

APPENDIX A – TEST DATA OF CONDUCTED EMISSION

Output Power Result

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Test Mode	Data Rate
802.11a	6Mbps
802.11n HT20	MCS0(6.5 Mbps)
802.11n HT40	MCS0(13.5 Mbps)
802.11ac HT20	MCS0(6.5 Mbps)
802.11ac HT40	MCS0(13.5 Mbps)
802.11ac HT80	MCS0(29.3 Mbps)

Directional Antenna Gain

The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain1 Antenna Gain(dBi)	Chain2 Antenna Gain(dBi)	Correlated Chains Directional Gain(dBi)
0.34	-0.58	2.91

Antenna Gain and Limits

Frequency (MHz)	Correlated Chains Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm)
5180	2.91	24.0	11.0
5200	2.91	24.0	11.0
5240	2.91	24.0	11.0
5190	2.91	24.0	11.0
5230	2.91	24.0	11.0
5210	2.91	24.0	11.0
5745	2.91	30.0	30.0
5785	2.91	30.0	30.0
5825	2.91	30.0	30.0
5755	2.91	30.0	30.0
5795	2.91	30.0	30.0
5775	2.91	30.0	30.0

Output Power

Band	Test Mode	Ant	Average Power(dBm)			Limit(dBm)
			5180 MHz	5200 MHz	5240MHz	
U-NII-1	802.11a	Ant1	15.46	15.53	15.49	24.0
	802.11a	Ant2	15.78	15.88	15.73	24.0
	802.11n HT20	Ant1	14.41	14.47	14.44	24.0
	802.11n HT20	Ant2	14.83	14.86	14.77	24.0
	802.11n HT20	MIMO	17.64	17.68	17.62	24.0
	802.11ac VHT20	Ant1	11.33	11.29	11.41	24.0
	802.11ac VHT20	Ant2	11.68	10.72	11.64	24.0
	802.11ac VHT20	MIMO	14.52	14.02	14.54	24.0
	Test Mode	Ant	Average Power(dBm)			Limit(dBm)
			5190 MHz	5230 MHz		
	802.11n HT40	Ant1	14.12	14.15		24.0
	802.11n HT40	Ant2	14.54	14.55		24.0
	802.11n HT40	MIMO	17.35	17.36		24.0
	802.11ac VHT40	Ant1	11.81	11.87		24.0
	802.11ac VHT40	Ant2	12.11	12.15		24.0
	802.11ac VHT40	MIMO	14.97	15.02		24.0
	Test Mode	Ant	Average Power(dBm)			Limit(dBm)
			5210 MHz			
802.11ac VHT80	Ant1	11.75			24.0	
802.11ac VHT80	Ant2	11.93			24.0	
802.11ac VHT80	MIMO	14.85			24.0	
Band	Test Mode	Ant	Average Power(dBm)			Limit(dBm)
			5745 MHz	5785 MHz	5825MHz	
U-NII-3	802.11a	Ant1	13.81	13.88	13.97	30.0
	802.11a	Ant2	14.17	14.28	14.34	30.0
	802.11n HT20	Ant1	13.31	13.37	13.44	30.0
	802.11n HT20	Ant2	13.72	13.83	13.88	30.0
	802.11n HT20	MIMO	16.53	16.62	16.68	30.0
	802.11ac VHT20	Ant1	11.13	11.17	11.25	30.0
	802.11ac VHT20	Ant2	11.48	11.57	11.64	30.0
	802.11ac VHT20	MIMO	14.32	14.38	14.46	30.0
	Test Mode	Ant	Average Power(dBm)			Limit(dBm)
			5755 MHz	5795 MHz		
	802.11n HT40	Ant1	13.24	13.39		30.0
	802.11n HT40	Ant2	13.70	13.87		30.0
	802.11n HT40	MIMO	16.49	16.65		30.0
	802.11ac VHT40	Ant1	12.10	12.15		30.0
	802.11ac VHT40	Ant2	12.39	12.43		30.0
	802.11ac VHT40	MIMO	15.26	15.30		30.0
	Test Mode	Ant	Average Power(dBm)			Limit(dBm)
			5775			
802.11ac VHT80	Ant1	11.88			30.0	
802.11ac VHT80	Ant2	12.11			30.0	

	802.11ac VHT80	MIMO	15.01	30.0
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We chose the Worst-modes are shown as following table:

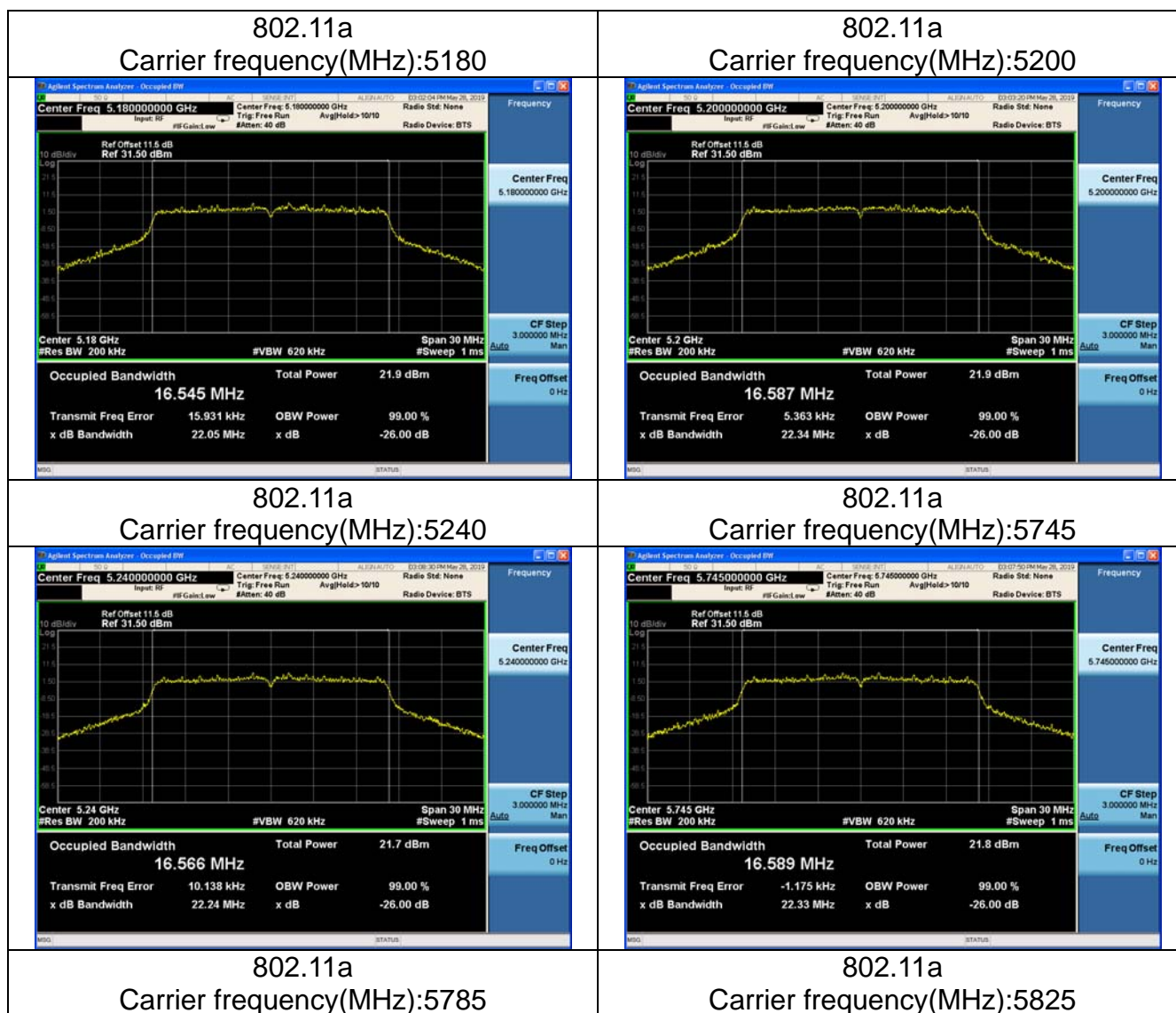
Test Mode	Ant	Note
802.11a	SISO Ant2	---
802.11n HT20	SISO Ant2	Cover 802.11ac VHT20
802.11n HT40	SISO Ant2	Cover 802.11ac VHT40
802.11ac VHT80	SISO Ant2	---
802.11n HT20	MIMO Ant1+Ant2	Cover 802.11ac VHT20
802.11n HT40	MIMO Ant1+Ant2	Cover 802.11ac VHT40
802.11ac VHT80	MIMO Ant1+Ant2	---

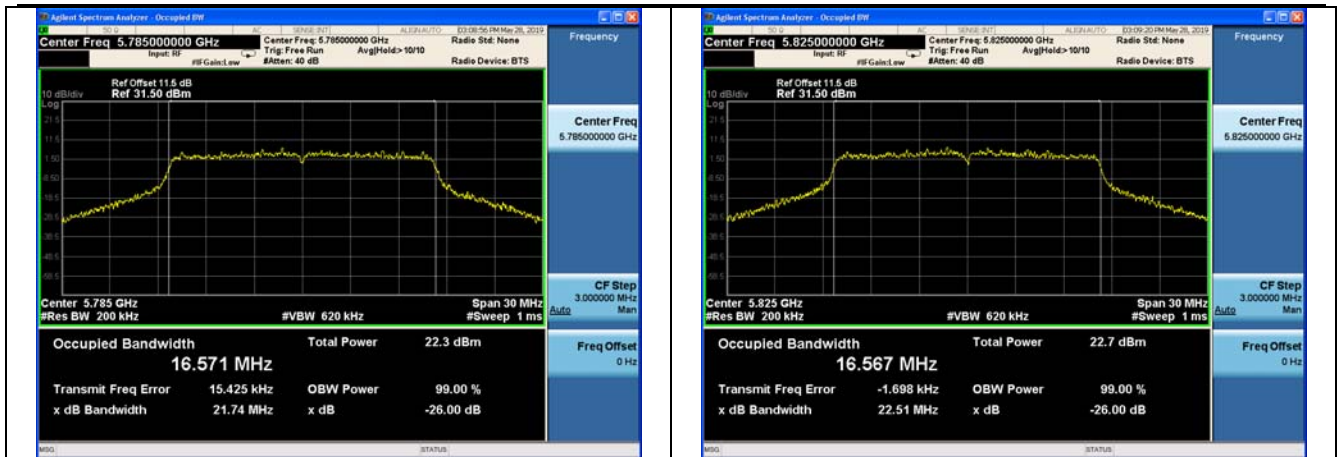
Occupied Bandwidth

Offset 11.5dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1.3dB

Test Mode: 802.11a (SISO Ant2)

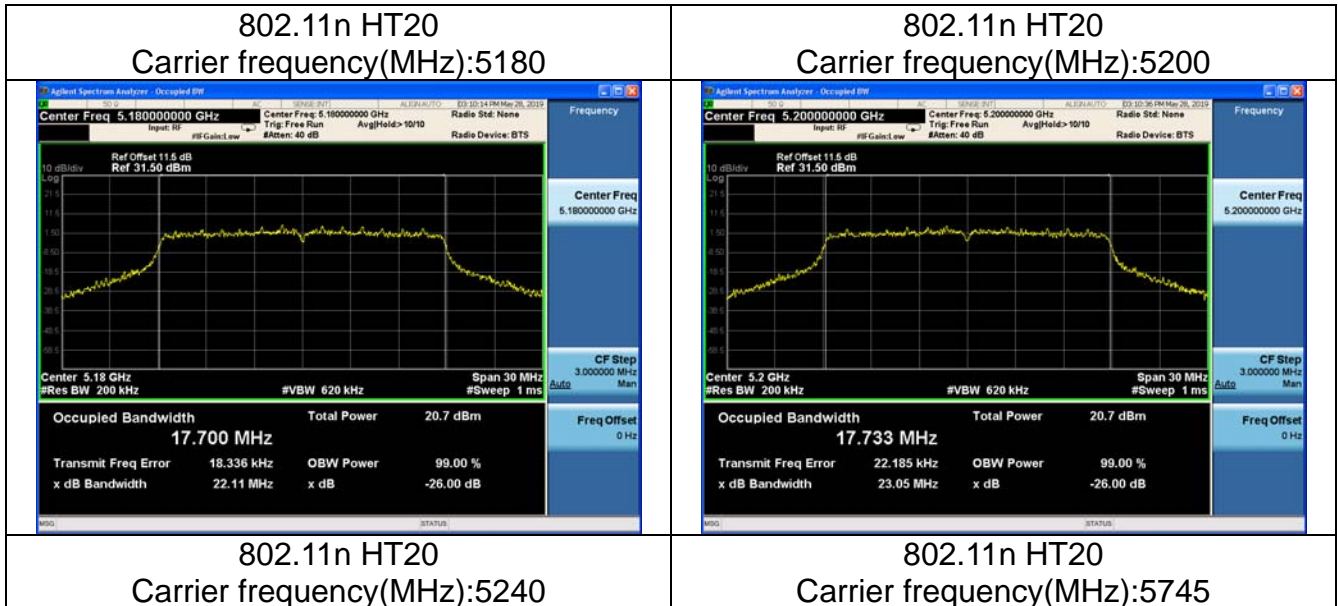
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5180	16.545	22.05	Pass
5200	16.587	22.34	Pass
5240	16.566	22.24	Pass
5745	16.589	22.33	Pass
5785	16.571	21.74	Pass
5825	16.567	22.51	Pass

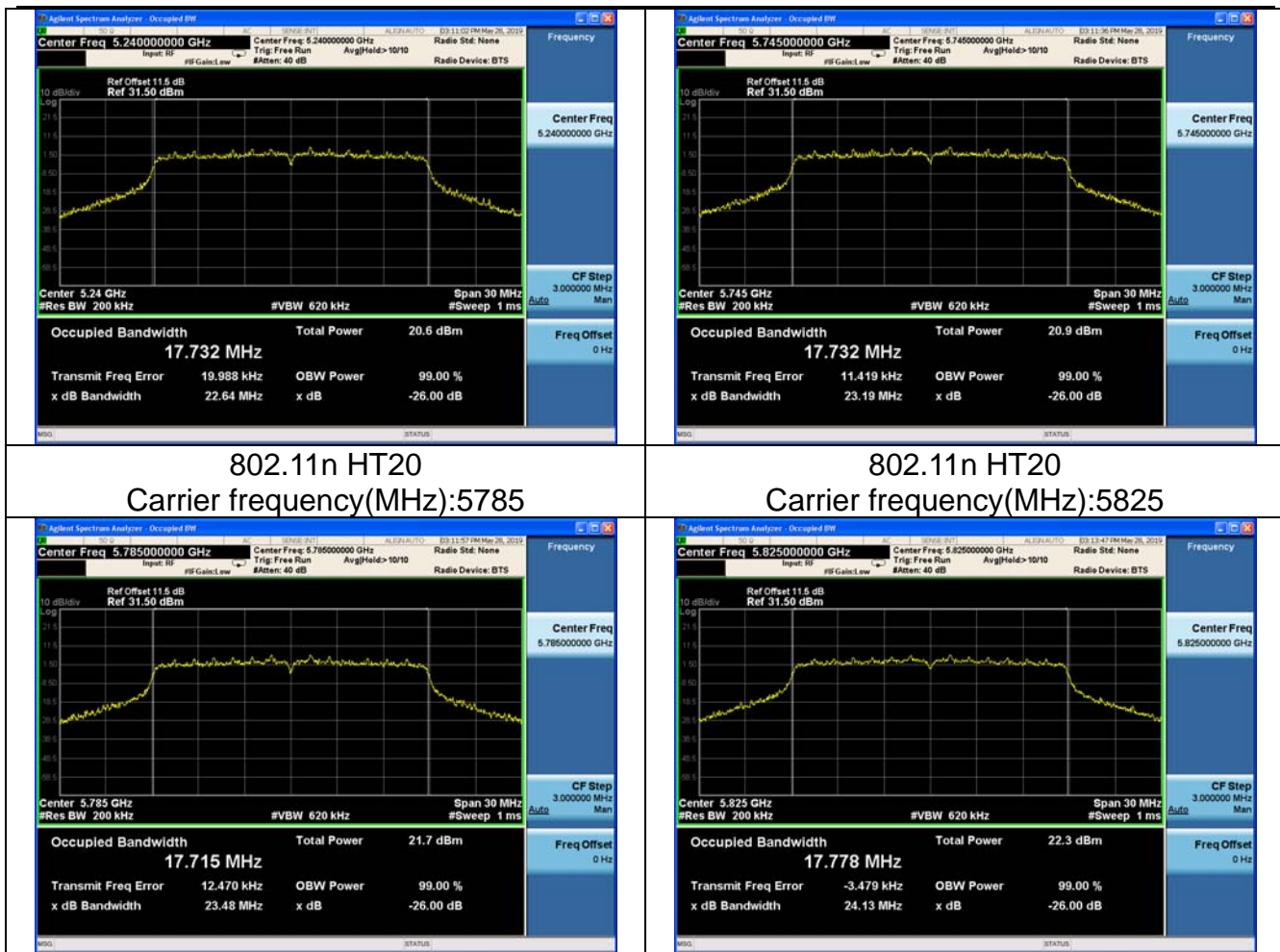




Test Mode: 802.11n HT20 (SISO Ant2)

