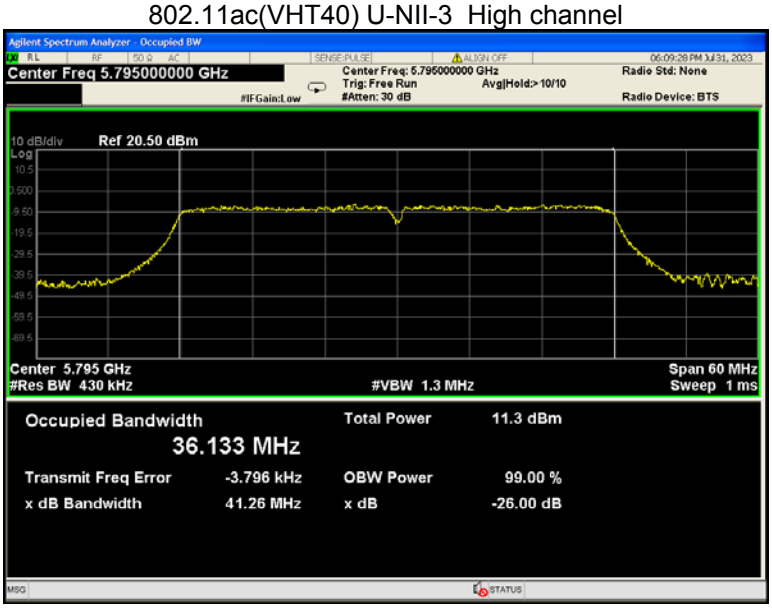
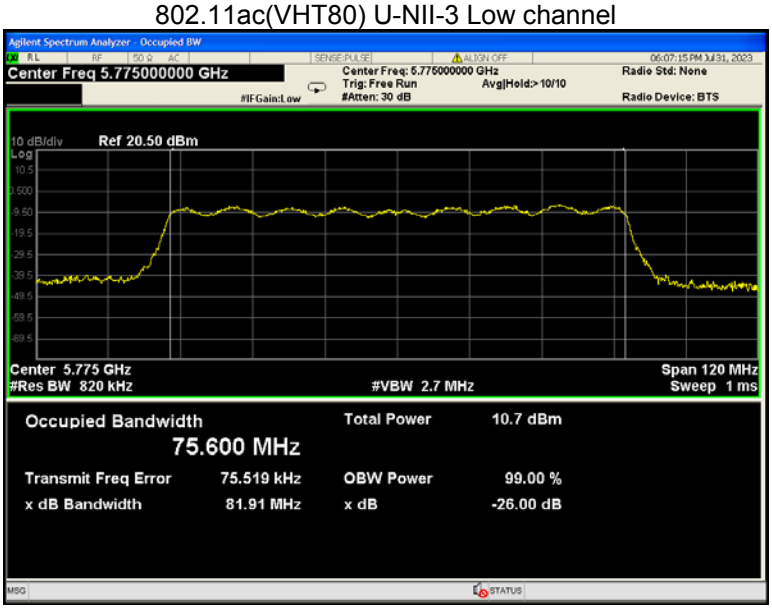
802.11ac(VHT40) U-NII-3 High channel



802.11ac(VHT80) U-NII-3 Low channel



12 Conducted Output Power

Test Requirement:	FCC 47CFR Part 15 Section 15.407(a)
Test Method:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section E
Test Limit:	U-NII-1 250mW(24dBm) U-NII-2A 250mW(24dBm) U-NII-2C 250mW(24dBm) U-NII-3 1W(30dBm)
Test Result:	PASS
Remark:	Conducted output power= measurement power+10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power

12.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

12.2 Test Result

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)
U-NII-1	802.11a	Low	6.86	0.27	7.13
		Middle	7.68		7.95
		High	9.06		9.33
	802.11n(HT20)	Low	6.87	0.32	7.19
		Middle	7.60		7.92
		High	8.98		9.30
	802.11n(HT40)	Low	7.54	0.48	8.02
		Middle	/		/
		High	8.97		9.45
	802.11ac(VHT20)	Low	6.91	0.30	7.21
		Middle	7.59		7.89
		High	9.01		9.31
	802.11ac(VHT40)	Low	7.51	0.34	7.85
		Middle	/		/
		High	8.99		9.33
	802.11ac(VHT80)	Low	8.66	1.29	**9.95**
		Middle	/		/
		High	/		/

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)
U-NII-3	802.11a	Low	5.40	0.21	5.61
		Middle	5.77		5.98
		High	6.16		6.37
	802.11n(HT20)	Low	5.36	0.38	5.74
		Middle	5.61		5.99
		High	6.06		6.44
	802.11n(HT40)	Low	5.66	0.71	6.37
		Middle	/		/
		High	6.12		6.83
	802.11ac(VHT20)	Low	5.39	0.27	5.66
		Middle	5.72		5.99
		High	6.03		6.3
	802.11ac(VHT40)	Low	5.61	0.62	6.23
		Middle	/		/
		High	6.06		6.68
	802.11ac(VHT80)	Low	6.22	1.55	**7.77**
		Middle	/		/
		High	/		/

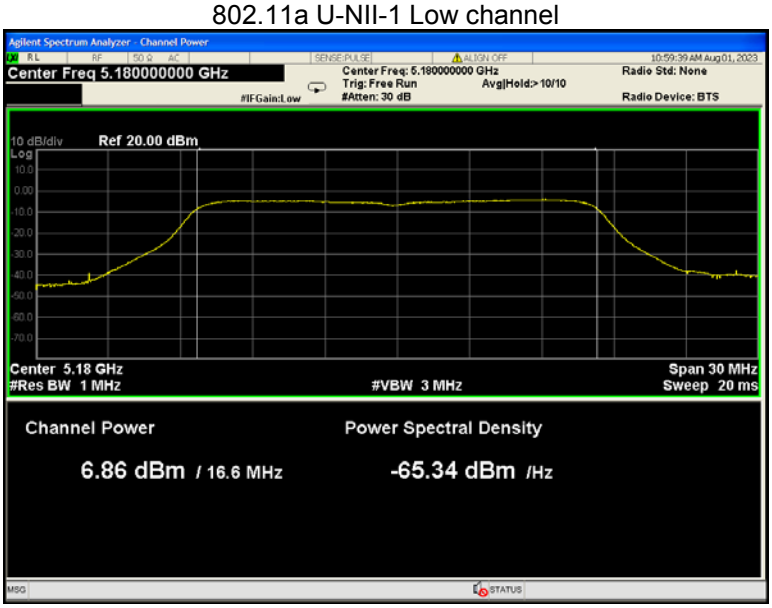
Note:

1. Conducted Output Power = Measurements + Duty Cycle Factor

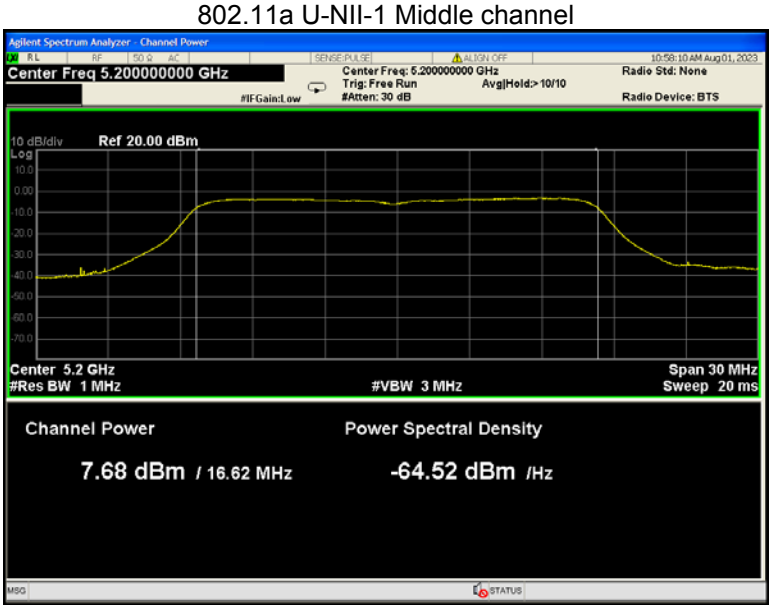
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

