

MEASUREMENT REPORT

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

Applicant Name:

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

Date of Testing:

6/15/2020 - 08/14/2020

Test Site/Location:

PCTEST Lab. Morgan Hill, CA, USA

Test Report Serial No.:

1C2004270028-08-R1.BCG

FCC ID:

BCGA2316

IC:

579C-A2316

APPLICANT:

Apple Inc.

Application Type:

Certification

Model/HVIN:

A2316

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.

This revised Test Report (S/N:1C2004270028-08-R1.BCG) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

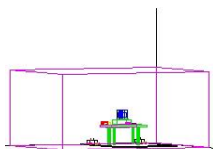


FCC ID: BCGA2316	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 1 of 208

TABLE OF CONTENTS

1.0	INTRODUCTION	4
1.1	Scope.....	4
1.2	PCTEST Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION	5
2.1	Equipment Description	5
2.2	Device Capabilities.....	5
2.3	Antenna Description.....	7
2.4	Test Support Equipment.....	7
2.5	Test Configuration	8
2.6	Software and Firmware	8
2.7	EMI Suppression Device(s)/Modifications.....	8
3.0	DESCRIPTION OF TESTS	9
3.1	Evaluation Procedure	9
3.2	AC Line Conducted Emissions	9
3.3	Radiated Emissions.....	10
3.4	Environmental Conditions.....	10
4.0	ANTENNA REQUIREMENTS	11
5.0	MEASUREMENT UNCERTAINTY	12
6.0	TEST EQUIPMENT CALIBRATION DATA.....	13
7.0	TEST RESULTS	14
7.1	Summary.....	14
7.2	26dB Bandwidth Measurement – 802.11a/n/ac	15
7.3	6dB Bandwidth Measurement – 802.11a/n/ac	38
7.4	Conducted Output Power and Max EIRP Measurement – 802.11a/n/ac.....	47
7.5	Maximum Power Spectral Density – 802.11a/n/ac.....	56
7.6	Radiated Spurious Emissions – Above 1GHz.....	125
7.6.1	Antenna WF8 Radiated Spurious Emission	128
7.6.2	Antenna WF7a Radiated Spurious Emission	138
7.6.3	CDD/SDM Radiated Spurious Emission	148
7.6.4	Antenna WF8 Radiated Band Edge Measurements (20MHz BW).....	159
7.6.5	Antenna WF8 Radiated Band Edge Measurements (40MHz BW).....	165
7.6.6	Antenna WF8 Radiated Band Edge Measurements (80MHz BW).....	170
7.6.7	Antenna WF7a Radiated Band Edge Measurements (20MHz BW).....	173
7.6.8	Antenna WF7a Radiated Band Edge Measurements (40MHz BW).....	179
7.6.9	Antenna WF7a Radiated Band Edge Measurements (80MHz BW).....	184
7.6.10	CDD/SDM Radiated Band Edge Measurements (20MHz BW).....	187
7.6.11	CDD/SDM Radiated Band Edge Measurements (40MHz BW).....	192
7.6.12	CDD/SDM Radiated Band Edge Measurements (80MHz BW).....	197
7.7	Radiated Spurious Emissions – Below 1GHz	200
7.8	AC Line-Conducted Emissions Measurement.....	204
8.0	CONCLUSION.....	208

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 2 of 208



MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	SISO				CDD/SDM					
			ANTWF8		ANTWF7A		ANTWF8		ANTWF7A		Summed	
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	5180 - 5240	100.000	20.00	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
2A		5260 - 5320	100.000	20.00	100.000	20.00	49.888	16.98	50.119	17.00	100.000	20.00
2C		5500 - 5720	100.000	20.00	100.000	20.00	50.119	17.00	50.119	17.00	100.231	20.01
3		5745 - 5825	125.893	21.00	125.893	21.00	125.893	21.00	125.893	21.00	250.611	23.99
1	40	5190 - 5230	100.000	20.00	100.000	20.00	79.433	19.00	78.886	18.97	158.489	22.00
2A		5270 - 5310	97.724	19.90	99.083	19.96	79.433	19.00	78.886	18.97	158.489	22.00
2C		5510 - 5710	124.738	20.96	124.165	20.94	89.125	19.50	89.125	19.50	177.419	22.49
3		5755 - 5795	125.893	21.00	125.893	21.00	125.893	21.00	125.314	20.98	251.189	24.00
1	80	5210	13.900	11.43	13.804	11.40	9.661	9.85	9.863	9.94	19.543	12.91
2A		5290	19.953	13.00	19.364	12.87	12.589	11.00	12.359	10.92	24.946	13.97
2C		5530 - 5690	124.738	20.96	122.462	20.88	97.499	19.89	100.000	20.00	197.697	22.96
3		5775	61.802	17.91	62.661	17.97	56.234	17.50	54.702	17.38	110.917	20.45

FCC EUT Overview

UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	SISO				CDD/SDM					
			ANTWF8		ANTWF7A		ANTWF8		ANTWF7A		Summed	
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	5180 - 5240	33.497	15.25	33.497	15.25	16.788	12.25	16.788	12.25	33.574	15.26
2A		5260 - 5320	84.140	19.25	53.088	17.25	49.888	16.98	50.119	17.00	100.000	20.00
2C		5500 - 5720	50.119	17.00	26.607	14.25	50.119	17.00	26.546	14.24	76.560	18.84
3		5745 - 5825	50.119	17.00	37.584	15.75	50.119	17.00	37.584	15.75	87.700	19.43
1	40	5190 - 5230	59.566	17.75	44.668	16.50	29.580	14.71	29.854	14.75	59.429	17.74
2A		5270 - 5310	84.140	19.25	53.088	17.25	79.433	19.00	53.088	17.25	132.434	21.22
2C		5510 - 5710	50.119	17.00	26.607	14.25	50.119	17.00	26.607	14.25	76.736	18.85
3		5755 - 5795	50.119	17.00	37.584	15.75	50.119	17.00	36.728	15.65	86.896	19.39
1	80	5210	13.900	11.43	13.804	11.40	9.661	9.85	9.863	9.94	19.543	12.91
2A		5290	19.953	13.00	19.364	12.87	12.589	11.00	12.359	10.92	24.946	13.97
2C		5530 - 5690	50.119	17.00	26.424	14.22	50.119	17.00	26.607	14.25	76.736	18.85
3		5775	48.978	16.90	37.154	15.70	50.119	17.00	37.154	15.70	87.297	19.41

ISED EUT Overview

FCC ID: BCGA2316		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device		Page 3 of 208

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 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

FCC ID: BCGA2316	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 4 of 208

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2316**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: DLXCR01PPWHW, DLXCR01JPWHW, DLXCR01SPWHW, DLXCR01QPWHW, DLX0226001FPWV22A

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE, HDR4, HDR8)

This device supports BT Beamforming

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

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

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

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

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

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 5 of 208

Notes:

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

Measured Duty Cycles				
802.11 Mode/Band		Duty Cycle [%]		
		ANTWF8	ANTWF7A	CDD/SDM
5GHz	a	99.1	99.1	99.2
	n (HT20)	90.1	91.8	87.7
	n (HT40)	84.0	86.5	81.7
	ac (vHT80)	79.5	77.7	74.3

Table 2-4. Measured Duty Cycles

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

WiFi Configurations		SISO		CDD		SDM		STBC	
		ANT WF8	ANT WF7a	ANT WF8	ANT WF7a	ANT WF8	ANT WF7a	ANT WF8	ANT WF7a
5GHz	11a	✓	✓	✓	✓	✗	✗	✗	✗
	11n (20MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓	✓	✓

Table 2-5. Frequency / Channel Operations

✓ = 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)

- This device supports simultaneous multi radio transmission feature, which allows Bluetooth (1x, EDR, LE, HDR4, HDR8) and WiFi UNII 5GHz (802.11a/n/ac/ax) to transmit simultaneously at the same antenna (WF8). All possible simultaneous configurations have been investigated and worst case configuration has been found and reported in Bluetooth and UNII (OFDMA) test reports.

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 6 of 208

2.3 Antenna Description

Following antennas were used for the testing.

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna WF8	Antenna WF7a
5.150 – 5.250	2.5	2.7
5.260 – 5.350	2.6	1.7
5.470 – 5.725	2.5	-0.3
5745 – 5.850	-0.2	1.9

Table 2-6. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook	Model: A1398	S/N: C2QKP008F6F3
	w/AC/DC Adapter	Model: A1435	S/N: N/A
2	Apple USB-C Cable	Model: Chimp	S/N: 420A57
3	USB-C Cable	Model: A146	S/N: N/A
	w/ AC Adapter	Model: A2305	S/N: N/A
4	Apple Pencil	Model: N/A	S/N: GQX91220J13LL6U7AS
5	DC Power Supply	Model: KPS3010D	S/N: N/A

Table 2-7. Test Support Equipment List

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 7 of 208

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 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.

2.6 Software and Firmware

The test was conducted with firmware version 18A325 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 8 of 208

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

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

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

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

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 9 of 208

3.3 Radiated Emissions

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

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

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

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

3.4 Environmental Conditions

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 10 of 208

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

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

Conclusion:

The EUT complies with the requirement of §15.203.

FCC ID: BCGA2316	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 11 of 208

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. 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	1.30
Line Conducted Disturbance	2.34
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.59
Radiated Disturbance (>18GHz)	4.96

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 12 of 208

6.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/4/2020	Annual	3/4/2021	MY49430244
Anritsu	ML2496A	Power Meter	10/29/2019	Annual	10/29/2020	184005
Anritsu	MA2411B	Pulse Power Sensor	10/29/2019	Annual	10/29/2020	1726261
Anritsu	MA2411B	Pulse Power Sensor	10/29/2019	Annual	10/29/2020	1726262
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	10/29/2019	Annual	10/29/2020	T058701-02
COM-POWER	LIN-120A	LISN	3/4/2020	Annual	3/4/2021	241297
ETS-Lindgren	3142E-PA	Pre-Amplifier (30MHz - 6GHz)	9/19/2019	Annual	9/19/2020	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	1/6/2020	Annual	1/6/2021	224569
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/21/2020	Annual	4/21/2021	205956
Rohde & Schwarz	ESW26	EMI Test Receiver	6/1/2020	Annual	6/1/2021	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	9/13/2019	Annual	9/13/2020	101570
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/19/2019	Annual	9/19/2020	100051
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/14/2019	Annual	11/14/2020	101057
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/12/2020	Annual	3/12/2021	100546

Table 6-1. Test Equipment List

Note:

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 13 of 208

7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
FCC ID: BCGA2316
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
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 (1C20042700 28-07.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
15.407	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 (RSS-Gen [8.8]) limits	LINE CONDUCTED	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

- 1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST “UNII Automation,” Version 4.7.
- 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 1.3.1.

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 14 of 208

7.2 26dB Bandwidth Measurement – 802.11a/n/ac §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

All antenna configurations and data rates were investigated and only the worst case are reported.

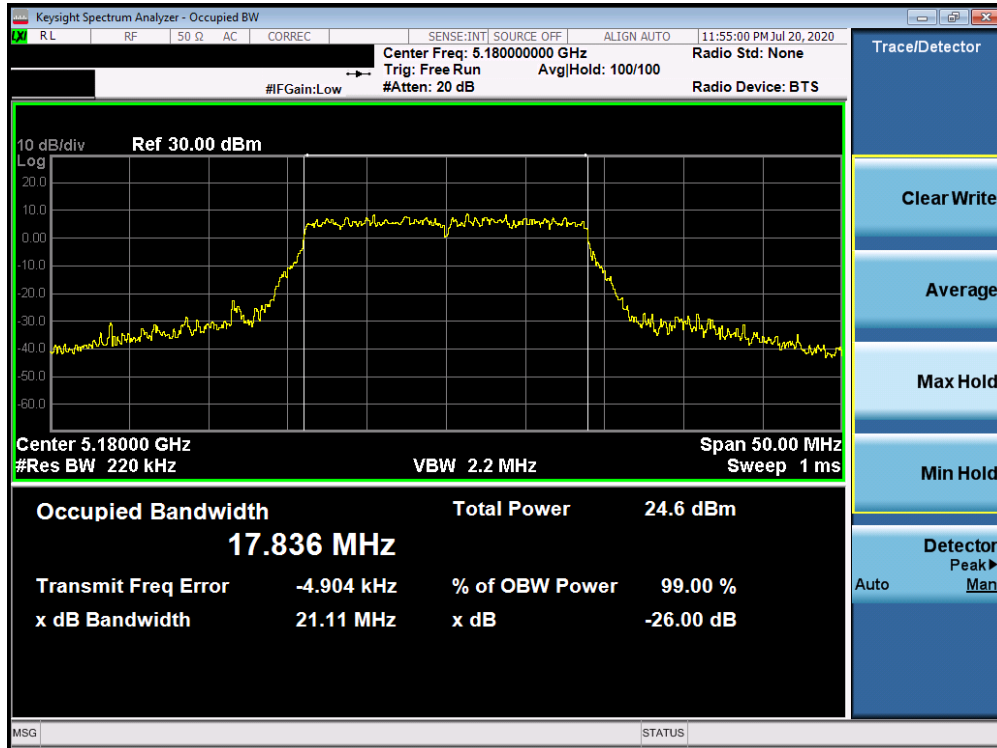
FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 15 of 208

Antenna WF8 26 dB Bandwidth Measurements

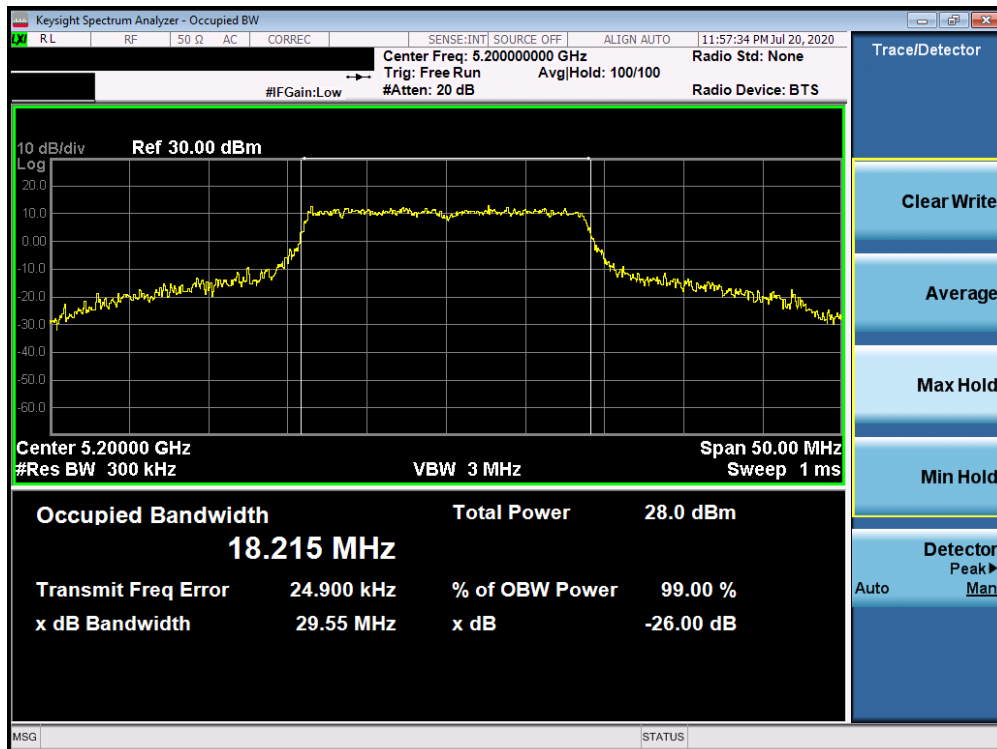
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	21.11
	5200	40	n (20MHz)	65/72.2 (MCS7)	29.55
	5240	48	n (20MHz)	65/72.2 (MCS7)	26.19
	5190	38	n (40MHz)	135/150 (MCS7)	39.15
	5230	46	n (40MHz)	135/150 (MCS7)	40.07
	5210	42	ac (80MHz)	390/433.3 (MCS9)	81.00
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	29.00
	5280	56	n (20MHz)	65/72.2 (MCS7)	23.16
	5320	64	n (20MHz)	65/72.2 (MCS7)	21.20
	5270	54	n (40MHz)	135/150 (MCS7)	39.52
	5310	62	n (40MHz)	135/150 (MCS7)	39.43
	5290	58	ac (80MHz)	390/433.3 (MCS9)	80.91
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	21.26
	5580	116	n (20MHz)	65/72.2 (MCS7)	22.87
	5720	144	n (20MHz)	65/72.2 (MCS7)	25.90
	5510	102	n (40MHz)	135/150 (MCS7)	39.25
	5550	110	n (40MHz)	135/150 (MCS7)	39.60
	5710	142	n (40MHz)	135/150 (MCS7)	45.01
	5530	106	ac (80MHz)	390/433.3 (MCS9)	80.81
	5690	138	ac (80MHz)	390/433.3 (MCS9)	81.14

Table 7-2. Conducted Bandwidth Measurements ANT WF8

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 16 of 208

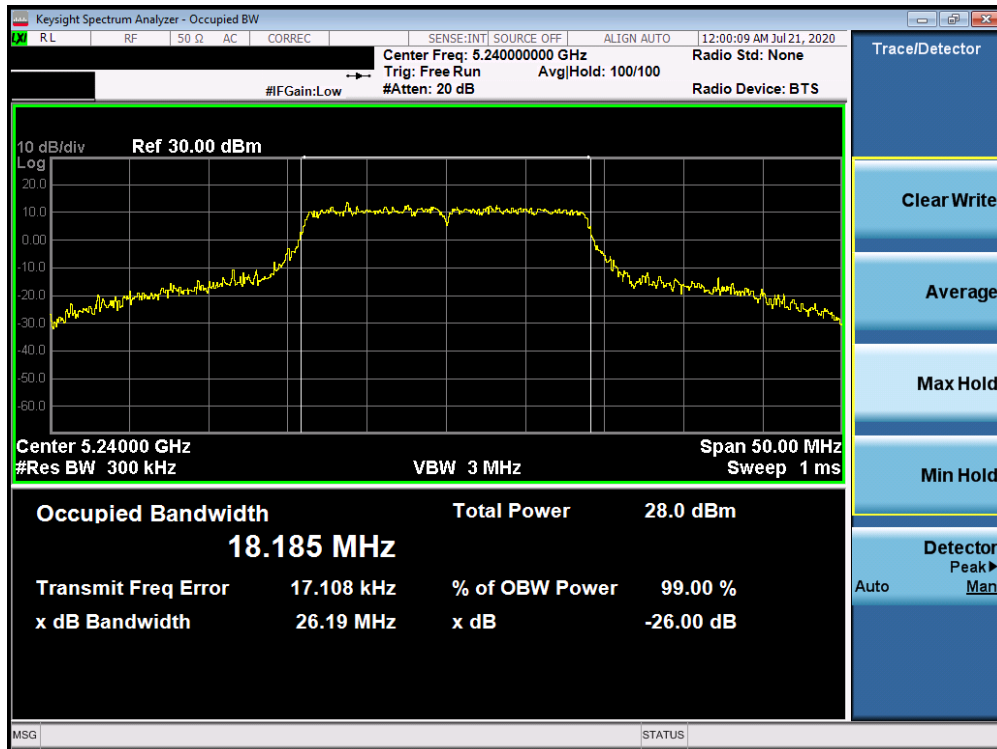


Plot 7-1. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

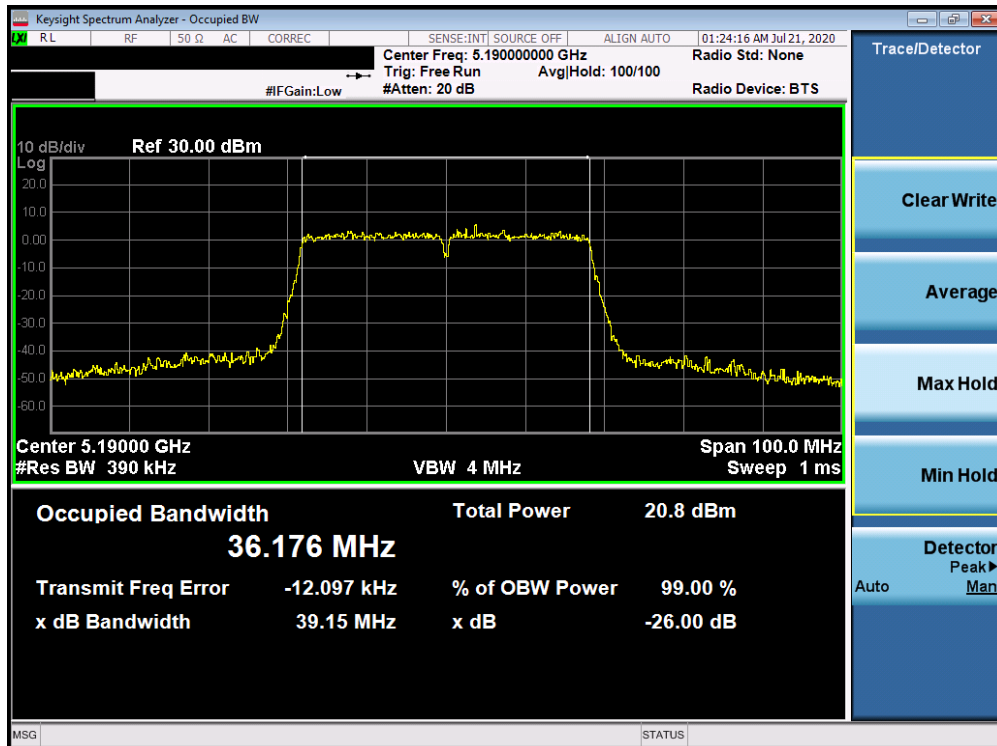


Plot 7-2. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 17 of 208

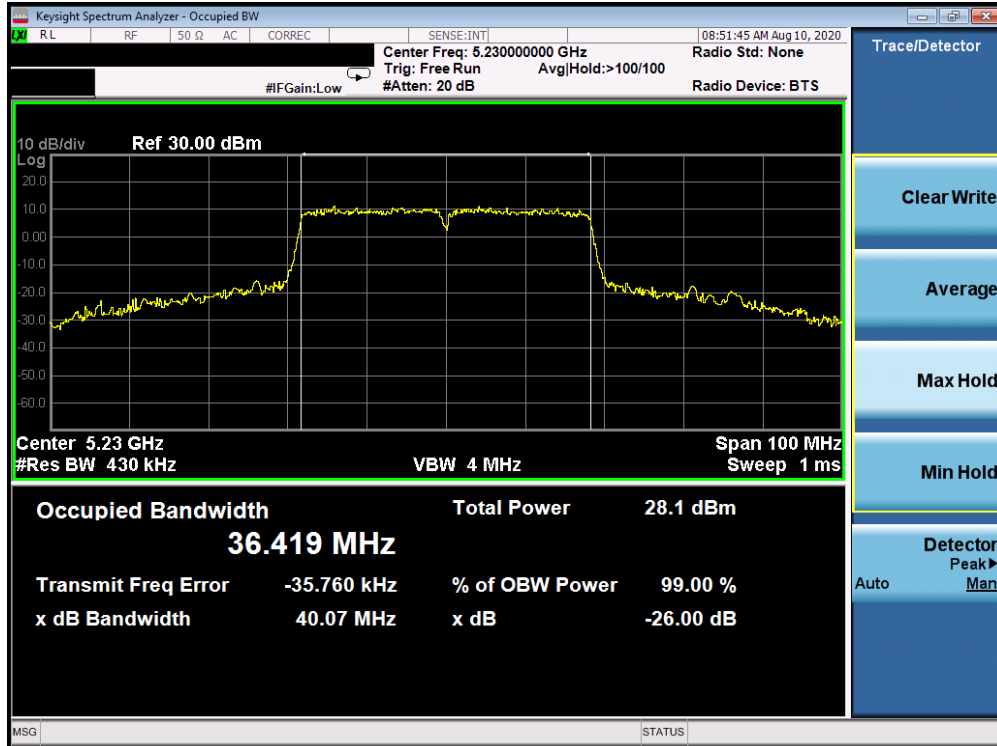


Plot 7-3. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

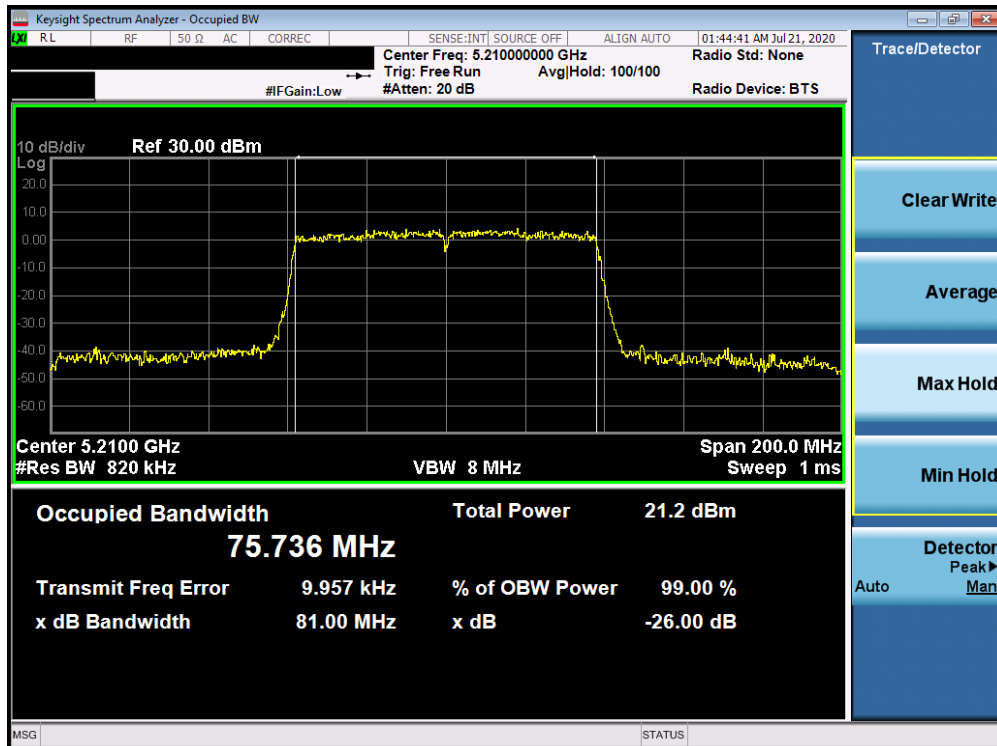


Plot 7-4. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 18 of 208

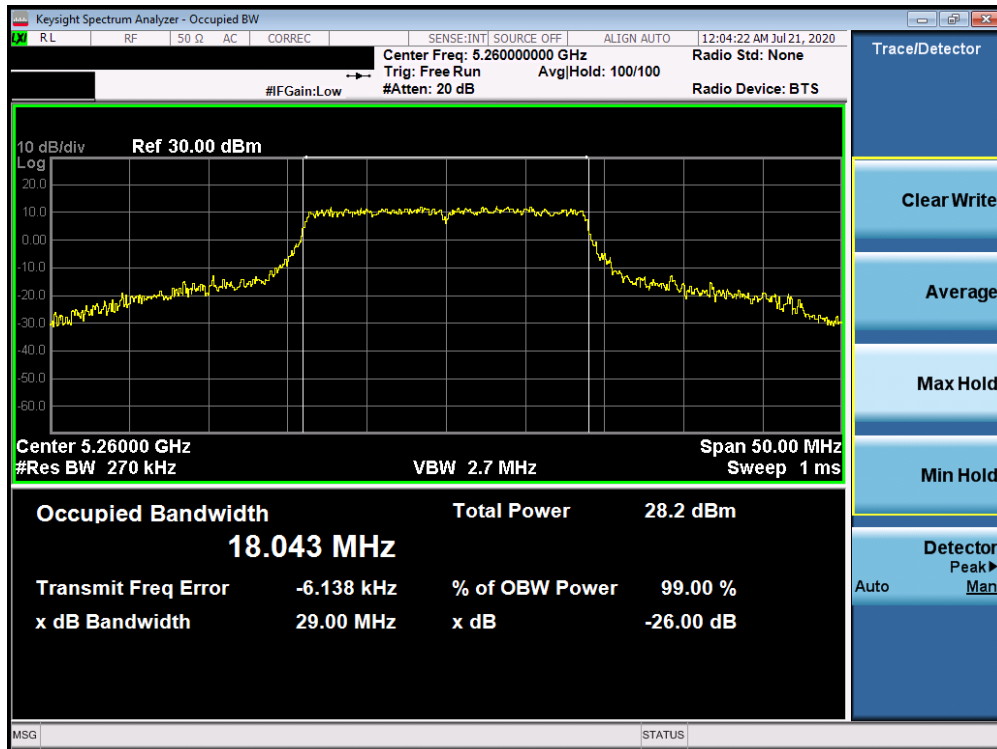


Plot 7-5. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 1) – Ch. 46)

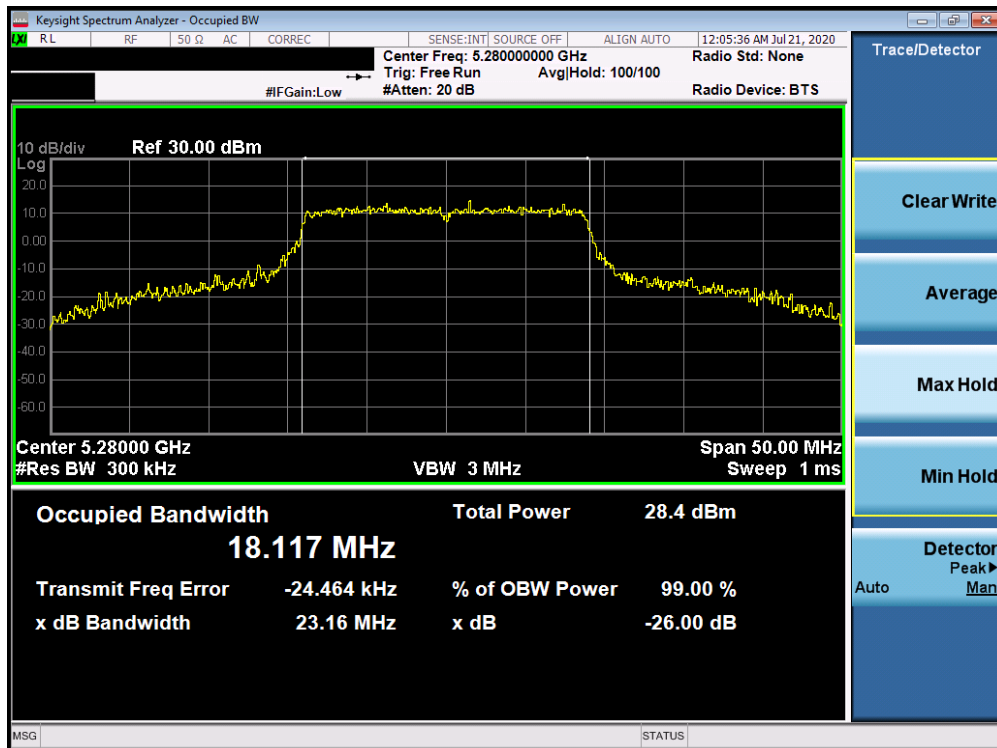


Plot 7-6. 26dB Bandwidth Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 19 of 208

