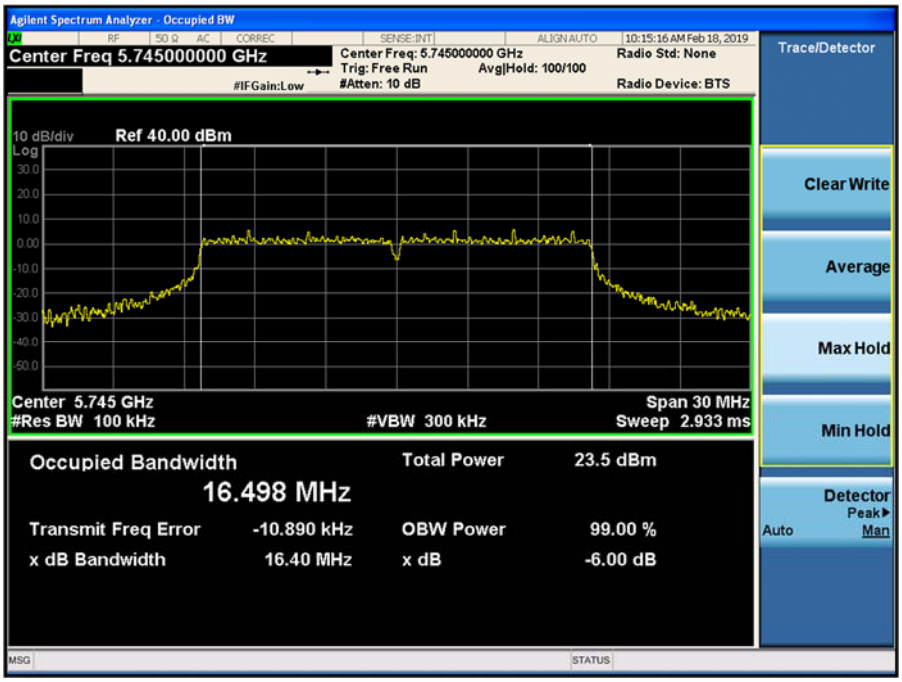
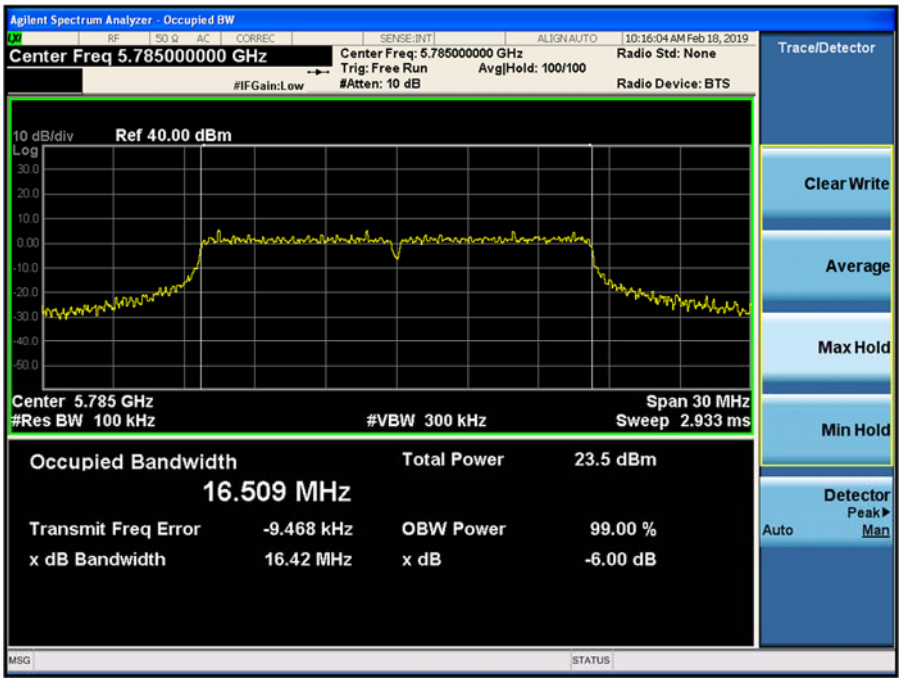
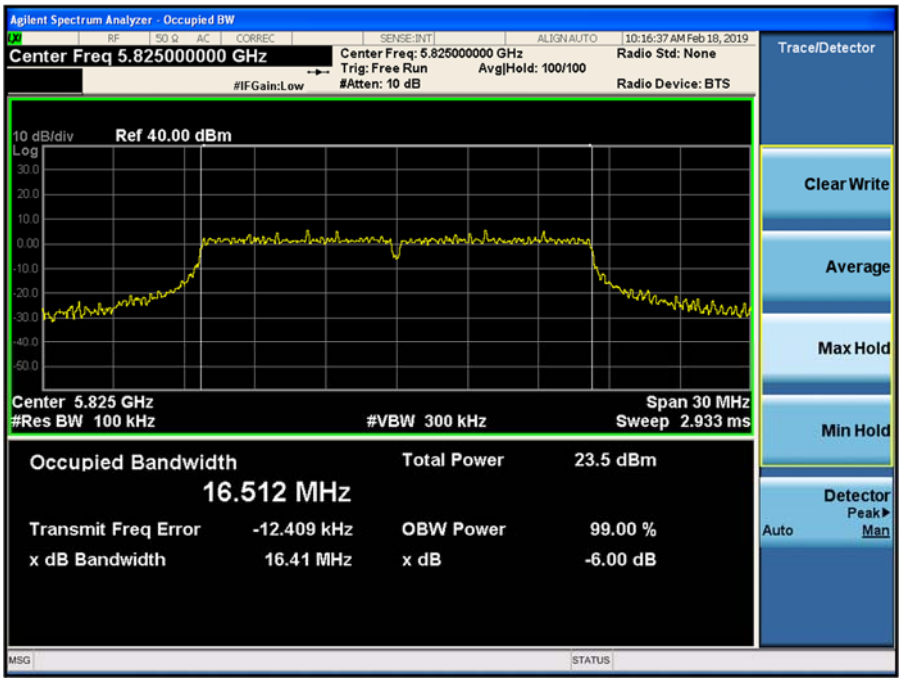


Plot 9-148. 6-dB Bandwidth Chain 1 802.11a (Ch. 149)



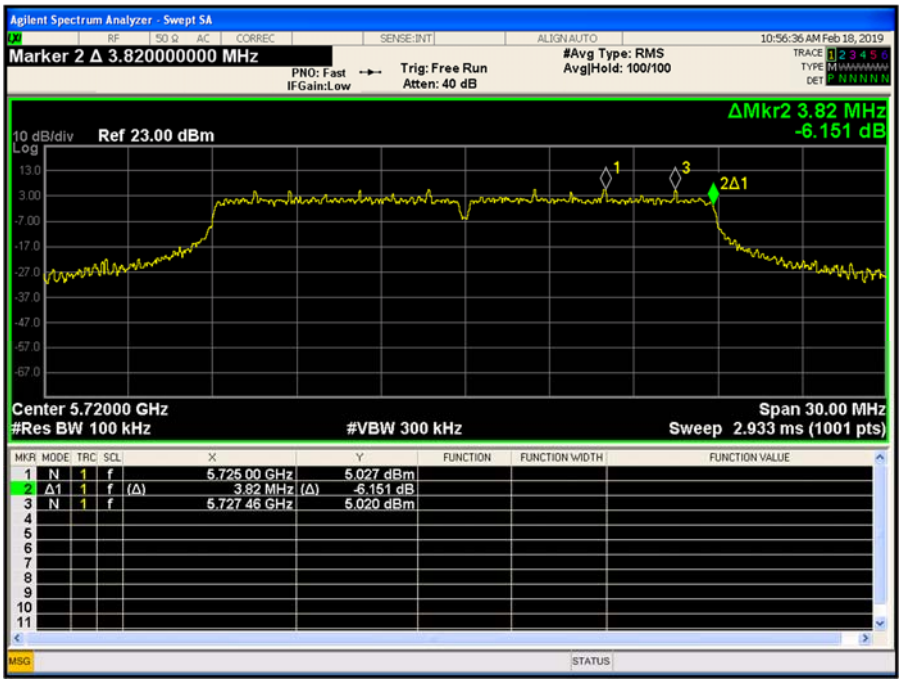
Plot 9-149. 6-dB Bandwidth Chain 1 802.11a (Ch. 157)



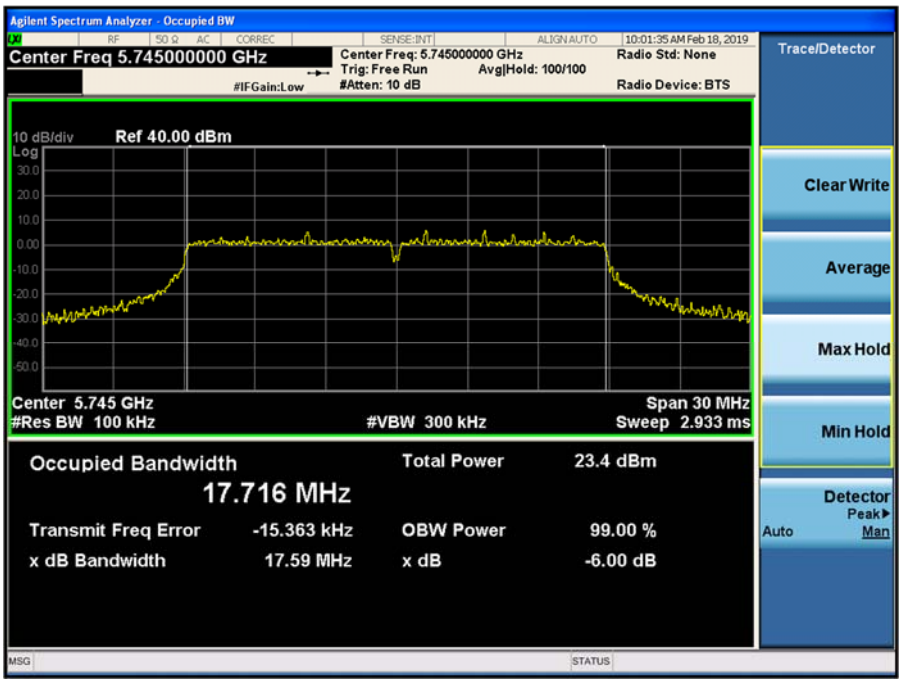
Plot 9-150. 6-dB Bandwidth Chain 1 802.11a (Ch. 165)

9.4.5.3 Chain 0 802.11n HT20 6-dB Bandwidth

Chain 0 802.11n HT20 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
144	5720	3.82
149	5745	17.59
157	5785	17.64
165	5825	17.63

