

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:

5/20/2024 - 8/28/2024

Test Report Issue Date:

9/4/2024

Test Site/Location:

Element Materials Technology, Morgan Hill, CA, USA

Test Report Serial No.:

1C2405200017-11.BCG

FCC ID:	BCGA2993
IC:	579C-A2993
APPLICANT:	Apple Inc.

Application Type:

Certification

Model/HVIN:

A2993

EUT Type:

Tablet Device

Frequency Range:

5180 – 5825MHz

Modulation Type:

OFDM

FCC Classification:

Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s):

Part 15 Subpart E (15.407)

ISED Specification:

RSS-247 Issue 3

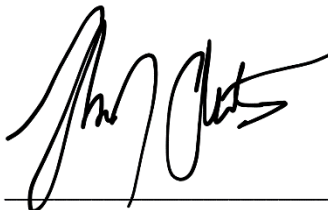
Test Procedure(s):

ANSI C63.10-2020, 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 C63.10-2020 and KDB 789033 D02 v02r01. Test results reported herein relate only to the item(s) tested.

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



RJ Ortanez
 Executive Vice President

Prepared by: WKR0000005849

Reviewed by: WKR0000005913

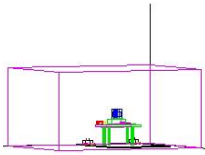


FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 1 of 380

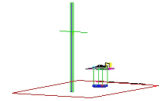
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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM	
				Antenna WF5T		Antenna WF2		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	100.000	20.00	96.805	19.86	98.628	19.94
2A		802.11a/n	5260 - 5320	98.901	19.95	98.333	19.93	97.499	19.89
2C		802.11a/n	5500 - 5720	98.628	19.94	99.839	19.99	99.083	19.96
3	40	802.11a/n	5745 - 5825	123.169	20.91	119.591	20.78	243.781	23.87
1		802.11n	5190 - 5230	121.088	20.83	118.905	20.75	167.494	22.24
2A		802.11n	5270 - 5310	118.522	20.74	120.282	20.80	172.584	22.37
2C	80	802.11n	5510 - 5710	123.310	20.91	125.545	20.99	171.002	22.33
3		802.11n	5755 - 5795	121.004	20.83	124.366	20.95	250.035	23.98
1		802.11ac	5210	30.276	14.81	31.477	14.98	50.003	16.99
2A	160	802.11ac	5290	43.985	16.43	42.687	16.30	61.944	17.92
2C		802.11ac	5530 - 5690	117.923	20.72	121.591	20.85	195.884	22.92
3		802.11ac	5775	76.155	18.82	77.607	18.90	148.252	21.71
1	20	802.11ax (SU)	5180 - 5240	96.450	19.84	93.843	19.72	99.083	19.96
2A		802.11ax (SU)	5260 - 5320	97.859	19.91	99.243	19.97	98.401	19.93
2C		802.11ax (SU)	5500 - 5720	98.175	19.92	99.954	20.00	97.275	19.88
3	40	802.11ax (SU)	5745 - 5825	122.574	20.88	122.687	20.89	250.611	23.99
1		802.11ax (SU)	5190 - 5230	123.538	20.92	120.254	20.80	172.187	22.36
2A		802.11ax (SU)	5270 - 5310	92.491	19.66	93.498	19.71	174.985	22.43
2C	80	802.11ax (SU)	5510 - 5710	125.026	20.97	120.393	20.81	167.880	22.25
3		802.11ax (SU)	5755 - 5795	122.914	20.90	119.840	20.79	247.172	23.93
1		802.11ax (SU)	5210	24.496	13.89	24.121	13.82	41.210	16.15
2A	160	802.11ax (SU)	5290	39.774	16.00	39.582	15.98	60.674	17.83
2C		802.11ax (SU)	5530 - 5690	124.165	20.94	119.015	20.76	187.932	22.74
3		802.11ax (SU)	5775	67.329	18.28	66.527	18.23	118.032	20.72
1/2A	160	802.11ac	5250	23.356	13.68	23.637	13.74	43.853	16.42
2C		802.11ac	5570	17.258	12.37	18.184	12.60	35.810	15.54
1/2A		802.11ax (SU)	5250	23.292	13.67	22.935	13.61	42.658	16.30
2C	802.11ax (SU)	5570	17.985	12.55	18.184	12.60	34.119	15.33	

FCC EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM	
				Antenna WF5T		Antenna WF2		Summed	
				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	23.308	13.68	23.507	13.71	34.356	15.36
2A		802.11a/n	5260 - 5320	98.901	19.95	98.333	19.93	97.499	19.89
2C		802.11a/n	5500 - 5720	98.628	19.94	99.839	19.99	99.083	19.96
3	40	802.11a/n	5745 - 5825	123.169	20.91	119.591	20.78	243.781	23.87
1		802.11n	5190 - 5230	42.015	16.23	39.783	16.00	60.674	17.83
2A		802.11n	5270 - 5310	118.522	20.74	120.282	20.80	172.584	22.37
2C	80	802.11n	5510 - 5710	122.067	20.87	125.545	20.99	171.791	22.35
3		802.11n	5755 - 5795	121.004	20.83	124.366	20.95	250.035	23.98
1		802.11ac	5210	29.147	14.65	31.254	14.95	45.394	16.57
2A	160	802.11ac	5290	43.985	16.43	42.687	16.30	61.944	17.92
2C		802.11ac	5530 - 5690	117.923	20.72	115.558	20.63	195.884	22.92
3		802.11ac	5775	76.155	18.82	77.607	18.90	148.252	21.71
1	20	802.11ax (SU)	5180 - 5240	22.798	13.58	23.469	13.71	34.594	15.39
2A		802.11ax (SU)	5260 - 5320	97.859	19.91	99.243	19.97	98.401	19.93
2C		802.11ax (SU)	5500 - 5720	99.083	19.96	99.954	20.00	97.275	19.88
3	40	802.11ax (SU)	5745 - 5825	122.574	20.88	122.687	20.89	250.611	23.99
1		802.11ax (SU)	5190 - 5230	38.815	15.89	40.588	16.08	60.954	17.85
2A		802.11ax (SU)	5270 - 5310	92.491	19.66	93.498	19.71	174.985	22.43
2C	80	802.11ax (SU)	5510 - 5710	114.078	20.57	120.393	20.81	174.582	22.42
3		802.11ax (SU)	5755 - 5795	122.914	20.90	119.840	20.79	247.172	23.93
1		802.11ax (SU)	5210	24.121	13.82	24.082	13.82	42.267	16.26
2A	160	802.11ax (SU)	5290	39.774	16.00	39.582	15.98	60.674	17.83
2C		802.11ax (SU)	5530 - 5690	124.165	20.94	119.015	20.76	187.932	22.74
3		802.11ax (SU)	5775	67.329	18.28	66.527	18.23	118.032	20.72
1/2A	160	802.11ac	5250	23.523	13.72	23.020	13.62	43.551	16.39
2C		802.11ac	5570	17.462	13.89	24.027	13.81	42.658	16.30
1/2A		802.11ax (SU)	5250	24.462	13.89	24.027	13.81	42.658	16.30

ISED EUT Overview (Low Data Rate)

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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM	
				Antenna WF5T		Antenna WF2		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	98.062	19.92	97.342	19.88	99.312	19.97
2A		802.11a/n	5260 - 5320	98.787	19.95	99.770	19.99	97.499	19.89
2C		802.11a/n	5500 - 5720	99.931	20.00	99.083	19.96	97.051	19.87
3		802.11a/n	5745 - 5825	124.308	20.95	123.937	20.93	248.313	23.95
1	40	802.11n	5190 - 5230	122.518	20.88	117.706	20.71	167.880	22.25
2A		802.11n	5270 - 5310	120.337	20.80	119.978	20.79	172.584	22.37
2C		802.11n	5510 - 5710	120.976	20.83	121.843	20.86	174.985	22.43
3		802.11n	5755 - 5795	125.516	20.99	115.585	20.63	241.546	23.83
1	80	802.11ac	5210	27.177	14.34	26.436	14.22	49.545	16.95
2A		802.11ac	5290	41.400	16.17	41.476	16.18	56.105	17.49
2C		802.11ac	5530 - 5690	118.741	20.75	118.222	20.73	196.336	22.93
3		802.11ac	5775	58.170	17.65	57.890	17.63	120.226	20.80
1	20	802.11ax (SU)	5180 - 5240	99.563	19.98	93.240	19.70	98.628	19.94
2A		802.11ax (SU)	5260 - 5320	98.152	19.92	97.208	19.88	97.051	19.87
2C		802.11ax (SU)	5500 - 5720	96.028	19.82	96.316	19.84	97.499	19.89
3		802.11ax (SU)	5745 - 5825	118.741	20.75	120.642	20.82	244.343	23.88
1	40	802.11ax (SU)	5190 - 5230	124.652	20.96	115.958	20.64	175.792	22.45
2A		802.11ax (SU)	5270 - 5310	94.037	19.73	91.369	19.61	167.494	22.24
2C		802.11ax (SU)	5510 - 5710	122.687	20.89	123.055	20.90	171.396	22.34
3		802.11ax (SU)	5755 - 5795	116.547	20.67	122.433	20.88	242.103	23.84
1	80	802.11ax (SU)	5210	23.426	13.70	24.372	13.87	43.551	16.39
2A		802.11ax (SU)	5290	34.475	15.38	33.744	15.28	58.210	17.65
2C		802.11ax (SU)	5530 - 5690	116.252	20.65	120.754	20.82	185.780	22.69
3		802.11ax (SU)	5775	48.764	16.88	48.798	16.88	95.280	19.79
1/2A	160	802.11ac	5250	19.489	12.90	19.584	12.92	34.674	15.40
2C		802.11ac	5570	17.077	12.32	16.387	12.15	27.669	14.42
1/2A	160	802.11ax (SU)	5250	20.526	13.12	20.512	13.12	35.237	15.47
2C		802.11ax (SU)	5570	14.969	11.75	15.552	11.92	26.730	14.27