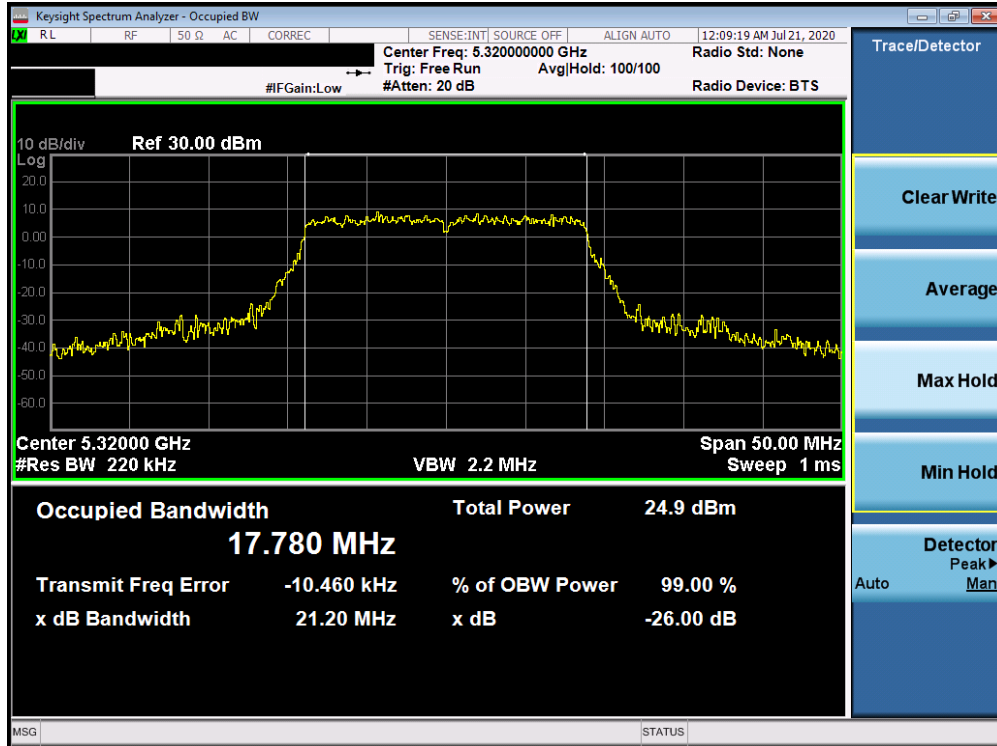


Plot 7-7. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

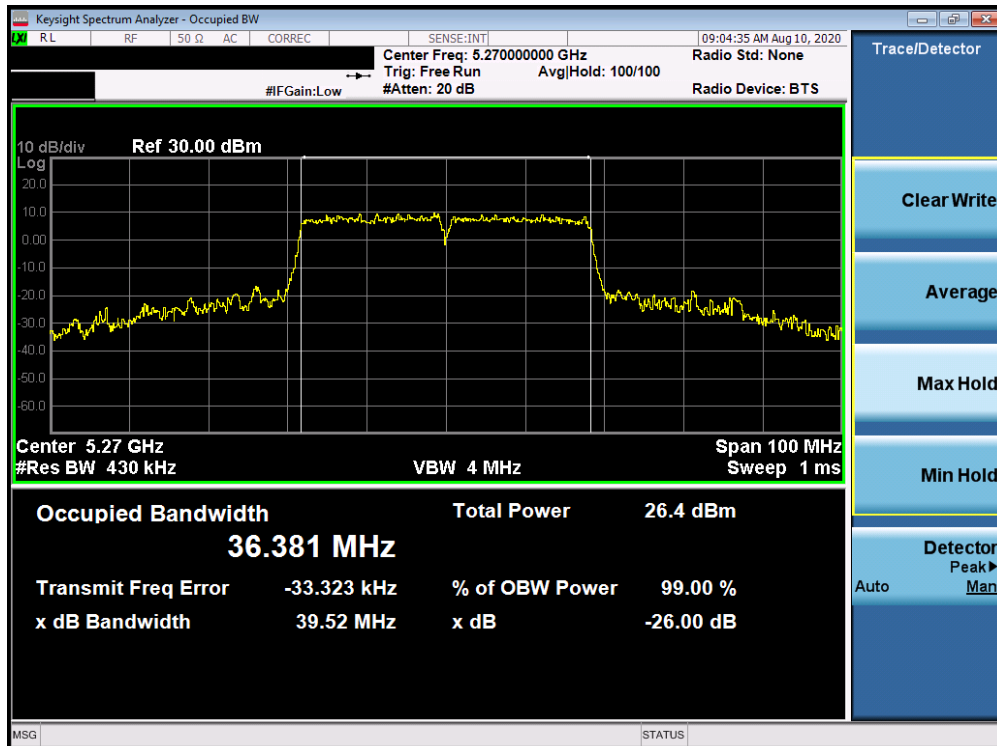


Plot 7-8. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 20 of 208

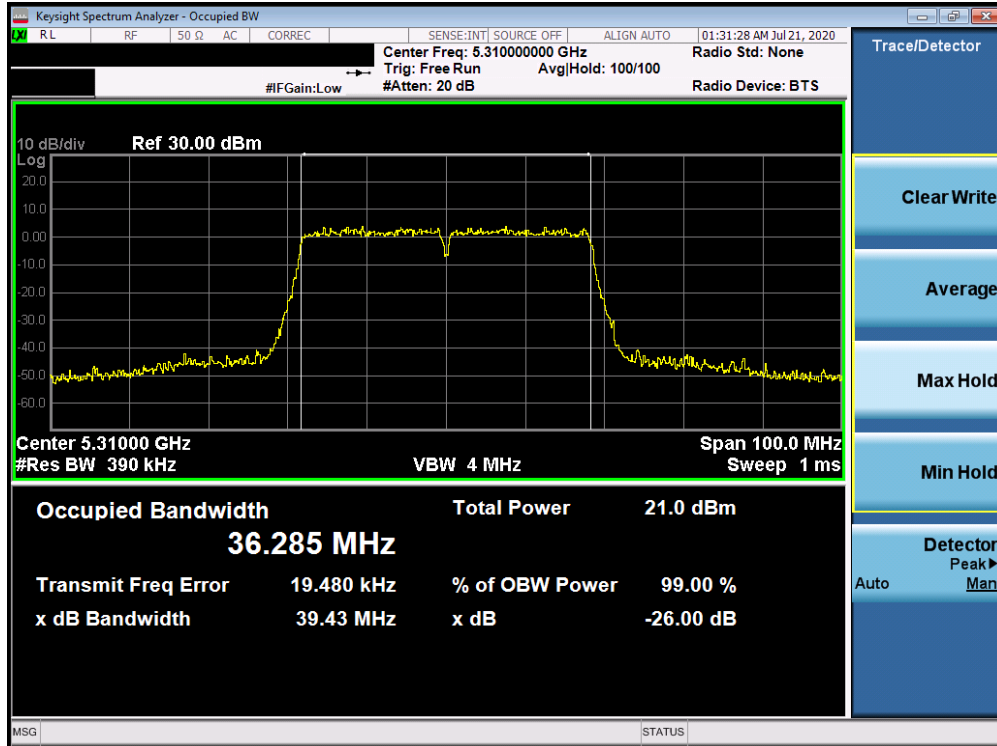


Plot 7-9. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)

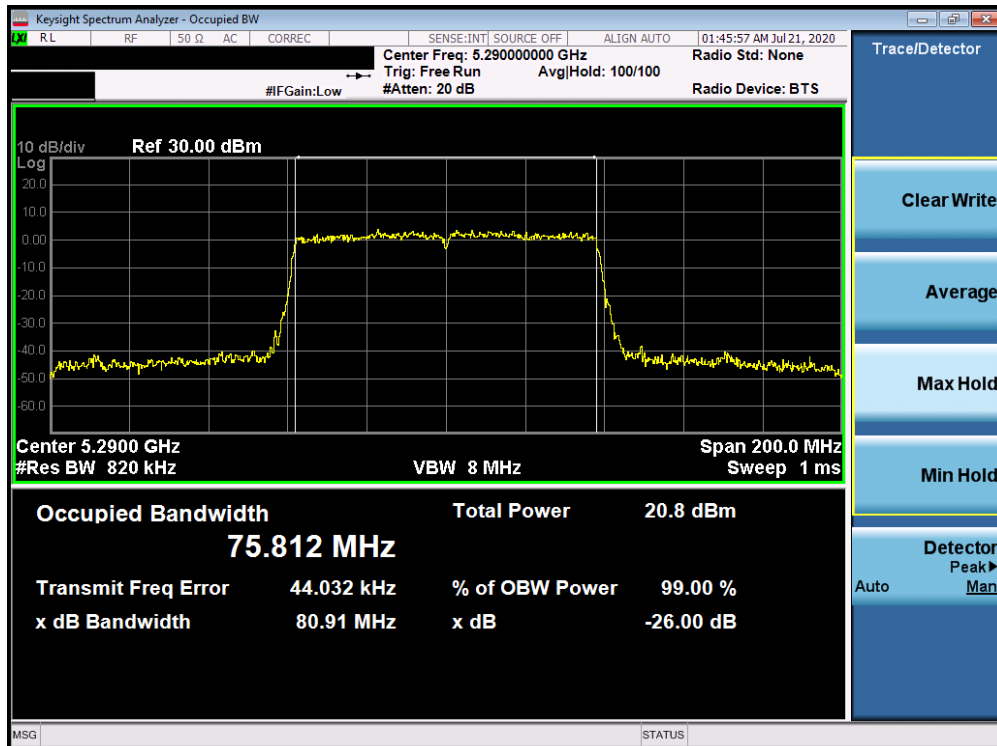


Plot 7-10. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 21 of 208

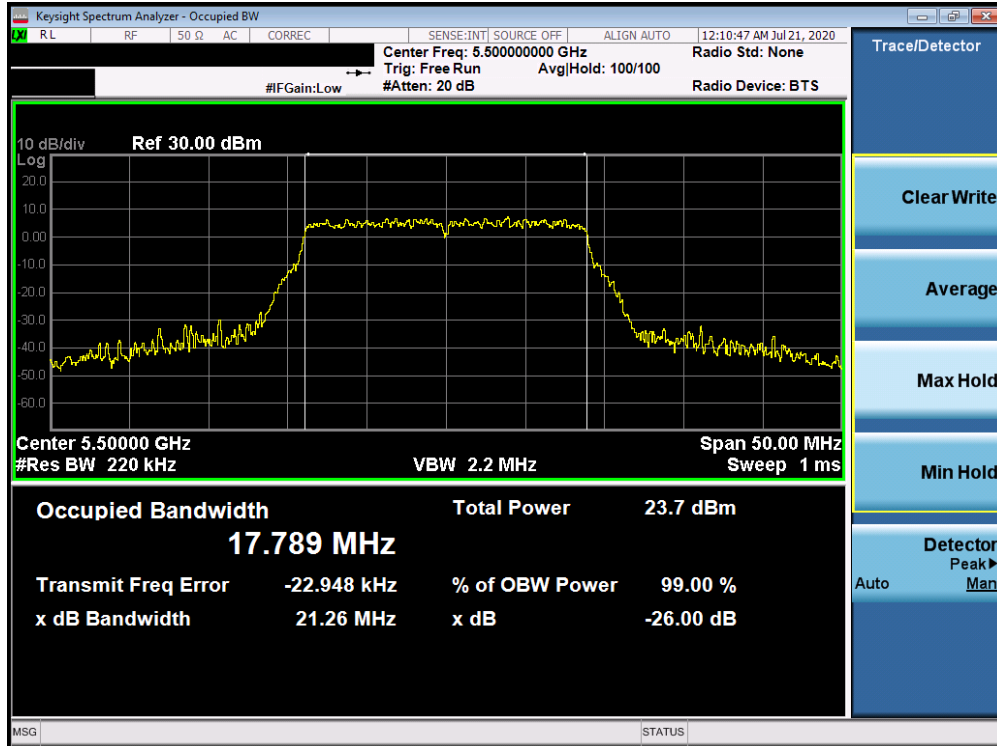


Plot 7-11. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2A) – Ch. 62)

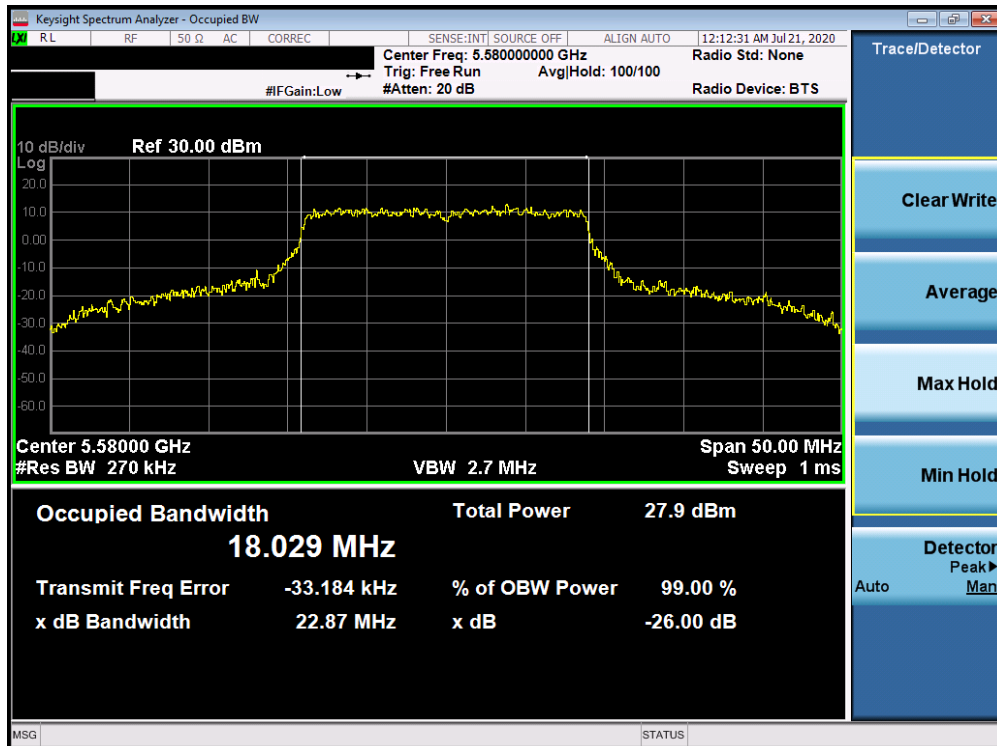


Plot 7-12. 26dB Bandwidth Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 22 of 208

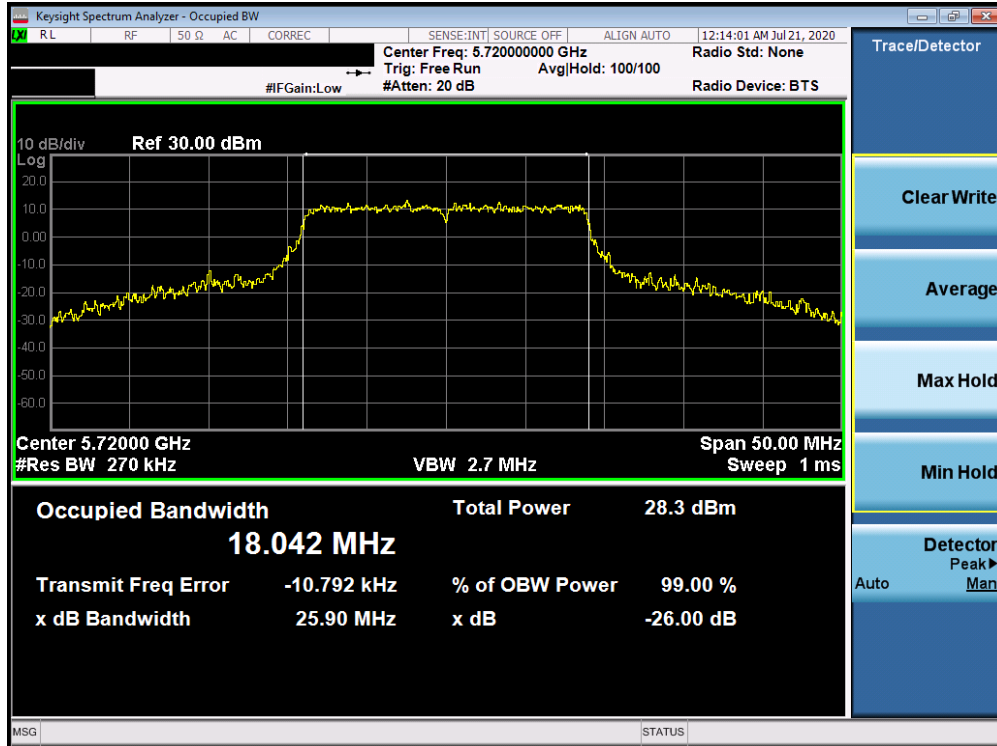


Plot 7-13. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

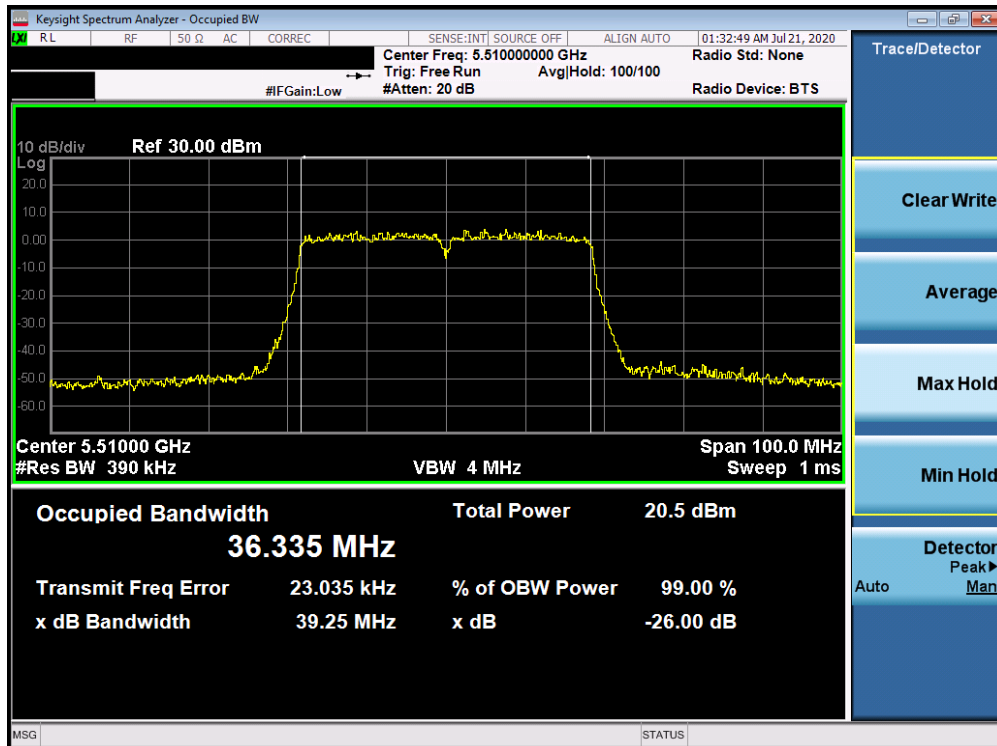


Plot 7-14. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2C) – Ch. 116)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 23 of 208

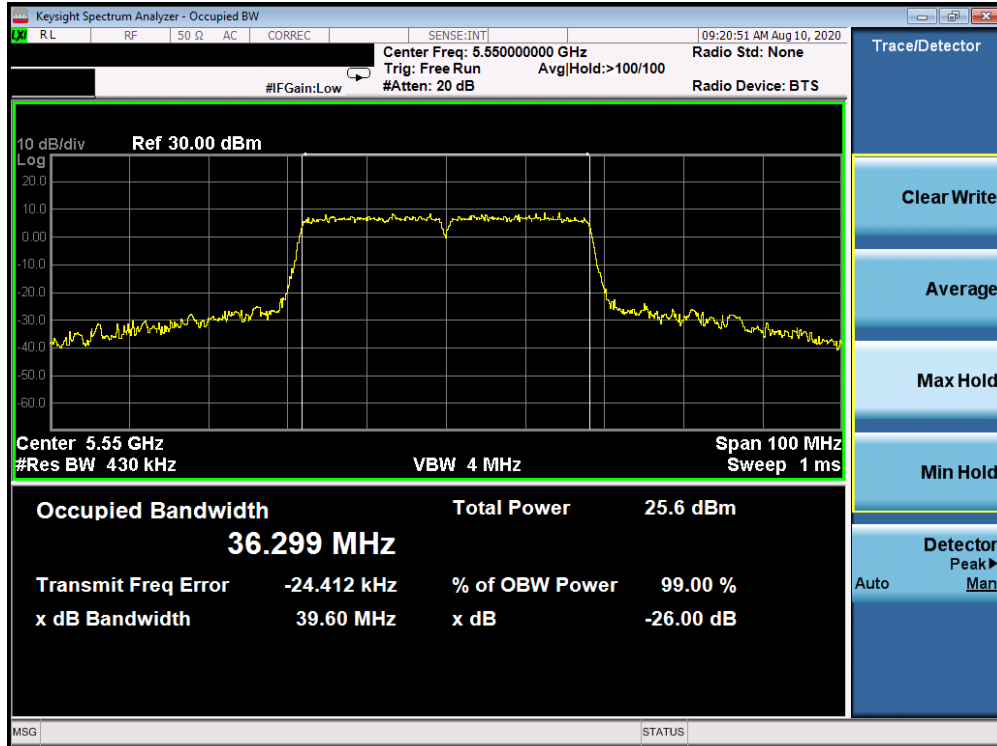


Plot 7-15. 26dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2C) – Ch. 44)

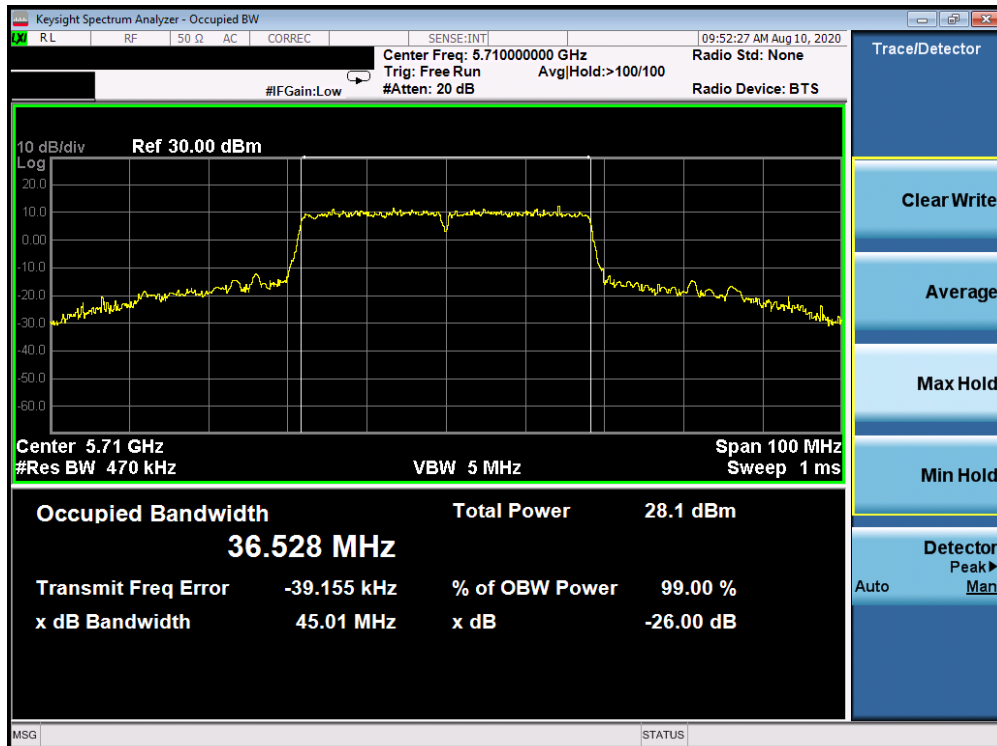


Plot 7-16. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2C) – Ch. 102)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 24 of 208

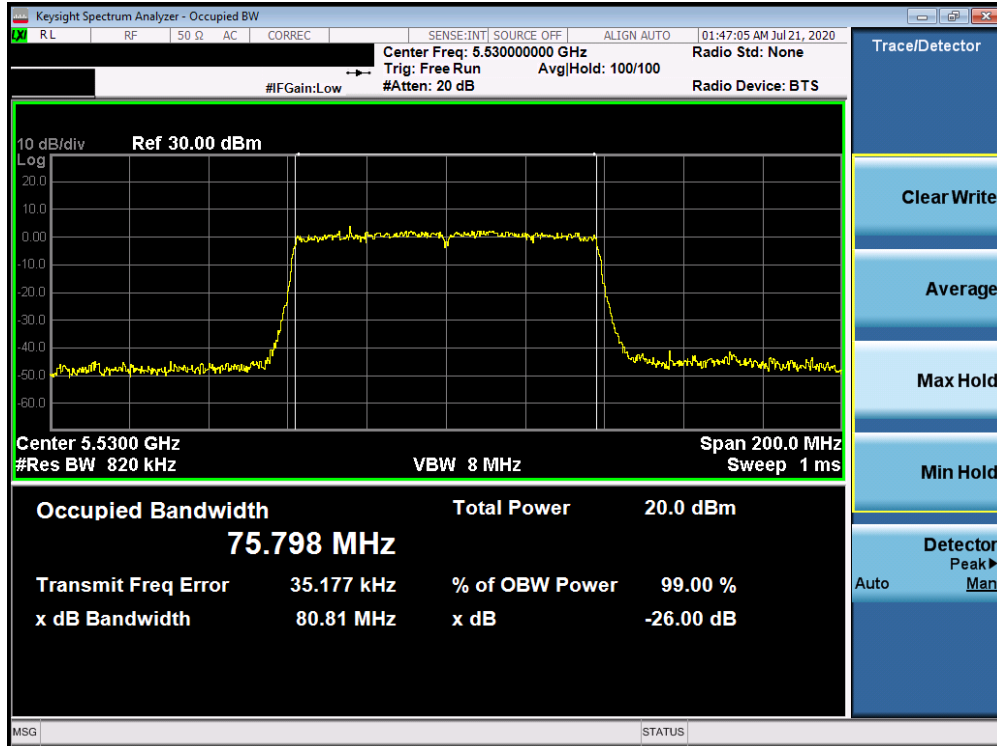


Plot 7-17. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2C) – Ch. 110)

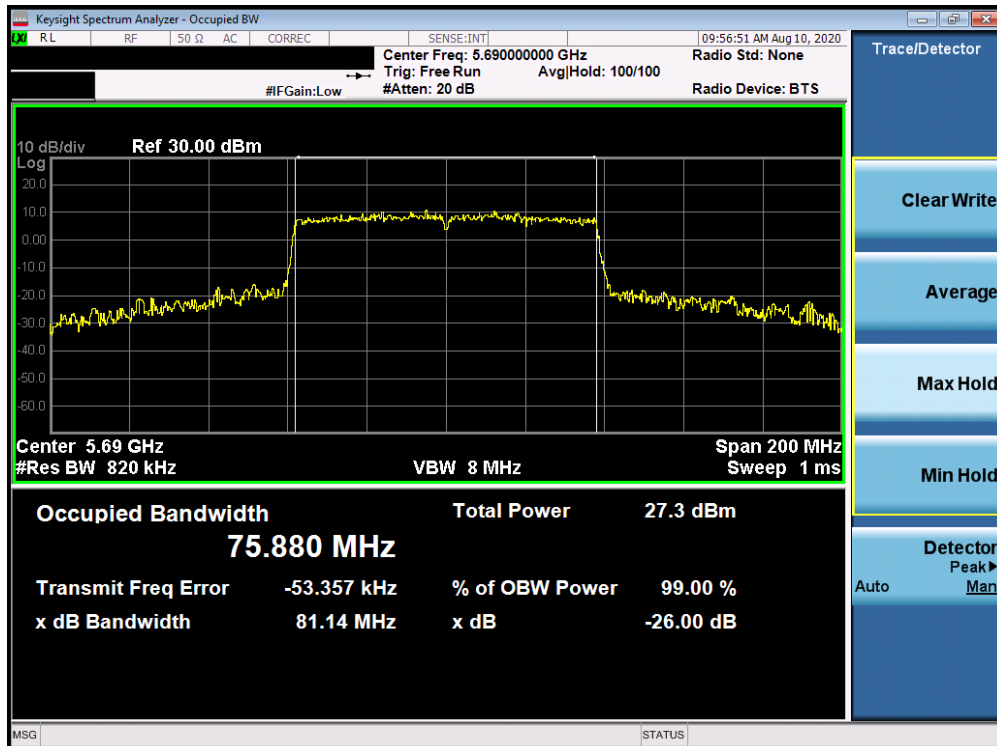


Plot 7-18. 26dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2C) – Ch. 142)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 25 of 208



Plot 7-19. 26dB Bandwidth Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 106)



Plot 7-20. 26dB Bandwidth Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 138)

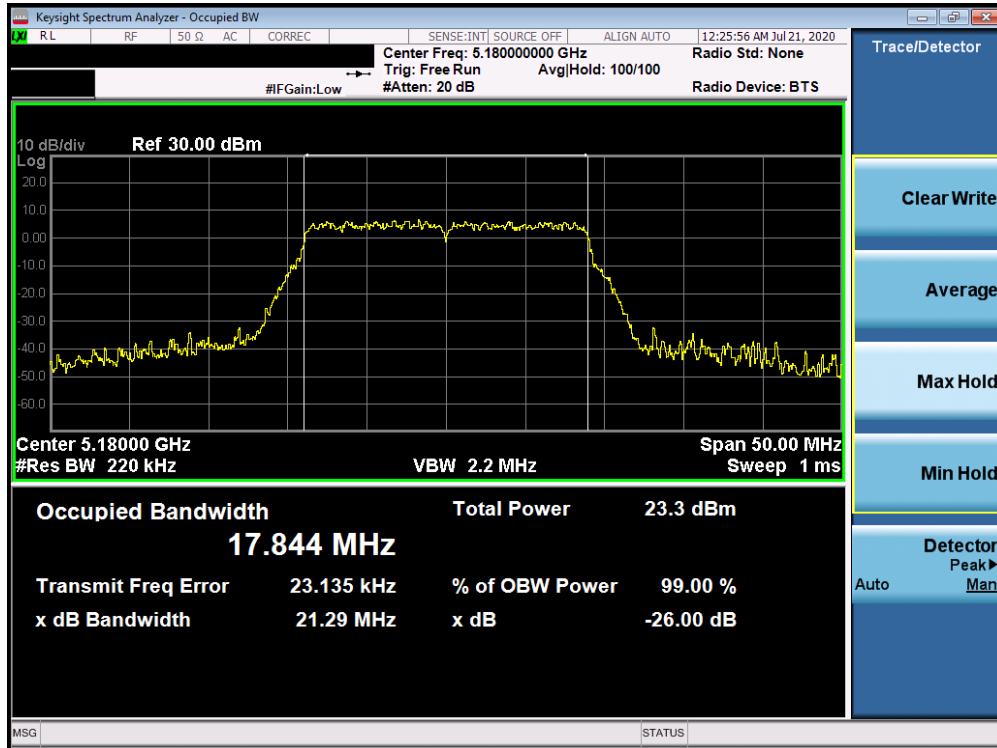
FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 26 of 208

Antenna WF7a 26dB Bandwidth Measurements

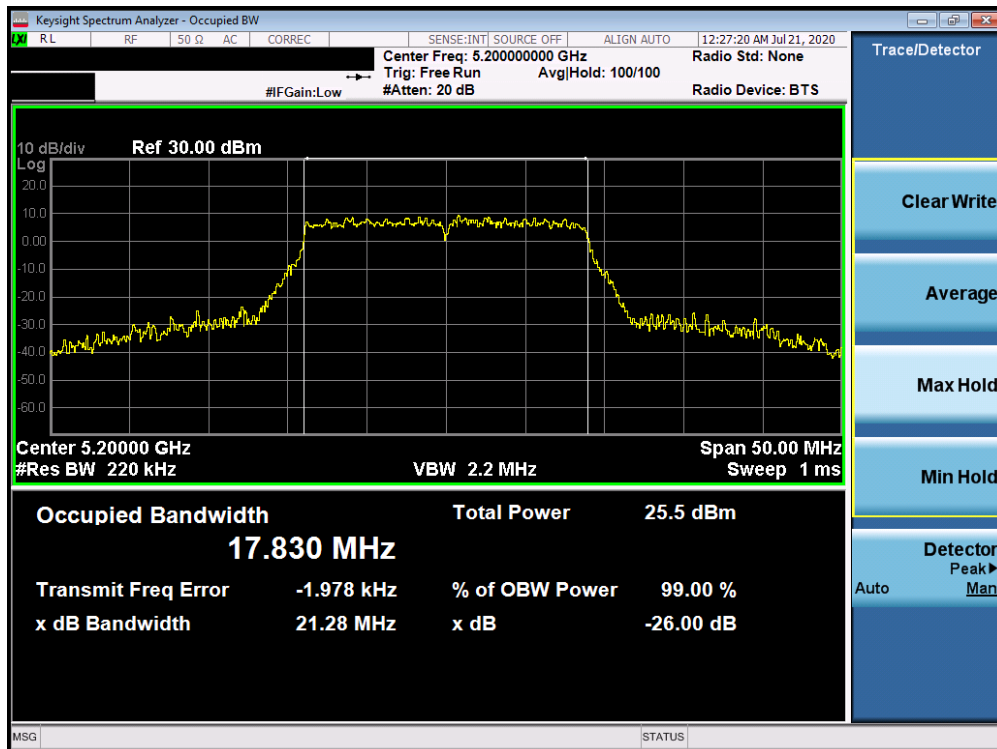
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	21.29
	5200	40	n (20MHz)	65/72.2 (MCS7)	21.28
	5240	48	n (20MHz)	65/72.2 (MCS7)	21.34
	5190	38	n (40MHz)	135/150 (MCS7)	39.37
	5230	46	n (40MHz)	135/150 (MCS7)	39.63
	5210	42	ac (80MHz)	390/433.3 (MCS9)	80.88
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	21.18
	5280	56	n (20MHz)	65/72.2 (MCS7)	21.11
	5320	64	n (20MHz)	65/72.2 (MCS7)	21.22
	5270	54	n (40MHz)	135/150 (MCS7)	39.36
	5310	62	n (40MHz)	135/150 (MCS7)	39.33
	5290	58	ac (80MHz)	390/433.3 (MCS9)	81.23
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	21.31
	5580	116	n (20MHz)	65/72.2 (MCS7)	21.34
	5720	144	n (20MHz)	65/72.2 (MCS7)	21.14
	5510	102	n (40MHz)	135/150 (MCS7)	39.47
	5550	110	n (40MHz)	135/150 (MCS7)	39.42
	5710	142	n (40MHz)	135/150 (MCS7)	44.25
	5530	106	ac (80MHz)	390/433.3 (MCS9)	81.14
	5690	138	ac (80MHz)	390/433.3 (MCS9)	81.43

