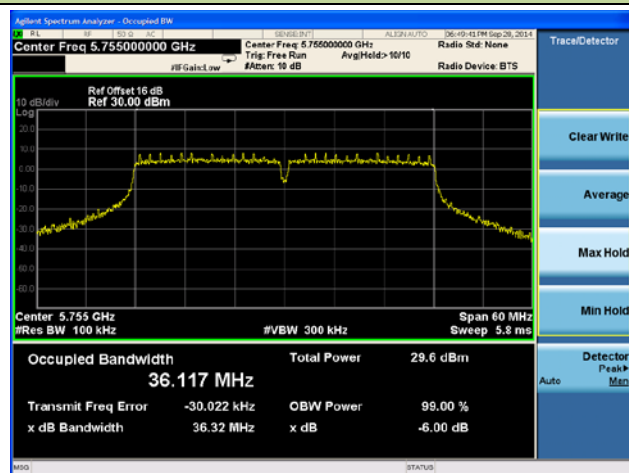
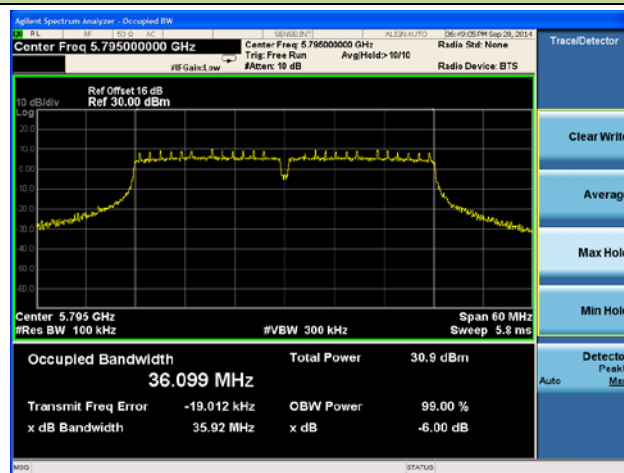


802.11n-HT40 6dB Bandwidth - Ant 0

Channel 151 (5755MHz)

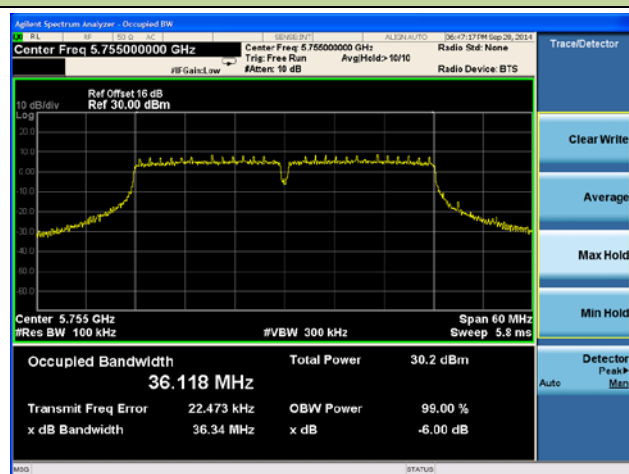


Channel 159 (5795MHz)

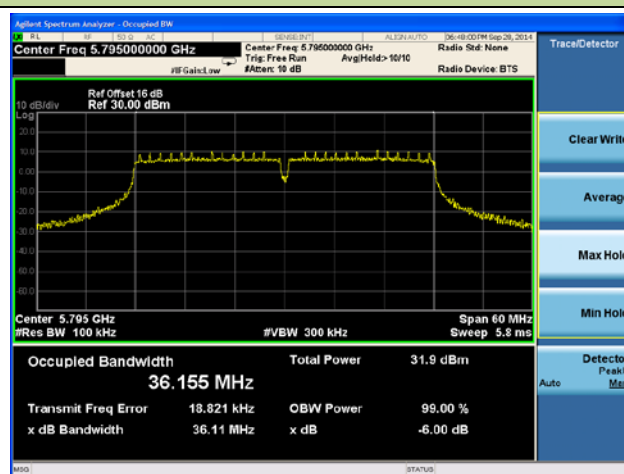


802.11n-HT40 6dB Bandwidth - Ant 1

Channel 151 (5755MHz)

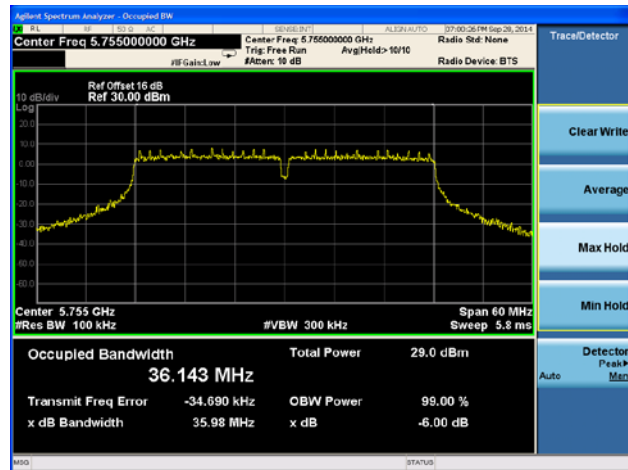


Channel 159 (5795MHz)

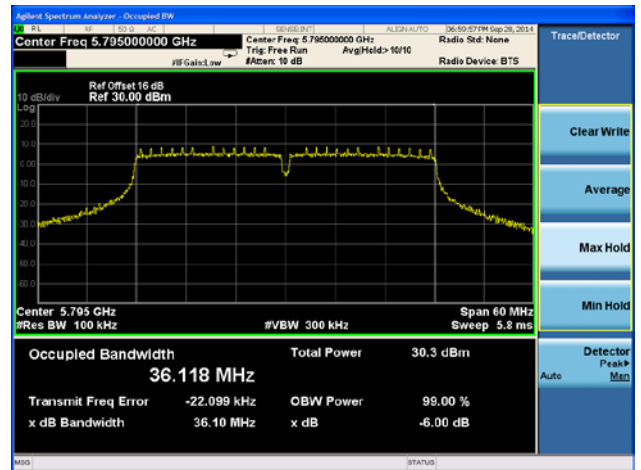


802.11ac-VHT40 6dB Bandwidth - Ant 0

Channel 151 (5755MHz)

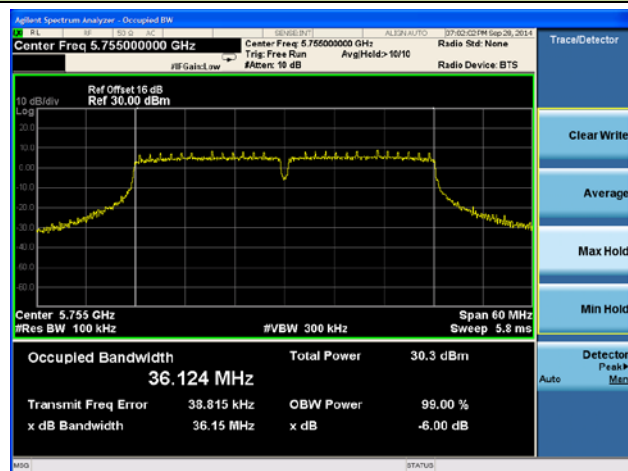


Channel 159 (5795MHz)

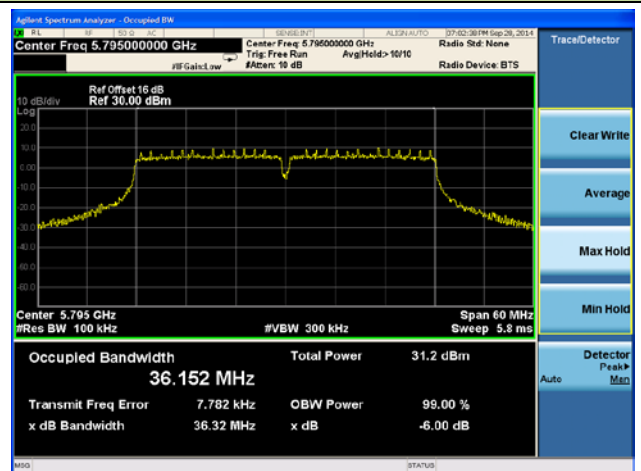


802.11ac-VHT40 6dB Bandwidth - Ant 1

Channel 151 (5755MHz)

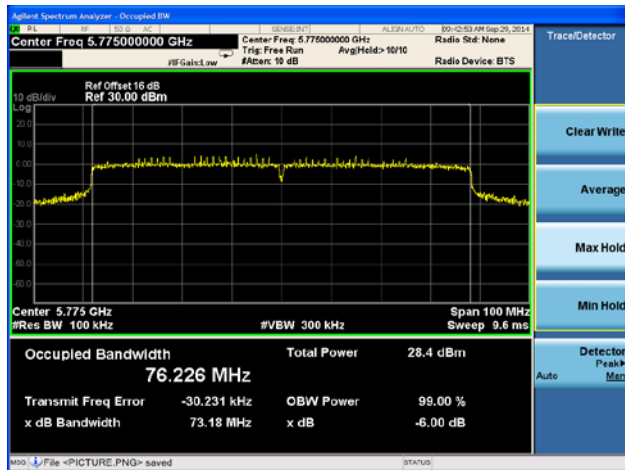


Channel 159 (5795MHz)



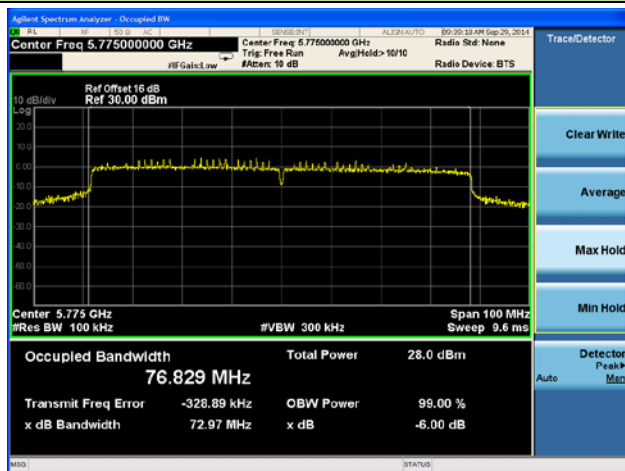
802.11ac-VHT80 6dB Bandwidth - Ant 0

Channel 155 (5775MHz)



802.11ac-VHT80 6dB Bandwidth - Ant 1

Channel 155 (5775MHz)



7.4. Output Power Measurement

7.4.1. Test Limit

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.

For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

5.15-5.25GHz: Limit (dBm) = 30dBm – (25dBi – 23dBi) = 28dBm.

5.725-5.85GHz: Limit (dBm) = 30dBm.

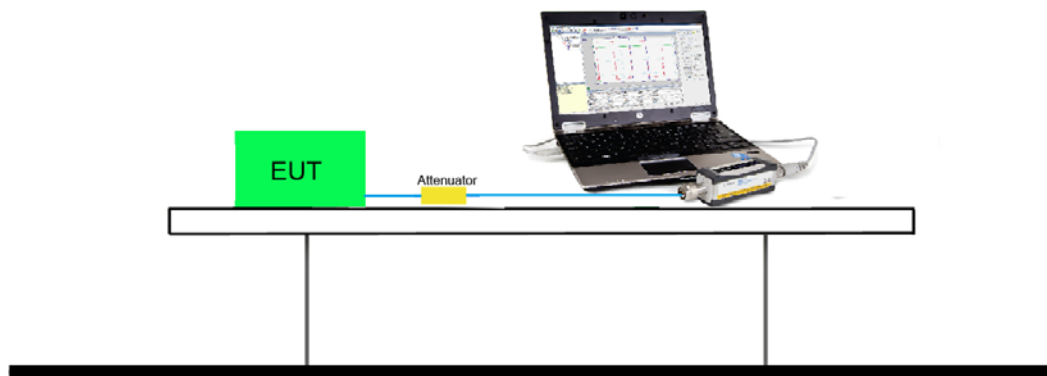
7.4.2. Test Procedure Used

KDB 789033 D02v01 - Section E) 3) b) Method PM-G

7.4.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

7.4.4. Test Setup



7.4.5. Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (yellow marker) for final test of each channel.