FCC EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM	
				Antenna WF5T		Antenna WF2		Summed	
				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	23.491	13.71	23.448	13.70	33.963	15.31
2A		802.11a/n	5260 - 5320	98.787	19.95	99.770	19.99	97.499	19.89
2C		802.11a/n	5500 - 5720	100.000	20.00	99.083	19.96	97.051	19.87
3		802.11a/n	5745 - 5825	124.308	20.95	123.937	20.93	248.313	23.95
1	40	802.11n	5190 - 5230	39.600	15.98	39.138	15.93	60.674	17.83
2A		802.11n	5270 - 5310	120.337	20.80	119.978	20.79	172.584	22.37
2C		802.11n	5510 - 5710	114.815	20.60	121.843	20.86	173.780	22.40
3		802.11n	5755 - 5795	125.516	20.99	115.585	20.63	241.546	23.83
1	80	802.11ac	5210	25.775	14.11	26.146	14.17	46.452	16.67
2A		802.11ac	5290	41.400	16.17	41.476	16.18	56.105	17.49
2C		802.11ac	5530 - 5690	118.741	20.75	118.222	20.73	196.336	22.93
3		802.11ac	5775	58.170	17.65	57.890	17.63	120.226	20.80
1	20	802.11ax (SU)	5180 - 5240	22.940	13.61	23.020	13.62	34.834	15.42
2A		802.11ax (SU)	5260 - 5320	98.152	19.92	97.208	19.88	97.051	19.87
2C		802.11ax (SU)	5500 - 5720	96.028	19.82	96.316	19.84	94.842	19.77
3		802.11ax (SU)	5745 - 5825	118.741	20.75	120.642	20.82	244.343	23.88
1	40	802.11ax (SU)	5190 - 5230	40.235	16.05	39.783	16.00	61.660	17.90
2A		802.11ax (SU)	5270 - 5310	94.037	19.73	91.369	19.61	167.494	22.24
2C		802.11ax (SU)	5510 - 5710	117.355	20.70	123.055	20.90	165.577	22.19
3		802.11ax (SU)	5755 - 5795	116.547	20.67	122.433	20.88	242.103	23.84
1	80	802.11ax (SU)	5210	23.356	13.68	23.431	13.70	43.451	16.38
2A		802.11ax (SU)	5290	34.475	15.38	33.744	15.28	58.210	17.65
2C		802.11ax (SU)	5530 - 5690	116.252	20.65	120.754	20.82	185.780	22.69
3		802.11ax (SU)	5775	48.764	16.88	48.798	16.88	95.280	19.79
1/2A	160	802.11ac	5250	20.644	13.15	20.156	13.04	35.810	15.54
1/2A		802.11ax (SU)	5250	19.584	12.92	20.188	13.05	34.914	15.43

ISED EUT Overview (Mid Data Rate)


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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM	
				Antenna WF5T		Antenna WF2		Summed	
				Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	802.11a/n	5180 - 5240	98.197	19.92	97.746	19.90	99.312	19.97
2A		802.11a/n	5260 - 5320	98.446	19.93	99.678	19.99	96.828	19.86
2C		802.11a/n	5500 - 5720	99.977	20.00	99.678	19.99	97.724	19.90
3		802.11a/n	5745 - 5825	124.940	20.97	120.088	20.80	243.781	23.87
1	40	802.11n	5190 - 5230	120.587	20.81	119.536	20.78	163.682	22.14
2A		802.11n	5270 - 5310	115.186	20.61	122.011	20.86	170.216	22.31
2C		802.11n	5510 - 5710	124.681	20.96	124.968	20.97	169.824	22.30
3		802.11n	5755 - 5795	119.069	20.76	124.451	20.95	247.742	23.94
1	80	802.11ac	5210	21.518	13.33	21.847	13.39	38.194	15.82
2A		802.11ac	5290	33.435	15.24	33.151	15.21	55.976	17.48
2C		802.11ac	5530 - 5690	117.139	20.69	119.536	20.78	188.799	22.76
3		802.11ac	5775	55.744	17.46	56.468	17.52	114.288	20.58
1	20	802.11ax (SU)	5180 - 5240	98.992	19.96	99.632	19.98	95.280	19.79
2A		802.11ax (SU)	5260 - 5320	99.632	19.98	94.558	19.76	97.949	19.91
2C		802.11ax (SU)	5500 - 5720	98.062	19.92	98.265	19.92	98.855	19.95
3		802.11ax (SU)	5745 - 5825	124.537	20.95	124.509	20.95	243.781	23.87
1	40	802.11ax (SU)	5190 - 5230	119.950	20.79	114.895	20.60	169.824	22.30
2A		802.11ax (SU)	5270 - 5310	95.477	19.80	95.258	19.79	169.434	22.29
2C		802.11ax (SU)	5510 - 5710	124.222	20.94	120.171	20.80	168.267	22.26
3		802.11ax (SU)	5755 - 5795	123.965	20.93	118.522	20.74	241.546	23.83
1	80	802.11ax (SU)	5210	21.237	13.27	21.498	13.32	39.719	15.99
2A		802.11ax (SU)	5290	32.174	15.08	34.056	15.32	58.614	17.68
2C		802.11ax (SU)	5530 - 5690	123.481	20.92	119.289	20.77	190.108	22.79
3		802.11ax (SU)	5775	49.465	16.94	50.084	17.00	84.528	19.27
1/2A	160	802.11ac	5250	15.613	11.94	14.511	11.62	30.339	14.82
2C		802.11ac	5570	13.029	11.15	13.259	11.23	21.330	13.29
1/2A	160	802.11ax (SU)	5250	15.798	11.99	15.435	11.89	29.992	14.77
2C		802.11ax (SU)	5570	12.100	10.83	12.159	10.85	21.478	13.32

FCC EUT Overview (High Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM	
				Antenna WF5T		Antenna WF2		Summed	
				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	23.621	13.73	23.523	13.72	34.198	15.34
2A		802.11a/n	5260 - 5320	98.446	19.93	99.678	19.99	96.828	19.86
2C		802.11a/n	5500 - 5720	99.977	20.00	100.000	20.00	97.724	19.90
3		802.11a/n	5745 - 5825	124.940	20.97	120.088	20.80	243.781	23.87
1	40	802.11n	5190 - 5230	39.039	15.92	39.765	16.00	61.660	17.90
2A		802.11n	5270 - 5310	115.186	20.61	122.011	20.86	170.216	22.31
2C		802.11n	5510 - 5710	124.366	20.95	124.968	20.97	169.824	22.30
3		802.11n	5755 - 5795	119.069	20.76	124.451	20.95	247.742	23.94
1	80	802.11ac	5210	21.444	13.31	21.963	13.42	38.194	15.82
2A		802.11ac	5290	33.435	15.24	33.151	15.21	55.976	17.48
2C		802.11ac	5530 - 5690	117.139	20.69	119.536	20.78	188.799	22.76
3		802.11ac	5775	55.744	17.46	56.468	17.52	114.288	20.58
1	20	802.11ax (SU)	5180 - 5240	23.637	13.74	23.616	13.73	34.041	15.32
2A		802.11ax (SU)	5260 - 5320	99.632	19.98	94.558	19.76	97.949	19.91
2C		802.11ax (SU)	5500 - 5720	98.628	19.94	98.628	19.94	98.855	19.95
3		802.11ax (SU)	5745 - 5825	124.537	20.95	124.509	20.95	243.781	23.87
1	40	802.11ax (SU)	5190 - 5230	38.503	15.86	41.629	16.19	59.704	17.76
2A		802.11ax (SU)	5270 - 5310	95.477	19.80	95.258	19.79	169.434	22.29
2C		802.11ax (SU)	5510 - 5710	124.222	20.94	119.536	20.78	168.267	22.26
3		802.11ax (SU)	5755 - 5795	123.965	20.93	118.522	20.74	241.546	23.83
1	80	802.11ax (SU)	5210	21.493	13.32	21.607	13.35	38.994	15.91
2A		802.11ax (SU)	5290	32.174	15.08	34.056	15.32	58.614	17.68
2C		802.11ax (SU)	5530 - 5690	123.481	20.92	119.289	20.77	190.108	22.79
3		802.11ax (SU)	5775	49.465	16.94	50.084	17.00	84.528	19.27
1/2A	160	802.11ac	5250	14.938	11.74	14.645	11.66	30.339	14.82
1/2A		802.11ax (SU)	5250	14.598	11.64	14.784	11.70	29.992	14.77

ISED EUT Overview (High Data Rate)

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1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Materials Technology Test Location

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

1.3 Test Facility / Accreditations

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

- Element Materials Technology is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Materials Technology facility is a registered (22831) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2993** and **IC: 579C-A2993**. 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.: X7NV4YVQYJ, QRQXC0F4VX, CWNWRCFHJ9, H9HH5L0000Z0000R50

2.2 Device Capabilities

This device contains the following capabilities:

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

This device supports BT Beamforming

Band 1		Band 2A		Band 2C		Band 3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5180	52	5260	100	5500	149	5745
:	:	:	:	:	:	:	:
40	5200	56	5280	116	5580	157	5785
:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825

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

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

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

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

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

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

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

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Notes:

1. TDWR channels are not supported for ISED.
2. 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz, and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) KDB 789033 D02 v02r01 and ANSI C63.10-2020. 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 WF5T	Antenna WF2	CDD/SDM
5GHz	a (Low Rate)	100.00	100.00	100.00
	a (Mid Rate)	95.72	95.50	95.68
	a (High Rate)	91.31	91.31	91.47
	n (HT20) (Low Rate)	96.83	96.61	93.33
	n (HT20) (Mid Rate)	93.97	94.19	90.36
	n (HT20) (High Rate)	90.78	90.78	86.10
	ax(SU) (HE20 Low Rate)	95.72	95.94	94.84
	ax(SU) (HE20 Mid Rate)	92.04	93.11	92.90
	ax(SU) (HE20 High Rate)	86.30	86.70	86.70
	n (HT40 Low Rate)	96.38	96.61	93.11
	n (HT40 Mid Rate)	93.76	93.54	89.33
	n (HT40 High Rate)	90.36	90.57	85.70
	ax(SU) (HE40 Low Rate)	95.94	95.72	95.94
	ax(SU) (HE40 Mid Rate)	93.11	91.62	93.33
	ax(SU) (HE40 High Rate)	86.70	85.90	86.30
	ac (VHT80 Low Rate)	95.94	96.16	92.68
	ac (VHT80 Mid Rate)	92.26	93.33	88.92
	ac (VHT80 High Rate)	87.90	87.50	81.66
	ax(SU) (HE80 Low Rate)	95.28	95.50	95.28
	ax(SU) (HE80 Mid Rate)	92.04	92.26	92.04
	ax(SU) (HE80 High Rate)	85.90	85.31	85.31
	ac (VHT160 Low Rate)	94.84	94.41	91.20
	ac (VHT160 Mid Rate)	91.41	90.99	86.70
	ac (VHT160 High Rate)	84.72	84.72	80.35
ax(SU) (HE160 Low Rate)	93.97	93.97	94.41	
ax(SU) (HE160 Mid Rate)	90.36	90.36	90.16	
ax(SU) (HE160 High Rate)	84.33	83.95	83.56	