Table 7-3. Conducted Bandwidth Measurements ANT WF7a

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 27 of 208

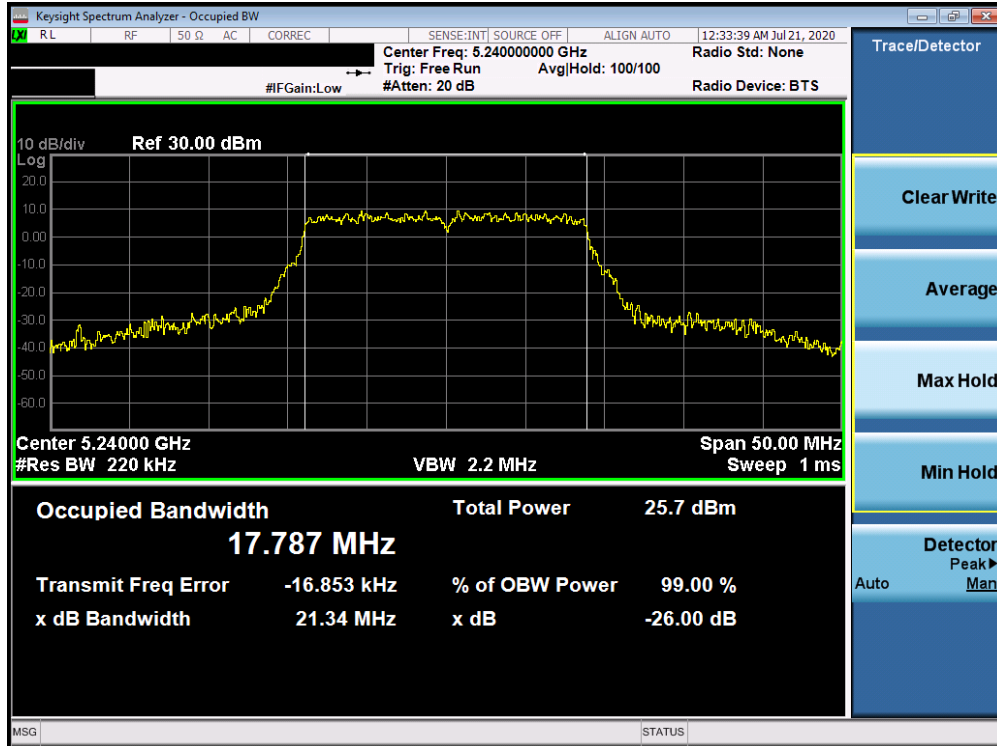


Plot 7-21. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

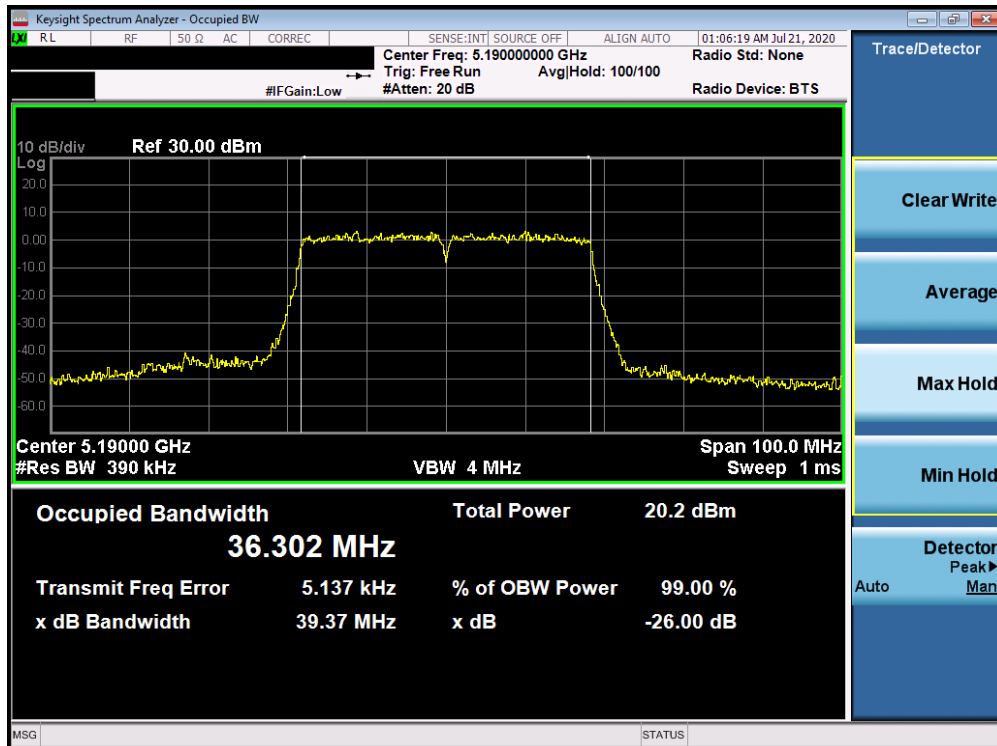


Plot 7-22. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 28 of 208

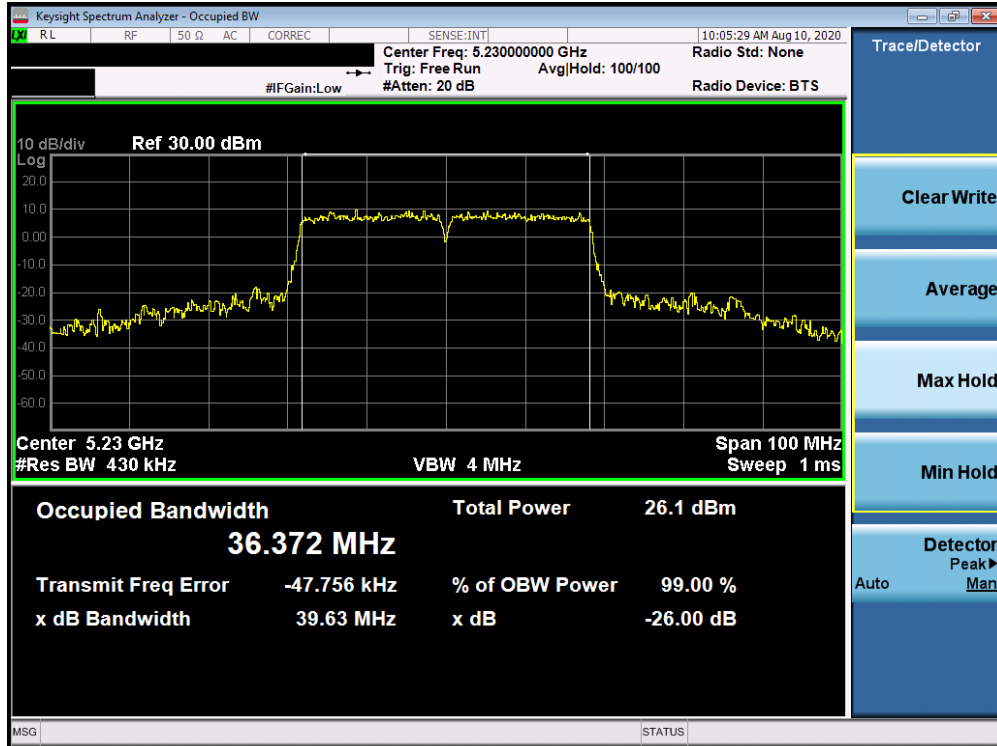


Plot 7-23. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

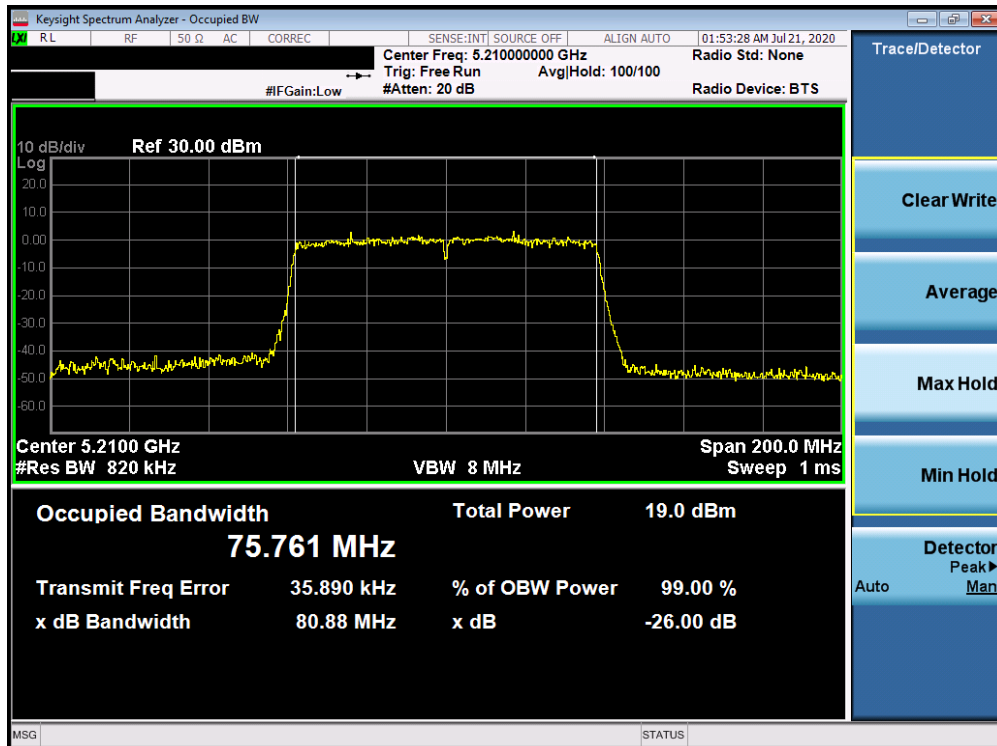


Plot 7-24. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 29 of 208

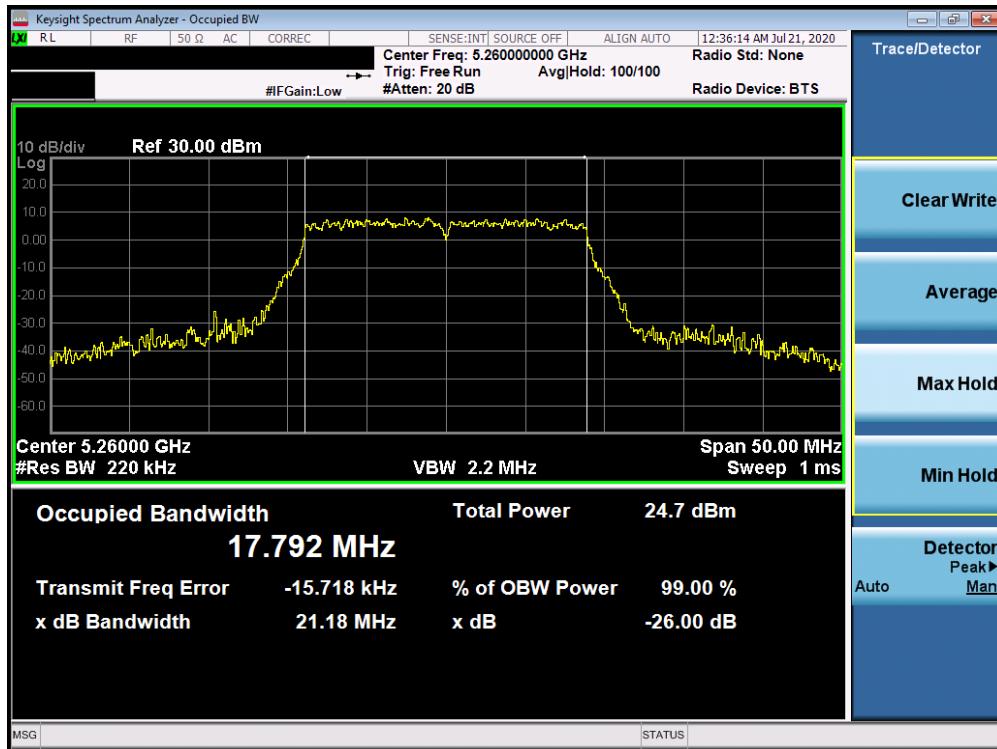


Plot 7-25. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 1) – Ch. 46)

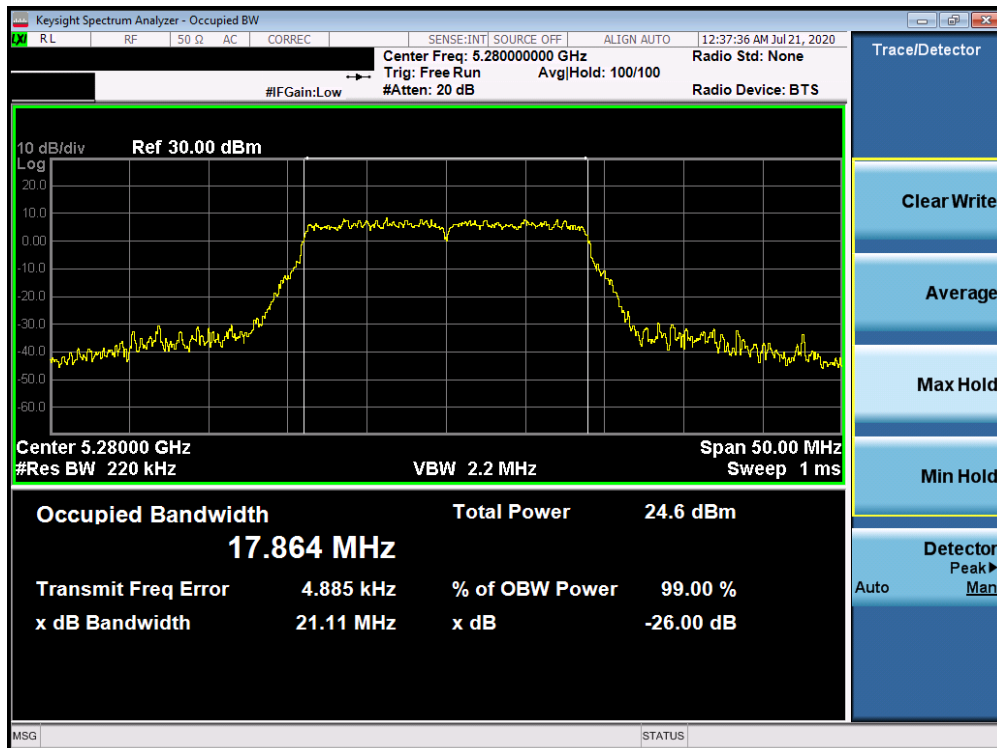


Plot 7-26. 26dB Bandwidth Plot ANT WF7a (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 30 of 208

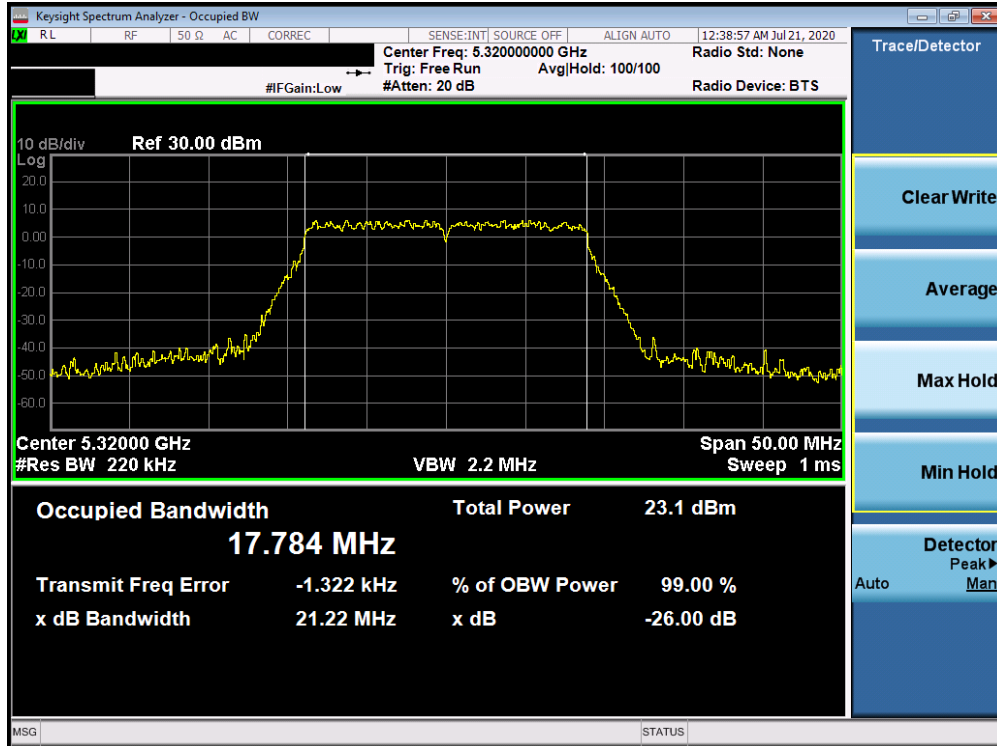


Plot 7-27. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

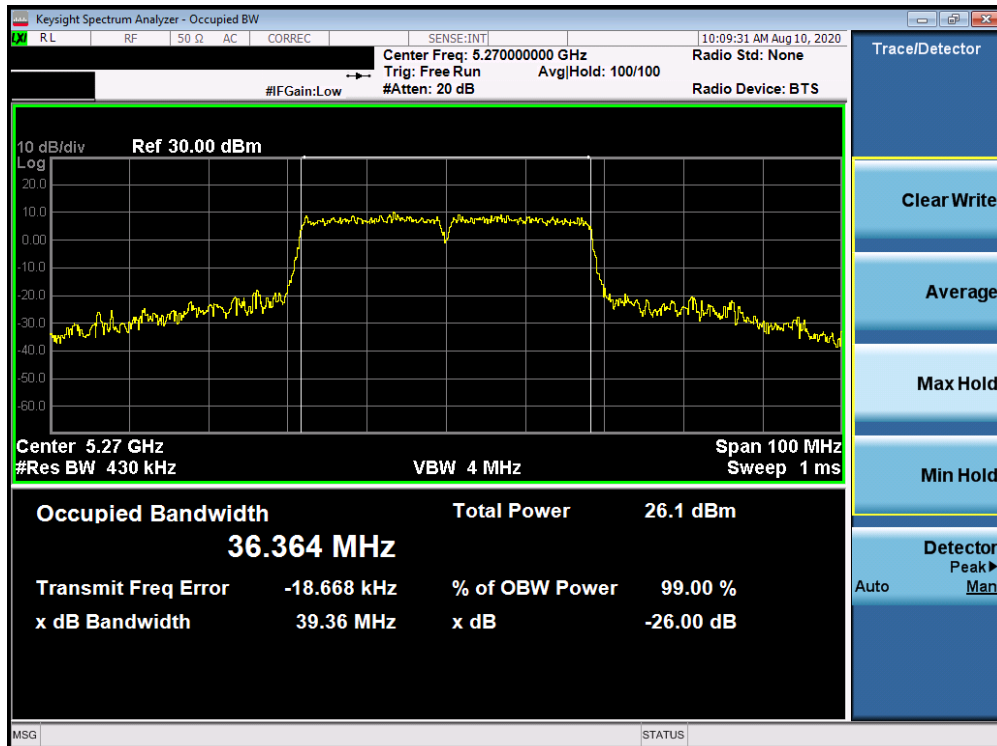


Plot 7-28. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 31 of 208

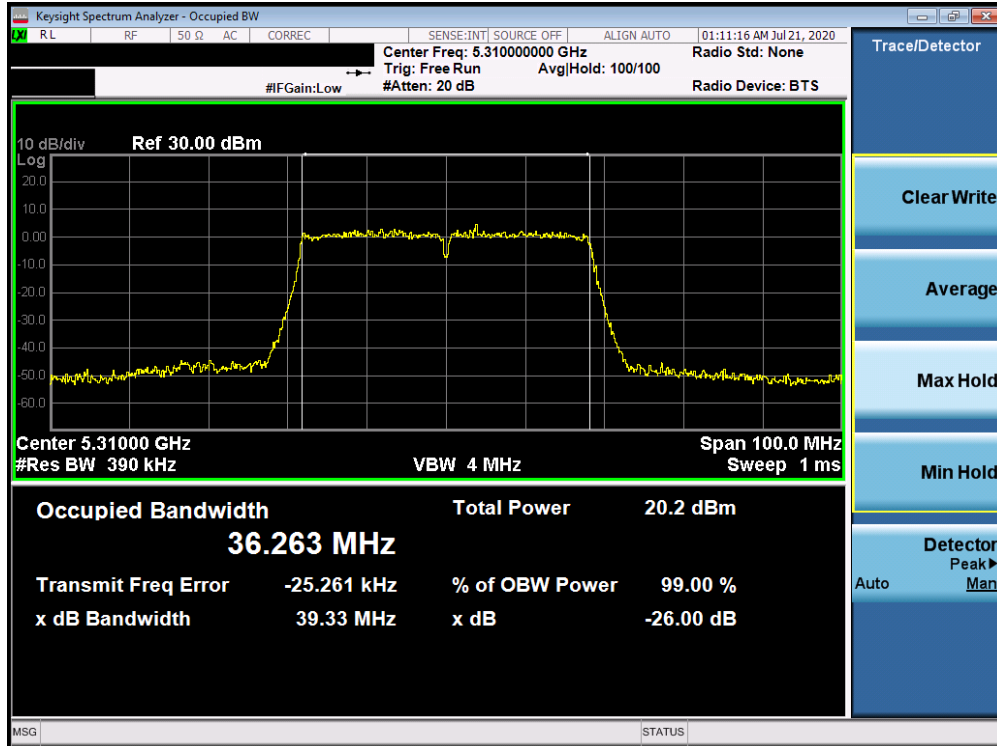


Plot 7-29. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)

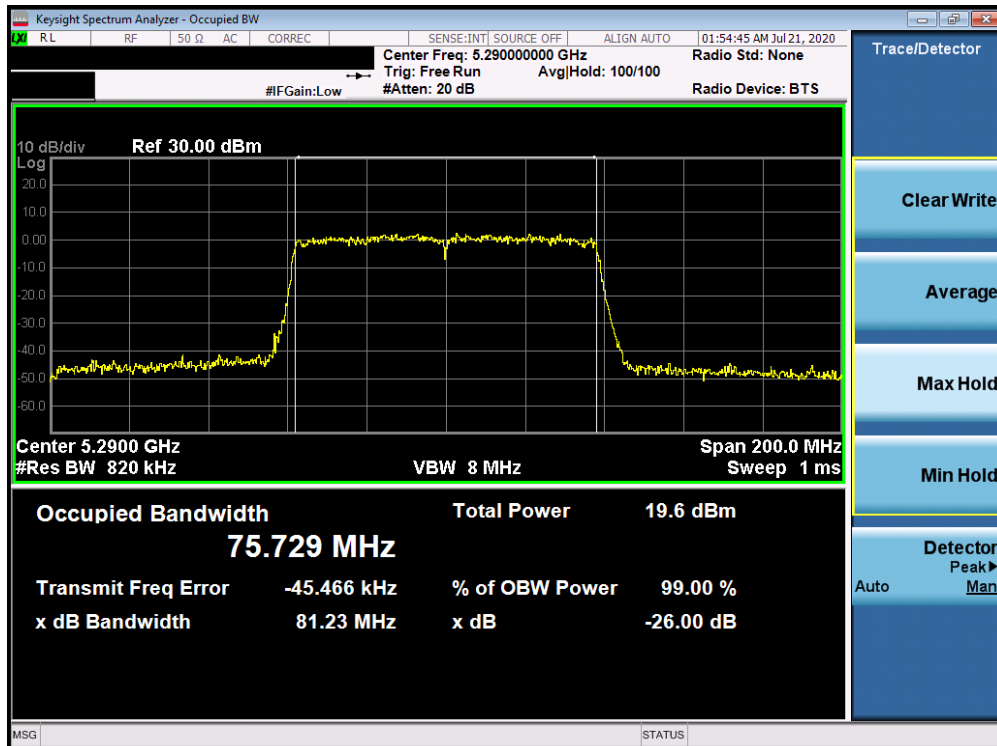


Plot 7-30. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 32 of 208

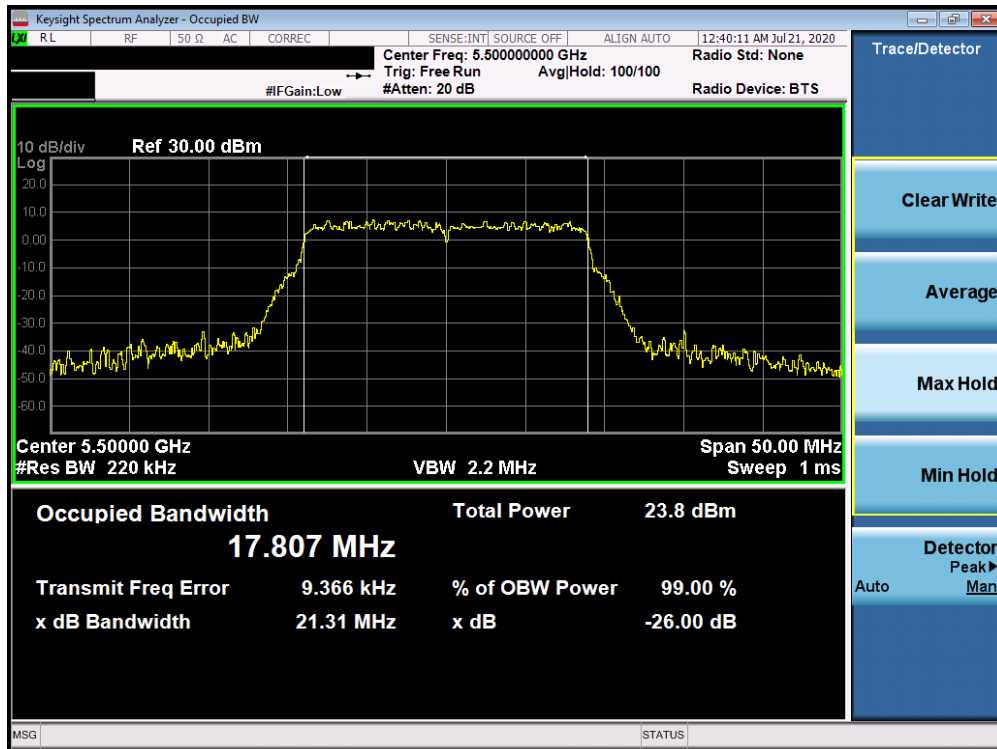


Plot 7-31. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2A) – Ch. 62)

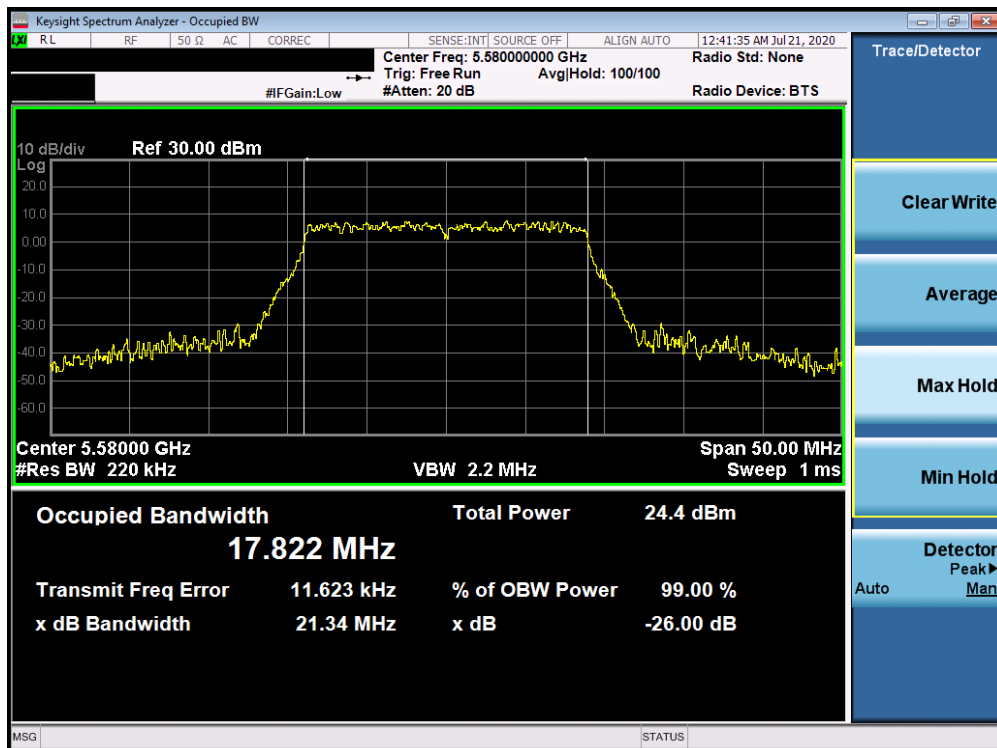


Plot 7-32. 26dB Bandwidth Plot ANT WF7a (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 33 of 208

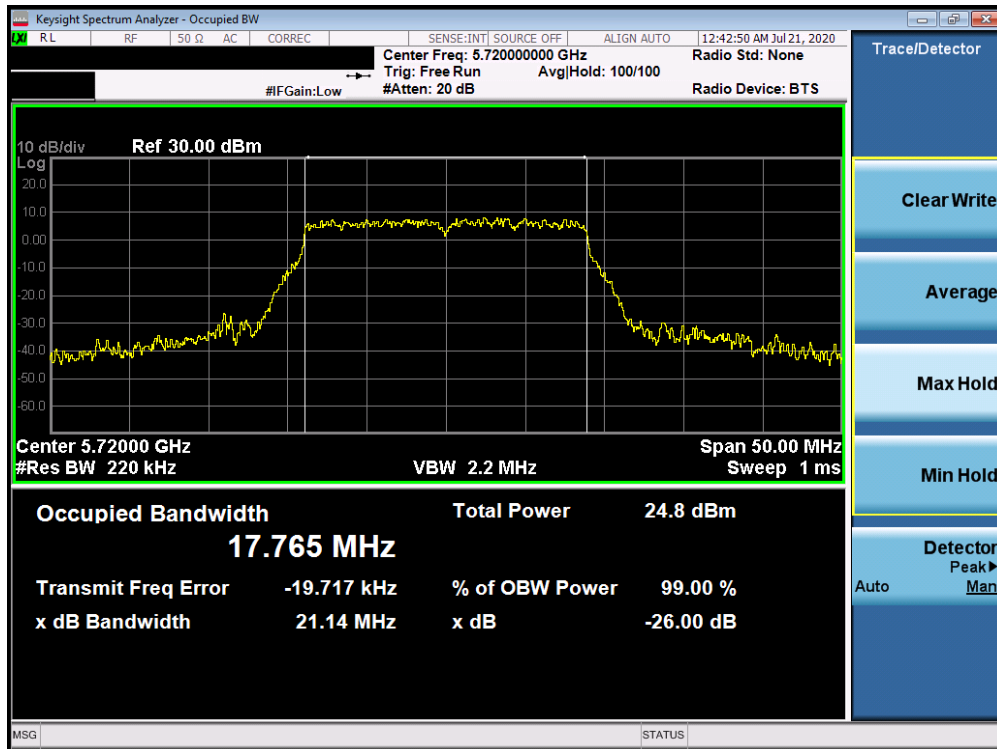


Plot 7-33. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

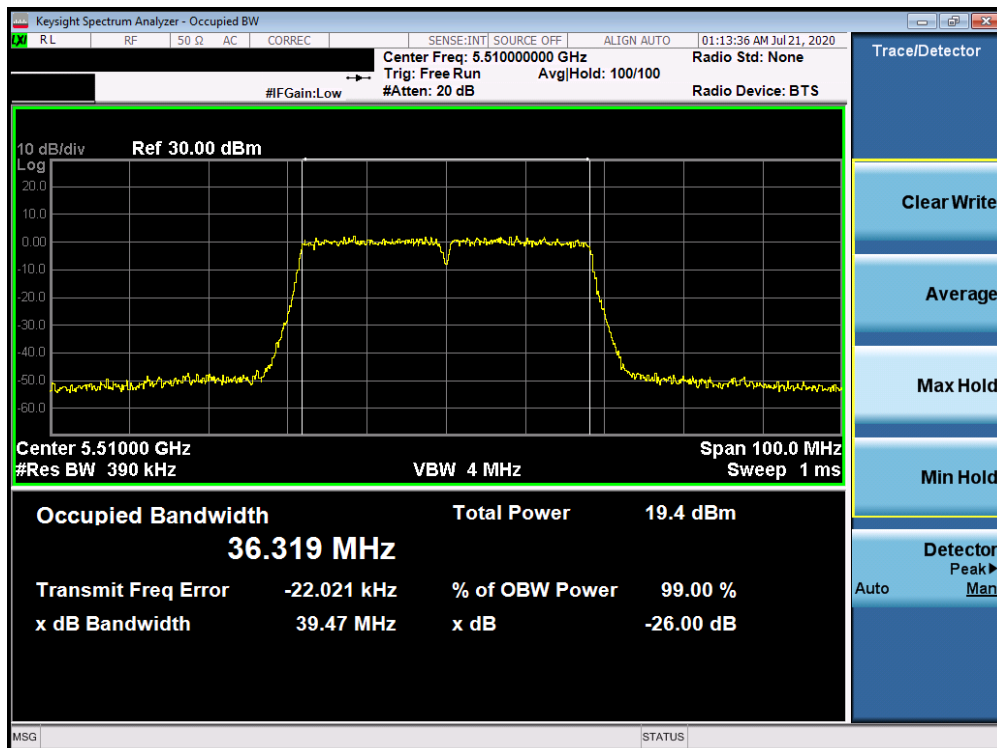


Plot 7-34. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2C) – Ch. 116)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 34 of 208

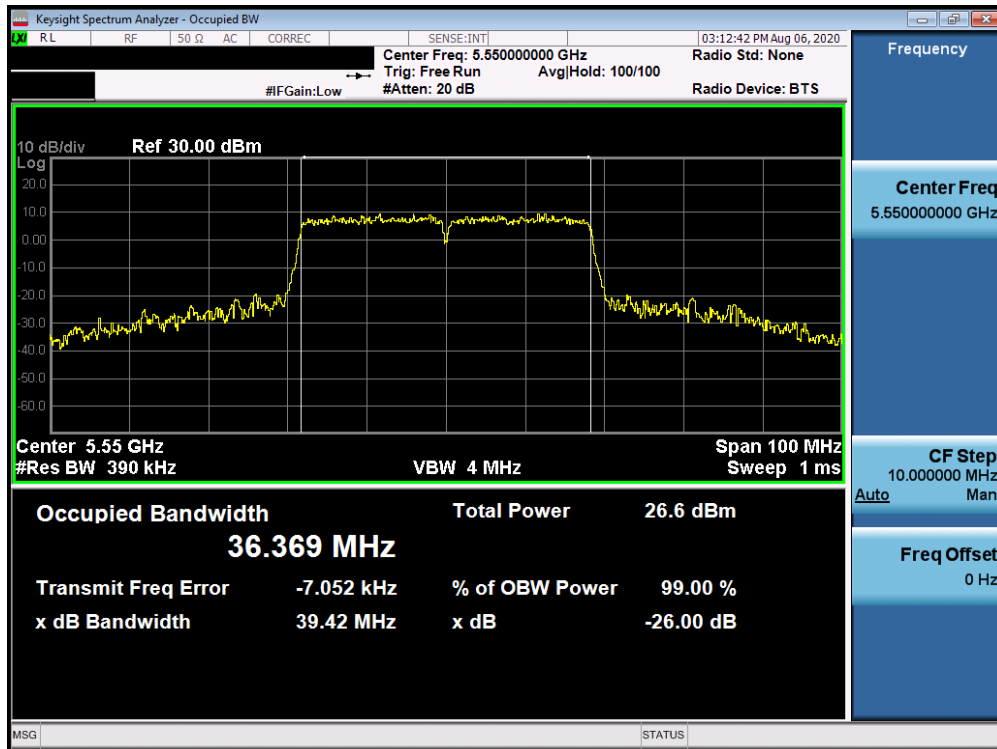


Plot 7-35. 26dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2C) – Ch. 44)

