

MEASUREMENT REPORT LTE

Applicant Name:

Apple Inc.

One Apple Park Way

Cupertino, CA 95014

United States

Date of Testing:

05/01/2019-08/08/2019

Test Site/Location:

PCTEST Lab. Morgan Hill, CA, USA

Test Report Serial No.:

1C1901280004-03.BCG

FCC ID:

BCGA2198

APPLICANT:

Apple Inc.

Application Type:

Certification

Model:

A2198, A2199

EUT Type:

Tablet Device

FCC Classification:

PCS Licensed Transmitter (PCB)

FCC Rule Part(s):

22, 24, & 27

Test Procedure(s):

ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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 §2.947. 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

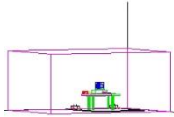


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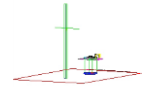
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FCC Part 22, 24, & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)		
LTE Band 12	27	699.7 - 715.3	0.180	22.55	0.295	24.70	1M11G7W	QPSK
LTE Band 12	27	699.7 - 715.3	0.150	21.75	0.245	23.90	1M11D7W	16QAM
LTE Band 12	27	699.7 - 715.3	0.120	20.80	0.197	22.95	1M11D7W	64QAM
LTE Band 12	27	700.5 - 714.5	0.180	22.55	0.295	24.70	2M74G7W	QPSK
LTE Band 12	27	700.5 - 714.5	0.150	21.75	0.245	23.90	2M73D7W	16QAM
LTE Band 12	27	700.5 - 714.5	0.119	20.75	0.195	22.90	2M73D7W	64QAM
LTE Band 12	27	701.5 - 713.5	0.180	22.55	0.295	24.70	4M56G7W	QPSK
LTE Band 12	27	701.5 - 713.5	0.150	21.76	0.246	23.91	4M53D7W	16QAM
LTE Band 12	27	701.5 - 713.5	0.119	20.75	0.195	22.90	4M55D7W	64QAM
LTE Band 12	27	704 - 711	0.180	22.55	0.295	24.70	9M08G7W	QPSK
LTE Band 12	27	704 - 711	0.150	21.75	0.245	23.90	9M07D7W	16QAM
LTE Band 12	27	704 - 711	0.119	20.75	0.195	22.90	9M05D7W	64QAM
LTE Band 17	27	706.5 - 713.5	0.180	22.55	0.295	24.70	4M56G7W	QPSK
LTE Band 17	27	706.5 - 713.5	0.151	21.80	0.248	23.95	4M53D7W	16QAM
LTE Band 17	27	706.5 - 713.5	0.119	20.75	0.195	22.90	4M55D7W	64QAM
LTE Band 17	27	709 - 711	0.180	22.55	0.295	24.70	9M08G7W	QPSK
LTE Band 17	27	709 - 711	0.150	21.75	0.245	23.90	9M07D7W	16QAM
LTE Band 17	27	709 - 711	0.119	20.74	0.195	22.89	9M05D7W	64QAM
LTE Band 13	27	779.5 - 784.5	0.180	22.55	0.295	24.70	4M55G7W	QPSK
LTE Band 13	27	779.5 - 784.5	0.150	21.77	0.247	23.92	4M55D7W	16QAM
LTE Band 13	27	779.5 - 784.5	0.119	20.75	0.195	22.90	4M54D7W	64QAM
LTE Band 13	27	782	0.180	22.55	0.295	24.70	9M04G7W	QPSK
LTE Band 13	27	782	0.150	21.75	0.245	23.90	9M04D7W	16QAM
LTE Band 13	27	782	0.119	20.74	0.195	22.89	9M03D7W	64QAM
LTE Band 5	22H	824.7 - 848.3	0.180	22.55	0.295	24.70	1M11G7W	QPSK
LTE Band 5	22H	824.7 - 848.3	0.151	21.80	0.248	23.95	1M12D7W	16QAM
LTE Band 5	22H	824.7 - 848.3	0.120	20.80	0.197	22.95	1M11D7W	64QAM
LTE Band 5	22H	825.5 - 847.5	0.180	22.55	0.295	24.70	2M73G7W	QPSK
LTE Band 5	22H	825.5 - 847.5	0.151	21.80	0.248	23.95	2M74D7W	16QAM
LTE Band 5	22H	825.5 - 847.5	0.119	20.75	0.195	22.90	2M73D7W	64QAM
LTE Band 5	22H	826.5 - 846.5	0.180	22.55	0.295	24.70	4M55G7W	QPSK
LTE Band 5	22H	826.5 - 846.5	0.150	21.75	0.245	23.90	4M55D7W	16QAM
LTE Band 5	22H	826.5 - 846.5	0.119	20.74	0.195	22.89	4M54D7W	64QAM
LTE Band 5	22H	829 - 844	0.180	22.55	0.295	24.70	9M09G7W	QPSK
LTE Band 5	22H	829 - 844	0.150	21.75	0.245	23.90	9M06D7W	16QAM
LTE Band 5	22H	829 - 844	0.119	20.75	0.195	22.90	9M07D7W	64QAM
LTE Band 26	22H	824.7 - 848.3	0.180	22.55	0.295	24.70	1M11G7W	QPSK
LTE Band 26	22H	824.7 - 848.3	0.150	21.75	0.245	23.90	1M12D7W	16QAM
LTE Band 26	22H	824.7 - 848.3	0.119	20.76	0.195	22.91	1M11D7W	64QAM
LTE Band 26	22H	825.5 - 847.5	0.180	22.55	0.295	24.70	2M73G7W	QPSK
LTE Band 26	22H	825.5 - 847.5	0.150	21.75	0.245	23.90	2M74D7W	16QAM
LTE Band 26	22H	825.5 - 847.5	0.119	20.75	0.195	22.90	2M73D7W	64QAM
LTE Band 26	22H	826.5 - 846.5	0.180	22.55	0.295	24.70	4M55G7W	QPSK
LTE Band 26	22H	826.5 - 846.5	0.150	21.75	0.245	23.90	4M55D7W	16QAM
LTE Band 26	22H	826.5 - 846.5	0.119	20.75	0.195	22.90	4M54D7W	64QAM
LTE Band 26	22H	829 - 844	0.180	22.55	0.295	24.70	9M09G7W	QPSK
LTE Band 26	22H	829 - 844	0.150	21.75	0.245	23.90	9M06D7W	16QAM
LTE Band 26	22H	829 - 844	0.119	20.75	0.195	22.90	9M07D7W	64QAM

EUT Overview (<1 GHz)

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Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 4	27	1710.7 - 1754.3	0.490	26.90	1M11G7W	QPSK
LTE Band 4	27	1710.7 - 1754.3	0.406	26.09	1M11D7W	16QAM
LTE Band 4	27	1710.7 - 1754.3	0.324	25.11	1M11D7W	64QAM
LTE Band 4	27	1711.5 - 1753.5	0.486	26.87	2M73G7W	QPSK
LTE Band 4	27	1711.5 - 1753.5	0.402	26.04	2M73D7W	16QAM
LTE Band 4	27	1711.5 - 1753.5	0.318	25.03	2M73D7W	64QAM
LTE Band 4	27	1712.5 - 1752.5	0.490	26.90	4M54G7W	QPSK
LTE Band 4	27	1712.5 - 1752.5	0.403	26.05	4M53D7W	16QAM
LTE Band 4	27	1712.5 - 1752.5	0.324	25.11	4M54D7W	64QAM
LTE Band 4	27	1715 - 1750	0.490	26.90	9M04G7W	QPSK
LTE Band 4	27	1715 - 1750	0.406	26.08	9M06D7W	16QAM
LTE Band 4	27	1715 - 1750	0.325	25.12	9M04D7W	64QAM
LTE Band 4	27	1717.5 - 1747.5	0.490	26.90	13M6G7W	QPSK
LTE Band 4	27	1717.5 - 1747.5	0.406	26.08	13M6D7W	16QAM
LTE Band 4	27	1717.5 - 1747.5	0.323	25.09	13M6D7W	64QAM
LTE Band 4	27	1720 - 1745	0.490	26.90	18M1G7W	QPSK
LTE Band 4	27	1720 - 1745	0.402	26.04	18M1D7W	16QAM
LTE Band 4	27	1720 - 1745	0.317	25.01	18M1D7W	64QAM
LTE Band 66	27	1710.7 - 1779.3	0.490	26.90	1M11G7W	QPSK
LTE Band 66	27	1710.7 - 1779.3	0.407	26.10	1M11D7W	16QAM
LTE Band 66	27	1710.7 - 1779.3	0.324	25.10	1M11D7W	64QAM
LTE Band 66	27	1711.5 - 1778.5	0.490	26.90	2M73G7W	QPSK
LTE Band 66	27	1711.5 - 1778.5	0.407	26.10	2M73D7W	16QAM
LTE Band 66	27	1711.5 - 1778.5	0.321	25.07	2M73D7W	64QAM
LTE Band 66	27	1712.5 - 1777.5	0.488	26.88	4M54G7W	QPSK
LTE Band 66	27	1712.5 - 1777.5	0.407	26.10	4M53D7W	16QAM
LTE Band 66	27	1712.5 - 1777.5	0.324	25.10	4M54D7W	64QAM
LTE Band 66	27	1715 - 1775	0.490	26.90	9M04G7W	QPSK
LTE Band 66	27	1715 - 1775	0.406	26.09	9M06D7W	16QAM
LTE Band 66	27	1715 - 1775	0.324	25.10	9M04D7W	64QAM
LTE Band 66	27	1717.5 - 1772.5	0.490	26.90	13M6G7W	QPSK
LTE Band 66	27	1717.5 - 1772.5	0.407	26.10	13M6D7W	16QAM
LTE Band 66	27	1717.5 - 1772.5	0.324	25.10	13M6D7W	64QAM
LTE Band 66	27	1720 - 1770	0.490	26.90	18M1G7W	QPSK
LTE Band 66	27	1720 - 1770	0.407	26.10	18M1D7W	16QAM
LTE Band 66	27	1720 - 1770	0.324	25.10	18M1D7W	64QAM
LTE Band 2	24E	1850.7 - 1909.3	0.570	27.56	1M11G7W	QPSK
LTE Band 2	24E	1850.7 - 1909.3	0.486	26.87	1M11D7W	16QAM
LTE Band 2	24E	1850.7 - 1909.3	0.376	25.75	1M11D7W	64QAM
LTE Band 2	24E	1851.5 - 1908.5	0.566	27.53	2M73G7W	QPSK
LTE Band 2	24E	1851.5 - 1908.5	0.477	26.79	2M73D7W	16QAM
LTE Band 2	24E	1851.5 - 1908.5	0.369	25.67	2M73D7W	64QAM
LTE Band 2	24E	1852.5 - 1907.5	0.582	27.65	4M55G7W	QPSK
LTE Band 2	24E	1852.5 - 1907.5	0.490	26.90	4M55D7W	16QAM
LTE Band 2	24E	1852.5 - 1907.5	0.386	25.87	4M55D7W	64QAM
LTE Band 2	24E	1855 - 1905	0.572	27.57	9M07G7W	QPSK
LTE Band 2	24E	1855 - 1905	0.475	26.76	9M07D7W	16QAM
LTE Band 2	24E	1855 - 1905	0.379	25.79	9M06D7W	64QAM
LTE Band 2	24E	1857.5 - 1902.5	0.581	27.64	13M6G7W	QPSK
LTE Band 2	24E	1857.5 - 1902.5	0.475	26.77	13M7D7W	16QAM
LTE Band 2	24E	1857.5 - 1902.5	0.378	25.77	13M6D7W	64QAM
LTE Band 2	24E	1860 - 1900	0.582	27.65	18M1G7W	QPSK
LTE Band 2	24E	1860 - 1900	0.498	26.97	18M2D7W	16QAM
LTE Band 2	24E	1860 - 1900	0.398	26.00	18M1D7W	64QAM
LTE Band 25	24E	1850.7 - 1914.3	0.573	27.58	1M11G7W	QPSK
LTE Band 25	24E	1850.7 - 1914.3	0.492	26.92	1M11D7W	16QAM
LTE Band 25	24E	1850.7 - 1914.3	0.381	25.81	1M11D7W	64QAM
LTE Band 25	24E	1851.5 - 1913.5	0.555	27.44	2M73G7W	QPSK
LTE Band 25	24E	1851.5 - 1913.5	0.481	26.82	2M73D7W	16QAM
LTE Band 25	24E	1851.5 - 1913.5	0.374	25.73	2M73D7W	64QAM
LTE Band 25	24E	1852.5 - 1912.5	0.578	27.62	4M55G7W	QPSK
LTE Band 25	24E	1852.5 - 1912.5	0.491	26.91	4M55D7W	16QAM
LTE Band 25	24E	1852.5 - 1912.5	0.394	25.96	4M55D7W	64QAM
LTE Band 25	24E	1855 - 1910	0.566	27.53	9M07G7W	QPSK
LTE Band 25	24E	1855 - 1910	0.479	26.80	9M07D7W	16QAM
LTE Band 25	24E	1855 - 1910	0.378	25.78	9M06D7W	64QAM
LTE Band 25	24E	1857.5 - 1907.5	0.562	27.50	13M6G7W	QPSK
LTE Band 25	24E	1857.5 - 1907.5	0.485	26.86	13M7D7W	16QAM
LTE Band 25	24E	1857.5 - 1907.5	0.383	25.83	13M6D7W	64QAM
LTE Band 25	24E	1860 - 1905	0.574	27.59	18M1G7W	QPSK
LTE Band 25	24E	1860 - 1905	0.501	27.00	18M2D7W	16QAM
LTE Band 25	24E	1860 - 1905	0.398	26.00	18M1D7W	64QAM

EUT Overview (Mid Bands)

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			Max. Power (W)	Max. Power (dBm)		
LTE Band 30	27	2307.5 - 2312.5	0.208	23.18	4M55G7W	QPSK
LTE Band 30	27	2307.5 - 2312.5	0.177	22.49	4M54D7W	16QAM
LTE Band 30	27	2307.5 - 2312.5	0.142	21.52	4M55D7W	64QAM
LTE Band 30	27	2310	0.203	23.07	9M07G7W	QPSK
LTE Band 30	27	2310	0.179	22.54	9M05D7W	16QAM
LTE Band 30	27	2310	0.138	21.41	9M05D7W	64QAM
LTE Band 7	27	2502.5 - 2567.5	0.521	27.17	4M54G7W	QPSK
LTE Band 7	27	2502.5 - 2567.5	0.437	26.40	4M54D7W	16QAM
LTE Band 7	27	2502.5 - 2567.5	0.347	25.40	4M54D7W	64QAM
LTE Band 7	27	2505 - 2565	0.522	27.18	9M08G7W	QPSK
LTE Band 7	27	2505 - 2565	0.437	26.40	9M07D7W	16QAM
LTE Band 7	27	2505 - 2565	0.338	25.29	9M06D7W	64QAM
LTE Band 7	27	2507.5 - 2562.5	0.520	27.16	13M7G7W	QPSK
LTE Band 7	27	2507.5 - 2562.5	0.435	26.38	13M6D7W	16QAM
LTE Band 7	27	2507.5 - 2562.5	0.340	25.32	13M6D7W	64QAM
LTE Band 7	27	2510 - 2560	0.525	27.20	18M1G7W	QPSK
LTE Band 7	27	2510 - 2560	0.437	26.40	18M1D7W	16QAM
LTE Band 7	27	2510 - 2560	0.345	25.38	18M1D7W	64QAM
LTE Band 41	27	2498.5 - 2687.5	0.733	28.65	4M60G7W	QPSK
LTE Band 41	27	2498.5 - 2687.5	0.628	27.98	4M63D7W	16QAM
LTE Band 41	27	2498.5 - 2687.5	0.500	26.99	4M66D7W	64QAM
LTE Band 41	27	2501 - 2685	0.741	28.70	9M22G7W	QPSK
LTE Band 41	27	2501 - 2685	0.631	28.00	9M20D7W	16QAM
LTE Band 41	27	2501 - 2685	0.484	26.85	9M21D7W	64QAM
LTE Band 41	27	2503.5 - 2682.5	0.738	28.68	13M8G7W	QPSK
LTE Band 41	27	2503.5 - 2682.5	0.630	27.99	13M7D7W	16QAM
LTE Band 41	27	2503.5 - 2682.5	0.484	26.85	14M0D7W	64QAM
LTE Band 41	27	2506 - 2680	0.741	28.70	18M3G7W	QPSK
LTE Band 41	27	2506 - 2680	0.618	27.91	18M2D7W	16QAM
LTE Band 41	27	2506 - 2680	0.495	26.95	18M2D7W	64QAM

EUT Overview (High Bands)

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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 Engineering Laboratory, Inc. 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 Engineering Lab located in Morgan Hill, CA 95037, U.S.A.

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

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2198**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

Test Device Serial No.: F9FYQ00DMLX0, F9FYL019MLX0

2.2 Device Capabilities

This device contains the following capabilities:

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

LTE Band 12 (698 - 716 MHz) overlaps the entire frequency range of LTE Band 17 (704 - 716 MHz). Therefore, test data provided in this report covers Band 17 as well as Band 12.

LTE Band 26 (814.7 – 849 MHz) overlaps the entire frequency range of LTE Band 5 (824 – 849 MHz). Therefore, test data provided in this report covers Band 5 and the portion of Band 26 subject to Part 22.

LTE Band 66 (1710 - 1780 MHz) overlaps the entire frequency range of LTE Band 4 (1710 - 1755 MHz). Therefore, test data provided in this report covers Band 4 as well as Band 66.

LTE Band 25 (1850 - 1915 MHz) overlaps the entire frequency range of LTE Band 2 (1850 - 1910 MHz). Therefore, test data provided in this report covers Band 2 as well as Band 25.

LTE Band 41 (2496 - 2690 MHz) overlaps the entire frequency range of LTE Band 38 (2570 - 2620 MHz). Therefore, test data provided in this report covers Band 38 as well as Band 41.

2.3 Antenna Description

Following antennas were used for the testing.

Antennas	
Port A	Port B
WF3	WF5

Table 2-1. Antenna vs Ports

Frequency [MHz]	Antenna Gain (dBi)	
	Port A	Port B
700-800	-0.8	-0.7
820-960	-0.8	-0.6
1700-1800	1.4	2
1820-2100	2.3	2.6
2300-2520	1.4	1.9
2540-2700	1.7	2

Table 2-2. Highest Antenna Gain

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2.4 Test Support Equipment

1	Apple MacBook	Model:	A1398	S/N:	C2QKP008F6F3
	w/AC/DC Adapter	Model:	A1435	S/N:	N/A
2	Apple USB Cable	Model:	Kanzi	S/N:	32530F
3	USB Lightning Cable	Model:	N/A	S/N:	N/A
	w/ AC Adapter	Model:	A1401	S/N:	N/A
4	Apple Pencil	Model:	A1603	S/N:	G64TG0FEGWTJ
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-3. Test Support Equipment Used

2.5 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

There are two vendors of the 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 channel and the worst case configuration.

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.

2.6 Software and Firmware

The test was conducted with firmware version 17A522 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Block C Frequency Range

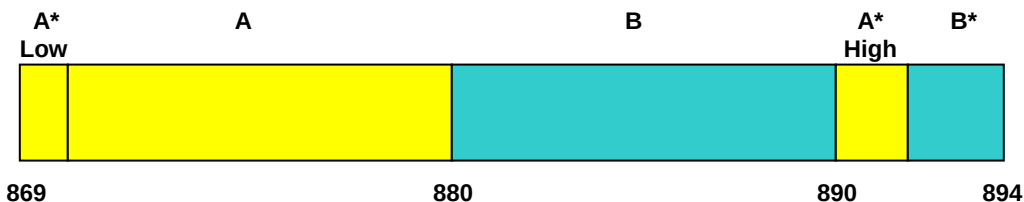
Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results do not satisfy the applicable reserve price, the spectrum in the 746-757 MHz and 776-787 MHz bands will instead be made available for assignment at a subsequent auction as follows: (i) Two paired channels of 6 megahertz each available for assignment in Block C1 in the 746-752 MHz and 776-782 MHz bands. (ii) Two paired channels of 5 megahertz each available for assignment in Block C2 in the 752-757 MHz and 782-787 MHz bands.

3.3 Block A Frequency Range

698-746 MHz band. The following frequencies are available for licensing pursuant to this part in the 698-746 MHz band: (1) Three paired channel blocks of 12 megahertz each are available for assignment as follows:

Block A: 698-704 MHz and 728-734 MHz;
Block B: 704-710 MHz and 734-740 MHz; and
Block C: 710-716 MHz and 740-746 MHz.

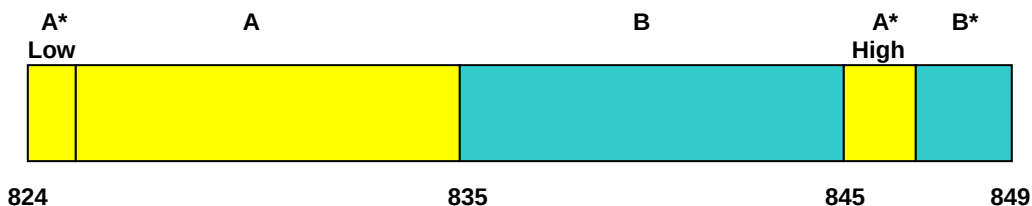
3.4 Cellular - Base Frequency Blocks



BLOCK 1: 869 – 880 MHz (A* Low + A)
BLOCK 2: 880 – 890 MHz (B)

BLOCK 3: 890 – 891.5 MHz (A* High)
BLOCK 4: 891.5 – 894 MHz (B*)

3.5 Cellular - Mobile Frequency Blocks

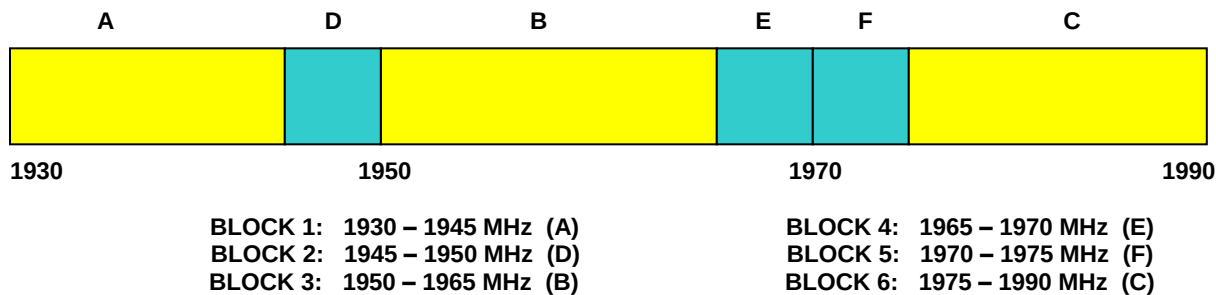


BLOCK 1: 824 – 835 MHz (A* Low + A)
BLOCK 2: 835 – 845 MHz (B)

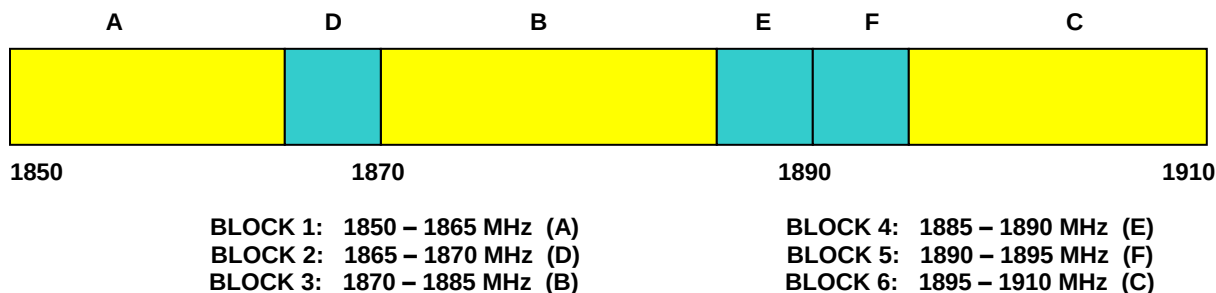
BLOCK 3: 845 – 846.5 MHz (A* High)
BLOCK 4: 846.5 – 849 MHz (B*)

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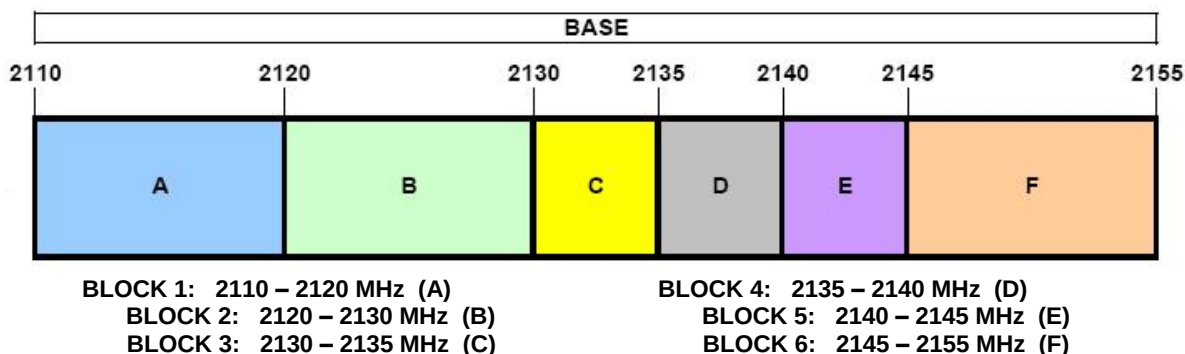
3.6 PCS - Base Frequency Blocks



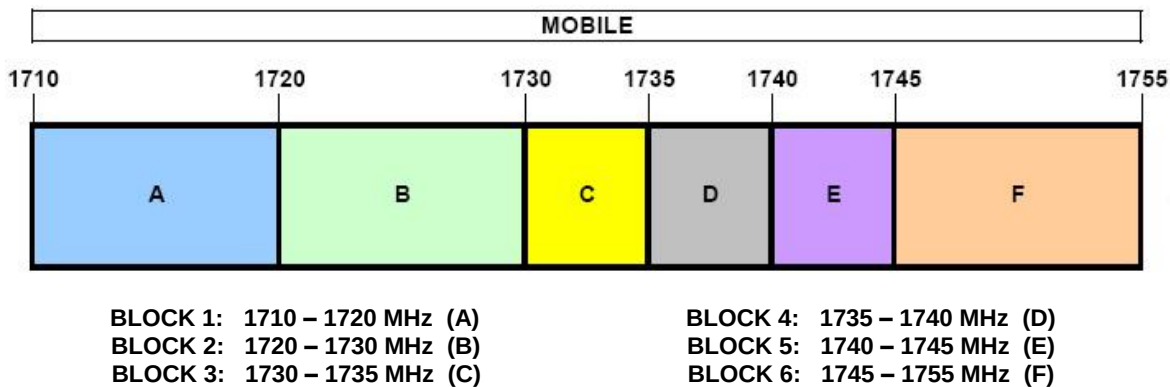
3.7 PCS - Mobile Frequency Blocks



3.8 AWS - Base Frequency Blocks



3.9 AWS - Mobile Frequency Blocks



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3.12 Radiated Power and Radiated Spurious 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. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Per the guidelines of KDB 412172 D01 v01r01, radiated power levels are measured using the following formula:

$$ERP \text{ or } EIRP = P_T + G_T - L_C$$

Where P_T is the transmitter output power, expressed in dBm, G_T is the gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP), and L_C signal attenuation in the connecting cable between the transmitter and antenna in dB.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10 \log_{10}(\text{Power [Watts]})$. For Band 7 and 41, the calculated P_d levels are compared to the absolute spurious emission limit of -25dBm which is equivalent to the required minimum attenuation of $55 + 10 \log_{10}(\text{Power [Watts]})$. For Band 30, the calculated P_d levels are compared to the absolute spurious emission limit of -40dBm which is equivalent to the required minimum attenuation of $70 + 10 \log_{10}(\text{Power [Watts]})$.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. 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	1.29
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.70
Radiated Disturbance (>18GHz)	5.01
Temperature	0.01

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5.0 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	3/13/2019	Annual	3/13/2020	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	9/10/2018	Annual	9/10/2019	T058701-03
ESPEC	SU-241	Tabletop Temperature Chamber	8/10/2018	Annual	8/10/2019	92009574
ETS-Lindgren	118490	Pre-Amplifier (30MHz - 6GHz)	8/31/2018	Annual	8/31/2019	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	12/11/2018	Annual	12/11/2019	224569
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	2/27/2019	Annual	2/27/2020	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	5/21/2019	Annual	5/21/2020	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/20/2018	Annual	11/20/2019	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/10/2018	Annual	8/10/2019	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2018	Annual	11/16/2019	164715
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/8/2019	Annual	1/8/2020	166869
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/5/2018	Annual	9/5/2019	100050
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/21/2018	Annual	11/21/2019	101057
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	12/7/2018	Annual	12/7/2019	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/21/2019	Annual	3/21/2020	100519

Table 5-1. Test Equipment

Notes:

- 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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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2198
 FCC Classification: PCS Licensed Transmitter (PCB)
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Out of Band Emissions	$> 43 + 10 \log_{10}(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions			Section 7.3, 7.4
27.53(m)	Out of Band Emissions	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.3, 7.4
27.53(a)	Out of Band Emissions	Undesirable emissions must meet the limits detailed in 27.53(a)			Section 7.3, 7.4
24.232(d) 27.50(d)(5)	Peak-Average Ratio	$< 13 \text{ dB}$			Section 7.5
2.1046	Transmitter Conducted Output Power	N/A			Section 7.8
2.1046	Additional Maximum Power Reduction (A-MPR)	N/A			Section 7.6
27.53(m)	Uplink Carrier Aggregation	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.7, 7.10
2.1055 22.355 24.235 27.54	Frequency Stability	$< 2.5 \text{ ppm}$ (Part 22) and fundamental emissions stay within authorized frequency block (Part 24, 27)			Section 7.11

Table 7-1. Summary of Conducted Test Results

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FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 26/5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.8
27.50(b)(10) 27.50(c)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 71, 12/17, 13)	< 3 Watts max. ERP			Section 7.8
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 25/2, 7, 41)	< 2 Watts max. EIRP			Section 7.8
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 66/4)	< 1 Watts max. EIRP			Section 7.8
27.50(a)(3)	Equivalent Isotropic Radiated Power (Band 30)	< 0.25 Watts max. EIRP			Section 7.8
2.1053 22.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Undesirable Emissions	> 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions			Section 7.9
27.53(f)	Undesirable Emissions (Band 13)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions less than 700Hz BW) For all emissions in the band 1559 – 1610 MHz			Section 7.9
27.53(a)	Undesirable Emissions (Band 30)	> 70 + 10 log ₁₀ (P[Watts])			Section 7.9
27.53(m)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.9

Table 7-2. Summary of Radiated 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 (Sections 7.2, 7.3, 7.4, 7.5) were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT 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, attenuators, and couplers.
- 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 "LTE Automation," Version 4.8.

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7.2 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
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
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

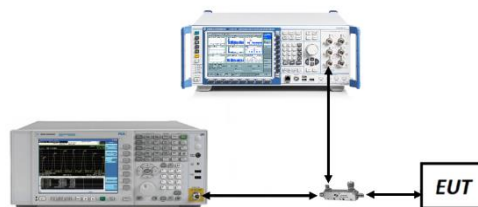


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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Mode	BW (MHz)	Modulation	Occupied BW [kHz]
LTE Band 12	1.4	QPSK	1106.8
LTE Band 12	1.4	16QAM	1109.8
LTE Band 12	1.4	64QAM	1110.5
LTE Band 12	3	QPSK	2738.2
LTE Band 12	3	16QAM	2733.8
LTE Band 12	3	64QAM	2727.1
LTE Band 12	5	QPSK	4558.8
LTE Band 12	5	16QAM	4534.6
LTE Band 12	5	64QAM	4549.0
LTE Band 12	10	QPSK	9080.3
LTE Band 12	10	16QAM	9074.1
LTE Band 12	10	64QAM	9046.7
LTE Band 17	5	QPSK	4558.8
LTE Band 17	5	16QAM	4534.6
LTE Band 17	5	64QAM	4549.0
LTE Band 17	10	QPSK	9080.3
LTE Band 17	10	16QAM	9074.1
LTE Band 17	10	64QAM	9046.7
LTE Band 13	5	QPSK	4549.0
LTE Band 13	5	16QAM	4551.9
LTE Band 13	5	64QAM	4537.0
LTE Band 13	10	QPSK	9038.2
LTE Band 13	10	16QAM	9043.1
LTE Band 13	10	64QAM	9031.8
LTE Band 5	1.4	QPSK	1107.4
LTE Band 5	1.4	16QAM	1117.9
LTE Band 5	1.4	64QAM	1107.4
LTE Band 5	3	QPSK	2729.6
LTE Band 5	3	16QAM	2736.3
LTE Band 5	3	64QAM	2725.6
LTE Band 5	5	QPSK	4552.2
LTE Band 5	5	16QAM	4551.5
LTE Band 5	5	64QAM	4544.8
LTE Band 5	10	QPSK	9093.7
LTE Band 5	10	16QAM	9056.5
LTE Band 5	10	64QAM	9070.9
LTE Band 26	1.4	QPSK	1107.4
LTE Band 26	1.4	16QAM	1117.9
LTE Band 26	1.4	64QAM	1107.4
LTE Band 26	3	QPSK	2729.6
LTE Band 26	3	16QAM	2736.3
LTE Band 26	3	64QAM	2725.6
LTE Band 26	5	QPSK	4552.2
LTE Band 26	5	16QAM	4551.5
LTE Band 26	5	64QAM	4544.8
LTE Band 26	10	QPSK	9093.7
LTE Band 26	10	16QAM	9056.5
LTE Band 26	10	64QAM	9070.9

Table 7-3. Occupied Band Width Results (<1 GHz)

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Mode	BW (MHz)	Modulation	Occupied BW (raw data)
LTE Band 4	1.4	QPSK	1105.3
LTE Band 4	1.4	16QAM	1108.7
LTE Band 4	1.4	64QAM	1112.0
LTE Band 4	3	QPSK	2731.9
LTE Band 4	3	16QAM	2727.9
LTE Band 4	3	64QAM	2728.3
LTE Band 4	5	QPSK	4542.5
LTE Band 4	5	16QAM	4533.8
LTE Band 4	5	64QAM	4535.0
LTE Band 4	10	QPSK	9044.9
LTE Band 4	10	16QAM	9057.0
LTE Band 4	10	64QAM	9042.7
LTE Band 4	15	QPSK	13606.5
LTE Band 4	15	16QAM	13631.1
LTE Band 4	15	64QAM	13615.5
LTE Band 4	20	QPSK	18054.2
LTE Band 4	20	16QAM	18088.5
LTE Band 4	20	64QAM	18084.6
LTE Band 66	1.4	QPSK	1105.3
LTE Band 66	1.4	16QAM	1108.7
LTE Band 66	1.4	64QAM	1112.0
LTE Band 66	3	QPSK	2731.9
LTE Band 66	3	16QAM	2727.9
LTE Band 66	3	64QAM	2728.3
LTE Band 66	5	QPSK	4542.5
LTE Band 66	5	16QAM	4533.8
LTE Band 66	5	64QAM	4535.0
LTE Band 66	10	QPSK	9044.9
LTE Band 66	10	16QAM	9057.0
LTE Band 66	10	64QAM	9042.7
LTE Band 66	15	QPSK	13606.5
LTE Band 66	15	16QAM	13631.1
LTE Band 66	15	64QAM	13615.5
LTE Band 66	20	QPSK	18054.2
LTE Band 66	20	16QAM	18088.5
LTE Band 66	20	64QAM	18084.6
LTE Band 2	1.4	QPSK	1106.7
LTE Band 2	1.4	16QAM	1109.2
LTE Band 2	1.4	64QAM	1113.6
LTE Band 2	3	QPSK	2730.7
LTE Band 2	3	16QAM	2730.5
LTE Band 2	3	64QAM	2727.3
LTE Band 2	5	QPSK	4552.4
LTE Band 2	5	16QAM	4545.6
LTE Band 2	5	64QAM	4546.1
LTE Band 2	10	QPSK	9069.5
LTE Band 2	10	16QAM	9066.5
LTE Band 2	10	64QAM	9063.6
LTE Band 2	15	QPSK	13642.3
LTE Band 2	15	16QAM	13652.1
LTE Band 2	15	64QAM	13633.4
LTE Band 2	20	QPSK	18127.7
LTE Band 2	20	16QAM	18171.0
LTE Band 2	20	64QAM	18136.3
LTE Band 25	1.4	QPSK	1106.7
LTE Band 25	1.4	16QAM	1109.2
LTE Band 25	1.4	64QAM	1113.6
LTE Band 25	3	QPSK	2730.7
LTE Band 25	3	16QAM	2730.5
LTE Band 25	3	64QAM	2727.3
LTE Band 25	5	QPSK	4552.4
LTE Band 25	5	16QAM	4545.6
LTE Band 25	5	64QAM	4546.1
LTE Band 25	10	QPSK	9069.5
LTE Band 25	10	16QAM	9066.5
LTE Band 25	10	64QAM	9063.6
LTE Band 25	15	QPSK	13642.3
LTE Band 25	15	16QAM	13652.1
LTE Band 25	15	64QAM	13633.4
LTE Band 25	20	QPSK	18127.7
LTE Band 25	20	16QAM	18171.0
LTE Band 25	20	64QAM	18136.3

Table 7-4. Occupied Band Width Results (Mid Bands)

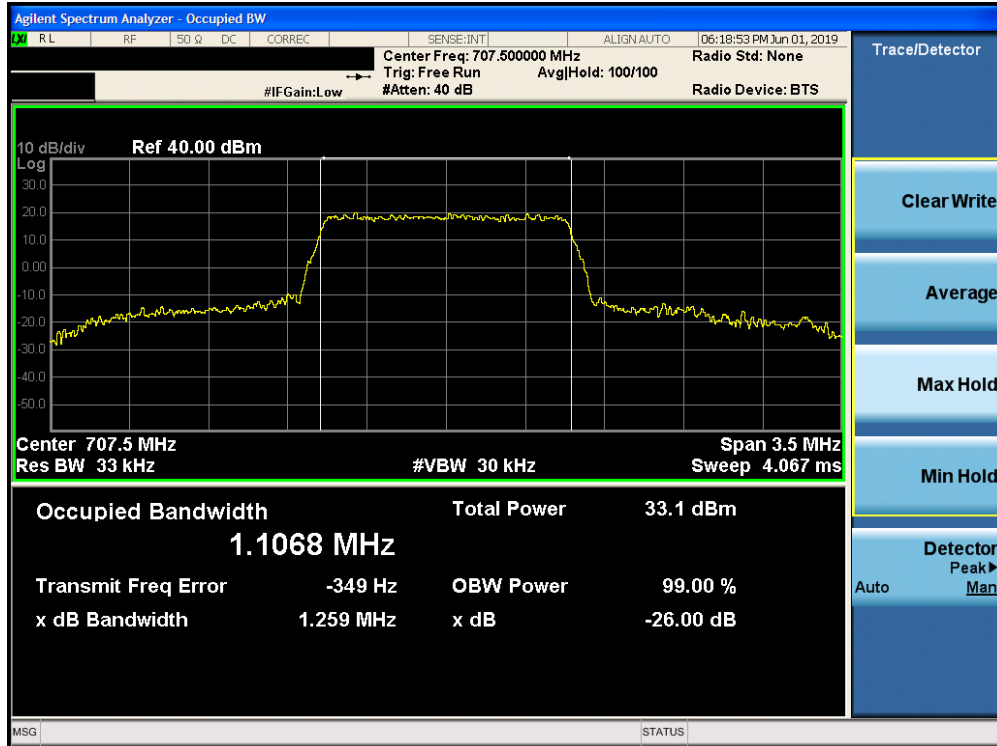
FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Mode	BW (MHz)	Modulation	Occupied BW (raw data)
LTE Band 30	5	QPSK	4554.0
LTE Band 30	5	16QAM	4544.3
LTE Band 30	5	64QAM	4548.7
LTE Band 30	10	QPSK	9074.7
LTE Band 30	10	16QAM	9049.1
LTE Band 30	10	64QAM	9054.1
LTE Band 7	5	QPSK	4537.2
LTE Band 7	5	16QAM	4543.5
LTE Band 7	5	64QAM	4543.1
LTE Band 7	10	QPSK	9075.6
LTE Band 7	10	16QAM	9072.0
LTE Band 7	10	64QAM	9063.2
LTE Band 7	15	QPSK	13673.7
LTE Band 7	15	16QAM	13617.6
LTE Band 7	15	64QAM	13603.5
LTE Band 7	20	QPSK	18081.5
LTE Band 7	20	16QAM	18110.6
LTE Band 7	20	64QAM	18087.4
LTE Band 41	5	QPSK	4595.6
LTE Band 41	5	16QAM	4626.1
LTE Band 41	5	64QAM	4656.5
LTE Band 41	10	QPSK	9224.3
LTE Band 41	10	16QAM	9196.4
LTE Band 41	10	64QAM	9205.2
LTE Band 41	15	QPSK	13815.3
LTE Band 41	15	16QAM	13743.8
LTE Band 41	15	64QAM	14021.8
LTE Band 41	20	QPSK	18318.1
LTE Band 41	20	16QAM	18212.4
LTE Band 41	20	64QAM	18227.1

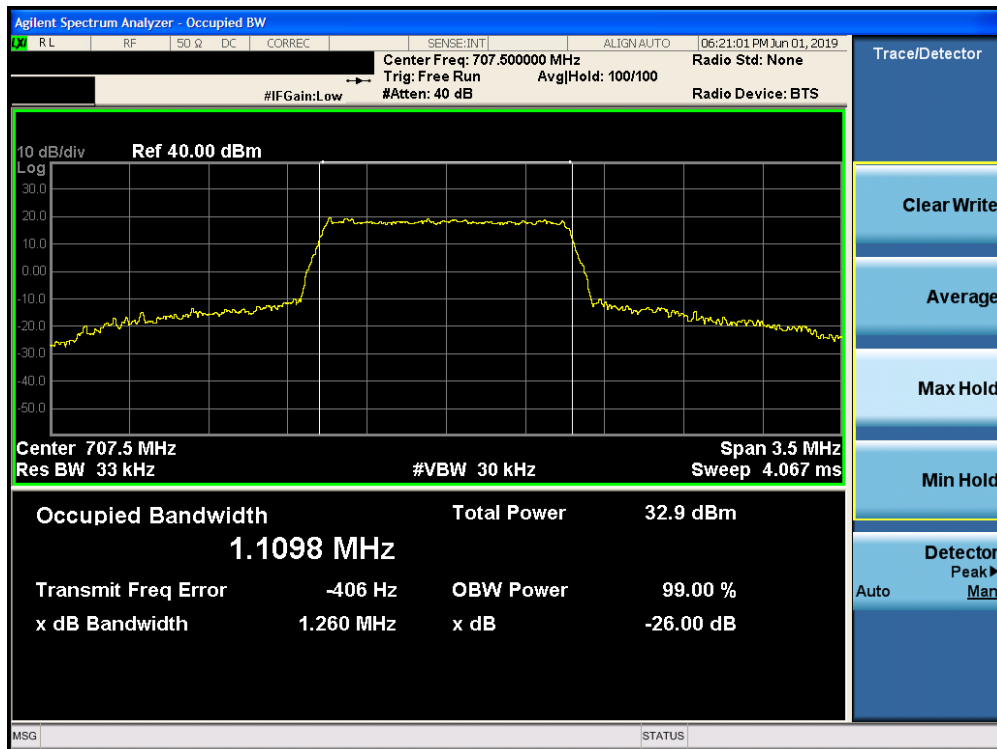
Table 7-5. Occupied Band Width Results (High Bands)

FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 21 of 341

Band 12/17

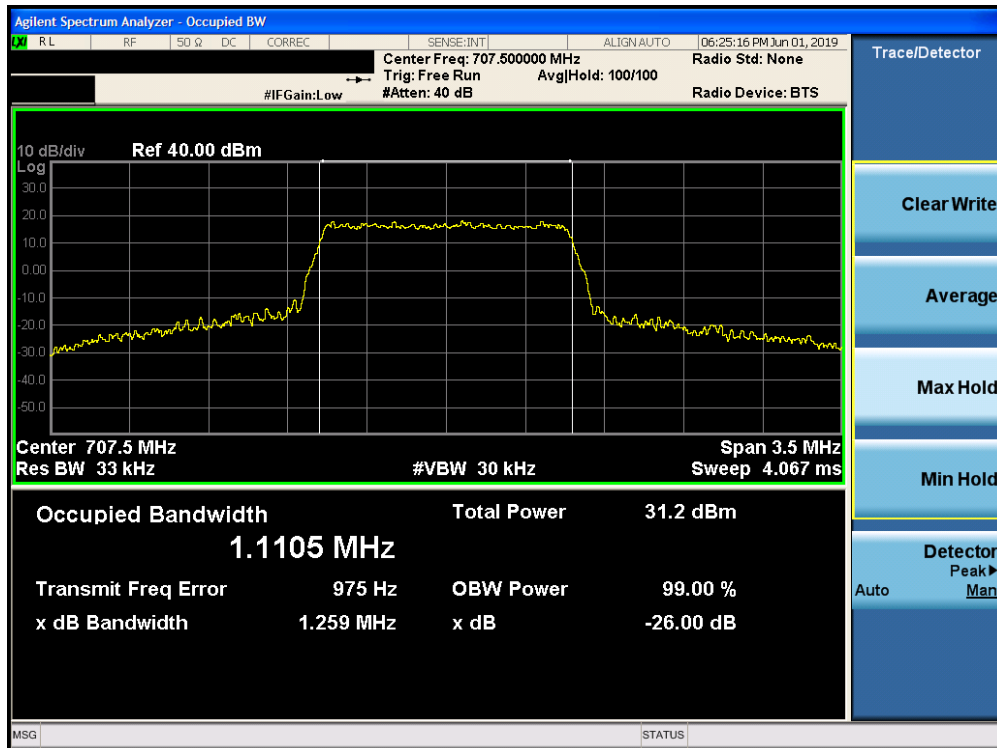


Plot 7-1. Occupied Bandwidth Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

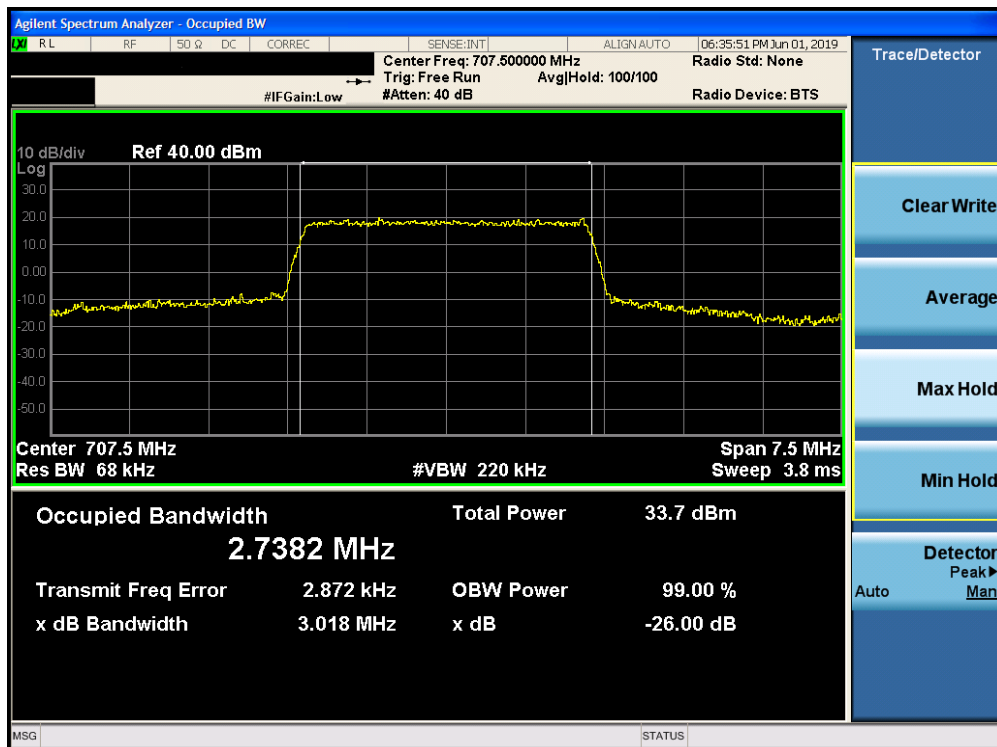


Plot 7-2. Occupied Bandwidth Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 22 of 341

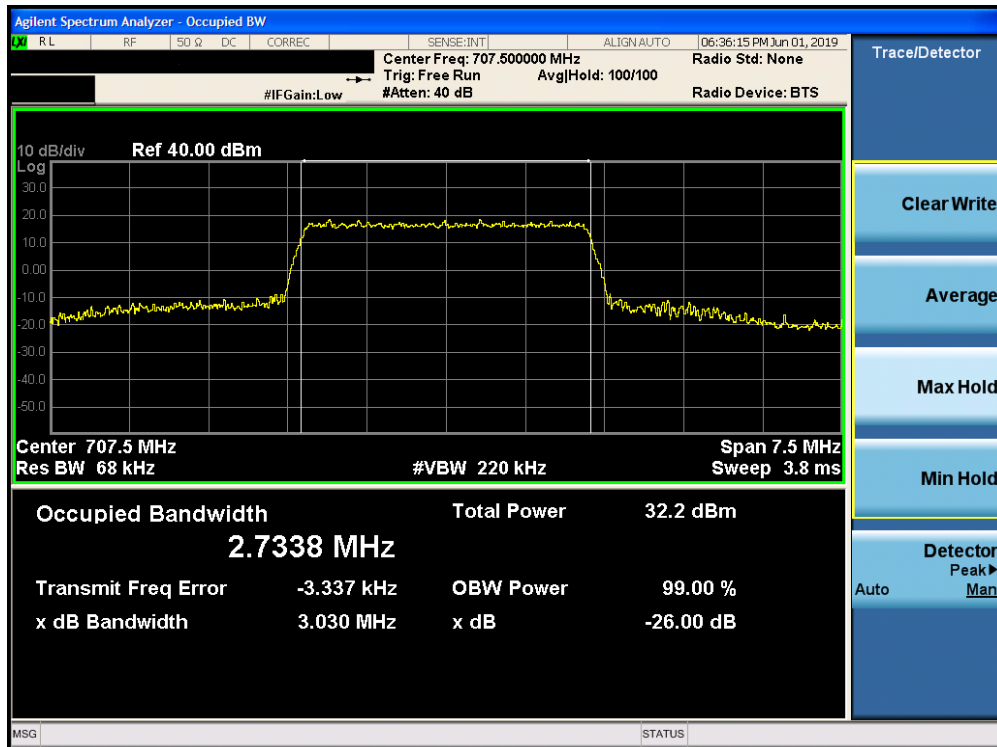


Plot 7-3. Occupied Bandwidth Plot (Band 12 - 1.4MHz 64-QAM - Full RB Configuration)

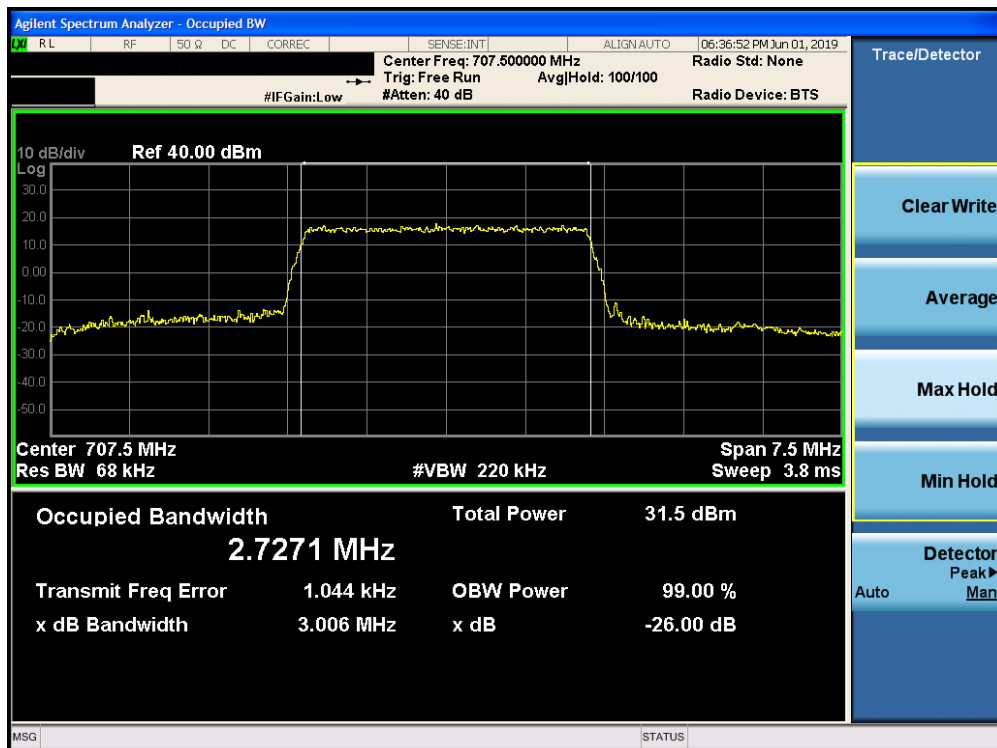


Plot 7-4. Occupied Bandwidth Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 23 of 341

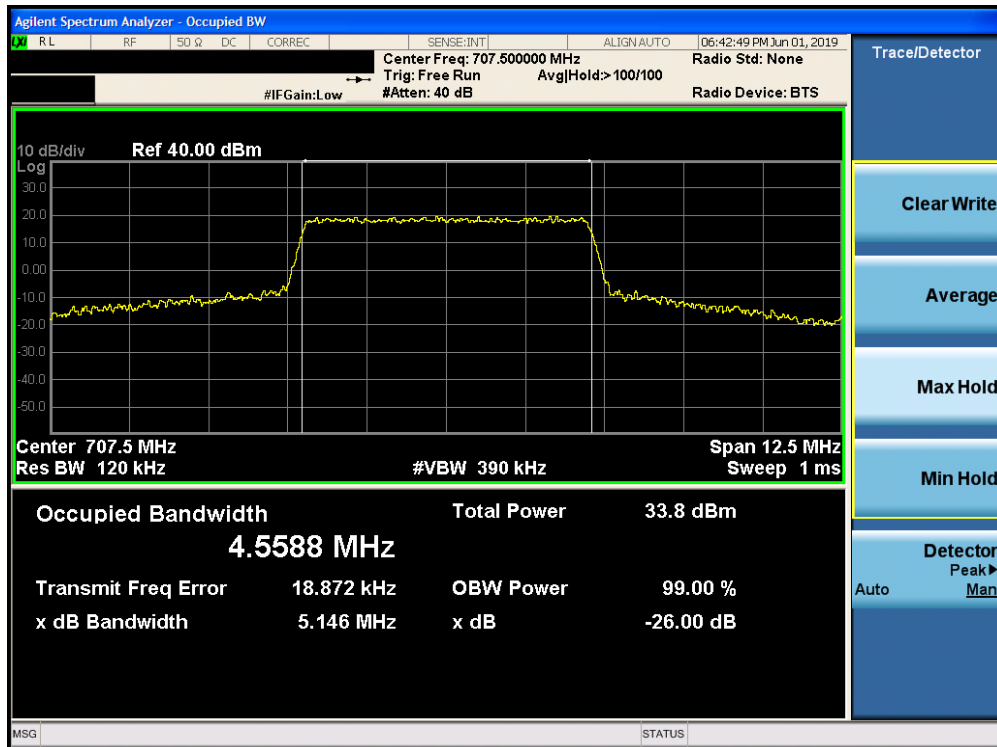


Plot 7-5. Occupied Bandwidth Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

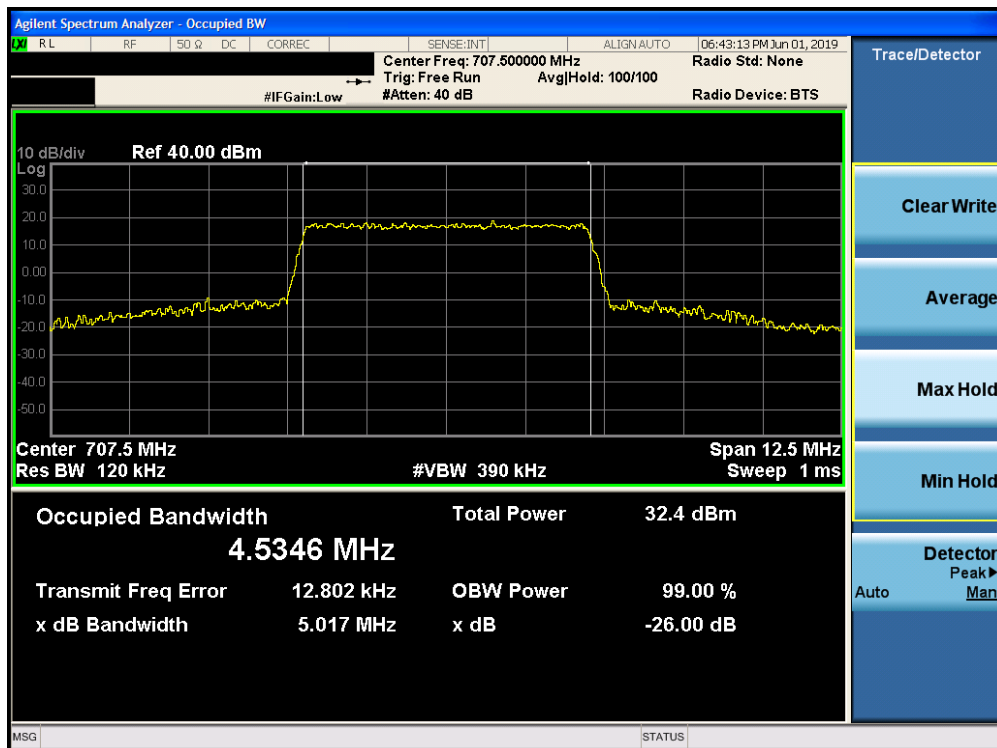


Plot 7-6. Occupied Bandwidth Plot (Band 12 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 24 of 341



Plot 7-7. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz QPSK - Full RB Configuration)

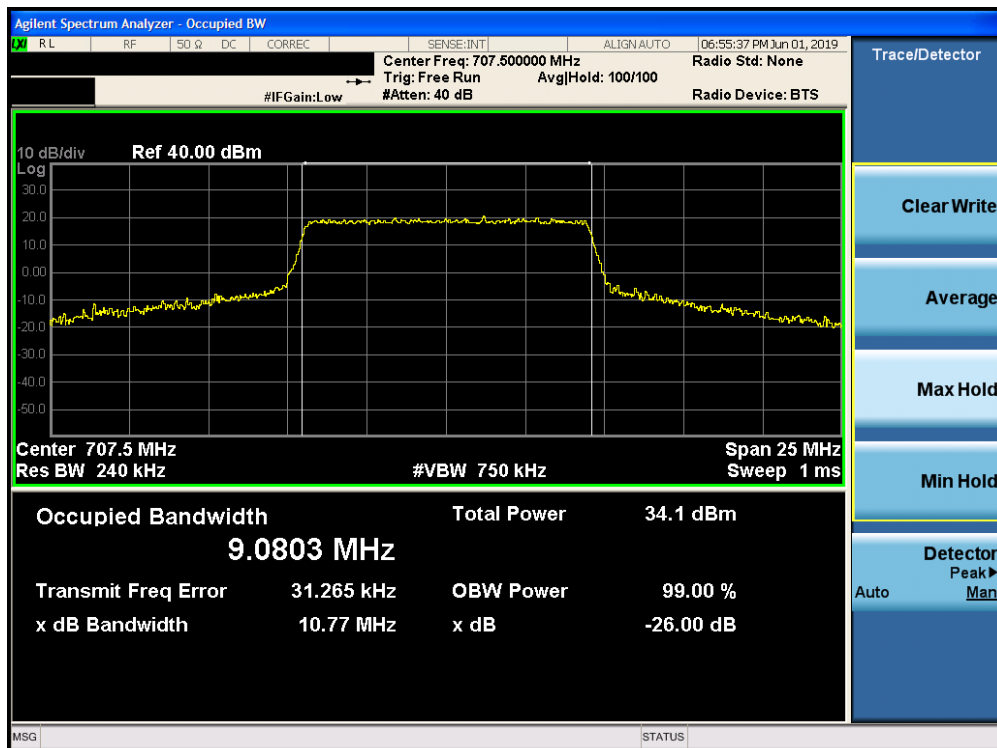


Plot 7-8. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 25 of 341

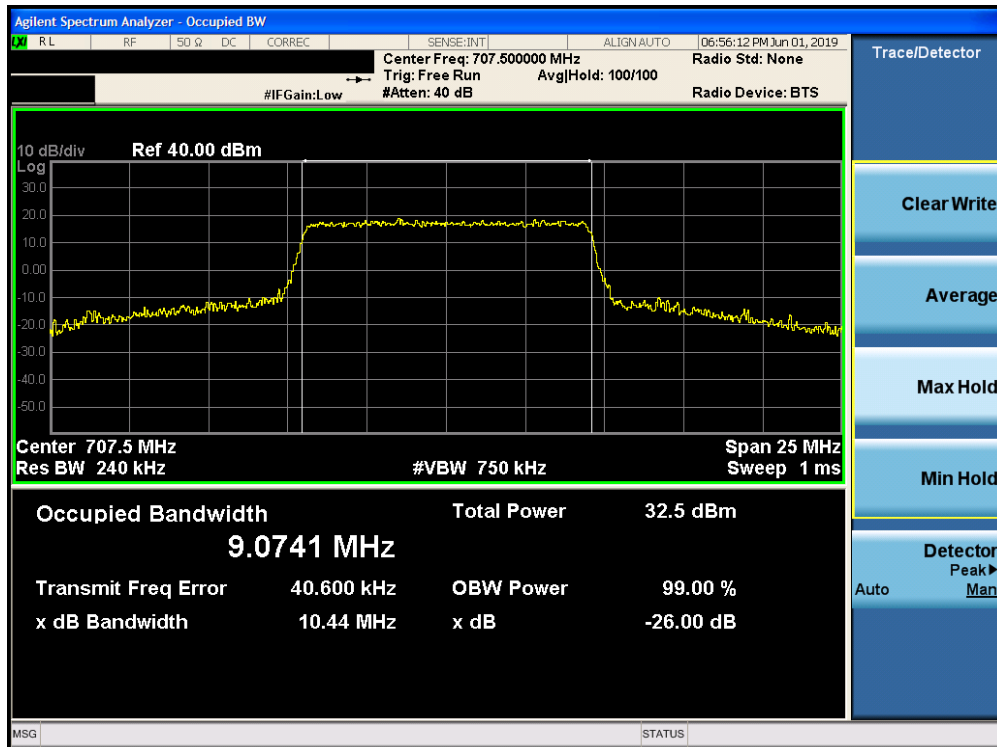


Plot 7-9. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz 64-QAM - Full RB Configuration)

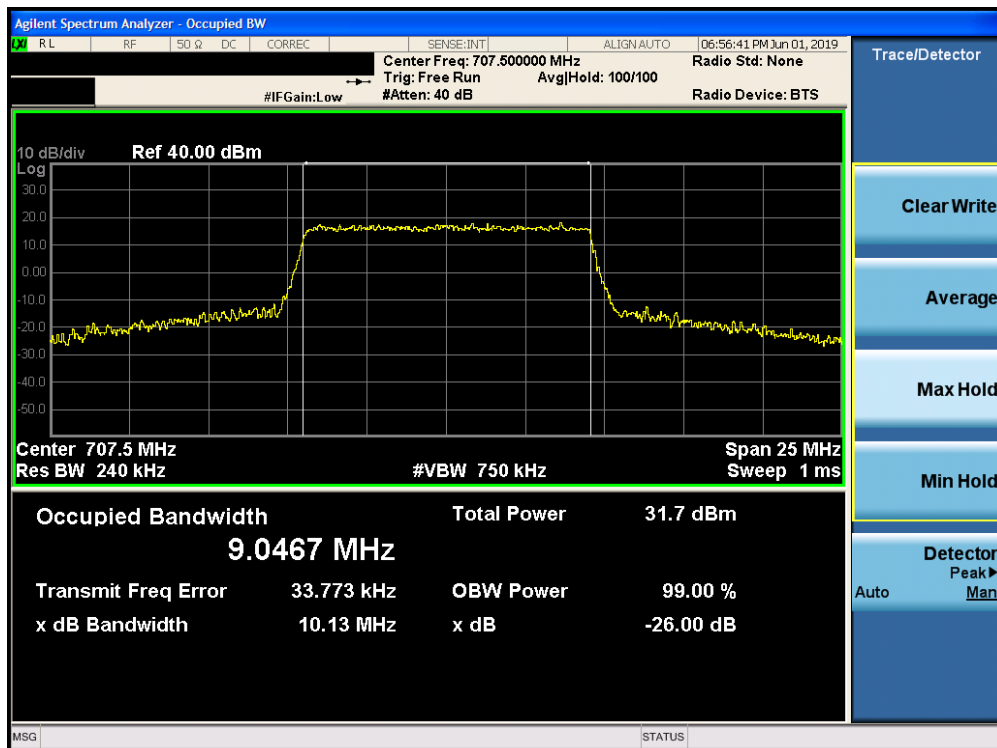


Plot 7-10. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 26 of 341



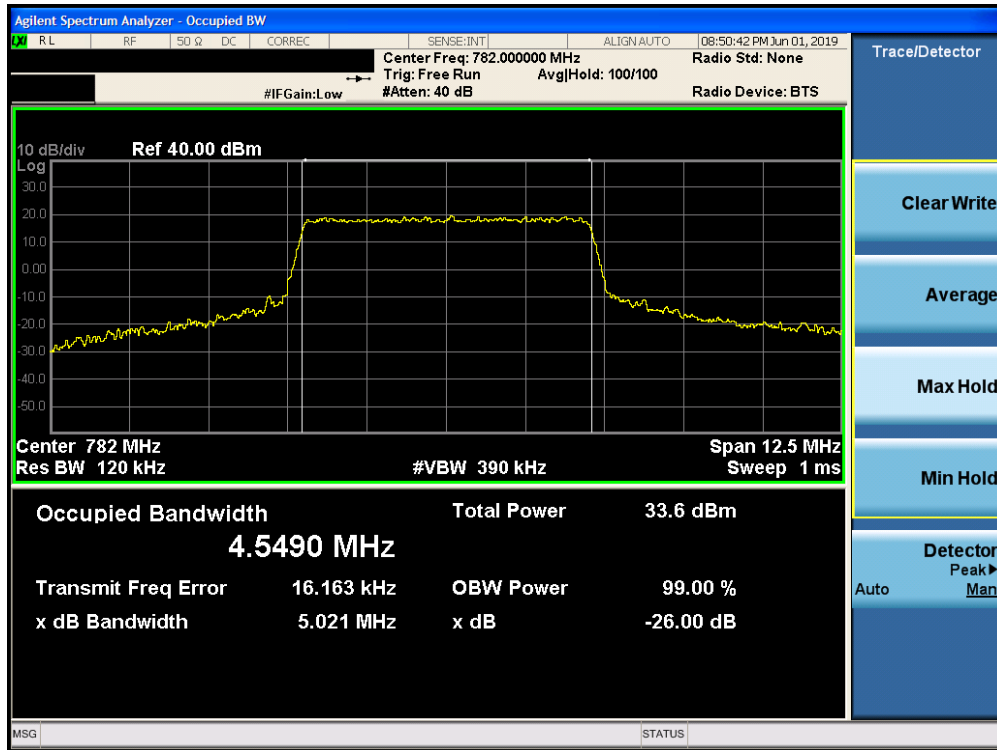
Plot 7-11. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz 16-QAM - Full RB Configuration)



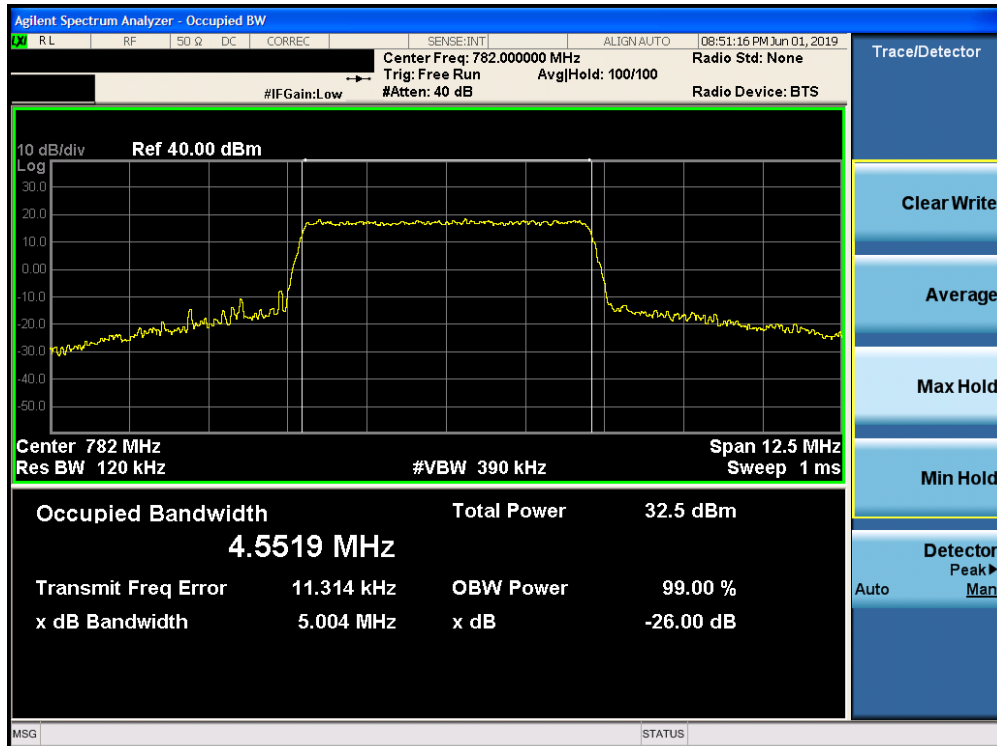
Plot 7-12. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 27 of 341

Band 13

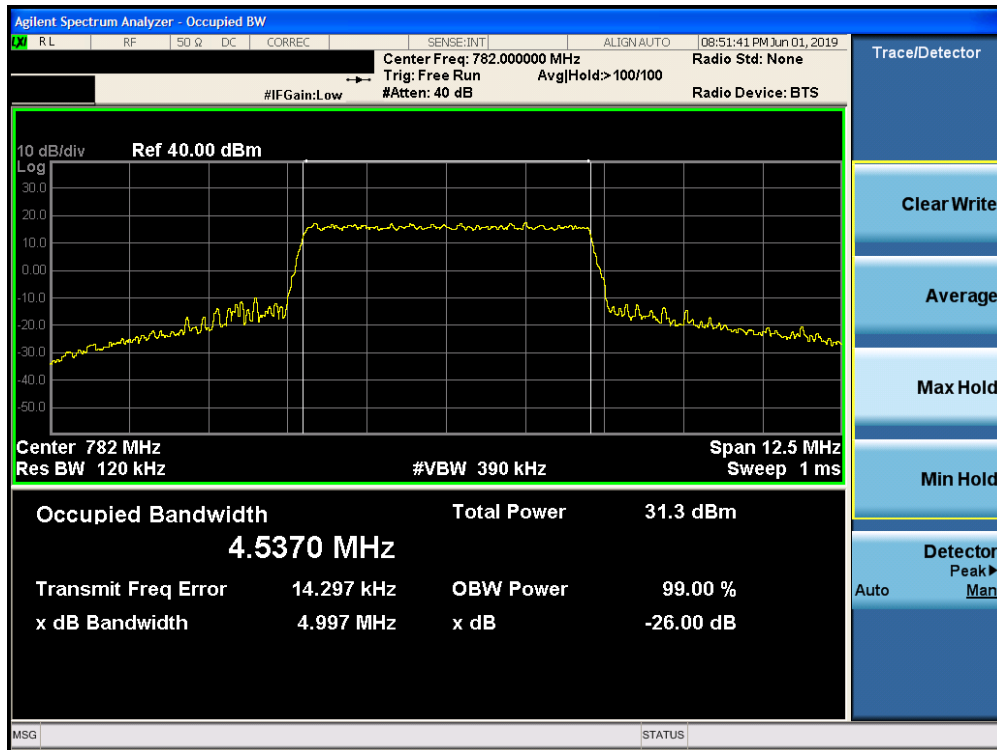


Plot 7-13. Occupied Bandwidth Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)

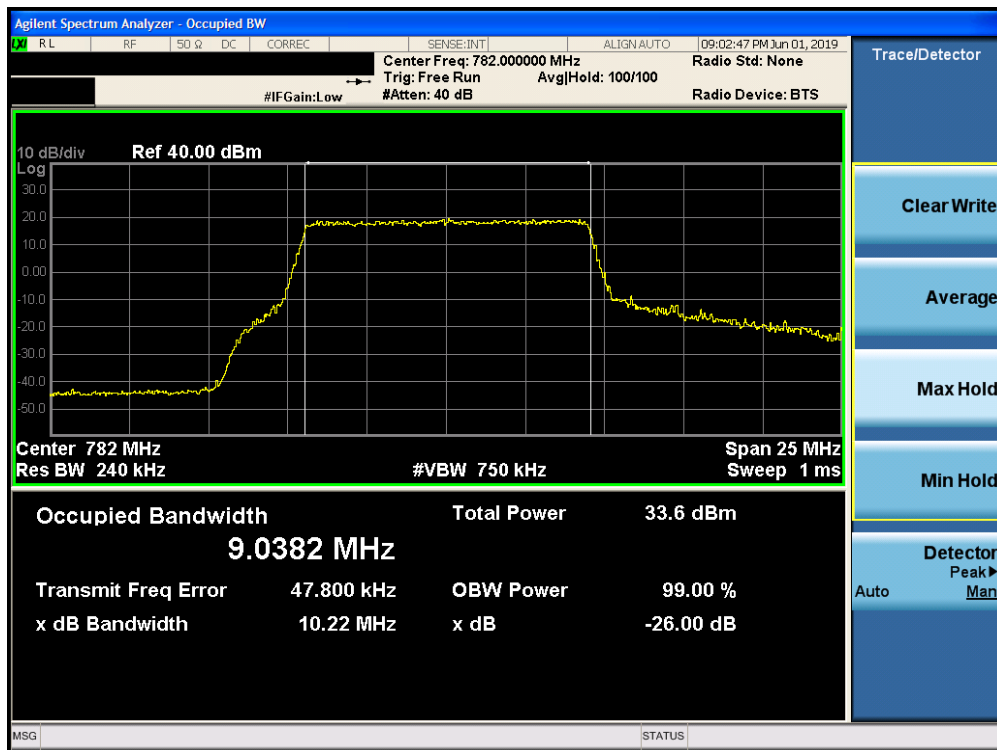


Plot 7-14. Occupied Bandwidth Plot (Band 13 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 28 of 341

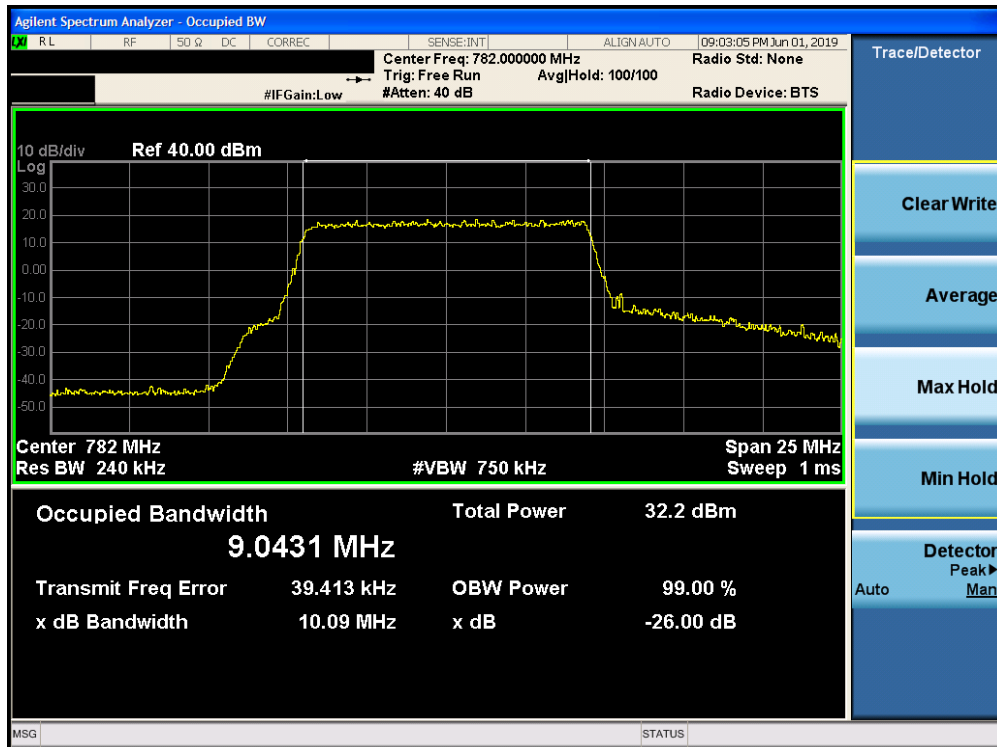


Plot 7-15. Occupied Bandwidth Plot (Band 13 - 5.0MHz 64-QAM - Full RB Configuration)

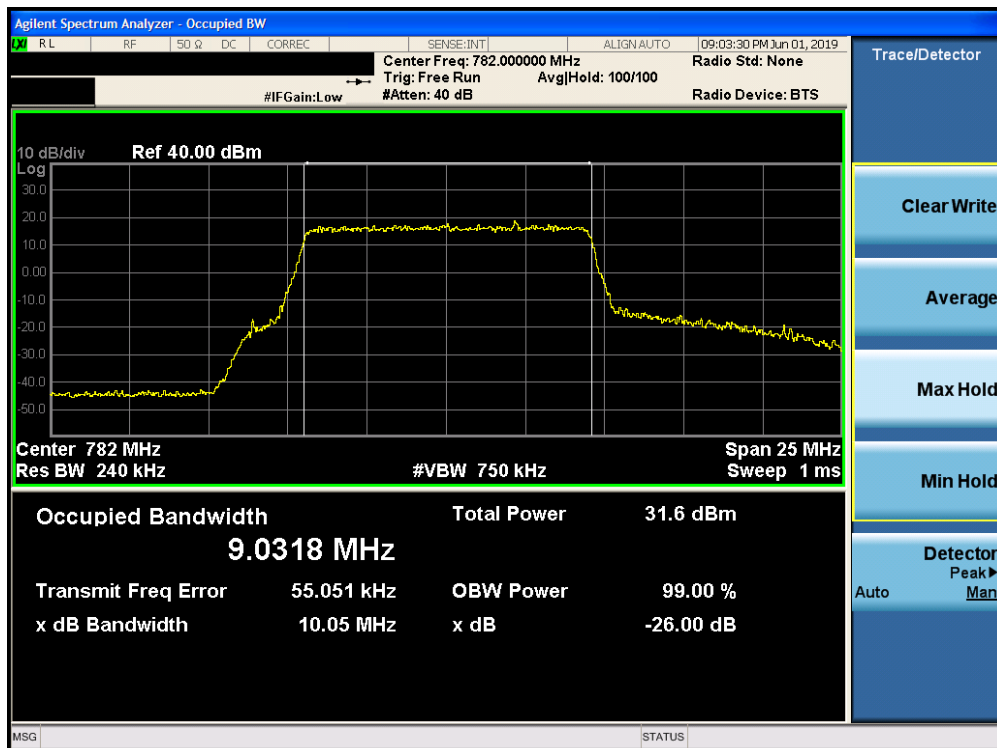


Plot 7-16. Occupied Bandwidth Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 29 of 341



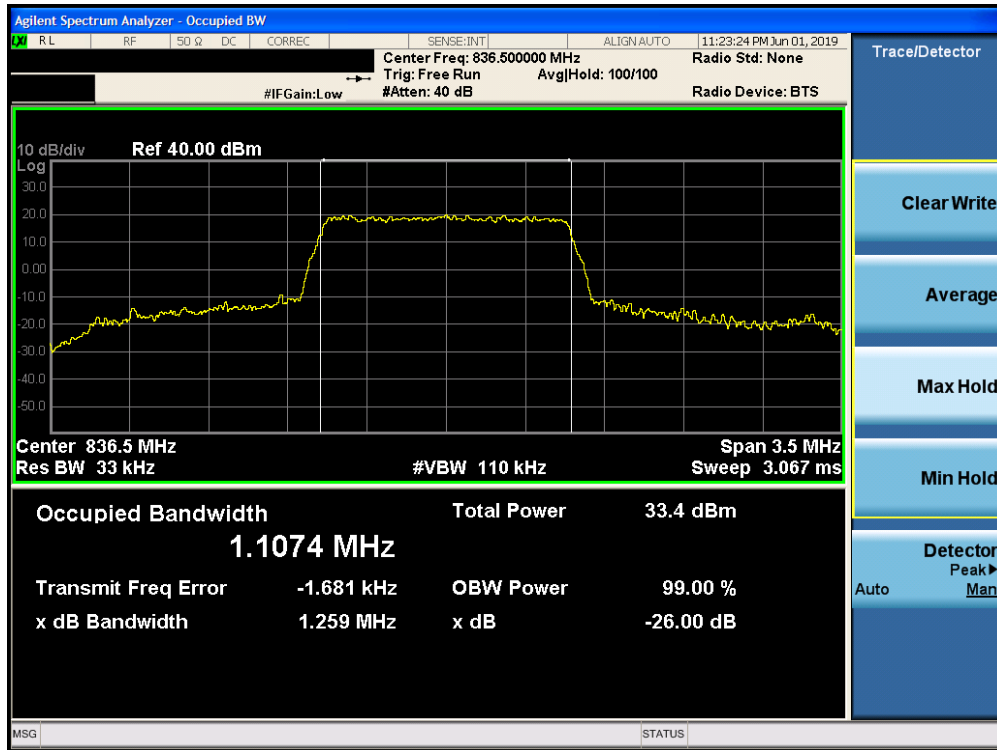
Plot 7-17. Occupied Bandwidth Plot (Band 13 - 10.0MHz 16-QAM - Full RB Configuration)



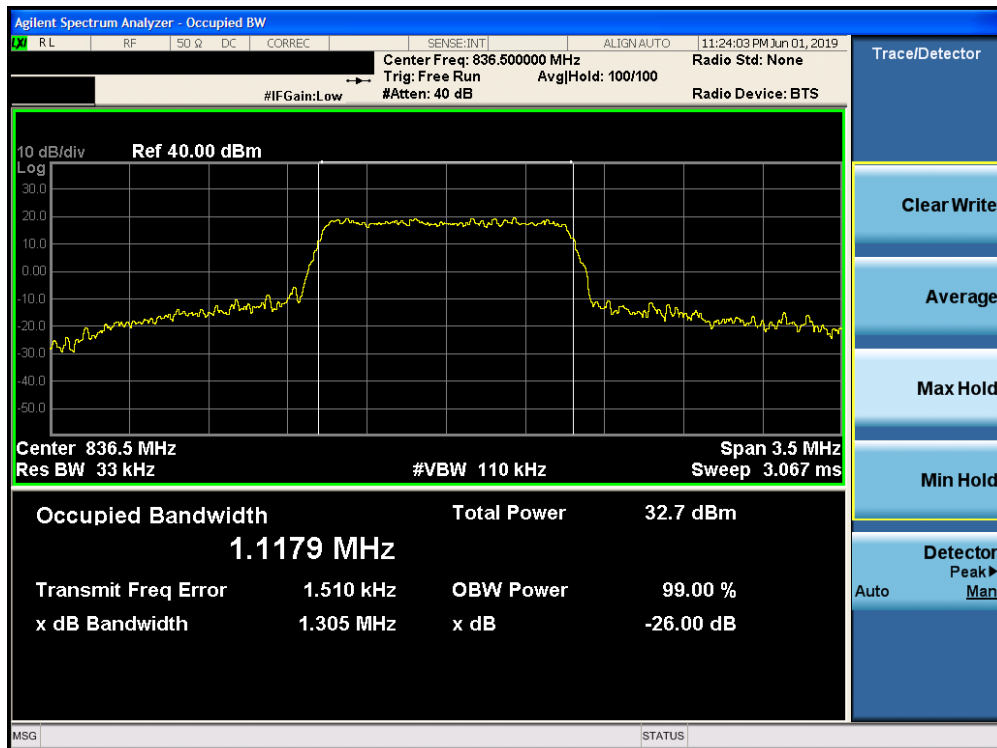
Plot 7-18. Occupied Bandwidth Plot (Band 13 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 30 of 341

