

Mode	CH	Freq.[MHz]	Test Result[dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (CDD)
802.11ac (VHT40)	38	5190	12.40	12.30	15.36
	46	5230	14.12	13.59	16.87
	54	5270	14.08	13.69	16.90
	62	5310	11.85	11.69	14.78
	102	5510	12.47	12.37	15.43
	118	5590	14.48	14.08	17.29
	142	5710	14.35	14.49	17.43
	151	5755	14.48	14.48	17.49
	159	5795	14.48	14.49	17.50

Mode	CH	Freq.[MHz]	Test Result[dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (CDD)
802.11ac (VHT80)	42	5210	13.80	13.45	16.64
	58	5290	9.84	9.69	12.78
	106	5530	13.99	14.01	17.01
	122	5610	13.86	13.90	16.89
	138	5690	13.85	14.21	17.04
	155	5775	13.85	14.01	16.94

- Summed Output Power: SDM

Mode	CH	Freq. [MHz]	Test Result [dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (SDM)
802.11n (HT20)	36	5180	13.94	13.80	16.88
	40	5200	14.08	14.03	17.07
	48	5240	14.20	14.10	17.16
	52	5260	14.30	14.02	17.17
	60	5300	14.00	14.13	17.08
	64	5320	14.10	14.23	17.18
	100	5500	14.39	14.45	17.43
	120	5600	14.26	14.44	17.36
	144	5720	14.35	14.48	17.43
	149	5745	14.36	14.49	17.44
	157	5785	14.43	14.50	17.48
	165	5825	14.32	14.43	17.39

Mode	CH	Freq.[MHz]	Test Result[dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (SDM)
802.11n (HT40)	38	5190	12.60	12.39	15.51
	46	5230	14.16	13.80	16.99
	54	5270	14.15	13.75	16.96
	62	5310	12.07	11.86	14.98
	102	5510	12.25	12.12	15.20
	118	5590	14.49	14.28	17.40
	142	5710	14.41	14.49	17.46
	151	5755	14.44	14.48	17.47
	159	5795	14.49	14.47	17.49

Mode	CH	Freq.[MHz]	Test Result[dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (SDM)
802.11ac (VHT20)	36	5180	13.95	13.95	16.96
	40	5200	13.98	13.89	16.95
	48	5240	14.19	13.99	17.10
	52	5260	14.10	14.05	17.09
	60	5300	14.03	14.05	17.05
	64	5320	14.02	14.14	17.09
	100	5500	14.49	14.35	17.43
	120	5600	14.27	14.46	17.38
	144	5720	14.30	14.48	17.40
	149	5745	14.40	14.46	17.44
	157	5785	14.43	14.48	17.47
	165	5825	14.20	14.44	17.33

Mode	CH	Freq.[MHz]	Test Result[dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (SDM)
802.11ac (VHT40)	38	5190	12.45	12.44	15.46
	46	5230	14.15	13.93	17.05
	54	5270	14.14	14.02	17.09
	62	5310	11.92	11.95	14.95
	102	5510	12.39	12.15	15.28
	118	5590	14.32	14.40	17.37
	142	5710	14.28	14.48	17.39
	151	5755	14.46	14.45	17.47
	159	5795	14.49	14.49	17.50

Mode	CH	Freq.[MHz]	Test Result[dBm]		
			ANT 1	ANT 2	ANT1+ANT2 (SDM)
802.11ac (VHT80)	42	5210	13.65	13.55	16.61
	58	5290	9.85	9.76	12.82
	106	5530	14.10	14.10	17.11
	122	5610	13.95	13.22	16.61
	138	5690	13.90	14.35	17.14
	155	5775	13.99	14.11	17.06

8.4 Maximum Power Spectral Density

■ Test requirements

Part. 15.407(a)

(1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. ^{note1}

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. ^{note1}

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, 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.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. ^{note1}

(2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. ^{note1}

(3) For the band 5.725 - 5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. ^{note1,note2}

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: 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. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

- Peak Power Spectral Density Limit Calculation

Band	Limit [dBm]	Antenna Gain (Worst case) [dBi]	Determined Limit [dBm]
U-NII 1	11	2.27	11
U-NII 2A	11	3.06	11
U-NII 2C	11	3.34	11
U-NII 3	30	1.64	30

■ Test Configuration

Refer to the APPENDIX I.

■ Test procedure

Maximum Power Spectral Density is measured using Measurement Procedure of **KDB789033 D02v02r01**

- 1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA - 1, SA - 2, SA - 3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
- 2) Use the peak search function on the instrument to find the peak of the spectrum and record its value.
- 3) Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) **If Method SA - 2 or SA - 2 Alternative was used, add $10 \log(1 / x)$, where x is the duty cycle, to the peak of the spectrum.**
 - b) If Method SA - 3 Alternative was used and the linear mode was used in step II.E.2.g (viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
- 4) The result is the Maximum PSD over 1 MHz reference bandwidth.
- 5) For devices operating in the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, and 5.47 - 5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725 - 5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set $RBW \geq 1 / T$, where T is defined in section II.B.1.a). (Refer to Appendix II)
 - b) Set $VBW \geq 3 RBW$.
 - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log(500 \text{ kHz} / RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log(1 \text{ MHz} / RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW = 100 kHz is available on nearly all spectrum analyzers.

■ Test results: **Comply**

- Power spectral density: Single

Mode	Channel	Frequency [MHz]	Reading [dBm]		T.F [dB] Note 1	Test Result [dBm]	
			ANT 1	ANT 2		ANT 1	ANT 2
802.11a	36	5180	6.52	6.11	0.08	6.60	6.19
	40	5200	6.69	6.33		6.77	6.41
	48	5240	6.56	6.25		6.64	6.33
	52	5260	6.61	6.05		6.69	6.13
	60	5300	6.44	6.32		6.52	6.40
	64	5320	6.46	6.44		6.54	6.52
	100	5500	6.48	6.94		6.56	7.02
	120	5600	7.14	7.01		7.22	7.09
	144	5720	6.81	7.17		6.89	7.25
	149	5745	-1.46	-1.91	7.07	5.61	5.16
	157	5785	-1.66	-1.66		5.41	5.41
	165	5825	-1.74	-1.76		5.33	5.31
802.11n (HT20)	36	5180	4.55	4.40	0.10	4.65	4.50
	40	5200	4.54	4.13		4.64	4.23
	48	5240	4.59	4.37		4.69	4.47
	52	5260	4.88	4.44		4.98	4.54
	60	5300	4.65	4.50		4.75	4.60
	64	5320	4.81	4.64		4.91	4.74
	100	5500	5.05	5.16		5.15	5.26
	120	5600	5.16	5.16		5.26	5.26
	144	5720	4.61	5.29		4.71	5.39
	149	5745	-4.01	-3.36	7.09	3.08	3.73
	157	5785	-4.13	-3.51		2.96	3.58
	165	5825	-4.40	-3.42		2.69	3.67
802.11n (HT40)	38	5190	0.63	0.57	0.13	0.76	0.70
	46	5230	2.30	2.04		2.43	2.17
	54	5270	2.19	1.88		2.32	2.01
	62	5310	0.35	-0.11		0.48	0.02
	102	5510	0.79	0.78		0.92	0.91
	118	5590	2.84	2.48		2.97	2.61
	142	5710	2.53	3.00		2.66	3.13
	151	5755	-6.74	-6.16	7.12	0.38	0.96
	159	5795	-6.50	-6.07		0.62	1.05
802.11ac (VHT80)	42	5210	-1.25	-1.63	0.14	-1.11	-1.49
	58	5290	-5.35	-5.50		-5.21	-5.36
	106	5530	-0.31	-0.57		-0.17	-0.43
	122	5610	-0.58	-0.51		-0.44	-0.37
	138	5690	-0.57	-0.42		-0.43	-0.28
	155	5775	-9.79	-9.98	7.13	-2.66	-2.85

Note 1: "Band 1, 2A, 2C [T.F] = 10*LOG(1000kHz/RBW) + D.C.F"

"Band 3 [T.F] = 10*LOG(500kHz/RBW) + D.C.F"

For D.C.F., please refer to appendix II.

Note 2: Test Result = Reading value + T.F

- Summed Power spectral density: CDD

Mode	Channel	Frequency [MHz]	Test Result [dBm]		Test Result [dBm]
			ANT 1	ANT 2	ANT1+ANT2 (CDD)
802.11a	36	5180	6.60	6.19	9.41
	40	5200	6.77	6.41	9.60
	48	5240	6.64	6.33	9.50
	52	5260	6.69	6.13	9.43
	60	5300	6.52	6.40	9.47
	64	5320	6.54	6.52	9.54
	100	5500	6.56	7.02	9.80
	120	5600	7.22	7.09	10.17
	144	5720	6.89	7.25	10.08
	149	5745	5.61	5.16	8.40
	157	5785	5.41	5.41	8.42
	165	5825	5.33	5.31	8.33
802.11n (HT20)	36	5180	4.65	4.50	7.58
	40	5200	4.64	4.23	7.45
	48	5240	4.69	4.47	7.59
	52	5260	4.98	4.54	7.78
	60	5300	4.75	4.60	7.68
	64	5320	4.91	4.74	7.83
	100	5500	5.15	5.26	8.21
	120	5600	5.26	5.26	8.27
	144	5720	4.71	5.39	8.07
	149	5745	3.08	3.73	6.43
	157	5785	2.96	3.58	6.29
	165	5825	2.69	3.67	6.22
802.11n (HT40)	38	5190	0.76	0.70	3.74
	46	5230	2.43	2.17	5.31
	54	5270	2.32	2.01	5.18
	62	5310	0.48	0.02	3.27
	102	5510	0.92	0.91	3.93
	118	5590	2.97	2.61	5.81
	142	5710	2.66	3.13	5.91
	151	5755	0.38	0.96	3.69
	159	5795	0.62	1.05	3.85
802.11ac (VHT80)	42	5210	-1.11	-1.49	1.71
	58	5290	-5.21	-5.36	-2.27
	106	5530	-0.17	-0.43	2.71
	122	5610	-0.44	-0.37	2.61
	138	5690	-0.43	-0.28	2.66
	155	5775	-2.66	-2.85	0.26

- Summed Power spectral density: SDM

Mode	Channel	Frequency [MHz]	Reading [dBm]		T.F [dB] Note 1	Test Result [dBm]
			ANT 1	ANT 2		ANT1+ANT2 (SDM)
802.11n (HT20)	36	5180	4.63	4.52	0.17	7.75
	40	5200	4.50	4.54		7.70
	48	5240	4.68	4.48		7.76
	52	5260	4.70	4.34		7.70
	60	5300	4.34	4.45		7.58
	64	5320	4.54	4.60		7.75
	100	5500	5.29	5.27		8.46
	120	5600	4.94	5.14		8.22
	144	5720	5.04	5.25		8.33
	149	5745	-3.76	-3.44	7.16	6.58
	157	5785	-3.59	-2.86		6.96
	165	5825	-3.54	-3.44		6.68
802.11ac (VHT40)	38	5190	0.24	0.34	0.23	3.53
	46	5230	2.04	1.82		5.17
	54	5270	2.04	1.97		5.25
	62	5310	0.10	-0.12		3.23
	102	5510	0.86	0.71		4.02
	118	5590	2.30	2.63		5.71
	142	5710	2.69	2.99		6.08
	151	5755	-5.95	-6.04	7.22	4.24
	159	5795	-6.09	-6.32		4.03
802.11ac (VHT80)	42	5210	-1.18	-1.68	0.26	1.85
	58	5290	-5.03	-5.62		-2.05
	106	5530	-0.26	-0.76		2.77
	122	5610	-0.58	-0.39		2.79
	138	5690	-0.91	-0.03		2.82
	155	5775	-9.53	-9.24	7.25	0.88

Note 1: "Band 1, 2A, 2C [T.F] = 10*LOG(1000kHz/RBW) + D.C.F"

"Band 3 [T.F] = 10*LOG(500kHz/RBW) + D.C.F"

For D.C.F., please refer to appendix II.

