

**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  
 United States

**Date of Testing:**

8/2/2022 – 9/7/2022

**Test Site/Location:**

Element Washington DC LLC, Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2205090022-07.BCG

<b>FCC ID:</b>	<b>BCGA2696</b>
<b>IC:</b>	<b>579C-A2696</b>
<b>APPLICANT:</b>	<b>Apple Inc.</b>

**Application Type:**

Certification

**Model/HVIN:**

A2696

**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 2

**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

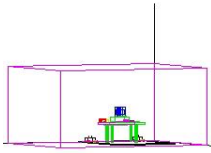


<b>FCC ID:</b> BCGA2696 <b>IC:</b> 579C-A2696	 <b>MEASUREMENT REPORT</b> (CERTIFICATION)	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device
		Page 1 of 358

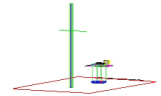
## TABLE OF CONTENTS

1.0	INTRODUCTION .....	6
1.1	Scope.....	6
1.2	Element Washington DC LLC Test Location.....	6
1.3	Test Facility / Accreditations.....	6
2.0	PRODUCT INFORMATION .....	7
2.1	Equipment Description .....	7
2.2	Device Capabilities.....	7
2.3	Antenna Description.....	10
2.4	Test Support Equipment.....	10
2.5	Test Configuration.....	11
2.6	Software and Firmware .....	12
2.7	EMI Suppression Device(s)/Modifications.....	12
3.0	DESCRIPTION OF TESTS .....	13
3.1	Evaluation Procedure.....	13
3.2	AC Line Conducted Emissions .....	13
3.3	Radiated Emissions.....	14
3.4	Environmental Conditions.....	14
4.0	ANTENNA REQUIREMENTS .....	15
5.0	MEASUREMENT UNCERTAINTY .....	16
6.0	TEST EQUIPMENT CALIBRATION DATA.....	17
7.0	TEST RESULTS .....	18
7.1	Summary.....	18
7.2	26dB & 99% Bandwidth Measurement – 802.11a/n/ac/ax(SU) .....	19
7.3	6dB & 99% Bandwidth Measurement – 802.11a/n/ac/ax(SU) .....	44
7.4	Conducted Output Power and Max EIRP Measurement – 802.11a/n/ac/ax(SU) .....	53
7.5	Maximum Power Spectral Density – 802.11a/n/ac/ax(SU).....	84
7.6	Radiated Spurious Emissions – Above 1GHz.....	165
7.7	Radiated Spurious Emissions – Below 1GHz .....	346
7.8	AC Line-Conducted Emissions Measurement.....	352
8.0	CONCLUSION.....	358

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		Page 2 of 358



# MEASUREMENT REPORT



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	97.051	19.87	100.000	20.00	49.774	16.97	49.545	16.95	98.855	19.95
2A		802.11a/n	5260 - 5320	99.770	19.99	99.541	19.98	50.119	17.00	49.431	16.94	98.401	19.93
2C		802.11a/n	5500 - 5720	99.312	19.97	99.770	19.99	49.888	16.98	50.003	16.99	99.541	19.98
3	40	802.11a/n	5745 - 5825	125.893	21.00	125.314	20.98	123.880	20.93	124.165	20.94	245.471	23.90
1		802.11n	5190 - 5230	120.504	20.81	120.226	20.80	86.696	19.38	88.105	19.45	174.985	22.43
2A		802.11n	5270 - 5310	107.647	20.32	107.399	20.31	88.512	19.47	83.176	19.20	171.791	22.35
2C	80	802.11n	5510 - 5710	121.899	20.86	125.893	21.00	85.507	19.32	88.920	19.49	172.982	22.38
3		802.11n	5755 - 5795	123.880	20.93	123.595	20.92	123.595	20.92	124.451	20.95	248.313	23.95
1		802.11ac	5210	24.946	13.97	25.061	13.99	13.521	11.31	13.583	11.33	27.102	14.33
2A	20	802.11ac	5290	15.596	11.93	15.668	11.95	13.772	11.39	14.093	11.49	27.861	14.45
2C		802.11ac	5530 - 5690	119.399	20.77	125.026	20.97	96.828	19.86	96.605	19.85	193.642	22.87
3		802.11ac	5775	60.814	17.84	62.951	17.99	55.590	17.45	55.847	17.47	111.429	20.47
1	40	802.11ax (SU)	5180 - 5240	97.275	19.88	99.312	19.97	49.774	16.97	48.865	16.89	98.175	19.92
2A		802.11ax (SU)	5260 - 5320	95.940	19.82	99.312	19.97	49.545	16.95	49.431	16.94	99.083	19.96
2C		802.11ax (SU)	5500 - 5720	97.499	19.89	100.000	20.00	49.888	16.98	50.003	16.99	99.541	19.98
3	80	802.11ax (SU)	5745 - 5825	121.619	20.85	122.462	20.88	123.310	20.91	124.738	20.96	248.313	23.95
1		802.11ax (SU)	5190 - 5230	122.462	20.88	121.339	20.84	77.090	18.87	77.625	18.90	154.882	21.90
2A		802.11ax (SU)	5270 - 5310	112.202	20.50	107.647	20.32	87.297	19.41	86.298	19.36	173.780	22.40
2C	20	802.11ax (SU)	5510 - 5710	124.165	20.94	122.180	20.87	85.901	19.34	88.308	19.46	172.982	22.38
3		802.11ax (SU)	5755 - 5795	125.893	21.00	123.880	20.93	120.781	20.82	125.026	20.97	246.037	23.91
1		802.11ax (SU)	5210	16.331	12.13	16.144	12.08	11.194	10.49	10.889	10.37	22.080	13.44
2A	40	802.11ax (SU)	5290	12.023	10.80	12.162	10.85	10.233	10.10	10.495	10.21	20.749	13.17
2C		802.11ax (SU)	5530 - 5690	120.781	20.82	122.462	20.88	99.083	19.96	98.628	19.94	197.697	22.96
3		802.11ax (SU)	5775	62.087	17.93	62.373	17.95	43.451	16.38	41.687	16.20	85.114	19.30

## 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	35.318	15.48	35.156	15.46	17.989	12.55	18.793	12.74	36.728	15.65
2A		802.11a/n	5260 - 5320	99.770	19.99	99.541	19.98	50.119	17.00	49.431	16.94	98.401	19.93
2C		802.11a/n	5500 - 5720	99.312	19.97	99.770	19.99	49.888	16.98	50.003	16.99	99.541	19.98
3	40	802.11a/n	5745 - 5825	125.893	21.00	125.314	20.98	123.880	20.93	124.165	20.94	245.471	23.90
1		802.11n	5190 - 5230	59.704	17.76	59.841	17.77	31.623	15.00	32.434	15.11	64.121	18.07
2A		802.11n	5270 - 5310	107.647	20.32	107.399	20.31	88.512	19.47	83.176	19.20	171.791	22.35
2C	80	802.11n	5510 - 5710	121.899	20.86	125.893	21.00	85.507	19.32	88.920	19.49	172.982	22.38
3		802.11n	5755 - 5795	123.880	20.93	123.595	20.92	123.595	20.92	124.451	20.95	248.313	23.95
1		802.11ac	5210	24.946	13.97	25.061	13.99	13.521	11.31	13.583	11.33	27.102	14.33
2A	20	802.11ac	5290	15.596	11.93	15.668	11.95	13.772	11.39	14.093	11.49	27.861	14.45
2C		802.11ac	5530 - 5690	119.399	20.77	125.026	20.97	96.828	19.86	96.605	19.85	193.642	22.87
3		802.11ac	5775	60.814	17.84	62.951	17.99	55.590	17.45	55.847	17.47	111.429	20.47
1	40	802.11ax (SU)	5180 - 5240	35.481	15.50	35.156	15.46	0.000	0.00	0.000	0.00	0.000	0.00
2A		802.11ax (SU)	5260 - 5320	95.940	19.82	99.312	19.97	49.545	16.95	49.431	16.94	99.083	19.96
2C		802.11ax (SU)	5500 - 5720	97.499	19.89	100.000	20.00	49.888	16.98	50.003	16.99	99.541	19.98
3	80	802.11ax (SU)	5745 - 5825	121.619	20.85	122.462	20.88	123.310	20.91	124.738	20.96	248.313	23.95
1		802.11ax (SU)	5190 - 5230	61.376	17.88	61.094	17.86	10.839	10.35	10.940	10.39	21.777	13.38
2A		802.11ax (SU)	5270 - 5310	112.202	20.50	107.647	20.32	87.297	19.41	86.298	19.36	173.780	22.40
2C	20	802.11ax (SU)	5510 - 5710	124.165	20.94	122.180	20.87	85.901	19.34	88.308	19.46	172.982	22.38
3		802.11ax (SU)	5755 - 5795	125.893	21.00	123.880	20.93	120.781	20.82	125.026	20.97	246.037	23.91
1		802.11ax (SU)	5210	16.331	12.13	16.144	12.08	11.194	10.49	10.889	10.37	22.080	13.44
2A	40	802.11ax (SU)	5290	12.023	10.80	12.162	10.85	10.233	10.10	10.495	10.21	20.749	13.17
2C		802.11ax (SU)	5530 - 5690	120.781	20.82	122.462	20.88	99.083	19.96	98.628	19.94	197.697	22.96
3		802.11ax (SU)	5775	62.087	17.93	62.373	17.95	43.451	16.38	41.687	16.20	85.114	19.30

## ISED EUT Overview (Low Data Rate)


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Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 3 of 358

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	100.000	20.00	100.000	20.00	50.003	16.99	48.978	16.90	98.628	19.94
2A		802.11a/n	5260 - 5320	100.000	20.00	100.000	20.00	49.888	16.98	50.003	16.99	99.770	19.99
2C		802.11a/n	5500 - 5720	100.000	20.00	100.000	20.00	49.888	16.98	50.003	16.99	100.000	20.00
3	40	802.11a/n	5745 - 5825	125.893	21.00	125.893	21.00	123.027	20.90	125.603	20.99	247.172	23.93
1		802.11n	5190 - 5230	112.202	20.50	112.202	20.50	76.913	18.86	75.336	18.77	152.405	21.83
2A		802.11n	5270 - 5310	110.408	20.43	112.202	20.50	76.560	18.84	76.560	18.84	153.109	21.85
2C		802.11n	5510 - 5710	125.314	20.98	125.893	21.00	86.896	19.39	86.099	19.35	172.584	22.37
3		802.11n	5755 - 5795	121.339	20.84	122.180	20.87	125.314	20.98	121.619	20.85	247.172	23.93
1		802.11ac	5210	19.907	12.99	19.953	13.00	10.069	10.03	10.568	10.24	20.654	13.15
2A	802.11ac	5290	14.125	11.50	13.397	11.27	11.967	10.78	12.050	10.81	24.044	13.81	
2C	802.11ac	5530 - 5690	123.880	20.93	125.893	21.00	98.175	19.92	98.401	19.93	196.789	22.94	
3	802.11ac	5775	53.088	17.25	52.602	17.21	47.315	16.75	46.238	16.65	93.541	19.71	
1	20	802.11ax (SU)	5180 - 5240	100.000	20.00	99.541	19.98	49.888	16.98	49.888	16.98	99.770	19.99
2A		802.11ax (SU)	5260 - 5320	97.499	19.89	100.000	20.00	49.888	16.98	48.978	16.90	98.855	19.95
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	100.000	20.00	50.003	16.99	49.091	16.91	98.855	19.95
3		802.11ax (SU)	5745 - 5825	125.893	21.00	125.893	21.00	125.603	20.99	124.738	20.96	250.611	23.99
1	40	802.11ax (SU)	5190 - 5230	108.143	20.34	110.917	20.45	75.858	18.80	75.162	18.76	151.008	21.79
2A		802.11ax (SU)	5270 - 5310	100.000	20.00	95.719	19.81	78.705	18.96	78.163	18.93	157.036	21.96
2C		802.11ax (SU)	5510 - 5710	125.314	20.98	123.595	20.92	86.298	19.36	87.096	19.40	173.380	22.39
3		802.11ax (SU)	5755 - 5795	122.180	20.87	124.451	20.95	123.595	20.92	123.880	20.93	247.742	23.94
1	80	802.11ax (SU)	5210	14.125	11.50	13.709	11.37	9.772	9.90	9.616	9.83	19.409	12.88
2A		802.11ax (SU)	5290	11.220	10.50	11.220	10.50	9.354	9.71	9.333	9.70	18.707	12.72
2C		802.11ax (SU)	5530 - 5690	123.310	20.91	124.451	20.95	98.855	19.95	93.541	19.71	192.309	22.84
3		802.11ax (SU)	5775	49.888	16.98	48.529	16.86	43.152	16.35	43.152	16.35	86.298	19.36