Band 26/5

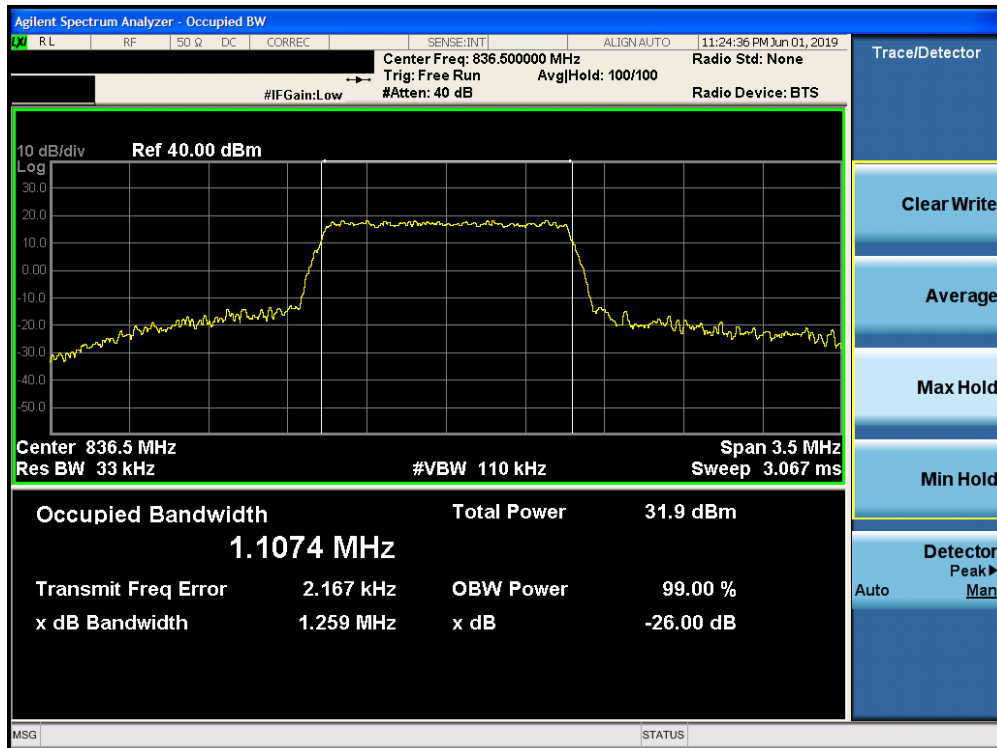


Plot 7-19. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz QPSK - Full RB Configuration)

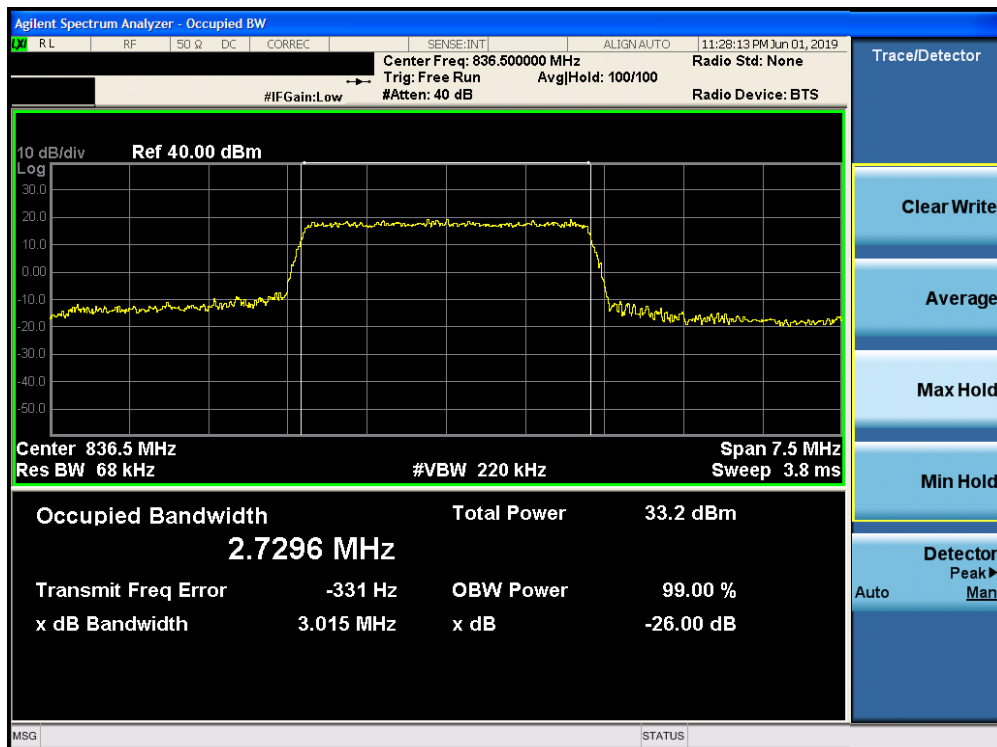


Plot 7-20. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 31 of 341

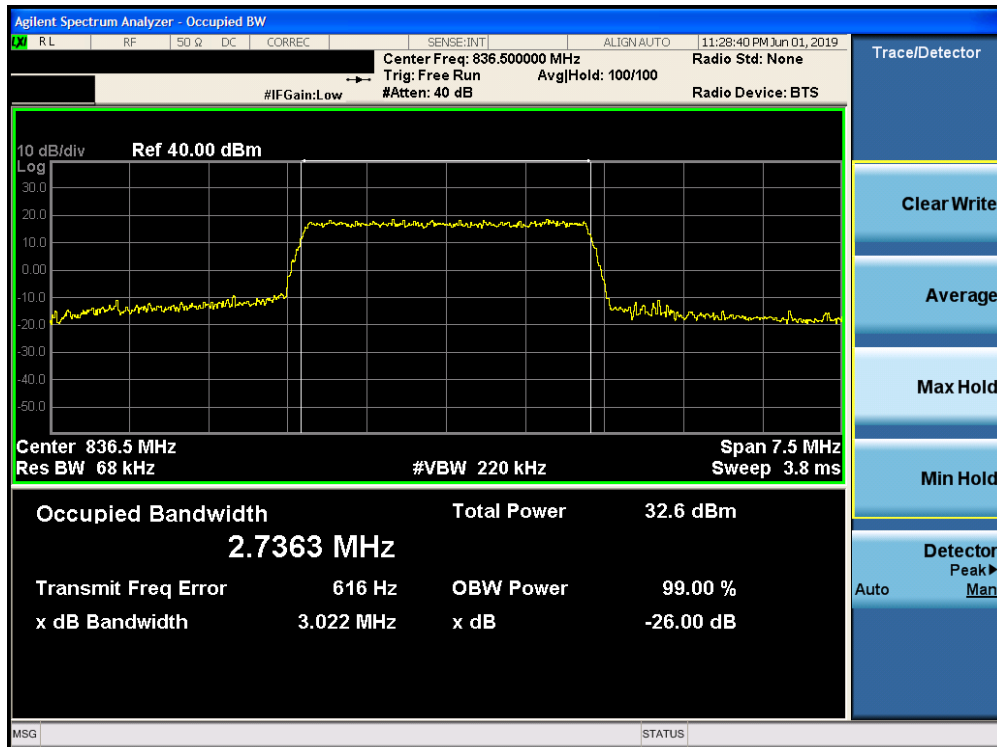


Plot 7-21. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 64-QAM - Full RB Configuration)

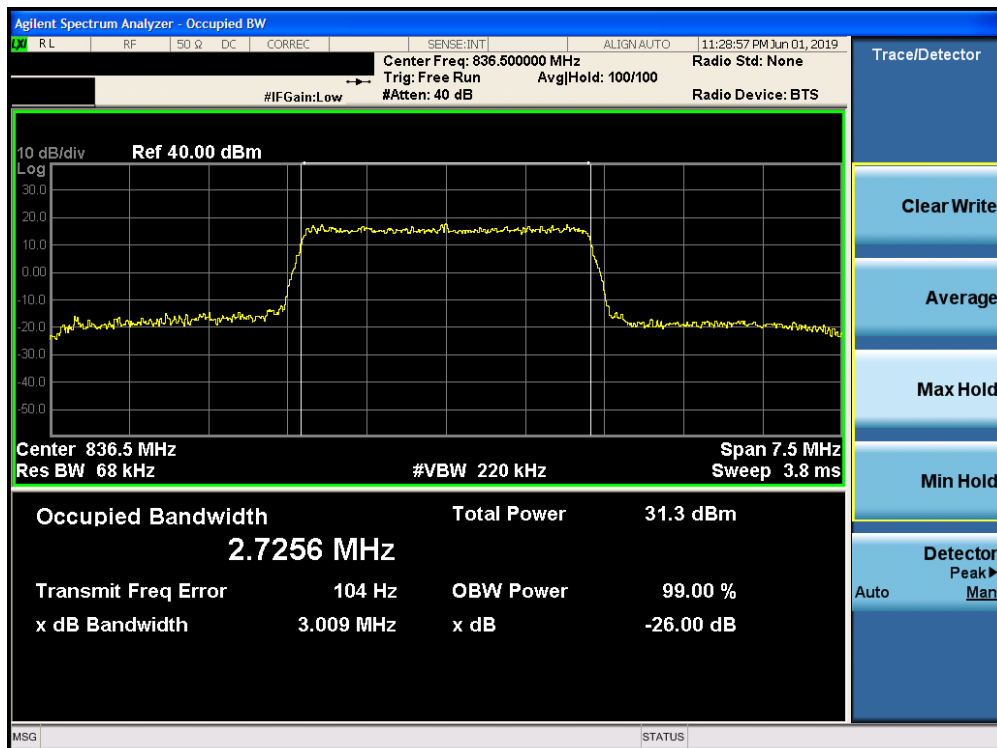


Plot 7-22. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 32 of 341

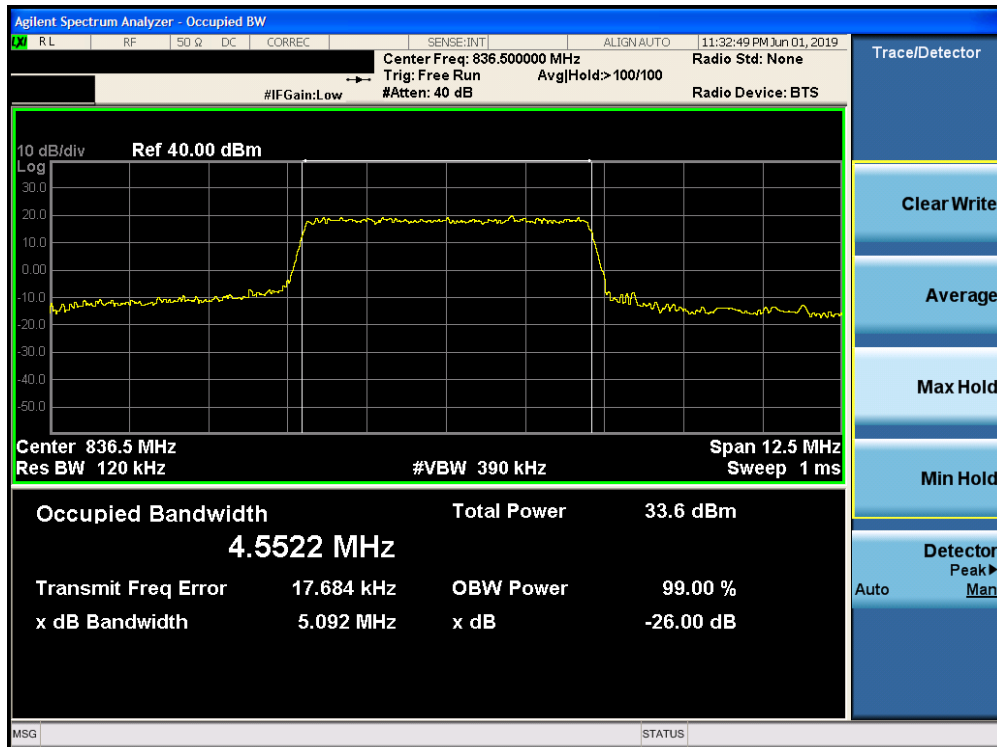


Plot 7-23. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 16-QAM - Full RB Configuration)

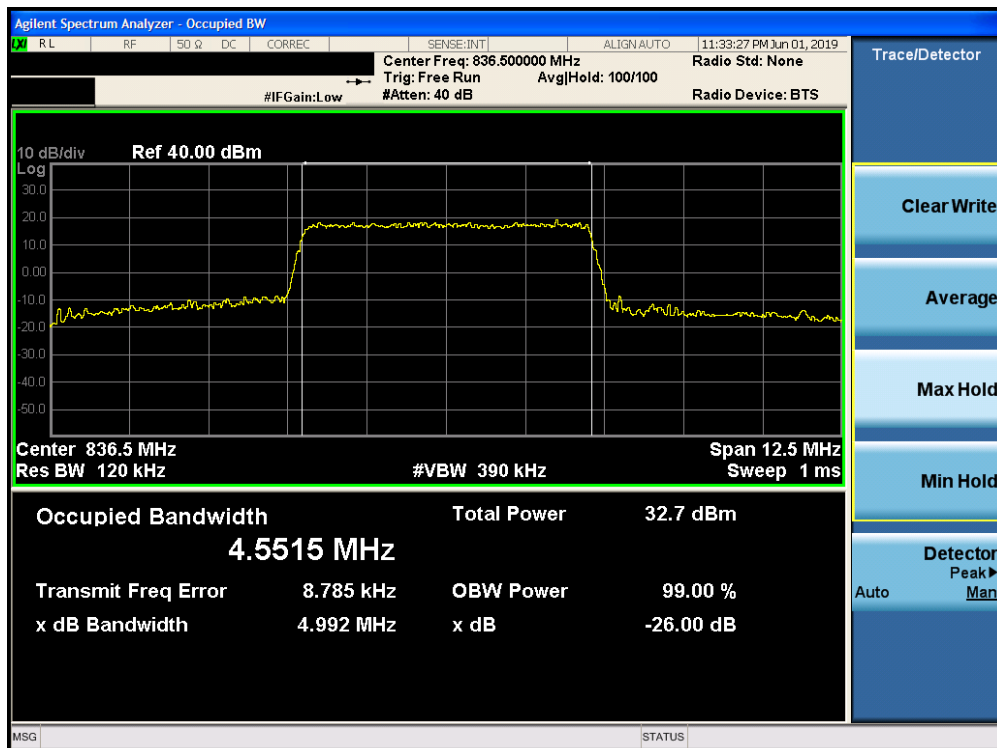


Plot 7-24. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 33 of 341

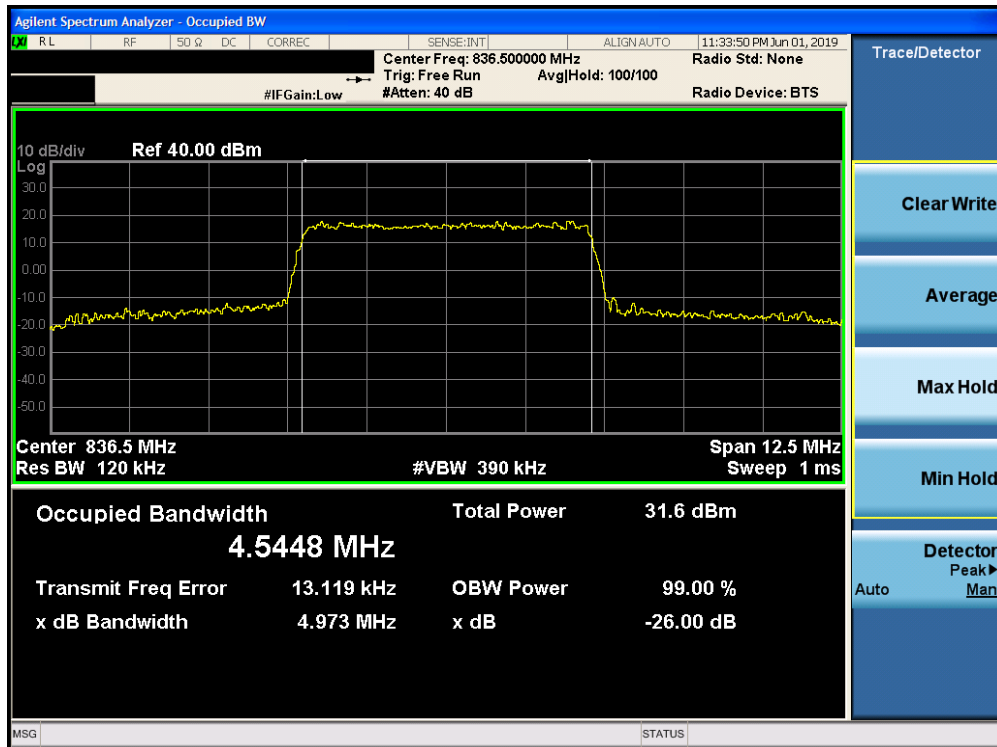


Plot 7-25. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz QPSK - Full RB Configuration)

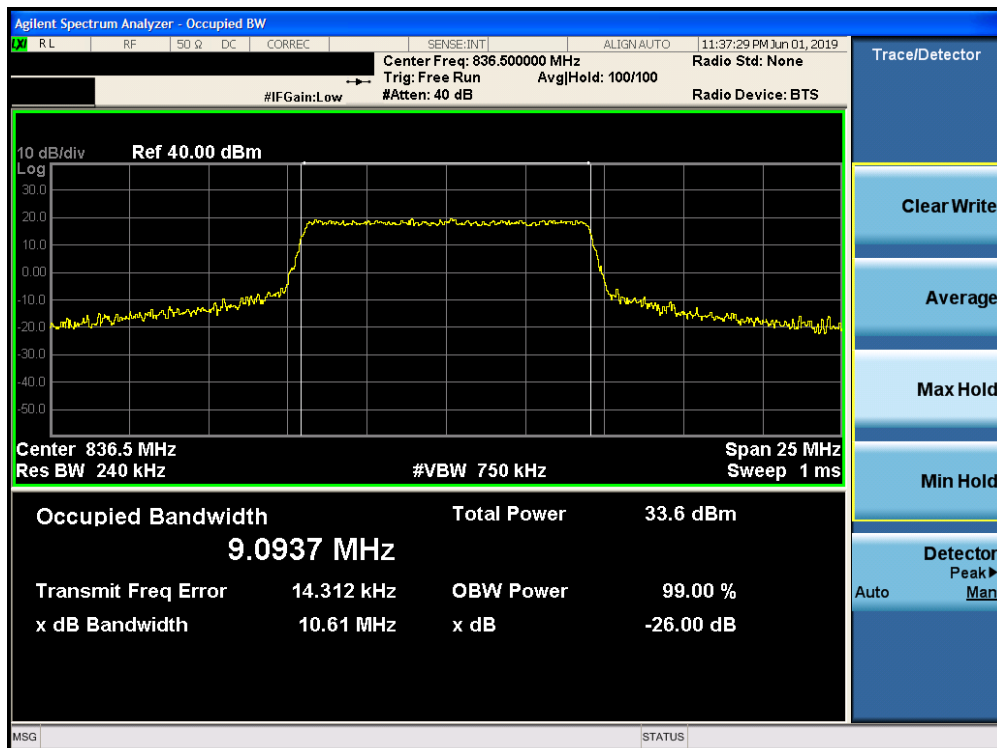


Plot 7-26. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 34 of 341

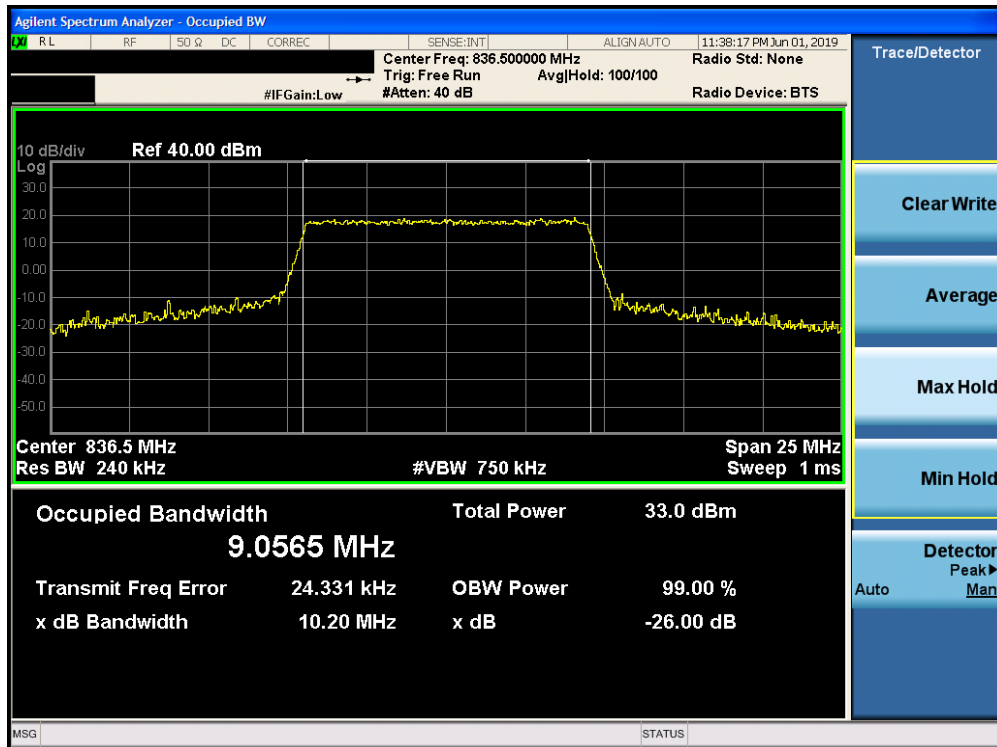


Plot 7-27. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 64-QAM - Full RB Configuration)

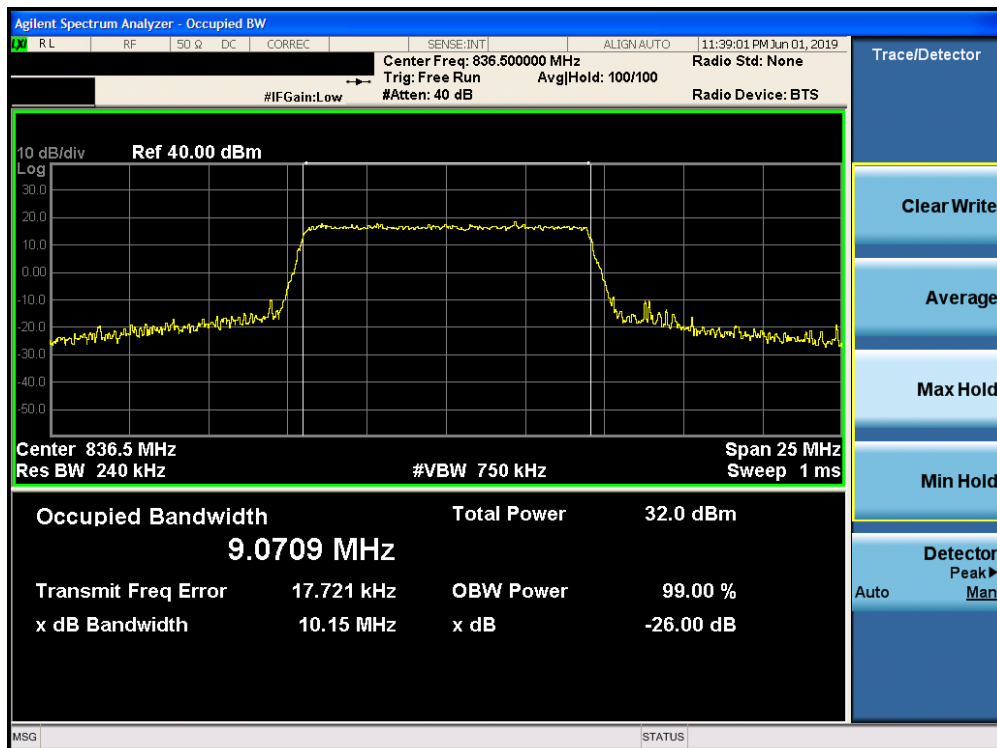


Plot 7-28. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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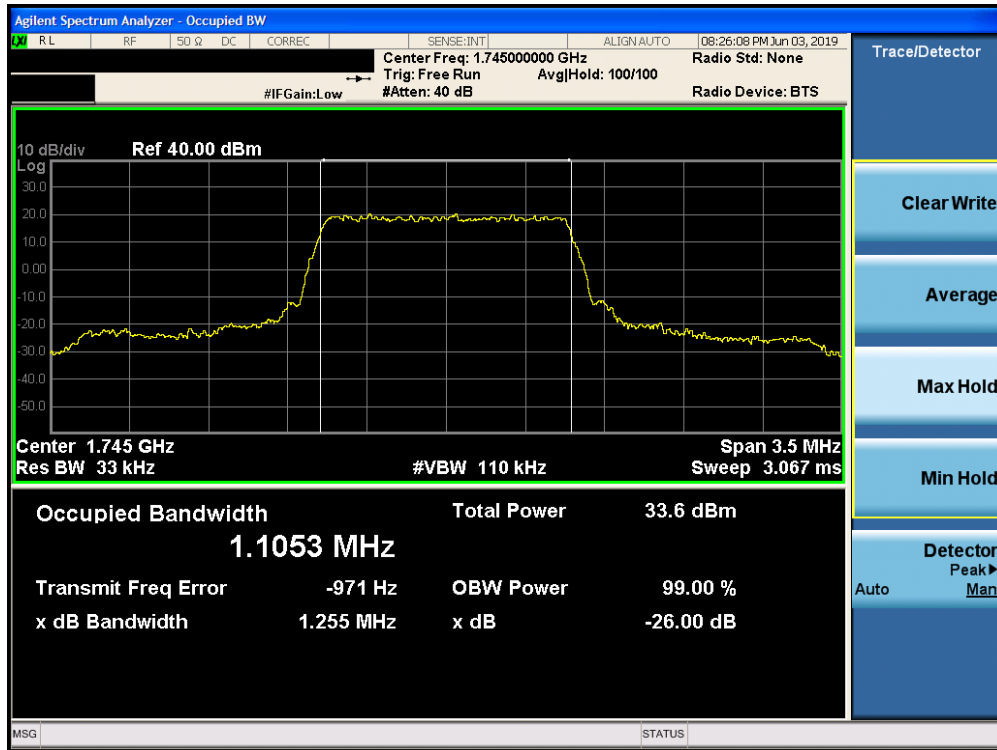
Plot 7-29. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 16-QAM - Full RB Configuration)



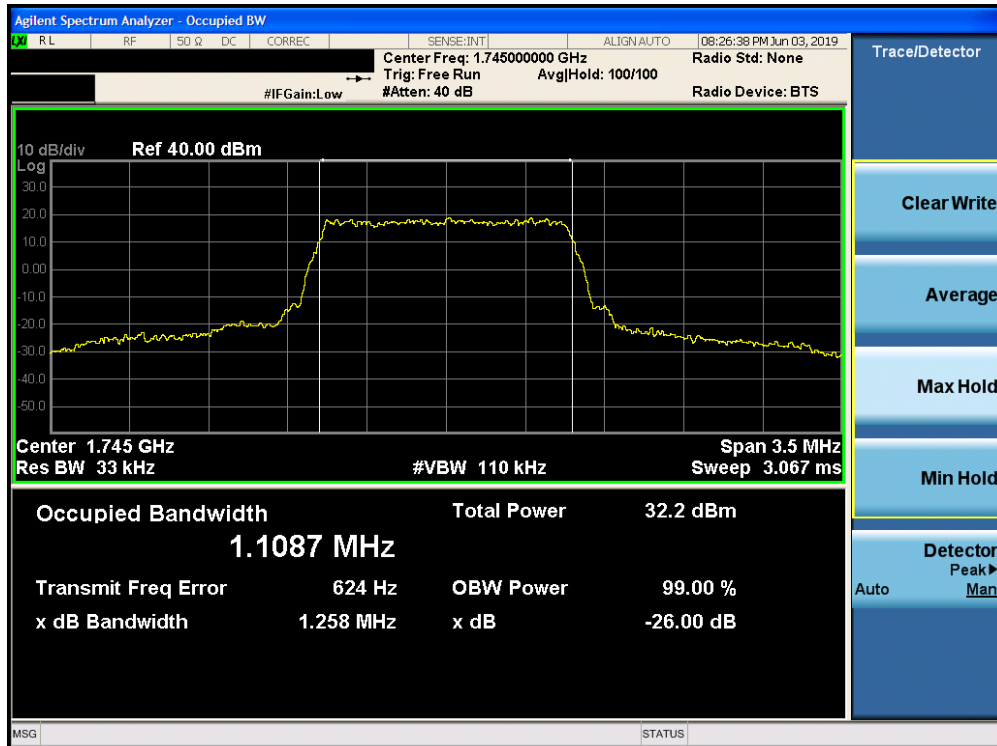
Plot 7-30. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 36 of 341

Band 66/4

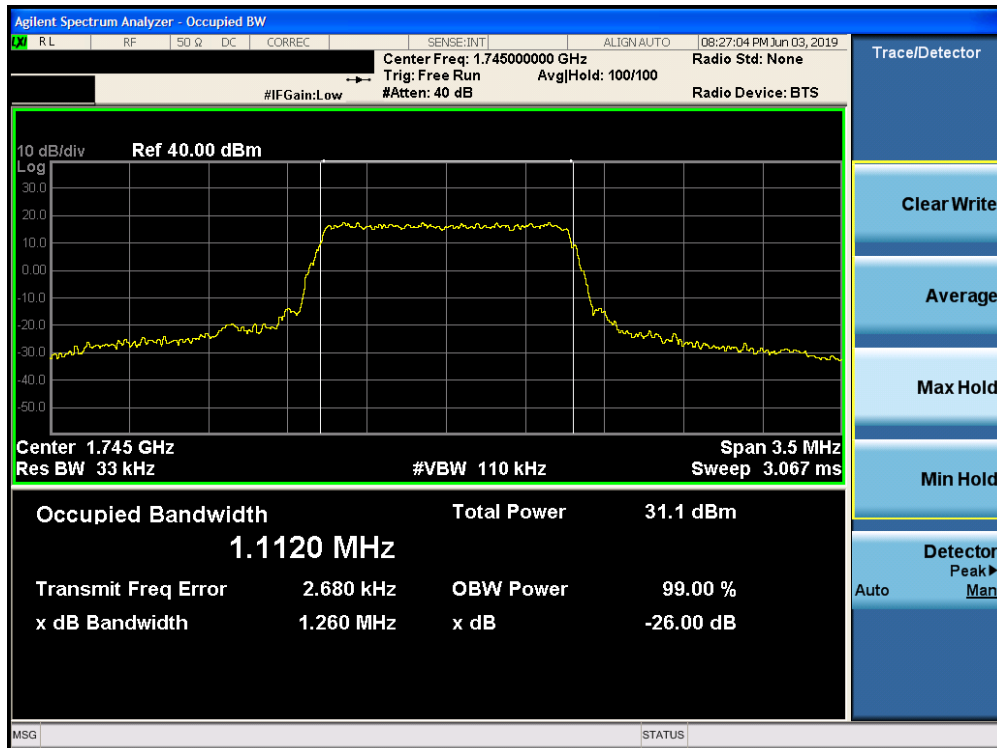


Plot 7-31. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

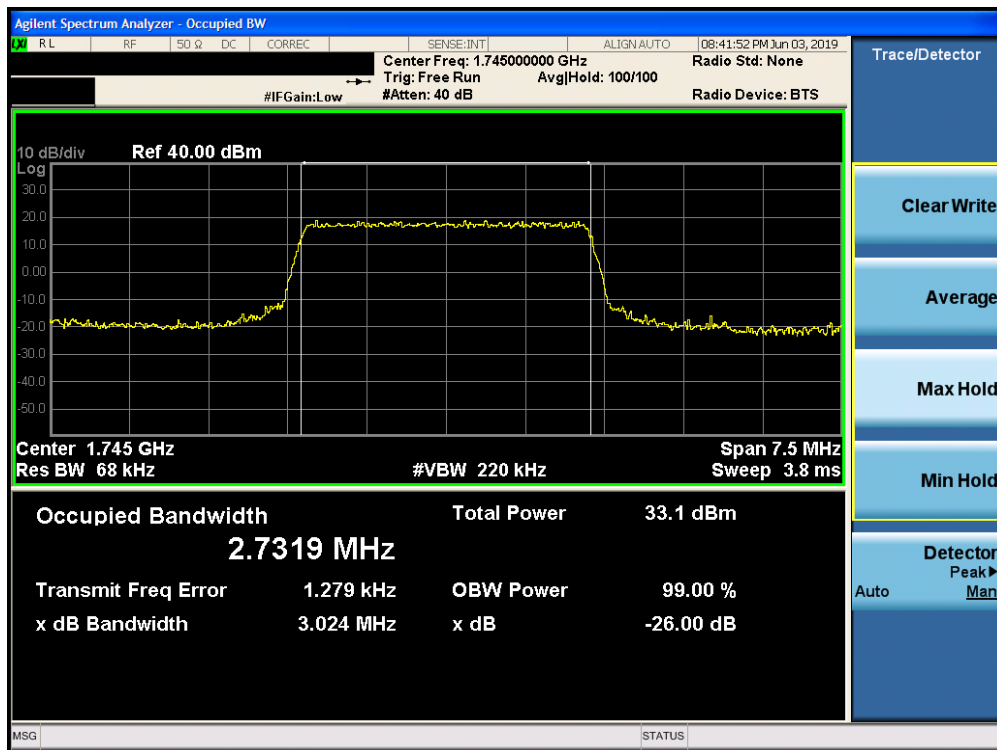


Plot 7-32. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 37 of 341

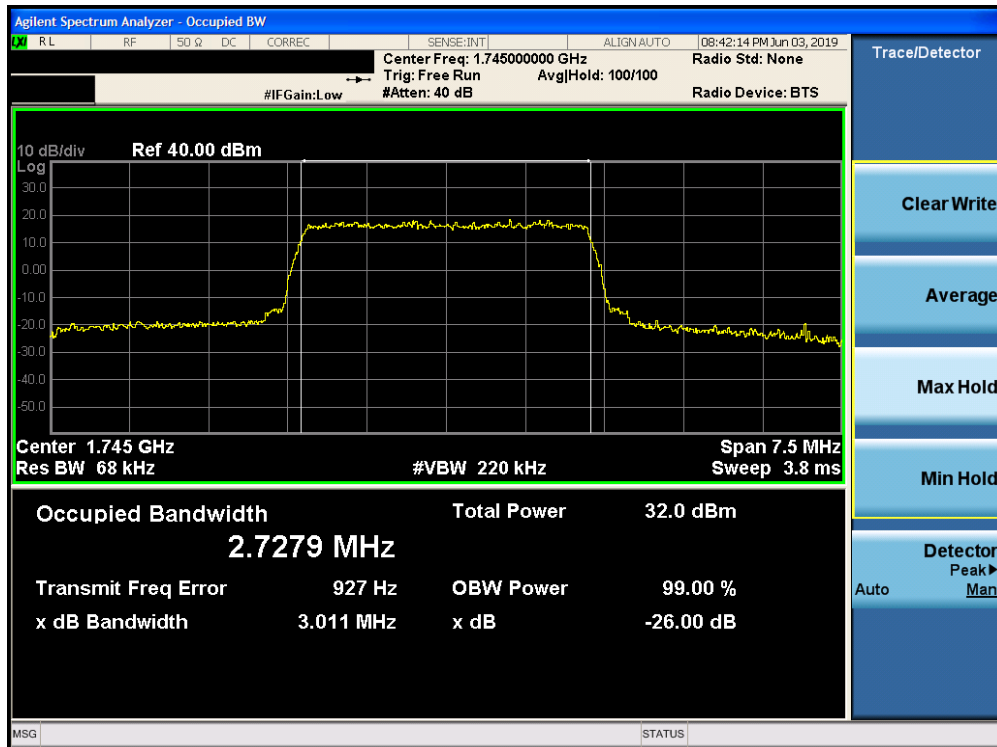


Plot 7-33. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)

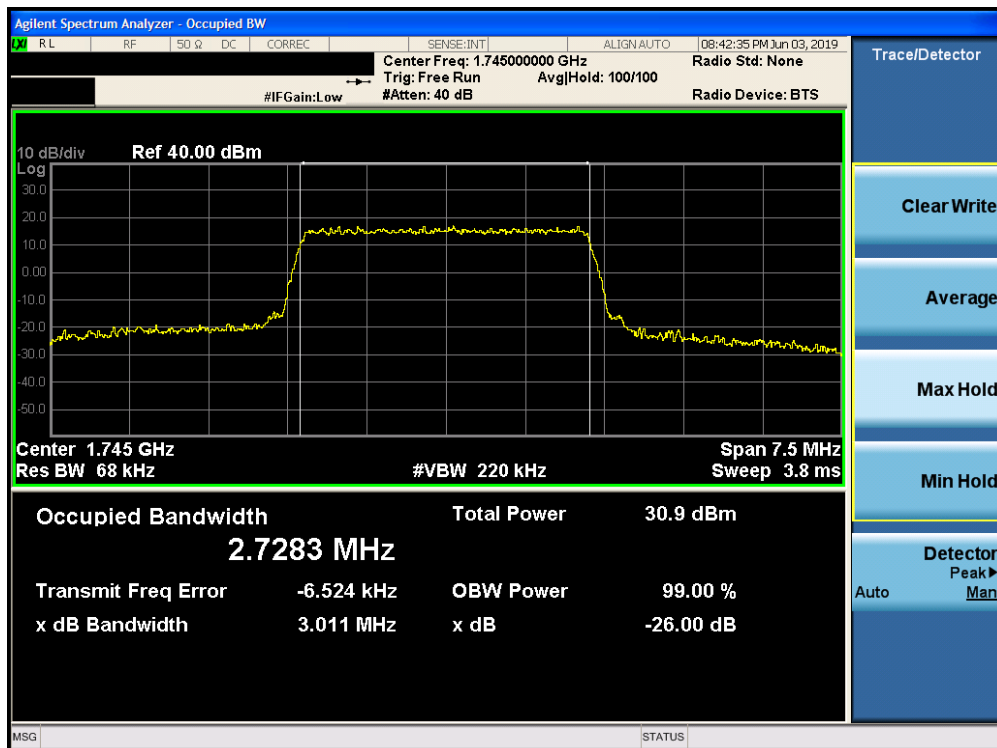


Plot 7-34. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 38 of 341

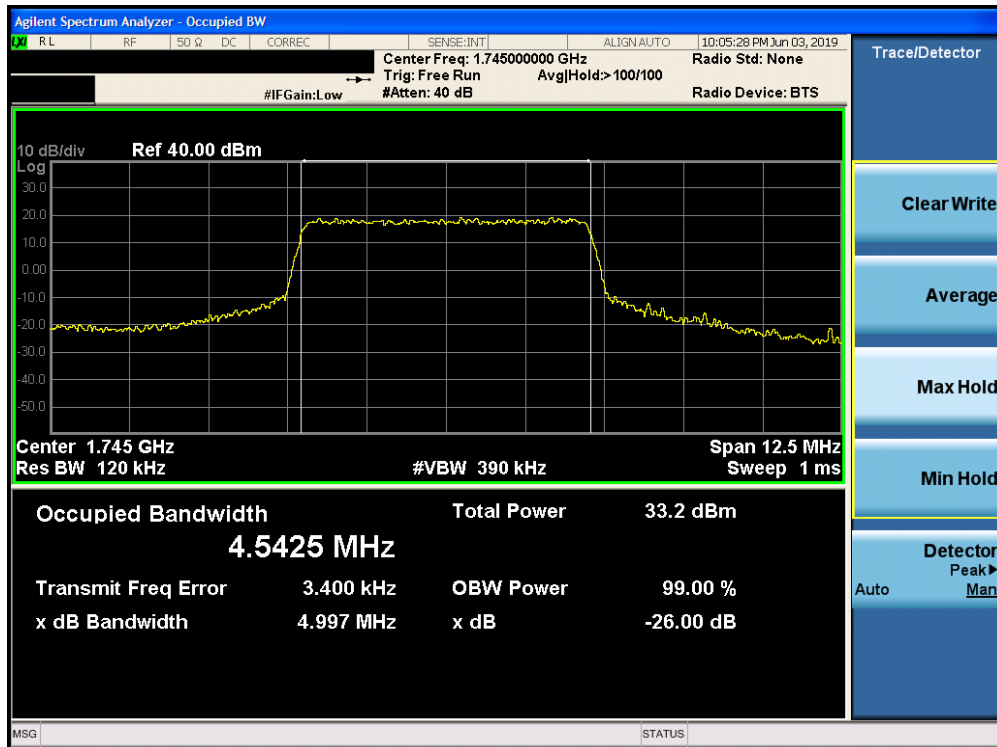


Plot 7-35. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)



Plot 7-36. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 39 of 341

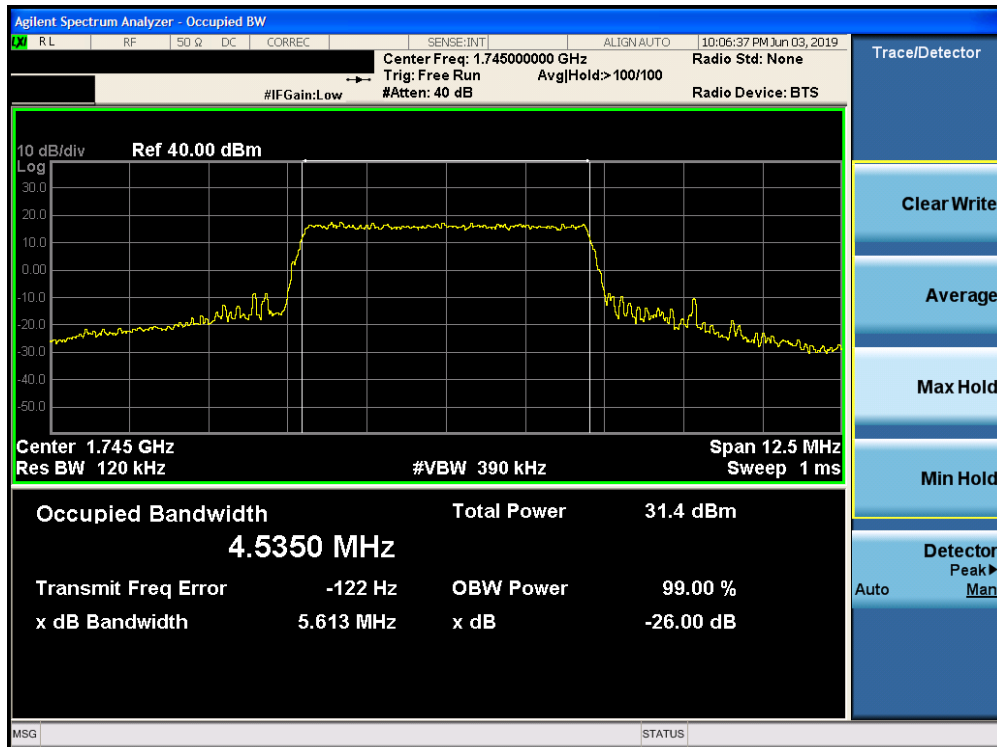


Plot 7-37. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)

