

DATA REFERENCE 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:

05/30/2022 - 09/03/2022

Test Site/Location:

Element Washington DC LLC, Morgan Hill, CA, USA

Test Report Serial No.:

1C2205090026-18.BCG

FCC ID:	BCGA2761
IC:	579C-A2761
APPLICANT:	Apple Inc.

Reference Model/HVIN:	A2435
Variant Model/HVIN:	A2761(A2762)
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)
ISSED 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: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 1 of 22

TABLE OF CONTENTS

1.0	INTRODUCTION	3
1.1	Scope	3
1.2	Element Test Location	3
1.3	Test Facility / Accreditations	3
2.0	PRODUCT INFORMATION	4
2.1	Equipment Description	4
2.2	Device Capabilities	4
2.3	Antenna Description	9
2.4	Test Support Equipment	9
2.5	Test Configuration	10
2.6	Software and Firmware	10
2.7	EMI Suppression Device(s)/Modifications	10
3.0	DESCRIPTION OF TESTS	11
3.1	Evaluation Procedure	11
3.2	Radiated Emissions	11
3.3	Environmental Conditions	12
4.0	ANTENNA REQUIREMENTS	13
5.0	MEASUREMENT UNCERTAINTY	14
6.0	TEST EQUIPMENT CALIBRATION DATA	15
7.0	TEST RESULTS (SPOT-CHECK DATA)	16
7.1	Summary	16
7.2	Radiated Spurious Emissions	17
8.0	CONCLUSION	21
9.0	APPENDIX A: REFERENCE MODEL TEST REPORT	22

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 2 of 22

1.0 INTRODUCTION

1.1 Scope

Per manufacturer declaration, there are two tablet device models, A2435 and A2761(A2762), with high degree of similarity, reference model FCC ID: BCGA2435 / IC: 579C-A2435 and variant model **FCC ID: BCGA2761 / IC: 579C-A2761**. The reference models support mmWave operations, while the variant models have the mmWave components/antennas removed. Both models share the same material, form factor, circuit design, and components, including antennas and their locations. The reference and variant models use the same power tables and have same tune-up tolerances.

Per FCC/ISED approved Data Referencing Test Plan, testing was done fully on the reference model FCC ID: BCGA2435 / IC: 579C-A2435, while radiated and conducted spot-check verification has been performed on variant model **FCC ID: BCGA2761 / IC: 579C-A2761**. Spot-check measurements were conducted, all measurements were investigated and found to be within acceptable tolerance.

Equipment Class	Reference Model FCC ID & IC	Reference Report	Report Title
NII	BCGA2435 579C-A2435	1C2205090025-19.BCG	RF UNII Test Report

Table 1-1. Reference Model Details

Reference model FCC ID: BCGA2435 / IC: 579C-A2435 test report has been included in Appendix A.

1.2 Element Washington DC LLC Test Location

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

1.3 Test Facility / Accreditations

Measurements were performed at Element Washington DC LLC located in Morgan Hill, CA 95037, U.S.A.

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

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 3 of 22

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2761** and **IC: 579C-A2761**. 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.: DLX2254004Z21NF15, W7NCJD7FYQ, X3JD904MC6

2.2 Device Capabilities

This device contains the following capabilities:

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

This device support 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

FCC ID: BCGA2761 IC: 579C-A2761		 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device		Page 4 of 22

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

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

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

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

Notes:

1. TDWR channels are not supported for ISED.
2. 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:

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 5 of 22

Measured Duty Cycles				
802.11 Mode/Band		Duty Cycle [%]		
		Antenna 5b	Antenna 4a	CDD/SDM
5GHz	a (Low Rate)	97.30	97.80	97.60
	a (Mid Rate)	96.00	95.90	96.30
	a (High Rate)	89.60	90.70	91.70
	n (HT20) (Low Rate)	96.80	96.90	94.60
	n (HT20) (Mid Rate)	94.10	94.40	90.20
	n (HT20) (High Rate)	91.20	91.70	86.10
	ax(SU) (HT20 Low Rate)	96.30	95.90	95.90
	ax(SU) (HT20 Mid Rate)	93.20	93.20	93.30
	ax(SU) (HT20 High Rate)	86.90	87.10	86.70
	n (HT40 Low Rate)	94.00	94.20	90.20
	n (HT40 Mid Rate)	90.00	89.80	85.00
	n (HT40 High Rate)	86.90	86.70	81.70
	ax(SU) (HT40 Low Rate)	93.60	93.70	93.50
	ax(SU) (HT40 Mid Rate)	89.70	89.80	90.10
	ax(SU) (HT40 High Rate)	82.90	82.90	83.30
	ac (HT80 Low Rate)	89.20	88.90	83.40
	ac (HT80 Mid Rate)	83.30	84.10	79.10
	ac (HT80 High Rate)	78.00	77.70	74.80
	ax(SU) (HT80 Low Rate)	88.80	89.00	89.10
	ax(SU) (HT80 Mid Rate)	85.00	84.70	85.10
	ax(SU) (HT80 High Rate)	80.20	77.66	80.00
	ac (HT160 Low Rate)	84.80	84.80	80.20
	ac (HT160 Mid Rate)	79.20	79.30	76.10
	ac (HT160 High Rate)	73.90	74.00	72.40
	ax(SU) (HT160 Low Rate)	84.30	85.30	84.90
	ax(SU) (HT160 Mid Rate)	80.90	81.60	81.60
	ax(SU) (HT160 High Rate)	77.90	78.00	76.20

Table 2-5. Measured Duty Cycles

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 6 of 22

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

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna 5b	Antenna 4a	Antenna 5b	Antenna 4a	Antenna 5b	Antenna 4a	Antenna 5b	Antenna 4a
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓

Table 2-6. WIFI Configurations

✓ = Support ; ✗ = NOT Support

SISO = Single Input Single Output

SDM = Spatial Diversity Multiplexing – MIMO function

CDD = Cyclic Delay Diversity - 2Tx Function

STBC = Space-Time Block Coding – 2Tx Function

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

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

13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW)

29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac – 80MHz BW)

58/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7 (ac 160MHz)

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, 351/780, 936/1040, 1053/1170, 1170/1300, 1402/1560, 1560/1733.4Mbps (MIMO ac – 80MHz)

116/130, 234/260, 351/390, 468/520, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7 (MIMO ac – 160MHz)

8/8.6, 16/17.2, 24/25.8, 33/34.4, 49/51.6, 65/68.8, 73/77.4, 81/86.0, 98/103.2, 108/114.7, 122/129.0, 135/143.4 (ax – 20MHz)

16/17.2, 33/34.4, 49/51.6, 65/68.8, 98/103.2, 130/137.6, 146/154.9, 163/172.1, 195/206.5, 217/229.4, 244/258.1, 271/286.8 (ax – 40MHz BW)

34/36.0, 68/72.1, 102/108.1, 136/144.1, 204/216.2, 272/288.2, 306/324.4, 340/360.3, 408/432.4, 453/480.4, 510/540.4, 567/600.5 (ax – 80MHz BW)

136.2/144.2, 272/288.2, 408.2/432.4, 544.4, 576.4/816.6864.8, 1088.8/1153, 1225/1297, 1361.2/1441.2, 1633.4/1729.4, 1814.8/1921.6, 2041.6/2161.8, 2268.6/2402Mbps, (MIMO ax – 160MHz)

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 7 of 22

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

Antenna	Simultaneous Tx Config	WIFI 2.4GHz	Bluetooth	NB UNII	WIFI 5GHz	WIFI 6GHz	LTE / FR1 NR
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	BDR, HDR4/8	802.11 a/n/ac/ax	802.11 a/ax	Ultra High Band
2a	Config 1	✓	✗	✗	✗	✗	✓
2a	Config 2	✗	✓	✗	✗	✗	✓
4a	Config 3	✓	✗	✓	✗	✗	✗
4a	Config 4	✗	✓	✗	✓	✗	✗

Table 2-7. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

Note:

1. All the above simultaneous transmission configurations have been tested and the worst-case configuration was found to be Config 2 and reported in RF Bluetooth and RF Part 96 test reports.
2. Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. For BT (2.4 GHz) in connected mode and Wi-Fi (2.4 GHz) – Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power. For BT (2.4 GHz) in disconnected mode and Wi-Fi (2.4 GHz) – BT will be using iPA only and Wi-Fi max power will not exceed minimum of (SAR max cap, Reg max cap) power.

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 8 of 22

2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna 5b	Antenna 4a
5.150 – 5.250	3.7	2.4
5.250 – 5.350	3.6	2.8
5.470 – 5.725	3.5	0.7
5.725 – 5.850	4.0	0.3

Table 2-8. 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: Spartan	S/N: 000MKTR02U
3	USB-C Cable w/ AC Adapter	Model: A246 Model: A2305	S/N: N/A S/N: N/A
4	Apple Pencil	Model: N/A	S/N: GQXGSXBJKM9
5	DC Power Supply	Model: KPS3010D	S/N: N/A

Table 2-9. Test Support Equipment List

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 9 of 22

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. See Sections 3.2 for radiated 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.

Per FCC/ISED Approved Data Referencing Test Plan, spot-check measurements have been conducted and reported. Spot-Check Test Plan can be referred to below Table 2-10.

Technology	Test Case	FCC ID: BCGA2761 IC: 579C-A2761	
		Mode	Channel
UNII (802.11a/n/ac/ax)	Radiated Spurious Emissions	MIMO Max Power 5.2G/5.3G/5.6G/5.8G: 11n	M

Table 2-10. FCC/ISED Approved Spot-Check Test Plan

Output powers were measured and confirmed to be consistent between Reference and Variant models prior to testing.

2.6 Software and Firmware

The test was conducted with firmware version 20A8359 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.

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 10 of 22

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 v01r01 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 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 rotated about its vertical axis 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.

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 11 of 22

3.3 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).

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 12 of 22

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 antenna(s) 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.

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 13 of 22

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)
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz - 1GHz)	4.75
Radiated Disturbance (1 - 18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 14 of 22

6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	6/10/2022	Annual	6/10/2023	MY49430244
Agilent Technologies	N9020A	MXA Signal Analyzer	4/26/2022	Annual	4/26/2023	MY56470202
Anritsu	ML2496A	Power Meter	11/29/2021	Annual	11/29/2022	1840005
Anritsu	MA2411B	Pulse Power Sensor	11/30/2021	Annual	11/30/2022	1726261
Anritsu	MA2411B	Pulse Power Sensor	11/30/2021	Annual	11/30/2022	1726262
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	1/19/2022	Annual	1/19/2023	T058701-02
Com-Power Corporation	LIN-120A	Line Impedance Stabilization Network (LISN)	3/7/2022	Annual	3/7/2023	241296
ETS-Lindgren	3142E	Biconilog Antenna (26-6000MHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Horn Antenna (1-18GHz)	10/25/2021	Annual	10/25/2022	227597
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz-6GHz)	1/6/2022	Annual	1/6/2023	102328
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	FSVA3044	Signal Analyzer (up to 44 GHz)	5/12/2022	Annual	5/12/2023	101098
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546
Rohde & Schwarz	TC-TA18	Cross-Polarized Antenna 400MHz-18GHz	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz-18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz-40GHz)	4/18/2022	Annual	4/18/2023	100050

Table 6-1. Test Equipment List

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 15 of 22

7.0 TEST RESULTS (SPOT-CHECK DATA)

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2761
 IC: 579C-A2761
 FCC Classification: Unlicensed National Information Infrastructure (UNII)

Technology	Test Configurations			Reference Model		Variant Model		Delta	
	Test Description	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2435 IC: 579C-A2435		FCC ID: BCGA2761 IC: 579C-A2761			
				Peak [dBµV/m]	Average [dBµV/m]	Peak [dBµV/m]	Average [dBµV/m]	Peak [dB]	Average [dB]
UNII 802.11n	Radiated Spurious Emissions	40	15600	55.28	43.59	54.92	43.68	0.36	0.09
		56	15840	56.48	44.48	56.70	44.82	0.22	0.34
		116	16740	56.57	-	55.59	-	0.98	-
		157	17355	56.77	-	56.01	-	0.76	-

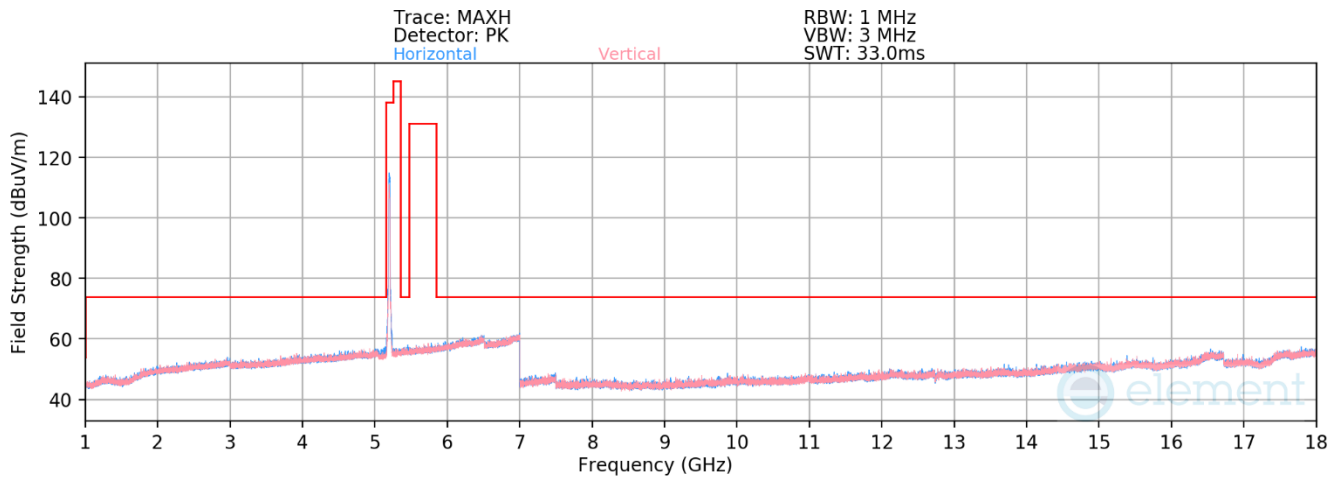
Table 7-1. Worst Case Spot-check Results

Spot-checks were conducted, all measurements were investigated and found to be within acceptable tolerance in accordance with FCC/ISED Approved Data Referencing Test Plan.

