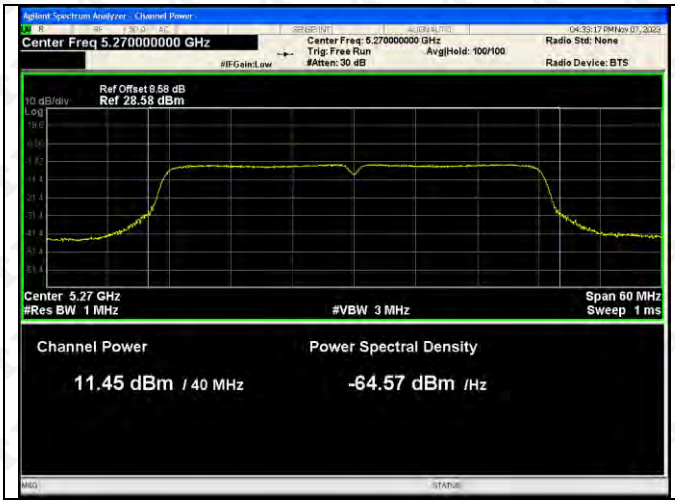
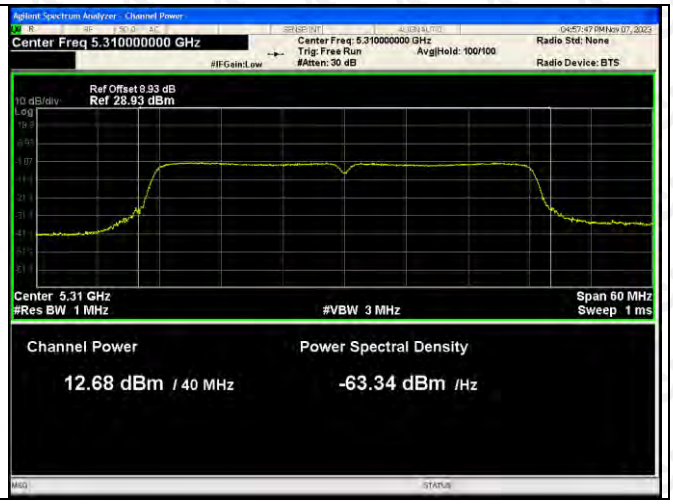
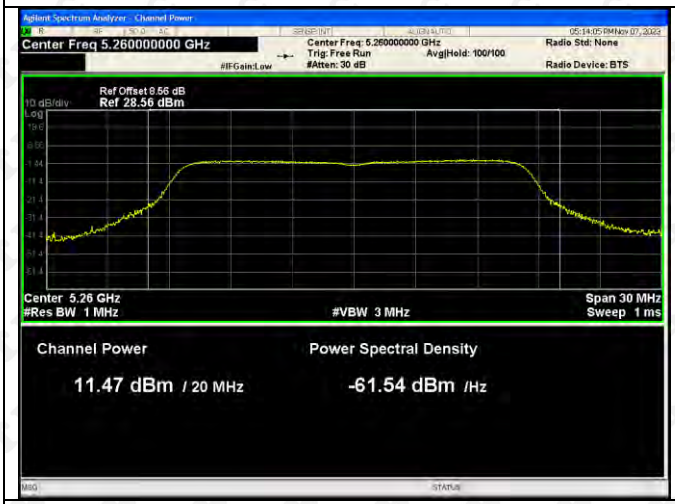
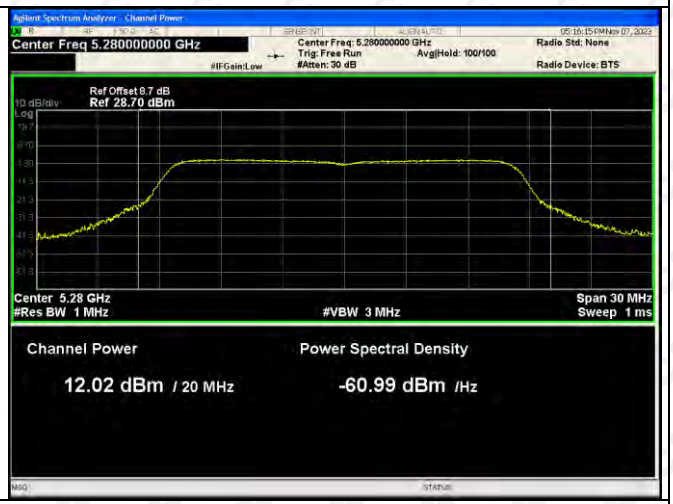




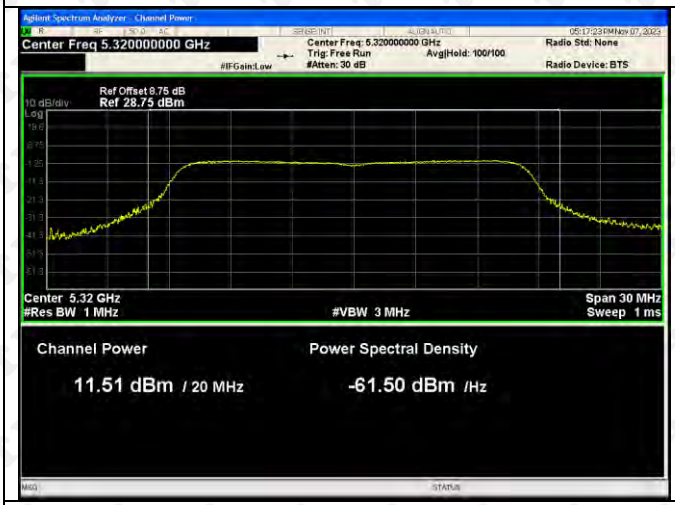
ANT2

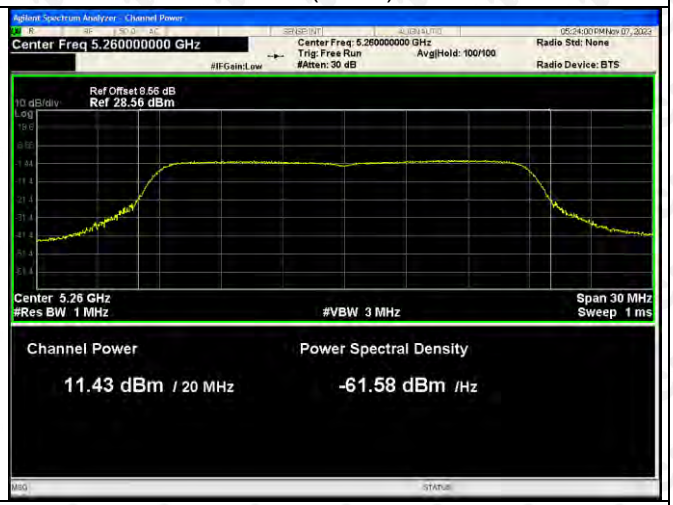
802.11a-5260	802.11a-5280



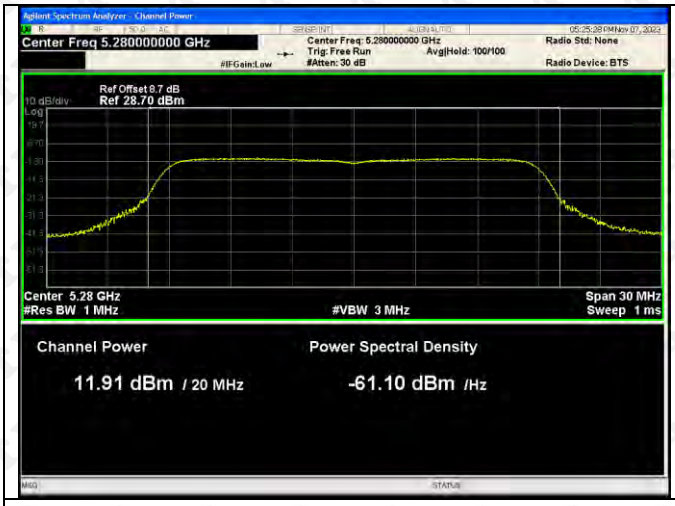


802.11a-5320	802.11ac(VH20)-5260





802.11ac(VH20)-5280	802.11ac(VH20)-5320



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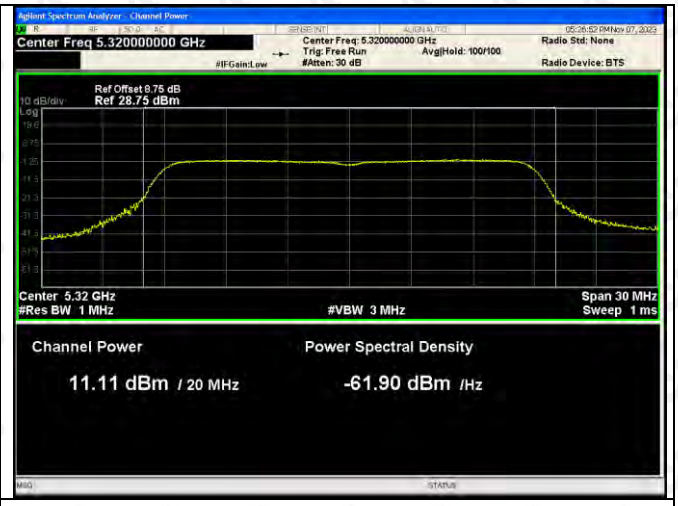
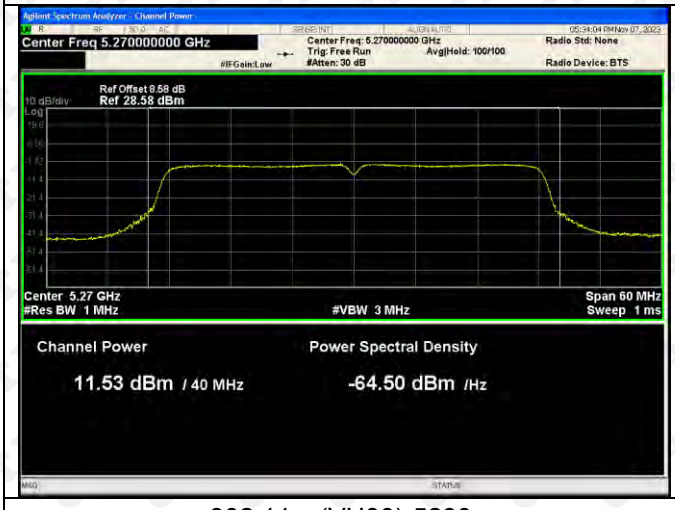
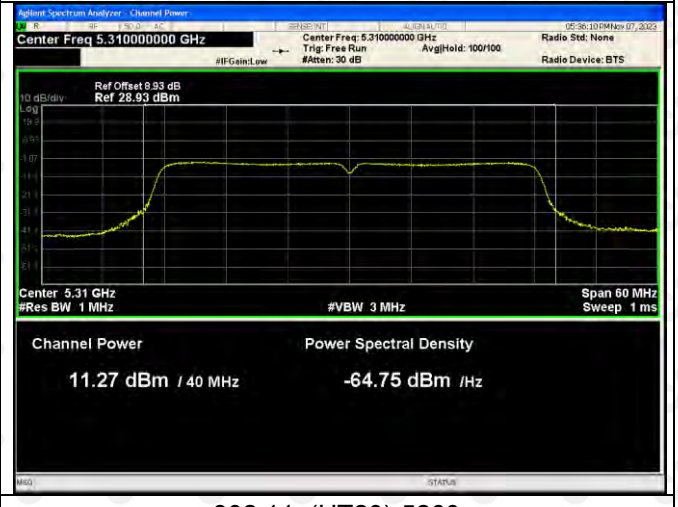


