



## MEASUREMENT REPORT LTE

**Applicant Name:**

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

**Date of Testing:**

7/31-10/18/2018

**Test Site/Location:**

PCTEST Lab. Morgan Hill, CA, USA

**Test Report Serial No.:**

1C1806220014-03-R1.BCG

**FCC ID:**
**BCGA1895**
**APPLICANT:**
**Apple Inc.**
**Application Type:**

Certification

**Model:**

A1895

**EUT Type:**

Tablet Device

**FCC Classification:**

PCS Licensed Transmitter (PCB)

**FCC Rule Part(s):**

22, 24, &amp; 27

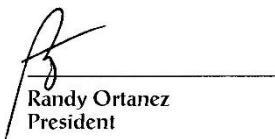
**Test Procedure(s):**

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: 1C1806220014-03-R1.BCG) supersedes and replaces the previously issued test report (S/N: 1C1806220014-03.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.

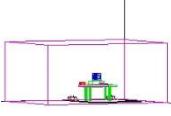
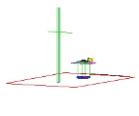

 \_\_\_\_\_  
 Randy Ortanez  
 President


FCC ID: BCGA1895	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 1 of 373

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## FCC Part

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	0.087	19.41	0.143	21.56	1M11G7W	QPSK
LTE Band 12	27	699.7 - 715.3	0.078	18.89	0.127	21.04	1M11D7W	16QAM
LTE Band 12	27	699.7 - 715.3	0.061	17.85	0.100	20.00	1M11D7W	64QAM
LTE Band 12	27	700.5 - 714.5	0.086	19.36	0.142	21.51	2M74G7W	QPSK
LTE Band 12	27	700.5 - 714.5	0.075	18.75	0.123	20.90	2M72D7W	16QAM
LTE Band 12	27	700.5 - 714.5	0.061	17.85	0.100	20.00	2M72D7W	64QAM
LTE Band 12	27	701.5 - 713.5	0.092	19.62	0.150	21.77	4M53G7W	QPSK
LTE Band 12	27	701.5 - 713.5	0.077	18.86	0.126	21.01	4M54D7W	16QAM
LTE Band 12	27	701.5 - 713.5	0.061	17.85	0.100	20.00	4M55D7W	64QAM
LTE Band 12	27	704 - 711	0.091	19.58	0.149	21.73	9M08G7W	QPSK
LTE Band 12	27	704 - 711	0.078	18.94	0.129	21.09	9M06D7W	16QAM
LTE Band 12	27	704 - 711	0.063	17.96	0.103	20.11	9M05D7W	64QAM
LTE Band 17	27	706.5 - 713.5	0.092	19.65	0.151	21.80	4M53G7W	QPSK
LTE Band 17	27	706.5 - 713.5	0.078	18.95	0.129	21.10	4M54D7W	16QAM
LTE Band 17	27	706.5 - 713.5	0.060	17.77	0.098	19.92	4M55D7W	64QAM
LTE Band 17	27	709 - 711	0.090	19.56	0.148	21.71	9M08G7W	QPSK
LTE Band 17	27	709 - 711	0.077	18.87	0.127	21.02	9M06D7W	16QAM
LTE Band 17	27	709 - 711	0.060	17.76	0.098	19.91	9M05D7W	64QAM
LTE Band 13	27	779.5 - 784.5	0.092	19.64	0.151	21.79	4M54G7W	QPSK
LTE Band 13	27	779.5 - 784.5	0.080	19.02	0.131	21.17	4M52D7W	16QAM
LTE Band 13	27	779.5 - 784.5	0.062	17.94	0.102	20.09	4M54D7W	64QAM
LTE Band 13	27	782	0.092	19.65	0.151	21.80	9M07G7W	QPSK
LTE Band 13	27	782	0.084	19.25	0.138	21.40	9M06D7W	16QAM
LTE Band 13	27	782	0.063	17.97	0.103	20.12	9M03D7W	64QAM
LTE Band 5	22H	824.7 - 848.3	0.090	19.55	0.148	21.70	1M11G7W	QPSK
LTE Band 5	22H	824.7 - 848.3	0.080	19.02	0.131	21.17	1M11D7W	16QAM
LTE Band 5	22H	824.7 - 848.3	0.059	17.74	0.097	19.89	1M11D7W	64QAM
LTE Band 5	22H	825.5 - 847.5	0.090	19.55	0.148	21.70	2M73G7W	QPSK
LTE Band 5	22H	825.5 - 847.5	0.078	18.95	0.129	21.10	2M71D7W	16QAM
LTE Band 5	22H	825.5 - 847.5	0.060	17.77	0.098	19.92	2M73D7W	64QAM
LTE Band 5	22H	826.5 - 846.5	0.090	19.55	0.148	21.70	4M53G7W	QPSK
LTE Band 5	22H	826.5 - 846.5	0.076	18.82	0.125	20.97	4M53D7W	16QAM
LTE Band 5	22H	826.5 - 846.5	0.058	17.66	0.096	19.81	4M55D7W	64QAM
LTE Band 5	22H	829 - 844	0.090	19.54	0.148	21.69	9M06G7W	QPSK
LTE Band 5	22H	829 - 844	0.076	18.84	0.125	20.99	9M06D7W	16QAM
LTE Band 5	22H	829 - 844	0.060	17.75	0.098	19.90	9M04D7W	64QAM
LTE Band 26	22H	824.7 - 848.3	0.091	19.61	0.150	21.76	1M11G7W	QPSK
LTE Band 26	22H	824.7 - 848.3	0.081	19.07	0.133	21.22	1M11D7W	16QAM
LTE Band 26	22H	824.7 - 848.3	0.091	19.61	0.150	21.76	1M11D7W	64QAM
LTE Band 26	22H	825.5 - 847.5	0.090	19.54	0.148	21.69	2M73G7W	QPSK
LTE Band 26	22H	825.5 - 847.5	0.081	19.06	0.132	21.21	2M71D7W	16QAM
LTE Band 26	22H	825.5 - 847.5	0.058	17.67	0.096	19.82	2M73D7W	64QAM
LTE Band 26	22H	826.5 - 846.5	0.090	19.55	0.148	21.70	4M53G7W	QPSK
LTE Band 26	22H	826.5 - 846.5	0.079	18.95	0.129	21.10	4M53D7W	16QAM
LTE Band 26	22H	826.5 - 846.5	0.059	17.74	0.097	19.89	4M55D7W	64QAM
LTE Band 26	22H	829 - 844	0.090	19.55	0.148	21.70	9M06G7W	QPSK
LTE Band 26	22H	829 - 844	0.077	18.88	0.127	21.03	9M06D7W	16QAM
LTE Band 26	22H	829 - 844	0.058	17.67	0.096	19.82	9M04D7W	64QAM

### EUT Overview (<1GHz)

FCC ID: BCGA1895	 PCTEST <sup>®</sup> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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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	0.175	22.44	1M10G7W	QPSK
LTE Band 4	27	1710.7 - 1754.3	0.151	21.80	1M10D7W	16QAM
LTE Band 4	27	1710.7 - 1754.3	0.115	20.60	1M11D7W	64QAM
LTE Band 4	27	1711.5 - 1753.5	0.174	22.40	2M72G7W	QPSK
LTE Band 4	27	1711.5 - 1753.5	0.149	21.73	2M72D7W	16QAM
LTE Band 4	27	1711.5 - 1753.5	0.117	20.67	2M71D7W	64QAM
LTE Band 4	27	1712.5 - 1752.5	0.181	22.59	4M54G7W	QPSK
LTE Band 4	27	1712.5 - 1752.5	0.153	21.85	4M61D7W	16QAM
LTE Band 4	27	1712.5 - 1752.5	0.175	22.44	4M54D7W	64QAM
LTE Band 4	27	1715 - 1750	0.176	22.45	9M06G7W	QPSK
LTE Band 4	27	1715 - 1750	0.153	21.84	9M02D7W	16QAM
LTE Band 4	27	1715 - 1750	0.112	20.51	9M07D7W	64QAM
LTE Band 4	27	1717.5 - 1747.5	0.175	22.42	13M6G7W	QPSK
LTE Band 4	27	1717.5 - 1747.5	0.152	21.80	13M6D7W	16QAM
LTE Band 4	27	1717.5 - 1747.5	0.114	20.56	13M6D7W	64QAM
LTE Band 4	27	1720 - 1745	0.175	22.43	18M0G7W	QPSK
LTE Band 4	27	1720 - 1745	0.154	21.89	18M1D7W	16QAM
LTE Band 4	27	1720 - 1745	0.117	20.69	18M1D7W	64QAM
LTE Band 66	27	1710.7 - 1779.3	0.176	22.45	1M10G7W	QPSK
LTE Band 66	27	1710.7 - 1779.3	0.152	21.81	1M10D7W	16QAM
LTE Band 66	27	1710.7 - 1779.3	0.115	20.59	1M11D7W	64QAM
LTE Band 66	27	1711.5 - 1778.5	0.176	22.45	2M72G7W	QPSK
LTE Band 66	27	1711.5 - 1778.5	0.154	21.88	2M72D7W	16QAM
LTE Band 66	27	1711.5 - 1778.5	0.112	20.50	2M71D7W	64QAM
LTE Band 66	27	1712.5 - 1777.5	0.185	22.67	4M54G7W	QPSK
LTE Band 66	27	1712.5 - 1777.5	0.154	21.87	4M51D7W	16QAM
LTE Band 66	27	1712.5 - 1777.5	0.111	20.45	4M54D7W	64QAM
LTE Band 66	27	1715 - 1775	0.179	22.52	9M06G7W	QPSK
LTE Band 66	27	1715 - 1775	0.152	21.80	9M02D7W	16QAM
LTE Band 66	27	1715 - 1775	0.113	20.54	9M07D7W	64QAM
LTE Band 66	27	1717.5 - 1772.5	0.176	22.45	13M6G7W	QPSK
LTE Band 66	27	1717.5 - 1772.5	0.156	21.94	13M6D7W	16QAM
LTE Band 66	27	1717.5 - 1772.5	0.112	20.51	13M6D7W	64QAM
LTE Band 66	27	1720 - 1770	0.177	22.47	18M0G7W	QPSK
LTE Band 66	27	1720 - 1770	0.159	22.01	18M1D7W	16QAM
LTE Band 66	27	1720 - 1770	0.113	20.52	18M1D7W	64QAM
LTE Band 66	27	1850.7 - 1909.3	0.200	23.02	1M10G7W	QPSK
LTE Band 2	24E	1850.7 - 1909.3	0.175	22.43	1M10D7W	16QAM
LTE Band 2	24E	1850.7 - 1909.3	0.148	21.69	1M10D7W	64QAM
LTE Band 2	24E	1851.5 - 1908.5	0.203	23.07	2M73G7W	QPSK
LTE Band 2	24E	1851.5 - 1908.5	0.180	22.55	2M74D7W	16QAM
LTE Band 2	24E	1851.5 - 1908.5	0.146	21.65	2M74D7W	64QAM
LTE Band 2	24E	1852.5 - 1907.5	0.216	23.34	4M53G7W	QPSK
LTE Band 2	24E	1852.5 - 1907.5	0.181	22.59	4M52D7W	16QAM
LTE Band 2	24E	1852.5 - 1907.5	0.148	21.70	4M53D7W	64QAM
LTE Band 2	24E	1855 - 1905	0.216	23.35	9M05G7W	QPSK
LTE Band 2	24E	1855 - 1905	0.184	22.64	9M02D7W	16QAM
LTE Band 2	24E	1855 - 1905	0.150	21.76	9M06D7W	64QAM
LTE Band 2	24E	1857.5 - 1902.5	0.215	23.32	13M6G7W	QPSK
LTE Band 2	24E	1857.5 - 1902.5	0.181	22.57	13M6D7W	16QAM
LTE Band 2	24E	1857.5 - 1902.5	0.150	21.75	13M6D7W	64QAM
LTE Band 2	24E	1860 - 1900	0.218	23.39	18M1G7W	QPSK
LTE Band 2	24E	1860 - 1900	0.187	22.71	18M1D7W	16QAM
LTE Band 2	24E	1860 - 1900	0.148	21.70	18M1D7W	64QAM
LTE Band 25	24E	1850.7 - 1914.3	0.206	23.13	1M10G7W	QPSK
LTE Band 25	24E	1850.7 - 1914.3	0.178	22.51	1M10D7W	16QAM
LTE Band 25	24E	1850.7 - 1914.3	0.115	20.60	1M10D7W	64QAM
LTE Band 25	24E	1851.5 - 1913.5	0.203	23.07	2M73G7W	QPSK
LTE Band 25	24E	1851.5 - 1913.5	0.181	22.58	2M74D7W	16QAM
LTE Band 25	24E	1851.5 - 1913.5	0.102	20.08	2M74D7W	64QAM
LTE Band 25	24E	1852.5 - 1912.5	0.213	23.28	4M53G7W	QPSK
LTE Band 25	24E	1852.5 - 1912.5	0.183	22.62	4M52D7W	16QAM
LTE Band 25	24E	1852.5 - 1912.5	0.103	20.11	4M53D7W	64QAM
LTE Band 25	24E	1855 - 1910	0.213	23.29	9M05G7W	QPSK
LTE Band 25	24E	1855 - 1910	0.182	22.59	9M02D7W	16QAM
LTE Band 25	24E	1855 - 1910	0.103	20.11	9M06D7W	64QAM
LTE Band 25	24E	1857.5 - 1907.5	0.214	23.30	13M6G7W	QPSK
LTE Band 25	24E	1857.5 - 1907.5	0.182	22.61	13M6D7W	16QAM
LTE Band 25	24E	1857.5 - 1907.5	0.103	20.11	13M6D7W	64QAM
LTE Band 25	24E	1860 - 1905	0.214	23.30	18M1G7W	QPSK
LTE Band 25	24E	1860 - 1905	0.187	22.72	18M1D7W	16QAM
LTE Band 25	24E	1860 - 1905	0.103	20.12	18M1D7W	64QAM
LTE Band 30	27	2307.5 - 2312.5	0.217	23.37	4M53G7W	QPSK
LTE Band 30	27	2307.5 - 2312.5	0.188	22.75	4M50D7W	16QAM
LTE Band 30	27	2307.5 - 2312.5	0.144	21.57	4M53D7W	64QAM
LTE Band 30	27	2310	0.218	23.39	9M05G7W	QPSK
LTE Band 30	27	2310	0.187	22.72	9M06D7W	16QAM
LTE Band 30	27	2310	0.144	21.57	9M02D7W	64QAM
LTE Band 7	27	2502.5 - 2567.5	0.349	25.43	4M54G7W	QPSK
LTE Band 7	27	2502.5 - 2567.5	0.299	24.75	4M54D7W	16QAM
LTE Band 7	27	2502.5 - 2567.5	0.229	23.60	4M54D7W	64QAM
LTE Band 7	27	2505 - 2565	0.341	25.32	9M06G7W	QPSK
LTE Band 7	27	2505 - 2565	0.182	22.61	13M6D7W	16QAM
LTE Band 7	27	2505 - 2565	0.103	20.11	13M6D7W	64QAM
LTE Band 7	27	2507.5 - 2562.5	0.340	25.32	13M6G7W	QPSK
LTE Band 7	27	2507.5 - 2562.5	0.300	24.77	13M6D7W	16QAM
LTE Band 7	27	2507.5 - 2562.5	0.232	23.66	13M6D7W	64QAM
LTE Band 7	27	2510 - 2560	0.339	25.30	18M1G7W	QPSK
LTE Band 7	27	2510 - 2560	0.298	24.75	18M0D7W	16QAM
LTE Band 7	27	2510 - 2560	0.224	23.50	18M1D7W	64QAM
LTE Band 41 (PC2)	27	2498.5 - 2687.5	0.513	27.10	4M53G7W	QPSK
LTE Band 41 (PC2)	27	2498.5 - 2687.5	0.443	26.46	4M53D7W	16QAM
LTE Band 41 (PC2)	27	2498.5 - 2687.5	0.332	25.21	4M57D7W	64QAM
LTE Band 41 (PC2)	27	2501 - 2685	0.497	26.96	9M07G7W	QPSK
LTE Band 41 (PC2)	27	2501 - 2685	0.440	26.43	9M04D7W	16QAM
LTE Band 41 (PC2)	27	2501 - 2685	0.321	25.06	9M09D7W	64QAM
LTE Band 41 (PC2)	27	2503.5 - 2682.5	0.500	26.99	13M6G7W	QPSK
LTE Band 41 (PC2)	27	2503.5 - 2682.5	0.435	26.38	13M6D7W	16QAM
LTE Band 41 (PC2)	27	2503.5 - 2682.5	0.324	25.11	13M6D7W	64QAM
LTE Band 41 (PC2)	27	2506 - 2680	0.513	27.10	18M0G7W	QPSK
LTE Band 41 (PC2)	27	2506 - 2680	0.437	26.40	18M0D7W	16QAM
LTE Band 41 (PC2)	27	2506 - 2680	0.327	25.14	18M0D7W	64QAM

### EUT Overview (>1GHz)

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Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 4 of 373

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

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Inc. Tablet Device FCC ID: BCGA1895**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

**Test Device Serial No.:** DLXX503RL3XD, DLXX3030KNQK

### 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, HDR4, HDR8, 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.

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## 2.3 Antenna Description

Following antenna was used for the testing.

Frequency [MHz]	Antennas			
	Port A	Port B	Port C	Port D
700-800	ANT 3	ANT 1	N/A	
820-960				
1700-1800	ANT 4b	ANT 2b	ANT 4a	ANT 2a
1820-2100				
2300-2520				
2540-2700				

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

Frequency [MHz]	Antenna Gain (dBi)			
	Port A	Port B	Port C	Port D
700-800	-3.7	-4.1	N/A	N/A
820-960	-3.8	-3.2		
1700-1800	-2.8	-3.8	-2.7	-3.0
1820-2100	-2.2	-2.4	-2.2	-1.4
2300-2520	-0.1	-0.6	-2.0	0.0
2540-2700	0.1	-1.0	-3.8	-4.1

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

## 2.4 Test Support Equipment

Test Support Equipment				
1	Apple MacBook w/AC/DC Adapter	Model: A1398 Model: A1435	S/N: C2QKP008F6F3 S/N: C04325505K1F288BG	
2	Apple USB-C Cable	Model: Chimp	S/N: 300C44	
3	USB-C Cable w/ AC Adapter	Model: A146 Model: A1720	S/N: N/A S/N: C3D8257A2EPGKVP2C	
4	USB-C to 3.5mm Aux Adapter	Model: A2049	S/N: DWH413100GJJKT12	
5	DC Power Supply	Model: KPS3010D	S/N: N/A	

**Table 2-3. Test Support Equipment Used**

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## 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.

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. The worst orientation was found to be Y-orientation (landscape).

## 2.6 Software and Firmware

The test was conducted with firmware version 16B64 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

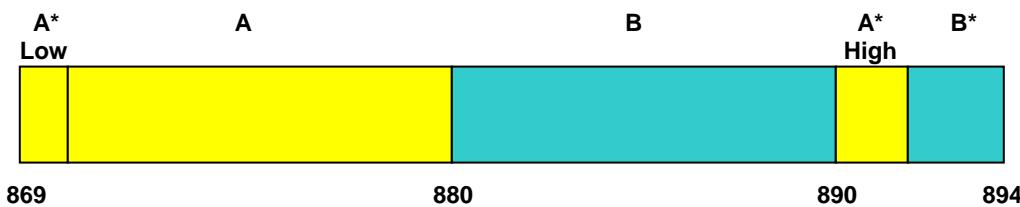
Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results 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.