N _{Tx}	a	MCS Index for 802.11n	Data Rate (Mbps)			
			20MHz Bandwidth		40MHz Bandwidth	
			800ns GI	400ns GI	800ns GI	400ns GI
1	6	0	6.5	7.2	13.5	15.0
1	9	1	13.0	14.4	27	30.0
1	12	2	19.5	21.7	40.5	45.0
1	18	3	26.0	28.9	54	60.0
1	24	4	39.0	43.3	81	90.0
1	36	5	52.0	57.8	108	120.0
1	48	6	58.5	65.0	121.5	135.0
1	54	7	65.0	72.2	135	150.0
2	---	8	13.0	14.4	27	30.0
2	---	9	26.0	28.9	54	60.0
2	---	10	39.0	43.3	81	90.0
2	---	11	52.0	57.8	108	120.0
2	---	12	78.0	86.7	162	180.0
2	---	13	104.0	115.6	216	240.0
2	---	14	117.0	130.0	243	270.0
2	---	15	130.0	144.4	270	300.0

MCS Index for 802.11ac	N _{Tx}	Data Rate (Mbps)					
		20MHz Bandwidth		40MHz Bandwidth		80MHz Bandwidth	
		800ns GI	400ns GI	800ns GI	400ns GI	800ns GI	400ns GI
0	1	6.5	7.2	13.5	15.0	29.3	32.5
1	1	13.0	14.4	27.0	30.0	58.5	65.0
2	1	19.5	21.7	40.5	45.0	87.8	97.5
3	1	26.0	28.9	54.0	60.0	117.0	130.0
4	1	39.0	43.3	81.0	90.0	175.5	195
5	1	52.0	57.8	108.0	120.0	234.0	260.0
6	1	58.5	65.0	121.5	135.0	263.3	292.5
7	1	65.0	72.2	135.0	150.0	292.5	325
8	1	78.0	86.7	162.0	180.0	351.0	390.0
9	1	--	--	180.0	200.0	390.0	433.3
10	2	13.0	14.4	27.0	30.0	58.6	65.0
11	2	26.0	28.8	54.0	60.0	117.0	130.0
12	2	39.0	43.4	81.0	90.0	175.6	195.0
13	2	52.0	57.8	108.0	120.0	234.0	260.0
14	2	78.0	86.6	162.0	180.0	351.0	390.0
15	2	104.0	115.6	216.0	240.0	468.0	520.0
16	2	117.0	130.0	243.0	270.0	526.6	585.0
17	2	130.0	144.4	270.0	300.0	585.0	650.0
18	2	156.0	173.4	324.0	360.0	702.0	780.0
19	2	--	--	360.0	400.0	780.0	866.6

Note: Power output test was verified over all data rates of each mode shown as above, and then choose the maximum power output (yellow marker) for final test of each channel.

Output power at various data rates:

Test Mode	Bandwidth	Channel	Frequency (MHz)	Data Rate (Mbps)	RMS Power (dBm)
802.11a	20	44	5220	6	12.76
				24	12.28
				54	11.63
802.11n	20	44	5220	6.5	12.65
				39	12.04
				65	11.59
802.11ac	20	44	5220	6.5	12.67
				39	12.11
				78	11.87
802.11n	40	46	5230	13.5	12.15
				81	11.74
				135	11.03
802.11ac	40	46	5230	13.5	12.22
				81	11.54
				180	10.93
802.11ac	80	42	5210	29.3	11.97
				175.5	11.52
				390	10.87

Test Mode	N _{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Limit (dBm)	Result
11a	1	6	36	5180	12.30	12.08	---	28.00	Pass
11a	1	6	44	5220	12.76	12.00	---	28.00	Pass
11a	1	6	48	5240	12.72	12.32	---	28.00	Pass
11a	1	6	149	5745	25.16	24.52	---	30.00	Pass
11a	1	6	157	5785	28.98	28.81	---	30.00	Pass
11a	1	6	165	5825	26.21	25.82	---	30.00	Pass
11n-HT20	1	6.5	36	5180	12.26	12.02	---	28.00	Pass
11n-HT20	1	6.5	44	5220	12.65	12.17	---	28.00	Pass
11n-HT20	1	6.5	48	5240	12.71	12.94	---	28.00	Pass
11n-HT20	2	13	36	5180	11.20	11.04	14.13	28.00	Pass
11n-HT20	2	13	44	5220	11.13	11.07	14.11	28.00	Pass
11n-HT20	2	13	48	5240	11.58	11.37	14.49	28.00	Pass
11n-HT20	1	6.5	149	5745	25.47	24.56	---	30.00	Pass
11n-HT20	1	6.5	157	5785	28.94	28.81	---	30.00	Pass
11n-HT20	1	6.5	165	5825	25.64	25.51	---	30.00	Pass
11n-HT20	2	13	149	5745	25.56	25.47	28.53	30.00	Pass
11n-HT20	2	13	157	5785	26.13	26.11	29.13	30.00	Pass
11n-HT20	2	13	165	5825	25.83	25.64	28.75	30.00	Pass
11ac-VHT20	1	6.5	36	5180	12.36	12.48	---	28.00	Pass
11ac-VHT20	1	6.5	44	5220	12.67	12.64	---	28.00	Pass
11ac-VHT20	1	6.5	48	5240	12.70	12.91	---	28.00	Pass
11ac-VHT20	2	13	36	5180	11.33	11.05	14.20	28.00	Pass
11ac-VHT20	2	13	44	5220	11.12	11.11	14.13	28.00	Pass
11ac-VHT20	2	13	48	5240	12.14	11.93	15.05	28.00	Pass
11ac-VHT20	1	6.5	149	5745	25.47	24.82	---	30.00	Pass
11ac-VHT20	1	6.5	157	5785	28.92	28.86	---	30.00	Pass
11ac-VHT20	1	6.5	165	5825	25.59	24.84	---	30.00	Pass
11ac-VHT20	2	13	149	5745	25.18	25.14	28.17	30.00	Pass
11ac-VHT20	2	13	157	5785	26.05	26.01	29.04	30.00	Pass
11ac-VHT20	2	13	165	5825	25.35	25.19	28.28	30.00	Pass
11n-HT40	1	13.5	38	5190	12.11	12.06	---	28.00	Pass
11n-HT40	1	13.5	46	5230	12.45	12.28	---	28.00	Pass

11n-HT40	2	27	38	5190	10.93	11.08	14.02	28.00	Pass
11n-HT40	2	27	46	5230	10.77	11.10	13.95	28.00	Pass
11n-HT40	1	13.5	151	5755	24.59	24.40	---	30.00	Pass
11n-HT40	1	13.5	159	5795	26.35	26.03	---	30.00	Pass
11n-HT40	2	27	151	5755	25.73	25.78	28.77	30.00	Pass
11n-HT40	2	27	159	5795	26.03	25.99	29.02	30.00	Pass
11ac-VHT40	1	13.5	38	5190	11.83	12.05	---	28.00	Pass
11ac-VHT40	1	13.5	46	5230	12.22	12.10	---	28.00	Pass
11ac-VHT40	2	27	38	5190	10.96	10.64	13.81	28.00	Pass
11ac-VHT40	2	27	46	5230	10.83	10.65	13.75	28.00	Pass
11ac-VHT40	1	13.5	151	5755	24.42	24.81	---	30.00	Pass
11ac-VHT40	1	13.5	159	5795	25.24	25.85	---	30.00	Pass
11ac-VHT40	2	27	151	5755	25.94	25.62	28.79	30.00	Pass
11ac-VHT40	2	27	159	5795	25.99	26.01	29.01	30.00	Pass
11ac-VHT80	1	29.3	42	5210	11.97	11.53	---	28.00	Pass
11ac-VHT80	2	58.6	42	5210	10.74	10.27	13.52	28.00	Pass
11ac-VHT80	1	29.3	155	5775	24.09	24.03	---	30.00	Pass
11ac-VHT80	2	58.6	155	5775	25.85	25.62	28.75	30.00	Pass

Note: Total Average Power (dBm) = $10 \cdot \log\{10^{(\text{Ant 0 Average Power} / 10)} + 10^{(\text{Ant 1 Average Power} / 10)}\}$.

7.5. Power Spectral Density Measurement

7.5.1. Test Limit

For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the 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 power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

For the band 5.725-5.85 GHz, 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, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.15-5.25 GHz: Limit (dBm/MHz) = 17dBm/MHz – (25dBi-23dBi) = 15dBm/MHz.

5.725-5.85 GHz Limit (dBm/500kHz) = 30dBm/500kHz.

7.5.2. Test Procedure Used

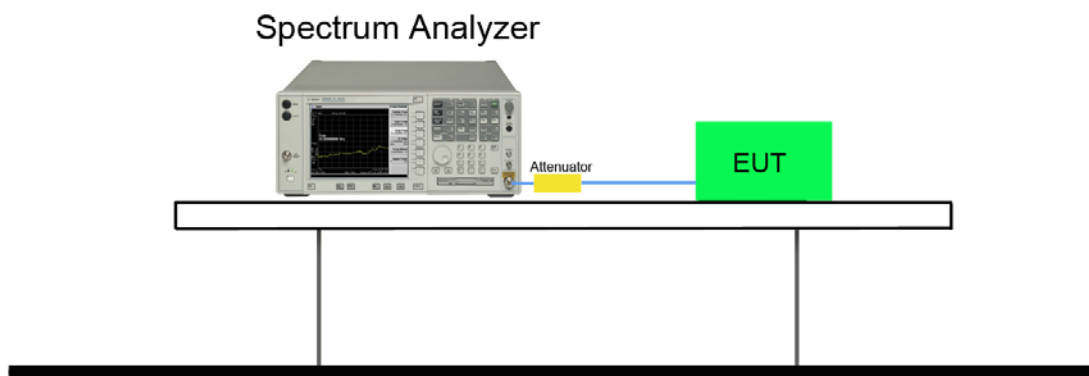
KDB 789033 D02v01 - Section F

7.5.3. Test Setting

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz,
RBW = 100 kHz
4. VBW = 3MHz
5. Number of sweep points $\geq 2 \times (\text{span} / \text{RBW})$
6. Detector = power averaging (RMS)
7. Sweep time = auto
8. Trigger = free run
9. Use the peak search function on the instrument to find the peak of the spectrum and record its value.

