5.8 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

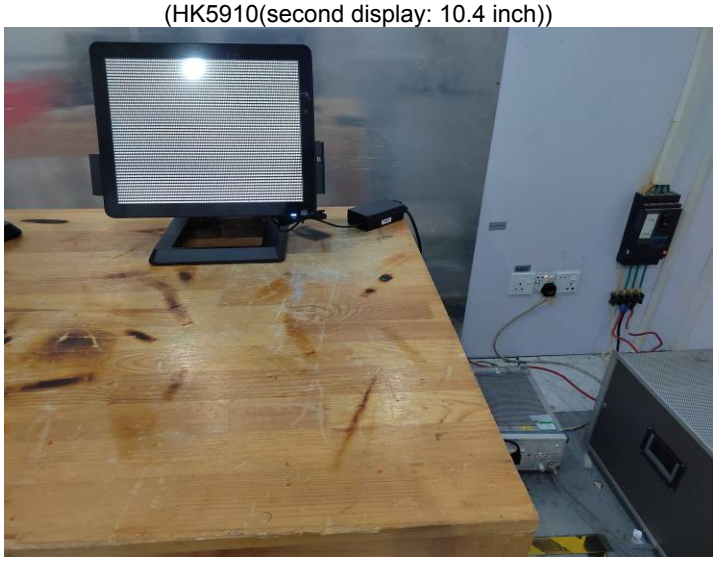
Test Result:

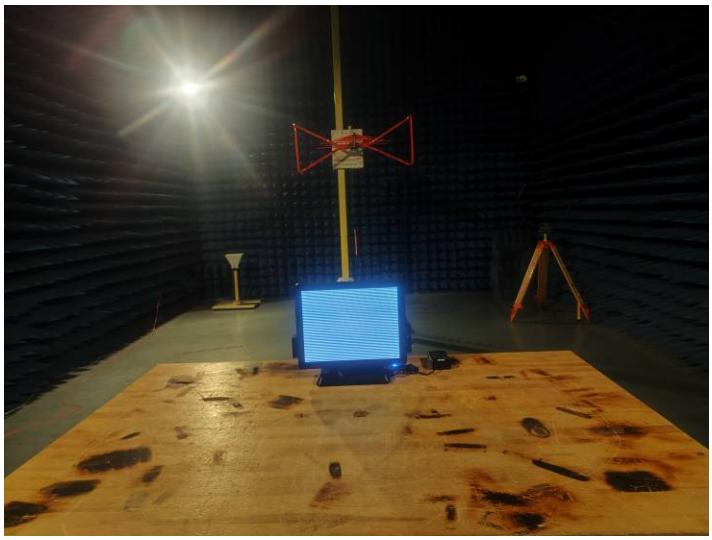
The directional gains of antenna used for transmitting is Antenna A: 5.4dBi(MAIN), Antenna B:5.2dBi(AUX), and the antenna is an Intergral Antenna and no consideration of replacement. Please see EUT photo for details.

Results: Compliance.

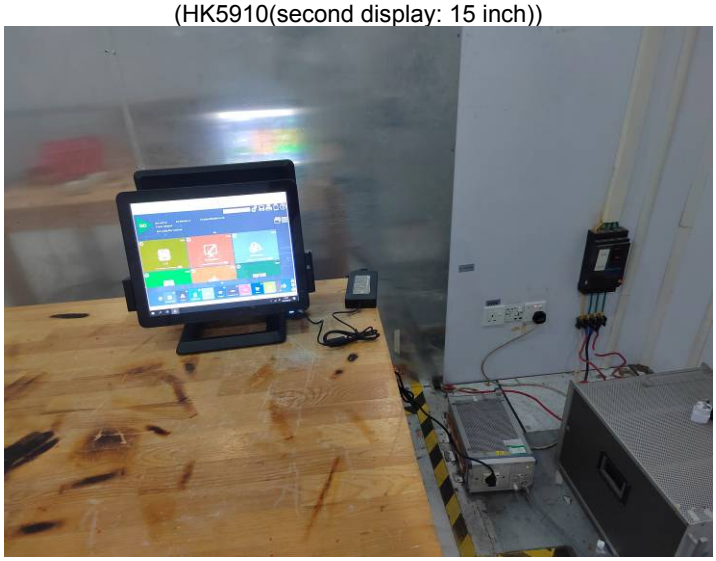
6 Test Setup Photos of the EUT

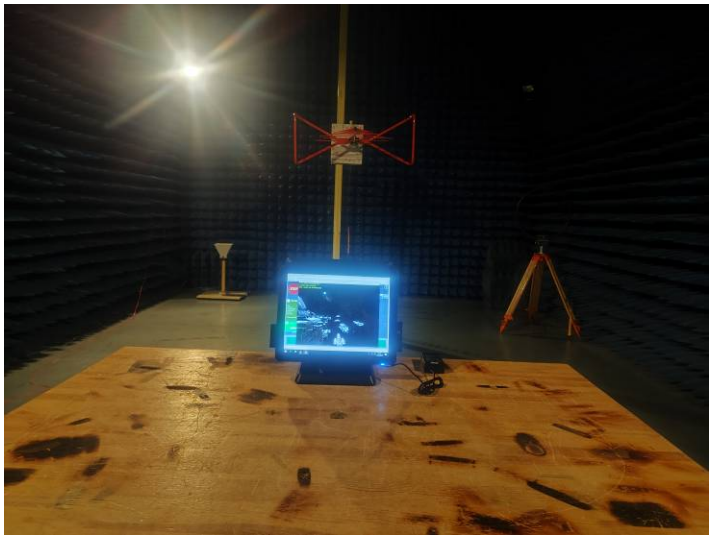
(HK5910(second display: 10.4 inch))

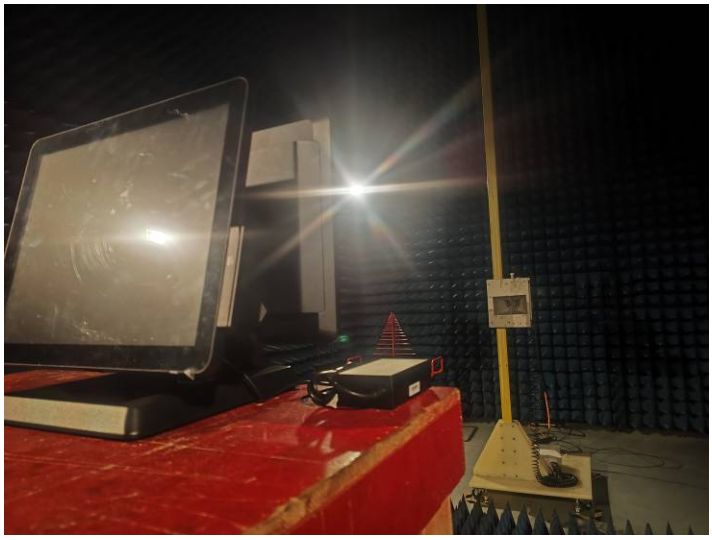




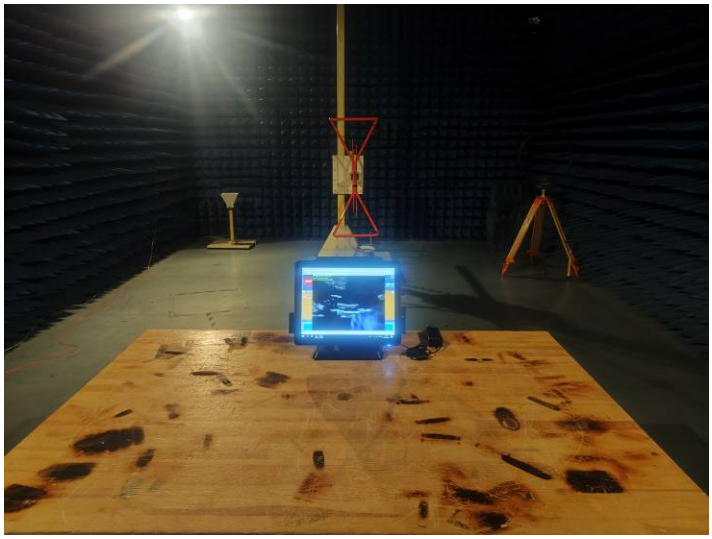
(HK5910(second display: 15 inch))







(HK5910(second display: VFD))



7 Photos of the EUT

See related photo report.

APPENDIX I.Conducted Peak Output Power

Antenna A:

Test Result

Conducted peak output power

Mode	Channel	Ant. 0 (dBm)	Ant. 1 (dBm)	Ant. 2 (dBm)	Ant. 3 (dBm)	Total (dBm)	Limit (dBm)	Result
IEEE 802.11b	1	19.13				N/A	30	PASS
	6	19.02				N/A	30	PASS
	11	19.04				N/A	30	PASS
IEEE 802.11g	1	17.12				N/A	30	PASS
	6	22.10				N/A	30	PASS
	11	16.80				N/A	30	PASS
IEEE 802.11n_20	1	16.72				N/A	30	PASS
	6	21.53				N/A	30	PASS
	11	16.27				N/A	30	PASS
IEEE 802.11n_40	3	14.60				N/A	30	PASS
	6	21.23				N/A	30	PASS
	9	14.43				N/A	30	PASS

Antenna B:

Test Result

Conducted peak output power

Mode	Channel	Ant. 0 (dBm)	Ant. 1 (dBm)	Ant. 2 (dBm)	Ant. 3 (dBm)	Total (dBm)	Limit (dBm)	Result
IEEE 802.11b	1	20.17				N/A	30	PASS
	6	20.70				N/A	30	PASS
	11	19.06				N/A	30	PASS
IEEE 802.11g	1	22.16				N/A	30	PASS
	6	20.30				N/A	30	PASS
	11	17.61				N/A	30	PASS
IEEE 802.11n_20	1	18.43				N/A	30	PASS
	6	15.09				N/A	30	PASS
	11	15.78				N/A	30	PASS
IEEE 802.11n_40	3	16.69				N/A	30	PASS
	6	17.81				N/A	30	PASS
	9	16.12				N/A	30	PASS

Antenna A+ Antenna B:

Test Result

Conducted peak output power

Mode	Channel	Ant. 0 (dBm)	Ant. 1 (dBm)	Ant. 2 (dBm)	Ant. 3 (dBm)	Total (dBm)	Limit (dBm)	Result
IEEE 802.11n_20	1	19.20				N/A	30	PASS
	6	21.25				N/A	30	PASS
	11	18.63				N/A	30	PASS
IEEE 802.11n_40	3	20.30				N/A	30	PASS
	6	17.45				N/A	30	PASS
	9	18.25				N/A	30	PASS

APPENDIX II.99% Bandwidth

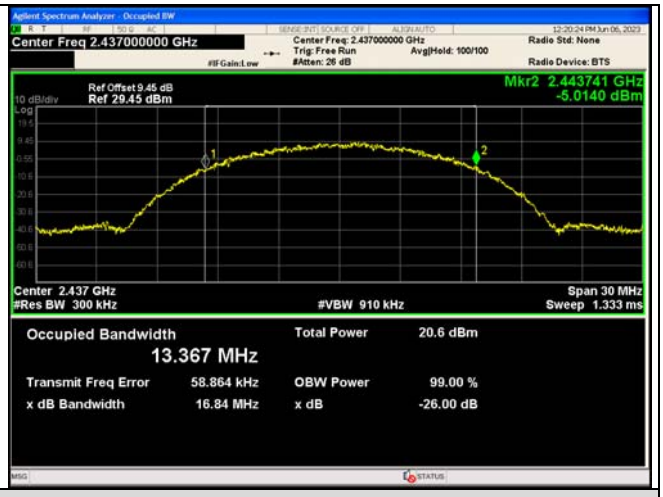
Antenna A:

Test Result

Mode	Channel	Ant.	99% BW (MHz)
IEEE 802.11b	1	0	13.324
	6		13.367
	11		13.339
IEEE 802.11g	1		16.510
	6		16.534
	11		16.537
IEEE 802.11n_20	1		17.646
	6		17.686
	11		17.661
IEEE 802.11n_40	3		36.073
	6		36.089
	9		36.058

Test Graphs

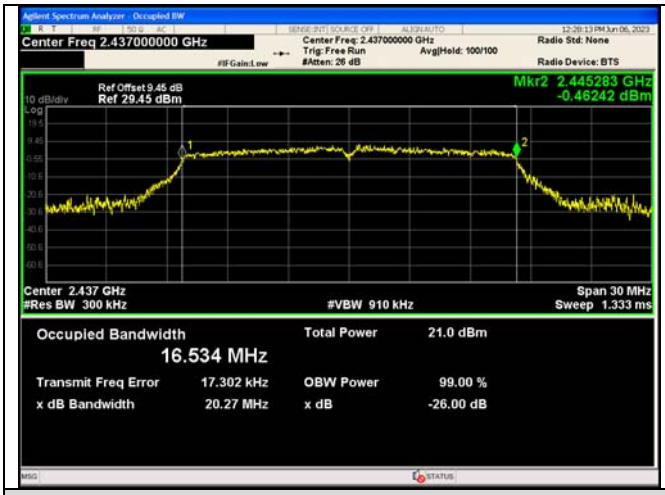
IEEE 802.11b_Channel 1_20MHz_Antenna 0



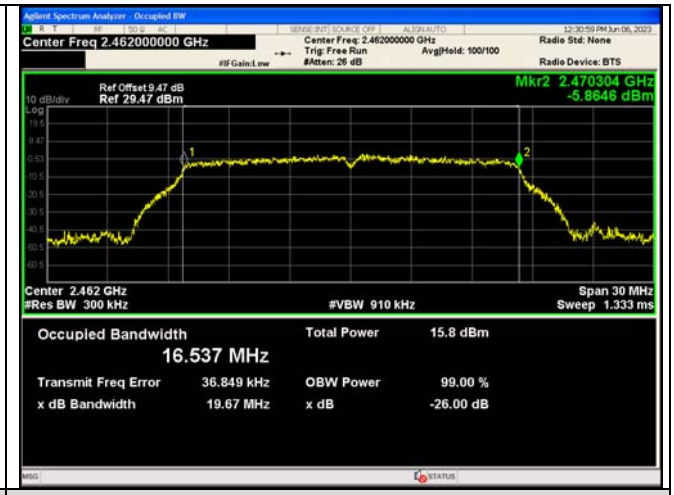
IEEE 802.11b_Channel 6_20MHz_Antenna 0

IEEE 802.11b_Channel 11_20MHz_Antenna 0

IEEE 802.11g_Channel 1_20MHz_Antenna 0



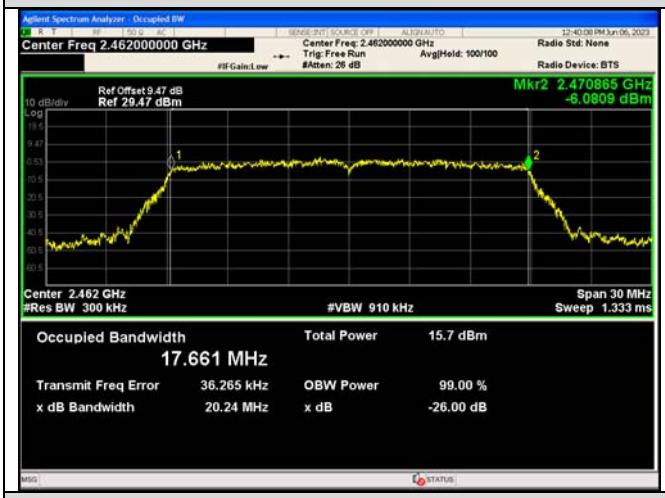
IEEE 802.11g_Channel 6_20MHz_Antenna 0



IEEE 802.11g_Channel 11_20MHz_Antenna 0

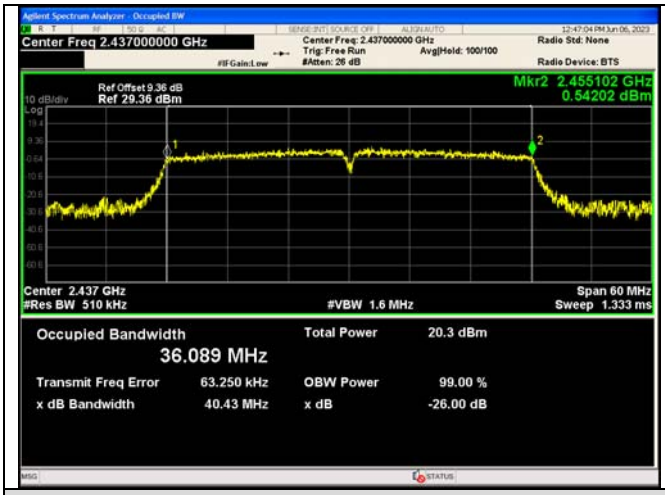
IEEE 802.11n_Channel 1_20MHz_Antenna 0

IEEE 802.11n_Channel 6_20MHz_Antenna 0



IEEE 802.11n_Channel 11_20MHz_Antenna 0

IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0

IEEE 802.11n_Channel 9_40MHz_Antenna 0

Antenna B:

Test Result

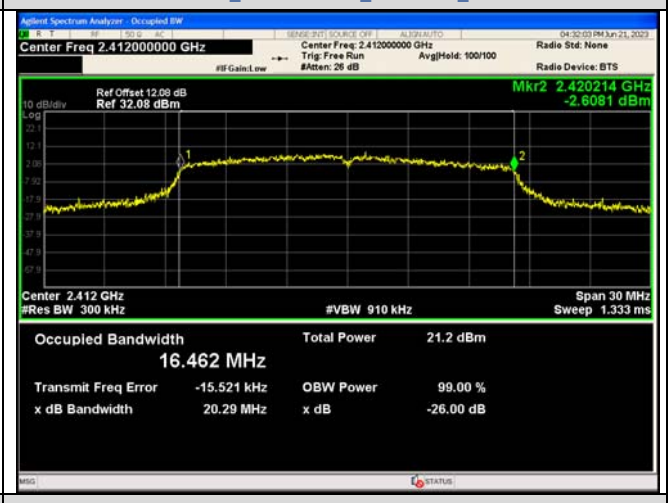
Mode	Channel	Ant.	99% BW (MHz)
IEEE 802.11b	1	0	12.211
	6		13.071
	11		13.064
IEEE 802.11g	1		16.462
	6		16.591
	11		16.333
IEEE 802.11n_20	1		17.382
	6		17.762
	11		17.205
IEEE 802.11n_40	3		35.829
	6		36.603
	9		34.671

Test Graphs

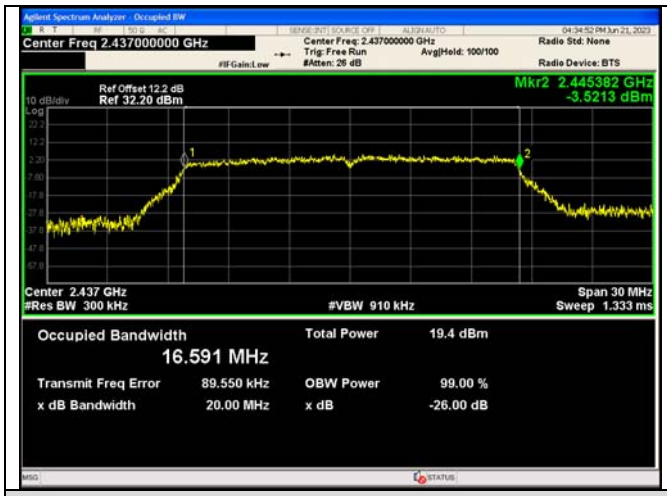
IEEE 802.11b_Channel 1_20MHz_Antenna 0

IEEE 802.11b_Channel 6_20MHz_Antenna 0

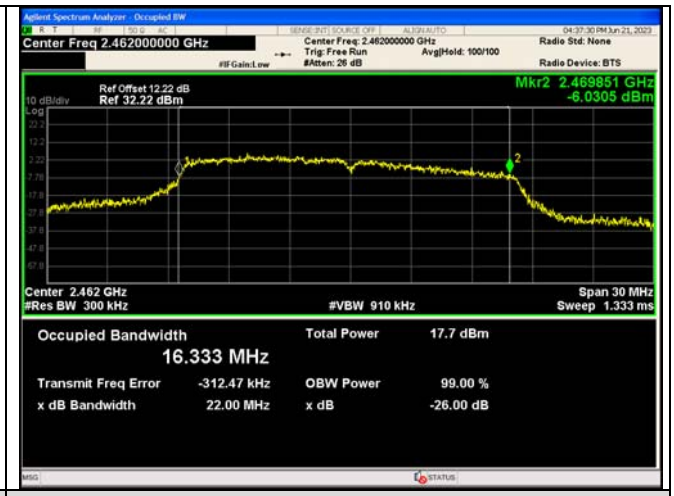
IEEE 802.11b_Channel 11_20MHz_Antenna 0



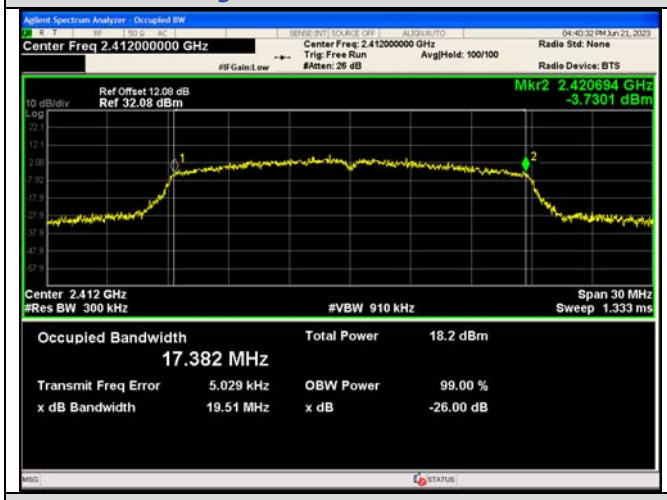
IEEE 802.11g_Channel 1_20MHz_Antenna 0



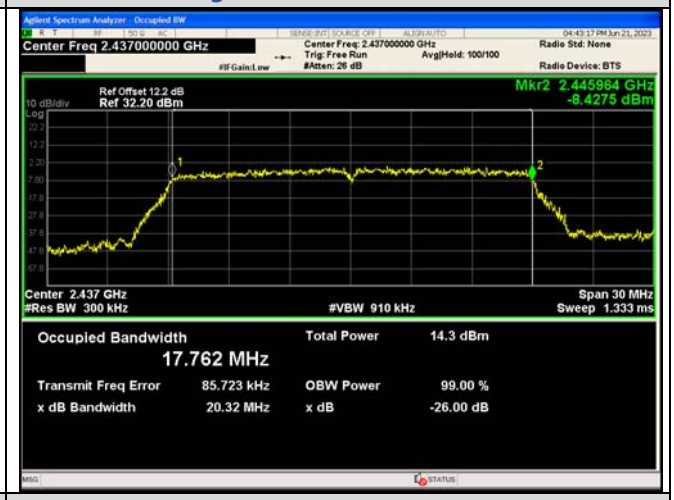
IEEE 802.11g_Channel 6_20MHz_Antenna 0



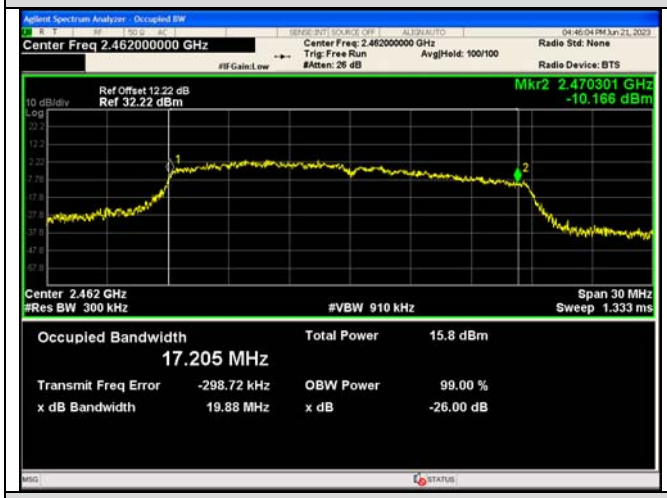
IEEE 802.11g_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 1_20MHz_Antenna 0

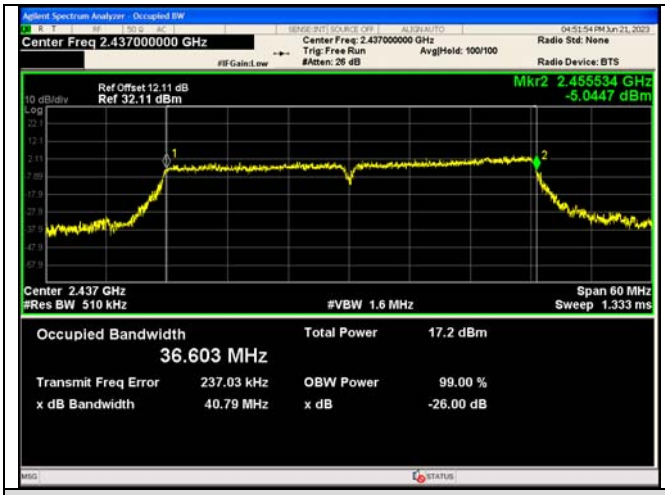


IEEE 802.11n_Channel 6_20MHz_Antenna 0

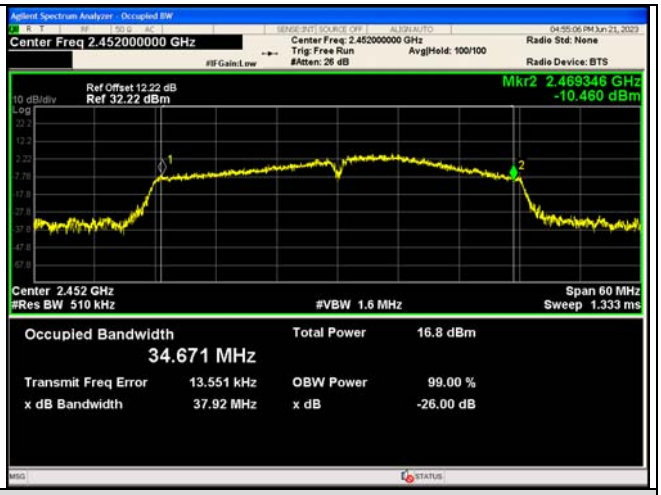


IEEE 802.11n_Channel 11_20MHz_Antenna 0

IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0



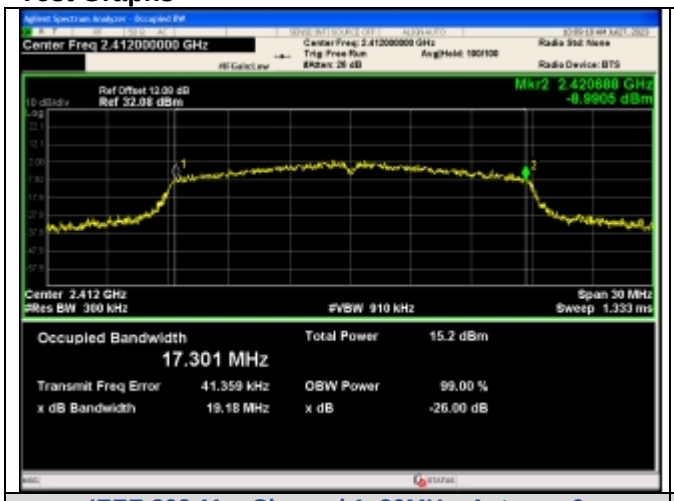
IEEE 802.11n_Channel 9_40MHz_Antenna 0

Antenna A+ Antenna B:

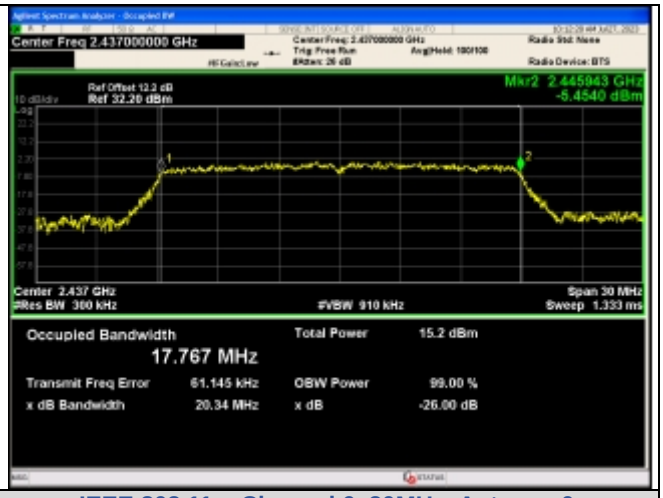
Test Result

Mode	Channel	Ant.	99% BW (MHz)
IEEE 802.11n_20	1	0	17.301
	6		17.767
	11		17.280
IEEE 802.11n_40	3		35.612
	6		37.002
	9		34.792

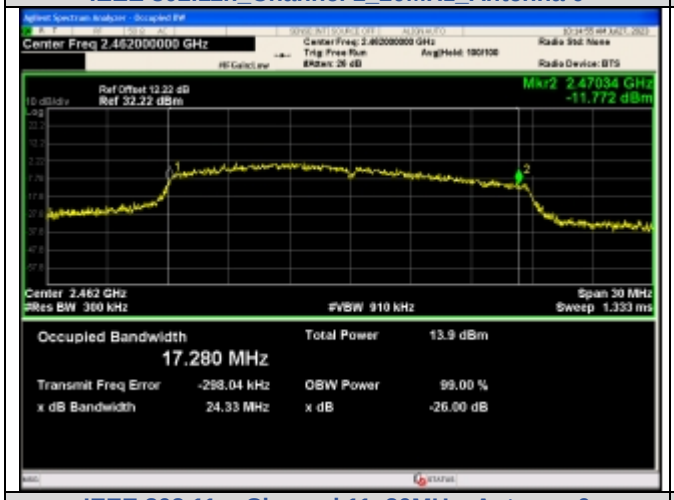
Test Graphs



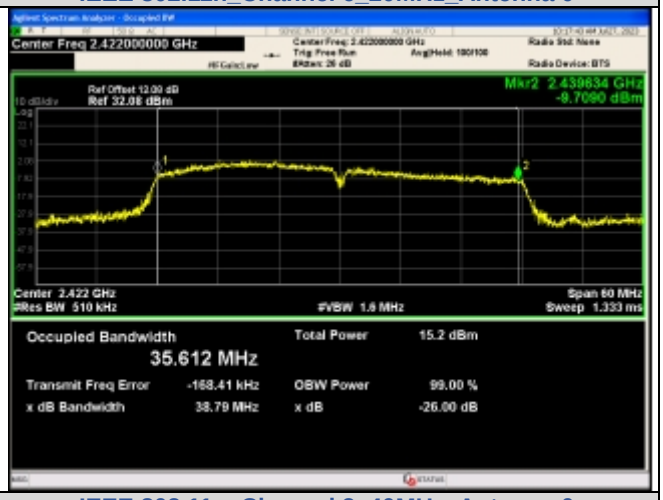
IEEE 802.11n_Channel 1_20MHz_Antenna 0



IEEE 802.11n_Channel 6_20MHz_Antenna 0

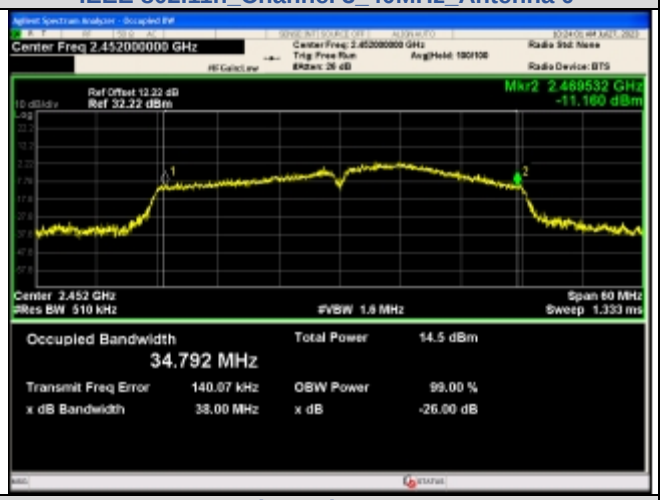


IEEE 802.11n_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 3_40MHz_Antenna 0