Table 2-5. Measured Duty Cycles

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3. The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna WF5T	Antenna WF2	Antenna WF5T	Antenna WF2	Antenna WF5T	Antenna WF2	Antenna WF5T	Antenna WF2
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓
11ax(SU) (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓	

Table 2-6. WIFI Configurations

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

4. The device supports the following data rates (shown in Mbps):

802.11a	MCS Index			Spatial Stream	OFDM (802.11n/802.11ac)				OFDM (802.11ac)				OFDM (802.11ax)											
					20MHz		40MHz		80MHz		160MHz		20MHz		40MHz		80MHz		160MHz					
	HT	VHT	HE		0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI					
6	0	0	0	1	6.5	7.2	13.5	15	29.3	32.5	58.5	65	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6	72.1	68.1	61.3
9	1	1	1	1	13	14.4	27	30	58.5	65	117	130	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
12	2	2	2	1	19.5	21.7	40.5	45	87.8	97.5	175.5	195	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9	216.2	204.2	183.8
18	3	3	3	1	26	28.9	54	60	117	130	234	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
24	4	4	4	1	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
36	5	5	5	1	52	57.8	108	120	234	260	468	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
48	6	6	6	1	58.5	65	121.5	135	263.3	292.5	526.5	585	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6	648.5	612.5	551.3
54	7	7	7	1	65	72.2	135	150	292.5	325	585	650	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3	720.6	680.6	612.5
-	-	8	8	1	-	-	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
-	-	9	9	1	-	-	180	200	390	433.3	780	866.7	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3	960.8	907.4	816.7
-	-	-	10	1	-	-	-	-	-	-	-	-	129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4	1080.9	1020.8	918.8
-	-	-	11	1	-	-	-	-	-	-	-	-	143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4	1201	1134.3	1020.8
6	8	0	0	2	13	14.4	27	30	58.5	65	117	130	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
9	9	1	1	2	26	28.9	54	60	117	130	234	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
12	10	2	2	2	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
18	11	3	3	2	52	57.8	108	120	234	260	468	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
24	12	4	4	2	78	86.7	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
36	13	5	5	2	104	115.6	216	240	468	520	936	1040	137.6	130	117	275.3	260	234	576.5	544.4	490	1152.9	1088.9	980
48	14	6	6	2	117	130	243	270	526.5	585	1053	1170	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5
54	15	7	7	2	130	144.4	270	300	585	650	1170	1300	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	1441.2	1361.1	1225
-	-	8	8	2	156	173.3	324	360	702	780	1404	1560	206.5	195	175.5	412.9	390	351	864.7	816.7	735	1729.4	1633.3	1470
-	-	9	9	2	-	-	360	400	780	866.7	1560	1733.3	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7	1921.6	1814.8	1633.3
-	-	-	10	2	-	-	-	-	-	-	-	-	258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8	2161.8	2041.7	1837.5
-	-	-	11	2	-	-	-	-	-	-	-	-	286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8	2402	2268.5	2041.7

Table 2-7. Supported Data Rates

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

Antenna	Simultaneous Tx Config	Wifi 2GHz	Bluetooth	Thread	Wifi 5GHz	Wifi 6GHz	NB UNII
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	802.15.4	802.11 a/n/ac/ax	802.11 a/ax	BDR, HDR4/8
WF2	Config 1	X	✓	X	X	✓	X
WF2	Config 2	X	✓	X	✓	X	X
WF2	Config 3	X	X	✓	X	✓	X
WF2	Config 4	X	X	✓	✓	X	X

Table 2-8. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

Note:

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

2.3 Antenna Description

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

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna WF5T	Antenna WF2
5.150 – 5.250	4.6	0.1
5.250 – 5.350	4.8	1.5
5.470 – 5.725	4.4	1.9
5725 – 5.850	3.2	1.3

Table 2-9. Highest Antenna Gain

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2.4 Test Support Equipment

1	Apple MacBook Pro	Model: A2141	S/N: C02H604EQ05D
	w/AC/DC Adapter	Model: A2166	S/N: C4H042705ZNP M0WA6
2	Apple USB-C Cable	Model: Spartan	S/N: GXK1336018XKTR024
3	USB-C Cable	Model: A246C	S/N: DWH80115BK826GV19
	w/ AC Adapter	Model: A2305	S/N: C4H95160004PF4F4V
4	Apple Pencil	Model: A2538	S/N: KJ26TCFXJW
5	DC Power Supply	Model: KPS3010D	S/N: N/A

Table 2-10. Test Support Equipment List

2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2020 and KDB 789033 D02 v02r01. ANSI C63.10-2020 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) HE20/40/80/160 and acVHT80/160 2TX CDD/SDM mode test data provided in this report covers 802.11n HT20/40, 11ax(SU) HE20/40/80/160 and 802.11acVHT80/160 2TX STBC mode

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

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

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

For 802.11ax (OFDMA) test result, see separate UNII 802.11ax (OFDMA) report, 1C2405200017-12.BCG.

All possible simultaneous transmission configurations have been investigated and the worst case config has been reported.

Description	Bluetooth	UNII
Antenna	WF2	WF2
Channel	79	36
Operating Frequency (MHz)	2480	5180
Mode/Modulation	GFSK iPA	802.11n

Table 2-11. Worst Case Simultaneous Transmission Configuration

2.6 Software and Firmware

The test was conducted with firmware version 22A312 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 C63.10-2020) and the guidance provided in KDB 789033 D02 v02r01 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

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

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

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

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

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3.3 Radiated Emissions

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

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

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

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

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS


Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

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

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	2.07
Line Conducted Disturbance	1.91
Radiated Disturbance (<30MHz)	4.12
Radiated Disturbance (30MHz - 1GHz)	4.85
Radiated Disturbance (1 - 18GHz)	5.08
Radiated Disturbance (>18GHz)	5.22

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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-26.5GHz PXA Signal Analyzer	10/18/2023	Annual	10/18/2024	MY55330128
Anritsu	ML2495A	Power Meter	7/8/2024	Annual	7/8/2025	1039008
Anritsu	MA2411B	Pulse Power Sensor	7/1/2024	Annual	7/1/2025	1911105
Anritsu	MA2411B	Pulse Power Sensor	11/8/2023	Annual	11/8/2024	1027293
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	3/14/2024	Annual	3/14/2025	T058701-01
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/9/2024	Annual	4/9/2025	00218555
Fairview Microwave/MCL	FMCA1975-36/BW-K10-2W44+	30MHz-40GHz Conducted Cable/Attenuator *	6/10/2024	Annual	6/10/2025	-
Keysight Technology	N9040B	UXA Signal Analyzer	5/28/2024	Annual	5/28/2025	MY57212015
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/15/2023	Annual	8/15/2024	101639
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/14/2024	Annual	8/15/2025	101648
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	5/29/2024	Annual	5/29/2025	101619
Rohde & Schwarz	ESW44	EMI Test Receiver	5/1/2024	Annual	5/1/2025	101867
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	7/3/2024	Annual	7/3/2025	102356
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	6/10/2024	Annual	6/10/2025	100057
Rohde & Schwarz	HFH2-Z2	Loop Antenna	6/21/2024	Annual	6/21/2025	100519
Rohde & Schwarz	ENV216	Two-Line V-Network	4/24/2024	Annual	4/24/2025	101364
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	4/29/2024	Annual	4/29/2025	00304

Table 6-1. Test Equipment List

Note:

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- * Denotes passive equipment that have been internally verified/calibrated.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2993
 IC: 579C-A2993
 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 (1C24052000 17-10.BCG)
15.407(b.1), (2), (3), (4)	RSS-247 [6.2]	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])		PASS	Section 7.5
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 7.5, 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:

- 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.
- 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.
- 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.
- 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 "Conducted Automation," Version 1.1.0.
- For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 3.0.0.
- 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

§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 C63.10-2020 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 C63.10-2020 – Section 12.5.2
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 = shall be in the range of 1% to 5% of the emission bandwidth
3. VBW > RBW
4. Detector = Peak
5. Trace mode = max hold

