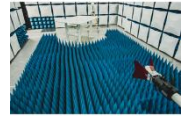




# PCTEST ENGINEERING LABORATORY, INC.

18855 Adams Court, Morgan Hill, CA 95037 USA  
Tel. 410.290.6652 / Fax 410.290.6654  
<http://www.pctest.com>



## MEASUREMENT REPORT LTE

**Applicant Name:**

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

**Date of Testing:**

11/09/2018-02/02/2019

**Test Site/Location:**

PCTEST Lab. Morgan Hill, CA, USA

**Test Report Serial No.:**

1C1811080029-03-R1.BCG

**FCC ID:**

**BCGA2123**

**APPLICANT:**

**Apple Inc.**

**Application Type:**

Certification

**Model:**

A2123, A2154

**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.

This revised Test Report (S/N: 1C1811080029-03-R1.BCG) supersedes and replaces the previously issued test report (S/N: 1C1811080028-03.BCG) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

  
Randy Ortanez  
President

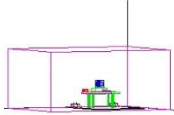


<b>FCC ID:</b> BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device	Page 1 of 338

# TABLE OF CONTENTS

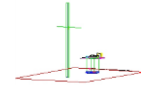
1.0	INTRODUCTION.....	6
1.1	Scope.....	6
1.2	PCTEST Test Location .....	6
1.3	Test Facility / Accreditations.....	6
2.0	PRODUCT INFORMATION.....	7
2.1	Equipment Description .....	7
2.2	Device Capabilities .....	7
2.3	Antenna Description.....	7
2.4	Test Support Equipment.....	8
2.5	Test Configuration .....	8
2.6	Software and Firmware .....	8
2.7	EMI Suppression Device(s)/Modifications .....	8
3.0	DESCRIPTION OF TESTS.....	9
3.1	Measurement Procedure.....	9
3.2	Block C Frequency Range .....	9
3.3	Block A Frequency Range.....	9
3.4	600MHz Frequency Range.....	9
3.5	Cellular - Base Frequency Blocks.....	9
3.6	Cellular - Mobile Frequency Blocks.....	10
3.7	PCS - Base Frequency Blocks .....	10
3.8	PCS - Mobile Frequency Blocks .....	10
3.9	AWS - Base Frequency Blocks.....	10
3.10	AWS - Mobile Frequency Blocks .....	11
3.11	WCS – Mobile/Base Frequency Blocks.....	11
3.12	BRS/EBS Frequency Block .....	11
3.13	Radiated Power and Radiated Spurious Emissions.....	12
4.0	MEASUREMENT UNCERTAINTY.....	13
5.0	TEST EQUIPMENT CALIBRATION DATA .....	14
6.0	SAMPLE CALCULATIONS.....	15
7.0	TEST RESULTS .....	16
7.1	Summary.....	16
7.2	Occupied Bandwidth.....	18
7.3	Spurious and Harmonic Emissions at Antenna Terminal.....	70
7.4	Band Edge Emissions at Antenna Terminal .....	111
7.5	Peak-Average Ratio.....	189
7.6	Additional Maximum Power Reduction (A-MPR) .....	227
7.7	Uplink Carrier Aggregation.....	229
7.8	Radiated Power (ERP/EIRP).....	251
7.9	Radiated Spurious Emissions Measurements .....	275
7.10	Uplink Carrier Aggregation Radiated Measurements.....	311
7.11	Frequency Stability / Temperature Variation.....	321
8.0	CONCLUSION .....	338

<b>FCC ID:</b> BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device	Page 2 of 338



# MEASUREMENT REPORT

## 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	0.208	23.19	0.342	25.34	1M11G7W	QPSK
LTE Band 12	27	699.7 - 715.3	0.179	22.52	0.293	24.67	1M11D7W	16QAM
LTE Band 12	27	699.7 - 715.3	0.130	21.15	0.214	23.30	1M11D7W	64QAM
LTE Band 12	27	700.5 - 714.5	0.208	23.19	0.342	25.34	2M73G7W	QPSK
LTE Band 12	27	700.5 - 714.5	0.181	22.58	0.297	24.73	2M73D7W	16QAM
LTE Band 12	27	700.5 - 714.5	0.131	21.17	0.215	23.32	2M73D7W	64QAM
LTE Band 12	27	701.5 - 713.5	0.208	23.19	0.342	25.34	4M55G7W	QPSK
LTE Band 12	27	701.5 - 713.5	0.178	22.51	0.292	24.66	4M55D7W	16QAM
LTE Band 12	27	701.5 - 713.5	0.131	21.18	0.215	23.33	4M56D7W	64QAM
LTE Band 12	27	704 - 711	0.208	23.19	0.342	25.34	9M06G7W	QPSK
LTE Band 12	27	704 - 711	0.178	22.51	0.292	24.66	9M03D7W	16QAM
LTE Band 12	27	704 - 711	0.131	21.16	0.214	23.31	9M06D7W	64QAM
LTE Band 17	27	706.5 - 713.5	0.208	23.19	0.342	25.34	4M55G7W	QPSK
LTE Band 17	27	706.5 - 713.5	0.179	22.54	0.294	24.69	4M55D7W	16QAM
LTE Band 17	27	706.5 - 713.5	0.133	21.24	0.218	23.39	4M56D7W	64QAM
LTE Band 17	27	709 - 711	0.208	23.19	0.342	25.34	9M06G7W	QPSK
LTE Band 17	27	709 - 711	0.181	22.57	0.296	24.72	9M03D7W	16QAM
LTE Band 17	27	709 - 711	0.132	21.21	0.217	23.36	9M06D7W	64QAM
LTE Band 13	27	779.5 - 784.5	0.208	23.19	0.342	25.34	4M55G7W	QPSK
LTE Band 13	27	779.5 - 784.5	0.177	22.47	0.290	24.62	4M54D7W	16QAM
LTE Band 13	27	779.5 - 784.5	0.136	21.34	0.223	23.49	4M56D7W	64QAM
LTE Band 13	27	782	0.208	23.19	0.342	25.34	9M04G7W	QPSK
LTE Band 13	27	782	0.180	22.56	0.296	24.71	9M02D7W	16QAM
LTE Band 13	27	782	0.132	21.22	0.217	23.37	9M03D7W	64QAM
LTE Band 5	22H	824.7 - 848.3	0.241	23.82	0.395	25.97	1M11G7W	QPSK
LTE Band 5	22H	824.7 - 848.3	0.202	23.05	0.331	25.20	1M11D7W	16QAM
LTE Band 5	22H	824.7 - 848.3	0.155	21.90	0.254	24.05	1M11D7W	64QAM
LTE Band 5	22H	825.5 - 847.5	0.237	23.74	0.388	25.89	2M73G7W	QPSK
LTE Band 5	22H	825.5 - 847.5	0.209	23.20	0.343	25.35	2M73D7W	16QAM
LTE Band 5	22H	825.5 - 847.5	0.153	21.85	0.251	24.00	2M73D7W	64QAM
LTE Band 5	22H	826.5 - 846.5	0.241	23.82	0.395	25.97	4M55G7W	QPSK
LTE Band 5	22H	826.5 - 846.5	0.203	23.07	0.333	25.22	4M55D7W	16QAM
LTE Band 5	22H	826.5 - 846.5	0.156	21.92	0.255	24.07	4M55D7W	64QAM
LTE Band 5	22H	829 - 844	0.241	23.82	0.395	25.97	9M09G7W	QPSK
LTE Band 5	22H	829 - 844	0.209	23.21	0.344	25.36	9M06D7W	16QAM
LTE Band 5	22H	829 - 844	0.150	21.77	0.247	23.92	9M04D7W	64QAM
LTE Band 26	22H	824.7 - 848.3	0.240	23.80	0.394	25.95	1M11G7W	QPSK
LTE Band 26	22H	824.7 - 848.3	0.209	23.20	0.343	25.35	1M11D7W	16QAM
LTE Band 26	22H	824.7 - 848.3	0.153	21.84	0.251	23.99	1M11D7W	64QAM
LTE Band 26	22H	825.5 - 847.5	0.237	23.75	0.389	25.90	2M73G7W	QPSK
LTE Band 26	22H	825.5 - 847.5	0.206	23.13	0.337	25.28	2M73D7W	16QAM
LTE Band 26	22H	825.5 - 847.5	0.152	21.83	0.250	23.98	2M73D7W	64QAM
LTE Band 26	22H	826.5 - 846.5	0.239	23.79	0.393	25.94	4M55G7W	QPSK
LTE Band 26	22H	826.5 - 846.5	0.214	23.31	0.352	25.46	4M55D7W	16QAM
LTE Band 26	22H	826.5 - 846.5	0.156	21.92	0.255	24.07	4M55D7W	64QAM
LTE Band 26	22H	829 - 844	0.241	23.82	0.395	25.97	9M09G7W	QPSK
LTE Band 26	22H	829 - 844	0.208	23.19	0.342	25.34	9M06D7W	16QAM
LTE Band 26	22H	829 - 844	0.151	21.79	0.248	23.94	9M04D7W	64QAM

### EUT Overview (<1GHz)

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 3 of 338

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	0.262	24.19	1M11G7W	QPSK
LTE Band 4	27	1710.7 - 1754.3	0.217	23.36	1M11D7W	16QAM
LTE Band 4	27	1710.7 - 1754.3	0.157	21.95	1M11D7W	64QAM
LTE Band 4	27	1711.5 - 1753.5	0.248	23.94	2M73G7W	QPSK
LTE Band 4	27	1711.5 - 1753.5	0.228	23.57	2M73D7W	16QAM
LTE Band 4	27	1711.5 - 1753.5	0.157	21.95	2M73D7W	64QAM
LTE Band 4	27	1712.5 - 1752.5	0.262	24.19	4M55G7W	QPSK
LTE Band 4	27	1712.5 - 1752.5	0.226	23.54	4M54D7W	16QAM
LTE Band 4	27	1712.5 - 1752.5	0.155	21.90	4M55D7W	64QAM
LTE Band 4	27	1715 - 1750	0.262	24.19	9M06G7W	QPSK
LTE Band 4	27	1715 - 1750	0.218	23.39	9M05D7W	16QAM
LTE Band 4	27	1715 - 1750	0.152	21.83	9M08D7W	64QAM
LTE Band 4	27	1717.5 - 1747.5	0.262	24.19	13M7G7W	QPSK
LTE Band 4	27	1717.5 - 1747.5	0.229	23.59	13M6D7W	16QAM
LTE Band 4	27	1717.5 - 1747.5	0.157	21.96	13M6D7W	64QAM
LTE Band 4	27	1720 - 1745	0.262	24.19	18M1G7W	QPSK
LTE Band 4	27	1720 - 1745	0.217	23.36	18M1D7W	16QAM
LTE Band 4	27	1720 - 1745	0.167	22.23	18M1D7W	64QAM
LTE Band 66	27	1710.7 - 1779.3	0.262	24.19	1M11G7W	QPSK
LTE Band 66	27	1710.7 - 1779.3	0.223	23.49	1M11D7W	16QAM
LTE Band 66	27	1710.7 - 1779.3	0.171	22.34	1M11D7W	64QAM
LTE Band 66	27	1711.5 - 1778.5	0.262	24.19	2M73G7W	QPSK
LTE Band 66	27	1711.5 - 1778.5	0.223	23.49	2M73D7W	16QAM
LTE Band 66	27	1711.5 - 1778.5	0.171	22.33	2M73D7W	64QAM
LTE Band 66	27	1712.5 - 1777.5	0.262	24.19	4M55G7W	QPSK
LTE Band 66	27	1712.5 - 1777.5	0.226	23.54	4M54D7W	16QAM
LTE Band 66	27	1712.5 - 1777.5	0.176	22.46	4M55D7W	64QAM
LTE Band 66	27	1715 - 1775	0.262	24.19	9M06G7W	QPSK
LTE Band 66	27	1715 - 1775	0.223	23.48	9M05D7W	16QAM
LTE Band 66	27	1715 - 1775	0.169	22.28	9M08D7W	64QAM
LTE Band 66	27	1717.5 - 1772.5	0.262	24.19	13M7G7W	QPSK
LTE Band 66	27	1717.5 - 1772.5	0.231	23.63	13M6D7W	16QAM
LTE Band 66	27	1717.5 - 1772.5	0.174	22.40	13M6D7W	64QAM
LTE Band 66	27	1720 - 1770	0.262	24.19	18M1G7W	QPSK
LTE Band 66	27	1720 - 1770	0.229	23.59	18M1D7W	16QAM
LTE Band 66	27	1720 - 1770	0.176	22.46	18M1D7W	64QAM
LTE Band 2	24E	1850.7 - 1909.3	0.379	25.79	1M11G7W	QPSK
LTE Band 2	24E	1850.7 - 1909.3	0.301	24.78	1M11D7W	16QAM
LTE Band 2	24E	1850.7 - 1909.3	0.226	23.54	1M11D7W	64QAM
LTE Band 2	24E	1851.5 - 1908.5	0.374	25.73	2M72G7W	QPSK
LTE Band 2	24E	1851.5 - 1908.5	0.294	24.68	2M73D7W	16QAM
LTE Band 2	24E	1851.5 - 1908.5	0.223	23.49	2M73D7W	64QAM
LTE Band 2	24E	1852.5 - 1907.5	0.379	25.79	4M55G7W	QPSK
LTE Band 2	24E	1852.5 - 1907.5	0.295	24.70	4M55D7W	16QAM
LTE Band 2	24E	1852.5 - 1907.5	0.229	23.59	4M53D7W	64QAM
LTE Band 2	24E	1855 - 1905	0.378	25.78	9M06G7W	QPSK
LTE Band 2	24E	1855 - 1905	0.301	24.79	9M06D7W	16QAM
LTE Band 2	24E	1855 - 1905	0.224	23.50	9M05D7W	64QAM
LTE Band 2	24E	1857.5 - 1902.5	0.375	25.74	13M6G7W	QPSK
LTE Band 2	24E	1857.5 - 1902.5	0.294	24.69	13M6D7W	16QAM
LTE Band 2	24E	1857.5 - 1902.5	0.222	23.46	13M6D7W	64QAM
LTE Band 2	24E	1860 - 1900	0.376	25.75	18M1G7W	QPSK
LTE Band 2	24E	1860 - 1900	0.298	24.74	18M1D7W	16QAM
LTE Band 2	24E	1860 - 1900	0.229	23.59	18M1D7W	64QAM
LTE Band 25	24E	1850.7 - 1914.3	0.379	25.79	1M11G7W	QPSK
LTE Band 25	24E	1850.7 - 1914.3	0.328	25.16	1M11D7W	16QAM
LTE Band 25	24E	1850.7 - 1914.3	0.247	23.93	1M11D7W	64QAM
LTE Band 25	24E	1851.5 - 1913.5	0.379	25.79	2M72G7W	QPSK
LTE Band 25	24E	1851.5 - 1913.5	0.327	25.15	2M73D7W	16QAM
LTE Band 25	24E	1851.5 - 1913.5	0.255	24.06	2M73D7W	64QAM
LTE Band 25	24E	1852.5 - 1912.5	0.379	25.79	4M55G7W	QPSK
LTE Band 25	24E	1852.5 - 1912.5	0.326	25.13	4M55D7W	16QAM
LTE Band 25	24E	1852.5 - 1912.5	0.252	24.01	4M53D7W	64QAM
LTE Band 25	24E	1855 - 1910	0.379	25.79	9M06G7W	QPSK
LTE Band 25	24E	1855 - 1910	0.327	25.14	9M06D7W	16QAM
LTE Band 25	24E	1855 - 1910	0.249	23.96	9M05D7W	64QAM
LTE Band 25	24E	1857.5 - 1907.5	0.379	25.79	13M6G7W	QPSK
LTE Band 25	24E	1857.5 - 1907.5	0.325	25.12	13M6D7W	16QAM
LTE Band 25	24E	1857.5 - 1907.5	0.257	24.10	13M6D7W	64QAM
LTE Band 25	24E	1860 - 1905	0.379	25.79	18M1G7W	QPSK
LTE Band 25	24E	1860 - 1905	0.321	25.06	18M1D7W	16QAM
LTE Band 25	24E	1860 - 1905	0.270	24.31	18M1D7W	64QAM

### EUT Overview (Mid Bands)

FCC ID: BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 4 of 338

Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 30	27	2307.5 - 2312.5	0.219	23.40	4M57G7W	QPSK
LTE Band 30	27	2307.5 - 2312.5	0.180	22.56	4M54D7W	16QAM
LTE Band 30	27	2307.5 - 2312.5	0.153	21.86	4M55D7W	64QAM
LTE Band 30	27	2310	0.219	23.40	9M05G7W	QPSK
LTE Band 30	27	2310	0.185	22.66	9M04D7W	16QAM
LTE Band 30	27	2310	0.150	21.75	9M06D7W	64QAM
LTE Band 7	27	2502.5 - 2567.5	0.332	25.21	4M56G7W	QPSK
LTE Band 7	27	2502.5 - 2567.5	0.293	24.67	4M54D7W	16QAM
LTE Band 7	27	2502.5 - 2567.5	0.215	23.33	4M53D7W	64QAM
LTE Band 7	27	2505 - 2565	0.339	25.30	9M07G7W	QPSK
LTE Band 7	27	2505 - 2565	0.301	24.79	9M07D7W	16QAM
LTE Band 7	27	2505 - 2565	0.221	23.44	9M04D7W	64QAM
LTE Band 7	27	2507.5 - 2562.5	0.341	25.33	13M6G7W	QPSK
LTE Band 7	27	2507.5 - 2562.5	0.308	24.88	13M6D7W	16QAM
LTE Band 7	27	2507.5 - 2562.5	0.228	23.57	13M6D7W	64QAM
LTE Band 7	27	2510 - 2560	0.330	25.18	18M1G7W	QPSK
LTE Band 7	27	2510 - 2560	0.318	25.03	18M1D7W	16QAM
LTE Band 7	27	2510 - 2560	0.225	23.52	18M1D7W	64QAM
LTE Band 41	27	2498.5 - 2687.5	0.490	26.90	4M58G7W	QPSK
LTE Band 41	27	2498.5 - 2687.5	0.424	26.27	4M53D7W	16QAM
LTE Band 41	27	2498.5 - 2687.5	0.341	25.33	4M56D7W	64QAM
LTE Band 41	27	2501 - 2685	0.489	26.89	9M15G7W	QPSK
LTE Band 41	27	2501 - 2685	0.431	26.34	9M10D7W	16QAM
LTE Band 41	27	2501 - 2685	0.324	25.11	9M16D7W	64QAM
LTE Band 41	27	2503.5 - 2682.5	0.483	26.84	13M7G7W	QPSK
LTE Band 41	27	2503.5 - 2682.5	0.431	26.34	13M7D7W	16QAM
LTE Band 41	27	2503.5 - 2682.5	0.320	25.05	13M6D7W	64QAM
LTE Band 41	27	2506 - 2680	0.490	26.90	18M1G7W	QPSK
LTE Band 41	27	2506 - 2680	0.418	26.21	18M1D7W	16QAM
LTE Band 41	27	2506 - 2680	0.327	25.15	18M1D7W	64QAM

**EUT Overview (High Bands)**

<b>FCC ID:</b> BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device	Page 5 of 338

# 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 v01.

## 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 ISED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISED.

<b>FCC ID:</b> BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device	Page 6 of 338



## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2123**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

**Test Device Serial No.:** DLXXT001LT6G, DLXXT00NLT6H

### 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, HDR4, HDR8)

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 as well as Band 26.

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.

### 2.3 Antenna Description

Following antenna was used for the testing.

Antennas	
Port A	Port B
WF3	WF5

**Table 2-1. Antennas vs Ports**

Frequency [MHz]	Antenna Gain (dBi)	
	Port A	Port B
700-800	-0.16	0.01
820-960	0.49	0.36
1700-1800	-1.31	-1.08
1820-2100	0.29	-0.61
2300-2520	-0.1	0.15
2540-2700	-0.81	0.56

**Table 2-2. Antenna Peak Gain**

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 7 of 338

## 2.4 Test Support Equipment

1	Apple MacBook w/AC/DC Adapter	Model: A1398 Model: A1435	S/N: C2QKP008F6F3 S/N: C04325505K1F288BG
2	Apple Lightning Cable	Model: Kanzi	S/N: 3252E9
3	USB Lightning Cable w/ AC Adapter	Model: N/A Model: A1385	S/N: N/A S/N: D292066H2NLDHLHAE
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 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.

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 16E31520i 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.

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 8 of 338



## 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:

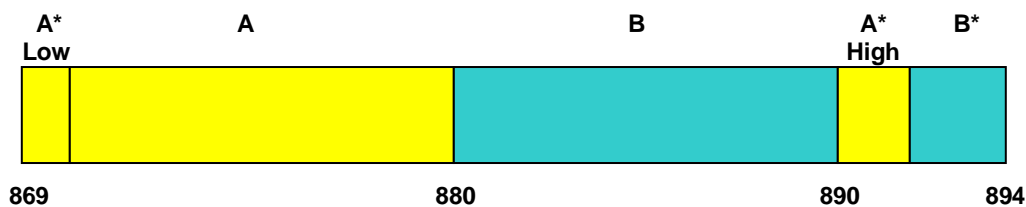
- Block A: 698-704 MHz and 728-734 MHz;
- Block B: 704-710 MHz and 734-740 MHz; and
- Block C: 710-716 MHz and 740-746 MHz

### 3.4 600MHz Frequency Range

600MHz band. The following frequencies are available for licensing pursuant to this part in the 600 MHz band: (1) Seven paired channel blocks of 5 megahertz each are available for assignment as follows:

- Block A: 617-622 MHz and 663-668 MHz;
- Block B: 622-627 MHz and 668-673 MHz;
- Block C: 627-632 MHz and 673-678 MHz;
- Block D: 632-637 MHz and 678-683 MHz;
- Block E: 637-642 MHz and 683-688 MHz;
- Block F: 642-647 MHz and 688-693 MHz; and
- Block G: 647-652 MHz and 693-698 MHz

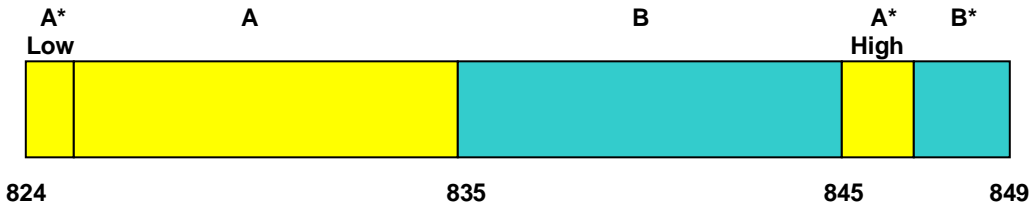
### 3.5 Cellular - Base Frequency Blocks



- BLOCK 1: 869 – 880 MHz (A\* Low + A)
- BLOCK 3: 890 – 891.5 MHz (A\* High)
- BLOCK 2: 880 – 890 MHz (B)
- BLOCK 4: 891.5 – 894 MHz (B\*)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 9 of 338

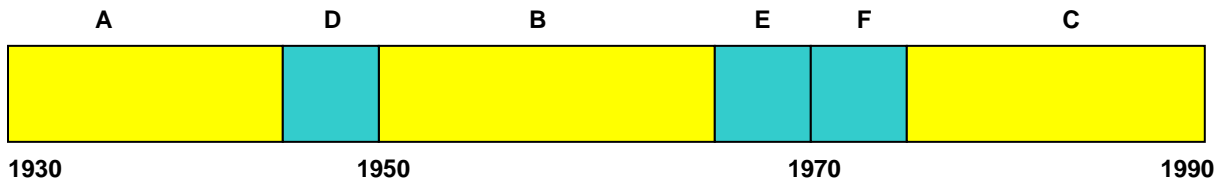
### 3.6 Cellular - Mobile Frequency Blocks



**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\*)

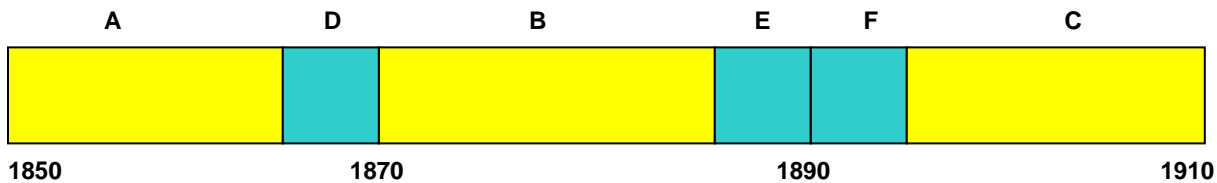
### 3.7 PCS - Base Frequency Blocks



**BLOCK 1:** 1930 – 1945 MHz (A)  
**BLOCK 2:** 1945 – 1950 MHz (D)  
**BLOCK 3:** 1950 – 1965 MHz (B)

**BLOCK 4:** 1965 – 1970 MHz (E)  
**BLOCK 5:** 1970 – 1975 MHz (F)  
**BLOCK 6:** 1975 – 1990 MHz (C)

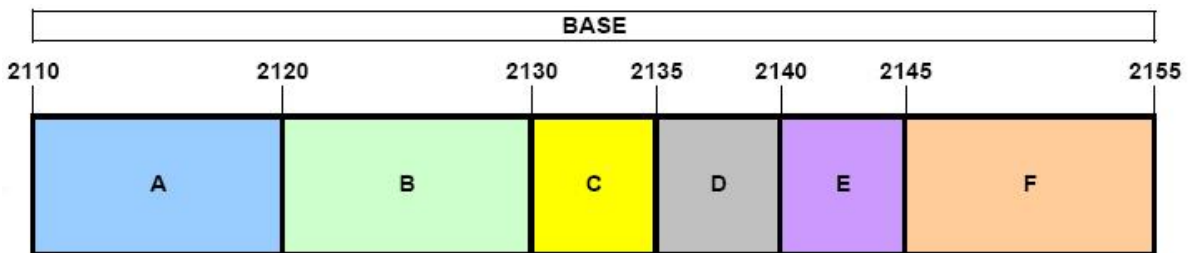
### 3.8 PCS - Mobile Frequency Blocks



**BLOCK 1:** 1850 – 1865 MHz (A)  
**BLOCK 2:** 1865 – 1870 MHz (D)  
**BLOCK 3:** 1870 – 1885 MHz (B)

**BLOCK 4:** 1885 – 1890 MHz (E)  
**BLOCK 5:** 1890 – 1895 MHz (F)  
**BLOCK 6:** 1895 – 1910 MHz (C)

### 3.9 AWS - Base Frequency Blocks

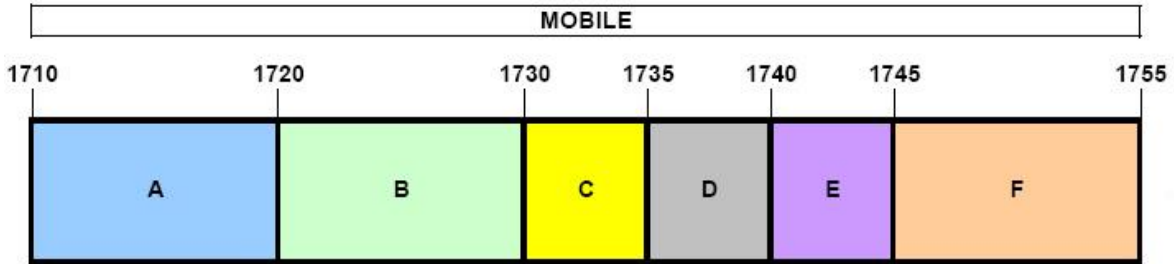


**BLOCK 1:** 2110 – 2120 MHz (A)  
**BLOCK 2:** 2120 – 2130 MHz (B)  
**BLOCK 3:** 2130 – 2135 MHz (C)

**BLOCK 4:** 2135 – 2140 MHz (D)  
**BLOCK 5:** 2140 – 2145 MHz (E)  
**BLOCK 6:** 2145 – 2155 MHz (F)

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT</b> (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 10 of 338

### 3.10 AWS - Mobile Frequency Blocks



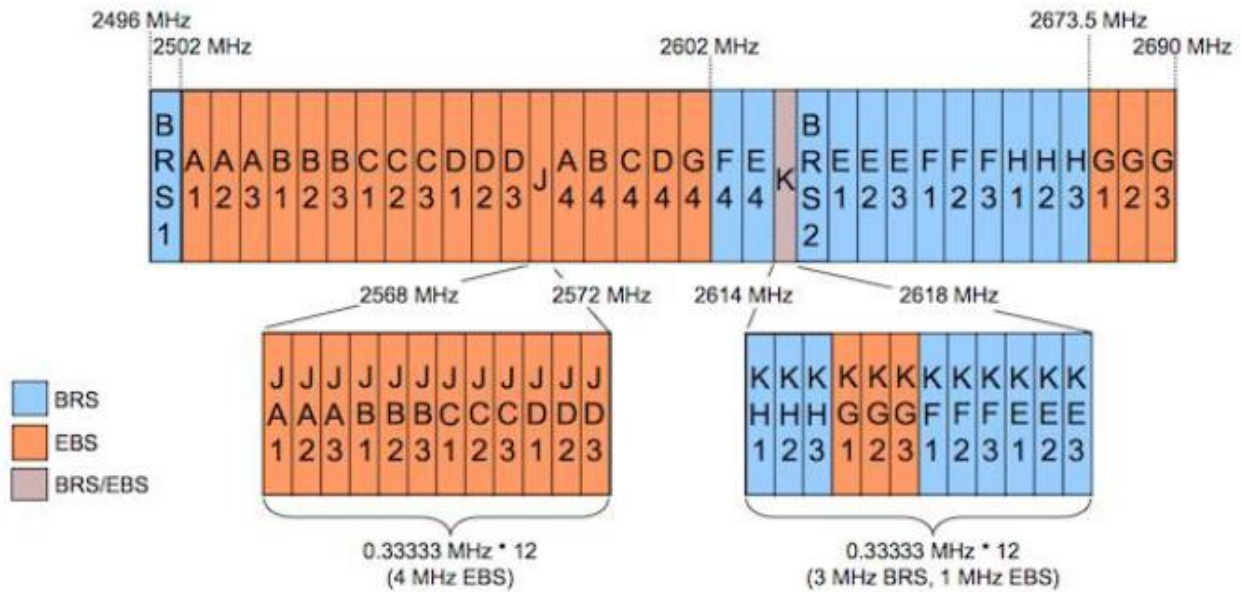
- BLOCK 1: 1710 – 1720 MHz (A)
- BLOCK 2: 1720 – 1730 MHz (B)
- BLOCK 3: 1730 – 1735 MHz (C)
- BLOCK 4: 1735 – 1740 MHz (D)
- BLOCK 5: 1740 – 1745 MHz (E)
- BLOCK 6: 1745 – 1755 MHz (F)

### 3.11 WCS – Mobile/Base Frequency Blocks

The following frequencies are available for WCS in the 2305-2320 MHz and 2345-2360 MHz bands:

- BLOCK 1: 2305-2310 and 2350-2355 MHz (A)
- BLOCK 2: 2310-2315 and 2355-236 MHz (B)
- BLOCK 3: 2315-2320 MHz (C)
- BLOCK 4: 2345-2350 MHz (D)

### 3.12 BRS/EBS Frequency Block



FCC ID: BCGA2123	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 11 of 338

### 3.13 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 dB (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  $70 + 10\log_{10}(\text{Power [Watts]})$ .

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 12 of 338

## 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  $U_{\text{CISPR}}$  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

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 13 of 338

## 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
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	3/13/2018	Annual	3/13/2019	T058601-02
COM-POWER	LIN-120A	LISN	3/7/2018	Annual	3/7/2019	241296
ESPEC	SU-241	Temperature Chamber	8/10/2018	Annual	8/10/2019	92009574
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	2/27/2018	Annual	2/27/2019	MY49430244
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	2/6/2018	Annual	2/6/2019	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	7/19/2018	Annual	7/19/2019	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/20/2018	Annual	11/20/2019	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/11/2018	Annual	6/11/2019	161675
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/16/2018	Annual	4/16/2019	161617
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2018	Annual	11/16/2019	164175
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	6/11/2018	Annual	6/11/2019	100051
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	1/25/2018	Annual	1/25/2019	102333
Rohde & Schwarz	HL562E	Ultra Broadband Antenna (30MHz - 6GHz)	6/8/2018	Annual	6/8/2019	100810
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	3/13/2018	Annual	3/13/2019	100519

**Table 5-1. Test Equipment**

**Notes:**

1. 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.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 14 of 338

## 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 2<sup>nd</sup> 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).

<b>FCC ID:</b> BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device
		Page 15 of 338



## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCGA2123  
 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 2.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Out of Band Emissions	> 43 + 10log <sub>10</sub> (P[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 dB			Section 7.5
2.1046	Transmitter Conducted Output Power	N/A			See RF Exposure Report
2.1046	Additional Maximum Power Reduction (A-MPR)	N/A			Section 7.6
27.53(m)	Uplink Carrier Aggregation	Undesirable emissions much meet the limits pdetailed in 27.53(m)			Section 7.7
2.1055 22.355 24.235 27.54	Frequency Stability	< 2.5 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**

<b>FCC ID:</b> BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device	Page 16 of 338

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) 27.50(d)(5)	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 + 10log <sub>10</sub> (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 + 10log <sub>10</sub> (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.

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 17 of 338

## 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.

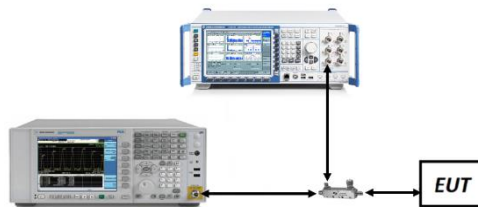


Figure 7-1. Test Instrument & Measurement Setup

### Test Notes

None.