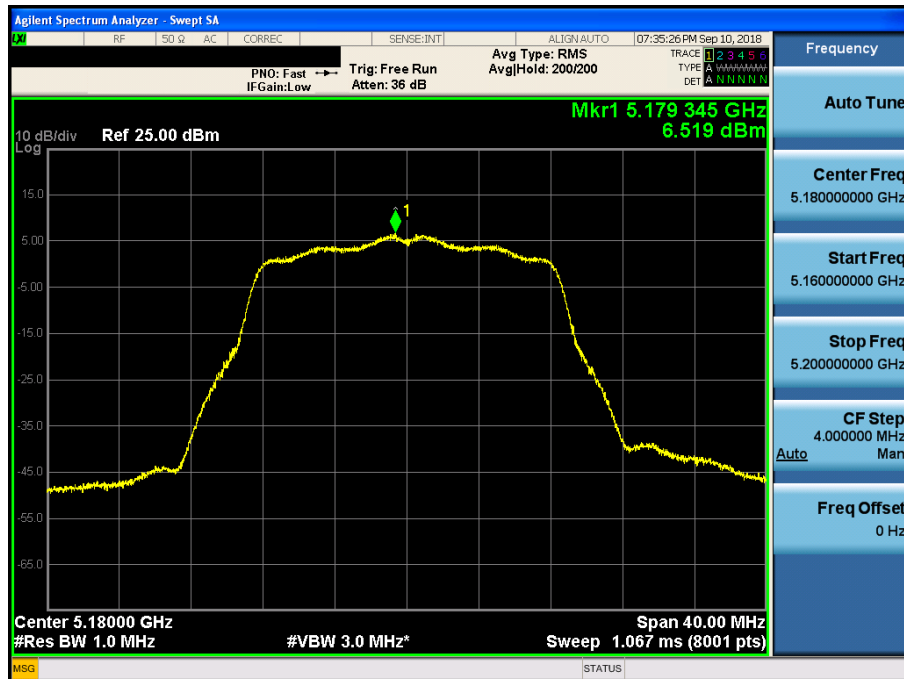
Note 2: Test Result = Reading value(ANT1 + ANT2) + T.F

RESULT PLOTS

- Power spectral density: Single-Antenna 1

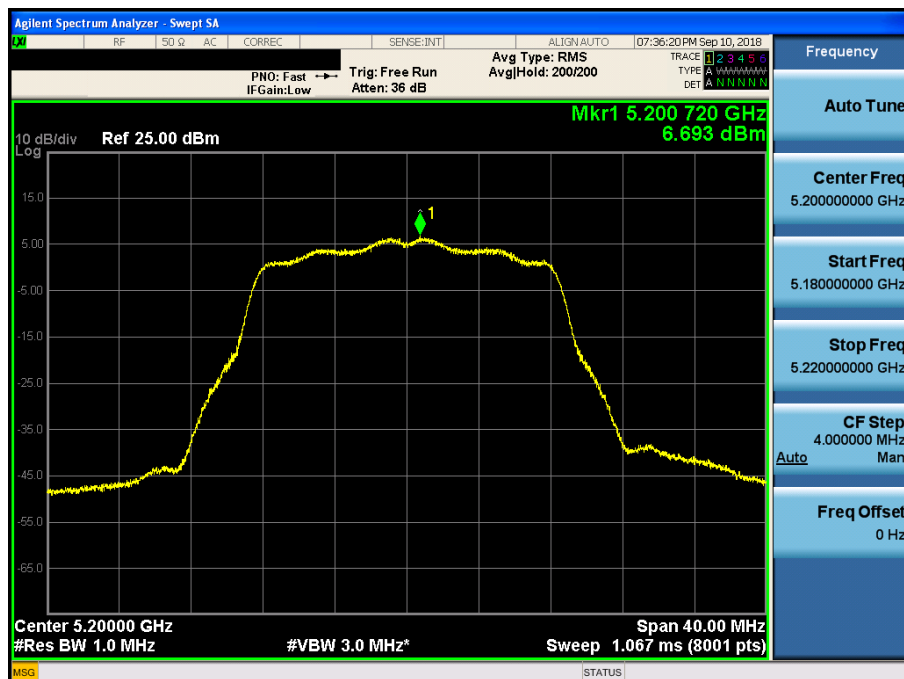
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 1 & Ch.36



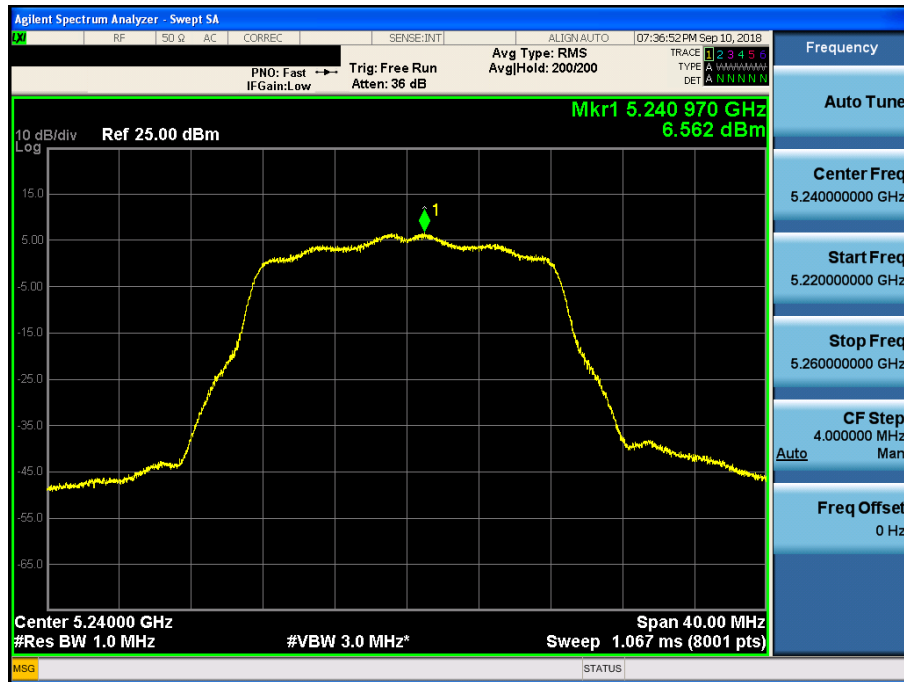
Maximum Power Spectral Density

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Maximum Power Spectral Density

Test Mode: 802.11a & ANT 1 & Ch.48

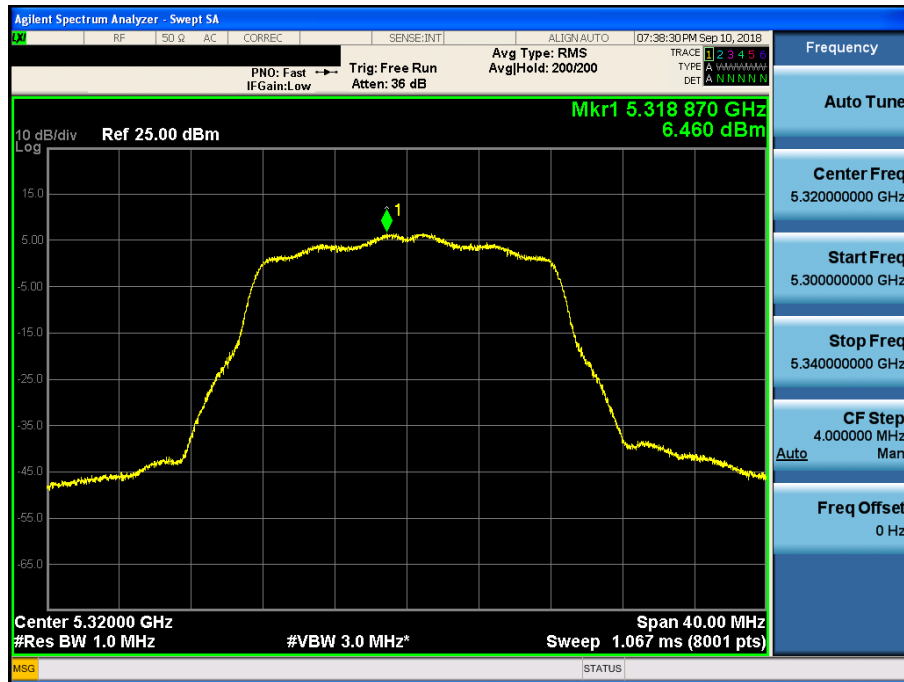


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Test Mode: 802.11a & ANT 1 & Ch.60

Maximum Power Spectral Density

Test Mode: 802.11a & ANT 1 & Ch.64

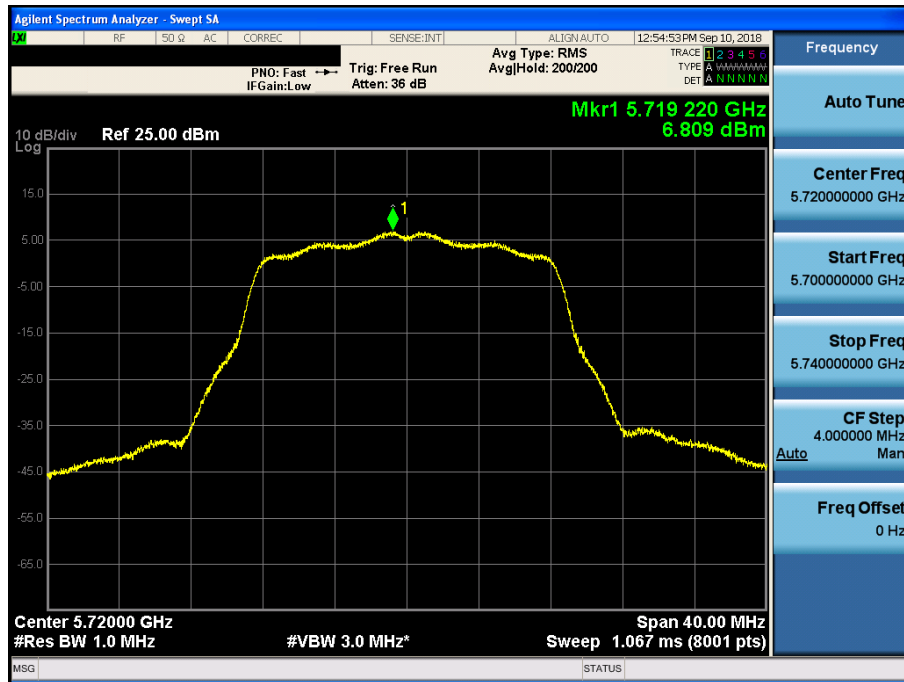


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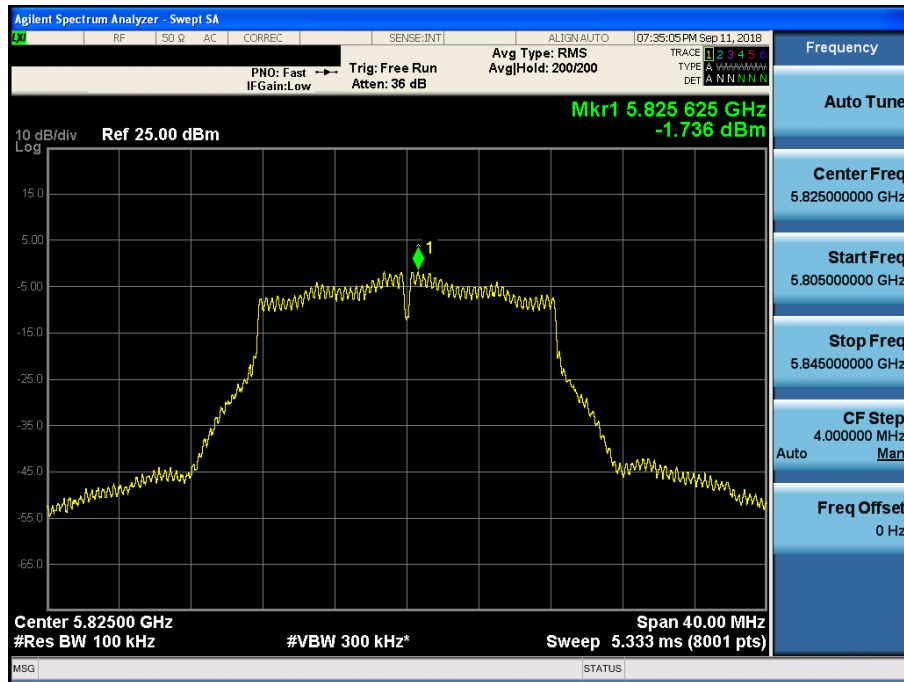
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 1 & Ch.144