IEEE 802.11n_Channel 6_40MHz_Antenna 0



IEEE 802.11n_Channel 9_40MHz_Antenna 0

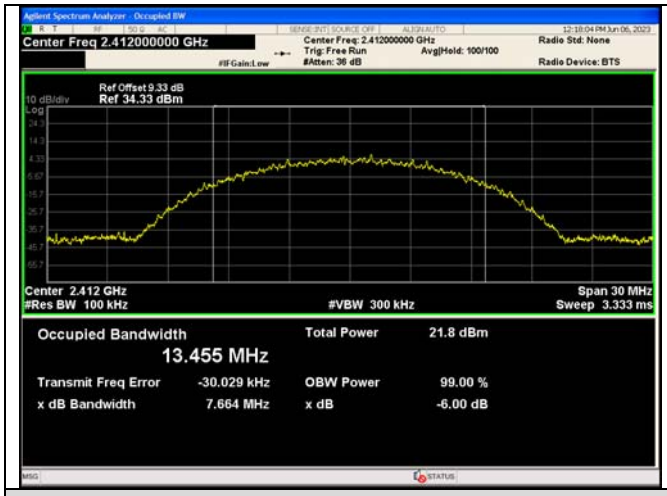
APPENDIX III.6dB Bandwidth

Antenna A:

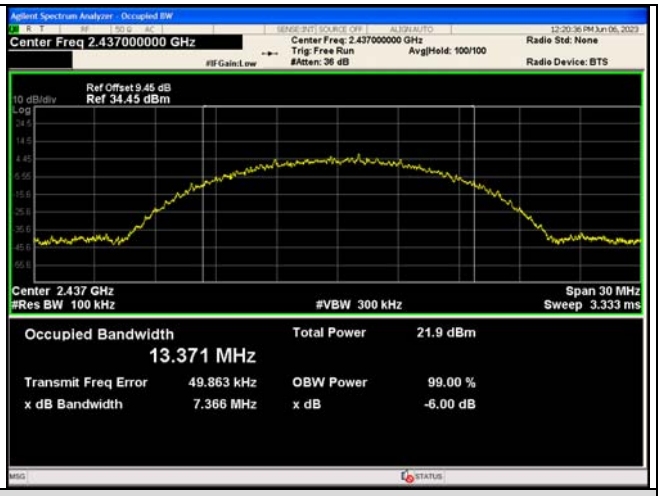
Test Result

Mode	Channel	Ant.	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11b	1	0	2412	7.664	0.5	PASS
	6		2437	7.366		PASS
	11		2462	8.326		PASS
IEEE 802.11g	1		2412	15.94		PASS
	6		2437	16.08		PASS
	11		2462	15.75		PASS
IEEE 802.11n_20	1		2412	16.62		PASS
	6		2437	16.02		PASS
	11		2462	16.03		PASS
IEEE 802.11n_40	3		2422	35.36		PASS
	6		2437	35.12		PASS
	9		2452	35.12		PASS

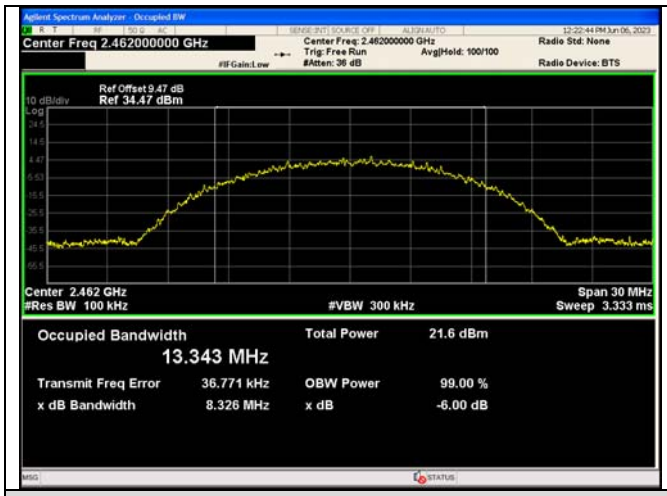
Test Graphs



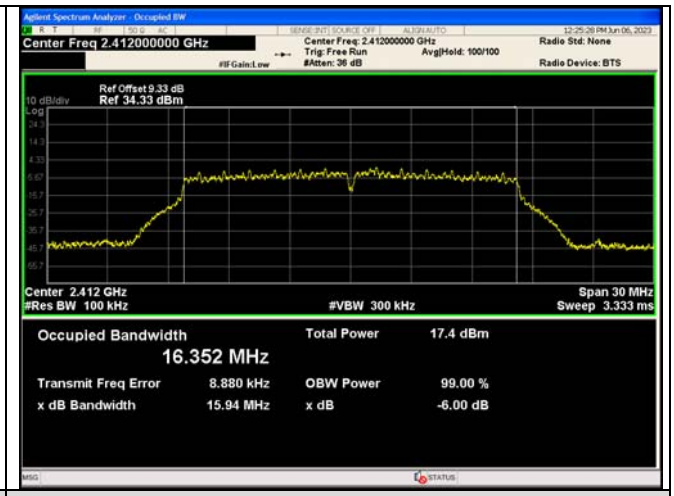
IEEE 802.11b_Channel 1_20MHz_Antenna 0



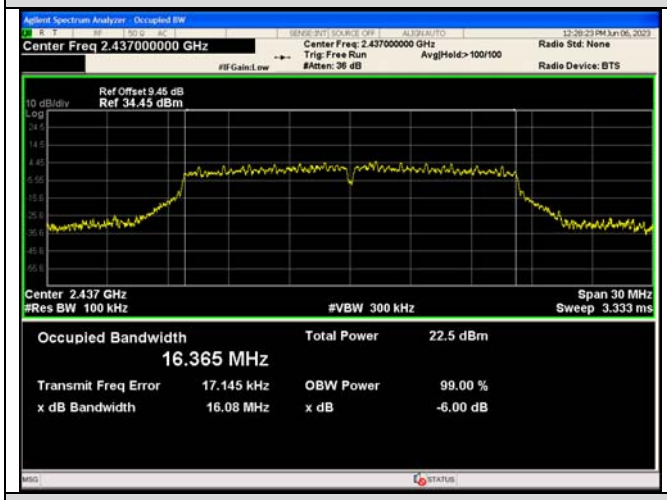
IEEE 802.11b_Channel 6_20MHz_Antenna 0



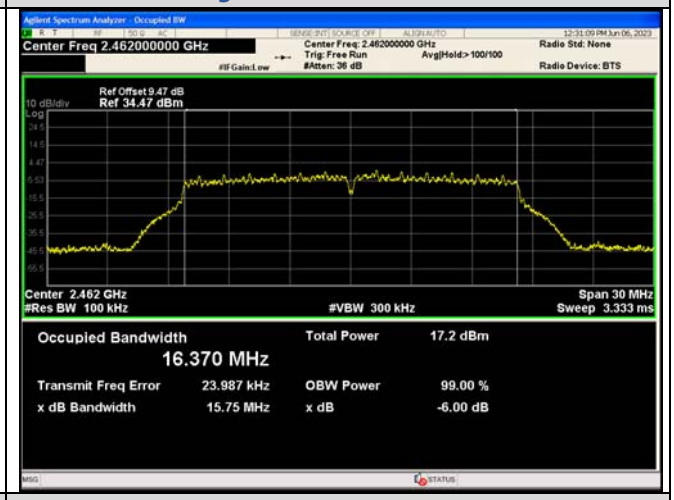
IEEE 802.11b_Channel 11_20MHz_Antenna 0



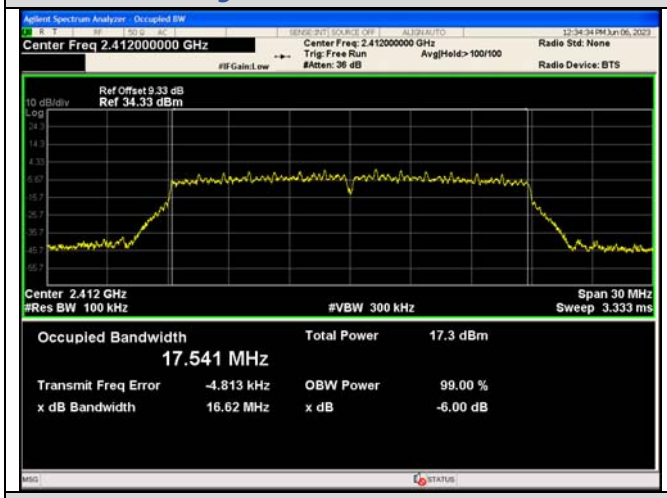
IEEE 802.11g_Channel 1_20MHz_Antenna 0



IEEE 802.11g_Channel 6_20MHz_Antenna 0

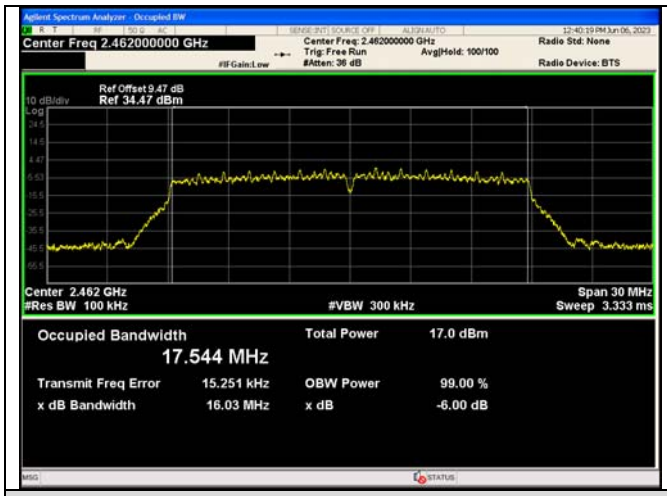


IEEE 802.11g_Channel 11_20MHz_Antenna 0

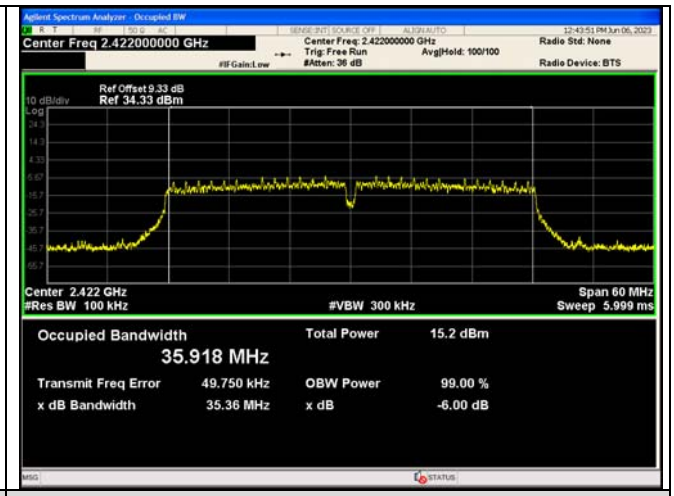


IEEE 802.11n_Channel 1_20MHz_Antenna 0

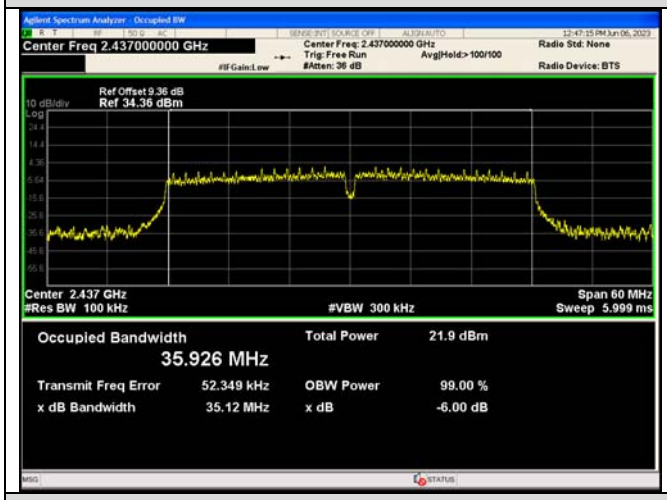
IEEE 802.11n_Channel 6_20MHz_Antenna 0



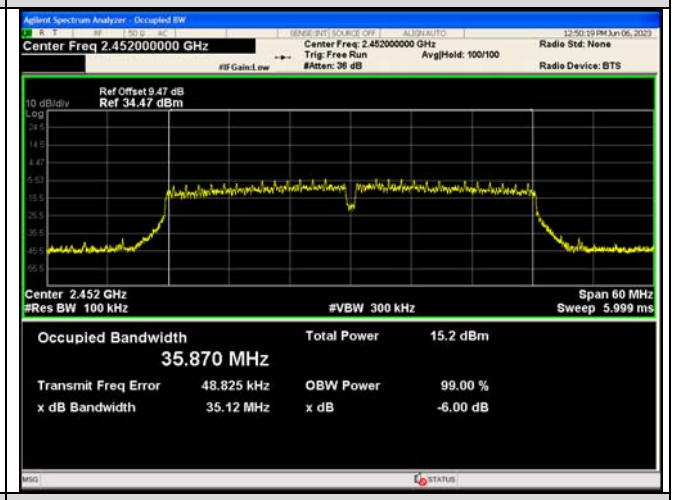
IEEE 802.11n_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0



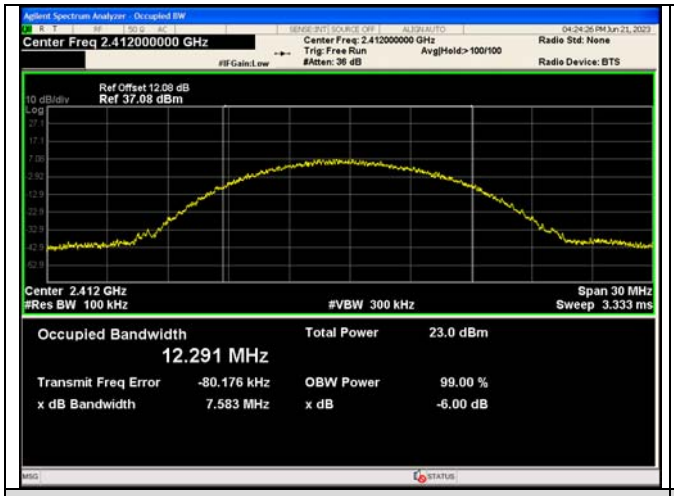
IEEE 802.11n_Channel 9_40MHz_Antenna 0

Antenna B:

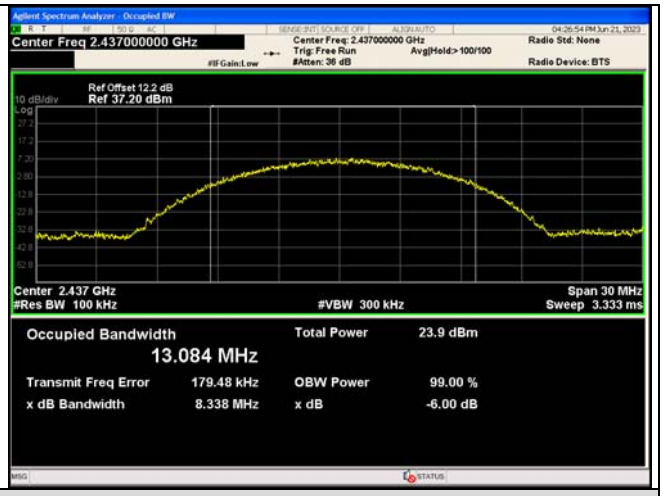
Test Result

Mode	Channel	Ant.	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11b	1	0	2412	7.583	0.5	PASS
	6		2437	8.338		PASS
	11		2462	8.348		PASS
IEEE 802.11g	1		2412	15.27		PASS
	6		2437	16.09		PASS
	11		2462	11.93		PASS
IEEE 802.11n_20	1		2412	13.82		PASS
	6		2437	16.95		PASS
	11		2462	12.57		PASS
IEEE 802.11n_40	3		2422	25.07		PASS
	6		2437	35.78		PASS
	9		2452	16.34		PASS

Test Graphs

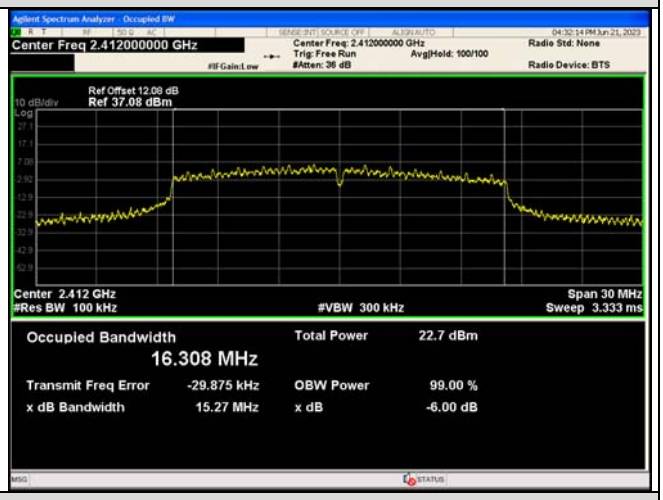


IEEE 802.11b_Channel 1_20MHz_Antenna 0

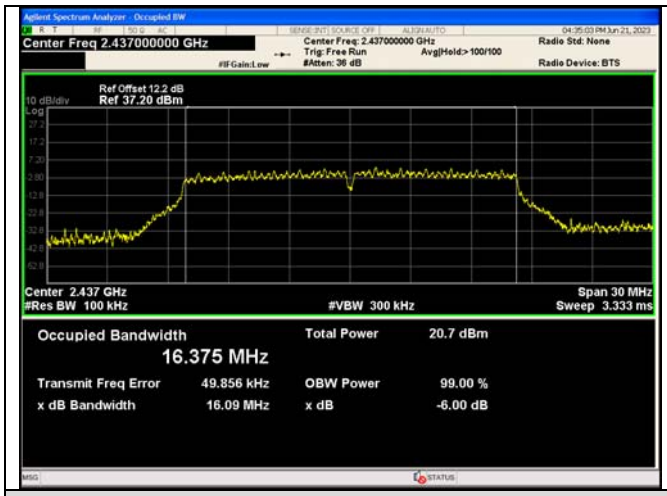


IEEE 802.11b_Channel 6_20MHz_Antenna 0

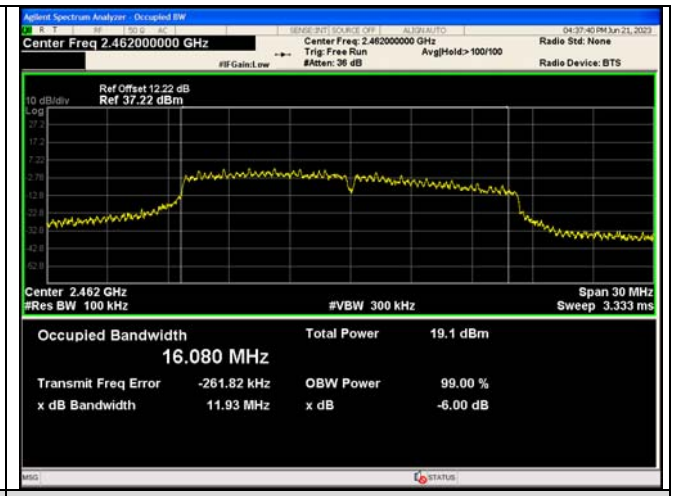
IEEE 802.11b_Channel 11_20MHz_Antenna 0



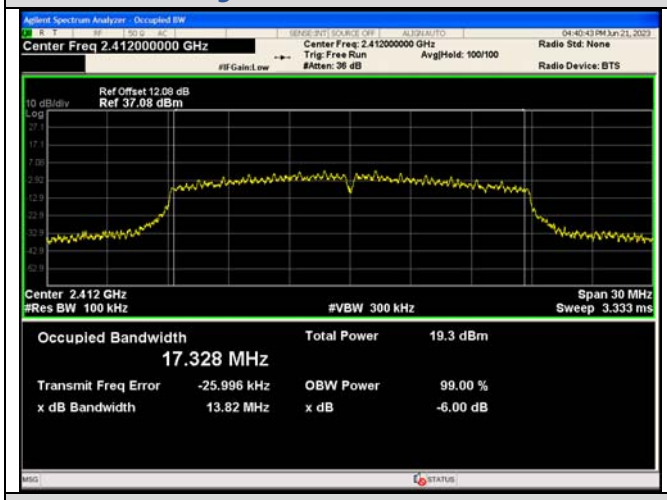
IEEE 802.11g_Channel 1_20MHz_Antenna 0



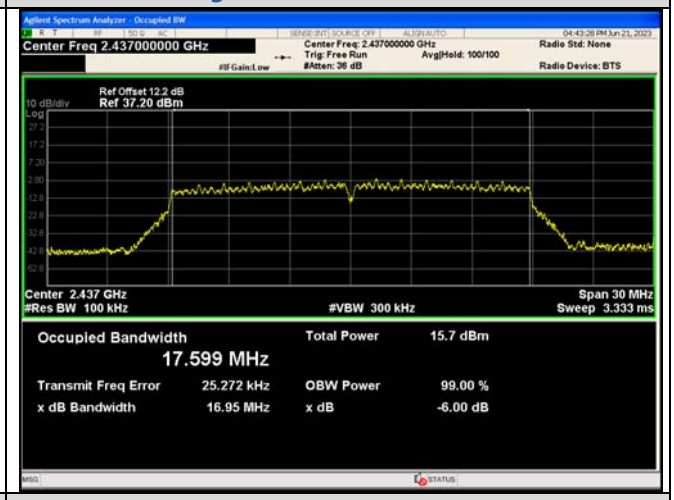
IEEE 802.11g_Channel 6_20MHz_Antenna 0



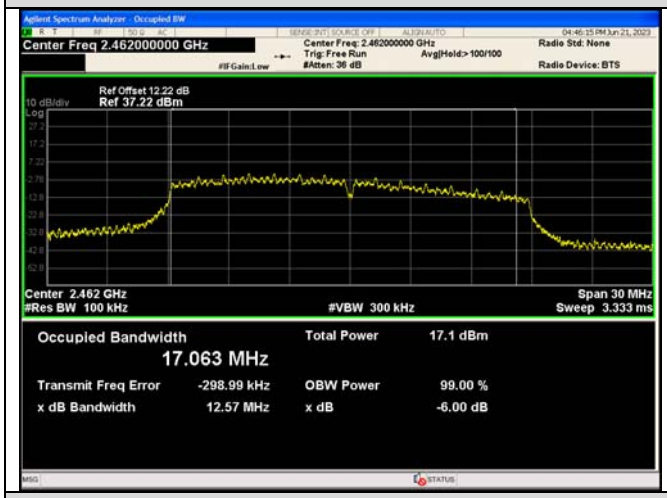
IEEE 802.11g_Channel 11_20MHz_Antenna 0



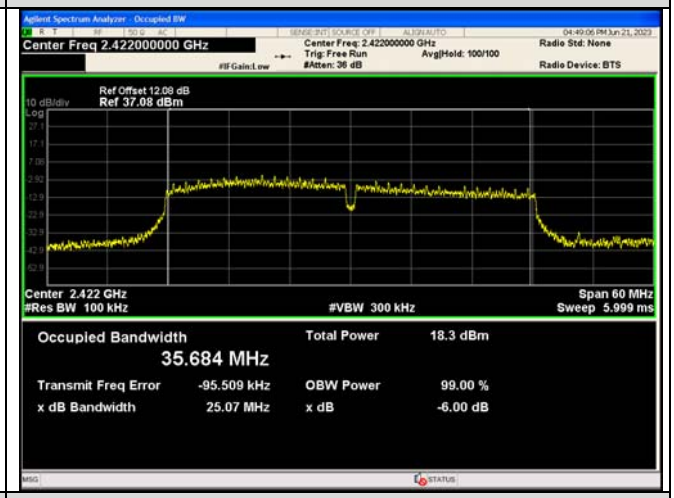
IEEE 802.11n_Channel 1_20MHz_Antenna 0



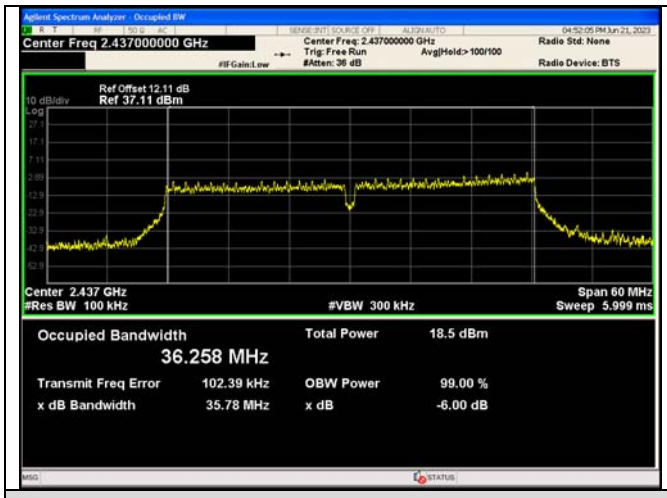
IEEE 802.11n_Channel 6_20MHz_Antenna 0



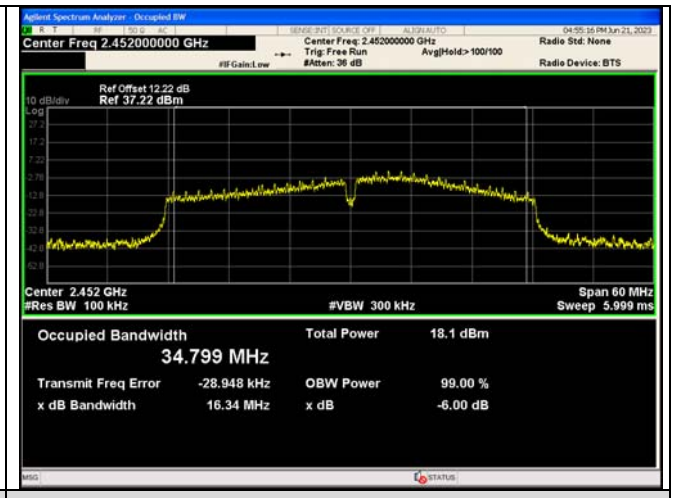
IEEE 802.11n_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0



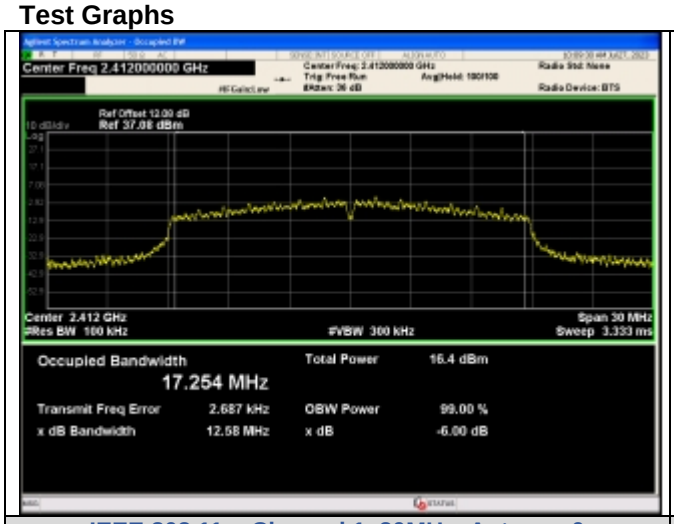
IEEE 802.11n_Channel 9_40MHz_Antenna 0

Antenna A+ Antenna B:

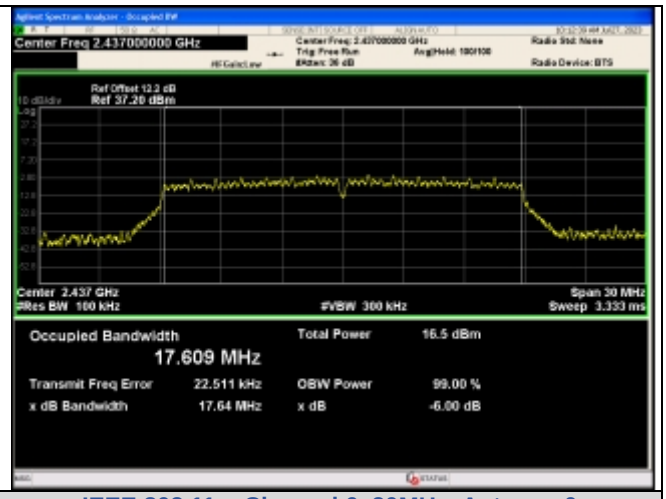
Test Result

Mode	Channel	Ant.	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11n_20	1	0	2412	12.58	0.5	PASS
	6		2437	17.64		PASS
	11		2462	10.69		PASS
IEEE 802.11n_40	3		2422	22.49		PASS
	6		2437	35.79		PASS
	9		2452	13.86		PASS

