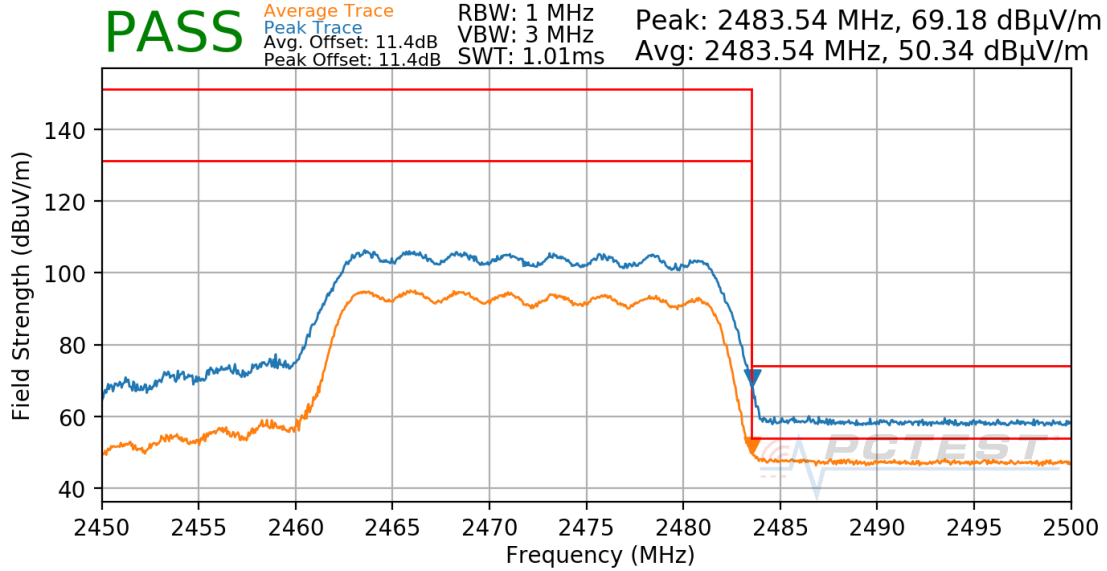
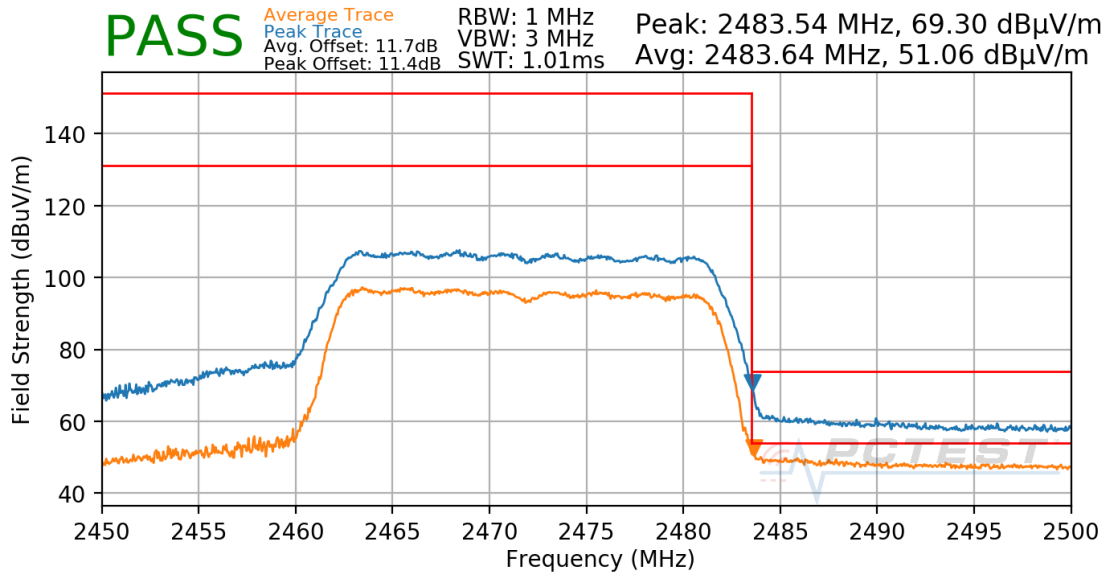


Mode: 802.11n
 Data Rate: MCS8
 Distance of Measurements: 3 Meters
 Operating Frequency: 2472MHz
 Channel: 13



Plot 7-94. Radiated Restricted Upper Band Edge Measurement CDD

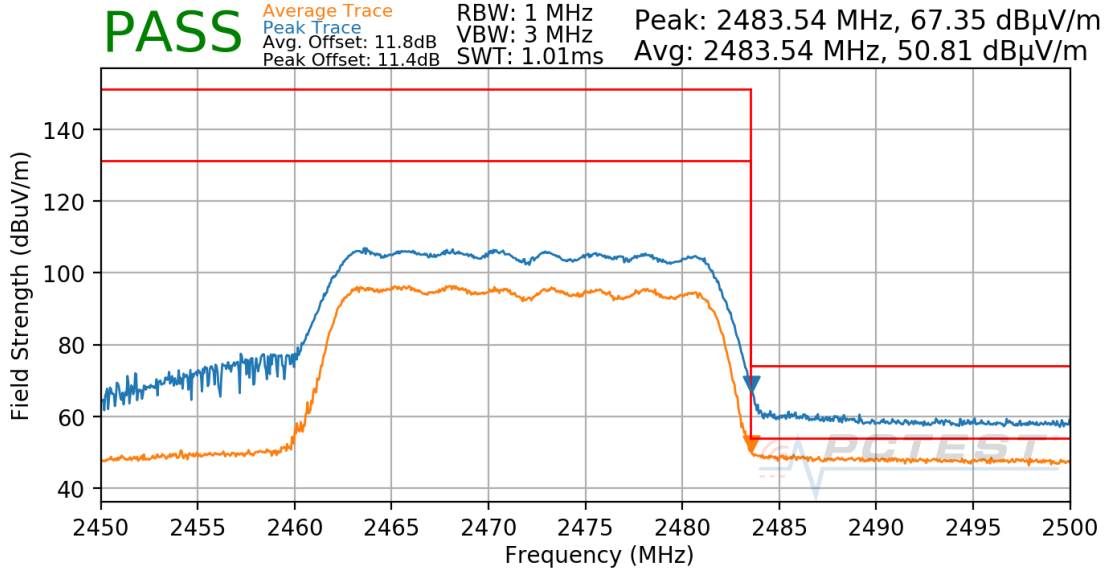
Mode: 802.11n
 Data Rate: MCS11
 Distance of Measurements: 3 Meters
 Operating Frequency: 2472MHz
 Channel: 13



Plot 7-95. Radiated Restricted Upper Band Edge Measurement CDD

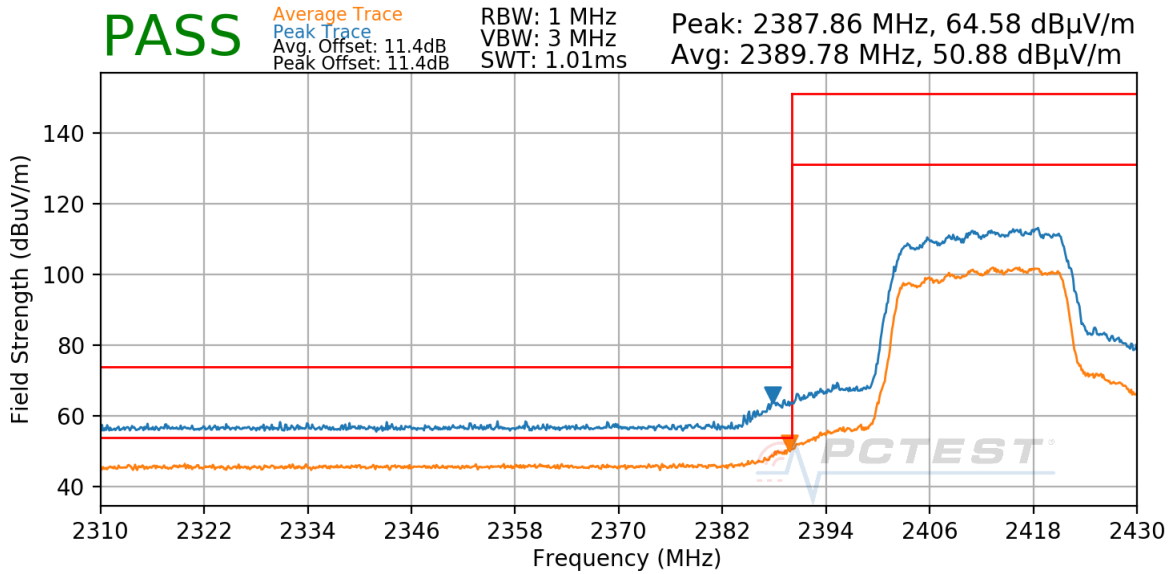
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 71 of 86

Mode: 802.11n
 Data Rate: MCS15
 Distance of Measurements: 3 Meters
 Operating Frequency: 2472MHz
 Channel: 13



Plot 7-96. Radiated Restricted Upper Band Edge Measurement CDD

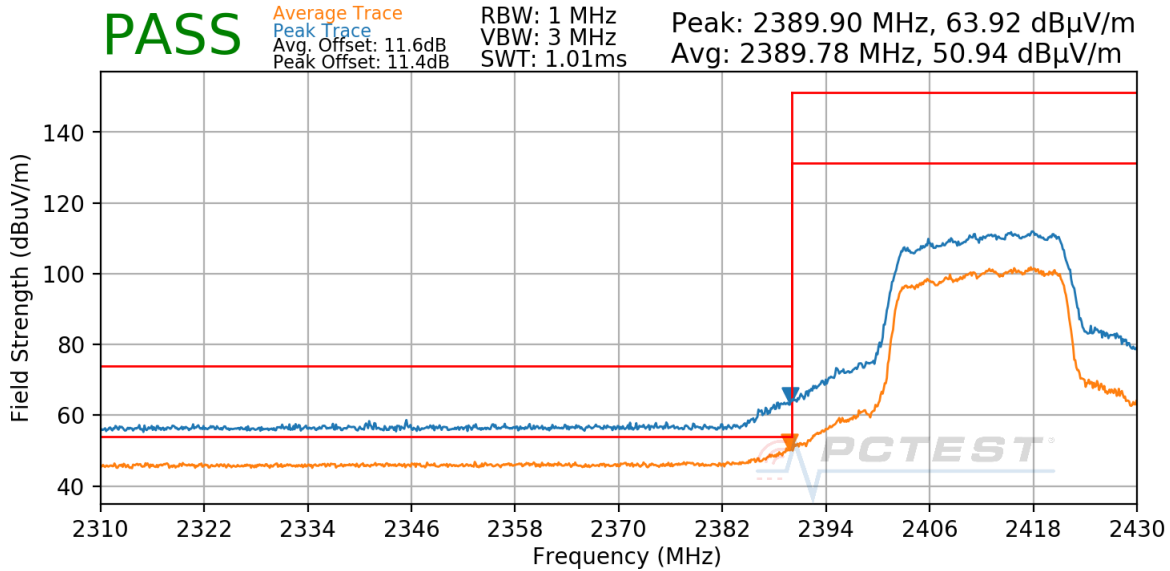
Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2412MHz
 Channel: 1



Plot 7-97. Radiated Restricted Lower Band Edge Measurement CDD

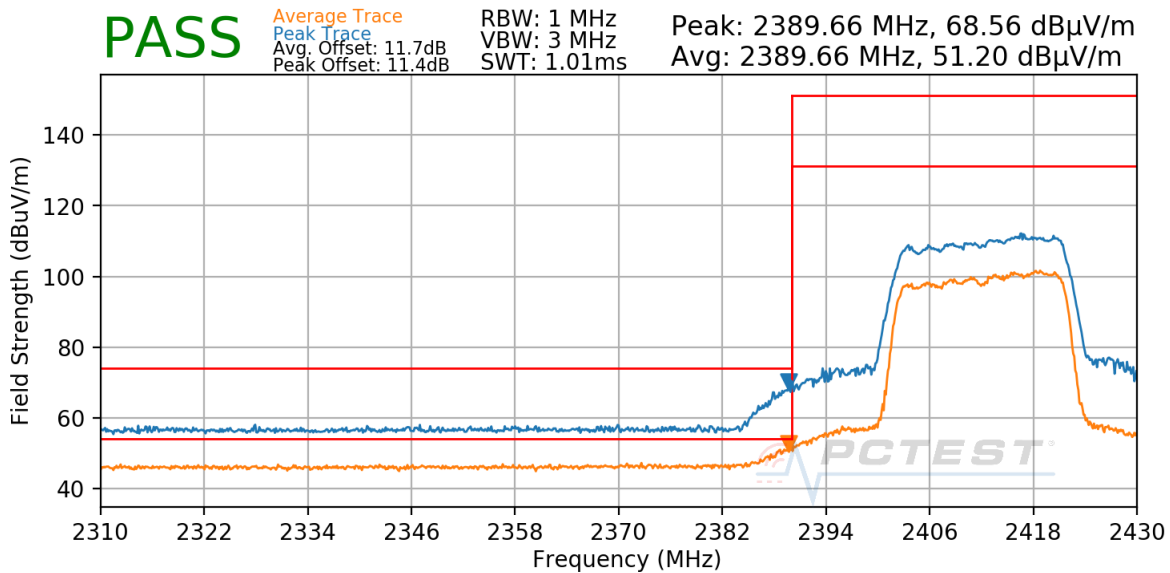
FCC ID: BCGA2459 IC: 579C-A2459		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 72 of 86

Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2412MHz
 Channel: 1



Plot 7-98. Radiated Restricted Lower Band Edge Measurement CDD

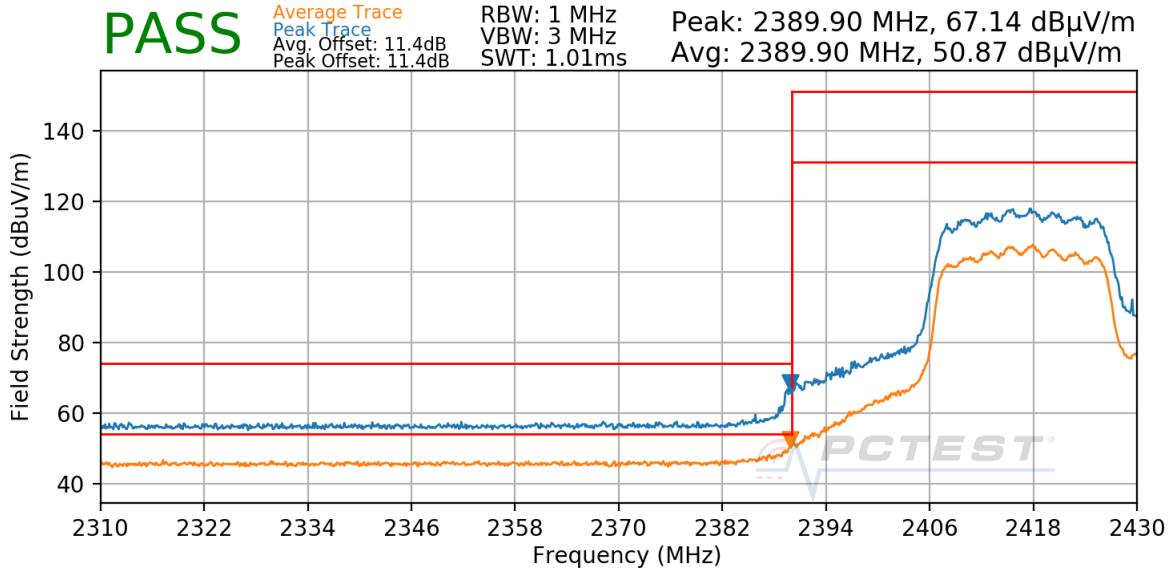
Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2412MHz
 Channel: 1



Plot 7-99. Radiated Restricted Lower Band Edge Measurement CDD

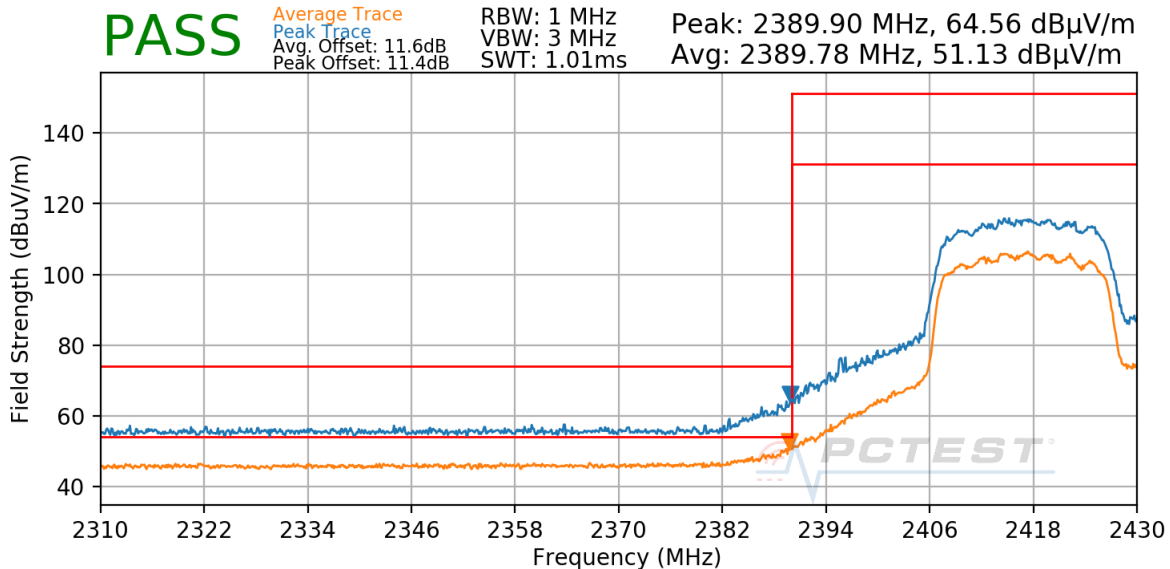
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 73 of 86

Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2417MHz
 Channel: 2



Plot 7-100. Radiated Restricted Lower Band Edge Measurement CDD

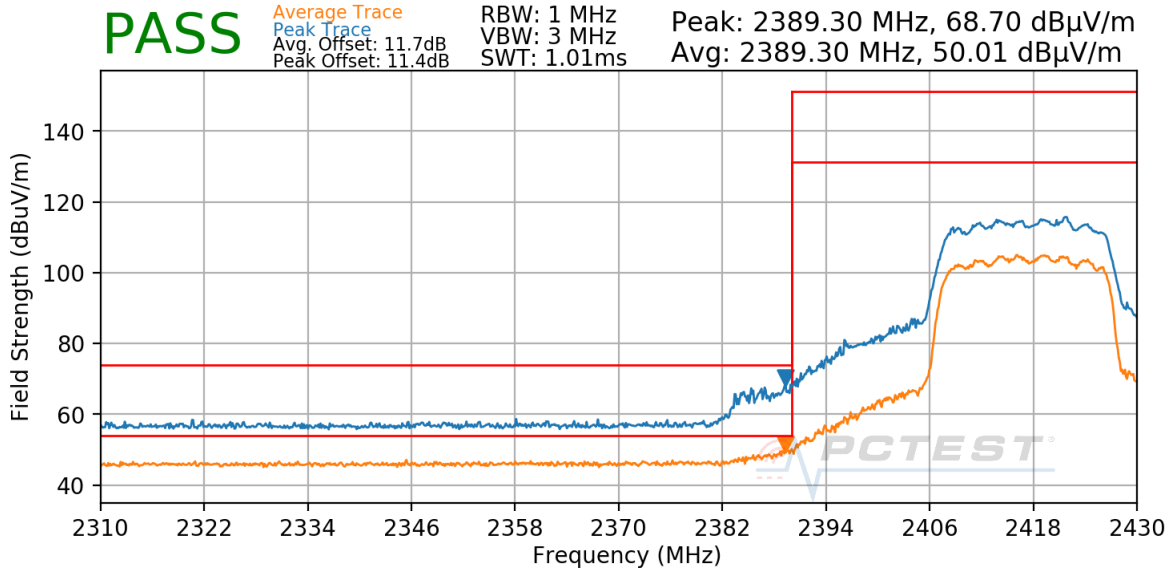
Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2417MHz
 Channel: 2



Plot 7-101. Radiated Restricted Lower Band Edge Measurement CDD

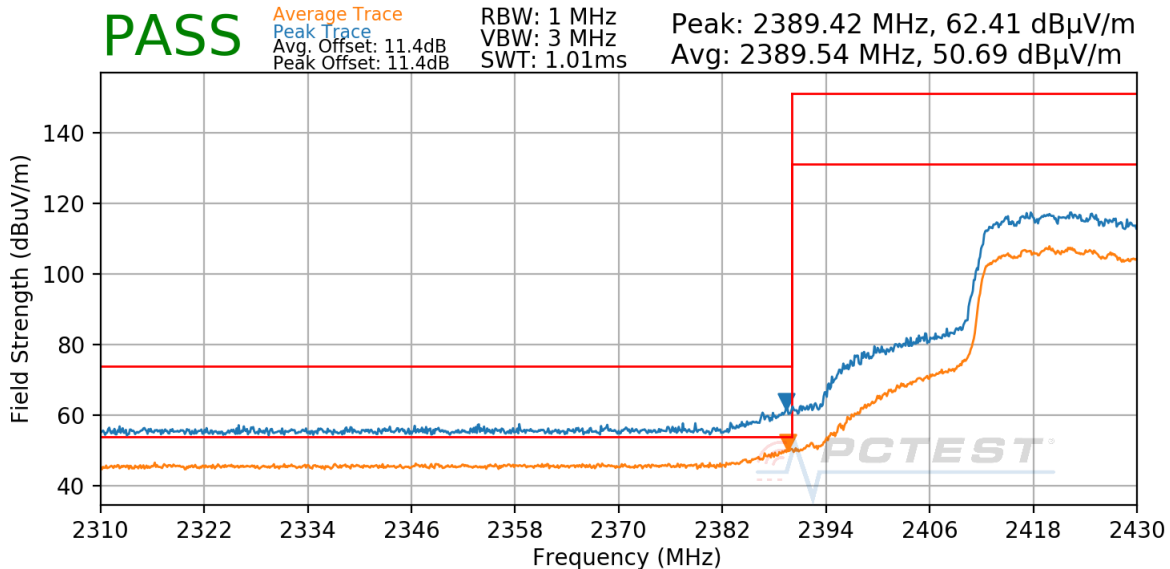
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 74 of 86

Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2417MHz
 Channel: 2



Plot 7-102. Radiated Restricted Lower Band Edge Measurement CDD

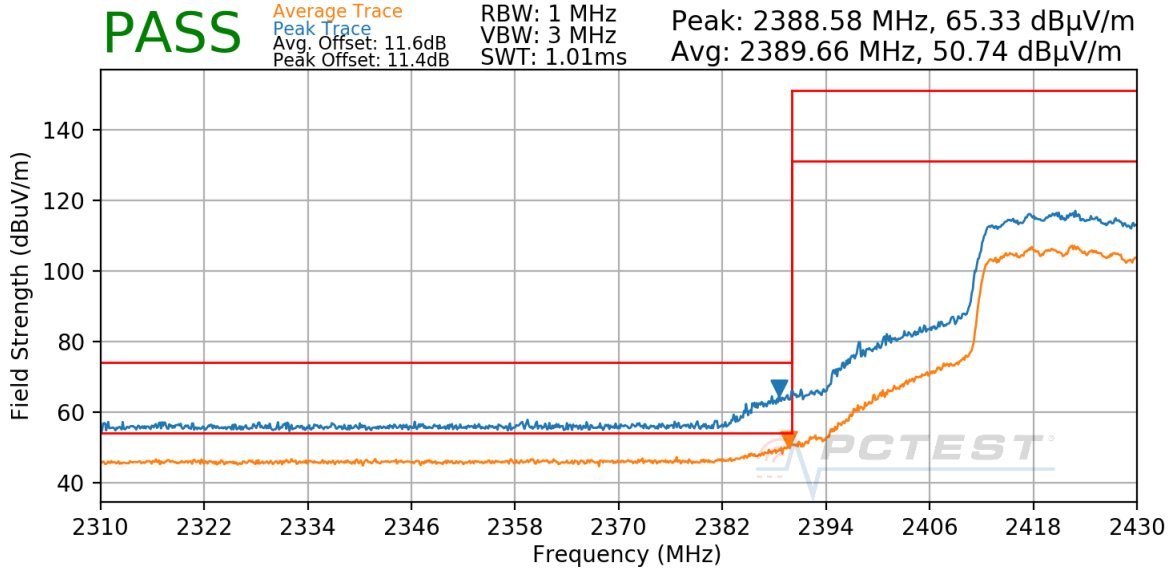
Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2422MHz
 Channel: 3



Plot 7-103. Radiated Restricted Lower Band Edge Measurement CDD

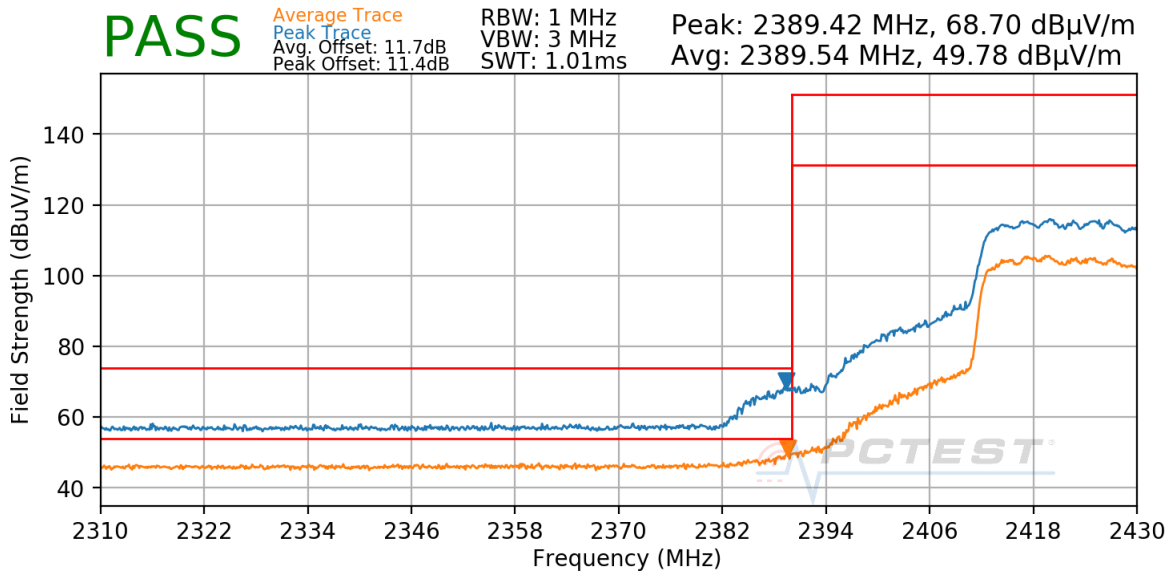
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 75 of 86

Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2422MHz
 Channel: 3



Plot 7-104. Radiated Restricted Lower Band Edge Measurement CDD

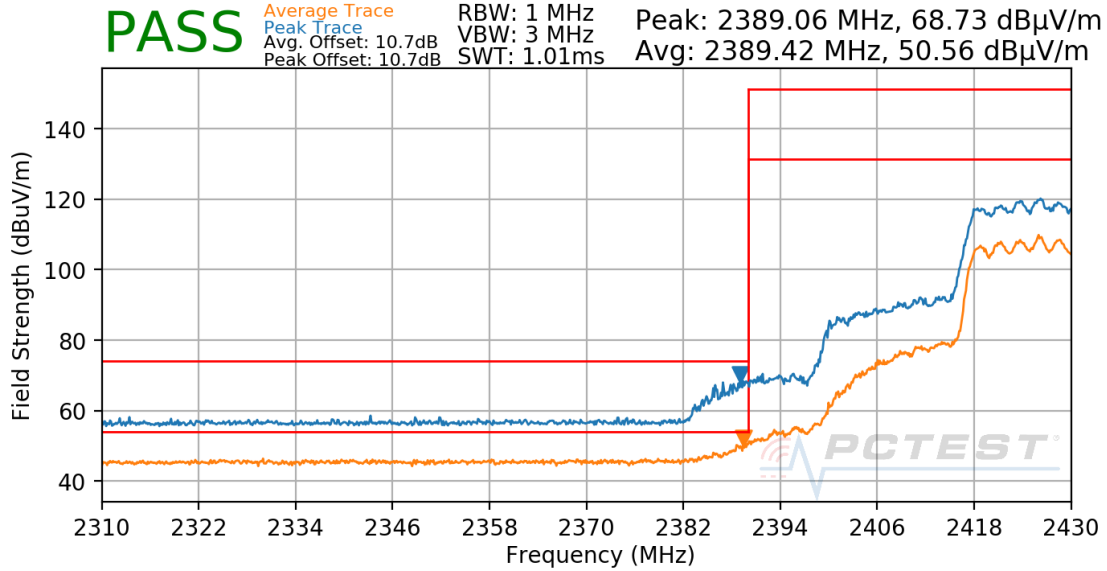
Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2422MHz
 Channel: 3



Plot 7-105. Radiated Restricted Lower Band Edge Measurement CDD

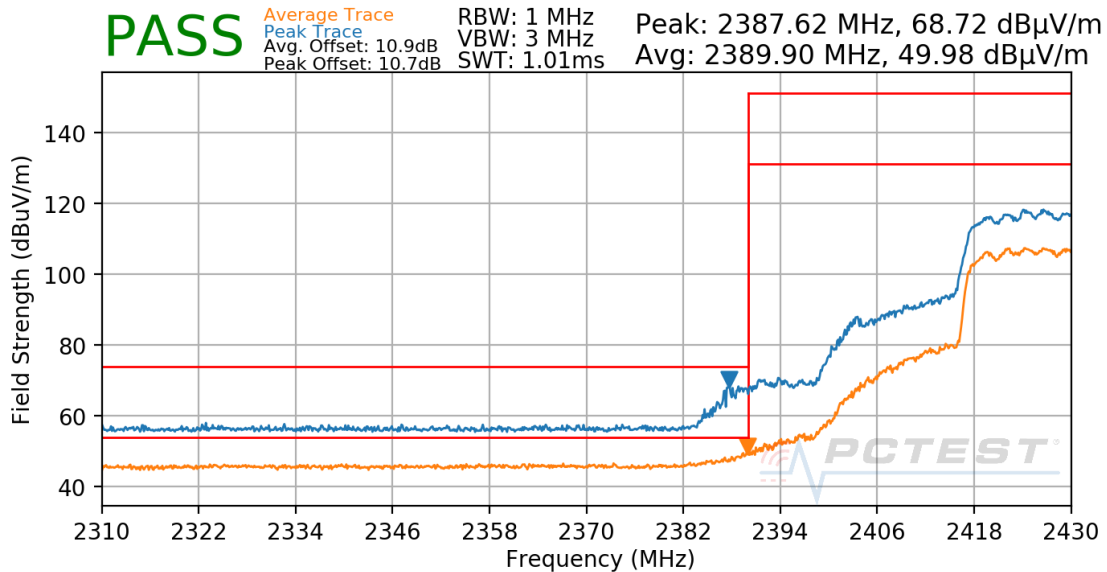
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 76 of 86

Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2427MHz
 Channel: 4



Plot 7-106. Radiated Restricted Lower Band Edge Measurement CDD

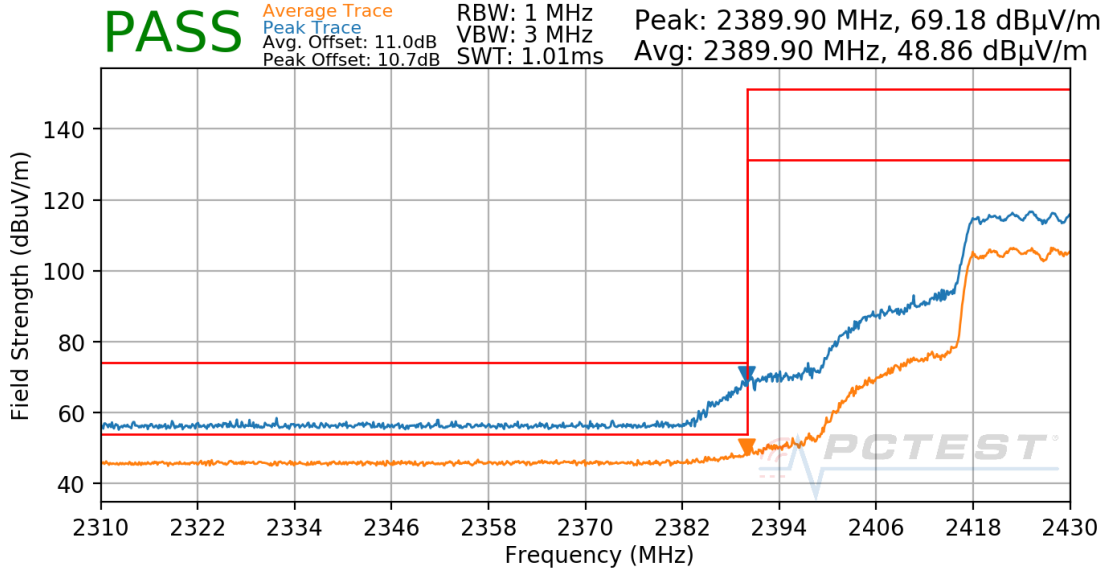
Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2427MHz
 Channel: 4



Plot 7-107. Radiated Restricted Lower Band Edge Measurement CDD

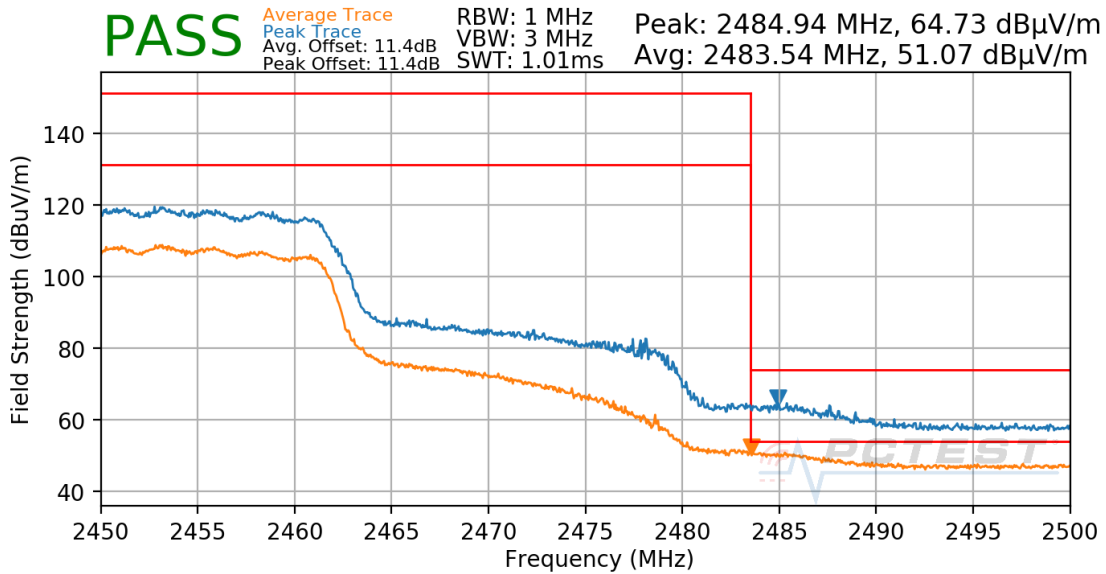
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 77 of 86

Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2427MHz
 Channel: 4



Plot 7-108. Radiated Restricted Lower Band Edge Measurement CDD

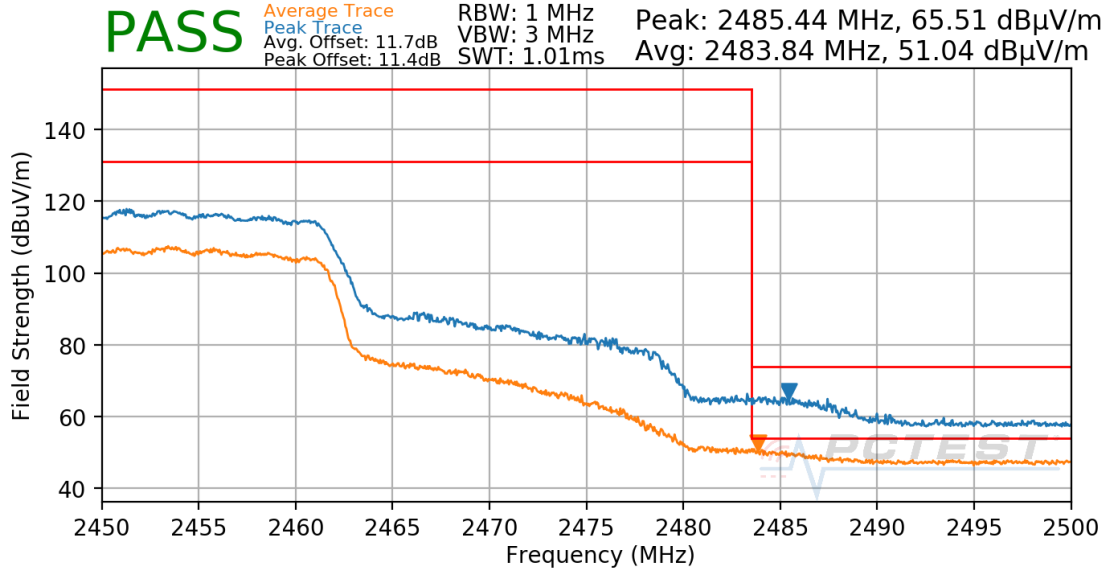
Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2452MHz
 Channel: 9



Plot 7-109. Radiated Restricted Upper Band Edge Measurement CDD

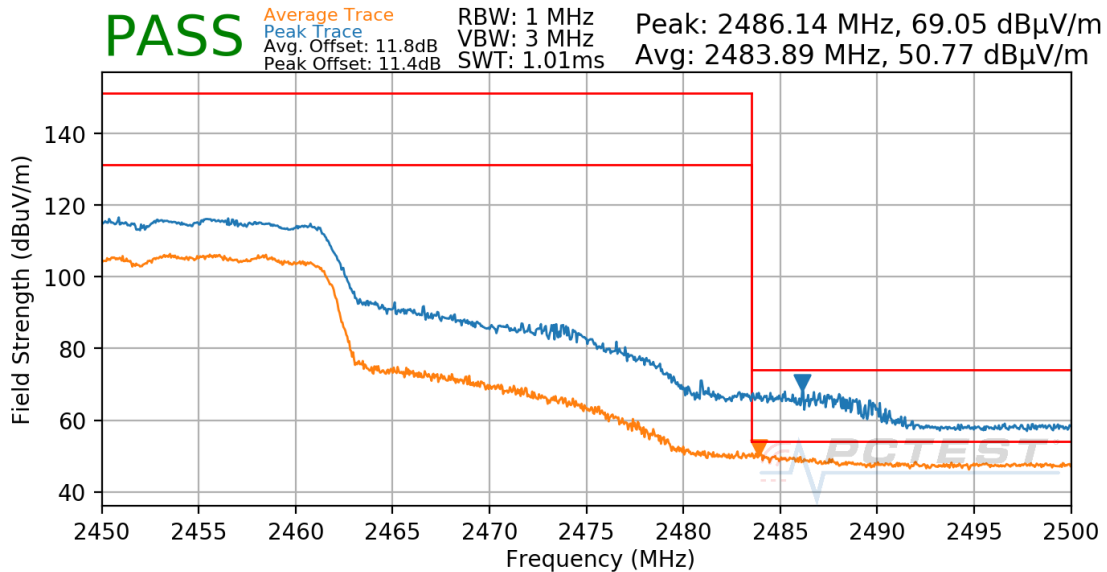
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 78 of 86

Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2452MHz
 Channel: 9



Plot 7-110. Radiated Restricted Upper Band Edge Measurement CDD

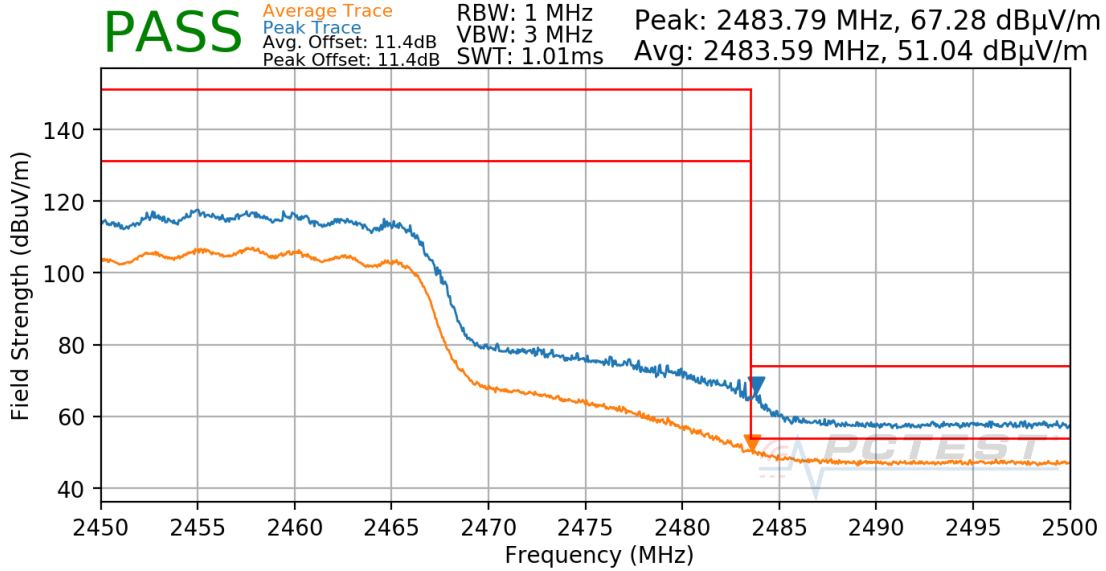
Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2452MHz
 Channel: 9



Plot 7-111. Radiated Restricted Upper Band Edge Measurement CDD

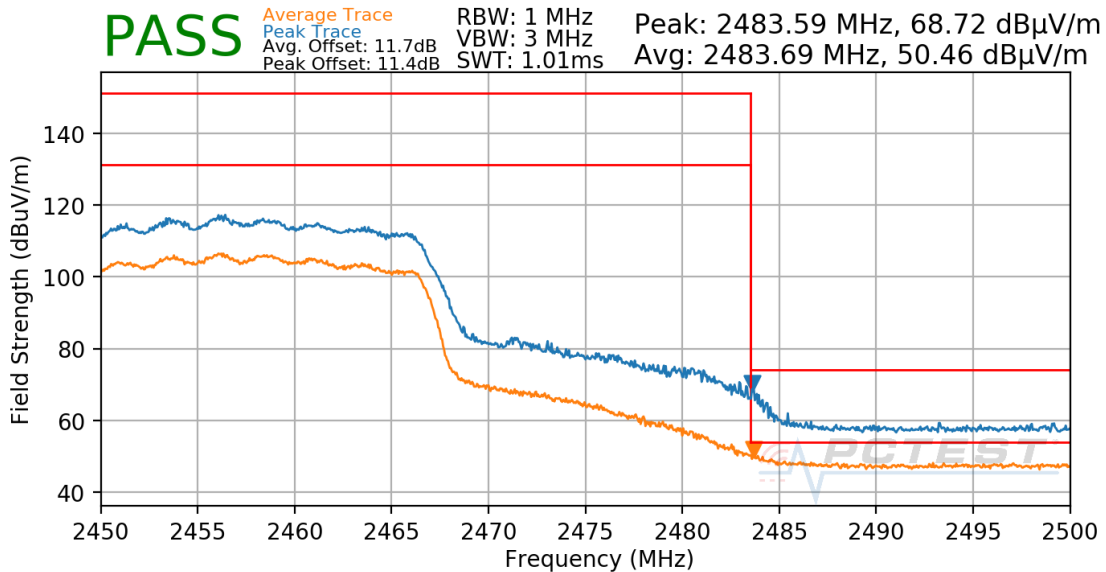
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 79 of 86

Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2457MHz
 Channel: 10



Plot 7-112. Radiated Restricted Upper Band Edge Measurement CDD

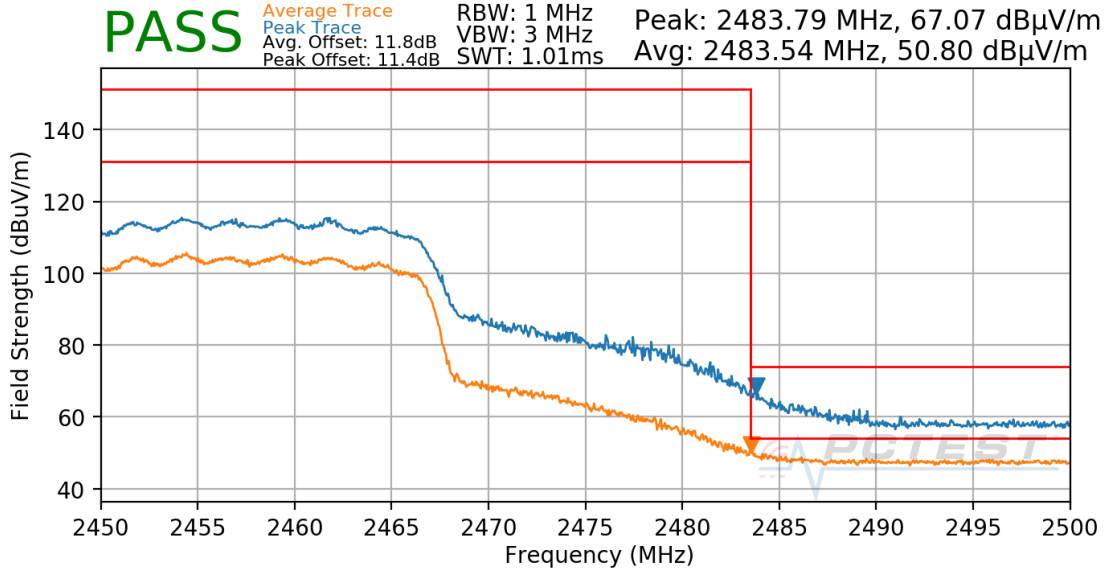
Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2457MHz
 Channel: 10



