

MEASUREMENT REPORT

FCC PART 15.407 / ISSED 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:

12/02/2021- 02/06/2022

Test Site/Location:

PCTEST Morgan Hill, CA, USA

Test Report Serial No.:

1C2111150078-07.BCG

FCC ID:

BCGA2588

IC:

579C-A2588

APPLICANT:

Apple Inc.

Application Type:

Certification

Model/HVIN:

A2588

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



FCC ID: BCGA2588 IC: 579C-A2588	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device
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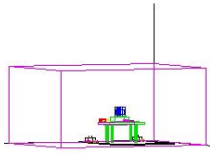
V 10.5 12/15/2021

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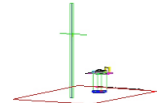
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MEASUREMENT REPORT



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	100.000	20.00	100.000	20.00	50.119	17.00	49.091	16.91	99.312	19.97
2A		802.11a/n	5260 - 5320	100.000	20.00	100.000	20.00	49.888	16.98	48.978	16.90	98.855	19.95
2C		802.11a/n	5500 - 5720	100.000	20.00	100.000	20.00	49.774	16.97	48.753	16.88	98.628	19.94
3		802.11a/n	5745 - 5825	125.893	21.00	125.893	21.00	124.451	20.95	125.893	21.00	248.886	23.96
1	40	802.11n	5190 - 5230	123.595	20.92	123.027	20.90	84.918	19.29	86.696	19.38	171.791	22.35
2A		802.11n	5270 - 5310	125.603	20.99	122.180	20.87	87.700	19.43	86.099	19.35	173.780	22.40
2C		802.11n	5510 - 5710	125.893	21.00	125.893	21.00	87.297	19.41	85.114	19.30	171.396	22.34
3		802.11n	5755 - 5795	125.893	21.00	125.893	21.00	122.744	20.89	125.603	20.99	247.172	23.93
1	80	802.11ac	5210	27.542	14.40	27.542	14.40	13.836	11.41	13.677	11.36	27.542	14.40
2A		802.11ac	5290	29.992	14.77	31.046	14.92	16.406	12.15	16.596	12.20	33.037	15.19
2C		802.11ac	5530 - 5690	121.899	20.86	125.893	21.00	100.000	20.00	100.000	20.00	199.986	23.01
3		802.11ac	5775	79.433	19.00	78.705	18.96	68.391	18.35	66.834	18.25	135.207	21.31
1	20	802.11ax (SU)	5180 - 5240	100.000	20.00	98.401	19.93	48.753	16.88	48.865	16.89	97.724	19.90
2A		802.11ax (SU)	5260 - 5320	99.083	19.96	99.083	19.96	50.003	16.99	49.091	16.91	99.083	19.96
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	100.000	20.00	49.888	16.98	50.003	16.99	100.000	20.00
3		802.11ax (SU)	5745 - 5825	125.893	21.00	125.893	21.00	121.619	20.85	124.738	20.96	246.604	23.92
1	40	802.11ax (SU)	5190 - 5230	123.880	20.93	122.180	20.87	89.125	19.50	89.125	19.50	178.238	22.51
2A		802.11ax (SU)	5270 - 5310	117.761	20.71	118.850	20.75	84.918	19.29	89.125	19.50	174.181	22.41
2C		802.11ax (SU)	5510 - 5710	125.893	21.00	125.603	20.99	89.125	19.50	87.096	19.40	176.198	22.46
3		802.11ax (SU)	5755 - 5795	124.451	20.95	124.738	20.96	121.339	20.84	123.880	20.93	244.343	23.88
1	80	802.11ax (SU)	5210	19.724	12.95	19.099	12.81	11.169	10.48	10.990	10.41	22.182	13.46
2A		802.11ax (SU)	5290	24.491	13.89	23.442	13.70	14.322	11.56	14.256	11.54	28.576	14.56
2C		802.11ax (SU)	5530 - 5690	125.893	21.00	124.451	20.95	98.855	19.95	93.972	19.73	192.752	22.85
3		802.11ax (SU)	5775	66.834	18.25	65.313	18.15	54.954	17.40	54.954	17.40	109.901	20.41

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	31.405	14.97	31.405	14.97	16.749	12.24	16.711	12.23	33.497	15.25
2A		802.11a/n	5260 - 5320	100.000	20.00	100.000	20.00	49.888	16.98	48.978	16.90	98.855	19.95
2C		802.11a/n	5500 - 5720	100.000	20.00	100.000	20.00	49.774	16.97	48.753	16.88	98.855	19.95
3		802.11a/n	5745 - 5825	125.893	21.00	125.893	21.00	124.451	20.95	125.893	21.00	248.886	23.96
1	40	802.11n	5190 - 5230	54.325	17.35	54.702	17.38	28.184	14.50	28.576	14.56	56.754	17.54
2A		802.11n	5270 - 5310	125.603	20.99	122.180	20.87	87.700	19.43	86.099	19.35	173.780	22.40
2C		802.11n	5510 - 5710	125.314	20.98	125.893	21.00	85.704	19.33	85.114	19.30	171.002	22.33
3		802.11n	5755 - 5795	125.893	21.00	125.893	21.00	122.744	20.89	125.603	20.99	247.172	23.93
1	80	802.11ac	5210	27.542	14.40	27.542	14.40	13.836	11.41	13.677	11.36	27.542	14.40
2A		802.11ac	5290	29.992	14.77	31.046	14.92	16.406	12.15	16.596	12.20	33.037	15.19
2C		802.11ac	5530 - 5690	121.899	20.86	125.893	21.00	100.000	20.00	100.000	20.00	199.986	23.01
3		802.11ac	5775	79.433	19.00	78.705	18.96	68.391	18.35	66.834	18.25	135.207	21.31
1	20	802.11ax (SU)	5180 - 5240	31.623	15.00	31.623	15.00	16.788	12.25	16.672	12.22	33.266	15.22
2A		802.11ax (SU)	5260 - 5320	99.083	19.96	99.083	19.96	50.003	16.99	49.091	16.91	99.083	19.96
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	100.000	20.00	49.888	16.98	50.003	16.99	100.000	20.00
3		802.11ax (SU)	5745 - 5825	125.893	21.00	125.893	21.00	121.619	20.85	124.738	20.96	246.604	23.92
1	40	802.11ax (SU)	5190 - 5230	54.075	17.33	55.590	17.45	29.309	14.67	29.717	14.73	59.020	17.71
2A		802.11ax (SU)	5270 - 5310	117.761	20.71	118.850	20.75	84.918	19.29	89.125	19.50	174.181	22.41
2C		802.11ax (SU)	5510 - 5710	125.893	21.00	125.603	20.99	84.333	19.26	86.099	19.35	170.608	22.32
3		802.11ax (SU)	5755 - 5795	124.451	20.95	124.738	20.96	121.339	20.84	123.880	20.93	244.343	23.88
1	80	802.11ax (SU)	5210	19.724	12.95	19.099	12.81	11.169	10.48	10.990	10.41	22.182	13.46
2A		802.11ax (SU)	5290	24.491	13.89	23.442	13.70	14.322	11.56	14.256	11.54	28.576	14.56
2C		802.11ax (SU)	5530 - 5690	125.893	21.00	124.451	20.95	98.855	19.95	93.972	19.73	192.752	22.85
3		802.11ax (SU)	5775	66.834	18.25	65.313	18.15	54.954	17.40	54.954	17.40	109.901	20.41

ISED EUT Overview (Low Data Rate)

FCC ID: BCGA2588 IC: 579C-A2588		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	100.000	20.00	100.000	20.00	50.119	17.00	48.978	16.90	99.083	19.96
2A		802.11a/n	5260 - 5320	99.770	19.99	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5720	100.000	20.00	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	125.893	21.00	125.893	21.00	125.893	21.00	125.893	21.00	251.768	24.01
1	40	802.11n	5190 - 5230	125.893	21.00	123.880	20.93	88.716	19.48	88.105	19.45	177.011	22.48
2A		802.11n	5270 - 5310	155.955	21.93	122.462	20.88	88.105	19.45	89.125	19.50	177.419	22.49
2C		802.11n	5510 - 5710	125.026	20.97	125.893	21.00	89.125	19.50	87.700	19.43	177.011	22.48
3		802.11n	5755 - 5795	125.026	20.97	125.893	21.00	125.893	21.00	125.893	21.00	251.768	24.01
1	80	802.11ac	5210	21.878	13.40	21.878	13.40	11.298	10.53	11.803	10.72	23.121	13.64
2A		802.11ac	5290	25.119	14.00	25.061	13.99	14.962	11.75	14.962	11.75	29.923	14.76
2C		802.11ac	5530 - 5690	121.619	20.85	125.893	21.00	97.499	19.89	100.000	20.00	197.697	22.96
3		802.11ac	5775	66.374	18.22	65.464	18.16	58.210	17.65	59.156	17.72	117.490	20.70
1	20	802.11ax (SU)	5180 - 5240	98.175	19.92	97.724	19.90	50.119	17.00	50.119	17.00	100.231	20.01
2A		802.11ax (SU)	5260 - 5320	100.000	20.00	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	99.083	19.96	99.083	19.96	50.003	16.99	50.119	17.00	100.231	20.01
3		802.11ax (SU)	5745 - 5825	121.619	20.85	125.893	21.00	122.462	20.88	125.893	21.00	247.742	23.94
1	40	802.11ax (SU)	5190 - 5230	123.880	20.93	123.027	20.90	89.125	19.50	89.125	19.50	178.238	22.51
2A		802.11ax (SU)	5270 - 5310	101.625	20.07	104.713	20.20	87.096	19.40	88.105	19.45	175.388	22.44
2C		802.11ax (SU)	5510 - 5710	125.314	20.98	125.893	21.00	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11ax (SU)	5755 - 5795	125.893	21.00	124.451	20.95	125.893	21.00	125.893	21.00	251.768	24.01
1	80	802.11ax (SU)	5210	17.539	12.44	17.620	12.46	9.863	9.94	9.750	9.89	19.634	12.93
2A		802.11ax (SU)	5290	19.907	12.99	19.275	12.85	12.735	11.05	13.032	11.15	25.763	14.11
2C		802.11ax (SU)	5530 - 5690	120.226	20.80	122.462	20.88	97.275	19.88	96.605	19.85	194.089	22.88
3		802.11ax (SU)	5775	56.105	17.49	54.954	17.40	50.119	17.00	50.119	17.00	100.231	20.01