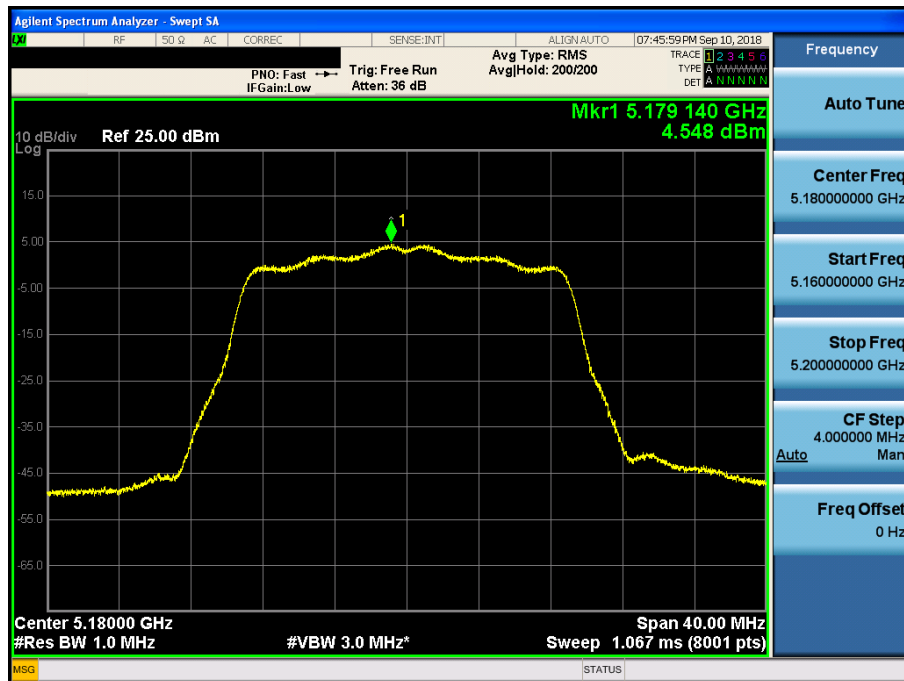
Maximum Power Spectral Density

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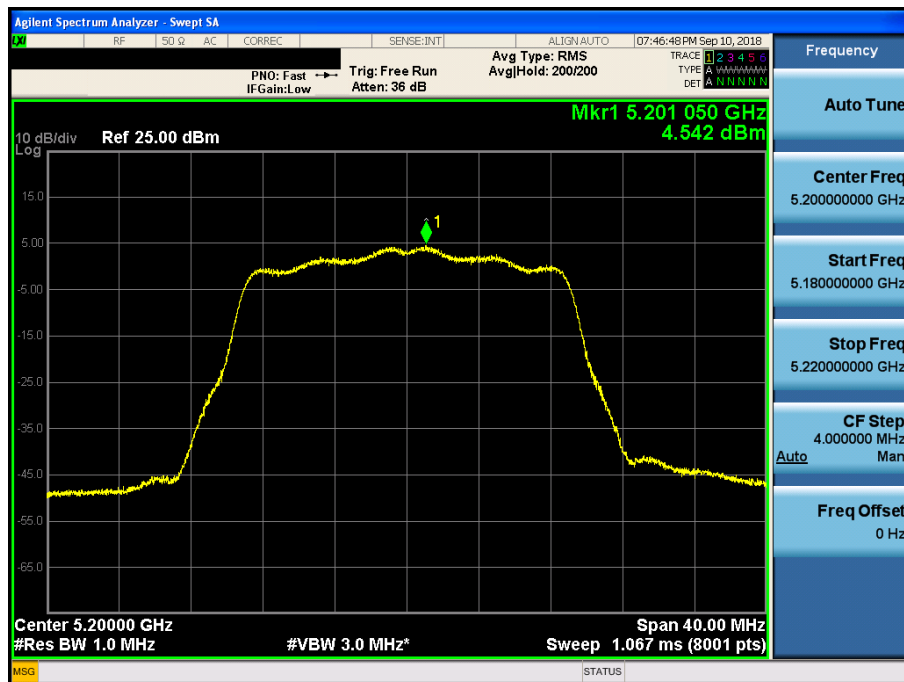
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.36



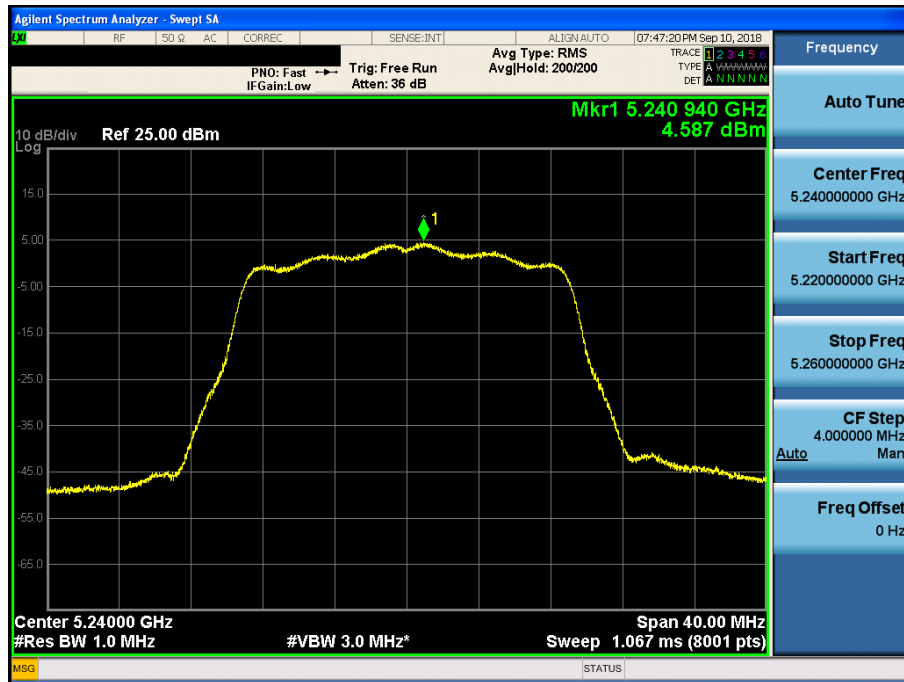
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.40



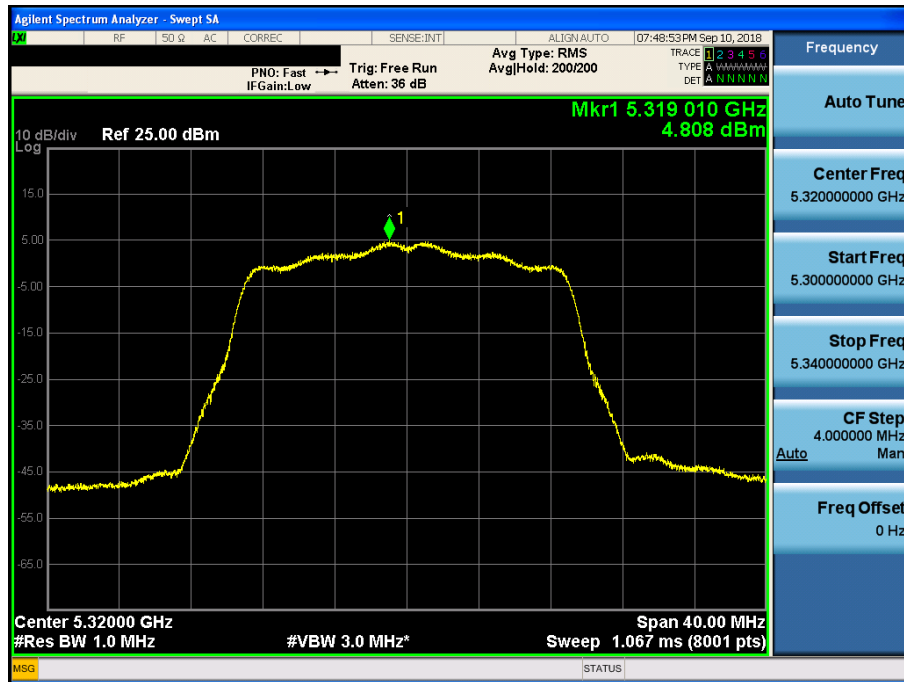
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.48



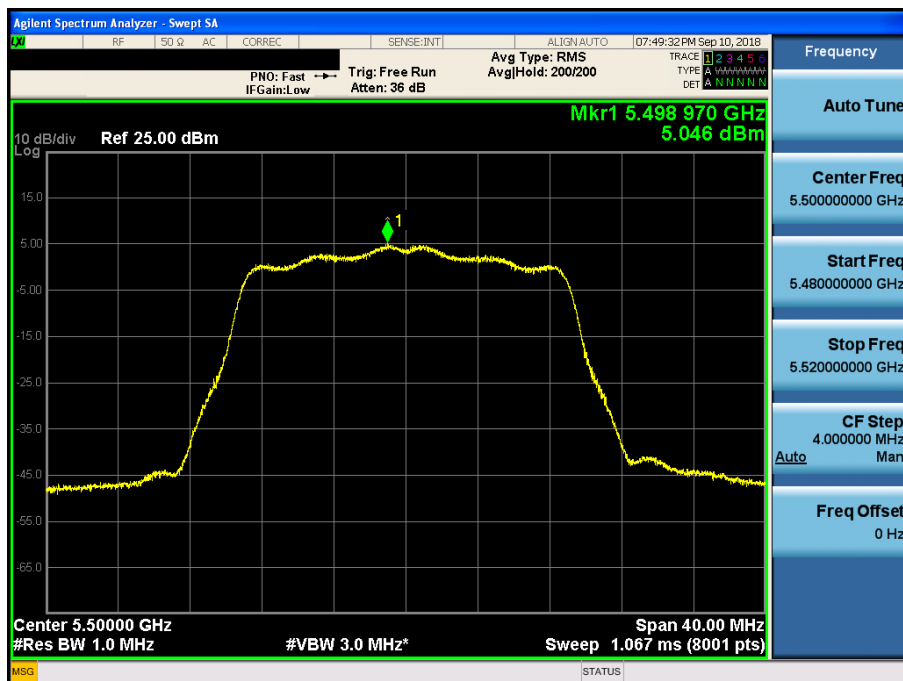
Maximum Power Spectral Density

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Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.100



