Element Materials Technology
(formerly PCTEST)
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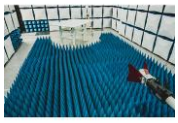

MEASUREMENT REPORT
FCC PART 15.407 / ISED RSS-247 UNII 802.11a/n/ac/ax(SU)

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

Date of Testing:
11/28/2023 – 3/11/2024
Test Report Issue Date:
3/24/2024
Test Site/Location:
Element Materials Technology, Morgan Hill, CA, USA
Test Report Serial No.:
1C2311270064-24.BCG

FCC ID:	**BCGA2903**
IC:	**579C-A2903**
APPLICANT:	**Apple Inc.**

Application Type:	Certification
Model/HVIN:	A2903, A2904
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.

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: WKR0000010596

Reviewed by: WKR0000005805

ACCREDITED
CERT #2041.02

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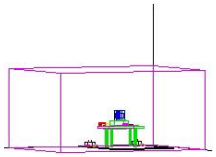
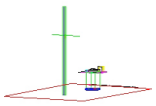


MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna 3c		Antenna 3a		Antenna 1b		Antenna 3c		Antenna 3a		Summed		Antenna 3c		Antenna 1b		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	89.125	19.50	89.125	19.50	49.888	16.98	49.671	16.96	99.541	19.98	50.119	17.00	49.774	16.97	99.770	19.99
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	89.125	19.50	49.774	16.97	50.119	17.00	99.770	19.99	49.545	16.95	50.119	17.00	98.855	19.95
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.119	17.00	49.888	16.98	100.000	20.00	50.003	16.99	49.774	16.97	99.770	19.99
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	88.920	19.49	88.716	19.48	177.828	22.50	88.716	19.48	88.105	19.45	173.380	22.39
1	40	802.11n	5190 - 5230	88.166	19.45	84.606	19.27	89.125	19.50	84.781	19.28	88.920	19.49	173.780	22.40	89.125	19.50	86.000	19.35	174.985	22.43
2A		802.11n	5270 - 5310	84.859	19.29	86.976	19.39	86.298	19.36	86.040	19.35	88.716	19.48	174.582	22.42	85.941	19.34	86.457	19.37	172.584	22.37
2C		802.11n	5510 - 5710	88.308	19.46	89.125	19.50	89.125	19.50	88.227	19.46	89.125	19.50	177.419	22.49	87.902	19.44	88.308	19.46	176.198	22.46
3		802.11n	5755 - 5795	87.398	19.42	89.125	19.50	89.125	19.50	88.920	19.49	87.056	19.40	175.792	22.45	89.125	19.50	88.512	19.47	177.419	22.49
1	80	802.11ac	5210	33.674	15.27	35.481	15.50	35.302	15.48	30.648	14.86	31.623	15.00	62.230	17.94	29.930	14.76	30.917	14.90	60.814	17.84
2A		802.11ac	5290	32.674	15.14	31.805	15.03	32.233	15.08	27.133	14.34	26.681	14.26	53.827	17.31	26.351	14.21	27.334	14.37	53.703	17.30
2C		802.11ac	5530 - 5690	85.763	19.33	89.125	19.50	89.125	19.50	83.714	19.23	85.882	19.34	169.434	22.29	87.619	19.43	86.199	19.36	173.780	22.40
3		802.11ac	5775	77.268	18.88	77.983	18.92	78.705	18.96	72.644	18.61	74.302	18.71	146.893	21.67	71.007	18.51	71.384	18.54	142.233	21.53
1/2A	160	802.11ac	5250	23.243	13.66	23.714	13.75	23.388	13.69	18.235	12.61	19.543	12.91	37.757	15.77	19.011	12.79	19.099	12.81	38.107	15.81
2C		802.11ac	5570	22.824	13.58	22.626	13.55	23.227	13.66	21.135	13.25	22.075	13.44	43.251	16.36	22.289	13.48	21.662	13.36	43.954	16.43
1	20	802.11ax (SU)	5180 - 5240	86.776	19.38	89.125	19.50	89.125	19.50	49.170	16.92	49.465	16.94	98.628	19.94	49.000	16.90	49.774	16.97	98.855	19.95
2A		802.11ax (SU)	5260 - 5320	87.157	19.40	89.125	19.50	86.377	19.36	50.003	16.99	49.888	16.98	99.770	19.99	49.911	16.98	49.091	16.91	98.628	19.94
2C		802.11ax (SU)	5500 - 5720	85.684	19.33	86.020	19.35	89.125	19.50	49.774	16.97	50.003	16.99	99.770	19.99	49.831	16.98	49.808	16.97	99.541	19.98
3		802.11ax (SU)	5745 - 5825	88.206	19.46	87.640	19.43	88.593	19.47	86.656	19.38	88.716	19.48	174.582	22.42	88.369	19.46	87.177	19.40	174.582	22.42
1	40	802.11ax (SU)	5190 - 5230	84.178	19.25	85.389	19.31	82.832	19.18	86.796	19.39	84.295	19.26	171.002	22.33	86.656	19.38	88.920	19.49	175.388	22.44
2A		802.11ax (SU)	5270 - 5310	88.125	19.45	87.458	19.42	86.557	19.37	88.450	19.47	85.055	19.30	173.380	22.39	87.237	19.41	88.512	19.47	175.792	22.45
2C		802.11ax (SU)	5510 - 5710	87.902	19.44	88.695	19.48	89.125	19.50	87.700	19.43	86.696	19.38	174.582	22.42	88.105	19.45	88.512	19.47	176.198	22.46
3		802.11ax (SU)	5755 - 5795	88.024	19.45	89.064	19.50	89.064	19.50	88.654	19.48	85.585	19.32	174.181	22.41	85.330	19.31	88.716	19.48	174.181	22.41
1	80	802.11ax (SU)	5210	28.294	14.52	29.737	14.73	29.478	14.70	26.455	14.23	26.546	14.24	52.966	17.24	25.906	14.13	25.474	14.06	51.404	17.11
2A		802.11ax (SU)	5290	28.255	14.51	28.695	14.58	29.854	14.75	25.015	13.98	26.485	14.23	51.523	17.12	25.896	14.13	25.639	14.09	51.523	17.12
2C		802.11ax (SU)	5530 - 5690	82.262	19.15	84.353	19.26	84.450	19.27	83.253	19.20	88.573	19.47	171.791	22.35	85.251	19.31	87.237	19.41	172.584	22.37
3		802.11ax (SU)	5775	61.944	17.92	62.517	17.96	62.806	17.98	51.298	17.10	53.003	17.24	104.232	20.18	52.772	17.22	51.381	17.11	104.232	20.18
1/2A	160	802.11ax (SU)	5250	22.454	13.51	22.735	13.57	23.388	13.69	19.427	12.88	19.525	12.91	38.994	15.91	19.156	12.82	19.656	12.94	38.815	15.89
2C		802.11ax (SU)	5570	23.453	13.70	22.983	13.61	23.227	13.66	18.510	12.67	19.355	12.87	37.844	15.78	19.320	12.86	19.861	12.98	39.174	15.93

FCC EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna 3c		Antenna 3a		Antenna 1b		Antenna 3c		Antenna 3a		Summed		Antenna 3c		Antenna 1b		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	53.088	17.25	53.088	17.25	53.088	17.25	33.458	15.25	33.060	15.19	65.615	18.17	33.497	15.25	33.497	15.25	66.988	18.26
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	89.125	19.50	49.774	16.97	50.119	17.00	99.770	19.99	49.545	16.95	50.119	17.00	98.855	19.95
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	89.125	19.50	50.119	17.00	49.888	16.98	100.000	20.00	50.003	16.99	49.774	16.97	99.770	19.99
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	88.920	19.49	88.716	19.48	177.828	22.50	88.716	19.48	88.105	19.45	173.380	22.39
1	40	802.11n	5190 - 5230	89.125	19.50	86.956	19.39	89.125	19.50	59.156	17.72	57.214	17.58	116.413	20.66	59.566	17.75	59.566	17.75	119.124	20.76
2A		802.11n	5270 - 5310	84.859	19.29	86.976	19.39	86.298	19.36	86.040	19.35	88.716	19.48	174.582	22.42	85.941	19.34	86.457	19.37	172.584	22.37
2C		802.11n	5510 - 5710	86.457	19.37	89.125	19.50	89.125	19.50	88.227	19.46	89.125	19.50	177.419	22.49	84.178	19.25	83.483	19.22	167.494	22.24
3		802.11n	5755 - 5795	87.398	19.42	89.125	19.50	89.125	19.50	88.920	19.49	87.056	19.40	175.792	22.45	89.125	19.50	88.512	19.47	177.419	22.49
1	80	802.11ac	5210	33.358	15.23	34.995	15.44	34.930	15.43	30.521	14.85	31.003	14.91	61.518	17.89	31.623	15.00	30.974	14.91	62.661	17.97
2A		802.11ac	5290	32.674	15.14	31.805	15.03	32.233	15.08	27.133	14.34	26.681	14.26	53.827	17.31	26.351	14.21	27.334	14.37	53.703	17.30
2C		802.11ac	5530 - 5690	85.763	19.33	89.125	19.50	88.900	19.49	83.714	19.23	85.882	19.34	169.434	22.29	87.619	19.43	86.199	19.36	173.780	22.40
3		802.11ac	5775	77.268	18.88	77.983	18.92	78.705	18.96	72.644	18.61	74.302	18.71	146.893	21.67	71.007	18.51	71.384	18.54	142.233	21.53
1/2A	160	802.11ac	5250	23.714	13.75	22.600	13.54	22.678	13.56	19.409	12.88	19.679	12.94	39.084	15.92	18.664	12.71	19.187	12.83	37.844	15.78
1	20	802.11ax (SU)	5180 - 5240	53.088	17.25	51.109	17.09	52.869	17.23	33.159	15.21	33.497	15.25	66.069	18.20	32.893	15.17	33.497	15.25	66.374	18.22
2A		802.11ax (SU)	5260 - 5320	87.157	19.40	89.125	19.50	86.377	19.36	50.003	16.99	49.888	16.98	99.770	19.99	49.911	16.98	49.091	16.91	98.628	19.94
2C		802.11ax (SU)	5500 - 5720	85.684	19.33	86.020	19.35	89.125	19.50	49.774	16.97	50.003	16.99	99.770	19.99	49.831	16.98	49.808	16.97	99.541	19.98
3		802.11ax (SU)	5745 - 5825	88.206	19.46	87.640	19.43	88.593	19.47	86.656	19.38	88.716	19.48	174.582	22.42	88.369	19.46	87.177	19.40	174.582	22.42
1	40	802.11ax (SU)	5190 - 5230	86.557	19.37	87.619	19.43	89.125	19.50	59.566	17.75	59.566	17.75	119.124	20.76	59.566	17.75	58.331	17.66	118.032	20.72
2A		802.11ax (SU)	5270 - 5310	88.125	19.45	87.458	19.42	86.557	19.37	88.450	19.47	85.055	19.30	173.380	22.39	87.237	19.41	88.512	19.47	175.792	22.45
2C		802.11ax (SU)	5510 - 5670	76.401	18.83	79.433	19.00	79.433	19.00	65.073	18.13	66.834	18.25	131.826	21.20	65.433	18.16	66.298	18.22	131.826	21.20
3		802.11ax (SU)	5755 - 5795	88.024	19.45	89.064	19.50	89.064	19.50	88.654	19.48	85.585	19.32	174.181	22.41	85.330	19.31	88.716	19.48	174.181	22.41
1	80	802.11ax (SU)	5210	29.020	14.63	29.546	14.71	29.356	14.68	26.564	14.24	26.357	14.21	52.966	17.24	26.412	14.22	26.266	14.19	52.723	17.22
2A		802.11ax (SU)	5290	28.255	14.51	28.695	14.58	29.854	14.75	25.015	13.98	26.485	14.23	51.523	17.12	25.896	14.13	25.639	14.09	51.523	17.12
2C		802.11ax (SU)	5530 - 5690	82.262	19.15	84.353	19.26	84.450	19.27	83.253	19.20	88.573	19.47	171.791	22.35	85.251	19.31	87.237	19.41	172.584	22.37
3		802.11ax (SU)	5775	61.944	17.92	62.517	17.96	62.806	17.98	51.298	17.10	53.003	17.24	104.232	20.18	52.772	17.22	51.381	17.11	104.232	20.18
1/2A	160	802.11ax (SU)	5250	22.861	13.59	23.105	13.64	23.169	13.65	19.099	12.81	19.570	12.92	38.637	15.87	19.907	12.99	19.369	12.87	39.264	15.94

