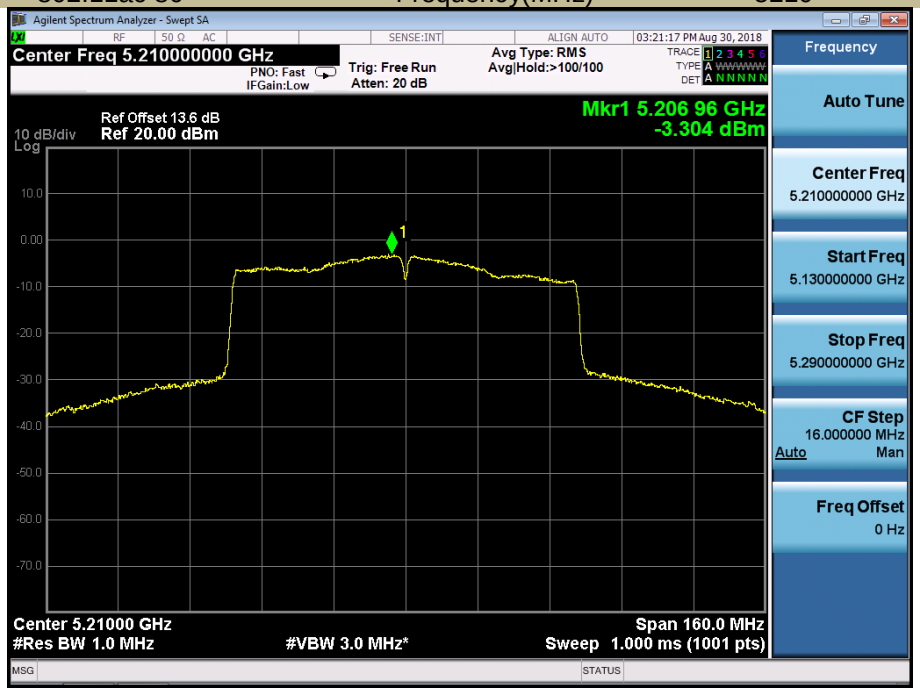
Power Spectral Density		U-NII - 1	
Test Model	802.11ac(HT40)	Frequency(MHz)	5190



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



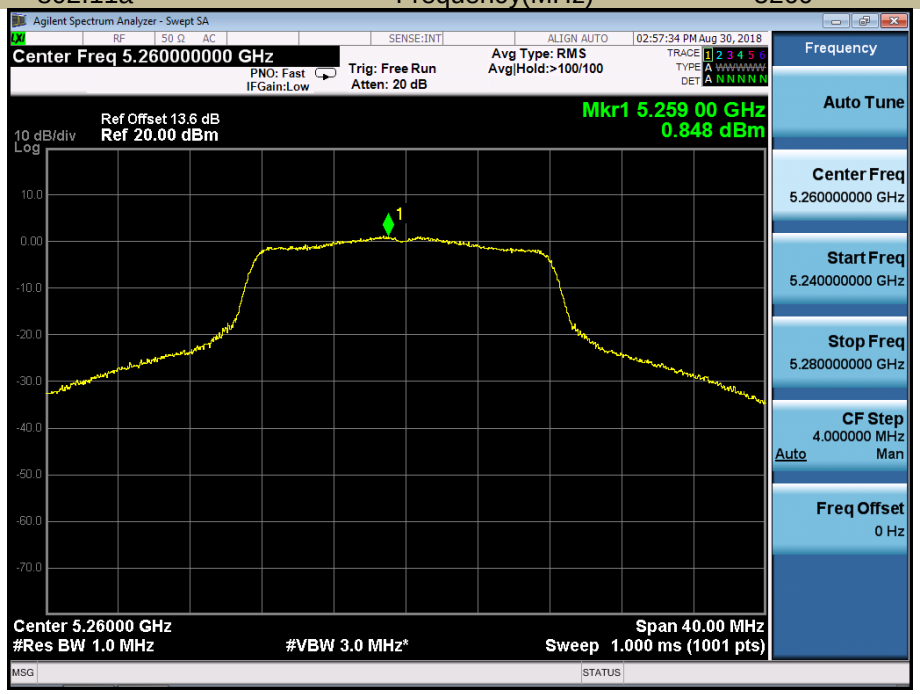
Power Spectral Density		U-NII - 1	
Test Model	802.11ac 80	Frequency(MHz)	5210



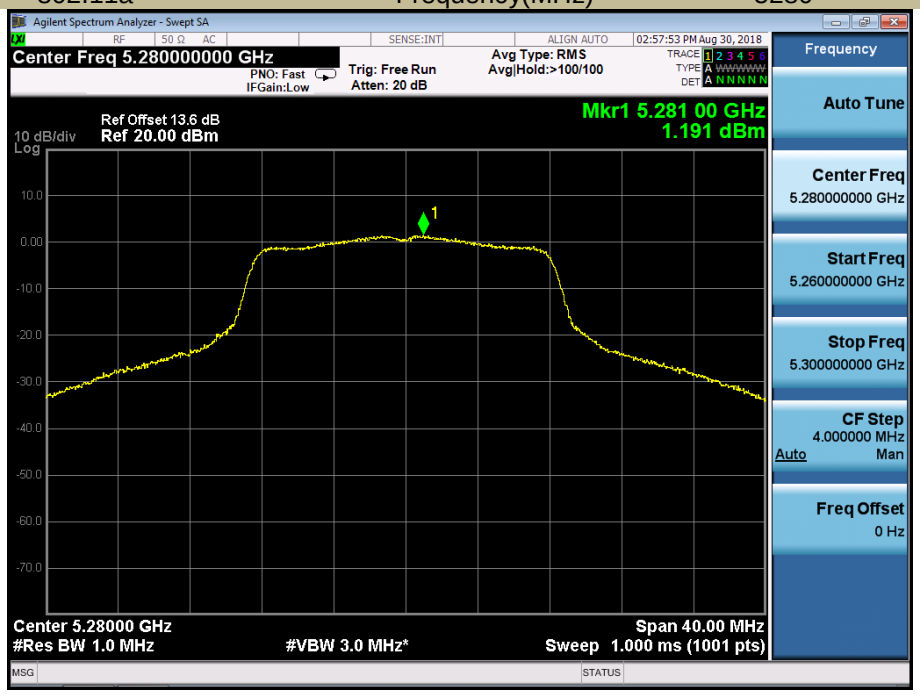
5250-5350MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5260	0.848	11
	5280	1.191	11
	5320	1.685	11
802.11n-HT20	5260	0.817	11
	5280	1.088	11
	5320	0.910	11
802.11ac(HT20)	5260	0.826	11
	5280	1.397	11
	5320	1.010	11
802.11n-HT40	5270	-2.503	11
	5310	-2.158	11
802.11ac(HT40)	5270	-2.422	11
	5310	-1.906	11
802.11ac(HT80)	5290	-5.161	11

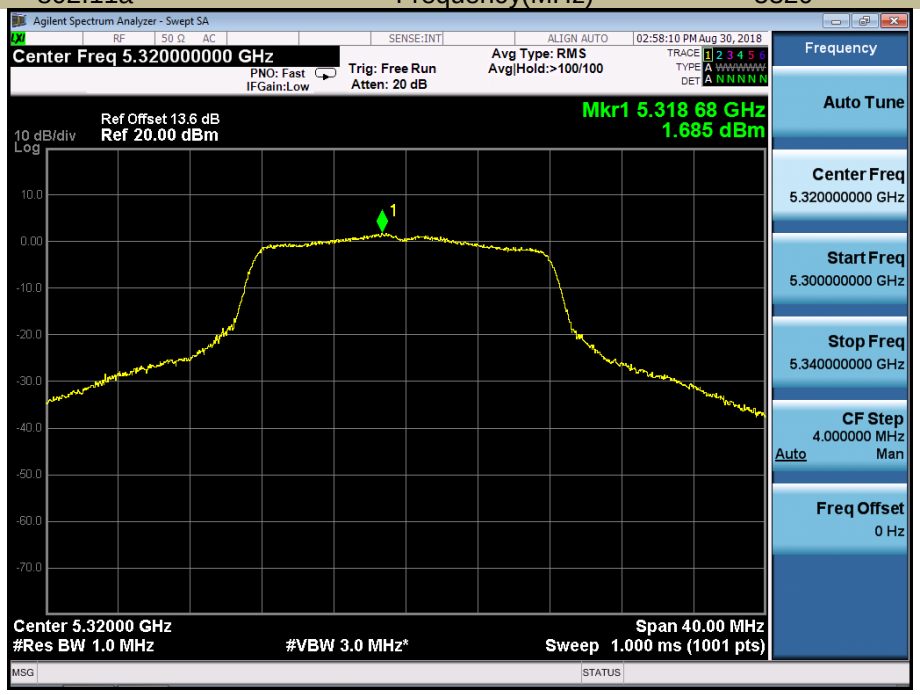
Power Spectral Density		U-NII – 2A	
Test Model	802.11a	Frequency(MHz)	5260



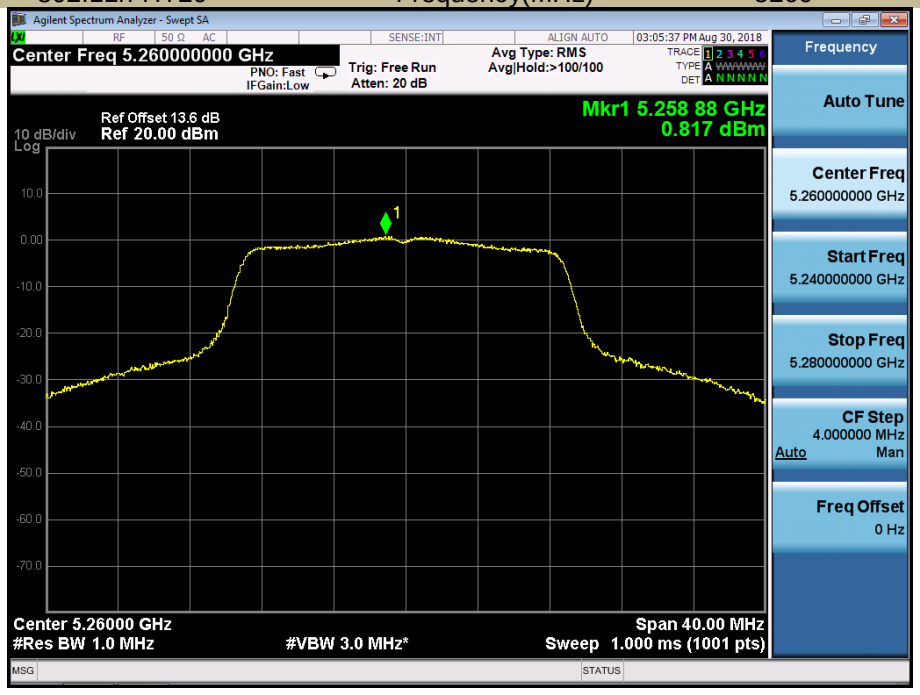
Power Spectral Density		U-NII – 2A	
Test Model	802.11a	Frequency(MHz)	5280



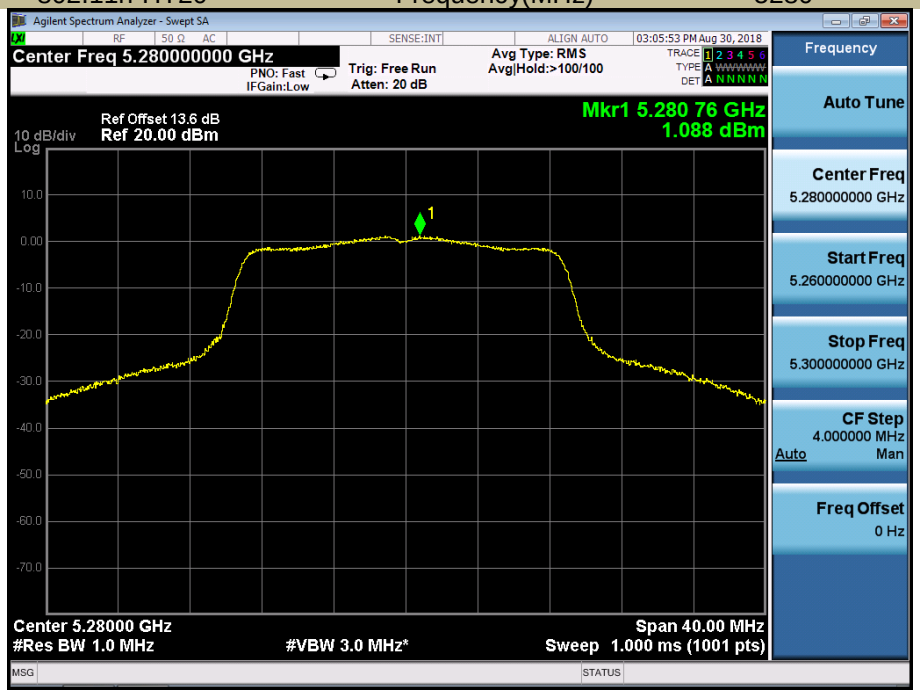
Power Spectral Density		U-NII – 2A	
Test Model	802.11a	Frequency(MHz)	5320



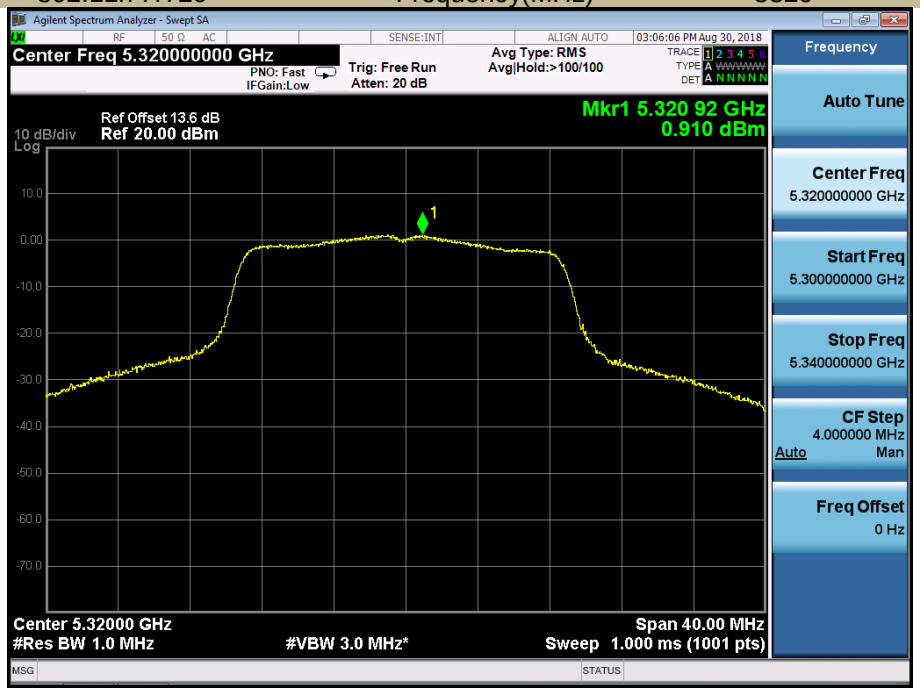
Power Spectral Density		U-NII – 2A	
Test Model	802.11n-HT20	Frequency(MHz)	5260



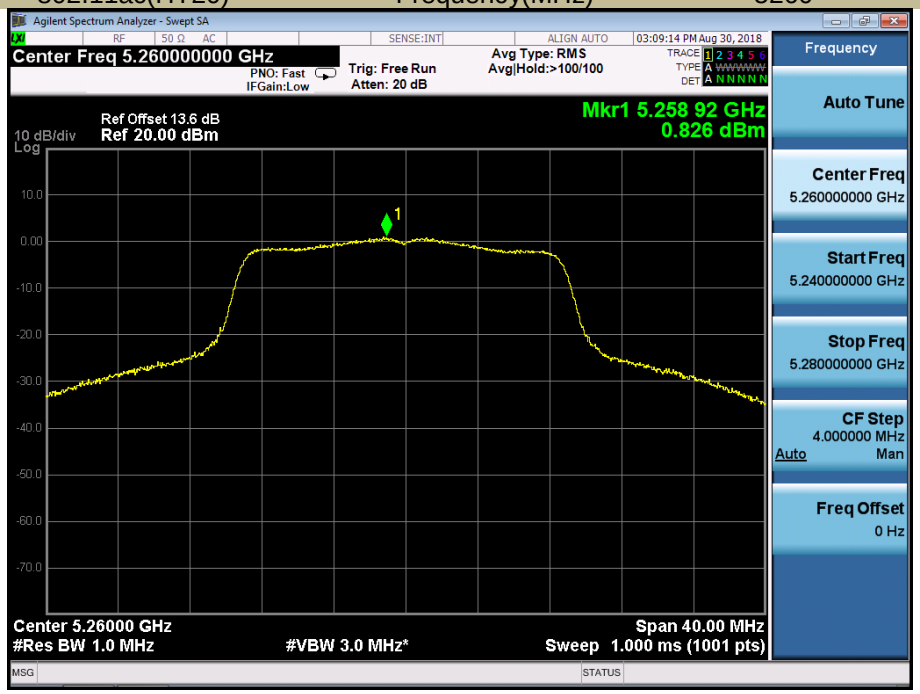
Power Spectral Density		U-NII – 2A	
Test Model	802.11n-HT20	Frequency(MHz)	5280



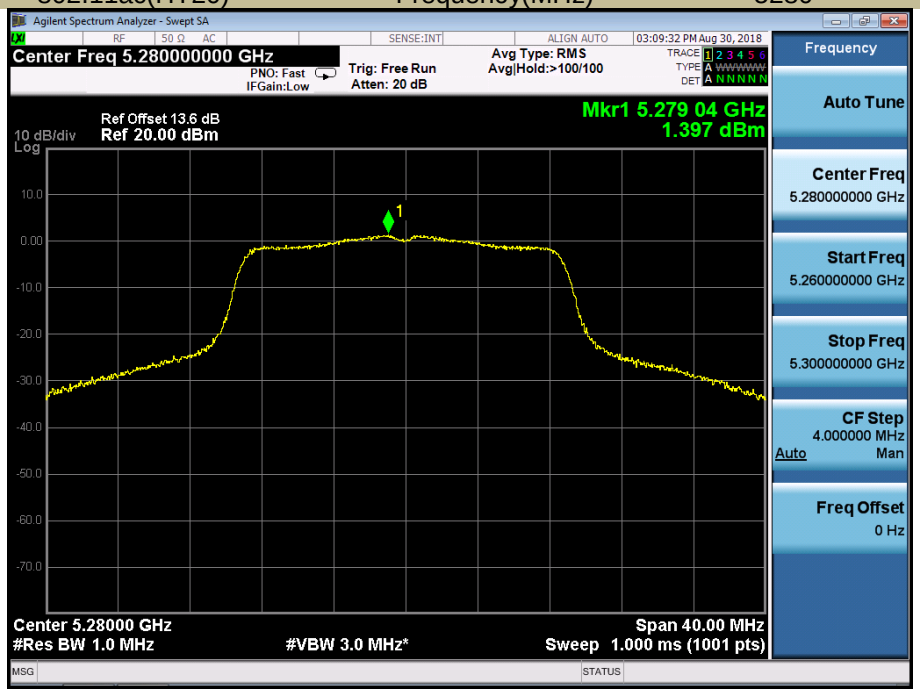
Power Spectral Density		U-NII – 2A	
Test Model	802.11n-HT20	Frequency(MHz)	5320



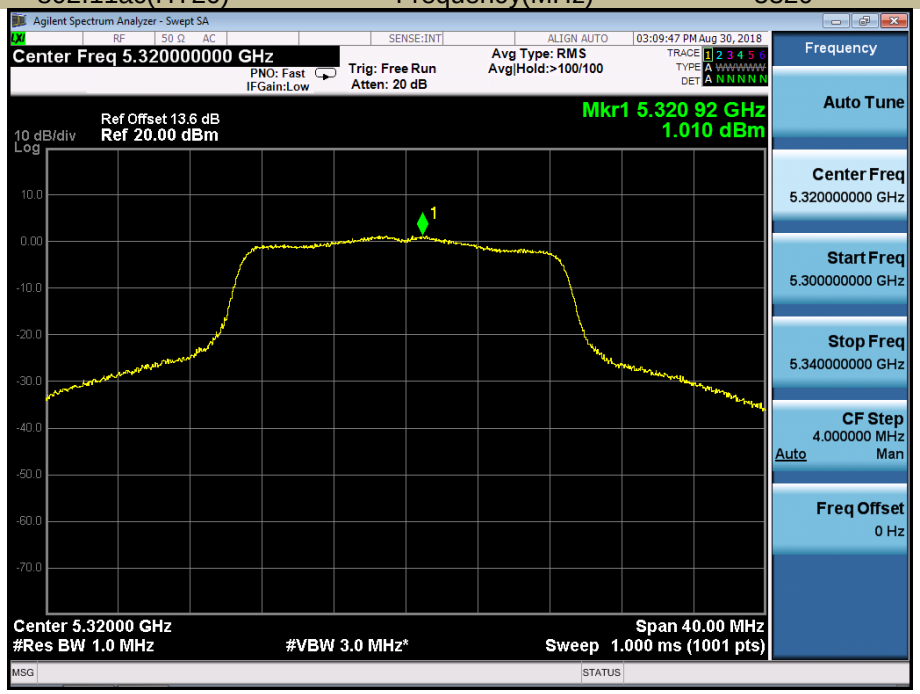
Power Spectral Density		U-NII – 2A	
Test Model	802.11ac(HT20)	Frequency(MHz)	5260



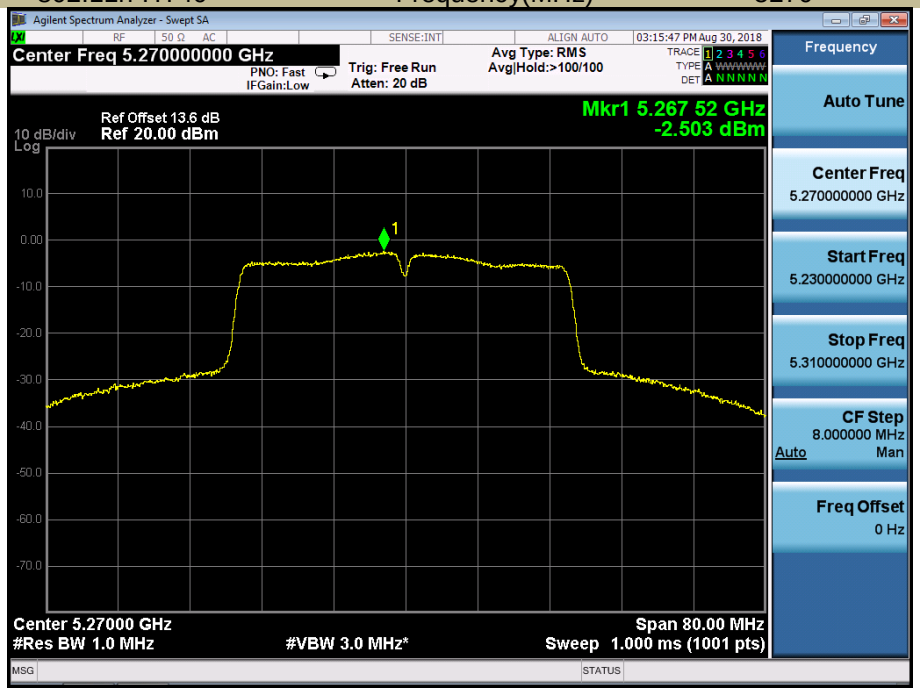
Power Spectral Density		U-NII – 2A	
Test Model	802.11ac(HT20)	Frequency(MHz)	5280



