

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:

11/29/2023 - 1/15/2024

Test Report Issue Date:

3/22/2024

Test Site/Location:

Element Materials Technology Morgan Hill

Test Report Serial No.:

1C2311270063-11.BCG

FCC ID:	BCGA2902
IC:	579C-A2902
APPLICANT:	Apple Inc.

Application Type:

Certification

Model/HVIN:

A2902

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: WKR0000005849

Reviewed by: WKR0000005796

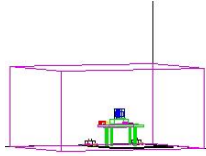


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Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 1 of 387

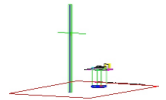
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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna WF8		Antenna WF7a		Antenna WF8		Antenna WF7a		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	98.243	19.92	100.000	20.00	49.934	16.98	50.119	17.00	100.000	20.00
2A		802.11a/n	5260 - 5320	99.816	19.99	100.000	20.00	51.428	17.11	50.119	17.00	100.693	20.03
2C		802.11a/n	5500 - 5720	99.701	19.99	100.000	20.00	99.083	19.96	98.855	19.95	198.153	22.97
3		802.11a/n	5745 - 5825	111.815	20.49	112.202	20.50	114.156	20.58	112.202	20.50	224.388	23.51
1	40	802.11n	5190 - 5230	110.815	20.45	112.202	20.50	88.471	19.47	89.125	19.50	177.419	22.49
2A		802.11n	5270 - 5310	109.471	20.39	112.202	20.50	88.716	19.48	89.125	19.50	177.828	22.50
2C		802.11n	5510 - 5710	109.245	20.38	112.202	20.50	89.125	19.50	89.125	19.50	176.604	22.47
3		802.11n	5755 - 5795	109.901	20.41	112.202	20.50	111.944	20.49	112.202	20.50	224.388	23.51
1	80	802.11ac	5210	26.638	14.26	27.733	14.43	18.147	12.59	18.836	12.75	36.983	15.68
2A		802.11ac	5290	34.970	15.44	34.387	15.36	26.620	14.25	28.184	14.50	54.828	17.39
2C		802.11ac	5530 - 5690	108.193	20.34	111.378	20.47	93.454	19.71	100.000	20.00	193.642	22.87
3		802.11ac	5775	61.944	17.92	62.951	17.99	55.208	17.42	55.081	17.41	110.408	20.43
1/2A	160	802.11ax	5250	19.820	12.97	19.480	12.90	12.100	10.83	12.331	10.91	24.434	13.88
2C		802.11ax	5570	17.215	12.36	17.783	12.50	12.474	10.96	12.531	10.98	25.003	13.98
1	20	802.11ax (SU)	5180 - 5240	98.855	19.95	99.312	19.97	49.888	16.98	49.204	16.92	99.083	19.96
2A		802.11ax (SU)	5260 - 5320	97.432	19.89	100.000	20.00	49.317	16.93	49.079	16.91	97.724	19.90
2C		802.11ax (SU)	5500 - 5720	98.062	19.92	100.000	20.00	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11ax (SU)	5745 - 5825	111.738	20.48	112.202	20.50	110.002	20.41	110.688	20.44	219.786	23.42
1	40	802.11ax (SU)	5190 - 5230	104.930	20.21	112.176	20.50	86.119	19.35	87.157	19.40	173.380	22.39
2A		802.11ax (SU)	5270 - 5310	111.635	20.48	112.202	20.50	86.099	19.35	85.153	19.30	171.396	22.34
2C		802.11ax (SU)	5510 - 5710	110.306	20.43	112.202	20.50	87.498	19.42	88.369	19.46	175.792	22.45
3		802.11ax (SU)	5755 - 5795	110.306	20.43	112.202	20.50	111.173	20.46	108.143	20.34	219.280	23.41
1	80	802.11ax (SU)	5210	22.310	13.49	21.933	13.41	15.070	11.78	15.535	11.91	30.620	14.86
2A		802.11ax (SU)	5290	31.347	14.96	30.910	14.90	27.842	14.45	26.897	14.30	54.702	17.38
2C		802.11ax (SU)	5530 - 5690	111.506	20.47	112.202	20.50	99.426	19.98	94.493	19.75	194.089	22.88
3		802.11ax (SU)	5775	55.667	17.46	55.976	17.48	49.204	16.92	49.431	16.94	98.628	19.94
1/2A	160	802.11ax (SU)	5250	19.249	12.84	19.028	12.79	12.274	10.89	12.359	10.92	24.660	13.92
2C		802.11ax (SU)	5570	15.823	11.99	15.798	11.99	12.388	10.93	12.560	10.99	24.946	13.97

FCC EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna WF8		Antenna WF7a		Antenna WF8		Antenna WF7a		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)
1	20	802.11a/n	5180 - 5240	35.481	15.50	34.858	15.42	21.009	13.22	21.135	13.25	42.073	16.24
2A		802.11a/n	5260 - 5320	99.816	19.99	100.000	20.00	50.026	16.99	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5720	99.701	19.99	100.000	20.00	99.083	19.96	98.855	19.95	198.153	22.97
3		802.11a/n	5745 - 5825	111.815	20.49	112.202	20.50	114.156	20.58	112.202	20.50	224.388	23.51
1	40	802.11n	5190 - 5230	62.734	17.98	62.806	17.98	36.720	15.65	37.034	15.69	73.790	18.68
2A		802.11n	5270 - 5310	109.471	20.39	112.202	20.50	88.716	19.48	89.125	19.50	177.828	22.50
2C		802.11n	5510 - 5710	109.245	20.38	112.202	20.50	87.498	19.42	89.125	19.50	176.604	22.47
3		802.11n	5755 - 5795	109.901	20.41	112.202	20.50	111.944	20.49	112.202	20.50	224.388	23.51
1	80	802.11ac	5210	28.054	14.48	27.606	14.41	18.446	12.66	18.176	12.60	36.644	15.64
2A		802.11ac	5290	34.970	15.44	34.387	15.36	26.620	14.25	28.184	14.50	54.828	17.39
2C		802.11ac	5530 - 5690	108.193	20.34	111.378	20.47	93.454	19.71	100.000	20.00	193.642	22.87
3		802.11ac	5775	61.944	17.92	62.951	17.99	55.208	17.42	55.081	17.41	110.408	20.43
1/2A	160	802.11ax	5250	19.454	12.89	19.116	12.81	12.100	10.83	12.331	10.91	24.434	13.88
1		20	802.11ax (SU)	5180 - 5240	35.481	15.50	34.293	15.35	21.135	13.25	20.597	13.14	41.687
2A	802.11ax (SU)		5260 - 5320	97.432	19.89	100.000	20.00	49.317	16.93	49.079	16.91	97.724	19.90
2C	802.11ax (SU)		5500 - 5720	98.062	19.92	100.000	20.00	49.900	16.98	50.119	17.00	100.000	20.00
3	802.11ax (SU)		5745 - 5825	111.738	20.48	112.202	20.50	110.002	20.41	110.688	20.44	219.786	23.42
1	40	802.11ax (SU)	5190 - 5230	61.038	17.86	61.944	17.92	35.760	15.53	36.174	15.58	71.945	18.57
2A		802.11ax (SU)	5270 - 5310	111.635	20.48	112.202	20.50	86.099	19.35	85.153	19.30	171.396	22.34
2C		802.11ax (SU)	5510 - 5710	108.868	20.37	111.789	20.48	87.498	19.42	88.369	19.46	175.792	22.45
3		802.11ax (SU)	5755 - 5795	110.306	20.43	112.202	20.50	111.173	20.46	108.143	20.34	219.280	23.41
1	80	802.11ax (SU)	5210	21.878	13.40	22.325	13.49	15.776	11.98	15.453	11.89	31.261	14.95
2A		802.11ax (SU)	5290	31.347	14.96	30.910	14.90	27.842	14.45	26.897	14.30	54.702	17.38
2C		802.11ax (SU)	5530 - 5690	111.506	20.47	112.202	20.50	99.426	19.98	94.493	19.75	194.089	22.88
3		802.11ax (SU)	5775	55.667	17.46	55.976	17.48	0.000	0.00	49.431	16.94	98.628	19.94
1/2A	160	802.11ax (SU)	5250	19.213	12.84	19.253	12.85	12.274	10.89	12.359	10.92	24.660	13.92

ISED EUT Overview (Low Data Rate)


FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna WF8		WF7a		Antenna WF8		WF7a		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)
1	20	802.11a/n	5180 - 5240	98.288	19.93	97.634	19.90	49.888	16.98	49.465	16.94	99.312	19.97
2A		802.11a/n	5260 - 5320	99.770	19.99	100.000	20.00	49.317	16.93	49.625	16.96	98.855	19.95
2C		802.11a/n	5500 - 5720	99.541	19.98	100.000	20.00	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11a/n	5745 - 5825	111.918	20.49	112.202	20.50	111.661	20.48	112.202	20.50	223.872	23.50
1	40	802.11n	5190 - 5230	109.774	20.41	112.202	20.50	88.879	19.49	89.125	19.50	177.828	22.50
2A		802.11n	5270 - 5310	112.047	20.49	112.202	20.50	85.625	19.33	89.125	19.50	174.582	22.42
2C		802.11n	5510 - 5710	111.429	20.47	112.202	20.50	87.963	19.44	89.125	19.50	176.198	22.46
3		802.11n	5755 - 5795	111.918	20.49	110.002	20.41	111.764	20.48	112.202	20.50	223.872	23.50
1	80	802.11ac	5210	22.055	13.44	22.387	13.50	15.664	11.95	15.360	11.86	31.046	14.92
2A		802.11ac	5290	28.953	14.62	28.353	14.53	25.021	13.98	24.010	13.80	48.978	16.90
2C		802.11ac	5530 - 5690	111.096	20.46	112.202	20.50	96.627	19.85	100.000	20.00	196.789	22.94
3		802.11ac	5775	49.204	16.92	48.865	16.89	49.204	16.92	49.888	16.98	99.083	19.96
1/2A	160	802.11ac	5250	15.171	11.81	15.776	11.98	12.560	10.99	12.331	10.91	22.029	13.43
2C		802.11ac	5570	15.596	11.93	15.453	11.89	11.169	10.48	11.092	10.45	21.979	13.42
1	20	802.11ax (SU)	5180 - 5240	98.084	19.92	100.000	20.00	48.978	16.90	48.051	16.82	96.383	19.84
2A		802.11ax (SU)	5260 - 5320	99.770	19.99	100.000	20.00	50.073	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	99.632	19.98	100.000	20.00	50.119	17.00	50.119	17.00	99.312	19.97
3		802.11ax (SU)	5745 - 5825	111.866	20.49	112.202	20.50	111.686	20.48	108.368	20.35	220.293	23.43
1	40	802.11ax (SU)	5190 - 5230	105.439	20.23	112.202	20.50	87.478	19.42	87.619	19.43	174.985	22.43
2A		802.11ax (SU)	5270 - 5310	110.917	20.45	112.202	20.50	83.253	19.20	82.604	19.17	165.959	22.20
2C		802.11ax (SU)	5510 - 5710	110.841	20.45	112.073	20.50	85.882	19.34	89.125	19.50	174.985	22.43
3		802.11ax (SU)	5755 - 5795	111.815	20.49	110.943	20.45	111.944	20.49	106.439	20.27	218.273	23.39
1	80	802.11ax (SU)	5210	19.566	12.92	19.884	12.99	13.555	11.32	14.025	11.47	27.606	14.41
2A		802.11ax (SU)	5290	27.208	14.35	27.816	14.44	24.694	13.93	24.774	13.94	49.431	16.94
2C		802.11ax (SU)	5530 - 5690	111.635	20.48	107.275	20.31	97.499	19.89	97.029	19.87	194.536	22.89
3		802.11ax (SU)	5775	44.157	16.45	44.566	16.49	39.264	15.94	39.446	15.96	78.705	18.96
1/2A	160	802.11ax (SU)	5250	15.297	11.85	15.513	11.91	11.066	10.44	10.940	10.39	22.029	13.43
2C		802.11ax (SU)	5570	15.234	11.83	15.849	12.00	10.965	10.40	10.990	10.41	21.979	13.42

