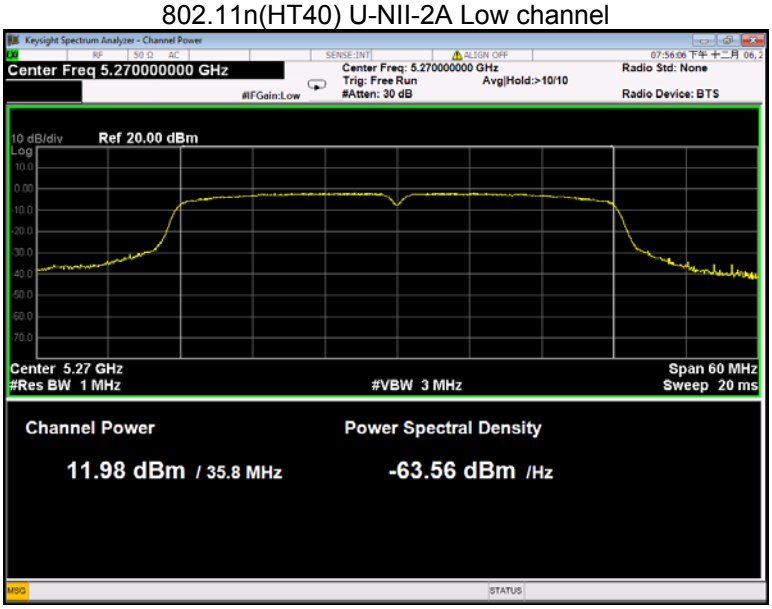
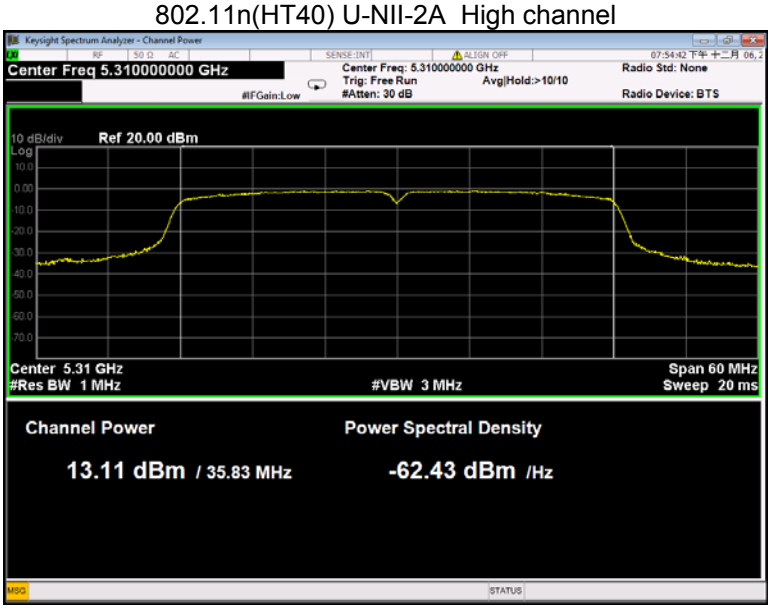
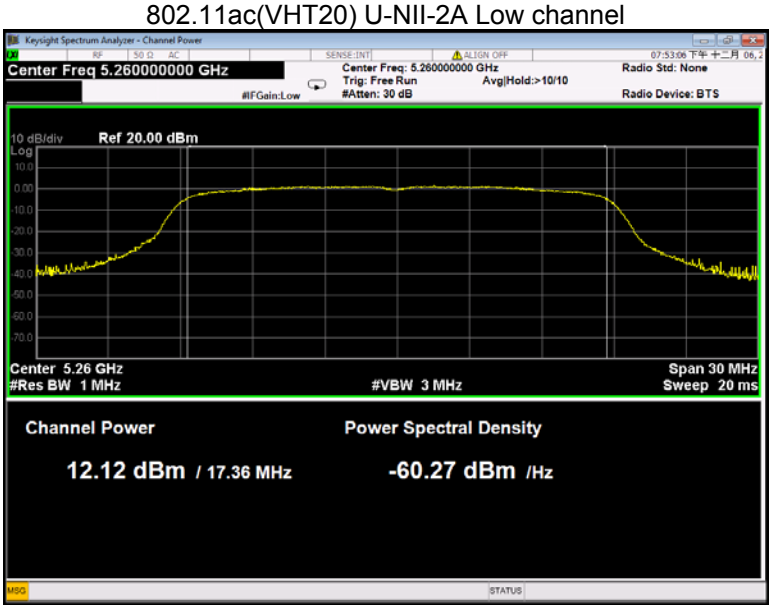
802.11n(HT40) U-NII-2A Low channel