ISED EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna 3c		Antenna 3a		Antenna 1b		Antenna 3c		Antenna 3a		Summed		Antenna 3c		Antenna 1b		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	87.882	19.44	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
2A		802.11a/n	5260 - 5320	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	49.911	16.98	99.083	19.96
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	88.797	19.48	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	99.312	19.97
3		802.11a/n	5745 - 5825	89.125	19.50	88.328	19.46	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	175.388	22.44
1	40	802.11n	5190 - 5230	84.820	19.29	89.125	19.50	87.599	19.43	88.430	19.47	87.781	19.43	176.198	22.46	87.559	19.42	88.982	19.49	176.604	22.47
2A		802.11n	5270 - 5310	86.557	19.37	87.016	19.40	86.338	19.36	86.477	19.37	88.838	19.49	175.388	22.44	87.539	19.42	86.517	19.37	174.181	22.41
2C		802.11n	5510 - 5710	88.308	19.46	88.532	19.47	88.920	19.49	88.105	19.45	89.125	19.50	174.985	22.43	88.695	19.48	88.004	19.45	176.604	22.47
3		802.11n	5755 - 5795	88.389	19.46	88.328	19.46	89.125	19.50	88.859	19.49	87.902	19.44	176.198	22.46	88.716	19.48	89.125	19.50	177.011	22.48
1	80	802.11ac	5210	30.960	14.91	29.874	14.75	31.623	15.00	26.412	14.22	26.607	14.25	52.966	17.24	25.148	14.01	26.050	14.16	51.168	17.09
2A		802.11ac	5290	27.265	14.36	28.184	14.50	27.887	14.45	25.021	13.98	24.305	13.86	49.317	16.93	24.831	13.95	24.553	13.90	49.431	16.94
2C		802.11ac	5530 - 5690	87.842	19.44	89.125	19.50	89.125	19.50	86.696	19.38	89.125	19.50	175.792	22.45	85.901	19.34	88.450	19.47	174.181	22.41
3		802.11ac	5775	70.146	18.46	69.343	18.41	69.502	18.42	63.445	18.02	65.978	18.19	129.420	21.12	61.873	17.92	66.834	18.25	128.825	21.10
1/2A	160	802.11ac	5250	22.300	13.48	22.387	13.50	22.233	13.47	16.932	12.29	17.579	12.45	34.514	15.38	17.713	12.48	17.330	12.39	35.075	15.45
2C		802.11ac	5570	19.293	12.85	19.953	13.00	19.543	12.91	17.726	12.49	18.218	12.61	35.975	15.56	18.189	12.60	18.260	12.62	36.475	15.62
1	20	802.11ax (SU)	5180 - 5240	84.004	19.24	87.056	19.40	89.125	19.50	48.195	16.83	50.119	17.00	97.724	19.90	49.969	16.99	48.630	16.87	97.499	19.89
2A		802.11ax (SU)	5260 - 5320	83.426	19.21	89.125	19.50	89.125	19.50	49.762	16.97	50.119	17.00	99.770	19.99	49.227	16.92	48.306	16.84	97.499	19.89
2C		802.11ax (SU)	5500 - 5720	88.818	19.49	86.676	19.38	89.125	19.50	49.431	16.94	50.119	17.00	99.541	19.98	50.119	17.00	49.545	16.95	98.401	19.93
3		802.11ax (SU)	5745 - 5825	87.116	19.40	87.781	19.43	89.043	19.50	87.761	19.43	85.310	19.31	171.791	22.35	88.675	19.48	89.125	19.50	177.828	22.50
1	40	802.11ax (SU)	5190 - 5230	85.251	19.31	88.654	19.48	87.740	19.43	80.872	19.08	86.596	19.38	167.494	22.24	80.891	19.08	83.849	19.24	164.816	22.17
2A		802.11ax (SU)	5270 - 5310	86.020	19.35	87.478	19.42	86.696	19.38	87.478	19.42	87.862	19.44	175.388	22.44	86.060	19.35	86.318	19.36	172.187	22.36
2C		802.11ax (SU)	5510 - 5710	87.902	19.44	88.961	19.49	89.125	19.50	87.862	19.44	89.125	19.50	177.011	22.48	85.704	19.33	89.125	19.50	173.780	22.40
3		802.11ax (SU)	5755 - 5795	88.777	19.48	89.002	19.49	89.125	19.50	86.298	19.36	89.125	19.50	175.388	22.44	88.288	19.46	89.125	19.50	175.792	22.45
1	80	802.11ax (SU)	5210	27.058	14.32	28.029	14.48	27.208	14.35	24.963	13.97	25.119	14.00	50.119	17.00	24.199	13.84	25.119	14.00	49.317	16.93
2A		802.11ax (SU)	5290	26.116	14.17	26.866	14.29	28.184	14.50	24.361	13.87	23.736	13.75	48.084	16.82	24.694	13.93	23.818	13.77	48.529	16.86
2C		802.11ax (SU)	5530 - 5690	86.896	19.39	89.125	19.50	85.094	19.30	89.002	19.49	89.125	19.50	178.238	22.51	86.736	19.38	89.125	19.50	175.792	22.45
3		802.11ax (SU)	5775	55.719	17.46	55.719	17.46	55.081	17.41	44.679	16.50	45.154	16.55	89.743	19.53	45.342	16.57	46.302	16.66	91.622	19.62
1/2A	160	802.11ax (SU)	5250	22.024	13.43	21.257	13.28	22.233	13.47	17.746	12.49	17.701	12.48	35.481	15.50	17.551	12.44	17.266	12.37	34.834	15.42
2C		802.11ax (SU)	5570	19.324	12.86	19.953	13.00	19.543	12.91	18.518	12.68	17.803	12.51	36.308	15.60	18.189	12.60	18.327	12.63	36.475	15.62

FCC EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna 3c		Antenna 3a		Antenna 1b		Antenna 3c		Antenna 3a		Summed		Antenna 3c		Antenna 1b		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	53.088	17.25	53.088	17.25	53.088	17.25	33.497	15.25	33.497	15.25	66.681	18.24	32.764	15.15	33.450	15.24	65.464	18.16
2A		802.11a/n	5260 - 5320	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	49.911	16.98	99.083	19.96
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	88.797	19.48	50.119	17.00	50.119	17.00	100.231	20.01	50.119	17.00	50.119	17.00	99.312	19.97
3		802.11a/n	5745 - 5825	89.125	19.50	88.328	19.46	89.125	19.50	89.125	19.50	89.125	19.50	178.238	22.51	89.125	19.50	89.125	19.50	175.388	22.44
1	40	802.11n	5190 - 5230	86.756	19.38	85.231	19.31	89.125	19.50	59.566	17.75	58.439	17.67	118.032	20.72	59.566	17.75	57.903	17.63	117.490	20.70
2A		802.11n	5270 - 5310	86.557	19.37	87.016	19.40	86.338	19.36	86.477	19.37	88.838	19.49	175.388	22.44	87.539	19.42	86.517	19.37	174.181	22.41
2C		802.11n	5510 - 5710	84.004	19.24	88.532	19.47	88.920	19.49	85.546	19.32	87.640	19.43	173.380	22.39	87.157	19.40	85.467	19.32	172.584	22.37
3		802.11n	5755 - 5795	88.389	19.46	88.328	19.46	89.125	19.50	88.859	19.49	87.902	19.44	176.198	22.46	88.716	19.48	89.125	19.50	177.011	22.48
1	80	802.11ac	5210	30.606	14.86	30.535	14.85	31.268	14.95	26.607	14.25	25.299	14.03	51.880	17.15	26.607	14.25	26.595	14.25	53.211	17.26
2A		802.11ac	5290	27.265	14.36	28.184	14.50	27.887	14.45	25.021	13.98	24.305	13.86	49.317	16.93	24.831	13.95	24.553	13.90	49.431	16.94
2C		802.11ac	5530 - 5690	87.842	19.44	89.125	19.50	89.125	19.50	86.696	19.38	89.125	19.50	175.792	22.45	85.901	19.34	88.450	19.47	174.181	22.41
3		802.11ac	5775	70.146	18.46	69.343	18.41	69.502	18.42	63.445	18.02	65.978	18.19	129.420	21.12	61.873	17.92	66.834	18.25	128.825	21.10
1/2A	160	802.11ac	5250	21.169	13.26	22.100	13.44	21.707	13.37	17.579	12.45	17.061	12.32	34.674	15.40	17.286	12.38	17.458	12.42	34.754	15.41
1	20	802.11ax (SU)	5180 - 5240	53.088	17.25	52.626	17.21	52.991	17.24	33.497	15.25	33.497	15.25	66.988	18.26	33.497	15.25	33.251	15.22	65.464	18.16
2A		802.11ax (SU)	5260 - 5320	83.426	19.21	89.125	19.50	89.125	19.50	49.762	16.97	50.119	17.00	99.770	19.99	49.227	16.92	48.306	16.84	97.499	19.89
2C		802.11ax (SU)	5500 - 5720	88.818	19.49	86.676	19.38	89.125	19.50	49.431	16.94	50.119	17.00	99.541	19.98	50.119	17.00	49.545	16.95	98.401	19.93
3		802.11ax (SU)	5745 - 5825	87.116	19.40	87.781	19.43	89.043	19.50	87.761	19.43	85.310	19.31	171.791	22.35	88.675	19.48	89.125	19.50	177.828	22.50
1	40	802.11ax (SU)	5190 - 5230	87.700	19.43	86.080	19.35	89.125	19.50	59.566	17.75	58.681	17.69	118.304	20.73	59.566	17.75	59.566	17.75	119.124	20.76
2A		802.11ax (SU)	5270 - 5310	86.020	19.35	87.478	19.42	86.696	19.38	87.478	19.42	87.862	19.44	175.388	22.44	86.060	19.35	86.318	19.36	172.187	22.36
2C		802.11ax (SU)	5510 - 5710	84.762	19.28	88.961	19.49	89.125	19.50	87.096	19.40	86.596	19.38	173.780	22.40	85.251	19.31	84.450	19.27	169.824	22.30
3		802.11ax (SU)	5755 - 5795	88.777	19.48	89.002	19.49	89.125	19.50	86.298	19.36	89.125	19.50	175.388	22.44	88.288	19.46	89.125	19.50	175.792	22.45
1	80	802.11ax (SU)	5210	27.893	14.46	28.080	14.48	27.077	14.33	24.587	13.91	24.946	13.97	49.545	16.95	24.826	13.95	24.946	13.97	49.774	16.97
2A		802.11ax (SU)	5290	26.116	14.17	26.866	14.29	28.184	14.50	24.361	13.87	23.736	13.75	48.084	16.82	24.694	13.93	23.818	13.77	48.529	16.86
2C		802.11ax (SU)	5530 - 5690	86.896	19.39	89.125	19.50	85.094	19.30	89.002	19.49	89.125	19.50	178.238	22.51	86.736	19.38	89.125	19.50	175.792	22.45
3		802.11ax (SU)	5775	55.719	17.46	55.719	17.46	55.081	17.41	44.679	16.50	46.206	16.65	90.782	19.58	36.016	15.57	46.302	16.66	82.224	19.15
1/2A	160	802.11ax (SU)	5250	22.387	13.50	21.286	13.28	21.707	13.37	17.350	12.39	17.701	12.48	35.075	15.45	17.612	12.46	17.390	12.40	34.995	15.44

ISED EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna 3c		Antenna 3a		Antenna 1b		Antenna 3c		Antenna 3a		Summed		Antenna 3c		Antenna 1b		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	88.736	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	100.231	20.01
2A		802.11a/n	5260 - 5320	89.125	19.50	84.938	19.29	89.125	19.50	50.119	17.00	50.107	17.00	100.000	20.00	50.119	17.00	49.454	16.94	99.541	19.98
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	88.982	19.49	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11n	5190 - 5230	80.891	19.08	85.330	19.31	86.020	19.35	87.680	19.43	88.838	19.49	176.604	22.47	87.217	19.41	86.796	19.39	174.181	22.41
2A		802.11n	5270 - 5310	85.212	19.31	88.614	19.48	89.125	19.50	87.217	19.41	89.125	19.50	176.198	22.46	87.519	19.42	89.125	19.50	176.604	22.47
2C		802.11n	5510 - 5710	88.695	19.48	87.700	19.43	89.125	19.50	88.085	19.45	89.125	19.50	176.604	22.47	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	88.288	19.46	89.125	19.50	87.700	19.43	89.125	19.50	89.125	19.50	177.011	22.48	89.125	19.50	89.125	19.50	178.238	22.51
1	80	802.11ac	5210	26.934	14.30	28.184	14.50	28.016	14.47	24.005	13.80	25.119	14.00	49.091	16.91	24.160	13.83	25.119	14.00	49.317	16.93
2A		802.11ac	5290	24.946	13.97	25.119	14.00	25.119	14.00	20.807	13.18	20.380	13.09	41.210	16.15	20.654	13.15	21.135	13.25	41.783	16.21
2C		802.11ac	5530 - 5690	84.353	19.26	89.125	19.50	88.267	19.46	88.125	19.45	85.743	19.33	173.780	22.40	83.830	19.23	88.328	19.46	172.187	22.36
3		802.11ac	5775	55.719	17.46	55.463	17.44	55.590	17.45	45.040	16.54	47.698	16.79	92.683	19.67	46.355	16.66	46.569	16.68	92.897	19.68
1/2A	160	802.11ac	5250	19.629	12.93	19.953	13.00	19.679	12.94	13.462	11.29	13.996	11.46	27.479	14.39	13.539	11.32	13.627	11.34	27.164	14.34
2C		802.11ac	5570	15.385	11.87	15.244	11.83	15.311	11.85	13.948	11.45	14.031	11.47	27.990	14.47	13.326	11.25	13.804	11.40	27.102	14.33
1	20	802.11ax (SU)	5180 - 5240	88.125	19.45	86.836	19.39	88.879	19.49	47.995	16.81	50.119	17.00	97.724	19.90	49.900	16.98	50.119	17.00	99.770	19.99
2A		802.11ax (SU)	5260 - 5320	87.801	19.44	87.781	19.43	89.125	19.50	48.574	16.86	50.119	17.00	97.724	19.90	49.034	16.91	49.454	16.94	97.499	19.89
2C		802.11ax (SU)	5500 - 5720	86.576	19.37	88.879	19.49	88.491	19.47	49.888	16.98	50.119	17.00	100.000	20.00	49.317	16.93	50.119	17.00	98.855	19.95
3		802.11ax (SU)	5745 - 5825	85.625	19.33	87.297	19.41	86.537	19.37	86.298	19.36	89.125	19.50	175.388	22.44	88.369	19.46	89.125	19.50	177.419	22.49
1	40	802.11ax (SU)	5190 - 5230	87.458	19.42	89.125	19.50	89.125	19.50	75.457	18.78	79.433	19.00	154.882	21.90	78.723	18.96	77.126	18.87	155.955	21.93
2A		802.11ax (SU)	5270 - 5310	86.199	19.36	87.257	19.41	85.428	19.32	85.566	19.32	85.192	19.30	170.608	22.32	86.457	19.37	88.004	19.45	174.582	22.42
2C		802.11ax (SU)	5510 - 5710	87.801	19.44	89.125	19.50	87.902	19.44	88.532	19.47	87.498	19.42	175.388	22.44	87.378	19.41	86.576	19.37	172.982	22.38
3		802.11ax (SU)	5755 - 5795	87.378	19.41	89.125	19.50	86.278	19.36	84.781	19.28	89.125	19.50	173.780	22.40	86.199	19.36	88.879	19.49	174.582	22.42
1	80	802.11ax (SU)	5210	25.710	14.10	26.363	14.21	26.503	14.23	21.096	13.24	22.387	13.50	43.451	16.38	22.213	13.47	21.498	13.32	43.752	16.41
2A		802.11ax (SU)	5290	21.184	13.26	22.387	13.50	21.414	13.31	20.592	13.14	20.597	13.14	41.210	16.15	20.730	13.17	20.554	13.13	41.305	16.16
2C		802.11ax (SU)	5530 - 5690	87.136	19.40	89.125	19.50	89.125	19.50	83.541	19.22	88.756	19.48	172.187	22.36	84.996	19.29	85.783	19.33	170.608	22.32
3		802.11ax (SU)	5775	52.602	17.21	52.360	17.19	52.723	17.22	44.015	16.44	44.463	16.48	88.512	19.47	42.131	16.25	43.521	16.39	85.704	19.33
1/2A	160	802.11ax (SU)	5250	17.599	12.46	16.862	12.27	19.679	12.94	14.025	11.47	13.868	11.42	27.861	14.45	13.709	11.37	13.366	11.26	27.102	14.33
2C		802.11ax (SU)	5570	13.932	11.44	13.459	11.29	15.311	11.85	13.335	11.25	13.384	11.27	26.730	14.27	13.449	11.29	13.508	11.31	26.977	14.31