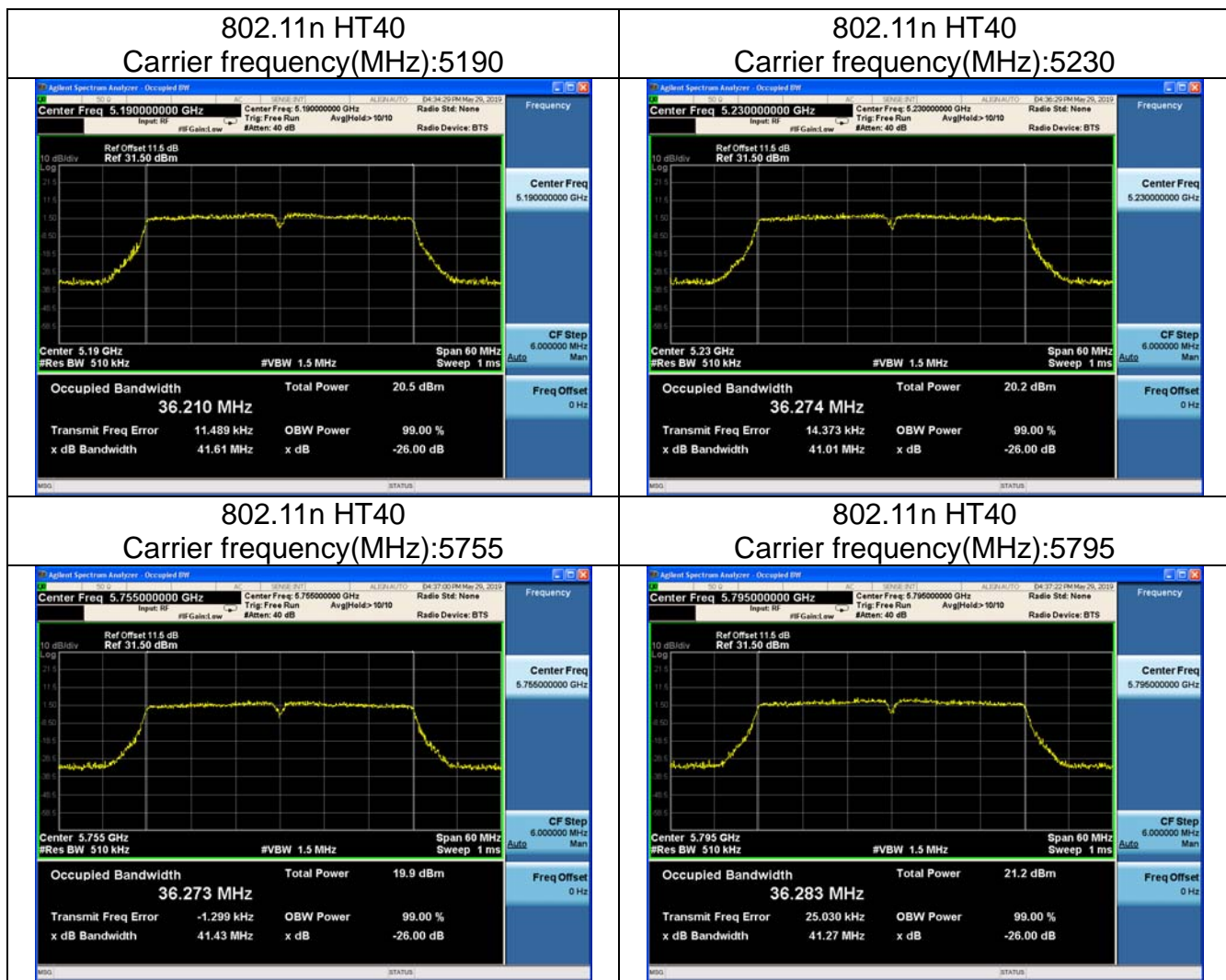
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5180	17.700	22.11	Pass
5200	17.733	23.05	Pass
5240	17.732	22.64	Pass
5745	17.732	23.19	Pass
5785	17.715	23.48	Pass
5825	17.778	24.13	Pass





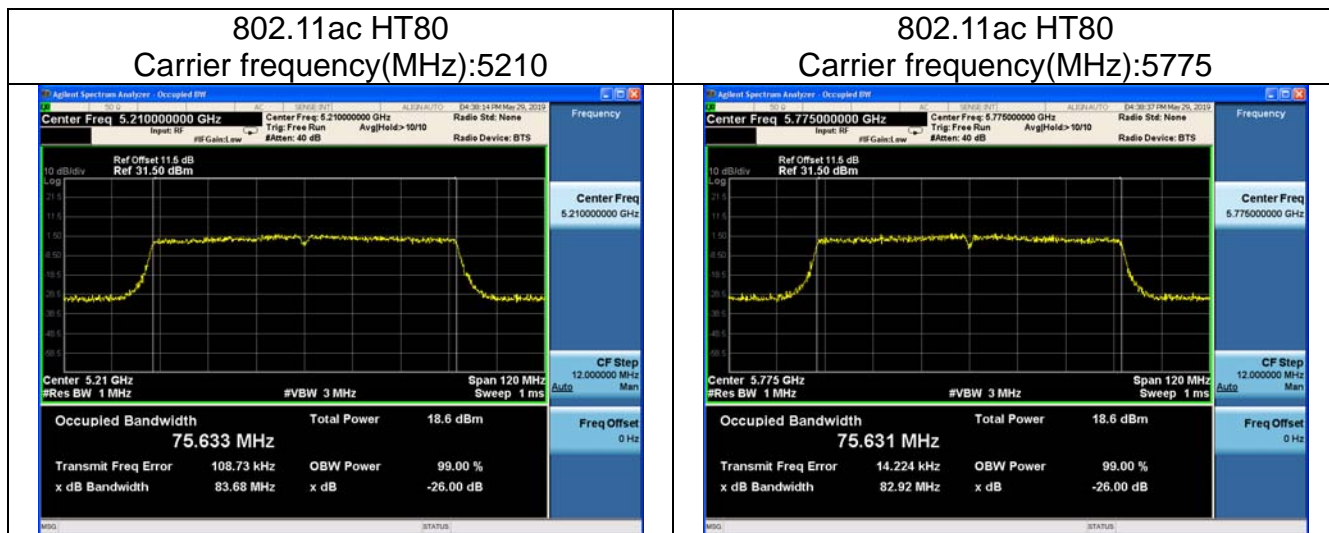
Test Mode: 802.11n HT40 (SISO Ant2)

Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5190	36.210	41.61	Pass
5230	36.274	41.01	Pass
5755	36.273	41.43	Pass
5795	36.283	41.27	Pass



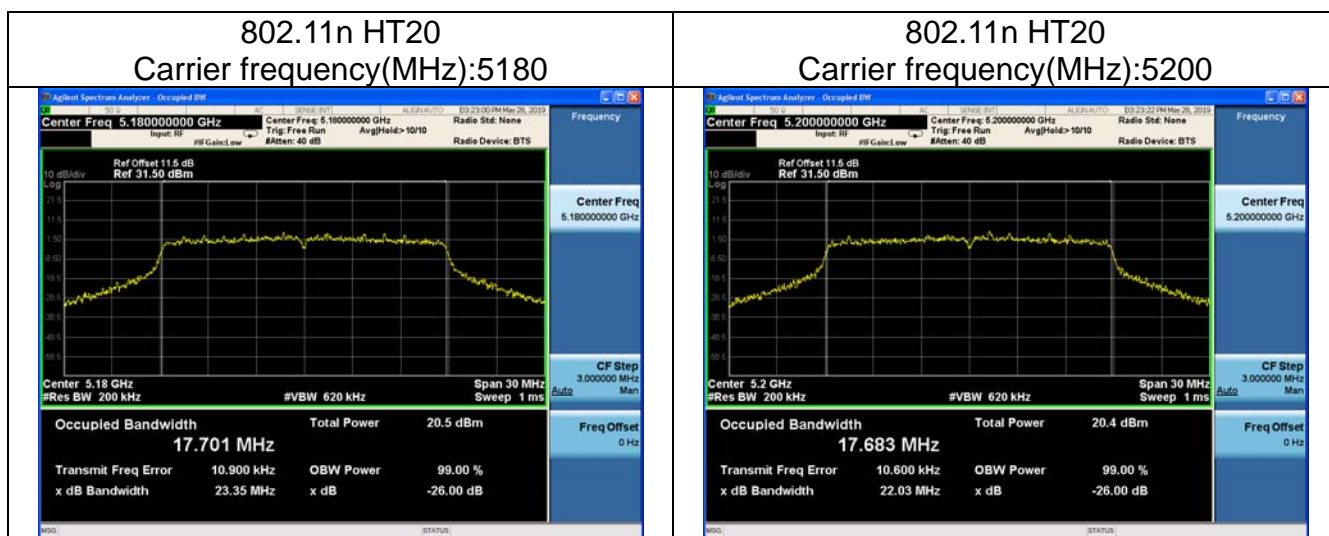
Test Mode: 802.11ac HT80 (SISO Ant2)

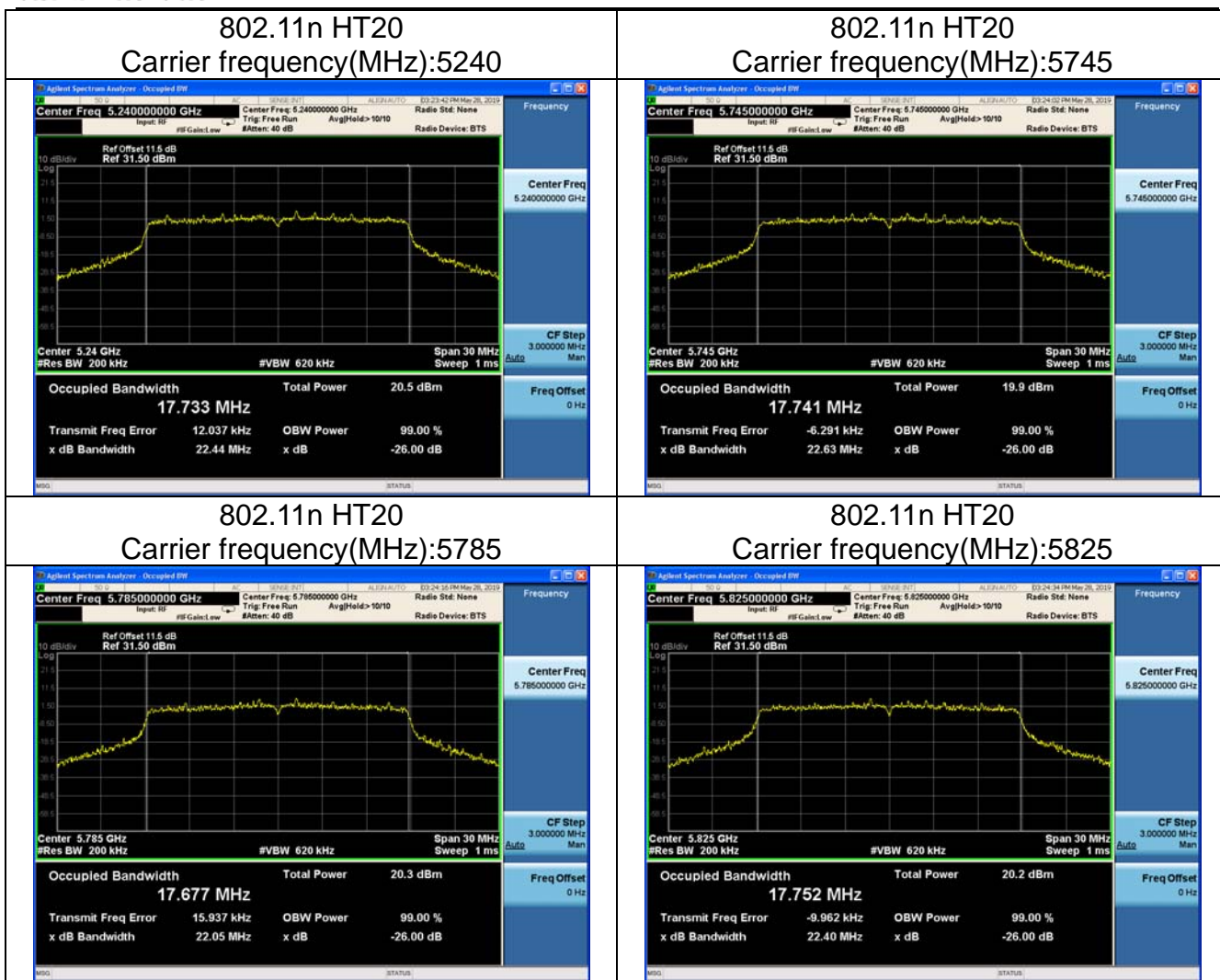
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5210	75.633	83.68	Pass
5775	75.631	82.92	Pass



Test Mode: 802.11n HT20 (MIMO Ant1)

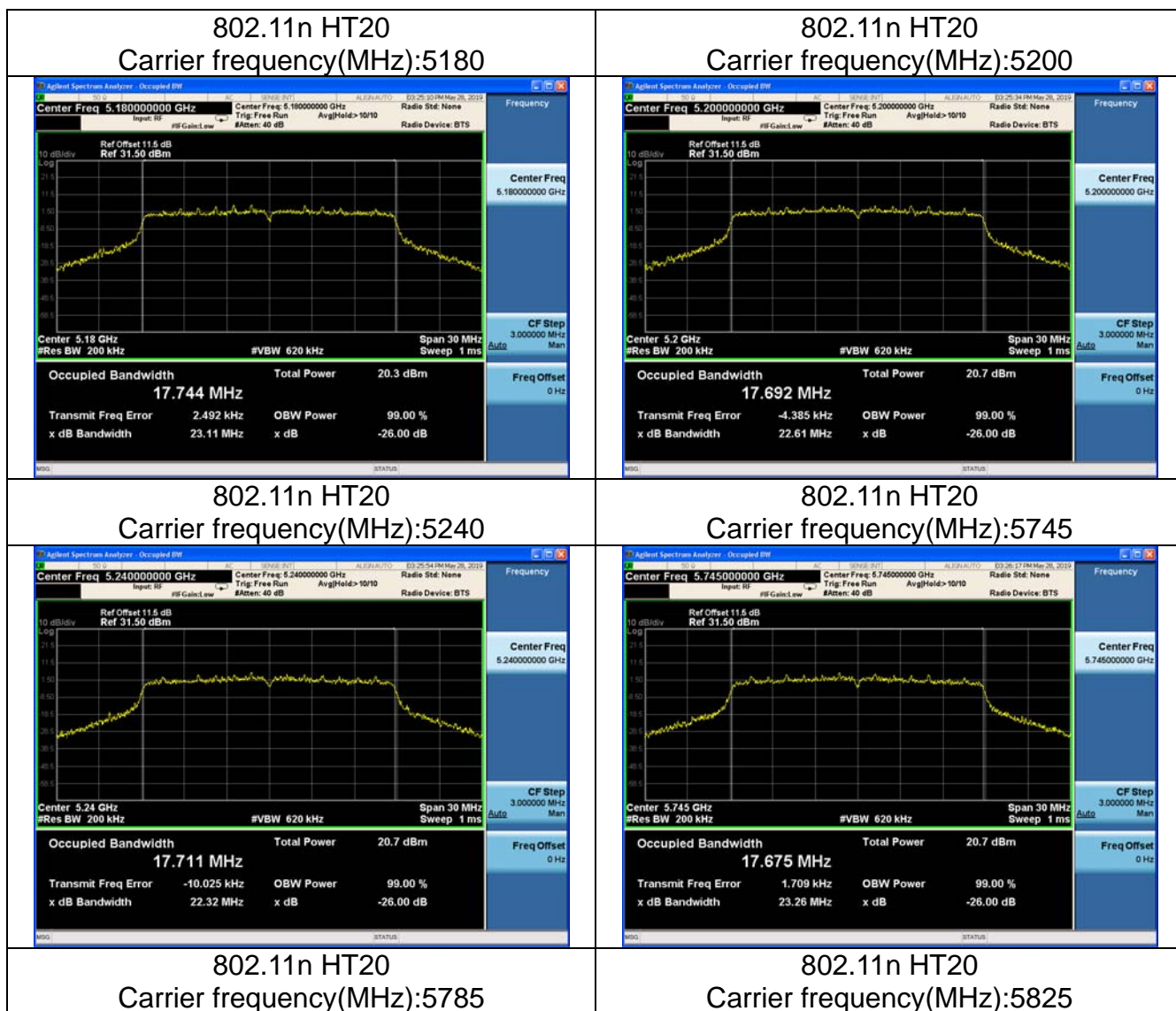
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5180	17.701	23.35	Pass
5200	17.683	22.03	Pass
5240	17.733	22.44	Pass
5745	17.741	22.63	Pass
5785	17.677	22.05	Pass
5825	17.752	22.40	Pass