### 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	35.318	15.48	34.834	15.42	18.780	12.74	18.681	12.71	37.325	15.72
2A		802.11a/n	5260 - 5320	100.000	20.00	100.000	20.00	49.888	16.98	50.003	16.99	99.770	19.99
2C		802.11a/n	5500 - 5720	100.000	20.00	100.000	20.00	49.888	16.98	50.003	16.99	100.000	20.00
3	802.11a/n	5745 - 5825	125.893	21.00	125.893	21.00	123.027	20.90	125.603	20.99	247.172	23.93	
1	40	802.11n	5190 - 5230	59.979	17.78	61.376	17.88	33.113	15.20	32.961	15.18	66.069	18.20
2A		802.11n	5270 - 5310	110.408	20.43	112.202	20.50	76.560	18.84	76.560	18.84	153.109	21.85
2C		802.11n	5510 - 5710	125.314	20.98	125.893	21.00	86.896	19.39	86.099	19.35	172.584	22.37
3		802.11n	5755 - 5795	121.339	20.84	122.180	20.87	125.314	20.98	121.619	20.85	247.172	23.93
1	80	802.11ac	5210	19.907	12.99	19.953	13.00	10.069	10.03	10.568	10.24	20.654	13.15
2A		802.11ac	5290	14.125	11.50	13.397	11.27	11.967	10.78	12.050	10.81	24.044	13.81
2C		802.11ac	5530 - 5690	123.880	20.93	125.893	21.00	98.175	19.92	98.401	19.93	196.789	22.94
3		802.11ac	5775	53.088	17.25	52.602	17.21	47.315	16.75	46.238	16.65	93.541	19.71
1	20	802.11ax (SU)	5180 - 5240	35.318	15.48	34.995	15.44	18.429	12.66	18.776	12.74	37.154	15.70
2A		802.11ax (SU)	5260 - 5320	97.499	19.89	100.000	20.00	49.888	16.98	48.978	16.90	98.855	19.95
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	100.000	20.00	50.003	16.99	49.091	16.91	98.855	19.95
3		802.11ax (SU)	5745 - 5825	125.893	21.00	125.893	21.00	125.603	20.99	124.738	20.96	250.611	23.99
1	40	802.11ax (SU)	5190 - 5230	60.534	17.82	62.951	17.99	32.434	15.11	33.266	15.22	65.766	18.18
2A		802.11ax (SU)	5270 - 5310	100.000	20.00	95.719	19.81	78.705	18.96	78.163	18.93	157.036	21.96
2C		802.11ax (SU)	5510 - 5710	125.314	20.98	123.595	20.92	86.298	19.36	87.096	19.40	173.380	22.39
3		802.11ax (SU)	5755 - 5795	122.180	20.87	124.451	20.95	123.595	20.92	123.880	20.93	247.742	23.94
1	80	802.11ax (SU)	5210	14.125	11.50	13.709	11.37	9.772	9.90	9.616	9.83	19.409	12.88
2A		802.11ax (SU)	5290	11.220	10.50	11.220	10.50	9.354	9.71	9.333	9.70	18.707	12.72
2C		802.11ax (SU)	5530 - 5690	123.310	20.91	124.451	20.95	98.855	19.95	93.541	19.71	192.309	22.84
3		802.11ax (SU)	5775	49.888	16.98	48.529	16.86	43.152	16.35	43.152	16.35	86.298	19.36

### ISED EUT Overview (Mid Data Rate)

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 4 of 358

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	100.000	20.00	99.541	19.98	50.003	16.99	49.317	16.93	98.855	19.95
2A		802.11a/n	5260 - 5320	100.000	20.00	99.770	19.99	49.545	16.95	48.865	16.89	97.949	19.91
2C		802.11a/n	5500 - 5720	100.000	20.00	99.770	19.99	50.119	17.00	50.003	16.99	100.000	20.00
3	40	802.11a/n	5745 - 5825	125.893	21.00	125.314	20.98	124.738	20.96	125.314	20.98	248.886	23.96
1		802.11n	5190 - 5230	98.628	19.94	95.280	19.79	72.277	18.59	74.131	18.70	146.555	21.66
2A		802.11n	5270 - 5310	99.541	19.98	100.000	20.00	74.131	18.70	72.946	18.63	147.231	21.68
2C		802.11n	5510 - 5710	123.880	20.93	125.603	20.99	88.920	19.49	88.512	19.47	175.388	22.44
3		802.11n	5755 - 5795	123.880	20.93	120.781	20.82	118.304	20.73	119.124	20.76	237.684	23.76
1	80	802.11ac	5210	15.136	11.80	15.382	11.87	8.128	9.10	8.375	9.23	16.520	12.18
2A		802.11ac	5290	12.417	10.94	12.078	10.82	9.817	9.92	9.550	9.80	19.364	12.87
2C		802.11ac	5530 - 5690	120.226	20.80	125.026	20.97	97.724	19.90	97.949	19.91	195.884	22.92
3	20	802.11ac	5775	47.206	16.74	46.774	16.70	41.783	16.21	41.879	16.22	83.753	19.23
1		802.11ax (SU)	5180 - 5240	98.855	19.95	99.770	19.99	49.888	16.98	49.431	16.94	99.312	19.97
2A		802.11ax (SU)	5260 - 5320	100.000	20.00	98.175	19.92	50.119	17.00	49.545	16.95	98.855	19.95
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	99.312	19.97	49.774	16.97	50.003	16.99	99.312	19.97
3		802.11ax (SU)	5745 - 5825	123.880	20.93	124.451	20.95	124.451	20.95	120.226	20.80	244.906	23.89
1	40	802.11ax (SU)	5190 - 5230	97.275	19.88	98.175	19.92	74.817	18.74	72.778	18.62	147.571	21.69
2A		802.11ax (SU)	5270 - 5310	89.125	19.50	86.896	19.39	70.958	18.51	69.984	18.45	140.929	21.49
2C		802.11ax (SU)	5510 - 5710	123.310	20.91	122.744	20.89	87.096	19.40	88.105	19.45	173.380	22.39
3		802.11ax (SU)	5755 - 5795	122.462	20.88	120.226	20.80	125.314	20.98	119.674	20.78	244.906	23.89
1		80	802.11ax (SU)	5210	12.417	10.94	12.589	11.00	7.568	8.79	7.816	8.93	15.382
2A	802.11ax (SU)		5290	10.839	10.35	11.169	10.48	8.851	9.47	8.551	9.32	17.418	12.41
2C	802.11ax (SU)		5530 - 5690	117.490	20.70	123.027	20.90	98.175	19.92	97.051	19.87	195.434	22.91
3	802.11ax (SU)		5775	43.551	16.39	44.668	16.50	39.355	15.95	39.084	15.92	78.524	18.95

### 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	35.343	15.48	34.922	15.43	18.832	12.75	18.668	12.71	37.411	15.73
2A		802.11a/n	5260 - 5320	100.000	20.00	99.770	19.99	49.545	16.95	48.865	16.89	97.949	19.91
2C		802.11a/n	5500 - 5720	100.000	20.00	99.770	19.99	50.119	17.00	50.003	16.99	100.000	20.00
3	40	802.11a/n	5745 - 5825	125.893	21.00	125.314	20.98	124.738	20.96	125.314	20.98	248.886	23.96
1		802.11n	5190 - 5230	61.094	17.86	61.376	17.88	33.266	15.22	33.343	15.23	66.681	18.24
2A		802.11n	5270 - 5310	99.541	19.98	100.000	20.00	74.131	18.70	72.946	18.63	147.231	21.68
2C		802.11n	5510 - 5710	123.880	20.93	125.603	20.99	88.920	19.49	88.512	19.47	175.388	22.44
3		802.11n	5755 - 5795	123.880	20.93	120.781	20.82	118.304	20.73	119.124	20.76	237.684	23.76
1	80	802.11ac	5210	15.136	11.80	15.382	11.87	8.128	9.10	8.375	9.23	16.520	12.18
2A		802.11ac	5290	12.417	10.94	12.078	10.82	9.817	9.92	9.550	9.80	19.364	12.87
2C		802.11ac	5530 - 5690	120.226	20.80	125.026	20.97	97.724	19.90	97.949	19.91	195.884	22.92
3	20	802.11ac	5775	47.206	16.74	46.774	16.70	41.783	16.21	41.879	16.22	83.753	19.23
1		802.11ax (SU)	5180 - 5240	34.794	15.42	35.270	15.47	18.715	12.72	18.294	12.62	36.898	15.67
2A		802.11ax (SU)	5260 - 5320	100.000	20.00	98.175	19.92	50.119	17.00	49.545	16.95	98.855	19.95
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	99.312	19.97	49.774	16.97	50.003	16.99	99.312	19.97
3		802.11ax (SU)	5745 - 5825	123.880	20.93	124.451	20.95	124.451	20.95	120.226	20.80	244.906	23.89
1	40	802.11ax (SU)	5190 - 5230	60.534	17.82	59.841	17.77	33.497	15.25	33.189	15.21	66.681	18.24
2A		802.11ax (SU)	5270 - 5310	89.125	19.50	86.896	19.39	70.958	18.51	69.984	18.45	140.929	21.49
2C		802.11ax (SU)	5510 - 5710	123.310	20.91	122.744	20.89	87.096	19.40	88.105	19.45	173.380	22.39
3		802.11ax (SU)	5755 - 5795	122.462	20.88	120.226	20.80	125.314	20.98	119.674	20.78	244.906	23.89
1		80	802.11ax (SU)	5210	12.417	10.94	12.589	11.00	7.568	8.79	7.816	8.93	15.382
2A	802.11ax (SU)		5290	10.839	10.35	11.169	10.48	8.851	9.47	8.551	9.32	17.418	12.41
2C	802.11ax (SU)		5530 - 5690	117.490	20.70	123.027	20.90	98.175	19.92	97.051	19.87	195.434	22.91
3	802.11ax (SU)		5775	43.551	16.39	44.668	16.50	39.355	15.95	39.084	15.92	78.524	18.95

### ISED EUT Overview (High Data Rate)

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device	Page 5 of 358

# 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 Washington DC LLC Test Location

These measurement tests were conducted at the Element Washington DC LLC 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 Washington DC LLC located in Morgan Hill, CA 95037, U.S.A.**

- Element Washington DC LLC 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 Washington DC LLC facility is a registered (22831) test laboratory with the site description on file with ISED.

