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MEASUREMENT REPORT FCC PART 15.407 / ISED RSS-247 UNII 802.11ax OFDMA

Applicant Name:
Apple Inc.

One Apple Park Way Cupertino, CA 95014

United States

Date of Testing:

1/3/2024 - 3/24/2024

Test Report Issue Date:

4/5/2024

Test Site/Location:

Element Materials Technology Morgan Hill, CA, USA

Test Report Serial No.: 1C2311270070-23-R2.BCG

FCC ID: BCGA2926

IC: 579C-A2926

APPLICANT: Apple Inc.

Application Type:CertificationModel/HVIN:A2926, A3007EUT Type:Tablet DeviceFrequency Range:5180 – 5825MHz

Modulation Type: OFDMA

FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Rule Part(s): Part 15 Subpart E (15.407)

ISED Specification: RSS-247 Issue 3

Test Procedure(s): ANSI C63.10-2013, 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: 1C2311270070-23-R2.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 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.

Prepared by: WKR0000007111

Reviewed by: WKR0000005805

Hac-MRA



RJ Ortanez

Executive Vice President

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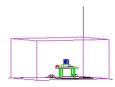


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			SISO					CDD Primary						CDD Diversity						
	Channel	Tx Frequency	Antenn	a WF5B	Anter	nna 4a	Anter	na 2a	Antenn	a WF5B	Anter	nna 4a	Surr	med	Anter	nna 4a	Anter	nna 2a	Sun	nmed
UNII Band	Bandwidth (MHz)	(MHz)	Max. Power (mW)	Max. Power (dBm)																
1		5180 - 5240	63.183	18.01	67.531	18.30	70.243	18.47	49.102	16.91	50.119	17.00	97.724	19.90	50.119	17.00	49.340	16.93	99.541	19.98
2A	20	5260 - 5320	65.963	18.19	68.992	18.39	68.770	18.37	50.119	17.00	49.843	16.98	98.628	19.94	49.843	16.98	50.119	17.00	100.000	20.00
2C	20	5500 - 5720	62.980	17.99	70.795	18.50	68.517	18.36	50.119	17.00	50.119	17.00	100.000	20.00	50.119	17.00	49.181	16.92	99.312	19.97
3		5745 - 5825	65.645	18.17	67.004	18.26	66.727	18.24	66.237	18.21	70.795	18.50	136.773	21.36	70.795	18.50	66.344	18.22	137.088	21.37
1		5190 - 5230	68.093	18.33	70.162	18.46	70.795	18.50	69.167	18.40	68.738	18.37	138.038	21.40	68.738	18.37	68.360	18.35	137.088	21.37
2A	40	5270 - 5310	68.218	18.34	67.158	18.27	70.778	18.50	68.960	18.39	69.422	18.42	138.357	21.41	69.422	18.42	66.988	18.26	136.458	21.35
2C	40	5510 - 5710	68.659	18.37	70.778	18.50	70.129	18.46	69.024	18.39	69.775	18.44	138.357	21.41	69.775	18.44	70.795	18.50	140.605	21.48
3		5755 - 5795	68.865	18.38	67.905	18.32	69.119	18.40	69.502	18.42	68.234	18.34	134.896	21.30	68.234	18.34	68.375	18.35	136.144	21.34
1		5210	15.542	11.92	15.336	11.86	15.849	12.00	15.849	12.00	15.812	11.99	31.696	15.01	15.812	11.99	15.849	12.00	31.261	14.95
2A	80	5290	19.953	13.00	19.797	12.97	19.289	12.85	19.454	12.89	19.953	13.00	38.994	15.91	19.953	13.00	19.209	12.84	38.994	15.91
2C	00	5530 - 5690	64.714	18.11	63.168	18.01	64.565	18.10	69.984	18.45	67.035	18.26	137.088	21.37	67.035	18.26	34.978	15.44	99.541	19.98
3		5775	39.811	16.00	38.708	15.88	39.165	15.93	39.811	16.00	39.811	16.00	77.983	18.92	39.811	16.00	39.537	15.97	79.433	19.00
1/2A	160	5250	11.194	10.49	11.194	10.49	11.079	10.45	9.966	9.99	9.931	9.97	19.815	12.97	9.931	9.97	10.009	10.00	19.861	12.98
2C	160	5570	8.892	9.49	8.831	9.46	8.810	9.45	8.874	9.48	8.634	9.36	17.498	12.43	8.634	9.36	8.892	9.49	17.458	12.42

FCC EUT Overview

					SI	80				CDD/SDM Primary						CDD/SDM Diversity					
	Channel		Antenn	a WF5B	Anter	ına 4a	Anten	nna 2a	Antenn	a WF5B	Anter	nna 4a	Sum	med	Anter	ına 4a	Anten	ına 2a	Sum	nmed	
UNII Band	Bandwidth (MHz)	Tx Frequency (MHz)	Max. Power (mW)	Max. Power (dBm)																	
1		5180 - 5240	50.119	17.00	50.119	17.00	50.050	16.99	30.811	14.89	31.623	15.00	62.373	17.95	31.623	15.00	31.456	14.98	63.096	18.00	
2A	20	5260 - 5320	65.963	18.19	68.992	18.39	68.770	18.37	50.119	17.00	49.843	16.98	98.628	19.94	49.843	16.98	50.119	17.00	100.000	20.00	
2C	20	5500 - 5720	62.980	17.99	70.795	18.50	68.517	18.36	50.119	17.00	50.119	17.00	100.000	20.00	50.119	17.00	49.181	16.92	99.312	19.97	
3		5745 - 5825	65.645	18.17	67.004	18.26	66.727	18.24	66.237	18.21	70.795	18.50	136.773	21.36	70.795	18.50	66.344	18.22	137.088	21.37	
1		5190 - 5230	67.143	18.27	68.707	18.37	69.151	18.40	54.891	17.40	53.691	17.30	108.643	20.36	53.691	17.30	54.563	17.37	108.143	20.34	
2A	40	5270 - 5310	68.218	18.34	67.158	18.27	70.778	18.50	68.960	18.39	69.422	18.42	138.357	21.41	69.422	18.42	66.988	18.26	136.458	21.35	
2C	40	5510 - 5710	64.759	18.11	68.423	18.35	70.113	18.46	64.343	18.09	69.359	18.41	133.660	21.26	69.359	18.41	68.691	18.37	138.038	21.40	
3		5755 - 5795	68.865	18.38	67.905	18.32	69.119	18.40	69.502	18.42	68.234	18.34	134.896	21.30	68.234	18.34	68.375	18.35	136.144	21.34	
1		5210	15.849	12.00	15.704	11.96	15.849	12.00	15.671	11.95	15.849	12.00	30.974	14.91	15.849	12.00	15.849	12.00	31.261	14.95	
2A	80	5290	19.953	13.00	19.797	12.97	19.289	12.85	19.454	12.89	19.953	13.00	38.994	15.91	19.953	13.00	19.209	12.84	38.994	15.91	
2C	80	5530 - 5690	64.714	18.11	63.168	18.01	64.565	18.10	69.984	18.45	67.035	18.26	137.088	21.37	67.035	18.26	32.434	15.11	99.541	19.98	
3		5775	39.811	16.00	38.708	15.88	39.165	15.93	39.811	16.00	39.811	16.00	77.983	18.92	39.811	16.00	39.537	15.97	79.433	19.00	
1/2A	160	5250	11.205	10.49	11.140	10.47	11.169	10.48	9.943	9.98	9.879	9.95	19.815	12.97	9.879	9.95	9.851	9.94	19.724	12.95	

ISED EUT Overview

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1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Materials Technology Test Location

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

1.3 Test Facility / Accreditations

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

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

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PRODUCT INFORMATION

2.1 **Equipment Description**

The Equipment Under Test (EUT) is the Apple Tablet Device FCC ID: BCGA2926 and IC: 579C-A2926. The test data contained in this report pertains only to the emissions due to the EUT's UNII 802.11ax - RU transmitter.