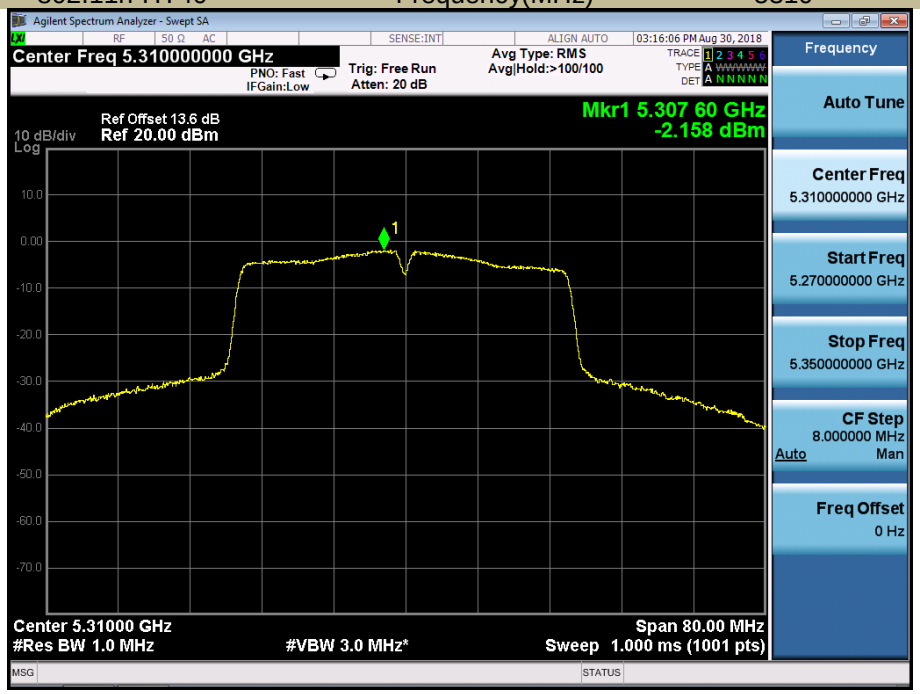
Power Spectral Density		U-NII – 2A	
Test Model	802.11ac(HT20)	Frequency(MHz)	5320



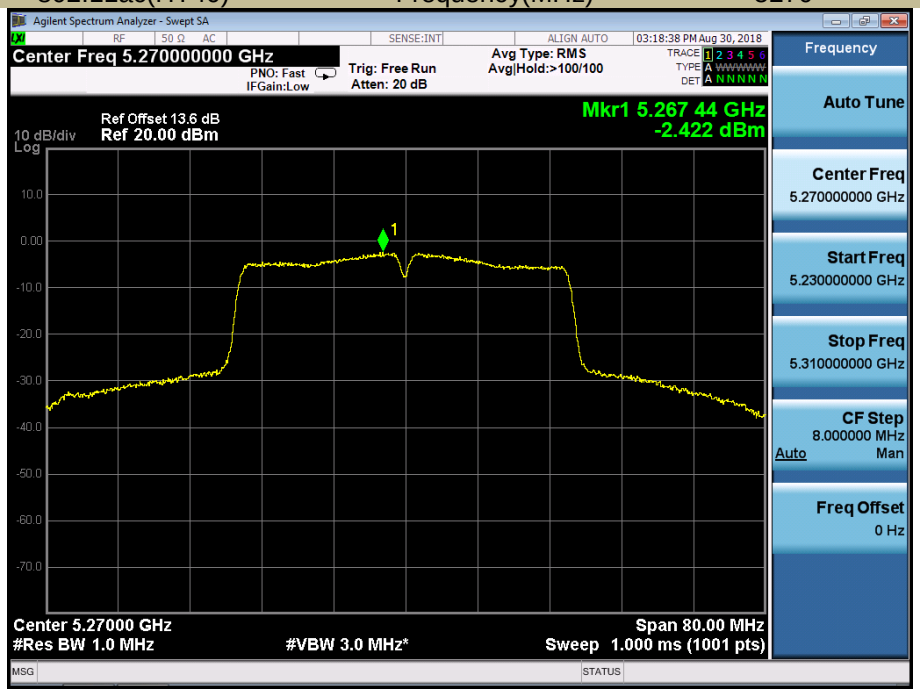
Power Spectral Density		U-NII – 2A	
Test Model	802.11n-HT40	Frequency(MHz)	5270



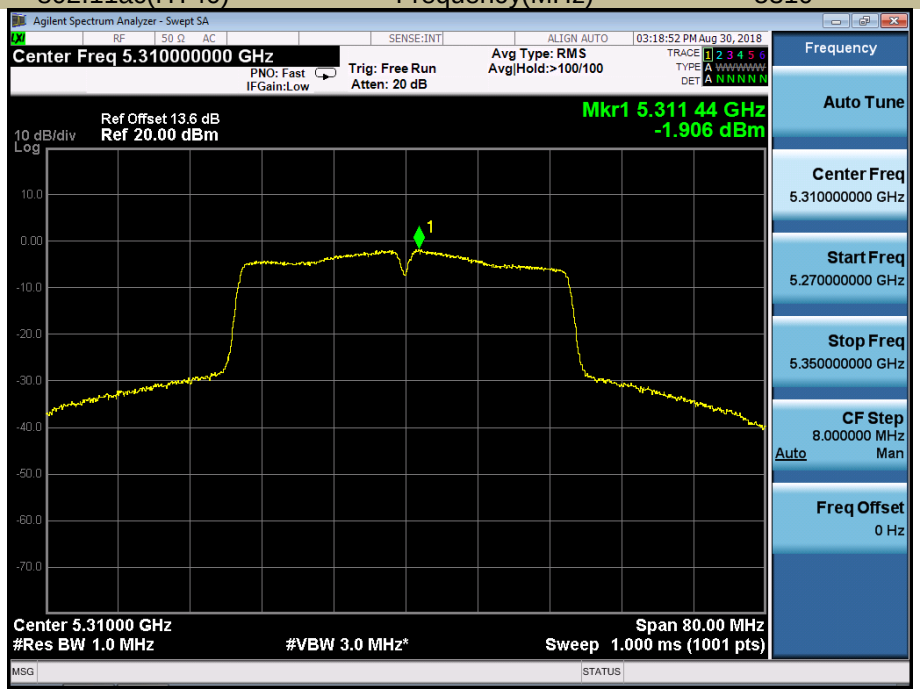
Power Spectral Density		U-NII – 2A	
Test Model	802.11n-HT40	Frequency(MHz)	5310



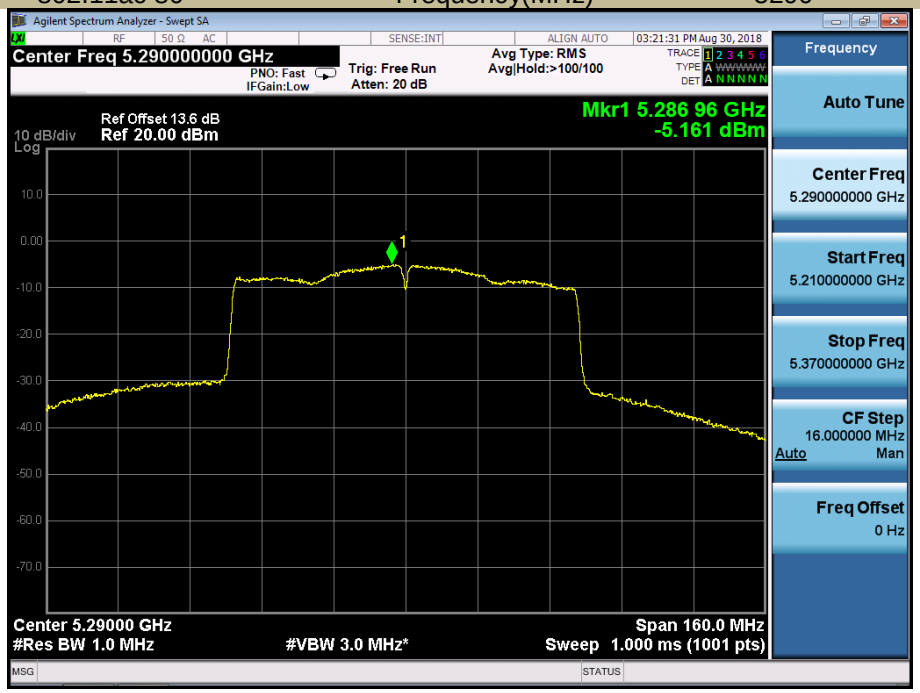
Power Spectral Density		U-NII – 2A	
Test Model	802.11ac(HT40)	Frequency(MHz)	5270



Power Spectral Density		U-NII – 2A	
Test Model	802.11ac(HT40)	Frequency(MHz)	5310



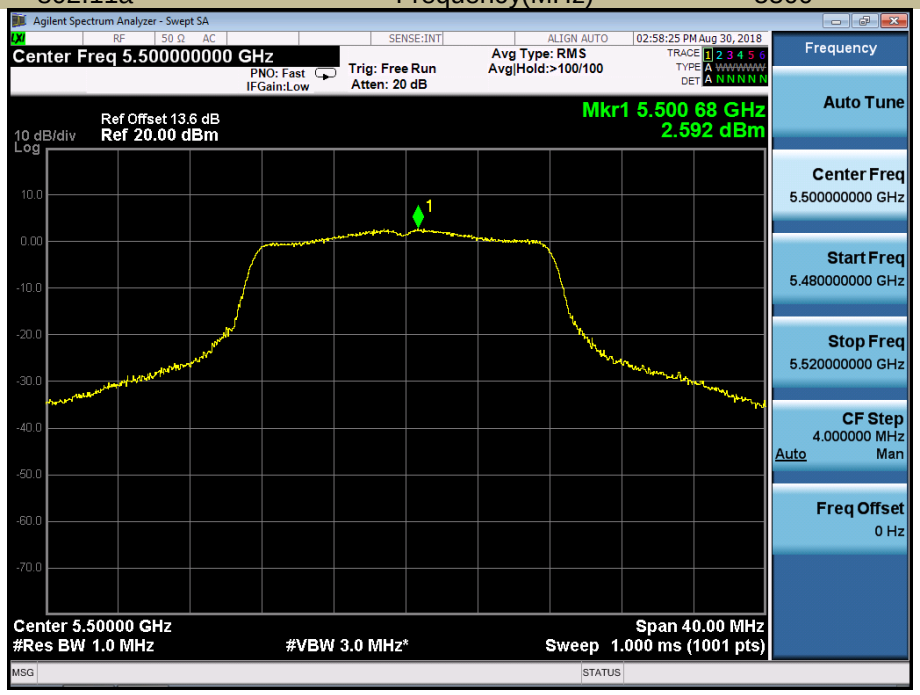
Power Spectral Density		U-NII – 2A	
Test Model	802.11ac 80	Frequency(MHz)	5290



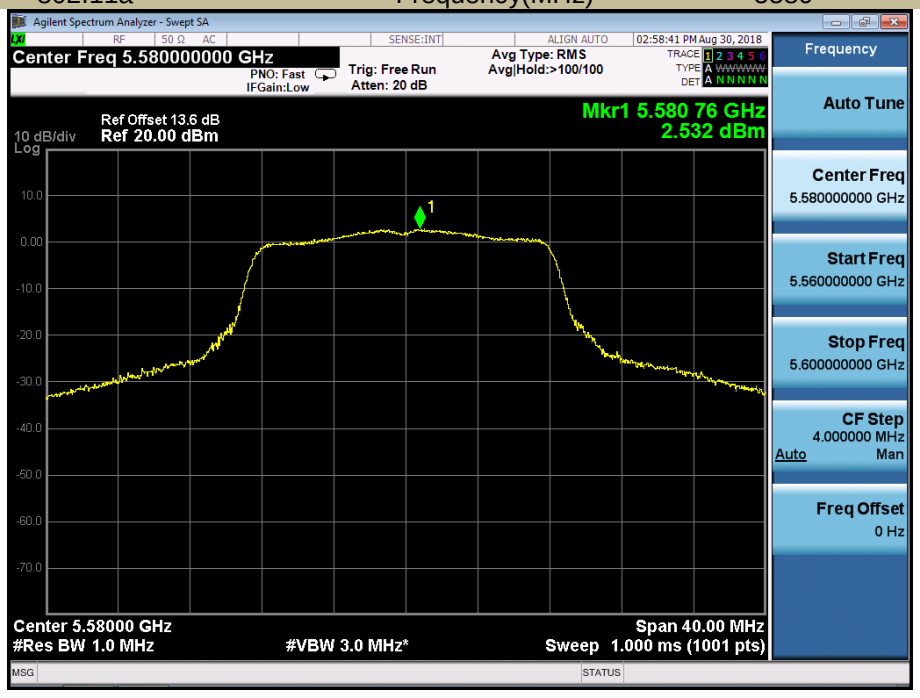
5470-5725MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5500	2.592	11
	5580	2.532	11
	5700	5.137	11
802.11n-HT20	5500	2.194	11
	5580	2.557	11
	5700	4.442	11
802.11ac(HT20)	5500	2.079	11
	5580	2.395	11
	5700	4.484	11
802.11n-HT40	5510	-0.638	11
	5550	-1.938	11
	5670	0.246	11
802.11ac(HT40)	5510	-0.929	11
	5550	-2.154	11
	5670	0.274	11
802.11ac(HT80)	5530	-4.271	11

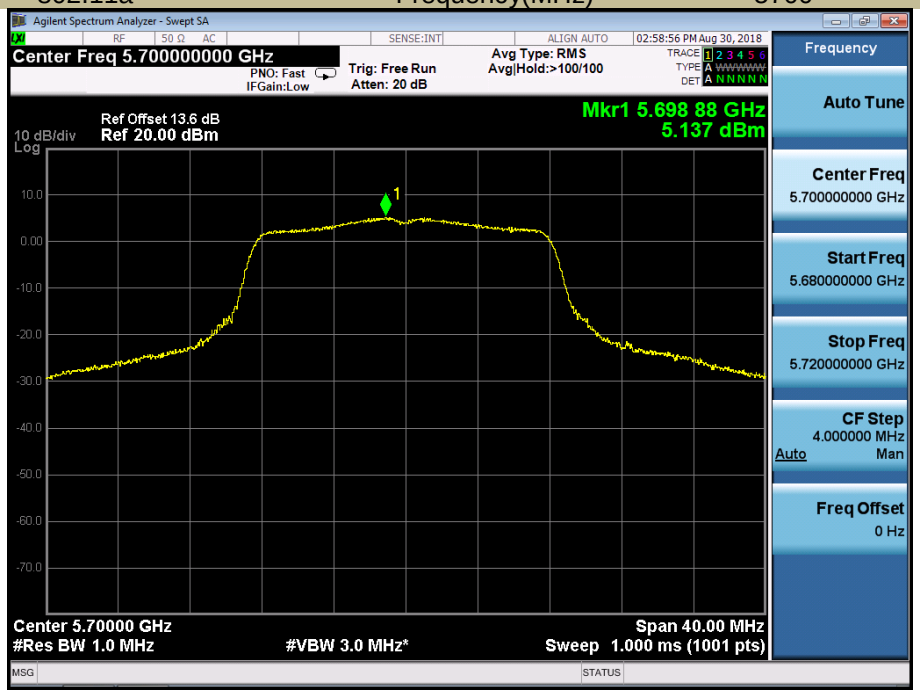
Power Spectral Density		U-NII – 2C	
Test Model	802.11a	Frequency(MHz)	5500



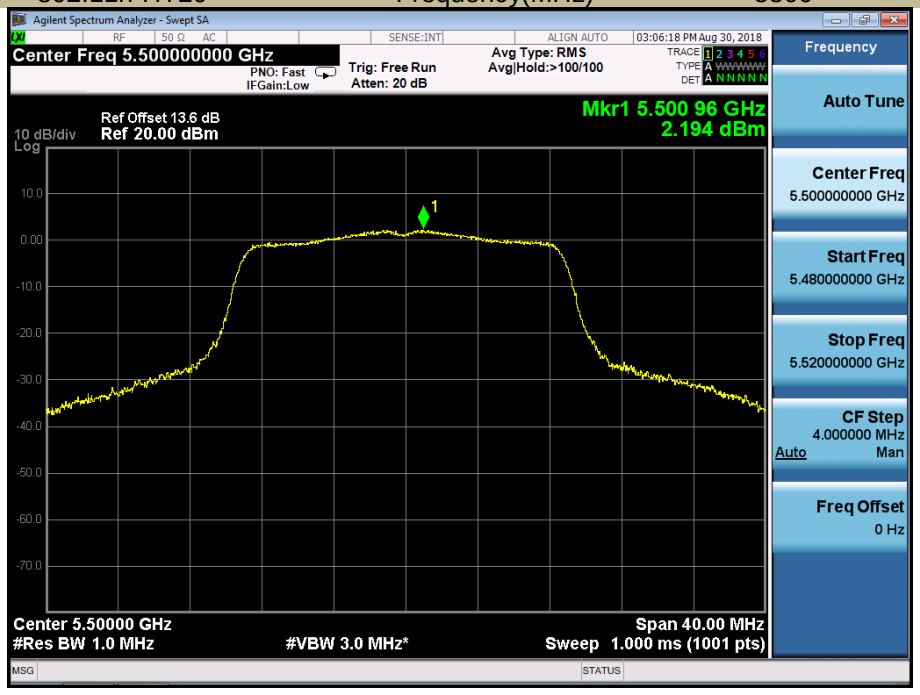
Power Spectral Density		U-NII – 2C	
Test Model	802.11a	Frequency(MHz)	5580



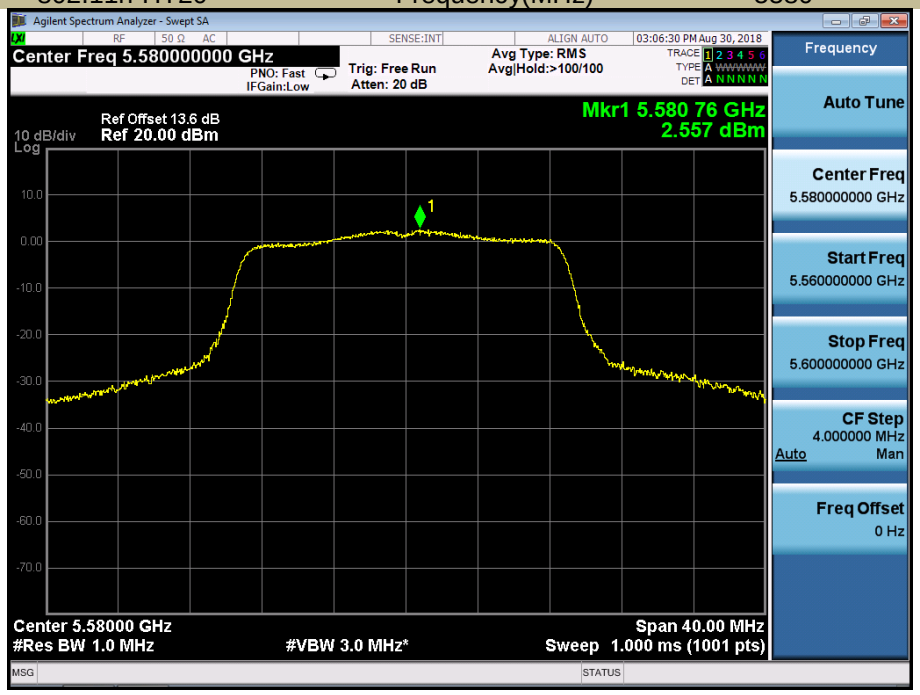
Power Spectral Density		U-NII – 2C	
Test Model	802.11a	Frequency(MHz)	5700



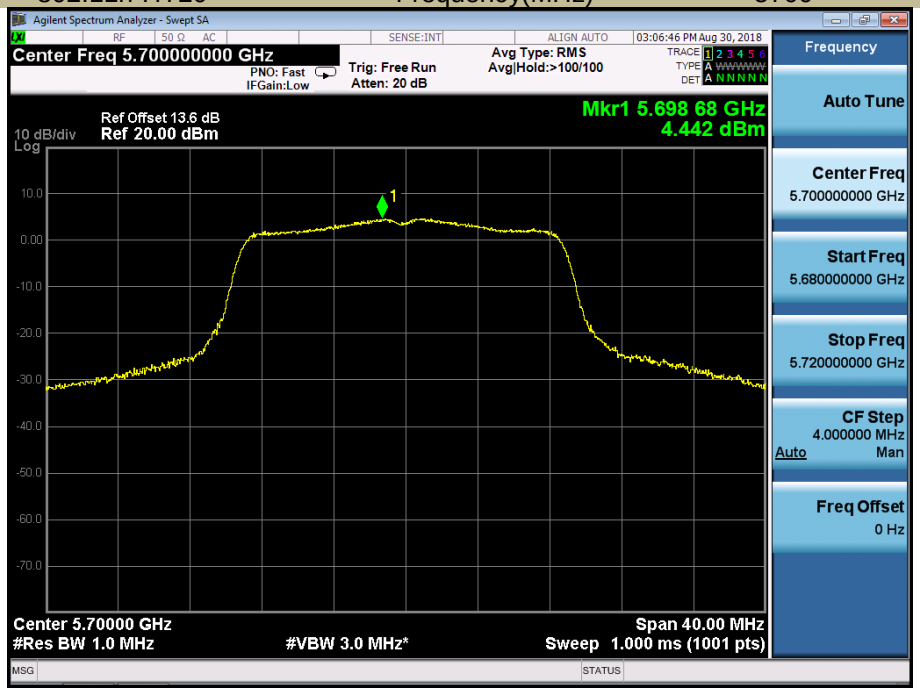
Power Spectral Density		U-NII – 2C	
Test Model	802.11n-HT20	Frequency(MHz)	5500



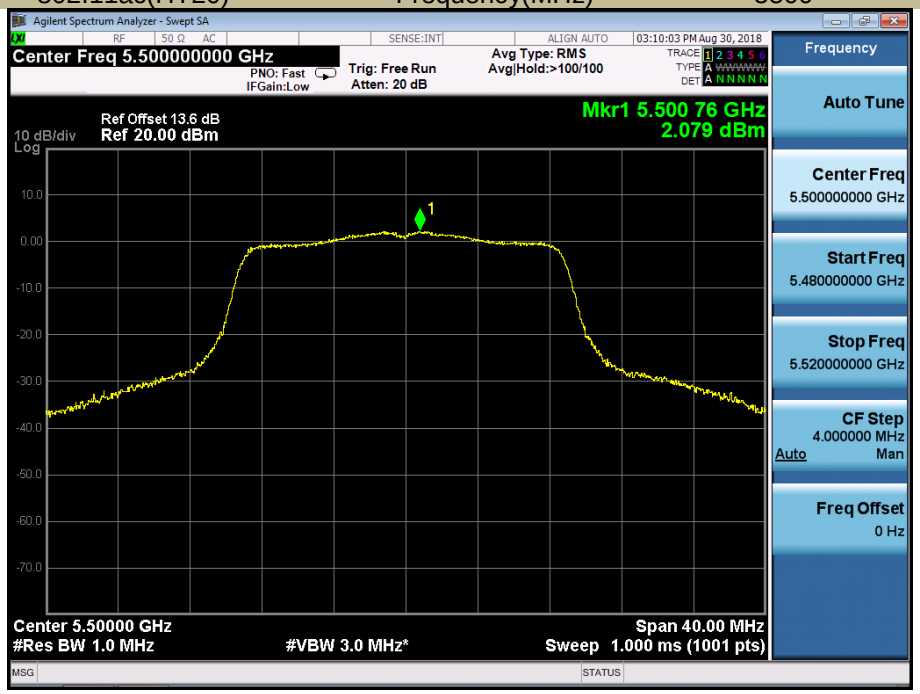
Power Spectral Density		U-NII – 2C	
Test Model	802.11n-HT20	Frequency(MHz)	5580



