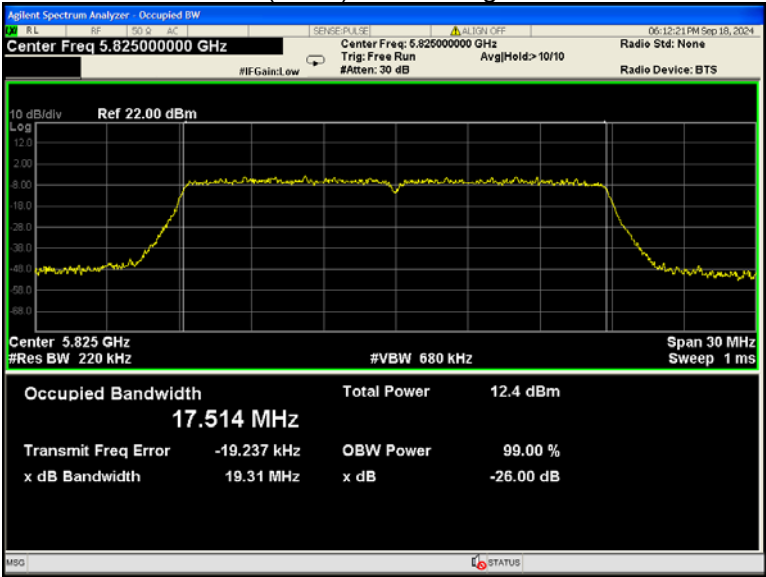
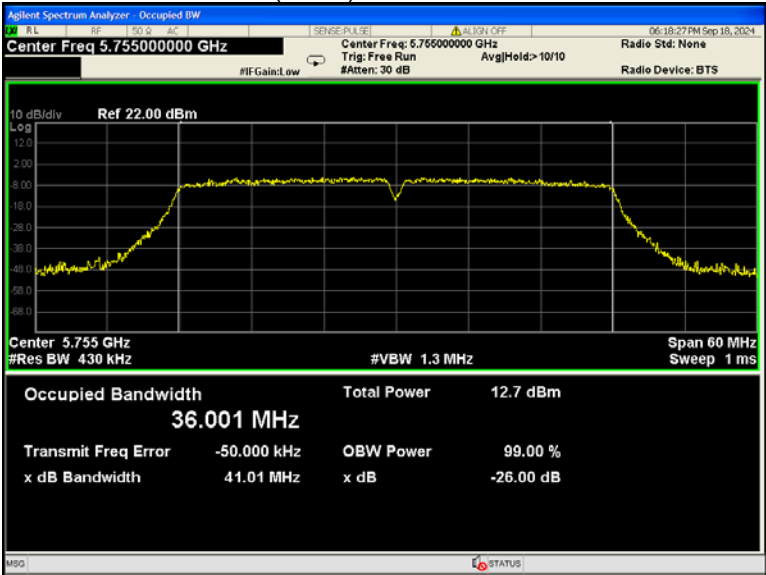


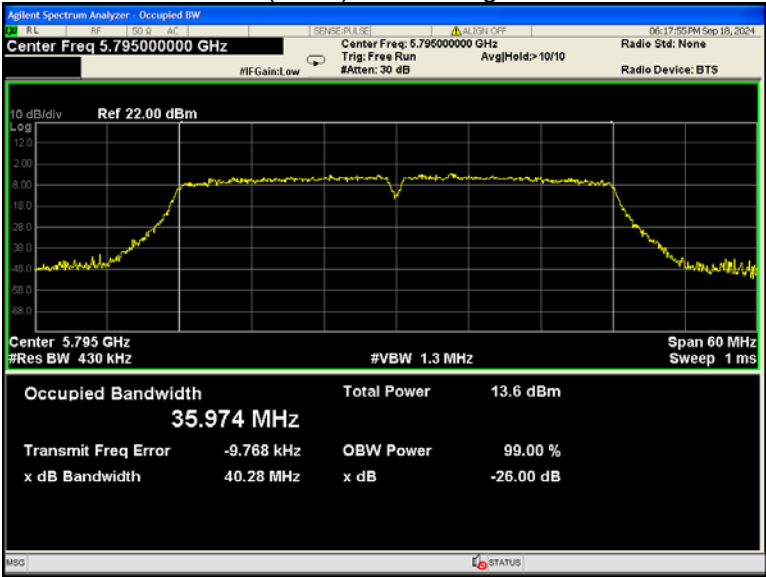
802.11ac(HT20) U-NII-3 High channel



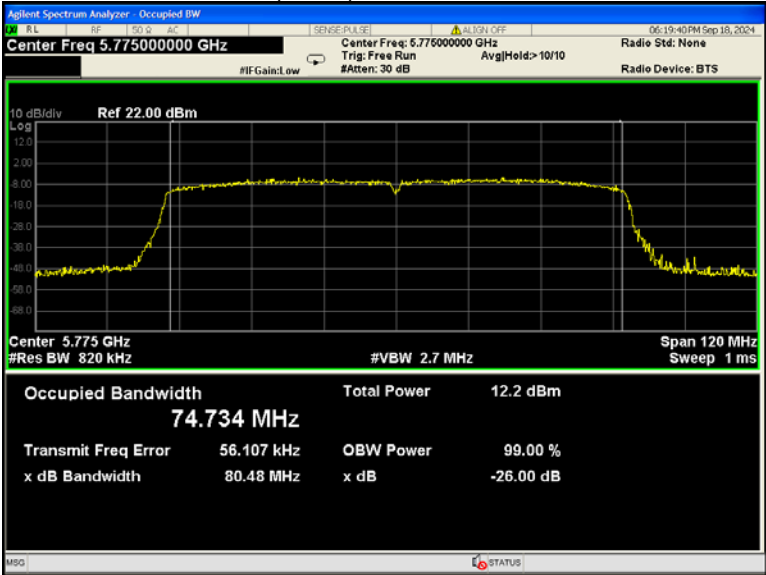
802.11ac(HT40) U-NII-3 Low channel



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



802.11ac(HT80) U-NII-3 Low channel



13 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

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: 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.

13.2 Test Result

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Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)
U-NII-1	802.11a	Low	12.08	0.46	12.54
		Middle	12.05		12.51
		High	13.17		13.63
	802.11n(HT20)	Low	12.12	0.42	12.54
		Middle	12.1		12.52
		High	12.51		12.93
	802.11n(HT40)	Low	11.55	0.74	12.29
		High	11.83		12.57
	802.11ac(HT20)	Low	12.31	0.45	12.76
		Middle	12.42		12.87
		High	12.73		13.18
	802.11ac(HT40)	Low	11.65	0.61	12.26
		High	11.99		12.6
	802.11ac(HT80)	Low	11.41	1.48	12.89

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)
U-NII-3	802.11a	Low	13.68	0.35	14.03
		Middle	13.23		13.58
		High	12.97		13.32
	802.11n(HT20)	Low	12.67	0.51	13.18
		Middle	12.37		12.88
		High	12.24		12.75
	802.11n(HT40)	Low	12.53	0.69	13.22
		High	12.8		13.49
	802.11ac(HT20)	Low	12.92	0.4	13.32
		Middle	12.68		13.08
		High	11.9		12.3
	802.11ac(HT40)	Low	12.02	0.87	12.89
		High	12.58		13.45
	802.11ac(HT80)	Low	12.28	1.72	14

ANT 1

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)
U-NII-1	802.11a	Low	11.24	0.46	11.7
		Middle	10.66		11.12
		High	11.19		11.65
	802.11n(HT20)	Low	10.92	0.42	11.34
		Middle	10.6		11.02
		High	11.45		11.87
	802.11n(HT40)	Low	10.81	0.74	11.55
		High	11.23		11.97
	802.11ac(HT20)	Low	11.05	0.45	11.5
		Middle	10.83		11.28
		High	11.77		12.22
	802.11ac(HT40)	Low	10.88	0.61	11.49
		High	11.53		12.14
	802.11ac(HT80)	Low	10.95	1.48	12.43

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)
U-NII-3	802.11a	Low	12.63	0.35	12.98
		Middle	12.32		12.67
		High	11.72		12.07
	802.11n(HT20)	Low	12.9	0.51	13.41
		Middle	13.26		13.77
		High	11.93		12.44
	802.11n(HT40)	Low	11.95	0.69	12.64
		High	12.22		12.91
	802.11ac(HT20)	Low	13.08	0.4	13.48
		Middle	12.54		12.94
		High	11.74		12.14
	802.11ac(HT40)	Low	12.24	0.87	13.11
		High	12.58		13.45
	802.11ac(HT80)	Low	13	1.72	14.72

Simultaneous Transmission

Band	Operation mode	Channel	Conducted Output Power (dBm)		
			Ant. 0	Ant. 1	SUM
U-NII-1	802.11a	Low	12.54	14.03	/
		Middle	12.51	13.58	/
		High	13.63	13.32	/
	802.11n(HT20)	Low	12.54	13.18	15.88
		Middle	12.52	12.88	15.71
		High	12.93	12.75	15.85
	802.11ac (HT20)	Low	12.76	13.32	16.06
		Middle	12.87	13.08	15.99
		High	13.18	12.30	15.77
	802.11n(HT40)	Low	12.29	13.22	15.79
		High	12.57	3.49	13.08
	802.11ac (HT40)	Low	12.26	12.89	15.60
		High	12.60	13.45	16.06
	802.11ac (HT80)	Middle	12.89	14.00	16.49

Band	Operation mode	Channel	Conducted Output Power (dBm)		
			Ant. 0	Ant. 1	SUM
U-NII-3	802.11a	Low	11.70	12.98	/
		Middle	11.12	12.67	/
		High	11.65	12.07	/
	802.11n(HT20)	Low	11.34	13.41	15.51
		Middle	11.02	13.77	15.62
		High	11.87	12.44	15.17
	802.11ac (HT20)	Low	11.50	13.48	15.61
		Middle	11.28	12.94	15.20
		High	12.22	12.14	15.19
	802.11n(HT40)	Low	11.55	12.64	15.14
		High	11.97	12.91	15.48
	802.11ac (HT40)	Low	11.49	13.11	15.39
		High	12.14	13.45	15.85
	802.11ac (HT80)	Middle	12.43	14.72	16.73

Note:

According to ANSI C63.10 clause 14.4.3.1,

U-NII-1: Directional gain=antenna gain + 10log(N)=3.51 + 10log2= 6.52dBi**U-NII-3: Directional gain=antenna gain + 10log(N)=2.16 + 10log2= 5.17dBi**

N is number of array elements or staves

According to ANSI C63.10 clause 11.7,

For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6dBi, the output power effective limit shall be calculated as follows in Equation:

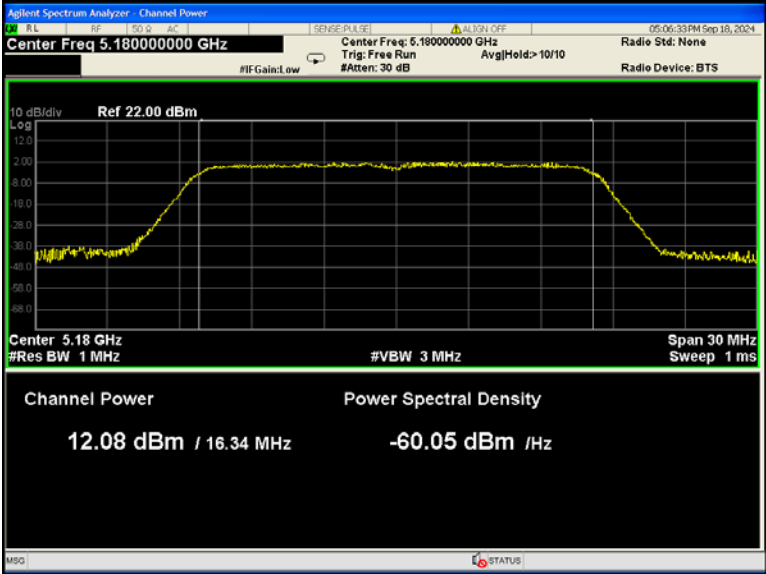
$$P_{\text{out}} = P_{\text{Limit}} - (G_{\text{TX}} - 6)$$

Then the limit of U-NII-1 should reduce 0.52dB, while U-NII-3 does not.

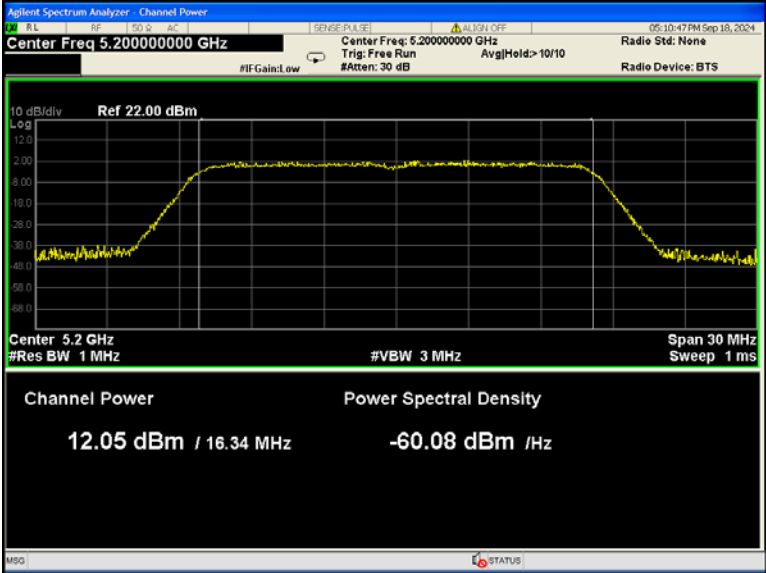
Test result plots shown as follows:

ANT 0

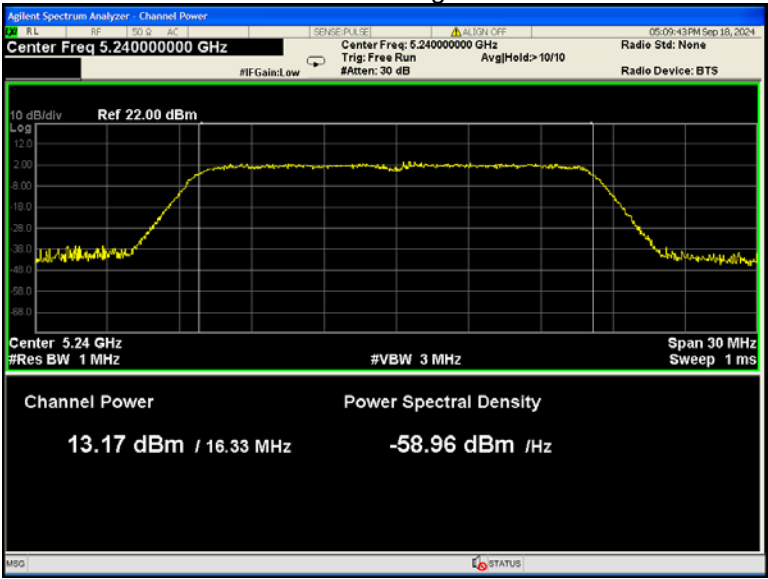
802.11a U-NII-1 Low channel



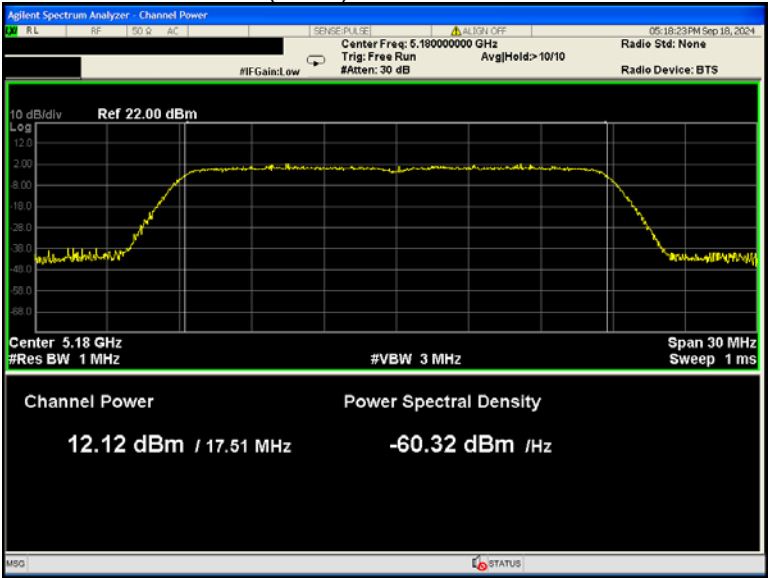
802.11a U-NII-1 Middle channel



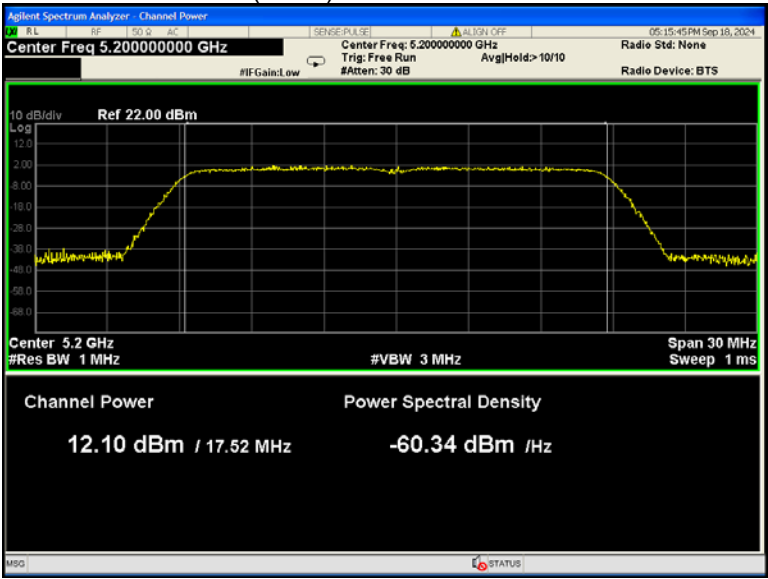
802.11a U-NII-1 High channel



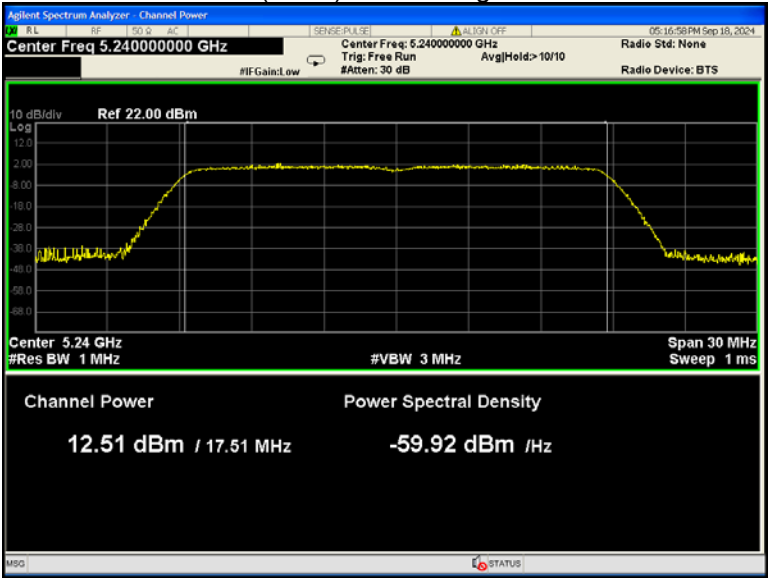
802.11n(HT20) U-NII-1 Low channel



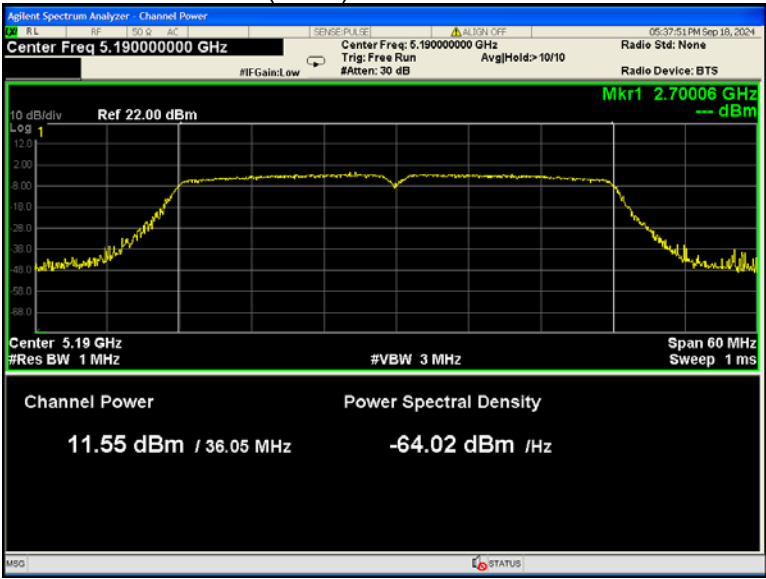
802.11n(HT20) U-NII-1 Middle channel



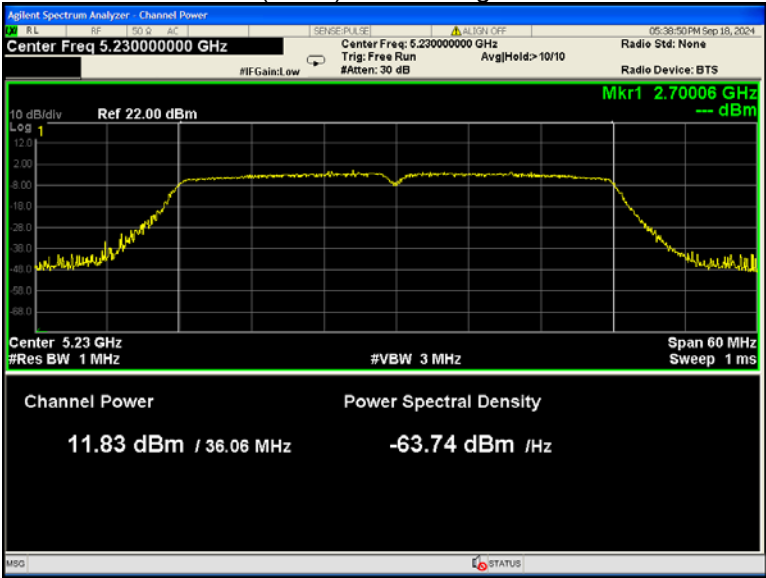
802.11n(HT20) U-NII-1 High channel



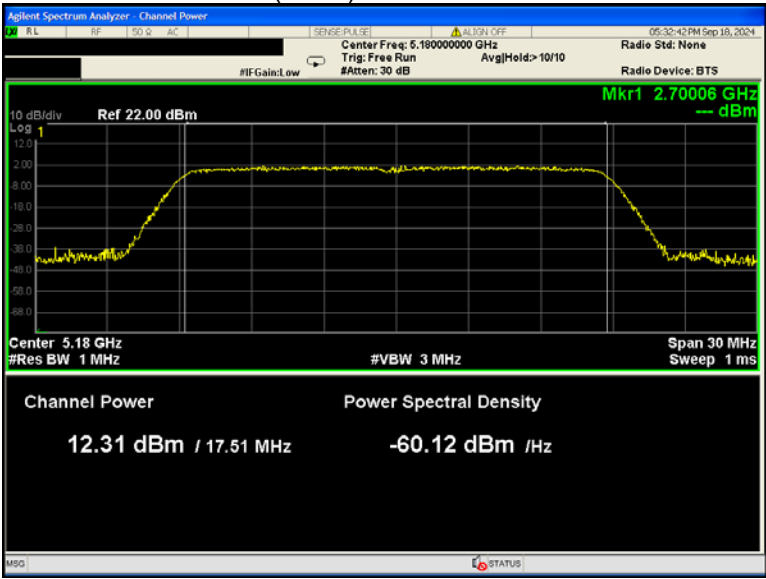
802.11n(HT40) U-NII-1 Low channel



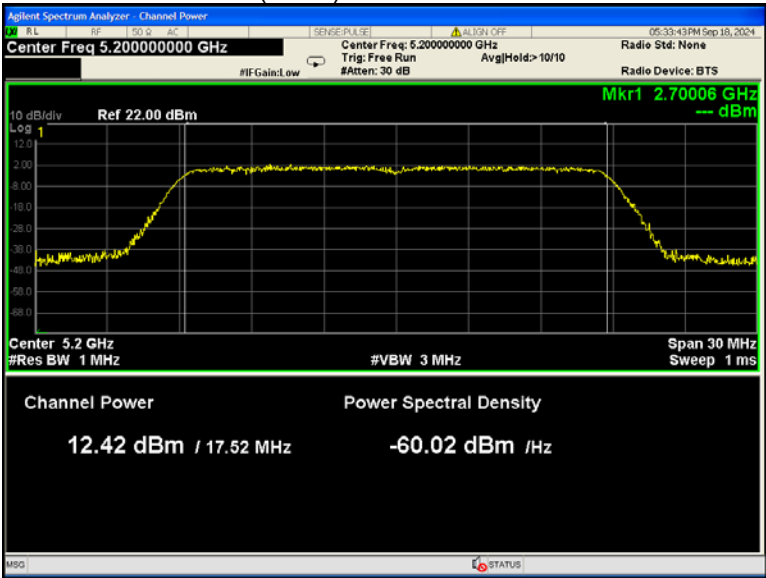
802.11n(HT40) U-NII-1 High channel



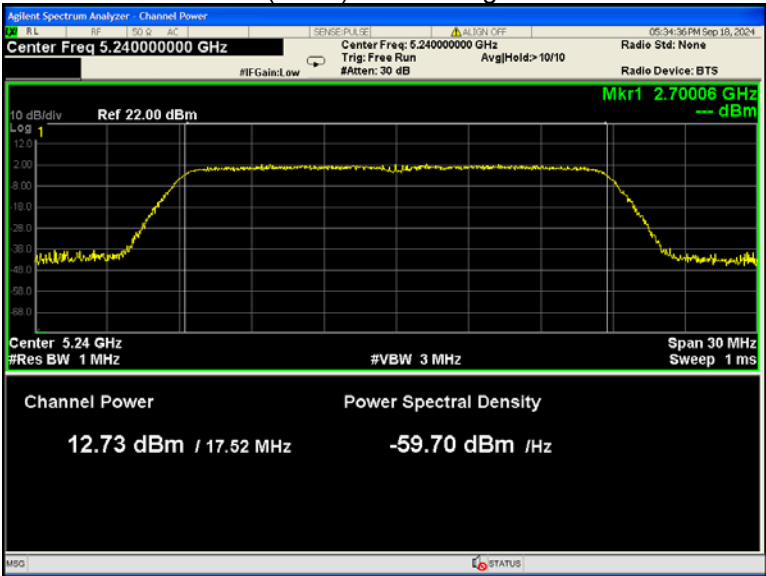
802.11ac(HT20) U-NII-1 Low channel



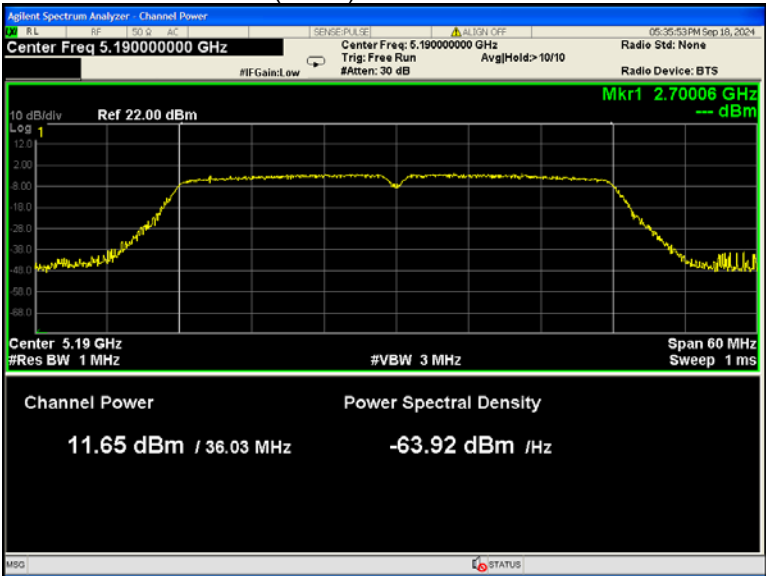
802.11ac(HT20) U-NII-1 Middle channel



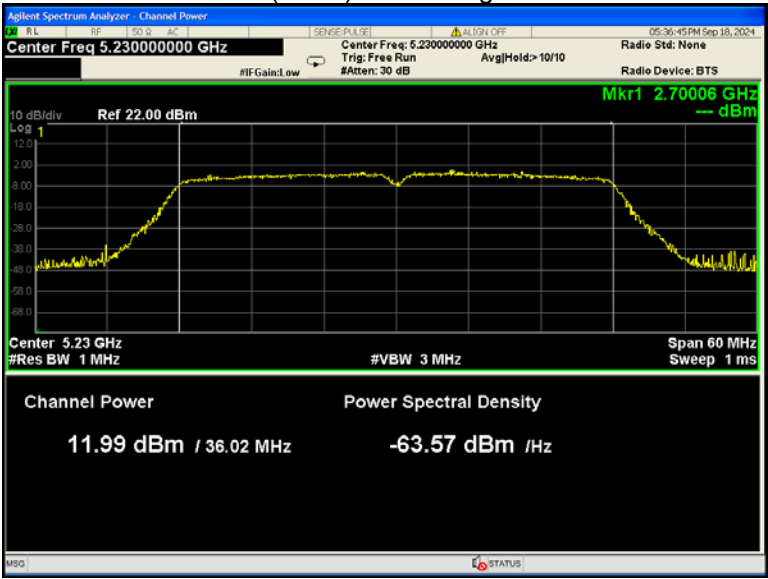
802.11ac(HT20) U-NII-1 High channel



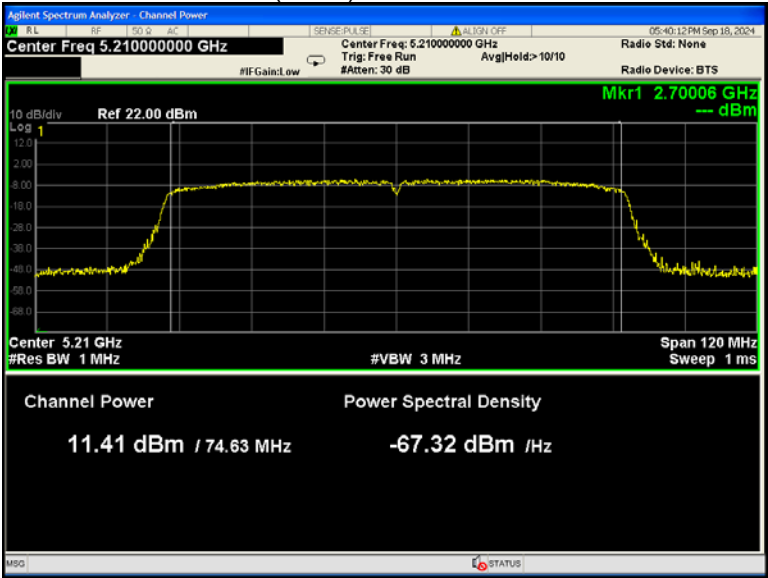
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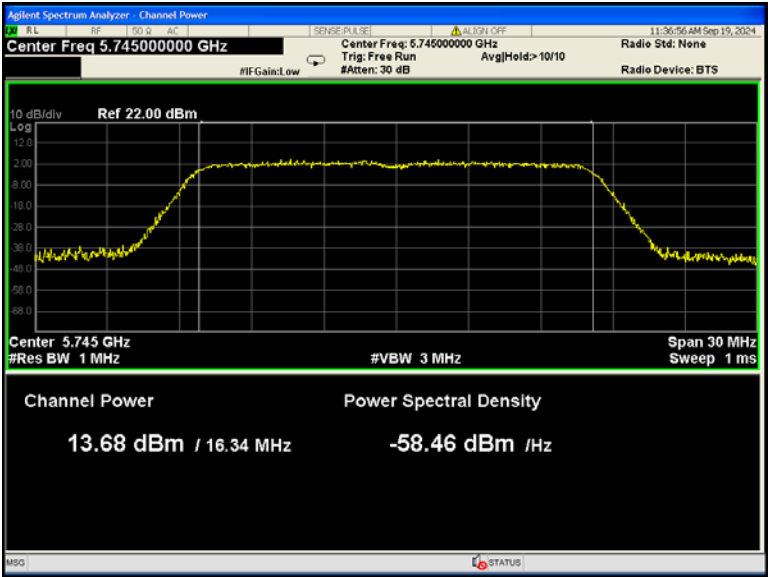
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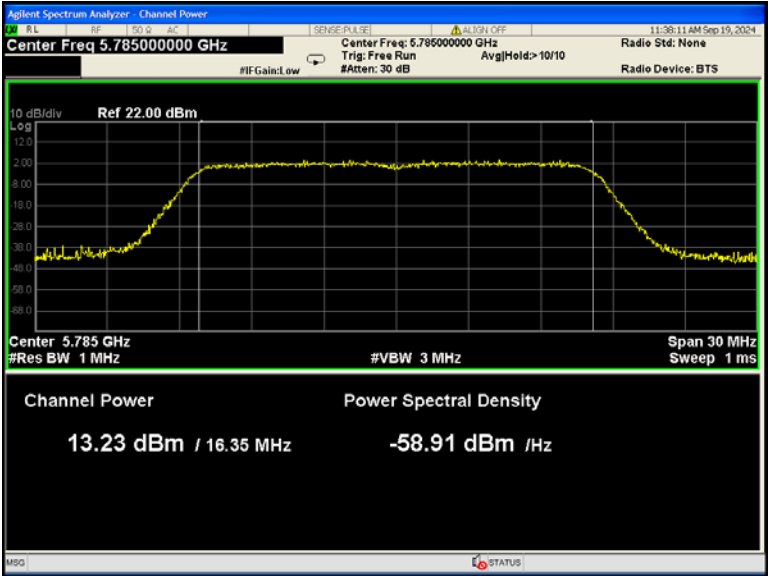
802.11ac(HT80) U-NII-1 Low channel