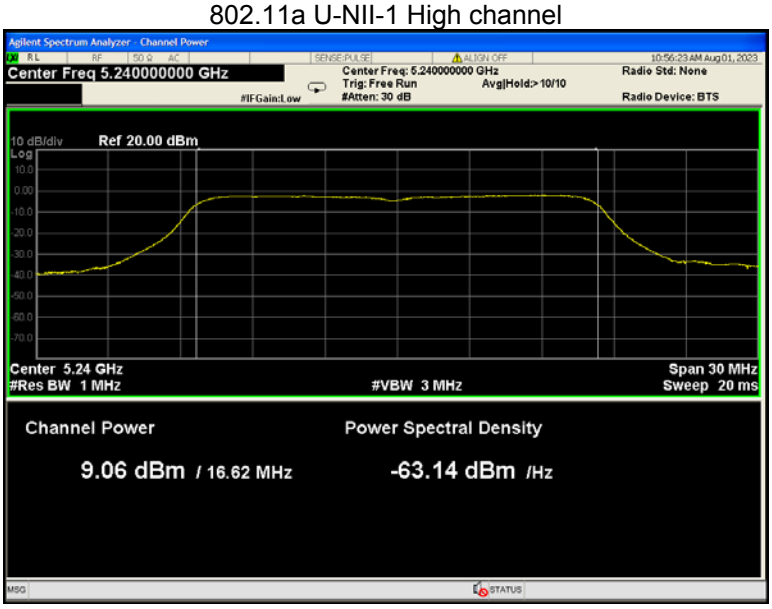
802.11a U-NII-1 Low channel



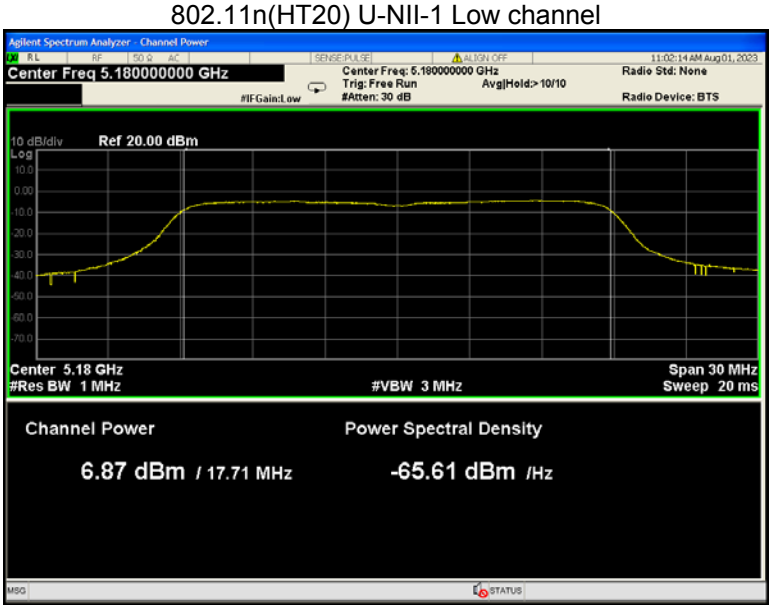
802.11a U-NII-1 Middle channel



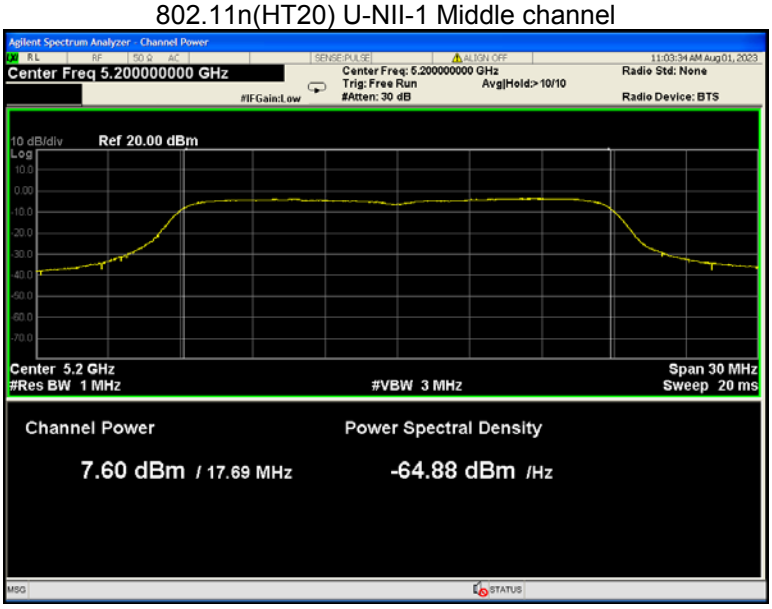
802.11a U-NII-1 High channel



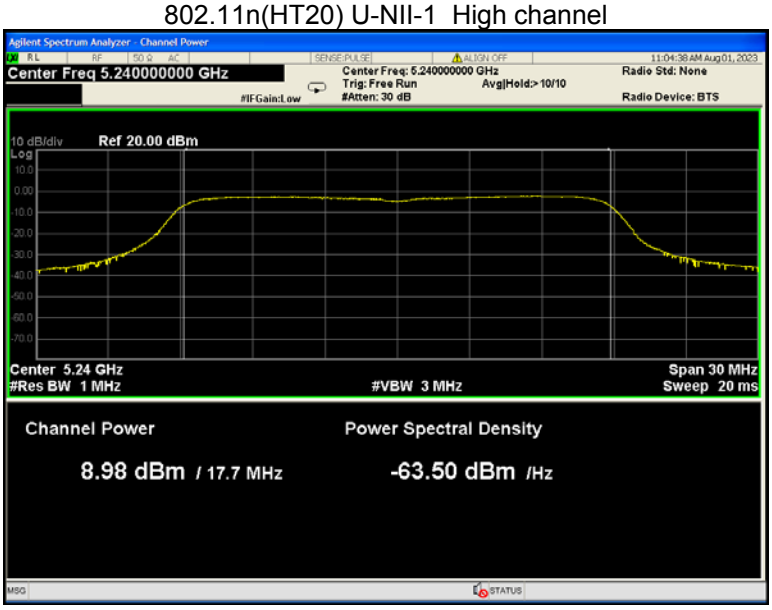
802.11n(HT20) U-NII-1 Low channel



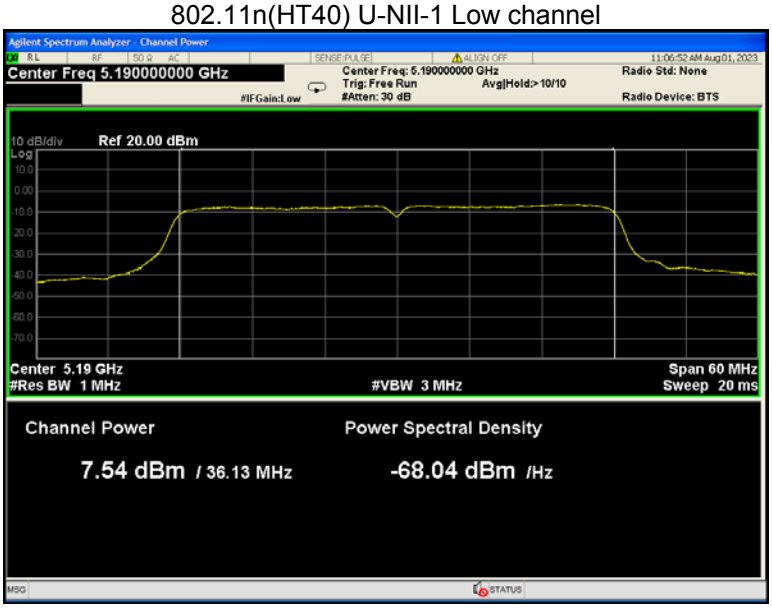
802.11n(HT20) U-NII-1 Middle channel



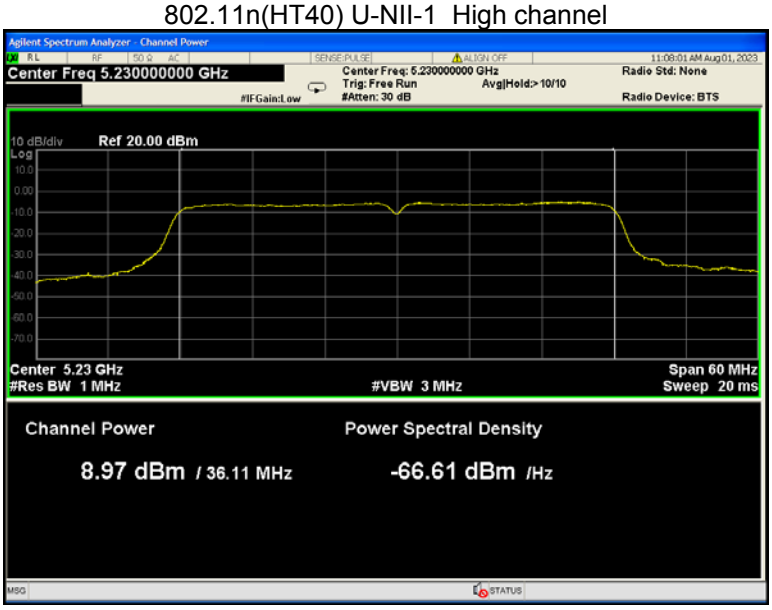
802.11n(HT20) U-NII-1 High channel



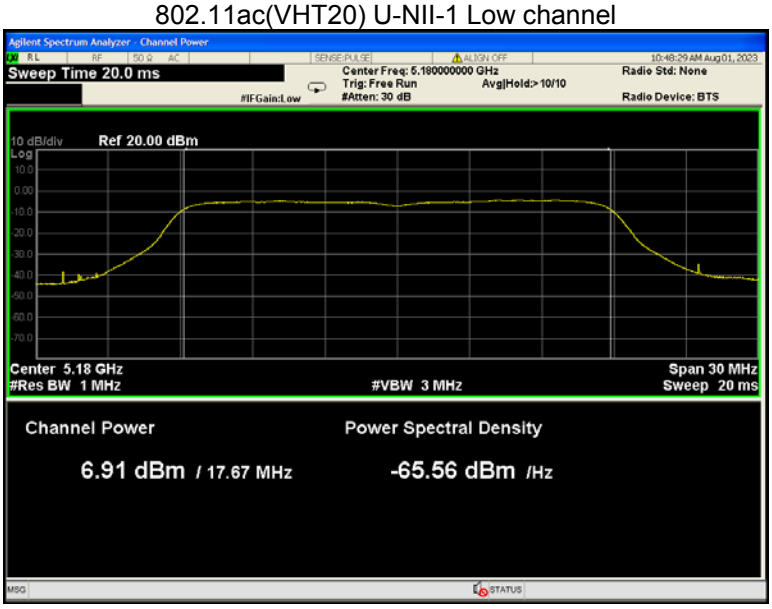
802.11n(HT40) U-NII-1 Low channel



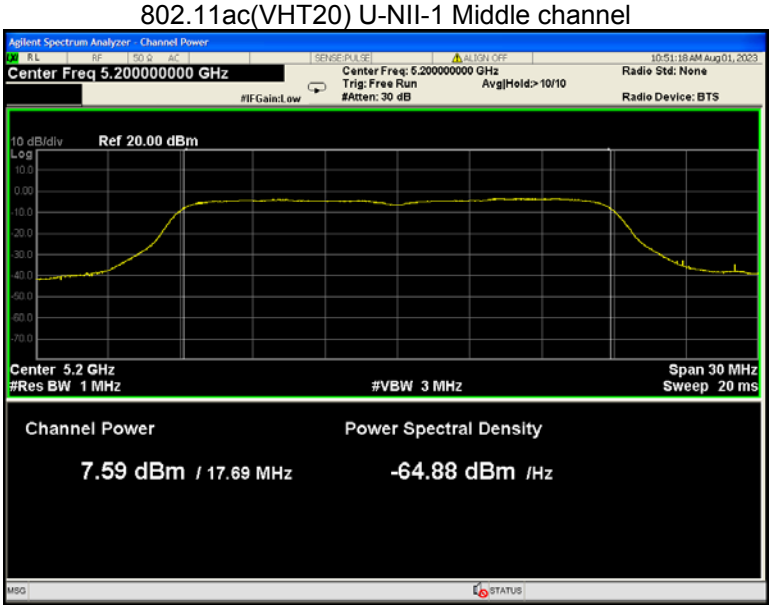
802.11n(HT40) U-NII-1 High channel



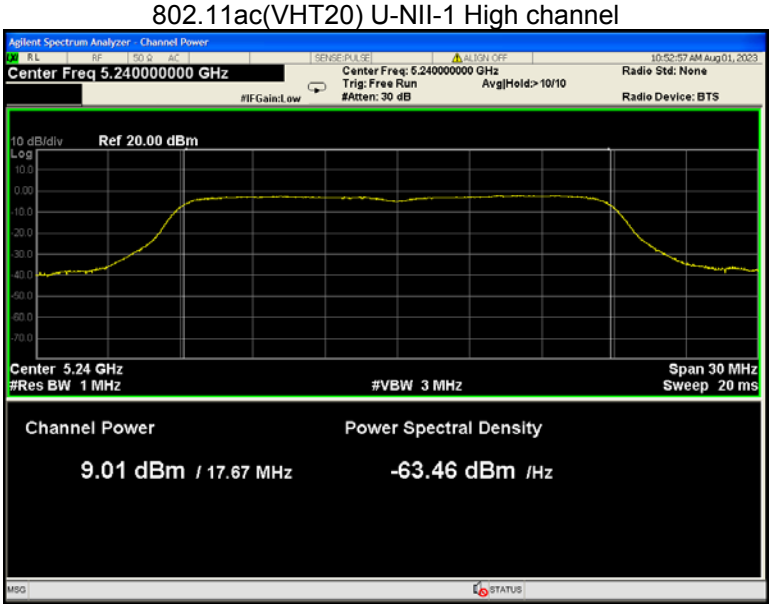
802.11ac(VHT20) U-NII-1 Low channel



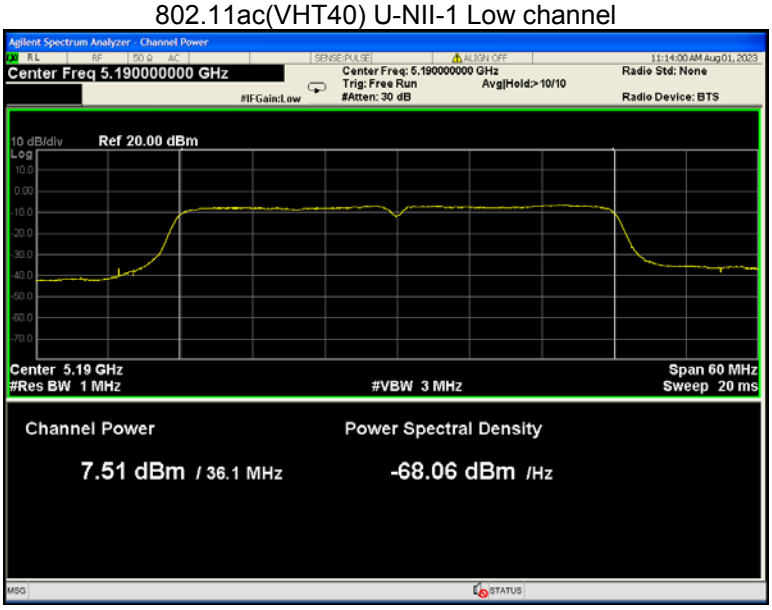
802.11ac(VHT20) U-NII-1 Middle channel



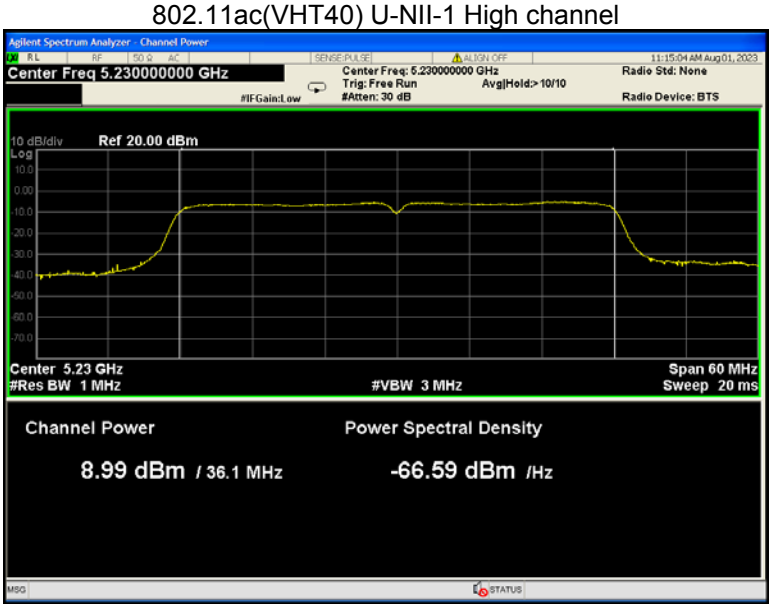
802.11ac(VHT20) U-NII-1 High channel