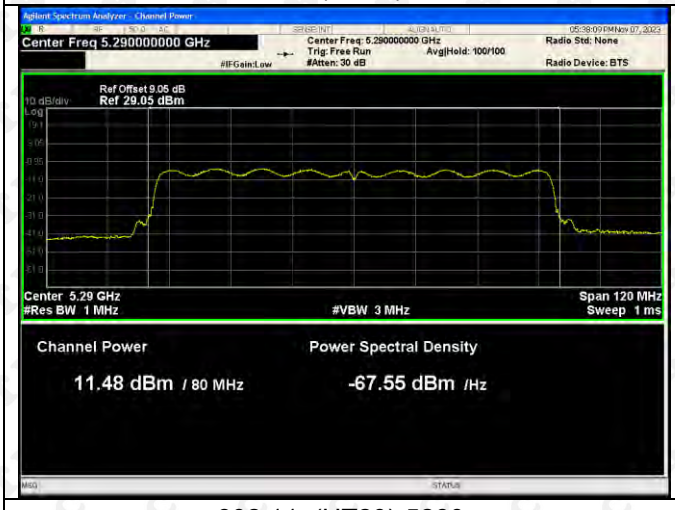
802.11ac(VH40)-5310



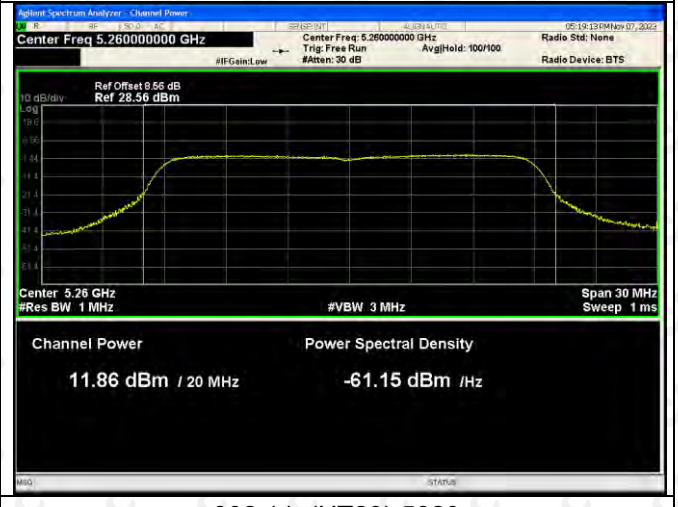
802.11ac(VH80)-5290



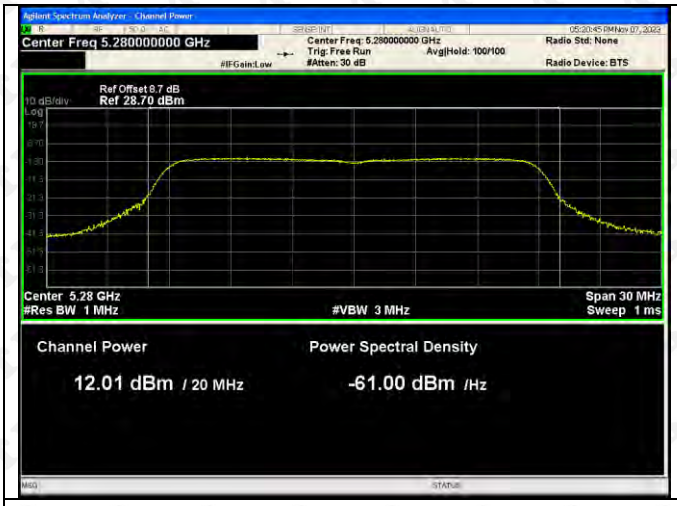
802.11n(HT20)-5260



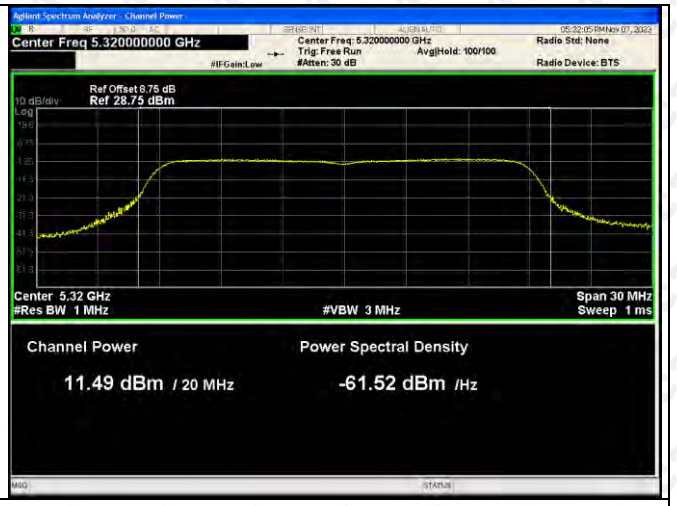
802.11n(HT20)-5280



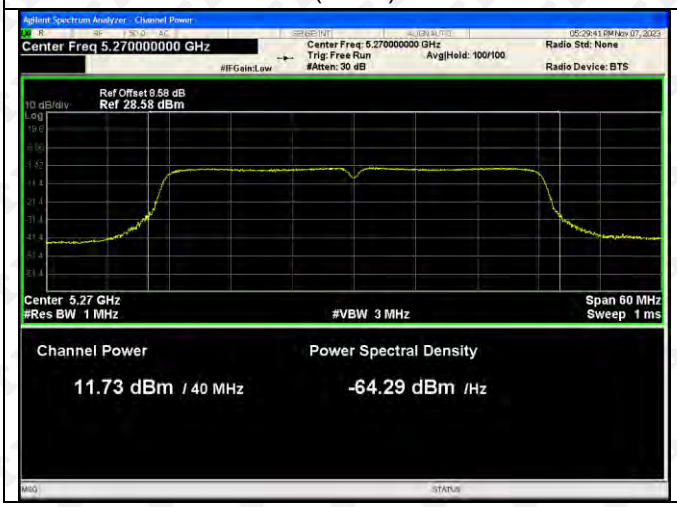
802.11n(HT20)-5320

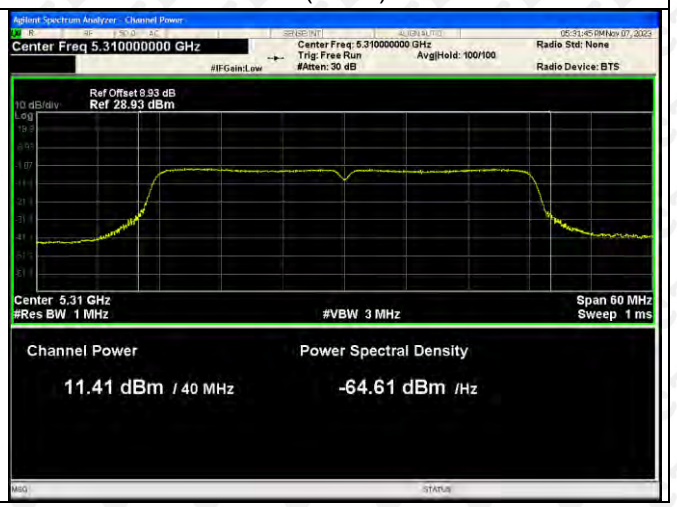


802.11n(HT40)-5270



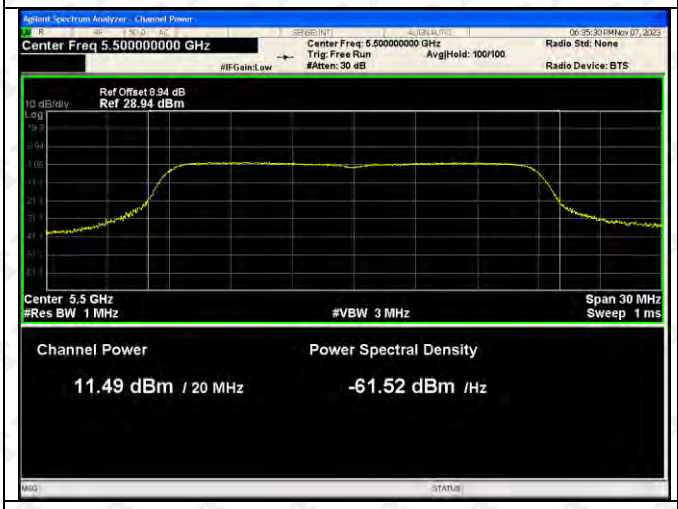
802.11n(HT40)-5310



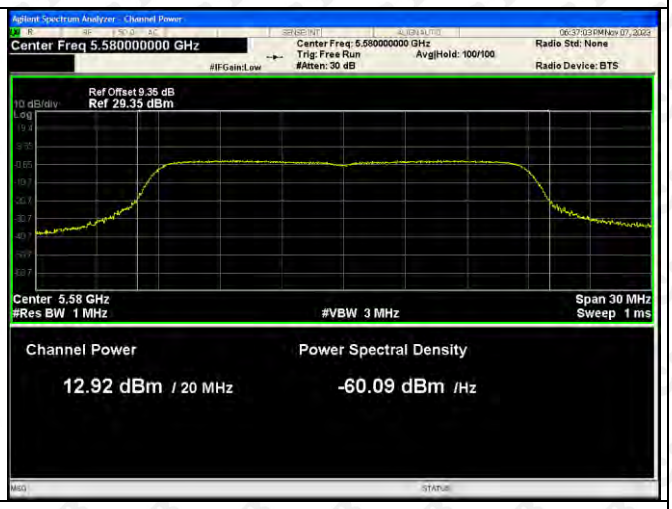


5470-5725MHz-Power
ANT1

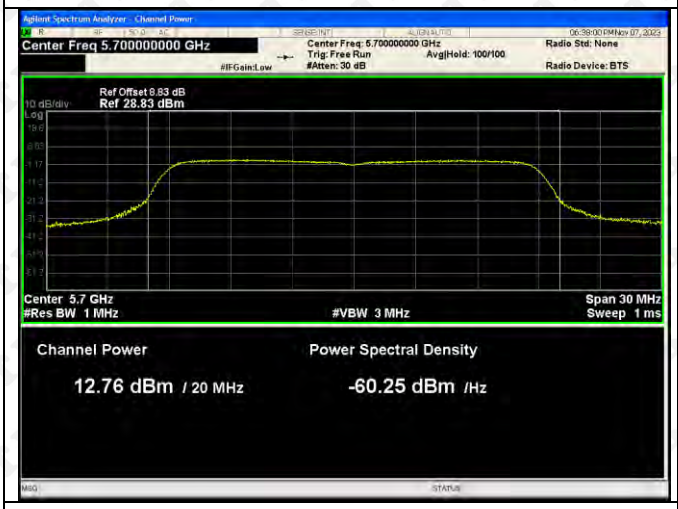
802.11a-5500



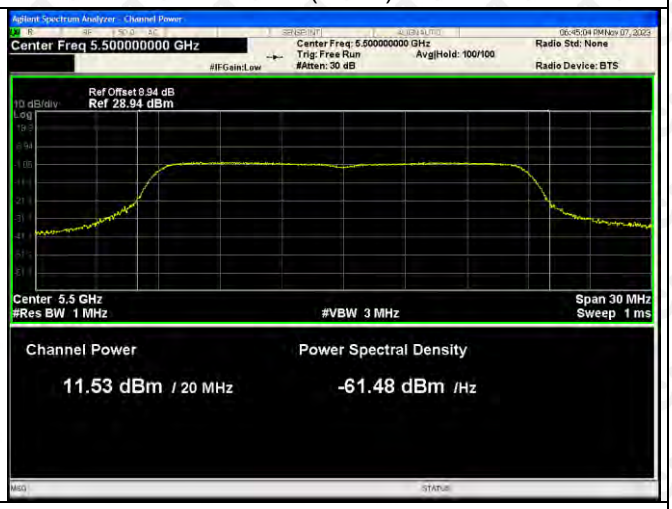
802.11a-5580



802.11a-5700

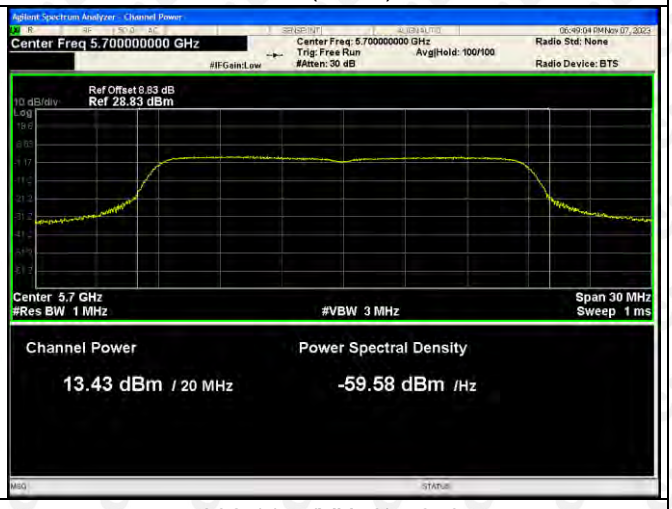


802.11ac(VH20)-5500



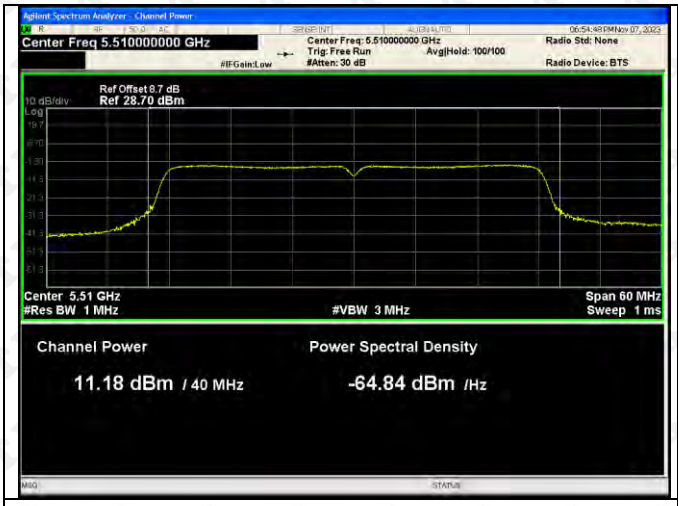
802.11ac(VH20)-5580

802.11ac(VH20)-5700

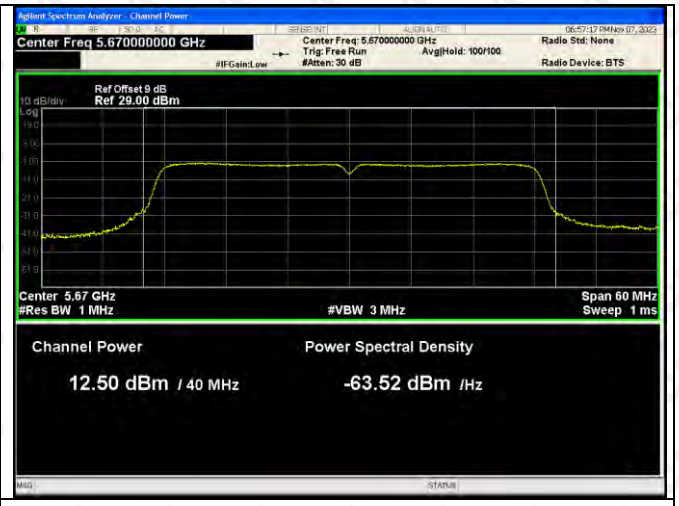


802.11ac(VH40)-5510

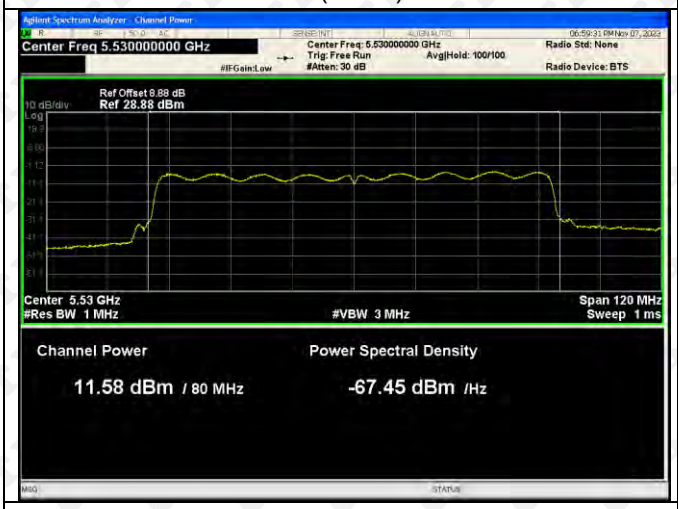
802.11ac(VH40)-5670



802.11ac(VH80)-5530

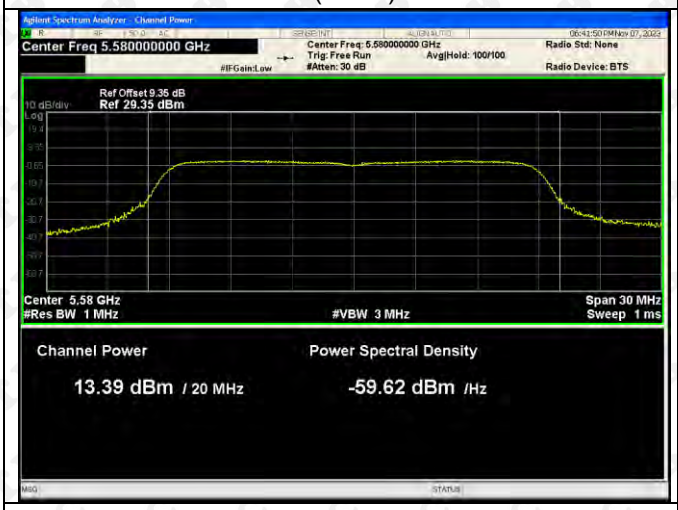


802.11n(HT20)-5500

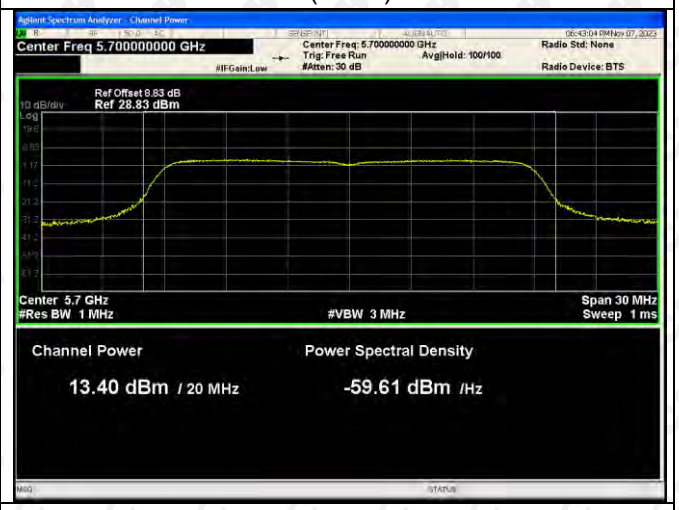


802.11n(HT20)-5580

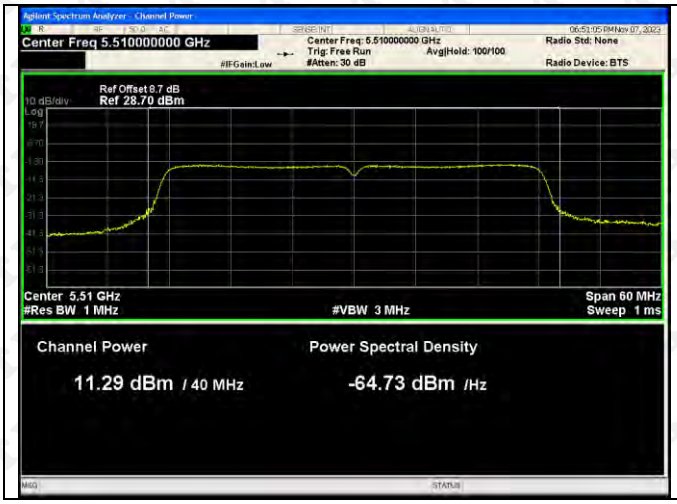
802.11n(HT20)-5700

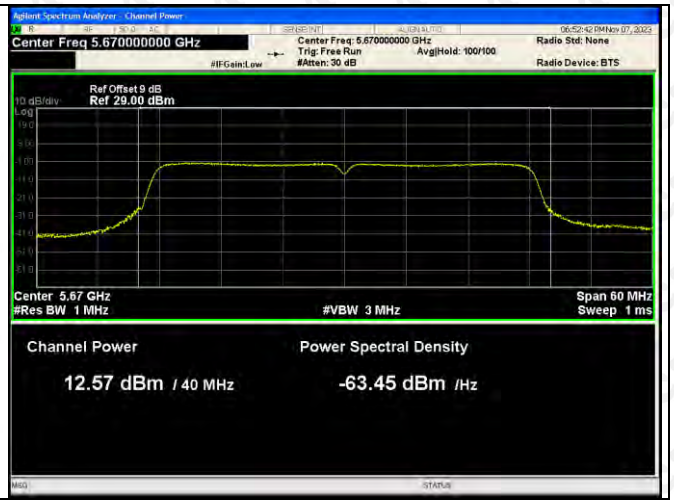


802.11n(HT40)-5510

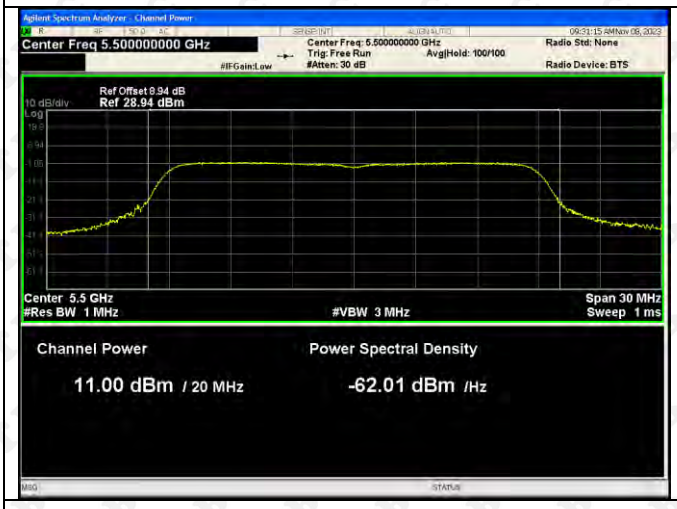
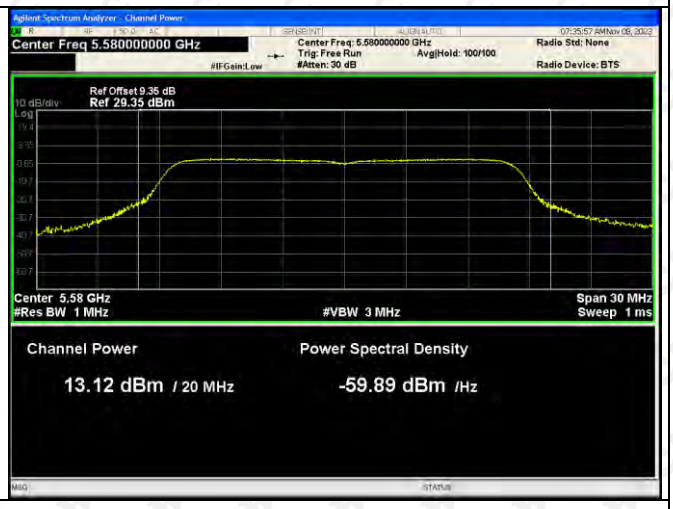
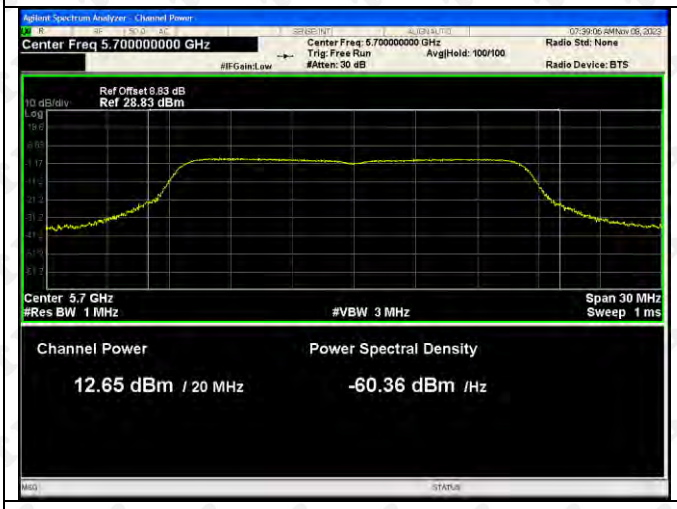
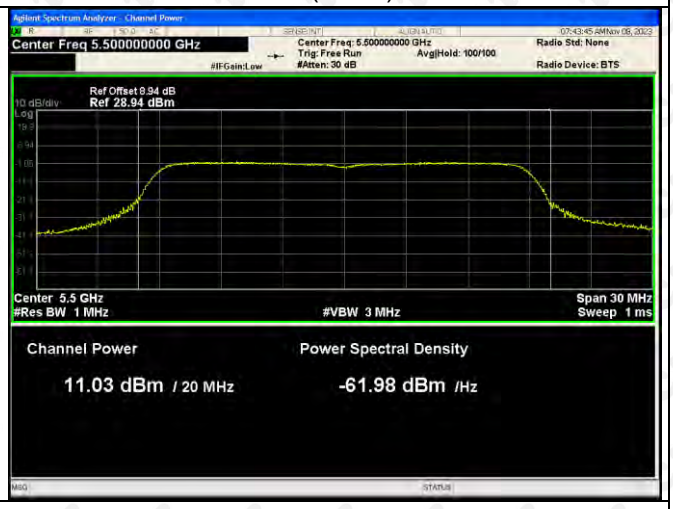