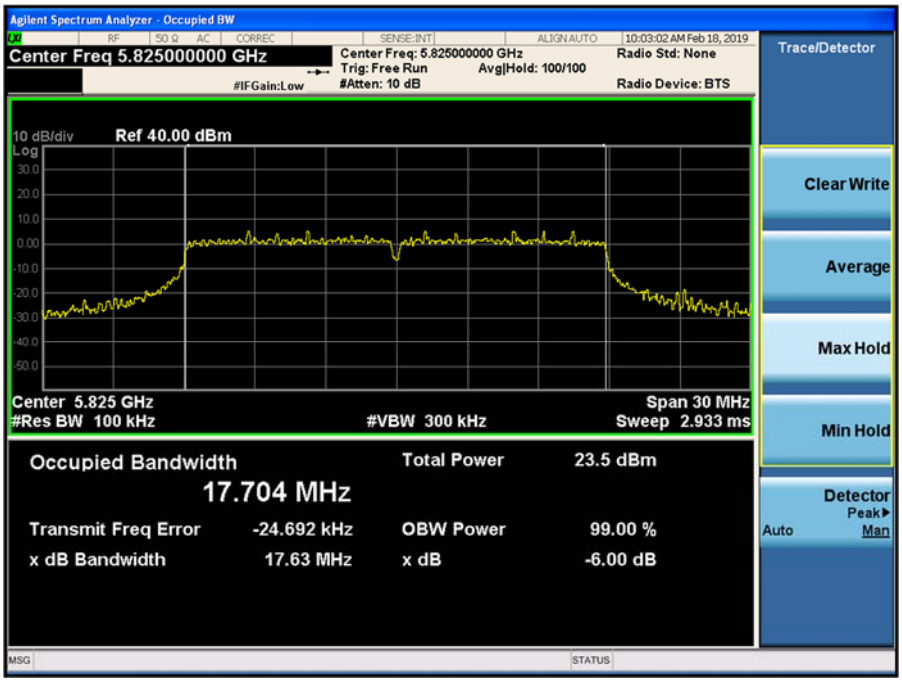


Plot 9-151. 6-dB Bandwidth Chain 0 802.11n HT20 (Ch. 144)



Plot 9-152. 6-dB Bandwidth Chain 0 802.11n HT20 (Ch. 149)

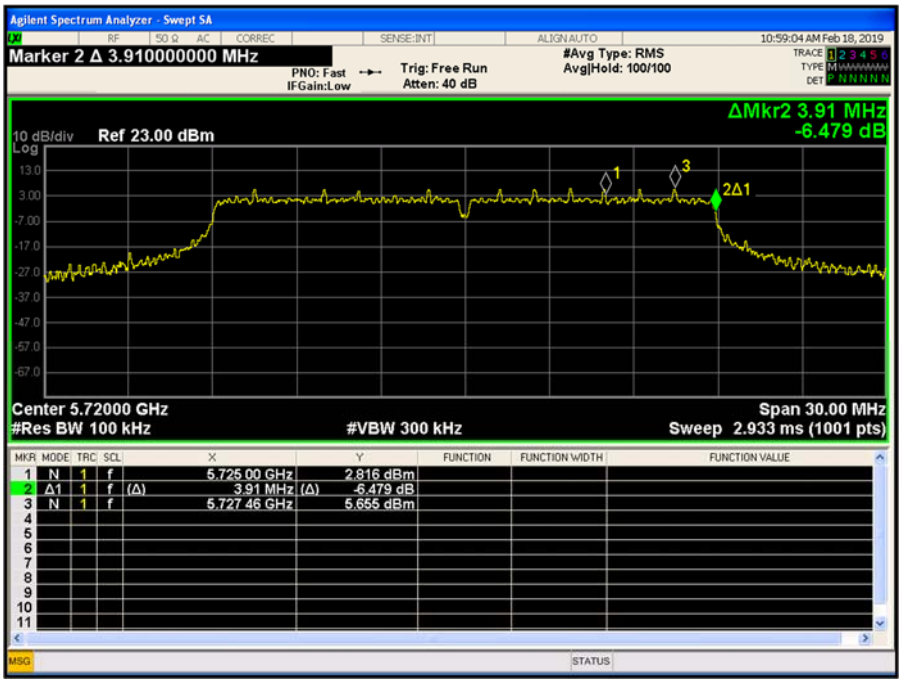
Plot 9-153. 6-dB Bandwidth Chain 0 802.11n HT20 (Ch. 157)



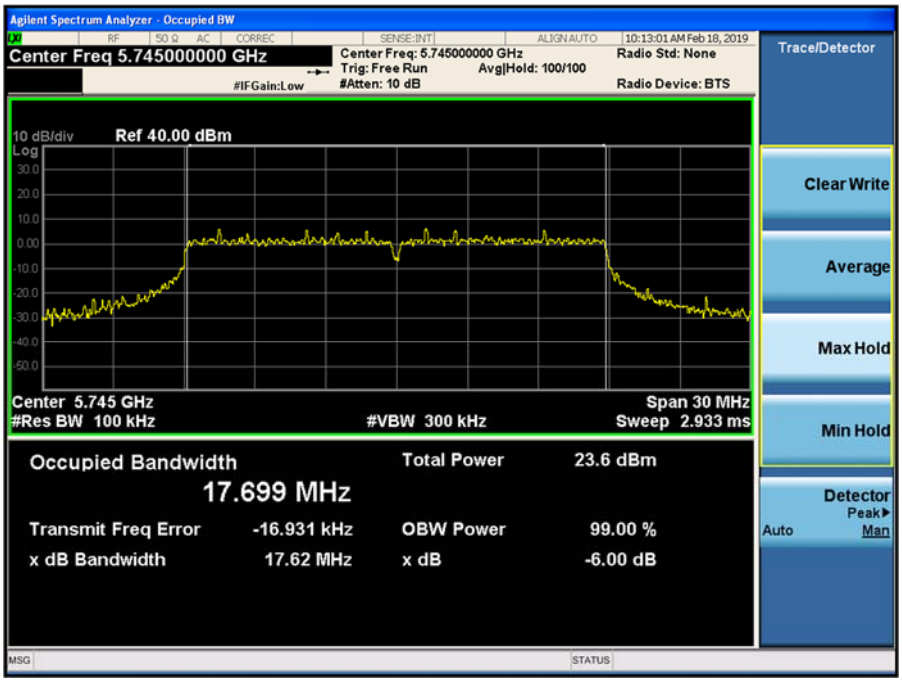
Plot 9-154. 6-dB Bandwidth Chain 0 802.11n HT20 (Ch. 165)

9.4.5.4 Chain 1 802.11n HT20 6-dB Bandwidth

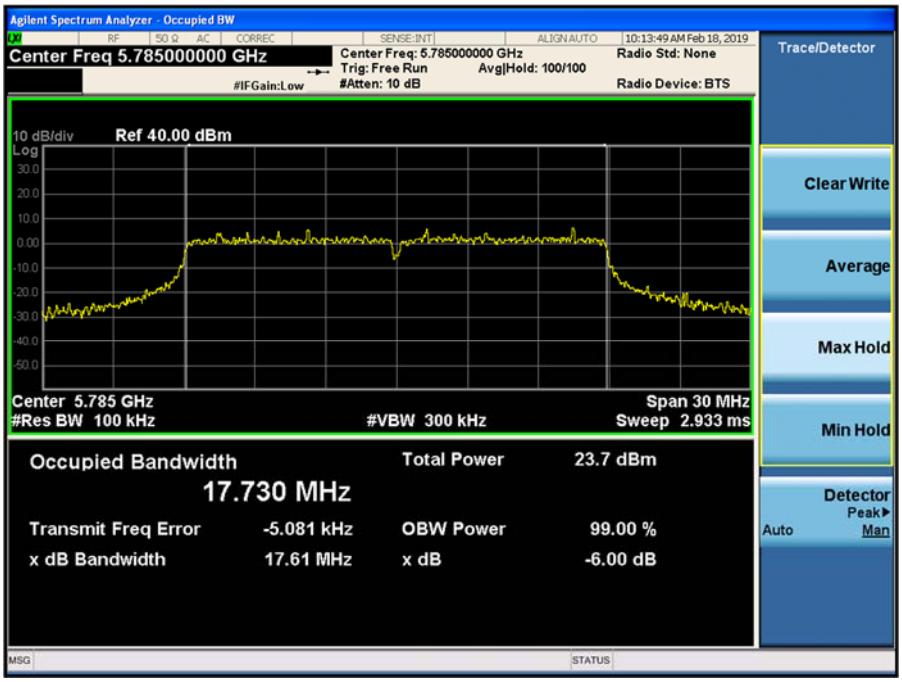
Chain 1 802.11n HT20 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
144	5720	3.91
149	5745	17.62
157	5785	17.61
165	5825	17.62



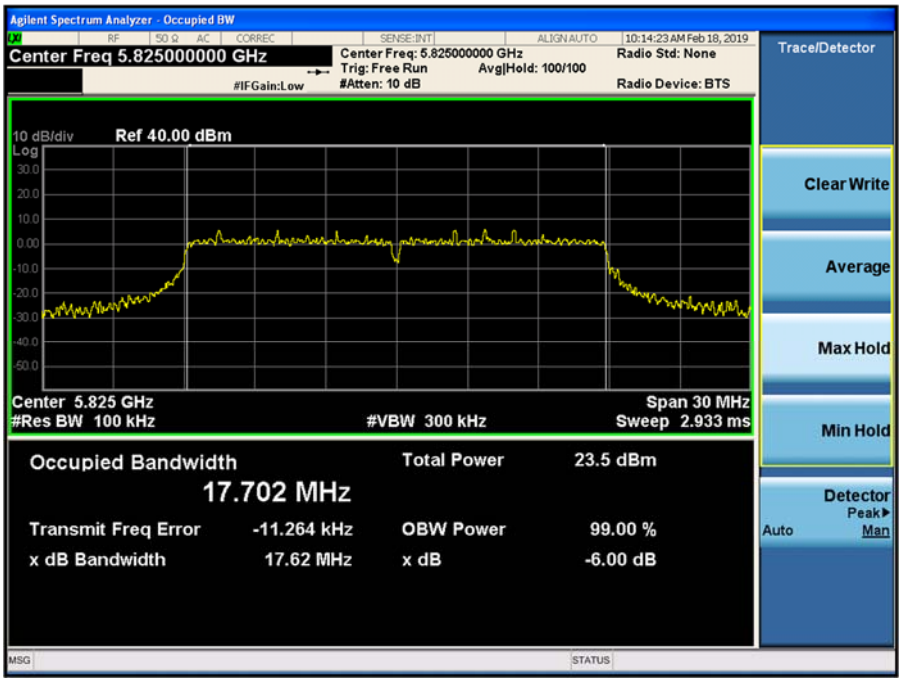
Plot 9-155. 6-dB Bandwidth Chain 1 802.11n HT20 (Ch. 144)



Plot 9-156. 6-dB Bandwidth Chain 1 802.11n HT20 (Ch. 157)



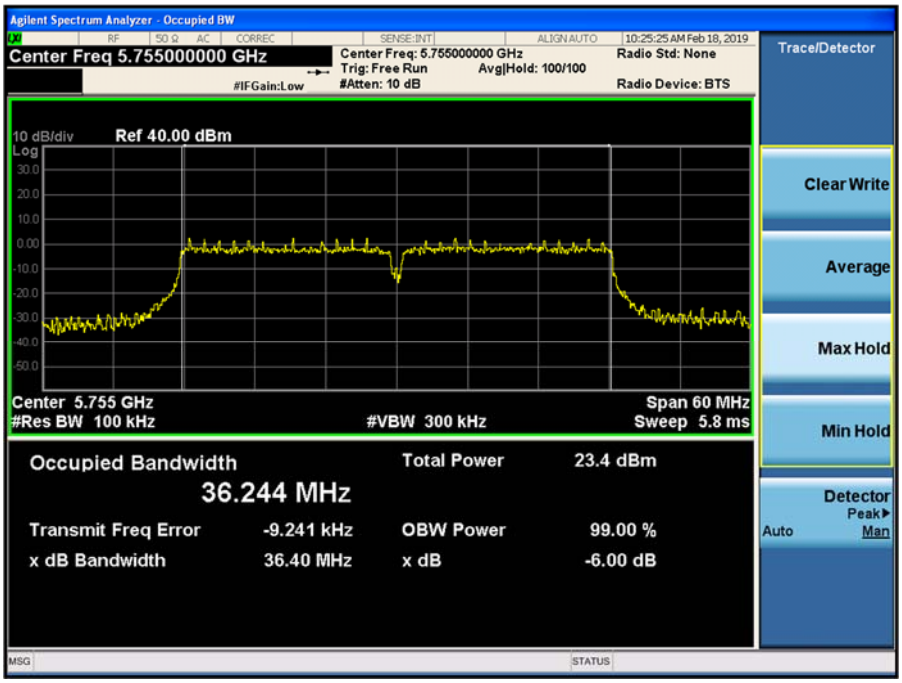
Plot 9-157. 6-dB Bandwidth Chain 1 802.11n HT20 (Ch. 157)



