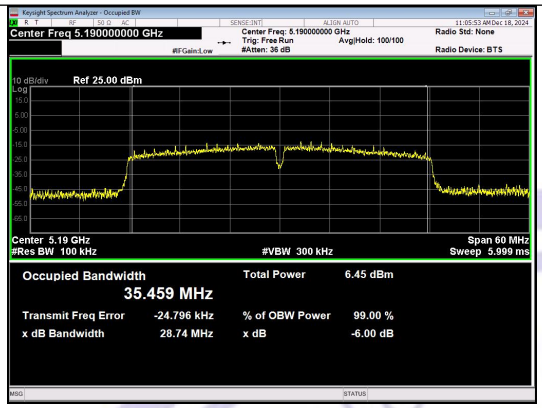
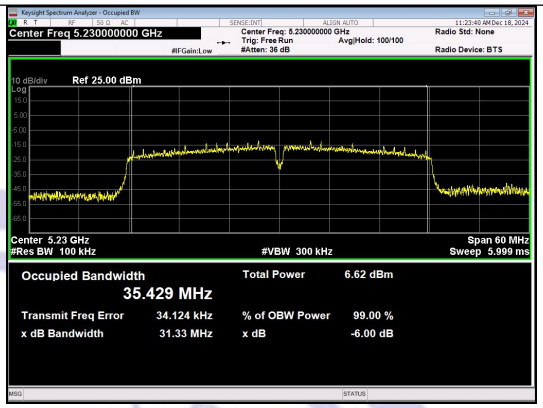


IEEE 802.11n_Channel 38_40MHz_Antenna 0



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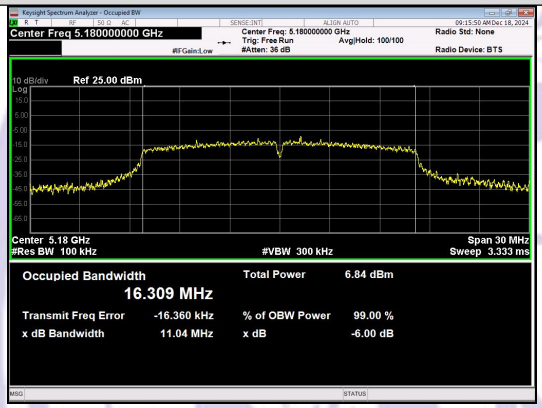

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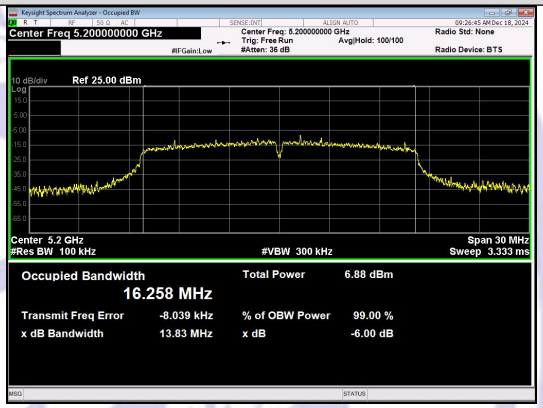

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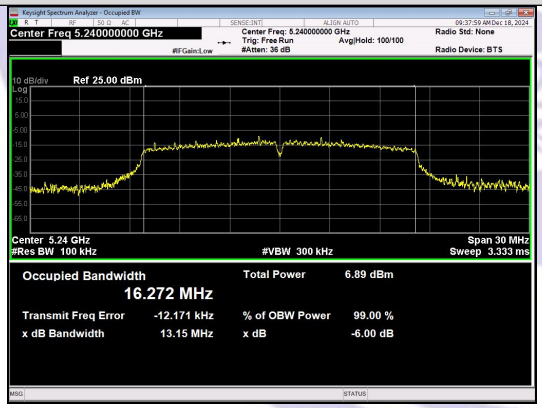

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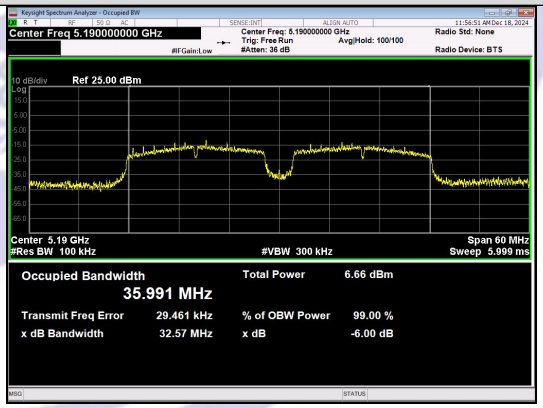

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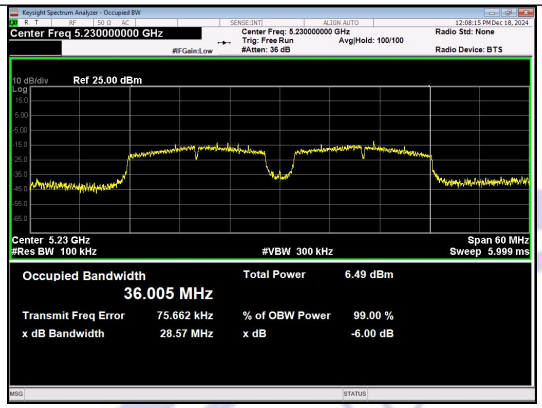