FCC EUT Overview (High Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO						CDD/SDM Primary						CDD/SDM Diversity					
				Antenna 3c		Antenna 3a		Antenna 1b		Antenna 3c		Antenna 3a		Summed		Antenna 3c		Antenna 1b		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	53.088	17.25	53.088	17.25	51.086	17.08	32.337	15.10	33.497	15.25	65.615	18.17	33.497	15.25	33.335	15.23	66.834	18.25
2A		802.11a/n	5260 - 5320	89.125	19.50	84.938	19.29	89.125	19.50	50.119	17.00	50.107	17.00	100.000	20.00	50.119	17.00	49.454	16.94	99.541	19.98
2C		802.11a/n	5500 - 5720	89.125	19.50	89.125	19.50	88.797	19.48	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	88.982	19.49	178.238	22.51	89.125	19.50	89.125	19.50	178.238	22.51
1	40	802.11n	5190 - 5230	88.410	19.47	85.981	19.34	89.125	19.50	58.143	17.65	59.566	17.75	117.761	20.71	57.056	17.56	57.082	17.57	114.025	20.57
2A		802.11n	5270 - 5310	85.212	19.31	88.614	19.48	89.125	19.50	87.217	19.41	89.125	19.50	176.198	22.46	87.519	19.42	89.125	19.50	176.604	22.47
2C		802.11n	5510 - 5710	88.695	19.48	86.896	19.39	85.585	19.32	88.085	19.45	85.941	19.34	174.181	22.41	85.408	19.32	87.197	19.41	172.584	22.37
3		802.11n	5755 - 5795	88.288	19.46	89.125	19.50	87.700	19.43	89.125	19.50	89.125	19.50	177.011	22.48	89.125	19.50	89.125	19.50	178.238	22.51
1	80	802.11ac	5210	28.184	14.50	26.786	14.28	26.866	14.29	25.026	13.98	23.790	13.76	48.865	16.89	24.171	13.83	25.119	14.00	49.317	16.93
2A		802.11ac	5290	24.946	13.97	25.119	14.00	25.119	14.00	20.807	13.18	20.380	13.09	41.210	16.15	20.654	13.15	21.135	13.25	41.783	16.21
2C		802.11ac	5530 - 5690	84.353	19.26	89.125	19.50	88.267	19.46	88.125	19.45	85.743	19.33	173.780	22.40	83.830	19.23	88.328	19.46	172.187	22.36
3		802.11ac	5775	55.719	17.46	55.463	17.44	55.590	17.45	45.040	16.54	47.698	16.79	92.683	19.67	46.355	16.66	46.569	16.68	92.897	19.68
1/2A	160	802.11ac	5250	19.231	12.84	19.953	13.00	17.298	12.38	13.896	11.43	13.740	11.38	27.606	14.41	13.446	11.29	13.687	11.36	27.102	14.33
1	20	802.11ax (SU)	5180 - 5240	51.333	17.10	53.088	17.25	52.493	17.20	33.105	15.20	32.689	15.14	65.313	18.15	33.497	15.25	33.497	15.25	66.988	18.26
2A		802.11ax (SU)	5260 - 5320	87.801	19.44	87.781	19.43	89.125	19.50	48.574	16.86	50.119	17.00	97.724	19.90	49.034	16.91	49.454	16.94	97.499	19.89
2C		802.11ax (SU)	5500 - 5720	86.576	19.37	88.879	19.49	89.125	19.50	49.888	16.98	50.119	17.00	100.000	20.00	49.317	16.93	50.119	17.00	98.855	19.95
3		802.11ax (SU)	5745 - 5825	85.625	19.33	87.297	19.41	86.537	19.37	86.298	19.36	89.125	19.50	175.388	22.44	88.369	19.46	89.125	19.50	177.419	22.49
1	40	802.11ax (SU)	5190 - 5230	88.024	19.45	86.936	19.39	89.125	19.50	59.566	17.75	59.115	17.72	118.577	20.74	59.566	17.75	59.566	17.75	119.124	20.76
2A		802.11ax (SU)	5270 - 5310	86.199	19.36	87.257	19.41	85.428	19.32	85.566	19.32	85.192	19.30	170.608	22.32	86.457	19.37	88.004	19.45	174.582	22.42
2C		802.11ax (SU)	5510 - 5710	87.801	19.44	85.408	19.32	87.781	19.43	88.532	19.47	85.783	19.33	174.181	22.41	87.378	19.41	85.605	19.33	172.982	22.38
3		802.11ax (SU)	5755 - 5795	87.378	19.41	89.125	19.50	86.278	19.36	84.781	19.28	89.125	19.50	173.780	22.40	86.199	19.36	88.879	19.49	174.582	22.42
1	80	802.11ax (SU)	5210	26.104	14.17	25.734	14.11	26.412	14.22	22.387	13.50	22.387	13.50	44.771	16.51	22.080	13.44	21.370	13.30	43.451	16.38
2A		802.11ax (SU)	5290	21.184	13.26	22.387	13.50	21.414	13.31	20.592	13.14	20.597	13.14	41.210	16.15	20.730	13.17	20.554	13.13	41.305	16.16
2C		802.11ax (SU)	5530 - 5690	87.136	19.40	89.125	19.50	89.125	19.50	83.541	19.22	88.756	19.48	172.187	22.36	84.996	19.29	85.783	19.33	170.608	22.32
3		802.11ax (SU)	5775	52.602	17.21	52.360	17.19	52.723	17.22	44.015	16.44	44.463	16.48	88.512	19.47	42.131	16.25	43.521	16.39	85.704	19.33
1/2A	160	802.11ax (SU)	5250	17.171	12.35	17.080	12.33	17.298	12.38	13.884	11.43	13.421	11.28	27.290	14.36	13.335	11.25	13.868	11.42	27.227	14.35

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 Materials Technology 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 Materials Technology 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 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 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).

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

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Tablet Device FCC ID: BCGA2903** and **IC: 579C-A2903**. 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:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, 802.11a/ax WIFI 6E, 802.15.4, Bluetooth (1x, EDR, LE1M, LE2M, HDR4, HDR8), WPT, NB UNII (1x, HDR4, HDR8)

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 3c	Antenna 3a	Antenna 1b	CDD/SDM (Primary)	CDD/SDM (Diversity)
5GHz	a (Low Rate)	99.4	99.1	98.9	98.5	98.7
	a (Mid Rate)	94.8	95.0	95.2	94.2	94.6
	a (High Rate)	91.5	91.4	90.9	90.6	91.1
	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 (HT80 Low Rate)	96.1	95.9	96.3	93.3	93.4
	ac (HT80 Mid Rate)	93.1	92.4	93.2	88.2	88.6
	ac (HT80 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 (HT160 Low Rate)	94.7	94.4	94.4	91.0	90.8
	ac (HT160 Mid Rate)	90.6	90.8	90.8	86.4	85.7
	ac (HT160 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 technology. Below are the possible configurations.

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna 3c	Antenna 3a	Antenna 3c	Antenna 3a	Antenna 3c	Antenna 3a	Antenna 3c	Antenna 3a
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 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	LTE/FR1 NR	
		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	MB/HB	UHB
3a	Config 1	✗	✓	✗	✓	✗	✗	✓	✗
3a	Config 2	✗	✓	✗	✗	✓	✗	✓	✗
3a	Config 3	✓	✗	✗	✗	✗	✓	✓	✗
3a	Config 4	✗	✗	✓	✓	✗	✗	✓	✗
3a	Config 5	✗	✗	✓	✗	✓	✗	✓	✗
3a	Config 6	✓	✗	✗	✗	✗	✓	✗	✗
3a	Config 7	✓	✗	✗	✗	✗	✗	✓	✗
3a	Config 8	✗	✓	✗	✓	✗	✗	✗	✗
3a	Config 9	✗	✓	✗	✗	✓	✗	✗	✗
3a	Config 10	✗	✓	✗	✗	✗	✗	✓	✗
3a	Config 11	✗	✗	✓	✓	✗	✗	✗	✗
3a	Config 13	✗	✗	✓	✗	✓	✗	✗	✗
3a	Config 14	✗	✗	✓	✗	✗	✗	✓	✗
3a	Config 15	✗	✗	✗	✓	✗	✗	✓	✗
3a	Config 16	✗	✗	✗	✗	✓	✗	✓	✗
3a	Config 17	✗	✗	✗	✗	✗	✓	✓	✗
1a	Config 18	✓	✗	✗	✗	✗	✗	✗	✓
1a	Config 15	✗	✓	✗	✗	✗	✗	✗	✓
1a	Config 16	✗	✗	✓	✗	✗	✗	✗	✓
1b	Config 17	✗	✗	✗	✓	✗	✗	✓	✗
1b	Config 18	✗	✗	✗	✗	✓	✗	✓	✗
1b	Config 19	✗	✗	✗	✗	✗	✓	✓	✗

Table 2-7. Simultaneous Transmission Configurations

✓ = Support; ✖ = Not Support

4. 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.
5. 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 3c	Antenna 3a	Antenna 1b
5.150 - 5.250	1.1	-1.1	-2.6
5.250 - 5.350	0.9	0.5	-1.4
5.470 - 5.725	2.2	1.2	-1.5
5.725 - 5.850	2.1	0.9	-1.8

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, 1C2311270064-25.BCG

Description	FR1 n41	802.11a/n/ac/ax 5GHz	Bluetooth
Antenna	Antenna 3a	Antenna 3a	Antenna 3a
Channel	41490	36	78
Operating Frequency (MHz)	2506	5180	2480
Mode/Modulation	QPSK/1RB/20MHz	802.11n/MCS0	GFSK ePa

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
Anritsu	ML2496A	Power Meter	4/4/2023	Annual	4/4/2024	1840005
Anritsu	MA2411B	Pulse Power Sensor	8/22/2023	Annual	8/22/2024	1726262
Anritsu	MA2411B	Pulse Power Sensor	4/5/2023	Annual	4/5/2024	1726261
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	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	ENV216	Two-Line V-Network	6/8/2023	Annual	6/8/2024	192052
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: BCGA2903
IC: 579C-A2903
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 (1C2311270064-23.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 7.7
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.