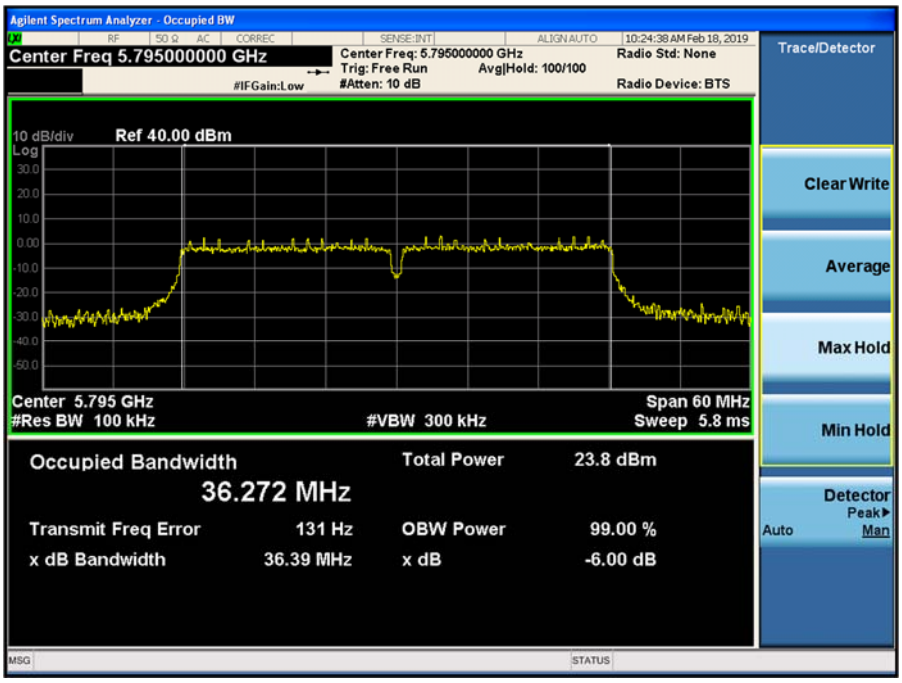
Plot 9-158. 6-dB Bandwidth Chain 1 802.11n HT20 (Ch. 165)

9.4.5.5 Chain 0 802.11n HT40 6-dB Bandwidth

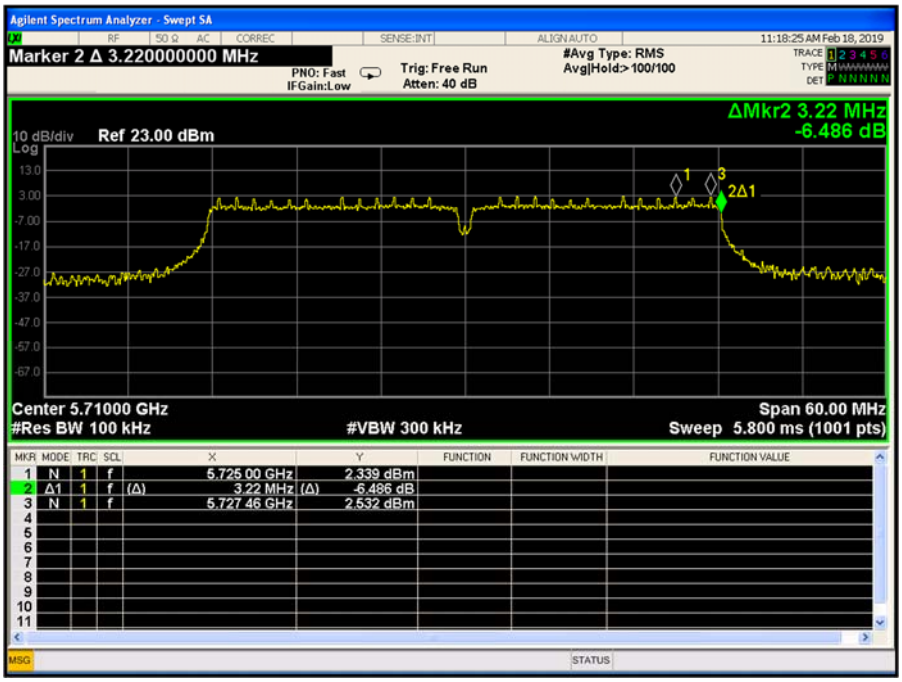
Chain 0 802.11n HT40 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
151	5755	36.40
159	5795	36.39
142	5710	3.22



Plot 9-159. 6-dB Bandwidth Chain 0 802.11n HT40 (Ch. 151)



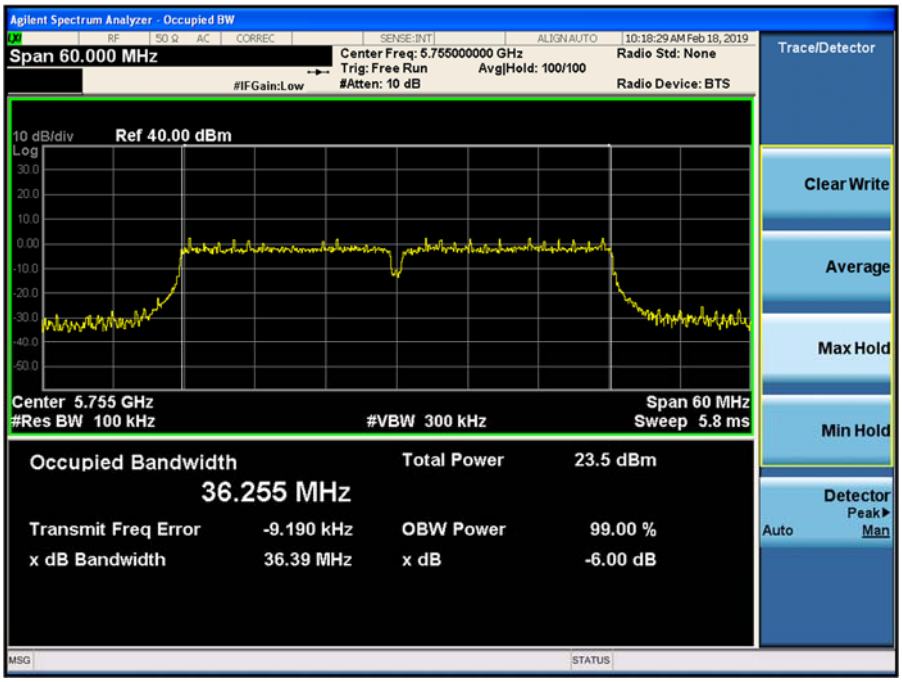
Plot 9-160. 6-dB Bandwidth Chain 0 802.11n HT40 (Ch. 159)



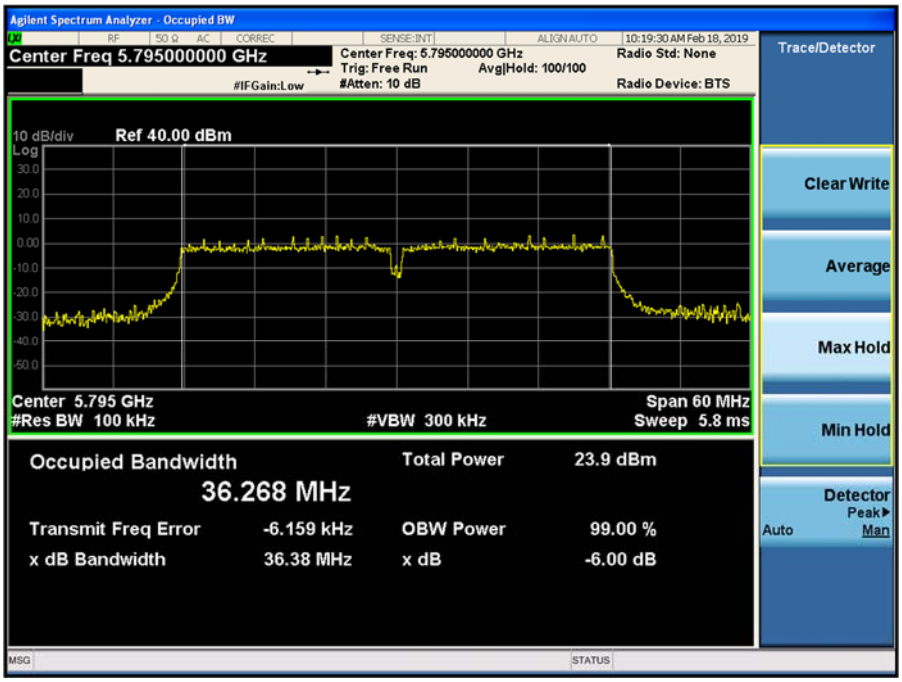
Plot 9-161. 6-dB Bandwidth Chain 0 802.11n HT40 (Ch. 142)

9.4.5.6 Chain 1 802.11n HT40 6-dB Bandwidth

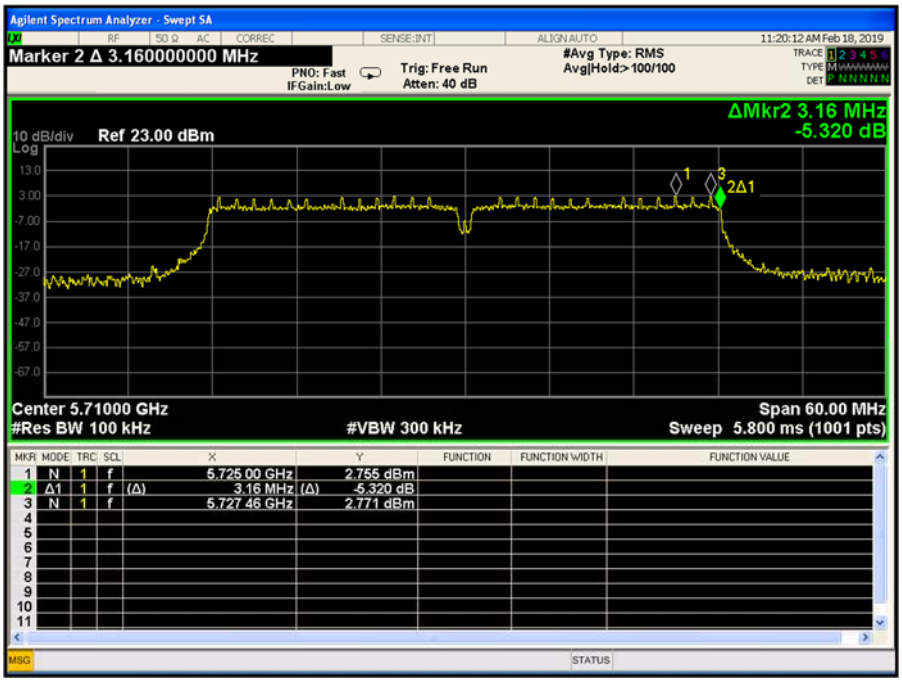
Chain 1 802.11n HT40 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
151	5755	36.39
159	5795	36.38
142	5710	3.16