Test Device Serial No.: RPWCVDPQ7F, KF6WWWG416, YNVJ4VL2N6, QNQV177VJH, R376G40P7L, Q06R090269, DLXH190000A000063A, DLXH190002M000063A, PD6XKGP0XX, WT23KQQ4LM

2.2 **Device Capabilities**

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, 802.11a/ax WIFI 6E, 802.15.4, Bluetooth (1x, EDR, LE1M, LE2M, HDR4, HDR8), WPT, NB UNII (1x, HDR4, HDR8).

This device supports BT Beamforming.

Band [•]

Ch.	Frequency (MHz)
36	5180
:	:
42	5210
:	:
48	5240

Band 2A

Ch.	Frequency (MHz)
52	5260
:	:
56	5280
:	:
64	5320

Band 2C

Ch.	Frequency (MHz)
100	5500
:	:
116	5580
:	:
144	5720

Band 3

Ch.	Frequency (MHz)
149	5745
:	:
157	5785
:	:
165	5825

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

Band 1

Ch.	Frequency (MHz)
38	5190
•••	••
46	5230

Ch.	Frequency (MHz)
54	5270
:	:
62	5310

Band 2C

Ch.	Frequency (MHz)
102	5510
:	:
110	5550
:	:
142	5710
	101 10

Band	3

Ch.	Frequency (MHz)
151	5755
:	:
159	5795

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

Band 1

Ch.	Frequency (MHz)
42	5210

Ran	Ы	2	Δ

Ch.	Frequency (MHz)
58	5290

Band 2C

Ch.	Frequency (MHz)
106	5530
:	:
138	5690

Band 3

Ch.	Frequency (MHz)
155	5775

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

Band 1

Ch.	Frequency (MHz)
50	5250

Band 2A

Band	20

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
50	5250	50	5250	114	5570
	= 11 0 1 000 11	 	4001UL DIAN = 44	 	

802.11ax (160MHz BW) Frequency / (

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Notes:

- 1. TDWR channels are not supported for ISED.
- 2. 5GHz NII operation is possible in 20MHz, 40MHz, 80MHz and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of 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:

	Measure Duty Cycles									
9.0	2.11 Mode/Band	Duty Cyles [%]								
80	22.11 Wode/Ballu	Antenna WF5B	Antenna 4a	CDD/SDM Primary	CDD/SDM Diversity					
	11ax(RU) 26T HE20	88.48	88.18	87.88	88.48	88.48				
	11ax(RU) 52T HE20	87.60	88.01	87.44	87.57	87.98				
	11ax(RU) 242T HE20	90.52	90.53	89.56	90.53	90.93				
	11ax(RU) 26T HE40	88.48	88.44	88.62	88.14	88.75				
	11ax(RU) 52T HE40	87.34	87.25	87.56	87.45	87.34				
5GHz	11ax(RU) 484T HE40	92.72	91.77	92.09	92.70	92.09				
	11ax(RU) 26T HE80	88.18	88.75	88.22	88.18	88.47				
	11ax(RU) 52T HE80	87.43	87.45	87.45	87.40	87.46				
	11ax(RU) 996T HE80	87.67	87.37	87.40	86.38	87.40				
	11ax(RU) 52T HE160	87.68	87.35	87.45	87.48	87.34				
	11ax(RU) 996x2T HE160	81.71	82.17	82.10	82.03	81.71				

Table 2-5. Measured Duty Cycles

3. The device employs CDD/SDM technology. Below are the possible configurations.

	SISO					Primary				Diversity						
WiFi	Configurations	SISO		CD	D	SD	М	ST	ВС	CI	DD	SD	M	ST	BC .	
		Antenna WF5B	Antenna 4a	Antenna 2a	Antenna WF5B	Antenna 4a	Antenna WF5B	Antenna 4a	Antenna WF5B	Antenna 4a	Antenna 4a	Antenna 2a	Antenna 4a	Antenna 2a	Antenna 4a	Antenna 2a
	11ax (20MHz)	✓	✓	✓	✓	✓	✓	✓	\	✓	✓	✓	^	✓	✓	✓
5GHz	11ax (40MHz)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SGHZ	11ax (80MHz)	✓	✓	✓	✓	✓	✓	√	✓	✓	✓	✓	✓	✓	✓	✓
	11ax (160MHz)	/	1	√	√	1	√	√	/	√	√	√	✓	√	√	/

Table 2-6. WIFI Configurations

✓ = Support; × = NOT Support SISO = Single Input Single Output

CDD = Cyclic Delay Diversity – 2Tx Function

SDM = Spatial Diversity Multiplexing – CDD/SDM function

STBC = Space-Time Block Coding – 2Tx Function

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Data Rate(s) Tested:

8/8.6, 16/17.2, 24/25.8, 33/34.4, 49/51.6, 65/68.8, 73/77.4, 81/86.0, 98/103.2, 108/114.7, 122/129.0,

135/143.4 Mbps (ax – 20MHz)

 $16/17.2,\ 33/34.4,\ 49/51.6,\ 65/68.8,\ 98/103.2,\ 130/137.6,\ 146/154.9,\ 163/172.1,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 195/206.5,\ 217/229.4,\ 217/206.5,\ 2$

244/258.1, 271/286.8 Mbps (ax - 40MHz BW)

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

510/540.4, 567/600.5 Mbps (ax – 80MHz BW)

 $34/36, \, 68.1/72.1, \, 102.1/108.1, \, 136.1/144.1, \, 204.2/216.2, \, 272.2/288.2, \, 306.3/324.3, \, 340.3/360.3, \, 408.3/432.4, \, 408.3/432.4,$

453.7/480.4, 510.4/540.4, 567.1/600.5 Mbps (ax - 160MHz BW)

 $16.3/17.2,\ 32.5/34.4,\ 48.8/51.6,\ 65/68.8,\ 97.5/103.2,\ 130/137.6,\ 146.3/154.9,\ 162.5/172.1,\ 195/206.5,\ 195/206.5$

216.7/229.4, 243.8/258.1, 270.8/286.8 Mbps (ax - 20MHz MIMO)

 $32.5/34.4,\,65/68.8,\,97.5/103.2,\,130/137.6,\,195/206.5,\,260/275.3,\,292.5/309.7,\,325/344.1,\,390/412.9,\,32.5/34.4,\,65/68.8,\,97.5/103.2,\,130/137.6,\,195/206.5,\,260/275.3,\,292.5/309.7,\,325/344.1,\,390/412.9,\,32.5/34.4,\,32.5/34.4,\,32.5/34.4,\,32.5/34.4,\,33.5/34$

433.3/458.8, 487.5/516.2, 541.7/573.5 Mbps (ax – 40MHz MIMO)

68.1/72.1, 136.1/144.1, 204.2/216.2, 272.2/288.2, 408.3/432.4, 544.4/576.5, 612.5/648.5, 680.6/720.6,

816.7/864.7, 907.4/960.8, 1020.8/1080.9, 1134.3/1201 Mbps (ax - 80/160MHz MIMO)

136.2/144.2, 272.2/288.2, 408.4/432.4, 544.4/576.4, 816.6/864.8, 1088.8/1153, 1225/1297, 1361.2/1441.2,

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

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.