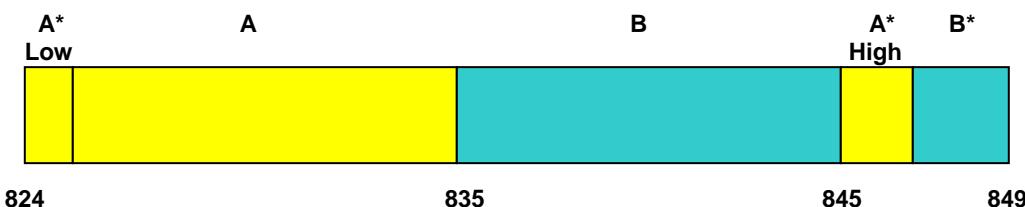
### 3.4 Cellular - Base Frequency Blocks



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

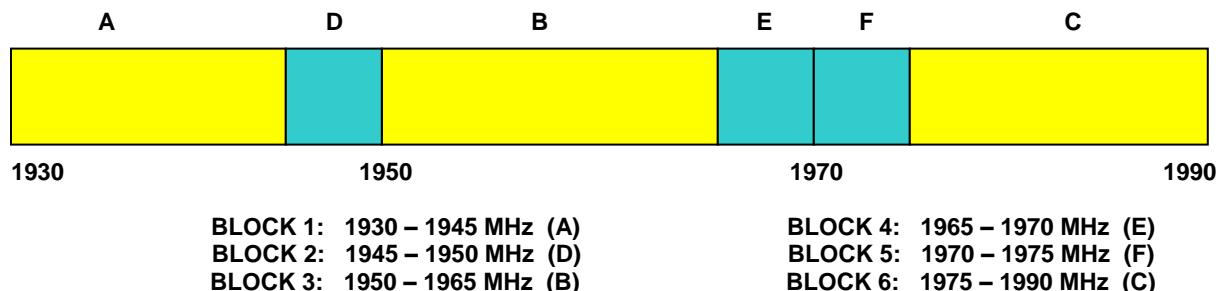


BLOCK 1: 824 – 835 MHz (A\* Low + A)  
 BLOCK 2: 835 – 845 MHz (B)

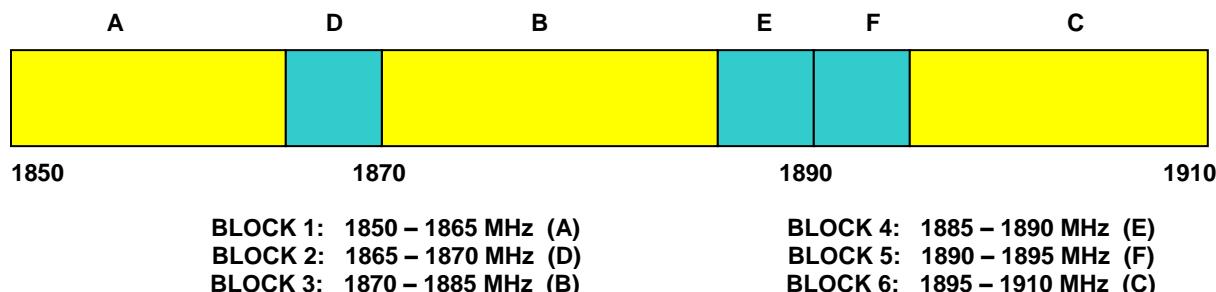
BLOCK 3: 845 – 846.5 MHz (A\* High)  
 BLOCK 4: 846.5 – 849 MHz (B\*)

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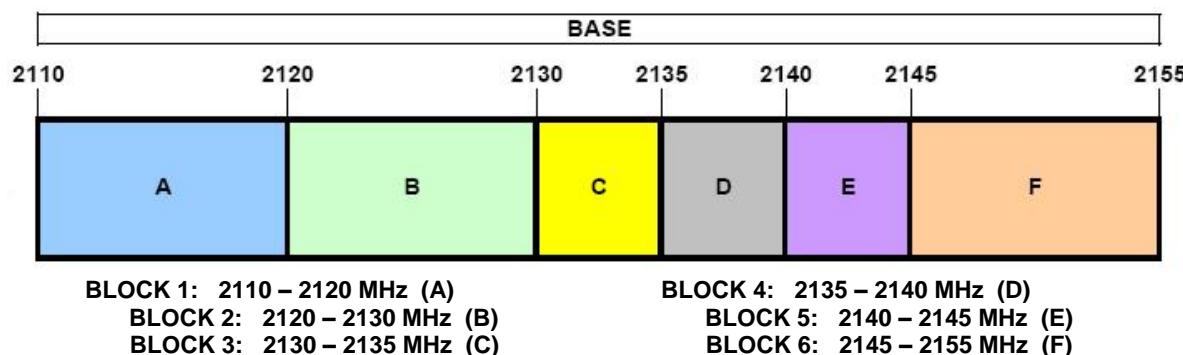
### 3.6 PCS - Base Frequency Blocks



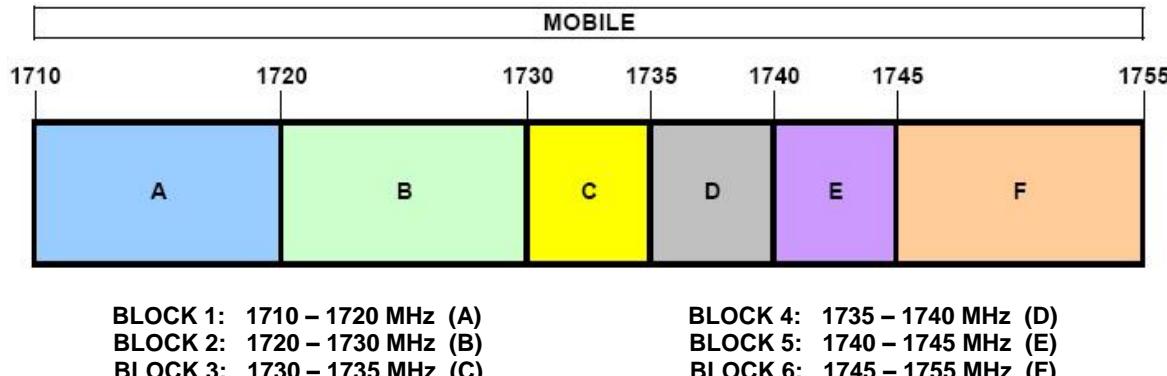
### 3.7 PCS - Mobile Frequency Blocks



### 3.8 AWS - Base Frequency Blocks



### 3.9 AWS - Mobile Frequency Blocks



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### 3.10 WCS – Mobile/Base Frequency Blocks

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

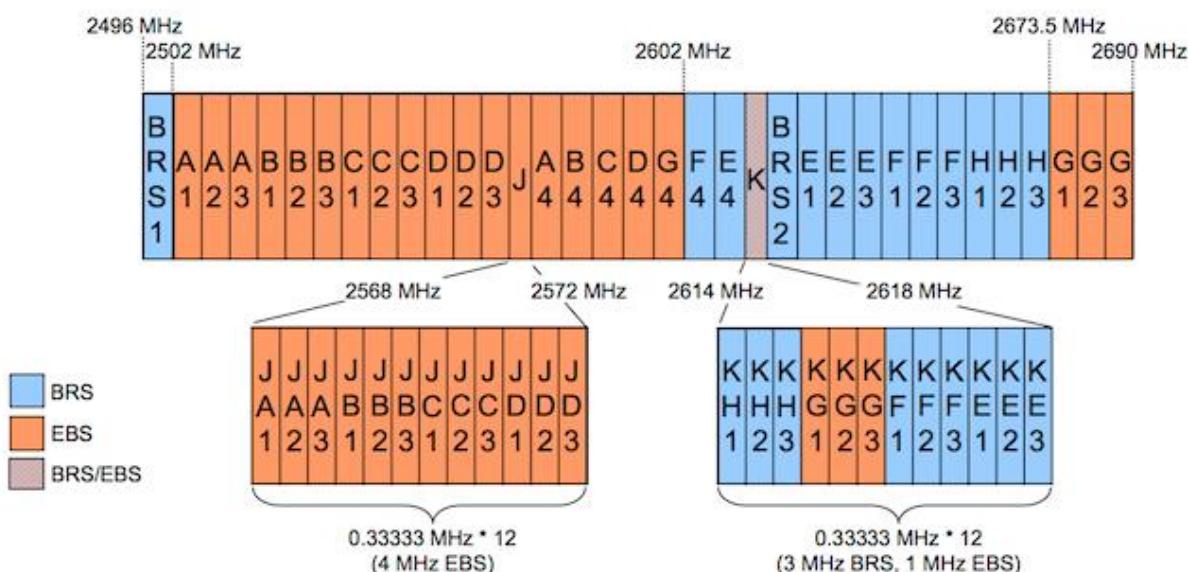
**BLOCK 1: 2305-2310 and 2350-2355 MHz (A)**

**BLOCK 2: 2310-2315 and 2355-236 MHz (B)**

**BLOCK 3: 2315-2320 MHz (C)**

**BLOCK 4: 2345-2350 MHz (D)**

### 3.11 BRS/EBS Frequency Block



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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:

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

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	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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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
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	ESW44	EMI Test Receiver	12/20/2017	Annual	12/20/2018	101668
Rohde & Schwarz	ESW44	EMI Test Receiver	11/16/2017	Annual	11/16/2018	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	12/8/2017	Annual	12/8/2018	164175
Rohde & Schwarz	SFUNIT-RX	Shielded Filter Unit	9/11/2017	Annual	9/11/2018	102132
Rohde & Schwarz	SFUNIT-RX	Shielded Filter Unit	12/11/2017	Annual	12/11/2018	102136
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)	11/13/2017	Annual	11/13/2018	101057
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/29/2017	Annual	11/29/2018	101063

**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 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).

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Apple Inc.  
FCC ID: BCGA1895  
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
2.1055 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 7.10

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 7.7
27.50(b)(10) 27.50(c)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 12/17, 13)	< 3 Watts max. ERP			Section 7.7
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 25/2, 7, 41)	< 2 Watts max. EIRP			Section 7.7
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 66/4)	< 1 Watts max. EIRP			Section 7.7
27.50(a)(3)	Equivalent Isotropic Radiated Power (Band 30)	< 0.25 Watts max. EIRP			Section 7.7
2.1053 22.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Undesirable Emissions	> $43 + 10\log_{10}(P[\text{Watts}])$ for all out-of-band emissions			Section 7.8
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 7.8
27.53(a)	Undesirable Emissions (Band 30)	> $70 + 10\log_{10}(P[\text{Watts}])$			Section 7.8
27.53(m)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.8

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 x 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.

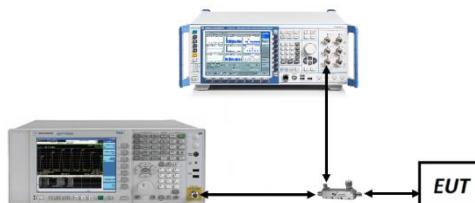


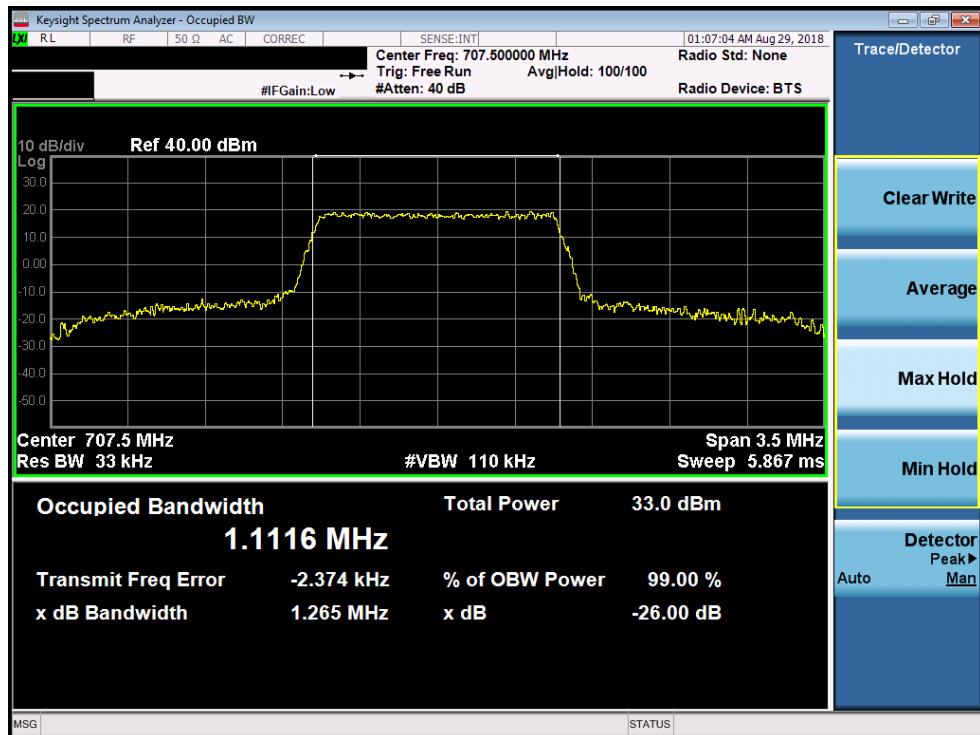
Figure 7-1. Test Instrument & Measurement Setup

### Test Notes

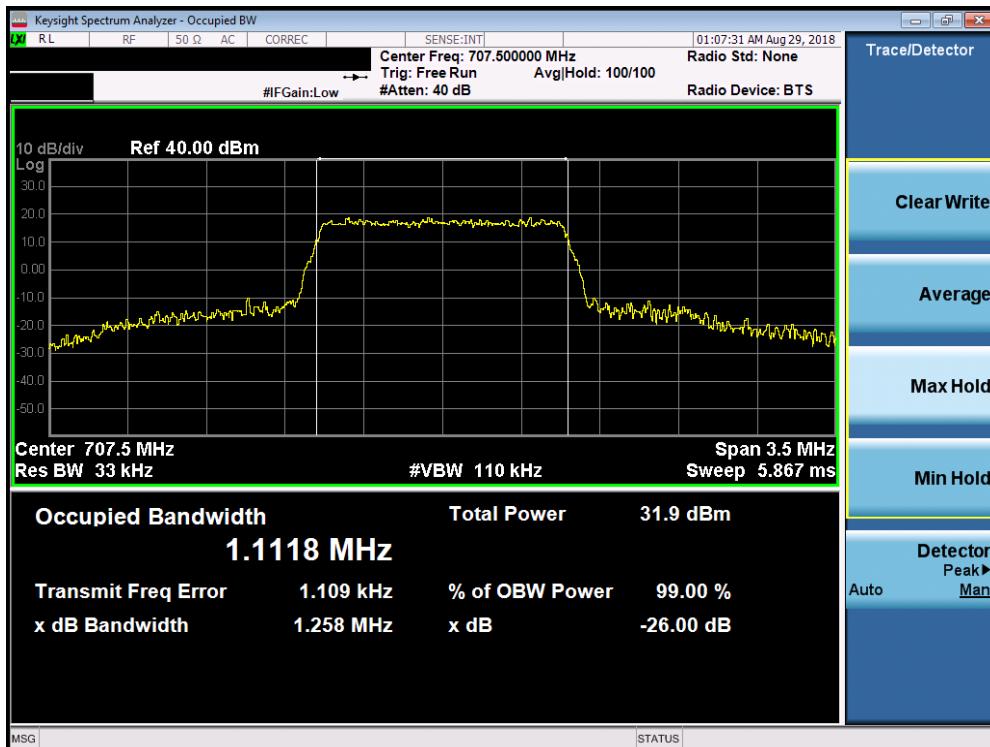
None.

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## Band 12/17



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

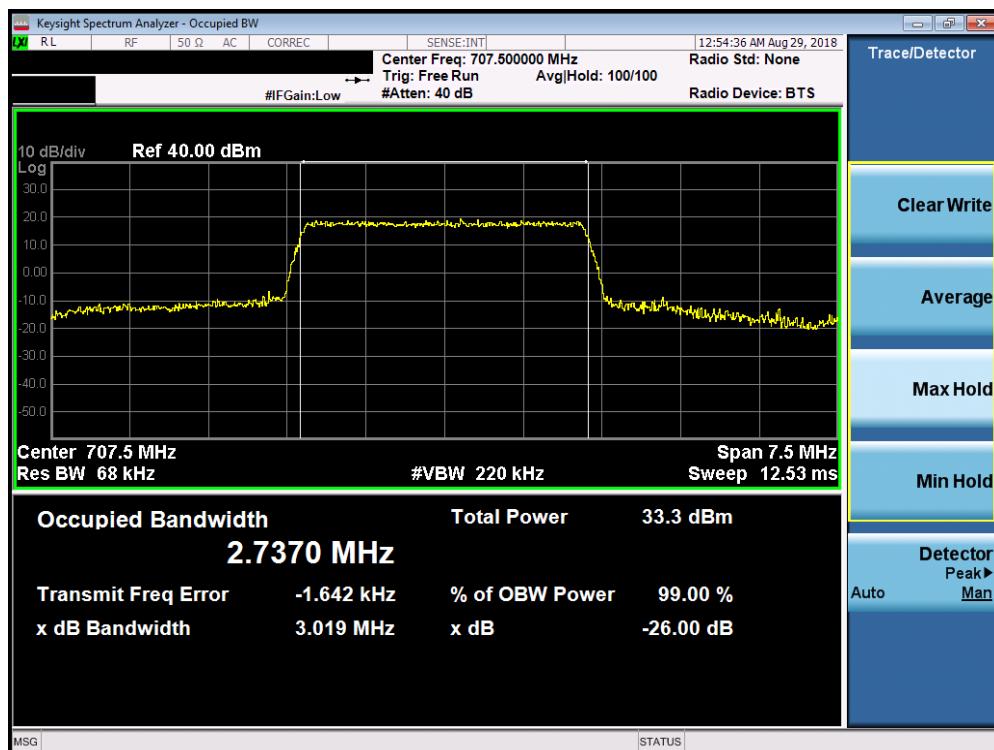


Plot 7-2. Occupied Bandwidth Plot (Band 12 – 1.4MHz 16-QAM – RB Size 6)

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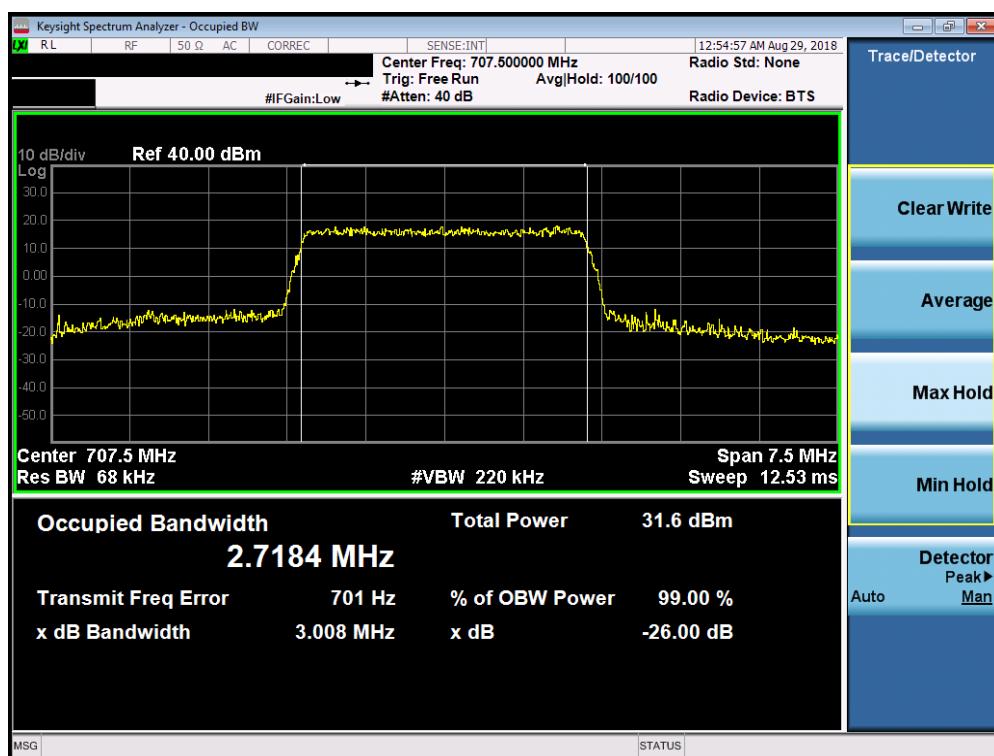


Plot 7-3. Occupied Bandwidth Plot (Band 12 – 1.4MHz 64-QAM – RB Size 6)

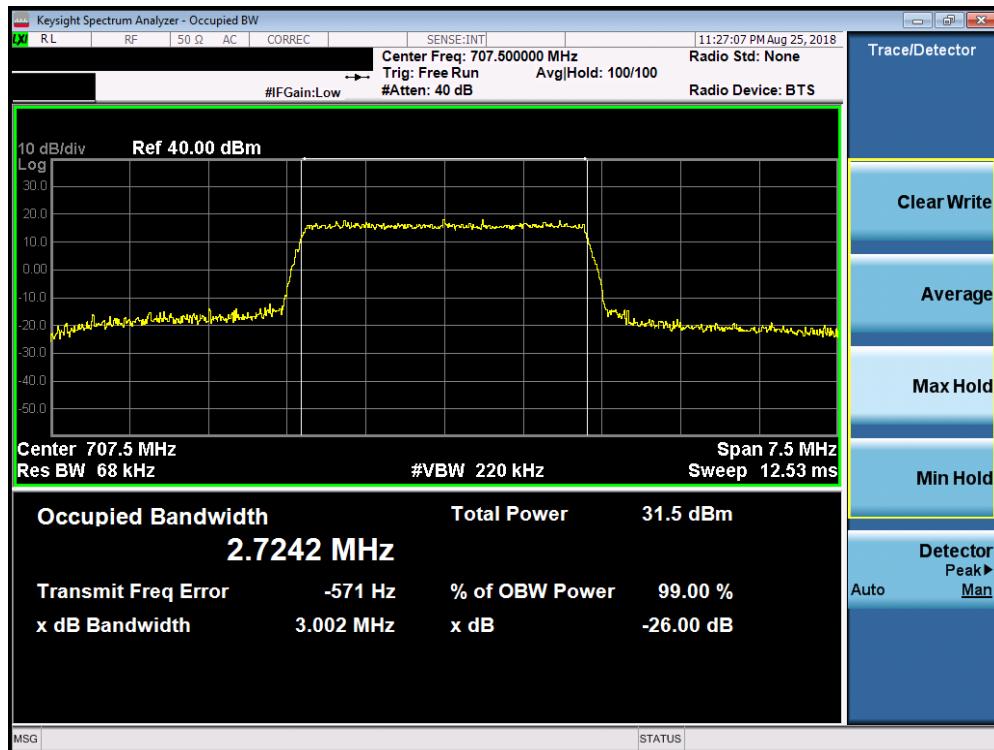


Plot 7-4. Occupied Bandwidth Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

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Plot 7-5. Occupied Bandwidth Plot (Band 12 – 3.0MHz 16-QAM – RB Size 15)



Plot 7-6. Occupied Bandwidth Plot (Band 12 – 3.0MHz 64-QAM – RB Size 15)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 21 of 373