10. Add $10 \cdot \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add $10 \cdot \log(1/0.25) = 6$ dB if the duty cycle is 25 percent.
11. When the measurement bandwidth of Maximum PSD is specified in 500 kHz, add a constant factor $10 \cdot \log(500\text{kHz}/100\text{kHz}) = 7$ dB to the measured result

7.5.4. Test Setup



7.5.5. Test Result

Test Mode	N _{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	10*log (1/X)	Ant 0 PSD (dBm/MHz)	Ant 1 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm /MHz)	Result
11a	1	6	36	5180	0.146	-2.259	-3.760	--	15	Pass
11a	1	6	44	5220	0.146	-1.775	-3.803	--	15	Pass
11a	1	6	48	5240	0.146	-1.413	-3.296	--	15	Pass
11n-HT20	1	6.5	36	5180	0.159	-1.830	-3.160	--	15	Pass
11n-HT20	1	6.5	44	5220	0.159	-1.691	-3.242	--	15	Pass
11n-HT20	1	6.5	48	5240	0.159	-0.516	-2.841	--	15	Pass
11n-HT20	2	13	36	5180	0.159	-2.646	-3.635	-0.102	15	Pass
11n-HT20	2	13	44	5220	0.159	-1.924	-2.574	0.774	15	Pass
11n-HT20	2	13	48	5240	0.159	-2.698	-2.848	0.238	15	Pass
11ac-VHT20	1	6.5	36	5180	0.191	-1.749	-3.275	--	15	Pass
11ac-VHT20	1	6.5	44	5220	0.191	-1.713	-4.331	--	15	Pass
11ac-VHT20	1	6.5	48	5240	0.191	-1.122	-4.343	--	15	Pass
11ac-VHT20	2	13	36	5180	0.191	-2.595	-5.922	-0.937	15	Pass
11ac-VHT20	2	13	44	5220	0.191	-2.302	-2.751	0.489	15	Pass
11ac-VHT20	2	13	48	5240	0.191	-1.613	-1.557	1.425	15	Pass
11n-HT40	1	13.5	38	5190	0.521	-5.311	-8.315	--	15	Pass
11n-HT40	1	13.5	46	5230	0.521	-4.865	-9.079	--	15	Pass
11n-HT40	2	27	38	5190	0.521	-6.008	-6.789	-3.371	15	Pass
11n-HT40	2	27	46	5230	0.521	-5.960	-6.792	-3.346	15	Pass
11ac-VHT40	1	13.5	38	5190	0.535	-5.394	-6.392	--	15	Pass
11ac-VHT40	1	13.5	46	5230	0.535	-4.911	-5.649	--	15	Pass
11ac-VHT40	2	27	38	5190	0.535	-6.126	-6.235	-3.169	15	Pass
11ac-VHT40	2	27	46	5230	0.535	-6.145	-5.794	-2.955	15	Pass
11ac-VHT80	1	29.3	42	5210	0.778	-6.980	-7.008	--	15	Pass
11ac-VHT80	2	58.6	42	5210	0.778	-7.560	-7.148	-4.339	15	Pass

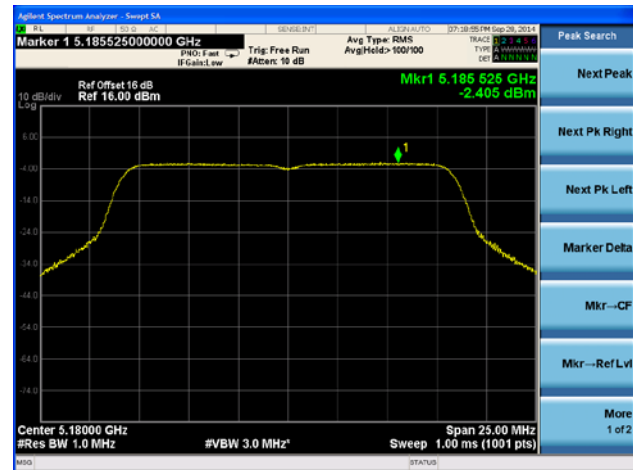
Note: When EUT duty cycle < 98%, the total PSD = $10 \cdot \log\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10)}\} + 10 \cdot \log(1/\text{duty cycle})$

Test Mode	N _{Tx}	Data Rate (Mbps)	Channel No.	Freq. (MHz)	10*log (1/X)	Constant Factor	Ant 0 PSD (dBm/500kHz)	Ant 1 PSD (dBm/500kHz)	Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
11a	1	6	149	5745	0.146	6.99	9.603	8.449	--	30	Pass
11a	1	6	157	5785	0.146	6.99	11.291	10.889	--	30	Pass
11a	1	6	165	5825	0.146	6.99	10.837	10.753	--	30	Pass
11n-HT20	1	6.5	149	5745	0.159	6.99	9.490	8.339	--	30	Pass
11n-HT20	1	6.5	157	5785	0.159	6.99	10.754	10.576	--	30	Pass
11n-HT20	1	6.5	165	5825	0.159	6.99	9.487	11.017	--	30	Pass
11n-HT20	2	13	149	5745	0.159	6.99	9.361	10.799	13.150	30	Pass
11n-HT20	2	13	157	5785	0.159	6.99	10.105	11.413	13.819	30	Pass
11n-HT20	2	13	165	5825	0.159	6.99	8.855	11.798	13.582	30	Pass
11ac-VHT20	1	6.5	149	5745	0.191	6.99	9.903	8.686	--	30	Pass
11ac-VHT20	1	6.5	157	5785	0.191	6.99	10.999	10.217	--	30	Pass
11ac-VHT20	1	6.5	165	5825	0.191	6.99	10.088	10.243	--	30	Pass
11ac-VHT20	2	13	149	5745	0.191	6.99	9.391	10.472	12.975	30	Pass
11ac-VHT20	2	13	157	5785	0.191	6.99	9.874	12.325	14.280	30	Pass
11ac-VHT20	2	13	165	5825	0.191	6.99	8.968	12.742	14.263	30	Pass
11n-HT40	1	13.5	151	5755	0.521	6.99	5.965	5.177	--	30	Pass
11n-HT40	1	13.5	159	5795	0.521	6.99	6.371	7.568	--	30	Pass
11n-HT40	2	27	151	5755	0.521	6.99	8.067	9.405	11.797	30	Pass
11n-HT40	2	27	159	5795	0.521	6.99	7.137	9.239	11.324	30	Pass
11ac-VHT40	1	13.5	151	5755	0.535	6.99	5.203	6.993	--	30	Pass
11ac-VHT40	1	13.5	159	5795	0.535	6.99	6.017	8.124	--	30	Pass
11ac-VHT40	2	27	151	5755	0.535	6.99	5.828	6.615	9.250	30	Pass
11ac-VHT40	2	27	159	5795	0.535	6.99	6.726	6.356	9.556	30	Pass
11ac-VHT80	1	29.3	155	5775	0.778	6.99	2.587	3.174	--	30	Pass
11ac-VHT80	2	58.6	155	5775	0.778	6.99	2.554	2.547	5.561	30	Pass

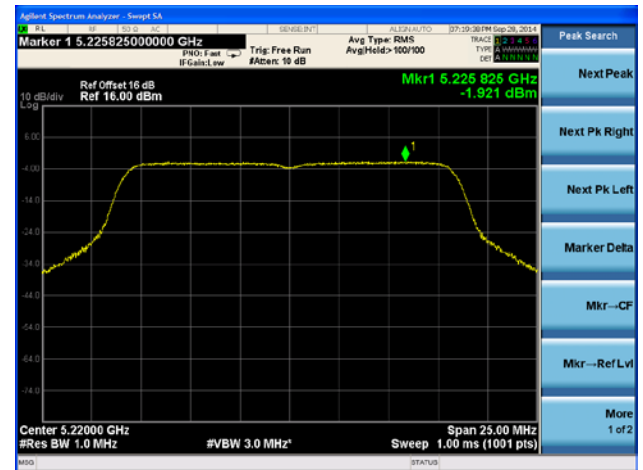
Note: When EUT duty cycle < 98%, the total PSD = $10 \cdot \log\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10)}\} + 10 \cdot \log(1/\text{duty cycle}) + \text{Constant Factor}$.

802.11a Power Spectral Density - Ant 0

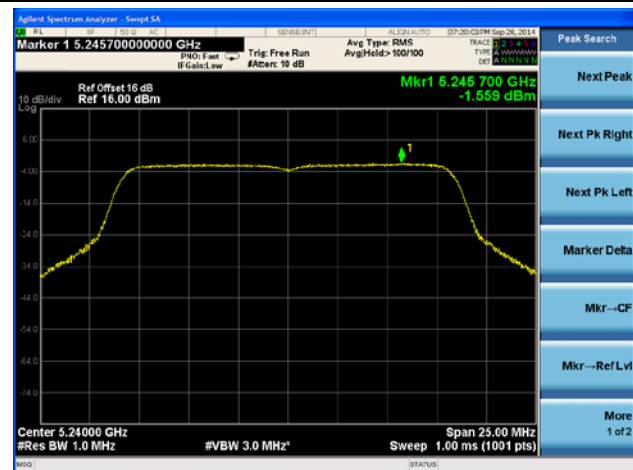
Channel 36 (5180MHz)



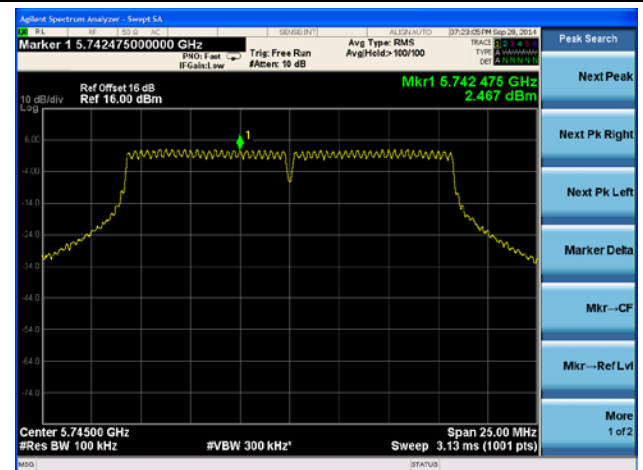
Channel 44 (5220MHz)



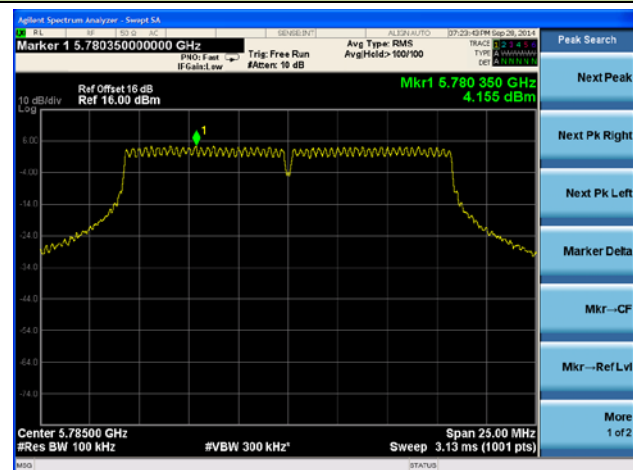
Channel 48 (5240MHz)



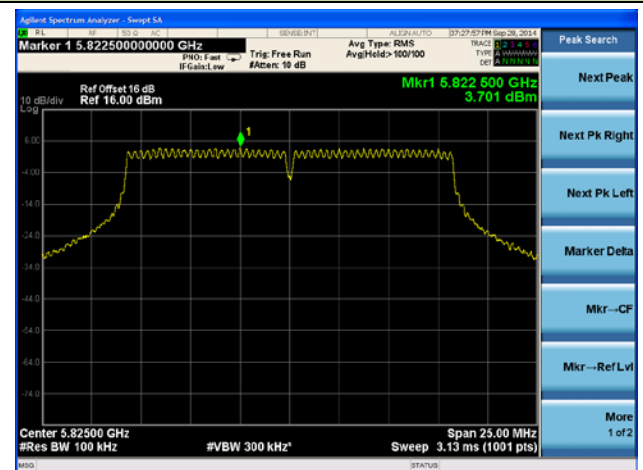
Channel 149 (5745MHz)



Channel 157 (5785MHz)

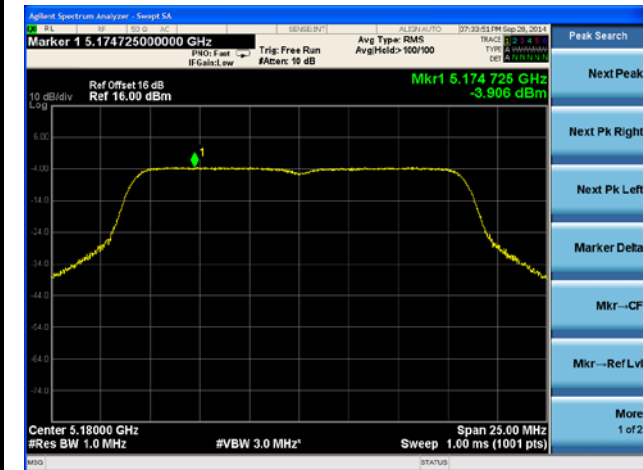


Channel 165 (5825MHz)