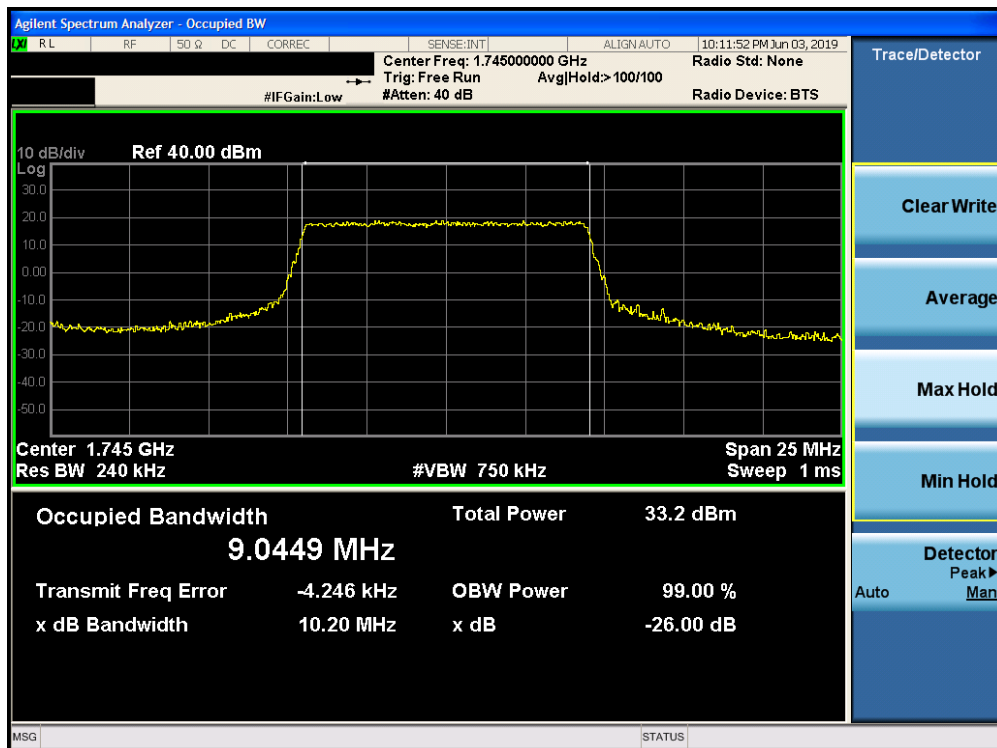


Plot 7-38. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 40 of 341

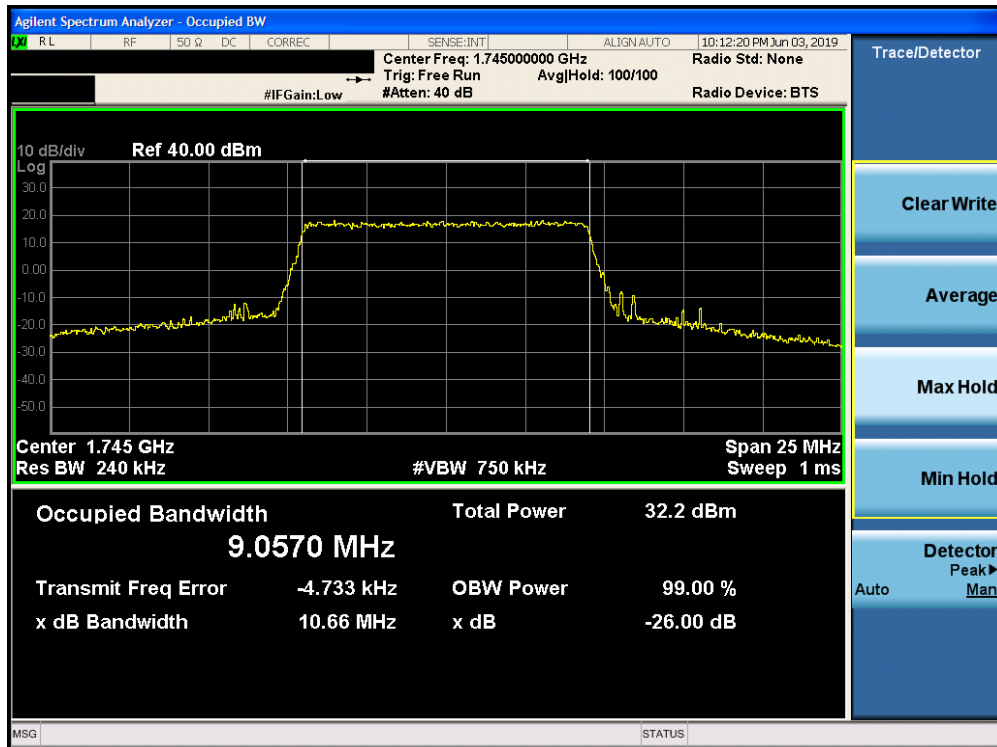


Plot 7-39. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 64-QAM - Full RB Configuration)

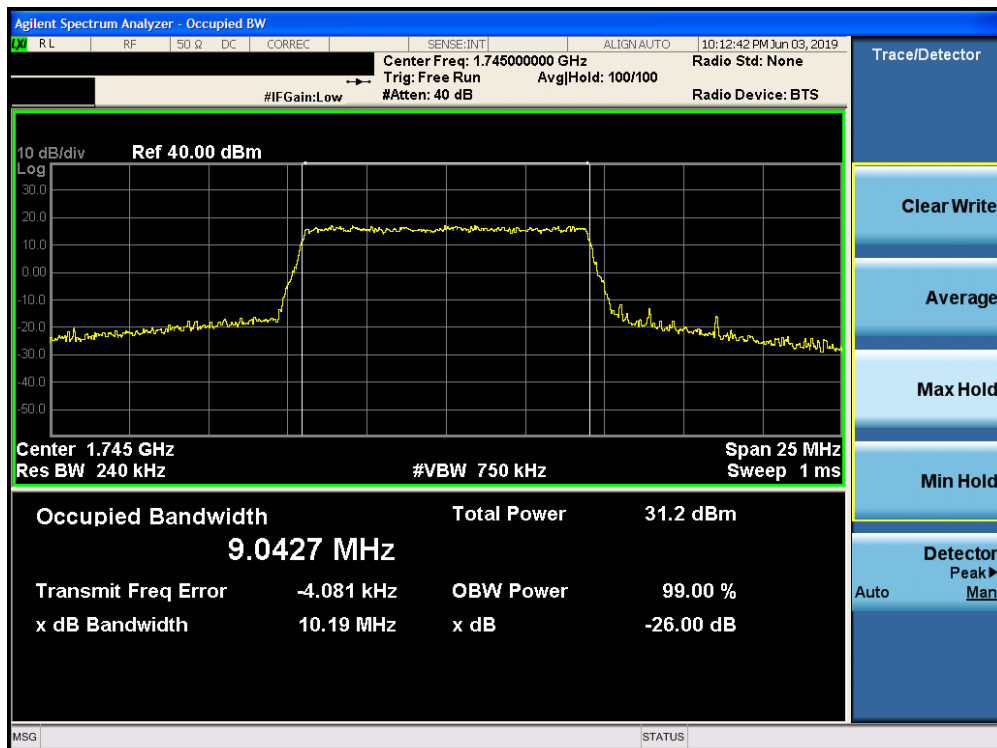


Plot 7-40. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 41 of 341

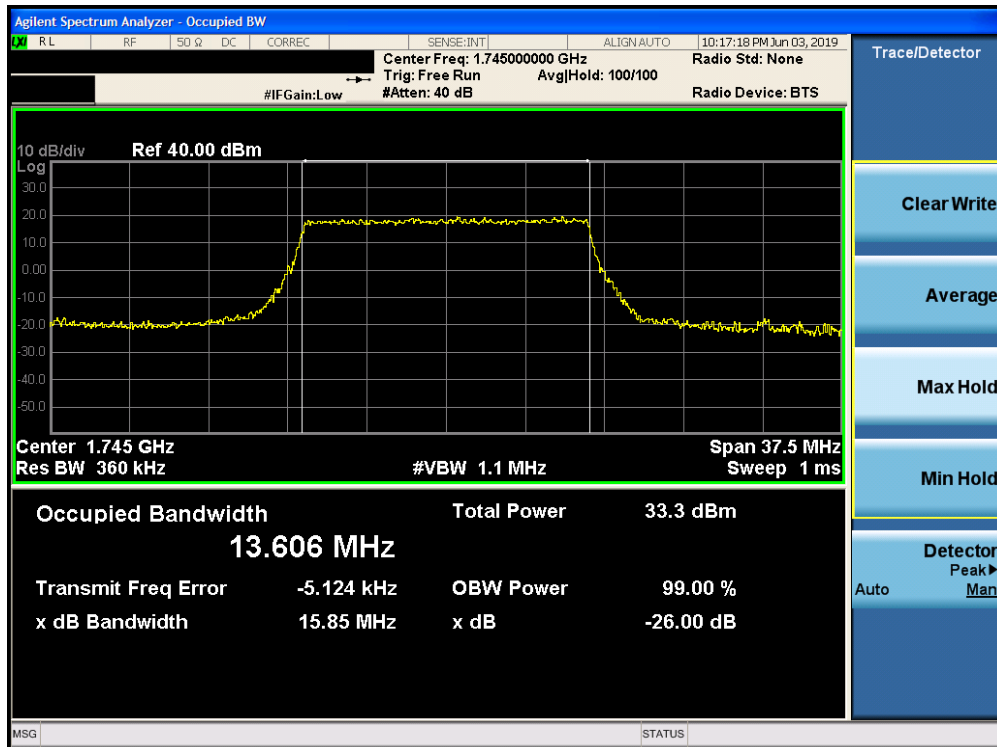


Plot 7-41. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB Configuration)

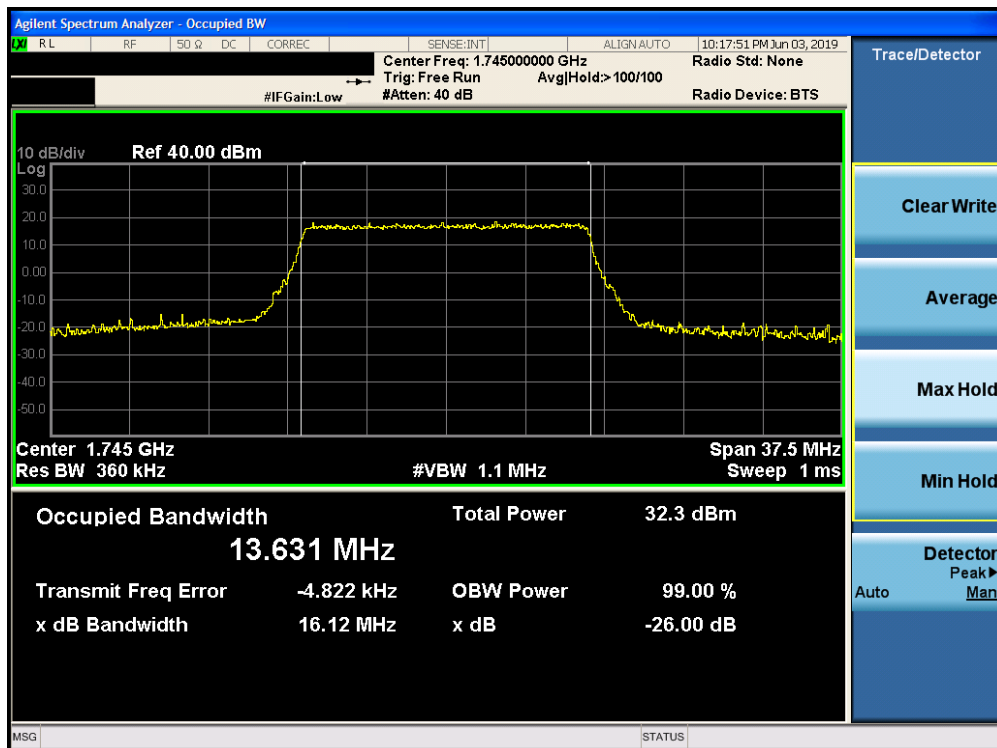


Plot 7-42. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 42 of 341

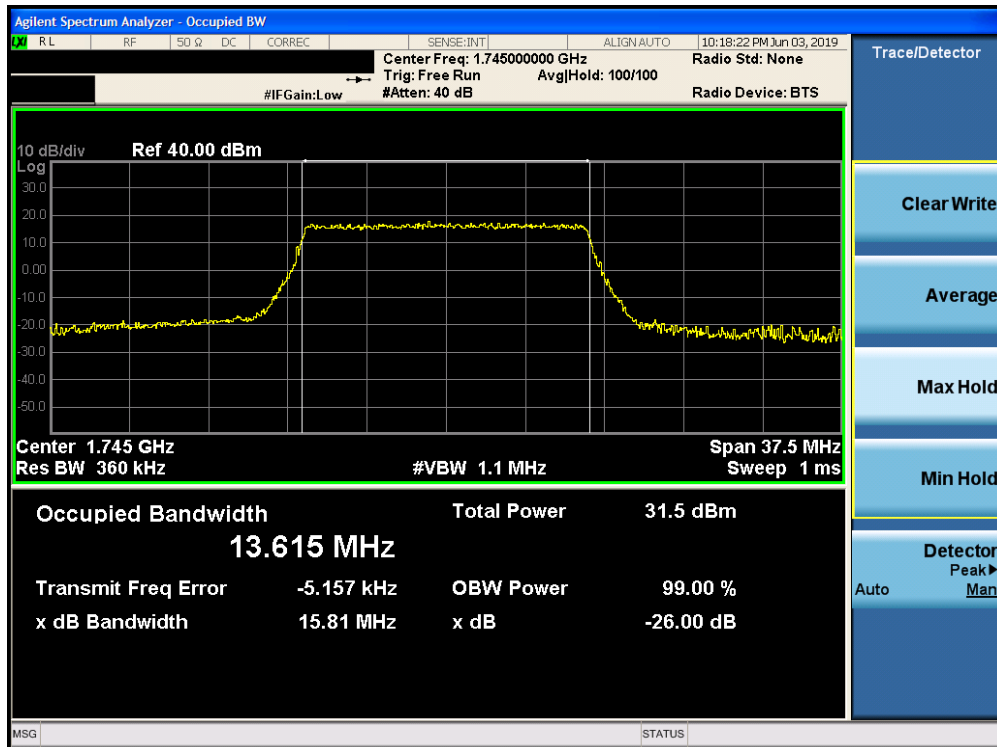


Plot 7-43. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)

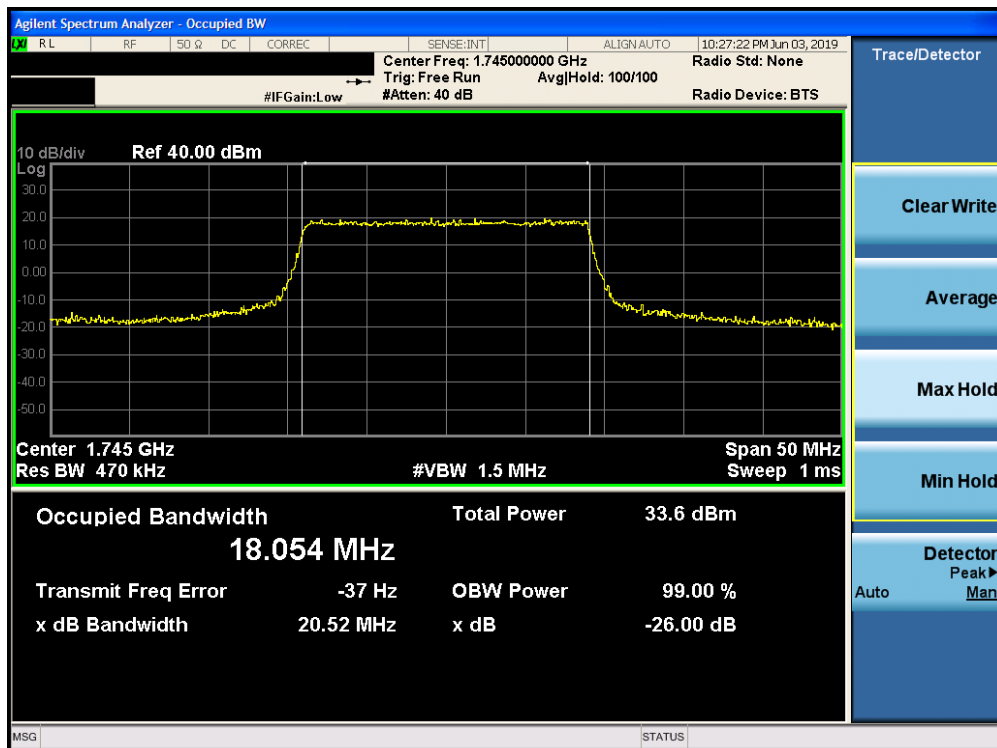


Plot 7-44. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 43 of 341

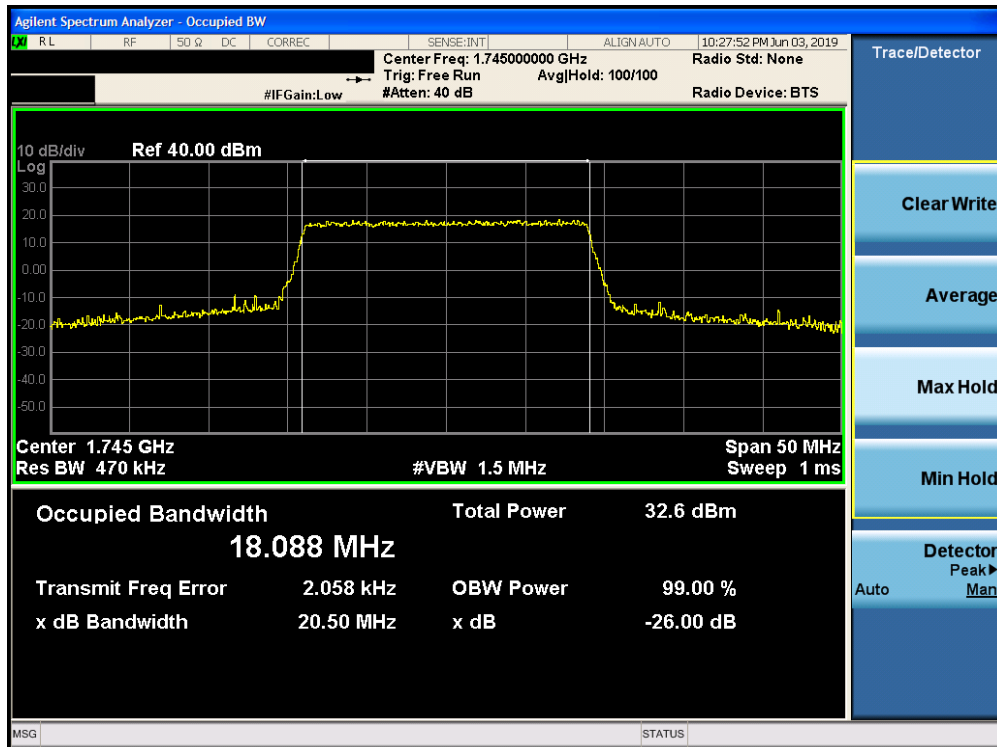


Plot 7-45. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 64-QAM - Full RB Configuration)

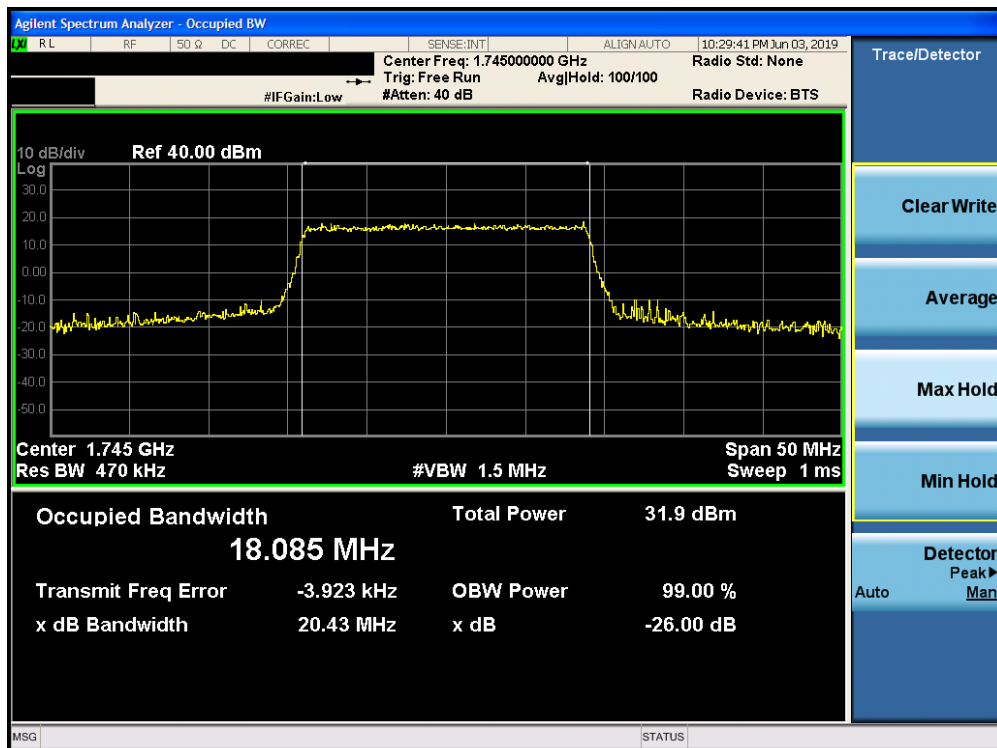


Plot 7-46. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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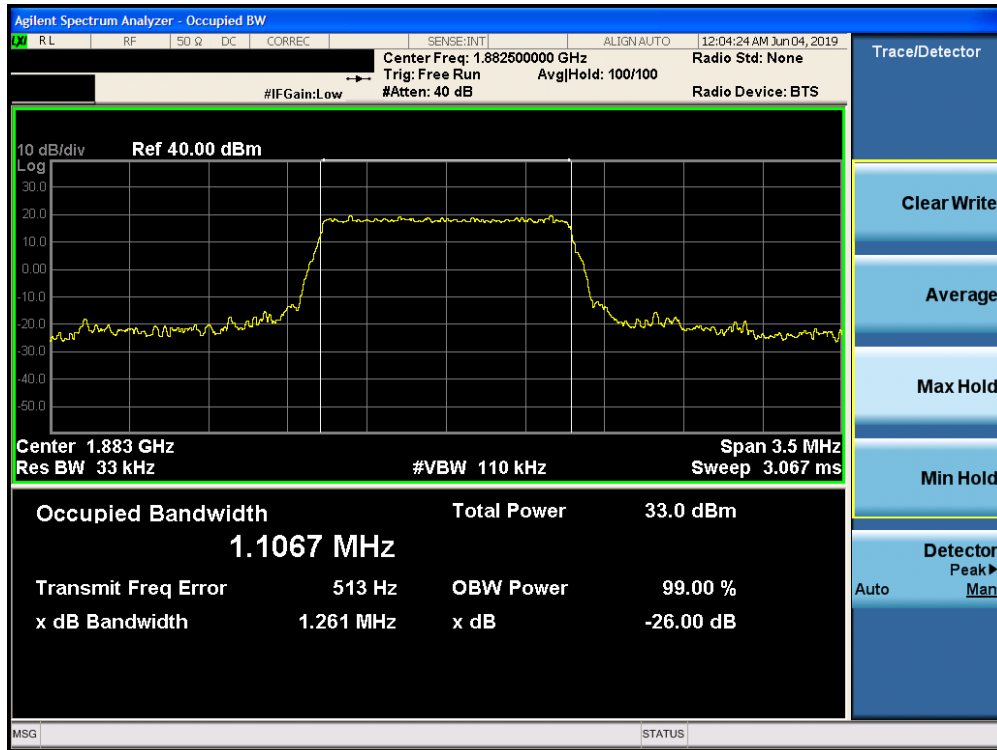
Plot 7-47. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)



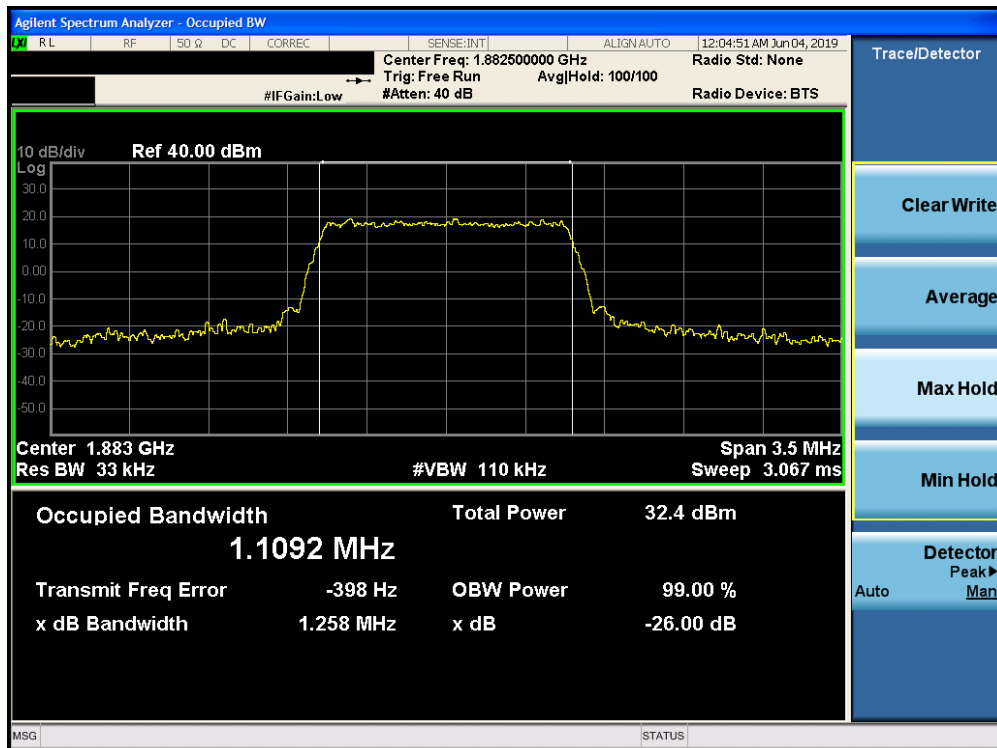
Plot 7-48. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 45 of 341

Band 25/2

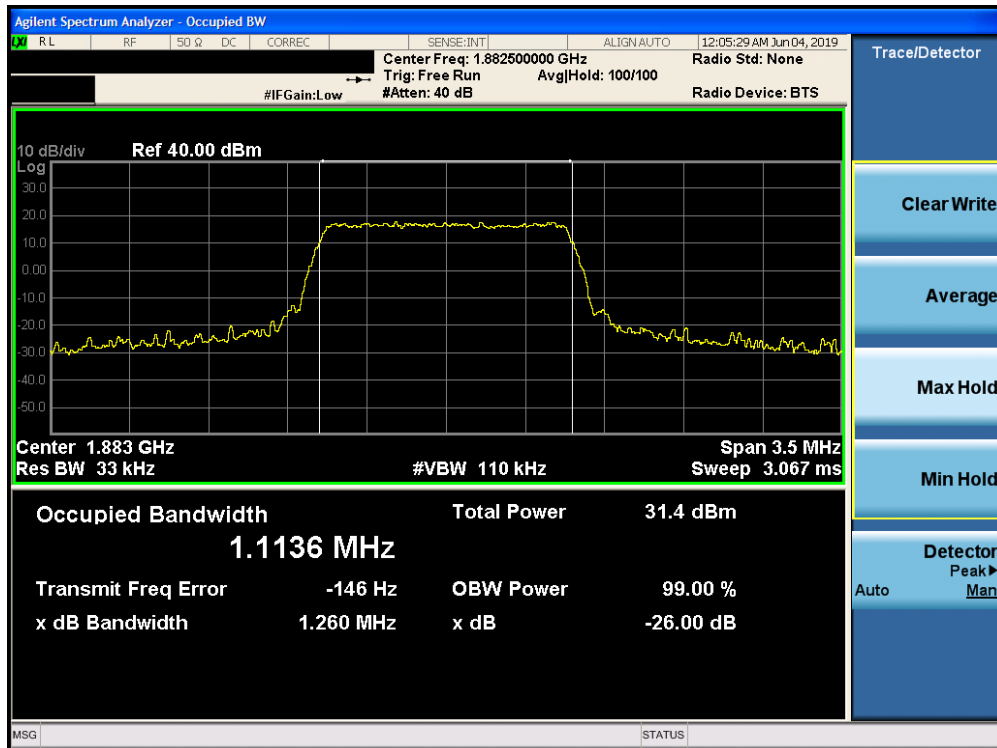


Plot 7-49. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz QPSK - Full RB Configuration)

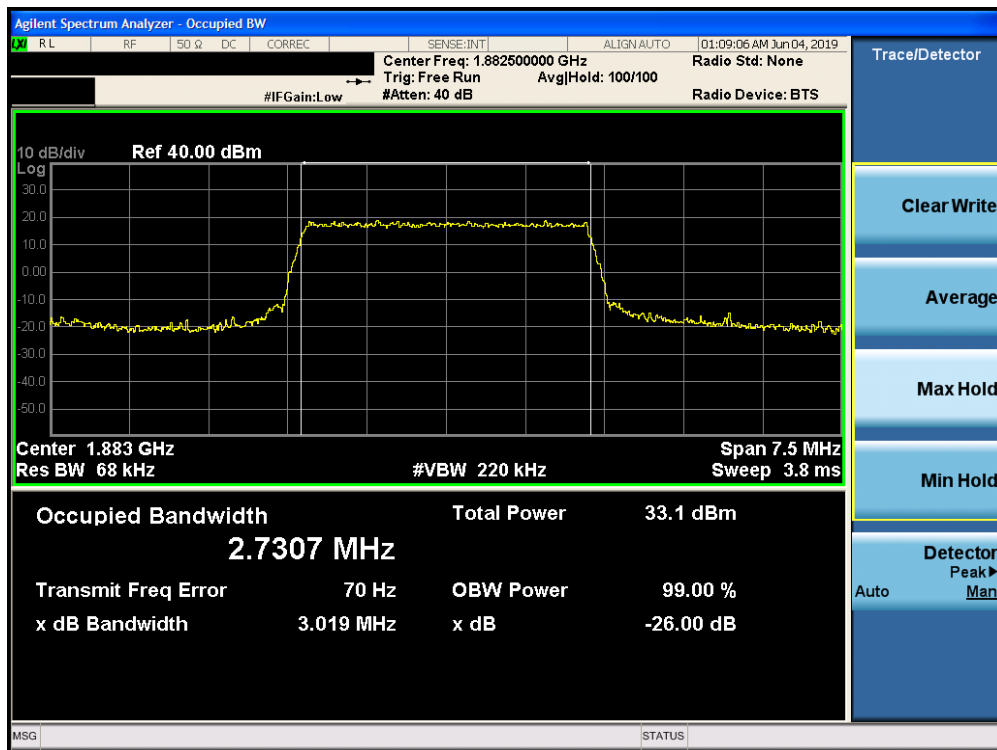


Plot 7-50. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 46 of 341

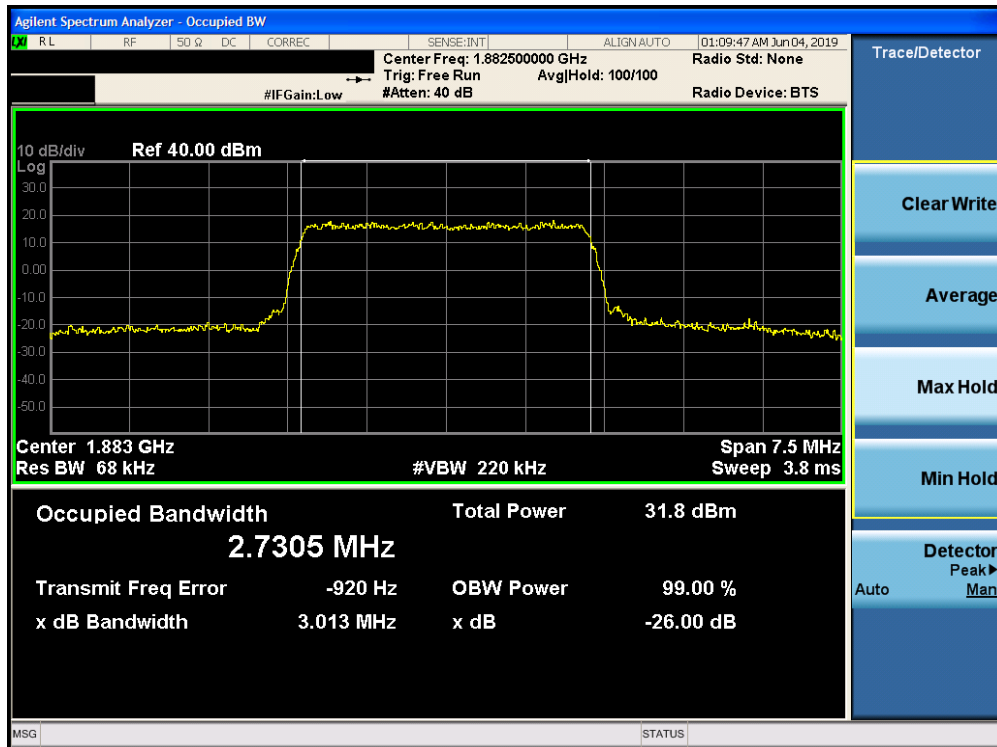


Plot 7-51. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 64-QAM - Full RB Configuration)

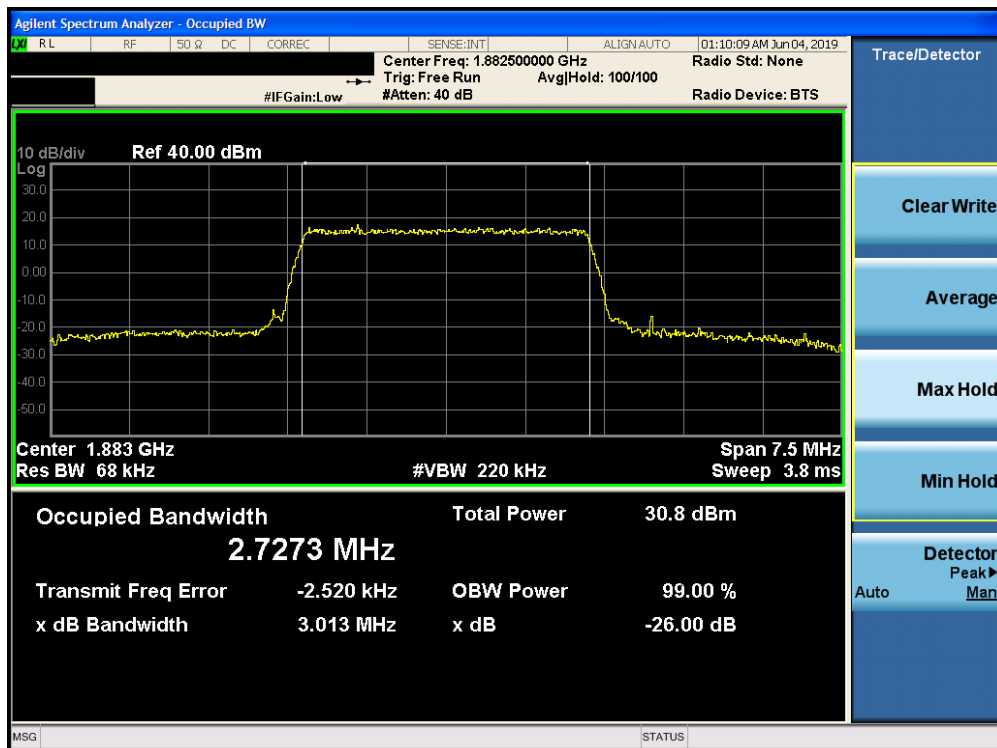


Plot 7-52. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 47 of 341

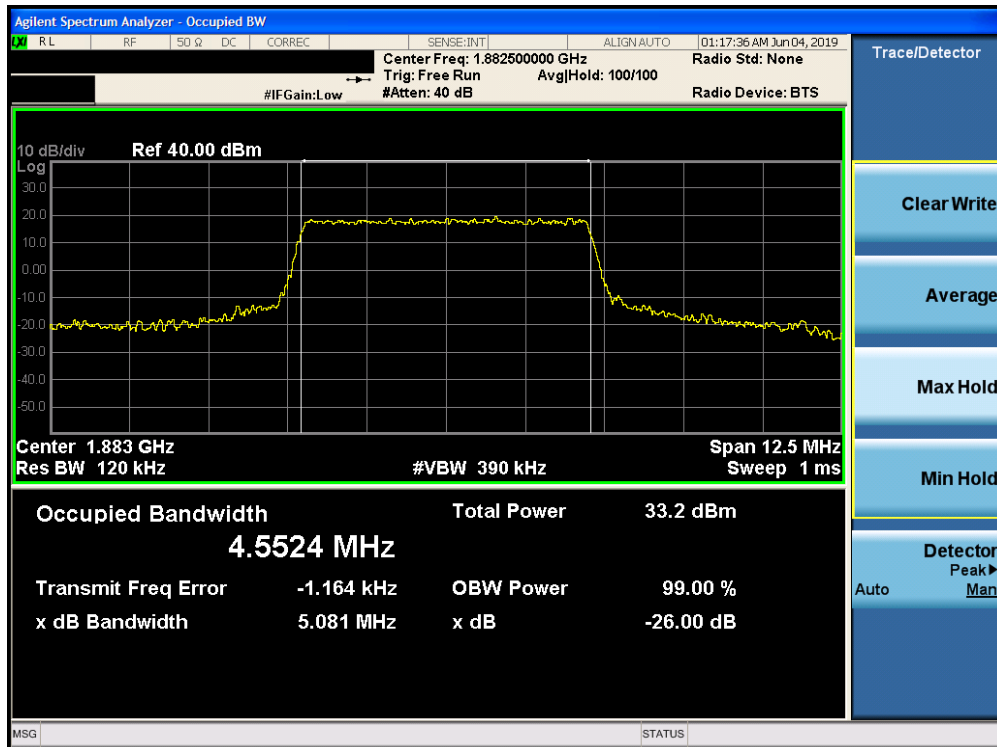


Plot 7-53. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 16-QAM - Full RB Configuration)

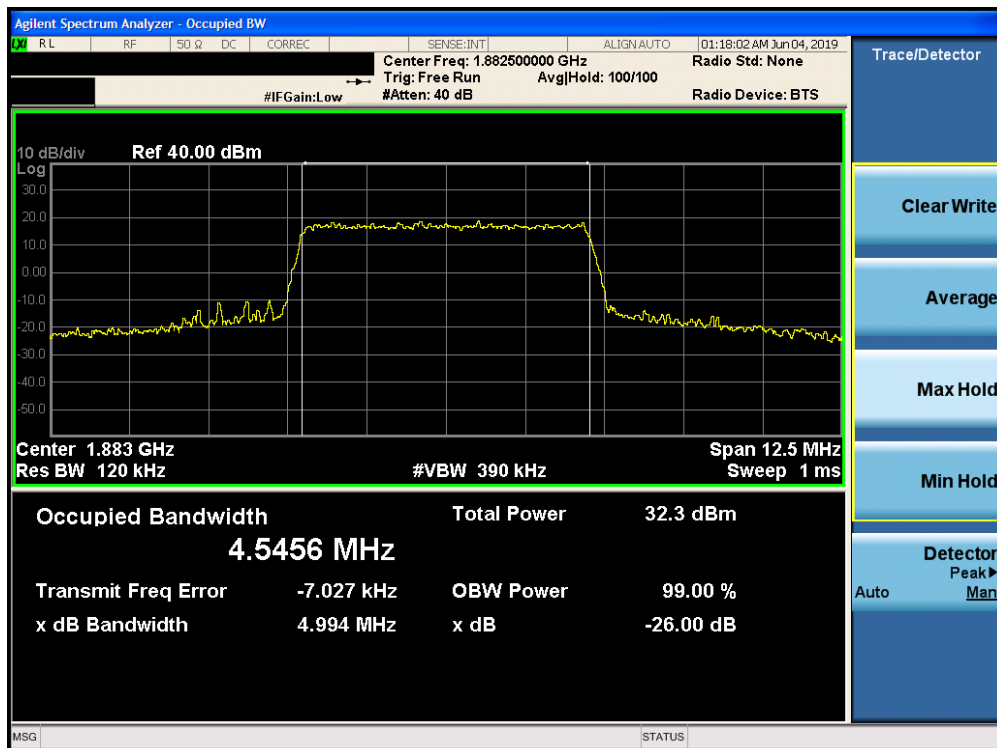


Plot 7-54. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 48 of 341

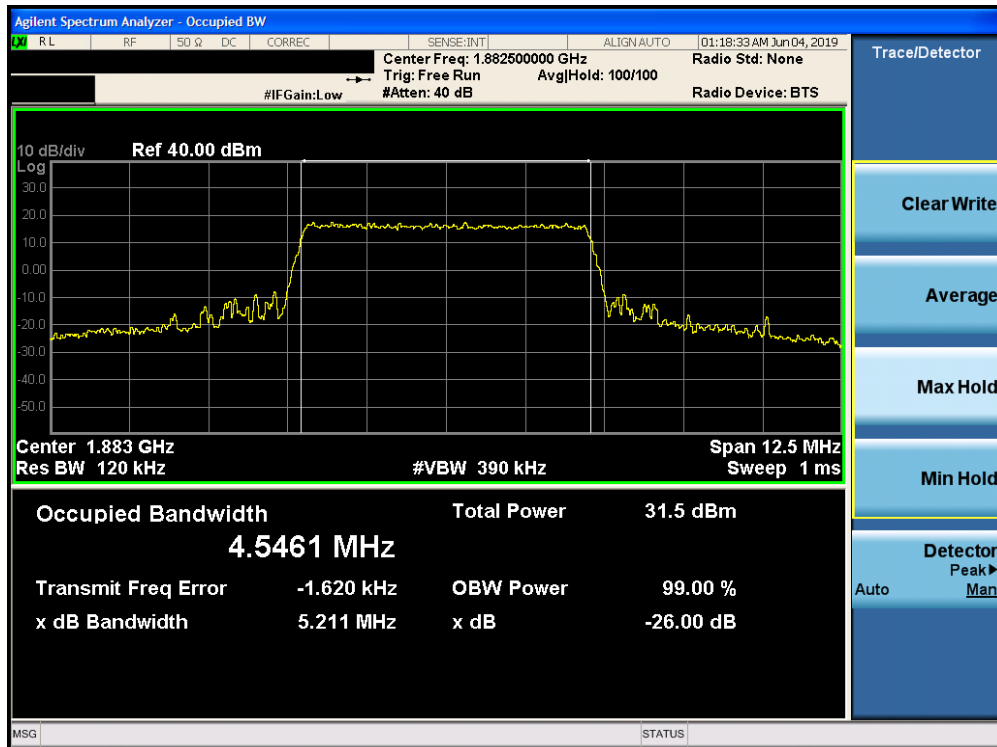


Plot 7-55. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz QPSK - Full RB Configuration)