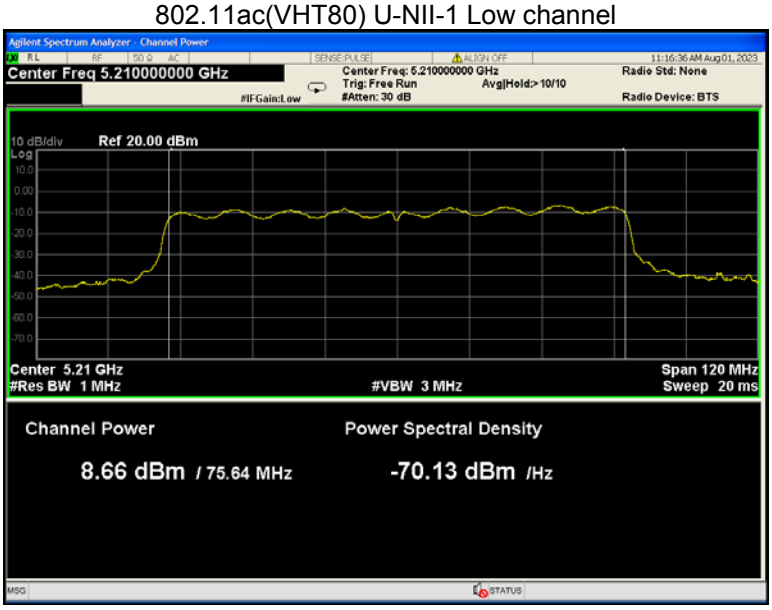
802.11ac(VHT40) U-NII-1 Low channel



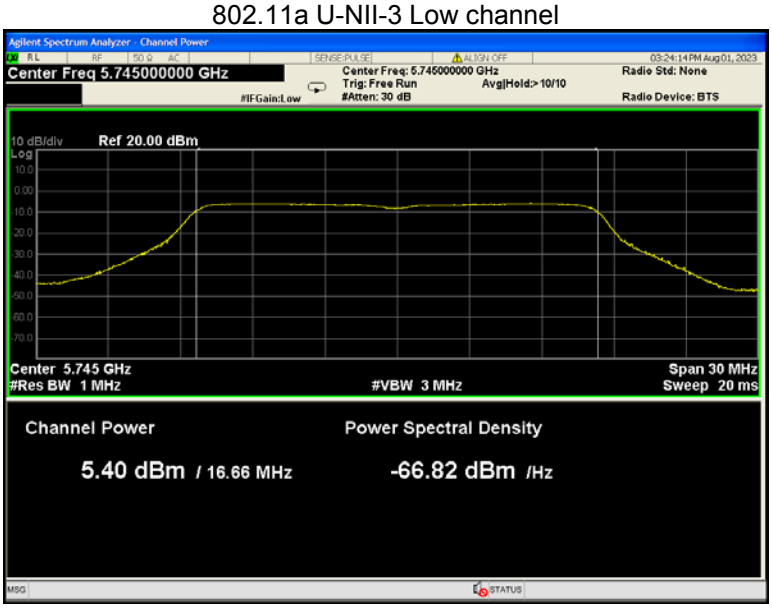
802.11ac(VHT40) U-NII-1 High channel



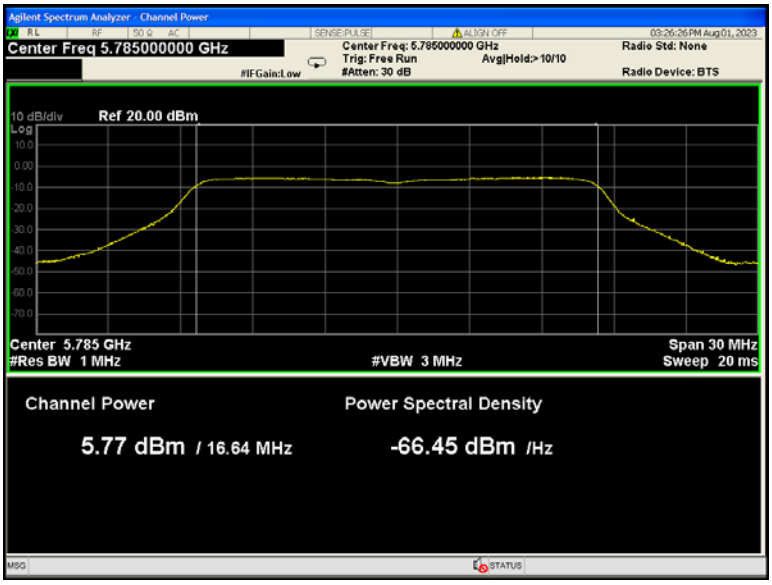
802.11ac(VHT80) U-NII-1 Low channel



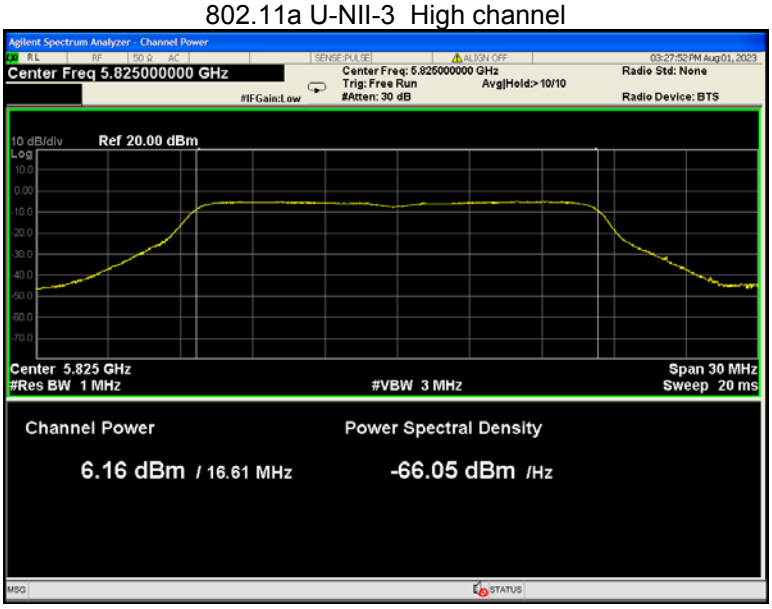
802.11a U-NII-3 Low channel



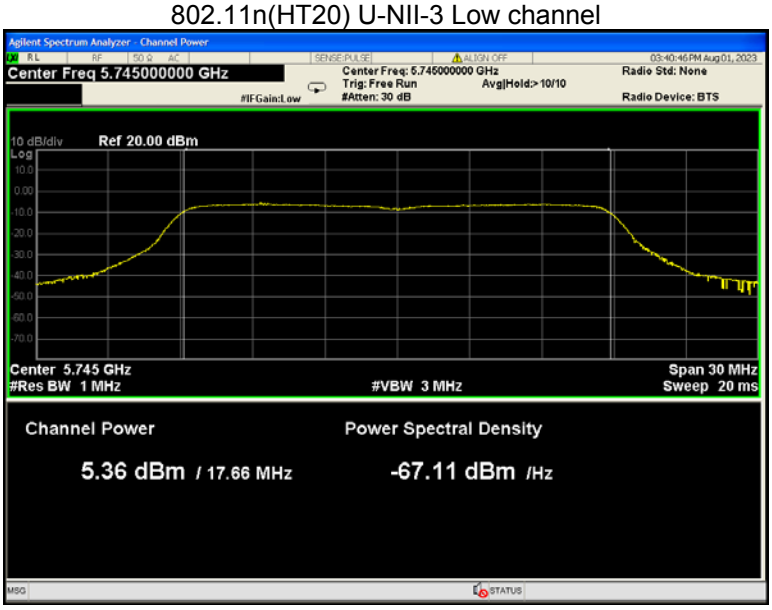
802.11a U-NII-3 Middle channel



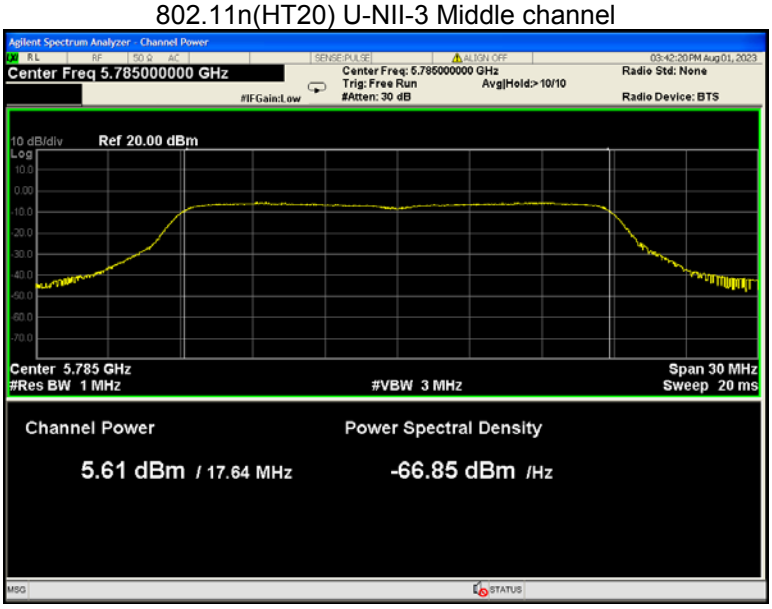
802.11a U-NII-3 High channel



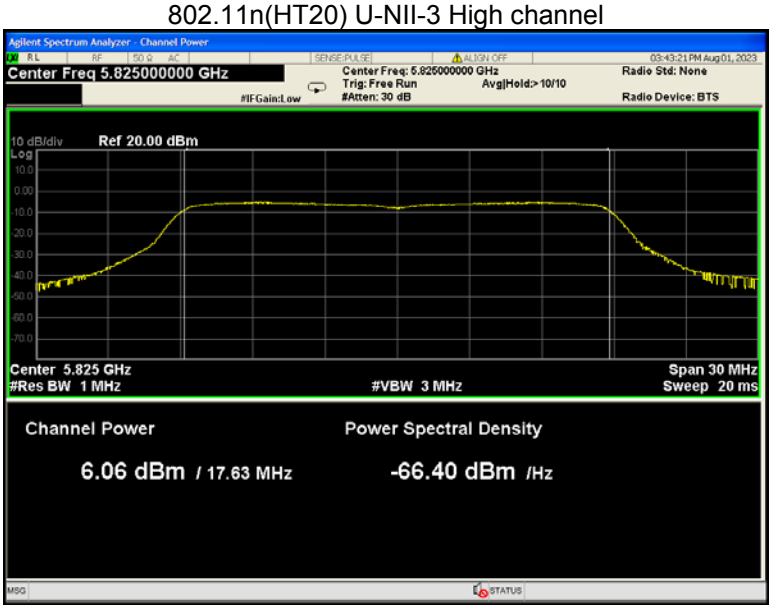
802.11n(HT20) U-NII-3 Low channel



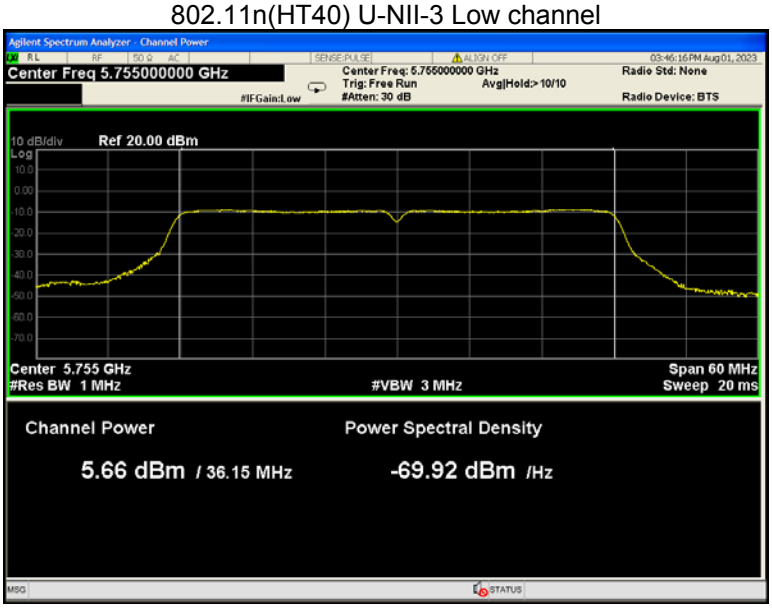
802.11n(HT20) U-NII-3 Middle channel



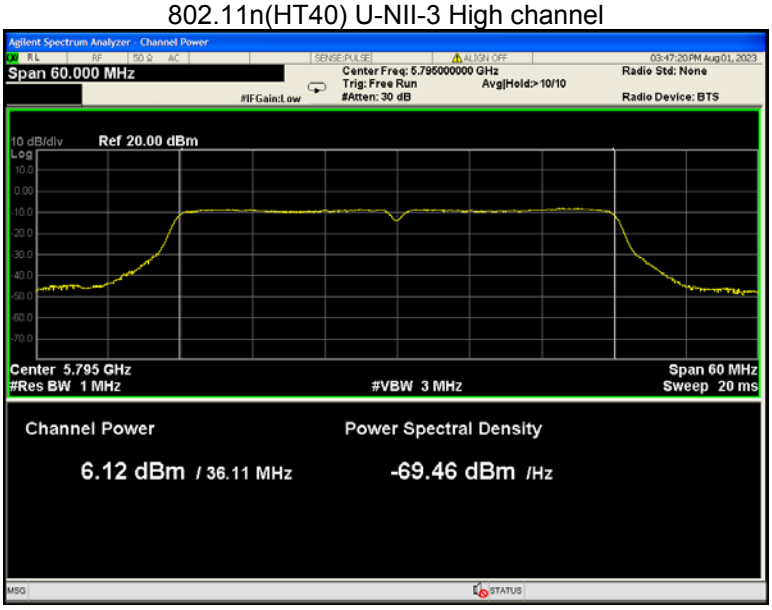
802.11n(HT20) U-NII-3 High channel



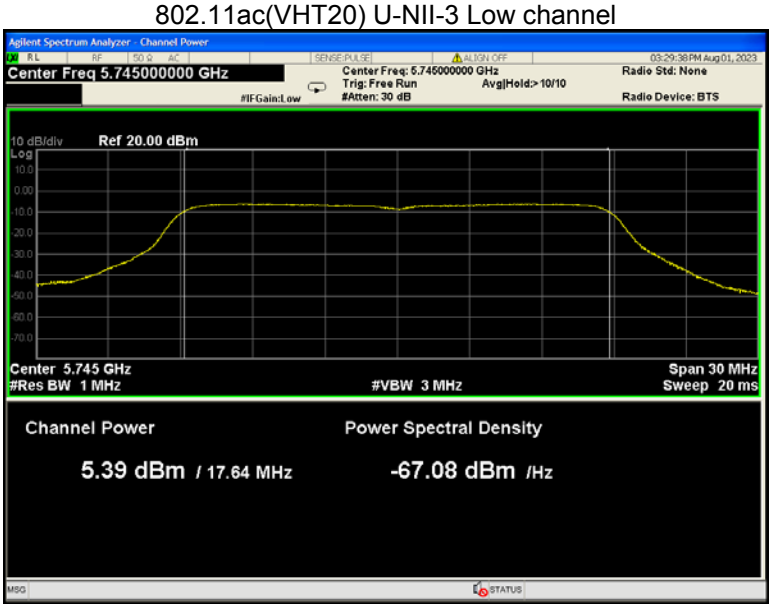
802.11n(HT40) U-NII-3 Low channel



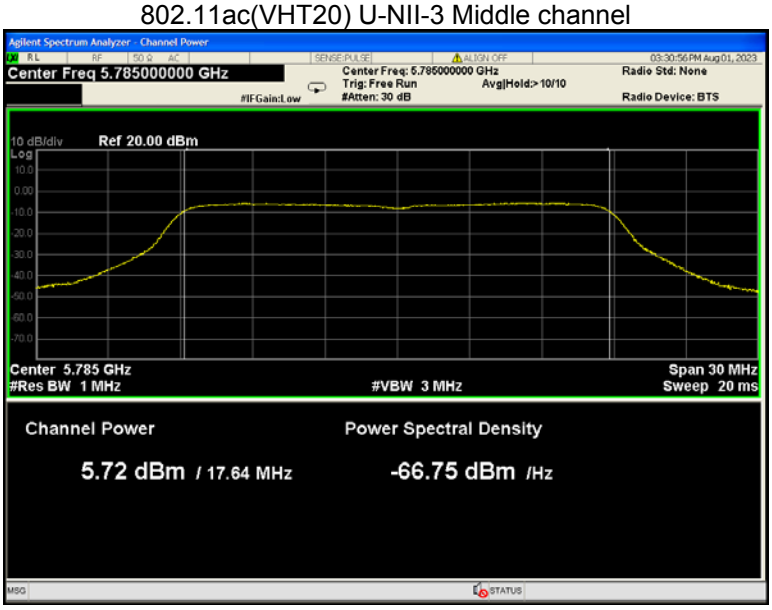
802.11n(HT40) U-NII-3 High channel