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

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

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7.2.1 Antenna WF5T 26dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	19.5/21.7 (MCS2)	17.83	21.57
	5200	40	n (20MHz)	19.5/21.7 (MCS2)	17.71	20.90
	5240	48	n (20MHz)	19.5/21.7 (MCS2)	17.72	20.98
	5180	36	ax (SU) (20MHz)	24/25.8 (MCS2)	19.11	24.83
	5200	40	ax (SU) (20MHz)	24/25.8 (MCS2)	19.05	21.22
	5240	48	ax (SU) (20MHz)	24/25.8 (MCS2)	19.03	21.41
	5190	38	n (40MHz)	40/40.5 (MCS2)	36.43	41.97
	5230	46	n (40MHz)	40/40.5 (MCS2)	36.24	41.25
	5190	38	ax (SU) (40MHz)	49/51.6 (MCS2)	38.11	45.45
	5230	46	ax (SU) (40MHz)	49/51.6 (MCS2)	37.94	41.42
Band 1/2	5210	42	ac (80MHz)	87.8/97.5 (MCS2)	75.70	83.57
	5210	42	ax (SU) (80MHz)	102/108.1 (MCS2)	77.30	86.32
Band 2A	5250	50	ac (160MHz)	87.8/97.5 (MCS2)	153.99	163.97
	5250	50	ax (SU) (160MHz)	102/108.1 (MCS2)	156.32	164.57
	5260	52	n (20MHz)	19.5/21.7 (MCS2)	17.72	20.99
	5300	60	n (20MHz)	19.5/21.7 (MCS2)	17.72	20.88
	5320	64	n (20MHz)	19.5/21.7 (MCS2)	17.80	21.61
	5260	52	ax (SU) (20MHz)	24/25.8 (MCS2)	19.05	21.42
	5300	60	ax (SU) (20MHz)	24/25.8 (MCS2)	19.04	21.27
	5320	64	ax (SU) (20MHz)	24/25.8 (MCS2)	19.09	22.18
	5270	54	n (40MHz)	40/40.5 (MCS2)	36.24	41.03
	5310	62	n (40MHz)	40/40.5 (MCS2)	36.47	42.12
	5270	54	ax (SU) (40MHz)	49/51.6 (MCS2)	37.98	41.59
	5310	62	ax (SU) (40MHz)	49/51.6 (MCS2)	38.07	43.22
	5290	58	ac (80MHz)	87.8/97.5 (MCS2)	75.64	84.06
	5290	58	ax (SU) (80MHz)	102/108.1 (MCS2)	77.29	85.60
Band 2C	5500	100	n (20MHz)	19.5/21.7 (MCS2)	17.81	21.55
	5580	116	n (20MHz)	19.5/21.7 (MCS2)	17.73	20.99
	*5600	120	n (20MHz)	19.5/21.7 (MCS2)	17.72	20.81
	5700	140	n (20MHz)	19.5/21.7 (MCS2)	17.83	21.47
	5720	144	n (20MHz)	19.5/21.7 (MCS2)	17.71	20.99
	5500	100	ax (SU) (20MHz)	24/25.8 (MCS2)	19.13	24.77
	5580	116	ax (SU) (20MHz)	24/25.8 (MCS2)	19.06	21.30
	*5600	120	ax (SU) (20MHz)	24/25.8 (MCS2)	19.05	21.24
	5700	140	ax (SU) (20MHz)	24/25.8 (MCS2)	19.13	22.03
	5720	144	ax (SU) (20MHz)	24/25.8 (MCS2)	19.03	21.25
	5510	102	n (40MHz)	40/40.5 (MCS2)	36.43	41.91
	5550	110	n (40MHz)	40/40.5 (MCS2)	36.22	41.03
	*5590	118	n (40MHz)	40/40.5 (MCS2)	36.31	41.07
	5670	134	n (40MHz)	40/40.5 (MCS2)	36.51	44.46
	5710	142	n (40MHz)	40/40.5 (MCS2)	36.24	41.11
	5510	102	ax (SU) (40MHz)	49/51.6 (MCS2)	38.08	47.75
	5550	110	ax (SU) (40MHz)	49/51.6 (MCS2)	37.99	41.48
	*5590	118	ax (SU) (40MHz)	49/51.6 (MCS2)	38.02	41.59
	5670	134	ax (SU) (40MHz)	49/51.6 (MCS2)	38.09	43.01
	5710	142	ax (SU) (40MHz)	49/51.6 (MCS2)	37.98	41.54
	5530	106	ac (80MHz)	87.8/97.5 (MCS2)	75.70	84.31
	*5610	122	ac (80MHz)	87.8/97.5 (MCS2)	75.68	83.83
	5690	138	ac (80MHz)	87.8/97.5 (MCS2)	75.46	81.04
	5530	106	ax (SU) (80MHz)	102/108.1 (MCS2)	77.33	84.90
	*5610	122	ax (SU) (80MHz)	102/108.1 (MCS2)	77.32	84.18
	5690	138	ax (SU) (80MHz)	102/108.1 (MCS2)	77.18	81.83
*5570	114	ac (160MHz)	87.8/97.5 (MCS2)	154.02	164.22	
*5570	114	ax (SU) (80MHz)	102/108.1 (MCS2)	156.07	164.72	

Table 7-2. Conducted Bandwidth Measurements Antenna WF5T (Low Data Rate)

*TDWR channel is not supported for ISED (denoted by a * next to the frequency)

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	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	39/43.3 (MCS4)	17.76	20.93
	5200	40	n (20MHz)	39/43.3 (MCS4)	17.71	20.95
	5240	48	n (20MHz)	39/43.3 (MCS4)	17.71	20.83
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.60
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	19.01	21.19
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	19.04	21.22
	5190	38	n (40MHz)	81/90 (MCS4)	36.33	40.67
	5230	46	n (40MHz)	81/90 (MCS4)	36.29	40.32
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	38.11	47.96
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	37.89	41.29
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.67	81.01
	5210	42	ax (SU) (80MHz)	204/216.2 (MCS4)	77.31	82.44
Band 1/2	5250	50	ac (160MHz)	175.5/195 (MCS4)	154.06	163.75
	5250	50	ax (SU) (160MHz)	204/216.2 (MCS4)	156.13	164.93
Band 2A	5260	52	n (20MHz)	39/43.3 (MCS4)	17.73	20.73
	5300	60	n (20MHz)	39/43.3 (MCS4)	17.73	20.79
	5320	64	n (20MHz)	39/43.3 (MCS4)	17.76	21.06
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.22
	5300	60	ax (SU) (20MHz)	49/51.6 (MCS4)	19.01	21.10
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	22.12
	5270	54	n (40MHz)	81/90 (MCS4)	36.24	40.93
	5310	62	n (40MHz)	81/90 (MCS4)	36.38	40.98
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	37.93	41.44
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	38.18	47.99
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.58	80.69
	5290	58	ax (SU) (80MHz)	204/216.2 (MCS4)	77.21	82.01
Band 2C	5500	100	n (20MHz)	39/43.3 (MCS4)	17.76	20.88
	5580	116	n (20MHz)	39/43.3 (MCS4)	17.74	20.79
	*5600	120	n (20MHz)	39/43.3 (MCS4)	17.75	20.89
	5700	140	n (20MHz)	39/43.3 (MCS4)	17.77	20.96
	5720	144	n (20MHz)	39/43.3 (MCS4)	17.72	20.80
	5500	100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.10	22.63
	5580	116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.05	21.08
	*5600	120	ax (SU) (20MHz)	49/51.6 (MCS4)	19.07	21.20
	5700	140	ax (SU) (20MHz)	49/51.6 (MCS4)	19.09	22.98
	5720	144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.08
	5510	102	n (40MHz)	81/90 (MCS4)	36.47	41.83
	5550	110	n (40MHz)	81/90 (MCS4)	36.31	40.79
	*5590	118	n (40MHz)	81/90 (MCS4)	36.29	41.02
	5670	134	n (40MHz)	81/90 (MCS4)	36.35	41.44
	5710	142	n (40MHz)	81/90 (MCS4)	36.25	40.81
	5510	102	ax (SU) (40MHz)	98/103.2 (MCS4)	38.07	47.83
	5550	110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.93	41.58
	*5590	118	ax (SU) (40MHz)	98/103.2 (MCS4)	37.98	41.67
	5670	134	ax (SU) (40MHz)	98/103.2 (MCS4)	38.15	57.68
	5710	142	ax (SU) (40MHz)	98/103.2 (MCS4)	37.95	41.60
	5530	106	ac (80MHz)	175.5/195 (MCS4)	75.66	81.33
	*5610	122	ac (80MHz)	175.5/195 (MCS4)	75.57	81.17
	5690	138	ac (80MHz)	175.5/195 (MCS4)	75.42	81.10
	5530	106	ax (SU) (80MHz)	204/216.2 (MCS4)	77.27	81.92
	*5610	122	ax (SU) (80MHz)	204/216.2 (MCS4)	77.25	82.06
	5690	138	ax (SU) (80MHz)	204/216.2 (MCS4)	77.25	81.40
	*5570	114	ac (160MHz)	175.5/195 (MCS4)	154.28	163.52
	*5570	114	ax (SU) (80MHz)	204/216.2 (MCS4)	155.97	164.76

Table 7-3. Conducted Bandwidth Measurements Antenna WF5T (Mid Data Rate)

*TDWR channel is not supported for ISED (denoted by a * next to the frequency)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 21 of 380

	Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]	
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	17.82	21.02	
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.83	20.88	
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.82	21.05	
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	19.03	21.22	
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.31	
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.15	
	5190	38	n (40MHz)	135/150 (MCS7)	36.53	41.33	
	5230	46	n (40MHz)	135/150 (MCS7)	36.56	41.19	
	5190	38	ax (SU) (40MHz)	271/286 (MCS11)	37.91	41.10	
	5230	46	ax (SU) (40MHz)	271/286 (MCS11)	37.94	41.42	
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.91	81.59	
	5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.09	81.66	
Band 1/2	5250	50	ac (160MHz)	390/433.3 (MCS9)	154.91	164.29	
	5250	50	ax (SU) (160MHz)	567/600.5 (MCS11)	156.18	164.55	
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.86	20.92	
	5300	60	n (20MHz)	65/72.2 (MCS7)	17.85	21.08	
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.83	21.01	
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.02	21.29	
	5300	60	ax (SU) (20MHz)	135/143.4 (MCS11)	19.07	21.34	
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.26	
	5270	54	n (40MHz)	135/150 (MCS7)	36.50	41.25	
	5310	62	n (40MHz)	135/150 (MCS7)	36.47	41.14	
	5270	54	ax (SU) (40MHz)	271/286 (MCS11)	37.96	41.26	
	5310	62	ax (SU) (40MHz)	271/286 (MCS11)	37.86	41.44	
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.78	81.64	
	5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.08	81.53	
	Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.83	20.76
		5580	116	n (20MHz)	65/72.2 (MCS7)	17.82	21.13
*5600		120	n (20MHz)	65/72.2 (MCS7)	17.87	21.22	
5700		140	n (20MHz)	65/72.2 (MCS7)	17.81	21.05	
5720		144	n (20MHz)	65/72.2 (MCS7)	17.86	21.09	
5500		100	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.24	
5580		116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.07	21.15	
*5600		120	ax (SU) (20MHz)	135/143.4 (MCS11)	19.06	21.32	
5700		140	ax (SU) (20MHz)	135/143.4 (MCS11)	19.01	21.30	
5720		144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.03	21.21	
5510		102	n (40MHz)	135/150 (MCS7)	36.50	41.20	
5550		110	n (40MHz)	135/150 (MCS7)	36.51	41.22	
*5590		118	n (40MHz)	135/150 (MCS7)	36.58	41.46	
5670		134	n (40MHz)	135/150 (MCS7)	36.45	41.25	
5710		142	n (40MHz)	135/150 (MCS7)	36.55	41.55	
5510		102	ax (SU) (40MHz)	271/286 (MCS11)	37.97	41.30	
5550		110	ax (SU) (40MHz)	271/286 (MCS11)	37.89	41.38	
*5590		118	ax (SU) (40MHz)	271/286 (MCS11)	38.04	50.12	
5670		134	ax (SU) (40MHz)	271/286 (MCS11)	37.91	41.11	
5710		142	ax (SU) (40MHz)	271/286 (MCS11)	37.96	41.21	
5530		106	ac (80MHz)	390/433.3 (MCS9)	75.89	81.40	
*5610		122	ac (80MHz)	390/433.3 (MCS9)	75.90	81.45	
5690		138	ac (80MHz)	390/433.3 (MCS9)	75.98	82.42	
5530		106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.21	82.08	
*5610		122	ax (SU) (80MHz)	567/600.5 (MCS11)	77.12	81.73	
5690		138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.26	81.71	
*5570		114	ac (160MHz)	390/433.3 (MCS9)	154.92	165.16	
*5570		114	ax (SU) (80MHz)	567/600.5 (MCS11)	156.02	164.78	