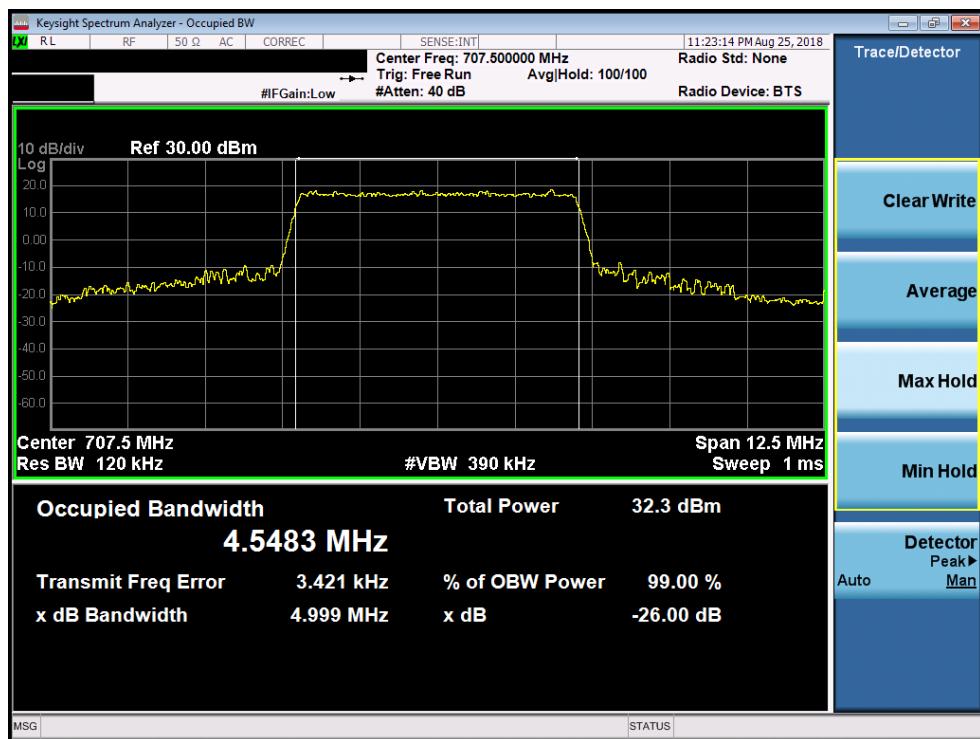


Plot 7-7. Occupied Bandwidth Plot (Band 12/17 – 5.0MHz QPSK – RB Size 25)

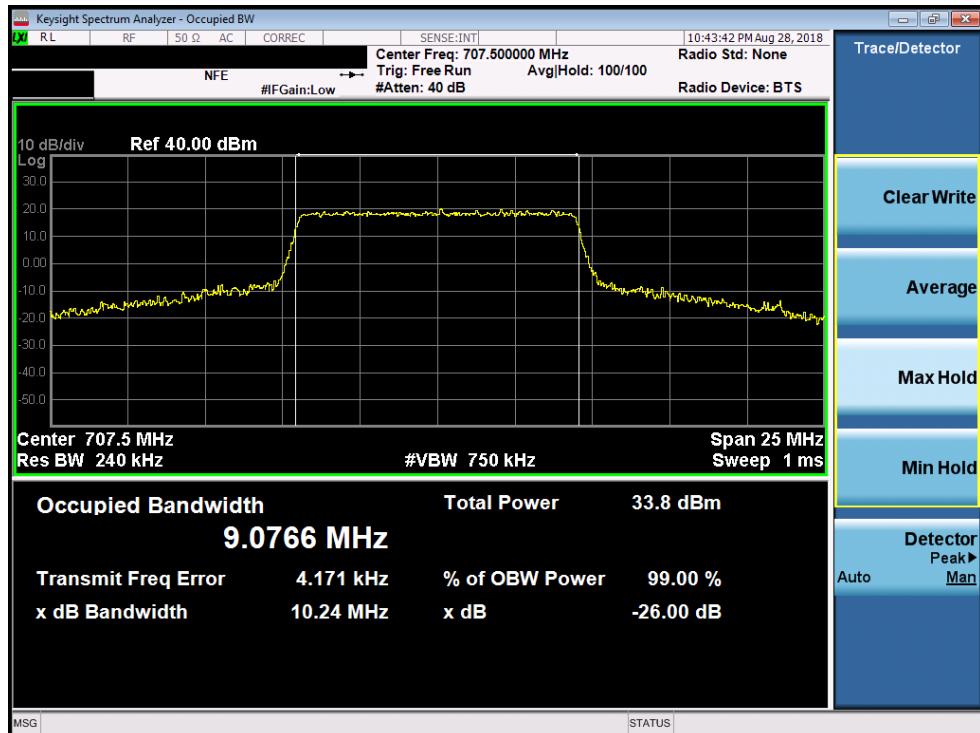


Plot 7-8. Occupied Bandwidth Plot (Band 12/17 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 22 of 373



Plot 7-9. Occupied Bandwidth Plot (Band 12/17 – 5.0MHz 64-QAM – RB Size 25)

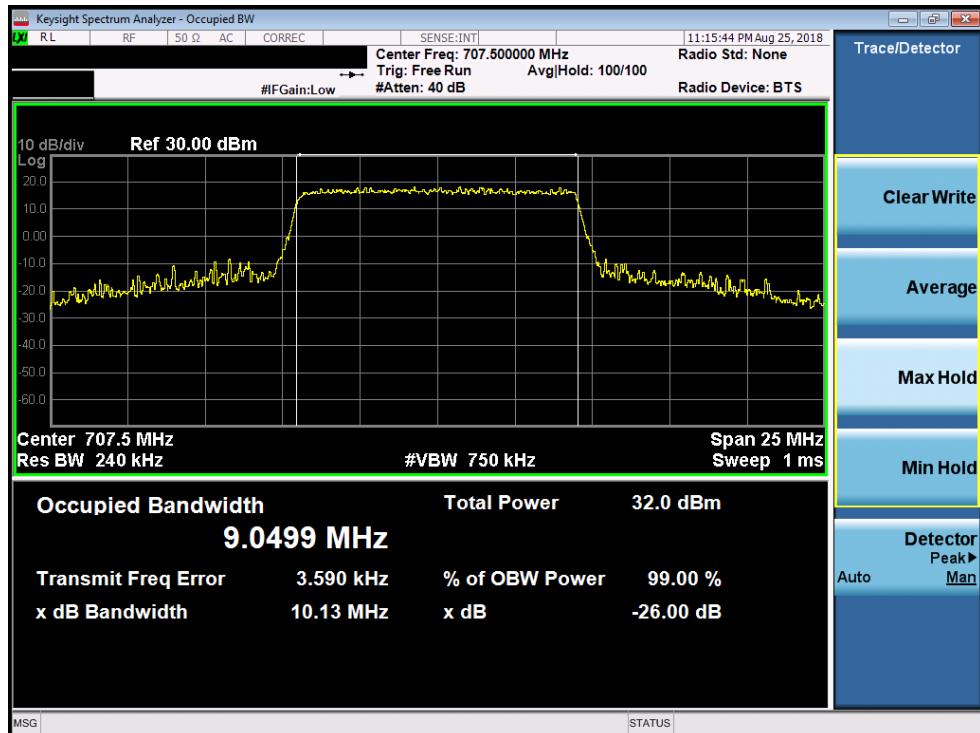


Plot 7-10. Occupied Bandwidth Plot (Band 12/17 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-11. Occupied Bandwidth Plot (Band 12/17 – 10.0MHz 16-QAM – RB Size 50)



Plot 7-12. Occupied Bandwidth Plot (Band 12/17 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 24 of 373

## Band 13



Plot 7-13. Occupied Bandwidth Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

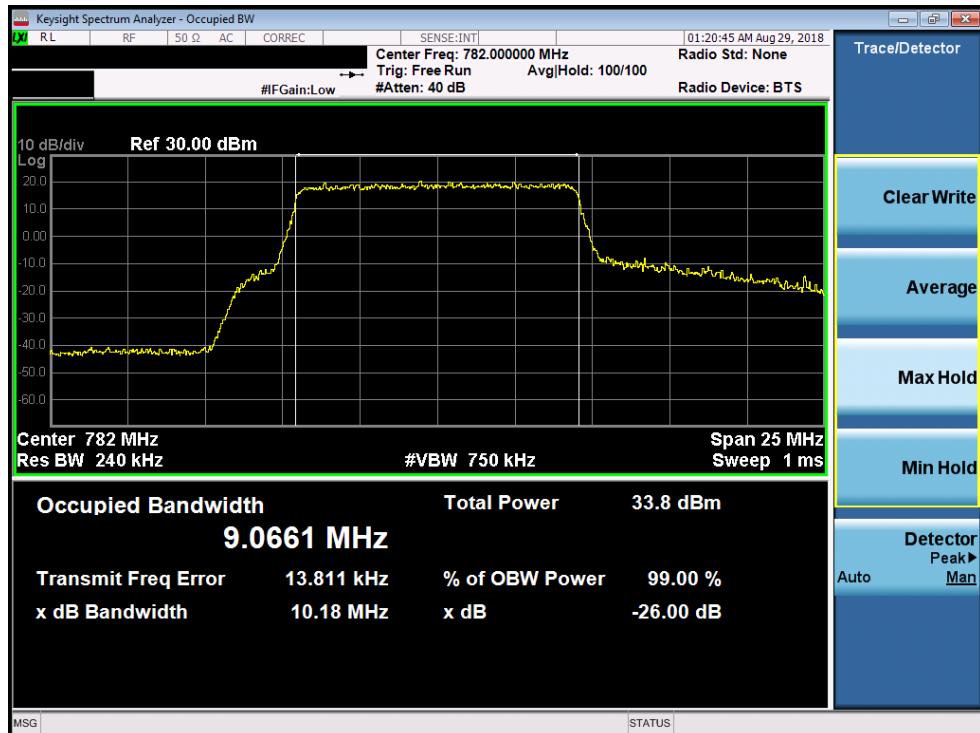


Plot 7-14. Occupied Bandwidth Plot (Band 13 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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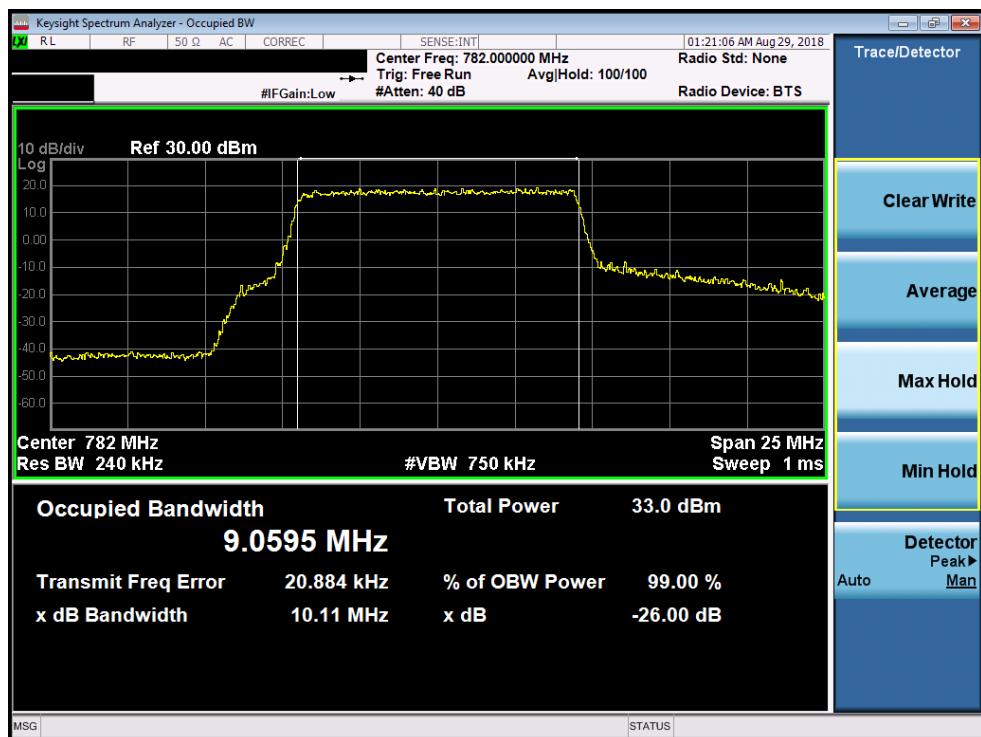


Plot 7-15. Occupied Bandwidth Plot (Band 13 – 5.0MHz 64-QAM – RB Size 25)

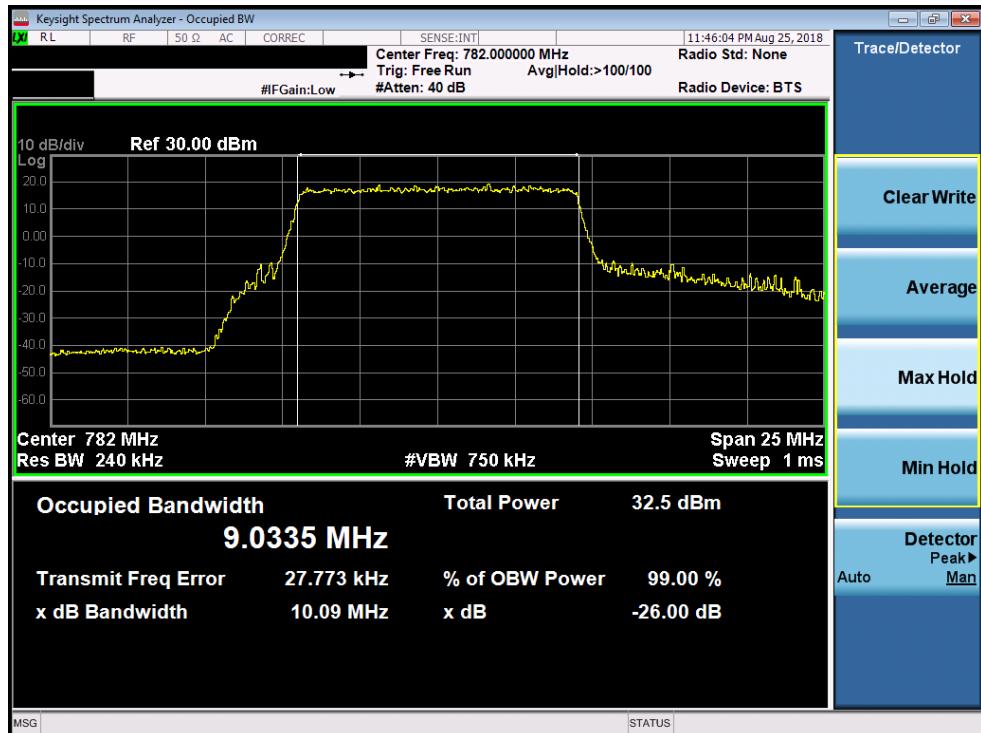


Plot 7-16. Occupied Bandwidth Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 26 of 373



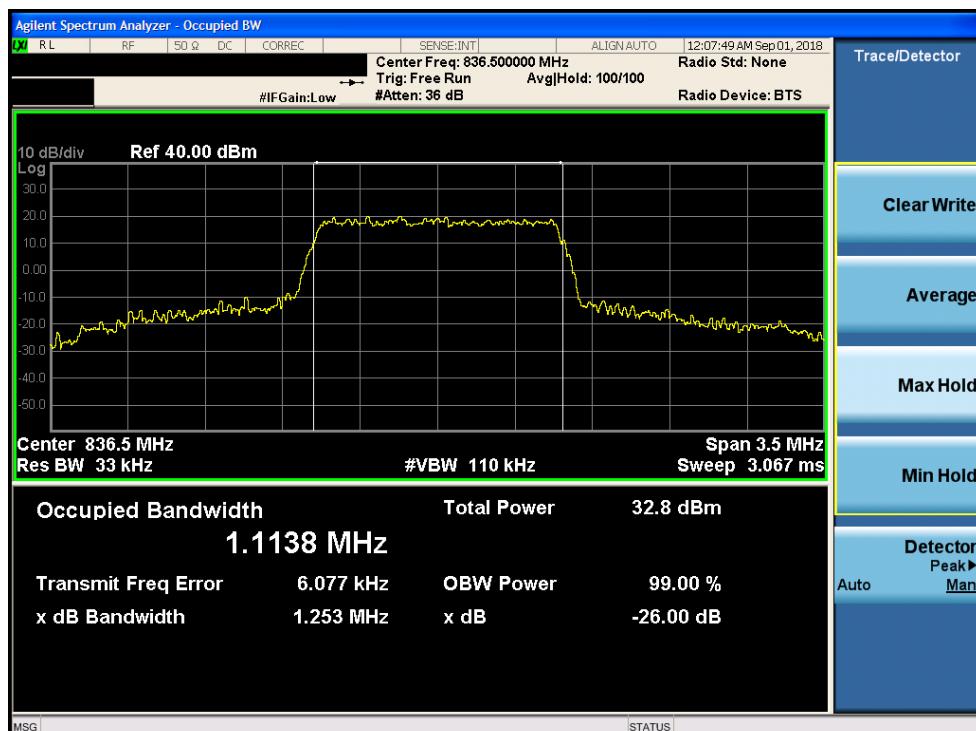
Plot 7-17. Occupied Bandwidth Plot (Band 13 – 10.0MHz 16-QAM – RB Size 50)



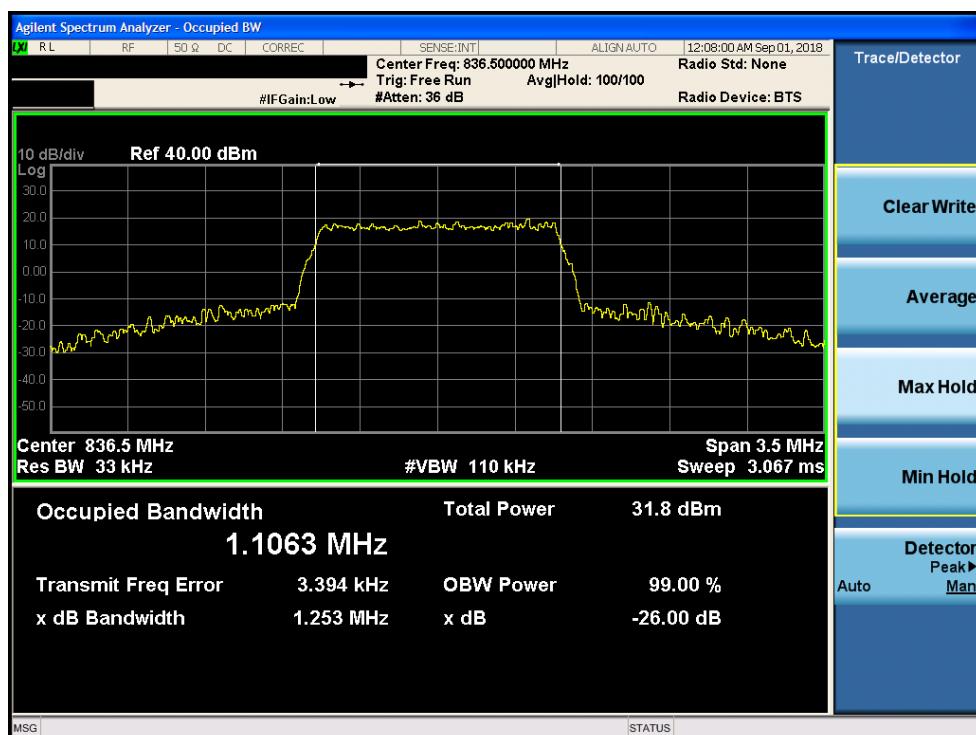
Plot 7-18. Occupied Bandwidth Plot (Band 13 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 27 of 373

## Band 26/5

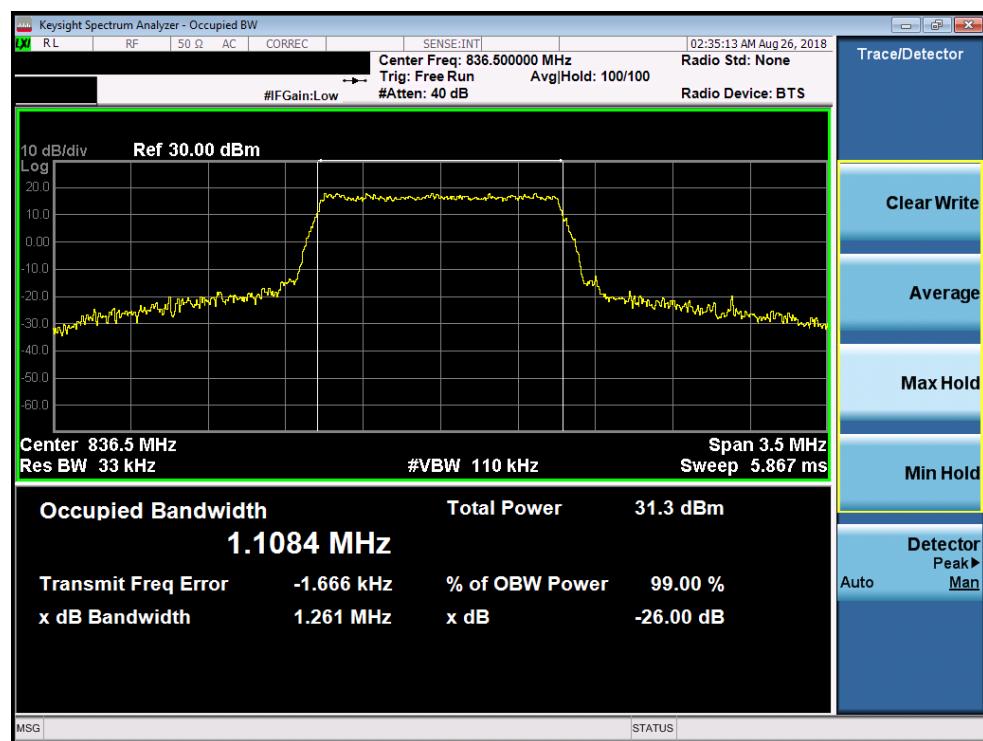


Plot 7-19. Occupied Bandwidth Plot (Band 26/5 – 1.4MHz QPSK – RB Size 6)



Plot 7-20. Occupied Bandwidth Plot (Band 26/5 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-21. Occupied Bandwidth Plot (Band 26/5 – 1.4MHz 64-QAM – RB Size 6)