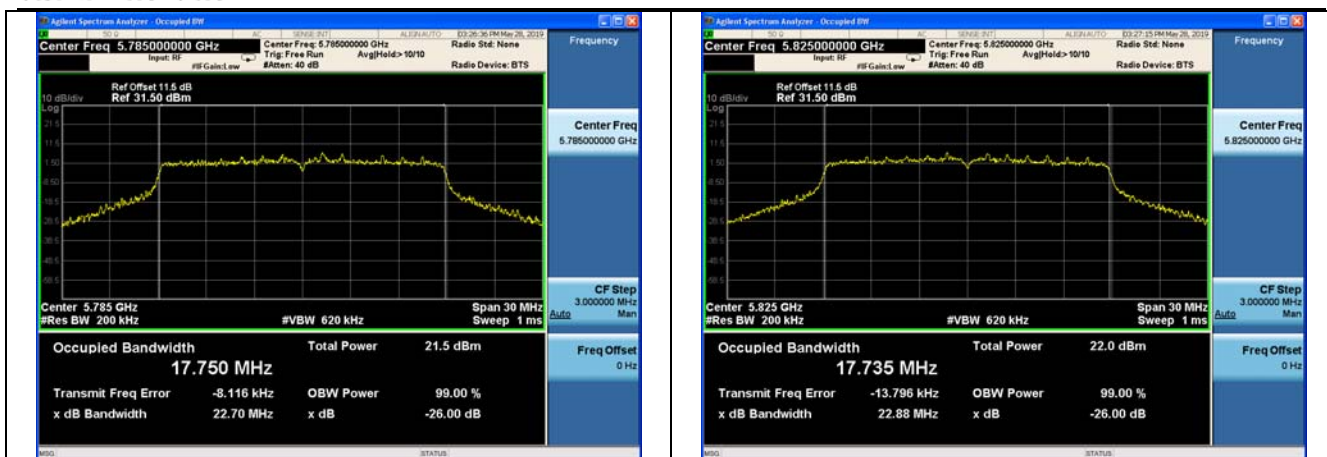




Test Mode: 802.11n HT20 (MIMO Ant2)

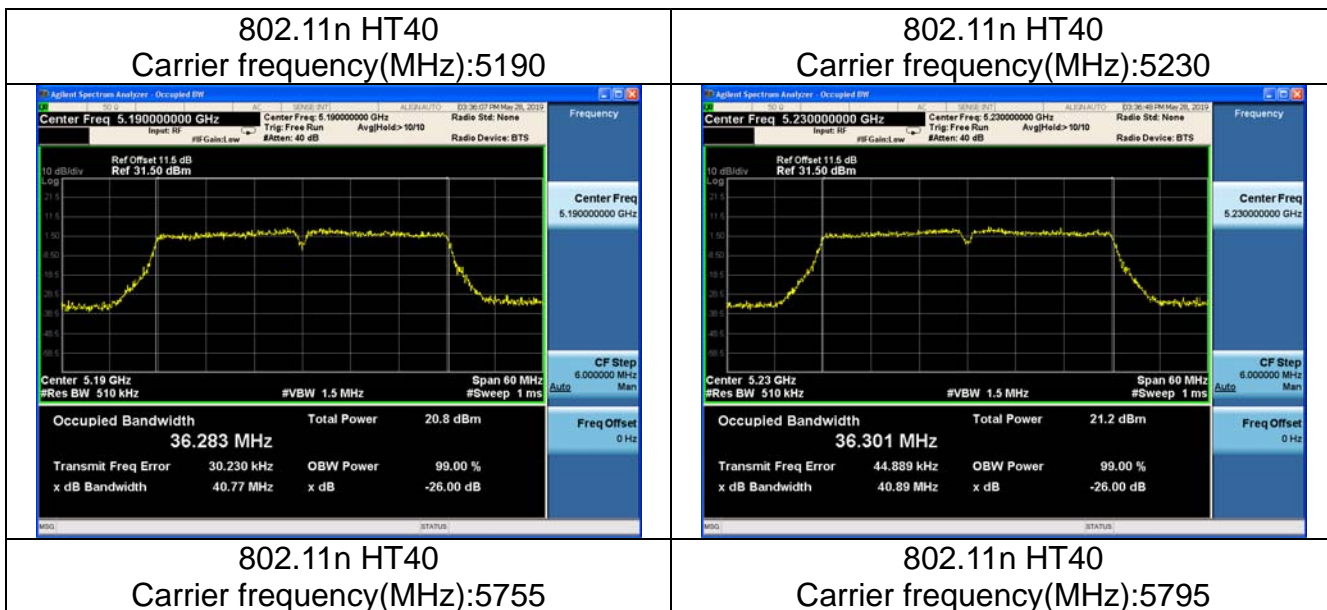
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5180	17.744	23.11	Pass
5200	17.692	22.61	Pass
5240	17.711	22.32	Pass
5745	17.675	23.26	Pass
5785	17.750	22.70	Pass
5825	17.735	22.88	Pass

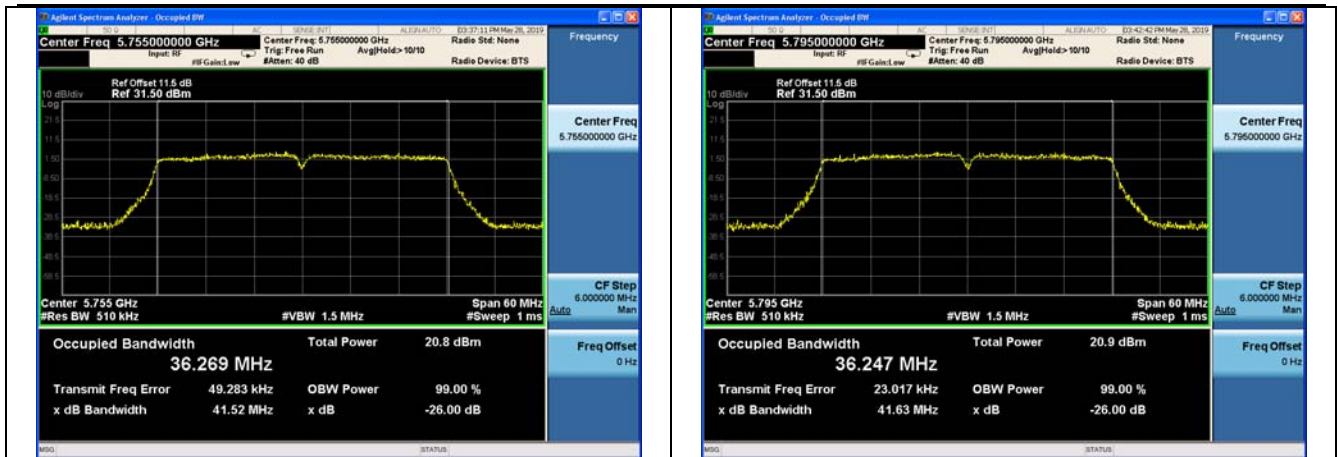




Test Mode: 802.11n HT40 (MIMO Ant1)

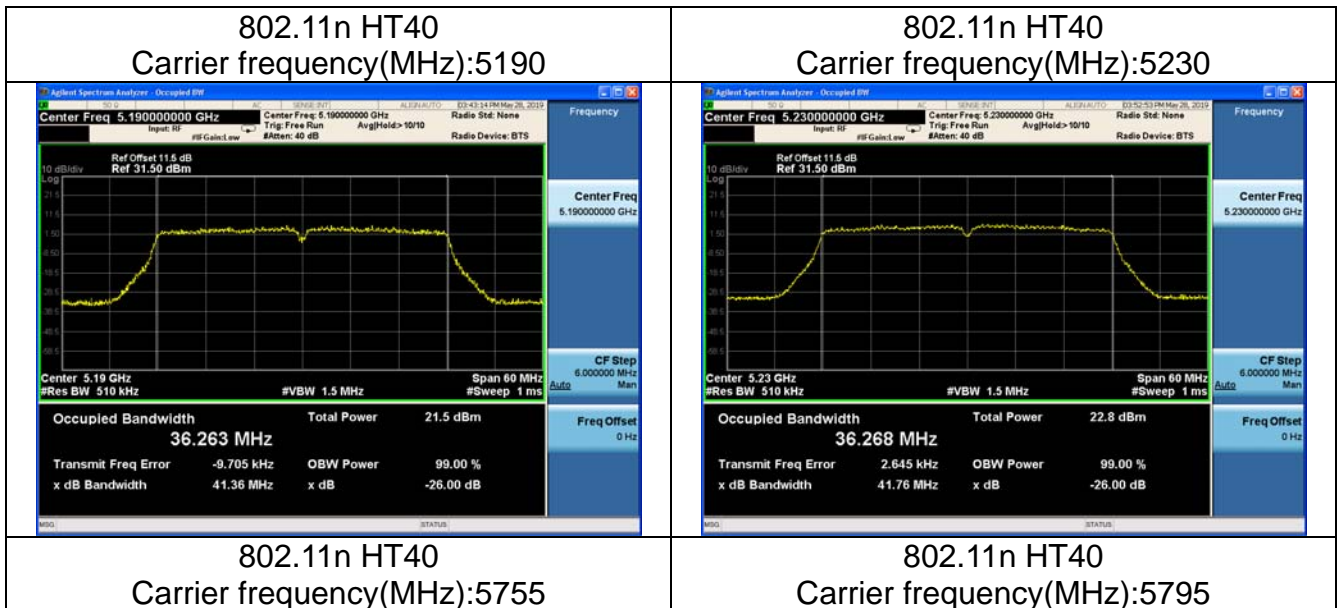
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5190	36.283	40.77	Pass
5230	36.301	40.89	Pass
5755	36.269	41.52	Pass
5795	36.247	41.63	Pass

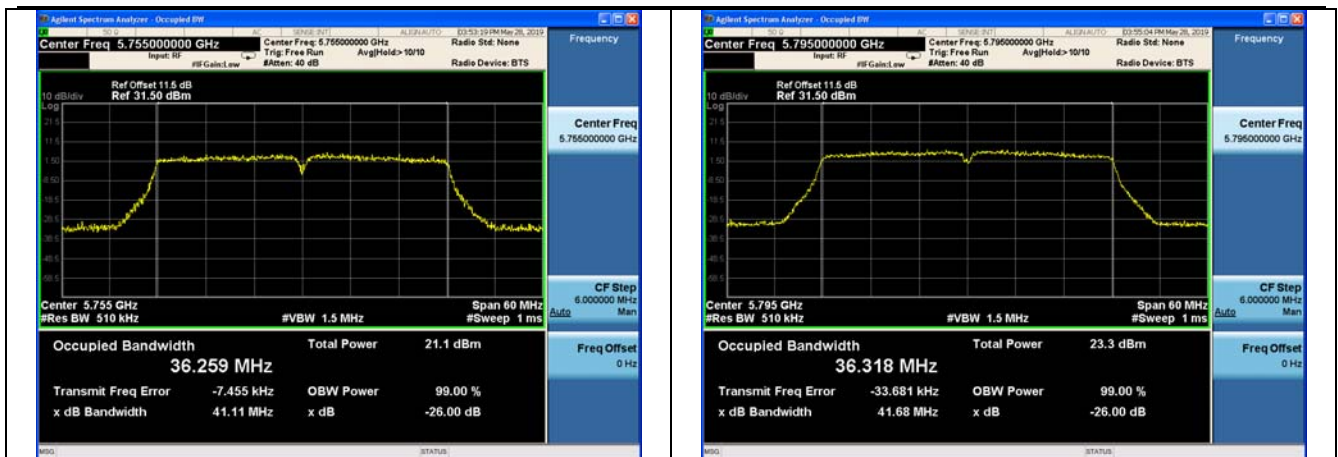




Test Mode: 802.11n HT40 (MIMO Ant2)

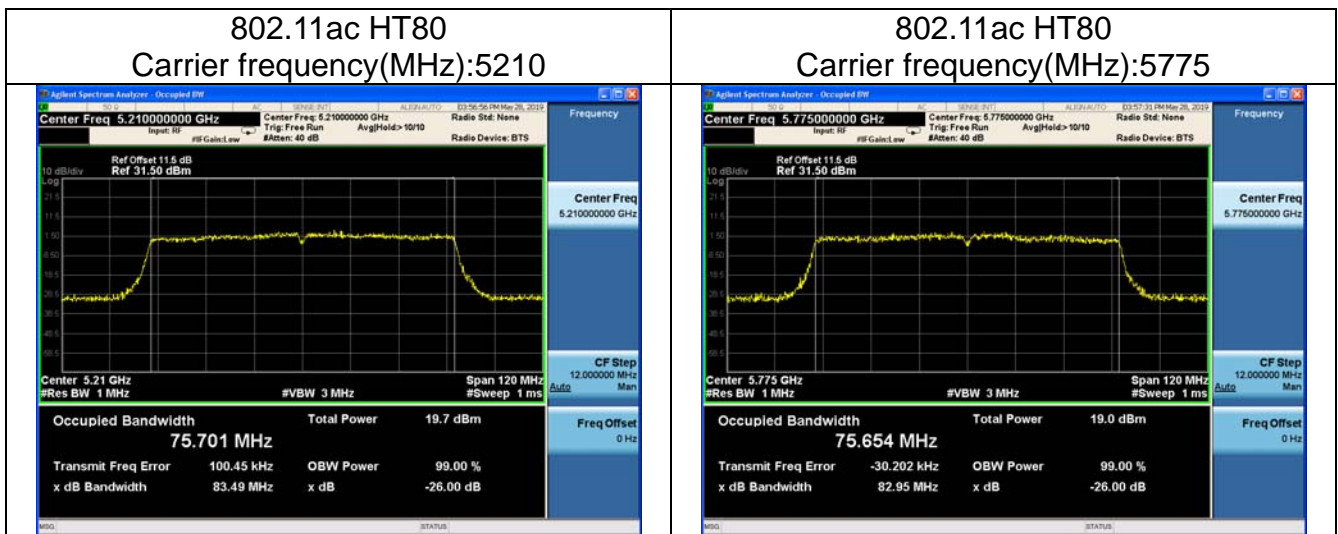
Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5190	36.263	41.36	Pass
5230	36.268	41.76	Pass
5755	36.259	41.11	Pass
5795	36.318	41.68	Pass





