



## MEASUREMENT REPORT LTE

**Applicant Name:**

LG Electronics USA, Inc.

1000 Sylvan Avenue

Englewood Cliffs, NJ 07632

United States

**Date of Testing:**

10/28 – 11/26/2019

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M1910280174-03-R2.ZNF

**FCC ID:**

**ZNFL455DL**

**APPLICANT:**

**LG Electronics USA, Inc.**

**Application Type:**

Certification

**Model:**

LG L455DL

**Additional Model(s):**

LG-L455DL, LM-K400UM, LM-K400MM, LM-K400QM,  
LM-K400VPP, LM-K400QM5, LM-K400QM6, LGL455DL,  
LMK400UM, LMK400MM, LMK400QM, LMK400QM5, LMK400QM6,  
LMK400VPP, L455DL, K400UM, K400MM, K400QM, K400QM5,  
K400QM6, K400VPP

**EUT Type:**

Portable Handset

**FCC Classification:**

PCS Licensed Transmitter Held to Ear (PCE)

**FCC Rule Part(s):**

22, 24, & 27

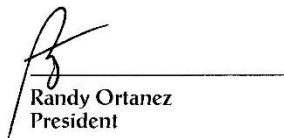
**Test Procedure(s):**

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

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

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

Note: This revised Test Report (S/N: 1M1910280174-03-R2.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.



Randy Ortanez  
President

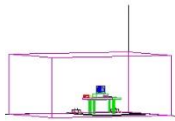


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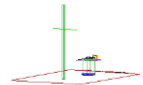
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## FCC Part 22, 24, & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)		
LTE Band 71	27	665.5 - 695.5	0.092	19.66			4M51G7D	QPSK
LTE Band 71	27	665.5 - 695.5	0.086	19.32			4M52W7D	16QAM
LTE Band 71	27	665.5 - 695.5	0.067	18.26			4M53W7D	64QAM
LTE Band 71	27	668 - 693	0.092	19.64			9M01G7D	QPSK
LTE Band 71	27	668 - 693	0.082	19.12			9M00W7D	16QAM
LTE Band 71	27	668 - 693	0.066	18.20			9M02W7D	64QAM
LTE Band 71	27	670.5 - 690.5	0.088	19.45			13M5G7D	QPSK
LTE Band 71	27	670.5 - 690.5	0.075	18.74			13M5W7D	16QAM
LTE Band 71	27	670.5 - 690.5	0.059	17.74			13M5W7D	64QAM
LTE Band 71	27	673 - 688	0.087	19.38			18M0G7D	QPSK
LTE Band 71	27	673 - 688	0.074	18.69			18M0W7D	16QAM
LTE Band 71	27	673 - 688	0.059	17.71			17M9W7D	64QAM
LTE Band 12	27	699.7 - 715.3	0.195	22.90	0.320	25.05	1M10G7D	QPSK
LTE Band 12	27	699.7 - 715.3	0.158	22.00	0.260	24.15	1M10W7D	16QAM
LTE Band 12	27	699.7 - 715.3	0.120	20.80	0.197	22.95	1M11W7D	64QAM
LTE Band 12	27	700.5 - 714.5	0.191	22.80	0.313	24.95	2M69G7D	QPSK
LTE Band 12	27	700.5 - 714.5	0.156	21.94	0.256	24.09	2M70W7D	16QAM
LTE Band 12	27	700.5 - 714.5	0.126	21.00	0.207	23.15	2M70W7D	64QAM
LTE Band 12	27	701.5 - 713.5	0.194	22.87	0.318	25.02	4M53G7D	QPSK
LTE Band 12	27	701.5 - 713.5	0.159	22.02	0.261	24.17	4M51W7D	16QAM
LTE Band 12	27	701.5 - 713.5	0.125	20.98	0.206	23.13	4M51W7D	64QAM
LTE Band 12	27	704 - 711	0.118	20.72	0.194	22.87	9M01G7D	QPSK
LTE Band 12	27	704 - 711	0.095	19.78	0.156	21.93	9M02W7D	16QAM
LTE Band 12	27	704 - 711	0.070	18.45	0.115	20.60	9M02W7D	64QAM
LTE Band 13	27	779.5 - 784.5	0.112	20.51	0.185	22.66	4M52G7D	QPSK
LTE Band 13	27	779.5 - 784.5	0.096	19.82	0.157	21.97	4M52W7D	16QAM
LTE Band 13	27	779.5 - 784.5	0.072	18.59	0.119	20.74	4M52W7D	64QAM
LTE Band 13	27	782	0.100	20.01	0.164	22.16	9M05G7D	QPSK
LTE Band 13	27	782	0.089	19.48	0.146	21.63	8M97W7D	16QAM
LTE Band 13	27	782	0.069	18.41	0.114	20.56	9M01W7D	64QAM
LTE Band 26/5	22H	824.7 - 848.3	0.191	22.80	0.313	24.95	1M09G7D	QPSK
LTE Band 26/5	22H	824.7 - 848.3	0.149	21.74	0.245	23.89	1M11W7D	16QAM
LTE Band 26/5	22H	824.7 - 848.3	0.126	21.00	0.207	23.15	1M10W7D	64QAM
LTE Band 26/5	22H	825.5 - 847.5	0.185	22.67	0.303	24.82	2M69G7D	QPSK
LTE Band 26/5	22H	825.5 - 847.5	0.153	21.86	0.252	24.01	2M69W7D	16QAM
LTE Band 26/5	22H	825.5 - 847.5	0.123	20.89	0.201	23.04	2M70W7D	64QAM
LTE Band 26/5	22H	826.5 - 846.5	0.191	22.80	0.313	24.95	4M51G7D	QPSK
LTE Band 26/5	22H	826.5 - 846.5	0.156	21.94	0.256	24.09	4M49W7D	16QAM
LTE Band 26/5	22H	826.5 - 846.5	0.126	21.00	0.207	23.15	4M50W7D	64QAM
LTE Band 26/5	22H	829 - 844	0.194	22.87	0.318	25.02	9M02G7D	QPSK
LTE Band 26/5	22H	829 - 844	0.160	22.04	0.262	24.19	9M00W7D	16QAM
LTE Band 26/5	22H	829 - 844	0.127	21.03	0.208	23.18	9M01W7D	64QAM
LTE Band 26	22H	831.5 - 841.5	0.081	19.08	0.133	21.23	13M5G7D	QPSK
LTE Band 26	22H	831.5 - 841.5	0.064	18.09	0.106	20.24	13M5W7D	16QAM
LTE Band 26	22H	831.5 - 841.5	0.053	17.24	0.087	19.39	13M5W7D	64QAM

### EUT Overview (<1 GHz)

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Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 66/4	27	1710.7 - 1779.3	0.279	24.46	1M10G7D	QPSK
LTE Band 66/4	27	1710.7 - 1779.3	0.225	23.52	1M10W7D	16QAM
LTE Band 66/4	27	1710.7 - 1779.3	0.179	22.52	1M10W7D	64QAM
LTE Band 66/4	27	1711.5 - 1778.5	0.282	24.50	2M70G7D	QPSK
LTE Band 66/4	27	1711.5 - 1778.5	0.228	23.59	2M70W7D	16QAM
LTE Band 66/4	27	1711.5 - 1778.5	0.182	22.61	2M70W7D	64QAM
LTE Band 66/4	27	1712.5 - 1777.5	0.288	24.59	4M55G7D	QPSK
LTE Band 66/4	27	1712.5 - 1777.5	0.236	23.72	4M53W7D	16QAM
LTE Band 66/4	27	1712.5 - 1777.5	0.182	22.60	4M53W7D	64QAM
LTE Band 66/4	27	1715 - 1775	0.291	24.64	9M04G7D	QPSK
LTE Band 66/4	27	1715 - 1775	0.225	23.52	9M06W7D	16QAM
LTE Band 66/4	27	1715 - 1775	0.168	22.25	9M03W7D	64QAM
LTE Band 66/4	27	1717.5 - 1772.5	0.282	24.50	13M6G7D	QPSK
LTE Band 66/4	27	1717.5 - 1772.5	0.223	23.48	13M6W7D	16QAM
LTE Band 66/4	27	1717.5 - 1772.5	0.168	22.26	13M5W7D	64QAM
LTE Band 66/4	27	1720 - 1770	0.242	23.84	18M0G7D	QPSK
LTE Band 66/4	27	1720 - 1770	0.182	22.60	18M1W7D	16QAM
LTE Band 66/4	27	1720 - 1770	0.147	21.68	18M0W7D	64QAM
LTE Band 25/2	24E	1850.7 - 1914.3	0.295	24.71	1M10G7D	QPSK
LTE Band 25/2	24E	1850.7 - 1914.3	0.231	23.64	1M10W7D	16QAM
LTE Band 25/2	24E	1850.7 - 1914.3	0.186	22.71	1M10W7D	64QAM
LTE Band 25/2	24E	1851.5 - 1913.5	0.299	24.75	2M69G7D	QPSK
LTE Band 25/2	24E	1851.5 - 1913.5	0.237	23.74	2M69W7D	16QAM
LTE Band 25/2	24E	1851.5 - 1913.5	0.180	22.55	2M69W7D	64QAM
LTE Band 25/2	24E	1852.5 - 1912.5	0.296	24.71	4M55G7D	QPSK
LTE Band 25/2	24E	1852.5 - 1912.5	0.236	23.74	4M54W7D	16QAM
LTE Band 25/2	24E	1852.5 - 1912.5	0.187	22.72	4M54W7D	64QAM
LTE Band 25/2	24E	1855 - 1910	0.295	24.70	9M05G7D	QPSK
LTE Band 25/2	24E	1855 - 1910	0.236	23.73	9M01W7D	16QAM
LTE Band 25/2	24E	1855 - 1910	0.184	22.65	9M07W7D	64QAM
LTE Band 25/2	24E	1857.5 - 1907.5	0.285	24.55	13M5G7D	QPSK
LTE Band 25/2	24E	1857.5 - 1907.5	0.232	23.65	13M6W7D	16QAM
LTE Band 25/2	24E	1857.5 - 1907.5	0.181	22.57	13M5W7D	64QAM
LTE Band 25/2	24E	1860 - 1905	0.359	25.55	18M0G7D	QPSK
LTE Band 25/2	24E	1860 - 1905	0.303	24.81	18M0W7D	16QAM
LTE Band 25/2	24E	1860 - 1905	0.252	24.01	18M0W7D	64QAM

### EUT Overview (Mid Bands)

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Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 41 (PC2)	27	2498.5 - 2687.5	0.234	23.70	4M52G7D	QPSK
LTE Band 41 (PC2)	27	2498.5 - 2687.5	0.170	22.32	4M54W7D	16QAM
LTE Band 41 (PC2)	27	2498.5 - 2687.5	0.150	21.77	4M50W7D	64QAM
LTE Band 41 (PC2)	27	2501 - 2685	0.236	23.72	8M95G7D	QPSK
LTE Band 41 (PC2)	27	2501 - 2685	0.172	22.34	8M97W7D	16QAM
LTE Band 41 (PC2)	27	2501 - 2685	0.144	21.58	8M98W7D	64QAM
LTE Band 41 (PC2)	27	2503.5 - 2682.5	0.235	23.70	13M5G7D	QPSK
LTE Band 41 (PC2)	27	2503.5 - 2682.5	0.188	22.73	13M5W7D	16QAM
LTE Band 41 (PC2)	27	2503.5 - 2682.5	0.165	22.16	13M5W7D	64QAM
LTE Band 41 (PC2)	27	2506 - 2680	0.229	23.59	18M0G7D	QPSK
LTE Band 41 (PC2)	27	2506 - 2680	0.185	22.67	18M0W7D	16QAM
LTE Band 41 (PC2)	27	2506 - 2680	0.145	21.62	18M0W7D	64QAM

### EUT Overview (High Bands)

FCC ID: ZNFL455DL	 <b>MEASUREMENT REPORT (CERTIFICATION)</b> 		Approved by: Quality Manager
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## 1.0 INTRODUCTION

### 1.1 Scope

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

### 1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

### 1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISSED.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFL455DL**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

**Test Device Serial No.:** 00350, 00368, 00376, 00384

### 2.2 Device Capabilities

This device contains the following capabilities:

800/850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE)

LTE Band 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.

### 2.3 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.

### 2.4 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.

### 3.2 600 MHz Band Frequency Range

600 MHz band. The 600 MHz band (617-652 MHz and 663-698 MHz) has seven pairs of 5 megahertz channel blocks available for assignment on a Partial Economic Area basis 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.

### 3.3 Block C Frequency Range

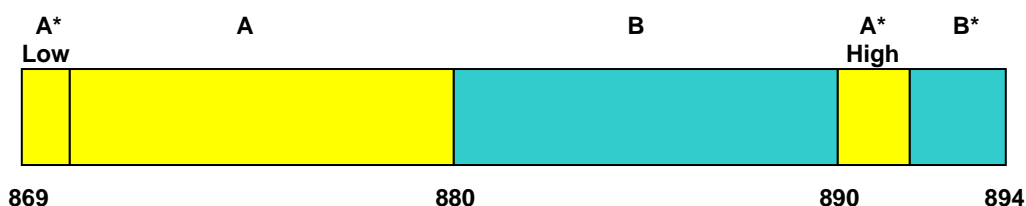
Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results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

### 3.4 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.

### 3.5 Cellular - Base Frequency Blocks



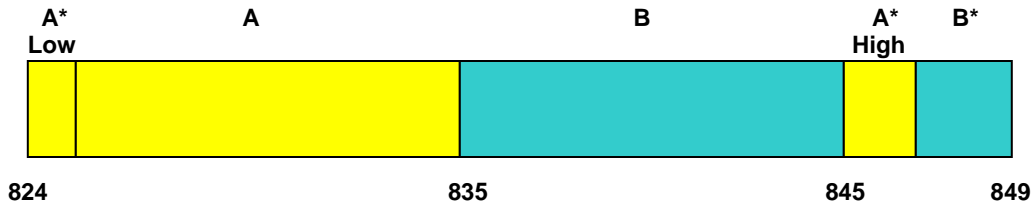
**BLOCK 1:** 869 – 880 MHz (A\* Low + A)  
**BLOCK 2:** 880 – 890 MHz (B)

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

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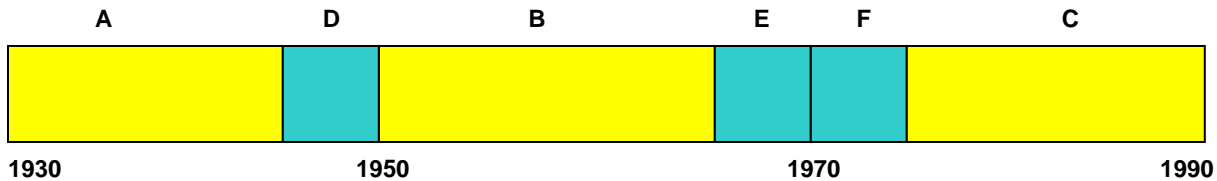
### 3.6 Cellular - Mobile Frequency Blocks



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\*)

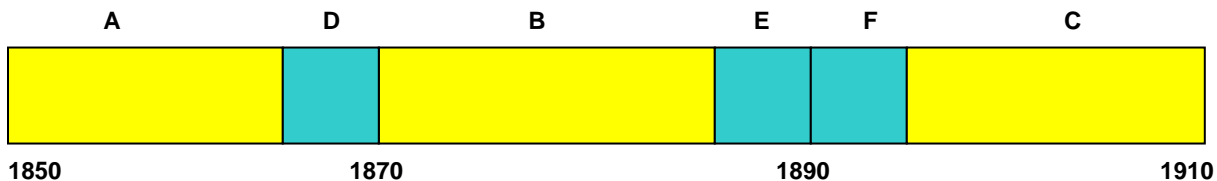
### 3.7 PCS - Base Frequency Blocks



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)

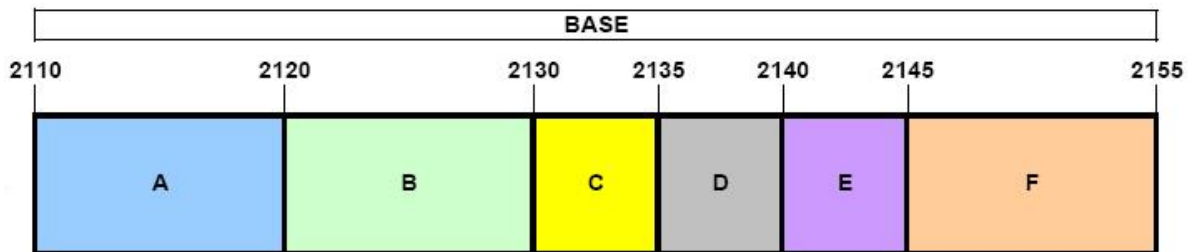
### 3.8 PCS - Mobile Frequency Blocks



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

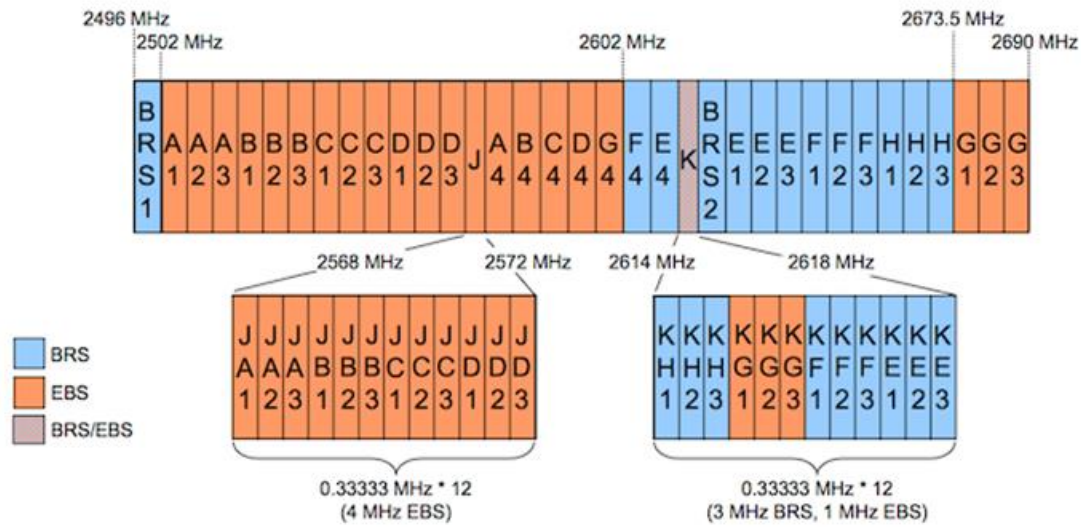


BLOCK 1: 2110 – 2120 MHz (A)  
BLOCK 2: 2120 – 2130 MHz (B)  
BLOCK 3: 2130 – 2135 MHz (C)

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

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### 3.10 BRS/EBS Frequency Block



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### 3.11 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. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

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  $43 + 10 \log_{10}(\text{Power [Watts]})$ .

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

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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  $U_{\text{CISPR}}$  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	1.13
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
-	LTx1	Licensed Transmitter Cable Set	6/4/2019	Annual	6/4/2020	LTx1
-	LTx3	Licensed Transmitter Cable Set	6/3/2019	Annual	6/3/2020	LTx3
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	135427
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/11/2019	Annual	7/11/2020	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
Seekonk	NC-100	Torque Wrench (8" lb)	5/10/2018	Biennial	5/10/2020	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 5-1. Test Equipment

### Notes:

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

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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: LG Electronics USA, Inc.  
 FCC ID: ZNFL455DL  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 Mode(s): LTE

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

table 7-1. Summary of Radiated Test Results

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 26/5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.8
27.50(b)(10) 27.50(c)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 71, 12, 13)	< 3 Watts max. ERP			Section 7.8
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 25/2, 71, 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
2.1053 22.917(a) 24.238(a) 27.53(c) 27.53(g) 27.53(h)	Undesirable Emissions (Band 12, 26/5, 66/4, 25/2)	> 43 + 10 log <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(m)	Undesirable Emissions (Band 41)	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.9
27.53(m)	Uplink Carrier Aggregation	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 5.3.
- 5) For operation <1GHz, the EIRP limits in the table above are referenced to the specifications written in the relevant Radio Standards Specifications for Innovation, Science, and Economic Development Canada.

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## 7.2 Occupied Bandwidth

### Test Overview

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

### Test Procedure Used

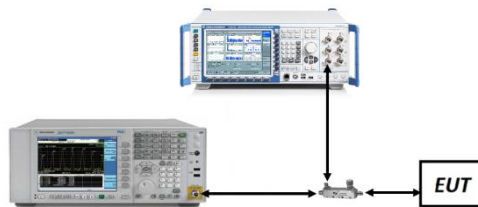
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### Test Setup

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



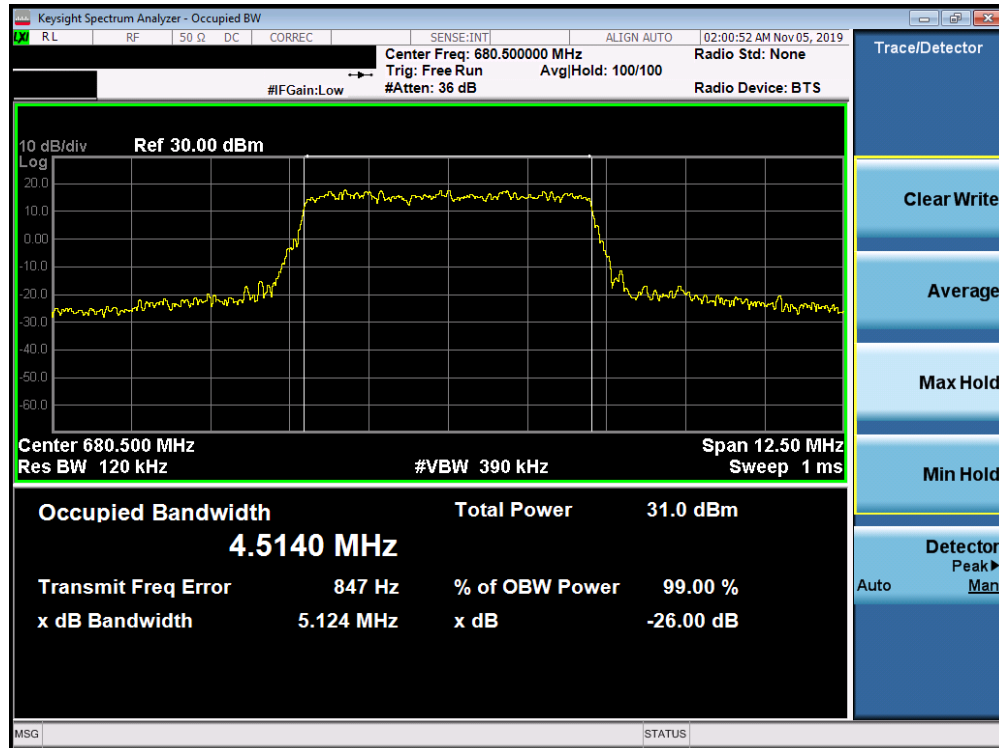
**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

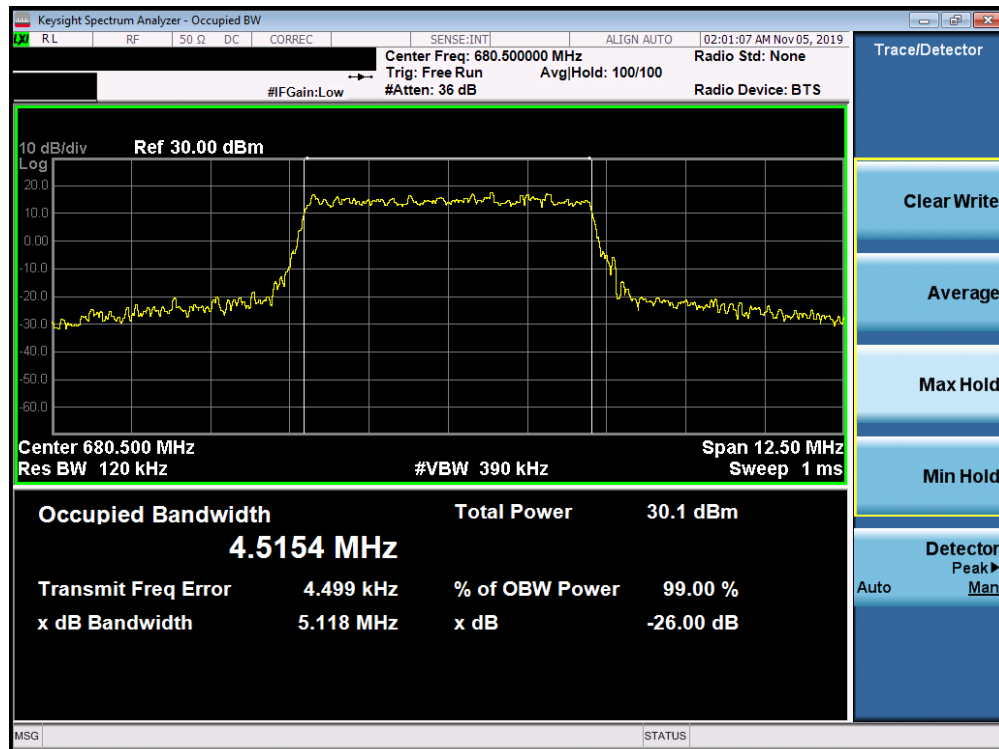
None.