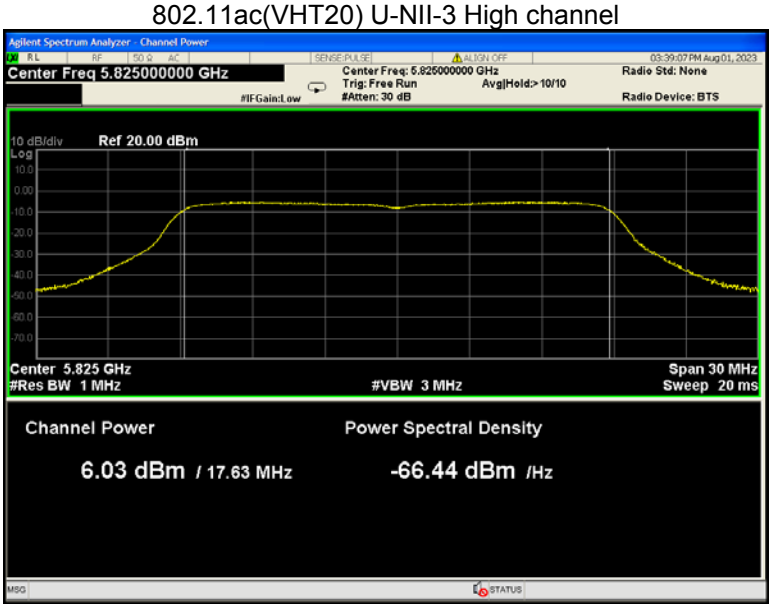
802.11ac(VHT20) U-NII-3 Low channel



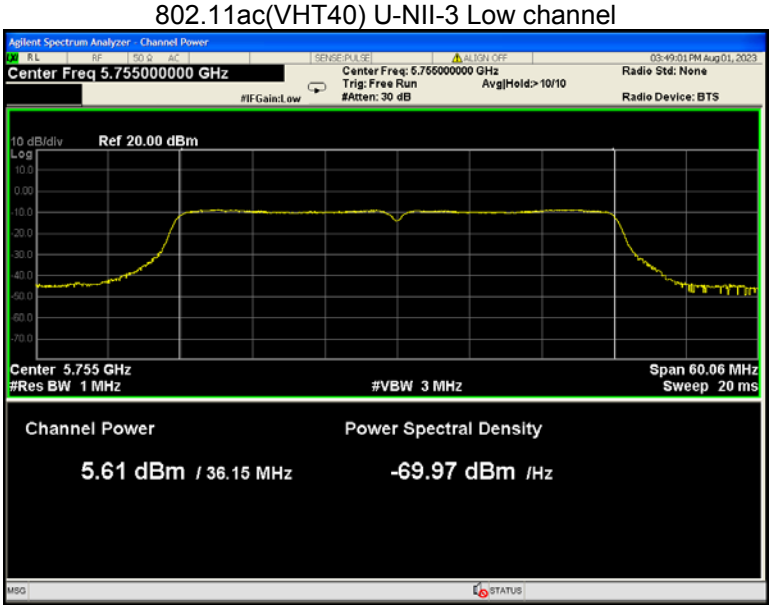
802.11ac(VHT20) U-NII-3 Middle channel



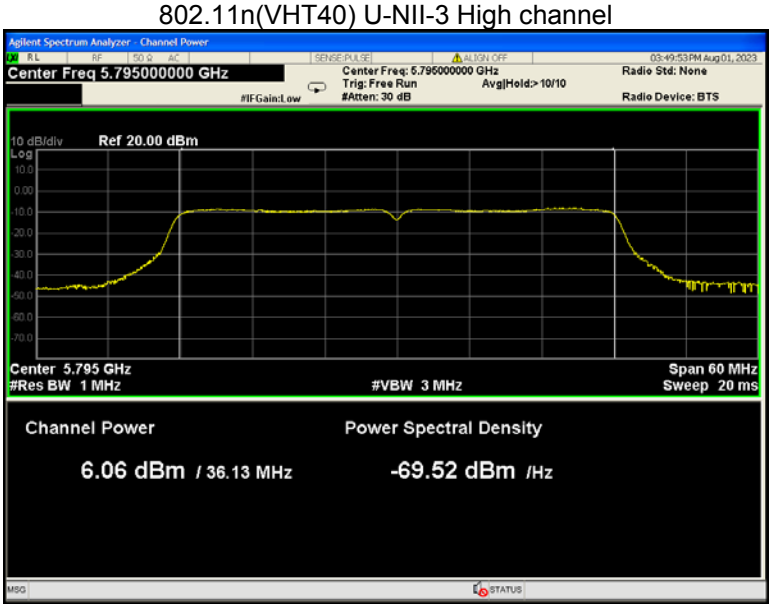
802.11ac(VHT20) U-NII-3 High channel



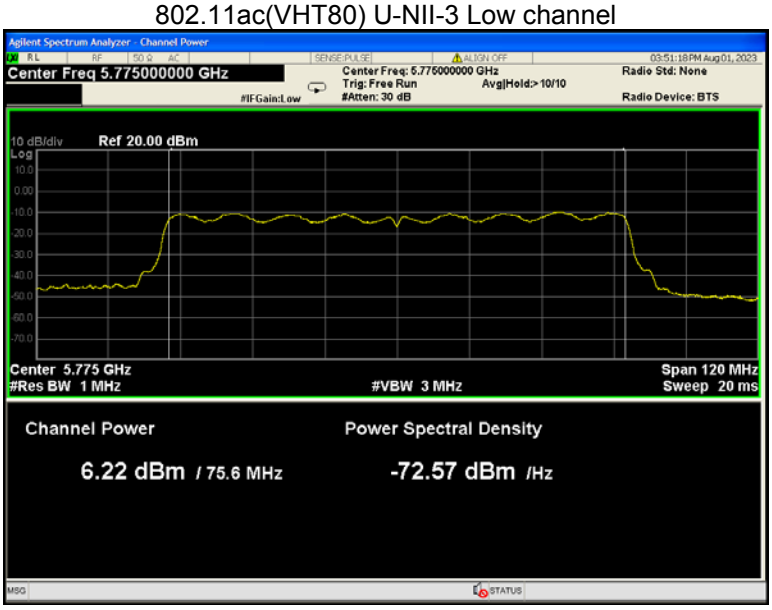
802.11ac(VHT40) U-NII-3 Low channel



802.11n(VHT40) U-NII-3 High channel



802.11ac(VHT80) U-NII-3 Low channel



13 Power Spectral density

Test Requirement:	FCC 47CFR Part 15 Section 15.407(a)
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Test Limit:	≤11dBm/MHz for Operation in the U-NII-1(5150MHz-5250MHz,5250-5350MHz and 5470-5725MHz)of device; ≤30dBm/500kHz for Operation in the U-NII-3(5725MHz-5850MHz)of device
Test Result:	PASS

13.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer:

U-NII-1

RBW = 1MHz, VBW ≥3* RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.