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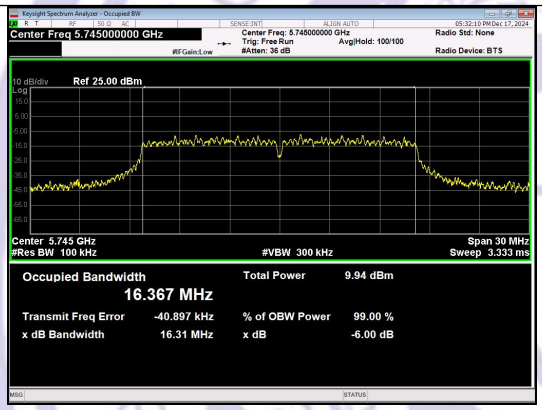

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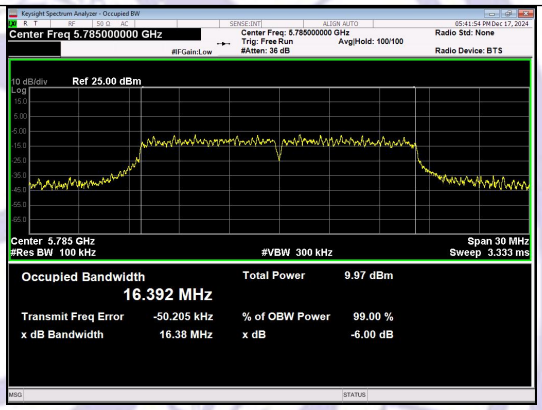

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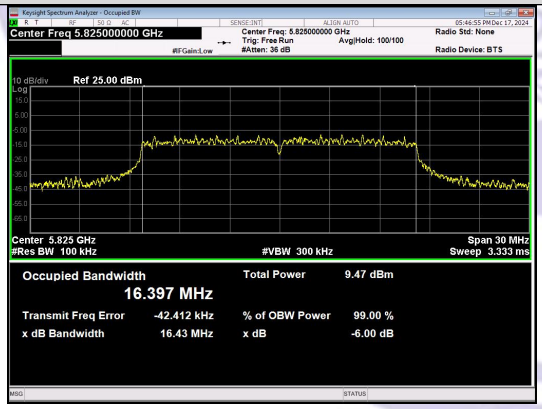

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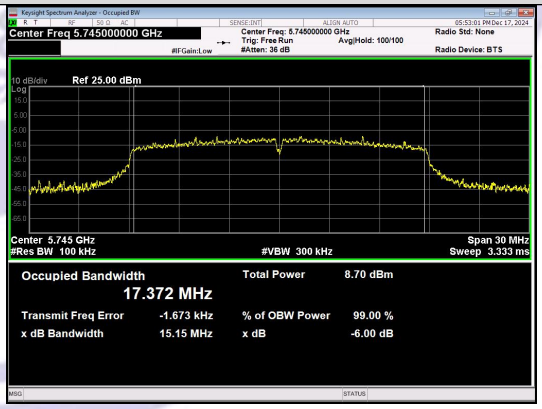

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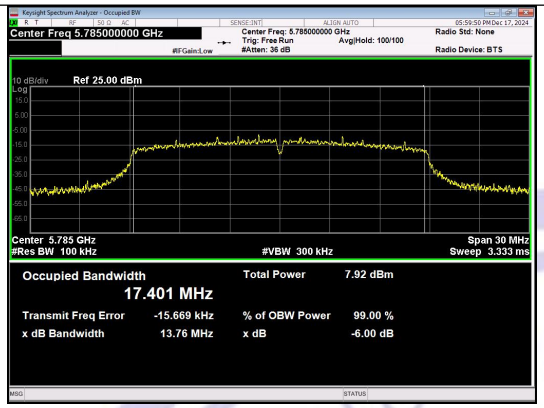

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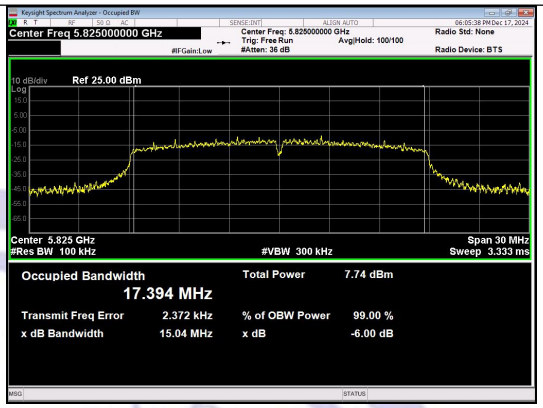

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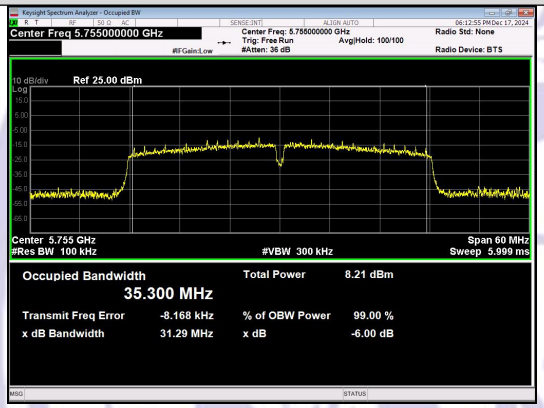