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	31.623	15.00	31.623	15.00	16.749	12.24	16.788	12.25	33.574	15.26
2A		802.11a/n	5260 - 5320	99.770	19.99	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5720	100.000	20.00	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	125.893	21.00	125.893	21.00	125.893	21.00	125.893	21.00	251.768	24.01
1	40	802.11n	5190 - 5230	55.590	17.45	56.105	17.49	29.854	14.75	29.648	14.72	59.566	17.75
2A		802.11n	5270 - 5310	155.955	21.93	122.462	20.88	88.105	19.45	89.125	19.50	177.419	22.49
2C		802.11n	5510 - 5710	123.027	20.90	124.738	20.96	89.125	19.50	87.700	19.43	177.011	22.48
3		802.11n	5755 - 5795	125.026	20.97	125.893	21.00	125.893	21.00	125.893	21.00	251.768	24.01
1	80	802.11ac	5210	21.878	13.40	21.878	13.40	11.298	10.53	11.803	10.72	23.121	13.64
2A		802.11ac	5290	25.119	14.00	25.061	13.99	14.962	11.75	14.962	11.75	29.923	14.76
2C		802.11ac	5530 - 5690	121.619	20.85	125.893	21.00	97.499	19.89	100.000	20.00	197.697	22.96
3		802.11ac	5775	66.374	18.22	65.464	18.16	58.210	17.65	59.156	17.72	117.490	20.70
1	20	802.11ax (SU)	5180 - 5240	31.550	14.99	31.550	14.99	16.788	12.25	16.788	12.25	33.574	15.26
2A		802.11ax (SU)	5260 - 5320	100.000	20.00	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	99.083	19.96	99.083	19.96	49.545	16.95	50.119	17.00	99.770	19.99
3		802.11ax (SU)	5745 - 5825	121.619	20.85	125.893	21.00	122.462	20.88	125.893	21.00	247.742	23.94
1	40	802.11ax (SU)	5190 - 5230	56.105	17.49	56.234	17.50	29.242	14.66	29.648	14.72	58.884	17.70
2A		802.11ax (SU)	5270 - 5310	101.625	20.07	104.713	20.20	87.096	19.40	88.105	19.45	175.388	22.44
2C		802.11ax (SU)	5510 - 5710	123.880	20.93	125.314	20.98	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11ax (SU)	5755 - 5795	125.893	21.00	124.451	20.95	125.893	21.00	125.893	21.00	251.768	24.01
1	80	802.11ax (SU)	5210	17.539	12.44	17.620	12.46	9.863	9.94	9.750	9.89	19.634	12.93
2A		802.11ax (SU)	5290	19.907	12.99	19.275	12.85	12.735	11.05	13.032	11.15	25.763	14.11
2C		802.11ax (SU)	5530 - 5690	120.226	20.80	122.462	20.88	97.275	19.88	96.605	19.85	194.089	22.88
3		802.11ax (SU)	5775	56.105	17.49	54.954	17.40	50.119	17.00	50.119	17.00	100.231	20.01

ISED EUT Overview (Mid Data Rate)

FCC ID: BCGA2588 IC: 579C-A2588		 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG		Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 4 of 352

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	99.312	19.97	98.175	19.92	50.119	17.00	50.119	17.00	100.231	20.01
2A		802.11a/n	5260 - 5320	100.000	20.00	97.724	19.90	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5720	99.541	19.98	99.312	19.97	50.119	17.00	50.003	16.99	100.000	20.00
3		802.11a/n	5745 - 5825	125.603	20.99	125.893	21.00	125.603	20.99	125.026	20.97	250.611	23.99
1	40	802.11n	5190 - 5230	119.399	20.77	124.738	20.96	87.902	19.44	87.700	19.43	175.792	22.45
2A		802.11n	5270 - 5310	104.954	20.21	104.232	20.18	80.910	19.08	84.140	19.25	165.196	22.18
2C		802.11n	5510 - 5710	124.738	20.96	125.026	20.97	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	125.603	20.99	125.314	20.98	125.893	21.00	125.893	21.00	251.768	24.01
1	80	802.11ac	5210	17.418	12.41	17.579	12.45	9.705	9.87	9.727	9.88	19.454	12.89
2A		802.11ac	5290	19.724	12.95	18.923	12.77	12.023	10.80	12.218	10.87	24.266	13.85
2C		802.11ac	5530 - 5690	123.595	20.92	125.026	20.97	100.000	20.00	97.724	19.90	197.697	22.96
3		802.11ac	5775	54.450	17.36	55.976	17.48	53.088	17.25	51.880	17.15	104.954	20.21
1	20	802.11ax (SU)	5180 - 5240	100.000	20.00	98.175	19.92	50.119	17.00	50.119	17.00	100.231	20.01
2A		802.11ax (SU)	5260 - 5320	99.541	19.98	98.855	19.95	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	100.000	20.00	100.000	20.00	49.317	16.93	50.119	17.00	99.083	19.96
3		802.11ax (SU)	5745 - 5825	125.603	20.99	125.603	20.99	125.893	21.00	122.180	20.87	248.313	23.95
1	40	802.11ax (SU)	5190 - 5230	99.770	19.99	97.051	19.87	78.343	18.94	79.433	19.00	157.761	21.98
2A		802.11ax (SU)	5270 - 5310	97.499	19.89	96.161	19.83	79.433	19.00	77.625	18.90	157.036	21.96
2C		802.11ax (SU)	5510 - 5710	125.603	20.99	121.899	20.86	89.125	19.50	89.125	19.50	177.419	22.49
3		802.11ax (SU)	5755 - 5795	125.603	20.99	124.165	20.94	124.738	20.96	124.165	20.94	248.886	23.96
1	80	802.11ax (SU)	5210	14.125	11.50	14.060	11.48	7.516	8.76	7.925	8.99	15.453	11.89
2A		802.11ax (SU)	5290	17.783	12.50	17.100	12.33	11.220	10.50	11.220	10.50	22.439	13.51
2C		802.11ax (SU)	5530 - 5690	125.314	20.98	119.950	20.79	100.000	20.00	100.000	20.00	199.986	23.01
3		802.11ax (SU)	5775	45.814	16.61	44.875	16.52	39.811	16.00	38.905	15.90	78.705	18.96

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	31.550	14.99	31.550	14.99	16.788	12.25	16.672	12.22	33.266	15.22
2A		802.11a/n	5260 - 5320	100.000	20.00	97.724	19.90	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5720	99.541	19.98	99.312	19.97	50.119	17.00	50.003	16.99	100.000	20.00
3		802.11a/n	5745 - 5825	125.603	20.99	125.893	21.00	125.603	20.99	125.026	20.97	250.611	23.99
1	40	802.11n	5190 - 5230	55.719	17.46	54.954	17.40	28.840	14.60	29.040	14.63	57.943	17.63
2A		802.11n	5270 - 5310	104.954	20.21	104.232	20.18	80.910	19.08	84.140	19.25	165.196	22.18
2C		802.11n	5510 - 5710	122.744	20.89	117.761	20.71	89.125	19.50	89.125	19.50	178.238	22.51
3		802.11n	5755 - 5795	125.603	20.99	125.314	20.98	125.893	21.00	125.893	21.00	251.768	24.01
1	80	802.11ac	5210	17.418	12.41	17.579	12.45	9.705	9.87	9.727	9.88	19.454	12.89
2A		802.11ac	5290	19.724	12.95	18.923	12.77	12.023	10.80	12.218	10.87	24.266	13.85
2C		802.11ac	5530 - 5690	123.595	20.92	125.026	20.97	100.000	20.00	97.724	19.90	197.697	22.96
3		802.11ac	5775	54.450	17.36	55.976	17.48	53.088	17.25	51.880	17.15	104.954	20.21
1	20	802.11ax (SU)	5180 - 5240	31.623	15.00	31.333	14.96	16.672	12.22	16.672	12.22	33.266	15.22
2A		802.11ax (SU)	5260 - 5320	99.541	19.98	98.855	19.95	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	99.770	19.99	100.000	20.00	49.317	16.93	50.119	17.00	99.083	19.96
3		802.11ax (SU)	5745 - 5825	125.603	20.99	125.603	20.99	125.893	21.00	122.180	20.87	248.313	23.95
1	40	802.11ax (SU)	5190 - 5230	54.200	17.34	54.325	17.35	28.576	14.56	29.854	14.75	58.479	17.67
2A		802.11ax (SU)	5270 - 5310	97.499	19.89	96.161	19.83	79.433	19.00	77.625	18.90	157.036	21.96
2C		802.11ax (SU)	5510 - 5710	121.339	20.84	121.899	20.86	86.099	19.35	89.125	19.50	175.388	22.44
3		802.11ax (SU)	5755 - 5795	125.603	20.99	124.165	20.94	124.738	20.96	124.165	20.94	248.886	23.96
1	80	802.11ax (SU)	5210	14.125	11.50	14.060	11.48	7.516	8.76	7.925	8.99	15.453	11.89
2A		802.11ax (SU)	5290	17.783	12.50	17.100	12.33	11.220	10.50	11.220	10.50	22.439	13.51
2C		802.11ax (SU)	5530 - 5690	125.314	20.98	119.950	20.79	100.000	20.00	100.000	20.00	199.986	23.01
3		802.11ax (SU)	5775	45.814	16.61	44.875	16.52	39.811	16.00	38.905	15.90	78.705	18.96

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 PCTEST Test Location

These measurement tests were conducted at the PCTEST 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 PCTEST located in Morgan Hill, CA 95037, U.S.A.

- PCTEST 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.
- PCTEST 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 ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2588** and **IC: 579C-A2588**. 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.: NCFV4L6Y4H, YV7N92V42X, K12KX00LWH, DLX1462002114D21F

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), WPT.

This device supports BT Beamforming

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

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

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

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

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

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

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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)	99.0	99.1	99.1
	a (Mid Rate)	96.9	96.6	96.9
	a (High Rate)	94.2	94.4	94.2
	n (HT20) (Low Rate)	99.0	98.6	98.0
	n (HT20) (Mid Rate)	97.0	96.3	92.5
	n (HT20) (High Rate)	92.6	93.2	88.6
	ax(SU) (HT20 Low Rate)	98.6	98.5	98.5
	ax(SU) (HT20 Mid Rate)	94.8	95.2	94.2
	ax(SU) (HT20 High Rate)	91.9	91.8	91.9
	n (HT40 Low Rate)	97.7	97.9	96.2
	n (HT40 Mid Rate)	92.5	92.7	88.2
	n (HT40 High Rate)	88.1	88.8	83.6
	ax(SU) (HT40 Low Rate)	97.3	97.3	97.4
	ax(SU) (HT40 Mid Rate)	92.6	92.8	92.1
	ax(SU) (HT40 High Rate)	88.3	88.3	88.2
	ac (HT80 Low Rate)	95.5	95.4	92.3
	ac (HT80 Mid Rate)	87.1	86.7	81.2
	ac (HT80 High Rate)	82.7	82.2	76.8
	ax(SU) (HT80 Low Rate)	94.9	94.7	94.7
	ax(SU) (HT80 Mid Rate)	86.6	87.2	87.0
	ax(SU) (HT80 High Rate)	83.3	83.5	82.6

Table 2-4. Measured Duty Cycles

FCC ID: BCGA2588 IC: 579C-A2588	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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2. The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna 1	Antenna 2	Antenna 1	Antenna 2	Antenna 1	Antenna 2	Antenna 1	Antenna 2
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓

Table 2-5. WIFI Configurations

✓ = Support ; ✗ = NOT Support

SISO = Single Input Single Output

SDM = Spatial Diversity Multiplexing – MIMO function

CDD = Cyclic Delay Diversity - 2Tx Function

STBC = Space-Time Block Coding – 2Tx Function

Data Rate(s) Tested: 6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)

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

13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150Mbps (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 Mbps (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 Mbps (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, 271/286.8Mbps (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, 567/600.5Mbps (ax – 80MHz BW)

16/17.2, 33/34.4, 48/51.6, 66/68.8, 73/77.4, 98/103.2, 130/137.6, 146/154.8, 162/172, 196/206.4, 216/229.4, 244/258, 270/286.8Mbps (MIMO ax – 20MHz)

32/34.4, 66/68.8, 98/103.2, 130/137.6, 196/206.4, 260/275.3, 292/309.7, 326/344.1, 390/412.9, 434/458.8, 488/516.2, 540/573.5Mbps (MIMO ax – 40MHz BW)

68/72.1, 136/144.1, 204/216.2, 272/288.2, 408/432.4, 574/576.5, 612/648.5, 680/720.6, 816/864.7, 906/960.8, 1020/1080.9, 1134/1201Mbps (MIMO ax – 80MHz BW)

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

Antenna	Simultaneous Tx Config	Bluetooth	UNII
		BDR, EDR, HDR4/8, LE1M/2M	802.11 a/n/ac/ax
WF8	Config 1	✓	✓

Table 2-6. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

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Note:

Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. 2.4 GHz WLAN Antenna WF8 can only transmit simultaneously with 2.4GHz Bluetooth Antenna WF7b. In this scenario Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Regulatory max cap) power.