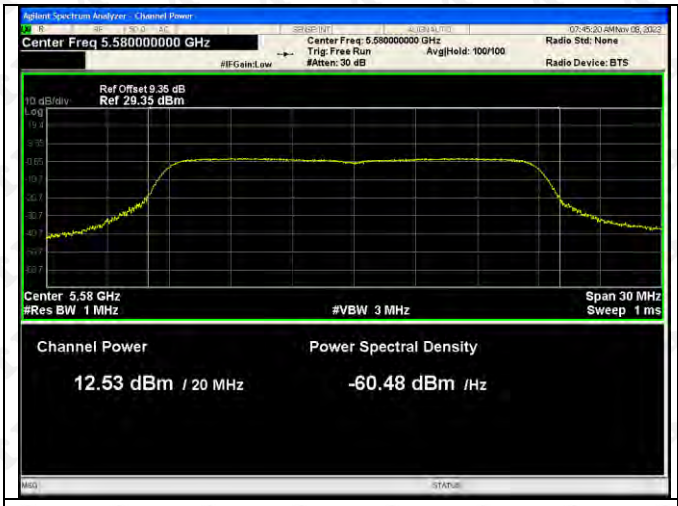
802.11n(HT40)-5670



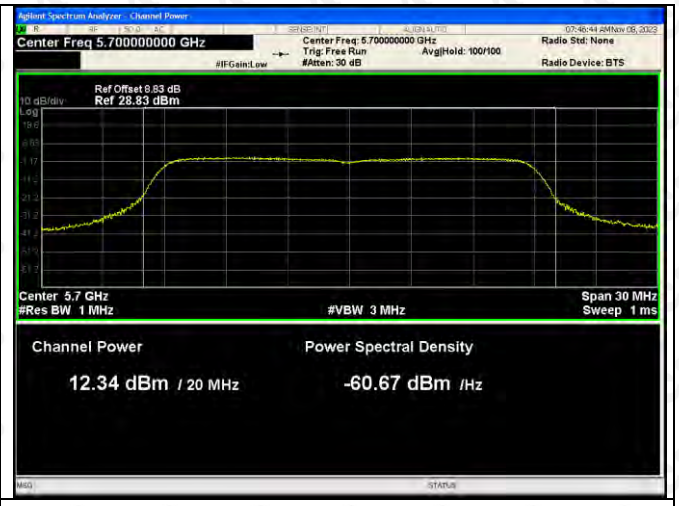


ANT2

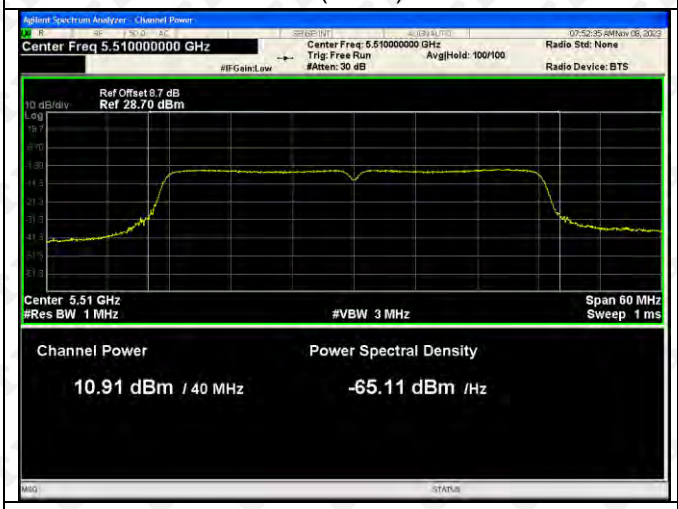
802.11a-5500	802.11a-5580
	
802.11a-5700	802.11ac(VH20)-5500
802.11ac(VH20)-5580	802.11ac(VH20)-5700
	



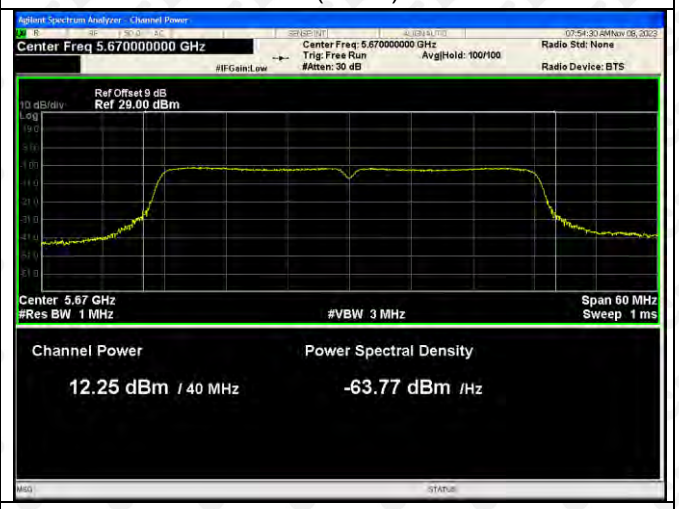
802.11ac(VH40)-5510



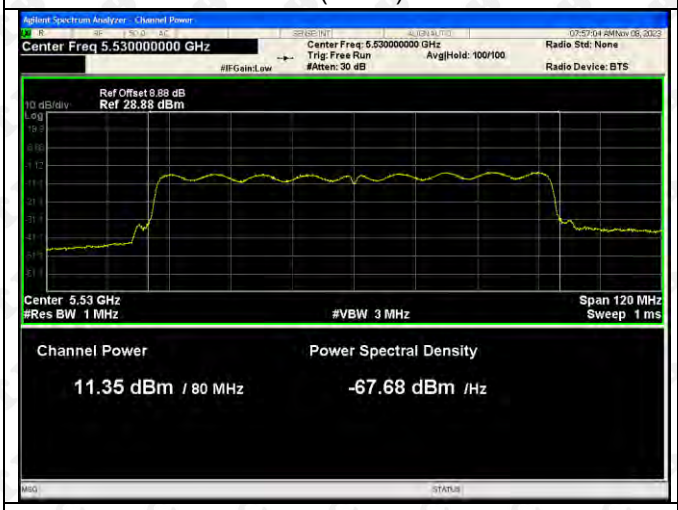
802.11ac(VH40)-5670



802.11ac(VH80)-5530

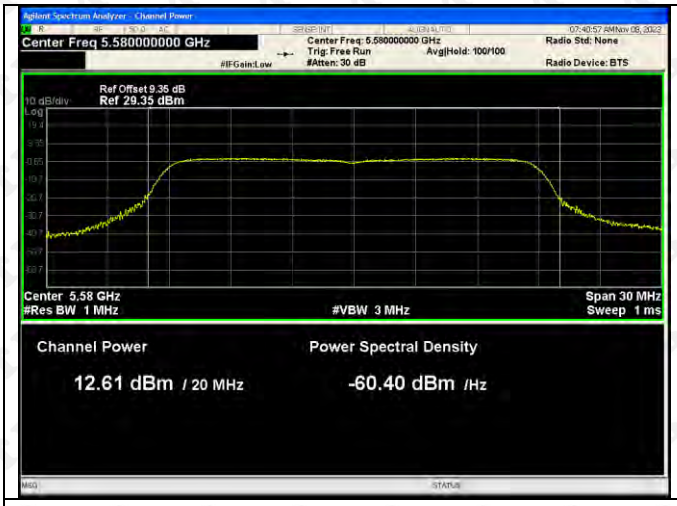


802.11n(HT20)-5500

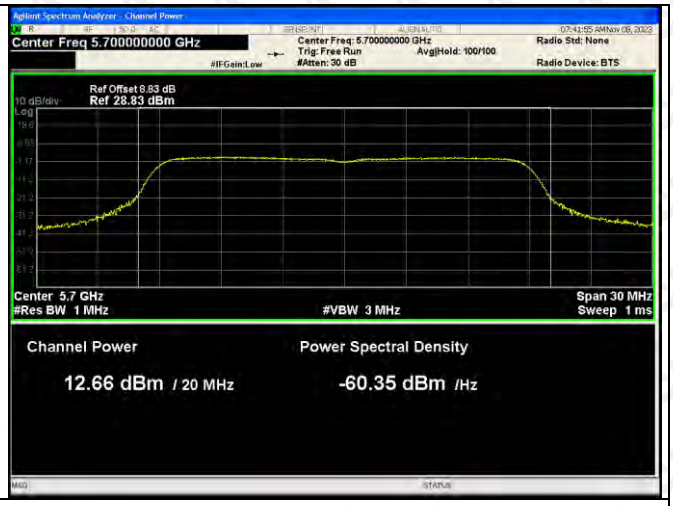


802.11n(HT20)-5580

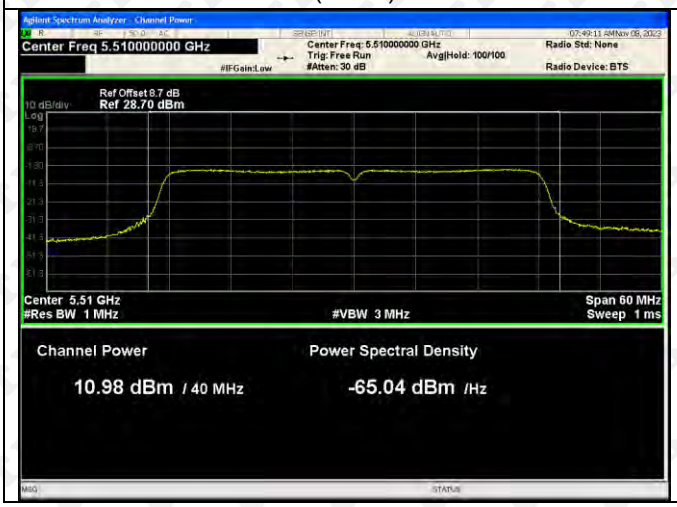
802.11n(HT20)-5700

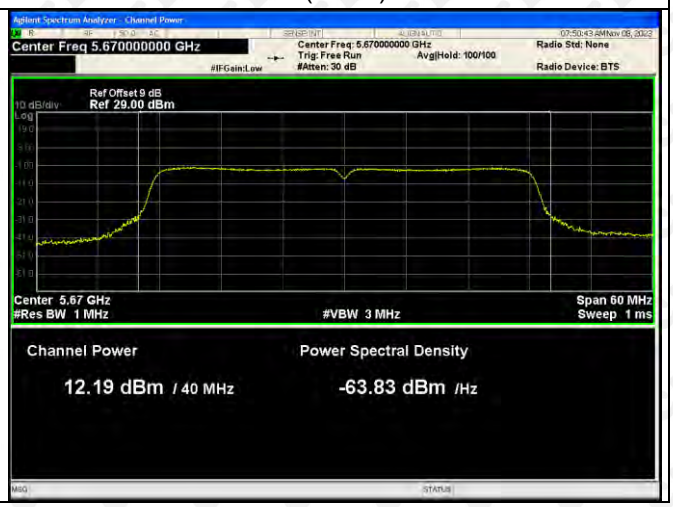


802.11n(HT40)-5510



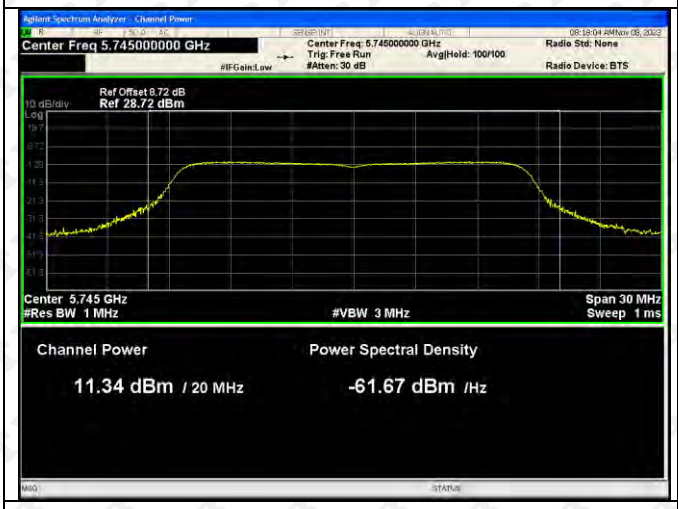
802.11n(HT40)-5670



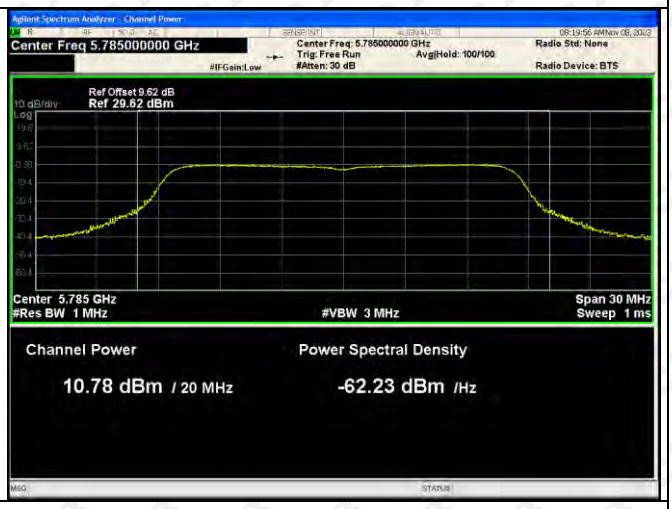


5725-5850MHz:-Power
ANT1

802.11a-5745

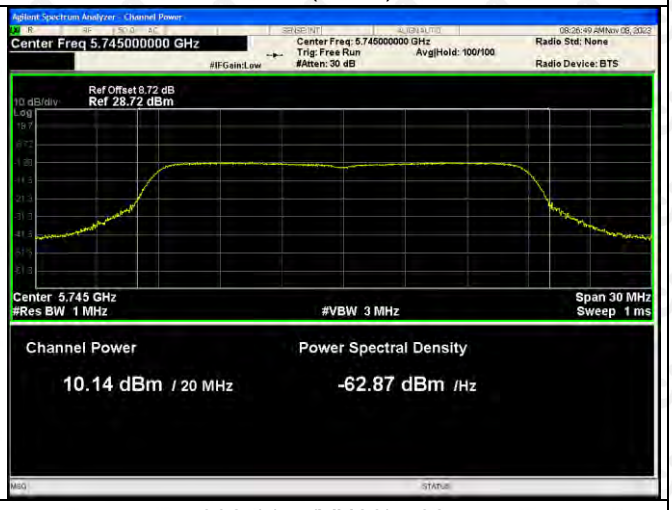


802.11a-5785

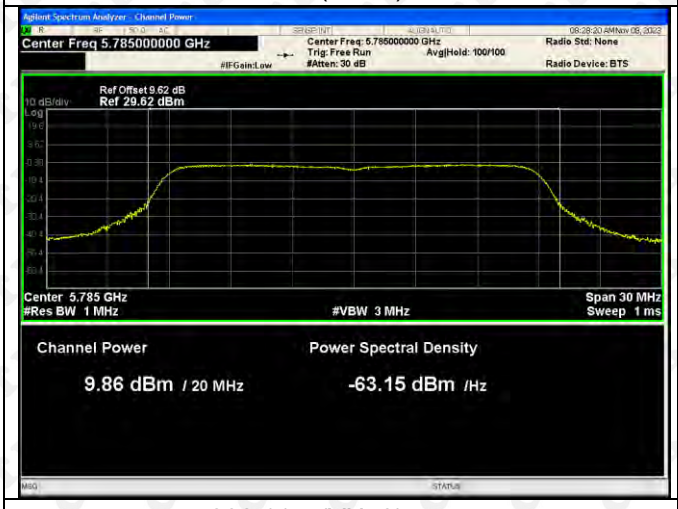