Antenna 3c 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)	17.86	21.33
	5200	40	n (20MHz)	19.5/21.7 (MCS2)	17.77	20.97
	5240	48	n (20MHz)	19.5/21.7 (MCS2)	17.74	20.98
	5180	36	ax (SU) (20MHz)	24/25.8 (MCS2)	19.11	23.33
	5200	40	ax (SU) (20MHz)	24/25.8 (MCS2)	19.09	21.30
	5240	48	ax (SU) (20MHz)	24/25.8 (MCS2)	19.05	21.17
	5190	38	n (40MHz)	40/40.5 (MCS2)	36.48	42.07
	5230	46	n (40MHz)	40/40.5 (MCS2)	36.39	41.41
	5190	38	ax (SU) (40MHz)	49/51.6 (MCS2)	38.10	44.29
	5230	46	ax (SU) (40MHz)	49/51.6 (MCS2)	37.98	41.78
	5210	42	ac (80MHz)	87.8/97.5 (MCS2)	75.68	83.59
	5210	42	ax (SU) (80MHz)	102/108.1 (MCS2)	77.27	86.98
Band 1/2	5250	50	ac (160MHz)	87.8/97.5 (MCS2)	155.30	166.30
	5250	50	ax (SU) (160MHz)	102/108.1 (MCS2)	157.29	166.44
Band 2A	5260	52	n (20MHz)	19.5/21.7 (MCS2)	17.78	21.03
	5300	60	n (20MHz)	19.5/21.7 (MCS2)	17.77	21.13
	5320	64	n (20MHz)	19.5/21.7 (MCS2)	17.85	21.35
	5260	52	ax (SU) (20MHz)	24/25.8 (MCS2)	19.05	21.46
	5300	60	ax (SU) (20MHz)	24/25.8 (MCS2)	19.10	21.36
	5320	64	ax (SU) (20MHz)	24/25.8 (MCS2)	19.14	22.71
	5270	54	n (40MHz)	40/40.5 (MCS2)	36.33	41.13
	5310	62	n (40MHz)	40/40.5 (MCS2)	36.49	41.97
	5270	54	ax (SU) (40MHz)	49/51.6 (MCS2)	37.99	41.63
	5310	62	ax (SU) (40MHz)	49/51.6 (MCS2)	38.04	43.60
	5290	58	ac (80MHz)	87.8/97.5 (MCS2)	75.71	87.86
	5290	58	ax (SU) (80MHz)	102/108.1 (MCS2)	77.40	85.62
Band 2C	5500	100	n (20MHz)	19.5/21.7 (MCS2)	17.85	21.64
	5580	116	n (20MHz)	19.5/21.7 (MCS2)	17.75	21.10
	5720	144	n (20MHz)	19.5/21.7 (MCS2)	17.73	20.95
	5500	100	ax (SU) (20MHz)	24/25.8 (MCS2)	19.13	22.21
	5580	116	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.38
	5720	144	ax (SU) (20MHz)	24/25.8 (MCS2)	19.04	21.33
	5510	102	n (40MHz)	40/40.5 (MCS2)	36.52	42.56
	5550	110	n (40MHz)	40/40.5 (MCS2)	36.26	41.13
	5710	142	n (40MHz)	40/40.5 (MCS2)	36.35	41.09
	5510	102	ax (SU) (40MHz)	49/51.6 (MCS2)	38.10	44.08
	5550	110	ax (SU) (40MHz)	49/51.6 (MCS2)	37.96	41.72
	5710	142	ax (SU) (40MHz)	49/51.6 (MCS2)	38.00	41.73
	5530	106	ac (80MHz)	87.8/97.5 (MCS2)	75.61	83.11
	5690	138	ac (80MHz)	87.8/97.5 (MCS2)	75.48	80.88
	5530	106	ax (SU) (80MHz)	102/108.1 (MCS2)	77.26	87.80
	5690	138	ax (SU) (80MHz)	102/108.1 (MCS2)	77.16	82.01
	5570	114	ac (160MHz)	87.8/97.5 (MCS2)	154.03	164.81
	5570	114	ax (SU) (160MHz)	102/108.1 (MCS2)	156.09	165.81

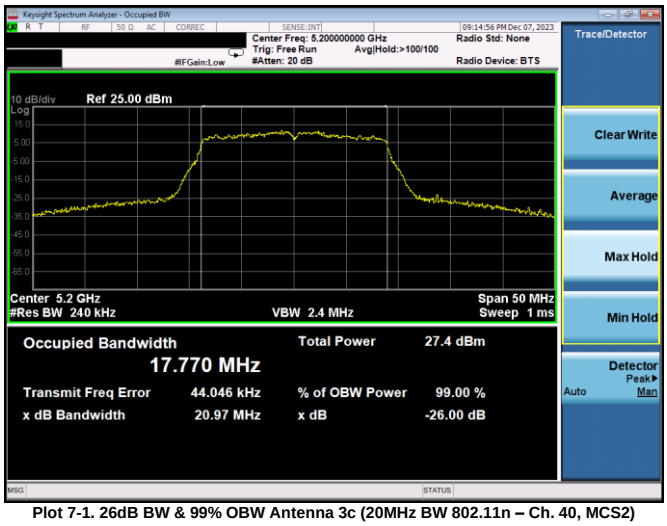
Table 7-2. Conducted Bandwidth Measurements Antenna 3c (Low Data Rate)

	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	20.89
	5200	40	n (20MHz)	39/43.3 (MCS4)	17.81	21.10
	5240	48	n (20MHz)	39/43.3 (MCS4)	17.74	20.80
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.09	23.08
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	19.11	21.50
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.15
	5190	38	n (40MHz)	81/90 (MCS4)	36.38	41.52
	5230	46	n (40MHz)	81/90 (MCS4)	36.44	41.18
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	38.03	51.07
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	38.06	41.71
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.65	81.36
	5210	42	ax (SU) (80MHz)	204/216.2 (MCS4)	77.27	82.78
Band 1/2	5250	50	ac (160MHz)	175.5/195 (MCS4)	155.56	166.28
	5250	50	ax (SU) (160MHz)	204/216.2 (MCS4)	157.26	166.23
Band 2A	5260	52	n (20MHz)	39/43.3 (MCS4)	17.78	20.78
	5300	60	n (20MHz)	39/43.3 (MCS4)	17.77	20.85
	5320	64	n (20MHz)	39/43.3 (MCS4)	17.80	20.94
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.05	21.07
	5300	60	ax (SU) (20MHz)	49/51.6 (MCS4)	19.07	21.26
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.09	23.39
	5270	54	n (40MHz)	81/90 (MCS4)	36.45	41.11
	5310	62	n (40MHz)	81/90 (MCS4)	36.45	41.28
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	38.02	41.80
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	38.05	46.10
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.73	80.92
	5290	58	ax (SU) (80MHz)	204/216.2 (MCS4)	77.32	82.24
Band 2C	5500	100	n (20MHz)	39/43.3 (MCS4)	17.79	21.14
	5580	116	n (20MHz)	39/43.3 (MCS4)	17.80	20.99
	5720	144	n (20MHz)	39/43.3 (MCS4)	17.76	20.92
	5500	100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	22.26
	5580	116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.07	21.31
	5720	144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.07	21.36
	5510	102	n (40MHz)	81/90 (MCS4)	36.42	40.63
	5550	110	n (40MHz)	81/90 (MCS4)	36.35	40.94
	5710	142	n (40MHz)	81/90 (MCS4)	36.36	40.87
	5510	102	ax (SU) (40MHz)	98/103.2 (MCS4)	38.06	47.66
	5550	110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.97	41.33
	5710	142	ax (SU) (40MHz)	98/103.2 (MCS4)	38.00	41.56
	5530	106	ac (80MHz)	175.5/195 (MCS4)	75.61	81.37
	5690	138	ac (80MHz)	175.5/195 (MCS4)	75.57	81.47
	5530	106	ax (SU) (80MHz)	204/216.2 (MCS4)	77.29	82.22
	5690	138	ax (SU) (80MHz)	204/216.2 (MCS4)	77.31	82.41
	5570	114	ac (160MHz)	175.5/195 (MCS4)	153.85	164.65
	5570	114	ax (SU) (160MHz)	204/216.2 (MCS4)	156.13	165.40

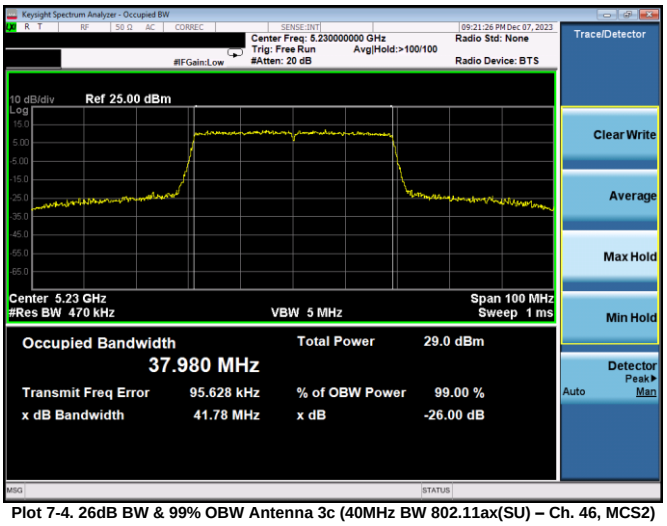
Table 7-3. Conducted Bandwidth Measurements Antenna 3c (Mid Data Rate)

	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)	17.88	21.06
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.92	21.60
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.93	21.27
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	19.07	21.24
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.08	27.01
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.08	25.85
	5190	38	n (40MHz)	135/150 (MCS7)	36.59	41.33
	5230	46	n (40MHz)	135/150 (MCS7)	36.65	41.69
	5190	38	ax (SU) (40MHz)	271/286 (MCS11)	37.88	41.49
	5230	46	ax (SU) (40MHz)	271/286 (MCS11)	38.08	50.12
	5210	42	ac (80MHz)	390/433.3 (MCS9)	76.00	81.79
	5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.24	81.82
Band 1/2	5250	50	ac (160MHz)	390/433.3 (MCS9)	155.84	166.62
	5250	50	ax (SU) (160MHz)	567/600.5 (MCS11)	157.13	165.29
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.95	21.44
	5300	60	n (20MHz)	65/72.2 (MCS7)	17.90	21.18
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.90	21.17
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.14	22.57
	5300	60	ax (SU) (20MHz)	135/143.4 (MCS11)	19.09	21.23
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	19.02	21.36
	5270	54	n (40MHz)	135/150 (MCS7)	36.65	41.70
	5310	62	n (40MHz)	135/150 (MCS7)	36.54	41.16
	5270	54	ax (SU) (40MHz)	271/286 (MCS11)	38.04	56.99
	5310	62	ax (SU) (40MHz)	271/286 (MCS11)	37.93	41.37
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.92	81.77
	5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.27	82.01
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.87	21.12
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.92	21.80
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.94	21.47
	5500	100	ax (SU) (20MHz)	135/143.4 (MCS11)	19.02	21.18
	5580	116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.12	27.01
	5720	144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.11	22.61
	5510	102	n (40MHz)	135/150 (MCS7)	36.54	41.29
	5550	110	n (40MHz)	135/150 (MCS7)	36.59	41.44
	5710	142	n (40MHz)	135/150 (MCS7)	36.68	41.67
	5510	102	ax (SU) (40MHz)	271/286 (MCS11)	37.89	41.57
	5550	110	ax (SU) (40MHz)	271/286 (MCS11)	37.93	41.39
	5710	142	ax (SU) (40MHz)	271/286 (MCS11)	38.03	50.11
	5530	106	ac (80MHz)	390/433.3 (MCS9)	75.87	81.58
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.08	84.57
	5530	106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.19	81.74
	5690	138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.17	84.94
	5570	114	ac (160MHz)	390/433.3 (MCS9)	154.86	165.47
	5570	114	ax (SU) (160MHz)	567/600.5 (MCS11)	155.79	165.24

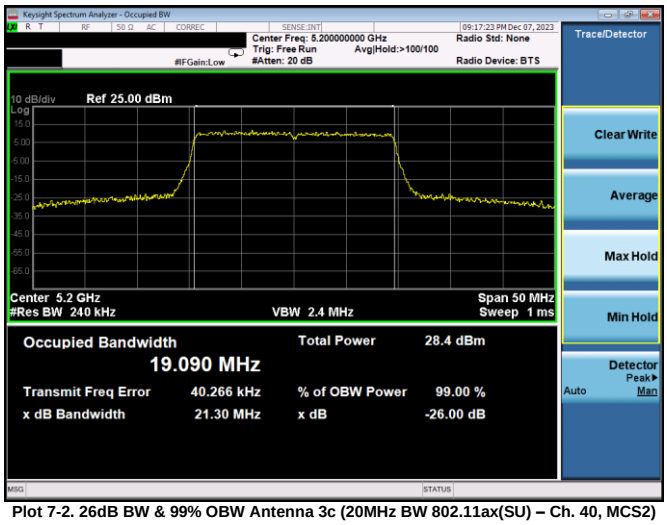
Table 7-4. Conducted Bandwidth Measurements Antenna 3c (High Data Rate)



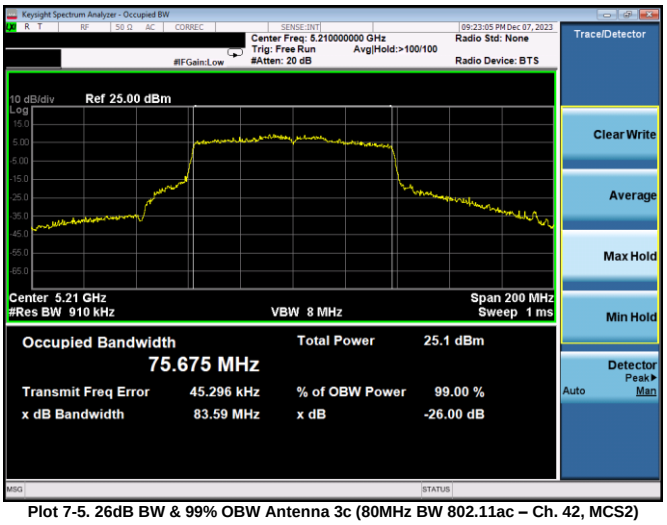
Plot 7-1. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 40, MCS2)



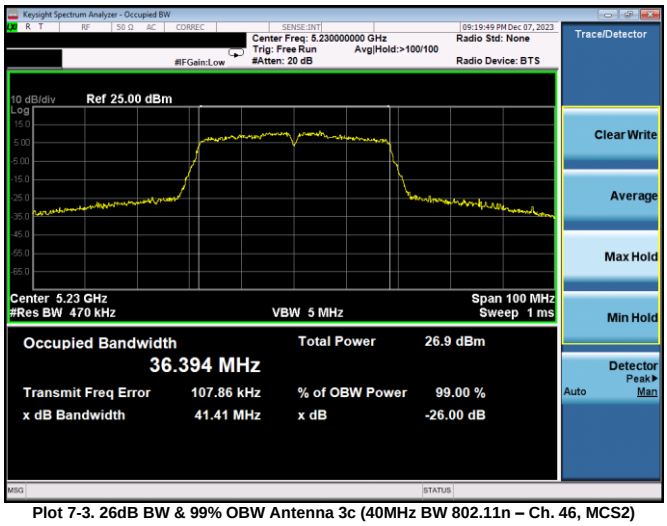
Plot 7-4. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 46, MCS2)