Plot 9-162. 6-dB Bandwidth Chain 1 802.11n HT40 (Ch. 151)



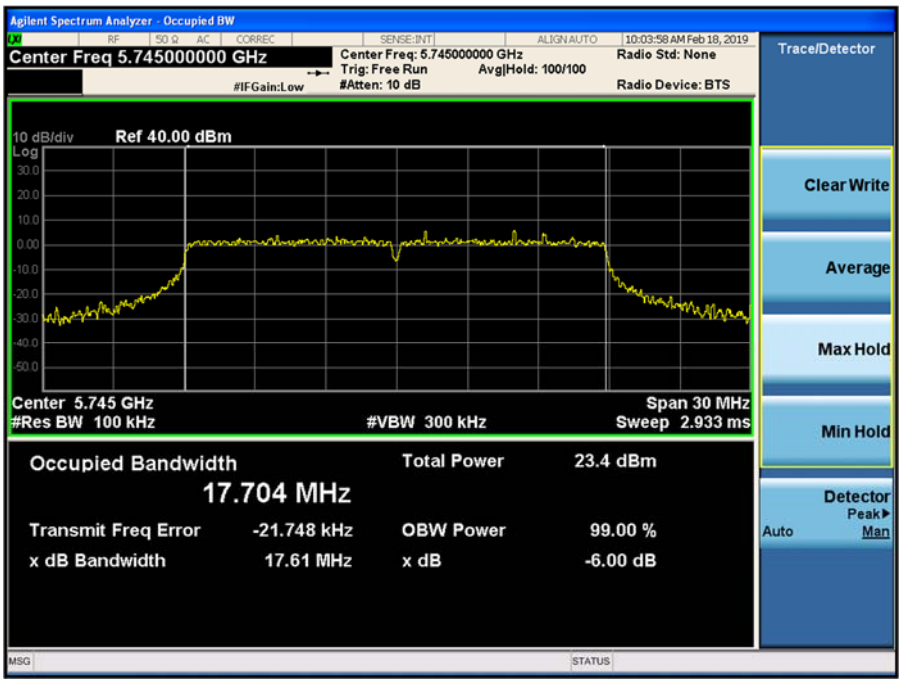
Plot 9-163. 6-dB Bandwidth Chain 1 802.11n HT40 (Ch. 159)



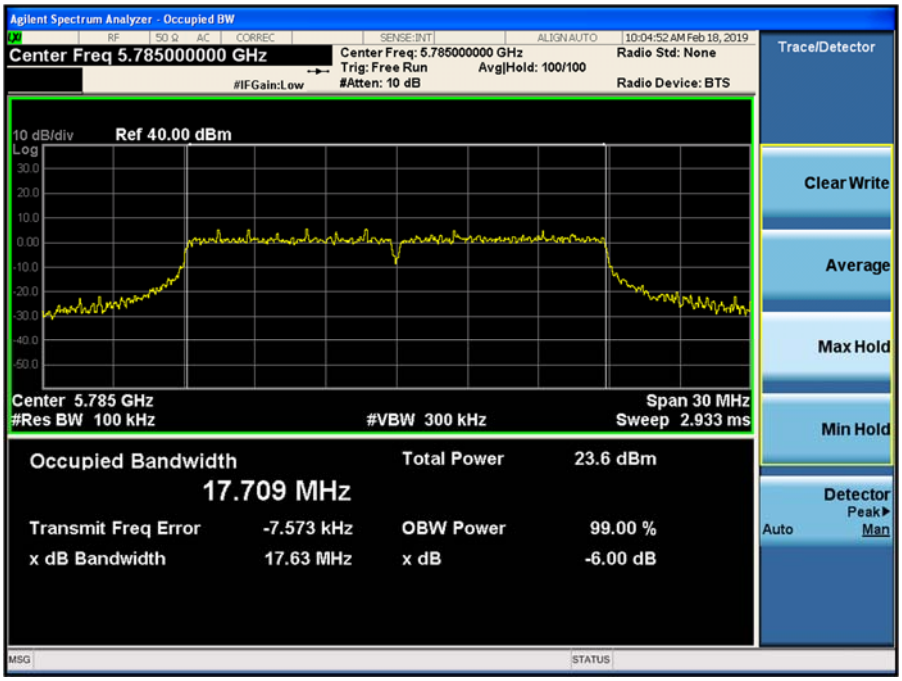
Plot 9-164. 6-dB Bandwidth Chain 1 802.11n HT40 (Ch. 142)

9.4.5.7 Chain 0 802.11ac VHT20 6-dB Bandwidth

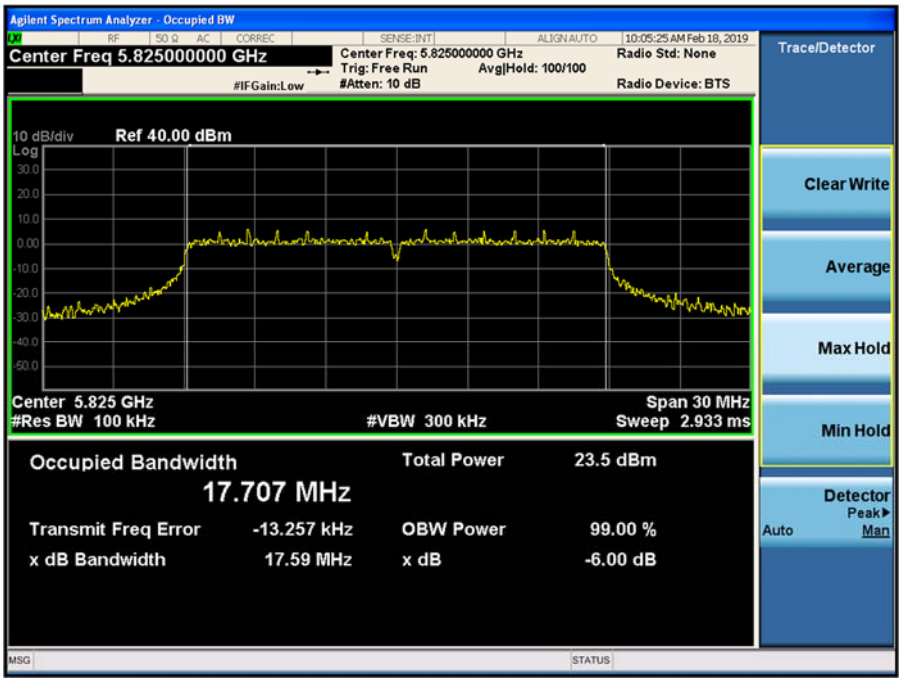
Chain 0 802.11ac VHT20 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
149	5745	17.61
157	5785	17.63
165	5825	17.59
144	5720	3.82



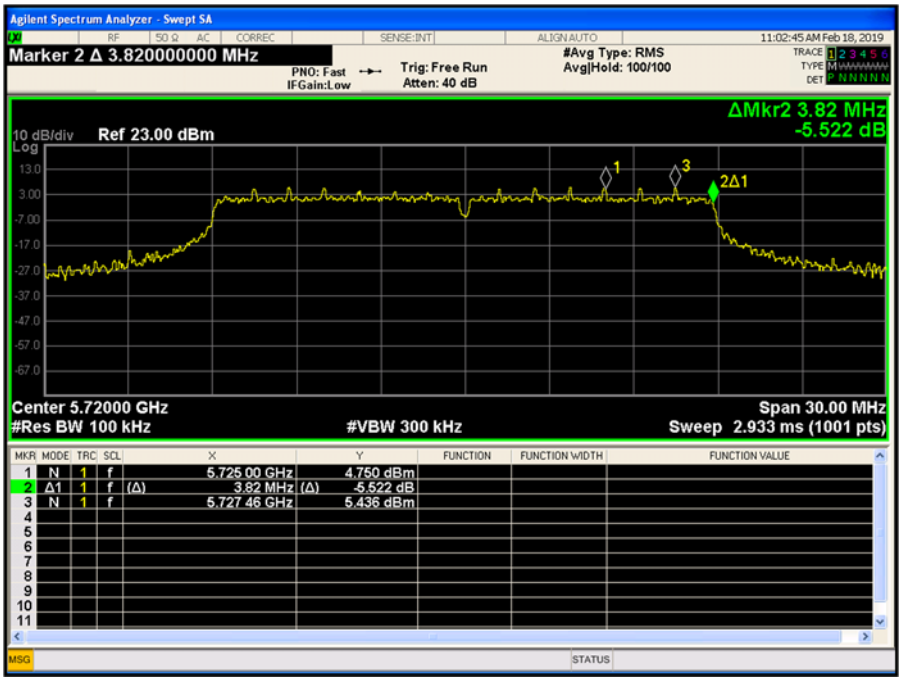
Plot 9-165. 6-dB Bandwidth Chain 0 802.11ac VHT20 (Ch. 149)



Plot 9-166. 6-dB Bandwidth Chain 0 802.11ac VHT20 (Ch. 157)



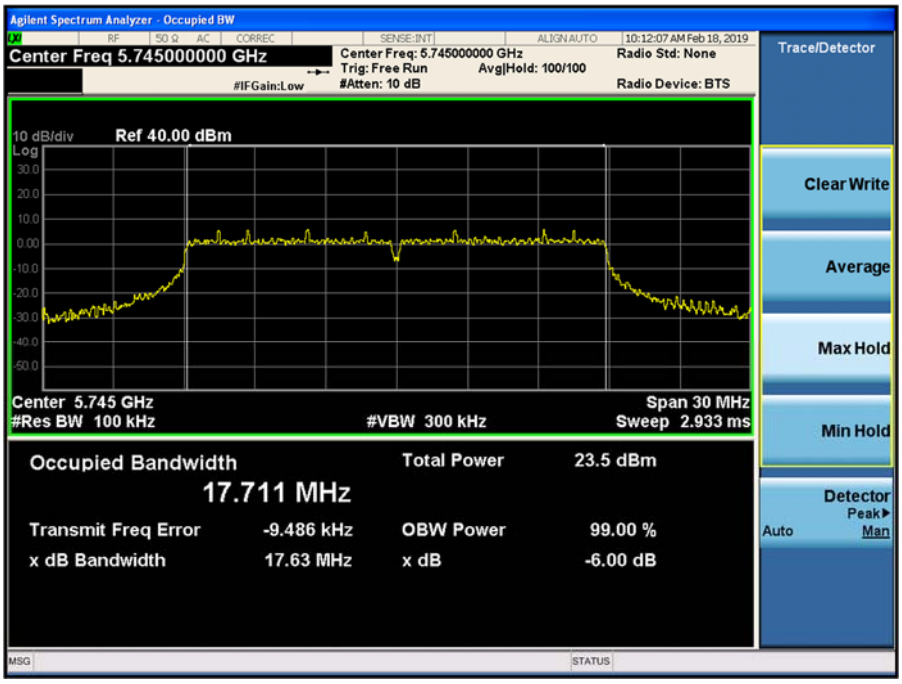
Plot 9-167. 6-dB Bandwidth Chain 0 802.11ac VHT20 (Ch. 165)