802.11a-5825

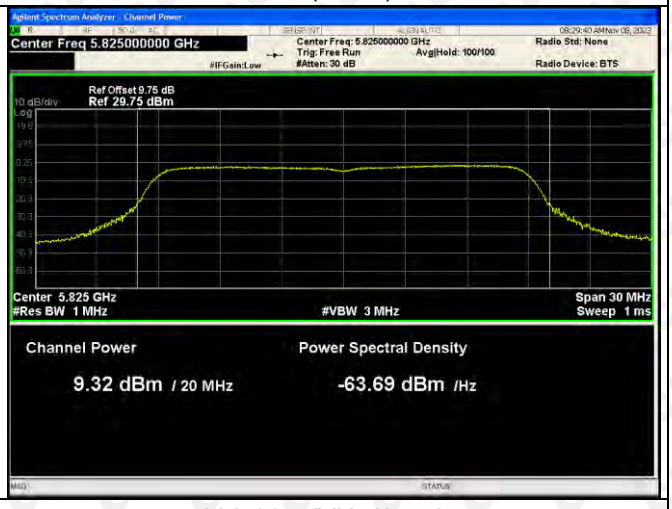
802.11ac(VH20)-5745



802.11ac(VH20)-5785

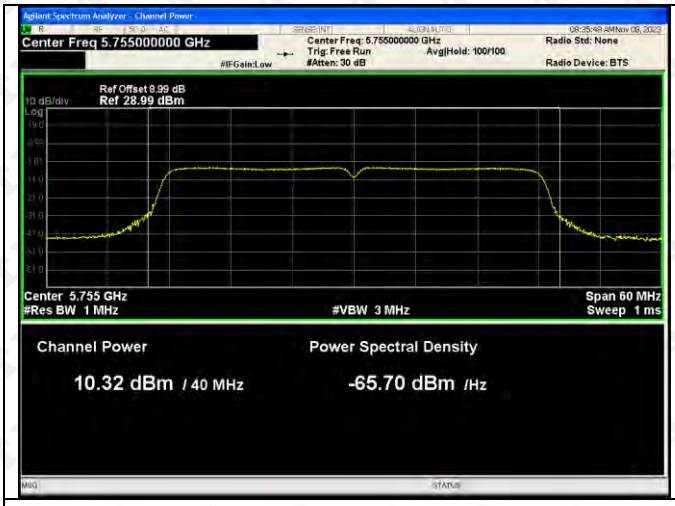


802.11ac(VH20)-5825

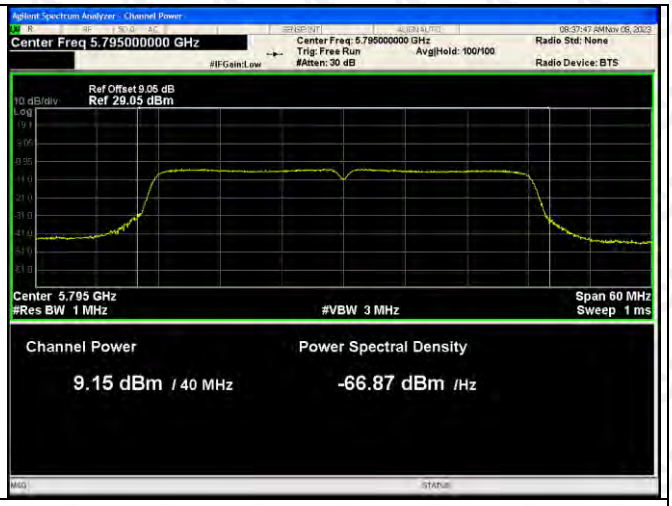


802.11ac(VH40)-5755

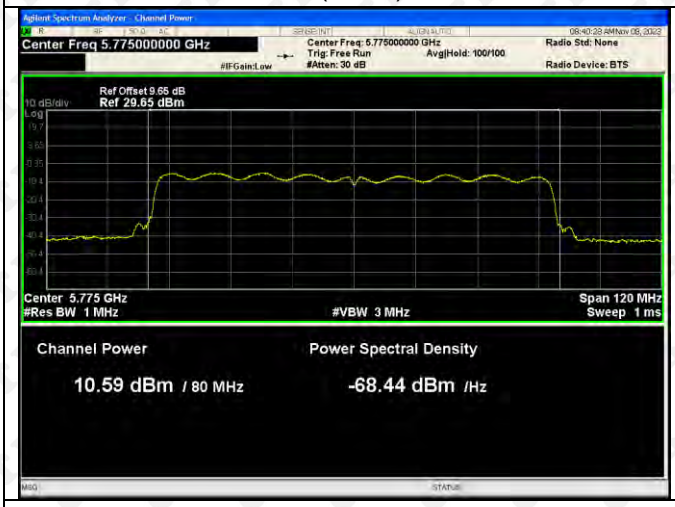
802.11ac(VH40)-5795



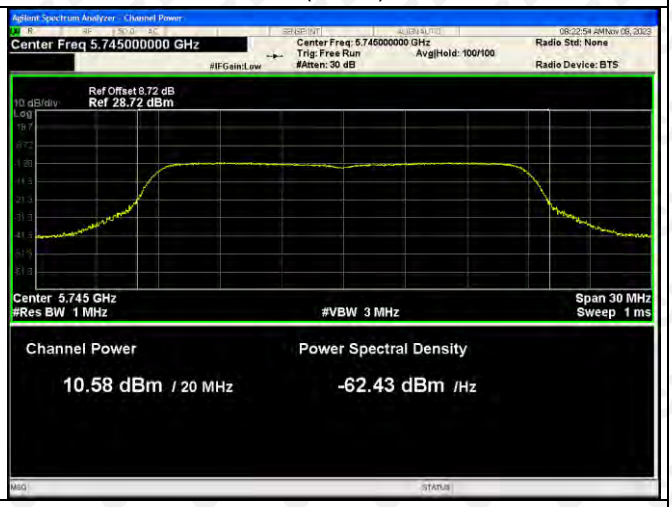
802.11ac(VH80)-5775



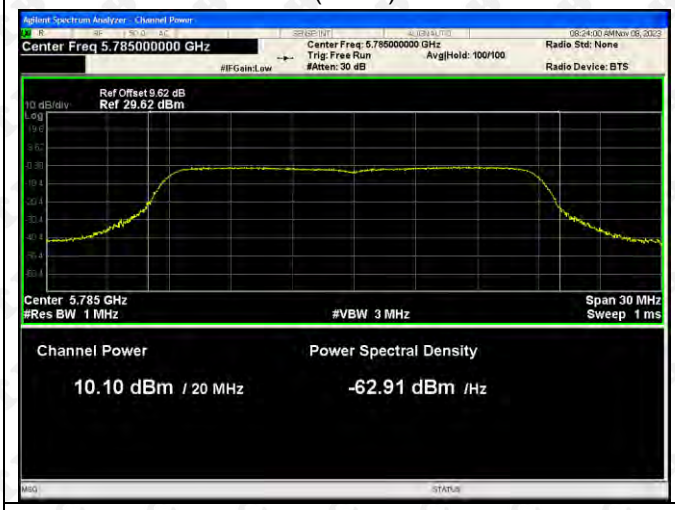
802.11n(HT20)-5745



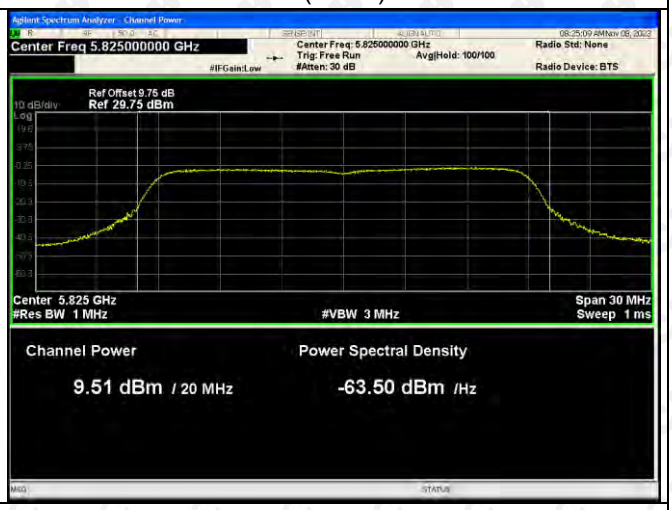
802.11n(HT20)-5785



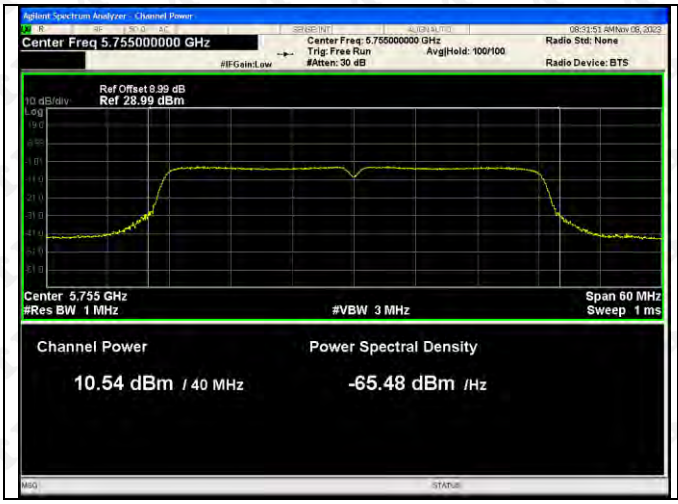
802.11n(HT20)-5825

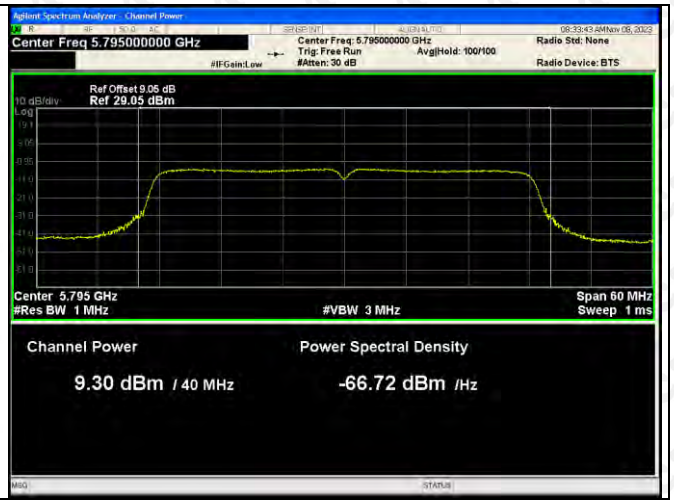


802.11n(HT40)-5795

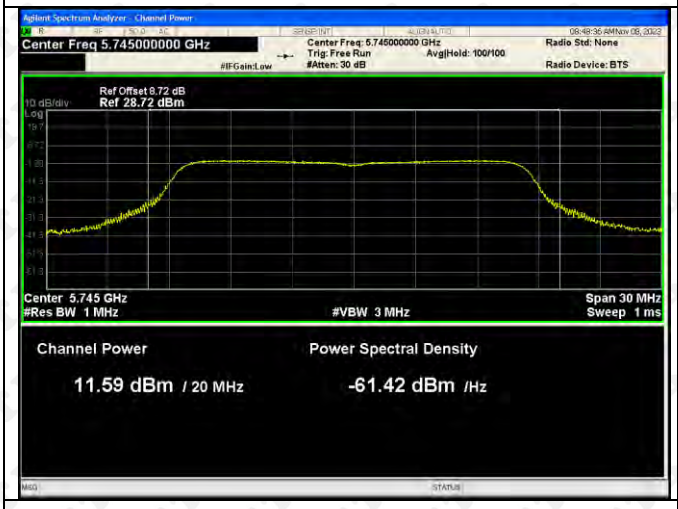
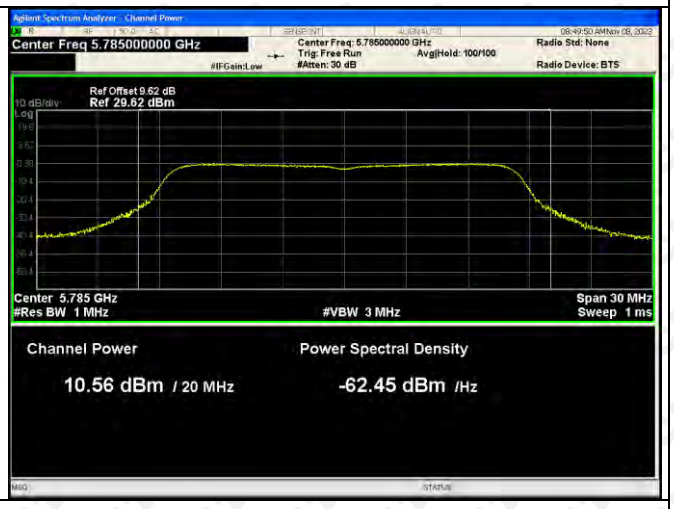
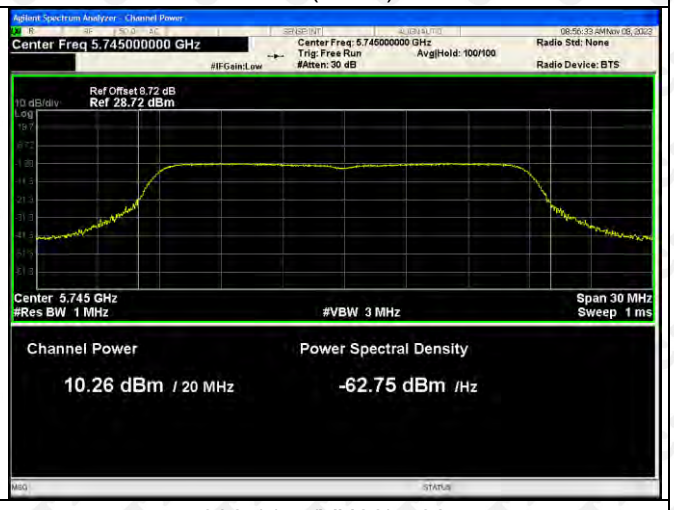


802.11n(HT40)-5825





ANT2

802.11a-5745	802.11a-5785
	
802.11a-5825	802.11ac(VH20)-5745
	
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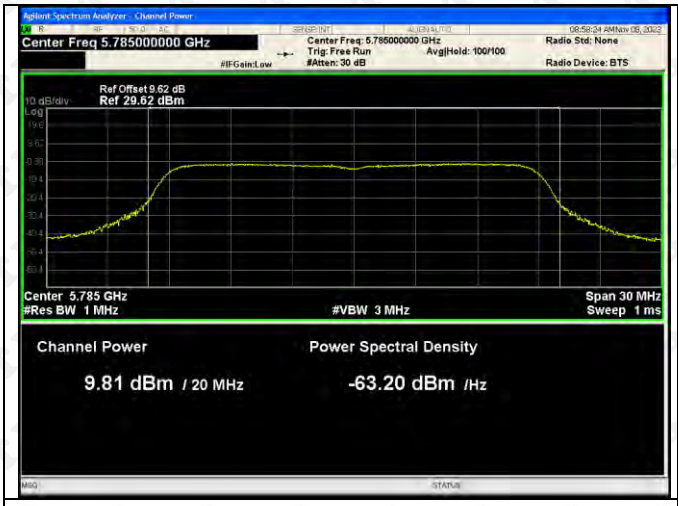

