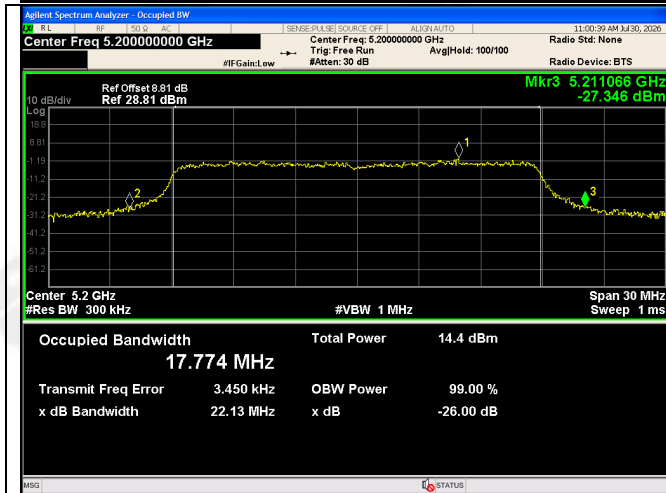
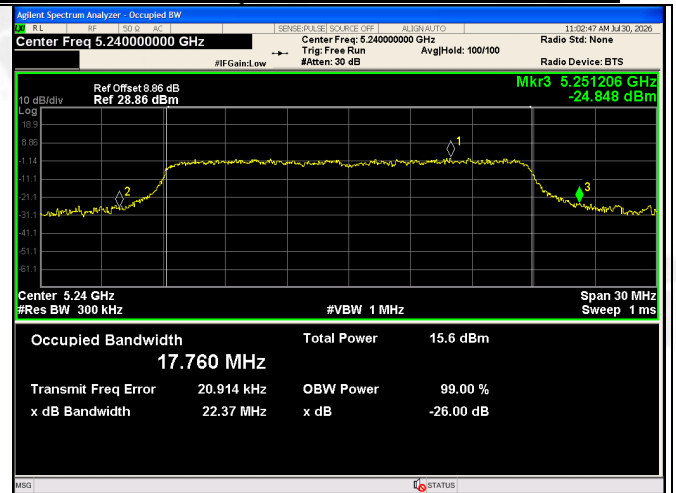
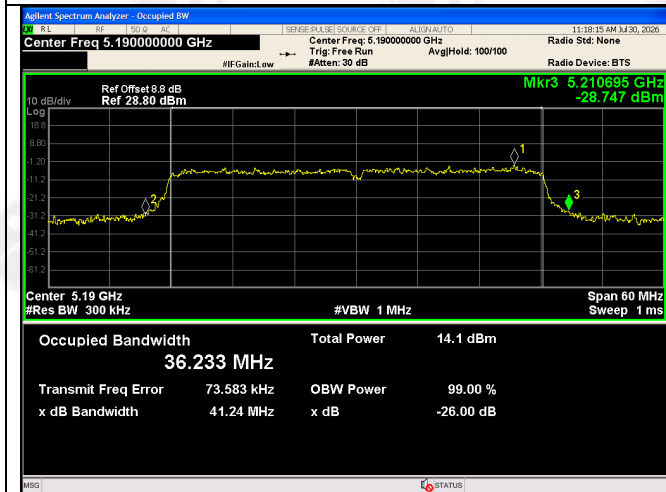




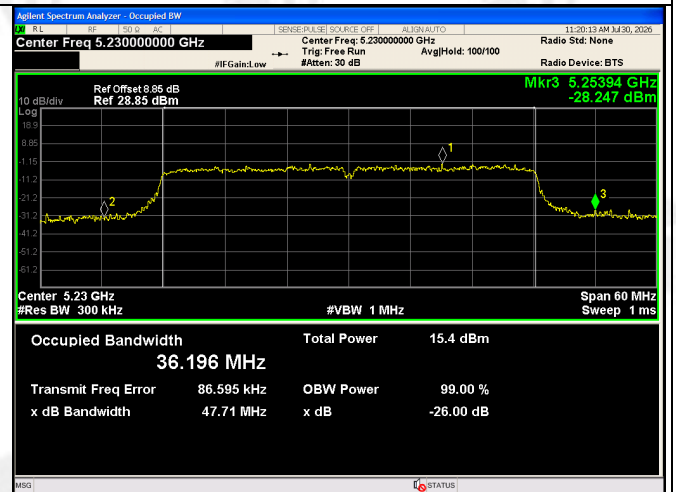
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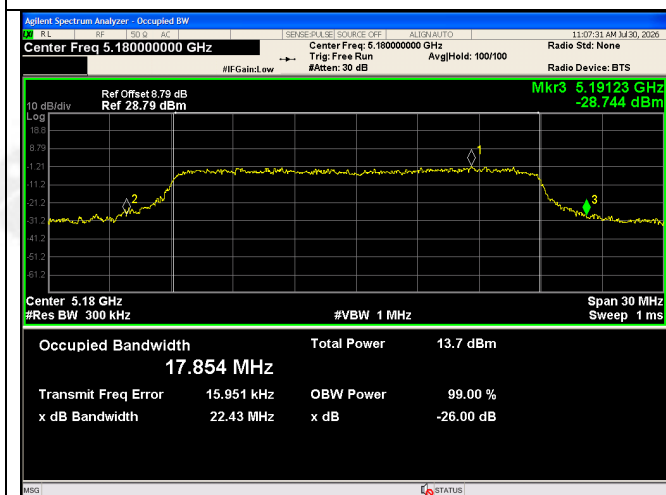
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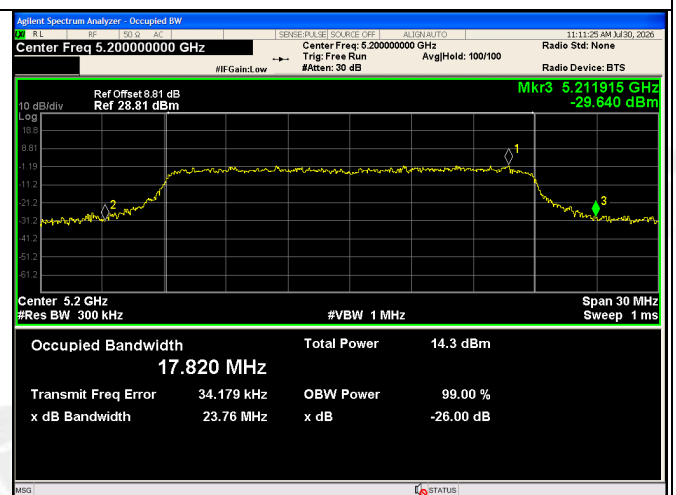
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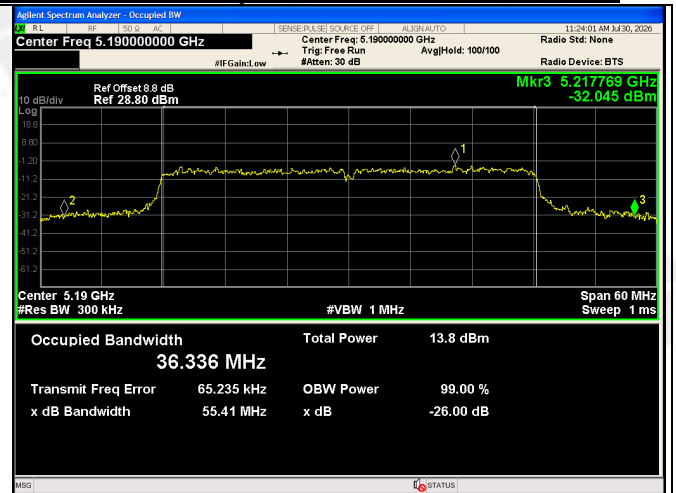
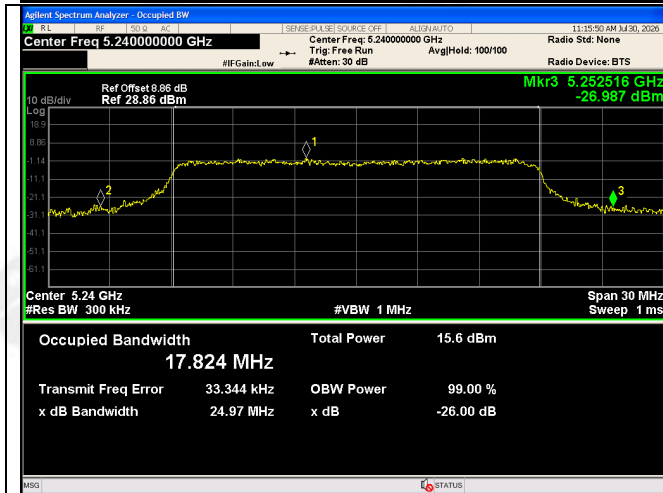
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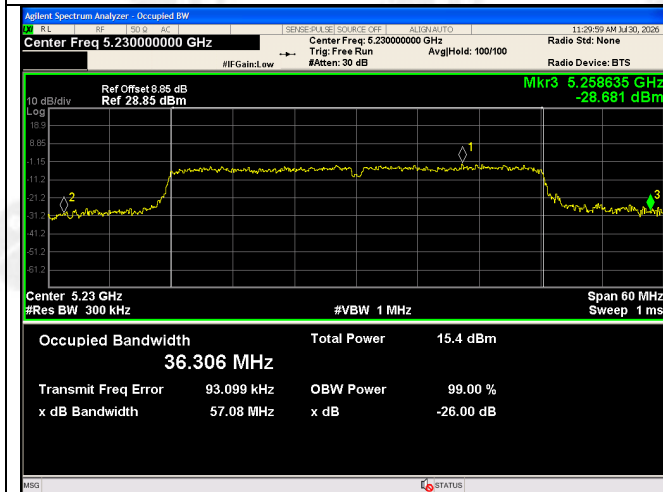
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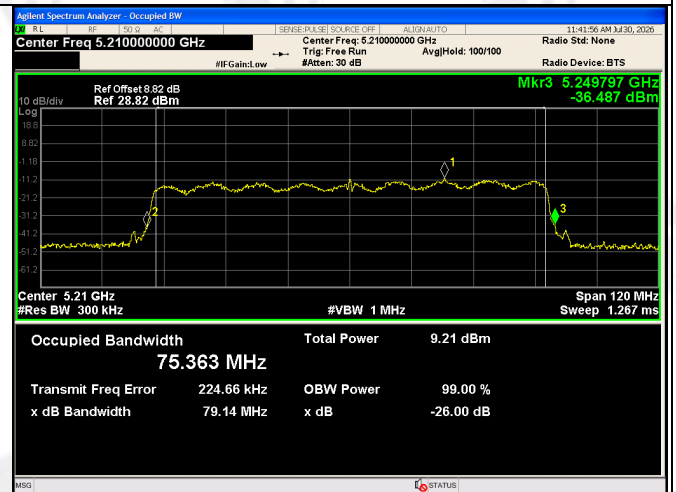
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802.11ax(HE40)-5230



802.11ax(HE80)-5210



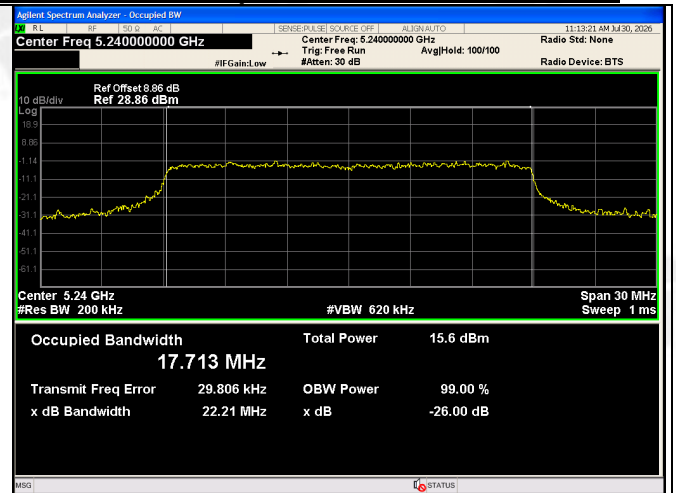
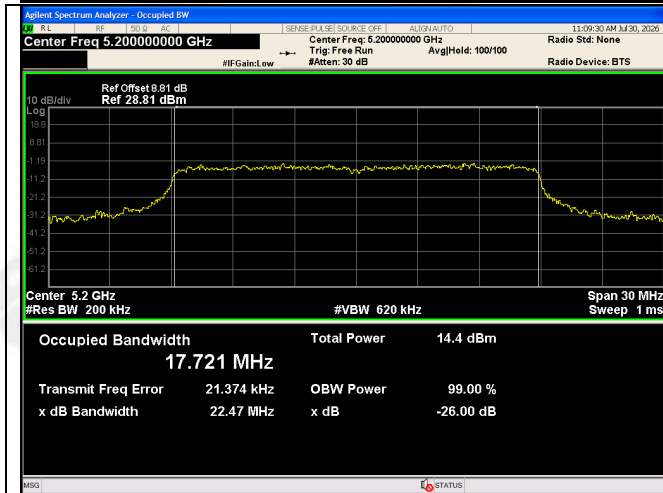


Test Graph

5150-5250MHz

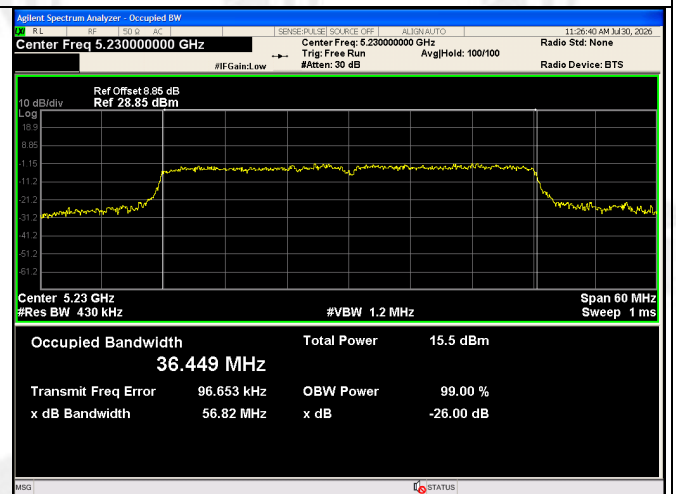
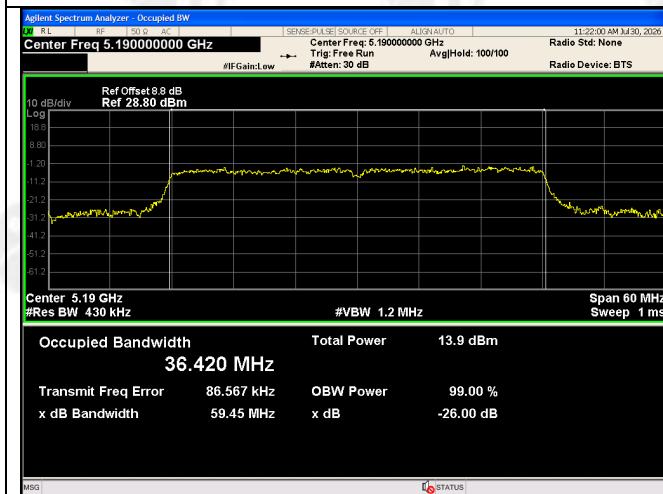
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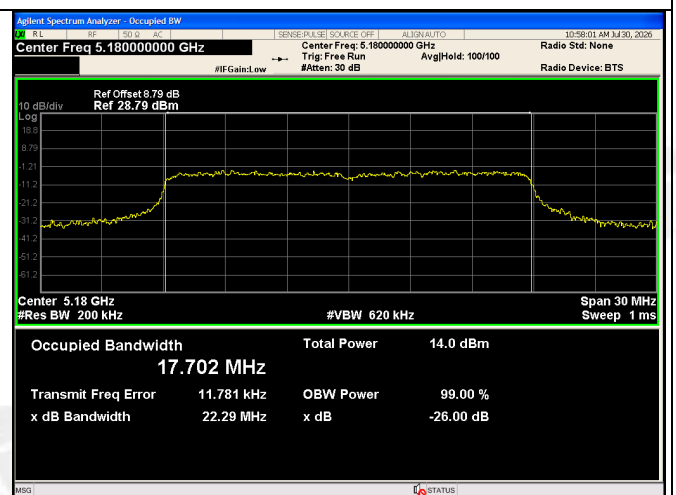
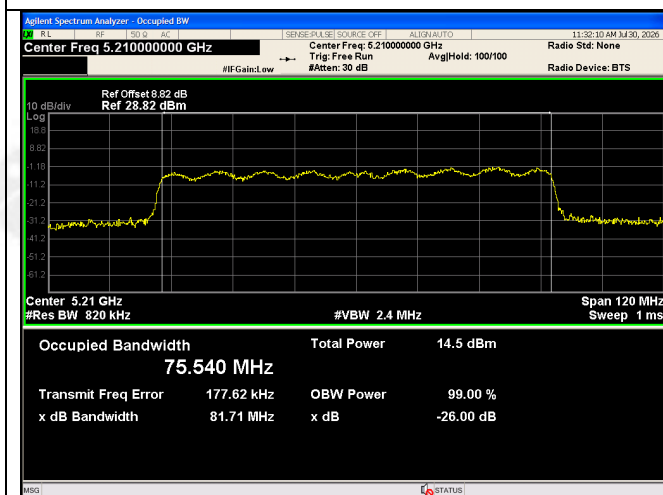
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802.11ac(VHT40)-5230