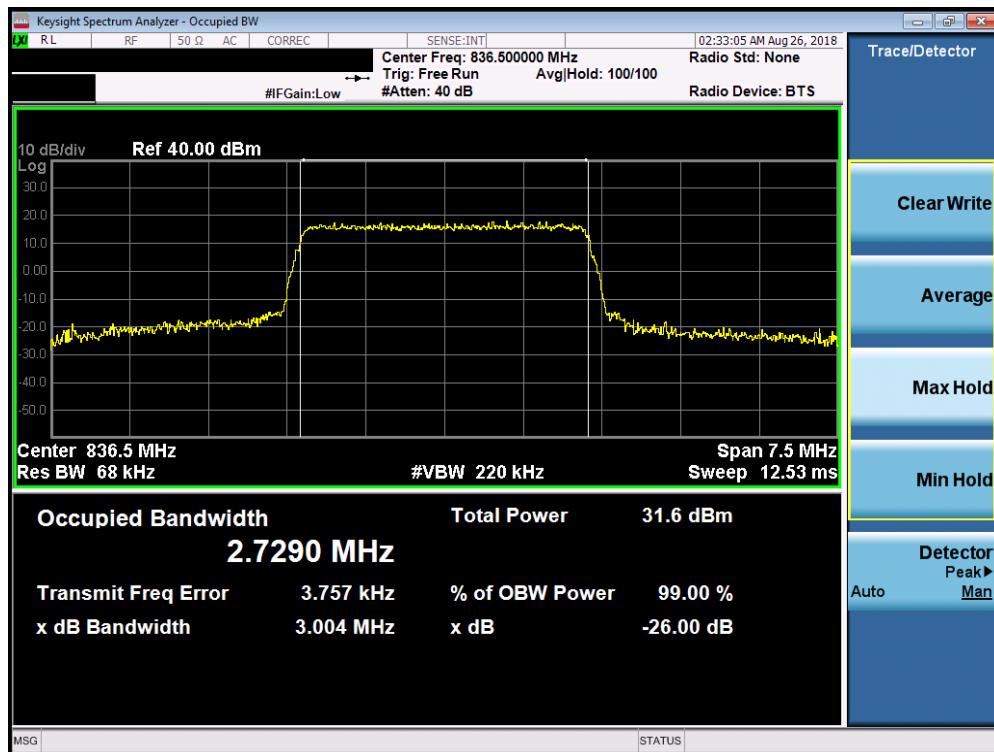


Plot 7-22. Occupied Bandwidth Plot (Band 26/5 – 3.0MHz QPSK – RB Size 15)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-23. Occupied Bandwidth Plot (Band 26/5 – 3.0MHz 16-QAM – RB Size 15)



Plot 7-24. Occupied Bandwidth Plot (Band 26/5 – 3.0MHz 64-QAM – RB Size 15)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 30 of 373

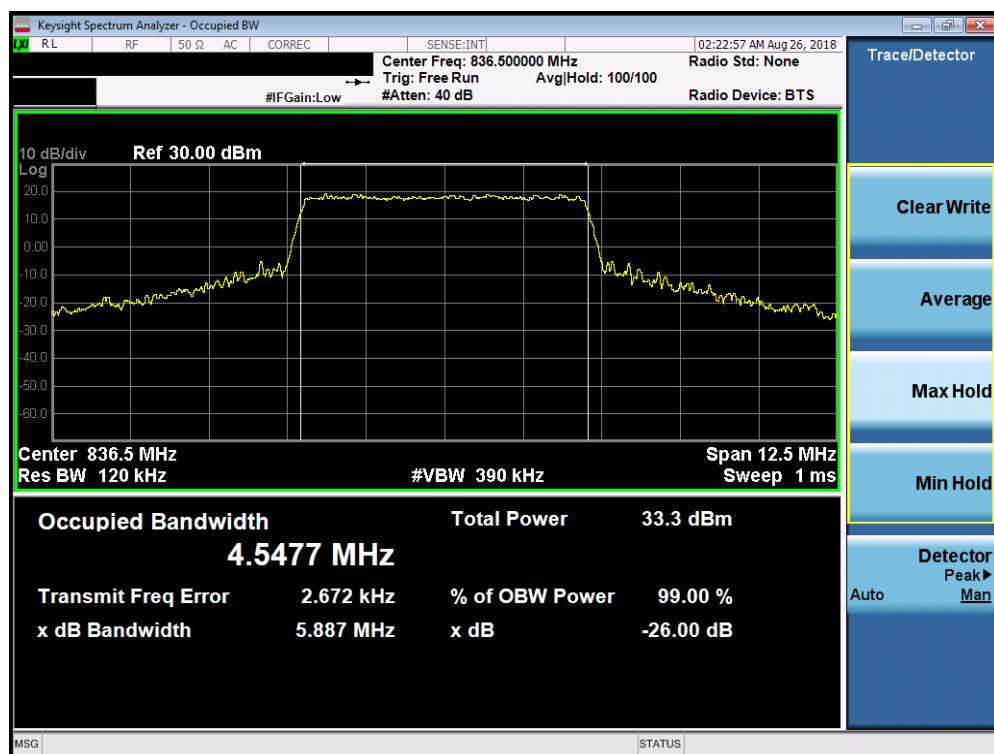


Plot 7-25. Occupied Bandwidth Plot (Band 26/5 – 5.0MHz QPSK – RB Size 25)



Plot 7-26. Occupied Bandwidth Plot (Band 26/5 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 31 of 373

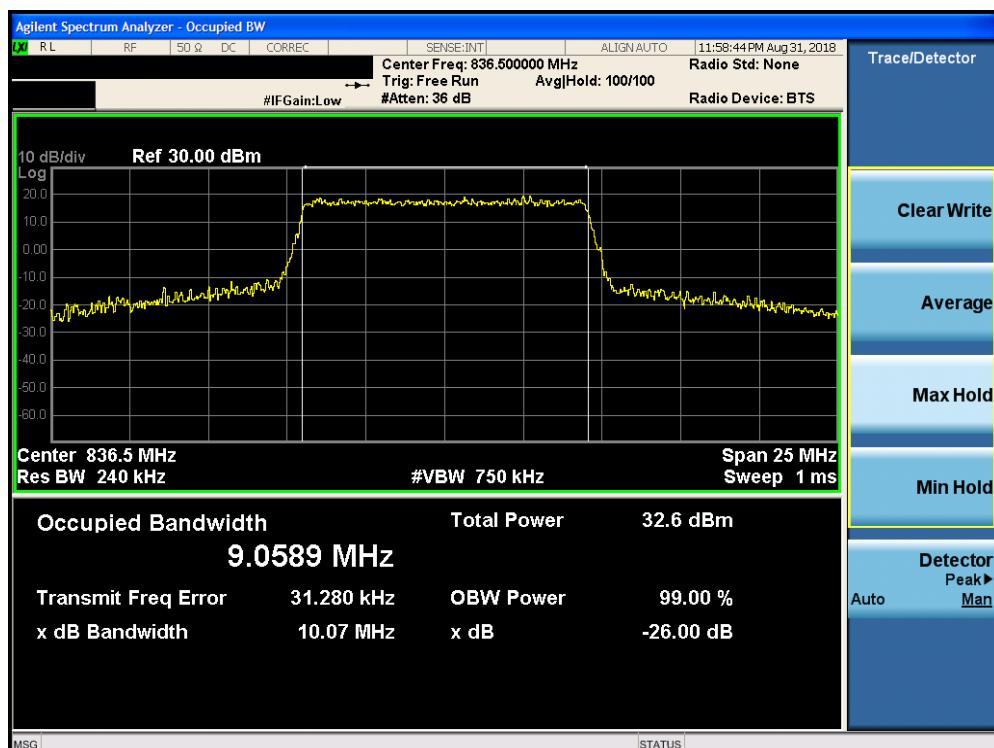


Plot 7-27. Occupied Bandwidth Plot (Band 26/5 – 5.0MHz 64-QAM – RB Size 25)

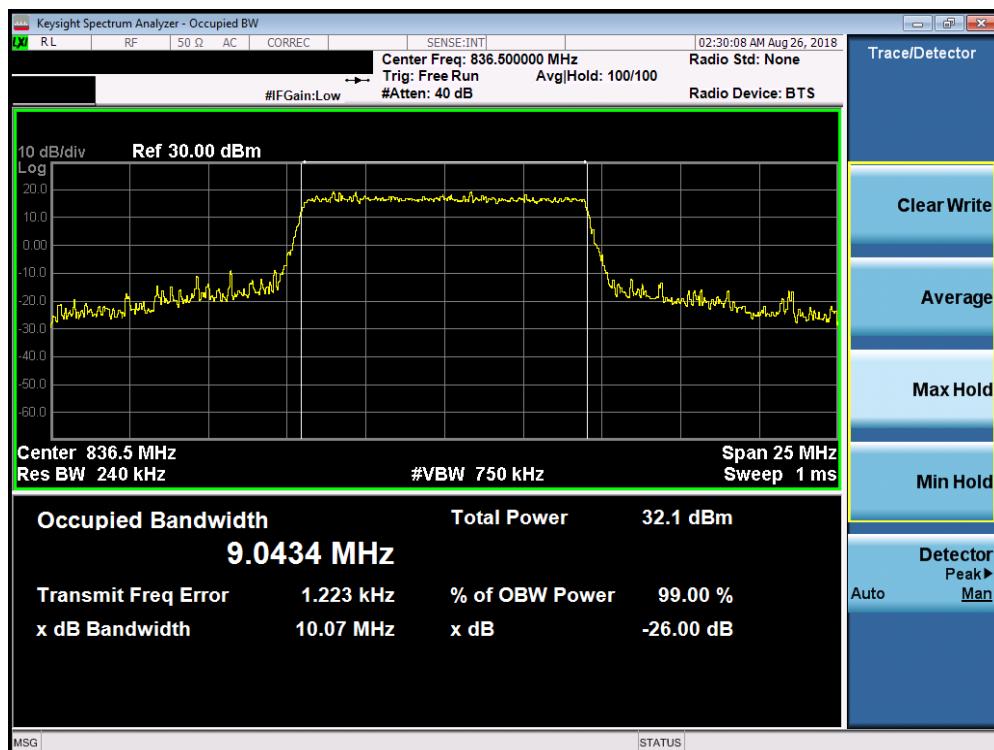


Plot 7-28. Occupied Bandwidth Plot (Band 26/5 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 32 of 373



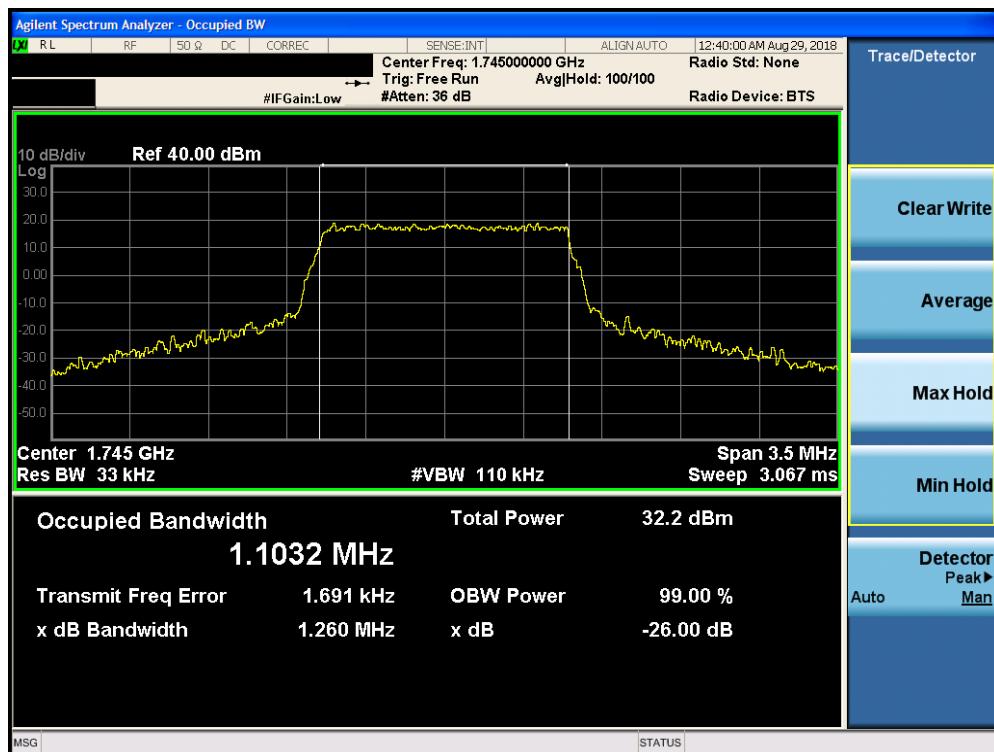
Plot 7-29. Occupied Bandwidth Plot (Band 26/5 – 10.0MHz 16-QAM – RB Size 50)



Plot 7-30. Occupied Bandwidth Plot (Band 26/5 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 33 of 373

## Band 66/4



Plot 7-31. Occupied Bandwidth Plot (Band 66/4 – 1.4MHz QPSK – RB Size 6)



Plot 7-32. Occupied Bandwidth Plot (Band 66/4 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: BCGA1895	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device

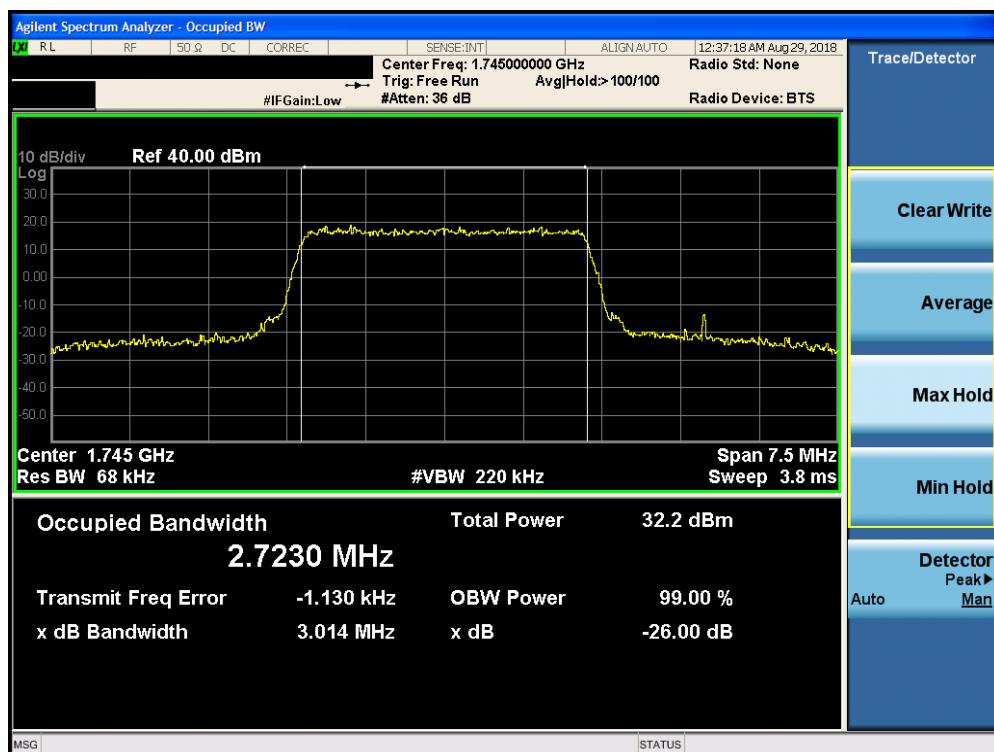


Plot 7-33. Occupied Bandwidth Plot (Band 66/4 – 1.4MHz 64-QAM – RB Size 6)



Plot 7-34. Occupied Bandwidth Plot (Band 66/4 – 3.0MHz QPSK – RB Size 15)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 35 of 373



Plot 7-35. Occupied Bandwidth Plot (Band 66/4 – 3.0MHz 16-QAM – RB Size 15)



Plot 7-36. Occupied Bandwidth Plot (Band 66/4 – 3.0MHz 64-QAM – RB Size 15)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 36 of 373

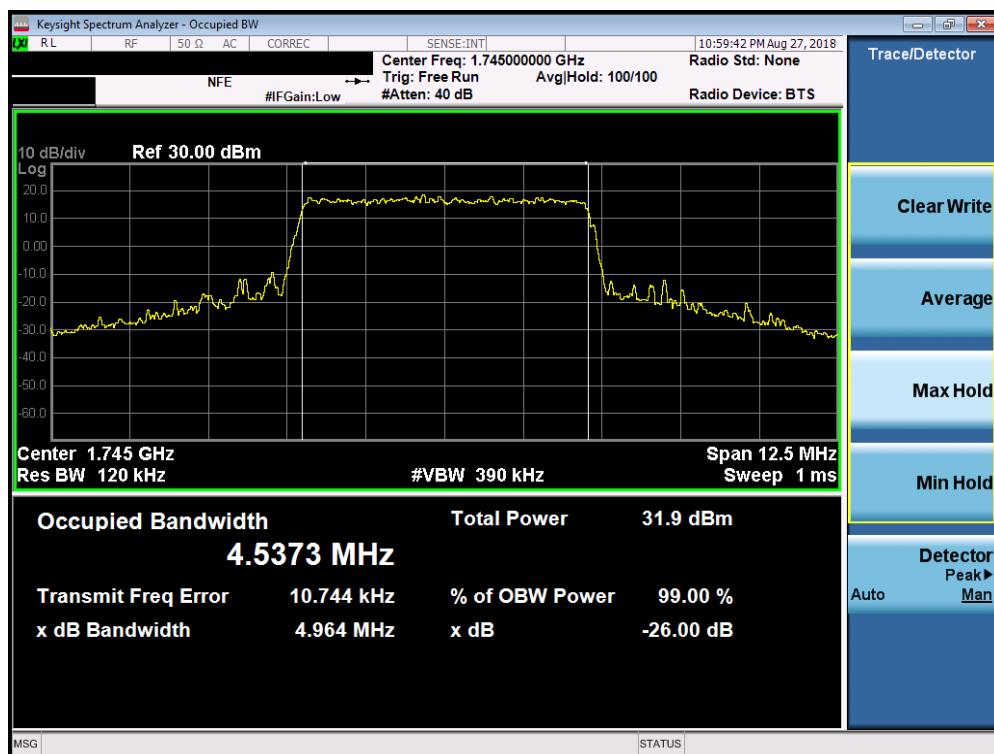


Plot 7-37. Occupied Bandwidth Plot (Band 66/4 – 5.0MHz QPSK – RB Size 25)



Plot 7-38. Occupied Bandwidth Plot (Band 66/4 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 37 of 373

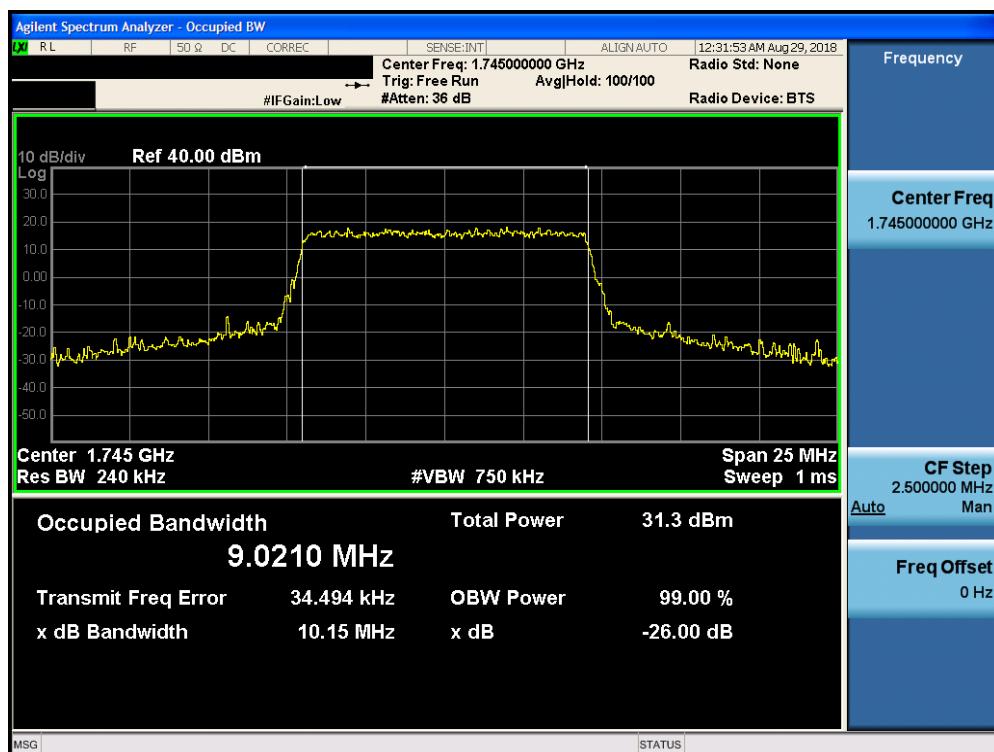


Plot 7-39. Occupied Bandwidth Plot (Band 66/4 – 5.0MHz 64-QAM – RB Size 25)



Plot 7-40. Occupied Bandwidth Plot (Band 66/4 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 38 of 373