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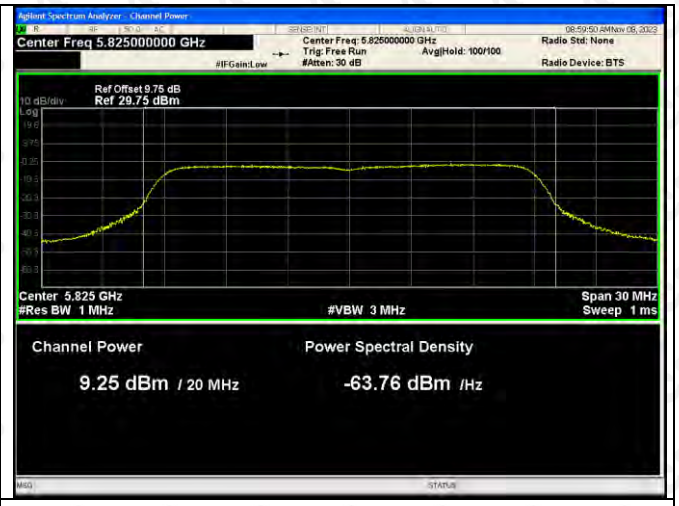

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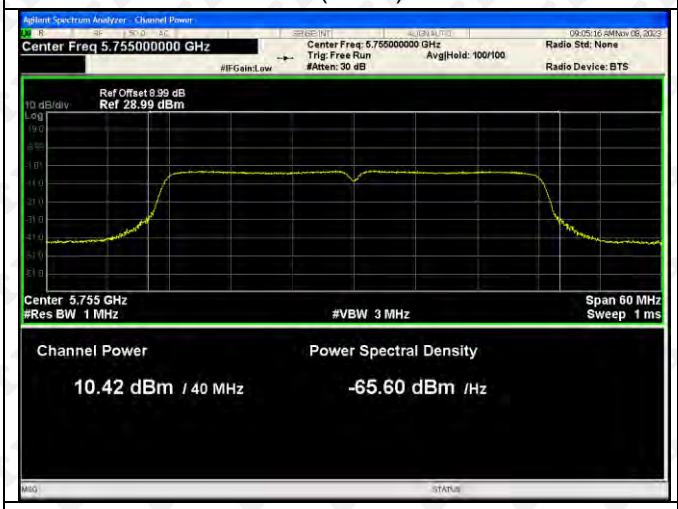

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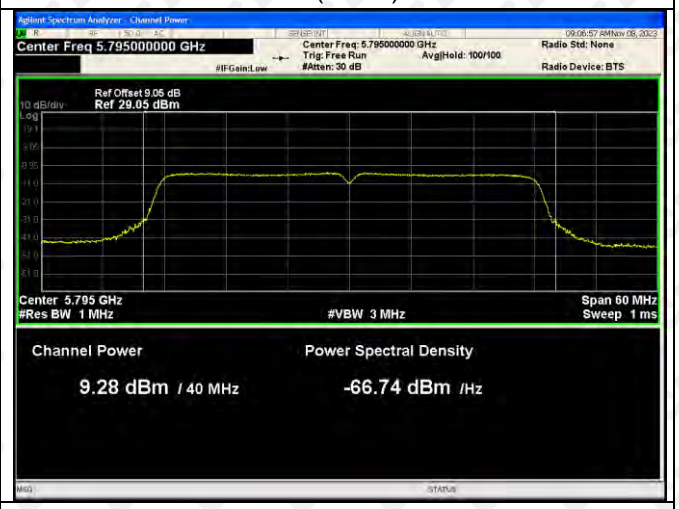

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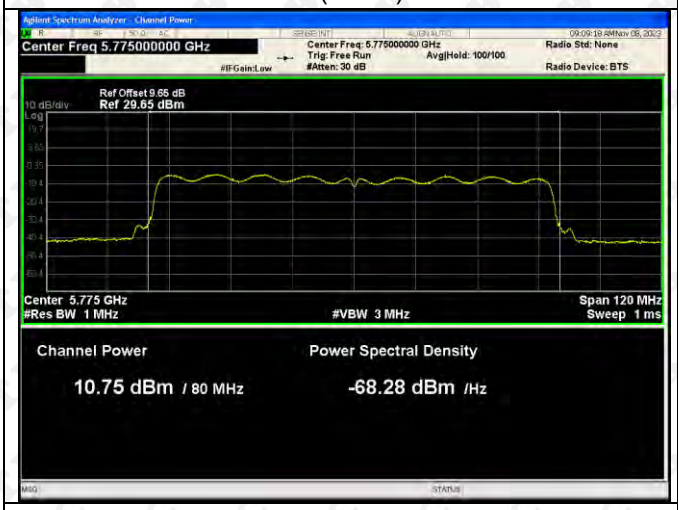

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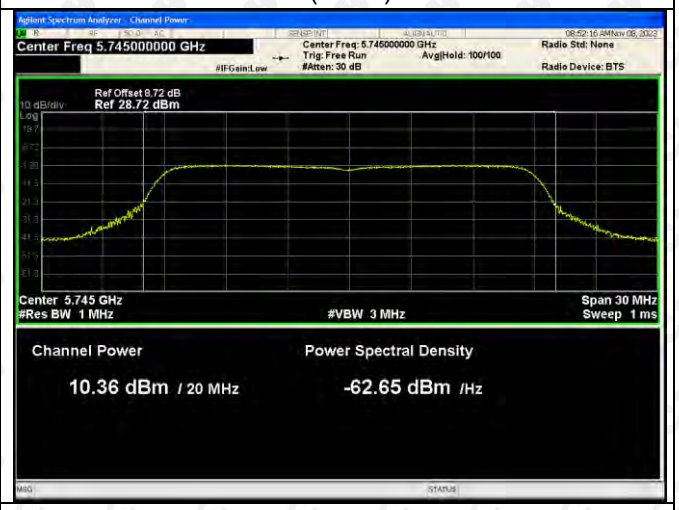

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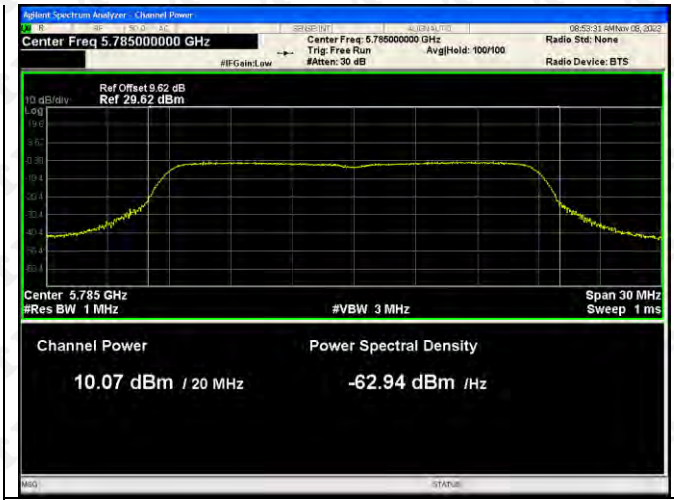
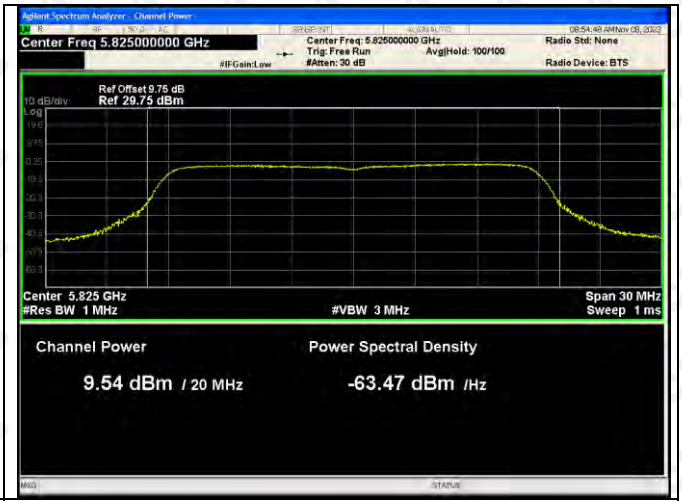


802.11n(HT40)-5795



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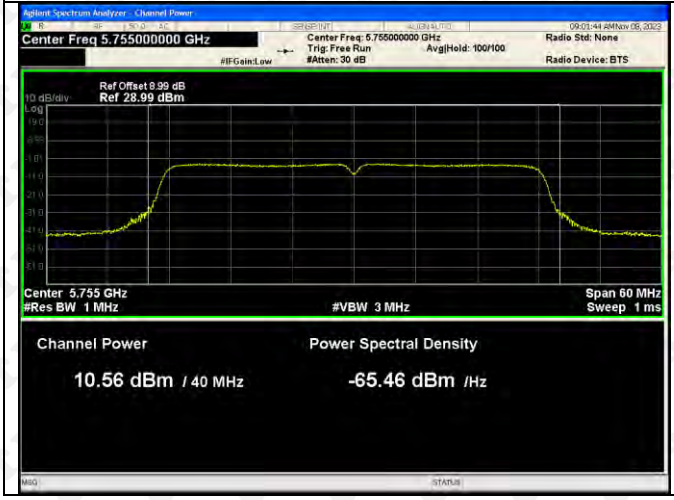
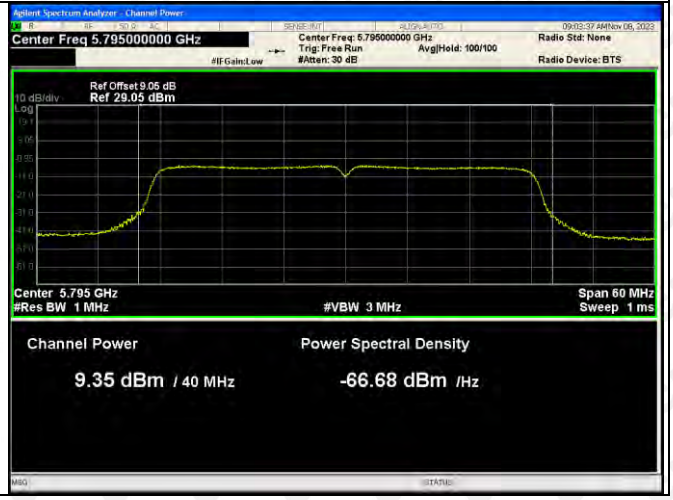
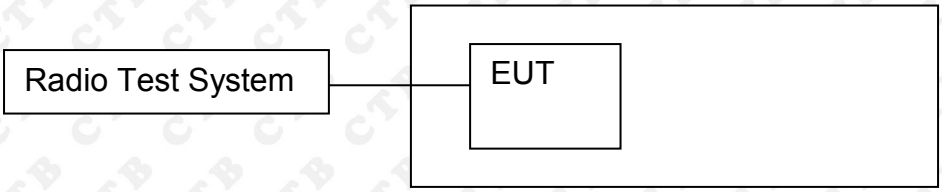




10. EMISSION BANDWIDTH& OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limits

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, 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, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

10.3 Test Procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
2. Minimum Emission Bandwidth for the band 5.725−5.85 GHz
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725−5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 * RBW.
c) Detector = Peak.

d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described in this section. For devices that use channel aggregation refer to III.A and III.C for determining emission bandwidth.

D. 99% Occupied Bandwidth

The 99% occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. Measurement of the 99% occupied bandwidth is *required* only as a condition for using the optional band-edge measurement techniques described in II.G.3.d). Measurements of 99% occupied bandwidth may also optionally be used in lieu of the EBW to define the minimum frequency range over which the 789033 D02 General UNII Test Procedures New Rules v02r01 Page 4 spectrum is integrated when measuring maximum conducted output power as described in II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with Section 15.407(a).
The following procedure shall be used for measuring (99%) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.

2. Set span = 1.5 times to 5.0 times the OBW.

3. Set RBW = 1% to 5% of the OBW

4. Set VBW ≥ 3 * RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

6. Use the 99% power bandwidth function of the instrument (if available).

7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

10.4 Test Results

5150-5250MHz:

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5180	20.835	20.733
	5200	21.036	20.963
	5240	21.117	21.064
802.11ac20	5180	21.505	21.345
	5200	21.304	21.551
	5240	21.466	21.652
802.11ac40	5190	41.275	40.855
	5230	40.878	40.752
802.11ac80	5210	81.801	79.059
802.11n(HT20)	5180	20.967	21.031
	5200	21.028	20.973
	5240	21.117	21.158
802.11n(HT40)	5190	40.970	41.122
	5230	40.541	40.530

5250-5350 MHz:

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5260	22.129	21.886
	5280	22.188	22.070
	5320	22.425	21.819
802.11ac20	5260	23.086	22.889
	5280	22.515	22.196
	5320	23.070	22.519
802.11ac40	5270	50.076	49.874
	5310	55.084	51.486
802.11ac80	5290	79.157	81.582
802.11n(HT20)	5260	21.371	21.385
	5280	21.758	21.434
	5320	21.564	21.833
802.11n(HT40)	5270	41.028	41.334
	5310	41.536	41.944

5470-5725MHz:

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz)&ANT1	26dB Bandwidth (MHz)&ANT2
802.11a	5500	21.109	21.232
	5580	22.030	21.37
	5700	21.683	21.750
802.11ac20	5500	21.606	22.174
	5580	22.573	21.499
	5700	22.123	22.003
802.11ac40	5510	41.295	44.844
	5670	50.439	50.061
802.11ac80	5530	81.658	81.737
802.11n(HT20)	5500	21.137	21.343
	5580	20.973	21.660
	5700	21.079	21.382
802.11n(HT40)	5510	40.897	41.767
	5670	41.613	41.218

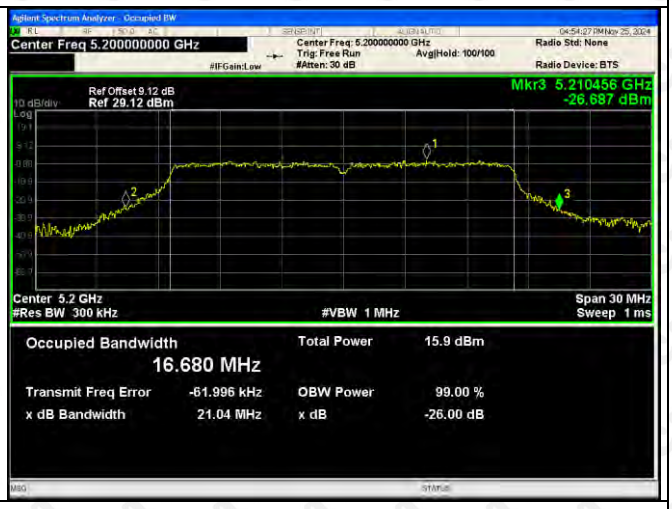
5725-5850MHz:

Test mode	Test Channel (MHz)	6dB Bandwidth (MHz)&ANT1	6dB Bandwidth (MHz)&ANT2
802.11a	5745	16.476	16.519
	5785	16.522	16.528
	5825	16.537	16.521
802.11ac20	5745	17.744	17.746
	5785	17.761	17.771
	5825	17.754	17.742
802.11ac40	5755	36.536	36.517
	5795	36.481	36.475
802.11ac80	5775	76.189	75.838
802.11n(HT20)	5745	17.778	17.782
	5785	17.790	17.762
	5825	17.785	17.771
802.11n(HT40)	5755	36.489	36.489
	5795	36.447	36.437