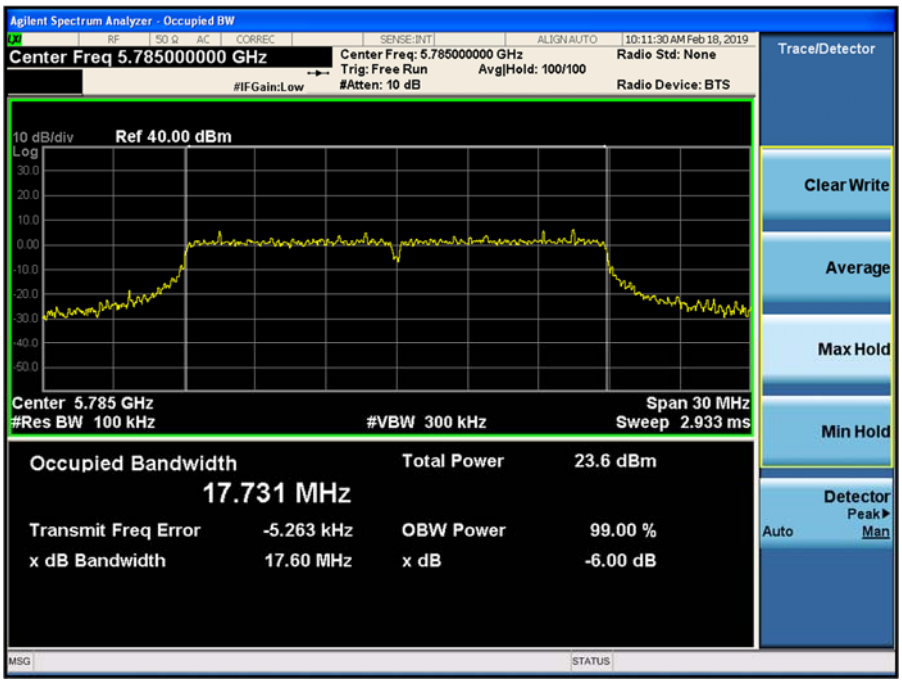
Plot 9-168. 6-dB Bandwidth Chain 0 802.11ac VHT20 (Ch. 144)

9.4.5.8 Chain 1 802.11ac VHT20 6-dB Bandwidth

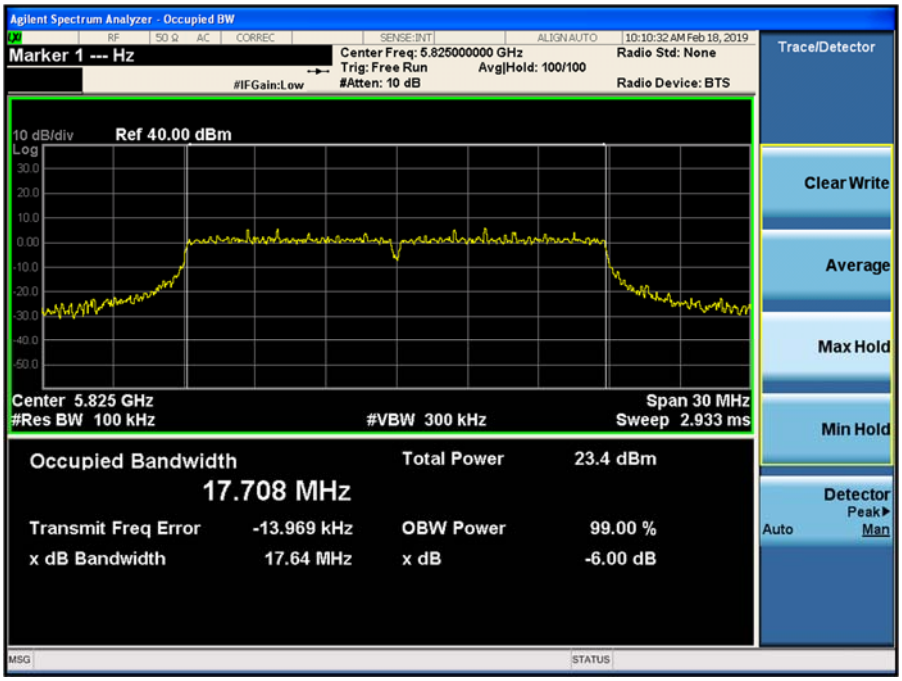
Chain 1 802.11ac VHT20 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
149	5745	17.63
157	5785	17.60
165	5825	17.64
144	5720	3.82



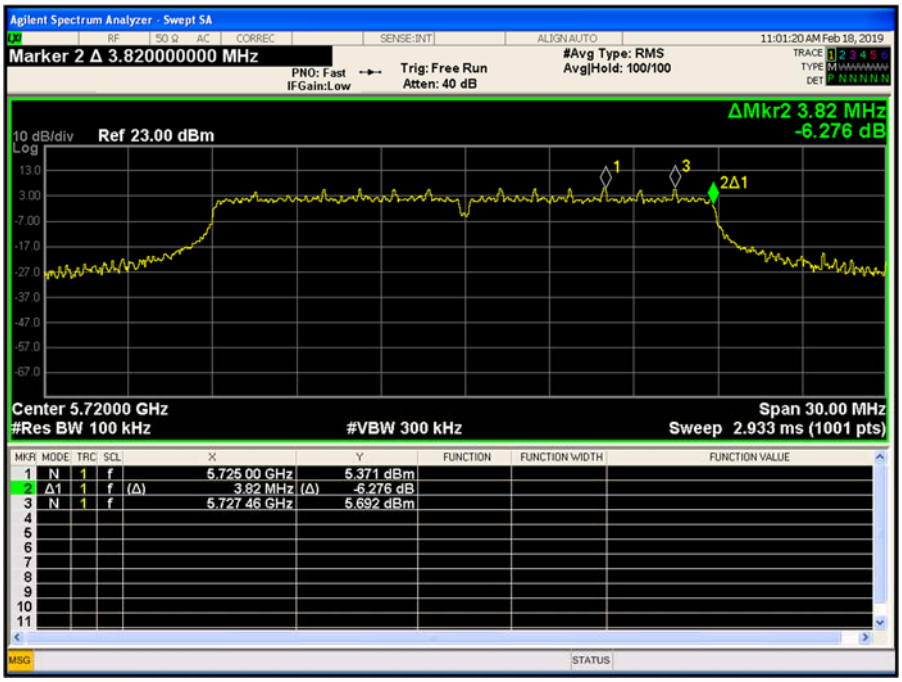
Plot 9-169. 6-dB Bandwidth Chain 1 802.11ac VHT20 (Ch. 149)



Plot 9-170. 6-dB Bandwidth Chain 1 802.11ac VHT20 (Ch. 157)



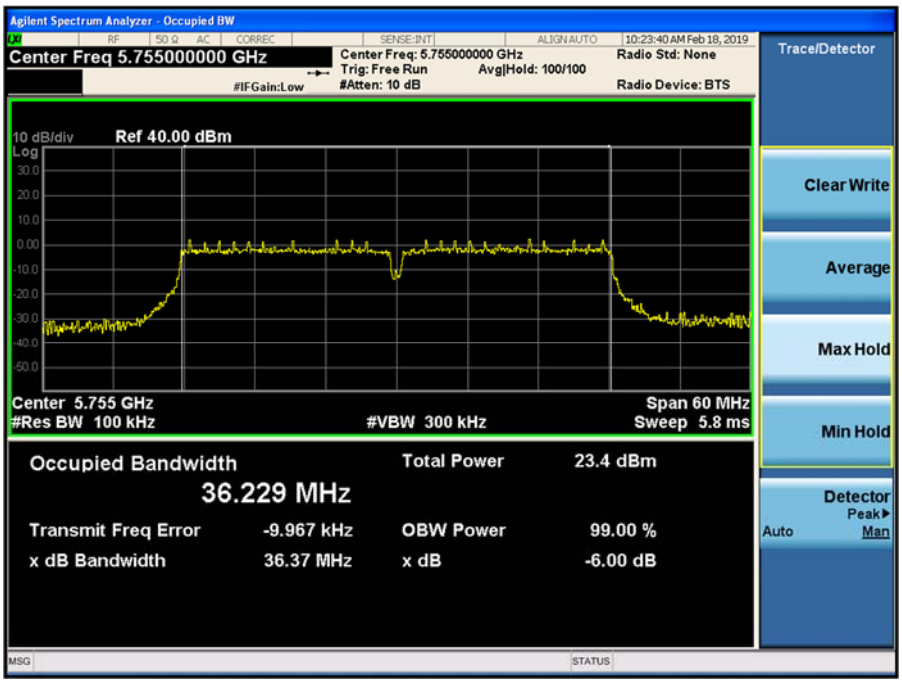
Plot 9-171. 6-dB Bandwidth Chain 1 802.11ac VHT20 (Ch. 165)



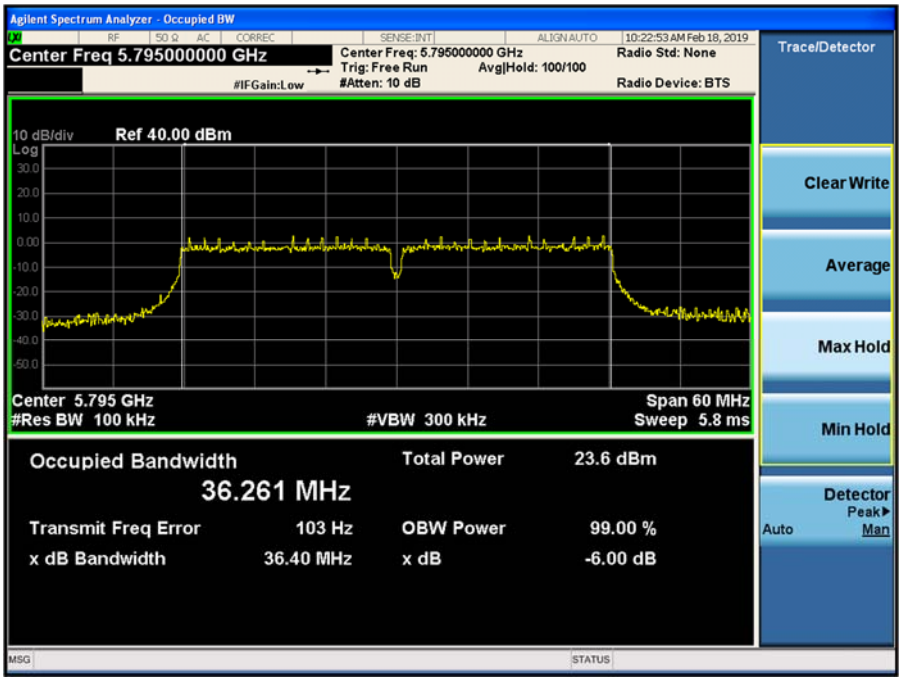
Plot 9-172. 6-dB Bandwidth Chain 1 802.11ac VHT20 (Ch. 144)