FCC EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna WF8		Antenna WF7a		Antenna WF8		Antenna WF7a		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)
1	20	802.11a/n	5180 - 5240	35.481	15.50	35.481	15.50	21.135	13.25	21.135	13.25	42.267	16.26
2A		802.11a/n	5260 - 5320	99.770	19.99	100.000	20.00	49.317	16.93	49.625	16.96	98.855	19.95
2C		802.11a/n	5500 - 5720	99.541	19.98	100.000	20.00	50.119	17.00	50.119	17.00	100.000	20.00
3		802.11a/n	5745 - 5825	111.918	20.49	112.202	20.50	111.661	20.48	112.202	20.50	223.872	23.50
1	40	802.11n	5190 - 5230	62.517	17.96	61.518	17.89	37.316	15.72	36.644	15.64	73.961	18.69
2A		802.11n	5270 - 5310	112.047	20.49	112.202	20.50	85.625	19.33	89.125	19.50	174.582	22.42
2C		802.11n	5510 - 5710	111.429	20.47	107.622	20.32	87.076	19.40	89.125	19.50	176.198	22.46
3		802.11n	5755 - 5795	111.918	20.49	110.002	20.41	111.764	20.48	112.202	20.50	223.872	23.50
1	80	802.11ac	5210	21.360	13.30	22.024	13.43	15.413	11.88	15.279	11.84	30.690	14.87
2A		802.11ac	5290	28.953	14.62	28.353	14.53	25.021	13.98	24.010	13.80	48.978	16.90
2C		802.11ac	5530 - 5690	111.096	20.46	112.202	20.50	96.627	19.85	100.000	20.00	196.789	22.94
3		802.11ac	5775	49.204	16.92	48.865	16.89	49.204	16.92	49.888	16.98	99.083	19.96
1/2A	160	802.11ac	5250	15.265	11.84	15.052	11.78	12.560	10.99	12.331	10.91	22.080	13.44
1	20	802.11ax (SU)	5180 - 5240	34.475	15.38	35.221	15.47	21.135	13.25	21.135	13.25	41.879	16.22
2A		802.11ax (SU)	5260 - 5320	99.770	19.99	100.000	20.00	50.073	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	99.632	19.98	100.000	20.00	50.119	17.00	50.119	17.00	99.312	19.97
3		802.11ax (SU)	5745 - 5825	111.866	20.49	112.202	20.50	111.686	20.48	108.368	20.35	220.293	23.43
1	40	802.11ax (SU)	5190 - 5230	61.376	17.88	61.560	17.89	36.830	15.66	37.575	15.75	74.473	18.72
2A		802.11ax (SU)	5270 - 5310	110.917	20.45	112.202	20.50	86.696	19.38	86.497	19.37	173.380	22.39
2C		802.11ax (SU)	5510 - 5710	107.448	20.31	108.143	20.34	85.882	19.34	89.125	19.50	174.985	22.43
3		802.11ax (SU)	5755 - 5795	111.815	20.49	110.943	20.45	111.944	20.49	106.439	20.27	218.273	23.39
1	80	802.11ax (SU)	5210	19.436	12.89	18.845	12.75	13.614	11.34	13.658	11.35	27.290	14.36
2A		802.11ax (SU)	5290	27.208	14.35	27.816	14.44	24.694	13.93	24.774	13.94	49.431	16.94
2C		802.11ax (SU)	5530 - 5690	111.635	20.48	107.275	20.31	97.499	19.89	97.029	19.87	194.536	22.89
3		802.11ax (SU)	5775	44.157	16.45	44.566	16.49	39.264	15.94	39.446	15.96	78.705	18.96
1/2A	160	802.11ax (SU)	5250	15.567	11.92	15.417	11.88	10.990	10.41	11.066	10.44	22.080	13.44

ISED EUT Overview (Mid Data Rate)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna WF8		Antenna WF7a		Antenna WF8		Antenna WF7a		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)
1	20	802.11a/n	5180 - 5240	98.855	19.95	100.000	20.00	50.003	16.99	50.119	17.00	100.000	20.00
2A		802.11a/n	5260 - 5320	98.833	19.95	100.000	20.00	49.579	16.95	50.119	17.00	99.770	19.99
2C		802.11a/n	5500 - 5720	99.541	19.98	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
3	40	802.11a/n	5745 - 5825	111.995	20.49	112.202	20.50	111.096	20.46	112.202	20.50	221.309	23.45
1		802.11n	5190 - 5230	102.000	20.09	108.218	20.34	86.736	19.38	88.961	19.49	175.792	22.45
2A		802.11n	5270 - 5310	102.306	20.10	105.172	20.22	86.298	19.36	85.704	19.33	172.187	22.36
2C	80	802.11n	5510 - 5710	112.202	20.50	110.586	20.44	86.996	19.40	88.756	19.48	173.780	22.40
3		802.11n	5755 - 5795	107.523	20.32	106.586	20.28	111.327	20.47	112.202	20.50	223.357	23.49
1		802.11ac	5210	17.302	12.38	17.298	12.38	13.586	11.33	14.125	11.50	27.733	14.43
2A	160	802.11ac	5290	24.027	13.81	25.119	14.00	19.566	12.92	19.077	12.81	38.637	15.87
2C		802.11ac	5530 - 5690	110.179	20.42	110.815	20.45	99.083	19.96	95.126	19.78	194.089	22.88
3		802.11ac	5775	44.157	16.45	43.853	16.42	43.652	16.40	44.055	16.44	87.700	19.43
1/2A	20	802.11ax (SU)	5180 - 5240	98.446	19.93	97.297	19.88	49.888	16.98	50.119	17.00	99.770	19.99
2A		802.11ax (SU)	5260 - 5320	99.243	19.97	100.000	20.00	49.238	16.92	50.119	17.00	99.312	19.97
2C		802.11ax (SU)	5500 - 5720	96.650	19.85	100.000	20.00	50.119	17.00	50.119	17.00	100.000	20.00
3	40	802.11ax (SU)	5745 - 5825	111.661	20.48	110.078	20.42	111.173	20.46	112.202	20.50	223.357	23.49
1		802.11ax (SU)	5190 - 5230	89.002	19.49	85.114	19.30	77.126	18.87	75.579	18.78	152.757	21.84
2A		802.11ax (SU)	5270 - 5310	96.073	19.83	98.946	19.95	78.886	18.97	78.560	18.95	157.398	21.97
2C	80	802.11ax (SU)	5510 - 5710	111.764	20.48	112.202	20.50	89.125	19.50	88.349	19.46	177.011	22.48
3		802.11ax (SU)	5755 - 5795	111.686	20.48	112.202	20.50	110.154	20.42	111.378	20.47	221.309	23.45
1		802.11ax (SU)	5210	16.516	12.18	17.783	12.50	14.028	11.47	13.906	11.43	27.925	14.46
2A	160	802.11ax (SU)	5290	24.848	13.95	25.119	14.00	19.409	12.88	19.815	12.97	39.264	15.94
2C		802.11ax (SU)	5530 - 5690	107.152	20.30	110.154	20.42	97.029	19.87	98.696	19.94	195.884	22.92
3		802.11ax (SU)	5775	44.463	16.48	44.055	16.44	38.815	15.89	38.994	15.91	77.804	18.91
1/2A	20	802.11ax (SU)	5250	12.221	10.87	10.958	10.96	9.727	9.88	9.750	9.89	19.498	12.90
2C		802.11ax (SU)	5570	12.331	10.91	10.950	10.95	7.727	8.88	7.870	8.96	15.596	11.93

FCC EUT Overview (High Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna WF8		Antenna WF7a		Antenna WF8		Antenna WF7a		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)
1	20	802.11a/n	5180 - 5240	35.481	15.50	35.164	15.46	20.879	13.20	21.038	13.23	41.687	16.20
2A		802.11a/n	5260 - 5320	98.833	19.95	100.000	20.00	49.579	16.95	50.119	17.00	99.770	19.99
2C		802.11a/n	5500 - 5720	99.541	19.98	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
3	40	802.11a/n	5745 - 5825	111.995	20.49	112.202	20.50	111.096	20.46	112.202	20.50	221.309	23.45
1		802.11n	5190 - 5230	61.660	17.90	61.574	17.89	37.411	15.73	36.881	15.67	74.302	18.71
2A		802.11n	5270 - 5310	102.306	20.10	105.172	20.22	86.298	19.36	85.704	19.33	172.187	22.36
2C	80	802.11n	5510 - 5710	109.749	20.40	108.143	20.34	86.996	19.40	84.411	19.26	171.396	22.34
3		802.11n	5755 - 5795	107.523	20.32	106.586	20.28	111.327	20.47	112.202	20.50	223.357	23.49
1		802.11ac	5210	17.298	12.38	17.579	12.45	13.925	11.44	13.772	11.39	27.669	14.42
2A	160	802.11ac	5290	24.027	13.81	25.119	14.00	19.566	12.92	19.077	12.81	38.637	15.87
2C		802.11ac	5530 - 5690	110.179	20.42	110.815	20.45	99.083	19.96	95.126	19.78	194.089	22.88
3		802.11ac	5775	55.590	17.45	43.853	16.42	43.652	16.40	44.055	16.44	87.700	19.43
1/2A	20	802.11ax (SU)	5180 - 5240	35.481	15.50	35.481	15.50	21.135	13.25	21.135	13.25	42.267	16.26
2A		802.11ax (SU)	5260 - 5320	99.243	19.97	100.000	20.00	49.238	16.92	49.682	16.96	98.855	19.95
2C		802.11ax (SU)	5500 - 5720	96.650	19.85	100.000	20.00	49.545	16.95	50.119	17.00	99.770	19.99
3	40	802.11ax (SU)	5745 - 5825	111.661	20.48	110.078	20.42	111.173	20.46	112.202	20.50	223.357	23.49
1		802.11ax (SU)	5190 - 5230	60.814	17.84	60.618	17.83	37.068	15.69	36.627	15.64	73.621	18.67
2A		802.11ax (SU)	5270 - 5310	96.073	19.83	98.946	19.95	78.886	18.97	78.560	18.95	157.398	21.97
2C	80	802.11ax (SU)	5510 - 5710	111.764	20.48	111.841	20.49	88.756	19.48	88.349	19.46	177.011	22.48
3		802.11ax (SU)	5755 - 5795	111.686	20.48	112.202	20.50	110.154	20.42	111.378	20.47	221.309	23.45
1		802.11ax (SU)	5210	17.527	12.44	17.132	12.34	13.804	11.40	13.425	11.28	27.227	14.35
2A	160	802.11ax (SU)	5290	24.848	13.95	25.119	14.00	19.409	12.88	19.815	12.97	39.264	15.94
2C		802.11ax (SU)	5530 - 5690	107.152	20.30	110.154	20.42	97.029	19.87	98.696	19.94	195.884	22.92
3		802.11ax (SU)	5775	44.463	16.48	44.055	16.44	38.815	15.89	38.994	15.91	77.804	18.91
1/2A	20	802.11ax (SU)	5250	12.274	10.89	10.912	10.91	9.727	9.88	9.750	9.89	19.498	12.90