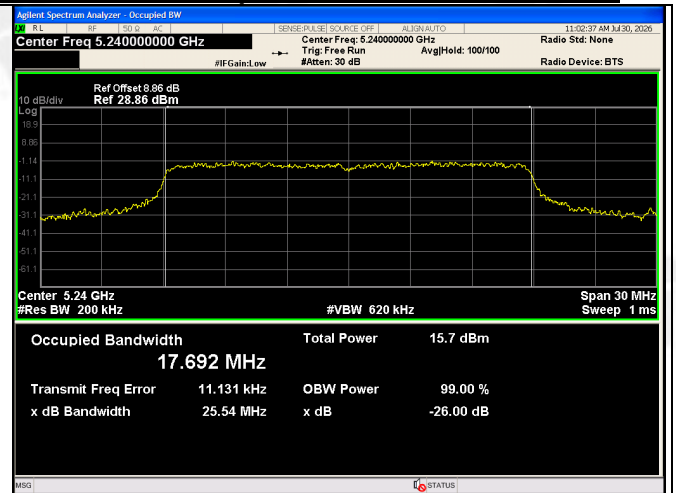
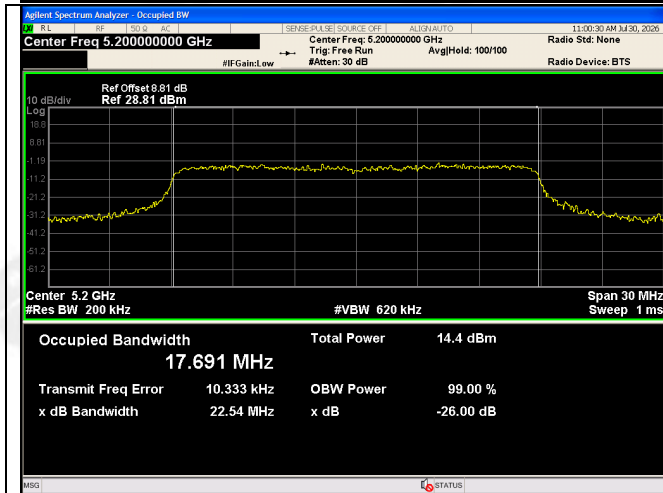
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802.11n(HT20)-5180



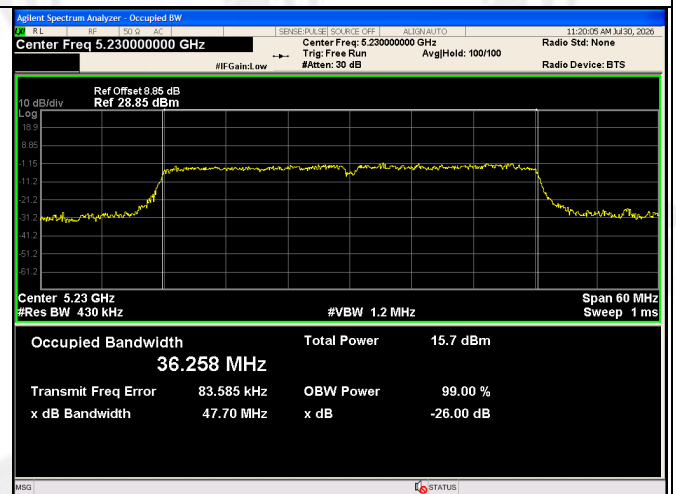
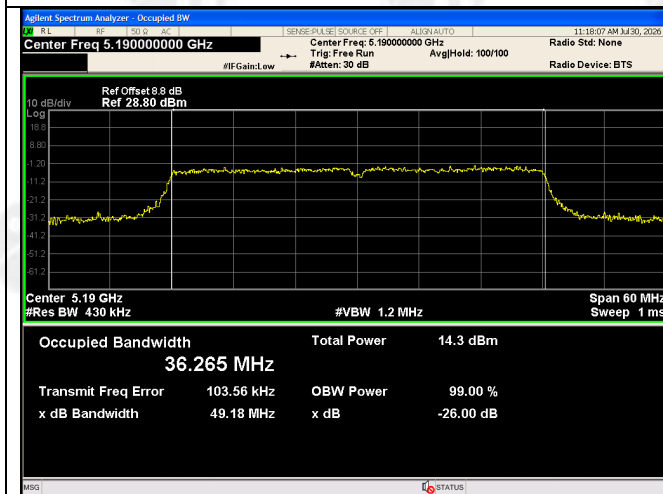
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802.11n(HT20)-5240



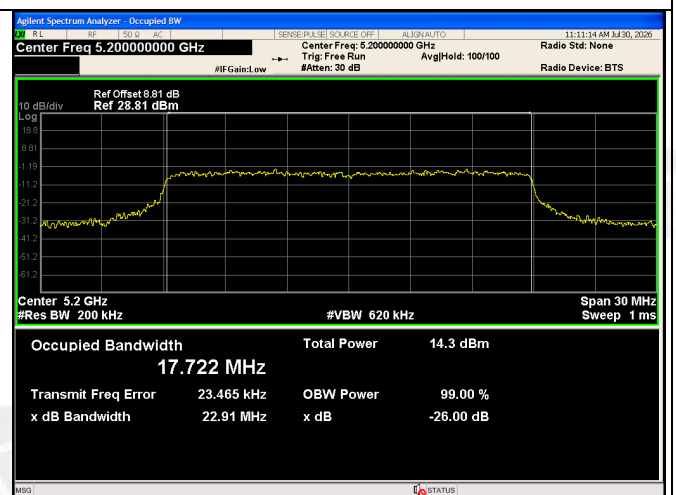
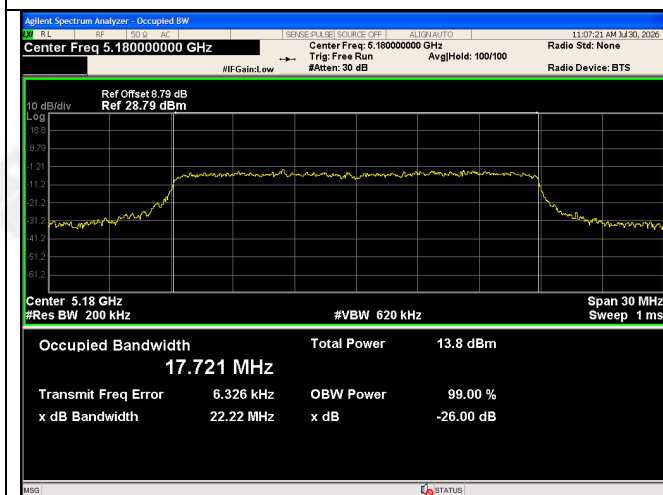
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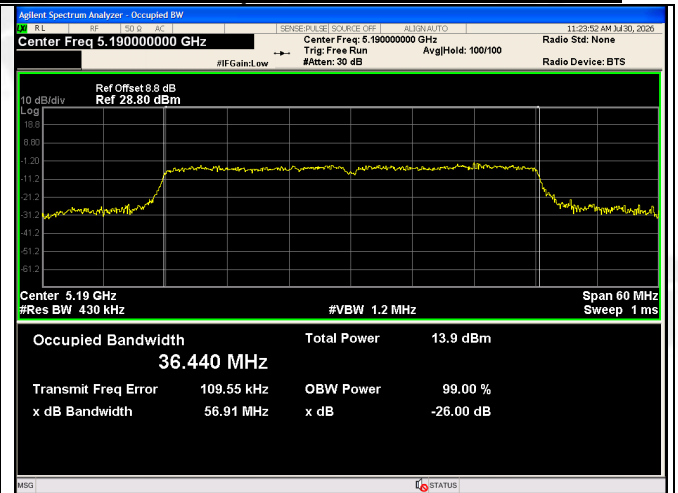
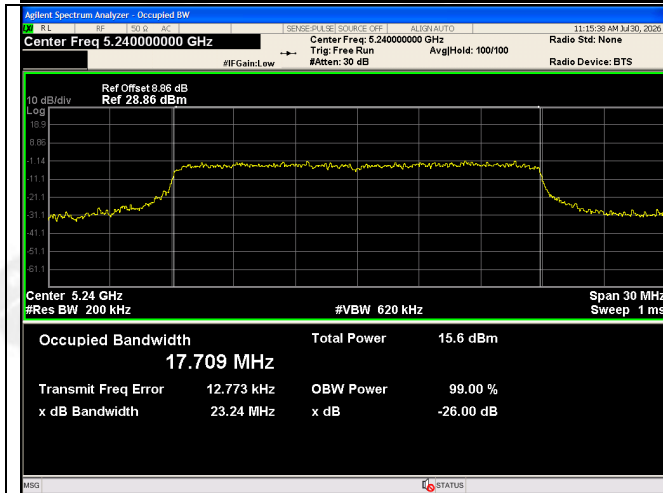
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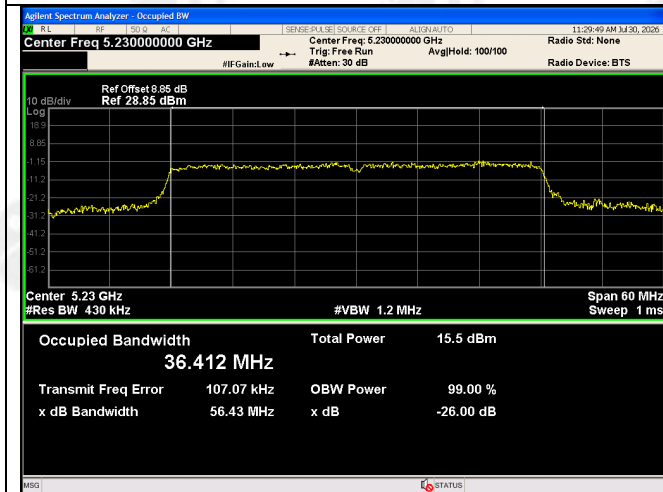


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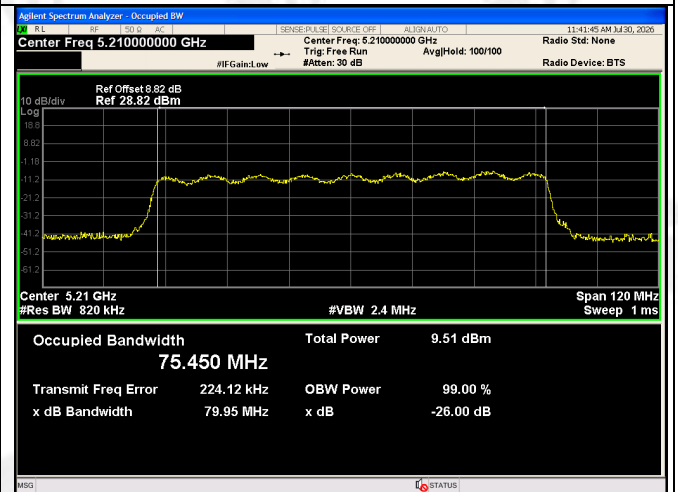
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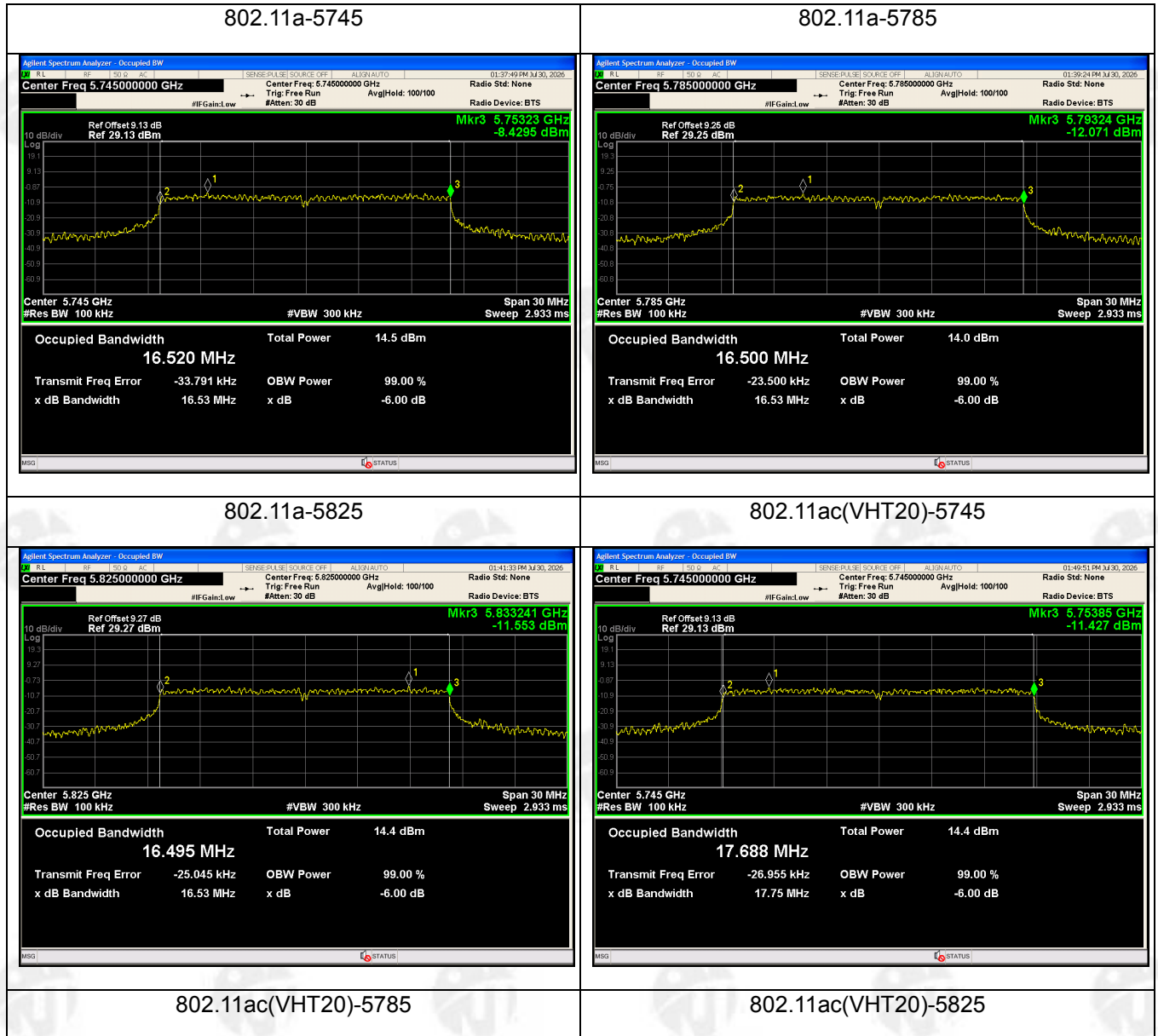
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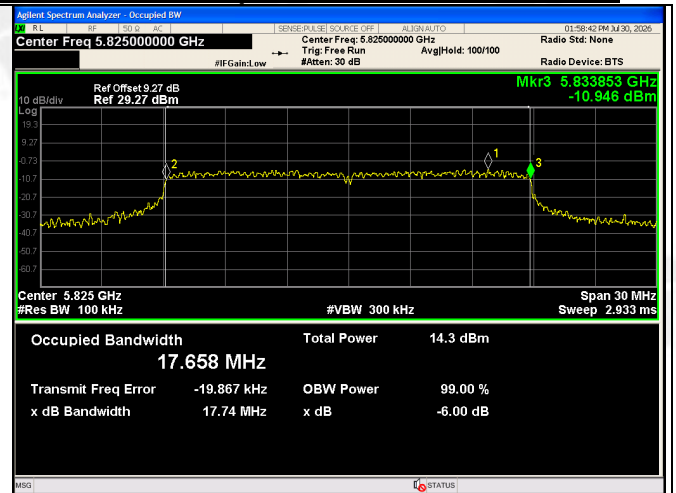
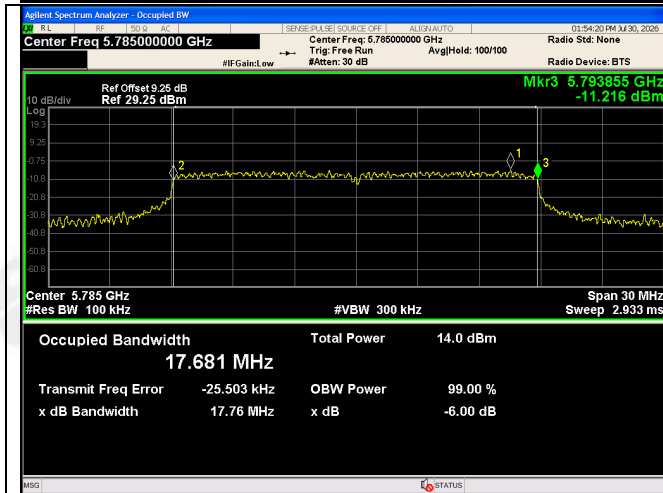




5725-5850MHz

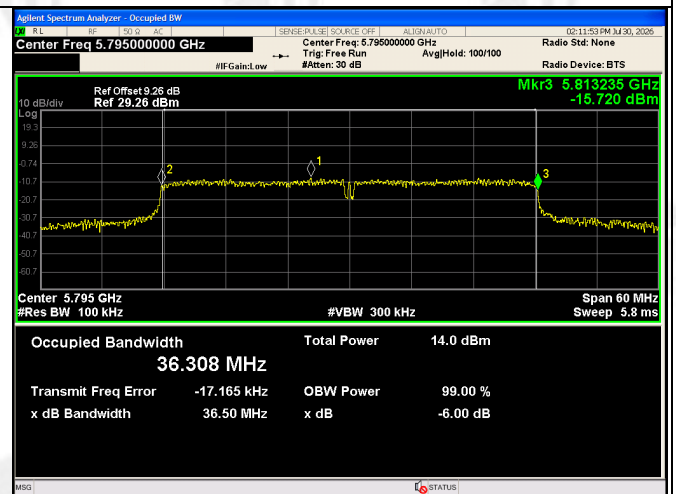
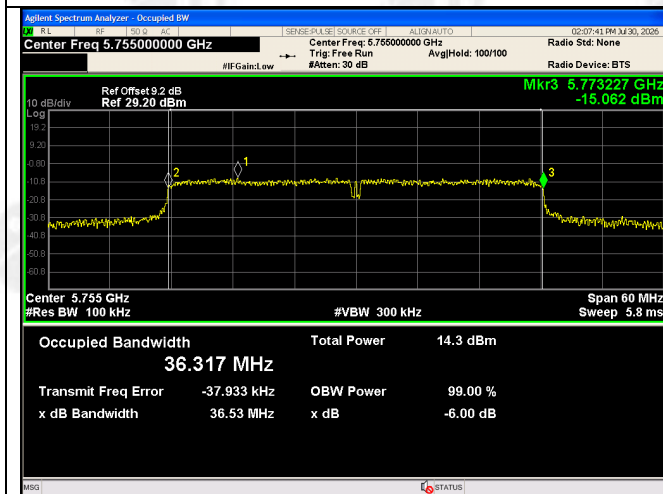
6dB