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 16 of 22

7.2 Radiated Spurious Emissions

§15.407(b) §15.205 §15.209; RSS-Gen [8.9]



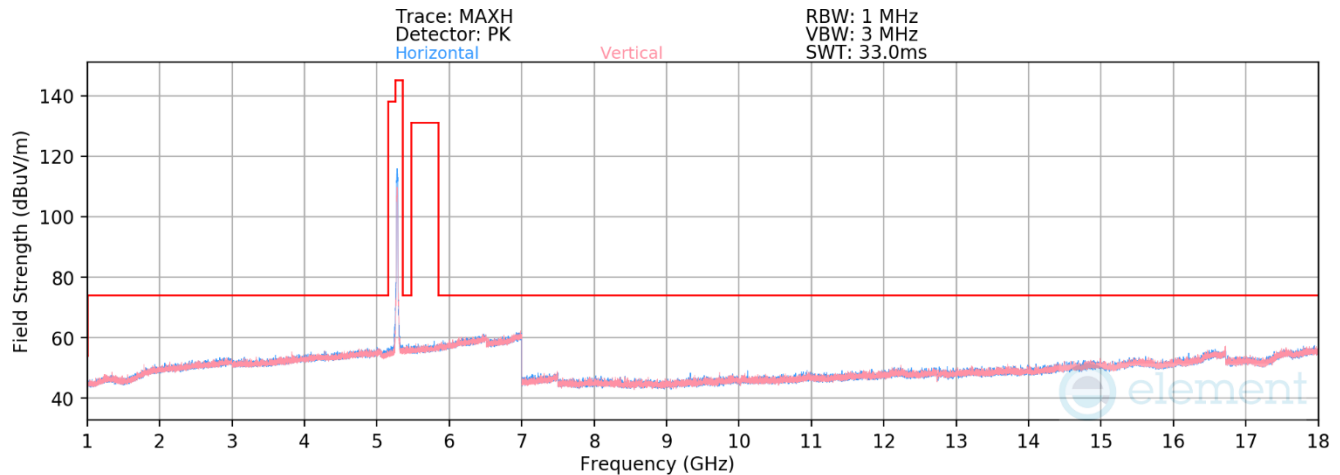
Plot 7-1. RSE above 1GHz SDM (802.11n - Ch.40)

Mode: 802.11n
Data Rate: MCS8
Distance of Measurements: 3 Meters
Operating Frequency: 5200MHz
Channel: 40

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
10400.00	Peak	H	-	-	-70.21	15.45	52.24	68.20	-15.96
* 15600.00	Average	H	-	-	-83.54	20.22	43.68	53.98	-10.30
* 15600.00	Peak	H	-	-	-72.30	20.22	54.92	73.98	-19.06

Table 7-2. Radiated Measurements SDM

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 17 of 22



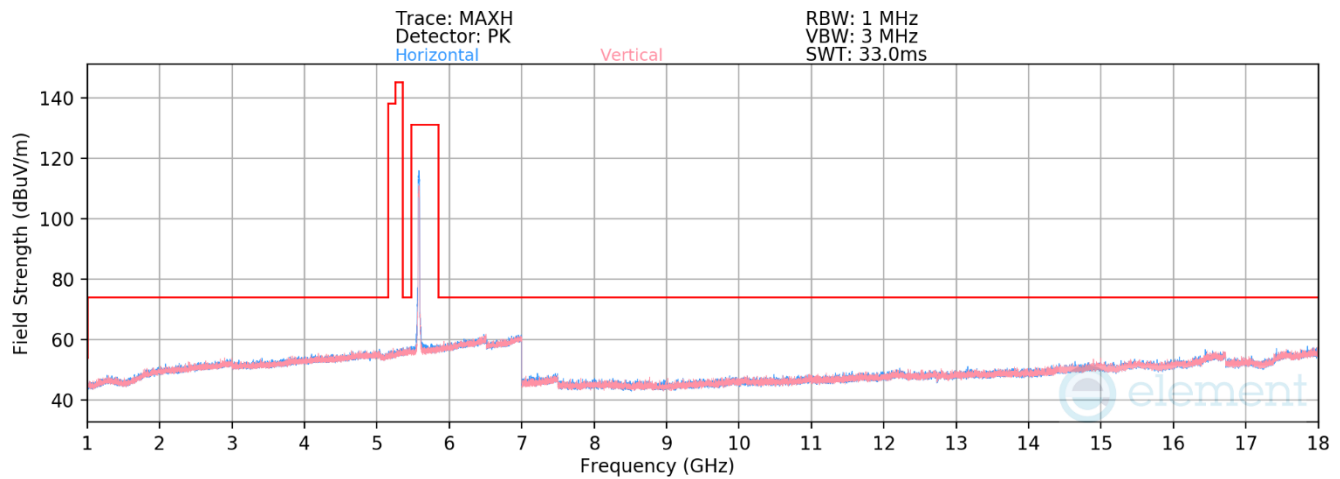
Plot 7-2. RSE above 1GHz SDM (802.11n – Ch.56)

Mode: 802.11n
Data Rate: MCS8
Distance of Measurements: 3 Meters
Operating Frequency: 5280MHz
Channel: 56

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
10560.00	Peak	H	-	-	-70.21	15.54	52.33	68.20	-15.87
* 15840.00	Average	H	-	-	-83.05	20.87	44.82	53.98	-9.16
* 15840.00	Peak	H	-	-	-71.17	20.87	56.70	73.98	-17.28

Table 7-3. Radiated Measurements SDM

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 18 of 22



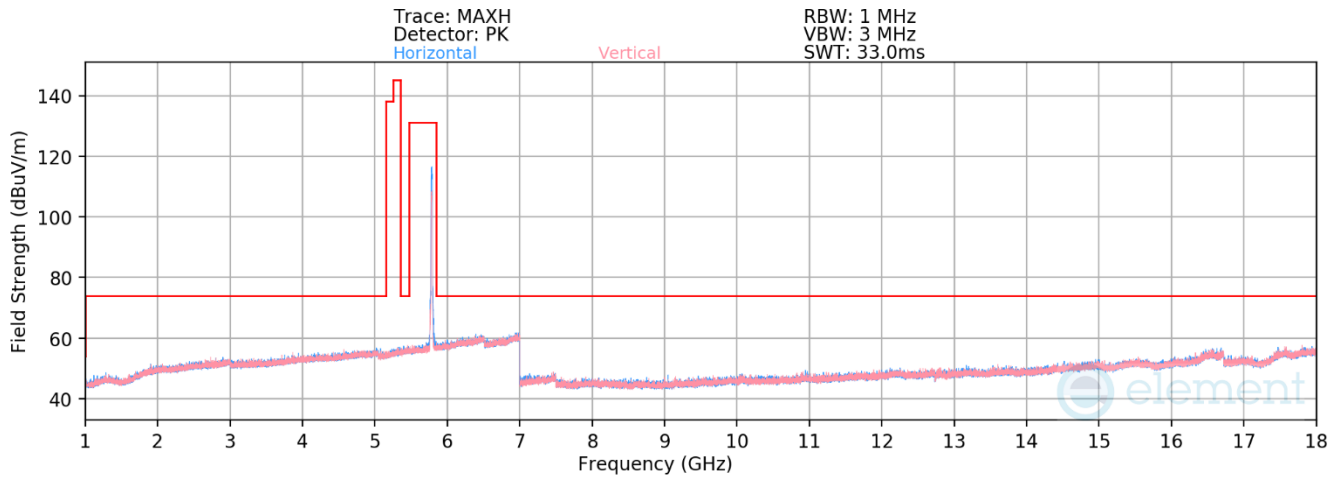
Plot 7-3. RSE above 1GHz CDD (802.11n – Ch.116)

Mode: 802.11n
Data Rate: MCS8
Distance of Measurements: 3 Meters
Operating Frequency: 5580MHz
Channel: 116

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
* 11160.00	Average	H	-	-	-81.83	15.72	40.89	53.98	-13.09
* 11160.00	Peak	H	-	-	-70.97	15.72	51.75	73.98	-22.23
16740.00	Peak	H	-	-	-72.90	21.49	55.59	68.20	-12.61

Table 7-4. Radiated Measurements CDD

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 19 of 22



Plot 7-4. RSE above 1GHz CDD (802.11n – Ch.157)

Mode: 802.11n
Data Rate: MCS8
Distance of Measurements: 3 Meters
Operating Frequency: 5785MHz
Channel: 157

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
* 11570.00	Average	H	-	-	-82.15	16.28	41.13	53.98	-12.85
* 11570.00	Peak	H	-	-	-71.17	16.28	52.11	73.98	-21.87
17355.00	Peak	H	-	-	-72.32	21.33	56.01	68.20	-12.19

Table 7-5. Radiated Measurements CDD

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 20 of 22

8.0 CONCLUSION

The spot-check data measured for variant model **FCC ID: BCGA2761 / IC: 579C-A2761** is in tolerance with reference model FCC ID: BCGA2435 / IC: 579C-A2435 per FCC/ISED Approved Data Referencing Test Plan.

FCC ID: BCGA2761 IC: 579C-A2761		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 21 of 22

9.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2205090025-19.BCG) from reference model FCC ID: BCGA2435 / IC: 579C-A2435, which includes referenced data results.

FCC ID: BCGA2761 IC: 579C-A2761	 DATA REFERENCE REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090026-18.BCG	Test Dates: 05/30/2022 - 09/03/2022	EUT Type: Tablet Device	Page 22 of 22



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:

05/31/2022-09/03/2022

Test Site/Location:

Element Washington DC LLC Morgan Hill, CA, USA

Test Report Serial No.:

1C2205090025-19.BCG

FCC ID:

BCGA2435

IC:

579C-A2435

APPLICANT:

Apple Inc.

Application Type:

Certification

Model/HVIN:

A2435

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: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 1 of 390

V 10.5 12/15/2021

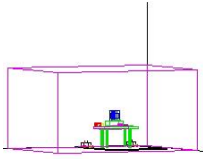
T A B L E O F C O N T E N T S

1.0	INTRODUCTION	6
1.1	Scope.....	6
1.2	Element Washington DC LLC Test Location.....	6
1.3	Test Facility / Accreditations.....	6
2.0	PRODUCT INFORMATION	7
2.1	Equipment Description	7
2.2	Device Capabilities.....	7
2.3	Antenna Description.....	11
2.4	Test Support Equipment.....	11
2.5	Test Configuration	12
2.6	Software and Firmware	13
2.7	EMI Suppression Device(s)/Modifications.....	13
3.0	DESCRIPTION OF TESTS	14
3.1	Evaluation Procedure	14
3.2	AC Line Conducted Emissions	14
3.3	Radiated Emissions.....	15
3.4	Environmental Conditions.....	15
4.0	ANTENNA REQUIREMENTS	16
5.0	MEASUREMENT UNCERTAINTY	17
6.0	TEST EQUIPMENT CALIBRATION DATA.....	18
7.0	TEST RESULTS	19
7.1	Summary.....	19
7.2	26dB & 99% Bandwidth Measurement – 802.11a/n/ac/ax(SU)	21
7.3	6dB & 99% Bandwidth Measurement – 802.11a/n/ac/ax(SU)	53
7.4	Conducted Output Power and Max EIRP Measurement – 802.11a/n/ac/ax(SU)	62
7.5	Maximum Power Spectral Density – 802.11a/n/ac/ax(SU).....	97
7.6	Radiated Spurious Emissions – Above 1GHz	195
7.7	Radiated Spurious Emissions – Below 1GHz	379
7.8	AC Line-Conducted Emissions Measurement.....	384
8.0	CONCLUSION.....	390

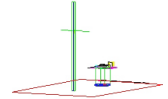
FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 2 of 390

V 10.5 12/15/2021

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MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD					
				Antenna 5b		Antenna 4a		Antenna 5b		Antenna 4a		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	86.099	19.35	88.308	19.46	50.003	16.99	50.119	17.00	100.231	20.01
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	49.431	16.94	49.317	16.93	98.855	19.95
2C		802.11a/n	5500 - 5720	89.125	19.50	88.716	19.48	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	88.308	19.46	88.920	19.49	88.716	19.48	89.125	19.50	177.828	22.50
1	40	802.11n	5190 - 5230	84.918	19.29	87.902	19.44	88.105	19.45	87.498	19.42	175.792	22.45
2A		802.11n	5270 - 5310	84.140	19.25	84.723	19.28	87.297	19.41	87.498	19.42	174.985	22.43
2C		802.11n	5510 - 5710	88.512	19.47	89.125	19.50	87.498	19.42	87.297	19.41	174.985	22.43
3		802.11n	5755 - 5795	86.497	19.37	87.096	19.40	86.497	19.37	85.310	19.31	171.791	22.35
1	80	802.11ac	5210	23.659	13.74	22.856	13.59	17.579	12.45	21.478	13.32	39.084	15.92
2A		802.11ac	5290	34.594	15.39	34.435	15.37	26.546	14.24	27.353	14.37	53.951	17.32
2C		802.11ac	5530 - 5690	88.716	19.48	87.700	19.43	85.704	19.33	84.333	19.26	170.216	22.31
3		802.11ac	5775	79.250	18.99	77.625	18.90	54.200	17.34	67.453	18.29	121.619	20.85
1/2	160	802.11ac	5170-5330	8.872	9.48	8.851	9.47	6.966	8.43	7.798	8.92	14.757	11.69
2C		802.11ac	5490-5650	8.630	9.36	8.375	9.23	7.798	8.92	7.745	8.89	15.560	11.92
1	20	802.11ax (SU)	5180 - 5240	88.920	19.49	87.498	19.42	48.084	16.82	49.659	16.96	97.724	19.90
2A		802.11ax (SU)	5260 - 5320	86.696	19.38	89.125	19.50	50.119	17.00	49.659	16.96	99.770	19.99
2C		802.11ax (SU)	5500 - 5720	88.308	19.46	88.512	19.47	50.003	16.99	49.888	16.98	100.000	20.00
3		802.11ax (SU)	5745 - 5825	87.902	19.44	89.125	19.50	87.700	19.43	88.512	19.47	176.198	22.46
1	40	802.11ax (SU)	5190 - 5230	76.208	18.82	78.886	18.97	78.163	18.93	76.736	18.85	154.882	21.90
2A		802.11ax (SU)	5270 - 5310	87.096	19.40	87.498	19.42	85.901	19.34	83.753	19.23	169.824	22.30
2C		802.11ax (SU)	5510 - 5710	88.512	19.47	87.096	19.40	88.308	19.46	88.512	19.47	177.011	22.48
3		802.11ax (SU)	5755 - 5795	88.105	19.45	89.125	19.50	87.096	19.40	86.099	19.35	173.380	22.39
1	80	802.11ax (SU)	5210	19.498	12.90	19.907	12.99	17.579	12.45	17.338	12.39	34.914	15.43
2A		802.11ax (SU)	5290	29.242	14.66	29.309	14.67	26.546	14.24	26.669	14.26	53.211	17.26
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	85.704	19.33	85.704	19.33	88.105	19.45	173.780	22.40
3		802.11ax (SU)	5775	63.096	18.00	61.376	17.88	54.200	17.34	53.703	17.30	107.895	20.33
1/2	160	802.11ax (SU)	5250	7.709	8.87	7.925	8.99	6.966	8.43	7.015	8.46	13.996	11.46
2C		802.11ax (SU)	5570	8.770	9.43	8.913	9.50	7.798	8.92	7.727	8.88	15.524	11.91