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 18 of 338	

Mode	BW (MHz)	Modulation	Occupied BW (kHz)
LTE Band 12	1.4	QPSK	1106.8
LTE Band 12	1.4	16QAM	1114.4
LTE Band 12	1.4	64QAM	1111.7
LTE Band 12	3	QPSK	2732.2
LTE Band 12	3	16QAM	2730.2
LTE Band 12	3	64QAM	2729.0
LTE Band 12	5	QPSK	4553.7
LTE Band 12	5	16QAM	4551.3
LTE Band 12	5	64QAM	4558.5
LTE Band 12	10	QPSK	9055.9
LTE Band 12	10	16QAM	9029.9
LTE Band 12	10	64QAM	9063.1
LTE Band 17	5	QPSK	4553.7
LTE Band 17	5	16QAM	4551.3
LTE Band 17	5	64QAM	4558.5
LTE Band 17	10	QPSK	9055.9
LTE Band 17	10	16QAM	9029.9
LTE Band 17	10	64QAM	9063.1
LTE Band 13	5	QPSK	4552.3
LTE Band 13	5	16QAM	4540.3
LTE Band 13	5	64QAM	4558.7
LTE Band 13	10	QPSK	9036.9
LTE Band 13	10	16QAM	9021.1
LTE Band 13	10	64QAM	9033.0
LTE Band 5	1.4	QPSK	1109.6
LTE Band 5	1.4	16QAM	1113.2
LTE Band 5	1.4	64QAM	1109.1
LTE Band 5	3	QPSK	2731.1
LTE Band 5	3	16QAM	2729.3
LTE Band 5	3	64QAM	2731.4
LTE Band 5	5	QPSK	4552.9
LTE Band 5	5	16QAM	4550.4
LTE Band 5	5	64QAM	4545.5
LTE Band 5	10	QPSK	9085.2
LTE Band 5	10	16QAM	9055.7
LTE Band 5	10	64QAM	9042.1
LTE Band 26	1.4	QPSK	1109.6
LTE Band 26	1.4	16QAM	1113.2
LTE Band 26	1.4	64QAM	1109.1
LTE Band 26	3	QPSK	2731.1
LTE Band 26	3	16QAM	2729.3
LTE Band 26	3	64QAM	2731.4
LTE Band 26	5	QPSK	4552.9
LTE Band 26	5	16QAM	4550.4
LTE Band 26	5	64QAM	4545.5
LTE Band 26	10	QPSK	9085.2
LTE Band 26	10	16QAM	9055.7
LTE Band 26	10	64QAM	9042.1

**Table 7-3. Occupied Bandwidth (Low Bands)**

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 19 of 338

Mode	BW (MHz)	Modulation	Occupied BW (kHz)
LTE Band 4	1.4	QPSK	1107.5
LTE Band 4	1.4	16QAM	1106.4
LTE Band 4	1.4	64QAM	1108.0
LTE Band 4	3	QPSK	2727.5
LTE Band 4	3	16QAM	2729.9
LTE Band 4	3	64QAM	2727.6
LTE Band 4	5	QPSK	4551.9
LTE Band 4	5	16QAM	4536.4
LTE Band 4	5	64QAM	4545.8
LTE Band 4	10	QPSK	9055.4
LTE Band 4	10	16QAM	9048.6
LTE Band 4	10	64QAM	9075.9
LTE Band 4	15	QPSK	13680.0
LTE Band 4	15	16QAM	13636.3
LTE Band 4	15	64QAM	13615.2
LTE Band 4	20	QPSK	18086.5
LTE Band 4	20	16QAM	18100.4
LTE Band 4	20	64QAM	18077.2
LTE Band 66	1.4	QPSK	1107.5
LTE Band 66	1.4	16QAM	1106.4
LTE Band 66	1.4	64QAM	1108.0
LTE Band 66	3	QPSK	2727.5
LTE Band 66	3	16QAM	2729.9
LTE Band 66	3	64QAM	2727.6
LTE Band 66	5	QPSK	4551.9
LTE Band 66	5	16QAM	4536.4
LTE Band 66	5	64QAM	4545.8
LTE Band 66	10	QPSK	9055.4
LTE Band 66	10	16QAM	9048.6
LTE Band 66	10	64QAM	9075.9
LTE Band 66	15	QPSK	13680.0
LTE Band 66	15	16QAM	13636.3
LTE Band 66	15	64QAM	13615.2
LTE Band 66	20	QPSK	18086.5
LTE Band 66	20	16QAM	18100.4
LTE Band 66	20	64QAM	18077.2
LTE Band 2	1.4	QPSK	1110.9
LTE Band 2	1.4	16QAM	1107.3
LTE Band 2	1.4	64QAM	1111.9
LTE Band 2	3	QPSK	2722.6
LTE Band 2	3	16QAM	2729.2
LTE Band 2	3	64QAM	2726.0
LTE Band 2	5	QPSK	4551.2
LTE Band 2	5	16QAM	4554.5
LTE Band 2	5	64QAM	4532.6
LTE Band 2	10	QPSK	9059.5
LTE Band 2	10	16QAM	9057.7
LTE Band 2	10	64QAM	9046.2
LTE Band 2	15	QPSK	13584.8
LTE Band 2	15	16QAM	13602.0
LTE Band 2	15	64QAM	13593.8
LTE Band 2	20	QPSK	18086.3
LTE Band 2	20	16QAM	18071.9
LTE Band 2	20	64QAM	18068.9
LTE Band 25	1.4	QPSK	1110.9
LTE Band 25	1.4	16QAM	1107.3
LTE Band 25	1.4	64QAM	1111.9
LTE Band 25	3	QPSK	2722.6
LTE Band 25	3	16QAM	2729.2
LTE Band 25	3	64QAM	2726.0
LTE Band 25	5	QPSK	4551.2
LTE Band 25	5	16QAM	4554.5
LTE Band 25	5	64QAM	4532.6
LTE Band 25	10	QPSK	9059.5
LTE Band 25	10	16QAM	9057.7
LTE Band 25	10	64QAM	9046.2
LTE Band 25	15	QPSK	13584.8
LTE Band 25	15	16QAM	13602.0
LTE Band 25	15	64QAM	13593.8
LTE Band 25	20	QPSK	18086.3
LTE Band 25	20	16QAM	18071.9
LTE Band 25	20	64QAM	18068.9

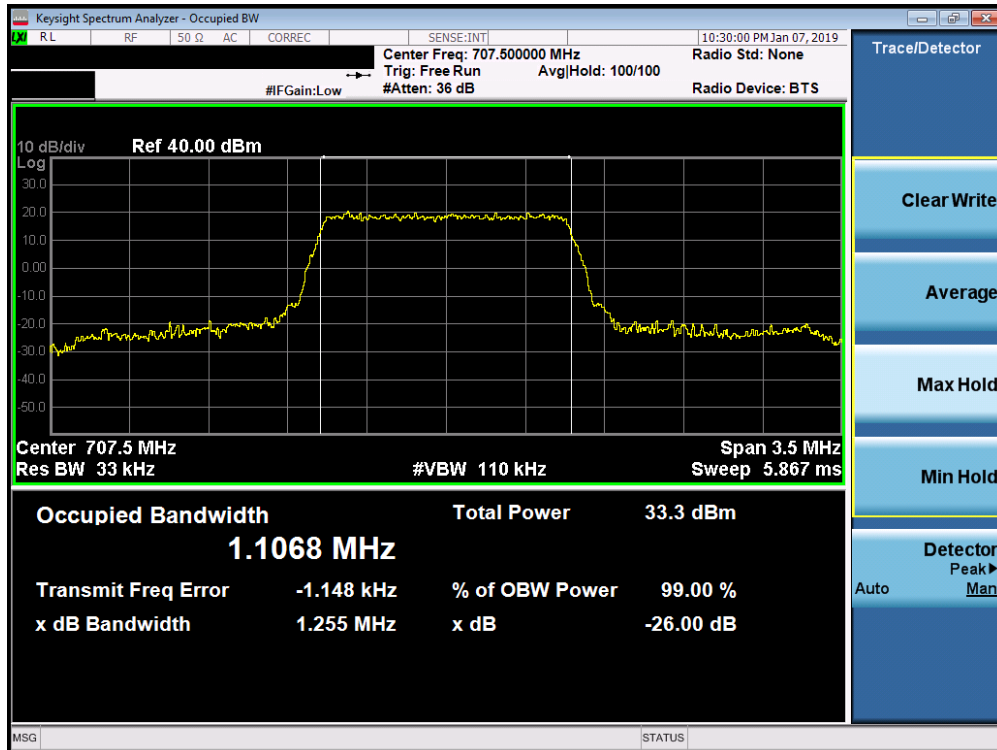
**Table 7-4. Occupied Bandwidth (Mid Bands)**

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 20 of 338

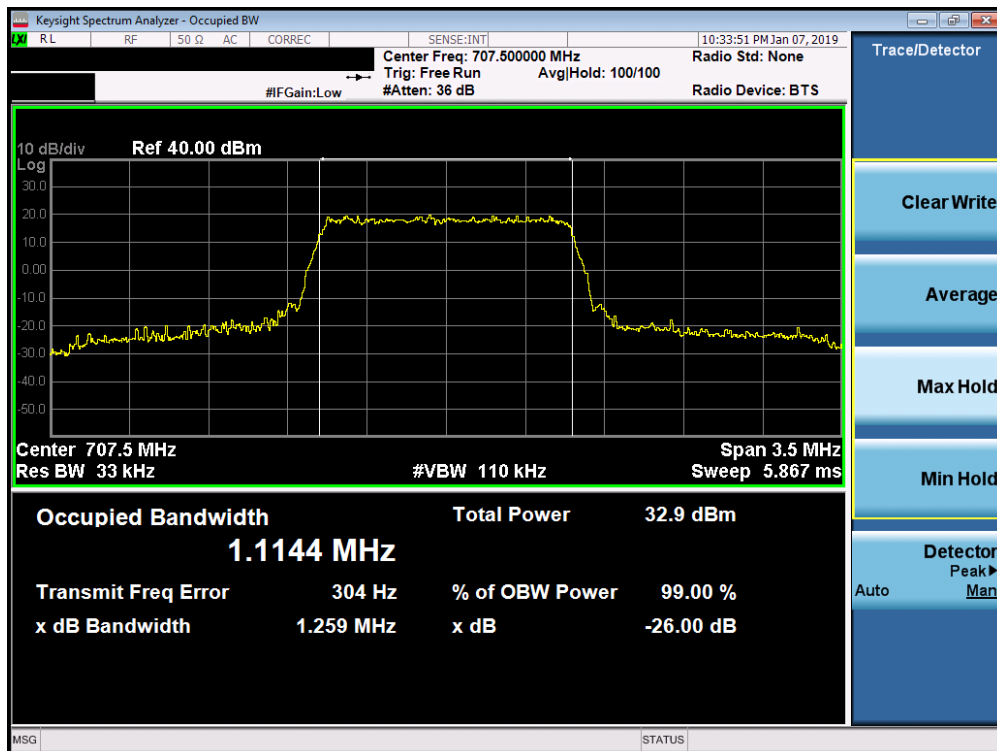
Mode	BW (MHz)	Modulation	Occupied BW (kHz)
LTE Band 30	5	QPSK	4570.1
LTE Band 30	5	16QAM	4540.3
LTE Band 30	5	64QAM	4547.4
LTE Band 30	10	QPSK	9051.5
LTE Band 30	10	16QAM	9035.1
LTE Band 30	10	64QAM	9059.7
LTE Band 7	5	QPSK	4556.9
LTE Band 7	5	16QAM	4541.9
LTE Band 7	5	64QAM	4534.4
LTE Band 7	10	QPSK	4666.4
LTE Band 7	10	16QAM	9068.9
LTE Band 7	10	64QAM	9044.7
LTE Band 7	15	QPSK	13606.7
LTE Band 7	15	16QAM	13587.3
LTE Band 7	15	64QAM	13612.3
LTE Band 7	20	QPSK	18104.2
LTE Band 7	20	16QAM	18120.3
LTE Band 7	20	64QAM	18123.8
LTE Band 41	5	QPSK	4580.5
LTE Band 41	5	16QAM	4530.4
LTE Band 41	5	64QAM	4558.8
LTE Band 41	10	QPSK	9148.0
LTE Band 41	10	16QAM	9099.0
LTE Band 41	10	64QAM	9158.1
LTE Band 41	15	QPSK	13540.3
LTE Band 41	15	16QAM	13679.2
LTE Band 41	15	64QAM	13648.2
LTE Band 41	20	QPSK	18229.8
LTE Band 41	20	16QAM	18145.5
LTE Band 41	20	64QAM	18122.2

**Table 7-5. Occupied Bandwidth (High Bands)**

<b>FCC ID:</b> BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1811080029-03-R1.BCG	<b>Test Dates:</b> 11/09/2018-02/02/2019	<b>EUT Type:</b> Tablet Device	Page 21 of 338



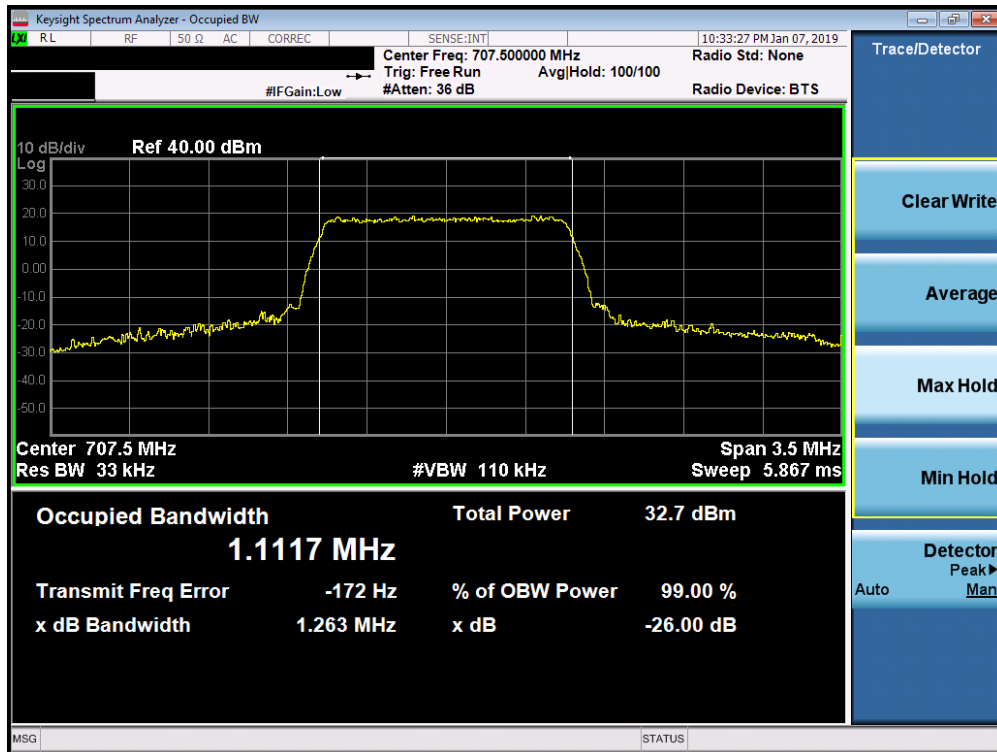
**Plot 7-1. Occupied Bandwidth Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)**



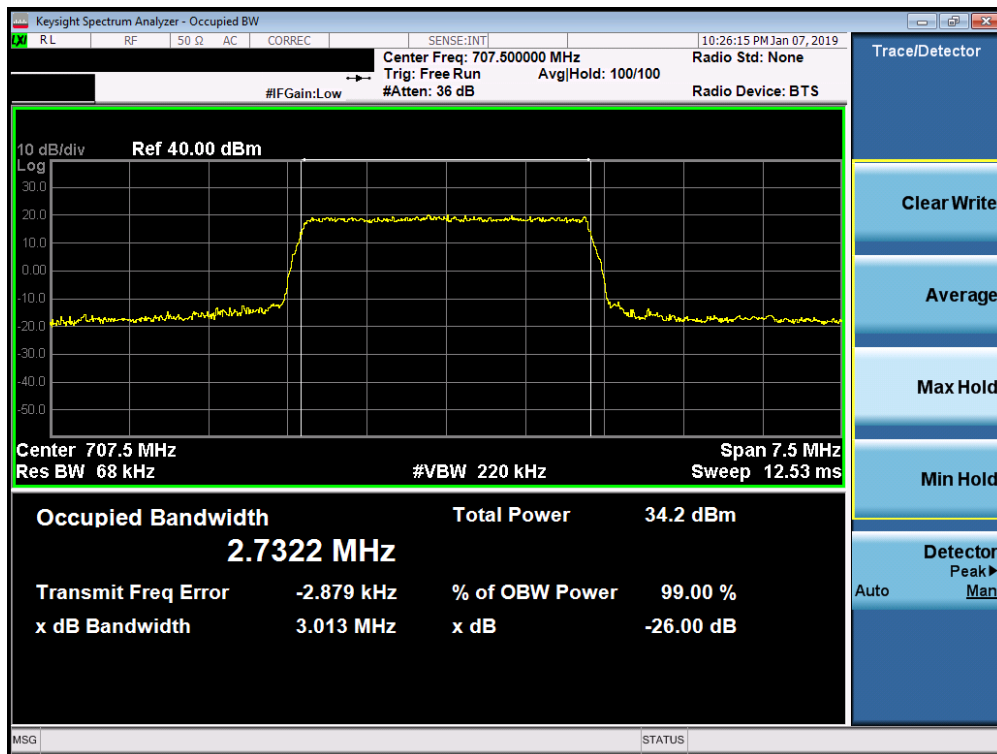
**Plot 7-2. Occupied Bandwidth Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		<b>MEASUREMENT REPORT</b> (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 22 of 338



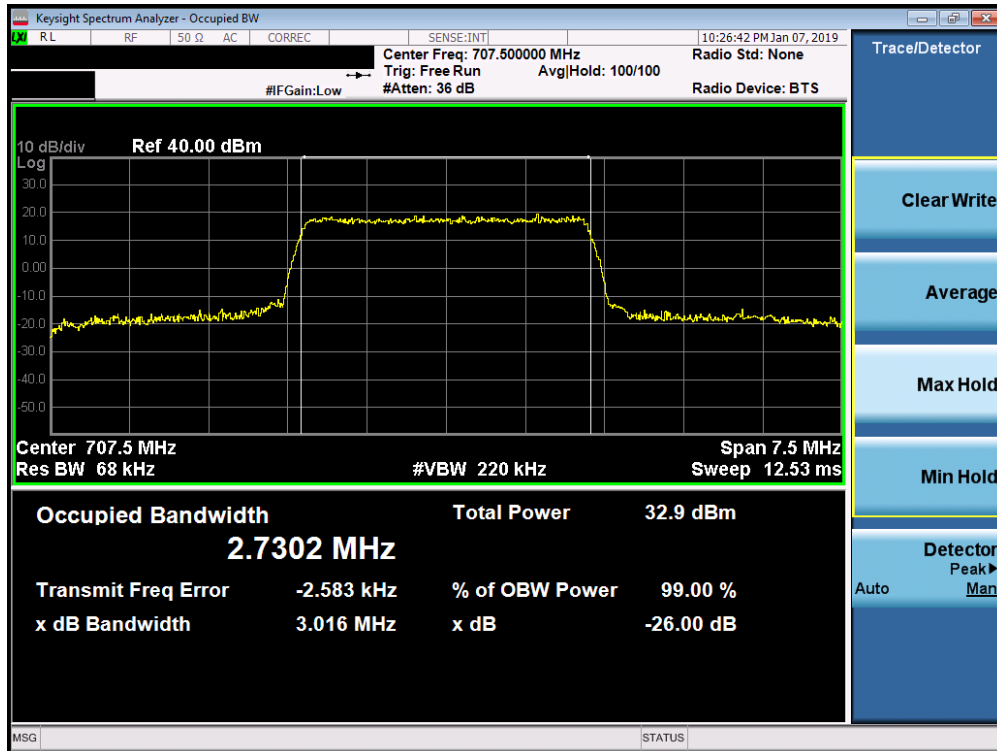


Plot 7-3. Occupied Bandwidth Plot (Band 12 - 1.4MHz 64-QAM - Full RB Configuration)

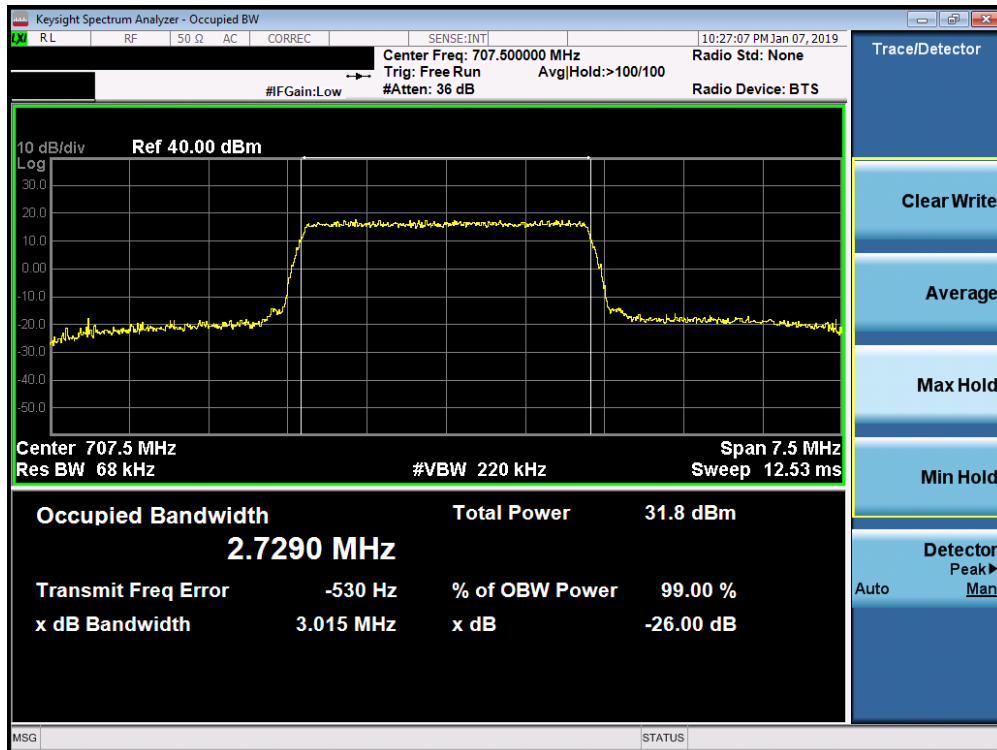


Plot 7-4. Occupied Bandwidth Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 23 of 338

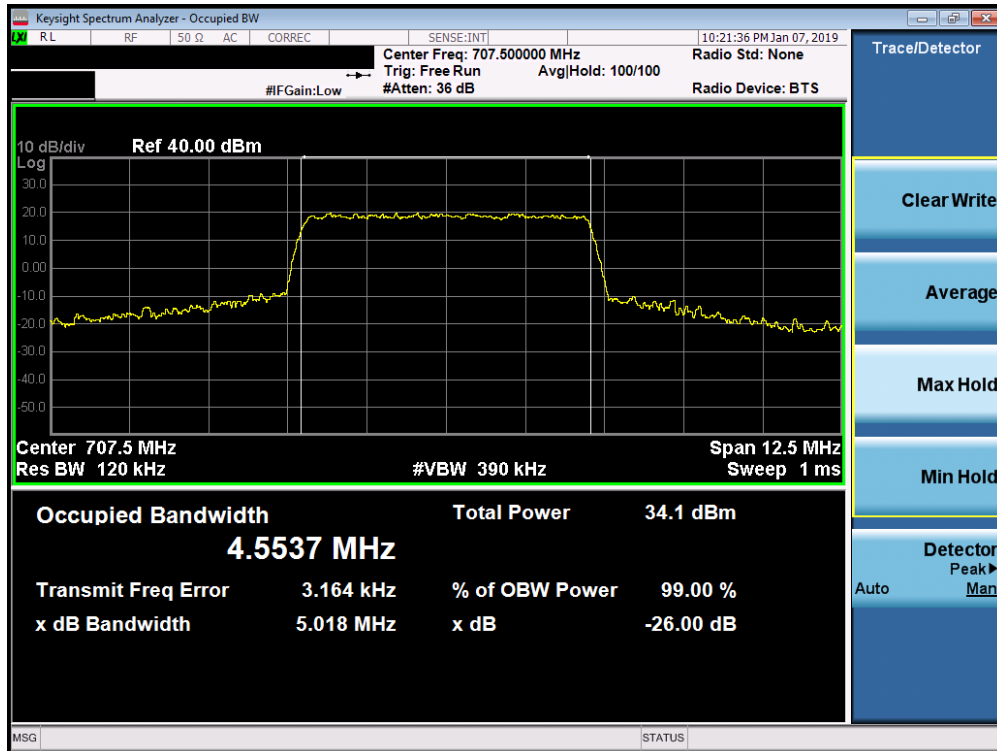


Plot 7-5. Occupied Bandwidth Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

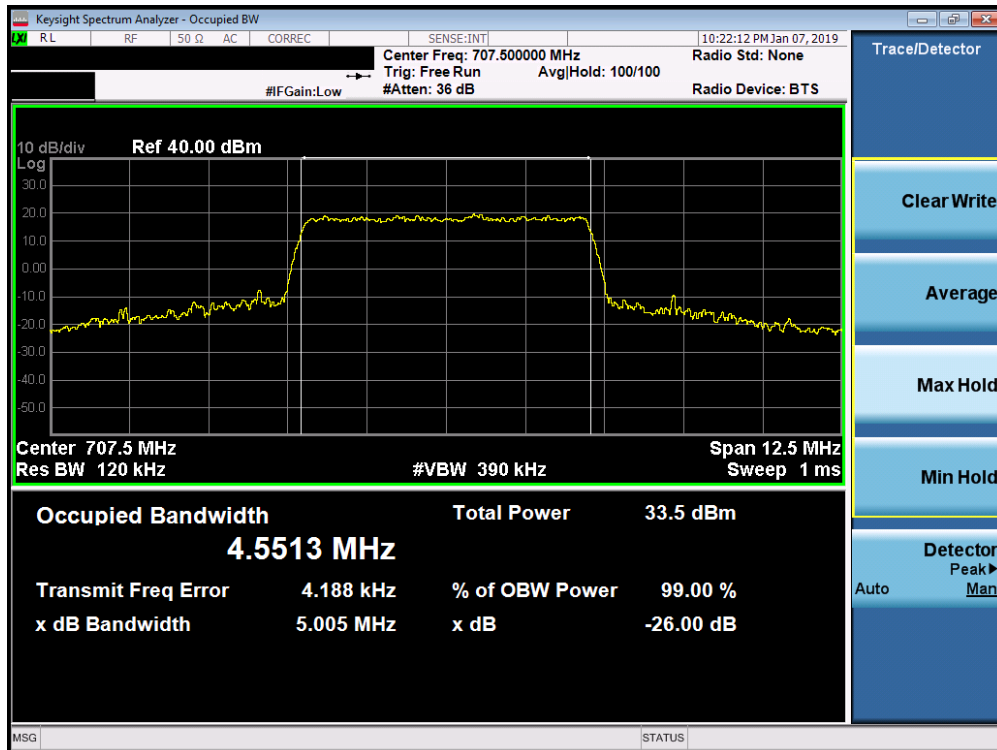


Plot 7-6. Occupied Bandwidth Plot (Band 12 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 24 of 338



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

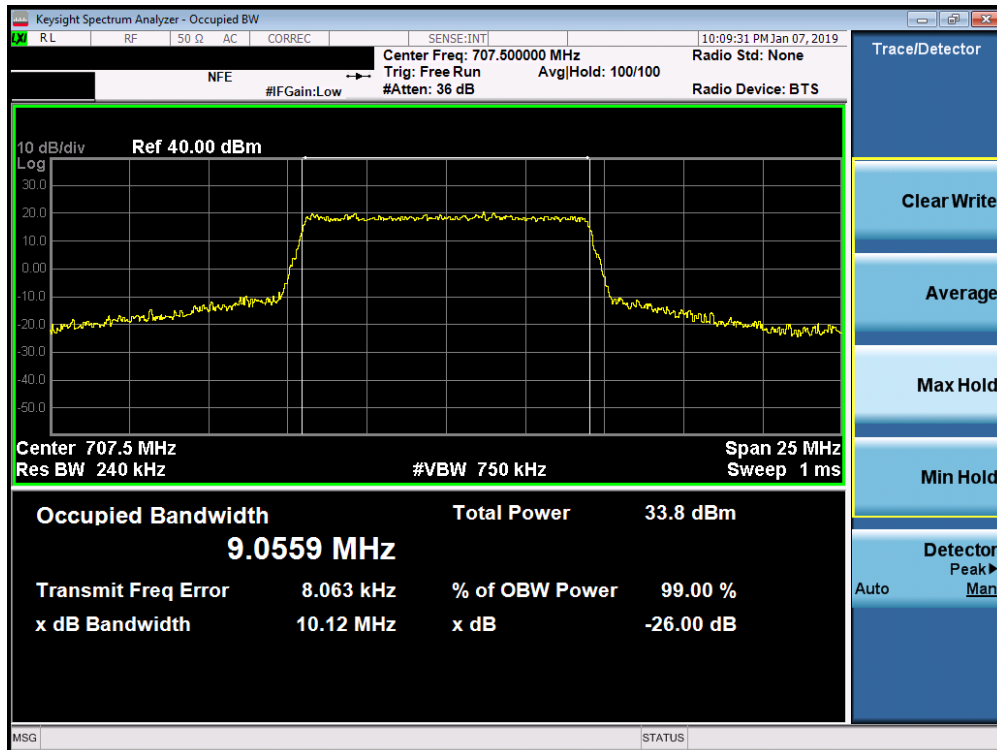


Plot 7-8. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT</b> (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 25 of 338

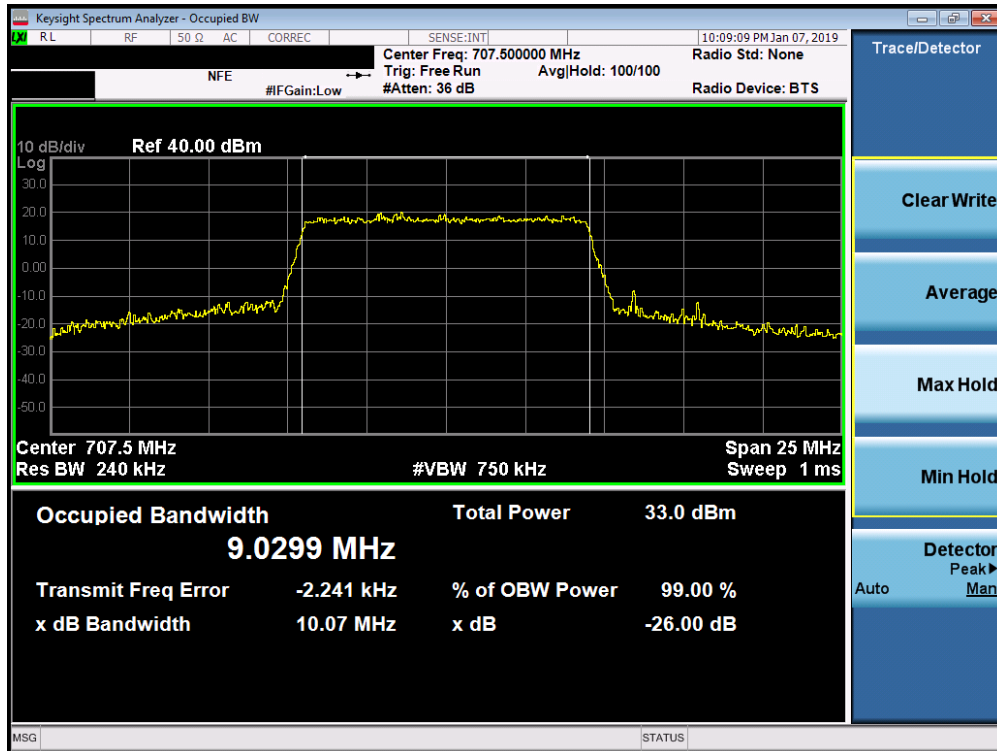


Plot 7-9. Occupied Bandwidth Plot (Band 12/17 - 5.0MHz 64-QAM - Full RB Configuration)



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

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 26 of 338



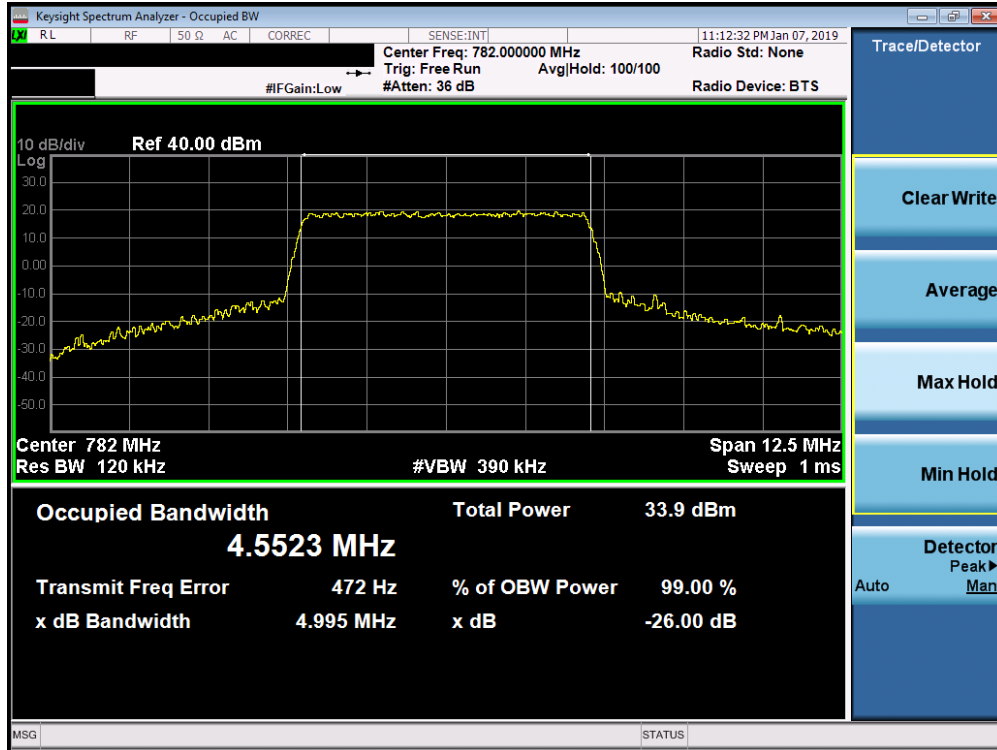
Plot 7-11. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz 16-QAM - Full RB Configuration)



