



## DATA REFERENCE REPORT

### FCC PART 15.407 / ISED RSS-247 UNII 802.11a/n/ac

**Applicant Name:**

Apple Inc.  
One Apple Park Way  
Cupertino, CA 95014  
United States

**Date of Testing:**

05/28/2021 - 07/27/2021

**Test Site/Location:**

PCTEST Lab. Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2106080052-10.BCG

<b>FCC ID:</b>	<b>BCGA2604</b>
<b>IC:</b>	<b>579C-A2604</b>
<b>APPLICANT:</b>	<b>Apple Inc.</b>

**Reference Model/HVIN:**

A2603

**Variant Model/HVIN:**

A2604(A2605)

**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 558074 D01 v05r02. 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.



\_\_\_\_\_  
Randy Ortanez  
President



FCC ID: BCGA2604 IC: 579C-A2604	<b>PCTEST<sup>®</sup></b> Proud to be part of element		<b>DATA REFERENCE REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C2106080052-10.BCG	<b>Test Dates:</b> 05/28/2021 - 07/27/2021 <b>EUT Type:</b> Tablet Device		<b>Approved by:</b> Quality Manager	

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## 1.0 INTRODUCTION

### 1.1 Scope

Per manufacturer declaration, there are two tablet device models, A2603 and A2604(A2605), with high degree of similarity, reference model FCC ID: BCGA2603 / IC: 579C-A2603 and variant model **FCC ID: BCGA2604 / IC: 579C-A2604**. The reference model supports LTE Band 71, while the variant model replaces LTE Band 71 with LTE Band 28 components. 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: BCGA2603 / IC: 579C-A2603, while radiated spot-check verification has been performed on variant model **FCC ID: BCGA2604 / IC: 579C-A2604**. 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	BCGA2603 579C-A2603	1C2106080051-10.BCG	RF UNII Test Report

**Table 1-1. Reference Model Details**

Reference model FCC ID: BCGA2603 / IC: 579C-A2603 test report has been included in Appendix A.

### 1.2 PCTEST Test Location

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

### 1.3 Test Facility / Accreditations

**Measurements were performed at PCTEST located in Morgan Hill, CA 95037, U.S.A.**

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

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2604** and **IC: 579C-A2604**. The test data contained in this report pertains only to the emissions due to the EUT's UNII 802.11a/n/ac transmitter.

Test Device Serial No.: JY40JD22FL, W2162DHGJW

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE)

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 (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 (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 (80MHz BW) Frequency / Channel Operations

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**Notes:**

1. 5GHz NII operation is possible in 20MHz, and 40MHz, and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) KDB 789033 D02 v02r01 and ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Measured Duty Cycles					
802.11 Mode/Band		Duty Cycle [%]			
		Antenna A	Antenna B	CDD/SDM	
5GHz	a	91.9	91.9	92.1	
	n (HT20)	91.1	91.1	86.3	
	n (HT40)	85.6	85.5	79.7	
	ac (VHT80)	76.0	76.5	76.5	

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

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

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna A	Antenna B						
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓

**Table 2-5. WIFI Configurations**

✓ = Support ; ✗ = NOT Support

**SISO** = Single Input Single Output

**SDM** = Spatial Diversity Multiplexing – MIMO function

**CDD** = Cyclic Delay Diversity - 2Tx Function

**STBC** = Space-Time Block Coding – 2Tx Function

Data Rate(s) Tested: 6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)  
6.5/7.2, 13/14.4, 19.5/21.7, 26/28.9, 39/43.3, 52/57.8, 58.5/65, 65/72.2 (n – 20MHz)  
13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW)  
29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac – 80MHz BW)  
13/14.4, 26.28.9, 39/43.3, 52/57.8, 78/86.7, 104/115.6, 117/130, 130/144.4Mbps (MIMO n/ac – 20MHz)  
156/173Mbps (MIMO ac – 20MHz)  
27/30, 54/60, 81/90, 108/120, 162/180, 216/240, 243,270, 270/300Mbps (MIMO n/ac – 40MHz) 324/360, 360/400Mbps (MIMO ac – 40MHz)  
58.5/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7Mbps (MIMO ac – 80MHz)

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

Antenna	Simultaneous Tx Config	Bluetooth		UNII
		BDR	LE1M	802.11 a/n/ac
A	Config 1	✓	✗	✓
A	Config 2	✗	✓	✓

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

✓ = Support; ✗ = Not Support

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## 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna A	Antenna B
5.150 – 5.250	1.27	2.64
5.250 – 5.350	2.24	2.77
5.470 – 5.725	3.39	3.17
5725 – 5.850	3.54	3.21

Table 2-7. Highest Antenna Gain

## 2.4 Test Support Equipment

Test Support Equipment List					
1	Apple MacBook w/AC/DC Adapter	Model: A1398 Model: A1435	S/N: C2QKP008F6F3 S/N: N/A		
2	Apple USB Cable	Model: Kanzi	S/N: 32530F		
3	USB-C to Lightning Cable w/ AC Adapter	Model: N/A Model: A2305	S/N: N/A S/N: N/A		
4	Apple Pencil	Model: A1603	S/N: G64TG0FEGWTJ		
5	DC Power Supply	Model: KPS3010D	S/N: N/A		

Table 2-8. Test Support Equipment List

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## 2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013 and KDB 558074 D01 v05r02. 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 2-9.

Technology	Test Case	FCC ID: BCGA2604 IC: 579C-A2604	
		Mode	Channel
UNII (802.11a/n/ac)	Radiated Spurious Emissions	MIMO Max Power 5.2/5.3/5.6/5.8 GHz: 11nHT20/HT40/ac80	M

Table 2-9. 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 19A32670z installed on the EUT.

## 2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05r02 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.

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### 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).

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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 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.

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## 5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty ( $\pm$ dB)
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (<1GHz)	4.30
Radiated Disturbance (>1GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

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## 6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). 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
Anritsu	ML2496A	Power Meter	11/3/2020	Annual	11/3/2021	184005
Anritsu	MA2411B	Pulse Power Sensor	11/10/2020	Annual	11/10/2021	1726261
Anritsu	MA2411B	Pulse Power Sensor	12/9/2020	Annual	12/9/2021	1726262
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/31/2021	Annual	3/31/2022	MY49430244
ATM	180-442-KF	20dB Nominal Gain Horn Antenna	12/9/2020	Annual	12/9/2021	T058701-01
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	9/15/2020	Annual	9/15/2021	208204
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	5/3/2021	Annual	5/3/2022	205956
Keysight Technology	N9040B	UXA Signal Analyzer	12/19/2020	Annual	12/19/2021	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	12/3/2020	Annual	12/3/2021	102327
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	12/3/2020	Annual	12/3/2021	101648
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/16/2021	Annual	3/16/2022	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	6/11/2021	Annual	6/11/2022	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/9/2020	Annual	11/9/2021	101570
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	4/29/2021	Annual	4/29/2022	100051
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	10/2/2020	Annual	10/2/2021	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/5/2021	Annual	4/5/2022	100519
Rohde & Schwarz	ENV216	Two-Line-V-Network (LISN)	12/7/2020	Annual	12/7/2021	101364

Table 6-1. Test Equipment List

**Note:**

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

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## 7.0 TEST RESULTS (SPOT-CHECK DATA)

### 7.1 Summary

Company Name: Apple Inc.  
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 FCC Classification: Unlicensed National Information Infrastructure (UNII)

Technology	Test Configurations			Reference Model		Variant Model		Delta	
	Test Description	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2603	IC: 579C-A2603	FCC ID: BCGA2604	IC: 579C-A2604		
				Peak [dB $\mu$ V/m]	Average [dB $\mu$ V/m]	Peak [dB $\mu$ V/m]	Average [dB $\mu$ V/m]	Peak [dB]	Average [dB]
UNII 802.11n	Radiated Spurious Emissions	40	15600	57.15	45.92	55.89	45.14	1.26	0.78
		56	15840	57.78	46.53	56.67	45.53	1.11	1.0
		116	16740	59.09	-	59.10	-	0.01	-
		157	17355	59.38	-	58.35	-	1.03	-

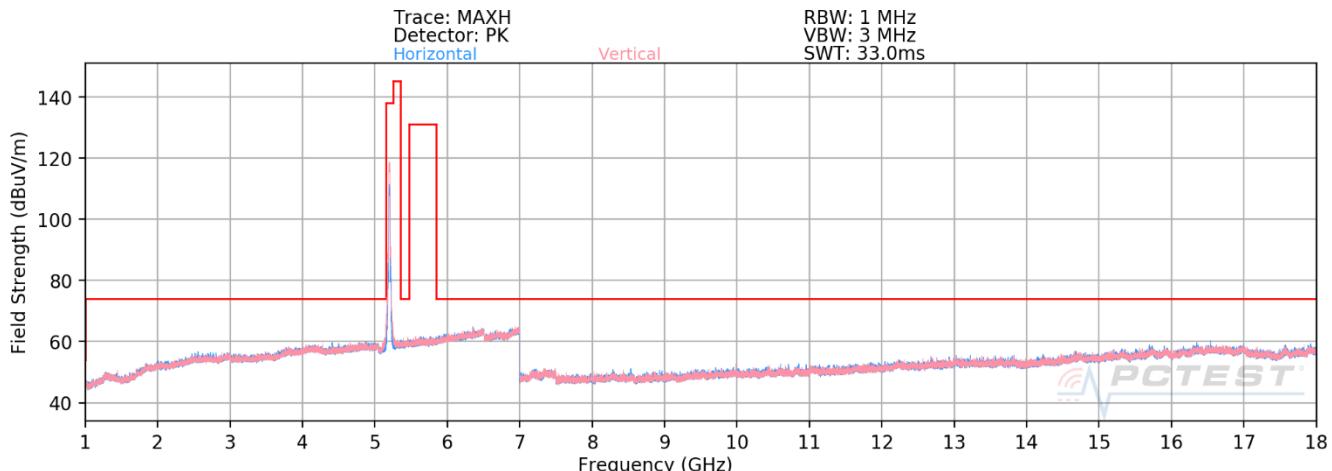
**Table 7-1. Worst Case Spot-check Results**

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.

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## 7.2 Radiated Spurious Emissions

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

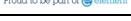


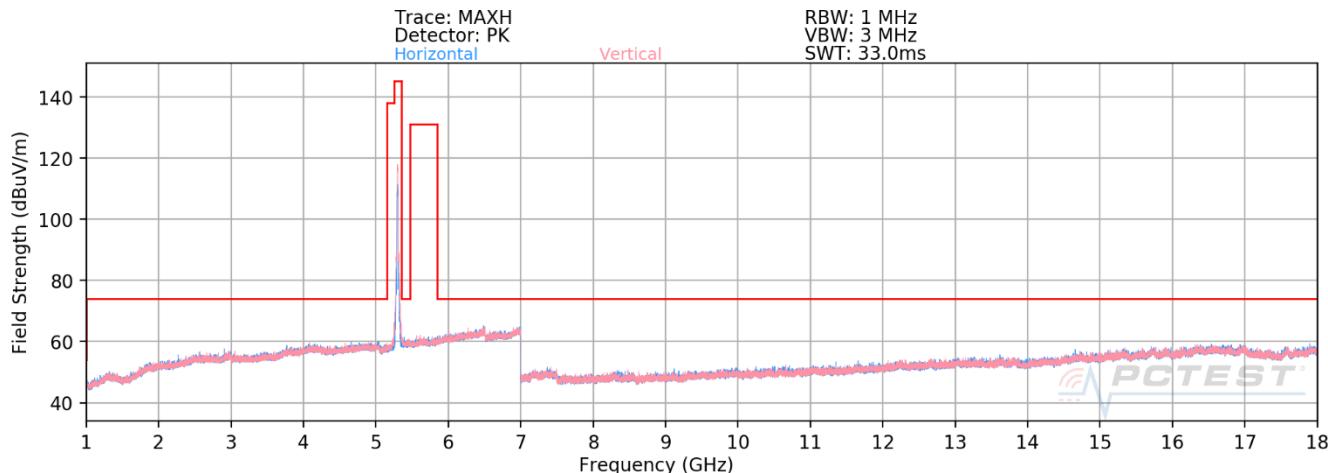
Plot 7-1. RSE above 1GHz CDD (802.11n – Ch.40)

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 [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
10400.00	Peak	-	-	-	-71.33	15.59	51.26	68.20	-16.94
* 15600.00	Average	-	-	-	-82.12	20.26	45.14	53.98	-8.84
* 15600.00	Peak	-	-	-	-71.37	20.26	55.89	73.98	-18.09

Table 7-2. Radiated Measurements CDD

FCC ID: BCGA2604 IC: 579C-A2604	 <b>PCTEST®</b> Proud to be part of 			DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080052-10.BCG	Test Dates: 05/28/2021 - 07/27/2021	EUT Type: Tablet Device			