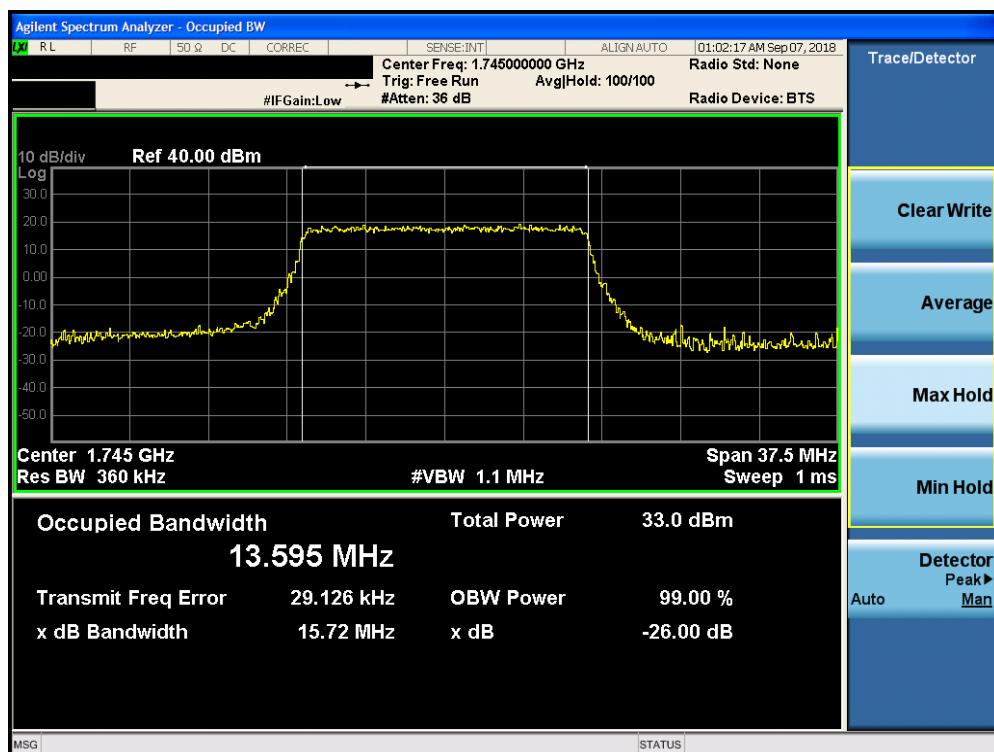


Plot 7-41. Occupied Bandwidth Plot (Band 66/4 – 10.0MHz 16-QAM – RB Size 50)

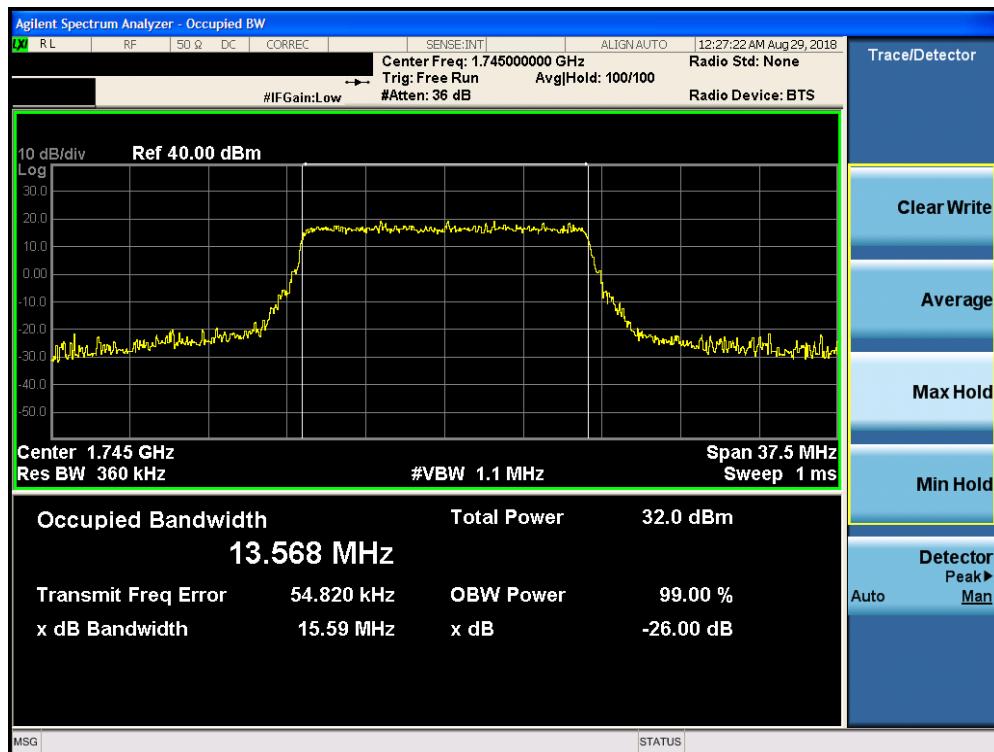


Plot 7-42. Occupied Bandwidth Plot (Band 66/4 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 39 of 373

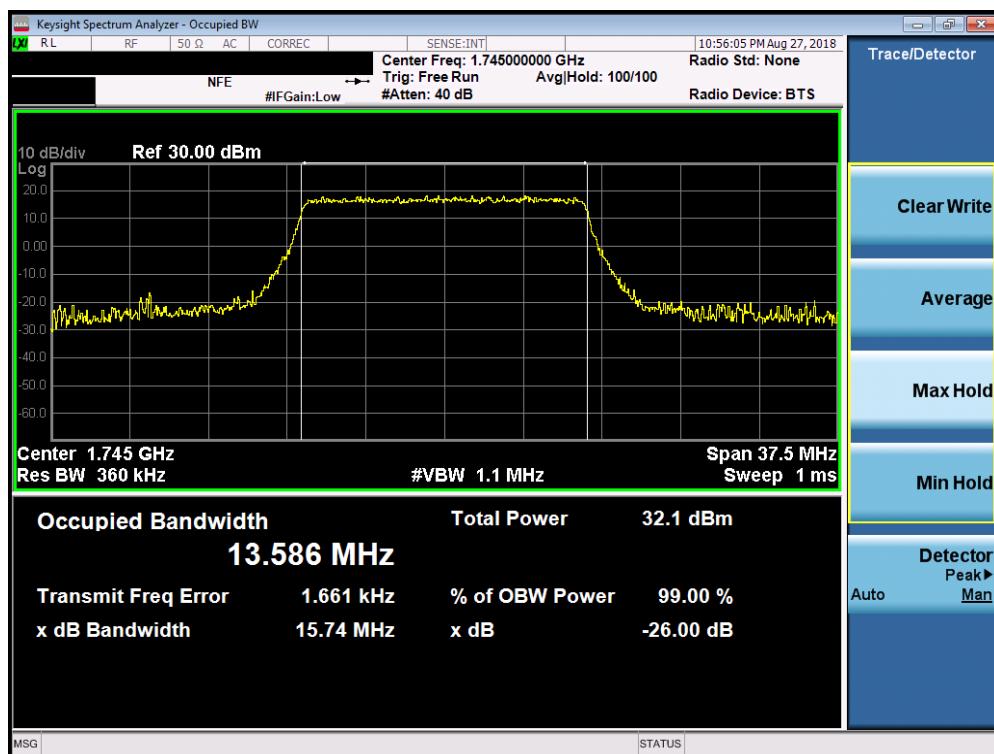


Plot 7-43. Occupied Bandwidth Plot (Band 66/4 – 15.0MHz QPSK – RB Size 75)



Plot 7-44. Occupied Bandwidth Plot (Band 66/4 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 40 of 373

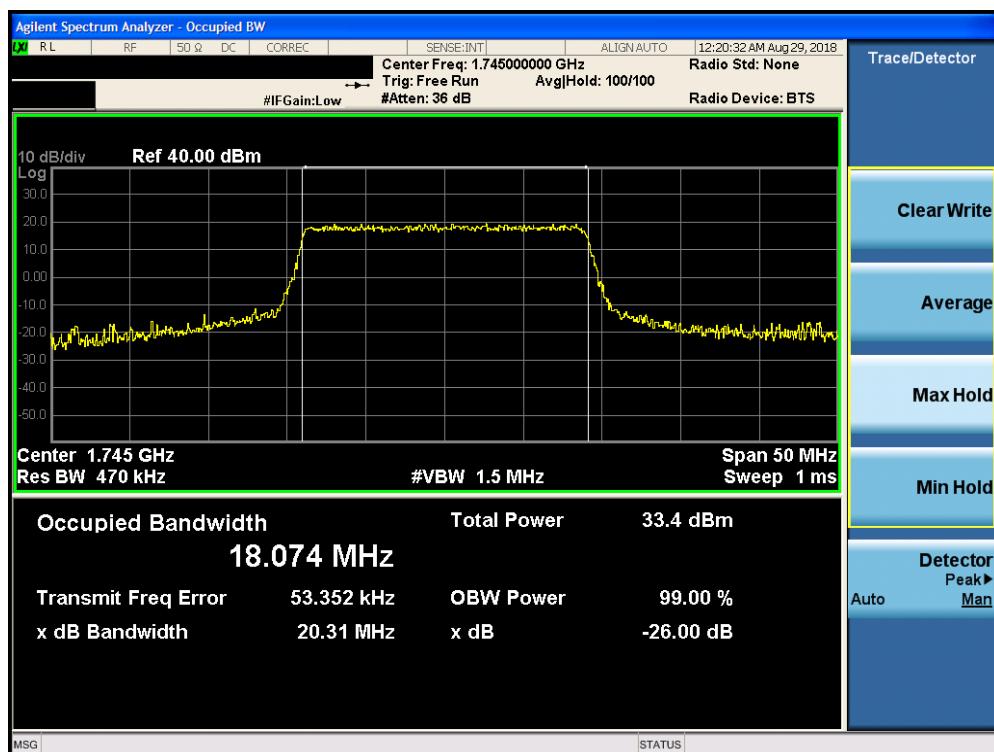


Plot 7-45. Occupied Bandwidth Plot (Band 66/4 – 15.0MHz 64-QAM – RB Size 75)

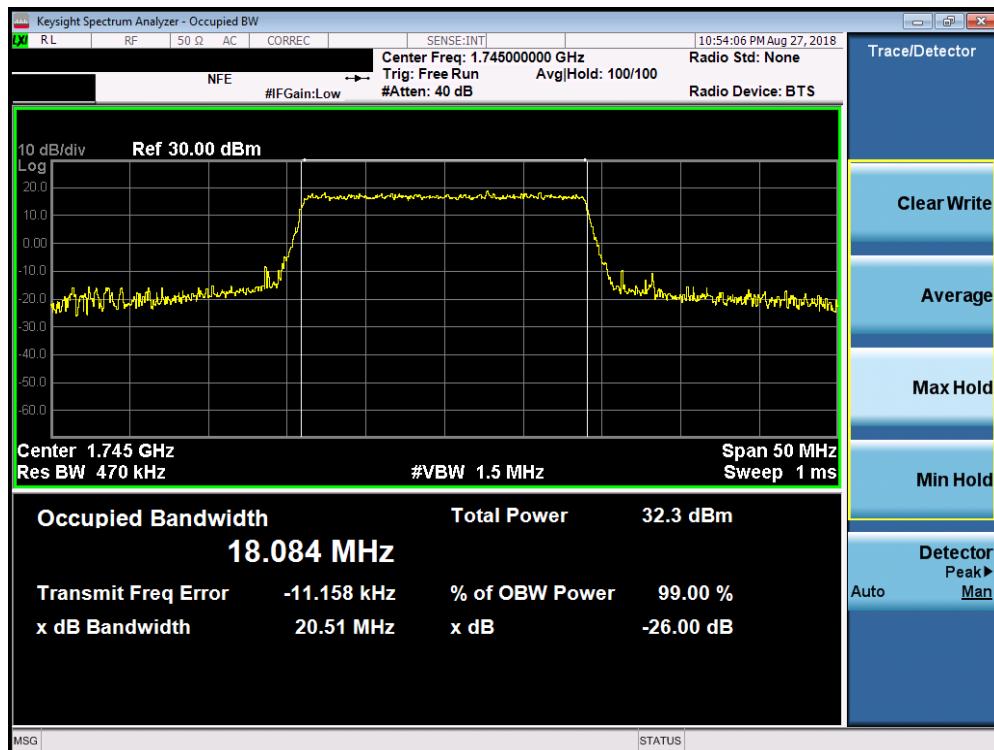


Plot 7-46. Occupied Bandwidth Plot (Band 66/4 – 20.0MHz QPSK – RB Size 100)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 41 of 373



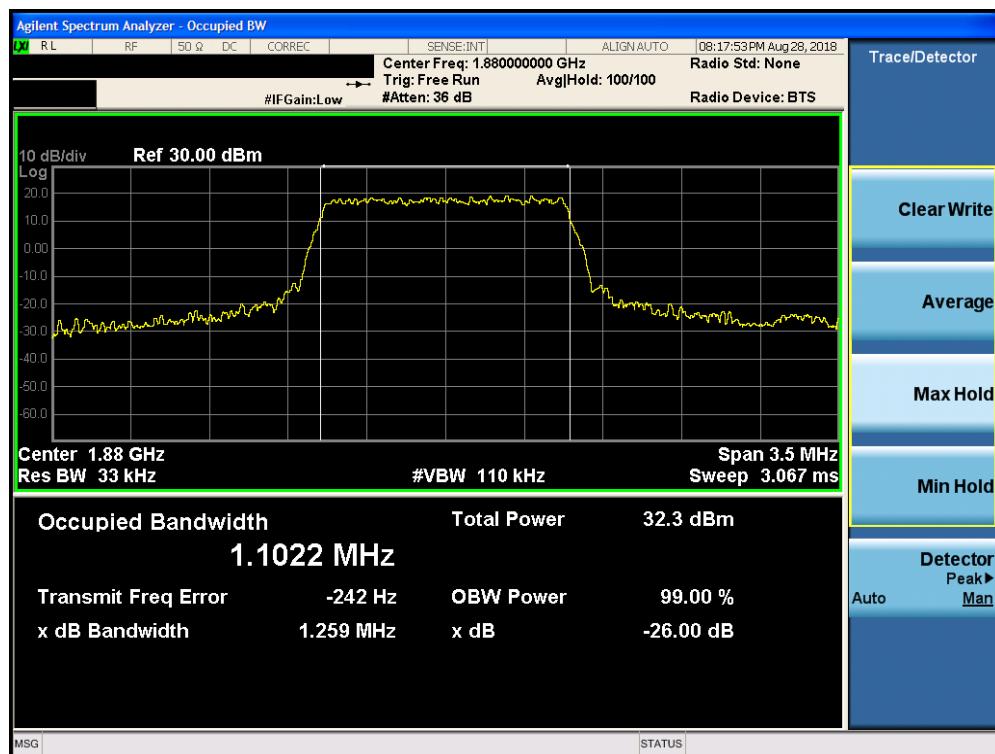
Plot 7-47. Occupied Bandwidth Plot (Band 66/4 – 20.0MHz 16-QAM – RB Size 100)



Plot 7-48. Occupied Bandwidth Plot (Band 66/4 – 20.0MHz 64-QAM – RB Size 100)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 42 of 373

## Band 2/25

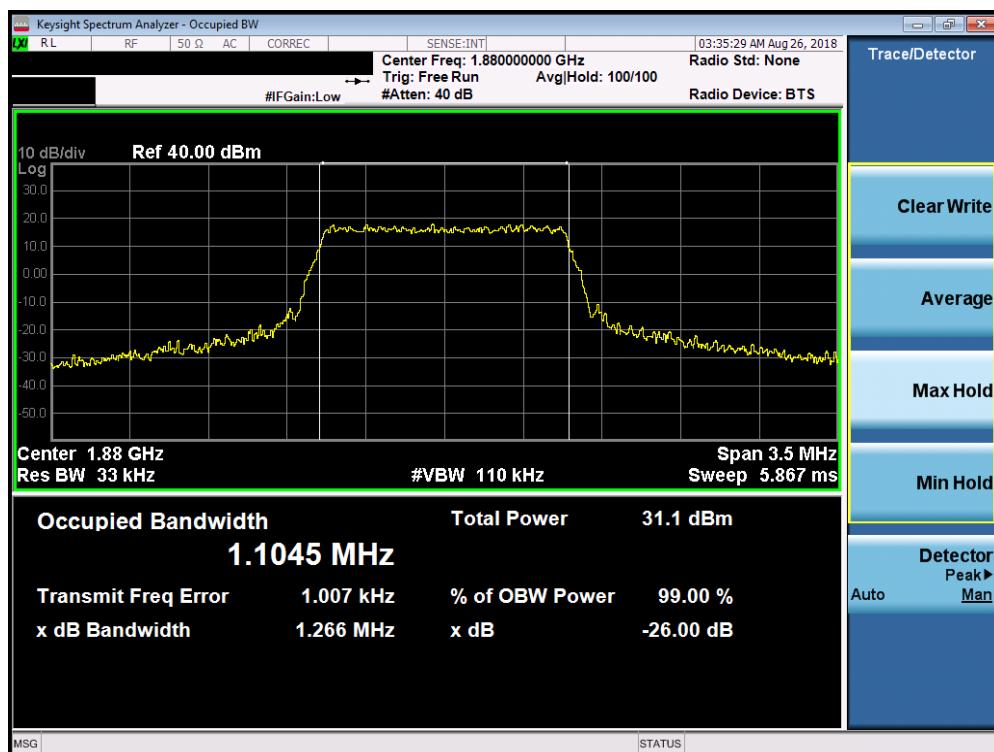


Plot 7-49. Occupied Bandwidth Plot (Band 25/2 – 1.4MHz QPSK – RB Size 6)

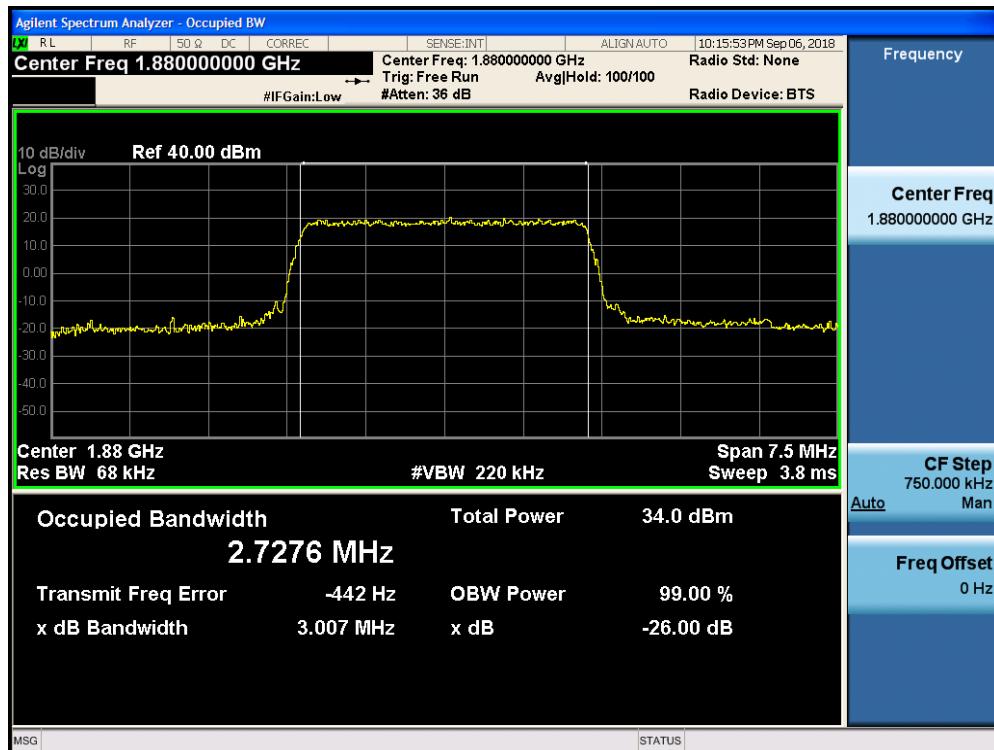


Plot 7-50. Occupied Bandwidth Plot (Band 25/2 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: BCGA1895	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 43 of 373



Plot 7-51. Occupied Bandwidth Plot (Band 25/2 – 1.4MHz 64-QAM – RB Size 6)



Plot 7-52. Occupied Bandwidth Plot (Band 25/2 – 3.0MHz QPSK – RB Size 15)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 44 of 373



Plot 7-53. Occupied Bandwidth Plot (Band 25/2 – 3.0MHz 16-QAM – RB Size 15)



Plot 7-54. Occupied Bandwidth Plot (Band 25/2 – 3.0MHz 64-QAM – RB Size 15)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 45 of 373



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



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

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 46 of 373

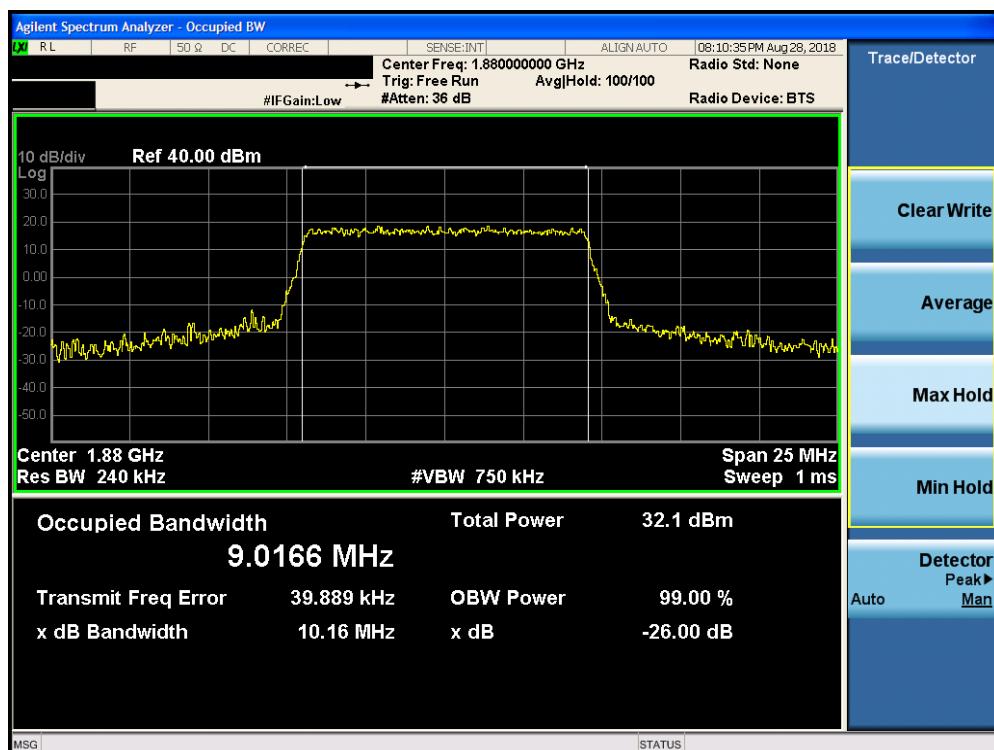


Plot 7-57. Occupied Bandwidth Plot (Band 25/2 – 5.0MHz 64-QAM – RB Size 25)