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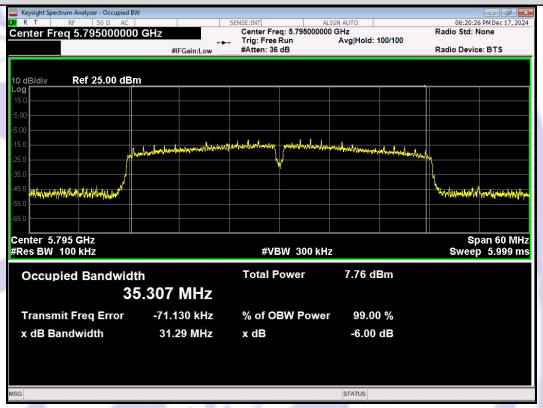

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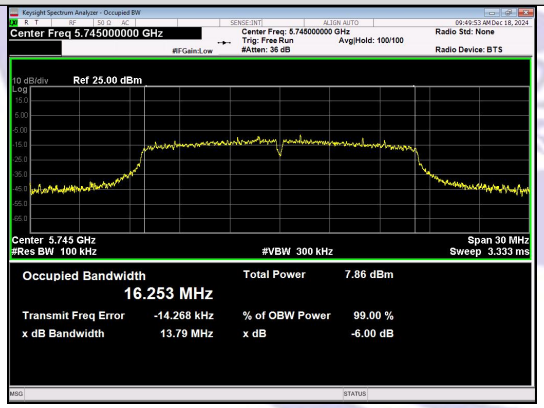

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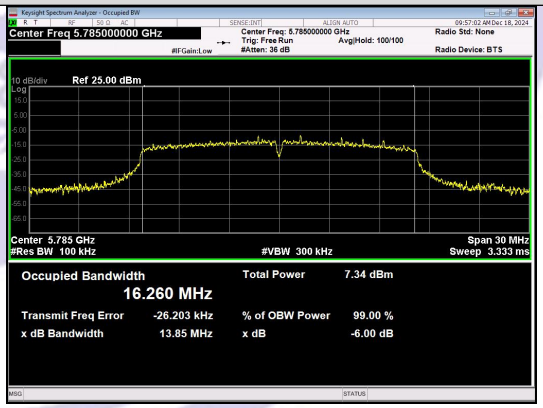

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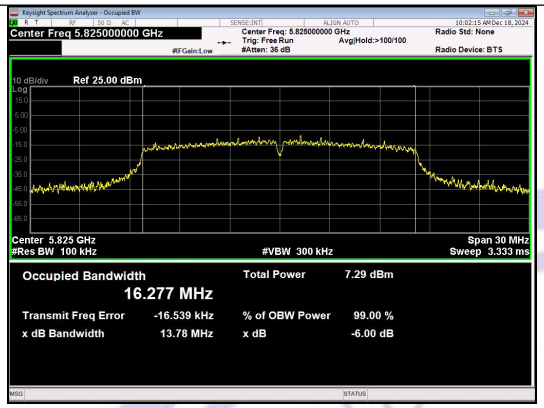
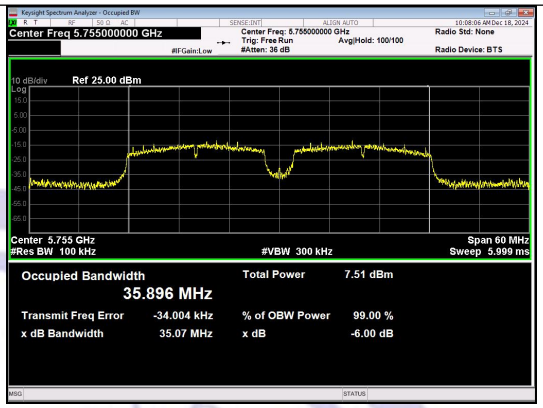


IEEE 802.11ac_Channel 165_20MHz_Antenna 0



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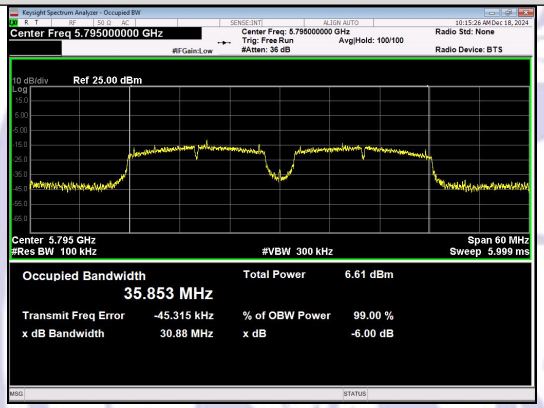


IEEE 802.11ac_Channel 159_40MHz_Antenna 0

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.