FCC EUT Overview (Low Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD					
				Antenna 5b		Antenna 4a		Antenna 5b		Antenna 4a		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	33.420	15.24	33.497	15.25	18.793	12.74	18.707	12.72	37.497	15.74
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	49.659	16.96	49.317	16.93	99.083	19.96
2C		802.11a/n	5500 - 5700	89.125	19.50	88.716	19.48	50.003	16.99	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	88.308	19.46	88.920	19.49	88.716	19.48	89.125	19.50	177.828	22.50
1	40	802.11n	5190 - 5230	58.749	17.69	59.156	17.72	32.734	15.15	32.961	15.18	65.766	18.18
2A		802.11n	5270 - 5310	84.140	19.25	84.723	19.28	87.297	19.41	87.498	19.42	174.985	22.43
2C		802.11n	5510 - 5710	88.512	19.47	89.125	19.50	87.498	19.42	87.297	19.41	174.985	22.43
3		802.11n	5755 - 5795	86.497	19.37	87.096	19.40	86.497	19.37	85.310	19.31	171.791	22.35
1	80	802.11ac	5210	23.659	13.74	22.856	13.59	22.131	13.45	21.478	13.32	43.652	16.40
2A		802.11ac	5290	34.594	15.39	34.435	15.37	27.797	14.44	27.353	14.37	55.208	17.42
2C		802.11ac	5530 - 5690	88.716	19.48	87.700	19.43	86.696	19.38	84.333	19.26	171.002	22.33
3		802.11ac	5775	79.250	18.99	77.625	18.90	66.681	18.24	67.453	18.29	134.276	21.28
1/2	160	802.11ac	5170-5330	8.872	9.48	8.851	9.47	7.925	8.99	7.798	8.92	15.740	11.97
2C		802.11ac	5490-5650	8.630	9.36	8.375	9.23	7.816	8.93	7.745	8.89	15.560	11.92
1	20	802.11ax (SU)	5180 - 5240	33.343	15.23	33.343	15.23	18.836	12.75	37.584	15.75	56.364	17.51
2A		802.11ax (SU)	5260 - 5320	89.125	19.50	89.125	19.50	50.119	17.00	49.659	16.96	99.770	19.99
2C		802.11ax (SU)	5500 - 5720	88.308	19.46	88.512	19.47	50.003	16.99	49.659	16.96	99.770	19.99
3		802.11ax (SU)	5745 - 5825	87.902	19.44	89.125	19.50	87.700	19.43	88.512	19.47	176.198	22.46
1	40	802.11ax (SU)	5190 - 5230	59.020	17.71	58.749	17.69	33.343	15.23	33.343	15.23	121.060	20.83
2A		802.11ax (SU)	5270 - 5310	87.096	19.40	87.498	19.42	33.189	15.21	83.753	19.23	116.950	20.68
2C		802.11ax (SU)	5510 - 5710	88.512	19.47	87.096	19.40	88.308	19.46	88.512	19.47	177.011	22.48
3		802.11ax (SU)	5755 - 5795	88.105	19.45	89.125	19.50	87.096	19.40	86.099	19.35	173.380	22.39
1	80	802.11ax (SU)	5210	19.498	12.90	19.907	12.99	17.579	12.45	17.338	12.39	34.914	15.43
2A		802.11ax (SU)	5290	29.242	14.66	29.309	14.67	26.546	14.24	26.669	14.26	53.211	17.26
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	85.704	19.33	85.704	19.33	88.105	19.45	173.780	22.40
3		802.11ax (SU)	5775	63.096	18.00	61.376	17.88	54.200	17.34	53.703	17.30	107.895	20.33
1/2	160	802.11ax (SU)	5250	7.709	8.87	7.925	8.99	6.966	8.43	7.015	8.46	13.996	11.46
2C		802.11ax (SU)	5570	8.770	9.43	8.913	9.50	7.798	8.92	7.727	8.88	15.524	11.91

ISED EUT Overview (Low Data Rate)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 3 of 390

V 10.5 12/15/2021

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UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD					
				Antenna 5b		Antenna 4a		Antenna 5b		Antenna 4a		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	86.298	19.36	77.090	18.87	48.417	16.85	49.774	16.97	98.175	19.92
2A		802.11a/n	5260 - 5320	88.105	19.45	88.105	19.45	49.888	16.98	49.204	16.92	99.083	19.96
2C		802.11a/n	5500 - 5700	89.125	19.50	87.498	19.42	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	88.716	19.48	87.700	19.43	176.198	22.46
1	40	802.11n	5190 - 5230	89.125	19.50	85.901	19.34	77.983	18.92	78.343	18.94	156.315	21.94
2A		802.11n	5270 - 5310	88.105	19.45	84.333	19.26	87.902	19.44	88.308	19.46	176.198	22.46
2C		802.11n	5510 - 5710	89.125	19.50	86.896	19.39	87.700	19.43	89.125	19.50	177.011	22.48
3		802.11n	5755 - 5795	88.105	19.45	88.716	19.48	88.716	19.48	89.125	19.50	177.828	22.50
1	80	802.11ac	5210	17.378	12.40	16.711	12.23	14.962	11.75	14.060	11.48	29.040	14.63
2A		802.11ac	5290	21.086	13.24	20.893	13.20	19.861	12.98	19.498	12.90	39.355	15.95
2C		802.11ac	5530 - 5690	86.497	19.37	83.368	19.21	86.896	19.39	88.716	19.48	175.792	22.45
3		802.11ac	5775	55.719	17.46	54.954	17.40	49.431	16.94	39.719	15.99	89.125	19.50
1/2	160	802.11ac	5170-5330	7.047	8.48	6.934	8.41	5.598	7.48	5.585	7.47	11.194	10.49
2C		802.11ac	5490-5650	6.180	7.91	6.138	7.88	5.623	7.50	5.572	7.46	11.194	10.49
1	20	802.11ax (SU)	5180 - 5240	87.297	19.41	85.704	19.33	49.431	16.94	49.888	16.98	99.312	19.97
2A		802.11ax (SU)	5260 - 5320	89.125	19.50	88.105	19.45	50.119	17.00	48.306	16.84	98.401	19.93
2C		802.11ax (SU)	5500 - 5720	89.125	19.50	89.125	19.50	50.119	17.00	49.659	16.96	99.770	19.99
3		802.11ax (SU)	5745 - 5825	88.308	19.46	89.125	19.50	88.716	19.48	86.696	19.38	175.388	22.44
1	40	802.11ax (SU)	5190 - 5230	68.077	18.33	67.764	18.31	68.234	18.34	67.608	18.30	135.831	21.33
2A		802.11ax (SU)	5270 - 5310	76.736	18.85	79.433	19.00	77.983	18.92	76.913	18.86	154.882	21.90
2C		802.11ax (SU)	5510 - 5710	89.125	19.50	86.298	19.36	88.105	19.45	88.308	19.46	176.604	22.47
3		802.11ax (SU)	5755 - 5795	88.716	19.48	86.896	19.39	89.125	19.50	85.704	19.33	174.985	22.43
1	80	802.11ax (SU)	5210	13.490	11.30	13.740	11.38	13.868	11.42	14.060	11.48	27.925	14.46
2A		802.11ax (SU)	5290	19.679	12.94	19.143	12.82	19.634	12.93	19.498	12.90	39.174	15.93
2C		802.11ax (SU)	5530 - 5690	88.105	19.45	88.105	19.45	86.497	19.37	88.716	19.48	175.388	22.44
3		802.11ax (SU)	5775	39.084	15.92	39.811	16.00	38.726	15.88	39.719	15.99	78.524	18.95
1/2	160	802.11ax (SU)	5250	6.252	7.96	6.152	7.89	5.508	7.41	5.585	7.47	11.092	10.45
2C		802.11ax (SU)	5570	6.194	7.92	6.180	7.91	5.546	7.44	5.572	7.46	11.117	10.46

FCC EUT Overview (Mid Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD					
				Antenna 5b		Antenna 4a		Antenna 5b		Antenna 4a		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	33.420	15.24	33.450	15.24	18.750	12.73	18.836	12.75	37.584	15.75
2A		802.11a/n	5260 - 5320	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11a/n	5500 - 5700	89.125	19.50	89.125	19.50	50.003	16.99	50.119	17.00	100.231	20.01
3		802.11a/n	5745 - 5825	87.498	19.42	89.125	19.50	88.920	19.49	87.700	19.43	176.604	22.47
1	40	802.11n	5190 - 5230	59.293	17.73	59.020	17.71	33.037	15.19	33.420	15.24	66.527	18.23
2A		802.11n	5270 - 5310	88.308	19.46	84.333	19.26	83.368	19.21	83.560	19.22	167.109	22.23
2C		802.11n	5510 - 5710	89.125	19.50	89.125	19.50	87.700	19.43	86.696	19.38	174.582	22.42
3		802.11n	5755 - 5795	88.920	19.49	88.716	19.48	87.498	19.42	85.704	19.33	173.380	22.39
1	80	802.11ac	5210	17.378	12.40	16.866	12.27	15.171	11.81	15.668	11.95	30.832	14.89
2A		802.11ac	5290	26.303	14.20	27.542	14.40	24.946	13.97	24.774	13.94	49.774	16.97
2C		802.11ac	5530 - 5690	89.125	19.50	83.560	19.22	86.099	19.35	88.920	19.49	174.985	22.43
3		802.11ac	5775	70.795	18.50	67.764	18.31	61.518	17.89	62.661	17.97	124.165	20.94
1/2	160	802.11ac	5170-5330	7.727	8.88	7.943	9.00	6.295	7.99	6.252	7.96	12.560	10.99
2C		802.11ac	5490-5650	6.637	8.22	6.871	8.37	6.295	7.99	6.039	7.81	12.331	10.91
1	20	802.11ax (SU)	5180 - 5240	33.420	15.24	33.420	15.24	18.750	12.73	18.664	12.71	37.411	15.73
2A		802.11ax (SU)	5260 - 5320	89.125	19.50	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01
2C		802.11ax (SU)	5500 - 5720	88.105	19.45	89.125	19.50	50.119	17.00	50.119	17.00	100.231	20.01
3		802.11ax (SU)	5745 - 5825	89.125	19.50	89.125	19.50	86.896	19.39	88.105	19.45	174.985	22.43
1	40	802.11ax (SU)	5190 - 5230	58.749	17.69	58.749	17.69	33.343	15.23	33.266	15.22	66.681	18.24
2A		802.11ax (SU)	5270 - 5310	80.168	19.04	78.705	18.96	76.384	18.83	76.560	18.84	153.109	21.85
2C		802.11ax (SU)	5510 - 5710	88.920	19.49	88.920	19.49	88.716	19.48	86.497	19.37	175.388	22.44
3		802.11ax (SU)	5755 - 5795	86.298	19.36	86.298	19.36	88.512	19.47	88.512	19.47	177.011	22.48
1	80	802.11ax (SU)	5210	17.378	12.40	17.140	12.34	14.962	11.75	15.276	11.84	30.269	14.81
2A		802.11ax (SU)	5290	23.878	13.78	24.774	13.94	23.496	13.71	23.174	13.65	46.666	16.69
2C		802.11ax (SU)	5530 - 5690	89.125	19.50	85.901	19.34	88.716	19.48	86.298	19.36	174.985	22.43
3		802.11ax (SU)	5775	53.088	17.25	52.240	17.18	60.117	17.79	60.814	17.84	121.060	20.83
1/2	160	802.11ax (SU)	5250	6.839	8.35	6.902	8.39	6.281	7.98	6.095	7.85	12.388	10.93
2C		802.11ax (SU)	5570	6.622	8.21	7.079	8.50	6.310	8.00	6.310	8.00	12.618	11.01

ISED EUT Overview (Mid Data Rate)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 4 of 390