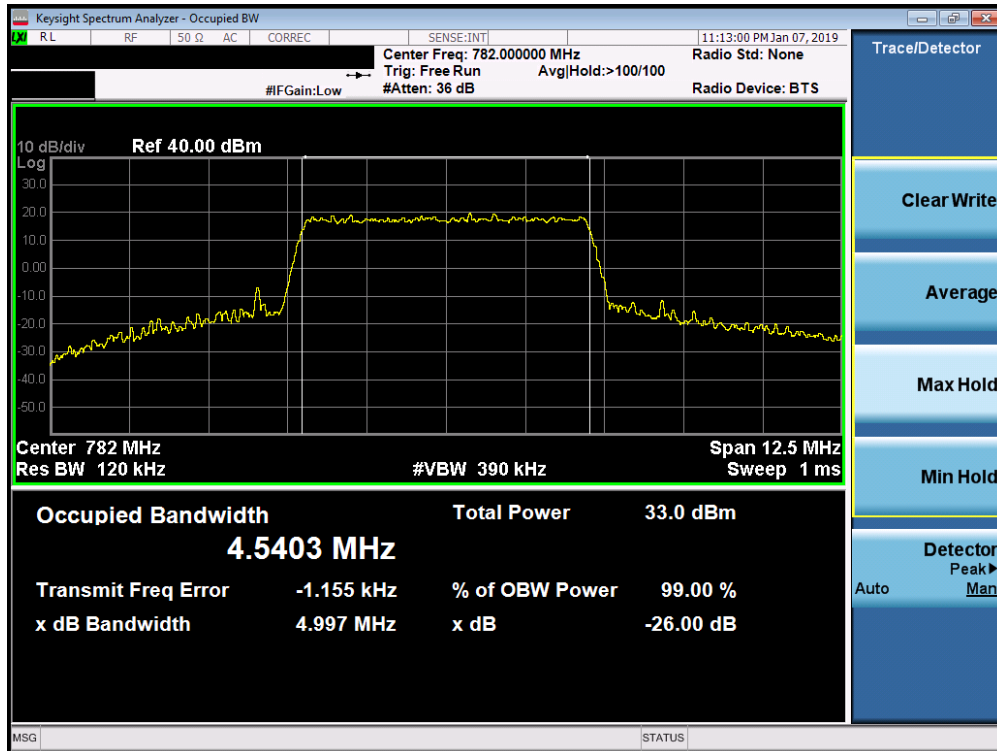
Plot 7-12. Occupied Bandwidth Plot (Band 12/17 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 27 of 338

**Band 13**



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

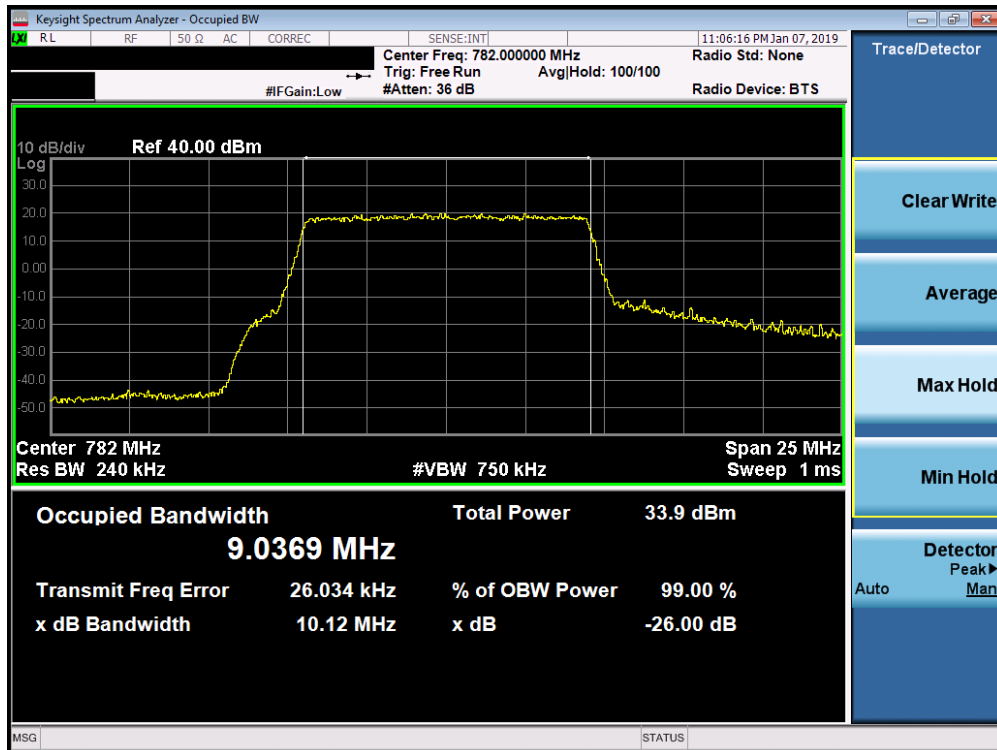


**Plot 7-14. Occupied Bandwidth Plot (Band 13 - 5.0MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 28 of 338



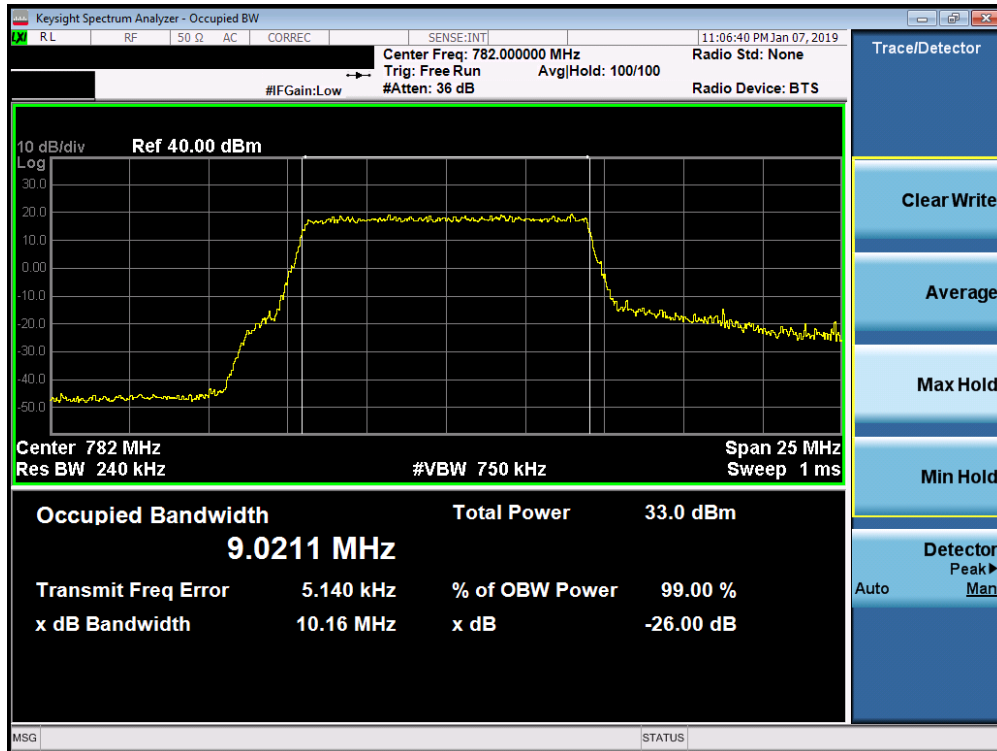
Plot 7-15. Occupied Bandwidth Plot (Band 13 - 5.0MHz 64-QAM - Full RB Configuration)



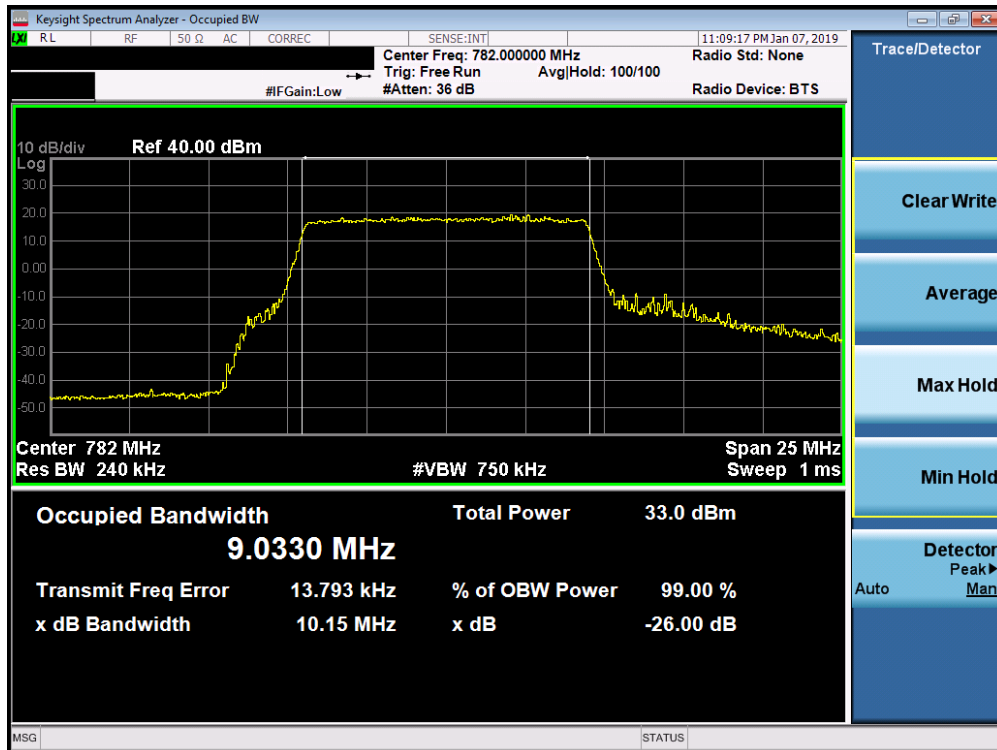
Plot 7-16. Occupied Bandwidth Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 29 of 338





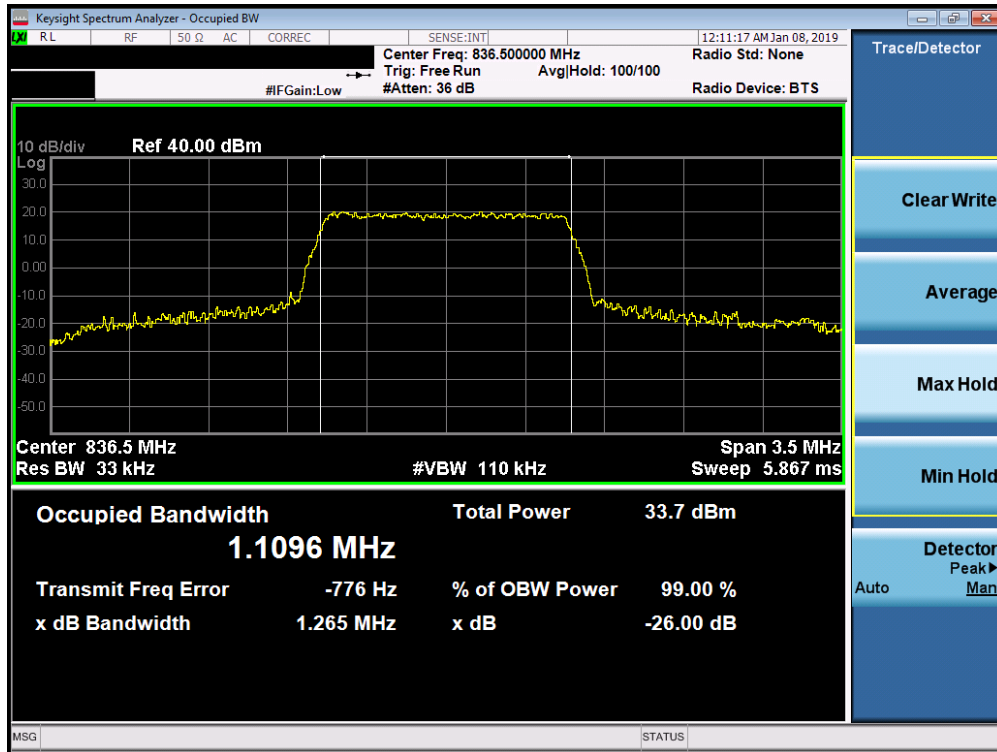
Plot 7-17. Occupied Bandwidth Plot (Band 13 - 10.0MHz 16-QAM - Full RB Configuration)



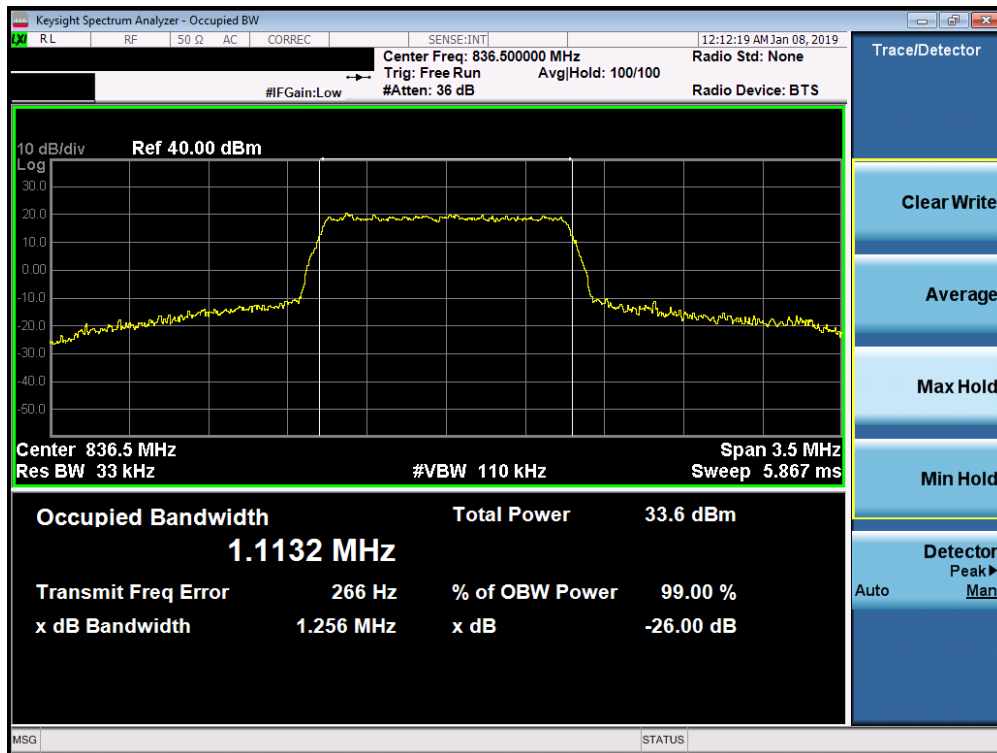
Plot 7-18. Occupied Bandwidth Plot (Band 13 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 30 of 338

**Band 26/5**

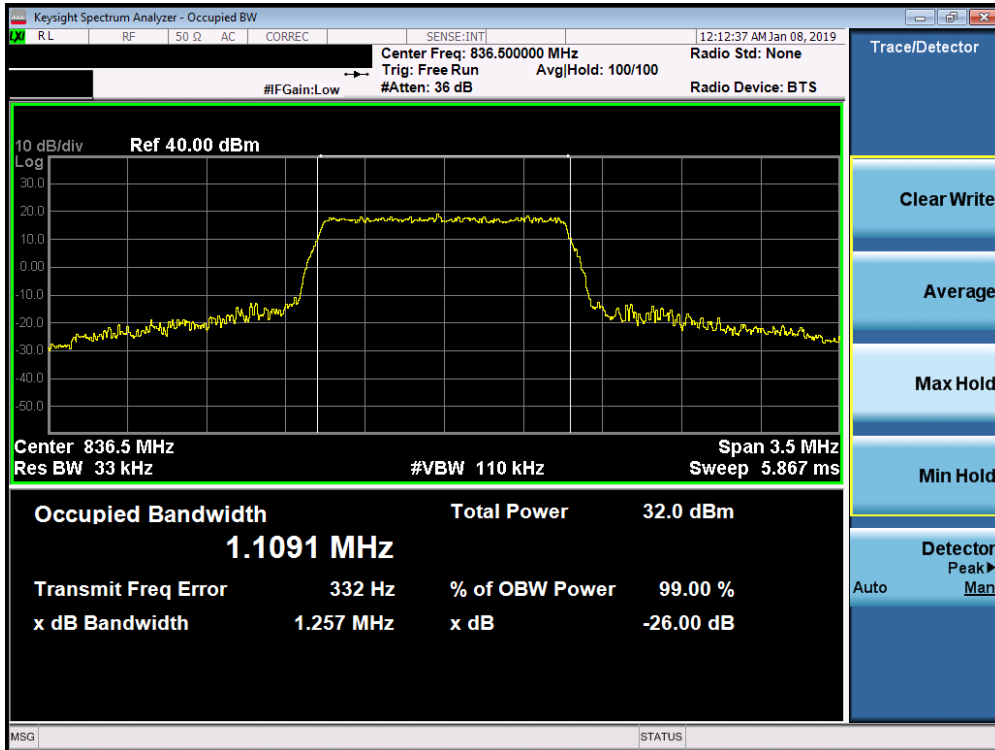


**Plot 7-19. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz QPSK - Full RB Configuration)**

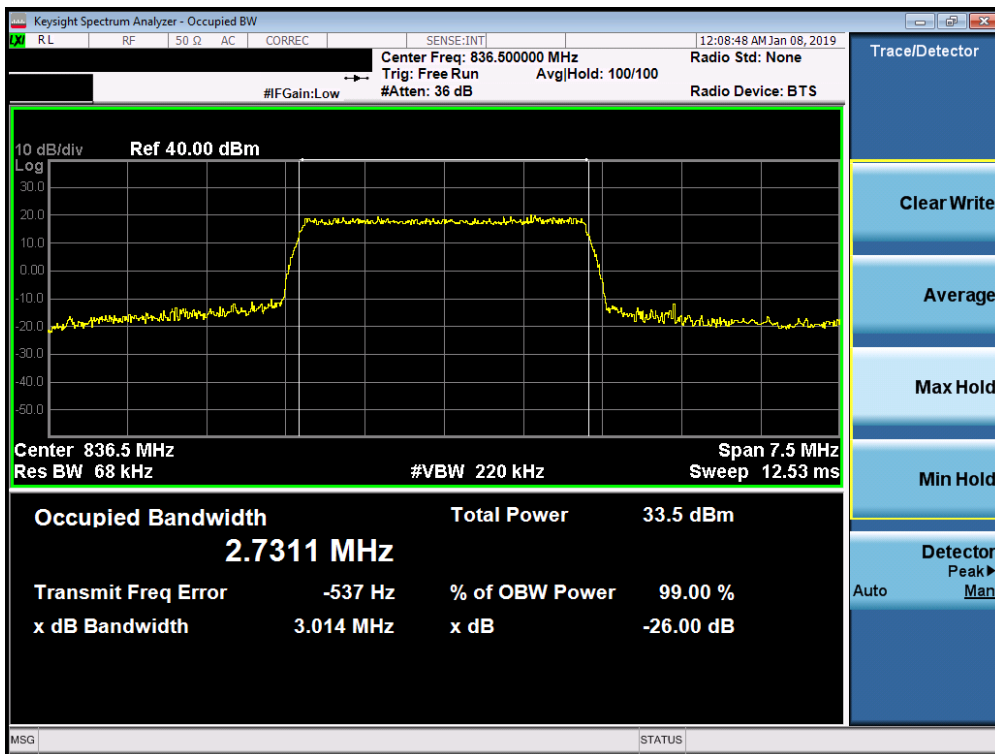


**Plot 7-20. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 31 of 338

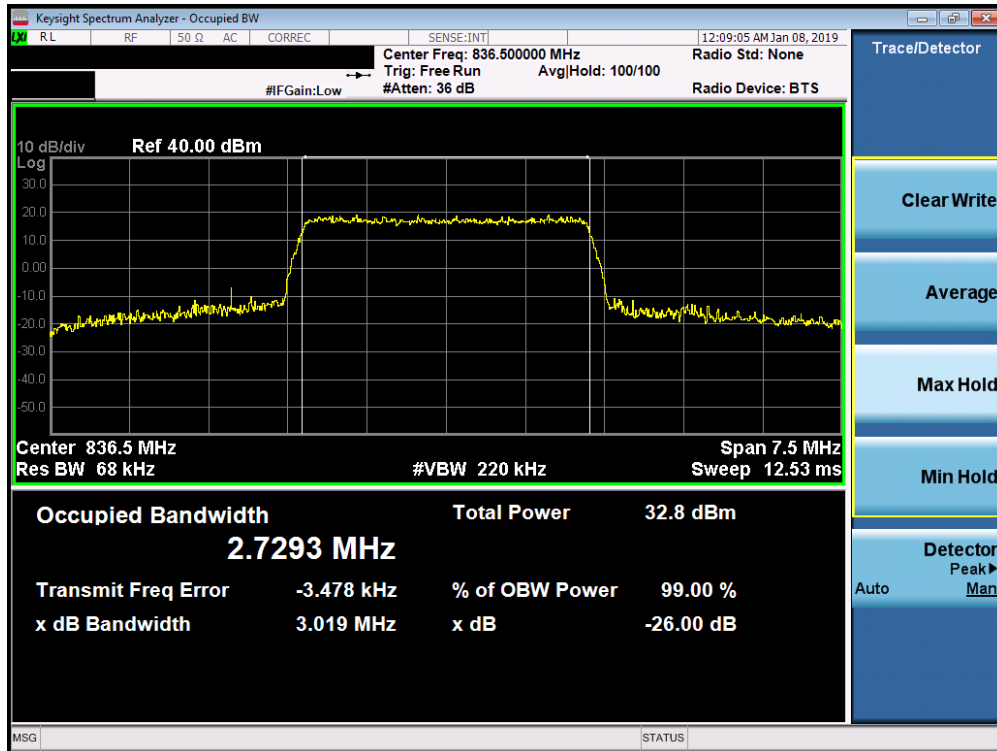


Plot 7-21. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 64-QAM - Full RB Configuration)

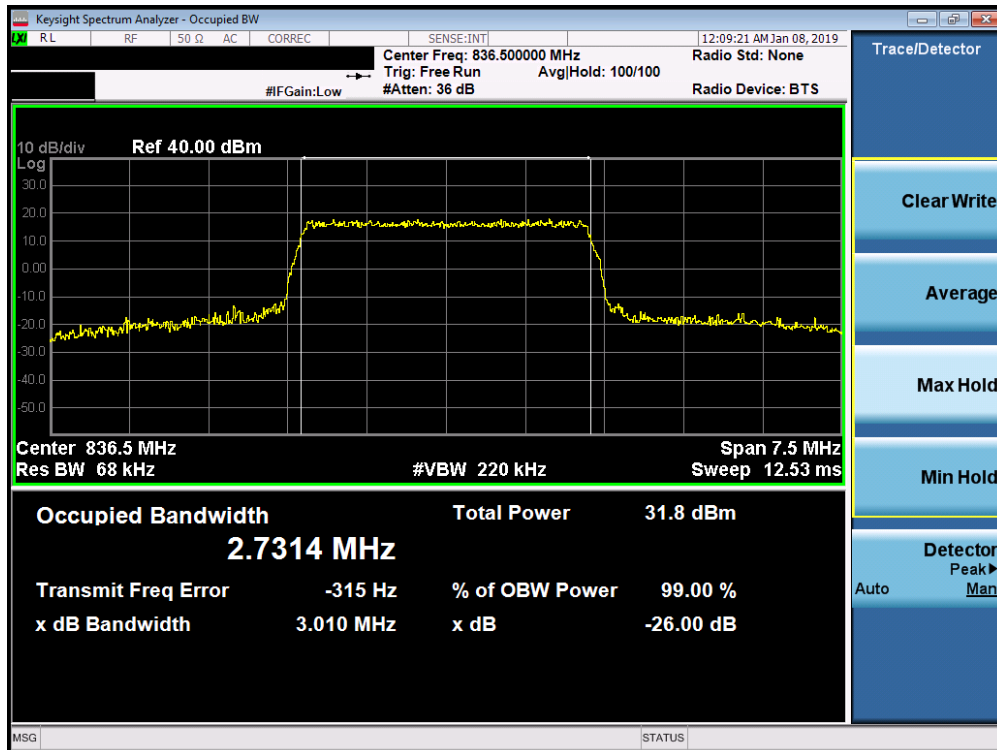


Plot 7-22. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 32 of 338



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

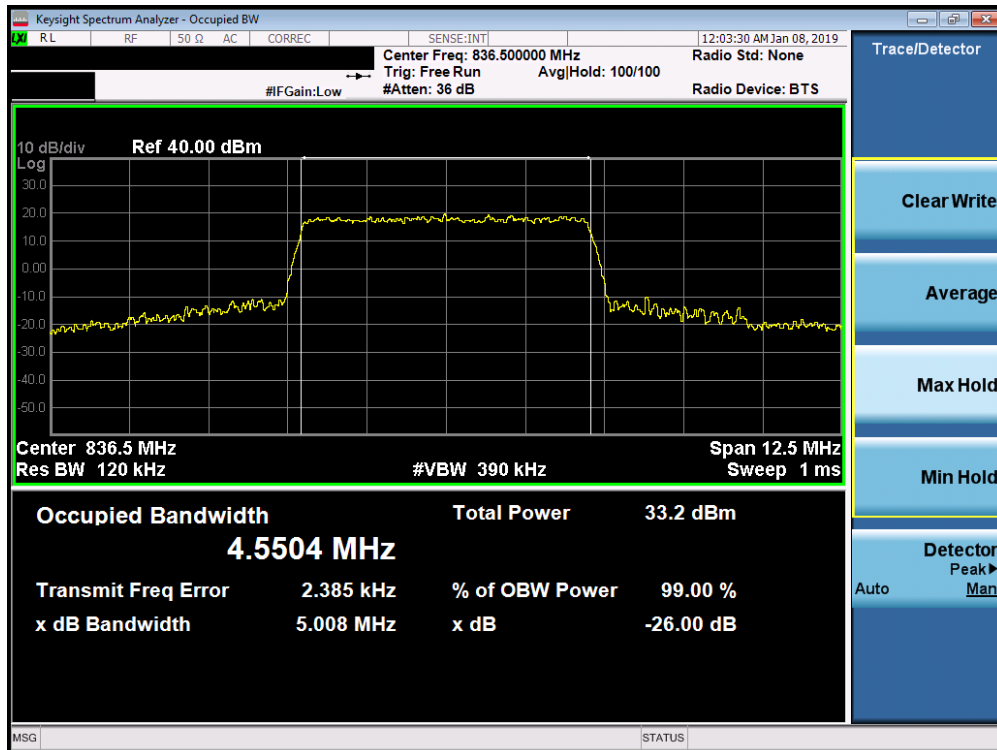


Plot 7-24. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 33 of 338

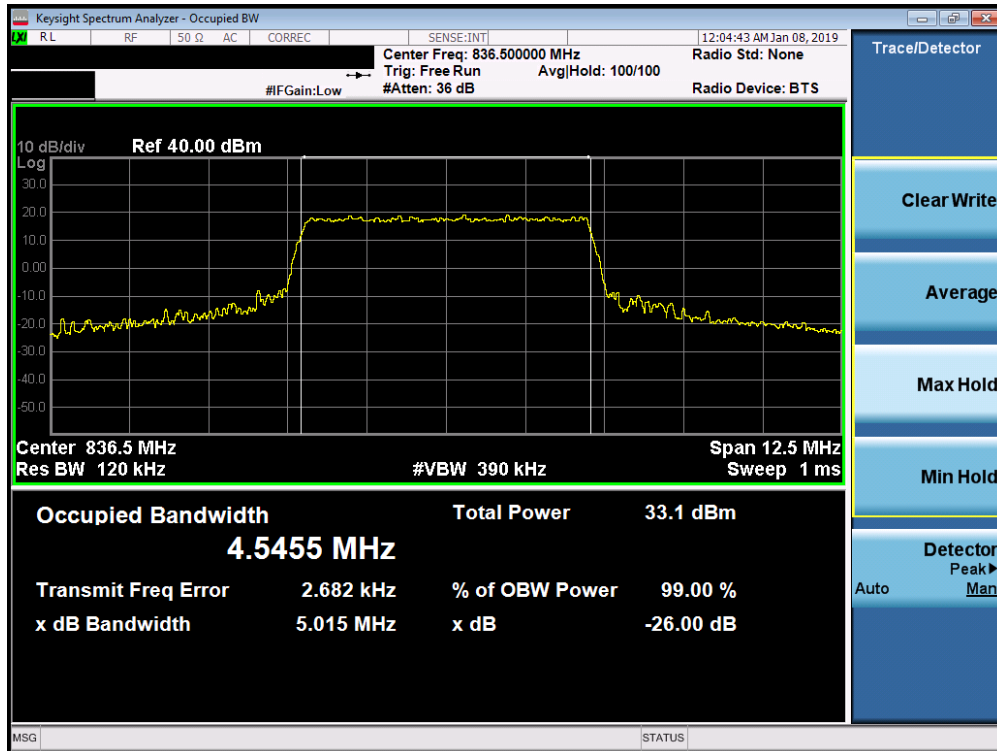


Plot 7-25. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz QPSK - Full RB Configuration)

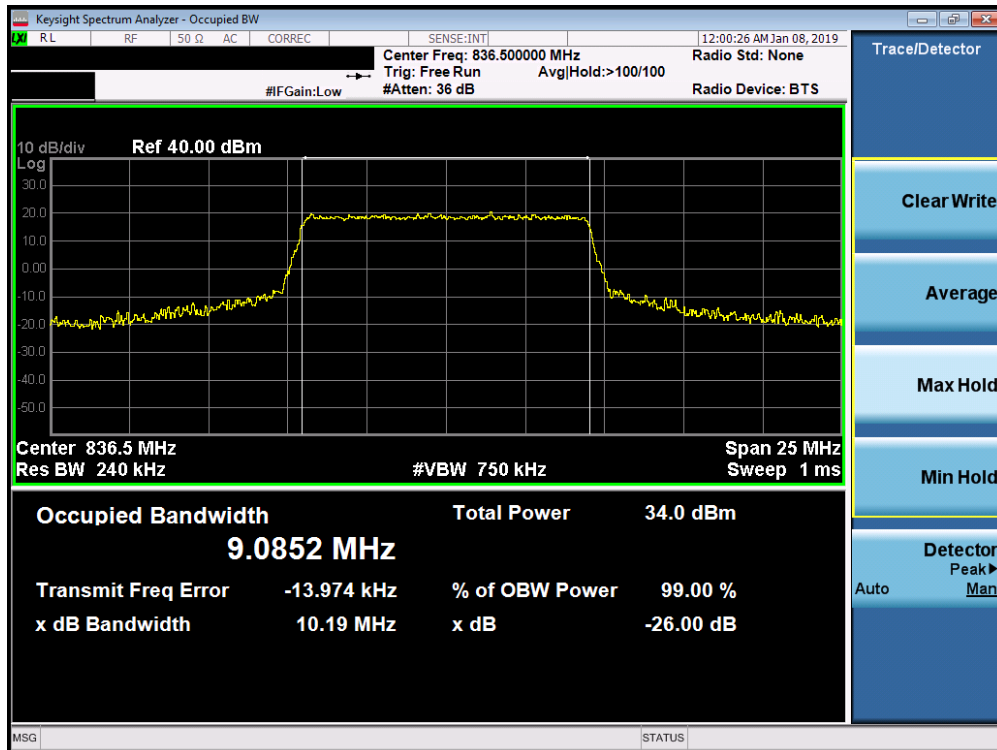


Plot 7-26. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 34 of 338

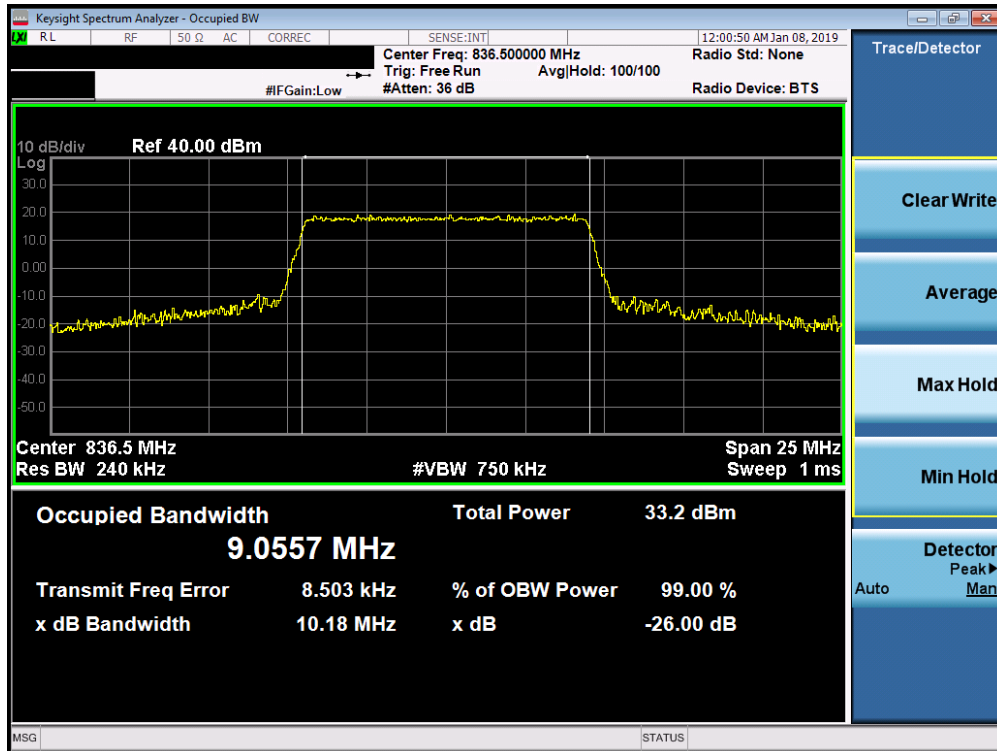


Plot 7-27. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 64-QAM - Full RB Configuration)