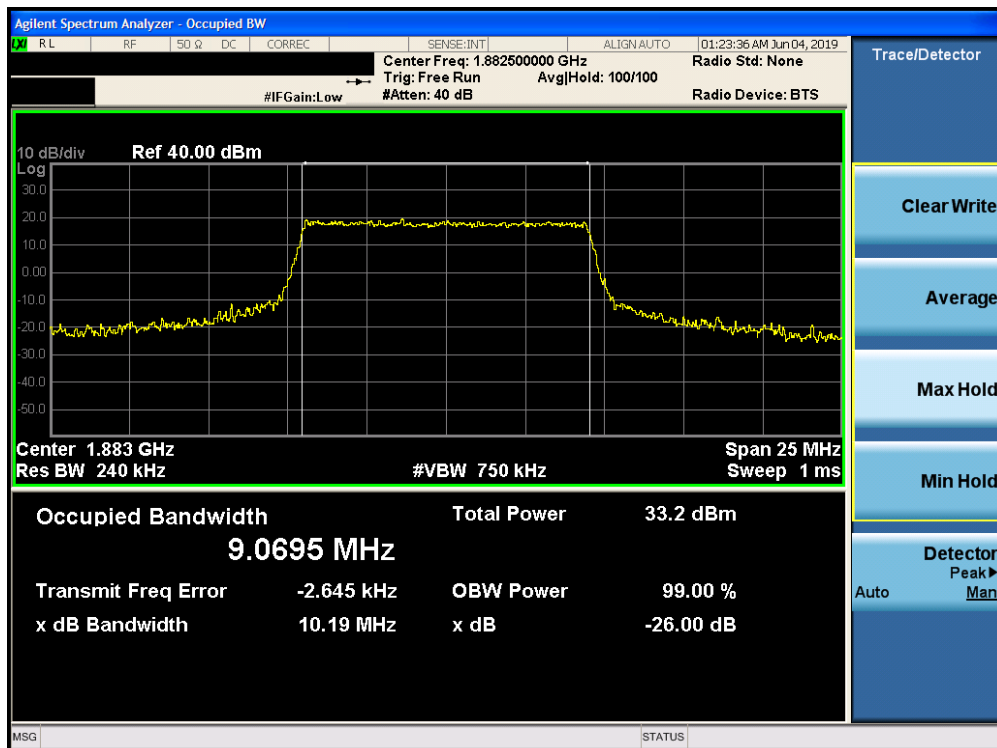


Plot 7-56. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 49 of 341

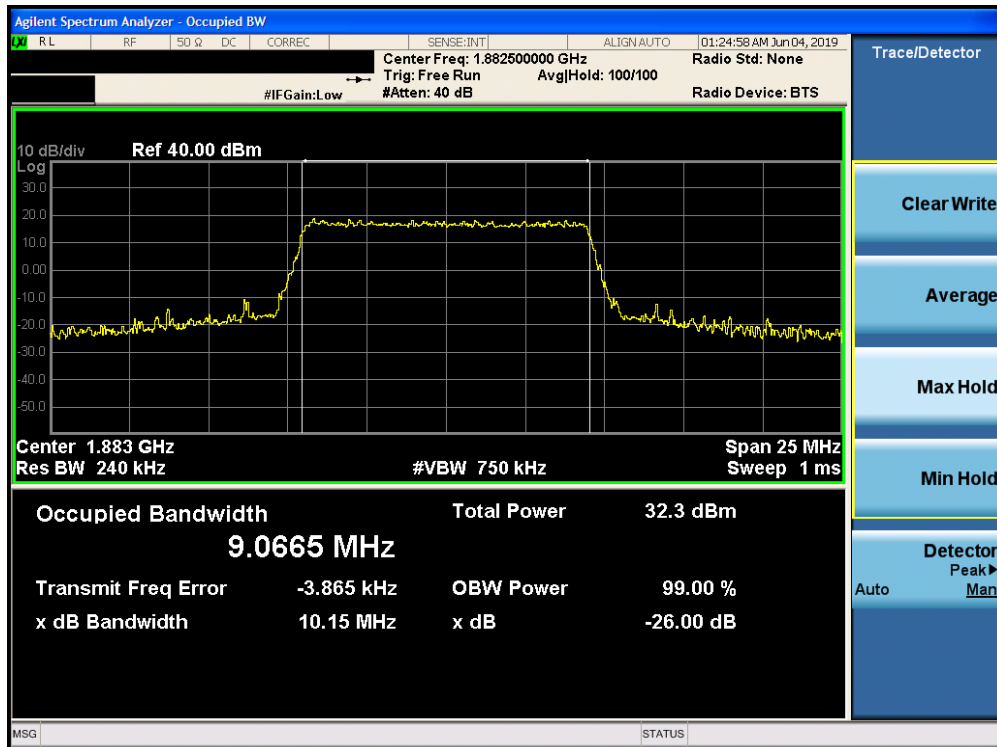


Plot 7-57. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 64-QAM - Full RB Configuration)

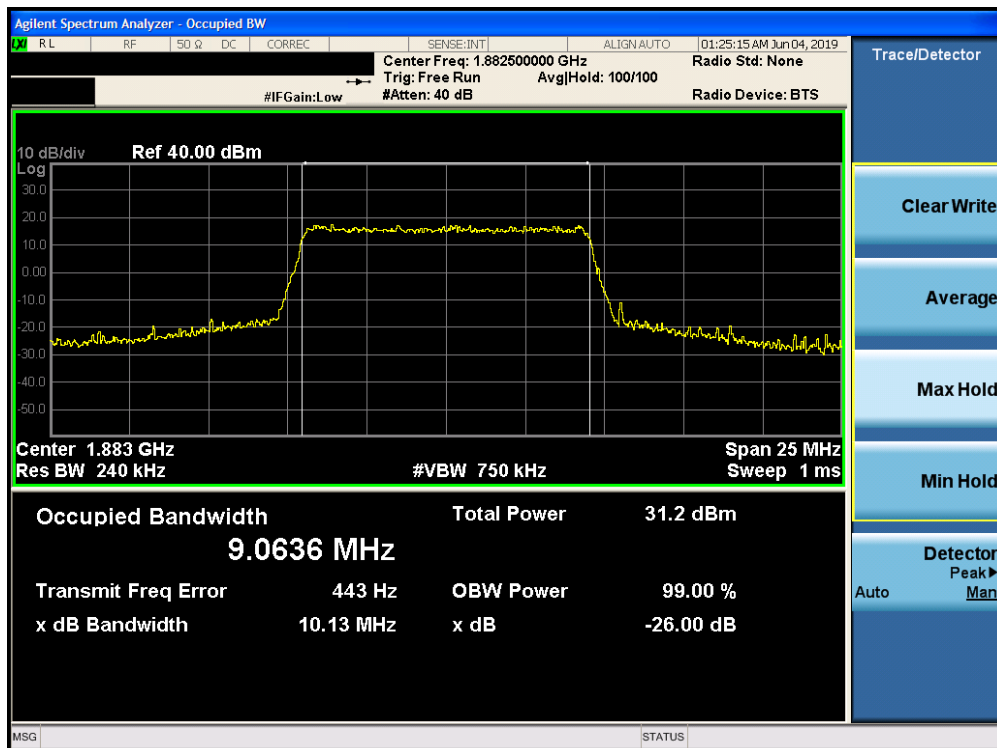


Plot 7-58. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 50 of 341

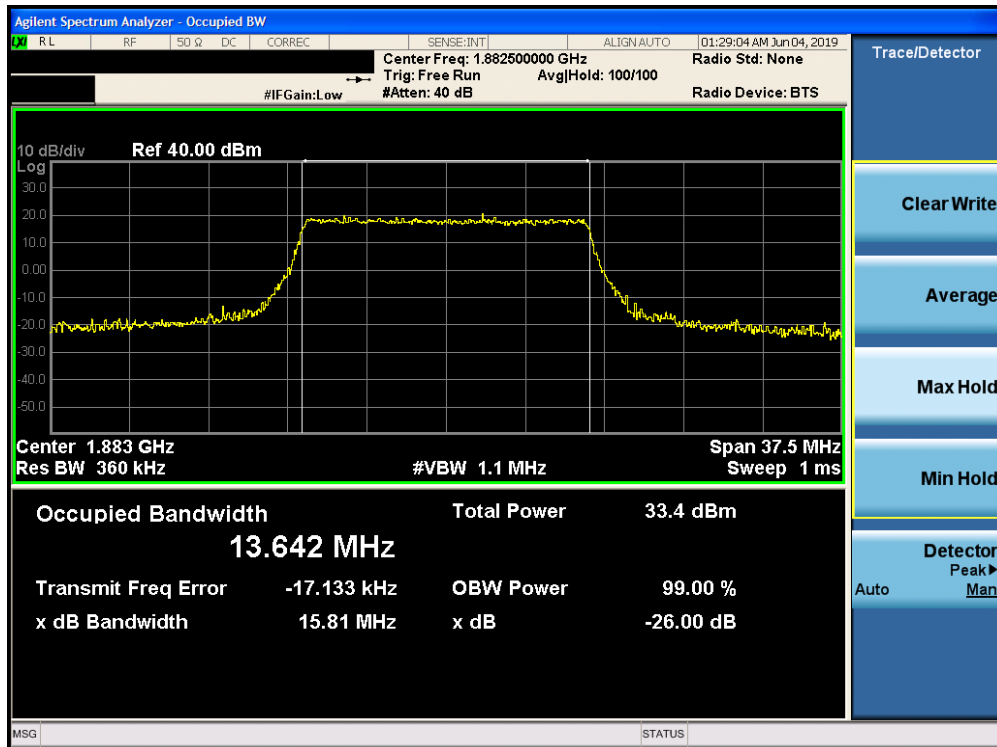


Plot 7-59. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 16-QAM - Full RB Configuration)

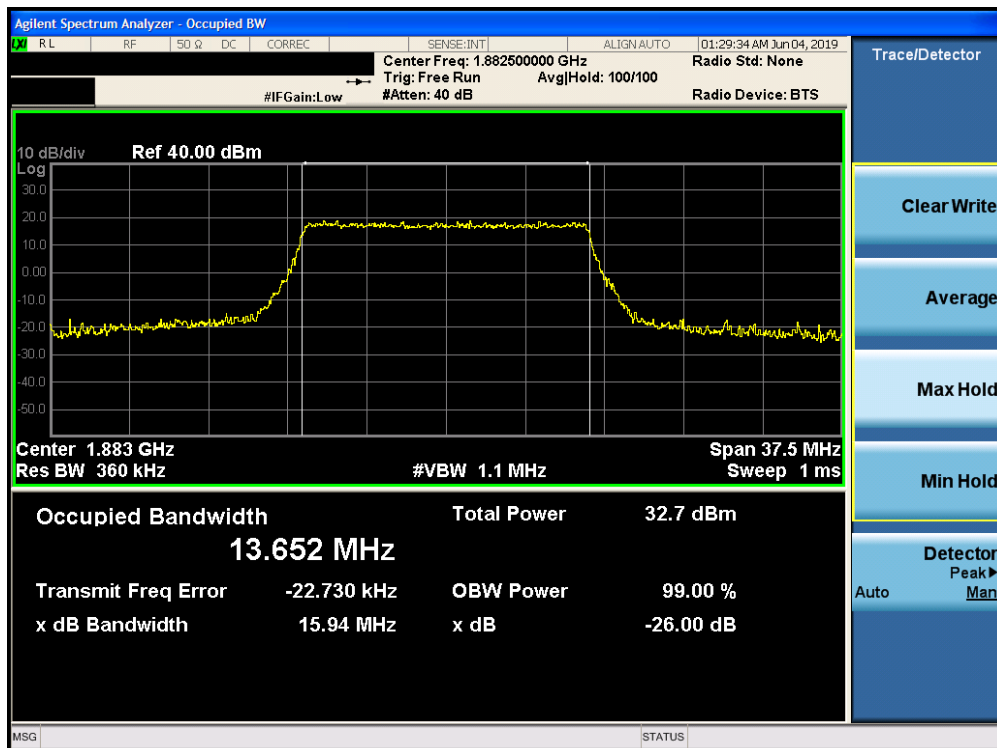


Plot 7-60. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 51 of 341

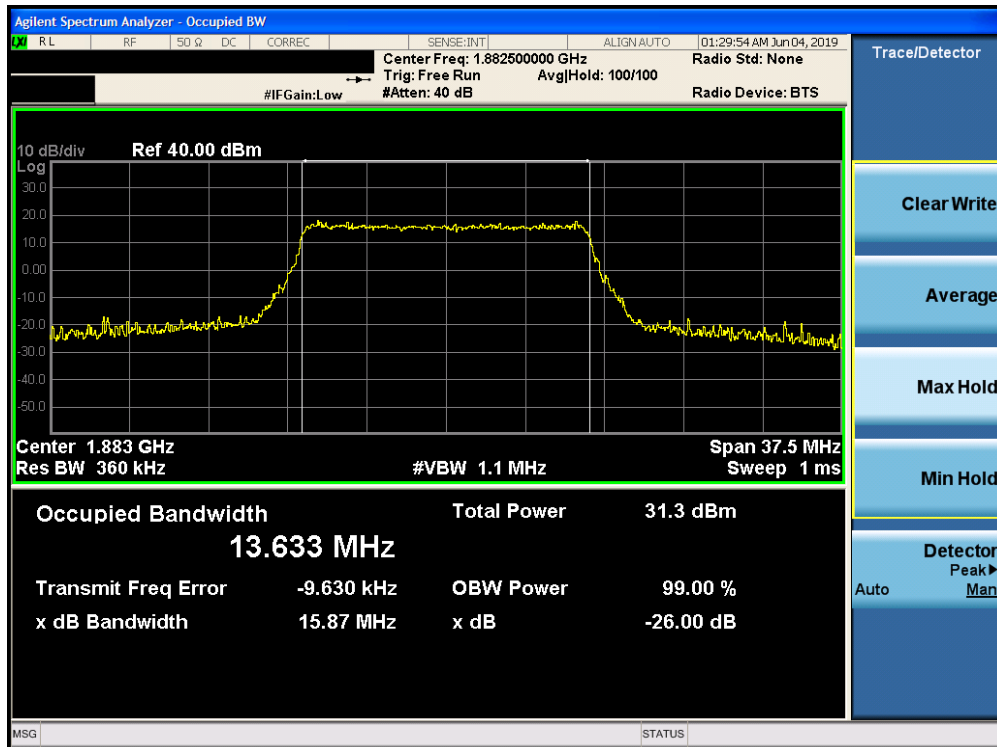


Plot 7-61. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz QPSK - Full RB Configuration)

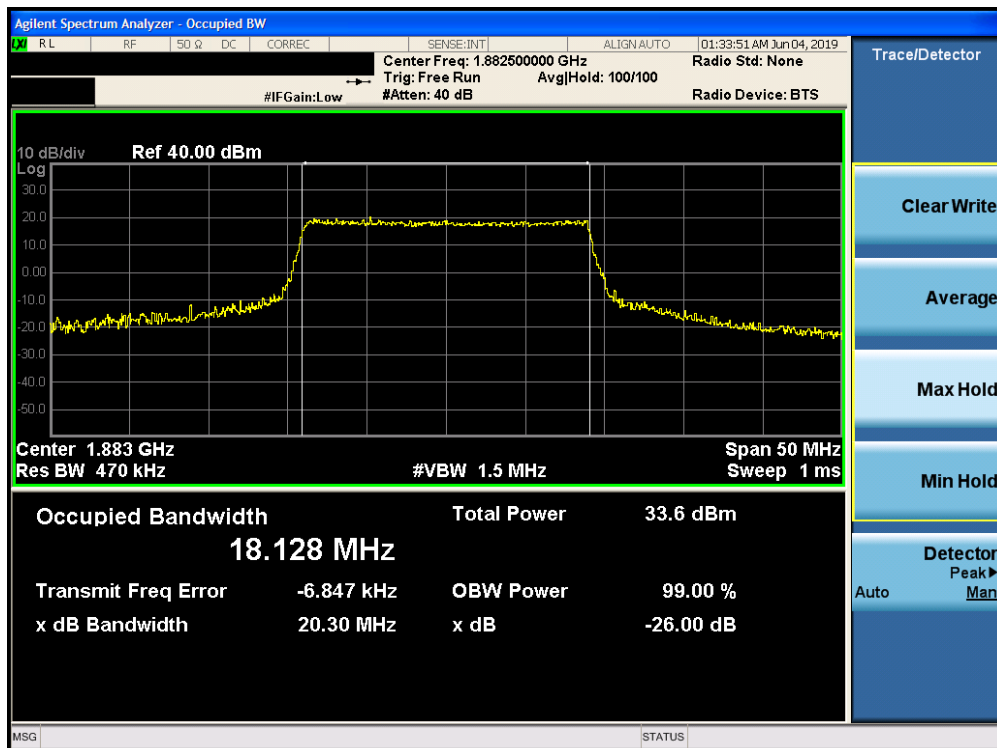


Plot 7-62. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 52 of 341

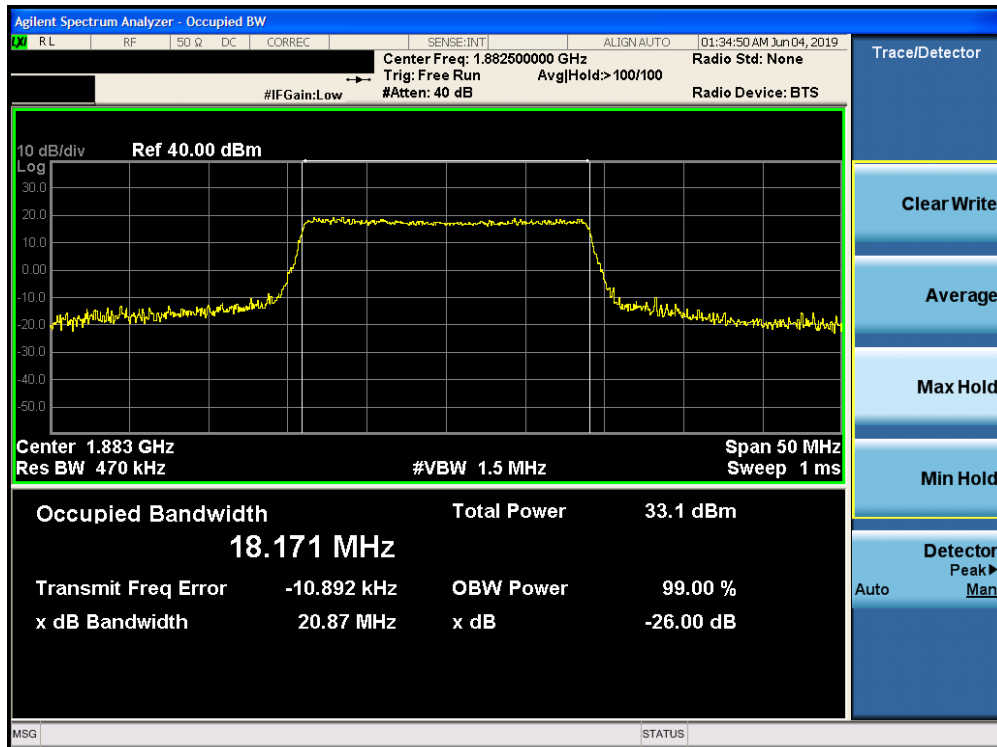


Plot 7-63. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 64-QAM - Full RB Configuration)

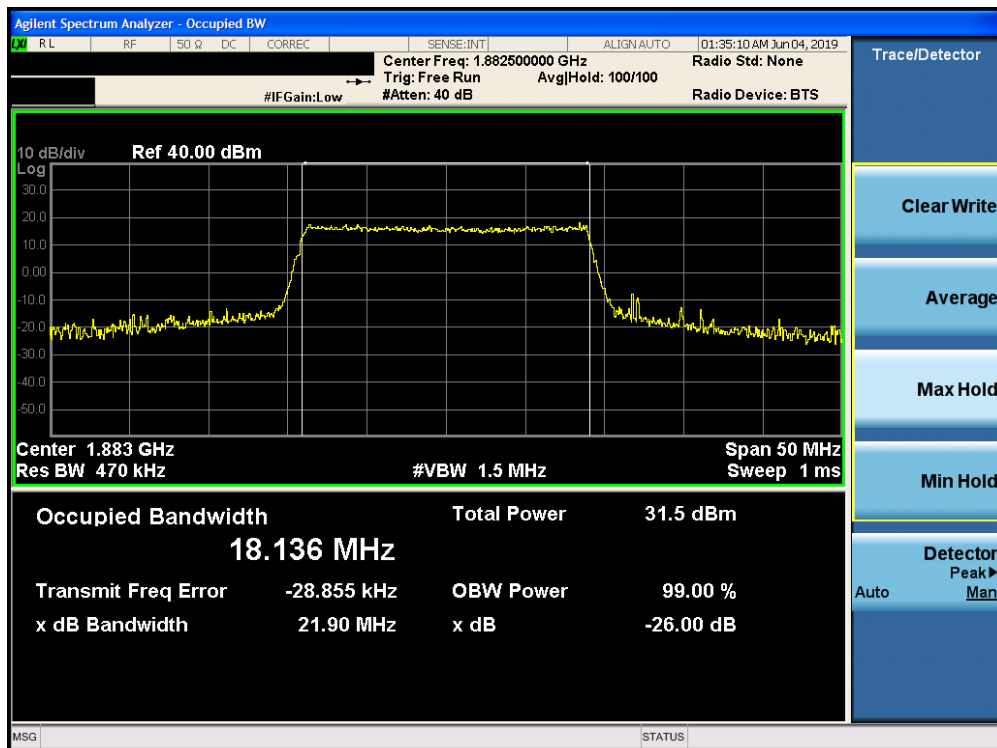


Plot 7-64. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 53 of 341



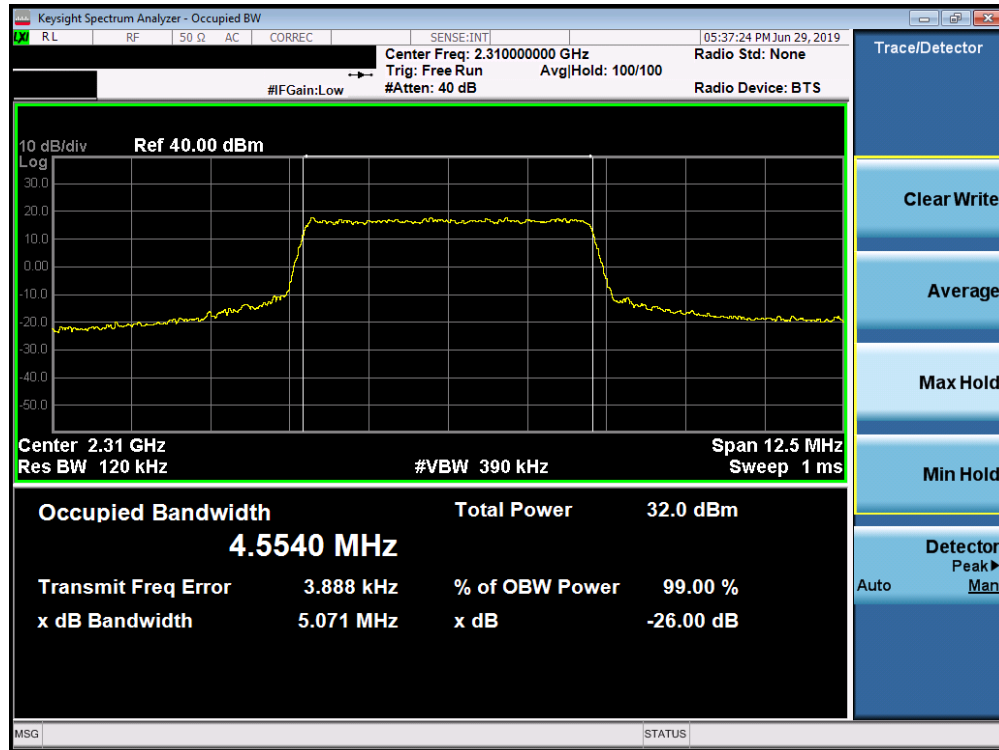
Plot 7-65. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 16-QAM - Full RB Configuration)



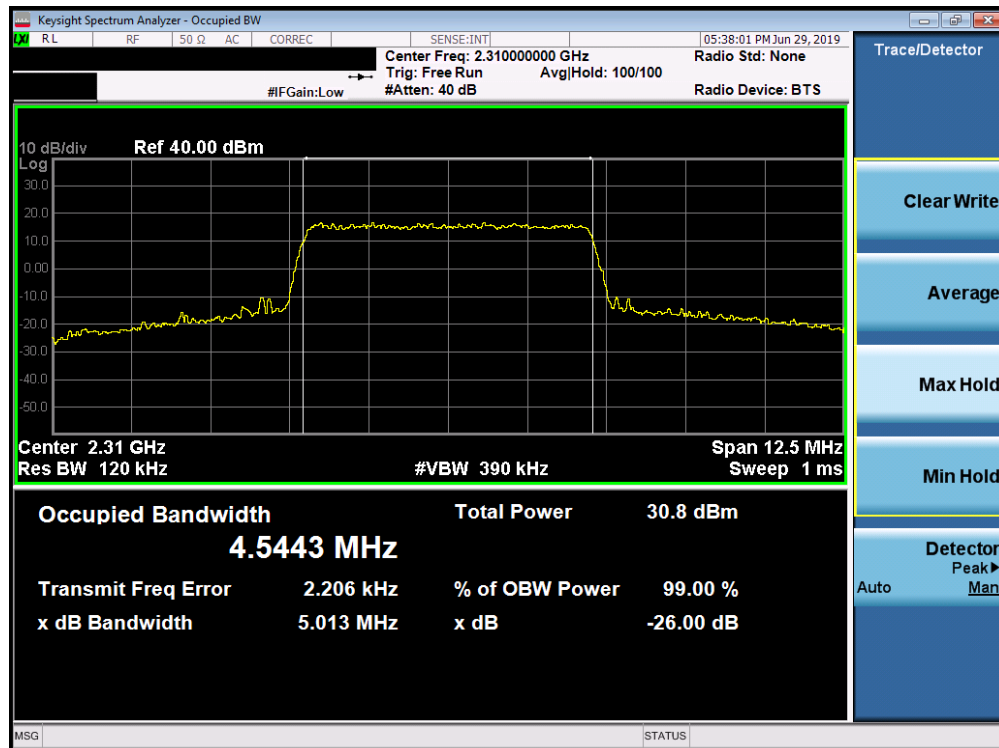
Plot 7-66. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 54 of 341

Band 30

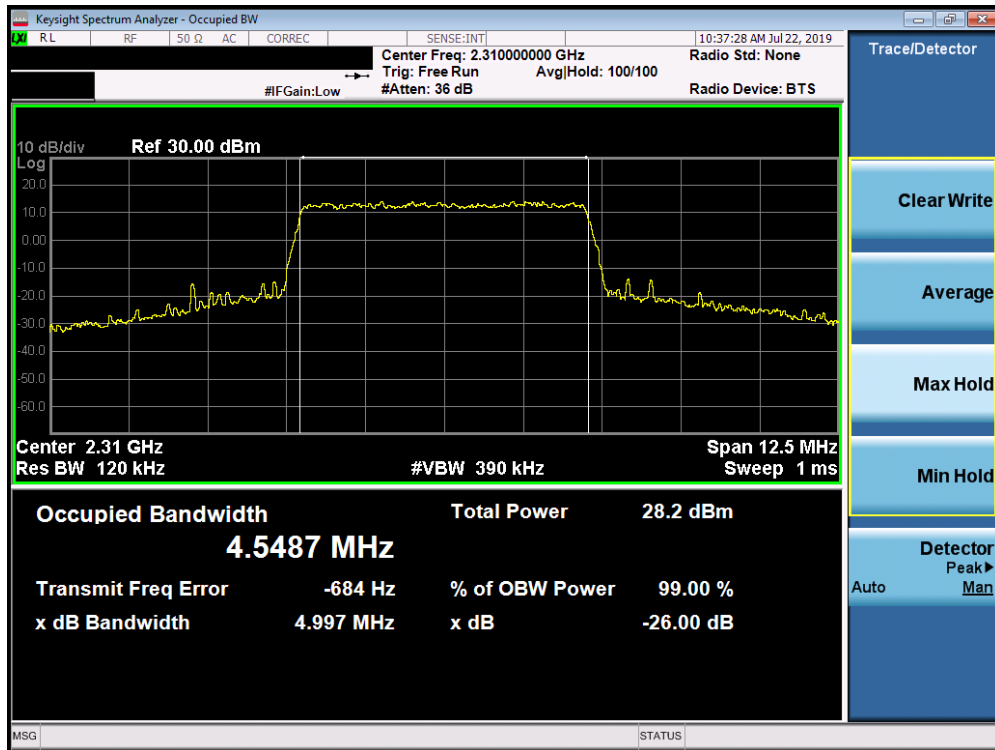


Plot 7-67. Occupied Bandwidth Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

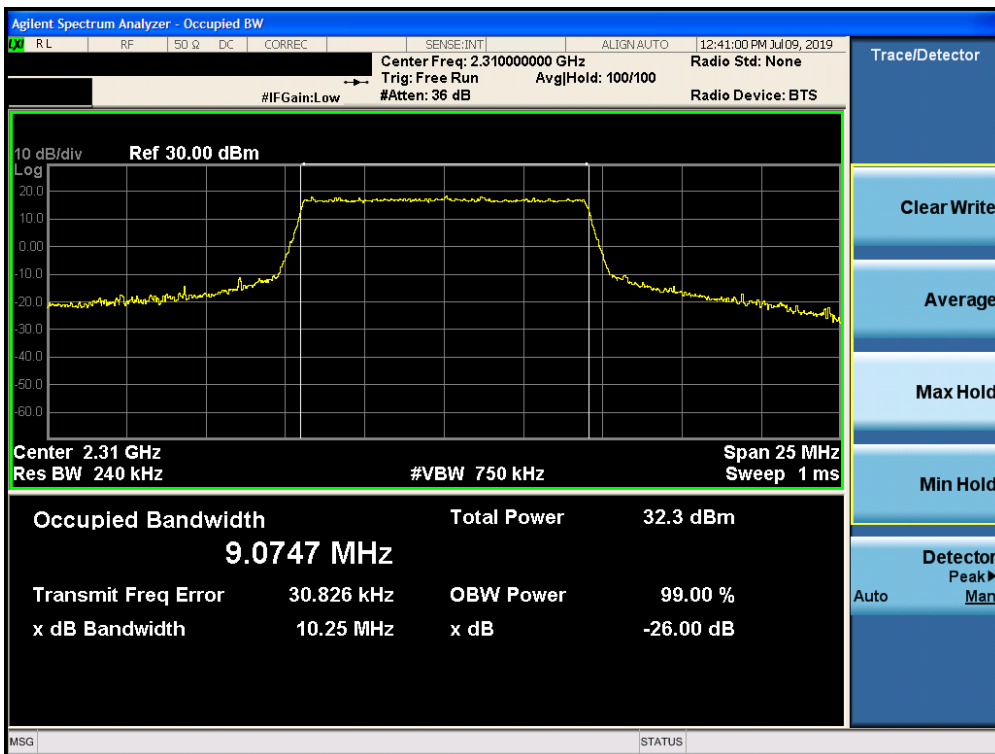


Plot 7-68. Occupied Bandwidth Plot (Band 30 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 55 of 341

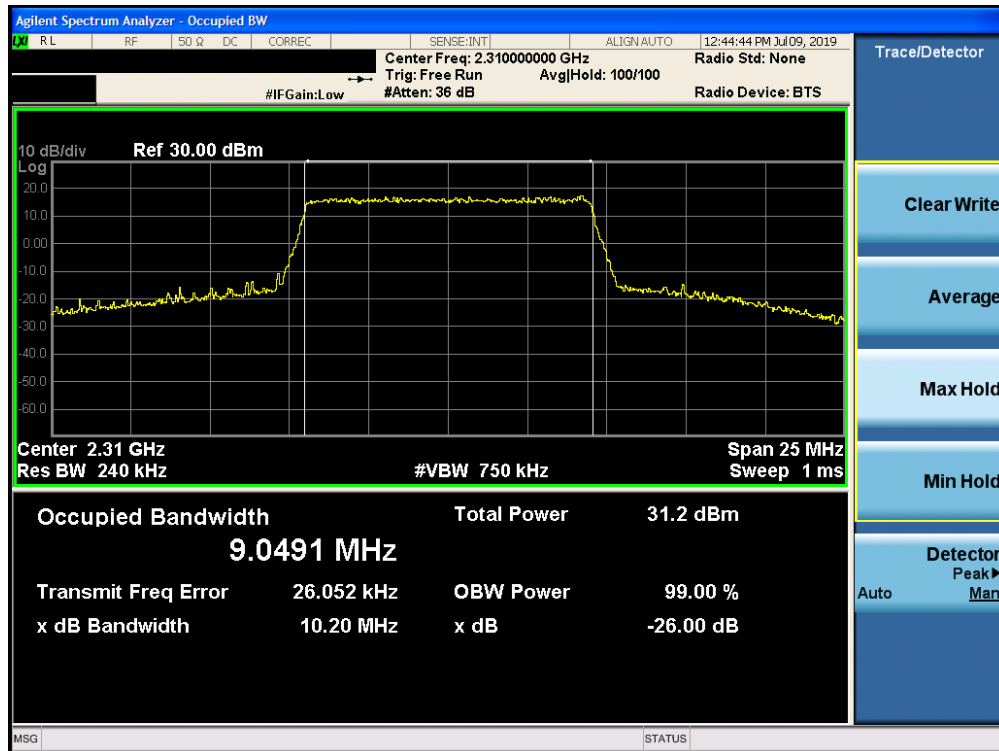


Plot 7-69. Occupied Bandwidth Plot (Band 30 - 5.0MHz 64-QAM - Full RB Configuration)

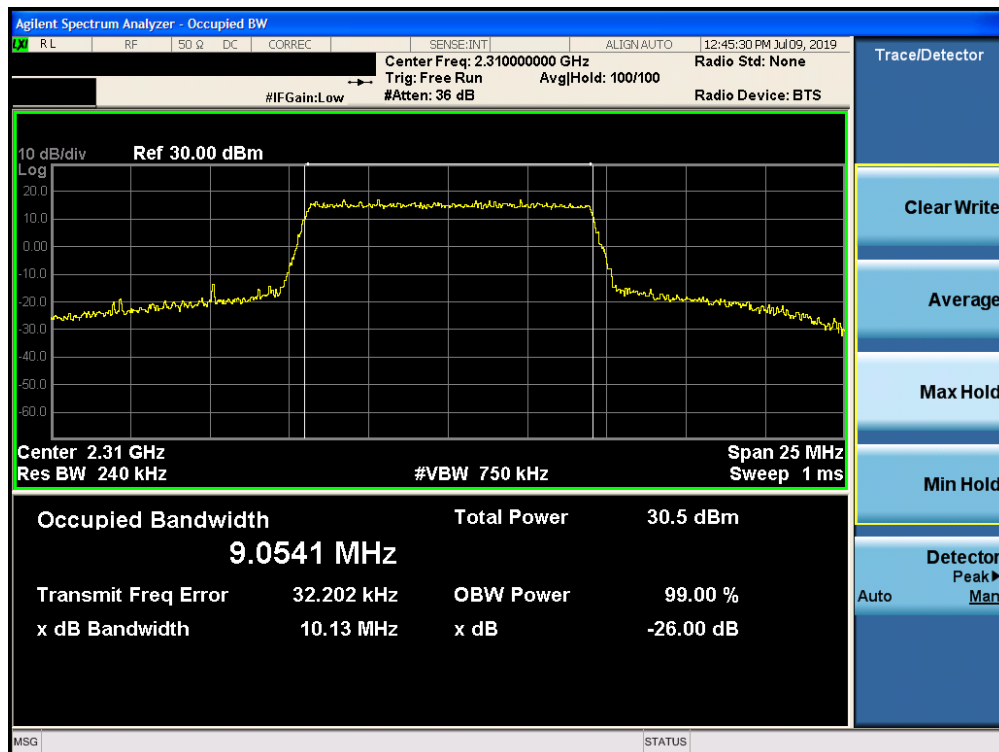


Plot 7-70. Occupied Bandwidth Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 56 of 341



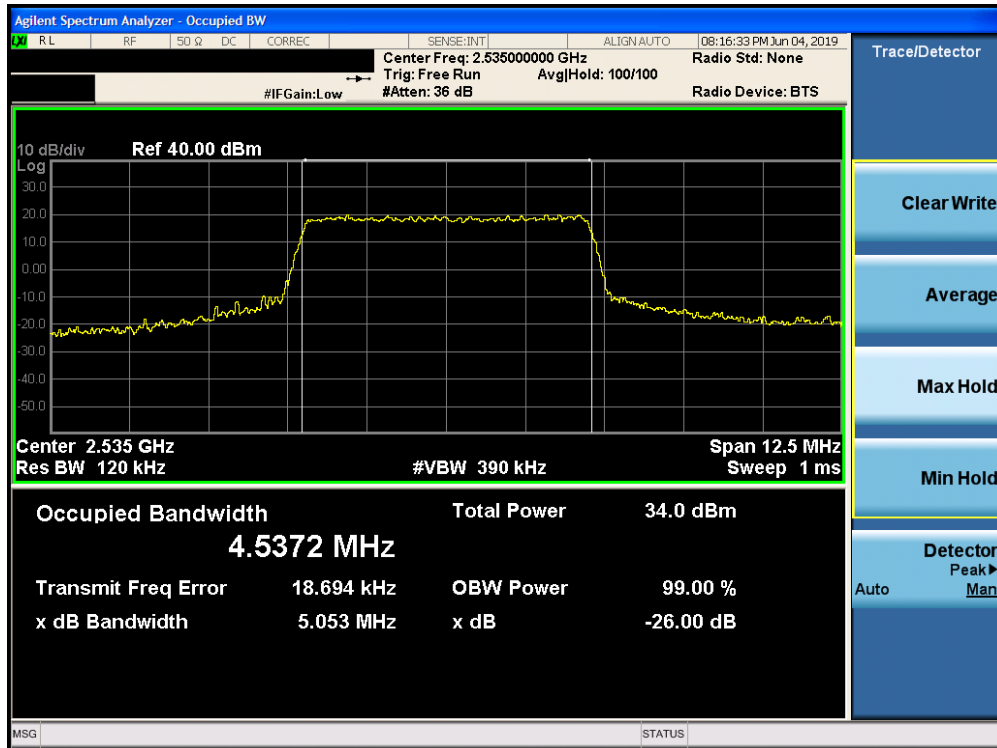
Plot 7-71. Occupied Bandwidth Plot (Band 30 - 10.0MHz 16-QAM - Full RB Configuration)



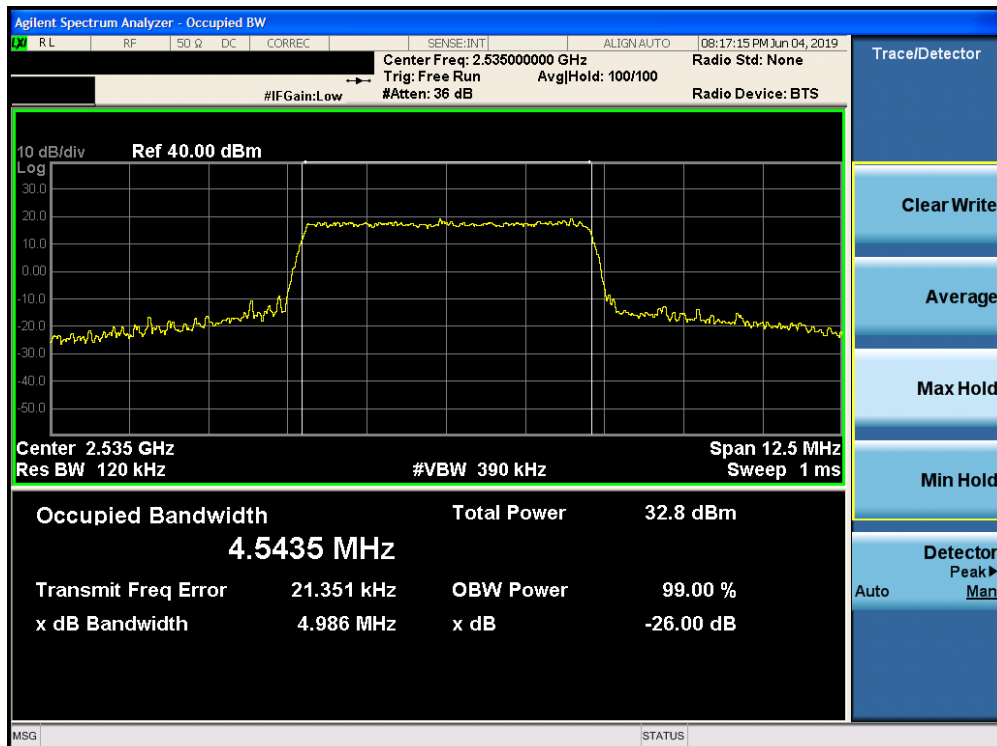
Plot 7-72. Occupied Bandwidth Plot (Band 30 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 57 of 341