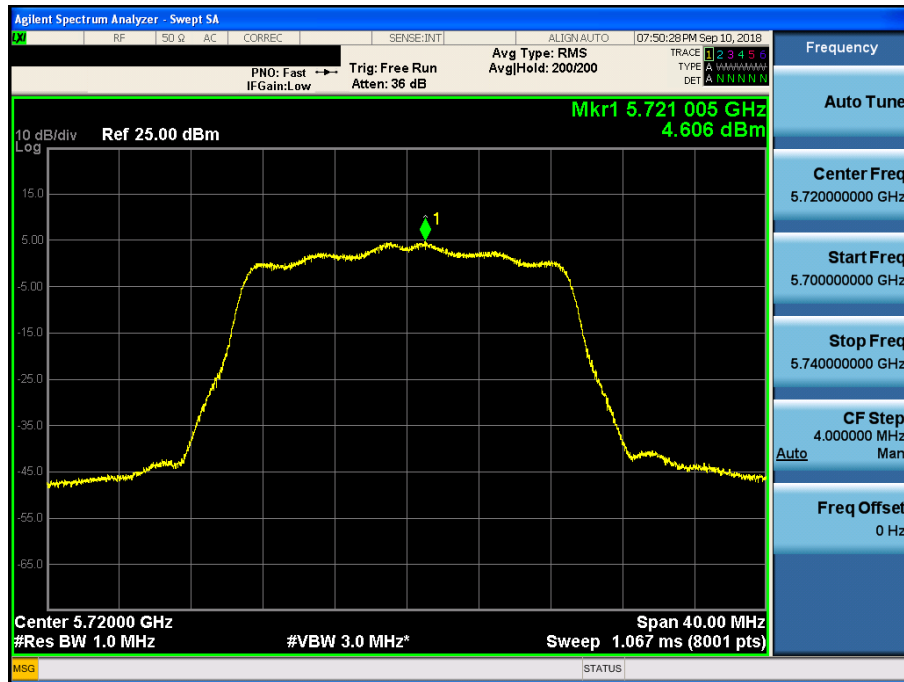
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.120



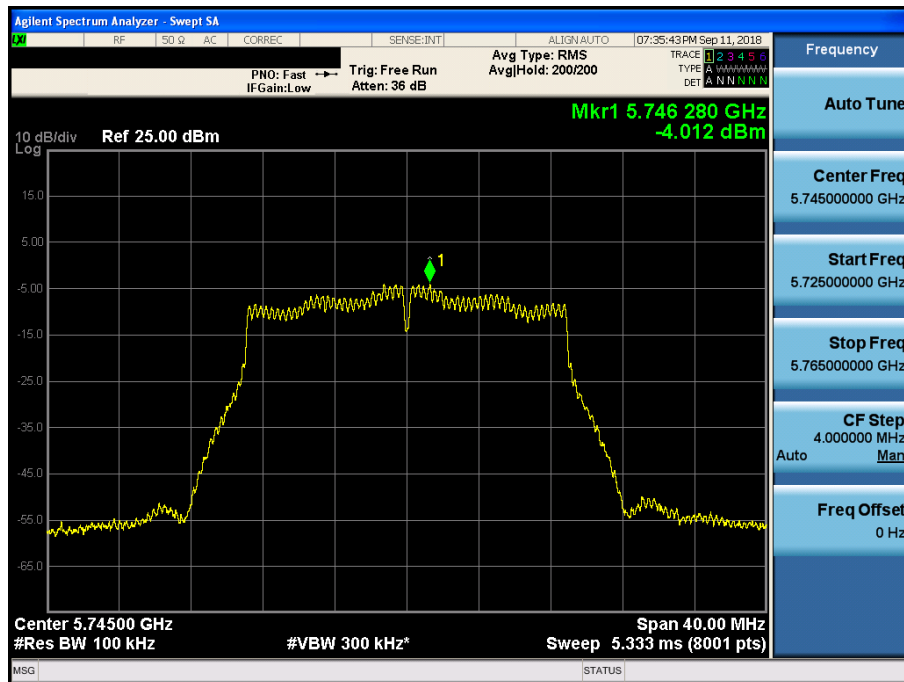
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.144



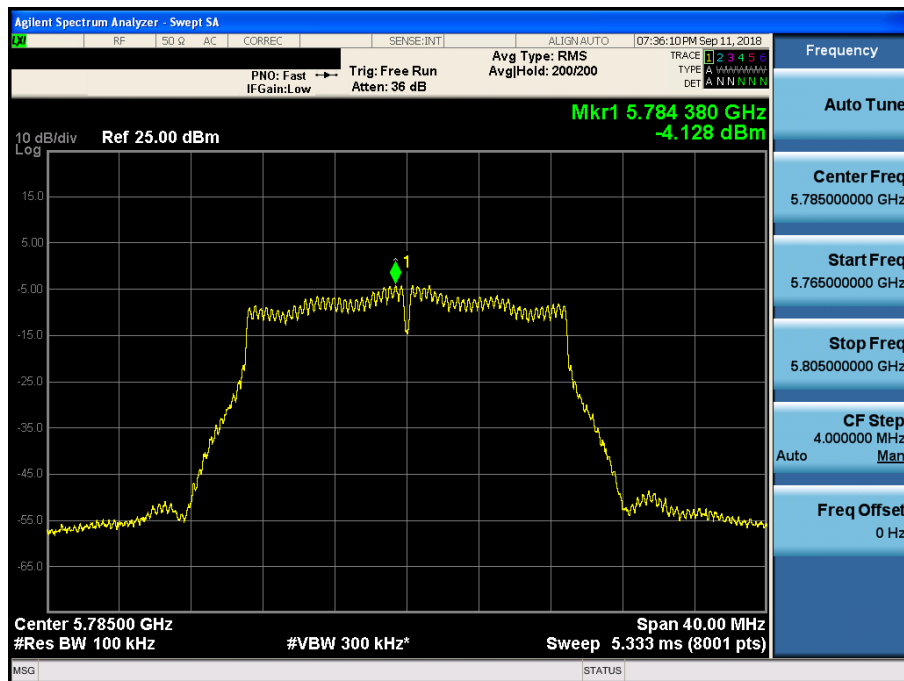
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.149



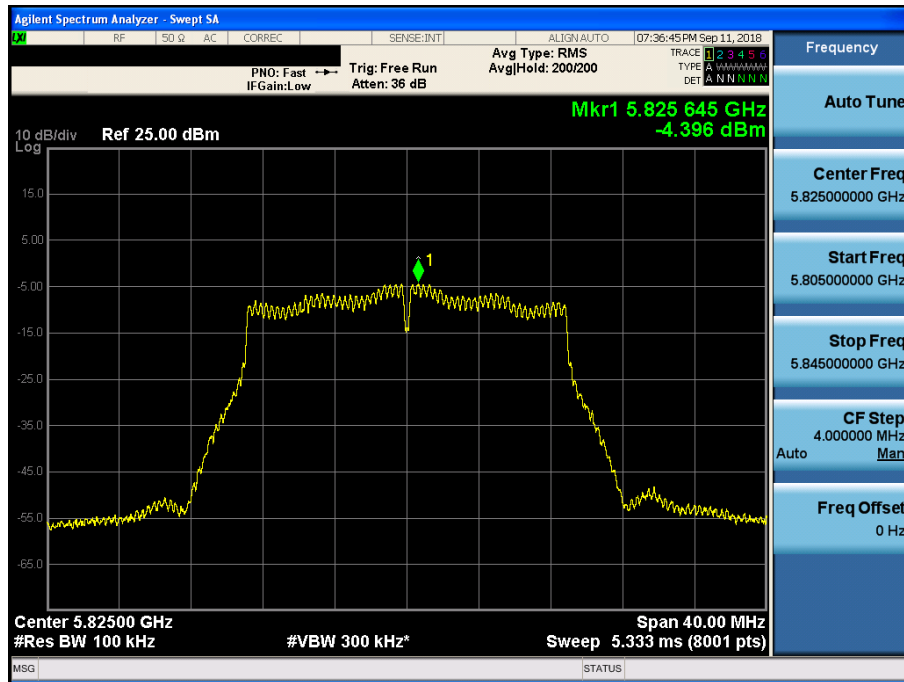
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.157



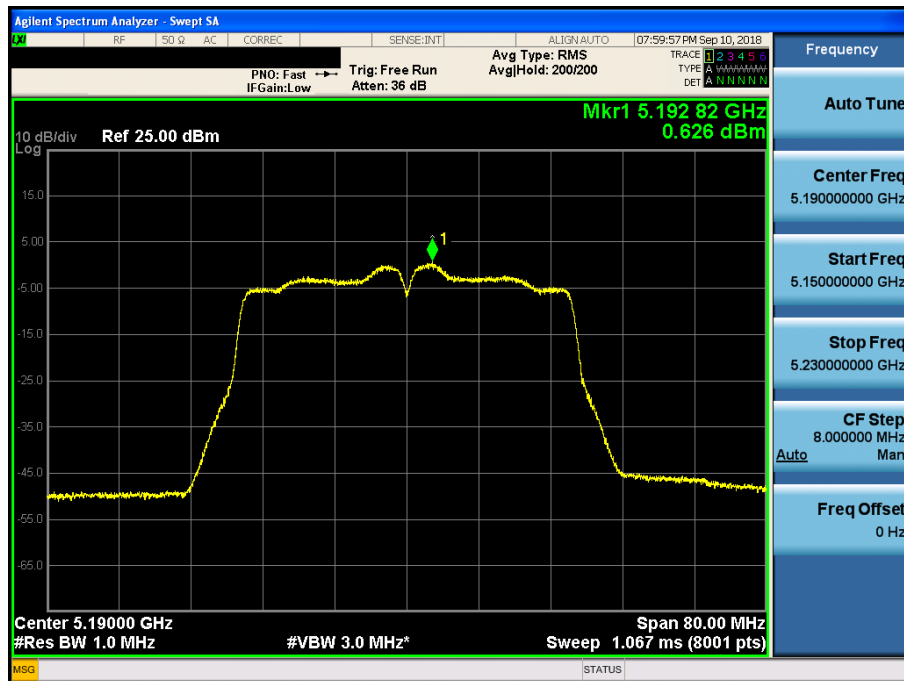
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 1 & Ch.165



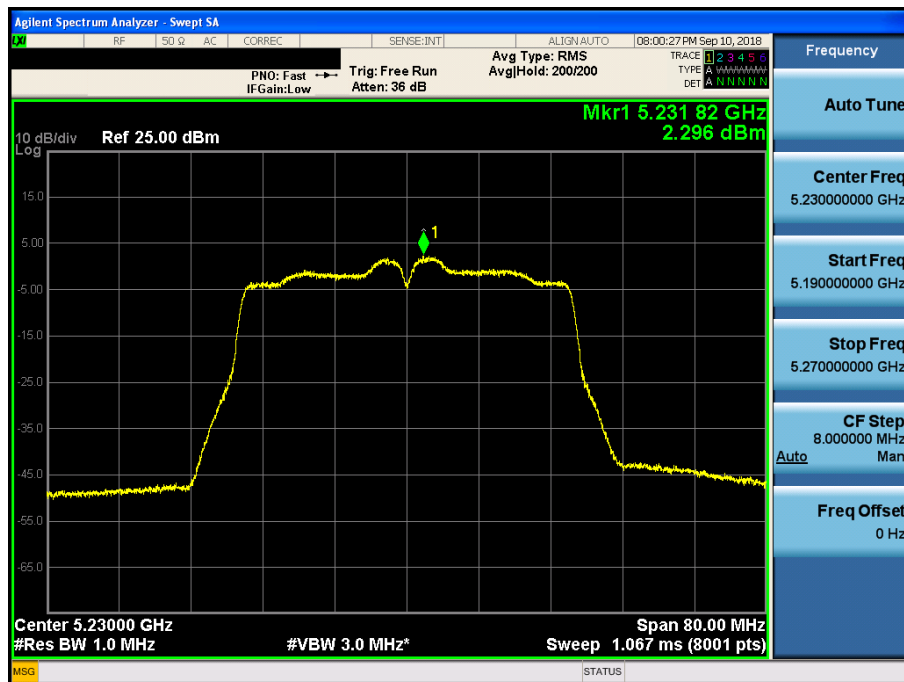
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 1 & Ch.38