Plot 7-113. Radiated Restricted Upper Band Edge Measurement CDD

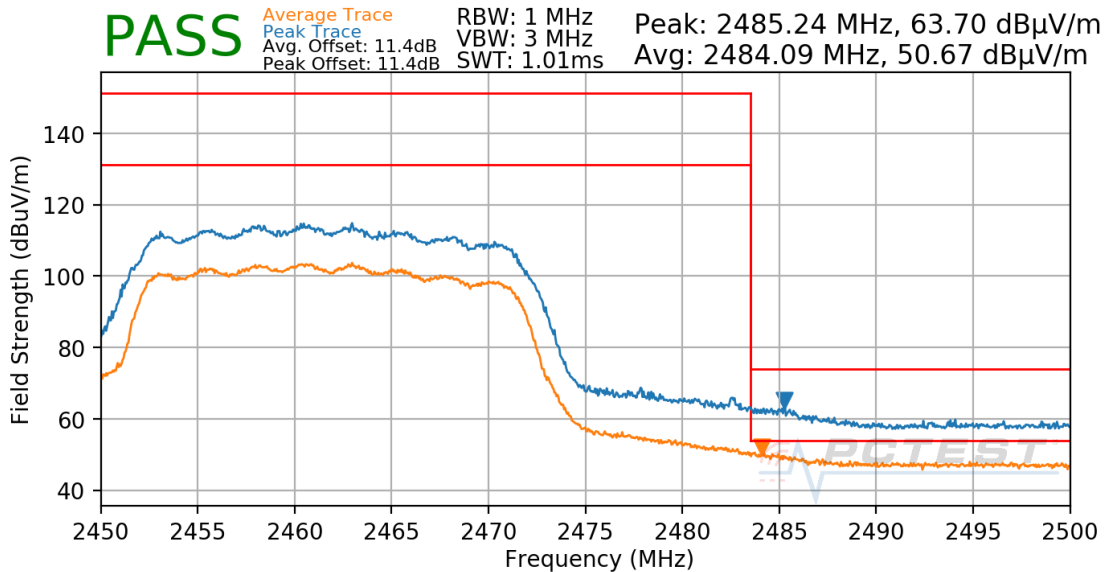
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 80 of 86

Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2457MHz
 Channel: 10



Plot 7-114. Radiated Restricted Upper Band Edge Measurement CDD

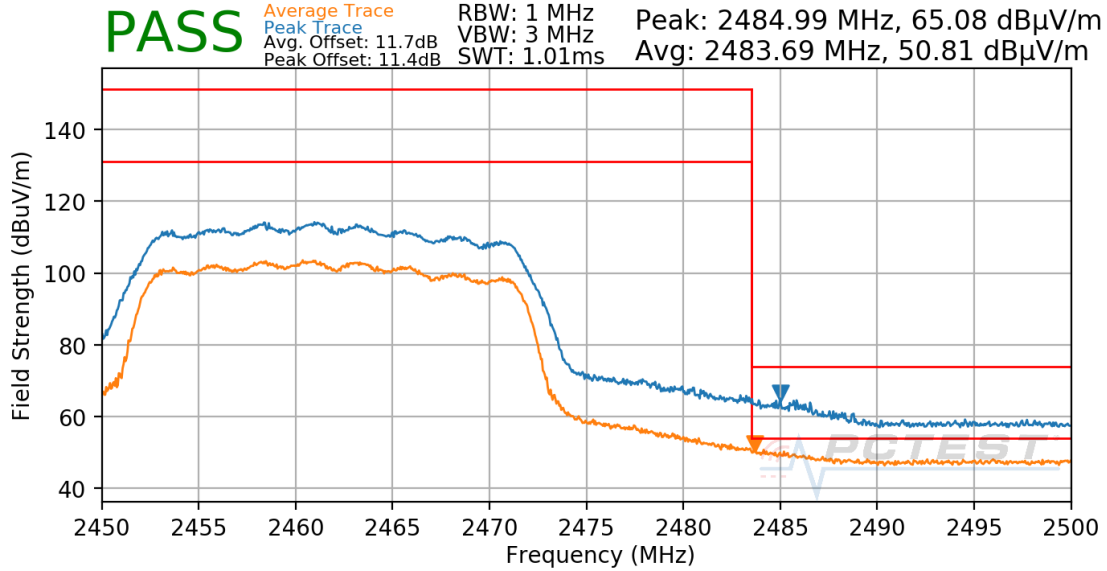
Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2462MHz
 Channel: 11



Plot 7-115. Radiated Restricted Upper Band Edge Measurement CDD

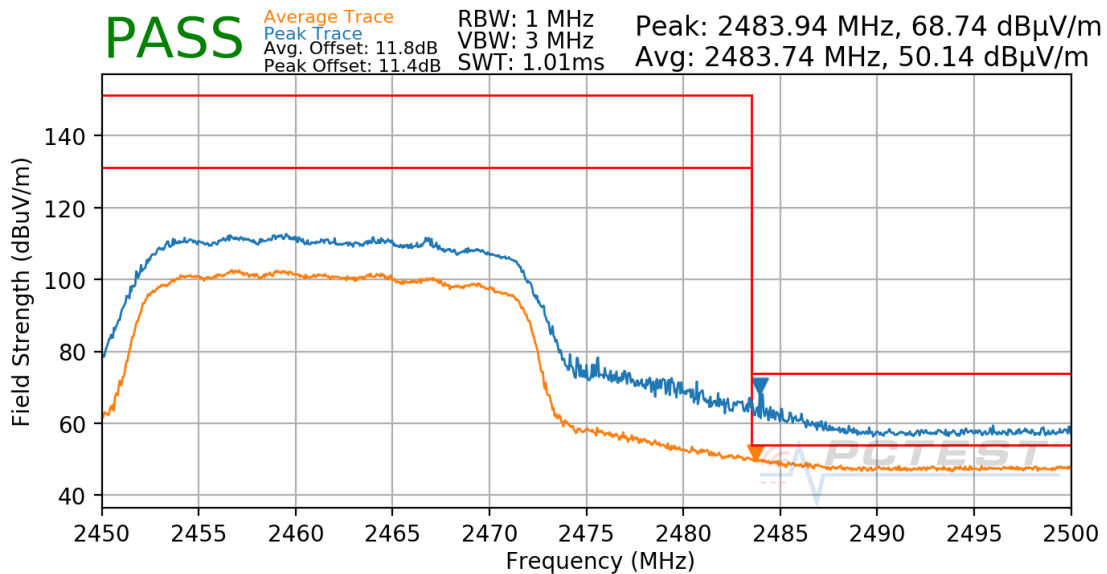
FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 81 of 86

Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2462MHz
 Channel: 11



Plot 7-116. Radiated Restricted Upper Band Edge Measurement CDD

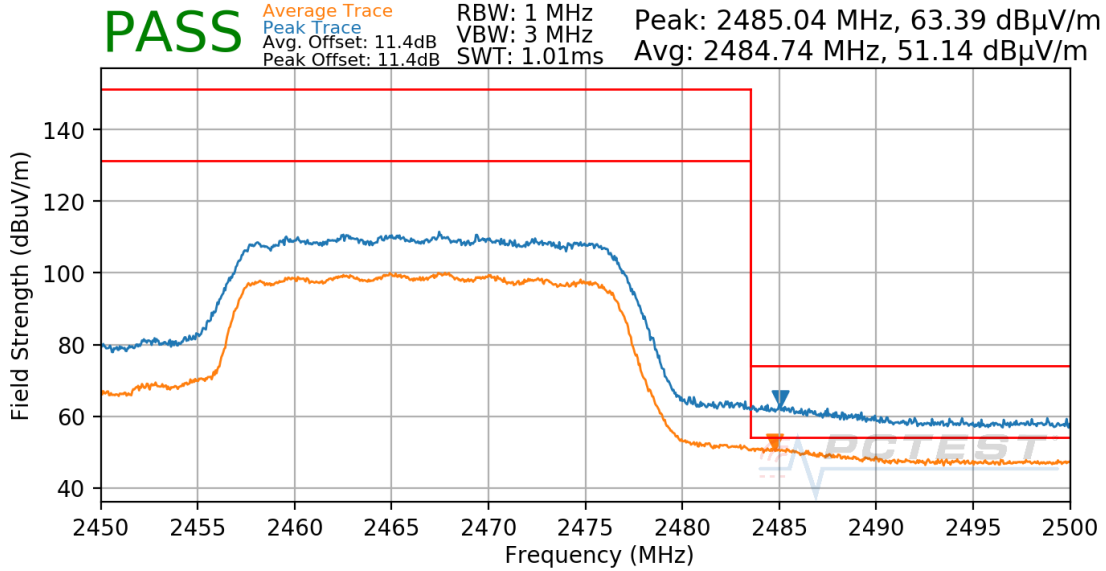
Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2462MHz
 Channel: 11



Plot 7-117. Radiated Restricted Upper Band Edge Measurement CDD

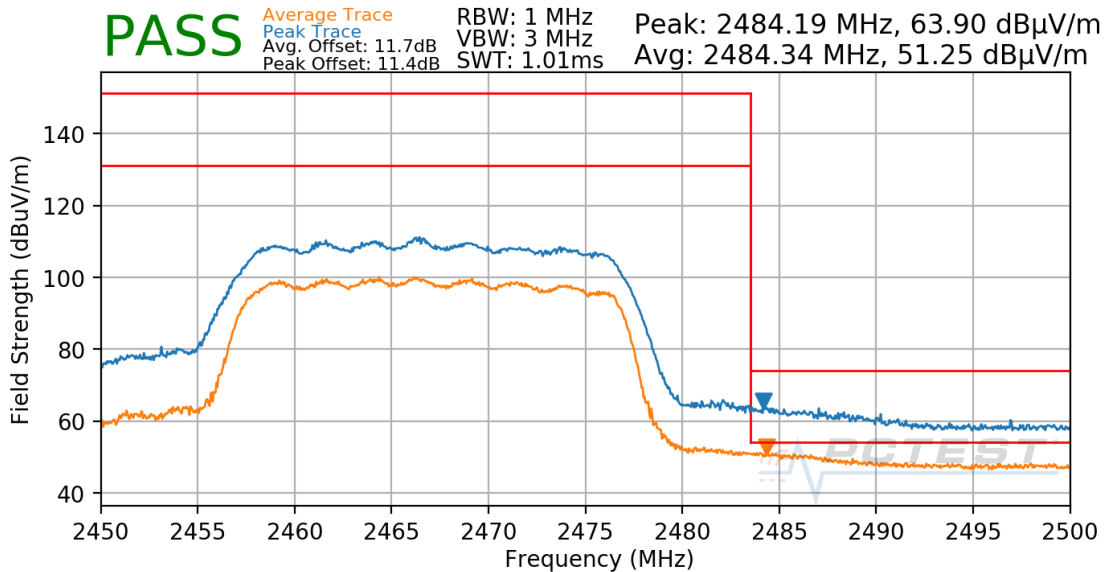
FCC ID: BCGA2459 IC: 579C-A2459		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 82 of 86

Mode: 802.11ax
 Data Rate: MCS0
 Distance of Measurements: 3 Meters
 Operating Frequency: 2467MHz
 Channel: 12



Plot 7-118. Radiated Restricted Upper Band Edge Measurement CDD

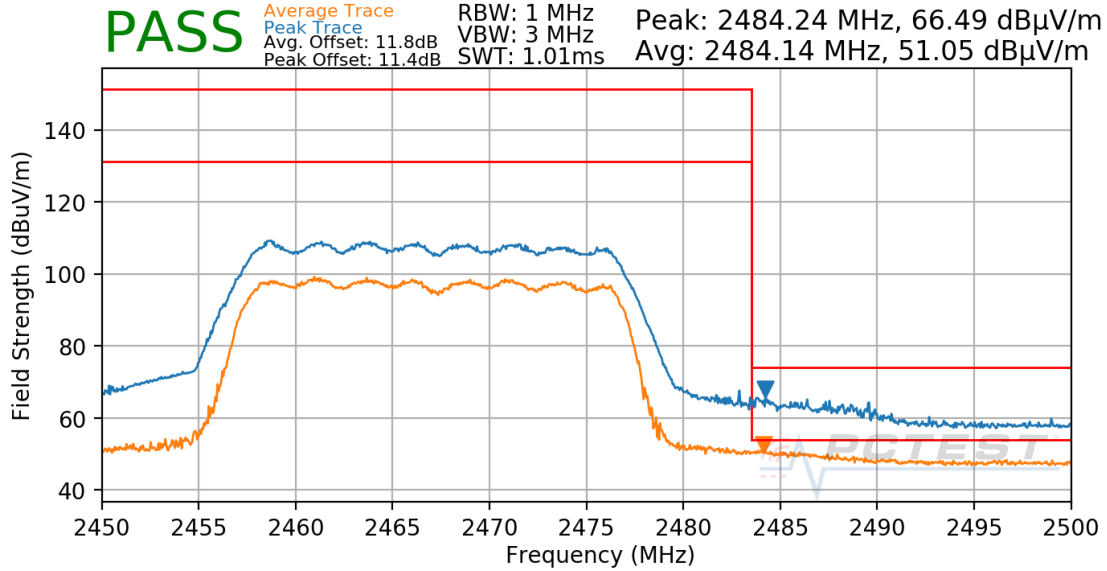
Mode: 802.11ax
 Data Rate: MCS3
 Distance of Measurements: 3 Meters
 Operating Frequency: 2467MHz
 Channel: 12



Plot 7-119. Radiated Restricted Upper Band Edge Measurement CDD

FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 83 of 86

Mode: 802.11ax
 Data Rate: MCS5
 Distance of Measurements: 3 Meters
 Operating Frequency: 2467MHz
 Channel: 12



Plot 7-120. Radiated Restricted Upper Band Edge Measurement CDD

FCC ID: BCGA2459 IC: 579C-A2459	 PCTEST® Proud to be part of element	DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 84 of 86

8.0 CONCLUSION

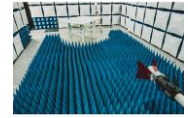
The spot-check data measured for variant model **FCC ID: BCGA2459 / IC: 579C-A2459** is in tolerance with reference model FCC ID: BCGA2301 / IC: 579C-A2301 per FCC/ISED Approved Data Referencing Test Plan. Additionally, Antenna 4a radiated testing has been fully conducted and results were found in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.

FCC ID: BCGA2459 IC: 579C-A2459		DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device	Page 85 of 86

9.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2101020002-09.BCG) from reference model FCC ID: BCGA2301 / IC: 579C-A2301, which includes referenced data results.

FCC ID: BCGA2459 IC: 579C-A2459	 DATA REFERENCE REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020003-10.BCG	Test Dates: 12/12/2020 - 3/19/2021	EUT Type: Tablet Device
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MEASUREMENT REPORT

FCC PART 15.247 / ISED RSS-247 WLAN 802.11b/g/n/ax-SU

Applicant Name:

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

Date of Testing:

12/15/2020 – 3/6/2021

Test Site/Location:

PCTEST Lab. Morgan Hill, CA, USA

Test Report Serial No.:

1C2101020002-09.BCG

FCC ID:	BCGA2301
IC:	579C-A2301
APPLICANT:	Apple Inc.

Application Type:

Certification

Model/HVIN:

A2301

EUT Type:

Tablet Device

Frequency Range:

2412 – 2472MHz

FCC Classification:

Digital Transmission System (DTS)

FCC Rule Part(s):

Part 15 Subpart C (15.247)

ISED Specification:


RSS-247 Issue 2

Test Procedure(s):

ANSI C63.10-2013, KDB 558074 D01 v05r02,
KDB 662911 D01 v02r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013 and KDB 558074 D01 v05r02. Test results reported herein relate only to the item(s) tested.

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




Randy Ortanez
President

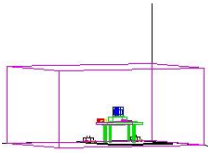


FCC ID: BCGA2301 IC: 579C-A2301	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device
© 2021 PCTEST		V 10.3 11/16/2020

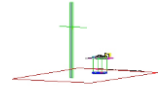
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FCC ID: BCGA2301 IC: 579C-A2301	 PCTEST <small>Proud to be part of  element</small>	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 2 of 345



MEASUREMENT REPORT



Mode	Tx Frequency (MHz)	Antenna 4a				Antenna 2a			
		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
		Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
802.11g	2412 - 2472	77.625	18.90	418.794	26.22	77.983	18.92	418.794	26.22
802.11n	2412 - 2472	76.913	18.86	440.555	26.44	78.705	18.96	451.856	26.55
802.11ax-SU	2412 - 2467	77.446	18.89	430.527	26.34	78.343	18.94	435.512	26.39

EUT Overview SISO (Low Data Rate)

Mode	Tx Frequency (MHz)	Antenna 4a				Antenna 2a				CDD			
		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
		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)	Max. Power (mW)	Max. Power (dBm)
802.11g	2412 - 2472	70.795	18.50	284.446	24.54	69.502	18.42	276.694	24.42	140.281	21.47	561.048	27.49
802.11n	2412 - 2472	69.823	18.44	279.254	24.46	68.865	18.38	298.538	24.75	138.357	21.41	571.479	27.57
802.11ax-SU	2412-2467	78.163	18.93	322.107	25.08	79.433	19.00	358.922	25.55	157.761	21.98	680.769	28.33

EUT Overview CDD (Low Data Rate)

Mode	Tx Frequency (MHz)	Antenna 4a				Antenna 2a			
		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
		Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
802.11g	2412 - 2472	70.146	18.46	355.631	25.51	69.823	18.44	344.350	25.37
802.11n	2412 - 2472	67.608	18.30	358.096	25.54	69.183	18.40	373.250	25.72
802.11ax-SU	2412 - 2467	68.549	18.36	349.945	25.44	69.823	18.44	409.261	26.12

EUT Overview SISO (Mid Data Rate)

Mode	Tx Frequency (MHz)	Antenna 4a				Antenna 2a				CDD			
		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
		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)	Max. Power (mW)	Max. Power (dBm)
802.11g	2412 - 2472	62.230	17.94	339.625	25.31	62.373	17.95	334.195	25.24	123.880	20.93	674.528	28.29
802.11n	2412 - 2472	61.094	17.86	340.408	25.32	62.806	17.98	361.410	25.58	123.880	20.93	701.455	28.46
802.11ax-SU	2412 - 2467	62.230	17.94	453.942	26.57	62.373	17.95	493.174	26.93	123.027	20.90	957.194	29.81

EUT Overview CDD (Mid Data Rate)

Mode	Tx Frequency (MHz)	Antenna 4a				Antenna 2a			
		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
		Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
802.11b	2412 - 2472	78.524	18.95	157.761	21.98	79.068	18.98	161.065	22.07
802.11g	2412 - 2472	62.517	17.96	316.228	25.00	61.802	17.91	328.852	25.17
802.11n	2412 - 2472	61.235	17.87	519.996	27.16	61.802	17.91	498.884	26.98
802.11ax-SU	2412 - 2467	62.517	17.96	533.335	27.27	62.661	17.97	506.991	27.05

EUT Overview SISO (High Data Rate)

Mode	Tx Frequency (MHz)	Antenna 4a				Antenna 2a				CDD			
		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted		Avg Conducted		Peak Conducted	
		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)	Max. Power (mW)	Max. Power (dBm)
802.11g	2412 - 2472	55.335	17.43	345.144	25.38	55.719	17.46	334.195	25.24	111.173	20.46	679.204	28.32
802.11n	2412 - 2472	56.105	17.49	449.780	26.53	55.208	17.42	488.652	26.89	111.429	20.47	937.562	29.72
802.11ax-SU	2412 - 2467	56.105	17.49	250.035	23.98	56.105	17.49	272.898	24.36	111.429	20.47	519.996	27.16

EUT Overview CDD (High Data Rate)

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

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

1.3 Test Facility / Accreditations

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

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

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2301, IC: 579C-A2301**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

Test Device Serial No.: NQ73CFK6VJ, VTXRQ6J9MW, YRXLKXLMHJ, LGXMHP6X6Y

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1/FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE1M, LE2M, HDR4, HDR8), WPT

This device supports BT Beamforming

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13*	2472
7	2442		

Table 2-1. 802.11b/g/n/ax Frequency/ Channel Operations

*Channel 13 is disabled for DTS 802.11ax HE20.

Note: 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 6.0 b) of KDB 558074 D01 v05r02 and ANSI C63.10-2013. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Measured Duty Cycles				
802.11 Mode/Band		Duty Cycle [%]		
		Antenna 4a	Antenna 2a	CDD
2.4GHz	b	98.7	98.6	-
	g (Low Data Rate)	98.8	98.9	98.8
	g (Mid Data Rate)	96.7	96.6	96.6
	g (High Data Rate)	92.5	92.2	92.1
	n (Low Data Rate)	98.6	98.7	97.3
	n (Mid Data Rate)	96.0	95.5	92.2
	n (High Data Rate)	91.4	91.4	87.2
	11ax - SU (Low Data Rate)	95.7	98.4	98.5
	11ax - SU (Mid Data Rate)	94.5	94.3	94.6
	11ax - SU (High Data Rate)	91.9	92.1	91.8

Table 2-2. Measured Duty Cycles

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The device employs CDD technology. Below are the possible configurations.

WiFi Configurations		SISO		SDM		CDD	
		Antenna 4a	Antenna 2a	Antenna 4a	Antenna 2a	Antenna 4a	Antenna 2a
2.4GHz	11b	✓	✓	✗	✗	✗	✗
	11g	✓	✓	✓	✓	✓	✓
	11n	✓	✓	✓	✓	✓	✓
	11ax	✓	✓	✓	✓	✓	✓

Table 2-3. Wi-Fi Configurations

✓ = Support ; ✗ = NOT Support

SISO = Single Input Single Output

SDM = Spatial Diversity Multiplexing – CDD function

CDD = Cyclic Delay Diversity - 2Tx Function

Data Rates Supported: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)
 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (g)
 6.5/7.2Mbps, 13/14.4Mbps, 19.5/21.7Mbps, 26/28.9Mbps, 39/43.3Mbps,
 52/57.8Mbps, 58.5/65Mbps, 65/72.2Mbps (n)
 13/14.4Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 78/86.7Mbps,
 104/115.6Mbps, 117/130Mbps, 130/144.4Mbps (CDD n)
 8/8.6Mbps, 16/17.2Mbps, 24/25.8Mbps, 33/34.4Mbps, 49/51.6Mbps,
 65/68.8Mbps, 73/77.4Mbps, 81/86.0Mbps, 98/103.2Mbps, 108/114.7Mbps (11ax)
 16/17.2Mbps, 32/34.4Mbps, 48/51.6Mbps, 66/68.8Mbps, 98/103.2Mbps,
 130/137.6Mbps, 146/154.8Mbps, 162/172Mbps, 196/206.4Mbps, 216/229.4Mbps
 (CDD 11ax)

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

Antenna	Simultaneous Tx Config	WLAN	Bluetooth	GSM / WCDMA	LTE / FR1 NR			UNII
		802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1M/2M	Mid Band	Mid Band	High Band	Ultra High Band	802.11 a/n/ac/ax
2a	Config 1	✓	✗	✗	✗	✗	✓	✗
2a	Config 2	✗	✓	✗	✗	✗	✓	✗
4a	Config 3	✓	✗	✗	✗	✗	✓	✗
4a	Config 4	✗	✓	✗	✗	✗	✓	✗
4b	Config 5	✗	✗	✓	✗	✗	✗	✓
4b	Config 6	✗	✗	✗	✓	✗	✗	✓
4b	Config 7	✗	✗	✗	✗	✓	✗	✓

Table 2-4. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

Note:

All the above simultaneous transmission configurations have been tested and the worst case configuration was found to be Config 6 and reported in UNII 802.11ax (OFDMA) and FCC part 27b test reports.