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD					
				Antenna 5b		Antenna 4a		Antenna 5b		Antenna 4a		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	86.298	19.36	77.090	18.87	48.417	16.85	49.774	16.97	98.175	19.92
2A		802.11a/n	5260 - 5320	88.105	19.45	88.105	19.45	49.888	16.98	49.204	16.92	99.083	19.96
2C		802.11a/n	5500 - 5700	89.125	19.50	87.498	19.42	50.119	17.00	50.119	17.00	100.231	20.01
3	40	802.11a/n	5745 - 5825	89.125	19.50	89.125	19.50	89.125	19.50	88.308	19.46	177.419	22.49
1		802.11n	5190 - 5230	89.125	19.50	85.901	19.34	77.983	18.92	78.343	18.94	156.315	21.94
2A		802.11n	5270 - 5310	88.105	19.45	84.333	19.26	87.902	19.44	88.308	19.46	176.198	22.46
2C	80	802.11n	5510 - 5710	89.125	19.50	86.896	19.39	87.700	19.43	89.125	19.50	177.011	22.48
3		802.11n	5755 - 5795	88.105	19.45	88.716	19.48	88.716	19.48	89.125	19.50	177.828	22.50
1		802.11ac	5210	17.378	12.40	16.711	12.23	14.962	11.75	14.060	11.48	29.040	14.63
2A	160	802.11ac	5290	21.086	13.24	20.893	13.20	19.861	12.98	19.498	12.90	39.355	15.95
2C		802.11ac	5530 - 5690	86.497	19.37	83.368	19.21	86.896	19.39	88.716	19.48	175.792	22.45
3		802.11ac	5775	55.719	17.46	54.954	17.40	49.431	16.94	39.719	15.99	89.125	19.50
1/2	160	802.11ac	5170-5330	7.047	8.48	6.934	8.41	5.598	7.48	5.585	7.47	11.194	10.49
2C		802.11ac	5490-5650	6.180	7.91	6.138	7.88	5.623	7.50	5.572	7.46	11.194	10.49
1	20	802.11ax (SU)	5180 - 5240	87.297	19.41	85.704	19.33	49.431	16.94	49.888	16.98	99.312	19.97
2A		802.11ax (SU)	5260 - 5320	89.125	19.50	88.105	19.45	50.119	17.00	48.306	16.84	98.401	19.93
2C		802.11ax (SU)	5500 - 5720	89.125	19.50	89.125	19.50	50.119	17.00	49.659	16.96	99.770	19.99
3	40	802.11ax (SU)	5745 - 5825	88.308	19.46	89.125	19.50	88.716	19.48	86.696	19.38	175.388	22.44
1		802.11ax (SU)	5190 - 5230	68.077	18.33	67.764	18.31	68.234	18.34	67.608	18.30	135.831	21.33
2A		802.11ax (SU)	5270 - 5310	76.736	18.85	79.433	19.00	77.983	18.92	76.913	18.86	154.882	21.90
2C	80	802.11ax (SU)	5510 - 5710	89.125	19.50	86.298	19.36	88.105	19.45	88.308	19.46	176.604	22.47
3		802.11ax (SU)	5755 - 5795	88.716	19.48	86.896	19.39	89.125	19.50	85.704	19.33	174.985	22.43
1		802.11ax (SU)	5210	13.490	11.30	13.740	11.38	13.868	11.42	14.060	11.48	27.925	14.46
2A	160	802.11ax (SU)	5290	19.679	12.94	19.143	12.82	19.634	12.93	19.498	12.90	39.174	15.93
2C		802.11ax (SU)	5530 - 5690	88.105	19.45	88.105	19.45	86.497	19.37	88.716	19.48	175.388	22.44
3		802.11ax (SU)	5775	39.084	15.92	39.811	16.00	38.726	15.88	39.719	15.99	78.524	18.95
1/2	160	802.11ax (SU)	5250	6.252	7.96	6.152	7.89	5.508	7.41	5.585	7.47	11.092	10.45
2C		802.11ax (SU)	5570	6.194	7.92	6.180	7.91	5.546	7.44	5.572	7.46	11.117	10.46

FCC EUT Overview (High Data Rate)

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD					
				Antenna 5b		Antenna 4a		Antenna 5b		Antenna 4a		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	33.189	15.21	33.420	15.24	18.664	12.71	18.707	12.72	37.411	15.73
2A		802.11a/n	5260 - 5320	88.105	19.45	88.716	19.48	49.431	16.94	48.978	16.90	98.401	19.93
2C		802.11a/n	5500 - 5700	88.716	19.48	88.105	19.45	49.774	16.97	50.119	17.00	100.000	20.00
3	40	802.11a/n	5745 - 5825	89.125	19.50	86.896	19.39	89.125	19.50	88.308	19.46	177.419	22.49
1		802.11n	5190 - 5230	59.293	17.73	58.210	17.65	33.189	15.21	33.037	15.19	66.222	18.21
2A		802.11n	5270 - 5310	88.105	19.45	84.333	19.26	87.902	19.44	88.308	19.46	176.198	22.46
2C	80	802.11n	5510 - 5710	89.125	19.50	86.896	19.39	87.700	19.43	89.125	19.50	177.011	22.48
3		802.11n	5755 - 5795	88.105	19.45	88.716	19.48	88.716	19.48	89.125	19.50	177.828	22.50
1		802.11ac	5210	17.378	12.40	16.711	12.23	15.241	11.83	14.962	11.75	30.200	14.80
2A	160	802.11ac	5290	21.086	13.24	20.893	13.20	19.543	12.91	19.861	12.98	39.446	15.96
2C		802.11ac	5530 - 5690	86.497	19.37	83.368	19.21	86.696	19.38	86.896	19.39	173.780	22.40
3		802.11ac	5775	55.719	17.46	54.954	17.40	49.774	16.97	49.431	16.94	99.312	19.97
1/2	160	802.11ac	5170-5330	7.047	8.48	6.934	8.41	5.521	7.42	5.598	7.48	11.117	10.46
2C		802.11ac	5490-5650	6.180	7.91	6.138	7.88	5.559	7.45	5.623	7.50	11.194	10.49
1	20	802.11ax (SU)	5180 - 5240	33.343	15.23	33.189	15.21	18.707	12.72	18.836	12.75	37.584	15.75
2A		802.11ax (SU)	5260 - 5320	89.125	19.50	88.105	19.45	50.119	17.00	98.401	19.93	148.594	21.72
2C		802.11ax (SU)	5500 - 5720	89.125	19.50	89.125	19.50	50.119	17.00	49.659	16.96	99.770	19.99
3	40	802.11ax (SU)	5745 - 5825	88.308	19.46	89.125	19.50	88.716	19.48	86.696	19.38	175.388	22.44
1		802.11ax (SU)	5190 - 5230	58.749	17.69	59.156	17.72	32.810	15.16	33.266	15.22	66.069	18.20
2A		802.11ax (SU)	5270 - 5310	76.736	18.85	79.433	19.00	77.983	18.92	76.913	18.86	154.882	21.90
2C	80	802.11ax (SU)	5510 - 5710	89.125	19.50	86.298	19.36	88.105	19.45	88.308	19.46	176.604	22.47
3		802.11ax (SU)	5755 - 5795	88.716	19.48	86.896	19.39	89.125	19.50	85.704	19.33	174.985	22.43
1		802.11ax (SU)	5210	13.490	11.30	13.740	11.38	13.868	11.42	14.060	11.48	27.925	14.46
2A	160	802.11ax (SU)	5290	21.038	13.23	19.143	12.82	19.634	12.93	19.498	12.90	39.174	15.93
2C		802.11ax (SU)	5530 - 5690	88.105	19.45	88.105	19.45	86.497	19.37	88.716	19.48	175.388	22.44
3		802.11ax (SU)	5775	39.084	15.92	39.811	16.00	38.726	15.88	39.719	15.99	78.524	18.95
1/2	160	802.11ax (SU)	5250	6.252	7.96	6.152	7.89	5.508	7.41	5.585	7.47	11.092	10.45
2C		802.11ax (SU)	5570	6.194	7.92	6.180	7.91	5.546	7.44	5.572	7.46	11.117	10.46

ISED EUT Overview (High Data Rate)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 5 of 390

1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Washington DC LLC Test Location

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

1.3 Test Facility / Accreditations

Measurements were performed at Element Washington DC LLC located in Morgan Hill, CA 95037, U.S.A.

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

FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 6 of 390

V 10.5 12/15/2021

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2435** and **IC: 579C-A2435**. 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.: GJ49H3K4GP, N6FT9Q03C0, DLX218300CD1JXQ1C

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1, FR2), 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

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

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

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

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

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

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

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

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

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 7 of 390

V 10.5 12/15/2021

Notes:

- 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) KDB 789033 D02 v02r01 and ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Measured Duty Cycles				
802.11 Mode/Band		Duty Cycle [%]		
		Antenna 5b	Antenna 4a	CDD/SDM
5GHz	a (Low Rate)	97.30	97.80	97.60
	a (Mid Rate)	96.00	95.90	96.30
	a (High Rate)	89.60	90.70	91.70
	n (HT20) (Low Rate)	96.80	96.90	94.60
	n (HT20) (Mid Rate)	94.10	94.40	90.20
	n (HT20) (High Rate)	91.20	91.70	86.10
	ax(SU) (HT20 Low Rate)	96.30	95.90	95.90
	ax(SU) (HT20 Mid Rate)	93.20	93.20	93.30
	ax(SU) (HT20 High Rate)	86.90	87.10	86.70
	n (HT40 Low Rate)	94.00	94.20	90.20
	n (HT40 Mid Rate)	90.00	89.80	85.00
	n (HT40 High Rate)	86.90	86.70	81.70
	ax(SU) (HT40 Low Rate)	93.60	93.70	93.50
	ax(SU) (HT40 Mid Rate)	89.70	89.80	90.10
	ax(SU) (HT40 High Rate)	82.90	82.90	83.30
	ac (HT80 Low Rate)	89.20	88.90	83.40
	ac (HT80 Mid Rate)	83.30	84.10	79.10
	ac (HT80 High Rate)	78.00	77.70	74.80
	ax(SU) (HT80 Low Rate)	88.80	89.00	89.10
	ax(SU) (HT80 Mid Rate)	85.00	84.70	85.10
	ax(SU) (HT80 High Rate)	80.20	77.66	80.00
	ac (HT160 Low Rate)	84.80	84.80	80.20
	ac (HT160 Mid Rate)	79.20	79.30	76.10
	ac (HT160 High Rate)	73.90	74.00	72.40
	ax(SU) (HT160 Low Rate)	84.30	85.30	84.90
	ax(SU) (HT160 Mid Rate)	80.90	81.60	81.60
	ax(SU) (HT160 High Rate)	77.90	78.00	76.20

Table 2-5. Measured Duty Cycles

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 8 of 390

V 10.5 12/15/2021

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

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna 5b	Antenna 4a	Antenna 5b	Antenna 4a	Antenna 5b	Antenna 4a	Antenna 5b	Antenna 4a
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ax(SU) (160MHz)	✓	✓	✓	✓	✓	✓	✓	✓

Table 2-6. WIFI Configurations

✓ = Support ; ✗ = NOT Support

SISO = Single Input Single Output

SDM = Spatial Diversity Multiplexing – MIMO function

CDD = Cyclic Delay Diversity -- 2Tx Function

STBC = Space Time Block Coding – 2Tx Function

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

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

13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW)

29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac – 80MHz BW)

58/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7 (ac 160MHz)

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, 351/780, 936/1040, 1053/1170, 1170/1300, 1402/1560,

1560/1733.4Mbps (MIMO ac – 80MHz)

116/130, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7 (MIMO ac – 160MHz)

8/8.6, 16/17.2, 24/25.8, 33/34.4, 49/51.6, 65/68.8, 73/77.4, 81/86.0, 98/103.2, 108/114.7, 122/129.0, 135/143.4 (ax – 20MHz)

16/17.2, 33/34.4, 49/51.6, 65/68.8, 98/103.2, 130/137.6, 146/154.9, 163/172.1, 195/206.5, 217/229.4,

244/258.1, 271/286.8 (ax – 40MHz BW)

34/36.0, 68/72.1, 102/108.1, 136/144.1, 204/216.2, 272/288.2, 306/324.4, 340/360.3, 408/432.4, 453/480.4,

510/540.4, 567/600.5 (ax – 80MHz BW)

136.2/144.2, 272/288.2, 408.2/432.4, 544.4, 576.4/816.6864.8, 1088.8/1153, 1225/1297, 1361.2/1441.2,

1633.4/1729.4, 1814.8/1921.6, 2041.6/2161.8, 2268.6/2402Mbps, (MIMO ax – 160MHz)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 9 of 390

V 10.5 12/15/2021

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

Antenna	Simultaneous Tx Config	WiFi 2.4GHz	Bluetooth	NB UNII	WiFi 5GHz	WiFi 6GHz	LTE / FR1 NR
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	BDR, HDR4/8	802.11 a/n/ac/ax	802.11 a/ax	Ultra High Band
2a	Config 1	✓	✗	✗	✗	✗	✓
2a	Config 2	✗	✓	✗	✗	✗	✓
4a	Config 3	✓	✗	✓	✗	✗	✗
4a	Config 4	✗	✓	✗	✓	✗	✗

Table 2-7. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

Note:

1. All the above simultaneous transmission configurations have been tested and the worst-case configuration was found to be Config 2 and reported in RF Bluetooth and RF Part 96 test reports.
2. Wi-Fi 2.4GHz and Bluetooth 2.4 GHz can transmit simultaneously on separate antennas. For BT (2.4 GHz) in connected mode and Wi-Fi (2.4 GHz) – Wi-Fi max power will not exceed minimum of (13.5dBm, SAR max cap, Reg max cap) power. For BT (2.4 GHz) in disconnected mode and Wi-Fi (2.4 GHz) – BT will be using iPA only and Wi-Fi max power will not exceed minimum of (SAR max cap, Reg max cap) power.

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 10 of 390

V 10.5 12/15/2021

2.3 Antenna Description

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

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna 5b	Antenna 4a
5.150 – 5.250	3.7	2.4
5.250 – 5.350	3.6	2.8
5.470 – 5.725	3.5	0.7
5.725 – 5.850	4.0	0.3

Table 2-8. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook Pro	Model:	A2141	S/N:	C02DV7VKMD6T
	w/AC/DC Adapter	Model:	A2166	S/N:	N/A
2	Apple USB-C Cable	Model:	Spartan	S/N:	000MKTR02U
3	USB-C Cable	Model:	A246	S/N:	N/A
	w/ AC Adapter	Model:	A2305	S/N:	N/A
4	Apple Pencil	Model:	N/A	S/N:	GQXGSXBJKM9
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-9. Test Support Equipment List

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 11 of 390

V 10.5 12/15/2021

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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) HE20/40/80/160 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 802.11ac VHT80/VHT160 STBC mode.

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

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

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

Notes:

For 802.11ax-RU test result, see separate UNII 802.11ax (OFDMA) report, 1C2205090025-20.BCG

FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 12 of 390

V 10.5 12/15/2021

2.6 Software and Firmware

The test was conducted with firmware version 20A8359 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.

FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 13 of 390

V 10.5 12/15/2021

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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.

FCC ID: BCGA2435 IC: 579C-A2435			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device		Page 14 of 390

V 10.5 12/15/2021

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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).

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 15 of 390

V 10.5 12/15/2021

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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.