<b>FCC ID:</b> BCGA2696 <b>IC:</b> 579C-A2696	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device
		Page 6 of 358

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2696** and **IC: 579C-A2696**. 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.:** C47219101BP1N7X2Y, C47219101DR1N7X2Q, K1W06YHLFQ, HT9FFX19FN

### 2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE1M, LE2M, 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

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 7 of 358

**Notes:**

- 5GHz NII operation is possible in 20MHz, and 40MHz, and 80MHz 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)	98.8	98.8	98.6
	a (Mid Rate)	95.0	94.9	96.0
	a (High Rate)	90.1	91.1	90.5
	n (HT20) (Low Rate)	94.2	95.8	94.2
	n (HT20) (Mid Rate)	89.3	93.0	89.2
	n (HT20) (High Rate)	90.4	90.6	84.4
	ax(SU) (HT20 Low Rate)	98.7	98.1	98.2
	ax(SU) (HT20 Mid Rate)	94.4	92.5	93.5
	ax(SU) (HT20 High Rate)	91.7	86.5	85.6
	n (HT40 Low Rate)	95.4	95.4	95.8
	n (HT40 Mid Rate)	89.7	89.9	84.9
	n (HT40 High Rate)	84.5	86.3	81.1
	ax(SU) (HT40 Low Rate)	97.0	97.2	96.8
	ax(SU) (HT40 Mid Rate)	89.8	89.0	89.3
	ax(SU) (HT40 High Rate)	83.2	83.2	83.2
	ac (HT80 Low Rate)	95.5	95.2	92.5
	ac (HT80 Mid Rate)	83.5	83.0	76.1
	ac (HT80 High Rate)	78.1	78.6	75.0
ax(SU) (HT80 Low Rate)	94.8	94.0	94.4	
ax(SU) (HT80 Mid Rate)	83.1	84.2	82.4	
ax(SU) (HT80 High Rate)	82.9	77.3	75.6	

**Table 2-4. Measured Duty Cycles**

The device employs MIMO 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	✓	✓	✓	✓	x	x	x	x
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓

**Table 2-5. WIFI Configurations**

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device		Page 8 of 358



✓ = 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 n/ac – 20MHz)  
 156/173Mbps (MIMO ac – 20MHz)  
 27/30, 54/60, 81/90, 108/120, 162/180, 216/240, 243,270, 270/300Mbps (MIMO n/ac – 40MHz) 324/360, 360/400Mbps (MIMO 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 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)  
 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, 271/286.8Mbps (MIMO ax – 20MHz 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, 567/600.5Mbps (MIMO ax – 40MHz BW)  
 68/72, 136/144.1, 204/216.2, 272/288.2, 408/432.4, 544/576.4, 612/648.8, 680/720.6, 816/864.8, 906/960.8, 1020/1080.8, 1134/1201Mbps (MIMO ax – 80MHz BW)

2. 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 2.4GHz	Bluetooth	WiFi 5GHz
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	802.11 a/n/ac/ax
WF8	Config 1	✗	✓	✓

**Table 2-6. Simultaneous Transmission Configurations**

✓ = Support; ✗ = Not Support

**Note:**

Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. For BT (2.4 GHz) in connected mode and Wi-Fi (2.4 GHz) – Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power. For BT (2.4 GHz) in disconnected mode and Wi-Fi (2.4 GHz) – BT will be using iPA only and Wi-Fi max power will not exceed minimum of (SAR max cap, Reg max cap) power.

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 9 of 358

### 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	3.4	2.9
5.250 – 5.350	3.0	3.4
5.470 – 5.725	5.1	4.0
5.725 – 5.850	5.1	4.0

**Table 2-7. Highest Antenna Gain**

### 2.4 Test Support Equipment

1	Apple MacBook Pro	Model: A2141	S/N: C02DV7VKMD6T
2	w/AC/DC Adapter	Model: A2166	S/N: N/A
3	Apple USB-C Cable	Model: Spartan	S/N: 000MKTR02U
4	USB-C Cable	Model: A246	S/N: N/A
5	w/ AC Adapter	Model: A2305	S/N: N/A
6	DC Power Supply	Model: KPS3010D	S/N: N/A

**Table 2-8. Test Support Equipment List**

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 10 of 358

## 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: 6Mbps
  - Mid Data Rate: 24Mbps
  - High Data Rate: 54Mbps
- 802.11n HT20/40:
  - Low Data Rate: MCS0/MCS8 (SISO/CDD)
  - Mid Data Rate: MCS4/MCS12 (SISO/CDD)
  - High Data Rate: MCS7/MCS15 (SISO/CDD)
- 802.11ac VHT80:
  - Low Data Rate: MCS0
  - Mid Data Rate: MCS4
  - High Data Rate: MCS9
- 802.11ax(SU) HE20/HE40/HE80:
  - Low Data Rate: MCS0
  - Mid Data Rate: MCS4
  - High Data Rate: MCS11

### Notes:

For 802.11ax-RU test result, see separate UNII 802.11ax (OFDMA) report, 1C2205090022-08.BCG


FCC ID: BCGA2696 IC: 579C-A2696	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 11 of 358

## 2.6 Software and Firmware

The test was conducted with firmware version 20A32640u 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.

<b>FCC ID:</b> BCGA2696 <b>IC:</b> 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device	Page 12 of 358

V 10.5 12/15/2021

## 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.

<b>FCC ID:</b> BCGA2696 <b>IC:</b> 579C-A2696	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device	Page 13 of 358

### 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).

<b>FCC ID:</b> BCGA2696 <b>IC:</b> 579C-A2696	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device	Page 14 of 358

## 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.

<b>FCC ID:</b> BCGA2696 <b>IC:</b> 579C-A2696	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device	Page 15 of 358

## 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  $U_{\text{CISPR}}$  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	1.77
Line Conducted Disturbance	2.70
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz - 1GHz)	4.75
Radiated Disturbance (1 - 18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 16 of 358



## 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	6/10/2022	Annual	6/10/2023	MY49430244
Agilent Technologies	N9020A	MXA Signal Analyzer	4/26/2022	Annual	4/26/2023	MY56470202
Anritsu	ML2496A	Power Meter	11/29/2021	Annual	11/29/2022	1840005
Anritsu	MA2411B	Pulse Power Sensor	11/30/2021	Annual	11/30/2022	1726261
Anritsu	MA2411B	Pulse Power Sensor	11/30/2021	Annual	11/30/2022	1726262
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	1/19/2022	Annual	1/19/2023	T058701-02
Com-Power Corporation	LIN-120A	Line Impedance Stabilization Network (LISN)	3/7/2022	Annual	3/7/2023	241296
ETS-Lindgren	3142E	Biconilog Antenna (26-6000MHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Horn Antenna (1-18GHz)	10/25/2021	Annual	10/25/2022	227597
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz-6GHz)	1/6/2022	Annual	1/6/2023	102328
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	FSVA3044	Signal Analyzer (up to 44 GHz)	5/12/2022	Annual	5/12/2023	101098
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546
Rohde & Schwarz	TC-TA18	Cross-Polarized Antenna 400MHz-18GHz	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz-18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz-40GHz)	4/18/2022	Annual	4/18/2023	100050

**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.

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1C2205090022-07.BCG	<b>Test Dates:</b> 8/7/2022 – 9/7/2022	<b>EUT Type:</b> Tablet Device	Page 17 of 358

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCGA2696  
 IC: 579C-A2696  
 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 (N/A)
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; 15.209	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 Washington DC LLC “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 Washington DC LLC “Chamber Automation,” Version 1.3.2.

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 18 of 358

## 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 data 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.

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 19 of 358

V 10.5 12/15/2021

## Antenna WF8 26dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	6.5/7.2 (MCS0)	17.93	22.03
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	17.84	21.06
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	17.78	20.98
	5180	36	ax (SU) (20MHz)	8/8.6 (MCS0)	19.09	26.12
	5200	40	ax (SU) (20MHz)	8/8.6 (MCS0)	19.06	20.84
	5240	48	ax (SU) (20MHz)	8/8.6 (MCS0)	19.07	21.28
	5190	38	n (40MHz)	13.5/15 (MCS0)	36.62	46.63
	5230	46	n (40MHz)	13.5/15 (MCS0)	36.40	41.56
	5190	38	ax (SU) (40MHz)	16/17.2 (MCS0)	38.02	42.61
	5230	46	ax (SU) (40MHz)	16/17.2 (MCS0)	37.93	41.24
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	75.49	83.65
Band 2A	5210	42	ax (SU) (80MHz)	34/36 (MCS0)	77.29	85.35
	5260	52	n (20MHz)	6.5/7.2 (MCS0)	17.81	21.39
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	17.78	20.87
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	17.95	21.50
	5260	52	ax (SU) (20MHz)	8/8.6 (MCS0)	19.02	21.42
	5280	56	ax (SU) (20MHz)	8/8.6 (MCS0)	19.02	21.14
	5320	64	ax (SU) (20MHz)	8/8.6 (MCS0)	19.11	23.37
	5270	54	n (40MHz)	13.5/15 (MCS0)	36.36	41.35
	5310	62	n (40MHz)	13.5/15 (MCS0)	36.53	42.35
	5270	54	ax (SU) (40MHz)	16/17.2 (MCS0)	37.95	41.57
	5310	62	ax (SU) (40MHz)	16/17.2 (MCS0)	38.07	42.04
Band 2C	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	75.57	84.76
	5290	58	ax (SU) (80MHz)	34/36 (MCS0)	77.16	83.62
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	17.92	21.65
	5580	116	n (20MHz)	6.5/7.2 (MCS0)	17.78	20.86
	5720	144	n (20MHz)	6.5/7.2 (MCS0)	17.78	21.24
	5500	100	ax (SU) (20MHz)	8/8.6 (MCS0)	19.12	23.74
	5580	116	ax (SU) (20MHz)	8/8.6 (MCS0)	19.06	21.21
	5720	144	ax (SU) (20MHz)	8/8.6 (MCS0)	19.03	21.11
	5510	102	n (40MHz)	13.5/15 (MCS0)	36.64	42.76
	5550	110	n (40MHz)	13.5/15 (MCS0)	36.30	40.86
	5710	142	n (40MHz)	13.5/15 (MCS0)	36.39	41.32
	5510	102	ax (SU) (40MHz)	16/17.2 (MCS0)	37.98	43.13
	5550	110	ax (SU) (40MHz)	16/17.2 (MCS0)	37.95	41.23
	5710	142	ax (SU) (40MHz)	16/17.2 (MCS0)	37.99	41.00
5530	106	ac (80MHz)	29.3/32.5 (MCS0)	75.59	83.09	
5690	138	ac (80MHz)	29.3/32.5 (MCS0)	75.40	81.22	
5530	106	ax (SU) (80MHz)	34/36 (MCS0)	77.42	82.56	
5690	138	ax (SU) (80MHz)	34/36 (MCS0)	77.16	81.68	

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

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 20 of 358

	Frequency [MHz]	Channel No.	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)	17.72	20.65
	5200	40	n (20MHz)	39/43.3 (MCS4)	17.69	20.72
	5240	48	n (20MHz)	39/43.3 (MCS4)	17.69	20.91
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.05
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	18.97	21.02
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	18.99	21.24
	5190	38	n (40MHz)	81/90 (MCS4)	36.28	41.75
	5230	46	n (40MHz)	81/90 (MCS4)	36.37	41.98
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	37.93	41.37
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	37.97	41.61
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.45	81.33
5210	42	ax (SU) (80MHz)	204/216.2 (MCS4)	77.27	82.24	
Band 2A	5260	52	n (20MHz)	39/43.3 (MCS4)	17.74	20.71
	5280	56	n (20MHz)	39/43.3 (MCS4)	17.68	20.78
	5320	64	n (20MHz)	39/43.3 (MCS4)	17.77	21.00
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.00	20.81
	5280	56	ax (SU) (20MHz)	49/51.6 (MCS4)	18.97	21.10
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.04	20.91
	5270	54	n (40MHz)	81/90 (MCS4)	36.37	41.15
	5310	62	n (40MHz)	81/90 (MCS4)	36.32	42.07
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	37.97	41.62
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	38.00	41.26
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.49	81.27
5290	58	ax (SU) (80MHz)	204/216.2 (MCS4)	77.16	81.64	
Band 2C	5500	100	n (20MHz)	39/43.3 (MCS4)	17.77	20.72
	5580	116	n (20MHz)	39/43.3 (MCS4)	17.72	20.66
	5720	144	n (20MHz)	39/43.3 (MCS4)	17.73	20.78
	5500	100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.80
	5580	116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.02	21.18
	5720	144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.00	20.99
	5510	102	n (40MHz)	81/90 (MCS4)	36.34	41.43
	5550	110	n (40MHz)	81/90 (MCS4)	36.23	41.07
	5710	142	n (40MHz)	81/90 (MCS4)	36.45	42.04
	5510	102	ax (SU) (40MHz)	98/103.2 (MCS4)	37.97	42.46
	5550	110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.90	41.75
	5710	142	ax (SU) (40MHz)	98/103.2 (MCS4)	37.98	41.59
	5530	106	ac (80MHz)	175.5/195 (MCS4)	75.49	81.19
	5690	138	ac (80MHz)	175.5/195 (MCS4)	75.46	81.08
5530	106	ax (SU) (80MHz)	204/216.2 (MCS4)	77.22	82.96	
5690	138	ax (SU) (80MHz)	204/216.2 (MCS4)	77.23	81.83	