		Wifi 2GHz	Bluetooth	Thread	Wifi 5GHz	Wifi 6GHz	NB UNII
Antenna	Simultaneous Tx Config	802.11 b/g/n/ax	BDR, EDR, HDR4/8, LE1/2M	802.15.4	802.11 a/n/ac/ax	802.11 a/ax	BDR, HDR4/8
Ant 2a	Config 1	✓	X	X	Х	Х	✓
Ant 2a	Config 2	X	✓	Х	✓	Х	X
Ant 2a	Config 3	X	✓	X	X	✓	X
Ant 2a	Config 4	X	X	✓	✓	Х	X
Ant 2a	Config 5	X	X	✓	Х	✓	Х
Ant 4a	Config 6	✓	X	X	X	Х	✓
Ant 4a	Config 7	X	✓	X	✓	Х	X
Ant 4a	Config 8	X	√	X	Х	✓	X
Ant 4a	Config 9	X	X	✓	✓	X	Х
Ant 4a	Config 10	X	Х	√	Х	√	Х

Table 2-7. Simultaneous Transmission Configurations

√ = Support; × = Not Support

Note:

All of the above simultaneous transmission configurations have been tested and the worst case configuration was found to be Config 2 and reported in the Bluetooth and UNII OFDM test report.

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

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2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

F	Antenna Gain (dBi)					
Frequency [GHz]	Antenna WF5B	Antenna 4a	Antenna 2a			
5.150 - 5.250	1.4	-1.1	-1.6			
5.250 - 5.350	1.2	-1.7	-1.4			
5.470 - 5.725	0.9	1.3	-0.2			
5.725 - 5.850	0.7	1.3	-0.6			

Table 2-8. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook Pro	Model:	A2141	S/N:	C02H604EQ05D
	w/AC/DC Adapter	Model:	A2166	S/N:	C4H042705ZNPM0WA6
2	Apple USB-C Cable	Model:	Spartan	S/N:	GXK1336018XKTR024
3	USB-C Cable	Model:	A246C	S/N:	DWH80115BK826GV19
	w/ AC Adapter	Model:	A2305	S/N:	C4H95160004PF4F4V
4	Apple Pencil	Model:	A2538	S/N:	KJ26TCFXJW
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-9. Test Support Equipment List

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2.5 Test Configuration

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

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

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

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

For AC line conducted and radiated test below 1GHz, following configuration were investigated and EUT powered by hot PC 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

802.11ax-RU HE20/40/80/160 2TX CDD/SDM mode test data provided in this report covers 802.11ax-RU HE20/40/80/160 2TX STBC mode.

For 802.11a/n/ac/ax-SU test results, see separate UNII report, 1C2311270070-22.BCG.

2.6 Software and Firmware

The test was conducted with firmware version 21E8197 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from measurement procedure......None

3.2 AC Line Conducted Emissions

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

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

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

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

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3.3 Radiated Emissions

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

Per KDB 414788 D01 v01r01, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was used while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

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

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

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

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

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	2.07
Line Conducted Disturbance	1.91
Radiated Disturbance (<30MHz)	4.12
Radiated Disturbance (30MHz - 1GHz)	4.85
Radiated Disturbance (1 - 18GHz)	5.08
Radiated Disturbance (>18GHz)	4.59

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6.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	6/21/2023	Annual	6/21/2024	MY49430244
Anritsu	ML2496A	Power Meter	4/4/2023	Annual	4/4/2024	1840005
Anritsu	MA2411B	Pulse Power Sensor	8/22/2023	Annual	8/22/2024	1726262
Anritsu	MA2411B	Pulse Power Sensor	4/5/2023	Annual	4/5/2024	1726261
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	3/30/2023	Annual	3/30/2024	00218555
Keysight Technology	N9040B	UXA Signal Analyzer	3/10/2023	Annual	3/10/2024	MY57212015
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/31/2023	Annual	8/31/2024	100052
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	5/11/2023	Annual	5/11/2024	101619
Rohde & Schwarz	ESW44	EMI Test Receiver	6/6/2023	Annual	6/6/2024	101668
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	6/22/2023	Annual	6/22/2024	102356
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	6/2/2023	Annual	6/2/2024	100050
Rohde & Schwarz	HFH2-Z2	Loop Antenna	5/1/2023	Annual	5/1/2024	100519
Rohde & Schwarz	ENV216	Two-Line V-Network	6/8/2023	Annual	6/8/2024	192052
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	4/17/2023	Annual	4/17/2024	00304

Table 6-1. Test Equipment List

Note:

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

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7.0 TEST RESULTS

7.1 Summary

 Company Name:
 Apple Inc.

 FCC ID:
 BCGA2926

 IC:
 579C-A2926

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		N/A	Section 7.2
15.407(e)	RSS-Gen [6.7]	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
2.1049	RSS-Gen [6.7]	Occupied Bandwidth	N/A		N/A	Section 7.2, 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])	CONDUCTED	TED 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		PASS	See DFS Test Report (1C2311270 070-21.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])	RADIATED	PASS	Section 7.6
15.407(b.1), (2), (3), (4)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		PASS	Section 7.6, 7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 (RSS-Gen [8.8]) limits	AC LINE CONDUCTED	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

- All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
- The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3. All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4. For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "UNII Automation," Version 7.0.
- 5. For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 3.0.0.
- 6. Per RSS-247 Section 6.2.3, transmission on channels which overlap the 5600-5650 MHz is prohibited. This device operates under these frequencies only under the control of a certified master device and does not support active scanning on these channels. This device does not transmit any beacons or initiate any transmissions in UNII Bands 2A or 2C.
- 7. 802.11ax OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.
- 8. Only one RU index could be selected at a time so no contiguous or non-contiguous RU's were considered for testing.

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7.2 26dB & 99% Bandwidth Measurement – 802.11ax OFDMA

§2.1049; §15.407; RSS-Gen [6.7]

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

The 26dB bandwidth is used to determine the conducted power limits.

Test Procedure Used

ANSI C63.10-2013 – Subclause 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. $VBW > 3 \times RBW$
- 4. Detector = Peak
- 5. Trace mode = max hold

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

- 1. All antenna configs were investigated and only the worst case is reported.
- 2. All RU's were investigated and only worst case partially-loaded and fully-loaded RU's were reported
- 3. Low, mid, and high channels were tested and tabular data has been reported. Only mid channel bandwidth plots have been reported.

