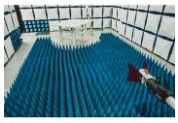
Element Materials Technology
(formerly PCTEST)
18855 Adams Court, Morgan Hill, CA 95037 USA
Tel. 408.538.5600
http://www.element.com



MEASUREMENT REPORT
FCC PART 15.407 / ISED RSS-247 UNII 802.11a/n/ac/ax(SU)

Applicant Name:
Apple Inc.
One Apple Park Way
Cupertino, CA 95014

Date of Testing:
11/29/2024 - 1/15/2024
Test Report Issue Date:
3/28/2024
Test Site/Location:
Element Materials Technology Morgan Hill, CA, USA
Test Report Serial No.:
1C2311270065-11-R1.BCG

FCC ID:	**BCGA2898**
IC:	**579C-A2898**
APPLICANT:	**Apple Inc.**

Application Type:	Certification
Model/HVIN:	A2898
EUT Type:	Tablet Device
Frequency Range:	5180 – 5825MHz
Modulation Type:	OFDM
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part 15 Subpart E (15.407)
ISED Specification:	RSS-247 Issue 3
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02 v02r01 KDB 662911 D01 v02r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013 and KDB 789033 D02 v02r01. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N:1C2311270065-11-R1.BCG) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

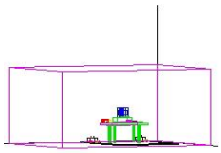
RJ Ortanez
Executive Vice President

Prepared by: WKR0000005849

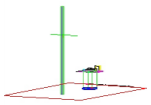
Reviewed by: WKR0000005805

ACCREDITED
CERT #2041.02

TABLE OF CONTENTS



MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				WF7a		WF2a		WF7b		WF7a		WF2a		Summed		WF7b		WF2a		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	89.125	19.50	86.517	19.37	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	99.541	19.98
2A		802.11a/n	5260 - 5320	88.818	19.49	85.428	19.32	89.125	19.50	50.119	17.00	50.119	17.00	99.312	19.97	50.119	17.00	50.119	17.00	100.000	20.01
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	88.716	19.48	89.125	19.50	88.227	19.46	177.419	22.49	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11n	5190 - 5230	89.125	19.50	86.318	19.36	89.125	19.50	86.377	19.36	87.458	19.42	173.780	22.40	88.450	19.47	85.251	19.31	173.780	22.40
2A		802.11n	5270 - 5310	89.125	19.50	84.820	19.29	84.353	19.26	89.125	19.50	86.357	19.36	175.388	22.44	89.002	19.49	89.125	19.50	178.238	22.51
2C		802.11n	5510 - 5710	89.125	19.50	89.125	19.50	88.105	19.45	88.736	19.48	89.125	19.50	177.828	22.50	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	89.125	19.50	88.308	19.46	89.125	19.50	89.125	19.50	87.357	19.41	176.604	22.47	89.125	19.50	89.125	19.50	178.238	22.51
1	80	802.11ac	5210	28.184	14.50	27.829	14.45	28.184	14.50	23.741	13.76	24.940	13.97	48.641	16.87	25.078	13.99	25.009	13.98	50.119	17.00
2A		802.11ac	5290	49.579	16.95	50.119	17.00	47.370	16.76	38.133	15.81	39.274	15.94	77.446	18.89	38.291	15.83	39.138	15.93	77.446	18.89
2C		802.11ac	5530 - 5690	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	177.828	22.50
3		802.11ac	5775	77.268	18.88	77.268	18.88	77.804	18.91	70.469	18.48	69.343	18.41	139.959	21.46	70.795	18.50	68.675	18.37	139.316	21.44
1/2A	160	802.11ac	5250	21.513	13.33	21.622	13.35	0.00	13.41	20.989	13.22	20.941	13.21	139.959	21.46	20.654	13.15	20.893	13.20	177.828	22.50
2C		802.11ac	5570	24.889	13.96	24.513	13.89	24.604	13.91	23.496	13.71	23.227	13.66	41.591	16.19	23.121	13.64	23.496	13.71	139.316	21.44
1	20	802.11ax (SU)	5180 - 5240	89.125	19.50	88.491	19.47	86.836	19.39	50.119	17.00	49.843	16.98	100.000	20.00	50.119	17.00	48.150	16.83	98.175	19.92
2A		802.11ax (SU)	5260 - 5320	87.116	19.40	86.956	19.39	85.389	19.31	49.751	16.97	50.119	17.00	99.541	19.98	49.659	16.96	49.888	16.98	99.312	19.97
2C		802.11ax (SU)	5500 - 5720	88.552	19.47	89.125	19.50	89.125	19.50	49.625	16.96	50.119	17.00	99.770	19.99	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11ax (SU)	5745 - 5825	87.438	19.42	87.619	19.43	88.920	19.49	89.125	19.50	86.119	19.35	174.985	22.43	87.781	19.43	89.125	19.50	173.380	22.39
1	40	802.11ax (SU)	5190 - 5230	88.920	19.49	86.238	19.36	85.349	19.31	86.936	19.39	84.723	19.28	171.791	22.35	89.125	19.50	85.585	19.32	174.582	22.42
2A		802.11ax (SU)	5270 - 5310	86.159	19.35	88.838	19.49	89.125	19.50	85.684	19.33	87.398	19.42	172.982	22.38	89.125	19.50	85.369	19.31	174.582	22.42
2C		802.11ax (SU)	5510 - 5710	87.378	19.41	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	177.419	22.49
3		802.11ax (SU)	5755 - 5795	88.716	19.48	89.125	19.50	89.125	19.50	88.614	19.48	89.125	19.50	177.828	22.50	89.125	19.50	89.125	19.50	178.238	22.51
1	80	802.11ax (SU)	5210	23.807	13.77	24.969	13.97	24.440	13.88	24.917	13.97	25.119	14.00	50.003	16.99	25.090	14.00	23.719	13.75	48.865	16.89
2A		802.11ax (SU)	5290	43.752	16.41	44.668	16.50	44.238	16.46	35.481	15.50	35.481	15.50	70.958	18.51	34.714	15.41	35.481	15.50	70.146	18.46
2C		802.11ax (SU)	5530 - 5690	88.512	19.47	89.125	19.50	88.369	19.46	89.125	19.50	88.288	19.46	177.419	22.49	84.996	19.29	88.961	19.49	173.780	22.40
3		802.11ax (SU)	5775	65.163	18.14	66.374	18.22	65.917	18.19	61.660	17.90	61.944	17.92	123.595	20.92	61.235	17.87	61.518	17.89	122.744	20.89
1/2A	160	802.11ax (SU)	5250	22.274	13.48	13.439	13.44	21.928	13.41	21.928	13.41	20.893	13.20	41.591	16.19	20.845	13.19	20.989	13.22	41.879	16.22
2C		802.11ax (SU)	5570	23.105	13.64	13.750	13.75	23.335	13.68	23.335	13.68	21.979	13.42	43.752	16.41	22.387	13.50	21.979	13.42	44.361	16.47

FCC EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				WF7a		WF2a		WF7b		WF7a		WF2a		Summed		WF7b		WF2a		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	56.234	17.50	56.234	17.50	56.234	17.50	31.623	15.00	31.623	15.00	63.241	18.01	31.623	15.00	31.623	15.00	63.241	18.01
2A		802.11a/n	5260 - 5320	88.818	19.49	85.428	19.32	89.125	19.50	50.119	17.00	50.119	17.00	99.312	19.97	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	88.716	19.48	89.125	19.50	88.227	19.46	177.419	22.49	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11n	5190 - 5230	88.288	19.46	84.957	19.29	87.740	19.43	56.234	17.50	55.043	17.41	111.173	20.46	56.234	17.50	56.234	17.50	112.460	20.51
2A		802.11n	5270 - 5310	89.125	19.50	84.820	19.29	84.353	19.26	89.125	19.50	86.357	19.36	175.388	22.44	89.002	19.49	89.125	19.50	178.238	22.51
2C		802.11n	5510 - 5710	89.125	19.50	89.125	19.50	86.576	19.37	88.736	19.48	89.125	19.50	177.828	22.50	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	89.125	19.50	88.308	19.46	89.125	19.50	89.125	19.50	87.357	19.41	176.604	22.47	89.125	19.50	89.125	19.50	178.238	22.51
1	80	802.11ac	5210	27.797	14.44	26.767	14.28	27.669	14.42	24.906	13.96	23.812	13.77	48.753	16.88	24.946	13.97	24.843	13.95	49.774	16.97
2A		802.11ac	5290	49.579	16.95	50.119	17.00	48.473	16.86	38.133	15.81	39.274	15.94	77.446	18.89	38.291	15.83	39.138	15.93	77.446	18.89
2C		802.11ac	5530 - 5690	86.199	19.36	88.675	19.48	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	86.099	19.35	89.125	19.50	175.388	22.44
3		802.11ac	5775	77.268	18.88	77.268	18.88	88.105	19.45	70.469	18.48	69.343	18.41	139.959	21.46	70.795	18.50	68.675	18.37	139.316	21.44
1/2A	160	802.11ac	5250	22.382	13.50	22.182	13.46	0.00	13.41	20.989	13.22	20.941	13.21	139.959	21.46	20.654	13.15	20.893	13.20	175.388	22.44
1	20	802.11ax (SU)	5180 - 5240	56.118	17.49	56.234	17.50	56.234	17.50	31.355	14.96	31.623	15.00	62.951	17.99	31.623	15.00	31.318	14.96	62.806	17.98
2A		802.11ax (SU)	5260 - 5320	87.116	19.40	86.956	19.39	85.389	19.31	49.751	16.97	50.119	17.00	99.541	19.98	49.659	16.96	49.888	16.98	99.312	19.97
2C		802.11ax (SU)	5500 - 5720	88.552	19.47	89.125	19.50	89.125	19.50	49.625	16.96	50.119	17.00	99.770	19.99	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11ax (SU)	5745 - 5825	87.438	19.42	87.619	19.43	88.920	19.49	89.125	19.50	86.119	19.35	174.985	22.43	87.781	19.43	89.125	19.50	173.380	22.39
1	40	802.11ax (SU)	5190 - 5230	87.217	19.41	88.859	19.49	84.742	19.28	55.208	17.42	56.234	17.50	111.429	20.47	55.783	17.47	54.538	17.37	110.408	20.43
2A		802.11ax (SU)	5270 - 5310	86.159	19.35	88.838	19.49	89.125	19.50	85.684	19.33	87.398	19.42	172.982	22.38	89.125	19.50	85.369	19.31	174.582	22.42
2C		802.11ax (SU)	5510 - 5710	87.378	19.41	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	177.419	22.49
3		802.11ax (SU)	5755 - 5795	88.716	19.48	89.125	19.50	89.125	19.50	88.614	19.48	89.125	19.50	177.828	22.50	89.125	19.50	89.125	19.50	178.238	22.51
1	80	802.11ax (SU)	5210	25.119	14.00	23.972	13.80	25.119	14.00	24.615	13.91	24.889	13.96	49.545	16.95	24.643	13.92	25.119	14.00	49.774	16.97
2A		802.11ax (SU)	5290	43.752	16.41	44.668	16.50	44.238	16.46	35.156	15.46	35.318	15.48	70.469	18.48	34.714	15.41	35.481	15.50	70.146	18.46
2C		802.11ax (SU)	5530 - 5690	88.308	19.46	89.125	19.50	87.761	19.43	89.125	19.50	88.288	19.46	177.419	22.49	84.996	19.29	88.961	19.49	173.780	22.40
3		802.11ax (SU)	5775	65.163	18.14	66.374	18.22	88.920	19.49	61.660	17.90	61.944	17.92	123.595	20.92	61.235	17.87	61.518	17.89	122.744	20.89
1/2A	160	802.11ax (SU)	5250	21.627	13.35	13.490	13.49	21.928	13.41	21.928	13.41	20.893	13.20	41.591	16.19	20.845	13.19	20.989	13.22	41.879	16.22

ISED EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna WF7a		Antenna WF2a		Antenna WF7b		Antenna WF7a		Antenna WF2a		Summed		Antenna WF7a		Antenna WF7b		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	86.517	19.37	87.317	19.41	89.125	19.50	50.119	17.00	50.119	17.00	100.000	20.00	49.261	16.93	50.119	17.00	99.312	19.97
2A		802.11a/n	5260 - 5320	88.920	19.49	86.956	19.39	88.756	19.48	50.003	16.99	50.119	17.00	99.770	19.99	49.682	16.96	49.888	16.98	98.855	19.95
2C		802.11a/n	5500 - 5720	88.716	19.48	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	88.186	19.45	89.125	19.50	177.419	22.49
1	40	802.11n	5190 - 5230	87.559	19.42	85.173	19.30	86.020	19.35	89.125	19.50	89.125	19.50	178.238	22.51	88.756	19.48	85.173	19.30	173.780	22.40
2A		802.11n	5270 - 5310	89.125	19.50	86.218	19.36	87.136	19.40	89.125	19.50	85.114	19.30	174.181	22.41	88.675	19.48	89.125	19.50	177.828	22.50
2C		802.11n	5510 - 5710	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	88.491	19.47	86.936	19.39	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	88.716	19.48	177.828	22.50
1	80	802.11ac	5210	23.988	13.80	24.322	13.86	24.266	13.85	22.387	13.50	22.341	13.49	44.771	16.51	22.387	13.50	22.387	13.50	44.771	16.51
2A		802.11ac	5290	39.811	16.00	38.815	15.89	38.080	15.81	30.974	14.91	31.261	14.95	62.230	17.94	31.623	15.00	31.623	15.00	63.241	18.01
2C		802.11ac	5530 - 5690	89.125	19.50	89.125	19.50	89.125	19.50	84.938	19.29	89.125	19.50	174.181	22.41	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11ac	5775	73.451	18.66	73.961	18.69	74.302	18.71	66.222	18.21	65.766	18.18	132.130	21.21	66.834	18.25	65.464	18.16	132.434	21.22
1/2A	160	802.11ac	5250	21.321	13.29	22.151	13.45	22.131	13.45	19.861	12.98	19.724	12.95	132.130	21.21	19.543	12.91	19.409	12.88	178.238	22.51
2C		802.11ac	5570	22.387	13.50	21.184	13.26	24.717	13.93	20.845	13.19	20.654	13.15	38.994	15.91	20.989	13.22	20.464	13.11	132.434	21.22
1	20	802.11ax (SU)	5180 - 5240	89.125	19.50	89.125	19.50	87.740	19.43	49.659	16.96	48.753	16.88	98.175	19.92	50.119	17.00	48.787	16.88	98.855	19.95
2A		802.11ax (SU)	5260 - 5320	86.836	19.39	88.288	19.46	89.125	19.50	50.119	17.00	49.545	16.95	99.312	19.97	50.096	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.003	16.99	49.682	16.96	99.312	19.97	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11ax (SU)	5745 - 5825	88.961	19.49	88.654	19.48	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11ax (SU)	5190 - 5230	89.125	19.50	86.477	19.37	88.532	19.47	87.418	19.42	85.961	19.34	173.380	22.39	89.125	19.50	85.724	19.33	174.985	22.43
2A		802.11ax (SU)	5270 - 5310	84.645	19.28	89.125	19.50	85.251	19.31	89.125	19.50	87.781	19.43	177.011	22.48	88.736	19.48	87.036	19.40	175.792	22.45
2C		802.11ax (SU)	5510 - 5710	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	88.920	19.49	89.125	19.50	176.604	22.47
3		802.11ax (SU)	5755 - 5795	89.125	19.50	87.297	19.41	88.614	19.48	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	176.604	22.47
1	80	802.11ax (SU)	5210	23.335	13.68	23.529	13.72	23.496	13.71	22.336	13.49	22.387	13.50	44.771	16.51	21.888	13.40	22.377	13.50	44.259	16.46
2A		802.11ax (SU)	5290	33.589	15.26	35.481	15.50	33.970	15.31	31.117	14.93	31.477	14.98	62.661	17.97	31.081	14.93	30.669	14.87	61.802	17.91
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	89.125	19.50	88.961	19.49	89.125	19.50	85.251	19.31	174.181	22.41	86.278	19.36	89.125	19.50	175.388	22.44
3		802.11ax (SU)	5775	55.208	17.42	55.719	17.46	55.208	17.42	49.545	16.95	49.091	16.91	98.628	19.94	49.091	16.91	48.753	16.88	97.949	19.91
1/2A	160	802.11ax (SU)	5250	21.682	13.36	13.500	13.50	0.00	13.38	17.418	12.41	17.338	12.39	34.754	15.41	17.539	12.44	17.783	12.50	35.318	15.48
2C		802.11ax (SU)	5570	21.360	13.30	13.315	13.32	23.550	13.72	17.219	12.36	17.179	12.35	34.435	15.37	17.458	12.42	17.579	12.45	35.075	15.45