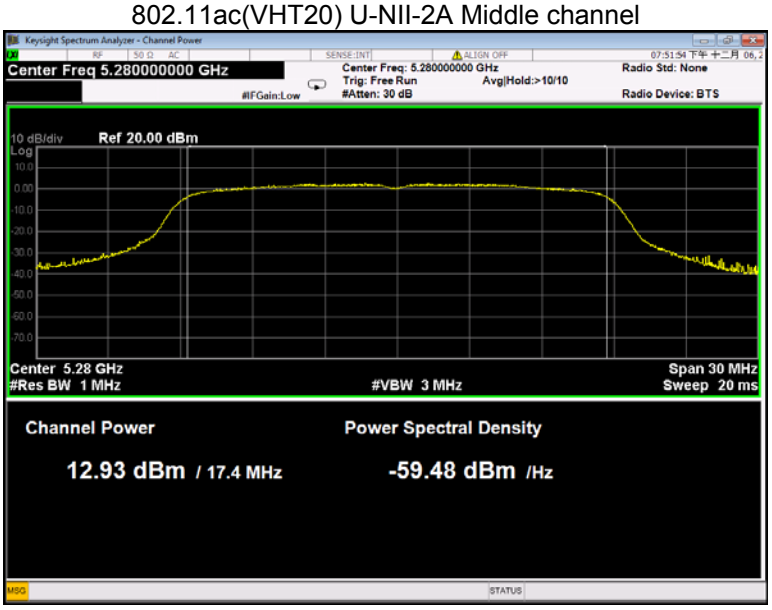
802.11n(HT40) U-NII-2A High channel



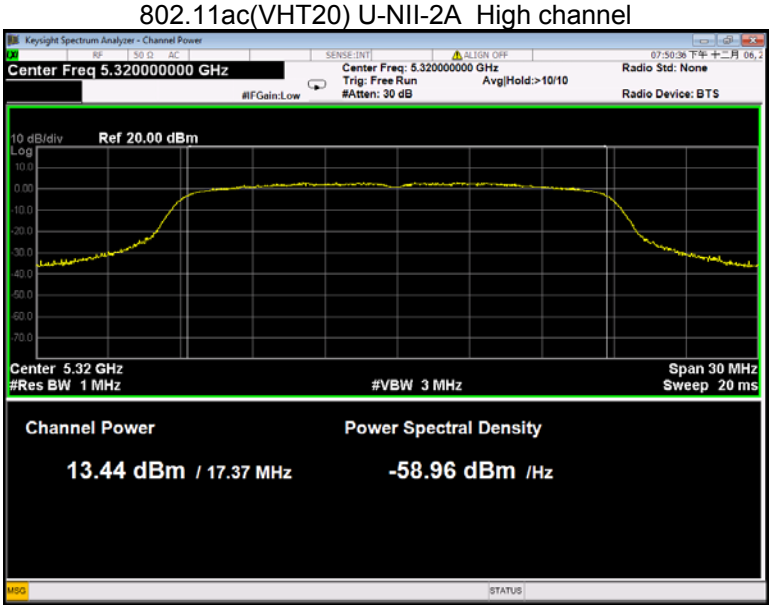
802.11ac(VHT20) U-NII-2A Low channel



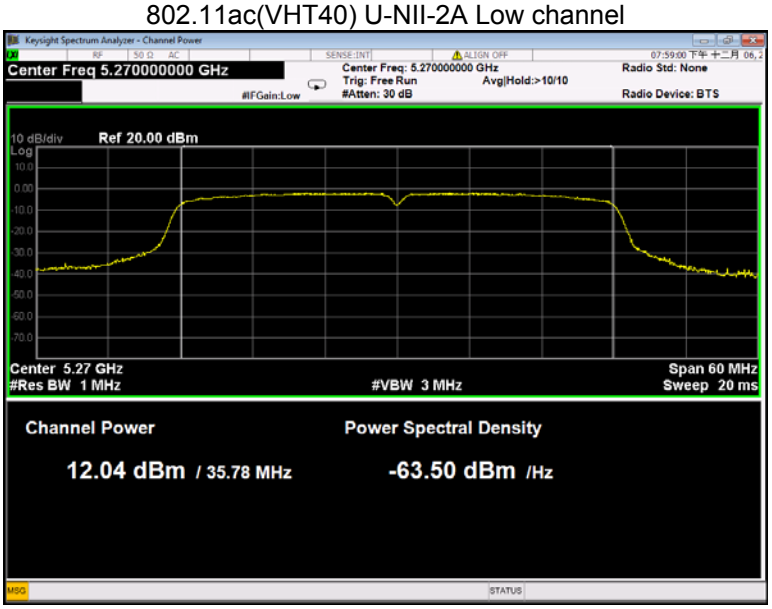
802.11ac(VHT20) U-NII-2A Middle channel



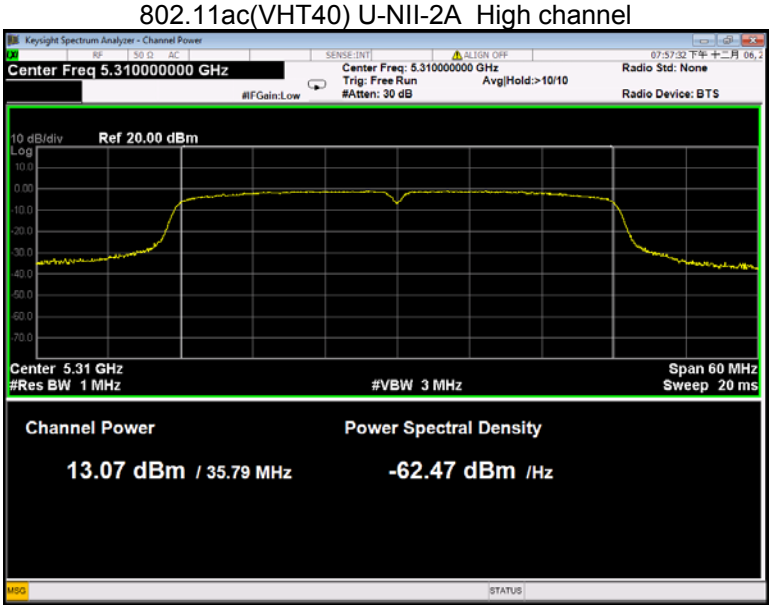
802.11ac(VHT20) U-NII-2A High channel



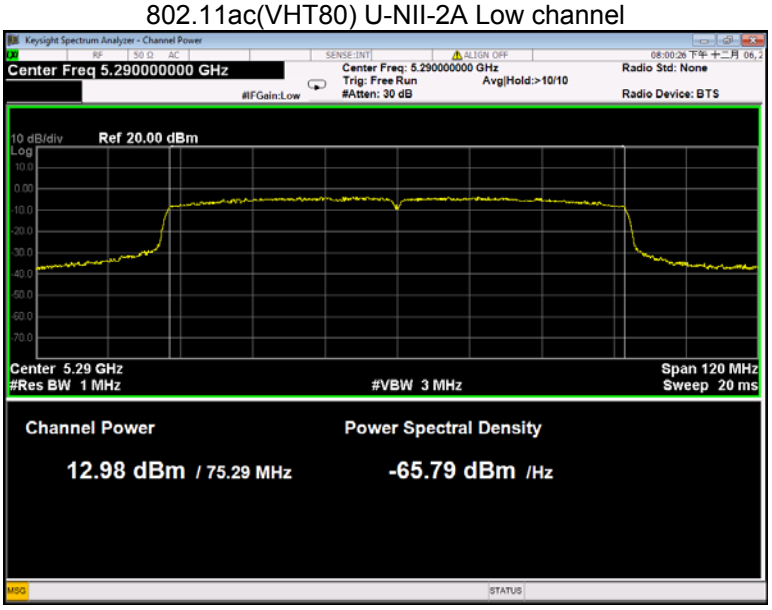
802.11ac(VHT40) U-NII-2A Low channel



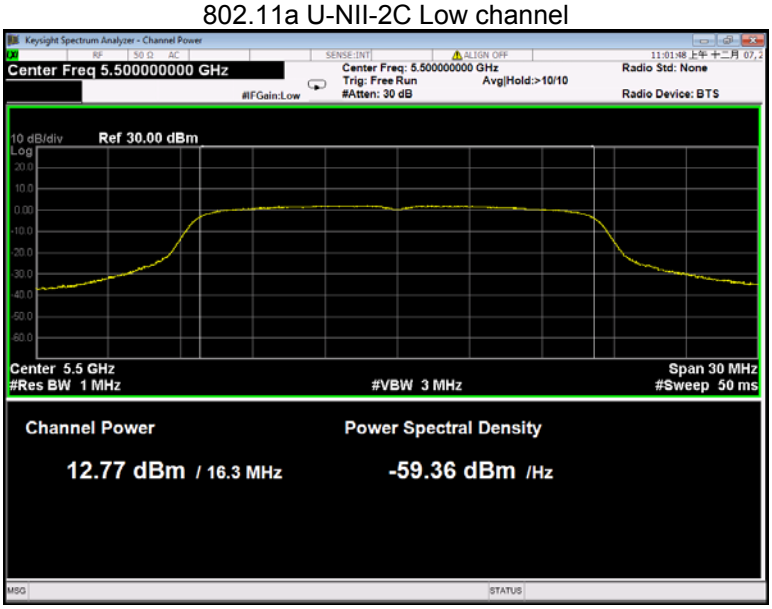
802.11ac(VHT40) U-NII-2A High channel



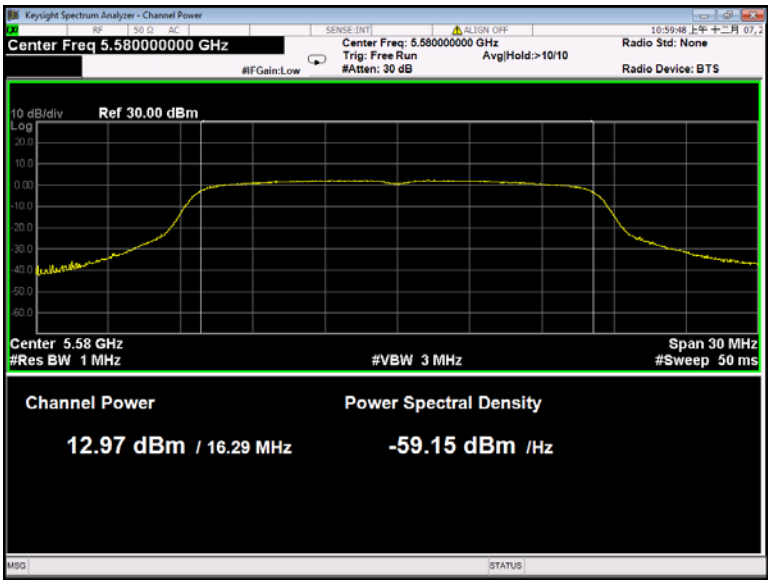
802.11ac(VHT80) U-NII-2A Low channel



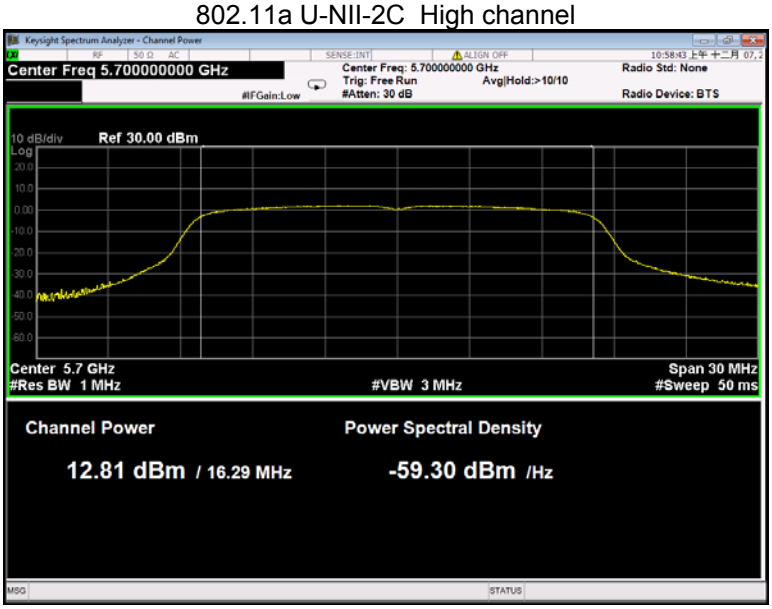
802.11a U-NII-2C Low channel



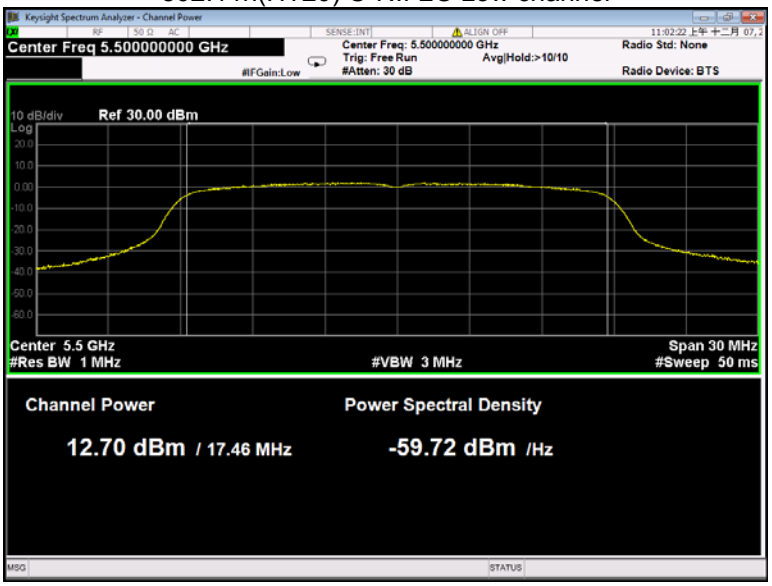
802.11a U-NII-2C Middle channel



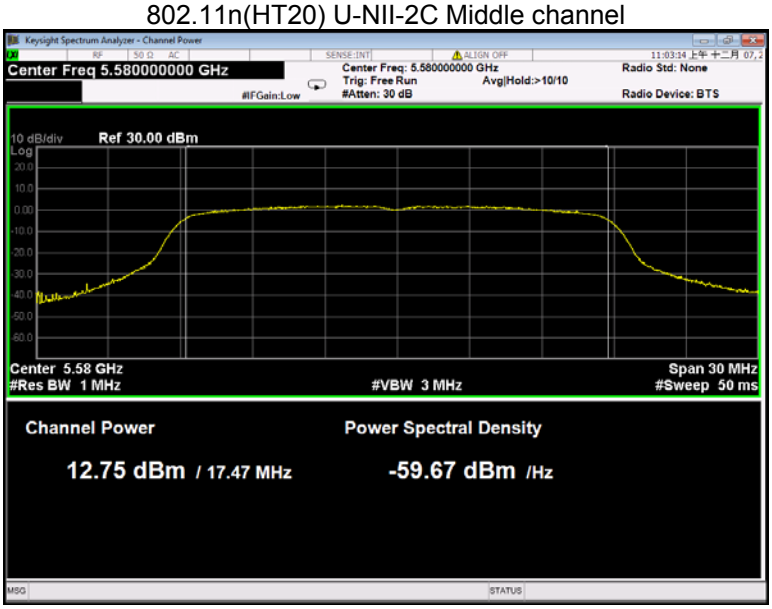
802.11a U-NII-2C High channel



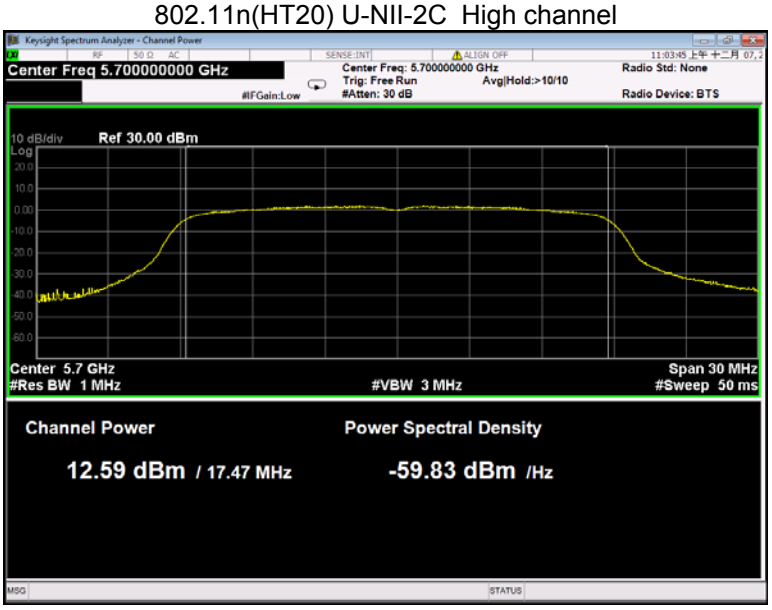
802.11n(HT20) U-NII-2C Low channel



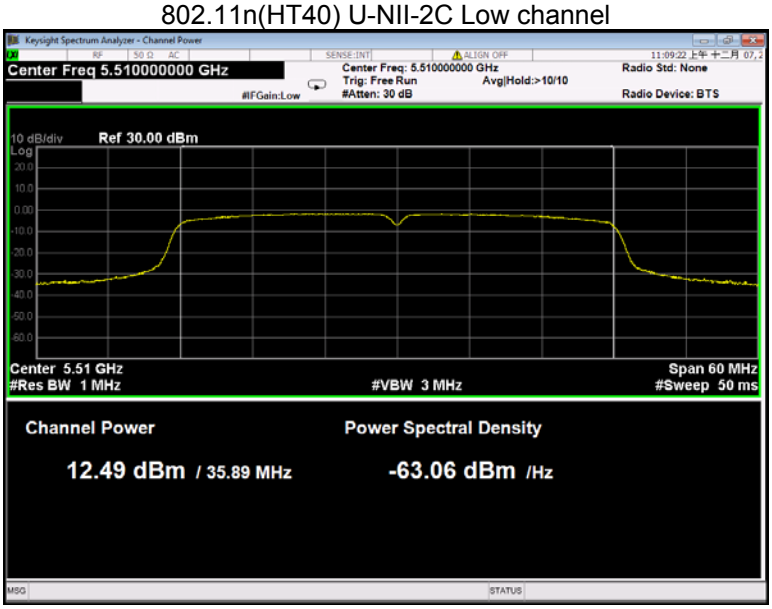
802.11n(HT20) U-NII-2C Middle channel



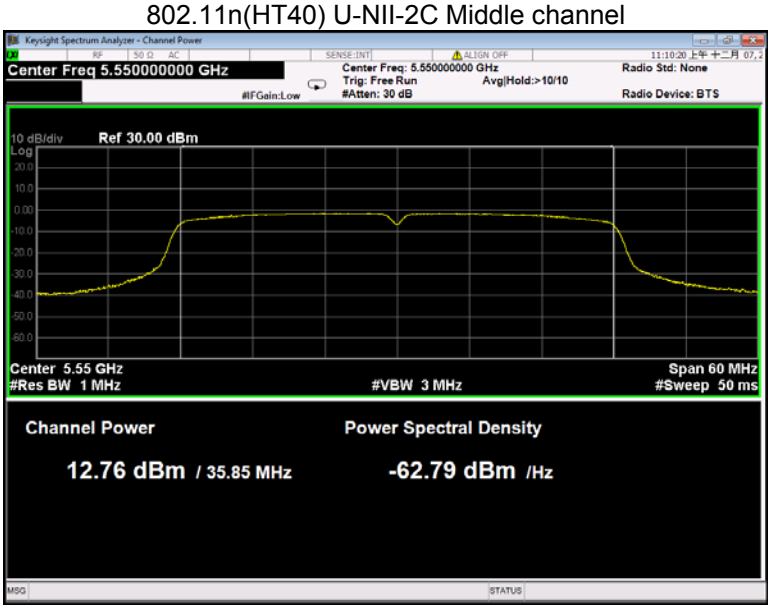
802.11n(HT20) U-NII-2C High channel



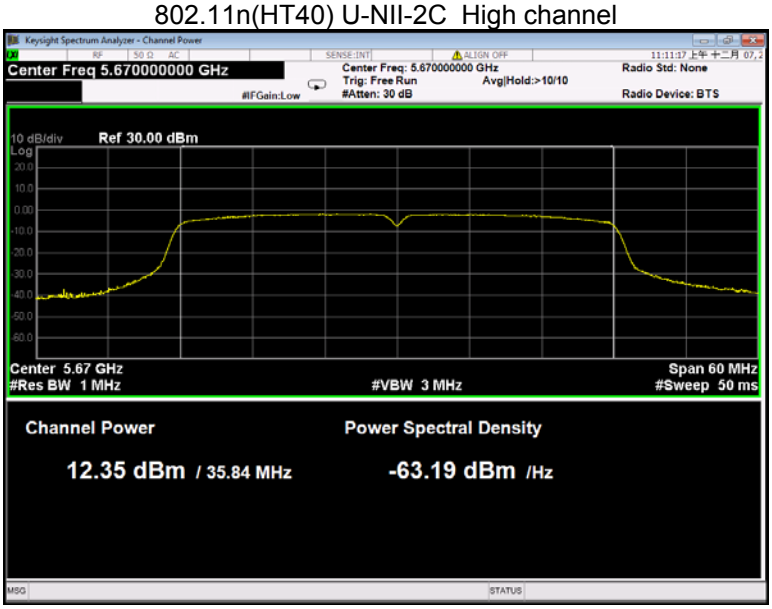
802.11n(HT40) U-NII-2C Low channel



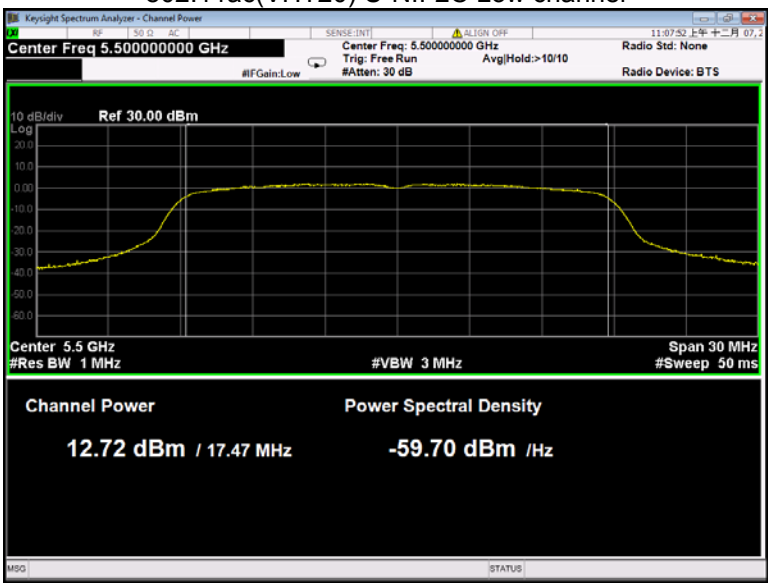
802.11n(HT40) U-NII-2C Middle channel



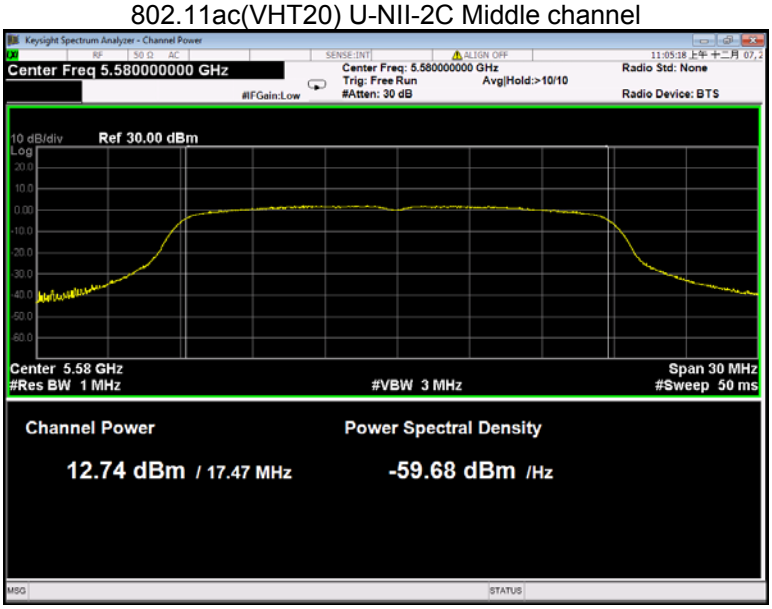
802.11n(HT40) U-NII-2C High channel



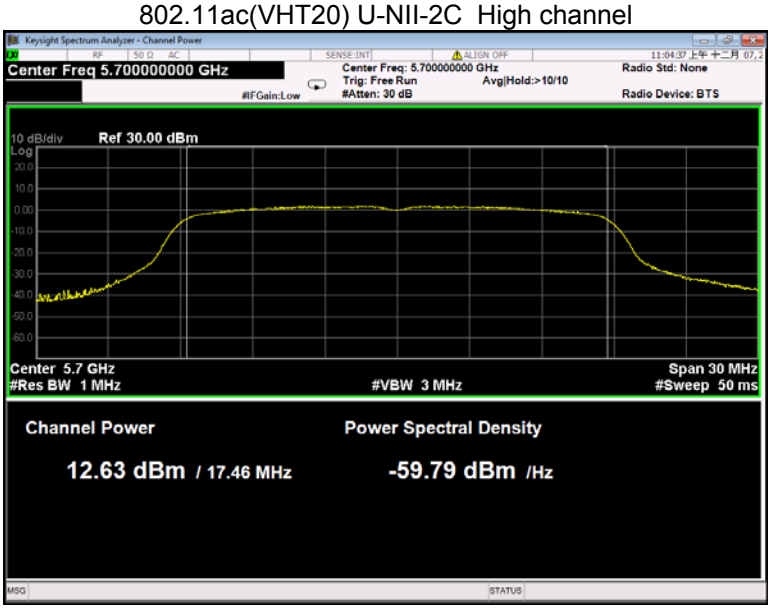
802.11ac(VHT20) U-NII-2C Low channel



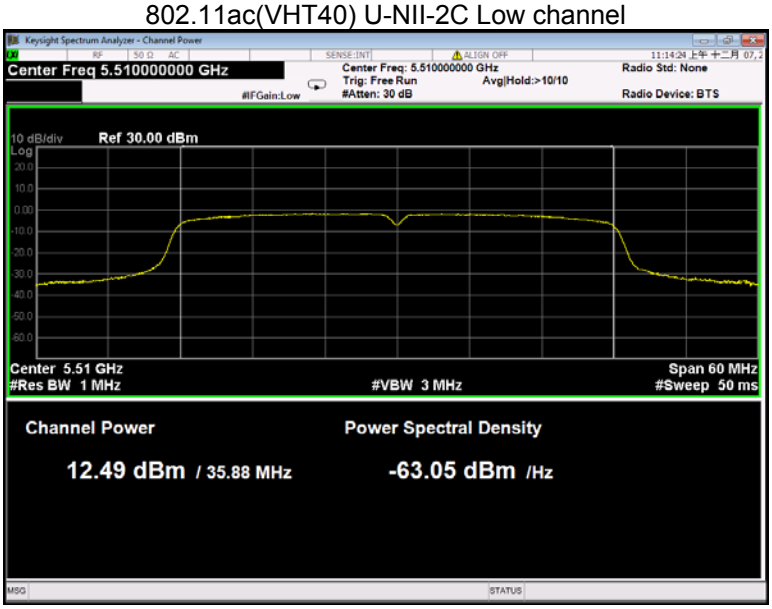
802.11ac(VHT20) U-NII-2C Middle channel



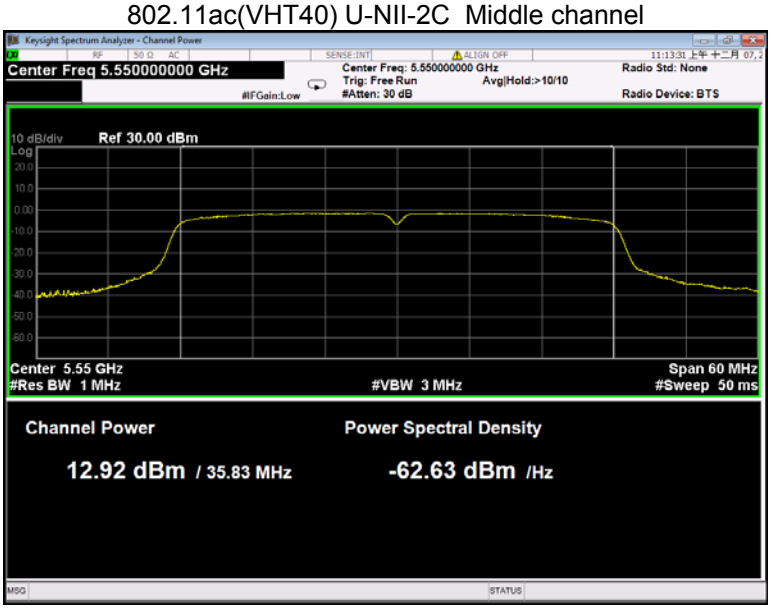
802.11ac(VHT20) U-NII-2C High channel



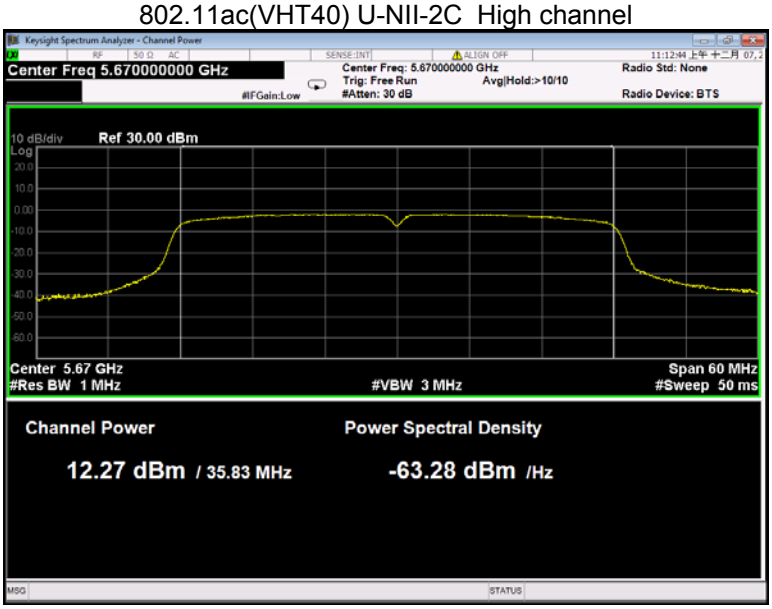
802.11ac(VHT40) U-NII-2C Low channel



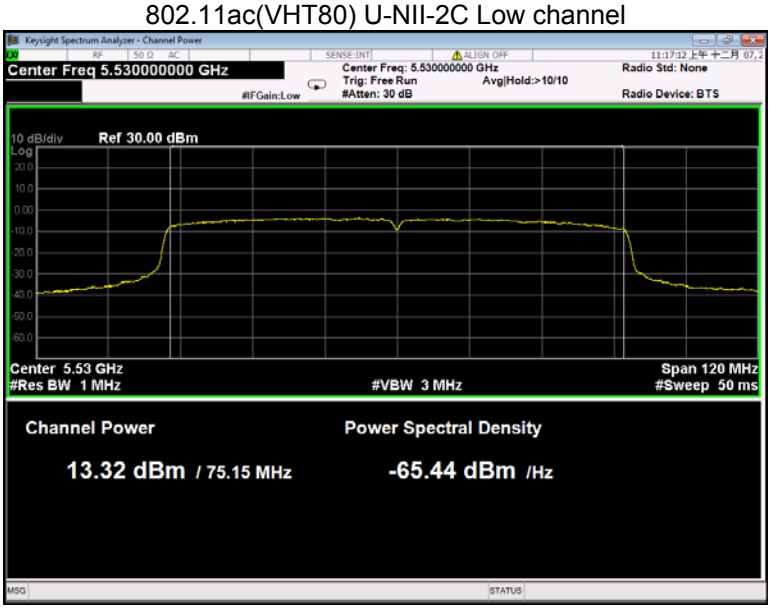
802.11ac(VHT40) U-NII-2C Middle channel