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	4.0
5.250 – 5.350	3.4	3.1
5.470 – 5.725	3.9	4.0
5.725 – 5.850	3.7	1.2

Table 2-7. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook Pro w/AC/DC Adapter	Model: A2141 Model: A2166	S/N: C02DV7VKMD6T S/N: N/A
2	Apple USB-C Cable	Model: Chimp	S/N: 420A57
3	Apple USB-C Cable	Model: Spartan	S/N: 000MKTR02U
4	USB-C Cable w/ AC Adapter	Model: A146 Model: A2305	S/N: N/A S/N: N/A
5	Apple Pencil	Model: N/A	S/N: GQXGSXBJKM9
6	DC Power Supply	Model: KPS3010D	S/N: N/A

Table 2-8. Test Support Equipment List

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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: 18Mbps
 - High Data Rate: 36Mbps
- 802.11n HT20/40:
 - Low Data Rate: MCS0/MCS8 (SISO/CDD)
 - Mid Data Rate: MCS3/MCS11 (SISO/CDD)
 - High Data Rate: MCS5/MCS13 (SISO/CDD)
- 802.11ac VHT80:
 - Low Data Rate: MCS0
 - Mid Data Rate: MCS3
 - High Data Rate: MCS5
- 802.11ax(SU) HE20/HE40/HE80:
 - Low Data Rate: MCS0
 - Mid Data Rate: MCS3
 - High Data Rate: MCS5

Notes:

For 802.11ax-RU test result, see separate UNII 802.11ax (OFDMA) report, 1C2111150078-08.BCG

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Worst Case Configuration: Antenna WF8 is simultaneously transmitting both 2.4GHz and 5GHz mode.

Description	Bluetooth	UNII
Antenna	Antenna WF8	Antenna WF8
Channel	19	36
Operating Frequency (MHz)	2440	5180
Data Rate (Mbps)	1.0	MCS0
Mode/Modulation	LE1M ePA	11n

Table 2-9. Worst Case Simultaneous Transmission Configuration

2.6 Software and Firmware

The test was conducted with firmware version 19E11500Q 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 D01 v01r01, 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	1.65
Line Conducted Disturbance	2.75
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (30MHz - 1GHz)	4.30
Radiated Disturbance (1 - 18GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

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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	3/31/2021	Annual	3/31/2022	MY49430244
Anritsu	ML2496A	Power Meter	11/29/2021	Annual	11/29/2022	184005
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	8/13/2021	Annual	8/13/2022	T058701-01
Com-Power Corporation	LIN-120A	Line Impedance Stabilization Network (LISN)	3/29/2021	Annual	3/29/2022	241297
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
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz-6GHz)	1/6/2022	Annual	1/6/2023	102328
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz-18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz-40GHz)	4/29/2021	Annual	4/29/2022	100051
Rohde & Schwarz	ESW26	EMI Test Receiver	6/11/2021	Annual	6/11/2022	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/5/2021	Annual	4/5/2022	100519
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/16/2021	Annual	3/16/2022	101619
Rohde & Schwarz	FSVA3044	Signal Analyzer (up to 44 GHz)	4/26/2021	Annual	4/26/2022	101098

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: BCGA2588
IC: 579C-A2588
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 (1C21111500 78-06.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

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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 PCTEST “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 PCTEST “Chamber Automation,” Version 1.3.2.
- 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 $\geq 3 \times$ 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.

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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)	17.83	21.11
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	17.73	20.87
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	17.81	21.08
	5180	36	ax (SU) (20MHz)	8/8.6 (MCS0)	19.11	22.53
	5200	40	ax (SU) (20MHz)	8/8.6 (MCS0)	19.08	21.28
	5240	48	ax (SU) (20MHz)	8/8.6 (MCS0)	19.14	21.38
	5190	38	n (40MHz)	13.5/15 (MCS0)	36.77	43.97
	5230	46	n (40MHz)	13.5/15 (MCS0)	36.35	41.27
	5190	38	ax (SU) (40MHz)	16/17.2 (MCS0)	38.06	42.81
	5230	46	ax (SU) (40MHz)	16/17.2 (MCS0)	38.03	41.39
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	75.83	81.72
	5210	42	ax (SU) (80MHz)	34/36 (MCS0)	77.32	83.02
Band 2A	5260	52	n (20MHz)	6.5/7.2 (MCS0)	17.78	21.10
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	17.78	21.07
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	17.87	21.48
	5260	52	ax (SU) (20MHz)	8/8.6 (MCS0)	19.11	21.65
	5280	56	ax (SU) (20MHz)	8/8.6 (MCS0)	19.05	21.30
	5320	64	ax (SU) (20MHz)	8/8.6 (MCS0)	19.15	25.98
	5270	54	n (40MHz)	13.5/15 (MCS0)	36.40	41.41
	5310	62	n (40MHz)	13.5/15 (MCS0)	36.69	44.52
	5270	54	ax (SU) (40MHz)	16/17.2 (MCS0)	38.04	41.58
	5310	62	ax (SU) (40MHz)	16/17.2 (MCS0)	38.05	42.60
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	75.54	84.29
	5290	58	ax (SU) (80MHz)	34/36 (MCS0)	77.30	83.32
Band 2C	5500	100	n (20MHz)	6.5/7.2 (MCS0)	17.88	22.37
	5580	116	n (20MHz)	6.5/7.2 (MCS0)	17.81	21.22
	5720	144	n (20MHz)	6.5/7.2 (MCS0)	17.81	21.08
	5500	100	ax (SU) (20MHz)	8/8.6 (MCS0)	19.20	23.69
	5580	116	ax (SU) (20MHz)	8/8.6 (MCS0)	19.07	21.52
	5720	144	ax (SU) (20MHz)	8/8.6 (MCS0)	19.06	21.38
	5510	102	n (40MHz)	13.5/15 (MCS0)	36.89	43.90
	5550	110	n (40MHz)	13.5/15 (MCS0)	36.39	41.21
	5710	142	n (40MHz)	13.5/15 (MCS0)	36.46	41.67
	5510	102	ax (SU) (40MHz)	16/17.2 (MCS0)	38.04	42.48
	5550	110	ax (SU) (40MHz)	16/17.2 (MCS0)	37.97	41.73
	5710	142	ax (SU) (40MHz)	16/17.2 (MCS0)	38.03	41.42
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	75.69	83.50
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	75.61	81.52
	5530	106	ax (SU) (80MHz)	34/36 (MCS0)	77.43	87.44
	5690	138	ax (SU) (80MHz)	34/36 (MCS0)	77.30	82.57

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

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	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)	26/28.9 (MCS3)	17.76	20.85
	5200	40	n (20MHz)	26/28.9 (MCS3)	17.77	20.87
	5240	48	n (20MHz)	26/28.9 (MCS3)	17.74	20.77
	5180	36	ax (SU) (20MHz)	33/34.4 (MCS3)	19.09	22.42
	5200	40	ax (SU) (20MHz)	33/34.4 (MCS3)	19.06	21.36
	5240	48	ax (SU) (20MHz)	33/34.4 (MCS3)	19.07	21.53
	5190	38	n (40MHz)	54/60 (MCS3)	36.31	41.30
	5230	46	n (40MHz)	54/60 (MCS3)	36.38	41.40
	5190	38	ax (SU) (40MHz)	65/68.8 (MCS3)	38.00	47.85
	5230	46	ax (SU) (40MHz)	65/68.8 (MCS3)	38.03	41.73
	5210	42	ac (80MHz)	117/130 (MCS3)	75.54	81.10
	5210	42	ax (SU) (80MHz)	136/144.1 (MCS3)	77.25	81.68
Band 2A	5260	52	n (20MHz)	26/28.9 (MCS3)	17.81	20.86
	5280	56	n (20MHz)	26/28.9 (MCS3)	17.71	20.65
	5320	64	n (20MHz)	26/28.9 (MCS3)	17.77	20.94
	5260	52	ax (SU) (20MHz)	33/34.4 (MCS3)	19.00	21.22
	5280	56	ax (SU) (20MHz)	33/34.4 (MCS3)	19.06	21.41
	5320	64	ax (SU) (20MHz)	33/34.4 (MCS3)	19.07	21.60
	5270	54	n (40MHz)	54/60 (MCS3)	36.25	40.95
	5310	62	n (40MHz)	54/60 (MCS3)	36.30	42.41
	5270	54	ax (SU) (40MHz)	65/68.8 (MCS3)	38.02	41.47
	5310	62	ax (SU) (40MHz)	65/68.8 (MCS3)	38.14	52.93
	5290	58	ac (80MHz)	117/130 (MCS3)	75.54	81.77
	5290	58	ax (SU) (80MHz)	136/144.1 (MCS3)	77.26	81.88
Band 2C	5500	100	n (20MHz)	26/28.9 (MCS3)	17.77	21.36
	5580	116	n (20MHz)	26/28.9 (MCS3)	17.74	20.98
	5720	144	n (20MHz)	26/28.9 (MCS3)	17.74	20.98
	5500	100	ax (SU) (20MHz)	33/34.4 (MCS3)	19.09	22.46
	5580	116	ax (SU) (20MHz)	33/34.4 (MCS3)	19.05	21.25
	5720	144	ax (SU) (20MHz)	33/34.4 (MCS3)	19.05	21.24
	5510	102	n (40MHz)	54/60 (MCS3)	36.37	41.26
	5550	110	n (40MHz)	54/60 (MCS3)	36.21	40.90
	5710	142	n (40MHz)	54/60 (MCS3)	36.39	41.51
	5510	102	ax (SU) (40MHz)	65/68.8 (MCS3)	38.00	50.83
	5550	110	ax (SU) (40MHz)	65/68.8 (MCS3)	37.96	41.45
	5710	142	ax (SU) (40MHz)	65/68.8 (MCS3)	38.02	41.62
	5530	106	ac (80MHz)	117/130 (MCS3)	75.45	80.76
	5690	138	ac (80MHz)	117/130 (MCS3)	75.57	81.20
	5530	106	ax (SU) (80MHz)	136/144.1 (MCS3)	77.23	81.65
	5690	138	ax (SU) (80MHz)	136/144.1 (MCS3)	77.24	81.98