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	LG	Approved by: Quality Manager
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## Band 71

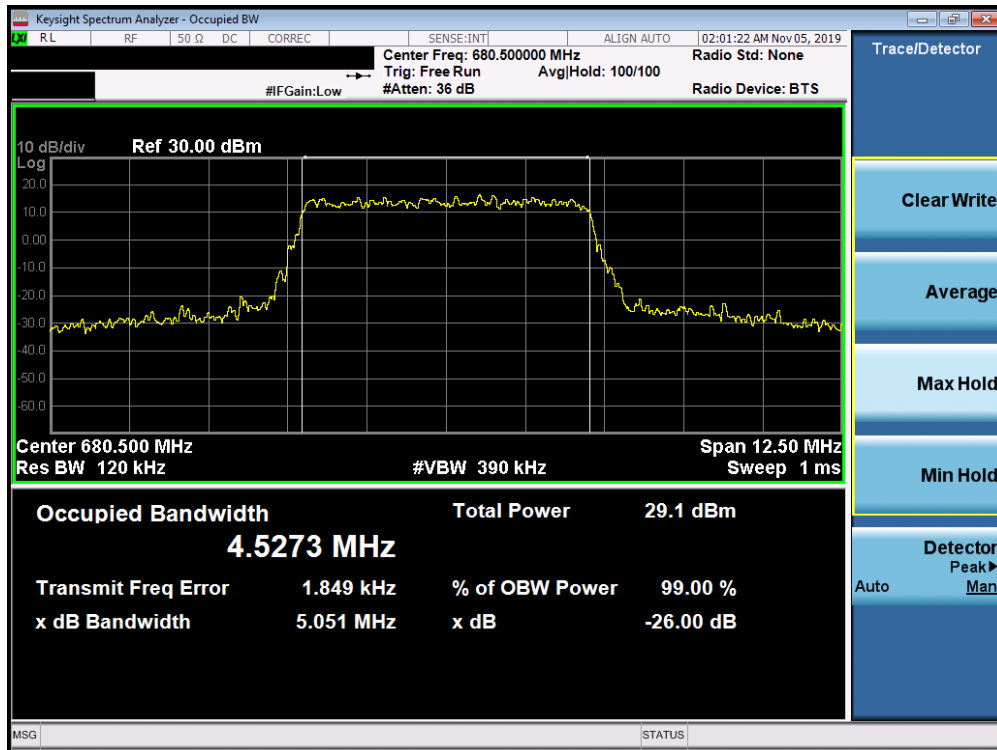


Plot 7-1. Occupied Bandwidth Plot (Band 71 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-2. Occupied Bandwidth Plot (Band 71 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT</b> (CERTIFICATION)		<b>Approved by:</b> Quality Manager
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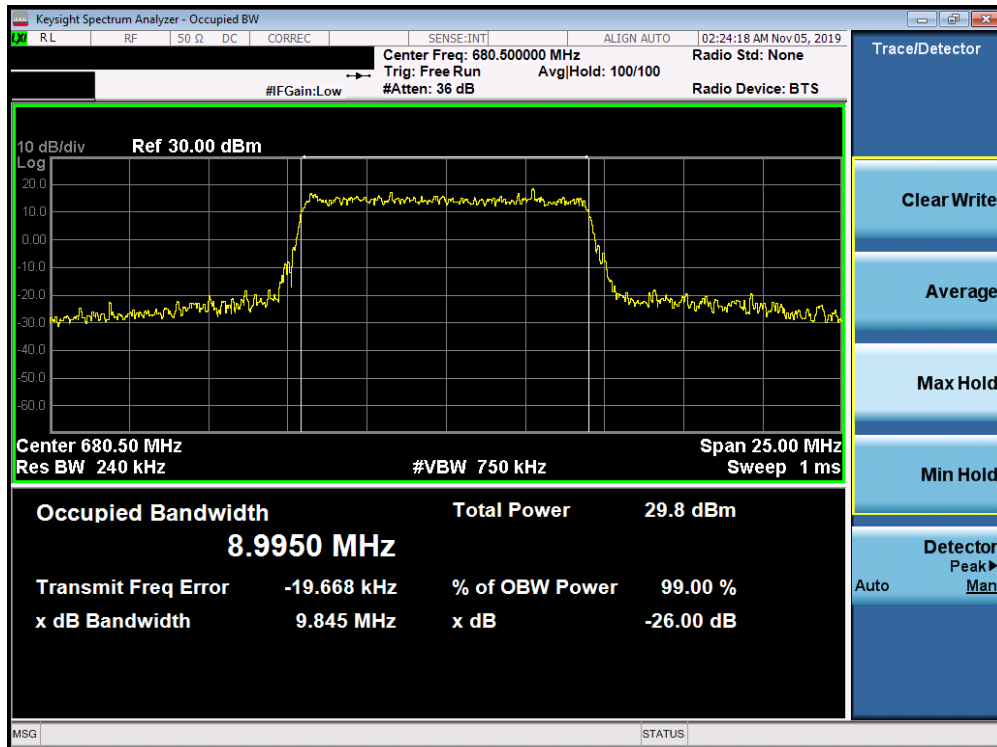


Plot 7-3. Occupied Bandwidth Plot (Band 71 - 5.0MHz 64-QAM - Full RB Configuration)

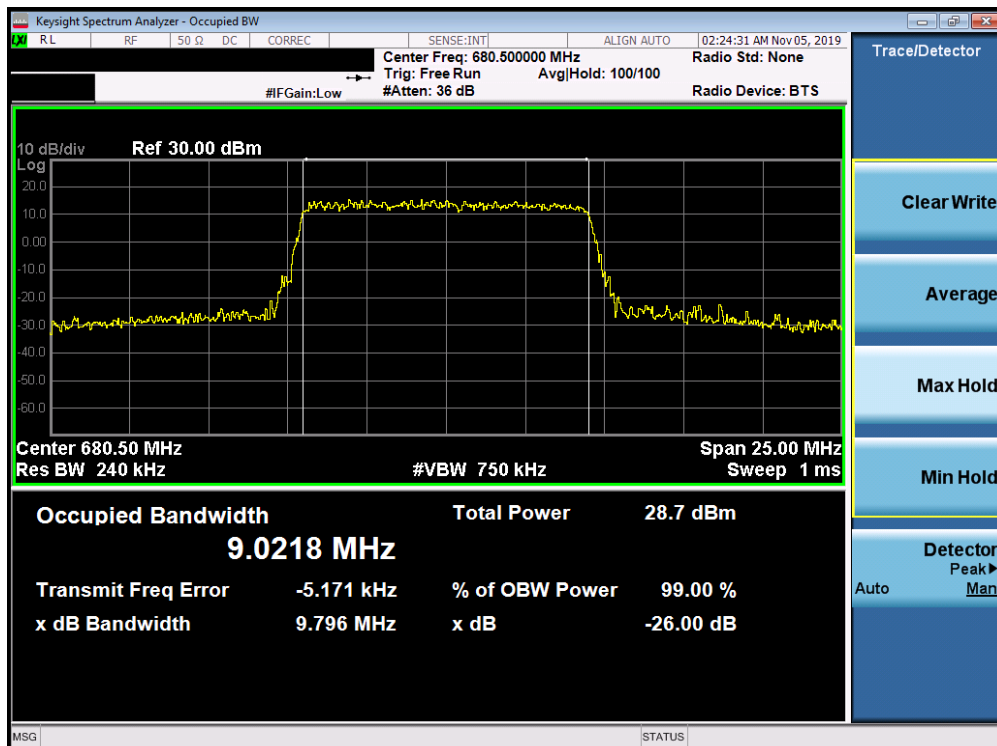


Plot 7-4. Occupied Bandwidth Plot (Band 71 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
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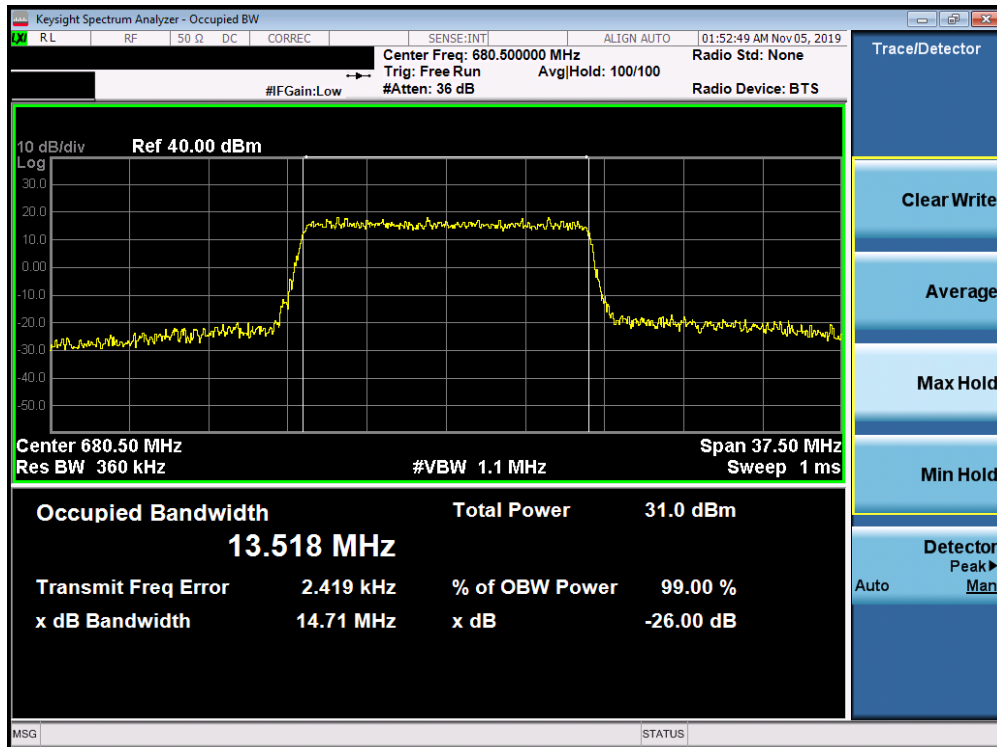


Plot 7-5. Occupied Bandwidth Plot (Band 71 - 10.0MHz 16-QAM - Full RB Configuration)

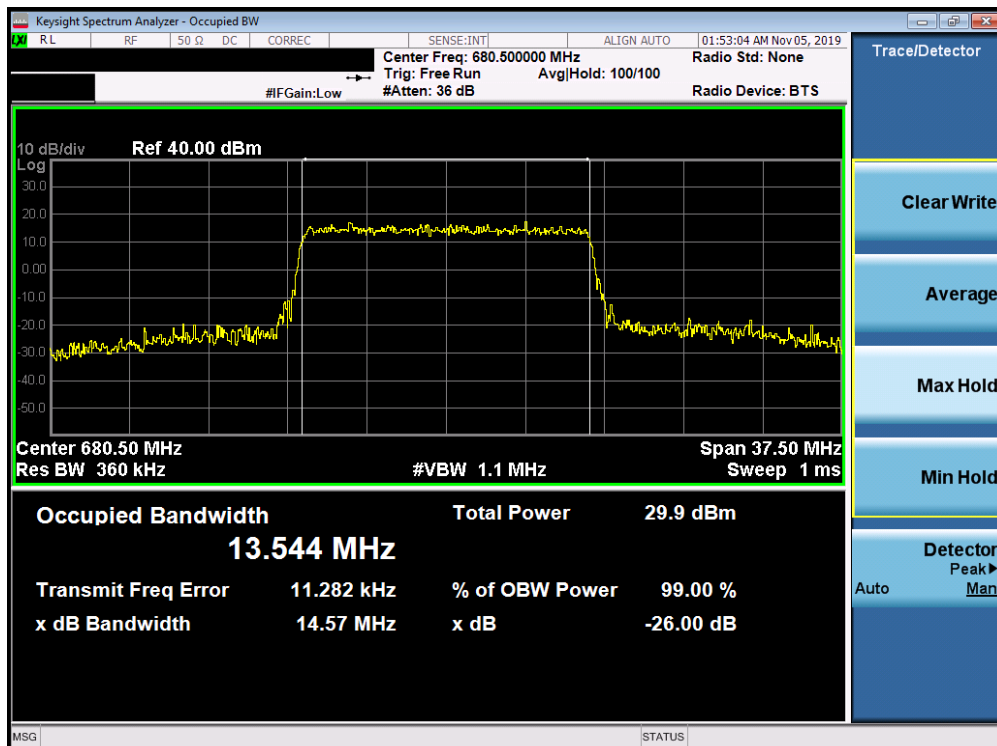


Plot 7-6. Occupied Bandwidth Plot (Band 71 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
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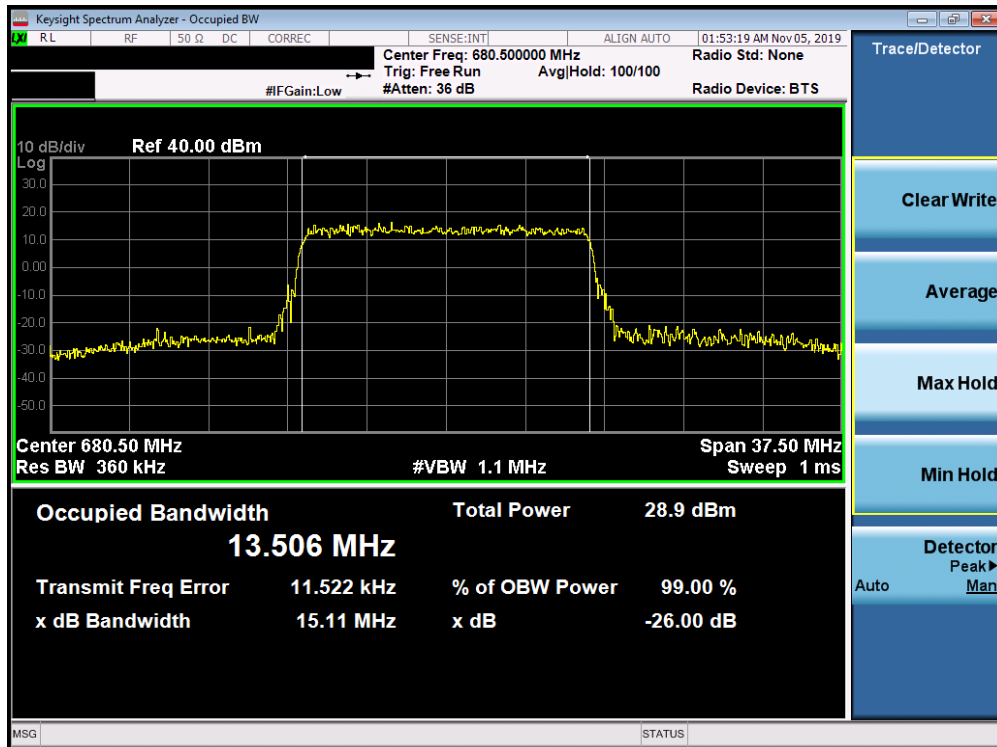


Plot 7-7. Occupied Bandwidth Plot (Band 71 - 15.0MHz QPSK - Full RB Configuration)

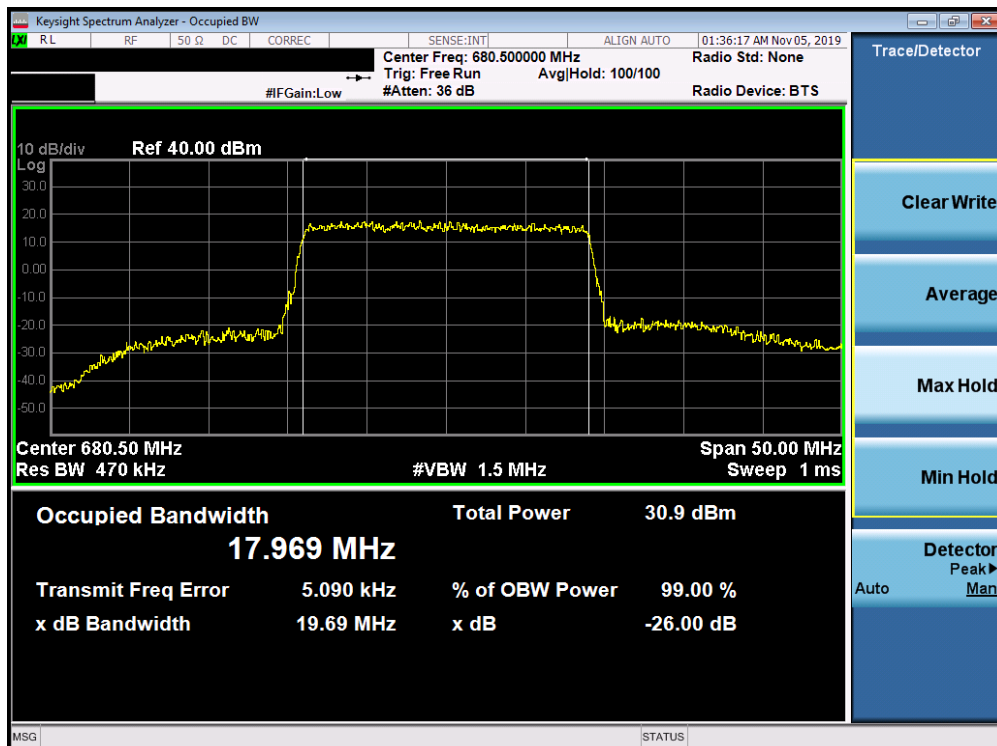


Plot 7-8. Occupied Bandwidth Plot (Band 71 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>LG</b>	Approved by: Quality Manager
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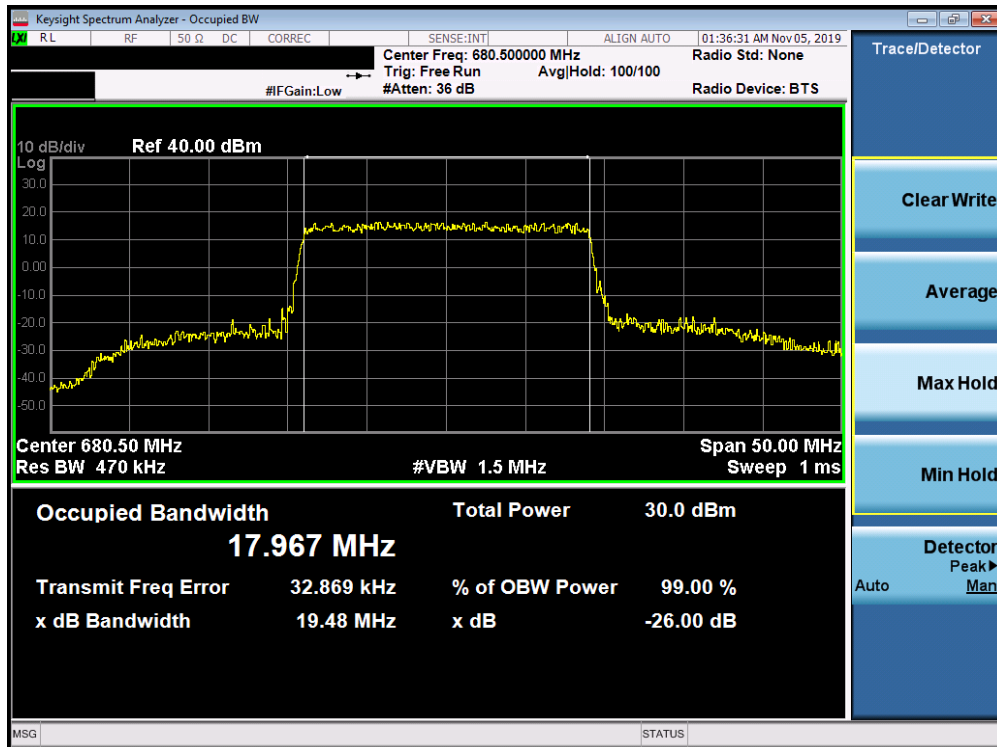
Plot 7-9. Occupied Bandwidth Plot (Band 71 - 15.0MHz 64-QAM - Full RB Configuration)



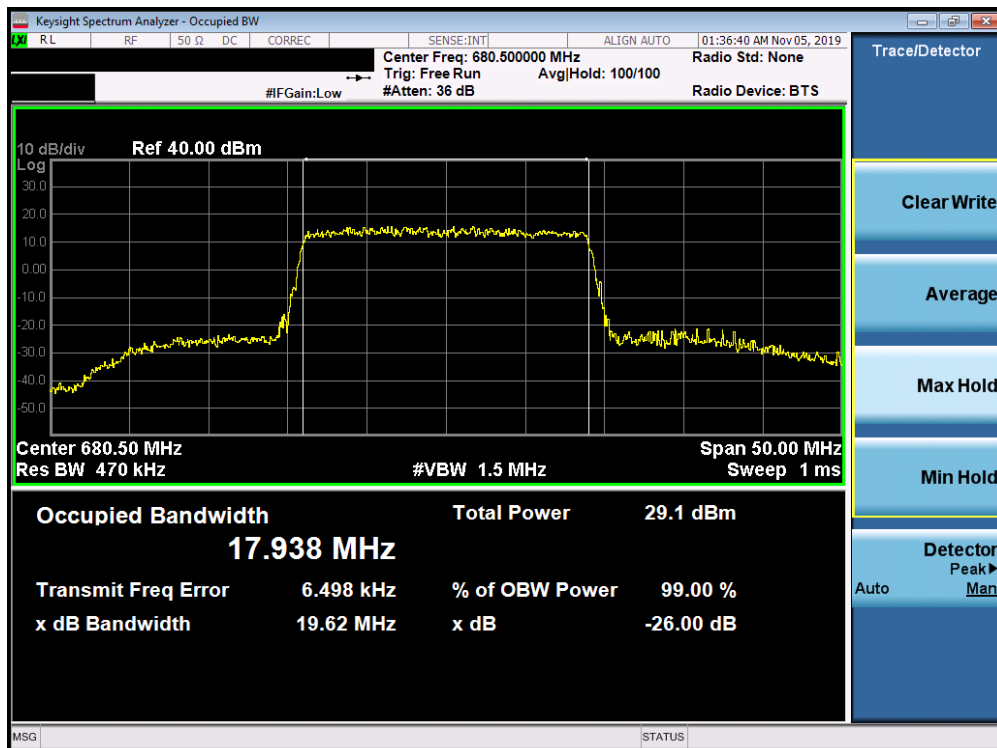
Plot 7-10. Occupied Bandwidth Plot (Band 71 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
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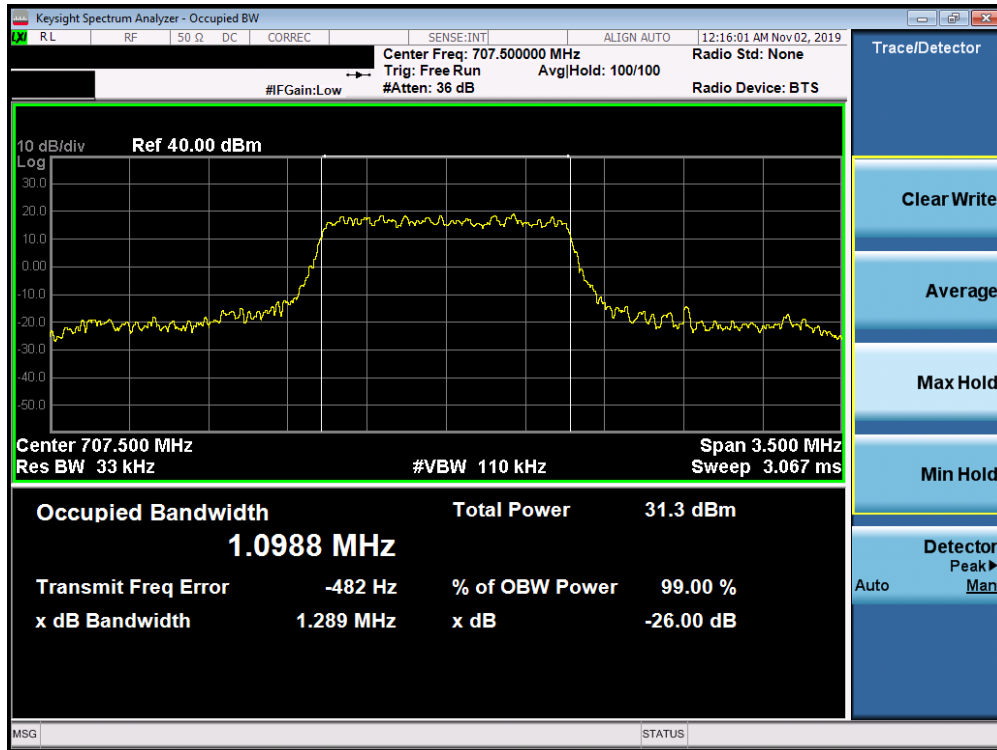
Plot 7-11. Occupied Bandwidth Plot (Band 71 - 20.0MHz 16-QAM - Full RB Configuration)



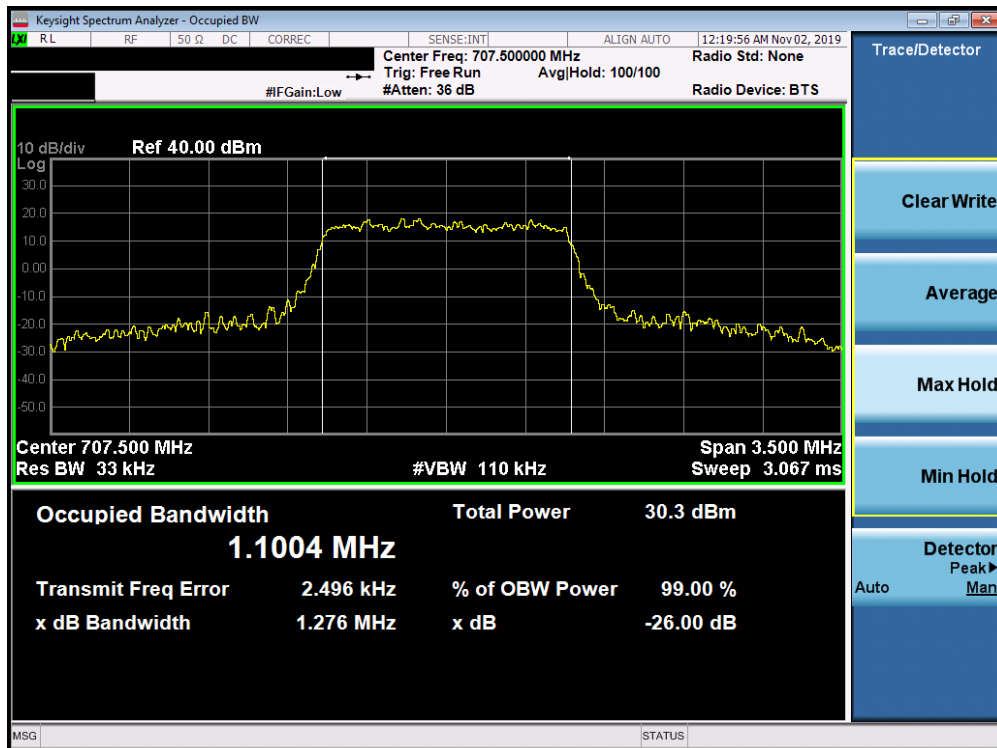
Plot 7-12. Occupied Bandwidth Plot (Band 71 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
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## Band 12

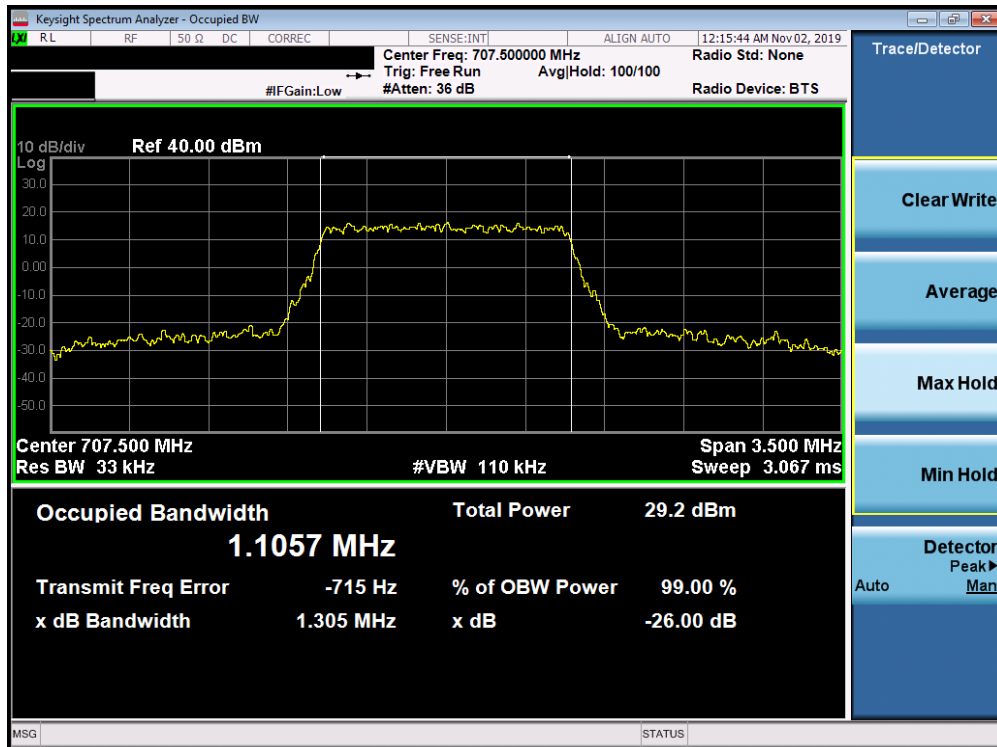


Plot 7-13. Occupied Bandwidth Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

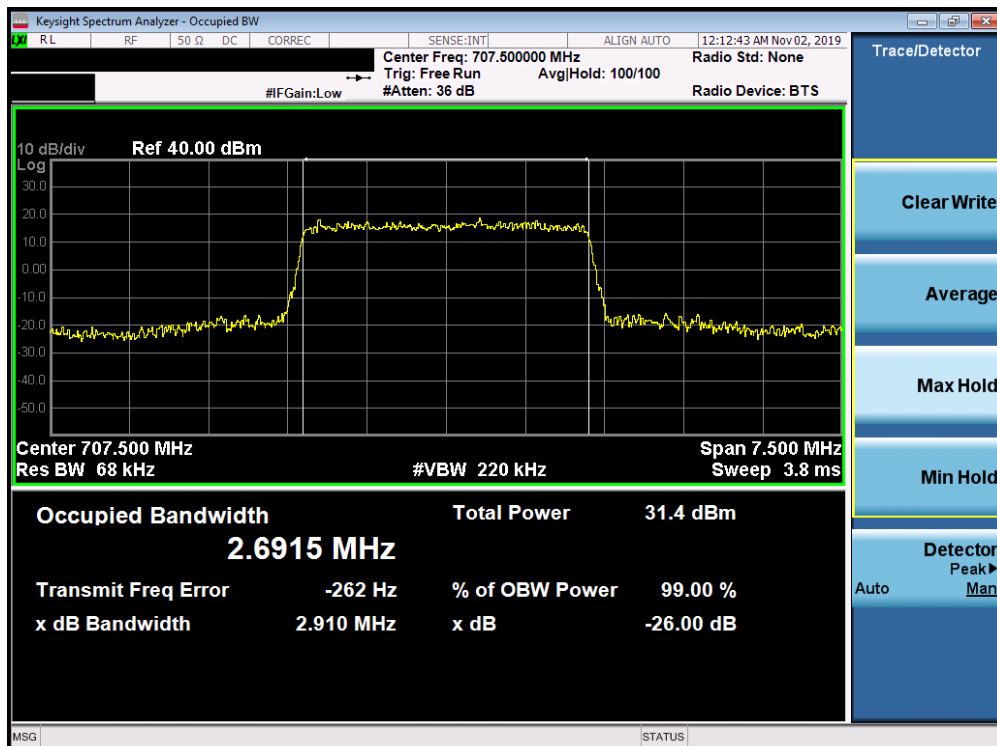


Plot 7-14. Occupied Bandwidth Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
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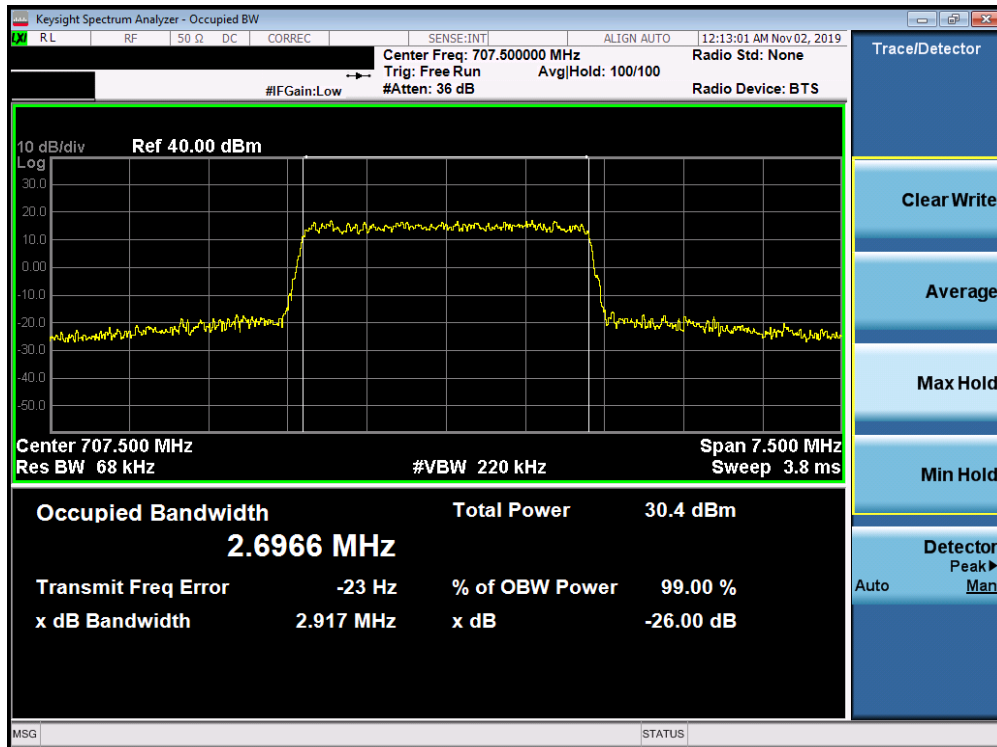