FCC EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				WF7a		WF2a		WF7b		WF7a		WF2a		Summed		WF7b		WF2a		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	56.234	17.50	56.234	17.50	55.847	17.47	31.623	15.00	31.623	15.00	63.241	18.01	31.623	15.00	31.623	15.00	63.241	18.01
2A		802.11a/n	5260 - 5320	88.920	19.49	86.956	19.39	88.756	19.48	50.003	16.99	50.119	17.00	99.770	19.99	49.682	16.96	49.888	16.98	98.855	19.95
2C		802.11a/n	5500 - 5720	88.716	19.48	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	88.186	19.45	89.125	19.50	177.419	22.49
1	40	802.11n	5190 - 5230	89.125	19.50	89.125	19.50	84.781	19.28	54.013	17.33	55.501	17.44	109.396	20.39	54.450	17.36	55.501	17.44	109.901	20.41
2A		802.11n	5270 - 5310	89.125	19.50	86.218	19.36	87.136	19.40	89.125	19.50	85.114	19.30	174.181	22.41	88.675	19.48	89.125	19.50	177.828	22.50
2C		802.11n	5510 - 5710	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	88.491	19.47	86.936	19.39	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	88.716	19.48	177.828	22.50
1	80	802.11ac	5210	24.570	13.90	24.227	13.84	24.998	13.98	22.269	13.48	22.039	13.43	44.259	16.46	22.387	13.50	21.267	13.28	43.652	16.40
2A		802.11ac	5290	39.811	16.00	38.815	15.89	38.080	15.81	31.521	14.99	31.615	15.00	63.096	18.00	31.623	15.00	31.623	15.00	63.241	18.01
2C		802.11ac	5530 - 5690	89.125	19.50	89.125	19.50	85.684	19.33	84.938	19.29	89.125	19.50	174.181	22.41	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11ac	5775	73.451	18.66	73.961	18.69	74.302	18.71	66.222	18.21	65.766	18.18	132.130	21.21	66.834	18.25	65.464	18.16	132.434	21.22
1/2A	160	802.11ac	5250	22.387	13.50	22.202	13.46	21.979	13.42	19.861	12.98	19.724	12.95	132.130	21.21	19.543	12.91	19.409	12.88	178.238	22.51
1	20	802.11ax (SU)	5180 - 5240	55.463	17.44	54.702	17.38	56.234	17.50	31.623	15.00	31.623	15.00	63.096	18.00	31.623	15.00	31.623	15.00	63.241	18.01
2A		802.11ax (SU)	5260 - 5320	86.836	19.39	88.288	19.46	89.125	19.50	50.119	17.00	49.545	16.95	99.312	19.97	50.096	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.003	16.99	49.682	16.96	99.312	19.97	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11ax (SU)	5745 - 5825	88.961	19.49	88.654	19.48	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11ax (SU)	5190 - 5230	84.314	19.26	88.247	19.46	88.614	19.48	53.716	17.30	56.234	17.50	109.901	20.41	56.234	17.50	55.501	17.44	111.686	20.48
2A		802.11ax (SU)	5270 - 5310	84.645	19.28	89.125	19.50	85.251	19.31	89.125	19.50	87.781	19.43	177.011	22.48	88.736	19.48	87.036	19.40	175.792	22.45
2C		802.11ax (SU)	5510 - 5710	89.125	19.50	89.125	19.50	89.125	19.50	87.963	19.44	87.337	19.41	175.388	22.44	88.105	19.45	89.125	19.50	176.604	22.47
3		802.11ax (SU)	5755 - 5795	89.125	19.50	87.297	19.41	88.614	19.48	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	176.604	22.47
1	80	802.11ax (SU)	5210	23.714	13.75	23.714	13.75	23.714	13.75	22.387	13.50	21.473	13.32	43.853	16.42	22.387	13.50	22.167	13.46	44.566	16.49
2A		802.11ax (SU)	5290	33.589	15.26	35.481	15.50	33.970	15.31	31.623	15.00	31.623	15.00	63.241	18.01	31.081	14.93	30.669	14.87	61.802	17.91
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	85.271	19.31	88.634	19.48	89.125	19.50	85.251	19.31	174.181	22.41	86.278	19.36	89.125	19.50	175.388	22.44
3		802.11ax (SU)	5775	55.208	17.42	55.719	17.46	55.208	17.42	49.545	16.95	49.091	16.91	98.628	19.94	49.091	16.91	48.753	16.88	97.949	19.91
1/2A	160	802.11ax (SU)	5250	22.387	13.50	13.500	13.50	0.00	13.45	17.418	12.41	17.338	12.39	34.754	15.41	17.539	12.44	17.783	12.50	35.318	15.48

ISED EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna WF7a		Antenna WF2a		Antenna WF7b		Antenna WF7a		Antenna WF2a		Summed		Antenna WF7b		Antenna WF2a		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	87.862	19.44	87.862	19.44	89.125	19.50	50.119	17.00	50.119	17.00	99.770	19.99	49.946	16.99	50.119	17.00	100.000	20.00
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	88.471	19.47	50.119	17.00	49.797	16.97	100.000	20.00	49.113	16.91	50.119	17.00	99.083	19.96
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11n	5190 - 5230	84.314	19.26	85.251	19.31	87.740	19.43	86.557	19.37	89.125	19.50	175.792	22.45	89.125	19.50	89.125	19.50	178.238	22.51
2A		802.11n	5270 - 5310	88.961	19.49	86.836	19.39	89.023	19.50	87.862	19.44	87.076	19.40	174.985	22.43	85.684	19.33	84.470	19.27	170.216	22.31
2C		802.11n	5510 - 5710	89.125	19.50	89.125	19.50	89.125	19.50	88.695	19.48	88.695	19.48	177.419	22.49	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	89.064	19.50	88.818	19.49	89.125	19.50	87.036	19.40	87.821	19.44	174.582	22.42	84.820	19.29	87.781	19.43	172.584	22.37
1	80	802.11ac	5210	22.387	13.50	22.233	13.47	22.387	13.50	19.387	12.88	19.953	13.00	39.355	15.95	19.643	12.93	19.953	13.00	39.628	15.98
2A		802.11ac	5290	25.119	14.00	24.513	13.89	25.119	14.00	24.660	13.92	24.831	13.95	49.545	16.95	25.119	14.00	25.119	14.00	50.234	17.01
2C		802.11ac	5530 - 5690	85.369	19.31	84.043	19.25	89.125	19.50	84.353	19.26	88.247	19.46	172.584	22.37	88.125	19.45	89.125	19.50	177.419	22.49
3		802.11ac	5775	58.749	17.69	57.810	17.62	58.076	17.64	58.210	17.65	59.020	17.71	117.220	20.69	58.776	17.69	57.570	17.60	116.413	20.66
1/2A	160	802.11ac	5250	19.498	12.90	19.129	12.82	19.275	12.85	15.668	11.95	15.488	11.90	117.220	20.69	15.488	11.90	15.417	11.88	177.419	22.49
2C		802.11ac	5570	19.588	12.92	19.041	12.80	19.409	12.88	13.677	11.36	13.836	11.41	27.542	14.40	13.836	11.41	13.646	11.35	116.413	20.66
1	20	802.11ax (SU)	5180 - 5240	89.125	19.50	88.797	19.48	85.704	19.33	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	49.511	16.95	99.541	19.98
2A		802.11ax (SU)	5260 - 5320	87.882	19.44	88.024	19.45	88.247	19.46	49.465	16.94	50.119	17.00	99.541	19.98	49.488	16.95	49.249	16.92	98.401	19.93
2C		802.11ax (SU)	5500 - 5720	88.064	19.45	86.477	19.37	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11ax (SU)	5745 - 5825	89.125	19.50	87.157	19.40	89.125	19.50	87.498	19.42	87.619	19.43	174.582	22.42	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11ax (SU)	5190 - 5230	87.983	19.44	85.349	19.31	89.125	19.50	86.776	19.38	88.389	19.46	174.985	22.43	85.724	19.33	85.133	19.30	171.002	22.33
2A		802.11ax (SU)	5270 - 5310	86.596	19.38	85.192	19.30	87.619	19.43	86.816	19.39	86.896	19.39	173.780	22.40	87.337	19.41	89.125	19.50	176.604	22.47
2C		802.11ax (SU)	5510 - 5710	89.125	19.50	87.378	19.41	89.125	19.50	89.125	19.50	87.821	19.44	175.792	22.45	89.125	19.50	89.023	19.50	177.419	22.49
3		802.11ax (SU)	5755 - 5795	88.044	19.45	88.267	19.46	89.125	19.50	86.636	19.38	89.125	19.50	174.985	22.43	88.879	19.49	89.125	19.50	176.604	22.47
1	80	802.11ax (SU)	5210	22.387	13.50	21.558	13.34	22.387	13.50	18.884	12.76	19.953	13.00	38.815	15.89	19.953	13.00	19.902	12.99	39.811	16.00
2A		802.11ax (SU)	5290	25.119	14.00	24.592	13.91	24.322	13.86	25.119	14.00	24.094	13.82	49.204	16.92	25.003	13.98	25.119	14.00	50.119	17.00
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	85.882	19.34	87.579	19.42	88.145	19.45	89.125	19.50	177.419	22.49	84.198	19.25	84.275	19.26	168.655	22.27
3		802.11ax (SU)	5775	55.208	17.42	55.976	17.48	55.208	17.42	48.978	16.90	49.204	16.92	98.175	19.92	48.417	16.85	48.865	16.89	97.275	19.88
1/2A	160	802.11ax (SU)	5250	19.275	12.85	19.182	12.83	19.498	12.90	15.488	11.90	15.560	11.92	31.046	14.92	15.570	11.92	15.453	11.89	31.046	14.92
2C		802.11ax (SU)	5570	19.409	12.88	19.454	12.89	19.143	12.82	13.646	11.35	13.868	11.42	27.542	14.40	13.552	11.32	13.677	11.36	27.227	14.35

FCC EUT Overview (High Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				WF7a		WF2a		WF7b		WF7a		WF2a		Summed		WF7b		WF2a		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	56.234	17.50	56.234	17.50	56.234	17.50	31.623	15.00	31.362	14.96	62.373	17.95	31.521	14.99	31.623	15.00	62.806	17.98
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	88.471	19.47	50.119	17.00	49.797	16.97	100.000	20.00	49.113	16.91	50.119	17.00	99.083	19.96
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11n	5190 - 5230	84.723	19.28	89.125	19.50	85.290	19.31	53.162	17.26	54.840	17.39	107.895	20.33	55.195	17.42	53.901	17.32	109.144	20.38
2A		802.11n	5270 - 5310	88.961	19.49	86.836	19.39	89.023	19.50	87.862	19.44	87.076	19.40	174.985	22.43	85.684	19.33	84.470	19.27	170.216	22.31
2C		802.11n	5510 - 5710	88.267	19.46	88.064	19.45	89.125	19.50	86.477	19.37	87.076	19.40	172.982	22.38	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	89.064	19.50	88.818	19.49	89.125	19.50	87.036	19.40	87.821	19.44	174.582	22.42	84.820	19.29	87.781	19.43	172.584	22.37
1	80	802.11ac	5210	22.387	13.50	21.281	13.28	22.387	13.50	19.404	12.88	19.953	13.00	39.355	15.95	19.953	13.00	19.953	13.00	39.902	16.01
2A		802.11ac	5290	25.119	14.00	23.933	13.79	25.119	14.00	25.119	14.00	25.119	14.00	50.234	17.01	25.119	14.00	25.119	14.00	50.234	17.01
2C		802.11ac	5530 - 5690	85.369	19.31	84.043	19.25	89.125	19.50	84.353	19.26	88.247	19.46	172.584	22.37	88.125	19.45	89.125	19.50	177.419	22.49
3		802.11ac	5775	58.749	17.69	57.810	17.62	58.076	17.64	58.210	17.65	59.020	17.71	117.220	20.69	58.776	17.69	57.570	17.60	116.413	20.66
1/2A	160	802.11ac	5250	19.953	13.00	19.861	12.98	19.275	12.85	15.668	11.95	15.488	11.90	117.220	20.69	15.488	11.90	15.417	11.88	177.419	22.49
1	20	802.11ax (SU)	5180 - 5240	54.200	17.34	54.929	17.40	56.234	17.50	31.536	14.99	31.623	15.00	62.806	17.98	31.623	15.00	30.542	14.85	62.230	17.94
2A		802.11ax (SU)	5260 - 5320	87.882	19.44	88.024	19.45	88.247	19.46	49.465	16.94	50.119	17.00	99.541	19.98	49.488	16.95	49.249	16.92	98.401	19.93
2C		802.11ax (SU)	5500 - 5720	88.064	19.45	86.477	19.37	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11ax (SU)	5745 - 5825	89.125	19.50	87.157	19.40	89.125	19.50	87.498	19.42	87.619	19.43	174.582	22.42	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11ax (SU)	5190 - 5230	89.125	19.50	87.498	19.42	89.125	19.50	56.014	17.48	56.234	17.50	112.202	20.50	56.234	17.50	56.234	17.50	112.460	20.51
2A		802.11ax (SU)	5270 - 5310	86.596	19.38	85.192	19.30	87.619	19.43	86.816	19.39	86.896	19.39	173.780	22.40	87.337	19.41	89.125	19.50	176.604	22.47
2C		802.11ax (SU)	5510 - 5710	89.125	19.50	87.378	19.41	87.963	19.44	89.125	19.50	87.821	19.44	175.792	22.45	89.125	19.50	89.023	19.50	177.419	22.49
3		802.11ax (SU)	5755 - 5795	88.044	19.45	88.267	19.46	89.125	19.50	86.636	19.38	89.125	19.50	174.985	22.43	88.879	19.49	89.125	19.50	176.604	22.47
1	80	802.11ax (SU)	5210	21.642	13.35	22.387	13.50	21.933	13.41	19.953	13.00	19.552	12.91	39.537	15.97	19.561	12.91	19.378	12.87	38.905	15.90
2A		802.11ax (SU)	5290	25.119	14.00	24.592	13.91	24.322	13.86	25.119	14.00	24.094	13.82	49.204	16.92	25.003	13.98	25.119	14.00	50.119	17.00
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	85.882	19.34	87.579	19.42	88.145	19.45	89.125	19.50	177.419	22.49	84.198	19.25	84.275	19.26	168.655	22.27
3		802.11ax (SU)	5775	55.208	17.42	55.590	17.45	55.208	17.42	48.978	16.90	49.204	16.92	98.175	19.92	48.417	16.85	48.865	16.89	97.275	19.88
1/2A	160	802.11ax (SU)	5250	19.742	12.95	19.634	12.93	19.498	12.90	15.488	11.90	15.560	11.92	31.046	14.92	15.570	11.92	15.453	11.89	31.046	14.92

ISED EUT Overview (High Data Rate)

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 Element Materials Technology Test Location

These measurement tests were conducted at the Element facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at Element located in Morgan Hill, CA 95037, U.S.A.