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Antenna WF5B 26dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel	802.11 MODE	RU Size	RU Index	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]				
				26	0	12.5/14.7 (MCS11)	18.20	19.67				
	5180	36	ax (20MHz)	26	4	12.5/14.7 (MCS11)	17.04	18.12				
				26	8	12.5/14.7 (MCS11)	18.34	19.70				
				26	0	12.5/14.7 (MCS11)	18.21	19.60				
	5200	40	ax (20MHz)	26	4	12.5/14.7 (MCS11)	17.03	18.09				
				26	8	12.5/14.7 (MCS11)	18.35	19.62				
				26	0	12.5/14.7 (MCS11)	18.21	19.71				
_	5240 48	48	48 ax (20MHz)	26	4	12.5/14.7 (MCS11)	17.03	18.11				
<u>5</u>				26	8	12.5/14.7 (MCS11)	18.33	19.56				
Band		38						26	0	12.5/14.7 (MCS11)	18.07	19.52
	5190		ax (40MHz)	26	8	12.5/14.7 (MCS11)	20.03	22.48				
				26	17	12.5/14.7 (MCS11)	18.21	19.92				
				26	0	12.5/14.7 (MCS11)	18.10	19.75				
	5230	230 46	ax (40MHz)	26	8	12.5/14.7 (MCS11)	19.81	21.92				
				26	17	12.5/14.7 (MCS11)	18.20	19.86				
				26	0	12.5/14.7 (MCS11)	17.95	19.38				
	5210	42	ax (80MHz)	26	18	12.5/14.7 (MCS11)	37.31	38.54				
				26	36	12.5/14.7 (MCS11)	18.23	19.50				

Table 7-2. Conducted BW Measurements Antenna WF5B (RU26)

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	Frequency [MHz]	Channel	802.11 MODE	RU Size	RU Index	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
D /		50(1)		52	37	25/29.4 (MCS11)	18.18	20.23
Band 1/2A	5250	50 (L)	ax (160MHz)	52	52	25/29.4 (MCS11)	21.04	25.33
ш т		50 (U)		52	52	25/29.4 (MCS11)	18.53	21.72
				52	37	25/29.4 (MCS11)	18.14	19.73
	5260	52	ax (20MHz)	52	38	25/29.4 (MCS11)	17.10	18.33
	9200			52	40	25/29.4 (MCS11)	18.23	19.72
				52	37	25/29.4 (MCS11)	18.12	19.77
	5300	60	ax (20MHz)	52	38	25/29.4 (MCS11)	17.09	18.29
	3333			52	40	25/29.4 (MCS11)	18.19	19.76
				52	37	25/29.4 (MCS11)	18.15	19.77
⋖	5320	64	ax (20MHz)	52	38	25/29.4 (MCS11)	17.10	18.43
Band 2A				52	40	25/29.4 (MCS11)	18.21	19.74
San				52	37	25/29.4 (MCS11)	17.91	20.19
	5270	54	ax (40MHz)	52	40	25/29.4 (MCS11)	19.61	23.68
				52	44	25/29.4 (MCS11)	18.03	20.40
				52	37	25/29.4 (MCS11)	17.94	19.98
	5310	62	ax (40MHz)	52	40	25/29.4 (MCS11)	19.72	23.20
				52	44	25/29.4 (MCS11)	18.09	20.44
				52	37	25/29.4 (MCS11)	17.97	19.52
	5290	58	ax (80MHz)	52	44	25/29.4 (MCS11)	20.64	22.68
				52	52	25/29.4 (MCS11)	18.05	20.50
				52	37	25/29.4 (MCS11)	18.10	19.68
	5500	100	ax (20MHz)	52	38	25/29.4 (MCS11)	17.11	18.47
				52	40	25/29.4 (MCS11)	18.23	19.85
	5590	440	(52	37	25/29.4 (MCS11)	18.16	19.75
	5580	116	ax (20MHz)	52	38	25/29.4 (MCS11)	17.12	18.44
				52	40	25/29.4 (MCS11)	18.22	19.80
	5700	444	(001411)	52	37	25/29.4 (MCS11)	18.15	19.70
	5720	144	ax (20MHz)	52	38	25/29.4 (MCS11)	17.10	18.34
				52	40	25/29.4 (MCS11)	18.21	19.88
	FF10	400	ov (40MLI=)	52	37	25/29.4 (MCS11)	17.89	19.95
	5510	102	ax (40MHz)	52	40	25/29.4 (MCS11)	19.52	22.53
				52	37	25/29.4 (MCS11)	18.11	20.48
	5550	110	ax (40MHz)	52 52	40	25/29.4 (MCS11)	17.89	19.96
20	3330	110	ax (401VII 12)		1	25/29.4 (MCS11)	19.57	23.32
Band 2C	-			52 52	37	25/29.4 (MCS11) 25/29.4 (MCS11)	18.08 17.92	20.16
Ba	5710	142	ax (40MHz)	52	40	25/29.4 (MCS11)	19.94	20.11 23.83
	37 10	172	ax (401VII 12)	52	44	25/29.4 (MCS11) 25/29.4 (MCS11)	18.04	20.33
				52	37	25/29.4 (MCS11) 25/29.4 (MCS11)	17.91	19.63
	5530	106	ax (80MHz)	52	44	25/29.4 (MCS11)	20.57	24.03
	0000	100	ax (001VII 12)	52	52	25/29.4 (MCS11)	18.06	20.44
				52	37	25/29.4 (MCS11)	17.91	19.54
	5610*	122	ax (80MHz)	52	44	25/29.4 (MCS11)	20.63	24.37
	3010		ω. (Ο ΟΙ ΥΙΙ ΙΙ Σ)	52	52	25/29.4 (MCS11)	18.06	19.95
				52	37	25/29.4 (MCS11)	17.97	19.84
	5690	138	ax (80MHz)	52	44	25/29.4 (MCS11)	20.64	23.51
		[· (- · · · · · · · · · · · · · · · · · ·	52	52	25/29.4 (MCS11)	18.06	20.65
				52	37	25/29.4 (MCS11)	18.29	21.22
	5570*	114 (L)	ax (160MHz)	52	52	25/29.4 (MCS11)	20.59	25.65
	1	114 (U)	, - ,	52	52	25/29.4 (MCS11)	18.83	22.26
						nente Antenna WE		

Table 7-3. Conducted BW Measurements Antenna WF5B (RU52)

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

FCC ID: BCGA2926 IC: 579C-A2926	elemen (annual man)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dog 40 of 450
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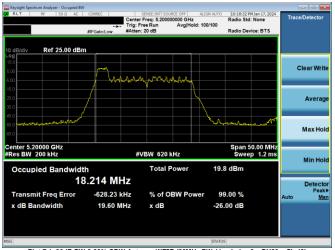
	Frequency [MHz]	Channel	802.11 MODE	RU Size	RU Index	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
	5180	36	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.03	21.02
_	5200	40	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.26	29.49
Band 1	5240	48	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.13	25.84
3ar	5190	38	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.00	41.22
_	5230	46	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.41	68.39
	5210	42	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.14	81.39
Band 1/2A	5250	50	ax (160MHz)	996x2	68	1020.8/1201 (MCS11)	157.17	166.46
	5260	52	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.17	25.54
∢	5300	60	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.08	21.40
7	5320	64	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.02	21.01
Band 2A	5270	54	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.30	70.85
ш	5310	62	ax (40MHz)	484	65	243.8/286.8 (MCS11)	37.92	41.34
	5290	58	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.27	81.59
	5500	100	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.02	21.13
	5580	116	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.13	22.69
	5720	144	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.07	21.40
ပ	5510	102	ax (40MHz)	484	65	243.8/286.8 (MCS11)	37.97	41.51
Q Q	5550	110	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.18	42.26
Band 2C	5710	142	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.29	67.59
ш	5530	106	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.23	81.66
	5610*	122	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.13	81.20
	5690	138	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.46	99.21
	5570*	114	ax (160MHz)	996x2	68	1020.8/1201 (MCS11)	156.20	165.54