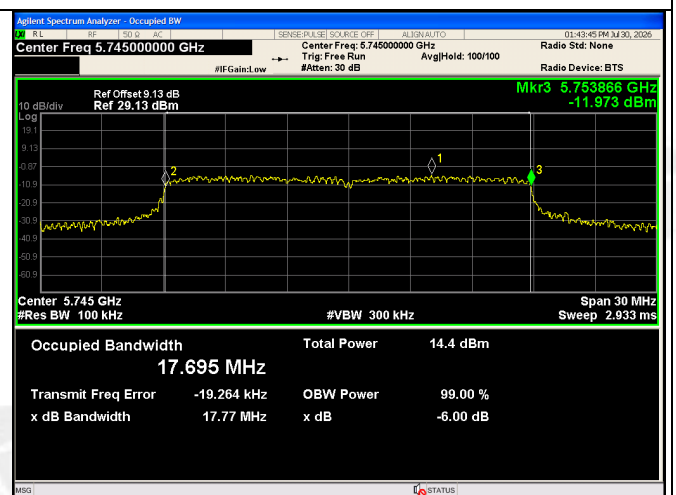
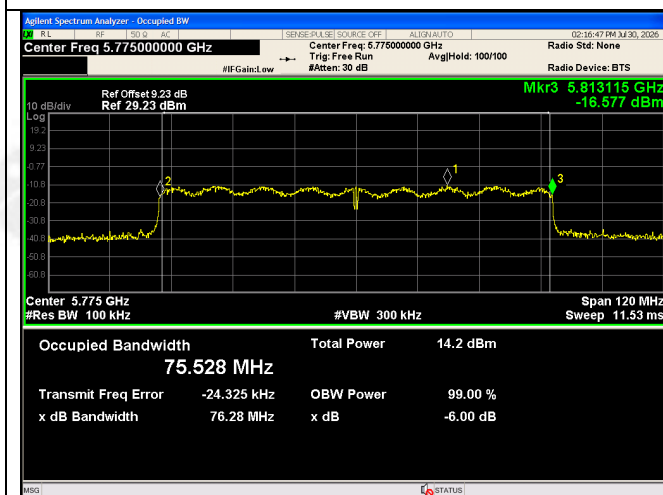
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802.11ac(VHT40)-5795



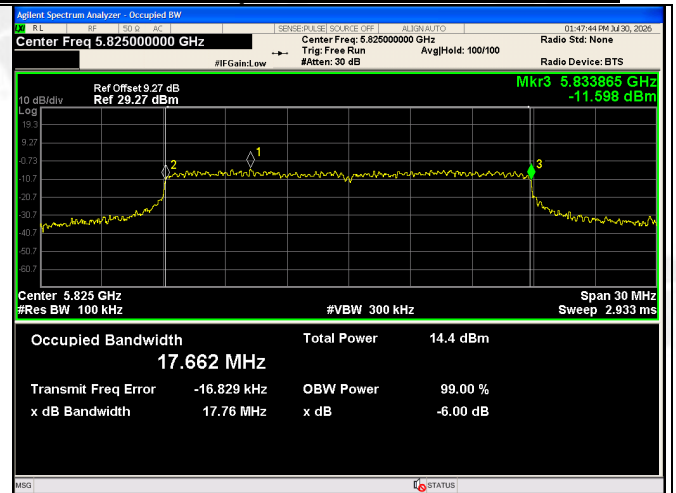
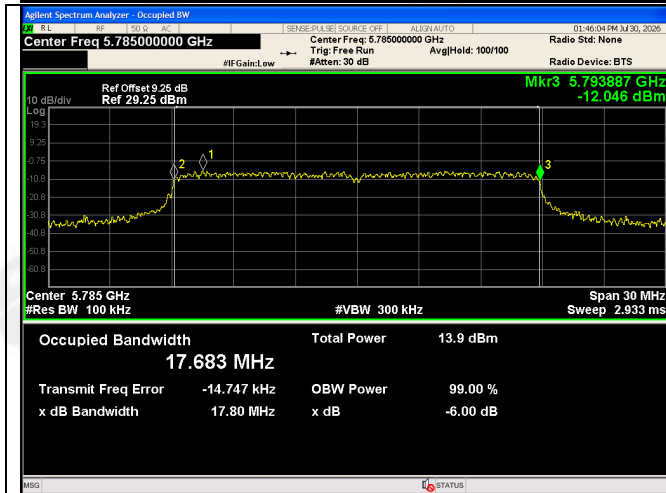
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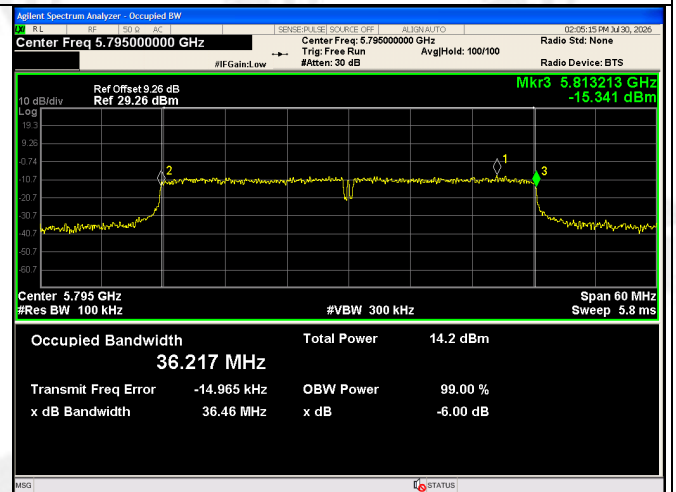
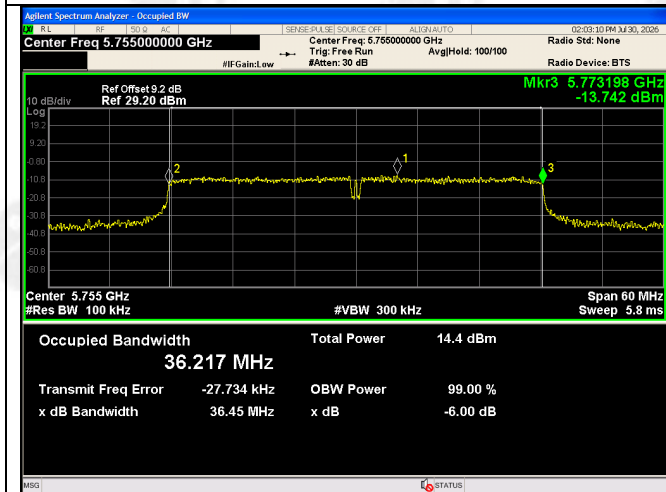
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802.11n(HT20)-5825



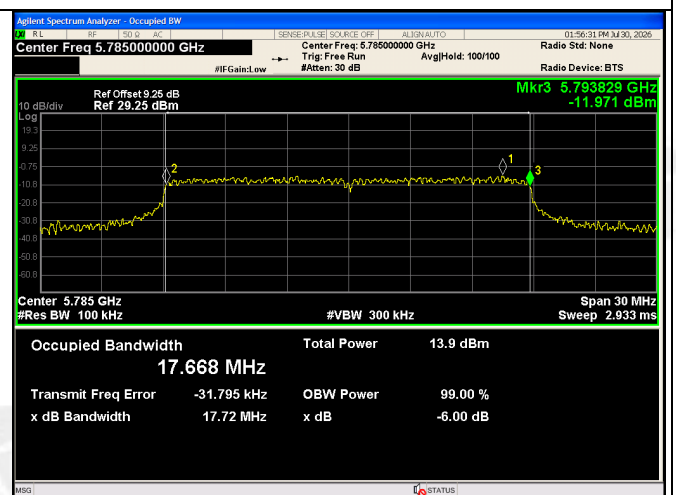
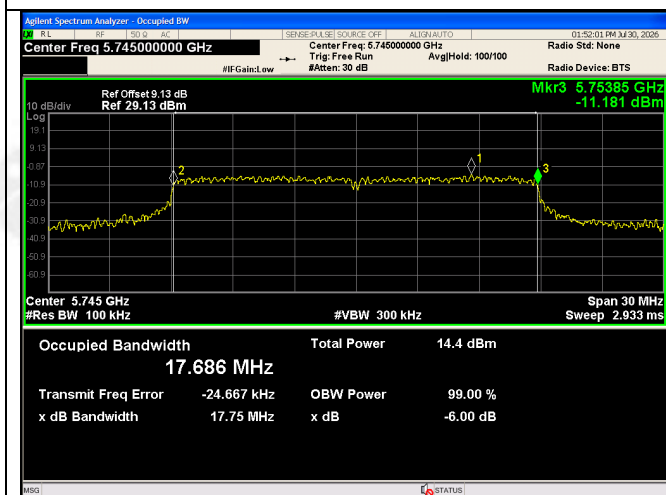
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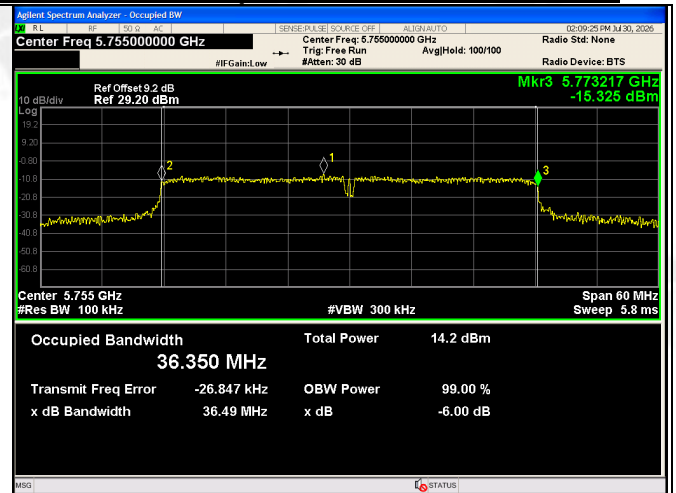
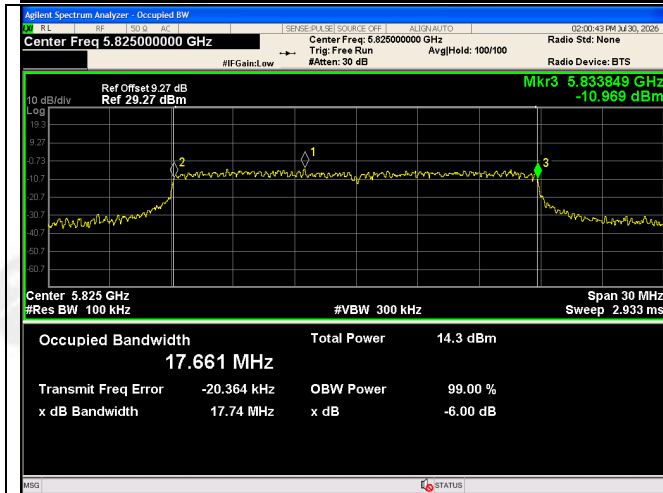
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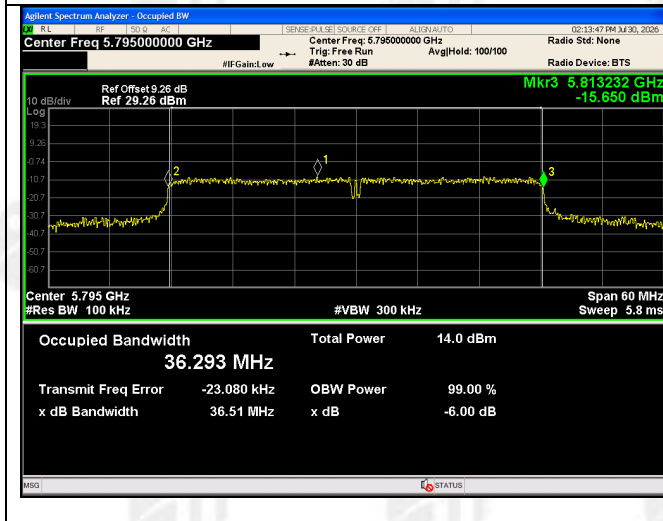


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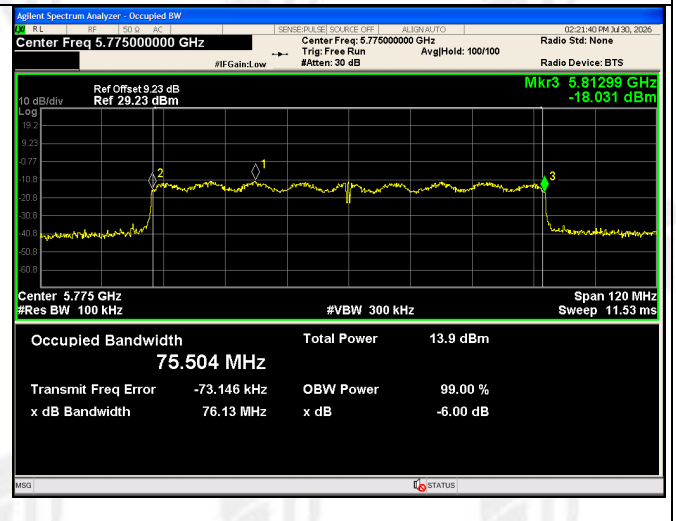
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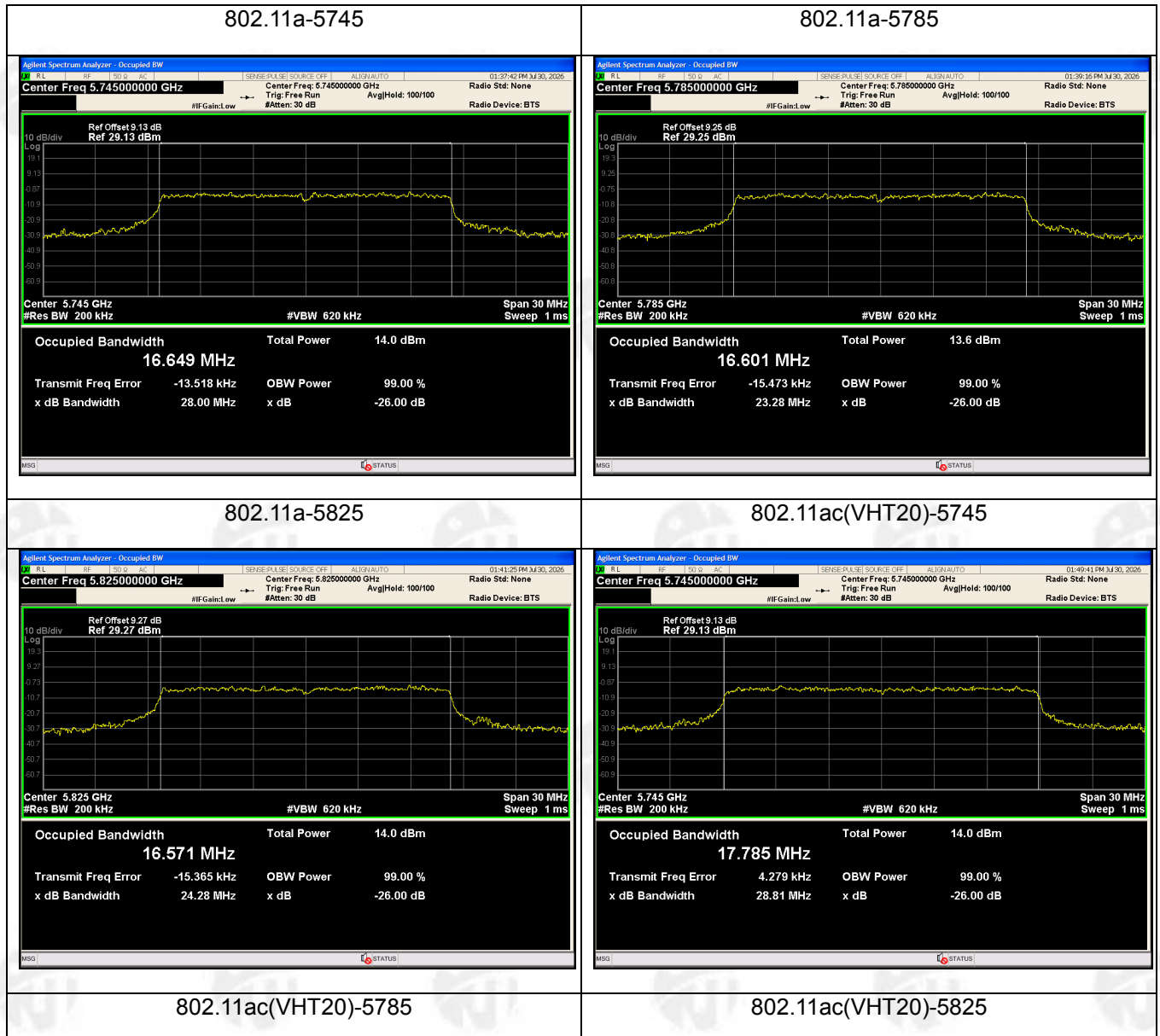
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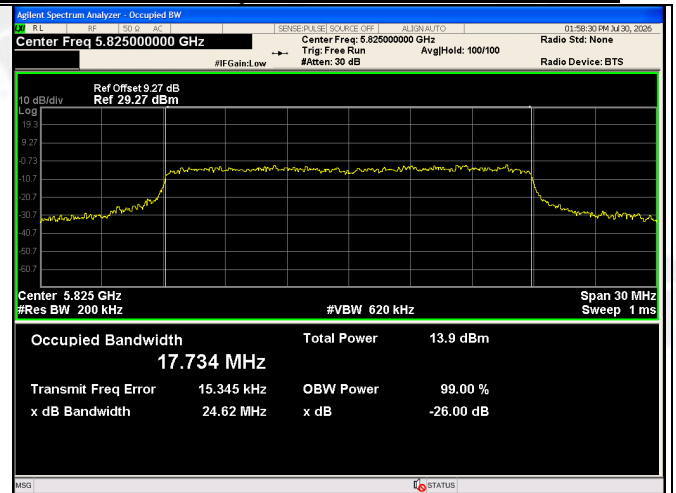
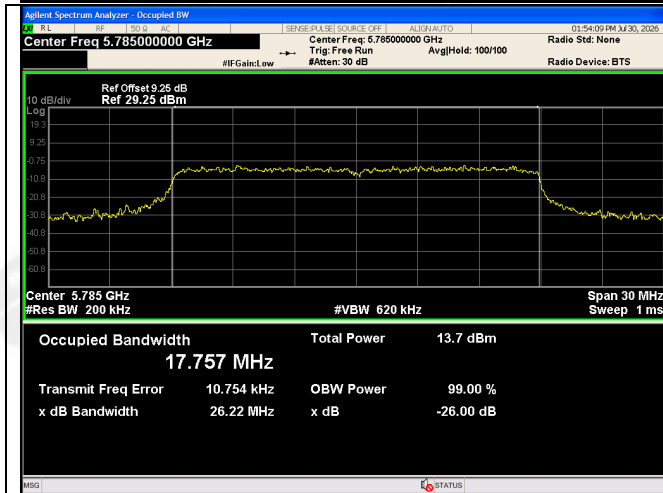