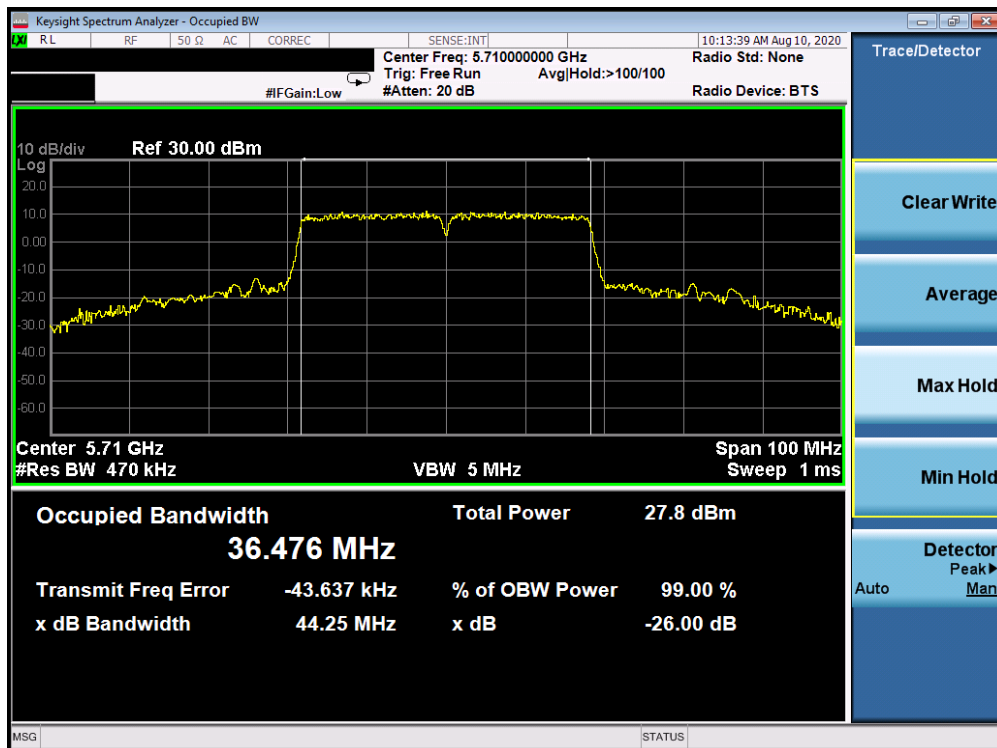


Plot 7-36. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2C) – Ch. 102)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 35 of 208

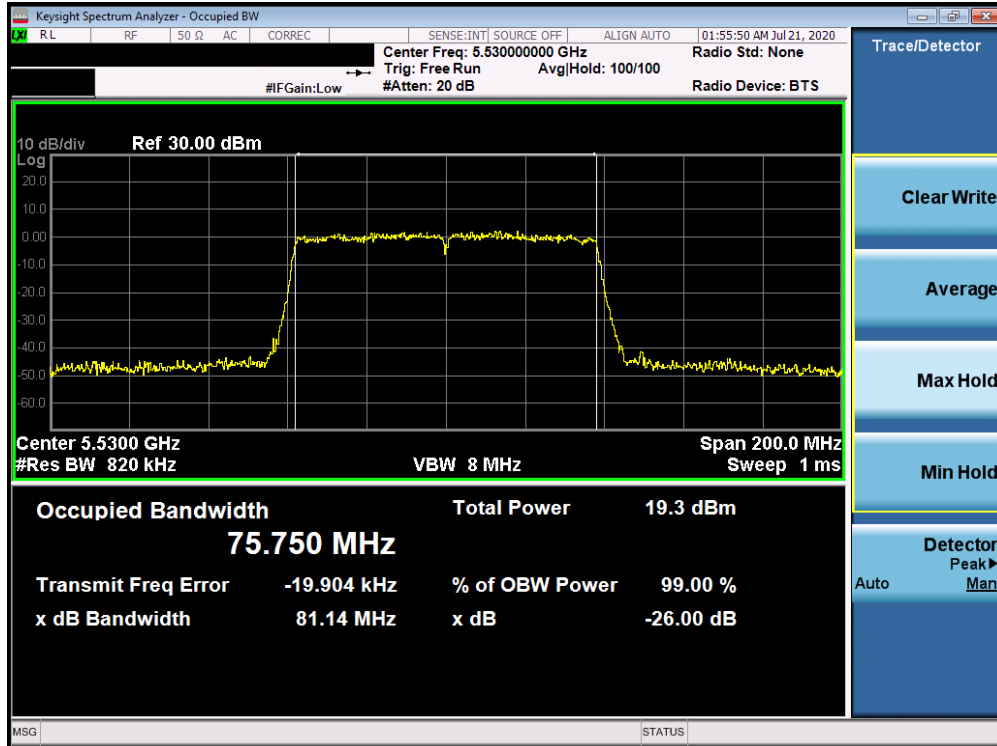


Plot 7-37. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2C) – Ch. 110)

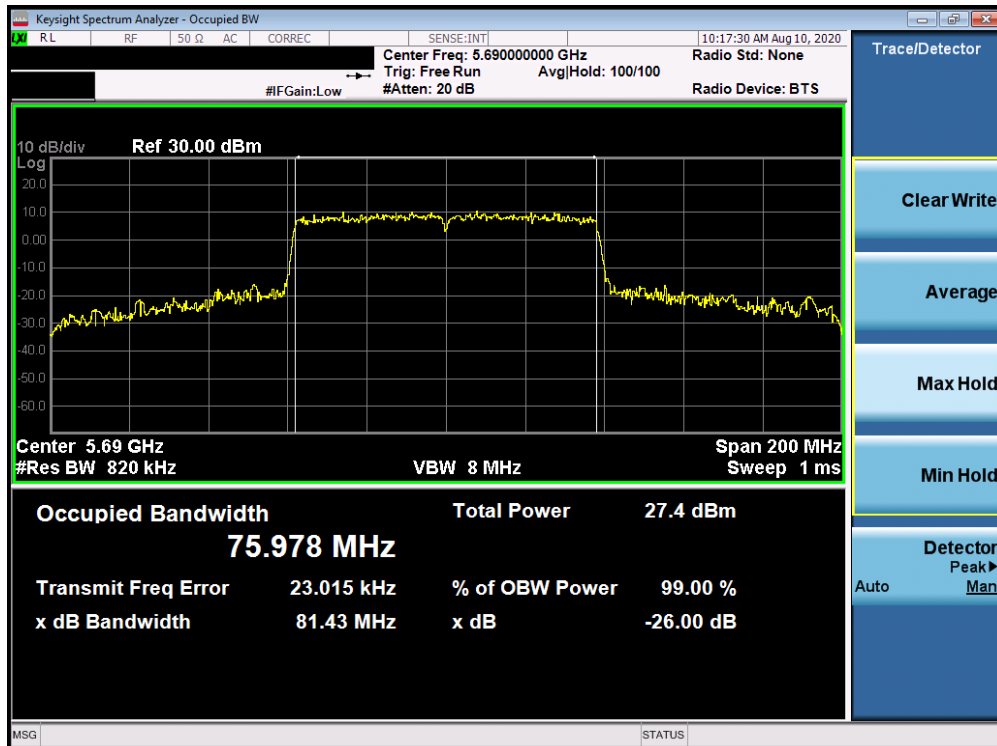


Plot 7-38. 26dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2C) – Ch. 142)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 36 of 208



Plot 7-39. 26dB Bandwidth Plot ANT WF7a (80MHz BW 802.11ac (UNII Band 2C) – Ch. 106)



Plot 7-40. 26dB Bandwidth Plot ANT WF7a (80MHz BW 802.11ac (UNII Band 2C) – Ch. 138)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 37 of 208

7.3 6dB Bandwidth Measurement – 802.11a/n/ac §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 ≥ 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

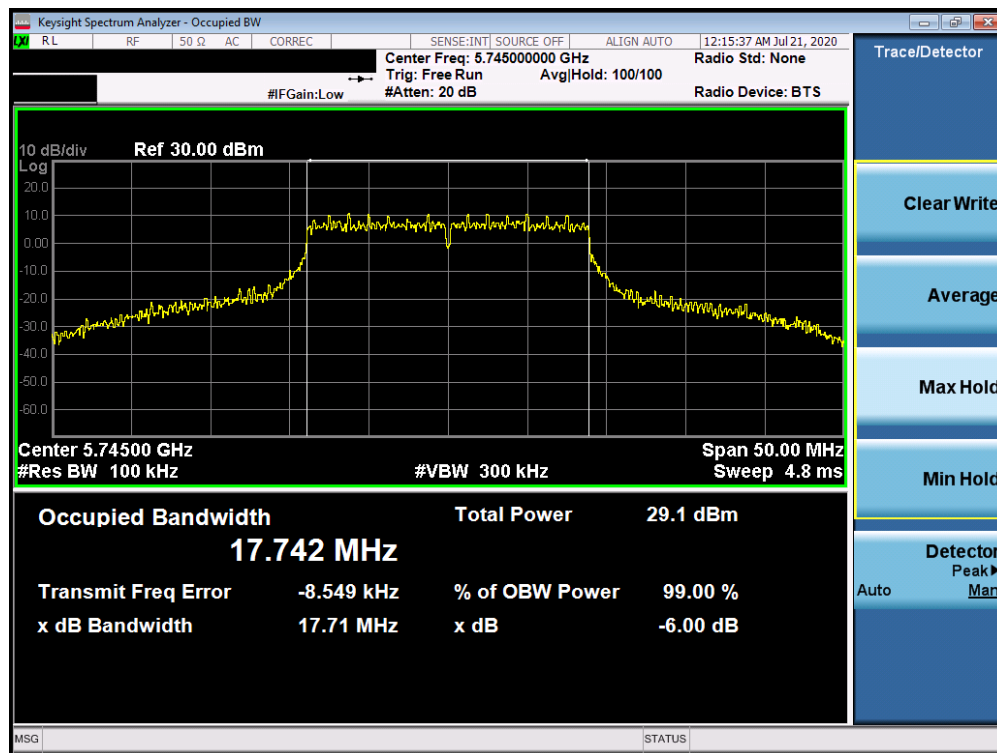
All antenna configurations and data rates were investigated and only the worst case are reported.

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 38 of 208

Antenna WF8 6 dB Bandwidth Measurements

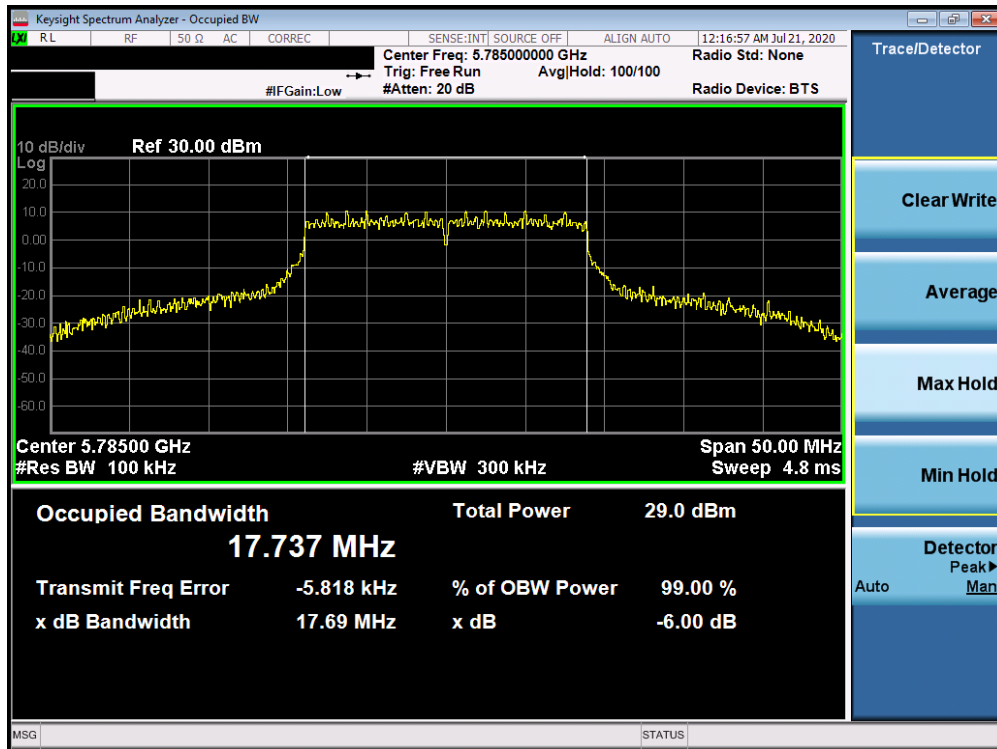
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	n (20MHz)	65/72.2 (MCS7)	17.71
	5785	157	n (20MHz)	65/72.2 (MCS7)	17.69
	5825	165	n (20MHz)	65/72.2 (MCS7)	17.71
	5755	151	n (40MHz)	135/150 (MCS7)	36.48
	5795	159	n (40MHz)	135/150 (MCS7)	36.44
	5775	155	ac (80MHz)	390/433.3 (MCS9)	76.36

Table 7-4. Conducted Bandwidth Measurements ANT WF8

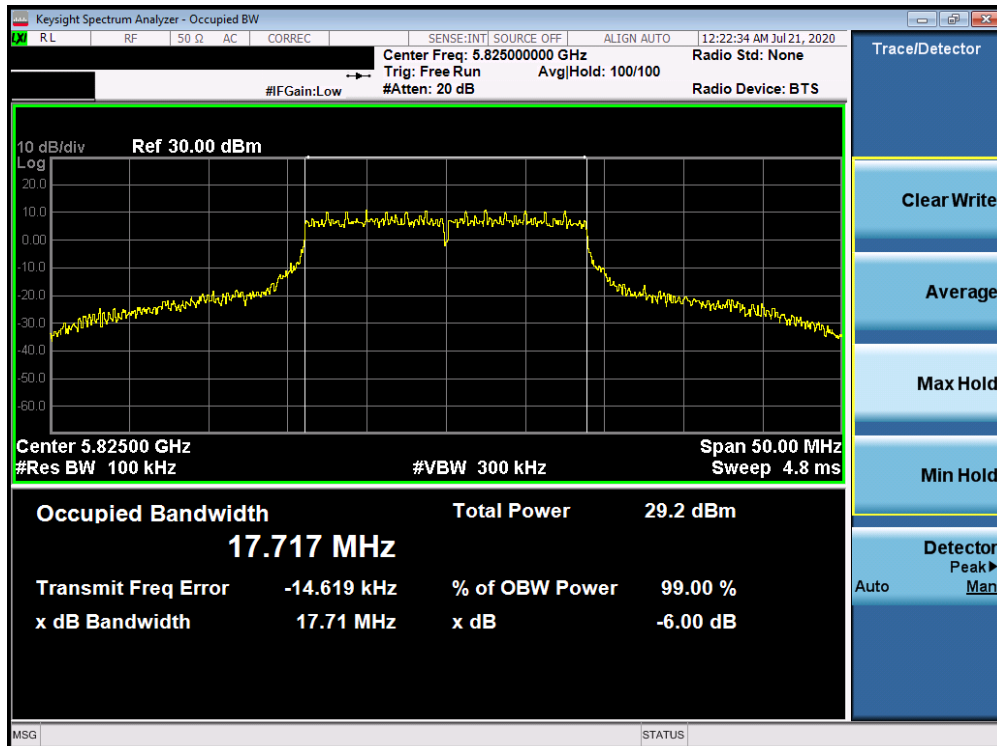


Plot 7-41. 6dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 3) – Ch. 149)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 39 of 208

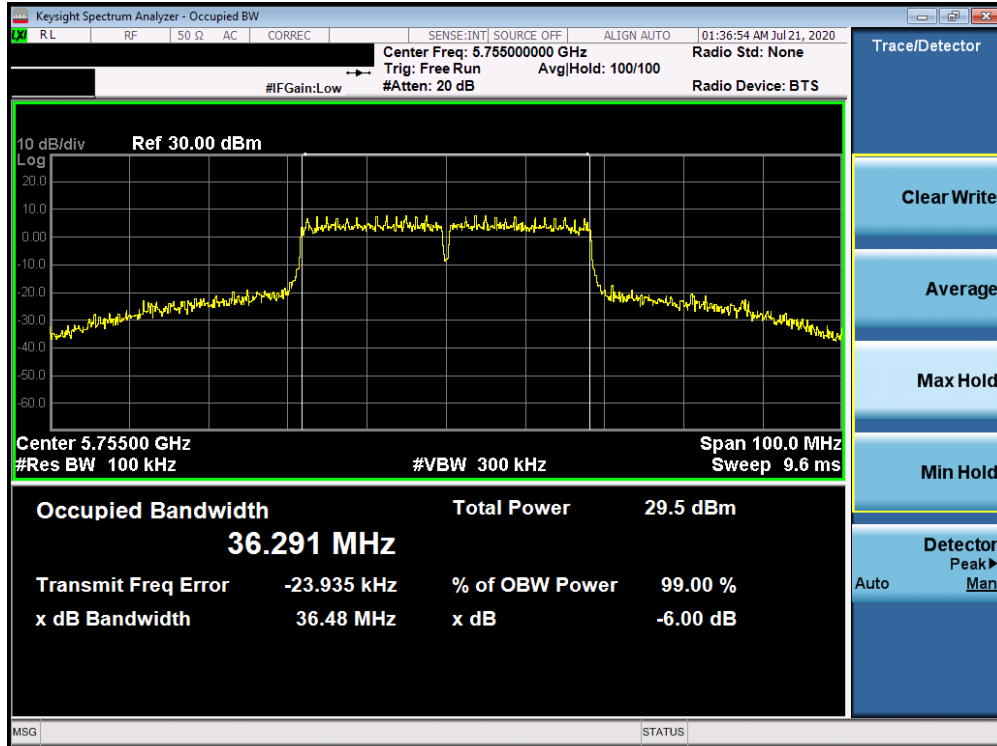


Plot 7-42. 6dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

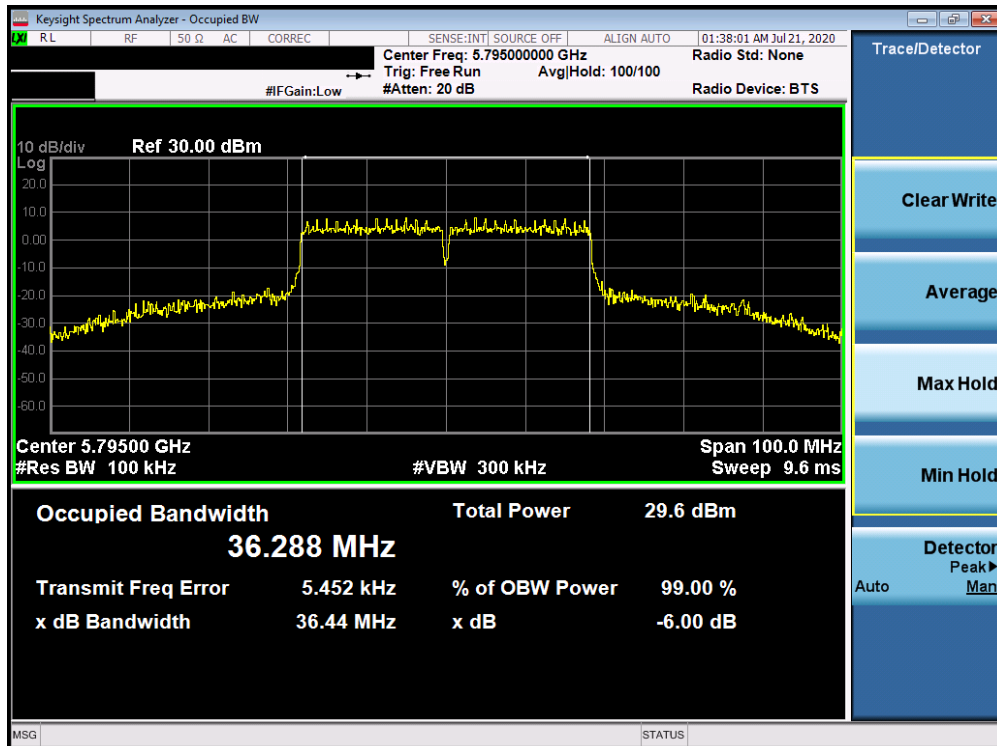


Plot 7-43. 6dB Bandwidth Plot ANT WF8 (20MHz BW 802.11n (UNII Band 3) – Ch. 165)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 40 of 208

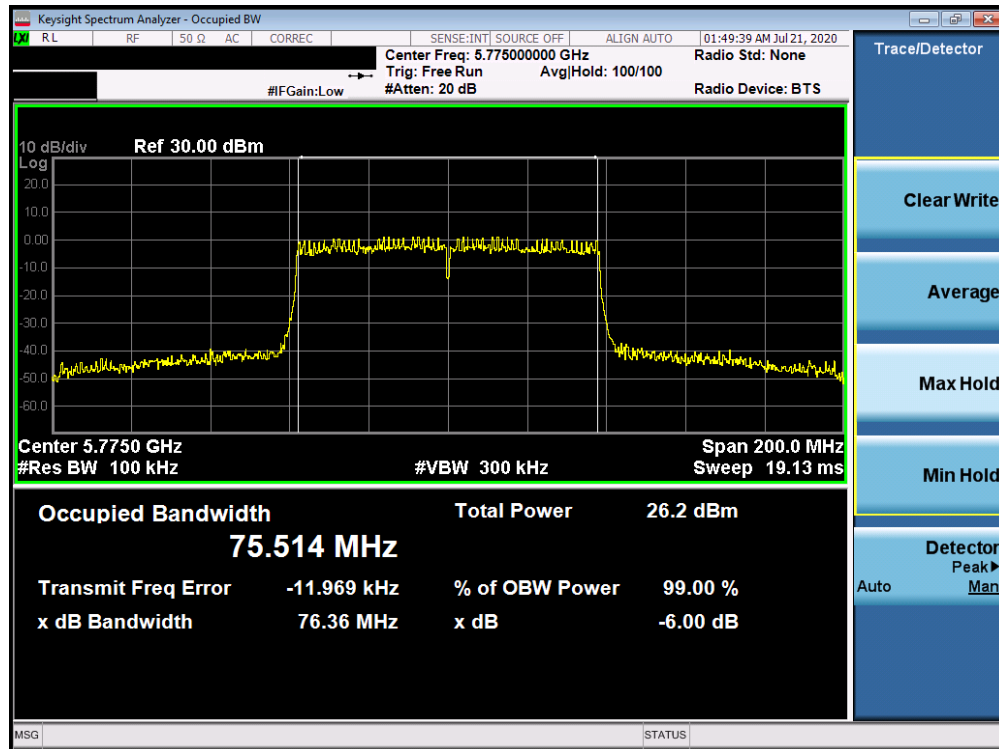


Plot 7-44. 6dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 3) – Ch. 151)



Plot 7-45. 6dB Bandwidth Plot ANT WF8 (40MHz BW 802.11n (UNII Band 3) – Ch. 159)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 41 of 208



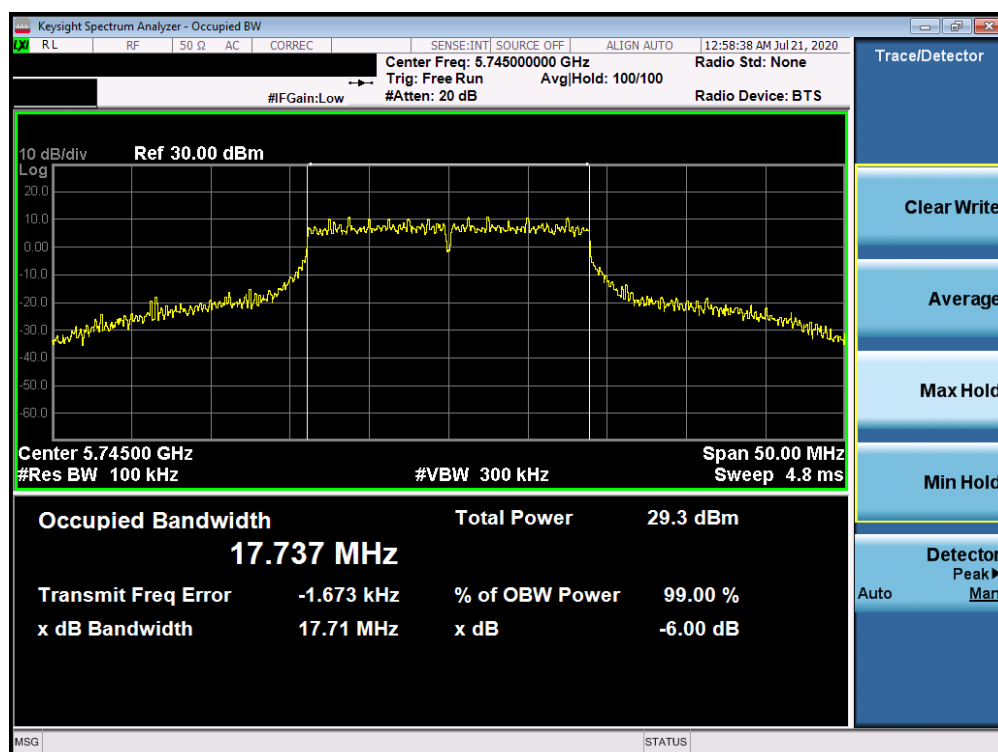
Plot 7-46. 6dB Bandwidth Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 42 of 208

Antenna WF7a 6dB Bandwidth Measurements

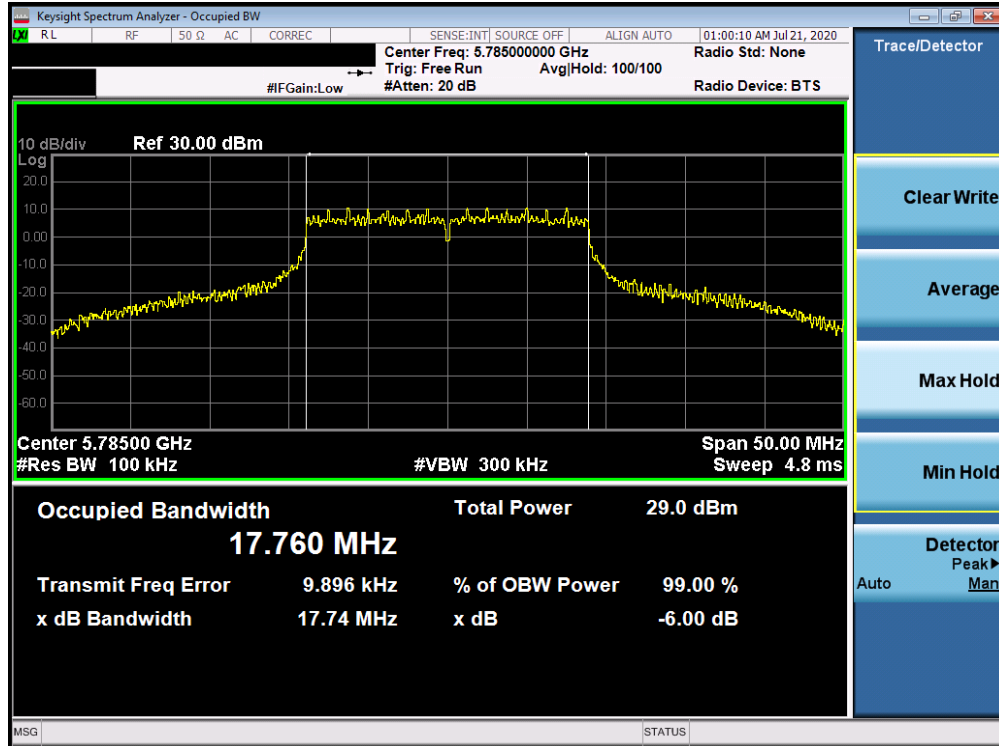
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	n (20MHz)	65/72.2 (MCS7)	17.71
	5785	157	n (20MHz)	65/72.2 (MCS7)	17.74
	5825	165	n (20MHz)	65/72.2 (MCS7)	17.70
	5755	151	n (40MHz)	135/150 (MCS7)	36.49
	5795	159	n (40MHz)	135/150 (MCS7)	36.43
	5775	155	ac (80MHz)	390/433.3 (MCS9)	76.11

Table 7-5. Conducted Bandwidth Measurements ANT WF7a

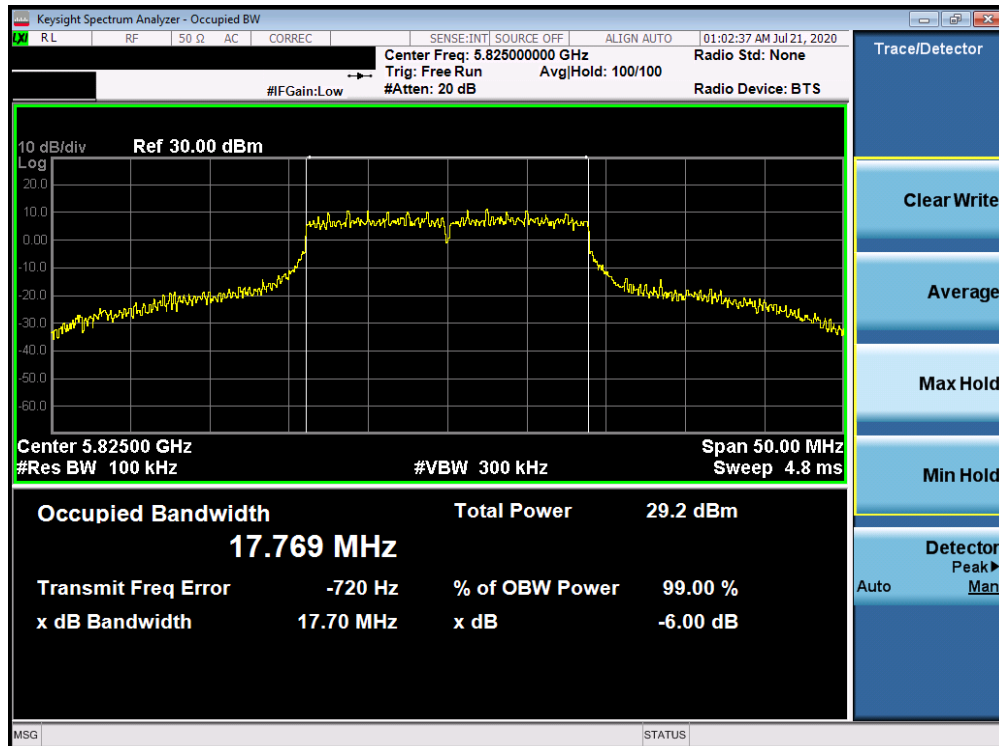


Plot 7-47. 6dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 3) – Ch. 149)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 43 of 208

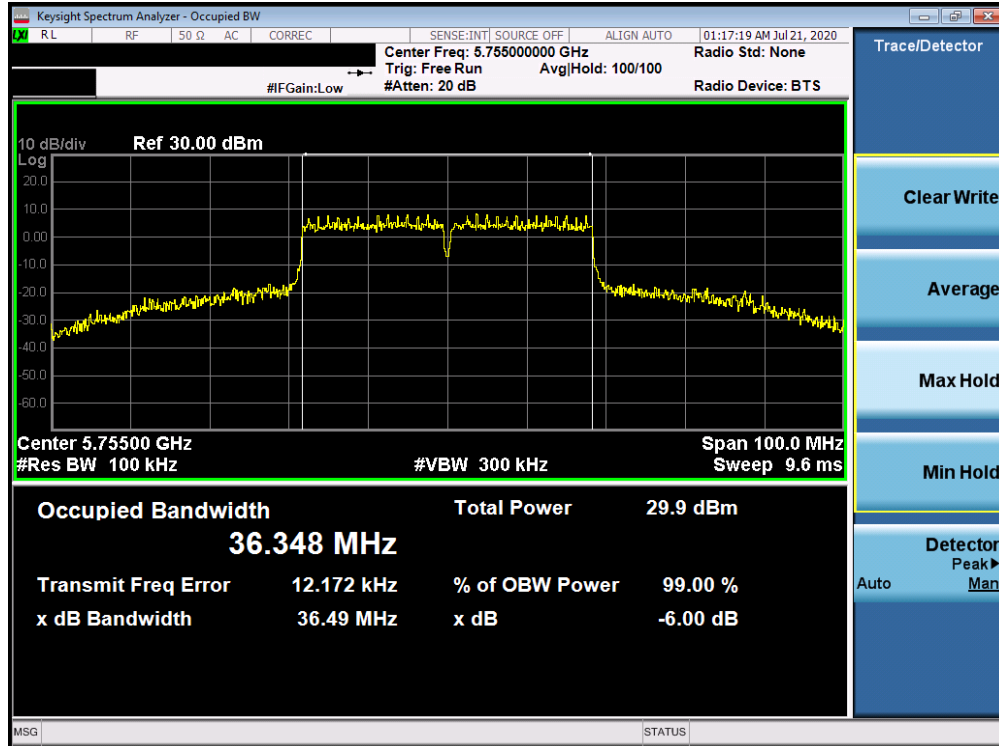


Plot 7-48. 6dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

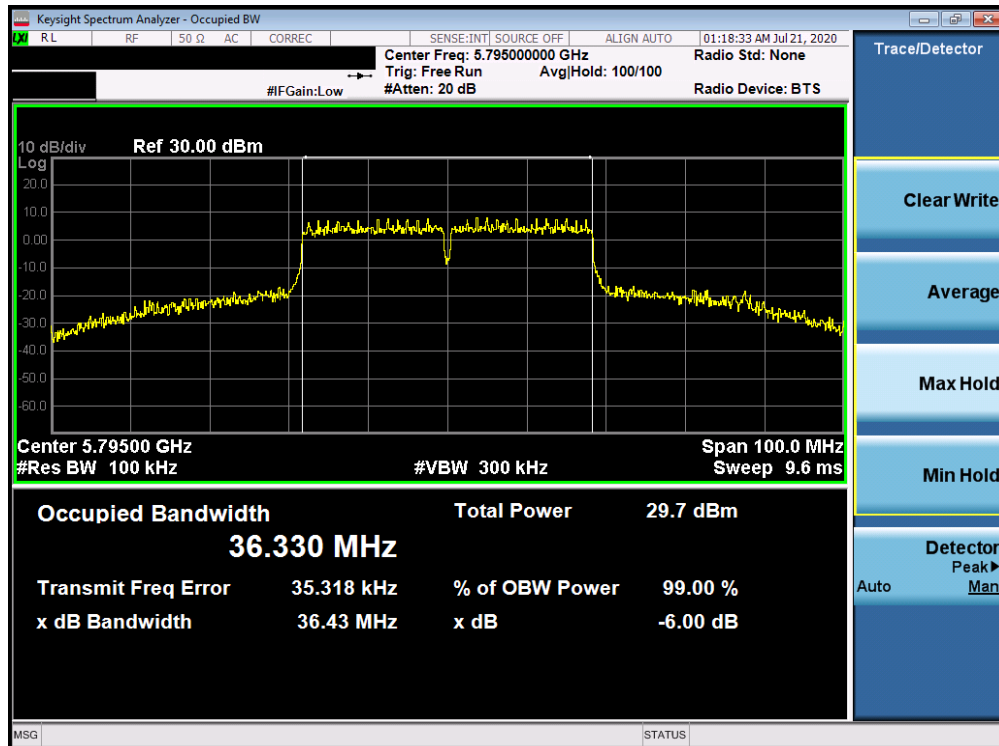


Plot 7-49. 6dB Bandwidth Plot ANT WF7a (20MHz BW 802.11n (UNII Band 3) – Ch. 165)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 44 of 208

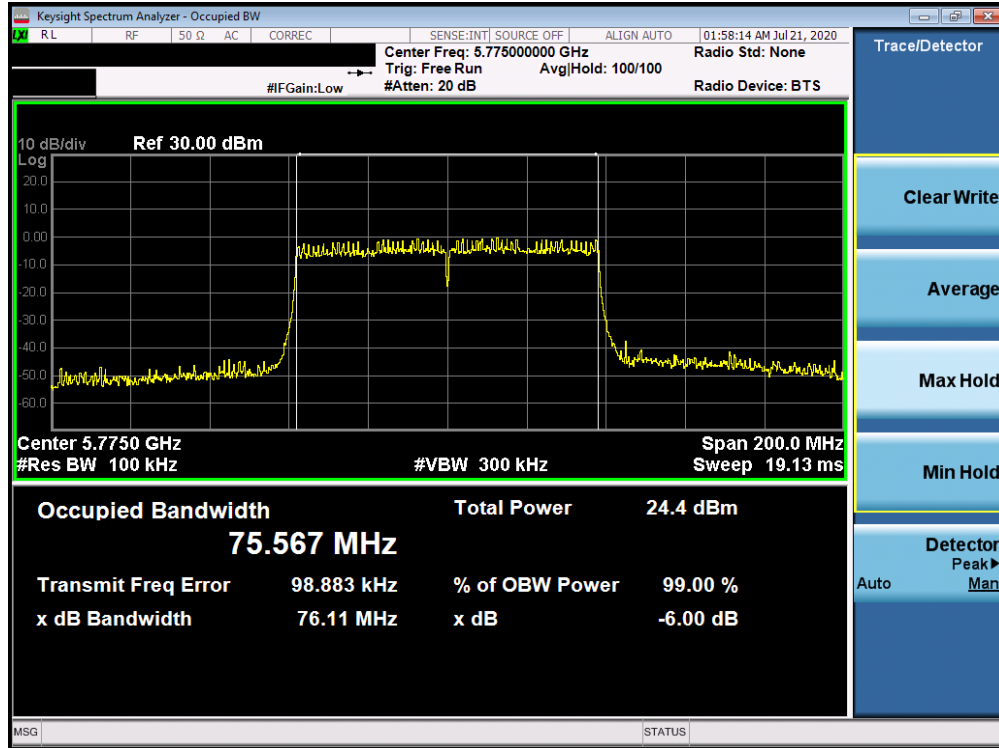


Plot 7-50. 6dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 3) – Ch. 151)



Plot 7-51. 6dB Bandwidth Plot ANT WF7a (40MHz BW 802.11n (UNII Band 3) – Ch. 159)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 45 of 208



Plot 7-52. 6dB Bandwidth Plot ANT WF7a (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 46 of 208

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 ISSED 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 $11 \text{ dBm} + 10\log_{10}(26\text{dB BW}) = 11 \text{ dBm} + 10\log_{10}(21.11) = 24.24\text{dBm}$. 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 $11 \text{ dBm} + 10\log_{10}(26\text{dB BW}) = 11 \text{ dBm} + 10\log_{10}(21.14) = 24.25\text{dBm}$. 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.
2. For 802.11n, the worst case data rate for HT20/40 was found to be MCS7 for SISO and MCS15 for CDD/SDM.
3. For 802.11ac, the worst case data rate for VHT80 was found to be MCS9.