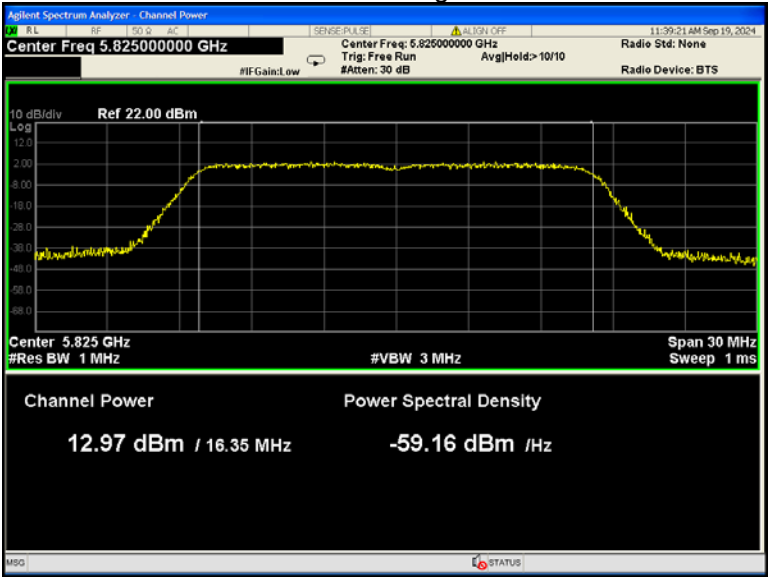
802.11a U-NII-3 Low channel



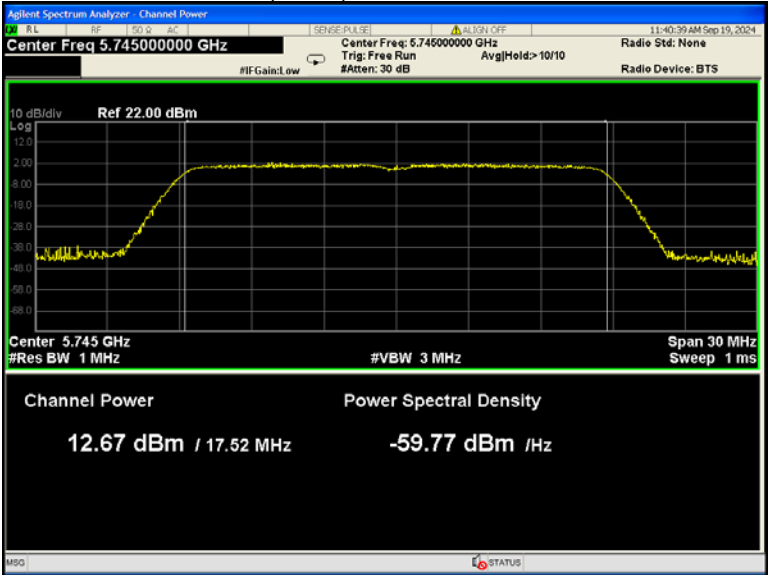
802.11a U-NII-3 Middle channel



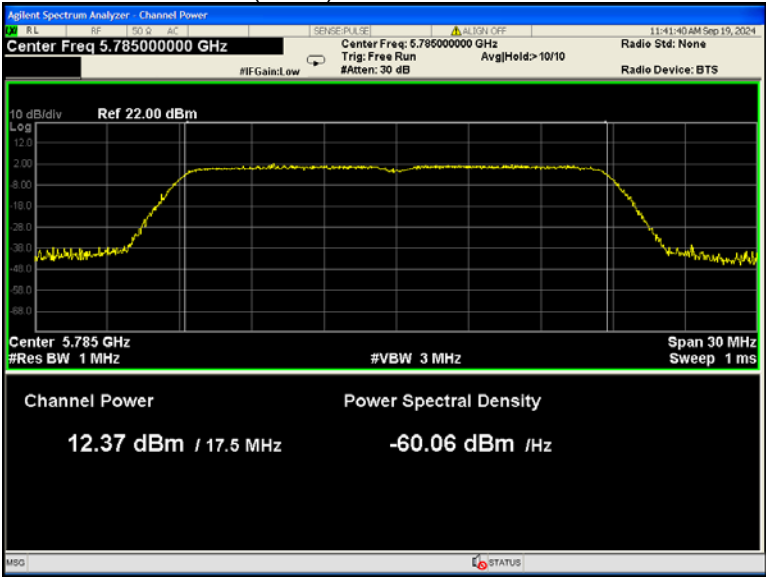
802.11a U-NII-3 High channel



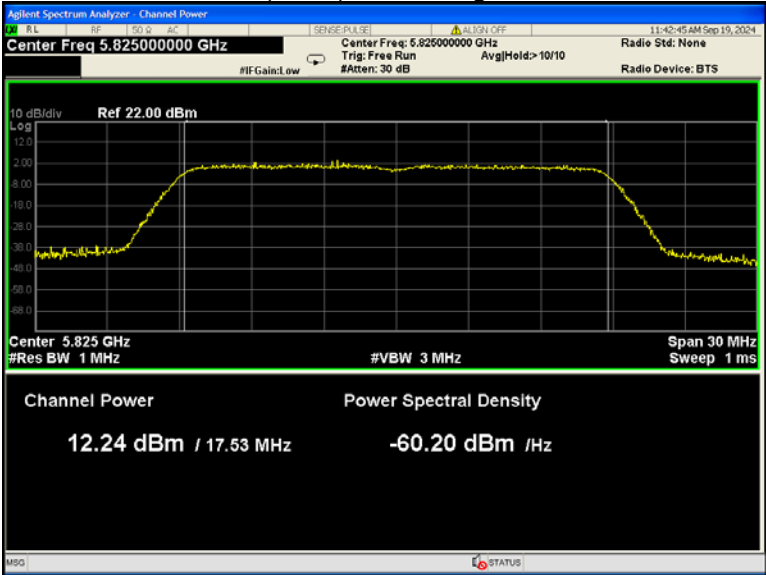
802.11n(HT20) U-NII-3 Low channel



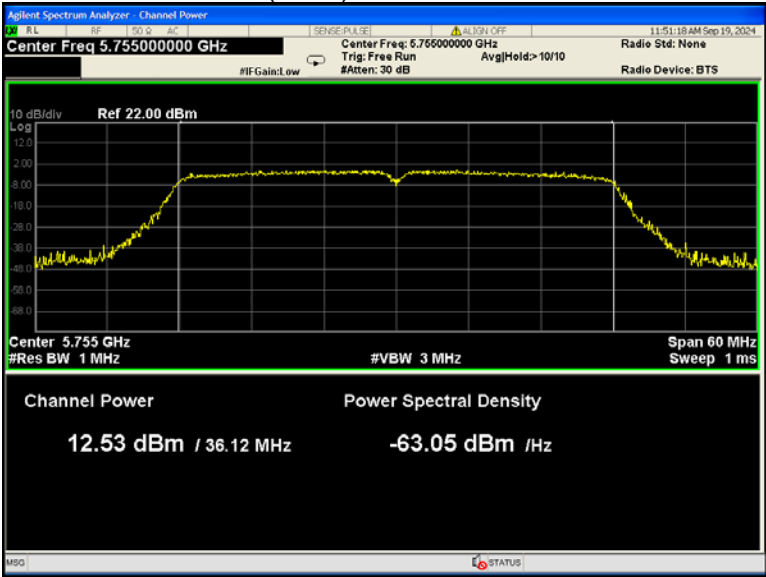
802.11n(HT20) U-NII-3 Middle channel



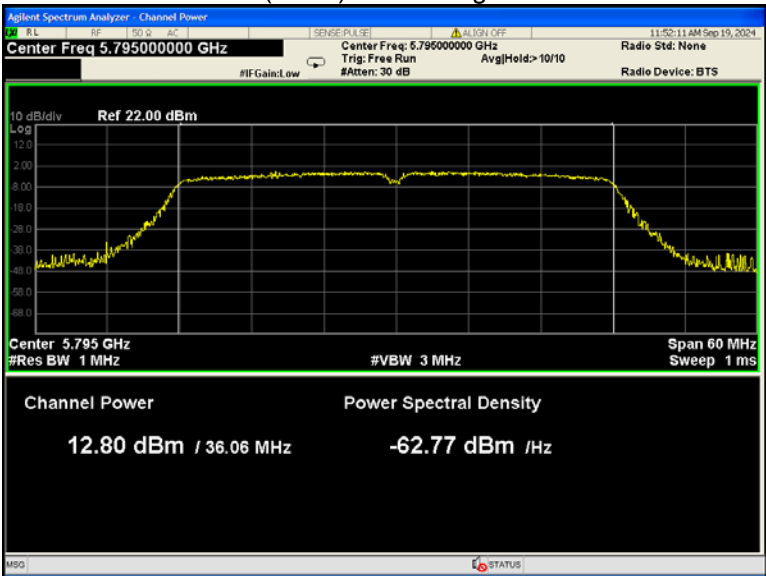
802.11n(HT20) U-NII-3 High channel



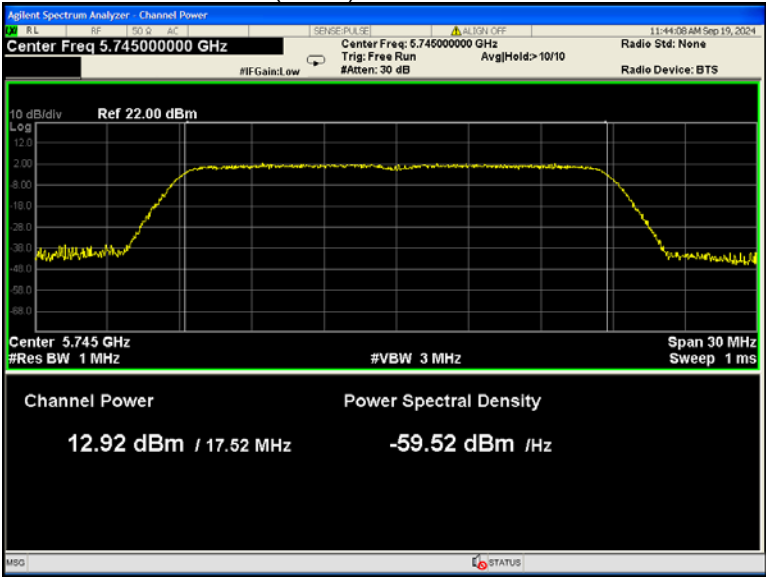
802.11n(HT40) U-NII-3 Low channel



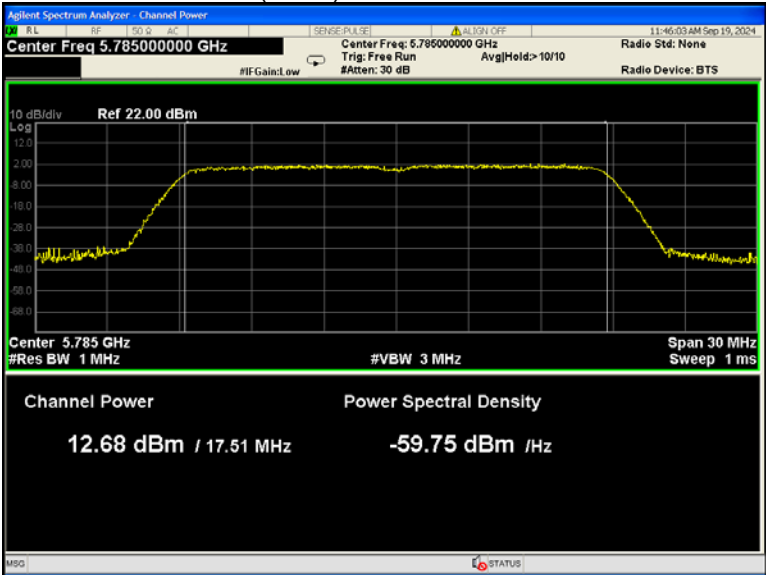
802.11n(HT40) U-NII-3 High channel



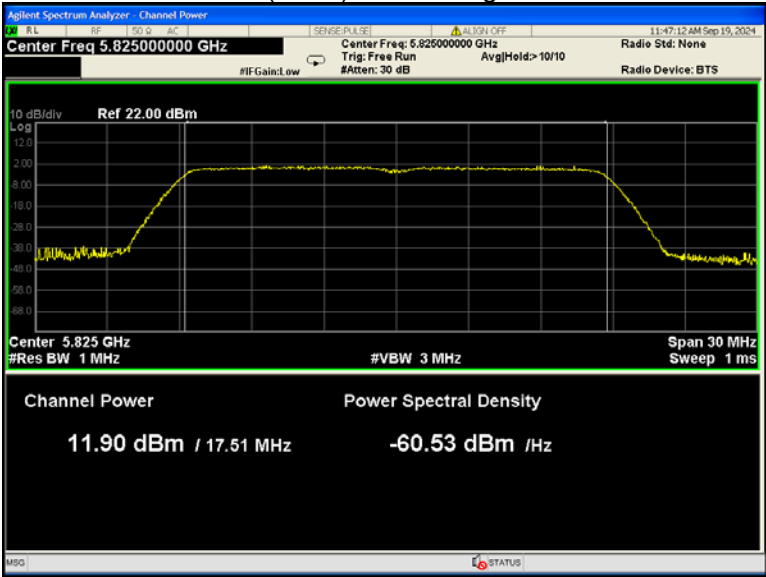
802.11ac(HT20) U-NII-3 Low channel



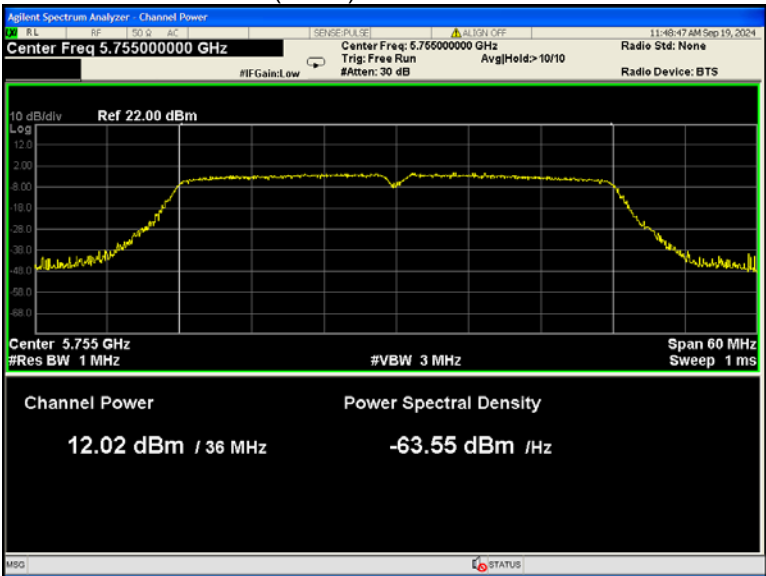
802.11ac(HT20) U-NII-3 Middle channel



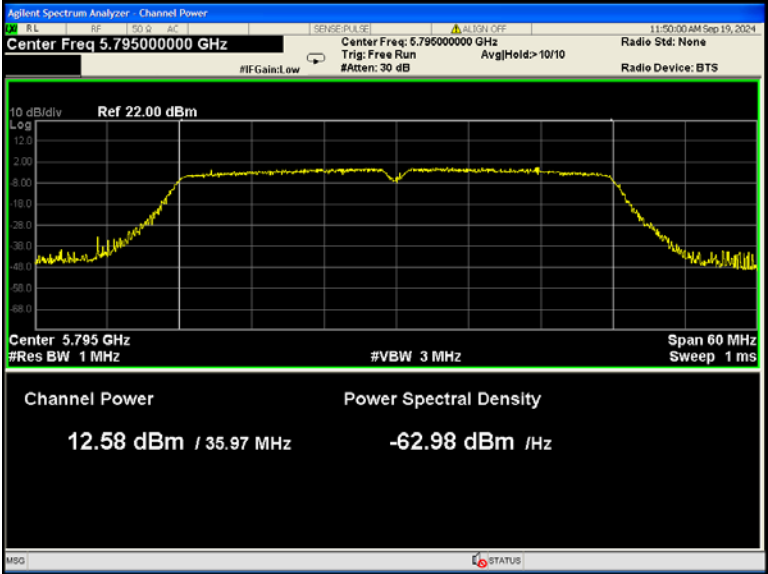
802.11ac(HT20) U-NII-3 High channel



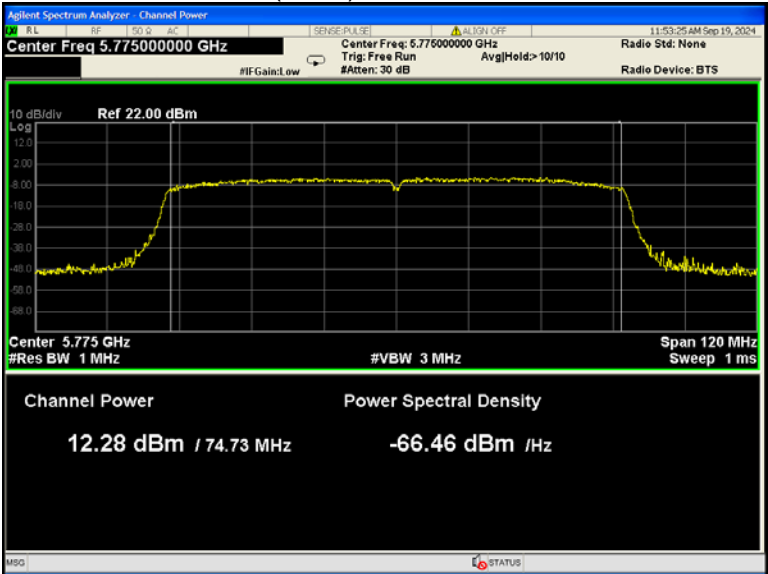
802.11ac(HT40) U-NII-3 Low channel