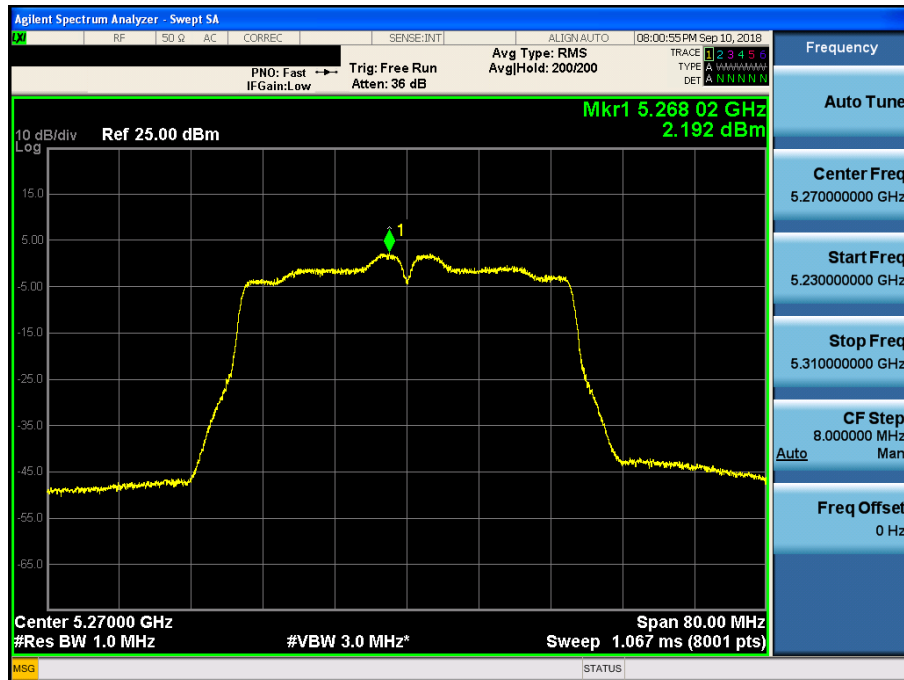
Maximum Power Spectral Density

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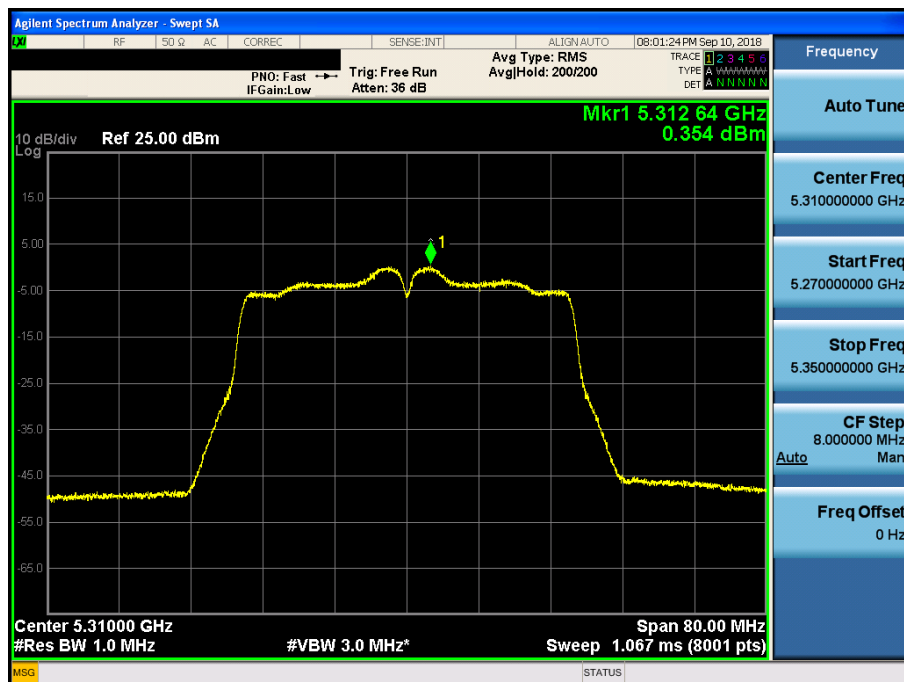
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 1 & Ch.54



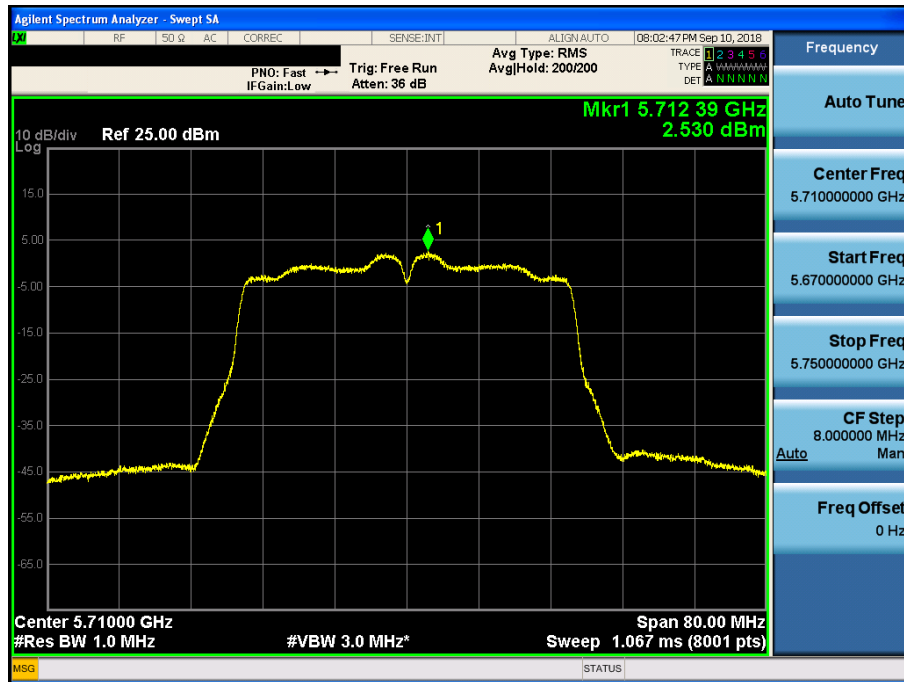
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 1 & Ch.62



Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 1 & Ch.142



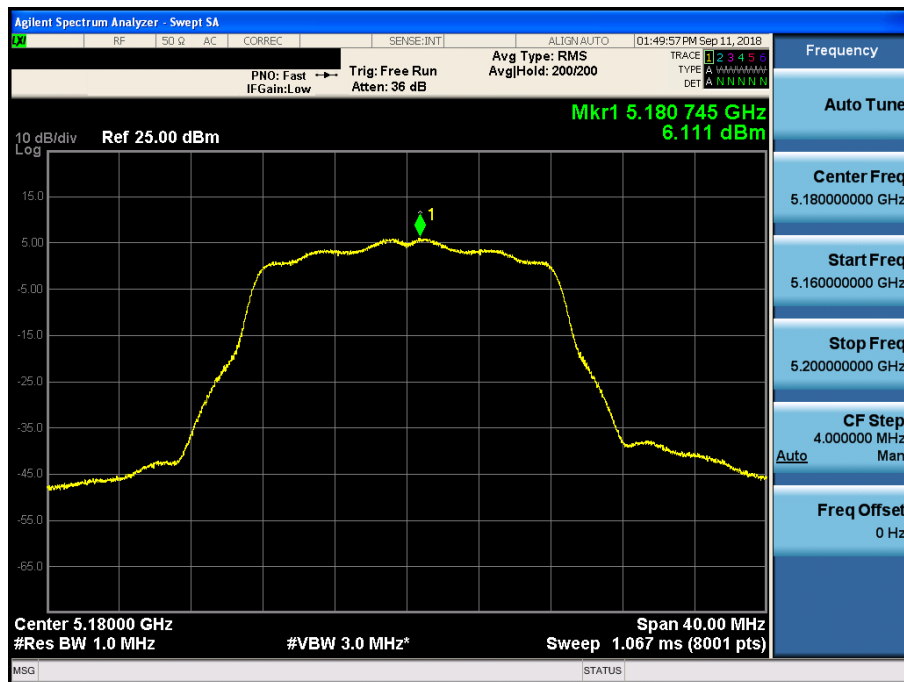
Test Mode: 802.11ac VHT80 & ANT 1 & Ch.42

Test Mode: 802.11ac VHT80 & ANT 1 & Ch.58

- Power spectral density: Single-Antenna 2

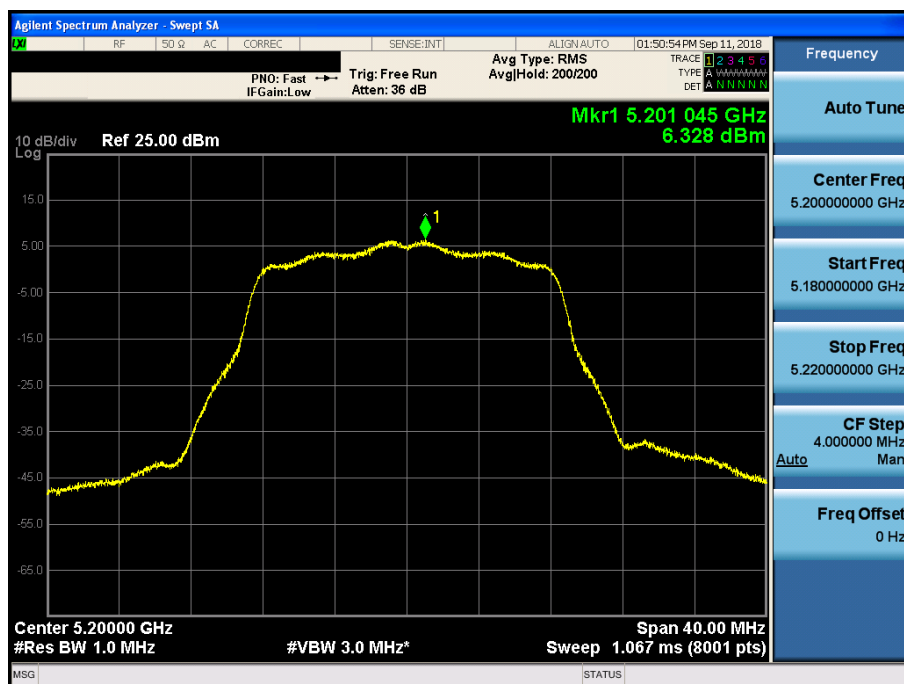
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.36