- Element Materials Technology is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Materials Technology facility is a registered (22831) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Tablet Device FCC ID: BCGA2898** and **IC: 579C-A2898**. The test data contained in this report pertains only to the emissions due to the EUT's UNII 802.11a/n/ac/ax(SU) transmitter.

Test Device Serial No.: *F1Y0XGN9Q3, J6RCW0M4FM, P16J94C77L, RH779H9653, DLXH09000370000EVP*

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n/ax WLAN, UNII 802.11a/n/ac/ax, WIFI 6E 802.11a/ax, Bluetooth (1x, EDR, LE1M, LE2M, HDR4, HDR8), NB UNII (1x, HDR4, HDR8), 802.15.4, WPT

This device supports BT Beamforming

Band 1		Band 2A		Band 2C		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
36	5180	52	5260	100	5500	149	5745
:	:	:	:	:	:	:	:
42	5210	56	5280	116	5580	157	5785
:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825

Table 2-1. 802.11a / 802.11n / 802.11ac / 802.11ax (20MHz) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
38	5190	54	5270	102	5510	151	5755
:	:	:	:	:	:	:	:
46	5230	62	5310	110	5550	159	5795
				:	:		
				142	5710		

Table 2-2. 802.11n / 802.11ac / 802.11ax (40MHz BW) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
42	5210	58	5290	106	5530	155	5775
				:	:		
				138	5690		

Table 2-3. 802.11ac / 802.11ax (80MHz BW) Frequency / Channel Operations

Band 1		Band 2A		Band 2C	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
50	5250	50	5250	114	5570

Table 2-4. 802.11ac / 802.11ax (160MHz BW) Frequency / Channel Operations

Notes:

1. 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz, and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) KDB 789033 D02 v02r01 and ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Measured Duty Cycles						
802.11 Mode/Band		Duty Cycle [%]				
		Antenna WF7a	Antenna WF7b	Antenna WF2a	CDD/SDM (Primary)	CDD/SDM (Diversity)
5GHz	n (HT20) (Low Rate)	96.5	96.3	96.4	93.4	93.9
	n (HT20) (Mid Rate)	93.9	94.1	93.6	89.5	89.4
	n (HT20 (High Rate)	91.0	91.2	90.6	85.8	85.5
	ax(SU) (HE20 Low Rate)	95.9	95.9	95.5	95.4	95.5
	ax(SU) (HE20 Mid Rate)	92.9	93.1	92.8	92.8	92.6
	ax(SU) (HE20 High Rate)	88.2	88.2	86.4	86.4	86.9
	n (HT40 Low Rate)	96.1	96.4	96.1	85.4	93.9
	n (HT40 Mid Rate)	93.6	93.3	93.0	89.0	89.3
	n (HT40 High Rate)	90.8	90.3	90.9	85.4	85.9
	ax(SU) (HE40 Low Rate)	95.9	95.5	95.7	95.9	95.8
	ax(SU) (HE40 Mid Rate)	92.5	92.9	92.6	92.8	92.9
	ax(SU) (HE40 High Rate)	86.4	86.0	86.9	85.5	86.9
	ac (VHT80 Low Rate)	96.1	95.9	96.3	93.3	93.4
	ac (VHT80 Mid Rate)	93.1	92.4	93.2	88.2	88.6
	ac (VHT80 High Rate)	87.2	95.9	87.9	82.1	82.6
	ax(SU) (HE80 Low Rate)	95.3	95.5	95.5	95.5	95.5
	ax(SU) (HE80 Mid Rate)	92.3	92.5	91.8	92.2	92.1
	ax(SU) (HE80 High Rate)	86.2	85.8	85.8	85.7	86.2
	ac (VHT160 Low Rate)	94.7	94.4	94.4	91.0	90.8
	ac (VHT160 Mid Rate)	90.6	90.8	90.8	86.4	85.7
	ac (VHT160 High Rate)	84.2	84.5	83.9	79.4	79.5
	ax(SU) (HE160 Low Rate)	94.2	94.2	93.9	93.7	93.9
	ax(SU) (HE160 Mid Rate)	90.2	90.5	90.5	90.4	90.5
	ax(SU) (HE160 High Rate)	83.7	83.3	83.7	83.0	83.7

Table 2-5. Measured Duty Cycles

2. The device employs MIMO CDD technology. Below are the possible configurations.

WiFi Configurations		SISO			Primary						Diversity					
					CDD		SDM		STBC		CDD		SDM		STBC	
		Antenna WF7a	Antenna WF2a	Antenna WF7b	Antenna WF7a	Antenna WF7b	Antenna WF7a	Antenna WF7b	Antenna WF7a	Antenna WF7b	Antenna WF7b	Antenna WF2a	Antenna WF7b	Antenna WF2a	Antenna WF7b	Antenna WF2a
5GHz	11a	✓	✓	✓	✓	✓	×	×	×	×	✓	✓	×	×	×	×
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 2-6. WIFI Configurations

✓= Support ; × = NOT Support
SISO = Single Input Single Output
SDM = Spatial Diversity Multiplexing – MIMO CDD function
CDD = Cyclic Delay Diversity - 2Tx Function
STBC = Space-Time Block Coding – 2Tx Function

Data Rate(s) Tested:

6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)

6.5/7.2, 13/14.4, 19.5/21.7, 26/28.9, 39/43.3, 52/57.8, 58.5/65, 65/72.2 (n – 20MHz)

13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW)

29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac – 80MHz BW)
13/14.4, 26.28.9, 39/43.3, 52/57.8, 78/86.7, 104/115.6, 117/130, 130/144.4MBps (MIMO CDD n/ac – 20MHz)
156/173Mbps (MIMO CDD ac – 20MHz)
27/30, 54/60, 81/90, 108/120, 162/180, 216/240, 243,270, 270/300Mbps (MIMO CDD n/ac – 40MHz)
324/360, 360/400Mbps (MIMO CDD ac – 40MHz)
58.5/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7Mbps (MIMO CDD ac – 80MHz)
8/8.6, 16/17.2, 24/25.8, 33/34.4, 49/51.6, 65/68.8, 73/77.4, 81/86.0, 98/103.2, 108/114.7, 122/129.0, 135/143.4 (ax – 20MHz)
16/17.2, 33/34.4, 49/51.6, 65/68.8, 98/103.2, 130/137.6, 146/154.9, 163/172.1, 195/206.5, 217/229.4, 244/258.1, 271/286.8 (ax – 40MHz BW)
34/36.0, 68/72.1, 102/108.1, 136/144.1, 204/216.2, 272/288.2, 306/324.4, 340/360.3, 408/432.4, 453/480.4, 510/540.4, 567/600.5 (ax – 80MHz BW).
136.2/144.2, 2721/288.2, 408.2/432.4, 544.4, 576.4/816.6864.8, 1088.8/1153, 1225/1297, 1361.2/1441.2, 1633.4/1729.4, 1814.8/1921.6, 2041.6/2161.8, 2268.6/2402Mbps, (MIMO ax – 160MHz)

3. This device supports simultaneous transmission operations, which allows for multiple transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.

Antenna	Simultaneous Tx Config	Wifi 2GHz	Bluetooth	Thread	Wifi 5GHz	Wifi 6GHz	NB UNII
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	802.15.4	802.11 a/n/ac/ax	802.11 a/ax	BDR, HDR4/8
WF7b	Config 1	✓	✗	✗	✗	✗	✓
WF7b	Config 2	✗	✓	✗	✓	✗	✗
WF7b	Config 3	✗	✓	✗	✗	✓	✗
WF7b	Config 4	✗	✗	✓	✓	✗	✗
WF7b	Config 5	✗	✗	✓	✗	✓	✗

Table 2-7. Simultaneous Transmission Configurations

✓ = Support; × = Not Support

Note:

Specific 2.4GHz Wi-Fi antenna that can only transmit simultaneously with 2.4GHz Bluetooth antenna is listed in the SAR test report. For BT (2.4GHz) in connected mode and Wi-Fi (2.4GHz) – Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power. For BT (2.4GHz) in disconnected mode and Wi-Fi (2.4GHz) – BT will be using iPA only and Wi-Fi max power will not exceed minimum of (SAR max cap, Reg max cap) power. Bluetooth can simultaneously transmit with IEEE 802.11a/n/ac/ax 5/6 GHz on separate antenna.

TDWR Channels are not supported for ISED

2.3 Antenna Description

Following antenna gains provided by manufacturer were used for the testing.

Frequency [GHz]	Antenna Gain (dBi)		
	Antenna WF7a	Antenna WF2a	Antenna WF7b
5.150 - 5.250	0.9	0.0	0.1
5.250 - 5.350	2.2	1.5	0.3
5.470 - 5.725	2.1	2.2	2.3
5.725 - 5.850	1.3	1.2	1.4

Table 2-8. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook Pro	Model:	A2141	S/N:	C02H604EQ05D
	w/AC/DC Adapter	Model:	A2166	S/N:	C4H042705ZNPM0WA6
2	Apple USB-C Cable	Model:	Spartan	S/N:	GXK1336018XKTR024
3	USB-C Cable	Model:	A246C	S/N:	DWH80115BK826GV19
	w/ AC Adapter	Model:	A2305	S/N:	C4H95160004PF4F4V
4	Apple Pencil	Model:	A2538	S/N:	KJ26TCFXJW
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-9. Test Support Equipment List

2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013 and KDB 789033 D02 v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, and 7.5 for antenna port conducted emissions test setups.

There are two vendors of the WiFi/Bluetooth radio modules, variant 1 and variant 2. Both radio modules have the same mechanical outline, same on-board antenna matching circuit, identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances. The worst case configuration was found between the two variants. The EUT was also investigated with and without charger.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration. The emissions below 1GHz and above 18GHz were tested with the highest transmitting power and the worst case channel.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

For AC line conducted and radiated test below 1GHz, following configuration were investigated and EUT powered by AC/DC was the worst case.

- EUT powered by AC/DC adaptor via USB-C cable with wire charger
- EUT powered by host PC via USB-C cable with wire charger

802.11n HT20/40, 11ax(SU) HE20/40/80 and acVHT80 2TX CDD/SDM mode test data provided in this report covers 802.11n HT20/40, 11ax(SU) HE20/40/80 and 802.11acVHT80 2TX STBC mode

802.11ac VHT20 and VHT40 mode are different from 802.11n HT20 and HT40 only in control messages and have the same power settings.

The data rates have been classified into three different groups; low data rate, middle data rate, and high data rate. All three groups of data rate have been investigated and only the worst case data rate per group is reported. The worst case data rate for each group per mode are as follows:

- 802.11a:
  - Low Data Rate: 12Mbps
  - Mid Data Rate: 24Mbps
  - High Data Rate: 54Mbps
- 802.11n HT20/40:
  - Low Data Rate: MCS2/MCS10 (SISO/CDD/SDM)
  - Mid Data Rate: MCS4/MCS12(SISO/CDD/SDM)
  - High Data Rate: MCS7/MCS15 (SISO/CDD/SDM)
- 802.11ac VHT80/160:
  - Low Data Rate: MCS2(SISO/CDD/SDM)
  - Mid Data Rate: MCS4(SISO/CDD/SDM)
  - High Data Rate: MCS9(SISO/CDD/SDM)
- 802.11ax(SU) HE20/HE40/HE80/HE160
  - Low Data Rate: MCS2(SISO/CDD/SDM)
  - Mid Data Rate: MCS4(SISO/CDD/SDM)
  - High Data Rate: MCS11(SISO/CDD/SDM)

For 802.11ax-RU test result, see separate UNII 802.11ax (OFDMA) report, 1C2311270065-12.BCG

Description	Bluetooth	UNII
Antenna	WF7b	WF7b
Channel	79	36
Operating Frequency (MHz)	2480	5180
Mode/Modulation	GFSK ePA	802.11n

Table 2-10. Worst Case Simultaneous Transmission Configuration

2.6 Software and Firmware

The test was conducted with firmware version 21E8197 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 v02r01 were used in the measurement of the EUT**.**

Deviation from measurement procedure……..…….....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielded enclosure is manufactured by AP Americas. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50µH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is EPCOS 2X60A Power Line Filter (100dB Attenuation, 14kHz-18GHz) and the two EPCOs 2X48A filters (100dB Minimum Insertion Loss, 14kHz - 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.8. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.50.40.

3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

Per KDB 414788, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was used while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

3.4 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	2.07
Line Conducted Disturbance	1.91
Radiated Disturbance (<30MHz)	4.12
Radiated Disturbance (30MHz - 1GHz)	4.85
Radiated Disturbance (1 - 18GHz)	5.08
Radiated Disturbance (>18GHz)	4.59

6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	6/21/2023	Annual	6/21/2024	MY49430244
ESPEC	SU-241	Tabletop Temperature Chamber	11/17/2023	Annual	11/17/2024	92009574
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	3/30/2023	Annual	3/30/2024	00218555
Keysight Technology	N9040B	UXA Signal Analyzer	3/10/2023	Annual	3/10/2024	MY57212015
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/31/2023	Annual	8/31/2024	100052
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	5/11/2023	Annual	5/11/2024	101619
Rohde & Schwarz	ESW44	EMI Test Receiver	6/6/2023	Annual	6/6/2024	101668
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	6/22/2023	Annual	6/22/2024	102356
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/30/2023	Annual	11/30/2024	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	12/27/2023	Annual	12/27/2024	164715
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	6/2/2023	Annual	6/2/2024	100050
Rohde & Schwarz	HFH2-Z2	Loop Antenna	5/1/2023	Annual	5/1/2024	100519
Rohde & Schwarz	FSW43	Signal Analyzer (2Hz-43.5GHz)	7/13/2023	Annual	7/13/2024	101261
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	4/17/2023	Annual	4/17/2024	00304

Table 6-1. Test Equipment List

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
FCC ID: BCGA2898
IC: 579C-A2898
FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407	RSS-Gen [6.7]	26dB Bandwidth	N/A	CONDUCTED	N/A	Section 7.2
15.407(e)	RSS-Gen [6.7]	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
2.1049	RSS-Gen [6.7]	Occupied Bandwidth	N/A		PASS	Section 7.2, Section 7.3
15.407 (a.1.iv), (a.2), (a.3)	RSS-247 [6.2]	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.4
15.407 (a.1.iv), (a.2), (a.3)	RSS-247 [6.2]	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.5
15.407(h)	RSS-247 [6.3]	Dynamic Frequency Selection	See DFS Test Report	RADIATED	PASS	See DFS Test Report (1C2311270065-10.BCG)
15.407(b.1), (2), (3), (4)	RSS-247 [6.2]	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])		PASS	Section 7.6
15.205, 15.407(b.1), (4), (5), (6)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		PASS	Section 7.6, 7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 (RSS-Gen [8.8]) limits	LINE CONDUCTED	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "UNII Automation," Version 7.0.
5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 3.0.