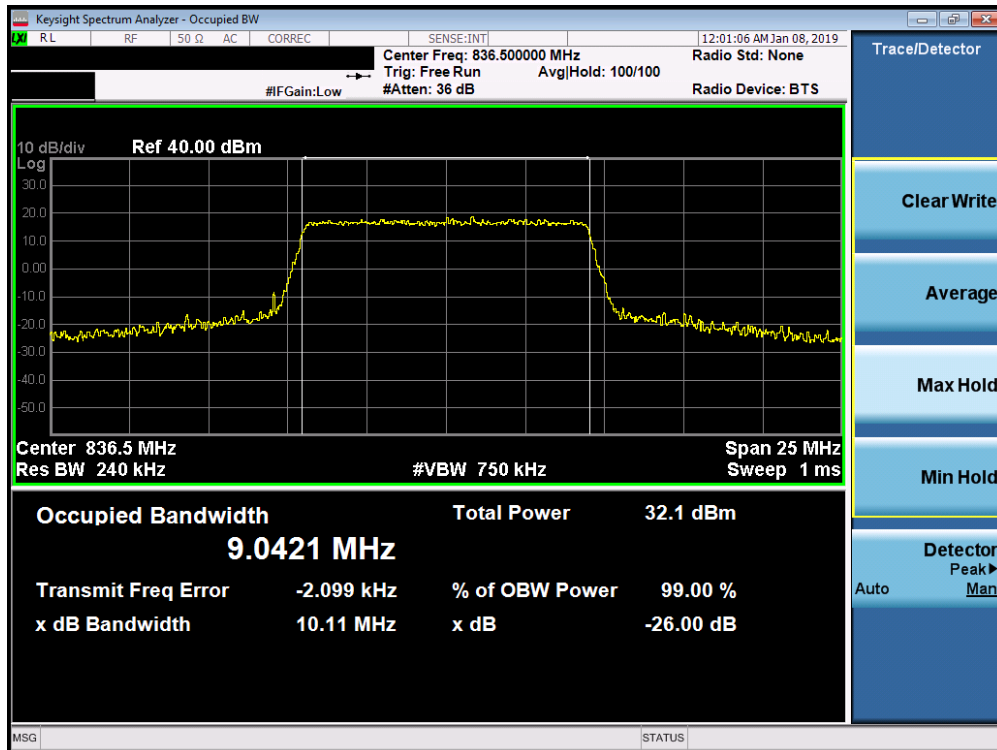


Plot 7-28. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 35 of 338



Plot 7-29. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 16-QAM - Full RB Configuration)

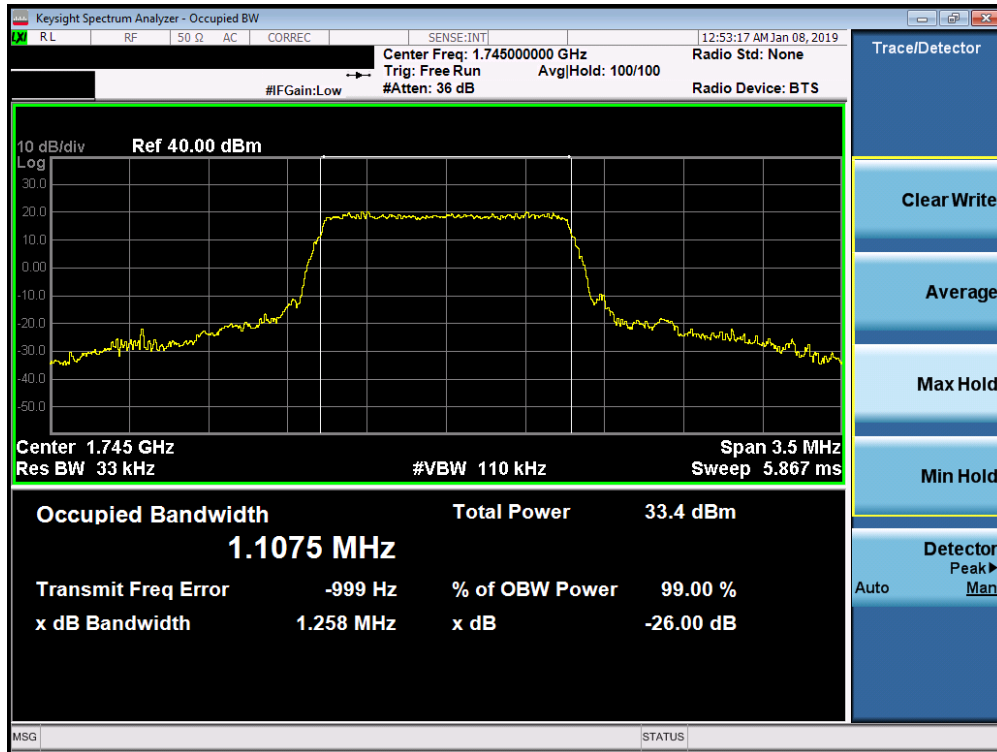


Plot 7-30. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 64-QAM - Full RB Configuration)

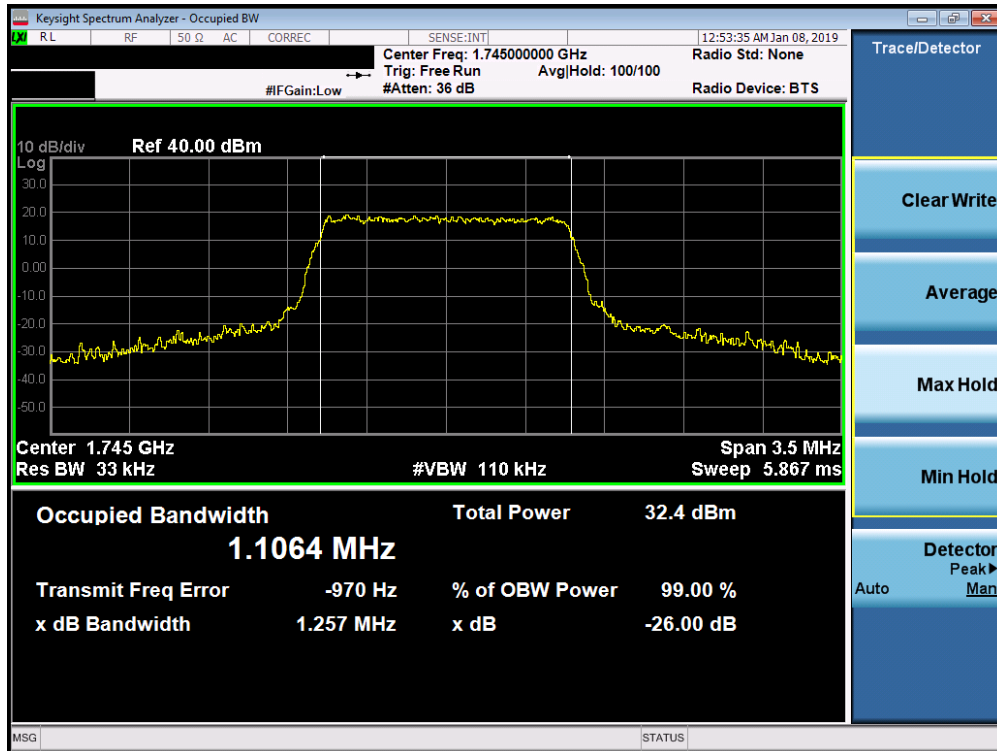
FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 36 of 338



**Band 66/4**

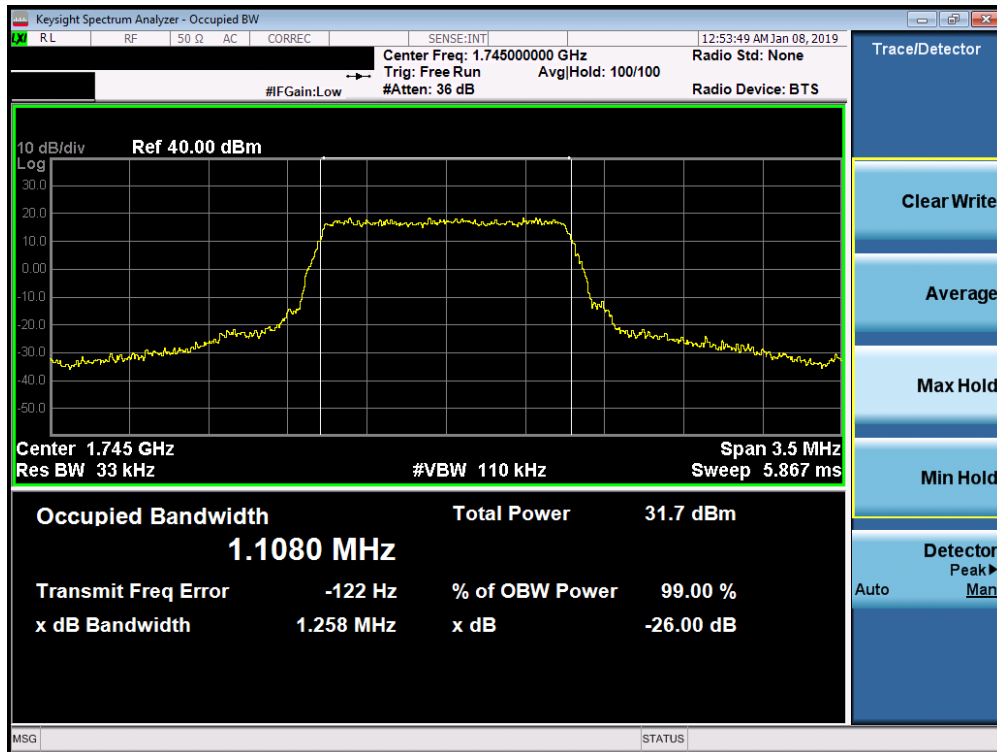


**Plot 7-31. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)**

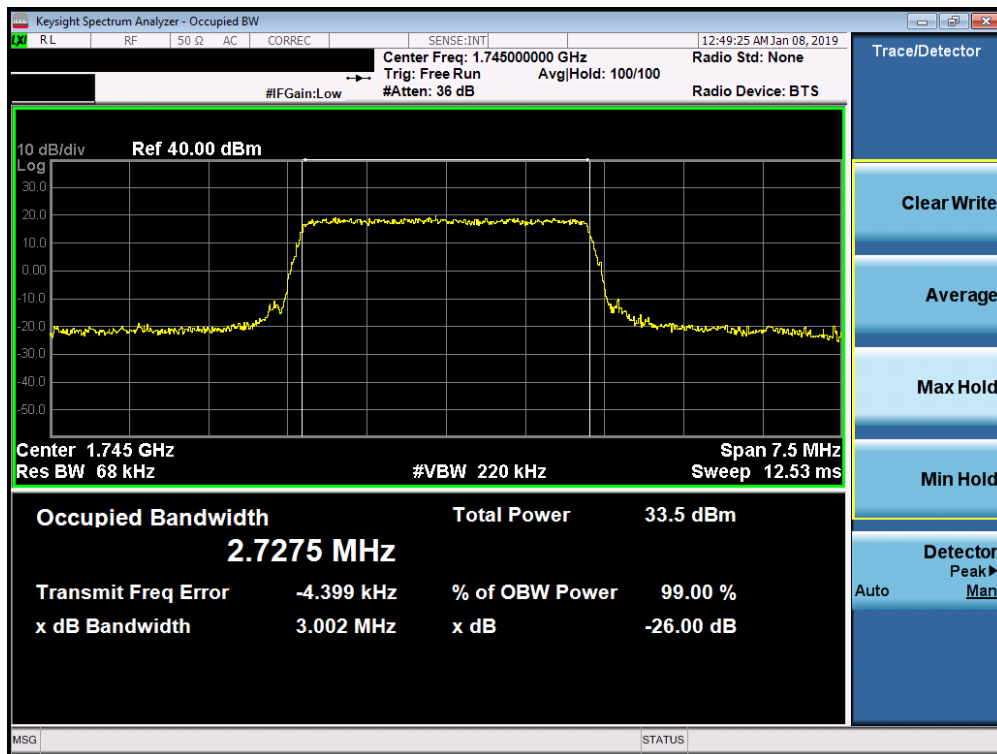


**Plot 7-32. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 37 of 338

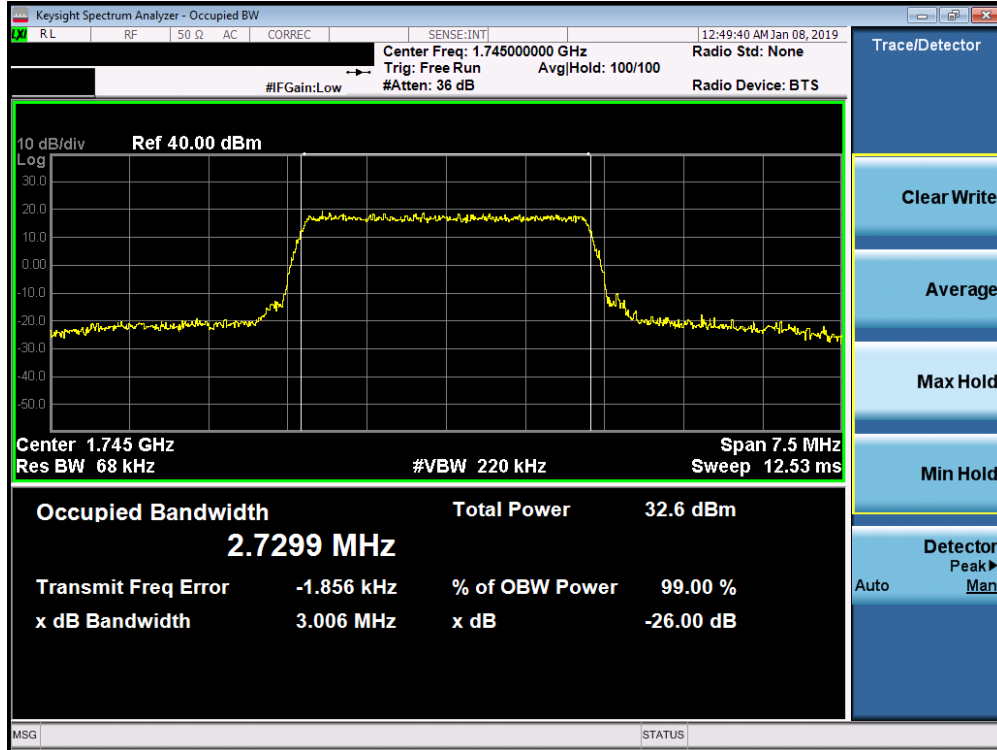


Plot 7-33. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)

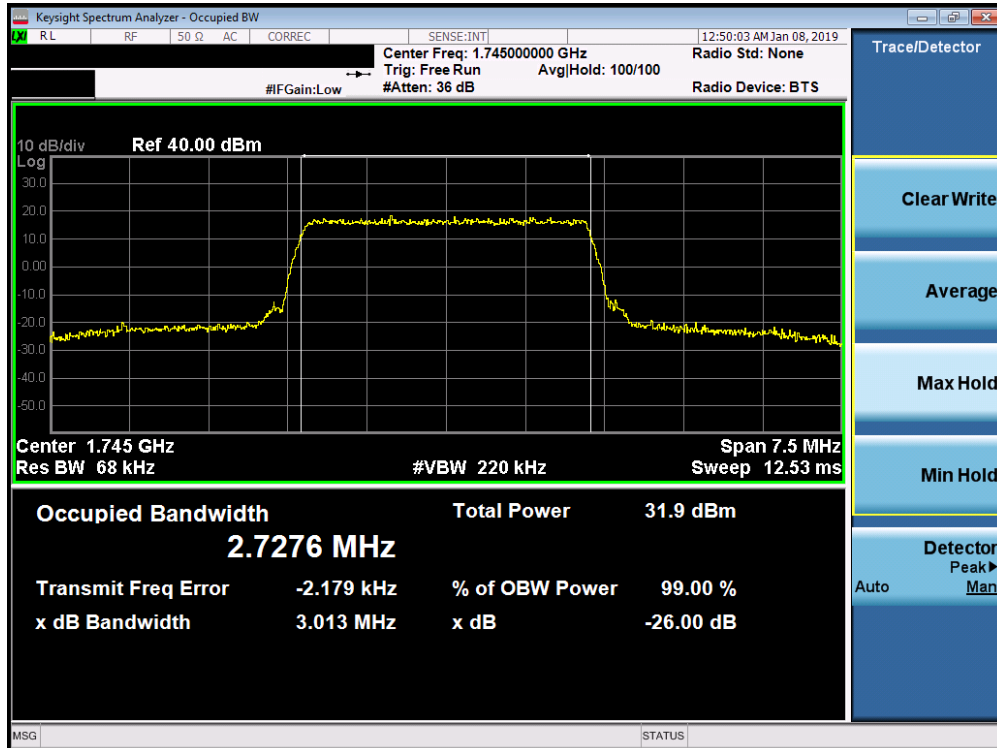


Plot 7-34. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 38 of 338

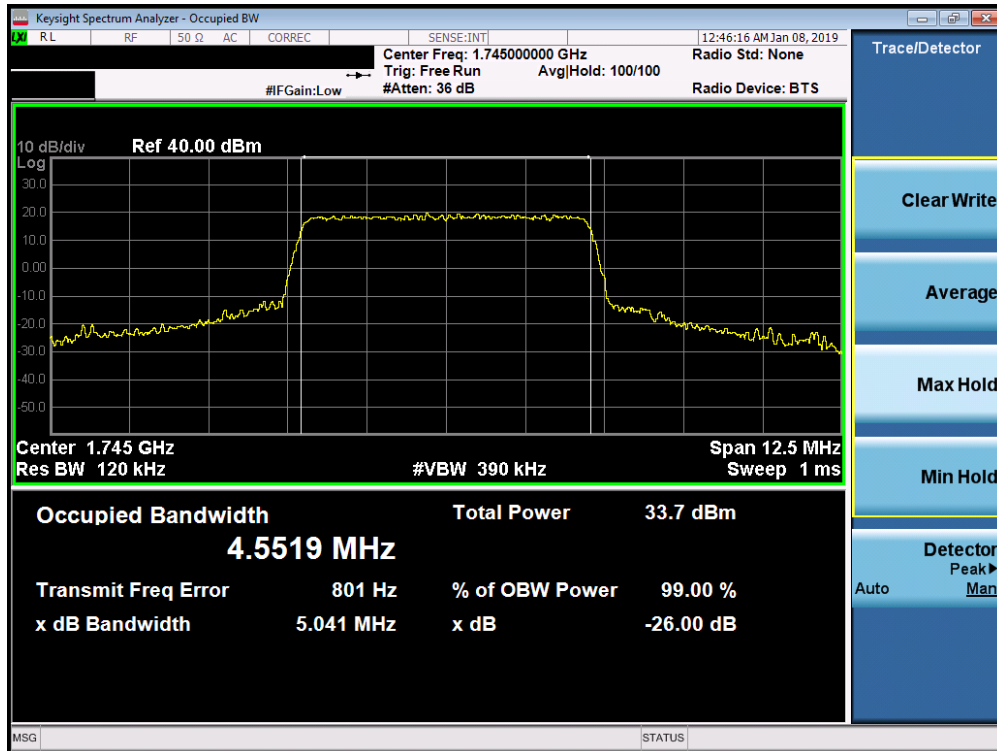


Plot 7-35. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)

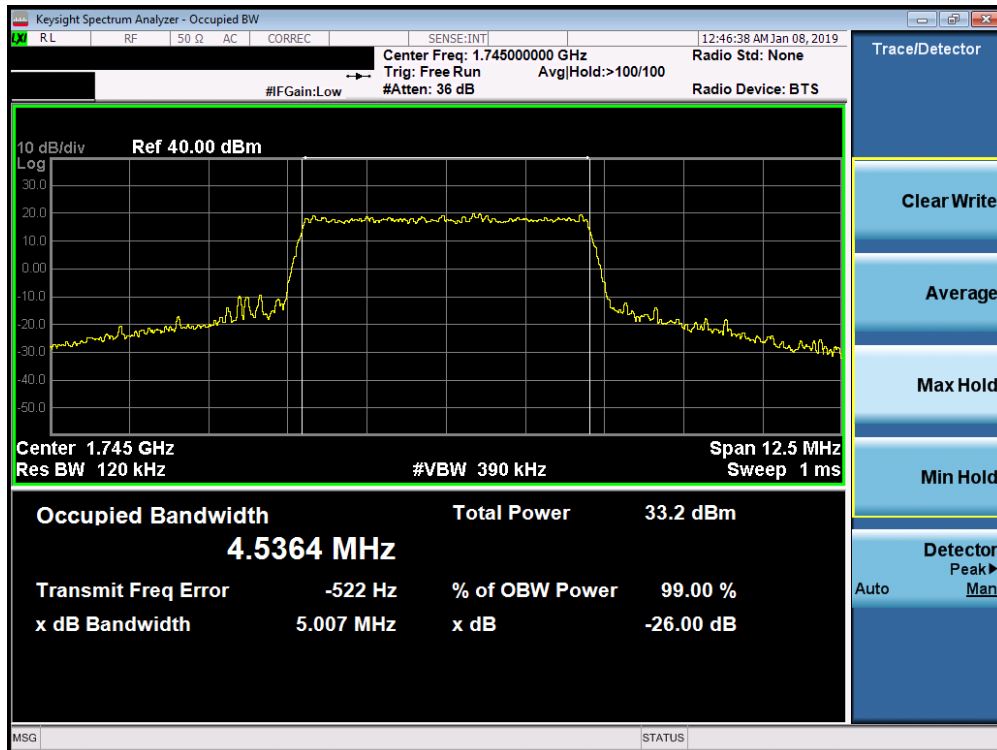


Plot 7-36. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 39 of 338

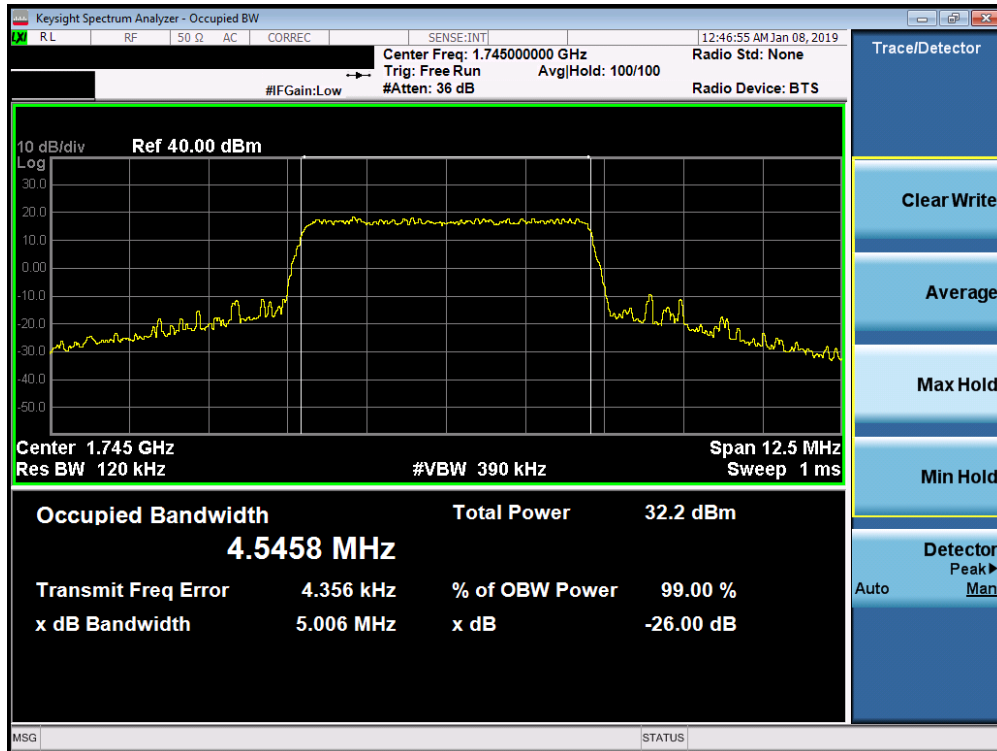


Plot 7-37. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)

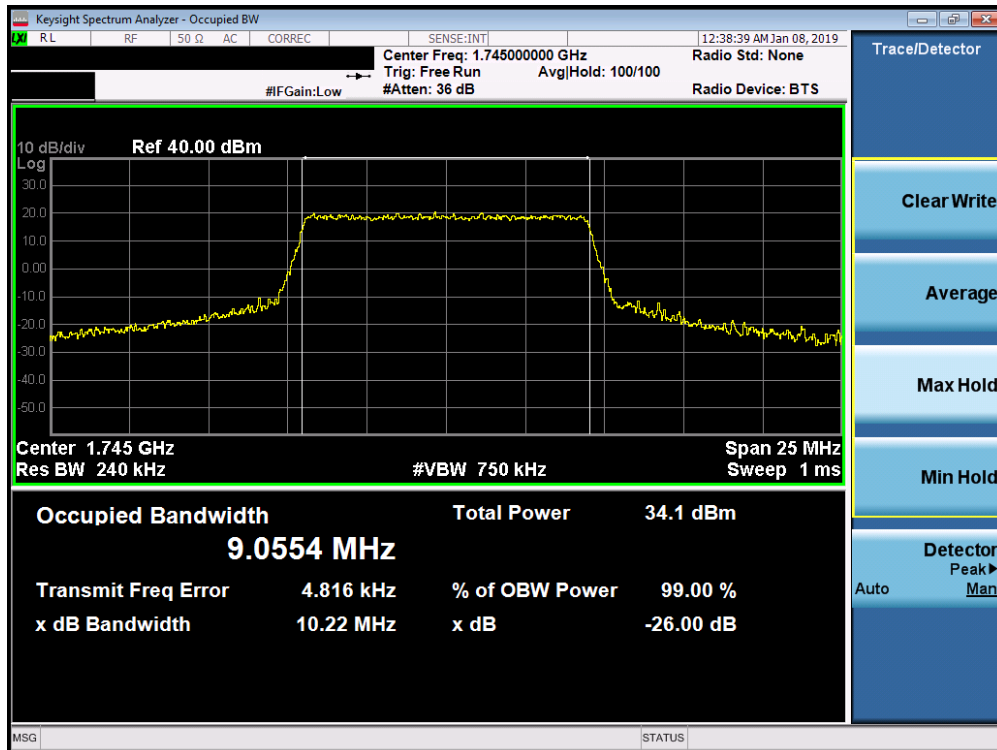


Plot 7-38. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 40 of 338

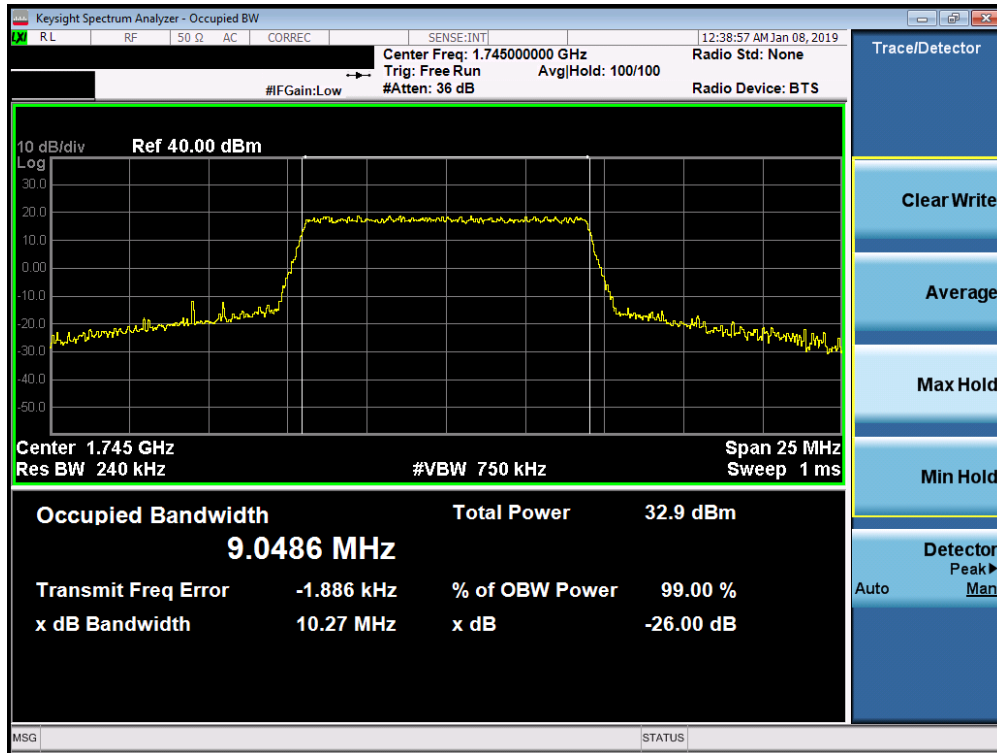


Plot 7-39. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 64-QAM - Full RB Configuration)



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

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 41 of 338

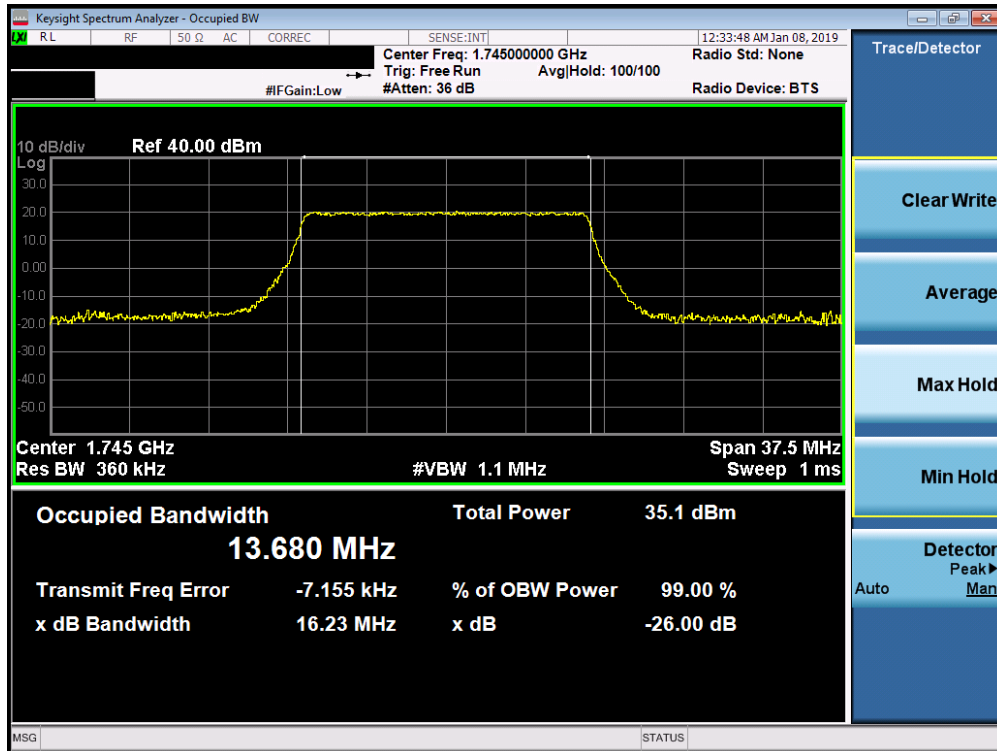


Plot 7-41. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB Configuration)

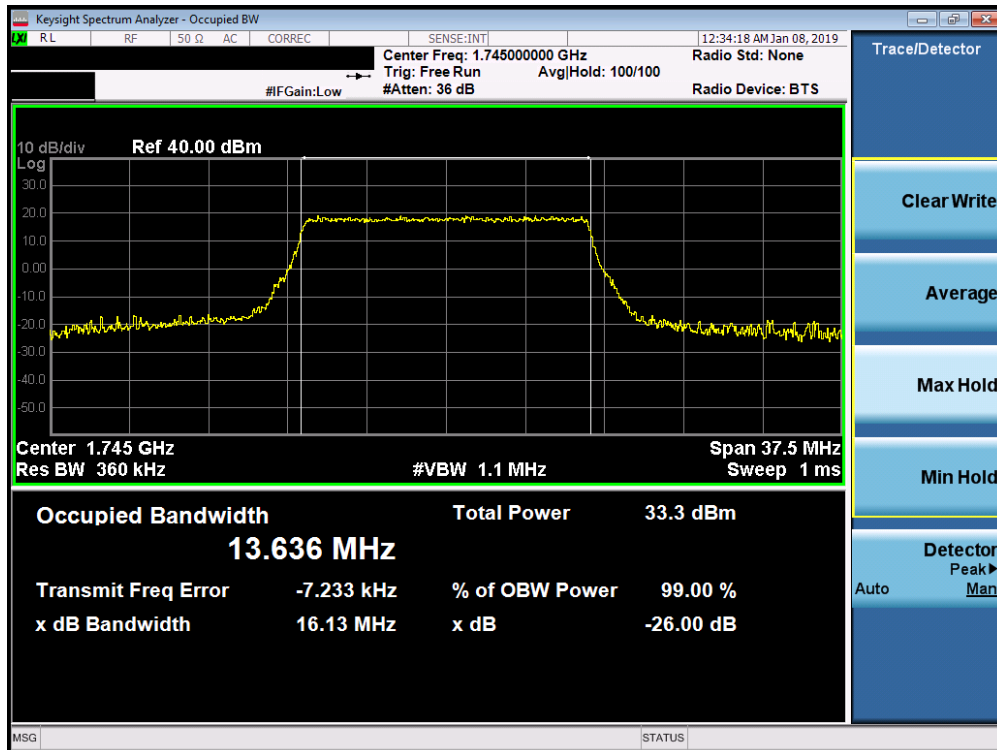


Plot 7-42. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 42 of 338



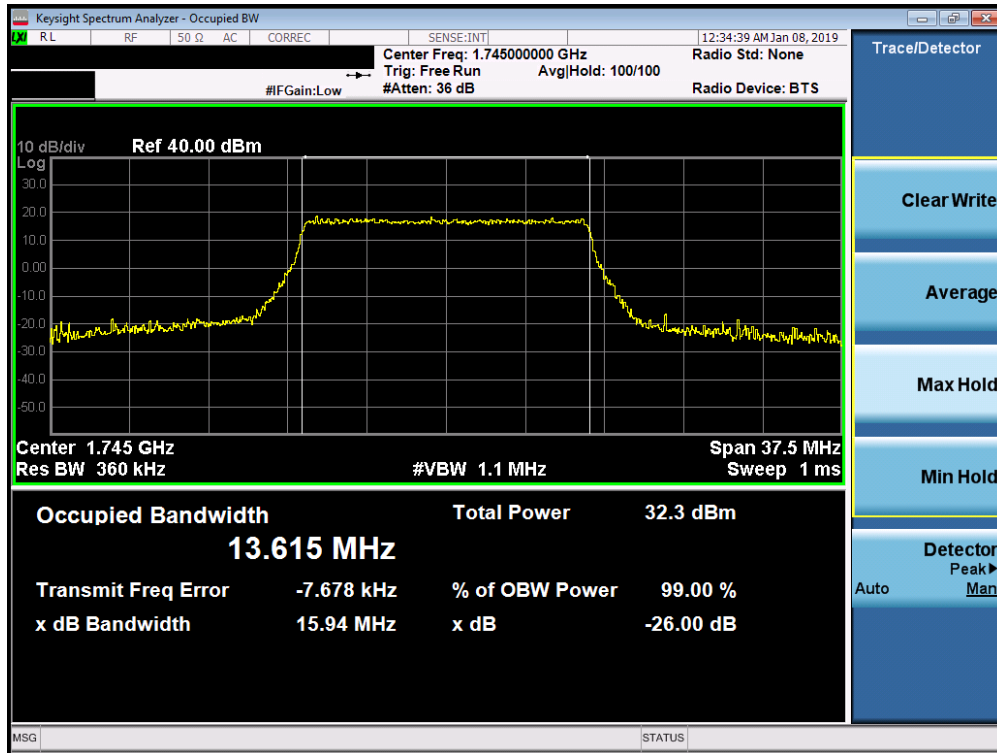
Plot 7-43. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)