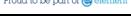


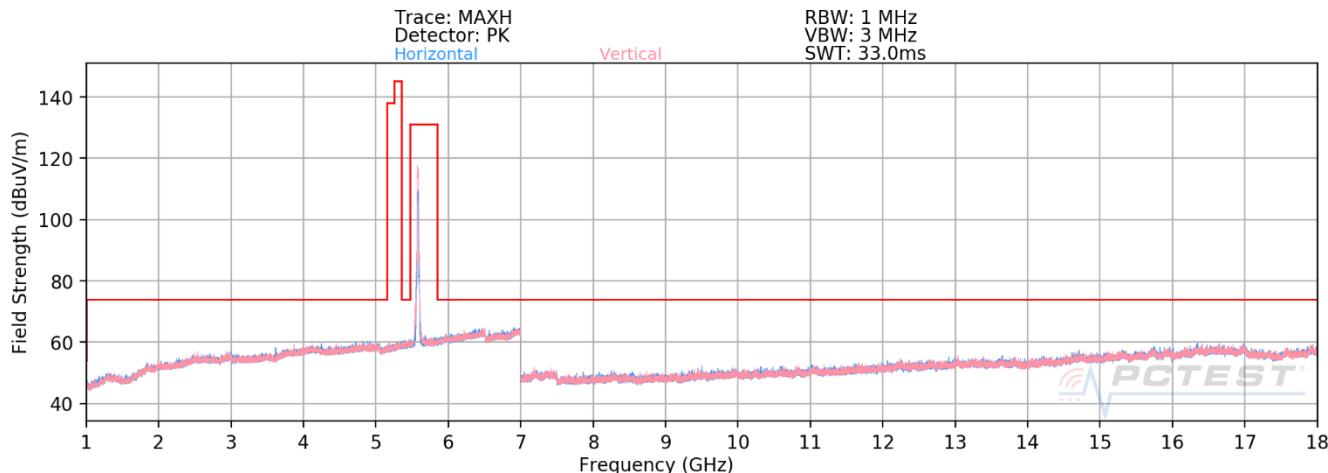
Plot 7-2. RSE above 1GHz SDM (802.11n – Ch.56)

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 [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
10560.00	Peak	-	-	-	-70.53	16.13	52.60	68.20	-15.60
* 15840.00	Average	-	-	-	-82.76	21.29	45.53	53.98	-8.45
* 15840.00	Peak	-	-	-	-71.62	21.29	56.67	73.98	-17.31

Table 7-3. Radiated Measurements SDM

FCC ID: BCGA2604 IC: 579C-A2604	 <b>PCTEST®</b> Proud to be part of 			DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080052-10.BCG	Test Dates: 05/28/2021 - 07/27/2021	EUT Type: Tablet Device			

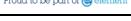


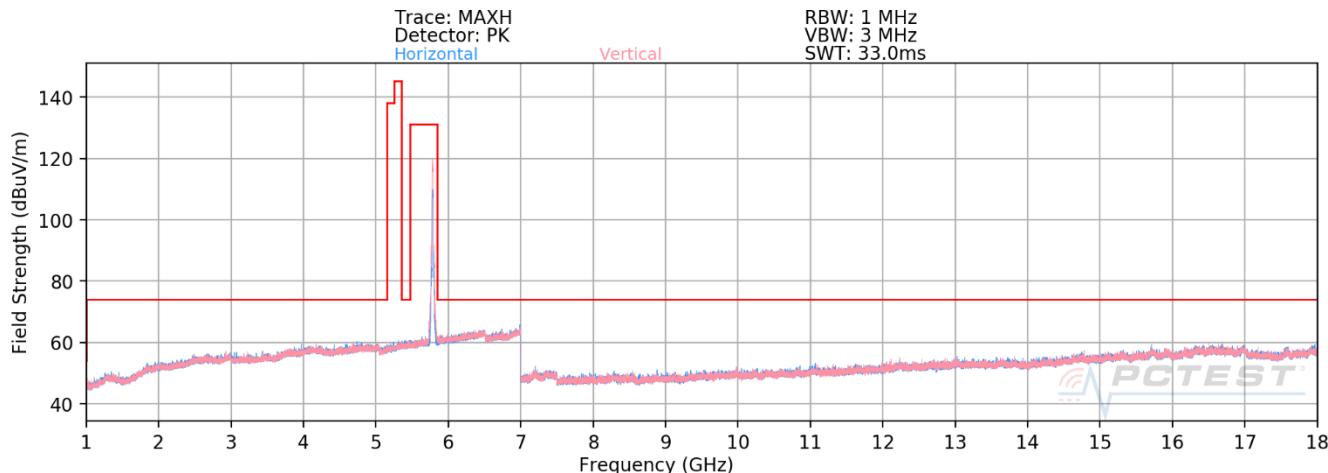
Plot 7-3. RSE above 1GHz SDM (802.11n – Ch.116)

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 [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
* 11160.00	Average	-	-	-	-81.66	15.67	41.01	53.98	-12.97
* 11160.00	Peak	-	-	-	-70.56	15.67	52.11	73.98	-21.87
16740.00	Peak	-	-	-	-69.91	22.01	59.10	68.20	-9.10

Table 7-4. Radiated Measurements SDM

FCC ID: BCGA2604 IC: 579C-A2604	 <b>PCTEST®</b> Proud to be part of 			DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080052-10.BCG	Test Dates: 05/28/2021 - 07/27/2021	EUT Type: Tablet Device			



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 [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
* 11570.00	Average	-	-	-	-81.25	16.18	41.93	53.98	-12.05
* 11570.00	Peak	-	-	-	-70.18	16.18	53.00	73.98	-20.98
17355.00	Peak	-	-	-	-70.15	21.50	58.35	68.20	-9.85

Table 7-5. Radiated Measurements CDD

FCC ID: BCGA2604 IC: 579C-A2604	 <b>DATA REFERENCE REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1C2106080052-10.BCG	Test Dates: 05/28/2021 - 07/27/2021	EUT Type: Tablet Device	Page 18 of 20	

## 8.0 CONCLUSION

The spot-check data measured for variant model **FCC ID: BCGA2604 / IC: 579C-A2604** is in tolerance with reference model FCC ID: BCGA2603 / IC: 579C-A2603 per FCC/ISED Approved Data Referencing Test Plan.

FCC ID: BCGA2604 IC: 579C-A2604	 Proud to be part of 		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080052-10.BCG	Test Dates: 05/28/2021 - 07/27/2021	EUT Type: Tablet Device	Page 19 of 20	

## 9.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2106080051-10.BCG) from reference model FCC ID: BCGA2603 / IC: 579C-A2603, which includes referenced data results.

FCC ID: BCGA2604 IC: 579C-A2604	 <b>PCTEST®</b> Proud to be part of 		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080052-10.BCG	Test Dates: 05/28/2021 - 07/27/2021	EUT Type: Tablet Device	Page 20 of 20	



## MEASUREMENT REPORT

### FCC PART 15.407 / ISED RSS-247 UNII 802.11a/n/ac

**Applicant Name:**

Apple Inc.  
One Apple Park Way  
Cupertino, CA 95014  
United States

**Date of Testing:**

05/28/2021 – 08/03/2021

**Test Site/Location:**

PCTEST Lab. Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2106080051-10.BCG

<b>FCC ID:</b>	<b>BCGA2603</b>
<b>IC:</b>	<b>579C-A2603</b>
<b>APPLICANT:</b>	<b>Apple Inc.</b>

**Application Type:**

Certification

**Model/HVIN:**

A2603

**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.



Randy Ortanez  
President



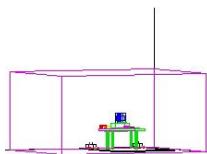
FCC ID: BCGA2603 IC: 579C-A2603	<b>PCTEST<sup>®</sup></b> Proud to be part of element		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
<b>Test Report S/N:</b> 1C2106080051-10.BCG	<b>Test Dates:</b> 05/28/2021 – 08/03/2021	<b>EUT Type:</b> Tablet Device		Page 1 of 156

## T A B L E   O F   C O N T E N T S

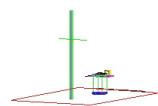
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FCC ID: BCGA2603 IC: 579C-A2603	<b>PCTEST®</b> Proud to be part of 		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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# MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna A		Antenna B		Antenna A		Antenna B		Summed	
				Max. Power (mW)	Max. Power (dBm)								
1	20	802.11a/n	5180 - 5240	44.668	16.50	42.170	16.25	44.361	16.47	41.687	16.20	84.723	19.28
2A		802.11a/n	5260 - 5320	50.119	17.00	46.989	16.72	50.119	17.00	47.315	16.75	97.499	19.89
2C		802.11a/n	5500 - 5720	56.234	17.50	53.088	17.25	56.234	17.50	52.966	17.24	108.643	20.36
3		802.11a/n	5745 - 5825	41.879	16.22	44.668	16.50	42.170	16.25	44.668	16.50	86.896	19.39
1	40	802.11n	5190 - 5230	44.463	16.48	41.495	16.18	43.652	16.40	41.687	16.20	85.310	19.31
2A		802.11n	5270 - 5310	50.119	17.00	47.315	16.75	39.811	16.00	38.548	15.86	78.343	18.94
2C		802.11n	5510 - 5710	56.234	17.50	52.845	17.23	55.208	17.42	53.088	17.25	108.393	20.35
3		802.11n	5755 - 5795	42.073	16.24	44.668	16.50	41.783	16.21	42.170	16.25	86.497	19.37
1	80	802.11ac	5210	13.521	11.31	14.125	11.50	9.772	9.90	9.840	9.93	19.634	12.93
2A		802.11ac	5290	15.205	11.82	15.101	11.79	10.940	10.39	11.220	10.50	22.182	13.46
2C		802.11ac	5530 - 5690	55.208	17.42	52.602	17.21	55.976	17.48	52.845	17.23	108.893	20.37
3		802.11ac	5775	31.623	15.00	31.261	14.95	24.547	13.90	25.119	14.00	49.659	16.96

## FCC EUT Overview

UNII Band	Channel Bandwidth (MHz)	Mode	Tx Frequency (MHz)	SISO				CDD/SDM					
				Antenna A		Antenna B		Antenna A		Antenna B		Summed	
				Max. Power (mW)	Max. Power (dBm)								
1	20	802.11a/n	5180 - 5240	31.623	15.00	31.623	15.00	15.849	12.00	15.849	12.00	31.550	14.99
2A		802.11a/n	5260 - 5320	50.119	17.00	46.989	16.72	50.119	17.00	47.315	16.75	97.499	19.89
2C		802.11a/n	5500 - 5720	56.234	17.50	53.088	17.25	56.234	17.50	52.966	17.24	108.643	20.36
3		802.11a/n	5745 - 5825	41.879	16.22	44.668	16.50	42.170	16.25	44.668	16.50	86.896	19.39
1	40	802.11n	5190 - 5230	44.463	16.48	41.495	16.18	24.266	13.85	24.831	13.95	49.091	16.91
2A		802.11n	5270 - 5310	50.119	17.00	47.315	16.75	39.811	16.00	38.548	15.86	78.343	18.94
2C		802.11n	5510 - 5710	56.234	17.50	52.240	17.18	55.208	17.42	53.088	17.25	108.393	20.35
3		802.11n	5755 - 5795	42.073	16.24	44.668	16.50	41.783	16.21	42.170	16.25	86.497	19.37
1	80	802.11ac	5210	13.521	11.31	14.125	11.50	9.772	9.90	9.840	9.93	19.634	12.93
2A		802.11ac	5290	15.205	11.82	15.101	11.79	10.940	10.39	11.220	10.50	22.182	13.46
2C		802.11ac	5530 - 5690	55.208	17.42	52.602	17.21	55.976	17.48	52.845	17.23	108.893	20.37
3		802.11ac	5775	31.623	15.00	31.261	14.95	24.547	13.90	25.119	14.00	49.659	16.96

## ISED EUT Overview

FCC ID: BCGA2603 IC: 579C-A2603	 PCTEST <sup>®</sup> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 3 of 156

## 1.0 INTRODUCTION

### 1.1 Scope

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

### 1.2 PCTEST Test Location

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

### 1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Morgan Hill, CA 95037, U.S.A.

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

FCC ID: BCGA2603 IC: 579C-A2603	 PCTEST <sup>®</sup> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2603 and IC: 579C-A2603**. The test data contained in this report pertains only to the emissions due to the EUT's UNII 802.11a/n/ac transmitter.

**Test Device Serial No.:** Y4925R6Y2T, Y461W0LQ4M, QCQ16N0YCW, WV4HX0WRXK

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE)

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 (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 (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 (80MHz BW) Frequency / Channel Operations

FCC ID: BCGA2603 IC: 579C-A2603	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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**Notes:**

1. 5GHz NII operation is possible in 20MHz, and 40MHz, and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) KDB 789033 D02 v02r01 and ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Measured Duty Cycles					
802.11 Mode/Band		Duty Cycle [%]			
		Antenna A	Antenna B	CDD/SDM	
5GHz	a	91.9	91.9	92.1	
	n (HT20)	91.1	91.1	86.3	
	n (HT40)	85.6	85.5	79.7	
	ac (VHT80)	76.0	76.5	76.5	

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

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

WiFi Configurations		SISO		CDD		SDM		STBC	
		Antenna A	Antenna B						
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓

**Table 2-5. WIFI Configurations**

✓ = Support ; ✗ = NOT Support

**SISO** = Single Input Single Output

**SDM** = Spatial Diversity Multiplexing – MIMO function

**CDD** = Cyclic Delay Diversity - 2Tx Function

**STBC** = Space-Time Block Coding – 2Tx Function

Data Rate(s) Tested: 6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)  
6.5/7.2, 13/14.4, 19.5/21.7, 26/28.9, 39/43.3, 52/57.8, 58.5/65, 65/72.2 (n – 20MHz)  
13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW)  
29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac – 80MHz BW)  
13/14.4, 26.28.9, 39/43.3, 52/57.8, 78/86.7, 104/115.6, 117/130, 130/144.4Mbps (MIMO n/ac – 20MHz)  
156/173Mbps (MIMO ac – 20MHz)  
27/30, 54/60, 81/90, 108/120, 162/180, 216/240, 243,270, 270/300Mbps (MIMO n/ac – 40MHz) 324/360, 360/400Mbps (MIMO ac – 40MHz)  
58.5/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7Mbps (MIMO ac – 80MHz)

FCC ID: BCGA2603 IC: 579C-A2603	 <b>PCTEST<sup>®</sup></b> Proud to be part of element			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device			

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

Antenna	Simultaneous Tx Config	Bluetooth		UNII
		BDR	LE1M	802.11 a/n/ac
A	Config 1	✓	✗	✓
A	Config 2	✗	✓	✓

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

✓ = Support; ✗ = Not Support

## 2.3 Antenna Description

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

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna A	Antenna B
5.150 – 5.250	1.27	2.64
5.250 – 5.350	2.24	2.77
5.470 – 5.725	3.39	3.17
5725 – 5.850	3.54	3.21

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

## 2.4 Test Support Equipment

Test Support Equipment List					
1	Apple MacBook w/AC/DC Adapter	Model: A1398 Model: A1435	S/N: C2QKP008F6F3 S/N: N/A		
2	Apple USB Cable	Model: Kanzi	S/N: 32530F		
3	USB-C to Lightning Cable w/ AC Adapter	Model: N/A Model: A2305	S/N: N/A S/N: N/A		
4	Apple Pencil	Model: A1603	S/N: G64TG0FEGWTJ		
5	DC Power Supply	Model: KPS3010D	S/N: N/A		

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

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## 2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013 and KDB 789033 D02 v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, and 7.5 for antenna port conducted emissions test setups.