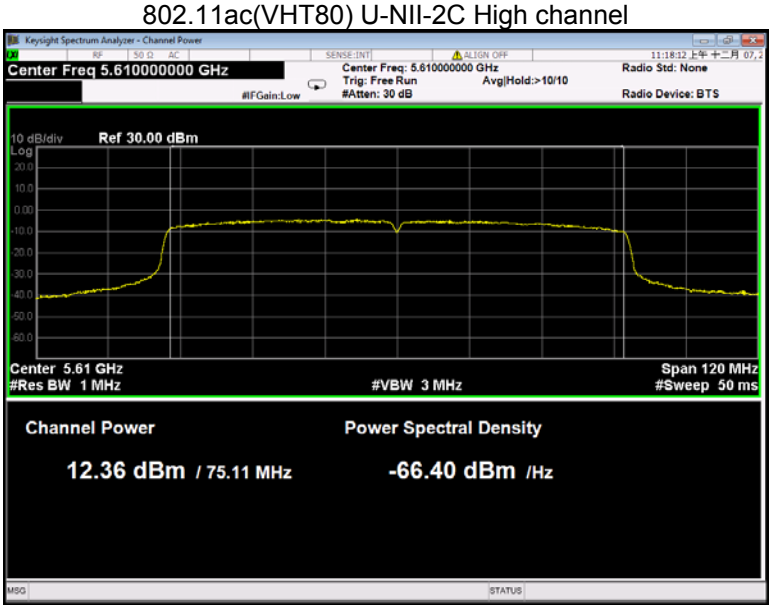
802.11ac(VHT40) U-NII-2C High channel



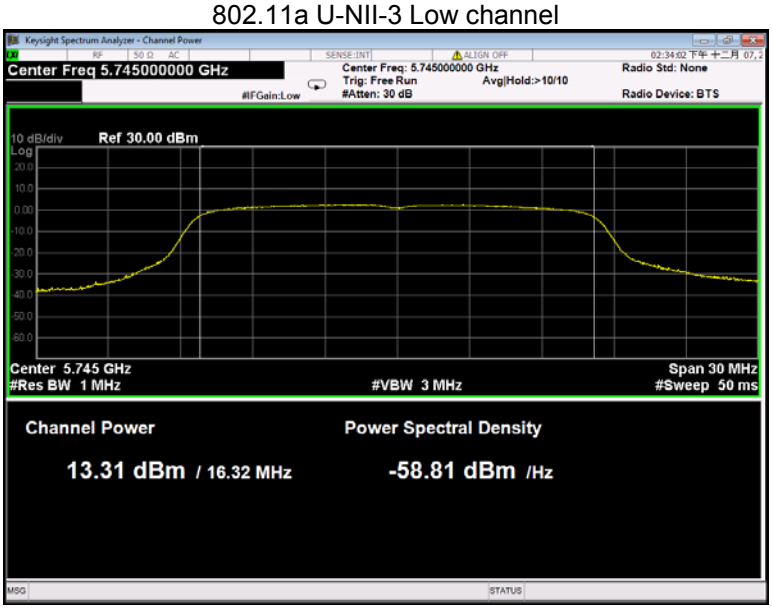
802.11ac(VHT80) U-NII-2C Low channel



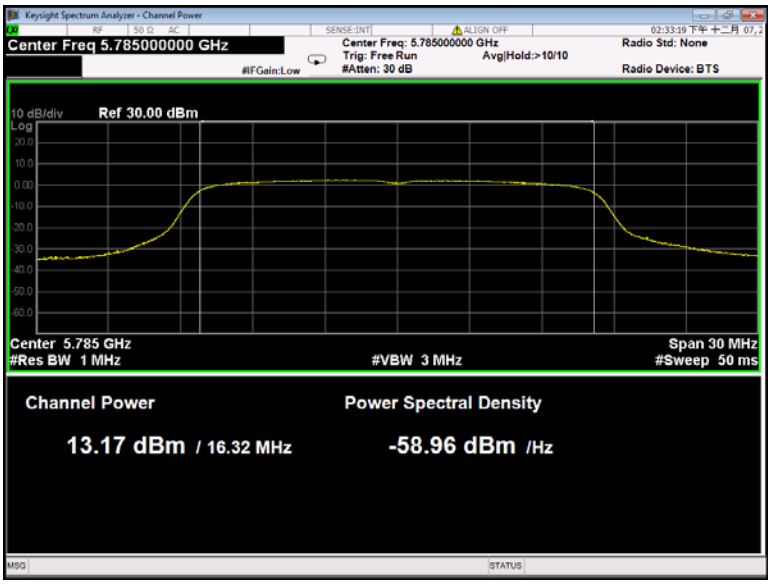
802.11ac(VHT80) U-NII-2C High channel



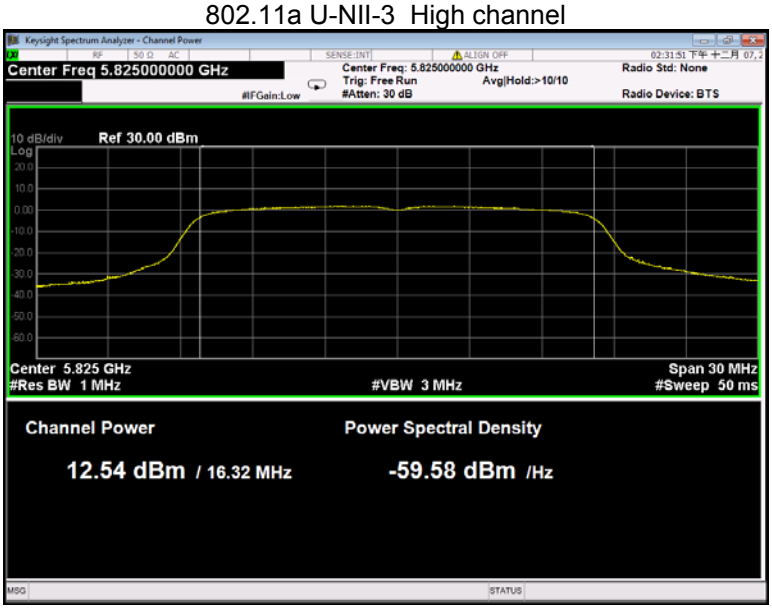
802.11a U-NII-3 Low channel



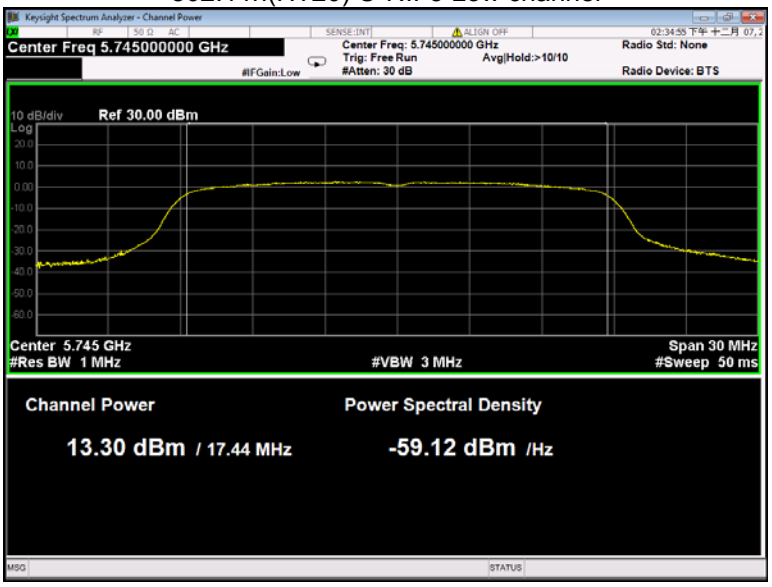
802.11a U-NII-3 Middle channel



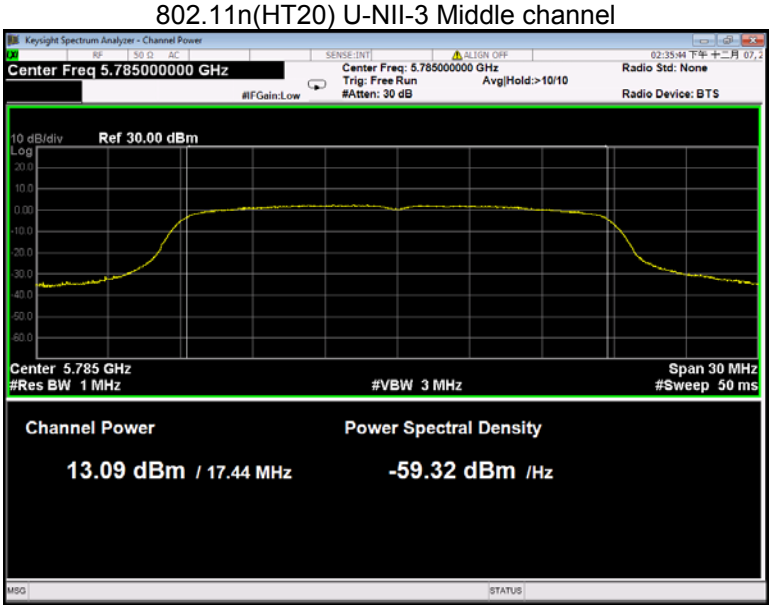
802.11a U-NII-3 High channel



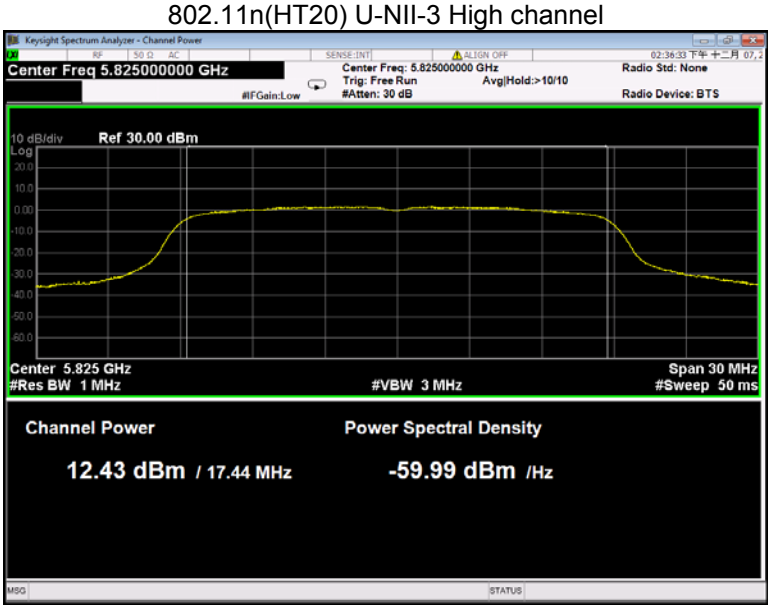
802.11n(HT20) U-NII-3 Low channel



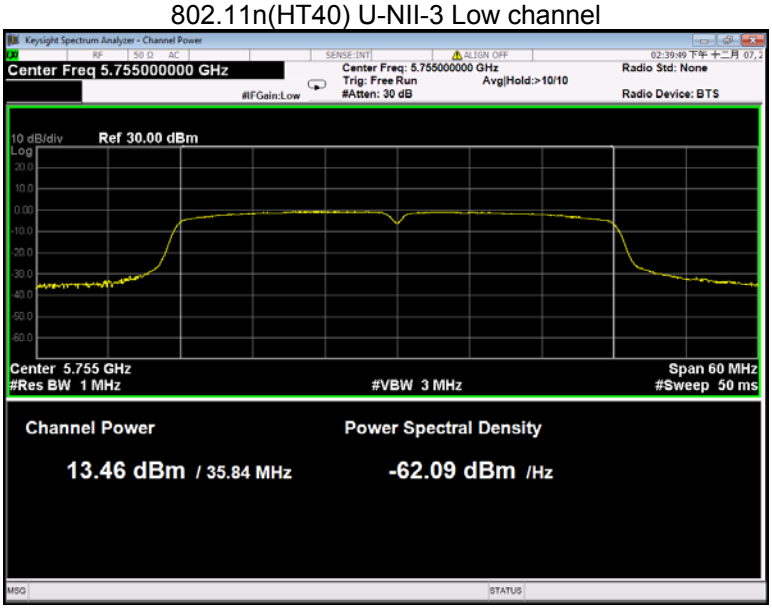
802.11n(HT20) U-NII-3 Middle channel



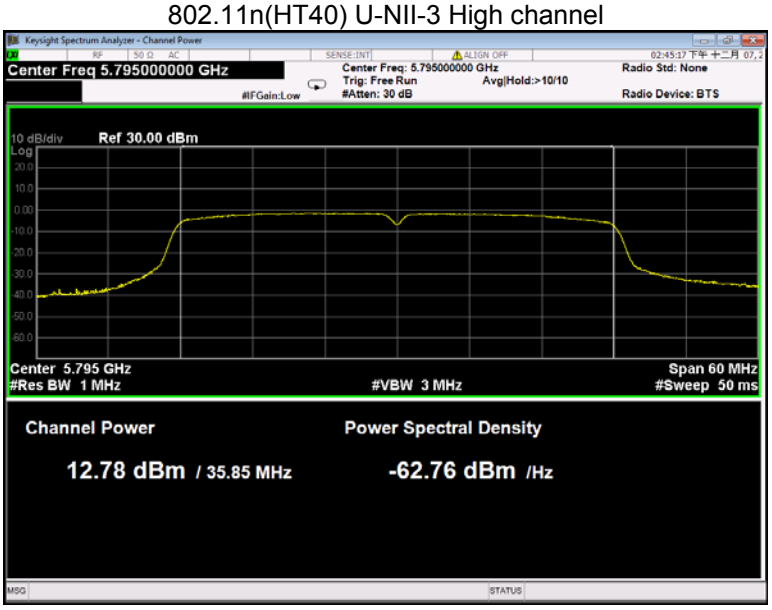
802.11n(HT20) U-NII-3 High channel



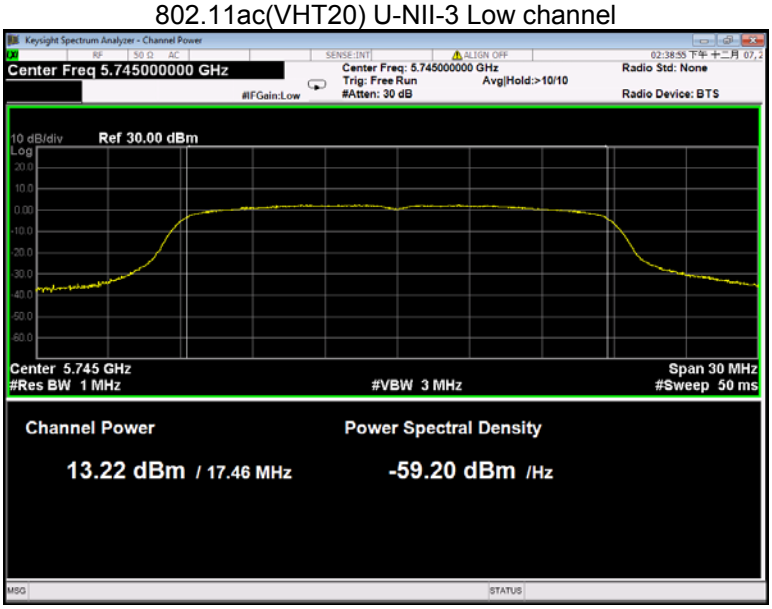
802.11n(HT40) U-NII-3 Low channel



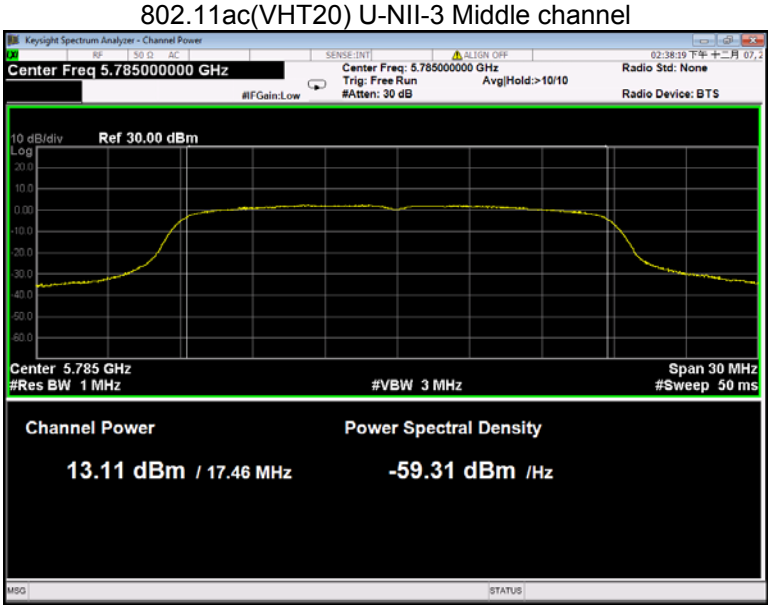
802.11n(HT40) U-NII-3 High channel



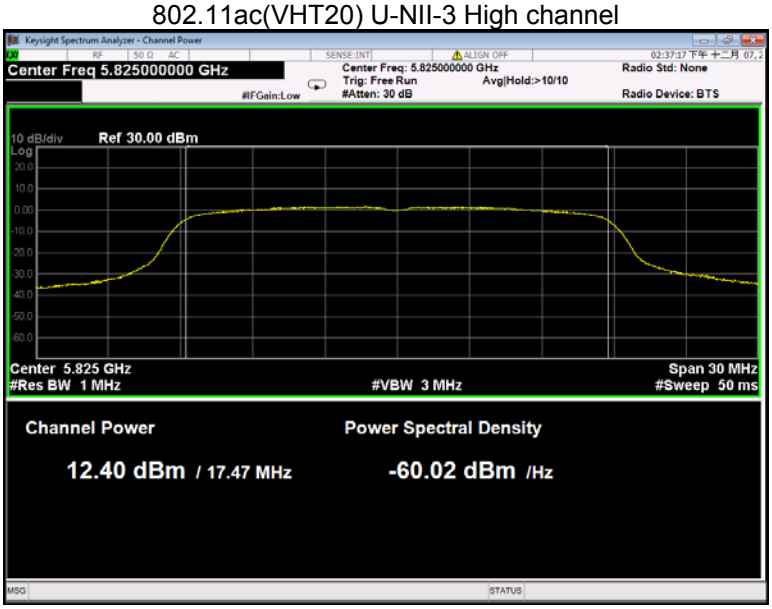
802.11ac(VHT20) U-NII-3 Low channel



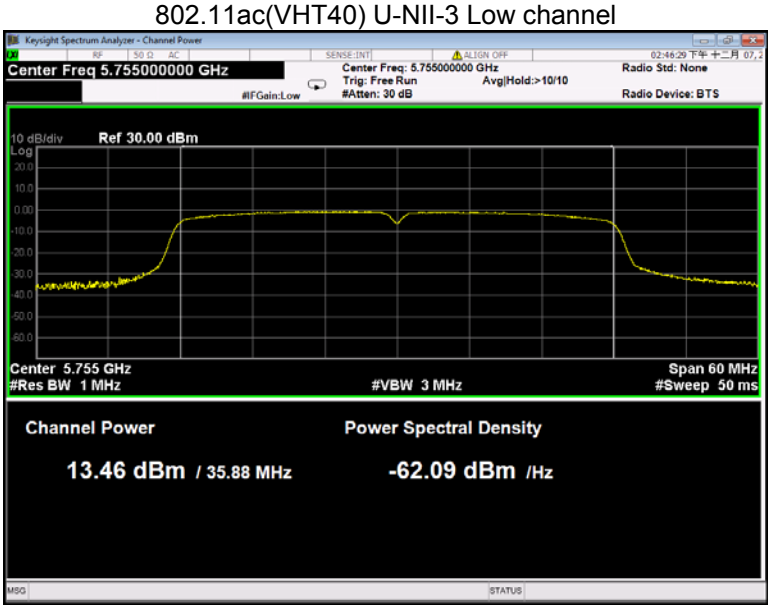
802.11ac(VHT20) U-NII-3 Middle channel



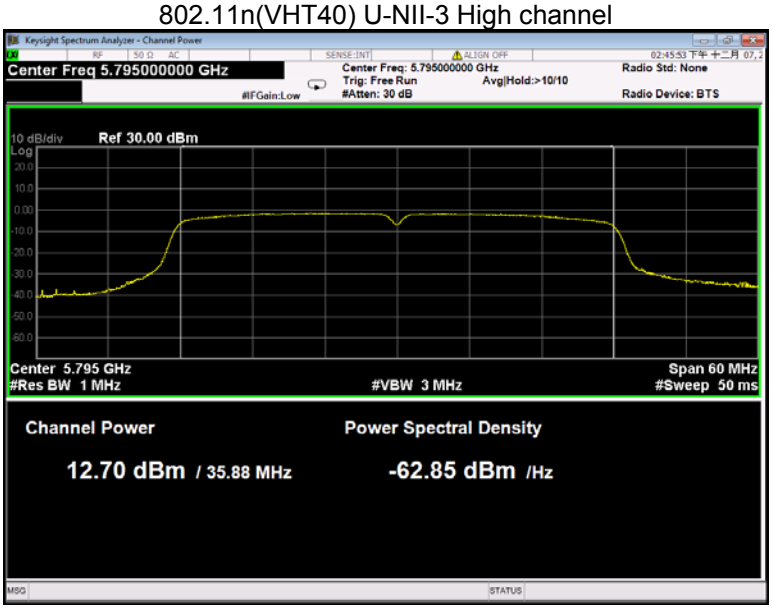
802.11ac(VHT20) U-NII-3 High channel



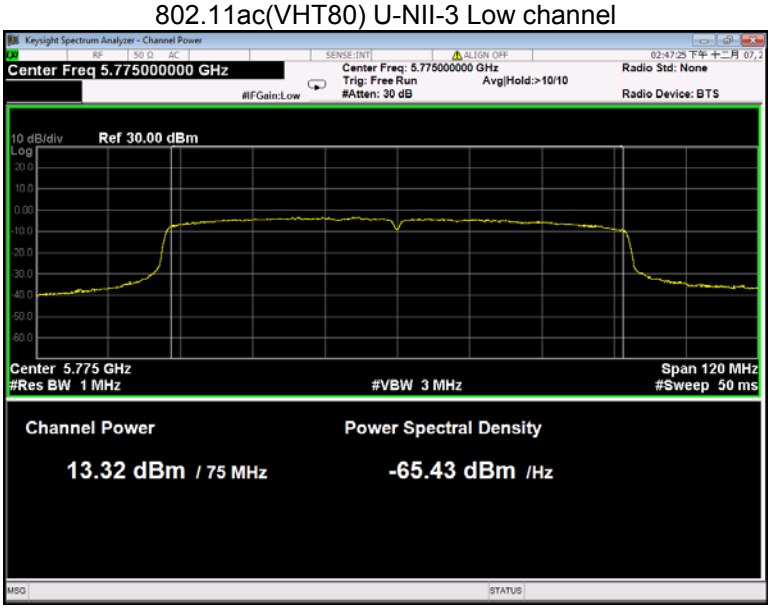
802.11ac(VHT40) U-NII-3 Low channel



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	1.197	0.26	1.457
		Middle	1.142		1.402
		High	1.946		2.206
	802.11n(HT20)	Low	0.792	0.36	1.152
		Middle	1.045		1.405
		High	1.701		2.061
	802.11n(HT40)	Low	-2.591	0.46	-2.131
		Middle	/		/
		High	-2.126		-1.666
	802.11ac(VHT20)	Low	0.776	0.85	1.626
		Middle	1.084		1.934
		High	1.521		2.371
	802.11ac(VHT40)	Low	-2.711	0.71	-2.001
		Middle	/		/
		High	-2.266		-1.556
	802.11ac(VHT80)	Low	-4.617	0.88	-3.737
		Middle	/		/
		High	/		/