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2.3 Antenna Description

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

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna 4a	Antenna 2a
2.4	1.5	2.5

Table 2-5. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook Pro	Model: A2141	S/N:	C02DV7VKMD6T
	w/AC/DC Adapter	Model: A2166	S/N:	N/A
2	Apple USB-C Cable	Model: 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:	GQXYGSXBJKM9
5	DC Power Supply	Model: KPS3010D	S/N:	N/A

Table 2-6. Test Support Equipment List

2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013 and KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, Section 3.3 for radiated emissions test setups, and, 7.2, 7.3, 7.4, 7.5, and 7.6 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 CDD mode test data provided in this report covers 802.11n SDM.

802.11ax-SU HE20 2TX CDD mode test data provided in this report covers 802.11ax-SU HE20 2TX SDM.

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

- 802.11b:
 - 11Mbps
- 802.11g:
 - Low Data Rate: 6Mbps
 - Mid Data Rate: 18Mbps
 - High Data Rate: 54Mbps
- 802.11n:
 - Low Data Rate: MCS0/MCS8 (SISO/CDD)
 - Mid Data Rate: MCS3/MCS11 (SISO/CDD)
 - High Data Rate: MCS7/MCS15 (SISO/CDD)
- 802.11ax(SU):
 - Low Data Rate: MCS0
 - Mid Data Rate: MCS3
 - High Data Rate: MCS5

For 802.11ax-RU test results, see separate WLAN (OFDMA) report, 1C2101020002-10.BCG

2.6 Software and Firmware

The test was conducted with firmware version 18E20700y installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from measurement procedure.....None

3.2 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 groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that the 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 7.9. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.50.40.

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3.3 Radiated Emissions

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

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

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

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

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

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

Conclusion:

The EUT unit complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

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

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

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). 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	4/9/2020	Annual	4/9/2021	2002005
Anritsu	MA2411B	Pulse Power Sensor	3/10/2020	Annual	3/10/2021	1911105
Anritsu	MA2411B	Pulse Power Sensor	3/10/2020	Annual	3/10/2021	1911106
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	8/11/2020	Annual	8/11/2021	T058701-01
COM-POWER	LIN-120A	LISN	3/4/2020	Annual	3/4/2021	241297
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	9/15/2020	Annual	9/15/2021	208204
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	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	8/7/2020	Annual	8/7/2021	101668
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	4/3/2020	Annual	4/3/2021	100052
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	10/2/2020	Annual	10/2/2021	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/12/2020	Annual	3/12/2021	100546
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	12/3/2020	Annual	12/3/2021	101648
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	3/4/2020	Annual	3/4/2021	102325
Rohde & Schwarz	ENV216	Two-Line V-Network (LISN)	12/7/2020	Annual	12/7/2021	101364

Table 6-1. Test Equipment List

Note:

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

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7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2301
 IC: 579C-A2301
 FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	> 500kHz	CONDUCTED	PASS	Section 7.2
2.1049	RSS-Gen [6.7]	Occupied Bandwidth	N/A		N/A	Section 7.2
15.247(b)(3)	RSS-247 [5.4]	Transmitter Output Power	< 1 Watt		PASS	Sections 7.3
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz Band		PASS	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	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])	RADIATED	PASS	Sections 7.7, 7.8
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen[8.8])	AC LINE CONDUCTED	PASS	Section 7.9

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. 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 “WLAN Automation,” Version 3.8.
- 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.

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7.2 6dB and 99% Bandwidth Measurement

§15.247(a.2); §2.1049, RSS-247 [5.2]

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 transmitter antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All antenna configuration and data rates were investigated and the worst case results are reported in this section.

The minimum permissible 6dB bandwidth is 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 11.8.2 Option 2
KDB 558074 D01 v05r02 – Section 8.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100kHz
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize

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

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

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Antenna 4a 6dB and 99% Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
2412	1	g	6	16.589	15.850	0.500	Pass
2437	6	g	6	16.436	16.090	0.500	Pass
2462	11	g	6	16.550	15.540	0.500	Pass
2412	1	n	6.5/7.2 (MCS0)	17.779	17.600	0.500	Pass
2437	6	n	6.5/7.2 (MCS0)	17.628	17.170	0.500	Pass
2462	11	n	6.5/7.2 (MCS0)	17.631	16.520	0.500	Pass
2412	1	ax-SU	8/8.6 (MCS0)	18.904	18.580	0.500	Pass
2437	6	ax-SU	8/8.6 (MCS0)	19.096	18.360	0.500	Pass
2462	11	ax-SU	8/8.6 (MCS0)	18.922	18.170	0.500	Pass

Table 7-2. Conducted Bandwidth Measurements Antenna 4a (Low Data Rate)

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
2412	1	g	18	16.518	16.060	0.500	Pass
2437	6	g	18	16.387	16.260	0.500	Pass
2462	11	g	18	16.479	15.360	0.500	Pass
2412	1	n	26/28.9 (MCS3)	17.677	17.750	0.500	Pass
2437	6	n	26/28.9 (MCS3)	17.635	17.740	0.500	Pass
2462	11	n	26/28.9 (MCS3)	17.618	17.690	0.500	Pass
2412	1	ax-SU	33/34.4 (MCS3)	18.915	19.050	0.500	Pass
2437	6	ax-SU	33/34.4 (MCS3)	19.060	18.960	0.500	Pass
2462	11	ax-SU	33/34.4 (MCS3)	18.900	19.050	0.500	Pass

Table 7-3. Conducted Bandwidth Measurements Antenna 4a (Mid Data Rate)

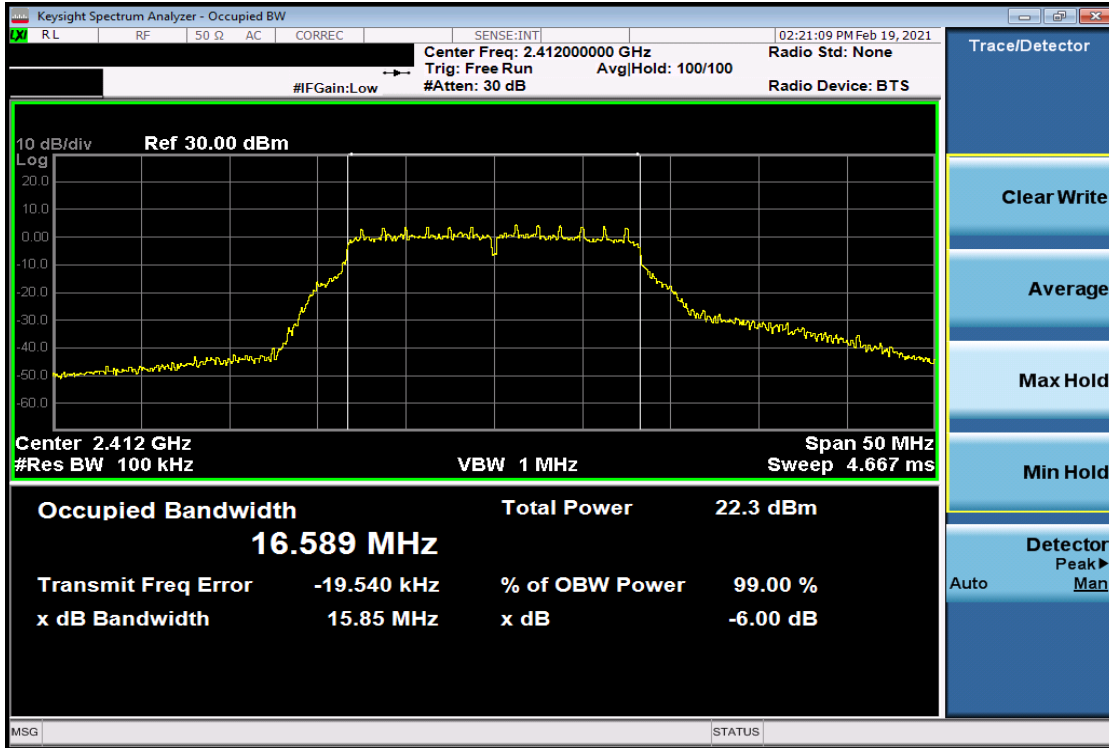
FCC ID: BCGA2301 IC: 579C-A2301	 PCTEST® Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
2412	1	b	11	12.767	8.644	0.500	Pass
2437	6	b	11	12.710	8.297	0.500	Pass
2462	11	b	11	12.662	8.634	0.500	Pass
2412	1	g	54	16.460	16.490	0.500	Pass
2437	6	g	54	16.458	16.490	0.500	Pass
2462	11	g	54	16.452	16.490	0.500	Pass
2412	1	n	65/72.2 (MCS7)	17.672	17.750	0.500	Pass
2437	6	n	65/72.2 (MCS7)	17.714	17.730	0.500	Pass
2462	11	n	65/72.2 (MCS7)	17.651	17.740	0.500	Pass
2412	1	ax-SU	65/68.8 (MCS5)	18.913	18.110	0.500	Pass
2437	6	ax-SU	65/68.8 (MCS5)	18.940	19.110	0.500	Pass
2462	11	ax-SU	65/68.8 (MCS5)	18.913	19.030	0.500	Pass

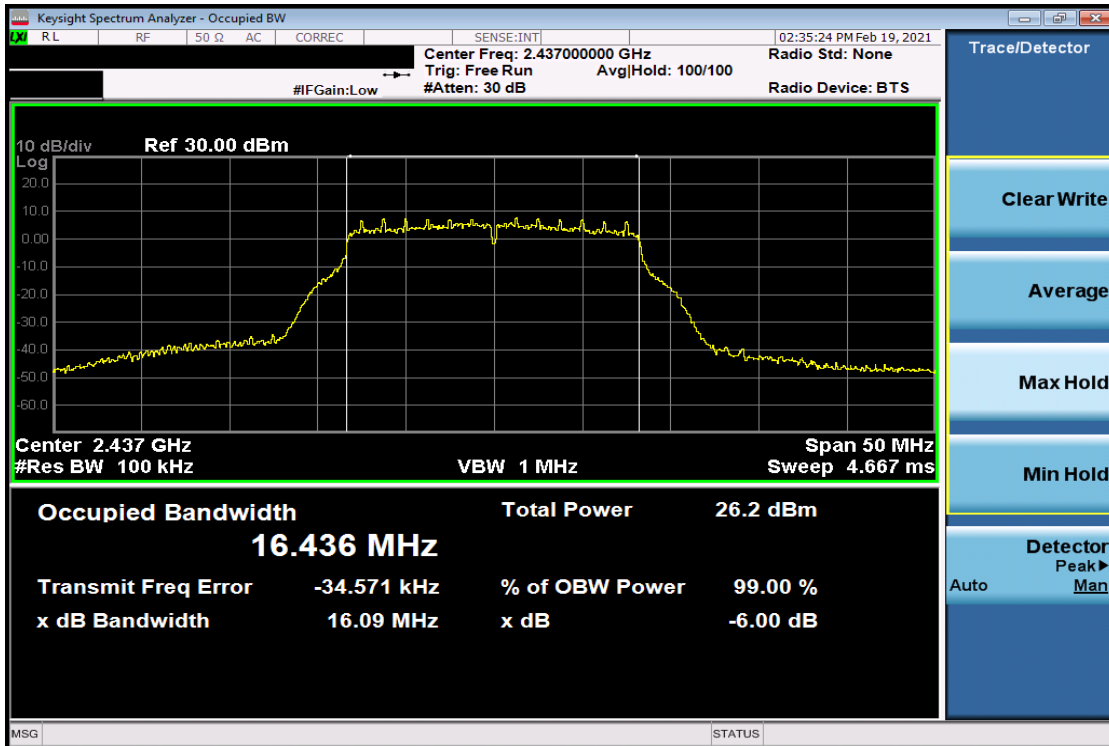
Table 7-4. Conducted Bandwidth Measurements Antenna 4a (High Data Rate)

FCC ID: BCGA2301 IC: 579C-A2301	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Low Data Rate

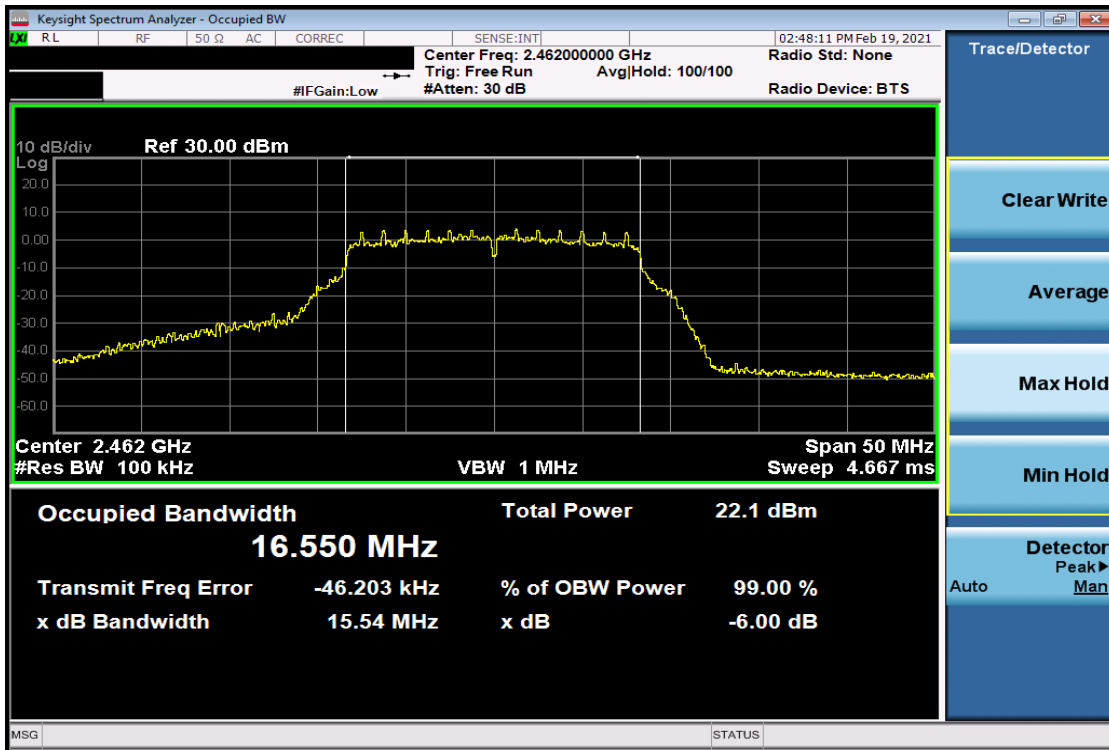


Plot 7-1. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 1) – 6Mbps

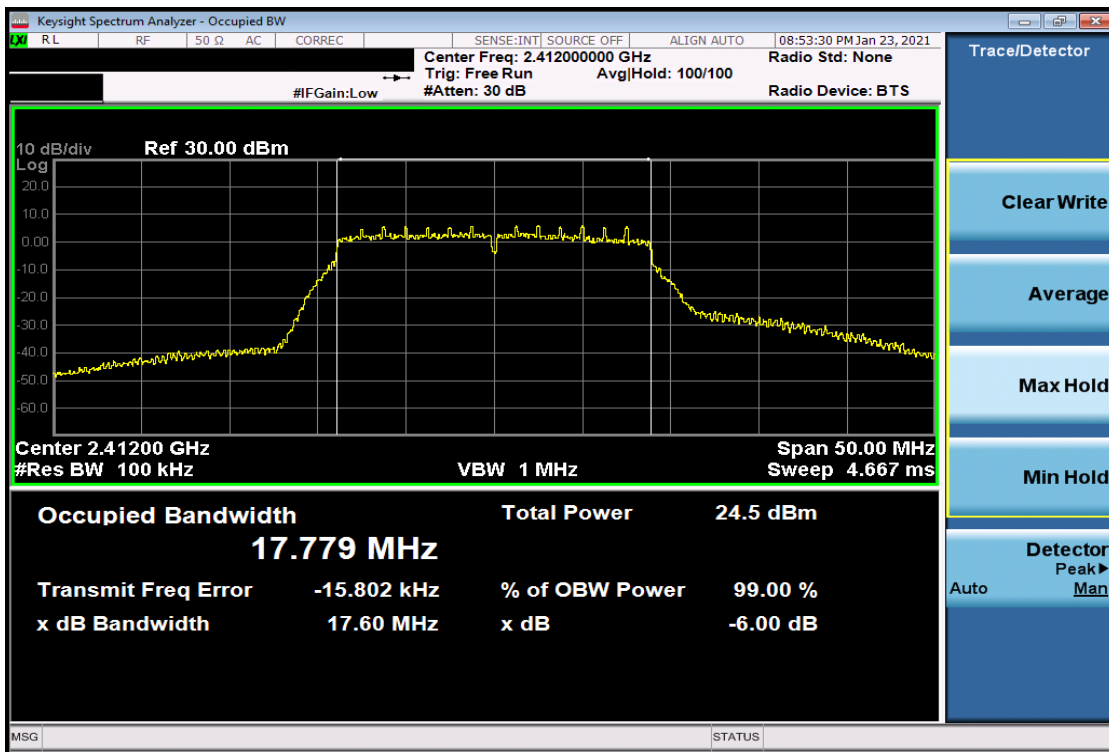


Plot 7-2. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 6) – 6Mbps

FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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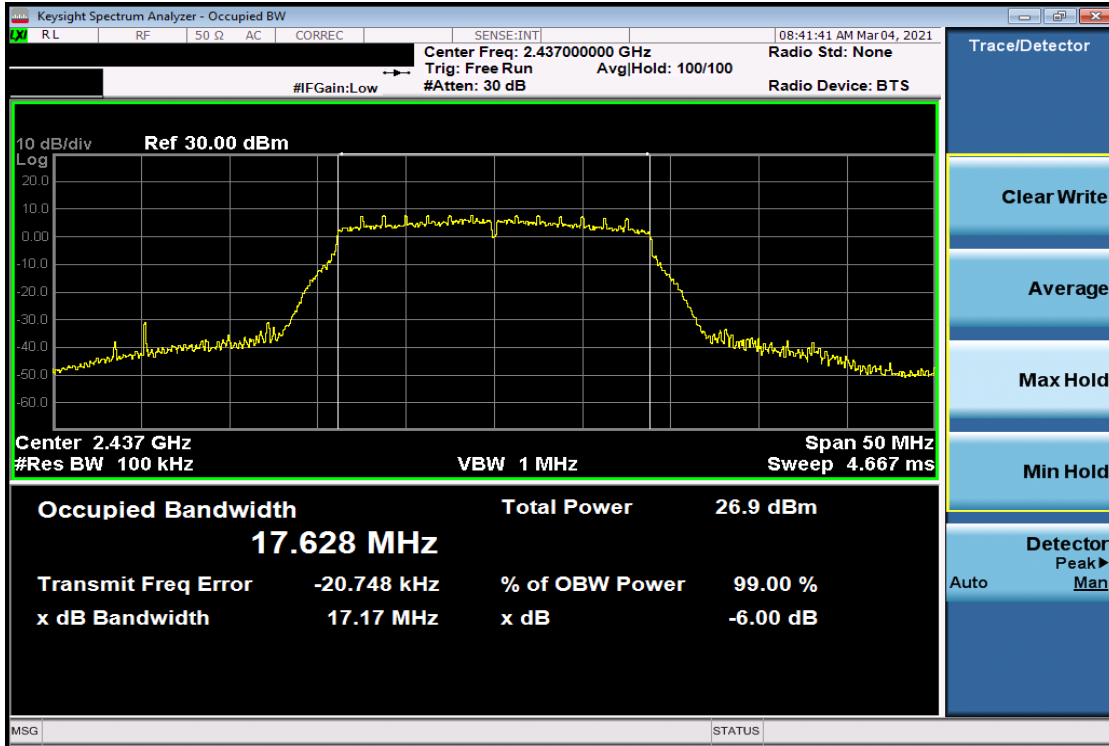