There are two vendors of the WiFi/Bluetooth radio modules, variant 1 and variant 2. Both radio modules have the same mechanical outline, same on-board antenna matching circuit, identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances. The worst case configuration was found between the two variants. The EUT was also investigated with and without charger.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration. The emissions below 1GHz and above 18GHz were tested with the highest transmitting power and the worst case channel.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

For AC line conducted and radiated test below 1GHz, following configuration were investigated and EUT powered by AC/DC was the worst case.

- EUT powered by AC/DC adaptor via USB-C cable with wire charger
- EUT powered by host PC via USB-C cable with wire charger

802.11n HT20/40 and acVHT80 2TX CDD/SDM mode test data provided in this report covers 802.11n HT20/40 and 802.11acVHT80 2TX STBC mode.

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

**Worst Case Configuration:** Antenna A is simultaneously transmitting both 2.4GHz and 5GHz mode

Description	Bluetooth	802.11a/n/ac 5GHz
Antenna	A	A
Channel	78	36
Operating Frequency (MHz)	2480	5180
Data Rate (Mbps)	1.0	MCS0
Mode	GFSK/ePA	802.11n

Table 2-9. Worst Case Simultaneous Transmission Configuration

## 2.6 Software and Firmware

The test was conducted with firmware version 19A32670z installed on the EUT.

## 2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 v02r01 were used in the measurement of the EUT.

Deviation from measurement procedure.....**None**

### 3.2 AC Line Conducted Emissions

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

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

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

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

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### 3.3 Radiated Emissions

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

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

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

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

### 3.4 Environmental Conditions

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

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## 4.0 ANTENNA REQUIREMENTS

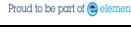
### Excerpt from §15.203 of the FCC Rules/Regulations:

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

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

### Conclusion:

The EUT complies with the requirement of §15.203.

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## 5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty ( $\pm$ dB)
Conducted Bench Top Measurements	1.65
Line Conducted Disturbance	2.75
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (30MHz - 1GHz)	4.30
Radiated Disturbance (1 - 18GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

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## 6.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Anritsu	ML2496A	Power Meter	11/3/2020	Annual	11/3/2021	184005
Anritsu	MA2411B	Pulse Power Sensor	11/10/2020	Annual	11/10/2021	1726261
Anritsu	MA2411B	Pulse Power Sensor	12/9/2020	Annual	12/9/2021	1726262
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/31/2021	Annual	3/31/2022	MY49430244
ATM	180-442-KF	20dB Nominal Gain Horn Antenna	12/9/2020	Annual	12/9/2021	T058701-01
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	9/15/2020	Annual	9/15/2021	208204
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	5/3/2021	Annual	5/3/2022	205956
Keysight Technology	N9040B	UXA Signal Analyzer	12/19/2020	Annual	12/19/2021	MY57212015
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	12/3/2020	Annual	12/3/2021	102327
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	12/3/2020	Annual	12/3/2021	101648
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/16/2021	Annual	3/16/2022	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	6/11/2021	Annual	6/11/2022	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/9/2020	Annual	11/9/2021	101570
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	4/29/2021	Annual	4/29/2022	100051
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	10/2/2020	Annual	10/2/2021	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/5/2021	Annual	4/5/2022	100519
Rohde & Schwarz	ENV216	Two-Line-V-Network (LISN)	12/7/2020	Annual	12/7/2021	101364

**Table 6-1. Test Equipment List**

**Note:**

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

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCGA2603  
 IC: 579C-A2603  
 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 (1C21060800 51-09.BCG)
15.407(b.1), (2), (3), (4)	RSS-247 [6.2]	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])		PASS	Section 7.6
15.205, 15.407(b.1), (4), (5), (6)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		PASS	Section 7.6, 7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 (RSS-Gen [8.8]) limits	AC LINE CONDUCTED	PASS	Section 7.8

Table 7-1. Summary of Test Results

**Notes:**

- 1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST “UNII Automation,” Version 6.0.
- 5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST “Chamber Automation,” Version 1.3.2.
- 6) Per RSS-247 Section 6.2.3, transmission on channels which overlap the 5600-5650 MHz is prohibited. This device operates under these frequencies only under the control of a certified master device and does not support active scanning on these channels. This device does not transmit any beacons or initiate any transmissions in UNII Bands 2A or 2C.

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## 7.2 26dB & 99% Bandwidth Measurement – 802.11a/n/ac

§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

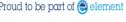
1. All antenna configurations and data rates were investigated and only the worst case are reported.
2. Low, mid, and high channels were tested and tabular data has been reported. Only mid channel bandwidth plots have been reported.

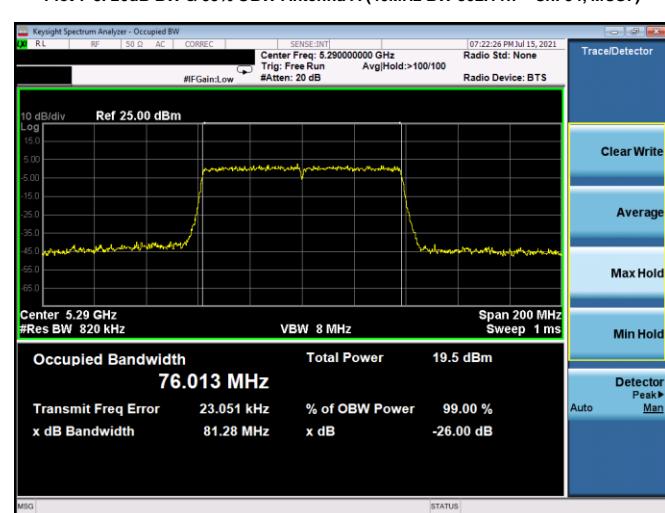
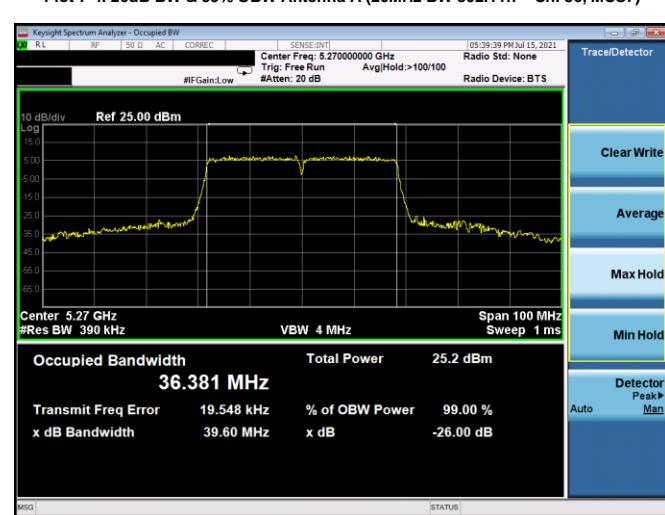
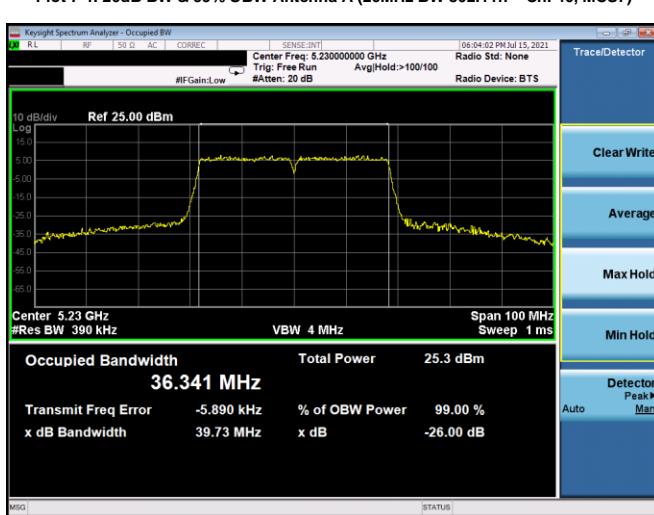
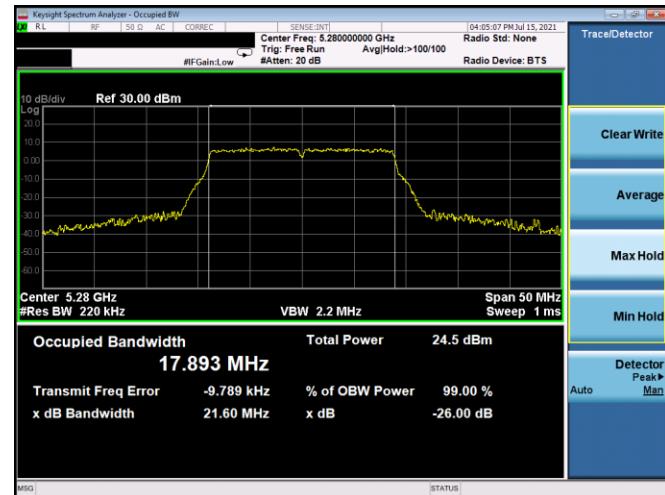
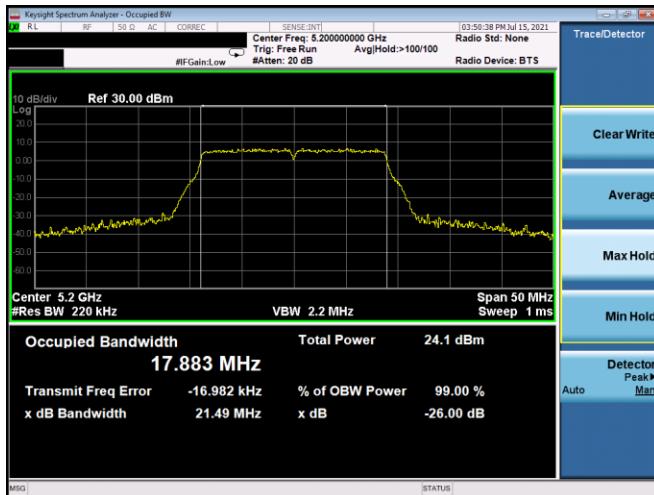
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## Antenna A 26dB & 99% Bandwidth Measurements

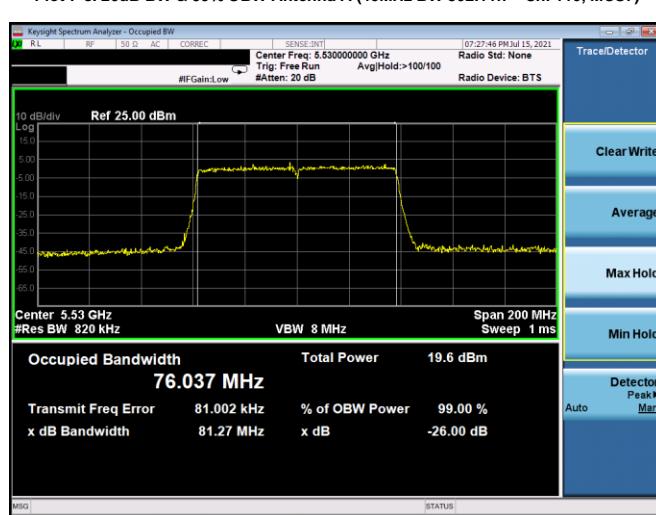
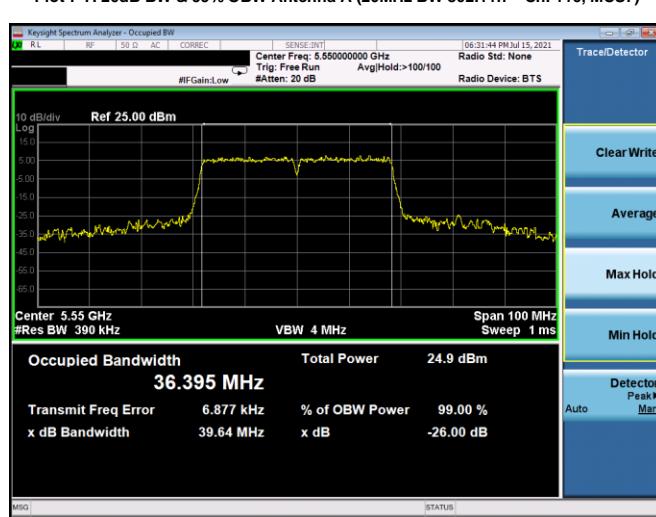
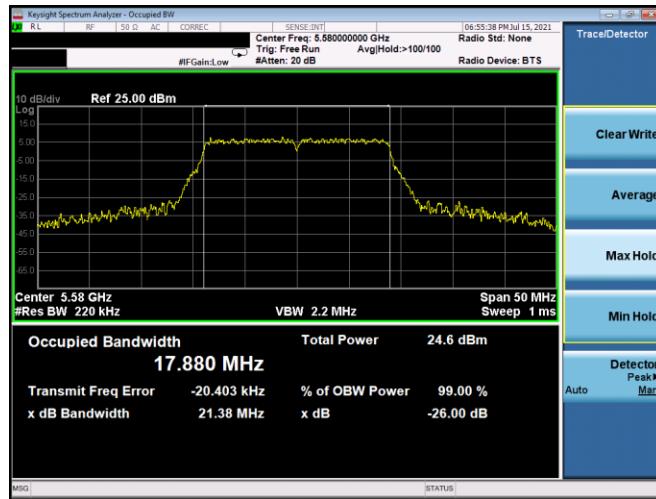
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied BW [MHz]	Measured 26dB BW [MHz]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	17.84	21.59
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.88	21.49
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.89	21.36
	5190	38	n (40MHz)	135/150 (MCS7)	36.35	39.79
	5230	46	n (40MHz)	135/150 (MCS7)	36.34	39.73
	5210	42	ac (80MHz)	390/433.3 (MCS9)	76.06	81.36
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.89	21.39
	5280	56	n (20MHz)	65/72.2 (MCS7)	17.89	21.60
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.91	21.37
	5270	54	n (40MHz)	135/150 (MCS7)	36.38	39.60
	5310	62	n (40MHz)	135/150 (MCS7)	36.32	39.72
	5290	58	ac (80MHz)	390/433.3 (MCS9)	76.01	81.28
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.88	21.57
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.88	21.38
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.91	21.60
	5510	102	n (40MHz)	135/150 (MCS7)	36.38	39.76
	5550	110	n (40MHz)	135/150 (MCS7)	36.40	39.64
	5710	142	n (40MHz)	135/150 (MCS7)	36.41	39.88
	5530	106	ac (80MHz)	390/433.3 (MCS9)	76.04	81.27
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.01	80.73