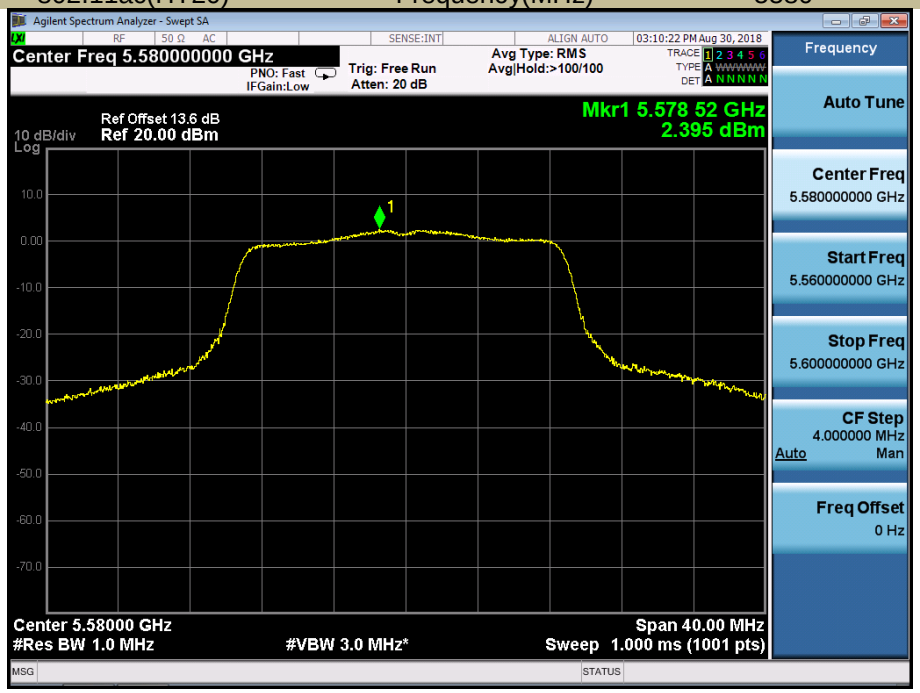
Power Spectral Density		U-NII – 2C	
Test Model	802.11n-HT20	Frequency(MHz)	5700



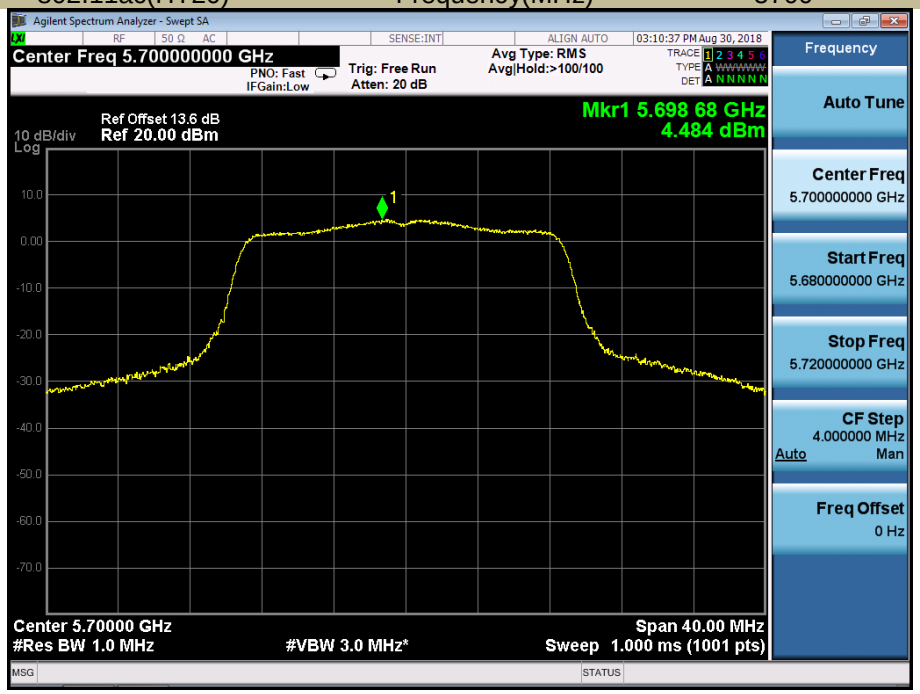
Power Spectral Density		U-NII – 2C	
Test Model	802.11ac(HT20)	Frequency(MHz)	5500



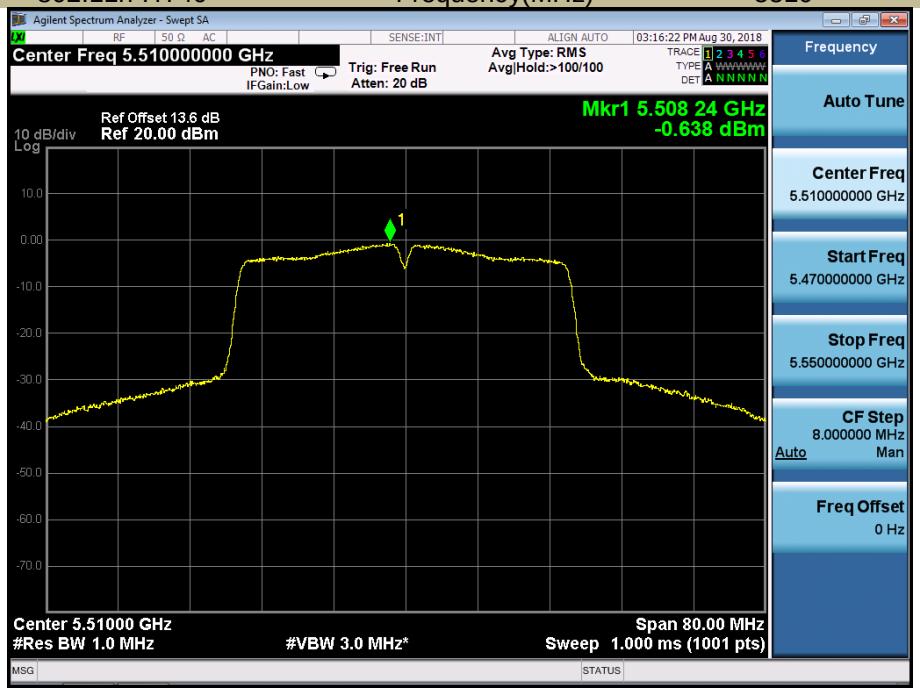
Power Spectral Density		U-NII – 2C	
Test Model	802.11ac(HT20)	Frequency(MHz)	5580



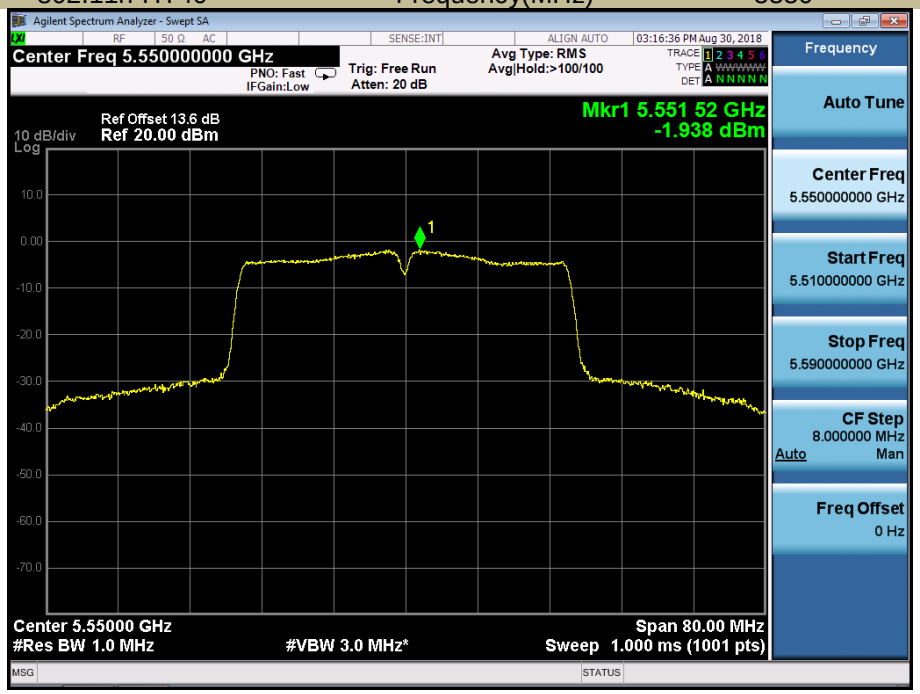
Power Spectral Density		U-NII – 2C	
Test Model	802.11ac(HT20)	Frequency(MHz)	5700



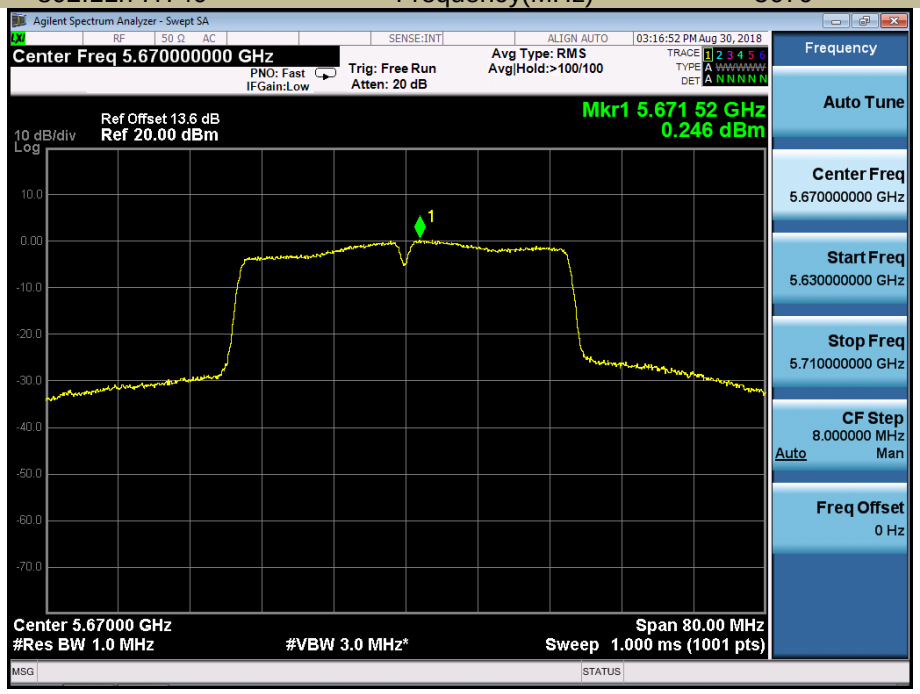
Power Spectral Density		U-NII – 2C	
Test Model	802.11n-HT40	Frequency(MHz)	5510



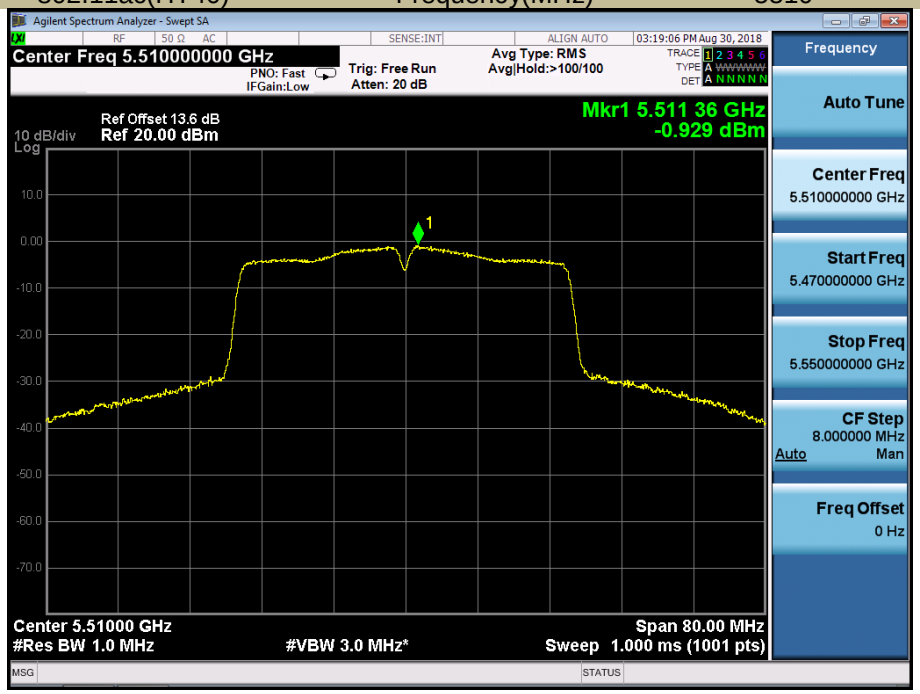
Power Spectral Density		U-NII – 2C	
Test Model	802.11n-HT40	Frequency(MHz)	5550



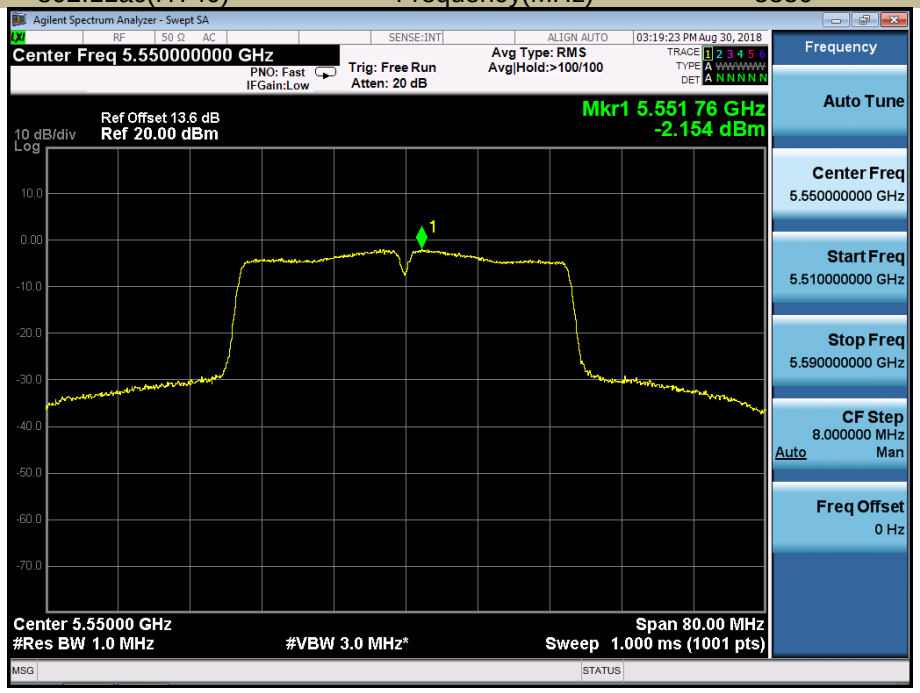
Power Spectral Density		U-NII – 2C	
Test Model	802.11n-HT40	Frequency(MHz)	5670



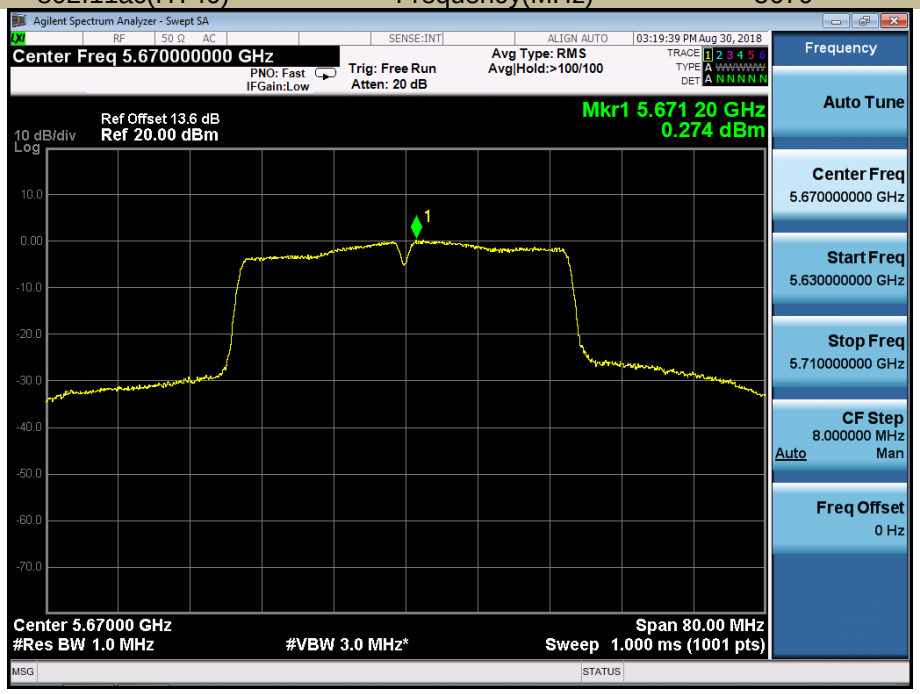
Power Spectral Density		U-NII – 2C	
Test Model	802.11ac(HT40)	Frequency(MHz)	5510



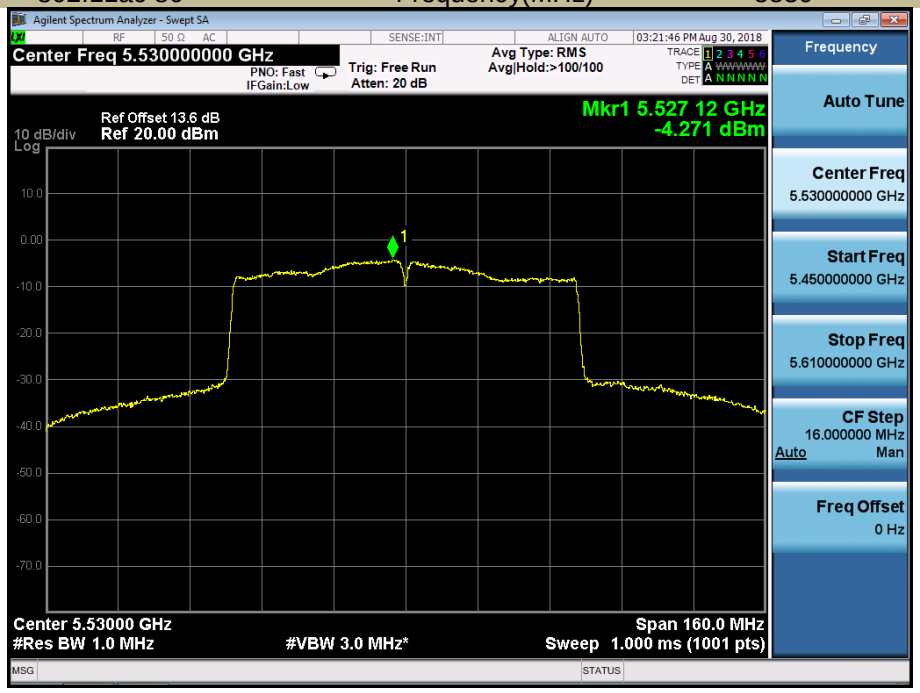
Power Spectral Density		U-NII – 2C	
Test Model	802.11ac(HT40)	Frequency(MHz)	5550



Power Spectral Density		U-NII – 2C	
Test Model	802.11ac(HT40)	Frequency(MHz)	5670



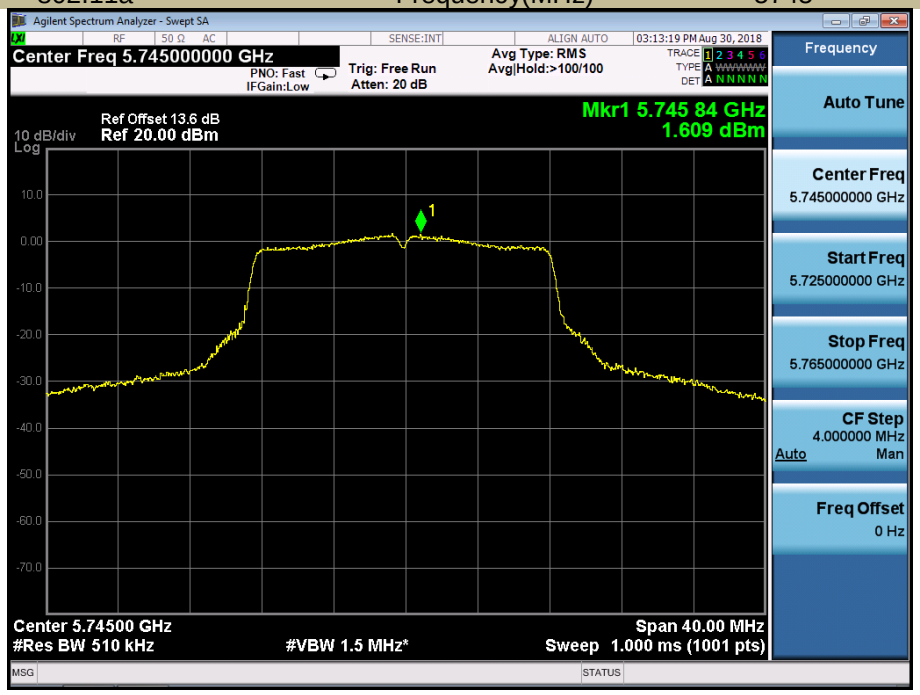
Power Spectral Density		U-NII – 2C	
Test Model	802.11ac 80	Frequency(MHz)	5530



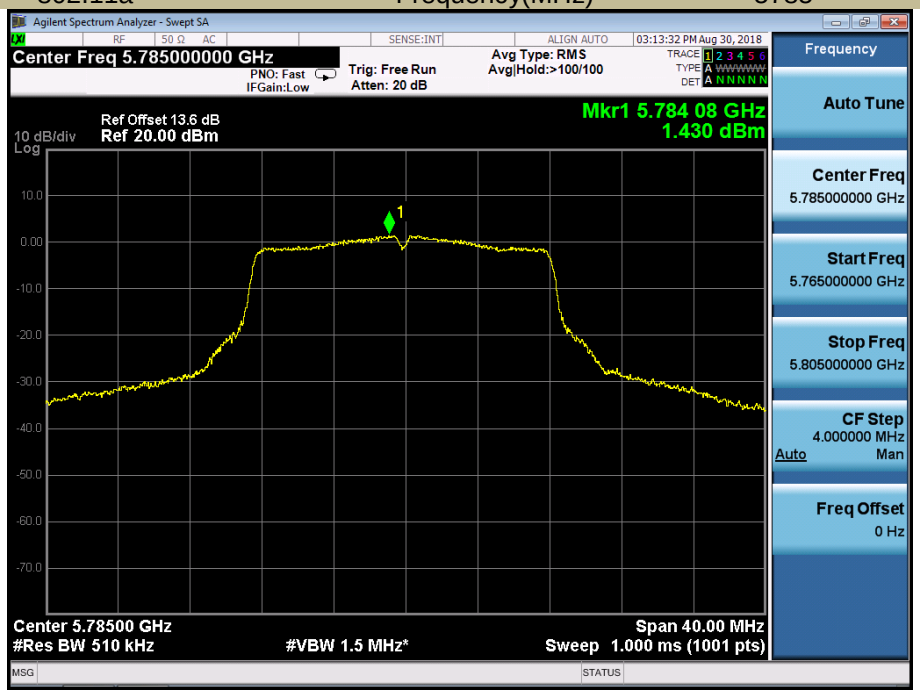
5725-5850MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5745	1.609	30
	5785	1.430	30
	5825	2.297	30
802.11n-HT20	5745	0.469	30
	5785	1.158	30
	5825	1.448	30
802.11ac(VHT20)	5745	0.827	30
	5785	0.430	30
	5825	1.333	30
802.11n-HT40	5755	-3.323	30
	5795	-2.087	30
802.11ac(VHT40)	5755	-2.874	30
	5795	-2.394	30
802.11ac(VHT80)	5775	-5.045	30