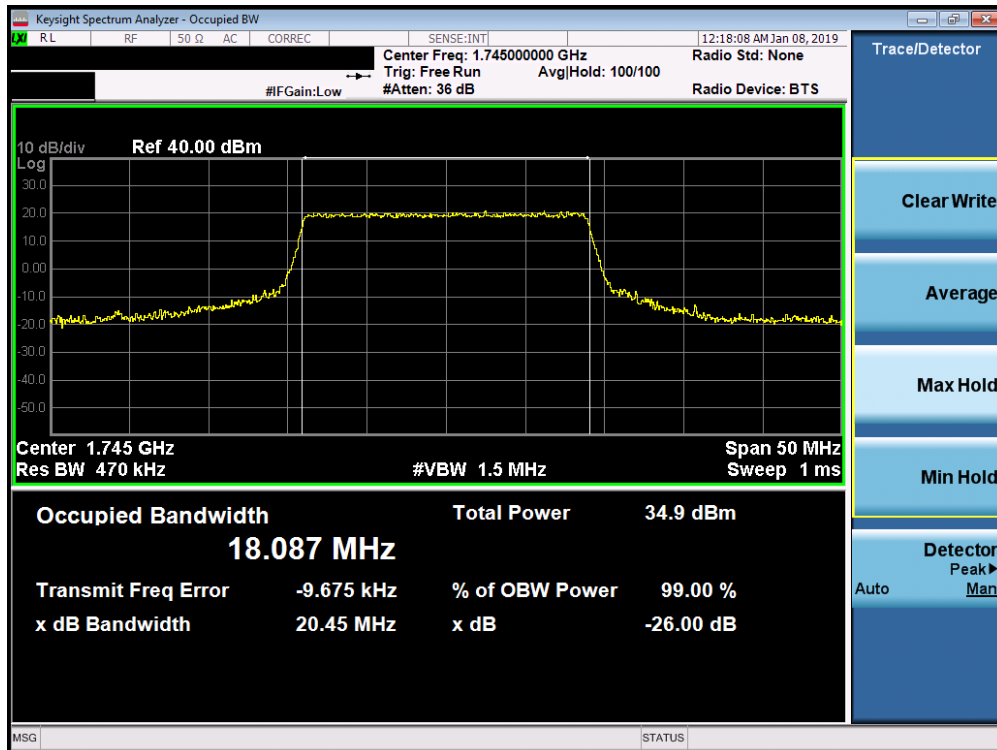
Plot 7-44. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 43 of 338



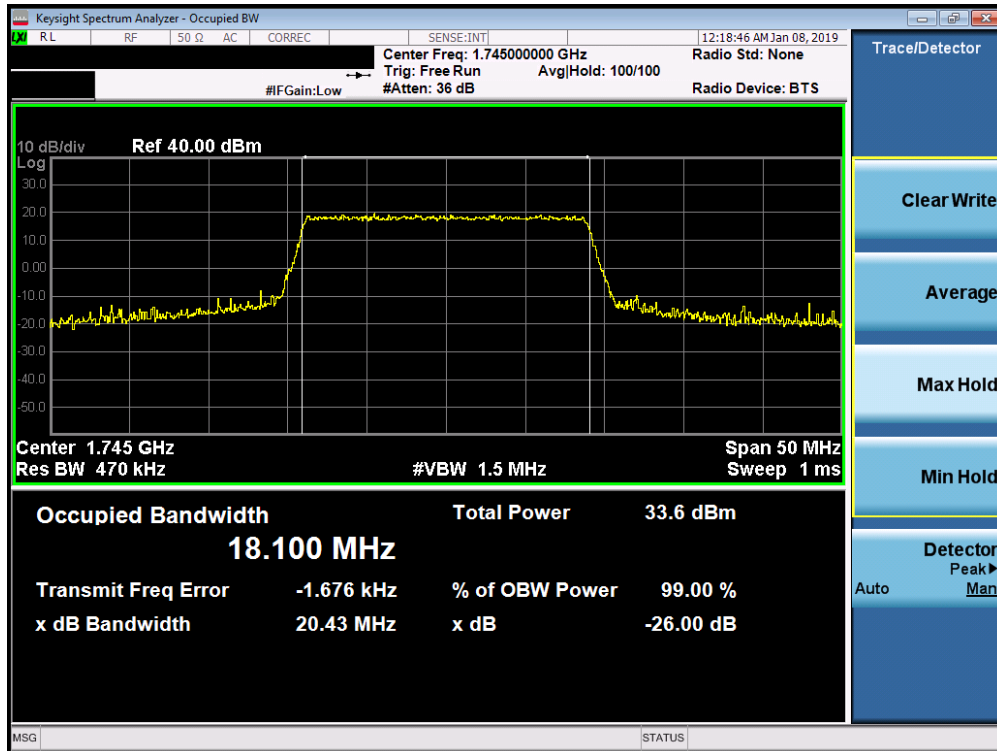


Plot 7-45. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 64-QAM - Full RB Configuration)

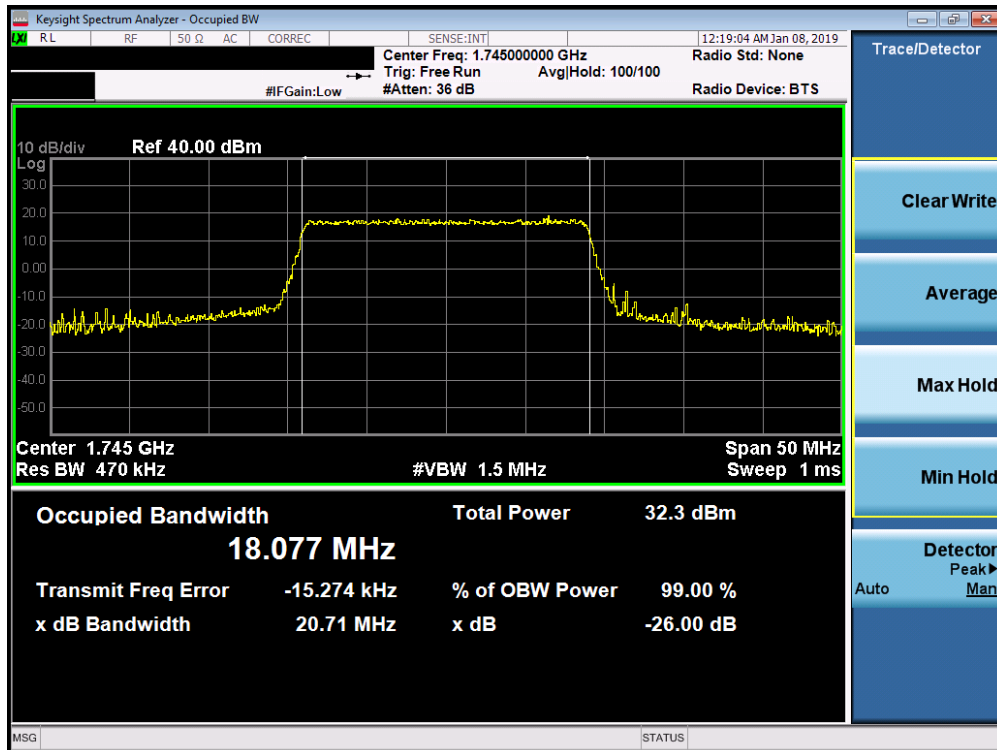


Plot 7-46. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 44 of 338



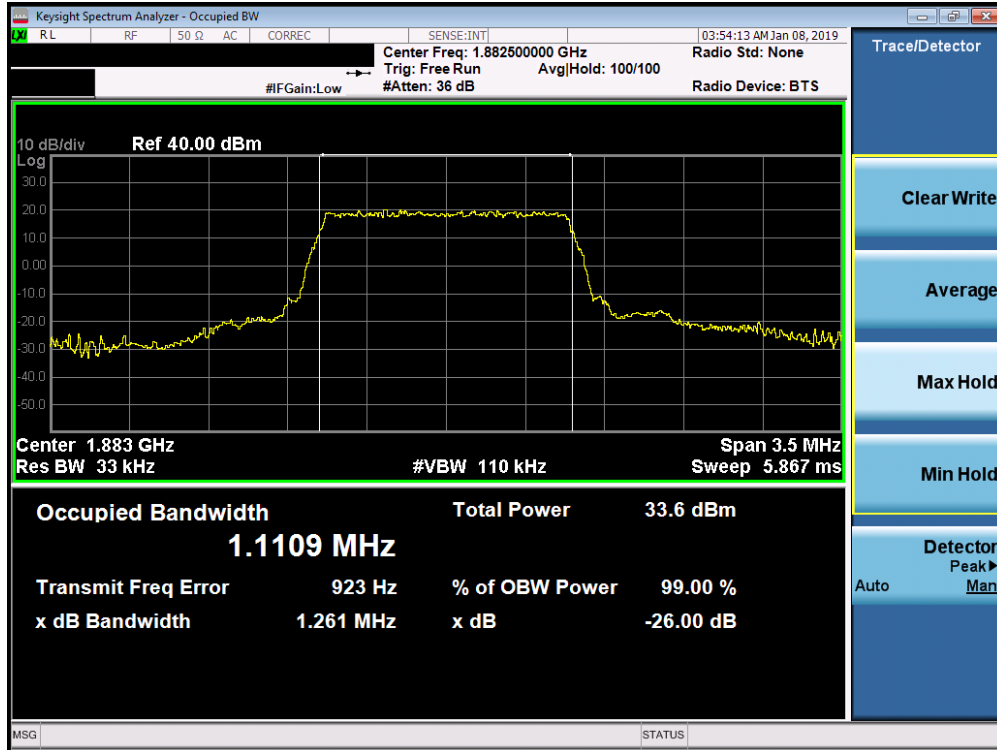
Plot 7-47. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)



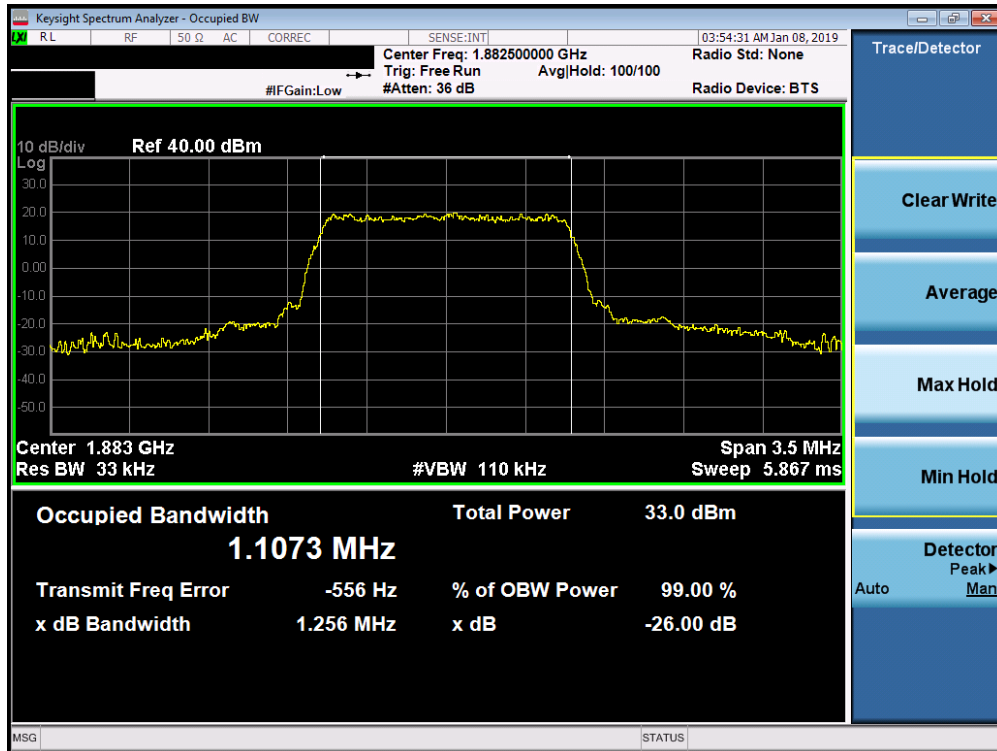
Plot 7-48. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 45 of 338

**Band 25/2**

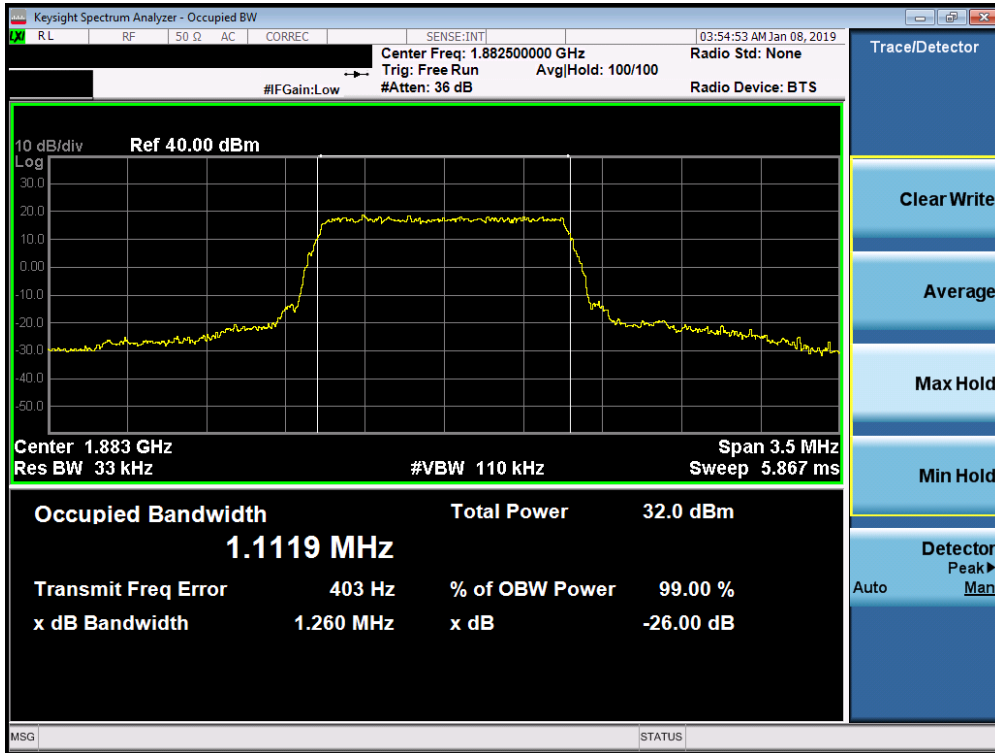


**Plot 7-49. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz QPSK - Full RB Configuration)**

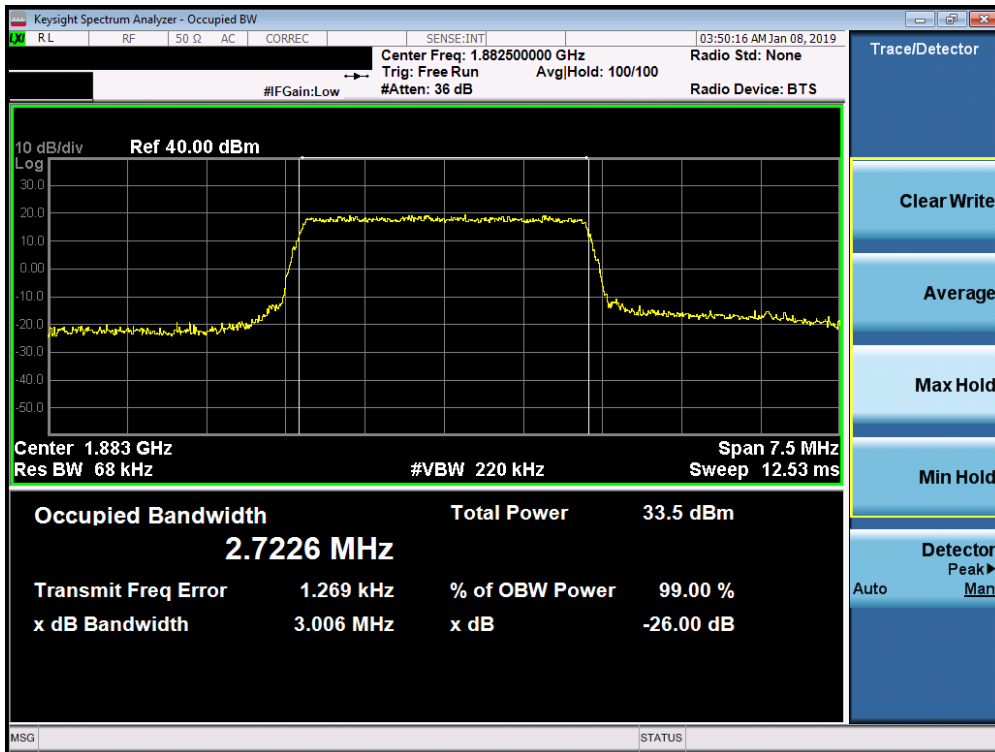


**Plot 7-50. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT</b> (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 46 of 338

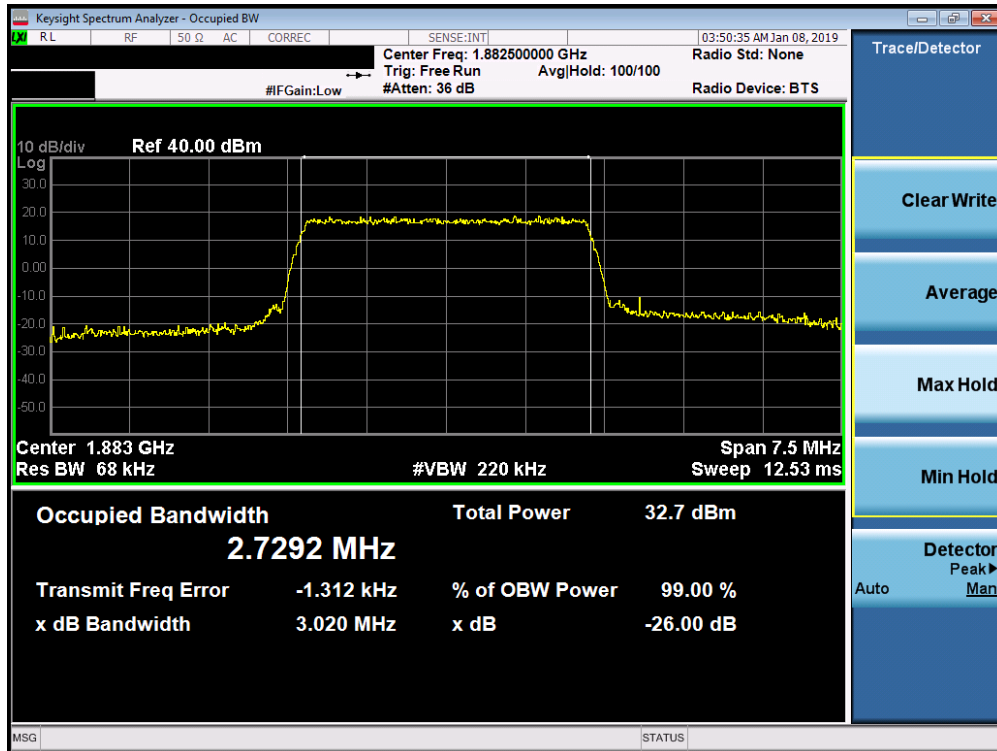


Plot 7-51. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 64-QAM - Full RB Configuration)

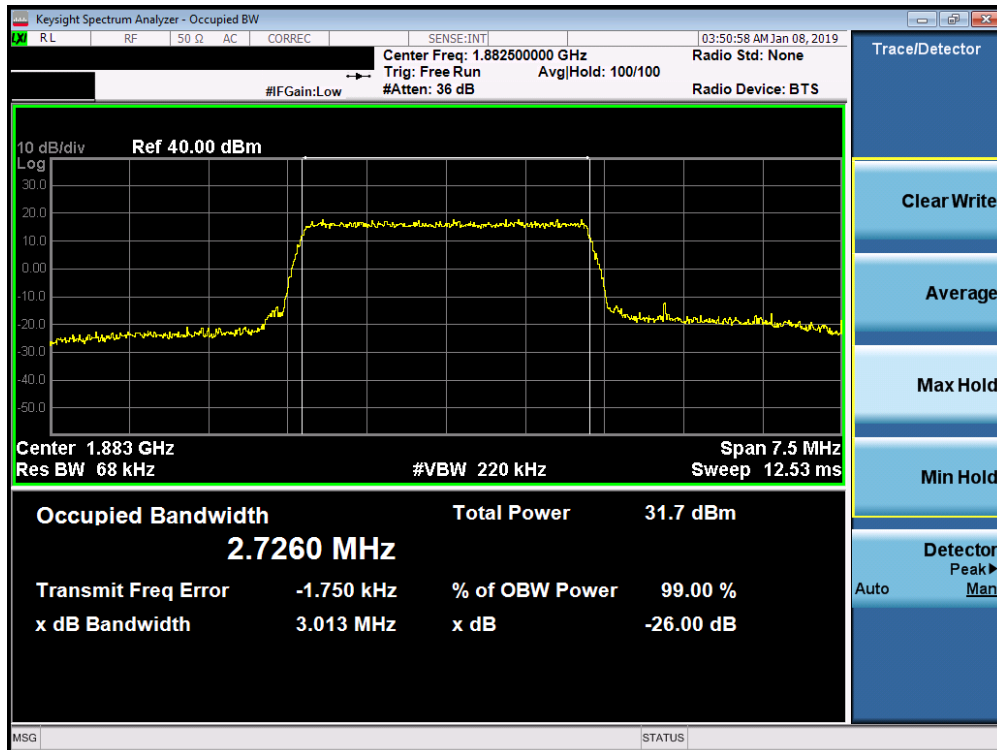


Plot 7-52. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 47 of 338

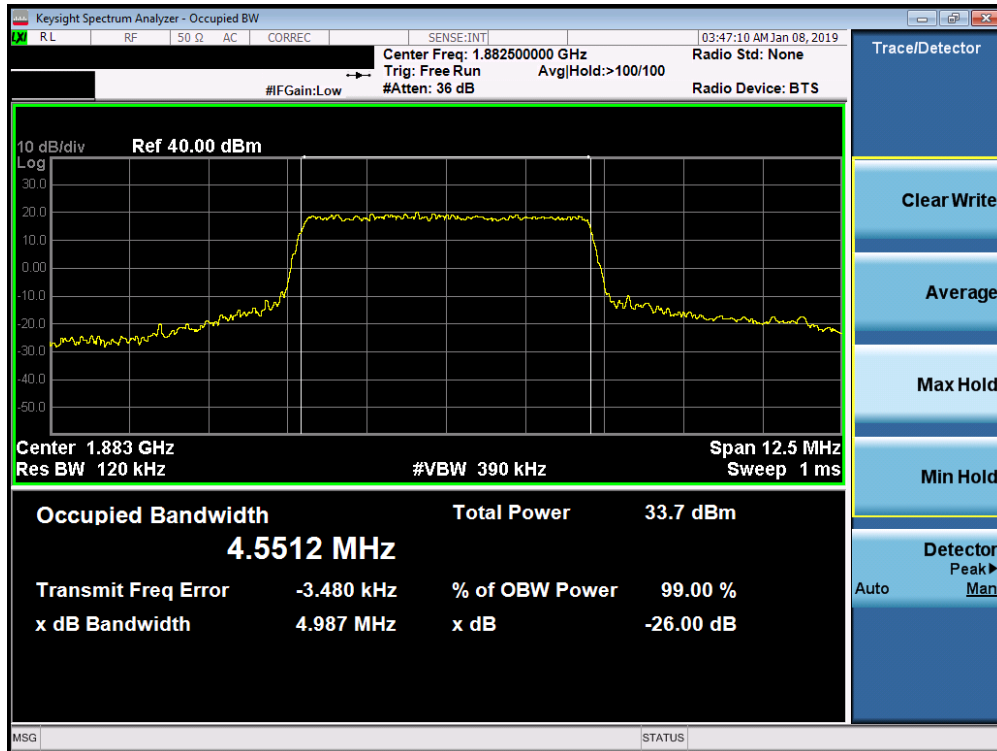


Plot 7-53. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 16-QAM - Full RB Configuration)

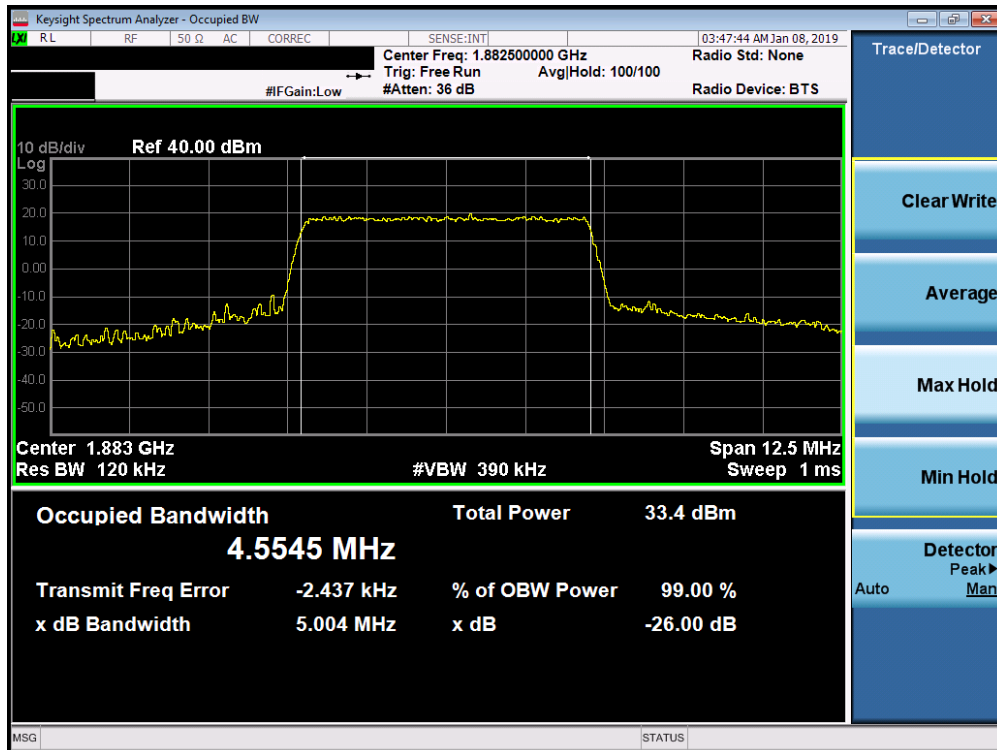


Plot 7-54. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 48 of 338



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

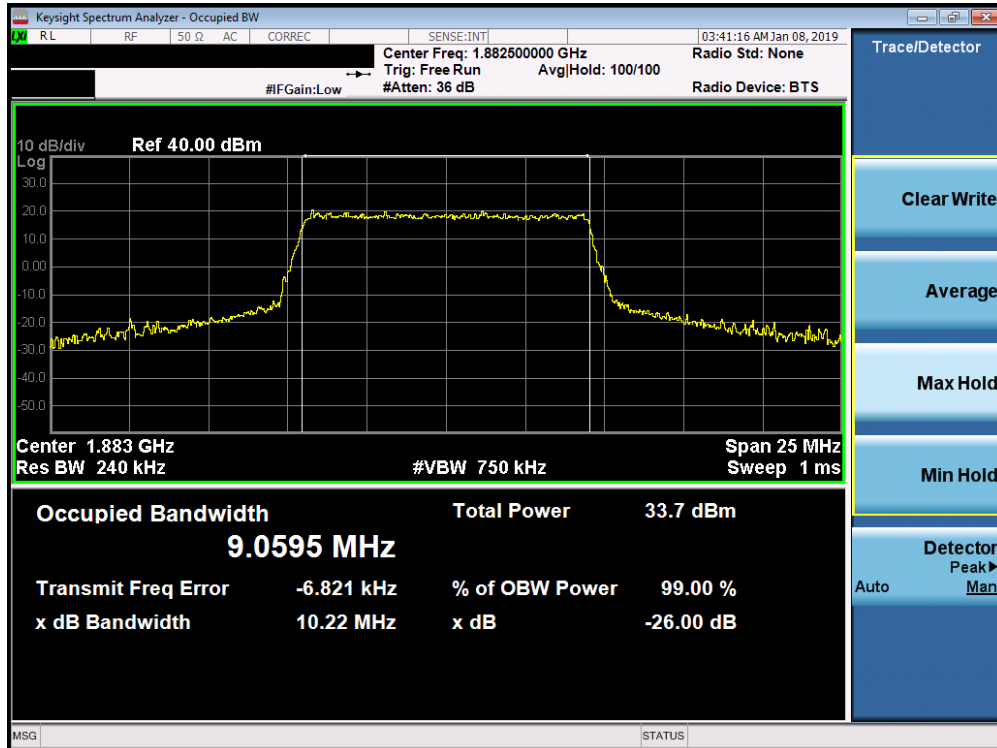


Plot 7-56. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 49 of 338



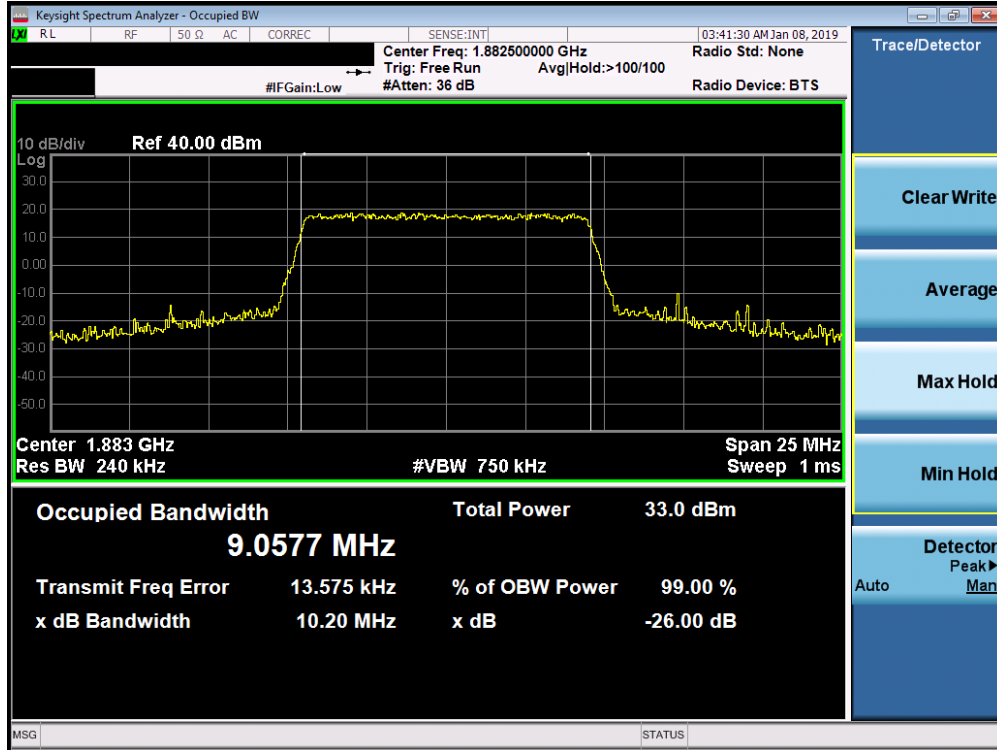
Plot 7-57. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 64-QAM - Full RB Configuration)



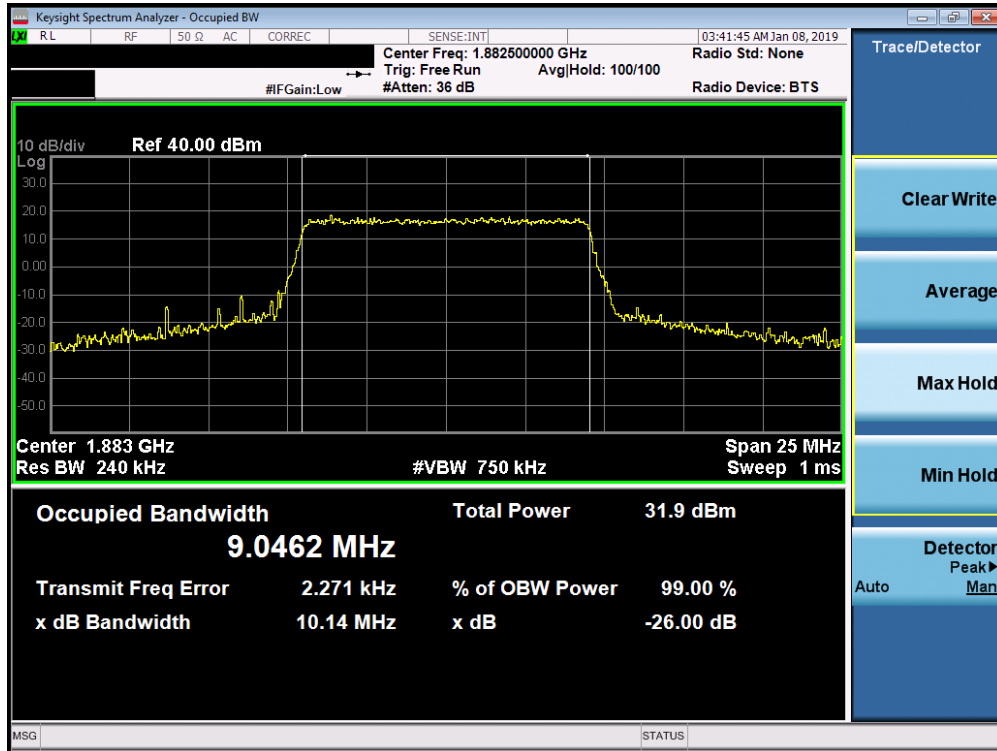
Plot 7-58. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 50 of 338