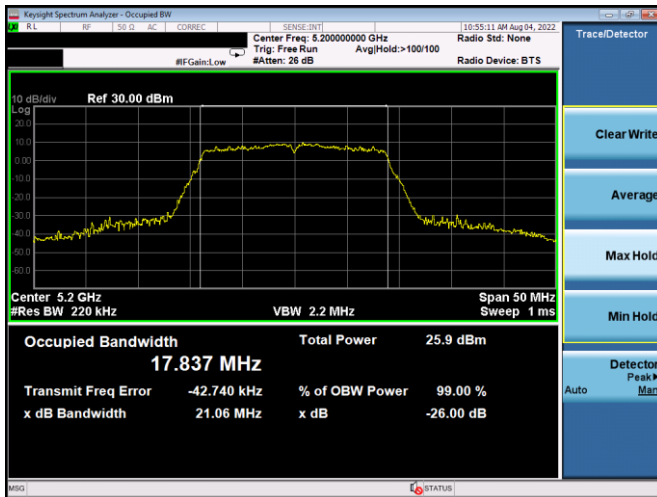
**Table 7-3. Conducted Bandwidth Measurements Antenna WF8 (Mid Data Rate)**

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 21 of 358

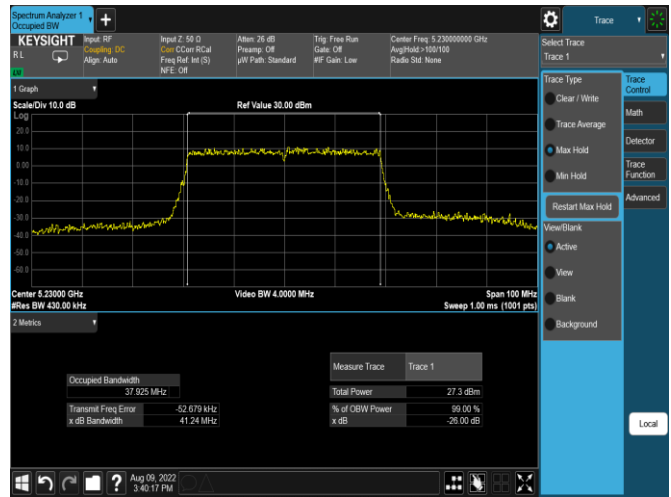
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	17.81	20.92
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.86	20.87
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.84	21.02
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.27
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.29
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.29
	5190	38	n (40MHz)	135/150 (MCS7)	36.42	40.93
	5230	46	n (40MHz)	135/150 (MCS7)	36.55	41.25
	5190	38	ax (SU) (40MHz)	271/286.8 (MCS11)	37.93	41.18
	5230	46	ax (SU) (40MHz)	271/286.8 (MCS11)	37.90	41.43
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.92	81.40
	5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.07	81.45
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.87	21.32
	5280	56	n (20MHz)	65/72.2 (MCS7)	17.69	20.78
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.83	20.91
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.07	20.92
	5280	56	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.35
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.14
	5270	54	n (40MHz)	135/150 (MCS7)	36.56	41.32
	5310	62	n (40MHz)	135/150 (MCS7)	36.47	41.16
	5270	54	ax (SU) (40MHz)	271/286.8 (MCS11)	37.86	41.36
	5310	62	ax (SU) (40MHz)	271/286.8 (MCS11)	37.85	41.41
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.87	81.44
	5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.06	81.44
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.84	21.14
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.81	21.01
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.87	21.01
	5500	100	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.16
	5580	116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.46
	5720	144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.29
	5510	102	n (40MHz)	135/150 (MCS7)	36.47	41.10
	5550	110	n (40MHz)	135/150 (MCS7)	36.51	41.13
	5710	142	n (40MHz)	135/150 (MCS7)	36.59	44.89
	5510	102	ax (SU) (40MHz)	271/286.8 (MCS11)	37.87	41.63
	5550	110	ax (SU) (40MHz)	271/286.8 (MCS11)	37.87	41.26
	5710	142	ax (SU) (40MHz)	271/286.8 (MCS11)	38.02	50.26
	5530	106	ac (80MHz)	390/433.3 (MCS9)	75.99	81.81
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.00	81.37
	5530	106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.07	81.24
	5690	138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.24	82.05

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

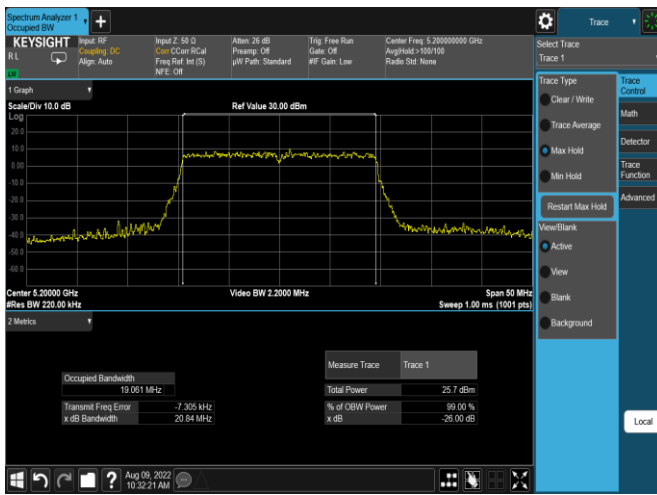
FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 22 of 358



Plot 7-1. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS0)



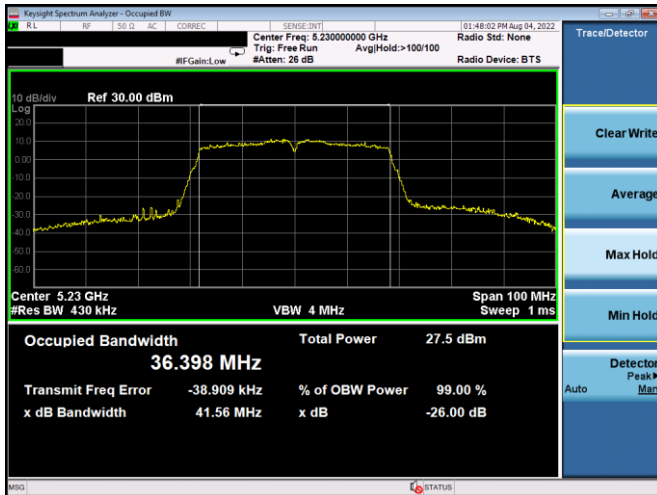
Plot 7-4. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS0)



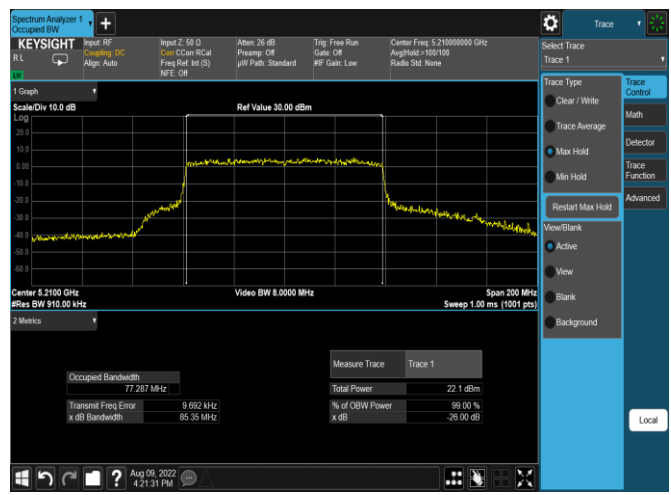
Plot 7-2. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS0)



Plot 7-5. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS0)

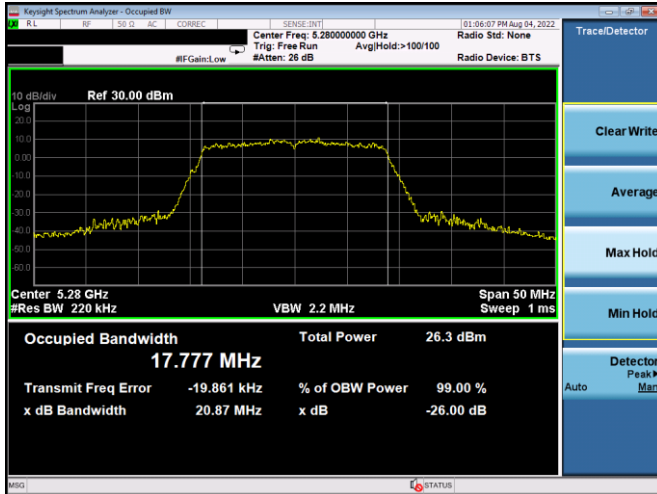


Plot 7-3. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS0)

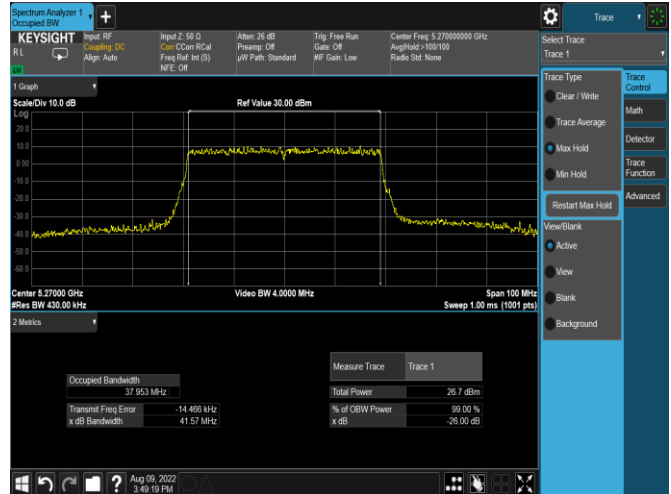


Plot 7-6. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS0)

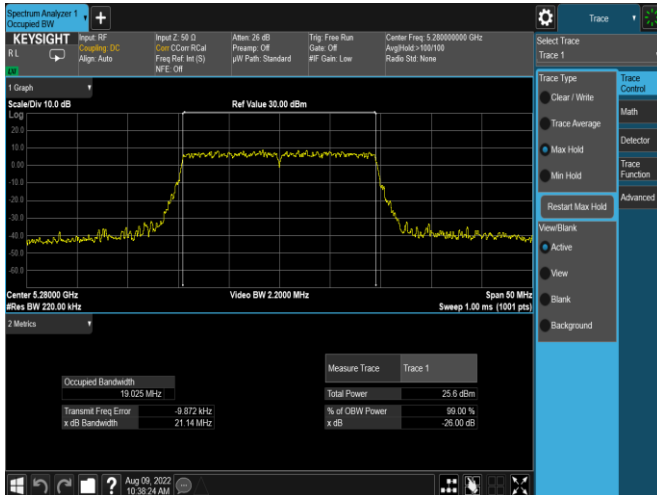
FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 23 of 358



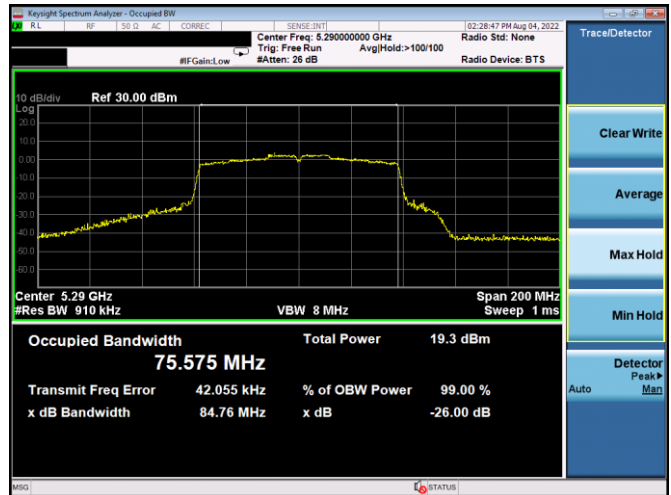
Plot 7-7. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 56, MCS0)



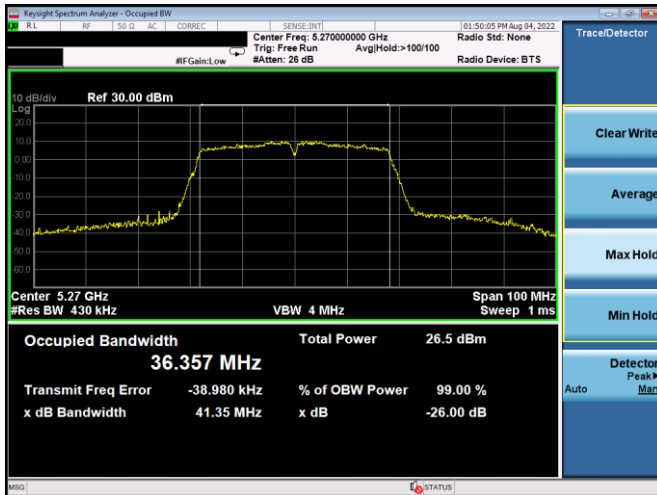
Plot 7-10. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS0)