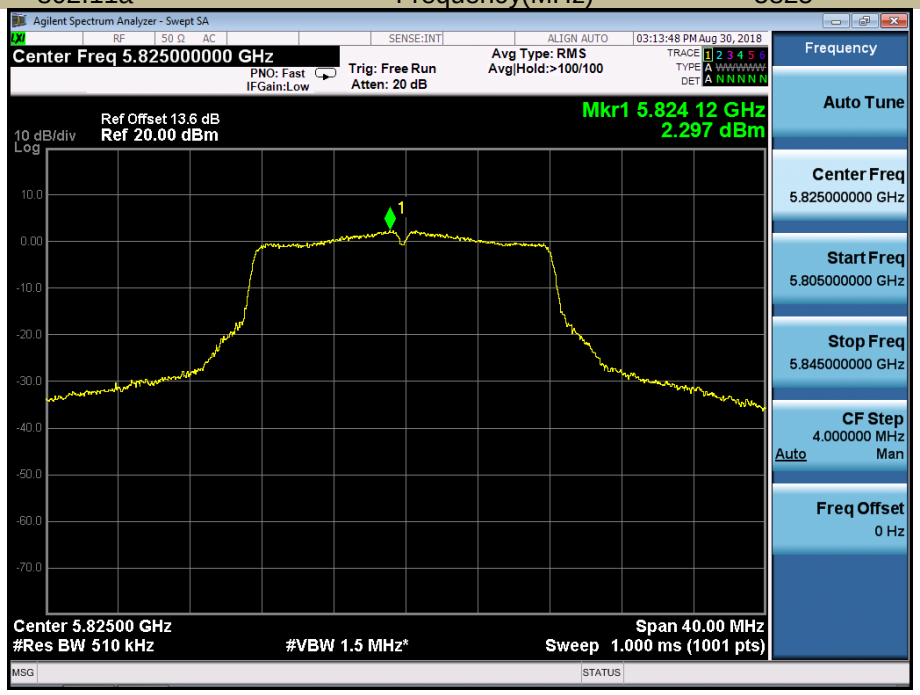
Power Spectral Density		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5745



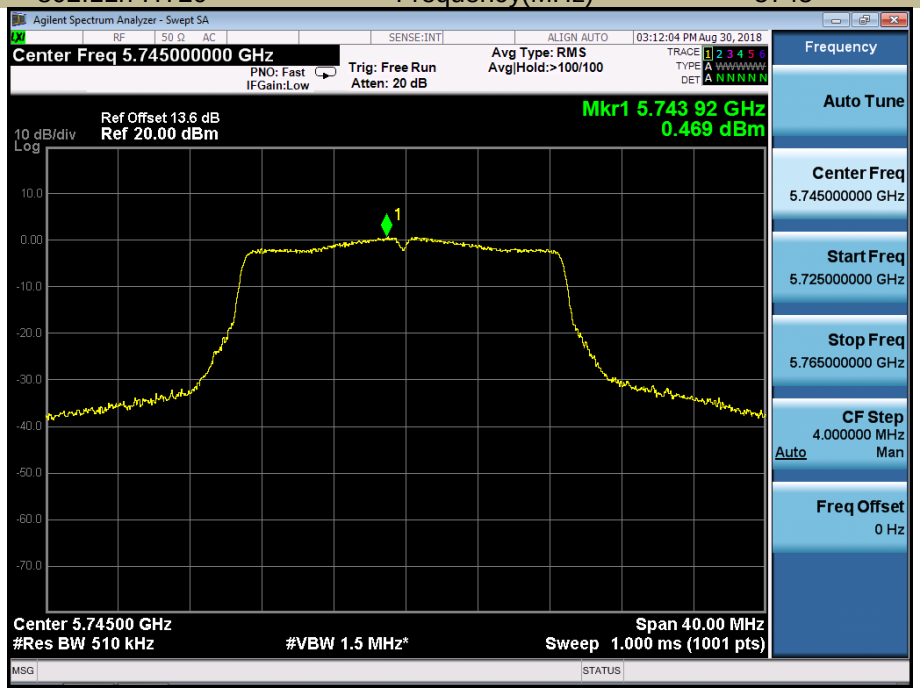
Power Spectral Density		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5785



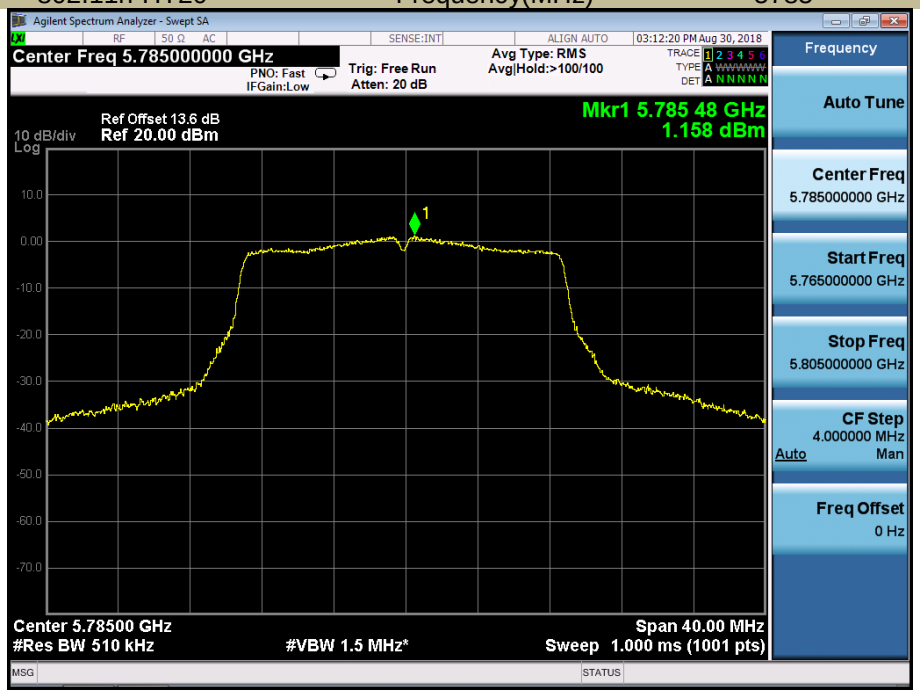
Power Spectral Density		U-NII - 3	
Test Model	802.11a	Frequency(MHz)	5825



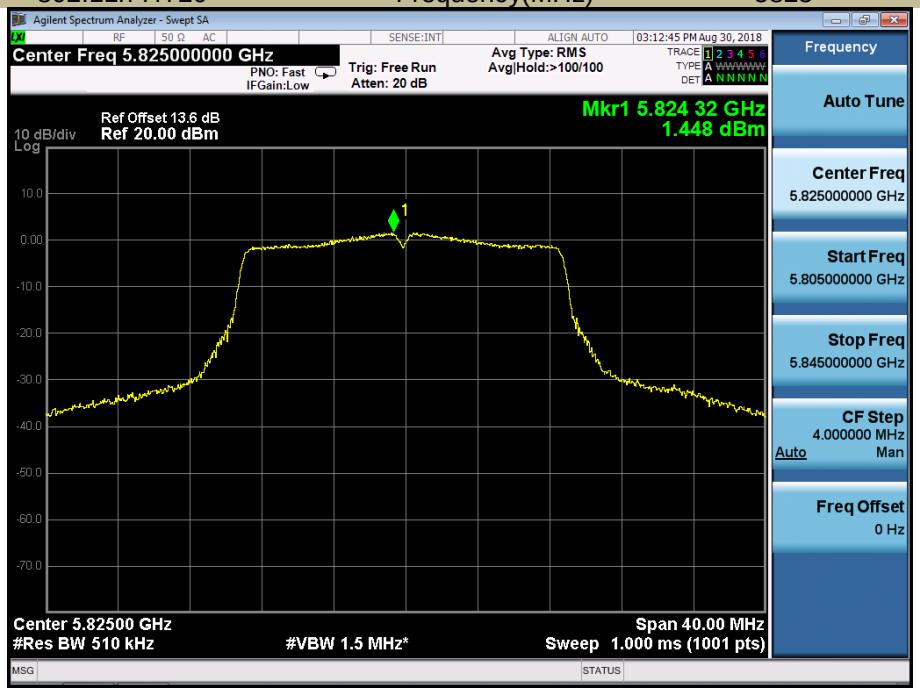
Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5745



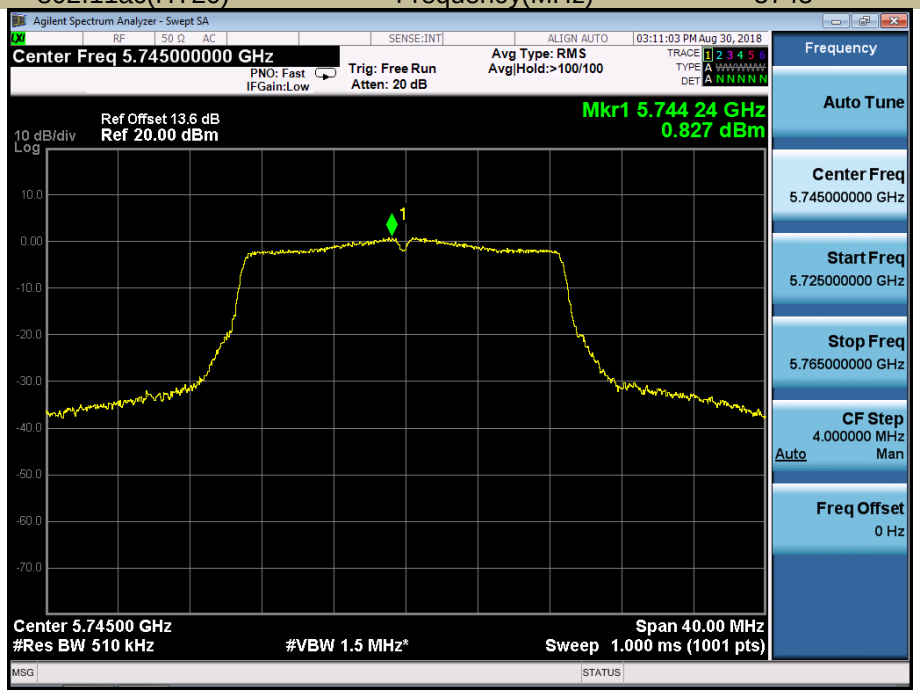
Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5785



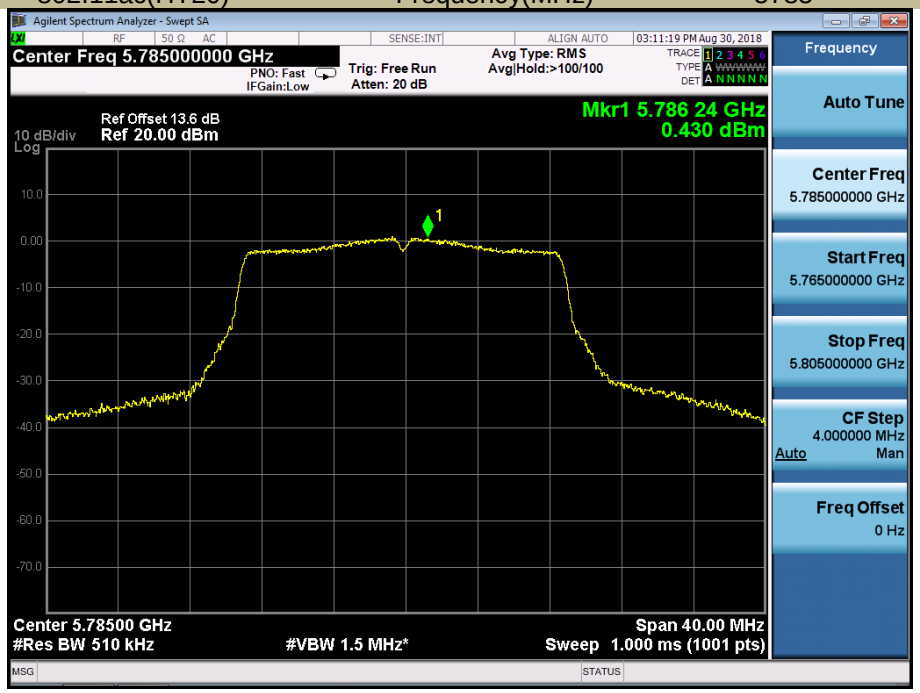
Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT20	Frequency(MHz)	5825



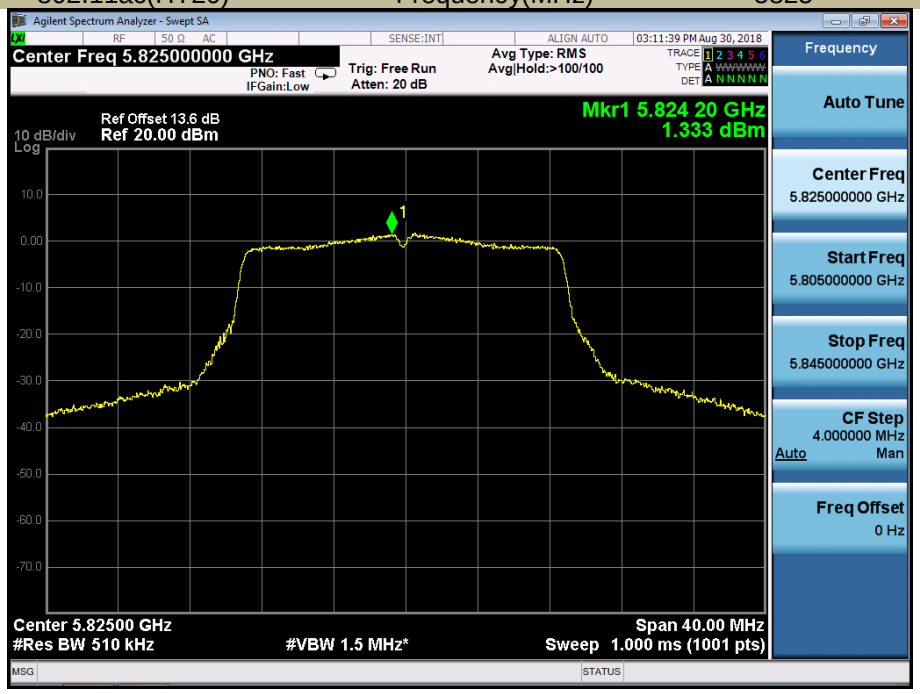
Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT20)	Frequency(MHz)	5745



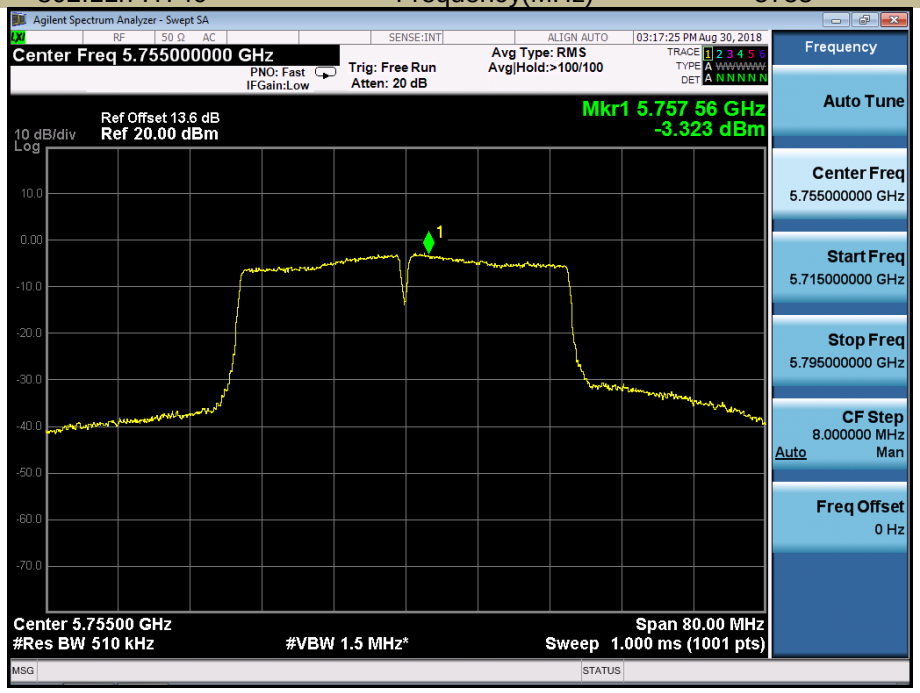
Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT20)	Frequency(MHz)	5785



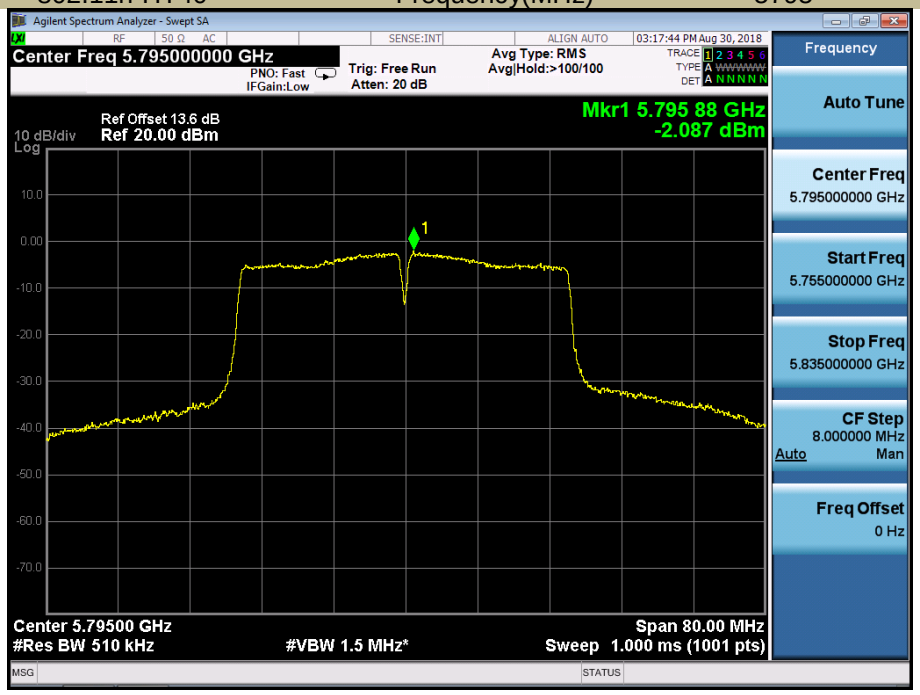
Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT20)	Frequency(MHz)	5825



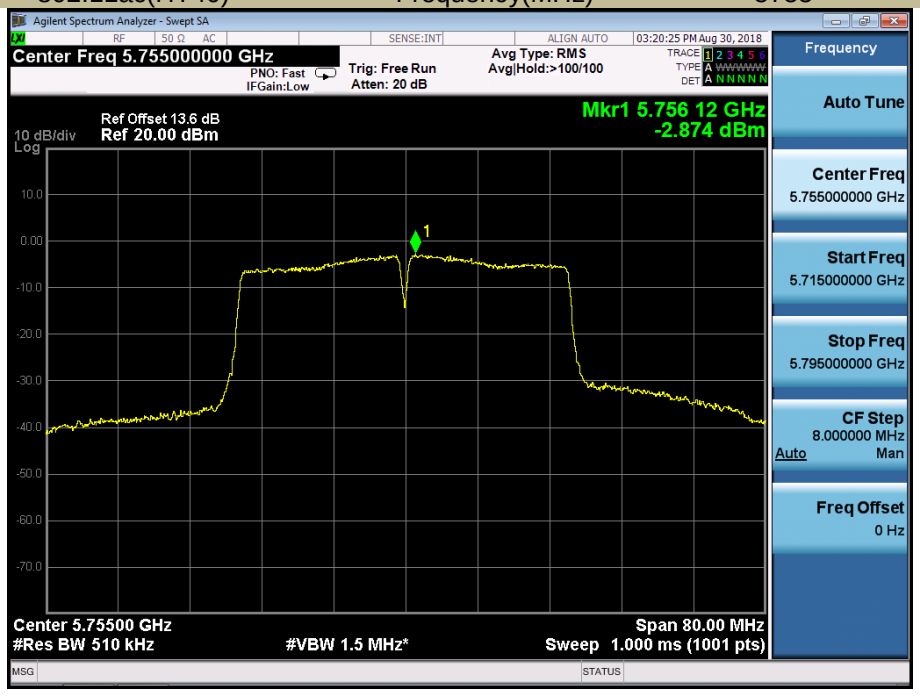
Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5755



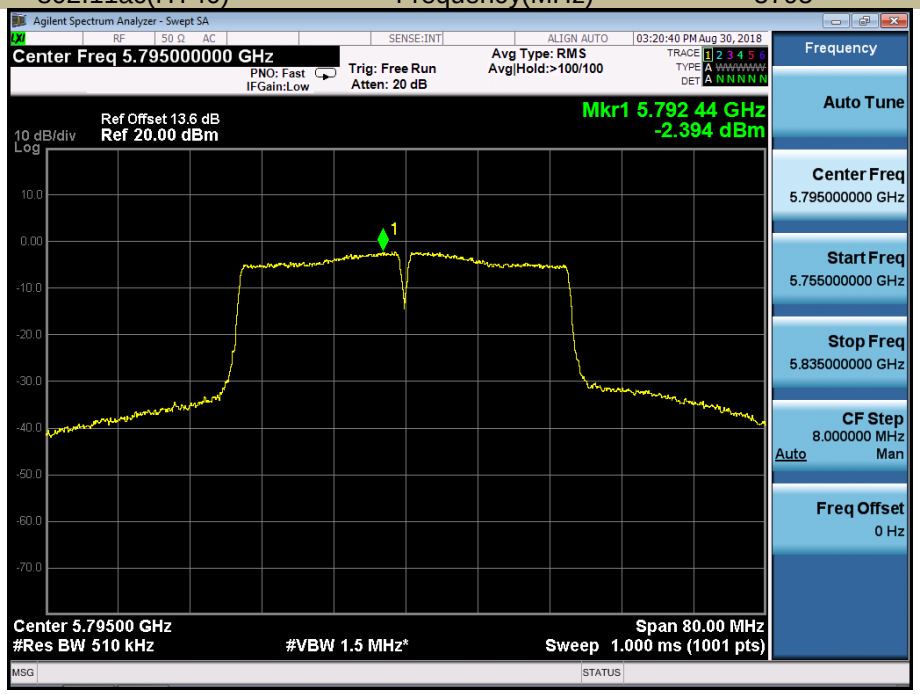
Power Spectral Density		U-NII - 3	
Test Model	802.11n-HT40	Frequency(MHz)	5795