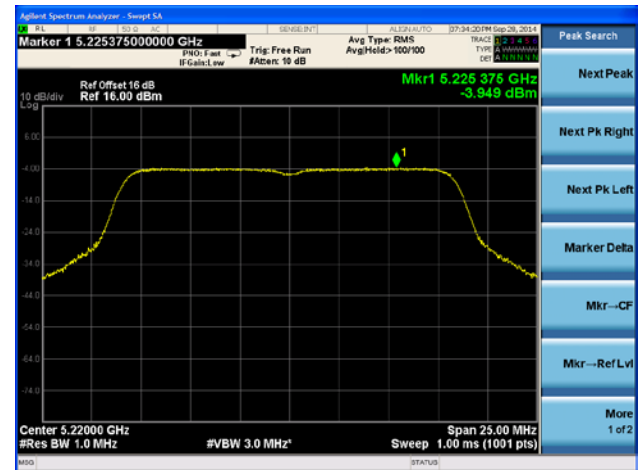


802.11a Power Spectral Density - Ant 1

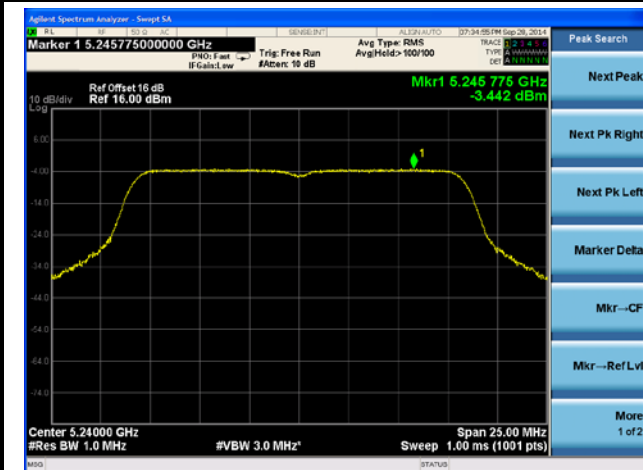
Channel 36 (5180MHz)



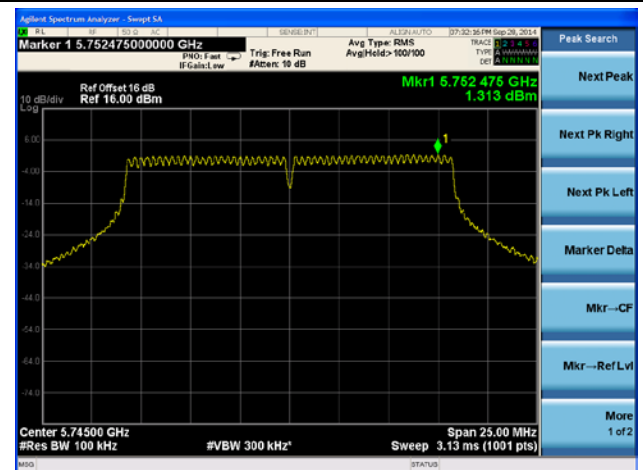
Channel 44 (5220MHz)



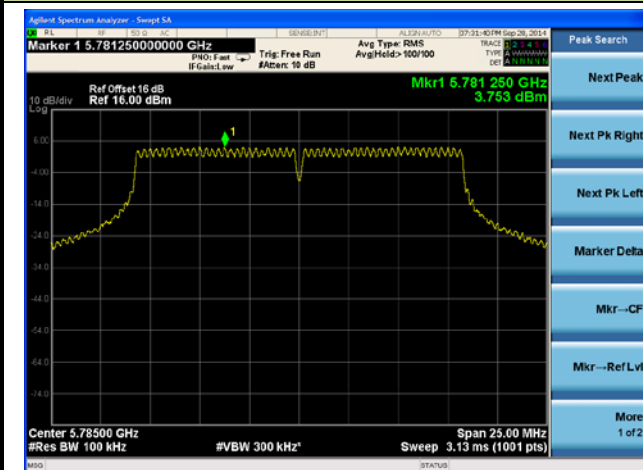
Channel 48 (5240MHz)



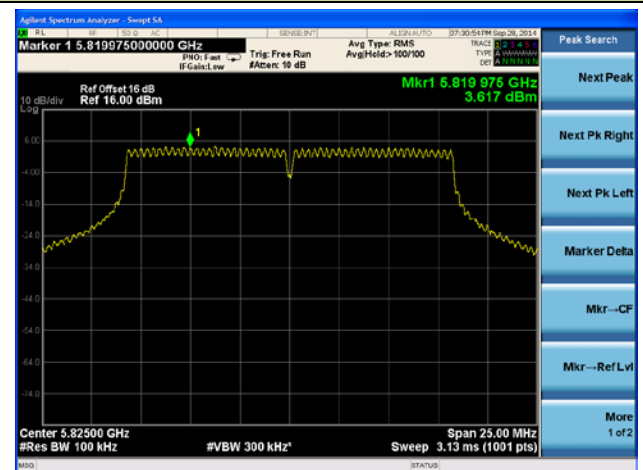
Channel 149 (5745MHz)



Channel 157 (5785MHz)

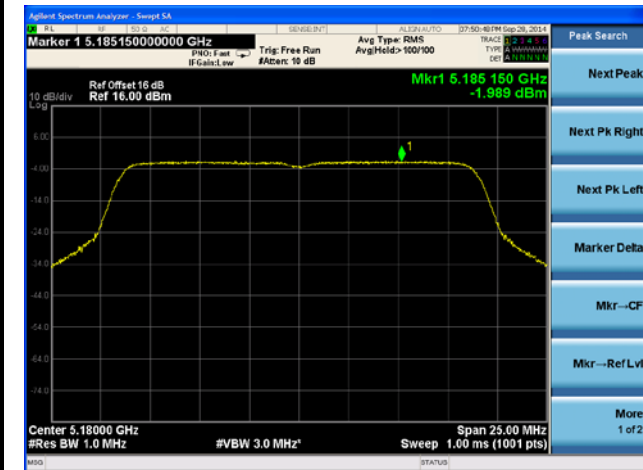


Channel 165 (5825MHz)

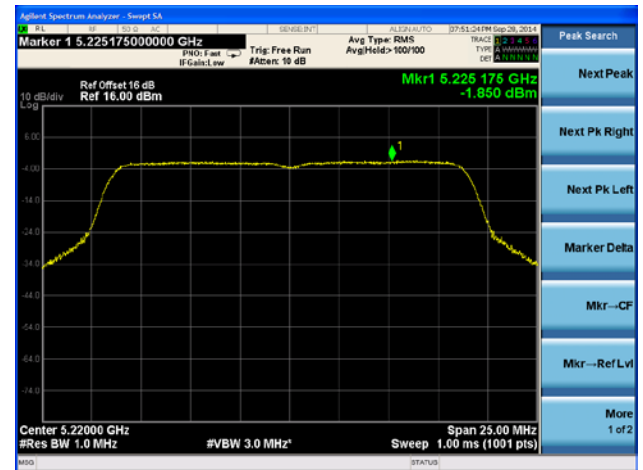


802.11n-HT20 Power Spectral Density - Ant 0

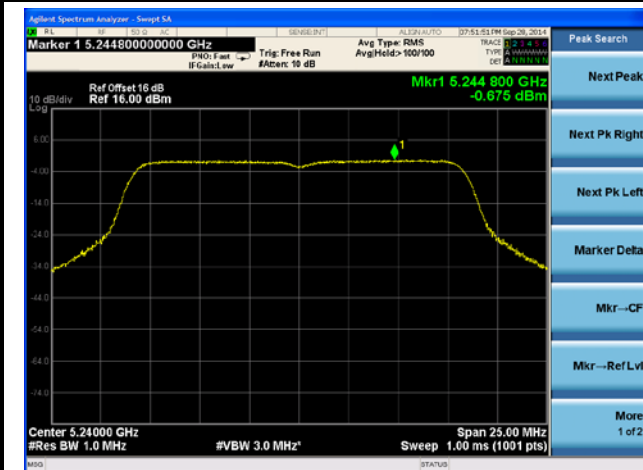
Channel 36 (5180MHz)



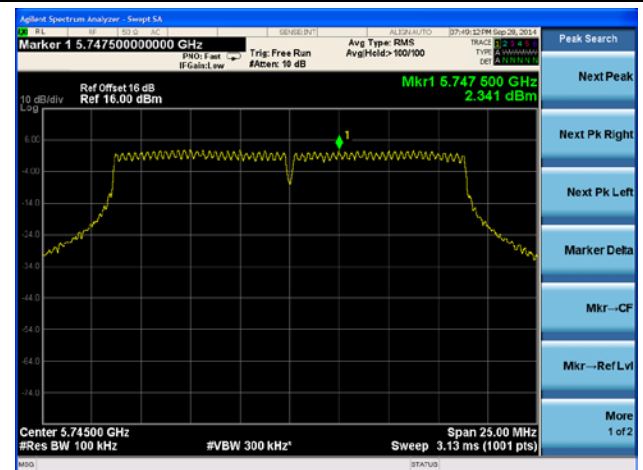
Channel 44 (5220MHz)



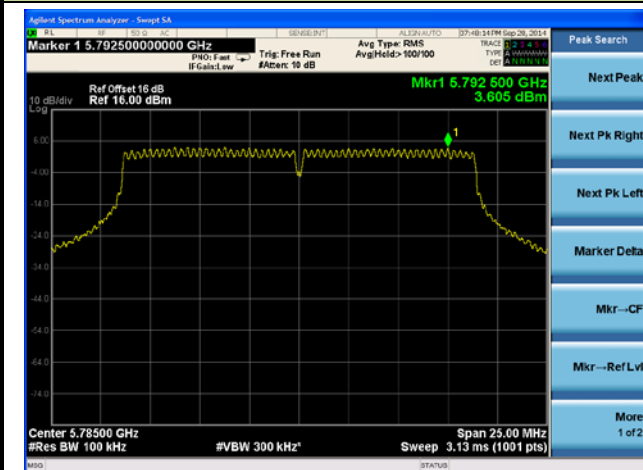
Channel 48 (5240MHz)



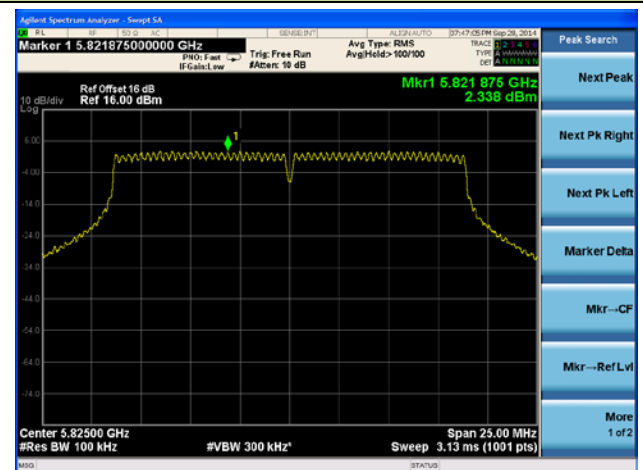
Channel 149 (5745MHz)



Channel 157 (5785MHz)

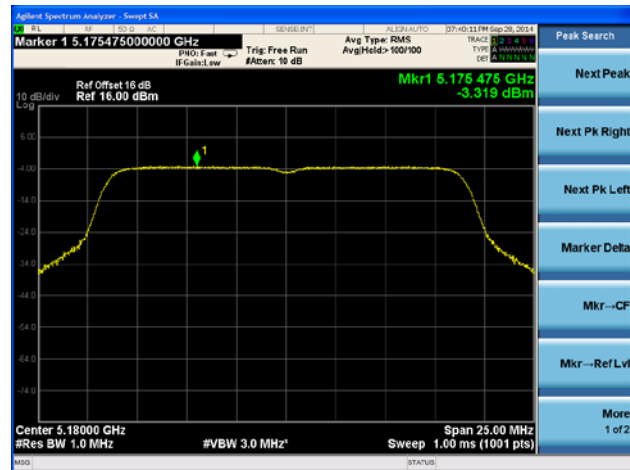


Channel 165 (5825MHz)