5725-5850MHz

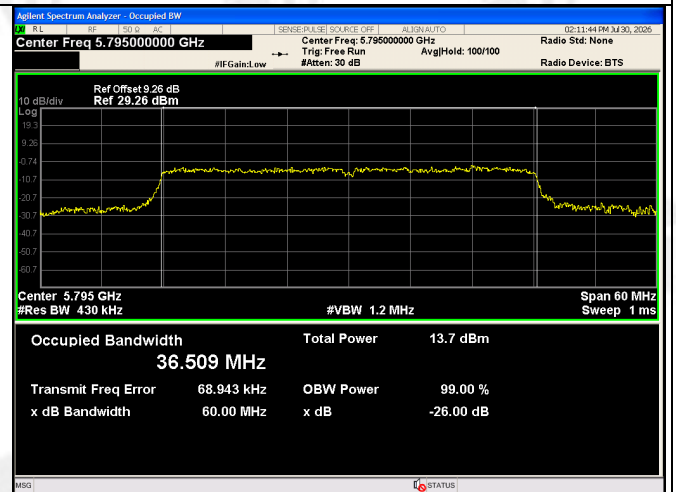
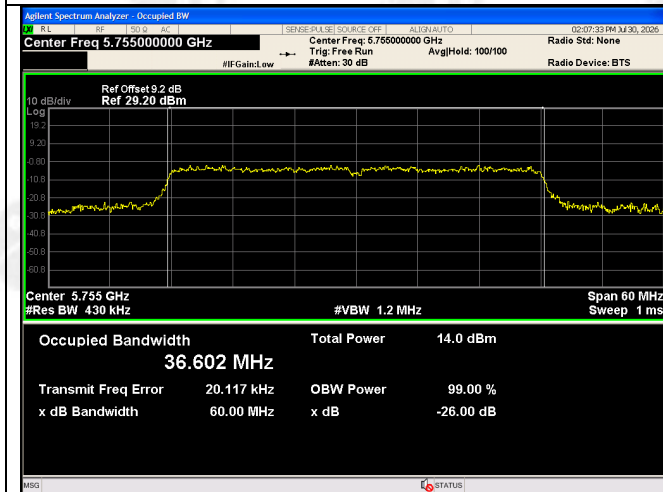
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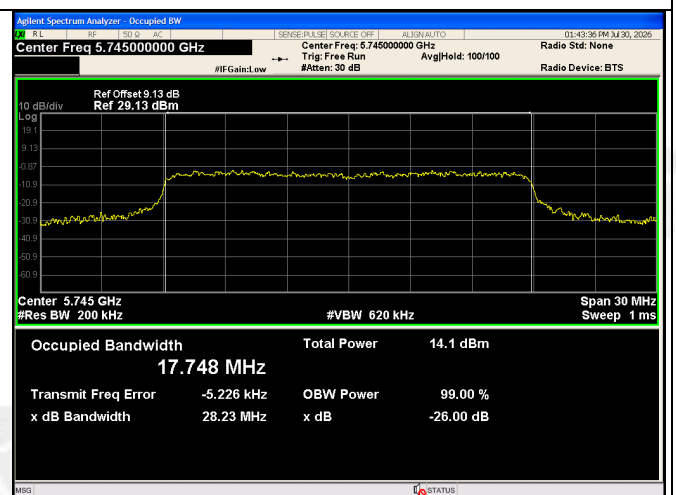
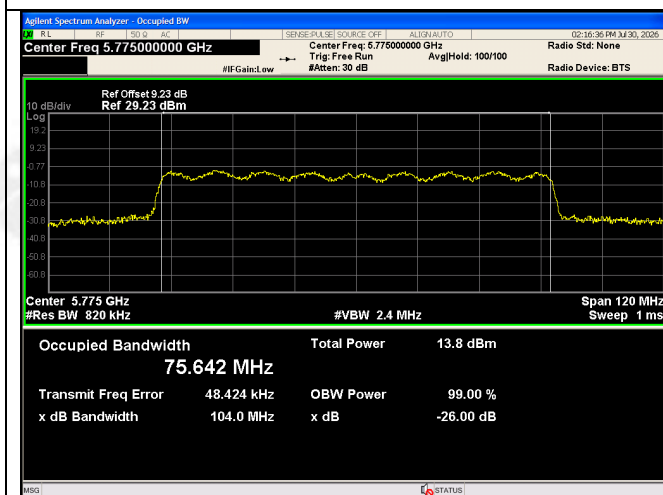
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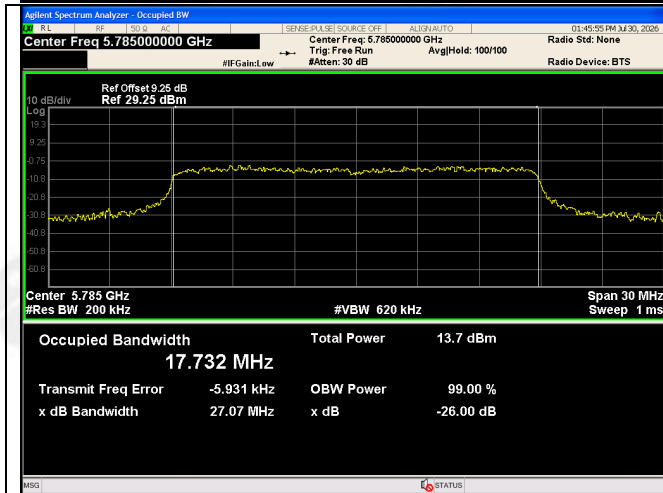
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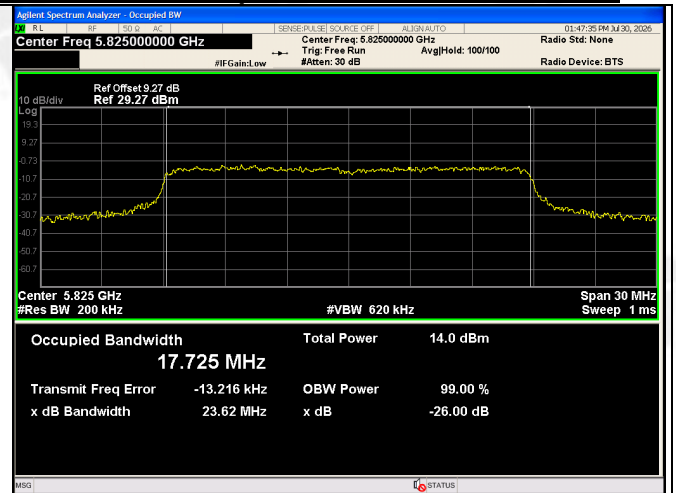


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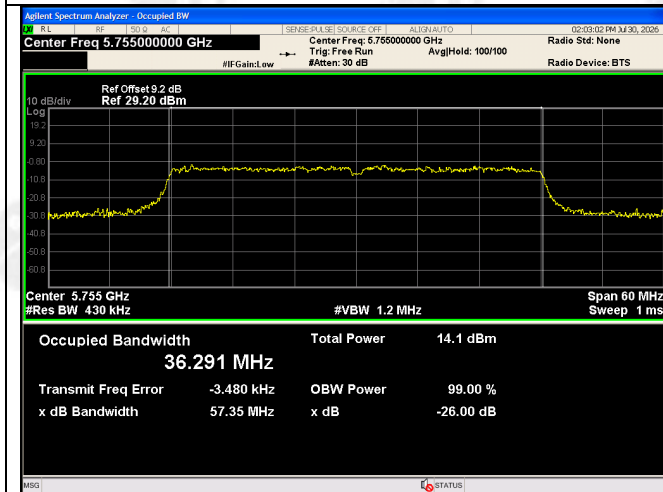
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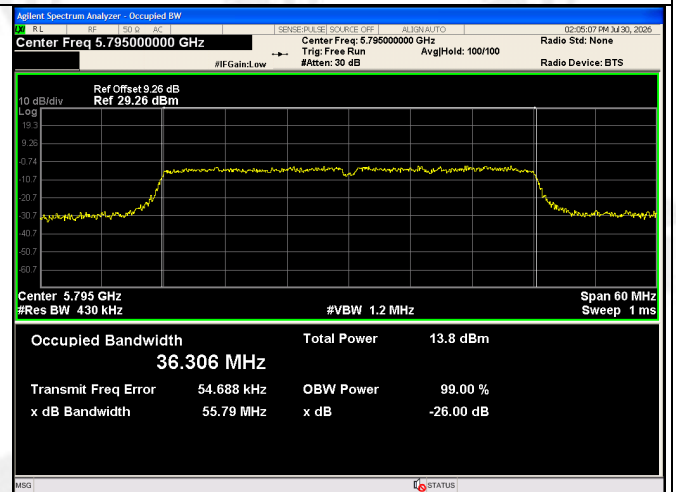
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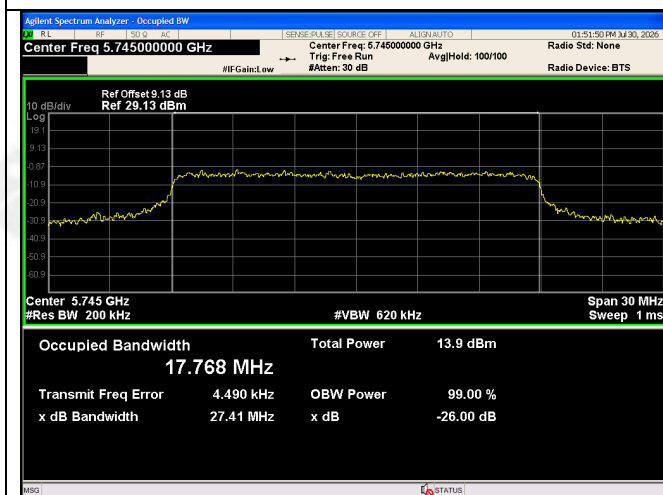
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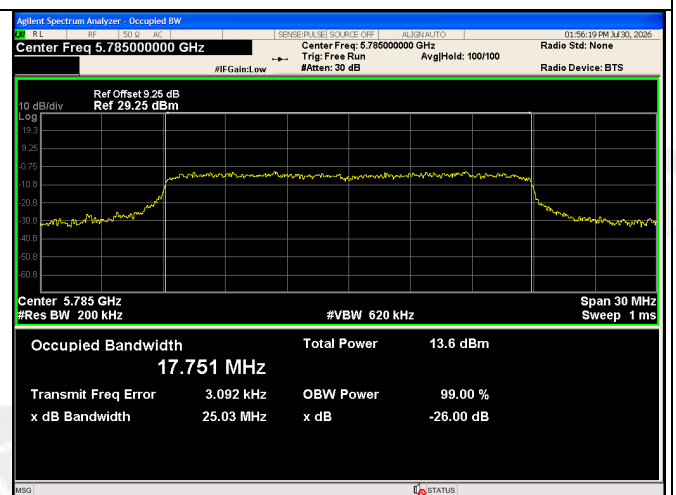
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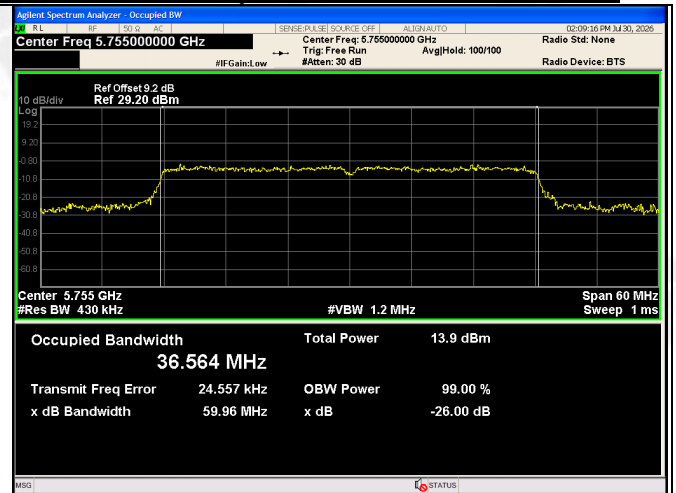
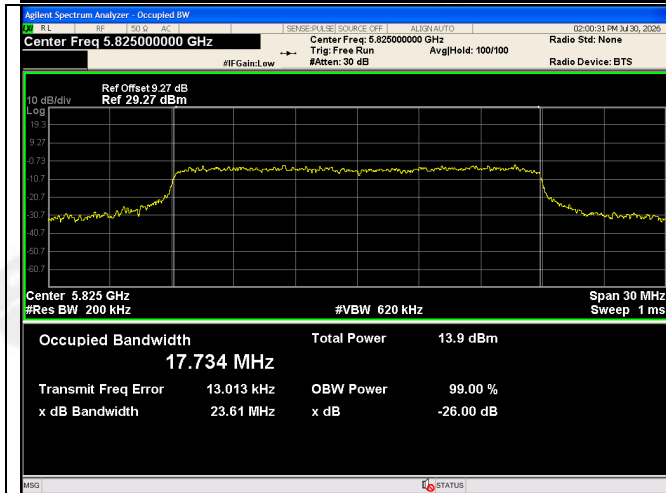
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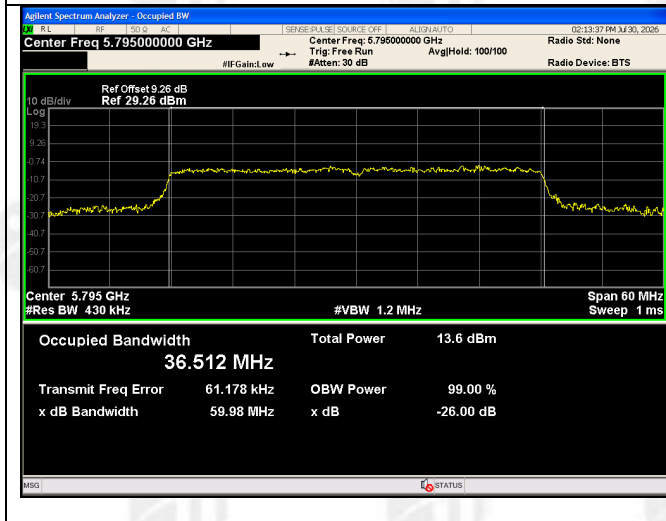
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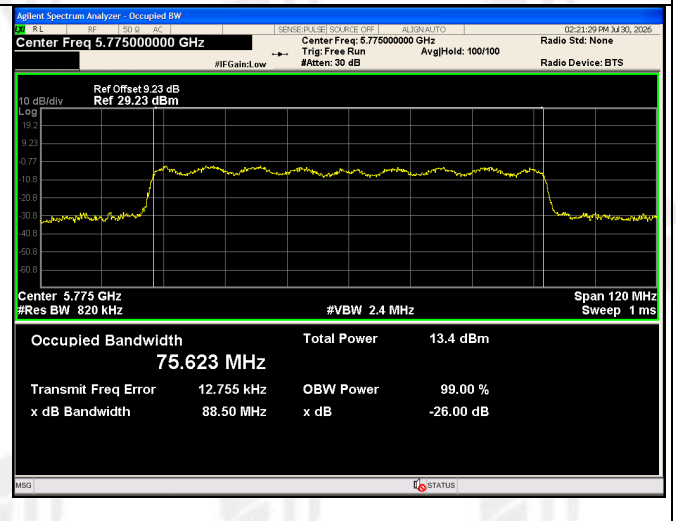
802.11ax(HE40)-5755



802.11ax(HE40)-5795



802.11ax(HE80)-5775





11 Maximum Conducted Output Power

11.1 Test Standard and Limit

According to FCC §15.407

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power.

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

For 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.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power 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.

11.2 Test Setup





11.3 Test Procedure

The EUT was directly connected to the Power meter

1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

Measurement using a Power Meter(PM)

a) Method PM (Measurement using an RF average power meter):

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:

- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(i) If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in IIL.B.

