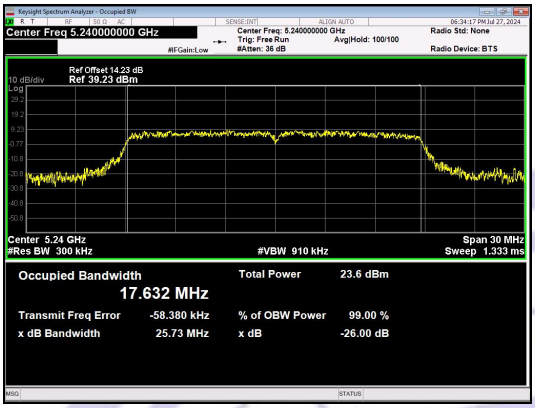
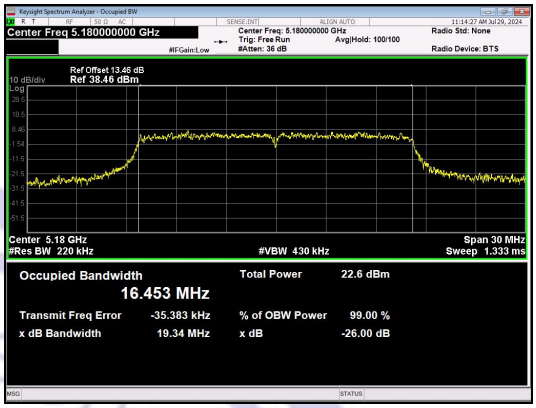


IEEE 802.11a_Channel 48_20MHz_Antenna 0



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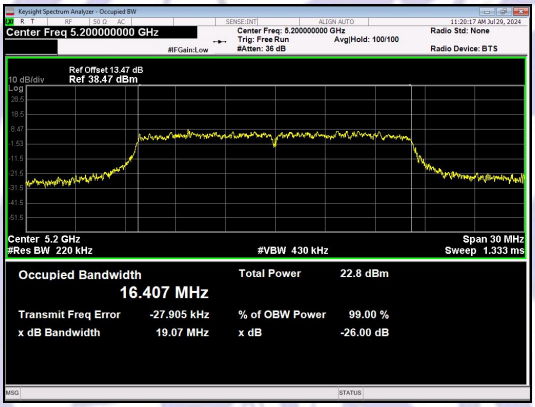

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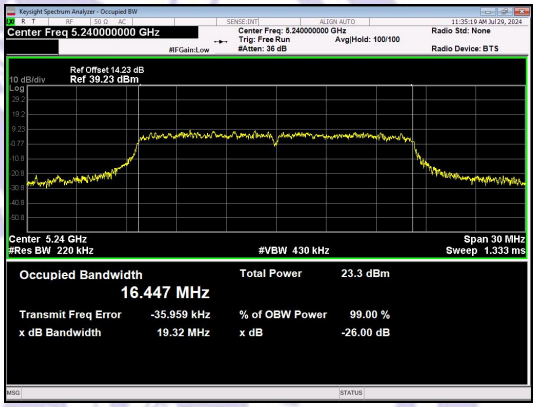

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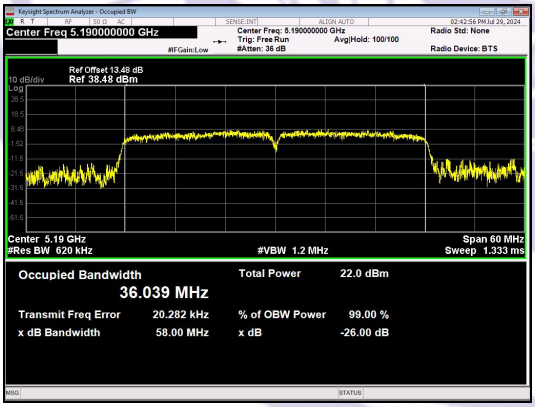

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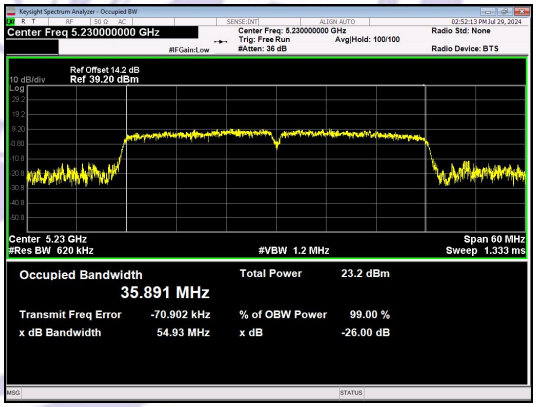