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 47 of 208

FCC Antenna WF8 Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11a	802.11n		
	5180	36	AVG	16.45	16.49	23.98	-7.49
	5200	40	AVG	19.98	20.00	23.98	-3.98
	5240	48	AVG	20.00	19.93	23.98	-3.98
	5260	52	AVG	20.00	19.98	23.98	-3.98
	5280	56	AVG	19.97	19.97	23.98	-4.01
	5320	64	AVG	16.50	16.46	23.98	-7.48
	5500	100	AVG	16.00	16.00	23.98	-7.98
	5520	104	AVG	18.00	18.00	23.98	-5.98
	5540	108	AVG	20.00	20.00	23.98	-3.98
	5580	116	AVG	20.00	20.00	23.98	-3.98
	5660	132	AVG	19.89	19.84	23.98	-4.09
	5680	136	AVG	16.98	17.00	23.98	-6.98
	5700	140	AVG	14.00	14.00	23.98	-9.98
	5720	144	AVG	20.00	20.00	23.98	-3.98
	5745	149	AVG	20.98	20.93	30.00	-9.02
	5785	157	AVG	21.00	20.89	30.00	-9.00
	5825	165	AVG	21.00	20.93	30.00	-9.00

Table 7-6. FCC ANT WF8 20MHz BW (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [dBm]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11n		
	5190	38	AVG	13.92	23.98	-10.06
	5230	46	AVG	20.00	23.98	-3.98
	5270	54	AVG	19.90	23.98	-4.08
	5310	62	AVG	14.50	23.98	-9.48
	5510	102	AVG	14.50	23.98	-9.48
	5550	110	AVG	20.00	23.98	-3.98
	5670	134	AVG	15.73	23.98	-8.25
	5710	142	AVG	20.96	23.98	-3.02
	5755	151	AVG	21.00	30.00	-9.00
	5795	159	AVG	21.00	30.00	-9.00

Table 7-7. FCC ANT WF8 40MHz BW (UNII) Maximum Conducted Output Power

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [dBm]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11ac		
	5210	42	AVG	11.43	23.98	-12.55
	5290	58	AVG	13.00	23.98	-10.98
	5530	106	AVG	13.00	23.98	-10.98
	5690	138	AVG	20.96	23.98	-3.02
	5775	155	AVG	17.91	30.00	-12.09

Table 7-8. FCC ANT WF8 80MHz BW (UNII) Maximum Conducted Output Power

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 48 of 208

ISED Antenna WF8 Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [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	15.24	15.25	-	-	2.50	17.75	23.01	-5.26
	5200	40	AVG	15.14	15.19	-	-	2.50	17.69	23.01	-5.32
	5240	48	AVG	15.09	15.10	-	-	2.50	17.60	23.01	-5.41
	5260	52	AVG	19.22	19.25	23.98	-4.73	2.60	21.85	30.00	-8.15
	5280	56	AVG	19.18	19.25	23.98	-4.73	2.60	21.85	30.00	-8.15
	5320	64	AVG	16.50	16.46	23.98	-7.48	2.60	19.10	30.00	-10.90
	5500	100	AVG	16.00	16.00	23.98	-7.98	2.50	18.50	30.00	-11.50
	5520	104	AVG	16.90	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5540	108	AVG	16.88	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5580	116	AVG	16.93	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5660	132	AVG	17.00	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5680	136	AVG	16.98	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5700	140	AVG	14.00	14.00	23.98	-9.98	2.50	16.50	30.00	-13.50
	5720	144	AVG	17.00	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5745	149	AVG	17.00	16.96	30.00	-13.00	-0.20	16.80	-	-
	5785	157	AVG	17.00	16.95	30.00	-13.00	-0.20	16.80	-	-
	5825	165	AVG	17.00	16.95	30.00	-13.00	-0.20	16.80	-	-

Table 7-9. ISED ANT WF8 20MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [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	13.92	-	-	2.50	16.42	23.01	-6.59
	5230	46	AVG	17.75	-	-	2.50	20.25	23.01	-2.76
	5270	54	AVG	19.25	23.98	-4.73	2.60	21.85	30.00	-8.15
	5310	62	AVG	14.50	23.98	-9.48	2.60	17.10	30.00	-12.90
	5510	102	AVG	14.50	23.98	-9.48	2.50	17.00	30.00	-13.00
	5550	110	AVG	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5670	134	AVG	15.73	23.98	-8.25	2.50	18.23	30.00	-11.77
	5710	142	AVG	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5755	151	AVG	16.97	30.00	-13.03	-0.20	16.77	-	-
	5795	159	AVG	17.00	30.00	-13.00	-0.20	16.80	-	-

Table 7-10. ISED ANT WF8 40MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [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	11.43	-	-	2.50	13.93	23.01	-9.08
	5290	58	AVG	13.00	23.98	-10.98	2.60	15.60	30.00	-14.40
	5530	106	AVG	13.00	23.98	-10.98	2.50	15.50	30.00	-14.50
	5690	138	AVG	17.00	23.98	-6.98	2.50	19.50	30.00	-10.50
	5775	155	AVG	16.90	30.00	-13.10	-0.20	16.70	-	-

Table 7-11. ISED ANT WF8 80MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

FCC ID: BCGA2316		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device		Page 49 of 208

FCC Antenna WF7a Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [dBm]		Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11a	802.11n		
	5180	36	AVG	16.42	16.50	23.98	-7.48
	5200	40	AVG	19.88	20.00	23.98	-3.98
	5240	48	AVG	20.00	20.00	23.98	-3.98
	5260	52	AVG	19.88	20.00	23.98	-3.98
	5280	56	AVG	20.00	19.96	23.98	-3.98
	5320	64	AVG	16.47	16.50	23.98	-7.48
	5500	100	AVG	15.95	15.97	23.98	-8.01
	5520	104	AVG	18.00	18.00	23.98	-5.98
	5540	108	AVG	19.90	20.00	23.98	-3.98
	5660	132	AVG	20.00	20.00	23.98	-3.98
	5680	136	AVG	18.00	18.00	23.98	-5.98
	5700	140	AVG	13.90	14.00	23.98	-9.98
	5720	144	AVG	20.00	20.00	23.98	-3.98
	5745	149	AVG	21.00	21.00	30.00	-9.00
	5785	157	AVG	21.00	21.00	30.00	-9.00
	5825	165	AVG	21.00	21.00	30.00	-9.00

Table 7-12. FCC ANT WF7a 20MHz BW (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [dBm]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11n		
	5190	38	AVG	13.92	23.98	-10.06
	5230	46	AVG	20.00	23.98	-3.98
	5270	54	AVG	19.96	23.98	-4.02
	5310	62	AVG	14.42	23.98	-9.56
	5510	102	AVG	14.40	23.98	-9.58
	5550	110	AVG	19.96	23.98	-4.02
	5670	134	AVG	15.75	23.98	-8.23
	5710	142	AVG	20.94	23.98	-3.04
	5755	151	AVG	21.00	30.00	-9.00
	5795	159	AVG	20.88	30.00	-9.12

Table 7-13. FCC ANT WF7a 40MHz BW (UNII) Maximum Conducted Output Power

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [dBm]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
				802.11ac		
	5210	42	AVG	11.4	23.98	-12.58
	5290	58	AVG	12.87	23.98	-11.11
	5530	106	AVG	12.92	23.98	-11.06
	5690	138	AVG	20.88	23.98	-3.10
	5775	155	AVG	17.97	30.00	-12.03

Table 7-14. FCC ANT WF7a 80MHz BW (UNII) Maximum Conducted Output Power

FCC ID: BCGA2316	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 50 of 208

ISED Antenna WF7a Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [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	15.17	15.24	-	-	2.70	17.94	23.01	-5.07
	5200	40	AVG	15.19	15.25	-	-	2.70	17.95	23.01	-5.06
	5240	48	AVG	15.14	15.21	-	-	2.70	17.91	23.01	-5.10
	5260	52	AVG	17.25	17.25	23.98	-6.73	1.70	18.95	30.00	-11.05
	5280	56	AVG	17.25	17.20	23.98	-6.73	1.70	18.95	30.00	-11.05
	5320	64	AVG	16.47	16.50	23.98	-7.48	1.70	18.20	30.00	-11.80
	5500	100	AVG	14.05	14.00	23.98	-9.93	-0.30	13.75	30.00	-16.25
	5520	104	AVG	14.24	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5540	108	AVG	14.25	14.14	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5580	116	AVG	14.25	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5660	132	AVG	14.25	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5680	136	AVG	14.25	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5700	140	AVG	13.90	14.00	23.98	-9.98	-0.30	13.70	30.00	-16.30
	5720	144	AVG	14.15	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5745	149	AVG	15.75	15.64	30.00	-14.25	1.90	17.65	-	-
	5785	157	AVG	15.75	15.71	30.00	-14.25	1.90	17.65	-	-
	5825	165	AVG	15.75	15.75	30.00	-14.25	1.90	17.65	-	-

Table 7-15. ISED ANT WF7a 20MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [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	13.92	-	-	2.70	16.62	23.01	-6.39
	5230	46	AVG	16.50	-	-	2.70	19.20	23.01	-3.81
	5270	54	AVG	17.25	23.98	-6.73	1.70	18.95	30.00	-11.05
	5310	62	AVG	14.42	23.98	-9.56	1.70	16.12	30.00	-13.88
	5510	102	AVG	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5550	110	AVG	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5670	134	AVG	14.25	23.98	-9.73	-0.30	13.95	30.00	-16.05
	5710	142	AVG	14.15	23.98	-9.83	-0.30	13.85	30.00	-16.15
	5755	151	AVG	15.70	30.00	-14.30	1.90	17.60	-	-
	5795	159	AVG	15.75	30.00	-14.25	1.90	17.65	-	-

Table 7-16. ISED ANT WF7a 40MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode [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	11.4	-	-	2.70	14.10	23.01	-8.91
	5290	58	AVG	12.87	23.98	-11.11	1.70	14.57	30.00	-15.43
	5530	106	AVG	12.92	23.98	-11.06	-0.30	12.62	30.00	-17.38
	5690	138	AVG	14.22	23.98	-9.76	-0.30	13.92	30.00	-16.08
	5775	155	AVG	15.70	30.00	-14.30	1.90	17.60	-	-

Table 7-17. ISED ANT WF7a 80MHz BW (UNII) Maximum Conducted Output Power and Max EIRP

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 51 of 208

FCC 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]
					ANTWF8	ANTWF7A	Summed		
	5180	36	CDD	AVG	15.00	14.86	17.94	23.98	-6.04
	5200	40	CDD	AVG	16.88	17.00	19.95	23.98	-4.03
	5240	48	CDD	AVG	16.89	17.00	19.96	23.98	-4.02
	5260	52	CDD	AVG	16.96	17.00	19.99	23.98	-3.99
	5280	56	CDD	AVG	16.95	17.00	19.99	23.98	-3.99
	5320	64	CDD	AVG	14.50	14.50	17.51	23.98	-6.47
	5500	100	CDD	AVG	15.49	15.50	18.51	23.98	-5.47
	5520	104	CDD	AVG	16.93	17.00	19.98	23.98	-4.00
	5540	108	CDD	AVG	16.87	17.00	19.95	23.98	-4.03
	5580	116	CDD	AVG	16.83	16.93	19.89	23.98	-4.09
	5660	132	CDD	AVG	17.00	16.85	19.94	23.98	-4.04
	5680	136	CDD	AVG	16.91	16.88	19.91	23.98	-4.07
	5700	140	CDD	AVG	12.96	12.97	15.98	23.98	-8.00
	5720	144	CDD	AVG	16.85	17.00	19.94	23.98	-4.04
	5745	149	CDD	AVG	20.88	21.00	23.95	30.00	-6.05
	5785	157	CDD	AVG	20.88	21.00	23.95	30.00	-6.05
	5825	165	CDD	AVG	20.99	20.95	23.98	30.00	-6.02

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

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					ANTWF8	ANTWF7A	Summed		
	5180	36	CDD	AVG	14.97	15.00	18.00	23.98	-5.98
	5200	40	CDD	AVG	16.89	17.00	19.96	23.98	-4.02
	5240	48	CDD	AVG	17.00	17.00	20.01	23.98	-3.97
	5260	52	CDD	AVG	16.98	17.00	20.00	23.98	-3.98
	5280	56	CDD	AVG	16.94	16.93	19.95	23.98	-4.03
	5320	64	CDD	AVG	14.50	14.50	17.51	23.98	-6.47
	5500	100	CDD	AVG	15.50	15.40	18.46	23.98	-5.52
	5520	104	CDD	AVG	17.00	16.98	20.00	23.98	-3.98
	5540	108	CDD	AVG	16.94	17.00	19.98	23.98	-4.00
	5580	116	CDD	AVG	16.93	17.00	19.98	23.98	-4.00
	5660	132	CDD	AVG	17.00	17.00	20.01	23.98	-3.97
	5680	136	CDD	AVG	17.00	16.98	20.00	23.98	-3.98
	5700	140	CDD	AVG	12.95	13.00	15.99	23.98	-7.99
	5720	144	CDD	AVG	16.95	17.00	19.99	23.98	-3.99
	5745	149	CDD	AVG	21.00	20.95	23.99	30.00	-6.01
	5785	157	CDD	AVG	20.96	20.97	23.98	30.00	-6.02
	5825	165	CDD	AVG	20.93	21.00	23.98	30.00	-6.02

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 52 of 208

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					ANTWF8	ANTWF7A	Summed		
	5190	38	CDD	AVG	11.99	12.00	15.01	23.98	-8.97
	5230	46	CDD	AVG	19.00	18.97	22.00	23.98	-1.98
	5270	54	CDD	AVG	19.00	18.97	22.00	23.98	-1.98
	5310	62	CDD	AVG	12.94	12.97	15.97	23.98	-8.01
	5510	102	CDD	AVG	12.50	12.50	15.51	23.98	-8.47
	5550	110	CDD	AVG	19.44	19.50	22.48	23.98	-1.50
	5670	134	CDD	AVG	14.43	14.40	17.43	23.98	-6.55
	5710	142	CDD	AVG	19.50	19.46	22.49	23.98	-1.49
	5755	151	CDD	AVG	20.95	20.92	23.95	30.00	-6.05
	5795	159	CDD	AVG	21.00	20.98	24.00	30.00	-6.00

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

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Mode	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]
					ANTWF8	ANTWF7A	Summed		
	5210	42	CDD	AVG	9.85	9.94	12.91	23.98	-11.07
	5290	58	CDD	AVG	11.00	10.92	13.97	23.98	-10.01
	5530	106	CDD	AVG	11.00	10.85	13.94	23.98	-10.04
	5690	138	CDD	AVG	19.89	20.00	22.96	23.98	-1.02
	5775	155	CDD	AVG	17.50	17.38	20.45	30.00	-9.55

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

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 53 of 208

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]
					ANTWF8	ANTWF7A	Summed						
	5180	36	CDD	AVG	9.25	9.17	12.22	-	-	5.61	17.83	23.01	-5.18
	5200	40	CDD	AVG	9.21	9.25	12.24	-	-	5.61	17.85	23.01	-5.16
	5240	48	CDD	AVG	9.25	9.25	12.26	-	-	5.61	17.87	23.01	-5.14
	5260	52	CDD	AVG	16.96	17.00	19.99	23.98	-3.99	5.17	25.16	30.00	-4.84
	5280	56	CDD	AVG	16.95	17.00	19.99	23.98	-3.99	5.17	25.16	30.00	-4.84
	5320	64	CDD	AVG	14.50	14.50	17.51	23.98	-6.47	5.17	22.68	30.00	-7.32
	5500	100	CDD	AVG	15.50	14.18	17.90	23.98	-6.08	4.22	22.12	30.00	-7.88
	5520	104	CDD	AVG	17.00	14.10	18.80	23.98	-5.18	4.22	23.02	30.00	-6.98
	5540	108	CDD	AVG	17.00	14.22	18.84	23.98	-5.14	4.22	23.06	30.00	-6.94
	5580	116	CDD	AVG	16.87	14.24	18.76	23.98	-5.22	4.22	22.98	30.00	-7.02
	5660	132	CDD	AVG	16.97	14.13	18.79	23.98	-5.19	4.22	23.01	30.00	-6.99
	5680	136	CDD	AVG	17.00	14.20	18.83	23.98	-5.15	4.22	23.05	30.00	-6.95
	5700	140	CDD	AVG	12.96	12.97	15.98	23.98	-8.00	4.22	20.20	30.00	-9.80
	5720	144	CDD	AVG	17.00	14.17	18.82	23.98	-5.16	4.22	23.04	30.00	-6.96
	5745	149	CDD	AVG	17.00	15.69	19.40	30.00	-10.60	3.92	23.32	-	-
	5785	157	CDD	AVG	17.00	15.75	19.43	30.00	-10.57	3.92	23.35	-	-
	5825	165	CDD	AVG	17.00	15.75	19.43	30.00	-10.57	3.92	23.35	-	-

Table 7-22. ISED CDD/SDM 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]
					ANTWF8	ANTWF7A	Summed						
	5180	36	SDM	AVG	12.21	12.25	15.24	-	-	2.60	17.84	23.01	-5.17
	5200	40	SDM	AVG	12.25	12.25	15.26	-	-	2.60	17.86	23.01	-5.15
	5240	48	SDM	AVG	12.16	12.25	15.22	-	-	2.60	17.82	23.01	-5.19
	5260	52	CDD	AVG	16.98	17.00	20.00	23.98	-3.98	5.17	25.17	30.00	-4.83
	5280	56	CDD	AVG	16.94	16.93	19.95	23.98	-4.03	5.17	25.12	30.00	-4.88
	5320	64	CDD	AVG	14.50	14.50	17.51	23.98	-6.47	5.17	22.68	30.00	-7.32
	5500	100	CDD	AVG	15.21	14.16	17.73	23.98	-6.25	4.22	21.95	30.00	-8.05
	5520	104	CDD	AVG	16.99	14.13	18.80	23.98	-5.18	4.22	23.02	30.00	-6.98
	5540	108	CDD	AVG	16.98	14.15	18.80	23.98	-5.18	4.22	23.02	30.00	-6.98
	5580	116	CDD	AVG	17.00	14.22	18.84	23.98	-5.14	4.22	23.06	30.00	-6.94
	5660	132	CDD	AVG	16.95	14.23	18.81	23.98	-5.17	4.22	23.03	30.00	-6.97
	5680	136	CDD	AVG	17.00	14.21	18.84	23.98	-5.14	4.22	23.06	30.00	-6.94
	5700	140	CDD	AVG	12.95	13.00	15.99	23.98	-7.99	4.22	20.21	30.00	-9.79
	5720	144	CDD	AVG	16.97	14.22	18.82	23.98	-5.16	4.22	23.04	30.00	-6.96
	5745	149	CDD	AVG	16.96	15.75	19.41	30.00	-10.59	3.92	23.33	-	-
	5785	157	CDD	AVG	17.00	15.72	19.42	30.00	-10.58	3.92	23.34	-	-
	5825	165	CDD	AVG	17.00	15.70	19.41	30.00	-10.59	3.92	23.33	-	-

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]
					ANTWF8	ANTWF7A	Summed						
	5190	38	SDM	AVG	11.99	12.00	15.01	-	-	2.60	17.61	23.01	-5.40
	5230	46	SDM	AVG	14.71	14.75	17.74	-	-	2.60	20.34	23.01	-2.67
	5270	54	CDD	AVG	19.00	17.25	21.22	23.98	-2.76	5.17	26.39	30.00	-3.61
	5310	62	CDD	AVG	12.94	12.97	15.97	23.98	-8.01	5.17	21.14	30.00	-8.86
	5510	102	CDD	AVG	12.50	12.50	15.51	23.98	-8.47	4.22	19.73	30.00	-10.27
	5550	110	CDD	AVG	17.00	14.21	18.84	23.98	-5.14	4.22	23.06	30.00	-6.94
	5670	134	CDD	AVG	14.41	14.23	17.33	23.98	-6.65	4.22	21.55	30.00	-8.45
	5710	142	CDD	AVG	17.00	14.25	18.85	23.98	-5.13	4.22	23.07	30.00	-6.93
	5755	151	CDD	AVG	17.00	15.65	19.39	30.00	-10.61	3.92	23.31	-	-
	5795	159	CDD	AVG	16.95	15.62	19.35	30.00	-10.65	3.92	23.27	-	-

Table 7-24. ISED CDD/SDM 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]
					ANTWF8	ANTWF7A	Summed						
	5210	42	CDD	AVG	9.85	9.94	12.91	-	-	5.61	18.52	23.01	-4.49
	5290	58	CDD	AVG	11.00	10.92	13.97	23.98	-10.01	5.17	19.14	30.00	-10.86
	5530	106	CDD	AVG	11.00	10.85	13.94	23.98	-10.04	4.22	18.16	30.00	-11.84
	5690	138	CDD	AVG	17.00	14.25	18.85	23.98	-5.13	4.22	23.07	30.00	-6.93
	5775	155	CDD	AVG	17.00	15.70	19.41	30.00	-10.59	3.92	23.33	-	-

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

FCC ID: BCGA2316		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device		Page 54 of 208

Note:

Per ANSI C63.10-2013 and KDB 662911 v02r01 Section E1), the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO 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.

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

Sample CDD Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average conducted output power was measured to be 14.97 dBm for ANT WF8 and 15.00 dBm for ANT WF7a.

$$\text{ANT WF8} + \text{ANT WF7a} = \text{CDD}$$

$$(14.97 \text{ dBm} + 15.00 \text{ dBm}) = (31.41 \text{ mW} + 31.62 \text{ mW}) = 63.03 \text{ mW} = 18.00 \text{ dBm}$$

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average MIMO conducted power was calculated to be 18.00 dBm with directional gain of 5.61 dBi.

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

$$18.00 \text{ dBm} + 5.61 \text{ dBi} = 23.61 \text{ dBm}$$

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 55 of 208

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 E)2) 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

All data rates were investigated and only the worse case is reported

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 56 of 208

Antenna WF8 Power Spectral Density Measurements

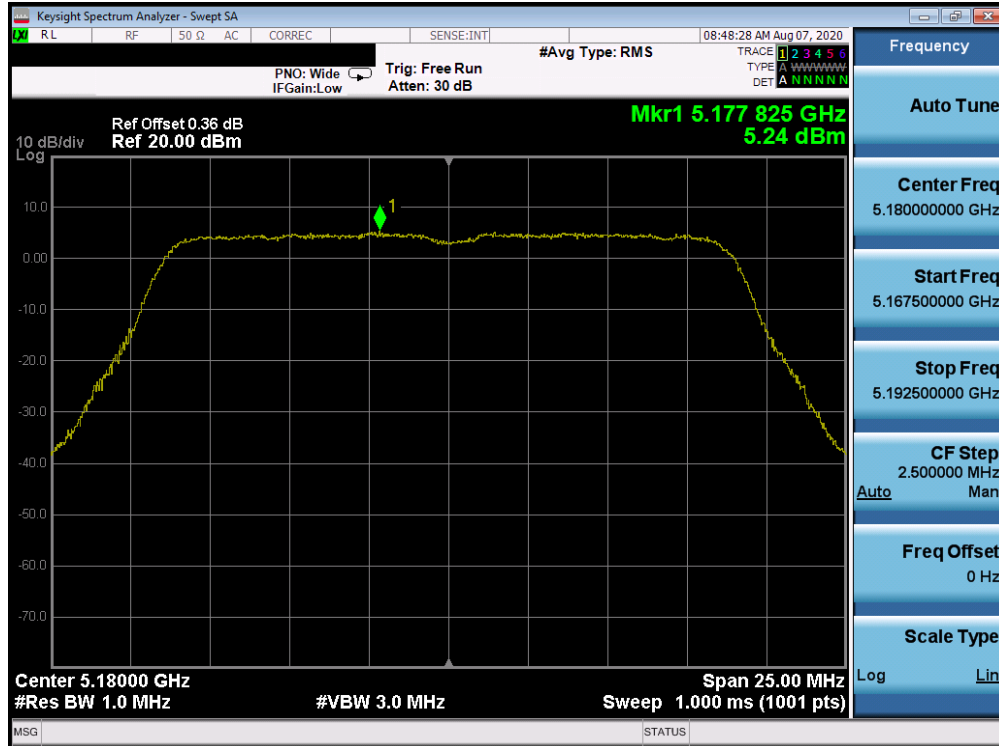
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	5.24	11.0	-5.76
	5200	40	n (20MHz)	65/72.2 (MCS7)	8.43	11.0	-2.57
	5240	48	n (20MHz)	65/72.2 (MCS7)	8.45	11.0	-2.55
	5190	38	n (40MHz)	135/150 (MCS7)	-0.33	11.0	-11.33
	5230	46	n (40MHz)	135/150 (MCS7)	5.10	11.0	-5.90
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-6.10	11.0	-17.10
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	8.31	11.0	-2.69
	5280	56	n (20MHz)	65/72.2 (MCS7)	8.59	11.0	-2.41
	5320	64	n (20MHz)	65/72.2 (MCS7)	4.93	11.0	-6.07
	5270	54	n (40MHz)	135/150 (MCS7)	4.89	11.0	-6.11
	5310	62	n (40MHz)	135/150 (MCS7)	-0.45	11.0	-11.45
	5290	58	ac (80MHz)	390/433.3 (MCS9)	-4.42	11.0	-15.42
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	4.20	11.0	-6.80
	5580	116	n (20MHz)	65/72.2 (MCS7)	8.42	11.0	-2.58
	5720	144	n (20MHz)	65/72.2 (MCS7)	8.49	11.0	-2.51
	5510	102	n (40MHz)	135/150 (MCS7)	-0.84	11.0	-11.84
	5550	110	n (40MHz)	135/150 (MCS7)	4.63	11.0	-6.37
	5710	142	n (40MHz)	135/150 (MCS7)	5.92	11.0	-5.08
	5530	106	ac (80MHz)	390/433.3 (MCS9)	-6.87	11.0	-17.87
	5690	138	ac (80MHz)	390/433.3 (MCS9)	3.36	11.0	-7.64

Table 7-26. Bands 1, 2A, 2C Power Spectral Density Measurements ANT WF8

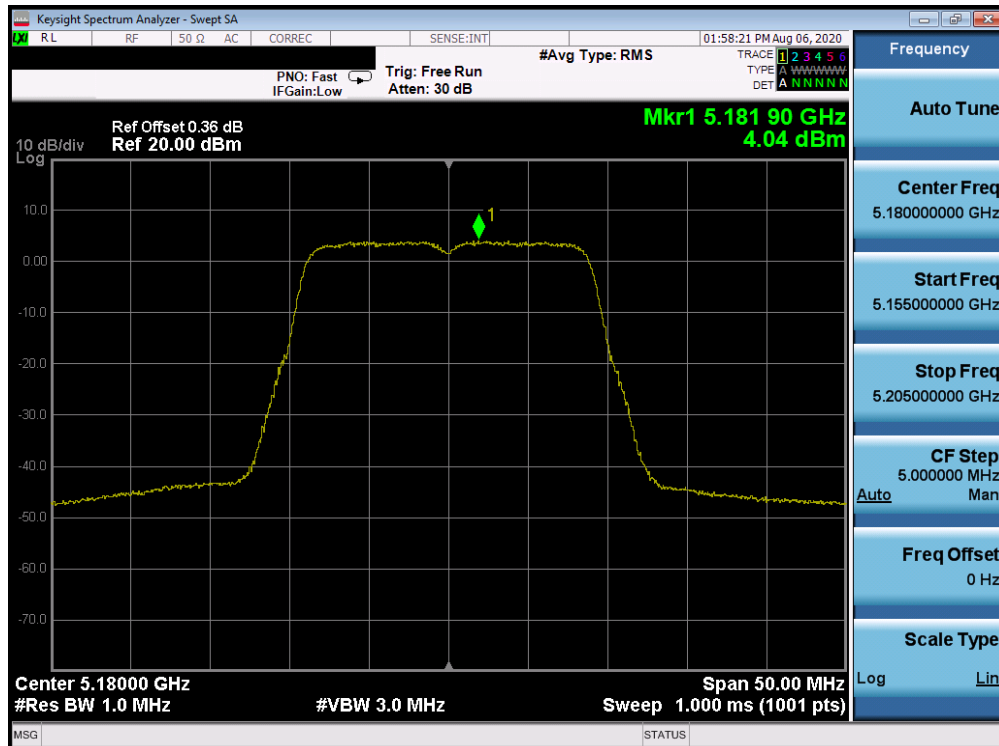
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	ISED Max e.i.r.p. Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	4.04	2.50	6.54	10.0	-3.46
	5200	40	n (20MHz)	65/72.2 (MCS7)	3.90	2.50	6.40	10.0	-3.60
	5240	48	n (20MHz)	65/72.2 (MCS7)	4.07	2.50	6.57	10.0	-3.43
	5190	38	n (40MHz)	135/150 (MCS7)	-0.33	2.50	2.17	10.0	-7.83
	5230	46	n (40MHz)	135/150 (MCS7)	5.10	2.50	7.60	10.0	-2.40
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-6.10	2.50	-3.60	10.0	-13.60