ISED EUT Overview (High Data Rate)

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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 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 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).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Tablet Device FCC ID: BCGA2902** and **IC: 579C-A2902**. 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.: M6NM4JFC3F, HJQ6KDT73J,YYW2W9H5YX, VNPP6G99NN, DLXH09000190000DHV

2.2 Device Capabilities

This device contains the following capabilities:

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

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

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Notes:

- 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 WF8	Antenna WF7a	CDD/SDM
5GHz	a (Low Rate)	99.2	98.6	98.5
	a (Mid Rate)	94.6	95.2	96.1
	a (High Rate)	91.4	91.6	91.8
	n (HT20) (Low Rate)	96.6	96.8	94.0
	n (HT20) (Mid Rate)	94.2	93.5	89.9
	n (HT20) (High Rate)	90.8	91.0	85.5
	ax(SU) (HE20 Low Rate)	96.2	95.9	95.9
	ax(SU) (HE20 Mid Rate)	92.7	92.9	93.1
	ax(SU) (HE20 High Rate)	86.7	86.3	86.7
	n (HT40 Low Rate)	96.6	96.6	93.1
	n (HT40 Mid Rate)	93.3	93.8	89.3
	n (HT40 High Rate)	90.2	90.4	85.1
	ax(SU) (HE40 Low Rate)	95.7	95.7	95.9
	ax(SU) (HE40 Mid Rate)	93.1	92.7	93.1
	ax(SU) (HE40 High Rate)	85.9	86.1	85.9
	ac (HT80 Low Rate)	96.2	96.2	93.1
	ac (HT80 Mid Rate)	92.9	93.1	88.9
	ac (HT80 High Rate)	87.7	87.1	81.7
	ax(SU) (HE80 Low Rate)	95.1	95.3	95.7
	ax(SU) (HE80 Mid Rate)	92.7	92.5	92.3
	ax(SU) (HE80 High Rate)	85.3	85.7	85.3
	ac (HT160 Low Rate)	94.8	94.4	91.0
	ac (HT160 Mid Rate)	91.0	90.8	85.9
	ac (HT160 High Rate)	84.5	85.5	80.7
	ax(SU) (HE160 Low Rate)	94.0	94.0	94.0
	ax(SU) (HE60 Mid Rate)	90.6	90.8	90.8
ax(SU) (HE160 High Rate)	84.3	84.3	84.1	

Table 2-5. Measured Duty Cycles

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

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna WF8	Antenna WF7a	Antenna WF8	Antenna WF7a	Antenna WF8	Antenna WF7a	Antenna WF8	Antenna WF7a
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, 272/288.2, 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. 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.

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4. TWDR Channels are not supported for ISED.
5. 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
WF8	Config 1	✓	✗	✗	✗	✗	✓
WF8	Config 2	✗	✓	✗	✓	✗	✗
WF8	Config 3	✗	✓	✗	✗	✓	✗
WF8	Config 4	✗	✗	✓	✓	✗	✗
WF8	Config 5	✗	✗	✓	✗	✓	✗

Table 2-7. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

2.3 Antenna Description

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

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna WF8	Antenna WF7a
5.150 – 5.250	1.3	2.9
5.250 – 5.350	1.6	2.7
5.470 – 5.725	4.4	2.5
5.725 – 5.850	5.0	2.1

Table 2-8. Highest Antenna Gain

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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2.4 Test Support Equipment

1	Apple MacBook Pro	Model:	A2141	S/N:	C02H604EQ05D
	w/AC/DC Adapter	Model:	A2166	S/N:	C4H042705ZNP0WA6
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.

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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/MCS10J(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, 1C2311270063-12.BCG

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.

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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.

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

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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.

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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 (\pm 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

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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.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2902
 IC: 579C-A2902
 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, 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 (1C23112700 63-10.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.
- 6) Per RSS-247 Section 6.2.3, transmission on channels which overlap the 5600-5650 MHz is prohibited. This device operates under these frequencies only under the control of a certified master device and does not support active scanning on these channels. This device does not transmit any beacons or initiate any transmissions in UNII Bands 2A or 2C.

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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.

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Antenna WF8 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)	17.87	22.37	
	5200	40	n (20MHz)	19.5/21.7 (MCS2)	17.76	20.87	
	5240	48	n (20MHz)	19.5/21.7 (MCS2)	17.74	20.91	
	5180	36	ax (SU) (20MHz)	24/25.8 (MCS2)	19.20	23.75	
	5200	40	ax (SU) (20MHz)	24/25.8 (MCS2)	19.04	21.28	
	5240	48	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.13	
	5190	38	n (40MHz)	40.5/45 (MCS2)	36.49	42.32	
	5230	46	n (40MHz)	40.5/45 (MCS2)	36.32	41.10	
	5190	38	ax (SU) (40MHz)	49/51.6 (MCS2)	38.12	42.98	
	5230	46	ax (SU) (40MHz)	49/51.6 (MCS2)	37.96	41.57	
	5210	42	ac (80MHz)	87.8/97.5 (MCS2)	75.65	86.12	
	5210	42	ax (SU) (80MHz)	102/108.1 (MCS2)	77.38	85.50	
Band 1/2	5250	50	ac (160MHz)	175.5/195 (MCS2)	154.14	165.20	
	5250	50	ax (SU) (160MHz)	204.2/216.2 (MCS2)	156.37	166.30	
Band 2A	5260	52	n (20MHz)	19.5/21.7 (MCS2)	17.76	21.09	
	5300	60	n (20MHz)	19.5/21.7 (MCS2)	17.74	20.87	
	5320	64	n (20MHz)	19.5/21.7 (MCS2)	17.85	21.30	
	5260	52	ax (SU) (20MHz)	24/25.8 (MCS2)	19.04	21.26	
	5300	60	ax (SU) (20MHz)	24/25.8 (MCS2)	19.09	21.29	
	5320	64	ax (SU) (20MHz)	24/25.8 (MCS2)	19.11	24.23	
	5270	54	n (40MHz)	40.5/45 (MCS2)	36.28	41.24	
	5310	62	n (40MHz)	40.5/45 (MCS2)	36.53	42.07	
	5270	54	ax (SU) (40MHz)	49/51.6 (MCS2)	38.01	41.44	
	5310	62	ax (SU) (40MHz)	49/51.6 (MCS2)	38.13	43.14	
	5290	58	ac (80MHz)	87.8/97.5 (MCS2)	75.52	87.55	
	5290	58	ax (SU) (80MHz)	102/108.1 (MCS2)	77.20	84.22	
	Band 2C	5500	100	n (20MHz)	19.5/21.7 (MCS2)	17.84	21.28
		5580	116	n (20MHz)	19.5/21.7 (MCS2)	17.75	20.94
5720		144	n (20MHz)	19.5/21.7 (MCS2)	17.77	20.90	
5500		100	ax (SU) (20MHz)	24/25.8 (MCS2)	19.17	24.24	
5580		116	ax (SU) (20MHz)	24/25.8 (MCS2)	19.07	21.32	
5720		144	ax (SU) (20MHz)	24/25.8 (MCS2)	19.07	21.24	
5510		102	n (40MHz)	40.5/45 (MCS2)	36.51	42.76	
5550		110	n (40MHz)	40.5/45 (MCS2)	36.29	41.08	
5710		142	n (40MHz)	40.5/45 (MCS2)	36.27	40.99	
5510		102	ax (SU) (40MHz)	49/51.6 (MCS2)	38.08	43.69	
5550		110	ax (SU) (40MHz)	49/51.6 (MCS2)	37.94	41.54	
5710		142	ax (SU) (40MHz)	49/51.6 (MCS2)	37.94	41.60	
5530		106	ac (80MHz)	87.8/97.5 (MCS2)	75.70	82.31	
5690		138	ac (80MHz)	87.8/97.5 (MCS2)	75.47	81.47	
5530		106	ax (SU) (80MHz)	102/108.1 (MCS2)	77.33	85.43	
5690		138	ax (SU) (80MHz)	102/108.1 (MCS2)	77.25	82.27	
5570		114	ac (160MHz)	175.5/195 (MCS2)	154.09	164.80	
5570		114	ax (SU) (160MHz)	204.2/216.2 (MCS2)	156.22	165.90	

Table 7-2. Conducted Bandwidth Measurements Antenna WF8 (Low Data Rate)