Plot 7-3. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 11) – 6Mbps

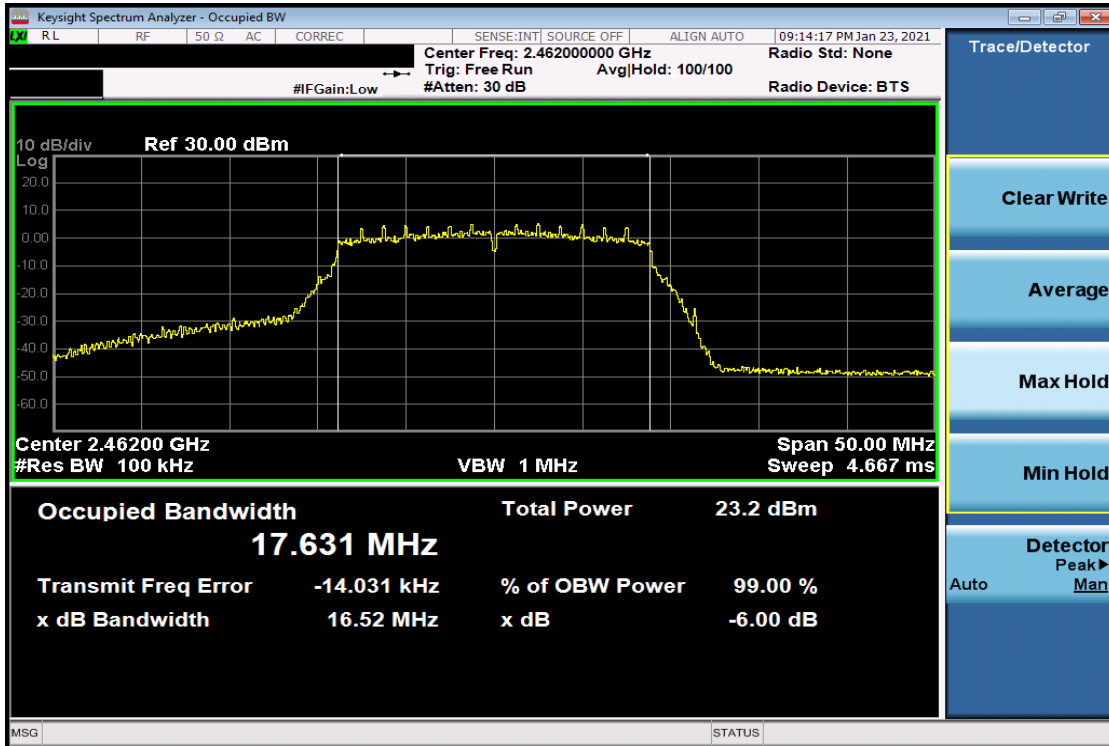


Plot 7-4. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 1) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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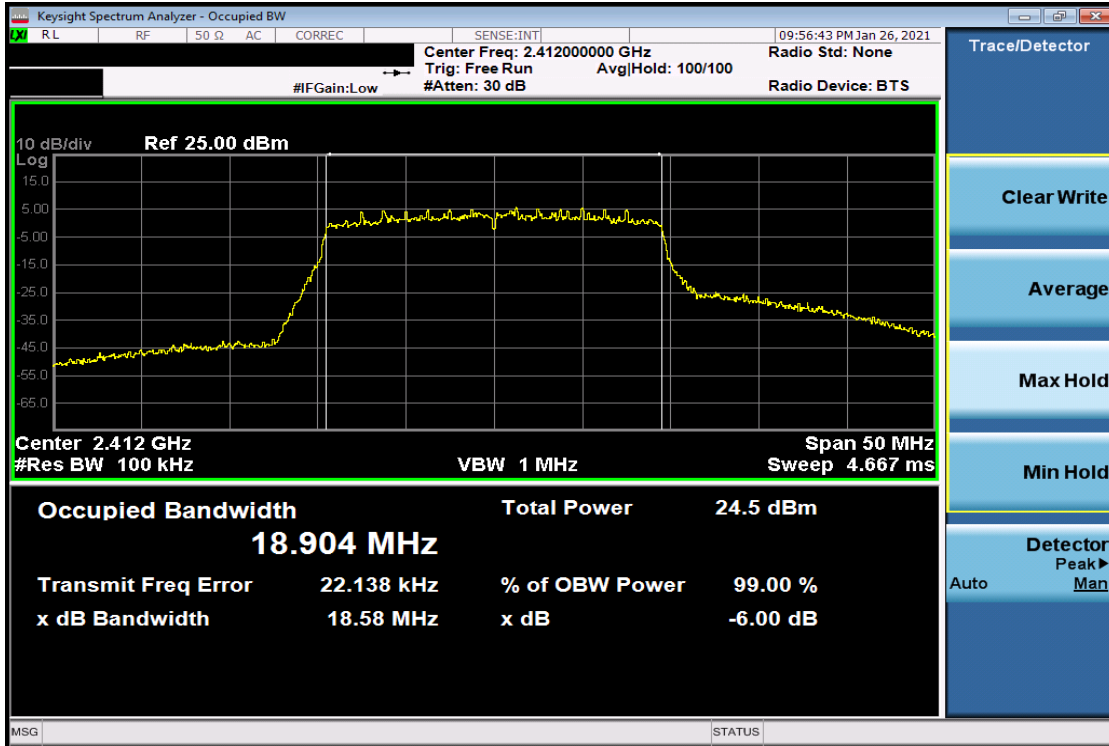


Plot 7-5. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 6) – MCS0

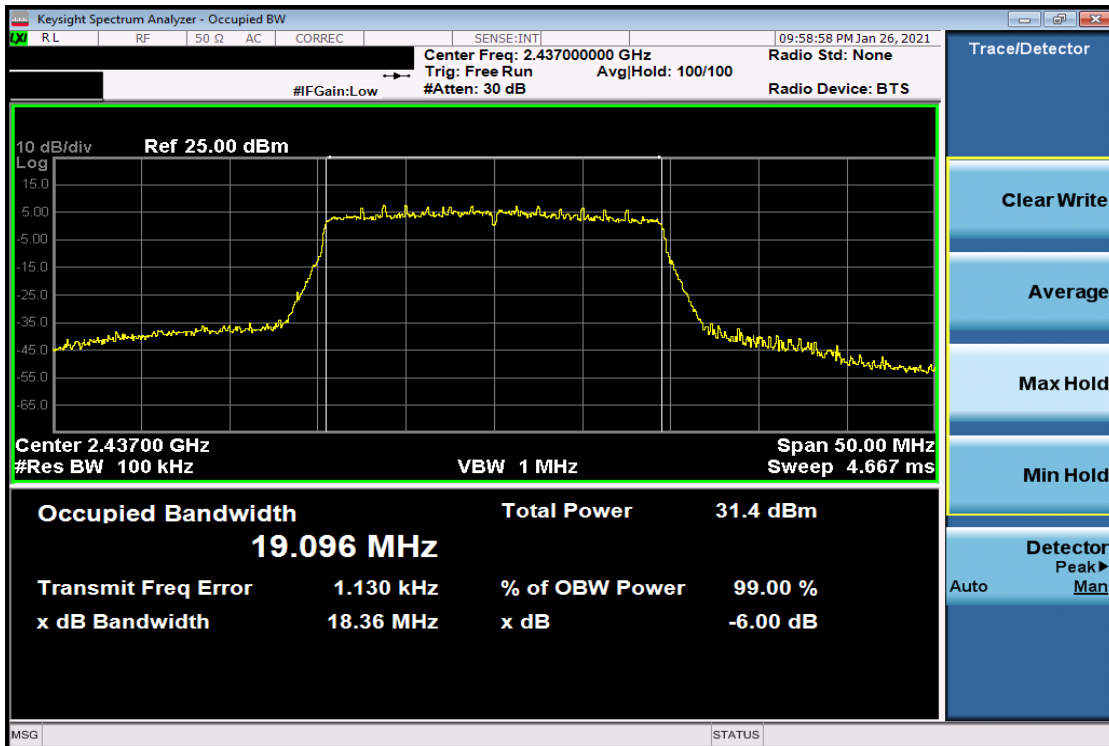


Plot 7-6. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 11) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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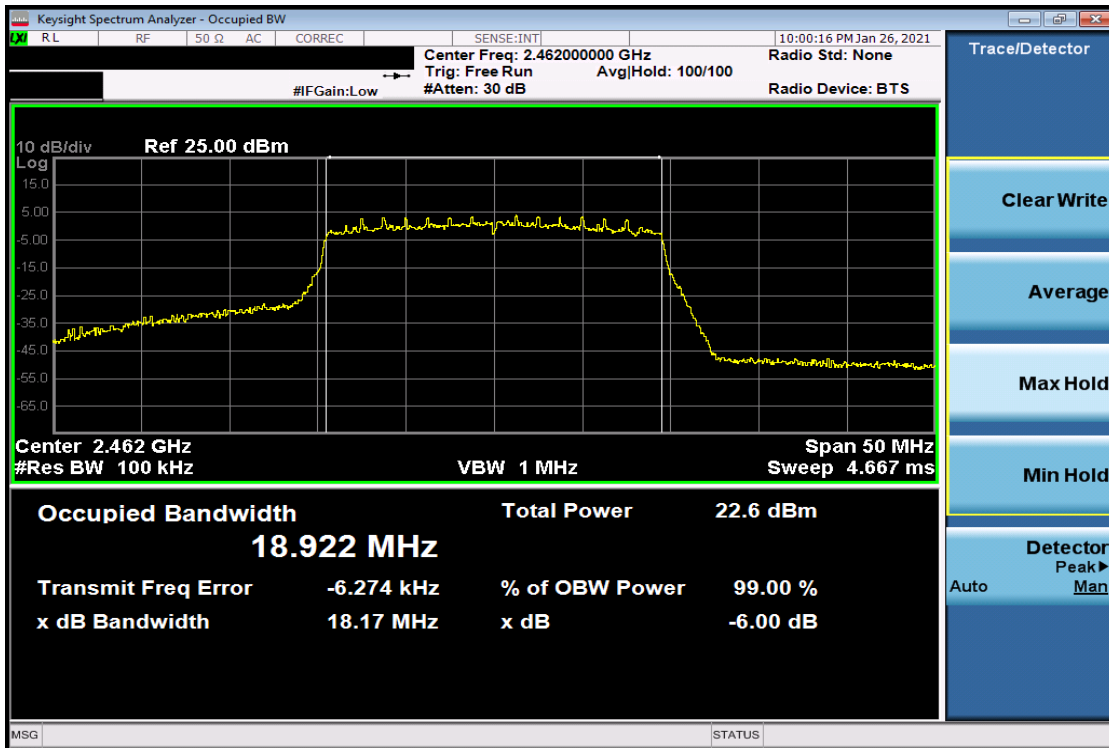


Plot 7-7. 6dB BW and 99% OBW Plot Antenna 4a (802.11ax (SU - 2.4GHz) – Ch. 1) – MCS0



Plot 7-8. 6dB BW and 99% OBW Plot Antenna 4a (802.11ax (SU - 2.4GHz) – Ch. 6) – MCS0

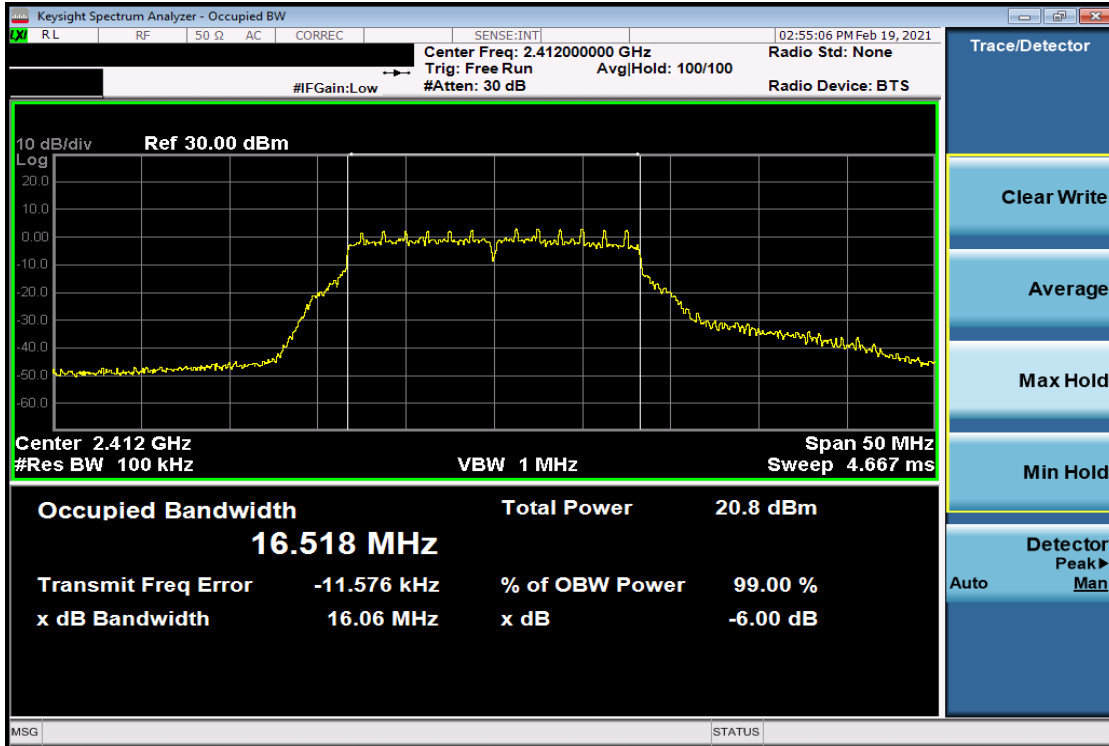
FCC ID: BCGA2301 IC: 579C-A2301	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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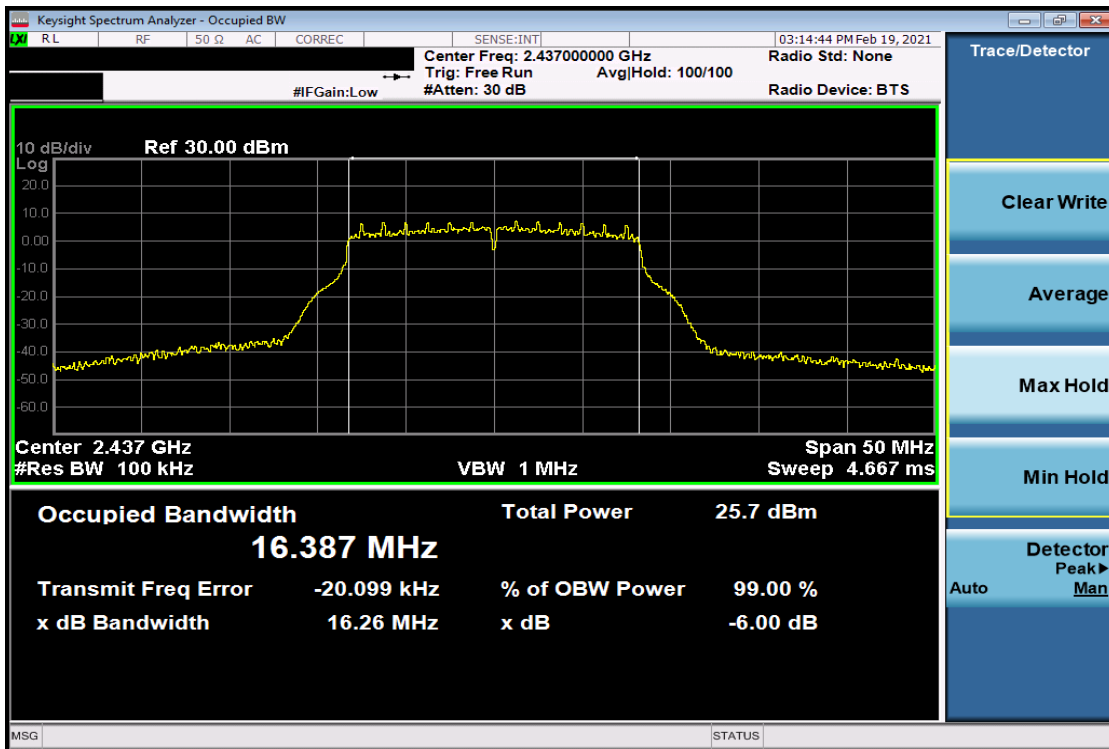
Plot 7-9. 6dB BW and 99% OBW Plot Antenna 4a (802. 11ax (SU - 2.4GHz) – Ch. 11) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Mid Data Rate

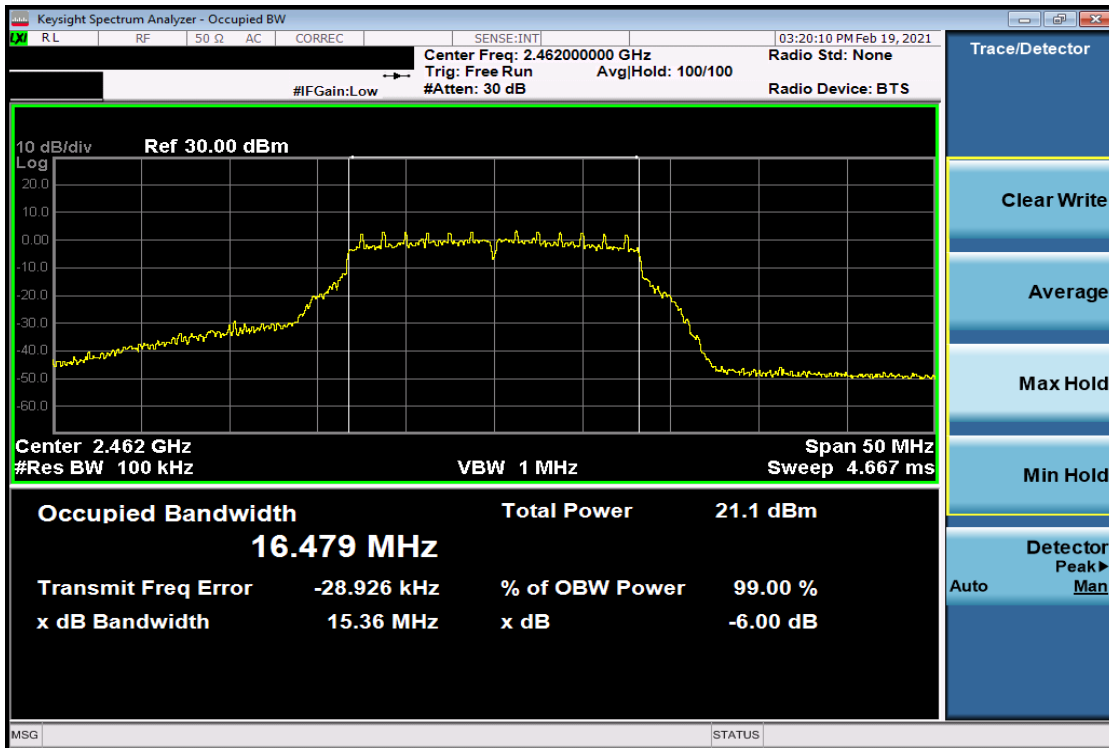


Plot 7-10. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 1) – 18Mbps

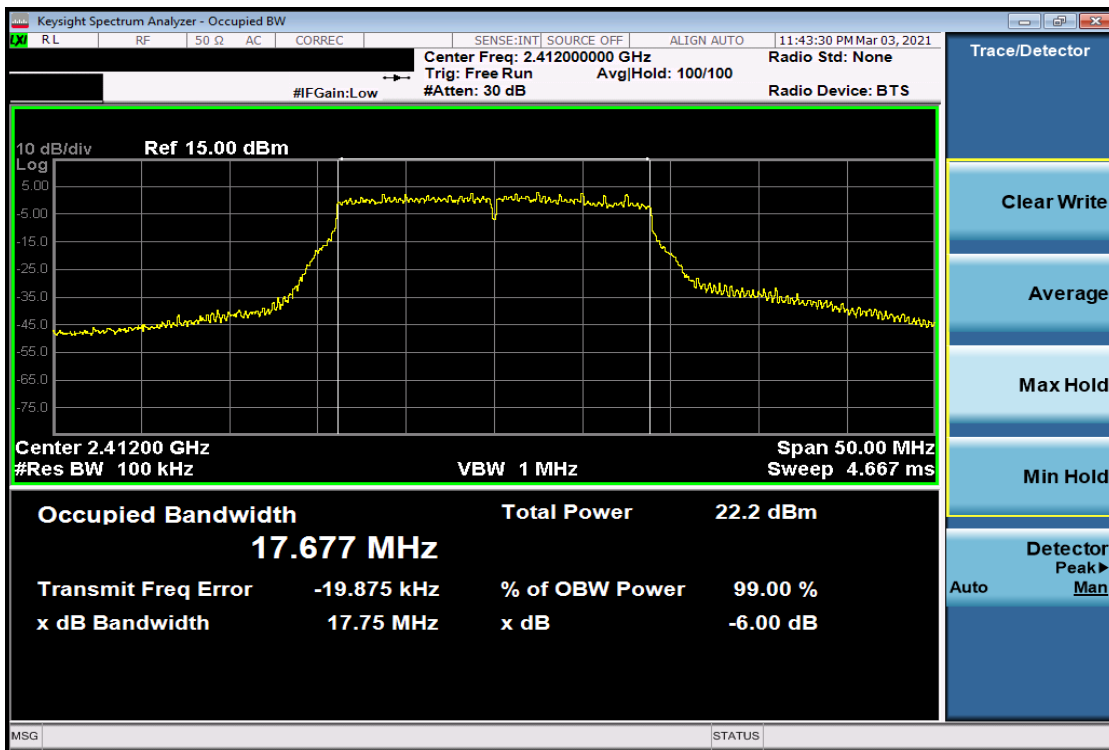


Plot 7-11. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 6) – 18Mbps

FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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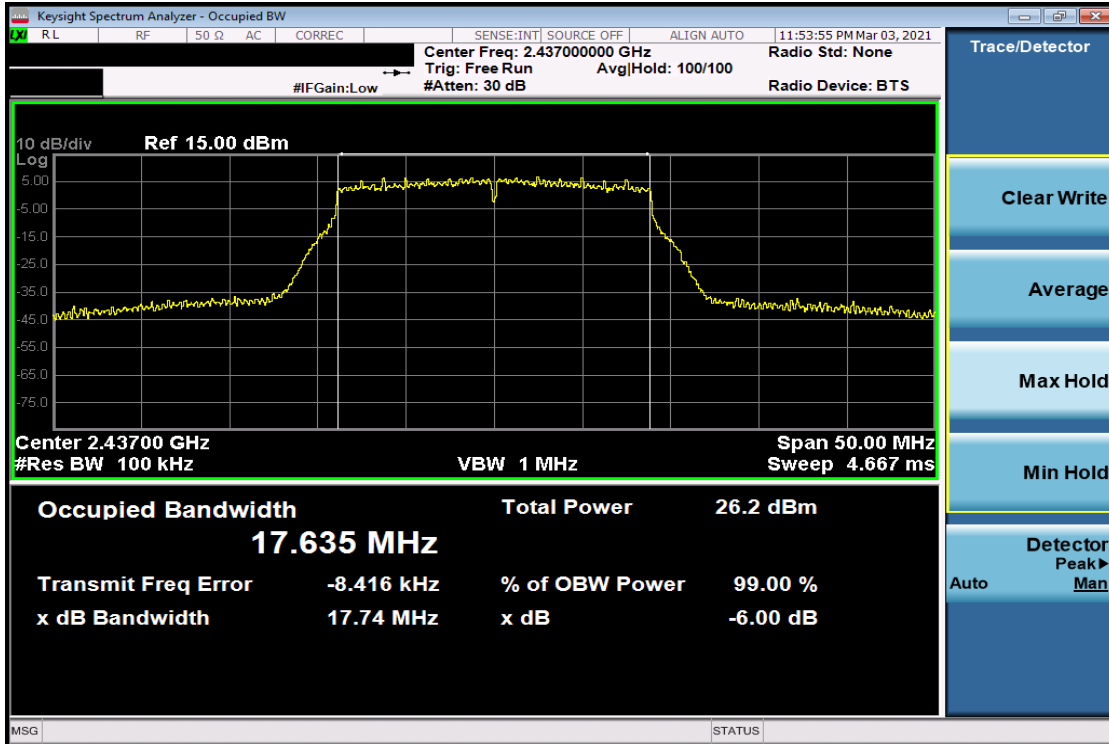