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

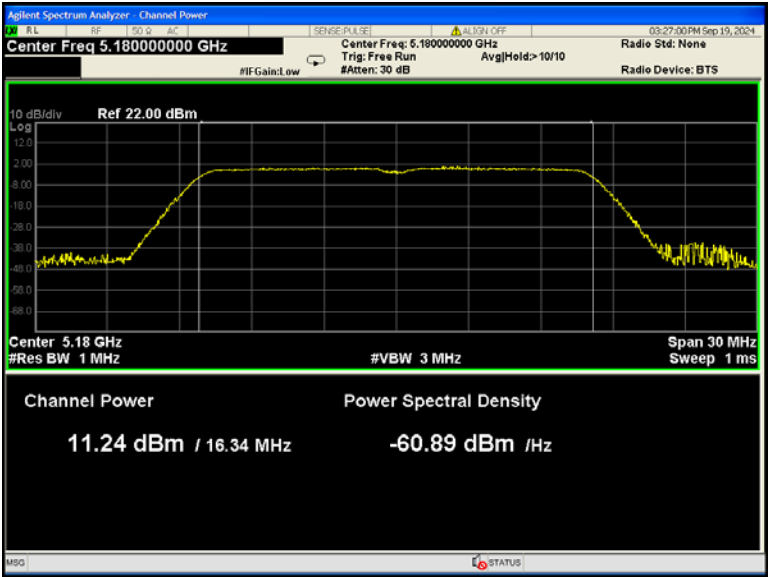


802.11ac(HT80) U-NII-3 Low channel

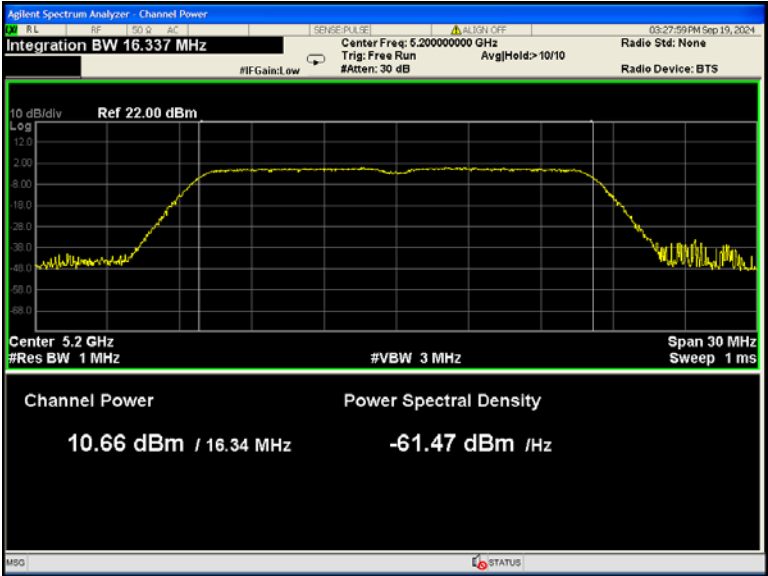


ANT 1

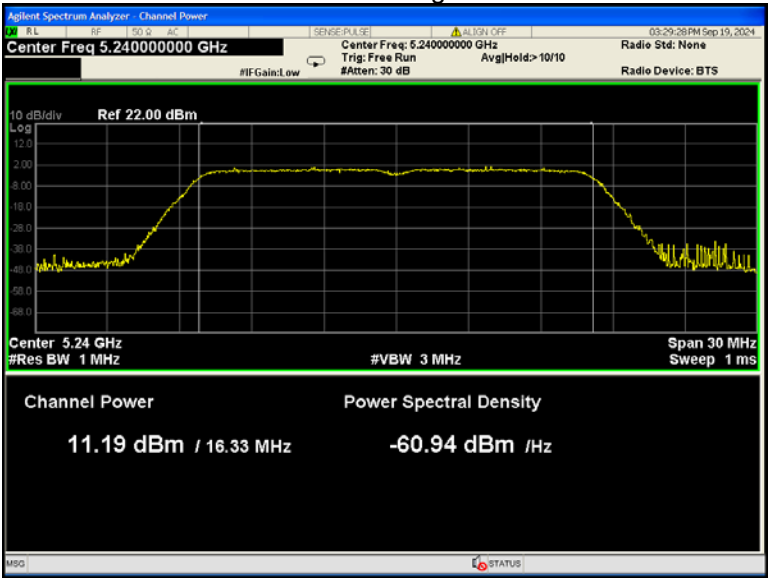
802.11a U-NII-1 Low channel



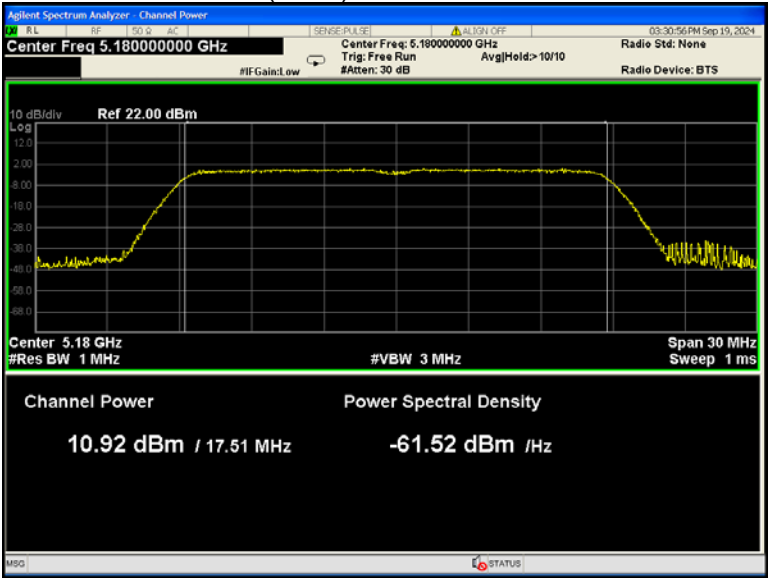
802.11a U-NII-1 Middle channel



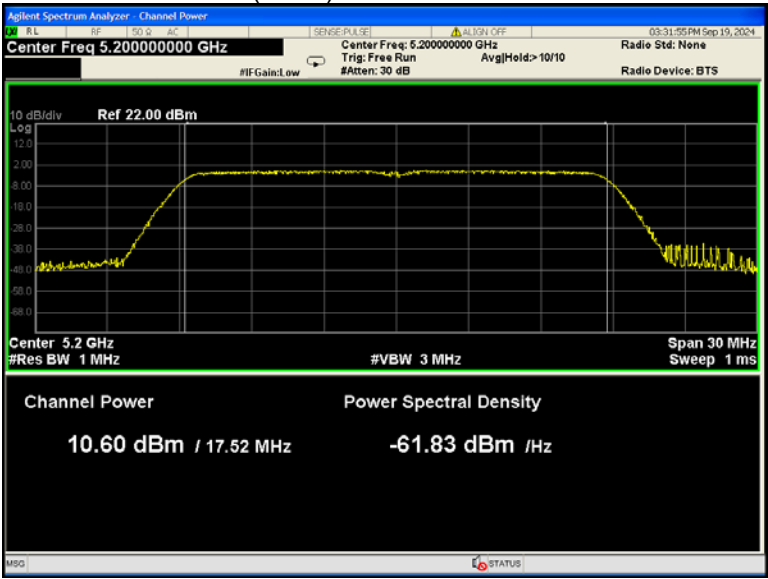
802.11a U-NII-1 High channel



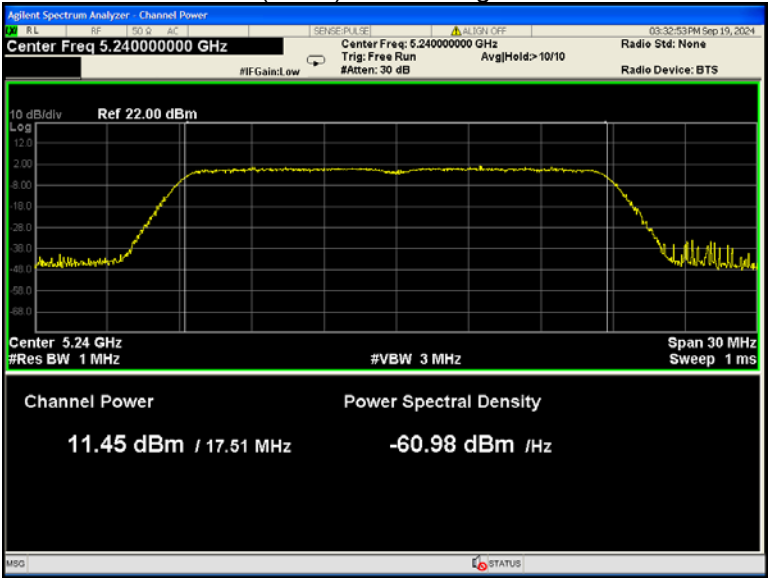
802.11n(HT20) U-NII-1 Low channel



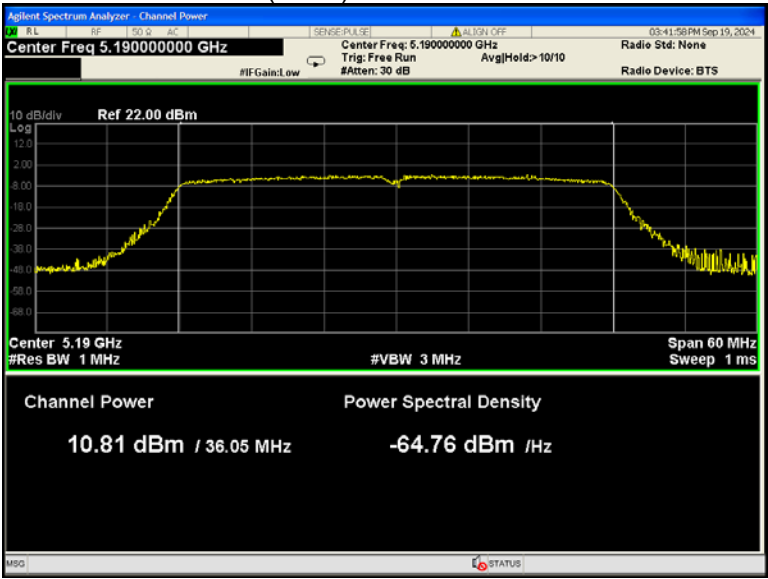
802.11n(HT20) U-NII-1 Middle channel



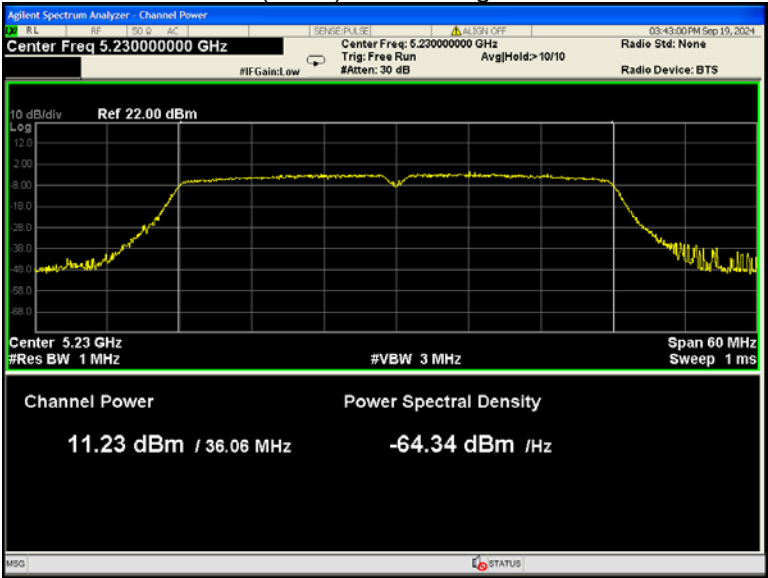
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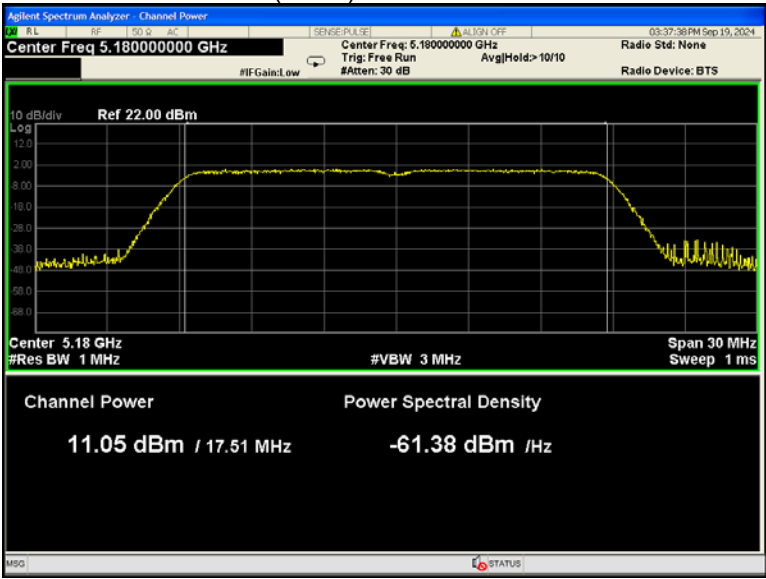
802.11n(HT40) U-NII-1 Low channel



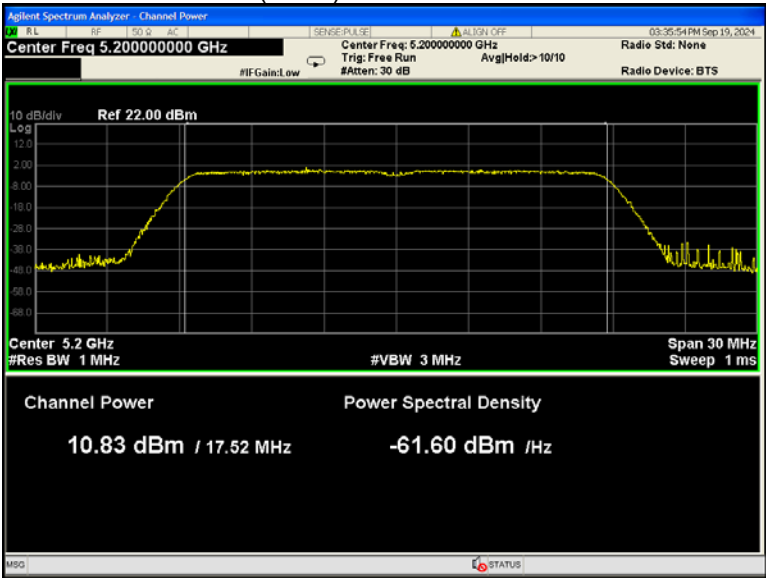
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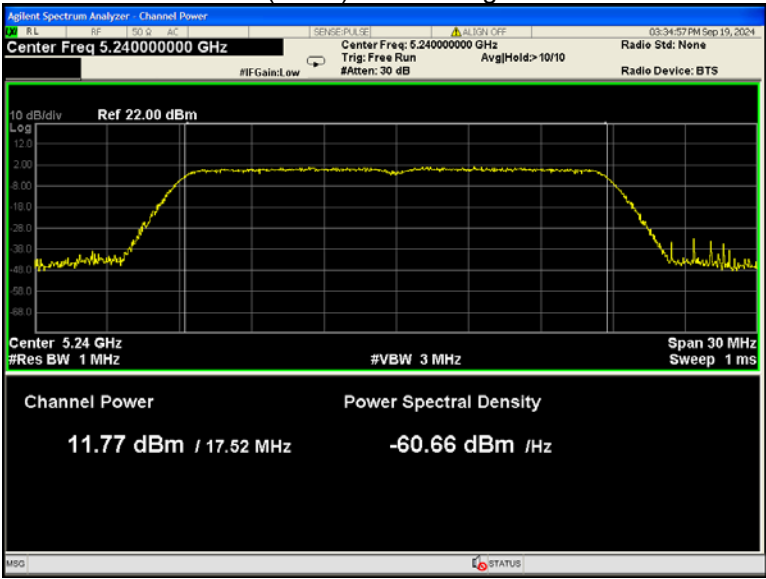
802.11ac(HT20) U-NII-1 Low channel