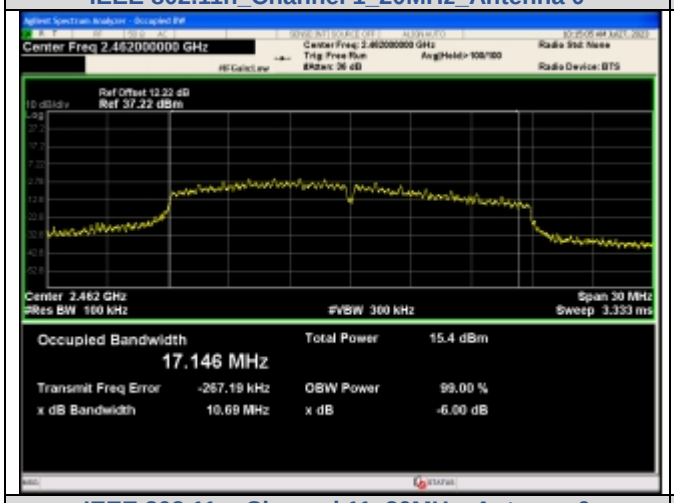
Test Graphs



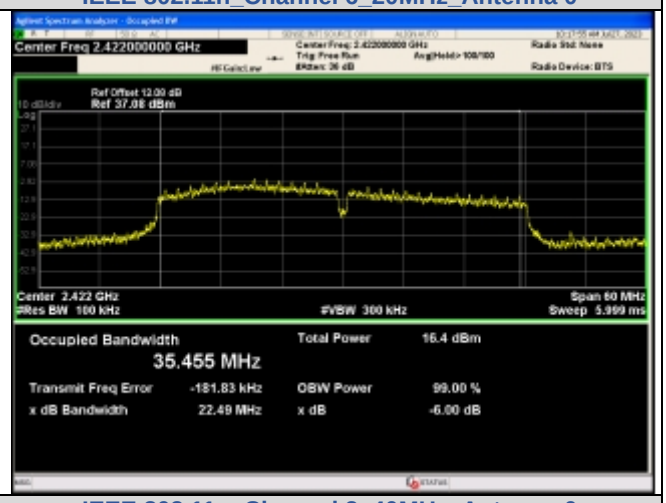
IEEE 802.11n_Channel 1_20MHz_Antenna 0



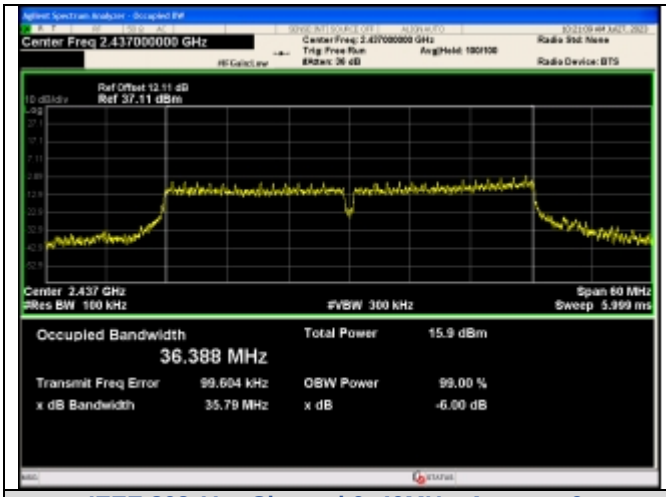
IEEE 802.11n_Channel 6_20MHz_Antenna 0



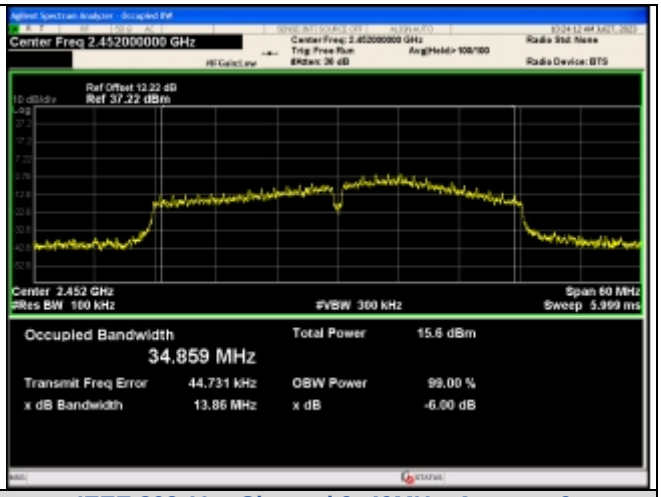
IEEE 802.11n_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0



IEEE 802.11n_Channel 9_40MHz_Antenna 0

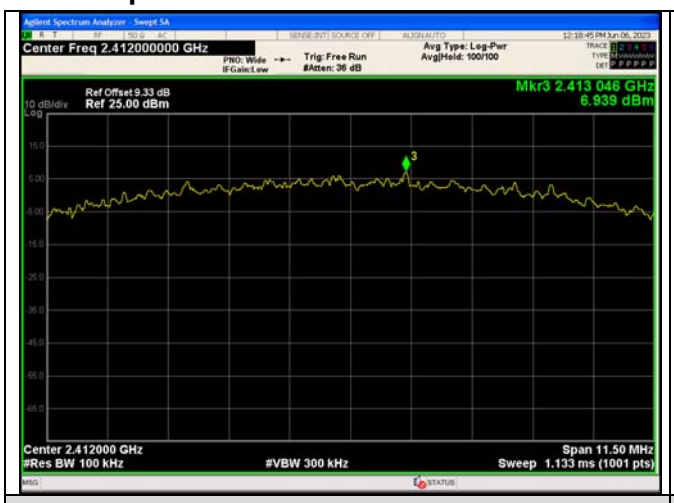
APPENDIX IV.Conducted Out Of Band Emission

Antenna A:

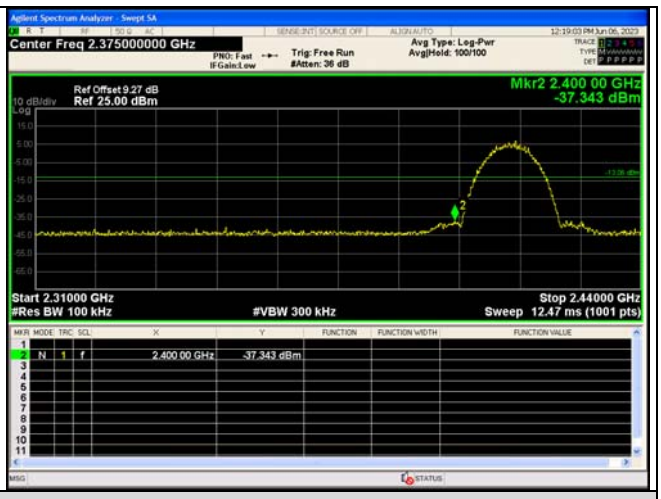
Test Result

Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11b	1	0	2400.00	-37.343	-13.06	-24	PASS
			24969.4	-37.800	-13.06	-24.740	PASS
	6		24925.7	-37.100	-12.73	-24.370	PASS
	11		2483.50	-42.380	-12.98	-29	PASS
			24896.4	-37.518	-12.98	-24.538	PASS
IEEE 802.11g	1		2400.00	-39.920	-19.72	-20	PASS
			24965.7	-37.842	-19.72	-18.122	PASS
	6		24923.8	-37.556	-14.65	-22.907	PASS
	11		2483.50	-43.789	-19.61	-24	PASS
			24940.1	-36.791	-19.61	-17.181	PASS
IEEE 802.11n_20	1		2400.00	-41.040	-19.73	-21.310	PASS
			2396.97	-40.169	-19.73	-20.439	PASS
			24972.5	-36.166	-19.73	-16.436	PASS
	6		24892.6	-37.179	-14.67	-22.509	PASS
	11		2483.50	-43.815	-19.88	-24	PASS
			24569.9	-36.831	-19.88	-16.951	PASS
IEEE 802.11n_40	3		2400.00	-44.305	-24.68	-19.625	PASS
			2395.80	-39.736	-24.68	-15.056	PASS
			24855.8	-37.519	-24.68	-12.839	PASS
	6		24944.4	-37.334	-17.63	-19.704	PASS
	9		2483.50	-42.230	-24.53	-18	PASS
			24963.8	-37.607	-24.53	-13.077	PASS

Test Graphs

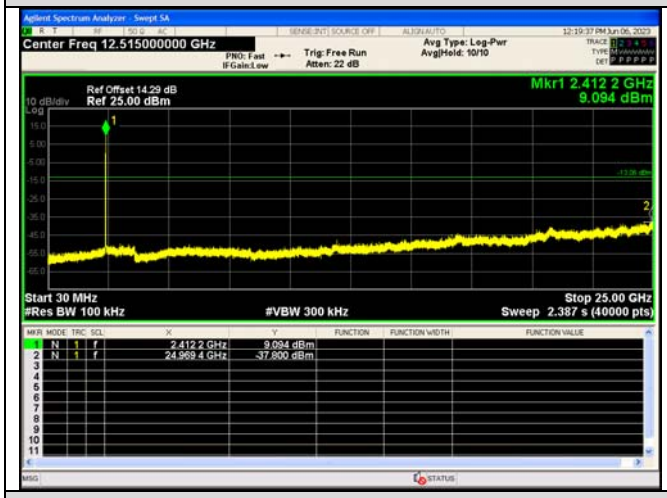


In-Band Reference Level



Out Of Band Emission

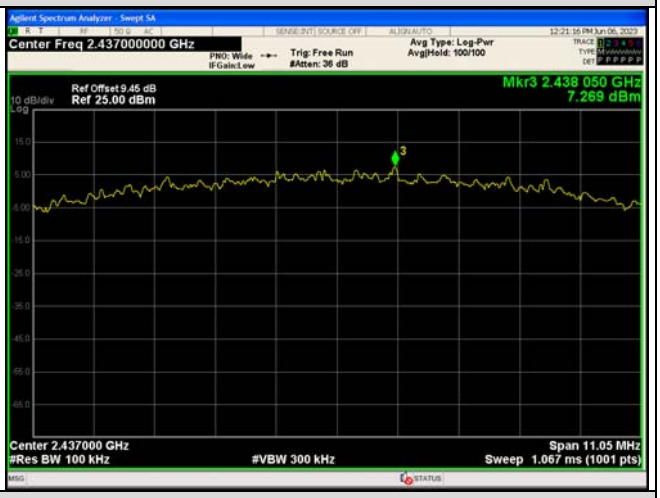
IEEE 802.11b_Channel 1_20MHz_Antenna 0



Spurious Emission

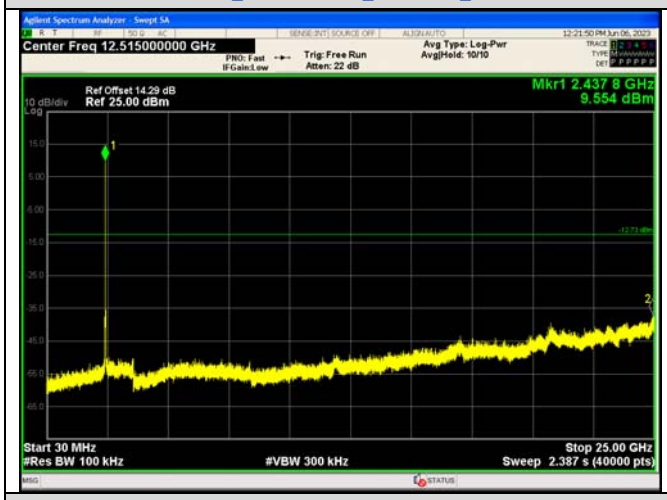
IEEE 802.11b_Channel 1_20MHz_Antenna 0

IEEE 802.11b_Channel 1_20MHz_Antenna 0



In-Band Reference Level

IEEE 802.11b_Channel 6_20MHz_Antenna 0

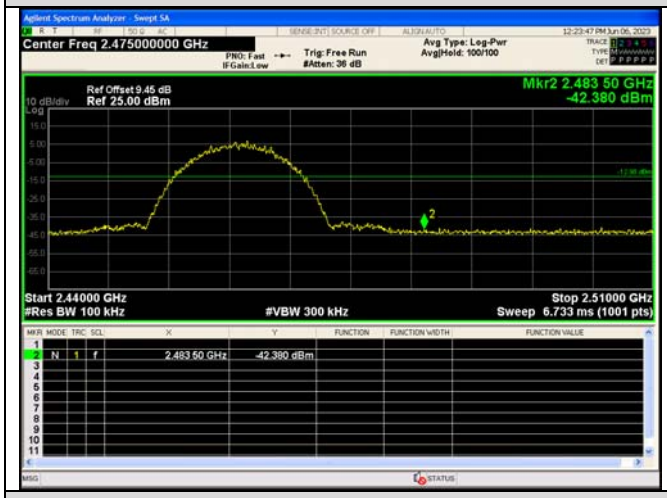


Spurious Emissions

IEEE 802.11b_Channel 6_20MHz_Antenna 0

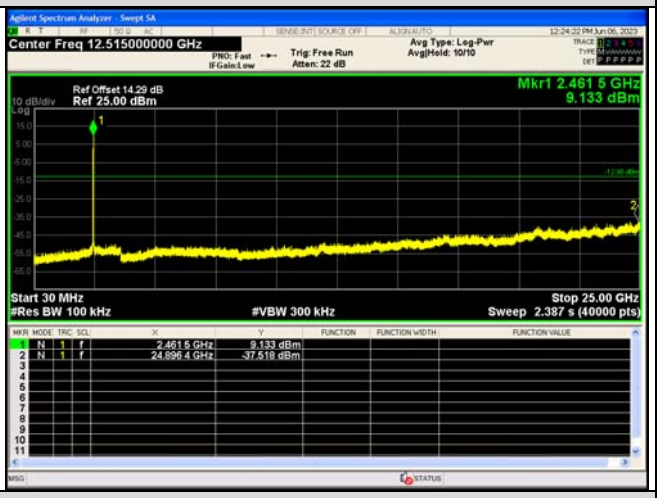
In-Band Reference Level

IEEE 802.11b_Channel 11_20MHz_Antenna 0



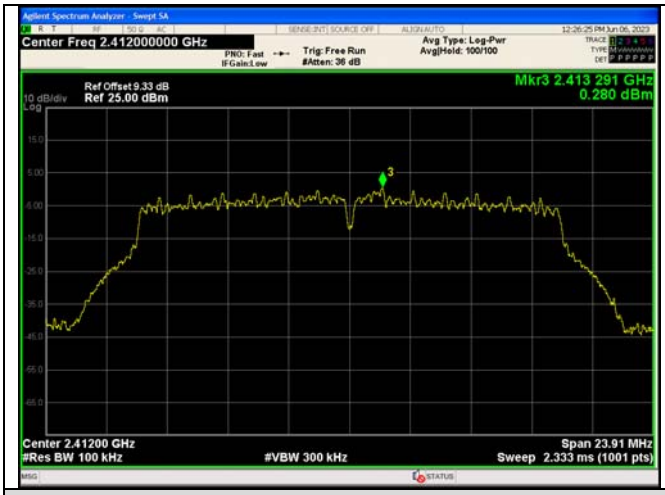
Out Of Band Emission

IEEE 802.11b_Channel 11_20MHz_Antenna 0



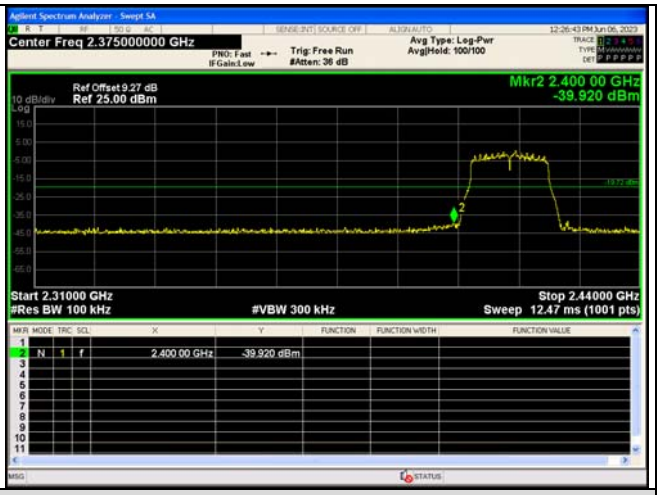
Spurious Emission

IEEE 802.11b_Channel 11_20MHz_Antenna 0



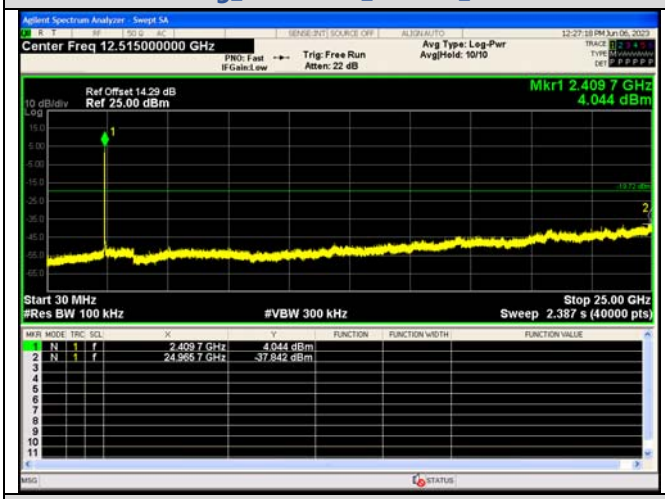
In-Band Reference Level

IEEE 802.11g_Channel 1_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11g_Channel 1_20MHz_Antenna 0