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 16 of 390

V 10.5 12/15/2021

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	1.77
Line Conducted Disturbance	2.70
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz - 1GHz)	4.75
Radiated Disturbance (1 - 18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 17 of 390

V 10.5 12/15/2021

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	6/10/2022	Annual	6/10/2023	MY49430244
Agilent Technologies	N9020A	MXA Signal Analyzer	4/26/2022	Annual	4/26/2023	MY56470202
Anritsu	ML2496A	Power Meter	11/29/2021	Annual	11/29/2022	1840005
Anritsu	MA2411B	Pulse Power Sensor	11/30/2021	Annual	11/30/2022	1726261
Anritsu	MA2411B	Pulse Power Sensor	11/30/2021	Annual	11/30/2022	1726262
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	1/19/2022	Annual	1/19/2023	T058701-02
Com-Power Corporation	LIN-120A	Line Impedance Stabilization Network (LISN)	3/7/2022	Annual	3/7/2023	241296
ETS-Lindgren	3142E	Biconilog Antenna (26-6000MHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Horn Antenna (1-18GHz)	10/25/2021	Annual	10/25/2022	227597
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz-6GHz)	1/6/2022	Annual	1/6/2023	102328
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	FSVA3044	Signal Analyzer (up to 44 GHz)	5/12/2022	Annual	5/12/2023	101098
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546
Rohde & Schwarz	TC-TA18	Cross-Polarized Antenna 400MHz-18GHz	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz-18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz-40GHz)	4/18/2022	Annual	4/18/2023	100050

Table 6-1. Test Equipment List

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 18 of 390

V 10.5 12/15/2021

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7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2435
 IC: 579C-A2435
 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 (1C22050900 25-18.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),	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

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 19 of 390

V 10.5 12/15/2021

Notes:

- 1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "UNII Automation," Version 7.0.
- 5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 1.3.1.
- 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.

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 20 of 390

V 10.5 12/15/2021

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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.

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 21 of 390

V 10.5 12/15/2021

Antenna 5b 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)	19.5/21.7 (MCS2)	17.81	21.43
	5200	40	n (20MHz)	19.5/21.7 (MCS2)	17.71	21.01
	5240	48	n (20MHz)	19.5/21.7 (MCS2)	17.71	20.87
	5180	36	ax (SU) (20MHz)	24/25.8 (MCS2)	19.07	23.88
	5200	40	ax (SU) (20MHz)	24/25.8 (MCS2)	19.04	21.05
	5240	48	ax (SU) (20MHz)	24/25.8 (MCS2)	18.99	21.17
	5190	38	n (40MHz)	40.5/45 (MCS2)	36.54	44.66
	5230	46	n (40MHz)	40.5/45 (MCS2)	36.34	41.46
	5190	38	ax (SU) (40MHz)	49/51.6 (MCS2)	38.12	52.57
	5230	46	ax (SU) (40MHz)	49/51.6 (MCS2)	38.00	41.38
	5210	42	ac (80MHz)	87.8/97.5 (MCS2)	75.69	83.18
	5210	42	ax (SU) (80MHz)	102/108.1 (MCS2)	77.16	84.48
	5250	50	ax (160MHz)	204.2/216.2(MCS2)	156.35	164.80
	5250	50	ac (160MHz)	175.5/195/65 (MCS2)	154.31	164.60
Band 2A	5260	52	n (20MHz)	19.5/21.7 (MCS2)	17.69	20.73
	5280	56	n (20MHz)	19.5/21.7 (MCS2)	17.70	20.72
	5320	64	n (20MHz)	19.5/21.7 (MCS2)	17.77	21.37
	5260	52	ax (SU) (20MHz)	24/25.8 (MCS2)	19.00	21.12
	5280	56	ax (SU) (20MHz)	24/25.8 (MCS2)	19.04	21.16
	5320	64	ax (SU) (20MHz)	24/25.8 (MCS2)	19.11	23.63
	5270	54	n (40MHz)	40.5/45 (MCS2)	36.29	40.90
	5310	62	n (40MHz)	40.5/45 (MCS2)	36.47	42.35
	5270	54	ax (SU) (40MHz)	49/51.6 (MCS2)	37.88	41.48
	5310	62	ax (SU) (40MHz)	49/51.6 (MCS2)	38.00	52.86
	5290	58	ac (80MHz)	87.8/97.5 (MCS2)	75.51	83.23
	5290	58	ax (SU) (80MHz)	102/108.1 (MCS2)	77.26	84.99
Band 2C	5500	100	n (20MHz)	19.5/21.7 (MCS2)	17.76	21.26
	5580	116	n (20MHz)	19.5/21.7 (MCS2)	17.67	20.62
	5720	144	n (20MHz)	19.5/21.7 (MCS2)	17.67	20.80
	5500	100	ax (SU) (20MHz)	24/25.8 (MCS2)	19.08	22.35
	5580	116	ax (SU) (20MHz)	24/25.8 (MCS2)	19.02	21.31
	5720	144	ax (SU) (20MHz)	24/25.8 (MCS2)	19.07	21.21
	5510	102	n (40MHz)	40.5/45 (MCS2)	36.45	42.00
	5550	110	n (40MHz)	40.5/45 (MCS2)	36.27	41.02
	5710	142	n (40MHz)	40.5/45 (MCS2)	36.29	41.05
	5510	102	ax (SU) (40MHz)	49/51.6 (MCS2)	38.07	52.89
	5550	110	ax (SU) (40MHz)	49/51.6 (MCS2)	37.93	41.55
	5710	142	ax (SU) (40MHz)	49/51.6 (MCS2)	38.00	41.79
	5530	106	ac (80MHz)	87.8/97.5 (MCS2)	75.61	85.72
	5690	138	ac (80MHz)	87.8/97.5 (MCS2)	75.52	80.58
	5530	106	ax (SU) (80MHz)	102/108.1 (MCS2)	77.29	89.03
	5690	138	ax (SU) (80MHz)	102/108.1 (MCS2)	77.17	81.27
	5570	114	ax (SU) (160MHz)	204.2/216.2(MCS2)	156.67	165.60
	5570	114	ac (160MHz)	175.5/195 (MCS2)	153.96	165.30

Table 7-2. Conducted Bandwidth Measurements Antenna 5b (Low Data Rate)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 22 of 390

V 10.5 12/15/2021

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	39/43.3 (MCS4)	17.80	20.86
	5200	40	n (20MHz)	39/43.3 (MCS4)	17.68	20.53
	5240	48	n (20MHz)	39/43.3 (MCS4)	17.67	20.72
	5180	36	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.07
	5200	40	ax (SU) (20MHz)	49/51.6 (MCS4)	19.04	21.48
	5240	48	ax (SU) (20MHz)	49/51.6 (MCS4)	19.00	21.19
	5190	38	n (40MHz)	81/90 (MCS4)	36.33	41.94
	5230	46	n (40MHz)	81/90 (MCS4)	36.39	41.93
	5190	38	ax (SU) (40MHz)	98/103.2 (MCS4)	38.04	43.11
	5230	46	ax (SU) (40MHz)	98/103.2 (MCS4)	37.94	41.63
	5210	42	ac (80MHz)	175.5/195 (MCS4)	75.50	80.81
	5210	42	ax (SU) (80MHz)	204/216.2 (MCS4)	77.37	81.58
	5250	50	ax (SU) (160MHz)	408.3/432.4 (MCS4)	156.30	165.00
	5250	50	ac (160MHz)	351/390 (MCS4)	154.79	164.70
Band 2A	5260	52	n (20MHz)	39/43.3 (MCS4)	17.76	20.74
	5280	56	n (20MHz)	39/43.3 (MCS4)	17.73	20.66
	5320	64	n (20MHz)	39/43.3 (MCS4)	17.77	20.91
	5260	52	ax (SU) (20MHz)	49/51.6 (MCS4)	19.02	21.08
	5280	56	ax (SU) (20MHz)	49/51.6 (MCS4)	19.01	21.06
	5320	64	ax (SU) (20MHz)	49/51.6 (MCS4)	19.08	21.23
	5270	54	n (40MHz)	81/90 (MCS4)	36.37	41.58
	5310	62	n (40MHz)	81/90 (MCS4)	36.31	43.87
	5270	54	ax (SU) (40MHz)	98/103.2 (MCS4)	37.95	41.46
	5310	62	ax (SU) (40MHz)	98/103.2 (MCS4)	37.95	43.04
	5290	58	ac (80MHz)	175.5/195 (MCS4)	75.55	81.06
	5290	58	ax (SU) (80MHz)	204/216.2 (MCS4)	77.18	81.79
Band 2C	5500	100	n (20MHz)	39/43.3 (MCS4)	17.79	20.82
	5580	116	n (20MHz)	39/43.3 (MCS4)	17.67	20.63
	5720	144	n (20MHz)	39/43.3 (MCS4)	17.69	20.24
	5500	100	ax (SU) (20MHz)	49/51.6 (MCS4)	19.06	21.20
	5580	116	ax (SU) (20MHz)	49/51.6 (MCS4)	19.00	21.02
	5720	144	ax (SU) (20MHz)	49/51.6 (MCS4)	19.03	21.30
	5510	102	n (40MHz)	81/90 (MCS4)	36.43	42.17
	5550	110	n (40MHz)	81/90 (MCS4)	36.31	41.15
	5710	142	n (40MHz)	81/90 (MCS4)	36.37	41.10
	5510	102	ax (SU) (40MHz)	98/103.2 (MCS4)	38.08	45.36
	5550	110	ax (SU) (40MHz)	98/103.2 (MCS4)	37.92	41.41
	5710	142	ax (SU) (40MHz)	98/103.2 (MCS4)	37.99	41.64
	5530	106	ac (80MHz)	175.5/195 (MCS4)	75.61	81.34
	5690	138	ac (80MHz)	175.5/195 (MCS4)	75.63	80.95
	5530	106	ax (SU) (80MHz)	204/216.2 (MCS4)	77.29	98.10
	5690	138	ax (SU) (80MHz)	204/216.2 (MCS4)	77.48	81.65
	5570	114	ax (SU) (160MHz)	408.3/432.4 (MCS4)	156.03	165.40
	5570	114	ac (160MHz)	351/390 (MCS4)	154.46	164.40

Table 7-3. Conducted Bandwidth Measurements Antenna 5b (Mid Data Rate)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 23 of 390

V 10.5 12/15/2021

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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)	65/72.2 (MCS7)	17.81	21.03
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.83	21.01
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.84	20.83
	5180	36	ax (SU) (20MHz)	135/143.4 (MCS11)	19.03	21.14
	5200	40	ax (SU) (20MHz)	135/143.4 (MCS11)	19.03	20.67
	5240	48	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	21.55
	5190	38	n (40MHz)	135/150 (MCS7)	36.44	41.26
	5230	46	n (40MHz)	135/150 (MCS7)	36.64	41.14
	5190	38	ax (SU) (40MHz)	271/286.8 (MCS11)	37.92	40.93
	5230	46	ax (SU) (40MHz)	271/286.8 (MCS11)	37.98	44.61
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.95	81.79
	5210	42	ax (SU) (80MHz)	567/600.5 (MCS11)	77.03	81.50
	5250	50	ax (SU) (160MHz)	1201/1134.3(MCS11)	156.43	166.00
	5250	50	ac (160MHz)	780/866.7 (MCS9)	155.01	166.30
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.83	21.10
	5280	56	n (20MHz)	65/72.2 (MCS7)	17.86	21.26
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.77	20.69
	5260	52	ax (SU) (20MHz)	135/143.4 (MCS11)	19.05	21.11
	5280	56	ax (SU) (20MHz)	135/143.4 (MCS11)	19.07	21.16
	5320	64	ax (SU) (20MHz)	135/143.4 (MCS11)	19.01	21.18
	5270	54	n (40MHz)	135/150 (MCS7)	36.62	44.40
	5310	62	n (40MHz)	135/150 (MCS7)	36.40	41.28
	5270	54	ax (SU) (40MHz)	271/286.8 (MCS11)	38.00	50.18
	5310	62	ax (SU) (40MHz)	271/286.8 (MCS11)	37.91	40.97
	5290	58	ac (80MHz)	390/433.3 (MCS9)	75.96	81.20
	5290	58	ax (SU) (80MHz)	567/600.5 (MCS11)	77.00	81.16
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.79	21.04
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.84	21.02
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.84	21.47
	5500	100	ax (SU) (20MHz)	135/143.4 (MCS11)	19.02	21.13
	5580	116	ax (SU) (20MHz)	135/143.4 (MCS11)	19.04	22.79
	5720	144	ax (SU) (20MHz)	135/143.4 (MCS11)	19.02	20.97
	5510	102	n (40MHz)	135/150 (MCS7)	36.46	41.18
	5550	110	n (40MHz)	135/150 (MCS7)	36.46	40.99
	5710	142	n (40MHz)	135/150 (MCS7)	36.57	44.66
	5510	102	ax (SU) (40MHz)	271/286.8 (MCS11)	37.90	41.23
	5550	110	ax (SU) (40MHz)	271/286.8 (MCS11)	37.94	41.07
	5710	142	ax (SU) (40MHz)	271/286.8 (MCS11)	38.03	50.24
	5530	106	ac (80MHz)	390/433.3 (MCS9)	76.02	81.11
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.10	81.38
	5530	106	ax (SU) (80MHz)	567/600.5 (MCS11)	77.04	81.41
	5690	138	ax (SU) (80MHz)	567/600.5 (MCS11)	77.18	81.87
	5570	114	ax (SU) (160MHz)	1201/1134.3(MCS11)	156.65	165.60
	5570	114	ac (160MHz)	780/866.7 (MCS9)	155.02	165.50

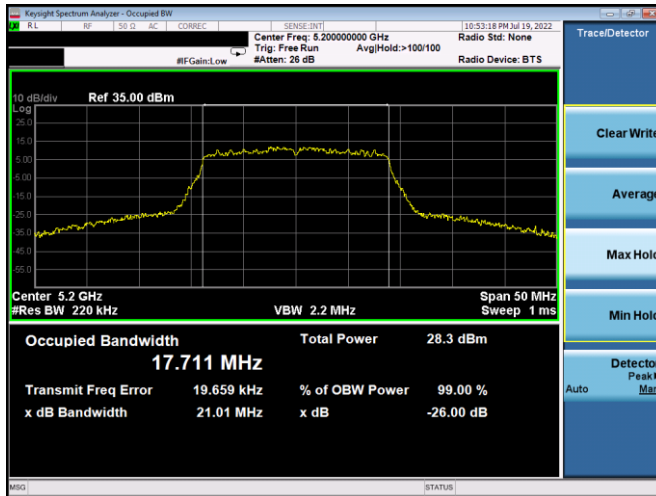
Table 7-4. Conducted Bandwidth Measurements Antenna 5b (High Data Rate)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 24 of 390