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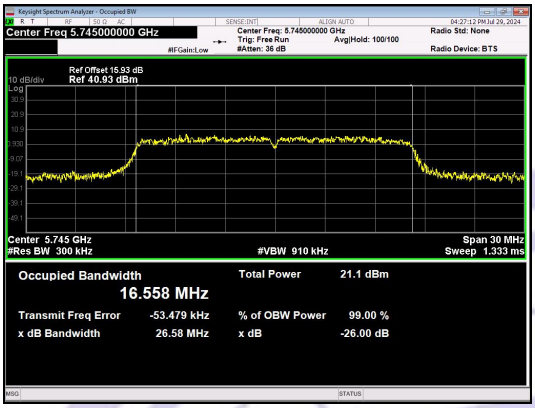
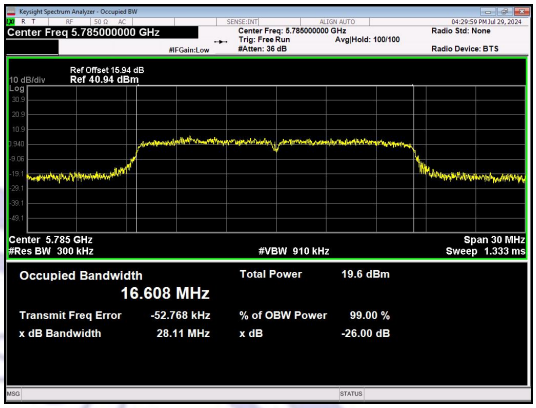


IEEE 802.11a_Channel 149_20MHz_Antenna 0



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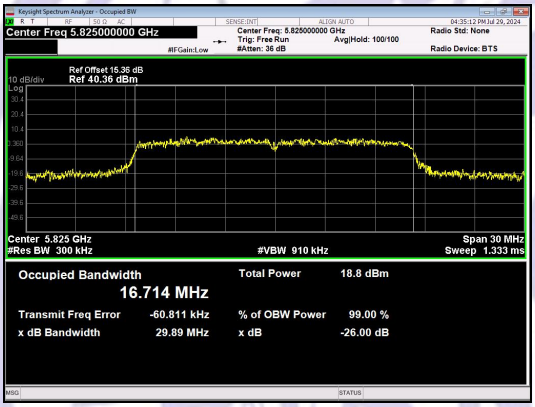

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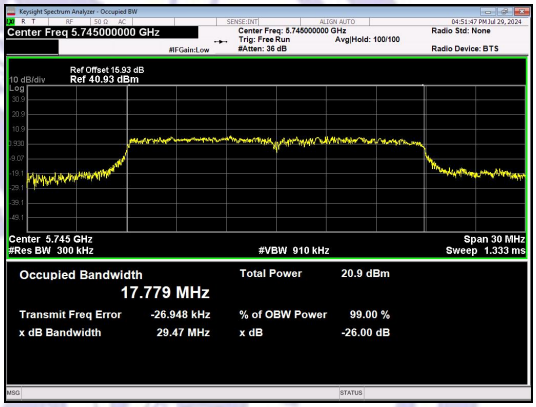

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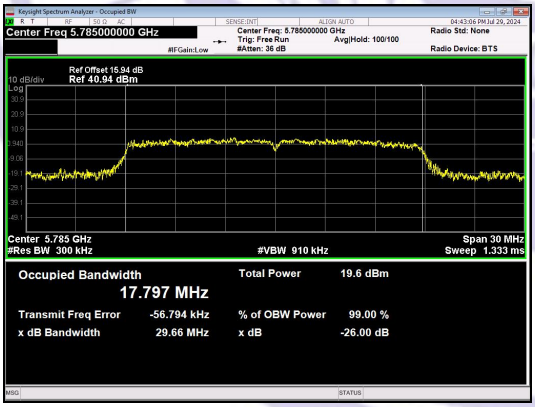

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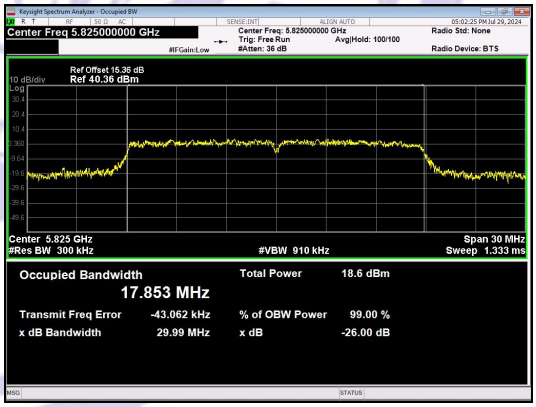

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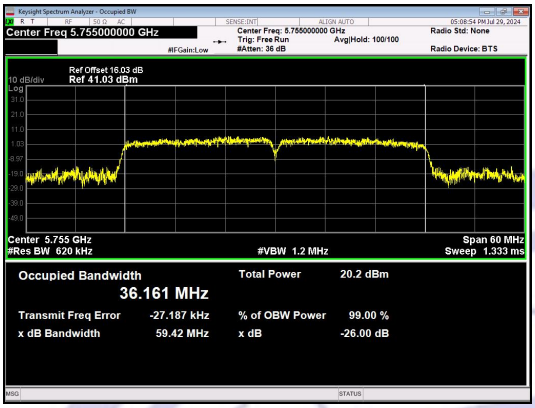