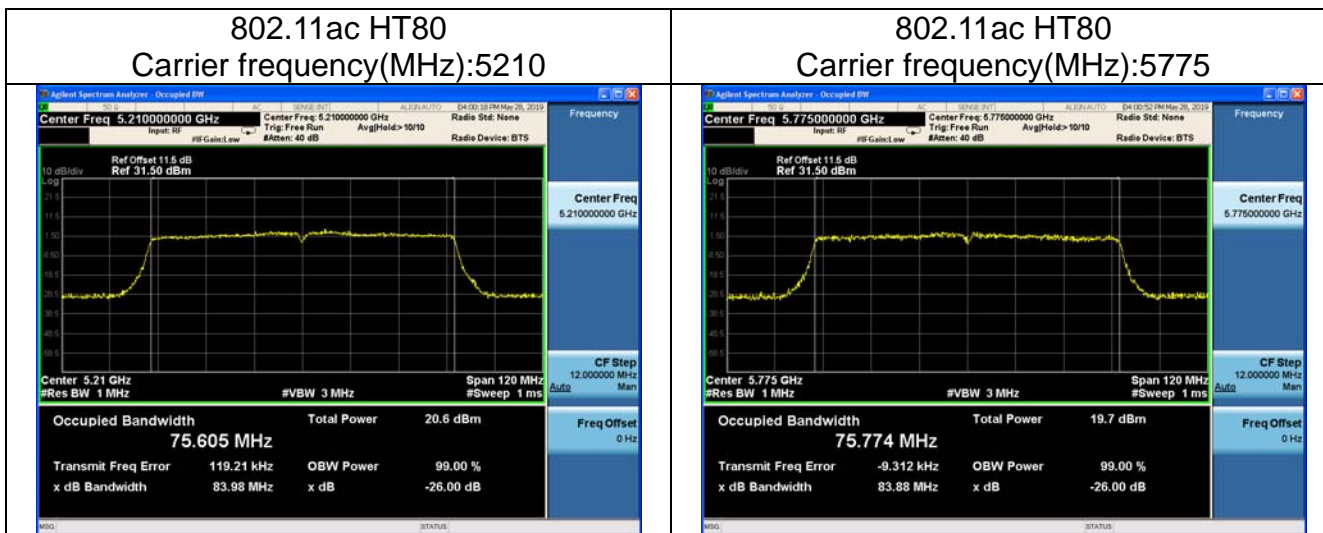
Test Mode: 802.11ac HT80 (MIMO Ant1)

Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5210	75.701	83.49	Pass
5775	75.654	82.95	Pass



Test Mode: 802.11ac HT80 (MIMO Ant2)

Carrier frequency (MHz)	99% Bandwidth(MHz)	Minimum 26dB Bandwidth(MHz)	Conclusion
5210	75.605	83.98	Pass
5775	75.774	83.88	Pass

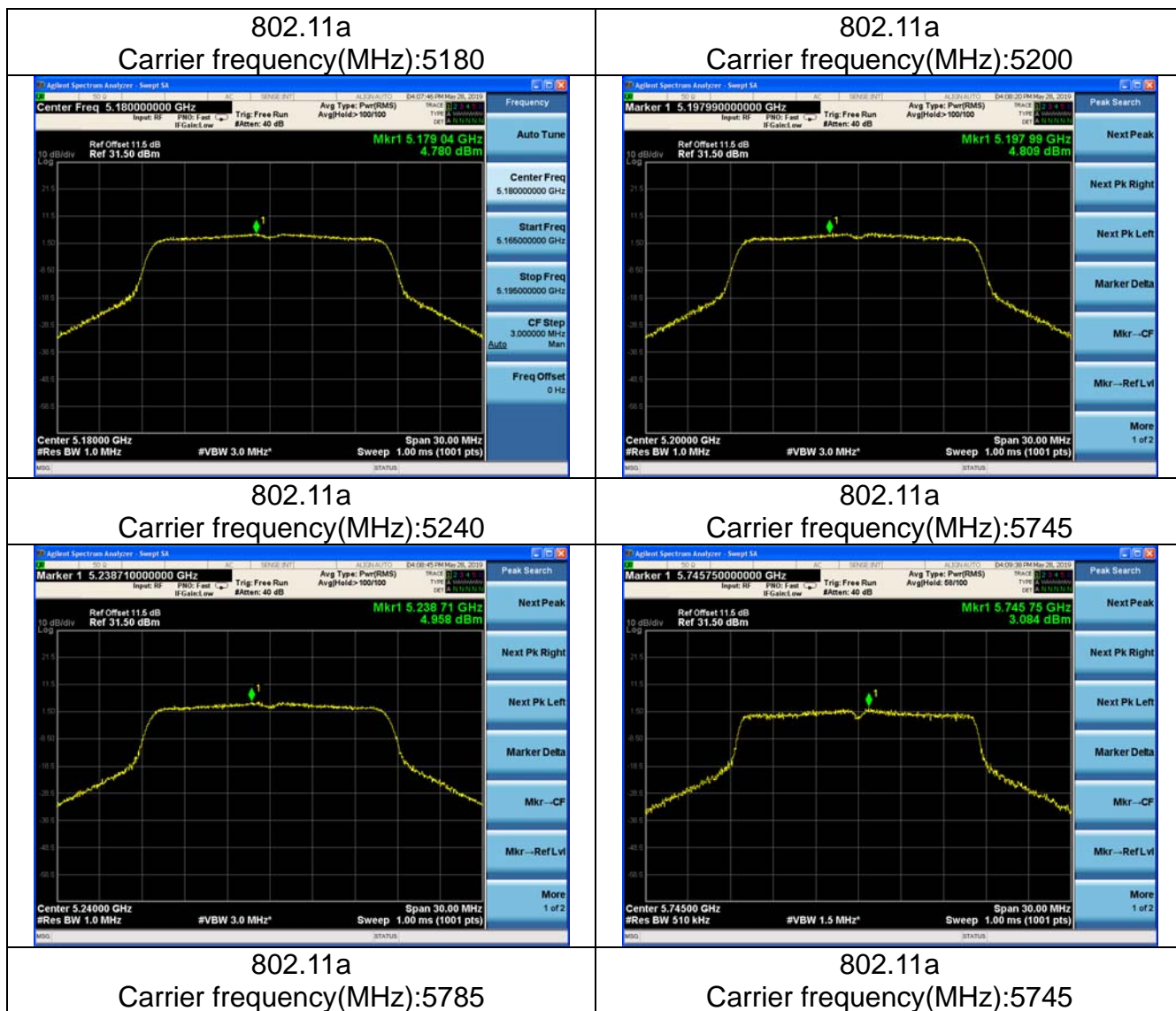


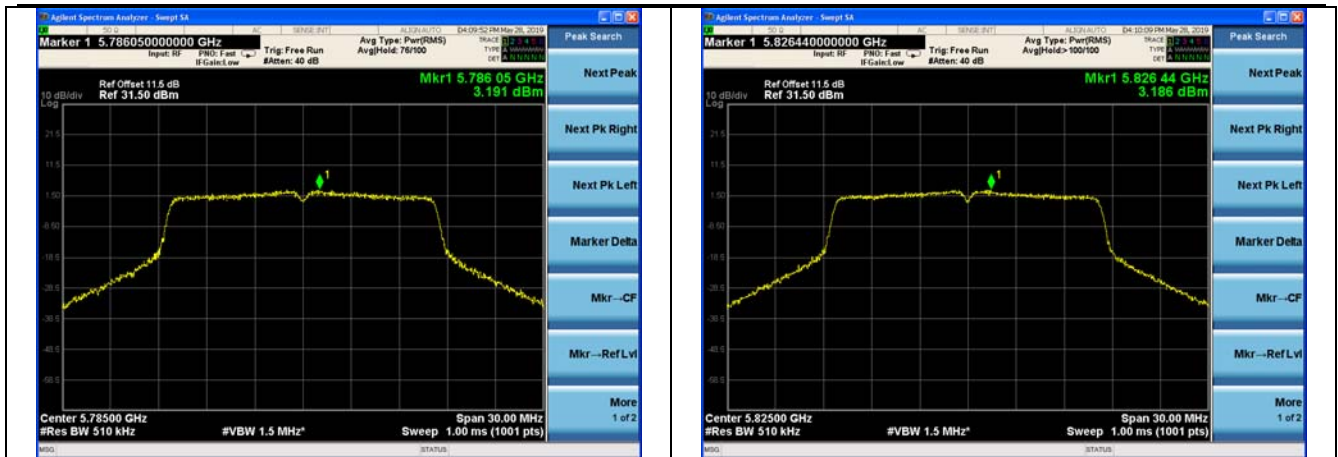
Transmitter Power Spectral Density

Offset 11.5dB = Attenuator 10dB+ Temporary antenna connector loss 0.2dB+ Cable loss 1.3dB

Test Mode: 802.11a (SISO Ant2)

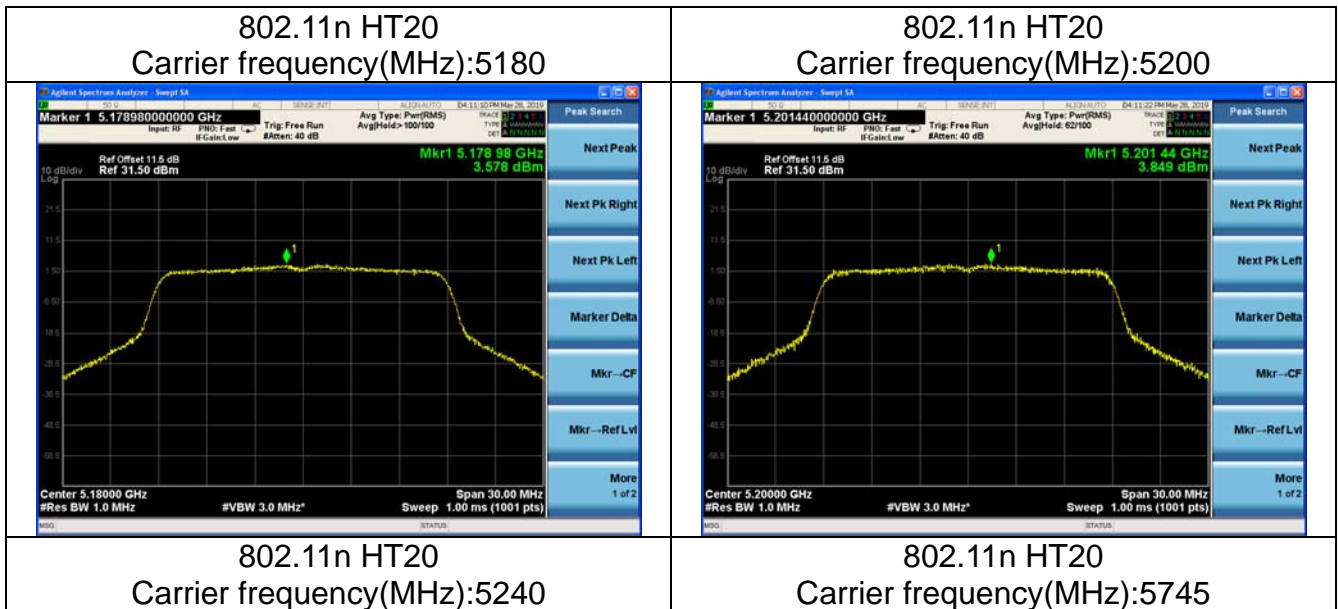
Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Conclusion
5180	0.079	4.780	11.0 dBm/MHz	Pass
5200	0.079	4.809	11.0 dBm/MHz	Pass
5240	0.079	4.958	11.0 dBm/MHz	Pass
5745	0.079	3.084	30.0 dBm/500kHz	Pass
5785	0.079	3.191	30.0 dBm/500kHz	Pass
5825	0.079	3.186	30.0 dBm/500kHz	Pass

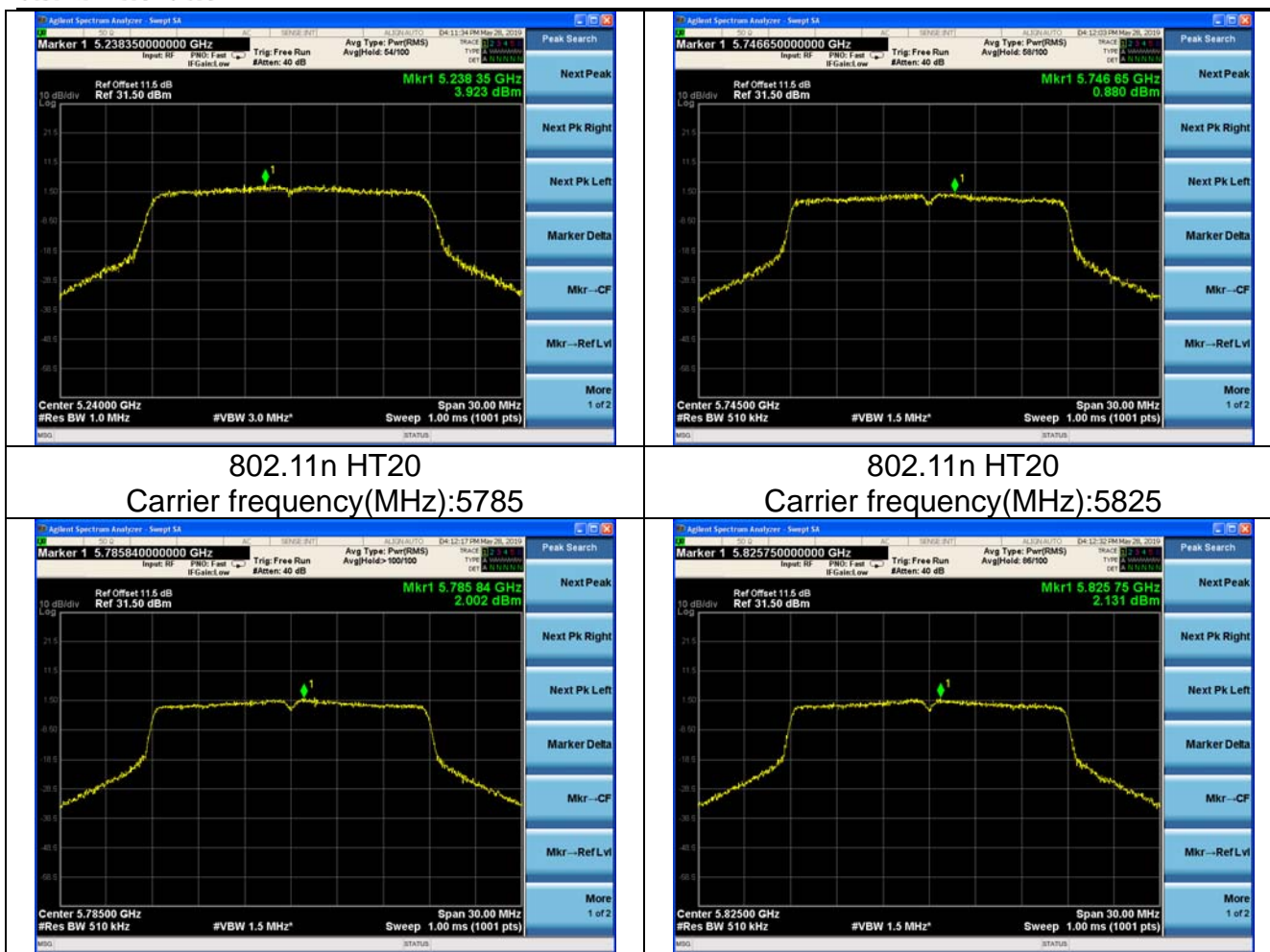




Test Mode: 802.11n HT20 (SISO Ant2)