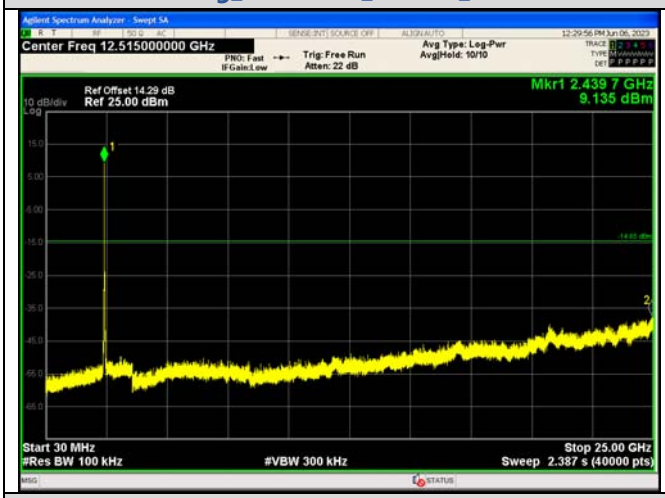


Spurious Emission

IEEE 802.11g_Channel 1_20MHz_Antenna 0

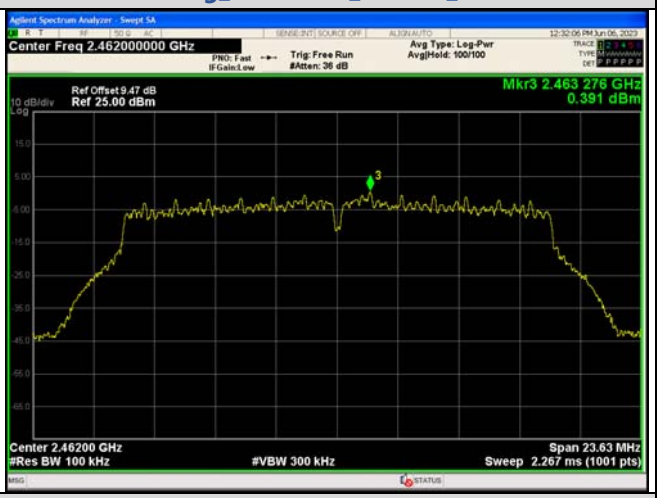
In-Band Reference Level

IEEE 802.11g_Channel 6_20MHz_Antenna 0



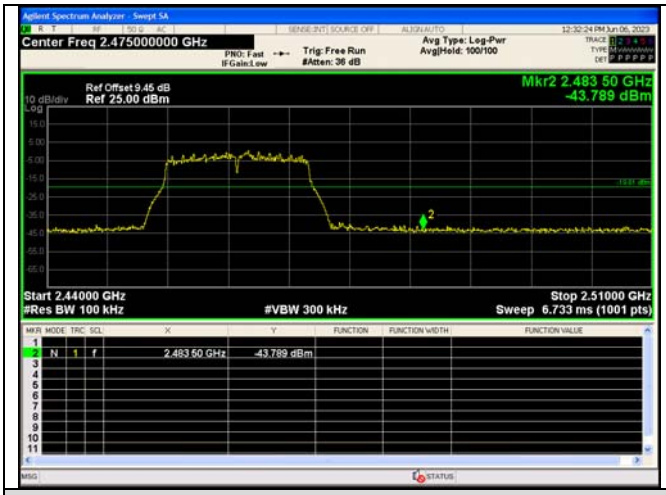
Spurious Emissions

IEEE 802.11g_Channel 6_20MHz_Antenna 0



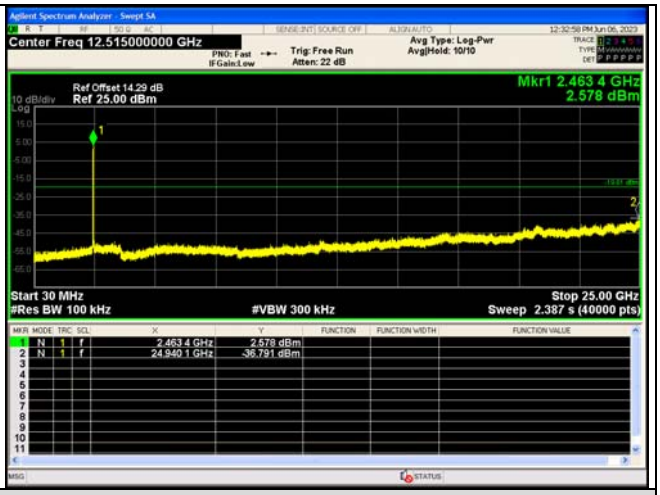
In-Band Reference Level

IEEE 802.11g_Channel 11_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11g_Channel 11_20MHz_Antenna 0

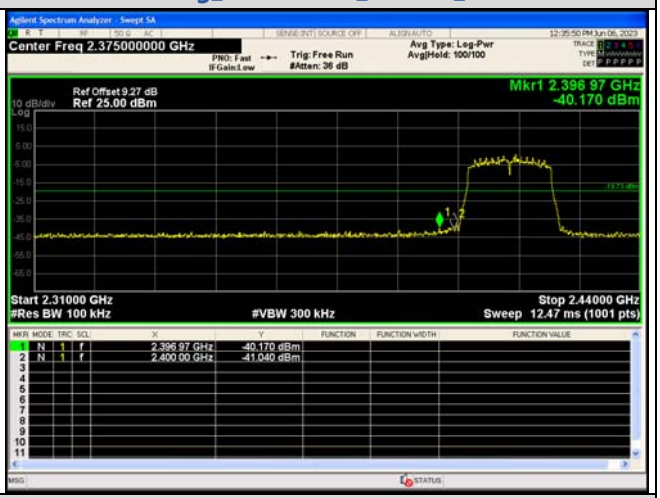


Spurious Emission

IEEE 802.11g_Channel 11_20MHz_Antenna 0

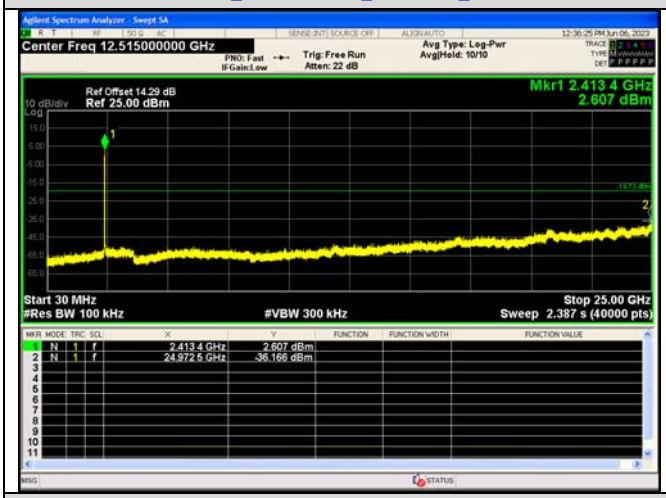
In-Band Reference Level

IEEE 802.11n_Channel 1_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11n_Channel 1_20MHz_Antenna 0

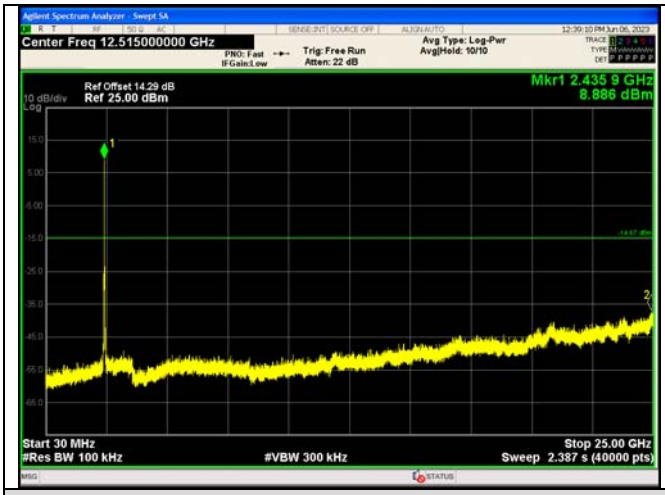


Spurious Emission

IEEE 802.11n_Channel 1_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11n_Channel 6_20MHz_Antenna 0



Spurious Emissions

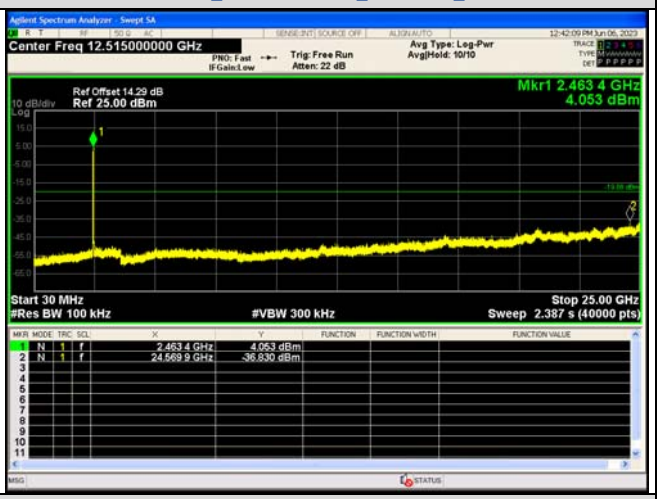
IEEE 802.11n_Channel 6_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11n_Channel 11_20MHz_Antenna 0

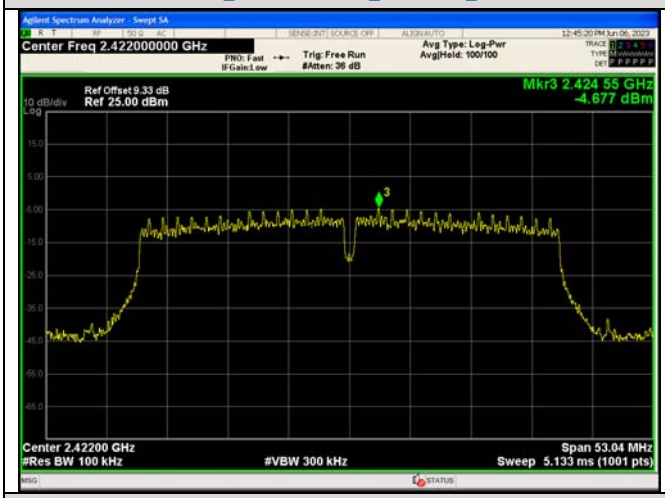
Out Of Band Emission

IEEE 802.11n_Channel 11_20MHz_Antenna 0



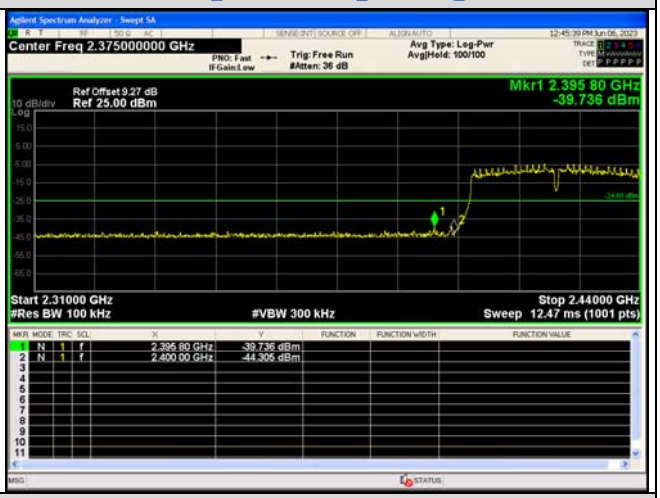
Spurious Emission

IEEE 802.11n_Channel 11_20MHz_Antenna 0



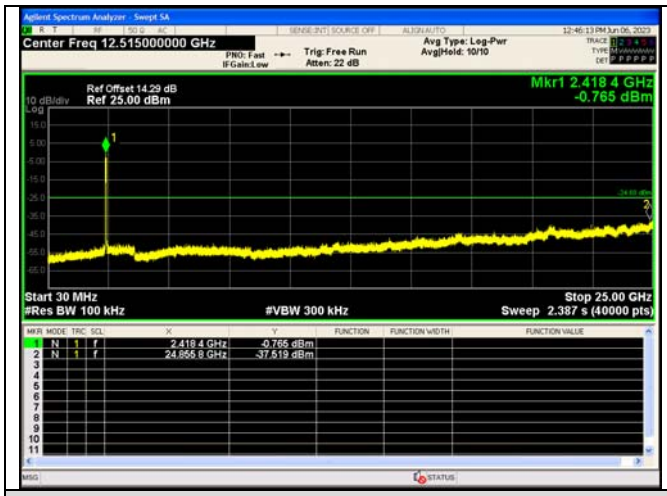
In-Band Reference Level

IEEE 802.11n_Channel 3_40MHz_Antenna 0



Out Of Band Emission

IEEE 802.11n_Channel 3_40MHz_Antenna 0

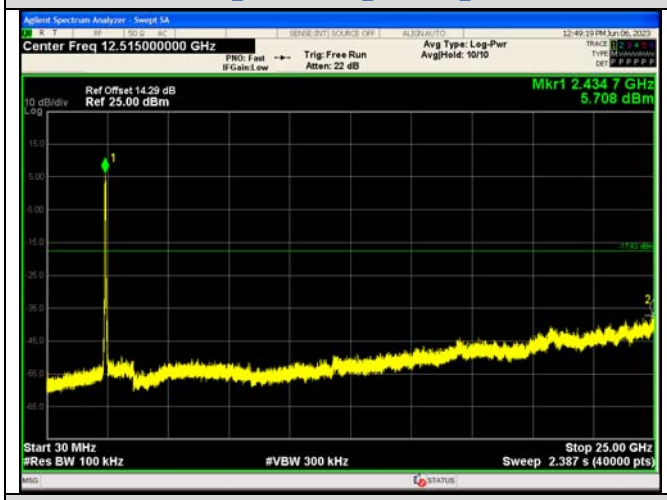


Spurious Emission

IEEE 802.11n_Channel 3_40MHz_Antenna 0

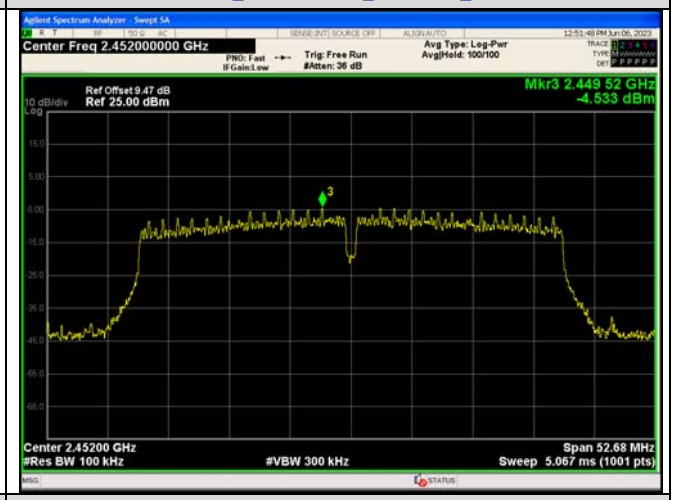
In-Band Reference Level

IEEE 802.11n_Channel 6_40MHz_Antenna 0



Spurious Emissions

IEEE 802.11n_Channel 6_40MHz_Antenna 0

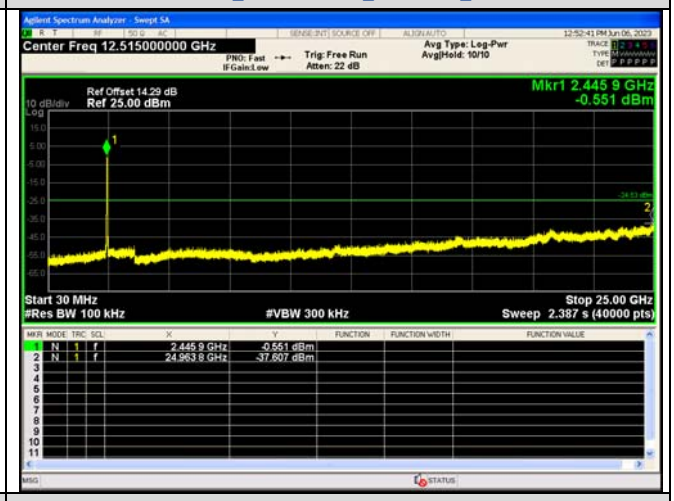


In-Band Reference Level

IEEE 802.11n_Channel 9_40MHz_Antenna 0

Out Of Band Emission

IEEE 802.11n_Channel 9_40MHz_Antenna 0



Spurious Emission

IEEE 802.11n_Channel 9_40MHz_Antenna 0

Antenna B:

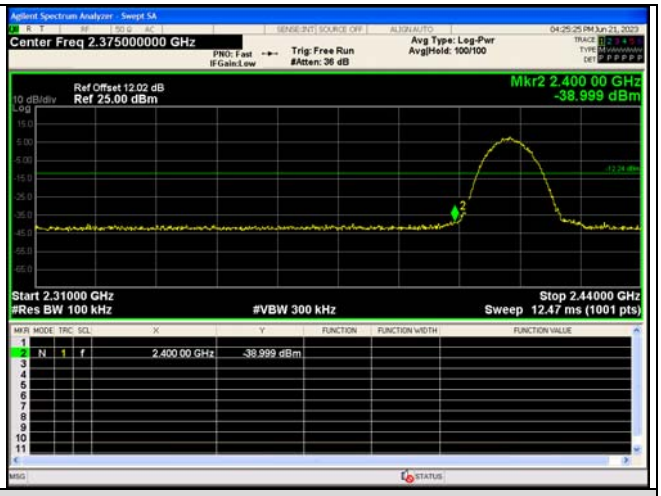
Test Result

Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11b	1	0	2400.00	-38.999	-12.24	-27	PASS
			902.72	-24.122	-12.24	-11.882	PASS
	6		24914.5	-37.118	-11.97	-25.148	PASS
	11		2483.50	-42.479	-13.34	-29	PASS
			24921.3	-36.816	-13.34	-23.476	PASS
IEEE 802.11g	1		2400.00	-22.686	-14.17	-9	PASS
			24951.3	-37.194	-14.17	-23.024	PASS
	6		24949.4	-36.831	-16.69	-20.140	PASS
	11		2483.50	-39.014	-17.45	-22	PASS
			24920.1	-36.058	-17.45	-18.608	PASS
IEEE 802.11n_20	1		2400.00	-31.950	-17.36	-14.590	PASS
			2397.88	-31.506	-17.36	-14.146	PASS
			24922.6	-37.021	-17.36	-19.661	PASS
	6		23753.3	-36.863	-21.55	-15.313	PASS
	11		2483.50	-42.013	-19.25	-23	PASS
			24924.5	-37.208	-19.25	-17.958	PASS
IEEE 802.11n_40	3		2400.00	-37.307	-20.29	-17.017	PASS
			2396.97	-35.869	-20.29	-15.579	PASS
			24887.0	-36.775	-20.29	-16.485	PASS
	6		24984.4	-36.928	-19.48	-17.448	PASS
	9		2483.50	-37.957	-18.96	-19	PASS
			24890.8	-36.455	-18.96	-17.495	PASS

Test Graphs

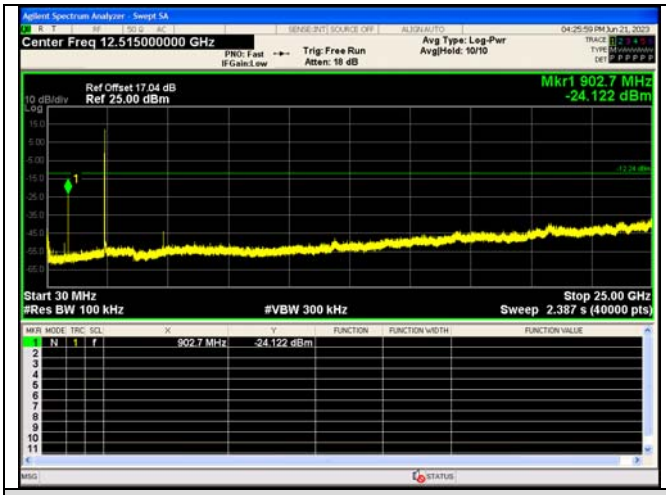
In-Band Reference Level

IEEE 802.11b_Channel 1_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11b_Channel 1_20MHz_Antenna 0

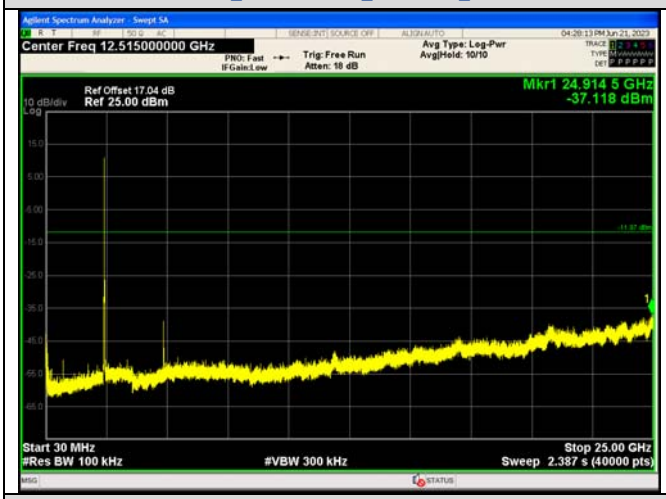


Spurious Emission

IEEE 802.11b_Channel 1_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11b_Channel 6_20MHz_Antenna 0

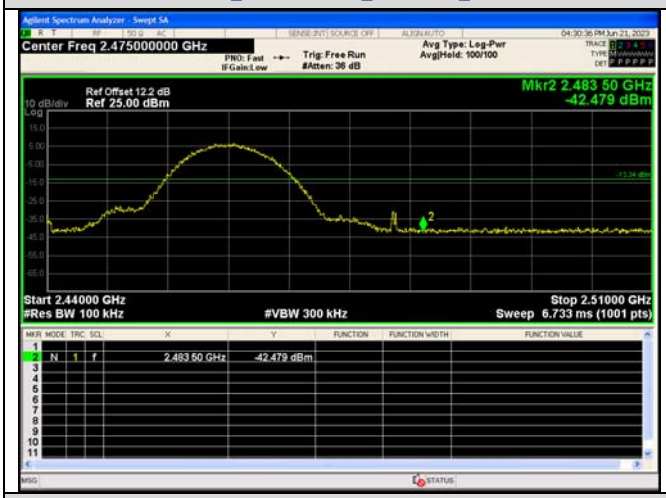


Spurious Emissions

IEEE 802.11b_Channel 6_20MHz_Antenna 0

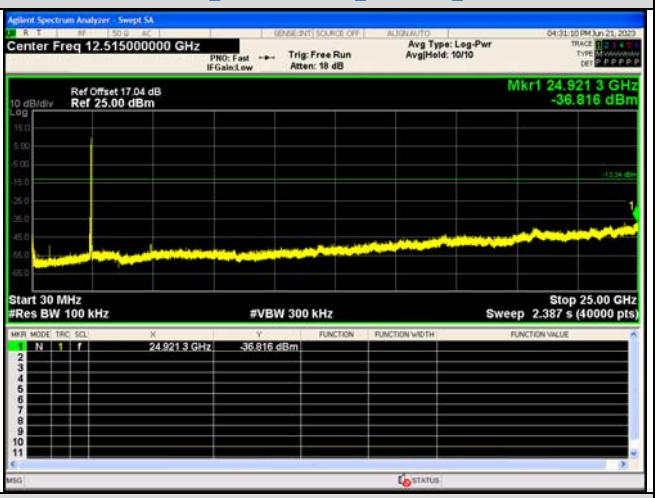
In-Band Reference Level

IEEE 802.11b_Channel 11_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11b_Channel 11_20MHz_Antenna 0

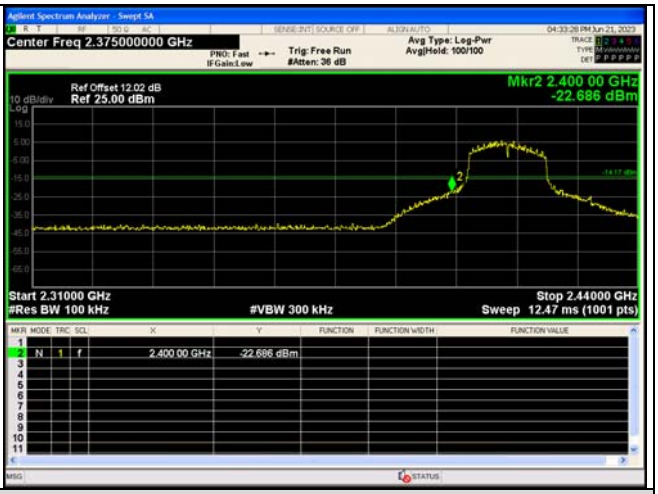


Spurious Emission

IEEE 802.11b_Channel 11_20MHz_Antenna 0

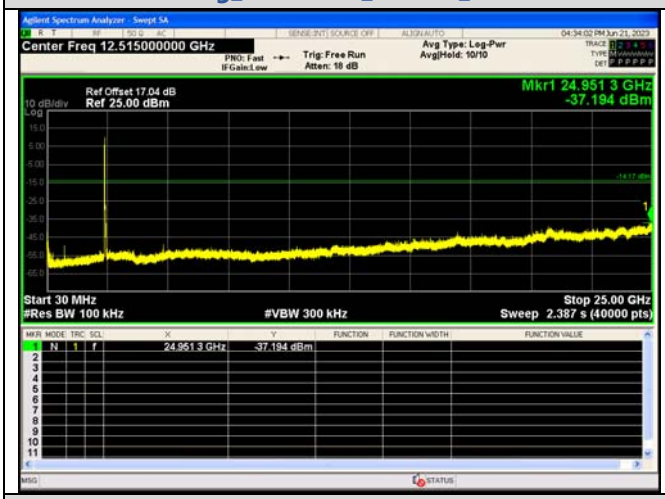
In-Band Reference Level

IEEE 802.11g_Channel 1_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11g_Channel 1_20MHz_Antenna 0