Plot 7-15. Occupied Bandwidth Plot (Band 12 - 1.4MHz 64-QAM - Full RB Configuration)

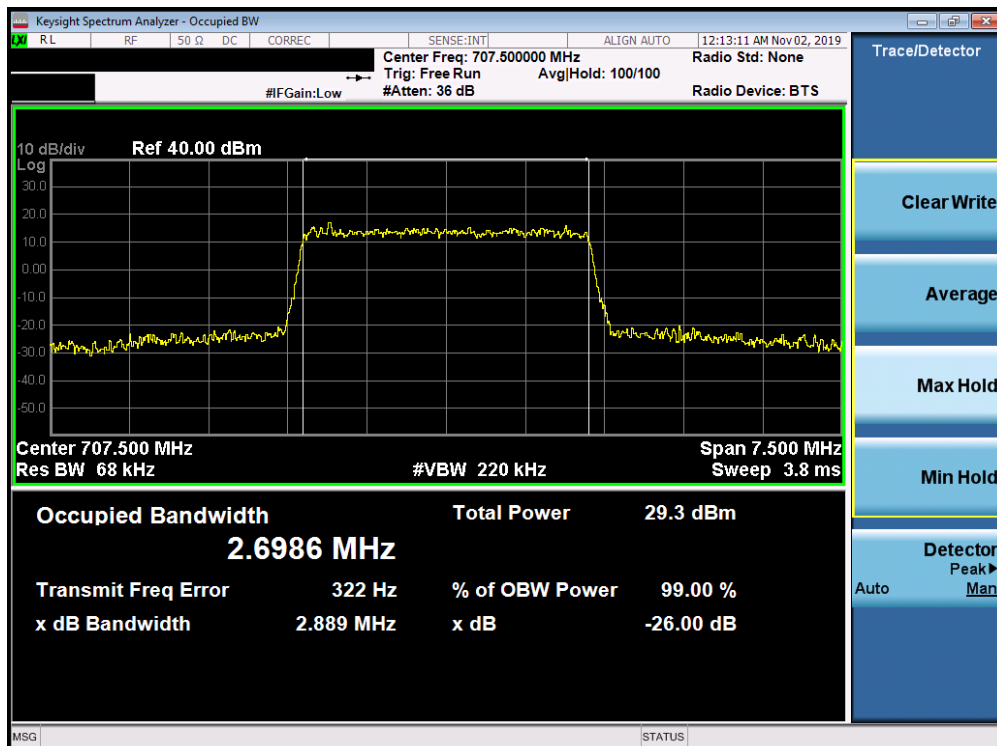


Plot 7-16. Occupied Bandwidth Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
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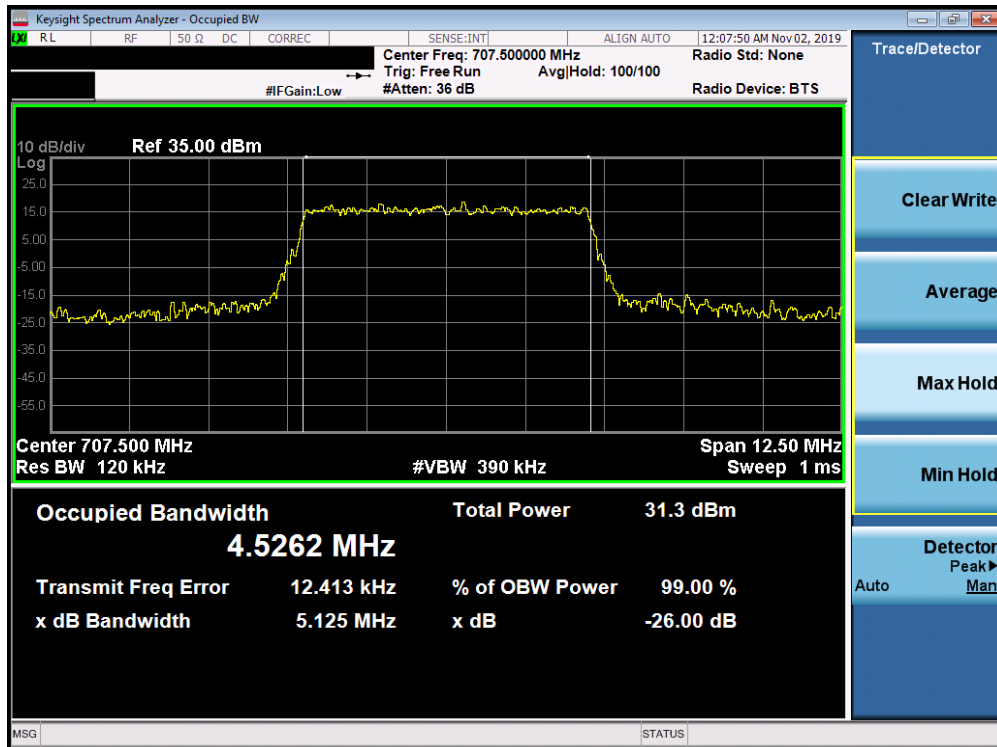


Plot 7-17. Occupied Bandwidth Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

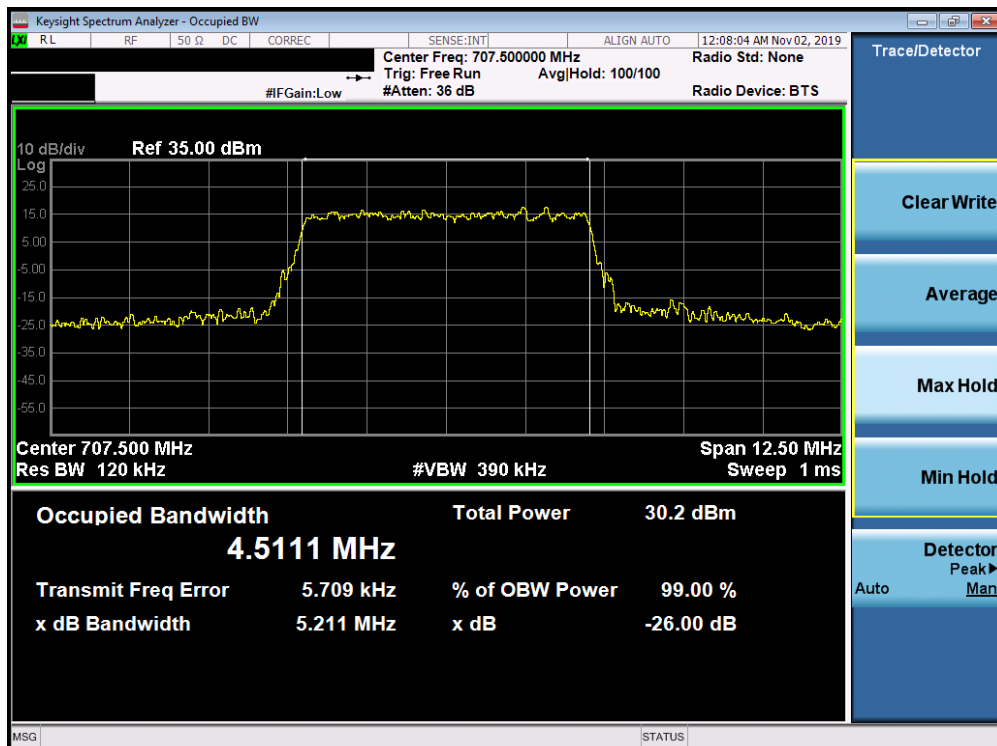


Plot 7-18. Occupied Bandwidth Plot (Band 12 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
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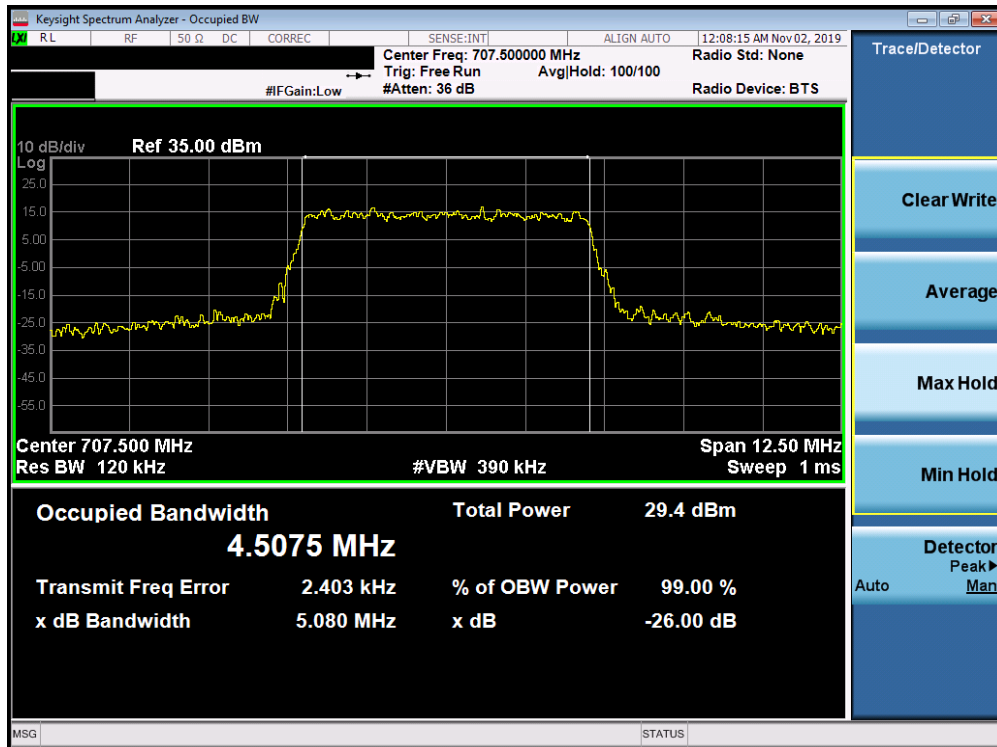


Plot 7-19. Occupied Bandwidth Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)

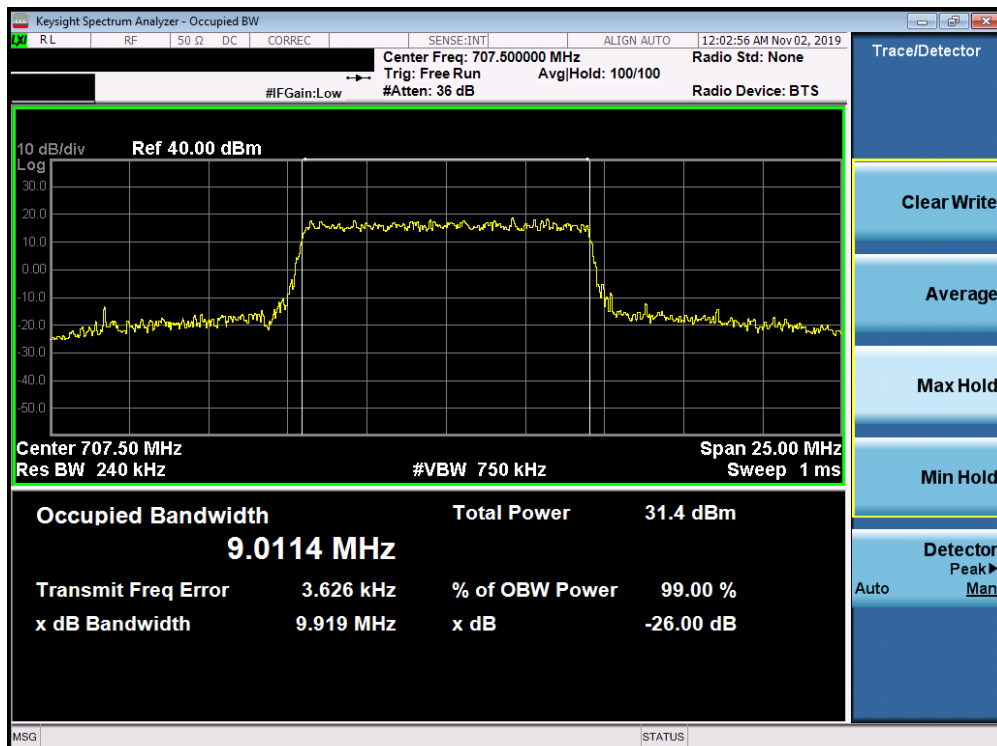


Plot 7-20. Occupied Bandwidth Plot (Band 12 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
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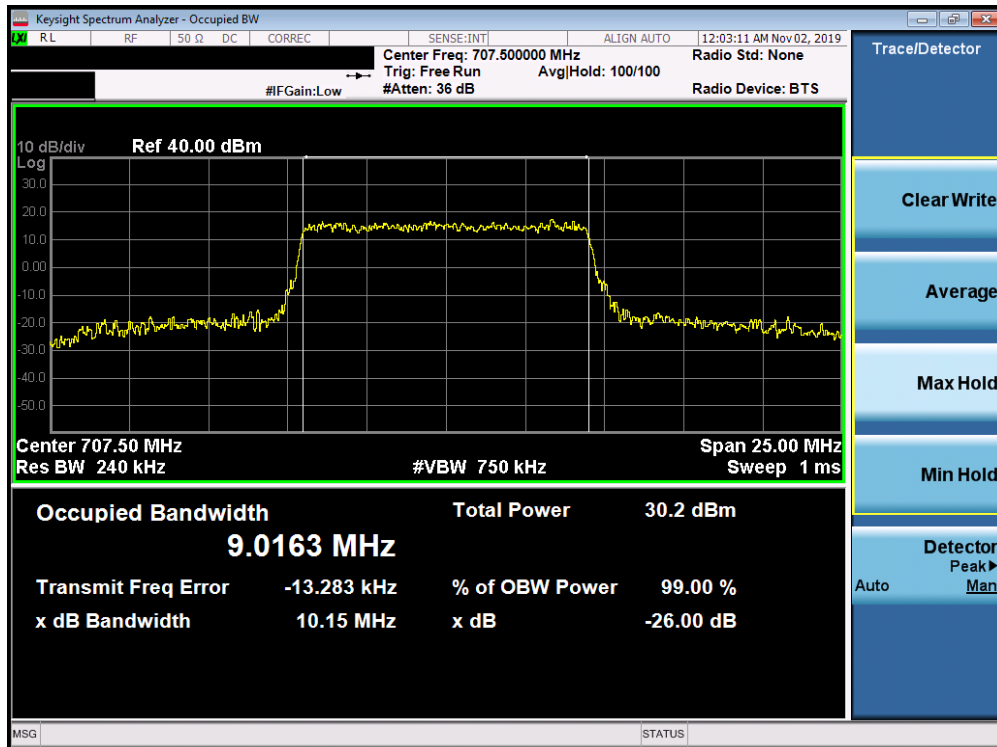


Plot 7-21. Occupied Bandwidth Plot (Band 12 - 5.0MHz 64-QAM - Full RB Configuration)

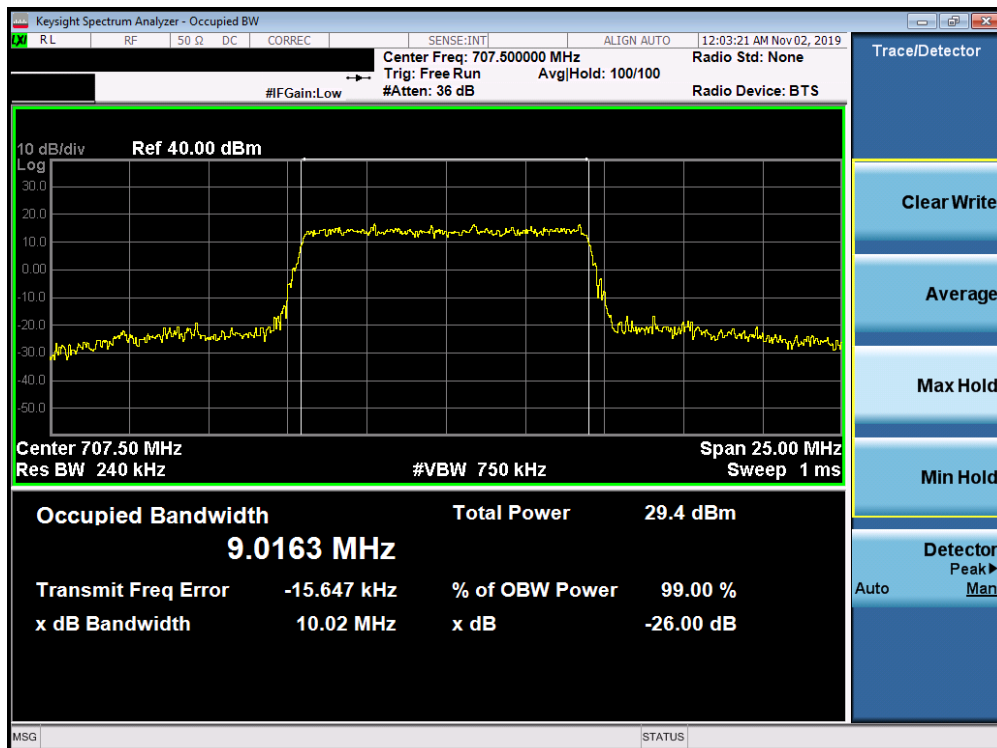


Plot 7-22. Occupied Bandwidth Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 28 of 250



Plot 7-23. Occupied Bandwidth Plot (Band 12 - 10.0MHz 16-QAM - Full RB Configuration)

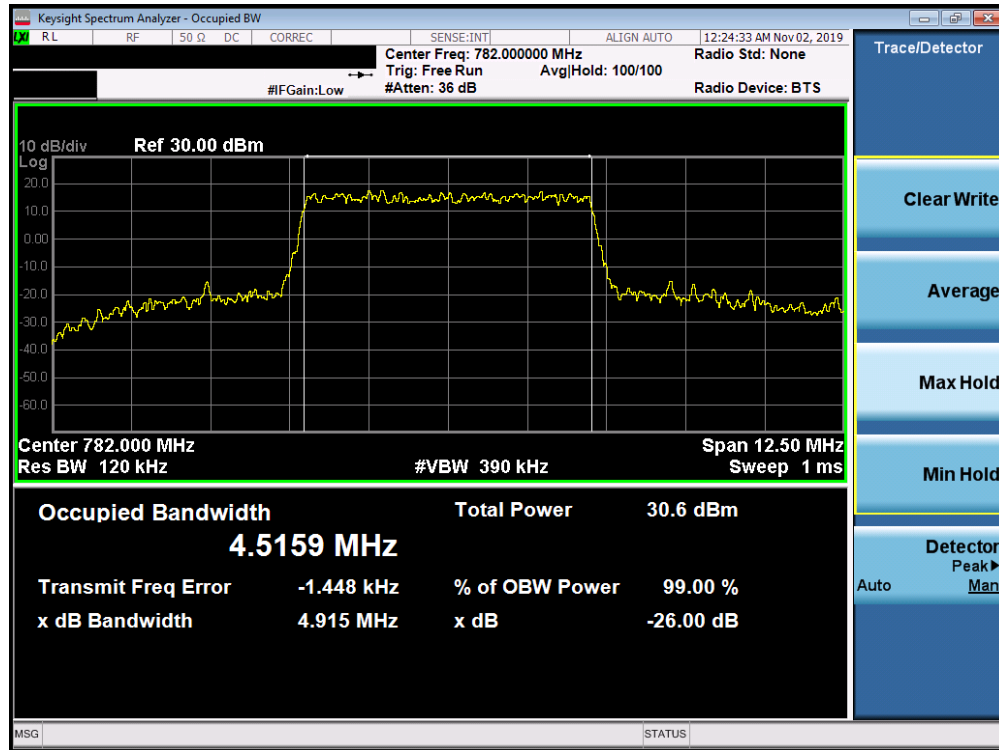


Plot 7-24. Occupied Bandwidth Plot (Band 12 - 10.0MHz 64-QAM - Full RB Configuration)

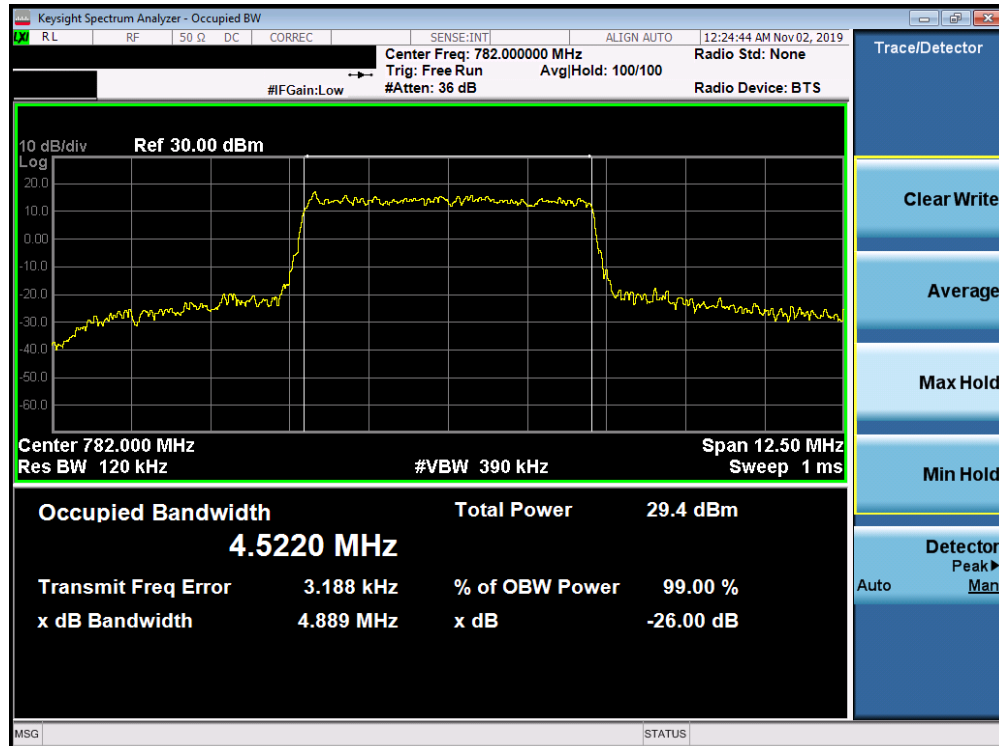
FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 29 of 250



## Band 13

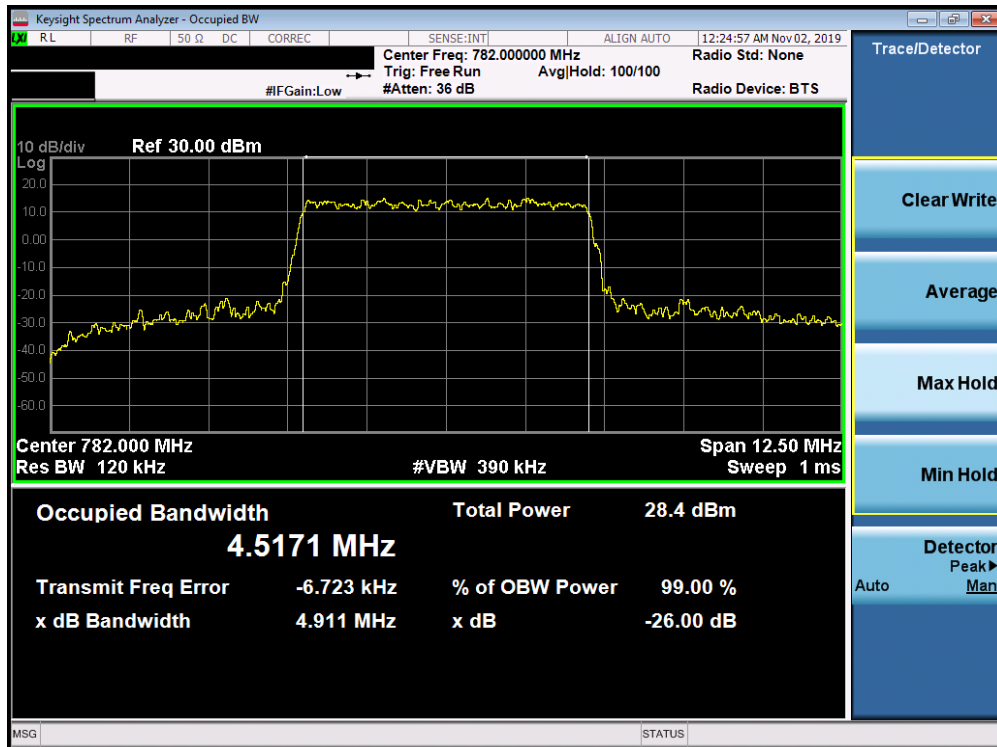


Plot 7-25. Occupied Bandwidth Plot (Band 13 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (Band 13 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 30 of 250

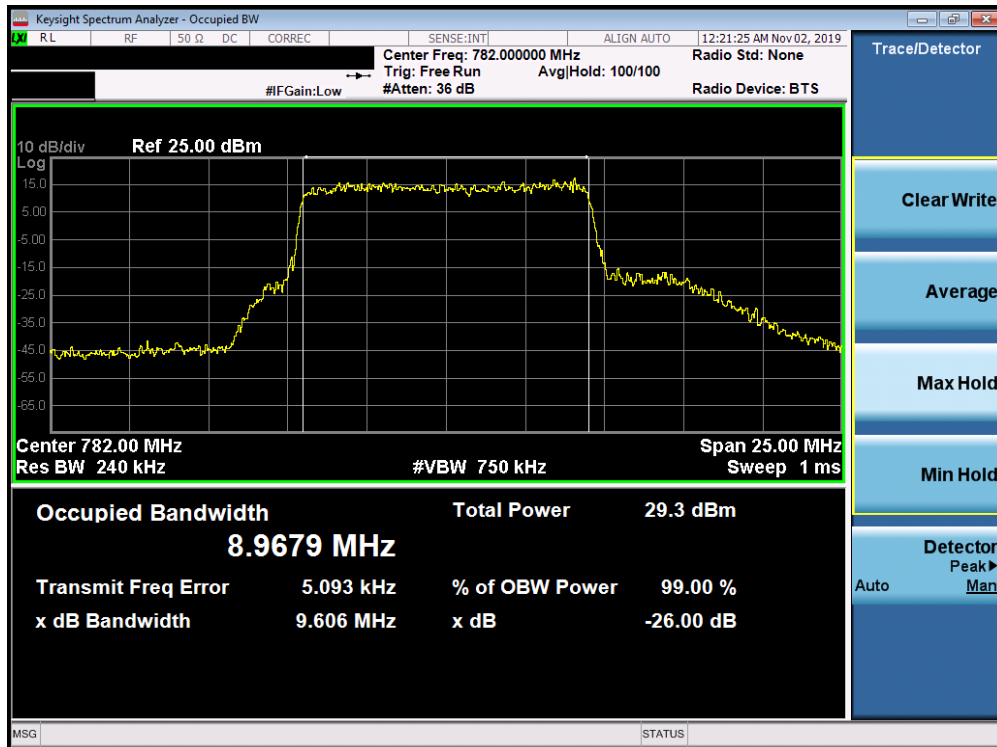


Plot 7-27. Occupied Bandwidth Plot (Band 13 - 5.0MHz 64-QAM - Full RB Configuration)