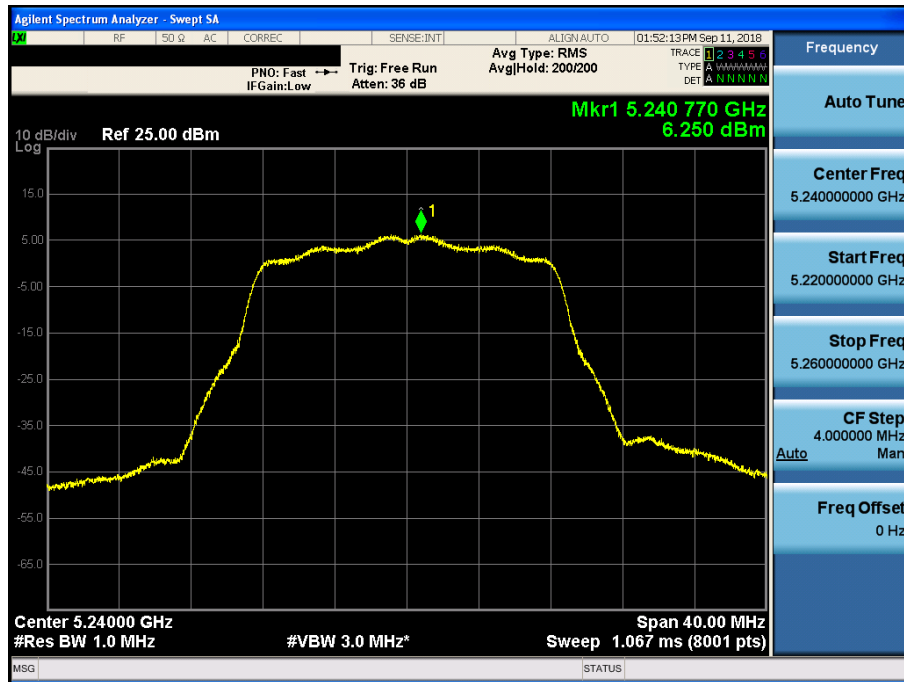
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.40



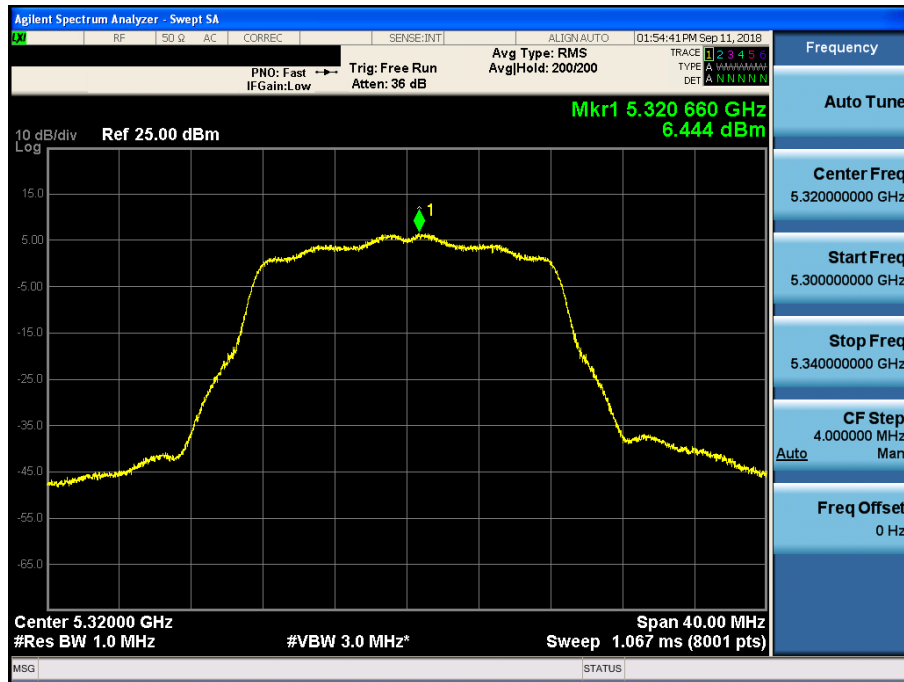
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.48



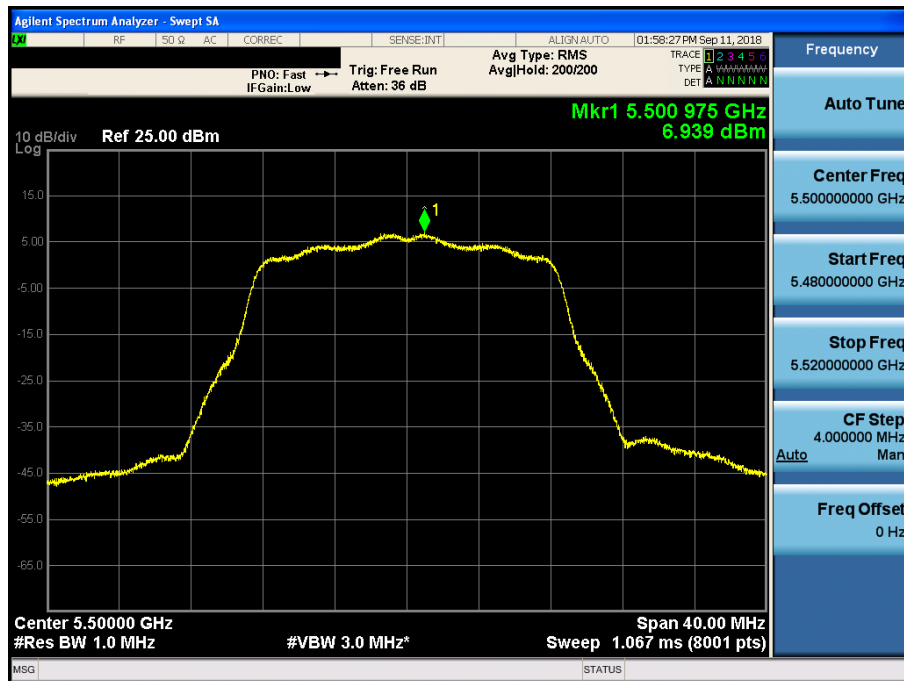
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.64



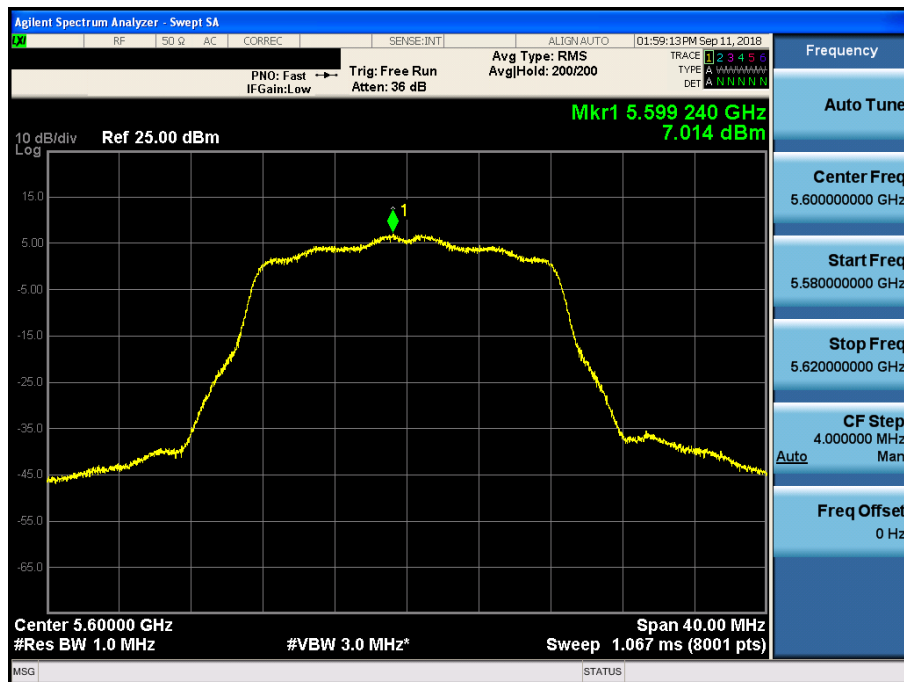
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.100



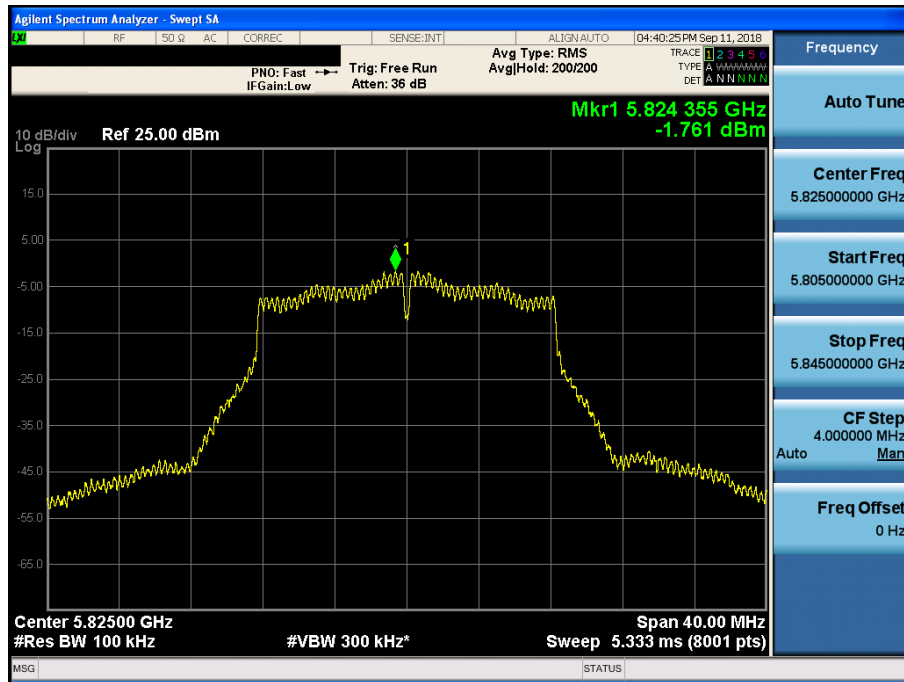
Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.120