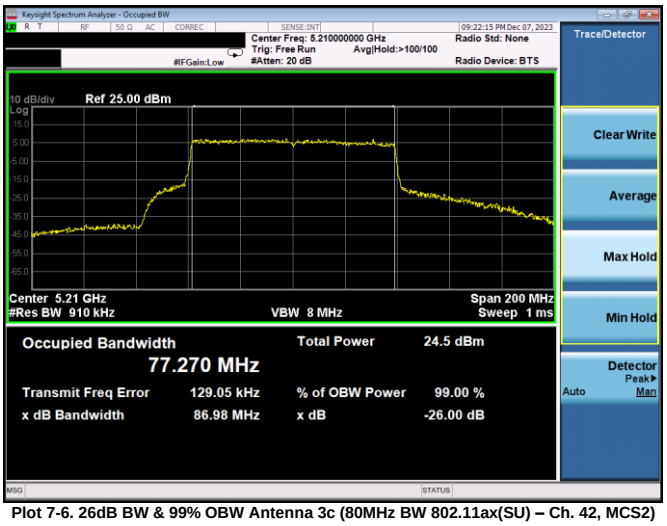
Plot 7-2. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 40, MCS2)



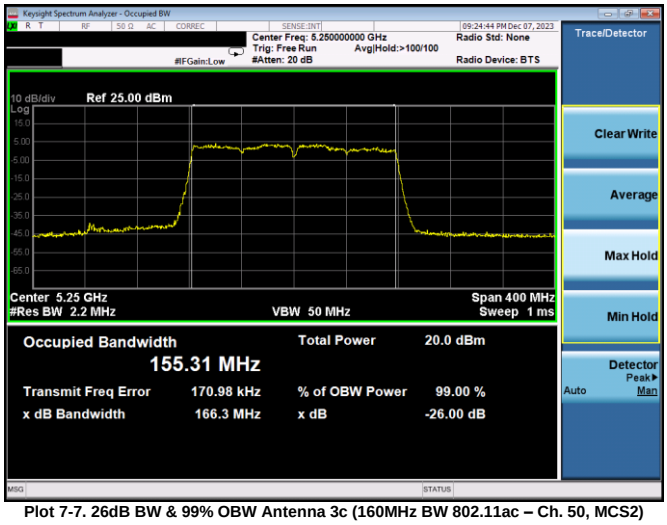
Plot 7-5. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 42, MCS2)



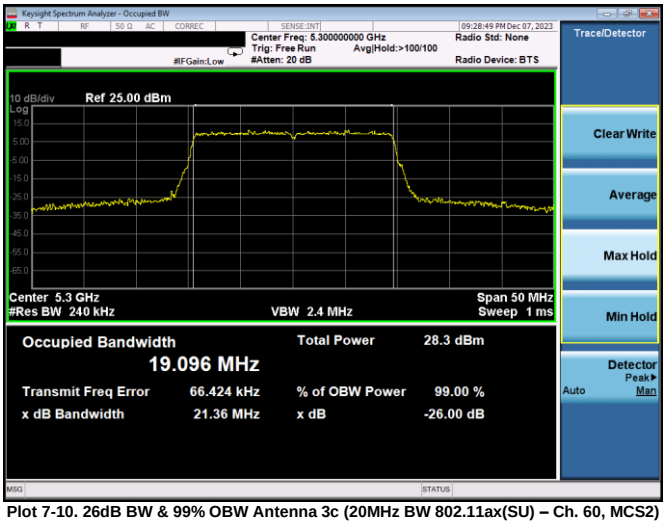
Plot 7-3. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 46, MCS2)



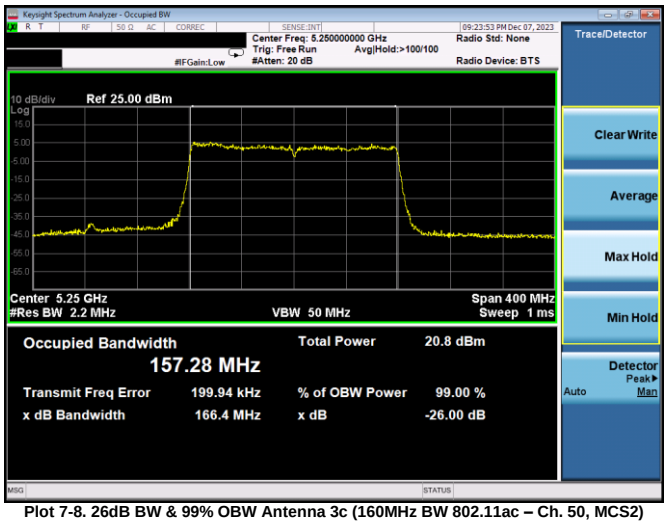
Plot 7-6. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 42, MCS2)



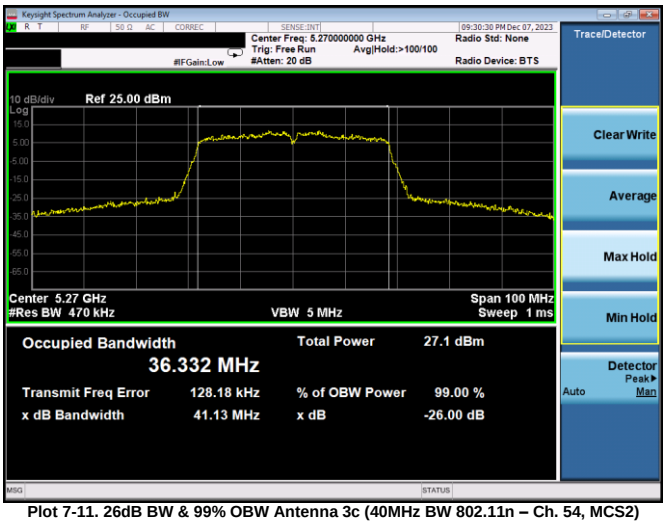
Plot 7-7. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 50, MCS2)



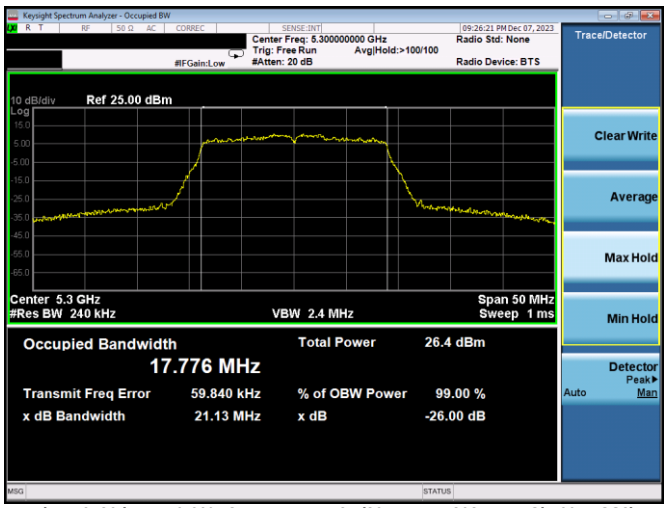
Plot 7-10. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 60, MCS2)



Plot 7-8. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 50, MCS2)

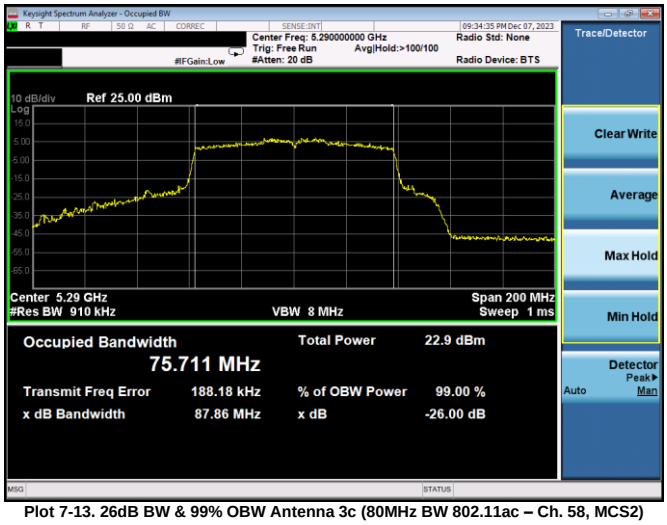


Plot 7-11. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 54, MCS2)

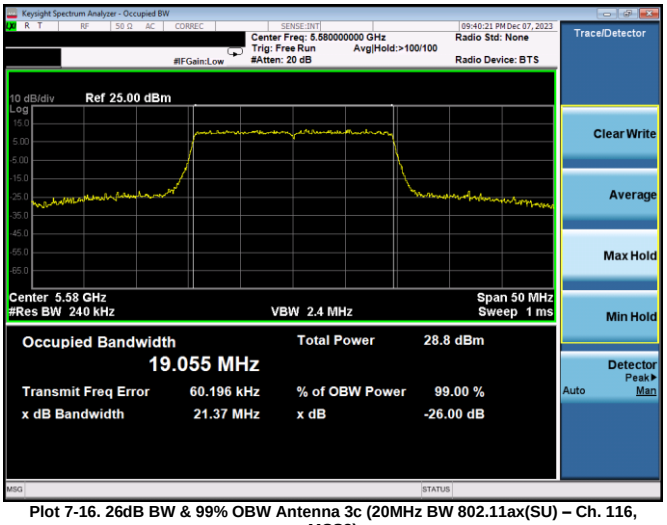


Plot 7-9. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 60, MCS2)

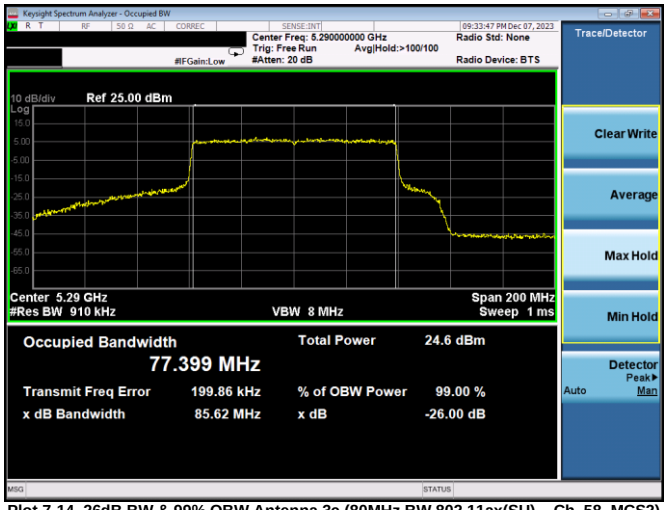
Plot 7-12. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 54, MCS2)



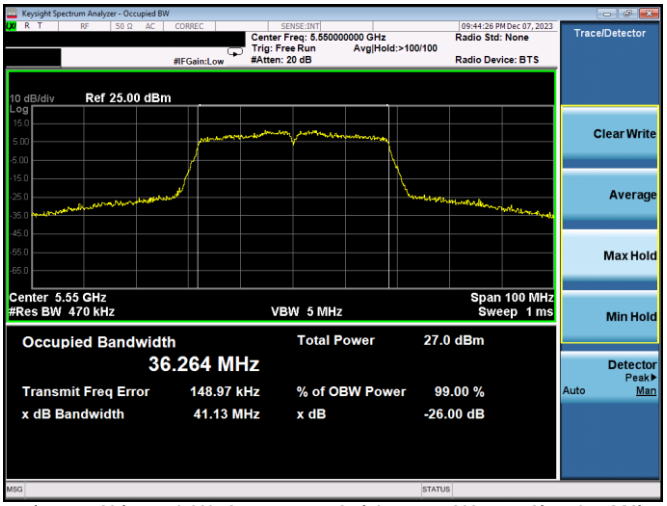
Plot 7-13. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 58, MCS2)



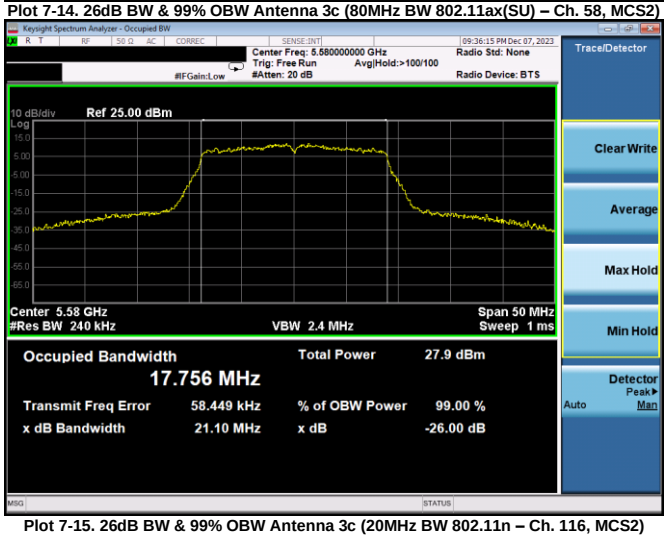
Plot 7-16. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 116, MCS2)



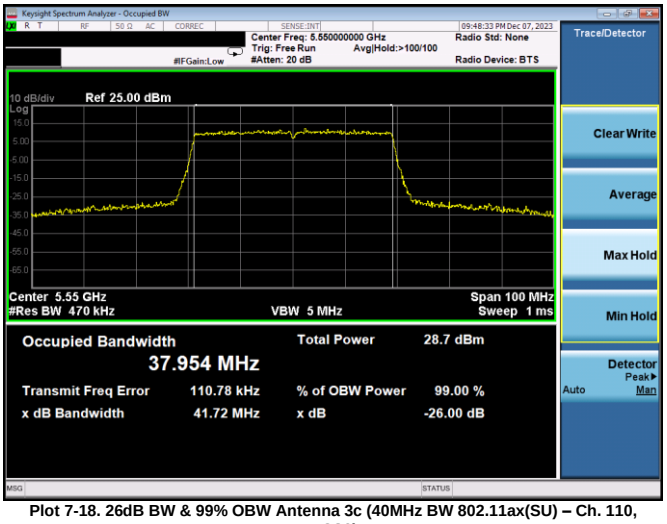
Plot 7-14. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 58, MCS2)