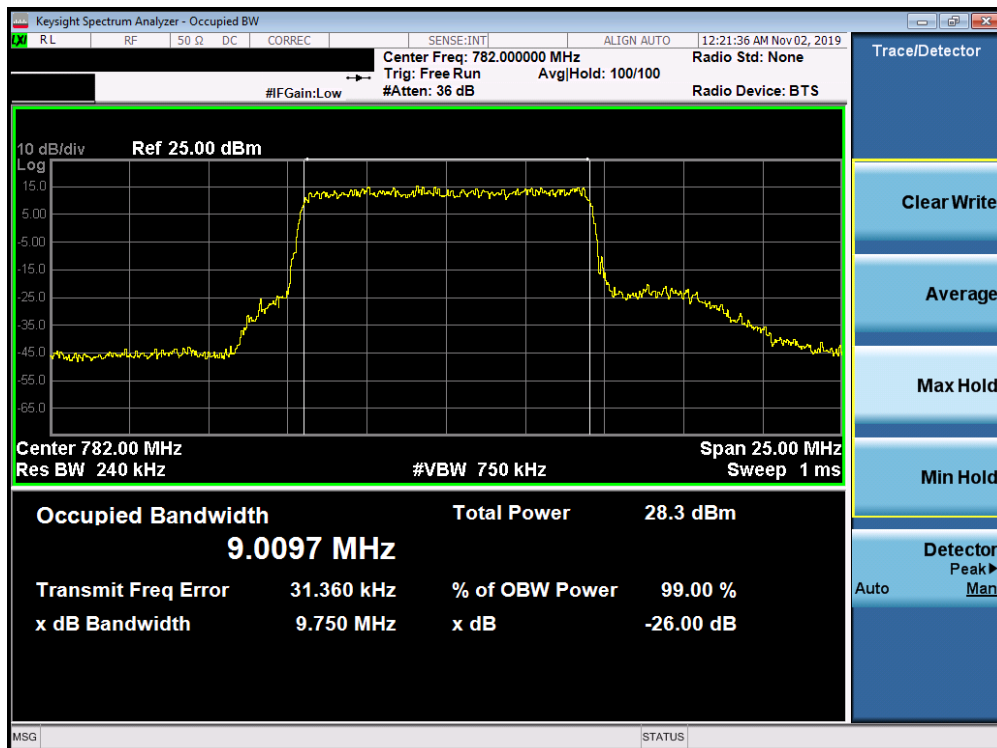


Plot 7-28. Occupied Bandwidth Plot (Band 13 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 31 of 250



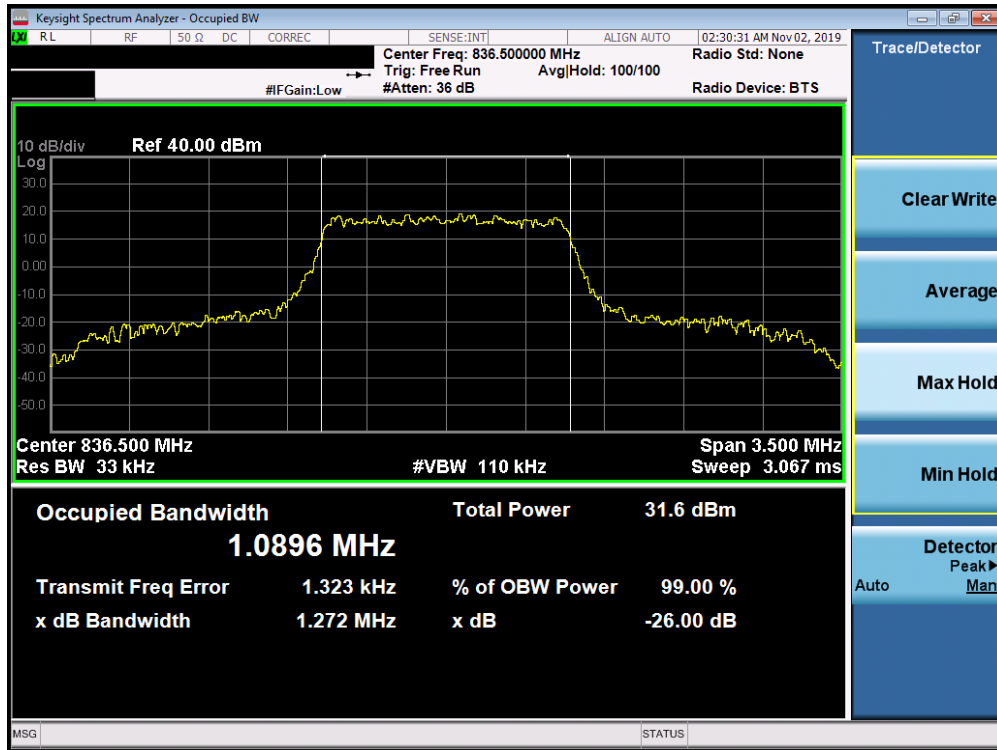
Plot 7-29. Occupied Bandwidth Plot (Band 13 - 10.0MHz 16-QAM - Full RB Configuration)



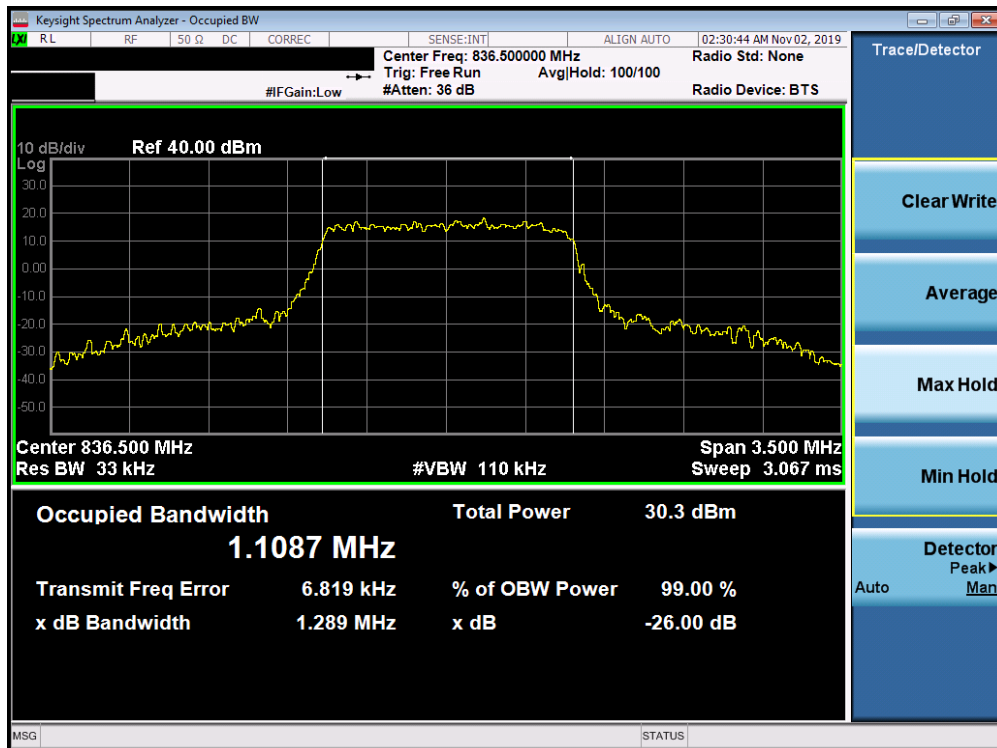
Plot 7-30. Occupied Bandwidth Plot (Band 13 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 32 of 250

## Band 26/5

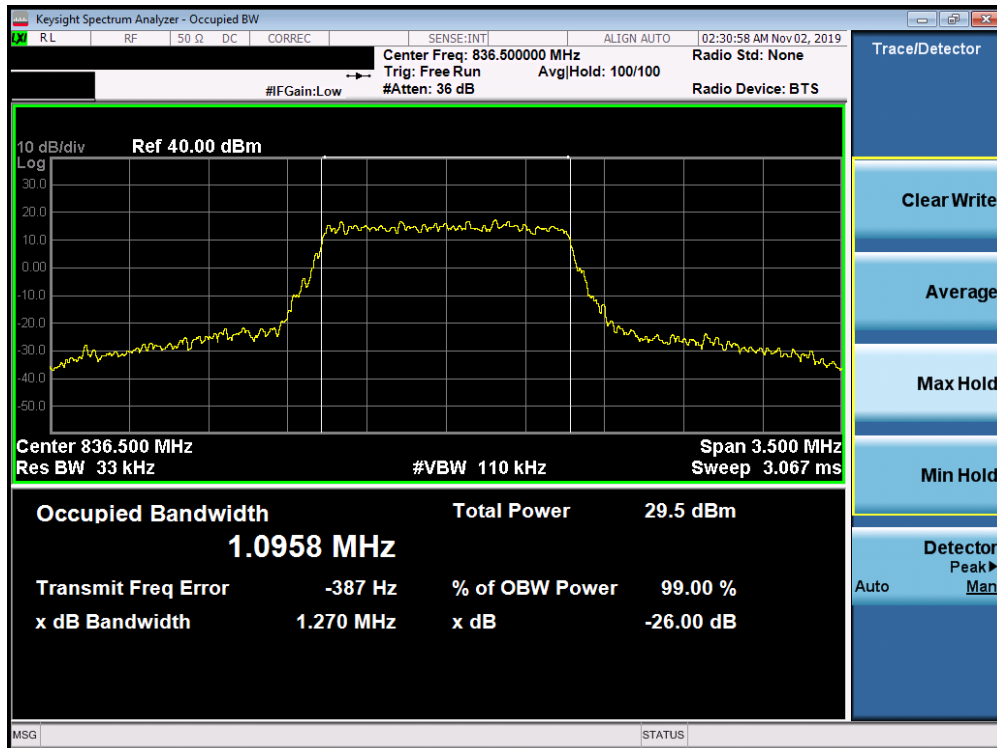


Plot 7-31. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz QPSK - Full RB Configuration)

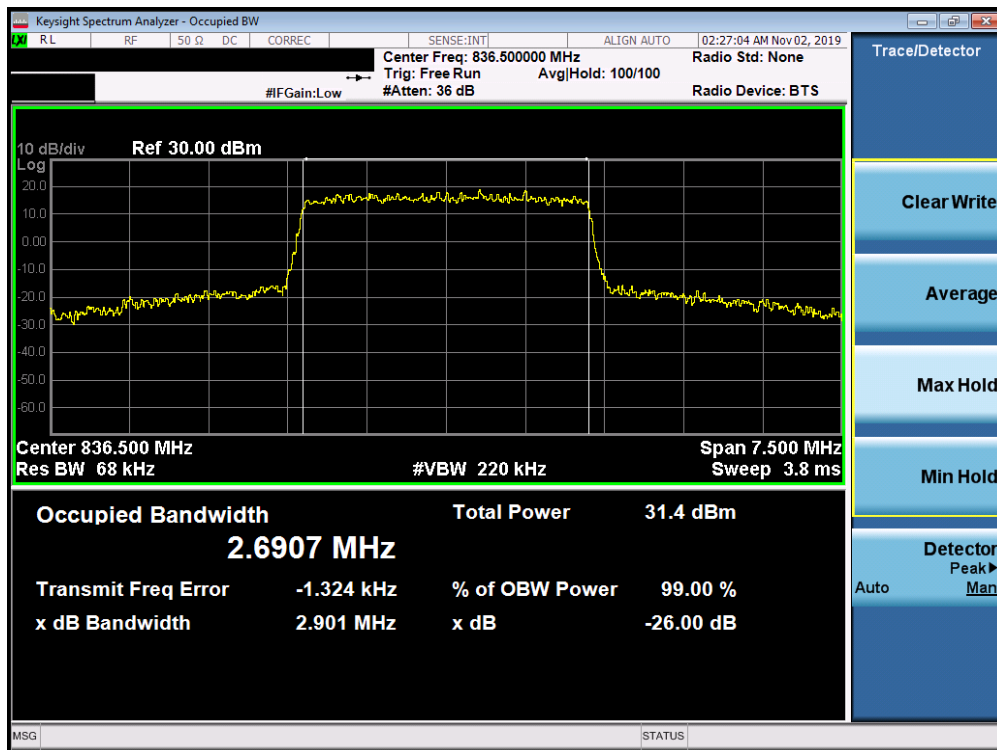


Plot 7-32. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 33 of 250

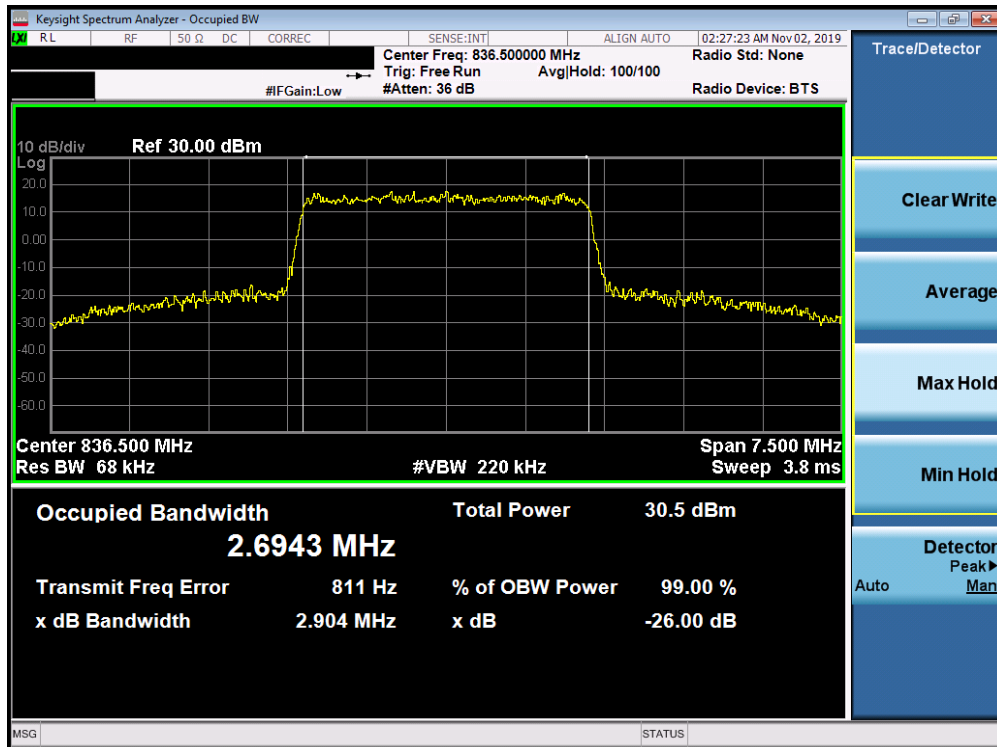


Plot 7-33. Occupied Bandwidth Plot (Band 26/5 - 1.4MHz 64-QAM - Full RB Configuration)

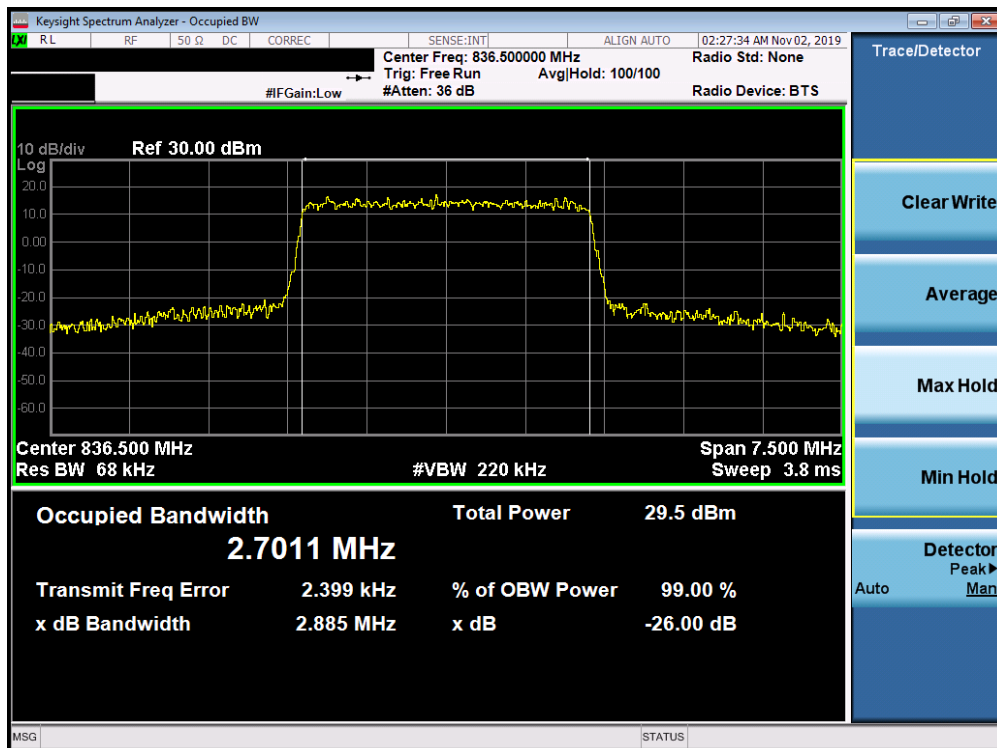


Plot 7-34. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 34 of 250

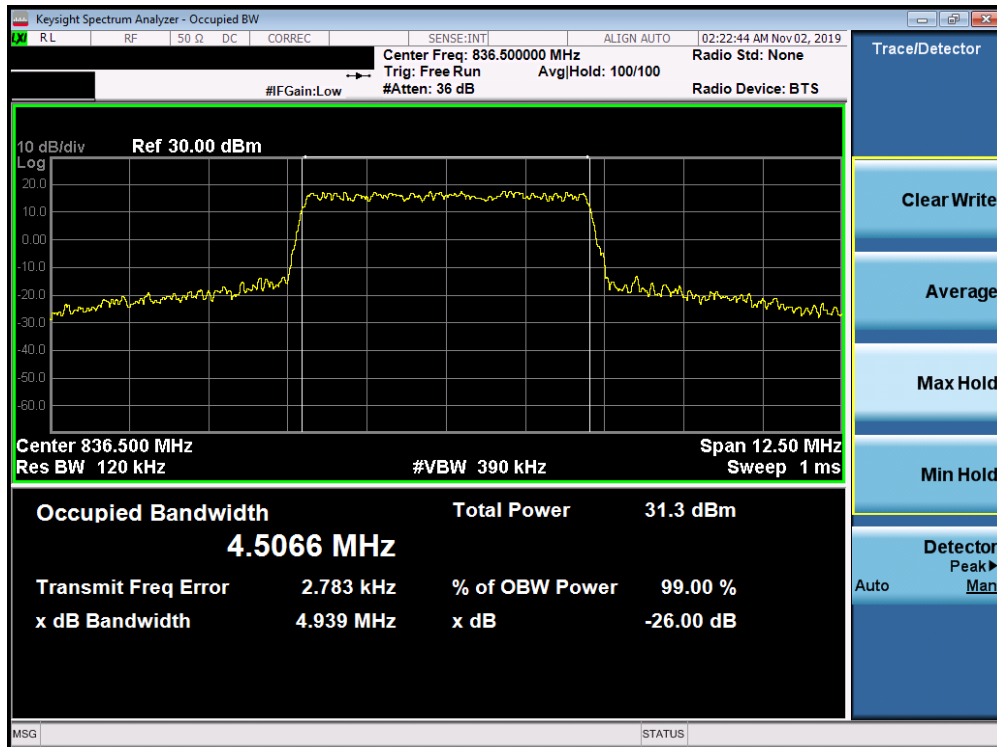


Plot 7-35. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 16-QAM - Full RB Configuration)

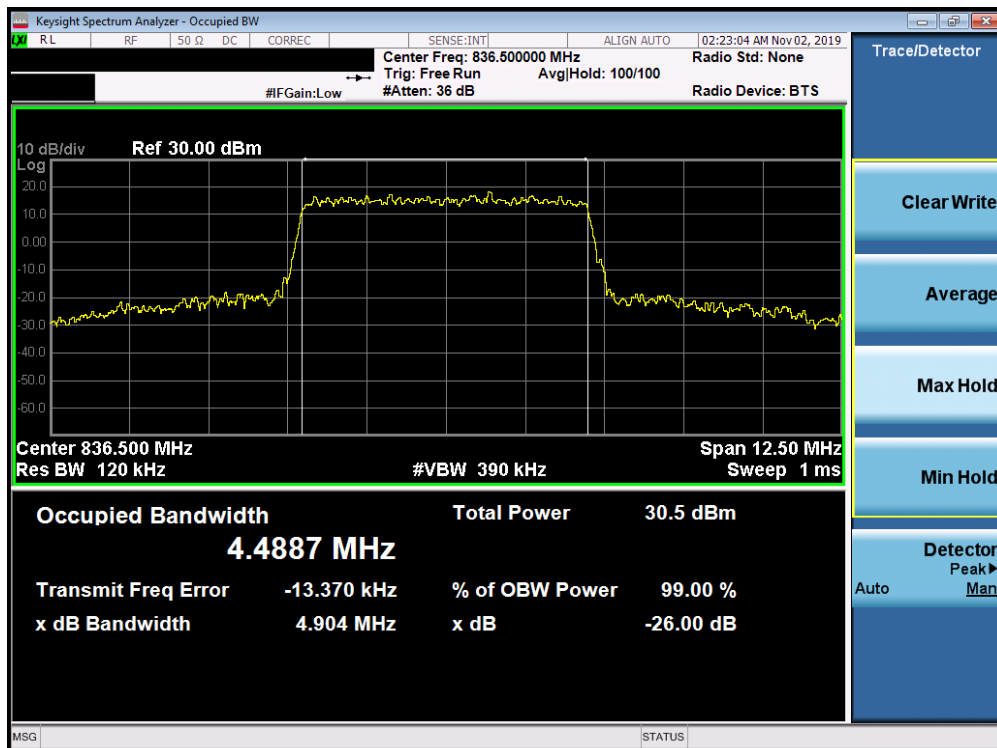


Plot 7-36. Occupied Bandwidth Plot (Band 26/5 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 35 of 250



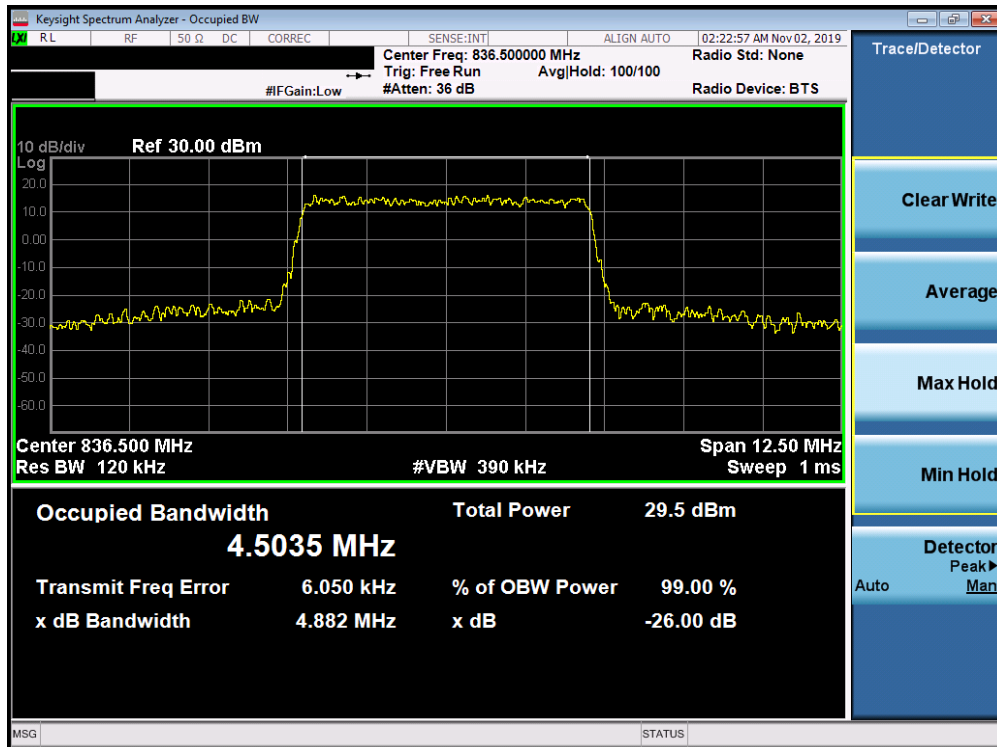
Plot 7-37. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz QPSK - Full RB Configuration)



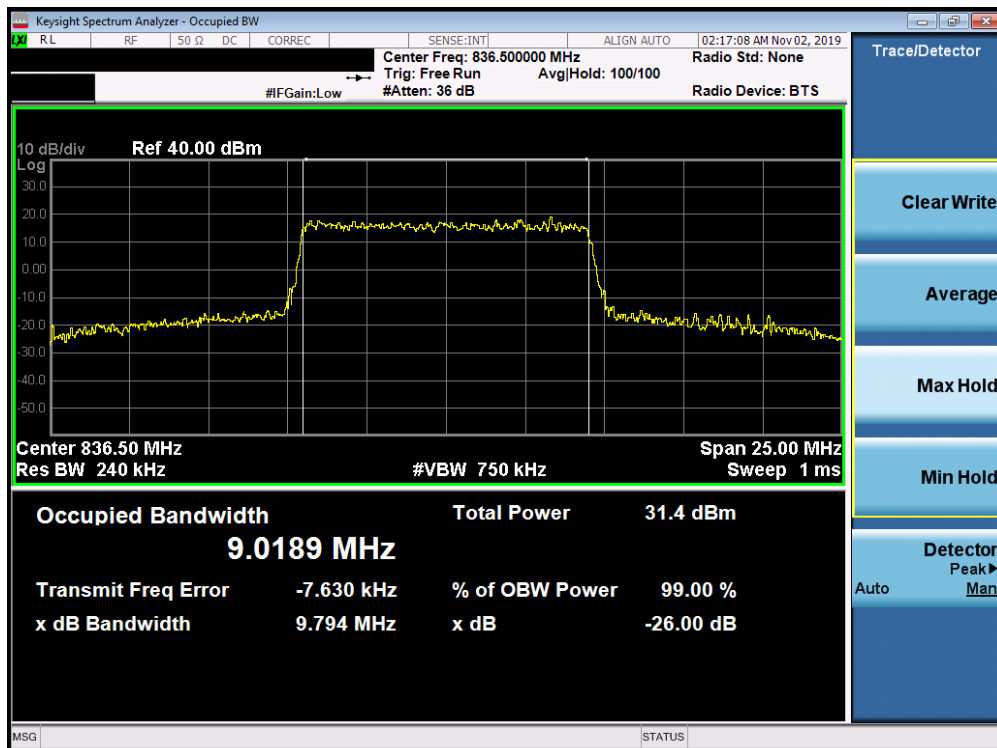
Plot 7-38. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 36 of 250





Plot 7-39. Occupied Bandwidth Plot (Band 26/5 - 5.0MHz 64-QAM - Full RB Configuration)