U-NII-3

RBW = 510KHz, VBW ≥3* RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

13.2 Test Result

Band	Operation mode	Channel	Measurements (dBm/MHz)	Duty Cycle Factor (dB)	Conducted Output Power Spectral Density (dBm/MHz)
U-NII-1	802.11a	Low	1.891	0.27	2.161
		Middle	2.448		2.718
		High	2.890		3.160
	802.11n(HT20)	Low	0.706	0.32	1.026
		Middle	1.083		1.403
		High	1.986		2.306
	802.11n(HT40)	Low	-1.444	0.48	-0.964
		Middle	/		/
		High	-0.894		-0.414
	802.11ac(VHT20)	Low	0.982	0.30	1.282
		Middle	1.403		1.703
		High	1.920		2.220
	802.11ac(VHT40)	Low	-1.280	0.34	-0.940
		Middle	/		/
		High	-0.597		-0.257
	802.11ac(VHT80)	Low	-2.234	1.29	-0.944
		Middle	/		/
		High	/		/

Band	Operation mode	Channel	Measurements (dBm/MHz)	Duty Cycle Factor (dB)	Conducted Output Power Spectral Density (dBm/500kHz)
U-NII-3	802.11a	Low	-2.132	0.21	-1.922
		Middle	-1.741		-1.531
		High	-1.463		-1.253
	802.11n(HT20)	Low	-2.691	0.38	-2.311
		Middle	-2.219		-1.839
		High	-2.093		-1.713
	802.11n(HT40)	Low	-4.820	0.71	-4.11
		Middle	/		/
		High	-4.754		-4.044
	802.11ac(VHT20)	Low	-1.982	0.27	-1.712
		Middle	-1.793		-1.523
		High	-1.676		-1.406
	802.11ac(VHT40)	Low	-4.809	0.62	-4.189
		Middle	/		/
		High	-4.198		-3.578
	802.11ac(VHT80)	Low	-7.367	1.55	-5.817
		Middle	/		/
		High	/		/

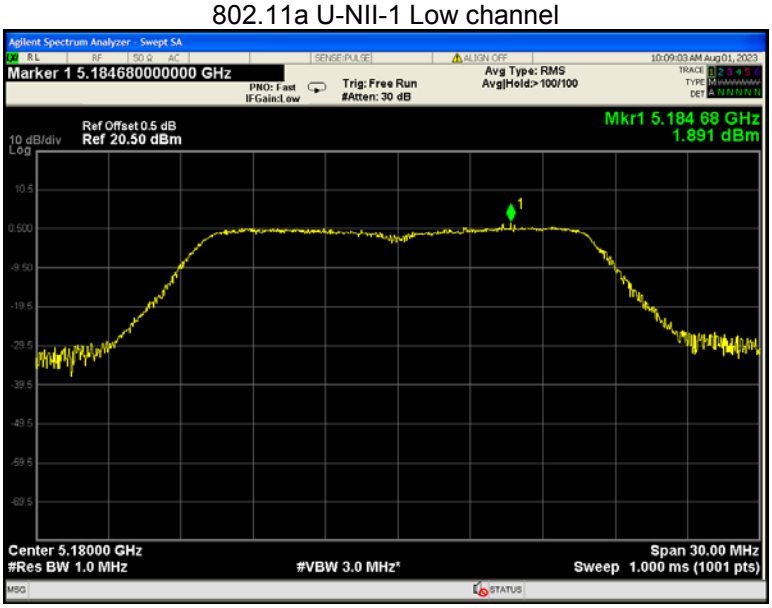
Note:

1. Conducted Output Power Spectral Density = Measurements + Duty Cycle Factor

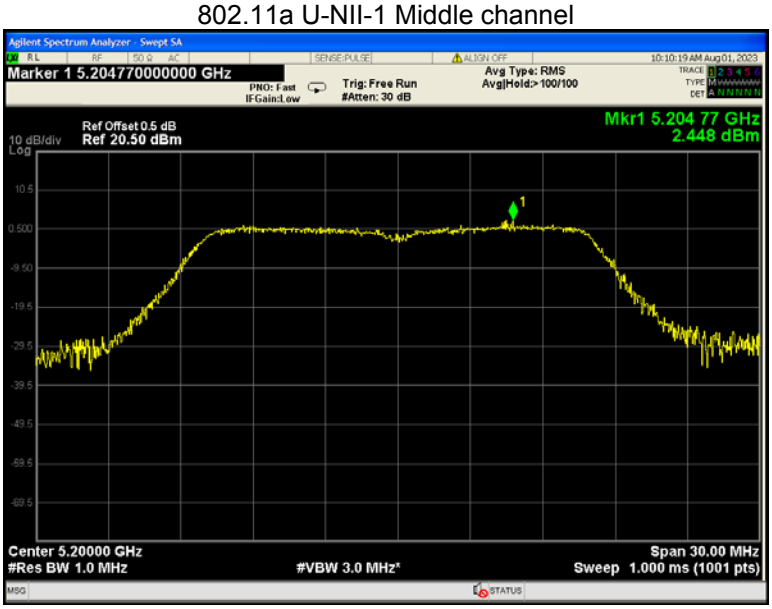
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