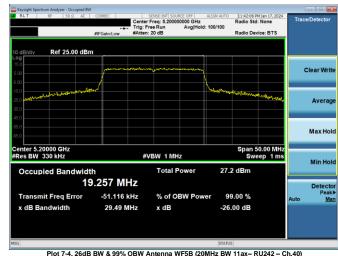
Table 7-4. Conducted BW Measurements Antenna WF5B (Fully - loaded RU)

FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dags 10 of 150
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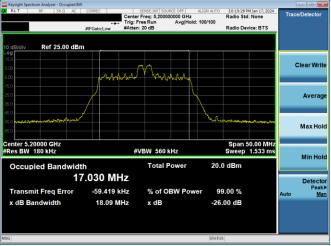
^{*}TDWR channel is not supported for ISED (denoted by a * next to the frequency)



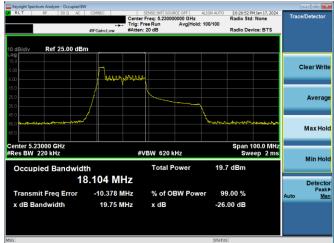




Plot 7-1, 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 0 - RU26 - Ch.40)

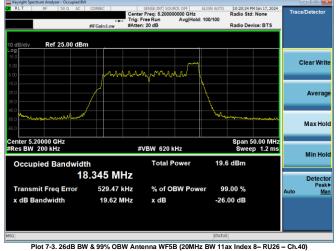






Plot 7-2, 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 4 - RU26 - Ch.40)



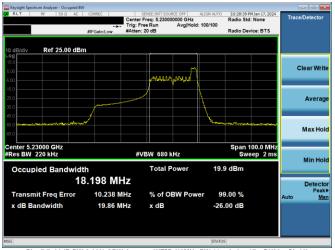




Plot 7-6, 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax Index 8 - RU26 - Ch.46)

FCC ID: BCGA2926 IC: 579C-A2926	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Dogg 20 of 450
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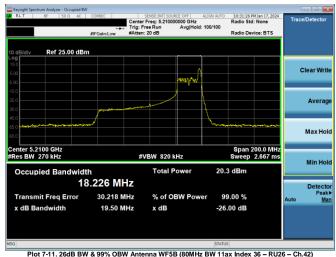








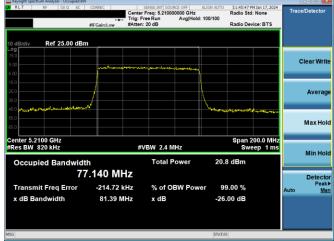
Plot 7-10. 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax Index 18 - RU26 - Ch.42)



Plot 7-8. 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax - RU484 - Ch.46)



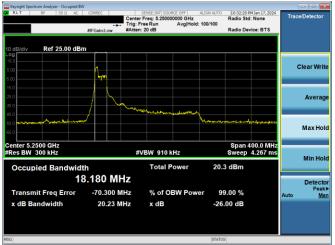
Plot 7-11. 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax Index 36 – RU26 – Ch.42)



0MHz BW 11ax Index 0 - RU26 - Ch.42) Plot 7-12. 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax - RU996 - Ch.42)

FCC ID: BCGA2926 IC: 579C-A2926	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 24 of 450
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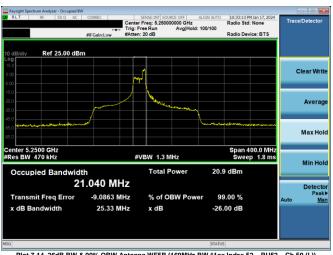


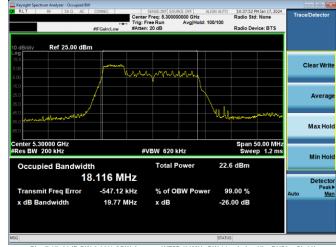




Plot 7-13. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax Index 37 - RU52 - Ch.50 (L))

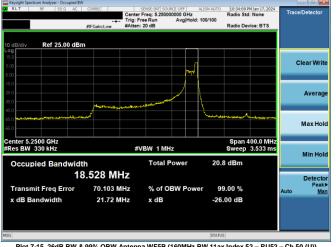
Plot 7-16. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax - RU996x2 - Ch.50)





Plot 7-14. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax Index 52 - RU52 - Ch.50 (L))

Plot 7-17. 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 37 - RU52 - Ch.60)



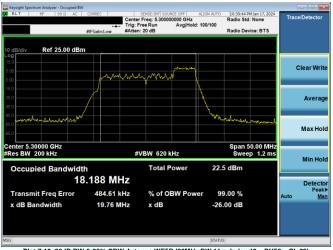


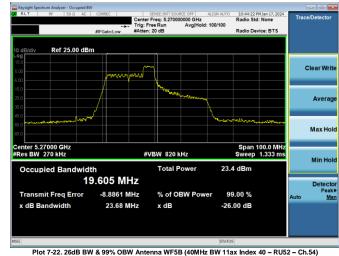
Plot 7-15. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax Index 52 - RU52 - Ch.50 (U))

Plot 7-18. 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 38 - RU52 - Ch.60)

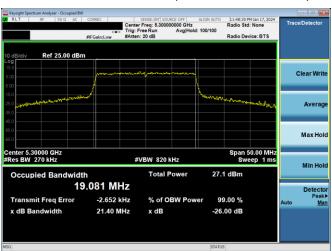
FCC ID: BCGA2926 IC: 579C-A2926	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Daga 22 of 450
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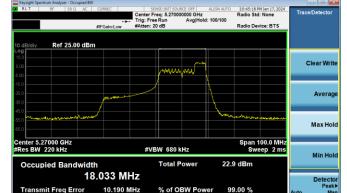






Plot 7-19. 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 40 - RU52 - Ch.60)





Plot 7-20. 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax- RU242 - Ch.60)



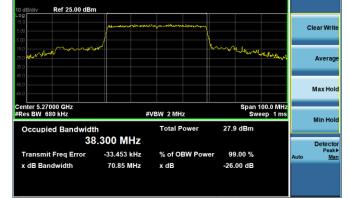
x dB

-26.00 dB

20.40 MHz

x dB Bandwidth



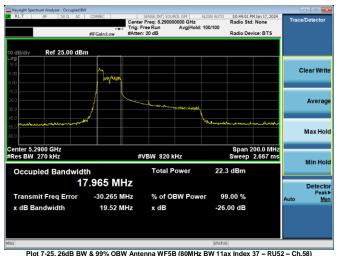


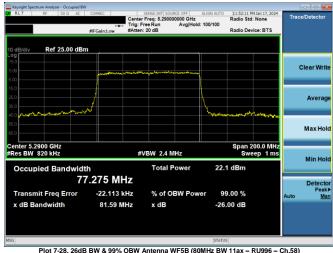
Plot 7-21, 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax Index 37 - RU52 - Ch.54)