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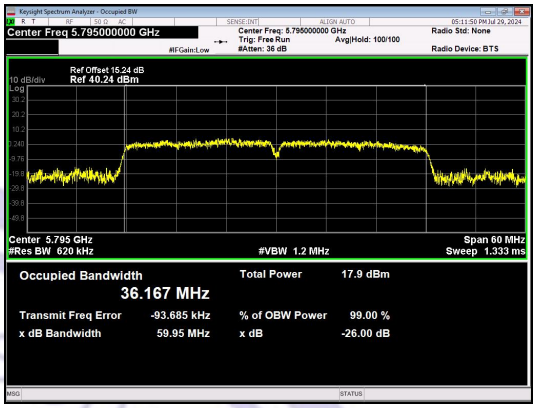
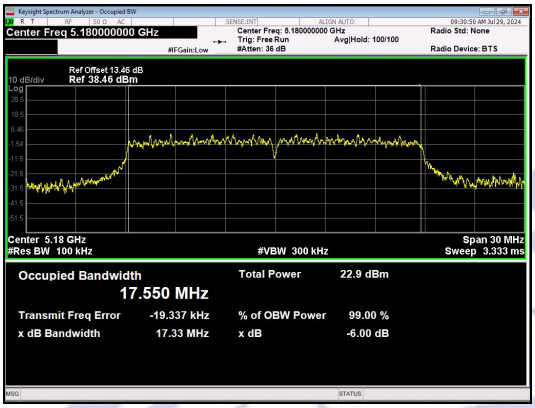


IEEE 802.11n_Channel 159_40MHz_Antenna 0

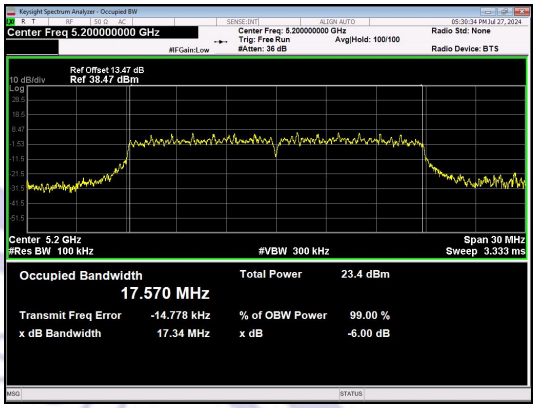
6dB Bandwidth:

Mode	Channel	Ant.	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11a	36	0	5180	17.33	≥0.5	PASS
	40		5200	17.34		PASS
	48		5240	17.34		PASS
IEEE 802.11n_20	36		5180	16.01		PASS
	40		5200	16.09		PASS
	48		5240	16.05		PASS
IEEE 802.11n_40	38		5190	35.02		PASS
	46		5230	35.12		PASS

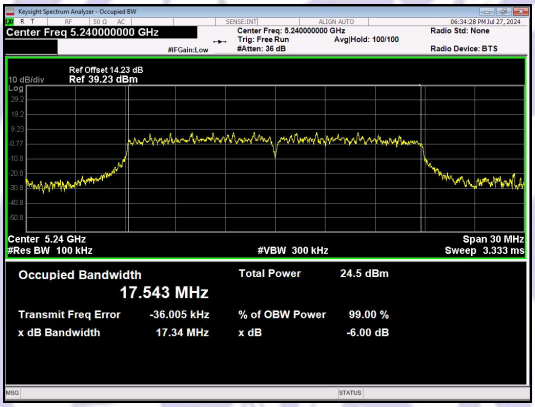
Mode	Channel	Ant.	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11a	149	0	5745	16.05	≥0.5	PASS
	157		5785	16.06		PASS
	165		5825	16.34		PASS
IEEE 802.11n_20	149		5745	17.25		PASS
	157		5785	17.32		PASS
	165		5825	16.62		PASS
IEEE 802.11n_40	151		5755	34.68		PASS
	159		5795	35.59		PASS



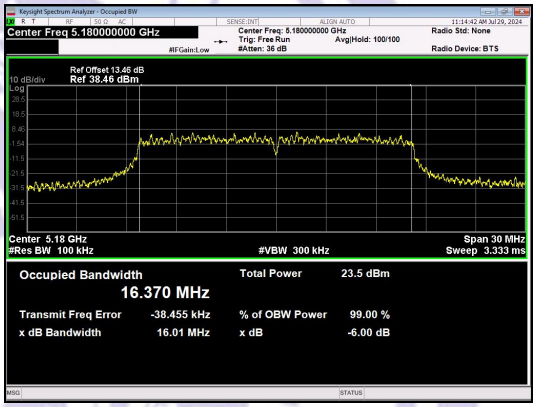
IEEE 802.11a_Channel 36_20MHz_Antenna 0



IEEE 802.11a_Channel 40_20MHz_Antenna 0



IEEE 802.11a_Channel 48_20MHz_Antenna 0



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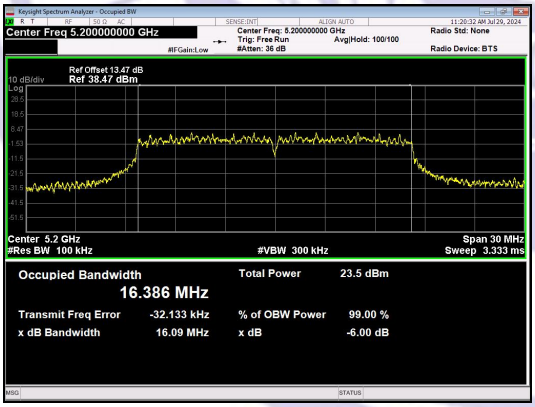