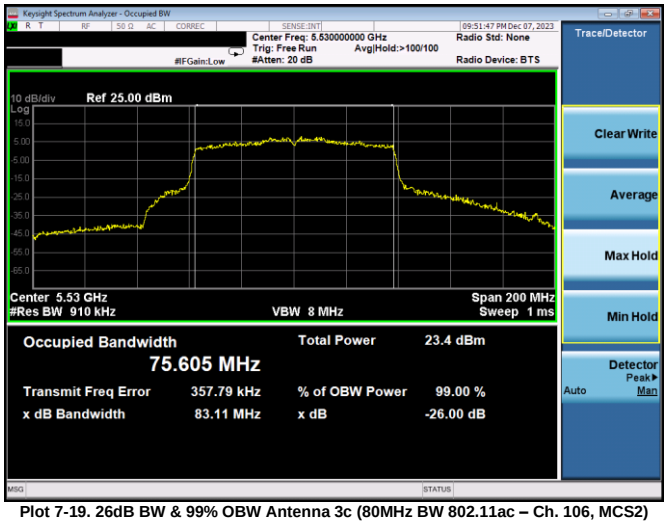
Plot 7-17. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 110, MCS2)



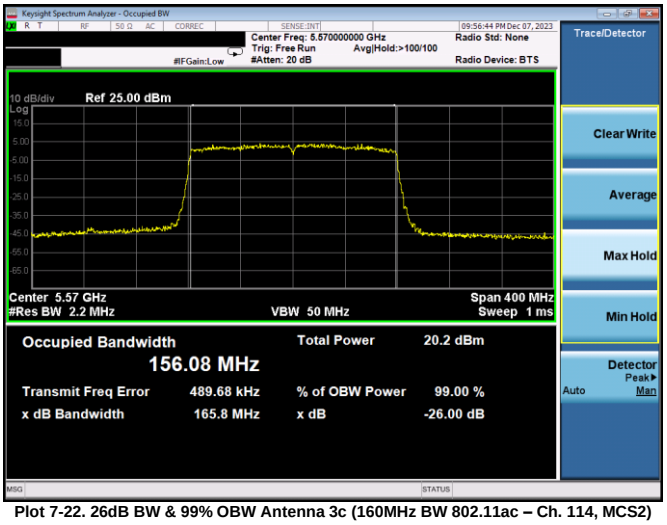
Plot 7-15. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 116, MCS2)



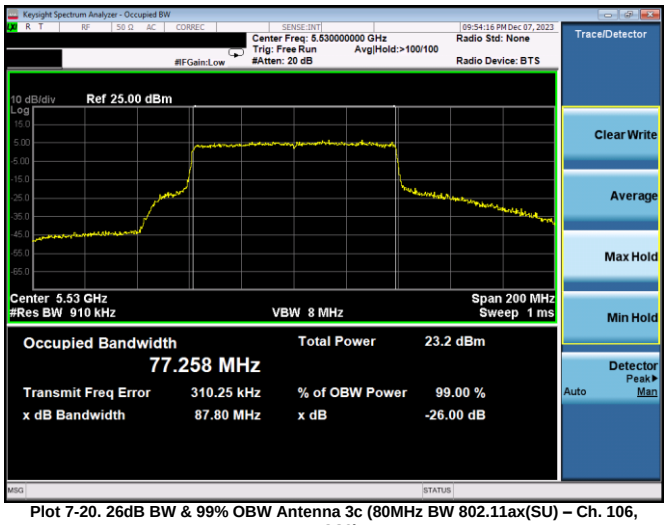
Plot 7-18. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 110, MCS2)



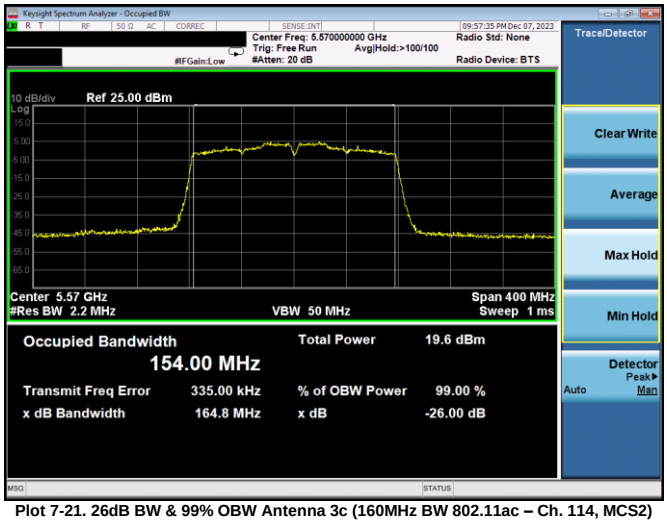
Plot 7-19. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 106, MCS2)



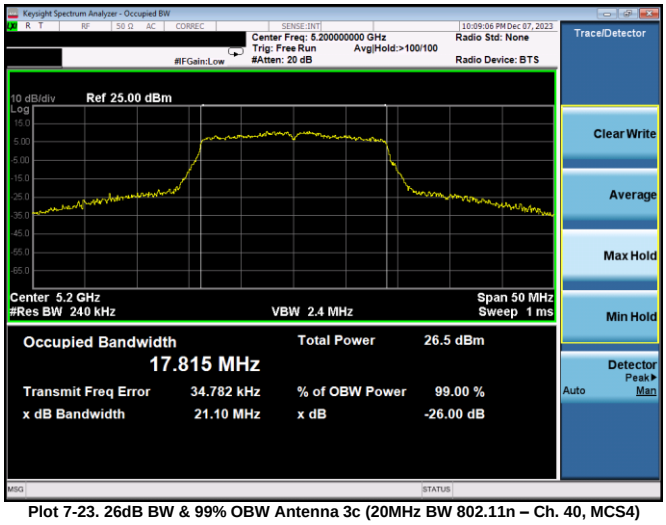
Plot 7-22. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 114, MCS2)



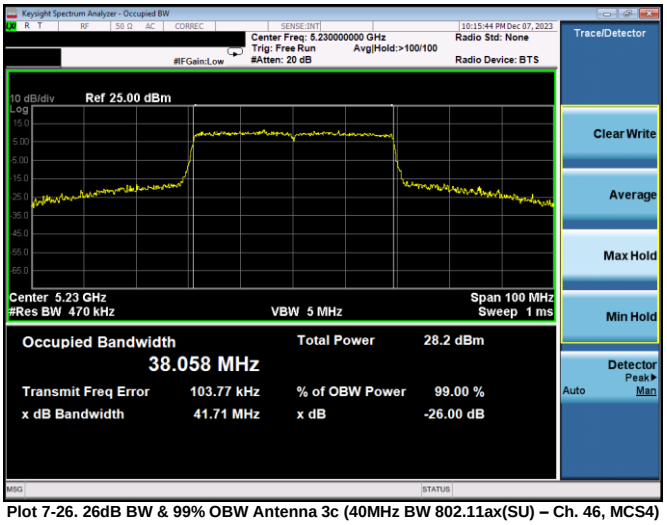
Plot 7-20. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 106, MCS2)



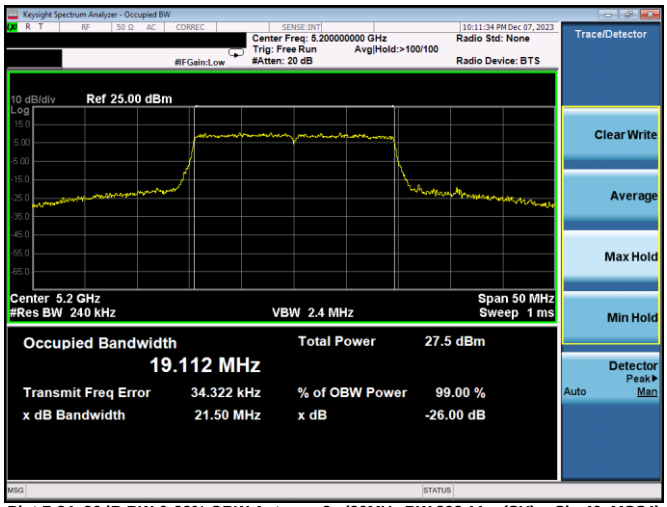
Plot 7-21. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 114, MCS2)



Plot 7-23. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 40, MCS4)

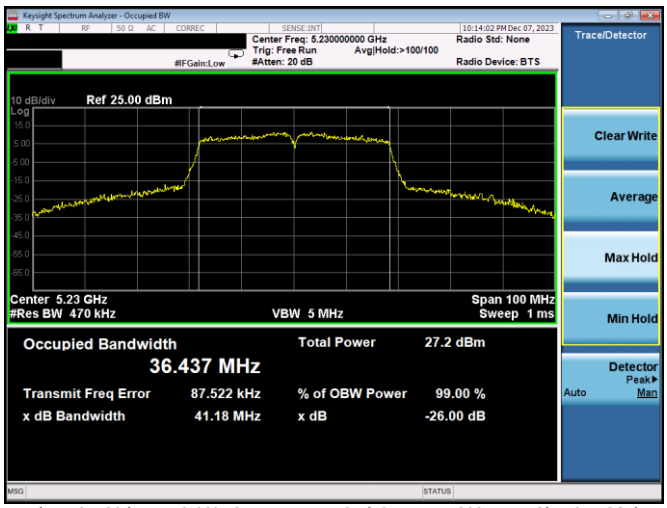


Plot 7-26. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 46, MCS4)



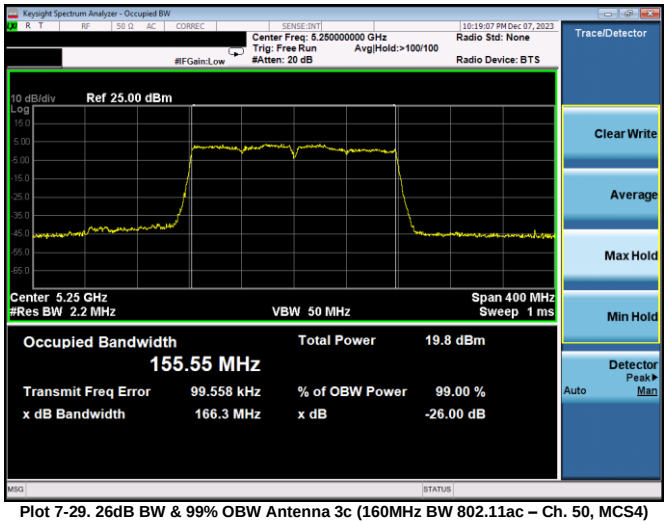
Plot 7-24. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 40, MCS4)

Plot 7-27. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 42, MCS4)

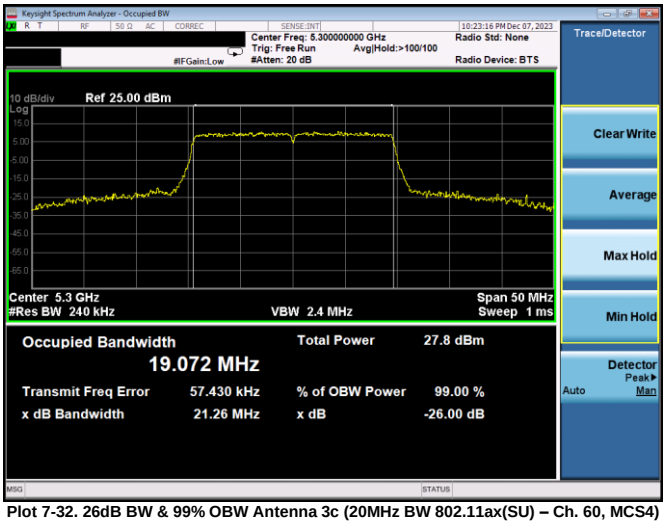


Plot 7-25. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 46, MCS4)

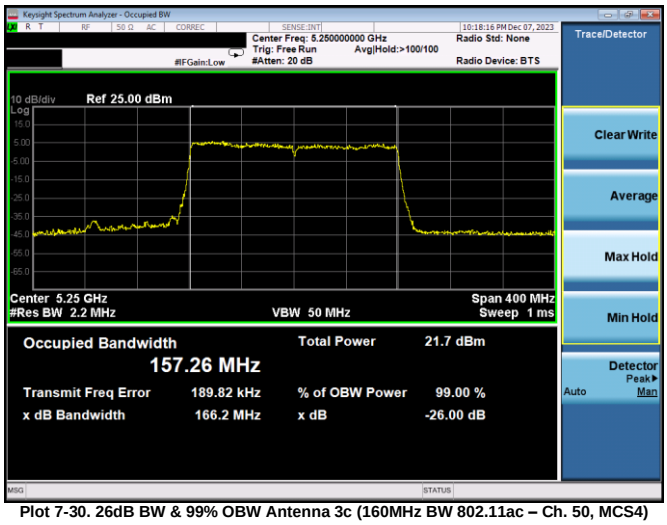
Plot 7-28. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 42, MCS4)