(ii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(iv) Adjust the measurement in dBm by adding $10 \log (1/x)$ where x is the duty cycle (e.g. $10 \log (1/0.25)$ if the duty cycle is 25%).

b) Method PM-G (Measurement using a gated RF average power meter):

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

11.4 Test Data

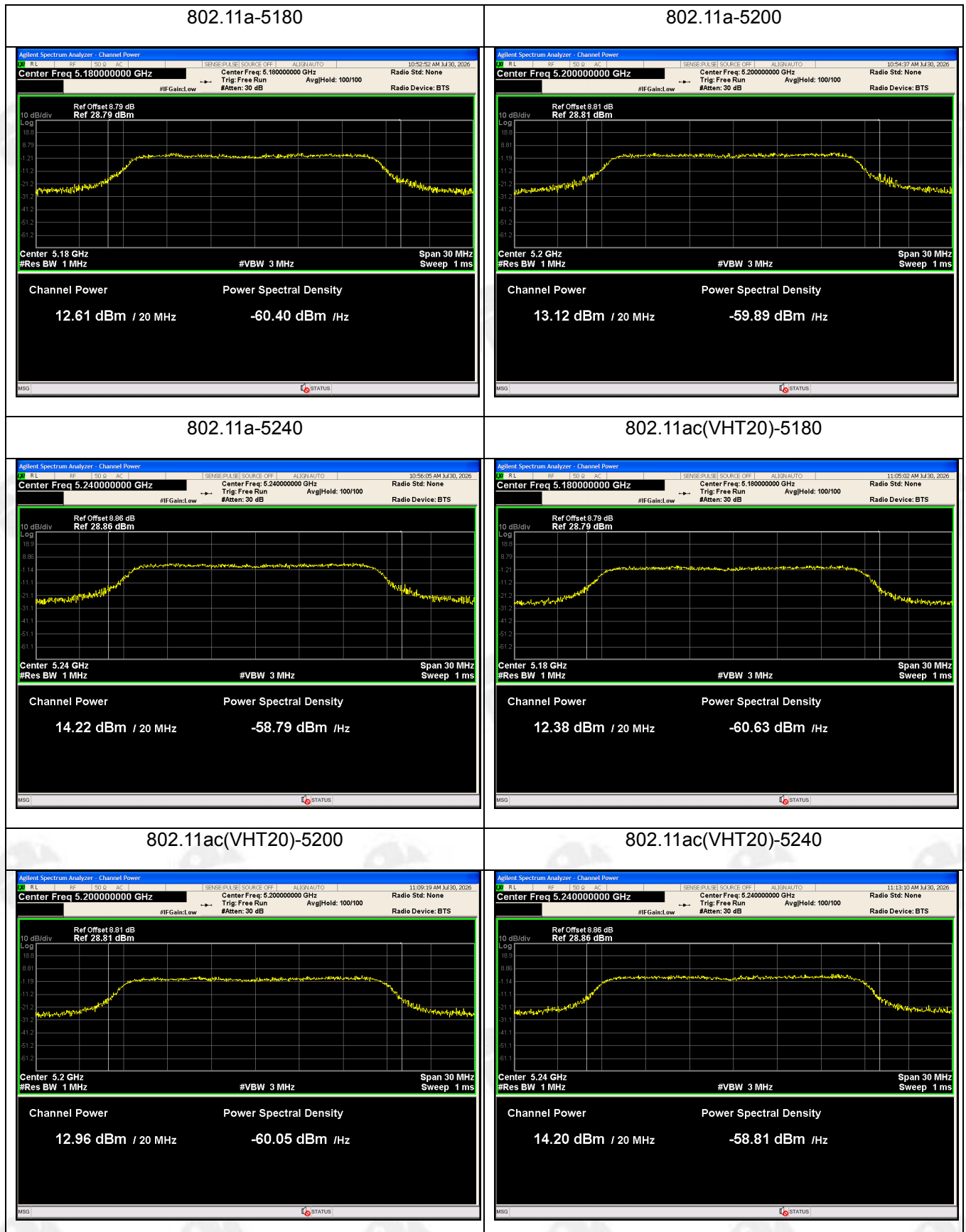
Test mode1	Test Channel (MHz)	Output Power (dBm)	Limit (dBm)
802.11a	5180	12.612	23.98
	5200	13.123	23.98
	5240	14.223	23.98
802.11ac(VHT20)	5180	12.384	23.98
	5200	12.959	23.98
	5240	14.201	23.98
802.11ac(VHT40)	5190	12.187	23.98
	5230	13.755	23.98
802.11ac(VHT80)	5210	12.164	23.98
802.11n(HT20)	5180	12.481	23.98
	5200	13.031	23.98
	5240	14.11	23.98
802.11n(HT40)	5190	12.668	23.98
	5230	14.01	23.98
802.11ax(HE20)	5180	12.304	23.98
	5200	12.856	23.98
	5240	14.07	23.98
802.11ax(HE40)	5190	12.118	23.98
	5230	13.669	23.98
802.11ax(HE80)	5210	7.169	23.98



Test mode1	Test Channel (MHz)	Output Power (dBm)	Limit (dBm)
802.11a	5745	12.898	30
	5785	12.394	30
	5825	12.791	30
802.11ac(VHT20)	5745	12.578	30
	5785	12.22	30
	5825	12.503	30
802.11ac(VHT40)	5755	12.132	30
	5795	11.969	30
802.11ac(VHT80)	5775	11.478	30
802.11n(HT20)	5745	12.537	30
	5785	12.182	30
	5825	12.597	30
802.11n(HT40)	5755	12.567	30
	5795	12.215	30
802.11ax(HE20)	5745	12.437	30
	5785	12.088	30
	5825	12.425	30
802.11ax(HE40)	5755	12.05	30
	5795	11.811	30
802.11ax(HE80)	5775	11.106	30

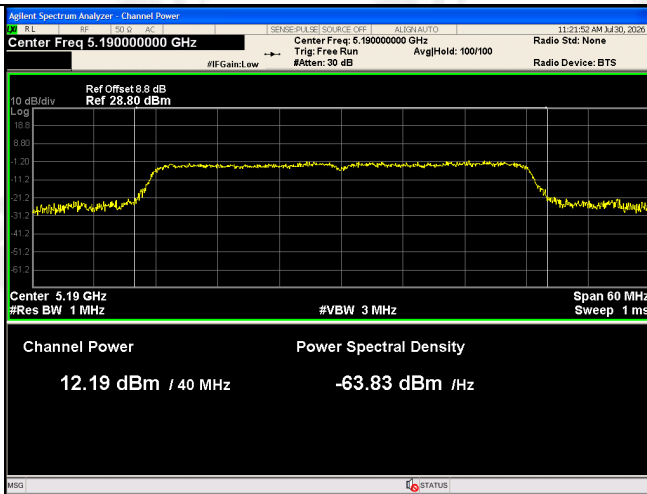


5180-5240MHz-Power

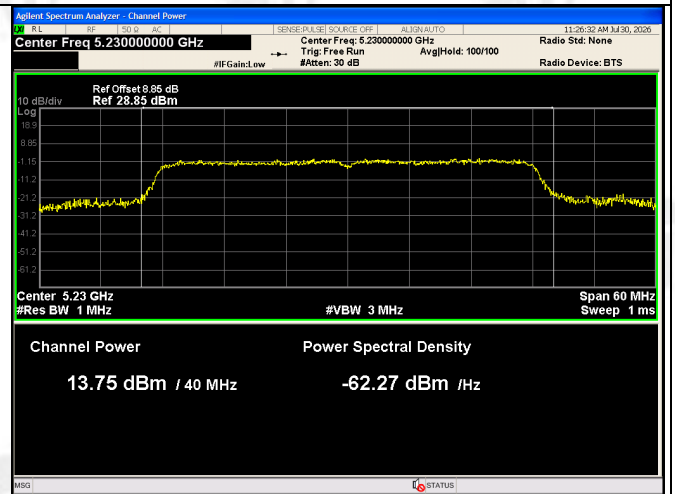




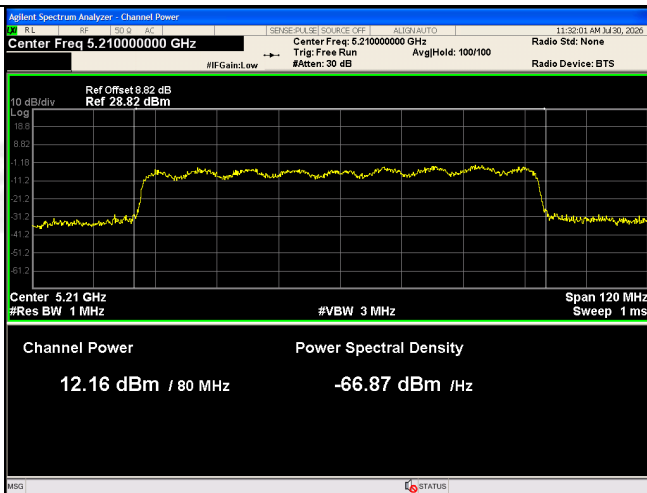
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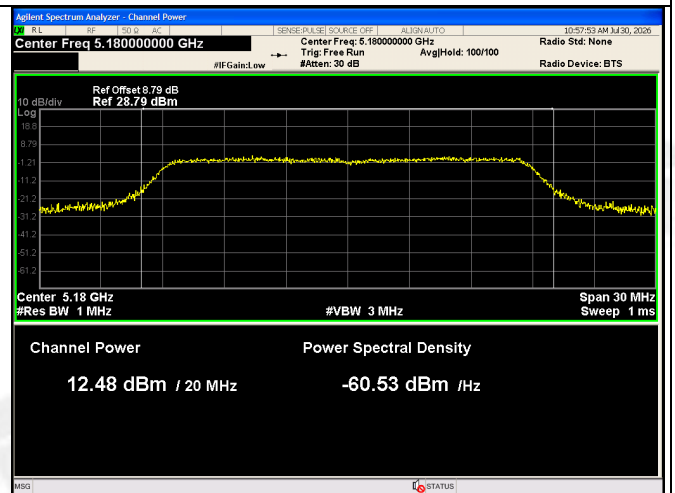
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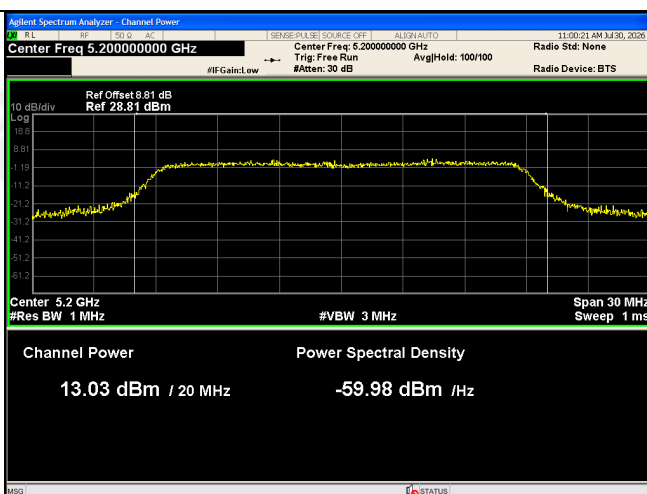
802.11ac(VHT80)-5210



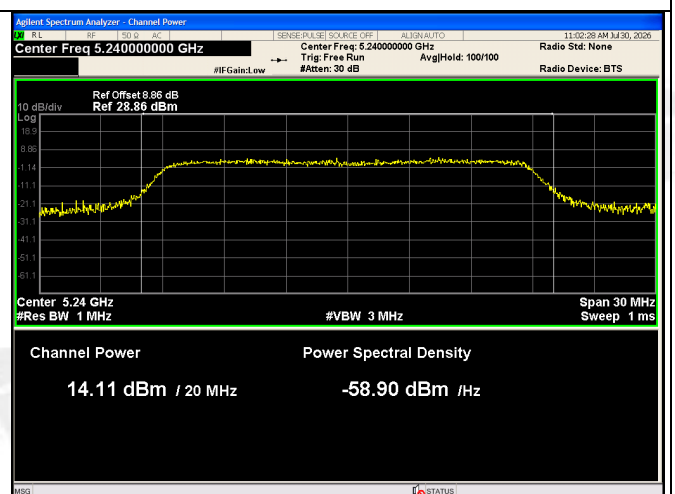
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802.11n(HT20)-5200

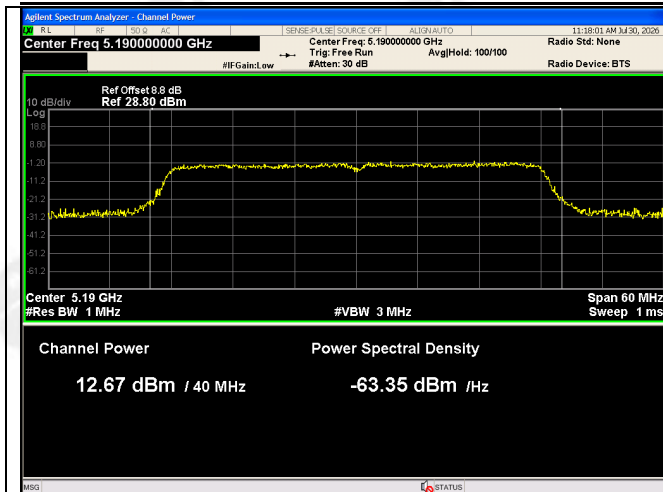


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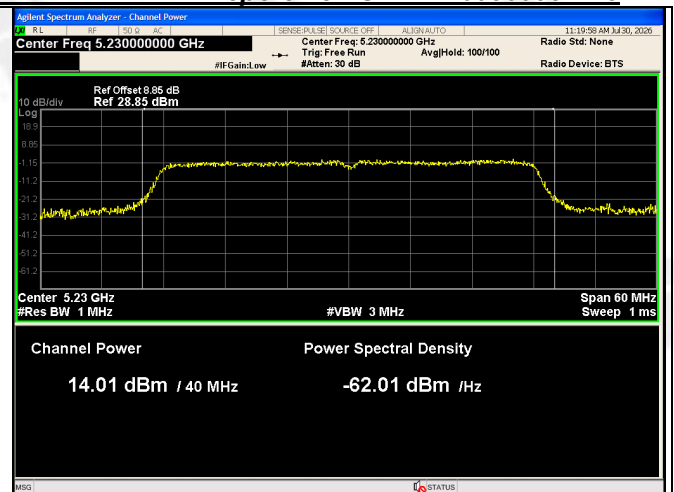


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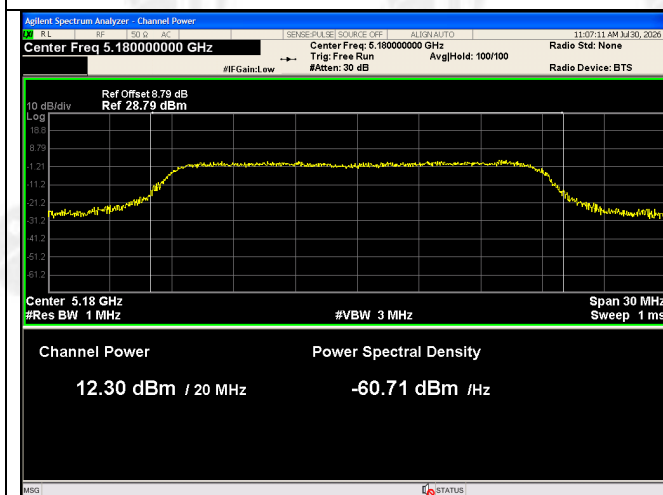
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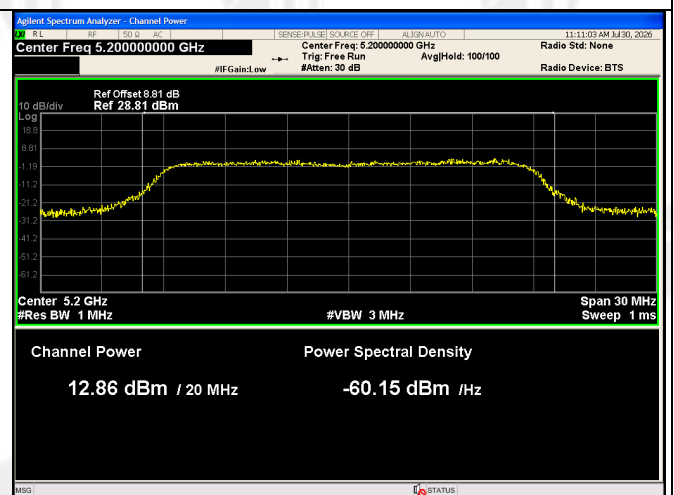
802.11ax(HE20)-5180



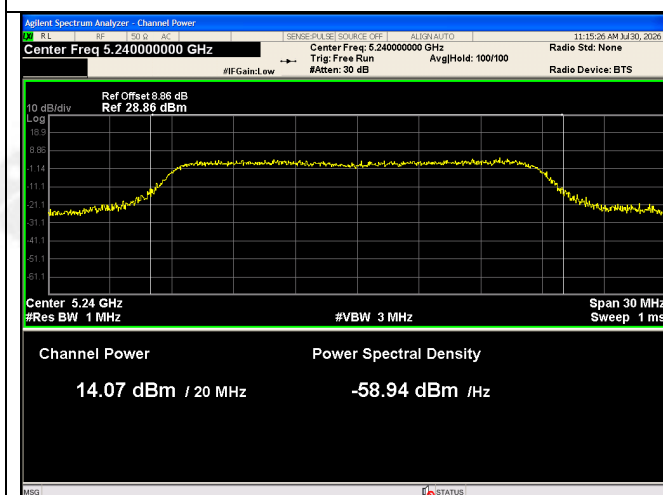
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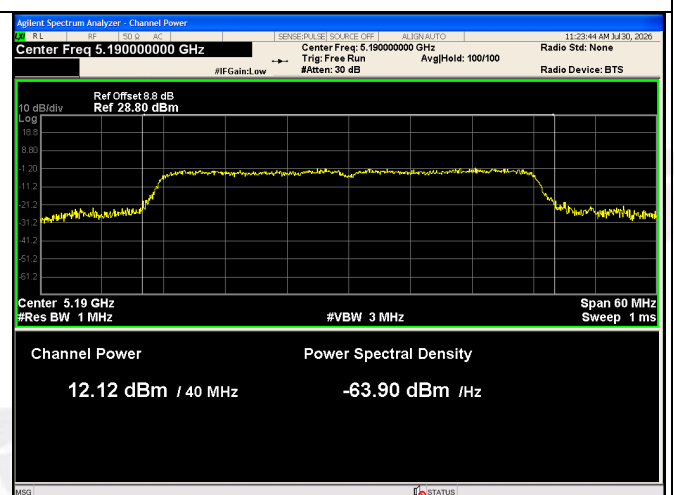
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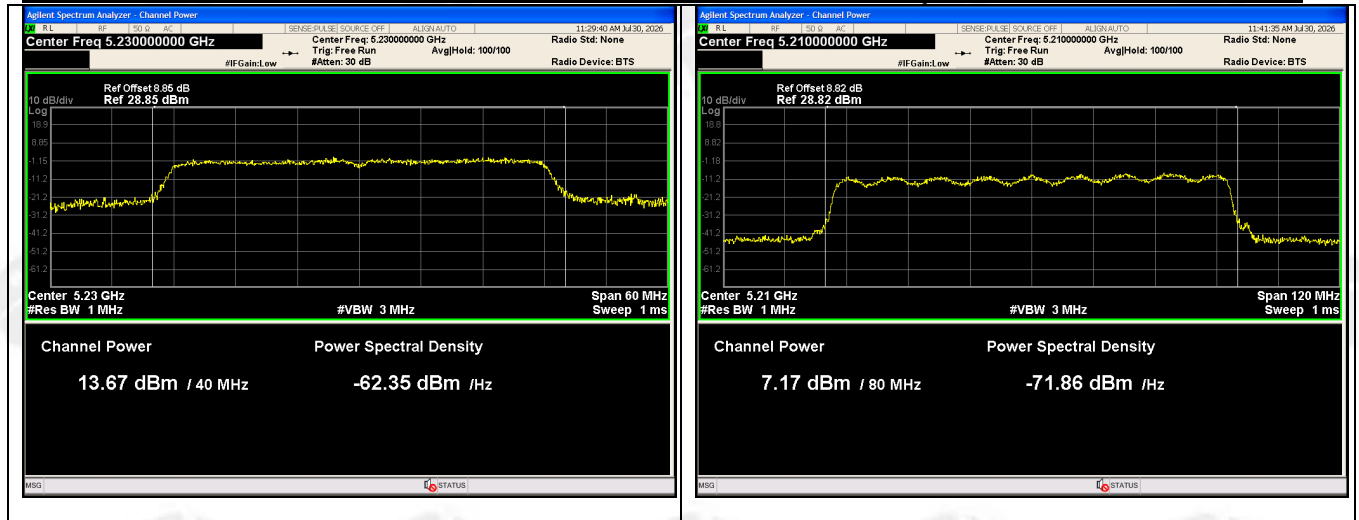
802.11ax(HE40)-5190