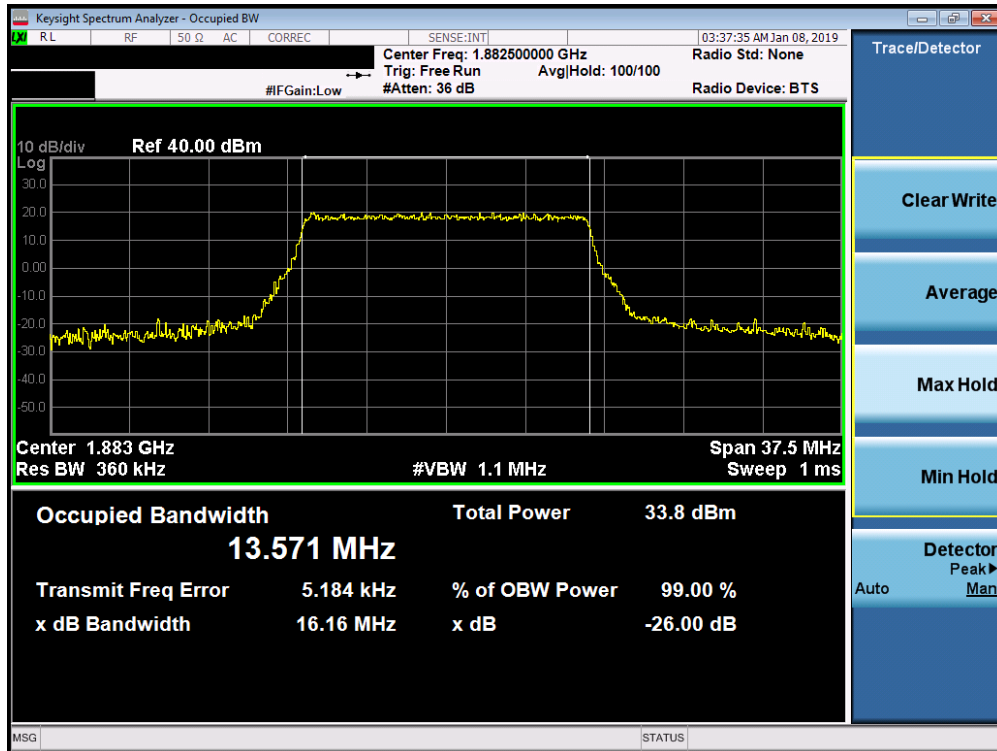


Plot 7-59. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 16-QAM - Full RB Configuration)

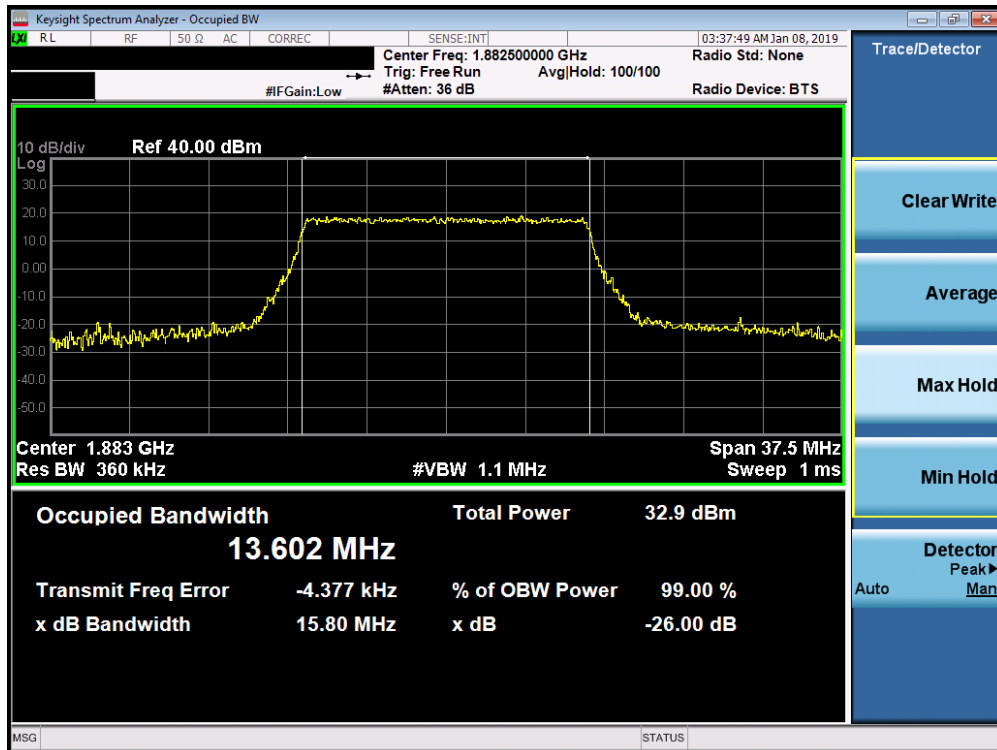


Plot 7-60. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 51 of 338

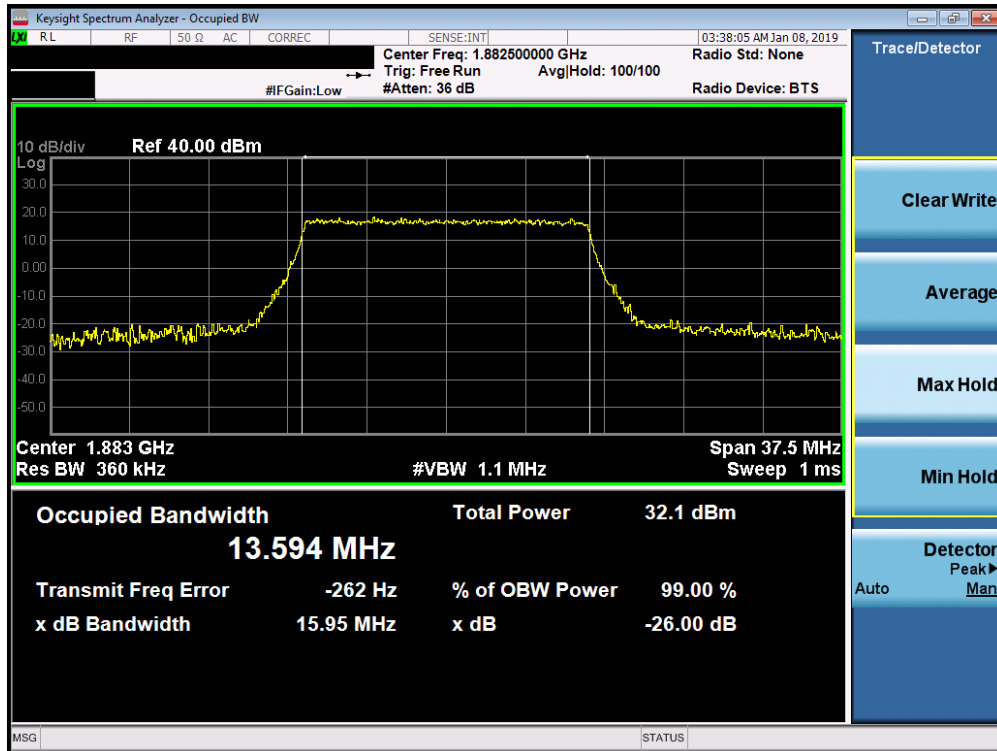


Plot 7-61. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz QPSK - Full RB Configuration)

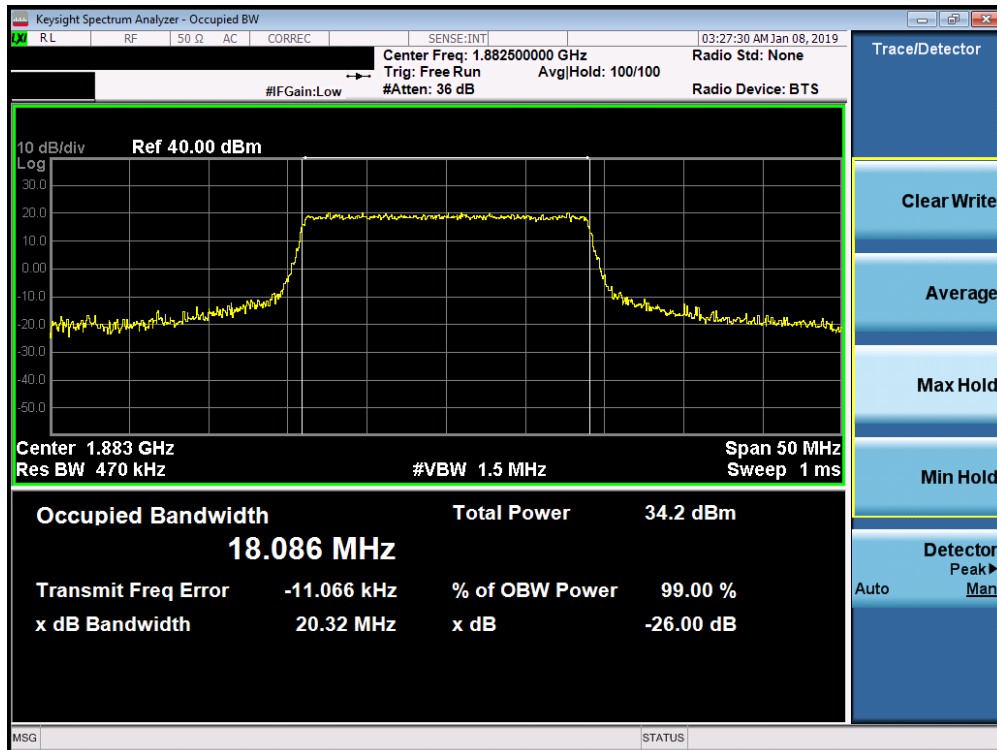


Plot 7-62. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 52 of 338

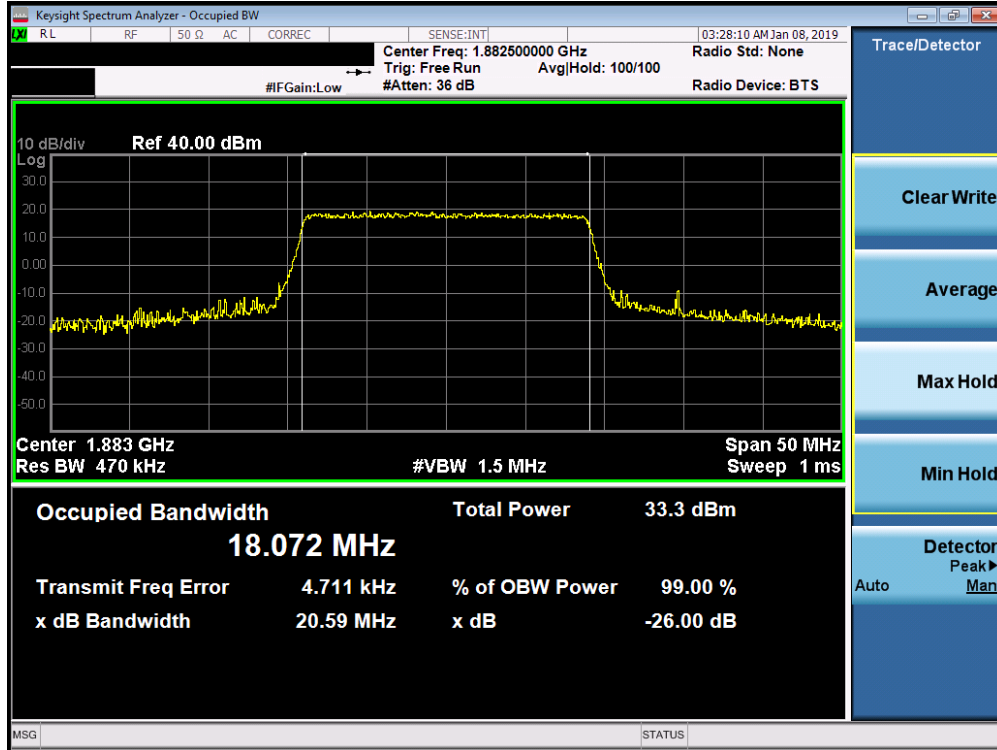


Plot 7-63. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 64-QAM - Full RB Configuration)

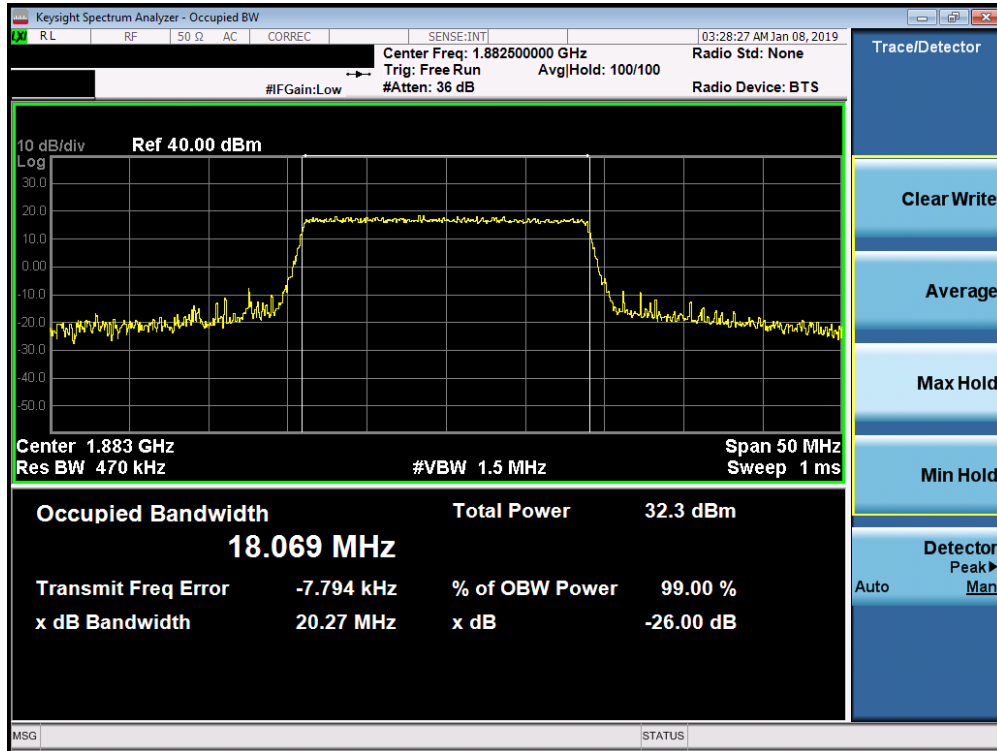


Plot 7-64. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 53 of 338



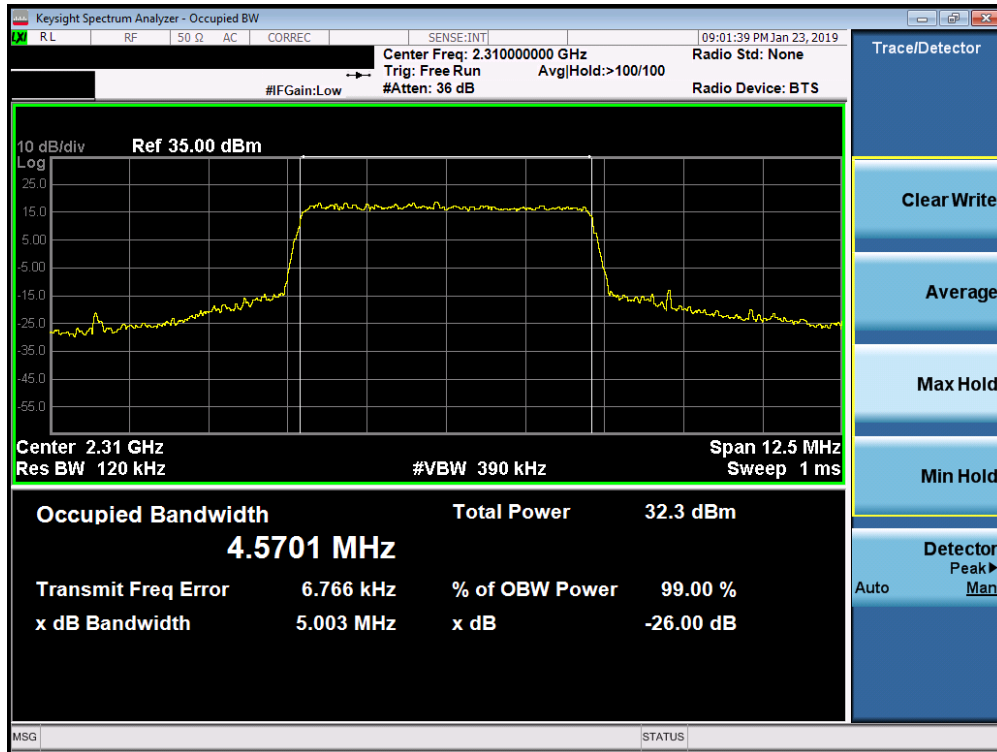
Plot 7-65. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 16-QAM - Full RB Configuration)



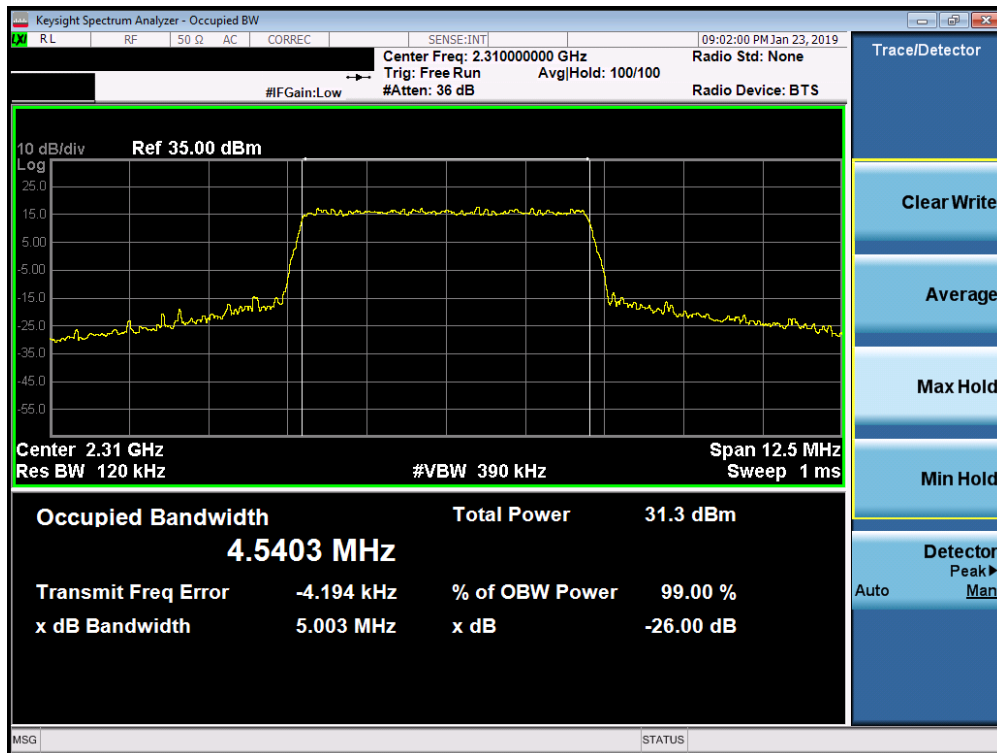
Plot 7-66. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 54 of 338

**Band 30**

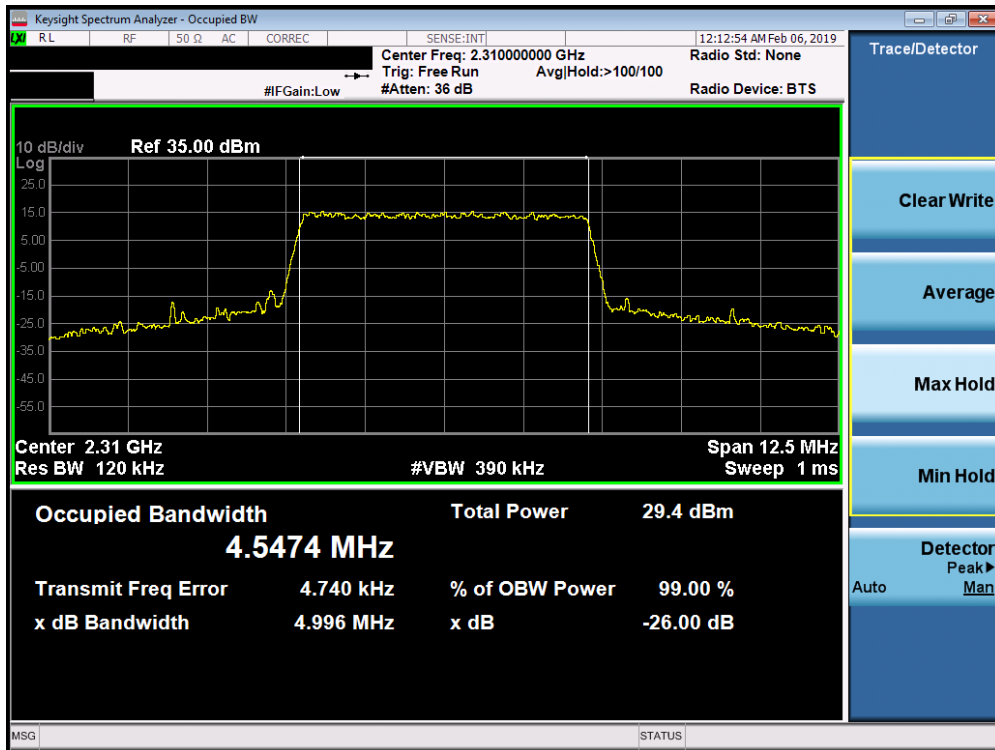


**Plot 7-67. Occupied Bandwidth Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)**

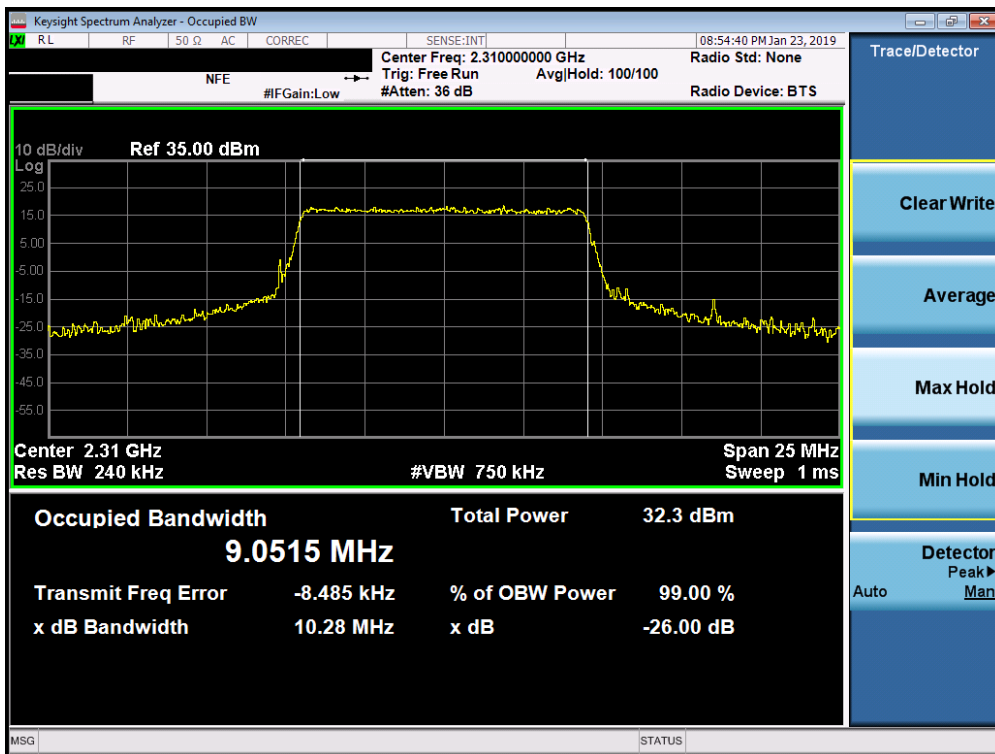


**Plot 7-68. Occupied Bandwidth Plot (Band 30 - 5.0MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT</b> (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 55 of 338

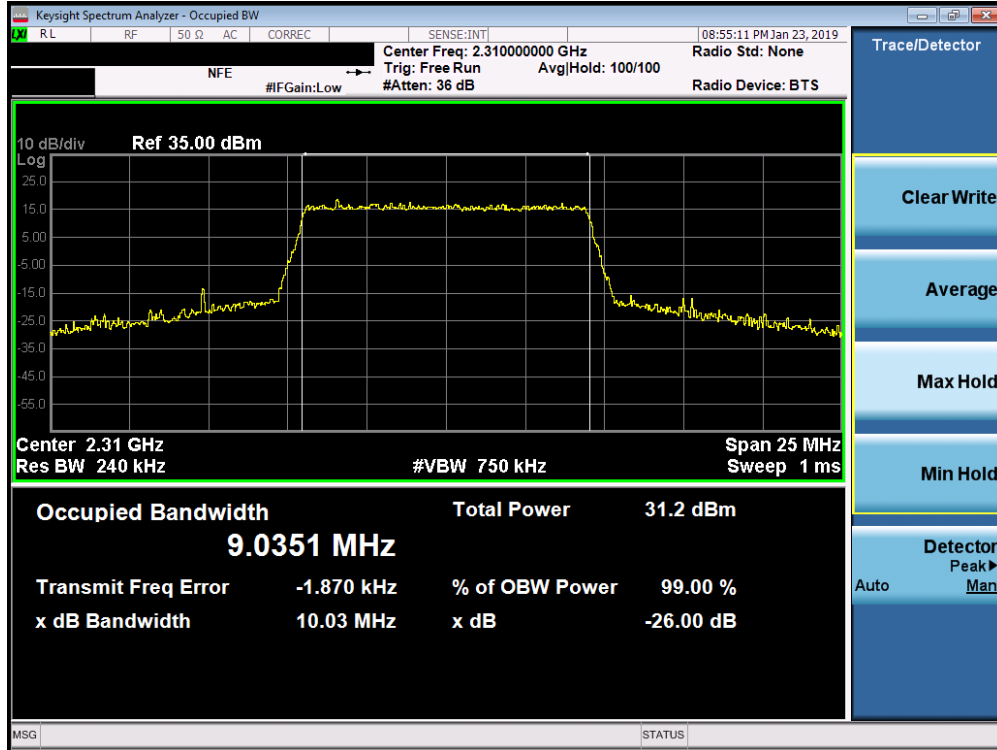


Plot 7-69. Occupied Bandwidth Plot (Band 30 - 5.0MHz 64-QAM - Full RB Configuration)

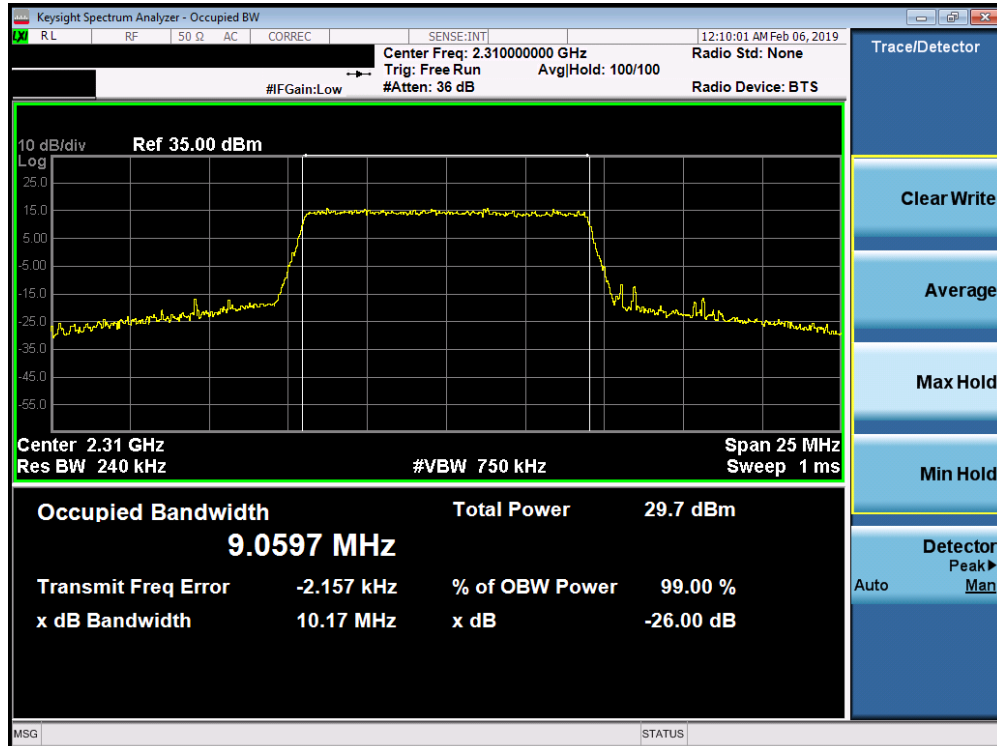


Plot 7-70. Occupied Bandwidth Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 56 of 338



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

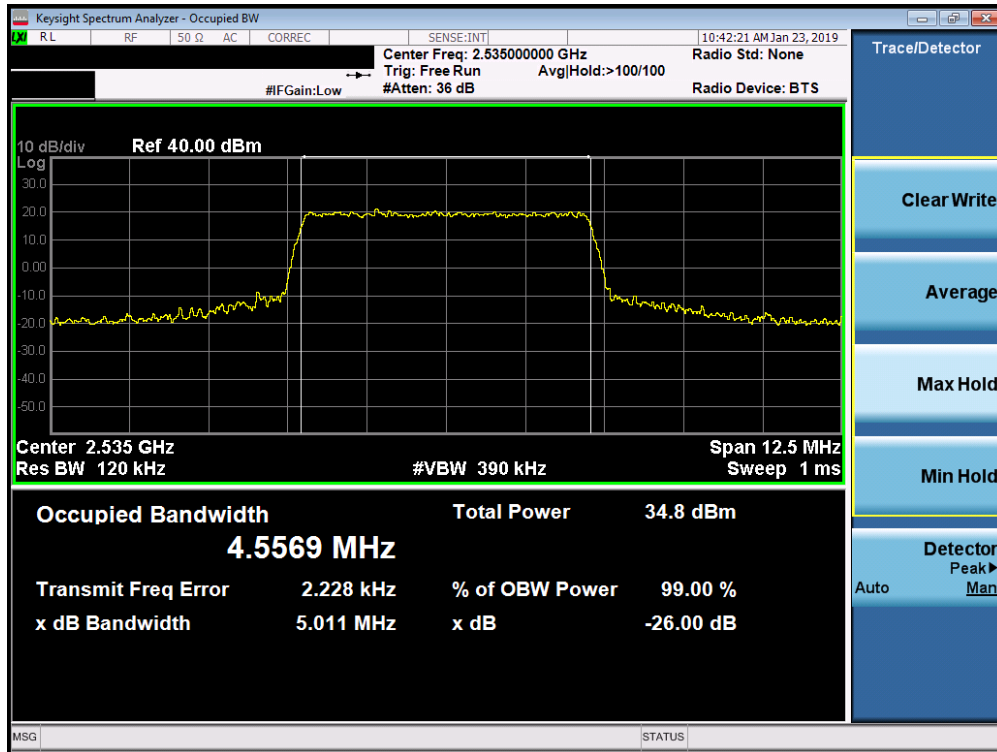


Plot 7-72. Occupied Bandwidth Plot (Band 30 - 10.0MHz 64-QAM - Full RB Configuration)

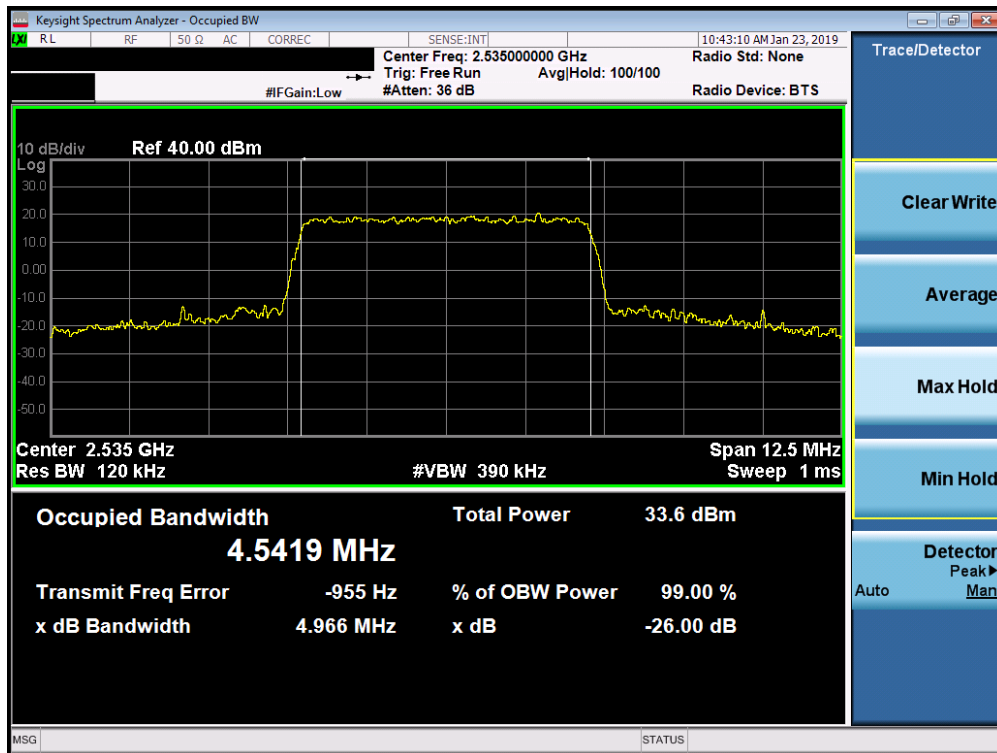
FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 57 of 338