Test Graph:
5150-5250MHz-Power
ANT1

802.11a-5180

802.11a-5200



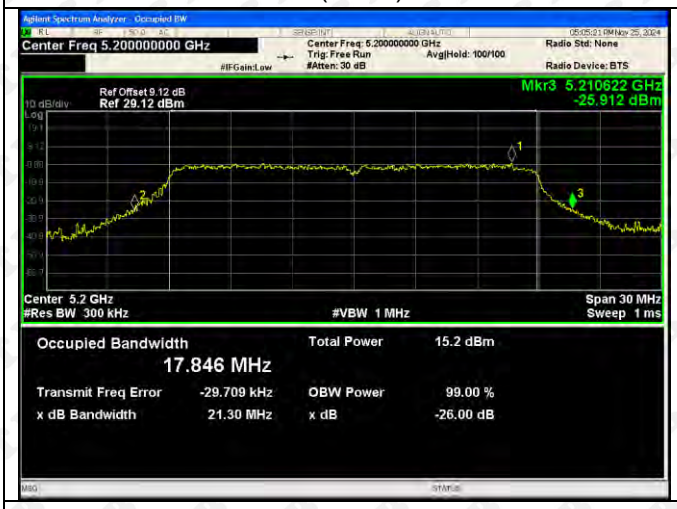
802.11a-5240

802.11ac(VH20)-5180

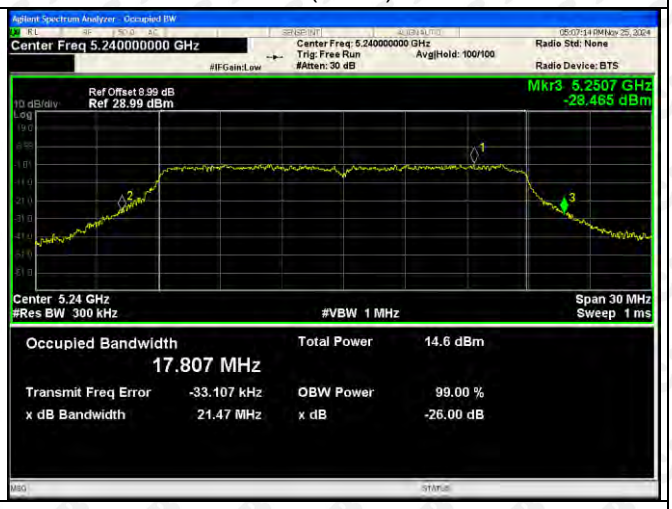
802.11ac(VH20)-5200

802.11ac(VH20)-5240

802.11ac(VH40)-5190



802.11ac(VH40)-5230



802.11ac(VH80)-5210

802.11n(HT20)-5180

802.11n(HT20)-5200

802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230

ANT2

802.11a-5180	802.11a-5200
	
802.11a-5240	802.11ac(VH20)-5180
	
802.11ac(VH20)-5200	802.11ac(VH20)-5240

802.11ac(VH40)-5190

802.11ac(VH40)-5230

802.11ac(VH80)-5210

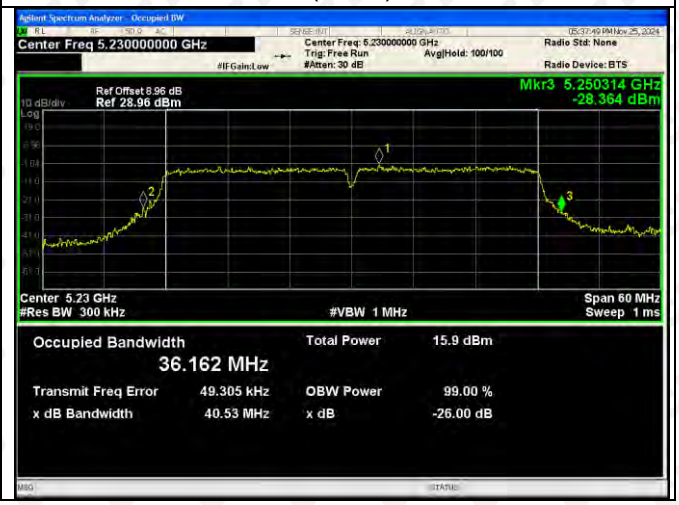
802.11n(HT20)-5180

802.11n(HT20)-5200

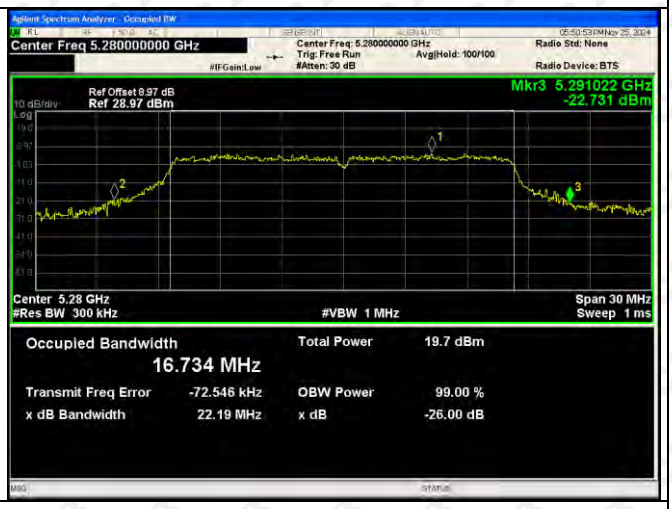
802.11n(HT20)-5240

802.11n(HT40)-5190

802.11n(HT40)-5230



5250-5350MHz-Power
ANT1

802.11a-5260	802.11a-5280
	
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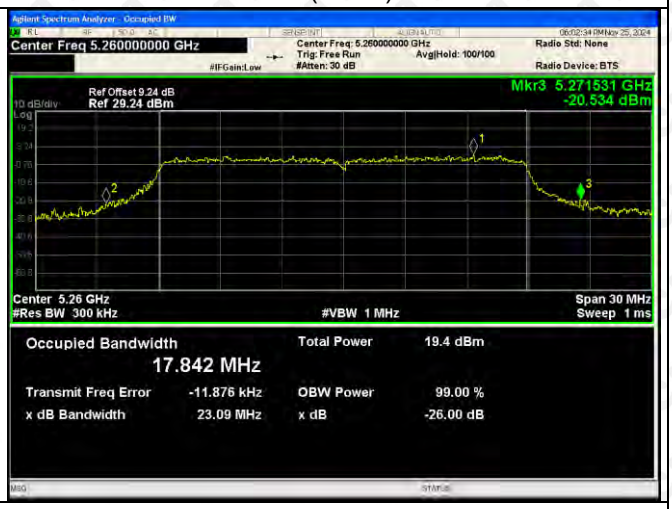
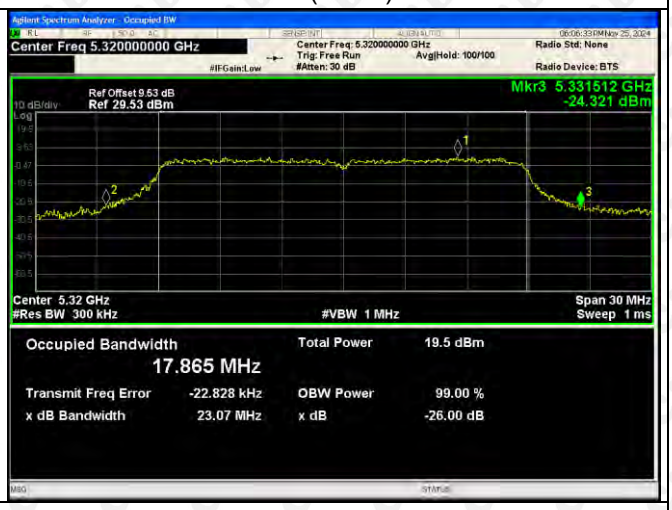
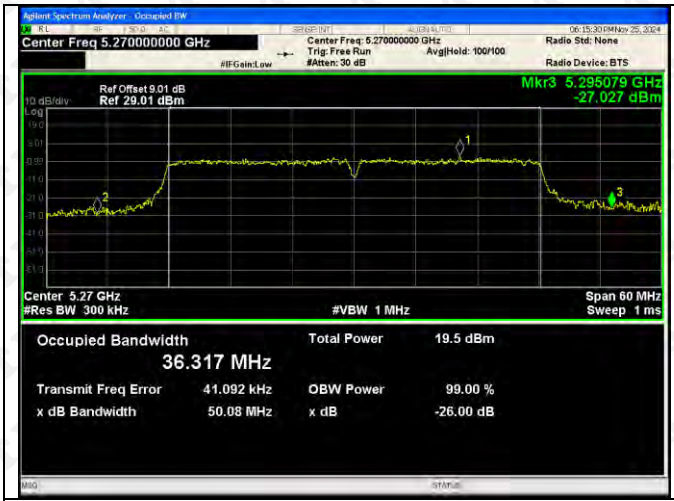
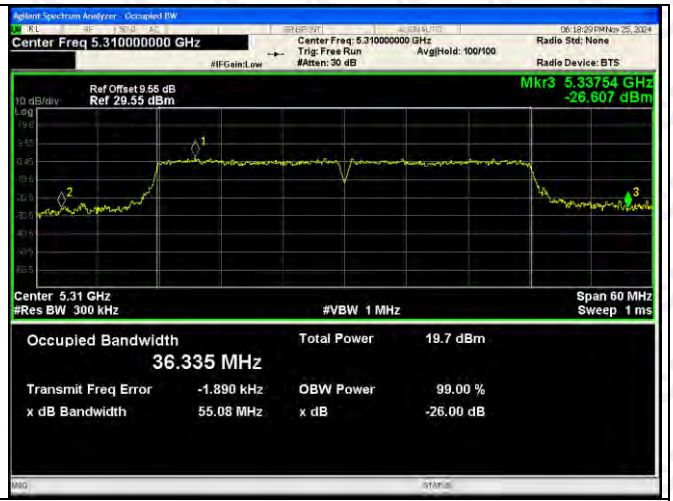
	