802.11ax(HE40)-5230



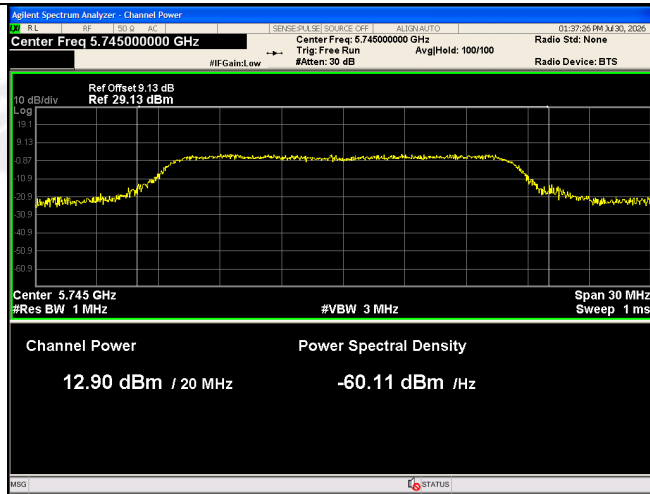
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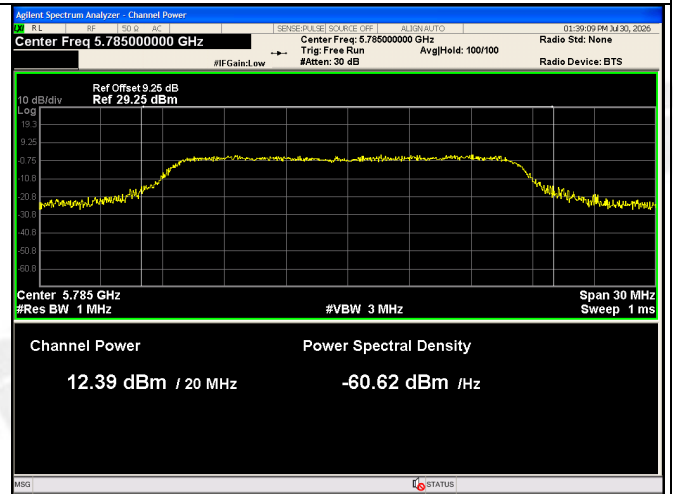


5745-5825MHz-Power

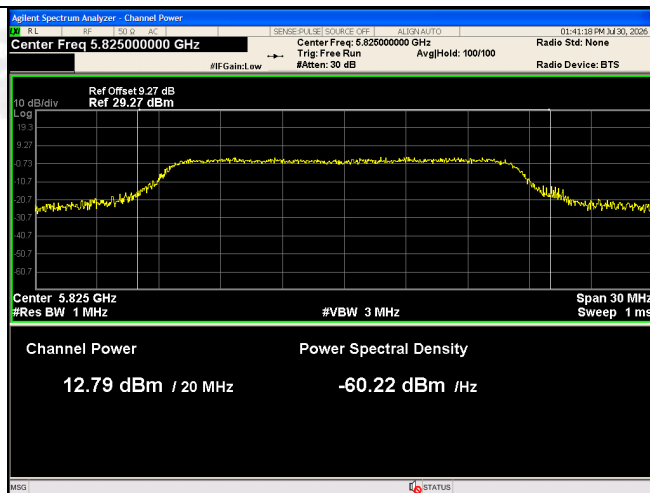
802.11a-5745



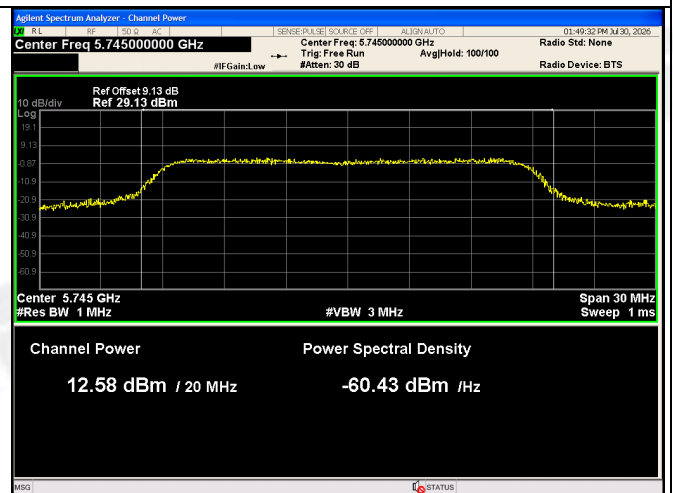
802.11a-5785



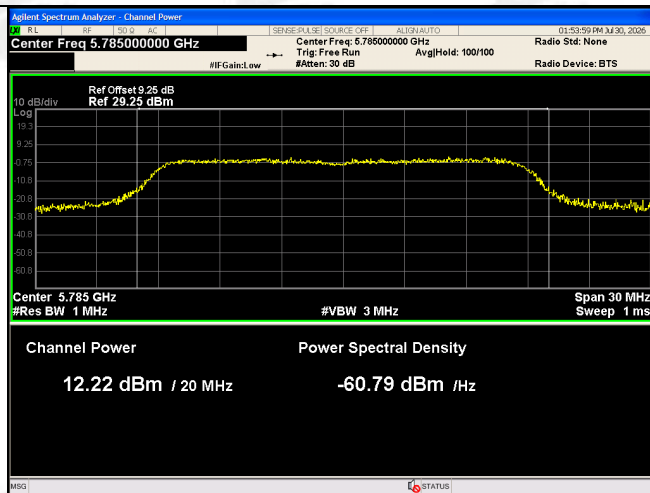
802.11a-5825



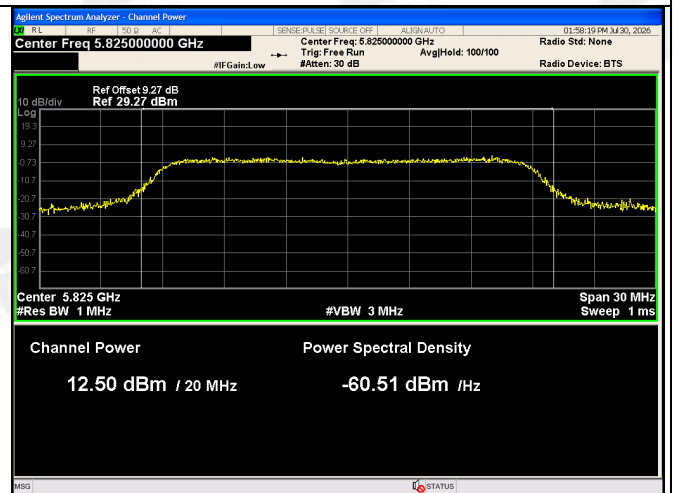
802.11ac(VHT20)-5745



802.11ac(VHT20)-5785

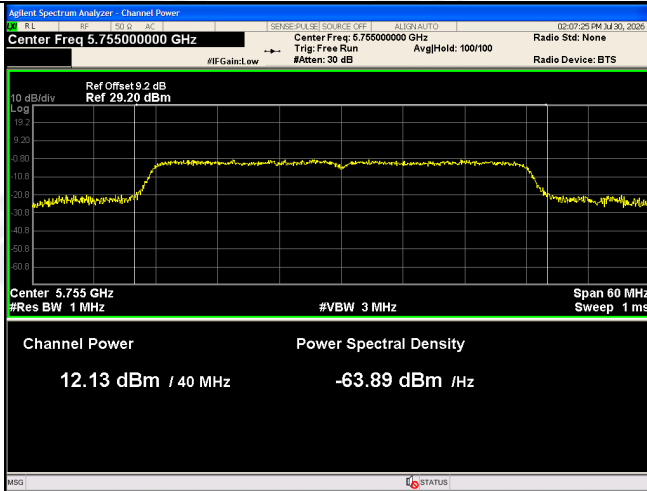


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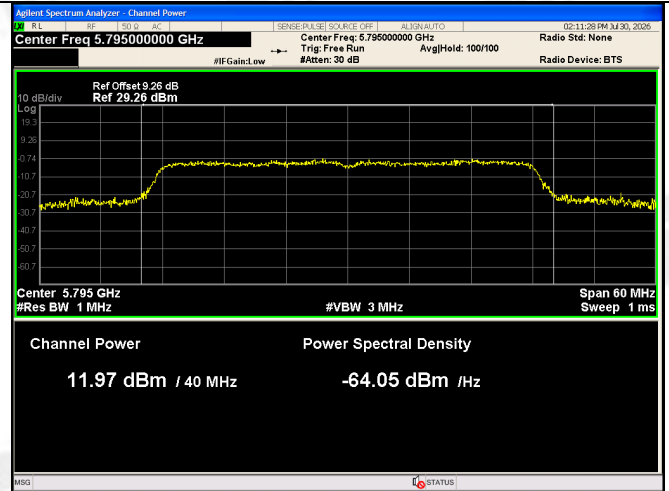




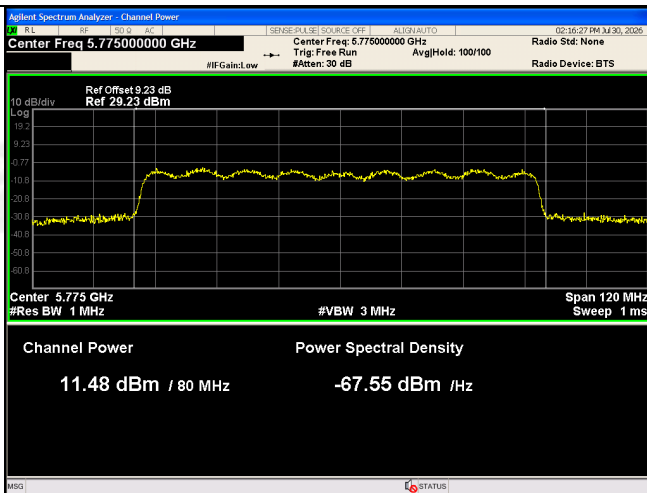
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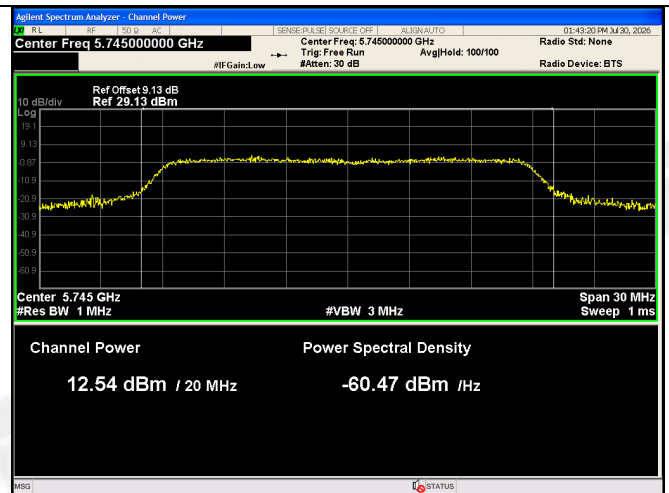
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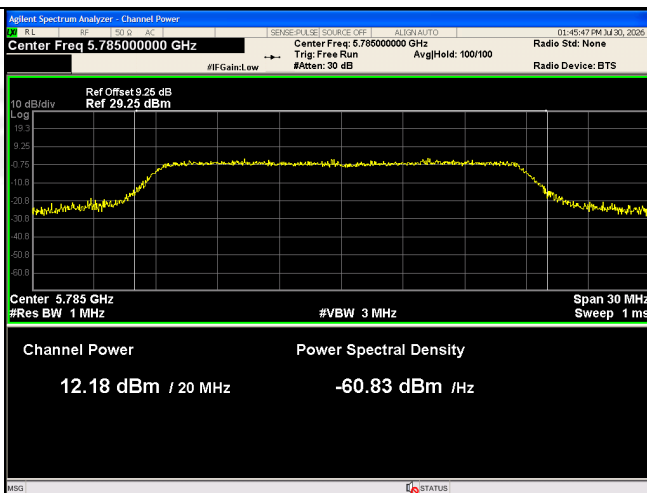
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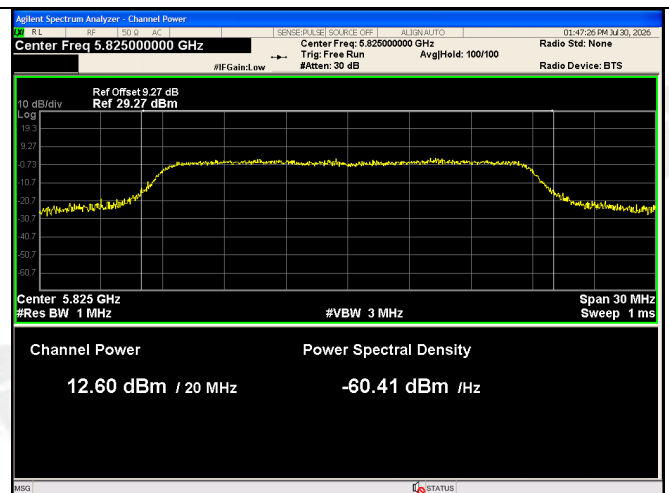
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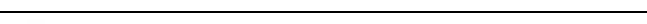
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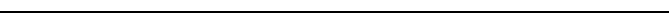
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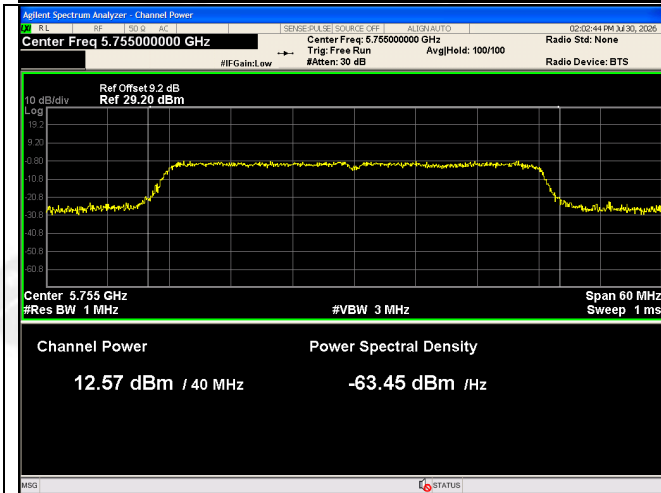


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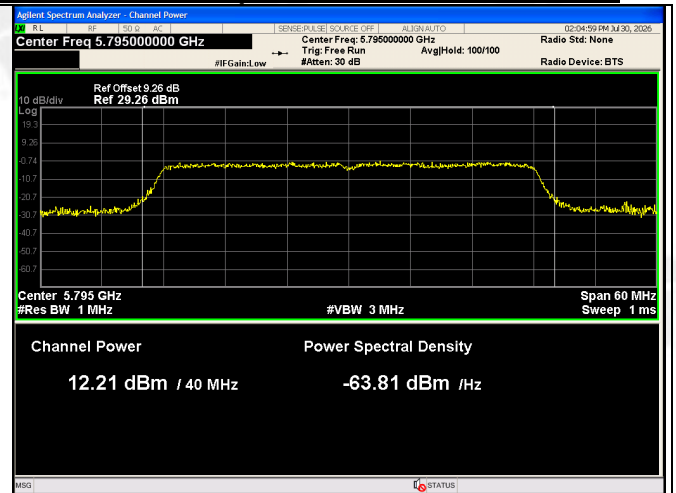


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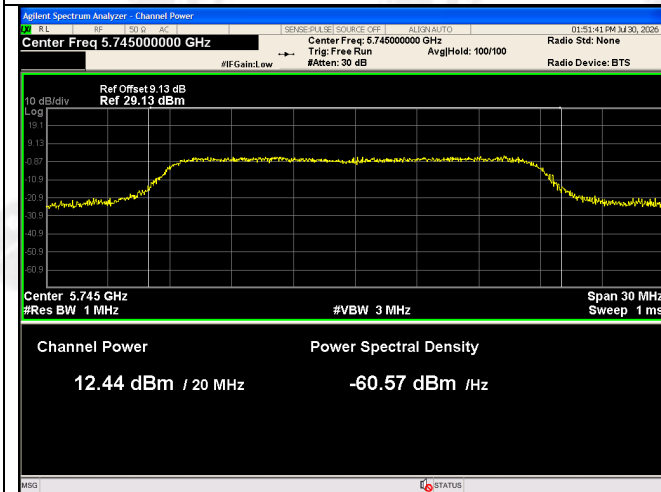