7.2 26dB & 99% Bandwidth Measurement – 802.11a/n/ac/ax(SU)

§2.1049; §15.407; RSS-Gen [6.7]

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

The 26dB bandwidth is used to determine the conducted power limits.

Test Procedure Used

ANSI C63.10-2013 – Section 12.4
KDB 789033 D02 v02r01 – Section C

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth
3. VBW $\geq$ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. All antenna configurations and data rates were investigated and only the worst case are reported.
2. The data rates have been classified into three different groups; Low Data Rate, Middle Rate, and High Data Rate. All three data rate groups of data rate have been investigated and only the worst case data rate per group is reported.
3. Low, mid, and high channels were tested and tabular data has been reported. Only mid channel bandwidth plots have been reported.

7.2.1 Antenna WF7a 26dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	19.5/21.7 (MCS2)	17.83	21.39
	5200	40	n (20MHz)	19.5/21.7 (MCS2)	17.77	20.94
	5240	48	n (20MHz)	19.5/21.7 (MCS2)	17.76	20.98
	5180	36	ax (SU) (20MHz)	24/25.8 (MCS2)	19.15	22.27
	5200	40	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.27
	5240	48	ax (SU) (20MHz)	24/25.8 (MCS2)	19.05	21.33
	5190	38	n (40MHz)	40/40.5 (MCS2)	36.44	42.40
	5230	46	n (40MHz)	40/40.5 (MCS2)	36.33	41.03
	5190	38	ax (SU) (40MHz)	49/51.6 (MCS2)	38.14	43.99
	5230	46	ax (SU) (40MHz)	49/51.6 (MCS2)	37.99	41.67
	5210	42	ac (80MHz)	87.8/97.5 (MCS2)	75.58	84.12
	5210	42	ax (SU) (80MHz)	102/108.1 (MCS2)	77.27	95.23
Band 1/2	5250	50	ac (160MHz)	87.8/97.5 (MCS2)	154.03	164.50
	5250	50	ax (SU) (160MHz)	102/108.1 (MCS2)	156.16	166.20
Band 2A	5260	52	n (20MHz)	19.5/21.7 (MCS2)	17.77	21.11
	5300	60	n (20MHz)	19.5/21.7 (MCS2)	17.74	20.94
	5320	64	n (20MHz)	19.5/21.7 (MCS2)	17.84	21.28
	5260	52	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.26
	5300	60	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.30
	5320	64	ax (SU) (20MHz)	24/25.8 (MCS2)	19.14	22.53
	5270	54	n (40MHz)	40/40.5 (MCS2)	36.28	41.05
	5310	62	n (40MHz)	40/40.5 (MCS2)	36.52	42.31
	5270	54	ax (SU) (40MHz)	49/51.6 (MCS2)	38.00	41.50
	5310	62	ax (SU) (40MHz)	49/51.6 (MCS2)	38.09	43.79
	5290	58	ac (80MHz)	87.8/97.5 (MCS2)	75.62	82.99
	5290	58	ax (SU) (80MHz)	102/108.1 (MCS2)	77.23	84.80
Band 2C	5500	100	n (20MHz)	19.5/21.7 (MCS2)	17.84	21.38
	5580	116	n (20MHz)	19.5/21.7 (MCS2)	17.74	20.89
	5720	144	n (20MHz)	19.5/21.7 (MCS2)	17.76	21.09
	5500	100	ax (SU) (20MHz)	24/25.8 (MCS2)	19.12	22.19
	5580	116	ax (SU) (20MHz)	24/25.8 (MCS2)	19.08	21.25
	5720	144	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.34
	5510	102	n (40MHz)	40/40.5 (MCS2)	36.43	42.62
	5550	110	n (40MHz)	40/40.5 (MCS2)	36.30	41.33
	5710	142	n (40MHz)	40/40.5 (MCS2)	36.28	41.05
	5510	102	ax (SU) (40MHz)	49/51.6 (MCS2)	38.04	44.46
	5550	110	ax (SU) (40MHz)	49/51.6 (MCS2)	38.03	41.77
	5710	142	ax (SU) (40MHz)	49/51.6 (MCS2)	37.96	41.71
	5530	106	ac (80MHz)	87.8/97.5 (MCS2)	75.75	82.36
	5690	138	ac (80MHz)	87.8/97.5 (MCS2)	75.56	81.08
	5530	106	ax (SU) (80MHz)	102/108.1 (MCS2)	77.26	86.40
	5690	138	ax (SU) (80MHz)	102/108.1 (MCS2)	77.17	82.10
	5570	114	ac (160MHz)	87.8/97.5 (MCS2)	154.10	165.20
	5570	114	ax (SU) (160MHz)	102/108.1 (MCS2)	156.11	165.60

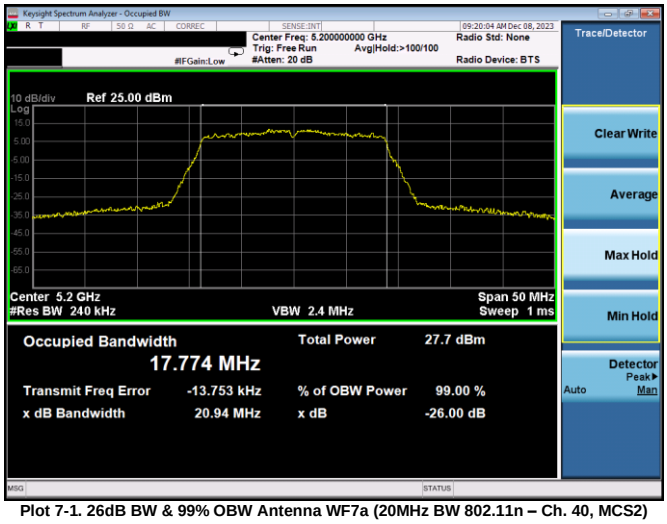
Table 7-2. Conducted Bandwidth Measurements Antenna WF7a (Low Data Rate)

	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	39/43.3 (MCS4)	17.80	21.37
	5200	40	n (20MHz)	39/43.3 (MCS4)	17.79	20.91
	5240	48	n (20MHz)	39/43.3 (MCS4)	17.77	21.01
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.45
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	19.05	21.34
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.43
	5190	38	n (40MHz)	81/90 (MCS4)	36.43	41.05
	5230	46	n (40MHz)	81/90 (MCS4)	36.48	40.75
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	38.03	47.76
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	38.04	44.78
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.61	81.19
	5210	42	ax (SU) (80MHz)	204/216.2 (MCS4)	77.31	85.41
Band 1/2	5250	50	ac (160MHz)	175.5/195 (MCS4)	153.98	164.70
	5250	50	ax (SU) (160MHz)	204/216.2 (MCS4)	156.31	166.20
Band 2A	5260	52	n (20MHz)	39/43.3 (MCS4)	17.74	20.94
	5300	60	n (20MHz)	39/43.3 (MCS4)	17.76	20.93
	5320	64	n (20MHz)	39/43.3 (MCS4)	17.78	20.75
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.51
	5300	60	ax (SU) (20MHz)	49/51.6 (MCS4)	19.07	21.39
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.07
	5270	54	n (40MHz)	81/90 (MCS4)	36.37	40.96
	5310	62	n (40MHz)	81/90 (MCS4)	36.38	40.73
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	37.99	41.63
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	38.04	46.45
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.51	81.25
	5290	58	ax (SU) (80MHz)	204/216.2 (MCS4)	77.23	82.08
Band 2C	5500	100	n (20MHz)	39/43.3 (MCS4)	17.81	20.90
	5580	116	n (20MHz)	39/43.3 (MCS4)	17.75	20.92
	5720	144	n (20MHz)	39/43.3 (MCS4)	17.73	20.88
	5500	100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.07	21.31
	5580	116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.24
	5720	144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.04	21.23
	5510	102	n (40MHz)	81/90 (MCS4)	36.47	41.53
	5550	110	n (40MHz)	81/90 (MCS4)	36.32	41.05
	5710	142	n (40MHz)	81/90 (MCS4)	36.38	41.14
	5510	102	ax (SU) (40MHz)	98/103.2 (MCS4)	38.07	46.21
	5550	110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.95	41.35
	5710	142	ax (SU) (40MHz)	98/103.2 (MCS4)	38.01	41.93
	5530	106	ac (80MHz)	175.5/195 (MCS4)	75.65	81.49
	5690	138	ac (80MHz)	175.5/195 (MCS4)	75.62	81.17
	5530	106	ax (SU) (80MHz)	204/216.2 (MCS4)	77.21	81.77
	5690	138	ax (SU) (80MHz)	204/216.2 (MCS4)	77.31	82.05
	5570	114	ac (160MHz)	175.5/195 (MCS4)	154.27	165.30
	5570	114	ax (SU) (160MHz)	204/216.2 (MCS4)	156.39	165.70

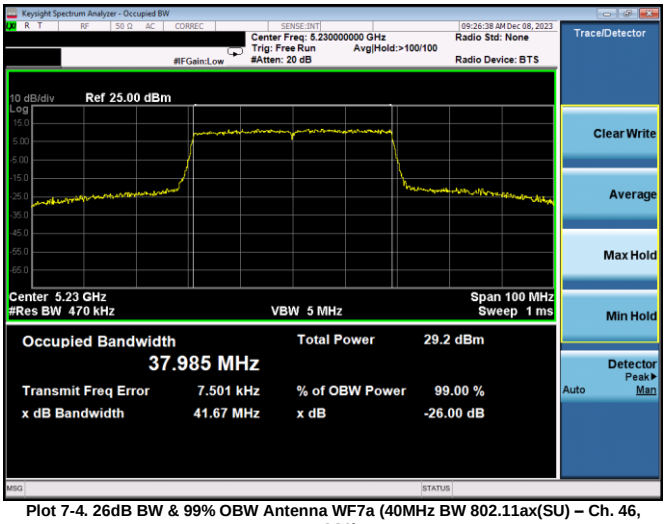
Table 7-3. Conducted Bandwidth Measurements Antenna WF7a (Mid Data Rate)

	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	17.85	21.17
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.87	21.11
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.89	21.10
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	18.99	21.24
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.25
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.08	21.47
	5190	38	n (40MHz)	135/150 (MCS7)	36.52	41.24
	5230	46	n (40MHz)	135/150 (MCS7)	36.76	42.00
	5190	38	ax (SU) (40MHz)	271/286 (MCS11)	37.92	41.33
	5230	46	ax (SU) (40MHz)	271/286 (MCS11)	38.08	51.81
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.93	81.59
	5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.22	81.81
Band 1/2	5250	50	ac (160MHz)	390/433.3 (MCS9)	154.86	166.30
	5250	50	ax (SU) (160MHz)	567/600.5 (MCS11)	156.14	165.70
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.93	21.21
	5300	60	n (20MHz)	65/72.2 (MCS7)	17.90	21.17
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.86	20.91
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.38
	5300	60	ax (SU) (20MHz)	135/143.4 (MCS11)	19.08	21.31
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.21
	5270	54	n (40MHz)	135/150 (MCS7)	36.59	41.52
	5310	62	n (40MHz)	135/150 (MCS7)	36.49	41.36
	5270	54	ax (SU) (40MHz)	271/286 (MCS11)	37.99	44.55
	5310	62	ax (SU) (40MHz)	271/286 (MCS11)	37.92	41.44
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.77	81.58
	5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.22	81.73
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.86	21.09
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.90	21.14
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.89	21.14
	5500	100	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.30
	5580	116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.08	21.25
	5720	144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.39
	5510	102	n (40MHz)	135/150 (MCS7)	36.58	41.49
	5550	110	n (40MHz)	135/150 (MCS7)	36.54	41.25
	5710	142	n (40MHz)	135/150 (MCS7)	36.66	41.55
	5510	102	ax (SU) (40MHz)	271/286 (MCS11)	37.96	41.09
	5550	110	ax (SU) (40MHz)	271/286 (MCS11)	37.92	41.34
	5710	142	ax (SU) (40MHz)	271/286 (MCS11)	37.96	55.37
	5530	106	ac (80MHz)	390/433.3 (MCS9)	75.90	81.53
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.04	84.84
	5530	106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.19	81.93
	5690	138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.36	84.87
	5570	114	ac (160MHz)	390/433.3 (MCS9)	154.83	166.20
	5570	114	ax (SU) (160MHz)	567/600.5 (MCS11)	156.14	165.80

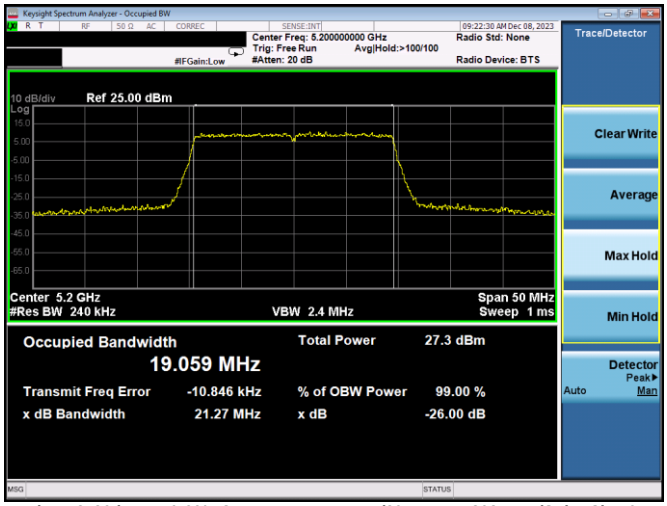
Table 7-4. Conducted Bandwidth Measurements Antenna WF7a (High Data Rate)



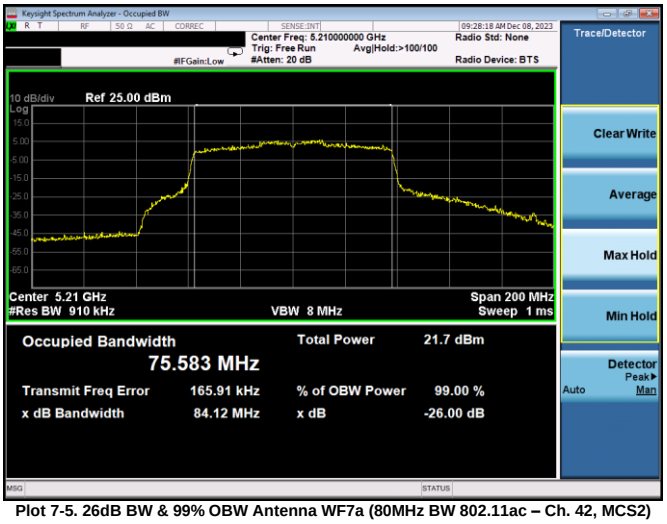
Plot 7-1. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 40, MCS2)