Plot 7-12. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 11) – 18Mbps

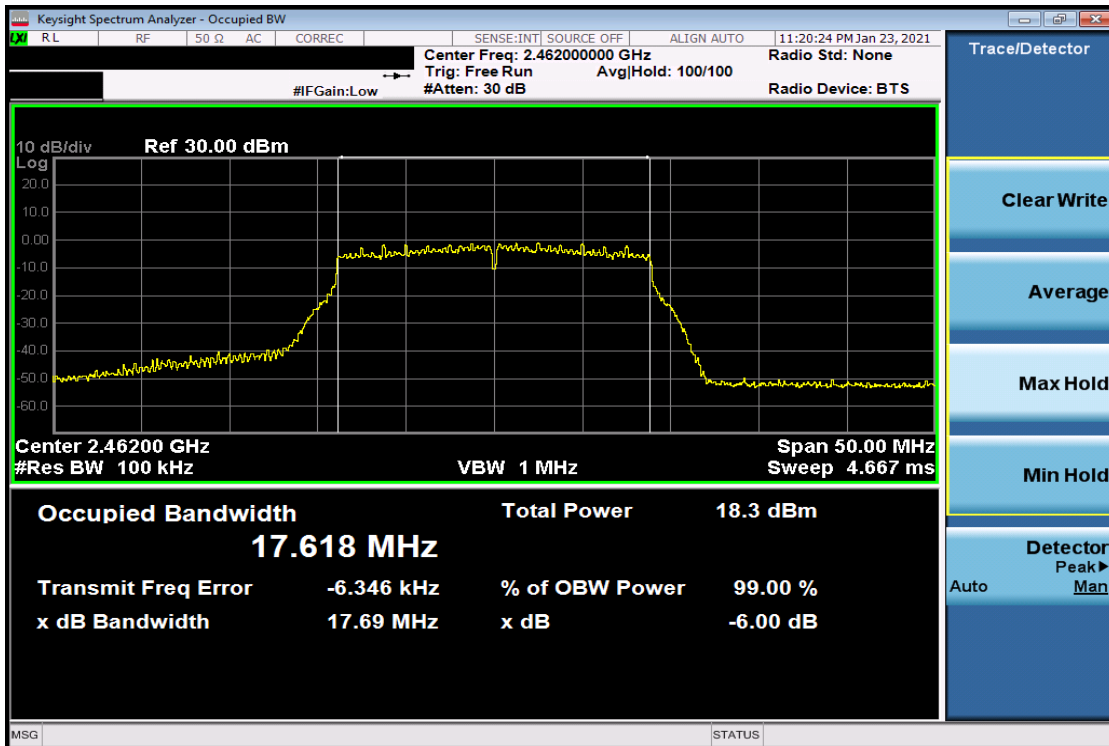


Plot 7-13. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 1) – MCS3

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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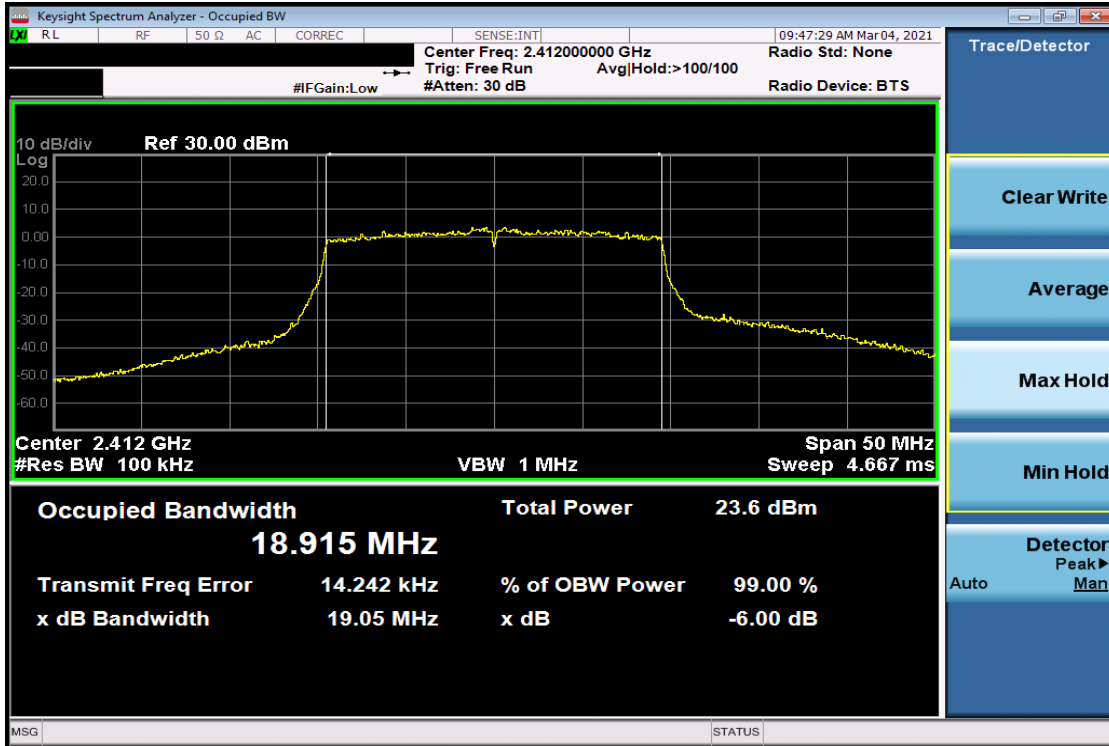


Plot 7-14. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 6) – MCS3

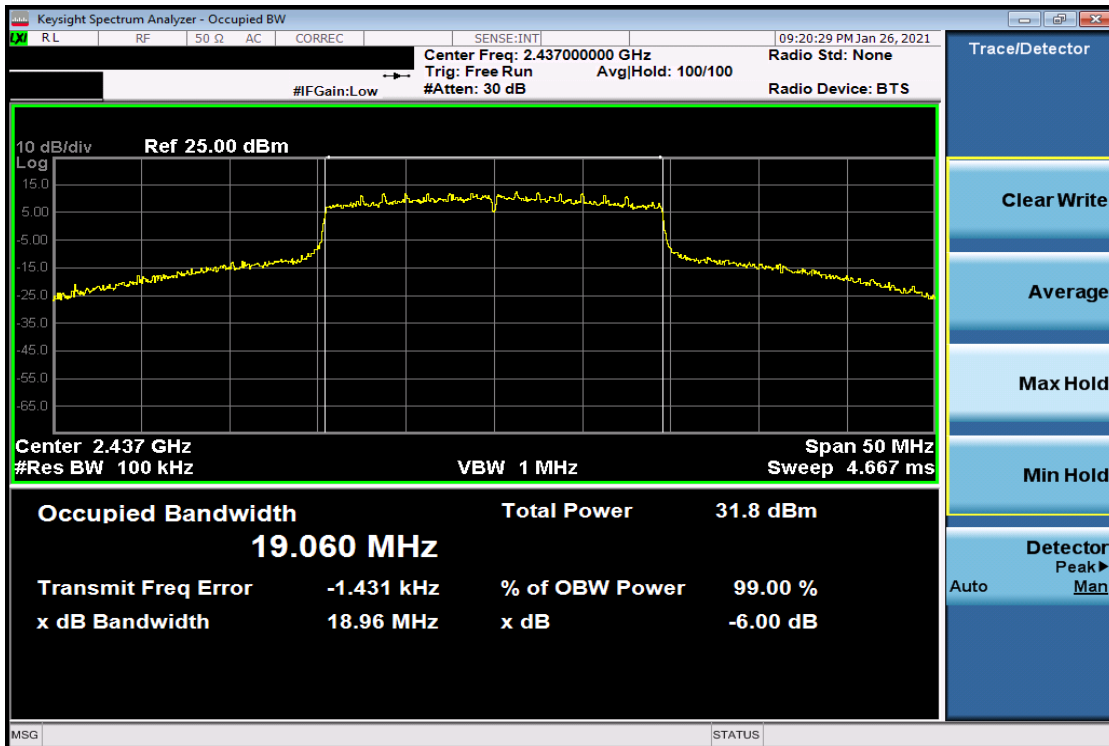


Plot 7-15. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 11) – MCS3

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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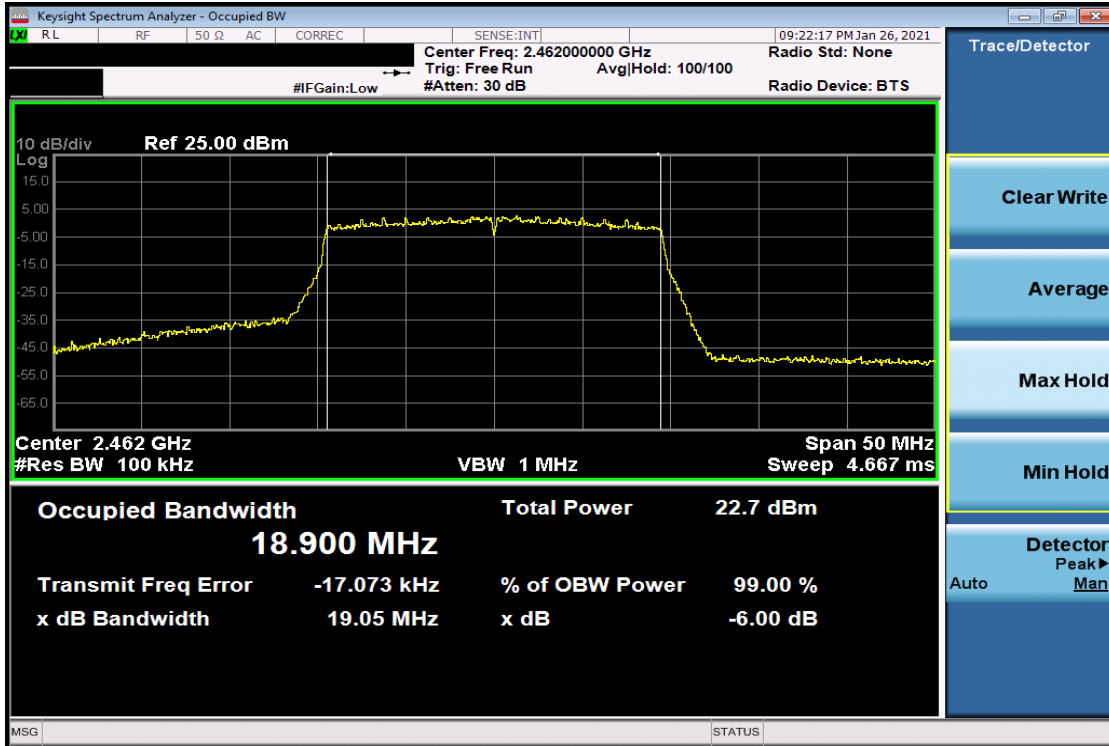


Plot 7-16. 6dB BW and 99% OBW Plot Antenna 4a (802. 11ax (SU - 2.4GHz) – Ch. 1) – MCS3



Plot 7-17. 6dB BW and 99% OBW Plot Antenna 4a (802. 11ax (SU - 2.4GHz) – Ch. 6) – MCS3

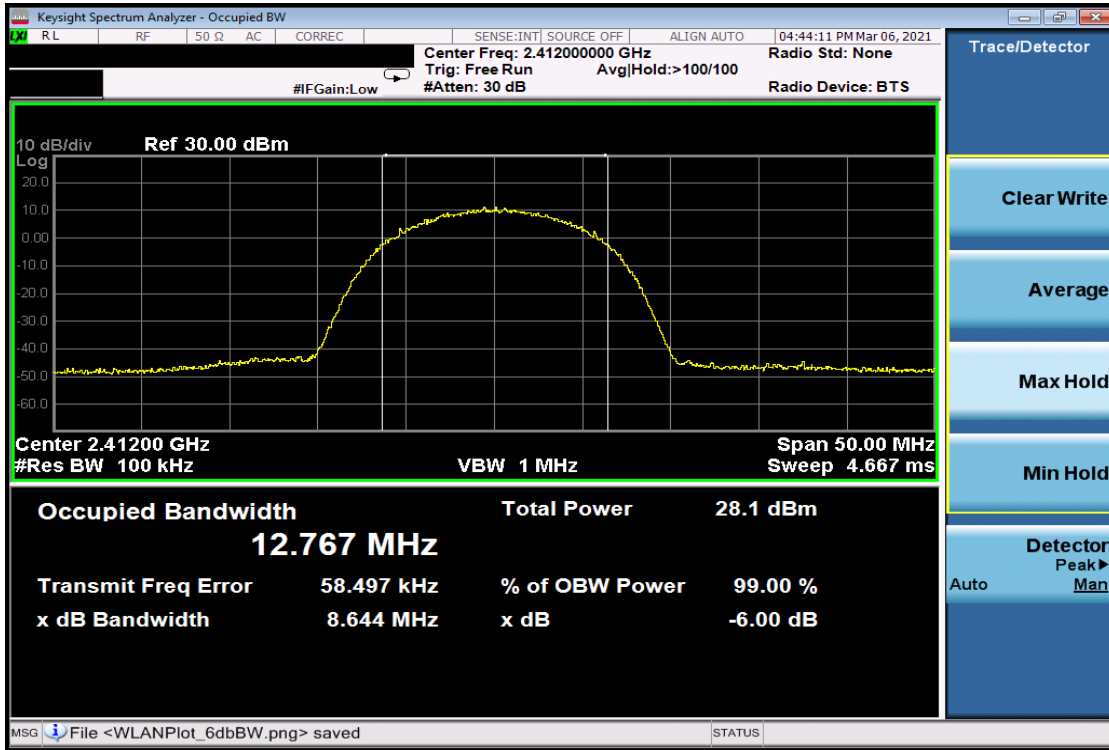
FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 26 of 345



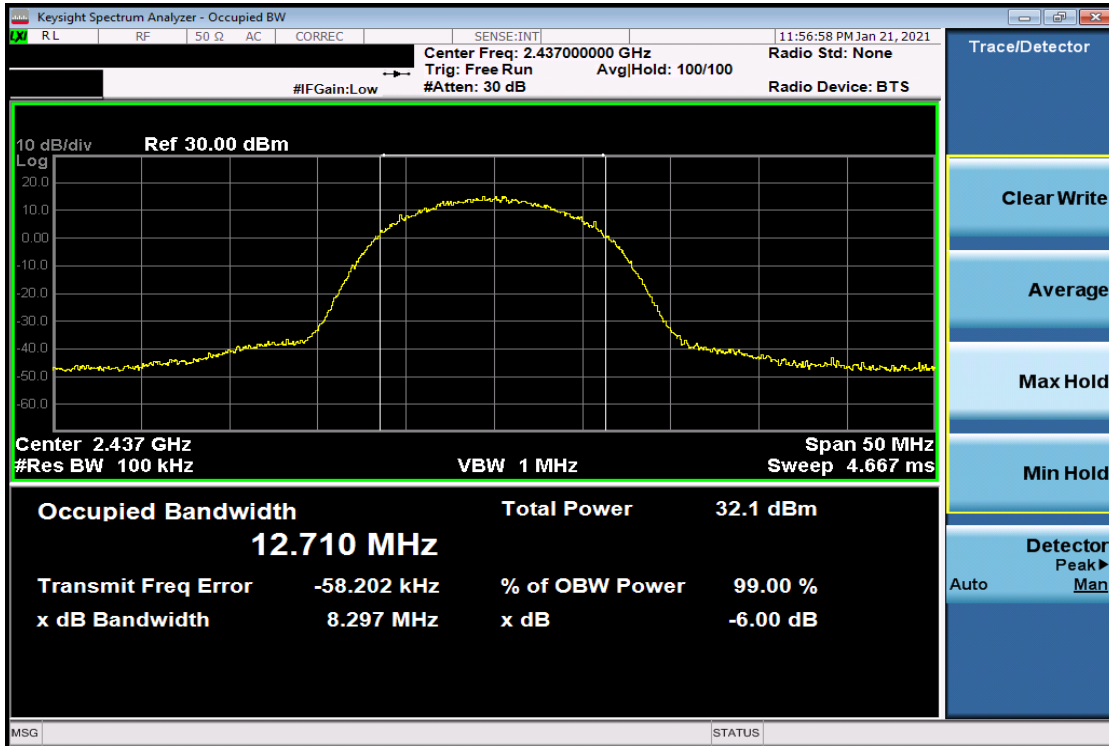
Plot 7-18. 6dB BW and 99% OBW Plot Antenna 4a (802. 11ax (SU - 2.4GHz) – Ch. 11) – MCS3

FCC ID: BCGA2301 IC: 579C-A2301	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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High Data Rate

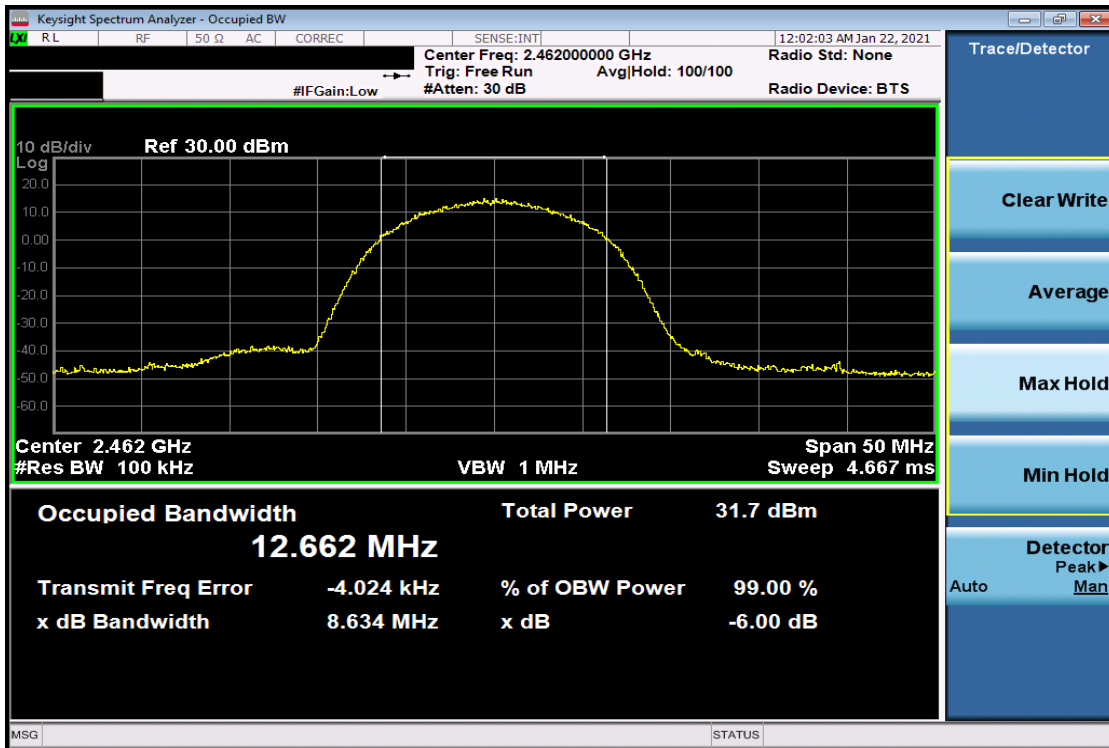


Plot 7-19. 6dB BW and 99% OBW Plot Antenna 4a (802.11b – Ch. 1) – 11Mbps

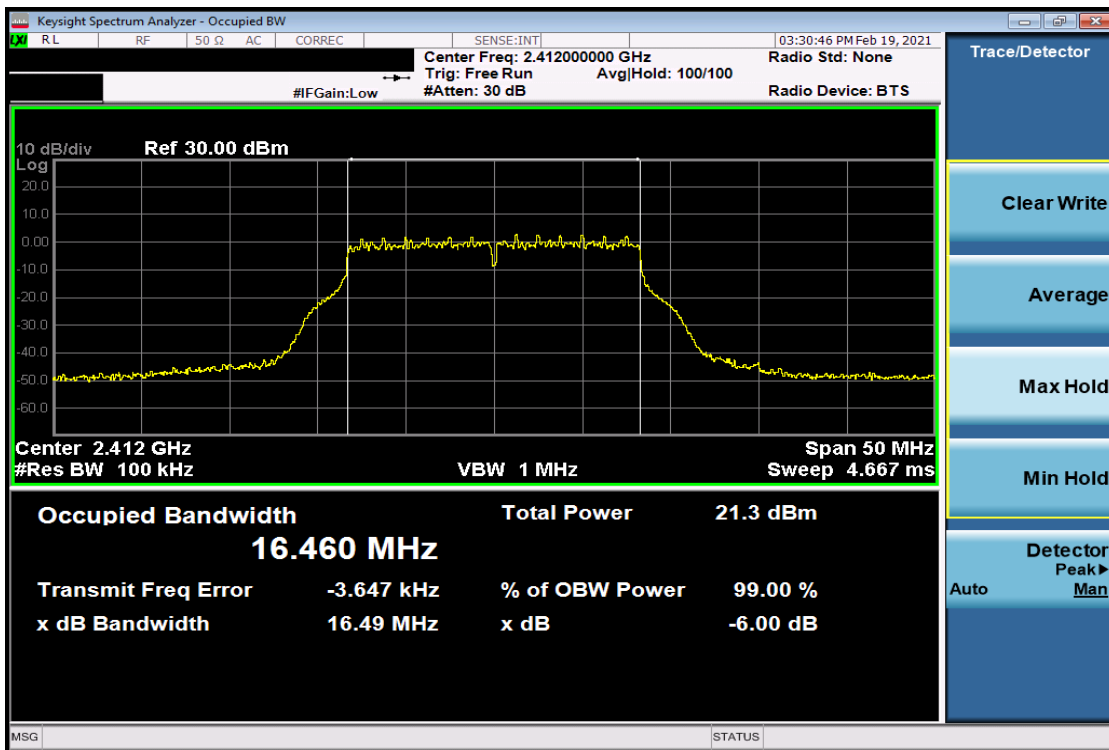


Plot 7-20. 6dB BW and 99% OBW Plot Antenna 4a (802.11b – Ch. 6) – 11Mbps

FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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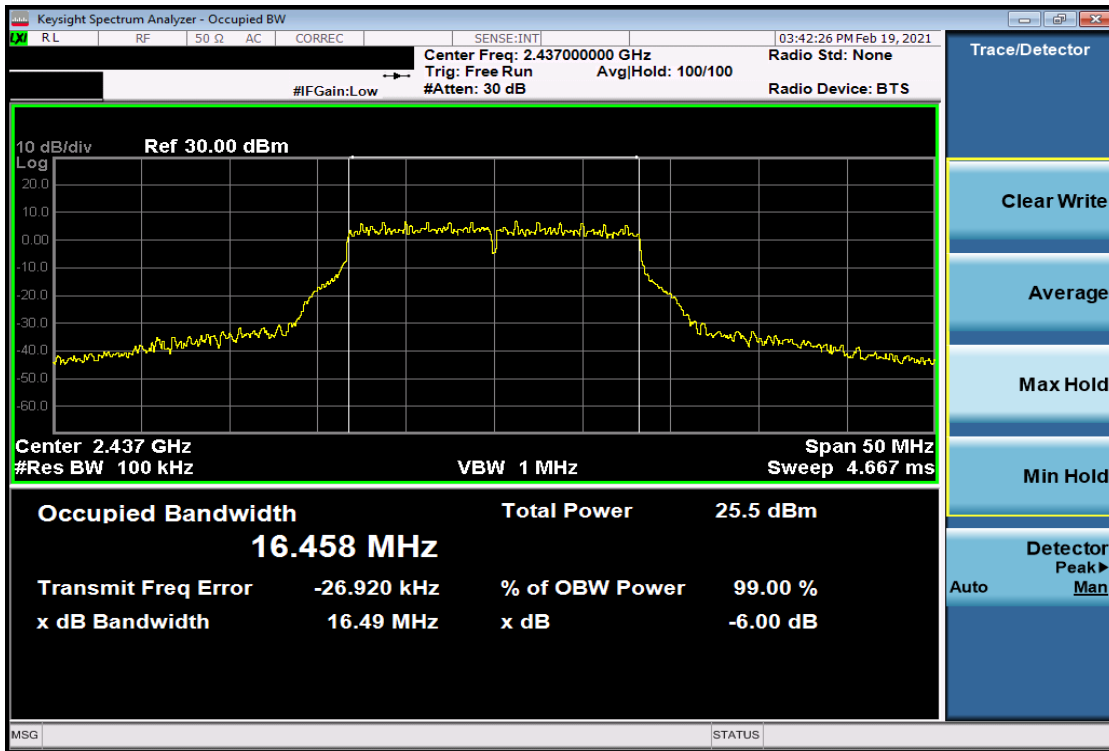