Table 7-4. Conducted Bandwidth Measurements Antenna WF5T (High Data Rate)

*TDWR channel is not supported for ISED (denoted by a * next to the frequency)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 22 of 380

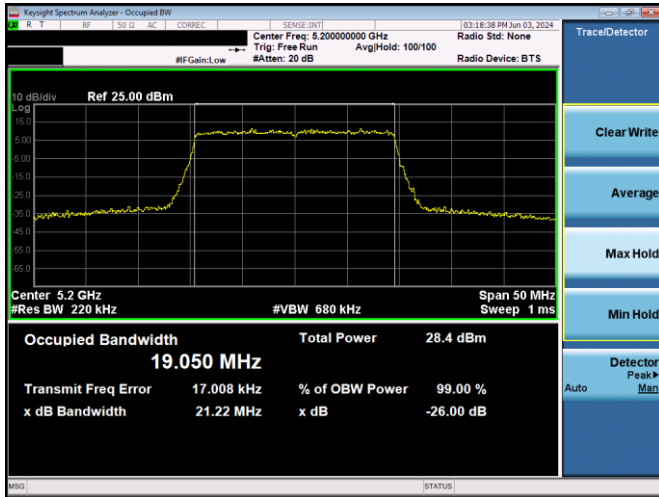
Low Data Rate



Plot 7-1. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n - Ch. 40, MCS2)



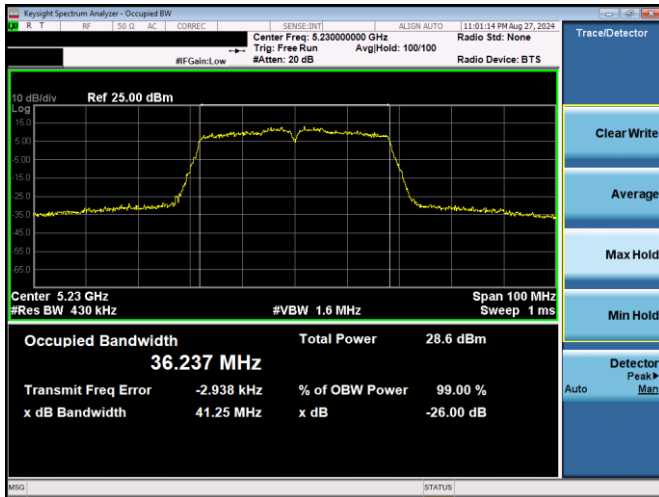
Plot 7-4. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) - Ch. 46, MCS2)



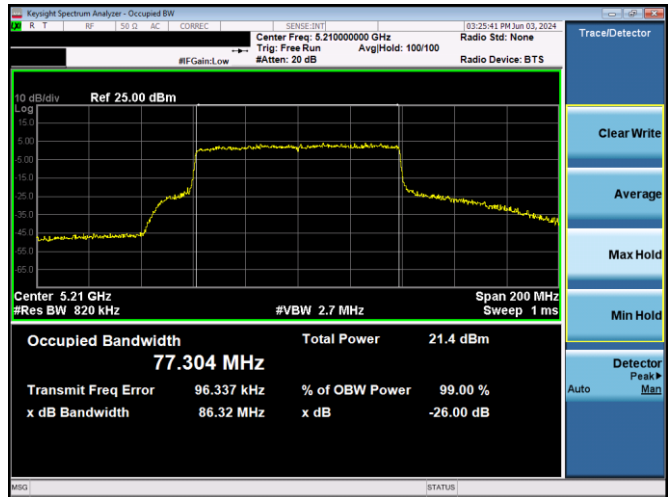
Plot 7-2. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) - Ch. 40, MCS2)



Plot 7-5. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac - Ch. 42, MCS2)

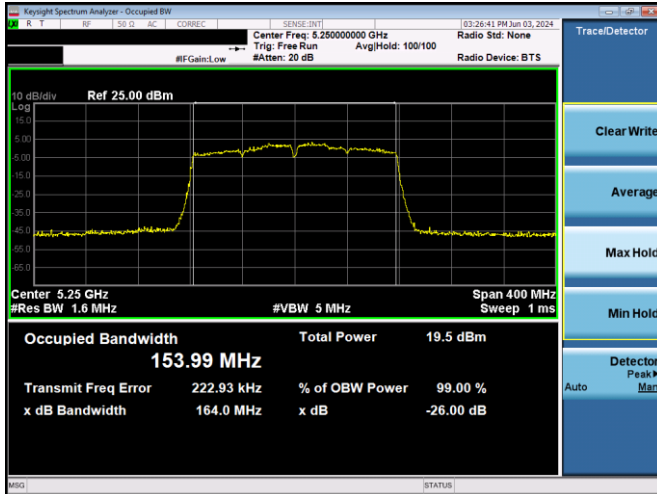


Plot 7-3. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n - Ch. 46, MCS2)

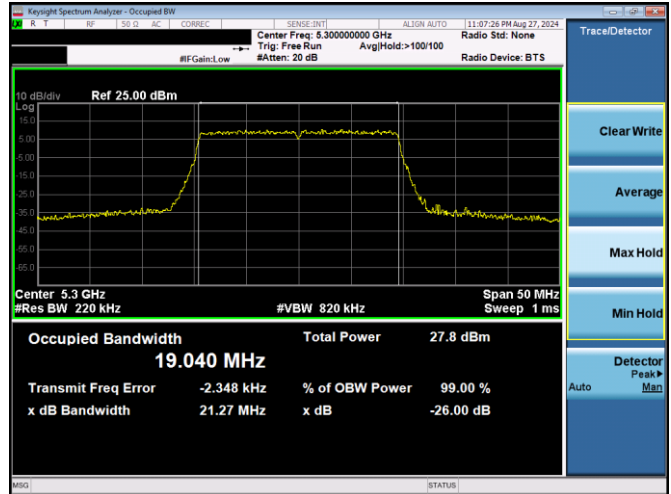


Plot 7-6. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) - Ch. 42, MCS2)

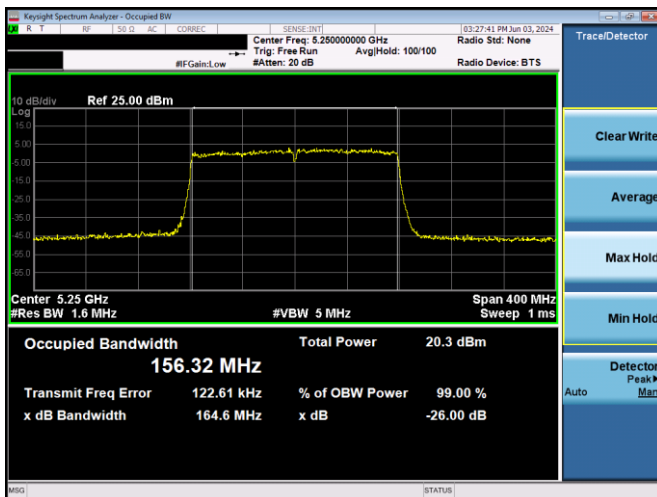
FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 23 of 380



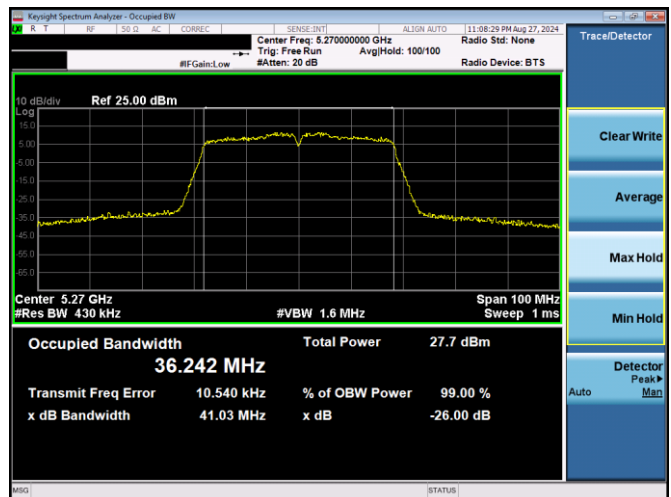
Plot 7-7. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ac – Ch. 50, MCS2)



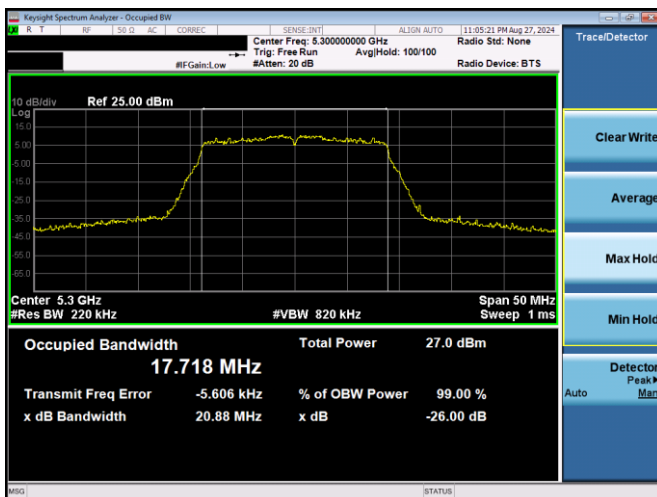
Plot 7-10. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) – Ch. 60, MCS2)