Plot 7-58. Occupied Bandwidth Plot (Band 25/2 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-59. Occupied Bandwidth Plot (Band 25/2 – 10.0MHz 16-QAM – RB Size 50)

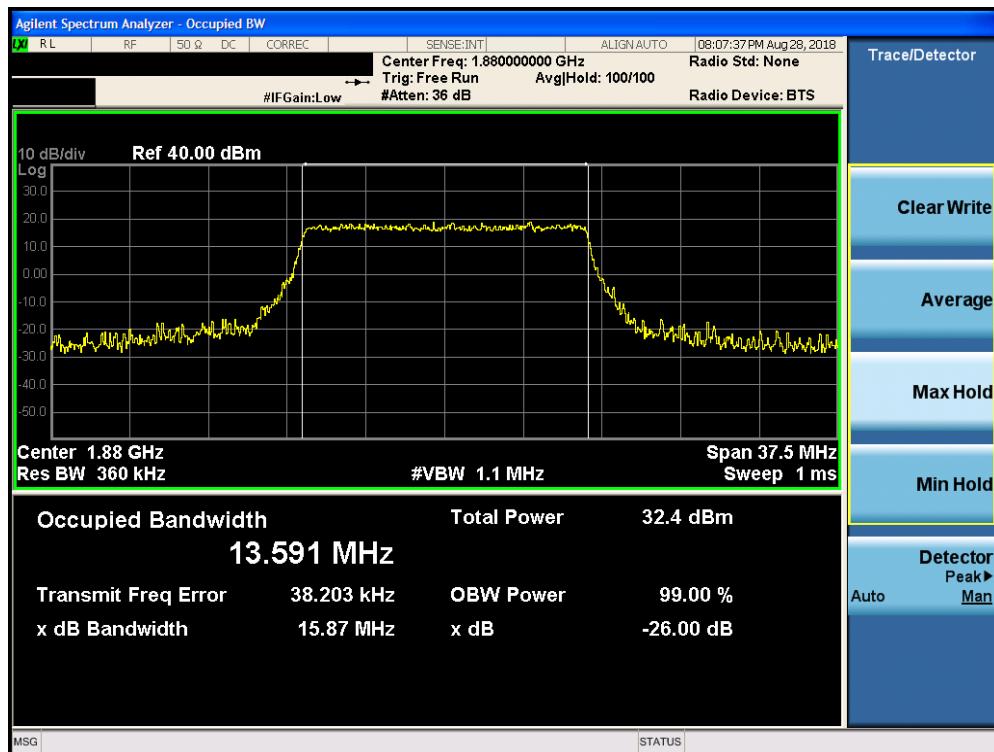


Plot 7-60. Occupied Bandwidth Plot (Band 25/2 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 48 of 373

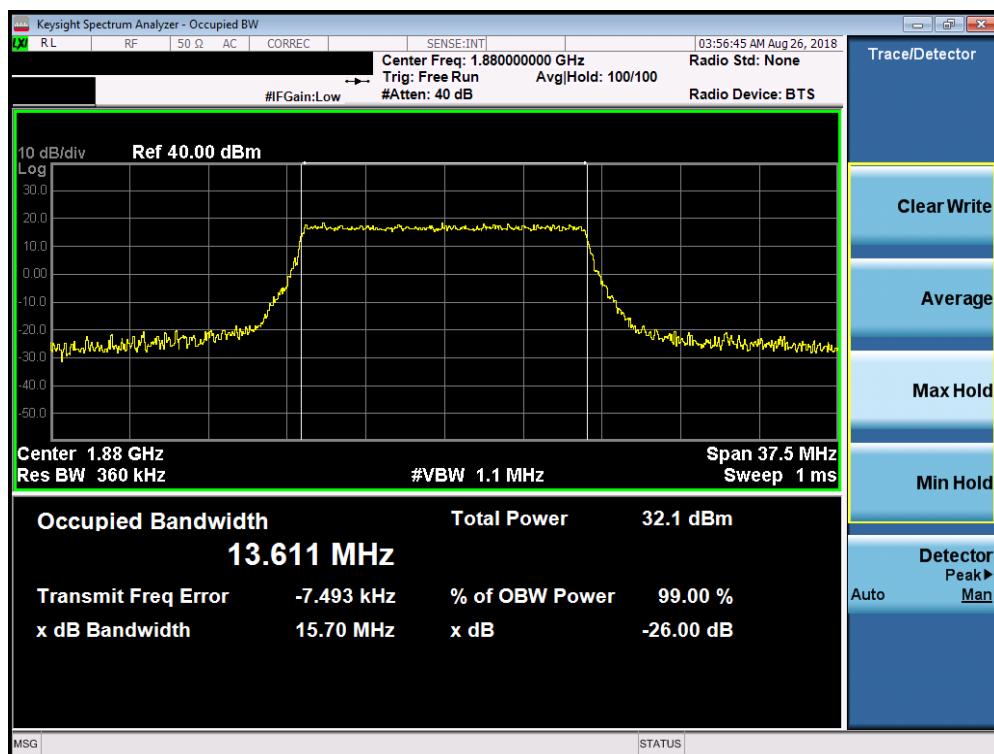


Plot 7-61. Occupied Bandwidth Plot (Band 25/2 – 15.0MHz QPSK – RB Size 75)



Plot 7-62. Occupied Bandwidth Plot (Band 25/2 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 49 of 373



Plot 7-63. Occupied Bandwidth Plot (Band 25/2 – 15.0MHz 64-QAM – RB Size 75)



Plot 7-64. Occupied Bandwidth Plot (Band 25/2 – 20.0MHz QPSK – RB Size 100)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 50 of 373



Plot 7-65. Occupied Bandwidth Plot (Band 25/2 – 20.0MHz 16-QAM – RB Size 100)



Plot 7-66. Occupied Bandwidth Plot (Band 25/2 – 20.0MHz 64-QAM – RB Size 100)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 51 of 373

## Band 30

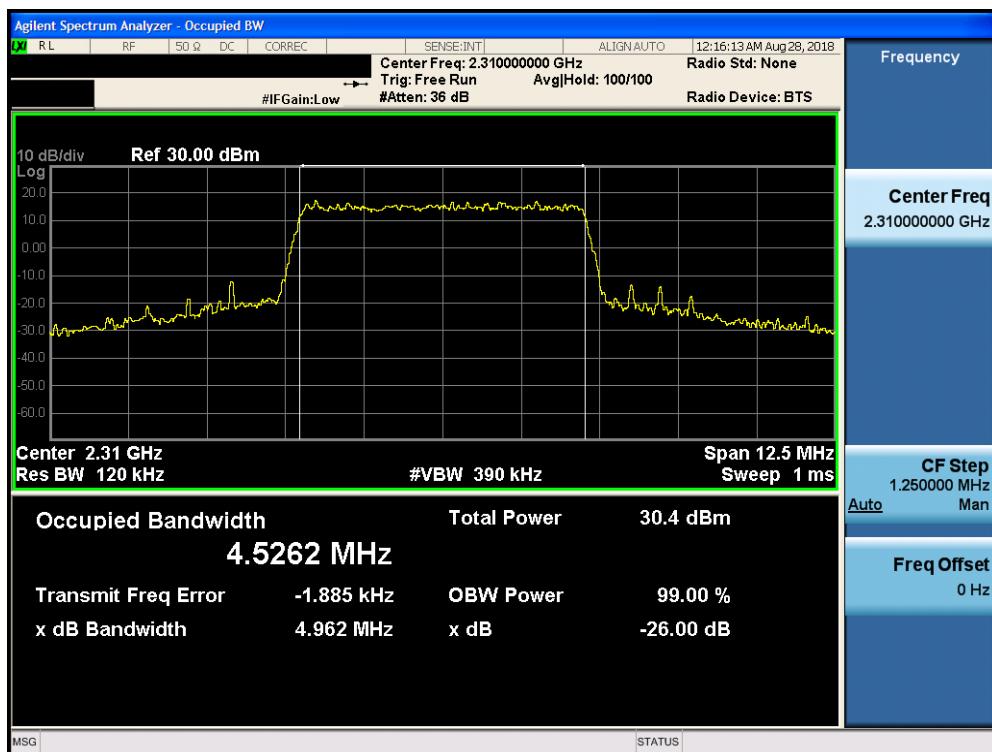


Plot 7-67. Occupied Bandwidth Plot (Band 30 – 5.0MHz QPSK – RB Size 25)



Plot 7-68. Occupied Bandwidth Plot (Band 30 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device

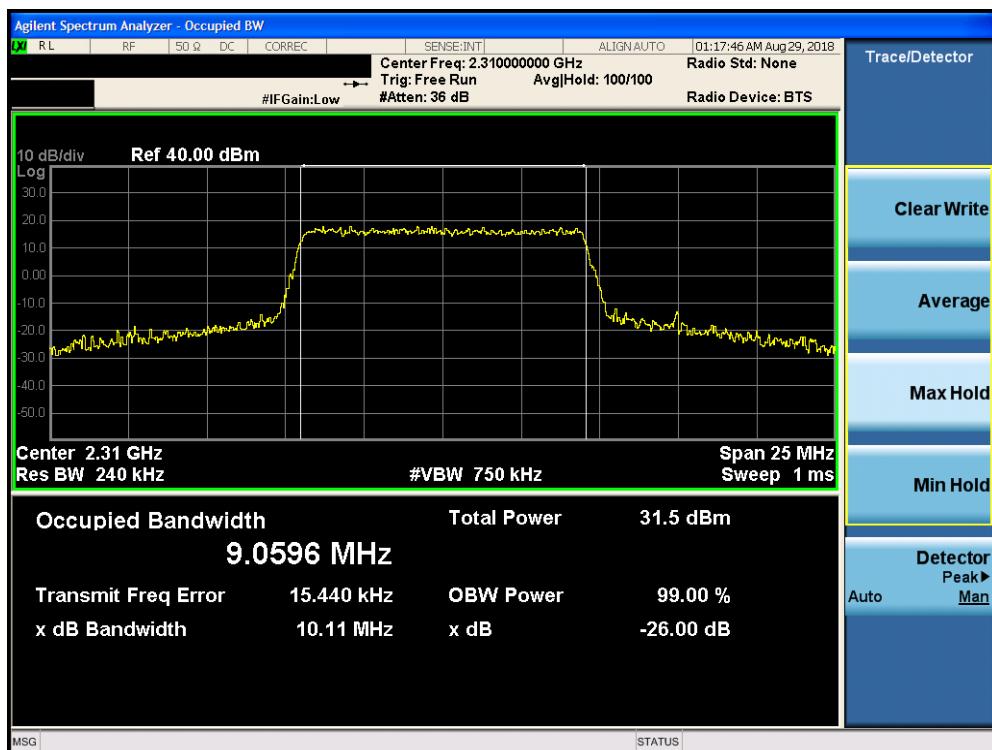


Plot 7-69. Occupied Bandwidth Plot (Band 30 – 5.0MHz 64-QAM – RB Size 25)

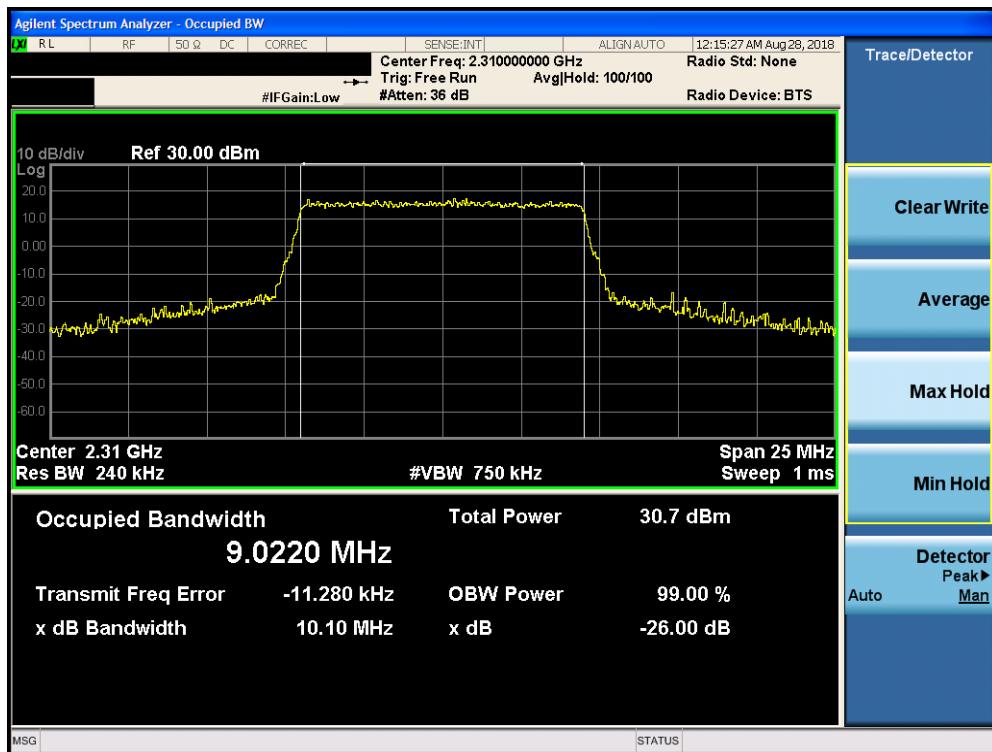


Plot 7-70. Occupied Bandwidth Plot (Band 30 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 53 of 373



Plot 7-71. Occupied Bandwidth Plot (Band 30 – 10.0MHz 16-QAM – RB Size 50)



Plot 7-72. Occupied Bandwidth Plot (Band 30 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 54 of 373

## Band 7

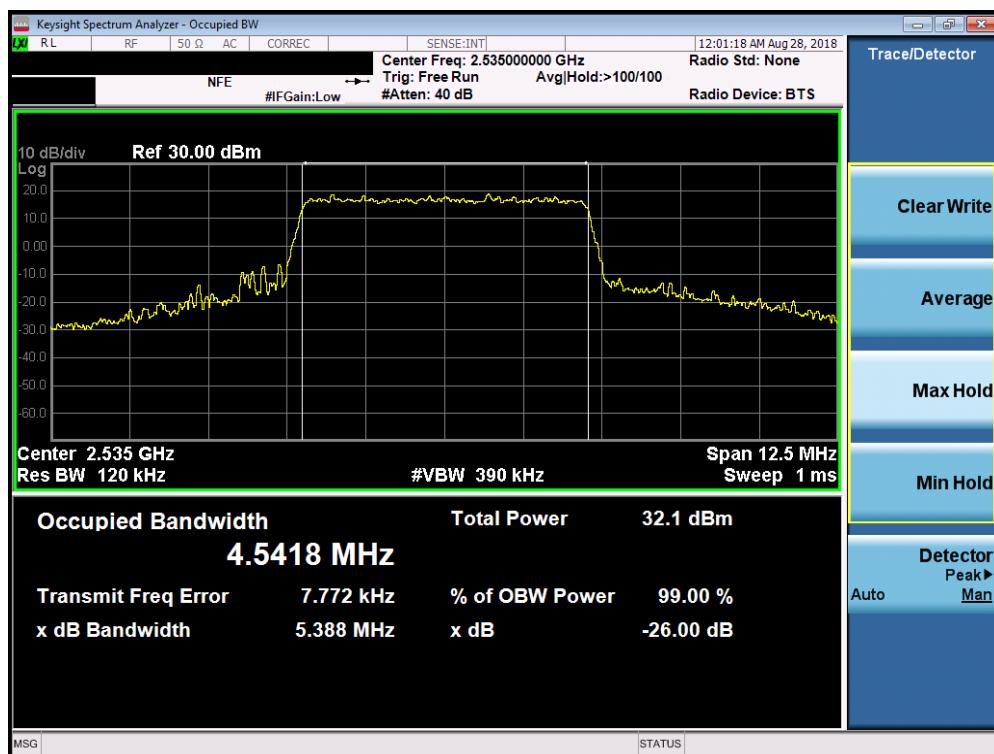


Plot 7-73. Occupied Bandwidth Plot (Band 7 – 5.0MHz QPSK – RB Size 25)



Plot 7-74. Occupied Bandwidth Plot (Band 7 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device



Plot 7-75. Occupied Bandwidth Plot (Band 7 – 5.0MHz 64-QAM – RB Size 25)

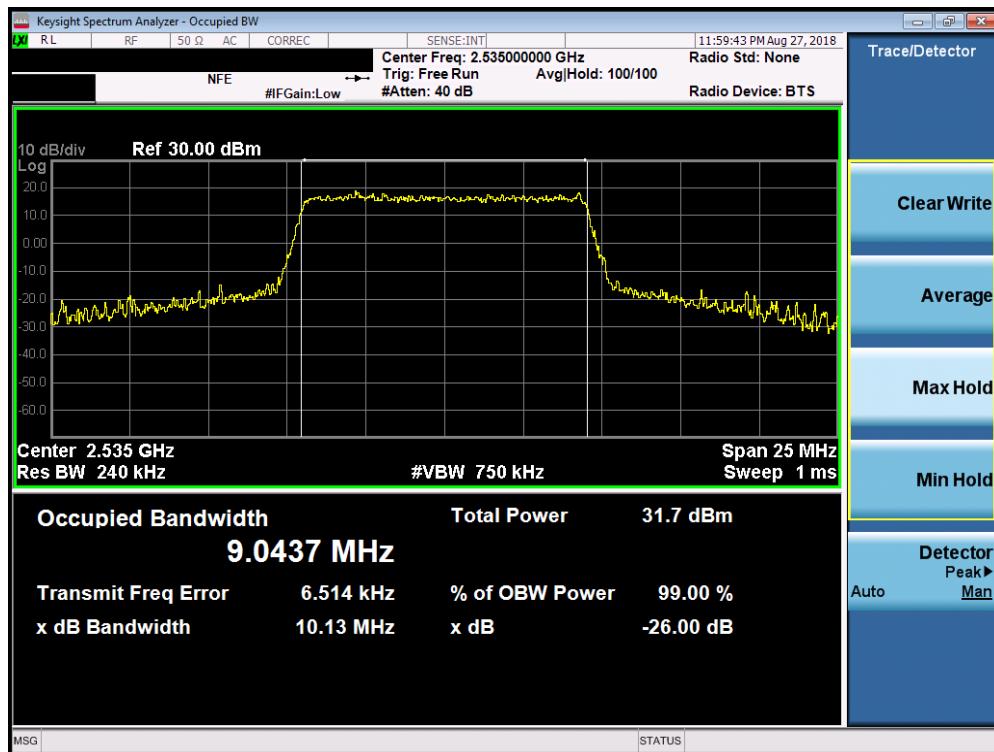


Plot 7-76. Occupied Bandwidth Plot (Band 7 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-77. Occupied Bandwidth Plot (Band 7 – 10.0MHz 16-QAM – RB Size 50)



Plot 7-78. Occupied Bandwidth Plot (Band 7 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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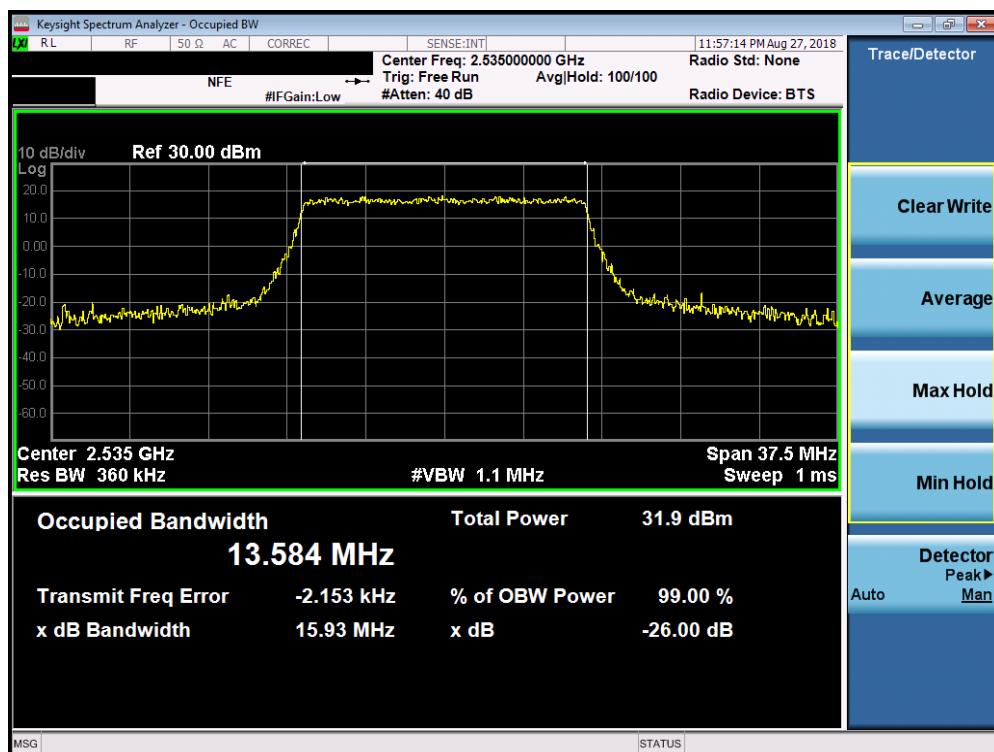