Maximum Power Spectral Density

Test Mode: 802.11a & ANT 2 & Ch.165

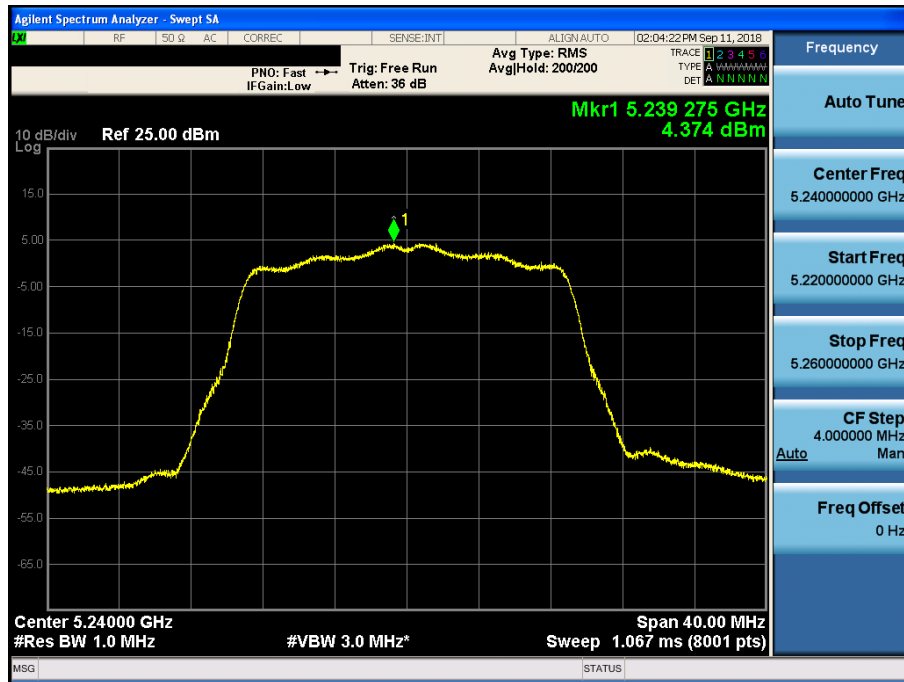


Test Mode: 802.11n HT20 & ANT 2 & Ch.36

Test Mode: 802.11n HT20 & ANT 2 & Ch.40

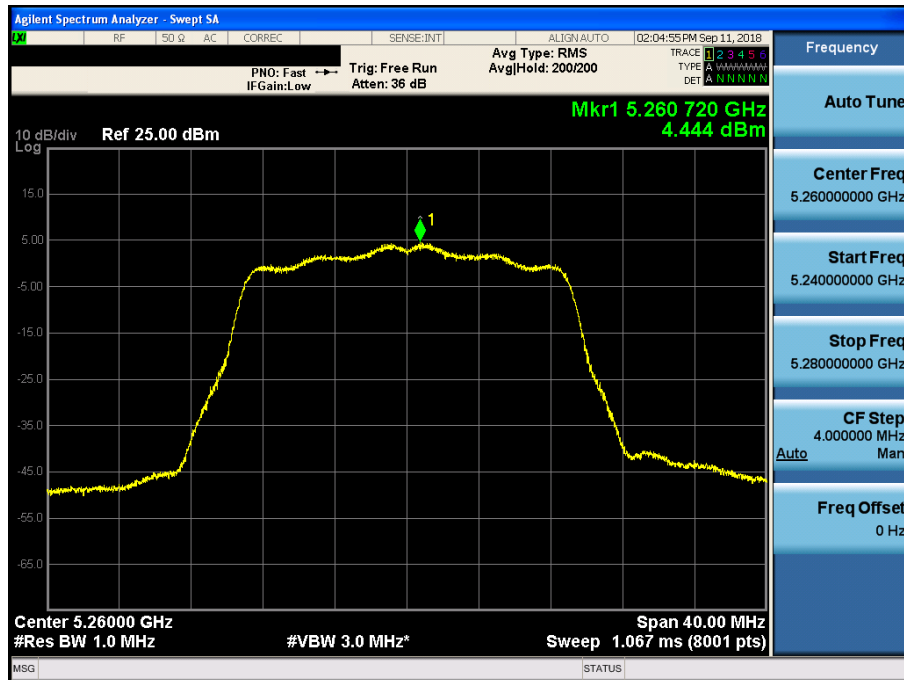
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.48



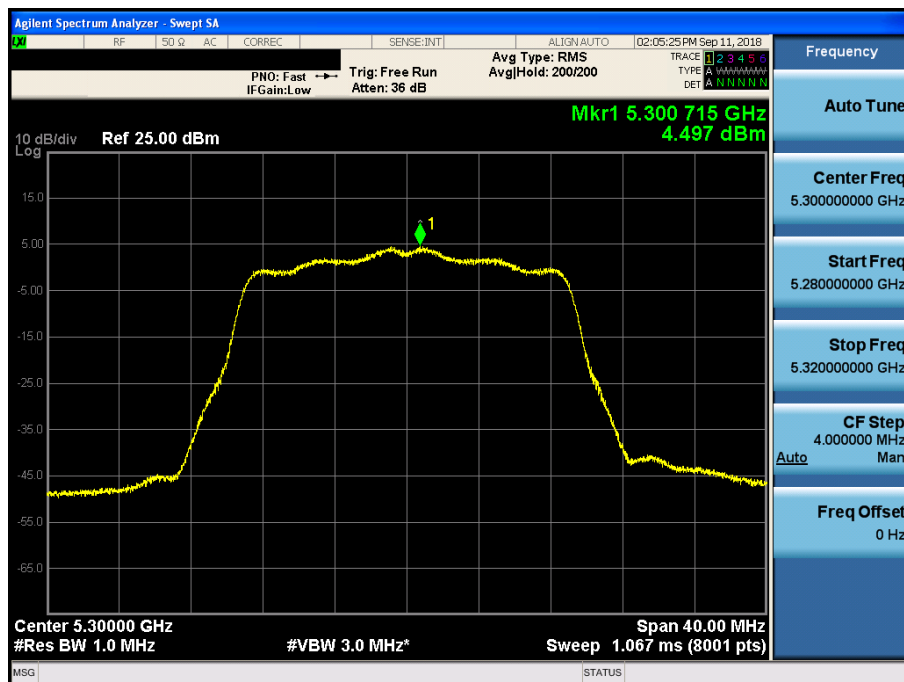
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.52



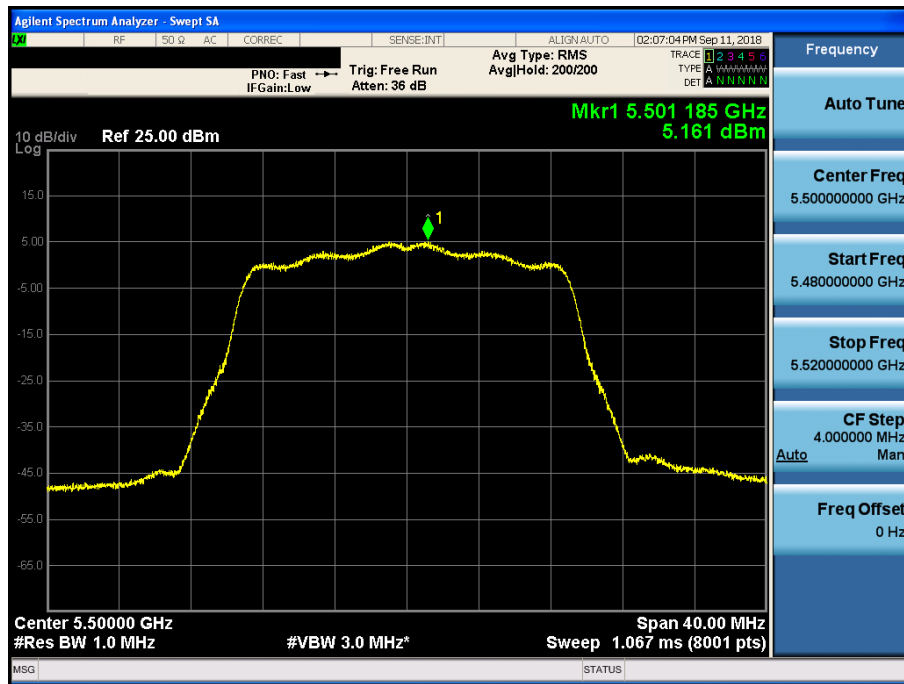
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.60



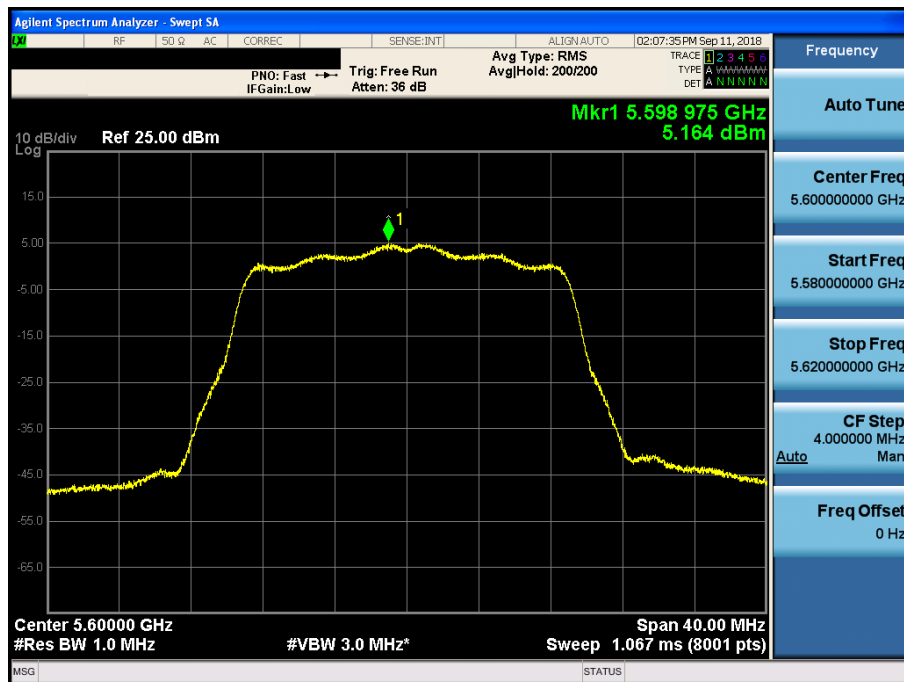
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.100



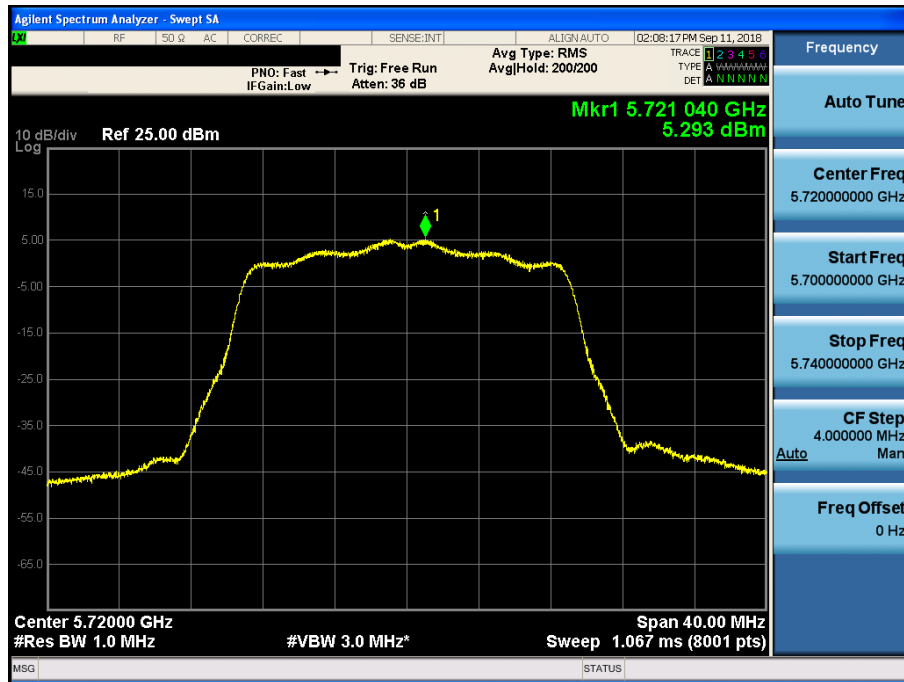
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.120



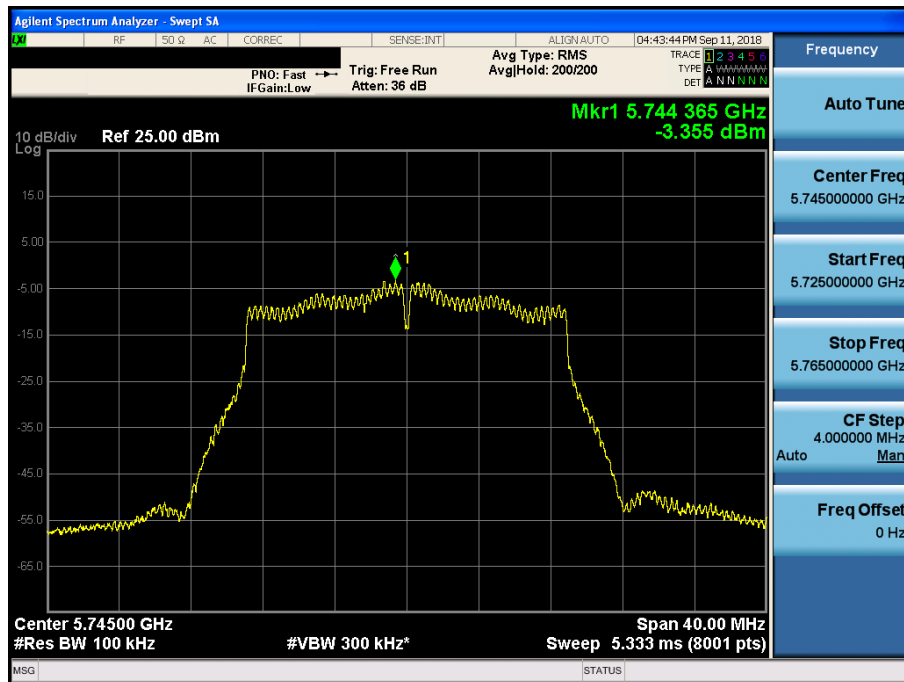
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.144