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	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]	
Band 1	5180	36	n (20MHz)	81/90 (MCS4)	17.80	20.82	
	5200	40	n (20MHz)	81/90 (MCS4)	17.75	20.85	
	5240	48	n (20MHz)	81/90 (MCS4)	17.74	20.71	
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.86	
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	19.05	21.18	
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.44	
	5190	38	n (40MHz)	81/90 (MCS4)	36.44	41.13	
	5230	46	n (40MHz)	81/90 (MCS4)	36.32	40.89	
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	38.04	46.39	
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	37.96	41.56	
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.56	81.08	
5210	42	ax (SU) (80MHz)	49/51.6 (MCS4)	77.37	82.10		
Band 1/2	5250	50	ac (160MHz)	351/390 (MCS4)	154.25	164.90	
	5250	50	ax (SU) (160MHz)	408.3/432.4 (MCS4)	156.13	165.90	
Band 2A	5260	52	n (20MHz)	81/90 (MCS4)	17.76	20.81	
	5300	60	n (20MHz)	81/90 (MCS4)	17.74	20.59	
	5320	64	n (20MHz)	81/90 (MCS4)	17.84	20.92	
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.16	
	5300	60	ax (SU) (20MHz)	49/51.6 (MCS4)	19.04	21.22	
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.10	22.69	
	5270	54	n (40MHz)	81/90 (MCS4)	36.38	40.65	
	5310	62	n (40MHz)	81/90 (MCS4)	36.51	40.55	
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	38.00	41.67	
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	38.03	46.02	
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.61	81.19	
	5290	58	ax (SU) (80MHz)	49/51.6 (MCS4)	77.27	82.06	
	Band 2C	5500	100	n (20MHz)	81/90 (MCS4)	17.80	20.84
		5580	116	n (20MHz)	81/90 (MCS4)	17.72	20.81
5720		144	n (20MHz)	81/90 (MCS4)	17.76	21.00	
5500		100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.77	
5580		116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.05	21.25	
5720		144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.53	
5510		102	n (40MHz)	81/90 (MCS4)	36.40	41.19	
5550		110	n (40MHz)	81/90 (MCS4)	36.31	40.93	
5710		142	n (40MHz)	81/90 (MCS4)	36.29	40.69	
5510		102	ax (SU) (40MHz)	98/103.2 (MCS4)	38.05	45.99	
5550		110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.95	41.39	
5710		142	ax (SU) (40MHz)	98/103.2 (MCS4)	38.00	41.53	
5530		106	ac (80MHz)	175.5/195 (MCS4)	75.62	81.20	
5690		138	ac (80MHz)	175.5/195 (MCS4)	75.67	81.06	
5530		106	ax (SU) (80MHz)	49/51.6 (MCS4)	77.25	81.77	
5690		138	ax (SU) (80MHz)	49/51.6 (MCS4)	77.35	81.84	
5570		114	ac (160MHz)	351/390 (MCS4)	154.09	165.30	
5570		114	ax (SU) (160MHz)	408.3/432.4 (MCS4)	156.15	165.60	

Table 7-3. Conducted Bandwidth Measurements Antenna WF8 (Mid Data Rate)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 21 of 387

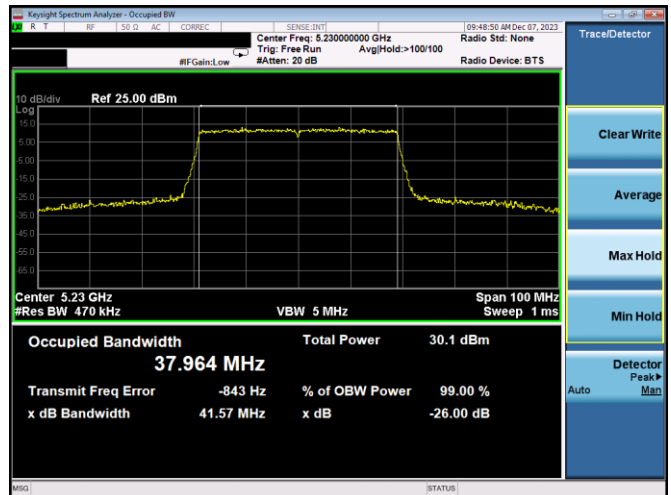
	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]	
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	17.85	21.04	
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.90	21.02	
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.87	21.09	
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	19.10	21.37	
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.38	
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.25	
	5190	38	n (40MHz)	135/150 (MCS7)	36.54	41.25	
	5230	46	n (40MHz)	135/150 (MCS7)	36.60	41.33	
	5190	38	ax (SU) (40MHz)	135/143.4 (MCS11)	37.93	41.14	
	5230	46	ax (SU) (40MHz)	135/143.4 (MCS11)	38.01	44.45	
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.87	81.80	
5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.17	81.79		
Band 1/2	5250	50	ac (160MHz)	780/866.7 (MCS9)	154.88	166.40	
	5250	50	ax (SU) (160MHz)	1134.3/1201 (MCS11)	156.27	165.30	
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.86	21.11	
	5300	60	n (20MHz)	65/72.2 (MCS7)	17.93	21.19	
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.85	21.06	
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.43	
	5300	60	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.27	
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.17	
	5270	54	n (40MHz)	135/150 (MCS7)	36.54	41.14	
	5310	62	n (40MHz)	135/150 (MCS7)	36.49	41.18	
	5270	54	ax (SU) (40MHz)	135/143.4 (MCS11)	37.96	41.72	
	5310	62	ax (SU) (40MHz)	135/143.4 (MCS11)	37.97	41.35	
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.81	81.75	
	5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.13	81.69	
	Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.86	21.08
		5580	116	n (20MHz)	65/72.2 (MCS7)	17.87	21.12
5720		144	n (20MHz)	65/72.2 (MCS7)	17.86	20.97	
5500		100	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.31	
5580		116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.23	
5720		144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.11	21.29	
5510		102	n (40MHz)	135/150 (MCS7)	36.58	41.38	
5550		110	n (40MHz)	135/150 (MCS7)	36.61	41.31	
5710		142	n (40MHz)	135/150 (MCS7)	36.56	41.42	
5510		102	ax (SU) (40MHz)	135/143.4 (MCS11)	37.92	41.50	
5550		110	ax (SU) (40MHz)	135/143.4 (MCS11)	37.92	41.44	
5710		142	ax (SU) (40MHz)	135/143.4 (MCS11)	37.99	41.53	
5530		106	ac (80MHz)	390/433.3 (MCS9)	75.97	81.71	
5690		138	ac (80MHz)	390/433.3 (MCS9)	76.00	82.05	
5530		106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.17	81.78	
5690		138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.30	82.31	
5570		114	ac (160MHz)	780/866.7 (MCS9)	155.01	166.70	
5570		114	ax (SU) (160MHz)	1134.3/1201 (MCS11)	156.22	166.30	

Table 7-4. Conducted Bandwidth Measurements Antenna WF8 (High Data Rate)

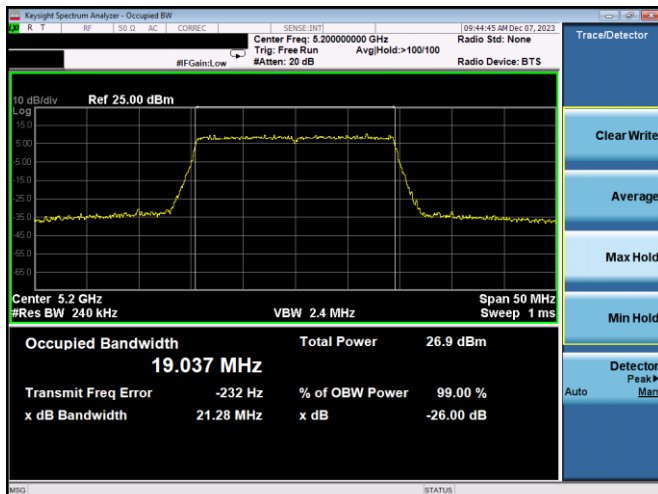
FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 22 of 387



Plot 7-1. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS2)



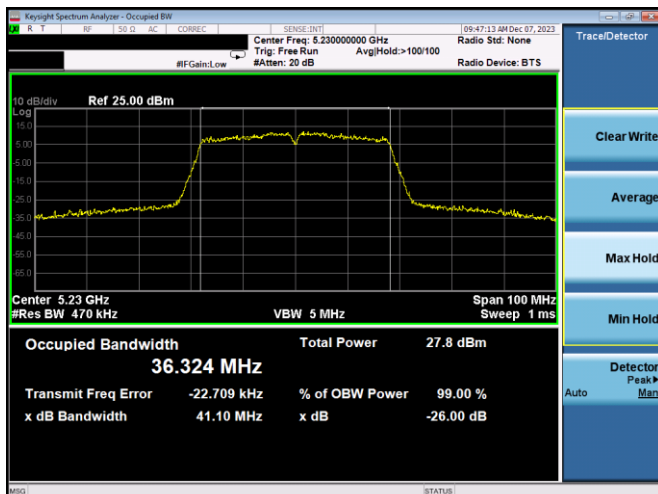
Plot 7-4. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS2)



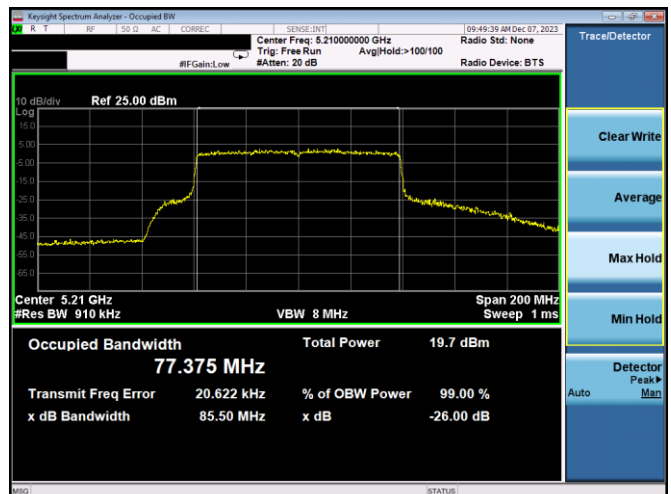
Plot 7-2. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS2)



Plot 7-5. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS2)

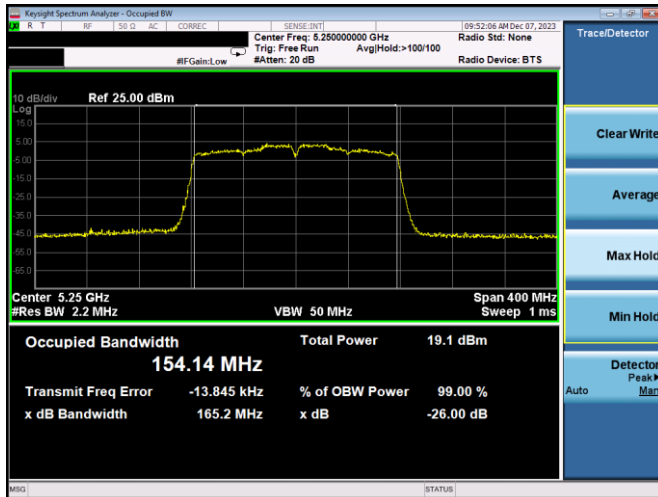


Plot 7-3. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS2)

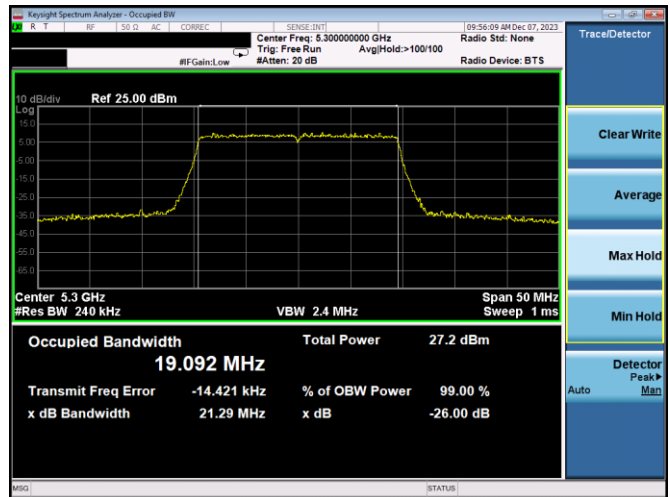


Plot 7-6. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS2)