Plot 7-79. Occupied Bandwidth Plot (Band 7 – 15.0MHz QPSK – RB Size 75)



Plot 7-80. Occupied Bandwidth Plot (Band 7 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-81. Occupied Bandwidth Plot (Band 7 – 15.0MHz 64-QAM – RB Size 75)

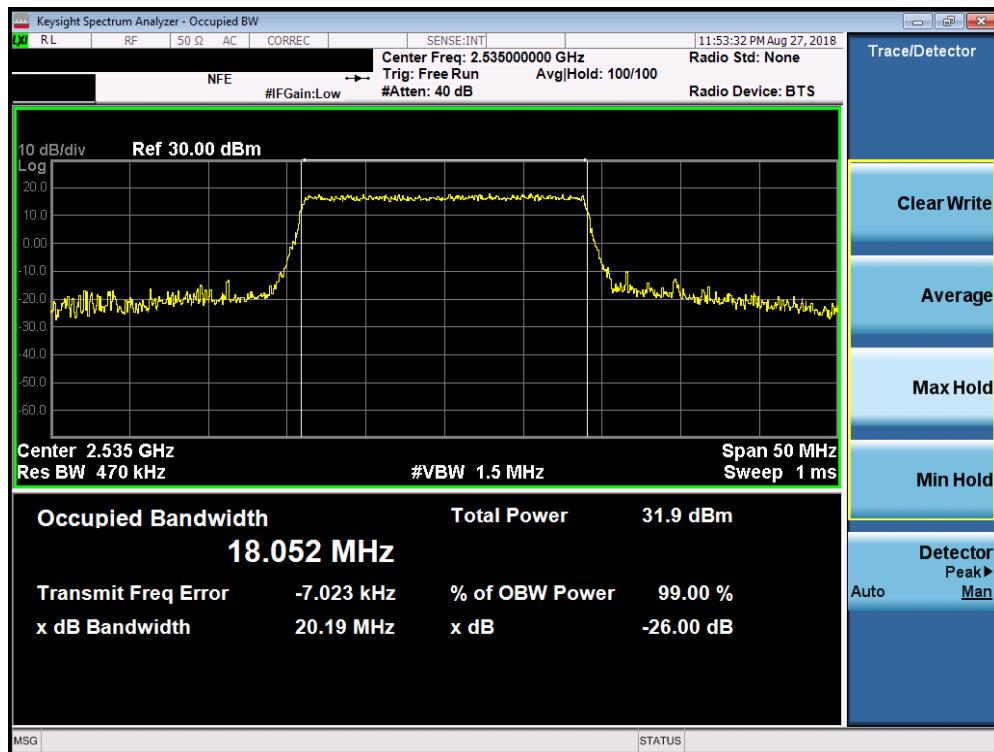


Plot 7-82. Occupied Bandwidth Plot (Band 7 – 20.0MHz QPSK – RB Size 100)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-83. Occupied Bandwidth Plot (Band 7 – 20.0MHz 16-QAM – RB Size 100)



Plot 7-84. Occupied Bandwidth Plot (Band 7 – 20.0MHz 64-QAM – RB Size 100)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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## Band 41



Plot 7-85. Occupied Bandwidth Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



Plot 7-86. Occupied Bandwidth Plot (Band 41 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: BCGA1895	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Plot 7-87. Occupied Bandwidth Plot (Band 41 – 5.0MHz 64-QAM – RB Size 25)



Plot 7-88. Occupied Bandwidth Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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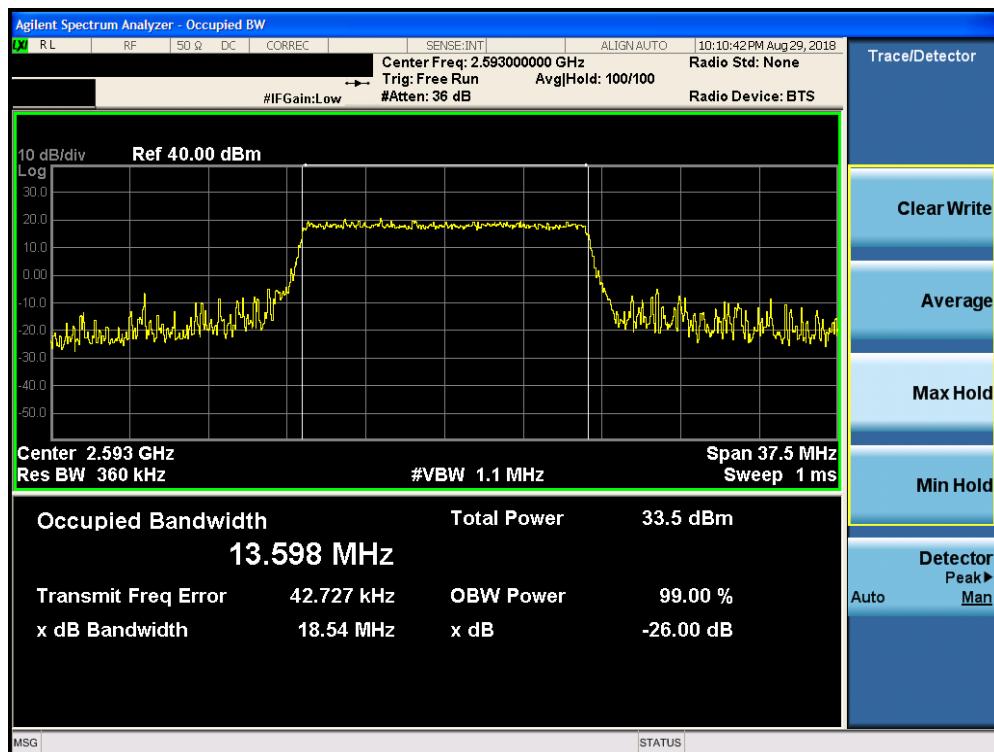


Plot 7-89. Occupied Bandwidth Plot (Band 41 – 10.0MHz 16-QAM – RB Size 50)

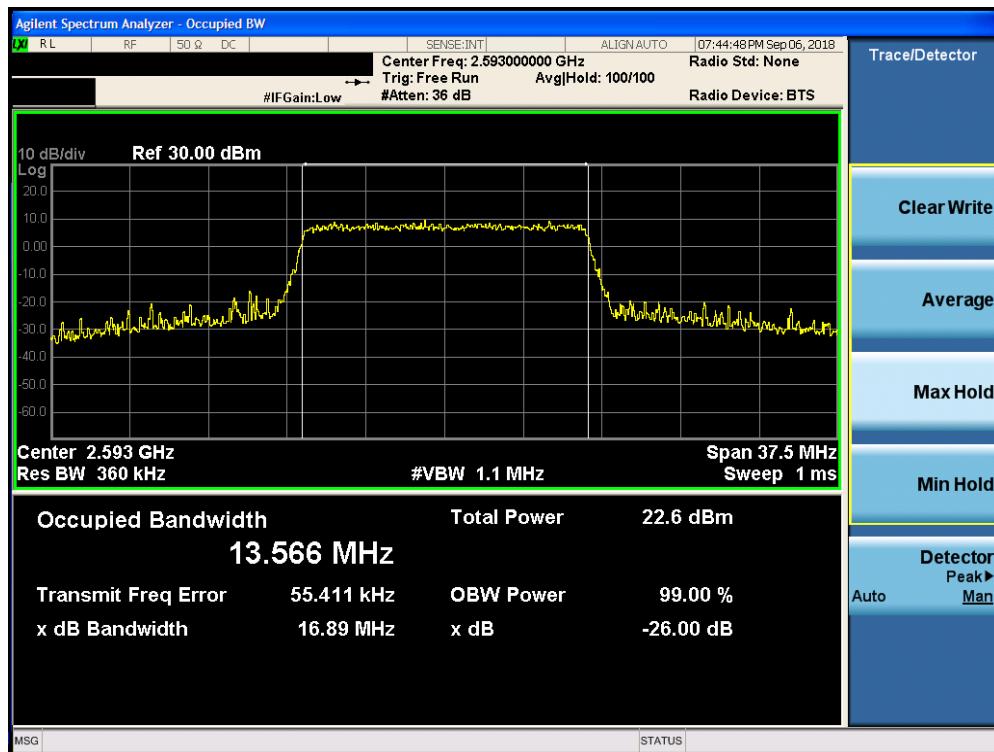


Plot 7-90. Occupied Bandwidth Plot (Band 41 – 10.0MHz 64-QAM – RB Size 50)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 63 of 373

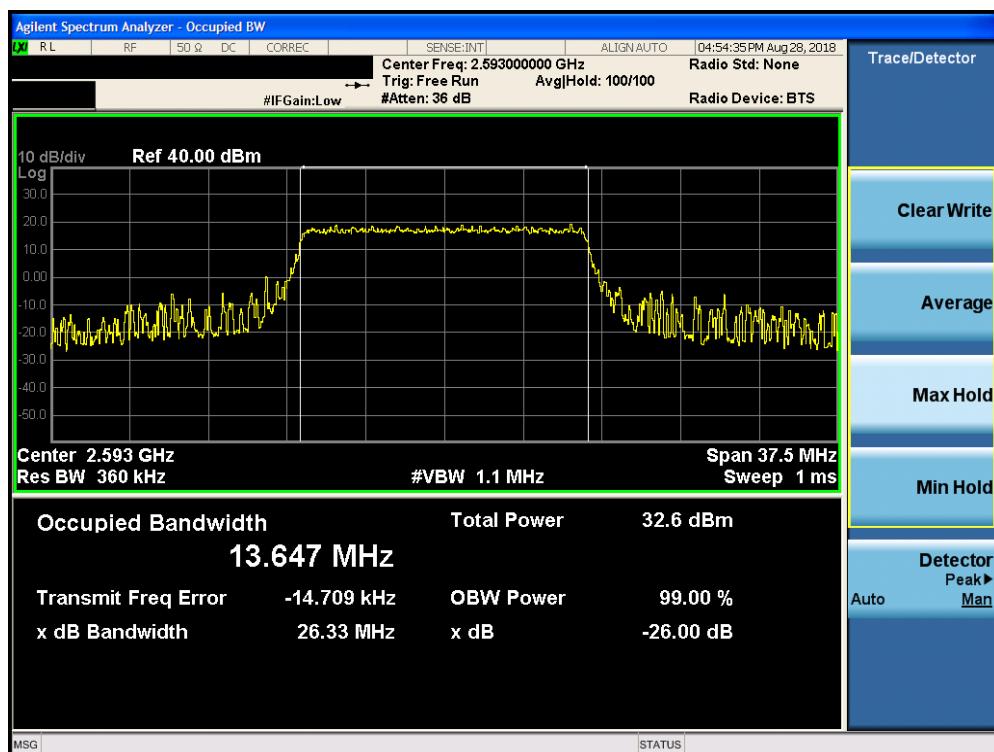


Plot 7-91. Occupied Bandwidth Plot (Band 41 – 15.0MHz QPSK – RB Size 75)

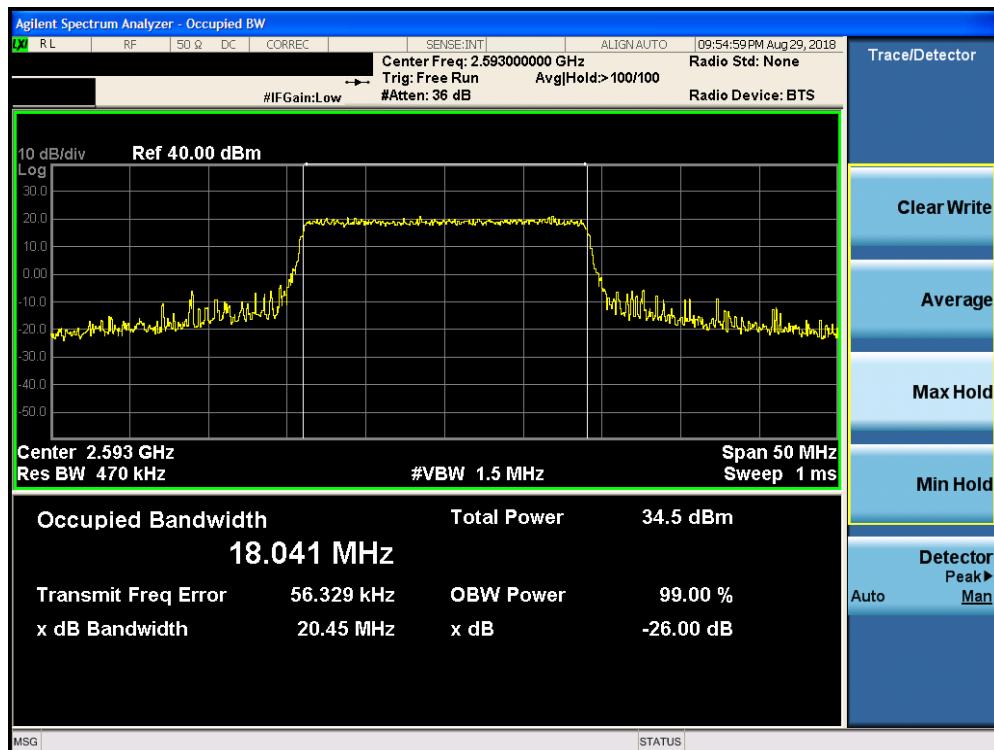


Plot 7-92. Occupied Bandwidth Plot (Band 41 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 64 of 373



Plot 7-93. Occupied Bandwidth Plot (Band 41 – 15.0MHz 64-QAM – RB Size 75)

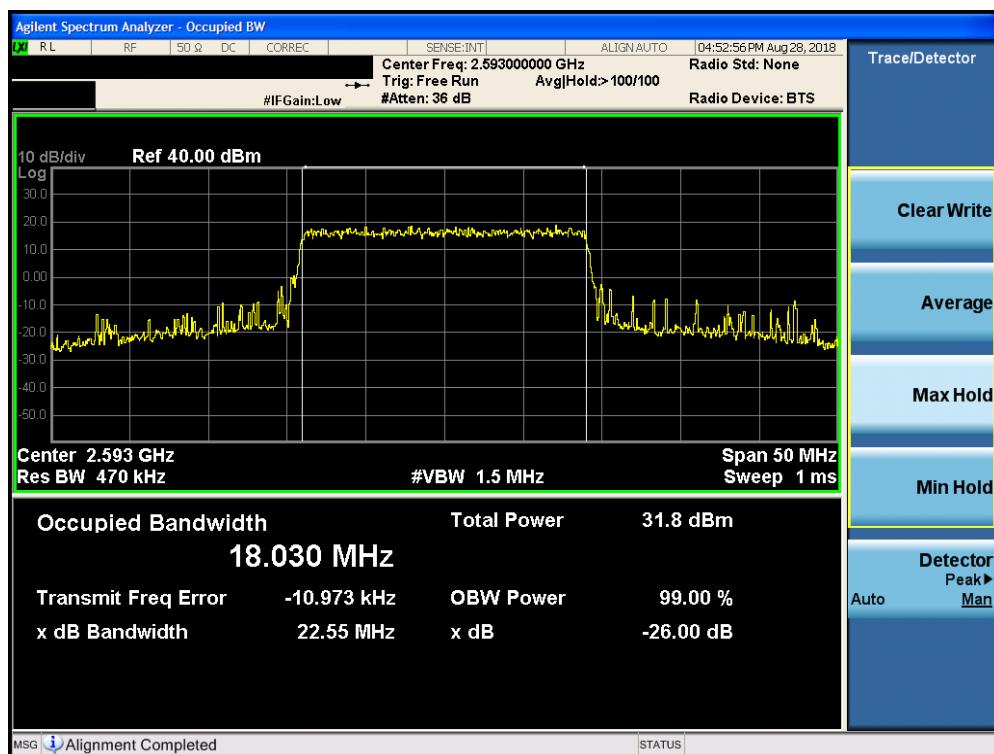


Plot 7-94. Occupied Bandwidth Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-95. Occupied Bandwidth Plot (Band 41 – 20.0MHz 16-QAM – RB Size 100)



Plot 7-96. Occupied Bandwidth Plot (Band 41 – 20.0MHz 64-QAM – RB Size 100)

FCC ID: BCGA1895		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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FCC ID: BCGA1895	 <b>PCTEST®</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	
<b>Test Report S/N:</b> 1C1806220014-03-R1.BCG	<b>Test Dates:</b> 7/31-10/18/2018	<b>EUT Type:</b> Tablet Device	<b>Approved by:</b> Quality Manager  Page 67 of 373

## 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.



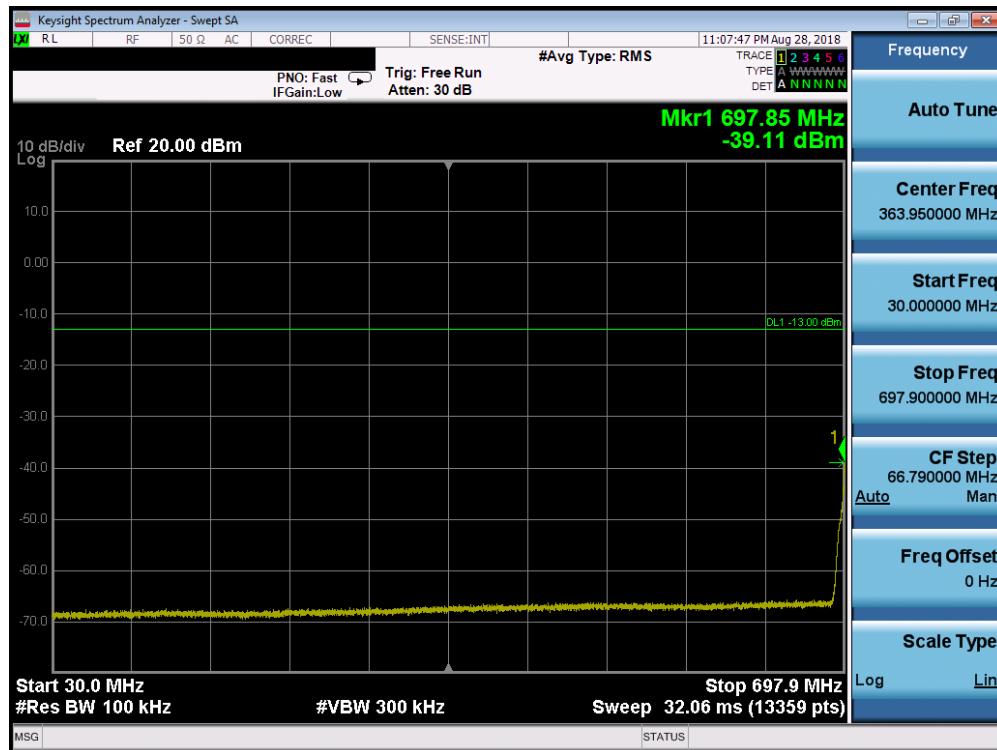
**Figure 7-2. Test Instrument & Measurement Setup**

### Test Notes

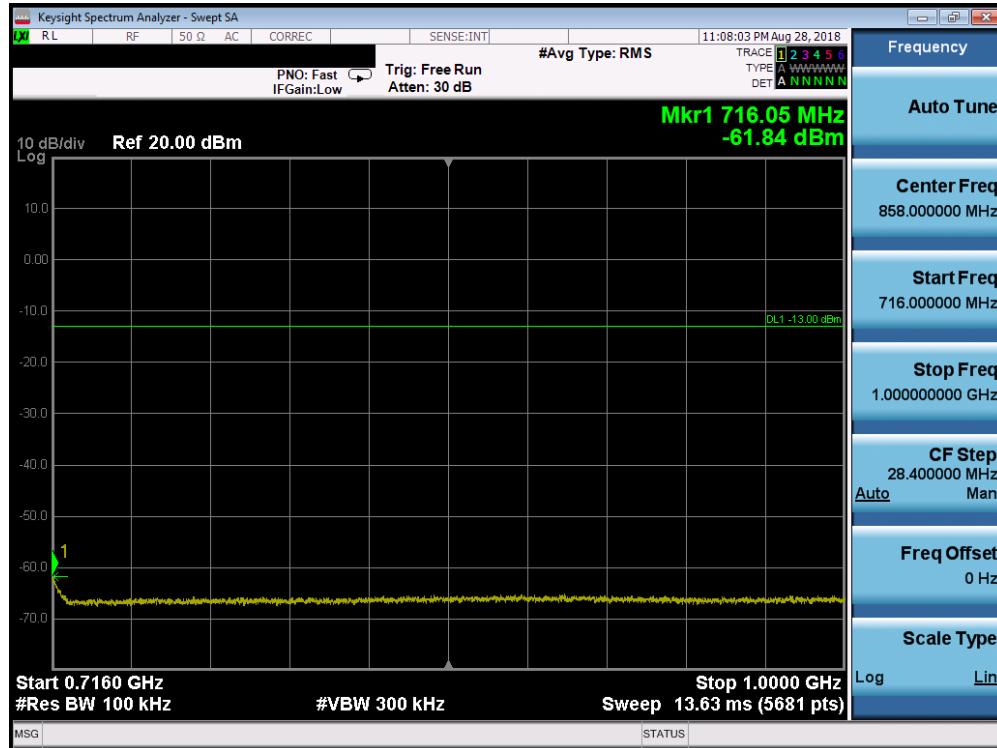
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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: BCGA1895	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device