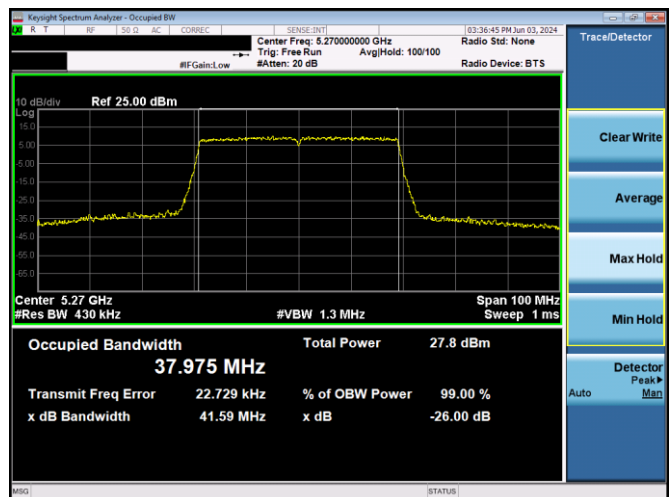
Plot 7-8. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ac – Ch. 50, MCS2)



Plot 7-11. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n – Ch. 54, MCS2)

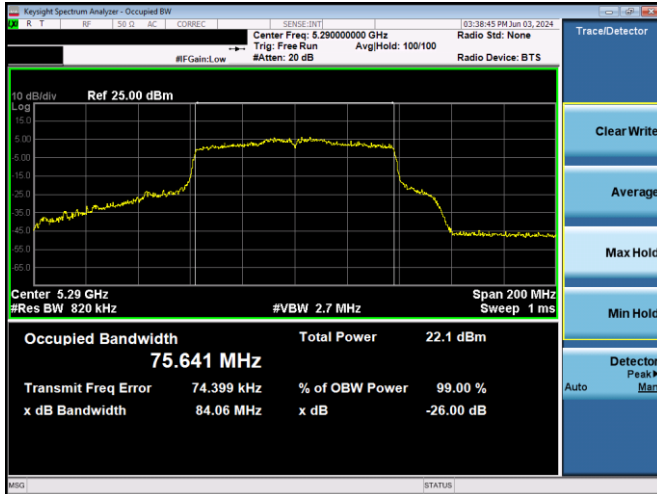


Plot 7-9. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n – Ch. 60, MCS2)

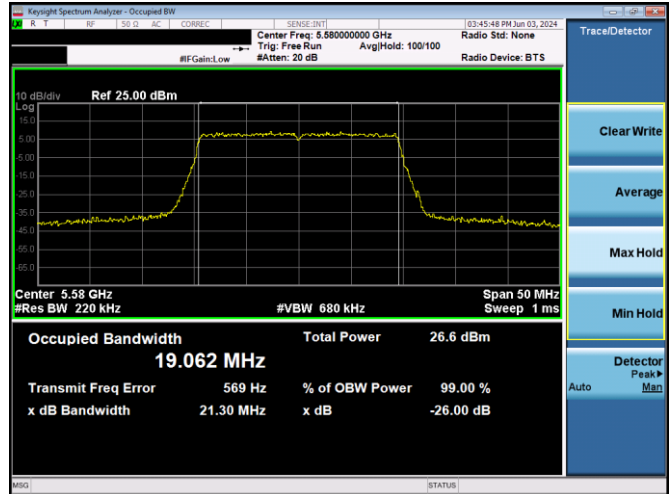


Plot 7-12. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) – Ch. 54, MCS2)

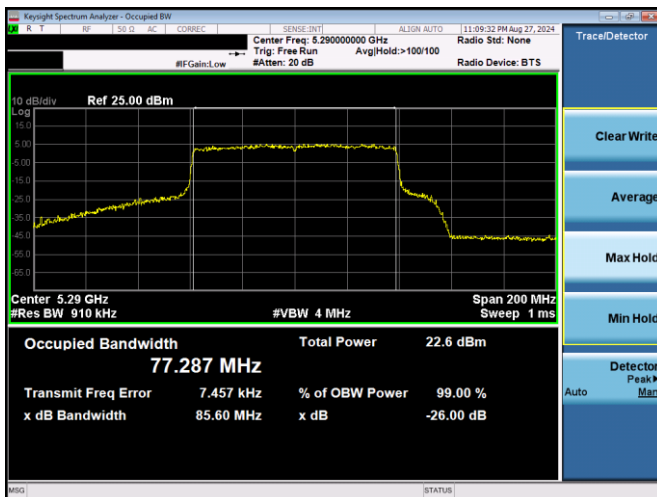
FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 24 of 380



Plot 7-13. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac – Ch. 58, MCS2)



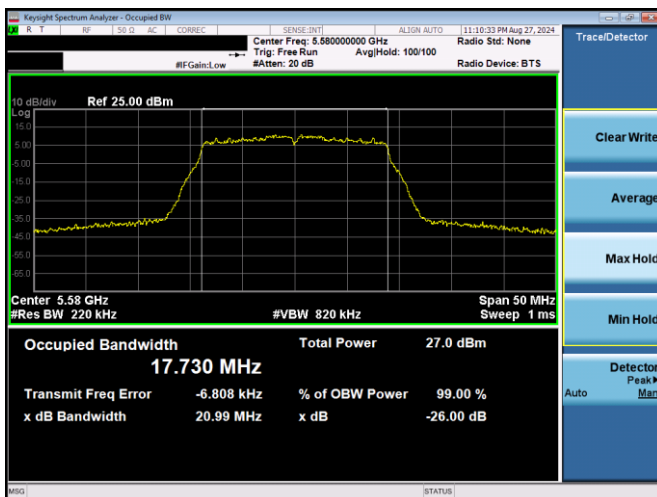
Plot 7-16. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) – Ch. 116, MCS2)



Plot 7-14. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) – Ch. 58, MCS2)



Plot 7-17. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n – Ch. 110, MCS2)

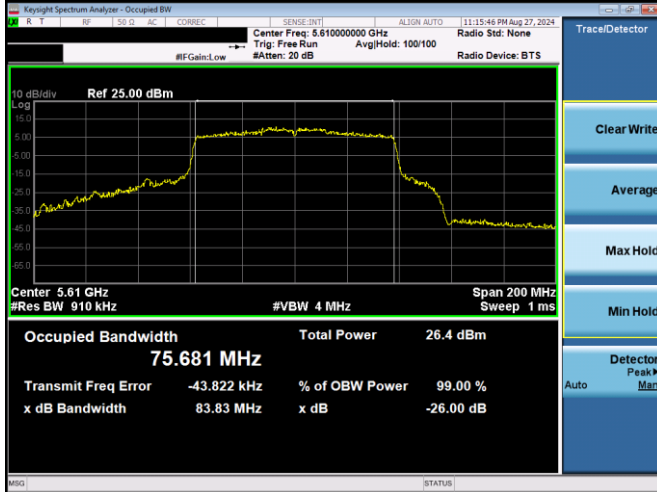


Plot 7-15. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n – Ch. 116, MCS2)

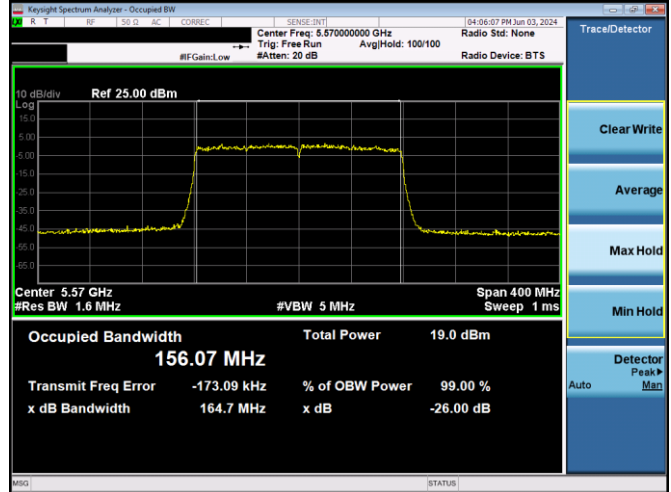


Plot 7-18. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) – Ch. 110, MCS2)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 25 of 380



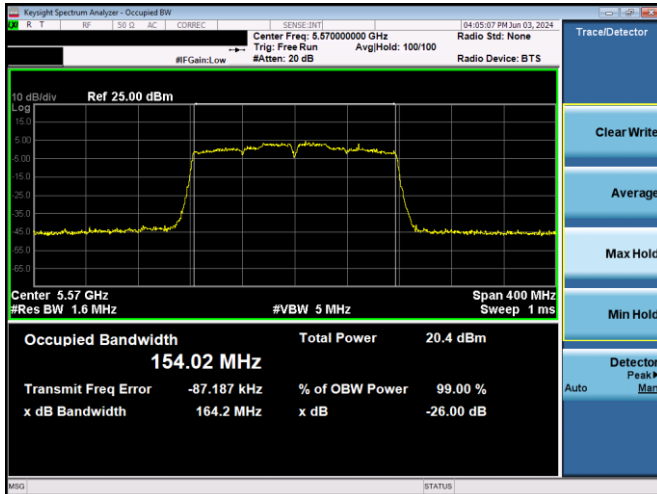
Plot 7-19. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac – Ch. 122, MCS2)



Plot 7-22. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ax – Ch. 114, MCS2)



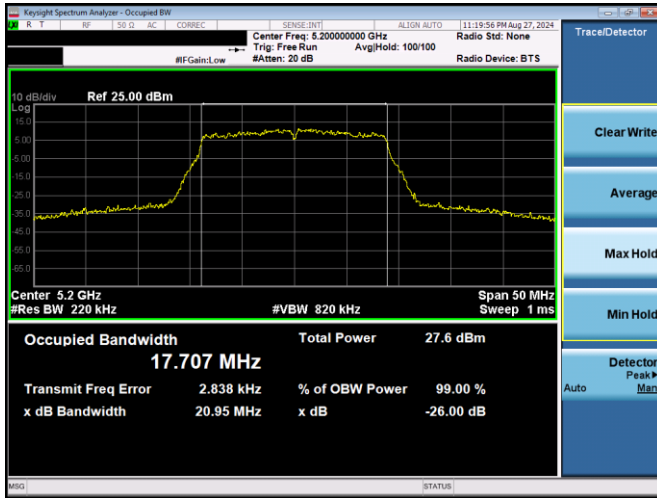
Plot 7-20. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) – Ch. 122, MCS2)