Plot 7-8. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 56, MCS0)



Plot 7-11. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS0)



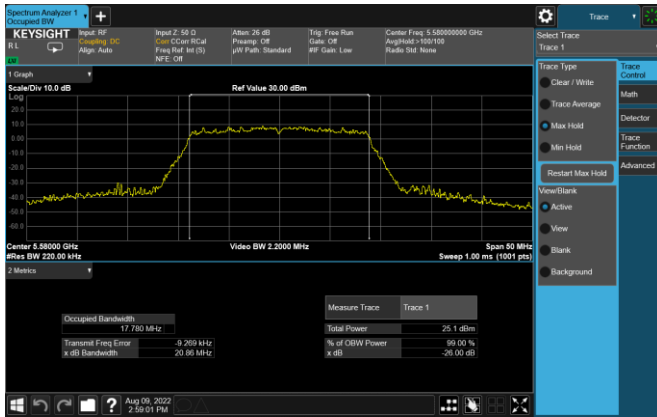
Plot 7-9. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS0)



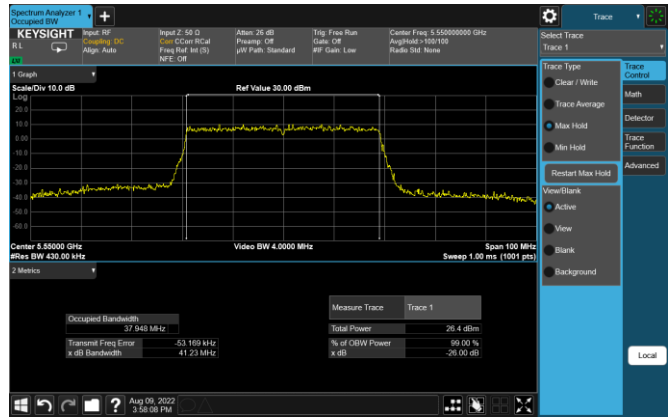
Plot 7-12. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS0)

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 24 of 358





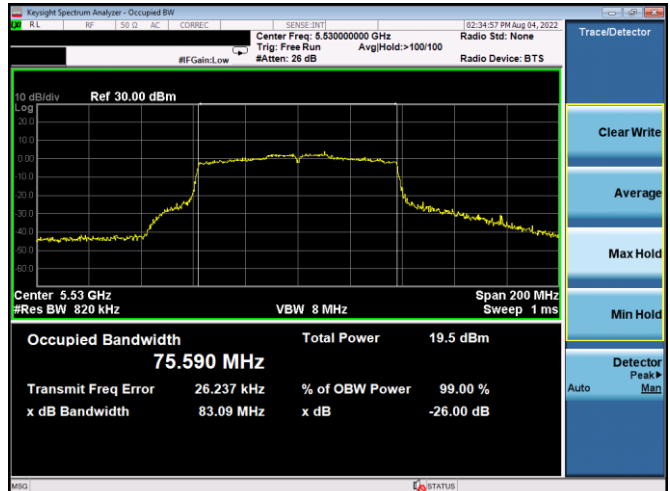
Plot 7-13. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS0)



Plot 7-16. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS0)



Plot 7-14. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS0)



Plot 7-17. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 106, MCS0)

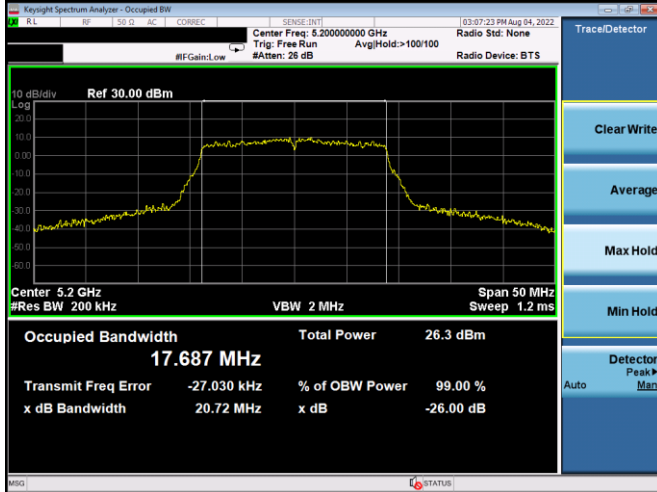


Plot 7-15. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110, MCS0)

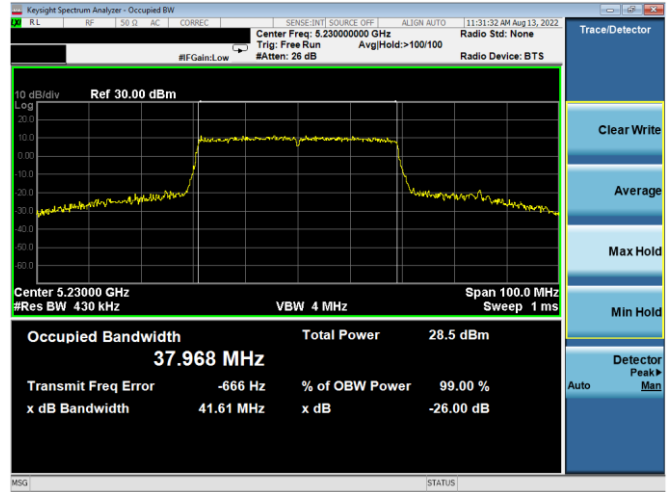


Plot 7-18. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS0)

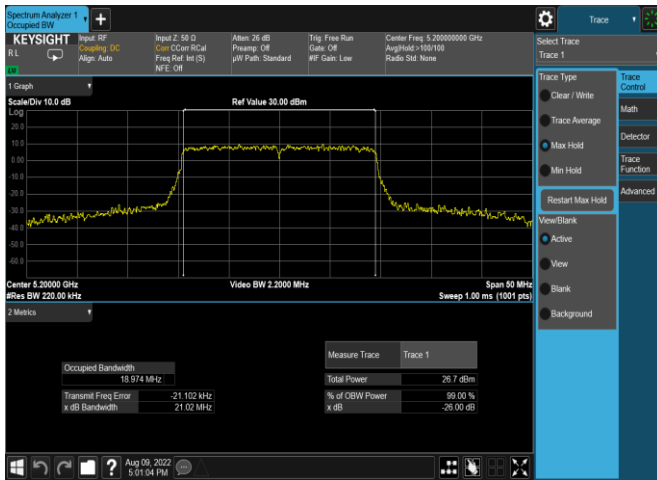
FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 25 of 358



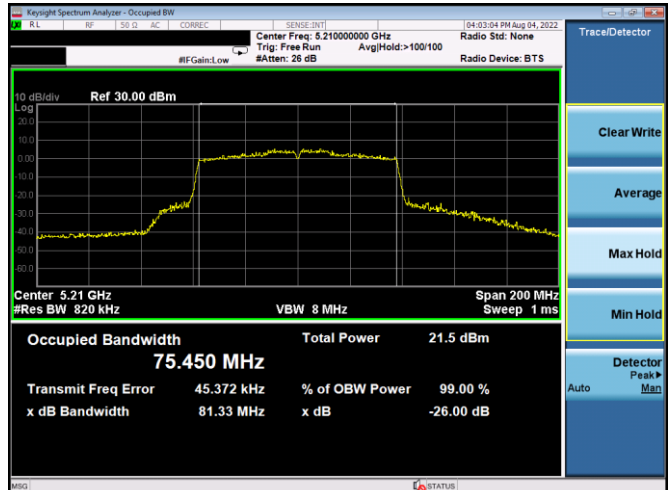
Plot 7-19. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS4)



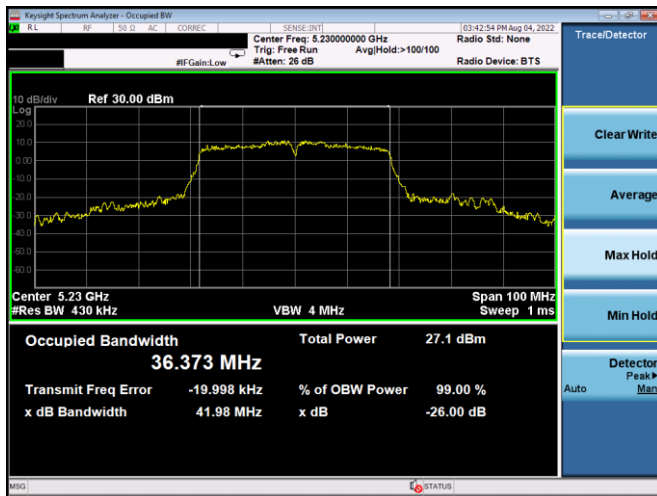
Plot 7-22. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS4)



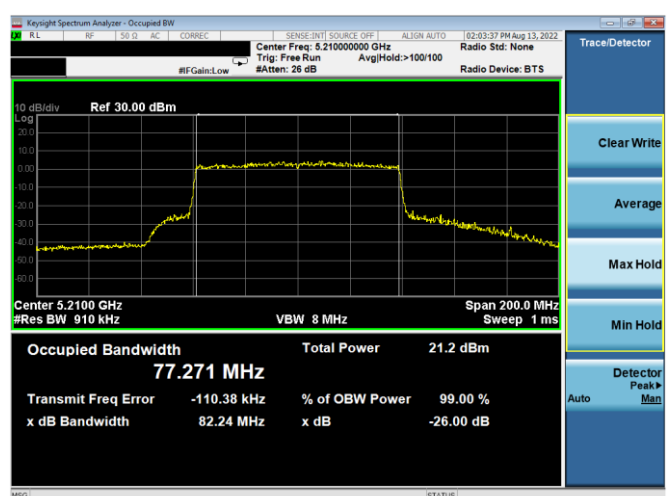
Plot 7-20. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS4)



Plot 7-23. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS4)

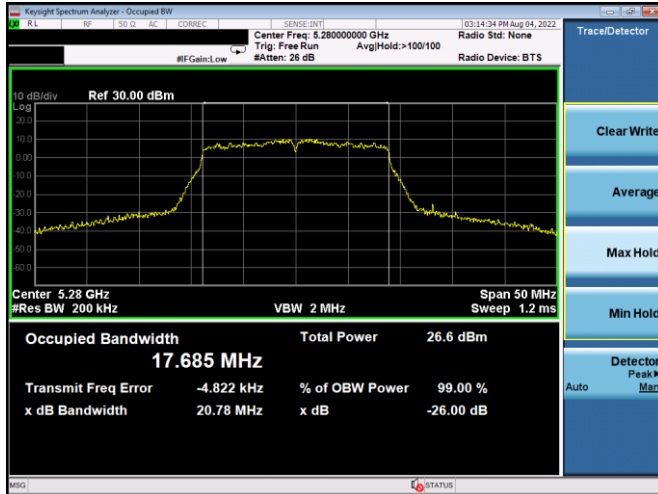


Plot 7-21. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS4)

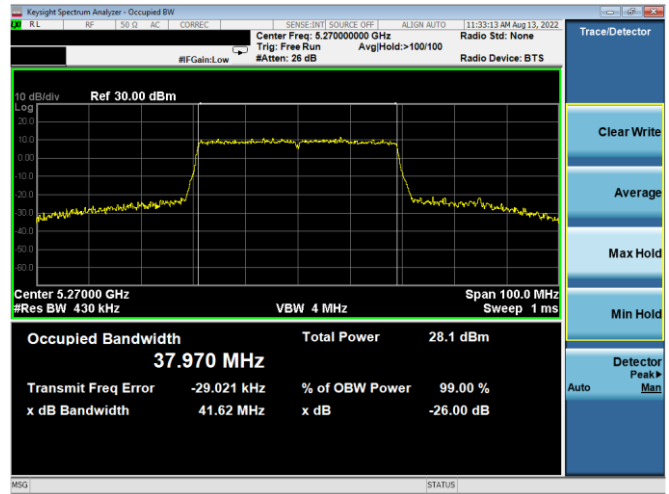


Plot 7-24. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS4)