Band	Operation mode	Channel	Measurements (dBm/MHz)	Duty Cycle Factor (dB)	Conducted Output Power Spectral Density (dBm/MHz)
U-NII-2A	802.11a	Low	1.530	0.25	1.780
		Middle	2.696		2.946
		High	2.962		3.212
	802.11n(HT20)	Low	1.693	0.28	1.973
		Middle	2.396		2.676
		High	2.710		2.990
	802.11n(HT40)	Low	-1.894	0.48	-1.414
		Middle	/		/
		High	-0.781		-0.301
	802.11ac(VHT20)	Low	1.511	0.32	1.831
		Middle	2.191		2.511
		High	2.788		3.108
	802.11ac(VHT40)	Low	-1.979	0.47	-1.509
		Middle	/		/
		High	-0.732		-0.262
	802.11ac(VHT80)	Low	-3.501	0.85	-2.651
		Middle	/		/
		High	/		/

Band	Operation mode	Channel	Measurements (dBm/MHz)	Duty Cycle Factor (dB)	Conducted Output Power Spectral Density (dBm/MHz)
U-NII-2C	802.11a	Low	2.533	0.28	2.813
		Middle	2.708		2.988
		High	2.284		2.564
	802.11n(HT20)	Low	2.357	0.32	2.677
		Middle	2.546		2.866
		High	2.340		2.660
	802.11n(HT40)	Low	-1.398	0.61	-0.788
		Middle	-0.986		-0.376
		High	-1.352		-0.742
	802.11ac(VHT20)	Low	2.340	0.27	2.610
		Middle	2.653		2.923
		High	2.294		2.564
	802.11ac(VHT40)	Low	-1.058	0.53	-0.528
		Middle	-0.659		-0.129
		High	-1.402		-0.872
	802.11ac(VHT80)	Low	-2.830	0.82	-2.010
		Middle	/		/
		High	-3.830		-3.010

Band	Operation mode	Channel	Measurements (dBm/MHz)	Duty Cycle Factor (dB)	Conducted Output Power Spectral Density (dBm/500kHz)
U-NII-3	802.11a	Low	-0.592	0.23	-0.362
		Middle	-0.662		-0.432
		High	-1.580		-1.35
	802.11n(HT20)	Low	-0.733	0.28	-0.453
		Middle	-1.151		-0.871
		High	-1.895		-1.615
	802.11n(HT40)	Low	-3.751	0.47	-3.281
		Middle	/		/
		High	-4.570		-4.1
	802.11ac(VHT20)	Low	-0.808	0.24	-0.568
		Middle	-0.973		-0.733
		High	-1.906		-1.666
	802.11ac(VHT40)	Low	-3.605	0.47	-3.135
		Middle	/		/
		High	-4.282		-3.812
	802.11ac(VHT80)	Low	-6.723	1.29	-5.433
		Middle	/		/
		High	/		/

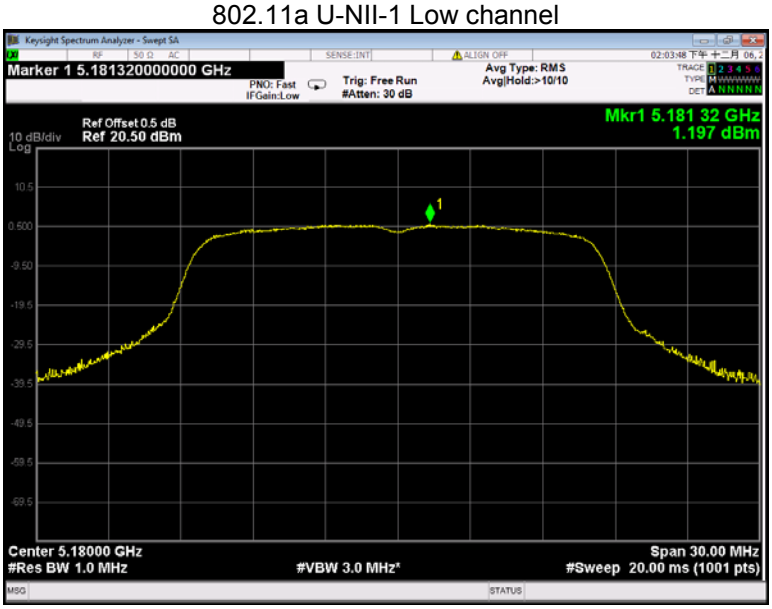
Note:

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

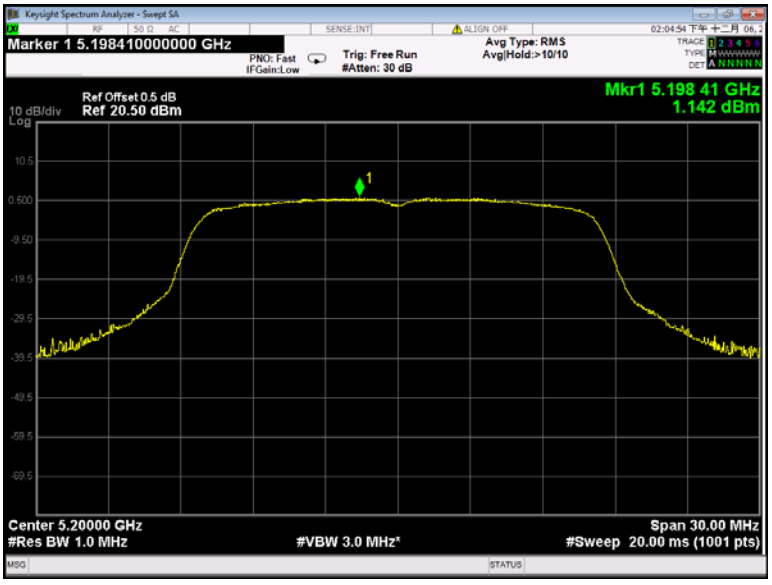
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