Table 7-27. ISED Band 1 e.i.r.p. Power Spectral Density Measurements ANT WF8

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 57 of 208

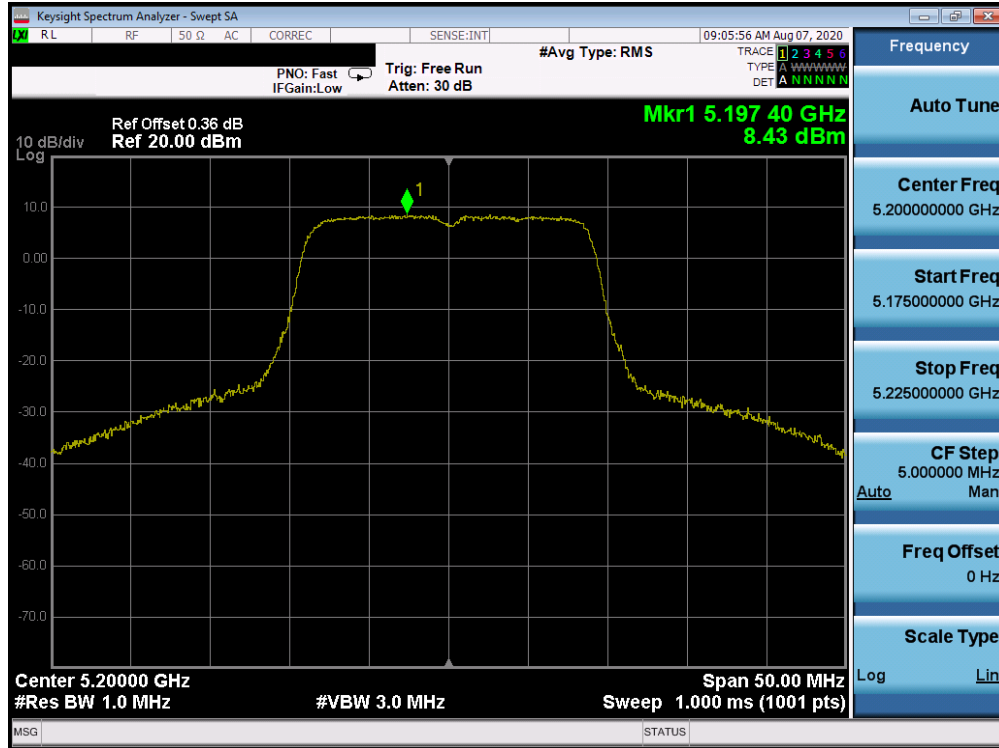


Plot 7-53. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

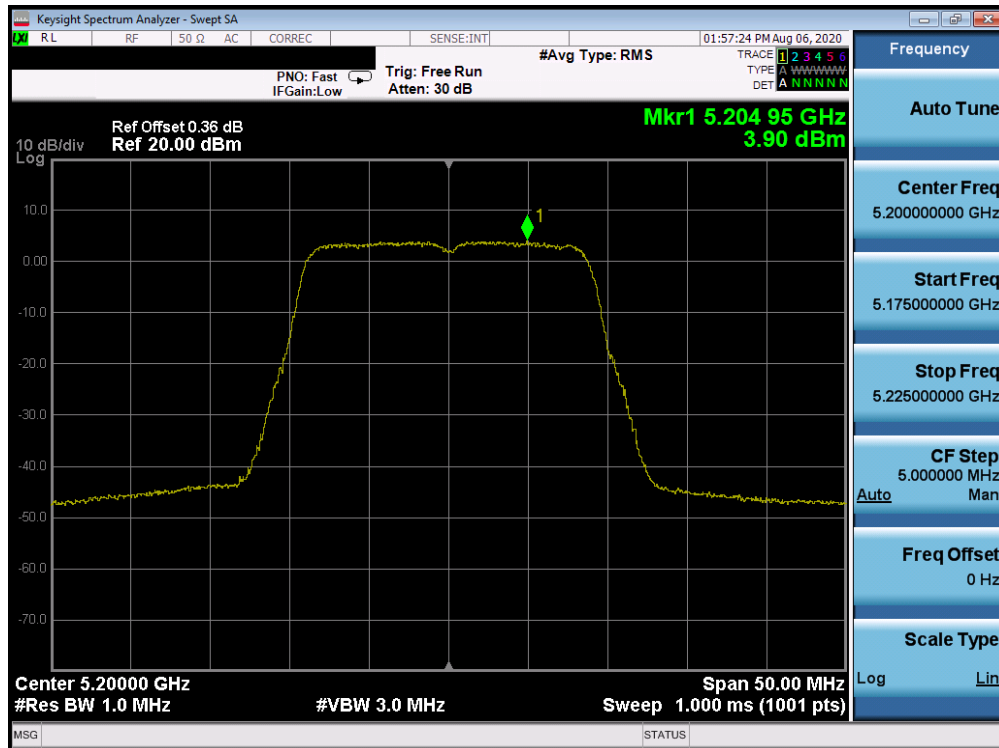


Plot 7-54. ISSED Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 58 of 208

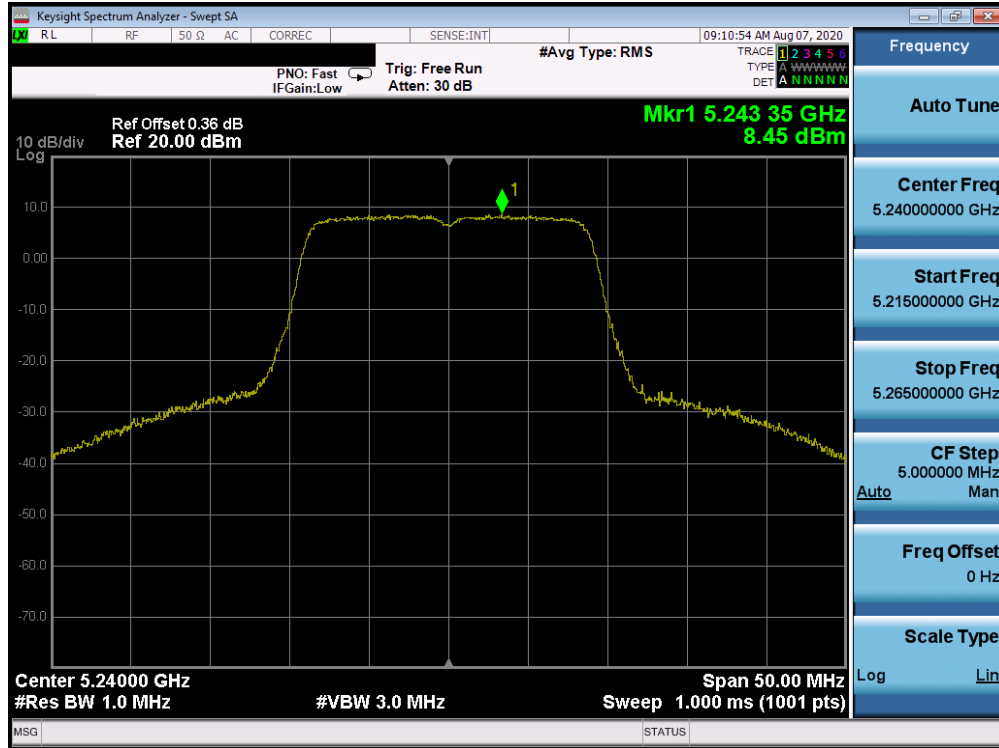


Plot 7-55. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

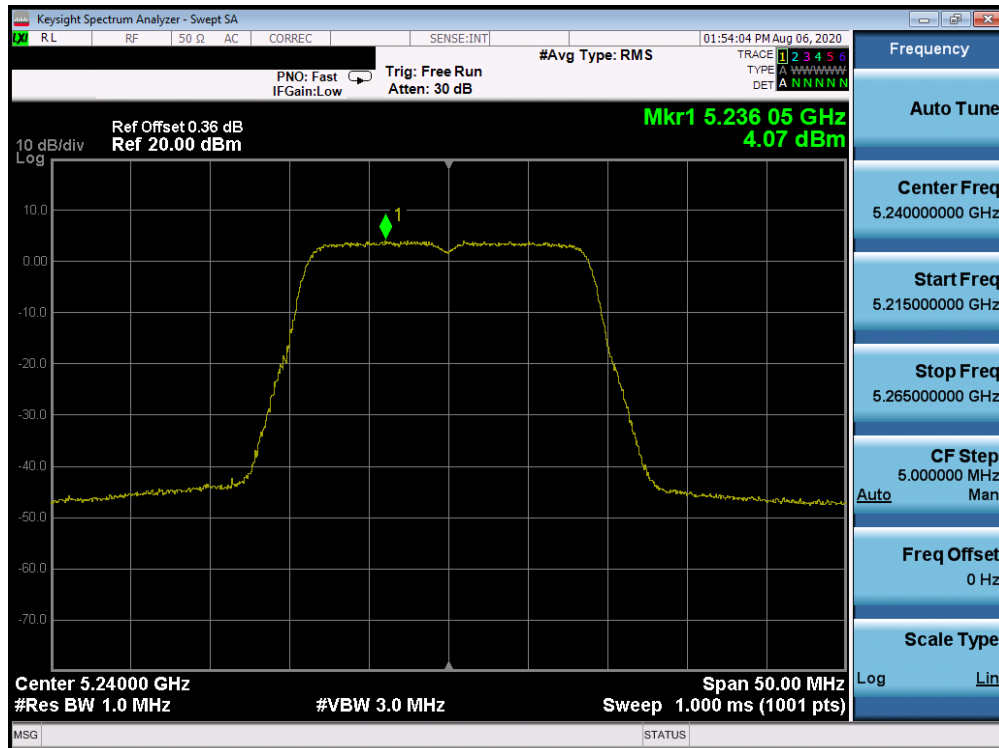


Plot 7-56. ISED Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 59 of 208

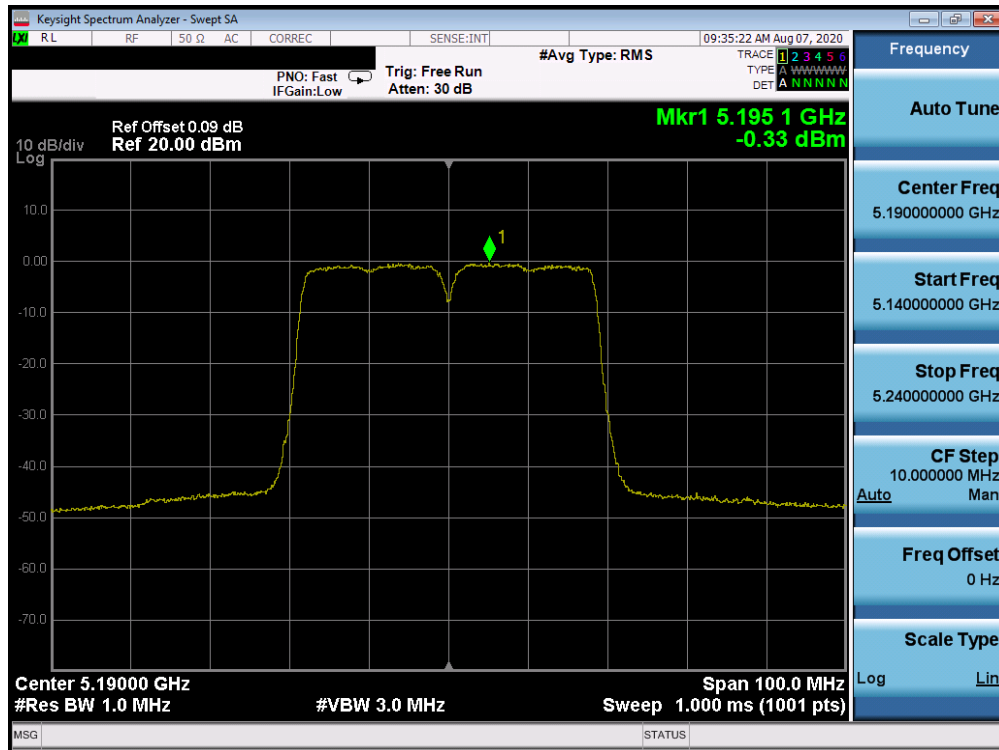


Plot 7-57. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

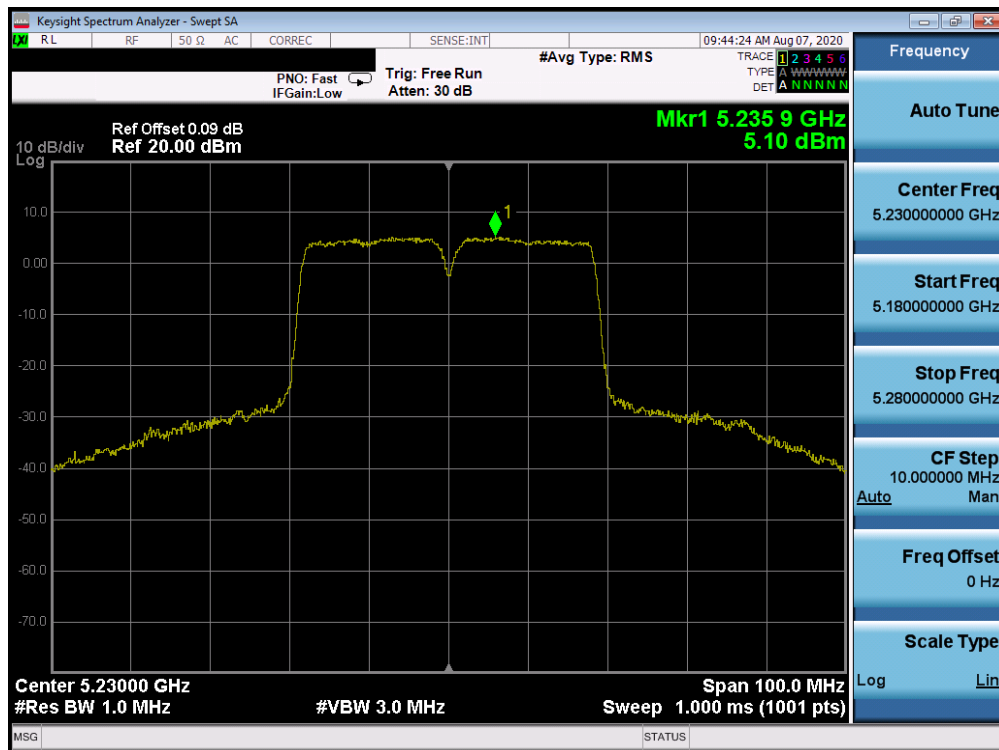


Plot 7-58. ISSED Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 60 of 208

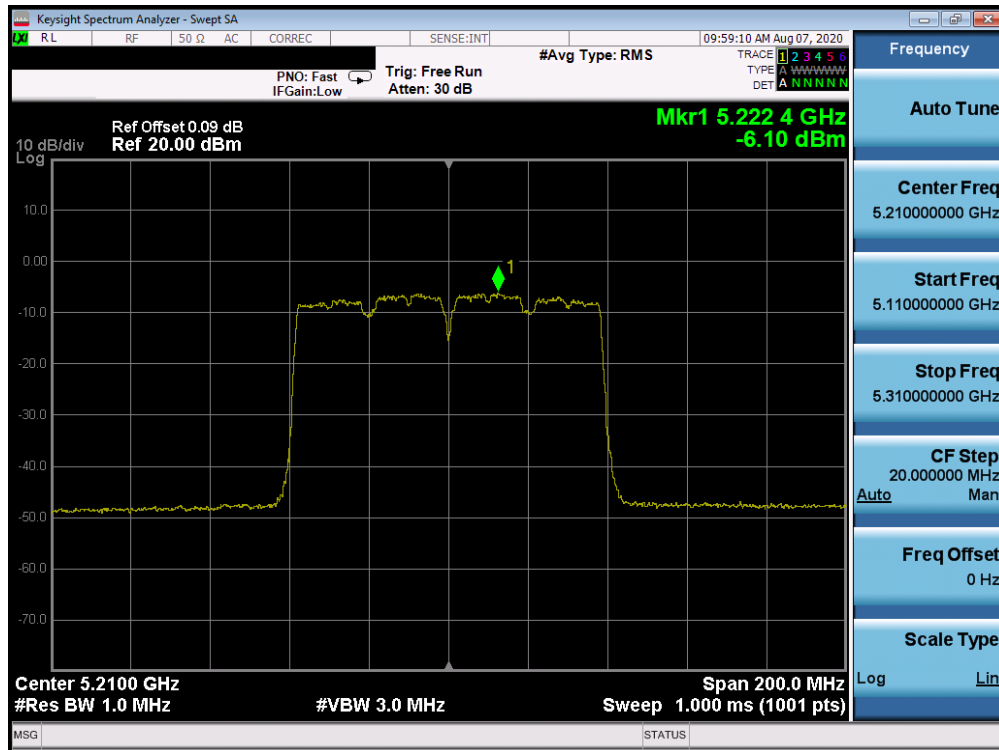


Plot 7-59. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

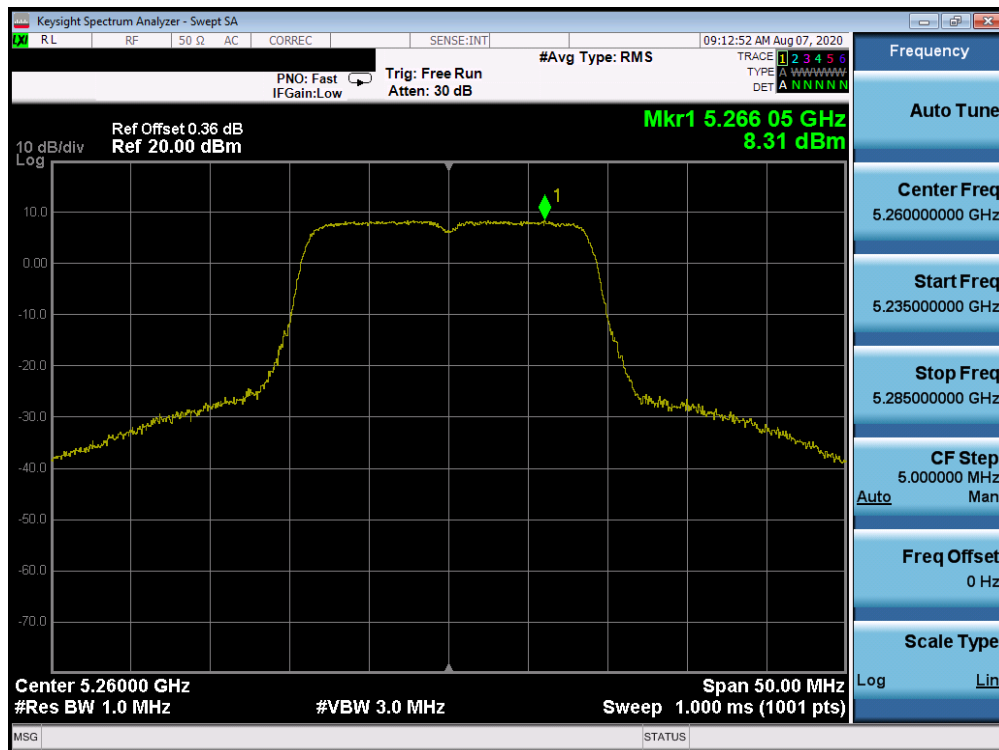


Plot 7-60. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 1) – Ch. 46)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 61 of 208

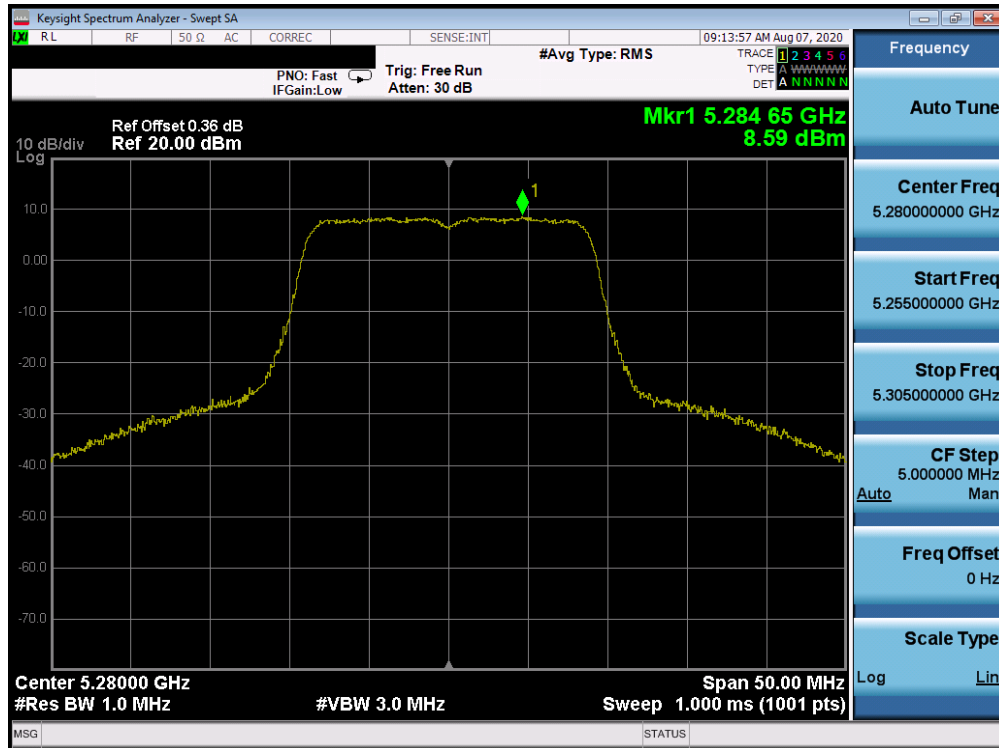


Plot 7-61. Power Spectral Density Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

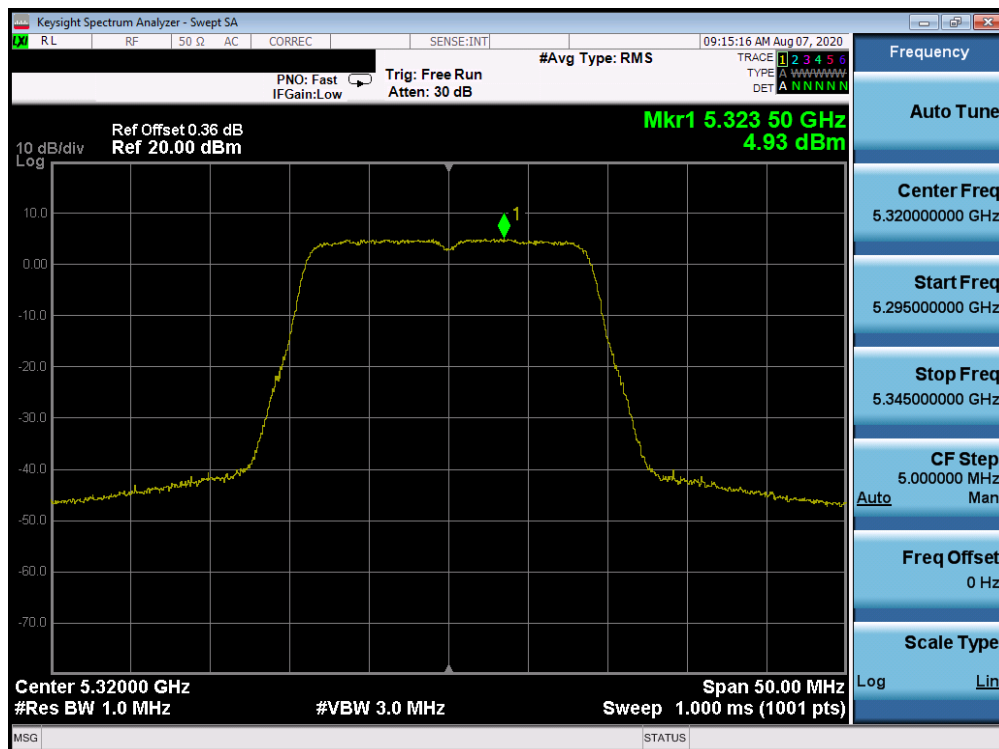


Plot 7-62. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 62 of 208

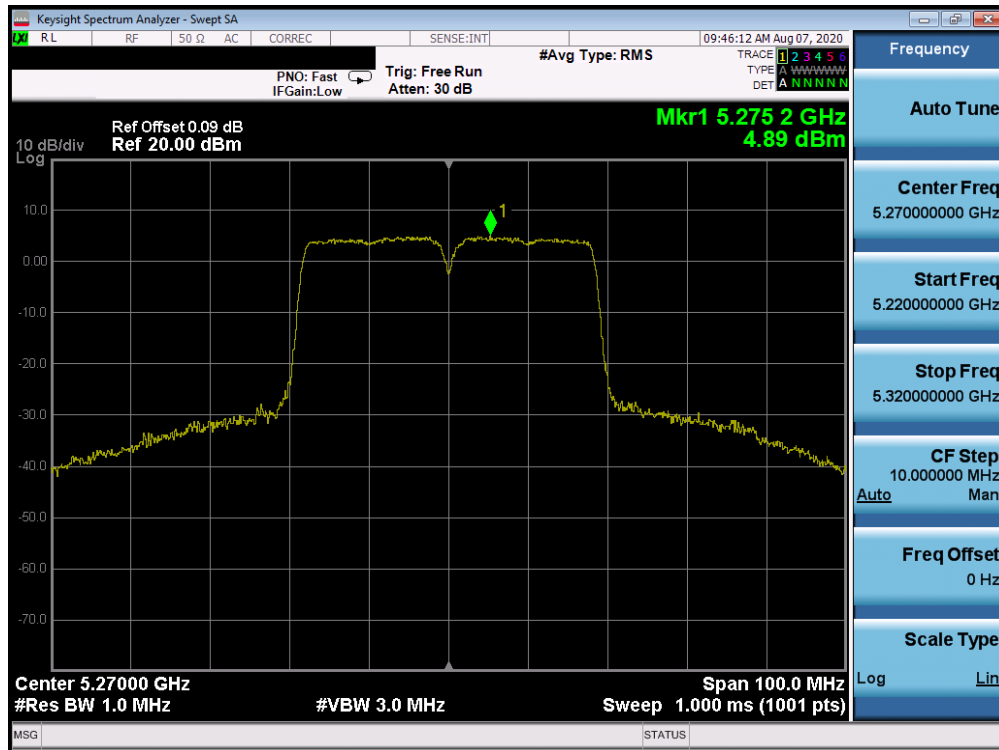


Plot 7-63. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

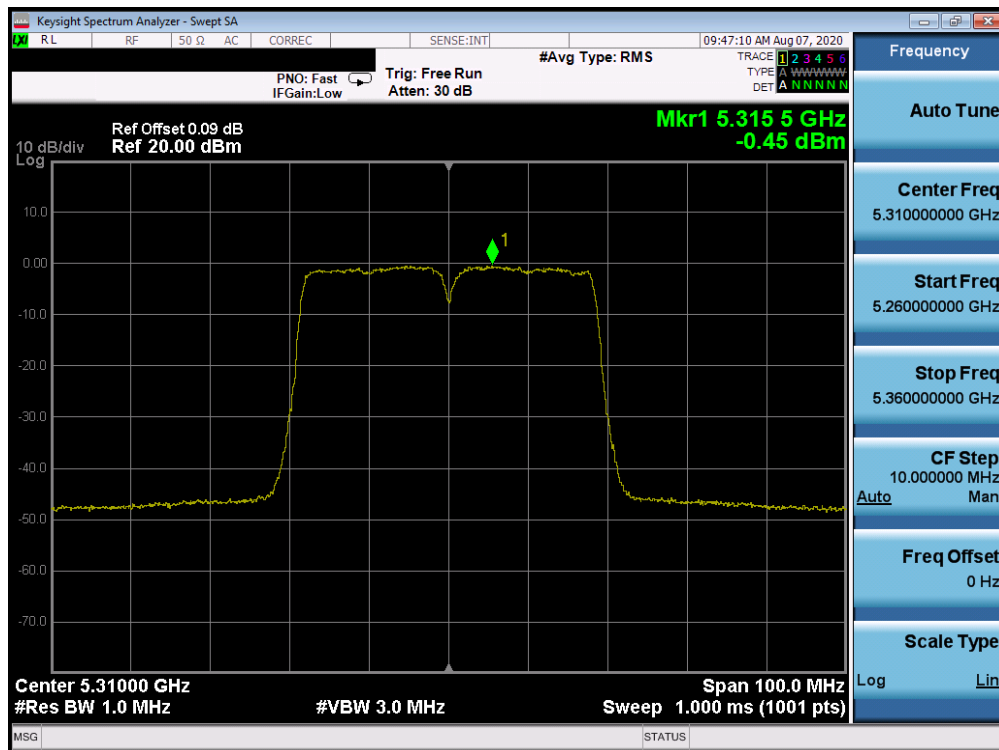


Plot 7-64. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 63 of 208

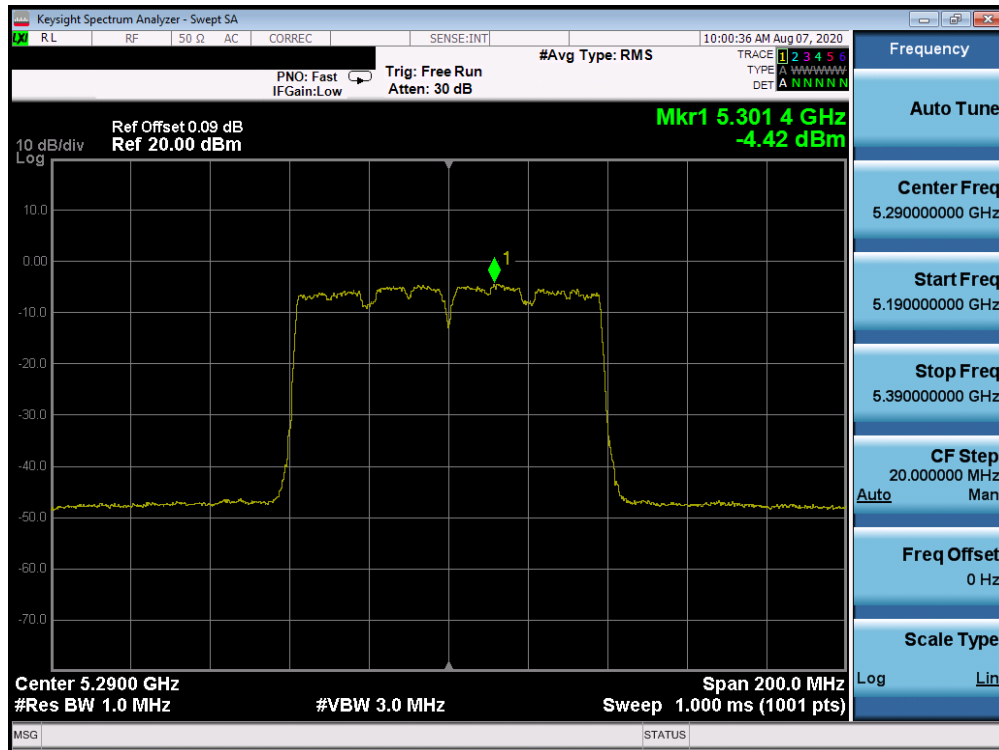


Plot 7-65. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

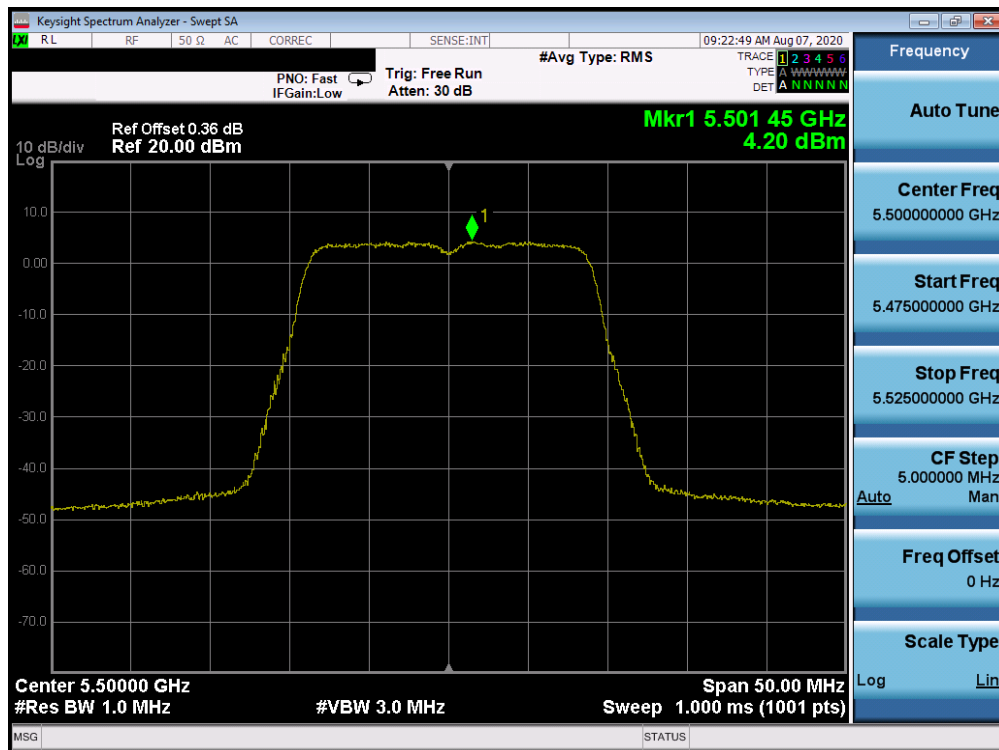


Plot 7-66. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2A) – Ch. 62)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 64 of 208