## Band 12/17

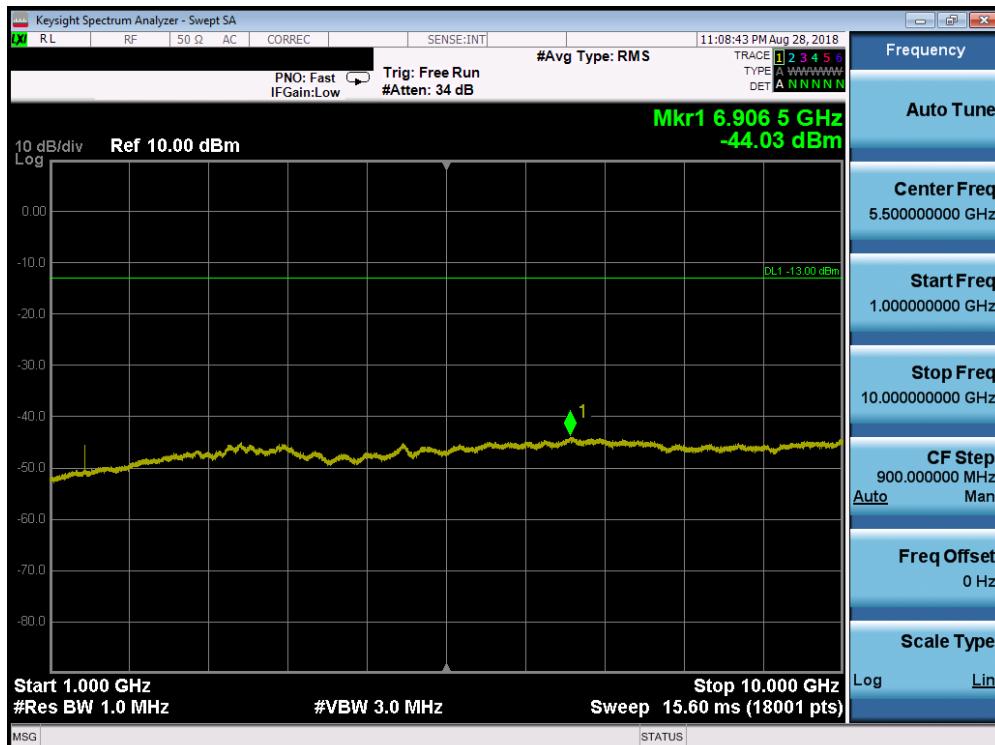


Plot 7-97. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

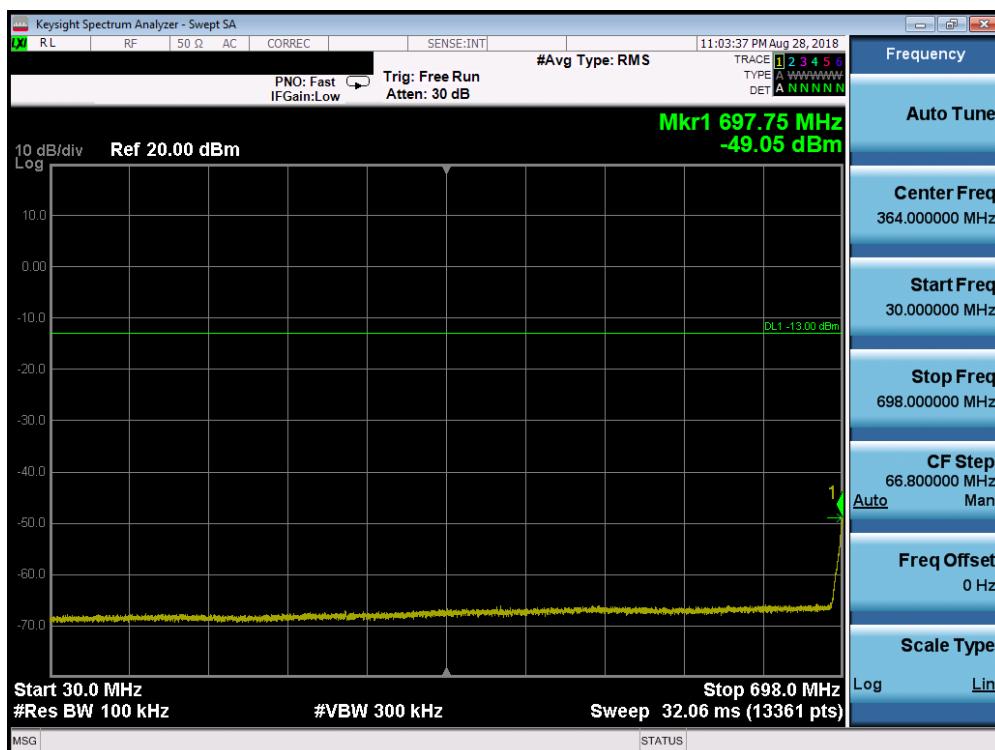


Plot 7-98. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: BCGA1895	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 69 of 373

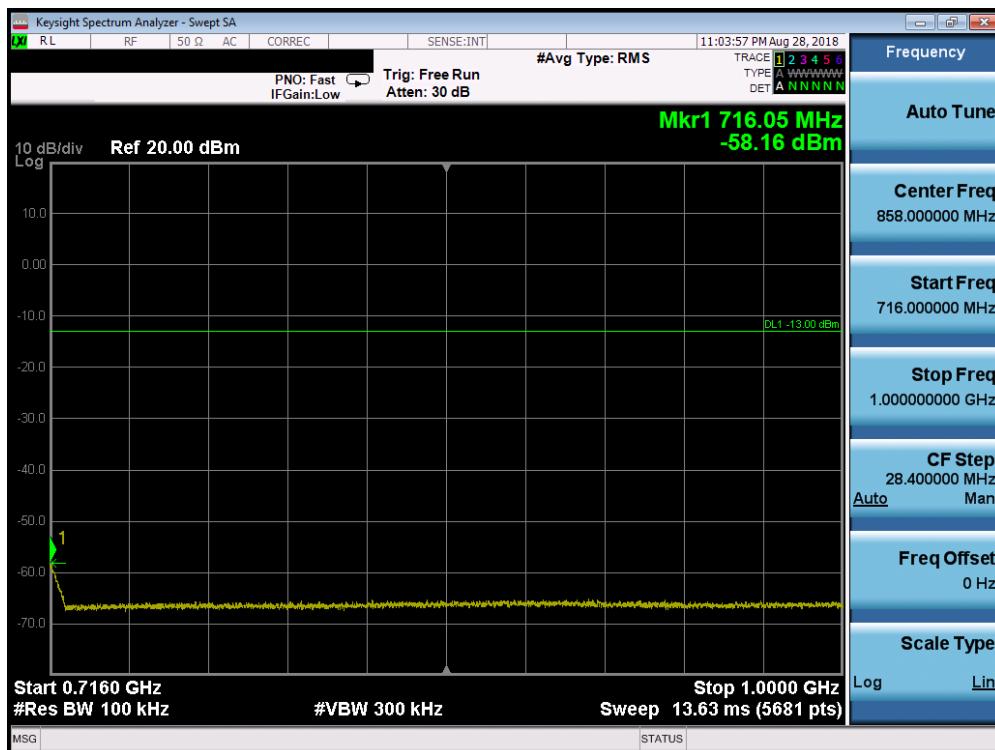


Plot 7-99. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

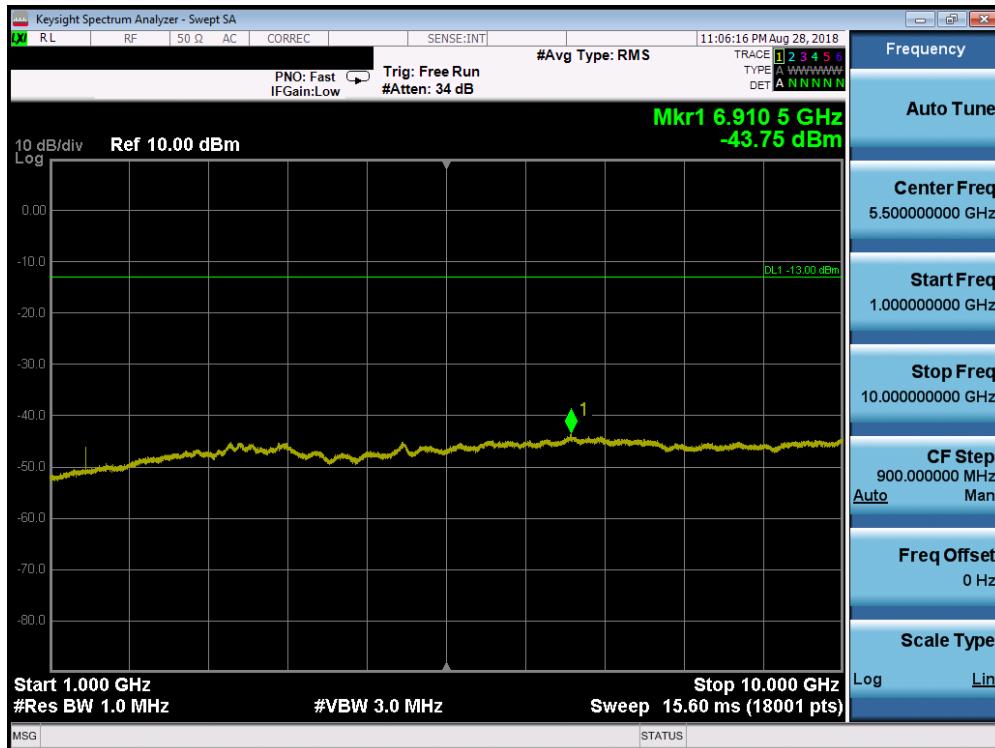


Plot 7-100. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: BCGA1895	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 70 of 373

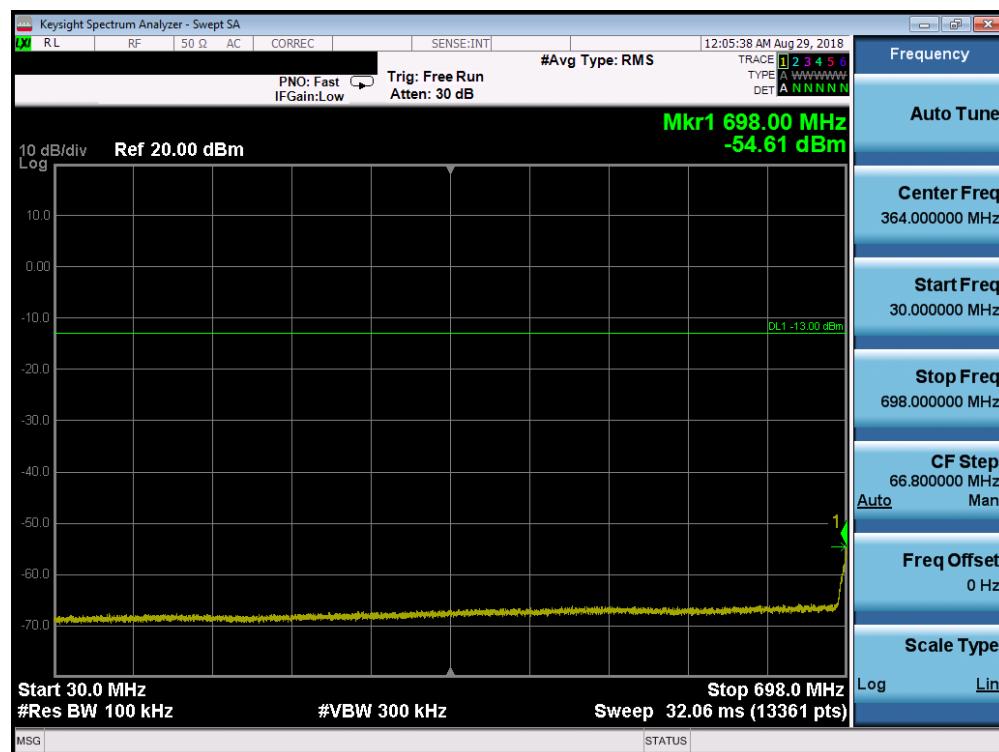


Plot 7-101. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

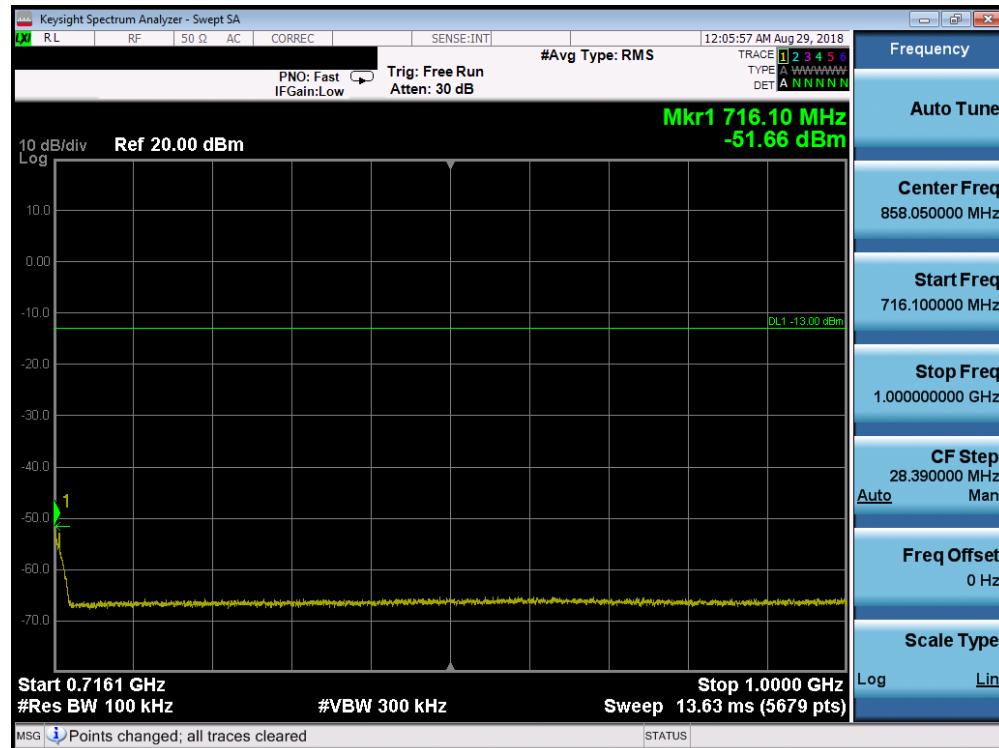


Plot 7-102. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 71 of 373

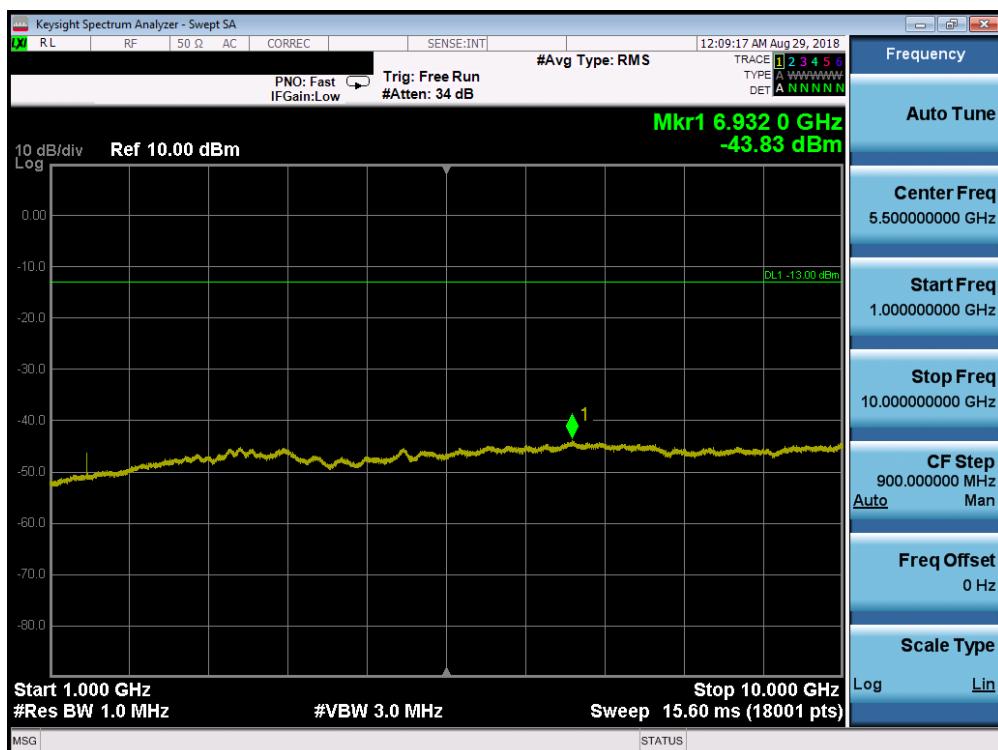


Plot 7-103. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



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

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 72 of 373



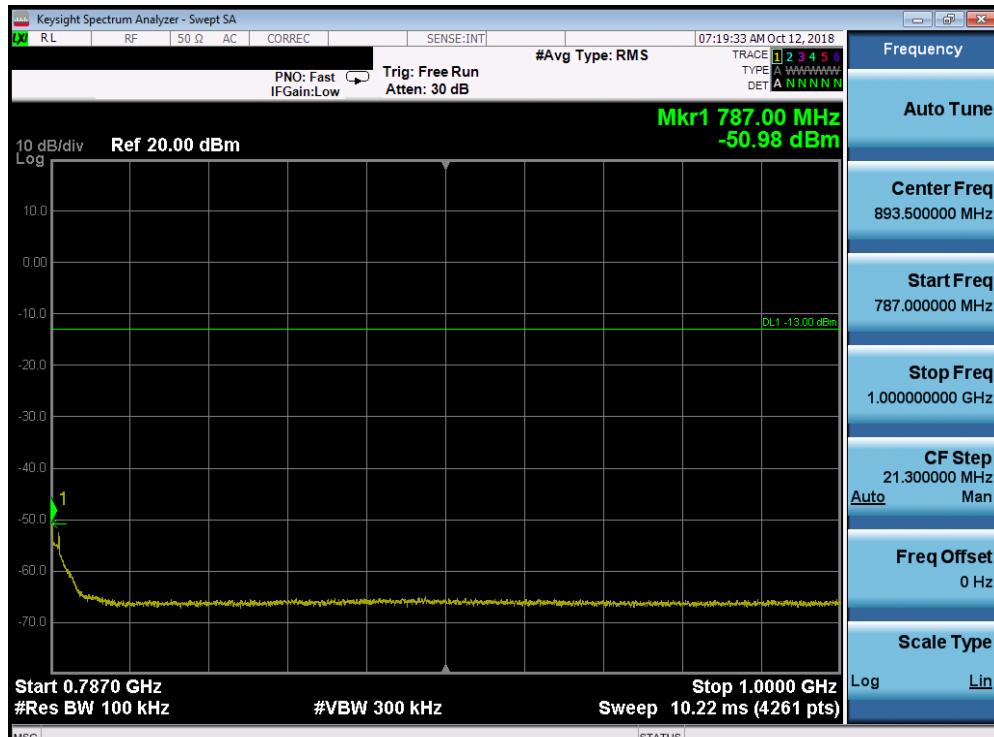
Plot 7-105. Conducted Spurious Plot (Band 12/17 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 73 of 373

## Band 13

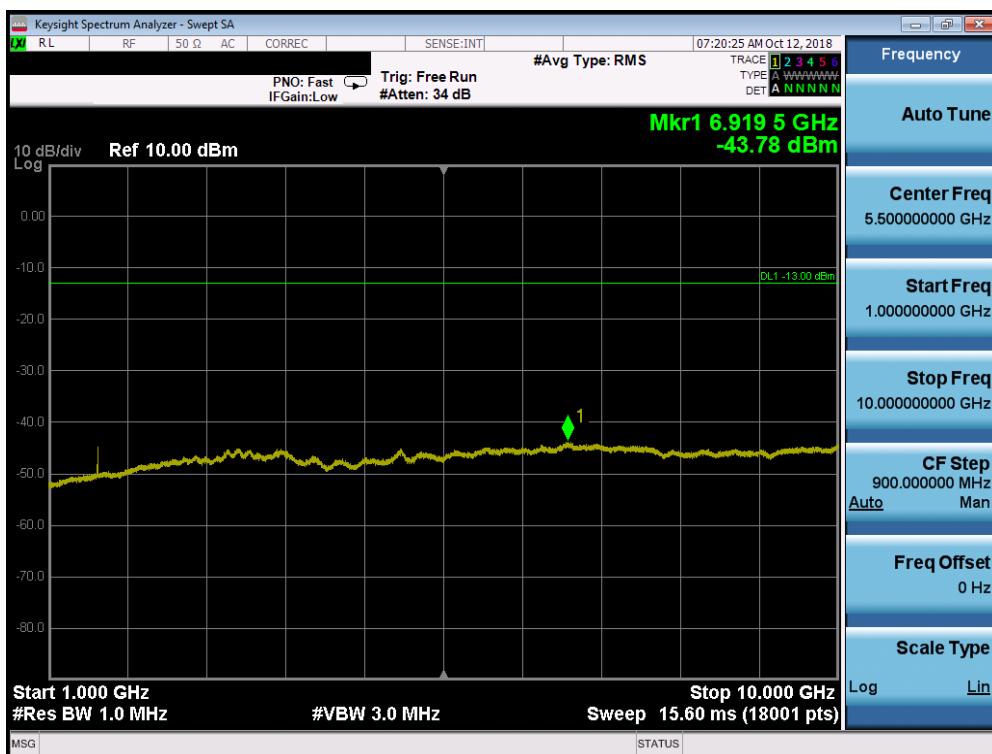


Plot 7-106. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0)



Plot 7-107. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0)

FCC ID: BCGA1895	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 74 of 373



Plot 7-108. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0)

FCC ID: BCGA1895	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1806220014-03-R1.BCG	Test Dates: 7/31-10/18/2018	EUT Type: Tablet Device	Page 75 of 373