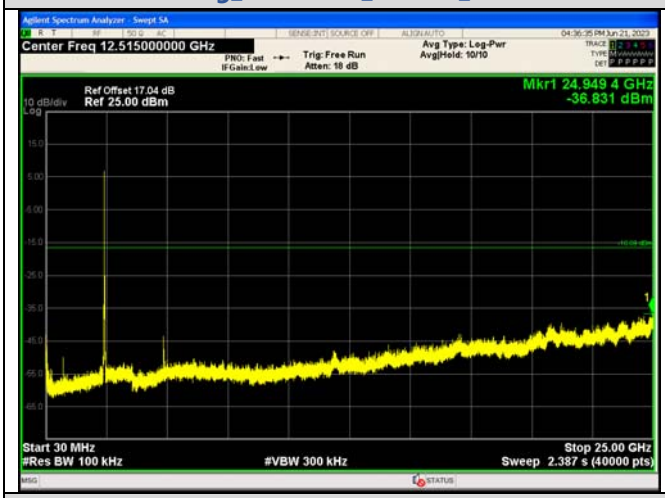


Spurious Emission

IEEE 802.11g_Channel 1_20MHz_Antenna 0

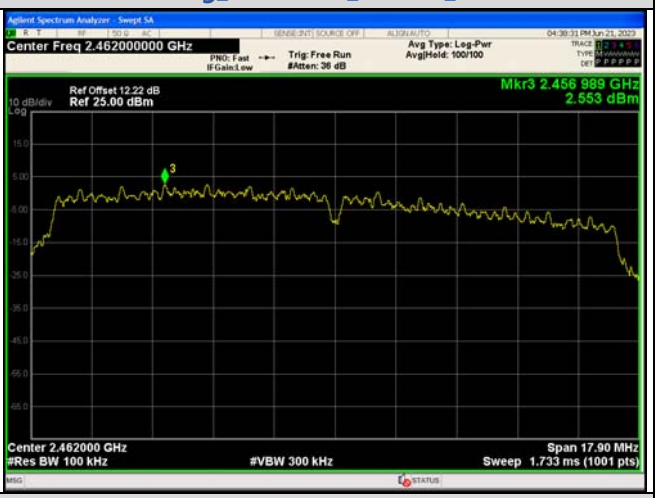
In-Band Reference Level

IEEE 802.11g_Channel 6_20MHz_Antenna 0



Spurious Emissions

IEEE 802.11g_Channel 6_20MHz_Antenna 0

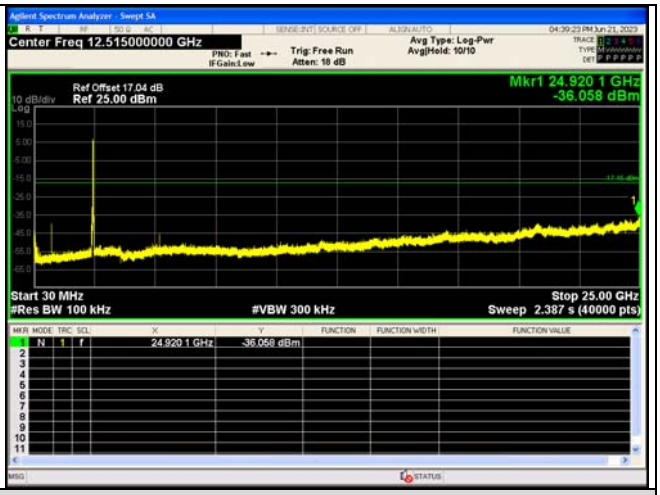


In-Band Reference Level

IEEE 802.11g_Channel 11_20MHz_Antenna 0

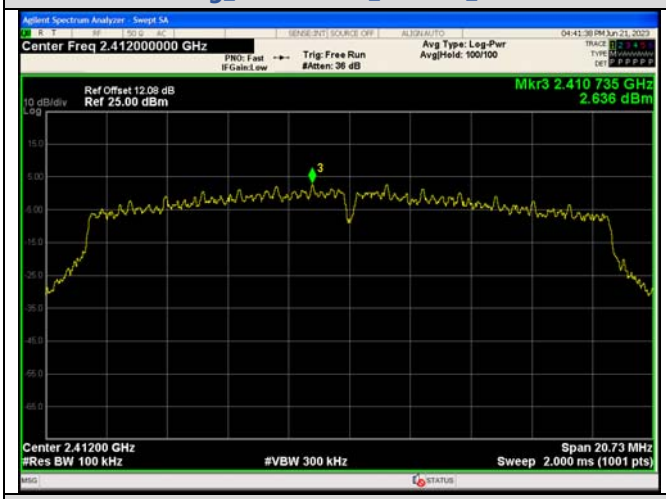
Out Of Band Emission

IEEE 802.11g_Channel 11_20MHz_Antenna 0



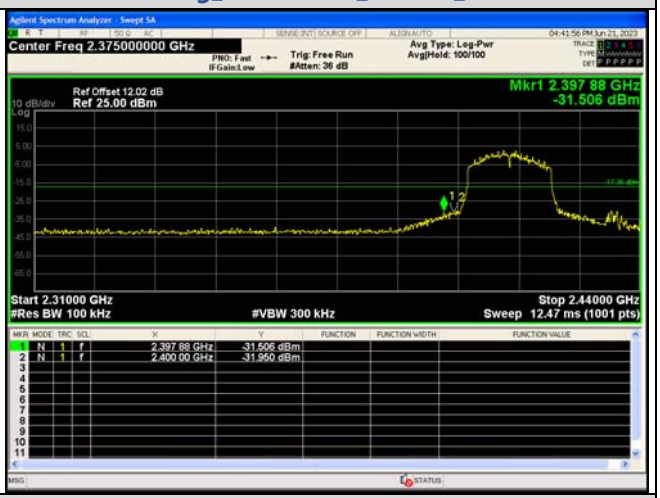
Spurious Emission

IEEE 802.11g_Channel 11_20MHz_Antenna 0



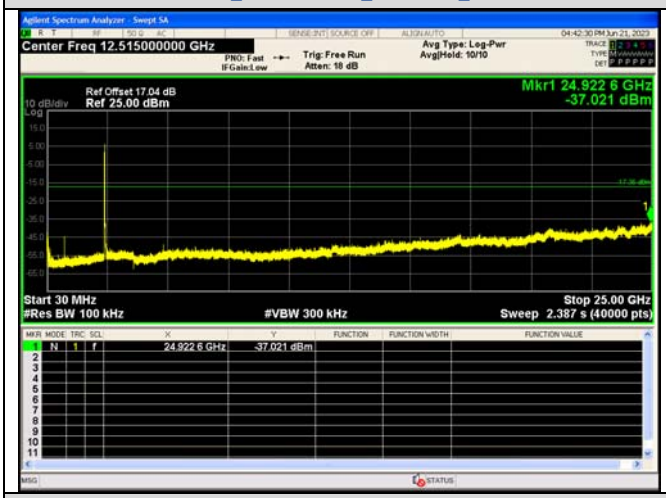
In-Band Reference Level

IEEE 802.11n_Channel 1_20MHz_Antenna 0



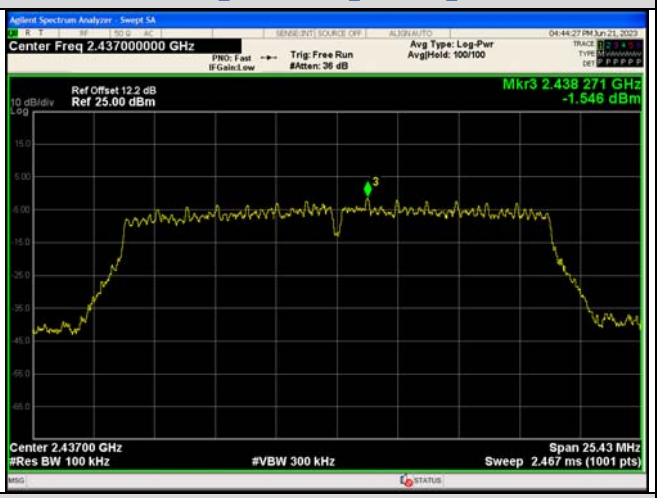
Out Of Band Emission

IEEE 802.11n_Channel 1_20MHz_Antenna 0



Spurious Emission

IEEE 802.11n_Channel 1_20MHz_Antenna 0



In-Band Reference Level

IEEE 802.11n_Channel 6_20MHz_Antenna 0

Spurious Emissions

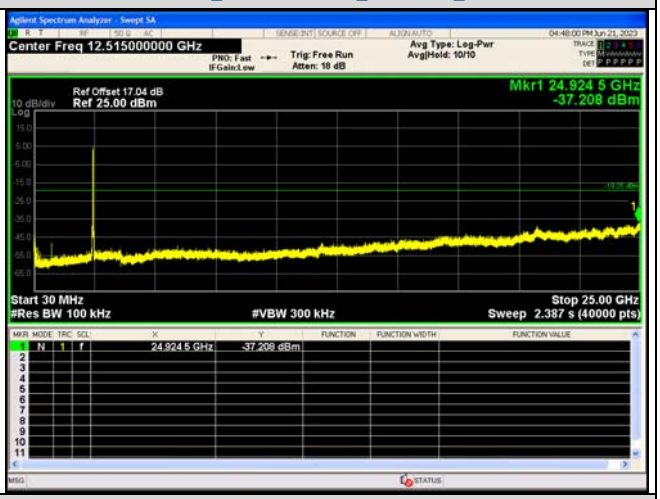
IEEE 802.11n_Channel 6_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11n_Channel 11_20MHz_Antenna 0

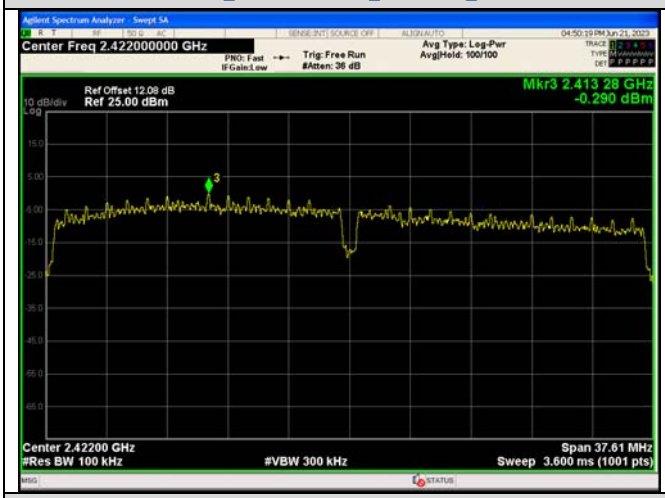
Out Of Band Emission

IEEE 802.11n_Channel 11_20MHz_Antenna 0



Spurious Emission

IEEE 802.11n_Channel 11_20MHz_Antenna 0

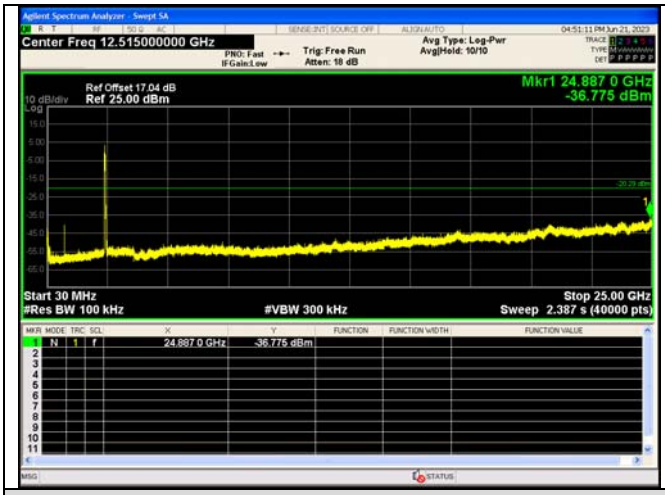


In-Band Reference Level

IEEE 802.11n_Channel 3_40MHz_Antenna 0

Out Of Band Emission

IEEE 802.11n_Channel 3_40MHz_Antenna 0

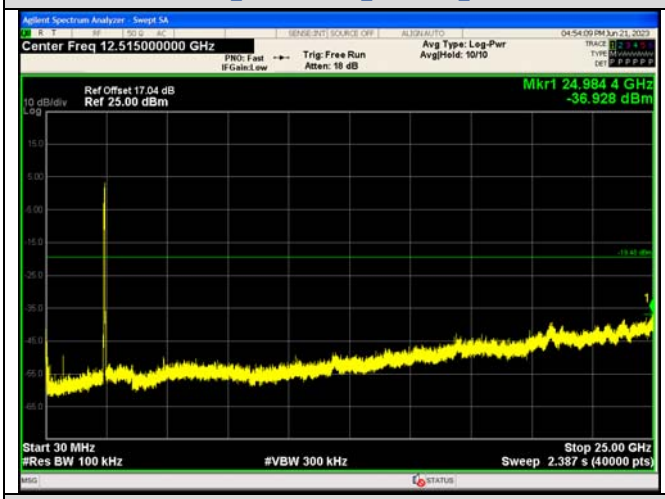


Spurious Emission

IEEE 802.11n_Channel 3_40MHz_Antenna 0

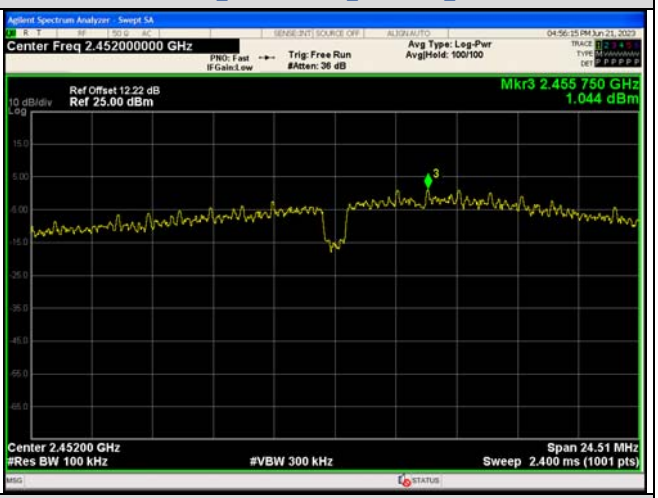
In-Band Reference Level

IEEE 802.11n_Channel 6_40MHz_Antenna 0



Spurious Emissions

IEEE 802.11n_Channel 6_40MHz_Antenna 0

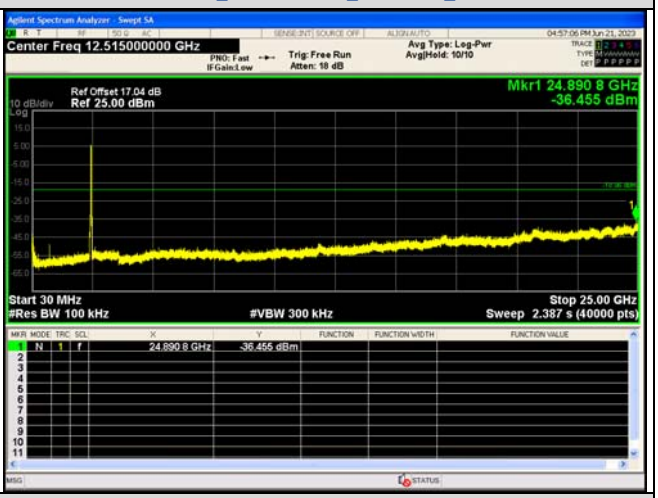


In-Band Reference Level

IEEE 802.11n_Channel 9_40MHz_Antenna 0

Out Of Band Emission

IEEE 802.11n_Channel 9_40MHz_Antenna 0



Spurious Emission

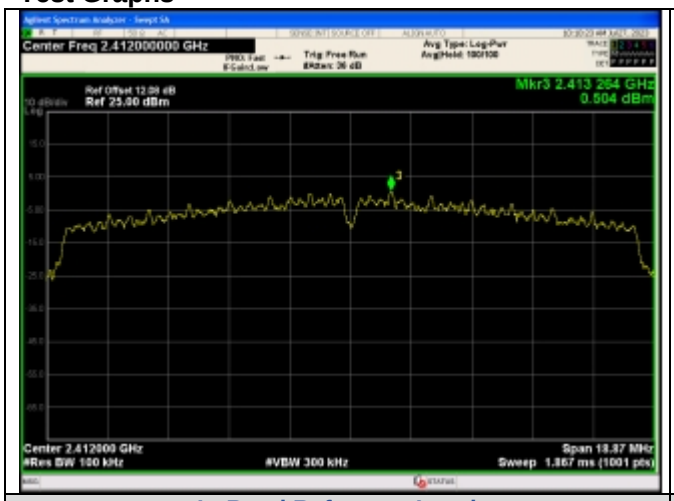
IEEE 802.11n_Channel 9_40MHz_Antenna 0

Antenna A+ Antenna B:

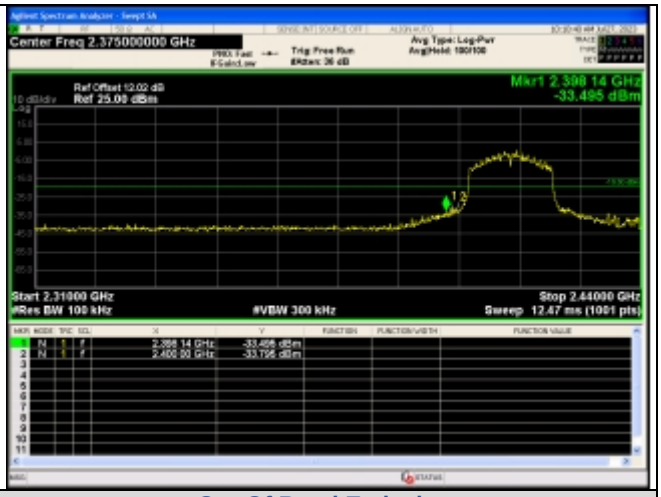
Test Result

Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11n_20	1	0	2400.00	-33.795	-19.5	-14.295	PASS
			2398.14	-33.495	-19.5	-13.995	PASS
			4830.00	-57.593	-19.5	-38.093	PASS
			7247.10	-56.504	-19.5	-37.004	PASS
			9654.30	-57.853	-19.5	-38.353	PASS
			24968.2	-42.322	-19.5	-22.822	PASS
	6		4862.44	-57.770	-20.85	-36.920	PASS
			7294.58	-56.839	-20.85	-35.989	PASS
			9751.06	-57.187	-20.85	-36.337	PASS
			24985.0	-41.528	-20.85	-20.678	PASS
	11		2483.50	-40.330	-20.68	-20	PASS
			4935.48	-57.638	-20.68	-36.958	PASS
			7403.20	-56.476	-20.68	-35.796	PASS
			9854.69	-57.221	-20.68	-36.541	PASS
			24948.2	-41.567	-20.68	-20.887	PASS
IEEE 802.11n_40	3		2400.00	-33.747	-21.33	-12.417	PASS
			2396.71	-32.238	-21.33	-10.908	PASS
			4848.70	-57.664	-21.33	-36.334	PASS
			7252.80	-56.254	-21.33	-34.924	PASS
			9700.50	-56.546	-21.33	-35.216	PASS
			24921.3	-41.825	-21.33	-20.495	PASS
	6		4846.83	-57.120	-21.89	-35.230	PASS
			7350.14	-57.327	-21.89	-35.437	PASS
			9768.54	-56.453	-21.89	-34.563	PASS
			24971.3	-41.775	-21.89	-19.885	PASS
	9		2483.50	-38.552	-21.13	-17	PASS
			4866.81	-56.797	-21.13	-35.667	PASS
			7317.68	-57.600	-21.13	-36.470	PASS
			9796.01	-56.461	-21.13	-35.331	PASS
			24907.6	-41.968	-21.13	-20.838	PASS

Test Graphs



In-Band Reference Level
IEEE 802.11n_Channel 1_20MHz_Antenna 0



Out Of Band Emission
IEEE 802.11n_Channel 1_20MHz_Antenna 0