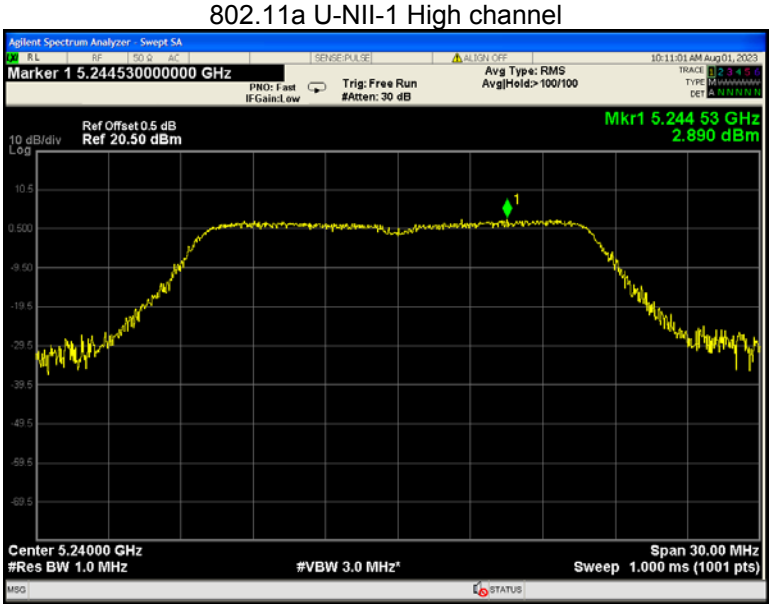
802.11a U-NII-1 Low channel



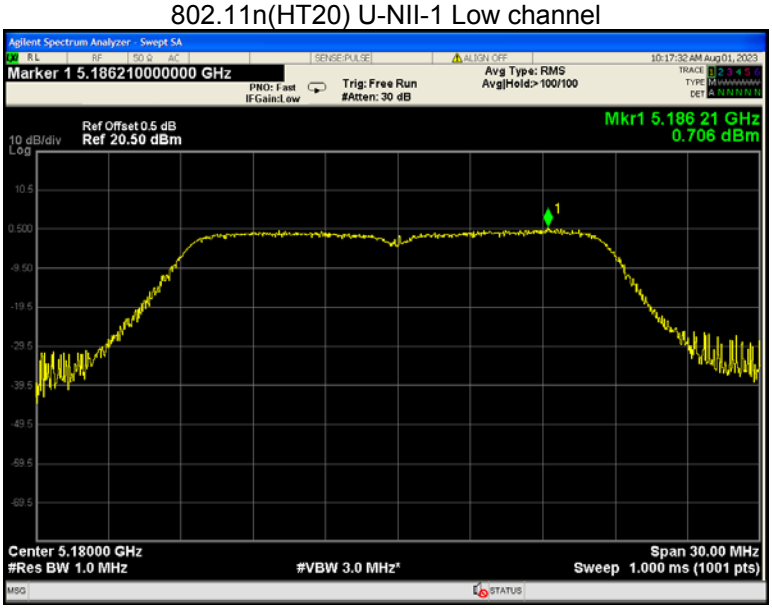
802.11a U-NII-1 Middle channel



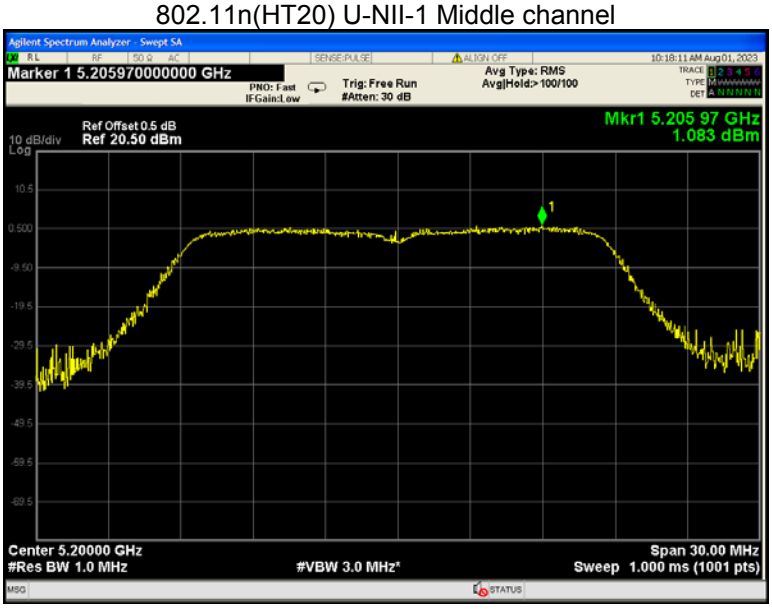
802.11a U-NII-1 High channel



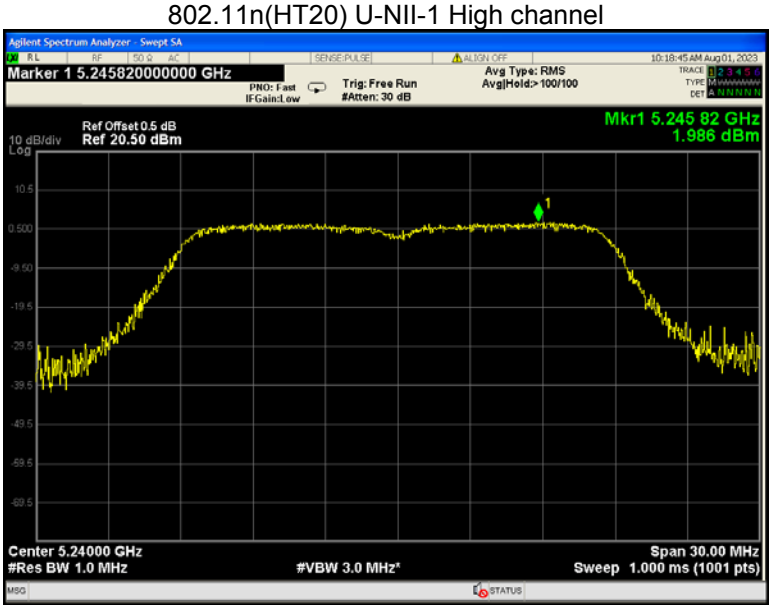
802.11n(HT20) U-NII-1 Low channel



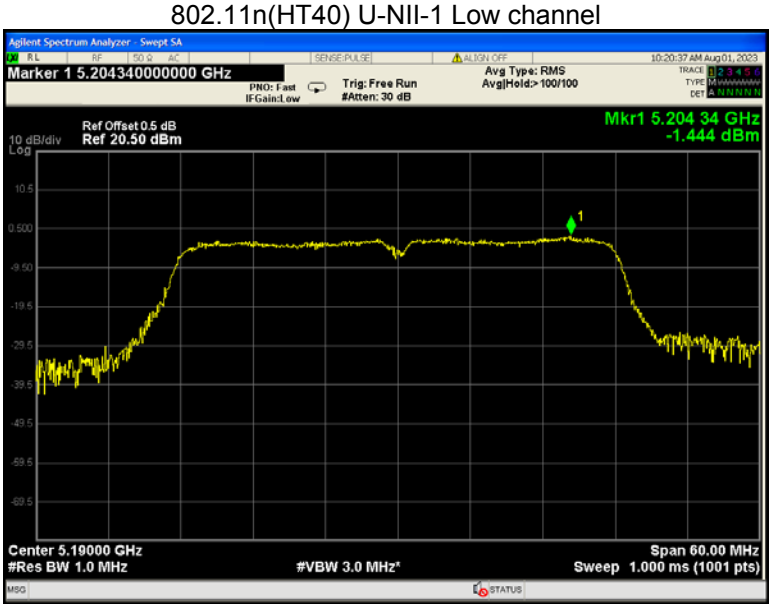
802.11n(HT20) U-NII-1 Middle channel



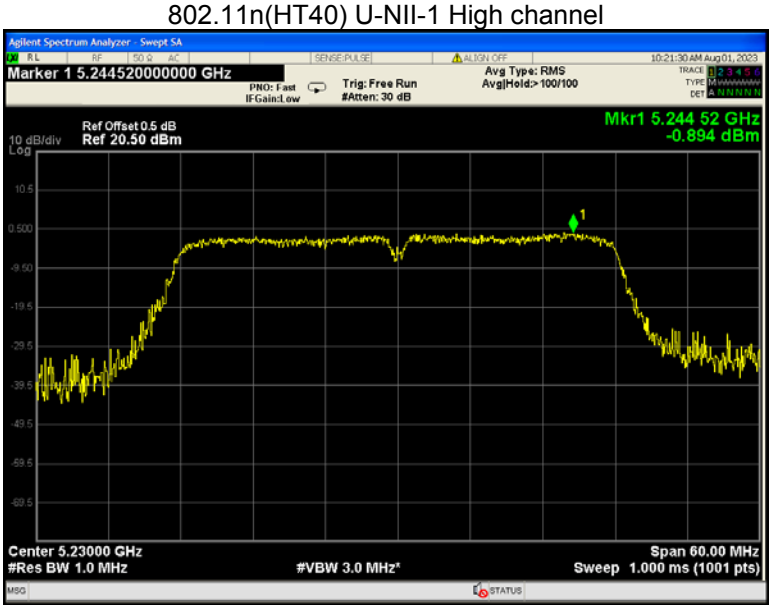
802.11n(HT20) U-NII-1 High channel



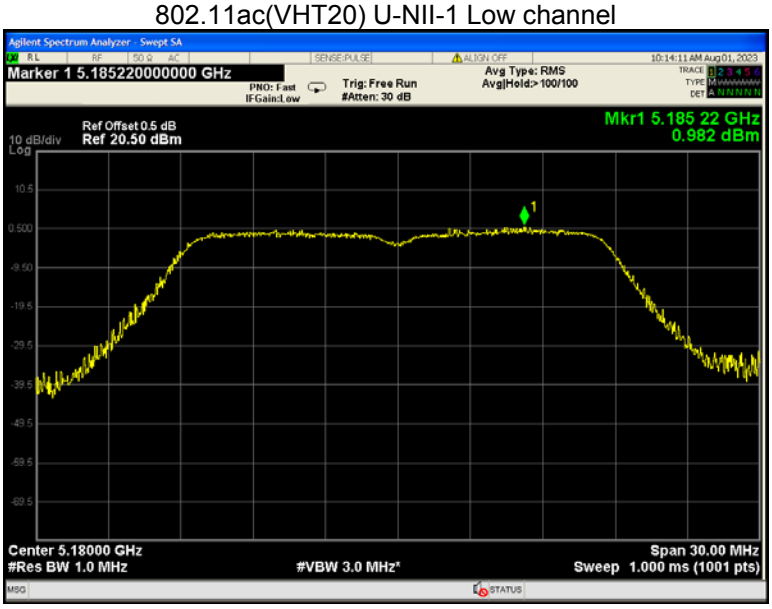
802.11n(HT40) U-NII-1 Low channel



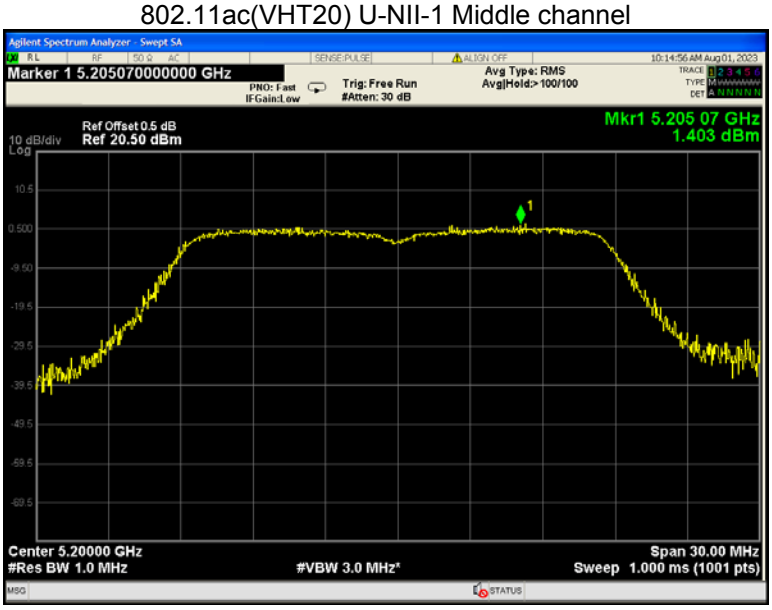
802.11n(HT40) U-NII-1 High channel



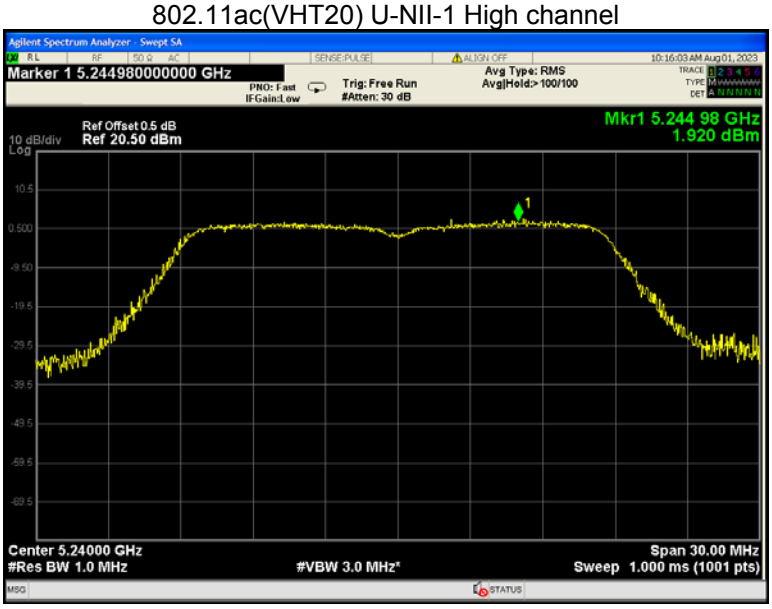
802.11ac(VHT20) U-NII-1 Low channel



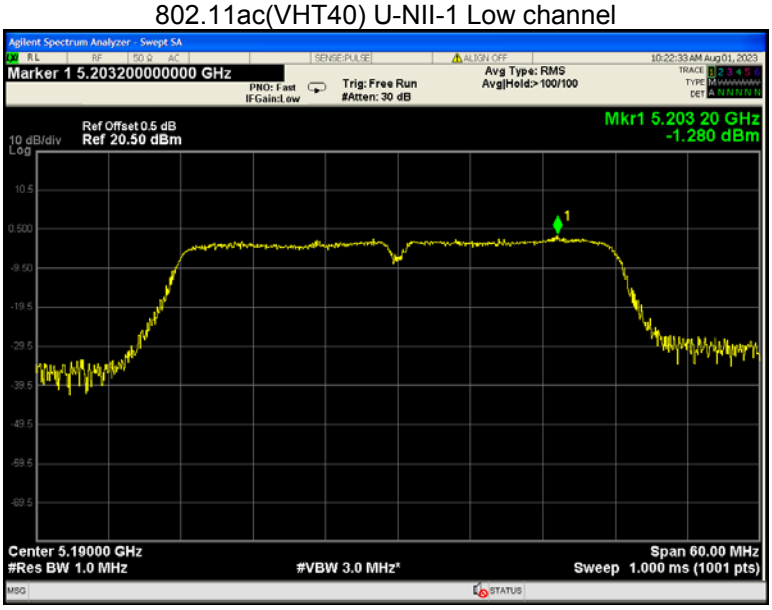
802.11ac(VHT20) U-NII-1 Middle channel



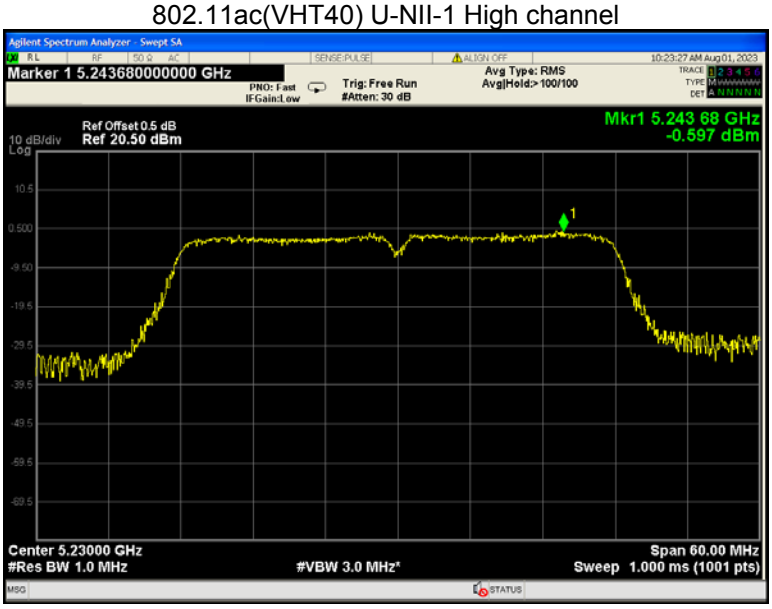
802.11ac(VHT20) U-NII-1 High channel



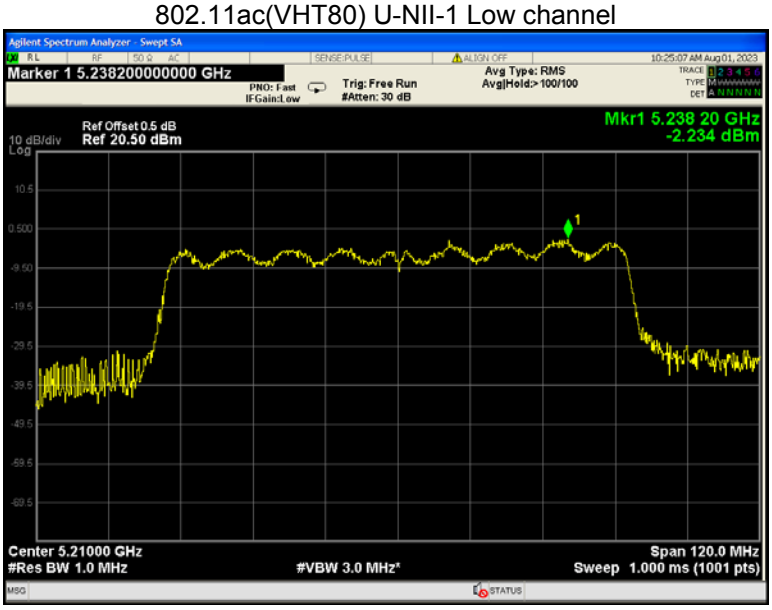
802.11ac(VHT40) U-NII-1 Low channel



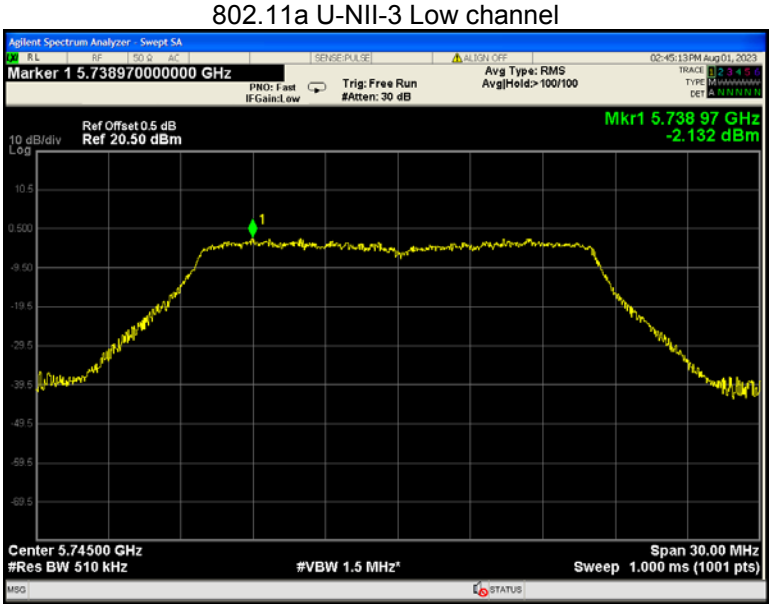
802.11ac(VHT40) U-NII-1 High channel



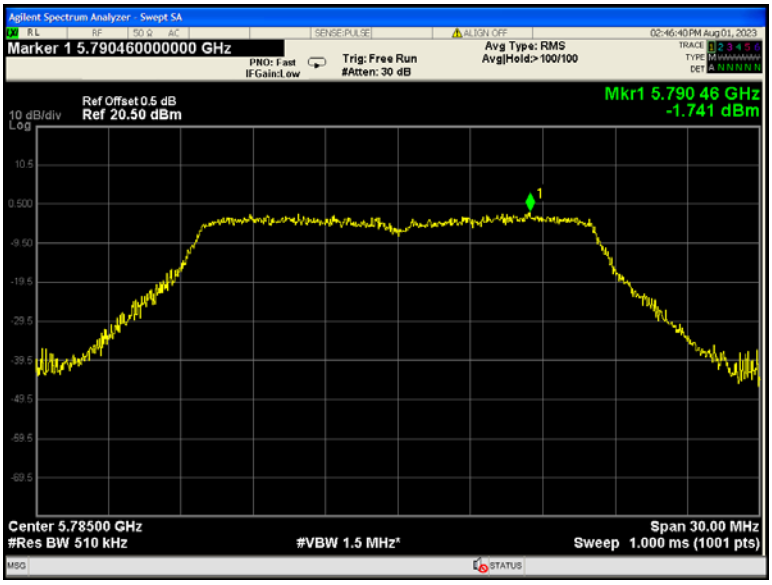
802.11ac(VHT80) U-NII-1 Low channel



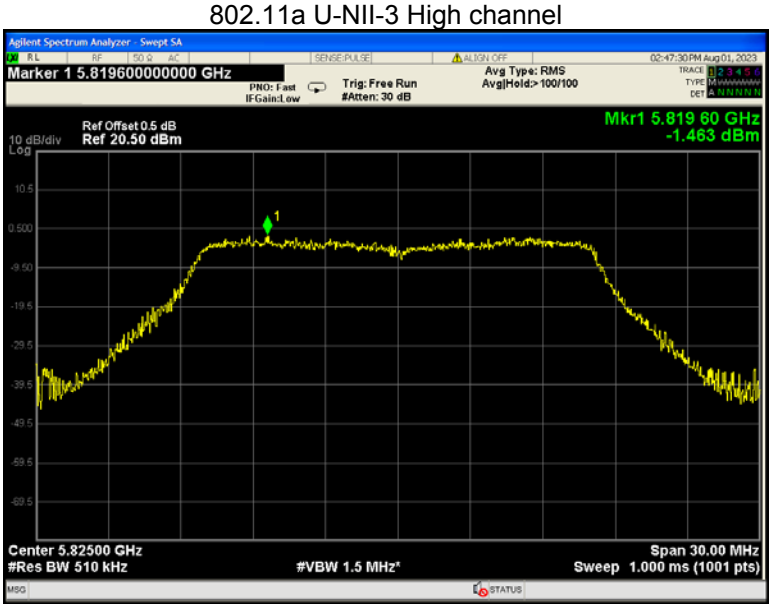
802.11a U-NII-3 Low channel



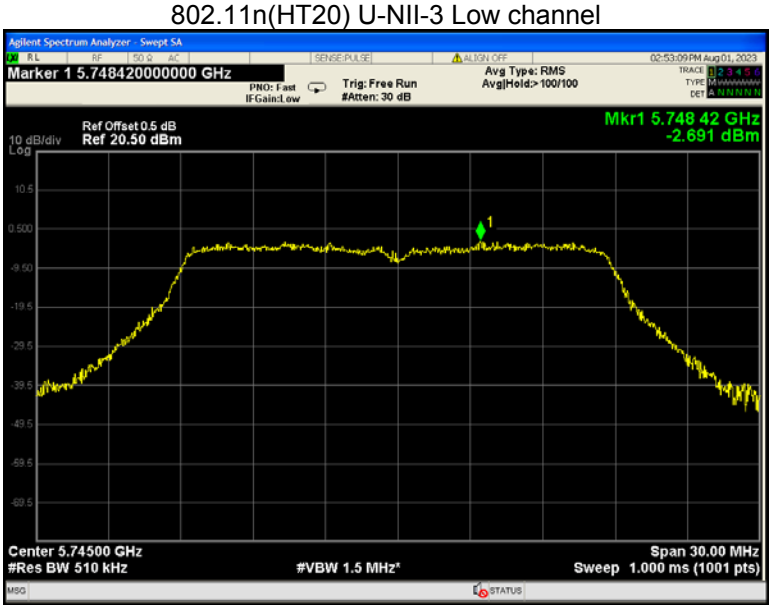
802.11a U-NII-3 Middle channel