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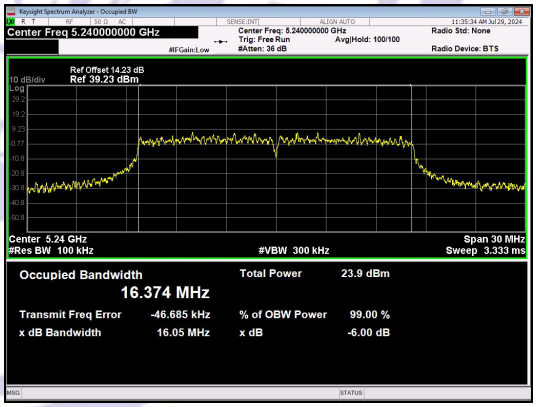
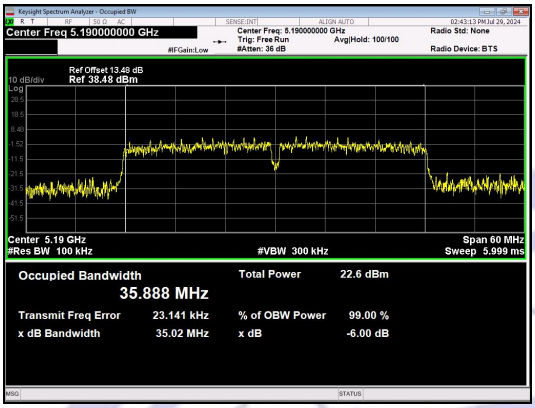


IEEE 802.11n_Channel 48_20MHz_Antenna 0



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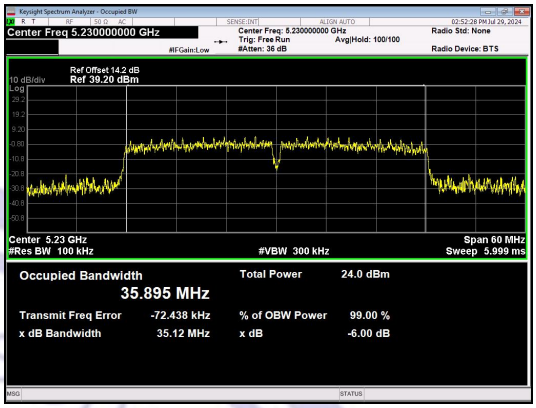

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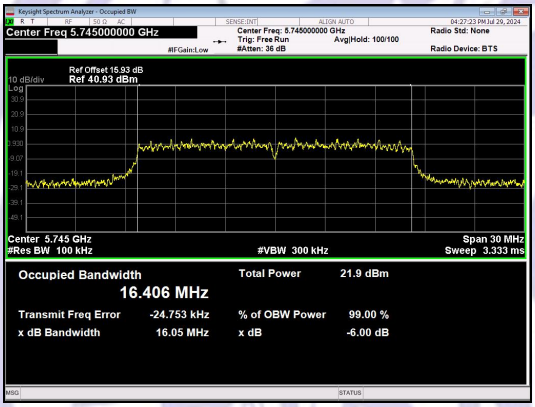
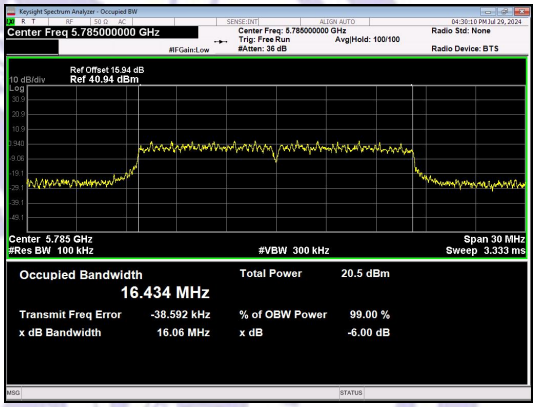
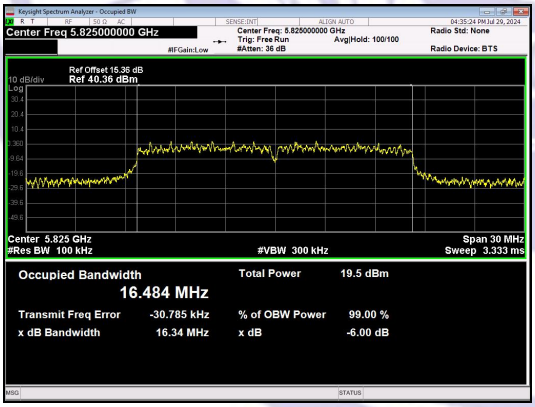