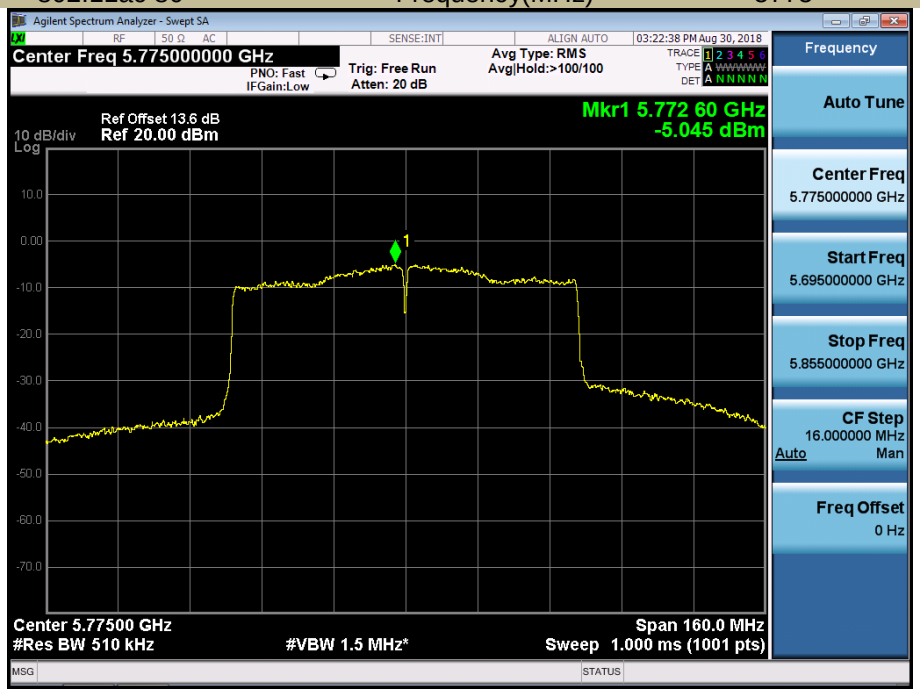
Power Spectral Density		U-NII - 3	
Test Model	802.11ac(HT40)	Frequency(MHz)	5755



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

802.11a	5180			
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5179.9894	-10.6	Pass
	-10	5179.9843	-15.7	Pass
	0	5179.9887	-11.3	Pass
	10	5179.9869	-13.1	Pass
	20	5179.9843	-15.7	Pass
	30	5179.9838	-16.2	Pass
	40	5179.9884	-11.6	Pass
	55	5179.9819	-18.1	Pass
85% Vnom	25	5179.9823	-17.7	Pass
115% Vnom	25	5179.9818	-18.2	Pass

5200				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5199.9854	-14.6	Pass
	-10	5199.9864	-13.6	Pass
	0	5199.9808	-19.2	Pass
	10	5199.9848	-15.2	Pass
	20	5199.985	-15	Pass
	30	5199.9875	-12.5	Pass
	40	5199.9836	-16.4	Pass
	55	5199.9863	-13.7	Pass
85% Vnom	25	5199.9871	-12.9	Pass
115% Vnom	25	5199.9892	-10.8	Pass

5240				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5239.9879	-12.1	Pass
	-10	5239.9872	-12.8	Pass
	0	5239.9873	-12.7	Pass
	10	5239.9833	-16.7	Pass
	20	5239.9869	-13.1	Pass
	30	5239.9822	-17.8	Pass
	40	5239.9892	-10.8	Pass
	55	5239.9889	-11.1	Pass
85% Vnom	25	5239.9845	-15.5	Pass
115% Vnom	25	5239.9855	-14.5	Pass

5190

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5189.9806	-19.4	Pass
	-10	5189.9883	-11.7	Pass
	0	5189.9881	-11.9	Pass
	10	5189.9828	-17.2	Pass
	20	5189.9804	-19.6	Pass
	30	5189.9844	-15.6	Pass
	40	5189.9861	-13.9	Pass
	55	5189.9835	-16.5	Pass
85% Vnom	25	5189.9819	-18.1	Pass
115% Vnom	25	5189.9803	-19.7	Pass

5230

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5229.9855	-14.5	Pass
	-10	5229.9868	-13.2	Pass
	0	5229.9834	-16.6	Pass
	10	5229.9805	-19.5	Pass
	20	5229.9885	-11.5	Pass
	30	5229.9869	-13.1	Pass
	40	5229.9891	-10.9	Pass
	55	5229.9821	-17.9	Pass
85% Vnom	25	5229.9804	-19.6	Pass
115% Vnom	25	5229.9866	-13.4	Pass

5210

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5209.9875	-12.5	Pass
	-10	5209.9845	-15.5	Pass
	0	5209.9845	-15.5	Pass
	10	5209.9856	-14.4	Pass
	20	5209.9822	-17.8	Pass
	30	5209.9808	-19.2	Pass
	40	5209.9833	-16.7	Pass
	55	5209.9841	-15.9	Pass
85% Vnom	25	5209.9886	-11.4	Pass
115% Vnom	25	5209.9852	-14.8	Pass

802.11a	5260			
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5259.9846	-15.4	Pass
	-10	5259.9822	-17.8	Pass
	0	5259.9873	-12.7	Pass
	10	5259.9852	-14.8	Pass
	20	5259.9886	-11.4	Pass
	30	5259.9802	-19.8	Pass
	40	5259.9837	-16.3	Pass
	55	5259.9898	-10.2	Pass
85% Vnom	25	5259.9802	-19.8	Pass
115% Vnom	25	5259.9845	-15.5	Pass

5280				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5279.9875	-12.5	Pass
	-10	5279.9828	-17.2	Pass
	0	5279.9873	-12.7	Pass
	10	5279.9805	-19.5	Pass
	20	5279.9806	-19.4	Pass
	30	5279.9811	-18.9	Pass
	40	5279.9833	-16.7	Pass
	55	5279.9879	-12.1	Pass
85% Vnom	25	5279.9852	-14.8	Pass
115% Vnom	25	5279.9814	-18.6	Pass

5320				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5319.9802	-19.8	Pass
	-10	5319.9841	-15.9	Pass
	0	5319.9864	-13.6	Pass
	10	5319.9834	-16.6	Pass
	20	5319.9896	-10.4	Pass
	30	5319.9813	-18.7	Pass
	40	5319.9849	-15.1	Pass
	55	5319.9807	-19.3	Pass
85% Vnom	25	5319.9829	-17.1	Pass
115% Vnom	25	5319.9852	-14.8	Pass

5270

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5269.9856	-14.4	Pass
	-10	5269.9893	-10.7	Pass
	0	5269.9868	-13.2	Pass
	10	5269.9827	-17.3	Pass
	20	5269.9876	-12.4	Pass
	30	5269.9834	-16.6	Pass
	40	5269.9859	-14.1	Pass
	55	5269.9868	-13.2	Pass
85% Vnom	25	5269.9847	-15.3	Pass
115% Vnom	25	5269.9844	-15.6	Pass

5310

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5309.9841	-15.9	Pass
	-10	5309.9896	-10.4	Pass
	0	5309.9869	-13.1	Pass
	10	5309.9897	-10.3	Pass
	20	5309.9883	-11.7	Pass
	30	5309.9887	-11.3	Pass
	40	5309.9864	-13.6	Pass
	55	5309.9847	-15.3	Pass
85% Vnom	25	5309.9828	-17.2	Pass
115% Vnom	25	5309.9809	-19.1	Pass

5290

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5289.9839	-16.1	Pass
	-10	5289.9827	-17.3	Pass
	0	5289.9888	-11.2	Pass
	10	5289.9818	-18.2	Pass
	20	5289.9876	-12.4	Pass
	30	5289.9838	-16.2	Pass
	40	5289.9831	-16.9	Pass
	55	5289.9898	-10.2	Pass
85% Vnom	25	5289.9822	-17.8	Pass
115% Vnom	25	5289.9861	-13.9	Pass

802.11a	5500			
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5499.9822	-17.8	Pass
	-10	5499.9842	-15.8	Pass
	0	5499.9873	-12.7	Pass
	10	5499.9858	-14.2	Pass
	20	5499.9882	-11.8	Pass
	30	5499.9885	-11.5	Pass
	40	5499.9855	-14.5	Pass
	55	5499.9889	-11.1	Pass
85% Vnom	25	5499.9867	-13.3	Pass
115% Vnom	25	5499.9888	-11.2	Pass

5580				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5579.9854	-14.6	Pass
	-10	5579.9833	-16.7	Pass
	0	5579.9821	-17.9	Pass
	10	5579.9814	-18.6	Pass
	20	5579.9802	-19.8	Pass
	30	5579.9869	-13.1	Pass
	40	5579.9802	-19.8	Pass
	55	5579.9896	-10.4	Pass
85% Vnom	25	5579.9899	-10.1	Pass
115% Vnom	25	5579.9881	-11.9	Pass

5700				
Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5699.9865	-13.5	Pass
	-10	5699.9836	-16.4	Pass
	0	5699.9866	-13.4	Pass
	10	5699.9813	-18.7	Pass
	20	5699.9824	-17.6	Pass
	30	5699.9893	-10.7	Pass
	40	5699.9808	-19.2	Pass
	55	5699.9853	-14.7	Pass
85% Vnom	25	5699.9871	-12.9	Pass
115% Vnom	25	5699.9837	-16.3	Pass

5510

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5509.9822	-17.8	Pass
	-10	5509.9844	-15.6	Pass
	0	5509.9848	-15.2	Pass
	10	5509.9831	-16.9	Pass
	20	5509.9895	-10.5	Pass
	30	5509.9833	-16.7	Pass
	40	5509.9835	-16.5	Pass
	55	5509.9873	-12.7	Pass
85% Vnom	25	5509.9851	-14.9	Pass
115% Vnom	25	5509.9876	-12.4	Pass

5550

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5549.9852	-14.8	Pass
	-10	5549.9883	-11.7	Pass
	0	5549.9839	-16.1	Pass
	10	5549.9802	-19.8	Pass
	20	5549.9804	-19.6	Pass
	30	5549.9844	-15.6	Pass
	40	5549.9878	-12.2	Pass
	55	5549.9815	-18.5	Pass
85% Vnom	25	5549.9836	-16.4	Pass
115% Vnom	25	5549.9801	-19.9	Pass

5670

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5669.9847	-15.3	Pass
	-10	5669.9801	-19.9	Pass
	0	5669.9858	-14.2	Pass
	10	5669.9877	-12.3	Pass
	20	5669.9803	-19.7	Pass
	30	5669.9871	-12.9	Pass
	40	5669.9856	-14.4	Pass
	55	5669.9863	-13.7	Pass
85% Vnom	25	5669.9844	-15.6	Pass
115% Vnom	25	5669.9808	-19.2	Pass

5530

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5529.9825	-17.5	Pass
	-10	5529.9846	-15.4	Pass
	0	5529.9846	-15.4	Pass
	10	5529.9807	-19.3	Pass
	20	5529.9856	-14.4	Pass
	30	5529.9873	-12.7	Pass
	40	5529.9813	-18.7	Pass
	55	5529.9829	-17.1	Pass
85% Vnom	25	5529.9888	-11.2	Pass
115% Vnom	25	5529.9829	-17.1	Pass

802.11a	5745

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5744.9892	-10.8	Pass
	-10	5744.9847	-15.3	Pass
	0	5744.9853	-14.7	Pass
	10	5744.9876	-12.4	Pass
	20	5744.9886	-11.4	Pass
	30	5744.9875	-12.5	Pass
	40	5744.9821	-17.9	Pass
	55	5744.9887	-11.3	Pass
85% Vnom	25	5744.9841	-15.9	Pass
115% Vnom	25	5744.9821	-17.9	Pass

5785

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5784.9804	-19.6	Pass
	-10	5784.9863	-13.7	Pass
	0	5784.9805	-19.5	Pass
	10	5784.9896	-10.4	Pass
	20	5784.9848	-15.2	Pass
	30	5784.9849	-15.1	Pass
	40	5784.9863	-13.7	Pass
	55	5784.9826	-17.4	Pass
85% Vnom	25	5784.9830	-17.0	Pass
115% Vnom	25	5784.9804	-19.6	Pass

5825

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5824.9849	-15.1	Pass
	-10	5824.9894	-10.6	Pass
	0	5824.9875	-12.5	Pass
	10	5824.9867	-13.3	Pass
	20	5824.9866	-13.4	Pass
	30	5824.9808	-19.2	Pass
	40	5824.9857	-14.3	Pass
	55	5824.9882	-11.8	Pass
85% Vnom	25	5824.9812	-18.8	Pass
115% Vnom	25	5824.9835	-16.5	Pass

5755

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5754.9877	-12.3	Pass
	-10	5754.9823	-17.7	Pass
	0	5754.9863	-13.7	Pass
	10	5754.9828	-17.2	Pass
	20	5754.9825	-17.5	Pass
	30	5754.9855	-14.5	Pass
	40	5754.9863	-13.7	Pass
	55	5754.9858	-14.2	Pass
85% Vnom	25	5754.9844	-15.6	Pass
115% Vnom	25	5754.9816	-18.4	Pass

5795

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5794.9844	-15.6	Pass
	-10	5794.9825	-17.5	Pass
	0	5794.9805	-19.5	Pass
	10	5794.9817	-18.3	Pass
	20	5794.9898	-10.2	Pass
	30	5794.9818	-18.2	Pass
	40	5794.9863	-13.7	Pass
	55	5794.9829	-17.1	Pass
85% Vnom	25	5794.9899	-10.1	Pass
115% Vnom	25	5794.9836	-16.4	Pass

5775

Voltage(V)	Temp(℃)	Test Frequency (MHz)	Max. Deviation (KHz)	Verdict
Vnom	-20	5774.9829	-17.1	Pass
	-10	5774.9856	-14.4	Pass
	0	5774.9838	-16.2	Pass
	10	5774.9821	-17.9	Pass
	20	5774.9893	-10.7	Pass
	30	5774.9887	-11.3	Pass
	40	5774.9823	-17.7	Pass
	55	5774.9888	-11.2	Pass
85% Vnom	25	5774.9866	-13.4	Pass
115% Vnom	25	5774.9825	-17.5	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	2400/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 120V &240V 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)
7798.03	V	60.28	-34.95	-27	-7.95
10360.00	V	61.04	-34.19	-27	-7.19
15540.00	V	56.27	-38.96	-27	-11.96
7798.03	H	60.04	-35.19	-27	-8.19
10360.00	H	60.06	-35.17	-27	-8.17
15540.00	H	55.97	-39.26	-27	-12.26

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)
7855.76	V	62.87	-32.36	-27	-5.36
10400.00	V	60.47	-34.76	-27	-7.76
15600.00	V	57.75	-37.48	-27	-10.48
7855.76	H	64.80	-30.43	-27	-3.43
10400.00	H	61.47	-33.76	-27	-6.76
15600.00	H	54.64	-40.59	-27	-13.59

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)
7612.58	V	63.19	-32.04	-27	-5.04
10480.00	V	60.99	-34.24	-27	-7.24
15720.00	V	56.81	-38.42	-27	-11.42
7612.58	H	64.94	-30.29	-27	-3.29
10480.00	H	57.27	-37.96	-27	-10.96
15720.00	H	57.90	-37.33	-27	-10.33

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

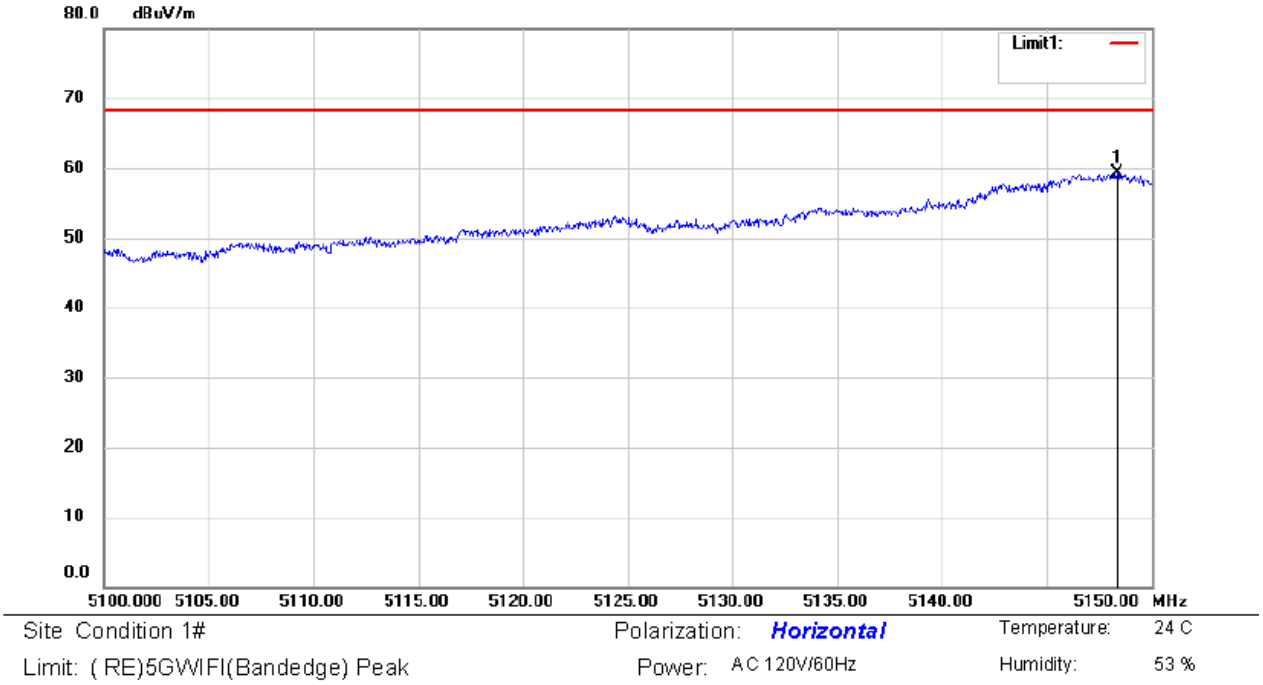
- ☒Undesirable radiated Undesirable radiated Spurious Emission in Band Edge

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
5148.36	H	59.40	-35.83	-27	Pass
5148.10	V	58.41	-36.82	-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
5350.05	V	57.04	-38.19	-27	Pass
5350.25	H	57.82	-37.41	-27	Pass

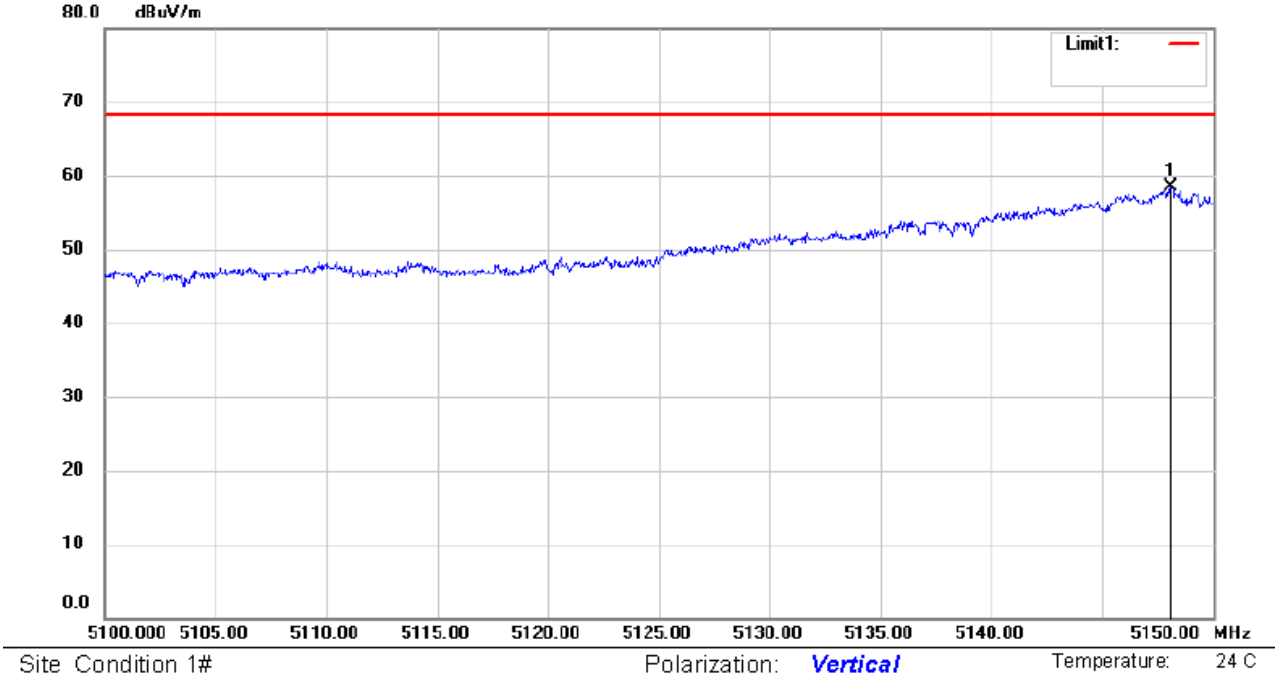
Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

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



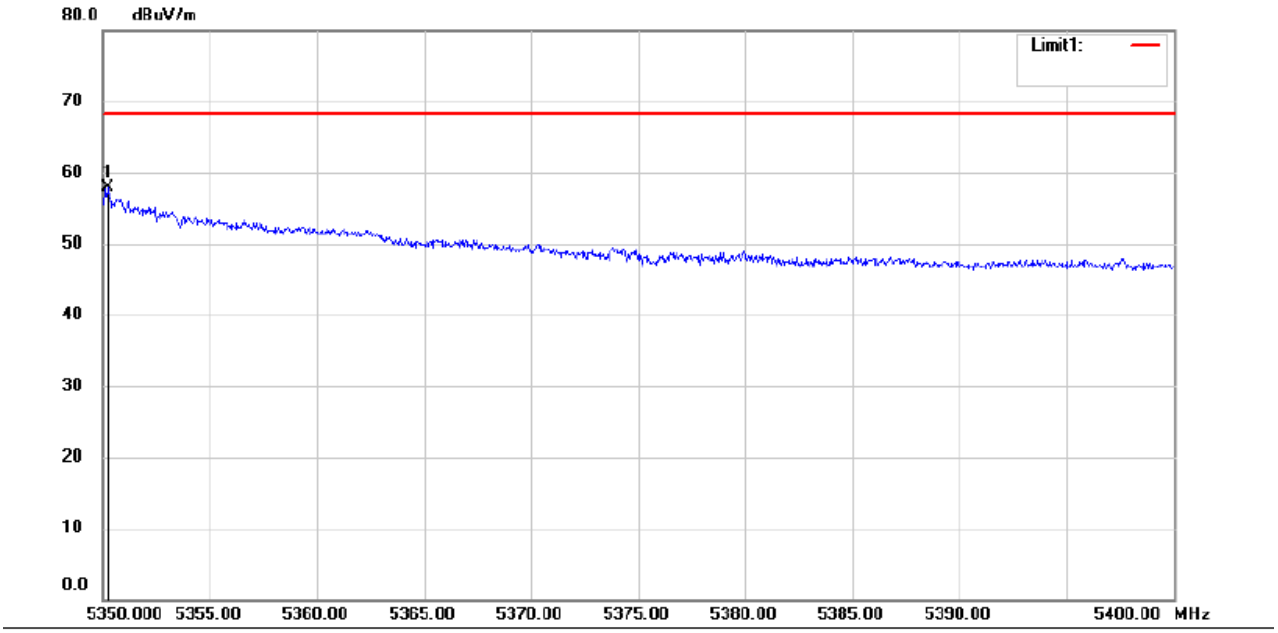
Site Condition 1# Polarization: *Horizontal* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