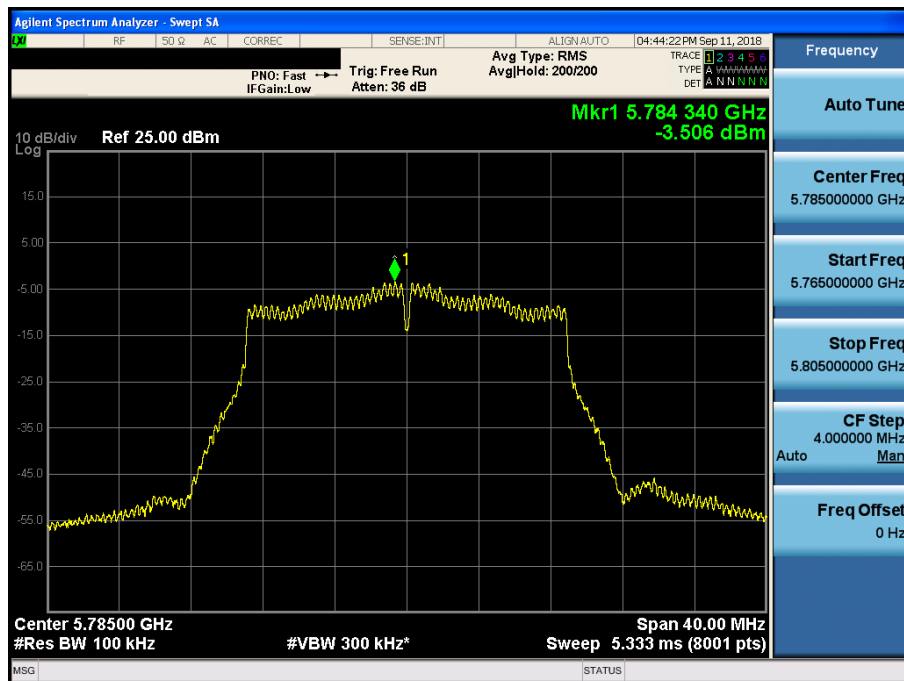
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.149



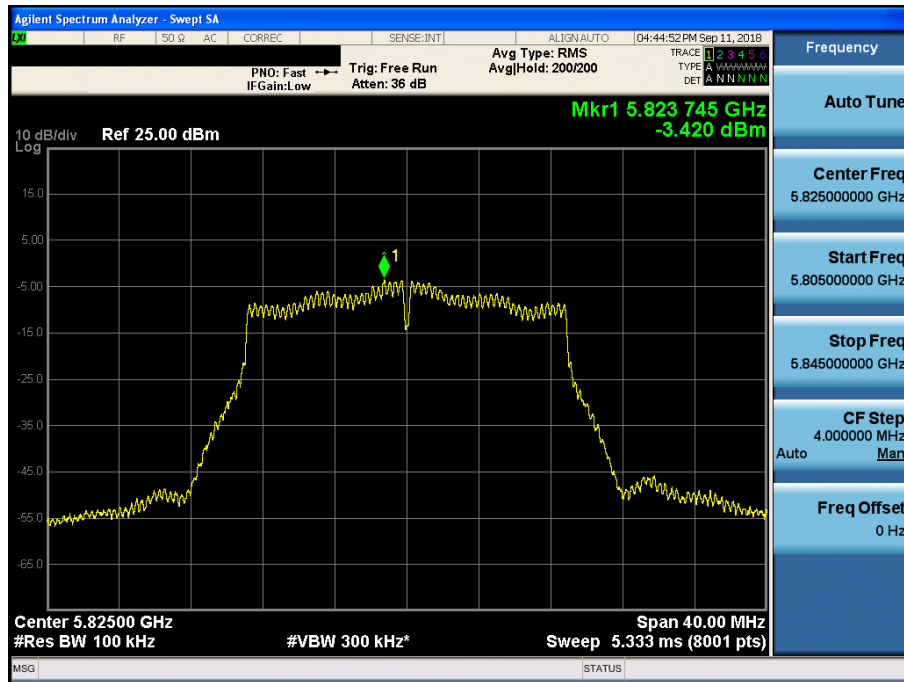
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.157



Maximum Power Spectral Density

Test Mode: 802.11n HT20 & ANT 2 & Ch.165

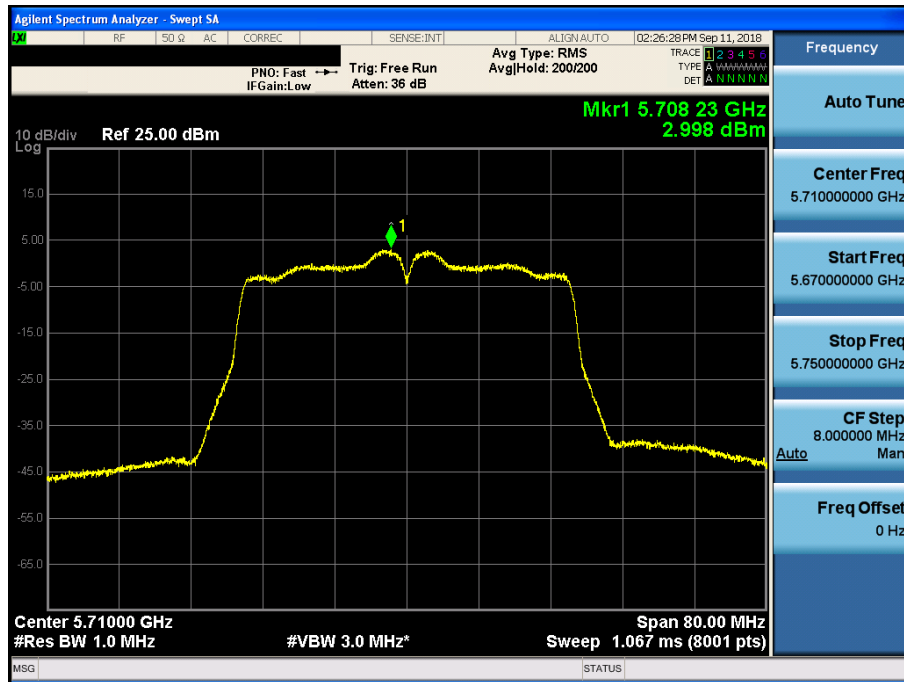


Test Mode: 802.11n HT40 & ANT 2 & Ch.38

Test Mode: 802.11n HT40 & ANT 2 & Ch.46

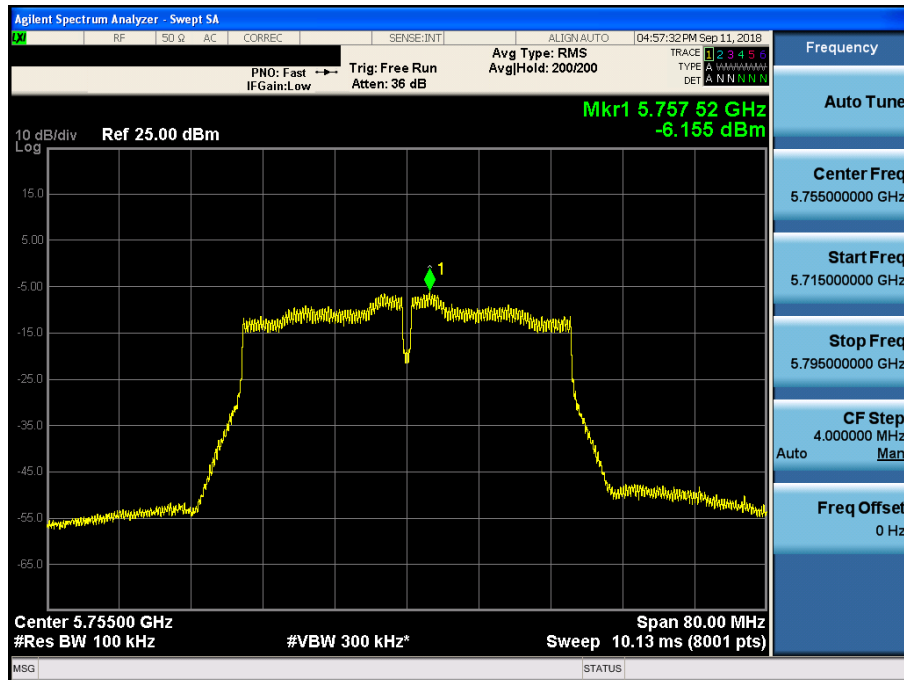
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 2 & Ch.142



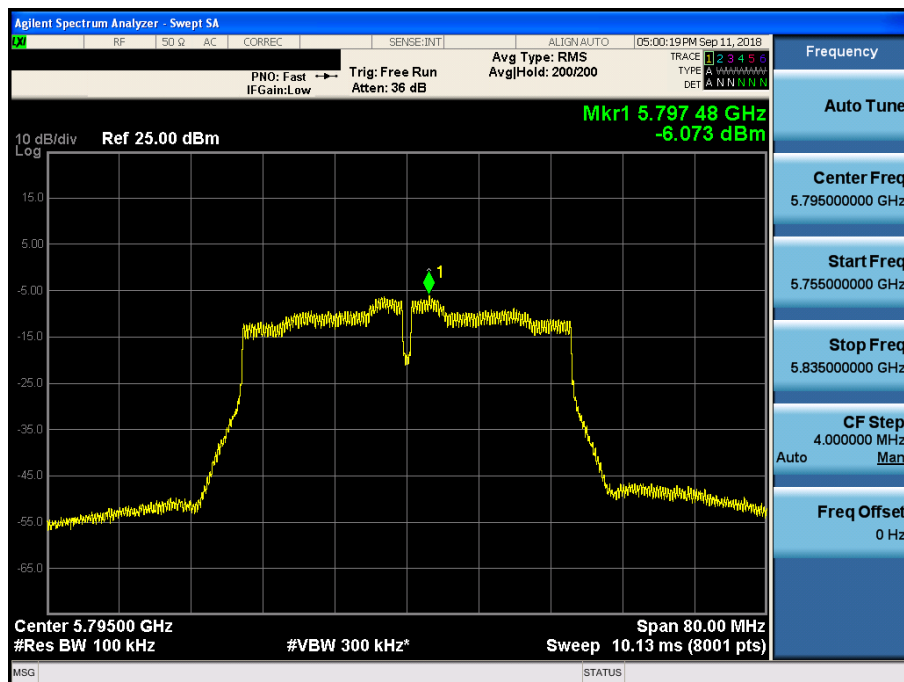
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 2 & Ch.151



Maximum Power Spectral Density

Test Mode: 802.11n HT40 & ANT 2 & Ch.159



Test Mode: 802.11ac VHT80 & ANT 2 & Ch.106

Test Mode: 802.11ac VHT80 & ANT 2 & Ch.122