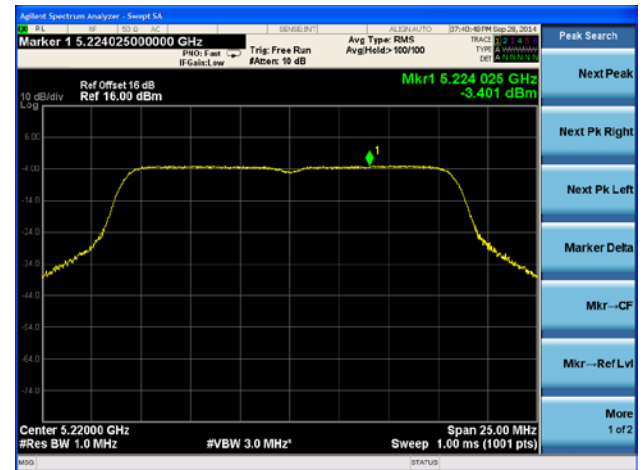


802.11n-HT20 Power Spectral Density - Ant 1

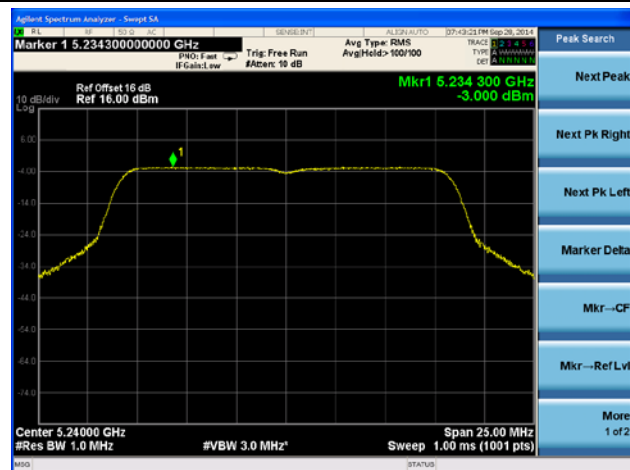
Channel 36 (5180MHz)



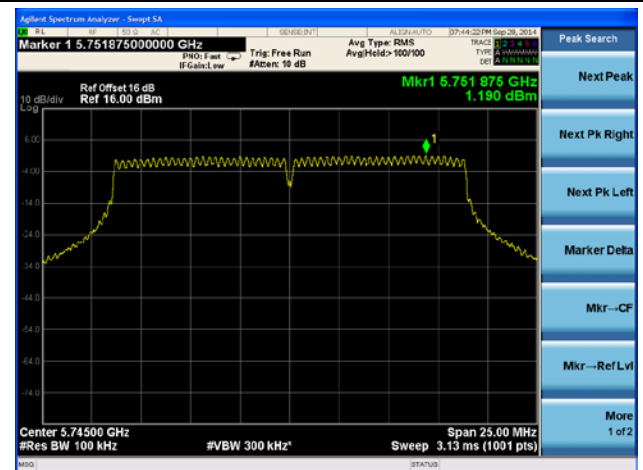
Channel 44 (5220MHz)



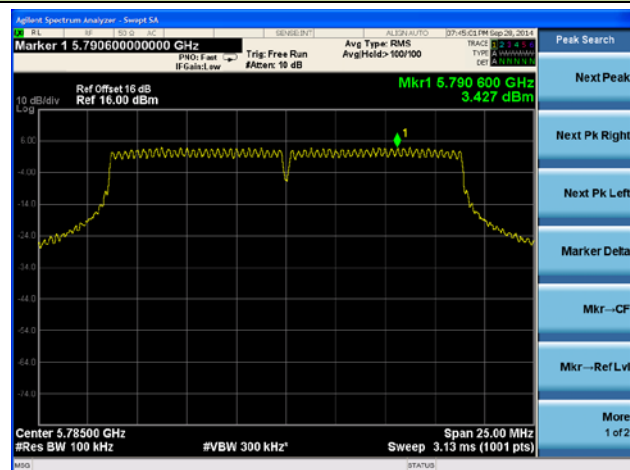
Channel 48 (5240MHz)



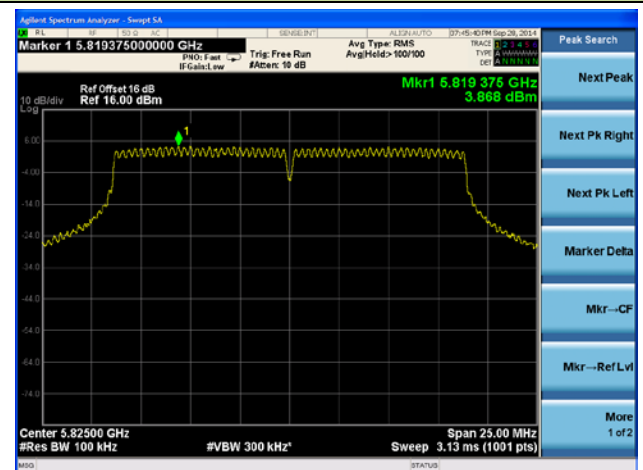
Channel 149 (5745MHz)



Channel 157 (5785MHz)

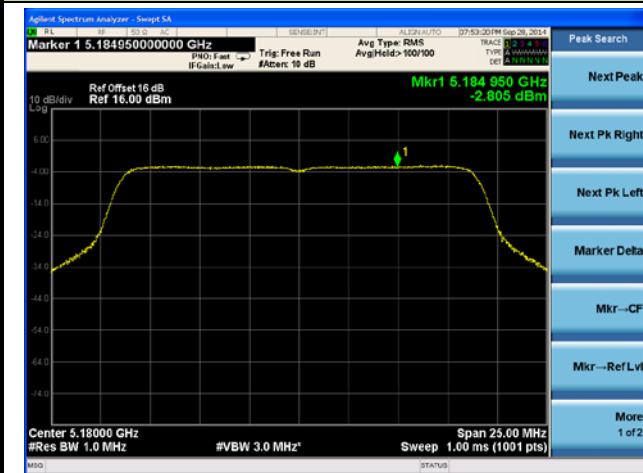


Channel 165 (5825MHz)

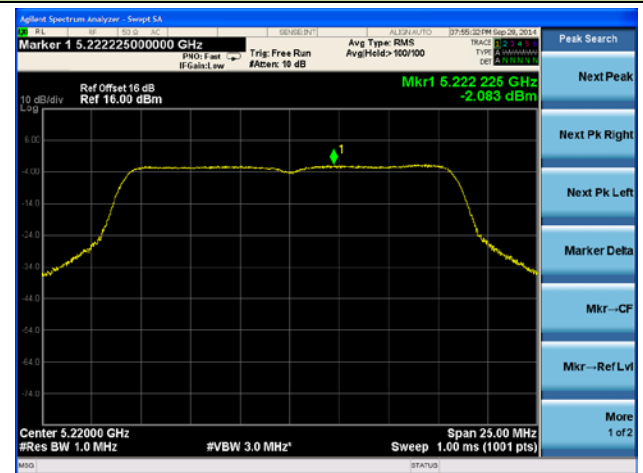


802.11n-HT20 Power Spectral Density - Ant 0 / Ant 0 + 1

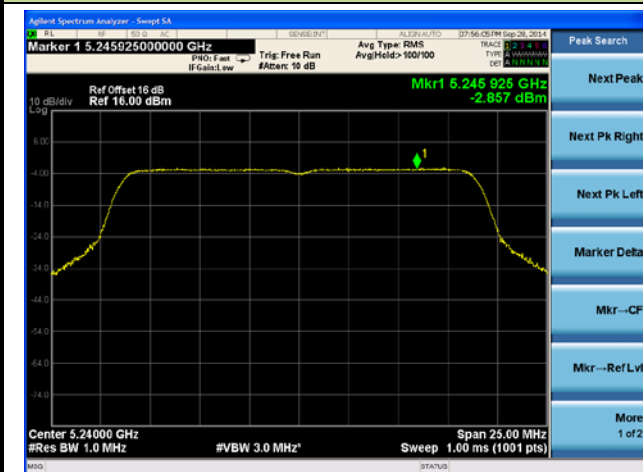
Channel 36 (5180MHz)



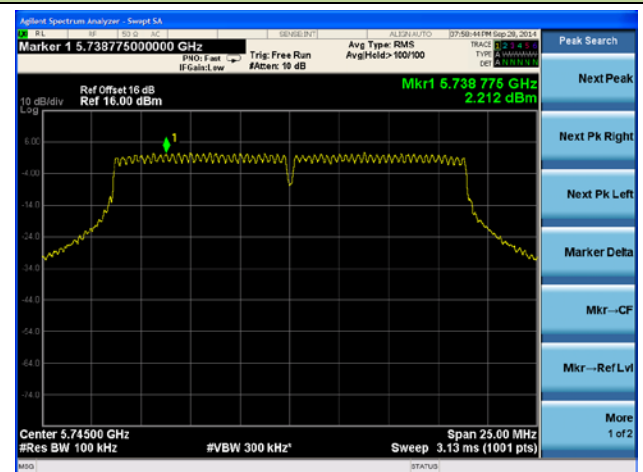
Channel 44 (5220MHz)



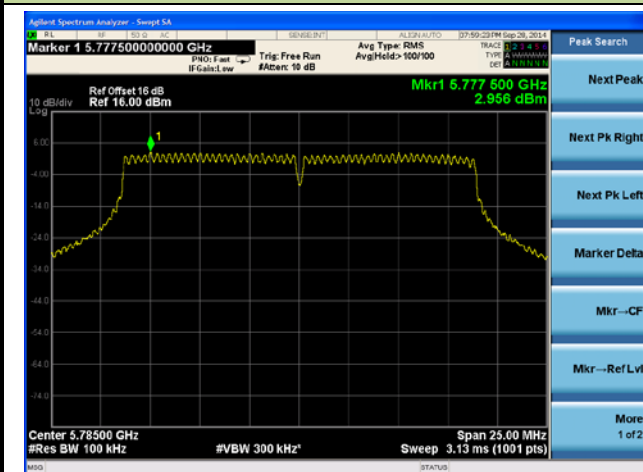
Channel 48 (5240MHz)



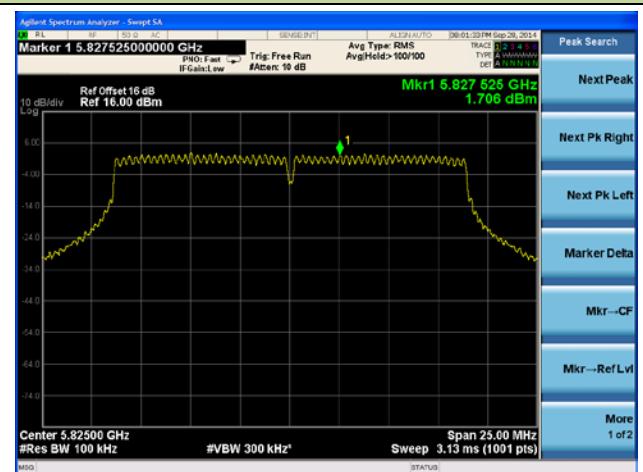
Channel 149 (5745MHz)



Channel 157 (5785MHz)