Table 7-2. Conducted Bandwidth Measurements Antenna A

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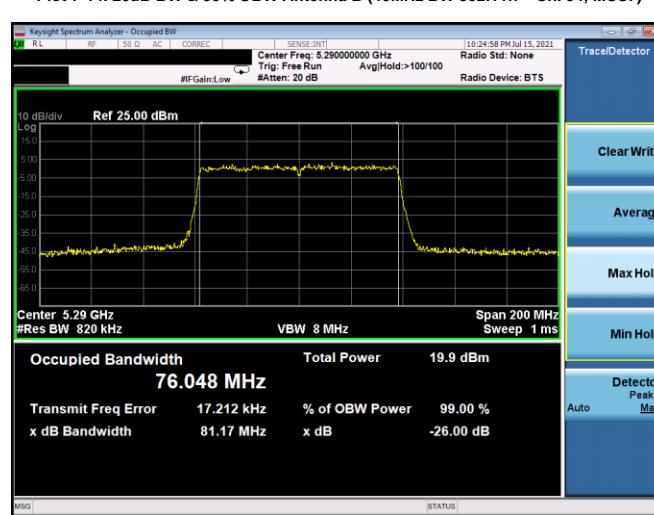
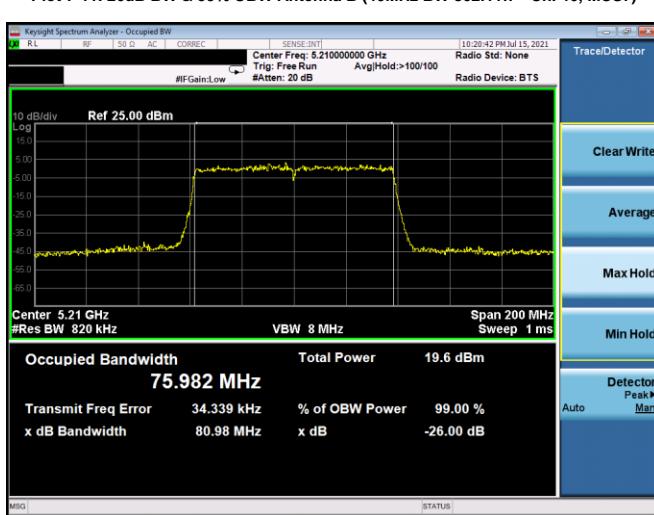
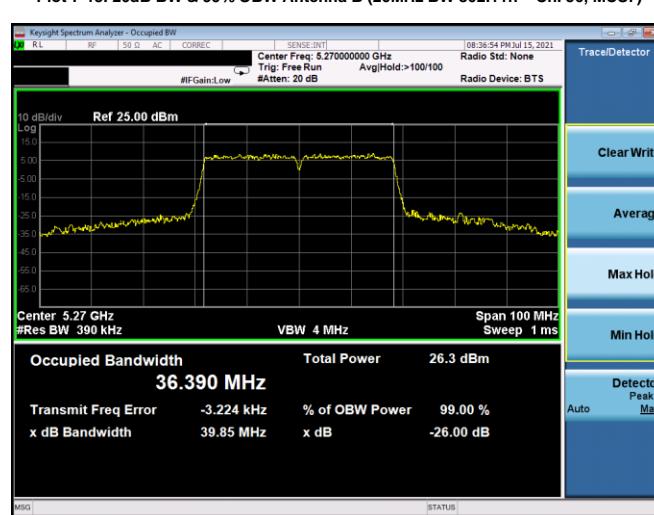
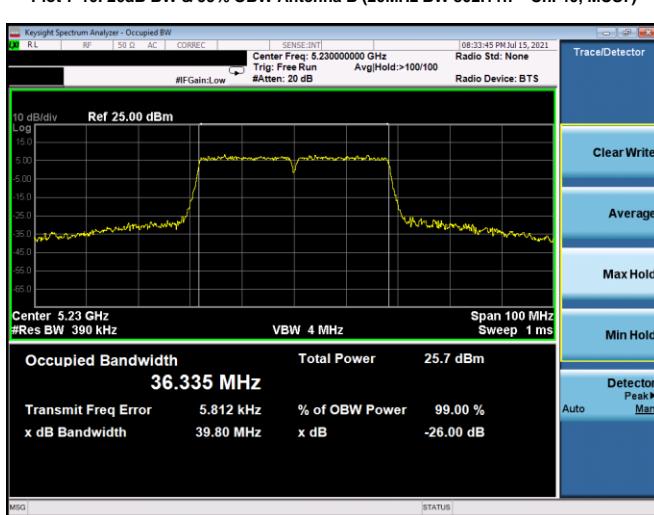
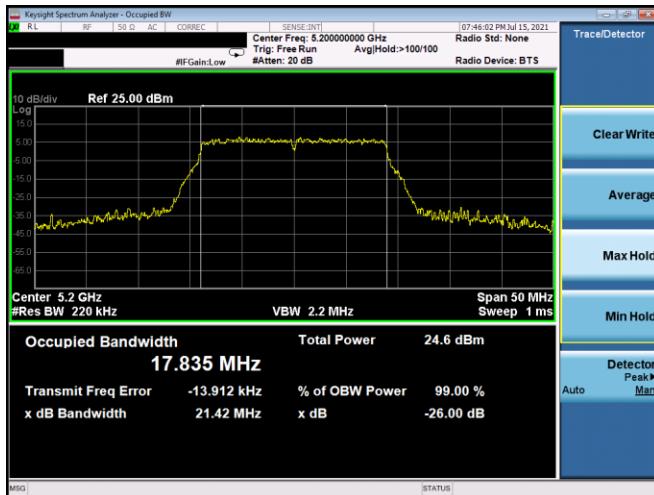
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## Antenna B 26dB & 99% Bandwidth Measurements

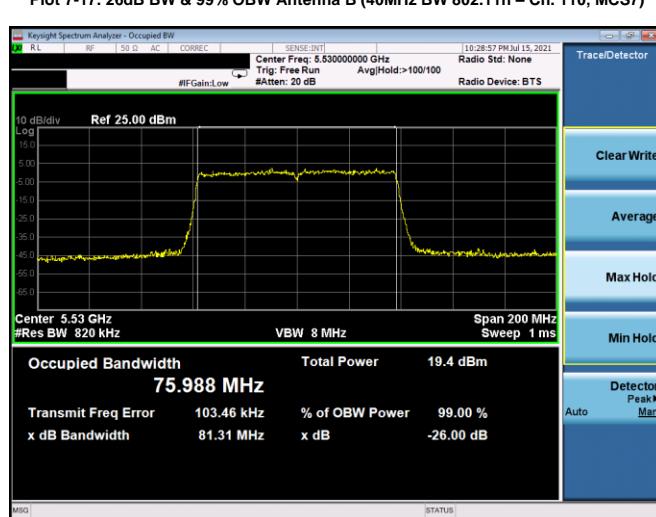
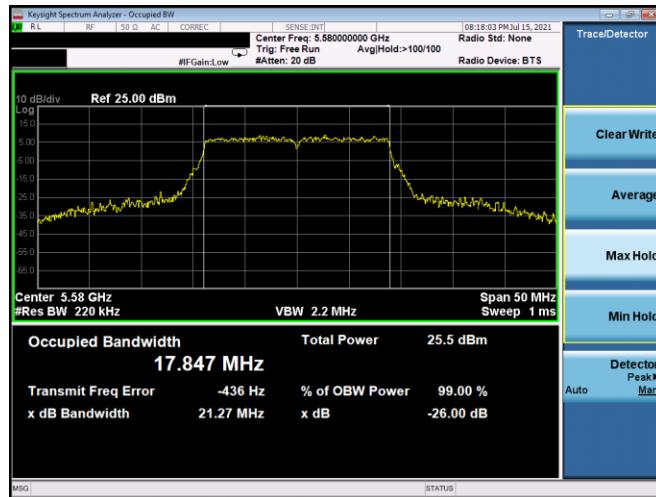
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied BW [MHz]	Measured 26dB BW [MHz]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	17.85	21.22
	5200	40	n (20MHz)	65/72.2 (MCS7)	17.84	21.42
	5240	48	n (20MHz)	65/72.2 (MCS7)	17.86	21.46
	5190	38	n (40MHz)	135/150 (MCS7)	36.34	39.77
	5230	46	n (40MHz)	135/150 (MCS7)	36.34	39.80
	5210	42	ac (80MHz)	390/433.3 (MCS9)	75.98	80.98
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	17.90	21.49
	5280	56	n (20MHz)	65/72.2 (MCS7)	17.86	21.36
	5320	64	n (20MHz)	65/72.2 (MCS7)	17.90	21.43
	5270	54	n (40MHz)	135/150 (MCS7)	36.39	39.85
	5310	62	n (40MHz)	135/150 (MCS7)	36.37	39.72
	5290	58	ac (80MHz)	390/433.3 (MCS9)	76.05	81.17
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	17.86	21.50
	5580	116	n (20MHz)	65/72.2 (MCS7)	17.85	21.27
	5720	144	n (20MHz)	65/72.2 (MCS7)	17.86	21.22
	5510	102	n (40MHz)	135/150 (MCS7)	36.31	39.52
	5550	110	n (40MHz)	135/150 (MCS7)	36.40	39.86
	5710	142	n (40MHz)	135/150 (MCS7)	36.46	39.80
	5530	106	ac (80MHz)	390/433.3 (MCS9)	75.99	81.31
	5690	138	ac (80MHz)	390/433.3 (MCS9)	76.22	81.70

Table 7-3. Conducted Bandwidth Measurements Antenna B

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FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
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## 7.3 6dB & 99% Bandwidth Measurement – 802.11a/n/ac

§2.1049; §15.407 (e); RSS-Gen [6.7]

### Test Overview and Limit

The bandwidth at 6dB 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 6dB bandwidth.

***In the 5.725 – 5.850GHz band, the 6dB bandwidth must be  $\geq 500$  kHz.***

### Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2  
 KDB 789033 D02 v02r01 – Section C

### Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. 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 = 100 kHz
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple

### Test Setup

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



**Figure 7-2. Test Instrument & Measurement Setup**

### Test Notes

1. All antenna configurations and data rates were investigated and only the worst case are reported.
2. Low, mid, and high channels were tested and tabular data has been reported. Only mid channel bandwidth plots have been reported.