9.4.5.9 Chain 0 802.11ac VHT40 6-dB Bandwidth

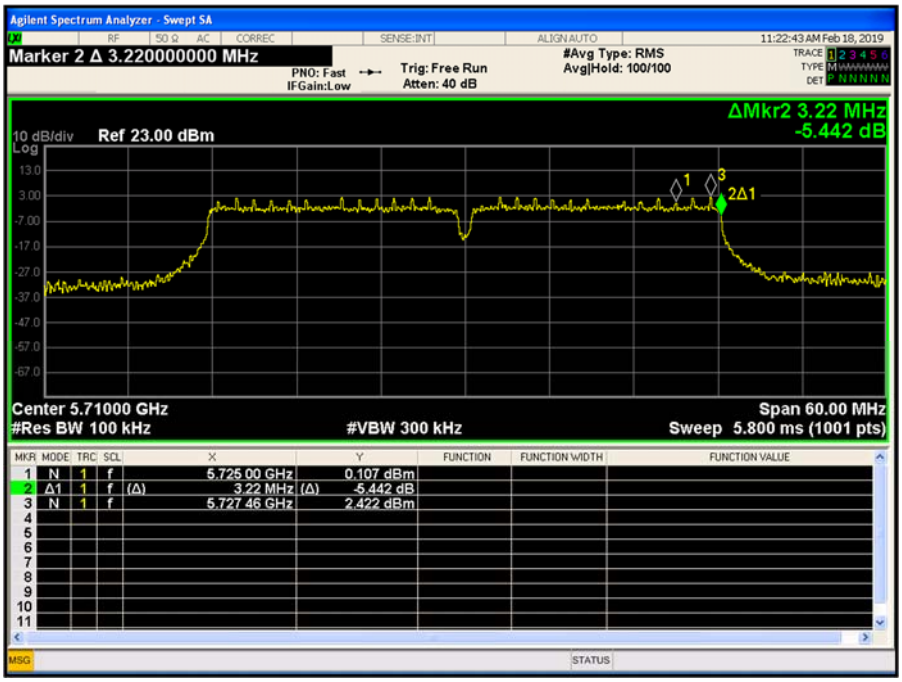
Chain 0 802.11ac VHT40 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
151	5755	36.37
159	5795	36.40
142	5710	3.22



Plot 9-173. 6-dB Bandwidth Chain 0 802.11ac VHT40 (Ch. 151)



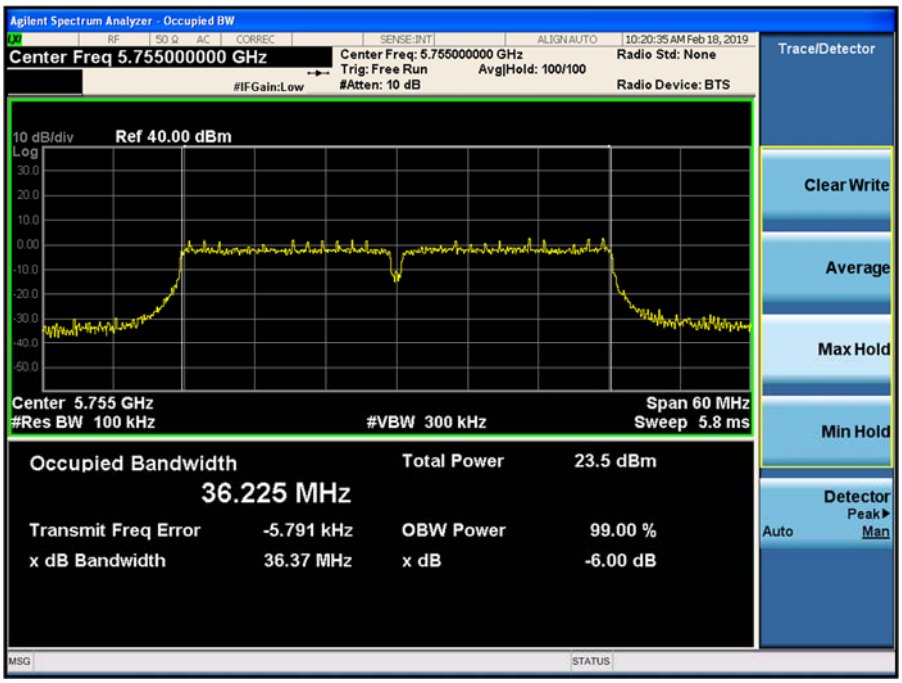
Plot 9-174. 6-dB Bandwidth Chain 0 802.11ac VHT40 (Ch. 159)



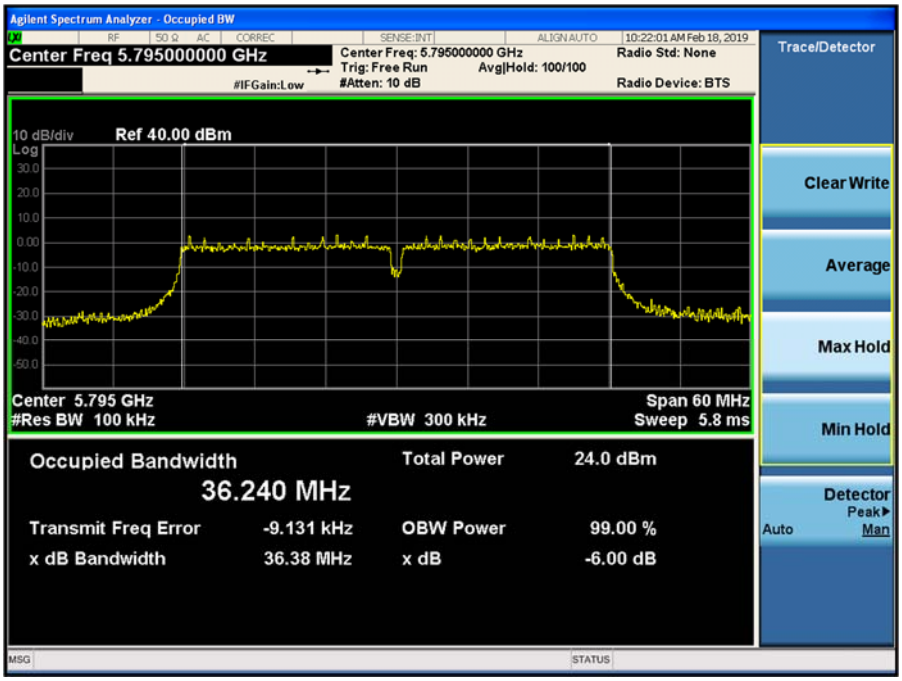
Plot 9-175. 6-dB Bandwidth Chain 0 802.11ac VHT40 (Ch. 142)

9.4.5.10 Chain 1 802.11ac VHT40 6-dB Bandwidth

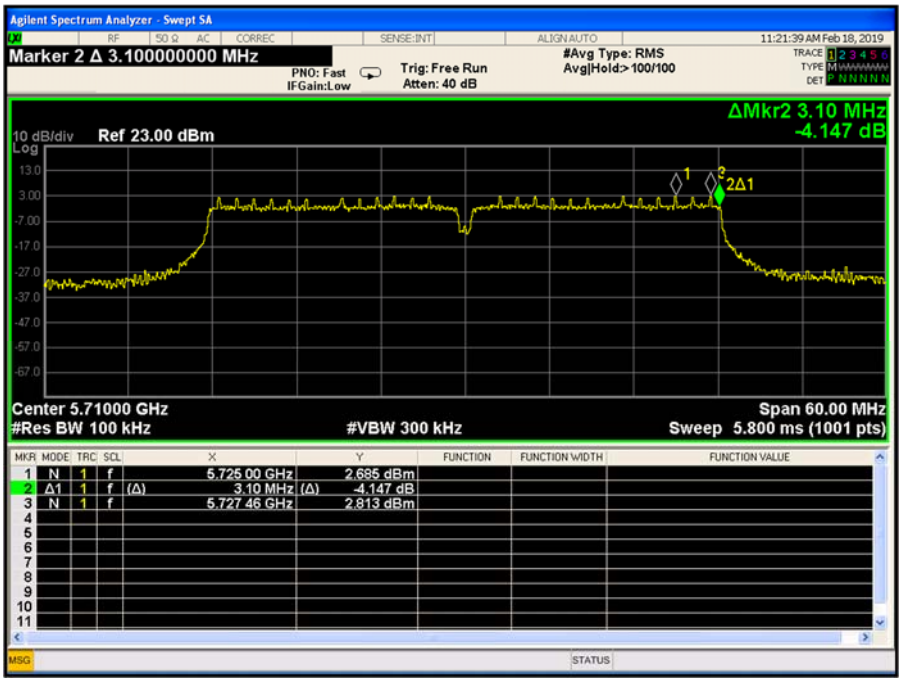
Chain 1 802.11ac VHT40 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
151	5755	36.37
159	5795	36.38
142	5710	3.10



Plot 9-176. 6-dB Bandwidth Chain 1 802.11ac VHT40 (Ch. 151)



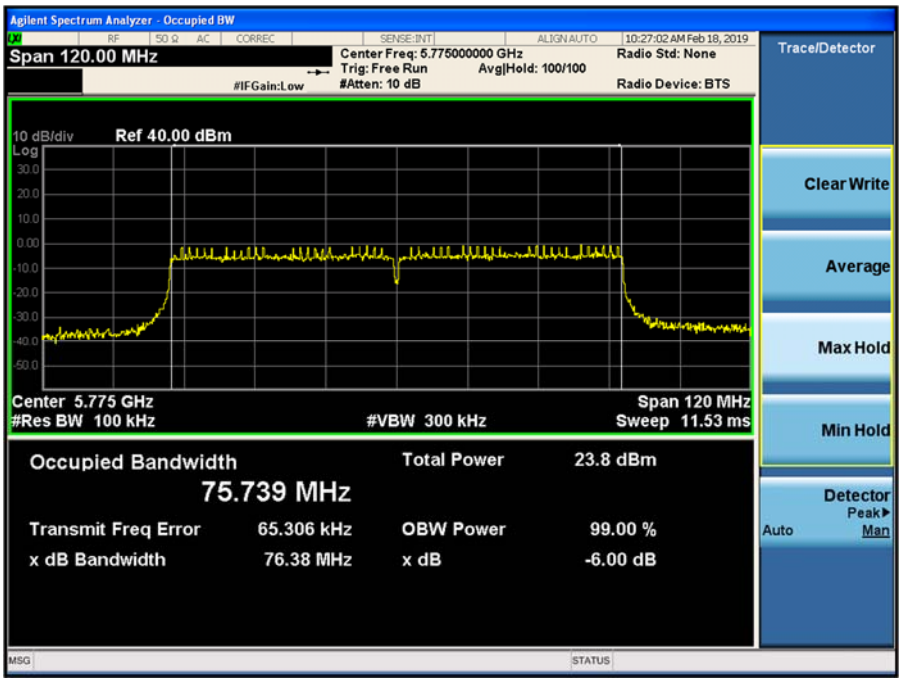
Plot 9-177. 6-dB Bandwidth Chain 1 802.11ac VHT40 (Ch. 159)