Band 7

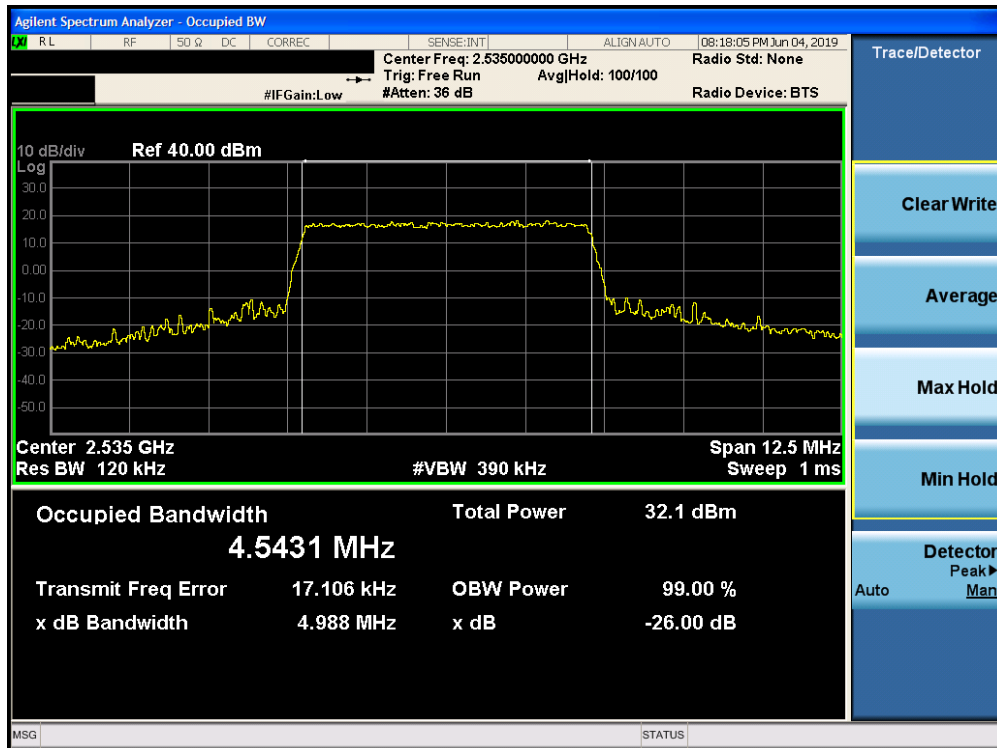


Plot 7-73. Occupied Bandwidth Plot (Band 7 - 5.0MHz QPSK - Full RB Configuration)

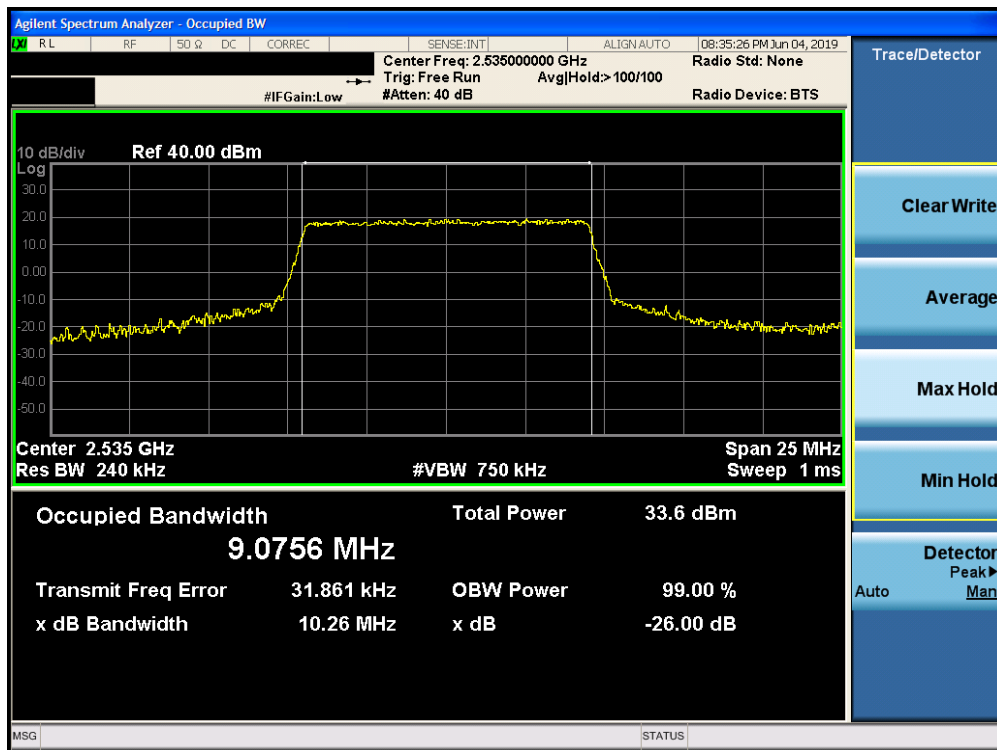


Plot 7-74. Occupied Bandwidth Plot (Band 7 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 58 of 341

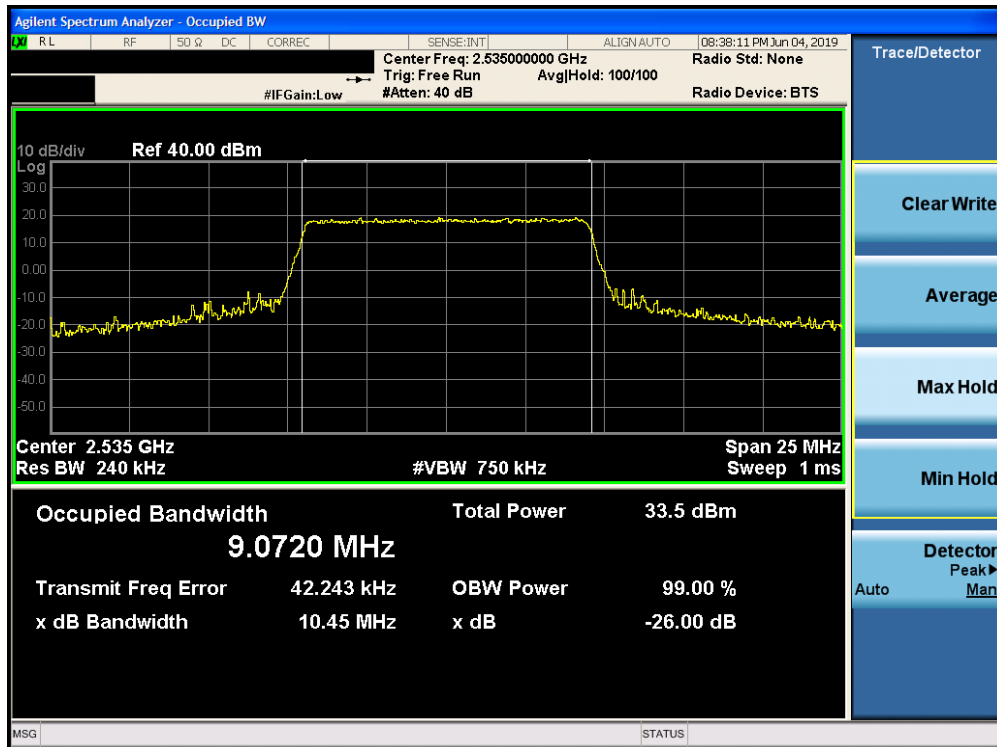


Plot 7-75. Occupied Bandwidth Plot (Band 7 - 5.0MHz 64-QAM - Full RB Configuration)

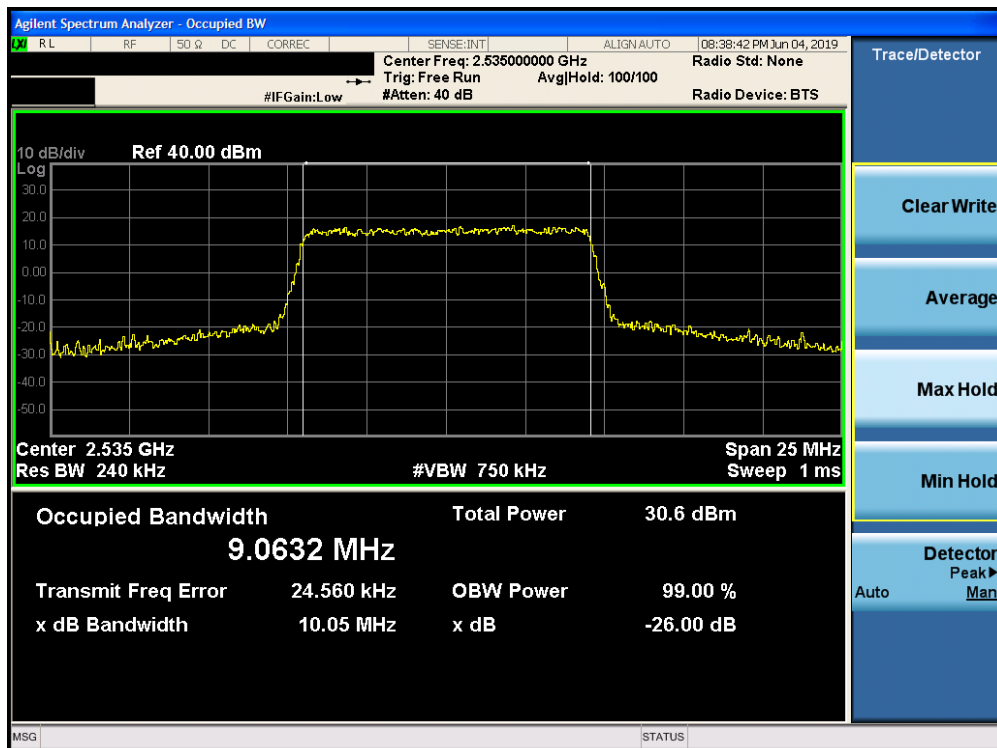


Plot 7-76. Occupied Bandwidth Plot (Band 7 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 59 of 341

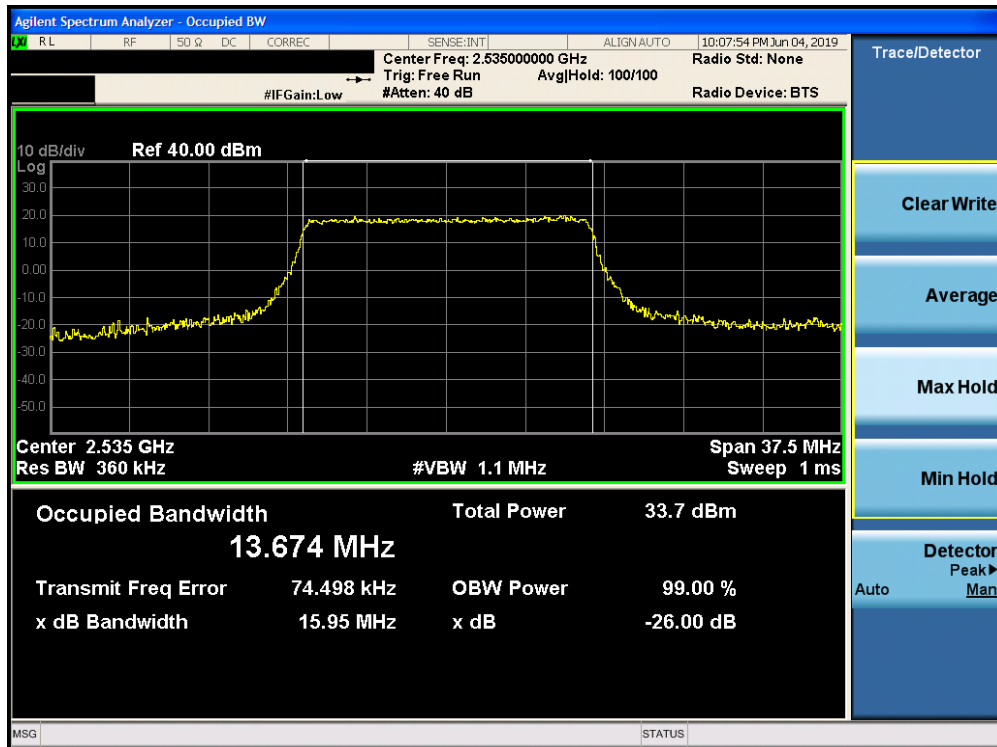


Plot 7-77. Occupied Bandwidth Plot (Band 7 - 10.0MHz 16-QAM - Full RB Configuration)

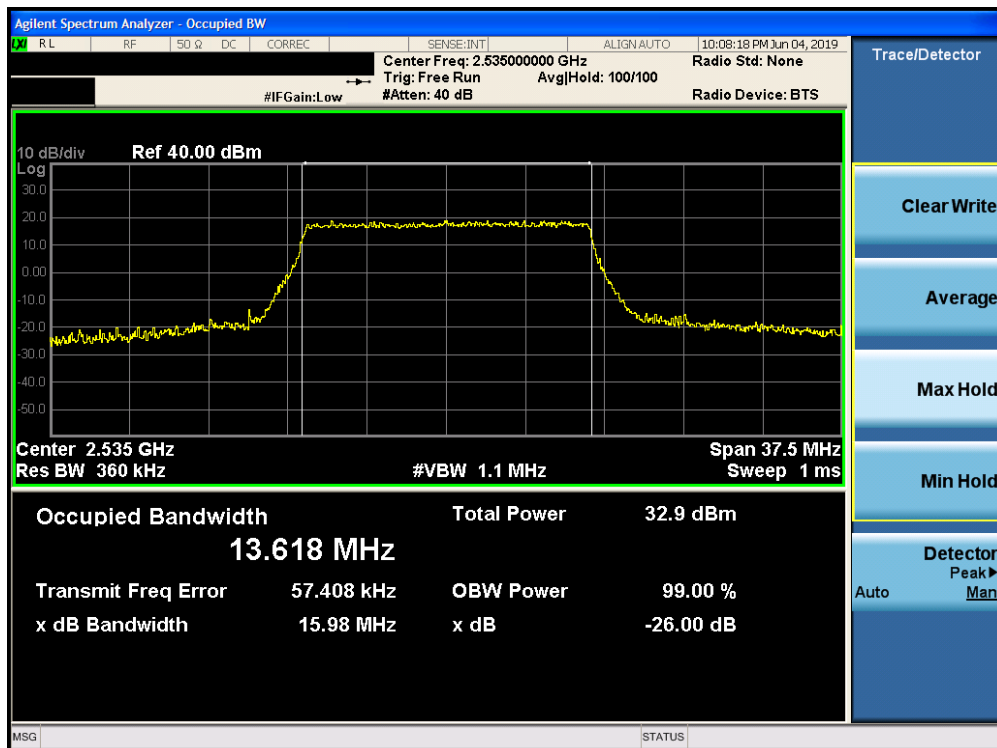


Plot 7-78. Occupied Bandwidth Plot (Band 7 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 60 of 341

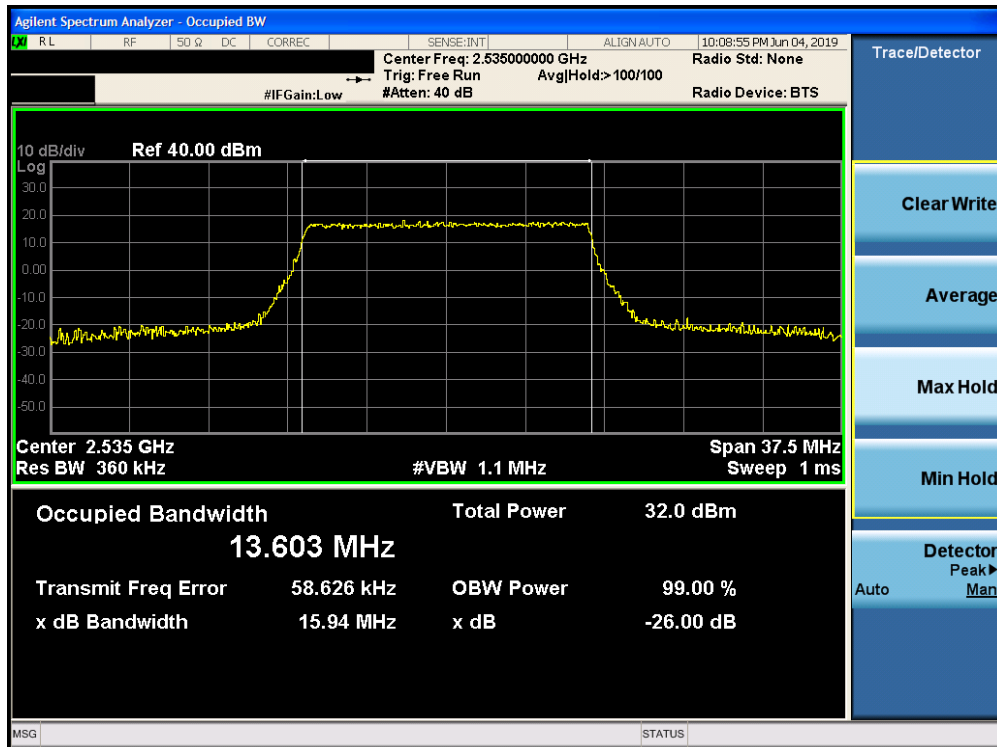


Plot 7-79. Occupied Bandwidth Plot (Band 7 - 15.0MHz QPSK - Full RB Configuration)

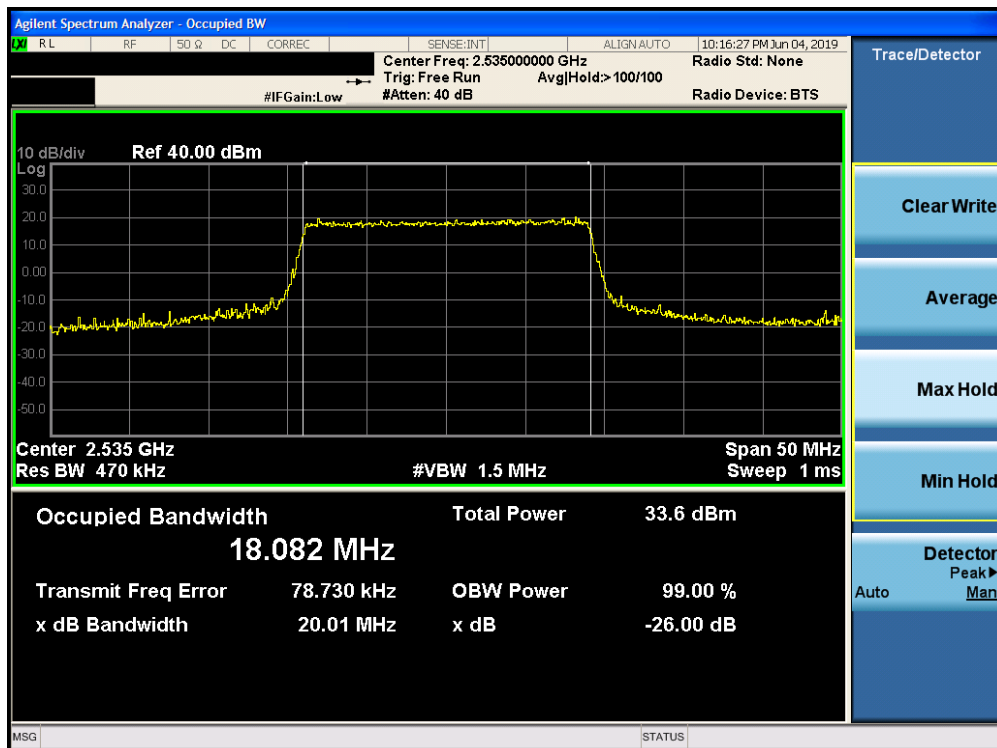


Plot 7-80. Occupied Bandwidth Plot (Band 7 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 61 of 341

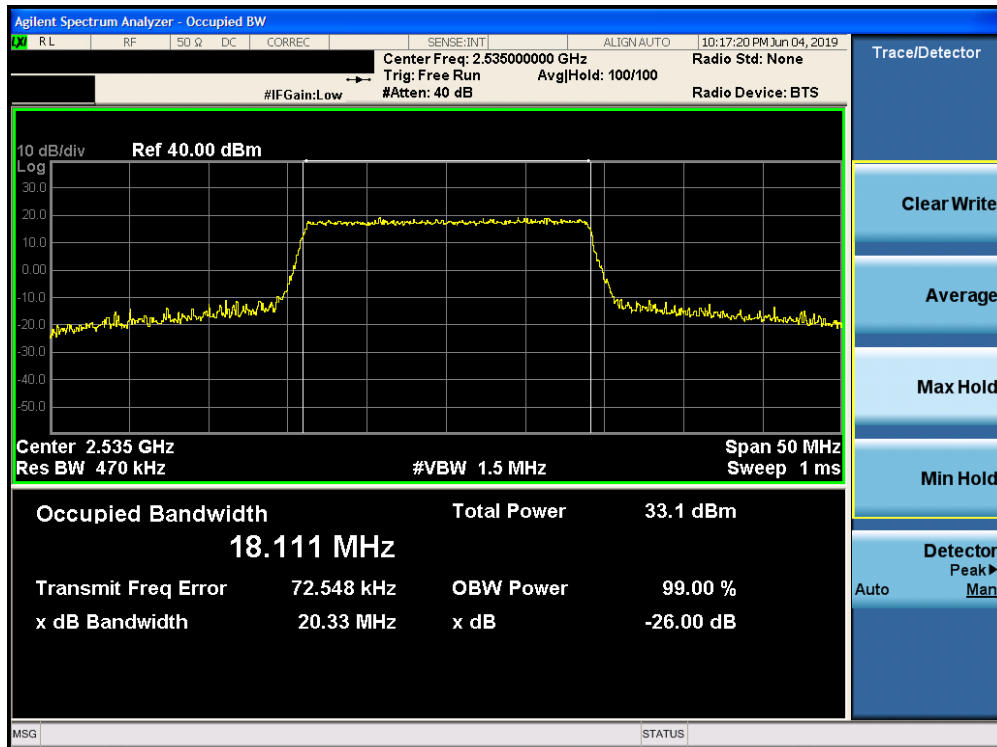


Plot 7-81. Occupied Bandwidth Plot (Band 7 - 15.0MHz 64-QAM - Full RB Configuration)

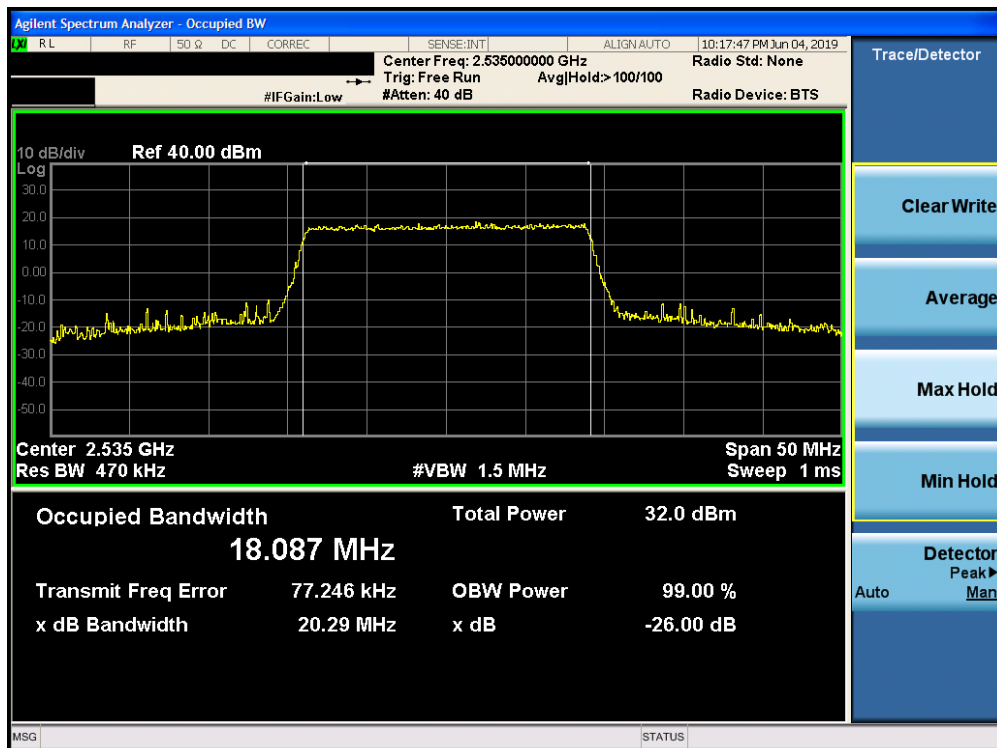


Plot 7-82. Occupied Bandwidth Plot (Band 7 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 62 of 341



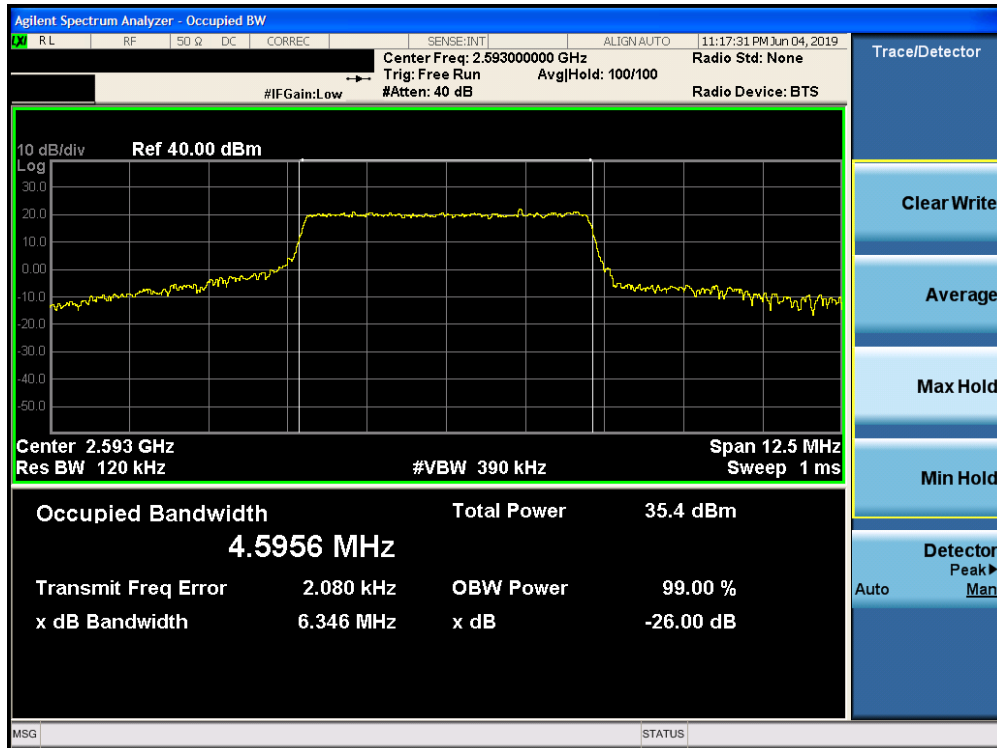
Plot 7-83. Occupied Bandwidth Plot (Band 7 - 20.0MHz 16-QAM - Full RB Configuration)



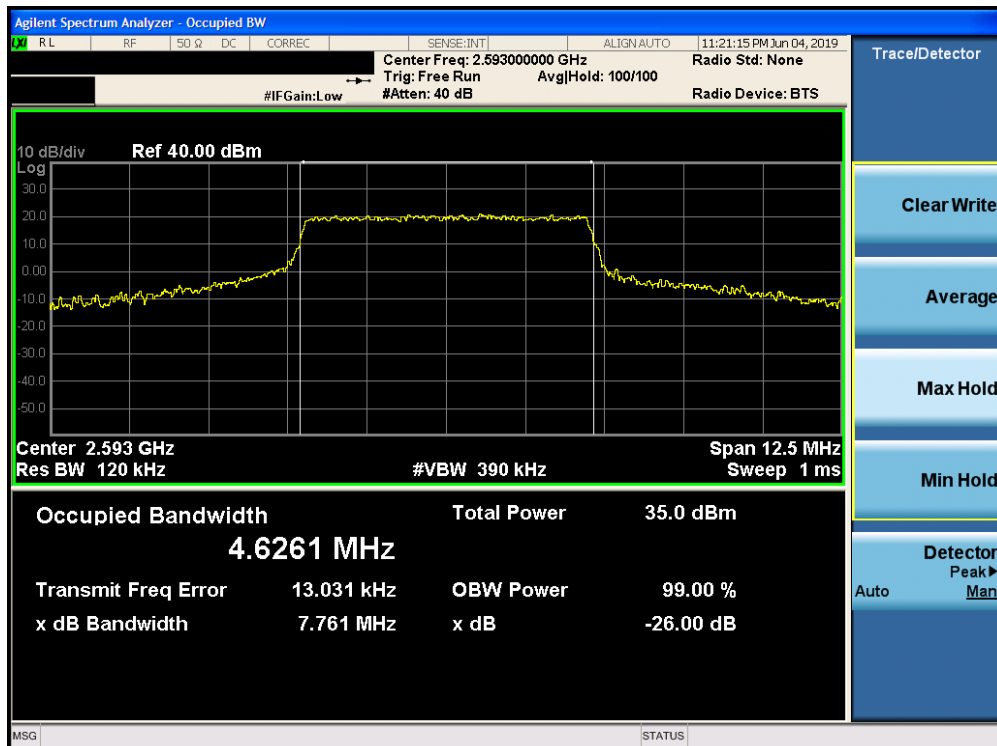
Plot 7-84. Occupied Bandwidth Plot (Band 7 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 63 of 341

Band 41

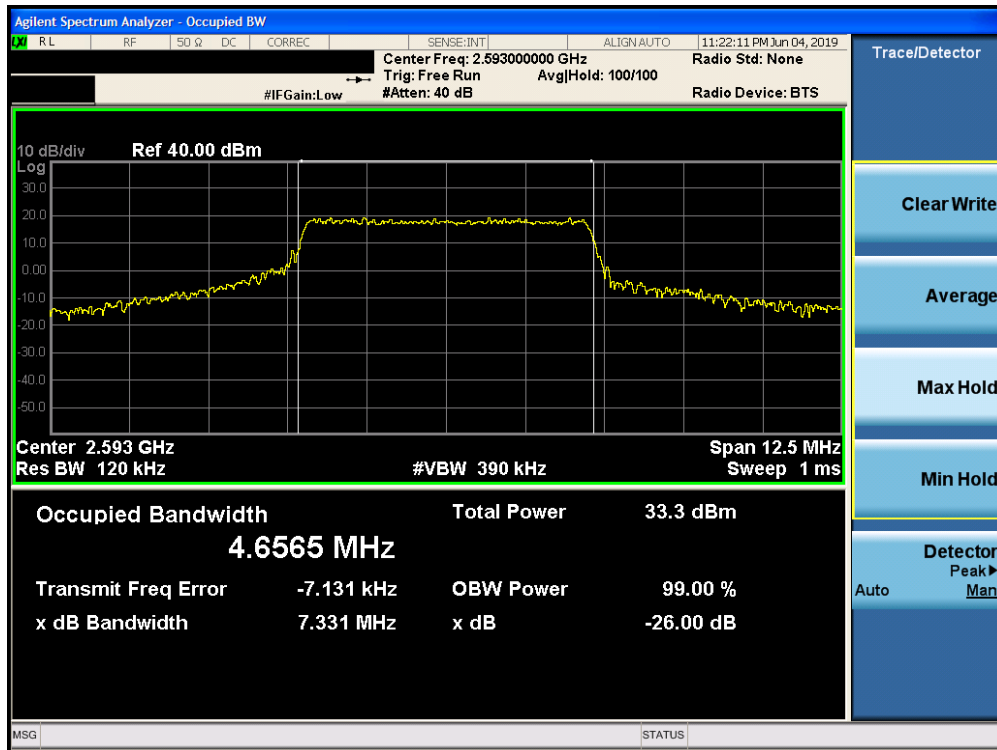


Plot 7-85. Occupied Bandwidth Plot (Band 41 - 5.0MHz QPSK - Full RB Configuration)

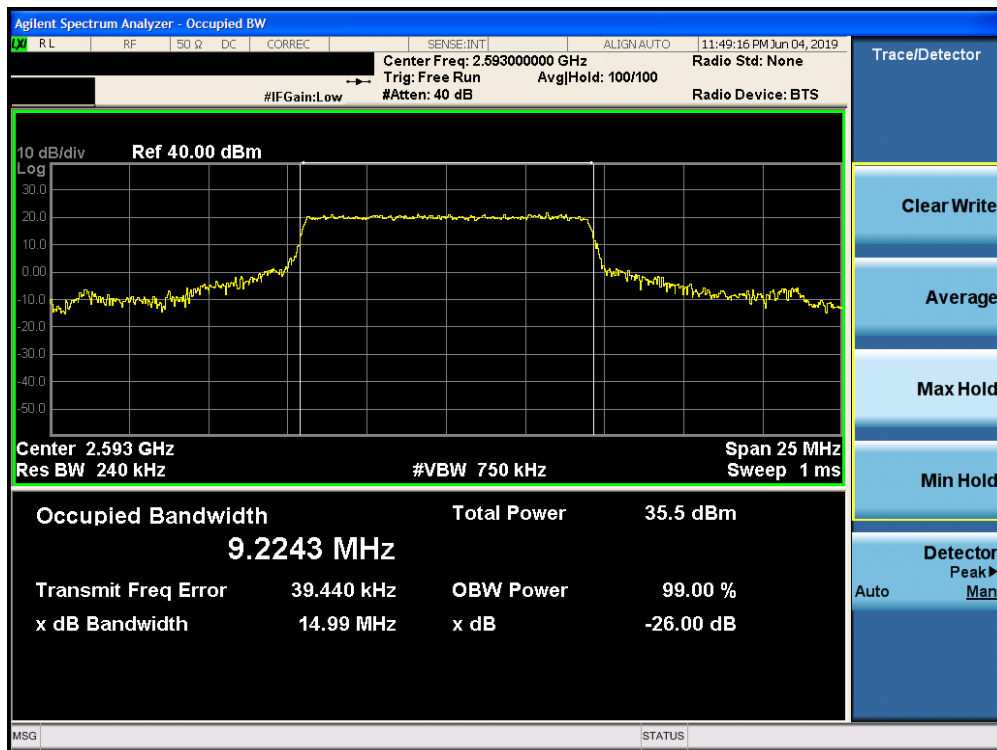


Plot 7-86. Occupied Bandwidth Plot (Band 41 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 64 of 341

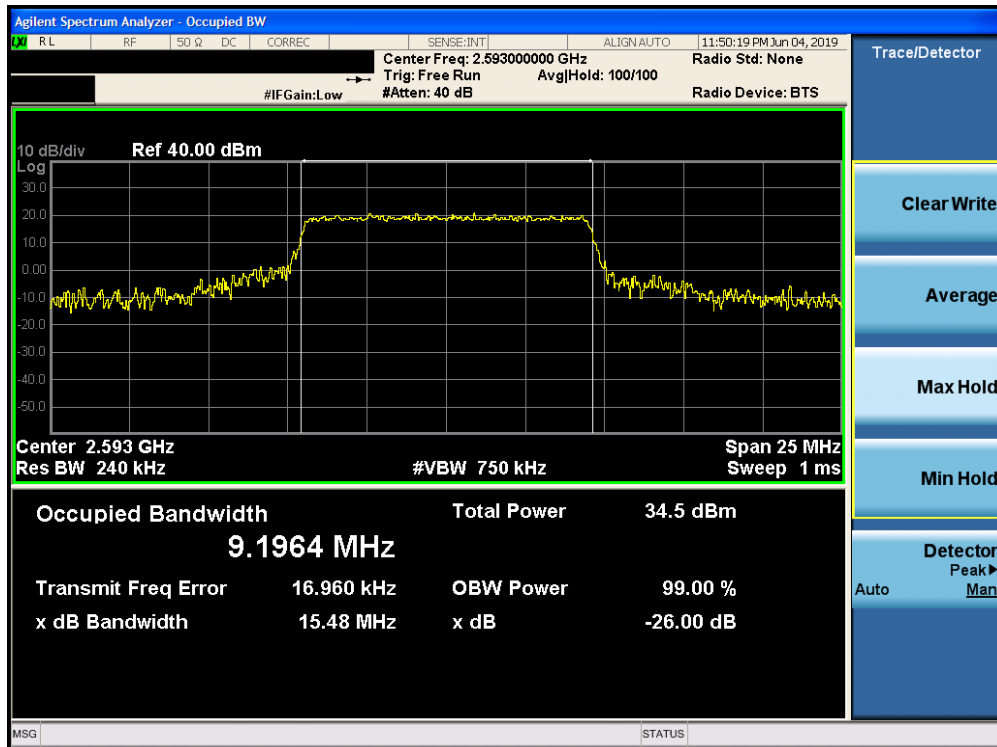


Plot 7-87. Occupied Bandwidth Plot (Band 41 - 5.0MHz 64-QAM - Full RB Configuration)

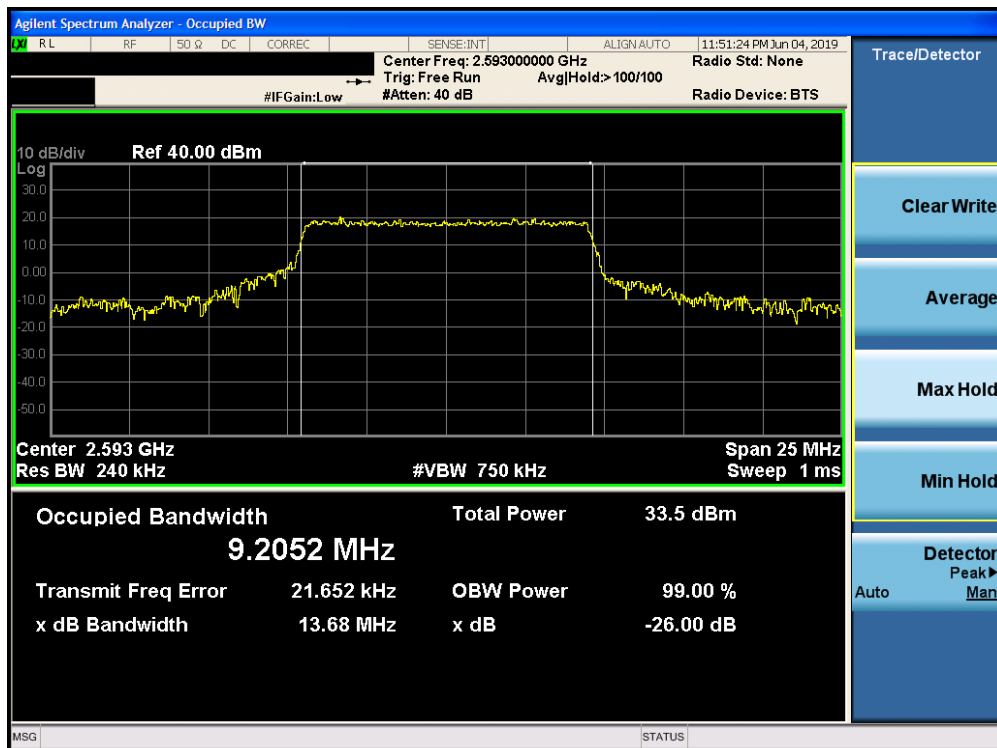


Plot 7-88. Occupied Bandwidth Plot (Band 41 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 65 of 341

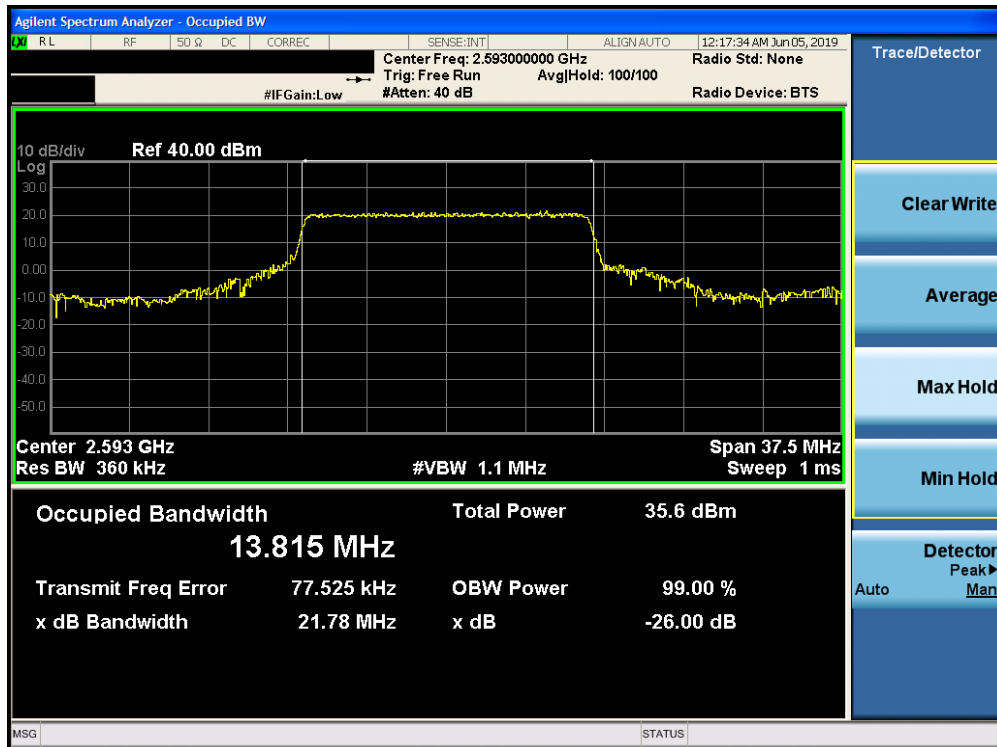


Plot 7-89. Occupied Bandwidth Plot (Band 41 - 10.0MHz 16-QAM - Full RB Configuration)

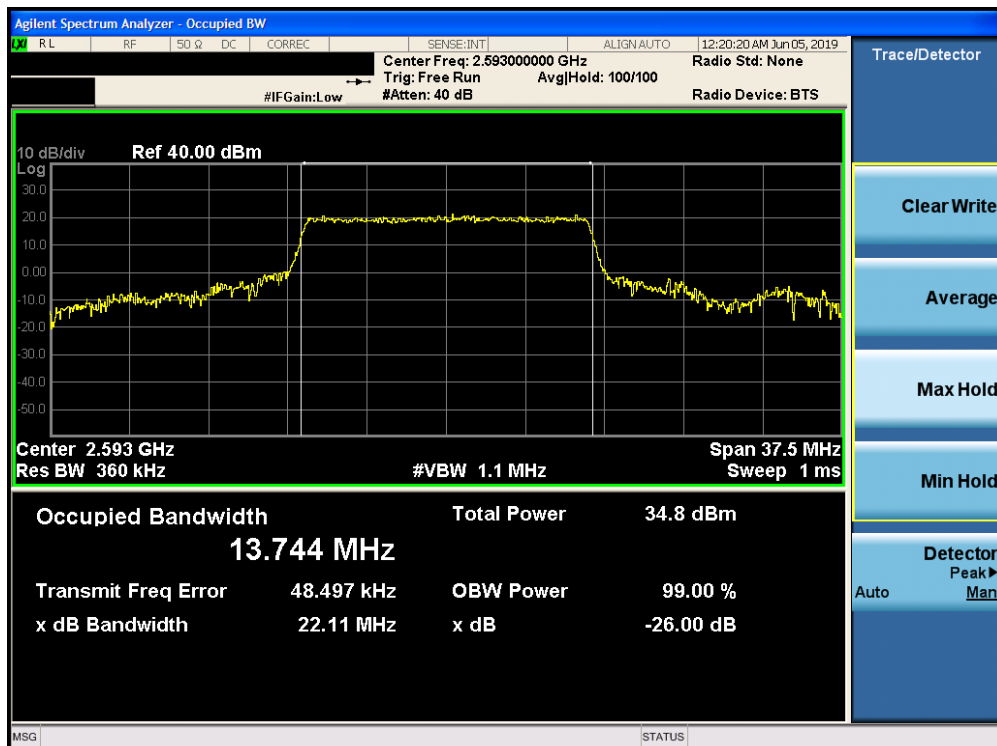


Plot 7-90. Occupied Bandwidth Plot (Band 41 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 66 of 341