**Band 7**

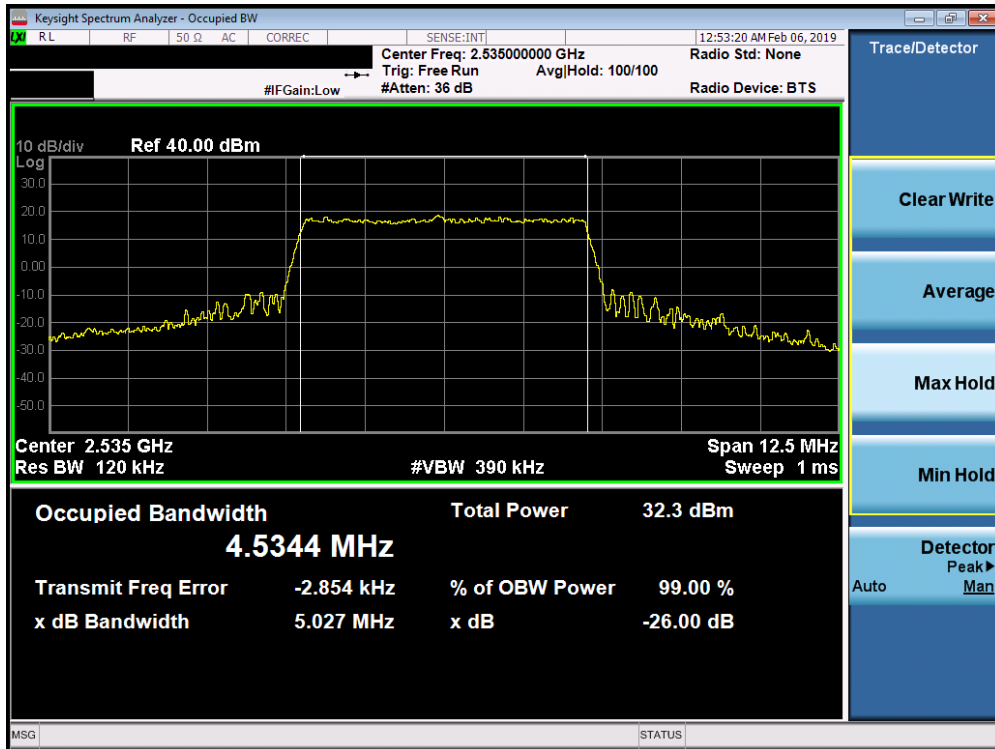


**Plot 7-73. Occupied Bandwidth Plot (Band 7 - 5.0MHz QPSK - Full RB Configuration)**

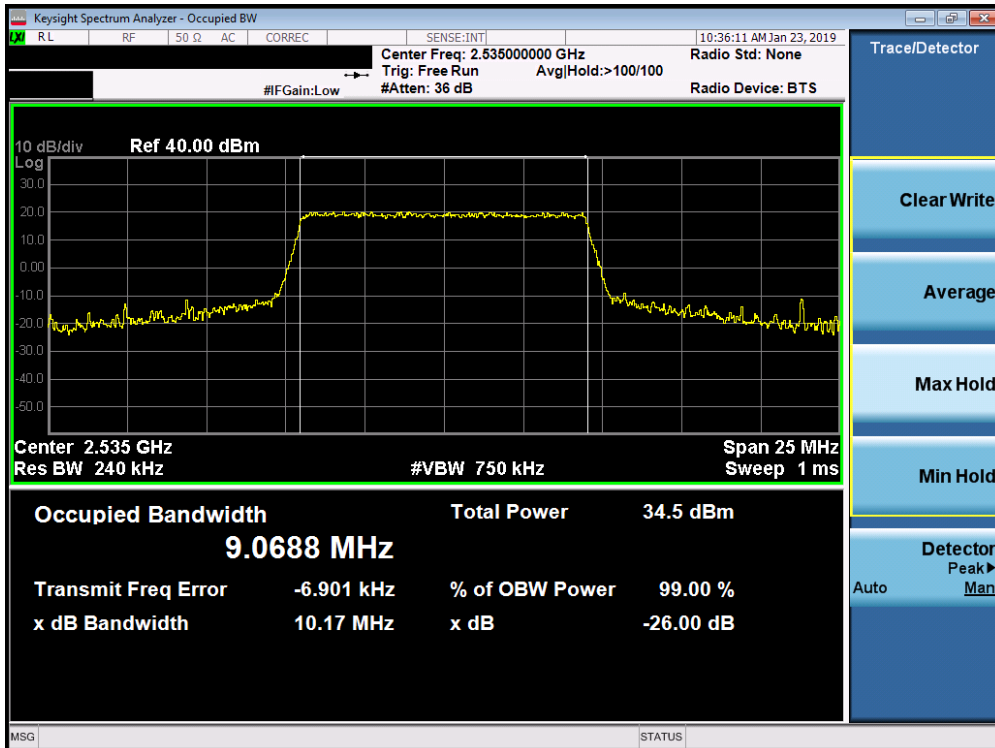


**Plot 7-74. Occupied Bandwidth Plot (Band 7 - 5.0MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 58 of 338

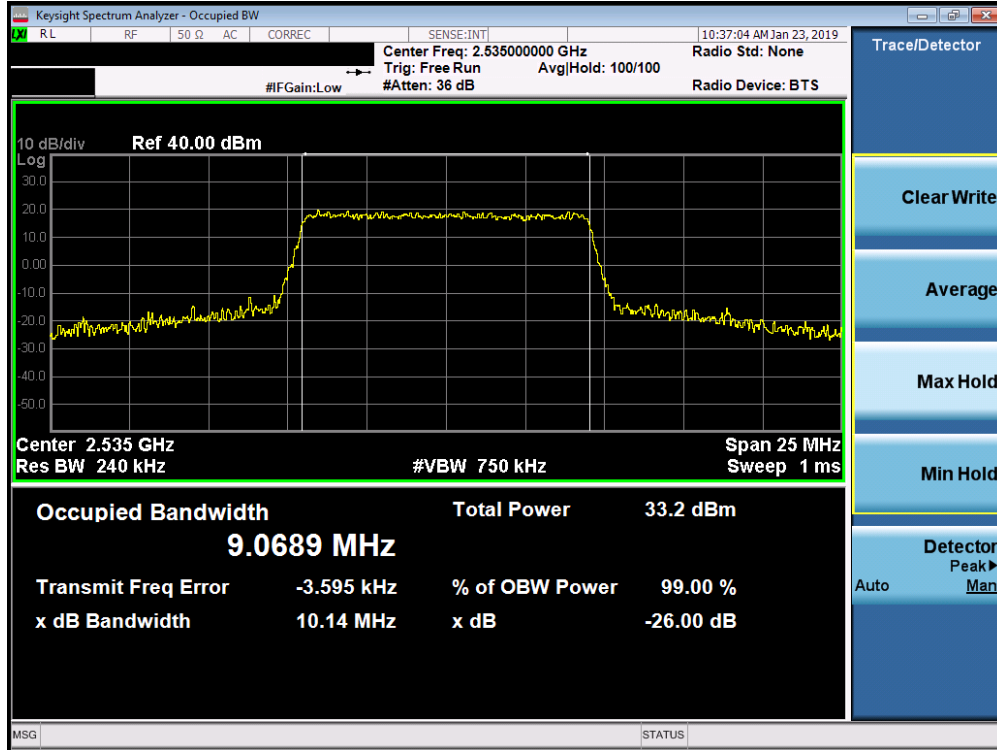


Plot 7-75. Occupied Bandwidth Plot (Band 7 - 5.0MHz 64-QAM - Full RB Configuration)

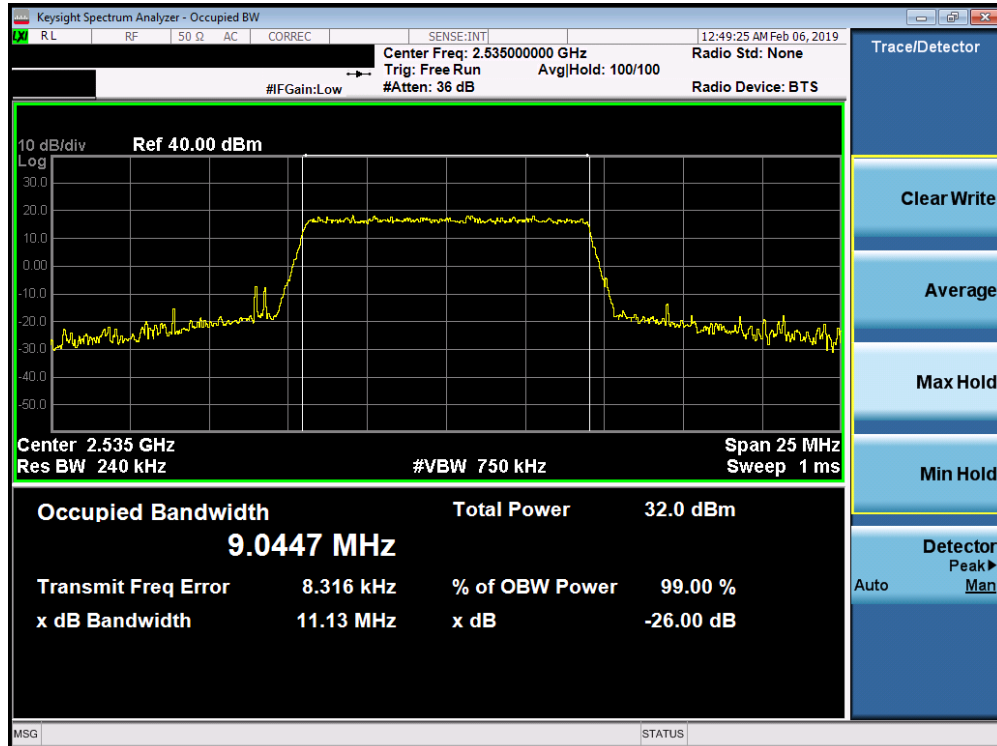


Plot 7-76. Occupied Bandwidth Plot (Band 7 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 59 of 338

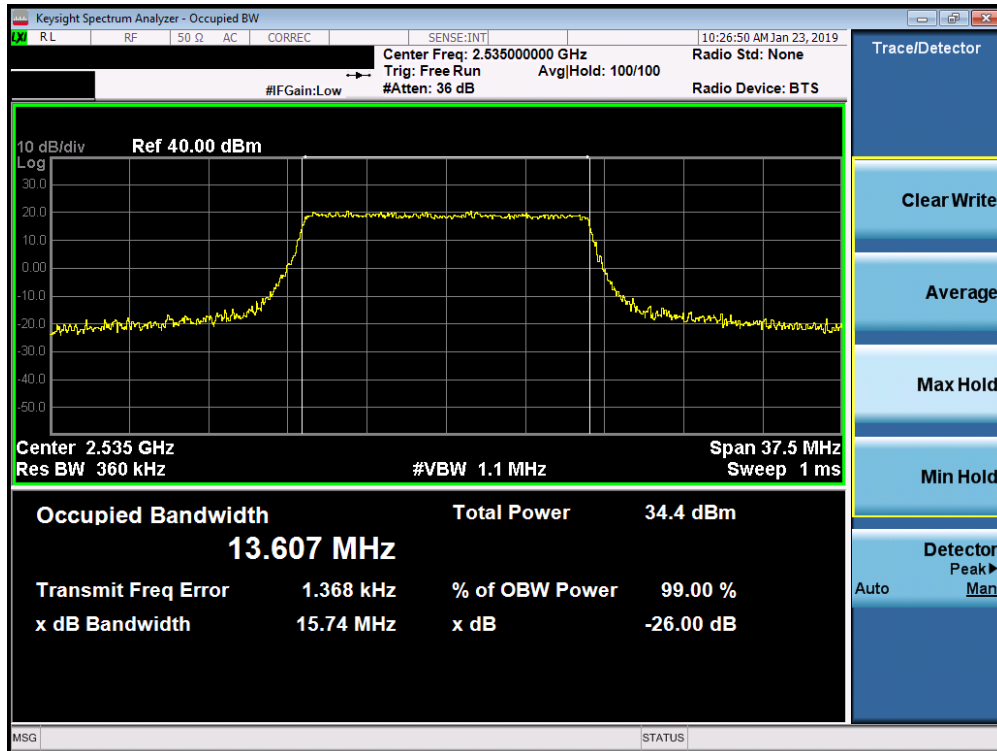


Plot 7-77. Occupied Bandwidth Plot (Band 7 - 10.0MHz 16-QAM - Full RB Configuration)

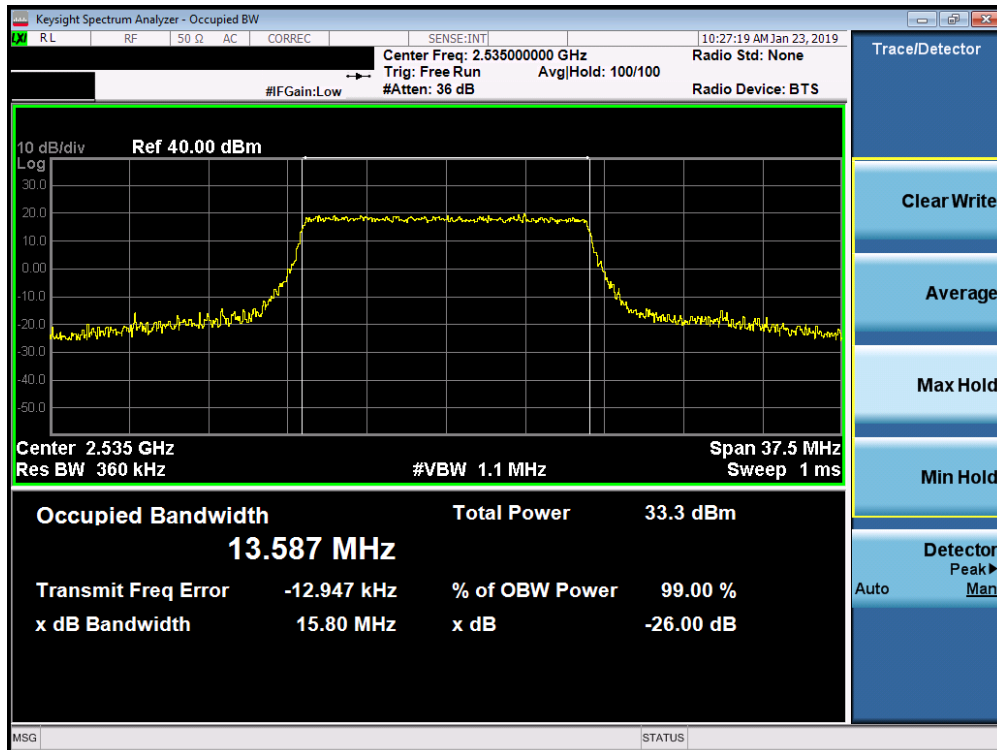


Plot 7-78. Occupied Bandwidth Plot (Band 7 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 60 of 338

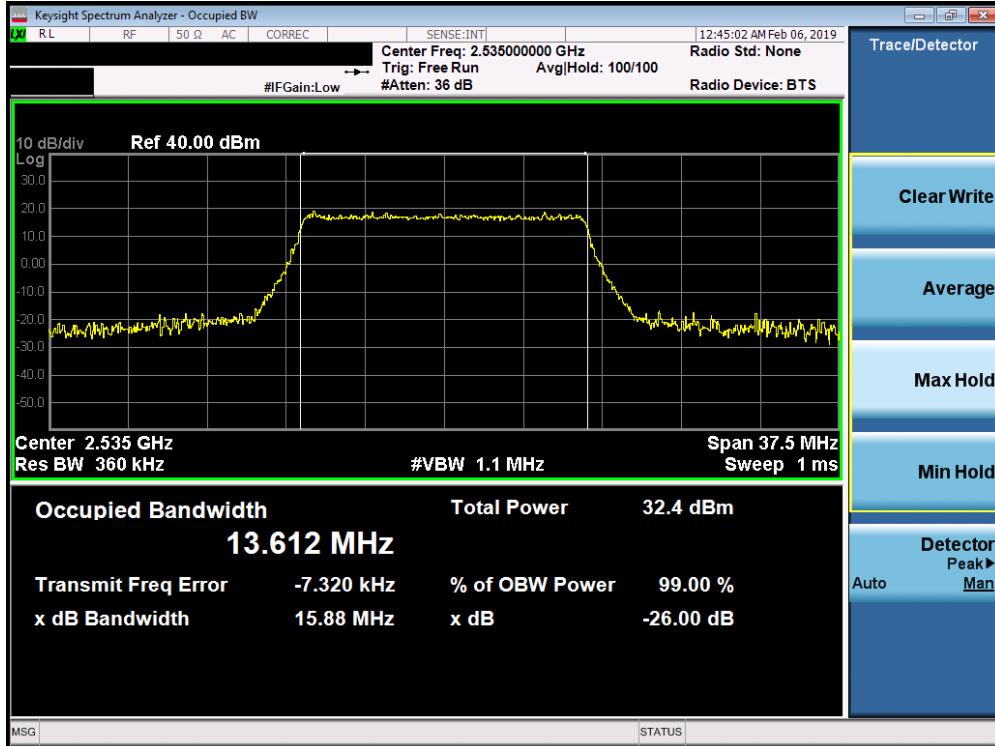


Plot 7-79. Occupied Bandwidth Plot (Band 7 - 15.0MHz QPSK - Full RB Configuration)

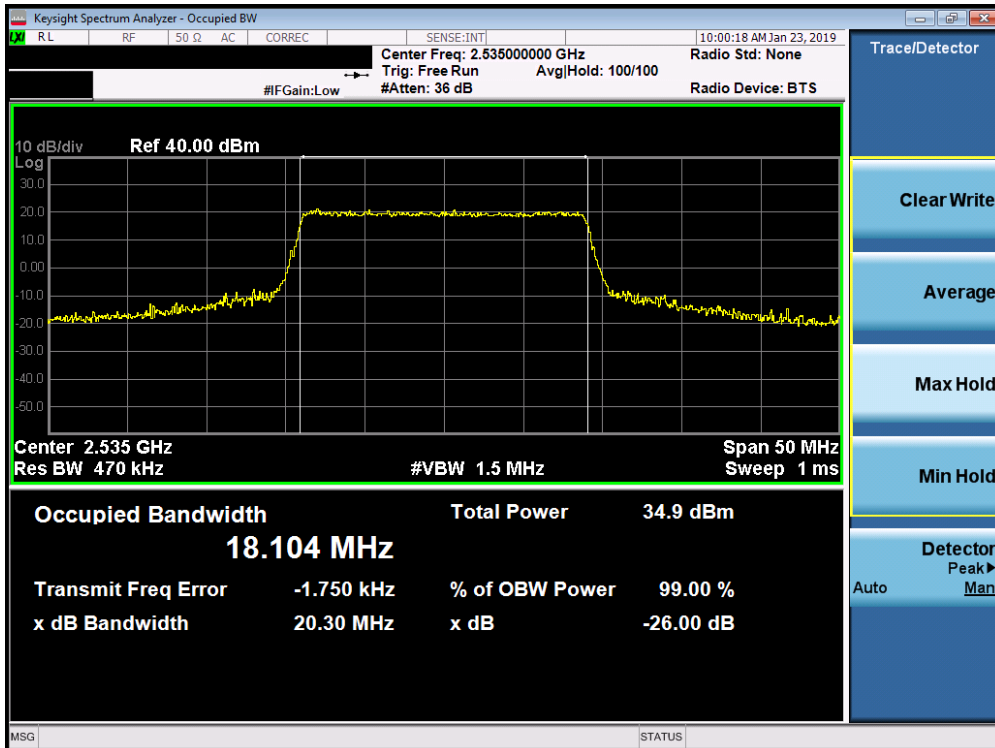


Plot 7-80. Occupied Bandwidth Plot (Band 7 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 61 of 338

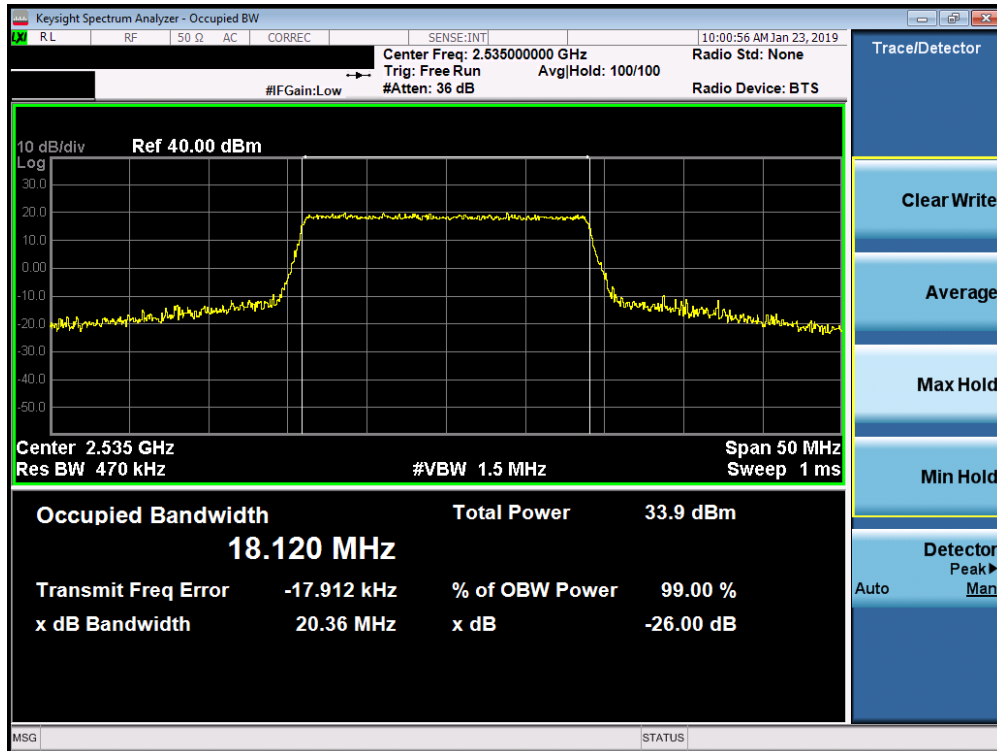


Plot 7-81. Occupied Bandwidth Plot (Band 7 - 15.0MHz 64-QAM - Full RB Configuration)

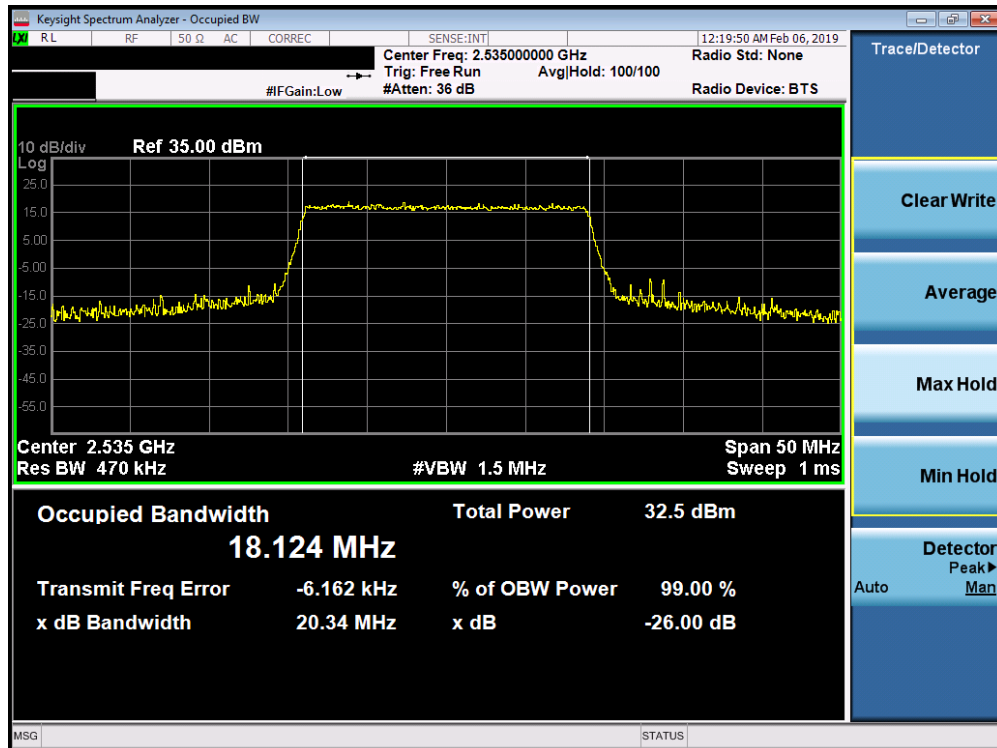


Plot 7-82. Occupied Bandwidth Plot (Band 7 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 62 of 338



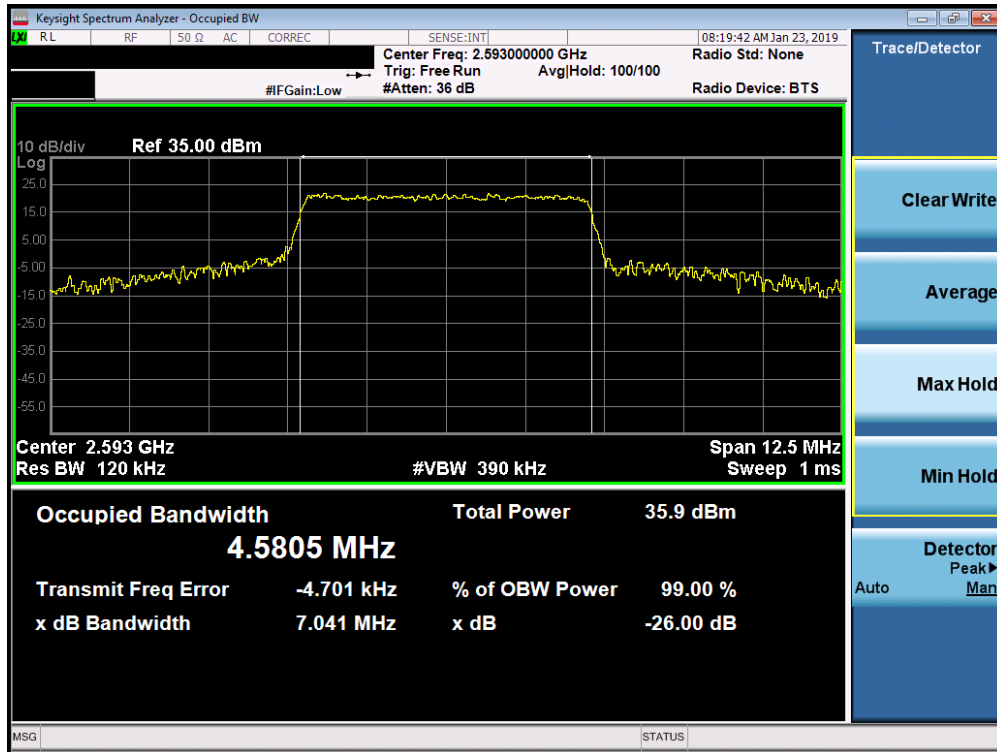
Plot 7-83. Occupied Bandwidth Plot (Band 7 - 20.0MHz 16-QAM - Full RB Configuration)



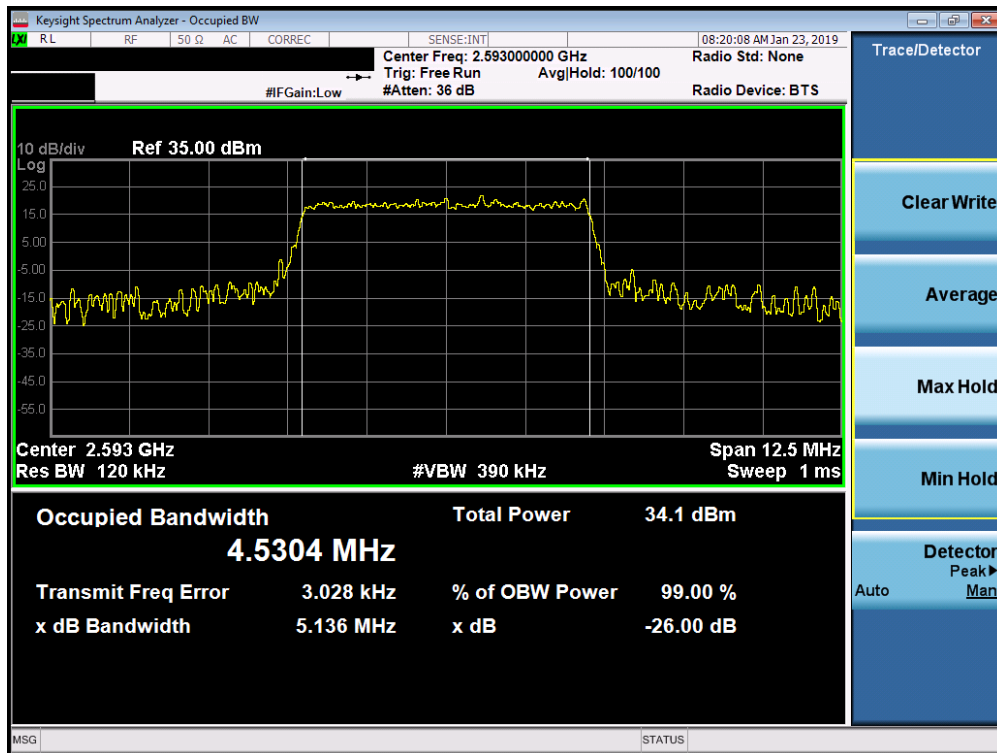
Plot 7-84. Occupied Bandwidth Plot (Band 7 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 63 of 338

**Band 41**



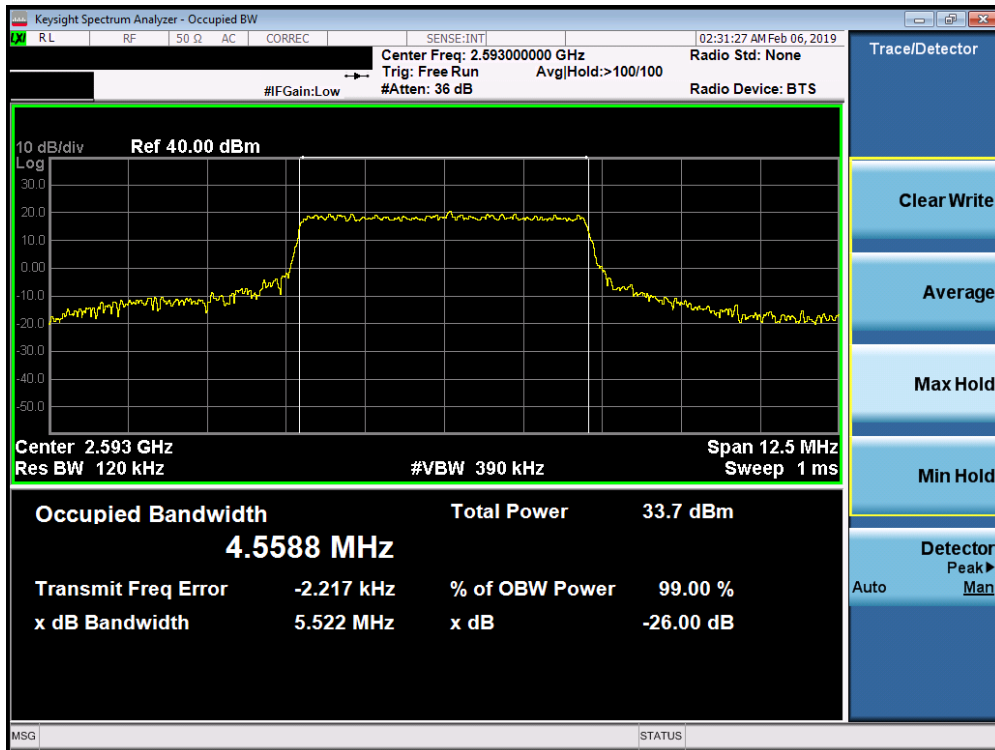
**Plot 7-85. Occupied Bandwidth Plot (Band 41 - 5.0MHz QPSK - Full RB Configuration)**



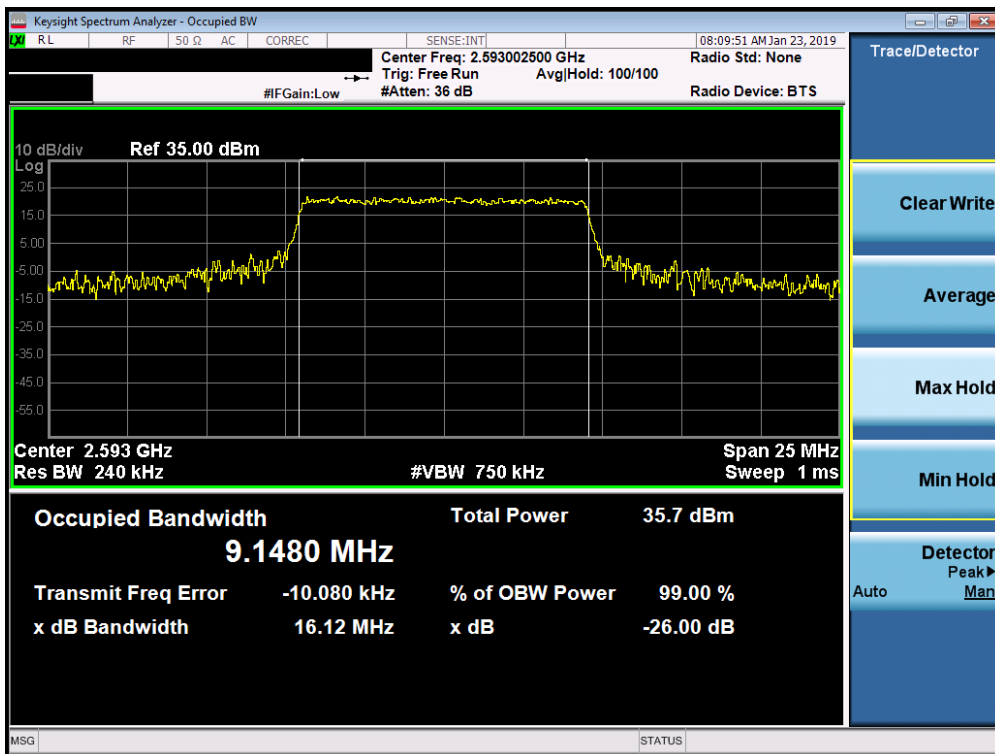
**Plot 7-86. Occupied Bandwidth Plot (Band 41 - 5.0MHz 16-QAM - Full RB Configuration)**