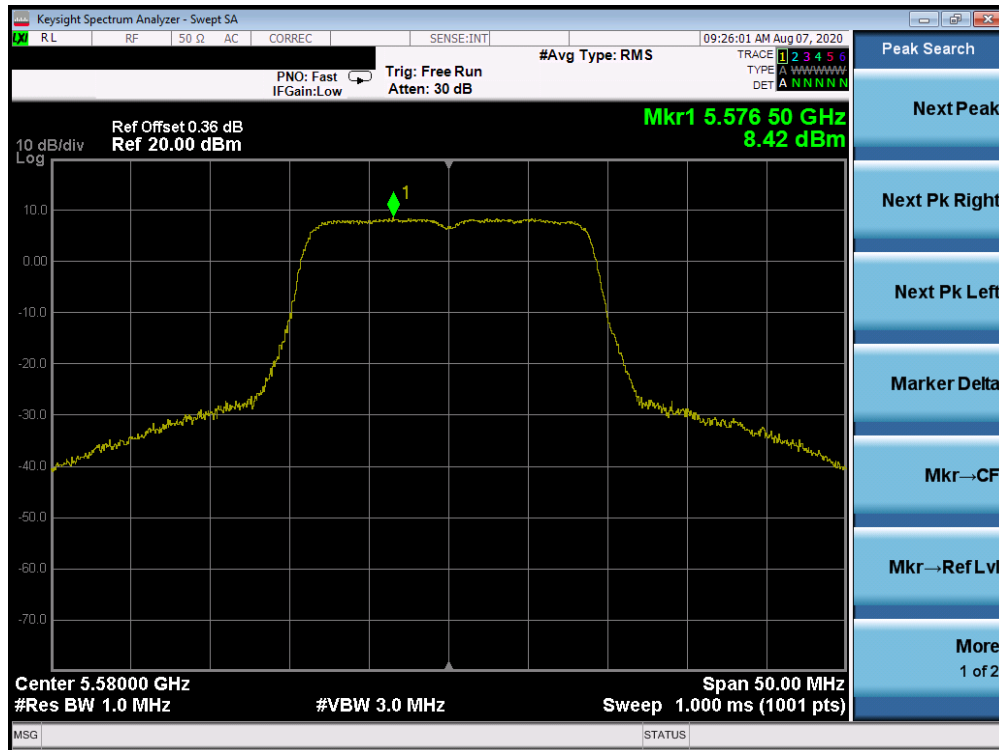


Plot 7-67. Power Spectral Density Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

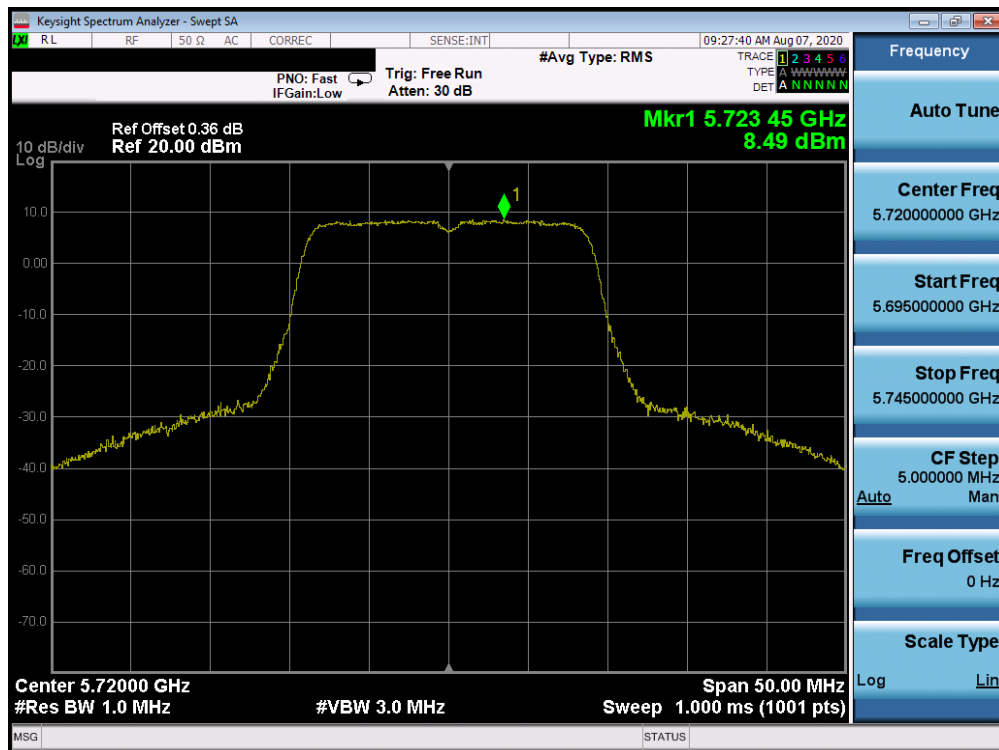


Plot 7-68. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 65 of 208

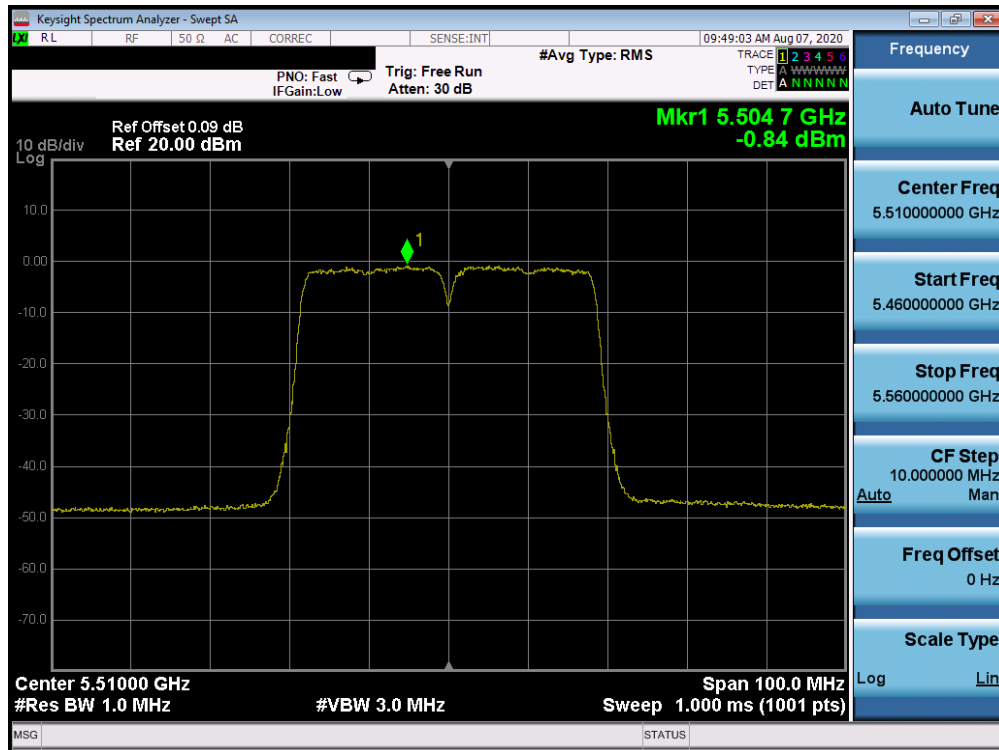


Plot 7-69. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2C) – Ch. 116

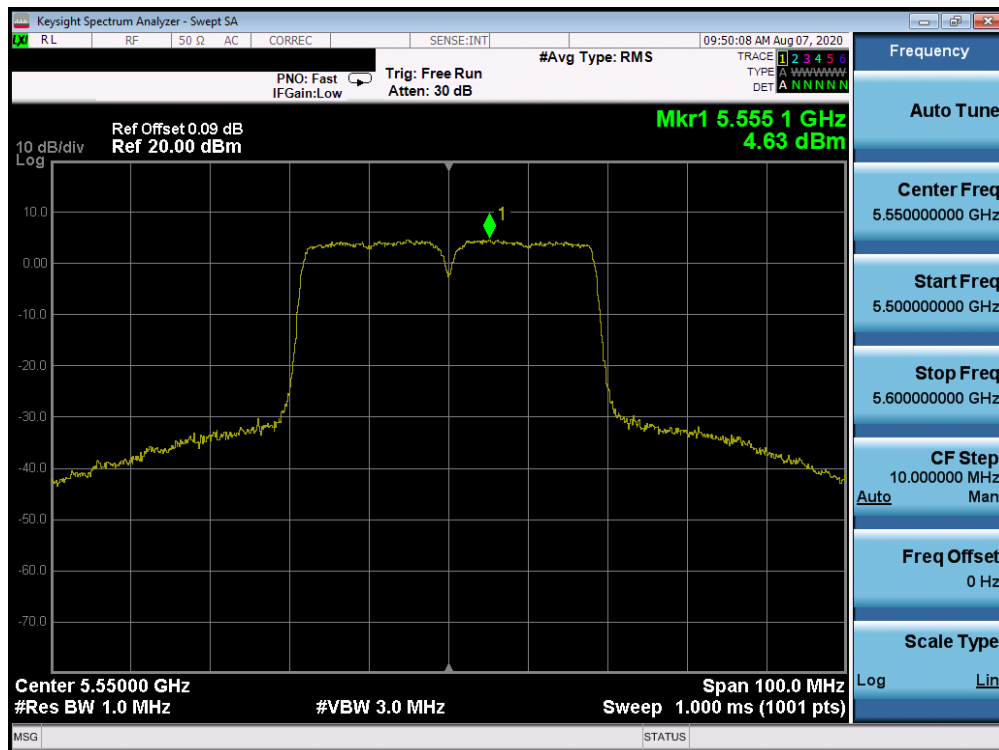


Plot 7-70. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 2C) – Ch. 44)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 66 of 208

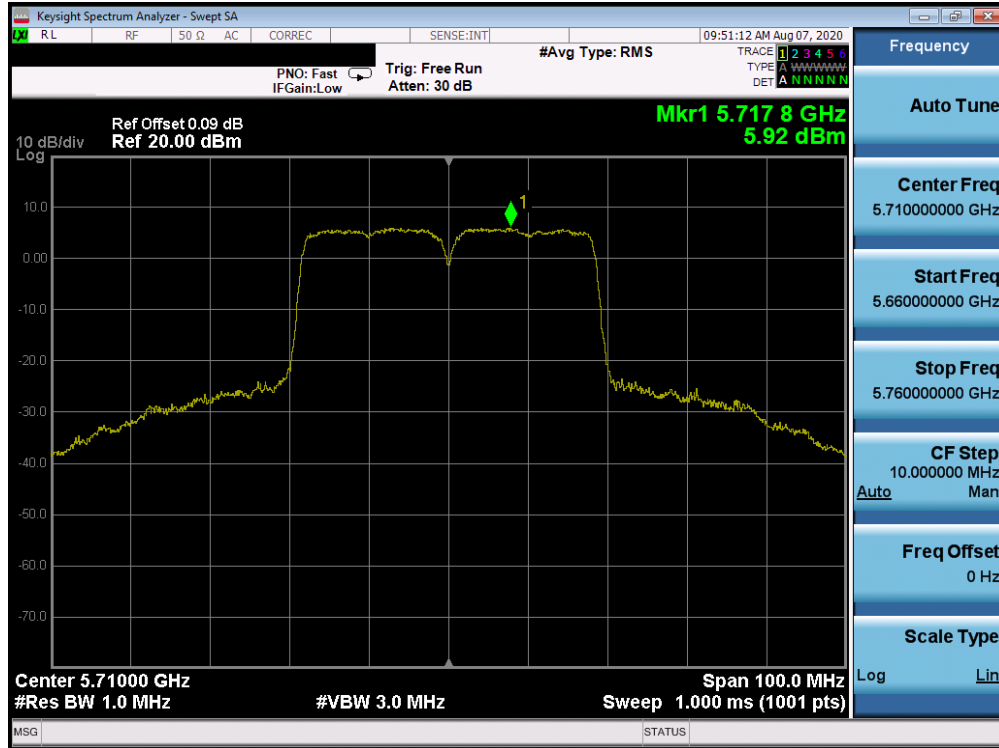


Plot 7-71. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2C) – Ch. 102)

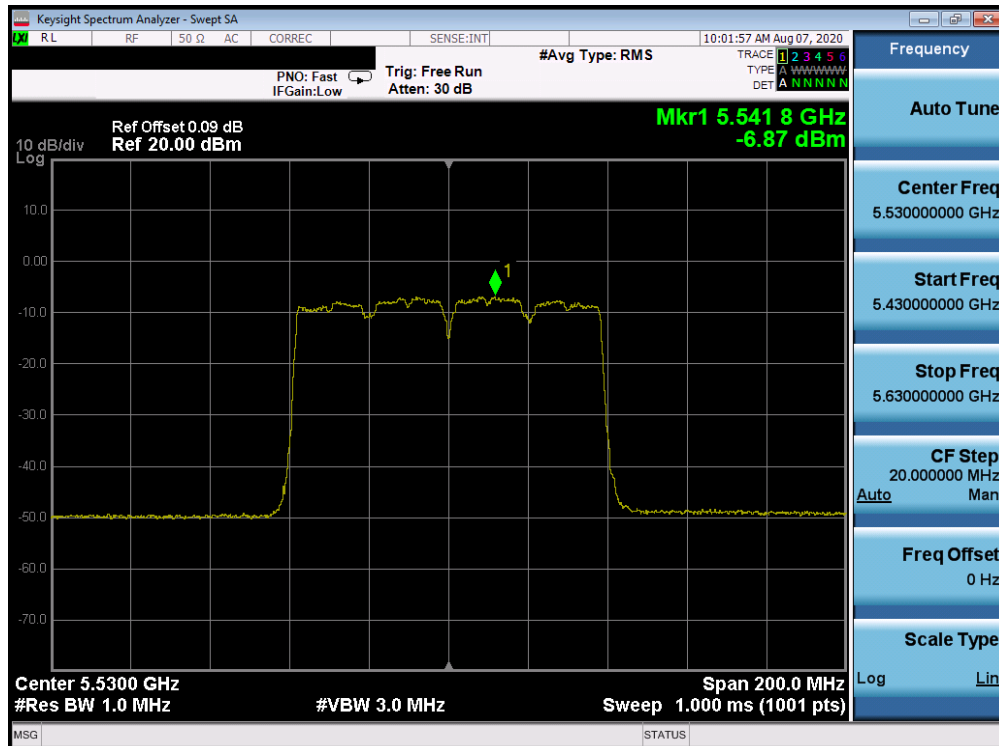


Plot 7-72. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2C) – Ch. 110)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 67 of 208

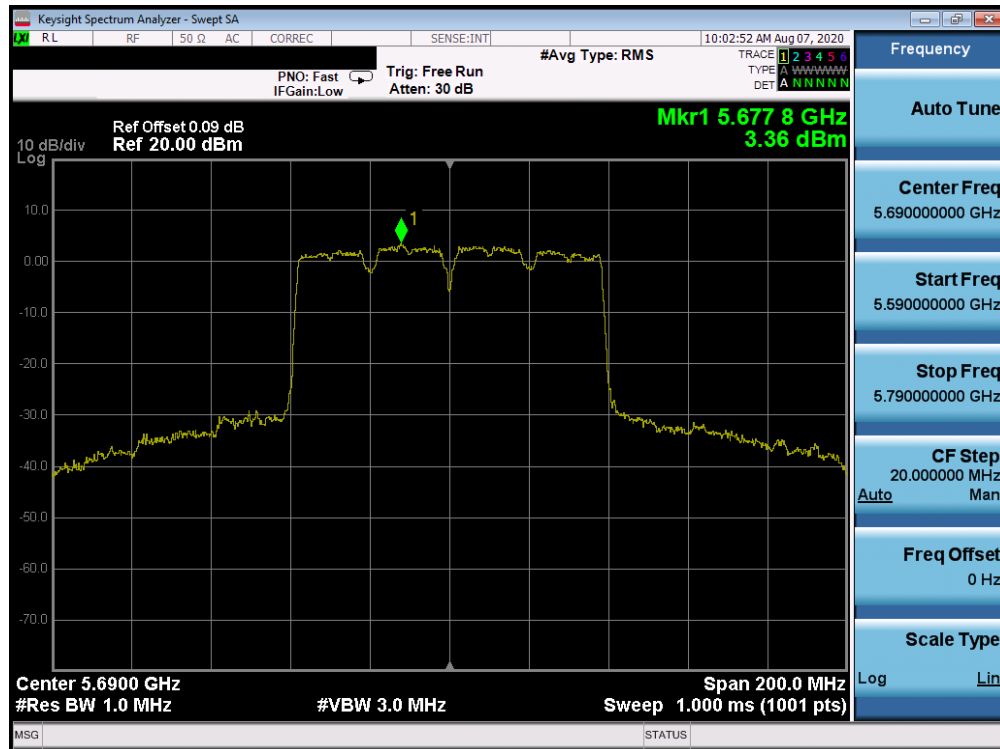


Plot 7-73. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 2C) – Ch. 142)



Plot 7-74. Power Spectral Density Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 106)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 68 of 208

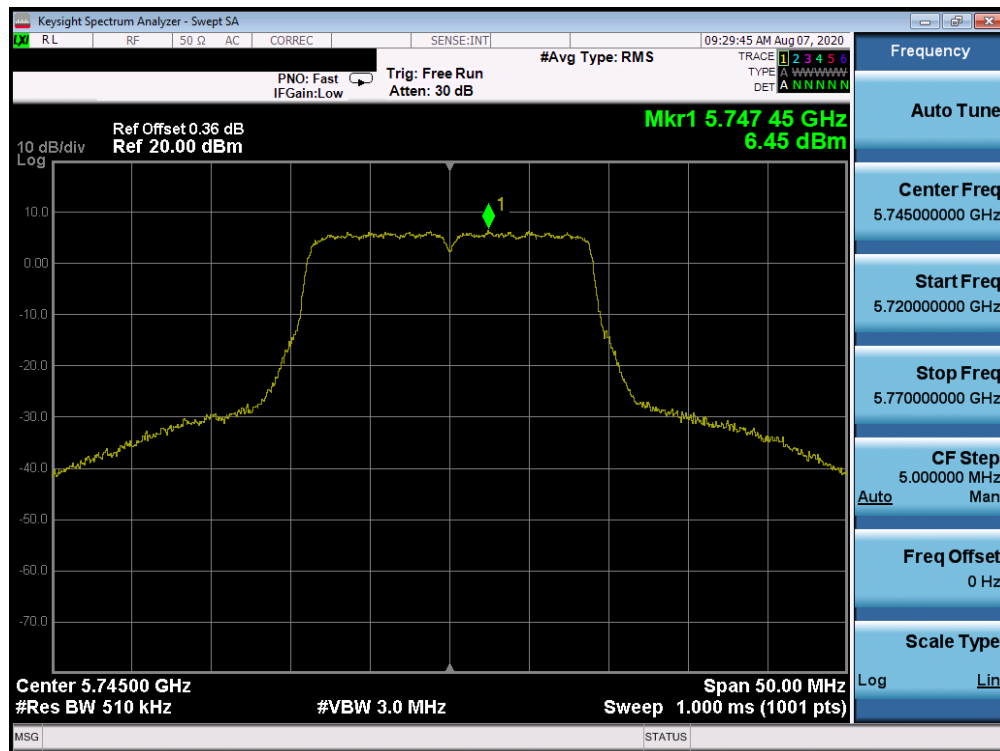


Plot 7-75. Power Spectral Density Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 2C) – Ch. 138)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 69 of 208

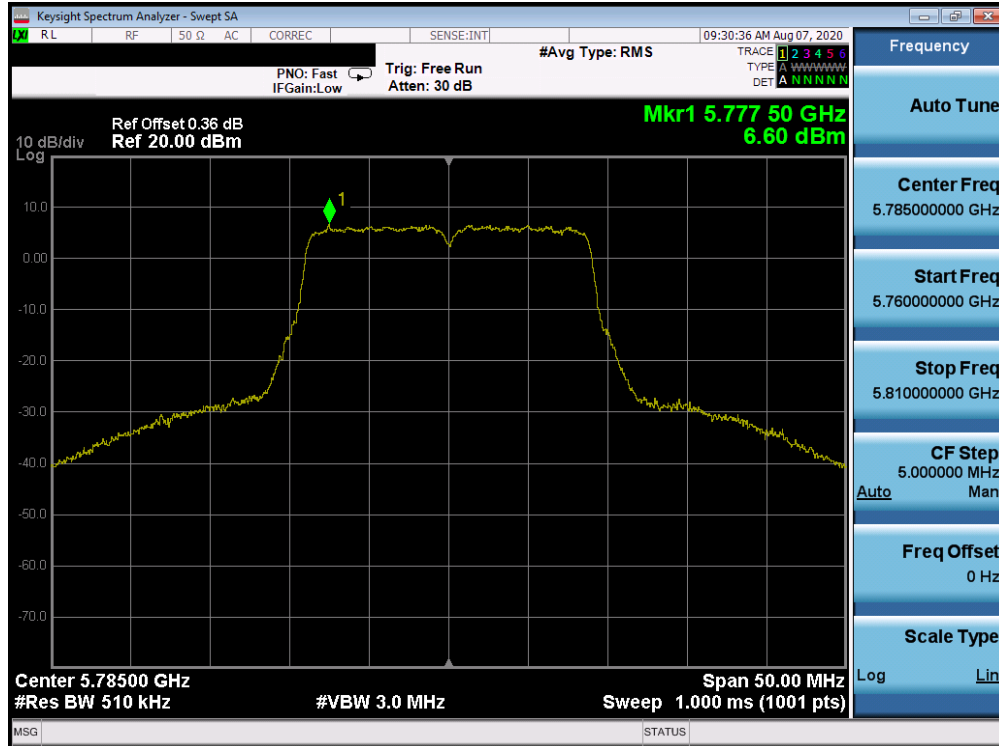
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/500kHz]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	n (20MHz)	65/72.2 (MCS7)	6.45	30.0	-23.55
	5785	157	n (20MHz)	65/72.2 (MCS7)	6.60	30.0	-23.40
	5825	165	n (20MHz)	65/72.2 (MCS7)	6.96	30.0	-23.04
	5755	151	n (40MHz)	135/150 (MCS7)	4.10	30.0	-25.90
	5795	159	n (40MHz)	135/150 (MCS7)	4.25	30.0	-25.75
	5775	155	ac (80MHz)	390/433.3 (MCS9)	-1.96	30.0	-31.96

Table 7-28. Band 3 Power Spectral Density Measurements ANT WF8

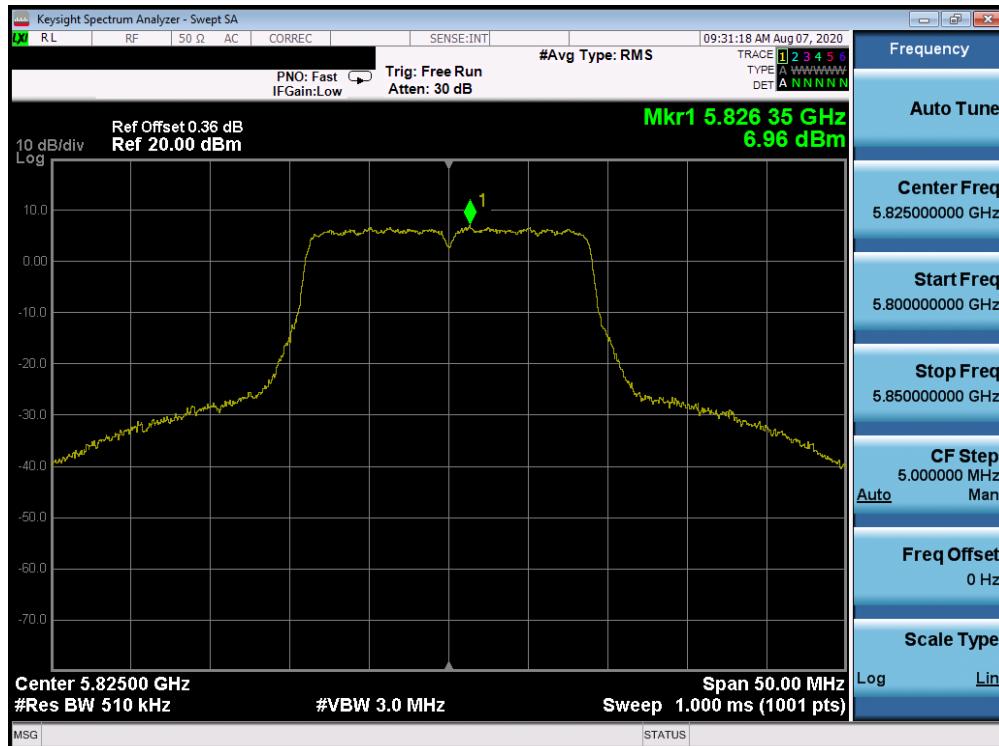


Plot 7-76. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 3) – Ch. 149)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 70 of 208

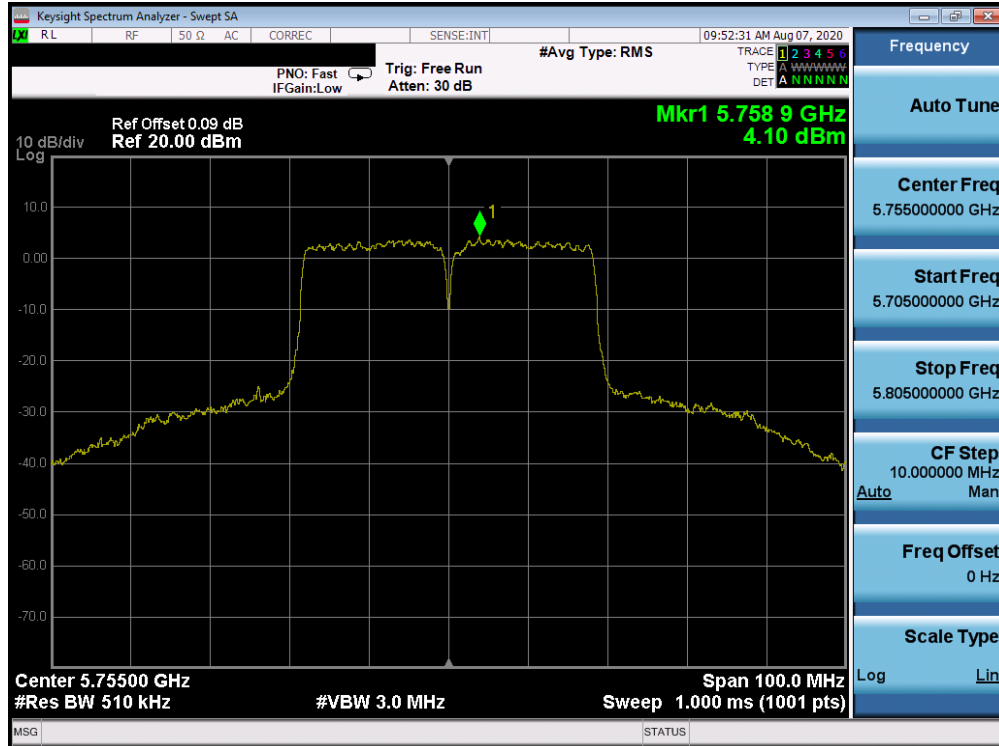


Plot 7-77. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

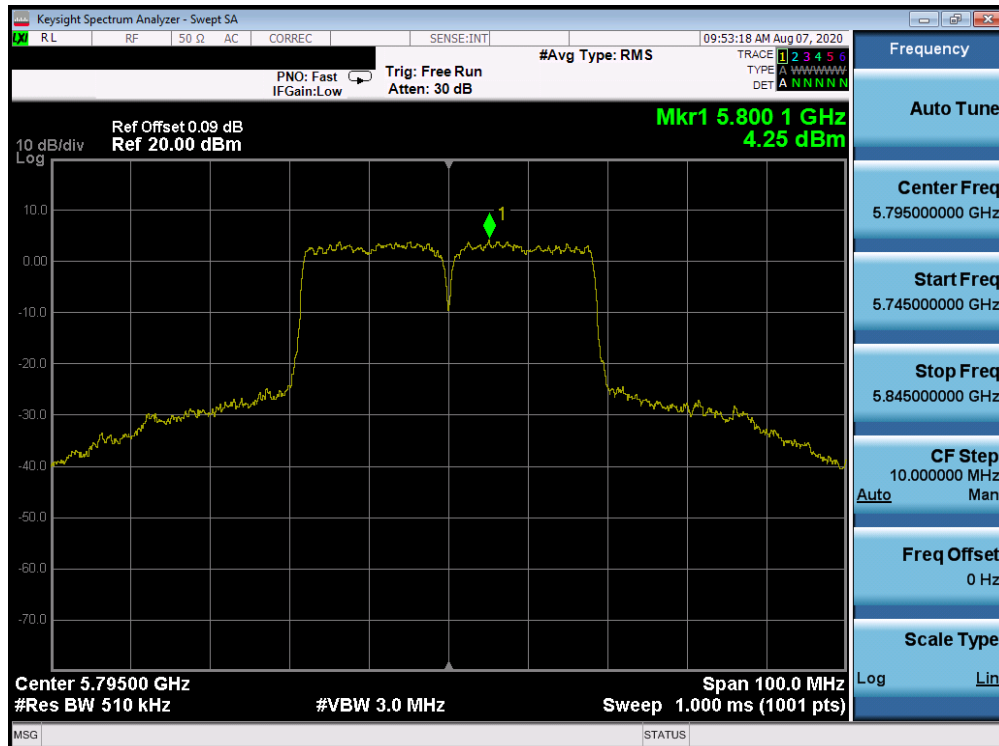


Plot 7-78. Power Spectral Density Plot ANT WF8 (20MHz BW 802.11n (UNII Band 3) – Ch. 165)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 71 of 208

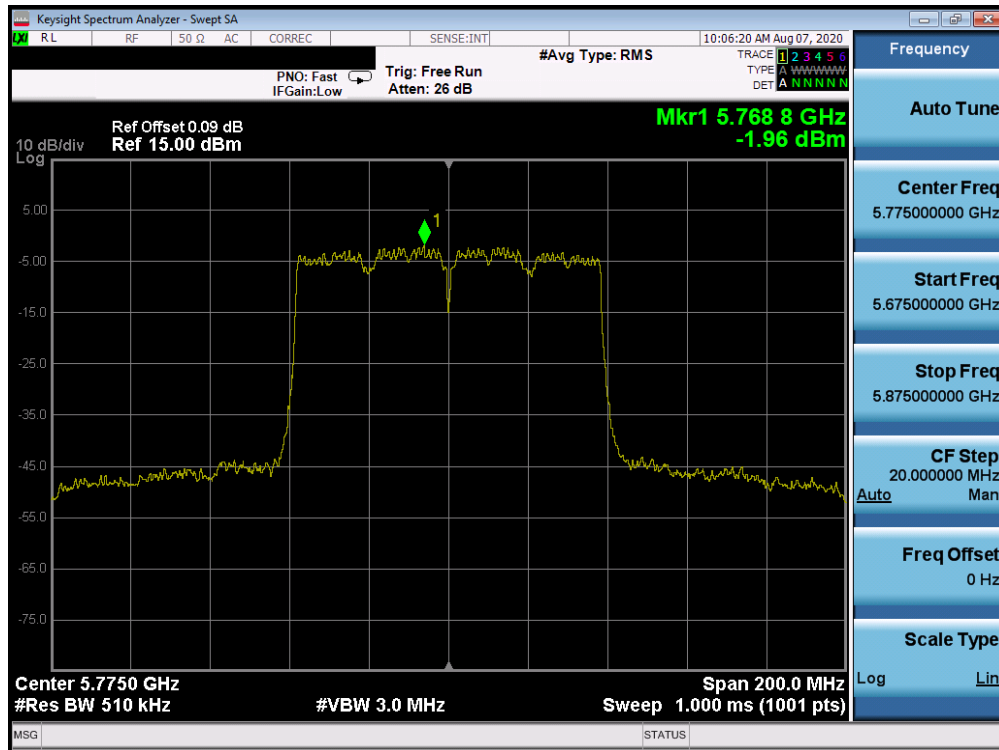


Plot 7-79. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 3) – Ch. 151)



Plot 7-80. Power Spectral Density Plot ANT WF8 (40MHz BW 802.11n (UNII Band 3) – Ch. 159)

FCC ID: BCGA2316	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 72 of 208



Plot 7-81. Power Spectral Density Plot ANT WF8 (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 73 of 208

Antenna WF7a Power Spectral Density Measurements

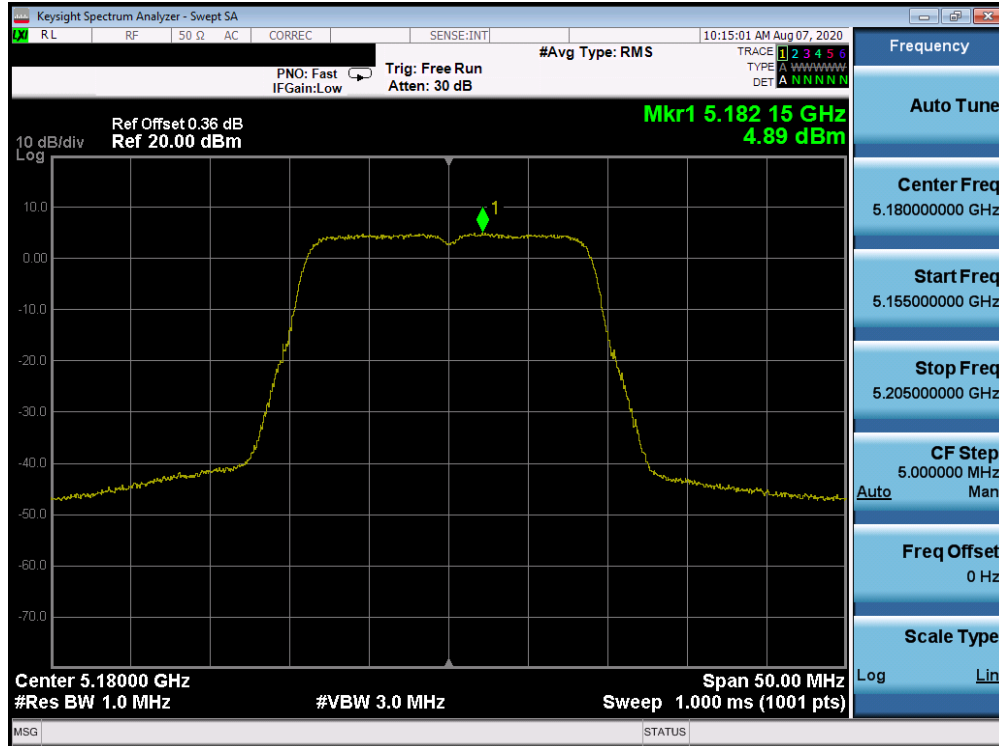
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	4.89	11.0	-6.11
	5200	40	n (20MHz)	65/72.2 (MCS7)	8.22	11.0	-2.78
	5240	48	n (20MHz)	65/72.2 (MCS7)	8.51	11.0	-2.49
	5190	38	n (40MHz)	135/150 (MCS7)	-0.66	11.0	-11.66
	5230	46	n (40MHz)	135/150 (MCS7)	5.18	11.0	-5.82
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-4.98	11.0	-15.98
Band 2A	5260	52	n (20MHz)	65/72.2 (MCS7)	8.31	11.0	-2.69
	5280	56	n (20MHz)	65/72.2 (MCS7)	8.43	11.0	-2.57
	5320	64	n (20MHz)	65/72.2 (MCS7)	3.45	11.0	-7.55
	5270	54	n (40MHz)	135/150 (MCS7)	5.28	11.0	-5.72
	5310	62	n (40MHz)	135/150 (MCS7)	-0.23	11.0	-11.23
	5290	58	ac (80MHz)	390/433.3 (MCS9)	-4.03	11.0	-15.03
Band 2C	5500	100	n (20MHz)	65/72.2 (MCS7)	4.16	11.0	-6.84
	5580	116	n (20MHz)	65/72.2 (MCS7)	8.39	11.0	-2.61
	5720	144	n (20MHz)	65/72.2 (MCS7)	8.16	11.0	-2.84
	5510	102	n (40MHz)	135/150 (MCS7)	-0.40	11.0	-11.40
	5550	110	n (40MHz)	135/150 (MCS7)	3.43	11.0	-7.57
	5710	142	n (40MHz)	135/150 (MCS7)	6.45	11.0	-4.55
	5530	106	ac (80MHz)	390/433.3 (MCS9)	-4.11	11.0	-15.11
	5690	138	ac (80MHz)	390/433.3 (MCS9)	4.34	11.0	-6.66