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 26 of 358



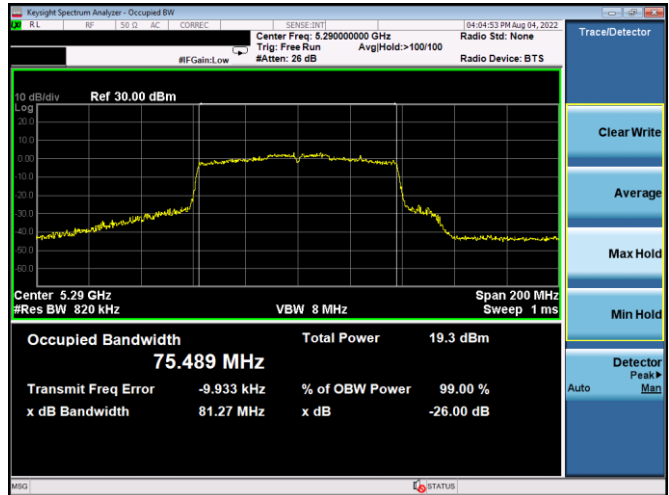
Plot 7-25. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 56, MCS4)



Plot 7-28. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS4)



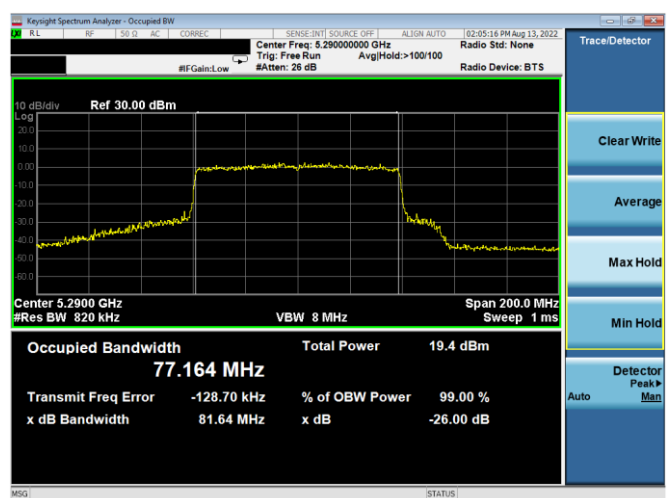
Plot 7-26. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 56, MCS4)



Plot 7-29. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS4)

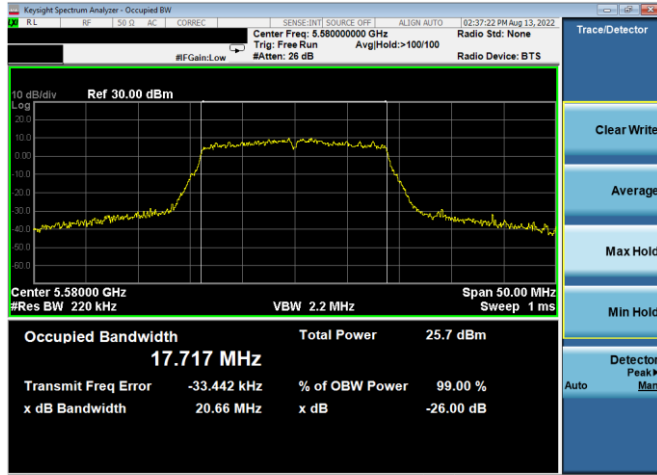


Plot 7-27. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS4)

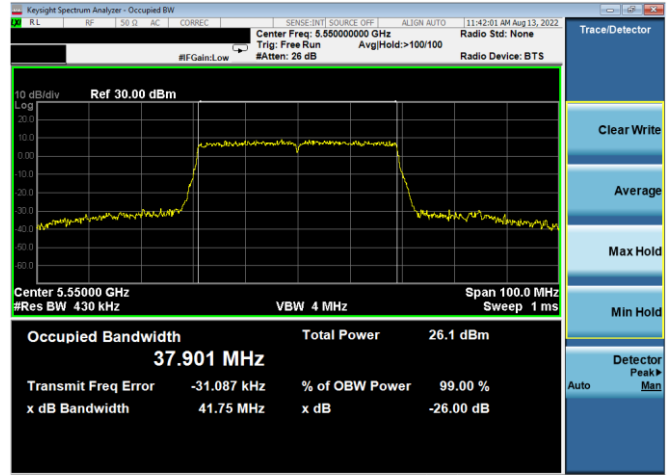


Plot 7-30. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS4)

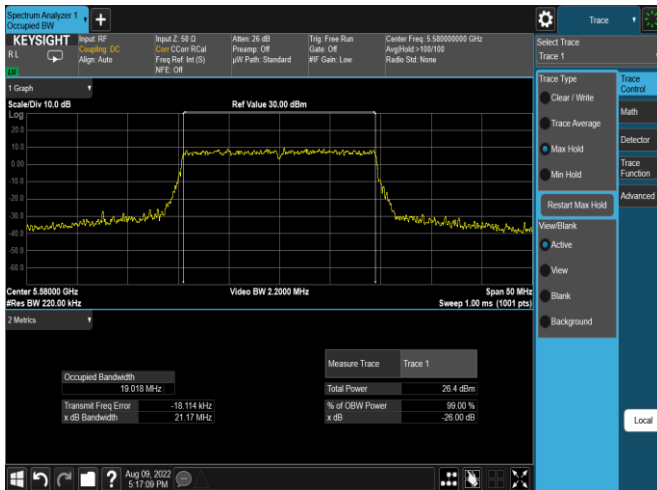
FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 27 of 358



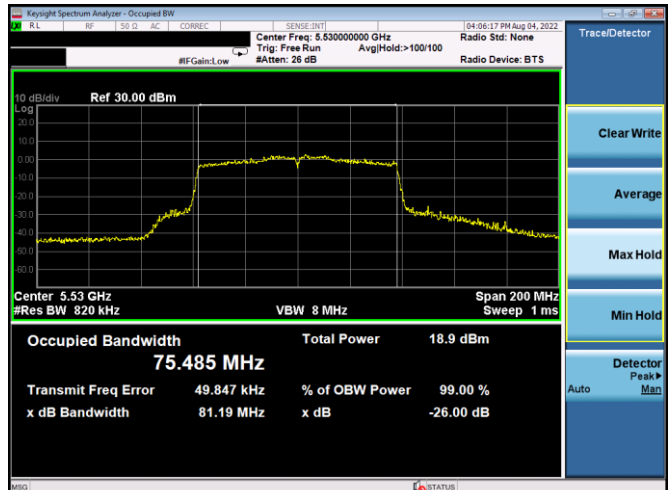
Plot 7-31. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS4)



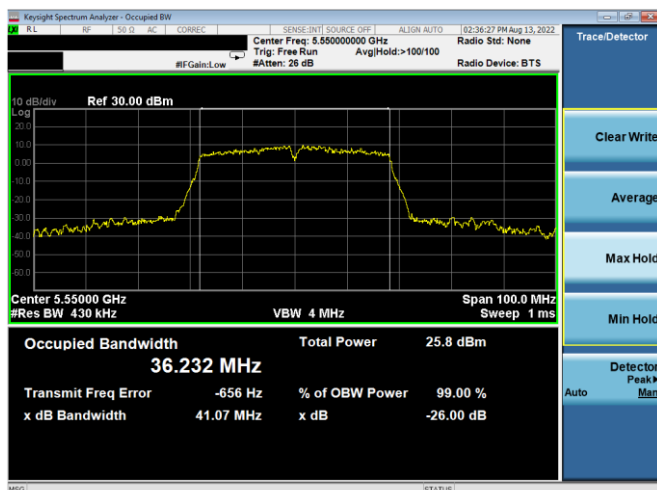
Plot 7-34. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS4)



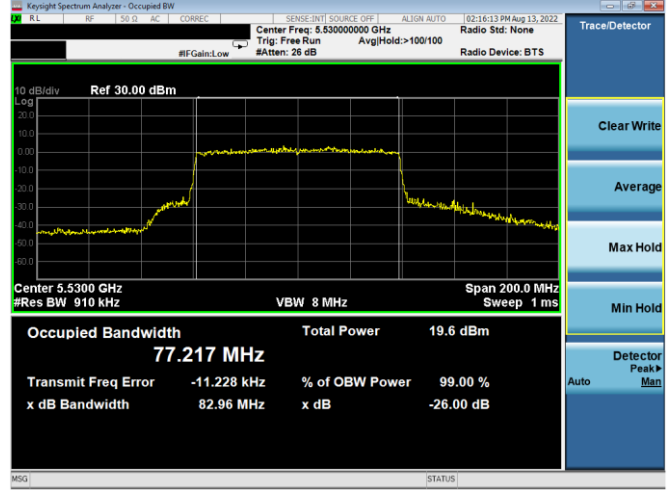
Plot 7-32. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS4)



Plot 7-35. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 106, MCS4)

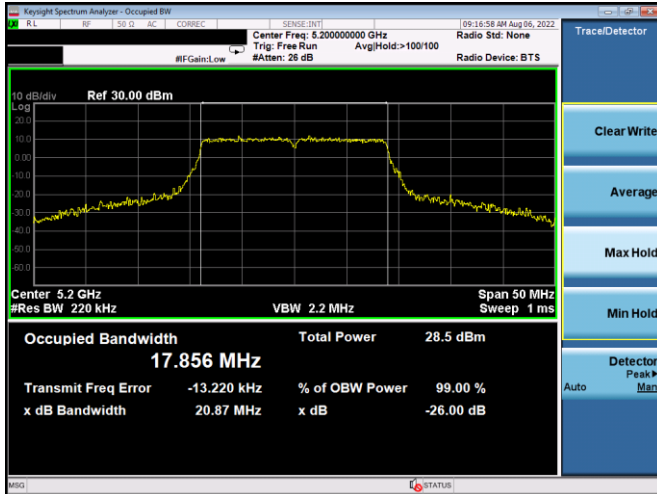


Plot 7-33. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110, MCS4)

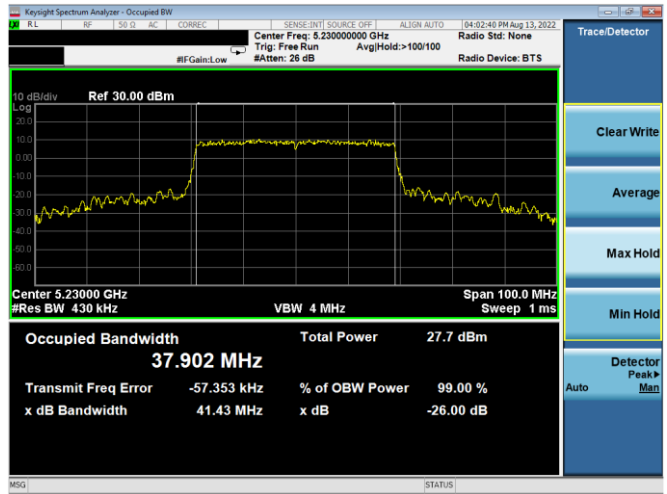


Plot 7-36. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS4)

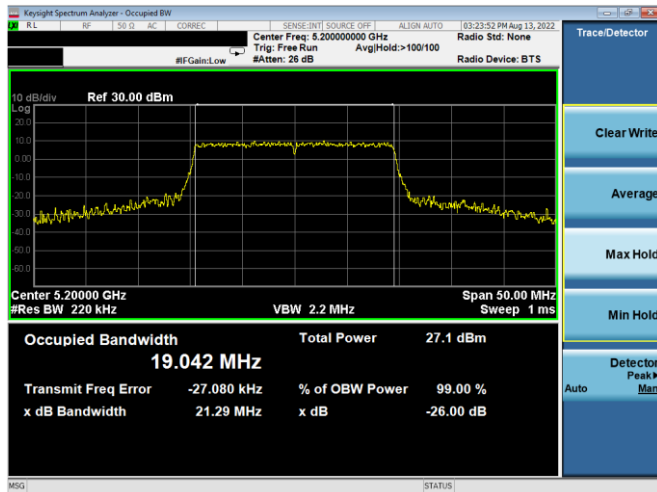
FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 28 of 358