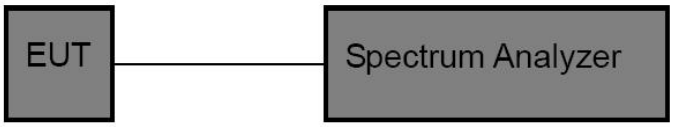
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both 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)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Result
802.11a	Low	1.09	2.5065	3.5965	24.00	Pass
	Moddle	0.91	1.6266	2.5366		
	High	0.74	2.6777	3.4177		
802.11n(HT20)	Low	0.96	0.2241	0.5815	24.00	Pass
	Moddle	0.69	0.2627	0.7126		
	High	0.96	0.4316	0.7133		
802.11n(HT40)	Low	-0.09	0.4832	1.0765	24.00	Pass
	High	0.61	0.8386	1.7132		
802.11ac(HT20)	Low	0.9	0.7484	1.4328	24.00	Pass
	Moddle	1.09	0.8118	1.5443		
	High	0.83	0.7484	1.5108		
802.11ac(HT40)	Low	0.67	0.905	1.7478	24.00	Pass
	High	0.41	0.7645	1.6232		

WIFI5.8G.

Type	Channel	AV Output power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Result
802.11a	Low	1.21	1.7321	2.9421	30.00	Pass
	Moddle	1.16	2.5822	3.7422		
	High	1.09	2.0412	3.1312		
802.11n(HT20)	Low	0.83	0.3574	1.1874	30.00	Pass
	Moddle	0.82	0.4499	1.2699		
	High	0.74	0.2817	1.0217		
802.11n(HT40)	Low	0.07	0.5933	0.6633	30.00	Pass
	High	-0.12	0.8746	0.7546		
802.11ac(HT20)	Low	0.9	0.6844	1.5844	30.00	Pass
	Moddle	0.51	0.7325	1.2425		
	High	0.5	0.7624	1.2624		
802.11ac(HT40)	Low	0.35	0.8428	1.1928	30.00	Pass
	High	0.56	0.8587	1.4187		

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.”

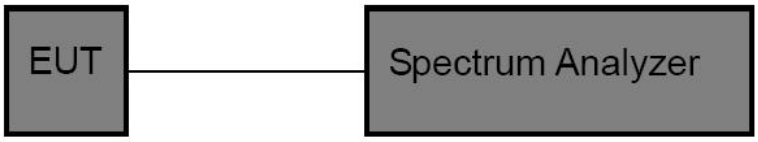
Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

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	5148.72	-45.196	-27	-18.200	PASS
			5150.00	-43.634	-27	-17	PASS
			5350.00	-45.847	-27	-19	PASS
			5412.96	-45.078	-27	-18	PASS
			21255.7	-54.806	-27	-27.810	PASS
	40		5144.16	-47.831	-27	-21	PASS
			5145.39	-59.455	-27	-32.450	PASS
			5150.00	-48.442	-27	-21	PASS
			5350.00	-47.030	-27	-20	PASS
			5456.16	-46.888	-27	-20	PASS
			21526.4	-55.345	-27	-28.340	PASS
	48		4922.80	-62.439	-27	-35.440	PASS
			5149.92	-48.947	-27	-22	PASS
			5150.00	-48.947	-27	-22	PASS
			5350.00	-47.733	-27	-21	PASS
			5460.00	-47.496	-27	-20	PASS
			21212.5	-55.149	-27	-28.150	PASS
IEEE 802.11n_20	36		5146.93	-49.931	-27	-22.930	PASS
			5148.96	-48.628	-27	-22	PASS
			5150.00	-48.768	-27	-22	PASS
			5350.00	-47.393	-27	-20	PASS
			5459.04	-46.249	-27	-19	PASS
			21619.7	-55.247	-27	-28.250	PASS
	40		5147.95	-62.112	-27	-35.110	PASS
			5148.96	-46.952	-27	-20	PASS

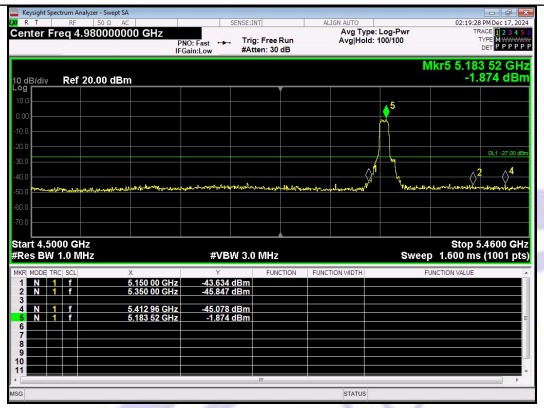
			5150.00	-47.443	-27	-20	PASS
			5350.00	-44.817	-27	-18	PASS
			21170.7	-55.080	-27	-28.080	PASS
	48		4918.32	-62.466	-27	-35.470	PASS
			5149.92	-48.618	-27	-22	PASS
			5150.00	-48.618	-27	-22	PASS
			5350.00	-46.886	-27	-20	PASS
			5456.16	-46.121	-27	-19	PASS
			21216.4	-54.973	-27	-27.970	PASS
IEEE 802.11n_40	38		5149.62	-41.454	-27	-14.450	PASS
			5150.00	-42.574	-27	-16	PASS
			5350.00	-47.065	-27	-20	PASS
			5460.00	-46.096	-27	-19	PASS
			21574.0	-55.230	-27	-28.230	PASS
	46		5149.23	-57.554	-27	-30.550	PASS
			5149.92	-48.219	-27	-21	PASS
			5150.00	-48.219	-27	-21	PASS
			5350.00	-48.069	-27	-21	PASS
			5459.04	-47.346	-27	-20	PASS
			21541.6	-55.018	-27	-28.020	PASS
IEEE 802.11ac_20	36		1747.38	-43.575	-27	-16.580	PASS
			5148.00	-46.239	-27	-19	PASS
			5150.00	-47.652	-27	-21	PASS
			5350.00	-47.852	-27	-21	PASS
			5460.00	-46.786	-27	-20	PASS
			21601.5	-55.062	-27	-28.060	PASS
	40		5121.58	-61.560	-27	-34.560	PASS
			5149.92	-48.813	-27	-22	PASS