FCC ID: BCGA2123	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 64 of 338



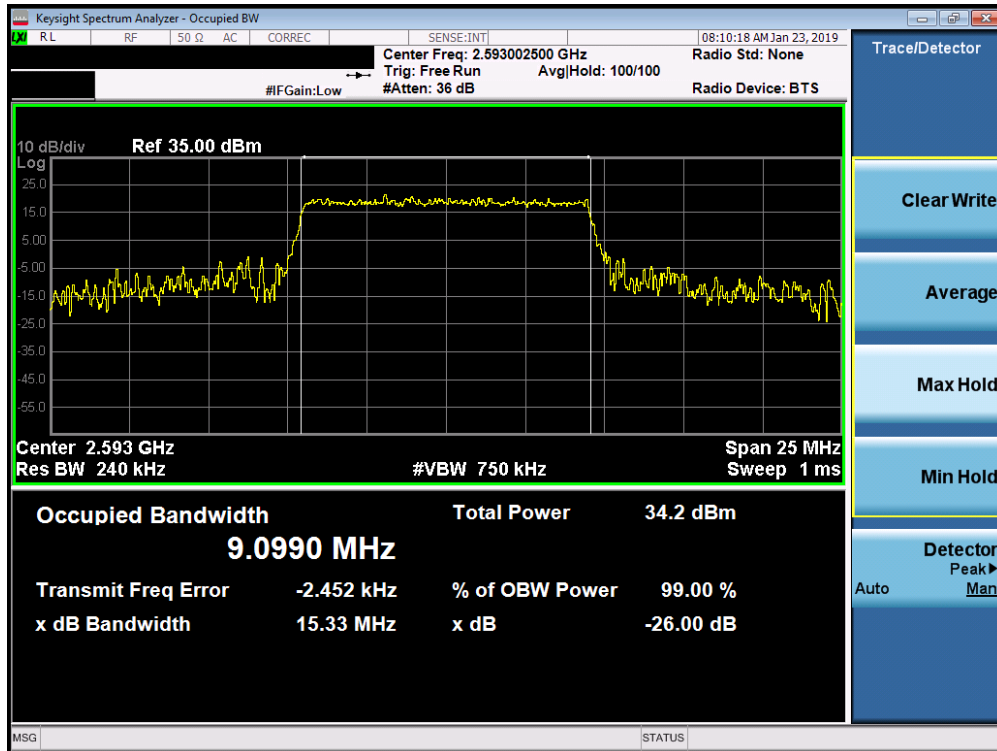


Plot 7-87. Occupied Bandwidth Plot (Band 41 - 5.0MHz 64-QAM - Full RB Configuration)

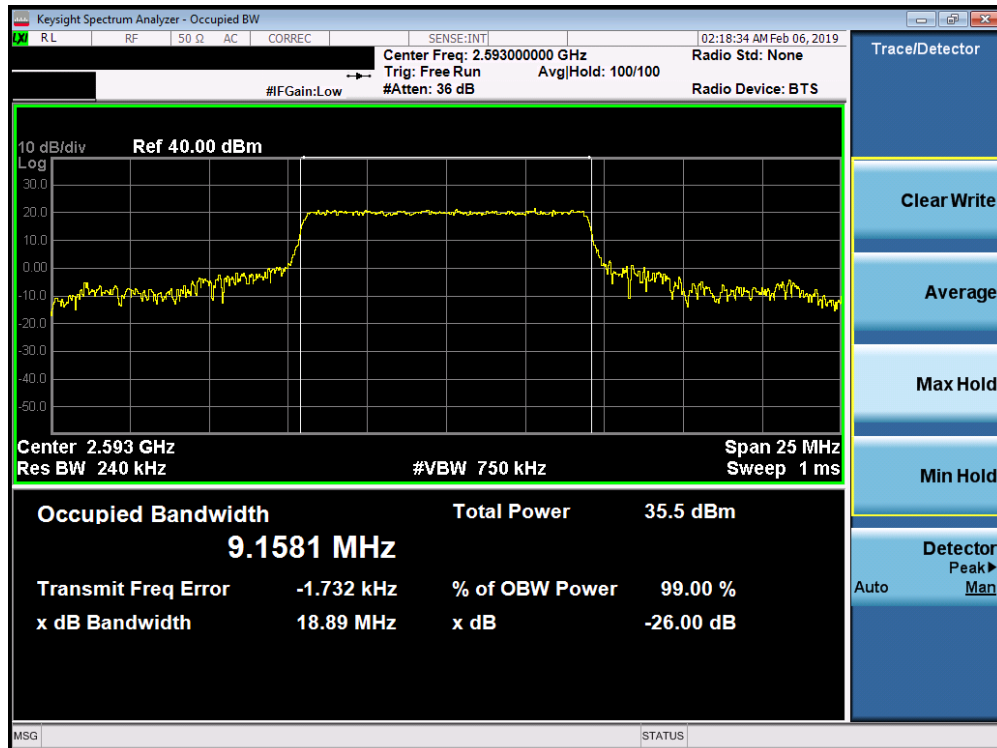


Plot 7-88. Occupied Bandwidth Plot (Band 41 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 65 of 338

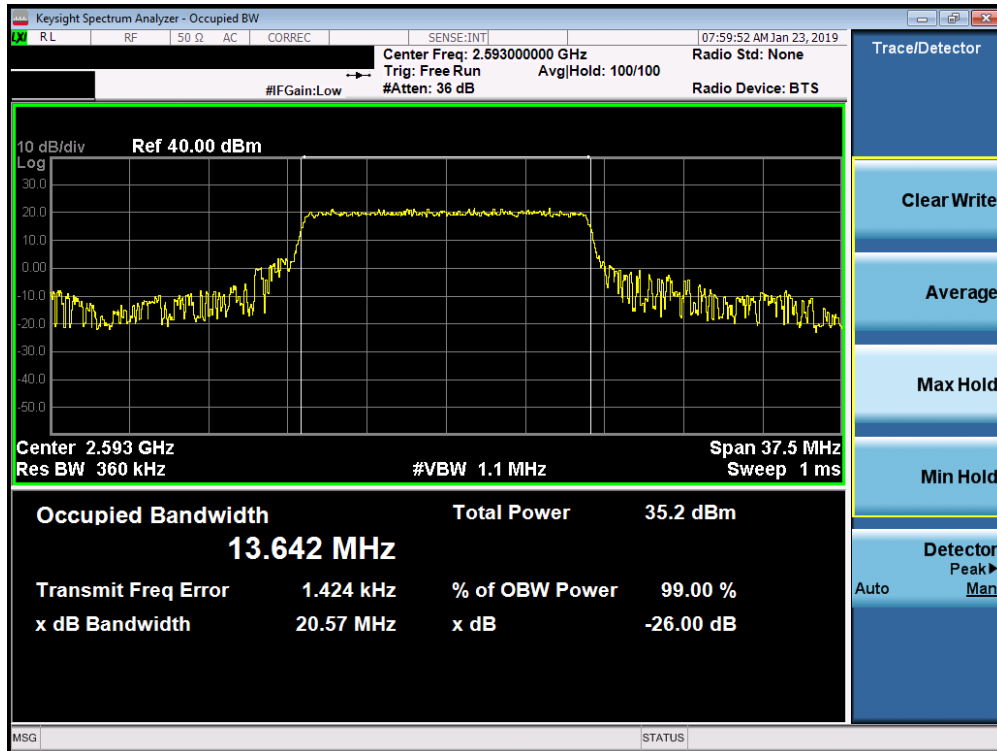


Plot 7-89. Occupied Bandwidth Plot (Band 41 - 10.0MHz 16-QAM - Full RB Configuration)

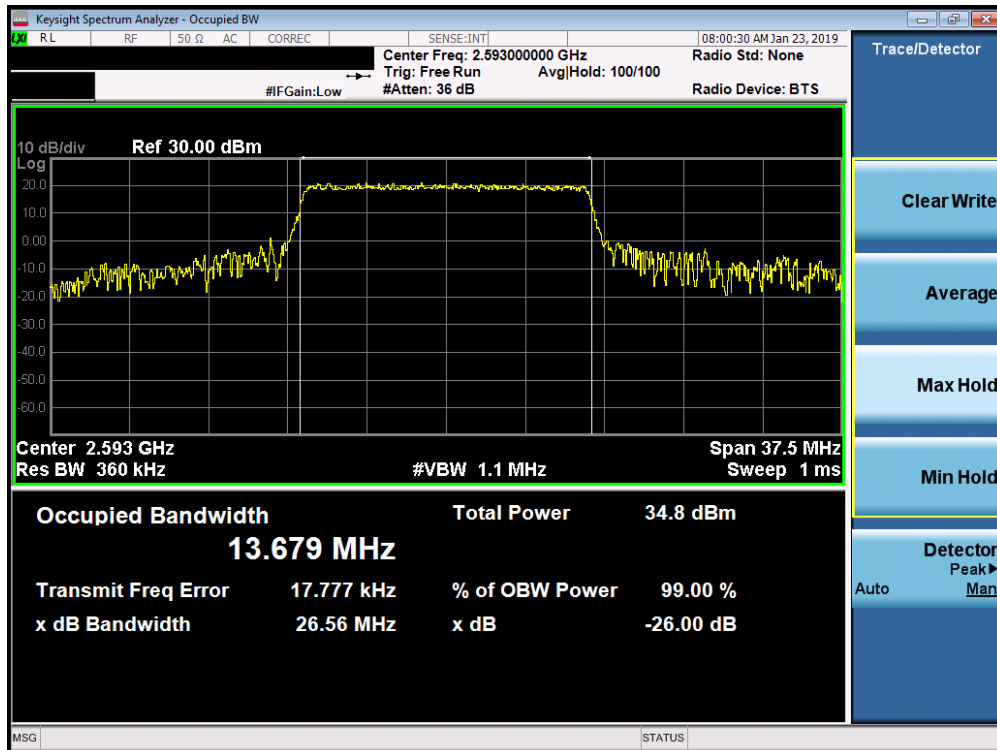


Plot 7-90. Occupied Bandwidth Plot (Band 41 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 66 of 338

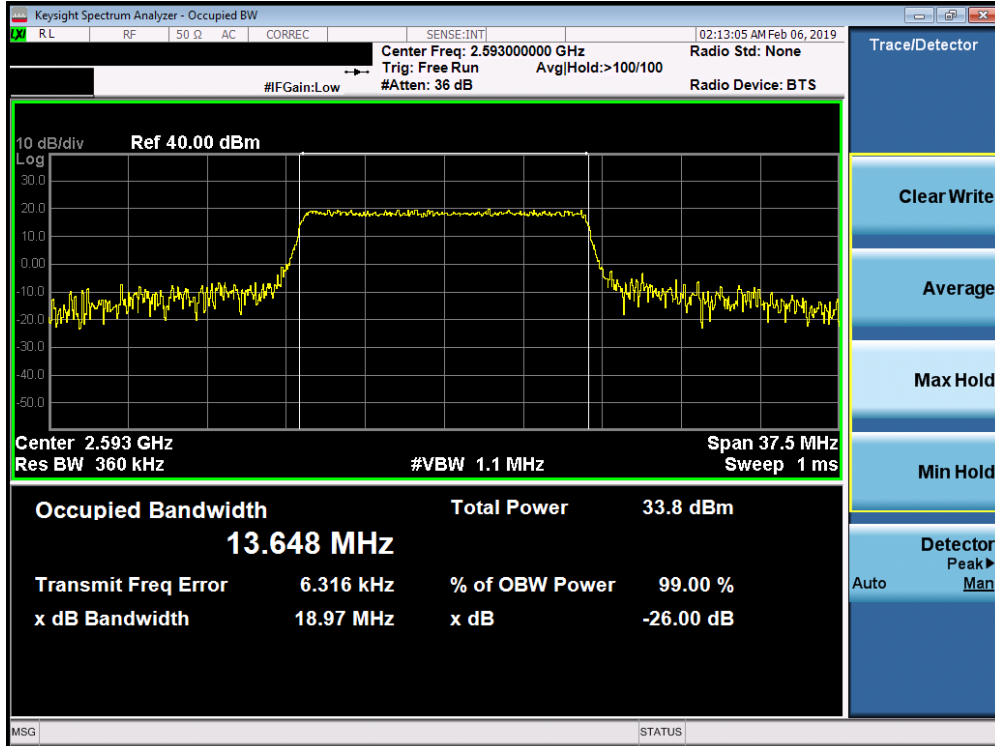


Plot 7-91. Occupied Bandwidth Plot (Band 41 - 15.0MHz QPSK - Full RB Configuration)

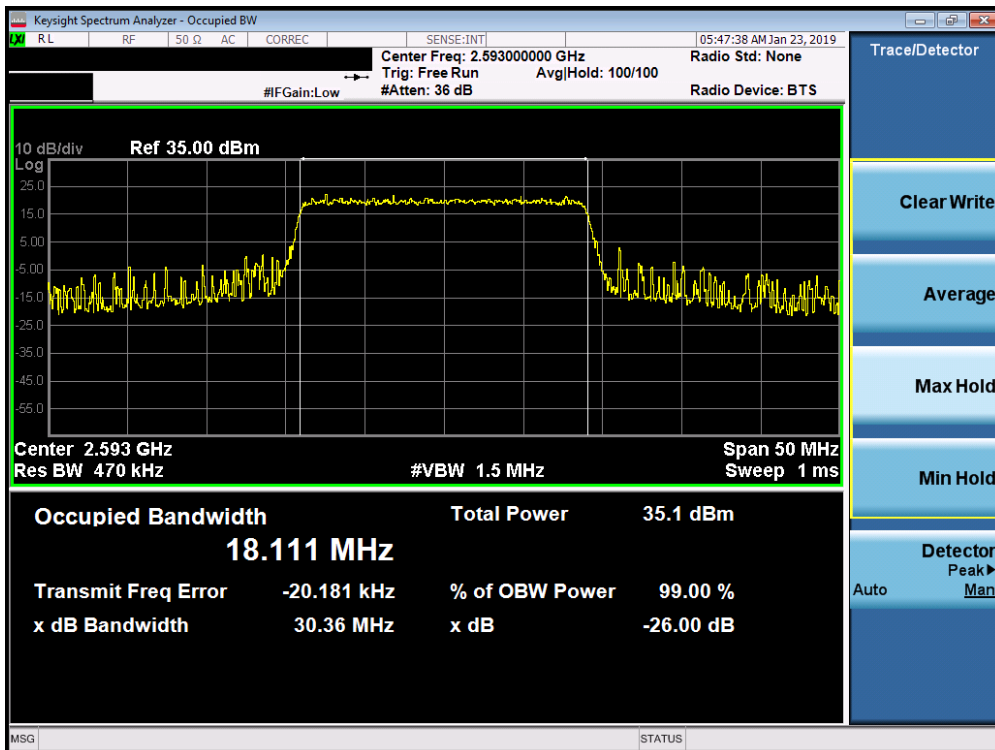


Plot 7-92. Occupied Bandwidth Plot (Band 41 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 67 of 338

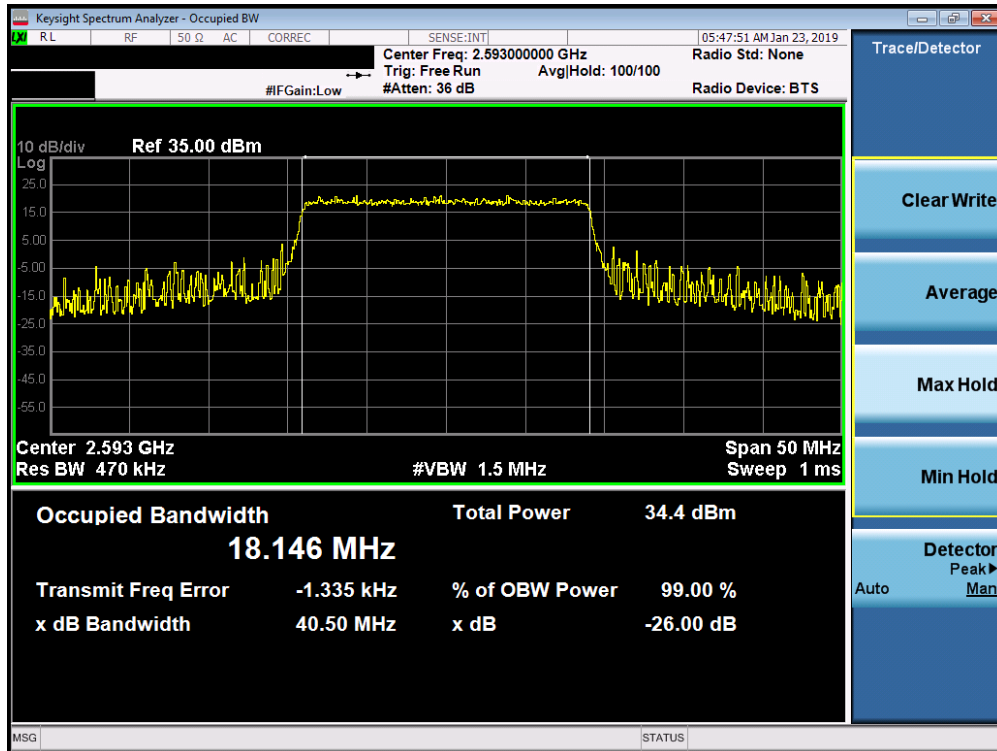


Plot 7-93. Occupied Bandwidth Plot (Band 41 - 15.0MHz 64-QAM - Full RB Configuration)

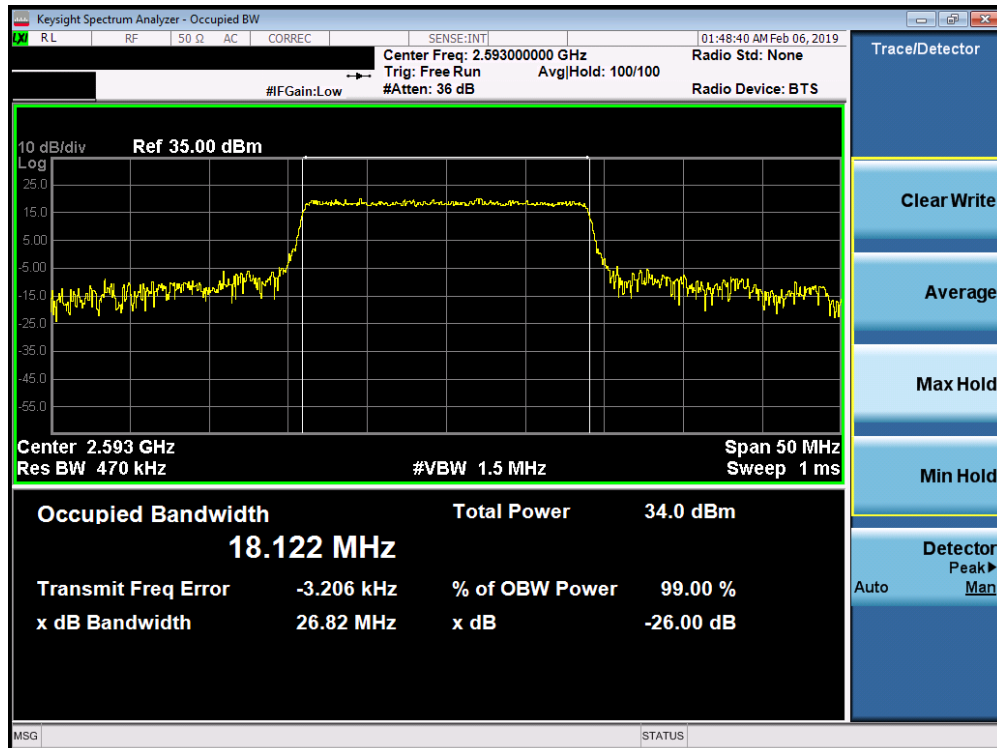


Plot 7-94. Occupied Bandwidth Plot (Band 41 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: BCGA2123			MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 68 of 338



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: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 69 of 338

### 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 10<sup>th</sup> 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  $43 + \log_{10}(P_{[Watts]})$ , where P is the transmitter power in Watts.**

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

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

#### 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.

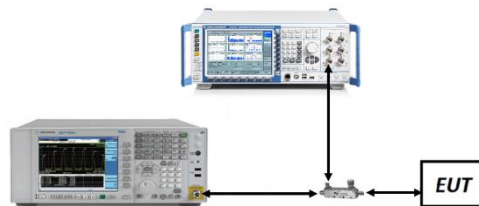


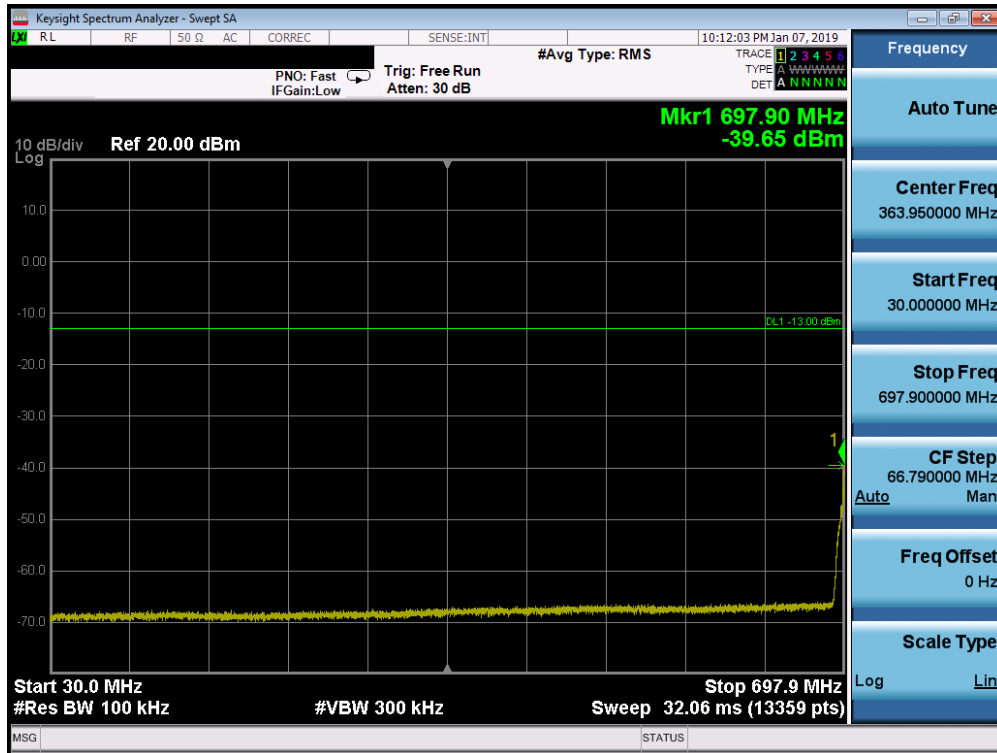
Figure 7-2. Test Instrument & Measurement Setup

#### Test Notes

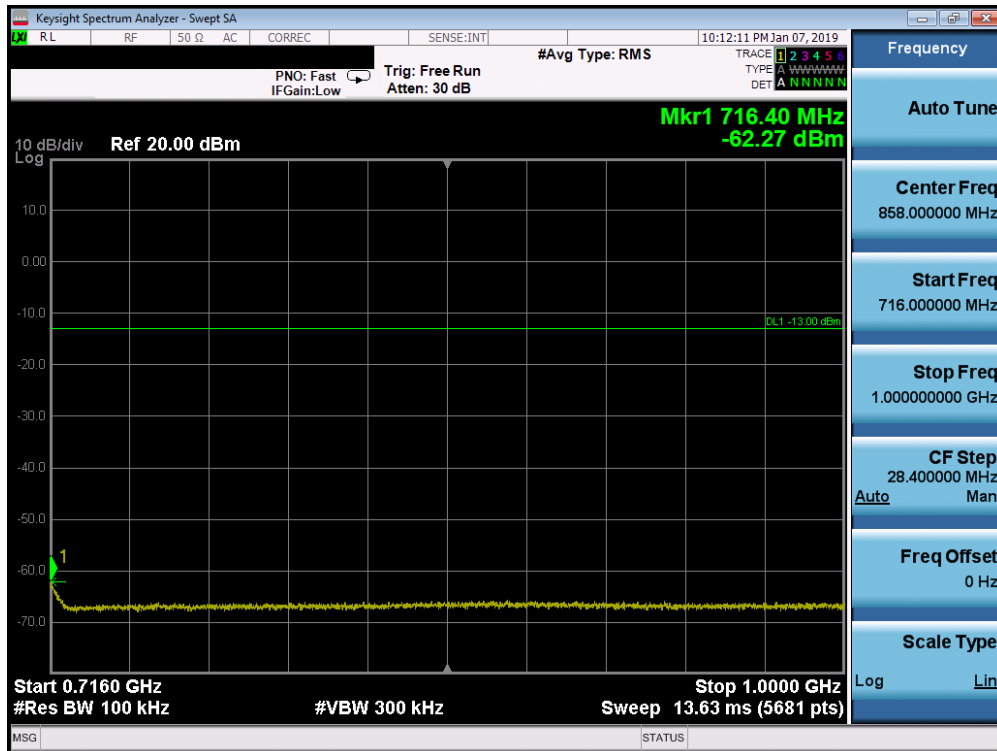
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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.

FCC ID: BCGA2123	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device	Page 70 of 338

**Band 12/17**



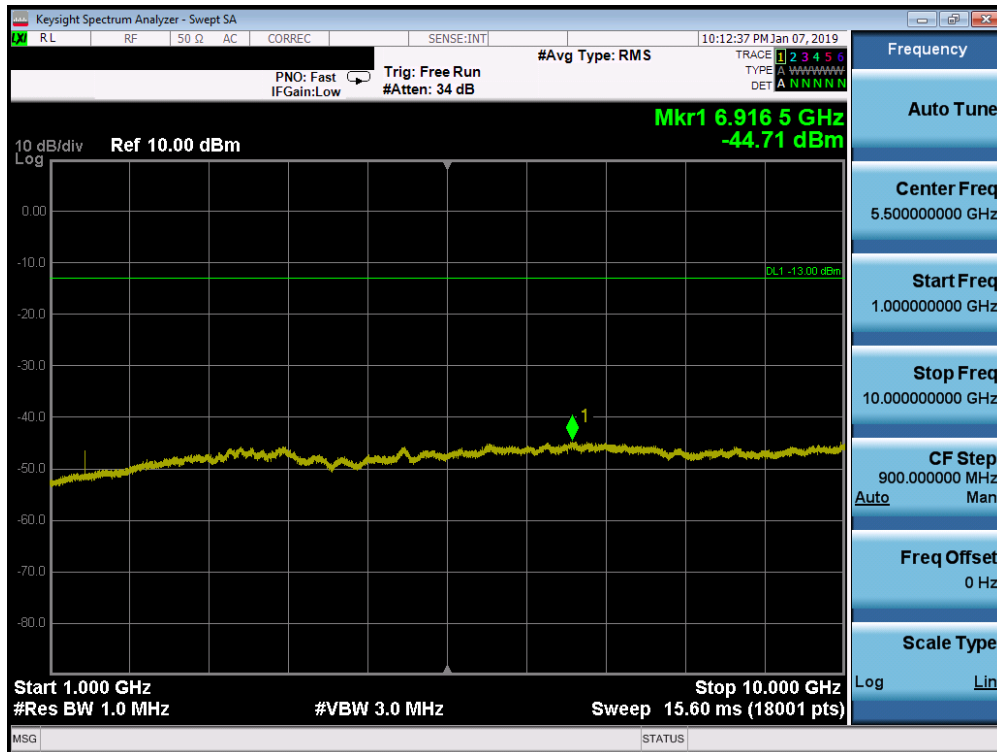
**Plot 7-97. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)**



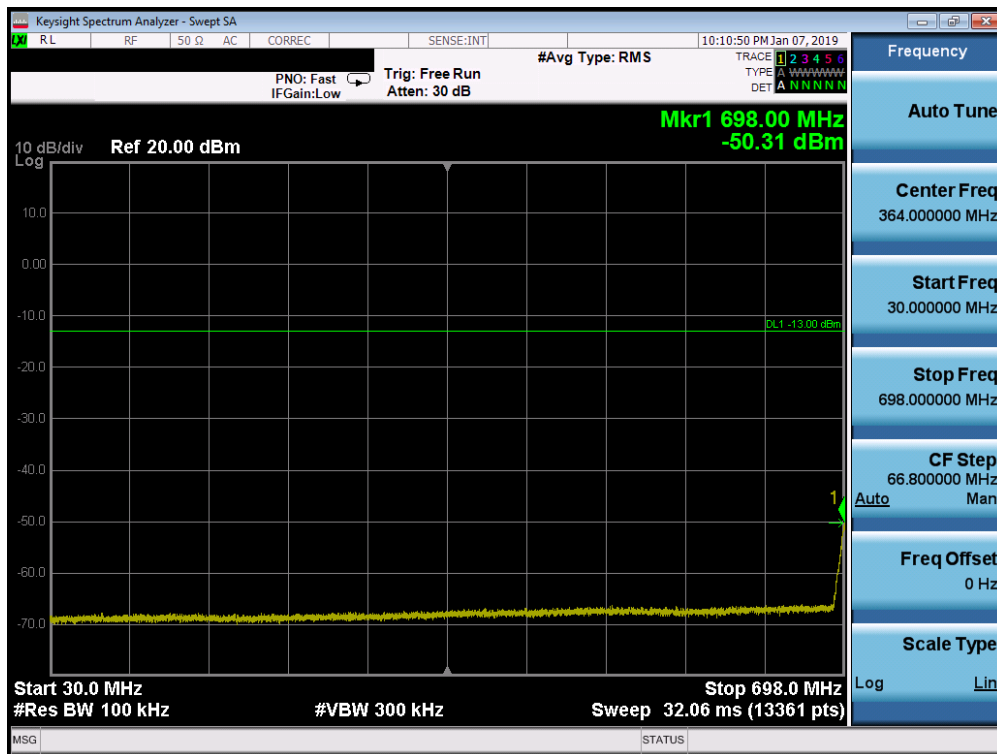
**Plot 7-98. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)**

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 71 of 338



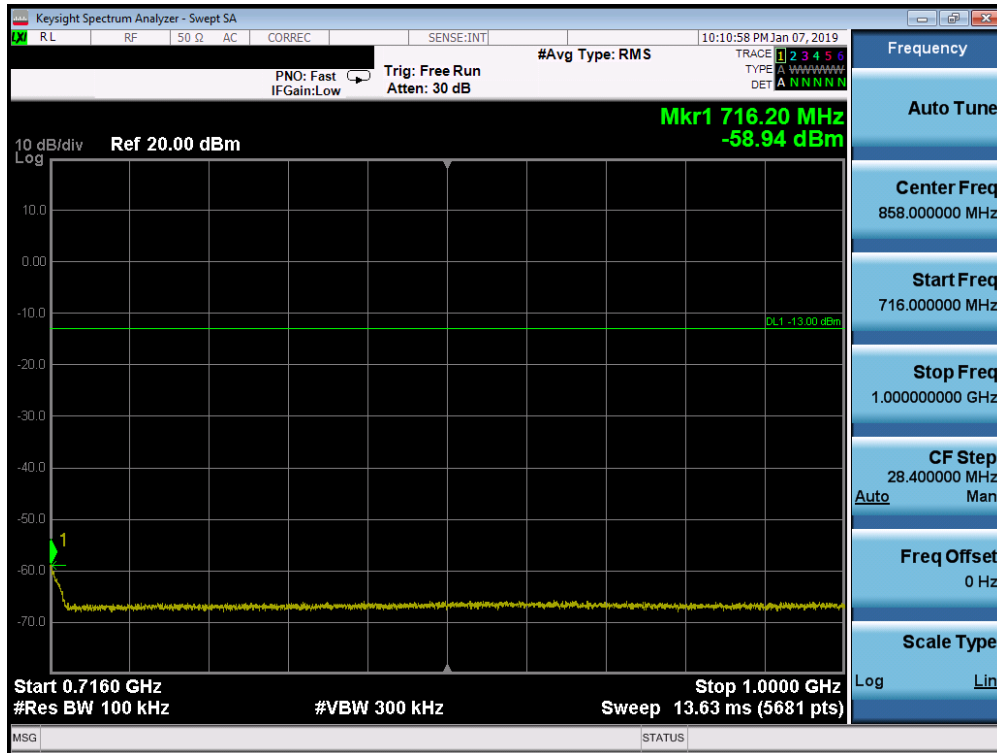


Plot 7-99. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

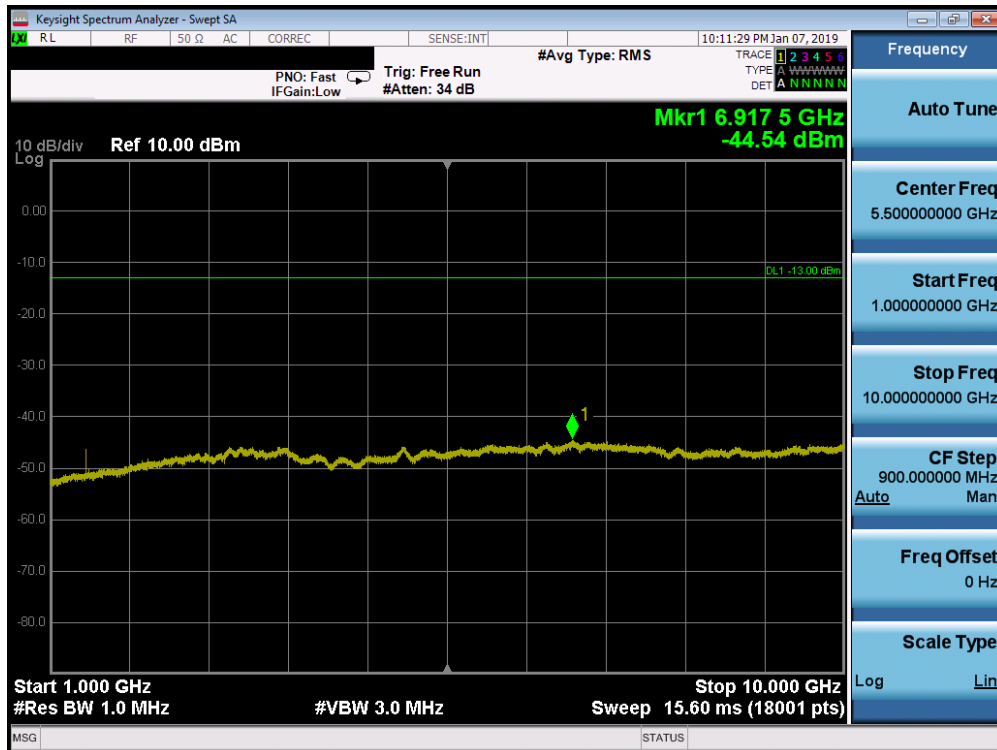


Plot 7-100. Conducted Spurious Plot (Band 12/17 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 72 of 338



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: BCGA2123	<b>PCTEST</b> ENGINEERING LABORATORY, INC.		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1811080029-03-R1.BCG	Test Dates: 11/09/2018-02/02/2019	EUT Type: Tablet Device		Page 73 of 338