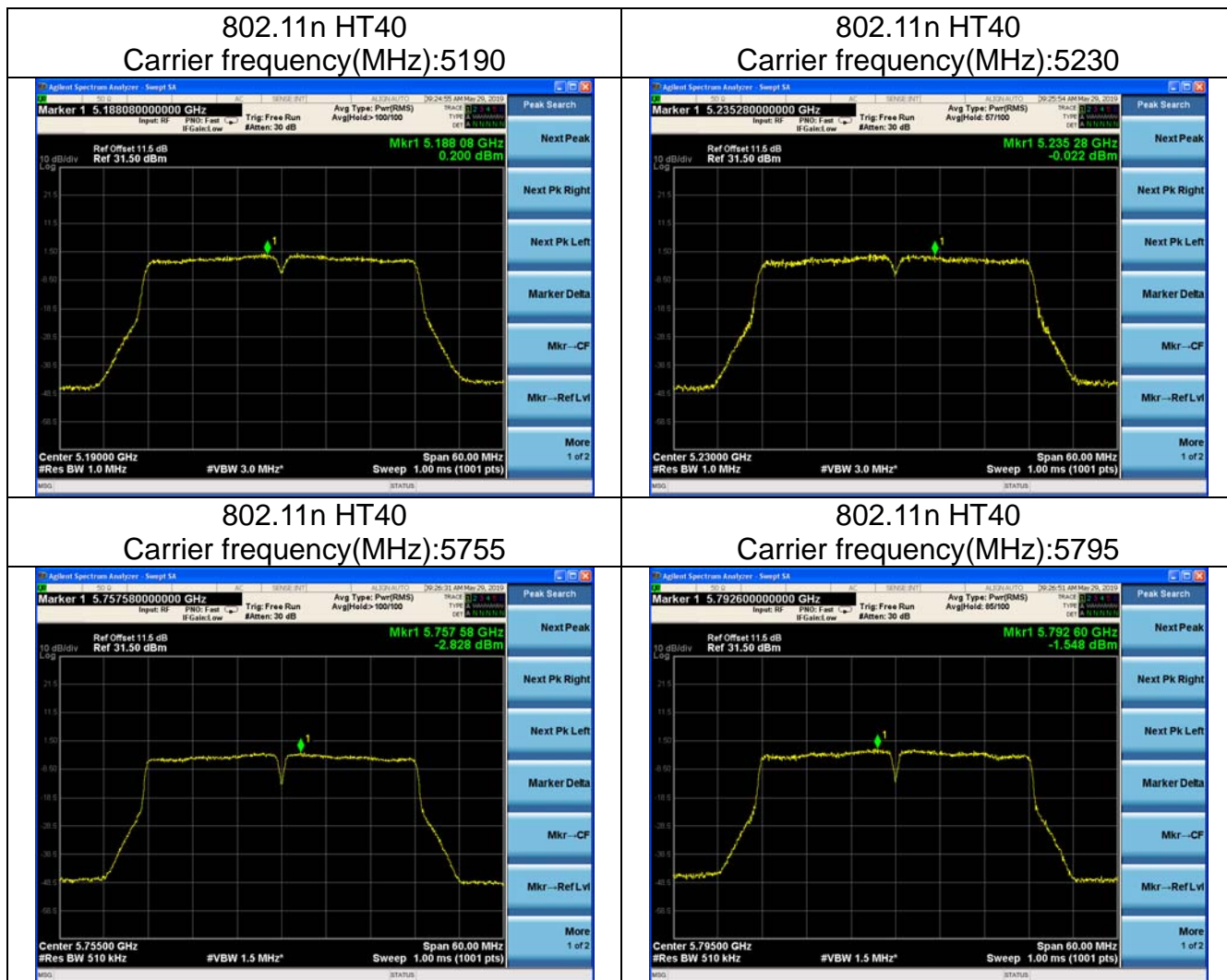
Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Conclusion
5180	0.089	5.178	11.0 dBm/MHz	Pass
5200	0.089	5.201	11.0 dBm/MHz	Pass
5240	0.089	3.923	11.0 dBm/MHz	Pass
5745	0.089	0.880	30.0 dBm/500kHz	Pass
5785	0.089	2.002	30.0 dBm/500kHz	Pass
5825	0.089	2.131	30.0 dBm/500kHz	Pass





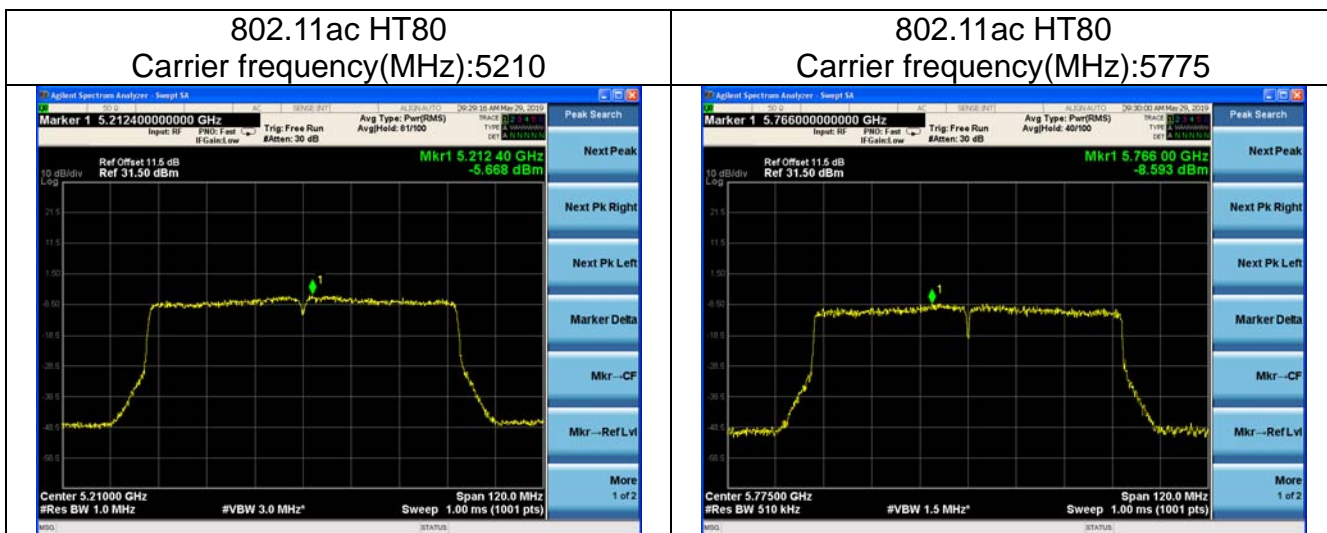
Test Mode: 802.11n HT40 (SISO Ant2)

Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Conclusion
5190	0.176	0.200	11.0 dBm/MHz	Pass
5230	0.176	-0.022	11.0 dBm/MHz	Pass
5755	0.176	-2.828	30.0 dBm/500kHz	Pass
5795	0.176	-1.548	30.0 dBm/500kHz	Pass



Test Mode: 802.11ac HT80 (SISO Ant2)

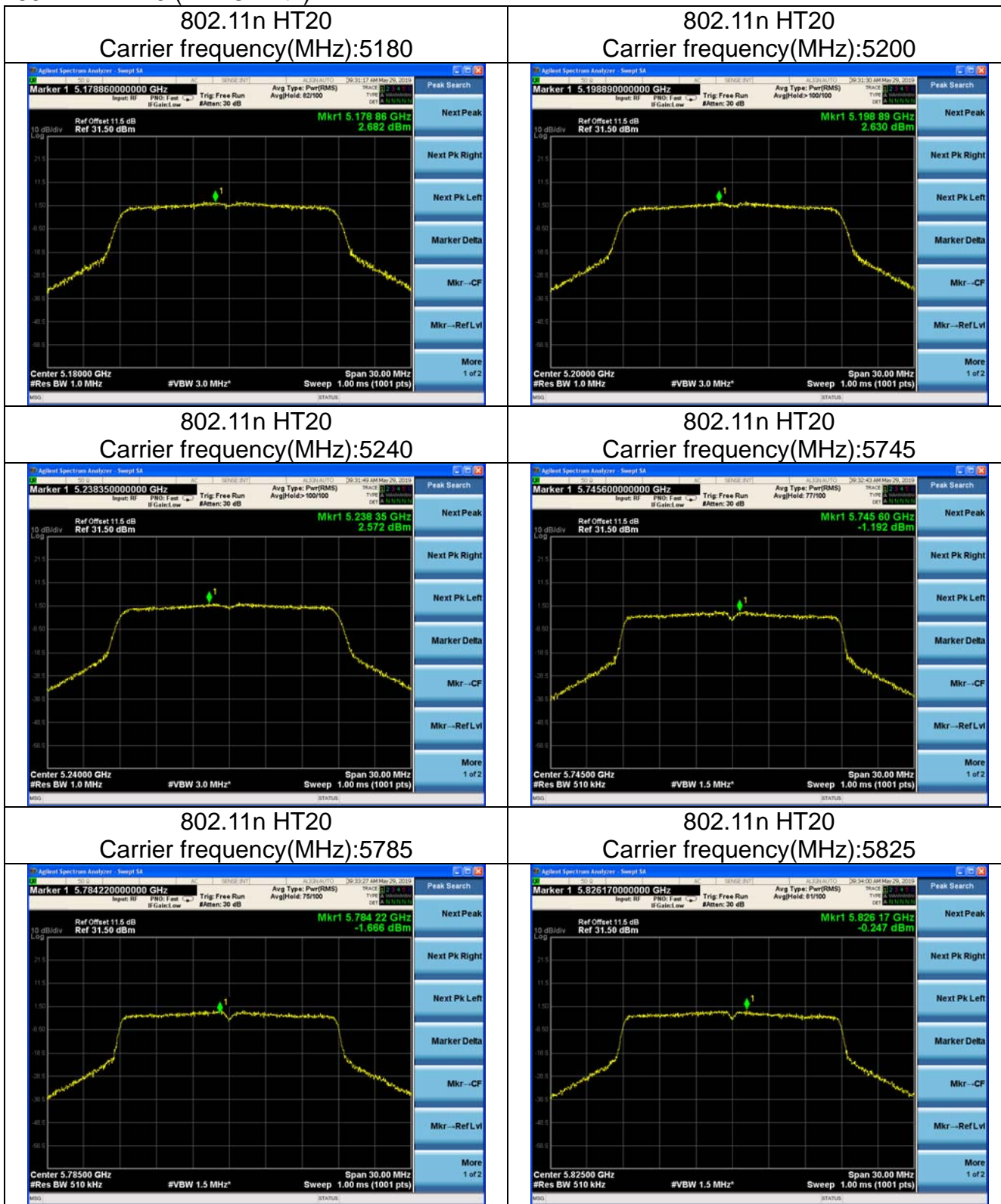
Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Power Spectral Density (dBm/MHz)	Limit	Conclusion
5210	0.341	-5.668	11.0 dBm/MHz	Pass
5775	0.341	-8.593	30.0 dBm/500kHz	Pass



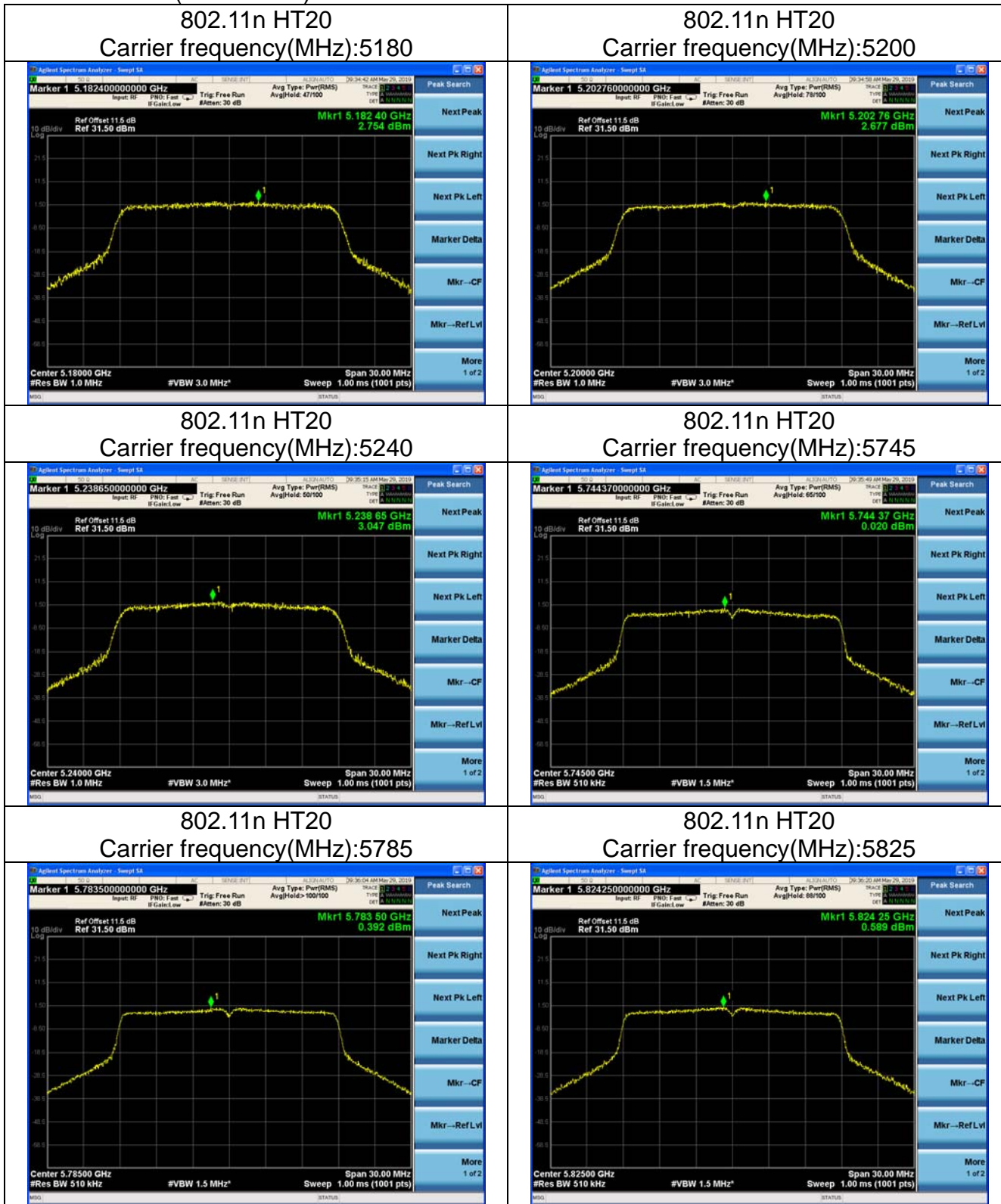
Test Mode: 802.11n HT20 (MIMO Ant1+Ant2)

Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Ant1 Meas PSD (dBm/MHz)	Ant2 Meas PSD (dBm/MHz)	Total Corr'd PSD (dBm/MHz)	Limit (dBm/MHz)	Conclusion
5180	0.089	2.682	2.754	5.73	11.0 dBm/MHz	Pass
5200	0.089	2.630	2.677	5.66	11.0 dBm/MHz	Pass
5240	0.089	2.572	3.047	5.83	11.0 dBm/MHz	Pass
5745	0.089	-1.192	0.020	2.47	30.0 dBm/500kHz	Pass
5785	0.089	-1.666	0.392	2.49	30.0 dBm/500kHz	Pass
5825	0.089	-0.247	0.589	3.20	30.0 dBm/500kHz	Pass

802.11n HT20 (MIMO Ant1)