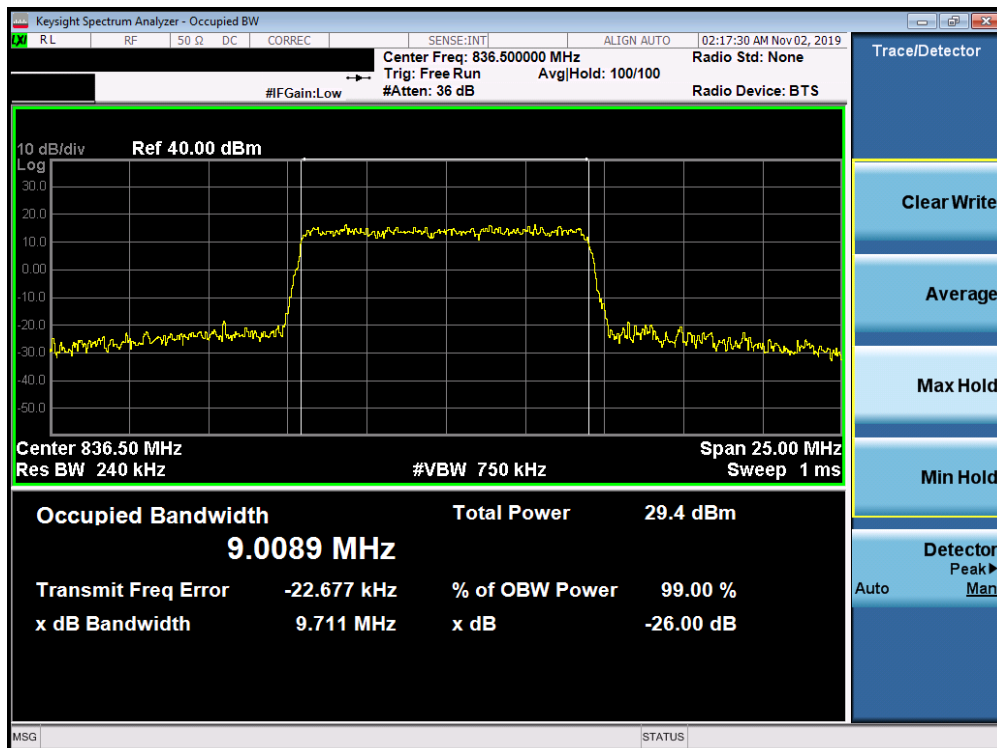


Plot 7-40. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 37 of 250

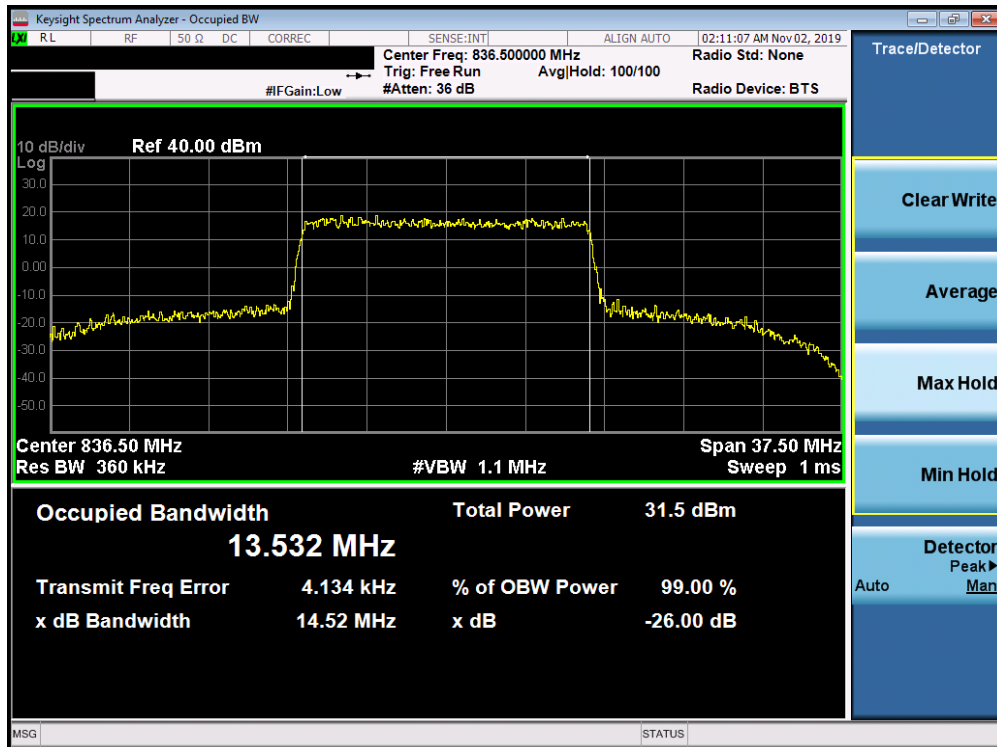


Plot 7-41. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 16-QAM - Full RB Configuration)

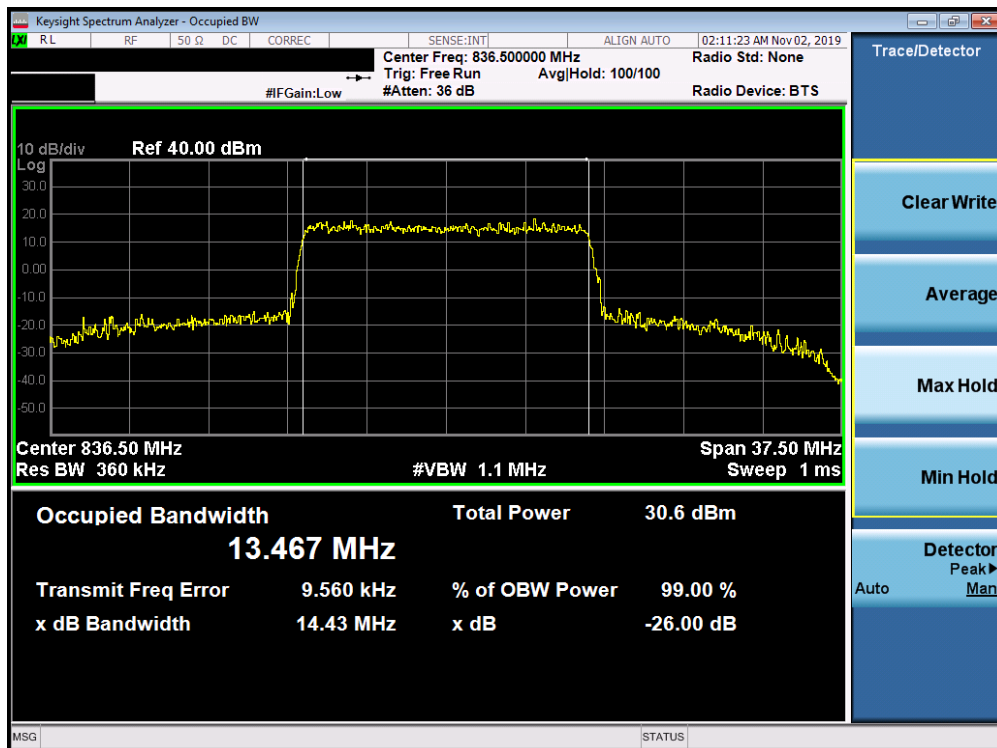


Plot 7-42. Occupied Bandwidth Plot (Band 26/5 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 38 of 250

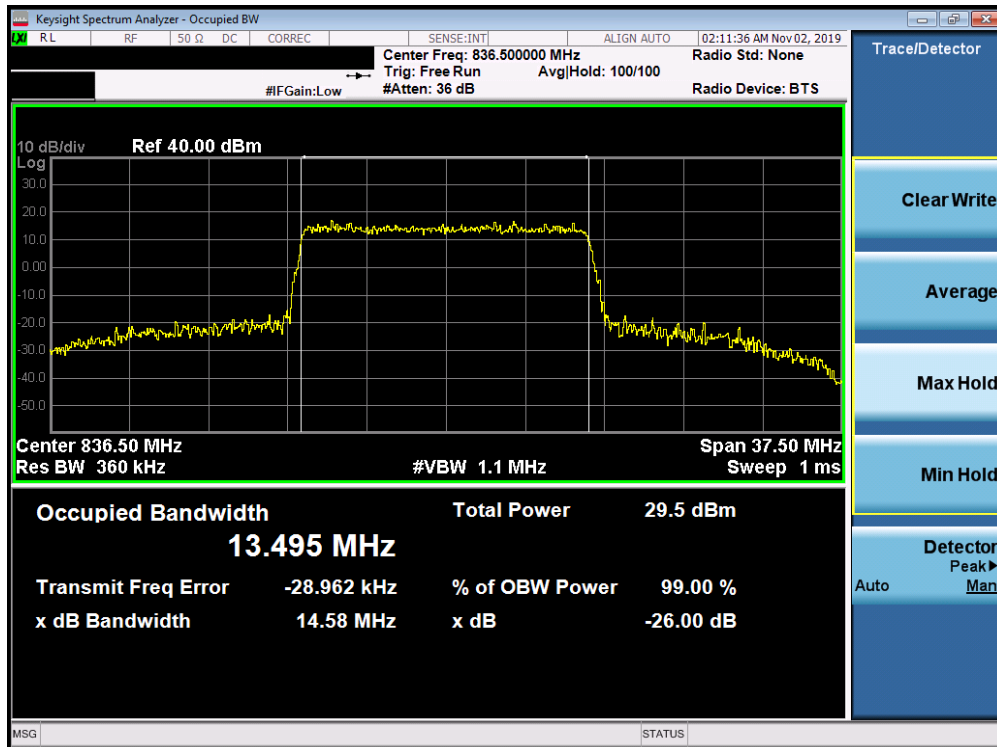


Plot 7-43. Occupied Bandwidth Plot (Band 26 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-44. Occupied Bandwidth Plot (Band 26 - 15.0MHz 16-QAM - Full RB Configuration)

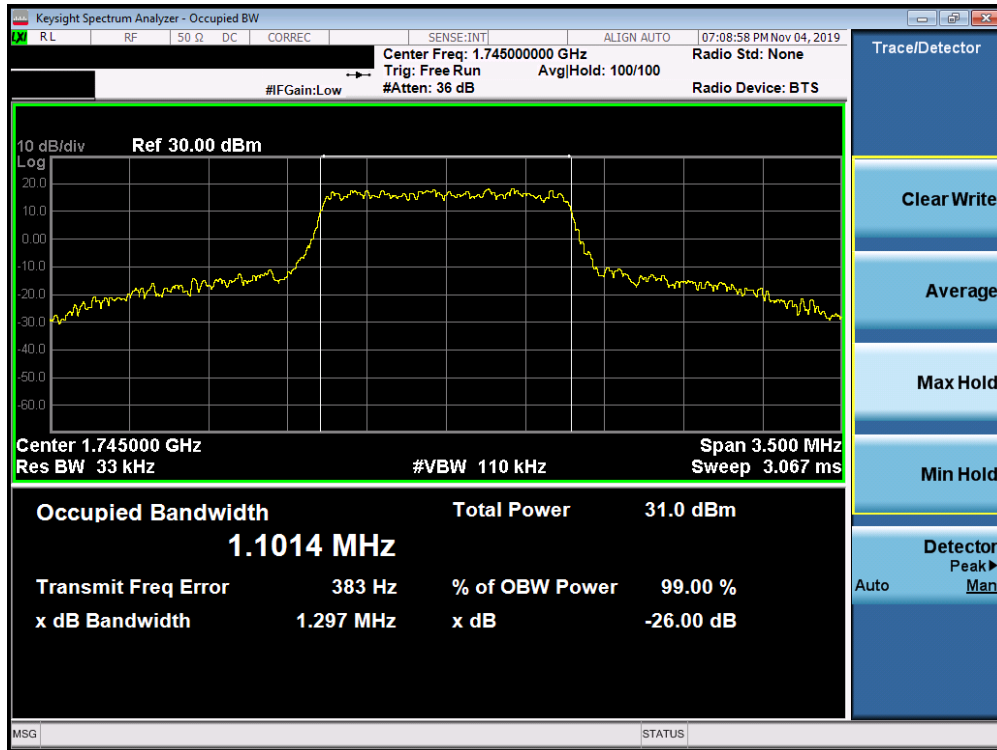
FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 39 of 250



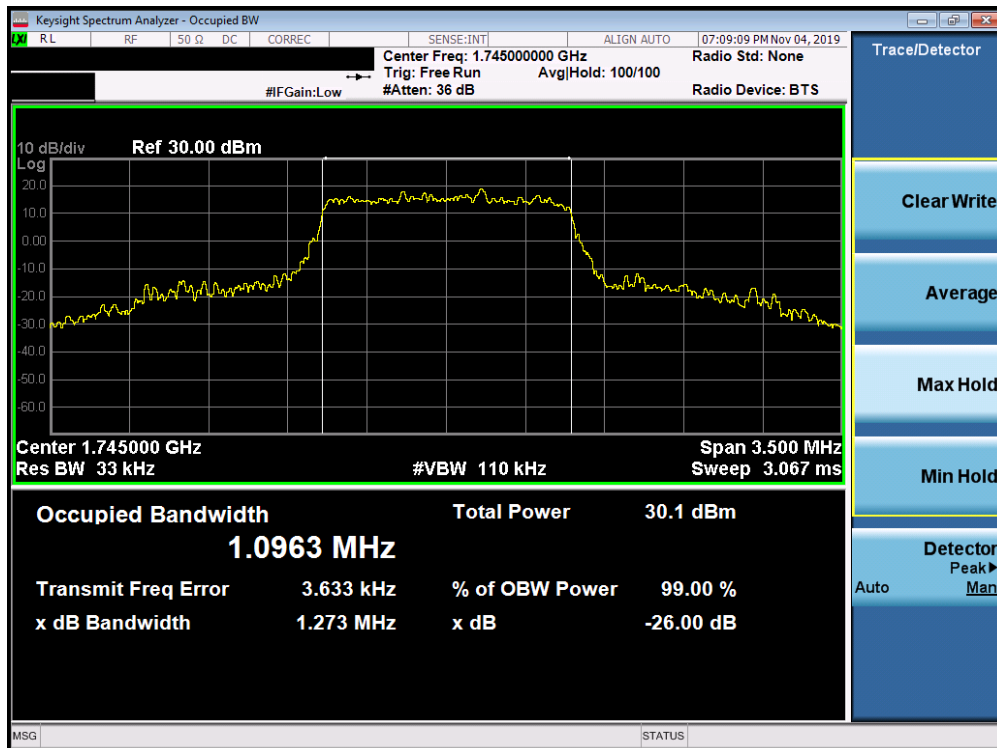
Plot 7-45. Occupied Bandwidth Plot (Band 26 - 15.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/209	EUT Type: Portable Handset	Page 40 of 250

## Band 66/4

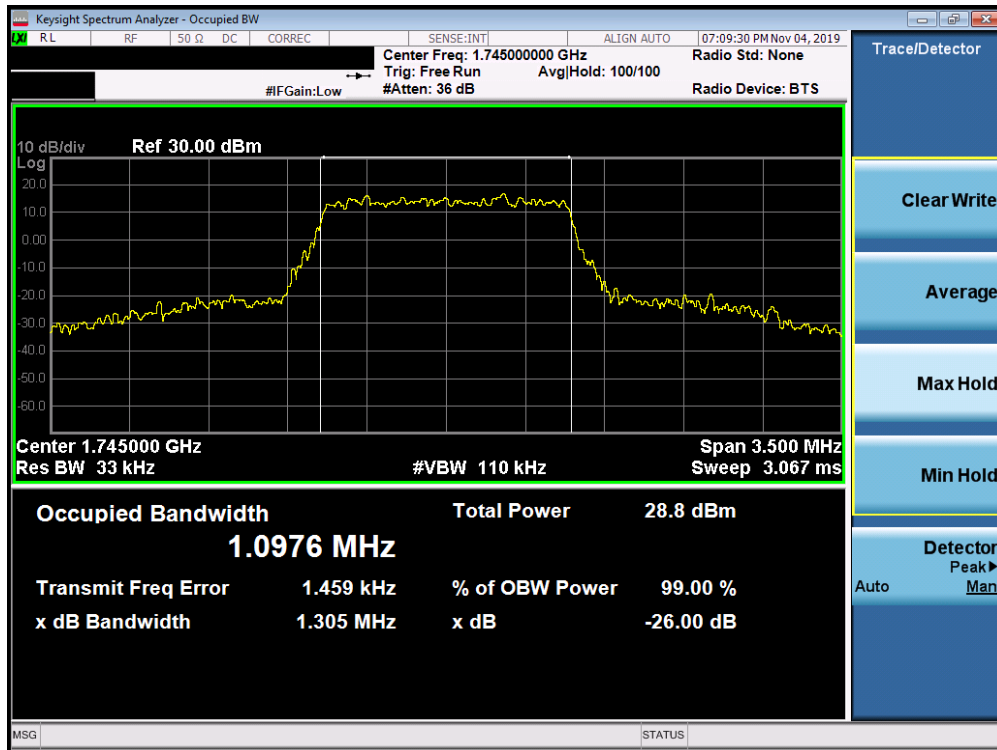


Plot 7-46. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

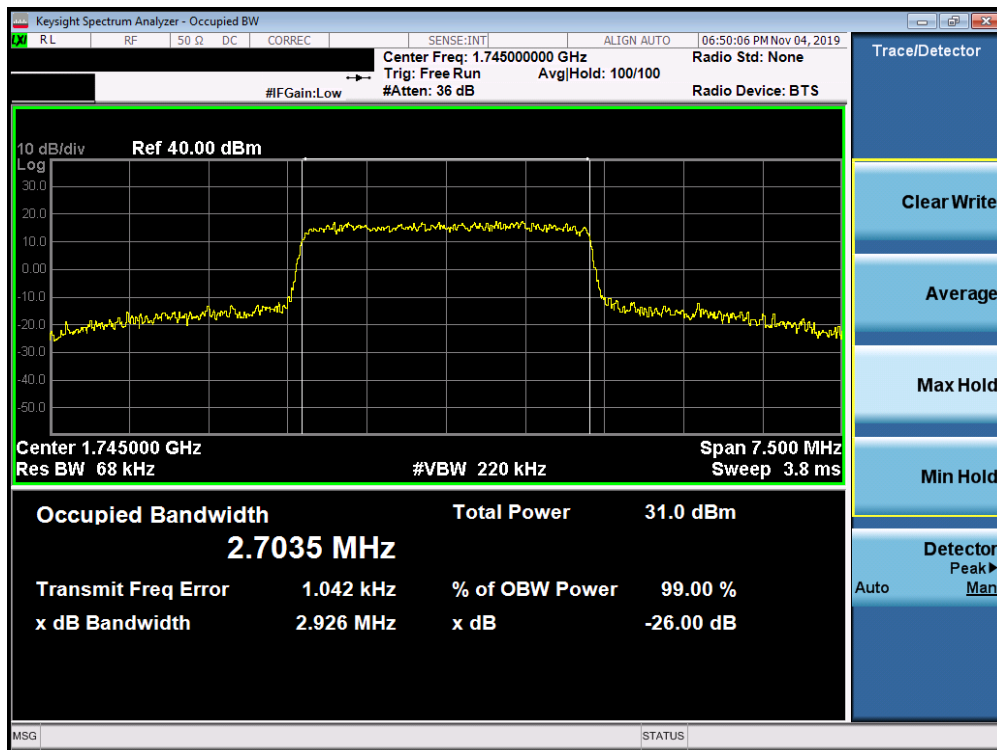


Plot 7-47. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 41 of 250

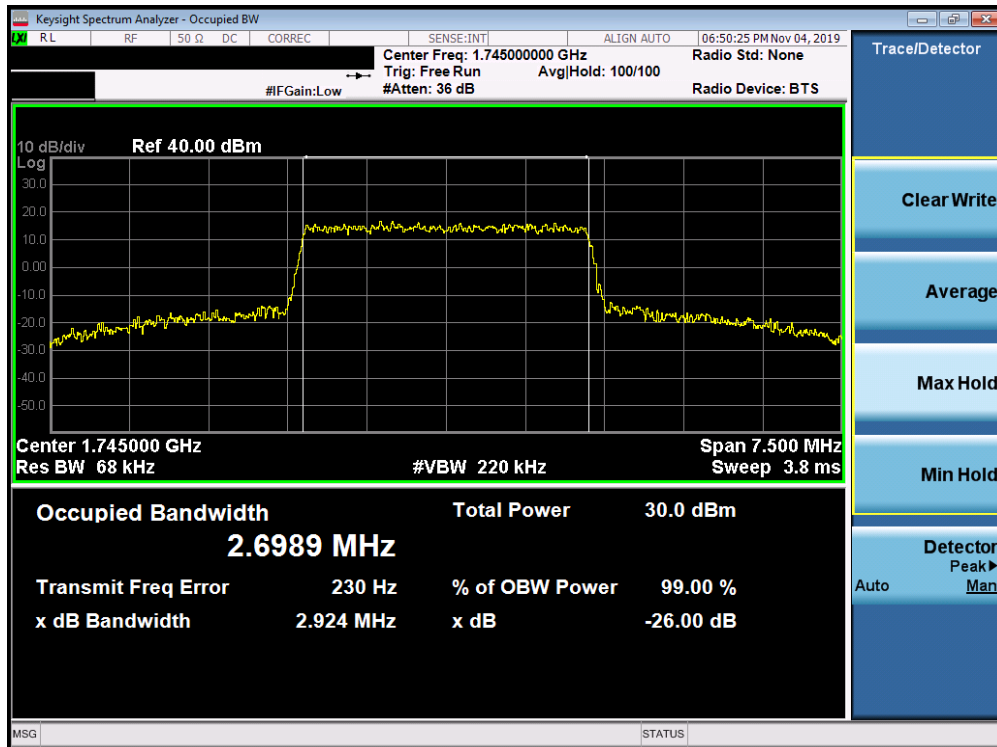


Plot 7-48. Occupied Bandwidth Plot (Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)

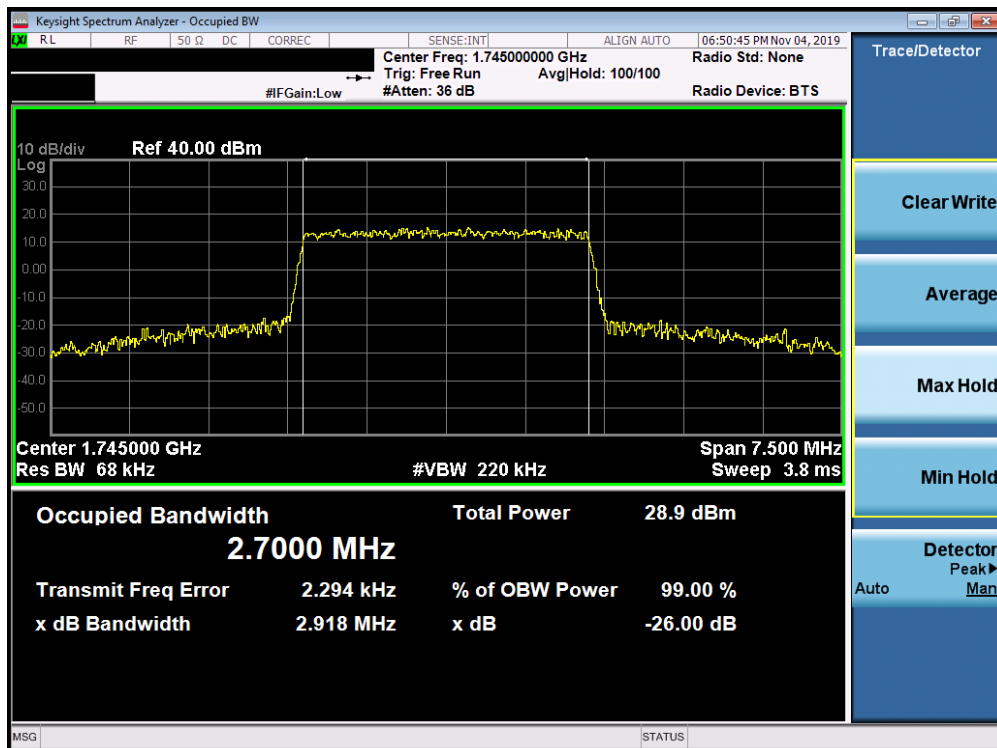


Plot 7-49. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT</b> (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 42 of 250



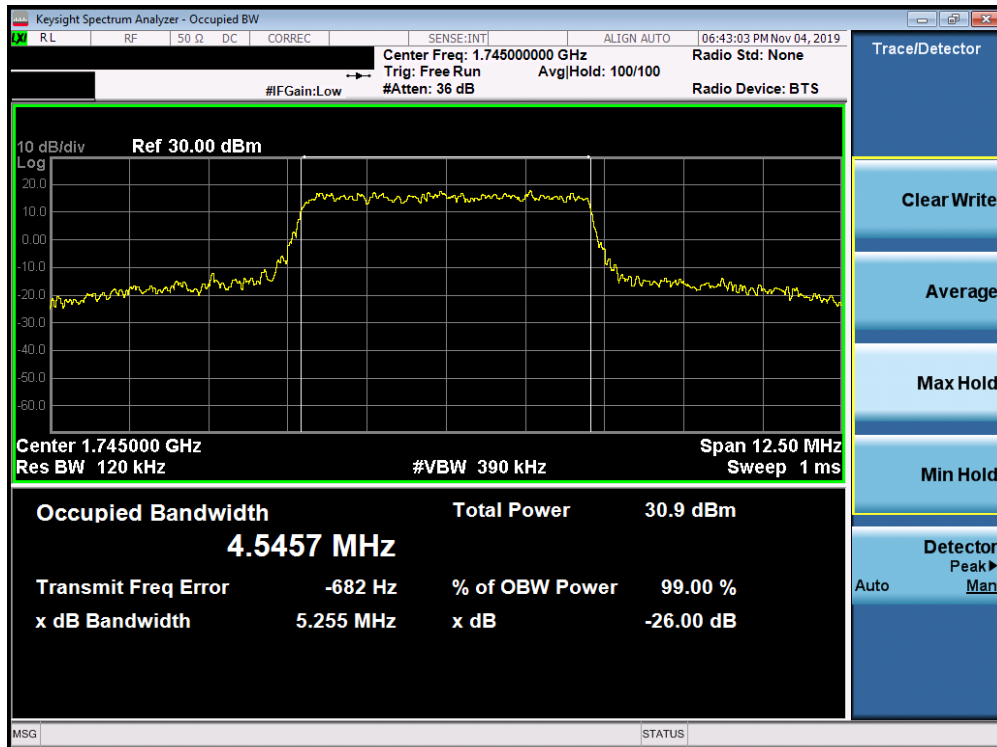
Plot 7-50. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 16-QAM - Full RB Configuration)



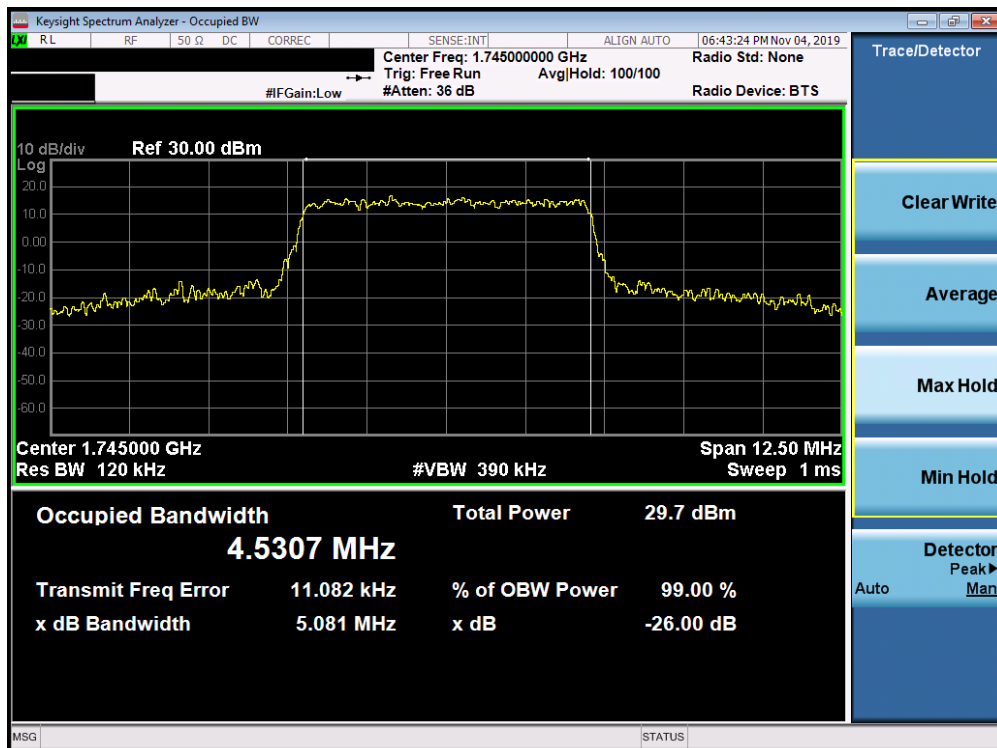
Plot 7-51. Occupied Bandwidth Plot (Band 66/4 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 43 of 250





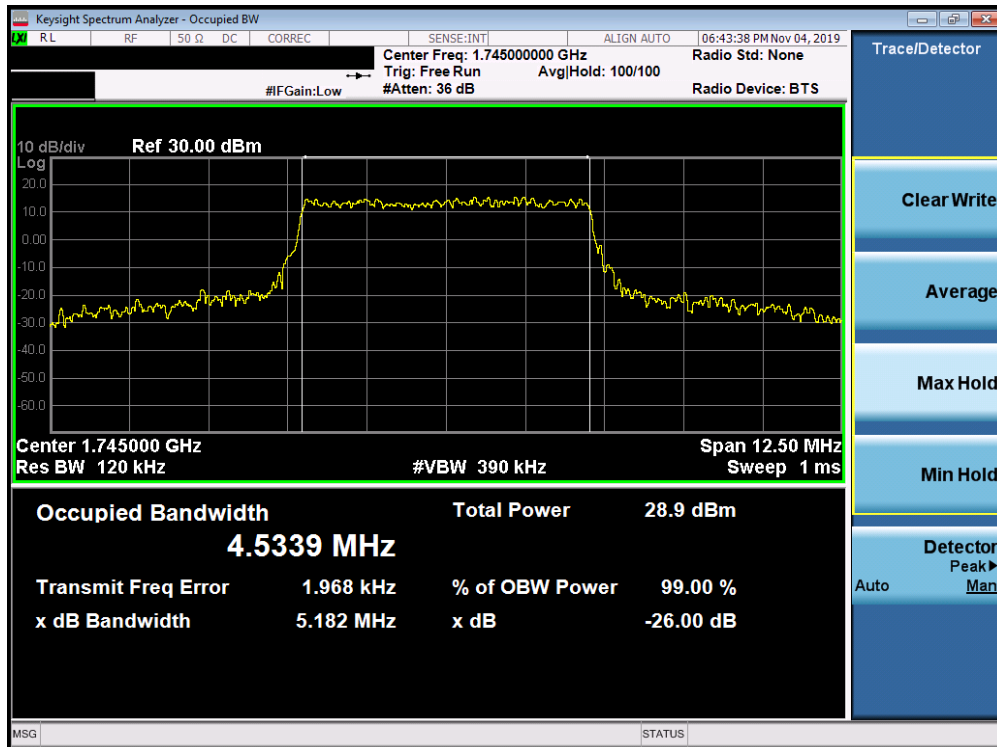
Plot 7-52. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz QPSK - Full RB Configuration)