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

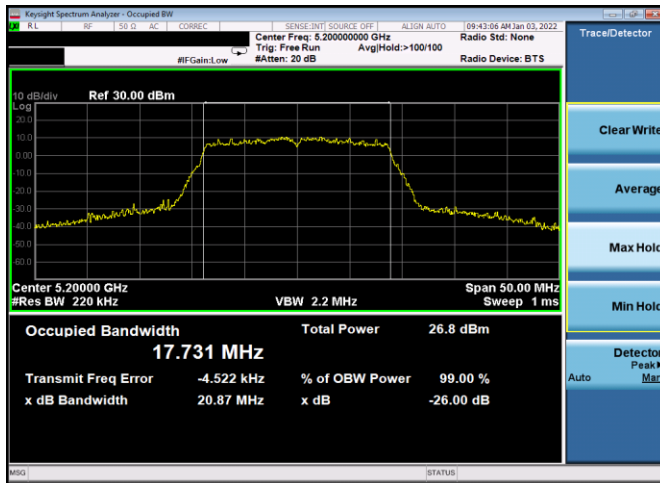
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	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	52/57.8 (MCS5)	17.83	21.03
	5200	40	n (20MHz)	52/57.8 (MCS5)	17.89	21.55
	5240	48	n (20MHz)	52/57.8 (MCS5)	17.87	21.64
	5180	36	ax (SU) (20MHz)	65/68.8 (MCS5)	19.02	21.30
	5200	40	ax (SU) (20MHz)	65/68.8 (MCS5)	19.11	21.46
	5240	48	ax (SU) (20MHz)	65/68.8 (MCS5)	19.11	21.35
	5190	38	n (40MHz)	108/120 (MCS5)	36.51	41.33
	5230	46	n (40MHz)	108/120 (MCS5)	36.93	52.69
	5190	38	ax (SU) (40MHz)	130/137.6 (MCS5)	37.97	41.42
	5230	46	ax (SU) (40MHz)	130/137.6 (MCS5)	38.09	49.87
	5210	42	ac (80MHz)	234/260 (MCS5)	75.95	81.62
	5210	42	ax (SU) (80MHz)	272/288.2 (MCS5)	77.27	81.60
Band 2A	5260	52	n (20MHz)	52/57.8 (MCS5)	17.88	21.28
	5280	56	n (20MHz)	52/57.8 (MCS5)	17.72	20.65
	5320	64	n (20MHz)	52/57.8 (MCS5)	17.85	20.98
	5260	52	ax (SU) (20MHz)	65/68.8 (MCS5)	19.11	21.87
	5280	56	ax (SU) (20MHz)	65/68.8 (MCS5)	19.10	21.57
	5320	64	ax (SU) (20MHz)	65/68.8 (MCS5)	19.07	21.27
	5270	54	n (40MHz)	108/120 (MCS5)	36.57	41.75
	5310	62	n (40MHz)	108/120 (MCS5)	36.50	41.43
	5270	54	ax (SU) (40MHz)	130/137.6 (MCS5)	37.98	41.35
	5310	62	ax (SU) (40MHz)	130/137.6 (MCS5)	37.95	41.25
	5290	58	ac (80MHz)	234/260 (MCS5)	75.79	81.44
	5290	58	ax (SU) (80MHz)	272/288.2 (MCS5)	77.26	81.43
Band 2C	5500	100	n (20MHz)	52/57.8 (MCS5)	17.81	21.02
	5580	116	n (20MHz)	52/57.8 (MCS5)	17.87	21.22
	5720	144	n (20MHz)	52/57.8 (MCS5)	17.85	21.16
	5500	100	ax (SU) (20MHz)	65/68.8 (MCS5)	19.05	21.20
	5580	116	ax (SU) (20MHz)	65/68.8 (MCS5)	19.06	21.38
	5720	144	ax (SU) (20MHz)	65/68.8 (MCS5)	19.03	21.33
	5510	102	n (40MHz)	108/120 (MCS5)	36.49	41.53
	5550	110	n (40MHz)	108/120 (MCS5)	36.52	41.43
	5710	142	n (40MHz)	108/120 (MCS5)	36.47	41.23
	5510	102	ax (SU) (40MHz)	130/137.6 (MCS5)	37.97	41.35
	5550	110	ax (SU) (40MHz)	130/137.6 (MCS5)	37.97	41.48
	5710	142	ax (SU) (40MHz)	130/137.6 (MCS5)	38.21	52.77
	5530	106	ac (80MHz)	234/260 (MCS5)	75.80	81.52
	5690	138	ac (80MHz)	234/260 (MCS5)	76.35	101.30
	5530	106	ax (SU) (80MHz)	272/288.2 (MCS5)	77.17	81.47
	5690	138	ax (SU) (80MHz)	272/288.2 (MCS5)	77.50	83.05

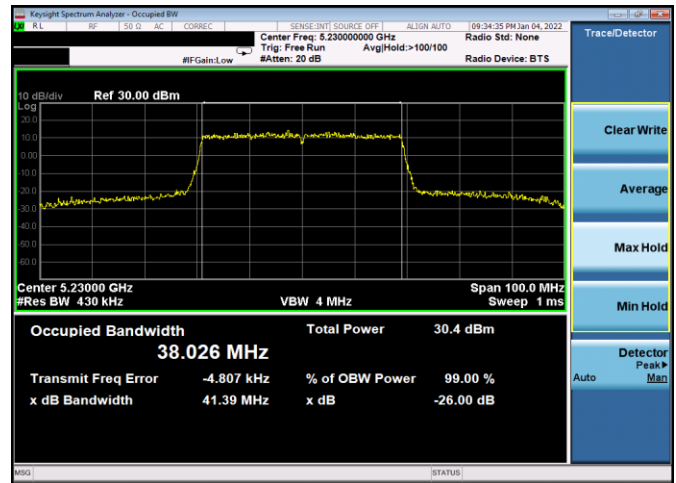
Table 7-4. Conducted Bandwidth Measurements Antenna WF8 (High Data Rate)

FCC ID: BCGA2588 IC: 579C-A2588	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 23 of 352

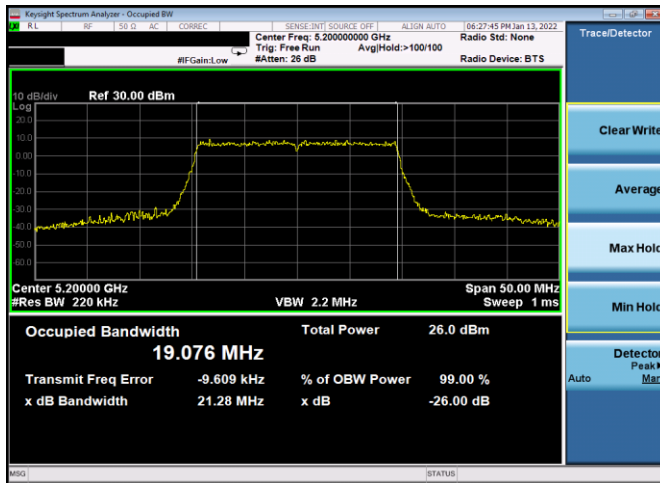
Low Data Rate



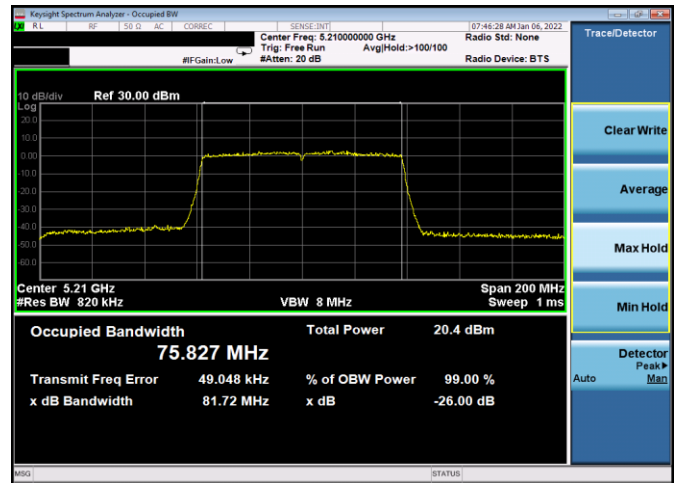
Plot 7-1. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS0)



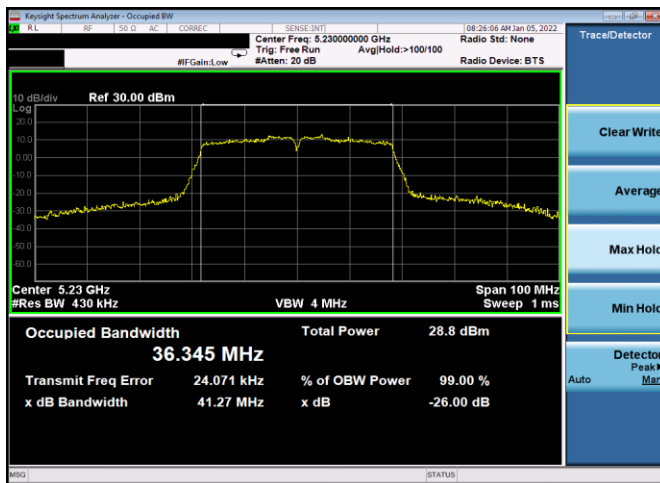
Plot 7-4. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS0)



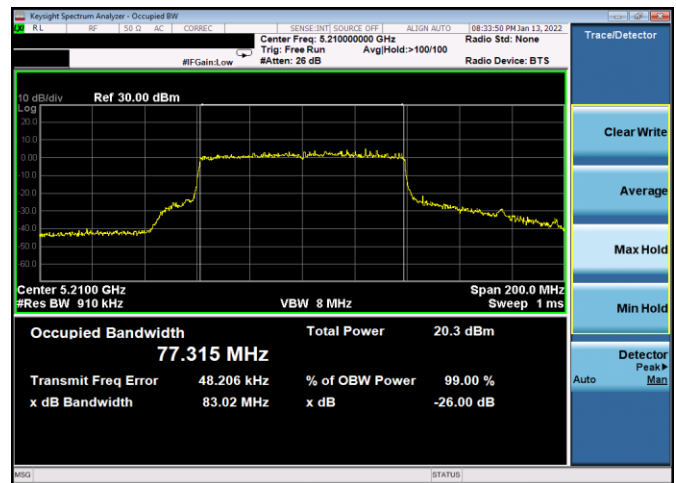
Plot 7-2. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS0)