Plot 7-24, 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax - RU484 - Ch.54)

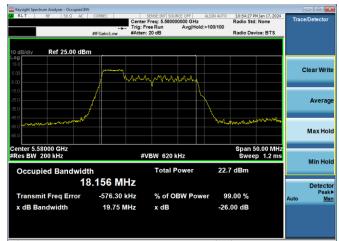
FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 22 of 450
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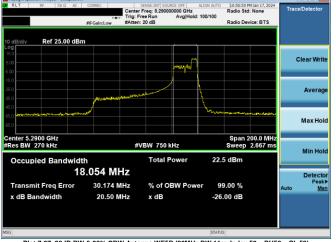


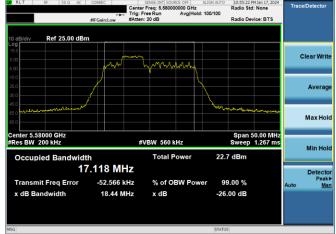












Plot 7-27. 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax Index 52 - RU52 - Ch.58)

Plot 7-30. 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 38 - RU52 - Ch.116)

FCC ID: BCGA2926 IC: 579C-A2926	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 24 of 450
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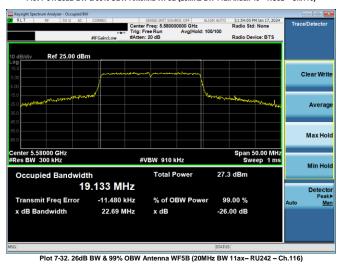


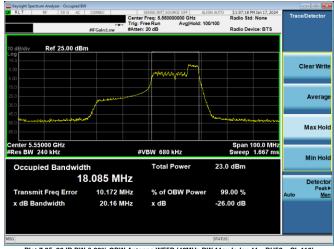




Plot 7-31. 26dB BW & 99% OBW Antenna WF5B (20MHz BW 11ax Index 40 - RU52 - Ch.116)







Plot 7-35. 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax Index 44 - RU52 - Ch.110)



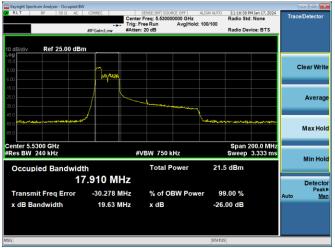


Plot 7-33. 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax Index 37 - RU52 - Ch.110)

Plot 7-36. 26dB BW & 99% OBW Antenna WF5B (40MHz BW 11ax - RU484 - Ch.110)

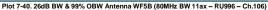
FCC ID: BCGA2926 IC: 579C-A2926	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 25 of 450
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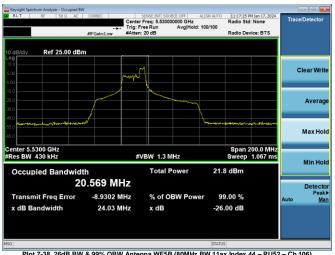


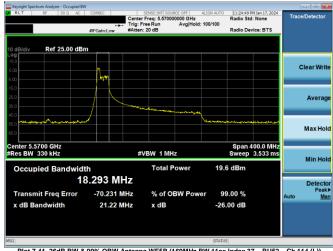




Plot 7-37. 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax Index 37 - RU52 - Ch.106)

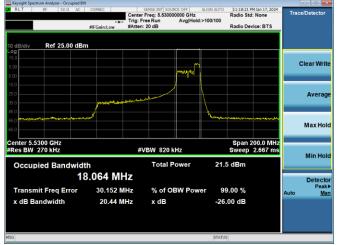


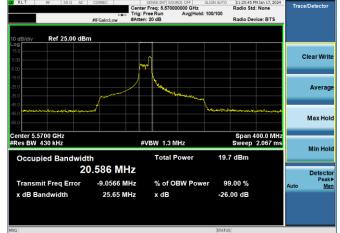




Plot 7-38. 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax Index 44 - RU52 - Ch.106)

Plot 7-41. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax Index 37 - RU52 - Ch.114 (L))

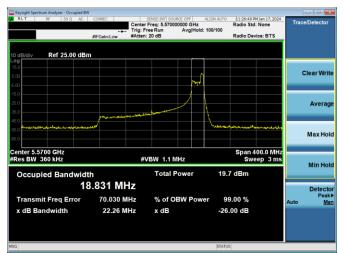




Plot 7-42. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax Index 52 - RU52 - Ch.114 (L)) Plot 7-39, 26dB BW & 99% OBW Antenna WF5B (80MHz BW 11ax Index 52 - RU52 - Ch.106)

FCC ID: BCGA2926 IC: 579C-A2926	element	element MEASUREMENT REPORT (CERTIFICATION)	
Test Report S/N:	Test Dates:	EUT Type:	Dogg 26 of 450
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Plot 7-44. 26dB BW & 99% OBW Antenna WF5B (160MHz BW 11ax - RU996x2 - Ch.114)

FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 27 of 450
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Antenna 4a 26dB & 99% Bandwidth Measurements

	Frequency [MHz]	Channel	802.11 MODE	RU Size	RU Index	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
				26	0	12.5/14.7 (MCS11)	18.23	19.56
	5180	36	ax (20MHz)	26	4	12.5/14.7 (MCS11)	17.00	18.10
				26	8	12.5/14.7 (MCS11)	18.27	19.60
				26	0	12.5/14.7 (MCS11)	18.26	19.51
5200	5200	40	ax (20MHz)	26	4	12.5/14.7 (MCS11)	17.02	18.11
				26	8	12.5/14.7 (MCS11)	18.27	19.60
		48	ax (20MHz)	26	0	12.5/14.7 (MCS11)	18.26	19.49
_	5240			26	4	12.5/14.7 (MCS11)	16.99	18.11
Band 1				26	8	12.5/14.7 (MCS11)	18.30	19.57
Bar		38	ax (40MHz)	26	0	12.5/14.7 (MCS11)	18.12	19.70
	5190			26	8	12.5/14.7 (MCS11)	19.94	21.76
				26	17	12.5/14.7 (MCS11)	18.15	19.59
				26	0	12.5/14.7 (MCS11)	18.19	19.73
	5230	46	ax (40MHz)	26	8	12.5/14.7 (MCS11)	19.98	21.74
				26	17	12.5/14.7 (MCS11)	18.13	19.91
				26	0	12.5/14.7 (MCS11)	18.13	19.51
	5210	42	ax (80MHz)	26	18	12.5/14.7 (MCS11)	37.26	38.57
				26	36	12.5/14.7 (MCS11)	18.14	19.72

Table 7-5. Conducted Bandwidth Measurements Antenna 4a (RU26)

FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 20 of 450
1C2311270070-23-R2.BCG	1/3/2024 - 3/24/2024	Tablet Device	Page 28 of 450