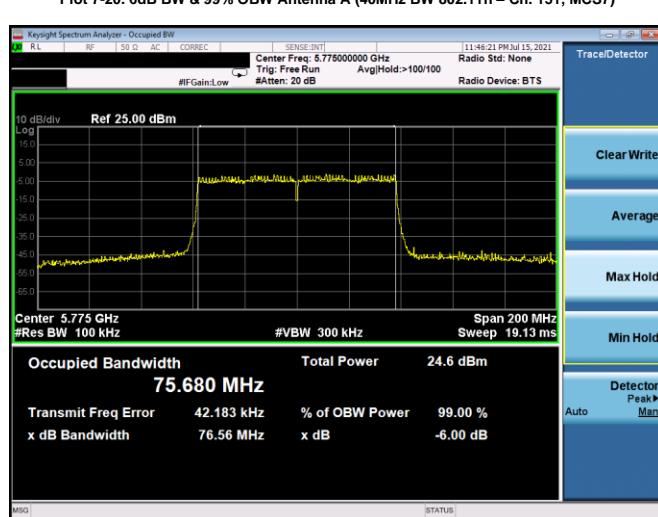
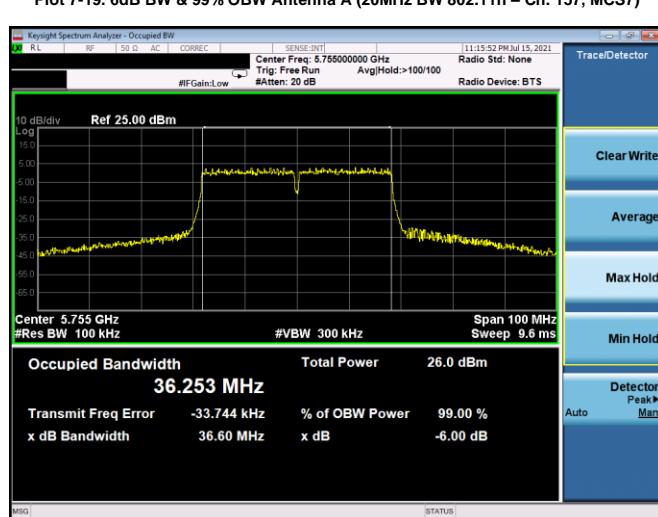
FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
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## Antenna A 6dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	Measured 6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
Band 3	5745	149	n (20MHz)	65/72.2 (MCS7)	17.70	17.77	0.50	Pass
	5785	157	n (20MHz)	65/72.2 (MCS7)	17.73	17.80	0.50	Pass
	5825	165	n (20MHz)	65/72.2 (MCS7)	17.71	17.79	0.50	Pass
	5755	151	n (40MHz)	135/150 (MCS7)	36.25	36.60	0.50	Pass
	5795	159	n (40MHz)	135/150 (MCS7)	36.25	36.60	0.50	Pass
	5775	155	ac (80MHz)	390/433.3 (MCS9)	75.68	76.56	0.50	Pass

**Table 7-4. Conducted Bandwidth Measurements Antenna A**

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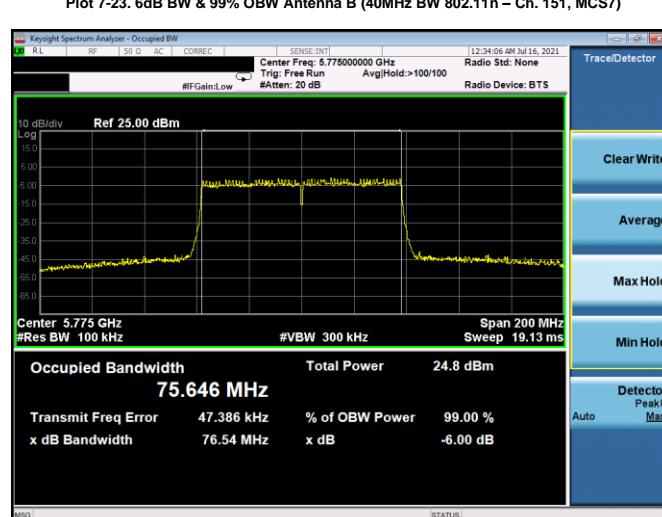
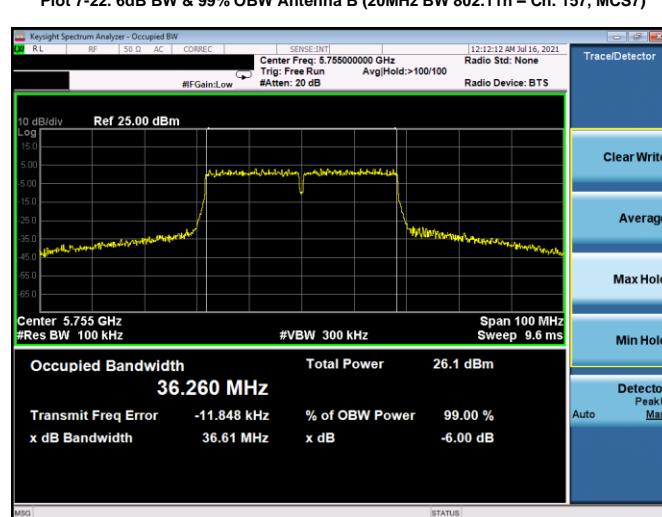
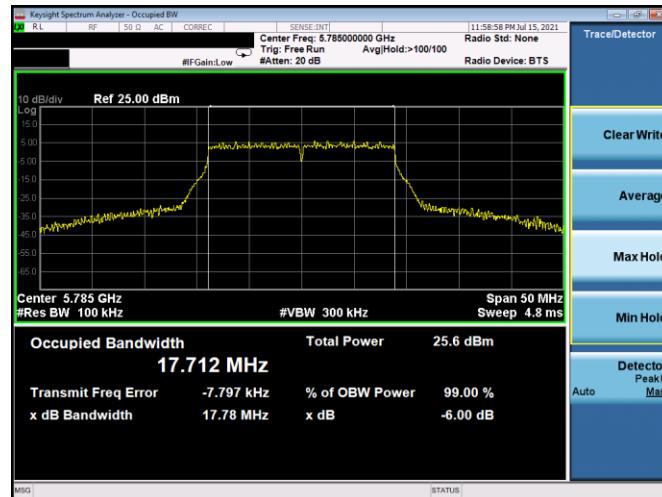
FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
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## Antenna B 6dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	Measured 6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
Band 3	5745	149	n (20MHz)	65/72.2 (MCS7)	17.72	17.79	0.50	Pass
	5785	157	n (20MHz)	65/72.2 (MCS7)	17.71	17.78	0.50	Pass
	5825	165	n (20MHz)	65/72.2 (MCS7)	17.73	17.80	0.50	Pass
	5755	151	n (40MHz)	135/150 (MCS7)	36.26	36.61	0.50	Pass
	5795	159	n (40MHz)	135/150 (MCS7)	36.24	36.57	0.50	Pass
	5775	155	ac (80MHz)	390/433.3 (MCS9)	75.65	76.54	0.50	Pass

**Table 7-5. Conducted Bandwidth Measurements Antenna B**

FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
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## 7.4 Conducted Output Power and Max EIRP Measurement – 802.11a/n/ac

§15.407(a.1.iv) §15.407(a.2) §15.407(a.3); RSS-247 [6.2]

### Test Overview and Limits

A transmitter antenna terminal of the EUT is connected to the input of an RF pulse power sensor. Measurement is made using a broadband average power meter 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. B is the 99% OBW per ISED RSS-247 and 26dB BW is per FCC 15.407.

*In the 5.15 – 5.25GHz band, the maximum permissible conducted output power is 250mW (23.98dBm). The maximum e.i.r.p. shall not exceed the lesser of 200 mW or  $10 + 10 \log_{10}B$ , dBm.*

*In the 5.25 – 5.35GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) or  $11 \text{ dBm} + 10 \log_{10}(26 \text{ dB BW}) = 11 \text{ dBm} + 10 \log_{10}(21.36) = 24.30 \text{ dBm}$ . The maximum e.i.r.p. shall not exceed the lesser of 1.0 W or  $17 + 10 \log_{10}B$ , dBm.*

*In the 5.47 – 5.725GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) or  $11 \text{ dBm} + 10 \log_{10}(26 \text{ dB BW}) = 11 \text{ dBm} + 10 \log_{10}(21.22) = 24.27 \text{ dBm}$ . The maximum e.i.r.p. shall not exceed the lesser of 1.0 W or  $17 + 10 \log_{10}B$ , dBm.*

*In the 5.725 – 5.850GHz band, the maximum permissible conducted output power is 1W (30dBm). The maximum e.i.r.p. is 36 dBm.*

### Test Procedure Used

ANSI C63.10-2013 – Section 12.3.3.2 Method PM-G

KDB 789033 D02 v02r01 – Section E)3)b) Method PM-G

ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique

KDB 662911 v02r01 – Section E)1) Measure-and-Sum Technique

### Test Settings

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

### Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

### Test Notes

1. Per RSS-247 Section 6.2.3, transmission on channels which overlap the 5600-5650 MHz is prohibited. This device operates under these frequencies only under the control of a certified master device and does not support active scanning on these channels. This device does not transmit any beacons or initiate any transmissions in UNII Bands 2A or 2C.

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### 7.4.1 FCC Antenna A Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11a	802.11n		
5180	36	AVG	15.84	15.92	23.98	-8.06	
5200	40	AVG	16.41	16.48	23.98	-7.50	
5240	48	AVG	16.45	16.50	23.98	-7.48	
5260	52	AVG	17.00	17.00	23.98	-6.98	
5300	60	AVG	16.92	16.95	23.98	-7.03	
5320	64	AVG	15.99	15.98	23.98	-7.99	
5500	100	AVG	14.45	14.40	23.98	-9.53	
5520	104	AVG	17.40	17.45	23.98	-6.53	
5580	116	AVG	17.50	17.35	23.98	-6.48	
5680	136	AVG	17.26	17.47	23.98	-6.51	
5700	140	AVG	12.96	12.98	23.98	-11.00	
5720	144	AVG	17.34	17.28	23.98	-6.64	
5745	149	AVG	16.22	16.13	30.00	-13.78	
5785	157	AVG	16.18	16.11	30.00	-13.82	
5825	165	AVG	16.19	16.16	30.00	-13.81	

Table 7-6. FCC Antenna A 20MHz BW (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11n	802.11n		
5190	38	AVG	13.00	23.98	23.98	-10.98	
5230	46	AVG	16.48	23.98	23.98	-7.50	
5270	54	AVG	17.00	23.98	23.98	-6.98	
5310	62	AVG	14.34	23.98	23.98	-9.64	
5510	102	AVG	12.39	23.98	23.98	-11.59	
5550	110	AVG	17.41	23.98	23.98	-6.57	
5630	126	AVG	17.32	23.98	23.98	-6.66	
5670	134	AVG	13.81	23.98	23.98	-10.17	
5710	142	AVG	17.50	23.98	23.98	-6.48	
5755	151	AVG	16.24	30.00	30.00	-13.76	
5795	159	AVG	16.13	30.00	30.00	-13.87	

Table 7-7. FCC Antenna A 40MHz BW (UNII) Maximum Conducted Output Power

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11ac	802.11ac		
5210	42	AVG	11.31	23.98	23.98	-12.67	
5290	58	AVG	11.82	23.98	23.98	-12.16	
5530	106	AVG	11.82	23.98	23.98	-12.16	
5610	122	AVG	15.00	23.98	23.98	-8.98	
5690	138	AVG	17.42	23.98	23.98	-6.56	
5775	155	AVG	15.00	30.00	30.00	-15.00	

Table 7-8. FCC Antenna A 80MHz BW (UNII) Maximum Conducted Output Power

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## 7.4.2 ISED Antenna A Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11a	802.11n						
	5180	36	AVG	14.98	14.87	-	-	1.27	16.25	23.01	-6.76
	5200	40	AVG	15.00	14.85	-	-	1.27	16.27	23.01	-6.74
	5240	48	AVG	14.84	15.00	-	-	1.27	16.27	23.01	-6.74
	5260	52	AVG	17.00	17.00	23.98	-6.98	2.24	19.24	30.00	-10.76
	5300	60	AVG	16.92	16.95	23.98	-7.03	2.24	19.19	30.00	-10.81
	5320	64	AVG	15.99	15.98	23.98	-7.99	2.24	18.23	30.00	-11.77
	5500	100	AVG	14.45	14.40	23.98	-9.53	3.32	17.77	30.00	-12.23
	5520	104	AVG	17.40	17.45	23.98	-6.53	3.32	20.77	30.00	-9.23
	5580	116	AVG	17.50	17.35	23.98	-6.48	3.32	20.82	30.00	-9.18
	5680	136	AVG	17.26	17.47	23.98	-6.51	3.32	20.79	30.00	-9.21
	5700	140	AVG	12.96	12.98	23.98	-11.00	3.32	16.30	30.00	-13.70
	5720	144	AVG	17.34	17.28	23.98	-6.64	3.32	20.66	30.00	-9.34
	5745	149	AVG	16.22	16.13	30.00	-13.78	3.54	19.76	-	-
	5785	157	AVG	16.18	16.11	30.00	-13.82	3.54	19.72	-	-
	5825	165	AVG	16.19	16.16	30.00	-13.81	3.54	19.73	-	-

Table 7-9. ISED Antenna A 20MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				Power [dBm]						
	5190	38	AVG	13.00	-	-	1.27	14.27	23.01	-8.74
	5230	46	AVG	16.48	-	-	1.27	17.75	23.01	-5.26
	5270	54	AVG	17.00	23.98	-6.98	2.24	19.24	30.00	-10.76
	5310	62	AVG	14.34	23.98	-9.64	2.24	16.58	30.00	-13.42
	5510	102	AVG	12.39	23.98	-11.59	3.32	15.71	30.00	-14.29
	5550	110	AVG	17.41	23.98	-6.57	3.32	20.73	30.00	-9.27
	5670	134	AVG	13.81	23.98	-10.17	3.32	17.13	30.00	-12.87
	5710	142	AVG	17.50	23.98	-6.48	3.32	20.82	30.00	-9.18
	5755	151	AVG	16.24	30.00	-13.76	3.54	19.78	-	-
	5795	159	AVG	16.13	30.00	-13.87	3.54	19.67	-	-

Table 7-10. ISED Antenna A 40MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				Power [dBm]						
	5210	42	AVG	11.31	-	-	1.27	12.58	23.01	-10.43
	5290	58	AVG	11.82	23.98	-12.16	2.24	14.06	30.00	-15.94
	5530	106	AVG	11.82	23.98	-12.16	3.32	15.14	30.00	-14.86
	5690	138	AVG	17.42	23.98	-6.56	3.32	20.74	30.00	-9.26
	5775	155	AVG	15.00	30.00	-15.00	3.54	18.54	-	-

Table 7-11. ISED Antenna A 80MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

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### 7.4.3 FCC Antenna B Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11a	802.11n		
5180	36	AVG	15.89	15.86	23.98	-8.09	
5200	40	AVG	16.05	16.05	23.98	-7.93	
5240	48	AVG	16.14	16.25	23.98	-7.73	
5260	52	AVG	16.72	16.68	23.98	-7.26	
5300	60	AVG	16.68	16.61	23.98	-7.30	
5320	64	AVG	15.75	15.87	23.98	-8.11	
5500	100	AVG	14.34	14.36	23.98	-9.62	
5520	104	AVG	17.14	17.13	23.98	-6.84	
5580	116	AVG	17.23	17.15	23.98	-6.75	
5680	136	AVG	17.25	17.25	23.98	-6.73	
5700	140	AVG	12.86	13.00	23.98	-10.98	
5720	144	AVG	17.25	17.12	23.98	-6.73	
5745	149	AVG	16.50	16.50	30.00	-13.50	
5785	157	AVG	16.50	16.50	30.00	-13.50	
5825	165	AVG	16.24	16.36	30.00	-13.64	