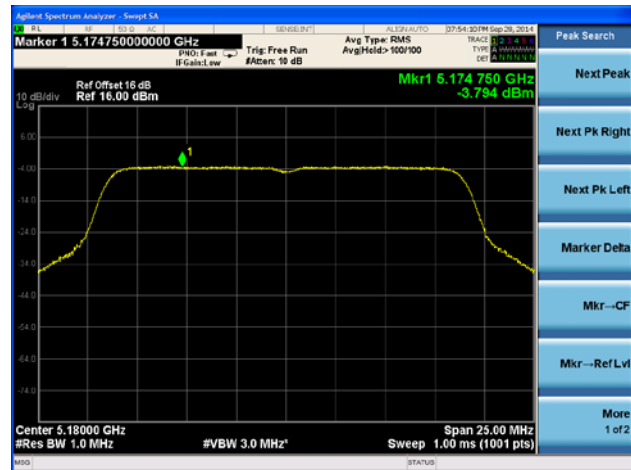


Channel 165 (5825MHz)

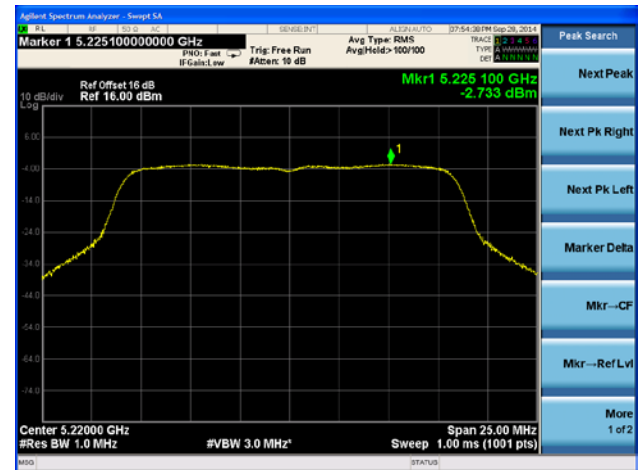


802.11n-HT20 Power Spectral Density - Ant 1 / Ant 0 + 1

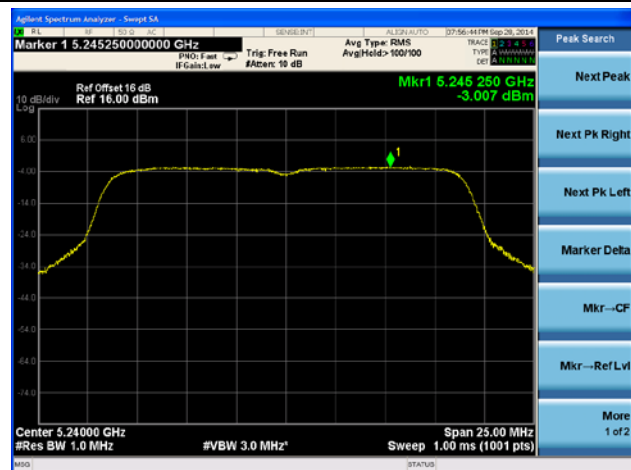
Channel 36 (5180MHz)



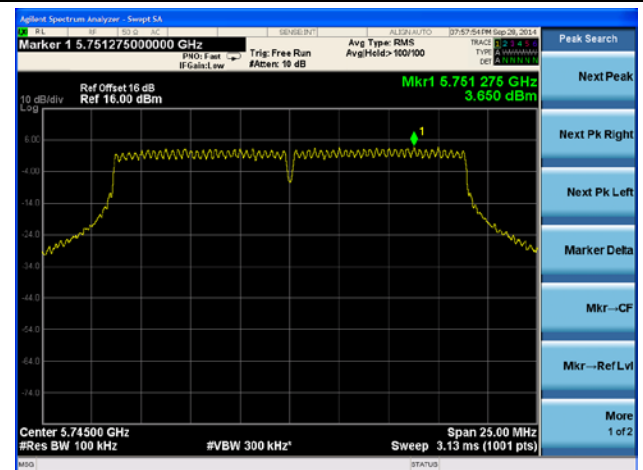
Channel 44 (5220MHz)



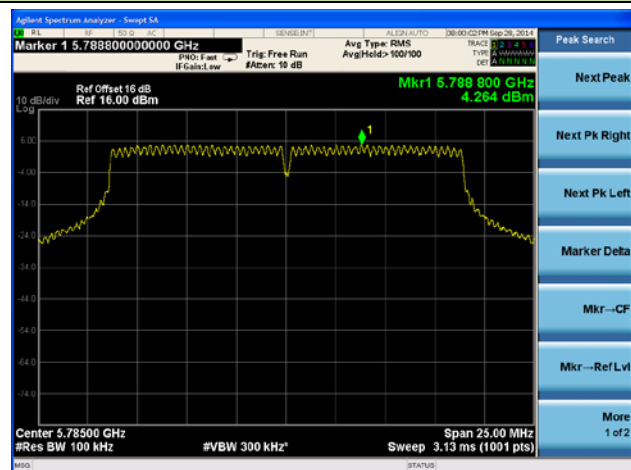
Channel 48 (5240MHz)



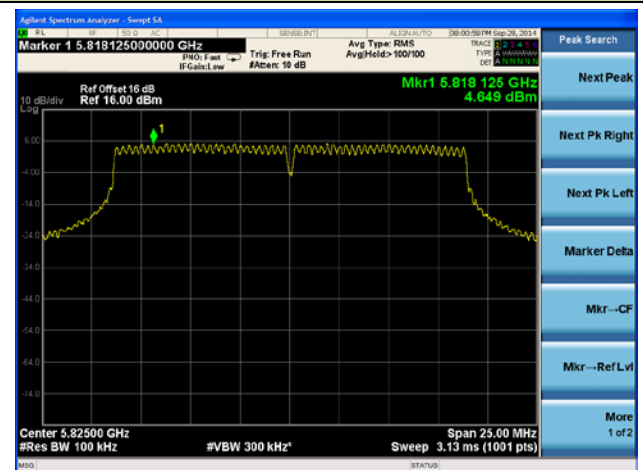
Channel 149 (5745MHz)



Channel 157 (5785MHz)

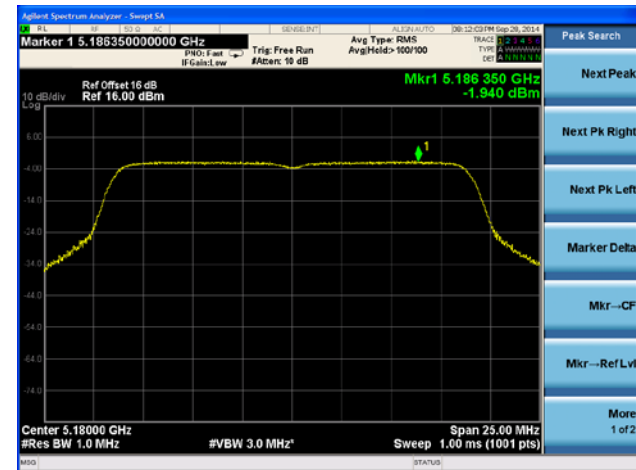


Channel 165 (5825MHz)

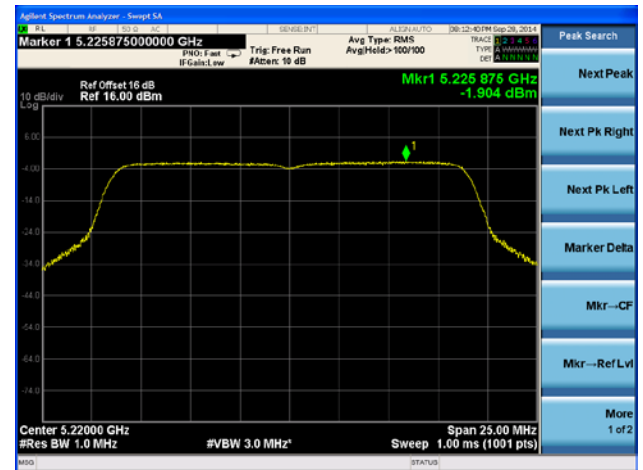


802.11ac-VHT20 Power Spectral Density - Ant 0

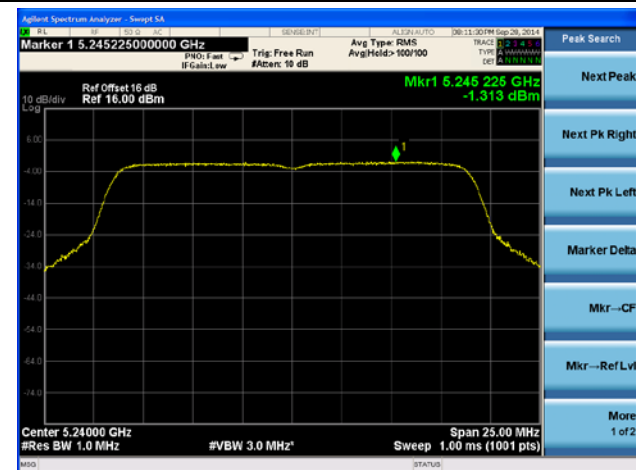
Channel 36 (5180MHz)



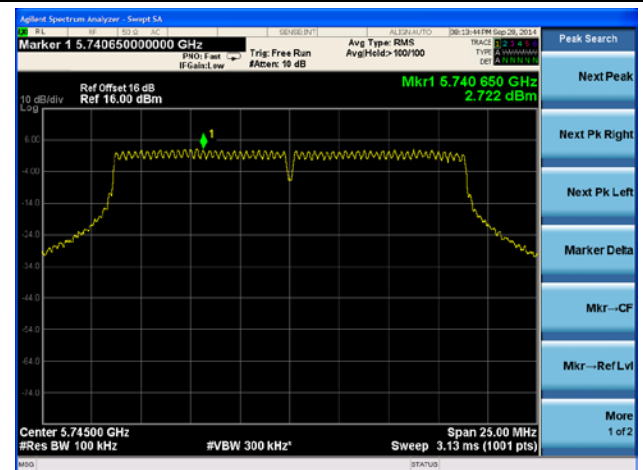
Channel 44 (5220MHz)



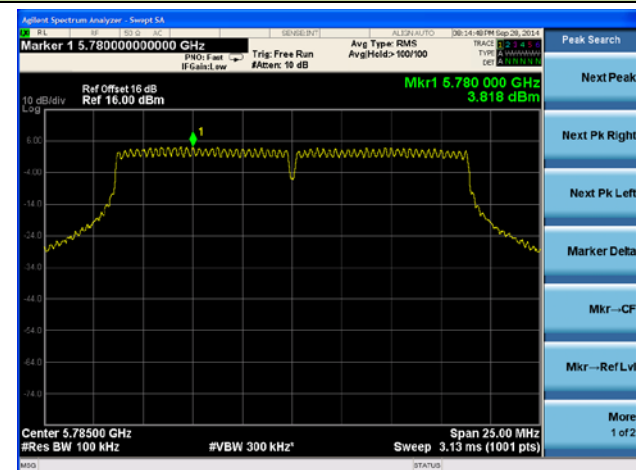
Channel 48 (5240MHz)



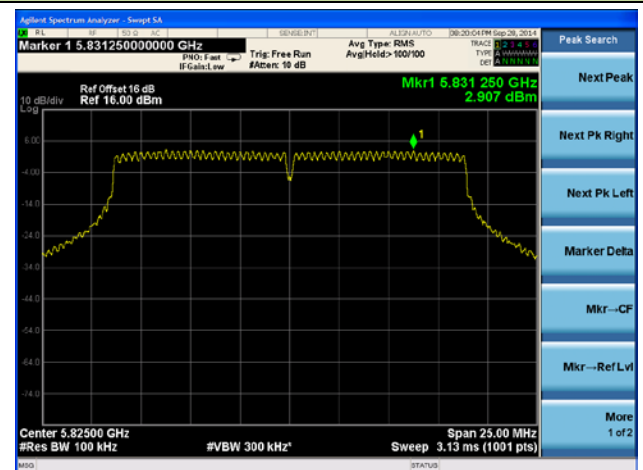
Channel 149 (5745MHz)