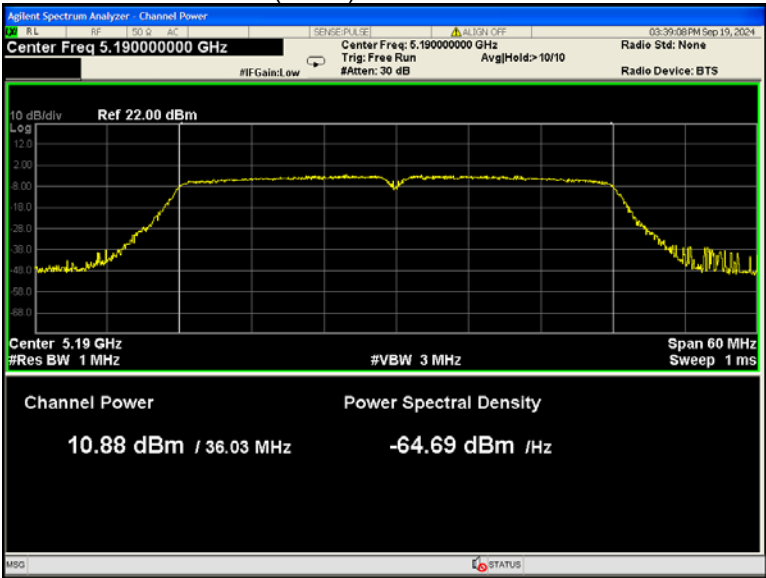
802.11ac(HT20) U-NII-1 Middle channel



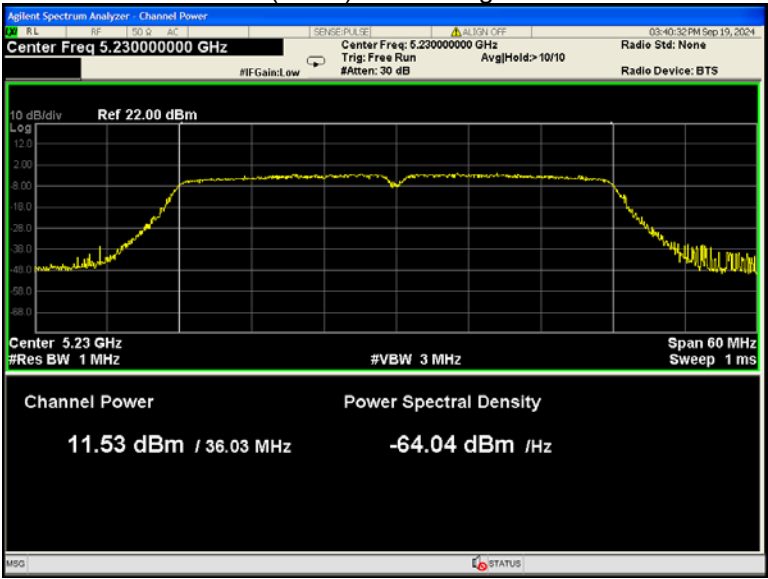
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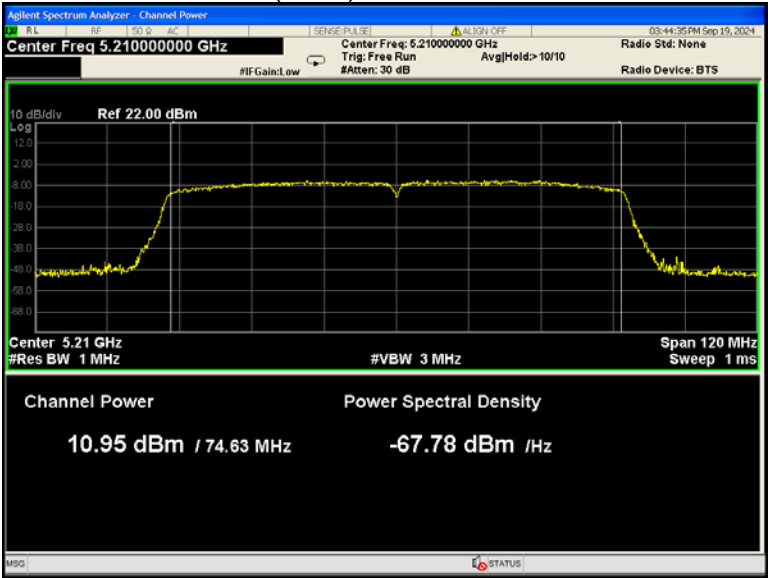
802.11ac(HT40) U-NII-1 Low channel



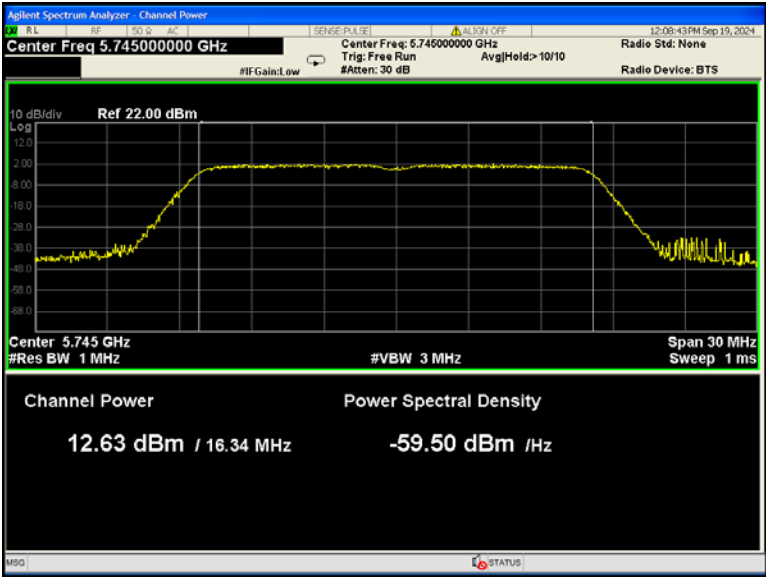
802.11ac(HT40) U-NII-1 High channel



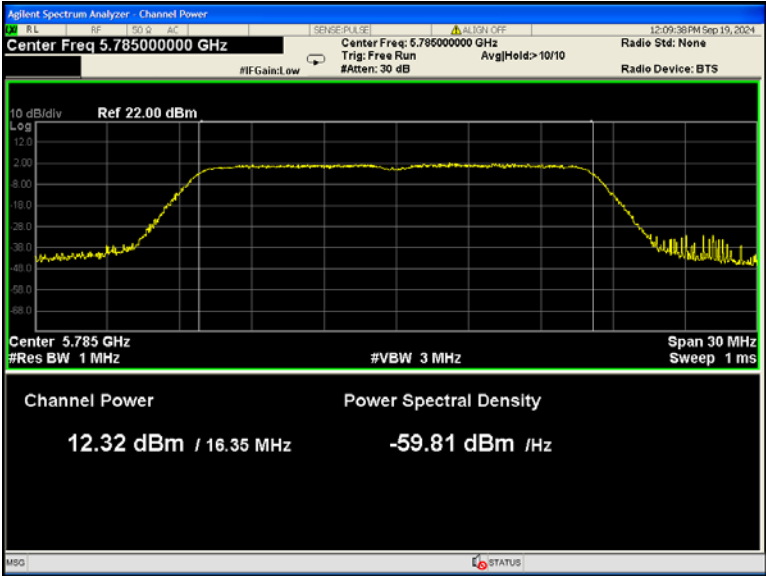
802.11ac(HT80) U-NII-1 Low channel



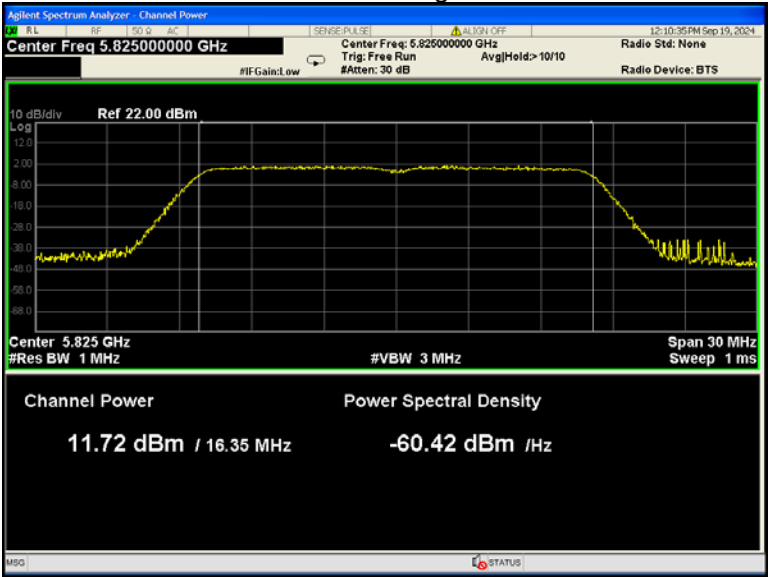
802.11a U-NII-3 Low channel



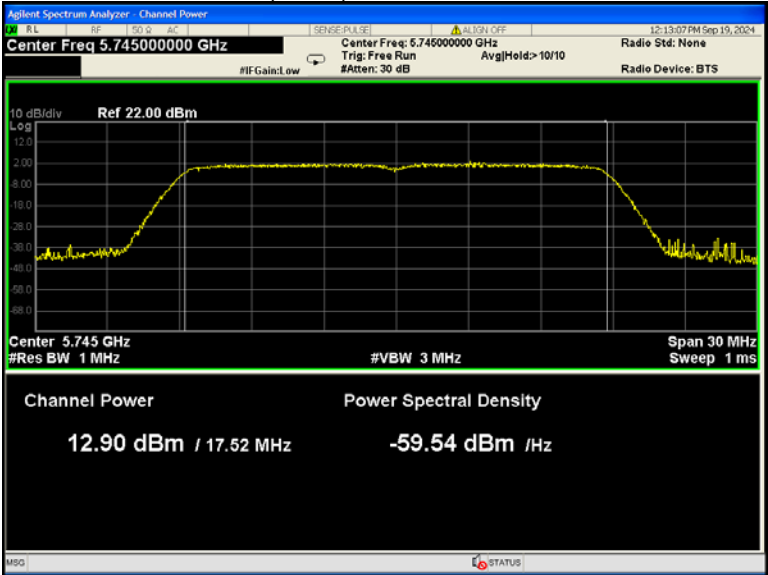
802.11a U-NII-3 Middle channel



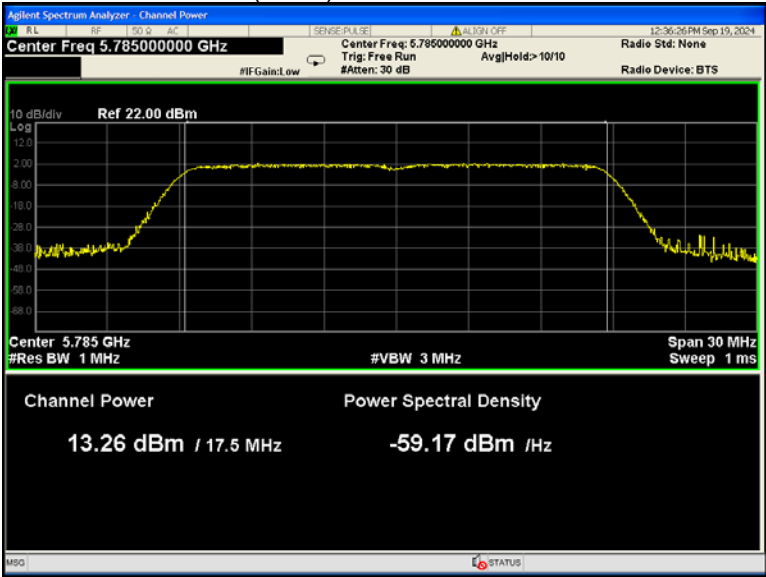
802.11a U-NII-3 High channel



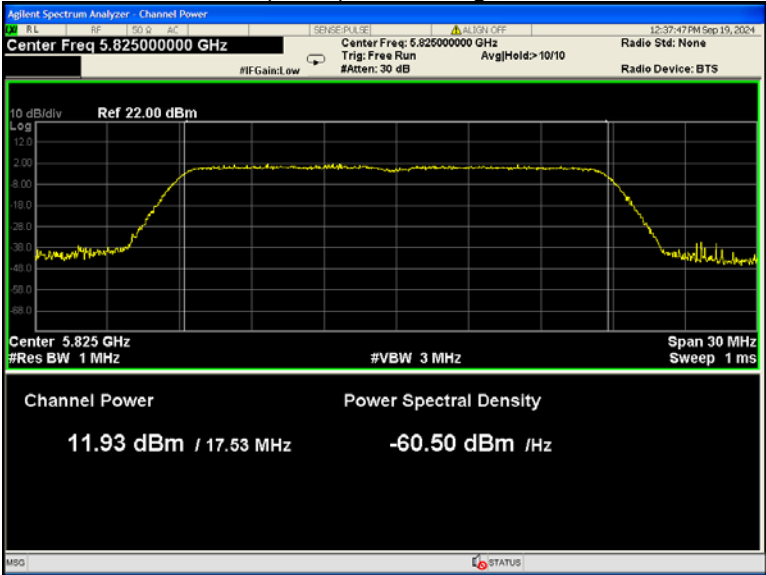
802.11n(HT20) U-NII-3 Low channel



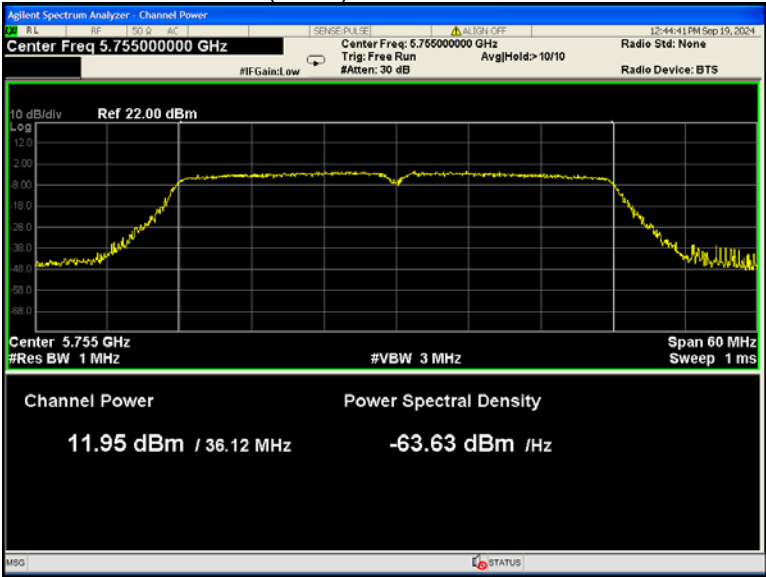
802.11n(HT20) U-NII-3 Middle channel



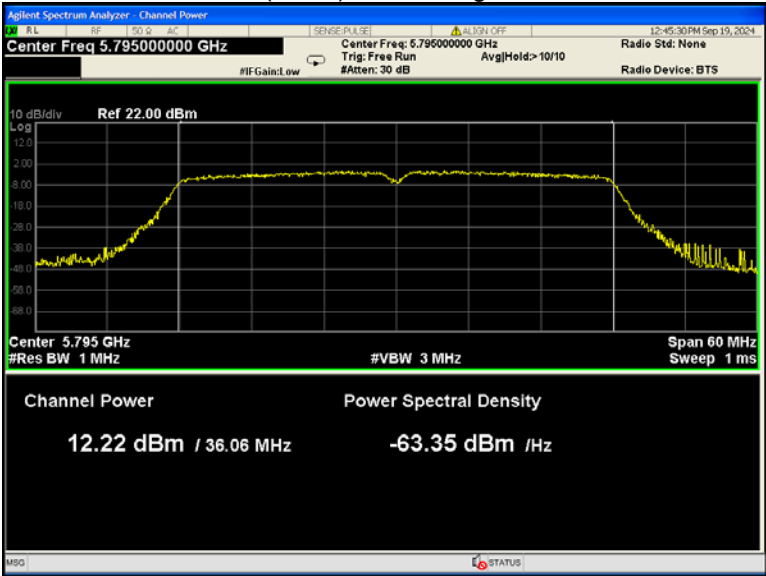
802.11n(HT20) U-NII-3 High channel



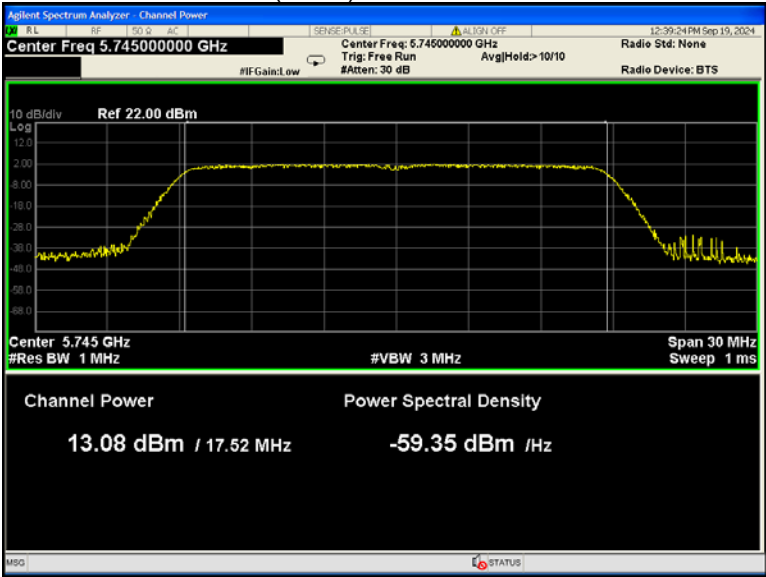
802.11n(HT40) U-NII-3 Low channel



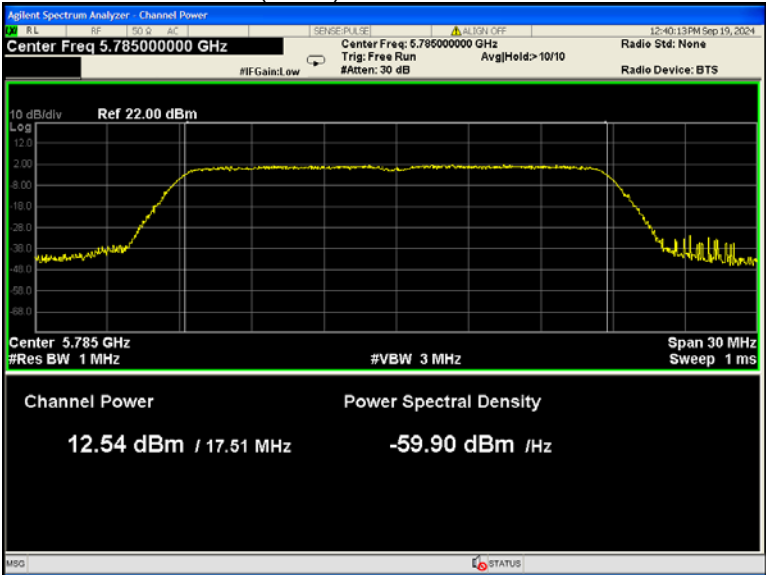
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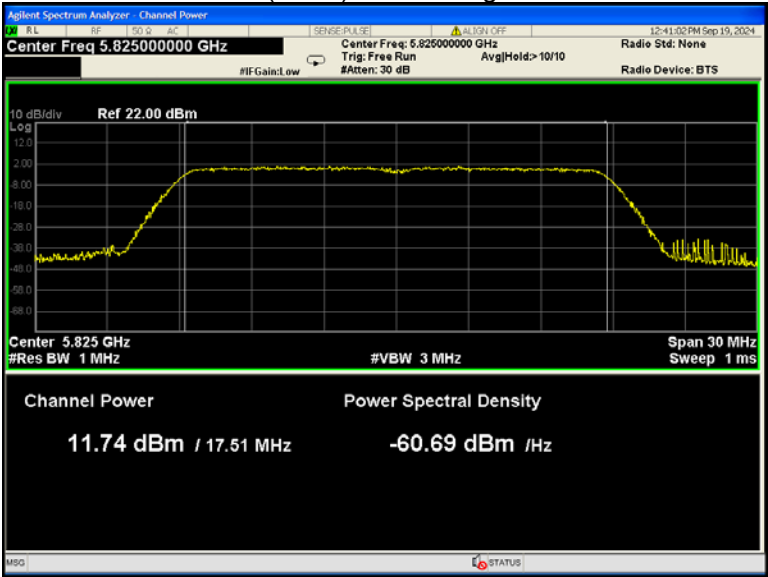
802.11ac(HT20) U-NII-3 Low channel