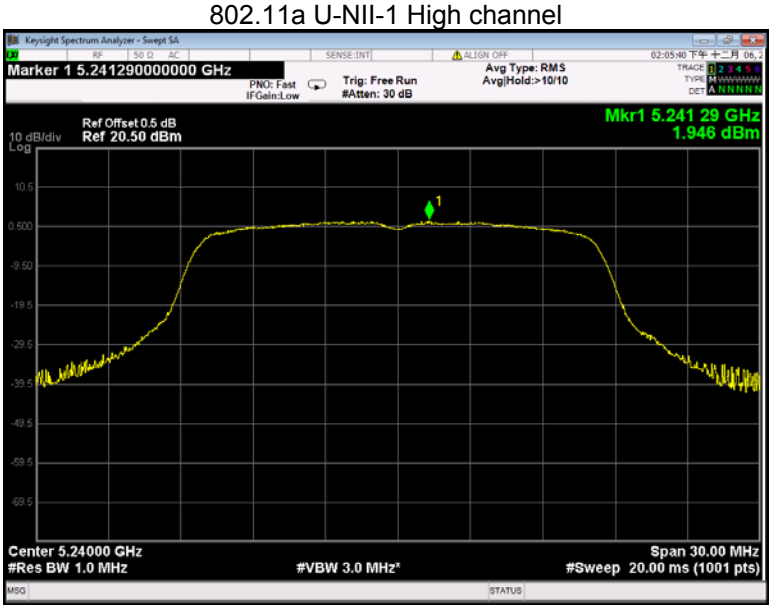
802.11a U-NII-1 Low channel



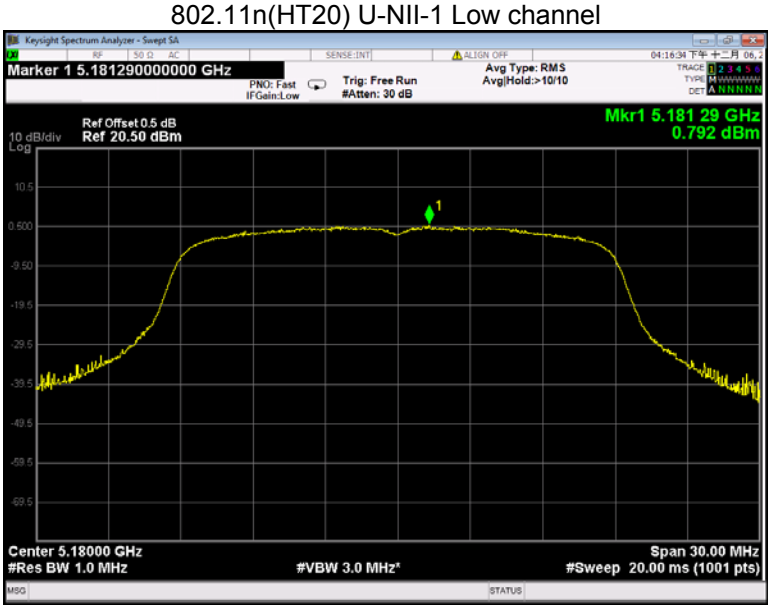
802.11a U-NII-1 Middle channel



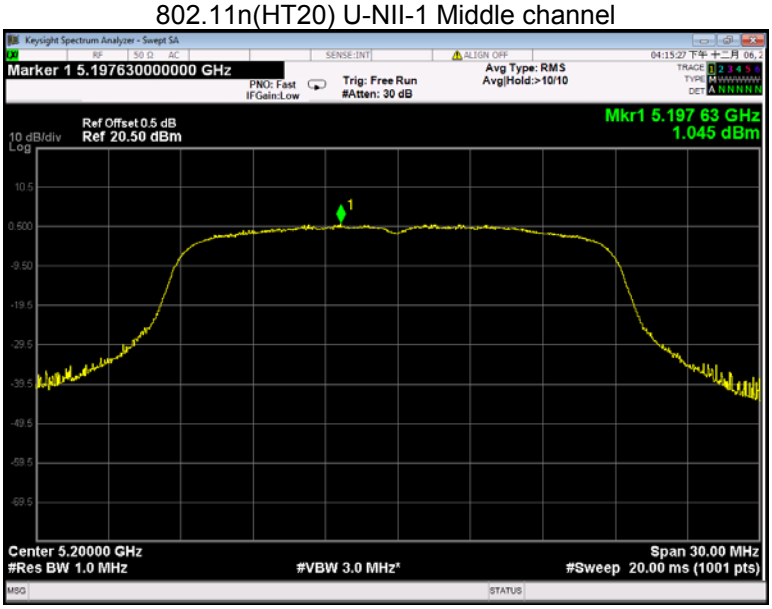
802.11a U-NII-1 High channel



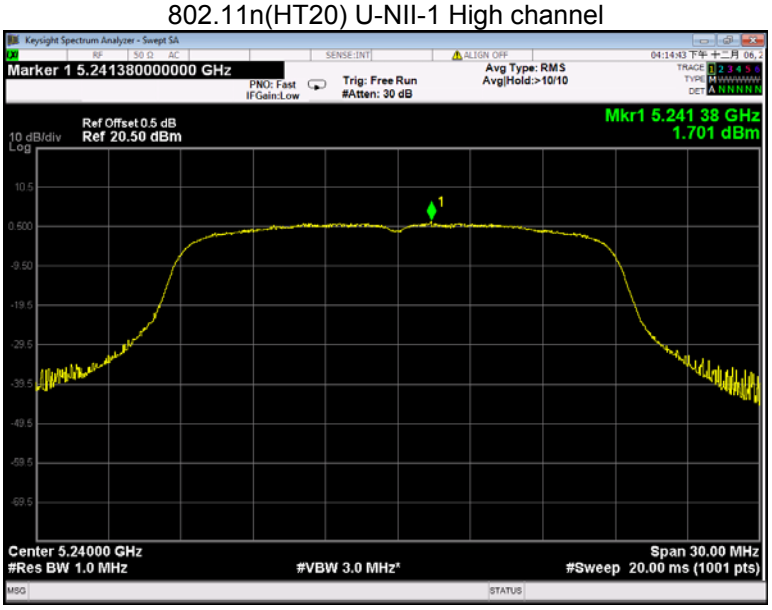
802.11n(HT20) U-NII-1 Low channel



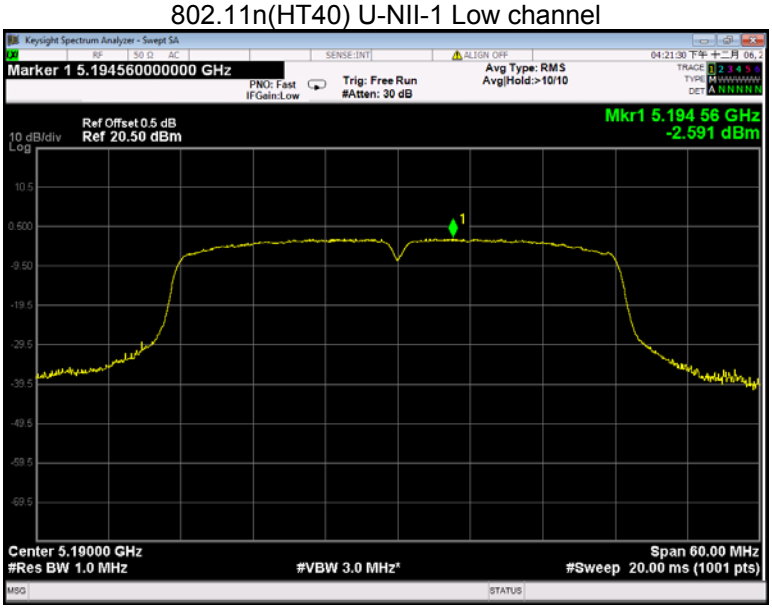
802.11n(HT20) U-NII-1 Middle channel



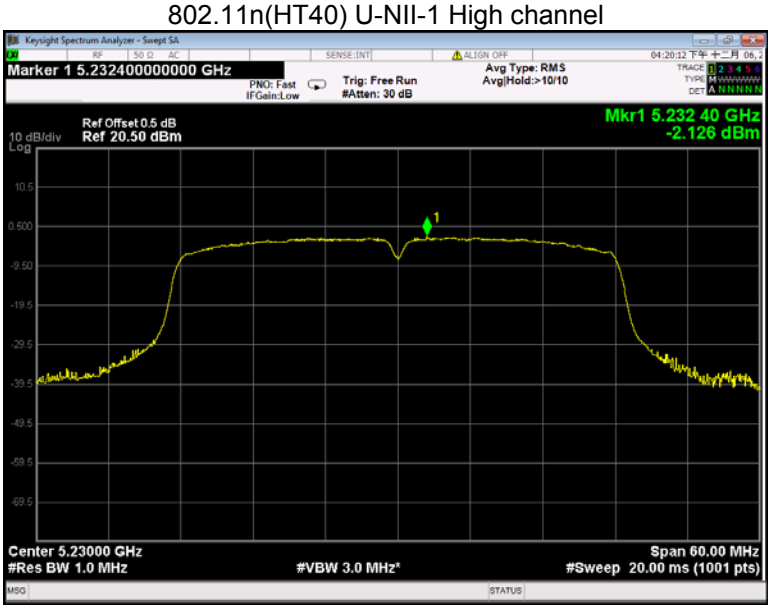
802.11n(HT20) U-NII-1 High channel



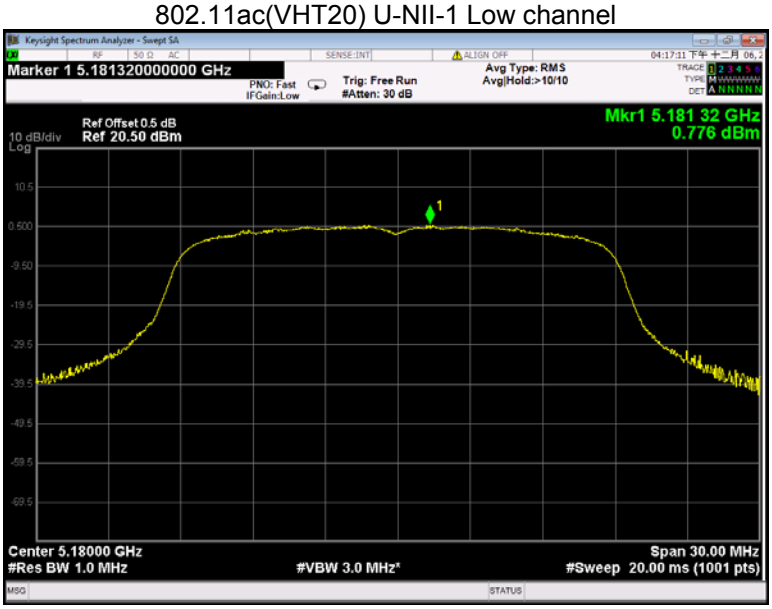
802.11n(HT40) U-NII-1 Low channel



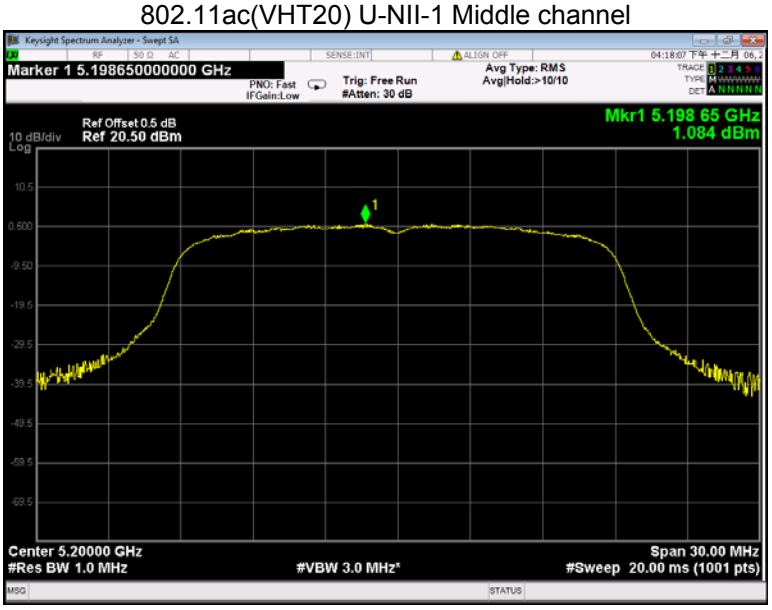
802.11n(HT40) U-NII-1 High channel



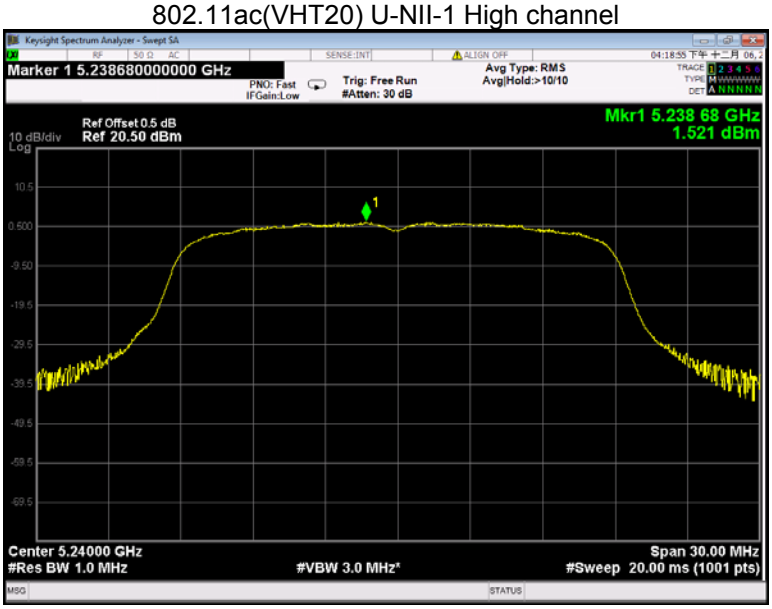
802.11ac(VHT20) U-NII-1 Low channel



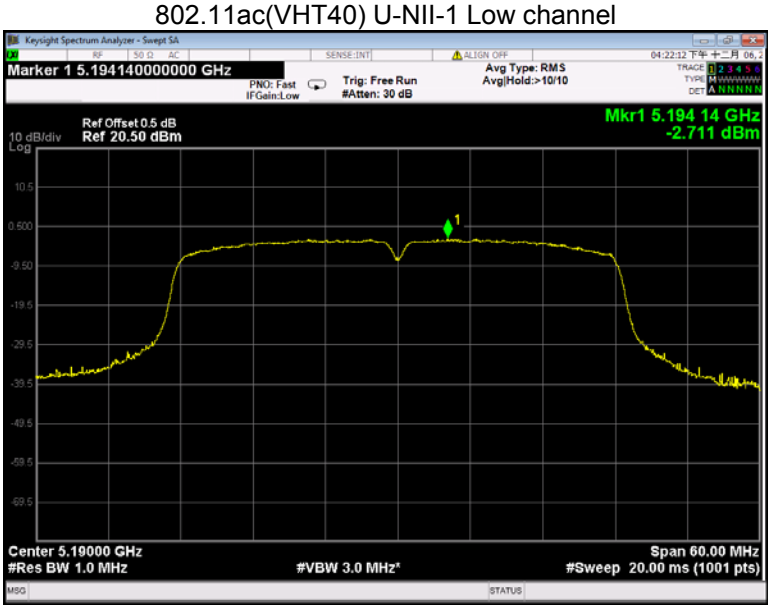
802.11ac(VHT20) U-NII-1 Middle channel



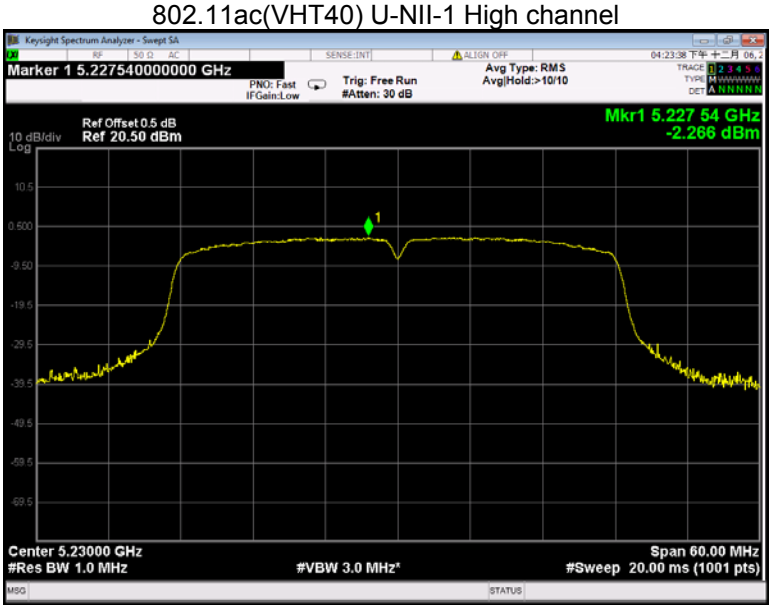
802.11ac(VHT20) U-NII-1 High channel



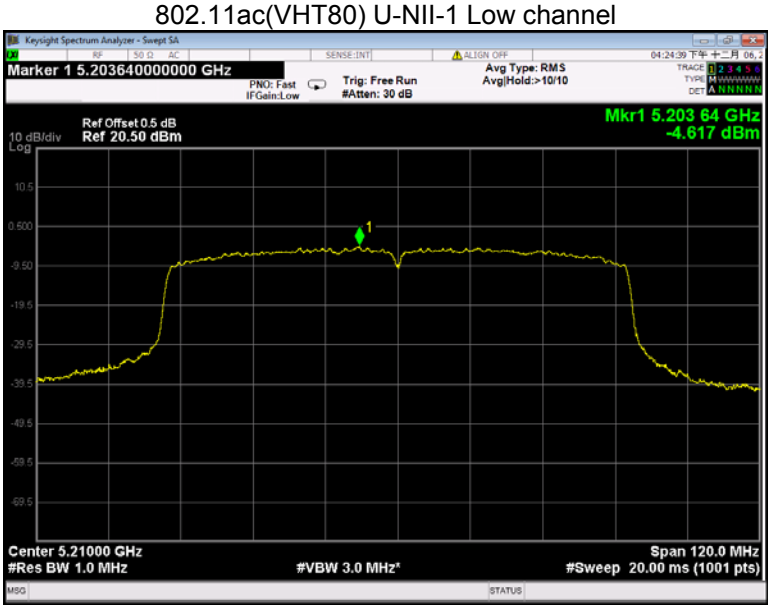
802.11ac(VHT40) U-NII-1 Low channel



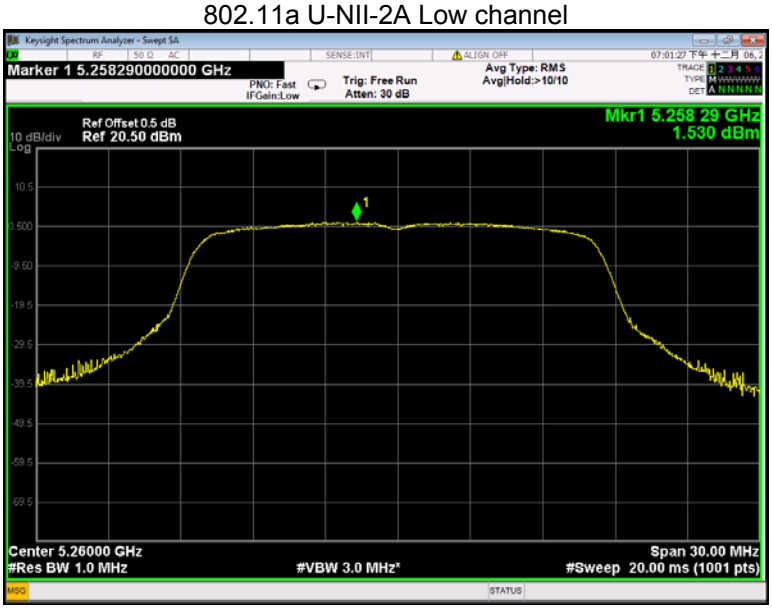
802.11ac(VHT40) U-NII-1 High channel



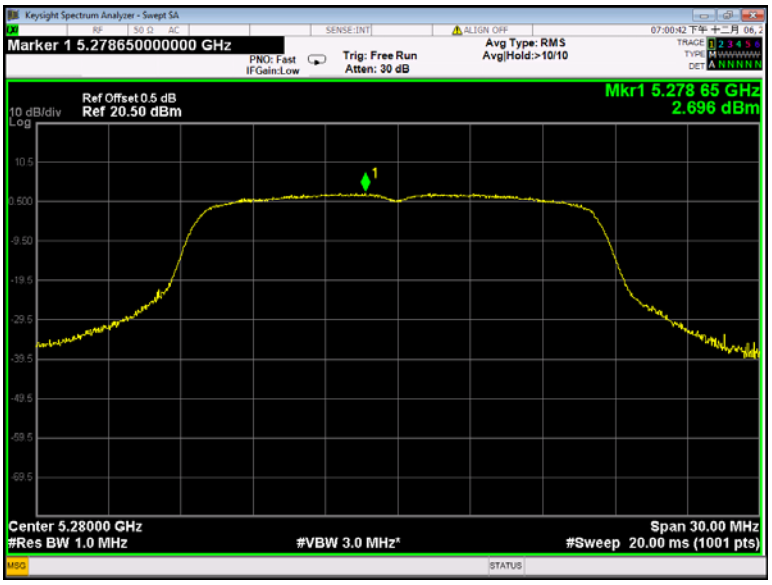
802.11ac(VHT80) U-NII-1 Low channel



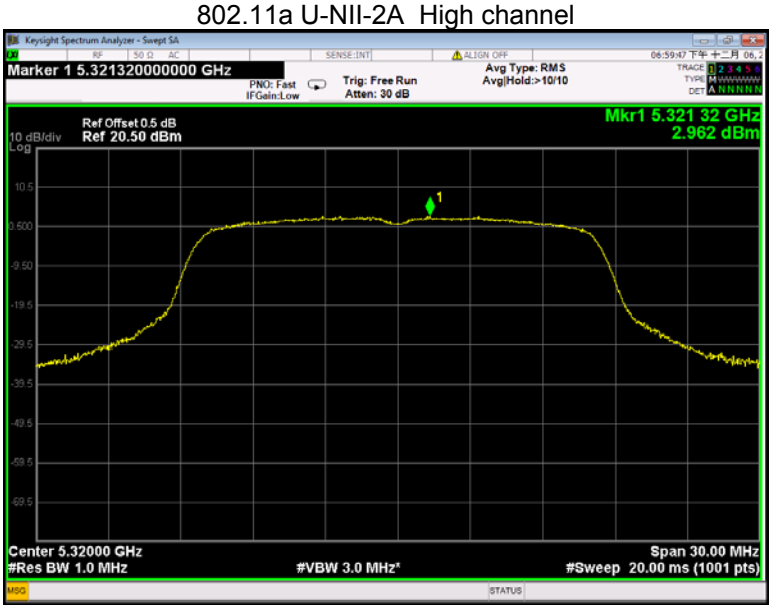
802.11a U-NII-2A Low channel



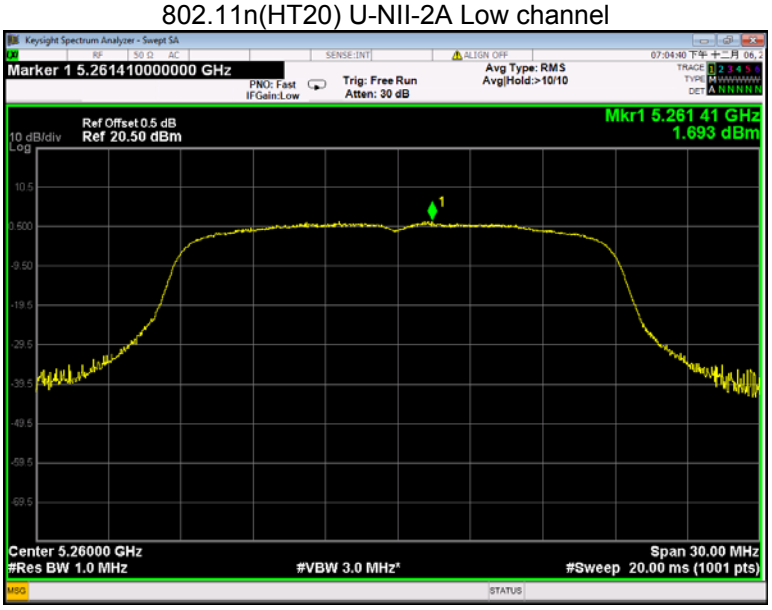
802.11a U-NII-2A Middle channel



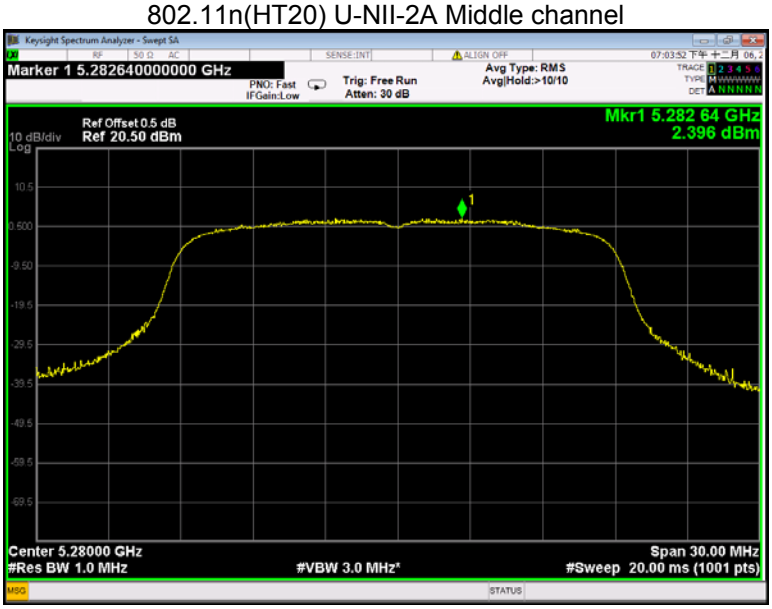
802.11a U-NII-2A High channel



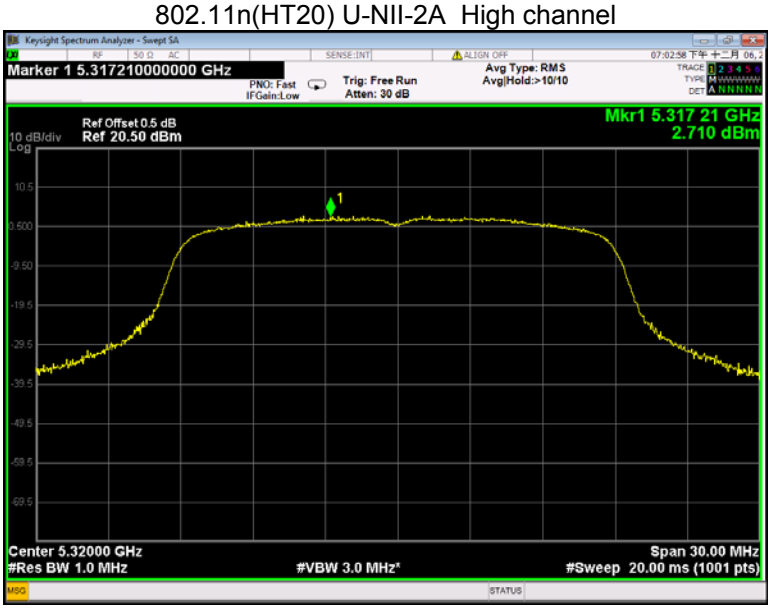
802.11n(HT20) U-NII-2A Low channel



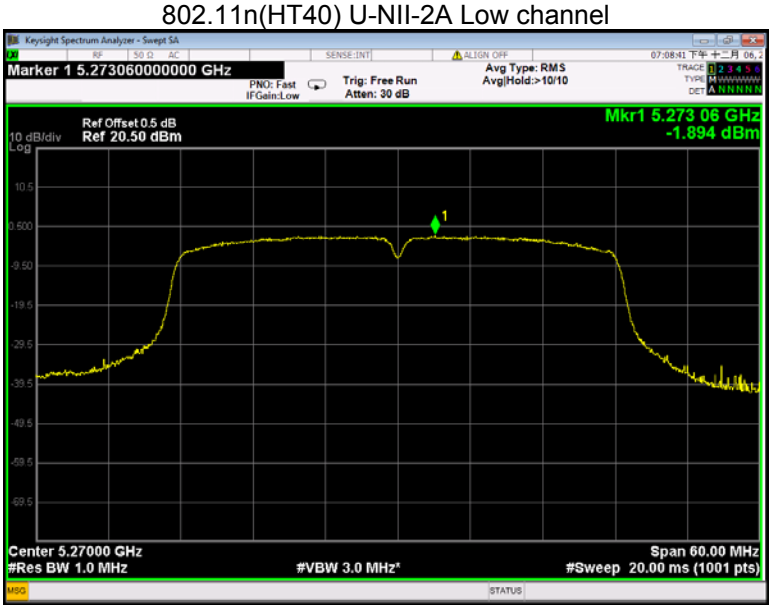
802.11n(HT20) U-NII-2A Middle channel