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



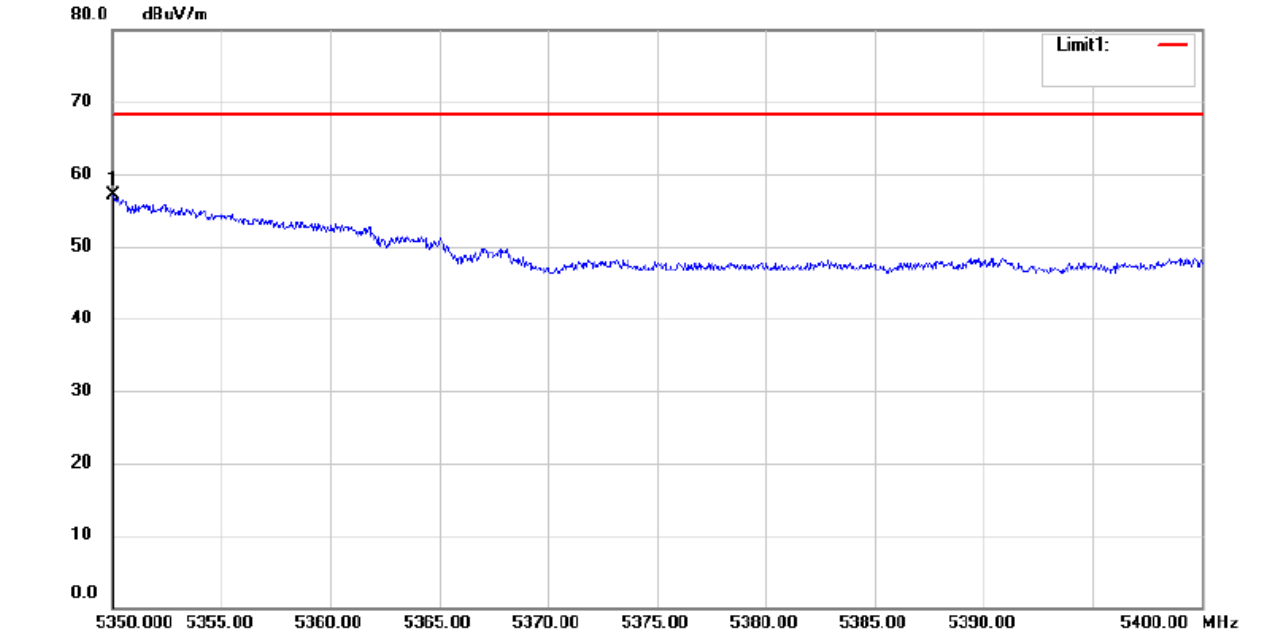
Site Condition 1# Polarization: *Vertical* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

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



Site Condition 1# Polarization: *Horizontal* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

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



Site Condition 1# Polarization: *Vertical* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

■ ☒For Undesirable radiated Spurious Emission in U-NII -2A
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): 5260

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7982.33	V	60.51	-34.72	-27	-7.72
10520.00	V	60.31	-34.92	-27	-7.92
15780.00	V	54.13	-41.1	-27	-14.1
7982.33	H	62.04	-33.19	-27	-6.19
10520.00	H	60.8	-34.43	-27	-7.43
15780.00	H	54.79	-40.44	-27	-13.44

Test mode: 802.11a Frequency(MHz): 5280

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7849.12	V	64.66	-30.57	-27	-3.57
10560.00	V	57.92	-37.31	-27	-10.31
15840.00	V	54.77	-40.46	-27	-13.46
7849.12	H	60.39	-34.84	-27	-7.84
10560.00	H	60.71	-34.52	-27	-7.52
15840.00	H	53.61	-41.62	-27	-14.62

Test mode: 802.11a Frequency(MHz): 5320

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7633.17	V	64.32	-30.91	-27	-3.91
10640.00	V	60.99	-34.24	-27	-7.24
15960.00	V	54.12	-41.11	-27	-14.11
7633.17	H	62.43	-32.8	-27	-5.8
10640.00	H	57.63	-37.6	-27	-10.6
15960.00	H	56.04	-39.19	-27	-12.19

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

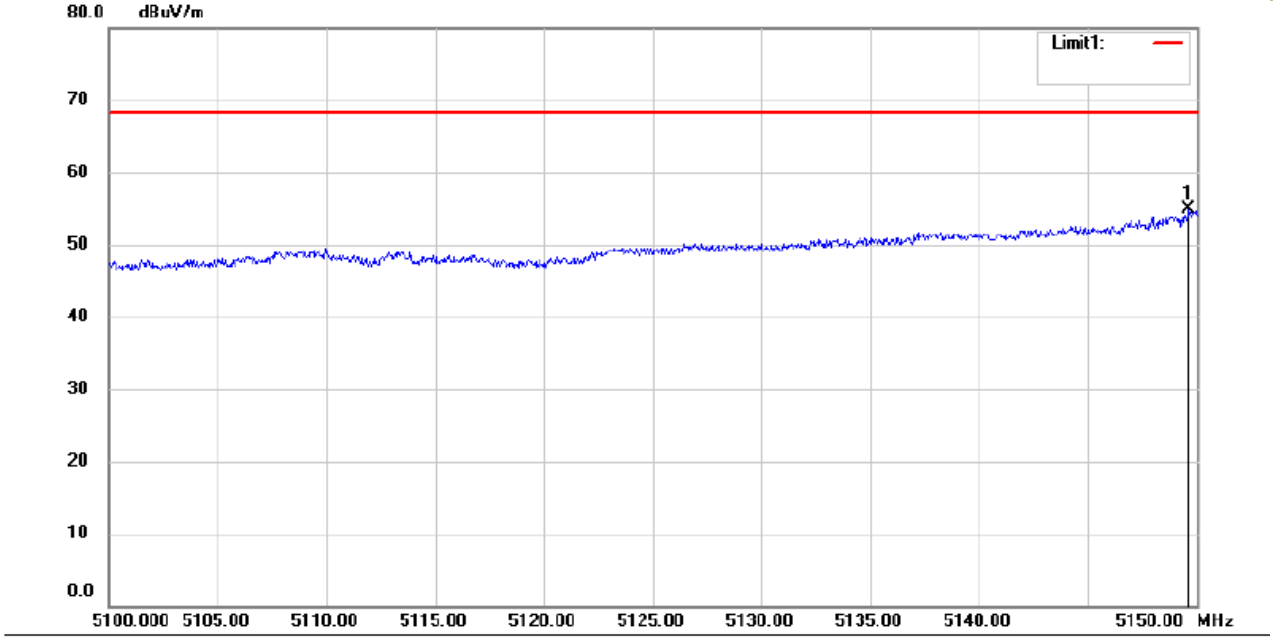
- ☒Undesirable radiated Undesirable radiated Spurious Emission in Band Edge

Test mode:	802.11a	Frequency(MHz):	5260		
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5149.65	H	54.89	-40.34	-27	Pass
5149.60	V	54.25	-40.98	-27	Pass

Test mode:	802.11a	Frequency(MHz):	5320		
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5351.60	V	55.85	-39.38	-27	Pass
5350.75	H	55.82	-39.41	-27	Pass

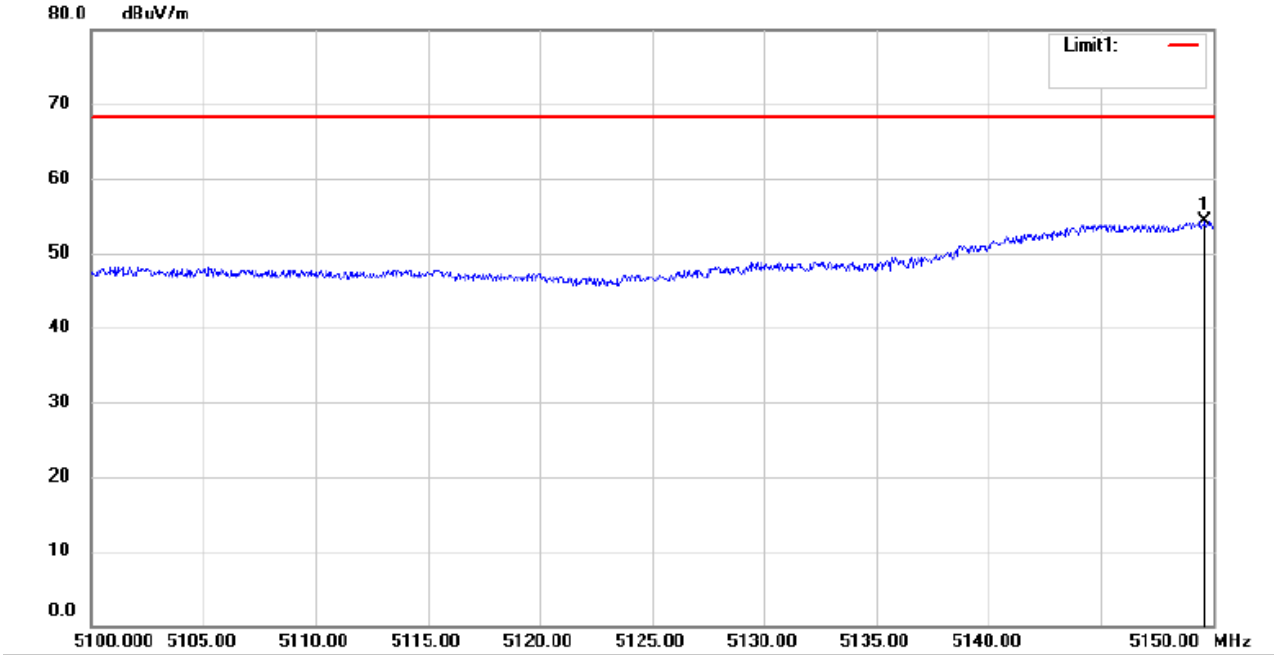
Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

Test Model	U-NII -2A Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20) ☒5260 ☐5300 ☐5320 Ant.Pol H



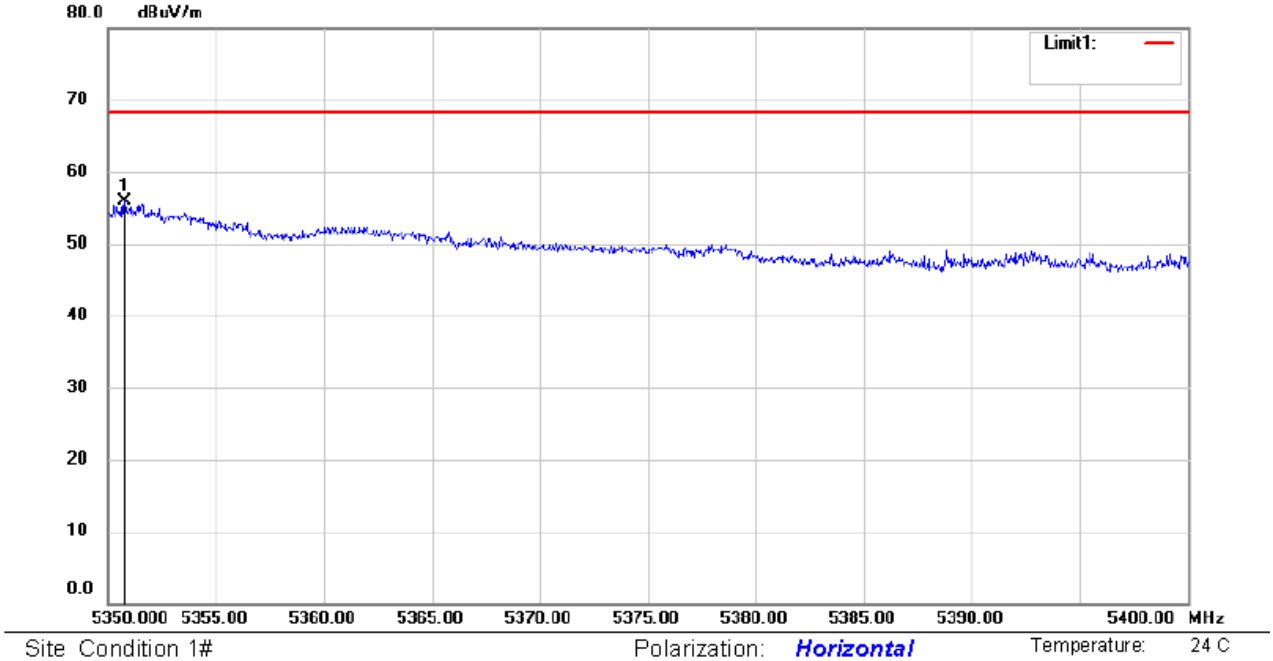
Site Condition 1# Polarization: *Horizontal* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

Test Model	U-NII -2A Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20) ☒5260 ☐5300 ☐5320 Ant.Pol V



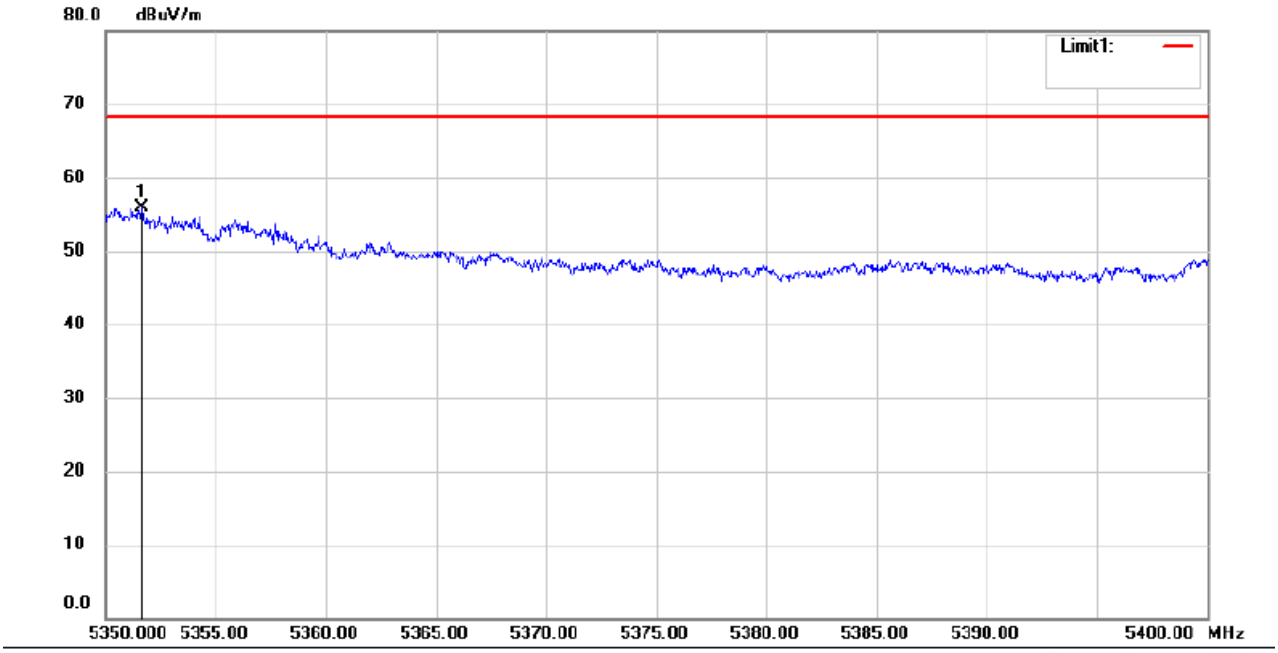
Site Condition 1# Polarization: *Vertical* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

Test Model	U-NII -2A Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz)
	☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20)
	☐5260 ☐5300 ☒5320 Ant.Pol H



Site Condition 1# Polarization: *Horizontal* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

Test Model	U-NII -2A Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz)
	☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20)
	☐5260 ☐5300 ☒5320 Ant.Pol V



Site Condition 1# Polarization: *Vertical* Temperature: 24 C
Limit: (RE)5GWIFI(Bandedge) Peak Power: AC 120V/60Hz Humidity: 53 %

■ ☒For Undesirable radiated Spurious Emission in U-NII -2C
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): 5500

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7846.40	V	60.75	-34.48	-27	-7.48
11000.00	V	61.49	-33.74	-27	-6.74
16500.00	V	53.32	-41.91	-27	-14.91
7846.40	H	61.33	-33.9	-27	-6.90
11000.00	H	60.24	-34.99	-27	-7.99
16500.00	H	57.17	-38.06	-27	-11.06

Test mode: 802.11a Frequency(MHz): 5580

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7513.92	V	62.52	-32.71	-27	-5.71
11160.00	V	61.97	-33.26	-27	-6.26
16740.00	V	57.62	-37.61	-27	-10.61
7513.92	H	60.87	-34.36	-27	-7.36
11160.00	H	57.76	-37.47	-27	-10.47
16740.00	H	54.61	-40.62	-27	-13.62

Test mode: 802.11a Frequency(MHz): 5700

Freq. (MHz)	Ant.Pol. H/V	Field Strength (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Over(dB)
7883.47	V	63.72	-31.51	-27	-4.51
11400.00	V	57.32	-37.91	-27	-10.91
17100.00	V	56.69	-38.54	-27	-11.54
7883.47	H	61.78	-33.45	-27	-6.45
11400.00	H	61.03	-34.20	-27	-7.20
17100.00	H	53.79	-41.44	-27	-14.44

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

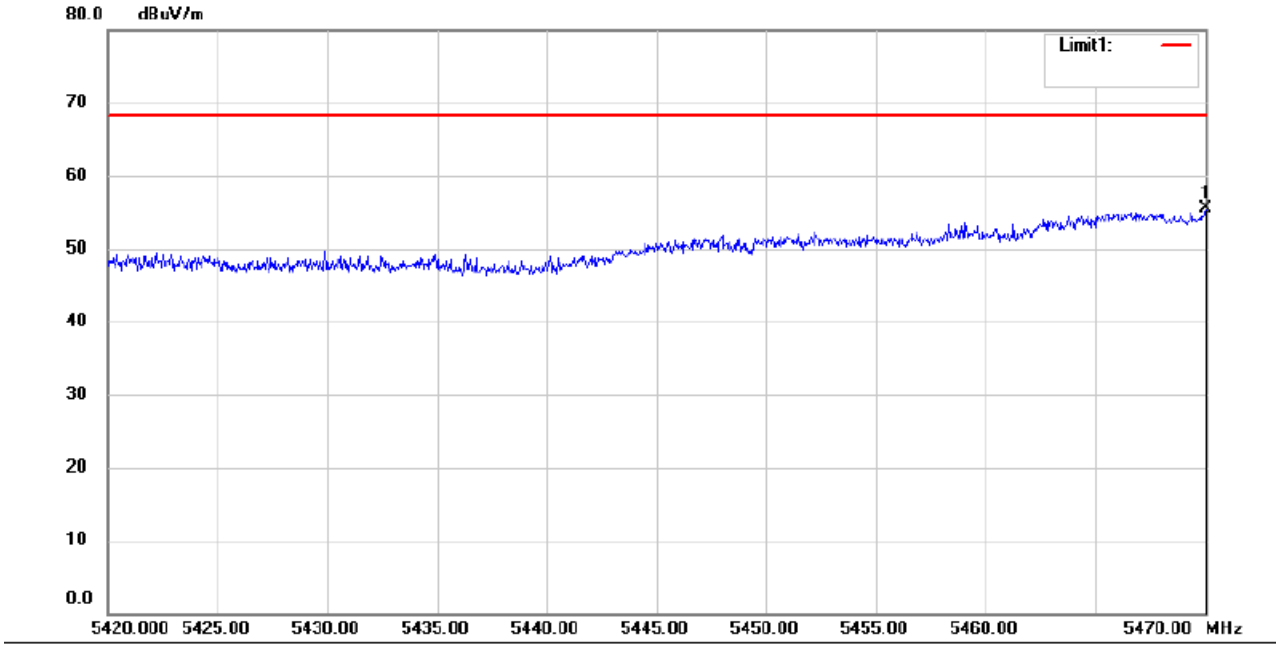
- ☒Undesirable radiated Undesirable radiated Spurious Emission in Band Edge

Test mode:	802.11a	Frequency(MHz):	5500		
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5470.00	H	55.49	-39.74	-27	Pass
5469.70	V	55.48	-39.75	-27	Pass

Test mode:	802.11a	Frequency(MHz):	5700		
Freq. (MHz)	Ant.Pol. H/V	Field Strength (RBW=100KHz) (dBuV/m)	E.I.R.P (dBm)	Limit (dBm)	Verdict
5725.20	V	56.49	-38.74	-27	Pass
5725.05	H	55.09	-40.14	-27	Pass

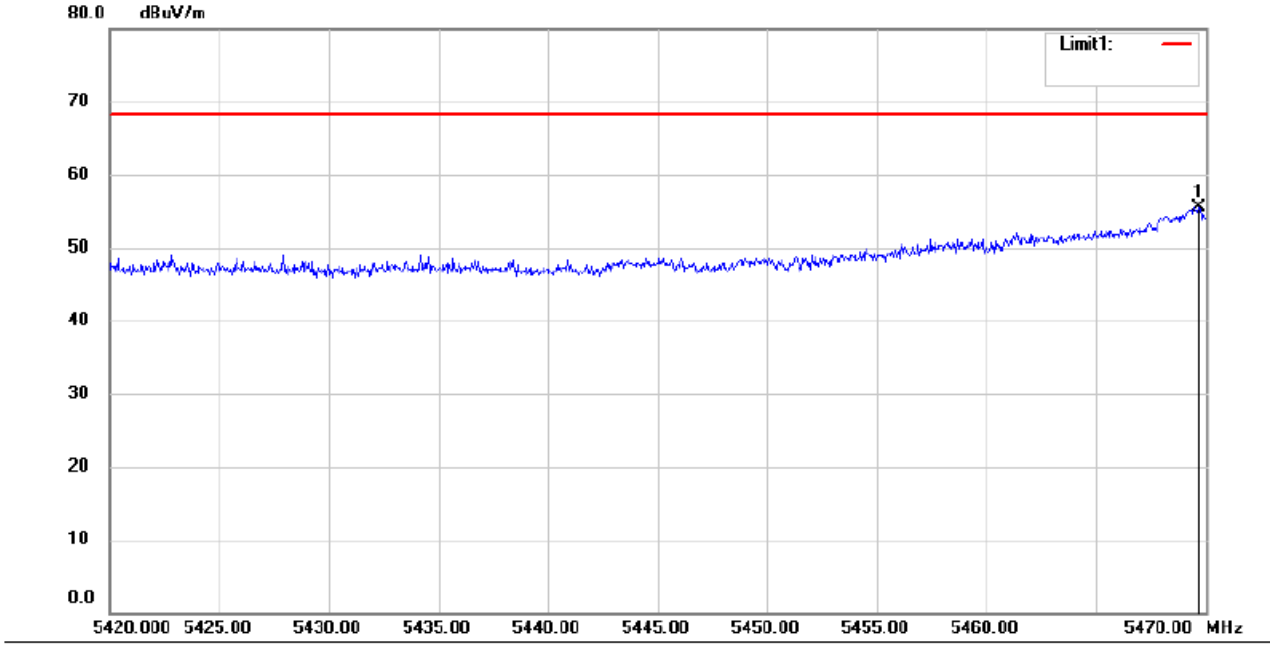
Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