Channel 157 (5785MHz)

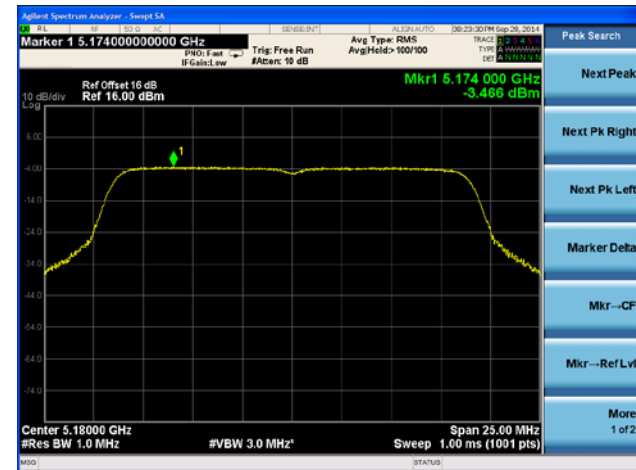


Channel 165 (5825MHz)

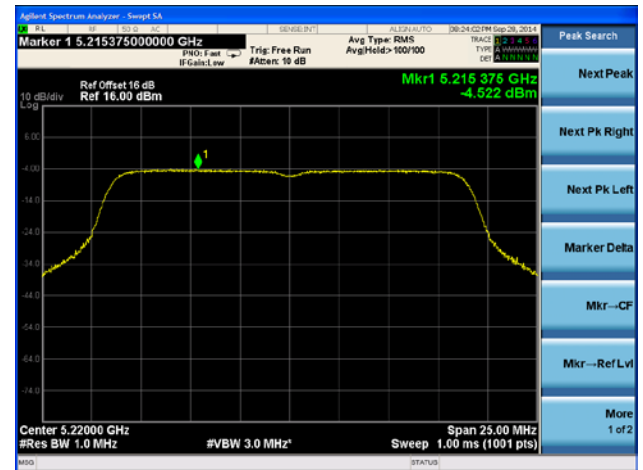


802.11ac-VHT20 Power Spectral Density - Ant 1

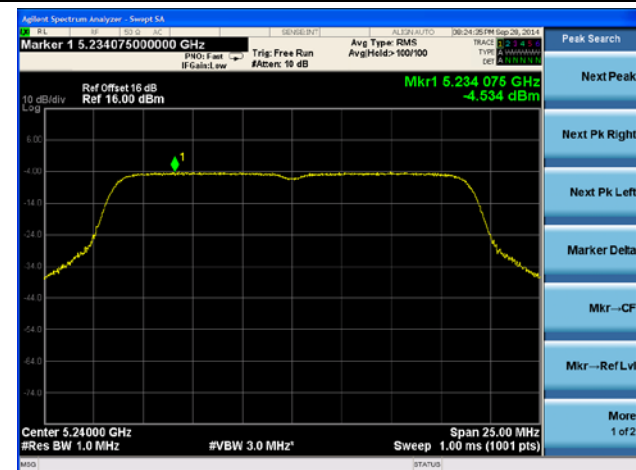
Channel 36 (5180MHz)



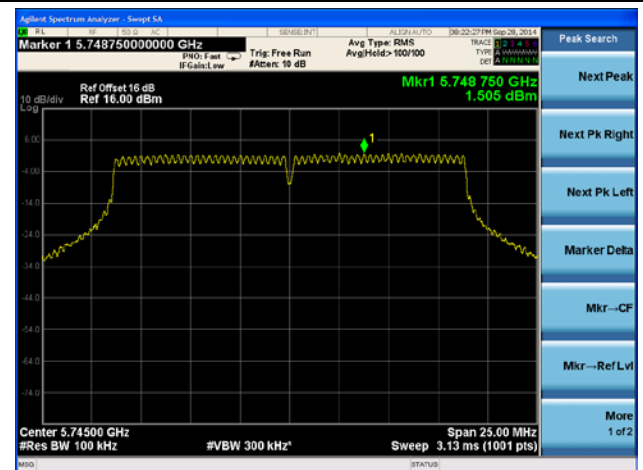
Channel 44 (5220MHz)



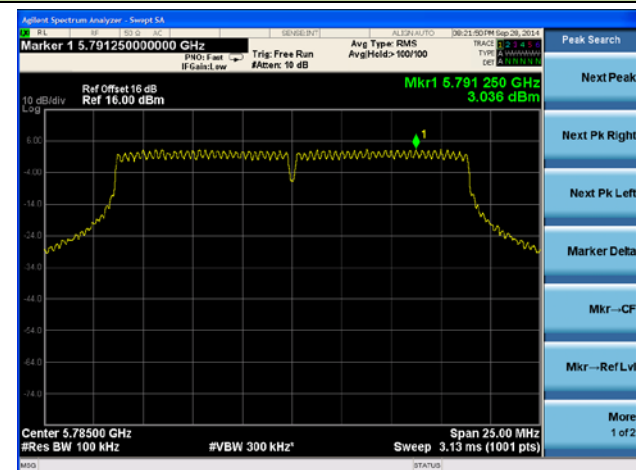
Channel 48 (5240MHz)



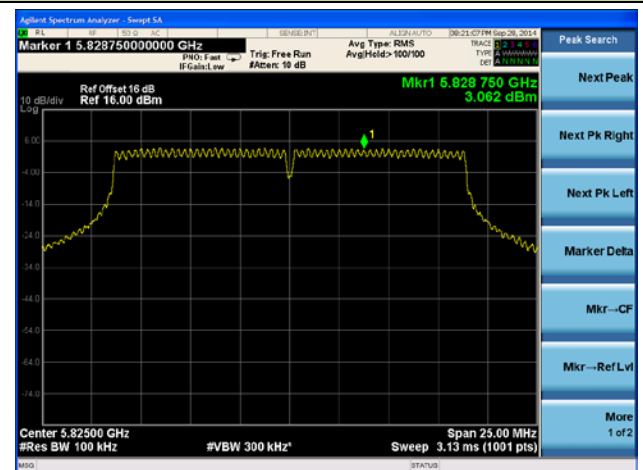
Channel 149 (5745MHz)



Channel 157 (5785MHz)

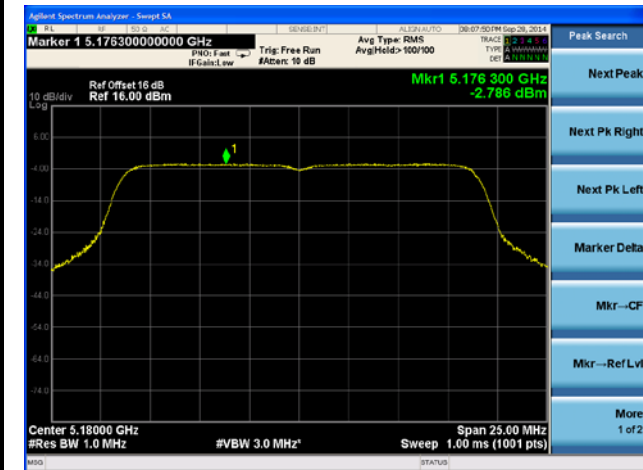


Channel 165 (5825MHz)

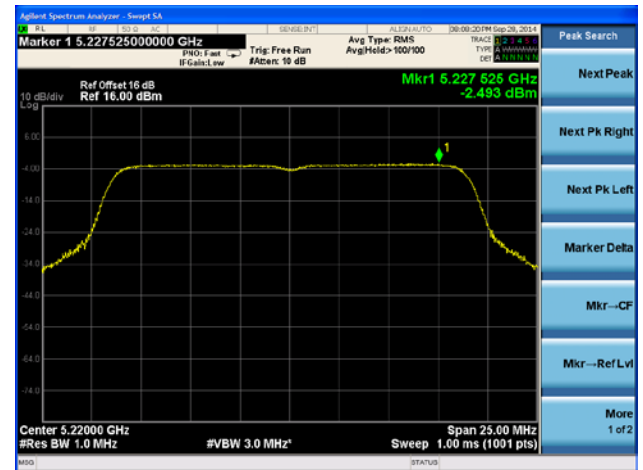


802.11ac-VHT20 Power Spectral Density - Ant 0 / Ant 0 + 1

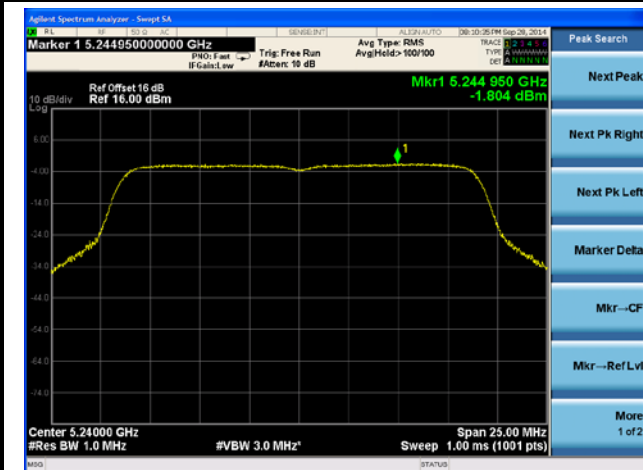
Channel 36 (5180MHz)



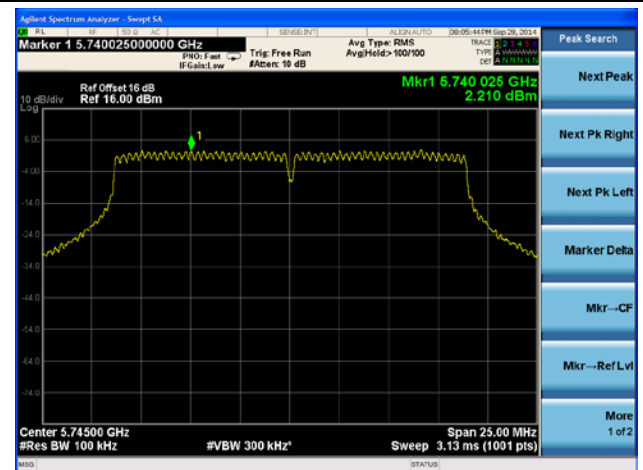
Channel 44 (5220MHz)



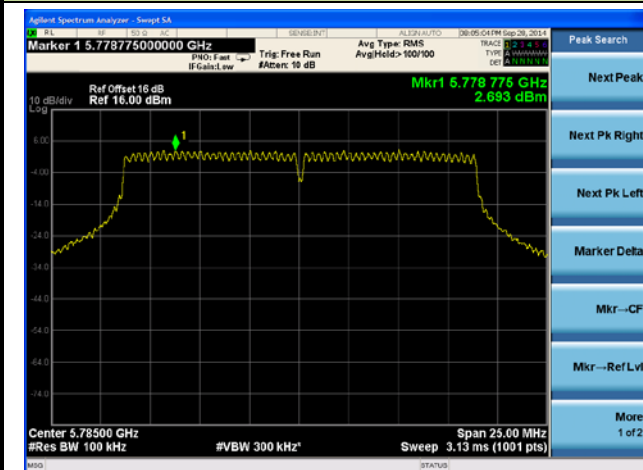
Channel 48 (5240MHz)



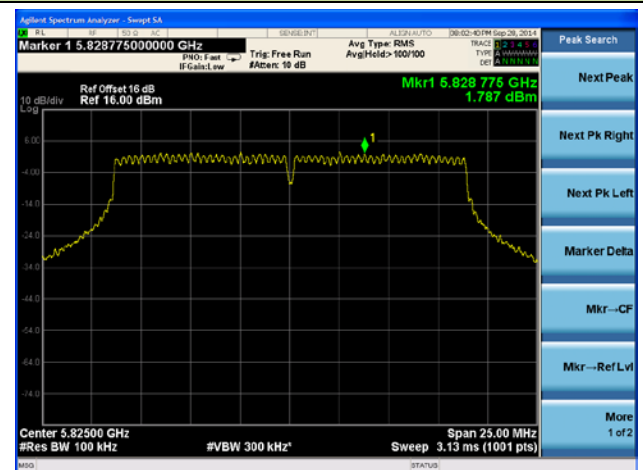
Channel 149 (5745MHz)