802.11ac(VH20)-5280	802.11ac(VH20)-5320
	
802.11ac(VH40)-5270	802.11ac(VH40)-5310



802.11ac(VH80)-5290

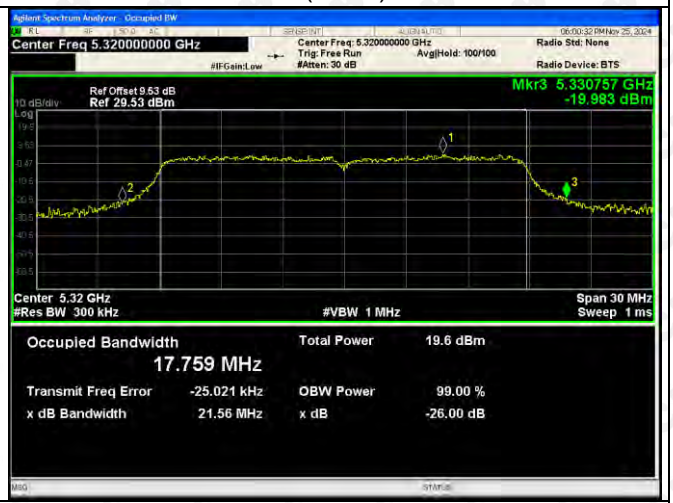


802.11n(HT20)-5260

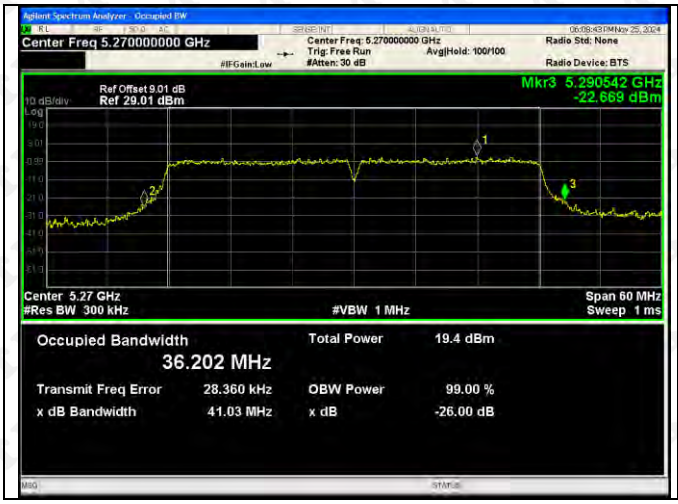
802.11n(HT20)-5280

802.11n(HT20)-5320

802.11n(HT40)-5270



802.11n(HT40)-5310

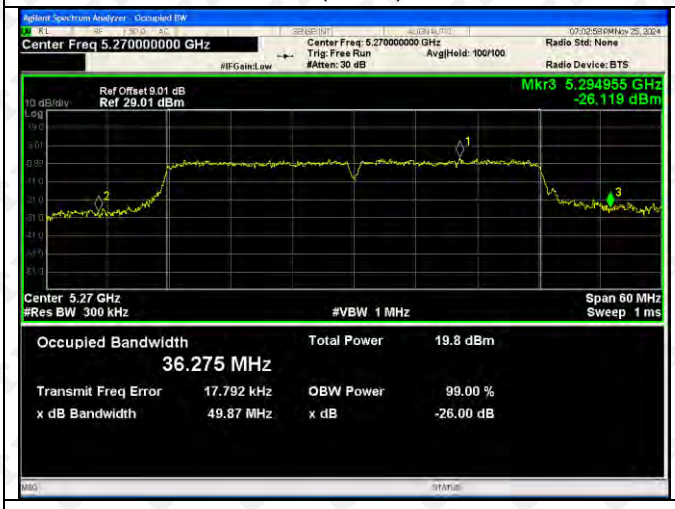


ANT2

802.11a-5260	802.11a-5280
	
802.11a-5320	802.11ac(VH20)-5260
	
802.11ac(VH20)-5280	802.11ac(VH20)-5320

802.11ac(VH40)-5270

802.11ac(VH40)-5310



802.11ac(VH80)-5290

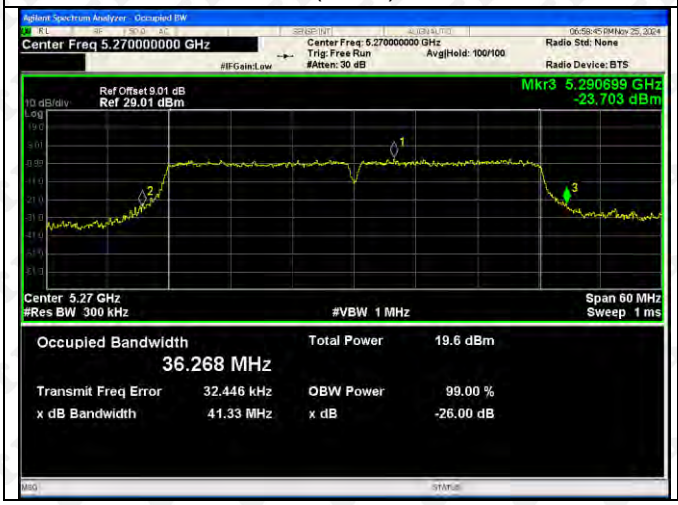
802.11n(HT20)-5260

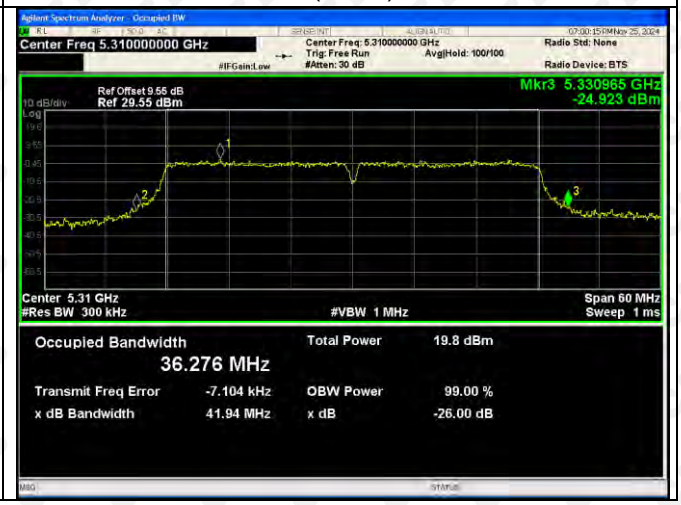
802.11n(HT20)-5280

802.11n(HT20)-5320

802.11n(HT40)-5270

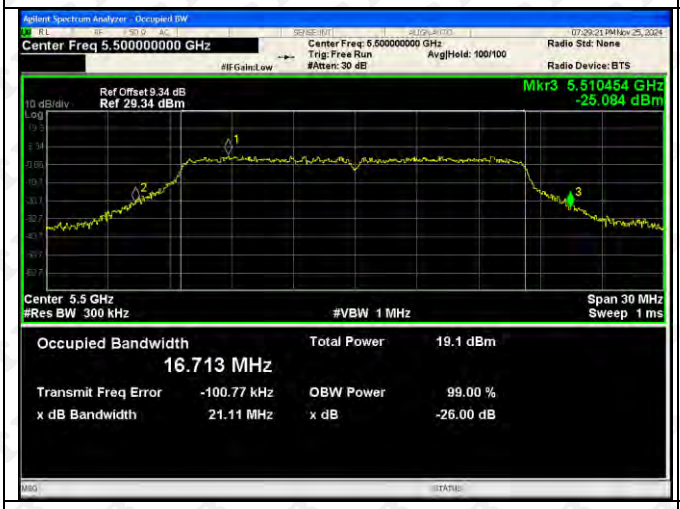
802.11n(HT40)-5310



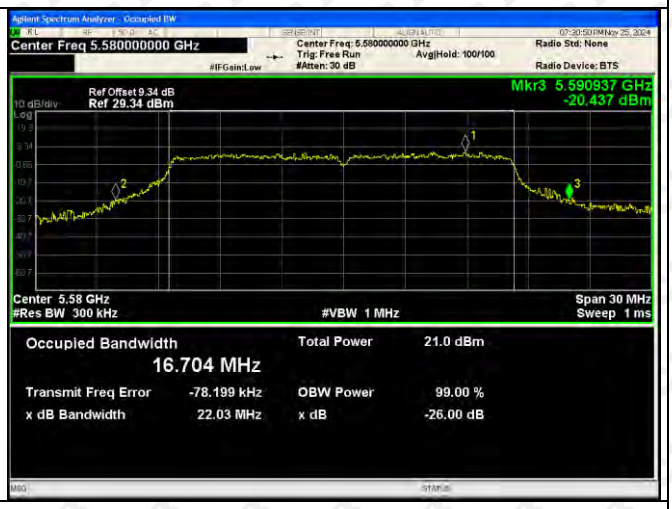


5470-5725MHz-Power
ANT1

802.11a-5500

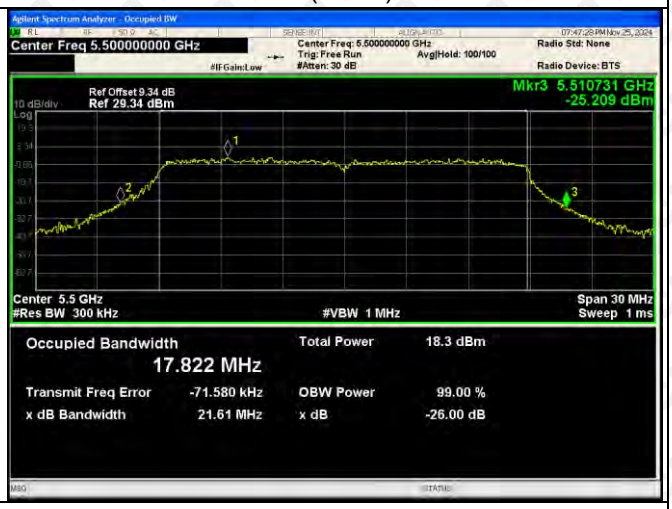


802.11a-5580



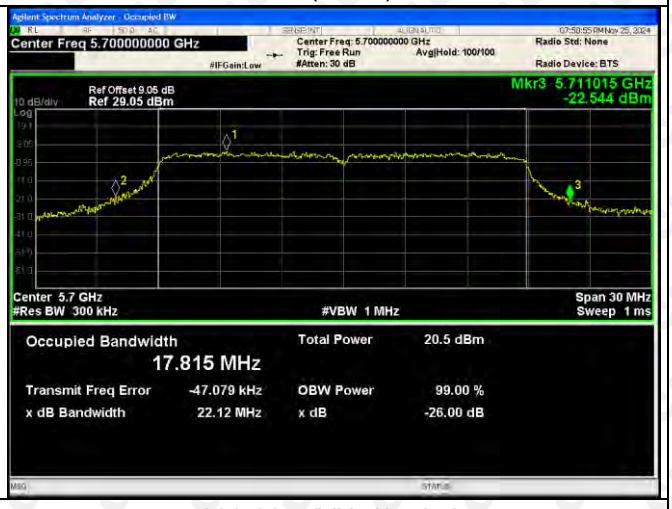
802.11a-5700

802.11ac(VH20)-5500



802.11ac(VH20)-5580

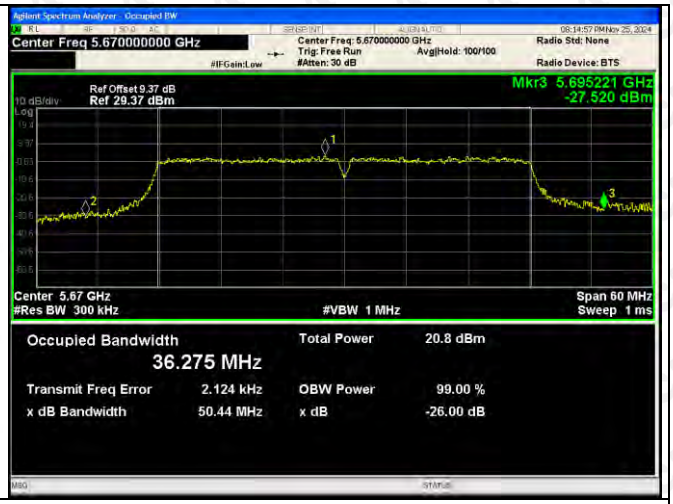
802.11ac(VH20)-5700



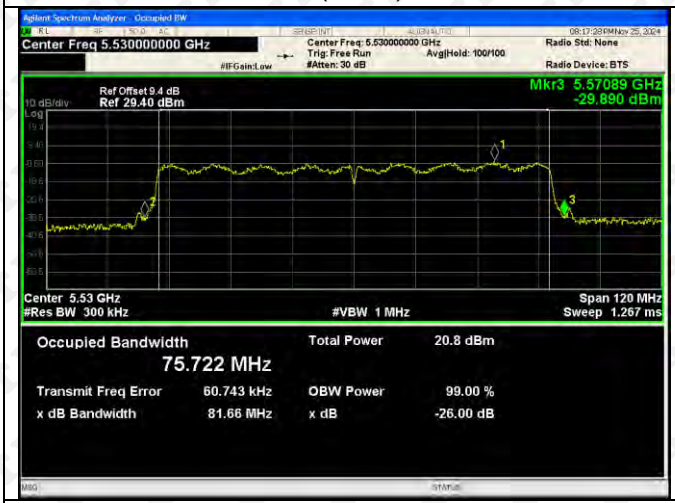
802.11ac(VH40)-5510

802.11ac(VH40)-5670

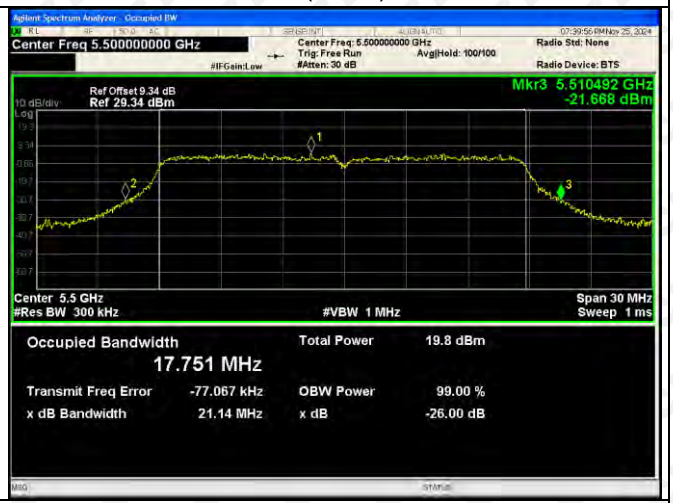
802.11ac(VH80)-5530



802.11n(HT20)-5500



802.11n(HT20)-5580



802.11n(HT20)-5700

802.11n(HT40)-5510

802.11n(HT40)-5670

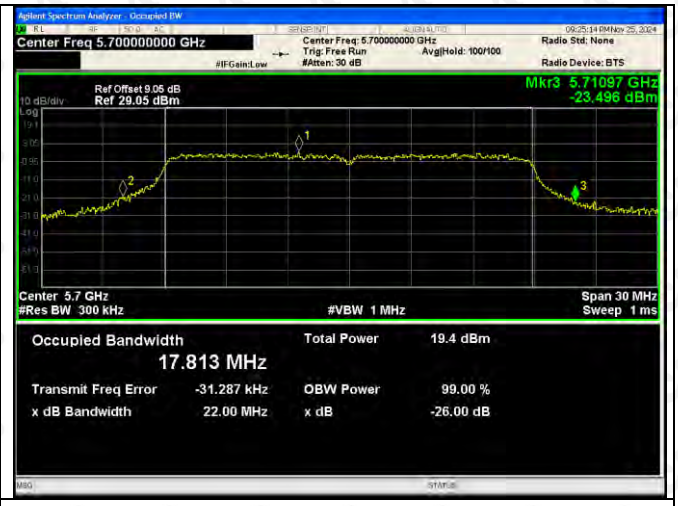
ANT2

802.11a-5500	802.11a-5580

802.11a-5700	802.11ac(VH20)-5500

802.11ac(VH20)-5580	802.11ac(VH20)-5700

802.11ac(VH40)-5510



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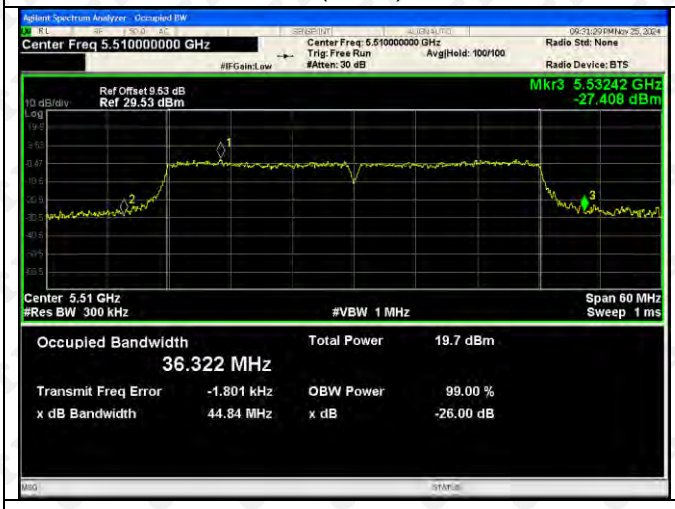

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802.11n(HT20)-5500

802.11n(HT20)-5580

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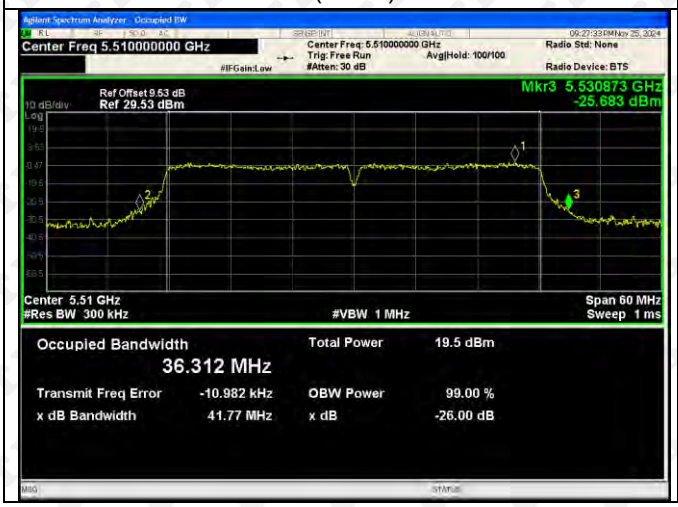
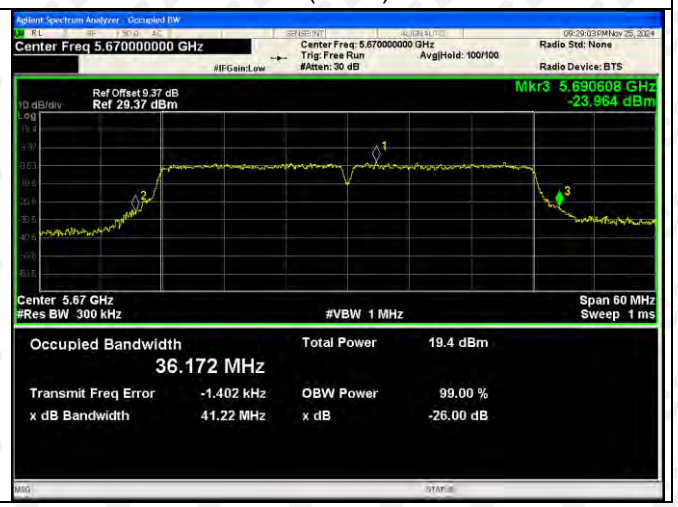
802.11n(HT40)-5510

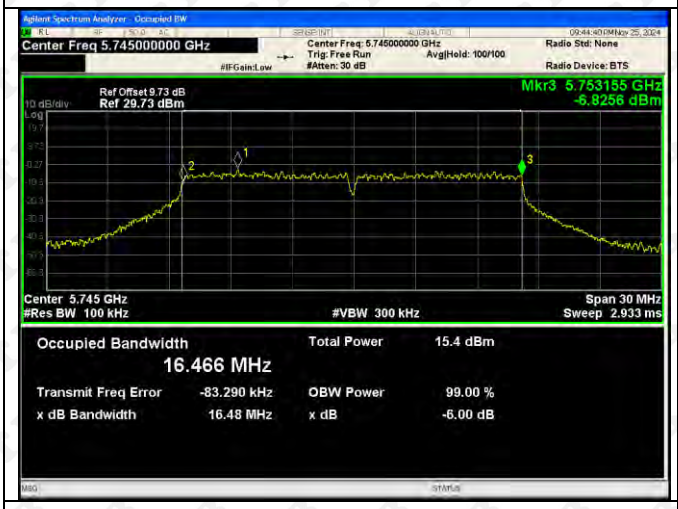
802.11n(HT40)-5670





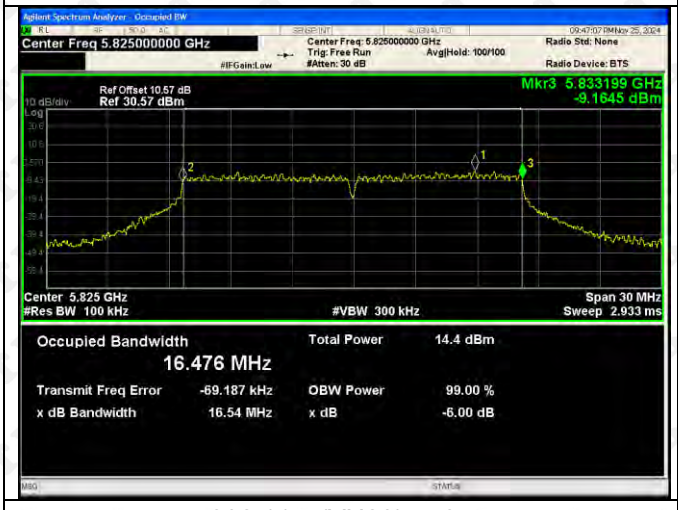
5725-5850MHz:-Power
ANT1

802.11a-5745



802.11a-5785

802.11a-5825



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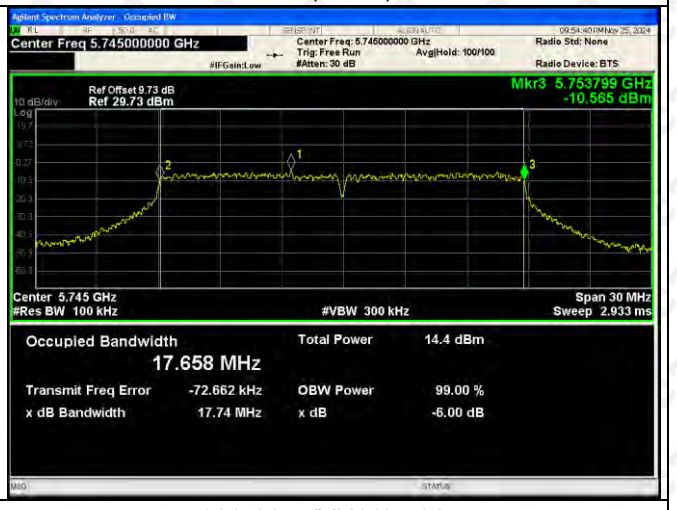

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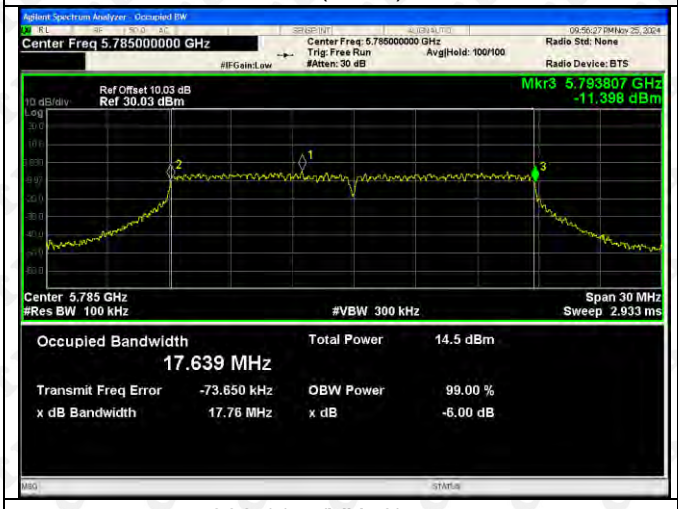

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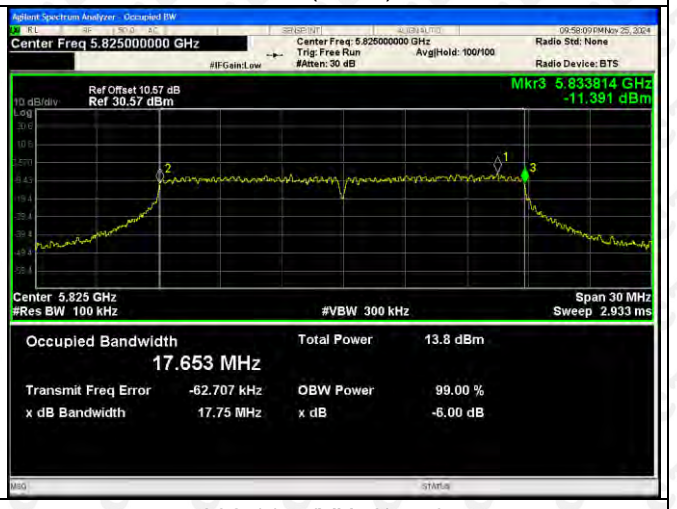