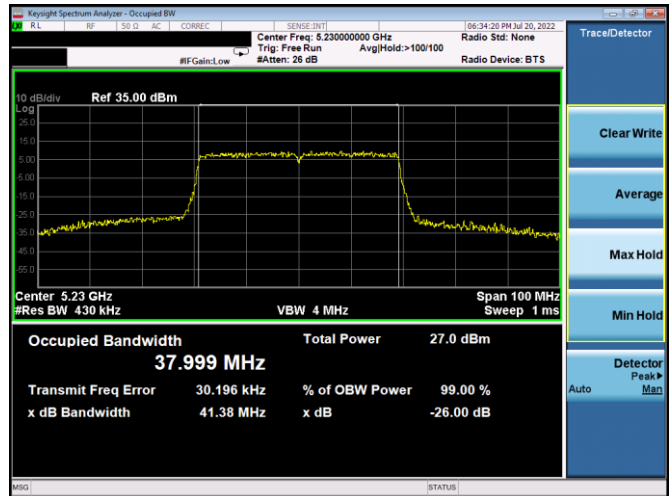
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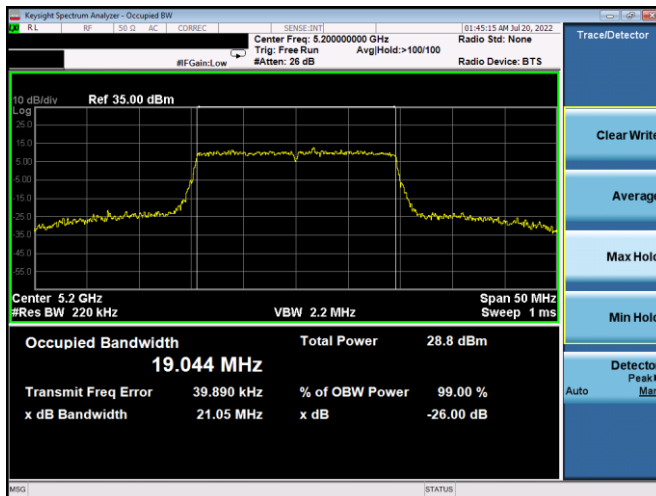
Low Data Rate



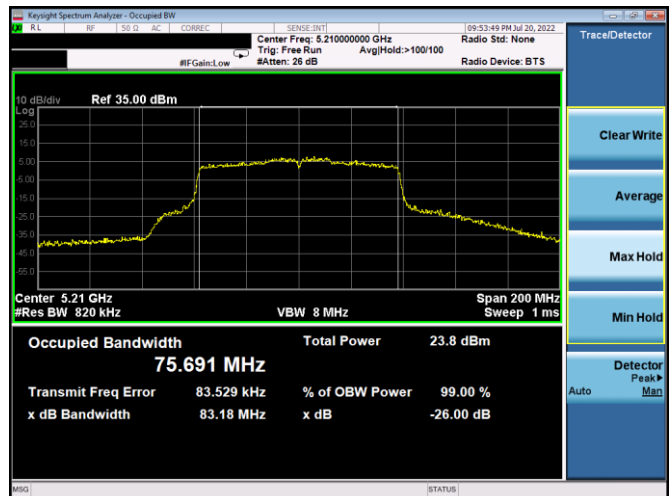
Plot 7-1. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11n – Ch. 40, MCS2)



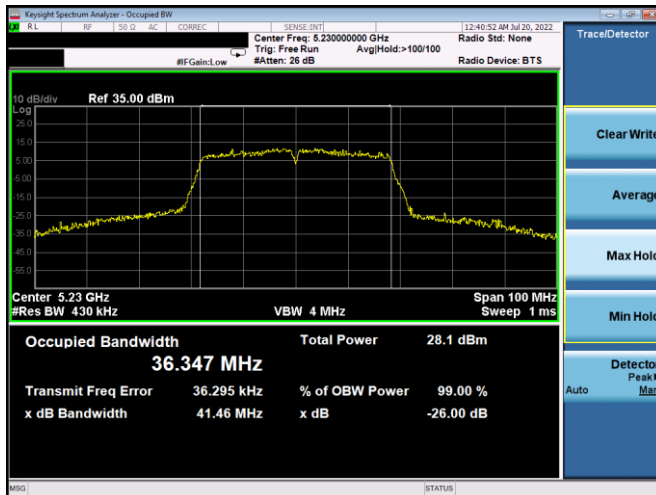
Plot 7-4. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11ax(SU) – Ch. 46, MCS2)



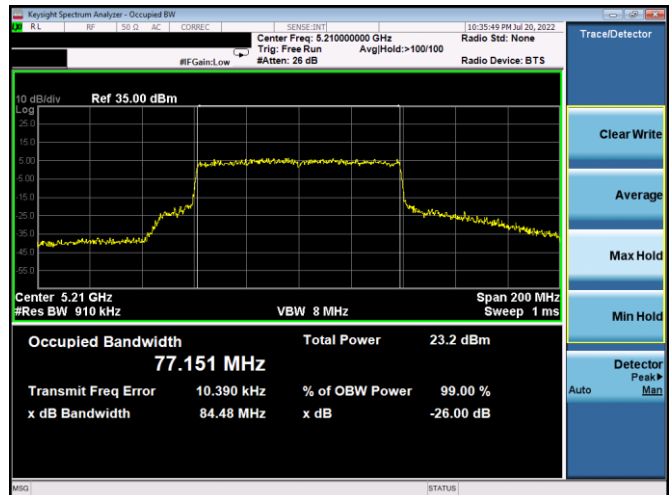
Plot 7-2. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11ax(SU) – Ch. 40, MCS2)



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



Plot 7-3. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11n – Ch. 46, MCS2)

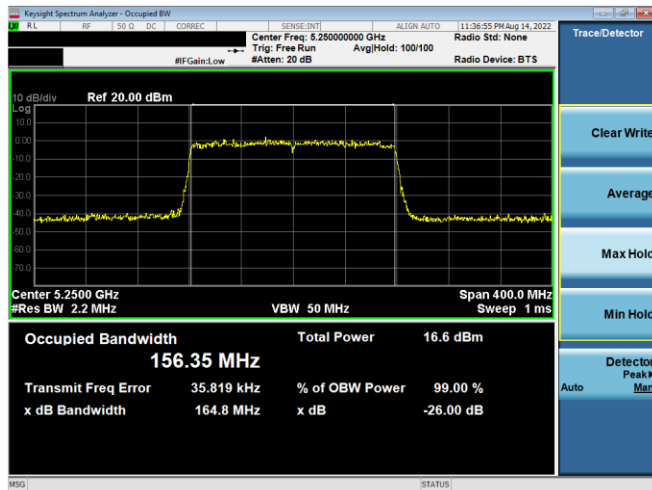


Plot 7-6. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ax(SU) – Ch. 42, MCS2)

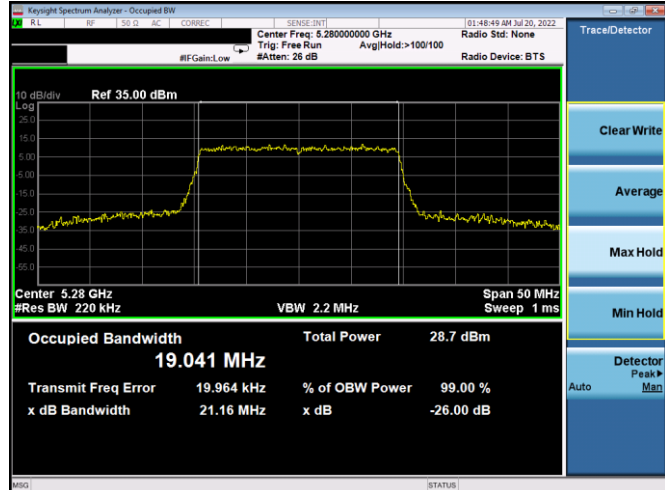
FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 25 of 390

V 10.5 12/15/2021

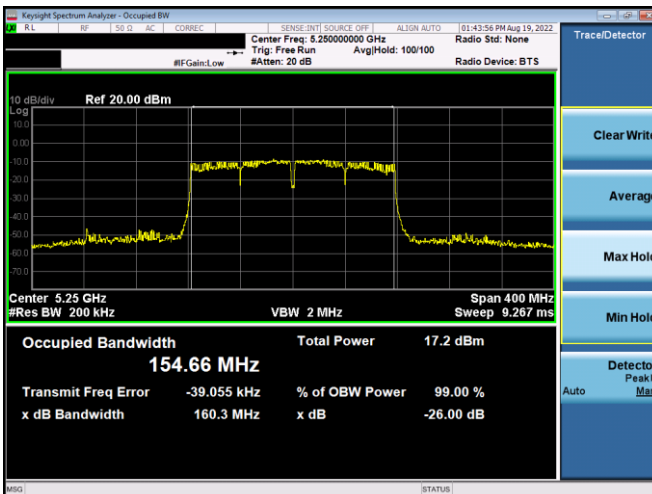
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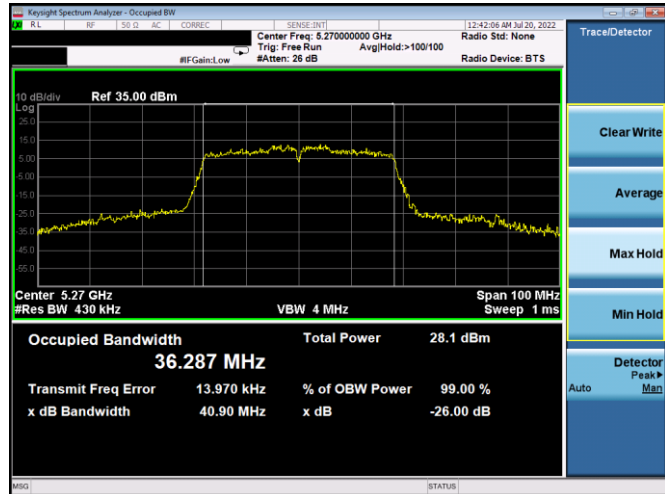
Plot 7-7. 26dB BW & 99% OBW Antenna 5b (160MHz BW 802.11ax – Ch. 50, MCS2)



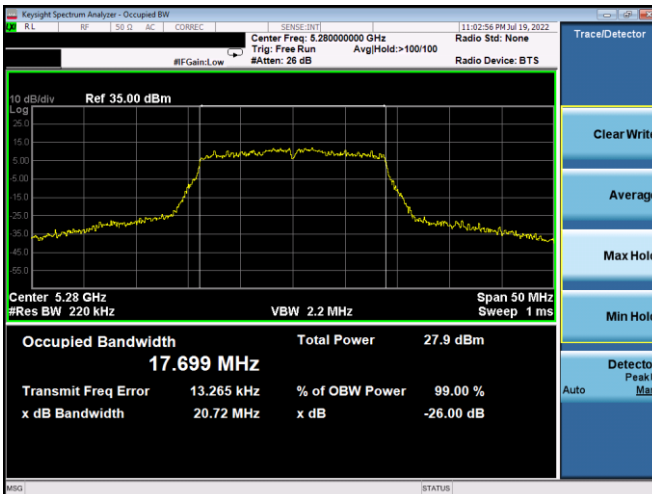
Plot 7-10. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11ax(SU) – Ch. 56, MCS2)



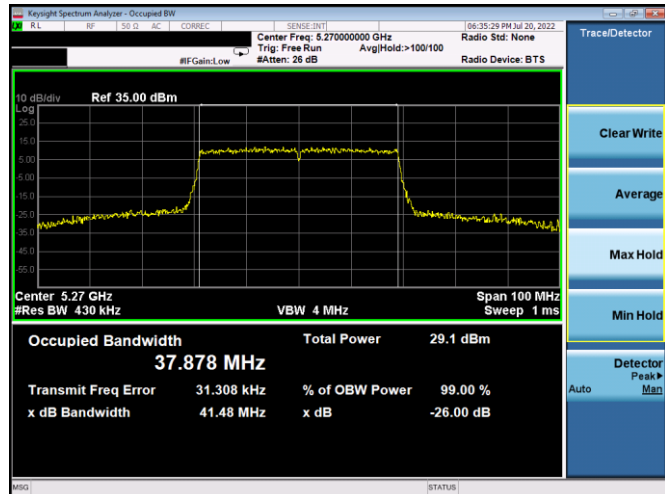
Plot 7-8. 26dB BW & 99% OBW Antenna 5b (160MHz BW 802.11ac – Ch. 50, MCS2)



Plot 7-11. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11n – Ch. 54, MCS2)

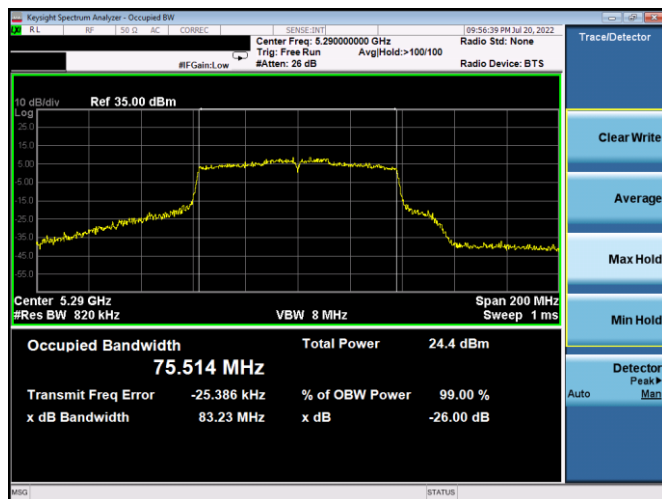


Plot 7-9. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11n – Ch. 56, MCS2)