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

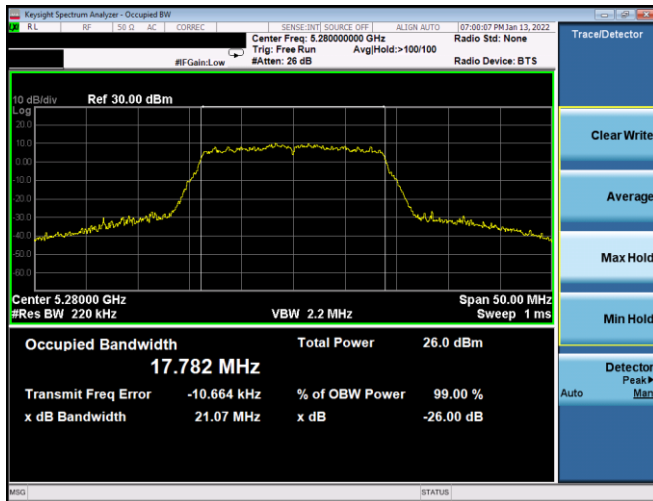


Plot 7-3. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS0)

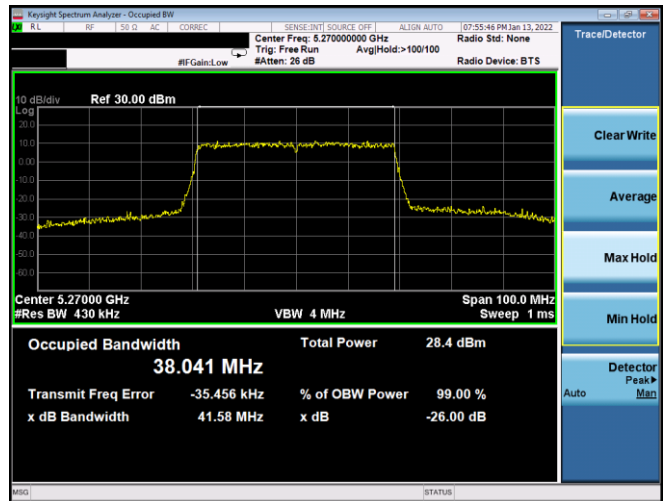


Plot 7-6. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS0)

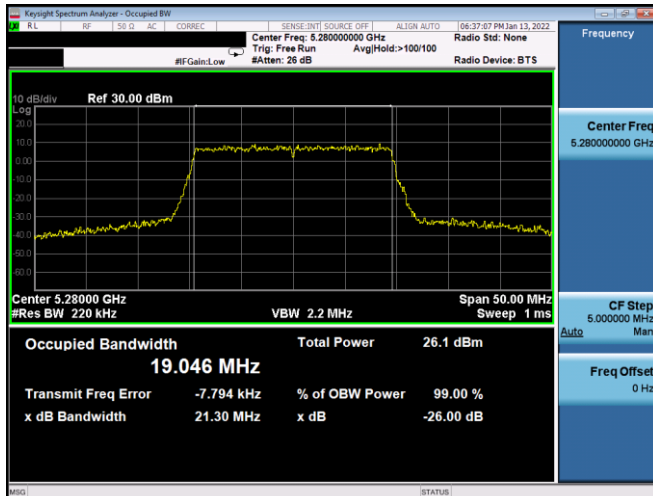
FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 24 of 352



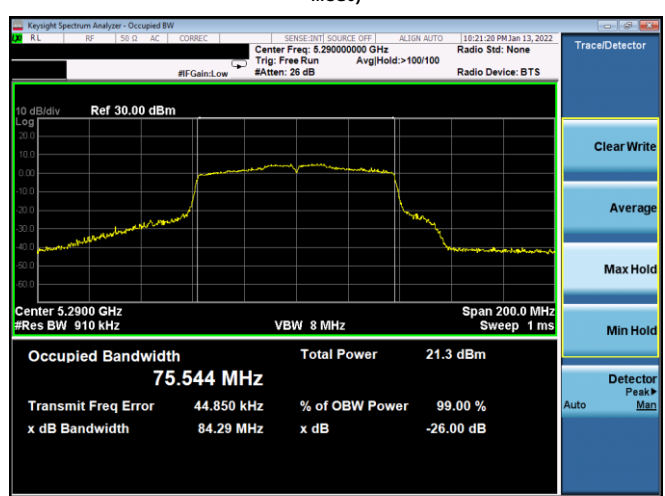
Plot 7-7. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 56, MCS0)



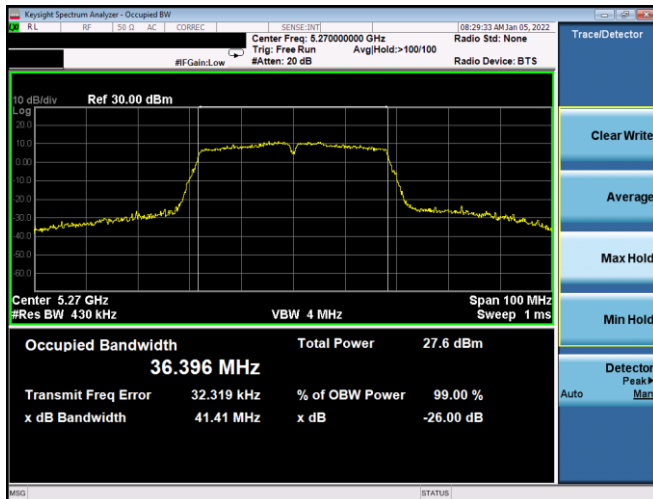
Plot 7-10. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS0)



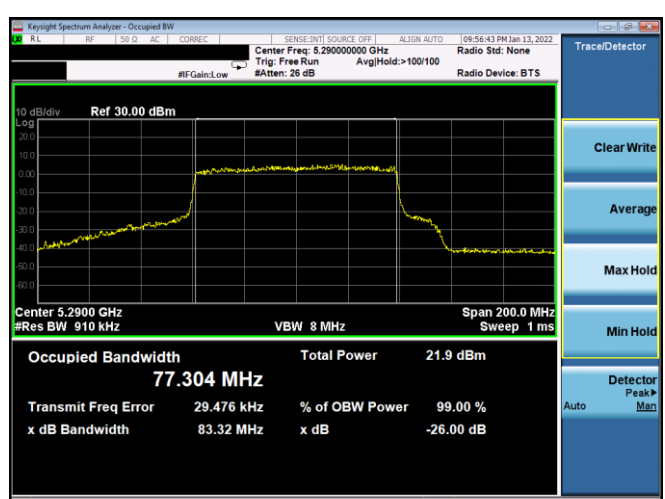
Plot 7-8. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 56, MCS0)



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

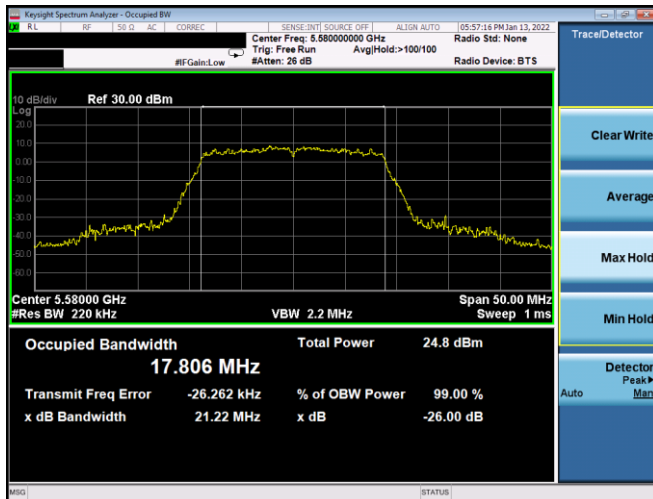


Plot 7-9. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS0)

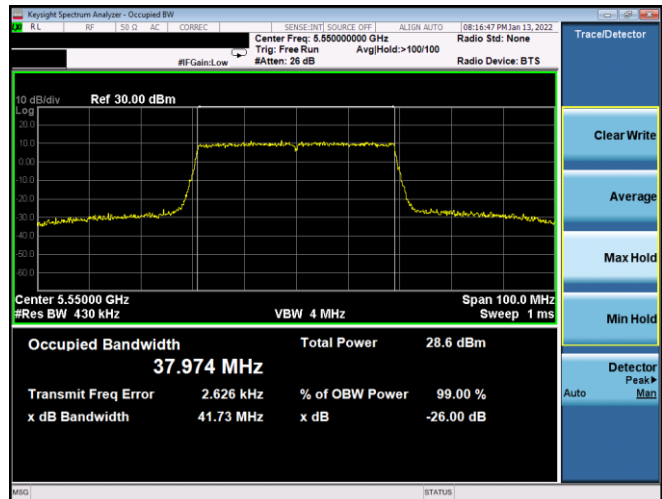


Plot 7-12. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS0)

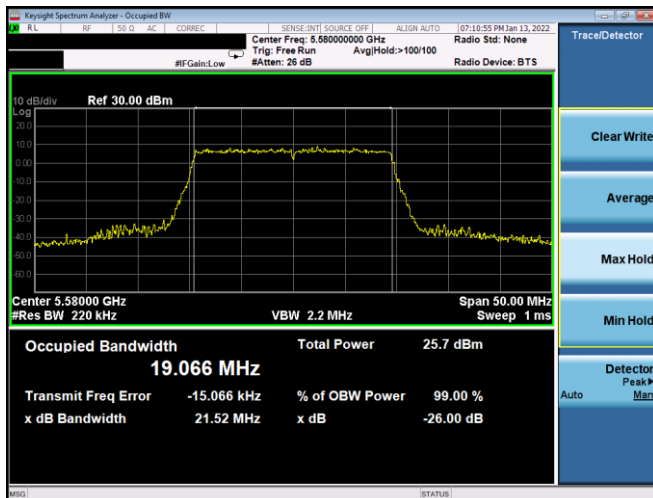
FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 25 of 352



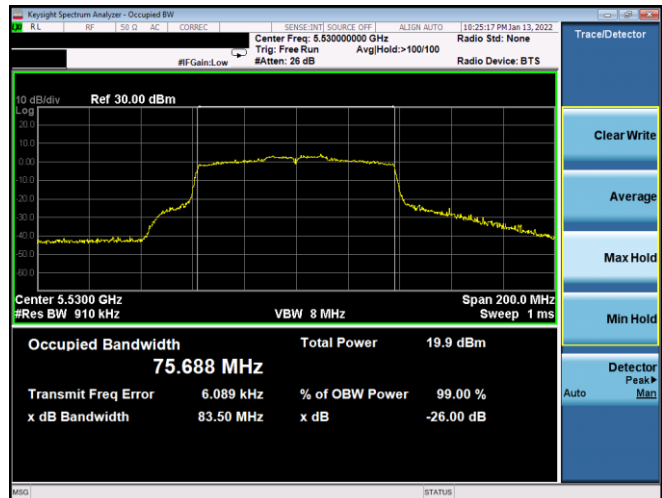
Plot 7-13. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS0)