Table 7-29. Power Spectral Density Measurements ANT WF7a

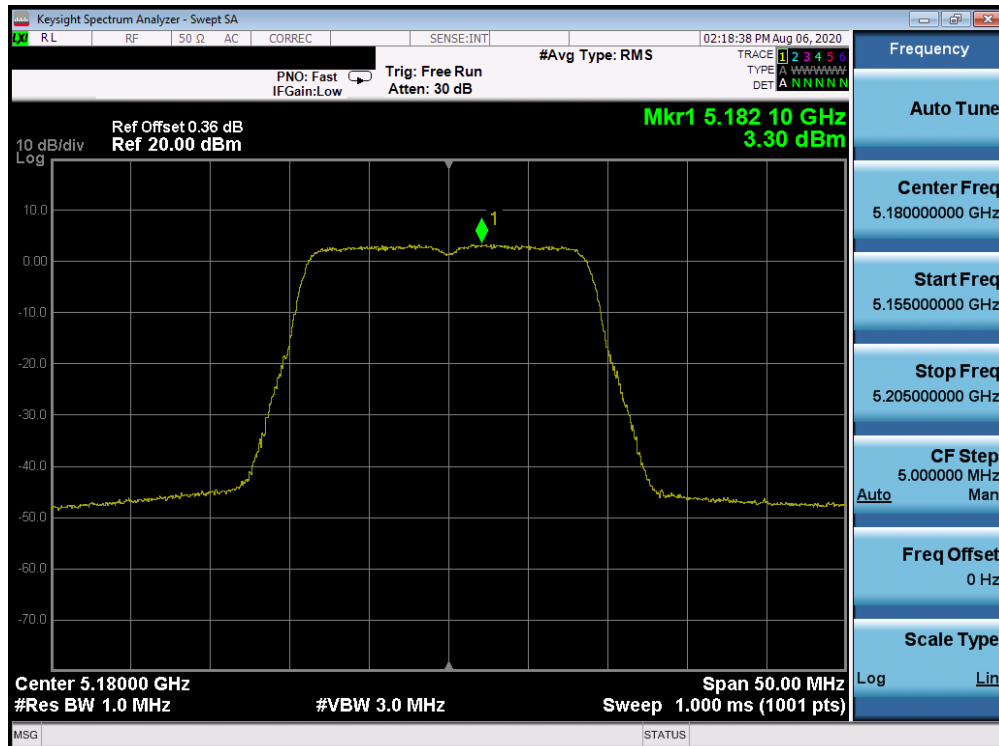
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm/MHz]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	ISED Max e.i.r.p. Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	n (20MHz)	65/72.2 (MCS7)	3.30	2.70	6.00	10.0	-4.00
	5200	40	n (20MHz)	65/72.2 (MCS7)	3.54	2.70	6.24	10.0	-3.76
	5240	48	n (20MHz)	65/72.2 (MCS7)	3.71	2.70	6.41	10.0	-3.59
	5190	38	n (40MHz)	135/150 (MCS7)	-0.66	2.70	2.04	10.0	-7.96
	5230	46	n (40MHz)	135/150 (MCS7)	5.18	2.70	7.88	10.0	-2.12
	5210	42	ac (80MHz)	390/433.3 (MCS9)	-4.98	2.70	-2.28	10.0	-12.28

Table 7-30. Band 1 e.i.r.p. Power Spectral Density Measurements (ISED) ANT WF7a

FCC ID: BCGA2316		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 74 of 208

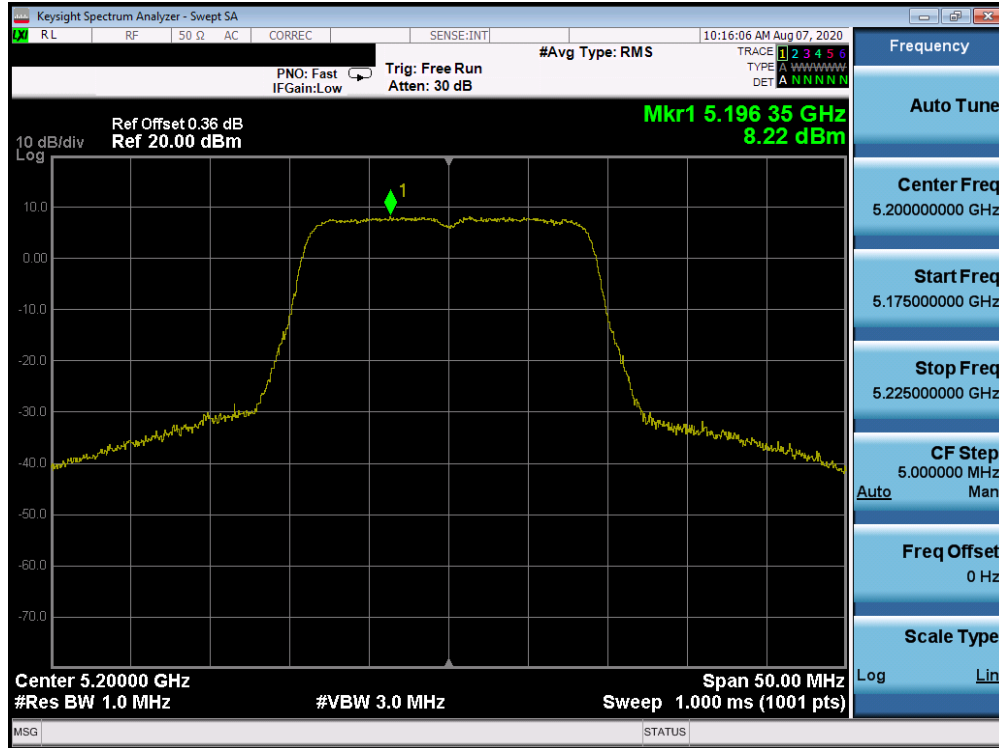


Plot 7-82. Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

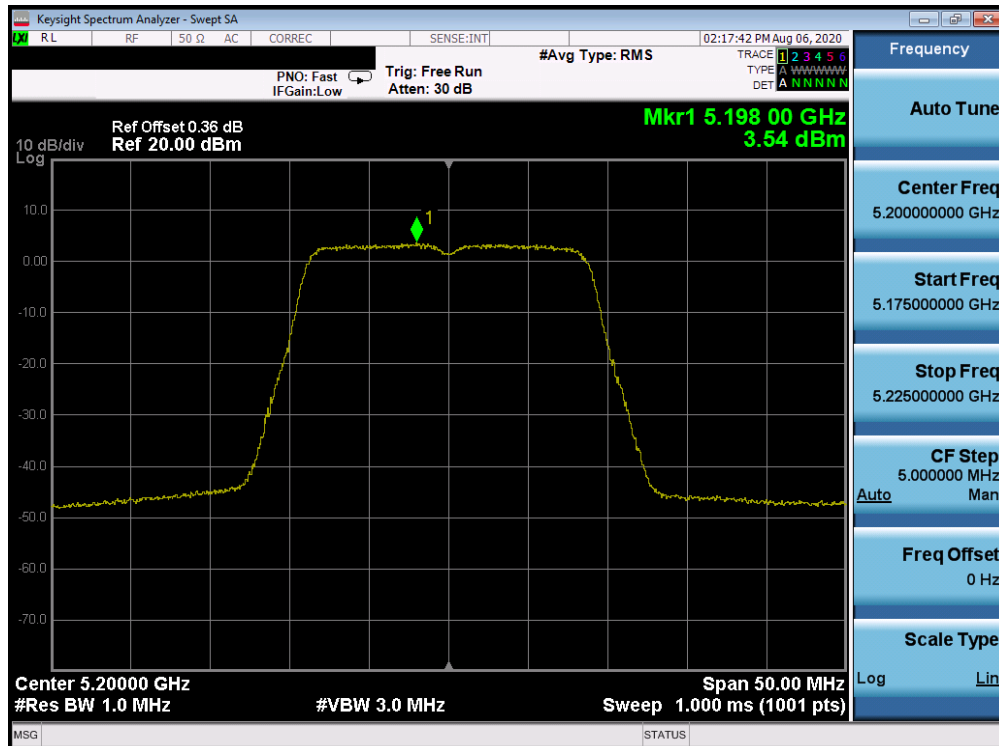


Plot 7-83. ISD Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 75 of 208

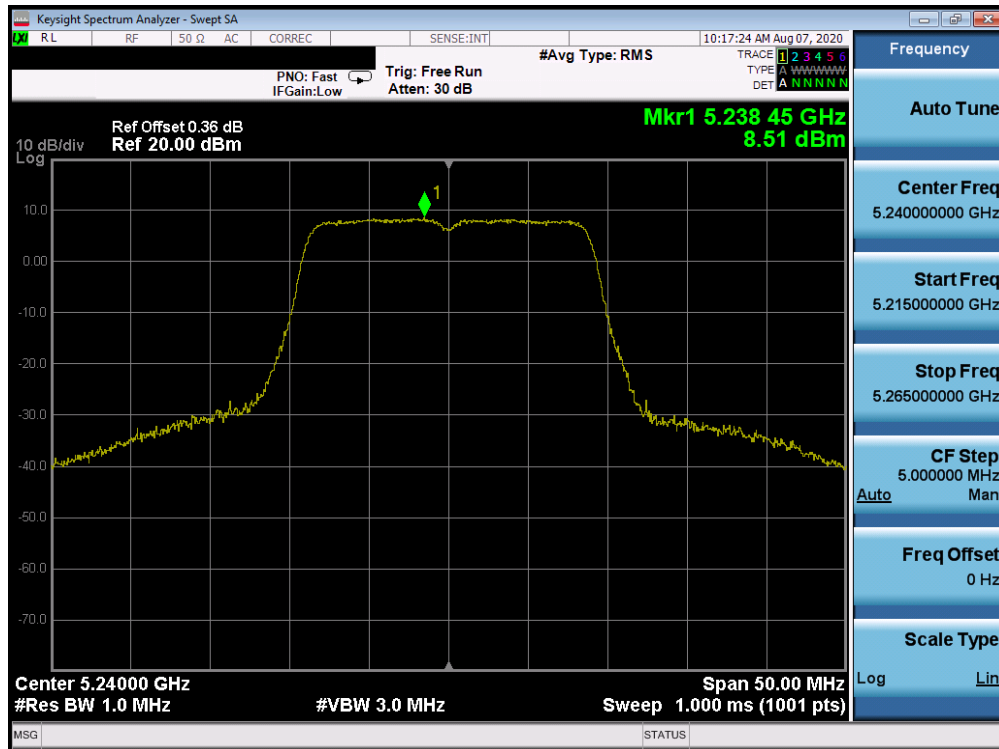


Plot 7-84. Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

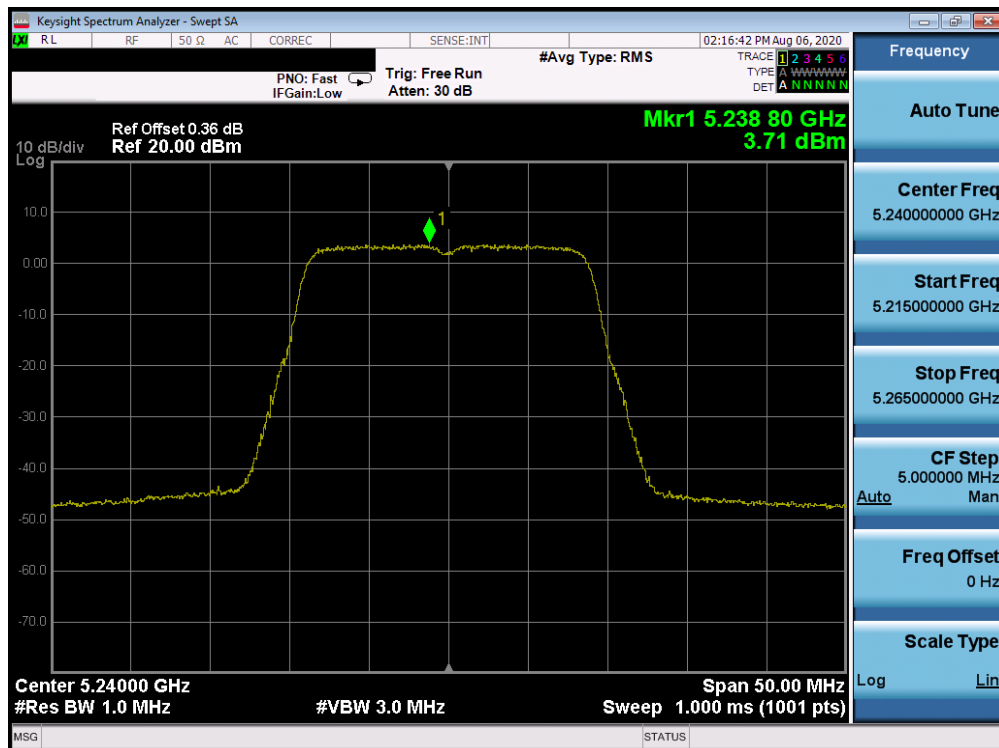


Plot 7-85. ISD Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 40)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 76 of 208

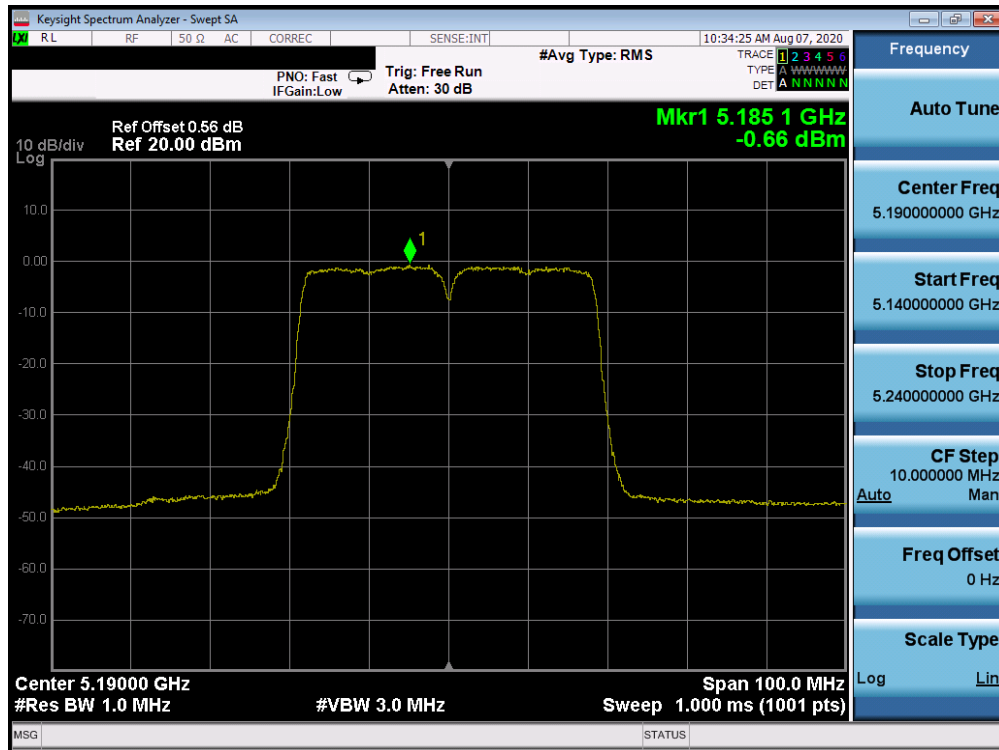


Plot 7-86. Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

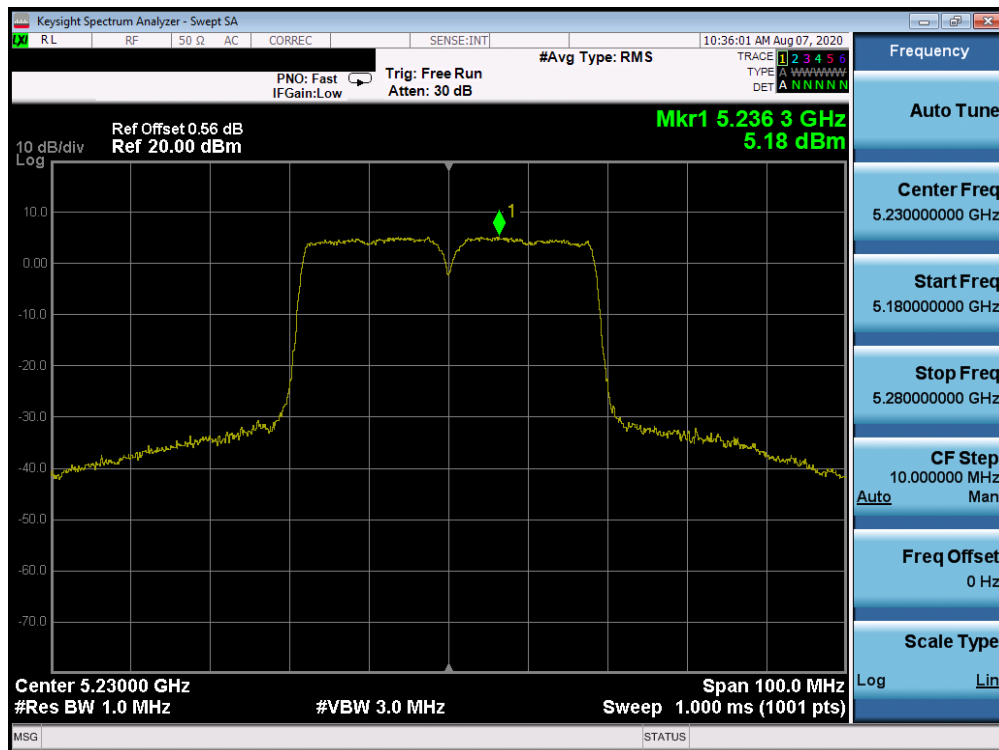


Plot 7-87. ISSED Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 77 of 208

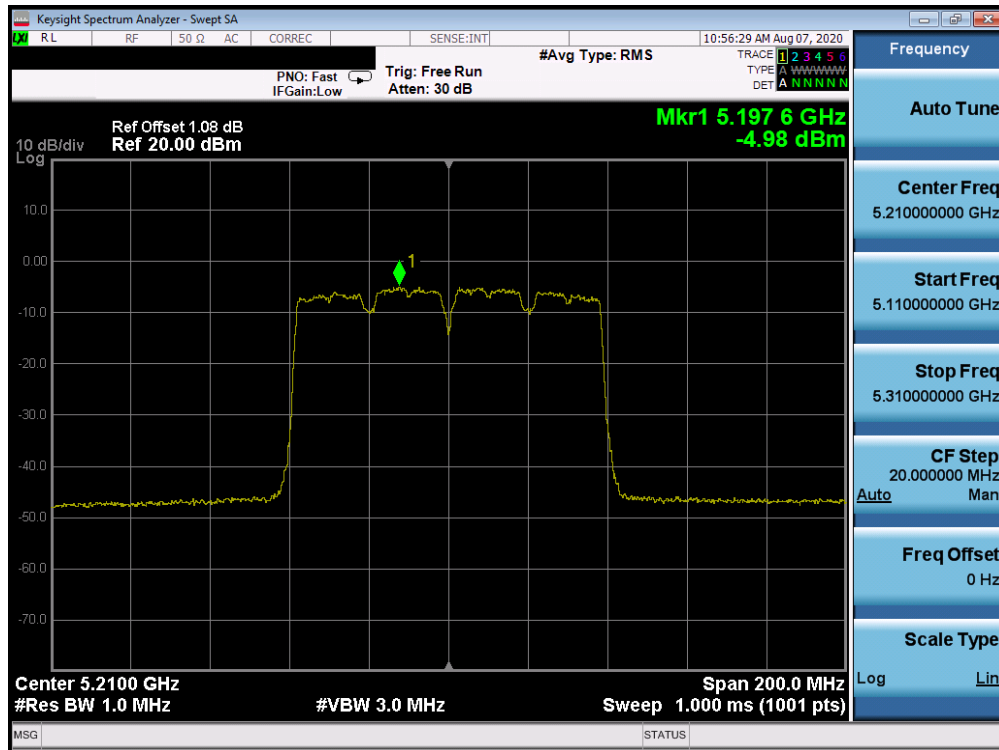


Plot 7-88. Power Spectral Density Plot ANT WF7a (40MHz BW 802.11n (UNII Band 1) – Ch. 38)

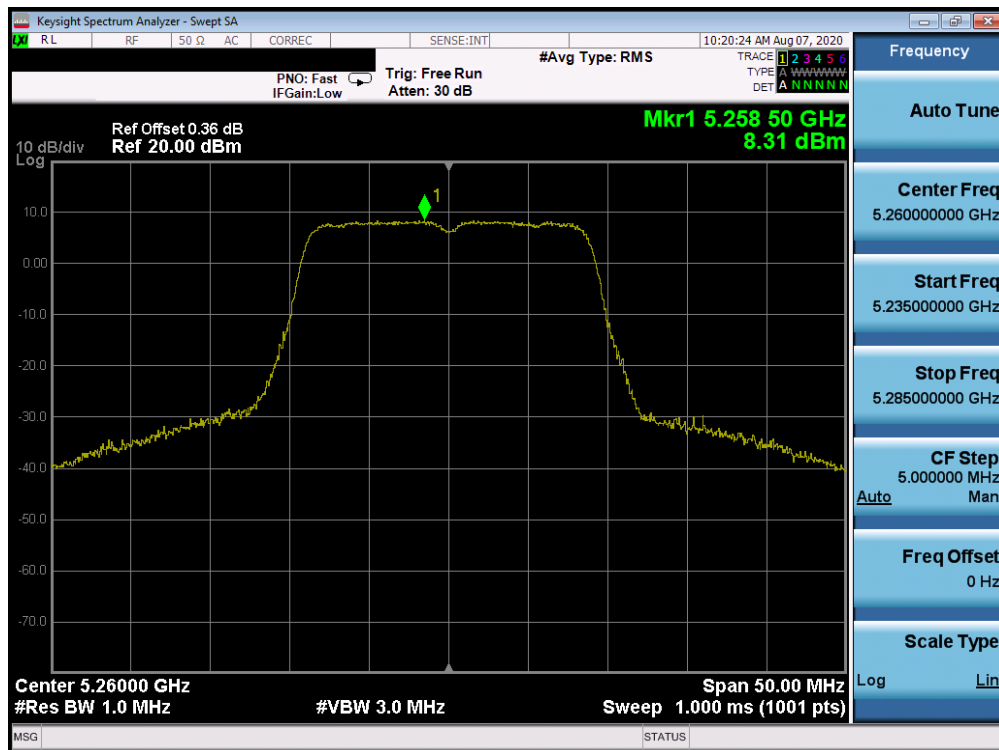


Plot 7-89. Power Spectral Density Plot ANT WF7a (40MHz BW 802.11n (UNII Band 1) – Ch. 46)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 78 of 208

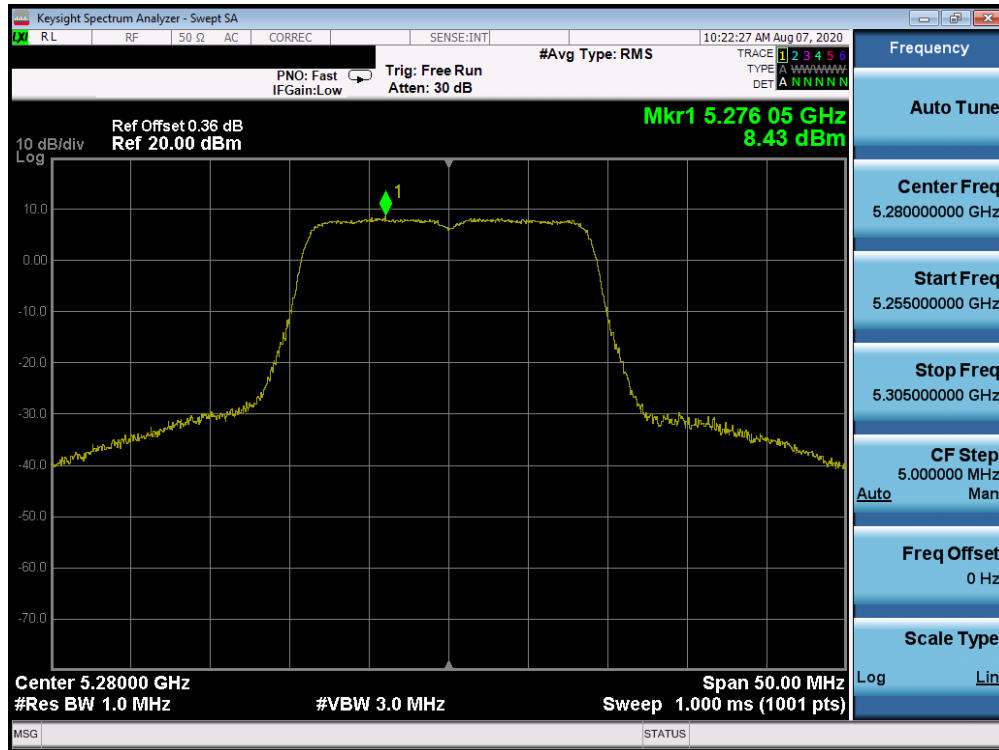


Plot 7-90. Power Spectral Density Plot ANT WF7a (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

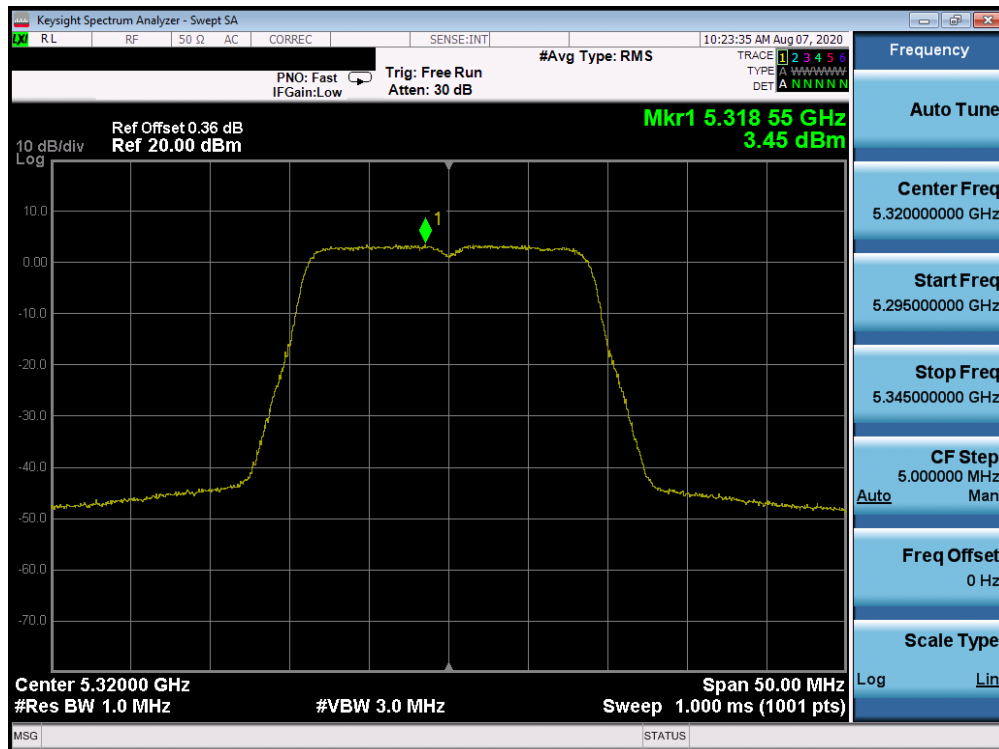


Plot 7-91. Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 79 of 208

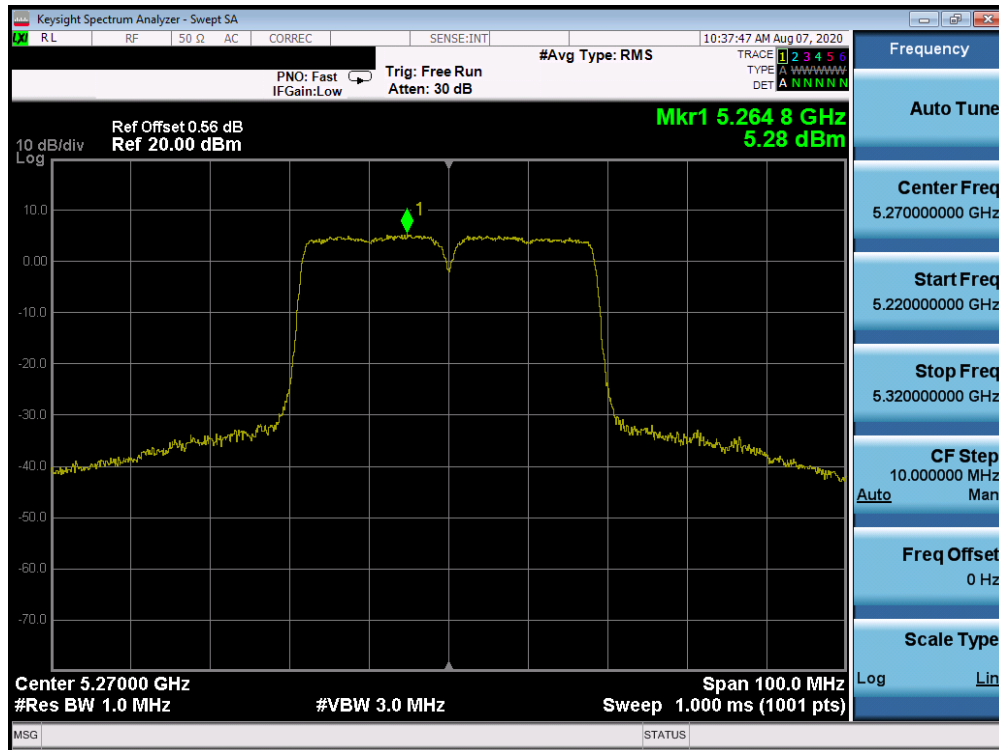


Plot 7-92. Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

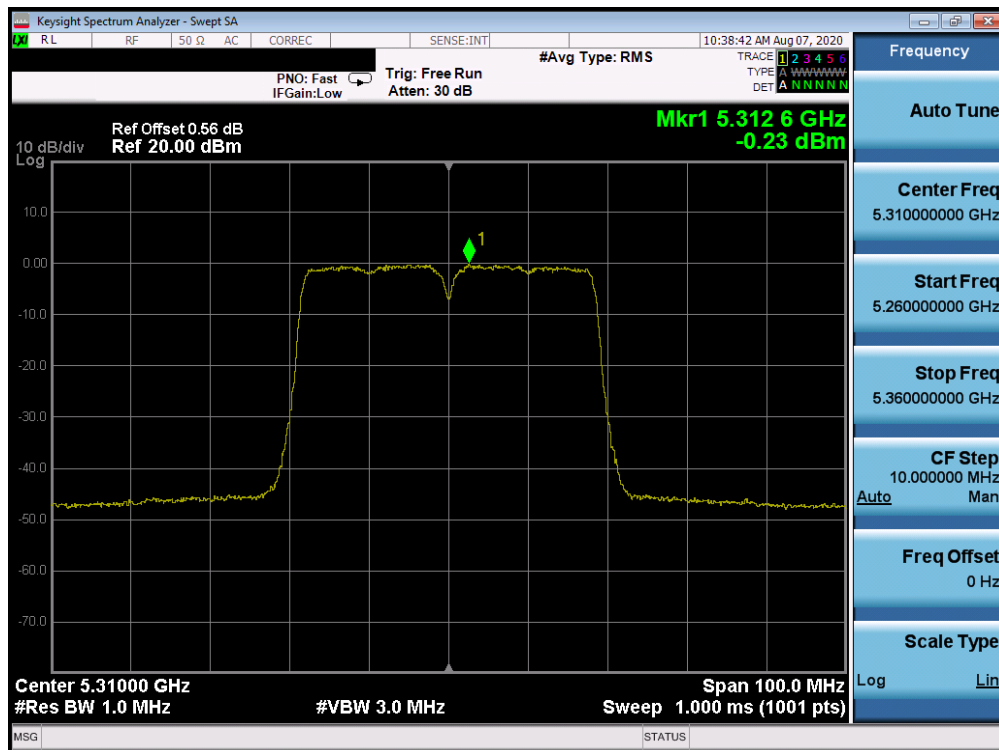


Plot 7-93. Power Spectral Density Plot ANT WF7a (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 80 of 208



Plot 7-94. Power Spectral Density Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)



Plot 7-95. Power Spectral Density Plot ANT WF7a (40MHz BW 802.11n (UNII Band 2A) – Ch. 62)

FCC ID: BCGA2316	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270028-08-R1.BCG	Test Dates: 6/15/2020 - 08/14/2020	EUT Type: Tablet Device	Page 81 of 208