6 5	5250 5260 5300	50 (L) 50 (U) 52 60	ax (160MHz) ax (20MHz) ax (20MHz)	52 52 52 52 52 52 52 52 52	37 52 52 37 38	25/29.4 (MCS11) 25/29.4 (MCS11) 25/29.4 (MCS11) 25/29.4 (MCS11)	18.30 20.56 18.65	20.66 25.98 22.21
5	5260	50 (U) 52	ax (20MHz)	52 52 52 52	52 37 38	25/29.4 (MCS11) 25/29.4 (MCS11)	18.65	22.21
5	5300	52		52 52 52	37 38	25/29.4 (MCS11)	†	
	5300			52 52	38	· · · · · · · · · · · · · · · · · · ·	10 17	
	5300			52	-		18.17	19.74
5		60	ax (20MHz)			25/29.4 (MCS11)	17.10	18.46
5		60	ax (20MHz)	52	40	25/29.4 (MCS11)	18.23	19.70
5		60	ax (20MHz)		37	25/29.4 (MCS11)	18.14	19.58
	5320			52	38	25/29.4 (MCS11)	17.08	18.46
	5320			52	40	25/29.4 (MCS11)	18.22	19.77
	5320			52	37	25/29.4 (MCS11)	18.13	19.80
≰ 5		64	ax (20MHz)	52	38	25/29.4 (MCS11)	17.10	18.50
Band 2A				52	40	25/29.4 (MCS11)	18.23	19.72
3an				52	37	25/29.4 (MCS11)	17.90	19.81
5	5270	54	ax (40MHz)	52	40	25/29.4 (MCS11)	19.49	22.97
				52	44	25/29.4 (MCS11)	18.11	20.59
				52	37	25/29.4 (MCS11)	17.88	19.98
5	5310	62	ax (40MHz)	52	40	25/29.4 (MCS11)	19.45	22.75
				52	44	25/29.4 (MCS11)	18.11	20.58
	5290			52	37	25/29.4 (MCS11)	17.92	19.72
5		58	ax (80MHz)	52	44	25/29.4 (MCS11)	20.12	23.63
				52	52	25/29.4 (MCS11)	18.04	20.41
		100	ax (20MHz)	52	37	25/29.4 (MCS11)	18.11	19.74
5	5500			52	38	25/29.4 (MCS11)	17.11	18.44
				52	40	25/29.4 (MCS11)	18.22	19.89
	ĺ		ax (20MHz)	52	37	25/29.4 (MCS11)	18.14	19.65
5	5580	116		52	38	25/29.4 (MCS11)	17.09	18.41
				52	40	25/29.4 (MCS11)	18.21	19.68
			ax (20MHz)	52	37	25/29.4 (MCS11)	18.13	19.69
5	5720	144		52	38	25/29.4 (MCS11)	17.09	18.35
				52	40	25/29.4 (MCS11)	18.20	19.75
			ax (40MHz)	52	37	25/29.4 (MCS11)	17.89	19.84
5	5510	102		52	40	25/29.4 (MCS11)	19.71	23.31
				52	44	25/29.4 (MCS11)	18.07	20.64
				52	37	25/29.4 (MCS11)	17.96	20.08
0 5	5550	110	ax (40MHz)	52	40	25/29.4 (MCS11)	19.46	22.28
Band 2C				52	44	25/29.4 (MCS11)	18.08	20.34
auc	ĺ			52	37	25/29.4 (MCS11)	17.91	20.13
m 5	5710	142	ax (40MHz)	52	40	25/29.4 (MCS11)	19.88	22.84
				52	44	25/29.4 (MCS11)	18.02	20.38
	ĺ			52	37	25/29.4 (MCS11)	17.94	19.69
5	5530	106	ax (80MHz)	52	44	25/29.4 (MCS11)	20.54	24.15
				52	52	25/29.4 (MCS11)	18.12	20.52
				52	37	25/29.4 (MCS11)	17.93	19.43
50	610*	122	ax (80MHz)	52	44	25/29.4 (MCS11)	19.91	22.95
				52	52	25/29.4 (MCS11)	18.10	20.39
				52	37	25/29.4 (MCS11)	17.90	19.71
5	5690	138	ax (80MHz)	52	44	25/29.4 (MCS11)	20.08	24.27
				52	52	25/29.4 (MCS11)	18.03	20.43
		44471		52	37	25/29.4 (MCS11)	18.45	21.57
5	570*	114 (L)	ax (160MHz)	52	52	25/29.4 (MCS11)	20.77	23.54
	Ī	114 (U)	,	52	52	25/29.4 (MCS11)	18.83	22.43

Table 7-6. Conducted Bandwidth Measurements Antenna 4a (RU52)

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

FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogg 20 of 450
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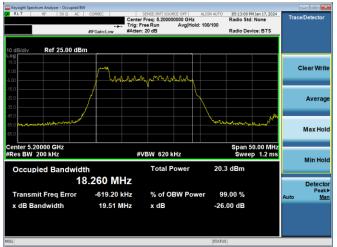
	Frequency [MHz]	Channel	802.11 MODE	RU Size	RU Index	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 26dB Bandwidth [MHz]
	5180	36	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.00	21.05
_	5200	40	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.05	21.40
Band 1	5240	48	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.05	21.17
Bar	5190	38	ax (40MHz)	484	65	243.8/286.8 (MCS11)	37.93	41.54
	5230	46	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.06	50.72
	5210	42	ax (80MHz)	996	67	510.4/600.5 (MCS11)	76.99	81.48
Band 1/2A	5250	50	ax (160MHz)	996x2	68	1020.8/1201 (MCS11)	156.23	165.28
	5260	52	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.04	21.34
∢	5300	60	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.05	21.27
Band 2A	5320	64	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.02	21.17
ğ	5270	54	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.24	42.00
ш	5310	62	ax (40MHz)	484	65	243.8/286.8 (MCS11)	37.96	41.43
	5290	58	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.10	81.56
	5500	100	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.01	21.16
	5580	116	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.04	21.24
	5720	144	ax (20MHz)	242	61	121.9/143.4 (MCS11)	19.04	21.13
ပ	5510	102	ax (40MHz)	484	65	243.8/286.8 (MCS11)	37.95	41.53
Band 2C	5550	110	ax (40MHz)	484	65	243.8/286.8 (MCS11)	37.94	41.46
gan	5710	142	ax (40MHz)	484	65	243.8/286.8 (MCS11)	38.16	42.38
ш	5530	106	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.16	81.39
	5610*	122	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.07	81.37
	5690	138	ax (80MHz)	996	67	510.4/600.5 (MCS11)	77.31	98.52
	5570*	114	ax (160MHz)	996x2	68	1020.8/1201 (MCS11)	156.31	165.76

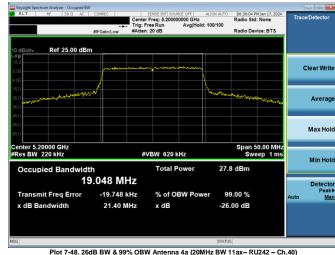
Table 7-7. Conducted Bandwidth Measurements Antenna 4a (Fully- loaded RU)

FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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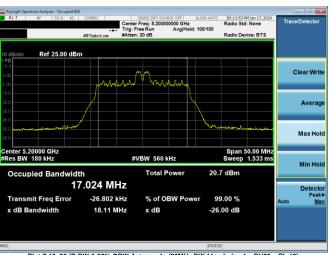
^{*}TDWR channel is not supported for ISED (denoted by a * next to the frequency)