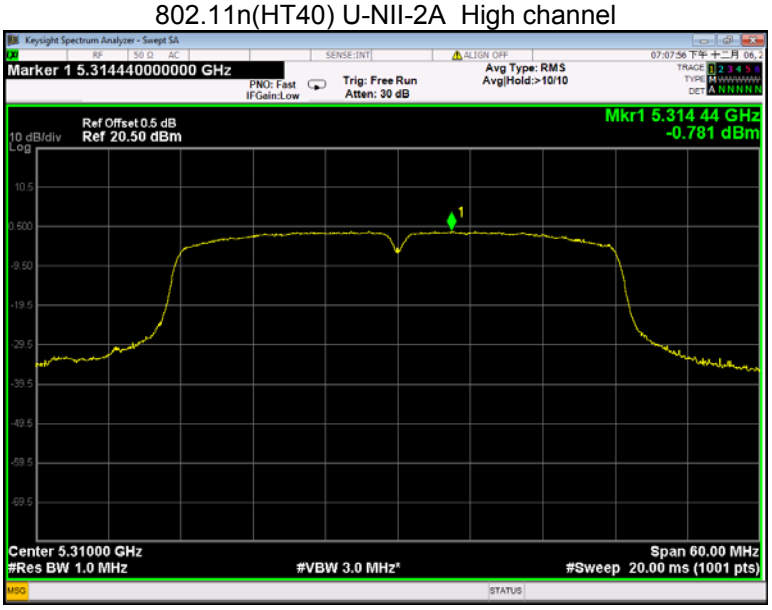
802.11n(HT20) U-NII-2A High channel



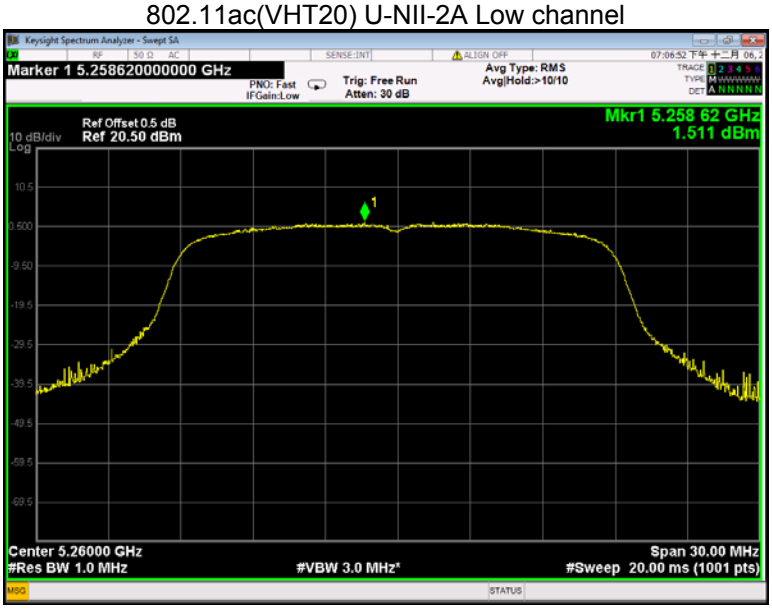
802.11n(HT40) U-NII-2A Low channel



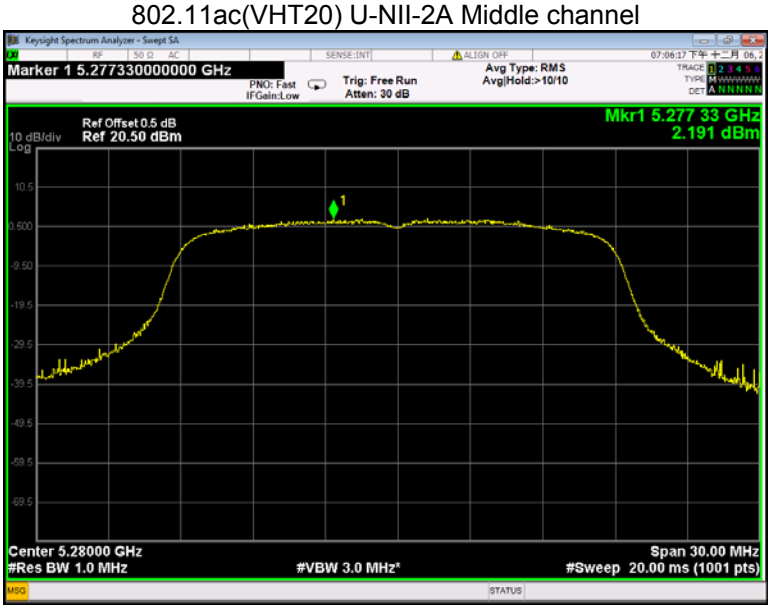
802.11n(HT40) U-NII-2A High channel



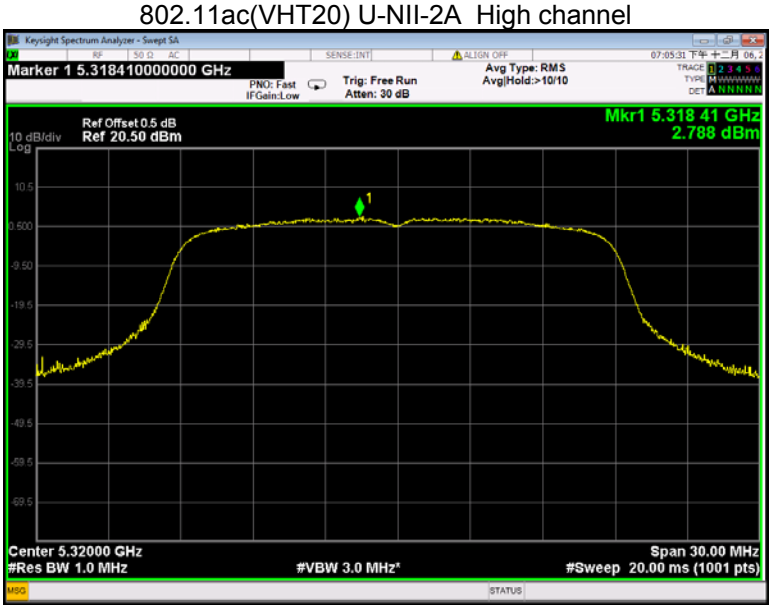
802.11ac(VHT20) U-NII-2A Low channel



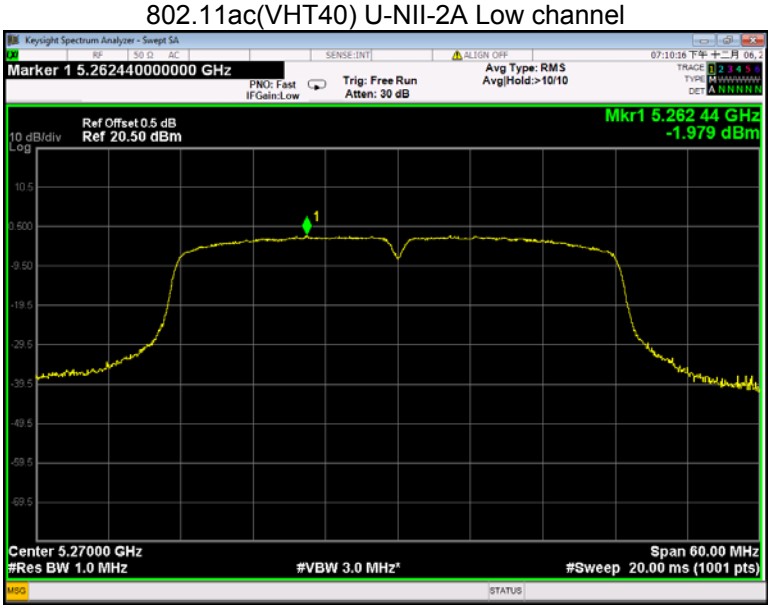
802.11ac(VHT20) U-NII-2A Middle channel



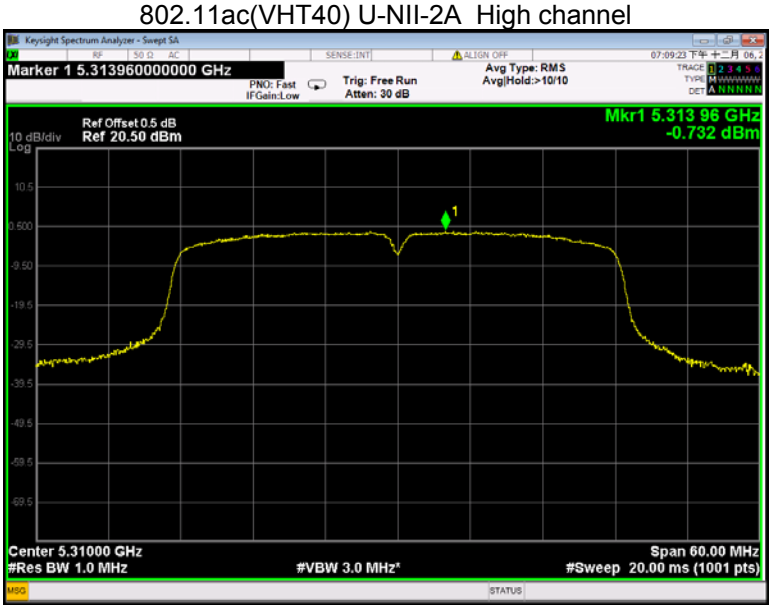
802.11ac(VHT20) U-NII-2A High channel



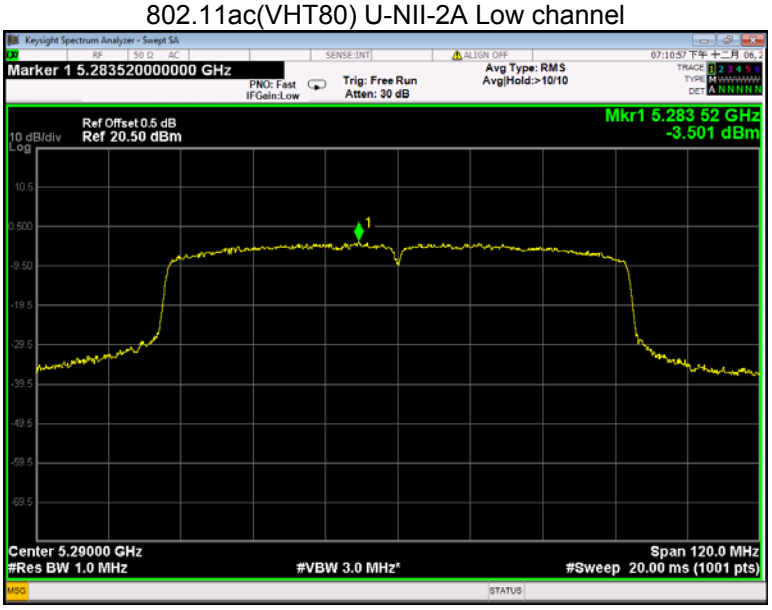
802.11ac(VHT40) U-NII-2A Low channel



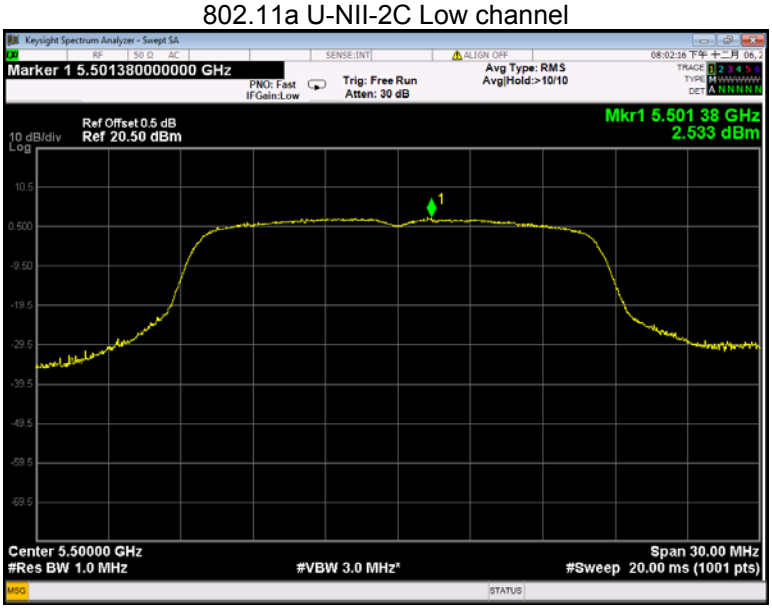
802.11ac(VHT40) U-NII-2A High channel



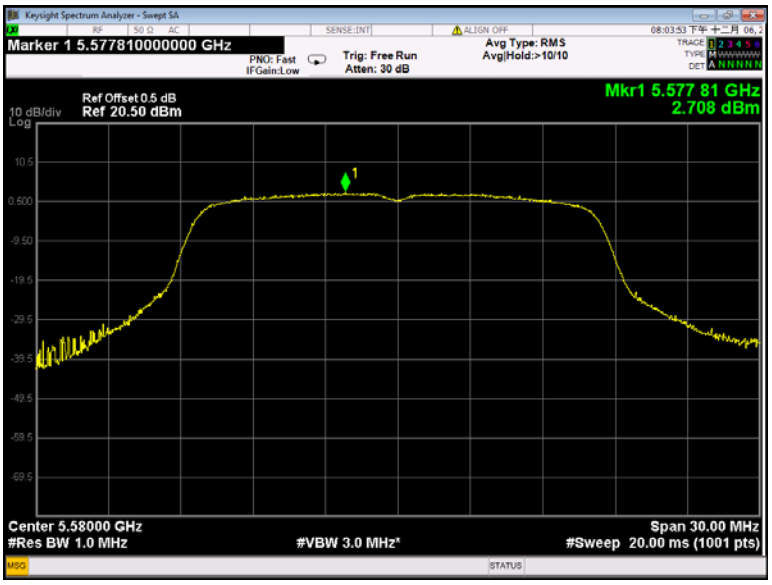
802.11ac(VHT80) U-NII-2A Low channel



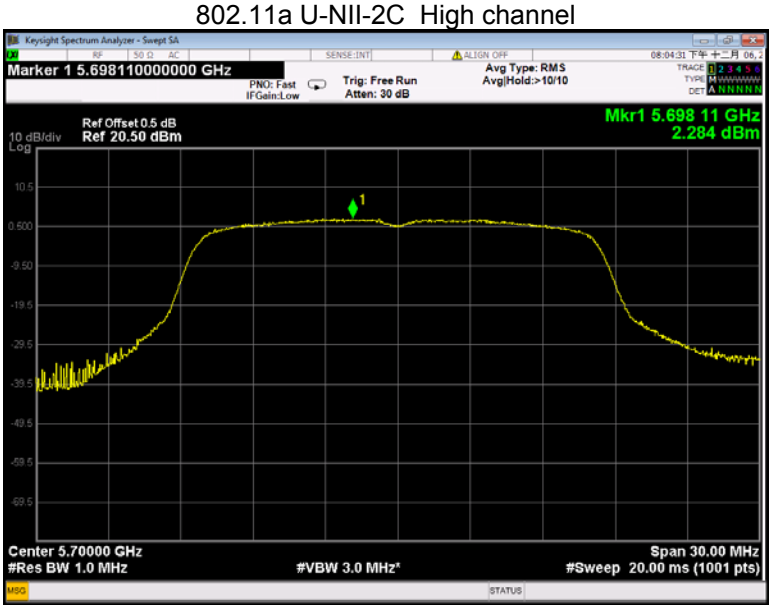
802.11a U-NII-2C Low channel



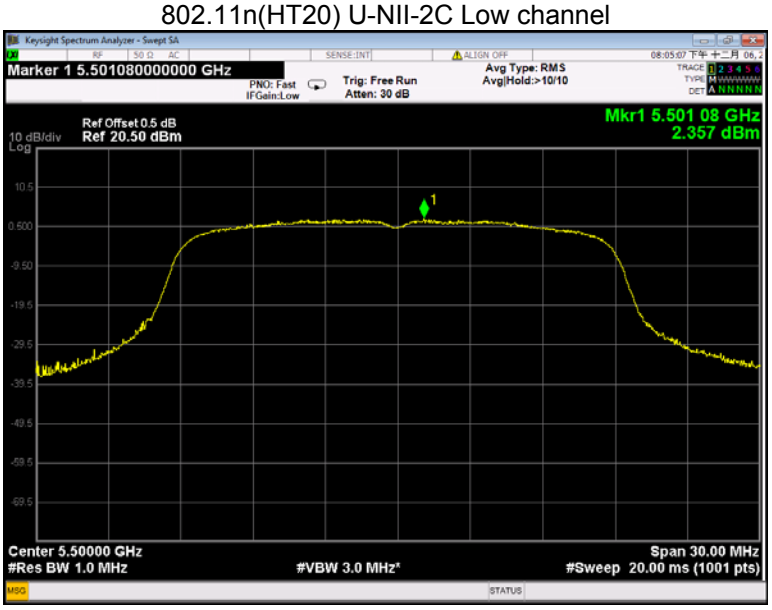
802.11a U-NII-2C Middle channel



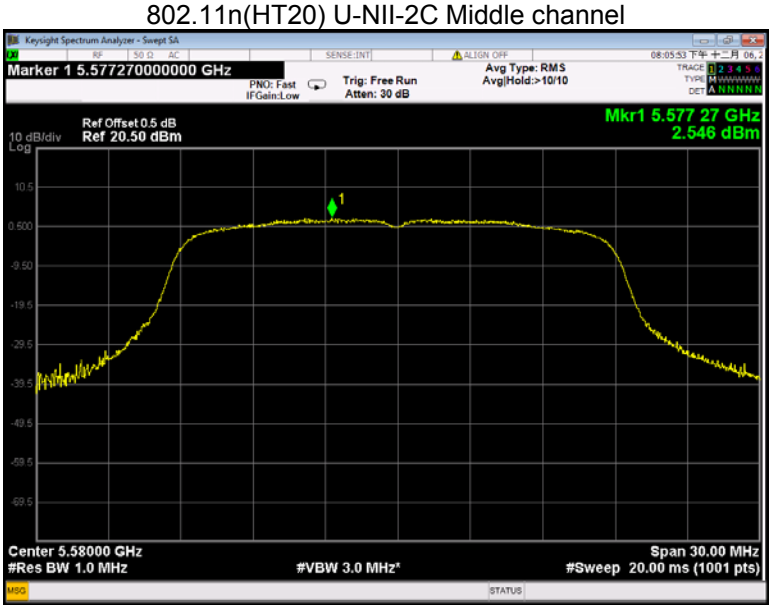
802.11a U-NII-2C High channel



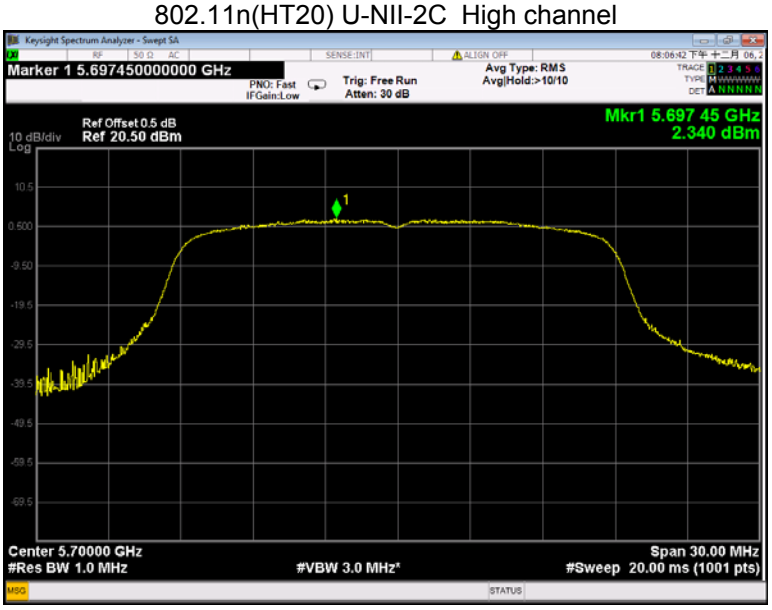
802.11n(HT20) U-NII-2C Low channel



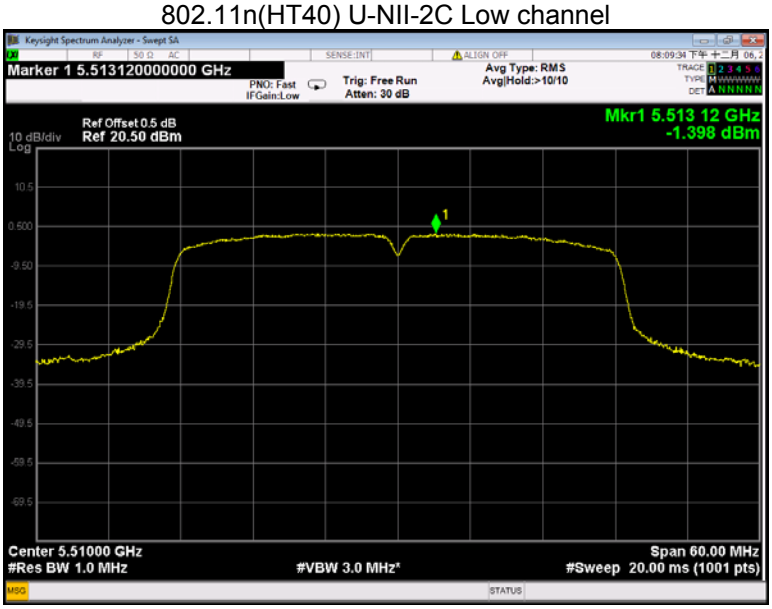
802.11n(HT20) U-NII-2C Middle channel



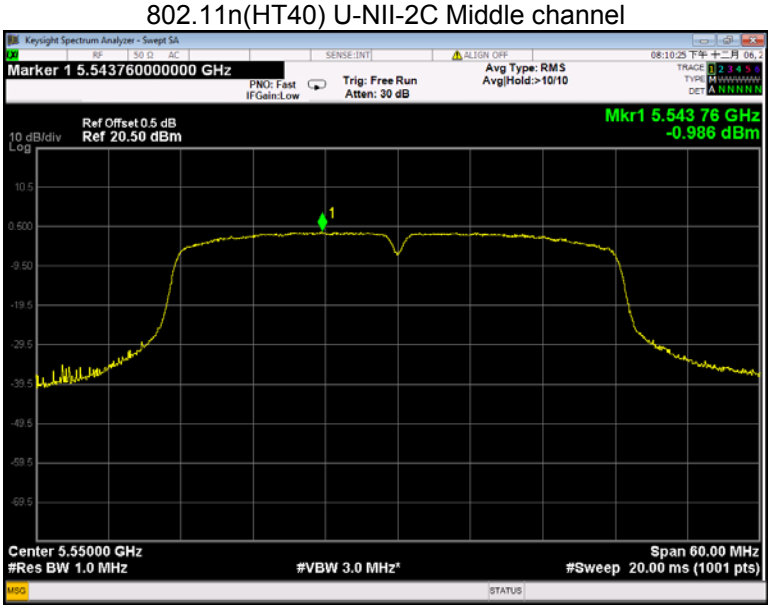
802.11n(HT20) U-NII-2C High channel



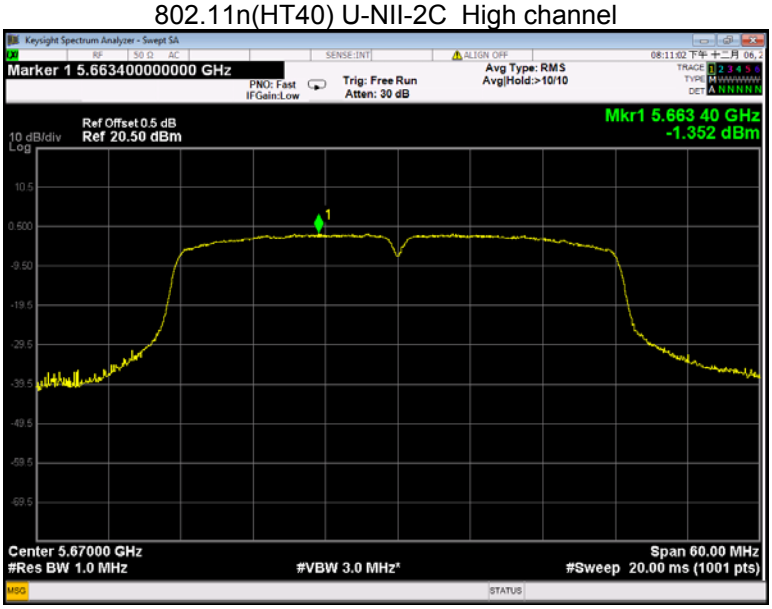
802.11n(HT40) U-NII-2C Low channel



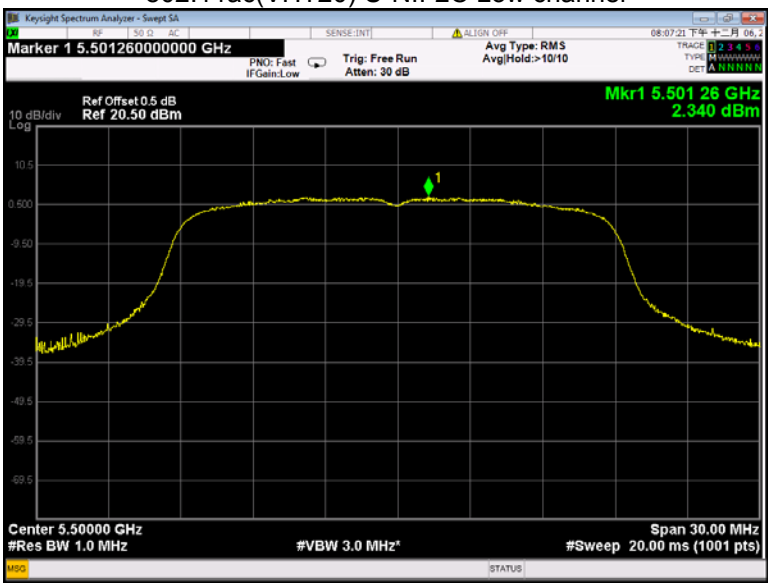
802.11n(HT40) U-NII-2C Middle channel



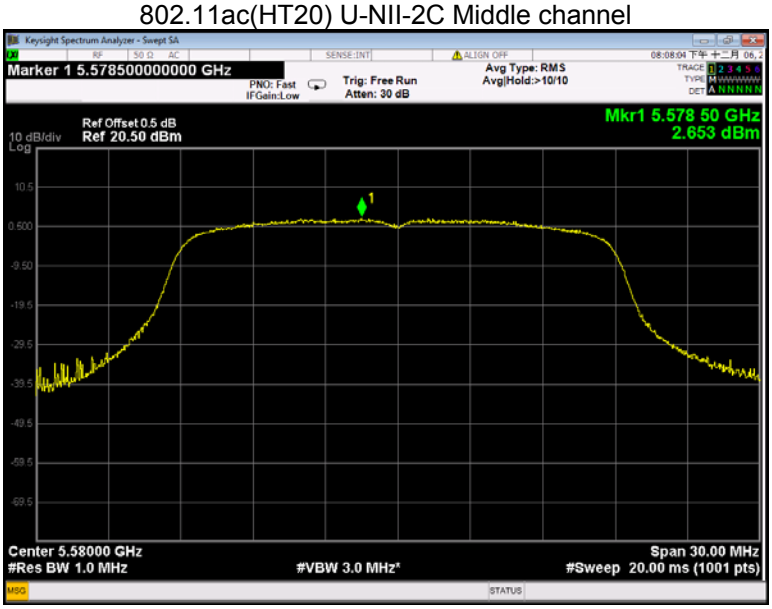
802.11n(HT40) U-NII-2C High channel



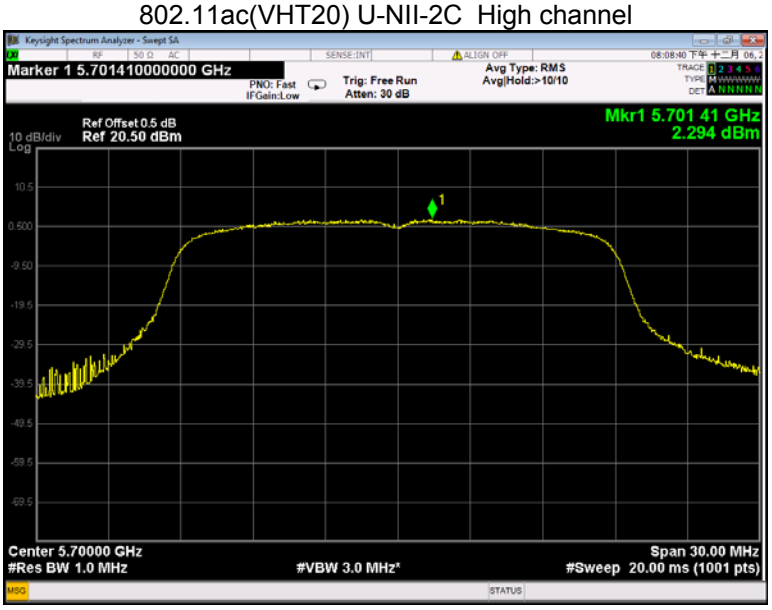
802.11ac(VHT20) U-NII-2C Low channel