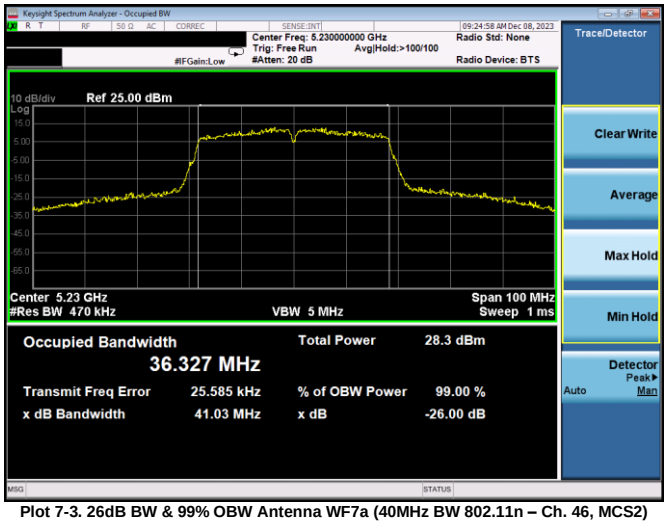
Plot 7-4. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 46, MCS2)



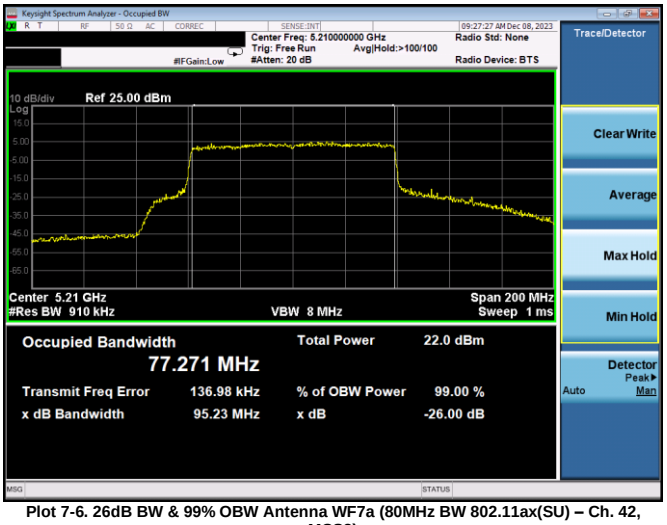
Plot 7-2. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 40, MCS2)



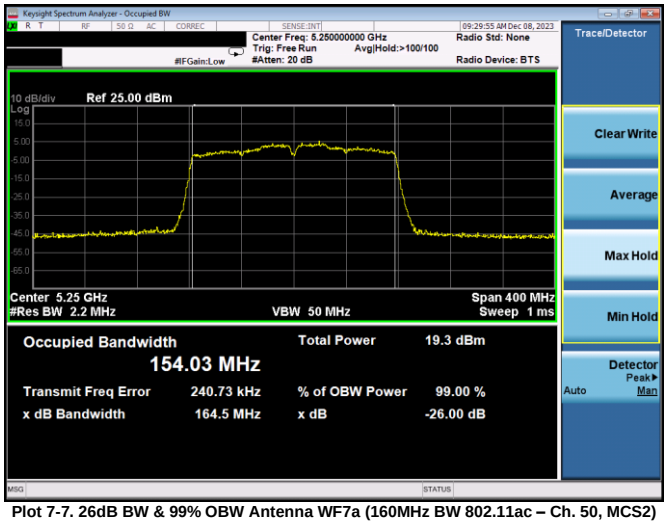
Plot 7-5. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 42, MCS2)



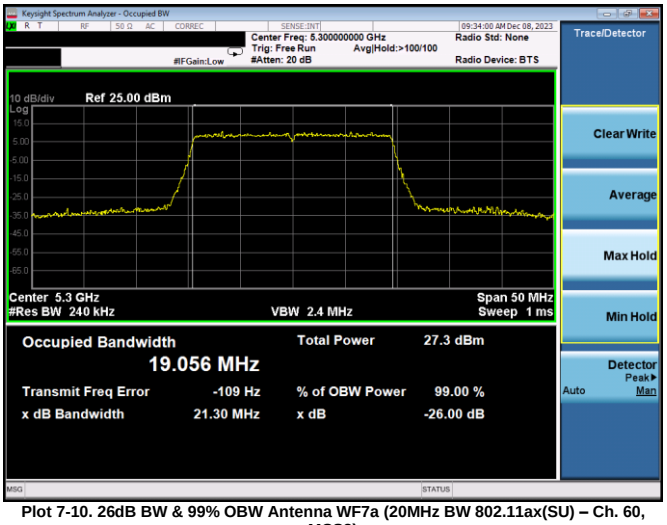
Plot 7-3. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 46, MCS2)



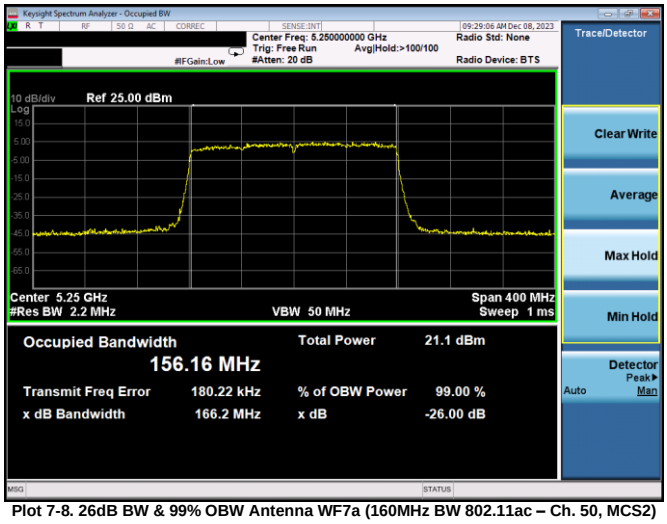
Plot 7-6. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 42, MCS2)



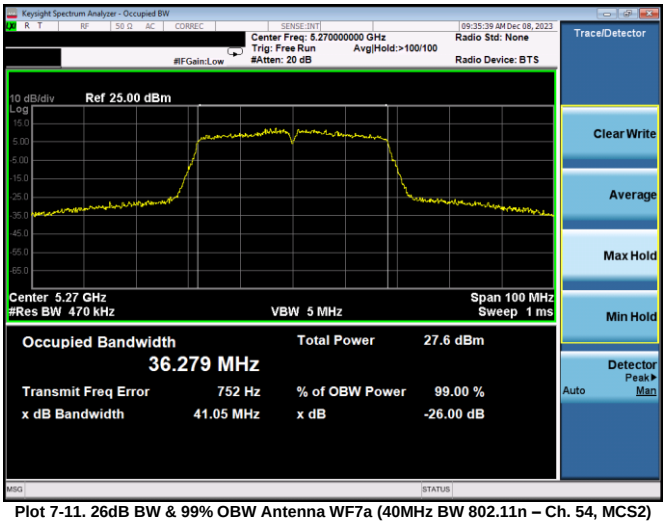
Plot 7-7. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 50, MCS2)



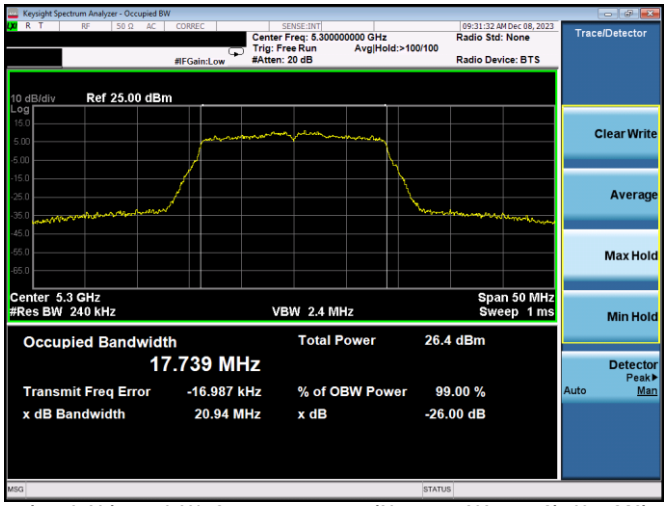
Plot 7-10. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 60, MCS2)



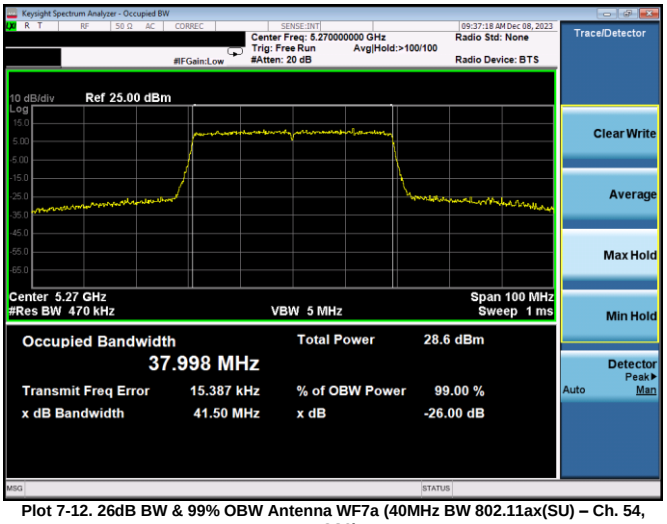
Plot 7-8. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 50, MCS2)



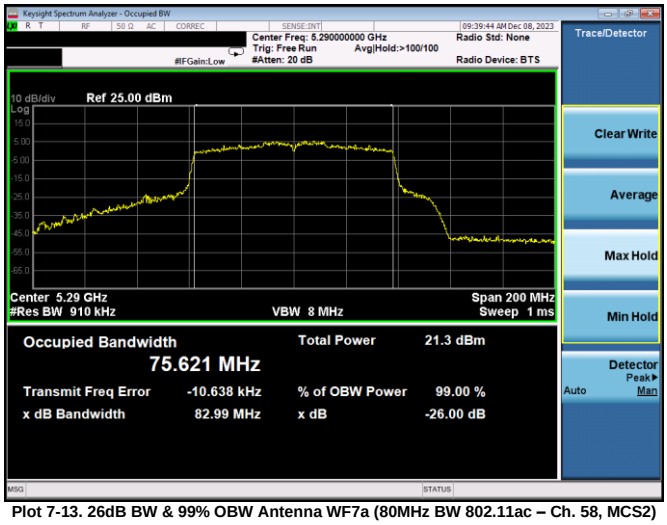
Plot 7-11. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 54, MCS2)



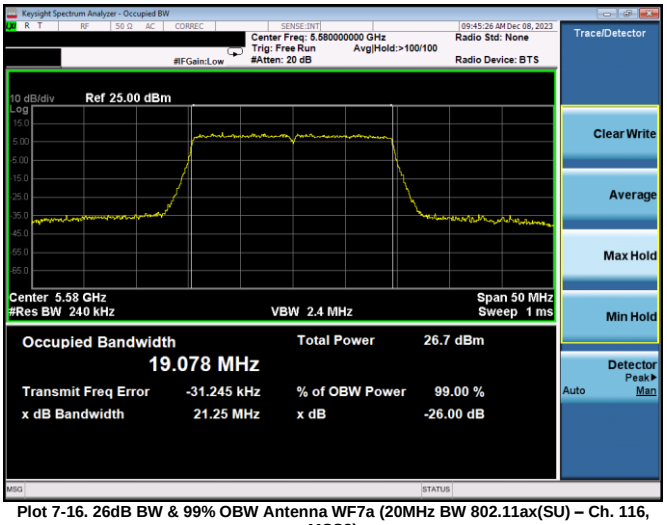
Plot 7-9. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 60, MCS2)



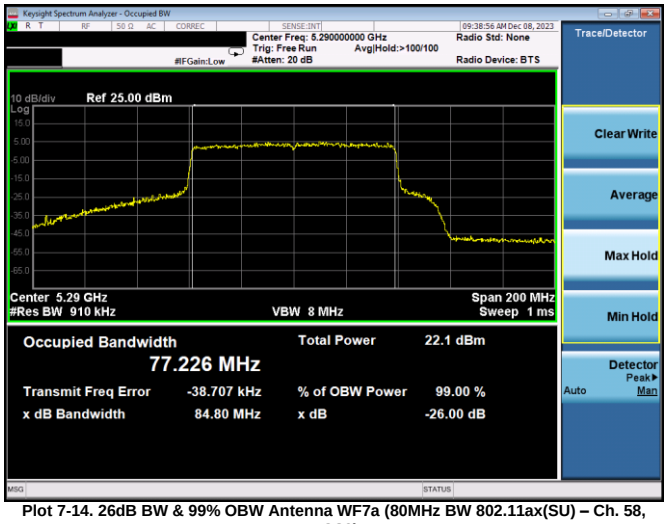
Plot 7-12. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 54, MCS2)



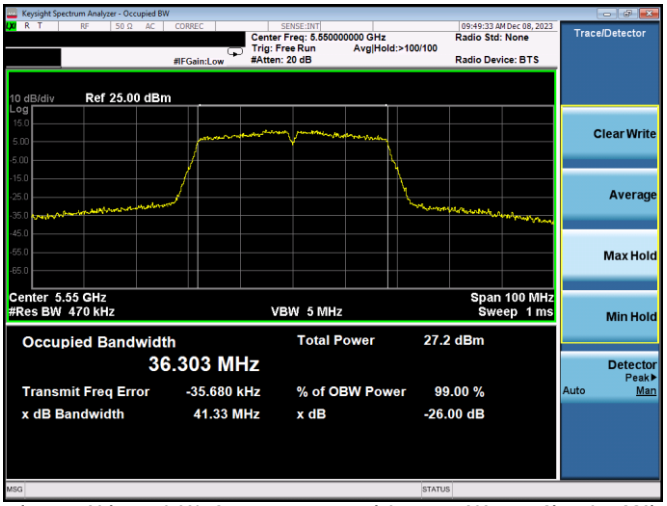
Plot 7-13. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 58, MCS2)



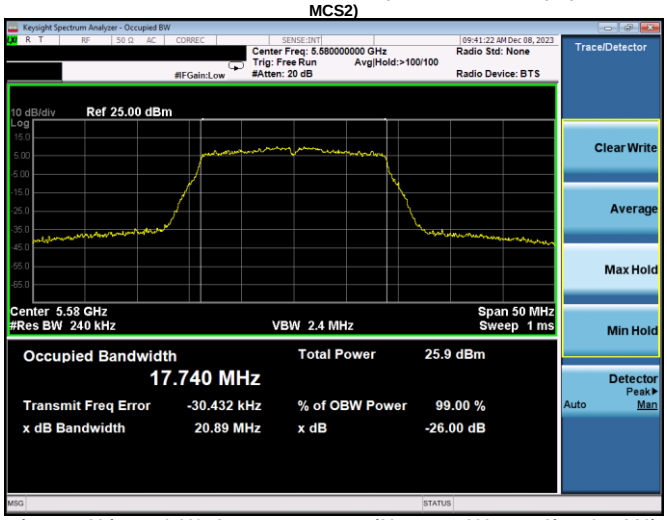
Plot 7-16. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 116, MCS2)