Plot 7-21. 6dB BW and 99% OBW Plot Antenna 4a (802.11b – Ch. 11) – 11Mbps

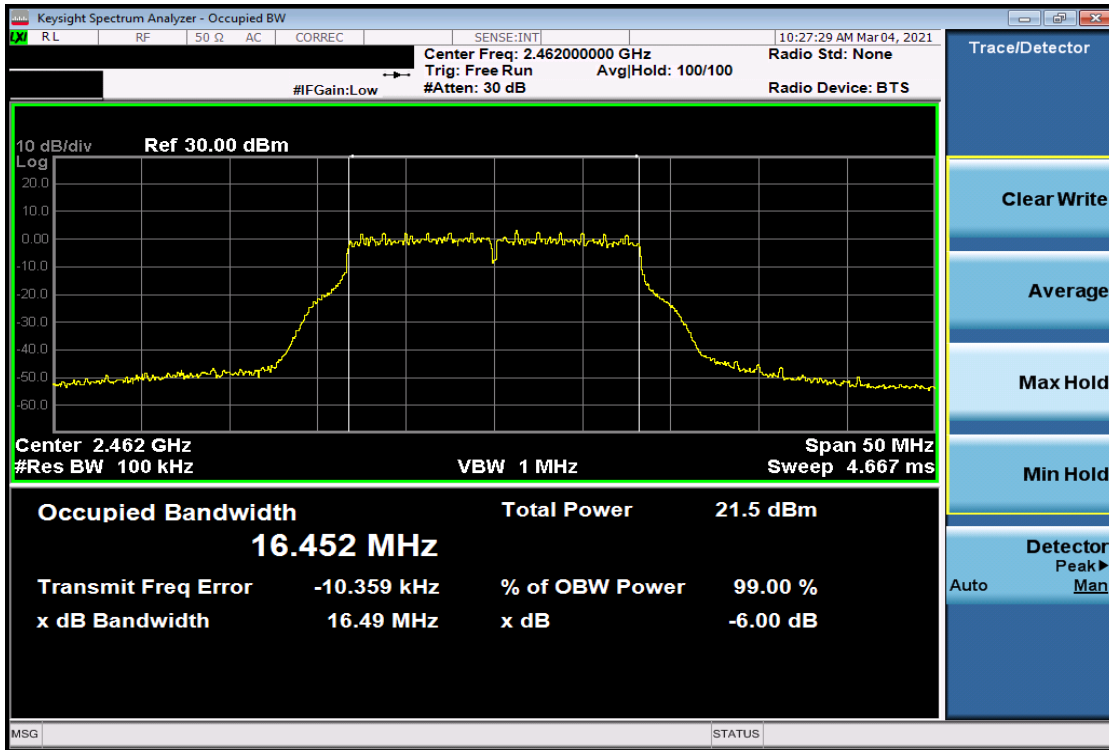


Plot 7-22. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 1) – 54Mbps

FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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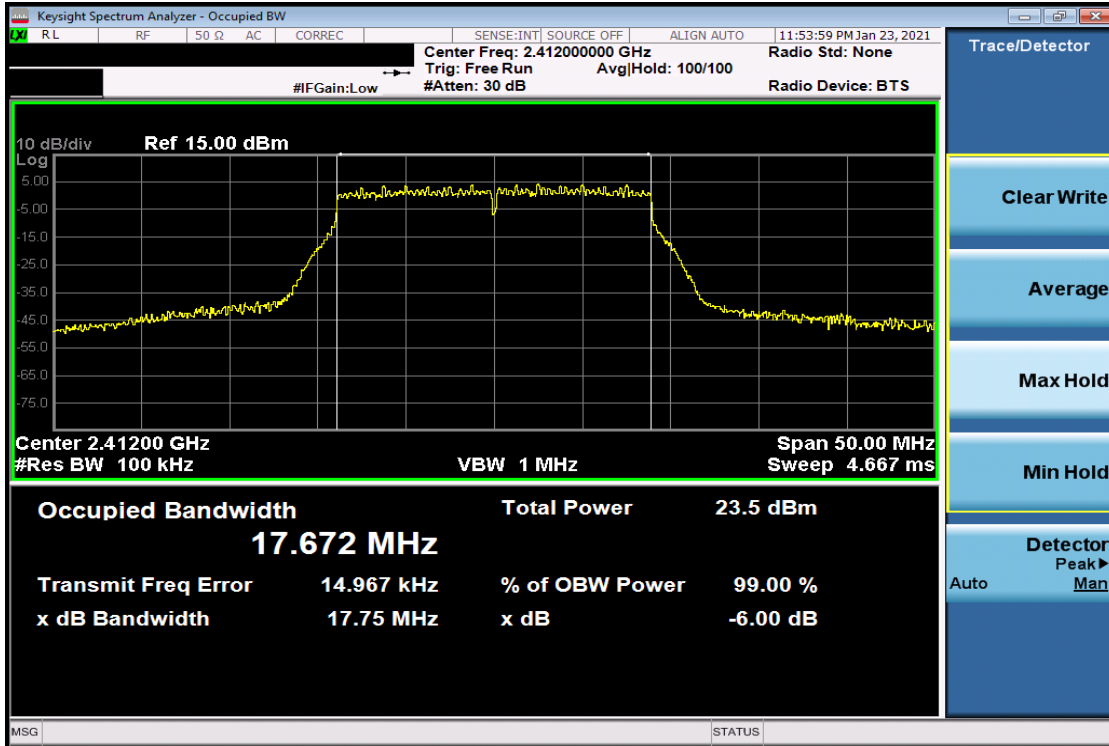


Plot 7-23. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 6) – 54Mbps

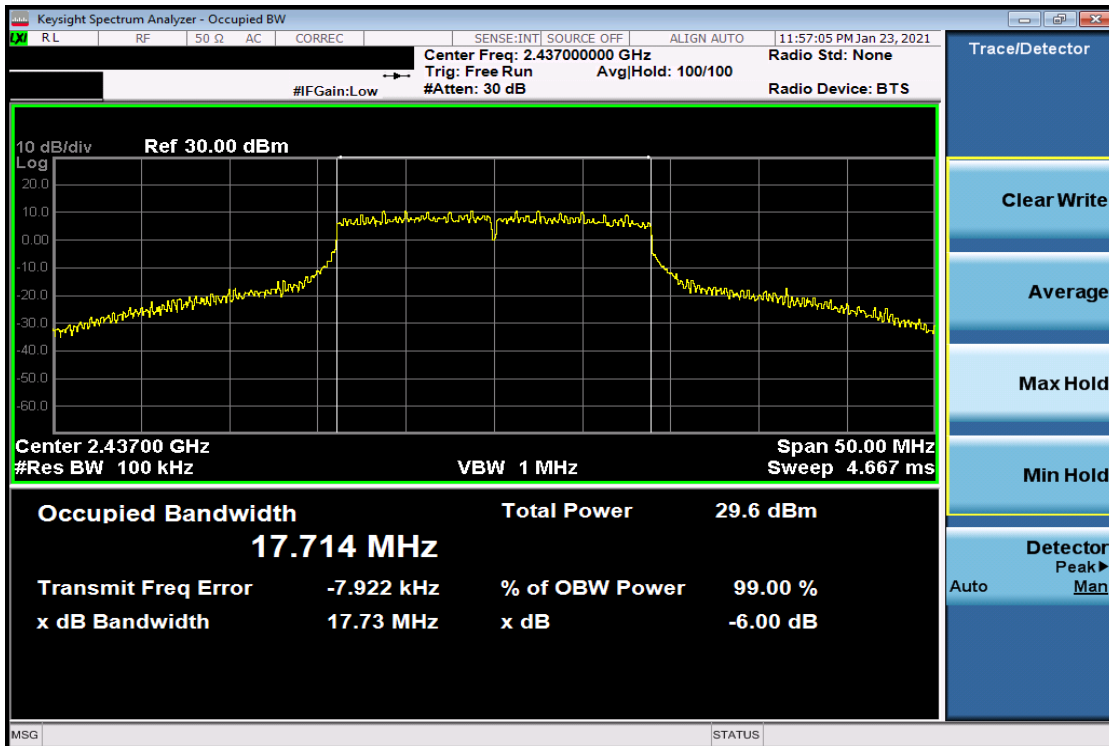


Plot 7-24. 6dB BW and 99% OBW Plot Antenna 4a (802.11g – Ch. 11) – 54Mbps

FCC ID: BCGA2301 IC: 579C-A2301	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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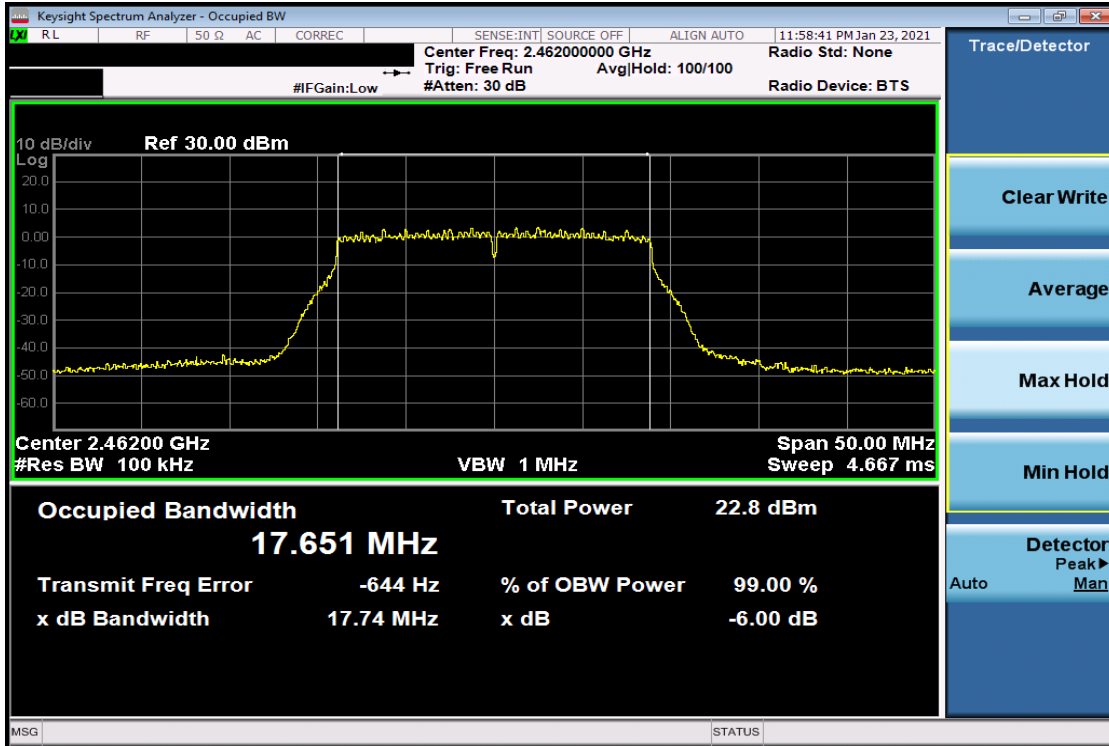


Plot 7-25. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 1) – MCS7

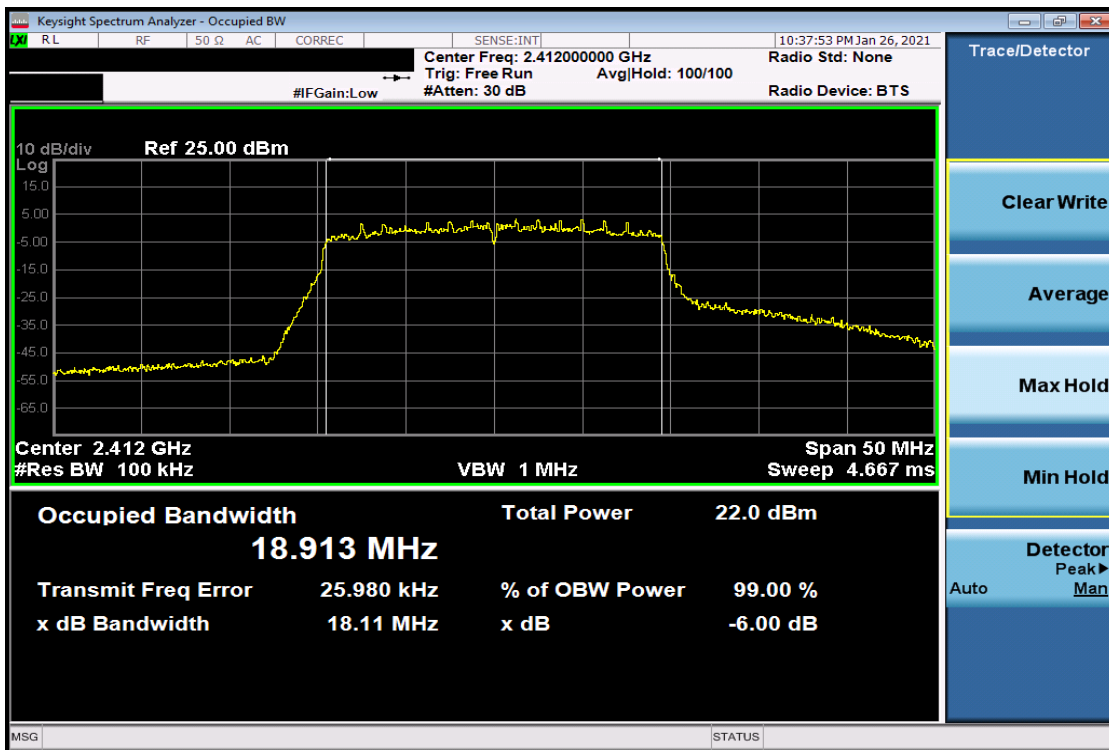


Plot 7-26. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 6) – MCS7

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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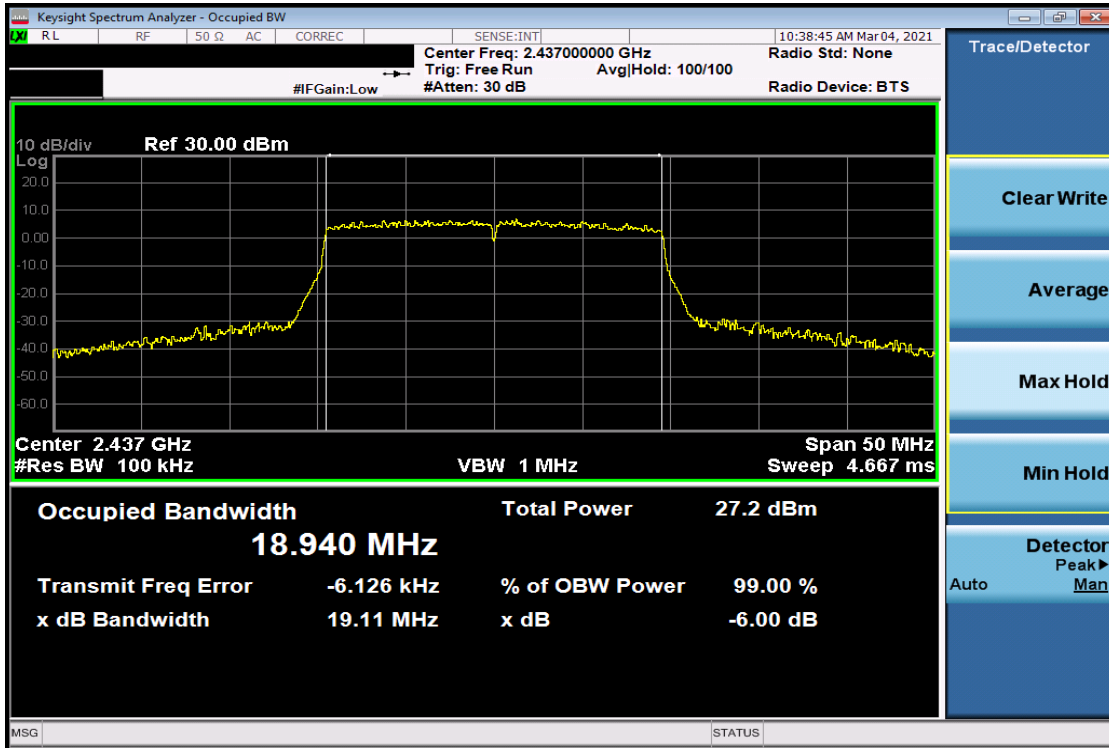


Plot 7-27. 6dB BW and 99% OBW Plot Antenna 4a (802.11n (2.4GHz) – Ch. 11) – MCS7

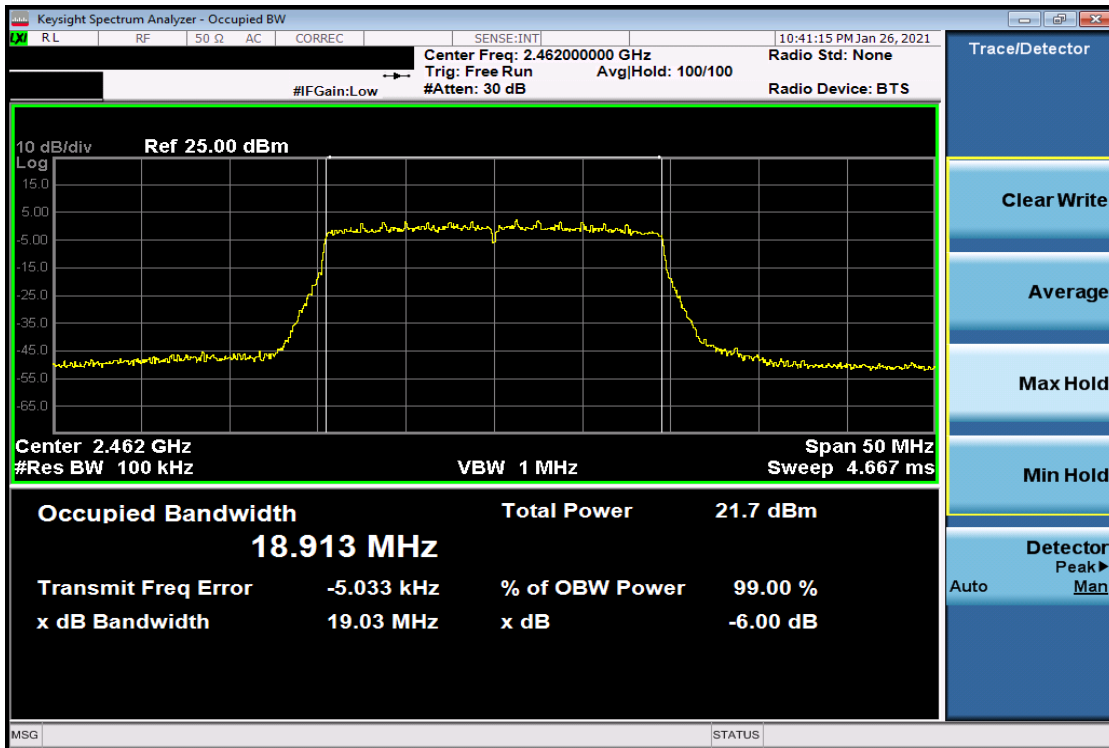


Plot 7-28. 6dB BW and 99% OBW Plot Antenna 4a (802.11ax (SU - 2.4GHz) – Ch. 1) – MCS5

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-29. 6dB BW and 99% OBW Plot Antenna 4a (802.11ax (SU - 2.4GHz) – Ch. 6) – MCS5



Plot 7-30. 6dB BW and 99% OBW Plot Antenna 4a (802.11ax (SU - 2.4GHz) – Ch. 11) – MCS5

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Antenna 2a 6dB and 99% Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
2412	1	g	6	16.624	16.330	0.500	Pass
2437	6	g	6	16.417	15.780	0.500	Pass
2462	11	g	6	16.457	15.190	0.500	Pass
2412	1	n	6.5/7.2 (MCS0)	17.749	17.180	0.500	Pass
2437	6	n	6.5/7.2 (MCS0)	17.652	17.220	0.500	Pass
2462	11	n	6.5/7.2 (MCS0)	17.658	16.570	0.500	Pass
2412	1	ax-SU	8/8.6 (MCS0)	18.925	18.570	0.500	Pass
2437	6	ax-SU	8/8.6 (MCS0)	19.155	18.380	0.500	Pass
2462	11	ax-SU	8/8.6 (MCS0)	18.872	18.180	0.500	Pass

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

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
2412	1	g	18	16.546	16.330	0.500	Pass
2437	6	g	18	16.400	16.090	0.500	Pass
2462	11	g	18	16.425	15.200	0.500	Pass
2412	1	n	26/28.9 (MCS3)	17.682	17.730	0.500	Pass
2437	6	n	26/28.9 (MCS3)	18.035	17.530	0.500	Pass
2462	11	n	26/28.9 (MCS3)	17.616	17.710	0.500	Pass
2412	1	ax-SU	33/34.4 (MCS3)	18.937	19.070	0.500	Pass
2437	6	ax-SU	33/34.4 (MCS3)	19.044	18.950	0.500	Pass
2462	11	ax-SU	33/34.4 (MCS3)	18.846	18.900	0.500	Pass

Table 7-6. Conducted Bandwidth Measurements Antenna 2a (Mid Data Rate)