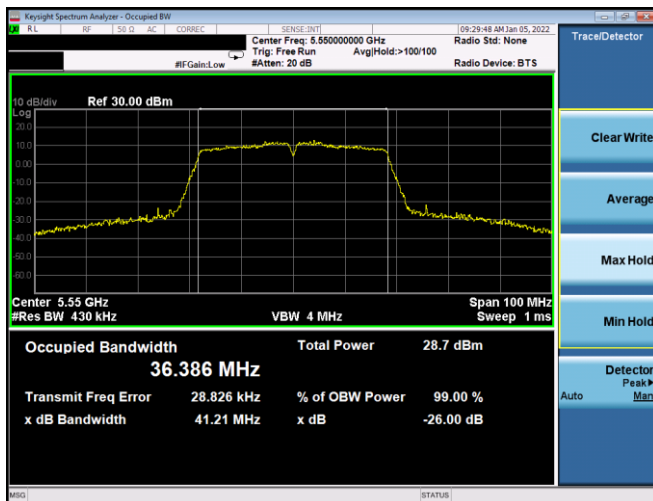
Plot 7-16. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS0)



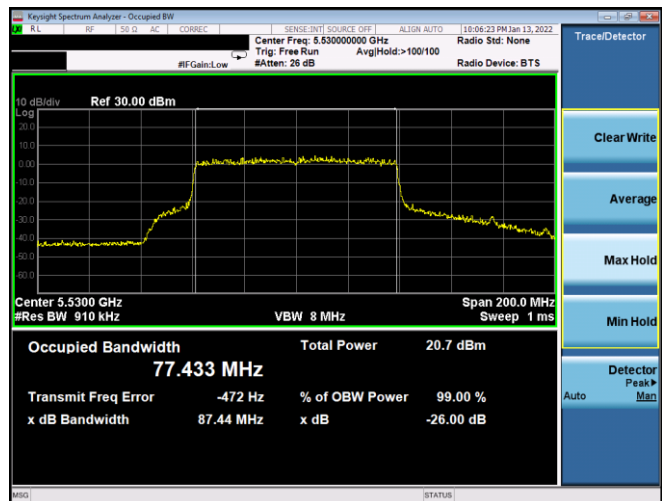
Plot 7-14. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS0)



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



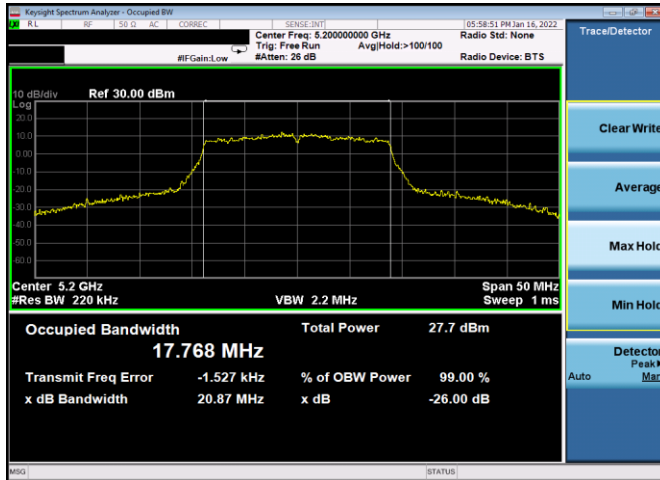
Plot 7-15. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110, MCS0)



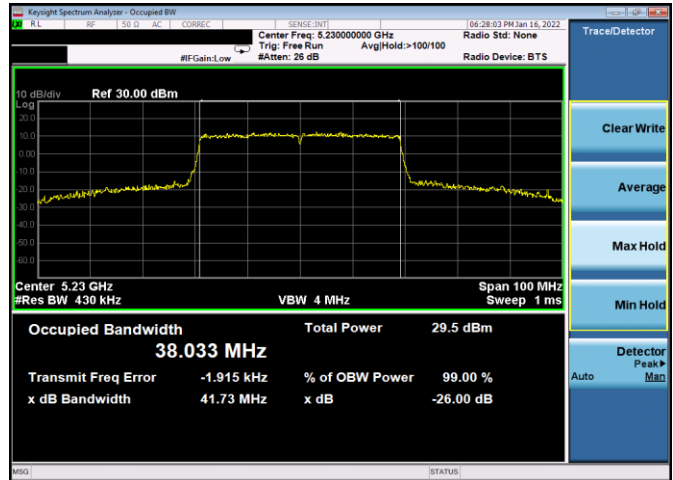
Plot 7-18. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS0)

FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 26 of 352

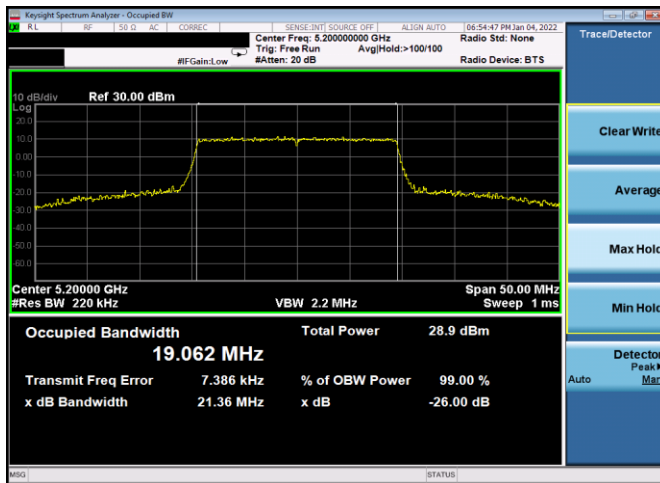
Mid Data Rate



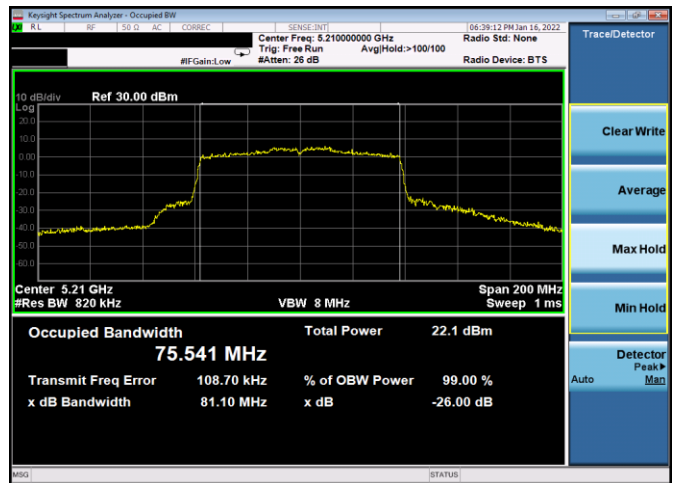
Plot 7-19. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS3)



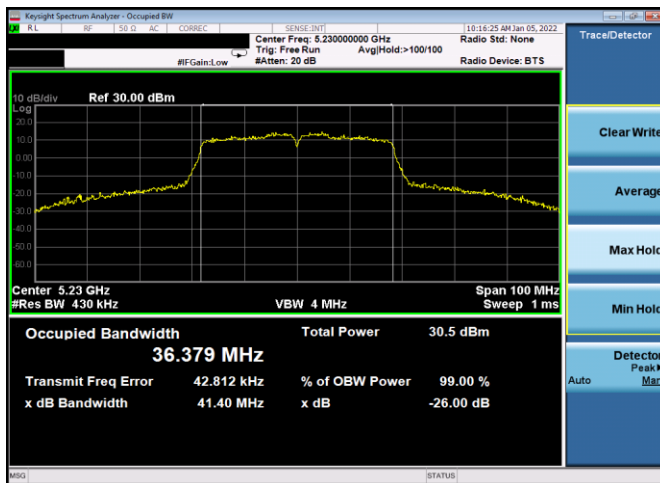
Plot 7-22. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS3)



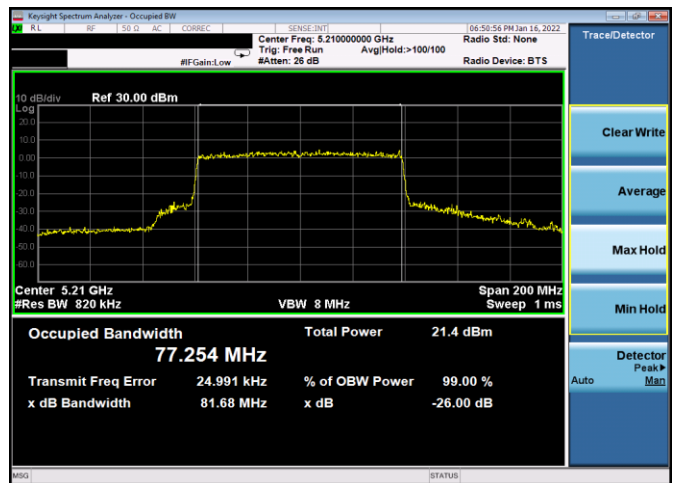
Plot 7-20. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS3)



Plot 7-23. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS3)



Plot 7-21. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS3)

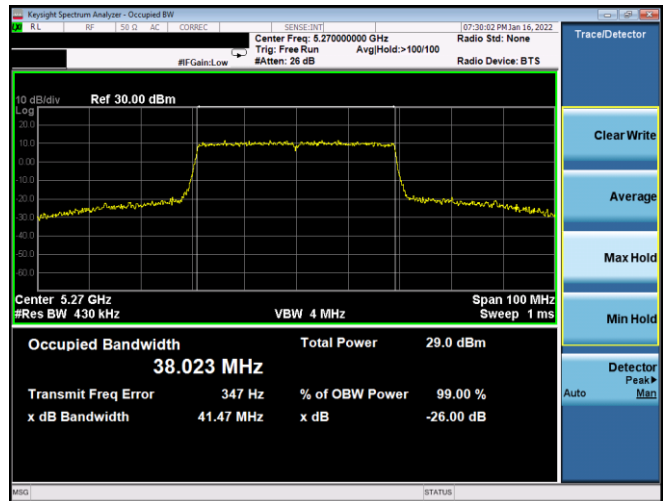


Plot 7-24. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS3)

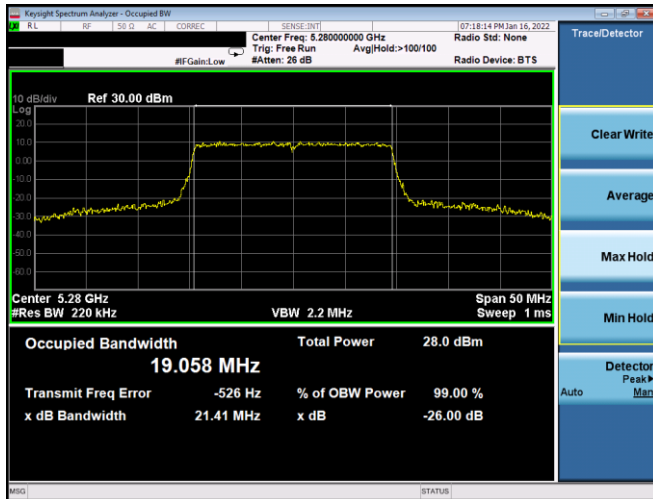
FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 27 of 352



Plot 7-25. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 56, MCS3)