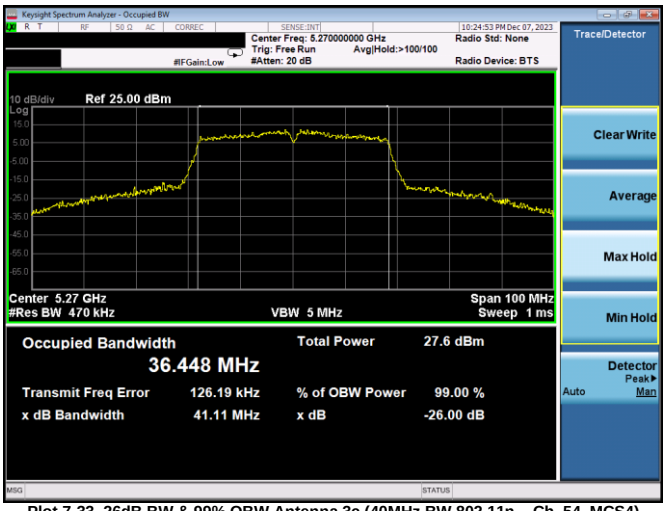
Plot 7-29. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 50, MCS4)



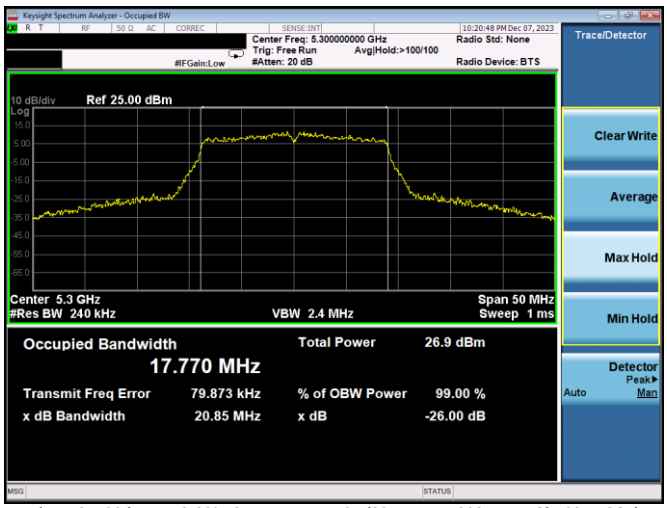
Plot 7-32. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 60, MCS4)



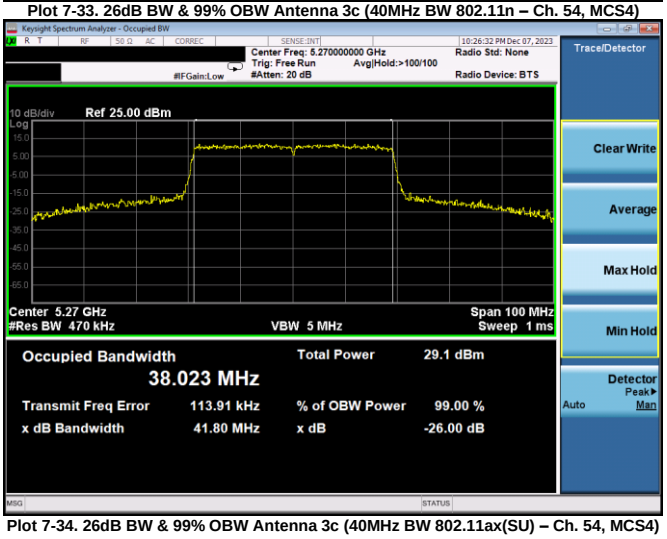
Plot 7-30. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 50, MCS4)



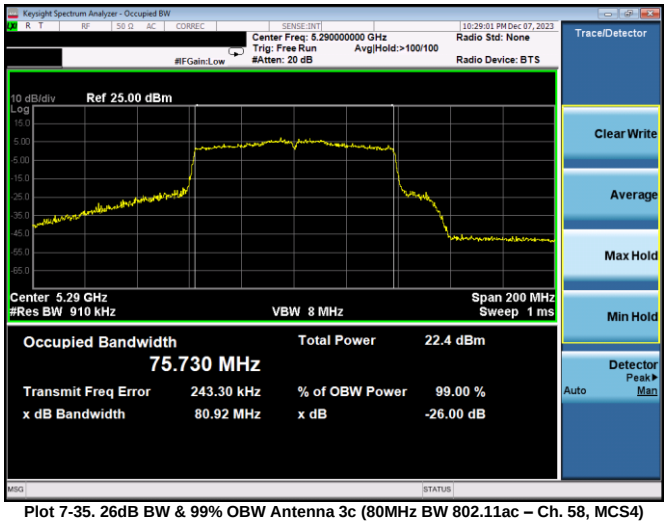
Plot 7-33. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 54, MCS4)



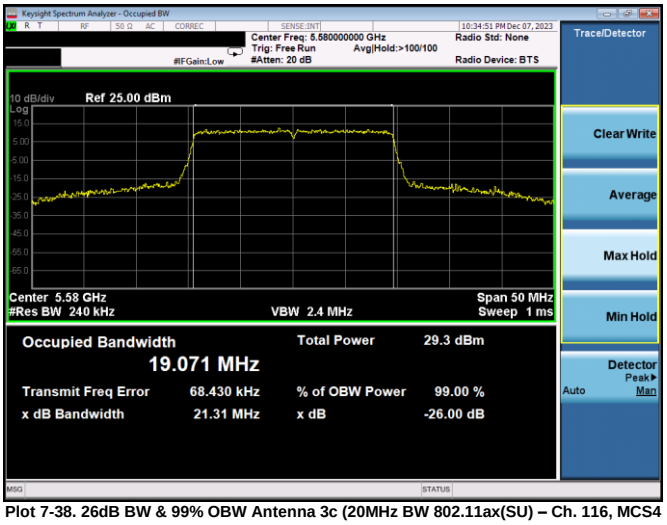
Plot 7-31. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 60, MCS4)



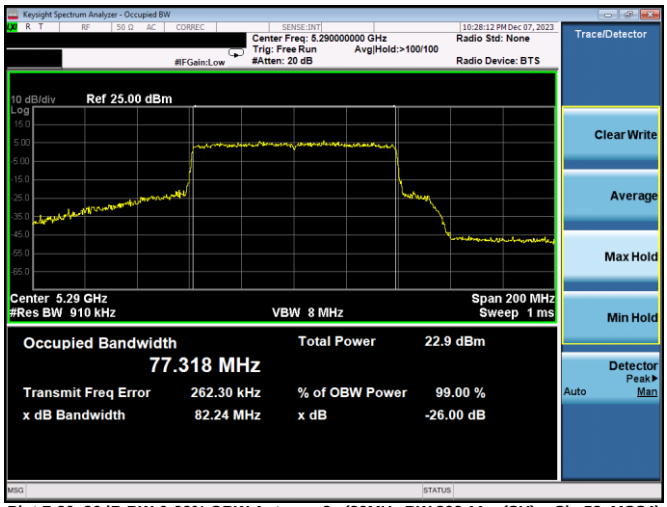
Plot 7-34. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 54, MCS4)



Plot 7-35. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 58, MCS4)

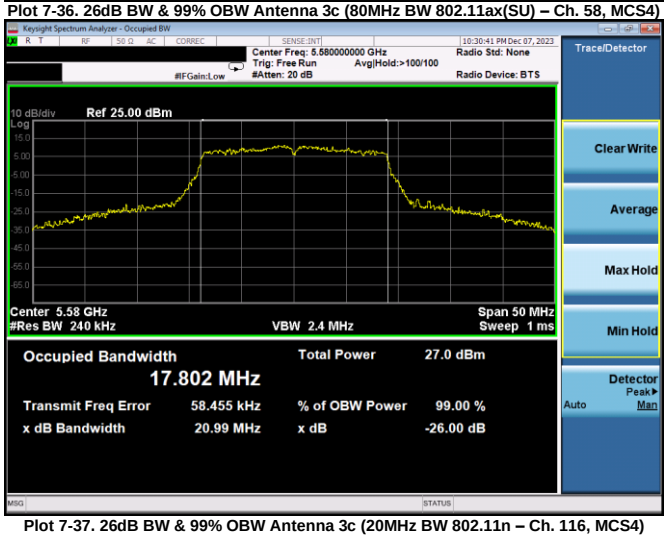


Plot 7-38. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 116, MCS4



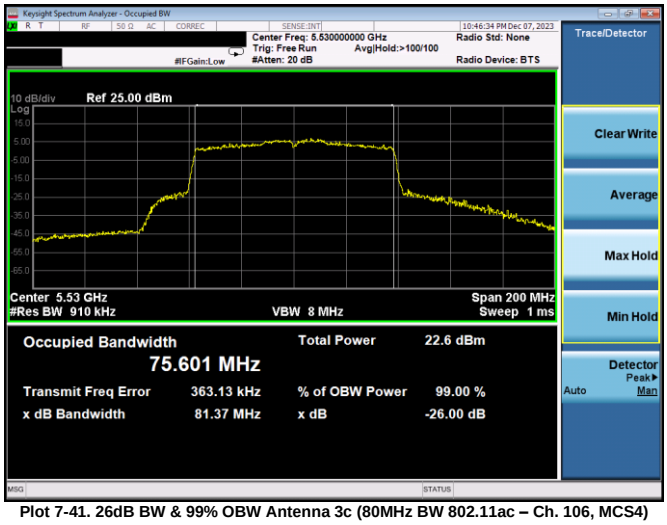
Plot 7-36. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 58, MCS4)

Plot 7-39. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 110, MCS4)

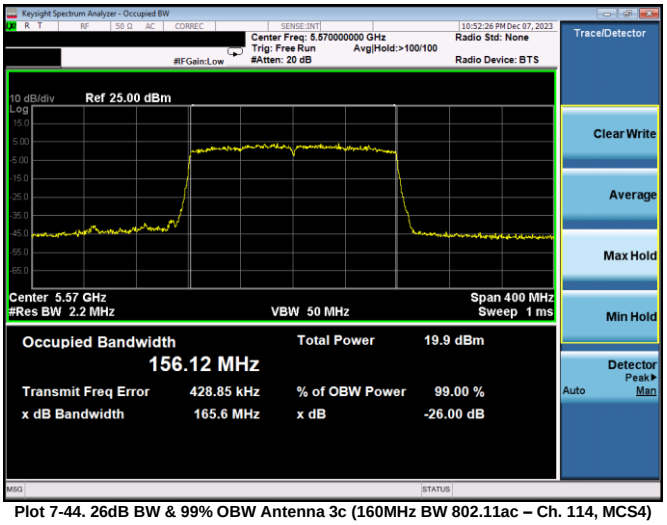


Plot 7-37. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 116, MCS4)

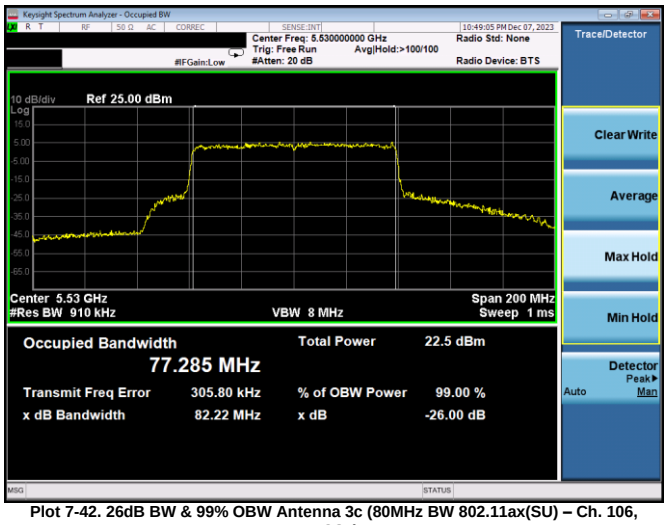
Plot 7-40. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 110, MCS4)



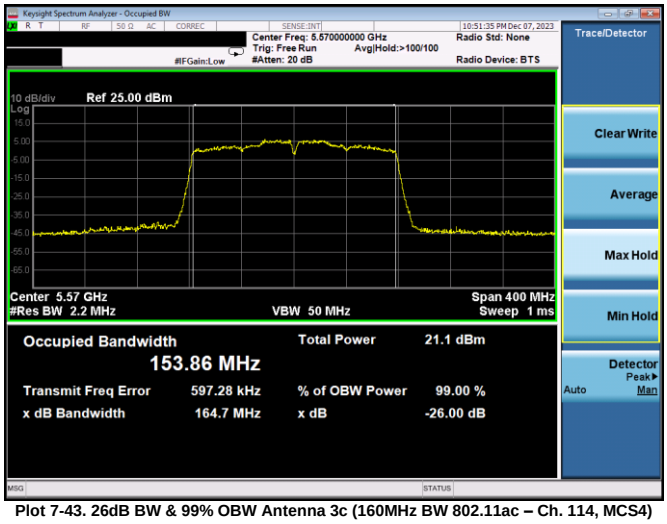
Plot 7-41. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 106, MCS4)



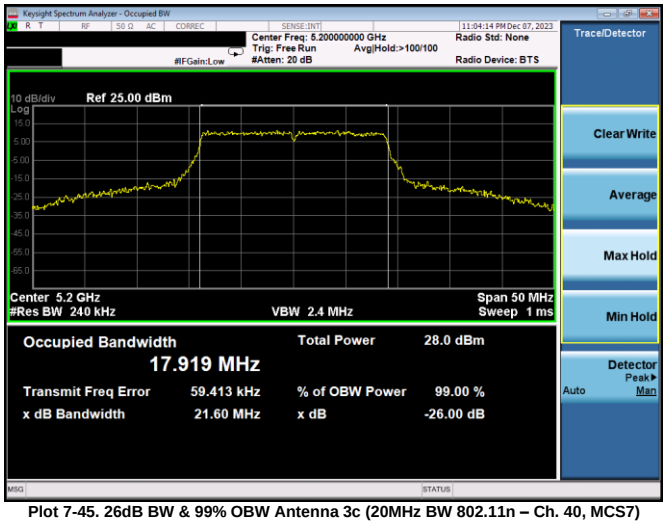
Plot 7-44. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 114, MCS4)