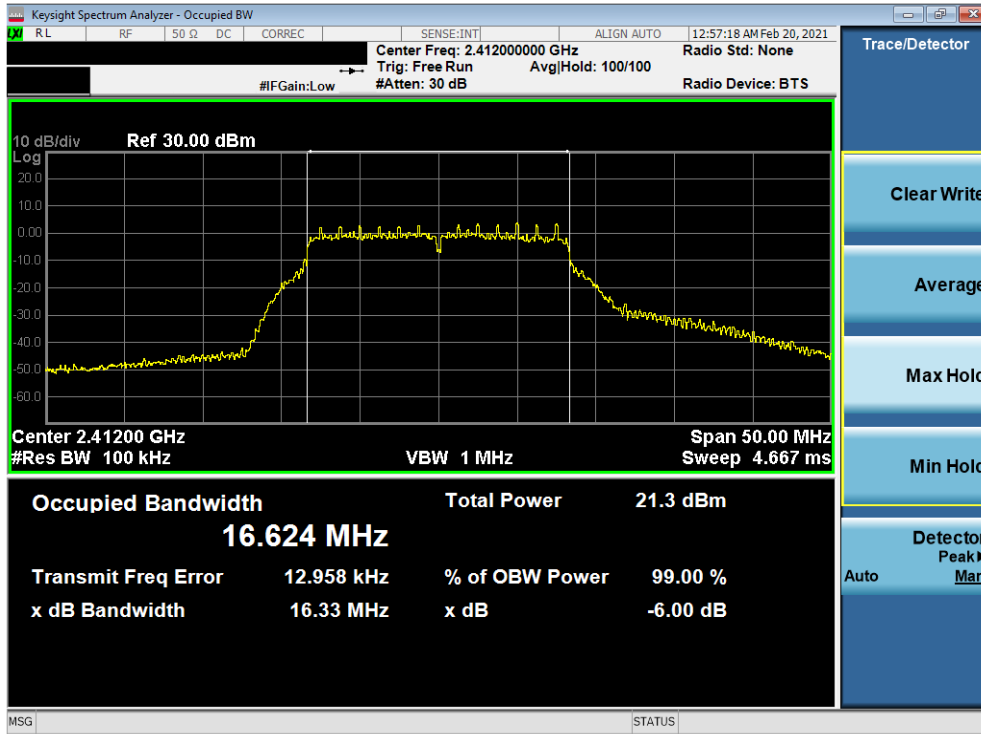
FCC ID: BCGA2301 IC: 579C-A2301	 PCTEST® Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	99% Occupied Bandwidth [MHz]	6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass / Fail
2412	1	b	11	12.785	8.409	0.500	Pass
2437	6	b	11	12.746	8.462	0.500	Pass
2462	11	b	11	12.655	8.619	0.500	Pass
2412	1	g	54	16.478	16.500	0.500	Pass
2437	6	g	54	16.450	16.480	0.500	Pass
2462	11	g	54	16.421	16.430	0.500	Pass
2412	1	n	65/72.2 (MCS7)	17.678	17.760	0.500	Pass
2437	6	n	65/72.2 (MCS7)	17.719	17.730	0.500	Pass
2462	11	n	65/72.2 (MCS7)	17.641	17.720	0.500	Pass
2412	1	ax-SU	65/68.8 (MCS5)	18.954	19.130	0.500	Pass
2437	6	ax-SU	65/68.8 (MCS5)	18.936	19.110	0.500	Pass
2462	11	ax-SU	65/68.8 (MCS5)	18.887	18.830	0.500	Pass

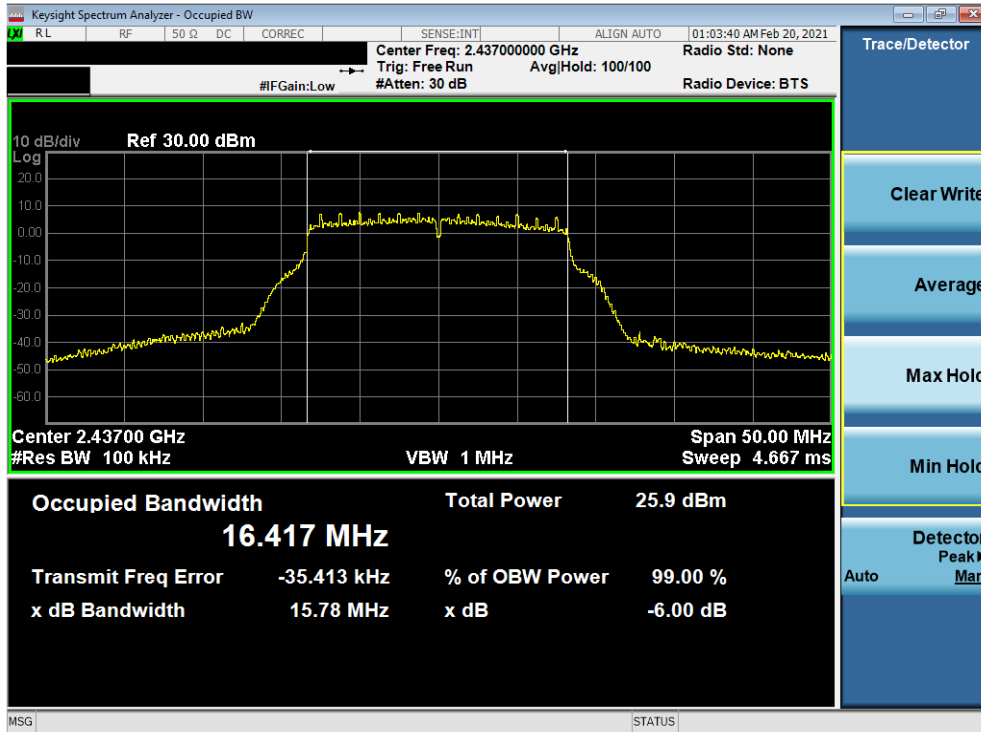
Table 7-7. Conducted Bandwidth Measurements Antenna 2a (High Data Rate)

FCC ID: BCGA2301 IC: 579C-A2301	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 35 of 345

Low Data Rate

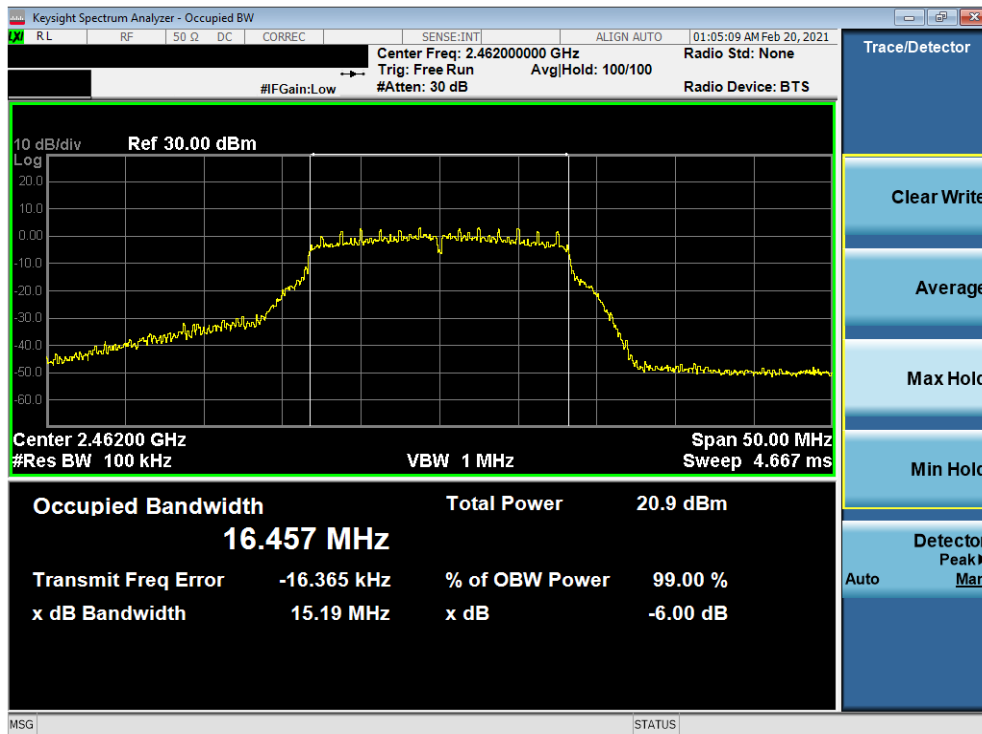


Plot 7-31. 6dB BW and 99% OBW Plot Antenna 2a (802.11g – Ch. 1) – 6Mbps

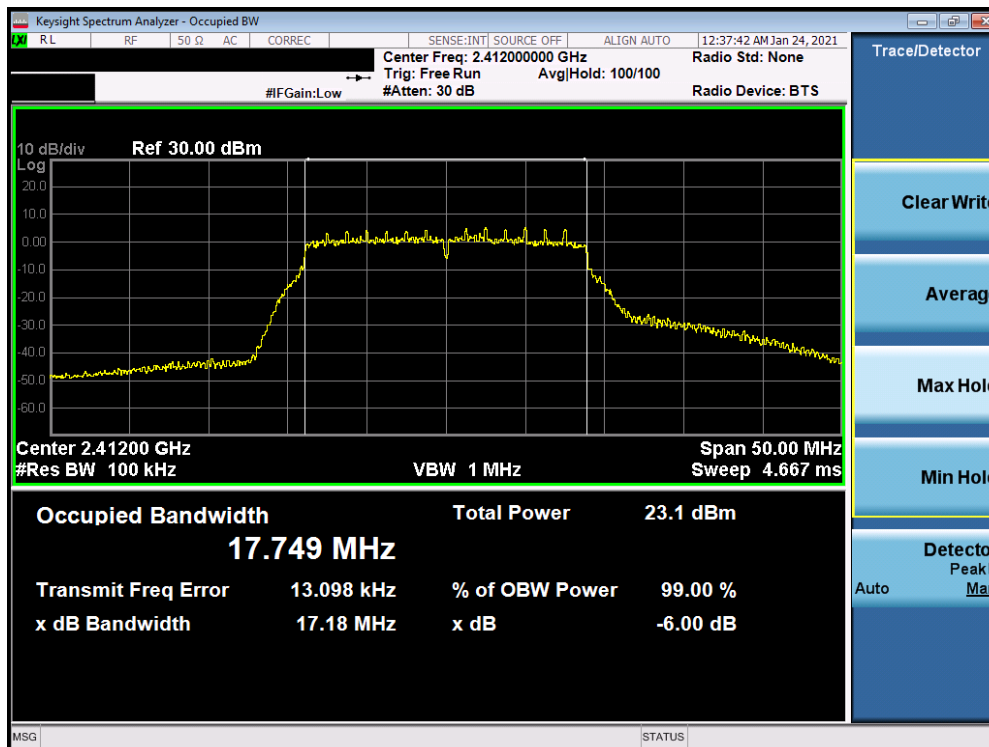


Plot 7-32. 6dB BW and 99% OBW Plot Antenna 2a (802.11g – Ch. 6) – 6Mbps

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 36 of 345

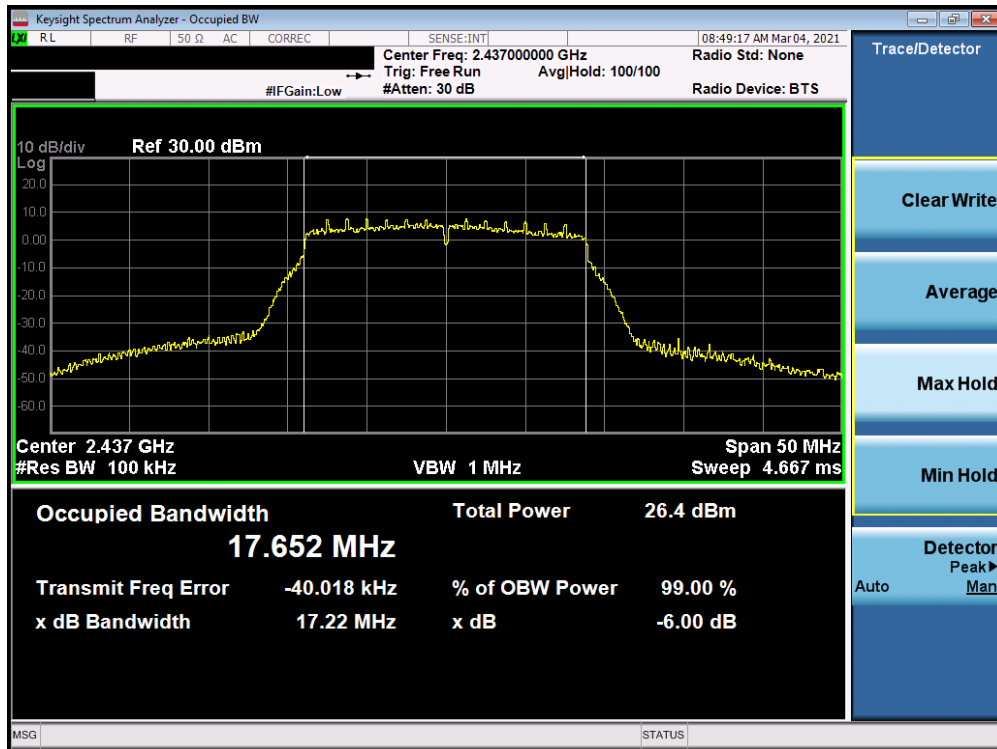


Plot 7-33. 6dB BW and 99% OBW Plot Antenna 2a (802.11g – Ch. 11) – 6Mbps

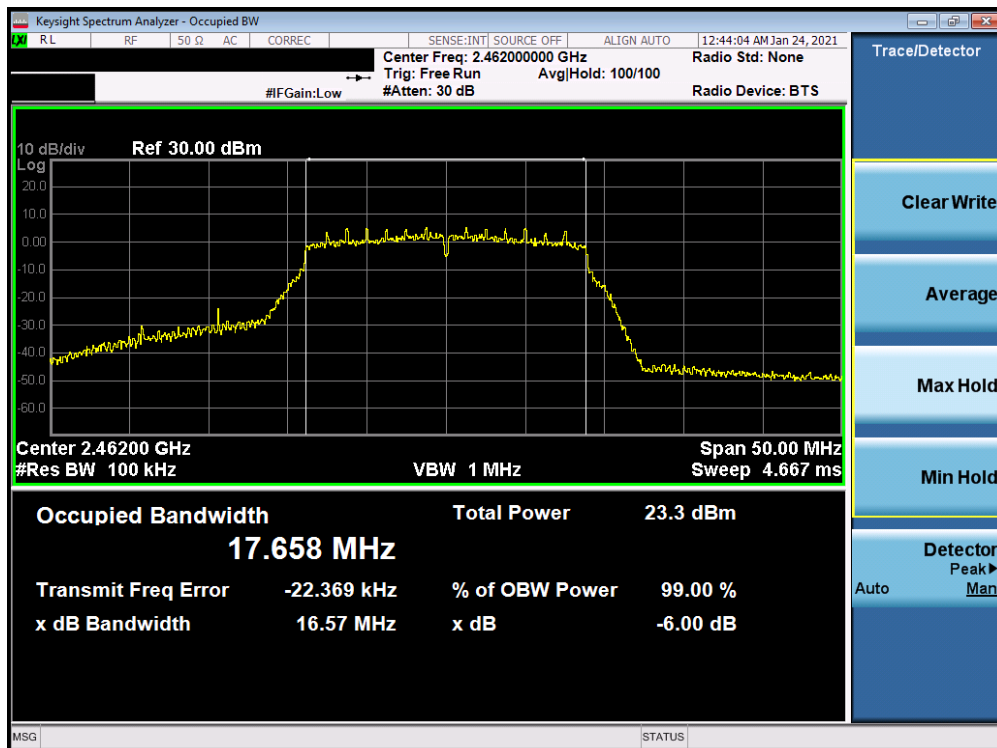


Plot 7-34. 6dB BW and 99% OBW Plot Antenna 2a (802.11n (2.4GHz) – Ch. 1) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 37 of 345

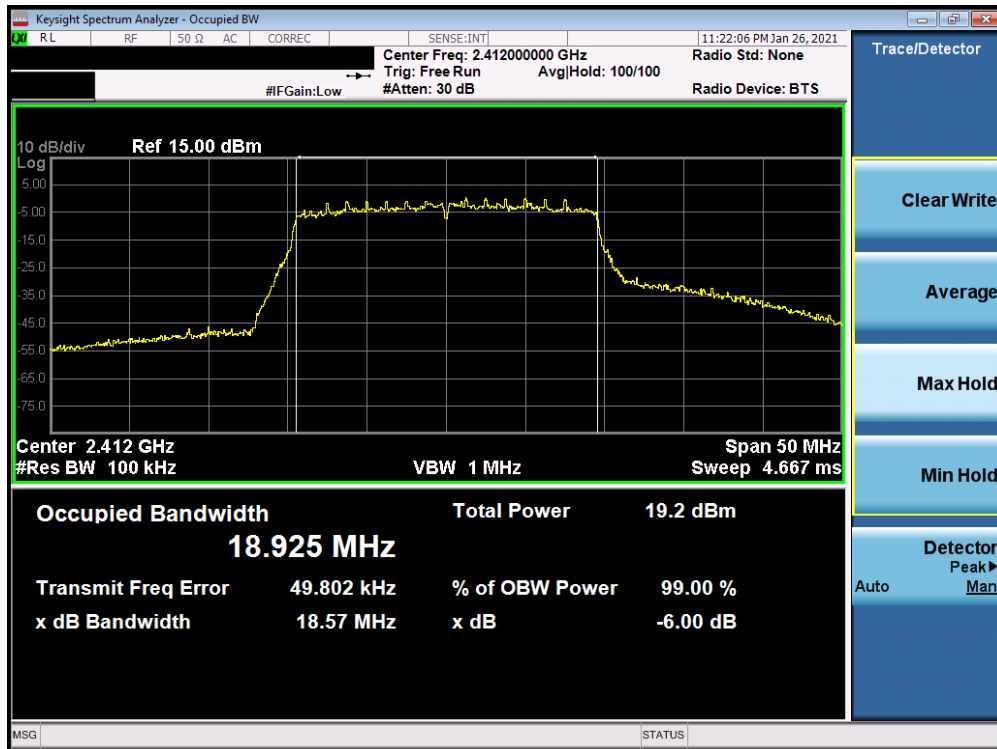


Plot 7-35. 6dB BW and 99% OBW Plot Antenna 2a (802.11n (2.4GHz) – Ch. 6) – MCS0

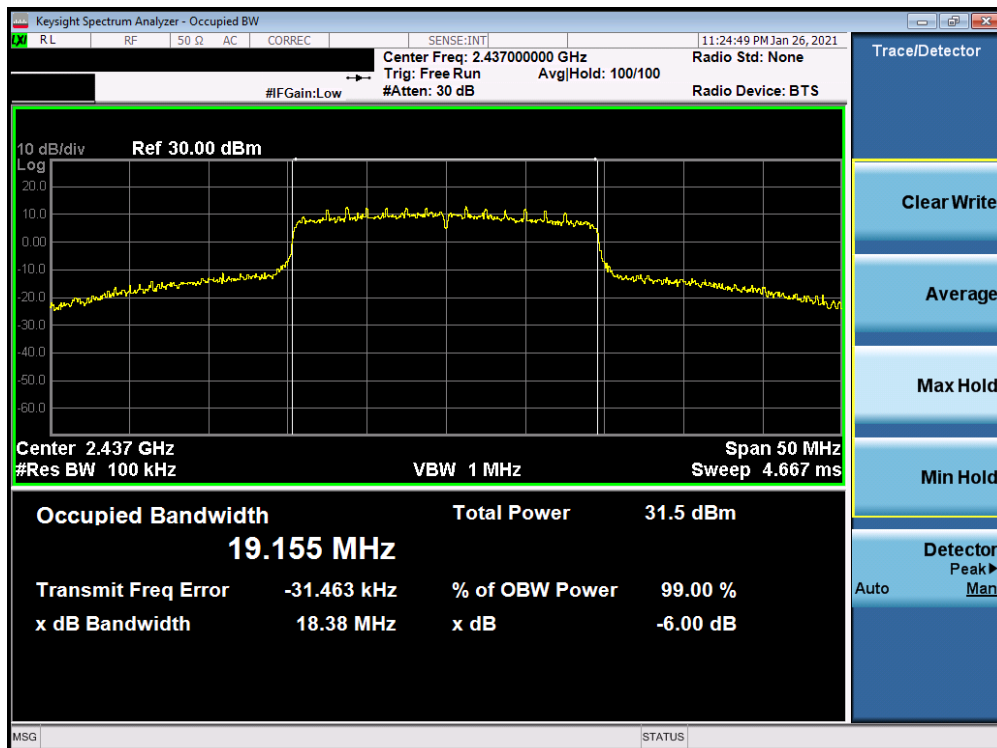


Plot 7-36. 6dB BW and 99% OBW Plot Antenna 2a (802.11n (2.4GHz) – Ch. 11) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 38 of 345

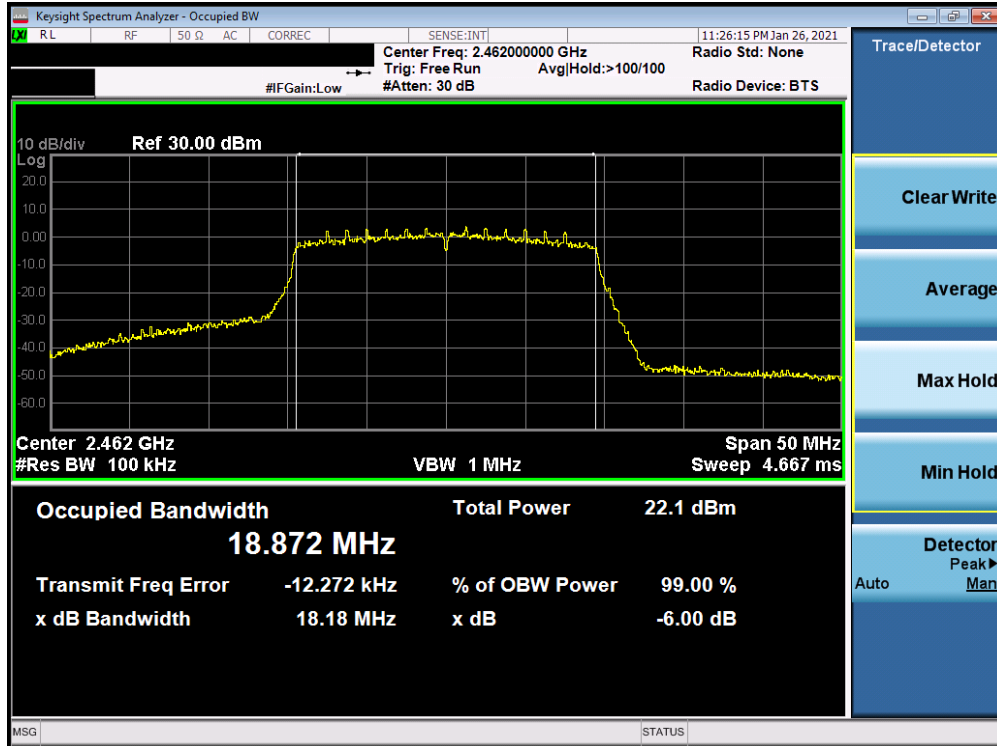


Plot 7-37. 6dB BW and 99% OBW Plot Antenna 2a (802.11ax (SU - 2.4GHz) – Ch. 1) – MCS0



Plot 7-38. 6dB BW and 99% OBW Plot Antenna 2a (802.11ax (SU - 2.4GHz) – Ch. 6) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device
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Plot 7-39. 6dB BW and 99% OBW Plot Antenna 2a (802. 11ax (SU - 2.4GHz) – Ch. 11) – MCS0

FCC ID: BCGA2301 IC: 579C-A2301		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2101020002-09.BCG	Test Dates: 12/15/2020-3/6/2021	EUT Type: Tablet Device	Page 40 of 345