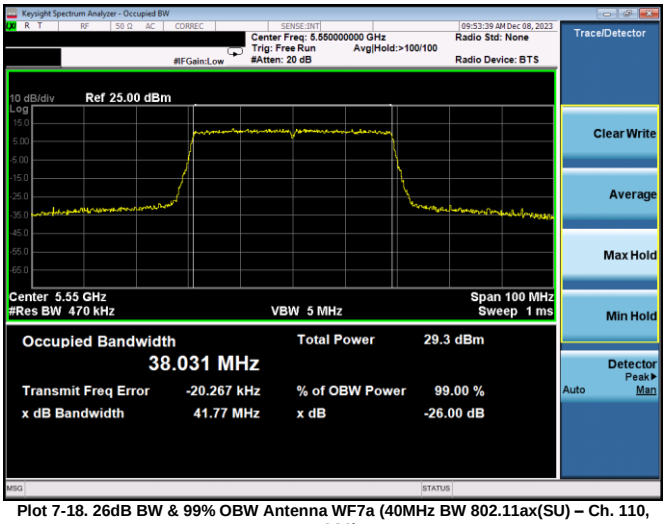
Plot 7-14. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 58, MCS2)



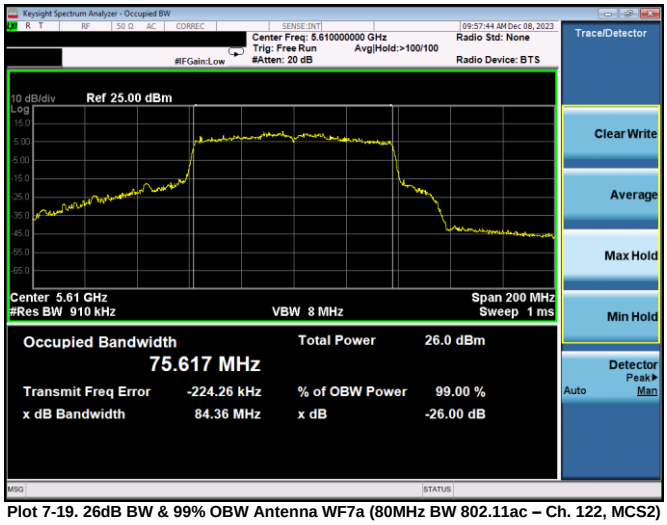
Plot 7-17. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 110, MCS2)



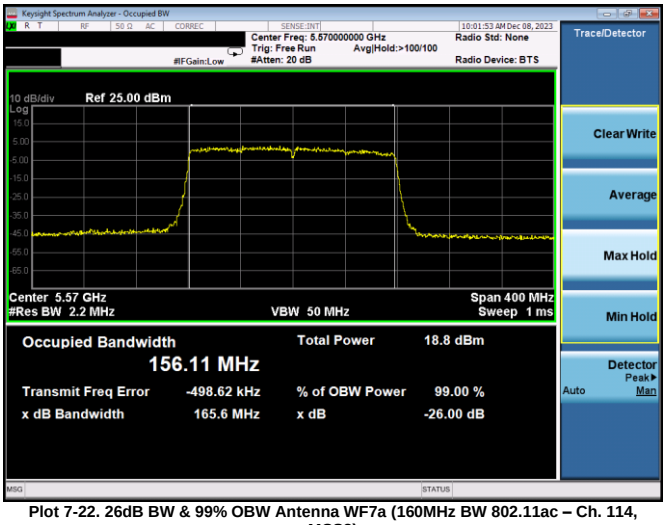
Plot 7-15. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 116, MCS2)



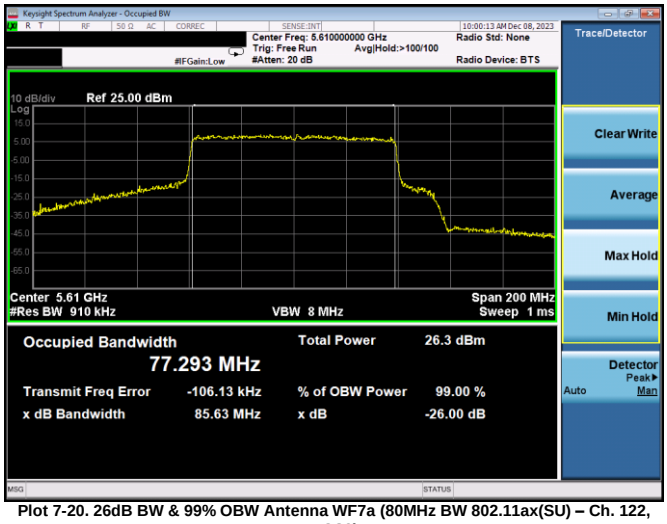
Plot 7-18. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 110, MCS2)



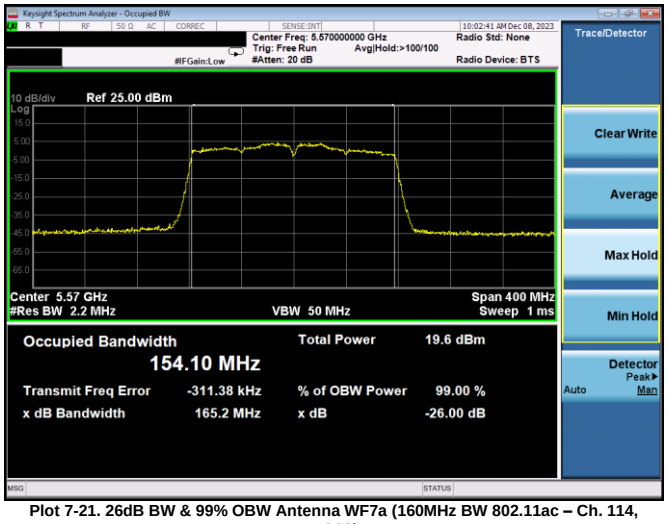
Plot 7-19. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 122, MCS2)



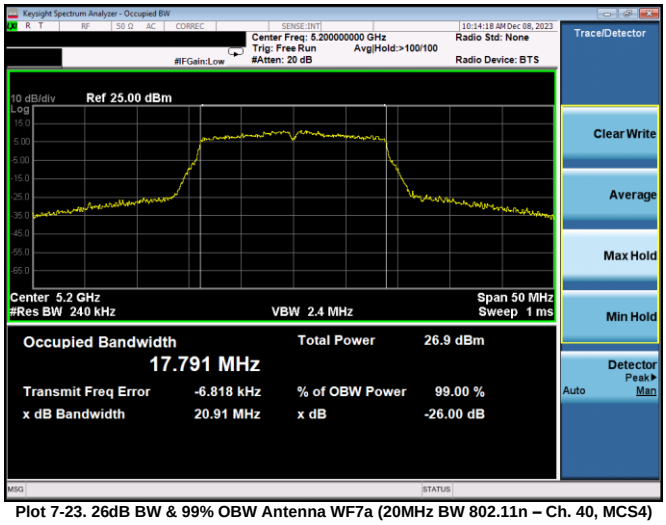
Plot 7-22. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 114, MCS2)



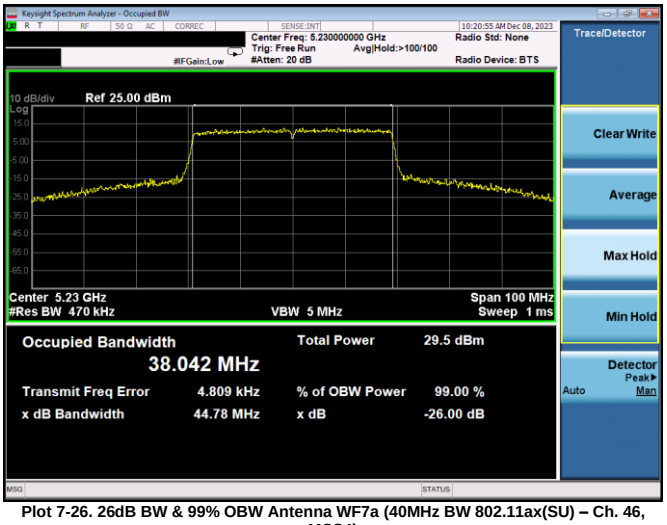
Plot 7-20. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 122, MCS2)



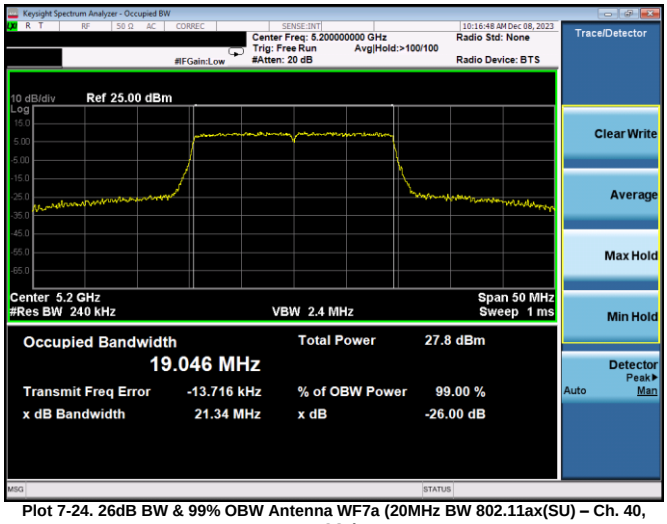
Plot 7-21. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 114, MCS2)



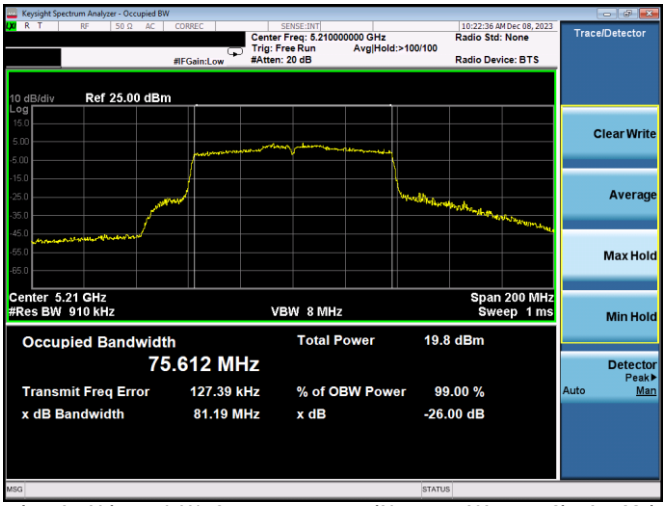
Plot 7-23. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 40, MCS4)



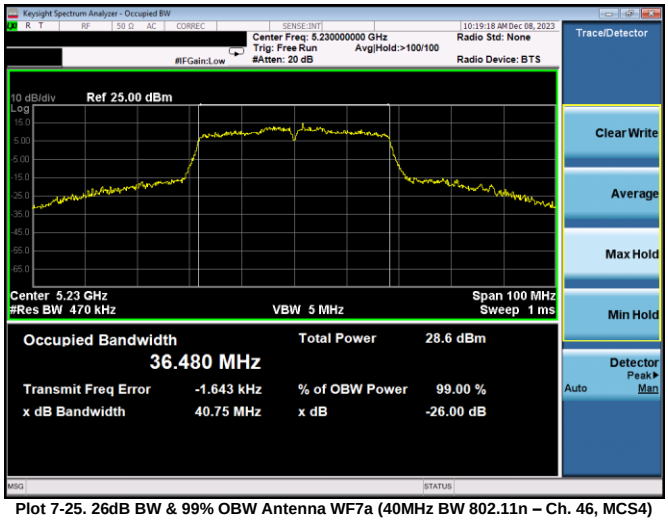
Plot 7-26. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 46, MCS4)



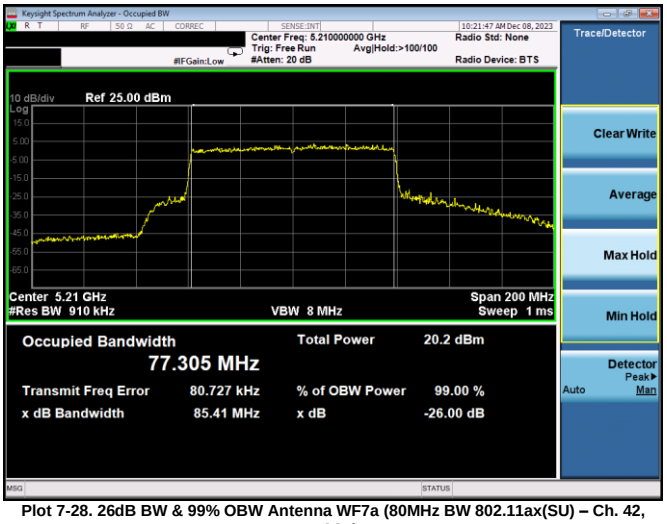
Plot 7-24. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 40, MCS4)



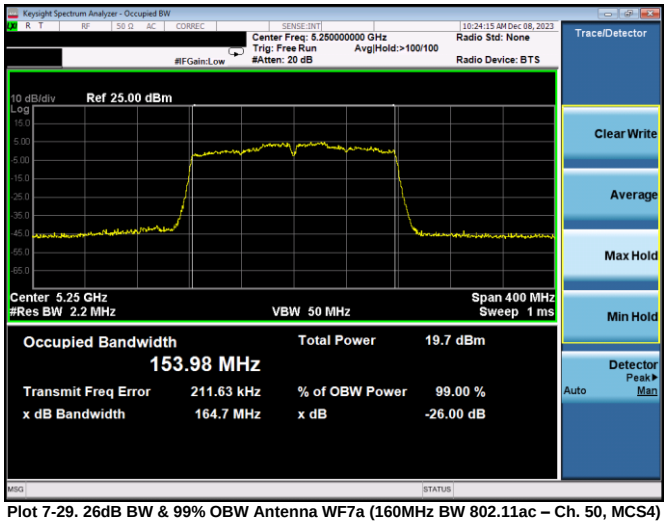
Plot 7-27. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 42, MCS4)



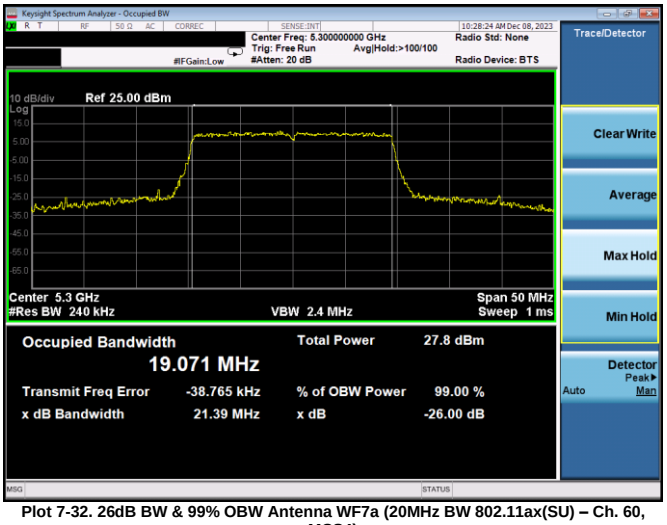
Plot 7-25. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 46, MCS4)