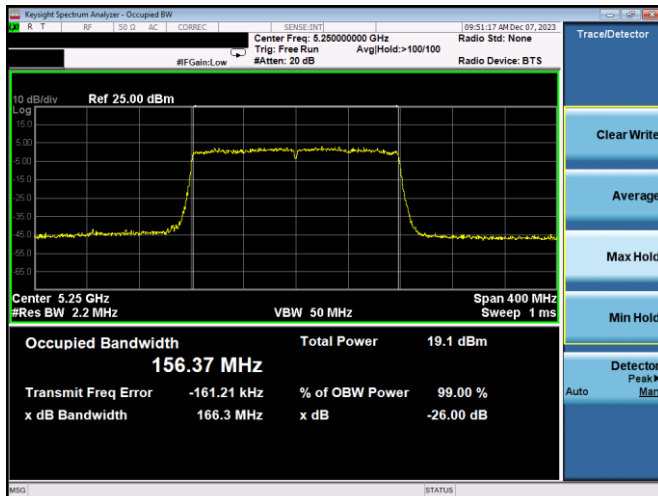
FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 23 of 387



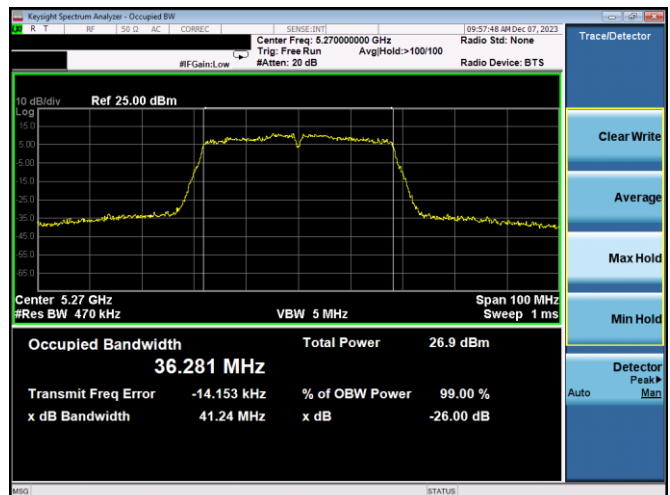
Plot 7-7. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ac – Ch. 50, MCS2)



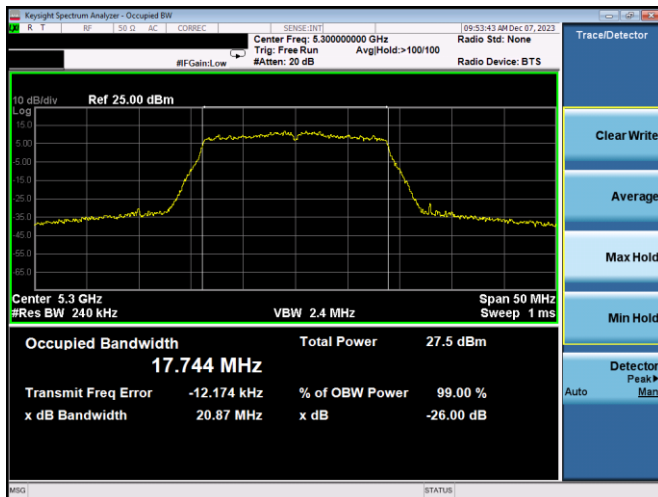
Plot 7-10. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 60, MCS2)



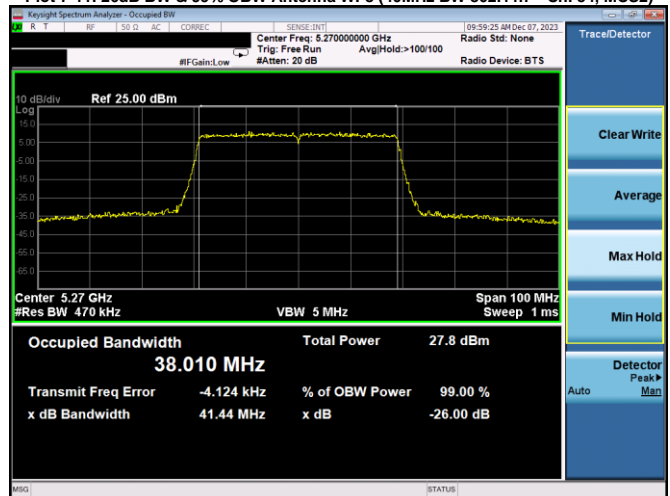
Plot 7-8. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ax(SU) – Ch. 50, MCS2)



Plot 7-11. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11n – Ch. 54, MCS2)

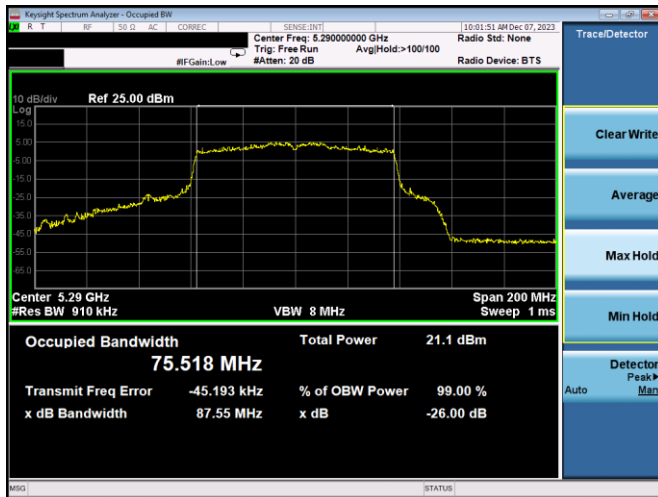


Plot 7-9. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 60, MCS2)

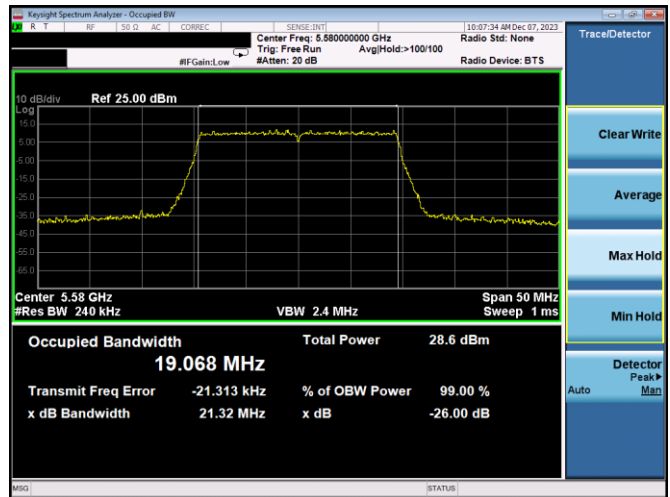


Plot 7-12. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS2)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 24 of 387



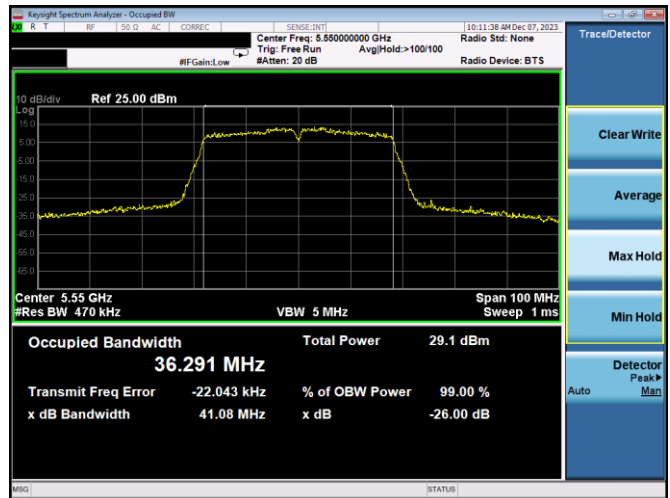
Plot 7-13. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS2)



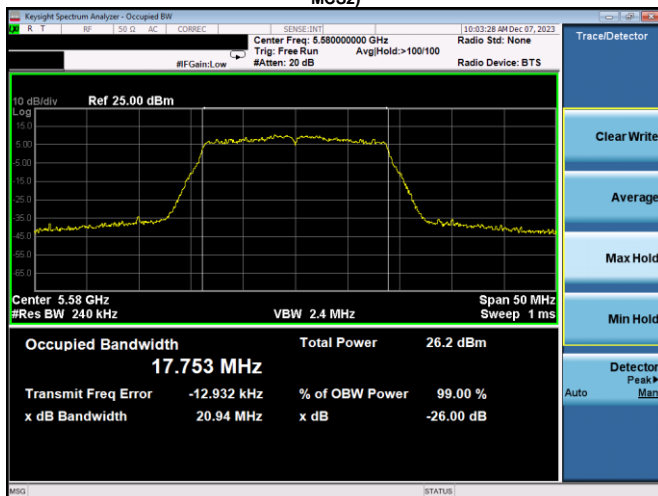
Plot 7-16. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS2)



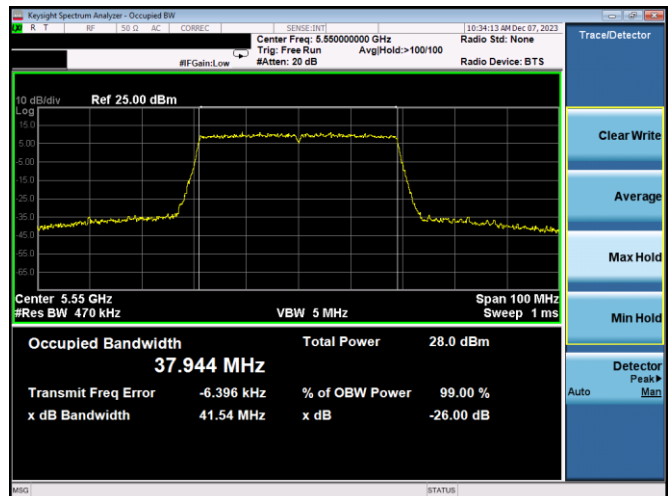
Plot 7-14. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS2)



Plot 7-17. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110, MCS2)



Plot 7-15. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS2)