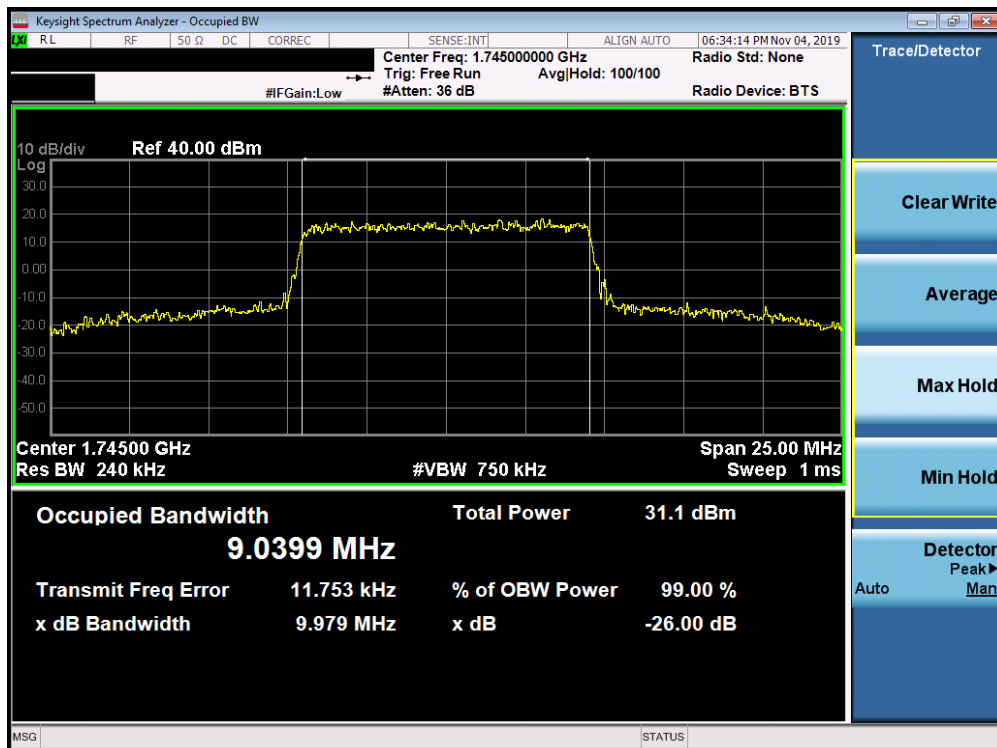
Plot 7-53. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 44 of 250



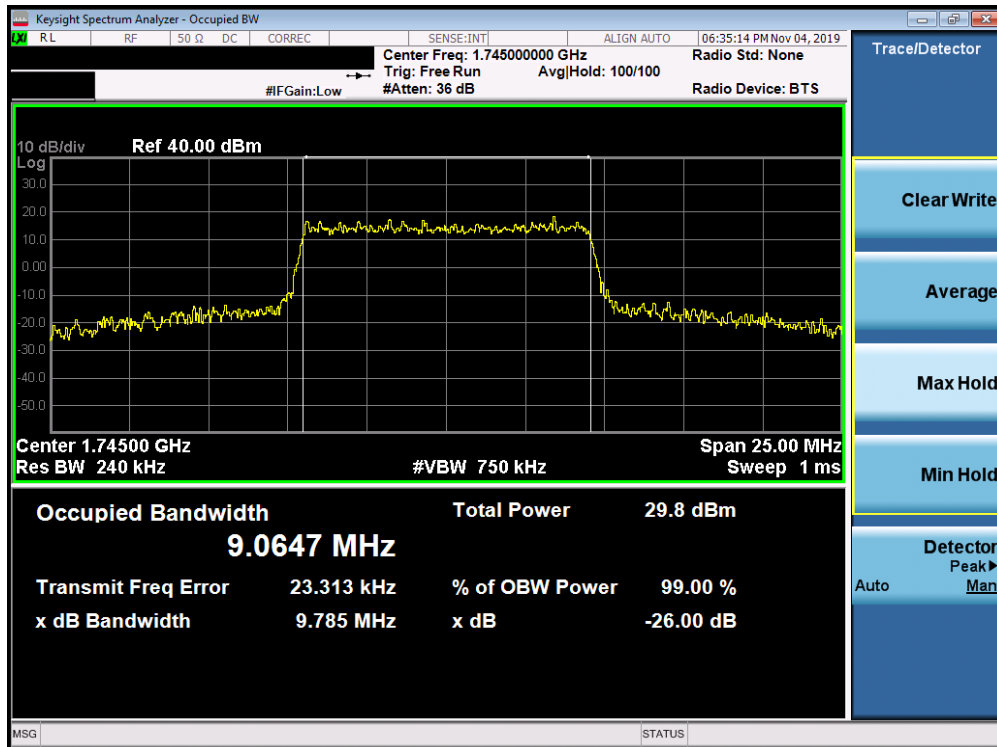


Plot 7-54. Occupied Bandwidth Plot (Band 66/4 - 5.0MHz 64-QAM - Full RB Configuration)

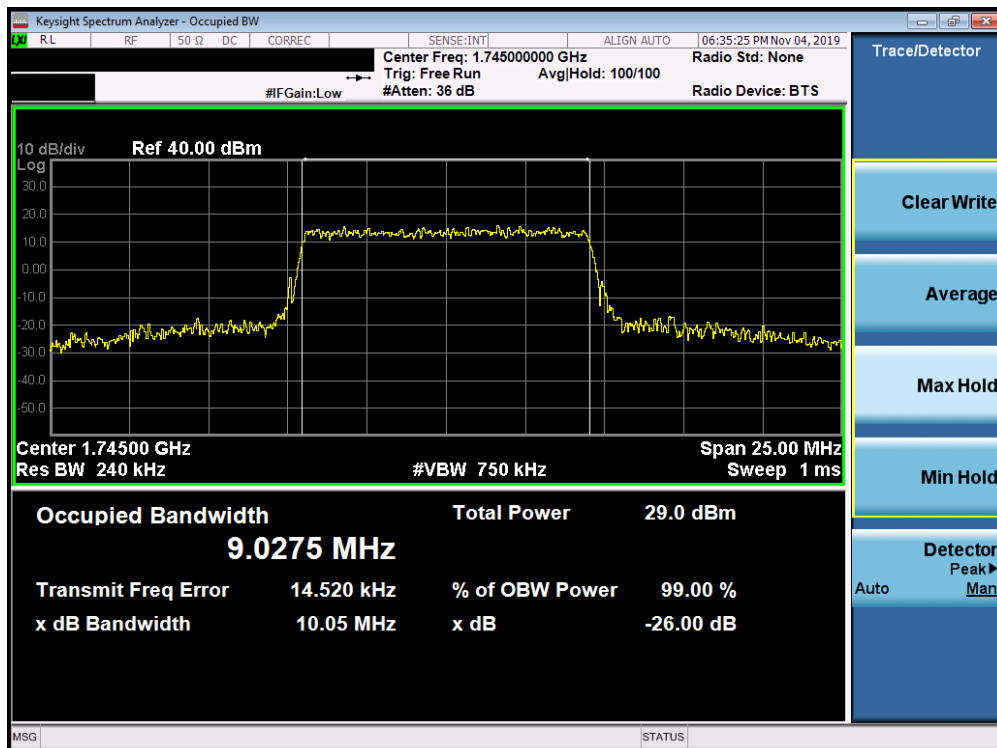


Plot 7-55. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset	Page 45 of 250

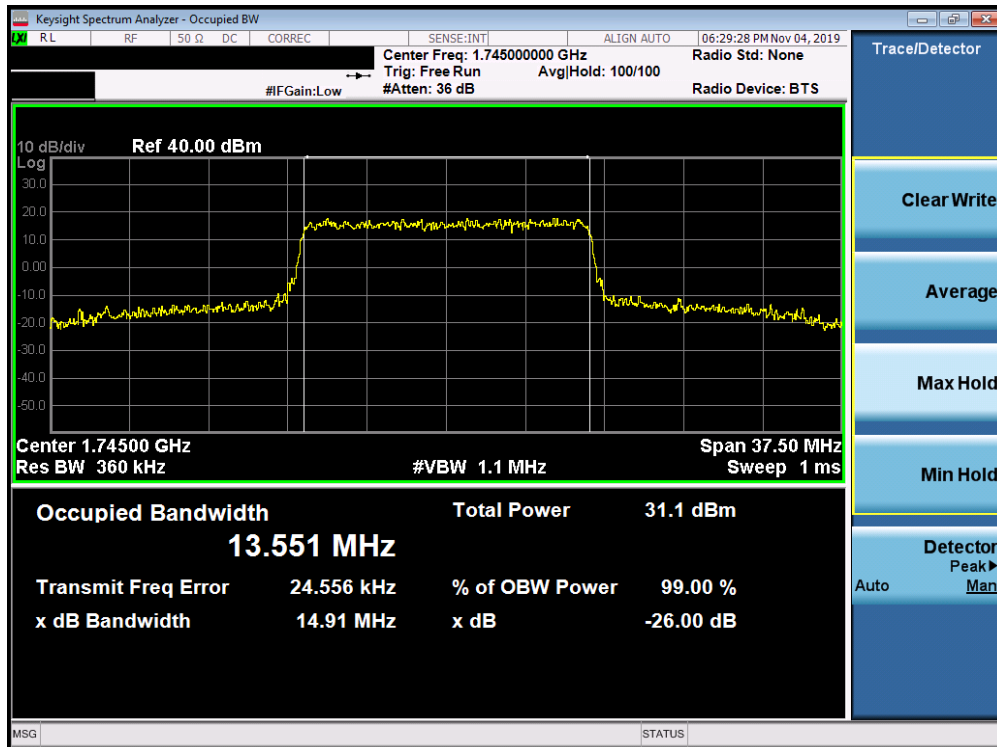


Plot 7-56. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 16-QAM - Full RB Configuration)

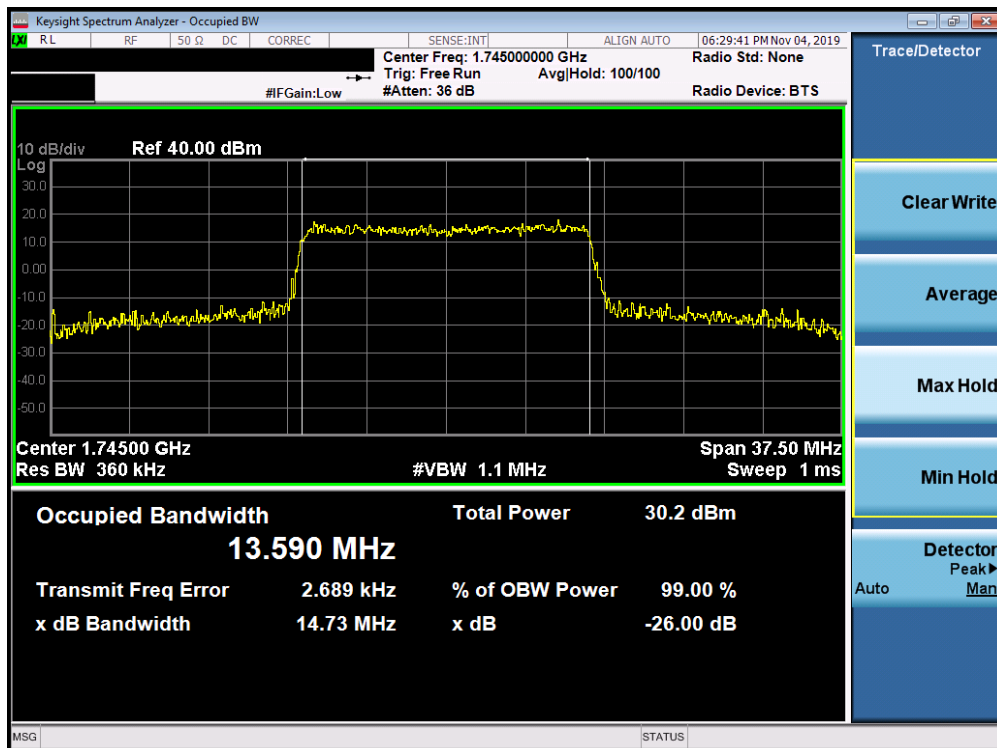


Plot 7-57. Occupied Bandwidth Plot (Band 66/4 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset	Page 46 of 250

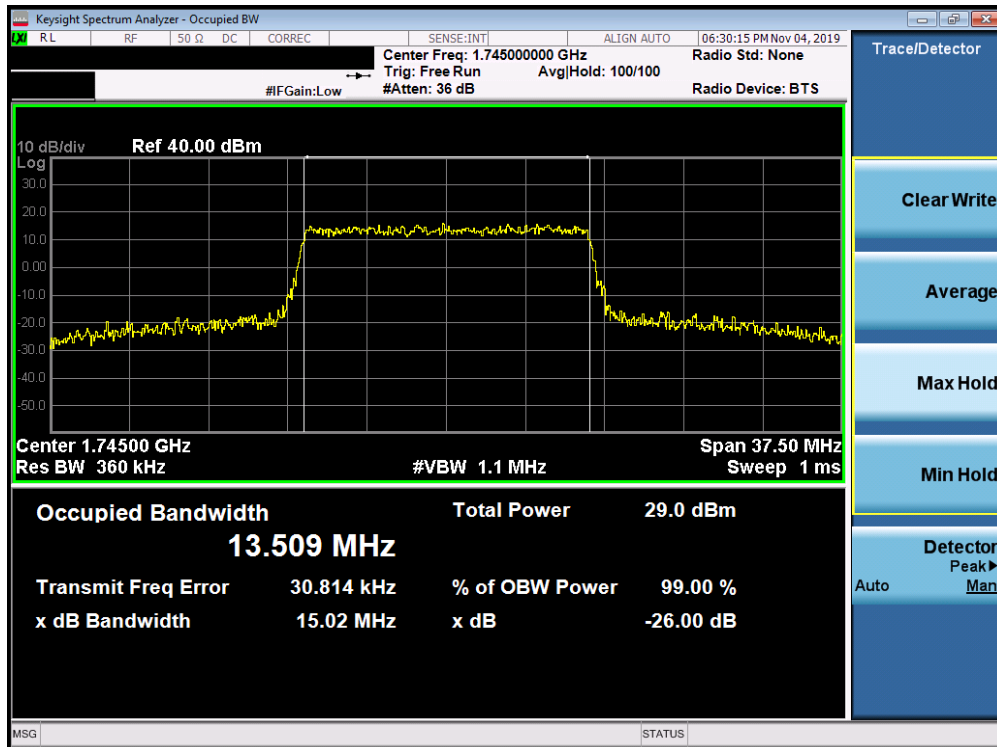


Plot 7-58. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz QPSK - Full RB Configuration)

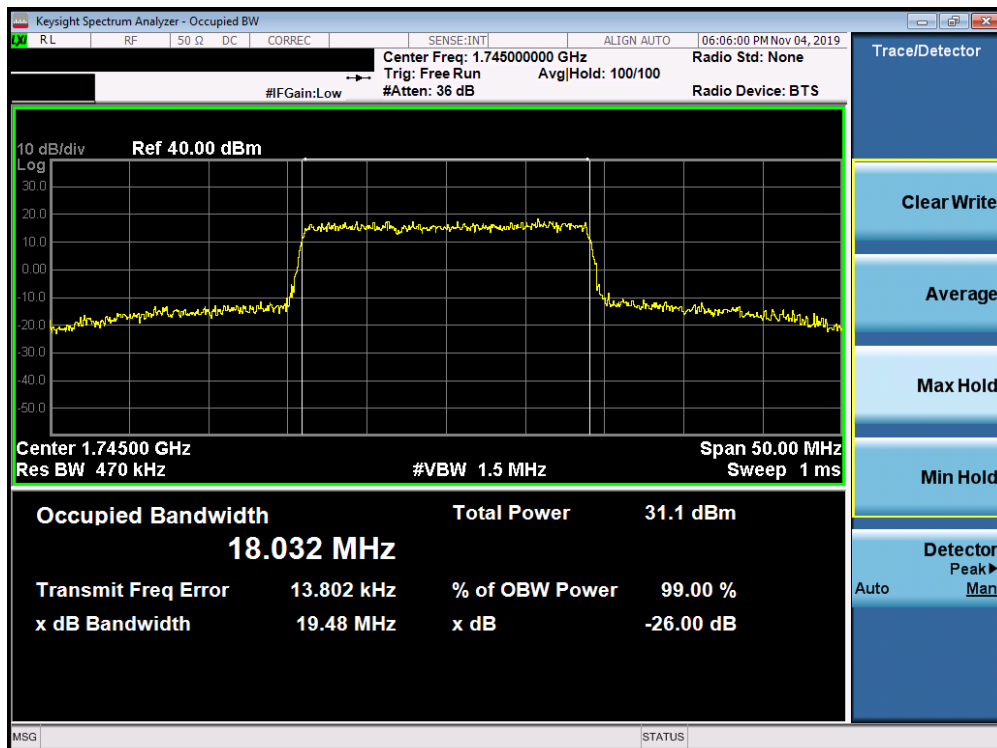


Plot 7-59. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 47 of 250

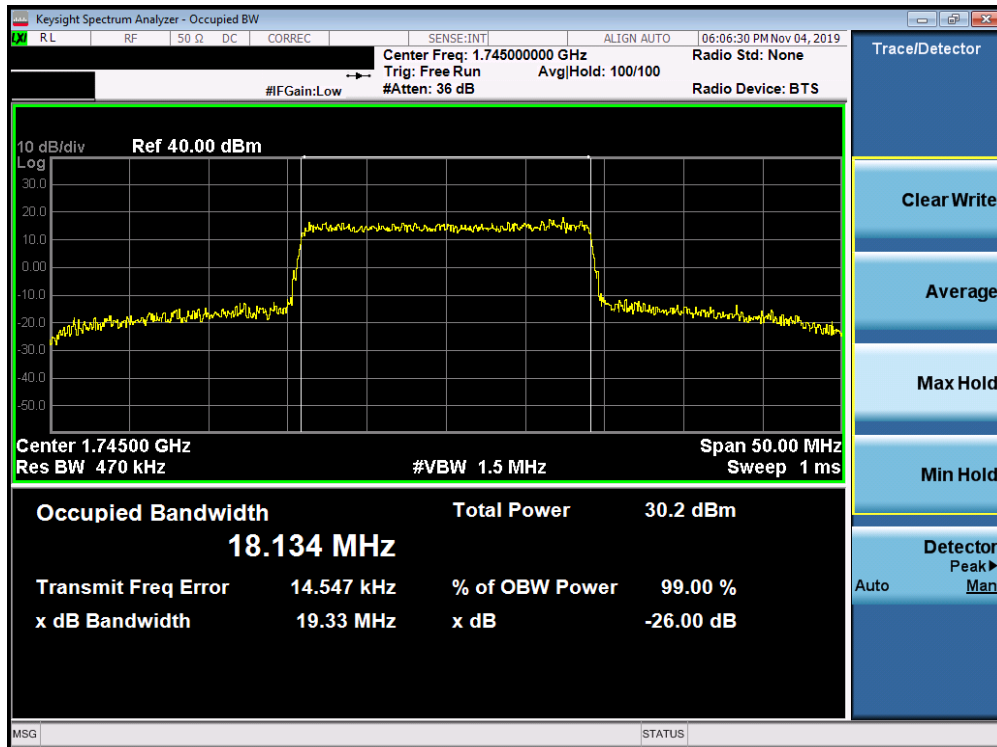


Plot 7-60. Occupied Bandwidth Plot (Band 66/4 - 15.0MHz 64-QAM - Full RB Configuration)

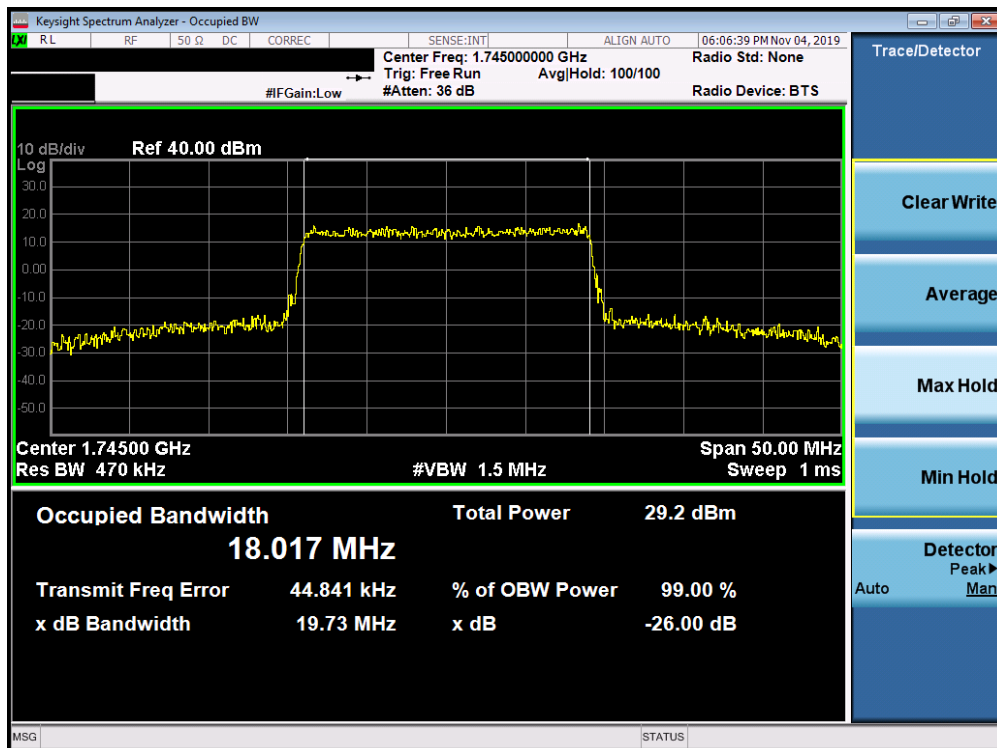


Plot 7-61. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 48 of 250



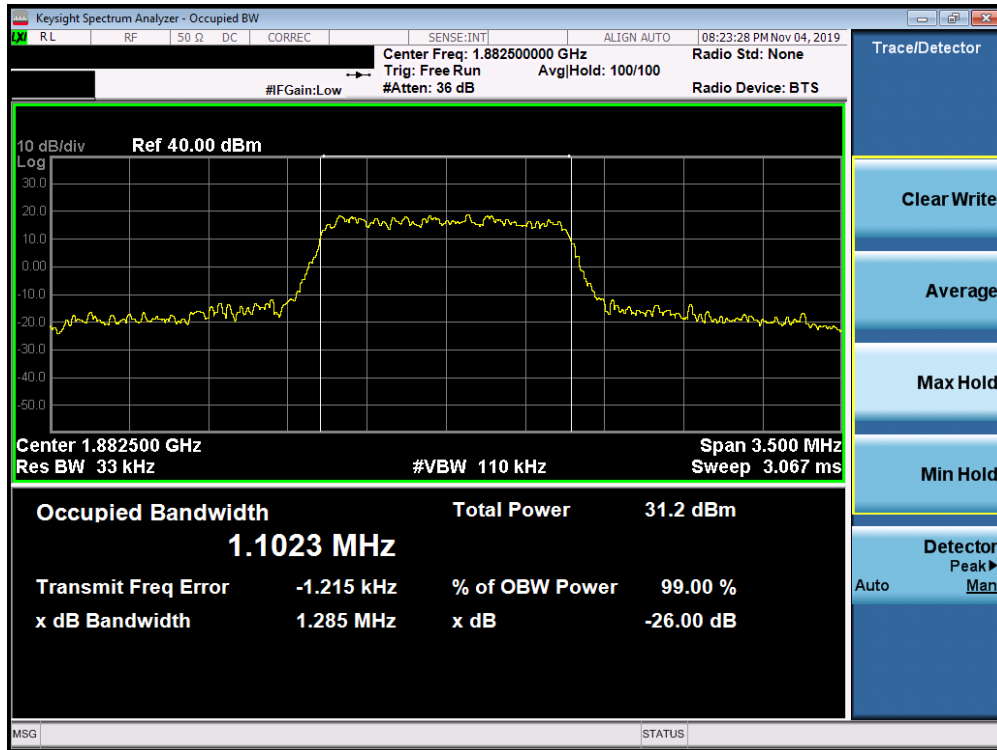
Plot 7-62. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 16-QAM - Full RB Configuration)



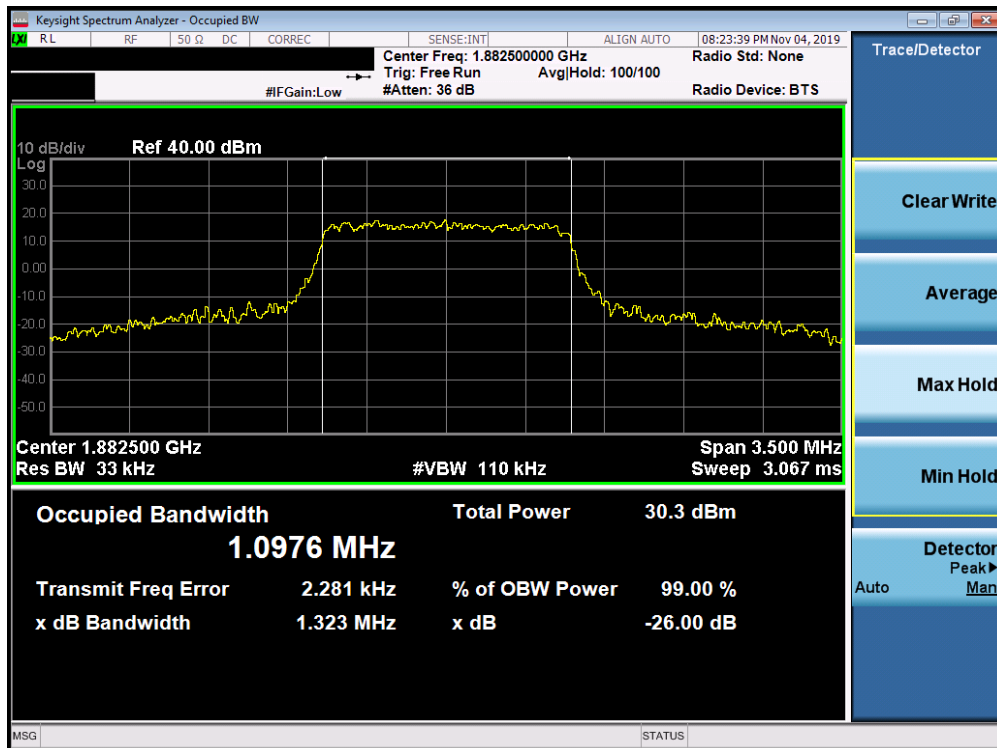
Plot 7-63. Occupied Bandwidth Plot (Band 66/4 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 49 of 250