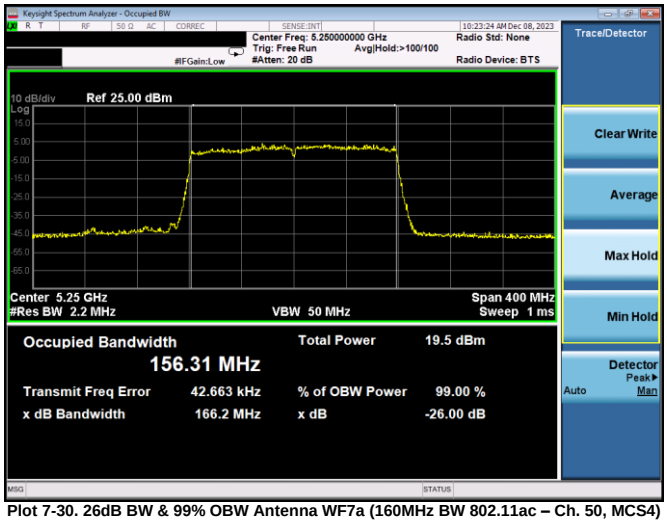
Plot 7-28. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 42, MCS4)



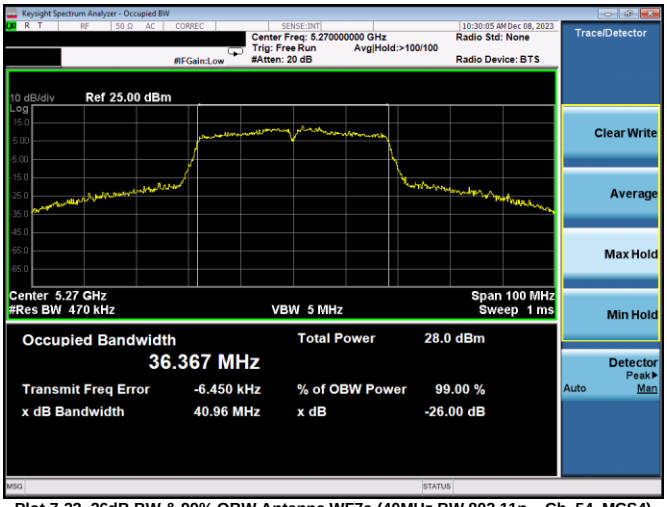
Plot 7-29. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 50, MCS4)



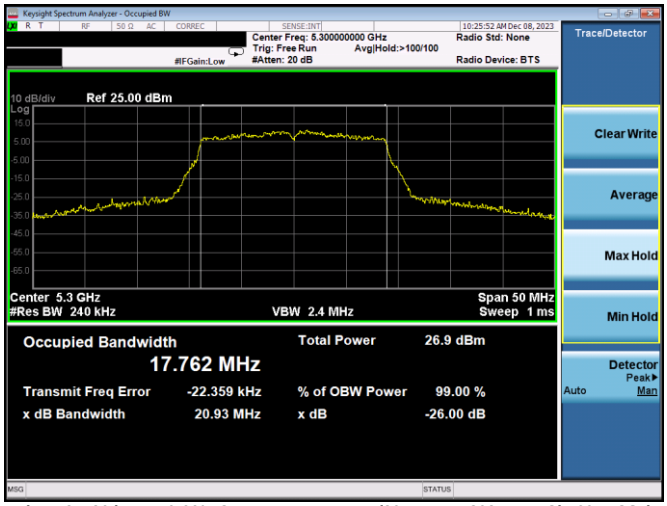
Plot 7-32. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 60, MCS4)



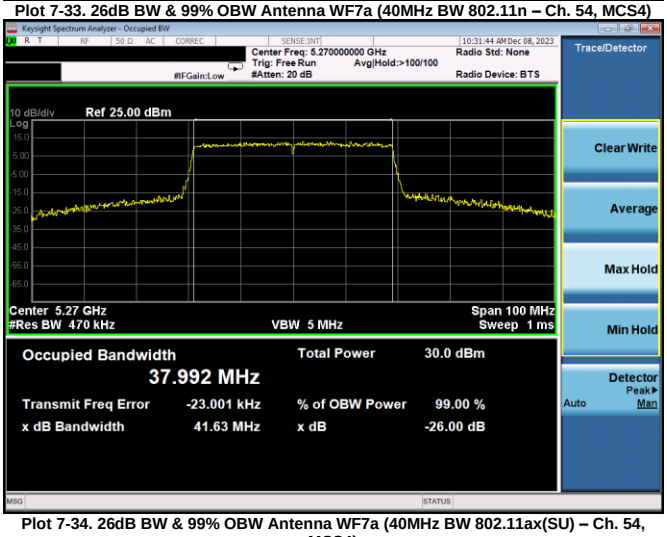
Plot 7-30. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 50, MCS4)



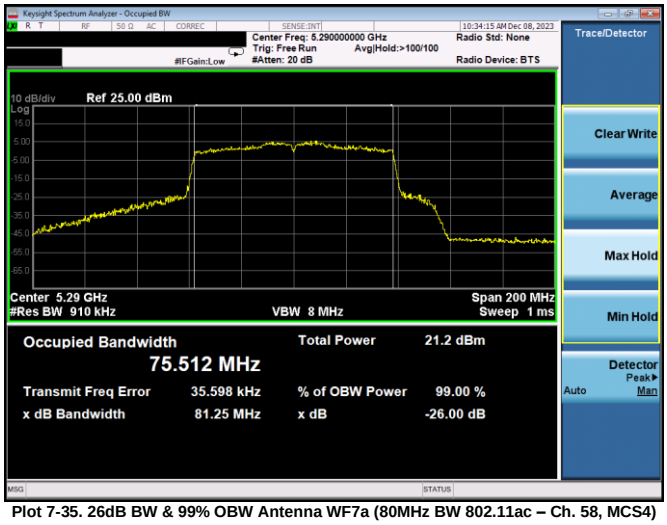
Plot 7-33. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 54, MCS4)



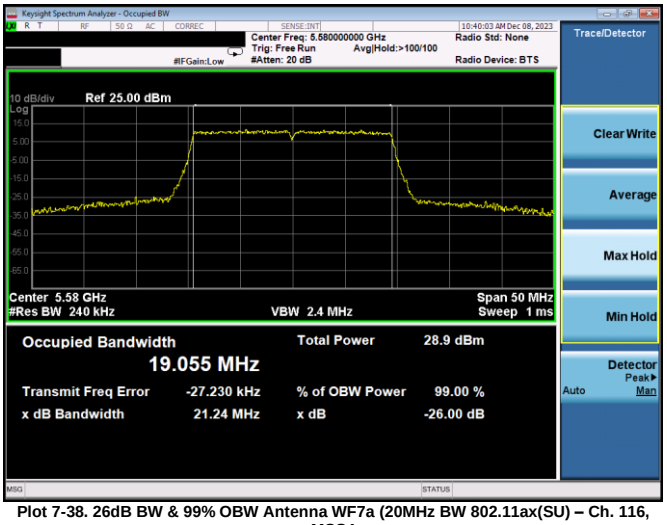
Plot 7-31. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 60, MCS4)



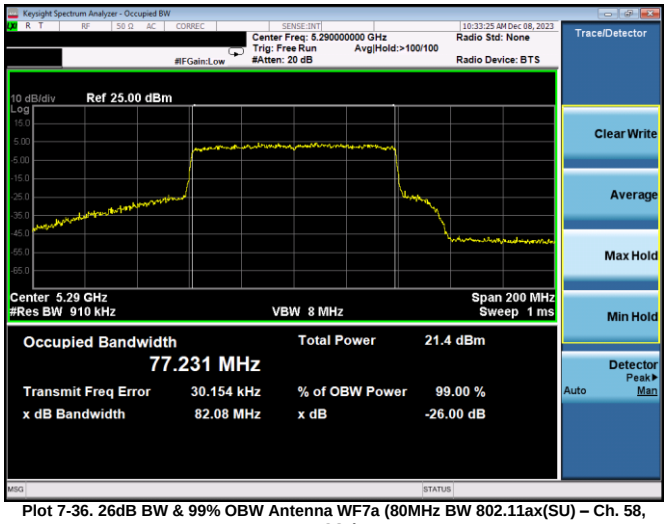
Plot 7-34. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 54, MCS4)



Plot 7-35. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 58, MCS4)

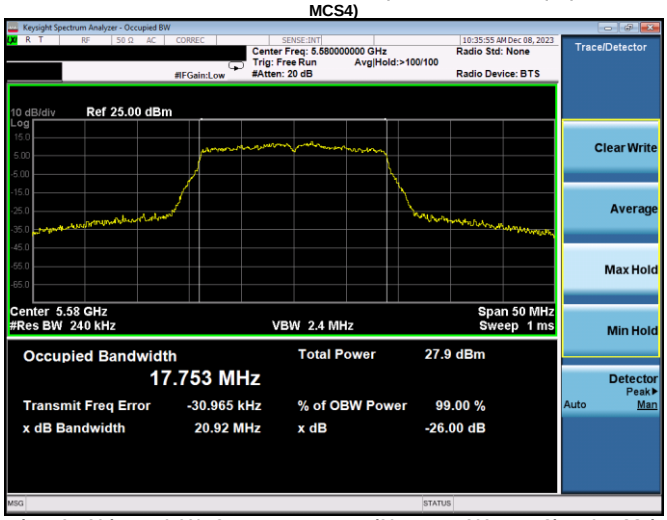


Plot 7-38. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 116, MCS4

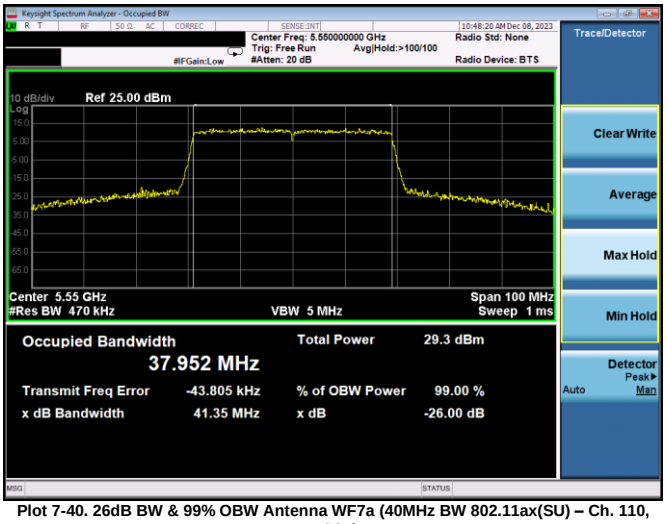


Plot 7-36. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 58, MCS4)

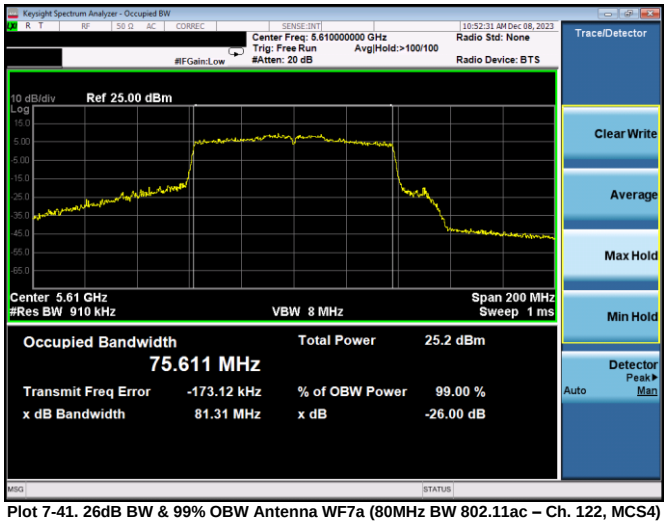
Plot 7-39. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 110, MCS4)



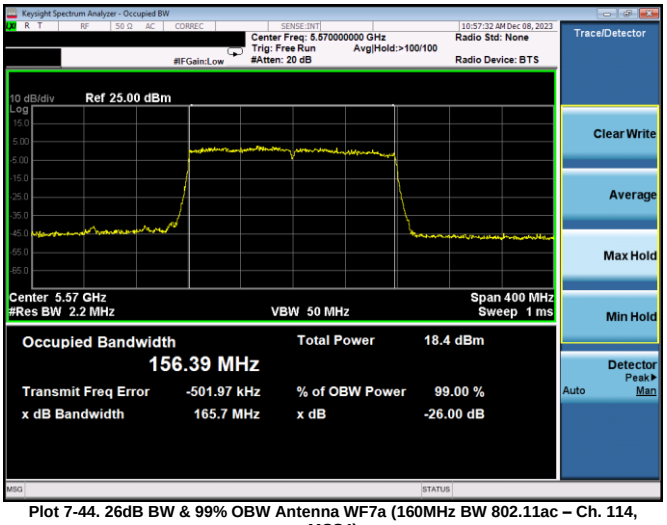
Plot 7-37. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 116, MCS4)



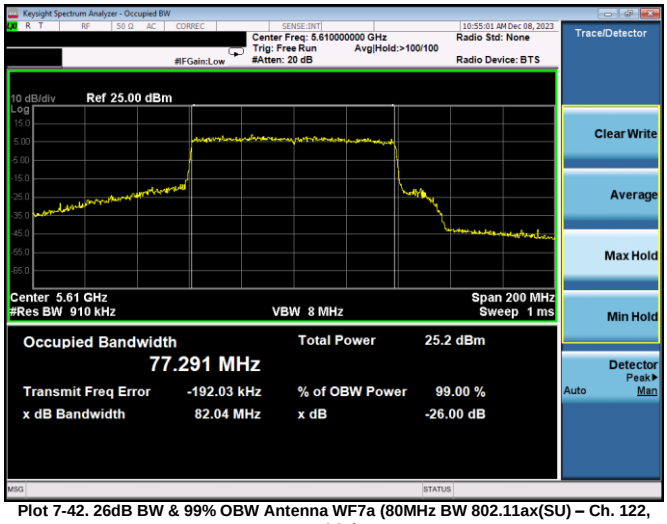
Plot 7-40. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 110, MCS4)