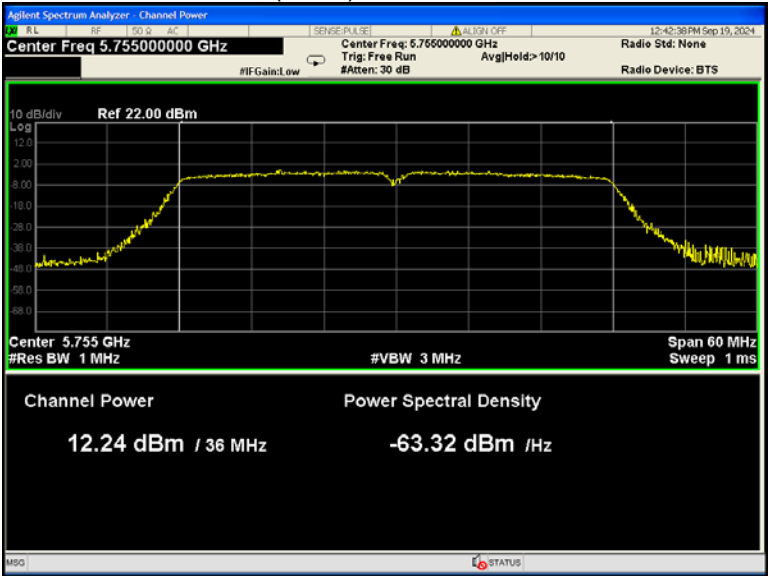
802.11ac(HT20) U-NII-3 Middle channel



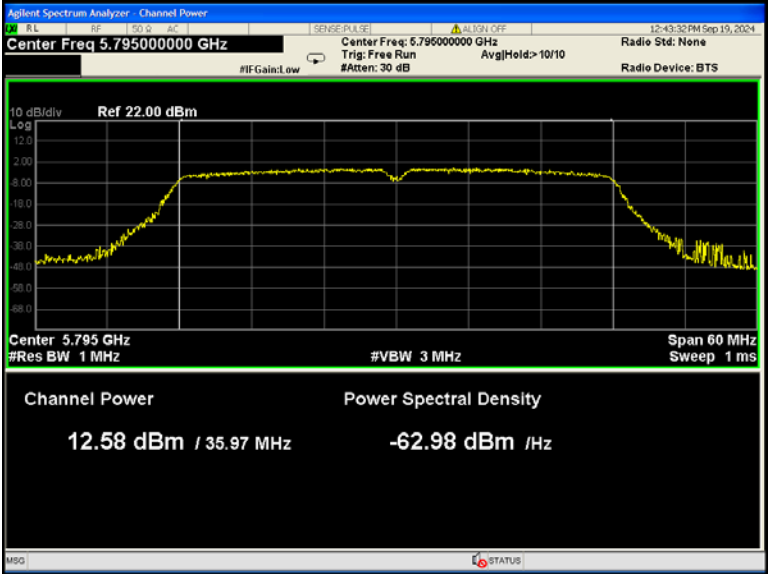
802.11ac(HT20) U-NII-3 High channel



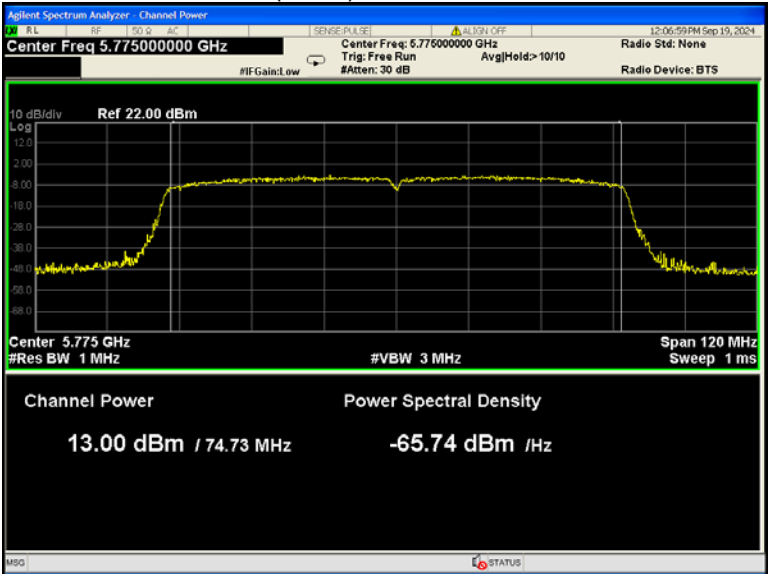
802.11ac(HT40) U-NII-3 Low channel



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



802.11ac(HT80) U-NII-3 Low channel



14 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:	$\leq 11\text{dBm/MHz}$ for Operation in the U-NII-1(5150MHz-5250MHz,5250-5350MHz and 5470-5725MHz)of device; $\leq 30\text{dBm/500kHz}$ for Operation in the U-NII-3(5725MHz-5850MHz)of device
Test Result:	PASS

14.1 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 $\geq 3 \times$ RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.
U-NII-3
RBW = 510KHz, VBW $\geq 3 \times$ 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.

14.2 Test Result

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Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Power Spectral density (dBm)
U-NII-1	802.11a	Low	2.896	0.46	3.356
		Middle	2.079		2.539
		High	3.605		4.065
	802.11n(HT20)	Low	2.057	0.42	2.477
		Middle	2.900		3.32
		High	2.817		3.237
	802.11n(HT40)	Low	-1.778	0.74	-1.038
		High	-1.592		-0.852
	802.11ac(HT20)	Low	2.685	0.45	3.135
		Middle	2.054		2.504
		High	2.045		2.495
	802.11ac(HT40)	Low	-1.376	0.61	-0.766
		High	-1.635		-1.025
	802.11ac(HT80)	Middle	-3.876	1.48	-2.396

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Power Spectral density (dBm)
U-NII-3	802.11a	Low	2.675	0.35	3.025
		Middle	2.044		2.394
		High	0.761		1.111
	802.11n(HT20)	Low	-0.088	0.51	0.422
		Middle	-0.044		0.466
		High	-0.342		0.168
	802.11n(HT40)	Low	-1.844	0.69	-1.154
		High	-1.39		-0.7
	802.11ac(HT20)	Low	0.298	0.4	0.698
		Middle	-0.407		-0.007
		High	-0.559		-0.159
	802.11ac(HT40)	Low	-2.157	0.87	-1.287
		High	-2.237		-1.367
	802.11ac(HT80)	Middle	-6.114	1.72	-4.394

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Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Power Spectral density (dBm)
U-NII-1	802.11a	Low	3.158	0.46	3.618
		Middle	2.962		3.422
		High	2.841		3.301
	802.11n(HT20)	Low	0.498	0.42	0.918
		Middle	0.887		1.307
		High	1.134		1.554
	802.11n(HT40)	Low	-2.155	0.74	-1.415
		High	-2.243		-1.503
	802.11ac(HT20)	Low	0.267	0.45	0.717
		Middle	6.7		7.15
		High	1.031		1.481
	802.11ac(HT40)	Low	-2.841	0.61	-2.231
		High	-2.391		-1.781
	802.11ac(HT80)	Middle	-6.145	1.48	-4.665

Band	Operation mode	Channel	Measurements (dBm)	Duty Cycle Factor (dB)	Power Spectral density (dBm)
U-NII-3	802.11a	Low	-0.366	0.35	-0.016
		Middle	-0.614		-0.264
		High	-1.316		-0.966
	802.11n(HT20)	Low	-0.258	0.51	0.252
		Middle	-0.713		-0.203
		High	-1.499		-0.989
	802.11n(HT40)	Low	-2.507	0.69	-1.817
		High	-2.966		-2.276
	802.11ac(HT20)	Low	-0.862	0.4	-0.462
		Middle	-0.405		-0.005
		High	-1.314		-0.914
	802.11ac(HT40)	Low	-2.939	0.87	-2.069
		High	-2.192		-1.322
	802.11ac(HT80)	Middle	-6.481	1.72	-4.761

Simultaneous Transmission

	Operation mode	Channel	Power Spectral density (dBm)		
			Ant. 0	Ant. 1	SUM
U-NII-1	802.11n(HT20)	Low	2.477	3.618	6.095
		Middle	3.32	3.422	6.382
		High	3.237	3.301	6.279
	802.11n(HT40)	Low	-1.038	0.918	3.060
		High	-0.852	1.307	3.371
	802.11ac(HT20)	Low	3.135	1.554	5.426
		Middle	2.504	-1.415	3.983
		High	2.495	-1.503	3.951
	802.11ac(HT40)	Low	-0.766	0.717	3.049
		High	-1.025	7.15	7.765
	802.11ac(HT80)	Middle	-2.396	1.481	2.972

	Operation mode	Channel	Power Spectral density (dBm)		
			Ant. 0	Ant. 1	SUM
U-NII-3	802.11n(HT20)	Low	0.422	0.252	3.348
		Middle	0.466	-0.203	3.155
		High	0.168	-0.989	2.638
	802.11n(HT40)	Low	-1.154	-1.817	1.537
		High	-0.7	-2.276	1.593
	802.11ac (HT20)	Low	0.698	-0.462	3.167
		Middle	-0.007	-0.005	3.004
		High	-0.159	-0.914	2.490
	802.11ac (HT40)	Low	-1.287	-2.069	1.350
		High	-1.367	-1.322	1.666
	802.11ac (HT80)	Middle	-4.394	-4.761	-1.563

Note:

According to ANSI C63.10 clause 14.4.3.1,

U-NII-1: Directional gain=antenna gain + 10log(N)=3.51 + 10log2= 6.52dBi

U-NII-3: Directional gain=antenna gain + 10log(N)=2.16 + 10log2= 5.17dBi

N is number of array elements or staves

According to ANSI C63.10 clause 11.7,

For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6dBi, the output power effective limit shall be calculated as follows in Equation:

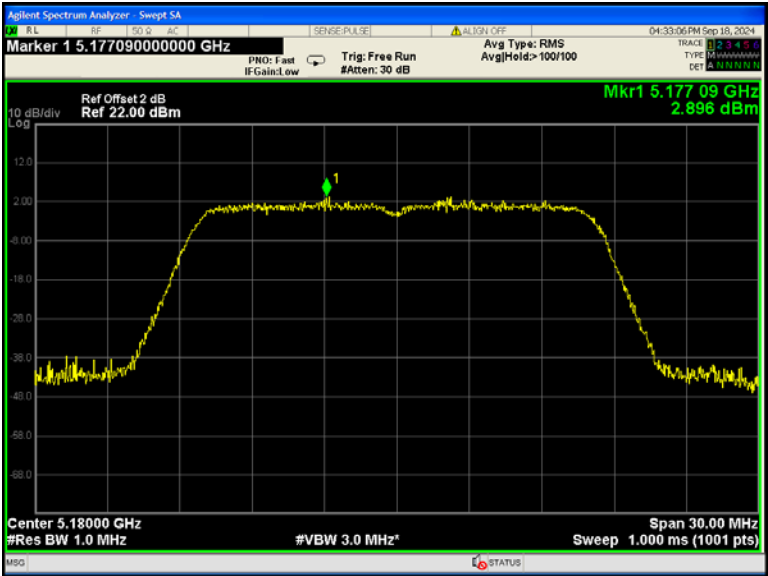
$$P_{out} = P_{Limit} - (G_{TX} - 6)$$

Then the limit of U-NII-1 should reduce 0.52dB, while U-NII-3 does not.

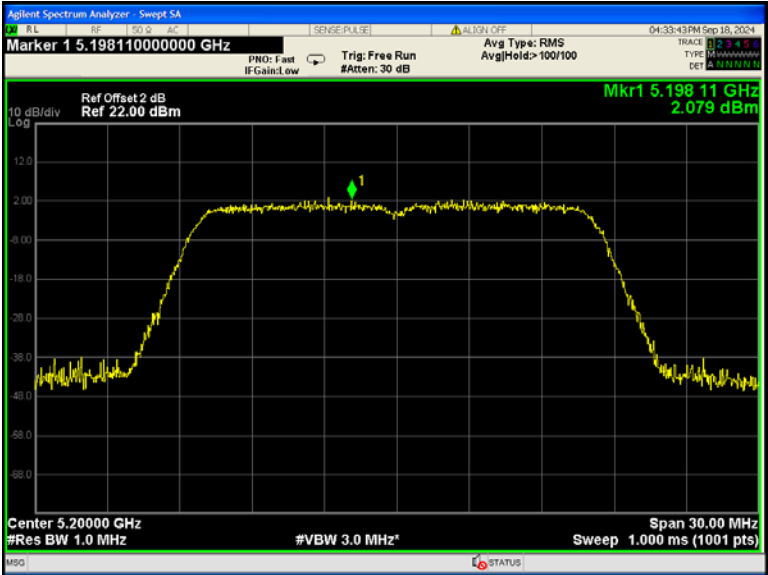
Test result plots shown as follows:

ANT 0

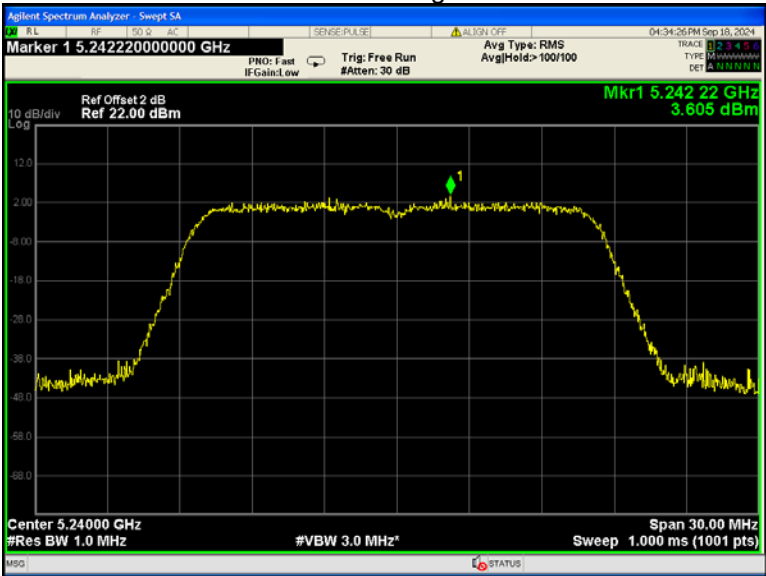
802.11a U-NII-1 Low channel



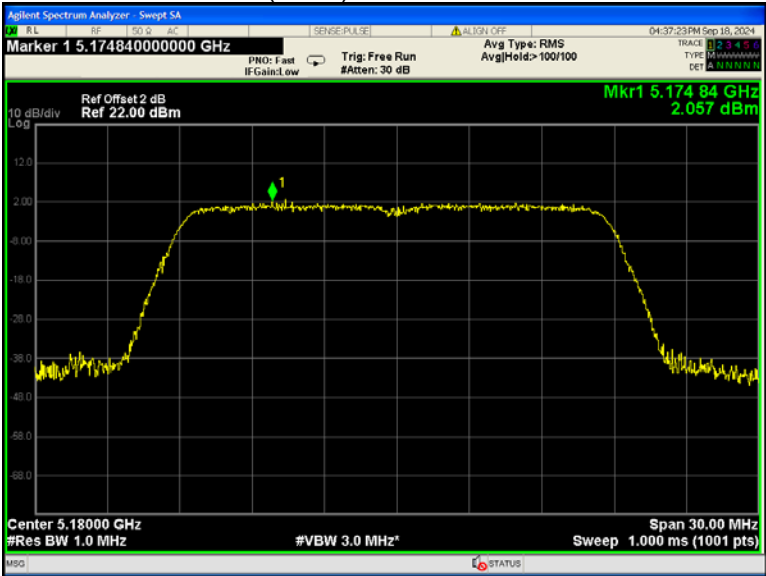
802.11a U-NII-1 Middle channel



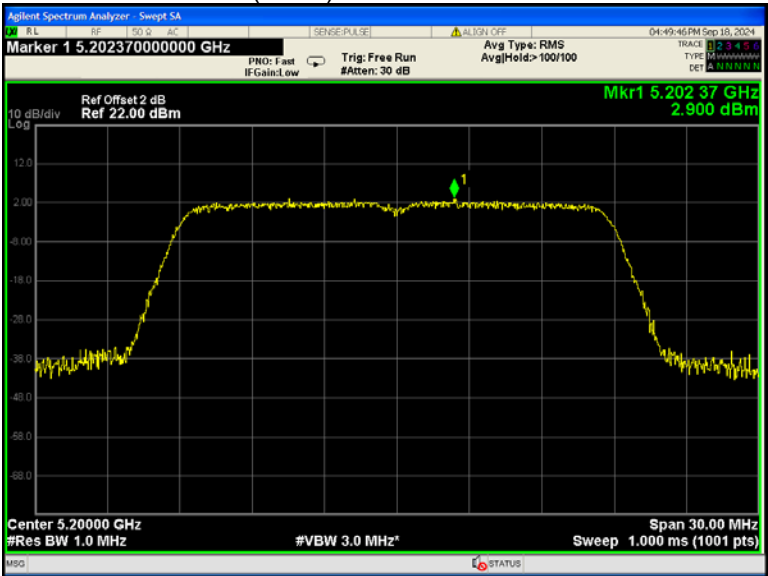
802.11a U-NII-1 High channel



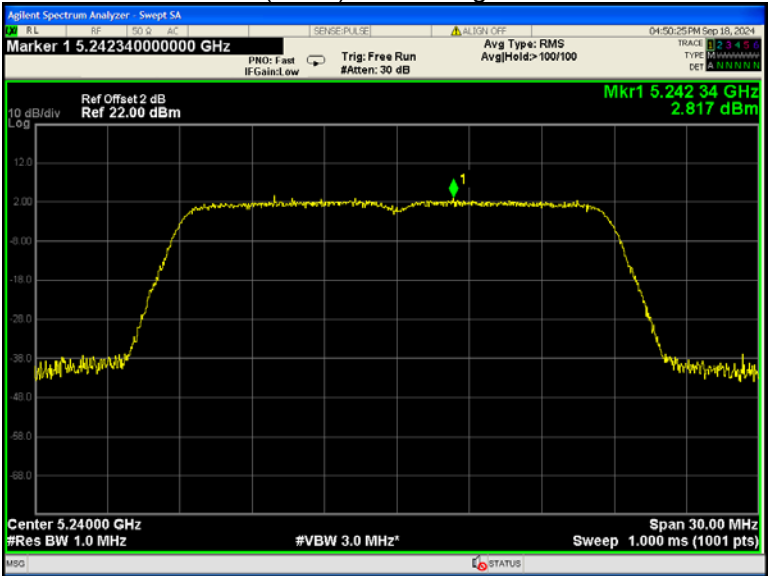
802.11n(HT20) U-NII-1 Low channel



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



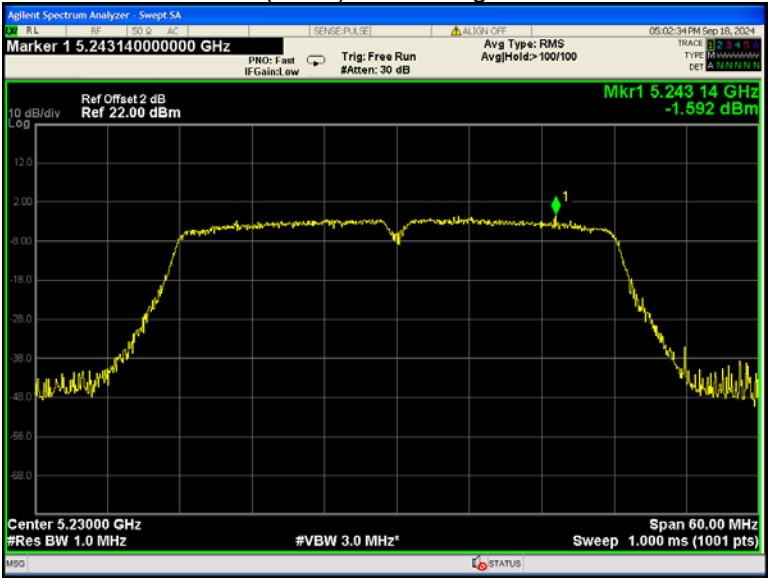
802.11n(HT20) U-NII-1 High channel



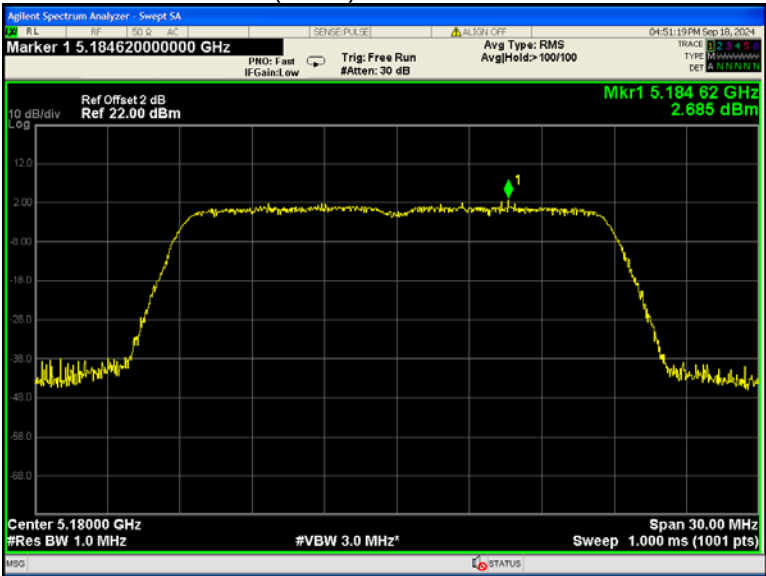
802.11n(HT40) U-NII-1 Low channel



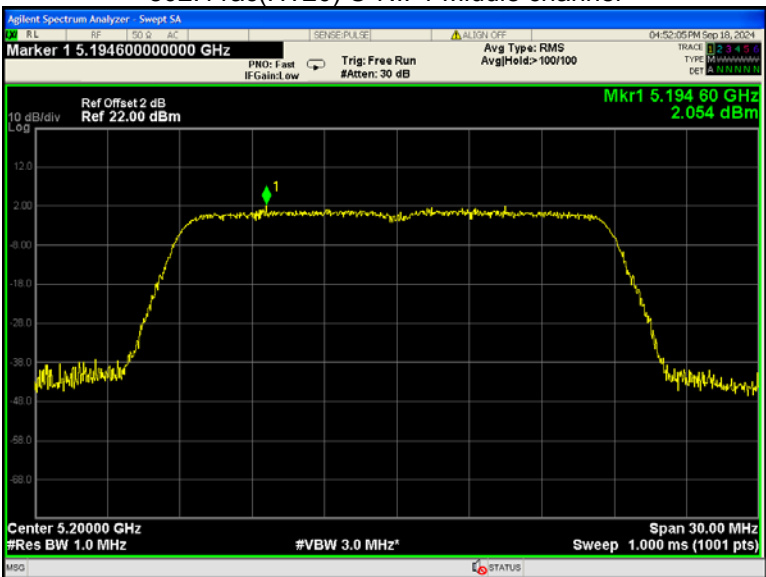
802.11n(HT40) U-NII-1 High channel



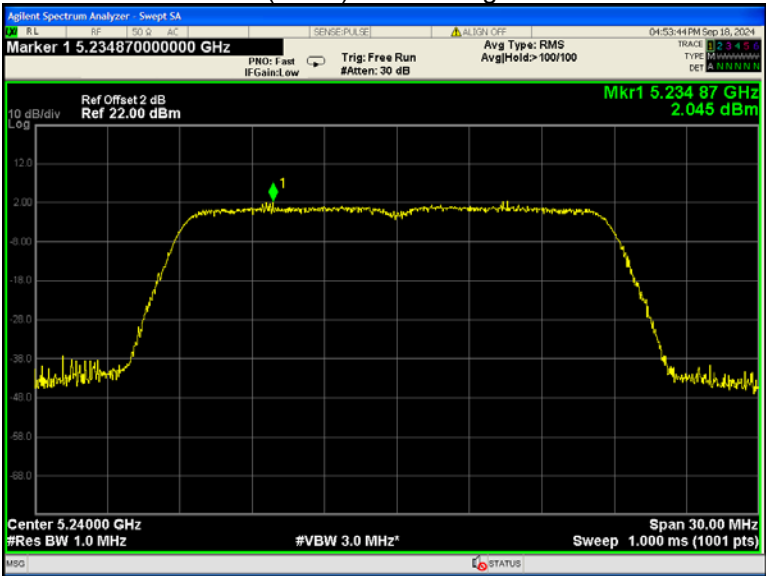
802.11ac(HT20) U-NII-1 Low channel



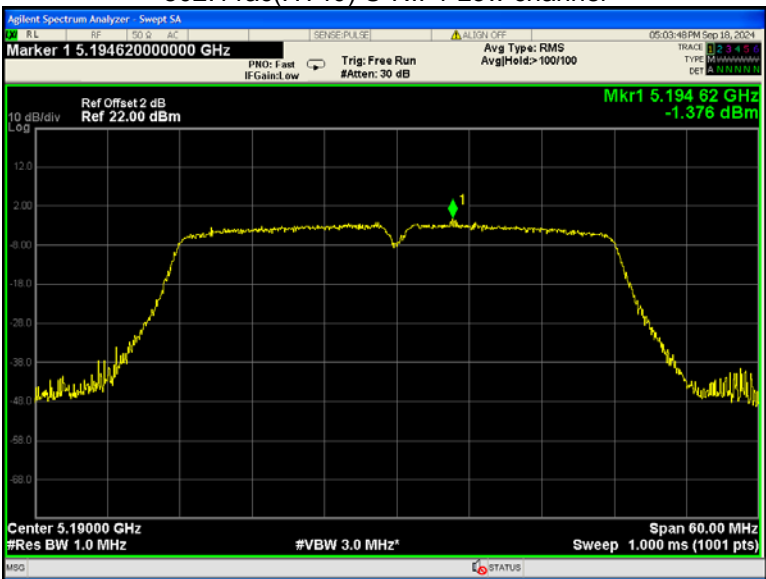
802.11ac(HT20) U-NII-1 Middle channel



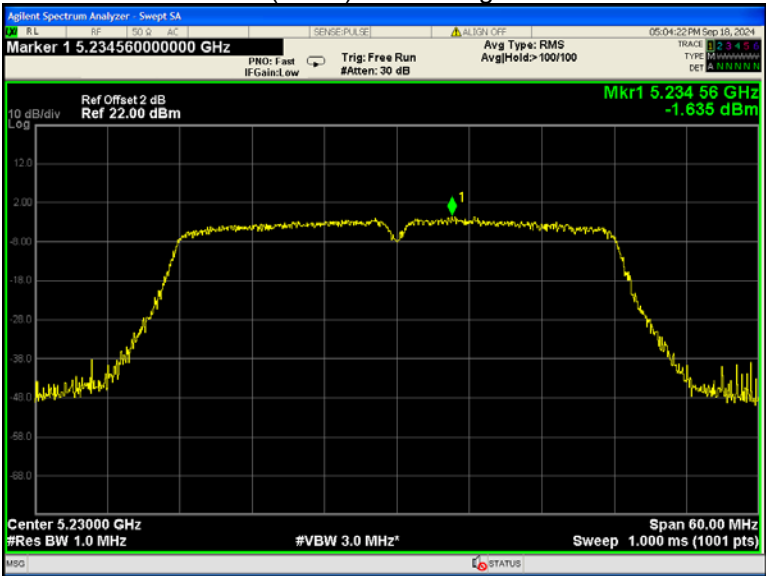
802.11ac(HT20) U-NII-1 High channel



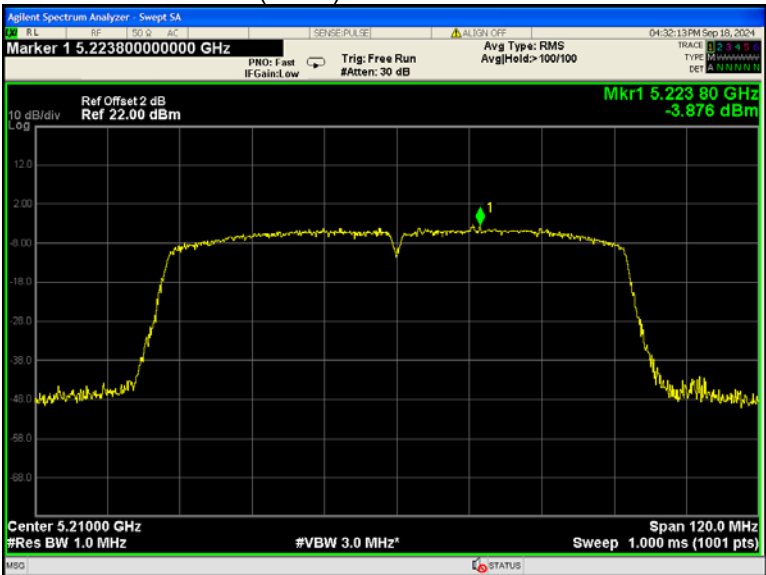
802.11ac(HT40) U-NII-1 Low channel



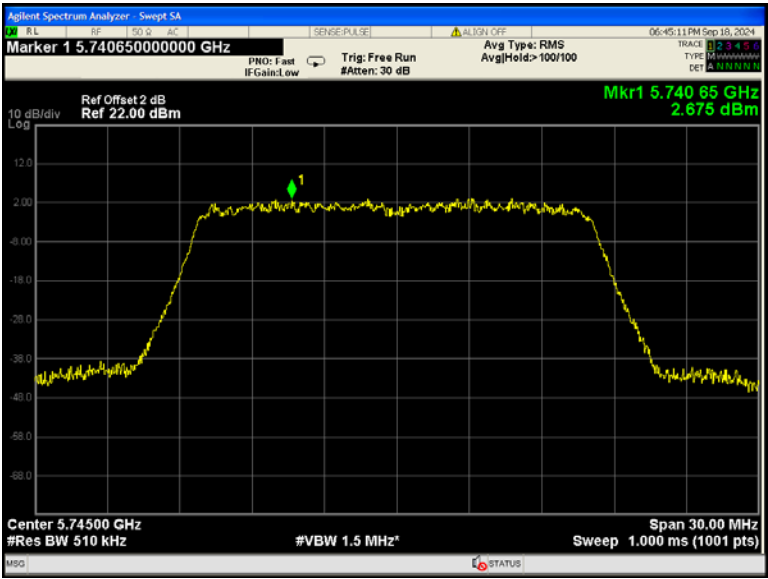
802.11ac(HT40) U-NII-1 High channel



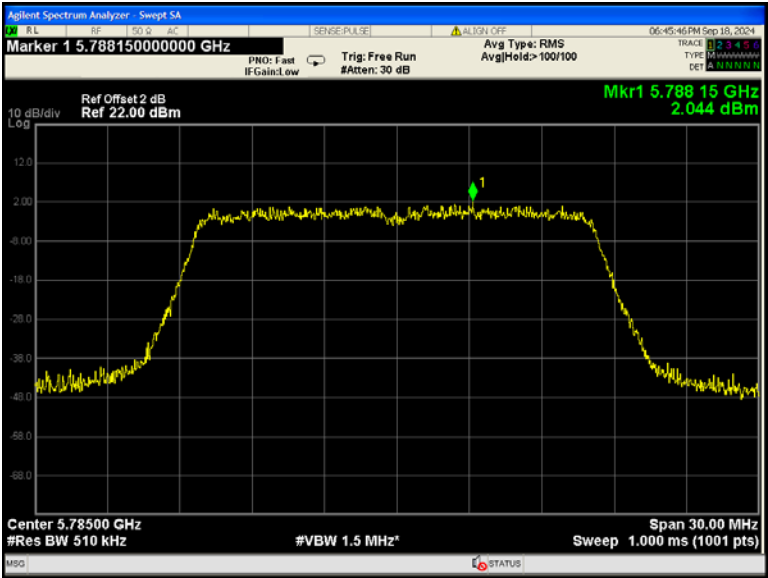
802.11ac(HT80) U-NII-1 Middle channel



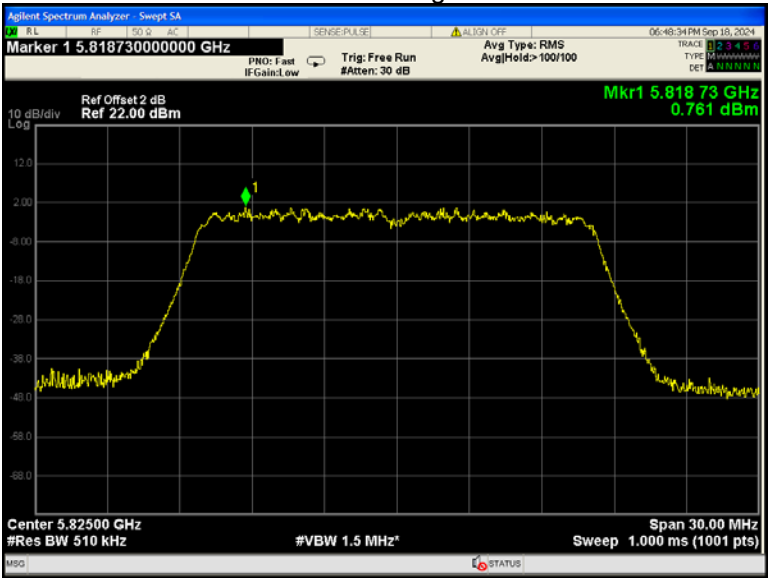