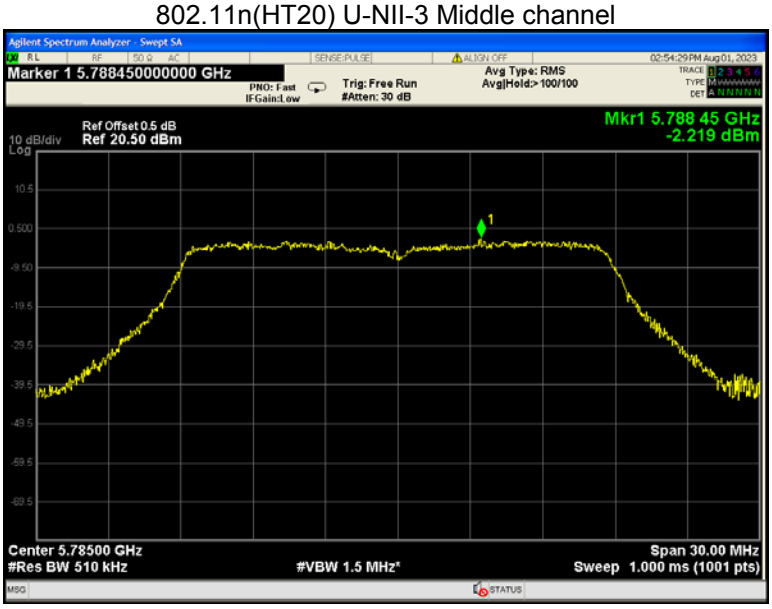
802.11a U-NII-3 High channel



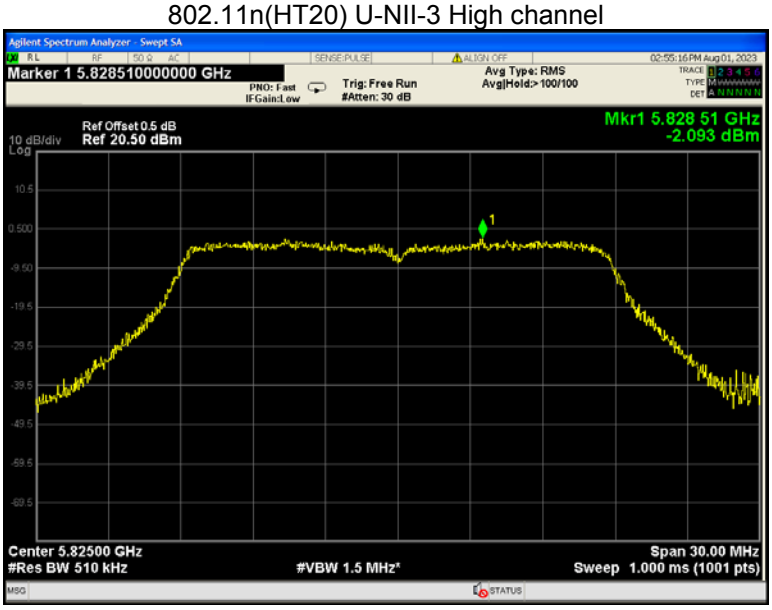
802.11n(HT20) U-NII-3 Low channel



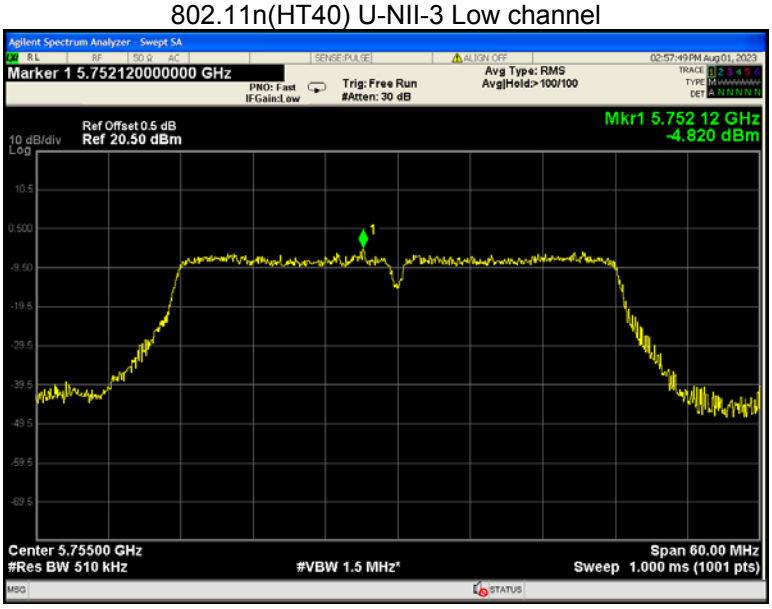
802.11n(HT20) U-NII-3 Middle channel



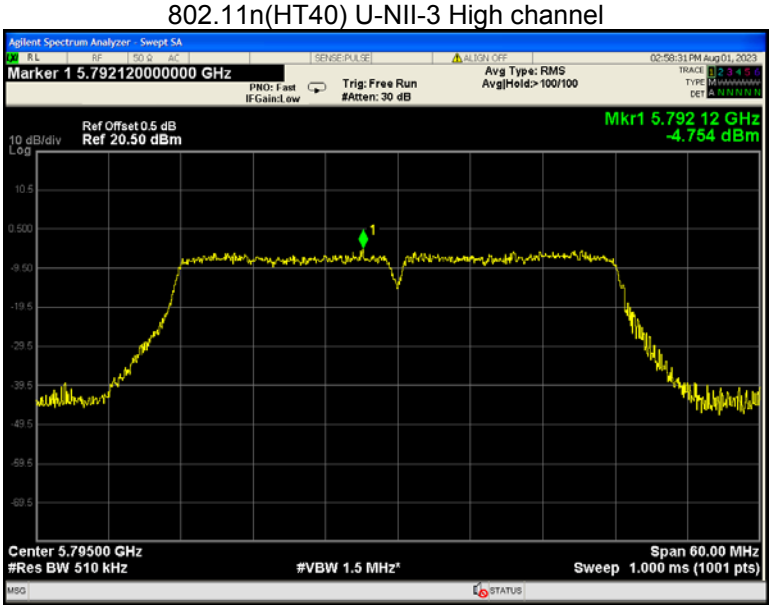
802.11n(HT20) U-NII-3 High channel



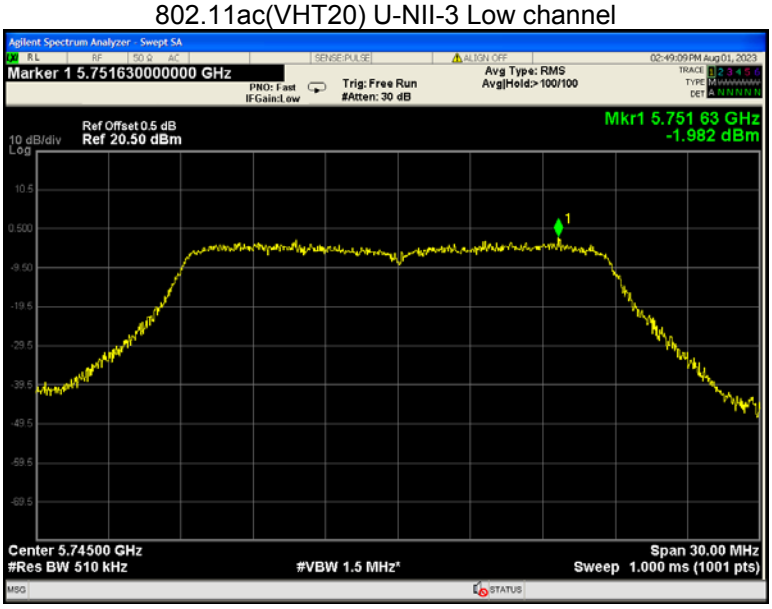
802.11n(HT40) U-NII-3 Low channel



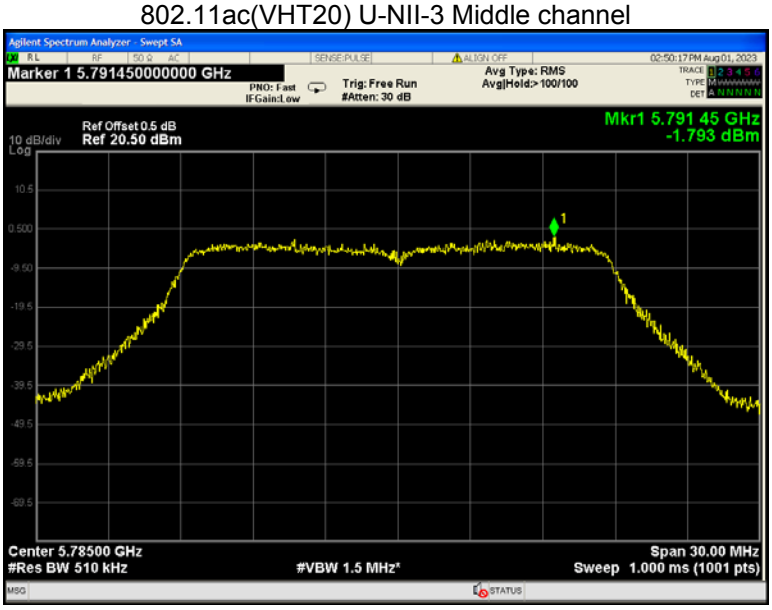
802.11n(HT40) U-NII-3 High channel



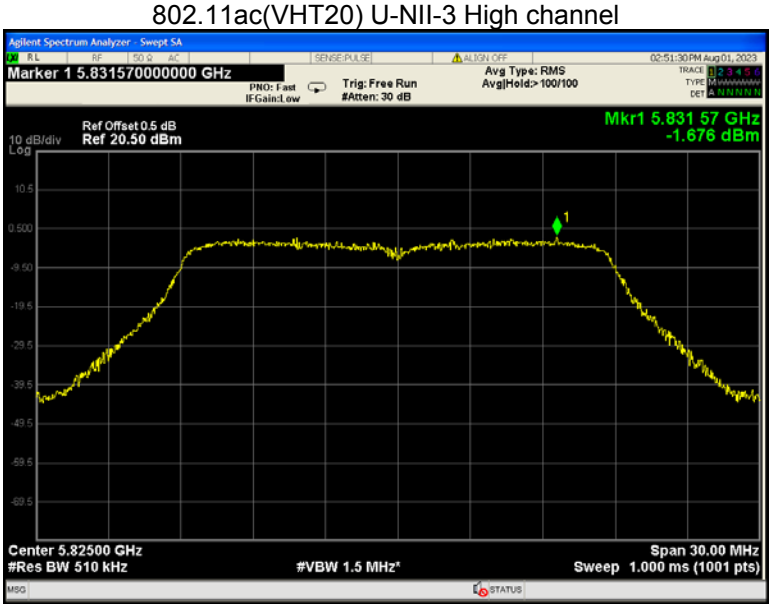
802.11ac(VHT20) U-NII-3 Low channel



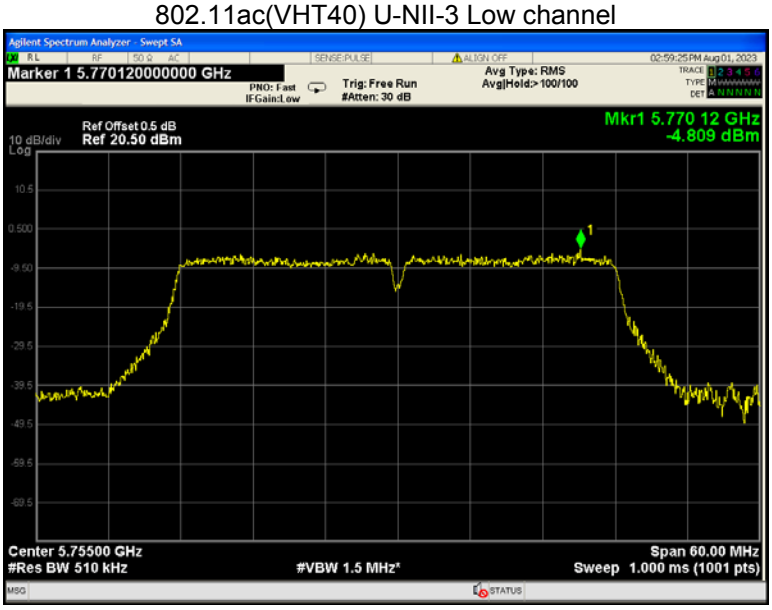
802.11ac(VHT20) U-NII-3 Middle channel



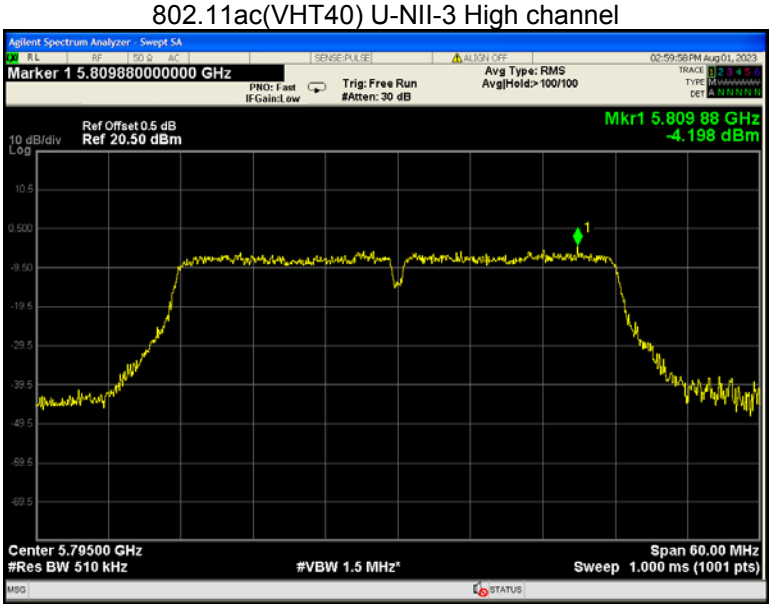
802.11ac(VHT20) U-NII-3 High channel



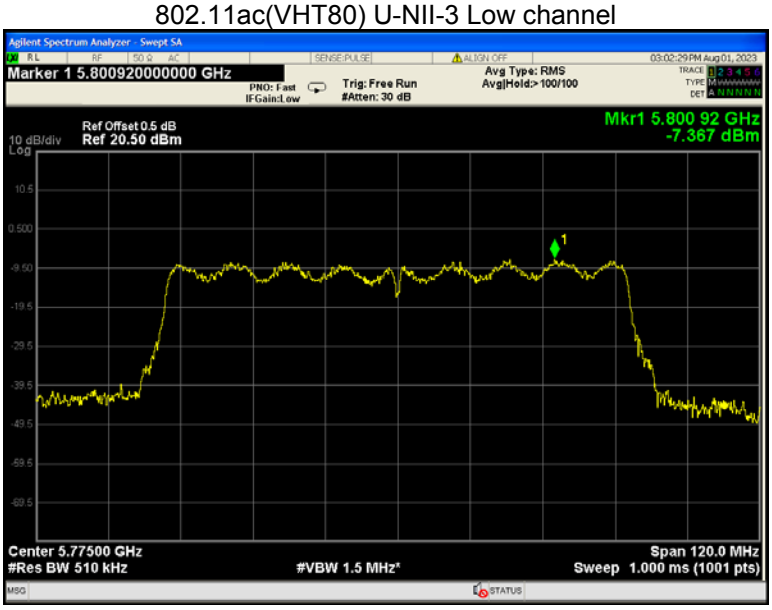
802.11ac(VHT40) U-NII-3 Low channel



802.11ac(VHT40) U-NII-3 High channel



802.11ac(VHT80) U-NII-3 Low channel



14 Frequency Stability

Test Requirement:	FCC 47CFR Part 15 Section 15.407(g)
Test Method:	ANSI C63.10:2013
Test 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 or 20ppm.
Test Result:	PASS

14.1 Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer. EUT have transmitted absence of unmodulation signal and fixed channelise. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings. f_C is declaring of channel frequency. Then the frequency error formula is $(f_C-f)/f_C \times 10^6$ ppm and the limit is less than ±20ppm The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.