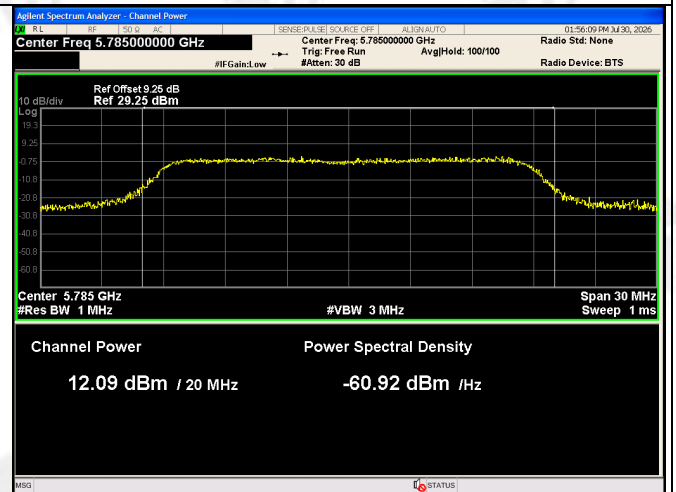
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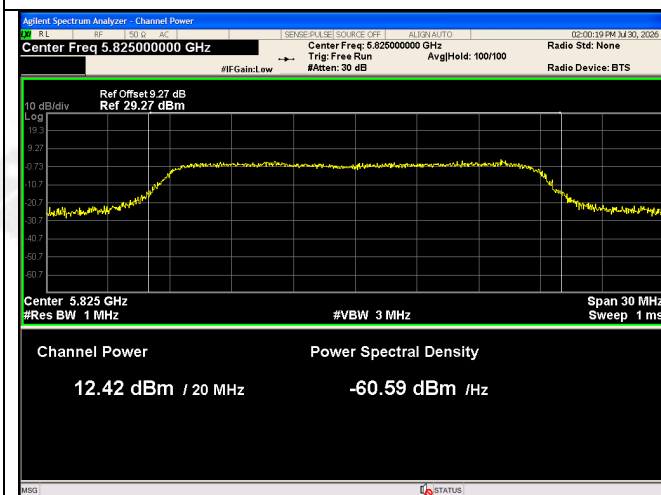
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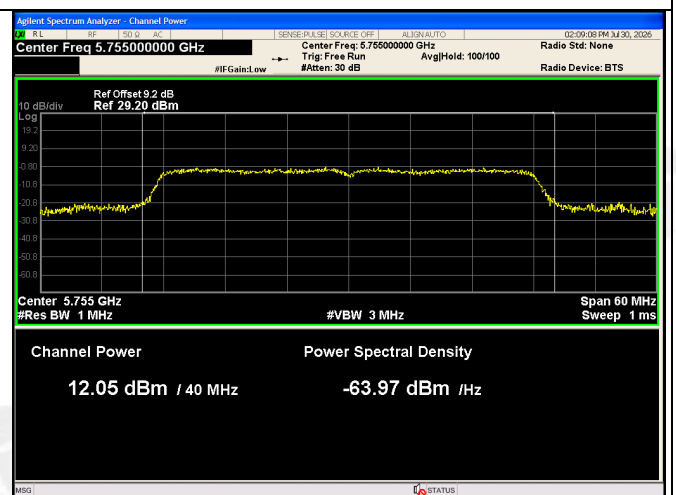
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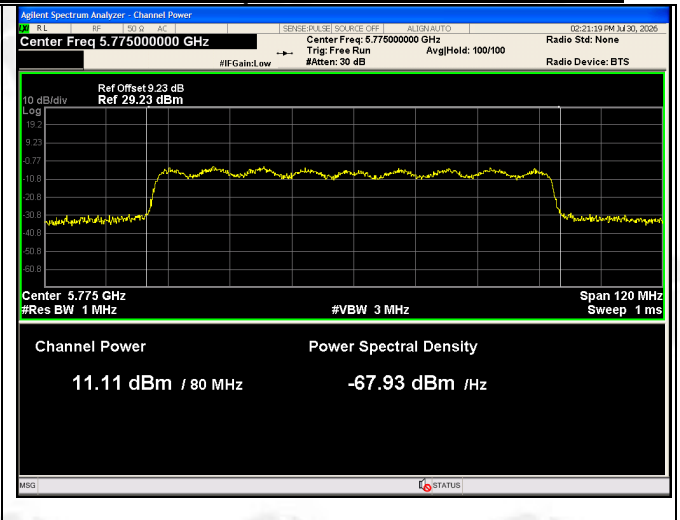
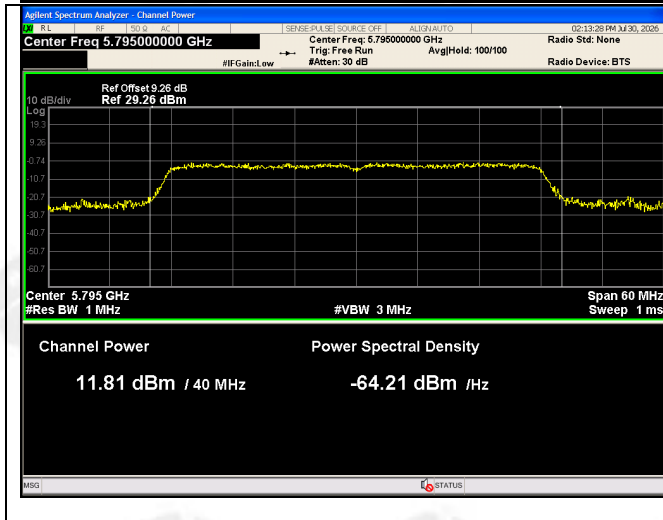
802.11ax(HE40)-5755



802.11ax(HE40)-5795



802.11ax(HE80)-5775





12 Out of Band Emissions and Spurious Emission

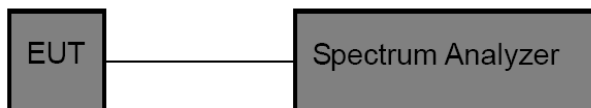
12.1 Test Standard and Limit

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

12.2 Test Setup



12.3 Test Procedure

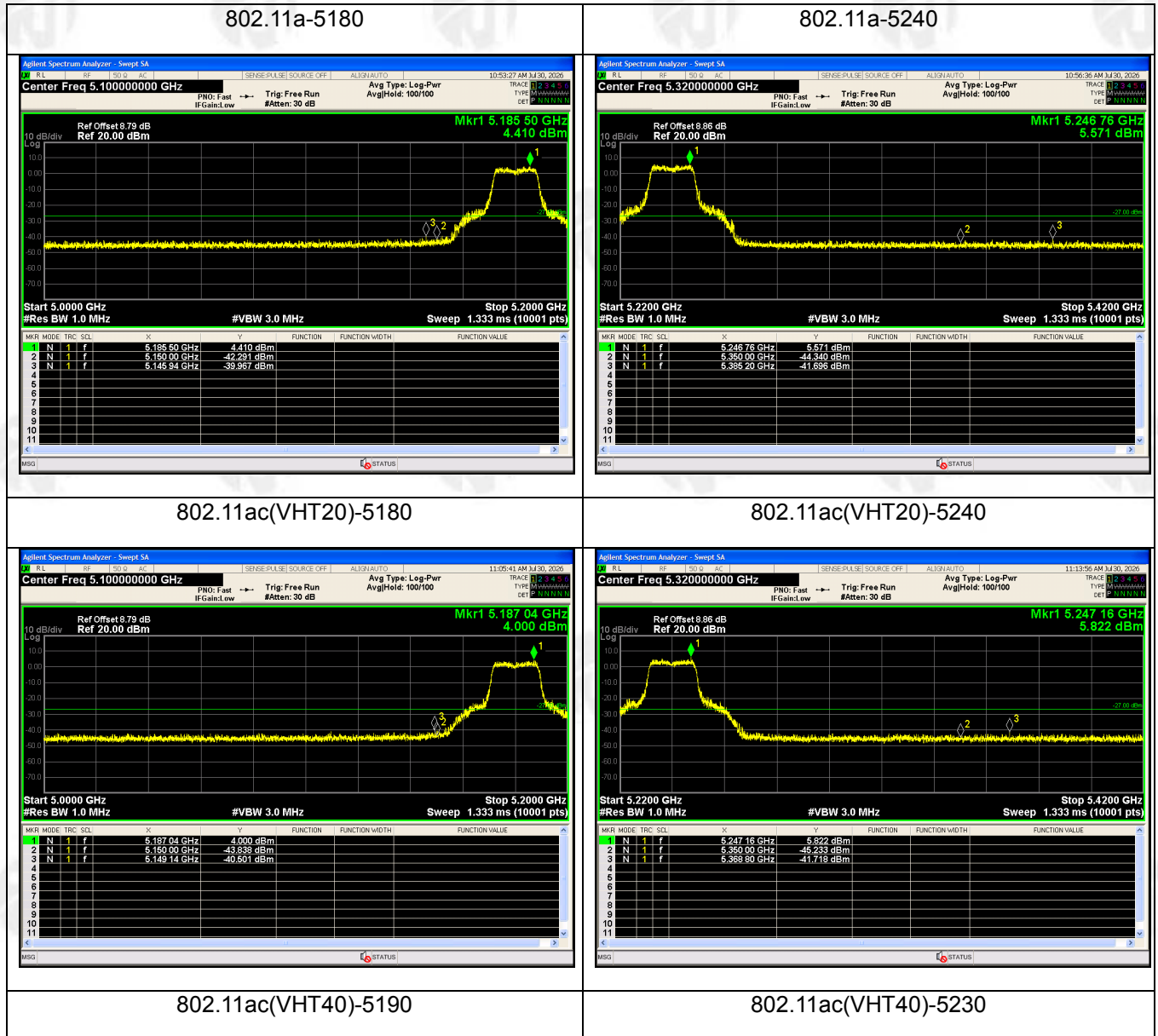
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

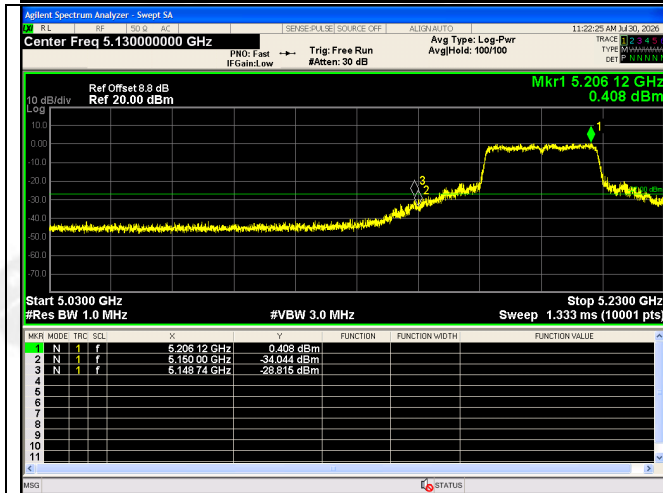


12.4 Test Data

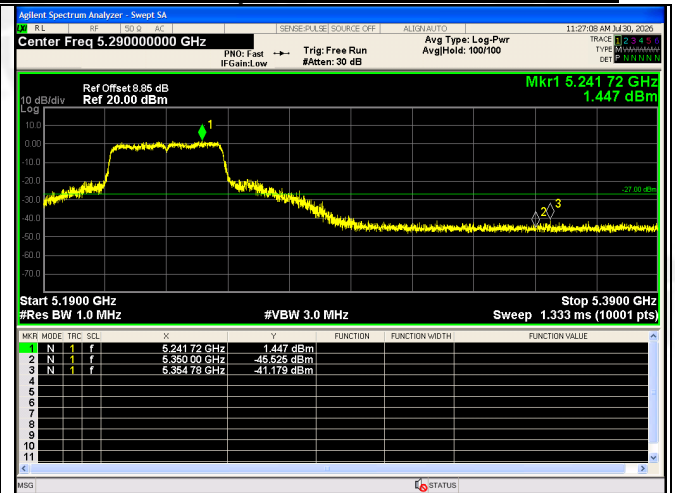
Test Graph

5180-5240MHz

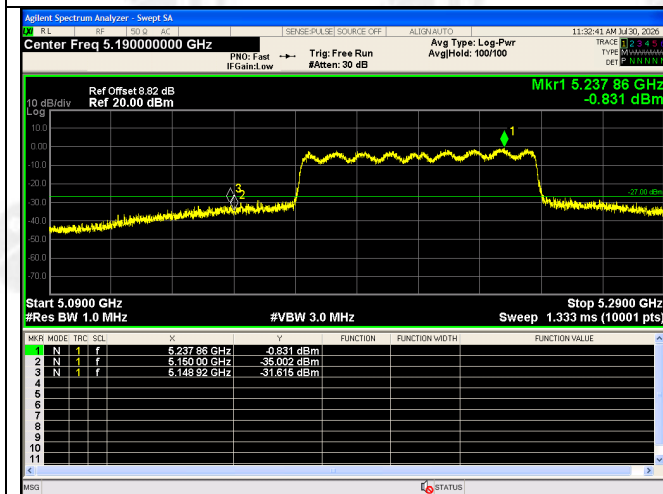




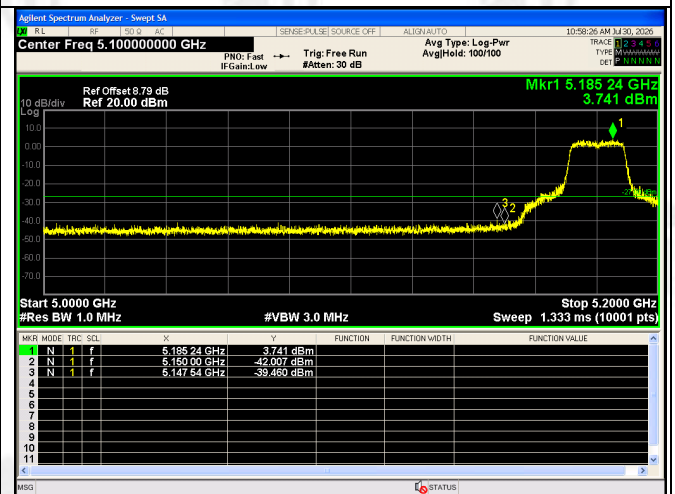
802.11ac(VHT80)-5210



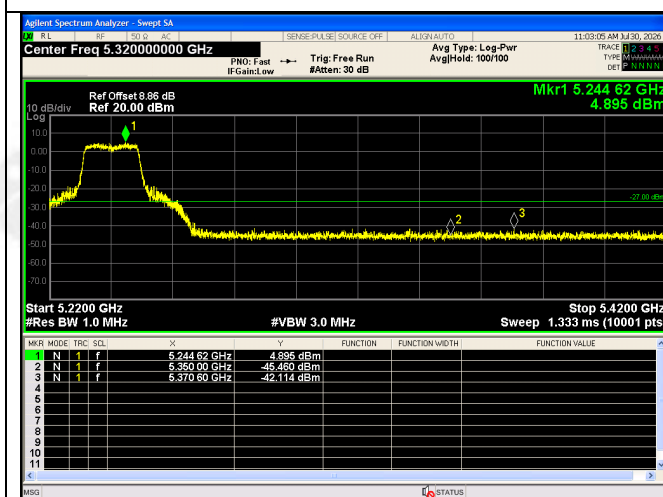
802.11n(HT20)-5180



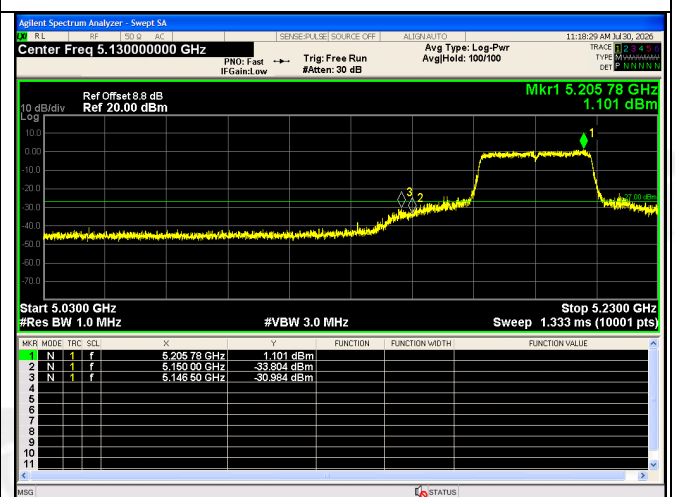
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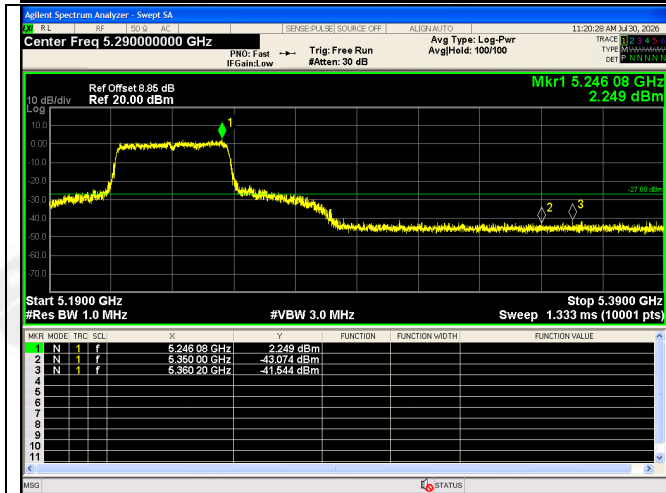
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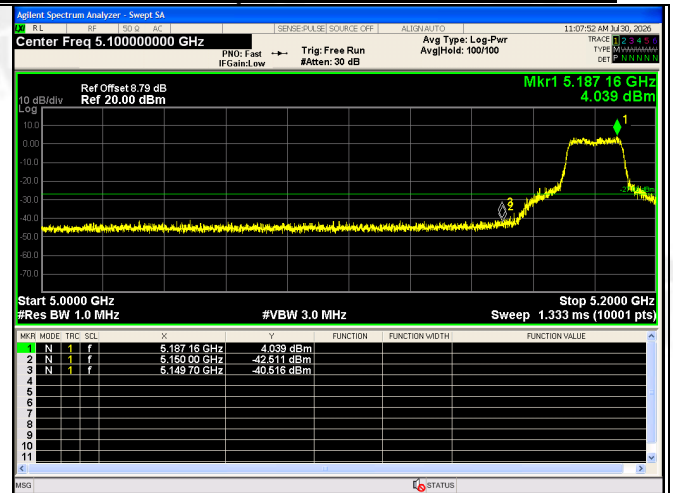
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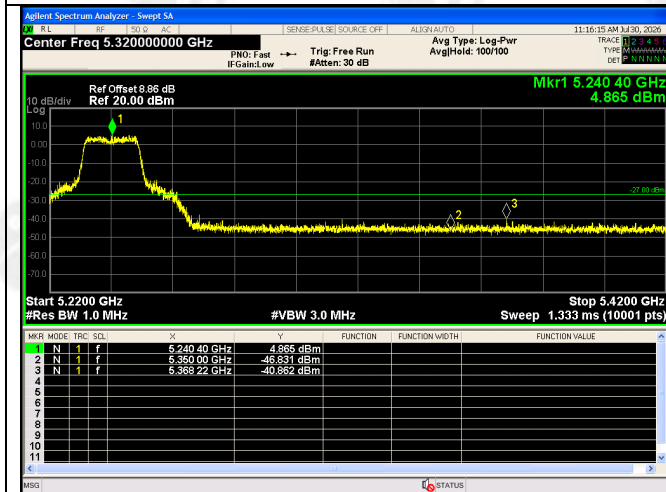
802.11ax(HE20)-5180