## Band 25/2

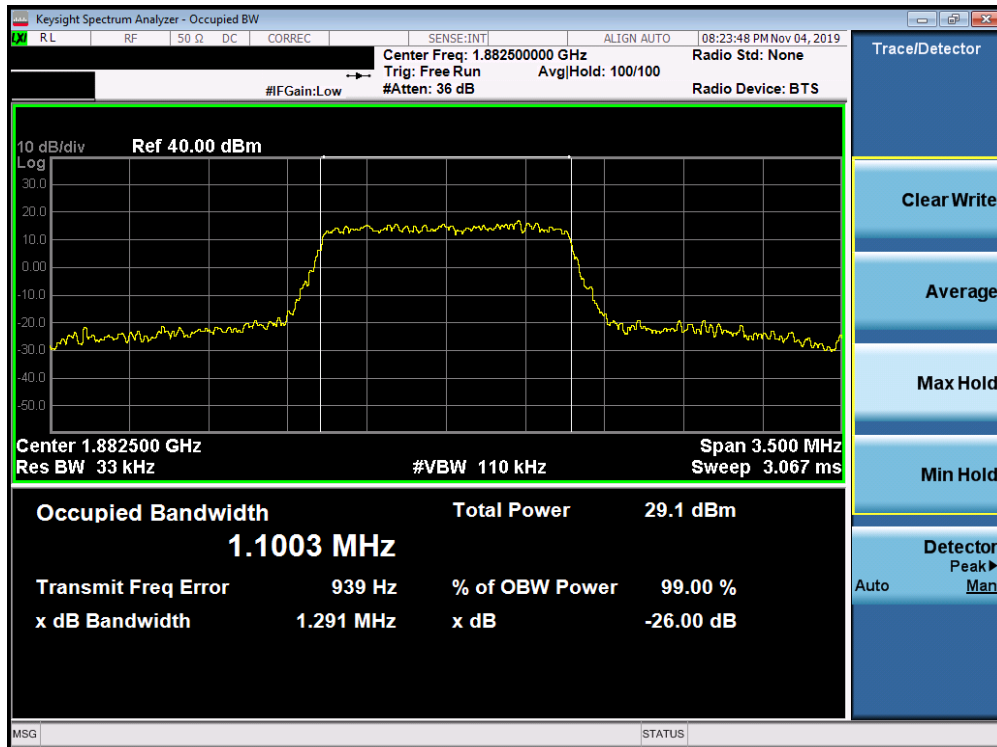


Plot 7-64. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz QPSK - Full RB Configuration)

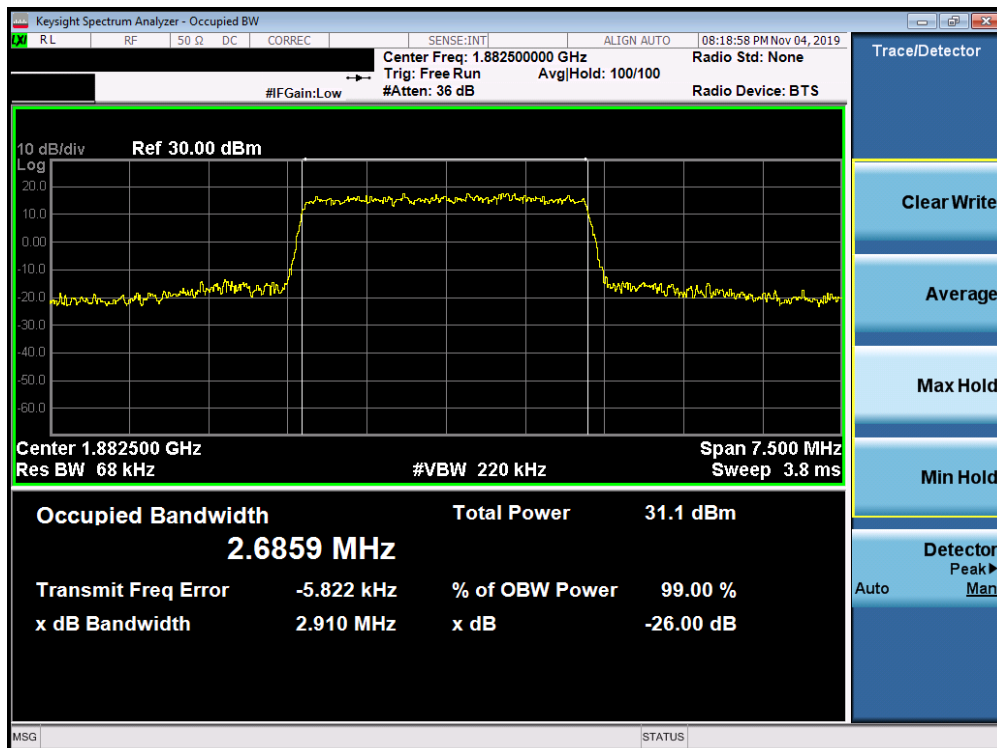


Plot 7-65. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 50 of 250



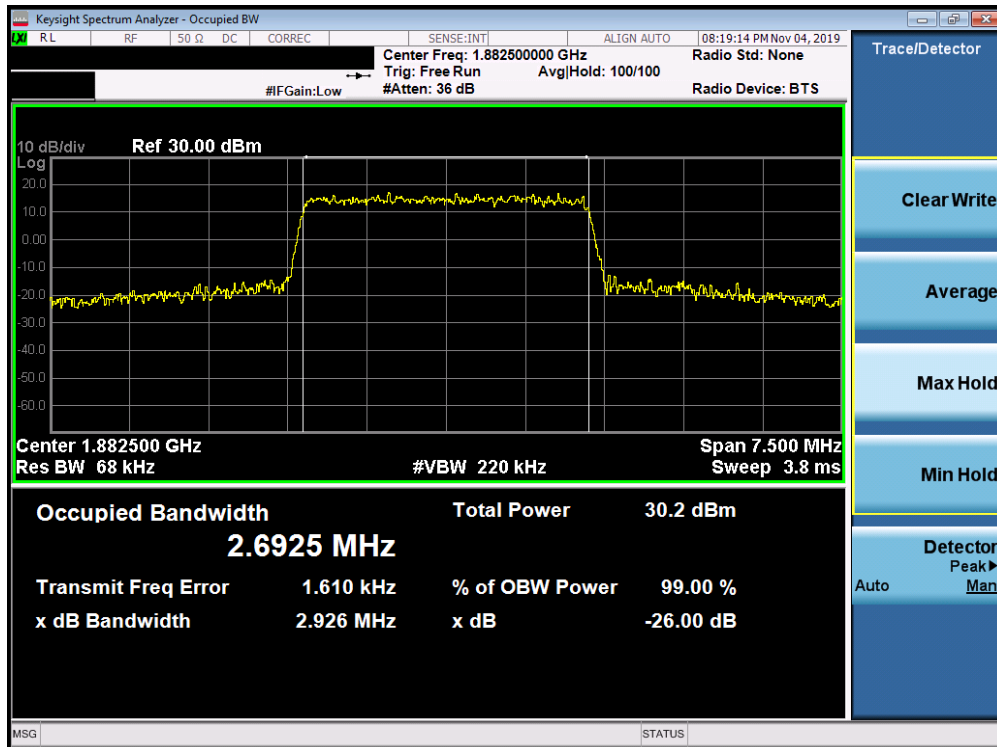
Plot 7-66. Occupied Bandwidth Plot (Band 25/2 - 1.4MHz 64-QAM - Full RB Configuration)



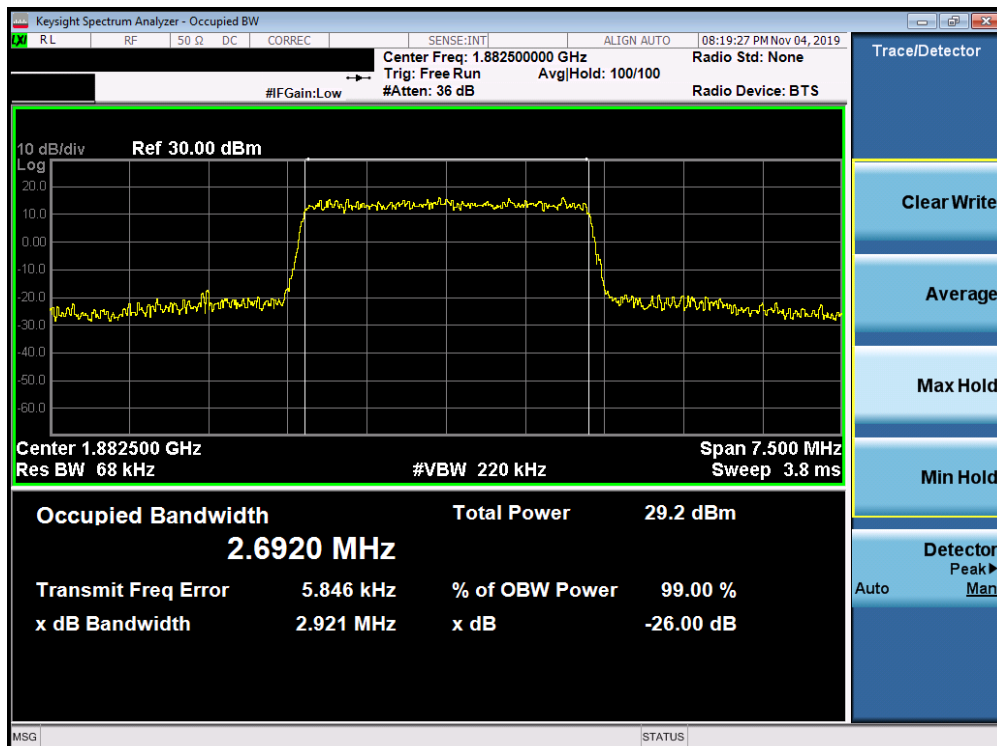
Plot 7-67. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset	Page 51 of 250





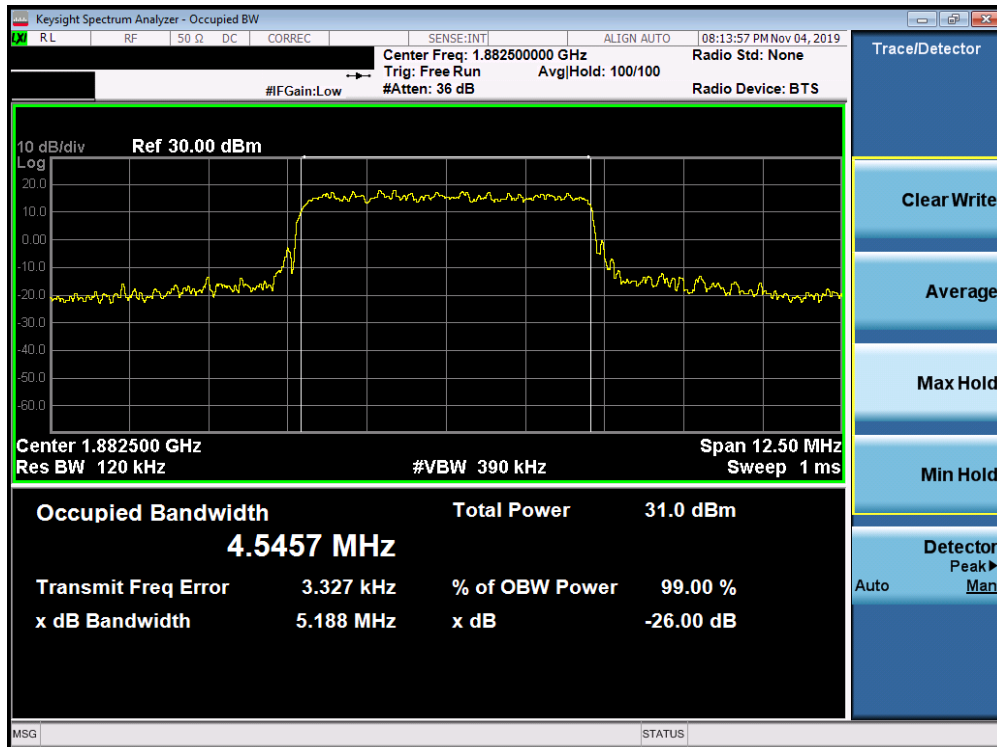
Plot 7-68. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 16-QAM - Full RB Configuration)



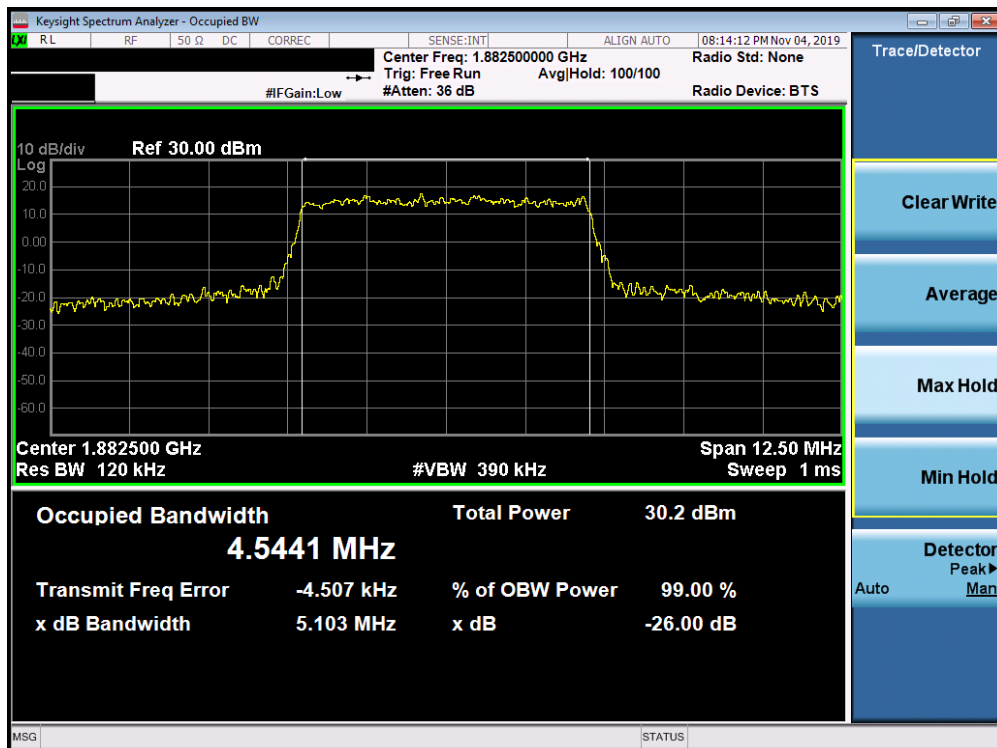
Plot 7-69. Occupied Bandwidth Plot (Band 25/2 - 3.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 52 of 250



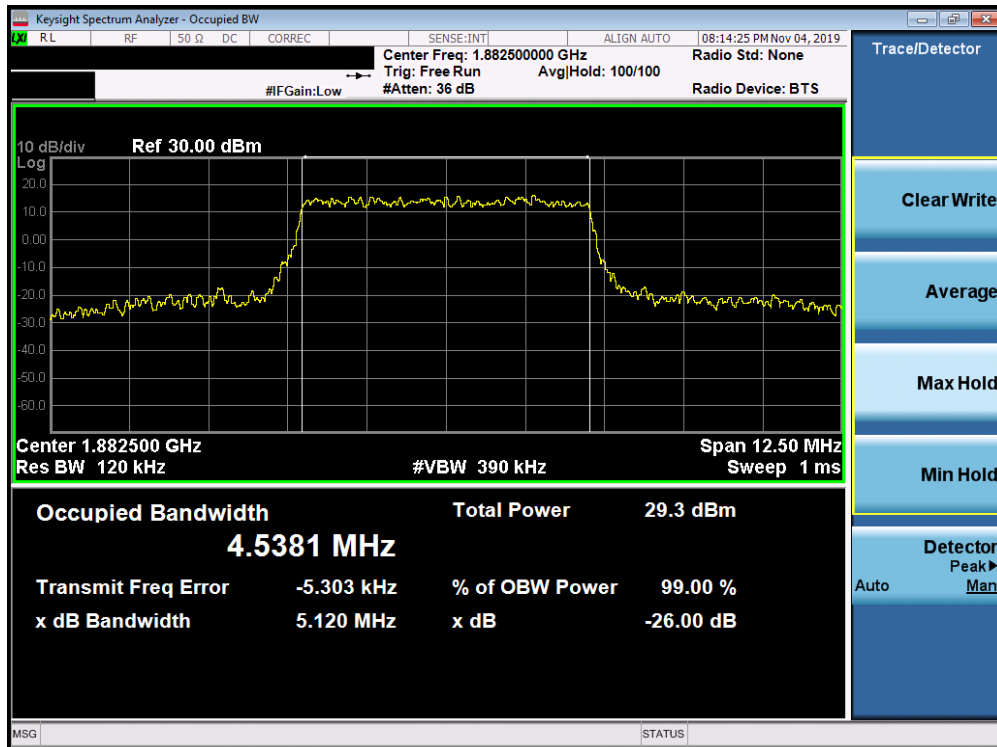


Plot 7-70. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz QPSK - Full RB Configuration)

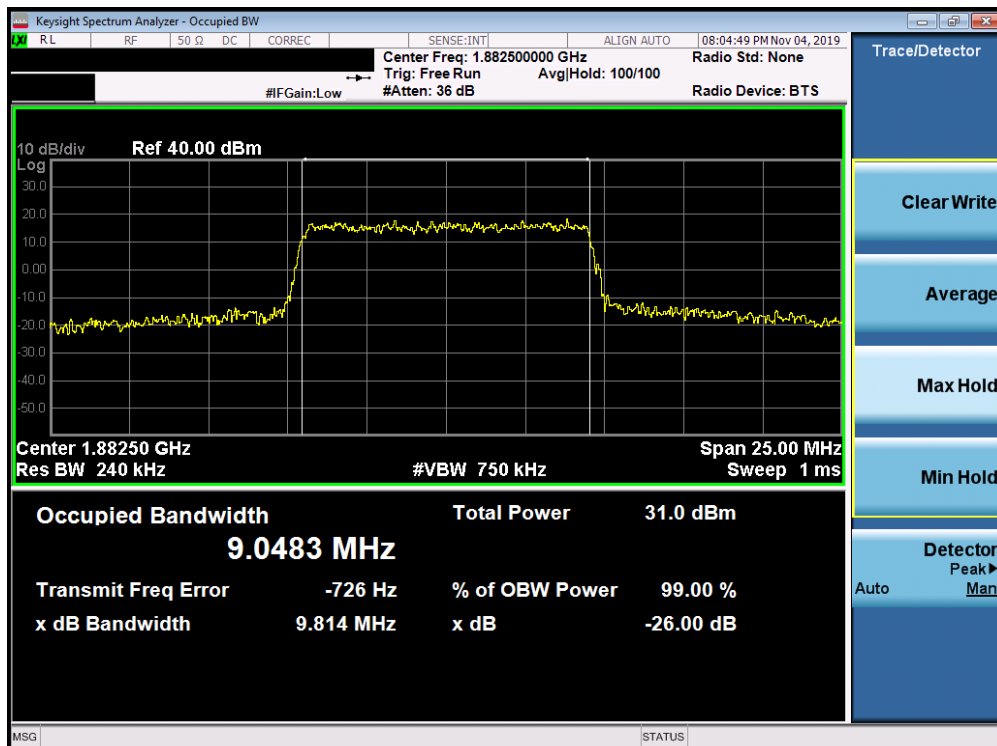


Plot 7-71. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 53 of 250

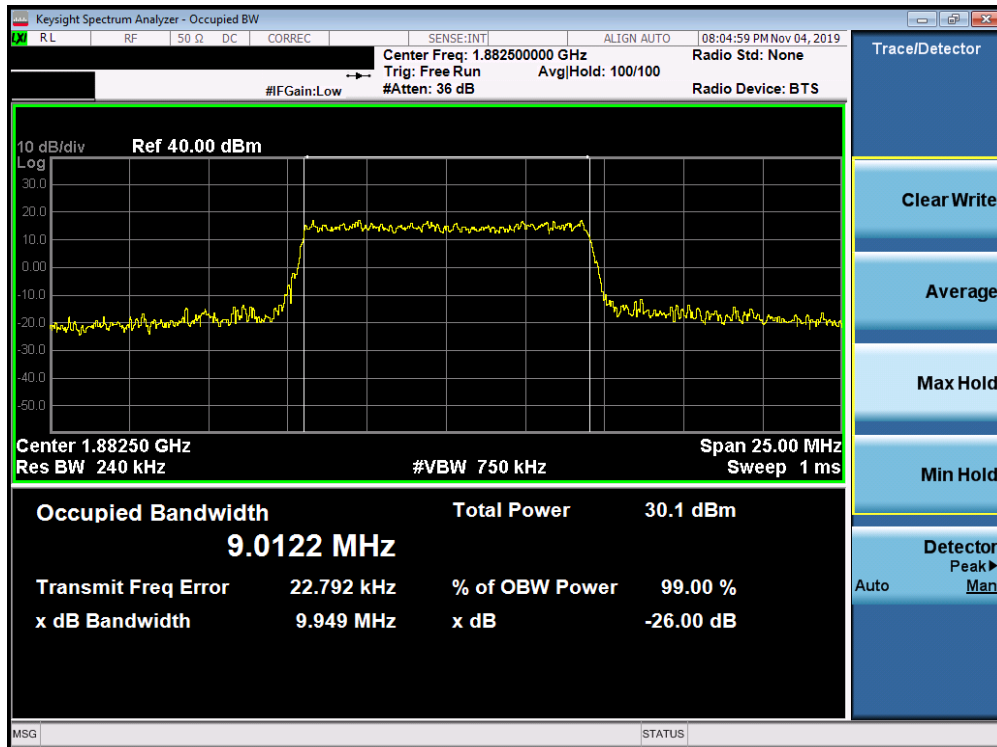


Plot 7-72. Occupied Bandwidth Plot (Band 25/2 - 5.0MHz 64-QAM - Full RB Configuration)

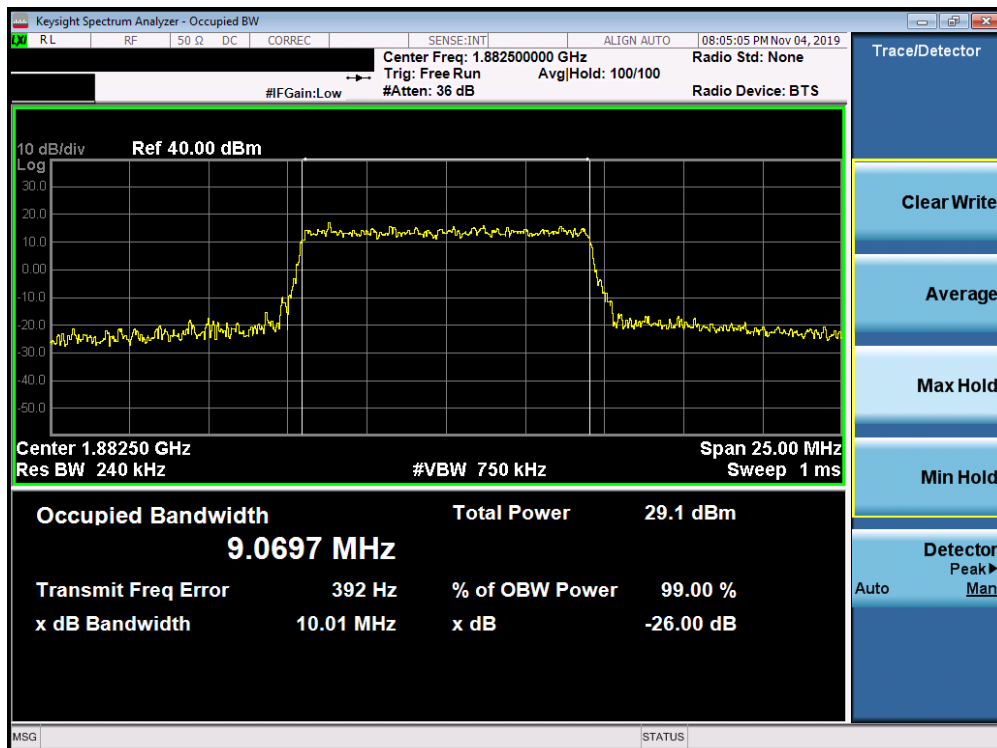


Plot 7-73. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 54 of 250

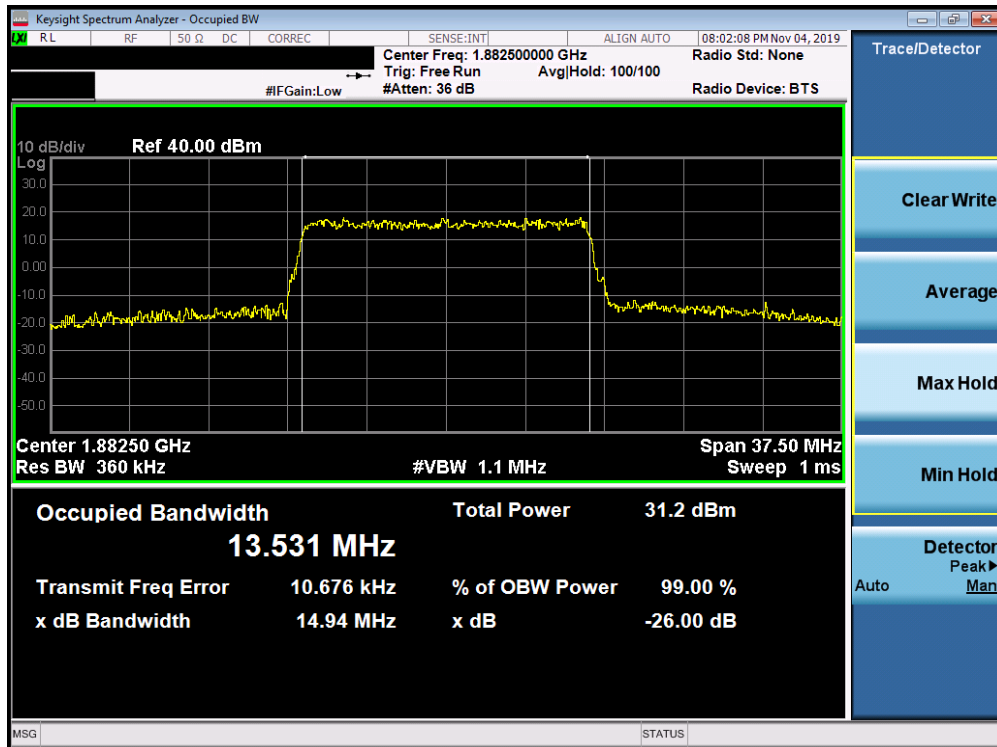


Plot 7-74. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 16-QAM - Full RB Configuration)

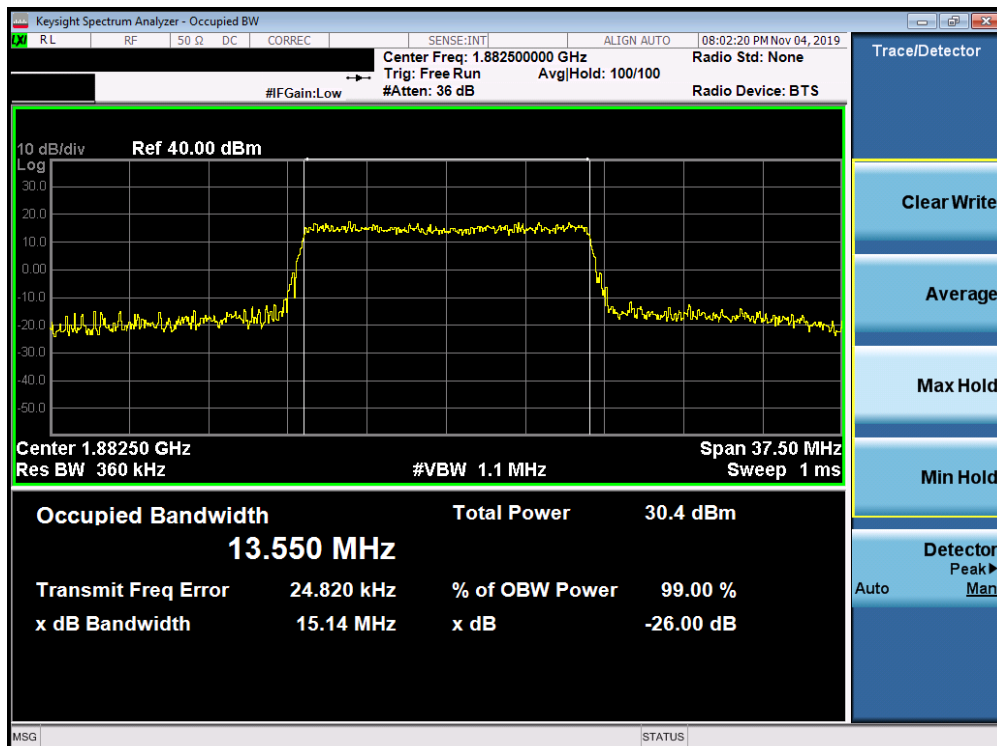


Plot 7-75. Occupied Bandwidth Plot (Band 25/2 - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset	Page 55 of 250