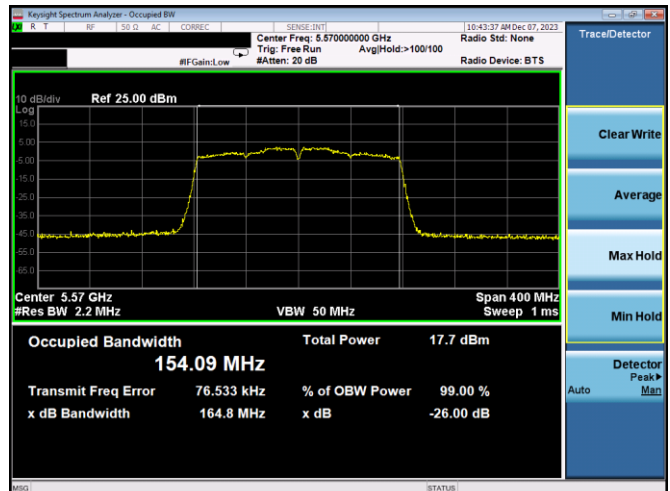


Plot 7-18. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS2)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 25 of 387



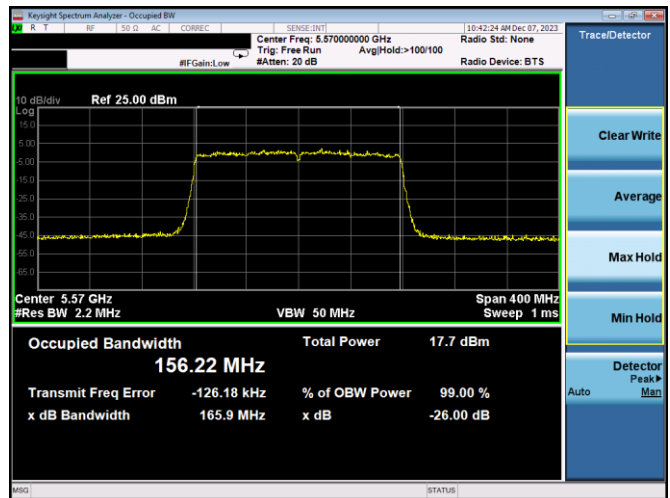
Plot 7-19. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 106, MCS2)



Plot 7-21. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ac – Ch. 114, MCS2)

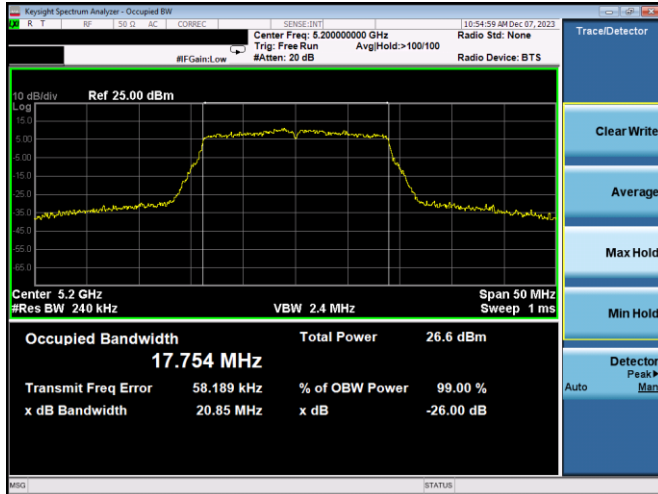


Plot 7-20. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS2)

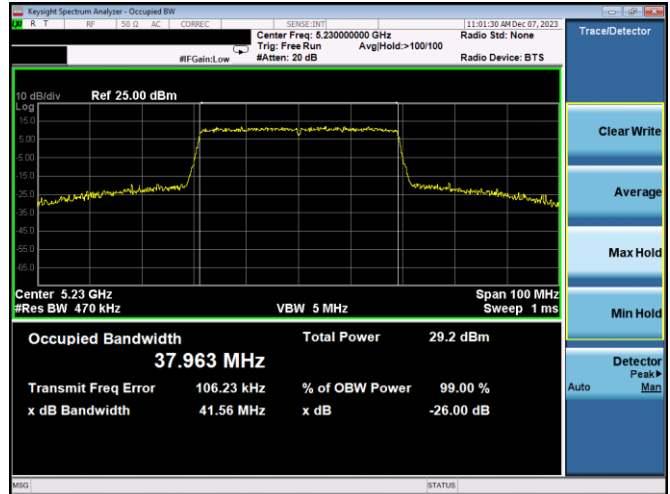


Plot 7-22. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ax(SU) – Ch. 114, MCS2)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 26 of 387



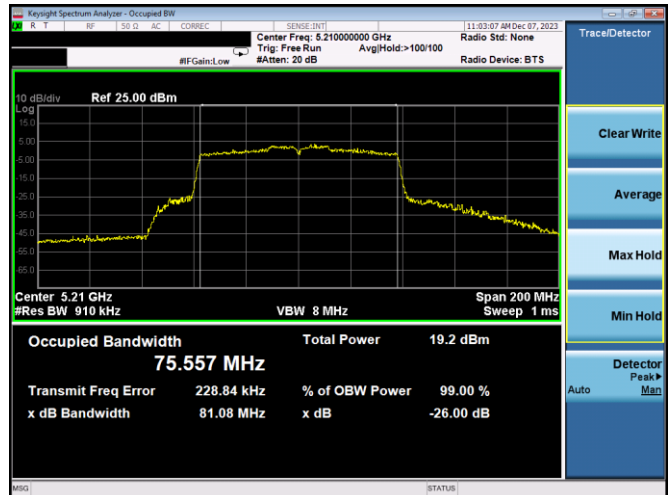
Plot 7-23. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS4)



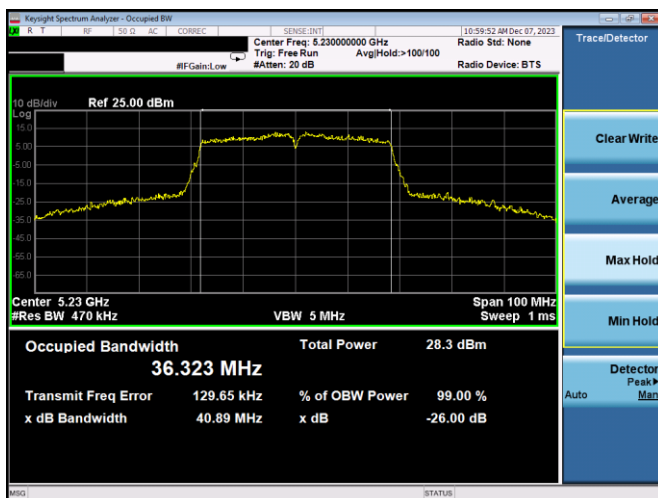
Plot 7-26. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS4)



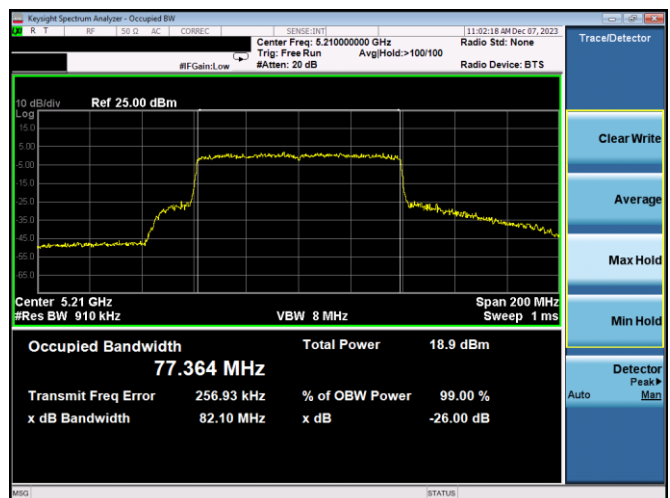
Plot 7-24. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS4)



Plot 7-27. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS4)

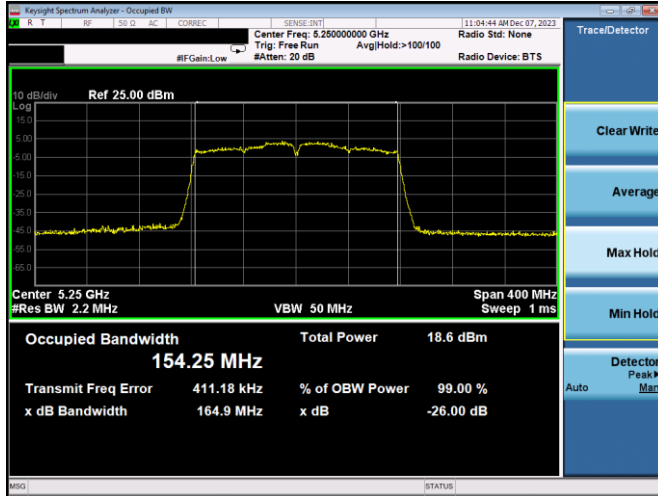


Plot 7-25. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS4)

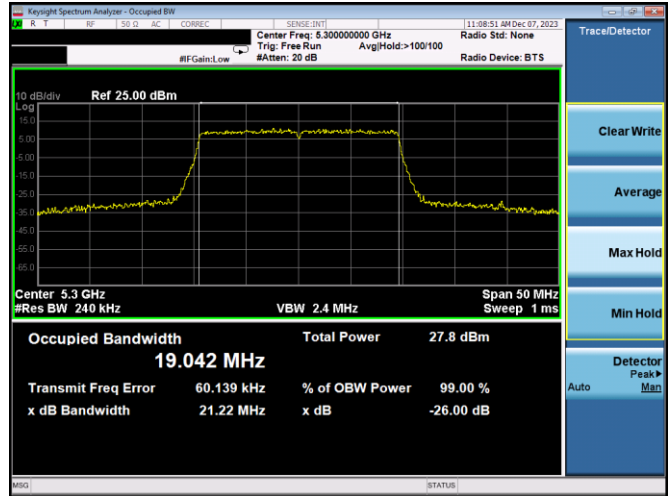


Plot 7-28. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS4)

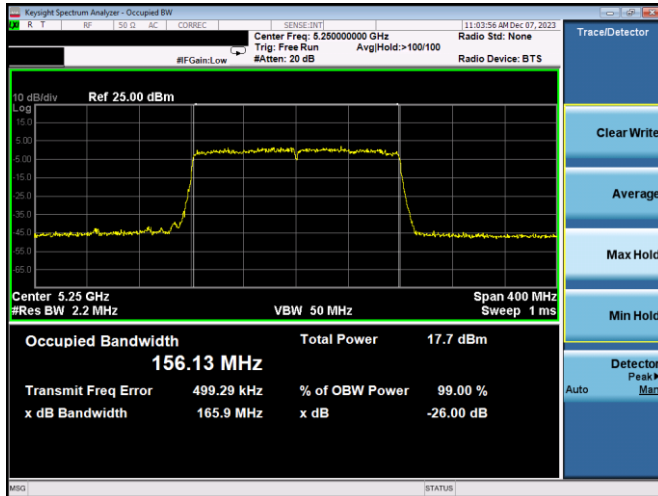
FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 27 of 387