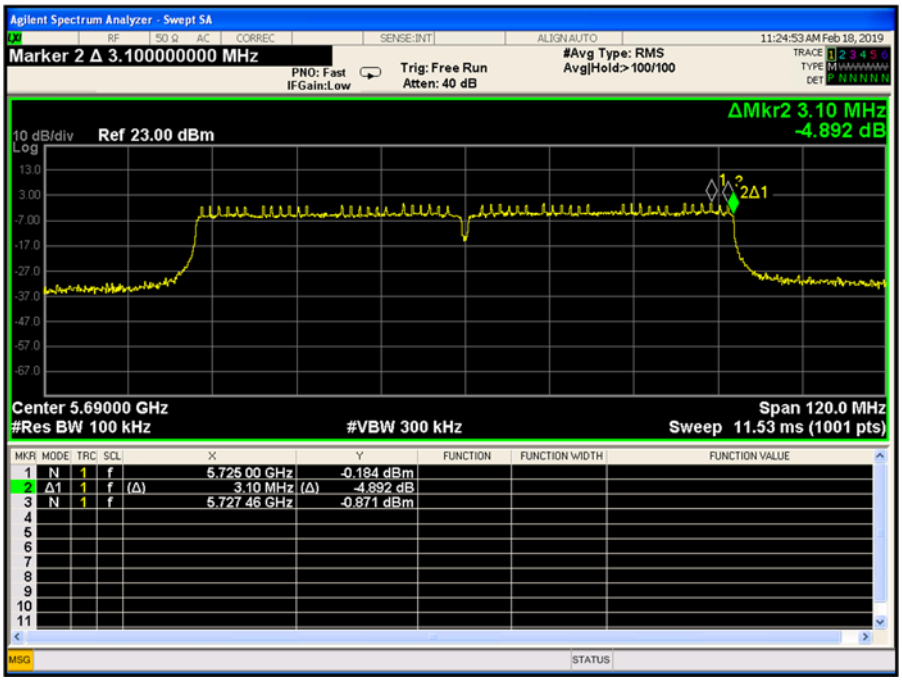
Plot 9-178. 6-dB Bandwidth Chain 1 802.11ac VHT40 (Ch. 142)

9.4.5.11 Chain 0 802.11ac VHT80 6-dB Bandwidth

Chain 0 802.11ac VHT80 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
155	5775	76.38
138	5690	3.10



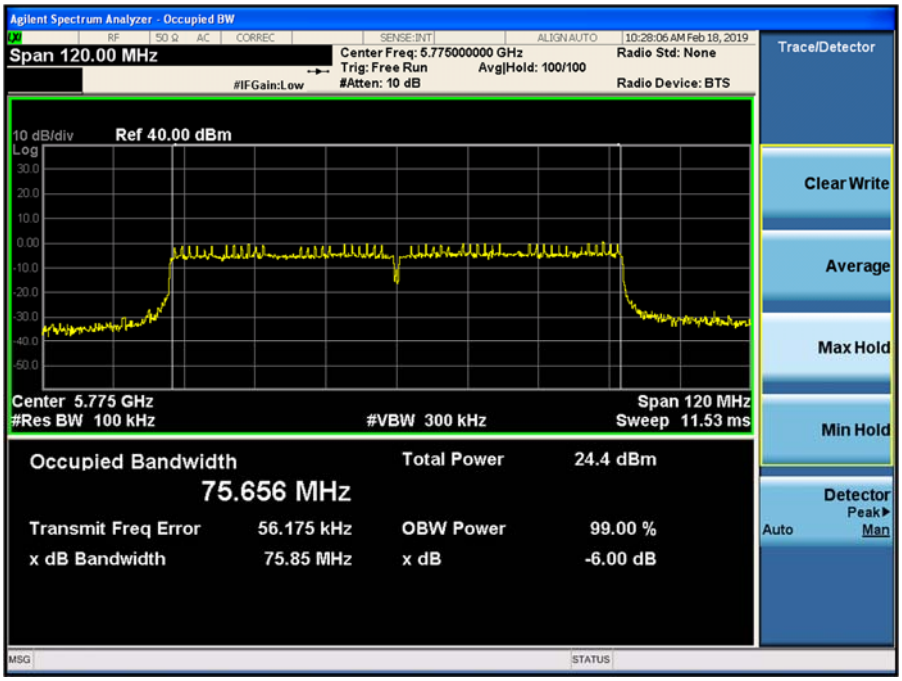
Plot 9-179. 6-dB Bandwidth Chain 0 802.11ac VHT80 (Ch. 155)



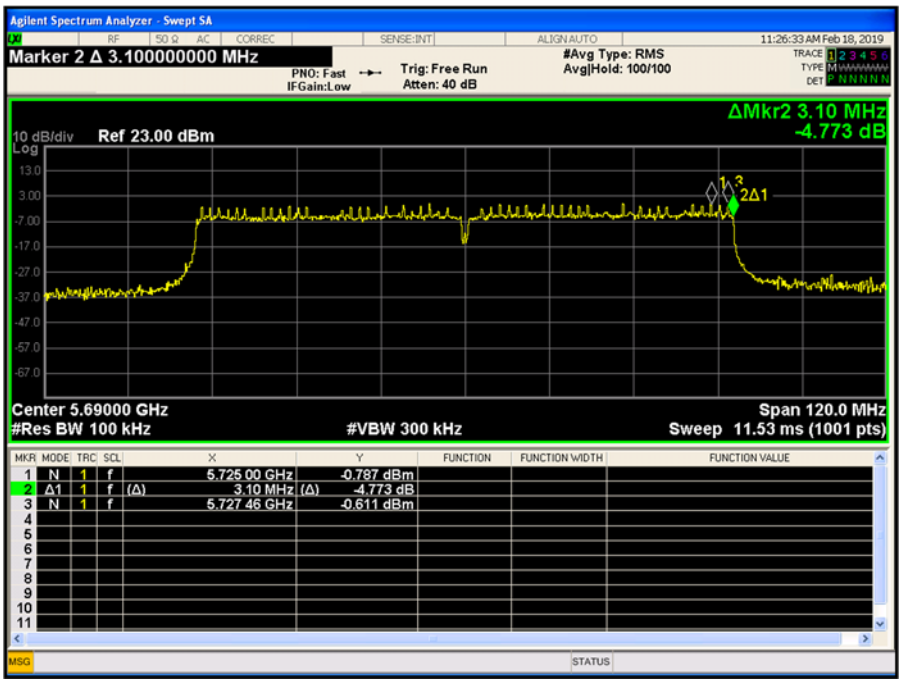
Plot 9-180. 6-dB Bandwidth Chain 0 802.11ac VHT80 (Ch. 138)

9.4.5.12 Chain 1 802.11ac VHT80 6-dB Bandwidth

Chain 1 802.11ac VHT80 6-dB Bandwidth		
Channel No.	**Frequency (MHz)**	**6-dB Bandwidth (MHz)**
155	5775	75.85
138	5690	3.10



Plot 9-181. 6-dB Bandwidth Chain 1 802.11ac VHT80 (Ch. 155)



Plot 9-182. 6-dB Bandwidth Chain 1 802.11ac VHT80 (Ch. 138)

9.5 Maximum Conducted Output Power

9.5.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (a)
ISED RSS-247 [6.2]

9.5.2 Test Method:

Measurements were performed according to the procedures defined in KDBs 789033- General UNII Test Procedures New Rules v02r01, 662911 D01 Multiple Transmitter Output v02r01, and ANSI C63.10 2013.

Spectrum Analyzer settings:

Average Power:

RBW= 1 MHz
VBW= 3 MHz
Detector = RMS
Trace Mode= Average over 100 traces
Sweep time= Auto
Sweep Point ≥ 2*Span/RBW
Span= large enough to encompass the 26-dB Emission Bandwidth or alternatively the 99% Occupied Bandwidth.
Use the band power measurement function to integrate the power over the 26-dB Emission Bandwidth or 99% Occupied Bandwidth.

9.5.3 Sample Calculation:

For MIMO, the total average power is calculated as follows,
Total Average Power= [10*LOG ((10^ (Power $_{(Chain\ 0)}$/10) +10^ (Power $_{(Chain\ 1)}$/10)] +DCF
For e.g.
Total Power= [10* LOG (10^ (17.54/10) +10^ (17.36/10))] +DCF = (20.46+0.14) =20.6dBm

9.5.4 Limits:

15.407: The maximum conducted output power shall not exceed the limits given the following table for antennas that do not exceed a directional gain > 6dBi:

Band of Operation (MHz)	15.407 Limit
5150 – 5250	24 dBm
5250 – 5350	24dBm or 11 dBm + 10 log (B)(1)
5470 – 5725	24dBm or 11 dBm + 10 log (B)(1)
5725 – 5825	30 dBm

Note(1): B is the 26-dB Emission bandwidth of signal in MHz.

RSS-247: The maximum conducted output power and/or EIRP shall not exceed the limits given the following table:

Band of Operation (MHz)	RSS-247 Conducted Output Power Limit	RSS-247 E.I.R.P Limit
5150 – 5250	--	23 dBm or 10 + 10 log (B)(1)
5250 – 5350	24 dBm or 11 + 10 log (B)(1)	30 dBm or 17 + 10 log (B)(1)
5470 – 5725	24 dBm or 11 + 10 log (B)(1)	30 dBm or 17 + 10 log (B)(1)
5725 – 5825	30 dBm	--

Note(1): B is the 99% Occupied Bandwidth of the signal in MHz.

Conducted Output Power and EIRP measurements for Straddle Channels, 5720, 5710 and 5690, were compared against the 5470 – 5725 MHz band limits which also demonstrates compliance with the 5725 - 5825 MHz band. As the total power complies with the limits for both bands the power within each band also complies with the limits of each band.
Limits for these channels were computed using only the portion of the bandwidth that falls completely within the 5470 – 5725 band using the following formula.

$$B_{Straddle}\ MHz = \frac{B_{emission}\ MHz}{2} + 5\ MHz,$$

Where,
$B_{Straddle}$ is the bandwidth portion falling completely within the 5470 – 5725 MHz Band.
$B_{Emission}$ is the total measured 26-dB (FCC) or 99% bandwidth (ISED) of the emission in MHz.

e.g. $$B_{Straddle}\ MHz\ (for\ 802.11a\ 5720MHz) = \frac{19.2\ MHz}{2} + 5\ MHz = 14.6\ MHz$$
$$Limit_{FCC\_15.407}\ dBm = 11\ dBm + 10 \times \log_{10} 14.6 = 22.64\ dBm$$

Straddle Channel Conducted Output Power and EIRP Limits						
Straddle Channel	**Mode**	**Measured Min 26-dB Bandwidth (MHz)**	**Measured Min 99% Occupied Bandwidth (MHz)**	**15.407 Conducted Output Power Limit (dBm)**	**RSS-247 Conducted Output Power Limit (dBm)**	**RSS-247 E.I.R.P Limit (dBm)**
5720	802.11a	22.82	16.68	24.00	23.22	29.22
5720	802.11n HT20	23.21	17.88	24.00	23.52	29.52
5720	802.11ac VHT20	25.48	17.89	24.00	23.53	29.53
5710	802.11n HT40	42.73	36.43	24.00	24.00	30.00
5710	802.11ac VHT40	42.35	36.47	24.00	24.00	30.00
5690	802.11ac VHT80	85.03	75.94	24.00	24.00	30.00

9.5.5 Test Results:

Pass. See Section 9.6.6 for test data.

9.6 Power Spectral Density

9.6.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (a)
ISED RSS-247 [6.2]

9.6.2 Test Method:

Measurements were performed according to the procedures defined in KDBs 789033- General UNII Test Procedures New Rules v02r01, 662911 D01 Multiple Transmitter Output v02r01, and ANSI C63.10 2013.