IEEE 802.11a_Channel 149_20MHz_Antenna 0



IEEE 802.11a_Channel 157_20MHz_Antenna 0



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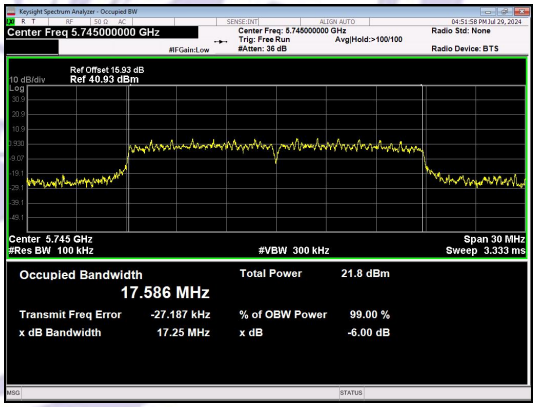

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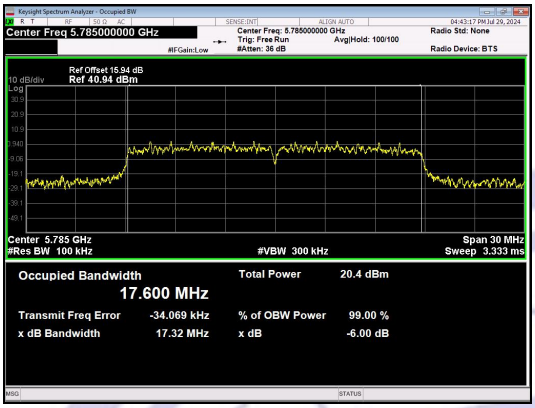
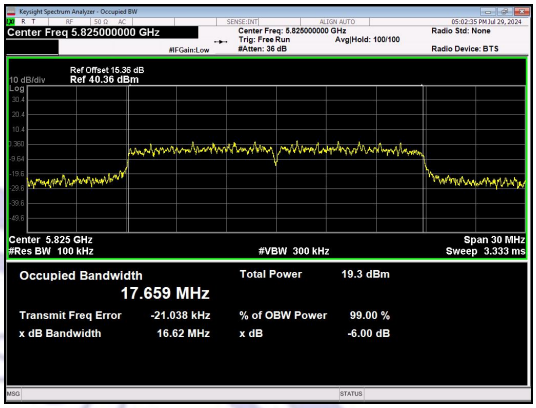
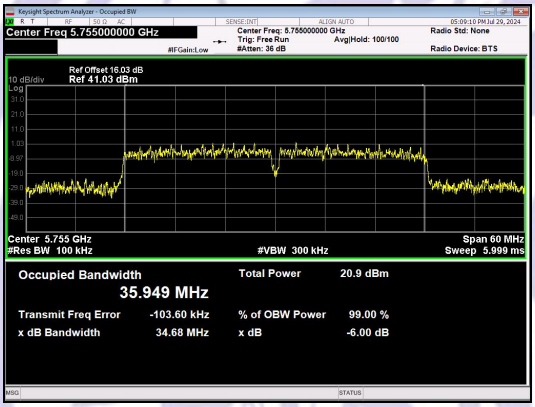


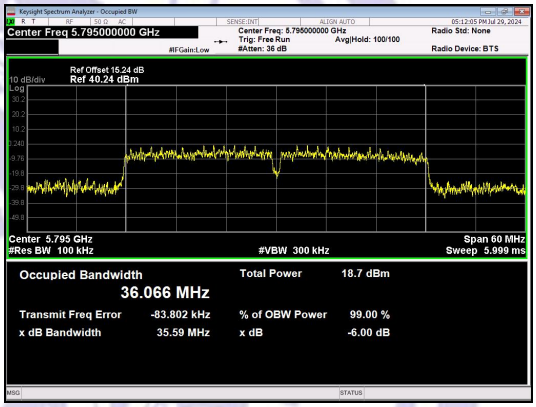
IEEE 802.11n_Channel 157_20MHz_Antenna 0



IEEE 802.11n_Channel 165_20MHz_Antenna 0



IEEE 802.11n_Channel 151_40MHz_Antenna 0



IEEE 802.11n_Channel 159_40MHz_Antenna 0

10 Maximum Conducted Output Power

10.1 Test Standard and Limit

According to FCC §15.407

(1) For the band 5.15~5.25GHz

(i) 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, 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. 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).

(ii) 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, 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.

(iii) 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 1dB 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.

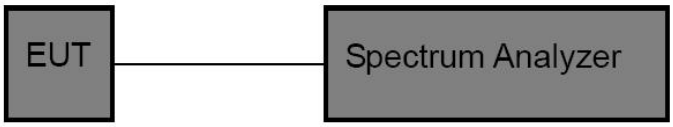
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For 5725~5850MHz

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.

10.2 Test Setup



10.3 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.

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

• The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

• Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be

averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep):
(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not

have a band power function, sum the spectrum

10.4 Test Data

Please see the attachment for WIFI5.2G and WIFI5.8G data

WIFI5.2G.

Type	Channel	AV Output power (dBm)	Limit (dBm)	Result
802.11a	Low	11.594	24.00	Pass
	Moddle	12.388		
	High	12.852		
802.11n(HT20)	Low	12.381	24.00	Pass
	Moddle	12.757		
	High	12.998		
802.11n(HT40)	Low	10.055	24.00	Pass
	High	10.583		

WIFI5.8G.