			5150.00	-48.814	-27	-22	PASS
			5350.00	-47.726	-27	-21	PASS
			5460.00	-46.430	-27	-19	PASS
			21566.2	-55.356	-27	-28.360	PASS
	48		5002.42	-62.739	-27	-35.740	PASS
			5149.92	-48.757	-27	-22	PASS
			5150.00	-48.757	-27	-22	PASS
			5350.00	-48.219	-27	-21	PASS
			5460.00	-47.829	-27	-21	PASS
			21600.5	-55.070	-27	-28.070	PASS
IEEE 802.11ac_40	38		5149.62	-34.498	-27	-7.500	PASS
			5149.92	-37.226	-27	-10	PASS
			5150.00	-37.226	-27	-10	PASS
			5350.00	-47.634	-27	-21	PASS
			5459.04	-47.263	-27	-20	PASS
			21577.0	-54.607	-27	-27.610	PASS
	46		5143.34	-53.586	-27	-26.590	PASS
			5149.92	-48.131	-27	-21	PASS
			5150.00	-48.131	-27	-21	PASS
			5350.00	-45.610	-27	-19	PASS
			5440.80	-45.526	-27	-19	PASS
			21128.5	-54.261	-27	-27.260	PASS

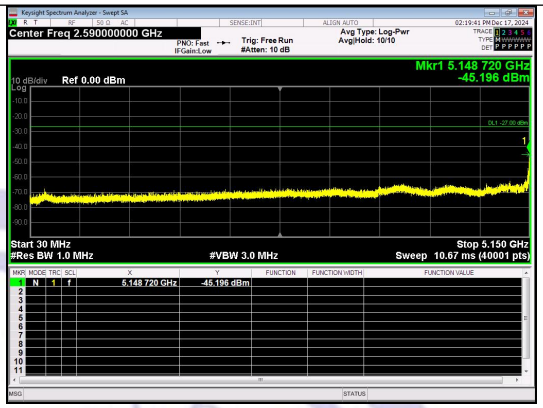
Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11a	149	0	5588.74	-61.172	-27	-34.170	PASS
			5643.50	-45.428	-27	-18.428	PASS
			5725.00	-31.722	27	-58.720	PASS
			5850.00	-47.947	27	-74.950	PASS
			5973.50	-46.044	-27	-19.044	PASS
			21588.4	-55.250	-27	-28.250	PASS
	157		5623.73	-59.866	-27	-32.870	PASS
			5640.50	-45.753	-27	-18.753	PASS
			5725.00	-47.825	27	-74.830	PASS
			5850.00	-47.408	27	-74.410	PASS
			5941.62	-46.605	-27	-19.605	PASS
			21185.0	-54.663	-27	-27.660	PASS
	165		5588.18	-61.549	-27	-34.550	PASS
			5638.62	-44.452	-27	-17.452	PASS
			5725.00	-47.547	27	-74.550	PASS
			5850.00	-44.943	27	-71.940	PASS
			5970.12	-46.251	-27	-19.250	PASS
			21143.0	-54.557	-27	-27.560	PASS
IEEE 802.11n_20	149		5586.77	-60.651	-27	-33.650	PASS
			5607.50	-45.534	-27	-18.534	PASS
			5725.00	-39.905	27	-66.910	PASS
			5850.00	-46.370	27	-73.370	PASS
			5968.25	-46.852	-27	-19.852	PASS
			21156.9	-54.204	-27	-27.200	PASS
	157		5627.52	-60.430	-27	-33.430	PASS

			5648.00	-45.217	-27	-18.217	PASS
			5725.00	-46.287	27	-73.290	PASS
			5850.00	-47.383	27	-74.380	PASS
			5943.12	-46.474	-27	-19.474	PASS
			17931.8	-55.319	-27	-28.320	PASS
	165		5584.39	-62.010	-27	-35.010	PASS
			5617.62	-45.848	-27	-18.848	PASS
			5725.00	-47.654	27	-74.650	PASS
			5850.00	-45.688	27	-72.690	PASS
			5948.38	-46.793	-27	-19.793	PASS
			21155.0	-54.441	-27	-27.440	PASS
IEEE 802.11n_40	151		825.79	-60.219	-27	-33.220	PASS
			5644.62	-45.042	-27	-18.042	PASS
			5725.00	-37.925	27	-64.920	PASS
			5850.00	-46.789	27	-73.790	PASS
			5960.75	-46.602	-27	-19.602	PASS
			21582.2	-54.538	-27	-27.540	PASS
	159		5557.97	-62.441	-27	-35.440	PASS
			5600.00	-45.853	-27	-18.853	PASS
			5725.00	-48.258	27	-75.260	PASS
			5850.00	-48.591	27	-75.590	PASS
			5942.00	-46.143	-27	-19.143	PASS
			21139.7	-55.546	-27	-28.550	PASS
IEEE 802.11ac_20	149		5507.39	-62.084	-27	-35.080	PASS
			5643.12	-45.681	-27	-18.681	PASS
			5725.00	-40.569	27	-67.570	PASS
			5850.00	-48.794	27	-75.790	PASS
			5930.75	-46.631	-27	-19.631	PASS