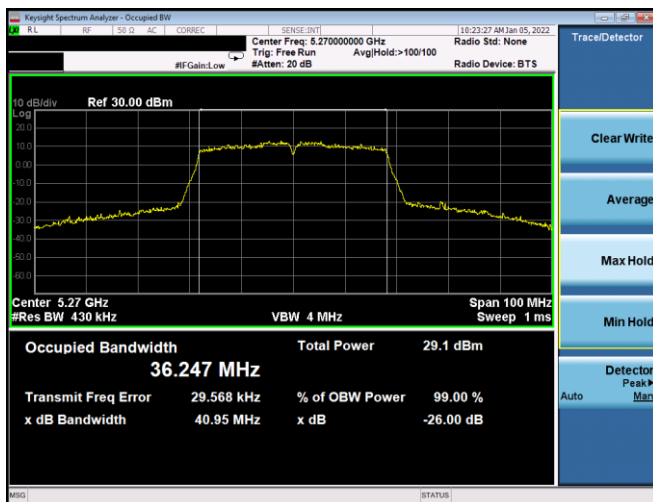
Plot 7-28. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS3)



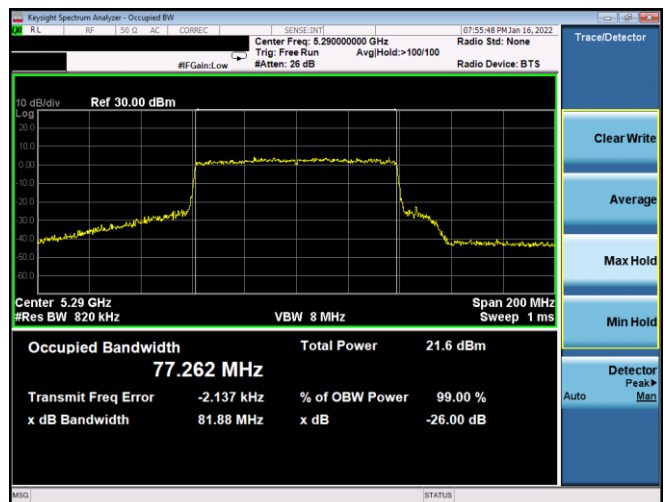
Plot 7-26. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 56, MCS3)



Plot 7-29. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS3)

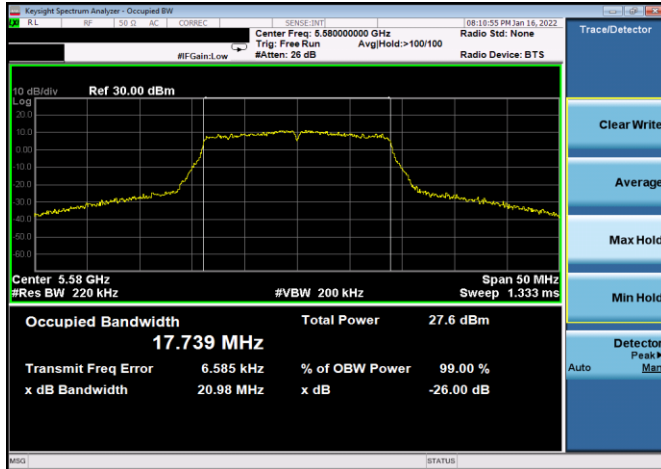


Plot 7-27. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS3)

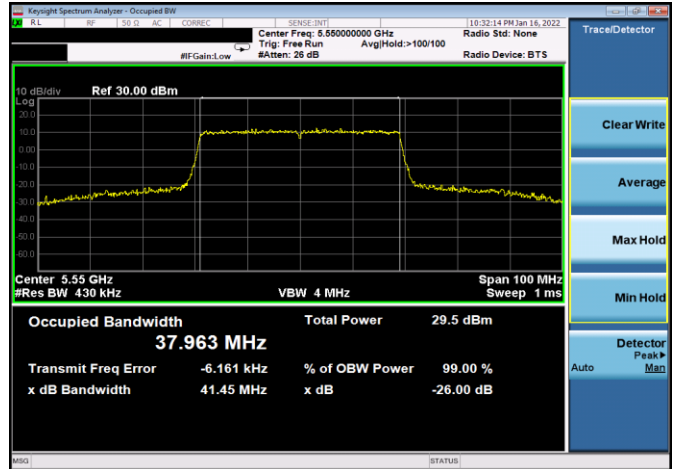


Plot 7-30. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS3)

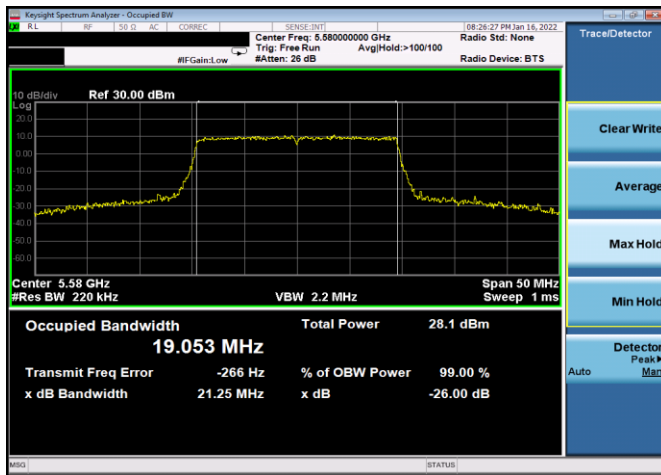
FCC ID: BCGA2588 IC: 579C-A2588			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C211150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device		Page 28 of 352



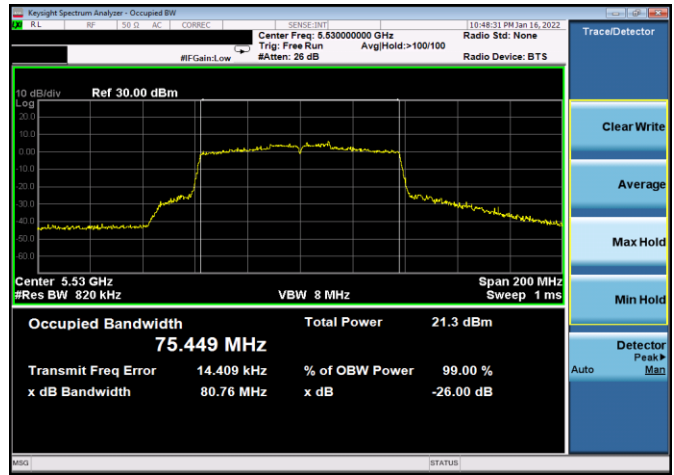
Plot 7-31. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 116, MCS3)



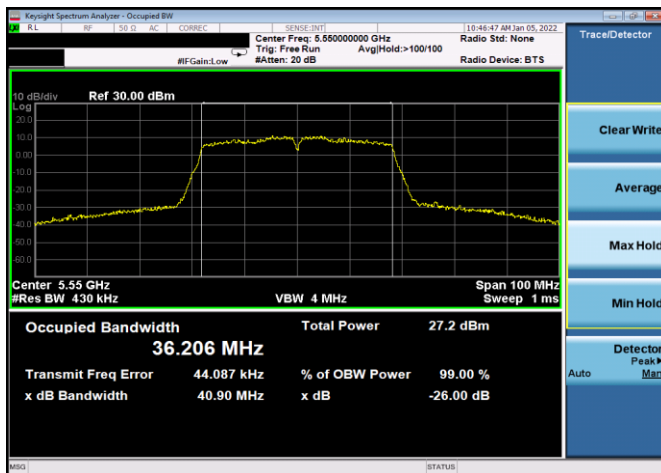
Plot 7-34. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 110, MCS3)



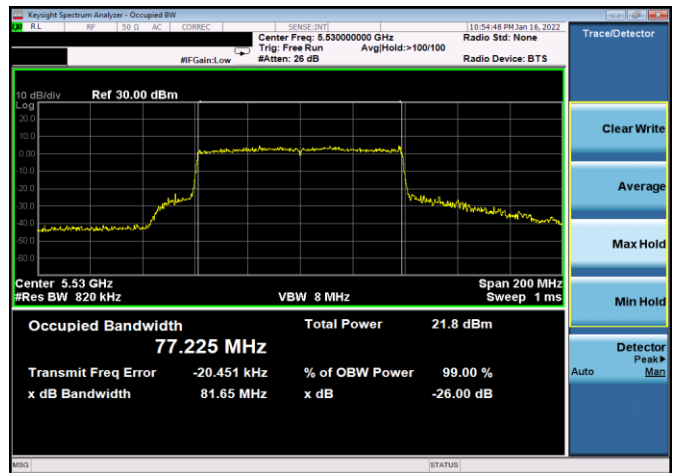
Plot 7-32. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 116, MCS3)



Plot 7-35. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 106, MCS3)



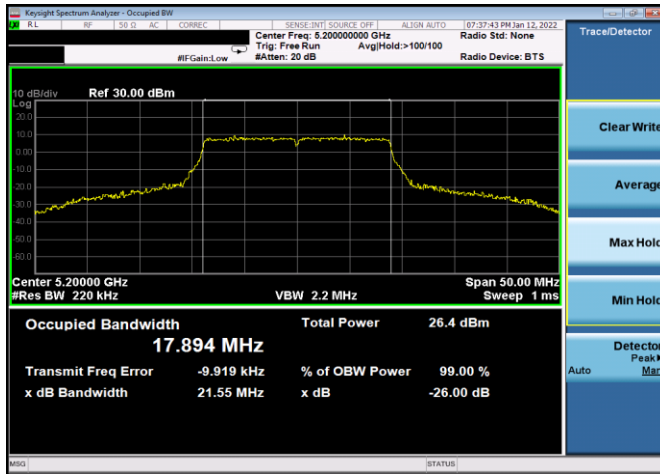
Plot 7-33. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 110, MCS3)



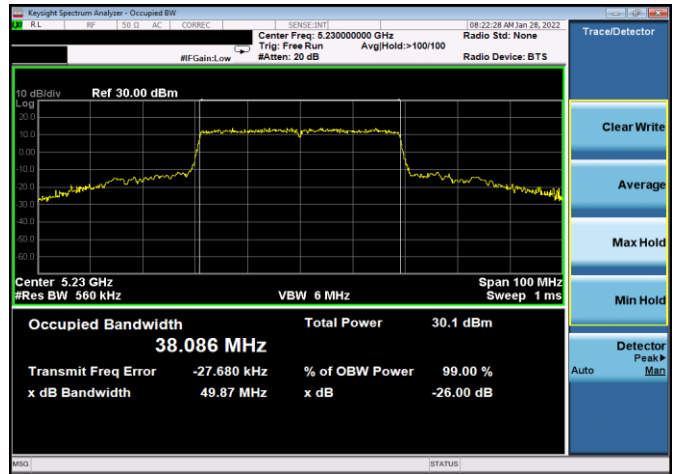
Plot 7-36. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 106, MCS3)

FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 29 of 352

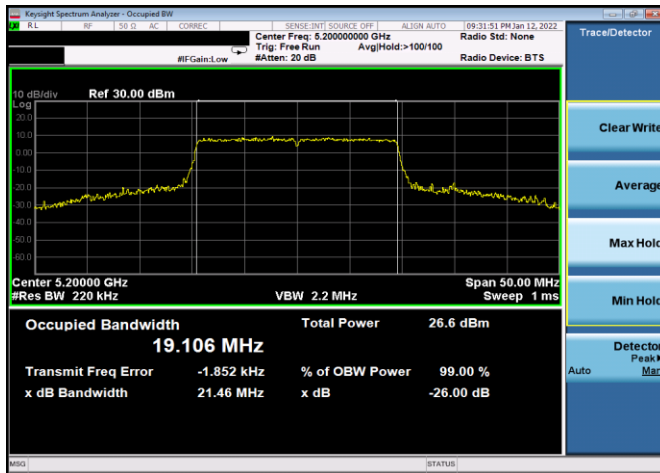
High Data Rate



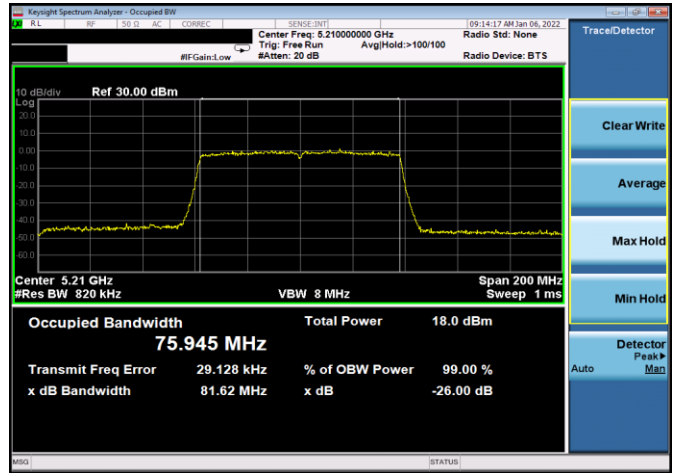
Plot 7-37. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 40, MCS5)



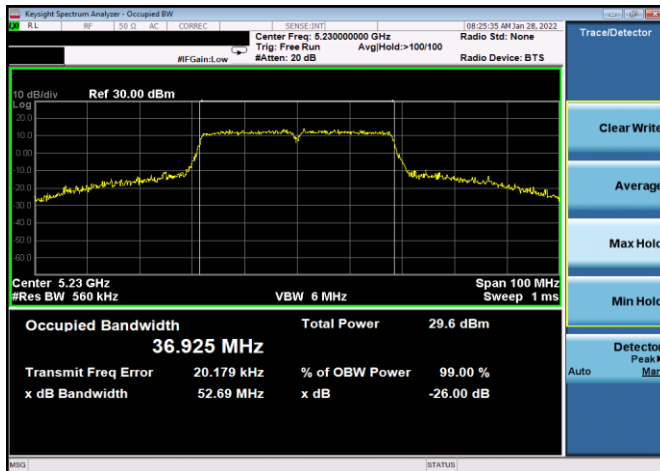
Plot 7-40. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 46, MCS5)



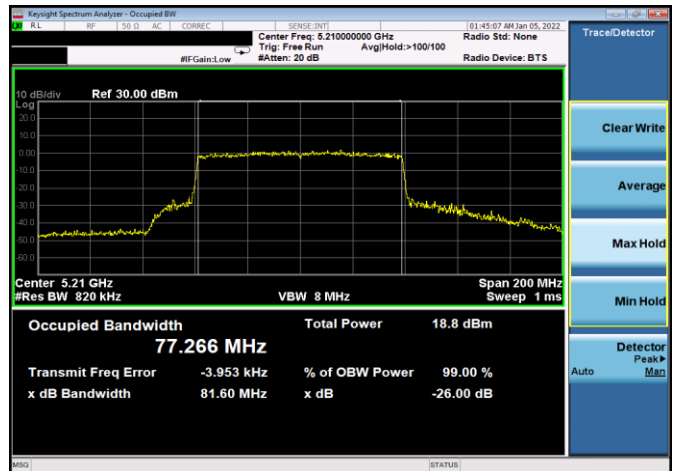
Plot 7-38. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 40, MCS5)



Plot 7-41. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 42, MCS5)

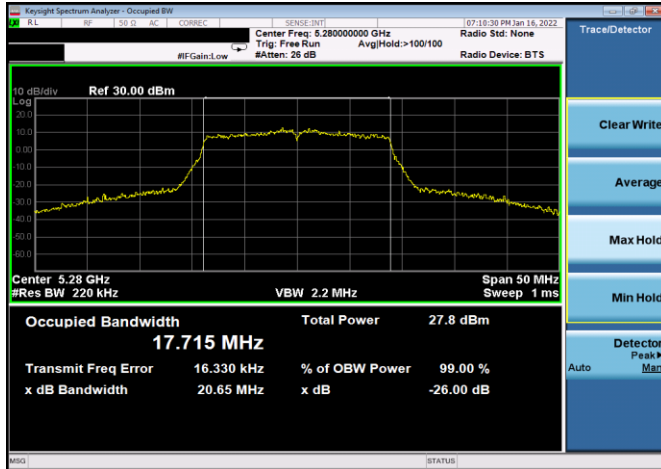


Plot 7-39. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 46, MCS5)

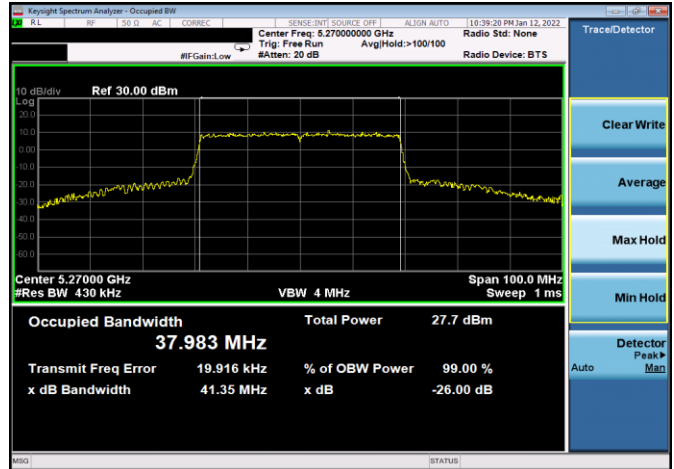


Plot 7-42. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 42, MCS5)

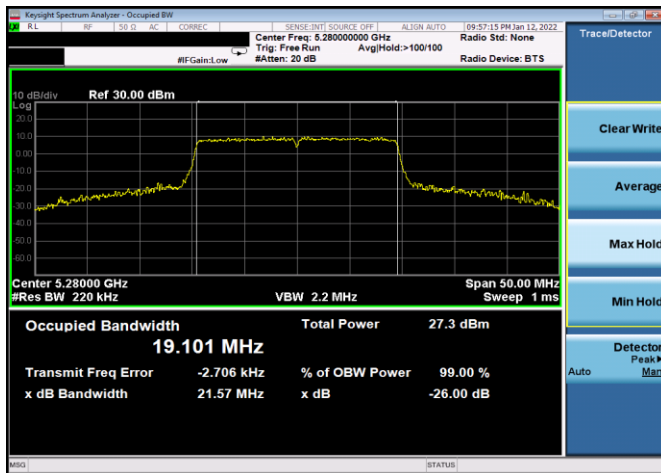
FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 30 of 352



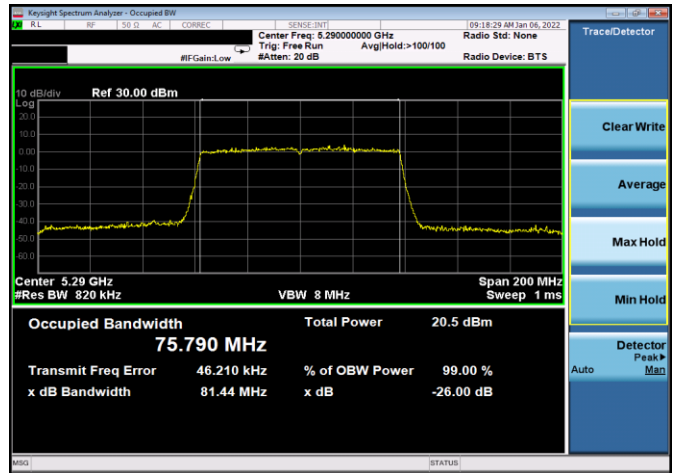
Plot 7-43. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11n – Ch. 56, MCS5)



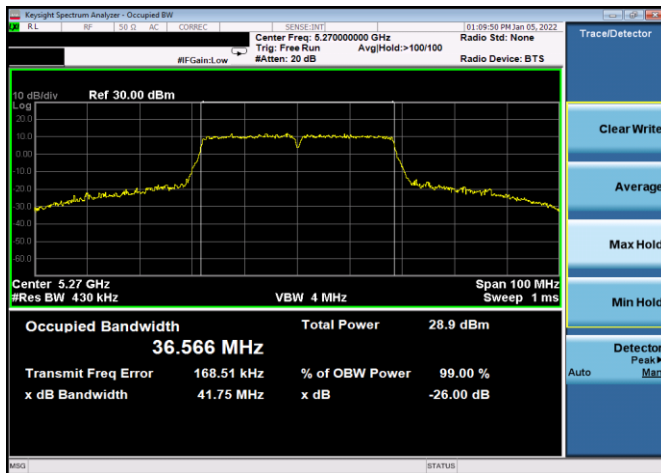
Plot 7-46. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11ax(SU) – Ch. 54, MCS5)



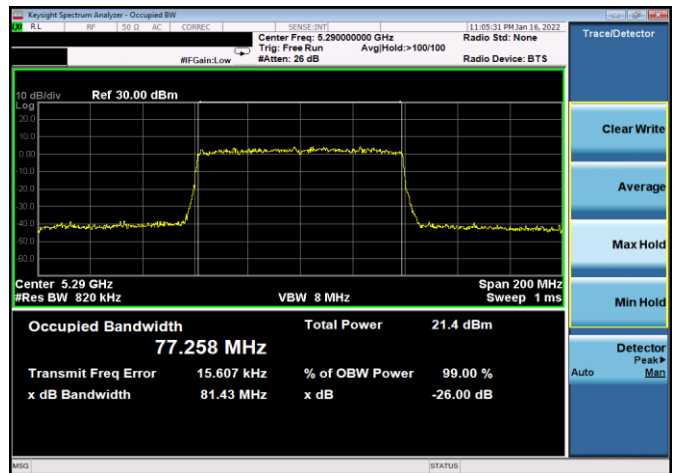
Plot 7-44. 26dB BW & 99% OBW Antenna WF8 (20MHz BW 802.11ax(SU) – Ch. 56, MCS5)



Plot 7-47. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ac – Ch. 58, MCS5)



Plot 7-45. 26dB BW & 99% OBW Antenna WF8 (40MHz BW 802.11n – Ch. 54, MCS5)



Plot 7-48. 26dB BW & 99% OBW Antenna WF8 (80MHz BW 802.11ax(SU) – Ch. 58, MCS5)

FCC ID: BCGA2588 IC: 579C-A2588	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2111150078-07.BCG	Test Dates: 12/02/2021- 02/06/2022	EUT Type: Tablet Device	Page 31 of 352