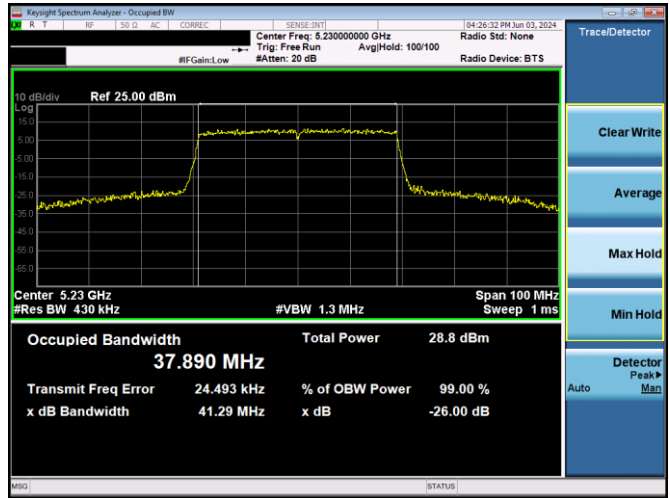
Plot 7-21. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ac – Ch. 114, MCS2)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 26 of 380

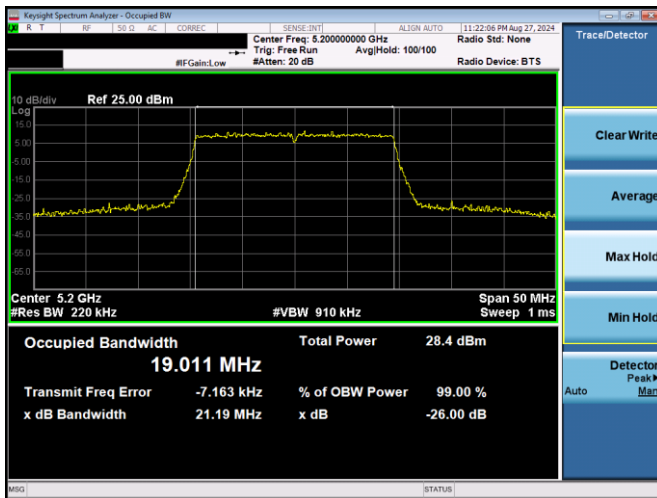
Mid Data Rate



Plot 7-23. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n – Ch. 40, MCS4)



Plot 7-26. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) – Ch. 46, MCS4)



Plot 7-24. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) – Ch. 40, MCS4)



Plot 7-27. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac – Ch. 42, MCS4)

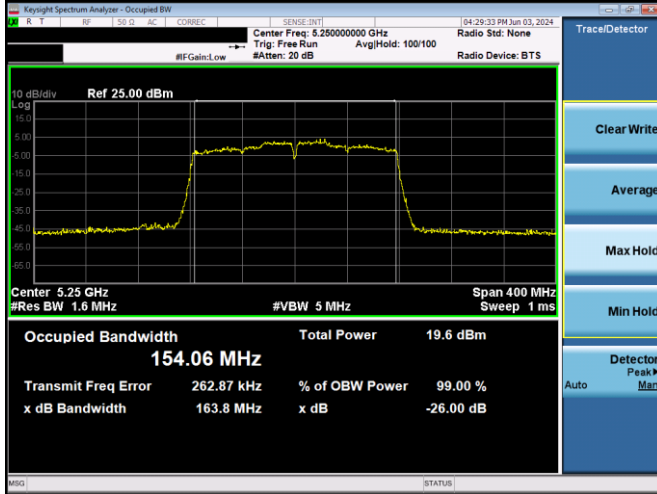


Plot 7-25. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n – Ch. 46, MCS4)

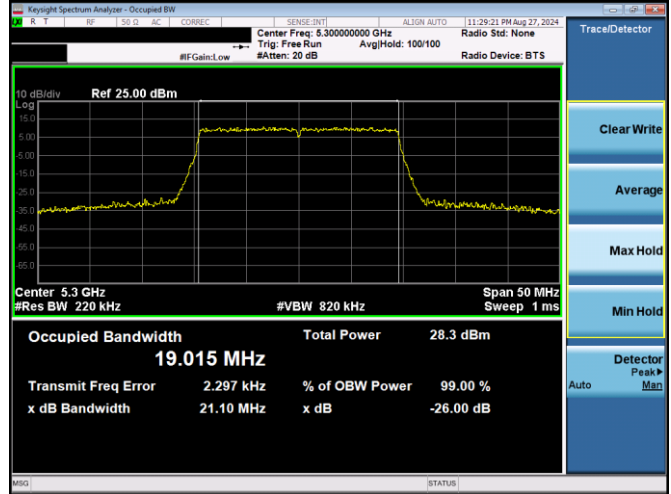


Plot 7-28. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) – Ch. 42, MCS4)

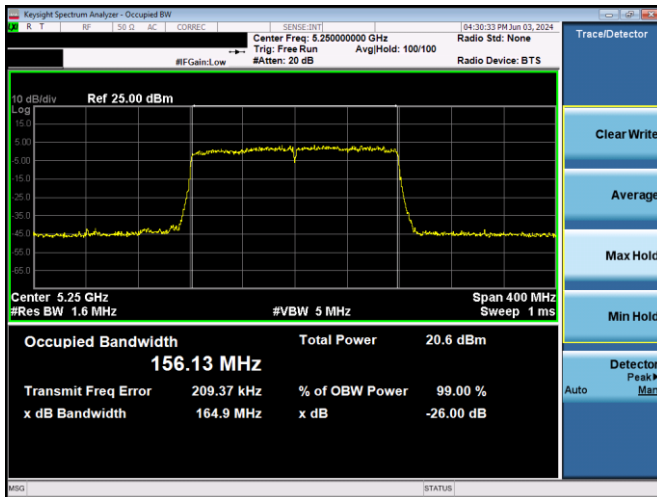
FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 27 of 380



Plot 7-29. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ac – Ch. 50, MCS4)



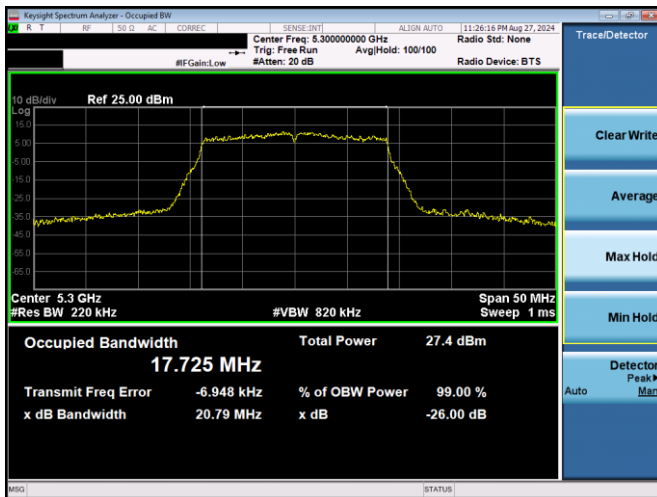
Plot 7-32. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) – Ch. 60, MCS4)



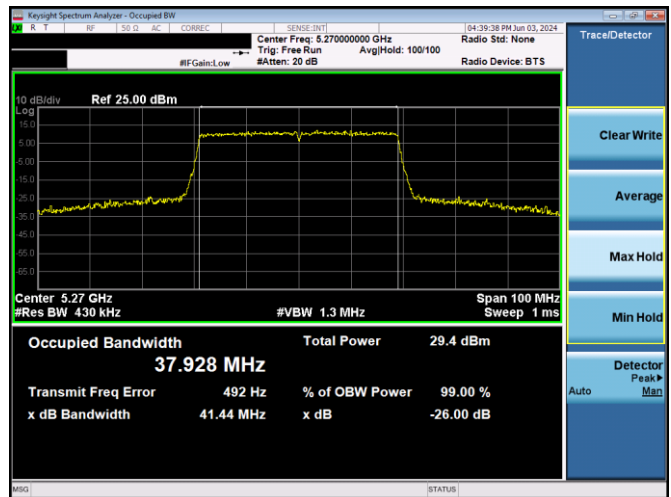
Plot 7-30. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ac – Ch. 50, MCS4)



Plot 7-33. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n – Ch. 54, MCS4)

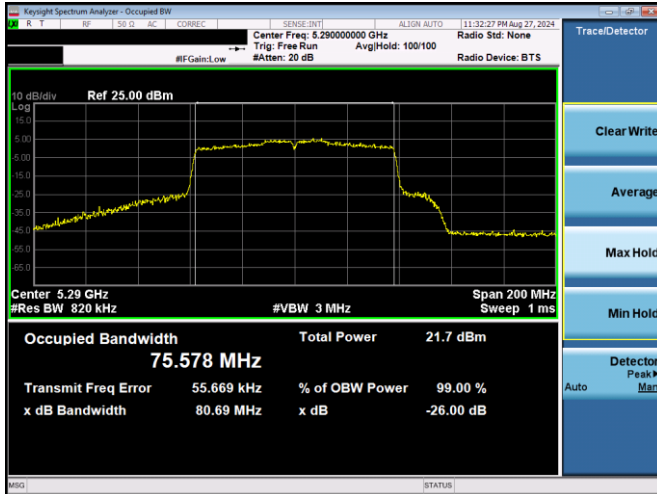


Plot 7-31. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n – Ch. 60, MCS4)

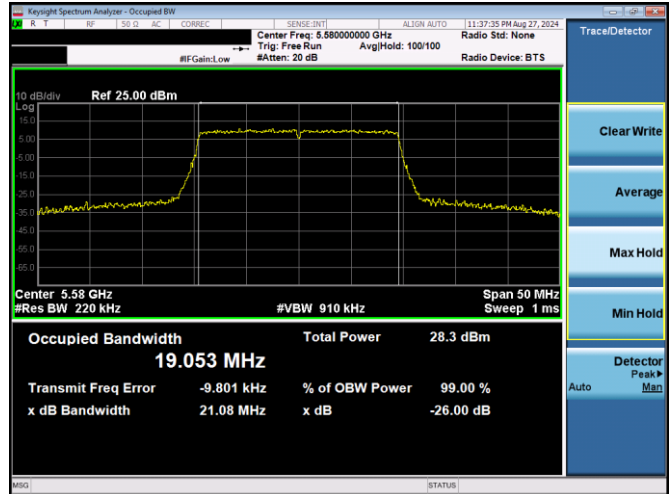


Plot 7-34. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) – Ch. 54, MCS4)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 28 of 380