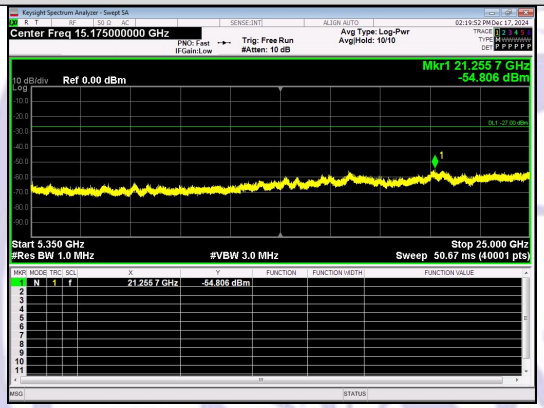
			21131.1	-55.024	-27	-28.020	PASS
	157		5606.75	-45.637	-27	-18.637	PASS
			5621.76	-61.860	-27	-34.860	PASS
			5725.00	-48.494	27	-75.490	PASS
			5850.00	-48.820	27	-75.820	PASS
			5928.12	-46.272	-27	-19.272	PASS
			21188.3	-55.165	-27	-28.160	PASS
	165		5581.01	-62.873	-27	-35.870	PASS
			5626.62	-46.272	-27	-19.272	PASS
			5725.00	-47.934	27	-74.930	PASS
			5850.00	-44.830	27	-71.830	PASS
			5933.00	-46.194	-27	-19.194	PASS
			21596.1	-54.626	-27	-27.630	PASS
IEEE 802.11ac_40	151		40.68	-60.760	-27	-33.760	PASS
			5604.12	-45.371	-27	-18.371	PASS
			5725.00	-26.017	27	-53.020	PASS
			5850.00	-48.430	27	-75.430	PASS
			5967.50	-46.720	-27	-19.720	PASS
			21200.3	-55.196	-27	-28.200	PASS
	159		5544.77	-61.986	-27	-34.990	PASS
			5617.62	-46.118	-27	-19.118	PASS
			5725.00	-47.222	27	-74.220	PASS
			5850.00	-44.366	27	-71.370	PASS
			5948.00	-46.178	-27	-19.178	PASS
			21127.3	-55.497	-27	-28.500	PASS



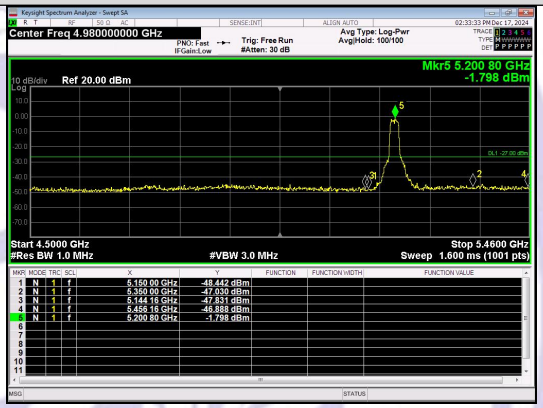
Out Of Band Emission
IEEE 802.11a_Channel 36_20MHz_Antenna 0



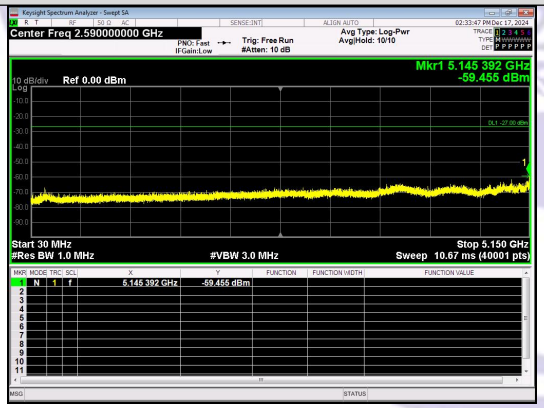
Spurious Emission:30.0~5150 MHz
IEEE 802.11a_Channel 36_20MHz_Antenna 0



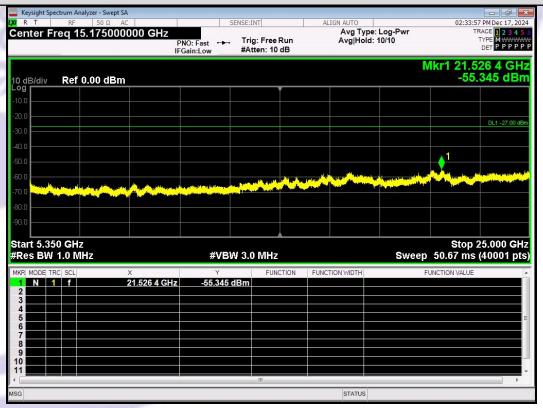
Spurious Emission:5350~25000.0 MHz
IEEE 802.11a_Channel 36_20MHz_Antenna 0