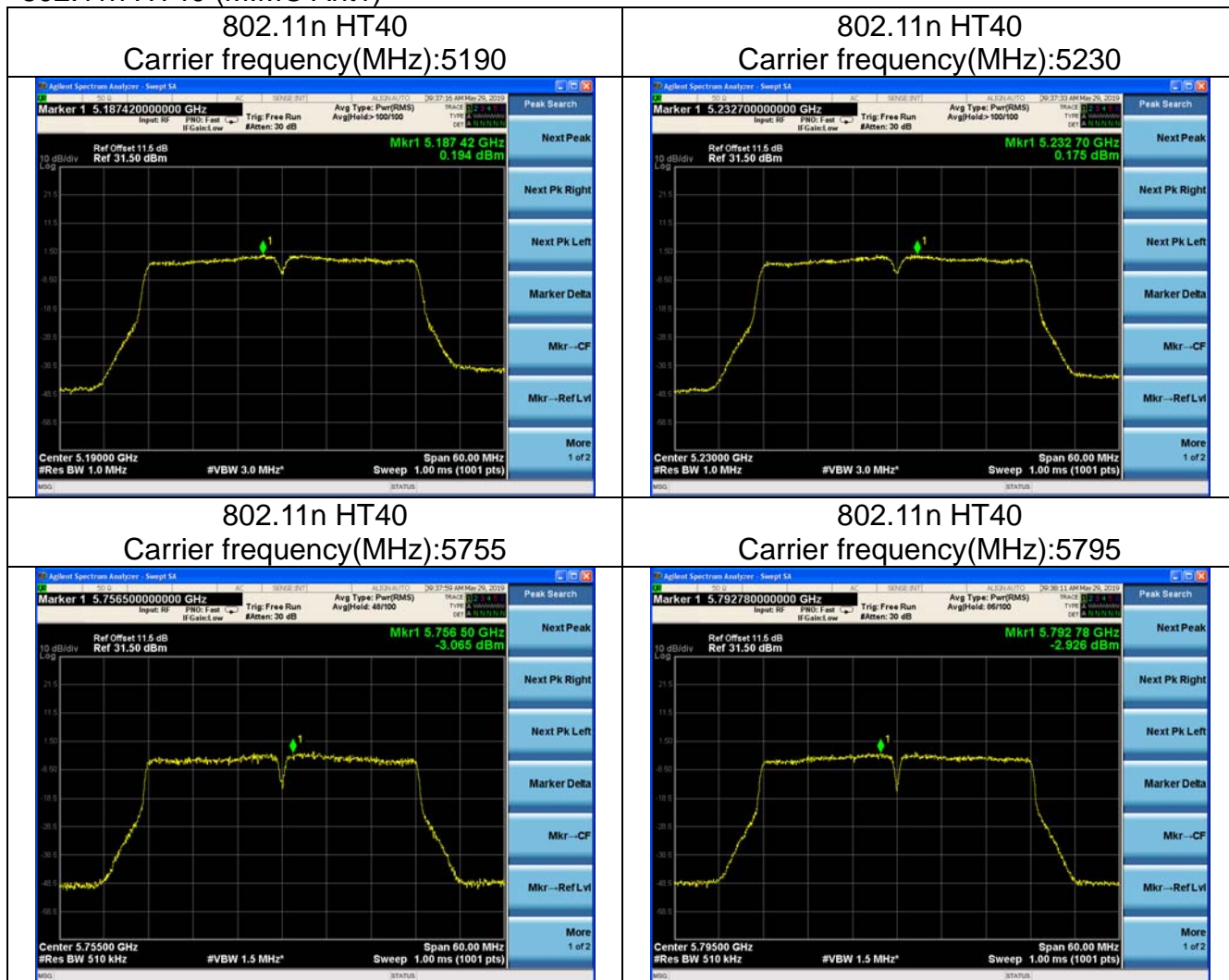
802.11n HT20 (MIMO Ant2)



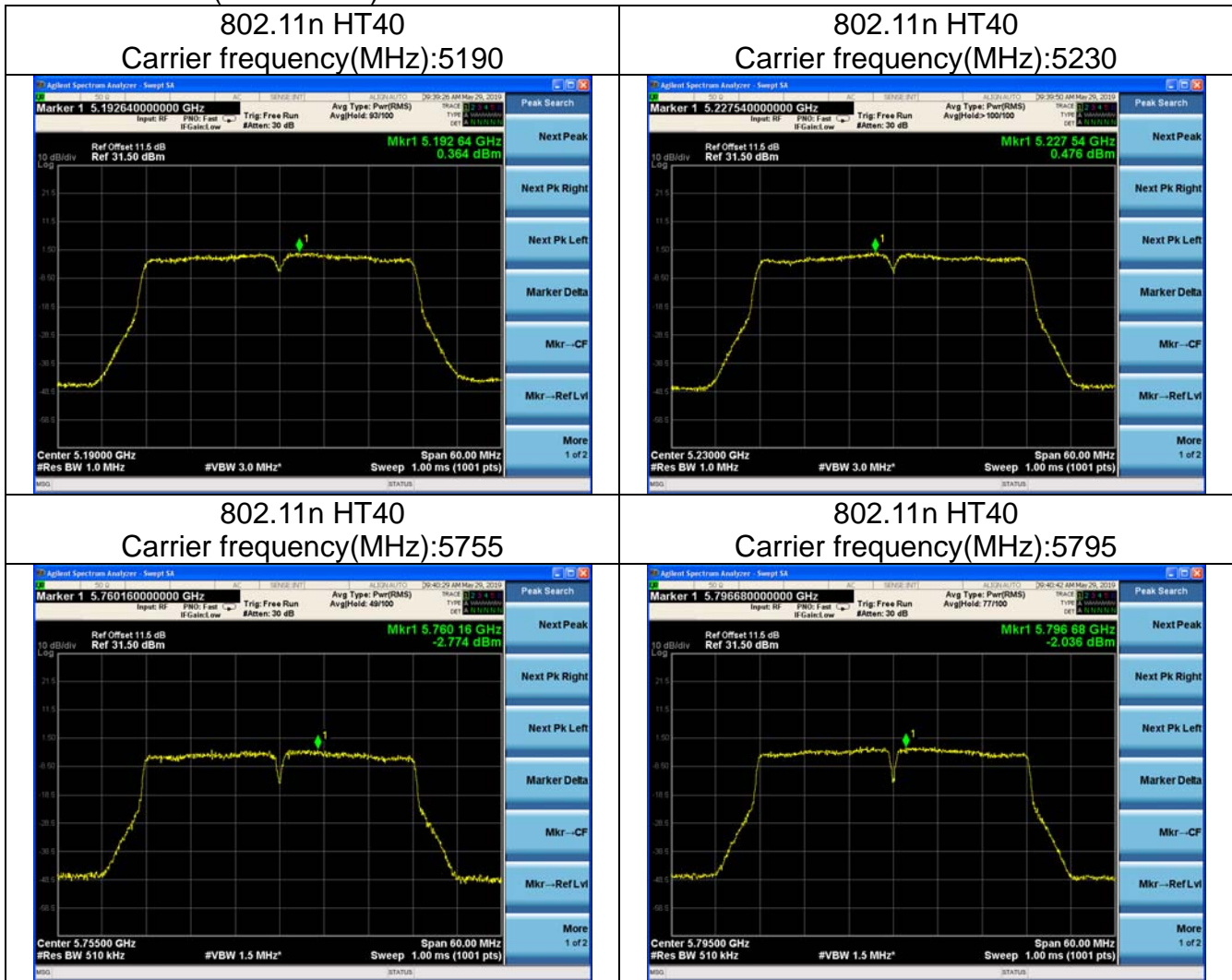
Test Mode: 802.11n HT40 (MIMO Ant1+Ant2)

Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Ant1 Meas PSD (dBm/MHz)	Ant2 Meas PSD (dBm/MHz)	Total Corr'd PSD (dBm/MHz)	Limit (dBm/MHz)	Conclusion
5190	0.176	0.194	0.364	3.29	11.0 dBm/MHz	Pass
5230	0.176	0.175	0.476	3.34	11.0 dBm/MHz	Pass
5755	0.176	-3.065	-2.774	0.09	30.0 dBm/500kHz	Pass
5795	0.176	-2.926	-2.036	0.55	30.0 dBm/500kHz	Pass

802.11n HT40 (MIMO Ant1)



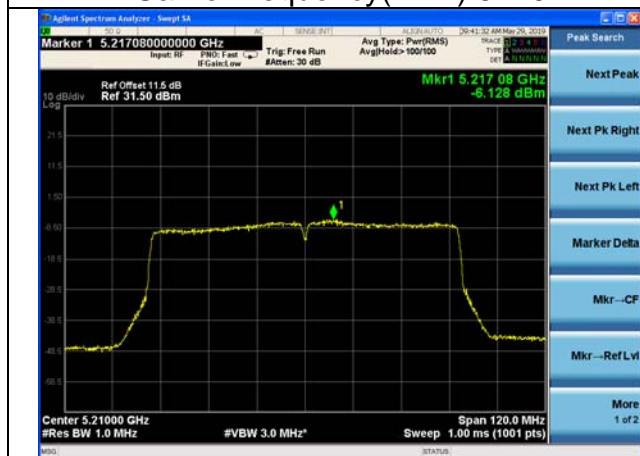
802.11n HT40 (MIMO Ant2)



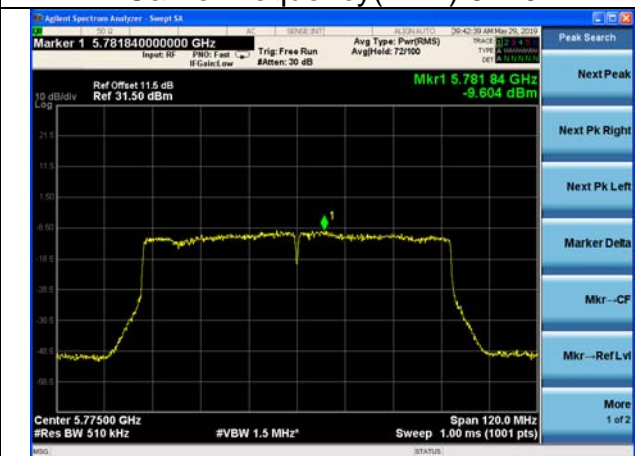
Test Mode: 802.11ac HT80 (MIMO Ant1+Ant2)

Carrier frequency (MHz)	Duty Cycle Correction Factor(dB)	Ant1 Meas PSD (dBm/MHz)	Ant2 Meas PSD (dBm/MHz)	Total Corr'd PSD (dBm/MHz)	Limit (dBm/MHz)	Conclusion
5210	0.341	-6.128	-9.604	-4.52	11.0 dBm/MHz	Pass
5775	0.341	-5.092	-8.724	-3.53	30.0 dBm/500kHz	Pass

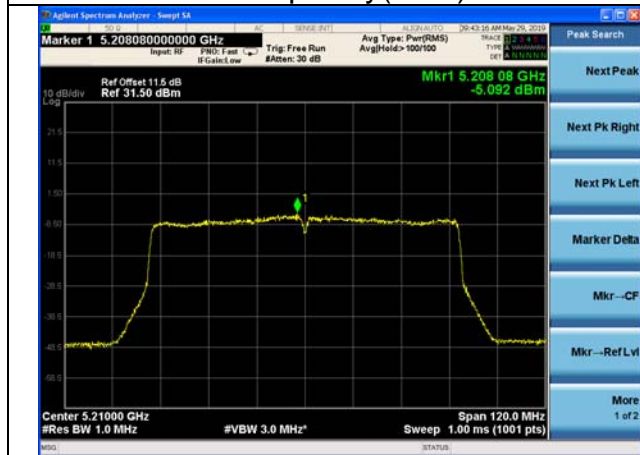
802.11ac HT80 (MIMO Ant1)
Carrier frequency(MHz):5210



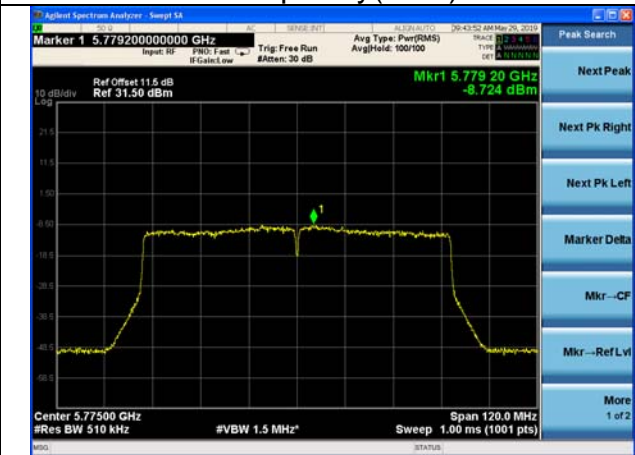
802.11ac HT80 (MIMO Ant2)
Carrier frequency(MHz):5210



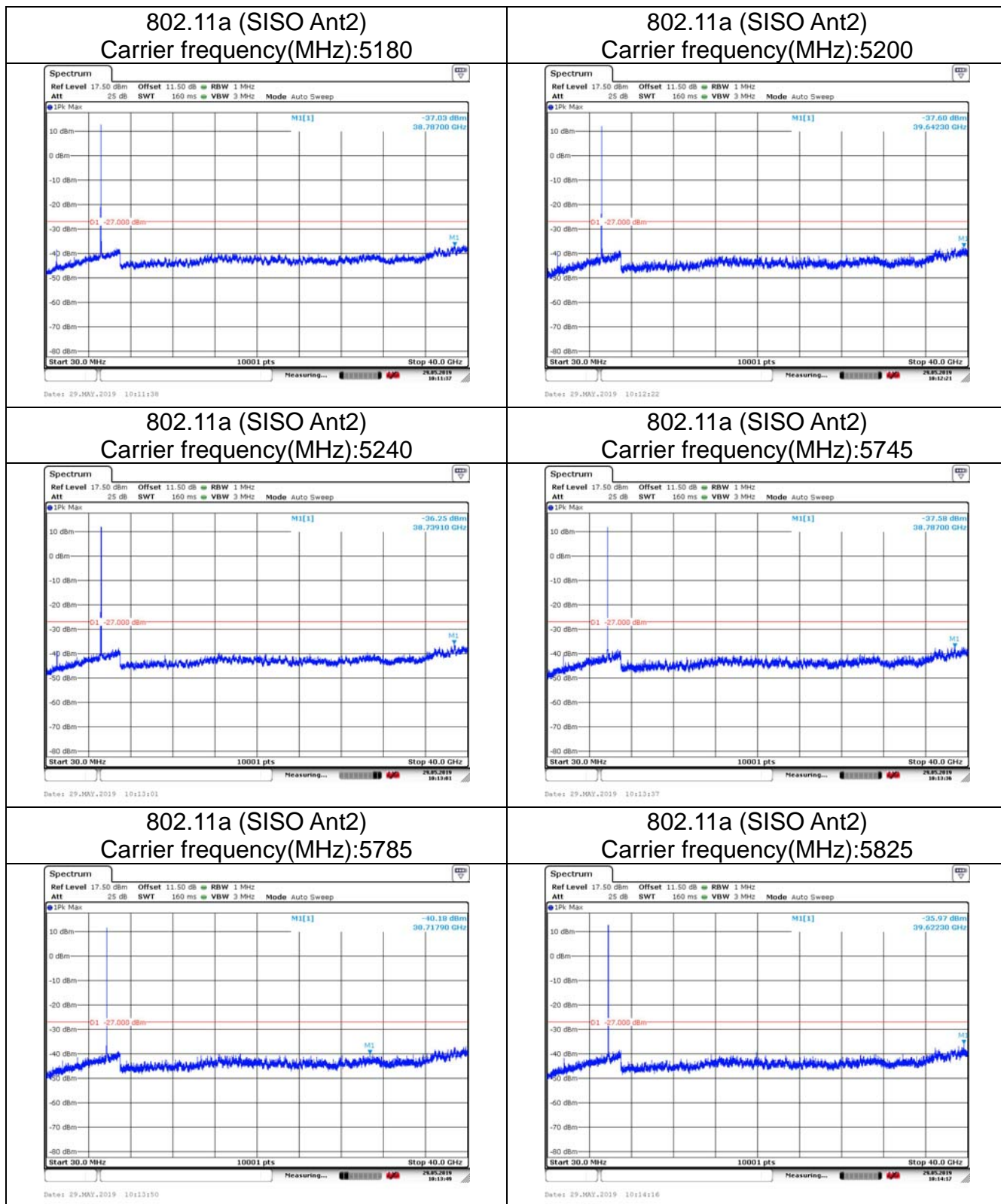
802.11ac HT80 (MIMO Ant1)
Carrier frequency(MHz):5775