Test Model	U-NII -2C Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20) ☒5500 ☐5580 ☐5700 Ant.Pol H



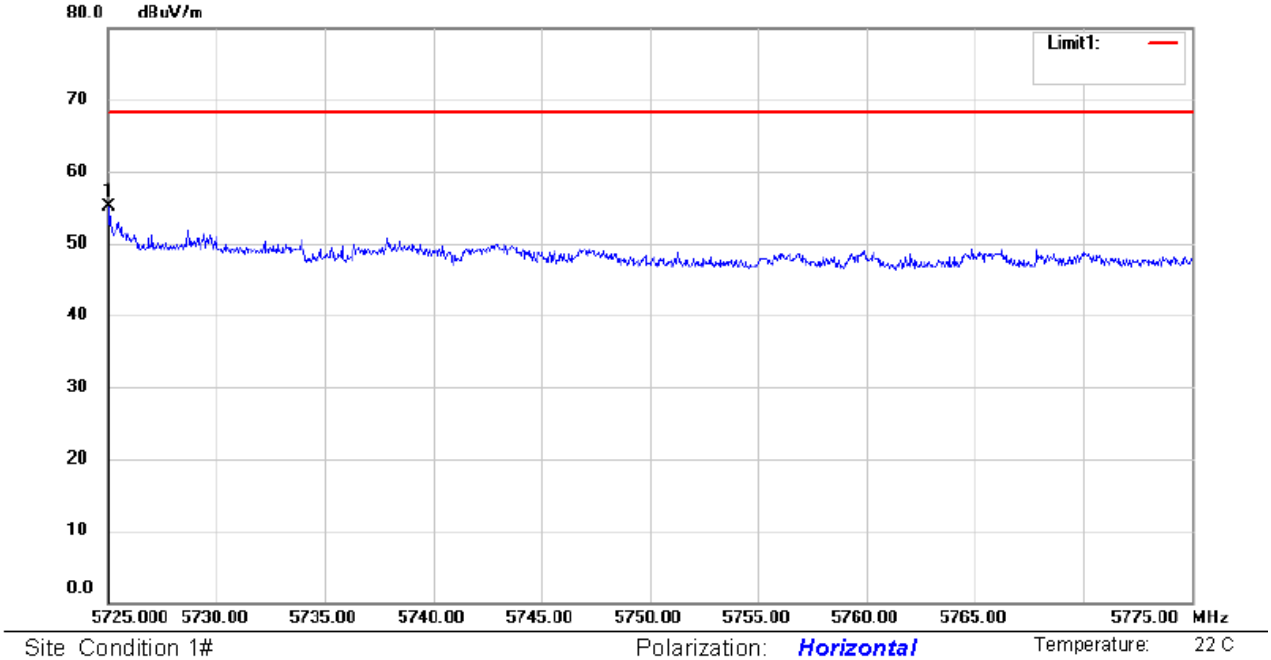
Site Condition 1# Polarization: *Horizontal* Temperature: 22 C
Limit: (RE)FCC PART 15C(Bandedge)Peak Power: AC 120V/60Hz Humidity: 50 %

Test Model	U-NII -2C Undesirable radiated Spurious Emission in Restricted Band (5100-5150MHz) ☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20) ☒5500 ☐5580 ☐5700 Ant.Pol V



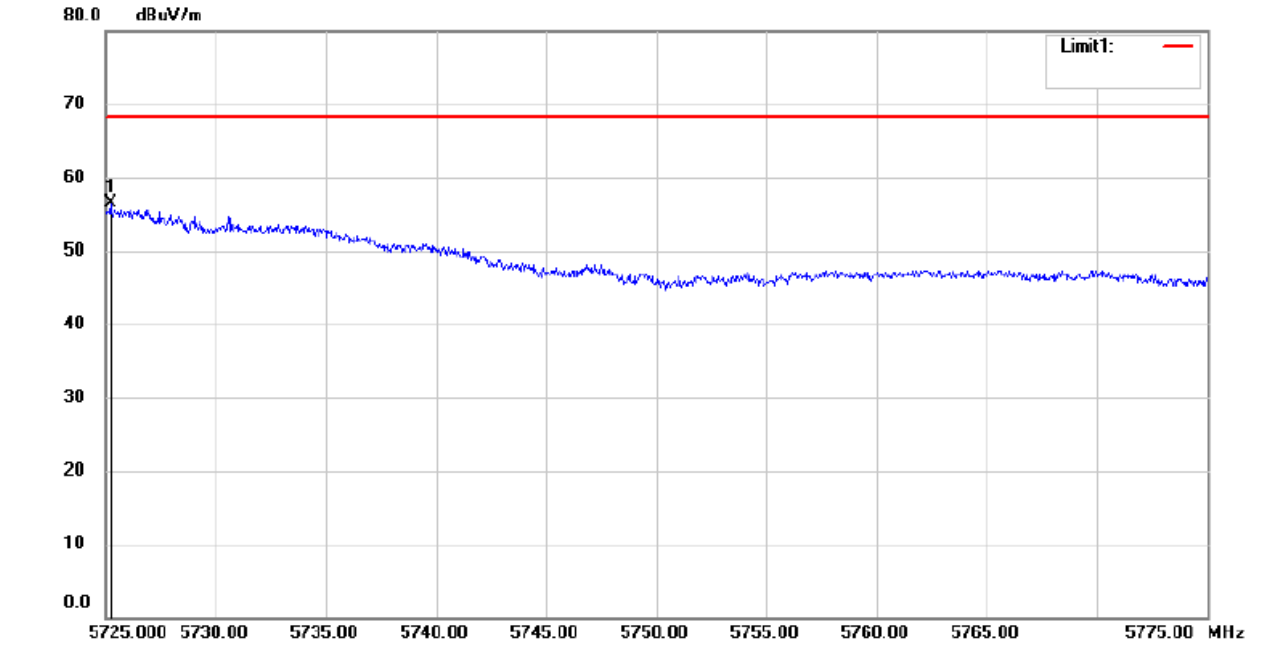
Site Condition 1# Polarization: *Vertical* Temperature: 22 C
Limit: (RE)FCC PART 15C(Bandedge)Peak Power: AC 120V/60Hz Humidity: 50 %

Test Model	U-NII -2C Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) ☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20) ☐5500 ☐5580 ☒5700 Ant.Pol H



Site Condition 1# Polarization: *Horizontal* Temperature: 22 C
Limit: (RE)FCC PART 15C(Bandedge)Peak Power: AC 120V/60Hz Humidity: 50 %

Test Model	U-NII -2C Undesirable radiated Spurious Emission in Restricted Band (5350-5400MHz) ☒802.11a ☐802.11n(HT20) ☐802.11 ac (VHT20) ☐5500 ☐5580 ☒5700 Ant.Pol V



Site Condition 1# Polarization: *Vertical* Temperature: 22 C
Limit: (RE)FCC PART 15C(Bandedge)Peak Power: AC 120V/60Hz Humidity: 50 %

■ ☒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)
7732.03	V	63.66	-31.57	-27	-4.57
11490.00	V	61.35	-33.88	-27	-6.88
17235.00	V	53.78	-41.45	-27	-14.45
7732.03	H	64.27	-30.96	-27	-3.96
11490.00	H	57.71	-37.52	-27	-10.52
17235.00	H	55.93	-39.3	-27	-12.3

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)
7837.25	V	62.98	-32.25	-27	-5.25
11570.00	V	61.66	-33.57	-27	-6.57
17355.00	V	56.15	-39.08	-27	-12.08
7837.25	H	61.39	-33.84	-27	-6.84
11570.00	H	58.84	-36.39	-27	-9.39
17355.00	H	53.49	-41.74	-27	-14.74

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)
7875.27	V	63.31	-31.92	-27	-4.92
11650.00	V	59.01	-36.22	-27	-9.22
17475.00	V	56.48	-38.75	-27	-11.75
7875.27	H	60.78	-34.45	-27	-7.45
11650.00	H	57.7	-37.53	-27	-10.53
17475.00	H	56.61	-38.62	-27	-11.62

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

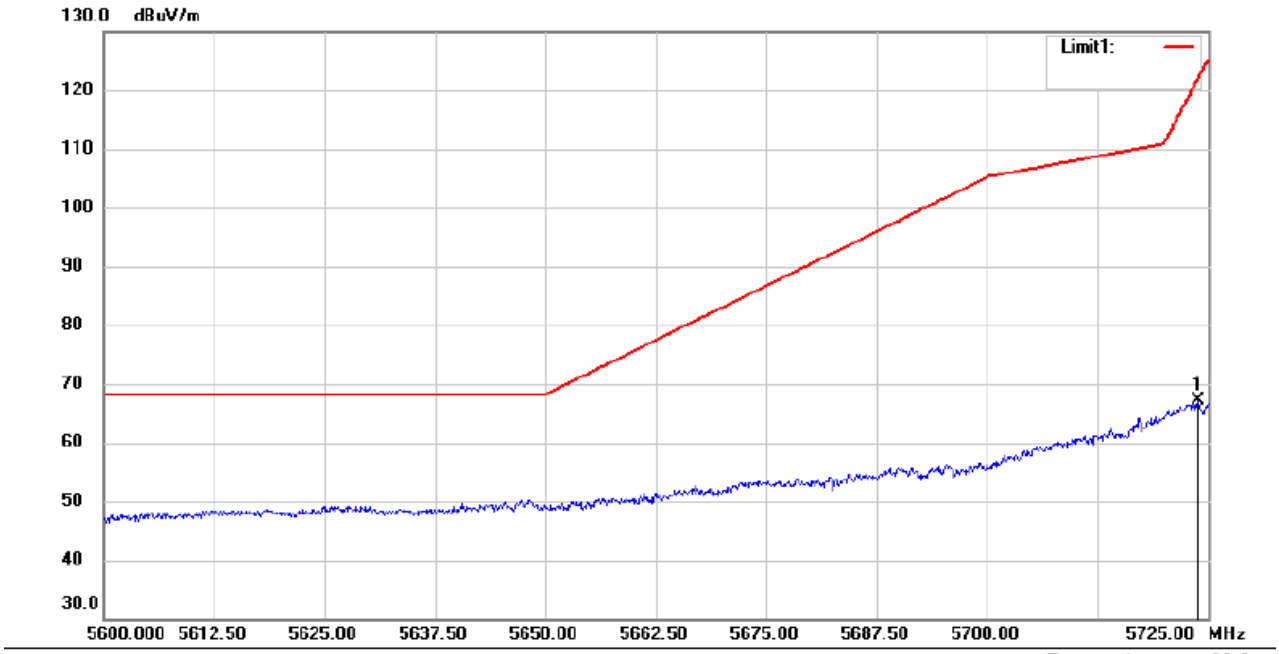
- ☒Undesirable radiated Spurious Emission in band edge

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
5723.87	H	67.01	-28.22	26.76	PASS
5724.87	V	65.73	-29.50	29.64	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
5851.03	V	67.38	-27.85	27.03	PASS
5851.62	H	64.92	-30.31	25.32	PASS

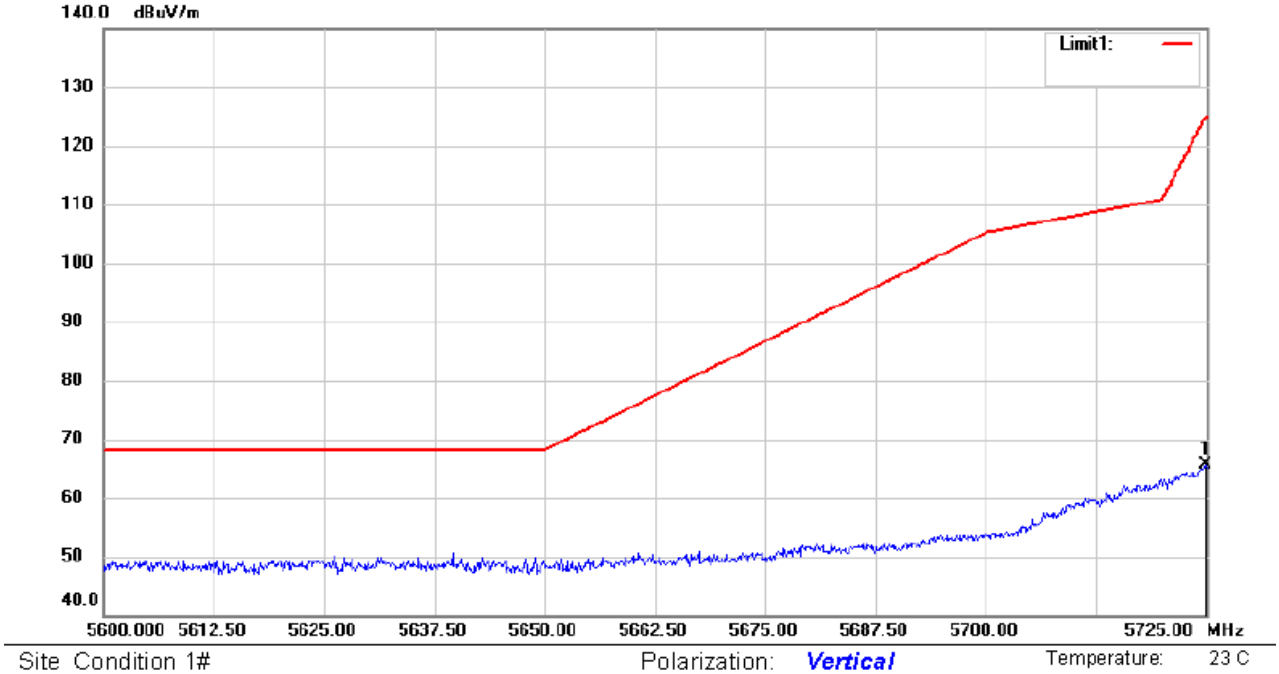
Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
d is the measurement distance in 3 meters

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



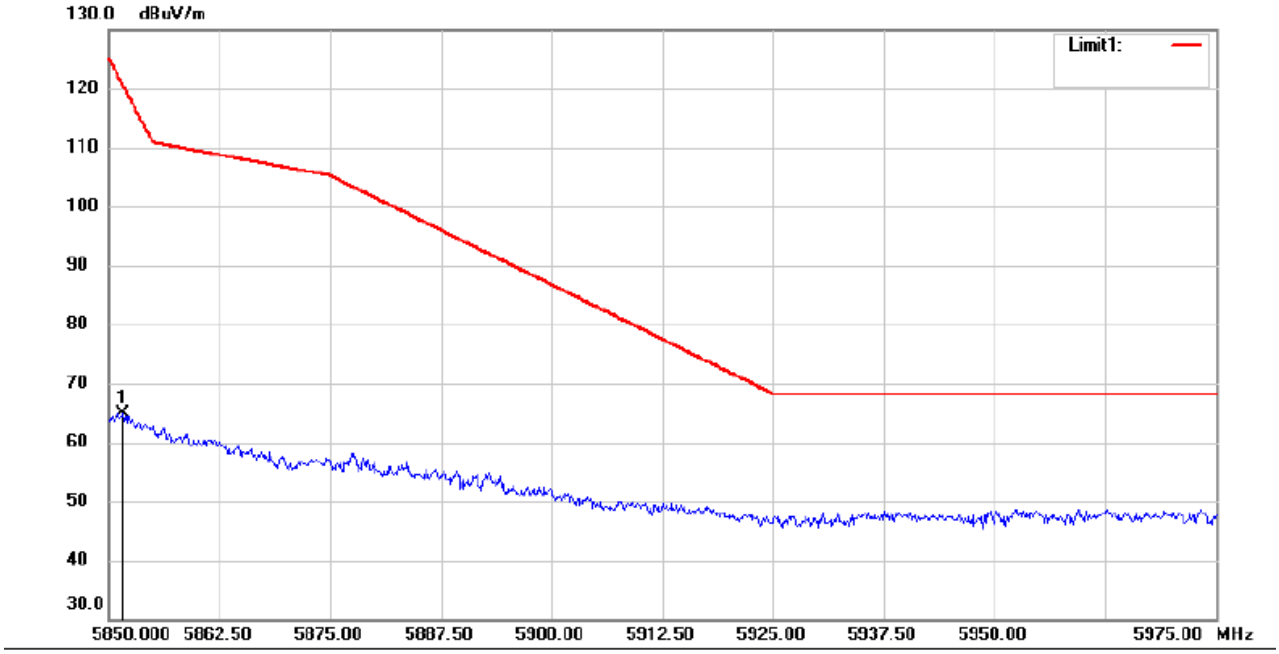
Site Condition 1#	Polarization:	*Horizontal*	Temperature: 23 C
Limit: (RE)FCC PART 15C B4 (5G Bandedge) Peak	Power:	AC 120V/60Hz	Humidity: 51 %

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



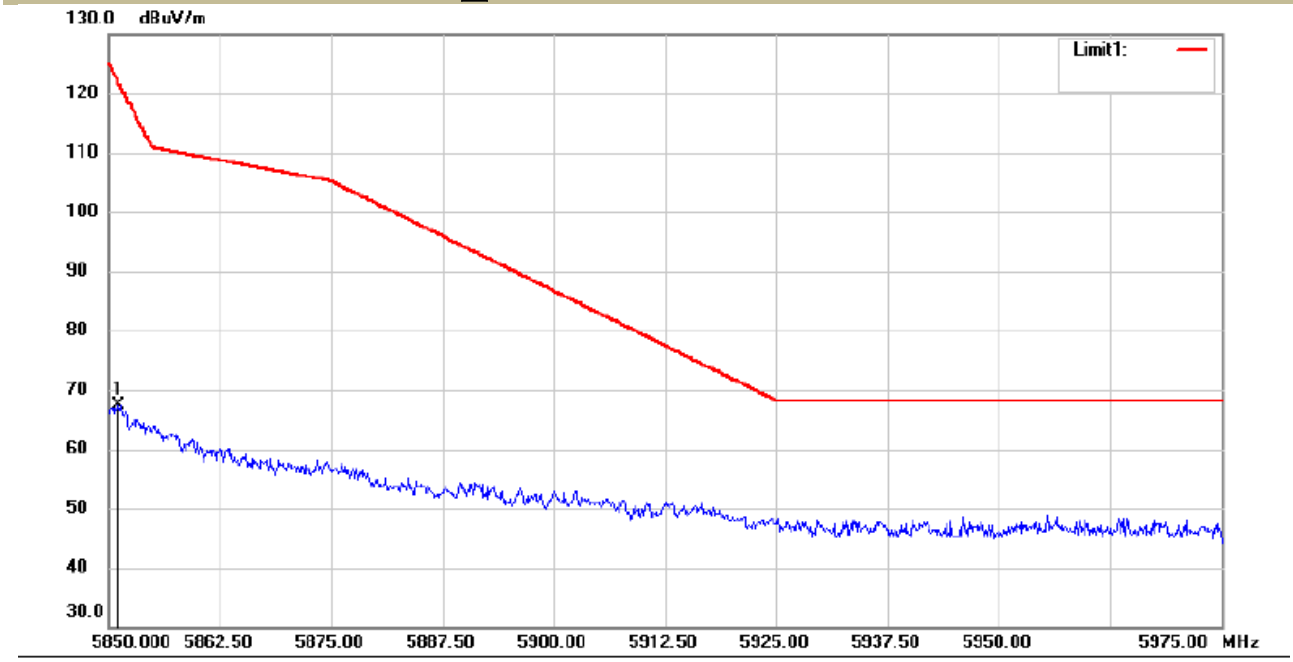
Site Condition 1#	Polarization:	*Vertical*	Temperature: 23 C
Limit: (RE)FCC PART 15C B4 (5G Bandedge) Peak	Power:	AC 120V/60Hz	Humidity: 51 %

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



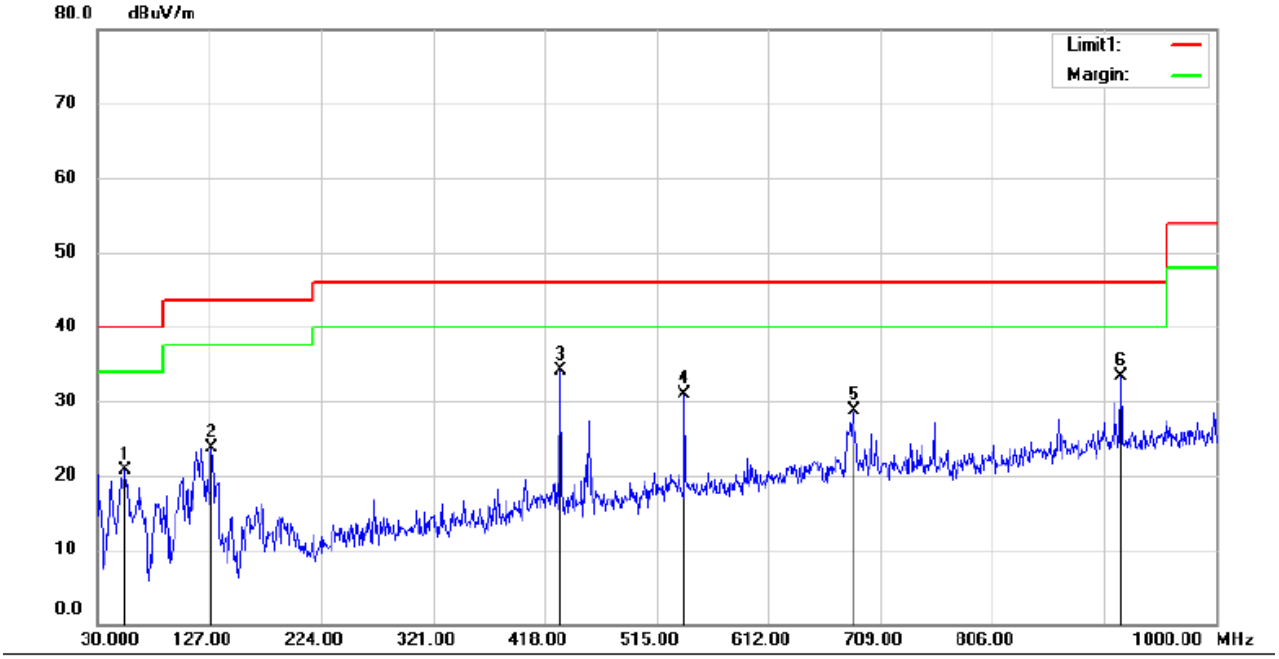
Site Condition 1#	Polarization:	*Horizontal*	Temperature: 23 C
Limit: (RE)FCC PART 15C B4 (5G Bandedge) Peak	Power:	AC 120V/60Hz	Humidity: 51 %

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



Site Condition 1#	Polarization:	*Vertical*	Temperature: 23 C
Limit: (RE)FCC PART 15C B4 (5G Bandedge) Peak	Power:	AC 120V/60Hz	Humidity: 51 %