Channel 157 (5785MHz)

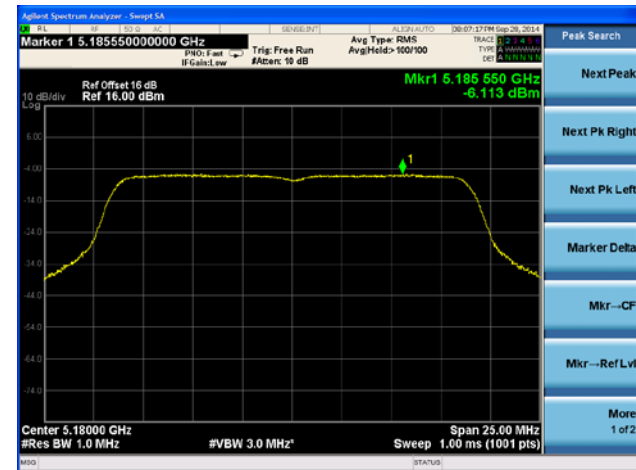


Channel 165 (5825MHz)

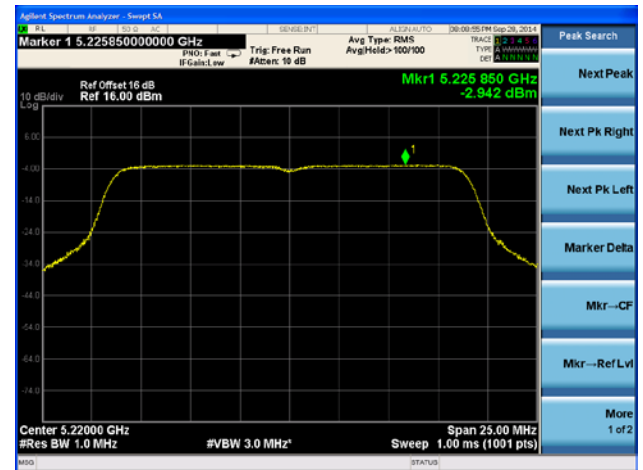


802.11ac-VHT20 Power Spectral Density - Ant 1 / Ant 0 + 1

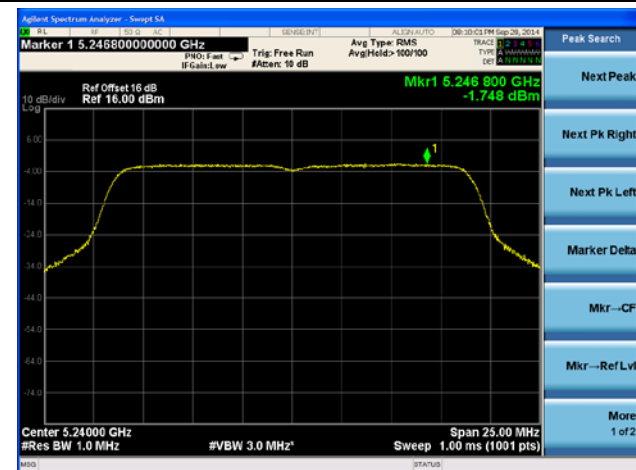
Channel 36 (5180MHz)



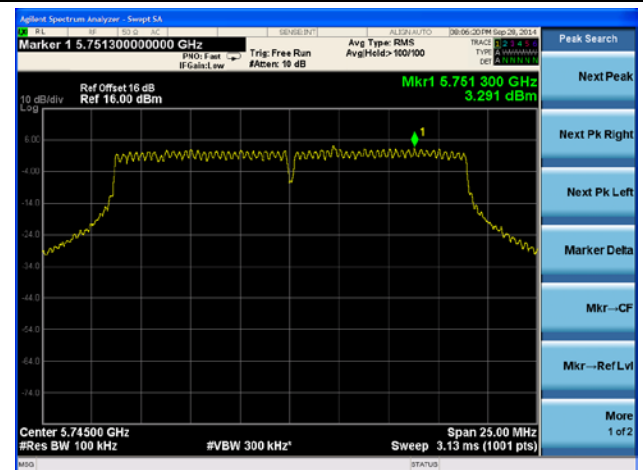
Channel 44 (5220MHz)



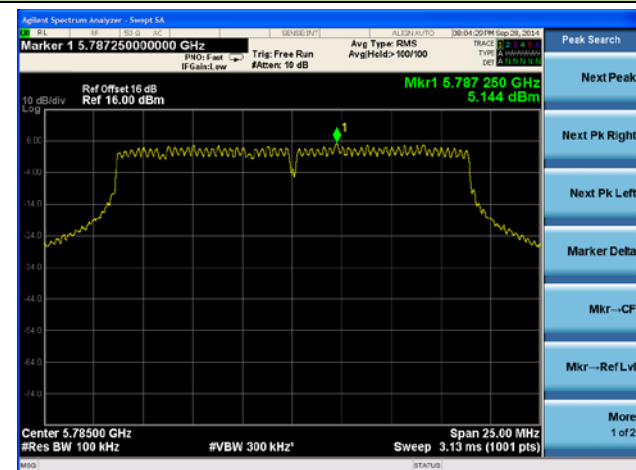
Channel 48 (5240MHz)



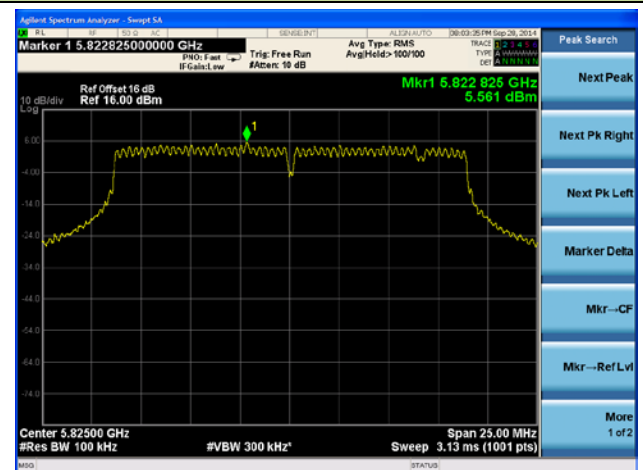
Channel 149 (5745MHz)



Channel 157 (5785MHz)

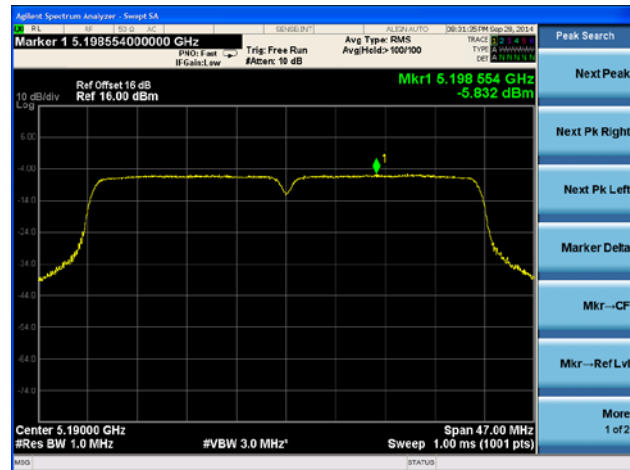


Channel 165 (5825MHz)

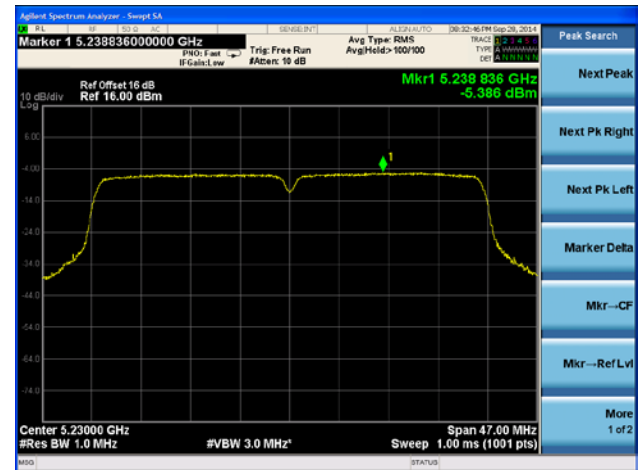


802.11n-HT40 Power Spectral Density - Ant 0

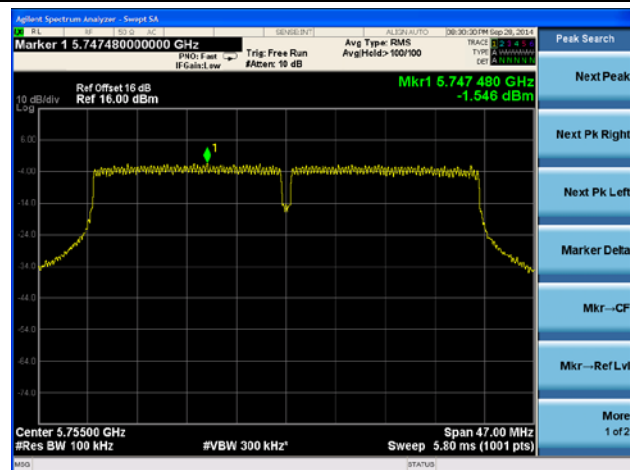
Channel 38 (5190MHz)



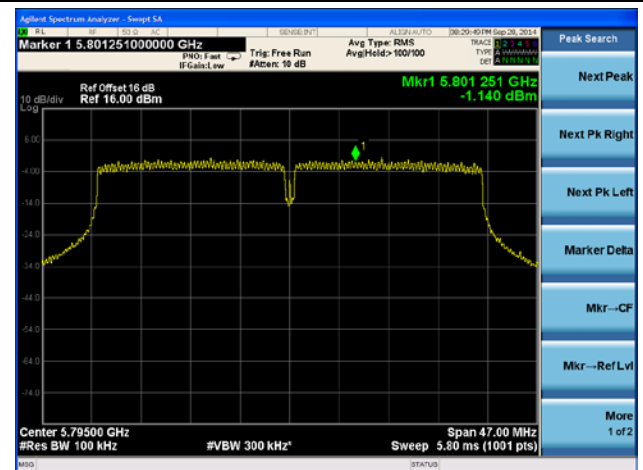
Channel 46 (5230MHz)



Channel 151 (5755MHz)

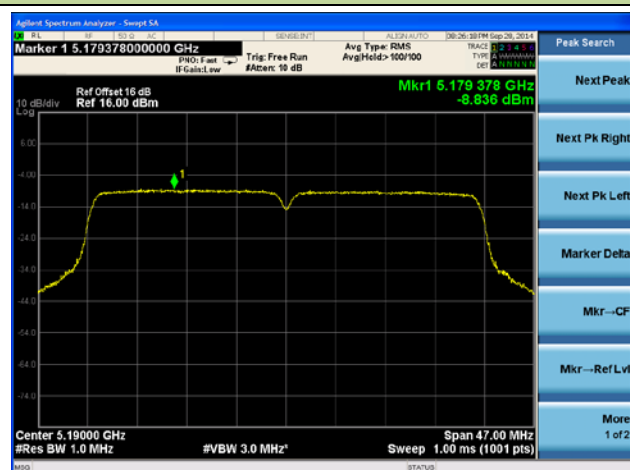


Channel 159 (5795MHz)



802.11n-HT40 Power Spectral Density - Ant 1

Channel 38 (5190MHz)



Channel 46 (5230MHz)