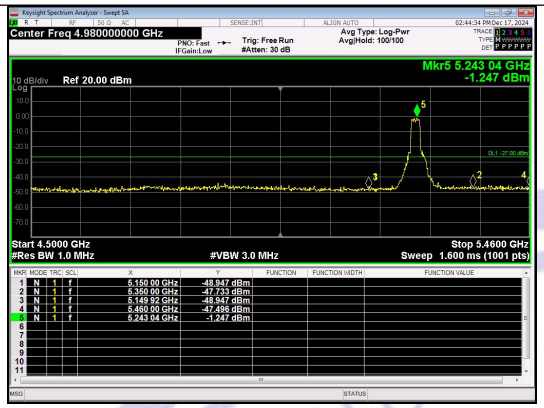
Out Of Band Emission
IEEE 802.11a_Channel 40_20MHz_Antenna 0



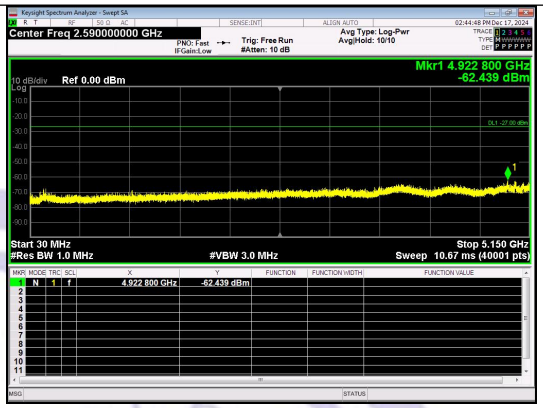
Spurious Emission:30.0~5150 MHz
IEEE 802.11a_Channel 40_20MHz_Antenna 0



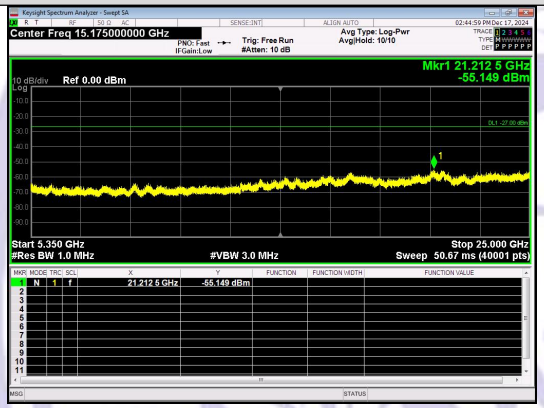
Spurious Emission:5350~25000.0 MHz
IEEE 802.11a_Channel 40_20MHz_Antenna 0



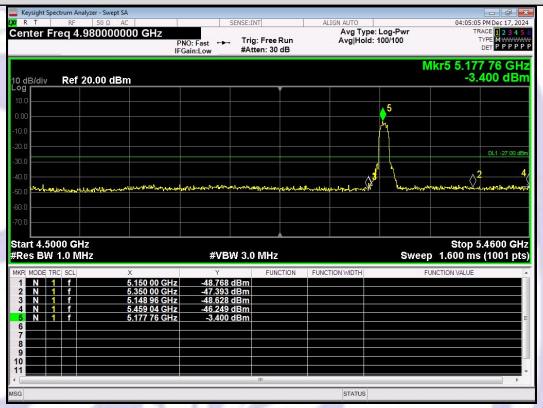
Out Of Band Emission
IEEE 802.11a_Channel 48_20MHz_Antenna 0



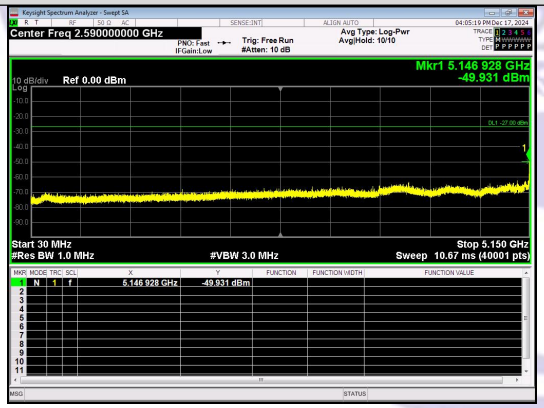
Spurious Emission:30.0~5150 MHz
IEEE 802.11a_Channel 48_20MHz_Antenna 0



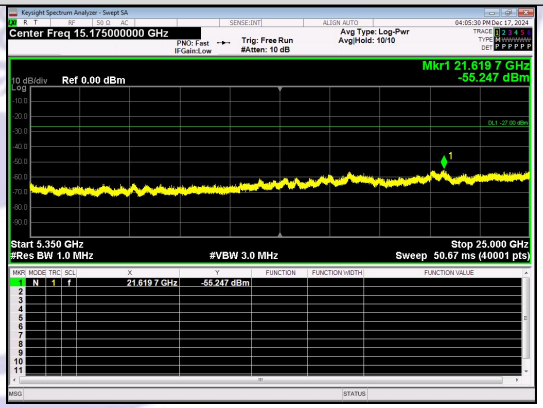
Spurious Emission:5350~25000.0 MHz
IEEE 802.11a_Channel 48_20MHz_Antenna 0