Type	Channel	AV Output power (dBm)	Limit (dBm)	Result
802.11a	Low	11.087	30.00	Pass
	Moddle	9.761		
	High	7.928		
802.11n(HT20)	Low	10.520	30.00	Pass
	Moddle	9.553		
	High	7.646		
802.11n(HT40)	Low	8.106	30.00	Pass
	High	7.097		

Note：The Duty Cycle Factor is compensated in the graph.

11 Out of Band Emissions and Spurious Emission

11.1 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.

RSS-247 Section 6.2

Devices shall comply with the following:

All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or

All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text “for indoor use only.”

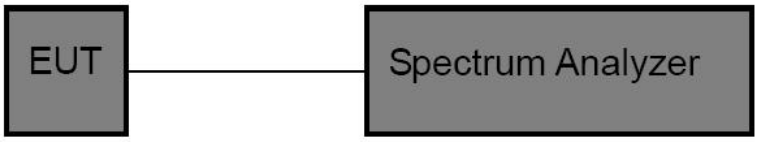
Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 Bm/MHz at 5 MHz above or below the band edges;

15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;

10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

11.2 Test Setup



11.3 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.

11.4 Test Data

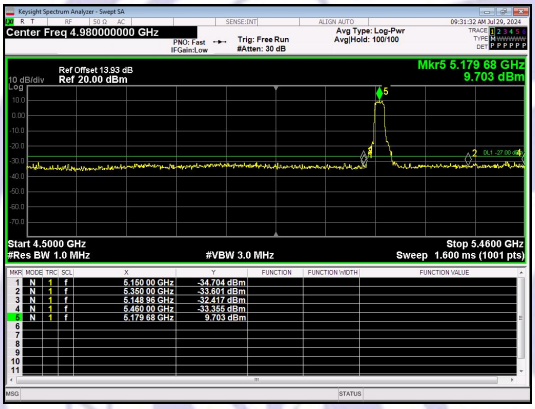
Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11a	36	0	5148.96	-32.417	-27	-5	PASS
			5149.74	-32.765	-27	-5.770	PASS
			5150.00	-34.704	-27	-8	PASS
			5350.00	-33.601	-27	-7	PASS
			5460.00	-33.355	-27	-6	PASS
			21169.7	-40.549	-27	-13.550	PASS
	40		5122.48	-47.239	-27	-20.240	PASS
			5149.92	-33.974	-27	-7	PASS
			5150.00	-33.974	-27	-7	PASS
			5350.00	-34.446	-27	-7	PASS
			5460.00	-33.370	-27	-6	PASS
			21166.8	-41.059	-27	-14.060	PASS
	48		4995.12	-47.522	-27	-20.520	PASS
			5148.00	-33.790	-27	-7	PASS
			5150.00	-34.159	-27	-7	PASS
			5350.00	-33.209	-27	-6	PASS
			5459.04	-32.713	-27	-6	PASS
			21152.5	-41.272	-27	-14.270	PASS
IEEE 802.11n_20	36		5102.88	-32.110	-27	-5	PASS
			5149.87	-33.448	-27	-6.450	PASS
			5150.00	-32.309	-27	-5	PASS
			5350.00	-33.926	-27	-7	PASS
			5460.00	-33.407	-27	-6	PASS
			21161.9	-41.355	-27	-14.350	PASS
	40		4954.03	-46.746	-27	-19.750	PASS
			5147.04	-34.054	-27	-7	PASS
			5150.00	-34.882	-27	-8	PASS
			5350.00	-33.987	-27	-7	PASS

			5460.00	-33.244	-27	-6	PASS
			21172.7	-41.271	-27	-14.270	PASS
	48		4997.81	-47.725	-27	-20.730	PASS
			5135.52	-32.492	-27	-5	PASS
			5150.00	-33.144	-27	-6	PASS
			5350.00	-33.271	-27	-6	PASS
			5454.24	-33.169	-27	-6	PASS
			21145.2	-41.362	-27	-14.360	PASS
IEEE 802.11n_40	38		5147.04	-33.954	-27	-7	PASS
			5149.74	-35.767	-27	-8.770	PASS
			5150.00	-34.038	-27	-7	PASS
			5350.00	-32.801	-27	-6	PASS
			5458.08	-32.253	-27	-5	PASS
			24995.1	-41.762	-27	-14.760	PASS
	46		5133.36	-45.402	-27	-18.400	PASS
			5149.92	-34.433	-27	-7	PASS
			5150.00	-34.433	-27	-7	PASS
			5350.00	-33.748	-27	-7	PASS
			5458.08	-33.030	-27	-6	PASS
			21163.8	-40.996	-27	-14.000	PASS

Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11a	149	0	3859.19	-50.271	-27	-23.270	PASS
			5601.12	-30.370	-27	-3.370	PASS
			5725.00	-20.599	27	-47.600	PASS
			5850.00	-35.042	27	-62.040	PASS
			5955.88	-31.968	-27	-4.968	PASS
			21589.9	-40.266	-27	-13.270	PASS
	157		5346.38	-50.125	-27	-23.120	PASS
			5639.38	-31.606	-27	-4.606	PASS