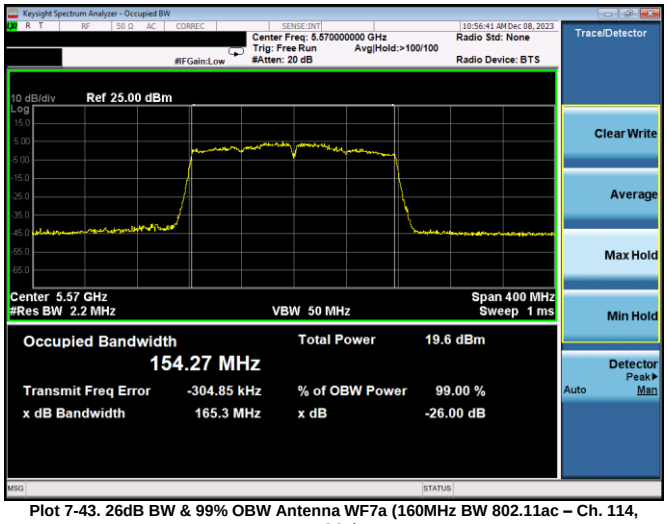
Plot 7-41. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 122, MCS4)



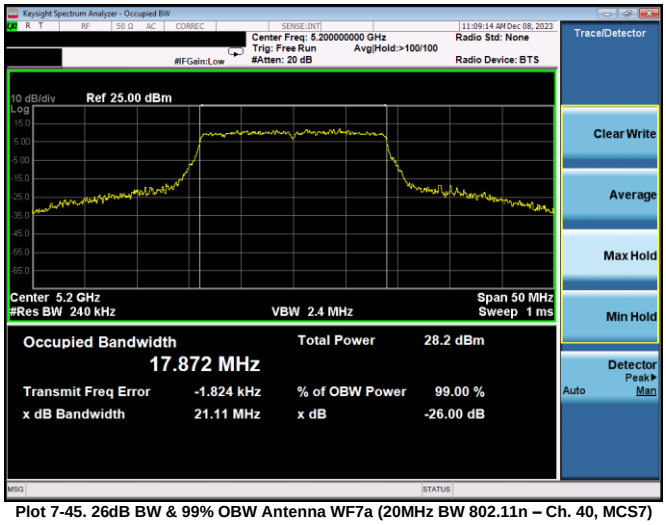
Plot 7-44. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 114, MCS4)



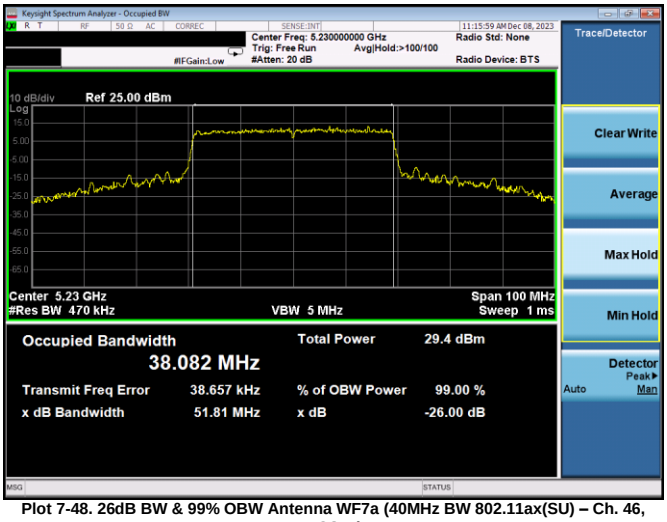
Plot 7-42. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 122, MCS4)



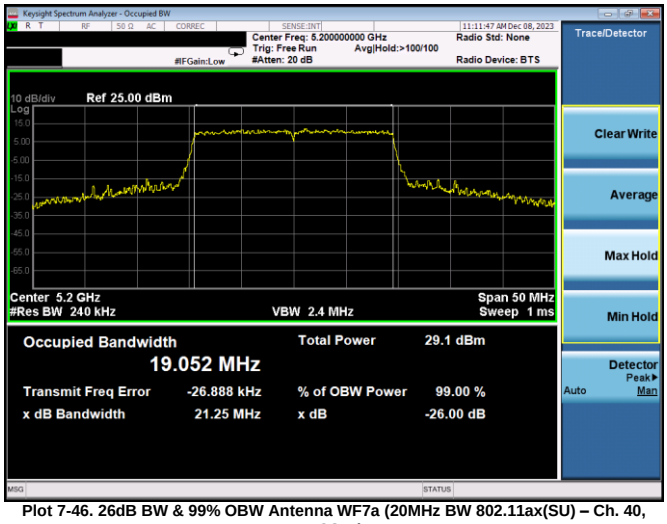
Plot 7-43. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 114, MCS4)



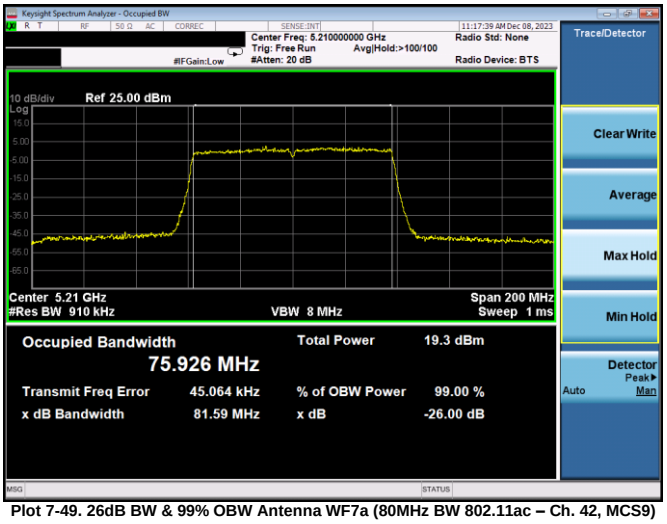
Plot 7-45. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 40, MCS7)



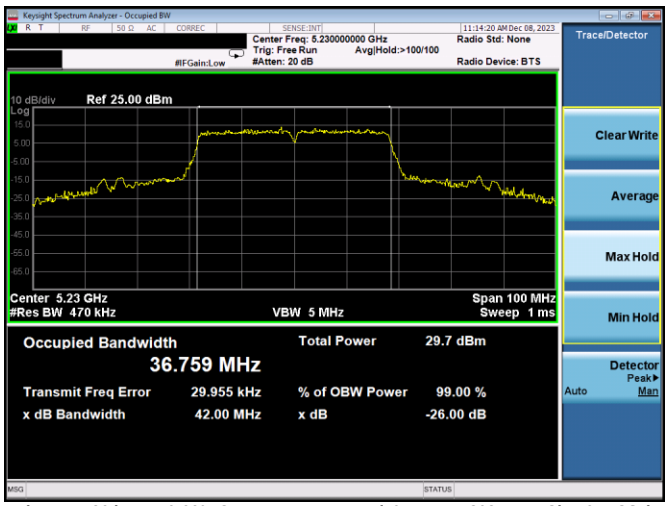
Plot 7-48. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 46, MCS11)



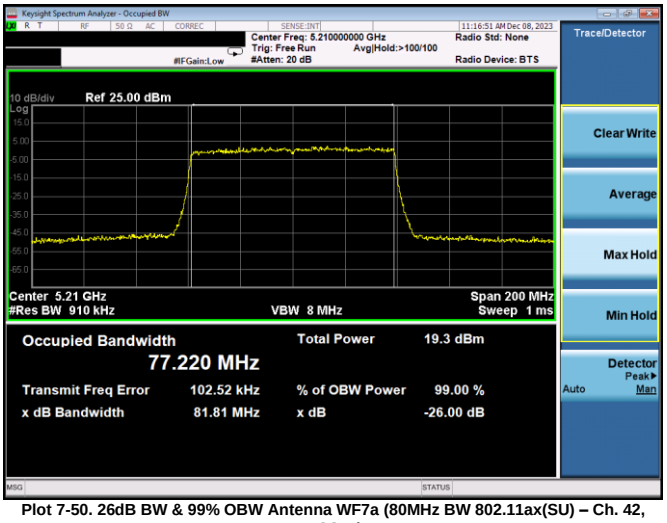
Plot 7-46. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 40, MCS11)



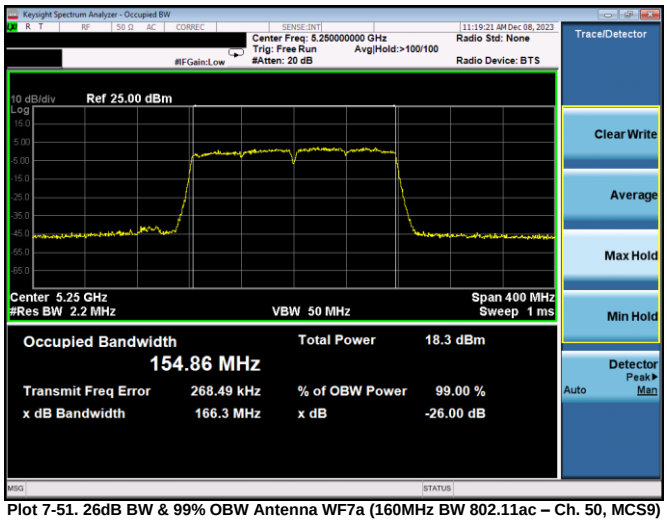
Plot 7-49. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ac – Ch. 42, MCS9)



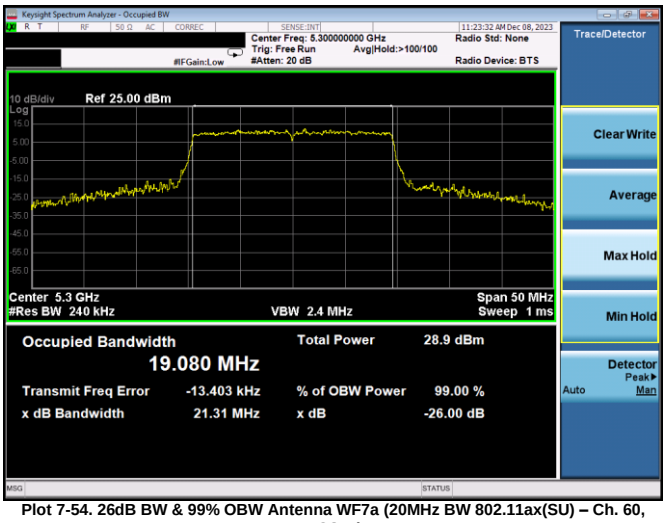
Plot 7-47. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 46, MCS7)



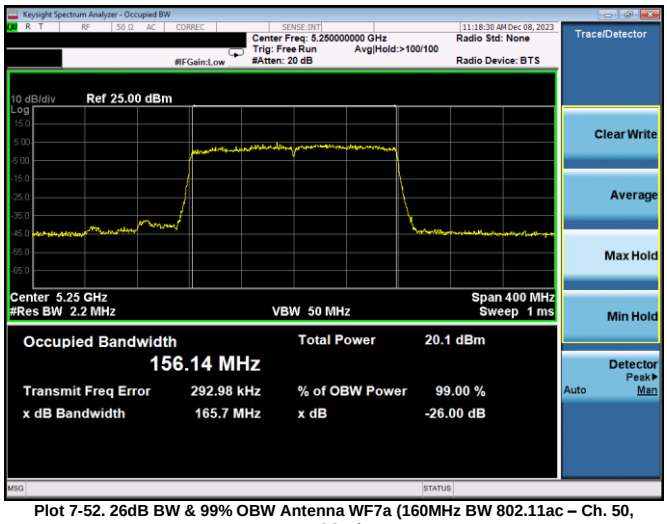
Plot 7-50. 26dB BW & 99% OBW Antenna WF7a (80MHz BW 802.11ax(SU) – Ch. 42, MCS11)



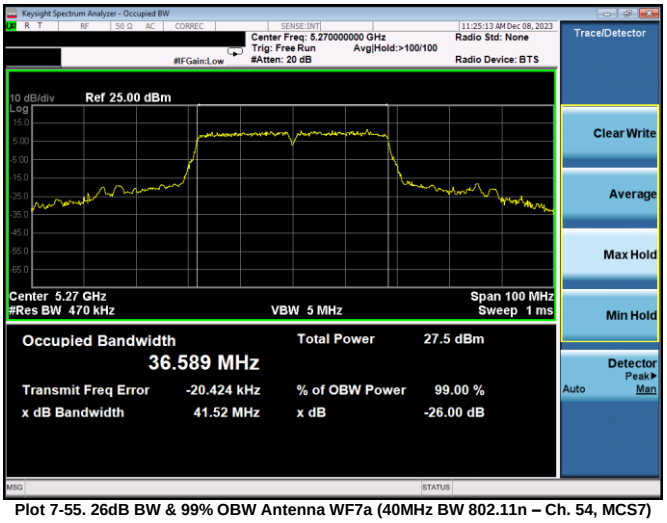
Plot 7-51. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 50, MCS9)



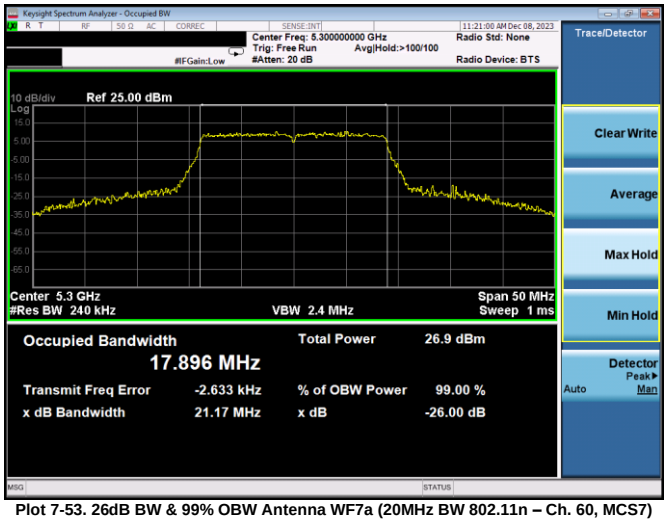
Plot 7-54. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11ax(SU) – Ch. 60, MCS11)



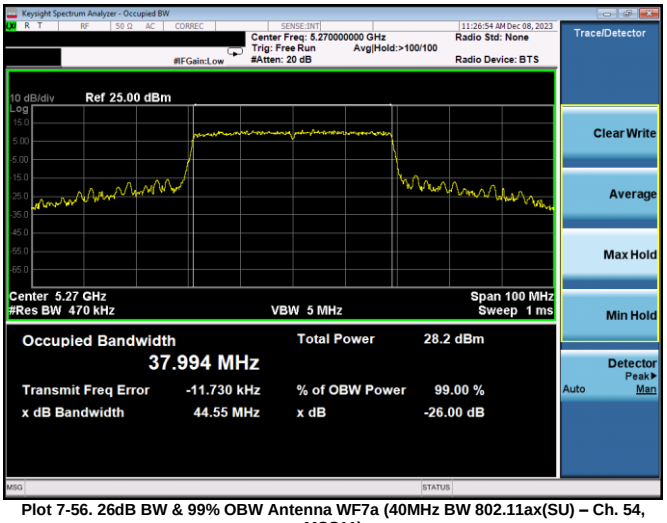
Plot 7-52. 26dB BW & 99% OBW Antenna WF7a (160MHz BW 802.11ac – Ch. 50, MCS11)



Plot 7-55. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11n – Ch. 54, MCS7)



Plot 7-53. 26dB BW & 99% OBW Antenna WF7a (20MHz BW 802.11n – Ch. 60, MCS7)



Plot 7-56. 26dB BW & 99% OBW Antenna WF7a (40MHz BW 802.11ax(SU) – Ch. 54, MCS11)