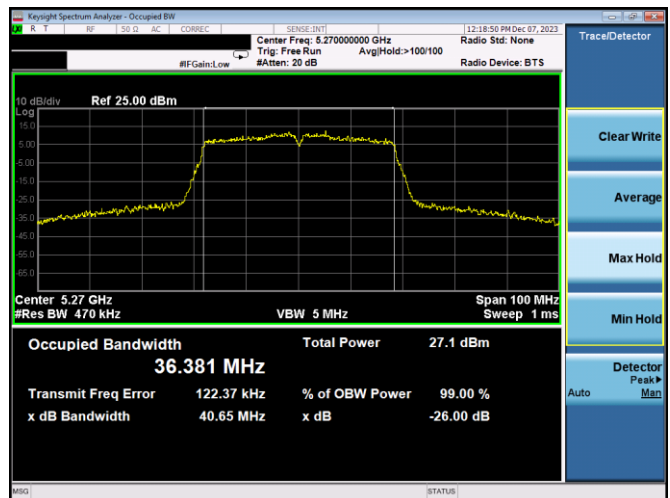
Plot 7-29. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ac – Ch. 50, MCS4)



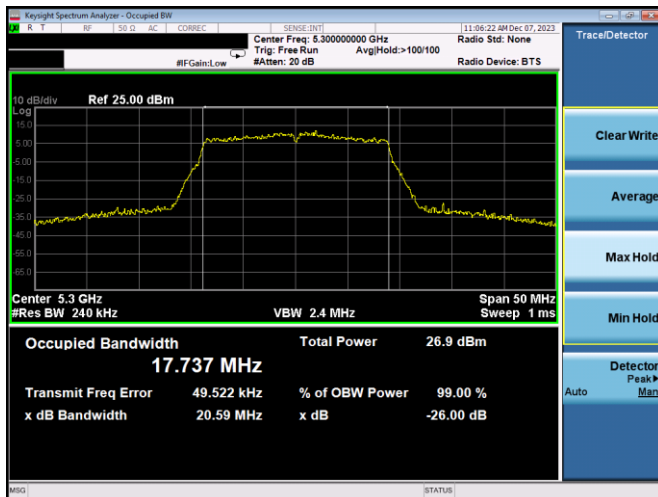
Plot 7-32. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 60, MCS4)



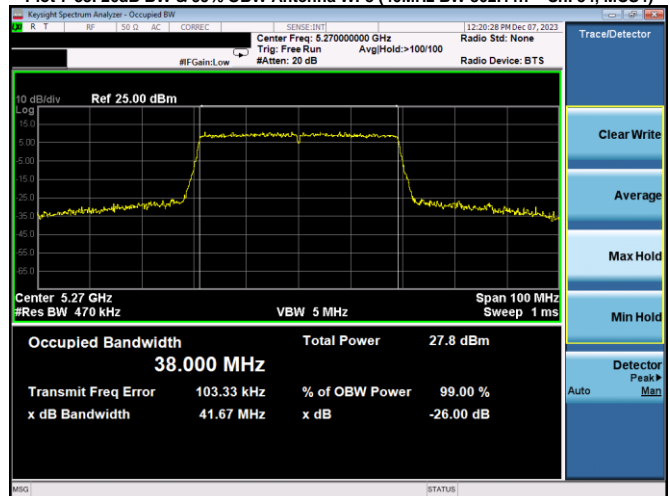
Plot 7-30. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ax(SU) – Ch. 50, MCS4)



Plot 7-33. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11n – Ch. 54, MCS4)



Plot 7-31. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 60, MCS4)

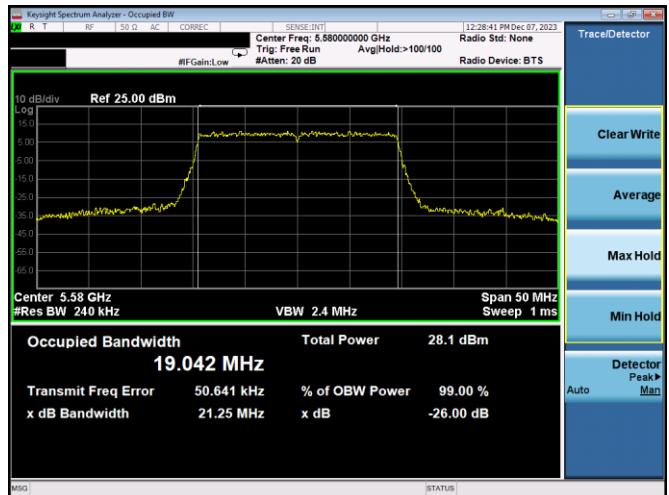


Plot 7-34. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS4)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 28 of 387



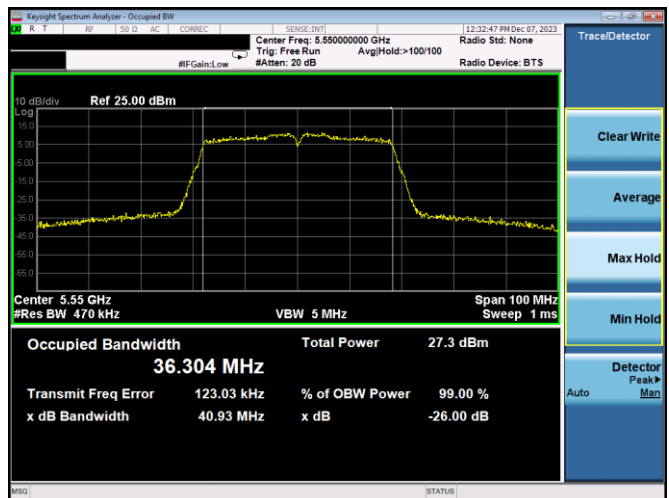
Plot 7-35. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS4)



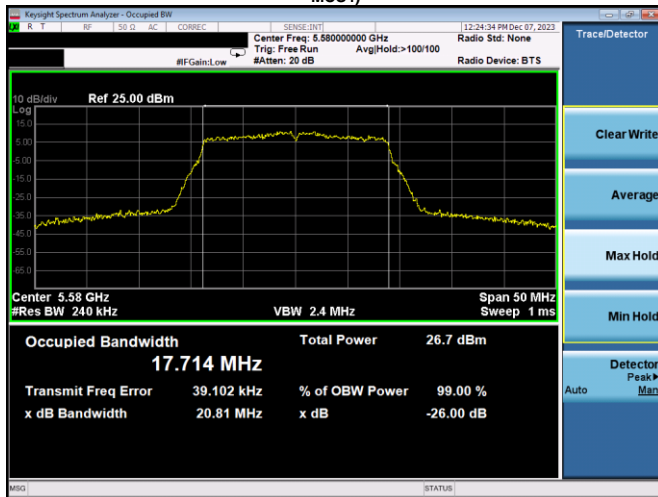
Plot 7-38. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS4)



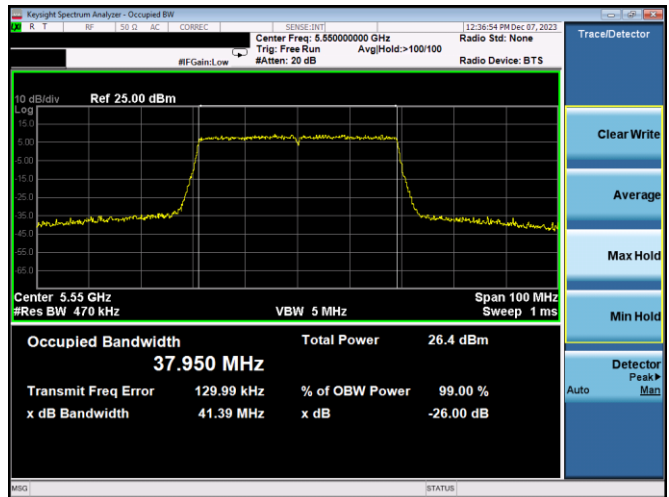
Plot 7-36. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS4)



Plot 7-39. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110, MCS4)



Plot 7-37. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS4)

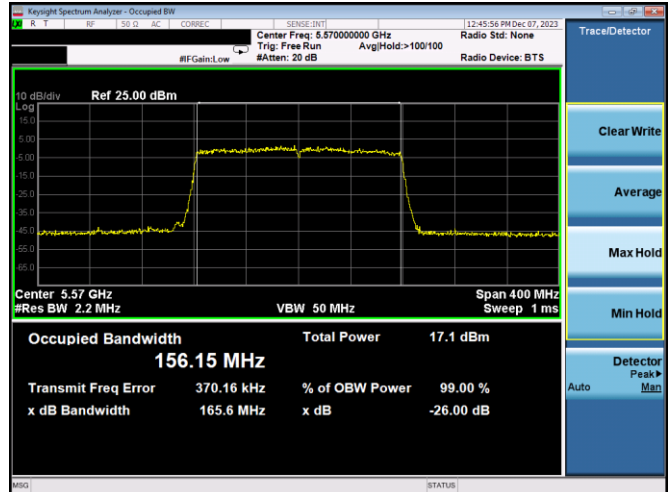


Plot 7-40. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS4)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 29 of 387



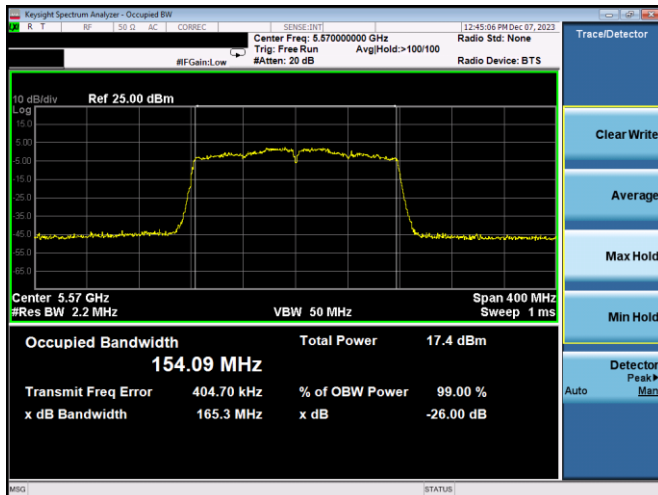
Plot 7-41. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 106, MCS4)



Plot 7-44. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ax(SU) – Ch. 114, MCS4)

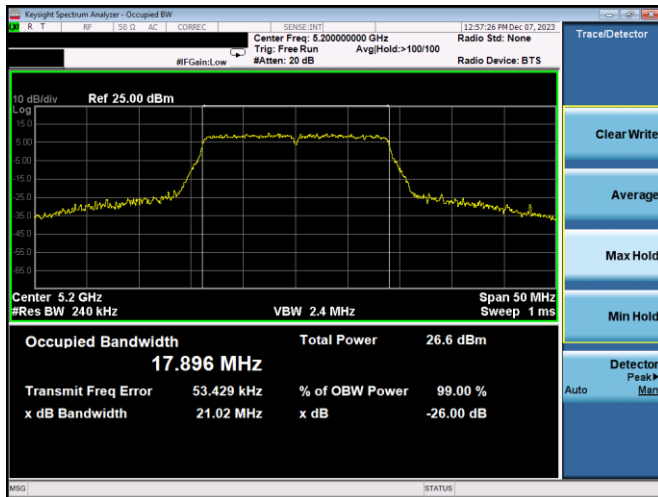


Plot 7-42. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS4)