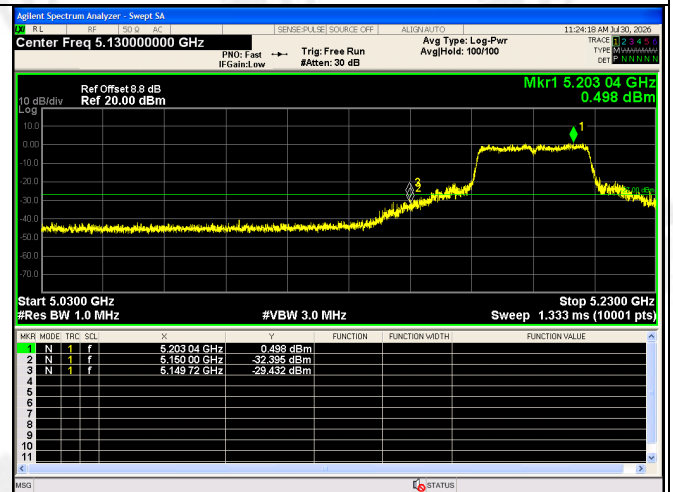
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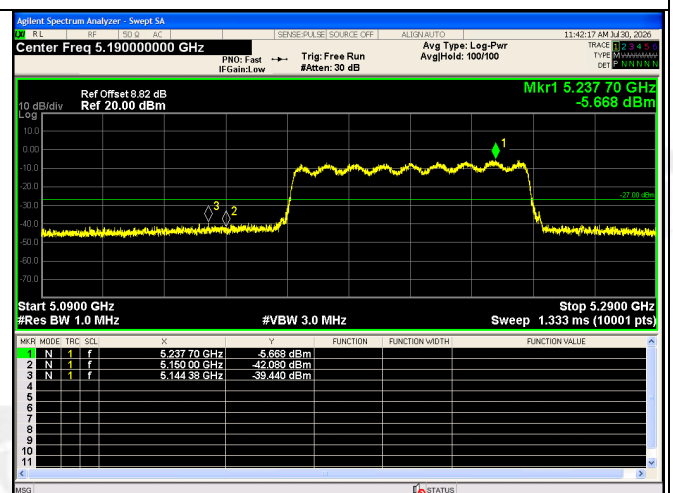
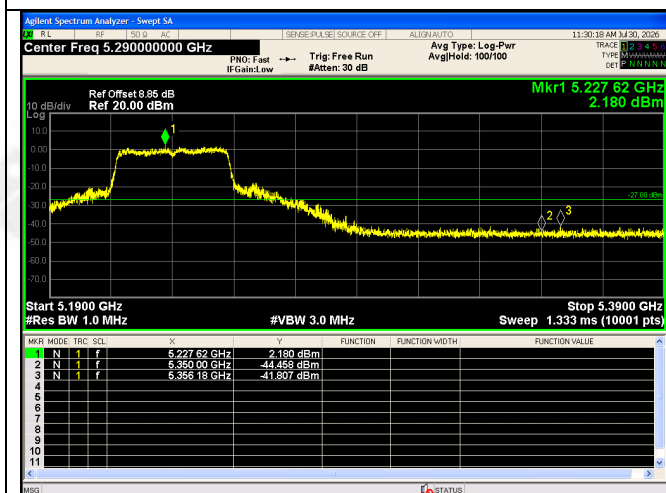
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802.11ax(HE40)-5230



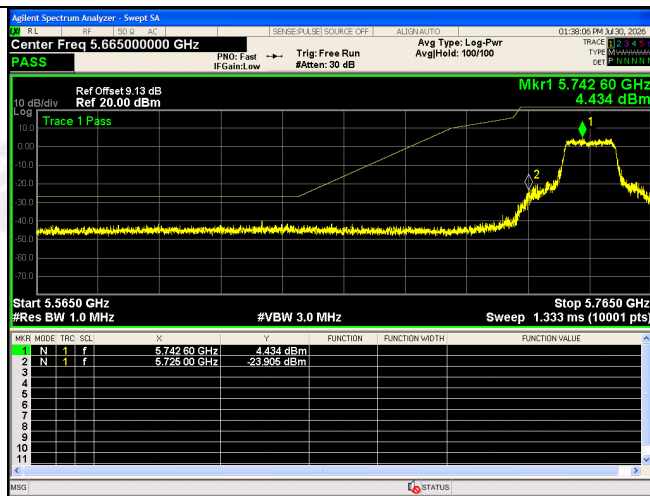
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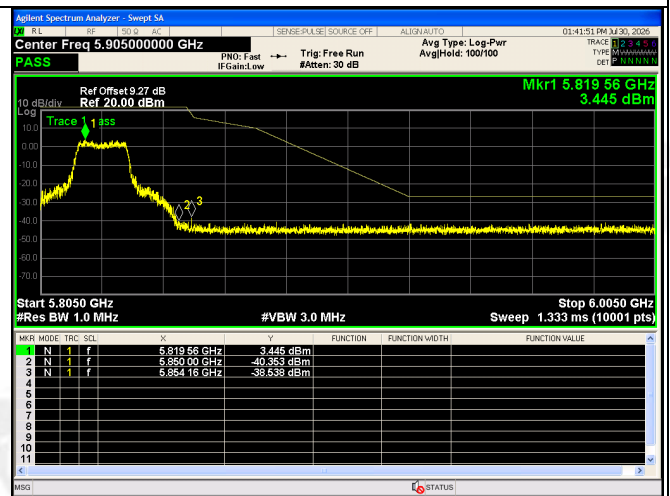


5745-5825MHz

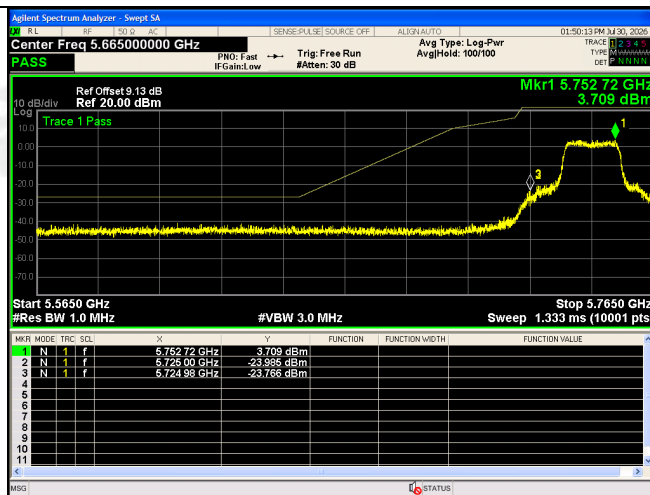
802.11a-5745



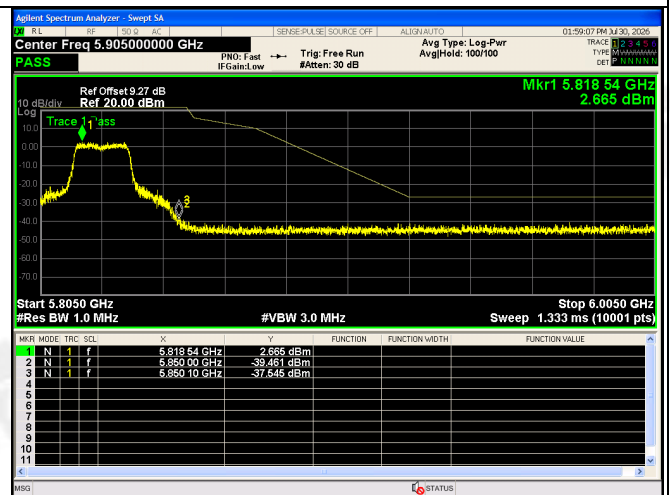
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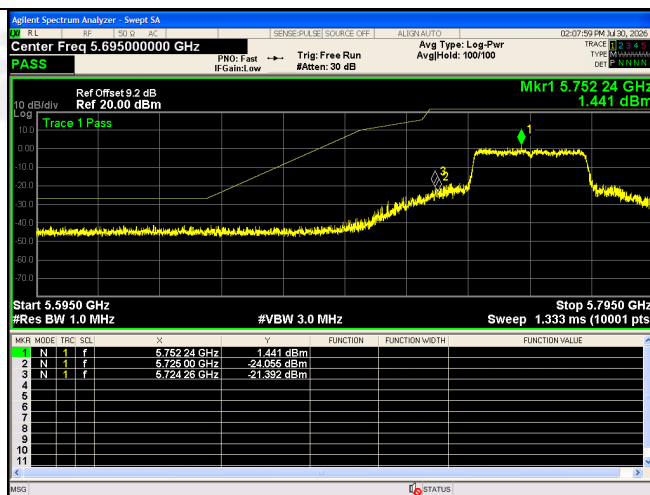
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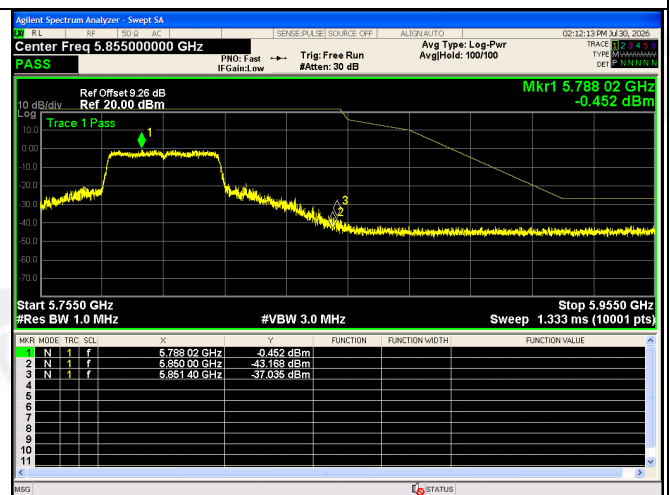
802.11ac(VHT20)-5825



802.11ac(VHT40)-5755

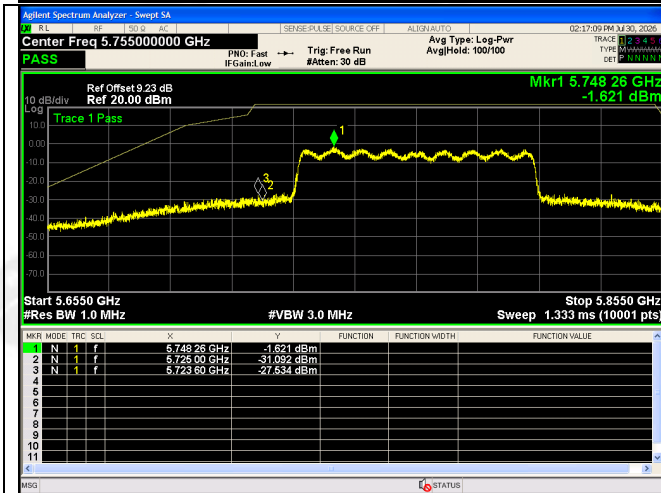


802.11ac(VHT40)-5795

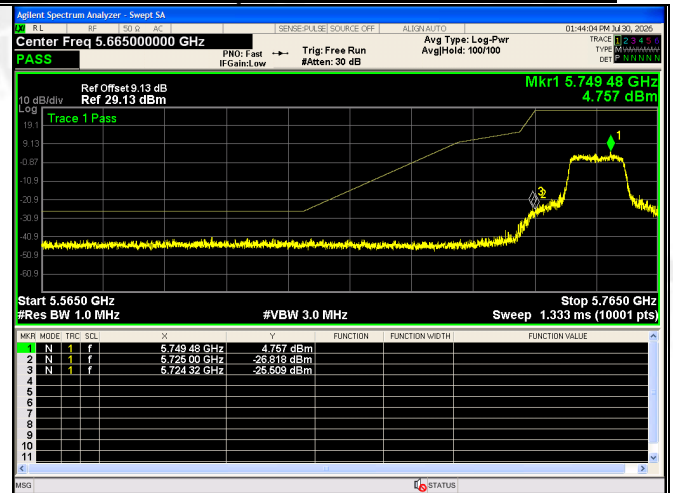


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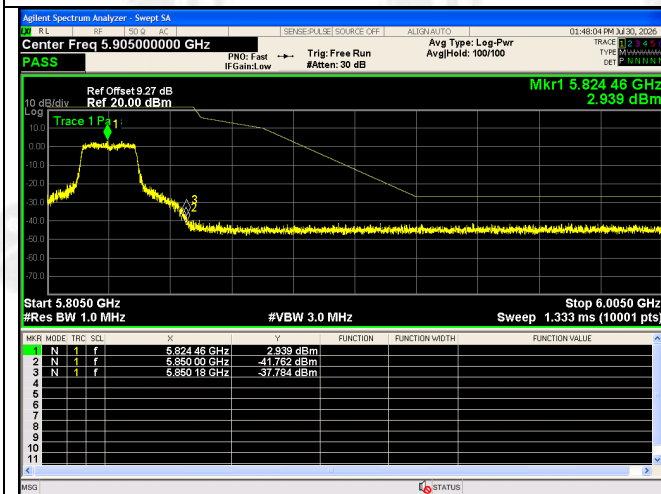
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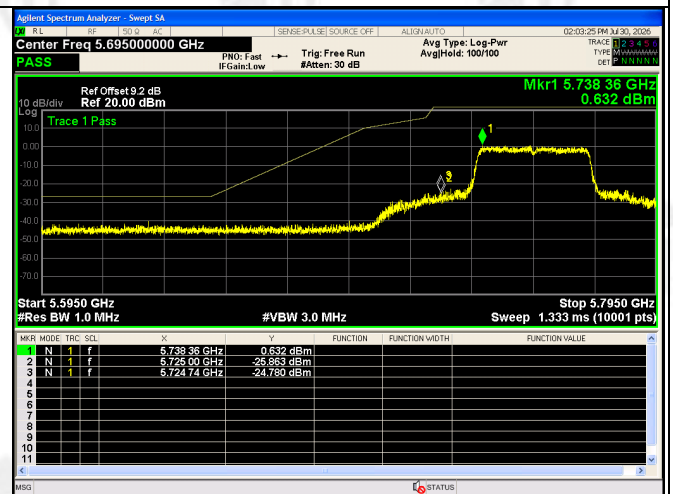
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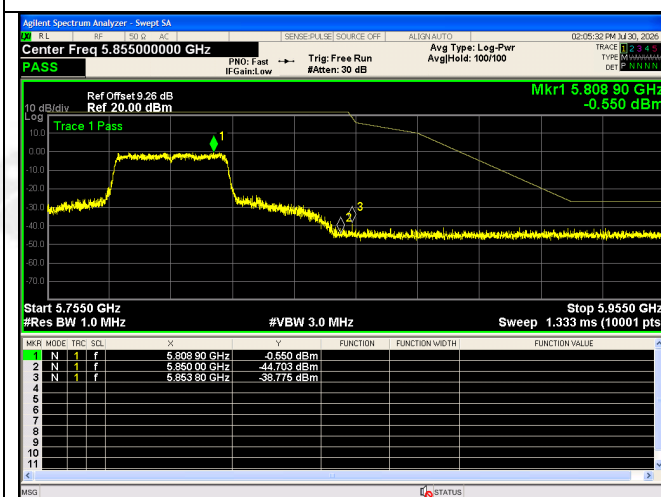
802.11(n40)-5755



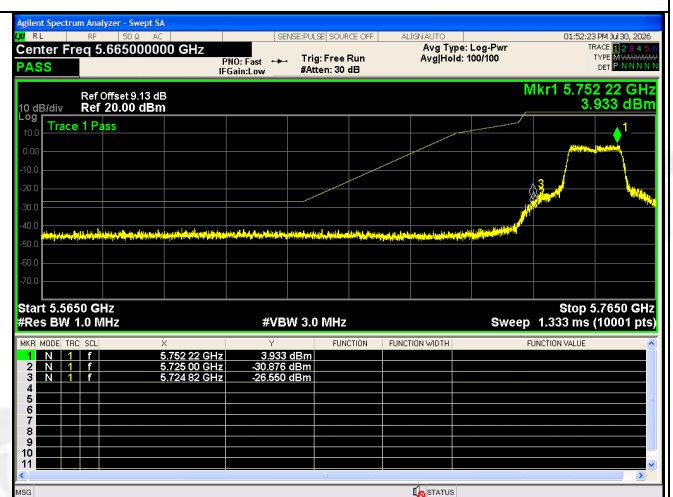
802.11(n40)-5795



802.11ax(HE20)-5745



802.11ax(HE20)-5825



802.11ax(HE40)-5755



13 Frequency Stability Measurement

13.1 Test Standard and Limit

FCC

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

13.2 Test Setup



13.3 Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 20 ppm (IEEE 802.11n specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is $-20^\circ\text{C} \sim 50^\circ\text{C}$.



13.4 Test Data

5150-5250MHz

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120	5180.0088	5180	0.0088	1.6944
		V max (V)	132	5180.0119	5180	0.0119	2.3054
		V min (V)	108	5180.0207	5180	0.0207	3.9952
Limits				±20ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	0	5180.0458	5180	0.0458	8.8489
		T (°C)	10	5180.0447	5180	0.0447	8.6220
		T (°C)	20	5180.0003	5180	0.0003	0.0647
		T (°C)	30	5180.0447	5180	0.0447	8.6257
		T (°C)	40	5180.0408	5180	0.0408	7.8790
Limits				±20ppm			
Result				Complies			