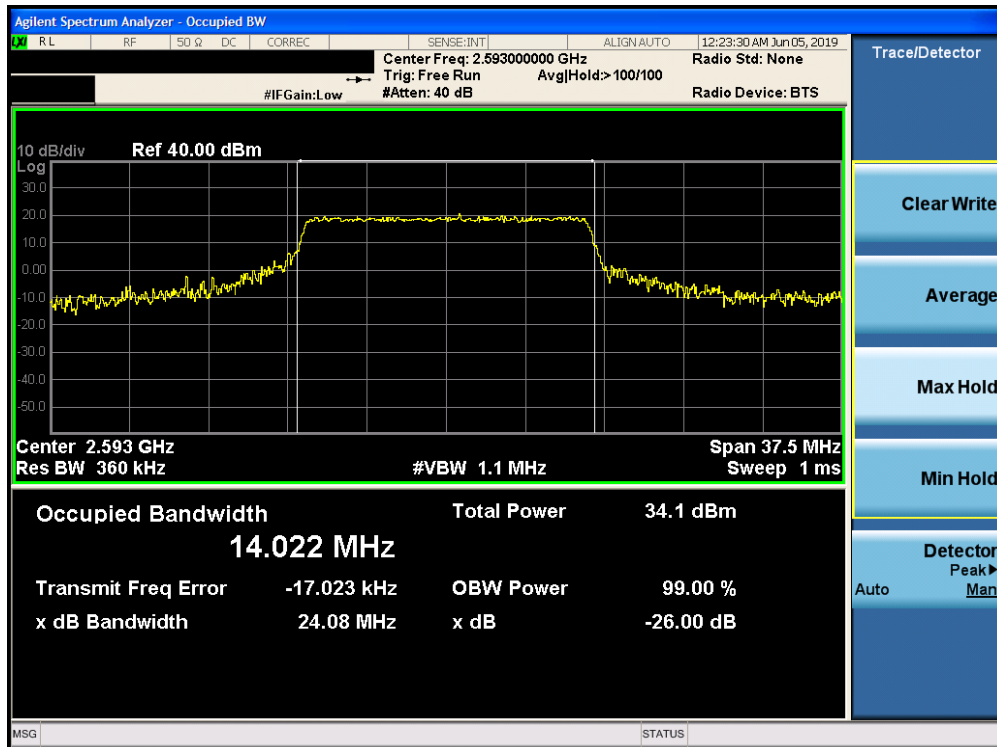


Plot 7-91. Occupied Bandwidth Plot (Band 41 - 15.0MHz QPSK - Full RB Configuration)

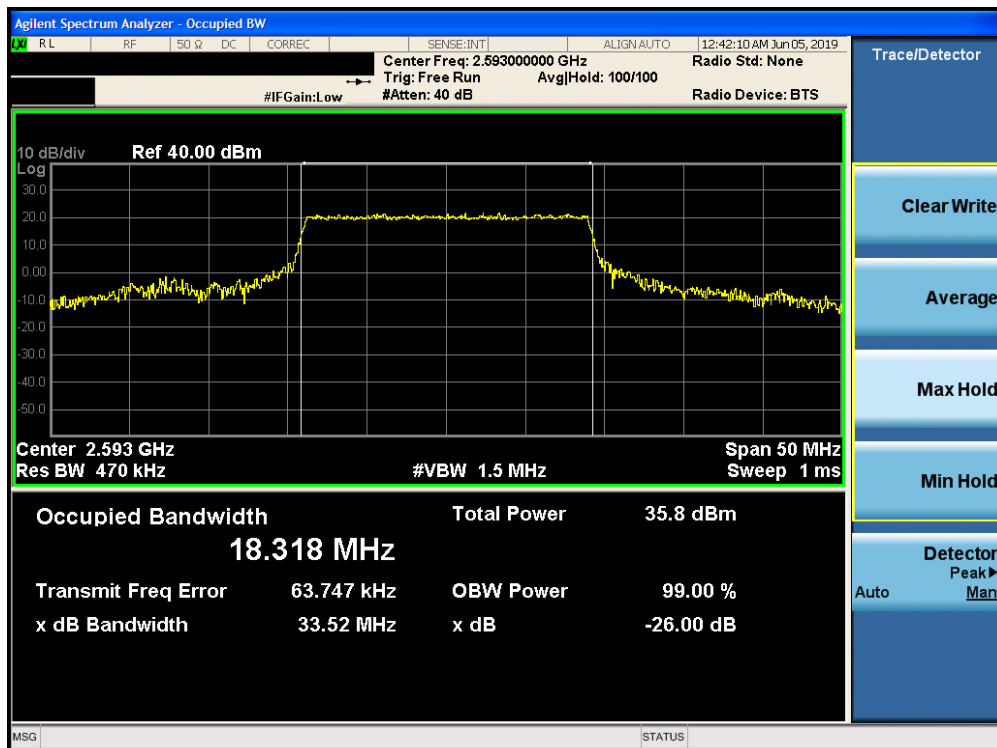


Plot 7-92. Occupied Bandwidth Plot (Band 41 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 67 of 341

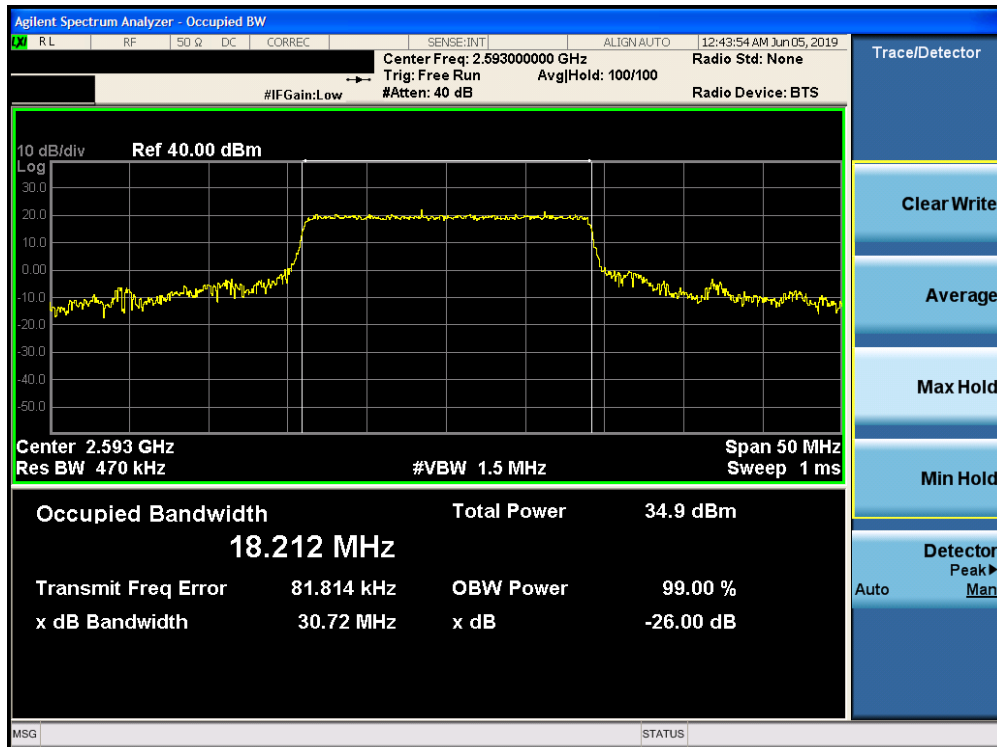


Plot 7-93. Occupied Bandwidth Plot (Band 41 - 15.0MHz 64-QAM - Full RB Configuration)

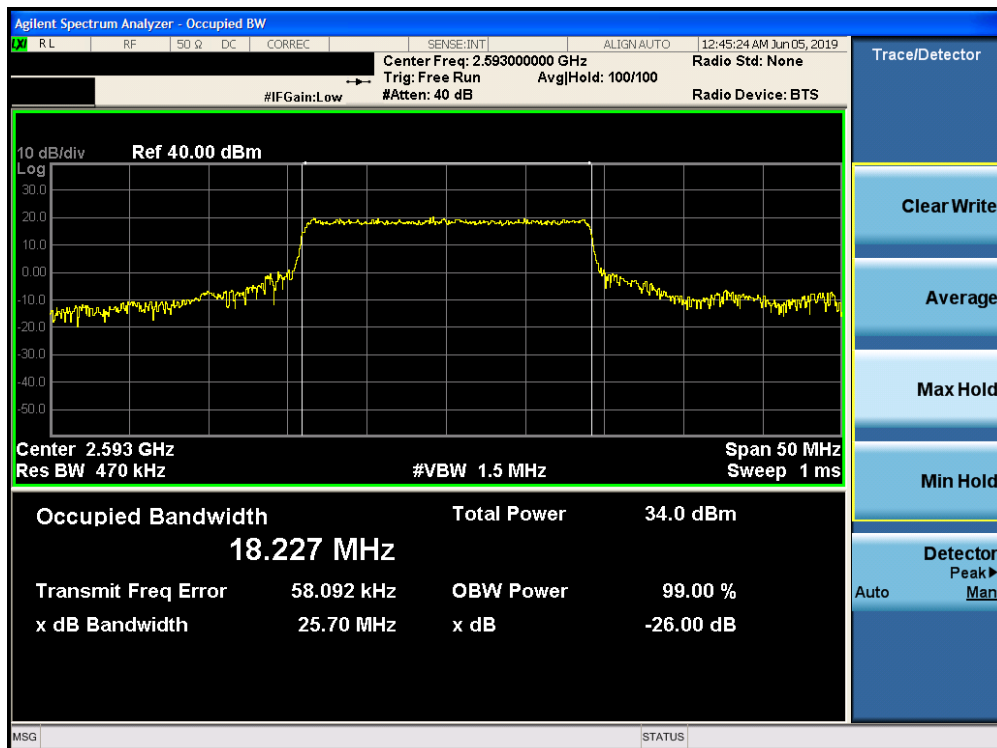


Plot 7-94. Occupied Bandwidth Plot (Band 41 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 68 of 341



Plot 7-95. Occupied Bandwidth Plot (Band 41 - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-96. Occupied Bandwidth Plot (Band 41 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1901280004-03.BCG	Test Dates: 05/01/2019-08/08/2019	EUT Type: Tablet Device	Page 69 of 341

7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is $43 + 10 \log_{10}(P_{\text{Watts}})$, where P is the transmitter power in Watts.

For Band 30, the minimum permissible attenuation level of any spurious emission <2288MHz and >2365MHz is $70 + 10 \log_{10}(P_{\text{Watts}})$.

For Band 7 and 41, the minimum permissible attenuation level of any spurious emission is $55 + 10 \log_{10}(P_{\text{Watts}})$.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

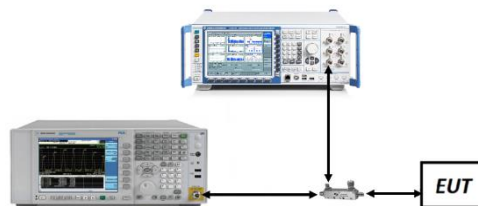


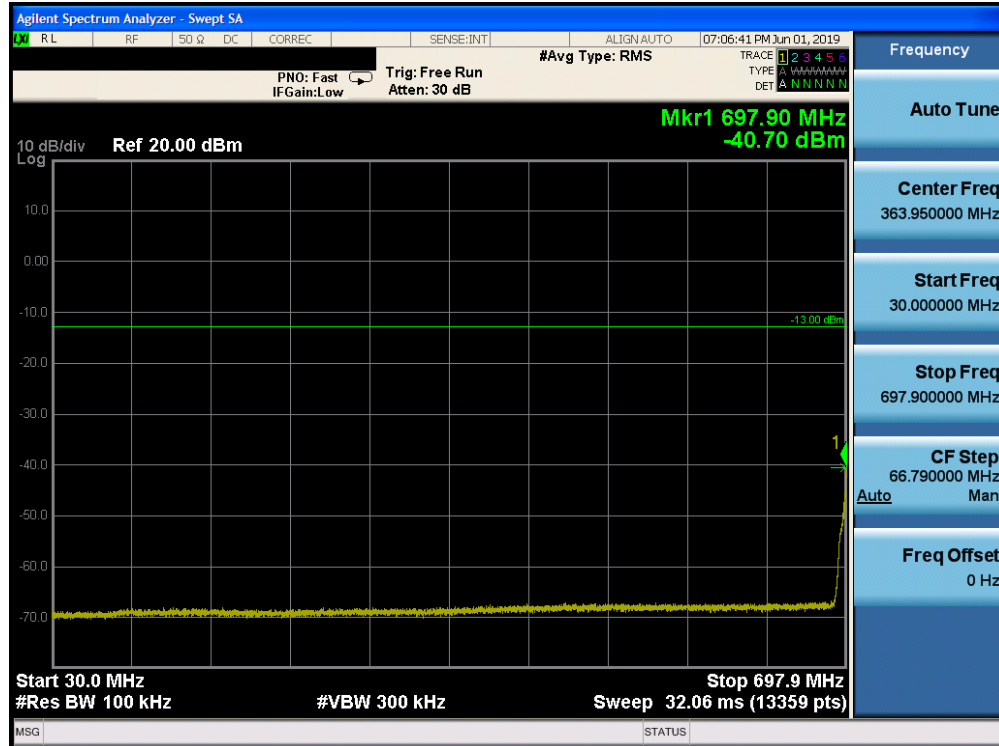
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

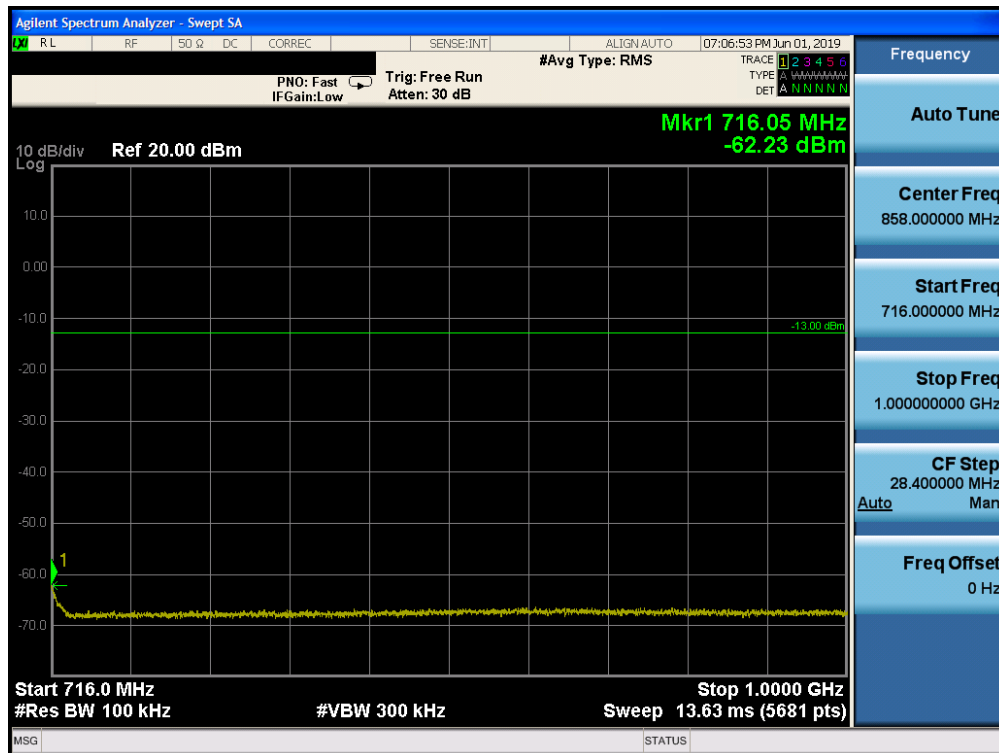
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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Band 12/17

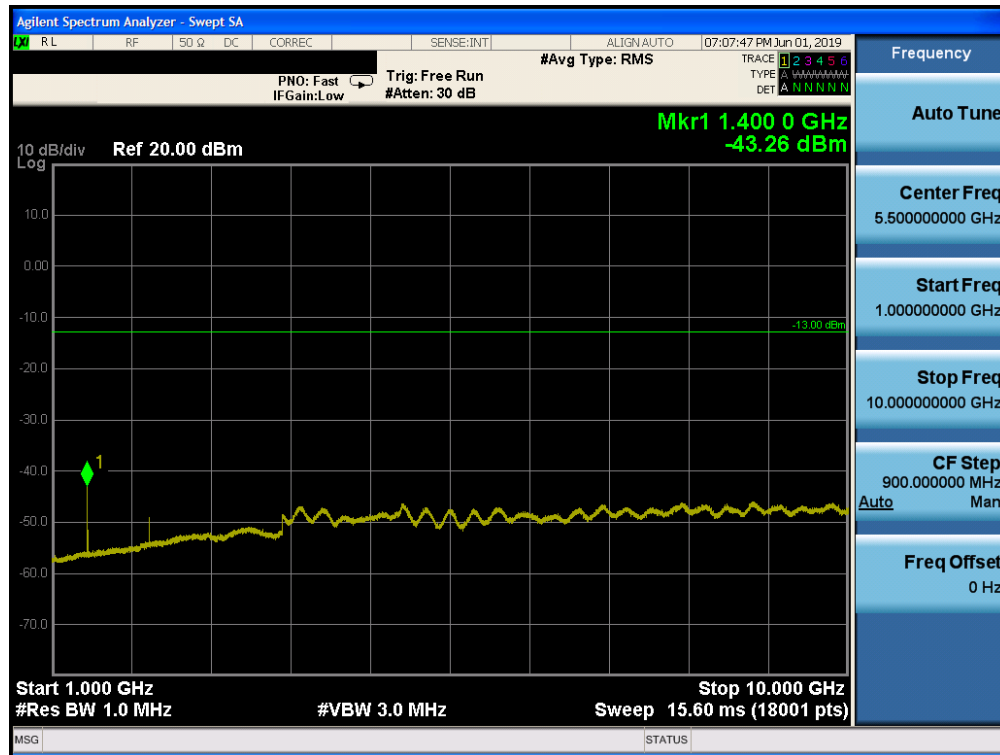


Plot 7-97. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

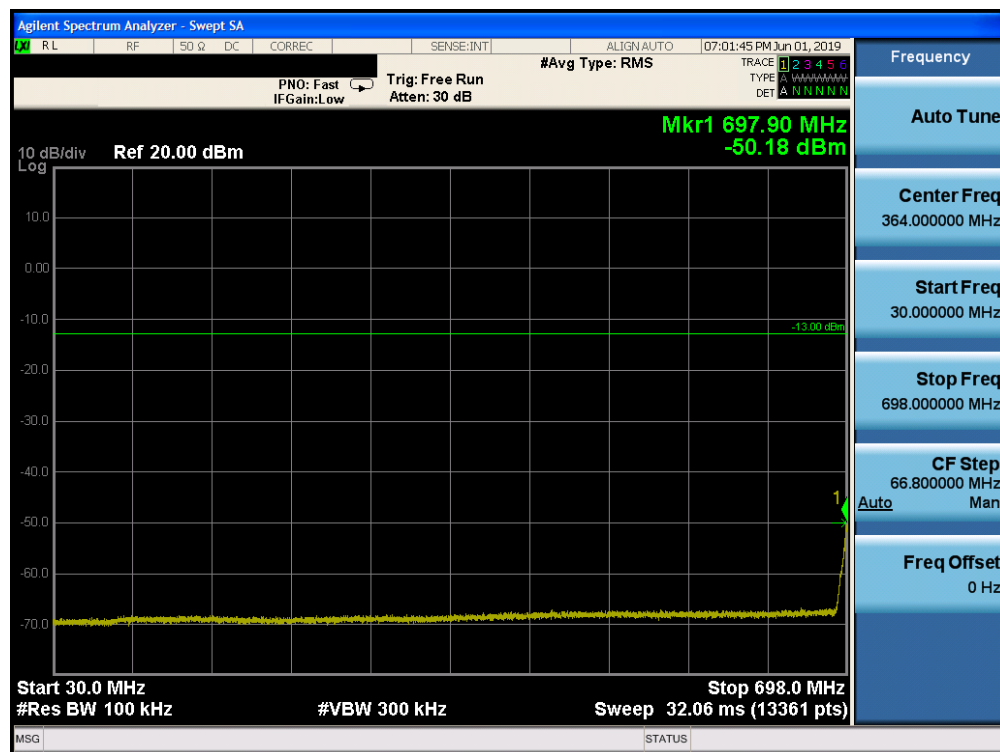


Plot 7-98. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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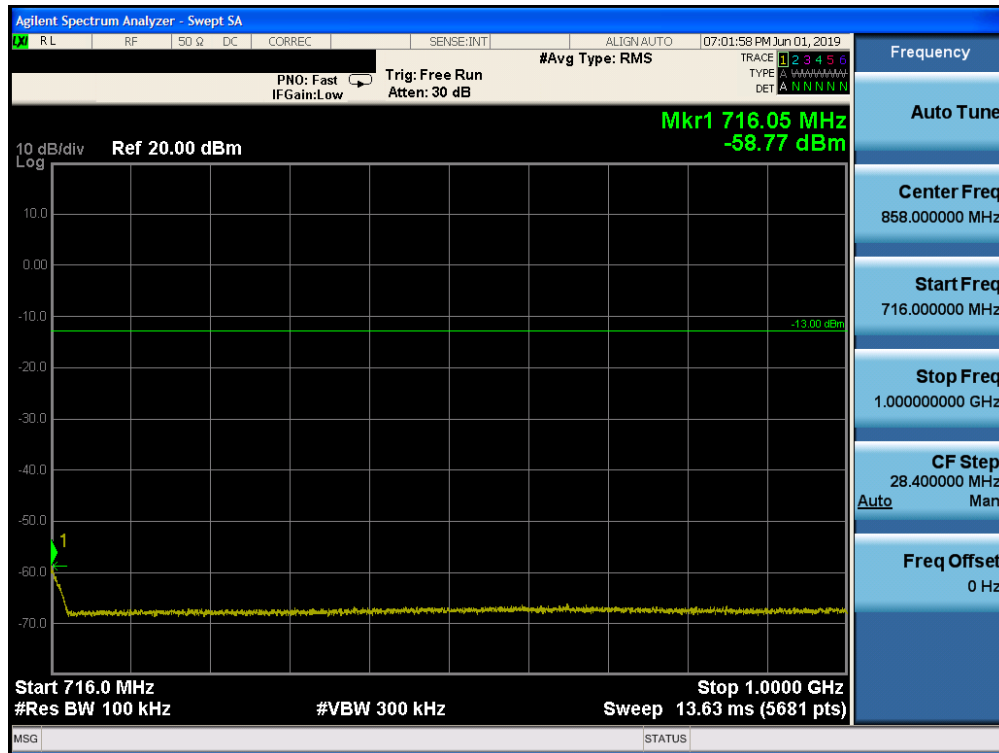


Plot 7-99. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

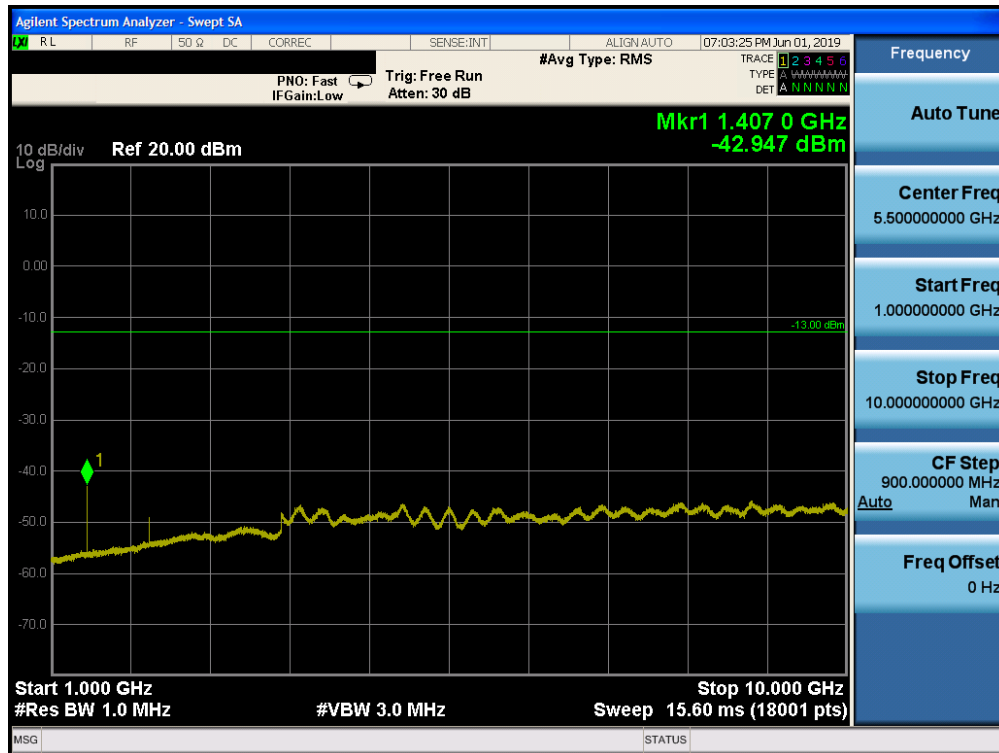


Plot 7-100. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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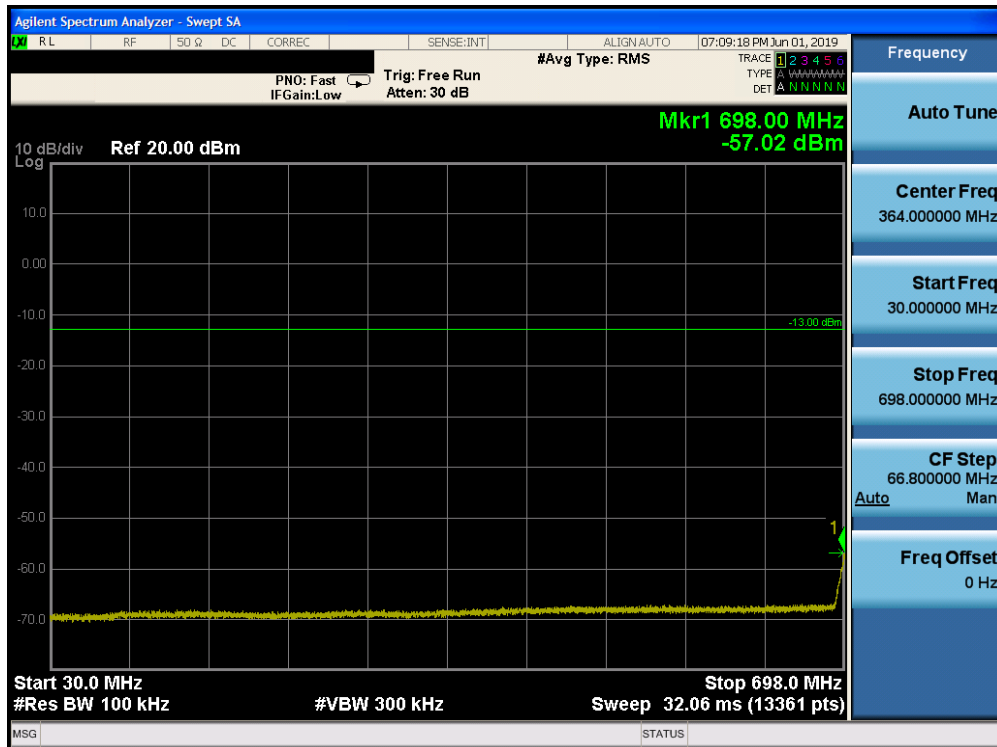


Plot 7-101. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

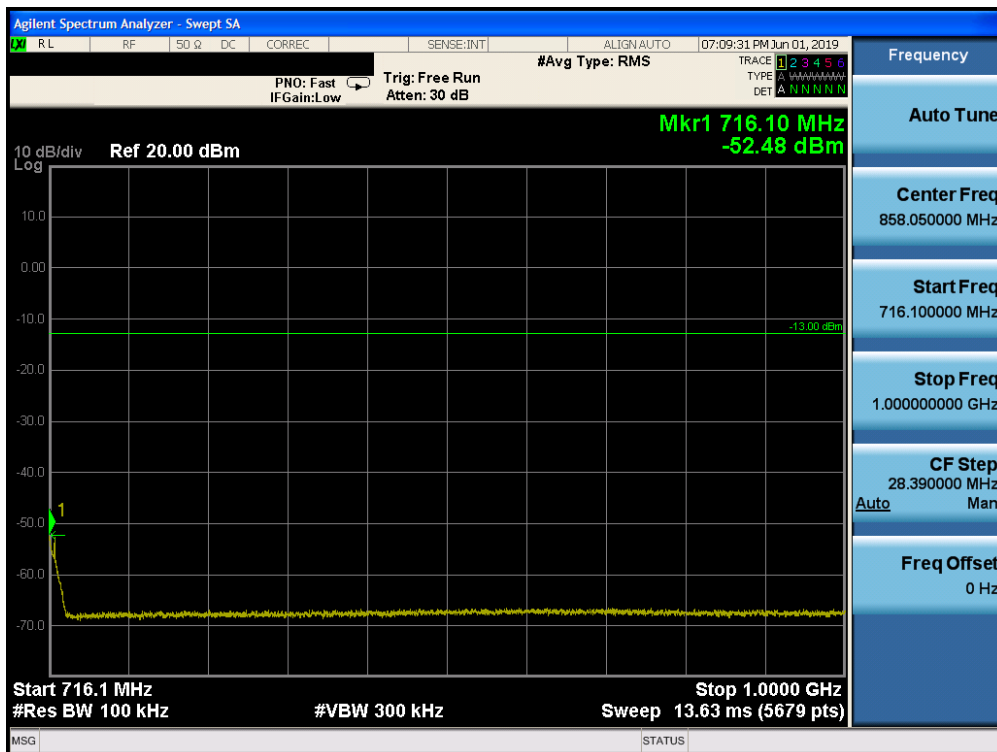


Plot 7-102. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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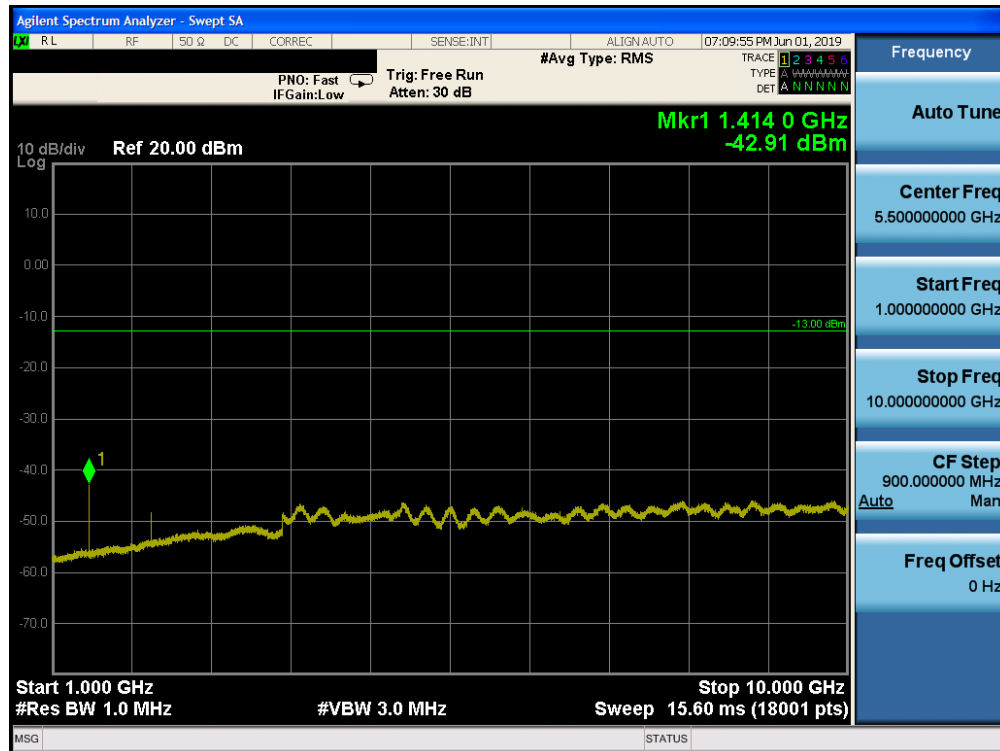


Plot 7-103. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-104. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

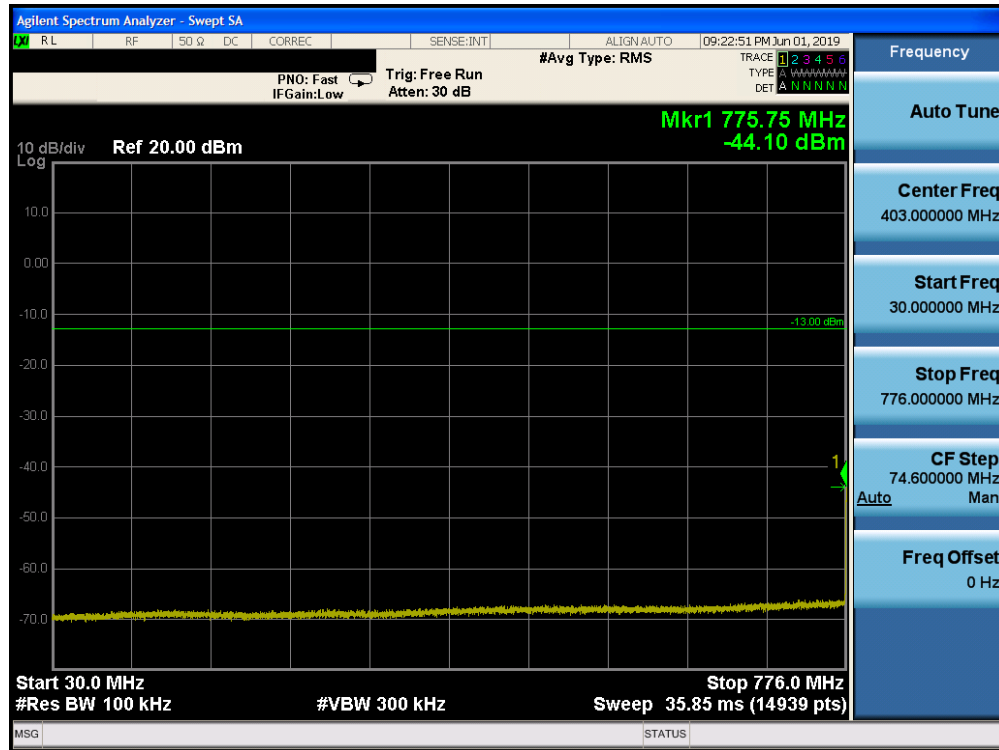
FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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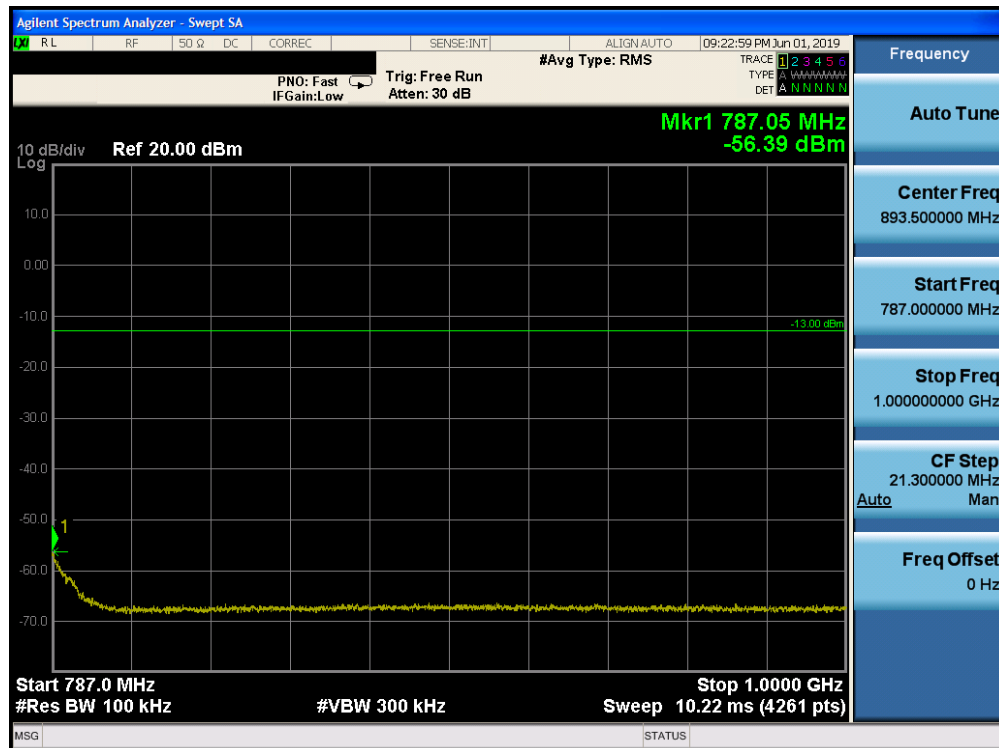
Plot 7-105. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 13

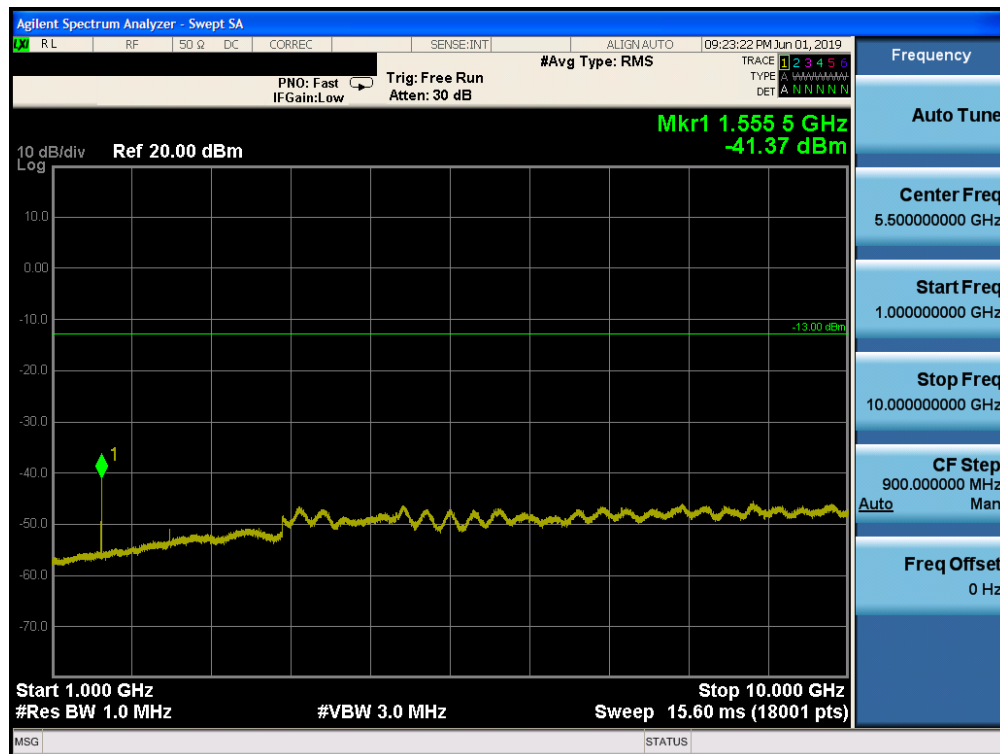


Plot 7-106. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

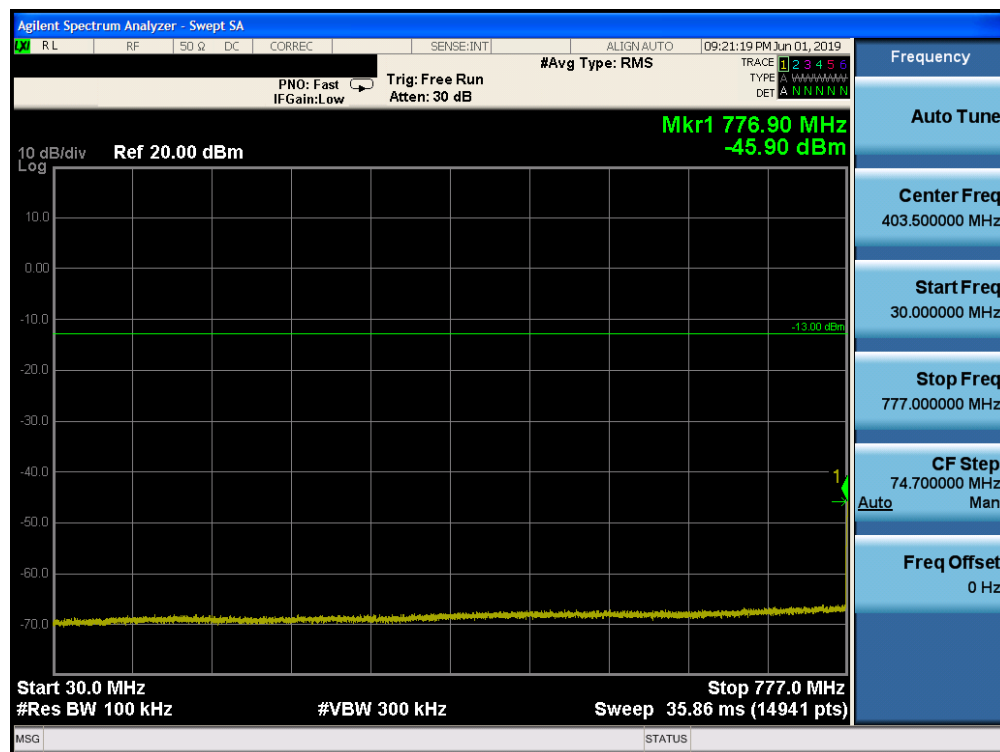


Plot 7-107. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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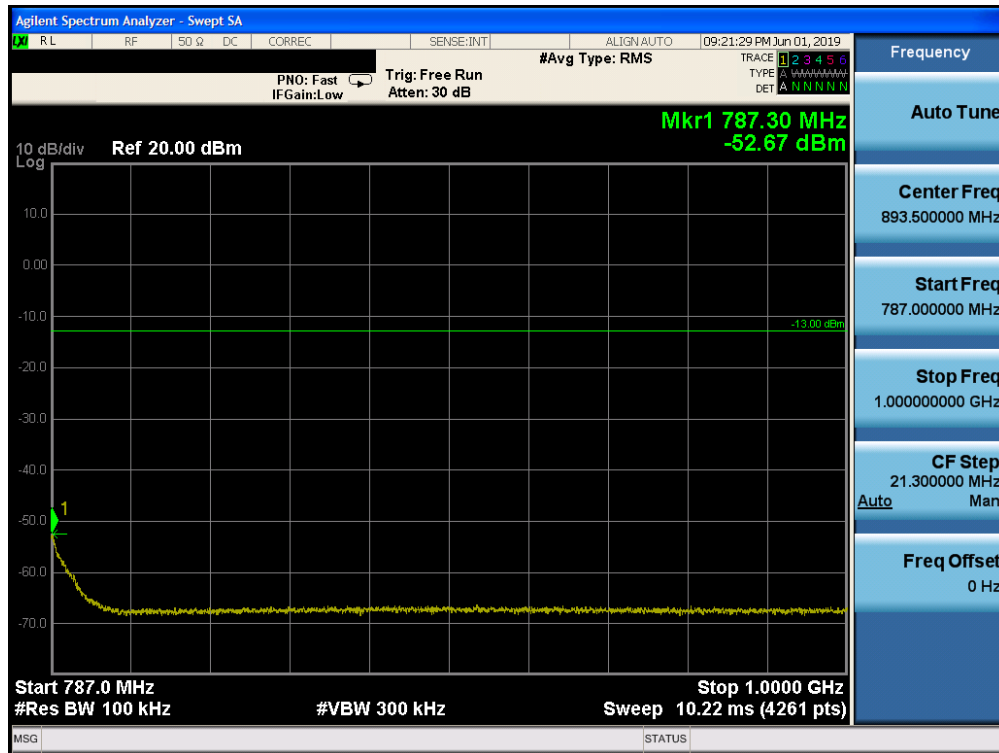