2. Extreme temperature rule is 0°C~ 50°C.

14.2 Test Result

U-NII-1 Test Frequency:5180MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (MHz)	Frequency Error (ppm)	Limit (ppm)
50	18.0	0.0542	10.47	20
40		0.0560	10.80	20
30		0.0578	11.16	20
20		0.0604	11.66	20
10		0.0674	13.01	20
0		0.0651	12.56	20
-10		0.0692	13.36	20
-20		0.0529	10.21	20
20	13.5	0.0663	12.80	20
20	20.7	0.0632	12.20	20

U-NII-3 Test Frequency:5785MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (MHz)	Frequency Error (ppm)	Limit (ppm)
50	18.0	0.0784	13.58	20
40		0.0789	13.66	20
30		0.0824	14.27	20
20		0.0850	14.72	20
10		0.0869	15.05	20
0		0.0851	14.74	20
-10		0.0876	15.18	20
-20		0.0871	15.08	20
20	13.5	0.0852	14.76	20
20	20.7	0.0822	14.24	20

15 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has an integrated antenna fulfil the requirement of this section.

Note: Please refer to EUT photos for more details.

16 RF Exposure

Remark: refer to MPE test report: WTD23X06128904W003.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix- ROCAM mini HD-Basis AMP-Photos.

======End of Report======