Table 7-12. FCC Antenna B 20MHz BW (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11n	802.11n		
5190	38	AVG	12.92	23.98	-11.06		
5230	46	AVG	16.18	23.98	-7.80		
5270	54	AVG	16.75	23.98	-7.23		
5310	62	AVG	14.50	23.98	-9.48		
5510	102	AVG	12.47	23.98	-11.51		
5550	110	AVG	17.18	23.98	-6.80		
5630	126	AVG	17.23	23.98	-6.75		
5670	134	AVG	13.93	23.98	-10.05		
5710	142	AVG	17.15	23.98	-6.83		
5755	151	AVG	16.50	30.00	-13.50		
5795	159	AVG	16.50	30.00	-13.50		

Table 7-13. FCC Antenna B 40MHz BW (UNII) Maximum Conducted Output Power

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11ac	802.11ac		
5210	42	AVG	11.50	23.98	-12.48		
5290	58	AVG	11.79	23.98	-12.19		
5530	106	AVG	11.92	23.98	-12.06		
5610	122	AVG	14.98	23.98	-9.00		
5690	138	AVG	17.21	23.98	-6.77		
5775	155	AVG	14.95	30.00	-15.05		

Table 7-14. FCC Antenna B 80MHz BW (UNII) Maximum Conducted Output Power

FCC ID: BCGA2603 IC: 579C-A2603	 <b>PCTEST®</b> Proud to be part of  <b>MEASUREMENT REPORT (CERTIFICATION)</b>					Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device				

#### 7.4.4 ISED Antenna B Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11a	802.11n						
	5180	36	AVG	15.00	14.93	-	-	2.64	17.64	23.01	-5.37
	5200	40	AVG	14.95	15.00	-	-	2.64	17.64	23.01	-5.37
	5240	48	AVG	14.99	15.00	-	-	2.64	17.64	23.01	-5.37
	5260	52	AVG	16.72	16.68	23.98	-7.26	2.77	19.49	30.00	-10.51
	5300	60	AVG	16.68	16.61	23.98	-7.30	2.77	19.45	30.00	-10.55
	5320	64	AVG	15.75	15.87	23.98	-8.11	2.77	18.64	30.00	-11.36
	5500	100	AVG	14.34	14.36	23.98	-9.62	3.17	17.53	30.00	-12.47
	5520	104	AVG	17.14	17.13	23.98	-6.84	3.17	20.31	30.00	-9.69
	5580	116	AVG	17.23	17.15	23.98	-6.75	3.17	20.40	30.00	-9.60
	5680	136	AVG	17.25	17.25	23.98	-6.73	3.17	20.42	30.00	-9.58
	5700	140	AVG	12.86	13.00	23.98	-10.98	3.17	16.17	30.00	-13.83
	5720	144	AVG	17.25	17.12	23.98	-6.73	3.17	20.42	30.00	-9.58
	5745	149	AVG	16.50	16.50	30.00	-13.50	3.21	19.71	-	-
	5785	157	AVG	16.50	16.50	30.00	-13.50	3.21	19.71	-	-
	5825	165	AVG	16.24	16.36	30.00	-13.64	3.21	19.57	-	-

Table 7-15. ISED Antenna B 20MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11n						
	5190	38	AVG	12.92	-	-	2.64	15.56	23.01	-7.45
	5230	46	AVG	16.18	-	-	2.64	18.82	23.01	-4.19
	5270	54	AVG	16.75	23.98	-7.23	2.77	19.52	30.00	-10.48
	5310	62	AVG	14.50	23.98	-9.48	2.77	17.27	30.00	-12.73
	5510	102	AVG	12.47	23.98	-11.51	3.17	15.64	30.00	-14.36
	5550	110	AVG	17.18	23.98	-6.80	3.17	20.35	30.00	-9.65
	5670	134	AVG	13.93	23.98	-10.05	3.17	17.10	30.00	-12.90
	5710	142	AVG	17.15	23.98	-6.83	3.17	20.32	30.00	-9.68
	5755	151	AVG	16.50	30.00	-13.50	3.21	19.71	-	-
	5795	159	AVG	16.50	30.00	-13.50	3.21	19.71	-	-

Table 7-16. ISED Antenna B 40MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11ac						
	5210	42	AVG	11.50	-	-	2.64	14.14	23.01	-8.87
	5290	58	AVG	11.79	23.98	-12.19	2.77	14.56	30.00	-15.44
	5530	106	AVG	11.92	23.98	-12.06	3.17	15.09	30.00	-14.91
	5690	138	AVG	17.21	23.98	-6.77	3.17	20.38	30.00	-9.62
	5775	155	AVG	14.95	30.00	-15.05	3.21	18.16	-	-

Table 7-17. ISED Antenna B 80MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

FCC ID: BCGA2603 IC: 579C-A2603	PCTEST® Proud to be part of  MEASUREMENT REPORT (CERTIFICATION)						Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device				Page 31 of 156	

### 7.4.5 FCC CDD/SDM Maximum Conducted Output Power Measurements

Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				Antenna A	Antenna B	Summed		
5180	36	CDD	AVG	15.00	15.00	18.01	23.98	-5.97
5200	40	CDD	AVG	16.38	16.10	19.25	23.98	-4.73
5240	48	CDD	AVG	16.45	16.08	19.28	23.98	-4.70
5260	52	CDD	AVG	16.39	16.50	19.80	23.98	-4.18
5300	60	CDD	AVG	16.44	16.50	19.89	23.98	-4.09
5320	64	CDD	AVG	14.50	14.40	17.46	23.98	-6.52
5500	100	CDD	AVG	13.90	14.00	16.96	23.72	-6.76
5520	104	CDD	AVG	15.50	15.33	20.31	23.72	-3.41
5580	116	CDD	AVG	15.47	15.50	20.31	23.72	-3.41
5680	136	CDD	AVG	15.41	15.50	20.22	23.72	-3.50
5700	140	CDD	AVG	11.89	11.75	14.83	23.72	-8.89
5720	144	CDD	AVG	15.26	15.50	20.33	23.72	-3.39
5745	149	CDD	AVG	16.19	16.39	19.30	29.61	-10.31
5785	157	CDD	AVG	16.25	16.50	19.39	29.61	-10.22
5825	165	CDD	AVG	16.12	16.40	19.27	29.61	-10.34

Table 7-18. FCC CDD 20MHz BW 802.11a (UNII) Maximum Conducted Output Power

Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				Antenna A	Antenna B	Summed		
5180	36	CDD	AVG	14.83	14.87	17.86	23.98	-6.12
5200	40	CDD	AVG	16.32	16.20	19.27	23.98	-4.71
5240	48	CDD	AVG	16.47	16.07	19.28	23.98	-4.70
5260	52	SDM	AVG	17.00	16.75	19.89	23.98	-4.09
5300	60	SDM	AVG	17.00	16.75	19.89	23.98	-4.09
5320	64	CDD	AVG	14.50	14.45	17.49	23.98	-6.49
5500	100	CDD	AVG	13.95	13.95	16.96	23.72	-6.76
5520	104	SDM	AVG	17.41	17.23	20.33	23.98	-3.65
5580	116	SDM	AVG	17.50	17.19	20.36	23.98	-3.62
5680	136	SDM	AVG	17.49	17.12	20.32	23.98	-3.66
5700	140	CDD	AVG	11.80	11.83	14.83	23.72	-8.89
5720	144	SDM	AVG	17.37	17.24	20.27	23.98	-3.71
5745	149	CDD	AVG	16.20	16.32	19.27	29.61	-10.34
5785	157	CDD	AVG	16.14	16.50	19.33	29.61	-10.28
5825	165	CDD	AVG	16.17	16.50	19.35	29.61	-10.26

Table 7-19. FCC CDD/SDM 20MHz BW 802.11n (UNII) Maximum Conducted Output Power

Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				Antenna A	Antenna B	Summed		
5190	38	CDD	AVG	11.50	11.31	14.42	23.98	-9.56
5230	46	CDD	AVG	16.40	16.20	19.31	23.98	-4.67
5270	54	CDD	AVG	16.00	15.86	18.94	23.98	-5.04
5310	62	CDD	AVG	11.50	11.50	14.51	23.98	-9.47
5510	102	CDD	AVG	11.38	11.50	14.45	23.72	-9.27
5550	110	CDD	AVG	16.92	17.00	19.97	23.72	-3.75
5590	118	CDD	AVG	17.34	17.13	20.25	23.72	-3.47
5630	126	CDD	AVG	17.00	16.94	19.98	23.72	-3.74
5670	134	CDD	AVG	12.41	12.34	15.39	23.72	-8.33
5710	142	CDD	AVG	17.42	17.25	20.35	23.72	-3.37
5755	151	CDD	AVG	16.21	16.25	19.37	29.61	-10.24
5795	159	CDD	AVG	16.14	16.25	19.27	29.61	-10.34

Table 7-20. FCC CDD 40MHz BW 802.11n (UNII) Maximum Conducted Output Power

Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				Antenna A	Antenna B	Summed		
5210	42	CDD	AVG	9.90	9.93	12.93	23.98	-11.05
5290	58	CDD	AVG	10.39	10.50	13.46	23.98	-10.52
5530	106	CDD	AVG	10.35	10.42	13.40	23.72	-10.32
5610	122	CDD	AVG	13.40	13.30	16.36	23.72	-7.36
5690	138	CDD	AVG	17.48	17.23	20.37	23.72	-3.35
5775	155	CDD	AVG	13.90	14.00	16.96	29.61	-12.65

Table 7-21. FCC CDD 80MHz BW 802.11ac (UNII) Maximum Conducted Output Power

FCC ID: BCGA2603 IC: 579C-A2603	MEASUREMENT REPORT (CERTIFICATION)						Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device					Page 32 of 156

## 7.4.6 ISED CDD/SDM Maximum Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
					Antenna A	Antenna B	Summed						
	5180	36	CDD	AVG	12.00	11.95	14.99	-	-	4.99	19.98	23.01	-3.03
	5200	40	CDD	AVG	11.79	12.00	14.91	-	-	4.99	19.90	23.01	-3.11
	5240	48	CDD	AVG	11.96	11.94	14.96	-	-	4.99	19.95	23.01	-3.06
	5260	52	CDD	AVG	16.39	16.50	19.80	23.98	-4.18	5.52	25.32	30.00	-4.68
	5300	60	CDD	AVG	16.44	16.50	19.89	23.98	-4.09	5.52	25.41	30.00	-4.59
	5320	64	CDD	AVG	14.50	14.40	17.46	23.98	-6.52	5.52	22.98	30.00	-7.02
	5500	100	CDD	AVG	13.90	14.00	16.96	23.72	-6.76	6.26	23.22	30.00	-6.78
	5520	104	CDD	AVG	15.50	15.33	20.31	23.72	-3.41	6.26	26.57	30.00	-3.43
	5580	116	CDD	AVG	15.47	15.50	20.31	23.72	-3.41	6.26	26.57	30.00	-3.43
	5680	136	CDD	AVG	15.41	15.50	20.22	23.72	-3.50	6.26	26.48	30.00	-3.52
	5700	140	CDD	AVG	11.89	11.75	14.83	23.72	-8.89	6.26	21.09	30.00	-8.91
	5720	144	CDD	AVG	15.26	15.50	20.33	23.72	-3.39	6.26	26.59	30.00	-3.41
	5745	149	CDD	AVG	16.19	16.39	19.30	29.61	-10.31	6.39	25.69	-	-
	5785	157	CDD	AVG	16.25	16.50	19.39	29.61	-10.22	6.39	25.78	-	-
	5825	165	CDD	AVG	16.12	16.40	19.27	29.61	-10.34	6.39	25.66	-	-

Table 7-22. ISED CDD 20MHz BW 802.11a (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
					Antenna A	Antenna B	Summed						
	5180	36	CDD	AVG	11.89	12.00	14.96	-	-	4.99	19.95	23.01	-3.06
	5200	40	CDD	AVG	11.97	11.99	14.99	-	-	4.99	19.98	23.01	-3.03
	5240	48	CDD	AVG	11.78	11.83	14.82	-	-	4.99	19.81	23.01	-3.20
	5260	52	SDM	AVG	17.00	16.75	19.89	23.98	-4.09	2.51	22.40	30.00	-7.60
	5300	60	SDM	AVG	17.00	16.75	19.89	23.98	-4.09	2.51	22.40	30.00	-7.60
	5320	64	CDD	AVG	14.50	14.45	17.49	23.98	-6.49	5.52	23.01	30.00	-6.99
	5500	100	CDD	AVG	13.95	13.95	16.96	23.72	-6.76	6.26	23.22	30.00	-6.78
	5520	104	SDM	AVG	17.41	17.23	20.33	23.98	-3.65	3.25	23.58	30.00	-6.42
	5580	116	SDM	AVG	17.50	17.19	20.36	23.98	-3.62	3.25	23.61	30.00	-6.39
	5680	136	SDM	AVG	17.49	17.12	20.32	23.98	-3.66	3.25	23.57	30.00	-6.43
	5700	140	CDD	AVG	11.80	11.83	14.83	23.72	-8.89	6.26	21.09	30.00	-8.91
	5720	144	SDM	AVG	17.37	17.24	20.27	23.98	-3.71	3.25	23.52	30.00	-6.48
	5745	149	CDD	AVG	16.20	16.32	19.27	29.61	-10.34	6.39	25.66	-	-
	5785	157	CDD	AVG	16.14	16.50	19.33	29.61	-10.28	6.39	25.72	-	-
	5825	165	CDD	AVG	16.17	16.50	19.35	29.61	-10.26	6.39	25.74	-	-