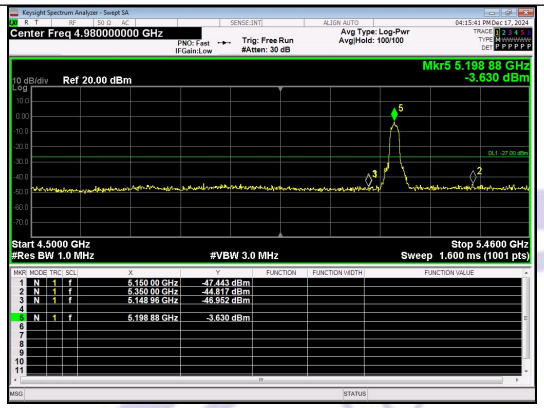
Out Of Band Emission
IEEE 802.11n_Channel 36_20MHz_Antenna 0



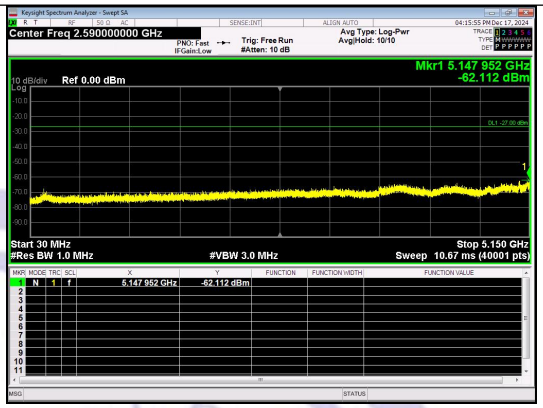
Spurious Emission:30.0~5150 MHz
IEEE 802.11n_Channel 36_20MHz_Antenna 0



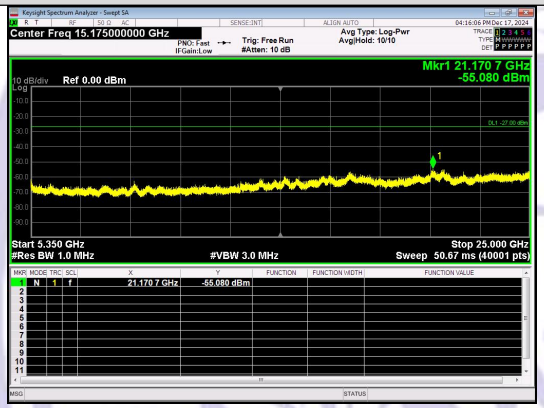
Spurious Emission:5350~25000.0 MHz
IEEE 802.11n_Channel 36_20MHz_Antenna 0



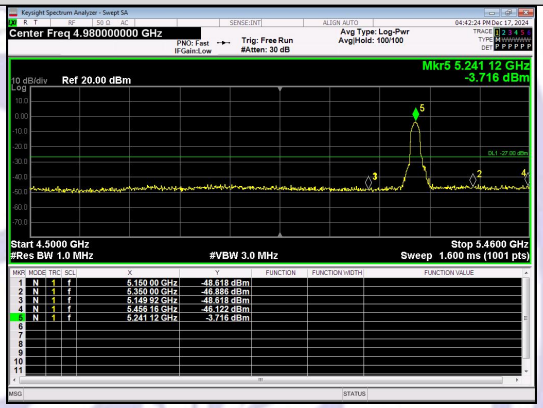
Out Of Band Emission
IEEE 802.11n_Channel 40_20MHz_Antenna 0



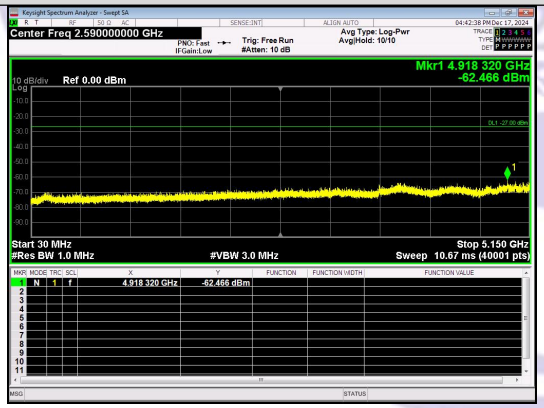
Spurious Emission:30.0~5150 MHz
IEEE 802.11n_Channel 40_20MHz_Antenna 0



Spurious Emission:5350~25000.0 MHz
IEEE 802.11n_Channel 40_20MHz_Antenna 0



Out Of Band Emission
IEEE 802.11n_Channel 48_20MHz_Antenna 0



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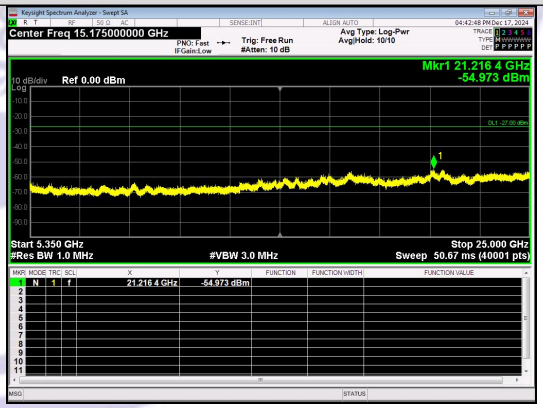
IEEE 802.11n_Channel 48_20MHz_Antenna 0



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IEEE 802.11n_Channel 48_20MHz_Antenna 0