Spectrum Analyzer settings for devices operating in the bands 5.15 – 5.25 GHz, 5.25 – 5.35GHz, and 5.47 – 5.725GHz:

RBW= 1 MHz
VBW= 3 MHz
Detector = RMS
Trace Mode= Average over 100 traces
Sweep time= Auto
Sweep Point ≥ 2*Span/RBW
Span= large enough to encompass the 26-dB Emission Bandwidth or alternatively the 99% Occupied Bandwidth. Use the peak marker function to identify the Maximum Power Spectral Density

Spectrum Analyzer settings for devices operating in the bands 5.725 – 5.85 GHz:

RBW= 100 kHz
VBW= 300 kHz
Detector = RMS
Trace Mode= Average over 100 traces
Sweep time= Auto
Sweep Point ≥ 2*Span/RBW
Span= large enough to encompass the 26-dB Emission Bandwidth or alternatively the 99% Occupied Bandwidth. Use the peak marker function to identify the Maximum Power Spectral Density
Offset is added if measurements are performed using a reduced resolution bandwidth 100 kHz, add 10* log (500KHz/RBW USED) to the measured result.

9.6.3 Sample Calculation:

For MIMO, the total average PSD is calculated as follows,
Total PSD=10*LOG ((10^ (PSD $_{(Chain\ 0)}$/10) +10^ (PSD $_{(Chain\ 1)}$/10)
For e.g. Total PSD= 10* LOG (10^ (3.41/10) +10^ (2.41/10)) = 5.94dBm/100kHz

9.6.4 Limits:

15.407: The Maximum Power Spectral Density shall not exceed the limits given the following table for antennas that do not exceed a directional gain > 6dBi:

Band of Operation (MHz)	15.407 Limits
5150 – 5250	11dBm/MHz
5250 – 5350	11dBm/MHz
5470 – 5725	11dBm/MHz
5725 – 5825	30dBm/500kHz

Band of Operation (MHz)	RSS-247 Limits
5150 – 5250	10dBm/MHz e.i.r.p.
5250 – 5350	11dBm/MHz
5470 – 5725	11dBm/MHz
5725 – 5825	30dBm/500kHz

For antenna gains >6dBi, the PSD limits are reduced by the amount it exceeds 6dBi.

9.6.5 Test Results:

Pass.

PSD measurements for Straddle Channels, 5720, 5710 and 5690, were compared against the 5470 – 5725 MHz band limits demonstrating compliance with the less stringent 5725 - 5825 MHz band limits as well.

9.6.6 Test Data

9.6.6.1 Chain 0+1 802.11a Maximum Conducted Output Power

Chain 0+1 802.11a Maximum Conducted Output Power								
Chan. No.	**Freq. (MHz)**	**Chain 0 (dBm)**	**Chain 1 (dBm)**	**Total Power (dBm)**	**15.407 Limit (dBm)**	**RSS-247 Limit (dBm)**	**15.407 Margin (dB)**	**RSS-247 Margin (dB)**
36	5180	8.93	8.89	12.08	24.00	--	-11.92	--
44	5220	9.03	9.12	12.25	24.00	--	-11.75	--
48	5240	9.12	9.33	12.40	24.00	--	-11.60	--
52	5260	16.51	16.39	19.62	24.00	23.21	-4.38	-3.59
60	5300	16.42	16.34	19.55	24.00	23.21	-4.45	-3.66
64	5320	16.12	16.23	19.35	24.00	23.22	-4.65	-3.87
100	5500	15.44	15.45	18.62	24.00	23.21	-5.38	-4.60
116	5580	15.52	15.65	18.76	24.00	23.22	-5.24	-4.46
140	5700	14.51	14.66	17.76	24.00	23.22	-6.24	-5.47
144	5720	16.42	16.57	19.67	24.00	23.22	-4.33	-3.56
149	5745	16.53	16.61	19.74	30.00	30.00	-10.26	-10.26
157	5785	16.79	16.88	20.01	30.00	30.00	-9.99	-9.99
165	5825	16.91	16.87	20.06	30.00	30.00	-9.94	-9.94

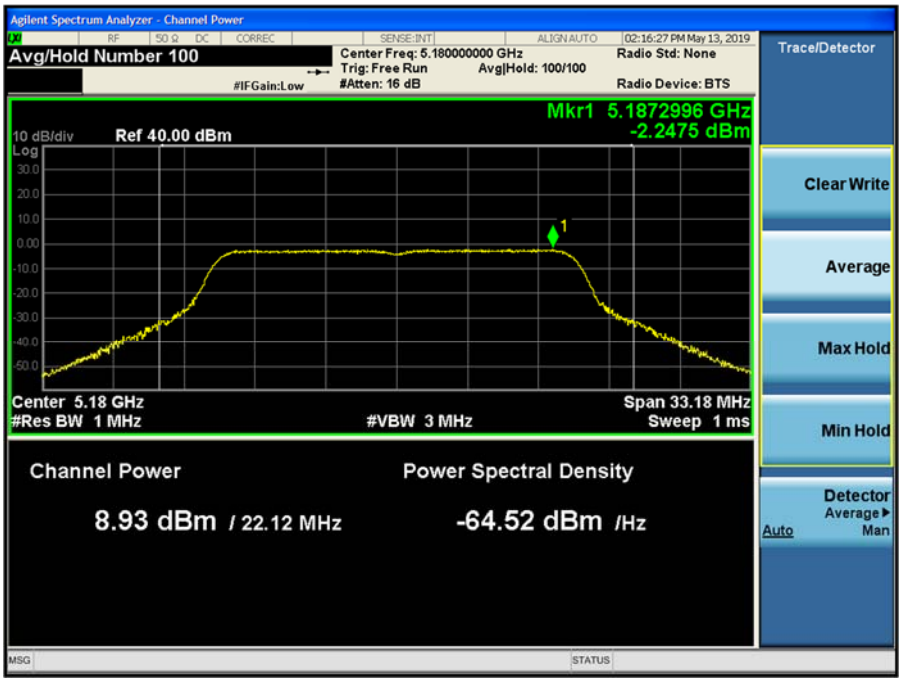
Chain 0+1 802.11a E.I.R.P						
Channel No.	**Frequency (MHz)**	**Total Power (dBm)**	**Antenna Gain (dBi)**	**E.I.R.P (dBm)**	**RSS-247 E.I.R.P Limit (dBm)**	**RSS-247 E.I.R.P. Margin (dB)**
36	5180	12.08	5.06	17.14	22.21	-5.08
44	5220	12.25	5.06	17.30	22.21	-4.91
48	5240	12.40	5.06	17.45	22.22	-4.76
52	5260	19.62	5.23	24.85	29.21	-4.36
60	5300	19.55	5.23	24.78	29.21	-4.43
64	5320	19.35	5.23	24.58	29.22	-4.64
100	5500	18.62	5.96	24.57	29.21	-4.64
116	5580	18.76	5.96	24.71	29.22	-4.51
140	5700	17.76	5.96	23.71	29.22	-5.51
144	5720	19.67	5.96	25.62	29.22	-3.60
149	5745	19.74	3.10	22.84	--	--
157	5785	20.01	3.10	23.11	--	--
165	5825	20.06	3.10	23.16	--	--

9.6.6.2 Chain 0+1 802.11a Maximum Power Spectral Density

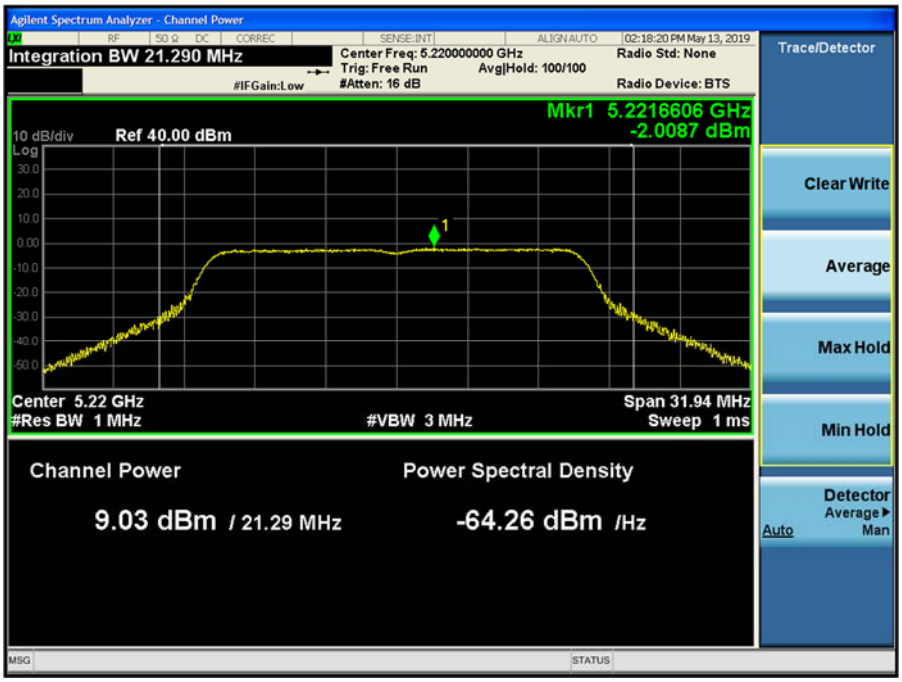
UNII-1 Chain 0+1 802.11a Maximum Power Spectral Density/MHz										
Chan. No.	Freq. (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Total PSD $(\frac{dBm}{MHz})$	Total Ant. Gain (dBi)	Total EIRP PSD $(\frac{dBm}{MHz})$	15.407 Limit $(\frac{dBm}{MHz})$	RSS-247 EIRP PSD Limit $(\frac{dBm}{MHz})$	15.407 Margin (dB)	RSS-247 Margin (dB)
36	5180	-2.25	-2.24	0.93	8.04	8.97	8.96	10.00	-8.03	-1.03
44	5220	-2.01	-1.79	1.27	8.04	9.31	8.96	10.00	-7.69	-0.69
48	5240	-1.78	-1.57	1.50	8.04	9.53	8.96	10.00	-7.47	-0.47

UNII-2A and UNII-2C Chain 0+1 802.11a Maximum Power Spectral Density/MHz								
Channel No.	Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Total PSD $(\frac{dBm}{MHz})$	15.407 Limit $(\frac{dBm}{MHz})$	RSS-247 Limit $(\frac{dBm}{MHz})$	15.407 Margin (dB)	RSS-247 Margin (dB)
52	5260	5.33	5.23	8.45	8.80	11.00	-0.35	-2.55
60	5300	5.08	5.24	8.33	8.80	11.00	-0.46	-2.67
64	5320	4.92	5.12	8.19	8.80	11.00	-0.61	-2.81
100	5500	4.25	4.19	7.39	8.06	11.00	-0.67	-3.61
116	5580	4.33	6.65	7.67	8.06	11.00	-0.39	-3.33
140	5700	3.34	3.41	6.54	8.06	11.00	-1.52	-4.46
144	5720	4.00	4.23	7.29	8.06	11.00	-0.78	-3.71

UNII-3 Chain 0+1 802.11a Maximum Power Spectral Density/500kHz								
Chan. No.	Freq. (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Total PSD $(\frac{dBm}{500\ kHz})$	15.407 Limit $(\frac{dBm}{500\ kHz})$	RSS-247 Limit $(\frac{dBm}{500\ kHz})$	15.407 Margin (dB)	RSS-247 Margin (dB)
149	5745	3.81	3.97	7.06	29.89	29.89	-22.82	-22.82
157	5785	4.09	4.29	7.36	29.89	29.89	-22.52	-22.52
165	5825	3.44	3.73	6.76	29.89	29.89	23.13	23.13



Plot 9-183. Maximum Conducted Output Power and PSD Chain 0 802.11a (Ch. 36)



Plot 9-184. Maximum Conducted Output Power and PSD Chain 0 802.11a (Ch. 44)