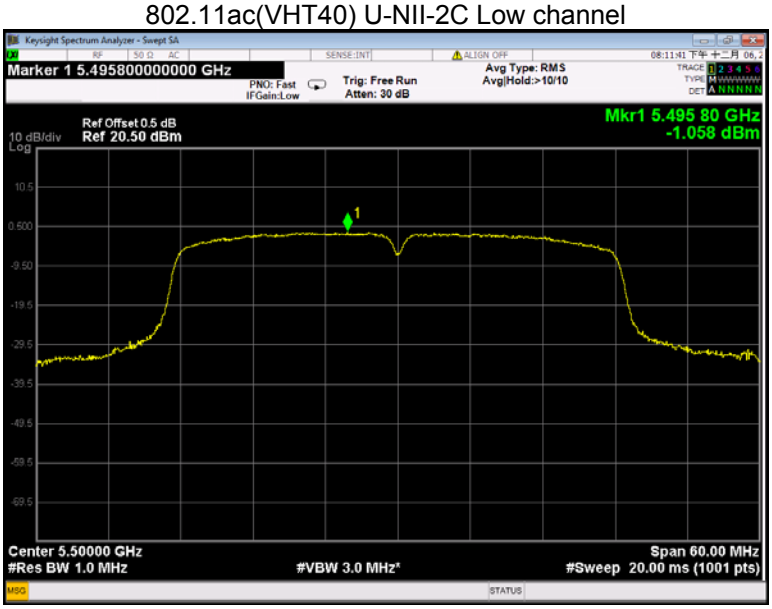
802.11ac(HT20) U-NII-2C Middle channel



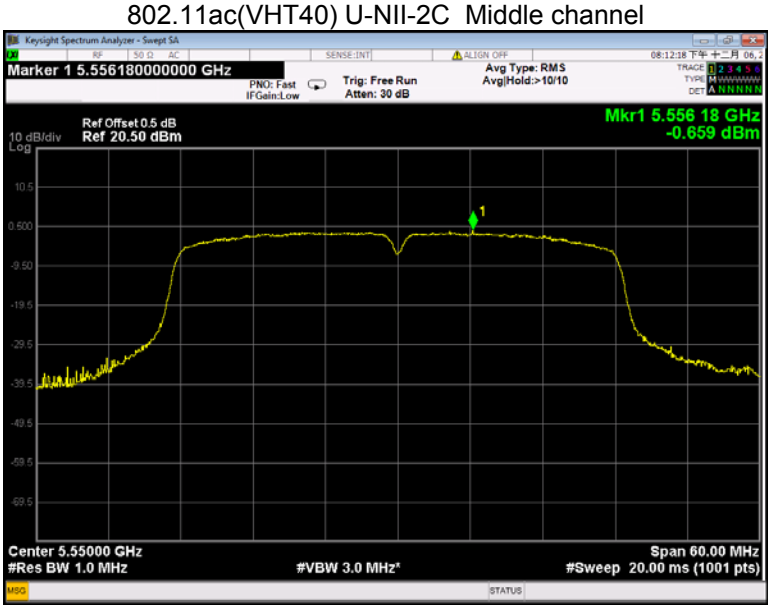
802.11ac(VHT20) U-NII-2C High channel



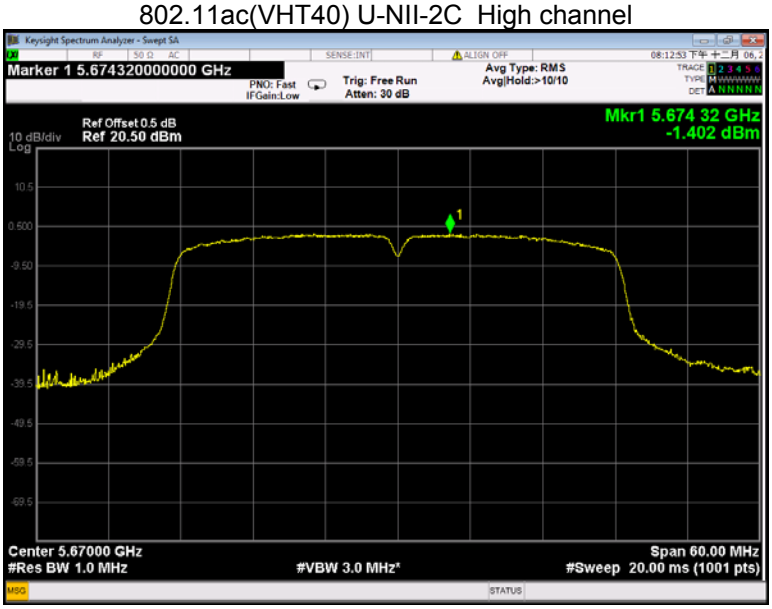
802.11ac(VHT40) U-NII-2C Low channel



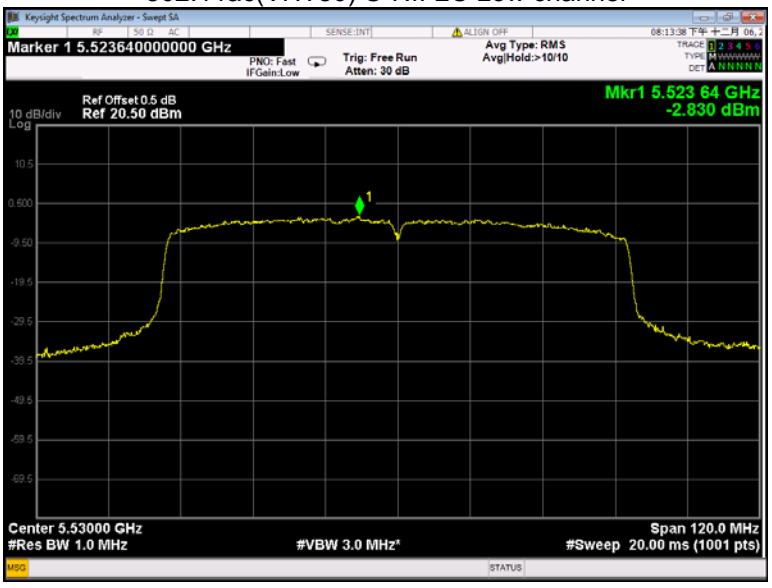
802.11ac(VHT40) U-NII-2C Middle channel



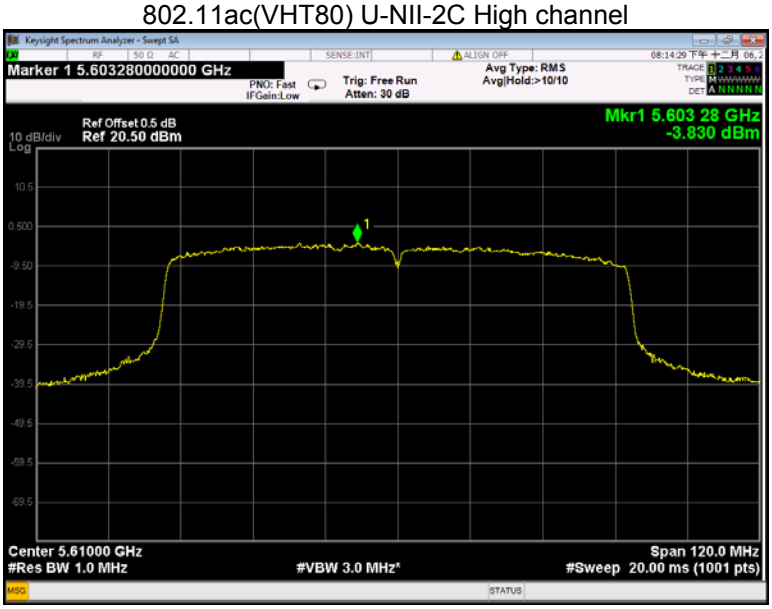
802.11ac(VHT40) U-NII-2C High channel



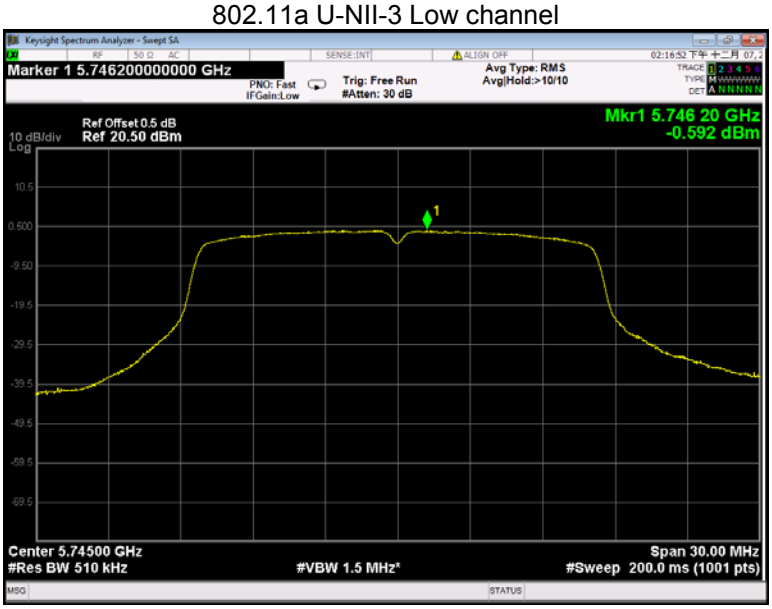
802.11ac(VHT80) U-NII-2C Low channel



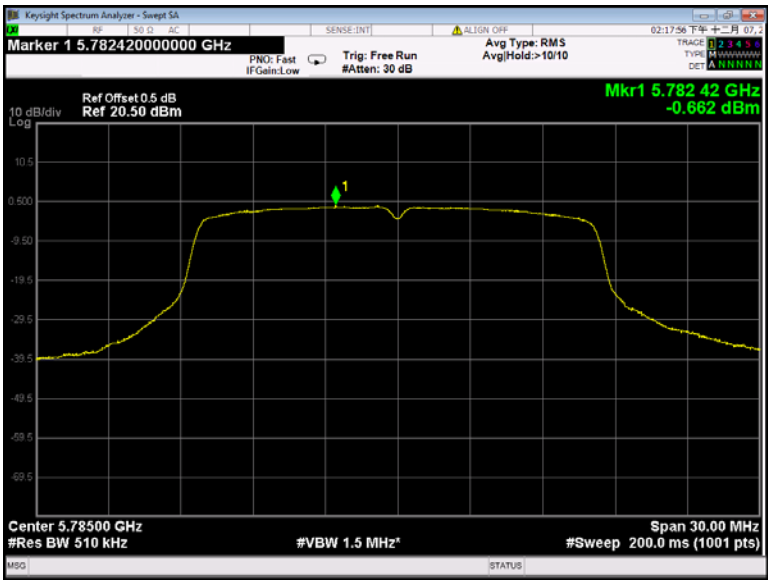
802.11ac(VHT80) U-NII-2C High channel



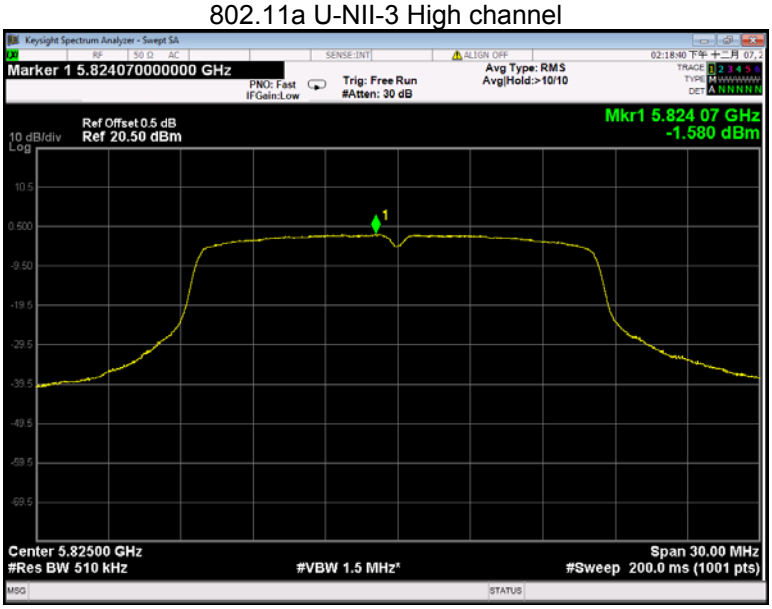
802.11a U-NII-3 Low channel



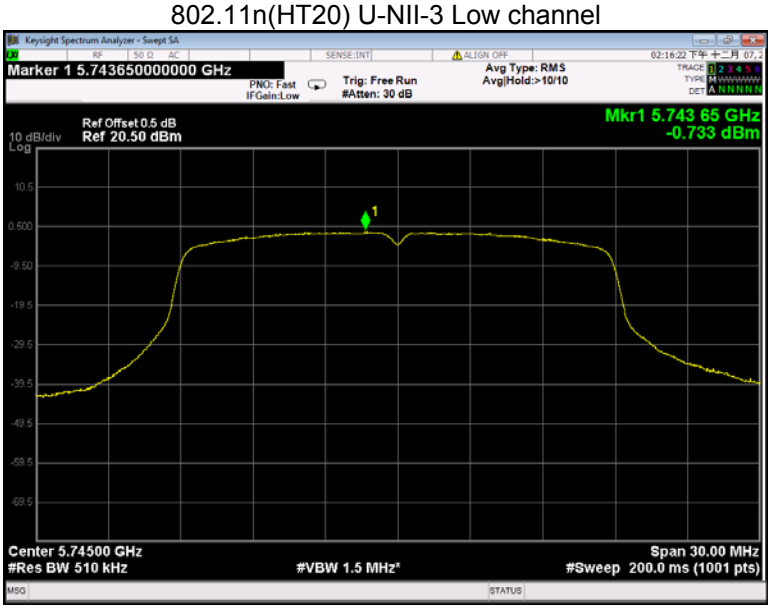
802.11a U-NII-3 Middle channel



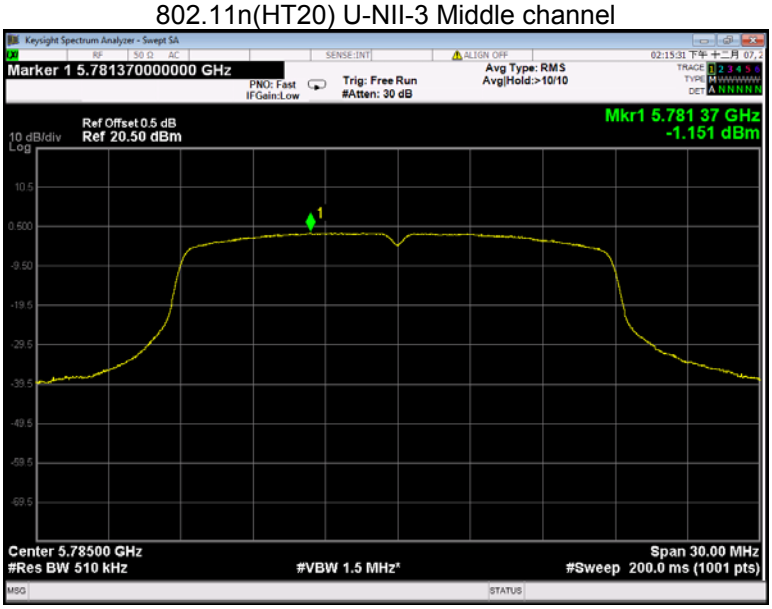
802.11a U-NII-3 High channel



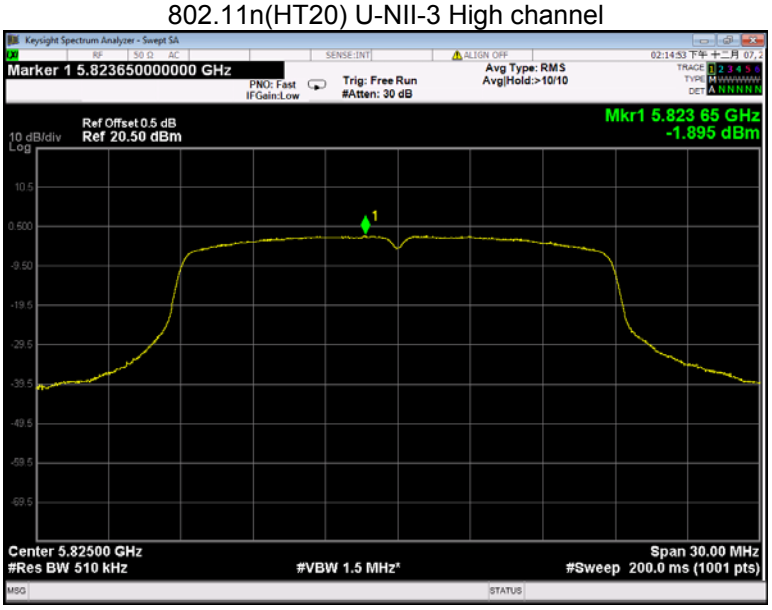
802.11n(HT20) U-NII-3 Low channel



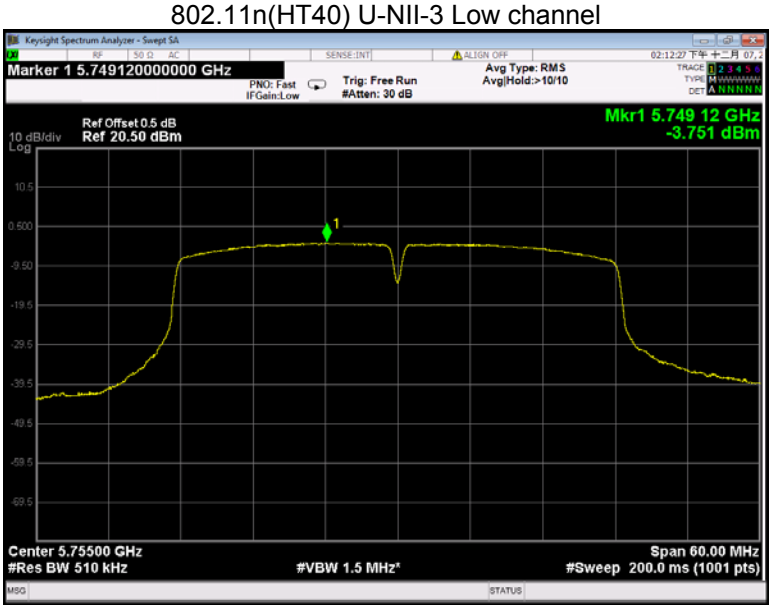
802.11n(HT20) U-NII-3 Middle channel



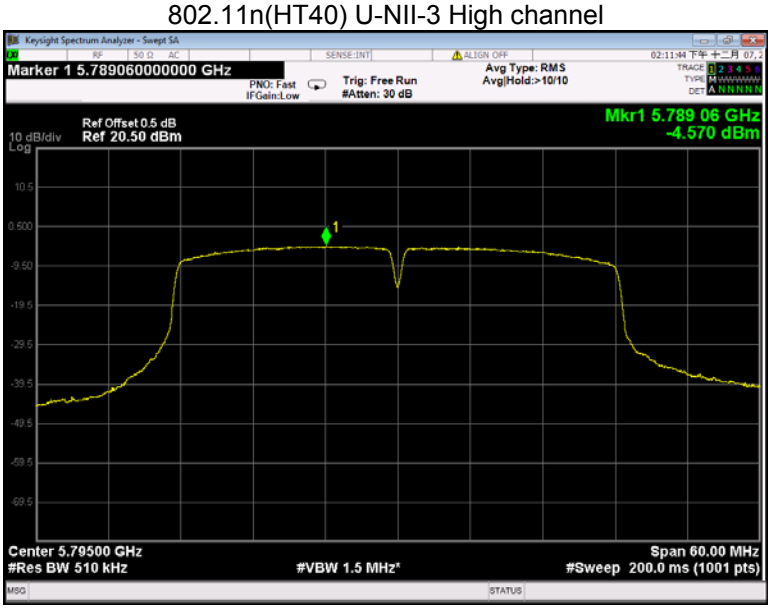
802.11n(HT20) U-NII-3 High channel



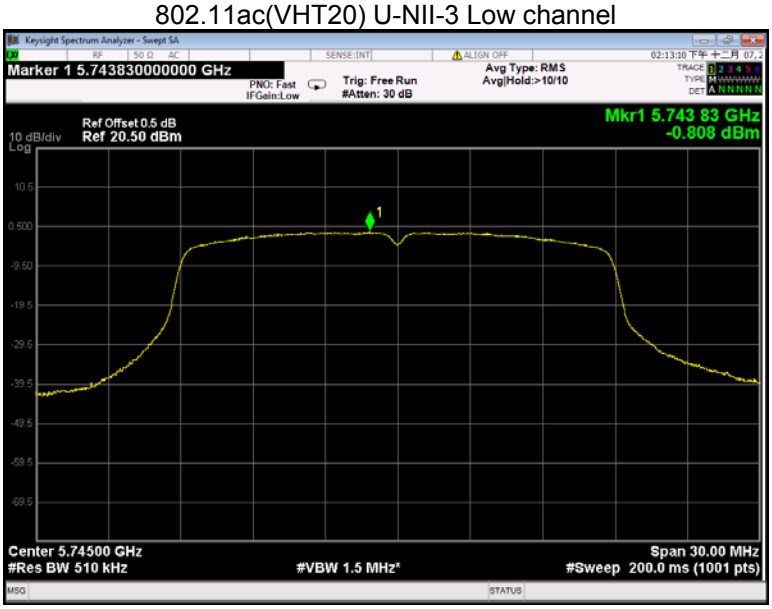
802.11n(HT40) U-NII-3 Low channel



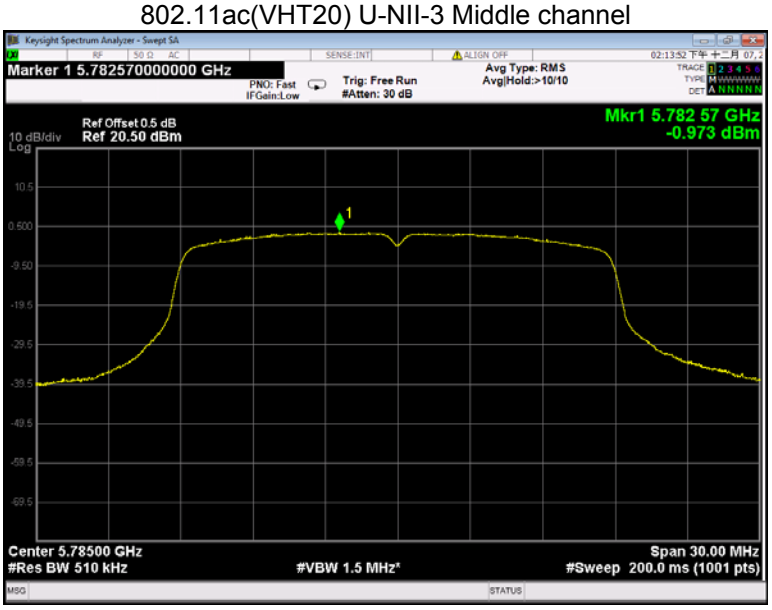
802.11n(HT40) U-NII-3 High channel



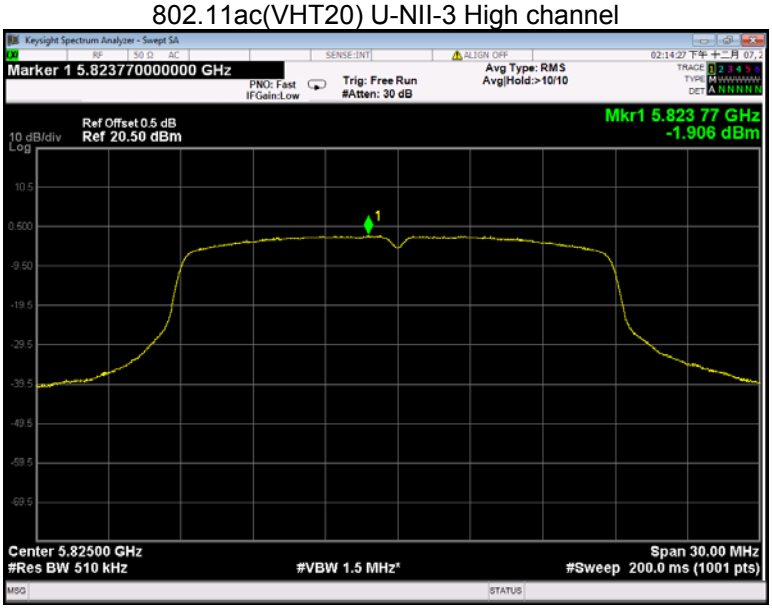
802.11ac(VHT20) U-NII-3 Low channel



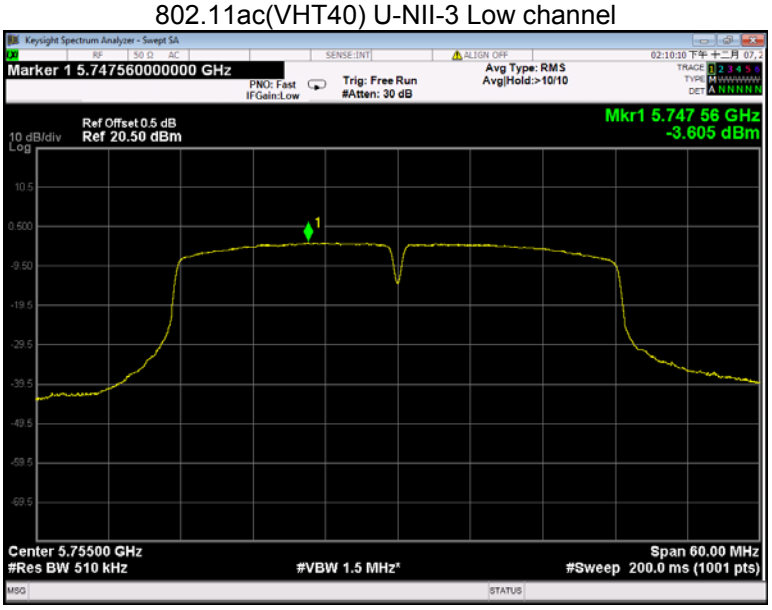
802.11ac(VHT20) U-NII-3 Middle channel



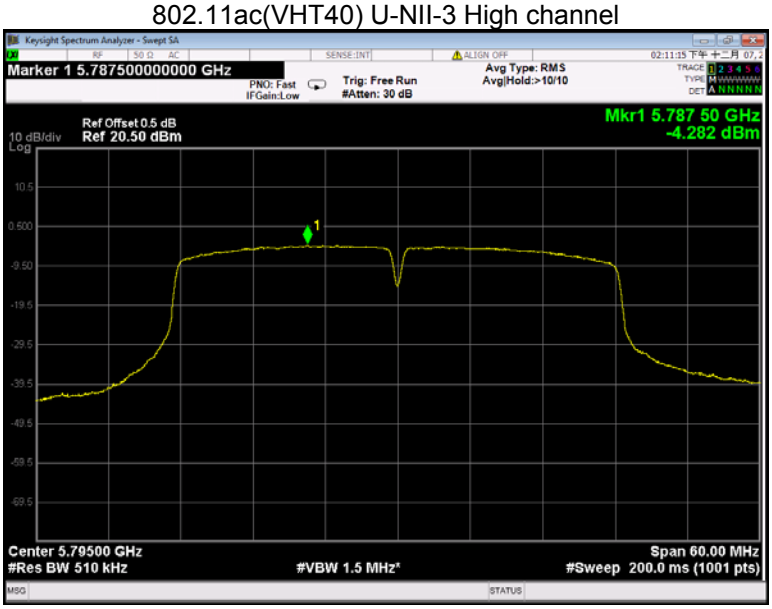
802.11ac(VHT20) U-NII-3 High channel



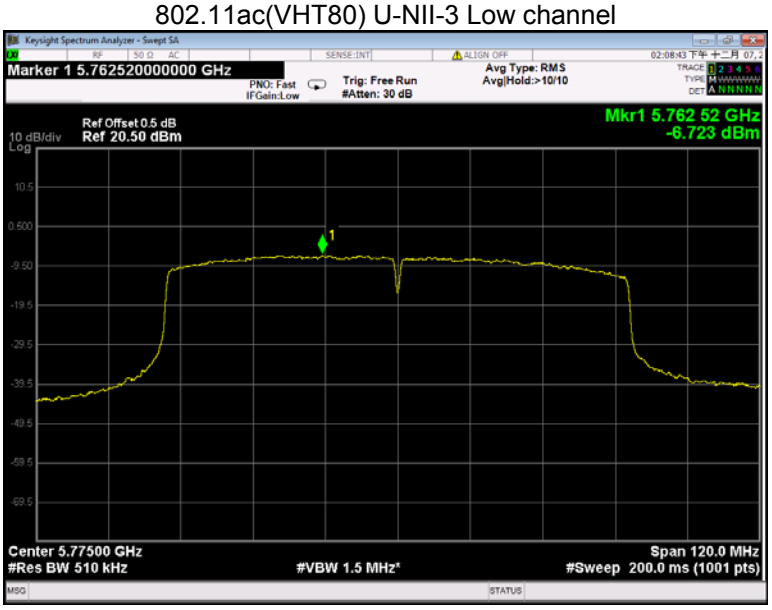
802.11ac(VHT40) U-NII-3 Low channel