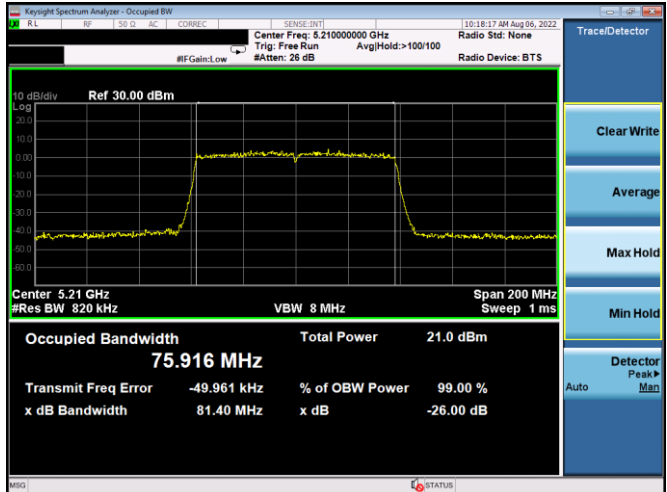
Plot 7-37. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS7)



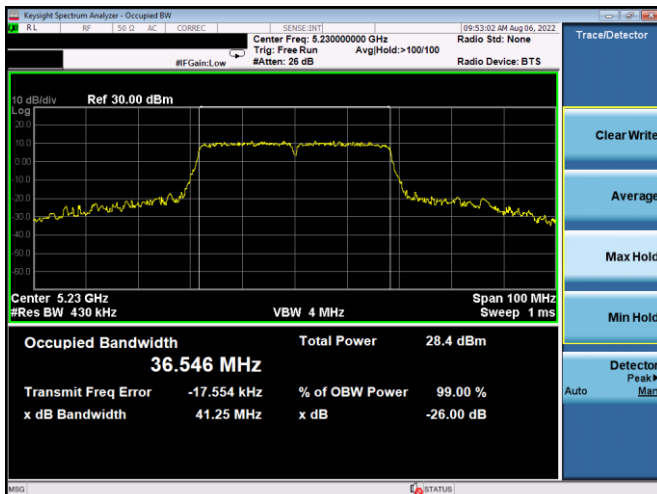
Plot 7-40. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS11)



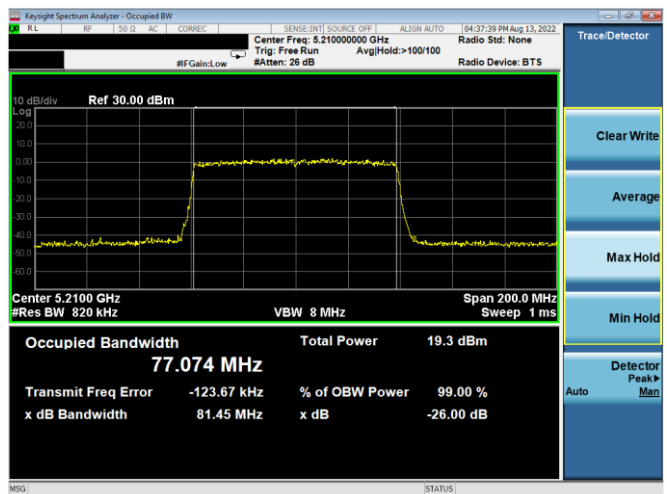
Plot 7-38. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS11)



Plot 7-41. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS9)

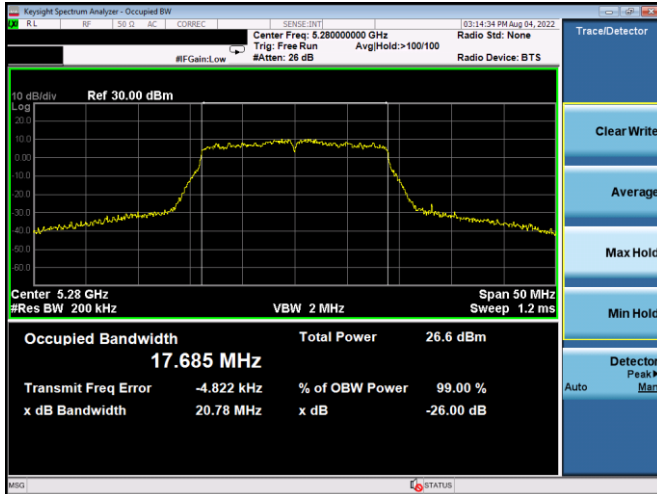


Plot 7-39. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS7)

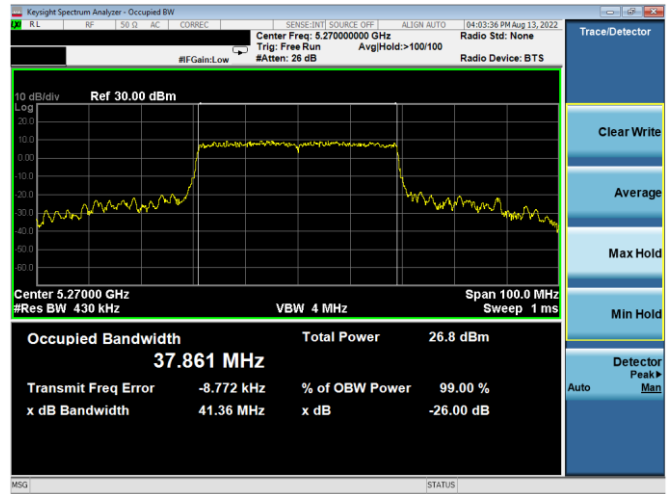


Plot 7-42. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS11)

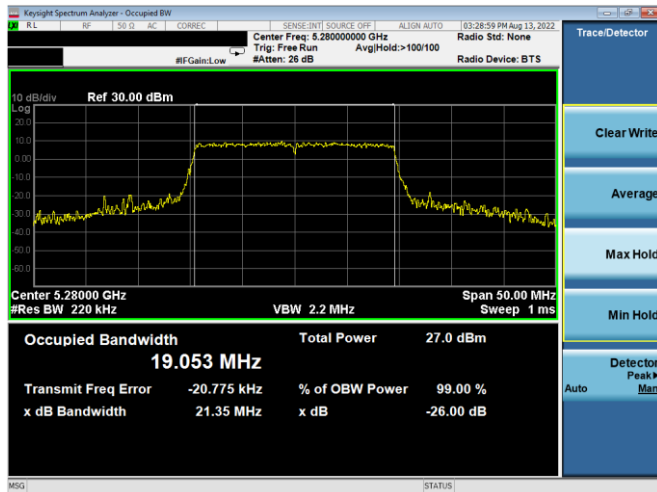
FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 29 of 358



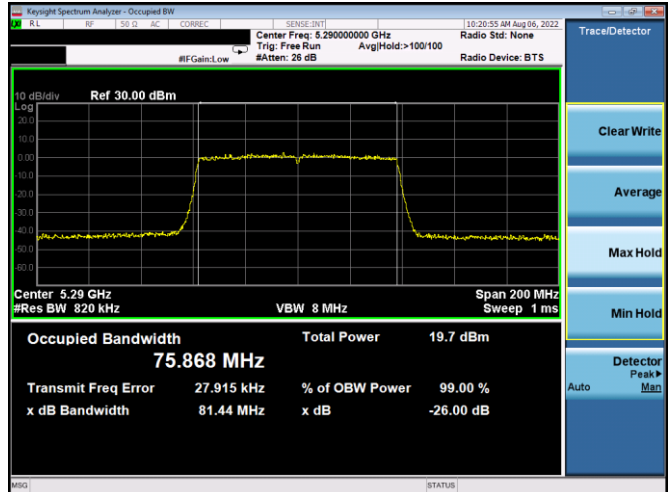
Plot 7-43. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 56, MCS7)



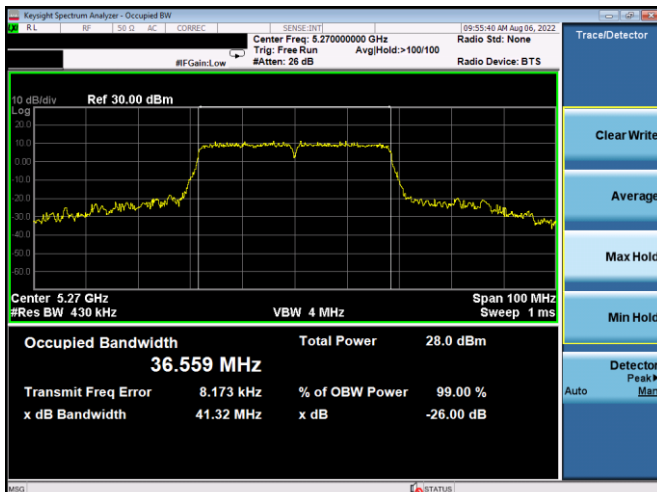
Plot 7-46. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS11)



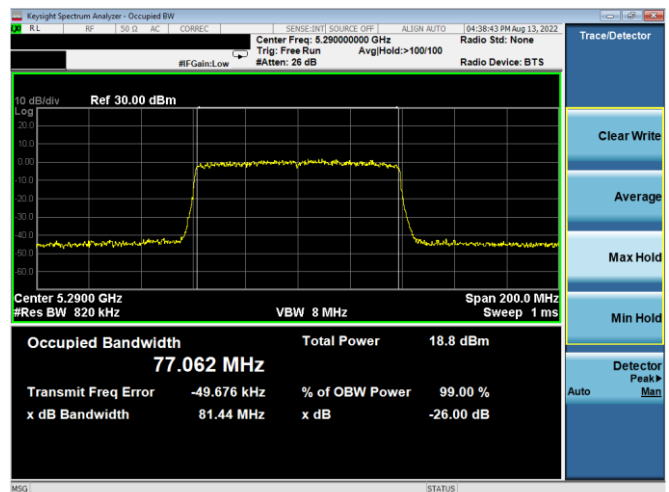
Plot 7-44. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 56, MCS11)



Plot 7-47. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS9)

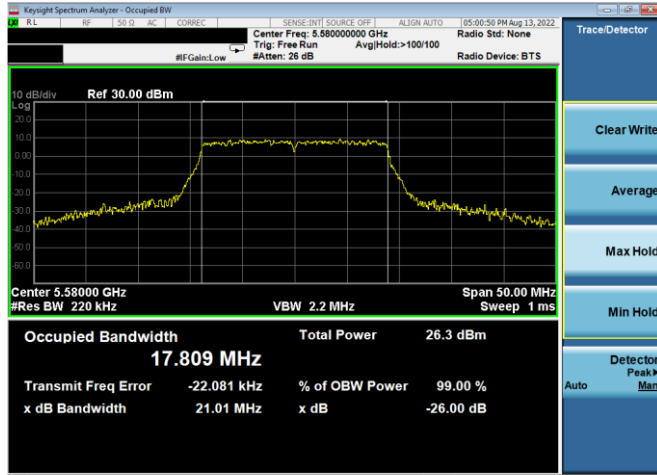


Plot 7-45. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS7)

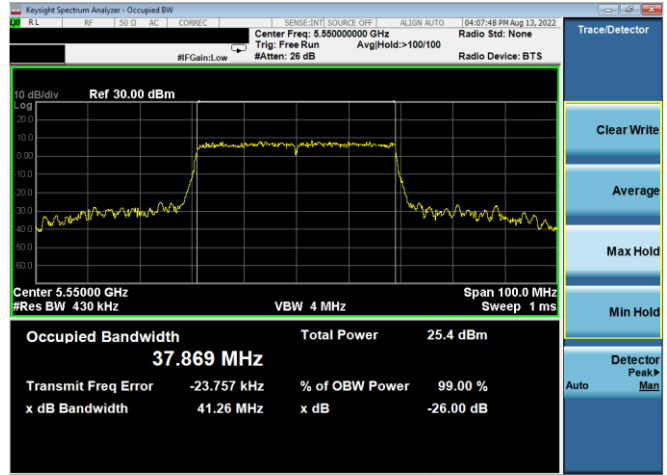


Plot 7-48. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS11)

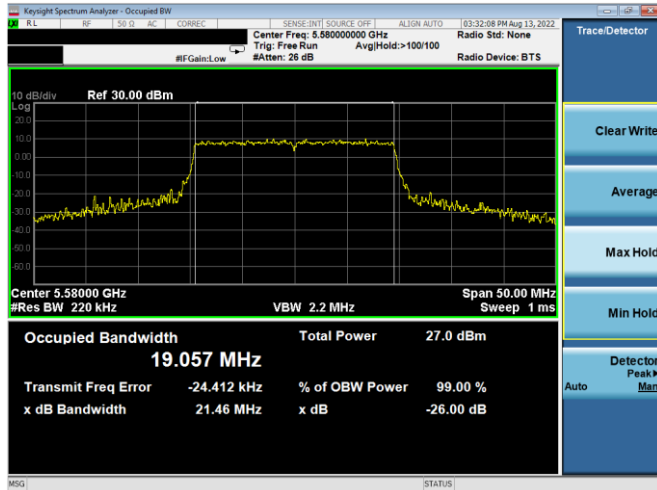
FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 30 of 358