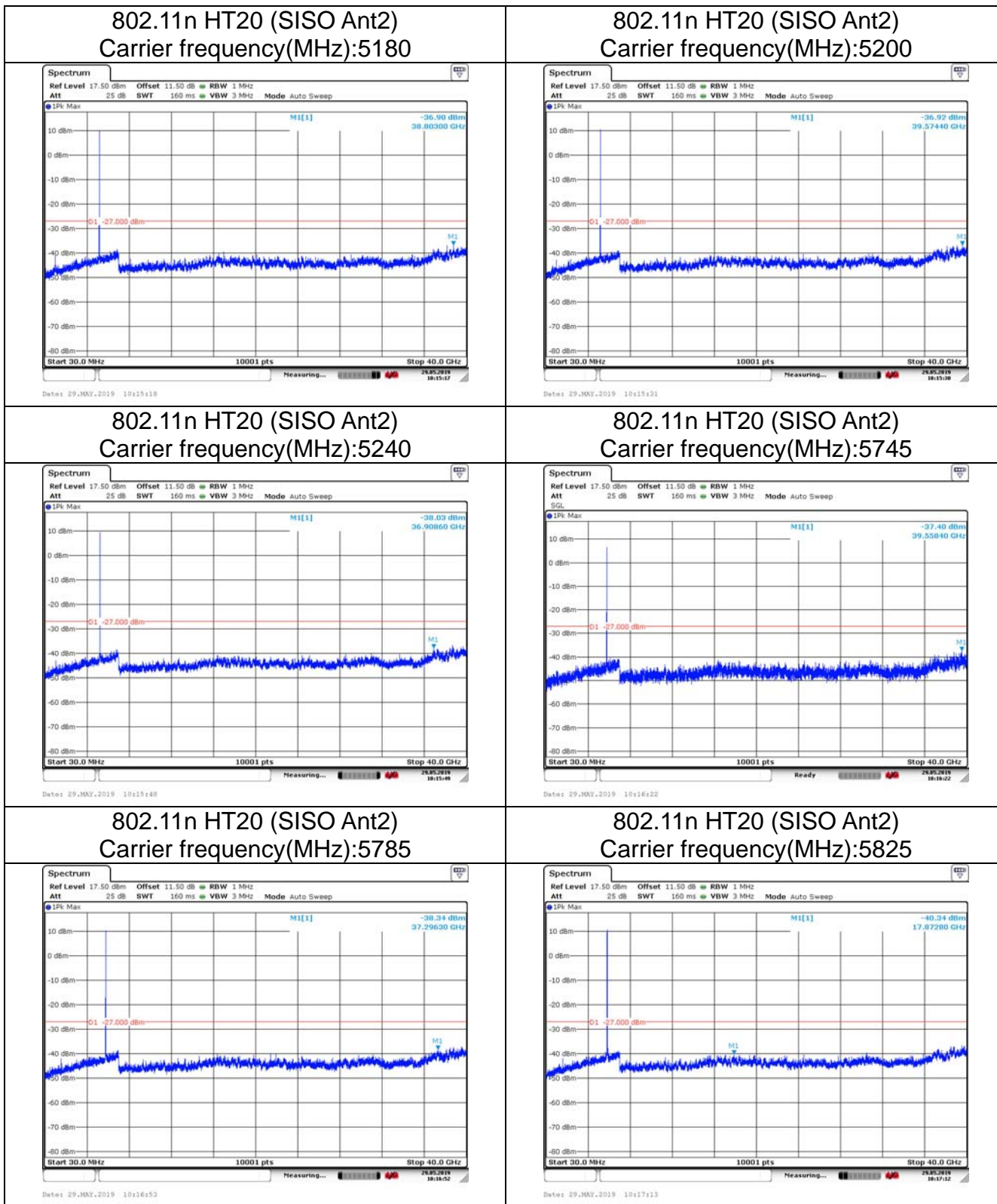


802.11ac HT80 (MIMO Ant2)
Carrier frequency(MHz):5775

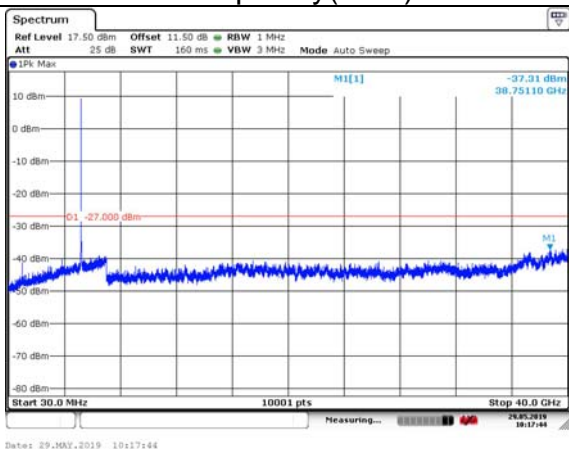


Unwanted Conducted Emission Measurement

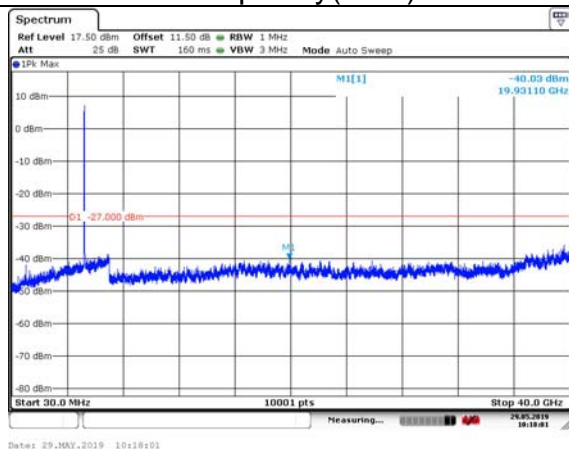




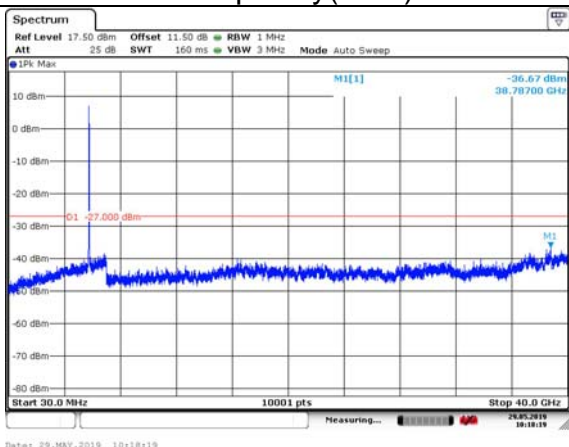
802.11n HT40 (SISO Ant2)
Carrier frequency(MHz):5190



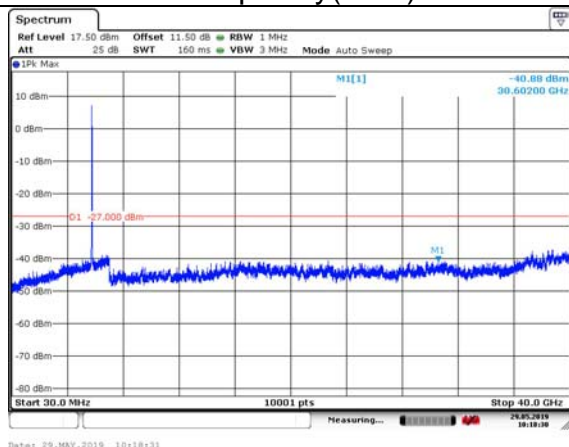
802.11n HT40 (SISO Ant2)
Carrier frequency(MHz):5230



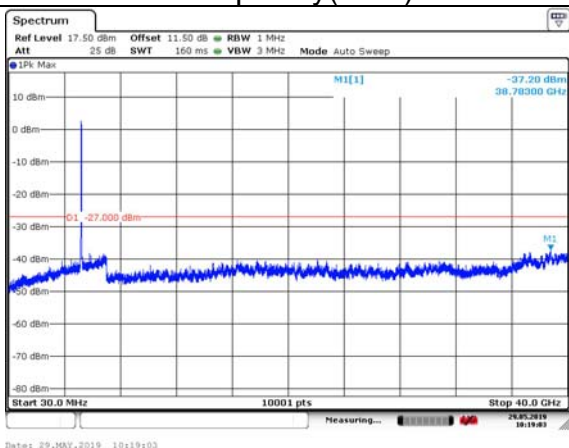
802.11n HT40 (SISO Ant2)
Carrier frequency(MHz):5755



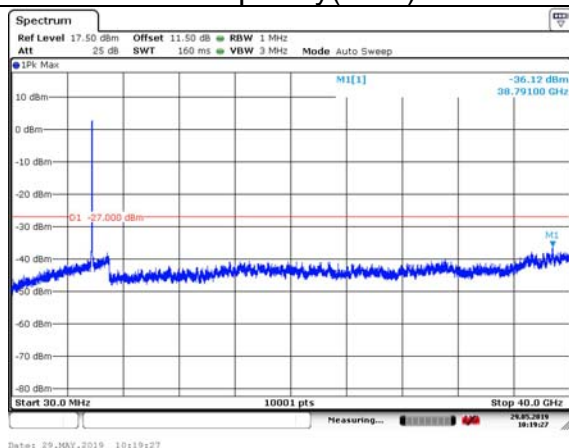
802.11n HT40 (SISO Ant2)
Carrier frequency(MHz):5795



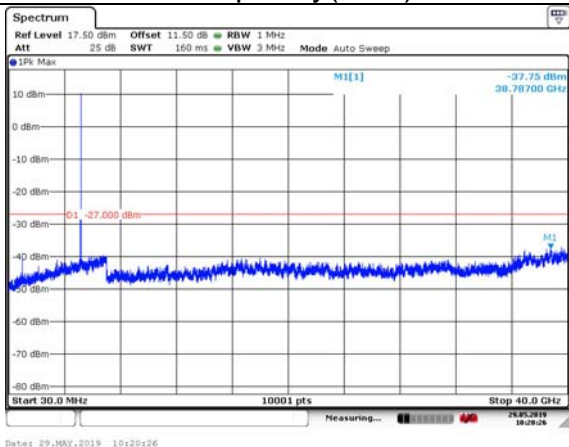
802.11ac HT80 (SISO Ant2)
Carrier frequency(MHz):5210