Plot 7-108. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

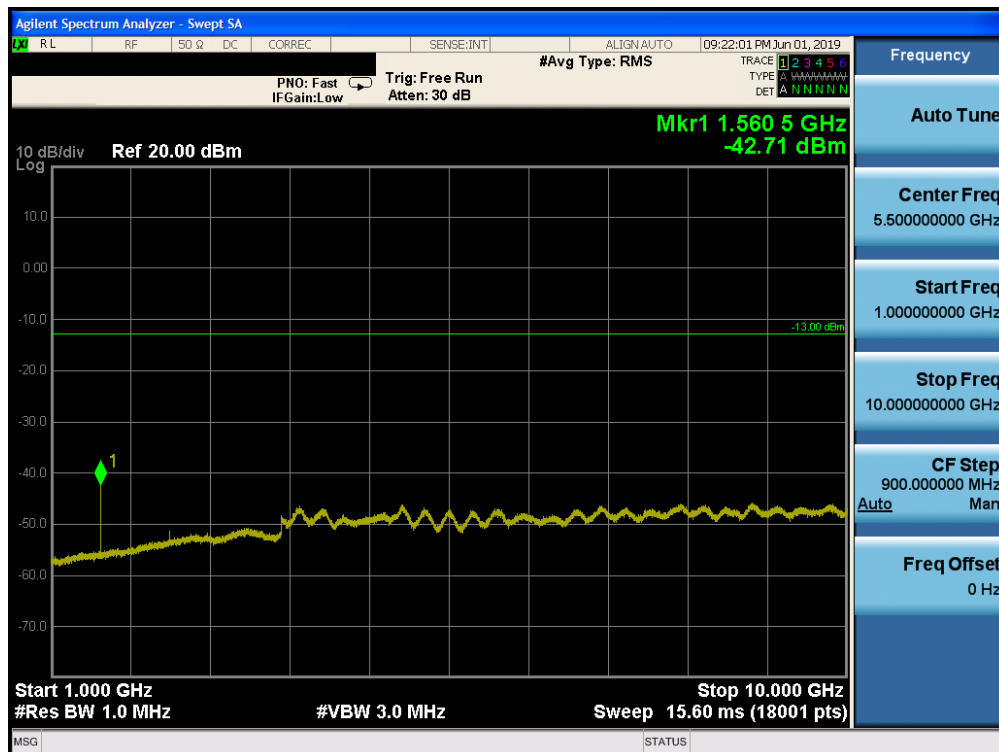


Plot 7-109. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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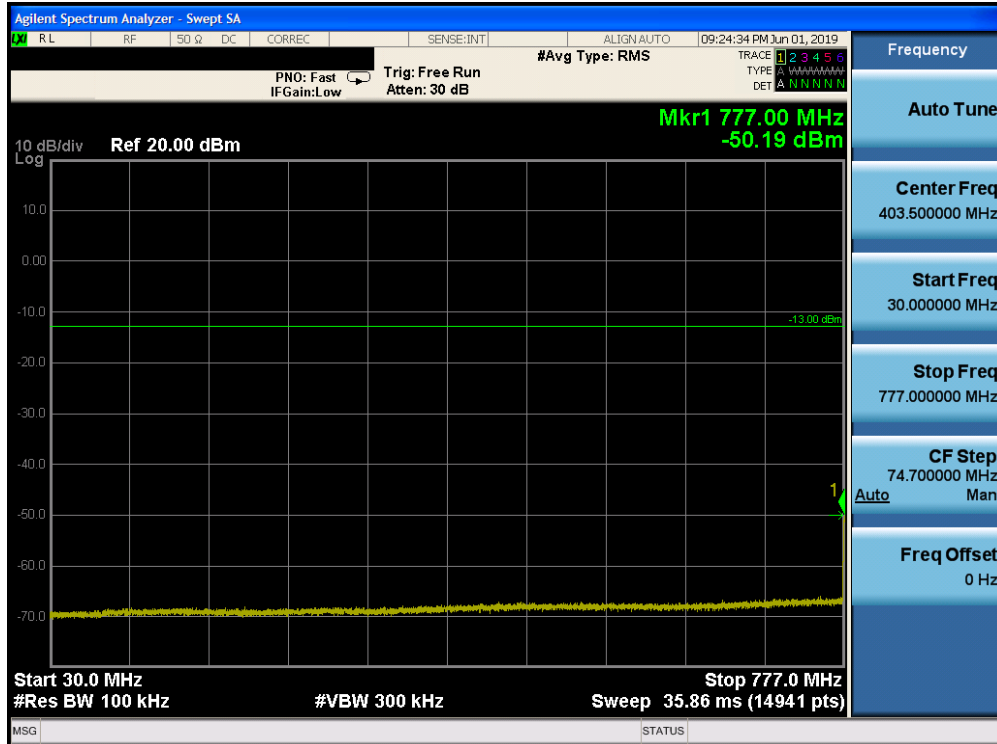


Plot 7-110. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

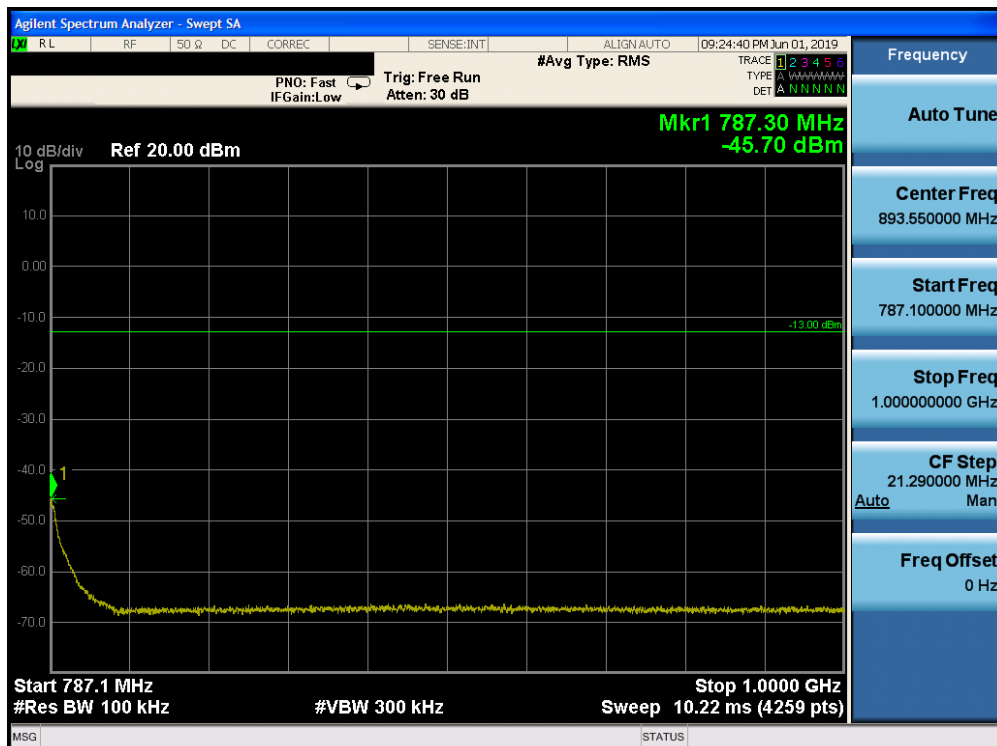


Plot 7-111. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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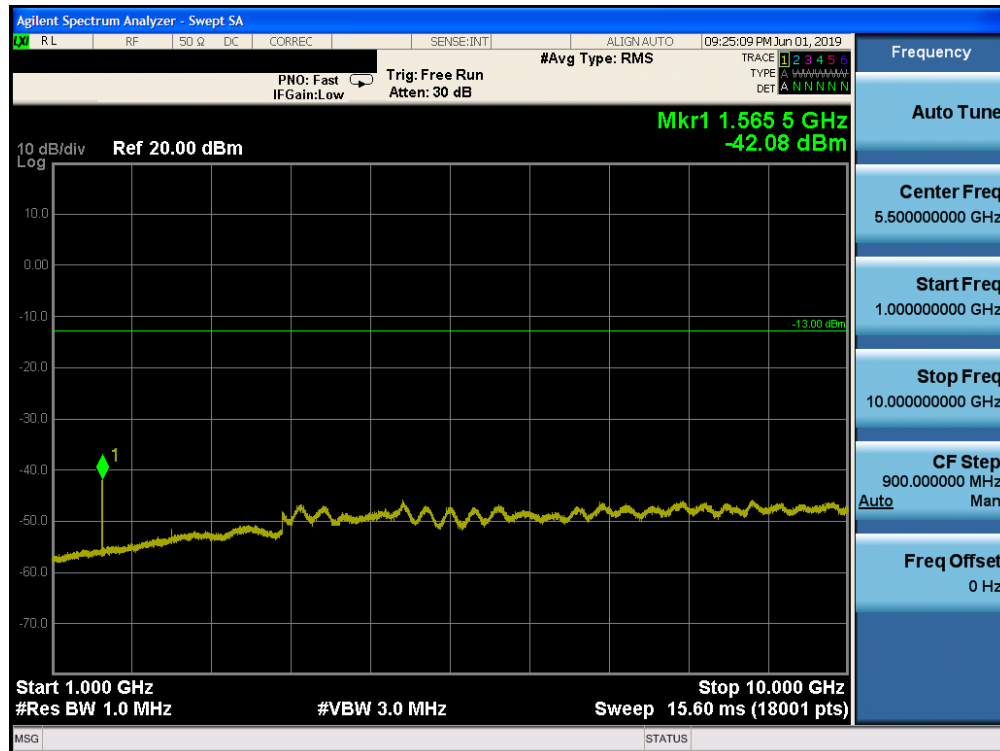


Plot 7-112. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-113. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

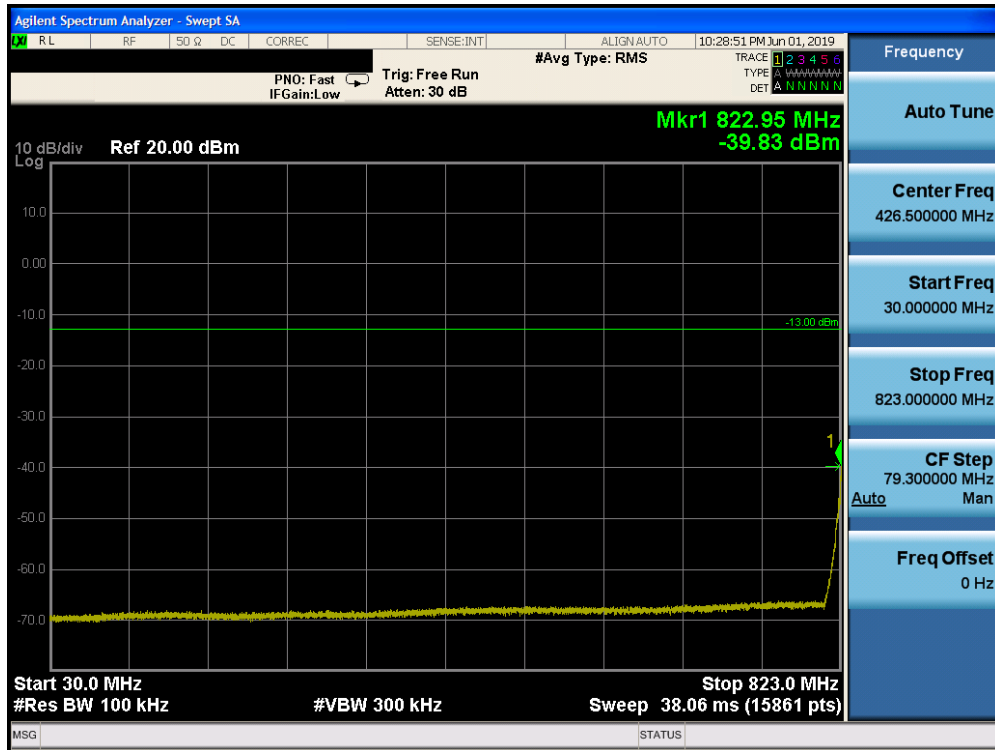
FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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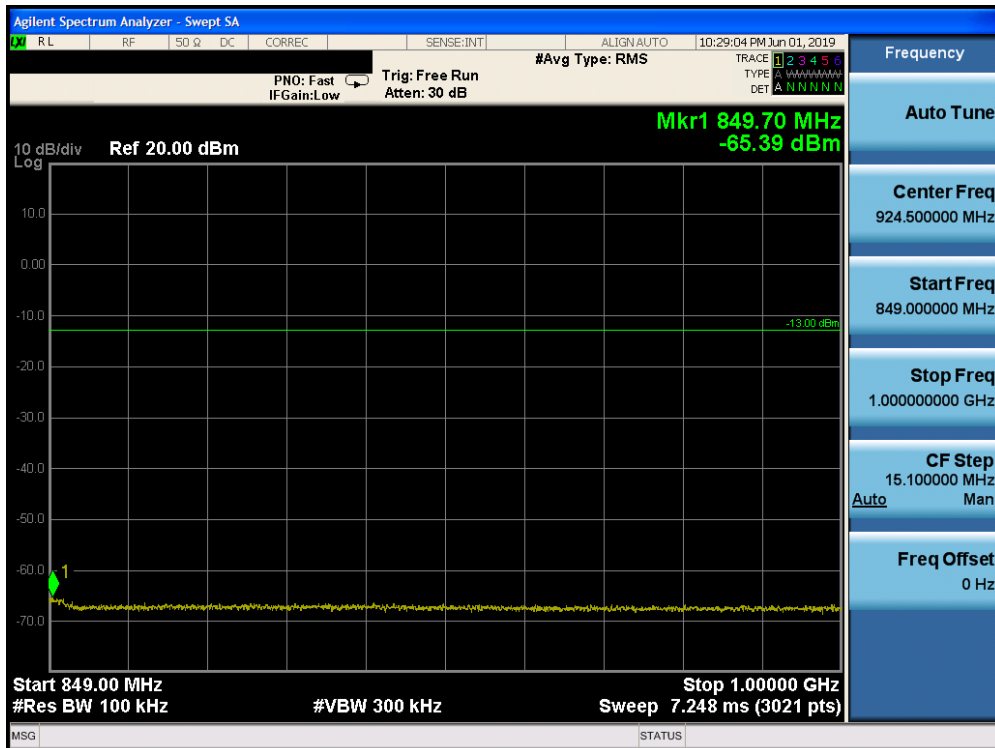
Plot 7-114. Conducted Spurious Plot (Band 13 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 26/5

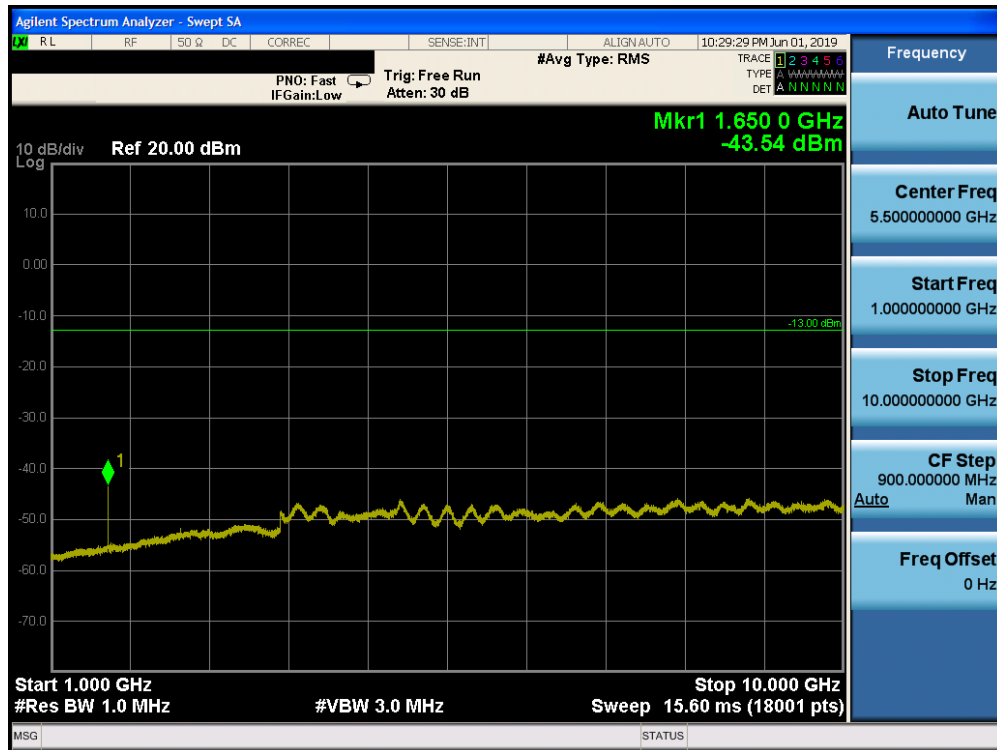


Plot 7-115. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

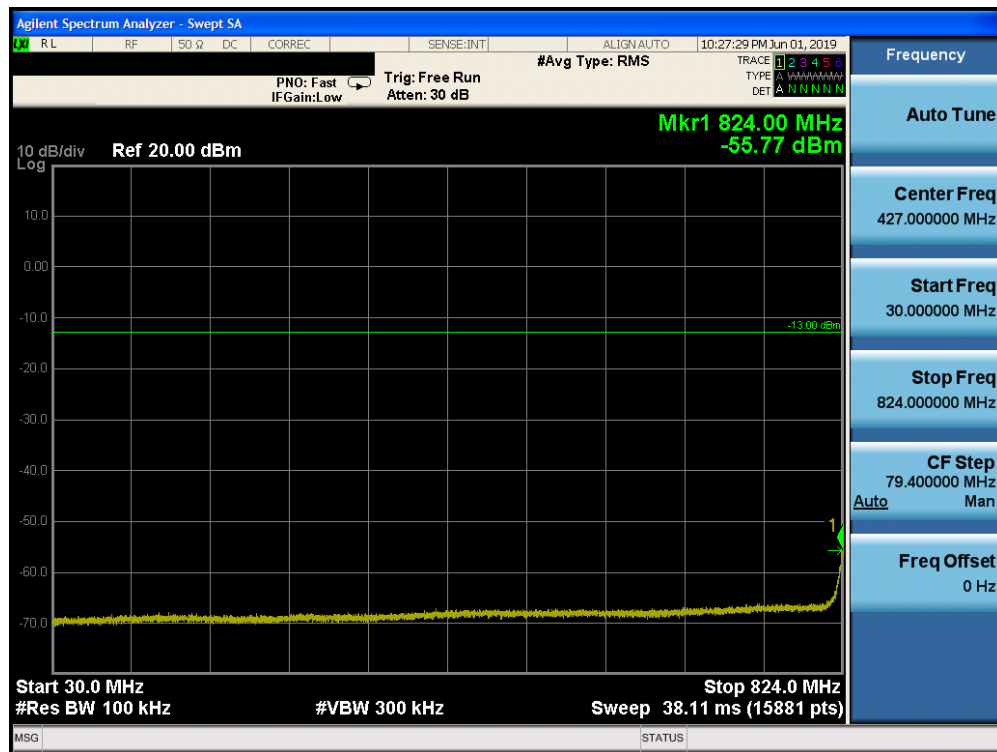


Plot 7-116. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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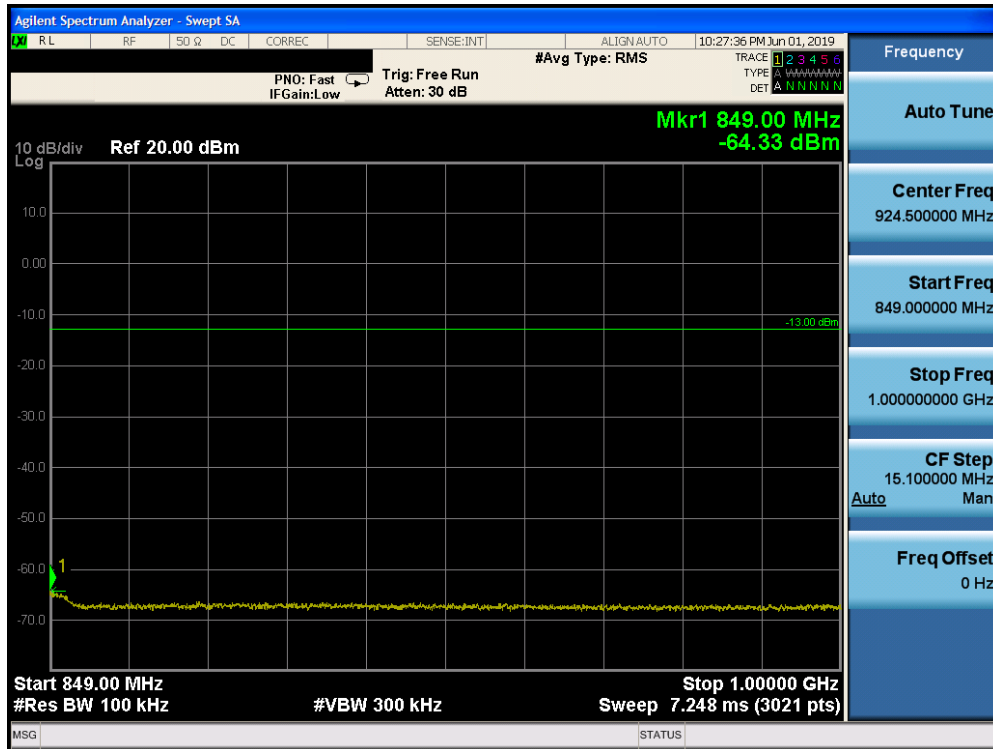


Plot 7-117. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

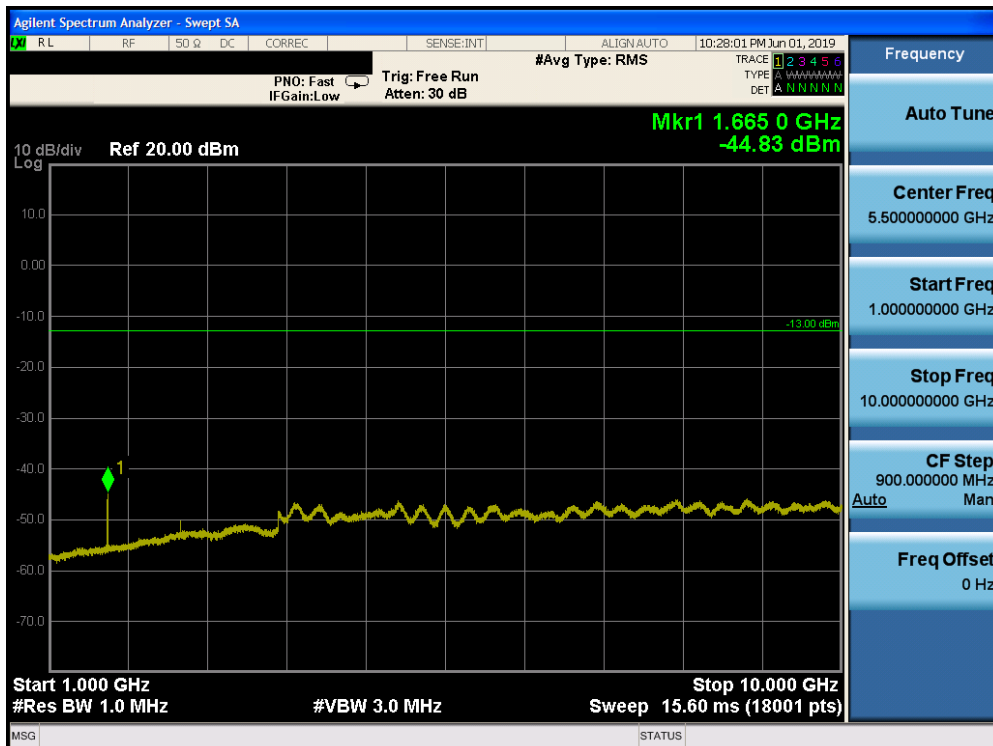


Plot 7-118. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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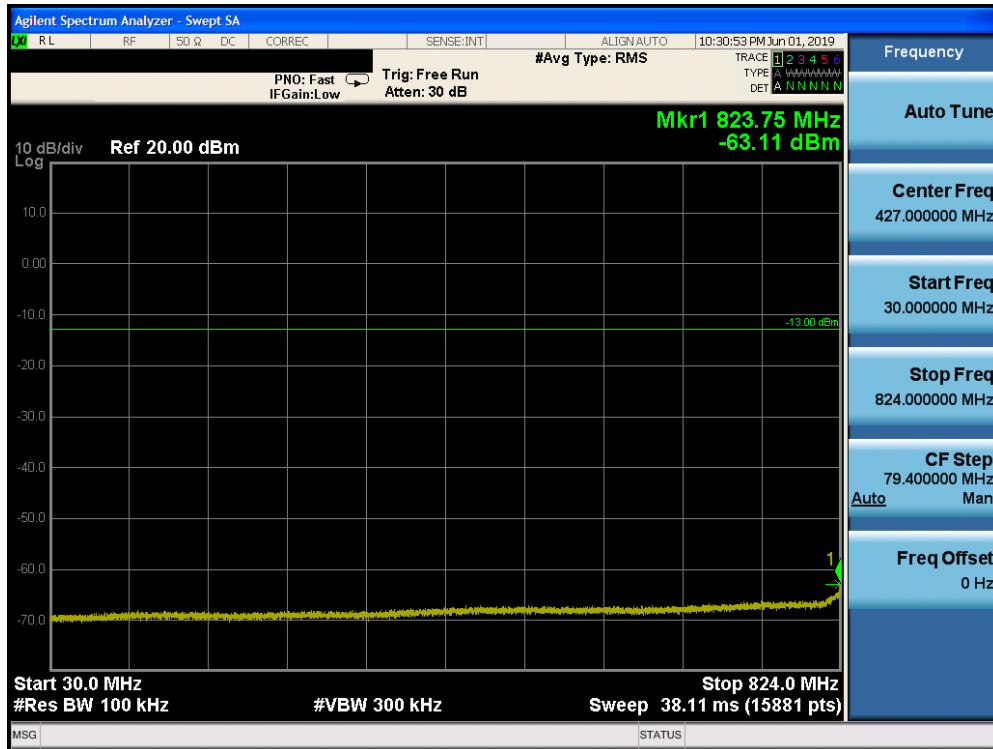


Plot 7-119. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

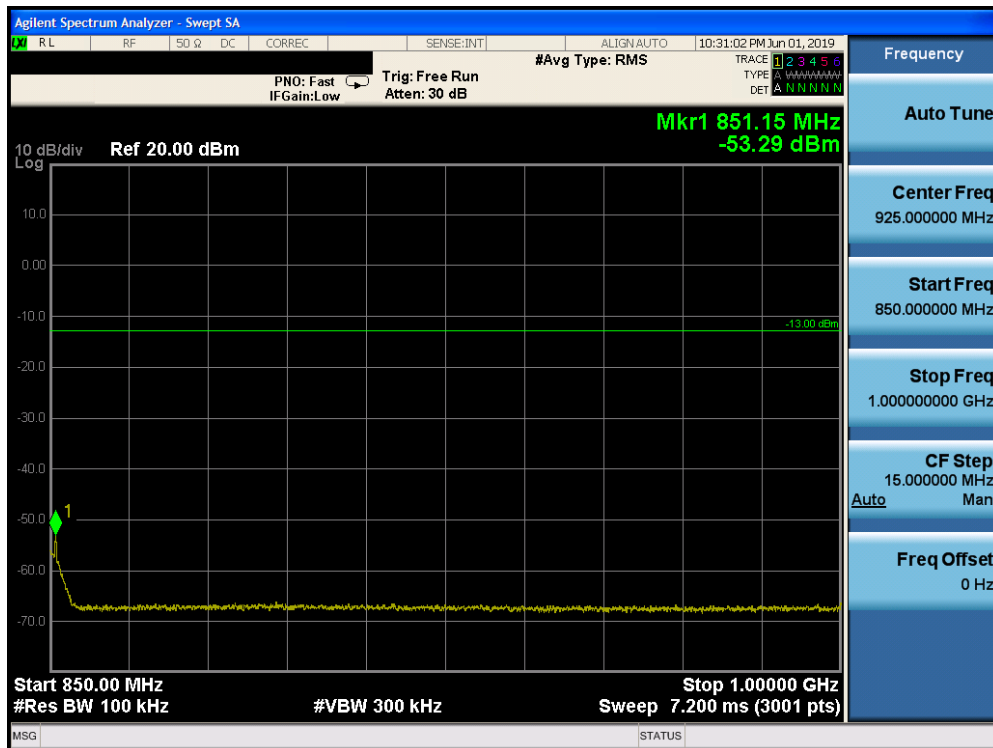


Plot 7-120. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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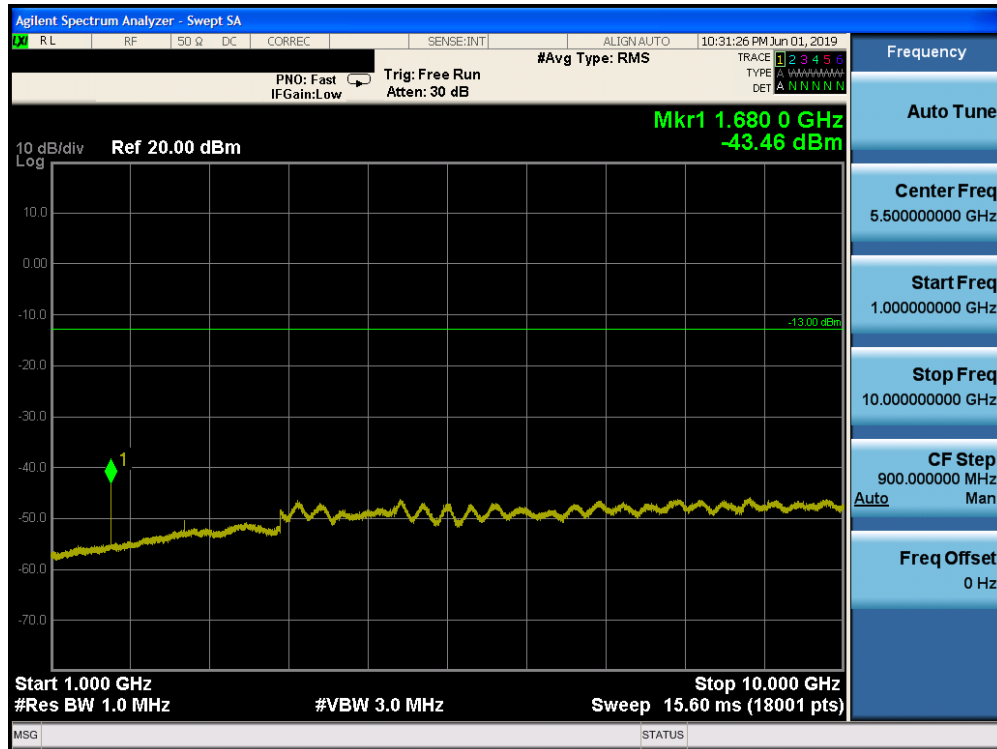


Plot 7-121. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-122. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

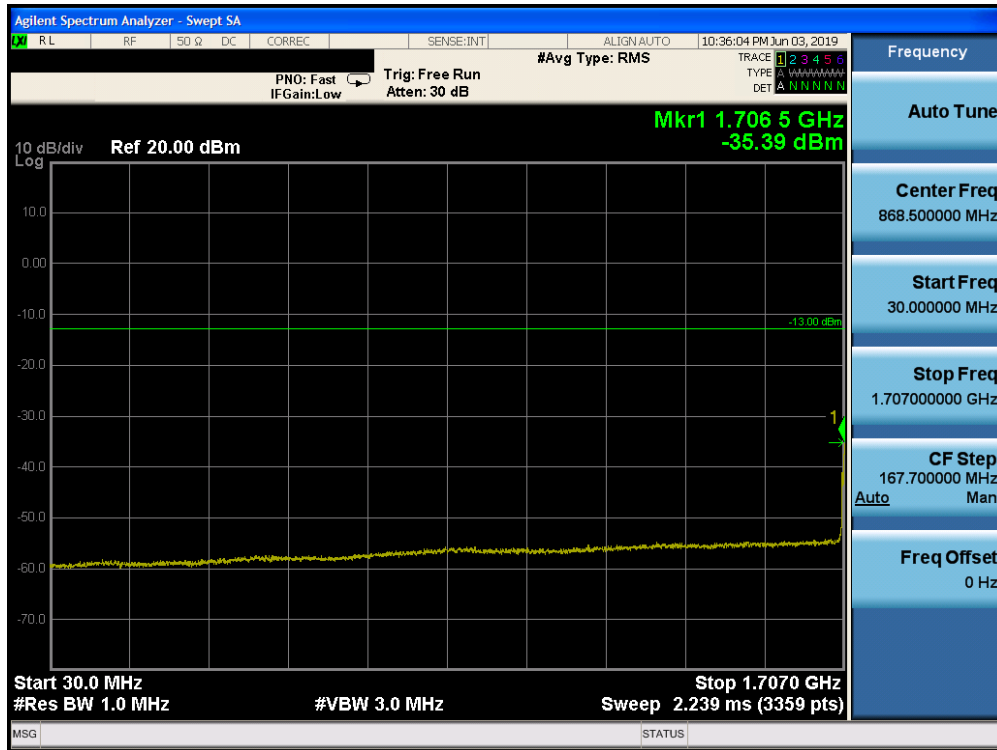
FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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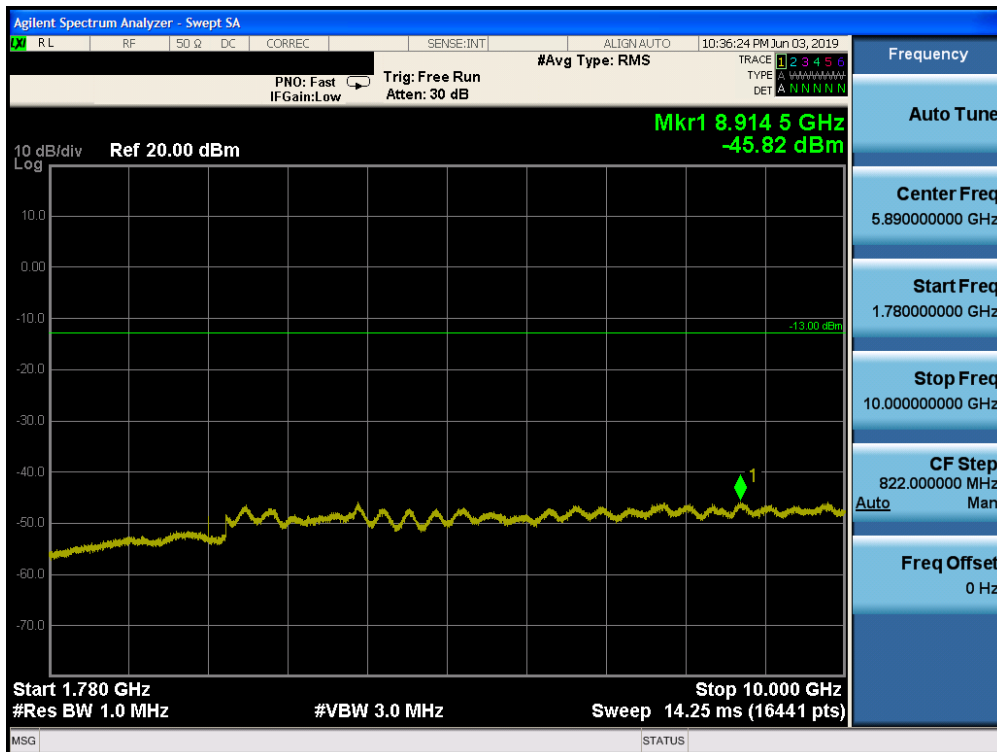
Plot 7-123. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2198	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Band 66/4

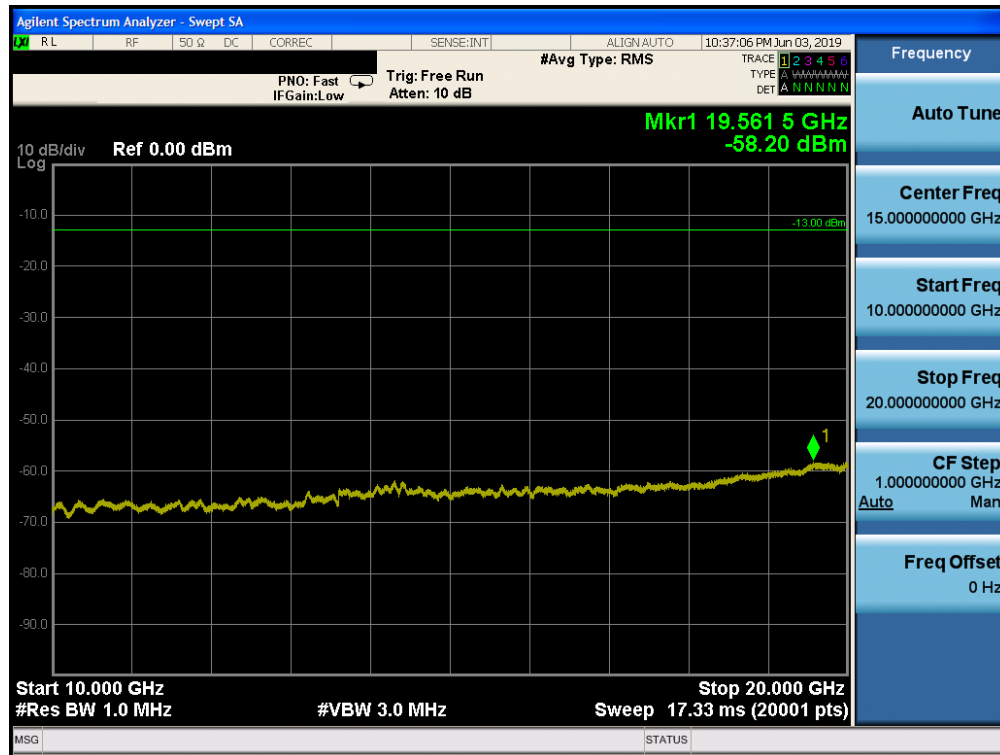


Plot 7-124. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

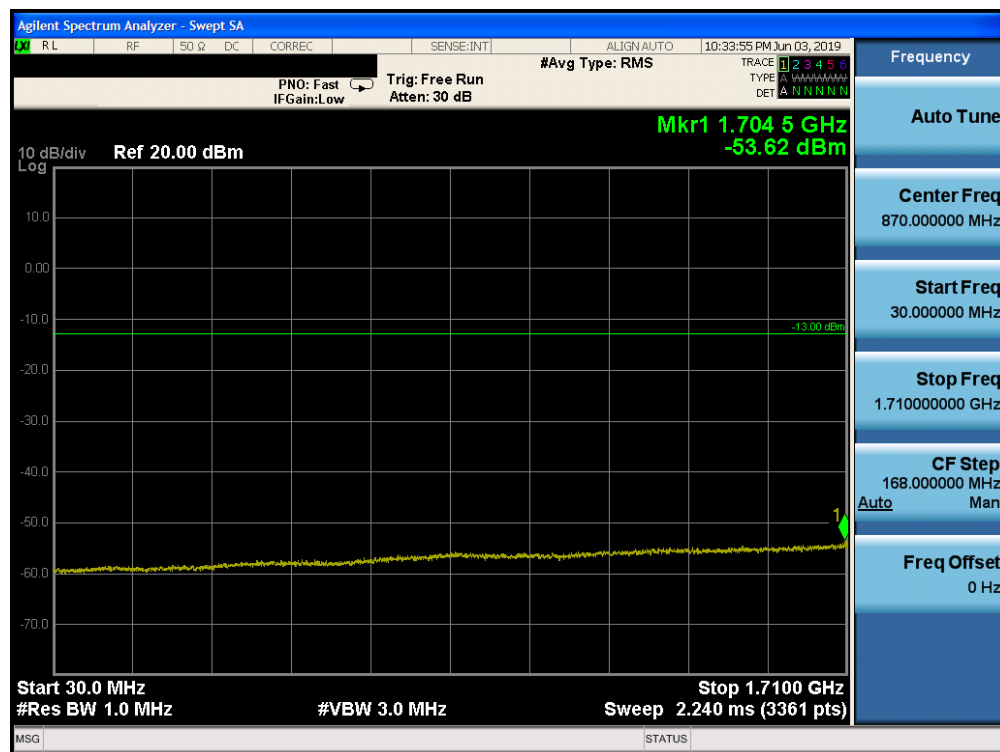


Plot 7-125. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Plot 7-126. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-127. Conducted Spurious Plot (Band 66/4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2198	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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