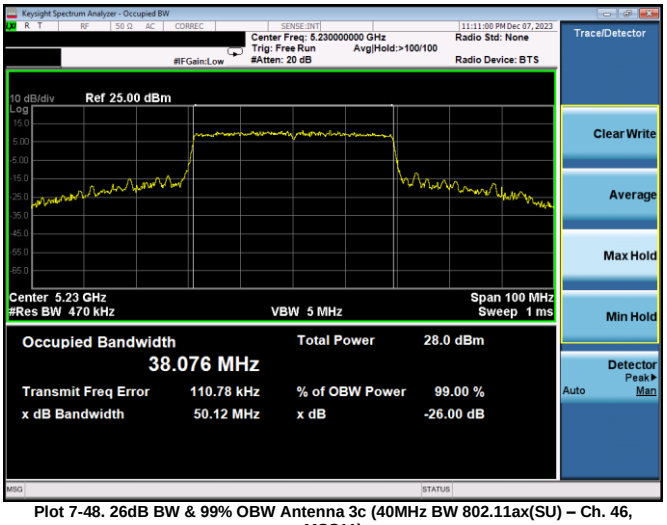
Plot 7-42. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 106, MCS4)



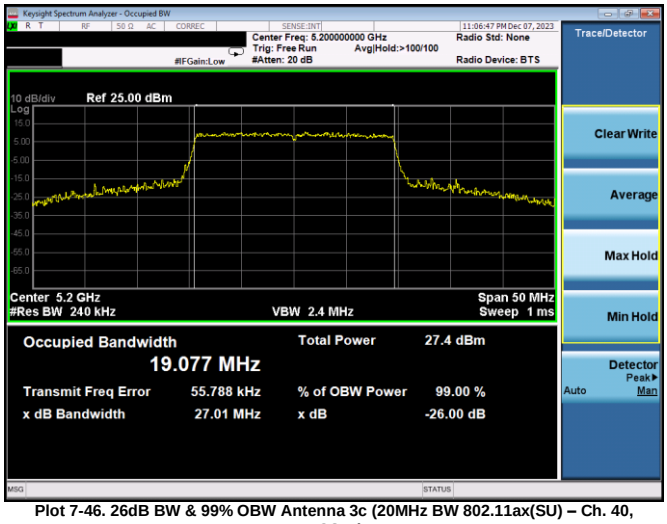
Plot 7-43. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 114, MCS4)



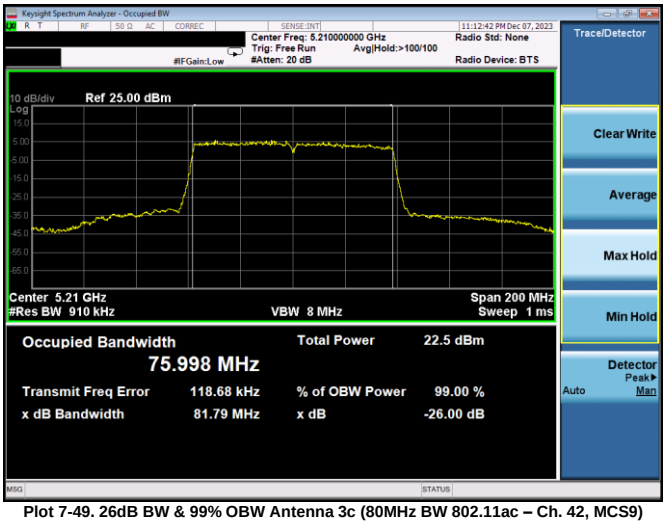
Plot 7-45. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 40, MCS7)



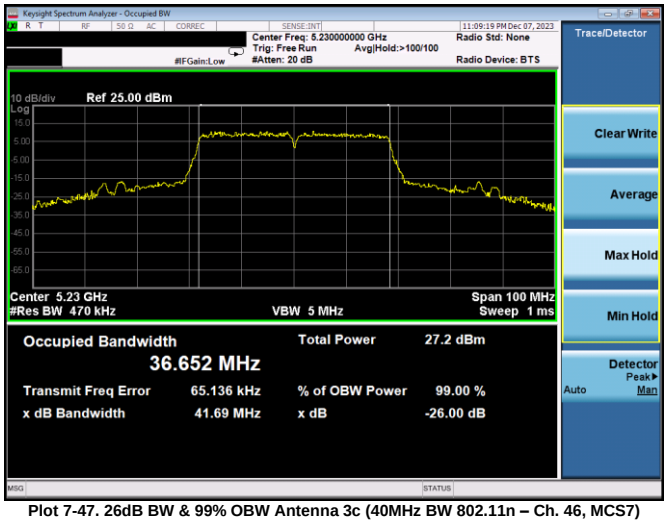
Plot 7-48. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 46, MCS11)



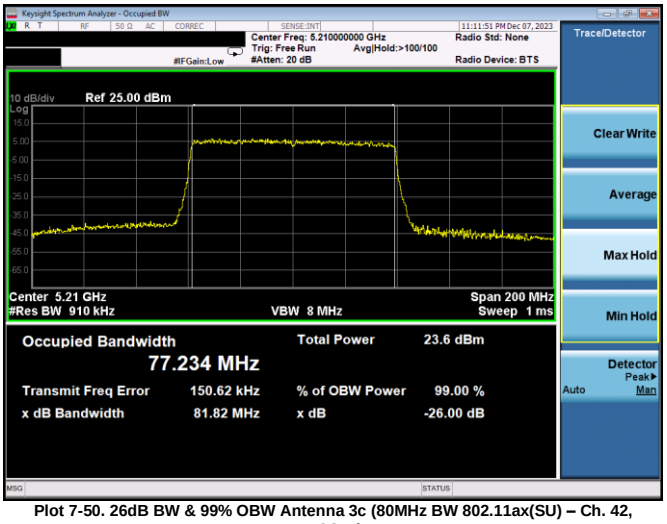
Plot 7-46. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 40, MCS11)



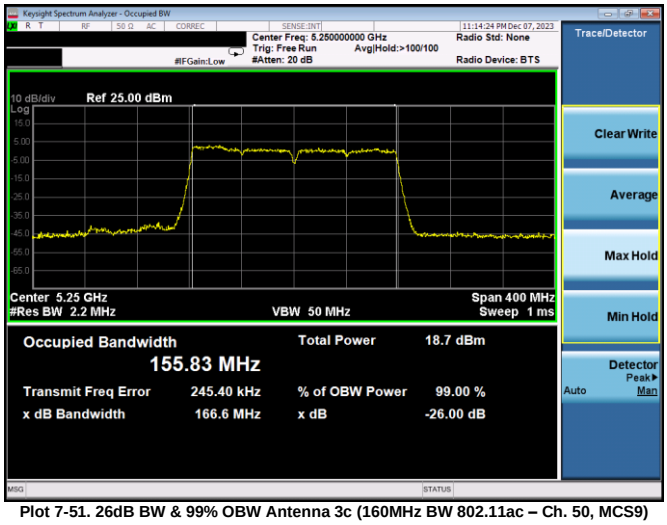
Plot 7-49. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ac – Ch. 42, MCS9)



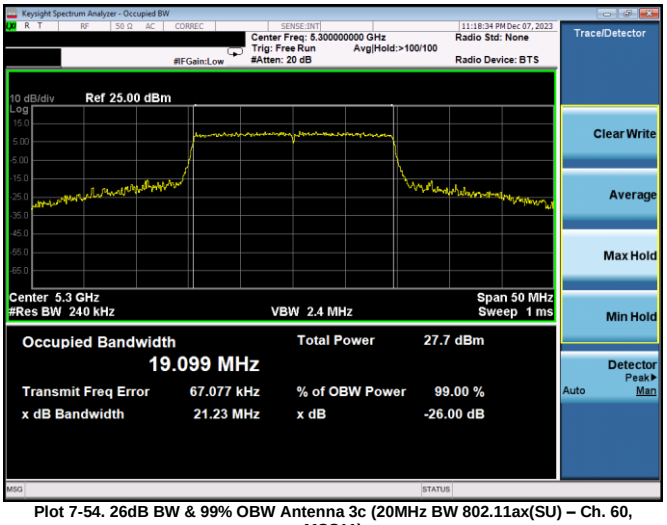
Plot 7-47. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 46, MCS7)



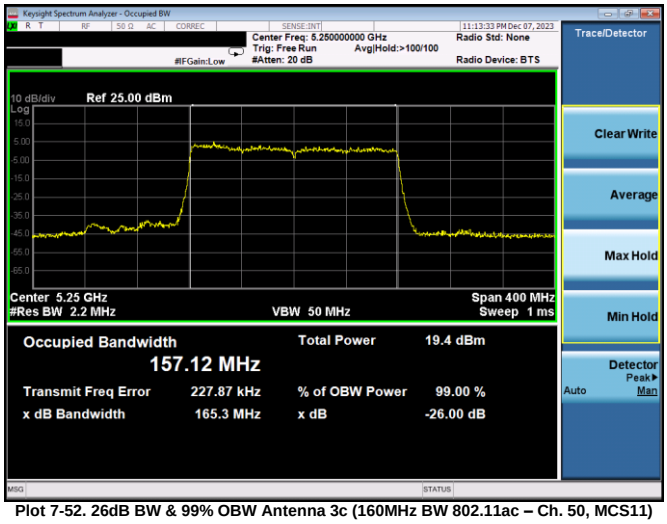
Plot 7-50. 26dB BW & 99% OBW Antenna 3c (80MHz BW 802.11ax(SU) – Ch. 42, MCS11)



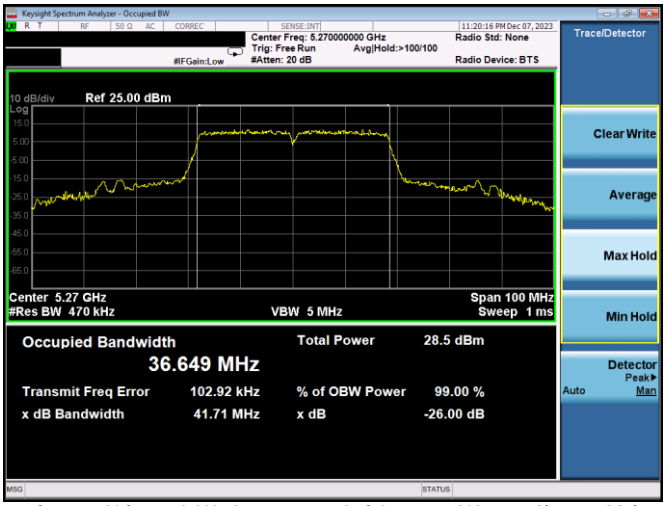
Plot 7-51. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 50, MCS9)



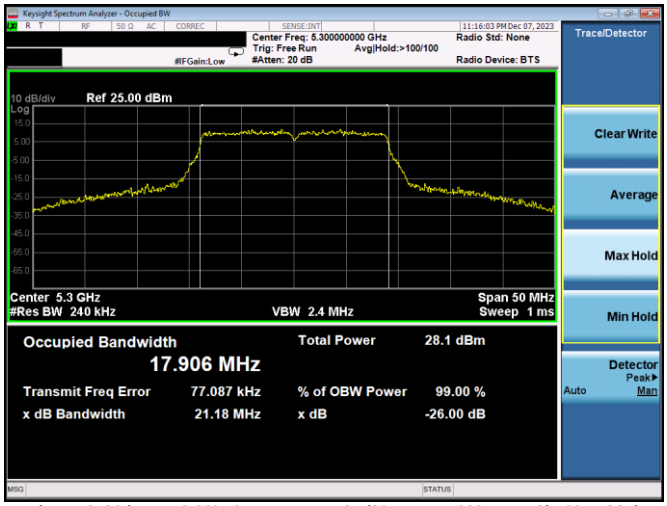
Plot 7-54. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11ax(SU) – Ch. 60, MCS11)



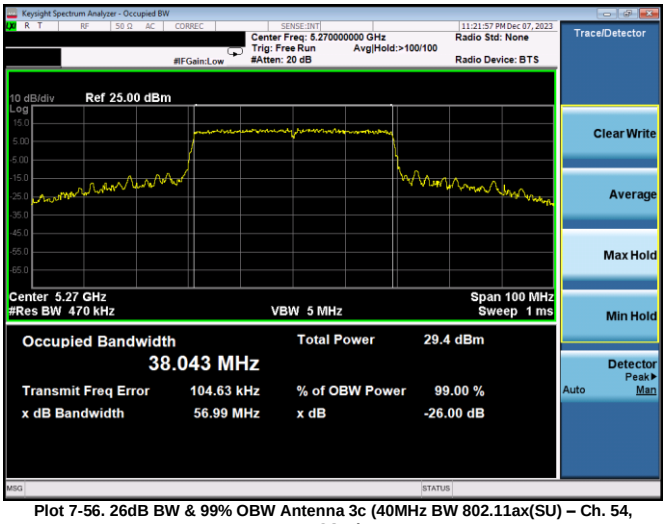
Plot 7-52. 26dB BW & 99% OBW Antenna 3c (160MHz BW 802.11ac – Ch. 50, MCS11)



Plot 7-55. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11n – Ch. 54, MCS7)



Plot 7-53. 26dB BW & 99% OBW Antenna 3c (20MHz BW 802.11n – Ch. 60, MCS7)



Plot 7-56. 26dB BW & 99% OBW Antenna 3c (40MHz BW 802.11ax(SU) – Ch. 54, MCS11)