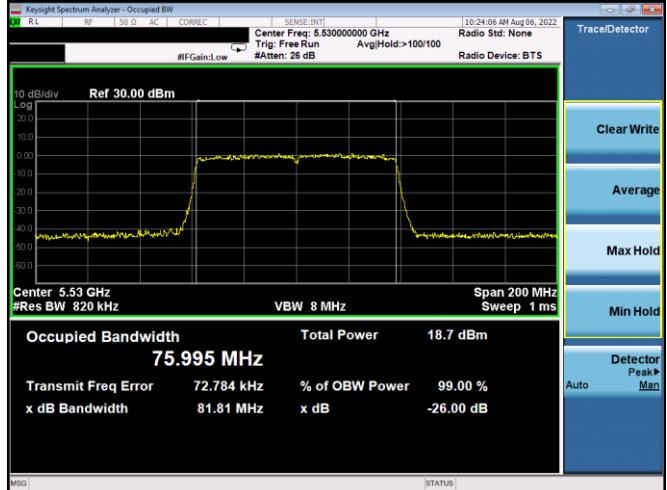
Plot 7-49. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS7)



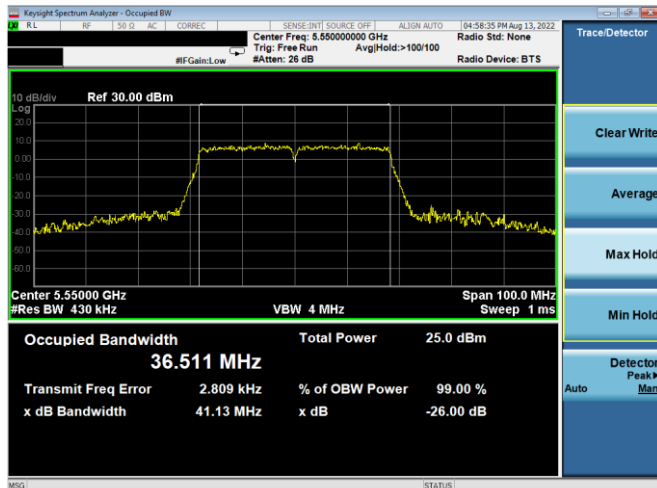
Plot 7-52. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS11)



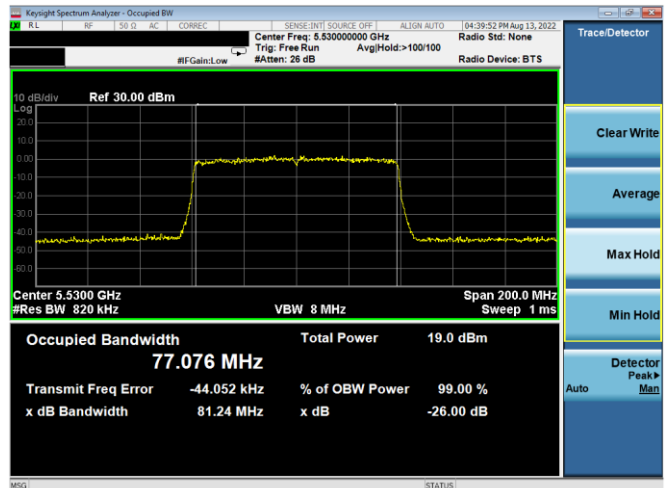
Plot 7-50. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS11)



Plot 7-53. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 106, MCS9)



Plot 7-51. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110), MCS7)



Plot 7-54. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS11)

FCC ID: BCGA2696 IC: 579C-A2696		<b>MEASUREMENT REPORT</b> (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 31 of 358

## Antenna WF7a 26dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	6.5/7.2 (MCS0)	17.85	21.62
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	17.80	21.09
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	17.78	21.29
	5180	36	ax (SU) (20MHz)	8/8.6 (MCS0)	19.04	21.69
	5200	40	ax (SU) (20MHz)	8/8.6 (MCS0)	19.02	21.11
	5240	48	ax (SU) (20MHz)	8/8.6 (MCS0)	19.04	21.09
	5190	38	n (40MHz)	13.5/15 (MCS0)	36.56	42.54
	5230	46	n (40MHz)	13.5/15 (MCS0)	36.32	41.14
	5190	38	ax (SU) (40MHz)	16/17.2 (MCS0)	38.09	42.63
	5230	46	ax (SU) (40MHz)	16/17.2 (MCS0)	37.92	40.92
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	75.41	81.81
5210	42	ax (SU) (80MHz)	34/36 (MCS0)	77.28	82.60	
Band 2A	5260	52	n (20MHz)	6.5/7.2 (MCS0)	17.82	21.06
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	17.86	21.27
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	17.89	21.48
	5260	52	ax (SU) (20MHz)	8/8.6 (MCS0)	19.03	21.17
	5280	56	ax (SU) (20MHz)	8/8.6 (MCS0)	19.05	21.43
	5320	64	ax (SU) (20MHz)	8/8.6 (MCS0)	19.10	22.40
	5270	54	n (40MHz)	13.5/15 (MCS0)	36.43	41.11
	5310	62	n (40MHz)	13.5/15 (MCS0)	36.50	42.73
	5270	54	ax (SU) (40MHz)	16/17.2 (MCS0)	38.04	41.41
	5310	62	ax (SU) (40MHz)	16/17.2 (MCS0)	38.07	42.22
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	75.53	82.99
5290	58	ax (SU) (80MHz)	34/36 (MCS0)	77.20	86.15	
Band 2C	5500	100	n (20MHz)	6.5/7.2 (MCS0)	17.93	21.43
	5580	116	n (20MHz)	6.5/7.2 (MCS0)	17.73	20.89
	5720	144	n (20MHz)	6.5/7.2 (MCS0)	17.77	21.34
	5500	100	ax (SU) (20MHz)	8/8.6 (MCS0)	19.10	22.78
	5580	116	ax (SU) (20MHz)	8/8.6 (MCS0)	19.08	20.95
	5720	144	ax (SU) (20MHz)	8/8.6 (MCS0)	19.03	21.28
	5510	102	n (40MHz)	13.5/15 (MCS0)	36.52	43.04
	5550	110	n (40MHz)	13.5/15 (MCS0)	36.38	41.30
	5710	142	n (40MHz)	13.5/15 (MCS0)	36.38	41.46
	5510	102	ax (SU) (40MHz)	16/17.2 (MCS0)	38.14	44.37
	5550	110	ax (SU) (40MHz)	16/17.2 (MCS0)	38.00	41.47
	5710	142	ax (SU) (40MHz)	16/17.2 (MCS0)	38.04	41.78
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	75.56	86.30
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	75.63	81.46
5530	106	ax (SU) (80MHz)	34/36 (MCS0)	77.13	82.60	
5690	138	ax (SU) (80MHz)	34/36 (MCS0)	77.26	81.60	


Table 7-5. Conducted Bandwidth Measurements Antenna WF7a (Low Data Rate)

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 32 of 358



	Frequency [MHz]	Channel No.	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)	17.79	20.62
	5200	40	n (20MHz)	39/43.3 (MCS4)	17.73	20.65
	5240	48	n (20MHz)	39/43.3 (MCS4)	17.69	20.70
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.08
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	18.99	21.03
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	19.01	21.06
	5190	38	n (40MHz)	81/90 (MCS4)	36.32	41.22
	5230	46	n (40MHz)	81/90 (MCS4)	36.32	40.75
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	37.97	41.51
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	37.92	41.53
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.37	80.88
5210	42	ax (SU) (80MHz)	204/216.2 (MCS4)	77.31	81.91	
Band 2A	5260	52	n (20MHz)	39/43.3 (MCS4)	17.71	20.74
	5280	56	n (20MHz)	39/43.3 (MCS4)	17.72	20.87
	5320	64	n (20MHz)	39/43.3 (MCS4)	17.76	20.84
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.00	21.21
	5280	56	ax (SU) (20MHz)	49/51.6 (MCS4)	18.99	20.88
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.03
	5270	54	n (40MHz)	81/90 (MCS4)	36.31	41.05
	5310	62	n (40MHz)	81/90 (MCS4)	36.33	41.01
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	37.96	41.47
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	37.98	42.90
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.50	80.78
5290	58	ax (SU) (80MHz)	204/216.2 (MCS4)	77.10	81.89	
Band 2C	5500	100	n (20MHz)	39/43.3 (MCS4)	17.77	20.83
	5580	116	n (20MHz)	39/43.3 (MCS4)	17.72	20.57
	5720	144	n (20MHz)	39/43.3 (MCS4)	17.71	20.65
	5500	100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.40
	5580	116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.00	21.06
	5720	144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.01	21.24
	5510	102	n (40MHz)	81/90 (MCS4)	36.30	40.97
	5550	110	n (40MHz)	81/90 (MCS4)	36.29	41.02
	5710	142	n (40MHz)	81/90 (MCS4)	36.34	40.81
	5510	102	ax (SU) (40MHz)	98/103.2 (MCS4)	37.97	42.67
	5550	110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.90	41.48
	5710	142	ax (SU) (40MHz)	98/103.2 (MCS4)	37.99	41.99
	5530	106	ac (80MHz)	175.5/195 (MCS4)	75.45	81.22
	5690	138	ac (80MHz)	175.5/195 (MCS4)	75.55	80.99
5530	106	ax (SU) (80MHz)	204/216.2 (MCS4)	77.22	81.63	
5690	138	ax (SU) (80MHz)	204/216.2 (MCS4)	77.35	82.22	

**Table 7-6. Conducted Bandwidth Measurements Antenna WF7a (Mid Data Rate)**

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 33 of 358

	Frequency [MHz]	Channel No.	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)	17.83	21.14
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.84	21.14
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.85	21.08
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	20.94
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.08	21.11
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.33
	5190	38	n (40MHz)	135/150 (MCS7)	36.44	41.27
	5230	46	n (40MHz)	135/150 (MCS7)	36.53	41.03
	5190	38	ax (SU) (40MHz)	271/286.8 (MCS11)	37.81	41.32
	5230	46	ax (SU) (40MHz)	271/286.8 (MCS11)	37.92	44.51
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.86	81.47
5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.20	81.34	
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.81	20.91
	5280	56	n (20MHz)	65/72.2 (MCS7)	17.72	20.87
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.81	20.92
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.09	21.16
	5280	56	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.17
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	18.98	21.17
	5270	54	n (40MHz)	135/150 (MCS7)	36.42	41.23
	5310	62	n (40MHz)	135/150 (MCS7)	36.45	41.24
	5270	54	ax (SU) (40MHz)	271/286.8 (MCS11)	37.93	41.08
	5310	62	ax (SU) (40MHz)	271/286.8 (MCS11)	37.91	41.22
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.85	81.74
5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.06	81.35	
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.81	21.01
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.85	21.03
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.85	20.92
	5500	100	ax (SU) (20MHz)	135/143.4 (MCS11)	18.98	21.41
	5580	116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.17
	5720	144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.15
	5510	102	n (40MHz)	135/150 (MCS7)	36.49	41.14
	5550	110	n (40MHz)	135/150 (MCS7)	36.48	41.37
	5710	142	n (40MHz)	135/150 (MCS7)	36.77	47.61
	5510	102	ax (SU) (40MHz)	271/286.8 (MCS11)	37.89	41.12
	5550	110	ax (SU) (40MHz)	271/286.8 (MCS11)	37.89	41.08
	5710	142	ax (SU) (40MHz)	271/286.8 (MCS11)	37.97	50.15
	5530	106	ac (80MHz)	390/433.3 (MCS9)	75.93	81.36
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.17	89.54
	5530	106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.07	81.17
5690	138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.33	81.75	

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

FCC ID: BCGA2696 IC: 579C-A2696		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090022-07.BCG	Test Dates: 8/7/2022 – 9/7/2022	EUT Type: Tablet Device	Page 34 of 358