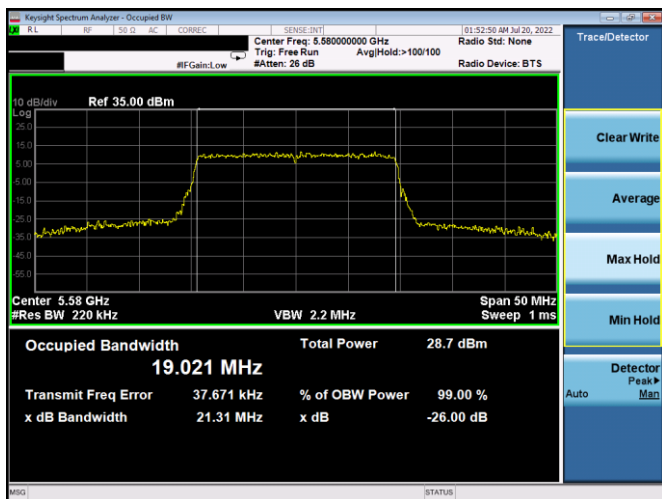


Plot 7-12. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11ax(SU) – Ch. 54, MCS2)

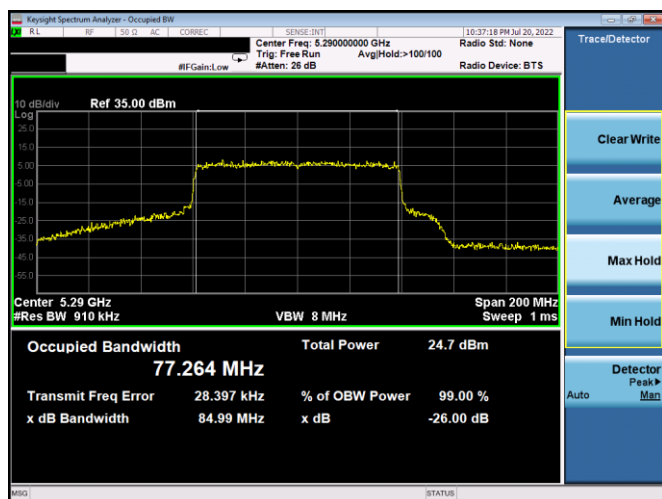
FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 26 of 390



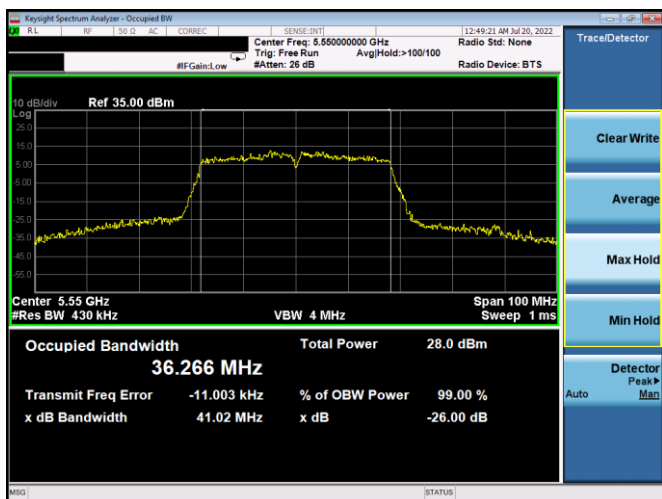
Plot 7-13. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ac – Ch. 58, MCS2)



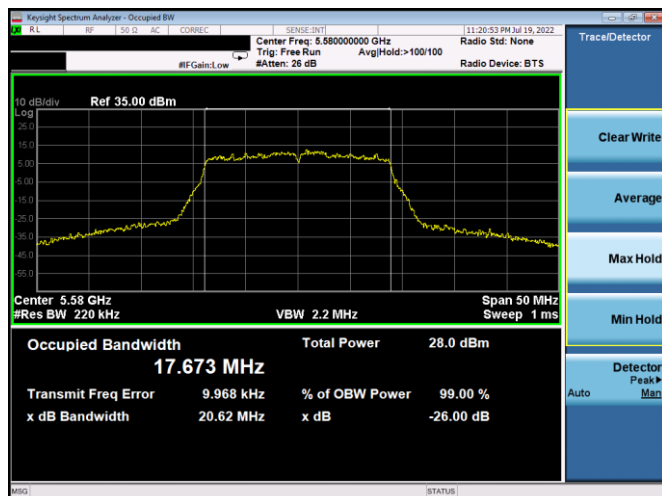
Plot 7-16. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11ax(SU) – Ch. 116, MCS2)



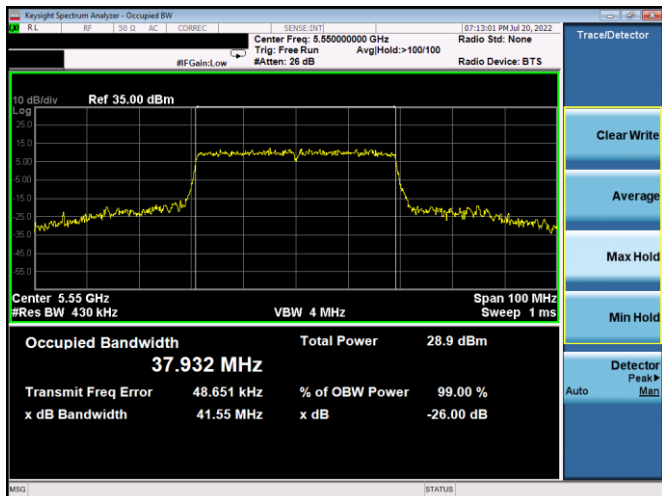
Plot 7-14. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ax(SU) – Ch. 58, MCS2)



Plot 7-17. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11n – Ch. 110, MCS2)



Plot 7-15. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11n – Ch. 116, MCS2)

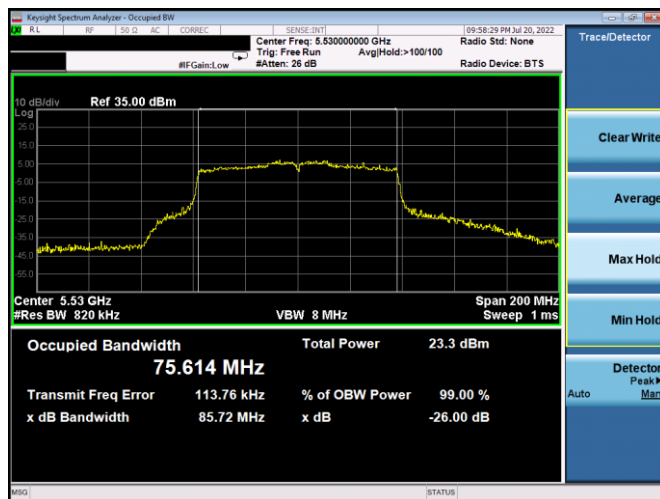


Plot 7-18. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11ax(SU) – Ch. 110, MCS2)

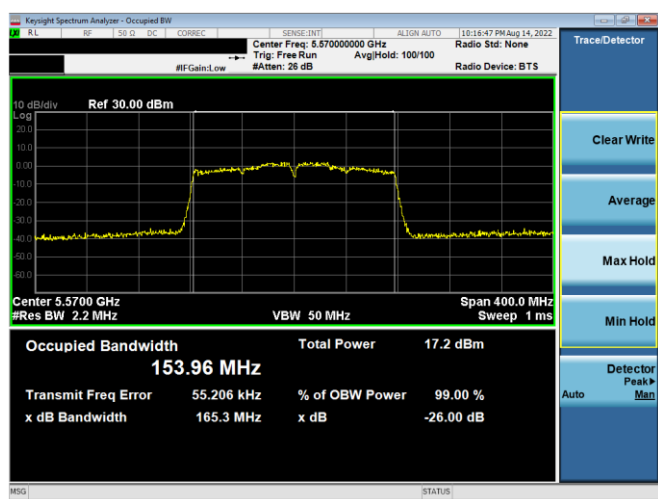
FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 27 of 390

V 10.5 12/15/2021

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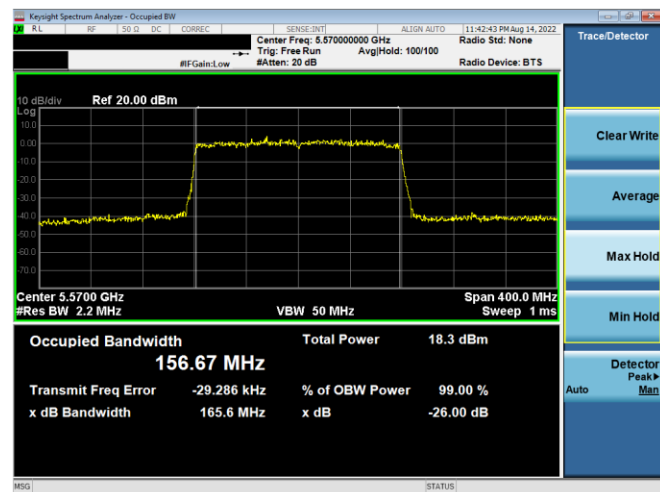
Plot 7-19. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ac – Ch. 106, MCS2)



Plot 7-22. 26dB BW & 99% OBW Antenna 5b (160MHz BW 802.11ac – Ch. 114, MCS2)



Plot 7-20. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ax(SU) – Ch. 106, MCS2)



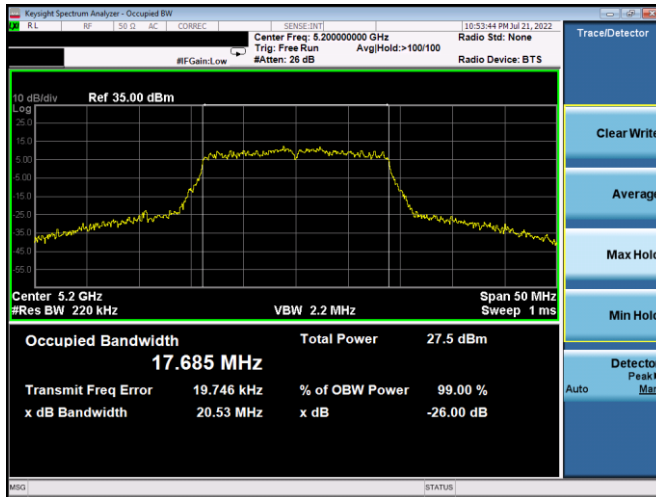
Plot 7-21. 26dB BW & 99% OBW Antenna 5b (160MHz BW 802.11ax – Ch. 114, MCS2)

FCC ID: BCGA2435 IC: 579C-A2435	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 28 of 390

V 10.5 12/15/2021

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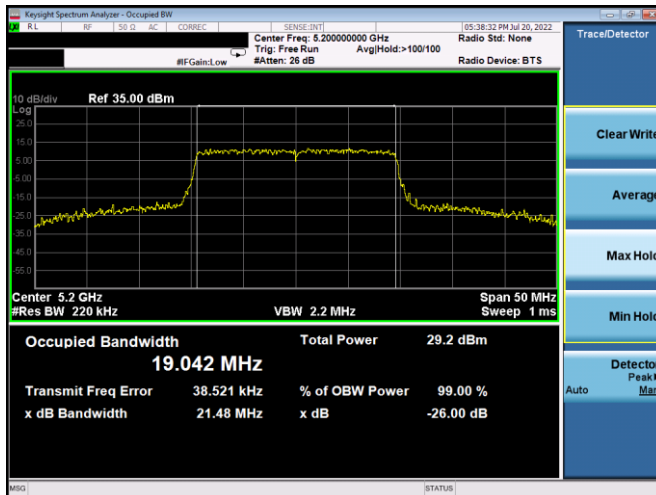
Mid Data Rate



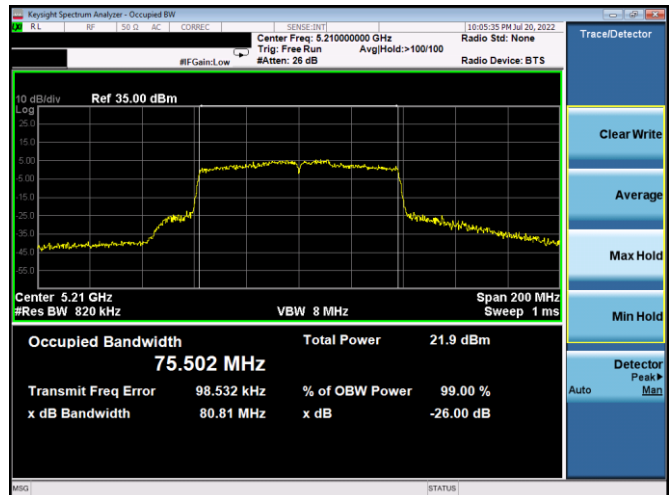
Plot 7-23. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11n – Ch. 40, MCS4)



Plot 7-26. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11ax(SU) – Ch. 46, MCS4)



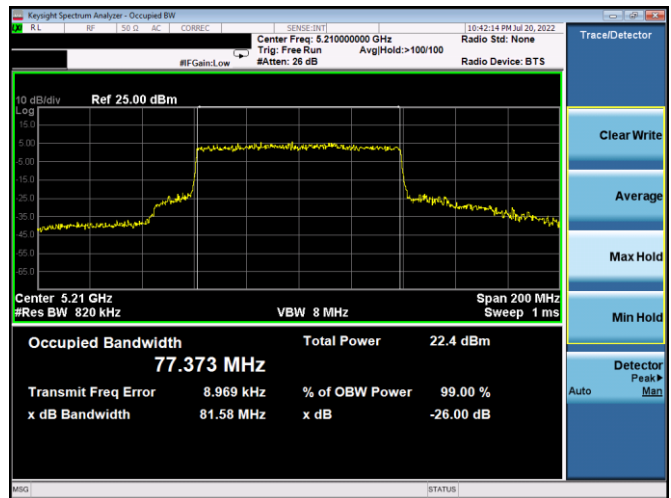
Plot 7-24. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11ax(SU) – Ch. 40, MCS4)



Plot 7-27. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ac – Ch. 42, MCS4)



Plot 7-25. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11n – Ch. 46, MCS4)