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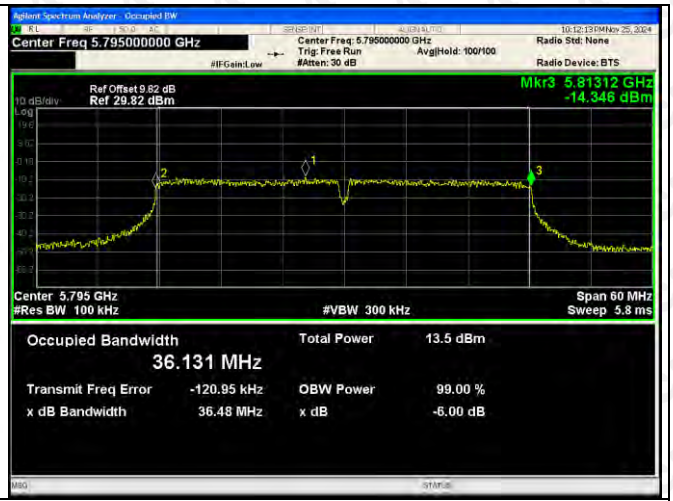
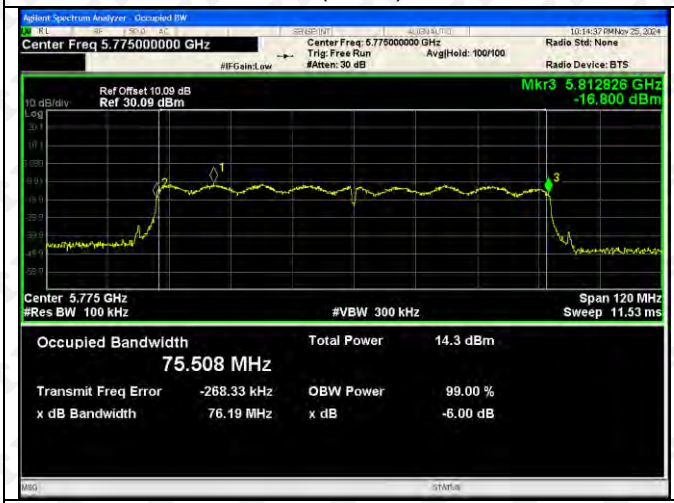
802.11ac(VH80)-5775



802.11n(HT20)-5745



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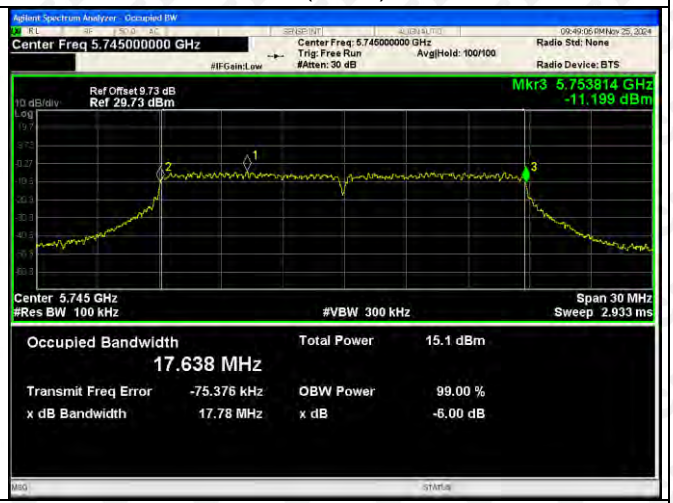

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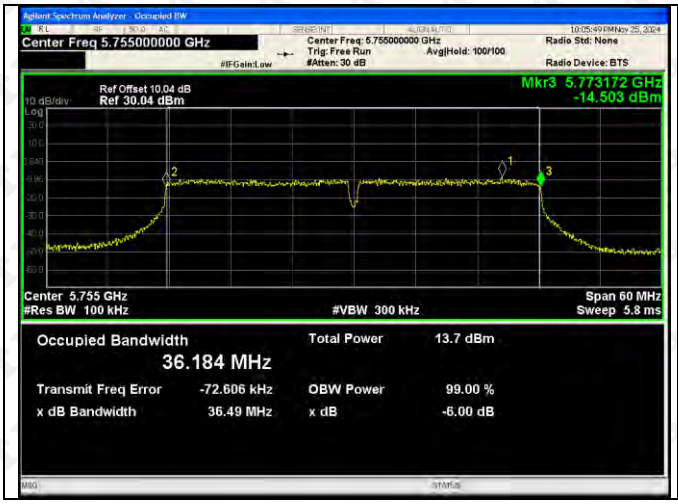
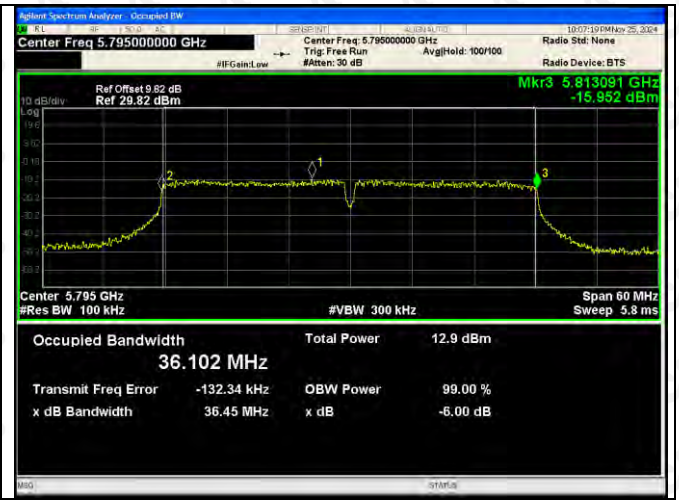
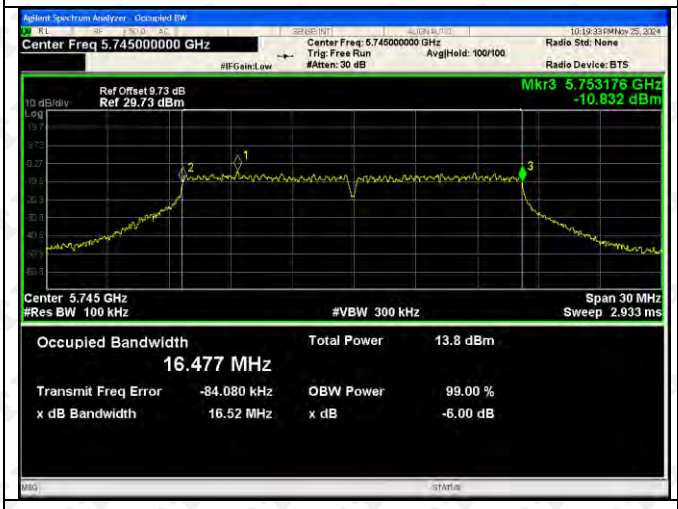
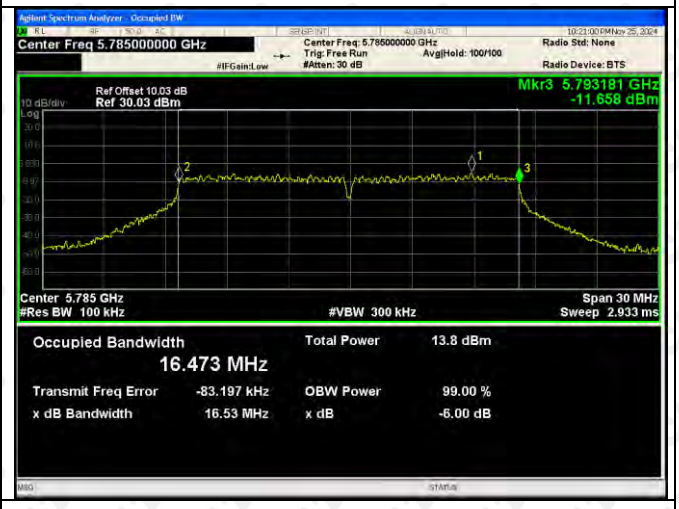
802.11n(HT40)-5795

802.11n(HT40)-5825





ANT2

802.11a-5745	802.11a-5785
	
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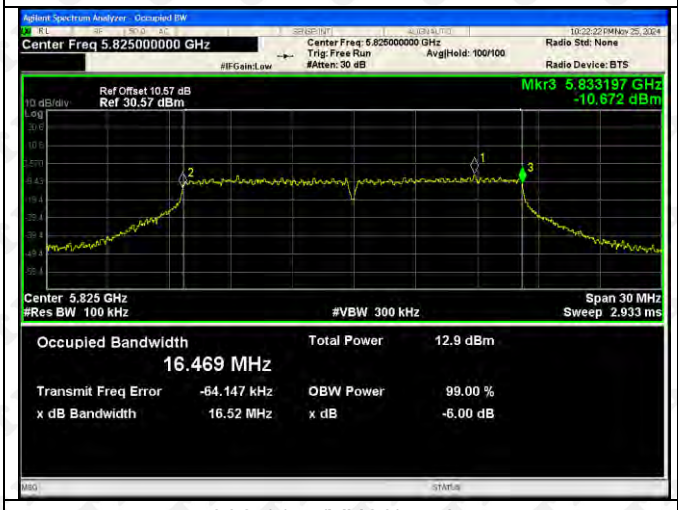	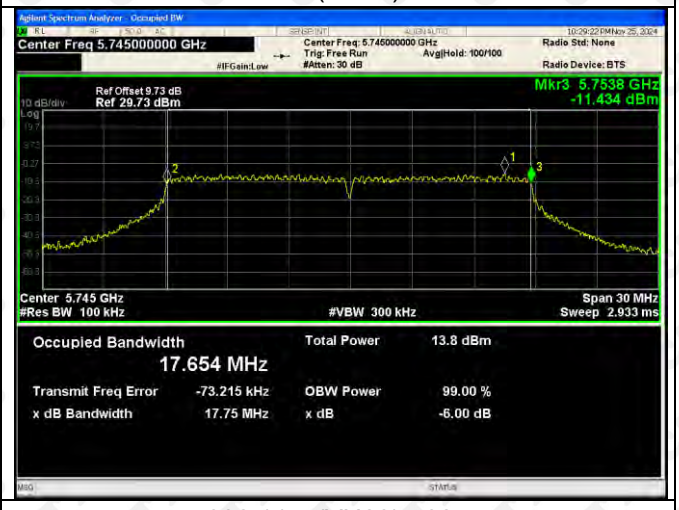
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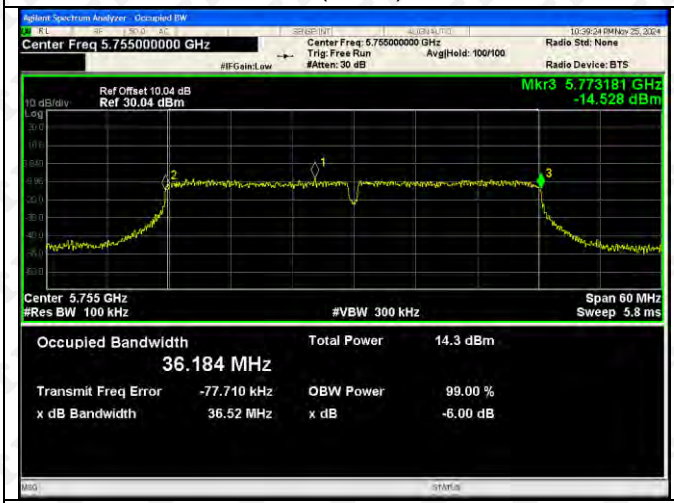
802.11ac(VH40)-5755

802.11ac(VH40)-5795



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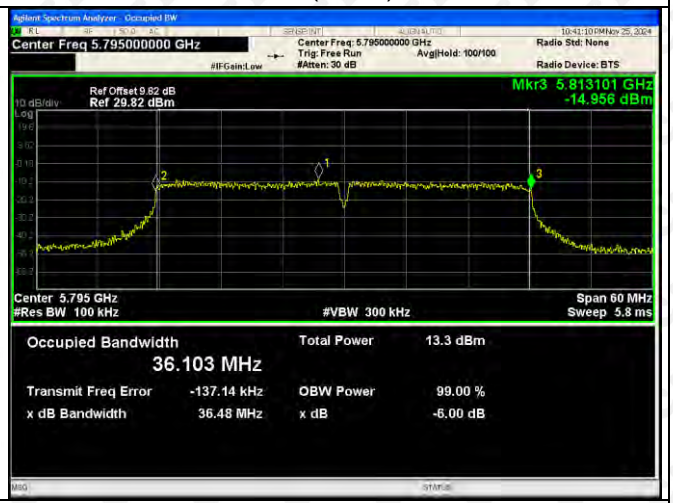

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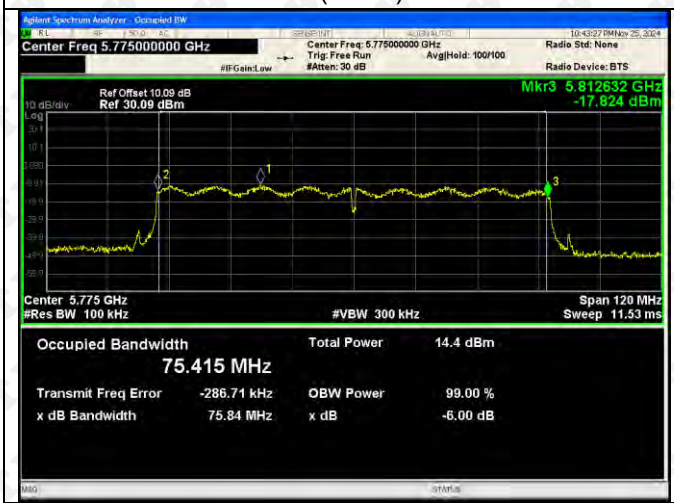
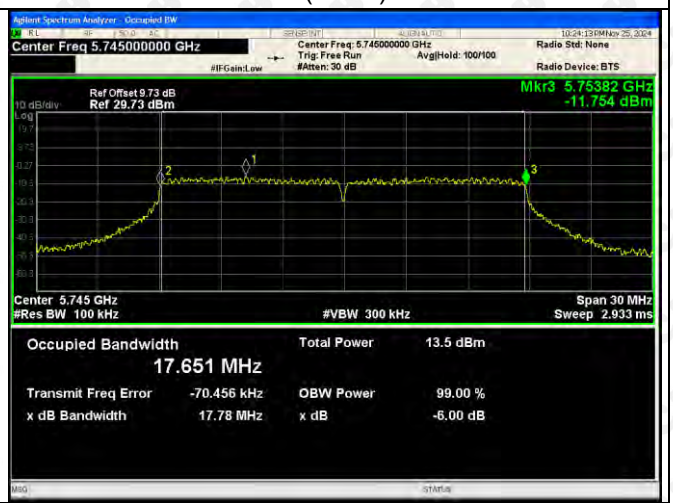


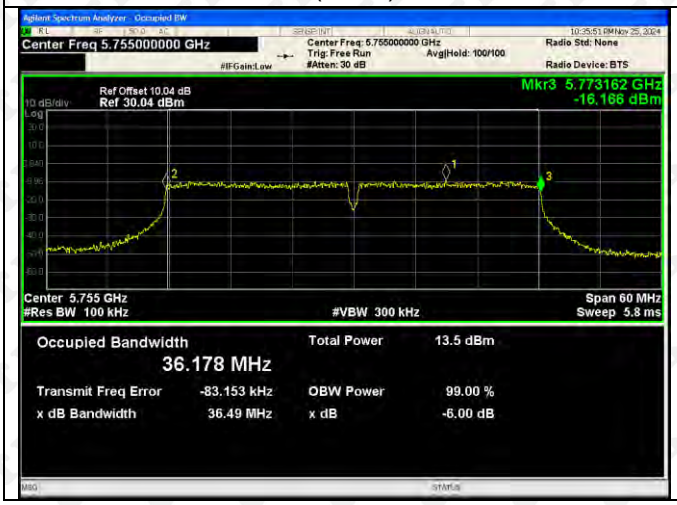
802.11n(HT20)-5785

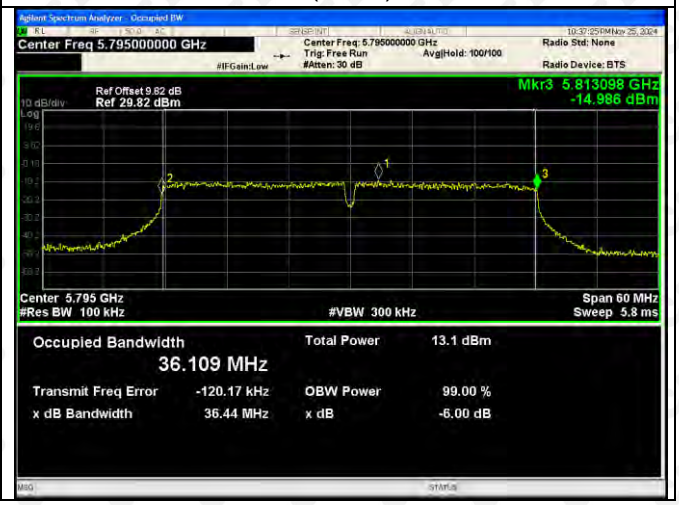


802.11n(HT20)-5825

802.11n(HT40)-5795

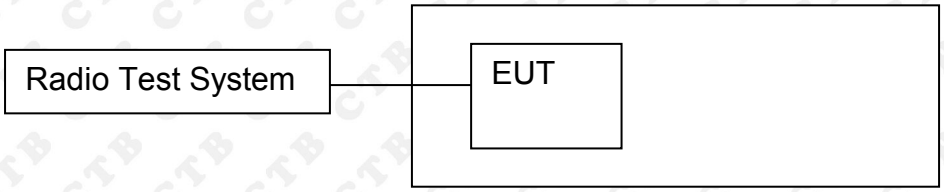
802.11n(HT40)-5825





11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, 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, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

11.3 Test procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

For devices operating in the bands 5.15−5.25 GHz, 5.25−5.35 GHz, and 5.47−5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 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 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 ≥ 1/*T*, where *T* is defined in II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the

measured result, whereas RBW (<500 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 (1MHz/RBW) to the measured result, whereas RBW (< 1 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 II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.