Table 7-23. ISED CDD/SDM 20MHz BW 802.11n (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
					Antenna A	Antenna B	Summed						
	5190	38	CDD	AVG	11.50	11.31	14.42	-	-	4.99	19.41	23.01	-3.60
	5230	46	CDD	AVG	13.85	13.95	16.91	-	-	4.99	21.90	23.01	-1.11
	5270	54	CDD	AVG	16.00	15.86	18.94	23.98	-5.04	5.52	24.46	30.00	-5.54
	5310	62	CDD	AVG	11.50	11.50	14.51	23.98	-9.47	5.52	20.03	30.00	-9.97
	5510	102	CDD	AVG	11.38	11.50	14.45	23.72	-9.27	6.26	20.71	30.00	-9.29
	5550	110	CDD	AVG	16.92	17.00	19.97	23.72	-3.75	6.26	26.23	30.00	-3.77
	5670	134	CDD	AVG	12.41	12.34	15.39	23.72	-8.33	6.26	21.65	30.00	-8.35
	5710	142	CDD	AVG	17.42	17.25	20.35	23.72	-3.37	6.26	26.61	30.00	-3.39
	5755	151	CDD	AVG	16.21	16.25	19.37	29.61	-10.24	6.39	25.76	-	-
	5795	159	CDD	AVG	16.14	16.25	19.27	29.61	-10.34	6.39	25.66	-	-

Table 7-24. ISED CDD 40MHz BW 802.11n (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
					Antenna A	Antenna B	Summed						
	5210	42	CDD	AVG	9.90	9.93	12.93	-	-	4.99	17.92	23.01	-5.09
	5290	58	CDD	AVG	10.39	10.50	13.46	23.98	-10.52	5.52	18.98	30.00	-11.02
	5530	106	CDD	AVG	10.35	10.42	13.40	23.72	-10.32	6.26	19.66	30.00	-10.34
	5690	138	CDD	AVG	17.48	17.23	20.37	23.72	-3.35	6.26	26.63	30.00	-3.37
	5775	155	CDD	AVG	13.90	14.00	16.96	29.61	-12.65	6.39	23.35	-	-

Table 7-25. ISED CDD 80MHz BW 802.11ac (UNII) Maximum Conducted Output Power and Max EIRP

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Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device						Page 33 of 156	V 10.4 5/21/2021

**Note:**

Per ANSI C63.10-2013 and KDB 662911 v02r01 Section E)1), the conducted powers at Antenna A and Antenna B were first measured separately during CDD/SDM transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Per ANSI C63.10-2013 Section 14.4.3, the directional gain is calculated using the following formula, where  $G_N$  is the gain of the nth antenna and  $N_{ANT}$ , the total number of antennas used.

$$\text{Directional gain} = 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi}$$

Per ANSI C63.10-2013 Section 14.4.3, the uncorrelated directional gain is calculated using the following formula, where  $G_N$  is the gain of the nth antenna and  $N_{ANT}$ , the total number of antennas used.

$$\text{Directional gain} = 10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{ANT}] \text{ dBi}$$

**Sample CDD/SDM Calculation:**

At 5180MHz in 802.11n (20MHz BW) mode, the average conducted output power was measured to be 14.83 dBm for Antenna A and 14.87 dBm for Antenna B.

$$\text{Antenna A + Antenna B} = \text{CDD/SDM}$$

$$(14.83 \text{ dBm} + 14.87 \text{ dBm}) = (30.41 \text{ mW} + 30.69 \text{ mW}) = 61.10 \text{ mW} = 17.86 \text{ dBm}$$

**Sample e.i.r.p. Calculation:**

At 5180MHz in 802.11n (20MHz BW) mode, the average CDD/SDM conducted power was calculated to be 17.86 dBm with directional gain of 4.99 dBi.

$$\text{e.i.r.p. (dBm)} = \text{Conducted Power (dBm)} + \text{Ant gain (dBi)}$$

$$17.86 \text{ dBm} + 4.99 \text{ dBi} = 22.85 \text{ dBm}$$

FCC ID: BCGA2603 IC: 579C-A2603	 <b>PCTEST<sup>®</sup></b> Proud to be part of element		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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## 7.5 Maximum Power Spectral Density – 802.11a/n/ac

§15.407(a.1.iv) §15.407(a.2) §15.407(a.3); RSS-247 [6.2]

### Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was 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. Method SA-1, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, was used to measure the power spectral density.

***In the 5.15 – 5.25GHz, 5.25 – 5.35GHz, 5.47 – 5.725GHz bands, the maximum permissible power spectral density is 11dBm/MHz.***

***In the 5.15 – 5.25GHz band, the e.i.r.p. spectral density shall not exceed 10 dBm in any 1 MHz band.***

***In the 5.725 – 5.850GHz band, the maximum permissible power spectral density is 30dBm/500kHz.***

### Test Procedure Used

ANSI C63.10-2013 – Section 12.3.2.2

KDB 789033 D02 v02r01 – Section F

ANSI C63.10-2013 – Section 14.3.2.2 Measure-and-Sum Technique

KDB 662911 v02r01 – Section E2) Measure-and-Sum Technique

### Test Settings

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire emission bandwidth of the signal
3. RBW = 1MHz
4. VBW = 3MHz
5. Number of sweep points  $\geq 2 \times (\text{span}/\text{RBW})$
6. Sweep time = auto
7. Detector = power averaging (RMS)
8. Trigger was set to free run for all modes
9. Trace was averaged over 100 sweeps
10. The peak search function of the spectrum analyzer was used to find the peak of the spectrum.

### Test Setup

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



**Figure 7-4. Test Instrument & Measurement Setup**

### Test Notes

1. Low, mid, and high channels were tested and tabular data has been reported. Only mid channel psd plots have been reported.

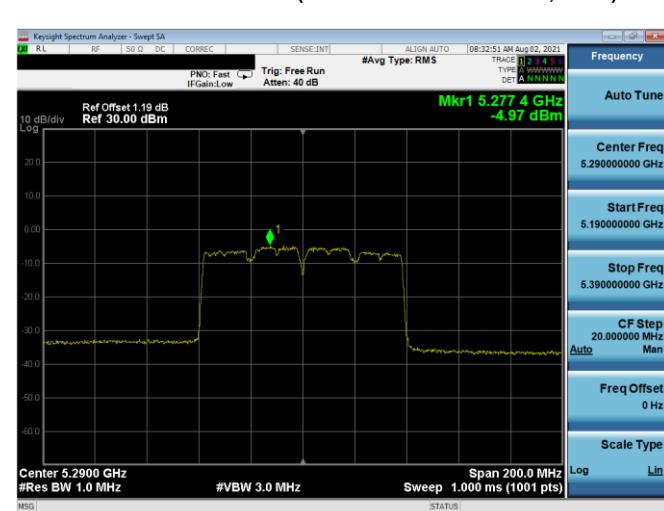
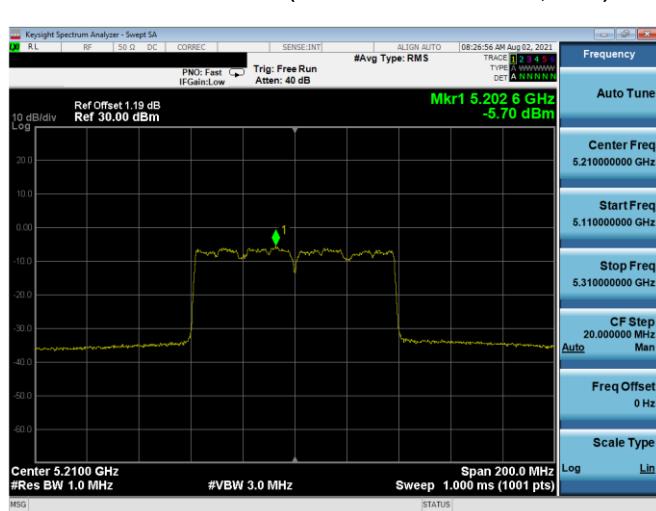
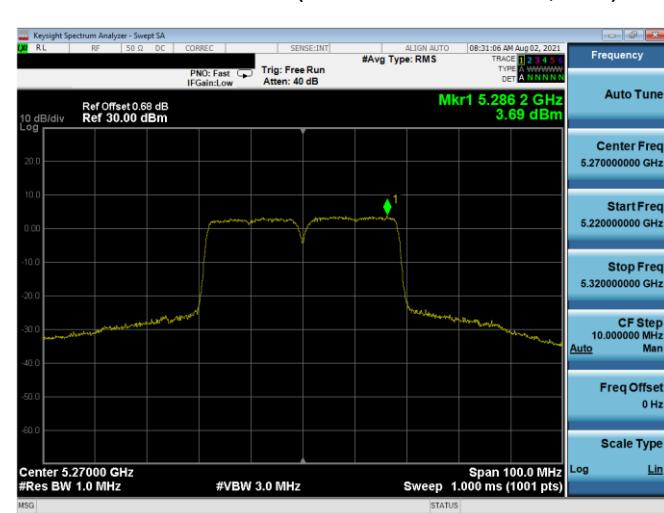
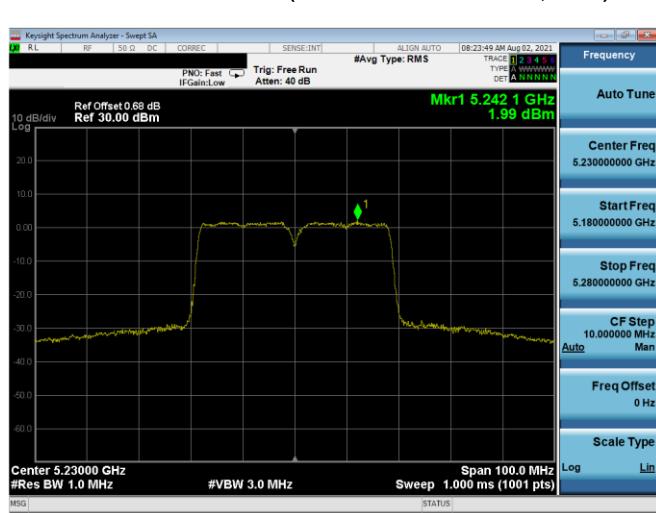
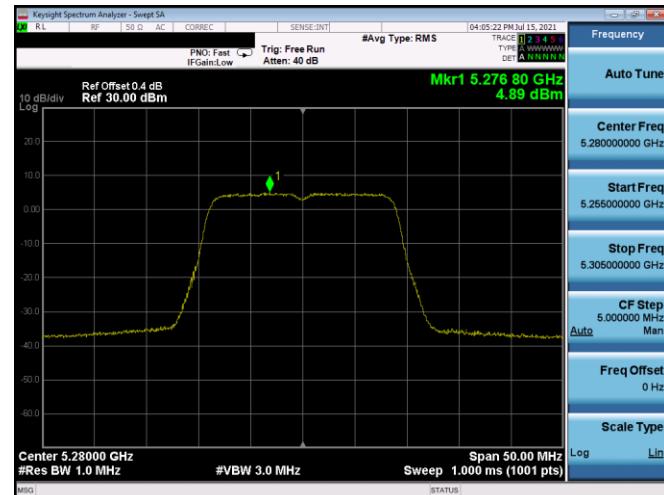
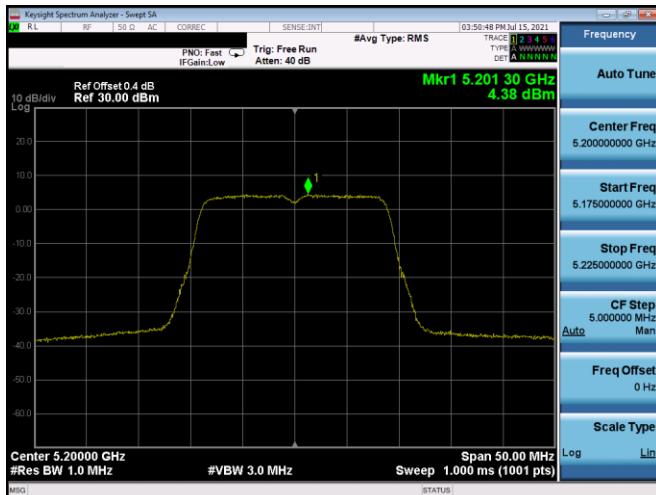
FCC ID: BCGA2603 IC: 579C-A2603	 <b>PCTEST®</b> Proud to be part of  <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 35 of 156