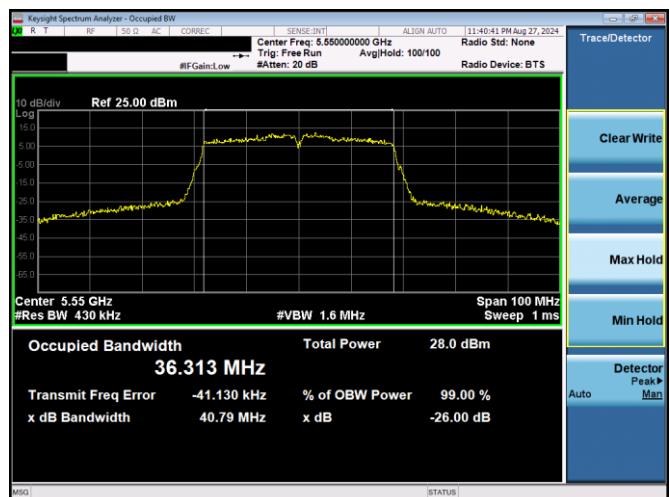
Plot 7-35. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac – Ch. 58, MCS4)



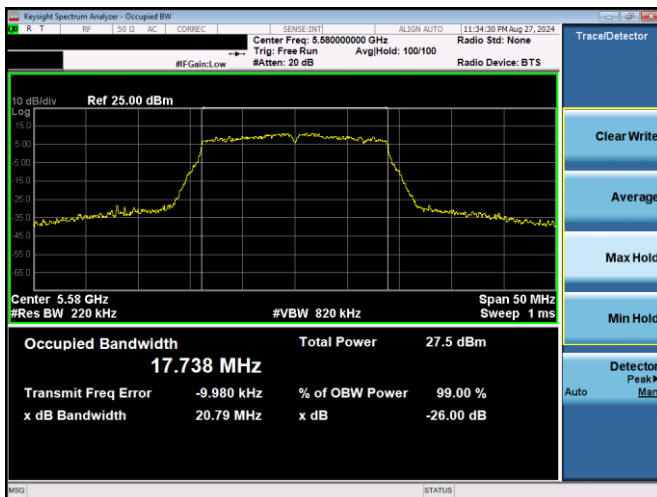
Plot 7-38. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) – Ch. 116, MCS4)



Plot 7-36. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) – Ch. 58, MCS4)



Plot 7-39. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n – Ch. 110, MCS4)

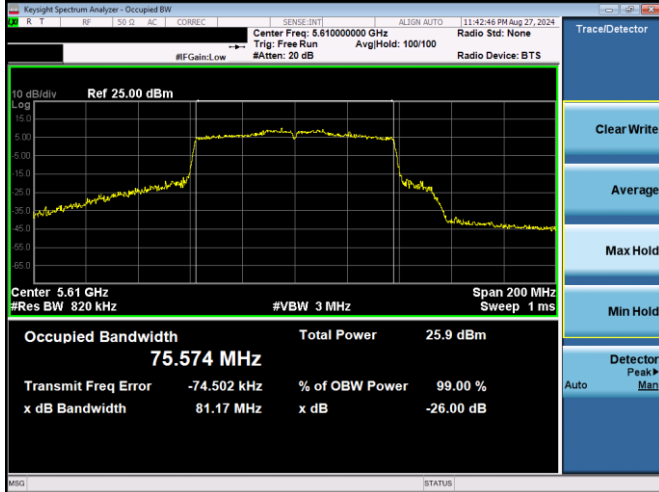


Plot 7-37. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n – Ch. 116, MCS4)

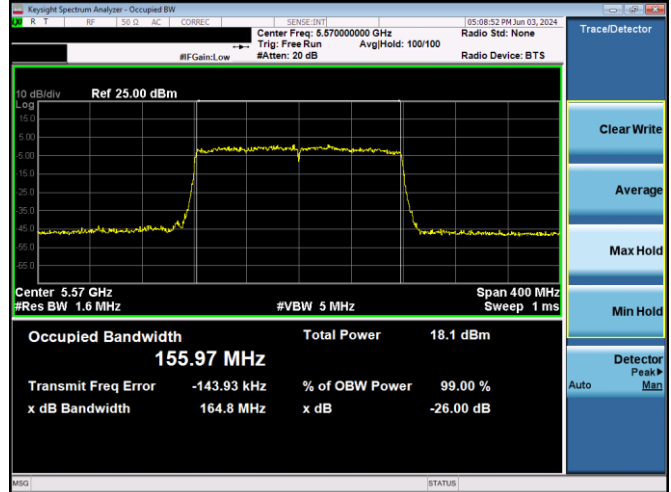


Plot 7-40. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) – Ch. 110, MCS4)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 29 of 380



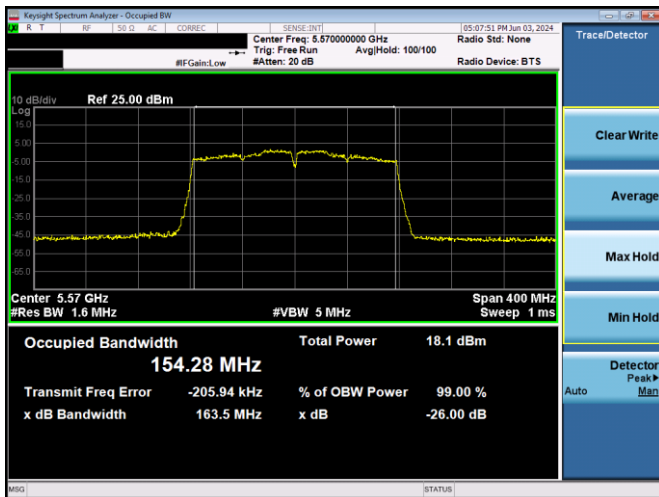
Plot 7-41. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac – Ch. 122, MCS4)



Plot 7-44. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ax – Ch. 114, MCS4)



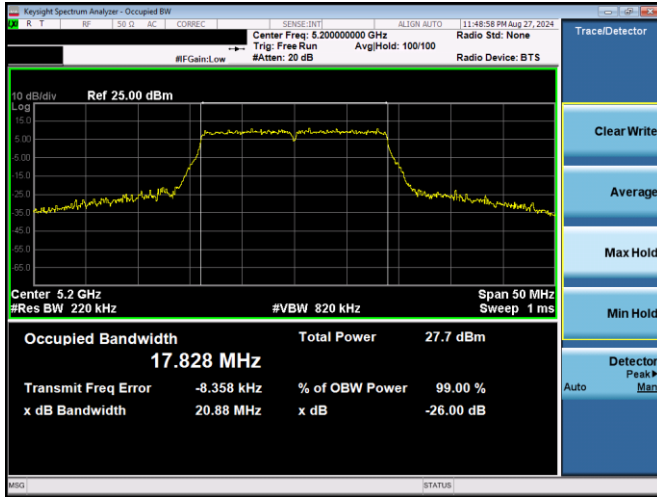
Plot 7-42. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) – Ch. 122, MCS4)



Plot 7-43. 26dB BW & 99% OBW Antenna WF5T (160MHz BW 802.11ac – Ch. 114, MCS4)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 30 of 380

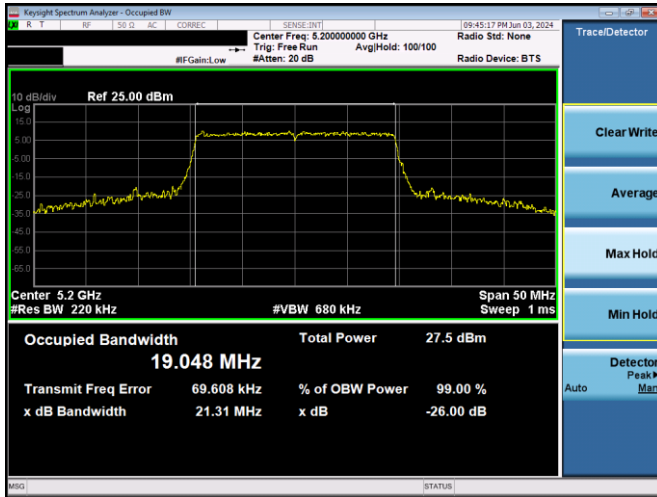
High Data Rate



Plot 7-45. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11n – Ch. 40, MCS7)



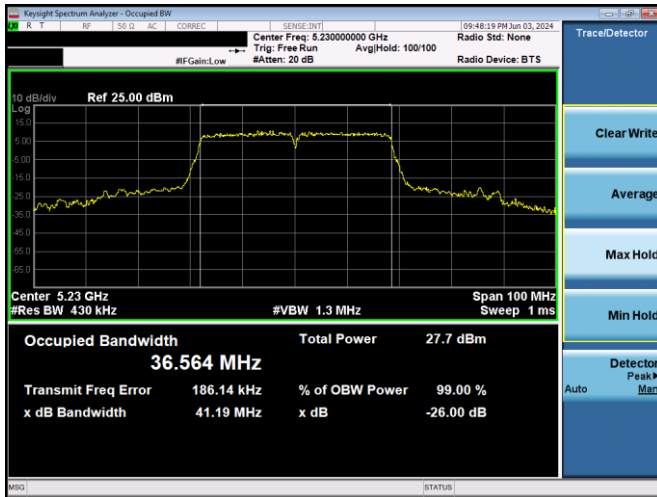
Plot 7-48. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11ax(SU) – Ch. 46, MCS11)



Plot 7-46. 26dB BW & 99% OBW Antenna WF5T (20MHz BW 802.11ax(SU) – Ch. 40, MCS11)



Plot 7-49. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ac – Ch. 42, MCS9)



Plot 7-47. 26dB BW & 99% OBW Antenna WF5T (40MHz BW 802.11n – Ch. 46, MCS7)



Plot 7-50. 26dB BW & 99% OBW Antenna WF5T (80MHz BW 802.11ax(SU) – Ch. 42, MCS11)

FCC ID: BCGA2993 IC: 579C-A2993		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2405200017-11.BCG	Test Dates: 5/20/2024 - 8/28/2024	EUT Type: Tablet Device	Page 31 of 380