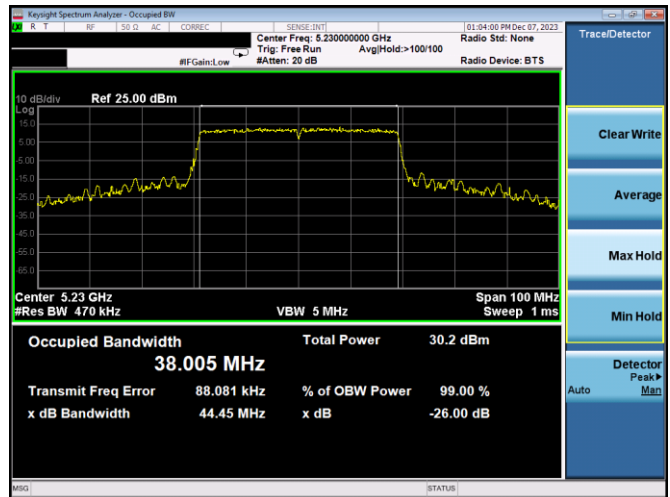


Plot 7-43. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ac – Ch. 114, MCS4)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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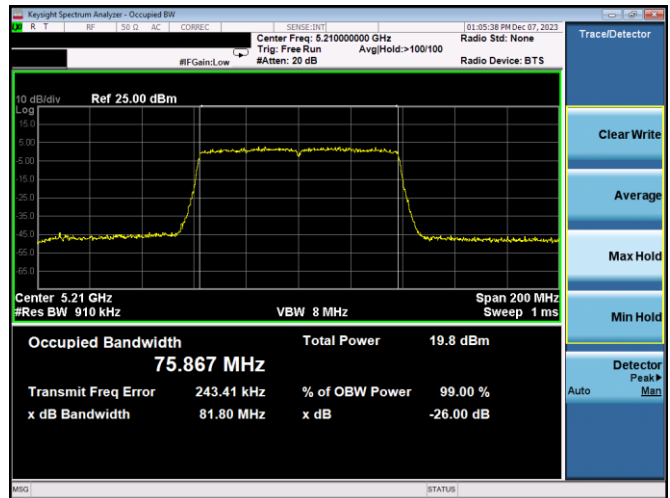
Plot 7-45. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS7)



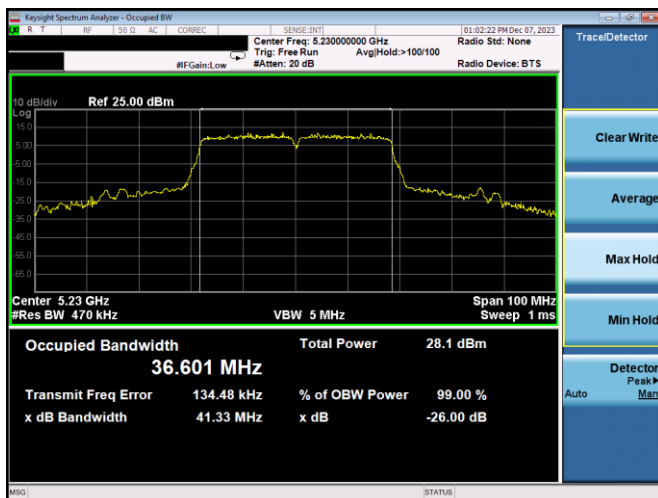
Plot 7-48. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS11)



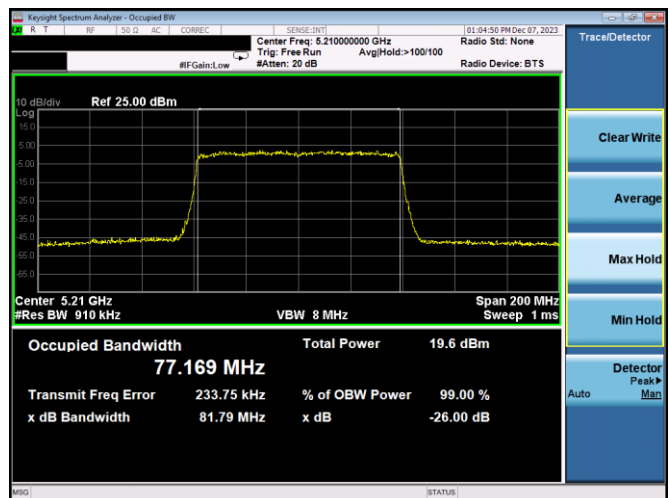
Plot 7-46. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS11)



Plot 7-49. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS9)

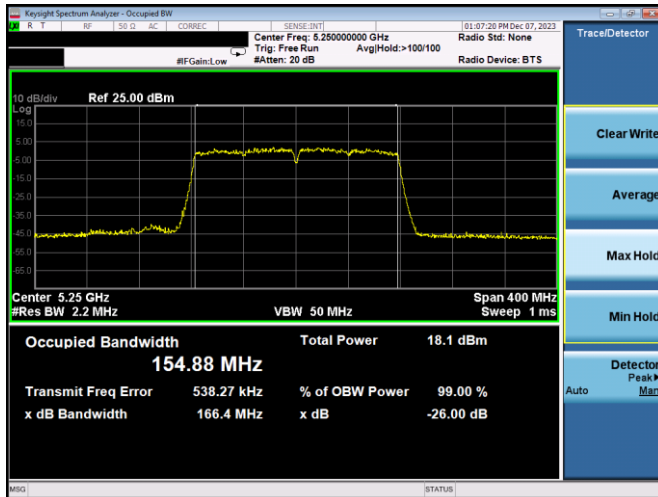


Plot 7-47. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS7)

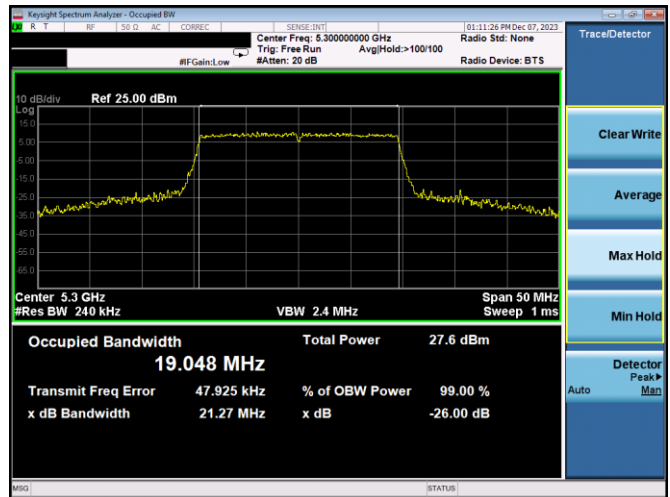


Plot 7-50. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS11)

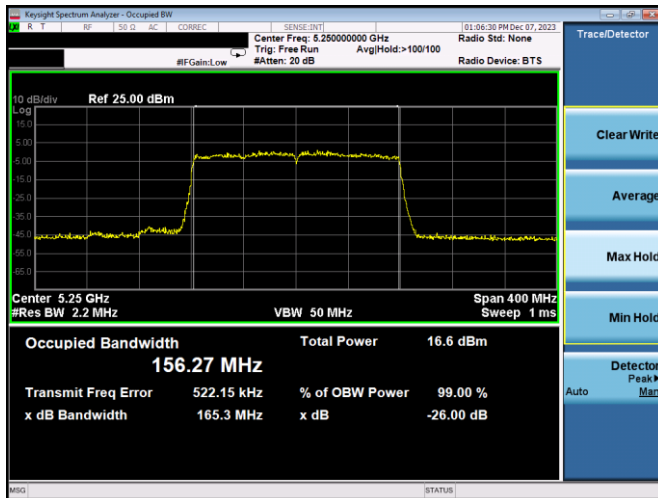
FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 31 of 387



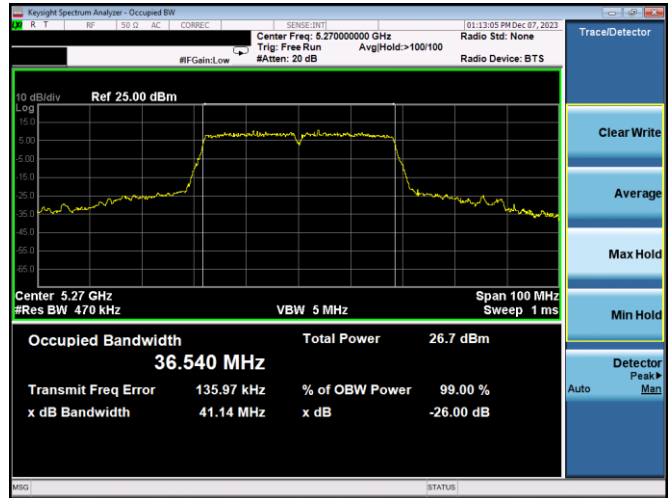
Plot 7-51. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ac – Ch. 50, MCS9)



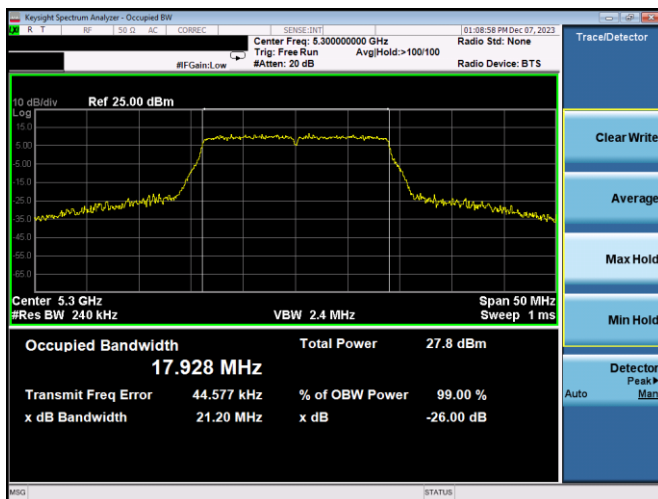
Plot 7-54. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 60, MCS11)



Plot 7-52. 26dB BW & 99% OBW Antenna WF8 (160MHz BW 802.11ax(SU) – Ch. 50, MCS11)



Plot 7-55. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS7)



Plot 7-53. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 60, MCS7)



Plot 7-56. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS11)

FCC ID: BCGA2902 IC: 579C-A2902		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2311270063-11.BCG	Test Dates: 11/29/2023 - 1/15/2024	EUT Type: Tablet Device	Page 32 of 387