### 7.5.1 Antenna A Power Spectral Density Measurements

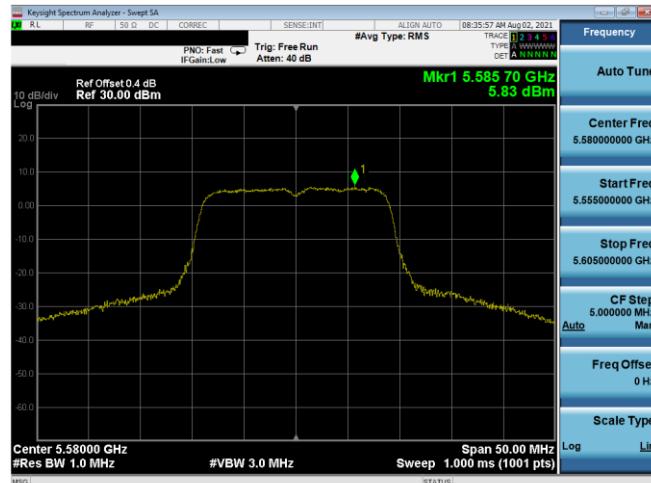
Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	4.05	11.0
	5200	40	n (20MHz)	65/72.2 (MCS7)	4.38	11.0
	5240	48	n (20MHz)	65/72.2 (MCS7)	4.57	11.0
	5190	38	n (40MHz)	135/150 (MCS7)	-0.10	11.0
	5230	46	n (40MHz)	135/150 (MCS7)	1.99	11.0
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-5.70	11.0
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	4.56	11.0
	5280	56	n (20MHz)	65/72.2 (MCS7)	4.89	11.0
	5320	64	n (20MHz)	65/72.2 (MCS7)	3.52	11.0
	5270	54	n (40MHz)	135/150 (MCS7)	3.69	11.0
	5310	62	n (40MHz)	135/150 (MCS7)	-0.27	11.0
	5290	58	ac (80MHz)	390/433.3 (MCS9)	-4.97	11.0
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	2.72	11.0
	5580	116	n (20MHz)	65/72.2 (MCS7)	5.83	11.0
	5720	144	n (20MHz)	65/72.2 (MCS7)	5.88	11.0
	5510	102	n (40MHz)	135/150 (MCS7)	-2.55	11.0
	5550	110	n (40MHz)	135/150 (MCS7)	2.68	11.0
	5710	142	n (40MHz)	135/150 (MCS7)	2.67	11.0
5530		106	ac (80MHz)	390/433.3 (MCS9)	-5.76	11.0
5690		138	ac (80MHz)	390/433.3 (MCS9)	-0.23	11.0
						-11.23

Table 7-26. Bands 1, 2A, 2C Power Spectral Density Measurements Antenna A

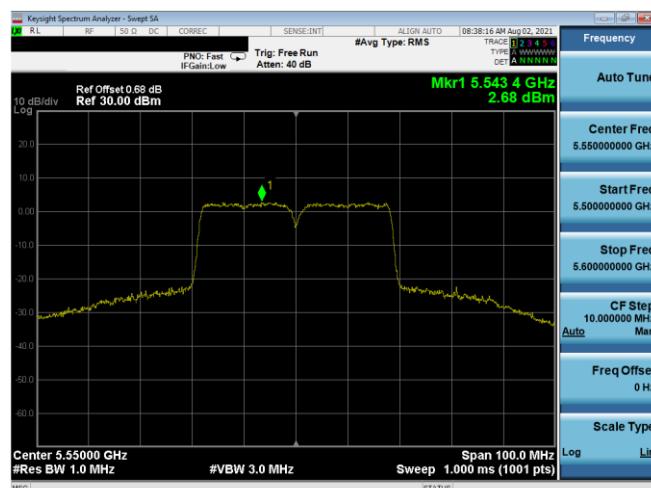
FCC ID: BCGA2603 IC: 579C-A2603	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 36 of 156



FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 37 of 156



Plot 7-31. PSD Antenna A (20MHz BW 802.11n – Ch. 116, MCS7)



Plot 7-32. PSD Antenna A (40MHz BW 802.11n – Ch. 110, MCS7)



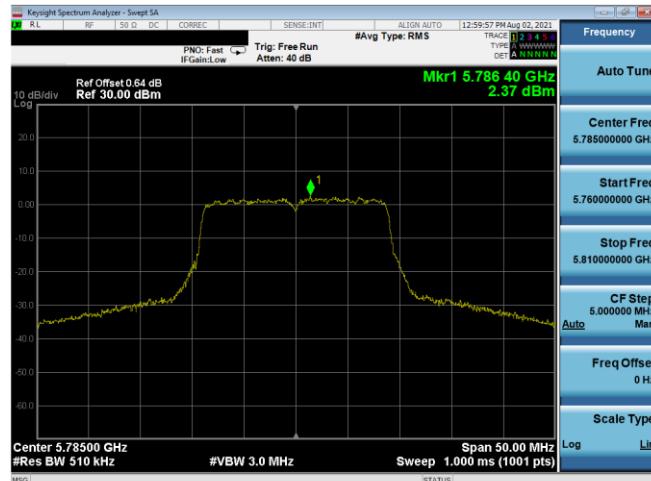
Plot 7-33. PSD Antenna A (80MHz BW 802.11ac – Ch. 106, MCS9)

FCC ID: BCGA2603 IC: 579C-A2603	 <b>PCTEST®</b> Proud to be part of  <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device		Page 38 of 156

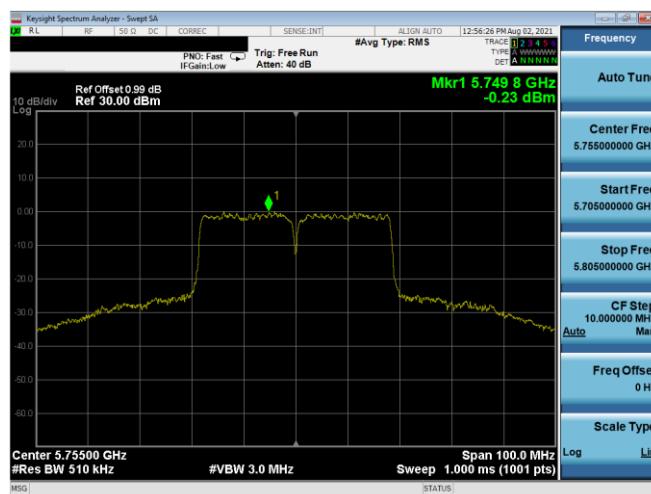
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/500kHz]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	n (20MHz)	65/72.2 (MCS7)	2.63	30.0	-27.37
	5785	157	n (20MHz)	65/72.2 (MCS7)	2.37	30.0	-27.63
	5825	165	n (20MHz)	65/72.2 (MCS7)	2.57	30.0	-27.43
	5755	151	n (40MHz)	135/150 (MCS7)	-0.23	30.0	-30.23
	5795	159	n (40MHz)	135/150 (MCS7)	-0.38	30.0	-30.38
	5775	155	ac (80MHz)	390/433.3 (MCS9)	-5.02	30.0	-35.02

**Table 7-27. Band 3 Power Spectral Density Measurements Antenna A**

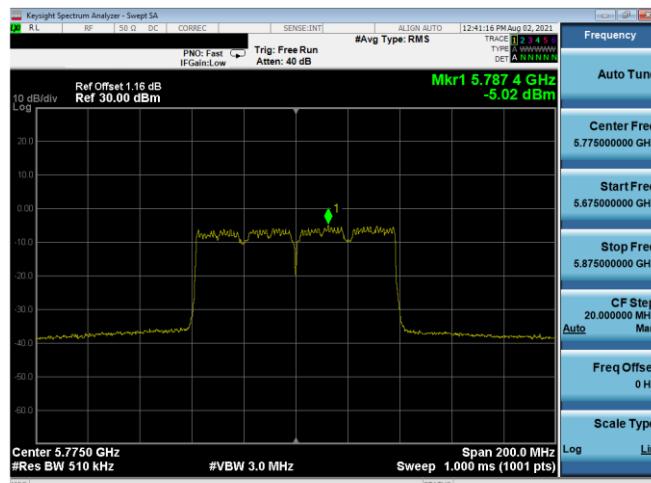
FCC ID: BCGA2603 IC: 579C-A2603	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 39 of 156



Plot 7-34. PSD Antenna A (20MHz BW 802.11n – Ch. 157, MCS7)



Plot 7-35. PSD Antenna A (40MHz BW 802.11n – Ch. 151, MCS7)



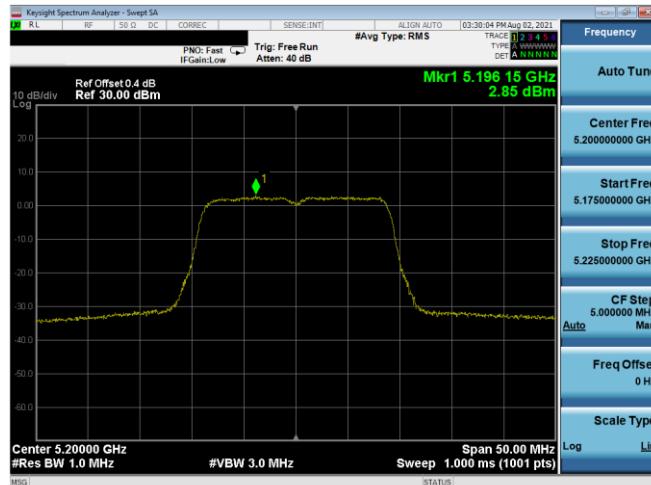
Plot 7-36. PSD Antenna A (80MHz BW 802.11ac – Ch. 155, MCS9)

FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 40 of 156	

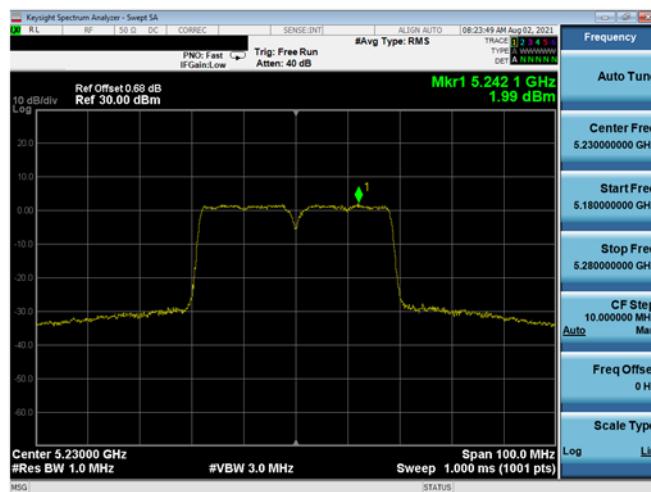
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	ISED Max e.i.r.p. Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	2.70	1.27	3.97	10.0	-6.03
	5200	40	n (20MHz)	65/72.2 (MCS7)	2.85	1.27	4.12	10.0	-5.88
	5240	48	n (20MHz)	65/72.2 (MCS7)	3.44	1.27	4.71	10.0	-5.29
	5190	38	n (40MHz)	135/150 (MCS7)	-0.10	1.27	1.17	10.0	-8.83
	5230	46	n (40MHz)	135/150 (MCS7)	1.99	1.27	3.26	10.0	-6.74
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-5.70	1.27	-4.43	10.0	-14.43

**Table 7-28. ISED Band 1 e.i.r.p. Power Spectral Density Measurements Antenna A**

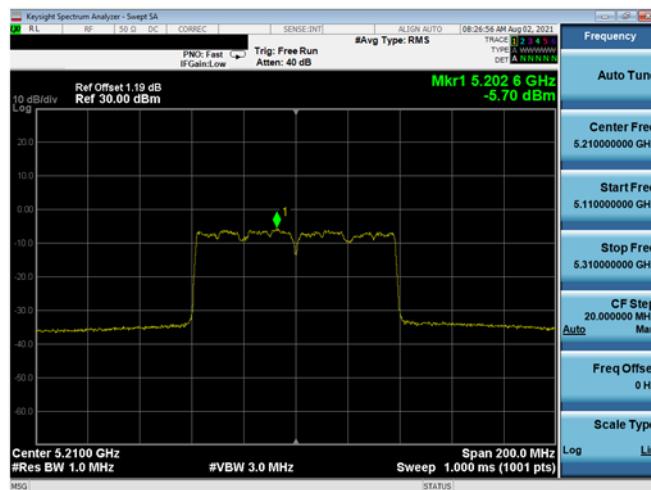
FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 41 of 156	



Plot 7-37. ISED PSD Antenna A (20MHz BW 11n – Ch.40, MCS7)



Plot 7-38. FCC PSD Antenna A (40MHz BW 11n – Ch.46, MCS7)



Plot 7-39. FCC PSD Antenna A (80MHz BW 11ac – Ch.42, MCS9)

FCC ID: BCGA2603 IC: 579C-A2603	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device		Page 42 of 156

### 7.5.2 Antenna B Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Max Power Density [dBm/MHz]	Margin [dB]	
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	4.84	11.0	-6.16
	5200	40	n (20MHz)	65/72.2 (MCS7)	4.81	11.0	-6.19
	5240	48	n (20MHz)	65/72.2 (MCS7)	5.48	11.0	-5.52
	5190	38	n (40MHz)	135/150 (MCS7)	-1.25	11.0	-12.25
	5230	46	n (40MHz)	135/150 (MCS7)	2.07	11.0	-8.93
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-6.41	11.0	-17.41
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	5.81	11.0	-5.19
	5280	56	n (20MHz)	65/72.2 (MCS7)	5.08	11.0	-5.92
	5320	64	n (20MHz)	65/72.2 (MCS7)	4.89	11.0	-6.11
	5270	54	n (40MHz)	135/150 (MCS7)	3.93	11.0	-7.08
	5310	62	n (40MHz)	135/150 (MCS7)	0.34	11.0	-10.67
	5290	58	ac (80MHz)	390/433.3 (MCS9)	-5.23	11.0	-16.23
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	3.25	11.0	-7.75
	5580	116	n (20MHz)	65/72.2 (MCS7)	5.26	11.0	-5.74
	5720	144	n (20MHz)	65/72.2 (MCS7)	6.39	11.0	-4.61
	5510	102	n (40MHz)	135/150 (MCS7)	-2.04	11.0	-13.04
	5550	110	n (40MHz)	135/150 (MCS7)	2.04	11.0	-8.96
	5710	142	n (40MHz)	135/150 (MCS7)	3.48	11.0	-7.52
	5530	106	ac (80MHz)	390/433.3 (MCS9)	-6.30	11.0	-17.30
	5690	138	ac (80MHz)	390/433.3 (MCS9)	-0.32	11.0	-11.32

Table 7-29. Power Spectral Density Measurements Antenna B

FCC ID: BCGA2603 IC: 579C-A2603	 PCTEST® <small>Proud to be part of element</small>	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2106080051-10.BCG	Test Dates: 05/28/2021 – 08/03/2021	EUT Type: Tablet Device	Page 43 of 156