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~ 45°C.

14.2 Test Result

U-NII-1 Test Frequency:5180MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (MHz)	Frequency Error (ppm)	Limit (ppm)
45	3.7	-0.0039	-6.40	20
40		-0.0028	-4.61	20
30		0.0009	1.48	20
20		0.0000	0.00	20
10		-0.0037	-6.06	20
0		-0.0008	-1.32	20
20	3.15	0.0025	4.13	20
20	4.26	0.0026	4.28	20

U-NII-2A Test Frequency:5180MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (MHz)	Frequency Error (ppm)	Limit (ppm)
45	3.7	0.0077	12.67	20
40		-0.0074	-12.14	20
30		-0.0012	-2.00	20
20		0.0000	0.00	20
10		0.0013	2.17	20
0		0.0006	1.00	20
20	3.15	0.0040	6.57	20
20	4.26	-0.0068	-11.20	20

U-NII-2C Test Frequency:5180MHz				
Temperature (℃)	**Power Supply (VDC)**	**Frequency Error (MHz)**	**Frequency Error (ppm)**	**Limit (ppm)**
45	3.7	0.0016	2.66	20
40		0.0056	9.24	20
30		-0.0053	-8.61	20
20		0.0000	0.00	20
10		-0.0088	-14.44	20
0		-0.0017	-2.81	20
20	3.15	-0.0026	-4.24	20
20	4.26	-0.0055	-9.02	20

U-NII-3 Test Frequency:5785MHz				
Temperature (℃)	**Power Supply (VDC)**	**Frequency Error (MHz)**	**Frequency Error (ppm)**	**Limit (ppm)**
45	3.7	-0.0008	-1.27	20
40		0.0008	1.34	20
30		-0.0006	-0.94	20
20		0.0000	0.00	20
10		0.0016	2.63	20
0		0.0089	14.53	20
20	3.15	-0.0019	-3.10	20
20	4.26	-0.0046	-7.54	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: WTD23X12261034W003.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-WT1-Photos.

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