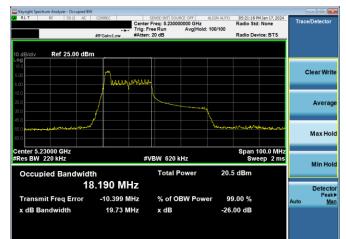




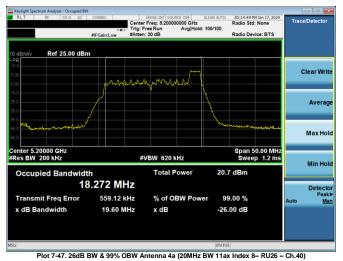


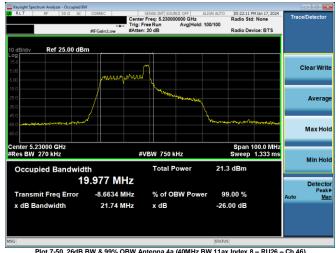
Plot 7-45. 26dB BW & 99% OBW Antenna 4a (20MHz BW 11ax Index 0 - RU26 - Ch.40)





Plot 7-46. 26dB BW & 99% OBW Antenna 4a (20MHz BW 11ax Index 4 - RU26 - Ch.40)

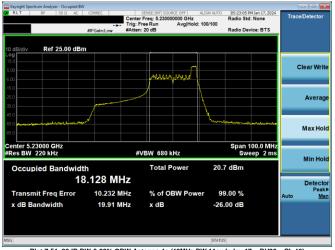




Plot 7-49. 26dB BW & 99% OBW Antenna 4a (40MHz BW 11ax Index 0 - RU26 - Ch.46)

FCC ID: BCGA2926 **MEASUREMENT REPORT** Approved by: element IC: 579C-A2926 (CERTIFICATION) Technical Manager EUT Type: Test Report S/N: **Test Dates:** Page 31 of 450 1C2311270070-23-R2.BCG 1/3/2024 - 3/24/2024 **Tablet Device**

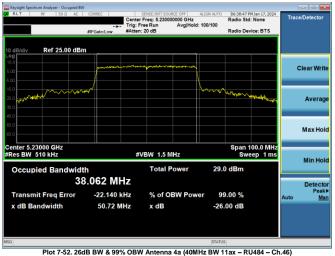


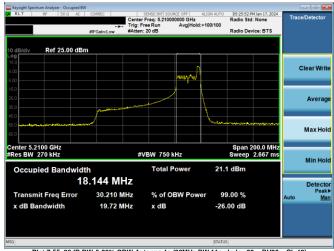




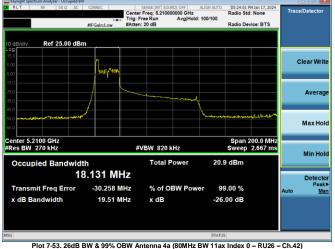
Plot 7-51. 26dB BW & 99% OBW Antenna 4a (40MHz BW 11ax Index 17 - RU26 - Ch.46)

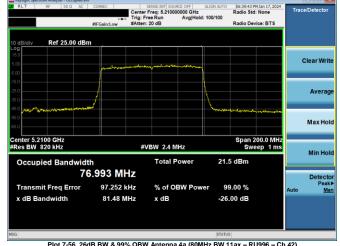






Plot 7-55. 26dB BW & 99% OBW Antenna 4a (80MHz BW 11ax Index 36 - RU26 - Ch.42)

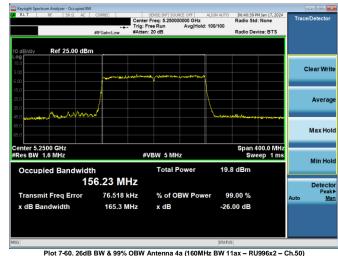




FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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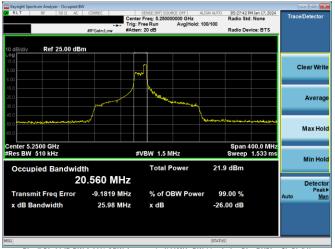


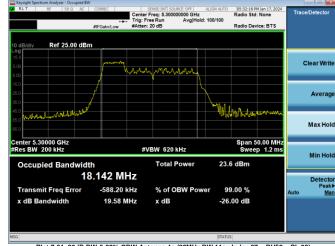




Plot 7-57. 26dB BW & 99% OBW Antenna 4a (160MHz BW 11ax Index 37 - RU52 - Ch.50 (L))



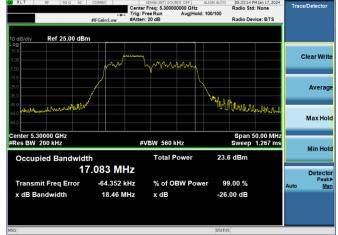




Plot 7-58. 26dB BW & 99% OBW Antenna 4a (160MHz BW 11ax Index 52 - RU52 - Ch.50 (L))





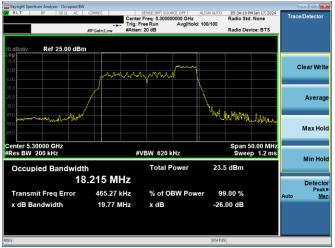


Plot 7-59. 26dB BW & 99% OBW Antenna 4a (160MHz BW 11ax Index 52 - RU52 - Ch.50 (U))

Plot 7-62. 26dB BW & 99% OBW Antenna 4a (20MHz BW 11ax Index 38 - RU52 - Ch.60)

): BCGA2926)C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Re	eport S/N:	Test Dates:	EUT Type:	Dogo 22 of 450
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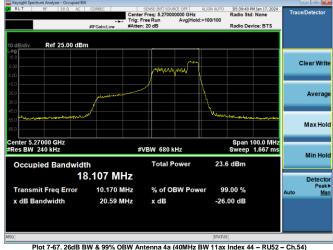




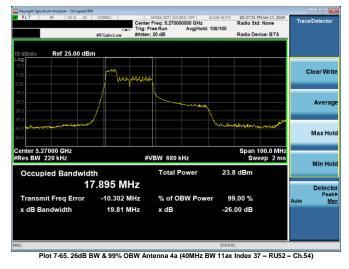
Plot 7-63. 26dB BW & 99% OBW Antenna 4a (20MHz BW 11ax Index 40 - RU52 - Ch.60)



Plot 7-66. 26dB BW & 99% OBW Antenna 4a (40MHz BW 11ax Index 40 - RU52 - Ch.54)



Plot 7-64. 26dB BW & 99% OBW Antenna 4a (20MHz BW 11ax- RU242 - Ch.60)



Center Freq: 5.270000000 GHz
Trig: Free Run Avg|Hold: 100/100 Ref 25.00 dBm Clear Write Max Hold enter 5.27000 GHz Res BW 680 kHz Span 100.0 MH Sweep 1 ms #VBW 2 MHz Min Hold Occupied Bandwidth 28.9 dBm 38.240 MHz Transmit Freg Error -25.027 kHz % of OBW Power 99.00 % 42.00 MHz x dB Bandwidth x dB -26.00 dB Plot 7-68, 26dB BW & 99% OBW Antenna 4a (40MHz BW 11ax - RU484 - Ch 54)

FCC ID: BCGA2926 IC: 579C-A2926	element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager	
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