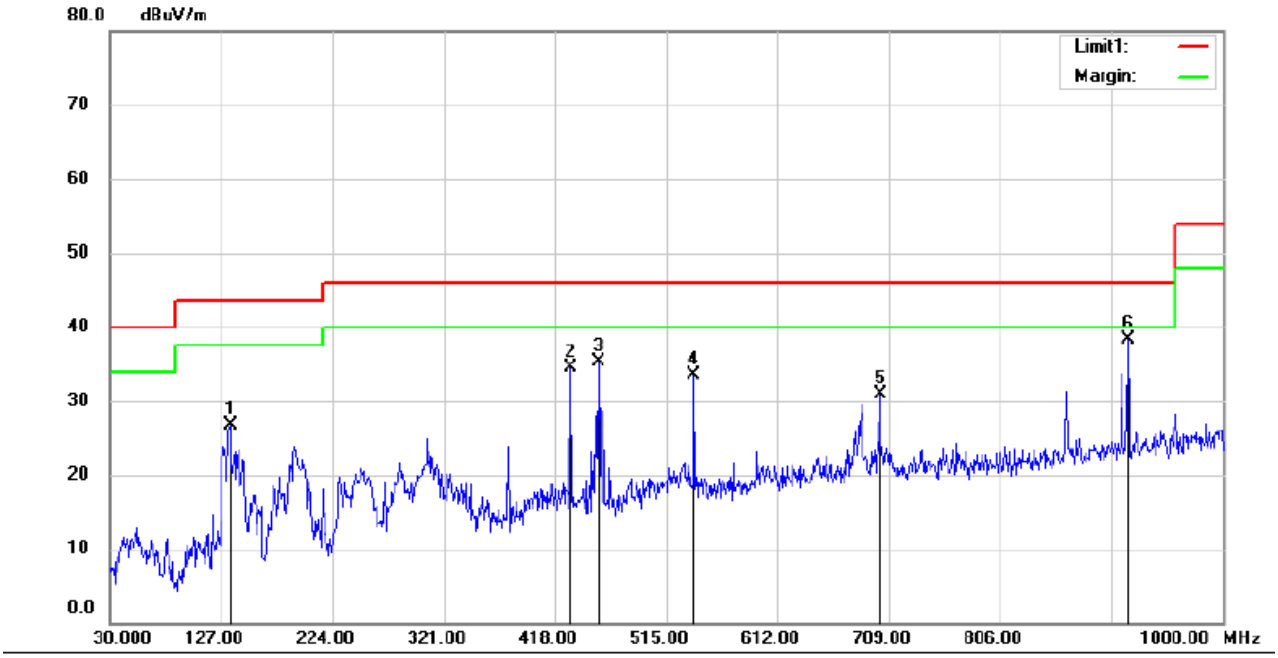
- Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)
  All the modes 802.11a/n/ac has been tested and the worst result 802.11a recorded as below:



Site 3m Chamber #3 Polarization: *Vertical* Temperature: C
Limit: (RE)FCC PART 15C Power: AC 120V/60Hz Humidity: %

Mode:5G WIFI 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		54.2500	35.47	-14.69	20.78	40.00	-19.22	QP			
2		129.7887	43.20	-19.56	23.64	43.50	-19.86	QP			
3	*	431.9438	43.99	-9.90	34.09	46.00	-11.91	QP			
4		539.9775	38.80	-7.95	30.85	46.00	-15.15	QP			
5		685.7200	33.87	-5.20	28.67	46.00	-17.33	QP			
6		918.0350	34.72	-1.33	33.39	46.00	-12.61	QP			



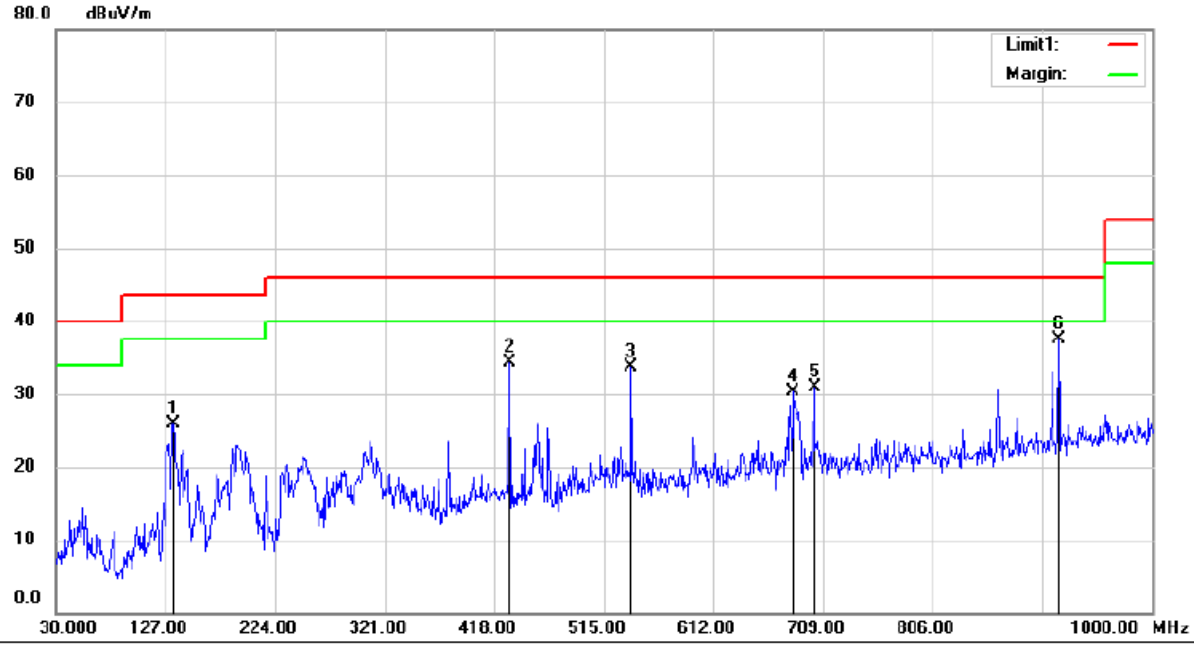
Site 3m Chamber #3 Polarization: *Horizontal* Temperature: C

Limit: (RE)FCC PART 15C Power: AC 120V/60Hz Humidity: %

Mode:5G WIFI 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		134.8812	46.57	-19.83	26.74	43.50	-16.76	QP			
2		431.9438	44.31	-9.90	34.41	46.00	-11.59	QP			
3		456.0725	44.86	-9.53	35.33	46.00	-10.67	QP			
4		539.9775	41.51	-7.95	33.56	46.00	-12.44	QP			
5		702.0888	35.92	-4.92	31.00	46.00	-15.00	QP			
6	*	918.0350	39.63	-1.33	38.30	46.00	-7.70	QP			



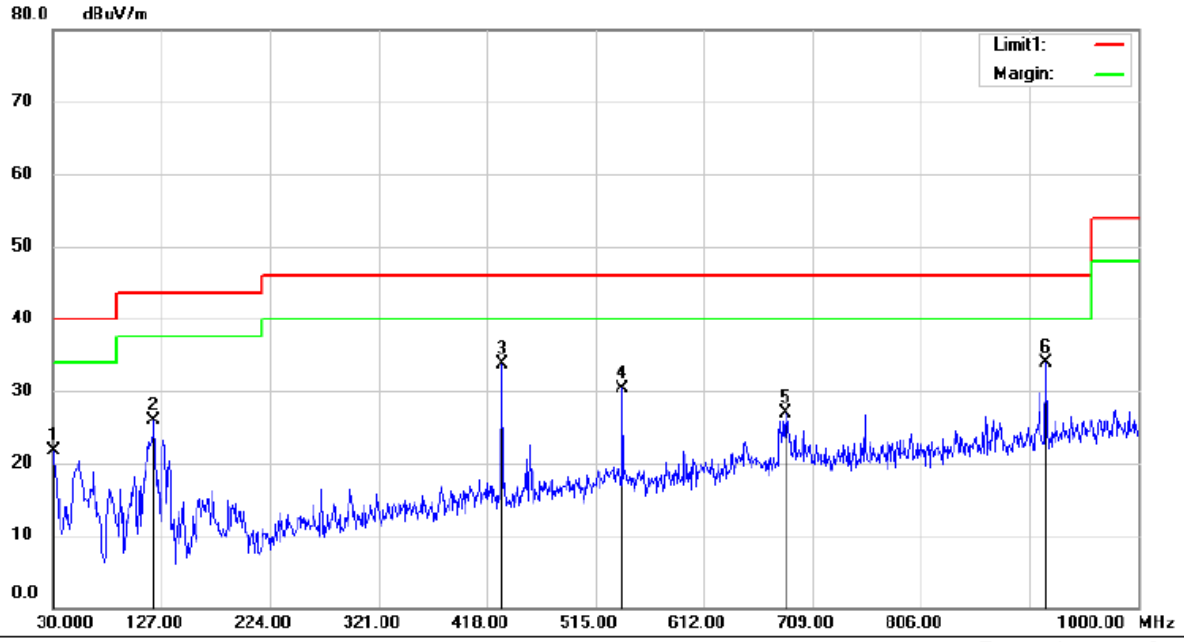
Site 3m Chamber #3 Polarization: *Horizontal* Temperature: C

Limit: (RE)FCC PART 15C Power: AC 120V/60Hz Humidity: %

Mode:5G WIFI 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		133.7900	45.77	-19.78	25.99	43.50	-17.51	QP			
2		431.9438	44.16	-9.90	34.26	46.00	-11.74	QP			
3		539.9775	41.57	-7.95	33.62	46.00	-12.38	QP			
4		682.8100	35.61	-5.26	30.35	46.00	-15.65	QP			
5		702.0888	35.91	-4.92	30.99	46.00	-15.01	QP			
6	*	918.0350	38.82	-1.33	37.49	46.00	-8.51	QP			



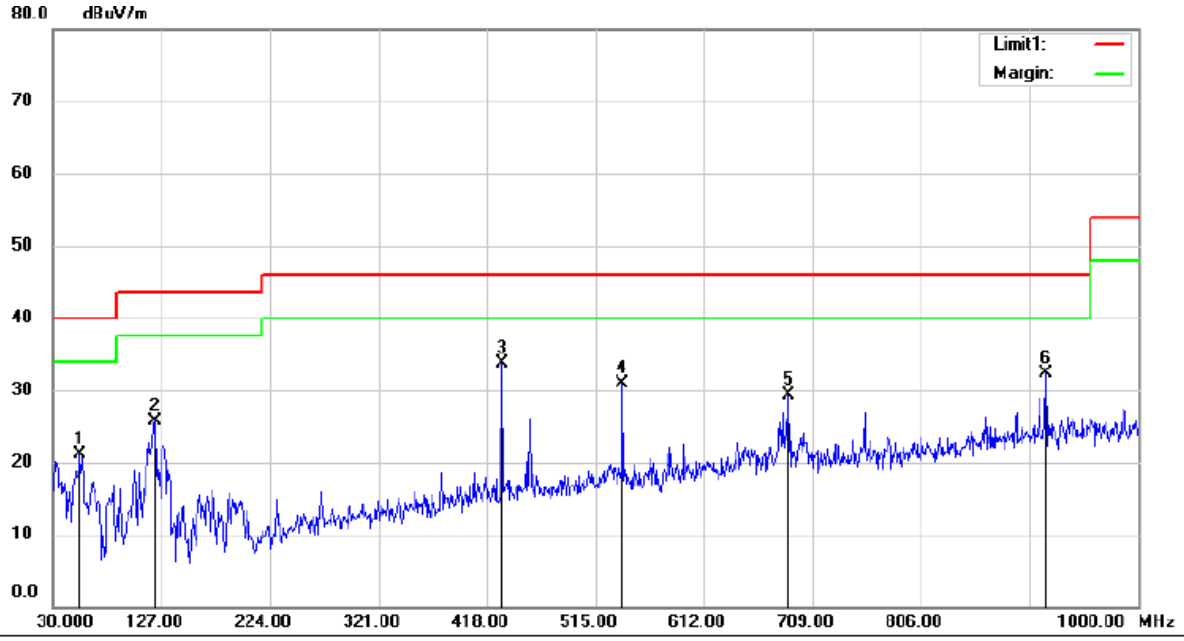
Site 3m Chamber #3 Polarization: *Vertical* Temperature: C

Limit: (RE)FCC PART 15C Power: AC 120V/60Hz Humidity: %

Mode:5G WIFI 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		30.8487	39.02	-17.27	21.75	40.00	-18.25	QP			
2		120.3312	43.95	-18.02	25.93	43.50	-17.57	QP			
3		431.9438	43.56	-9.90	33.66	46.00	-12.34	QP			
4		539.9775	38.28	-7.95	30.33	46.00	-15.67	QP			
5		685.5987	32.16	-5.20	26.96	46.00	-19.04	QP			
6	*	918.0350	35.26	-1.33	33.93	46.00	-12.07	QP			



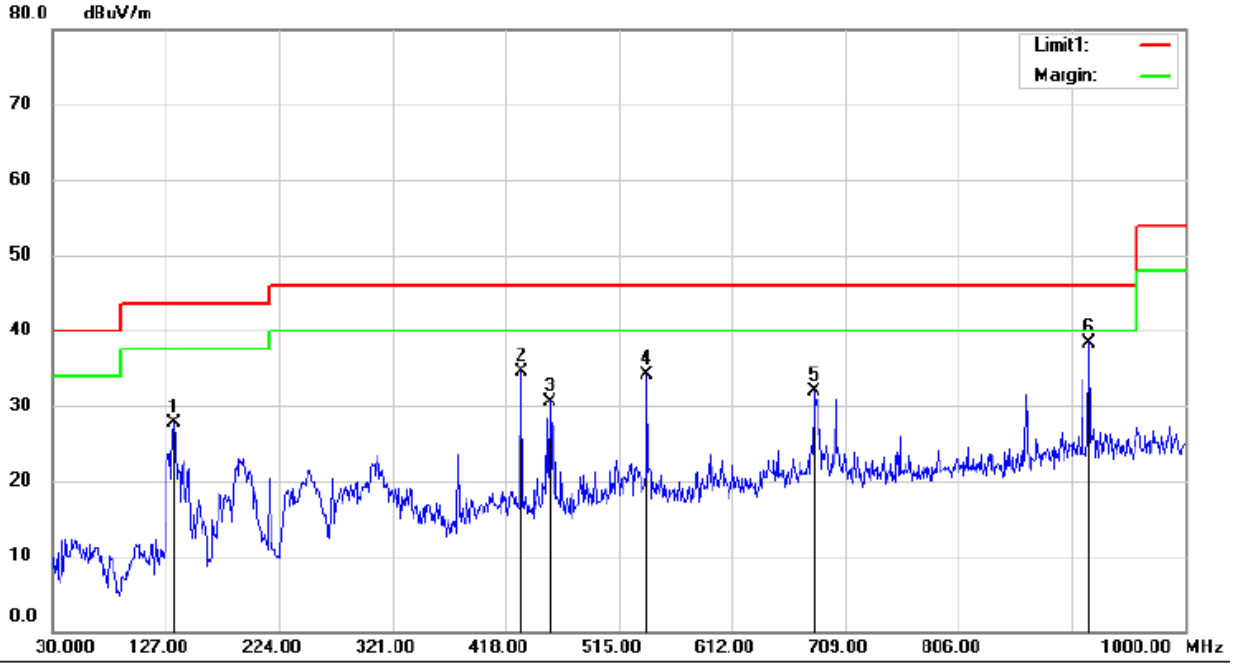
Site 3m Chamber #3 Polarization: *Vertical* Temperature: C

Limit: (RE)FCC PART 15C Power: AC 120V/60Hz Humidity: %

Mode:5G WIFI 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		54.7350	35.82	-14.79	21.03	40.00	-18.97	QP			
2		121.3012	43.85	-18.21	25.64	43.50	-17.86	QP			
3	*	431.9438	43.67	-9.90	33.77	46.00	-12.23	QP			
4		539.9775	38.89	-7.95	30.94	46.00	-15.06	QP			
5		688.0237	34.44	-5.15	29.29	46.00	-16.71	QP			
6		918.0350	33.62	-1.33	32.29	46.00	-13.71	QP			



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

Limit: (RE)FCC PART 15C Power: AC 120V/60Hz Humidity: %

Mode:5G WIFI 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		134.5175	47.45	-19.82	27.63	43.50	-15.87	QP			
2		431.9438	44.40	-9.90	34.50	46.00	-11.50	QP			
3		456.0725	40.12	-9.53	30.59	46.00	-15.41	QP			
4		539.9775	42.12	-7.95	34.17	46.00	-11.83	QP			
5		682.8100	37.17	-5.26	31.91	46.00	-14.09	QP			
6	*	918.0350	39.68	-1.33	38.35	46.00	-7.65	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

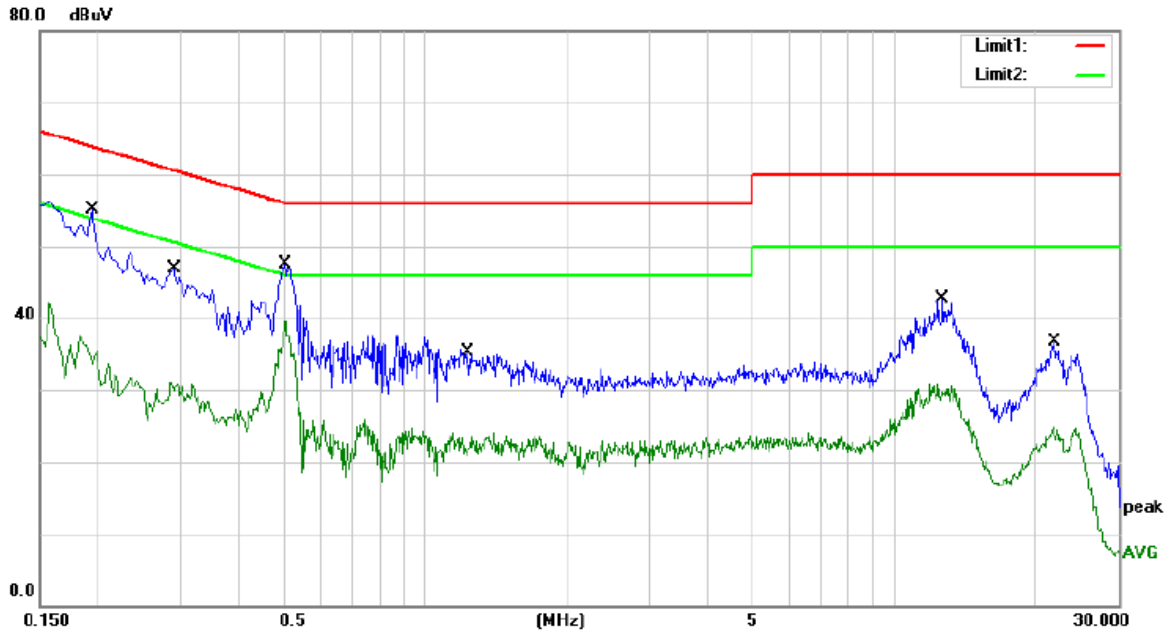
8.6.4 Test Procedure

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

The 120V &240V voltagehave been tested, and the worst result recorded was report as below:



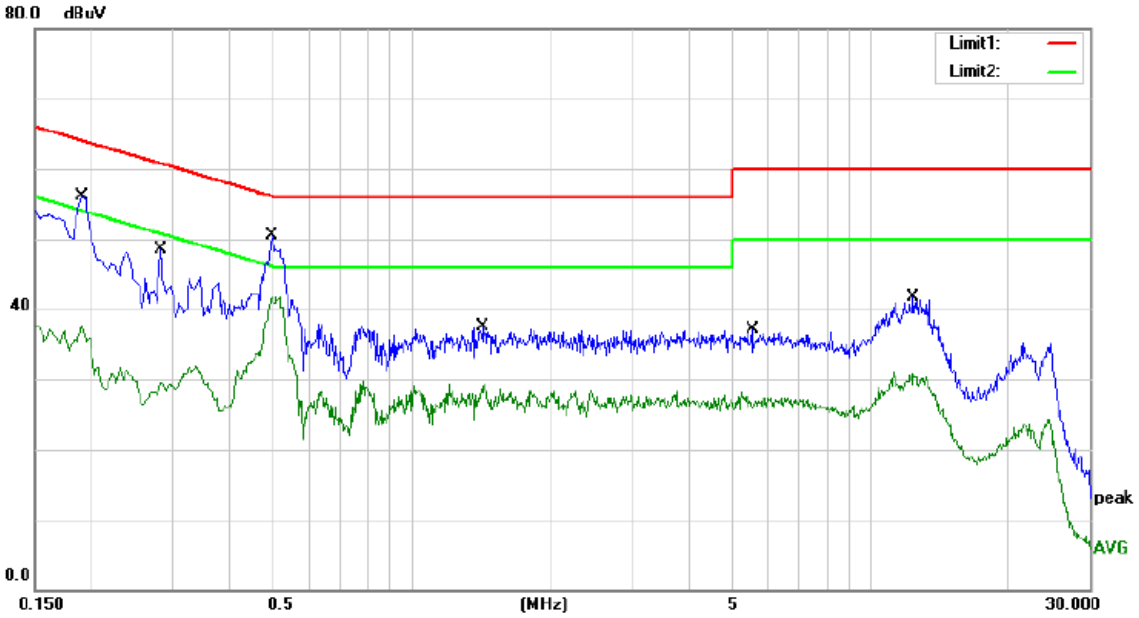
Site Conduction #1 Phase: L1 Temperature: 24.9

Limit: (CE)FCC PART15 Class B_QP Power: AC 120V/60Hz Humidity: 54 %

Mode: TX

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1940	45.63	9.56	55.19	63.86	-8.67	QP	
2		0.1940	28.03	9.56	37.59	53.86	-16.27	AVG	
3		0.2900	37.44	9.56	47.00	60.52	-13.52	QP	
4		0.2900	21.62	9.56	31.18	50.52	-19.34	AVG	
5		0.5020	37.99	9.57	47.56	56.00	-8.44	QP	
6	*	0.5020	29.89	9.57	39.46	46.00	-6.54	AVG	
7		1.2300	25.64	9.59	35.23	56.00	-20.77	QP	
8		1.2300	13.82	9.59	23.41	46.00	-22.59	AVG	
9		12.6940	32.83	9.85	42.68	60.00	-17.32	QP	
10		12.6940	20.83	9.85	30.68	50.00	-19.32	AVG	
11		21.9860	26.79	9.99	36.78	60.00	-23.22	QP	
12		21.9860	14.86	9.99	24.85	50.00	-25.15	AVG	



Site Conduction #1 Phase: N Temperature: 24.9

Limit: (CE)FCC PART15 Class B_QP Power: AC 120V/60Hz Humidity: 54 %

Mode: TX

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1900	46.62	9.56	56.18	64.04	-7.86	QP	
2		0.1900	28.13	9.56	37.69	54.04	-16.35	AVG	
3		0.2820	38.94	9.56	48.50	60.76	-12.26	QP	
4		0.2820	20.15	9.56	29.71	50.76	-21.05	AVG	
5		0.4940	40.95	9.57	50.52	56.10	-5.58	QP	
6	*	0.4940	32.15	9.57	41.72	46.10	-4.38	AVG	
7		1.4260	27.90	9.60	37.50	56.00	-18.50	QP	
8		1.4260	19.70	9.60	29.30	46.00	-16.70	AVG	
9		5.5060	27.36	9.67	37.03	60.00	-22.97	QP	
10		5.5060	17.87	9.67	27.54	50.00	-22.46	AVG	
11		12.4460	31.86	9.84	41.70	60.00	-18.30	QP	
12		12.4460	21.11	9.84	30.95	50.00	-19.05	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 1 antennas: an external Antenna for WIFI 5G, O the gain is 2 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