802.11ac HT80 (SISO Ant2)
Carrier frequency(MHz):5775

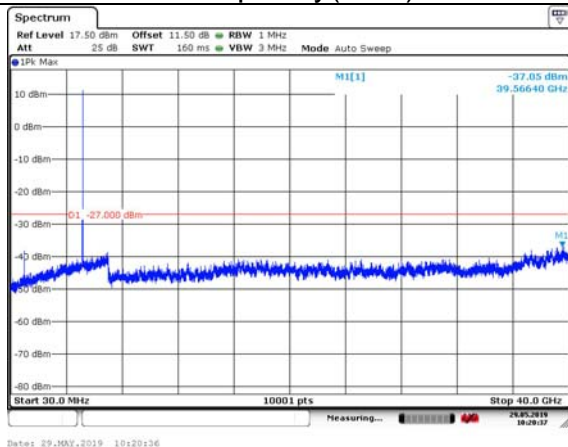


802.11n HT20 (MIMO Ant1)
Carrier frequency(MHz):5180



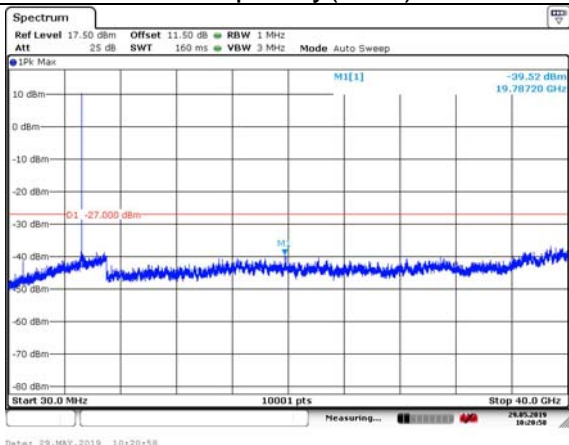
Date: 29.MAY.2019 10:20:26

802.11n HT20 (MIMO Ant1)
Carrier frequency(MHz):5200



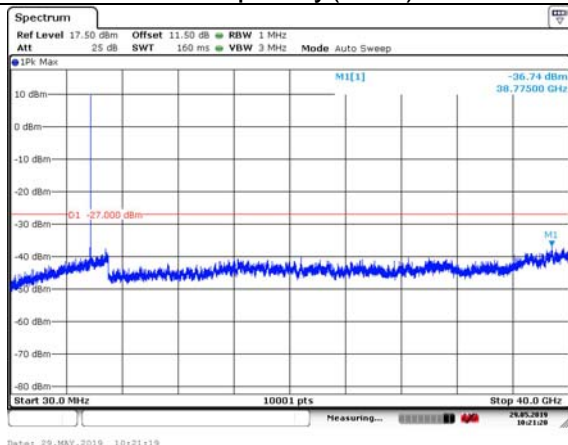
Date: 29.MAY.2019 10:20:26

802.11n HT20 (MIMO Ant1)
Carrier frequency(MHz):5240



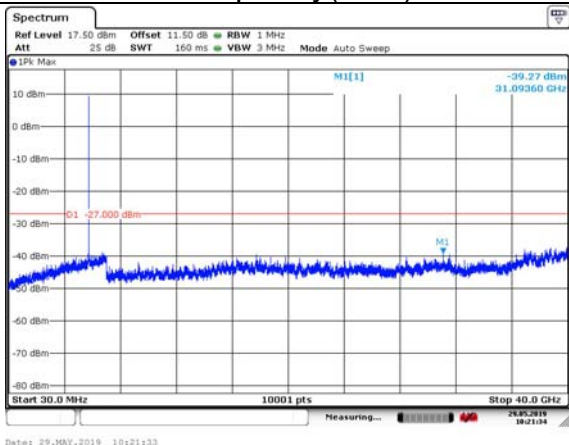
Date: 29.MAY.2019 10:20:28

802.11n HT20 (MIMO Ant1)
Carrier frequency(MHz):5745



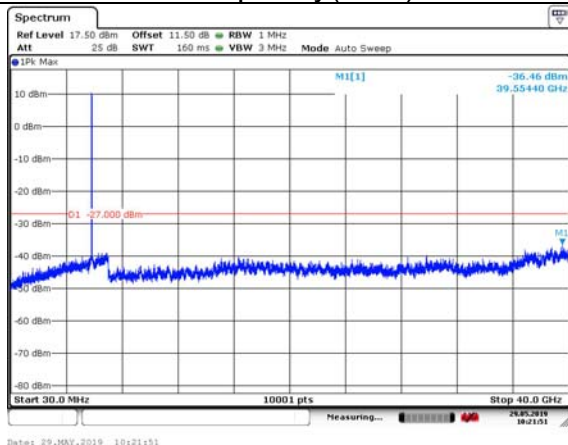
Date: 29.MAY.2019 10:21:19

802.11n HT20 (MIMO Ant1)
Carrier frequency(MHz):5785



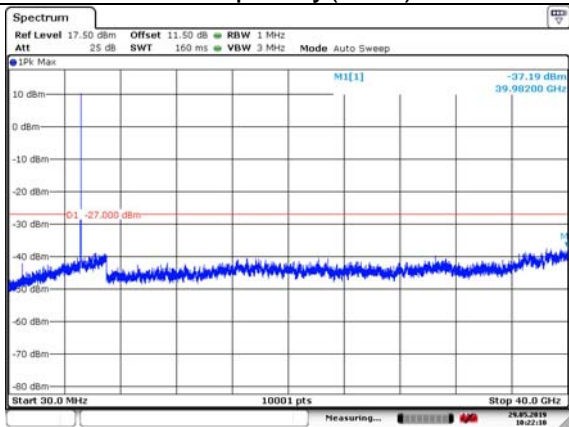
Date: 29.MAY.2019 10:21:33

802.11n HT20 (MIMO Ant1)
Carrier frequency(MHz):5825



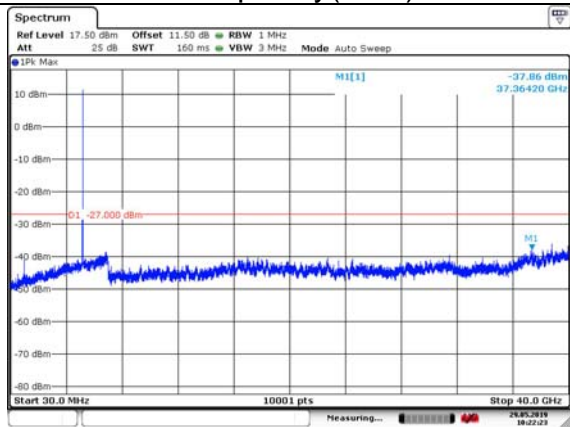
Date: 29.MAY.2019 10:21:51

802.11n HT20 (MIMO Ant2)
Carrier frequency(MHz):5180



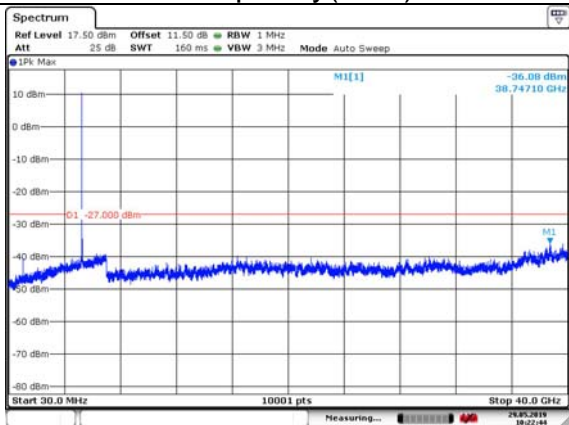
Date: 29.MAY.2019 10:22:10

802.11n HT20 (MIMO Ant2)
Carrier frequency(MHz):5200



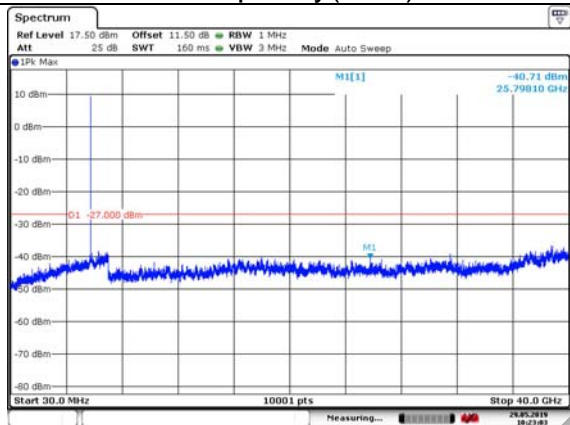
Date: 29.MAY.2019 10:22:23

802.11n HT20 (MIMO Ant2)
Carrier frequency(MHz):5240



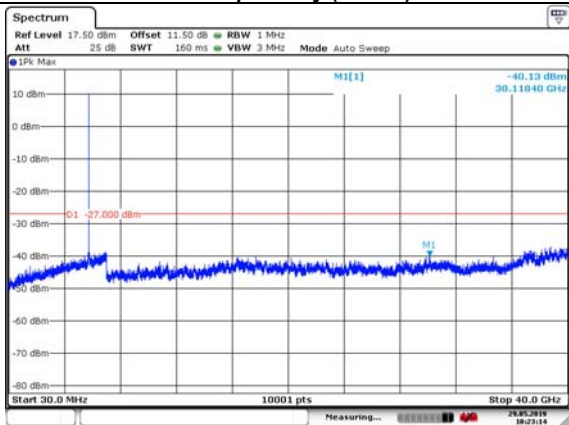
Date: 29.MAY.2019 10:22:43

802.11n HT20 (MIMO Ant2)
Carrier frequency(MHz):5745



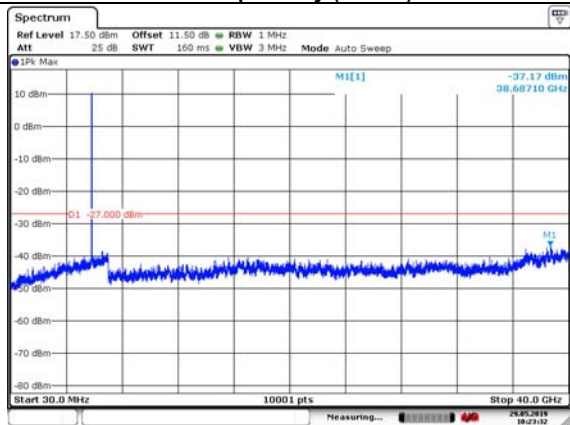
Date: 29.MAY.2019 10:23:02

802.11n HT20 (MIMO Ant2)
Carrier frequency(MHz):5785



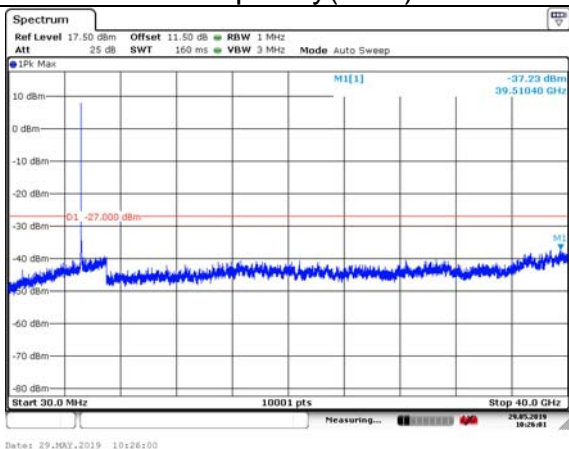
Date: 29.MAY.2019 10:23:14

802.11n HT20 (MIMO Ant2)
Carrier frequency(MHz):5825

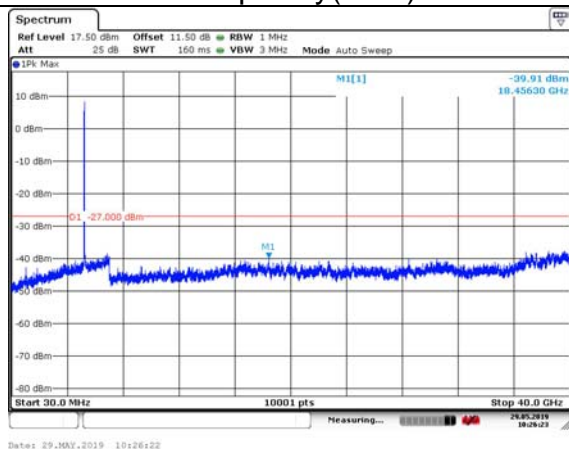


Date: 29.MAY.2019 10:23:22

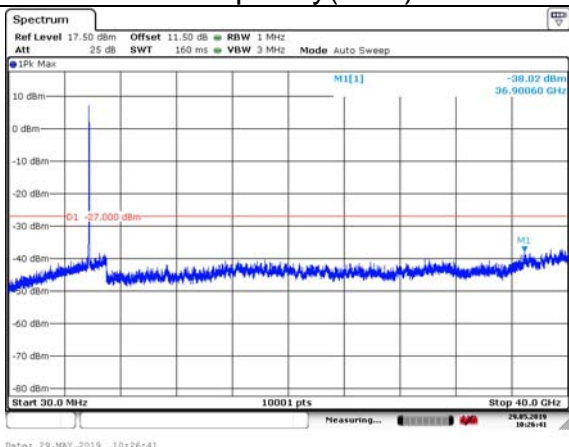
802.11n HT40 (MIMO Ant1)
Carrier frequency(MHz):5190



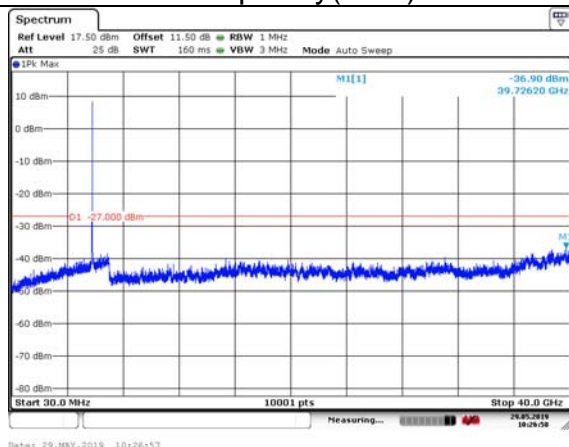
802.11n HT40 (MIMO Ant1)
Carrier frequency(MHz):5230



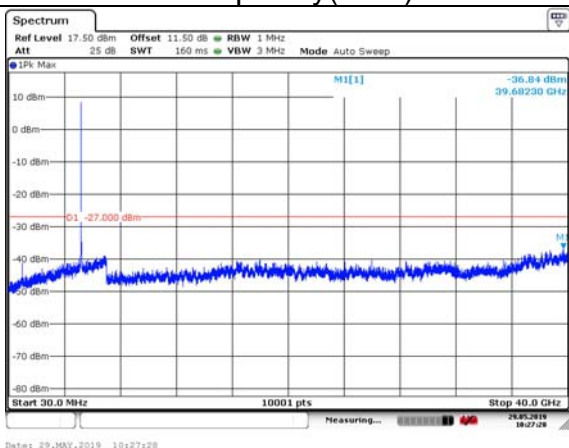
802.11n HT40 (MIMO Ant1)
Carrier frequency(MHz):5755



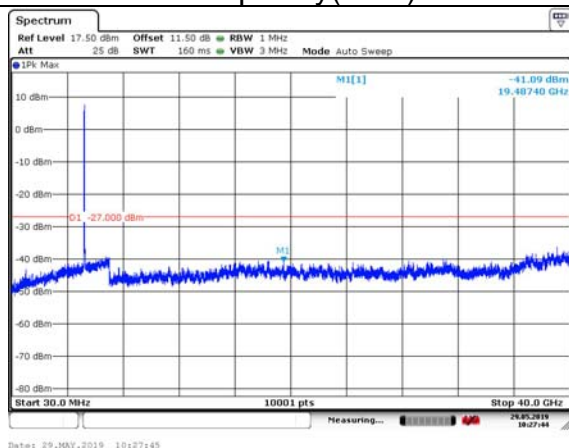
802.11n HT40 (MIMO Ant1)
Carrier frequency(MHz):5795



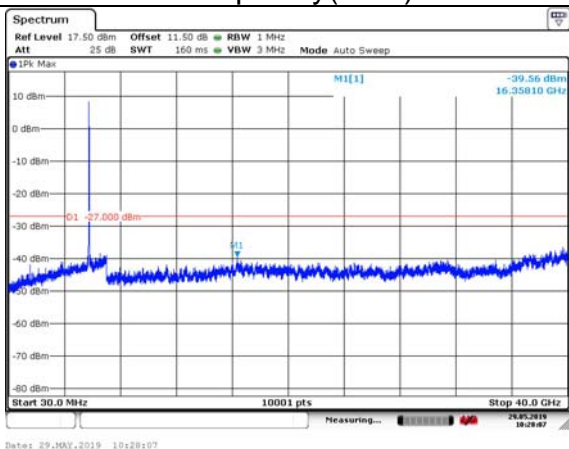
802.11n HT40 (MIMO Ant2)
Carrier frequency(MHz):5190



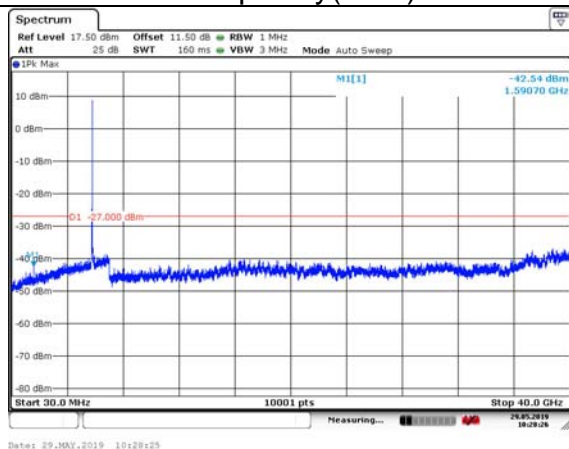
802.11n HT40 (MIMO Ant2)
Carrier frequency(MHz):5230



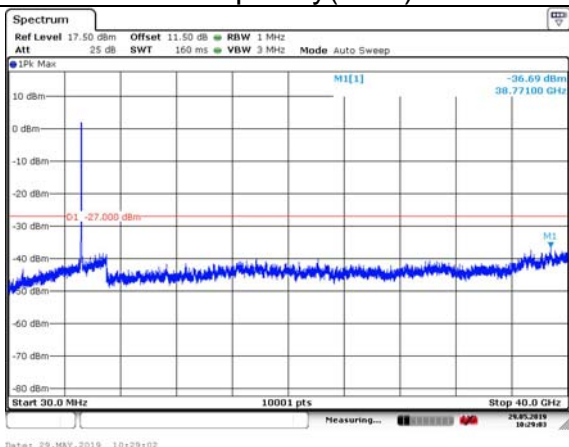
802.11n HT40 (MIMO Ant2)
Carrier frequency(MHz):5755



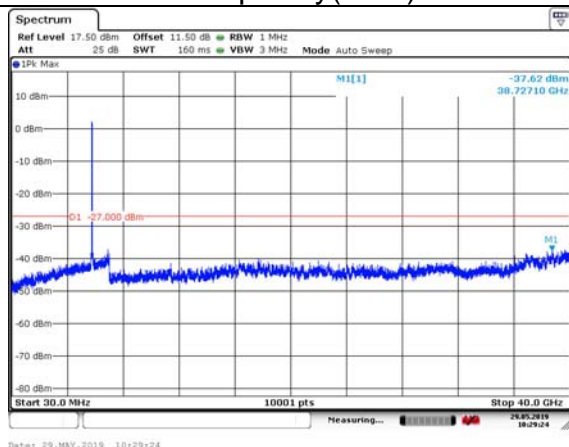
802.11n HT40 (MIMO Ant2)
Carrier frequency(MHz):5795



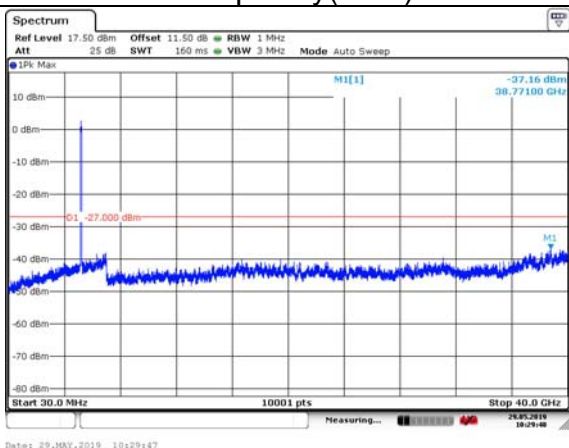
802.11ac HT80 (MIMO Ant1)
Carrier frequency(MHz):5210



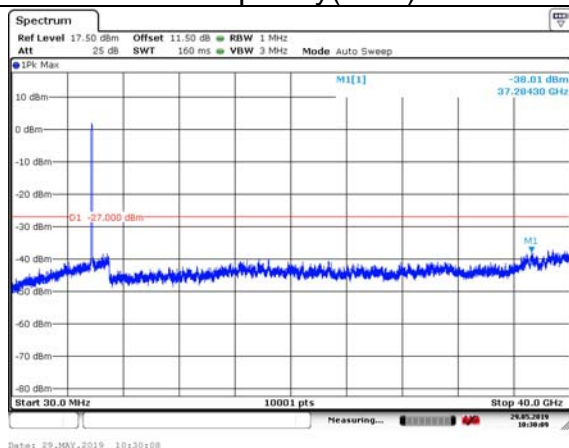
802.11ac HT80 (MIMO Ant1)
Carrier frequency(MHz):5775



802.11ac HT80 (MIMO Ant2)
Carrier frequency(MHz):5210



802.11ac HT80 (MIMO Ant2)
Carrier frequency(MHz):5775



Frequency Stability

U-NII-1

Mod.	Data Rate	Frequency (MHz)	Frequency Stability(ppm)	Voltage(V)	Temperature(°C)
11a	6Mbps	5180	3.12	NV	-10
11a	6Mbps	5180	0.24	NV	0
11a	6Mbps	5180	-1.34	NV	+10
11a	6Mbps	5180	2.32	HV	+20
11a	6Mbps	5180	-1.78	LV	+20
11a	6Mbps	5180	2.23	NV	+20
11a	6Mbps	5180	3.55	NV	+30
11a	6Mbps	5180	2.39	NV	+40
11a	6Mbps	5180	-1.26	NV	+50
11a	6Mbps	5180	1.67	NV	+55