802.11a U-NII-3 Low channel



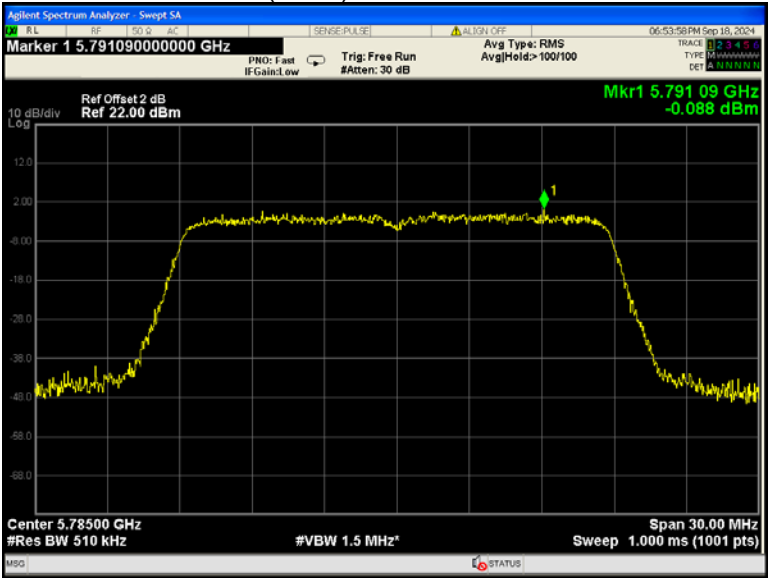
802.11a U-NII-3 Middle channel



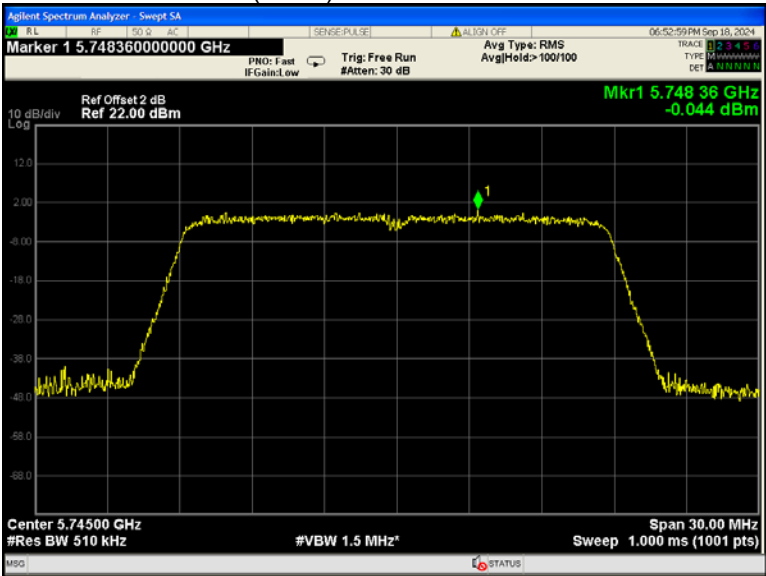
802.11a U-NII-3 High channel



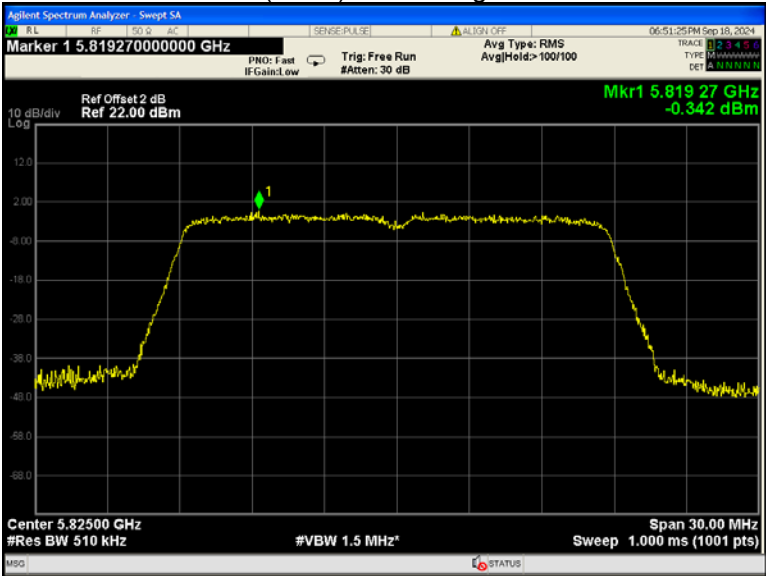
802.11n(HT20) U-NII-3 Low channel



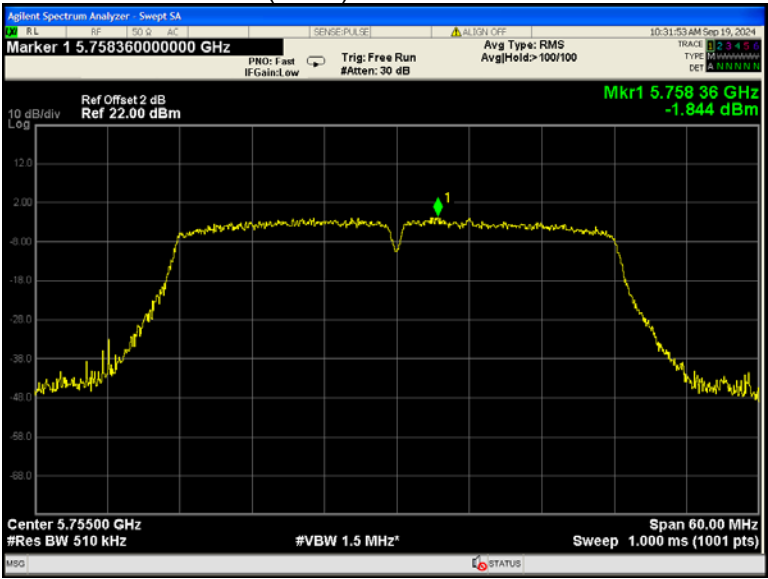
802.11n(HT20) U-NII-3 Middle channel



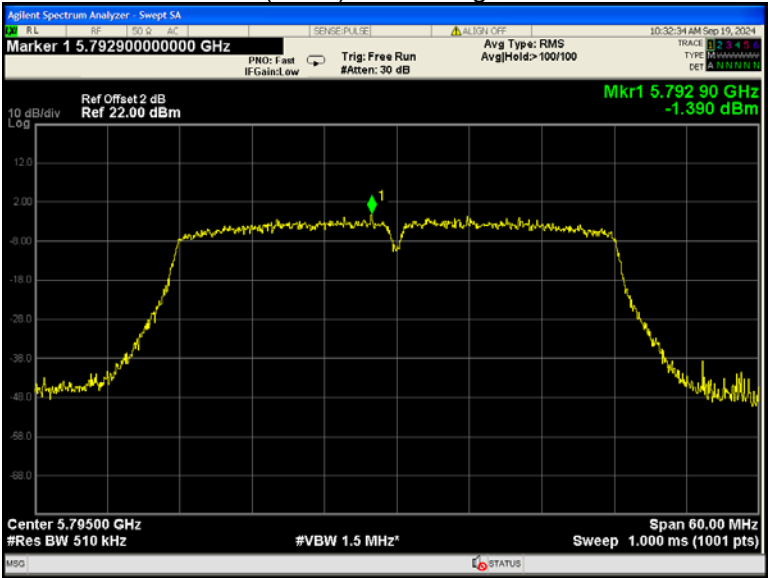
802.11n(HT20) U-NII-3 High channel



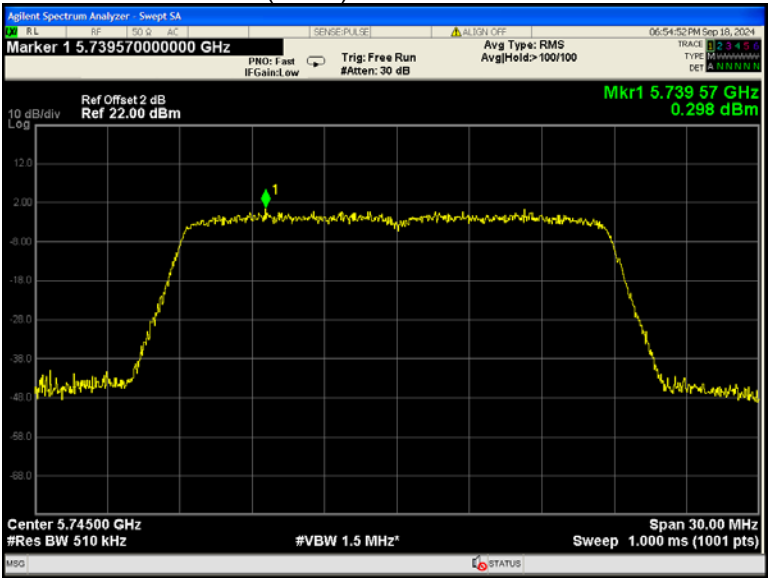
802.11n(HT40) U-NII-3 Low channel



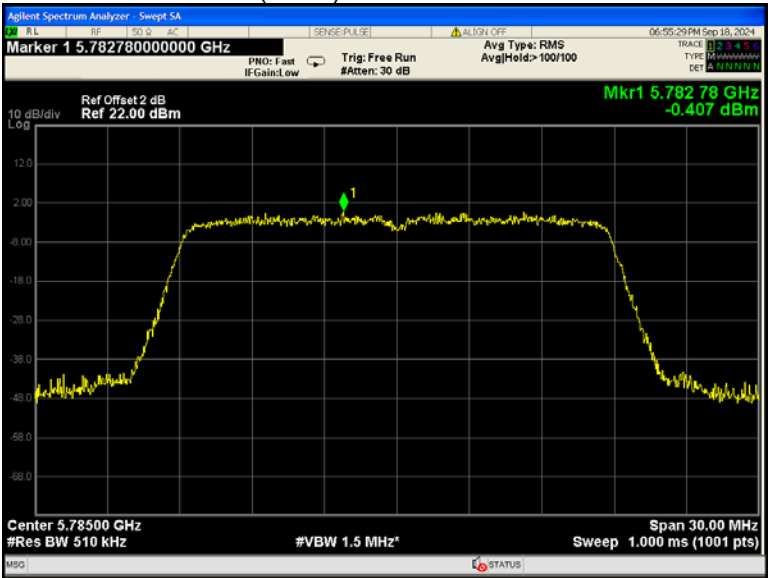
802.11n(HT40) U-NII-3 High channel



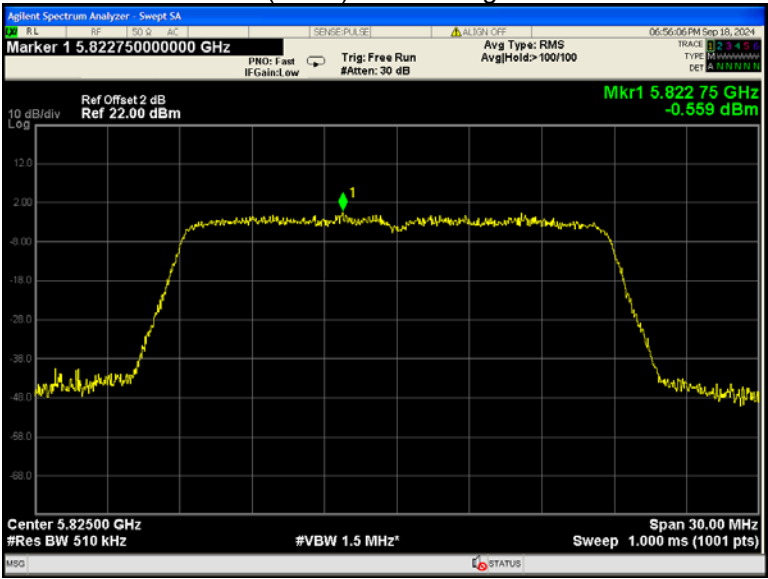
802.11ac(HT20) U-NII-13 Low channel



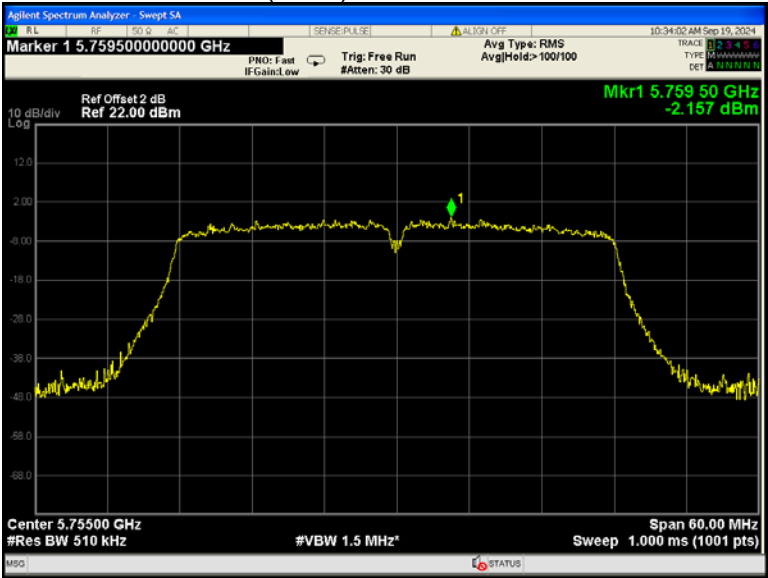
802.11ac(HT20) U-NII-3 Middle channel



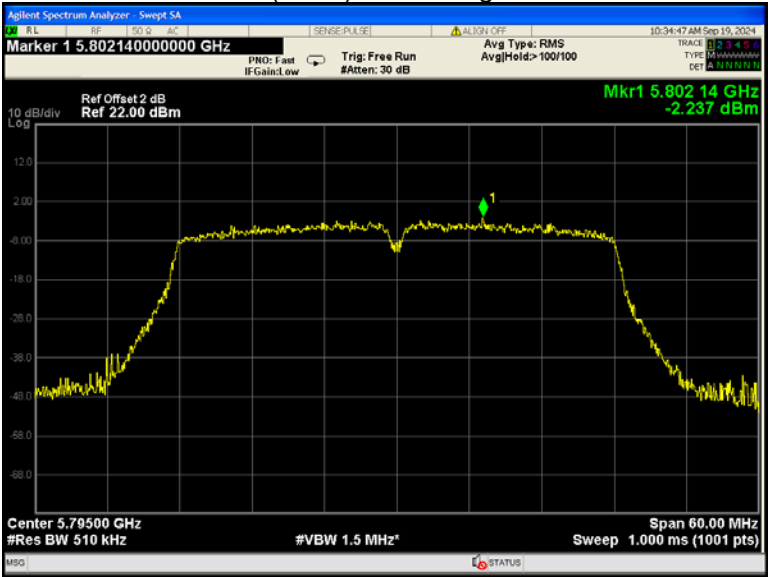
802.11ac(HT20) U-NII-3 High channel



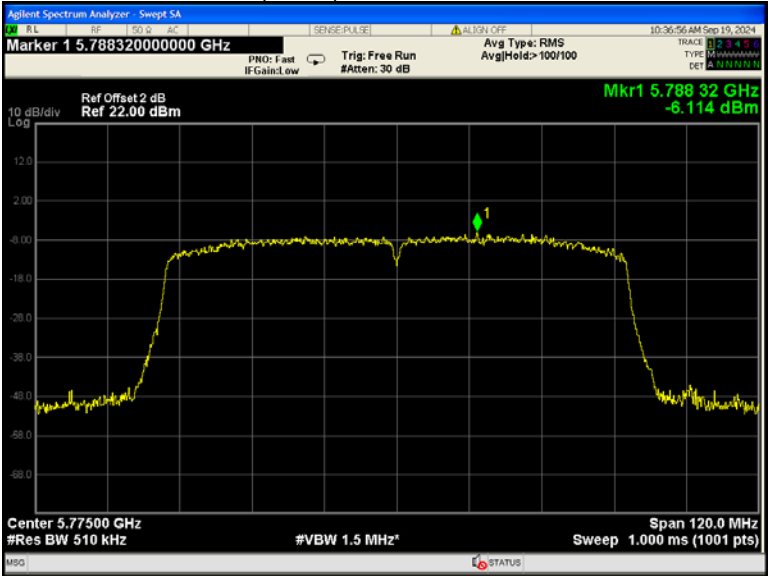
802.11ac(HT40) U-NII-13 Low channel



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

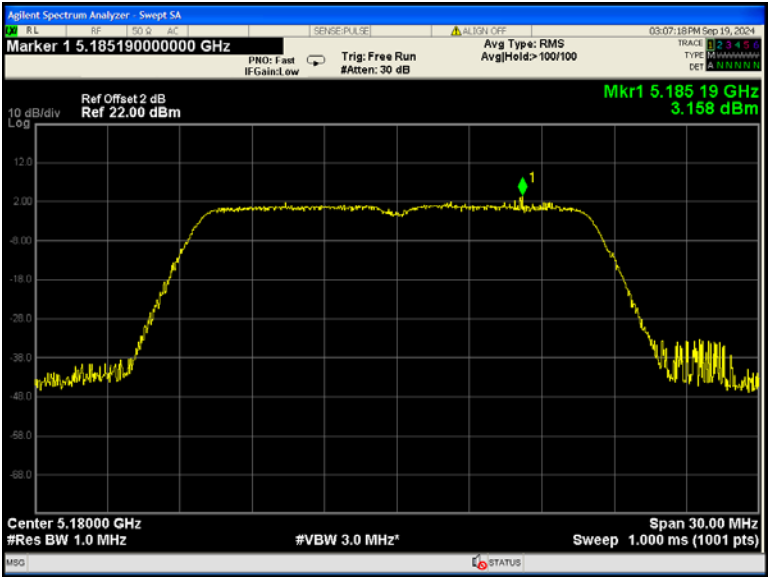


802.11ac(HT80) U-NII-1 Middle channel



ANT 1

802.11a U-NII-1 Low channel



802.11a U-NII-1 Middle channel