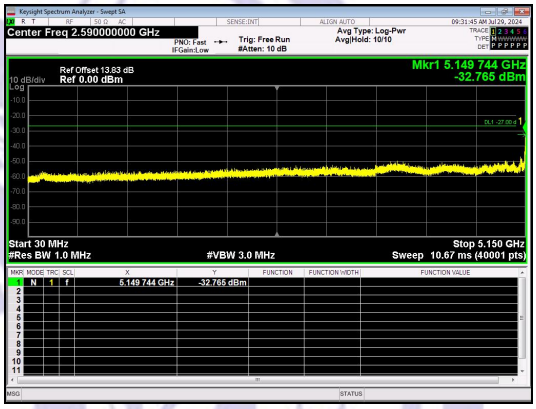
			5725.00	-33.136	27	-60.140	PASS
			5850.00	-33.334	27	-60.330	PASS
			5958.50	-31.606	-27	-4.606	PASS
			21586.5	-40.712	-27	-13.710	PASS
	165		5616.84	-49.689	-27	-22.690	PASS
			5637.88	-30.845	-27	-3.845	PASS
			5725.00	-33.122	27	-60.120	PASS
			5850.00	-26.802	27	-53.800	PASS
			5937.88	-31.425	-27	-4.425	PASS
			21557.4	-40.580	-27	-13.580	PASS
IEEE 802.11n_20	149		5630.47	-49.600	-27	-22.600	PASS
			5650.25	-31.017	-26.815	-4.202	PASS
			5725.00	-17.440	27	-44.440	PASS
			5850.00	-34.307	27	-61.310	PASS
			5944.62	-31.834	-27	-4.834	PASS
			21166.4	-41.123	-27	-14.120	PASS
	157		5601.88	-31.350	-27	-4.350	PASS
			5634.55	-49.511	-27	-22.510	PASS
			5725.00	-32.649	27	-59.650	PASS
			5850.00	-33.961	27	-60.960	PASS
			5972.00	-32.296	-27	-5.296	PASS
			21177.4	-41.084	-27	-14.080	PASS
	165		5583.68	-49.047	-27	-22.050	PASS
			5630.00	-30.615	-27	-3.615	PASS
			5725.00	-33.115	27	-60.120	PASS
			5850.00	-25.528	27	-52.530	PASS
			5947.62	-31.270	-27	-4.269	PASS
			21165.9	-41.237	-27	-14.240	PASS
IEEE 802.11n_40	151		2435.64	-41.567	-27	-14.570	PASS
			5625.50	-31.050	-27	-4.050	PASS
			5725.00	-17.368	27	-44.370	PASS
			5850.00	-33.883	27	-60.880	PASS
			5928.50	-32.316	-27	-5.316	PASS

			21204.6	-40.223	-27	-13.220	PASS
	159		5630.38	-30.345	-27	-3.345	PASS
			5632.72	-50.371	-27	-23.370	PASS
			5725.00	-32.475	27	-59.480	PASS
			5850.00	-29.218	27	-56.220	PASS
			5969.75	-31.939	-27	-4.939	PASS
			21561.3	-41.162	-27	-14.160	PASS