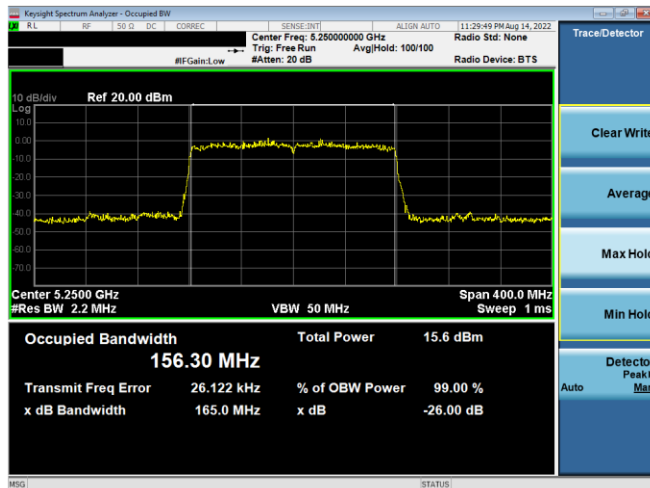


Plot 7-28. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ax(SU) – Ch. 42, MCS4)

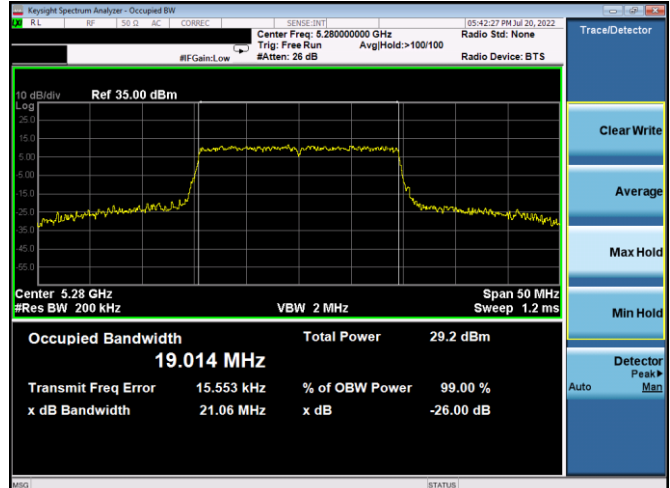
FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 29 of 390

V 10.5 12/15/2021

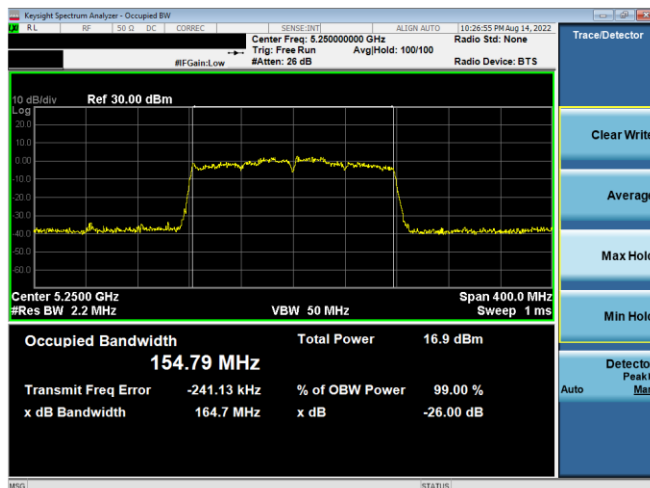
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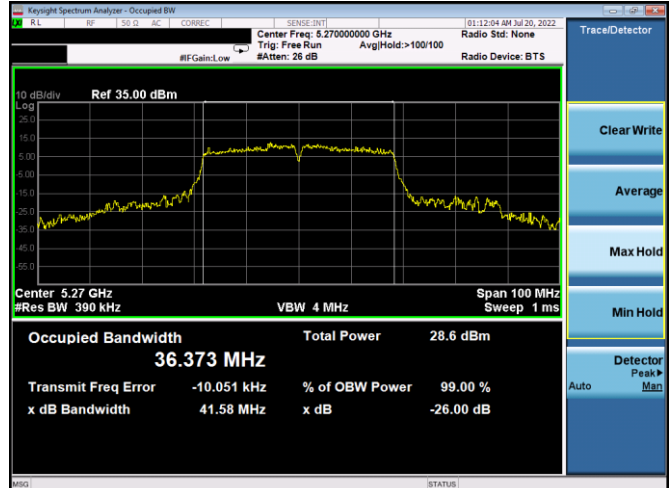
Plot 7-29. 26dB BW & 99% OBW Antenna 5b (160MHz BW 802.11ax – Ch. 50, MCS4)



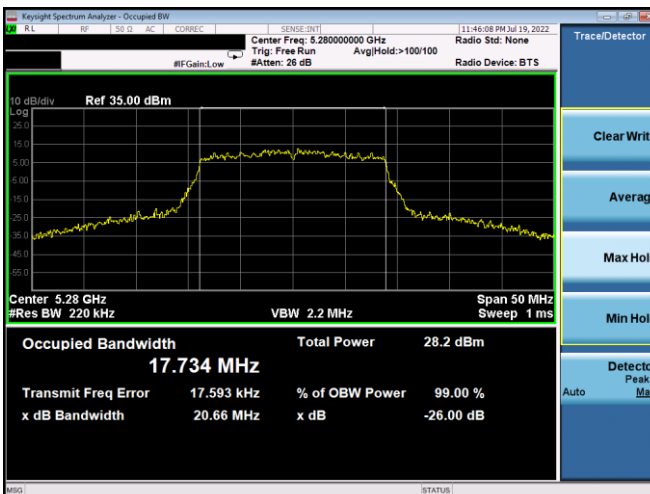
Plot 7-32. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11ax(SU) – Ch. 56, MCS4)



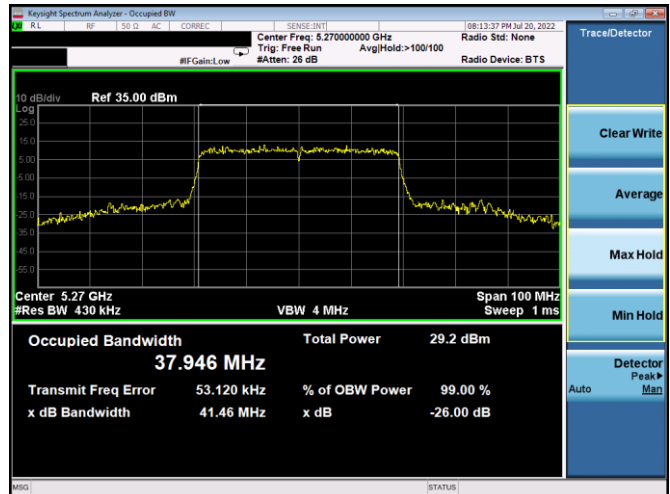
Plot 7-30. 26dB BW & 99% OBW Antenna 5b (160MHz BW 802.11ac – Ch. 50, MCS4)



Plot 7-33. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11n – Ch. 54, MCS4)



Plot 7-31. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11n – Ch. 56, MCS4)

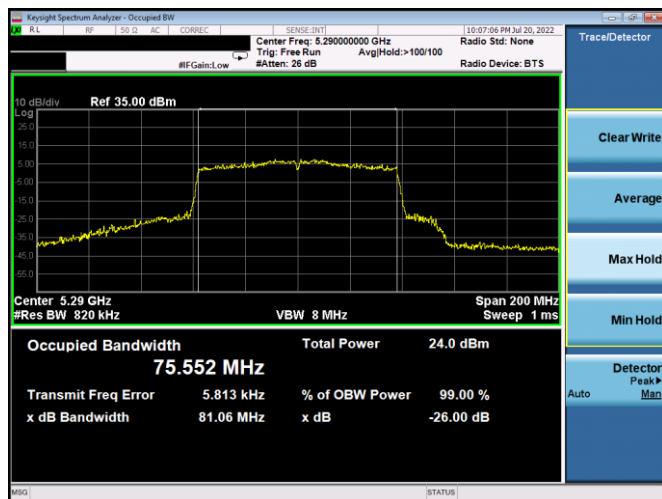


Plot 7-34. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11ax(SU) – Ch. 54, MCS4)

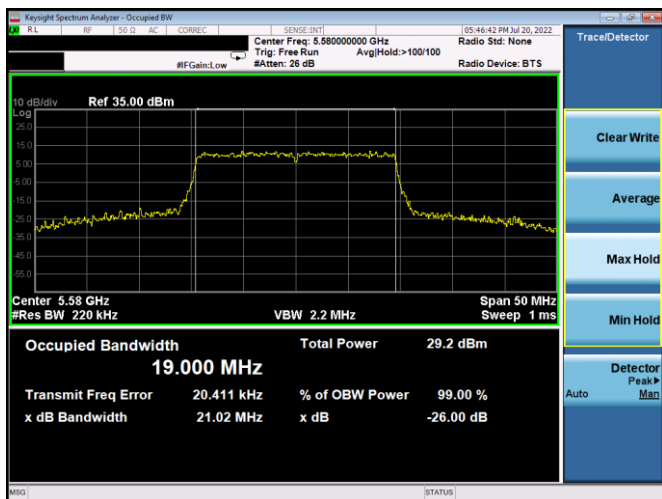
FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 30 of 390

V 10.5 12/15/2021

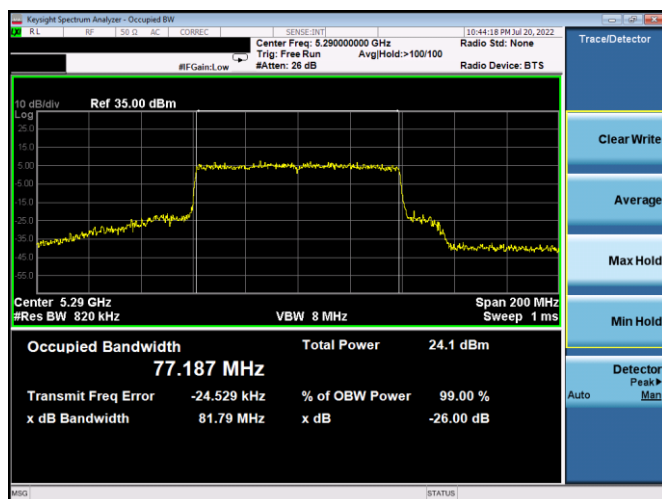
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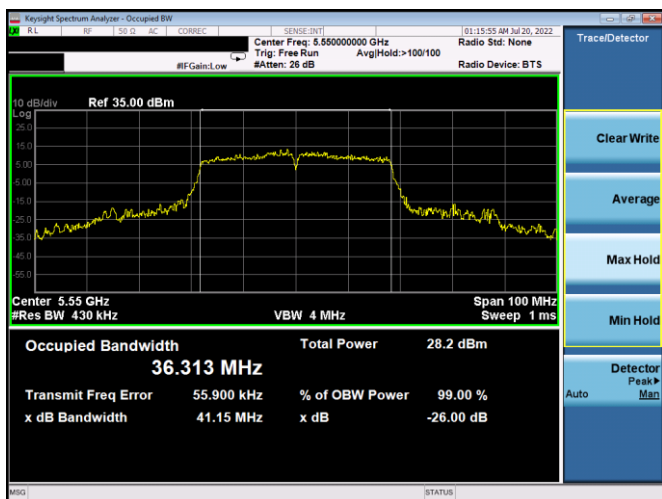
Plot 7-35. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ac – Ch. 58, MCS4)



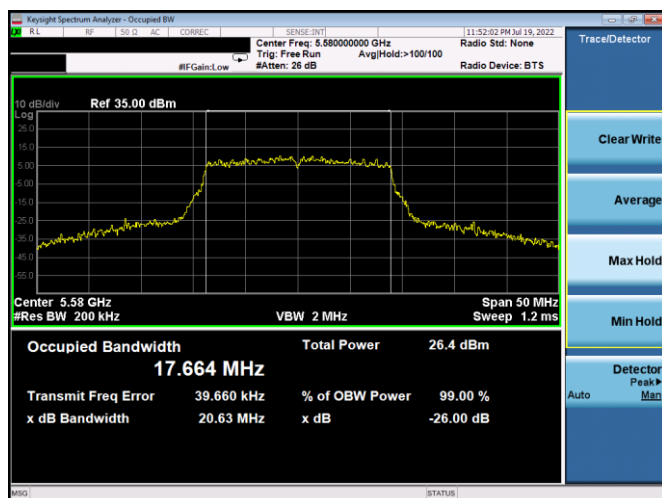
Plot 7-38. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11ax(SU) – Ch. 116, MCS4)



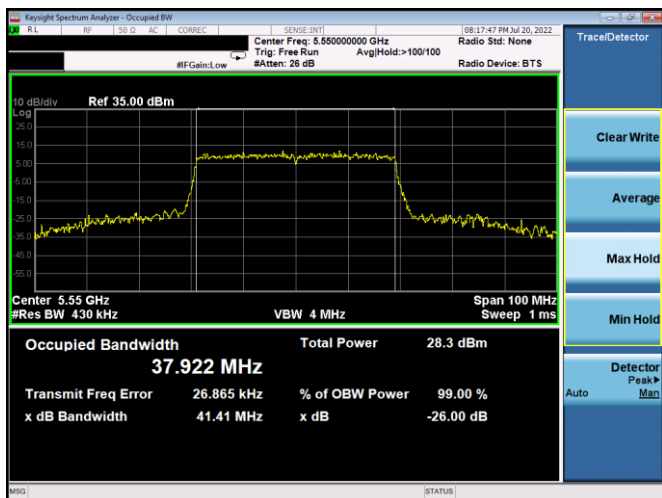
Plot 7-36. 26dB BW & 99% OBW Antenna 5b (80MHz BW 802.11ax(SU) – Ch. 58, MCS4)



Plot 7-39. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11n – Ch. 110, MCS4)



Plot 7-37. 26dB BW & 99% OBW Antenna 5b (20MHz BW 802.11n – Ch. 116, MCS4)



Plot 7-40. 26dB BW & 99% OBW Antenna 5b (40MHz BW 802.11ax(SU) – Ch. 110, MCS4)

FCC ID: BCGA2435 IC: 579C-A2435		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1C2205090025-19.BCG	Test Dates: 05/31/2022-09/03/2022	EUT Type: Tablet Device	Page 31 of 390

V 10.5 12/15/2021

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