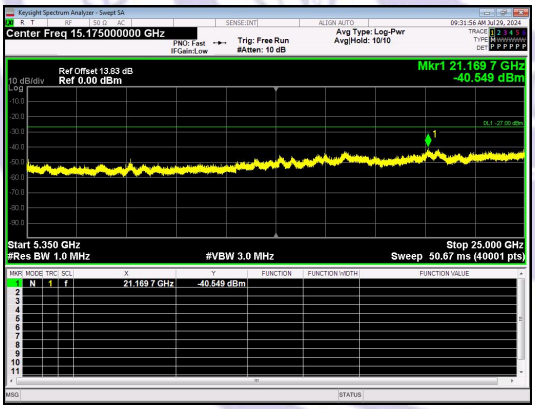
Out Of Band Emission

IEEE 802.11a_Channel 36_20MHz_Antenna 0



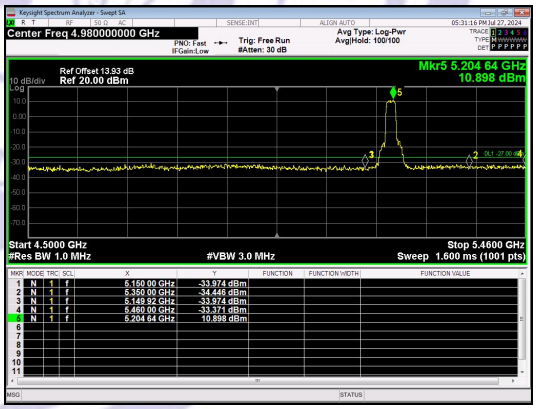
Spurious Emission:30.0~5150 MHz

IEEE 802.11a_Channel 36_20MHz_Antenna 0



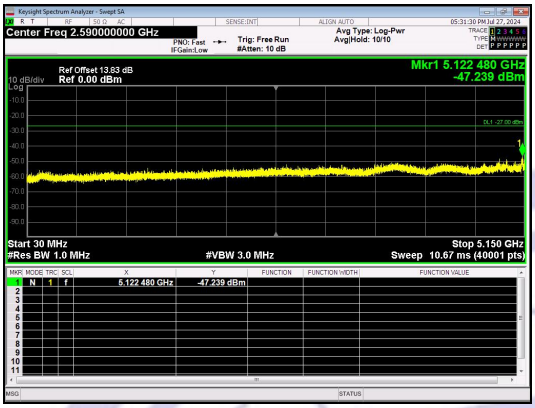
Spurious Emission:5350~25000.0 MHz

IEEE 802.11a_Channel 36_20MHz_Antenna 0



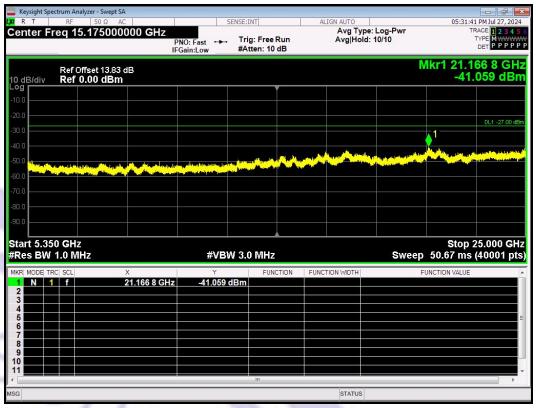
Out Of Band Emission

IEEE 802.11a_Channel 40_20MHz_Antenna 0



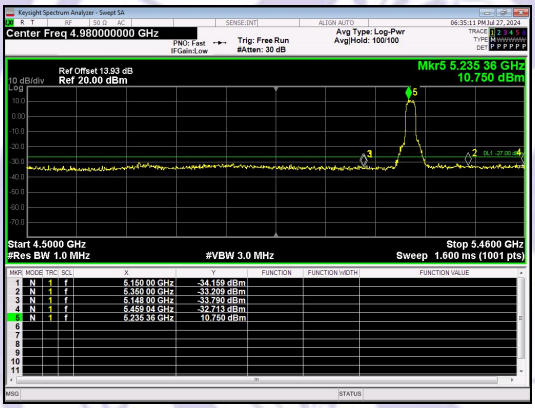
Spurious Emission:30.0~5150 MHz

IEEE 802.11a_Channel 40_20MHz_Antenna 0



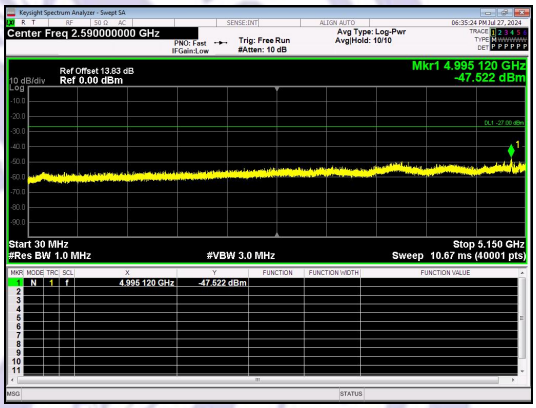
Spurious Emission:5350~25000.0 MHz

IEEE 802.11a_Channel 40_20MHz_Antenna 0



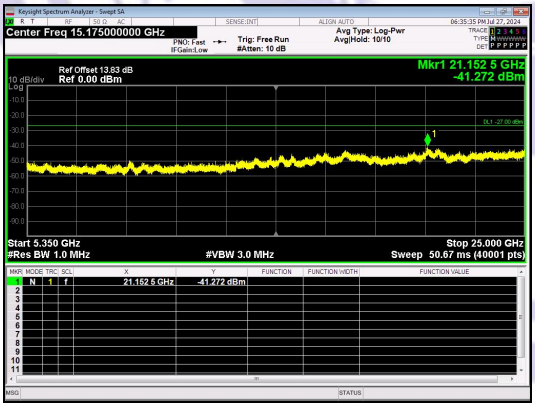
Out Of Band Emission

IEEE 802.11a_Channel 48_20MHz_Antenna 0



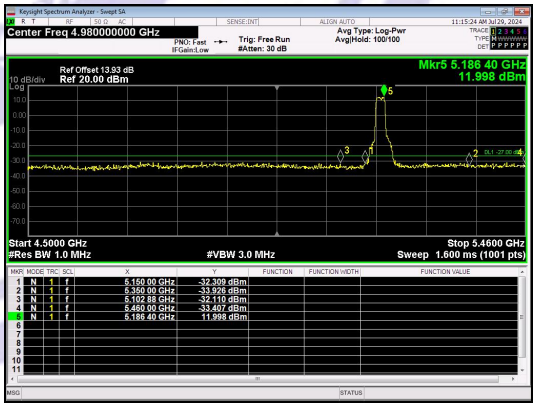
Spurious Emission:30.0~5150 MHz

IEEE 802.11a_Channel 48_20MHz_Antenna 0



Spurious Emission:5350~25000.0 MHz

IEEE 802.11a_Channel 48_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11n_Channel 36_20MHz_Antenna 0