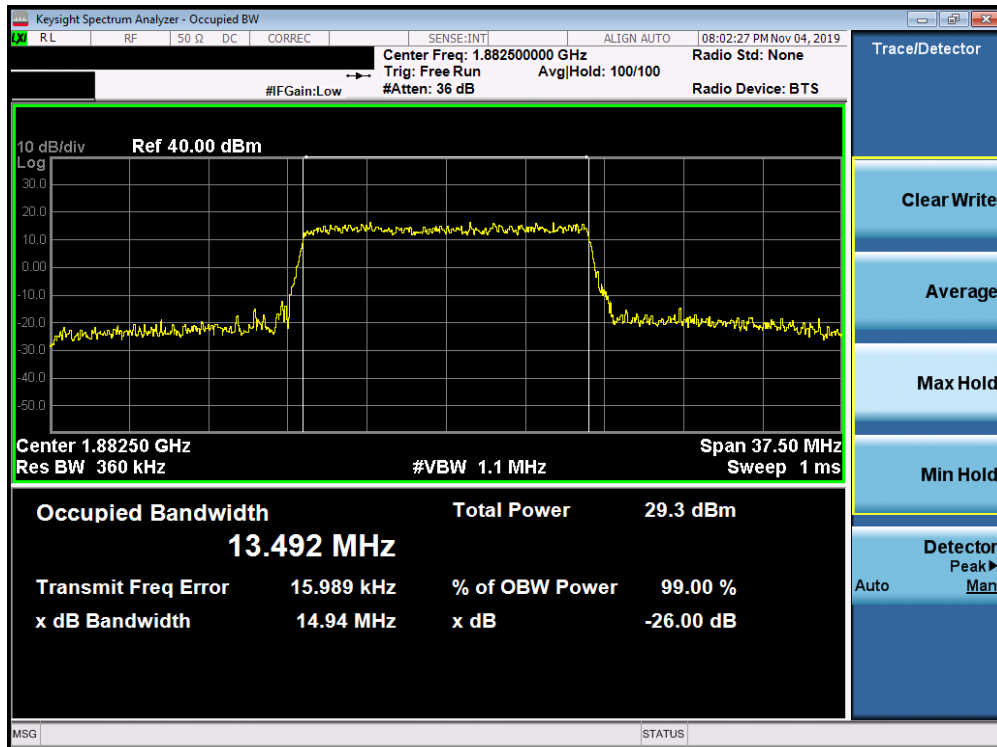


Plot 7-76. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz QPSK - Full RB Configuration)

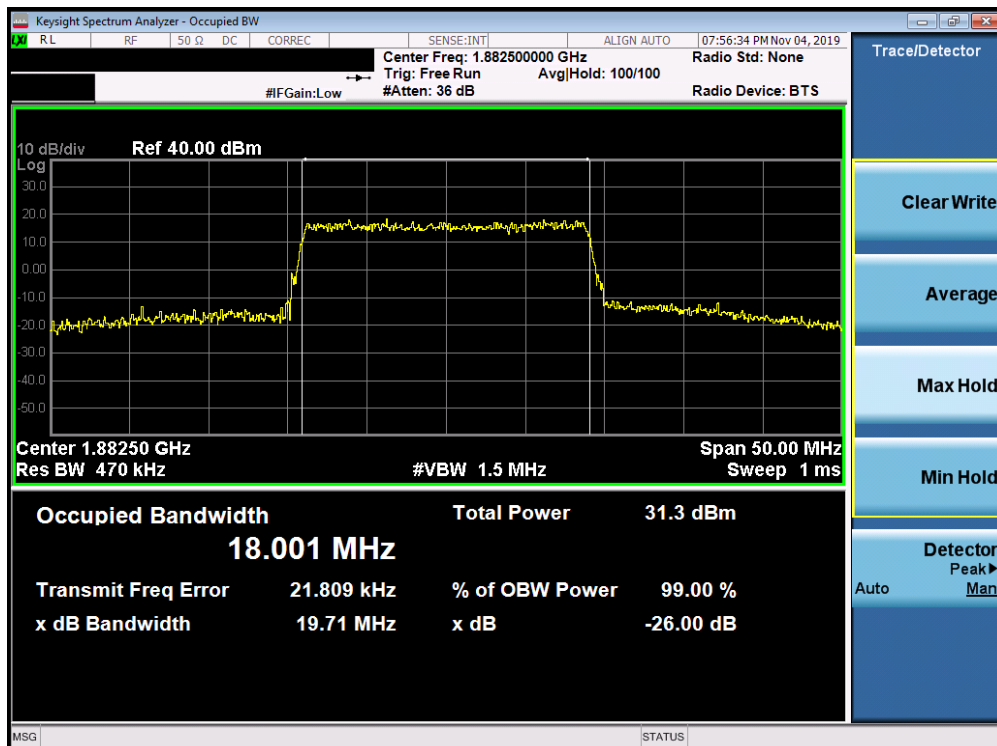


Plot 7-77. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 56 of 250

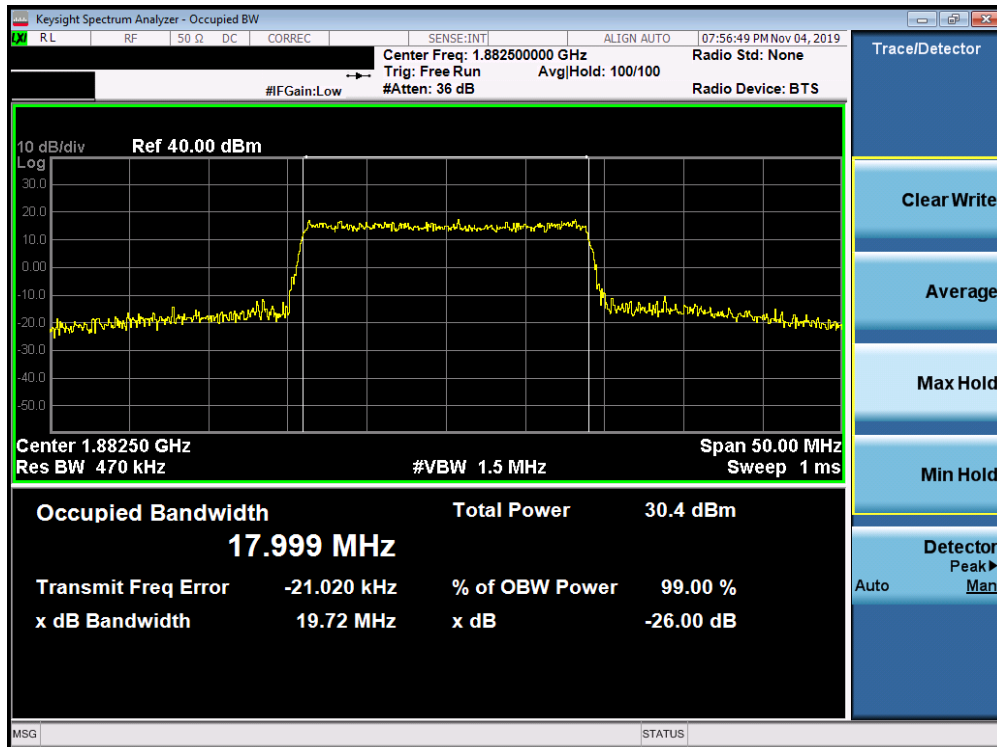


Plot 7-78. Occupied Bandwidth Plot (Band 25/2 - 15.0MHz 64-QAM - Full RB Configuration)

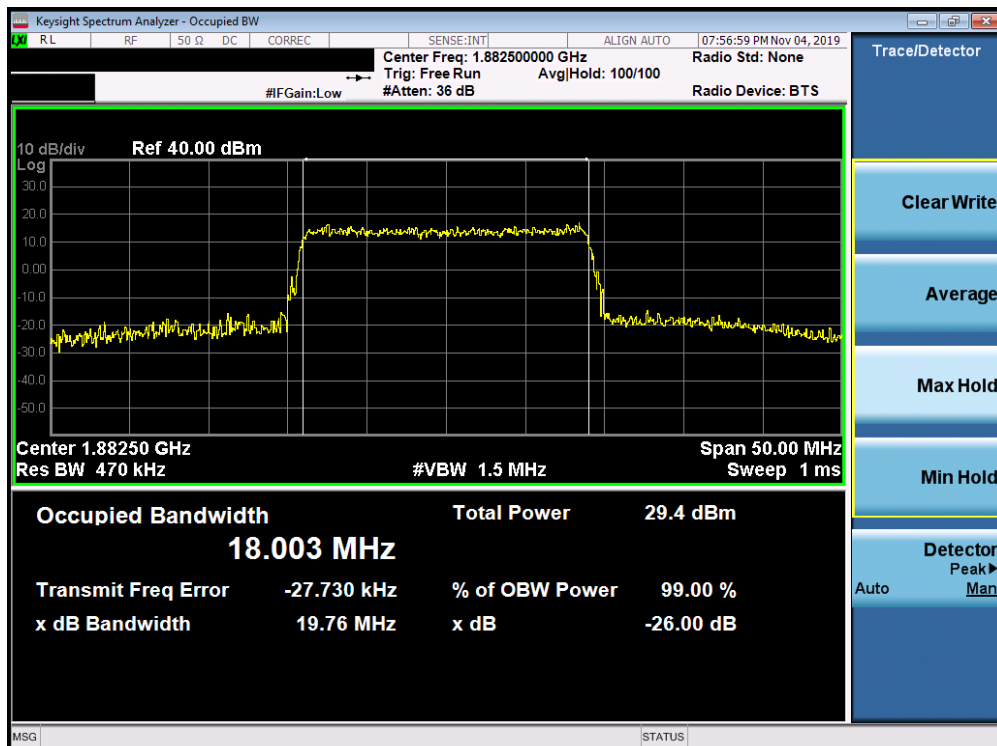


Plot 7-79. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 57 of 250



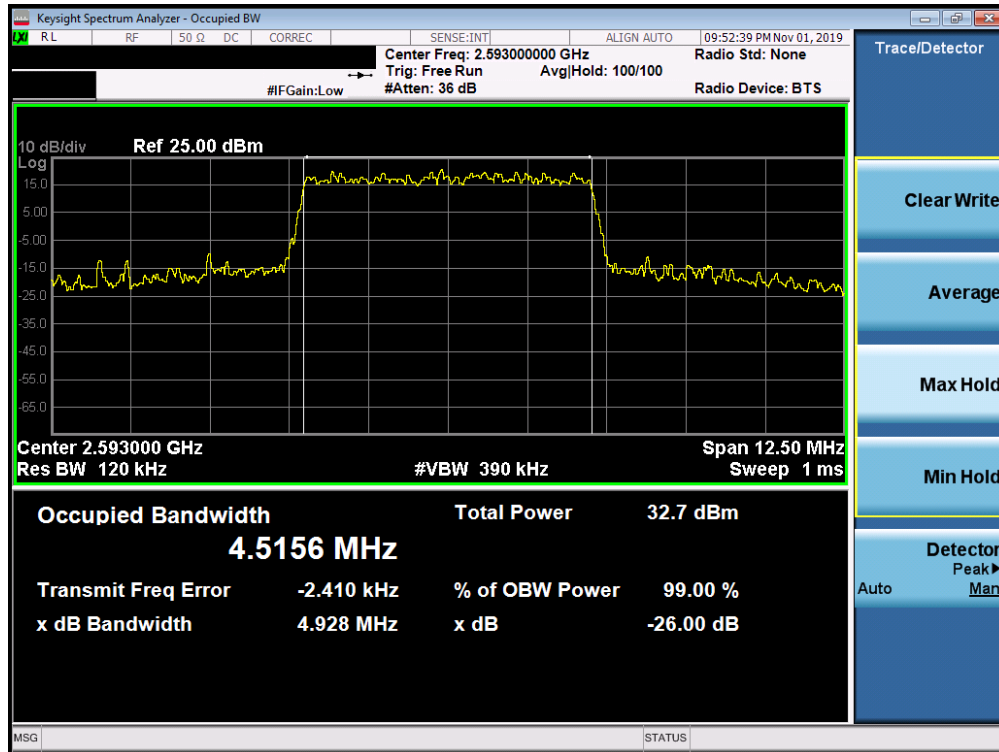
Plot 7-80. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 16-QAM - Full RB Configuration)



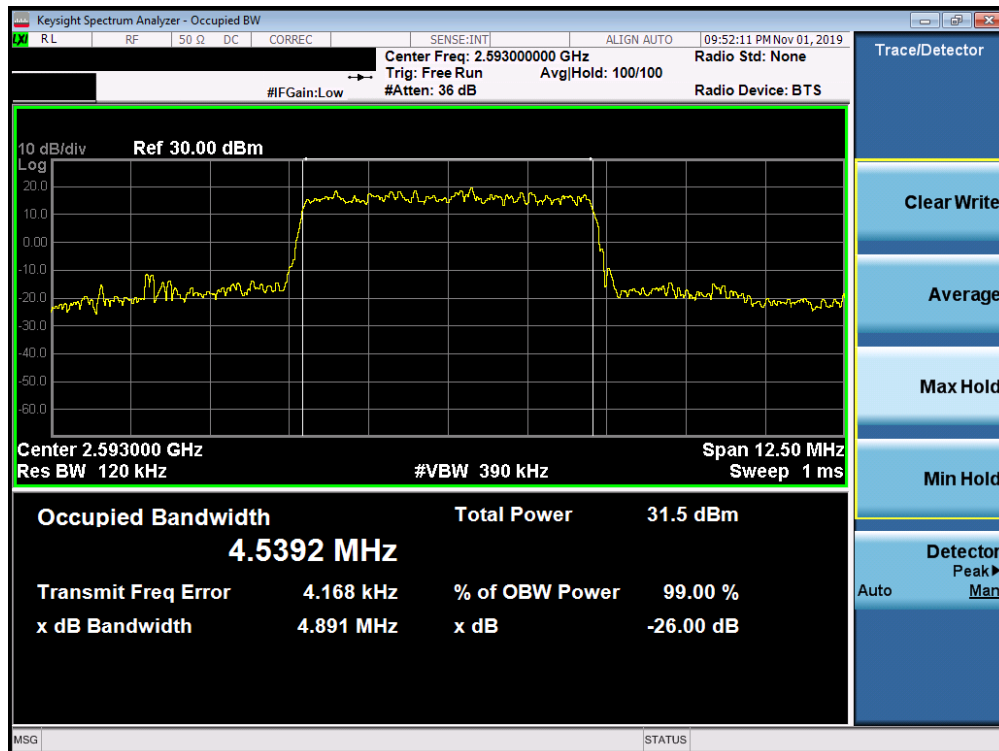
Plot 7-81. Occupied Bandwidth Plot (Band 25/2 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 58 of 250

## Band 41 (PC2)



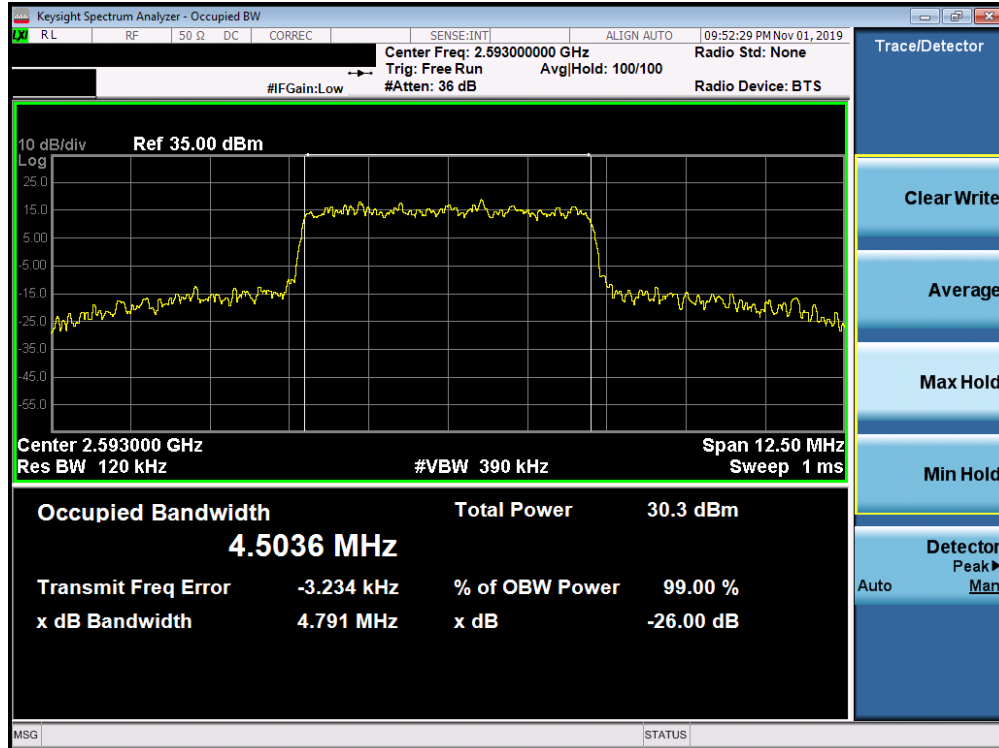
Plot 7-82. Occupied Bandwidth Plot (Band 41 (PC2) - 5.0MHz QPSK - Full RB Configuration)



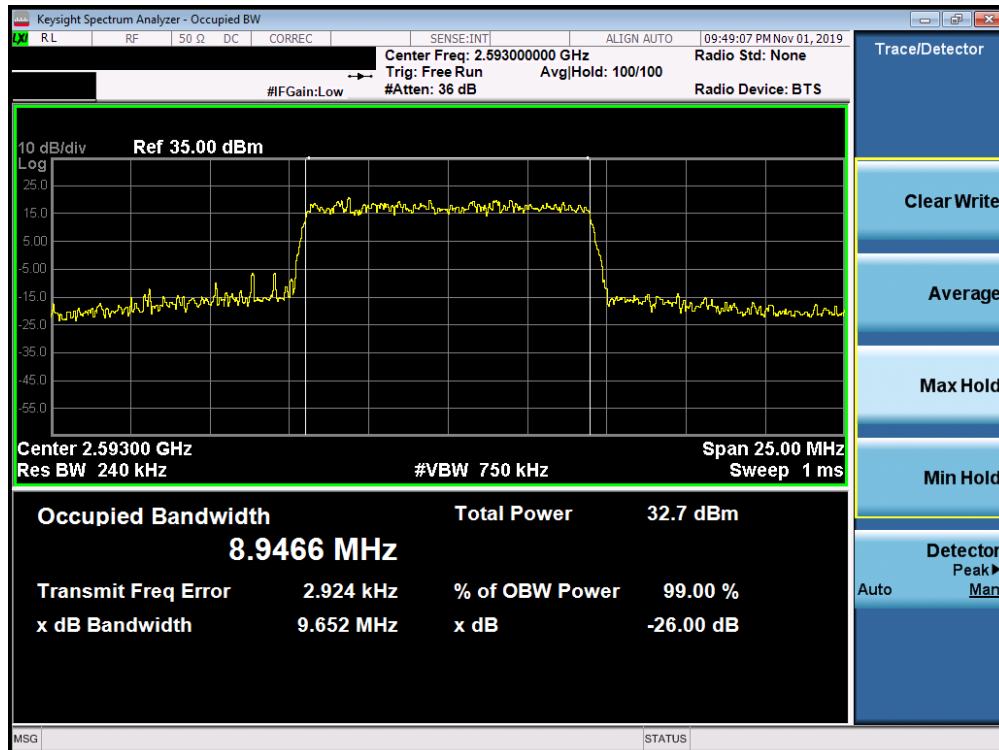
Plot 7-83. Occupied Bandwidth Plot (Band 41 (PC2) - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT</b> (CERTIFICATION)		<b>Approved by:</b> Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset	Page 59 of 250





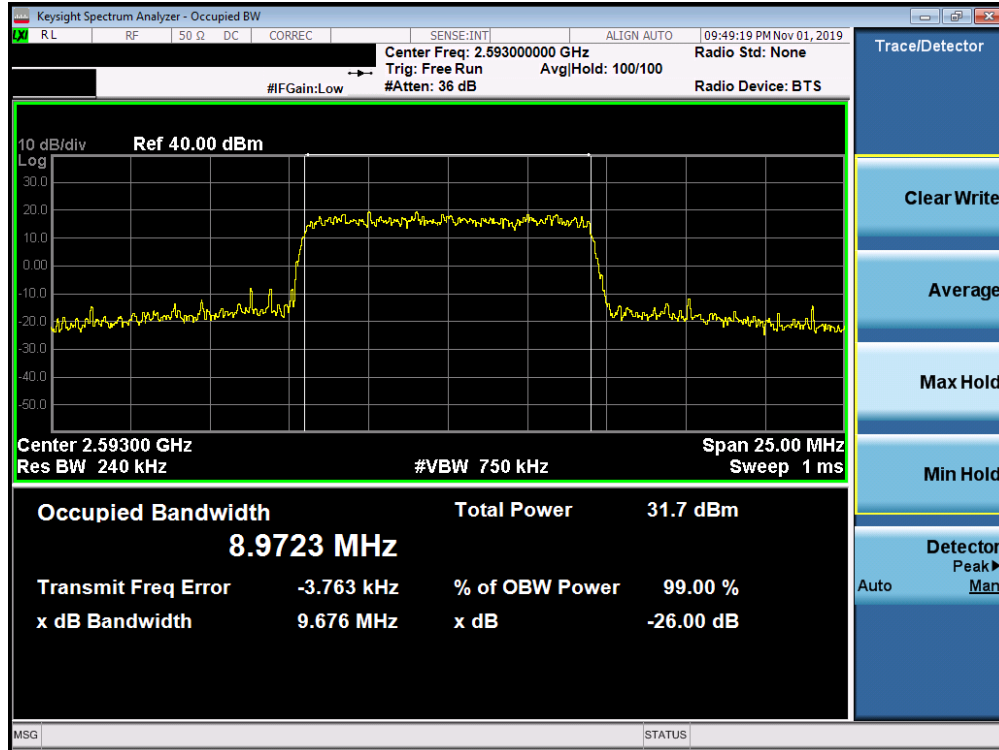
Plot 7-84. Occupied Bandwidth Plot (Band 41 (PC2) - 5.0MHz 64-QAM - Full RB Configuration)



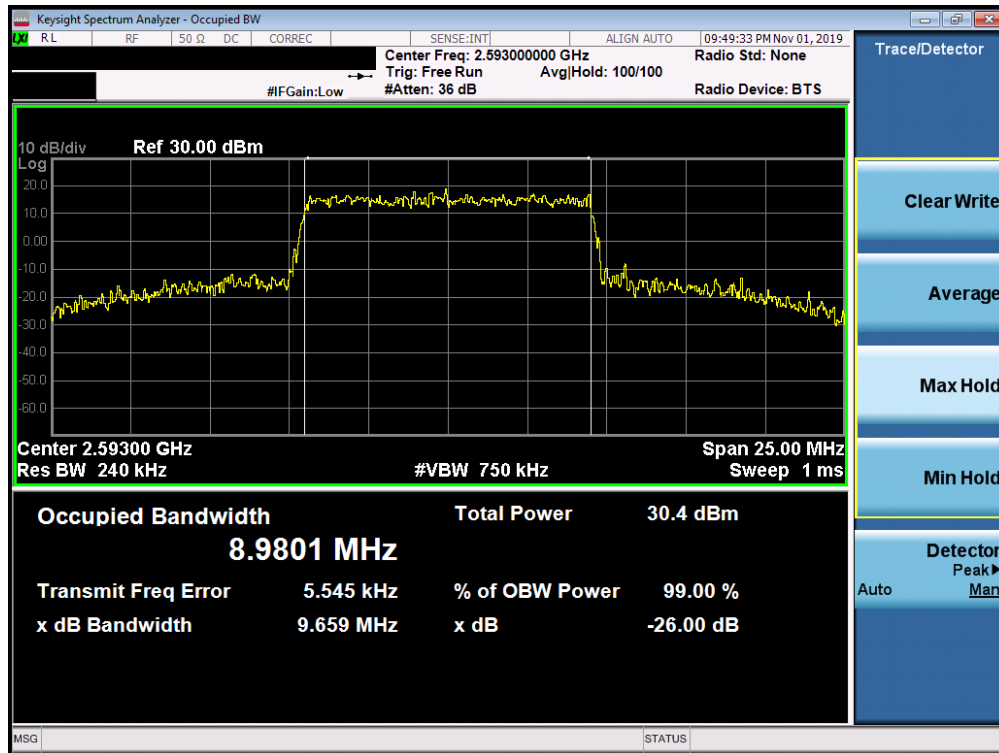
Plot 7-85. Occupied Bandwidth Plot (Band 41 (PC2) - 10.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 60 of 250



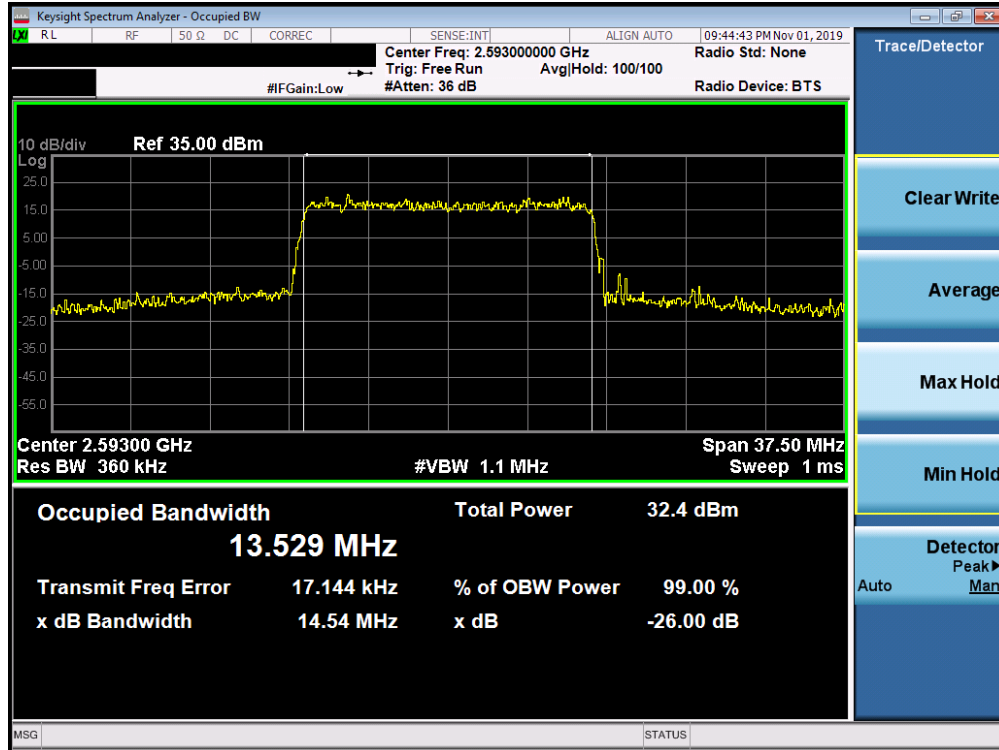


Plot 7-86. Occupied Bandwidth Plot (Band 41 (PC2) - 10.0MHz 16-QAM - Full RB Configuration)

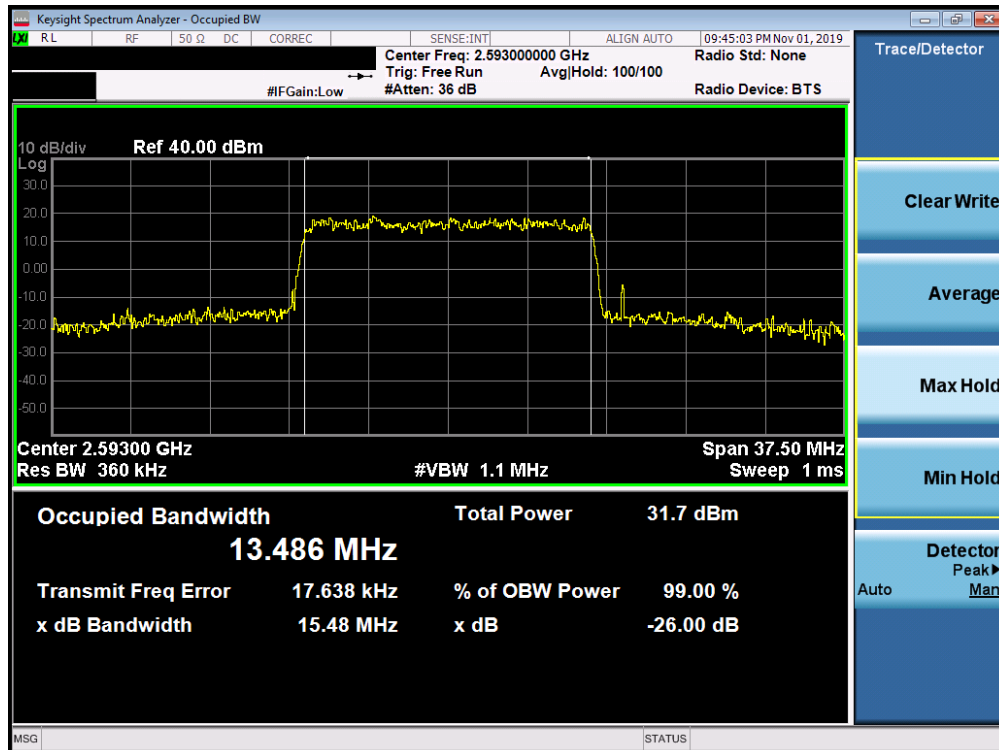


Plot 7-87. Occupied Bandwidth Plot (Band 41 (PC2) - 10.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 61 of 250

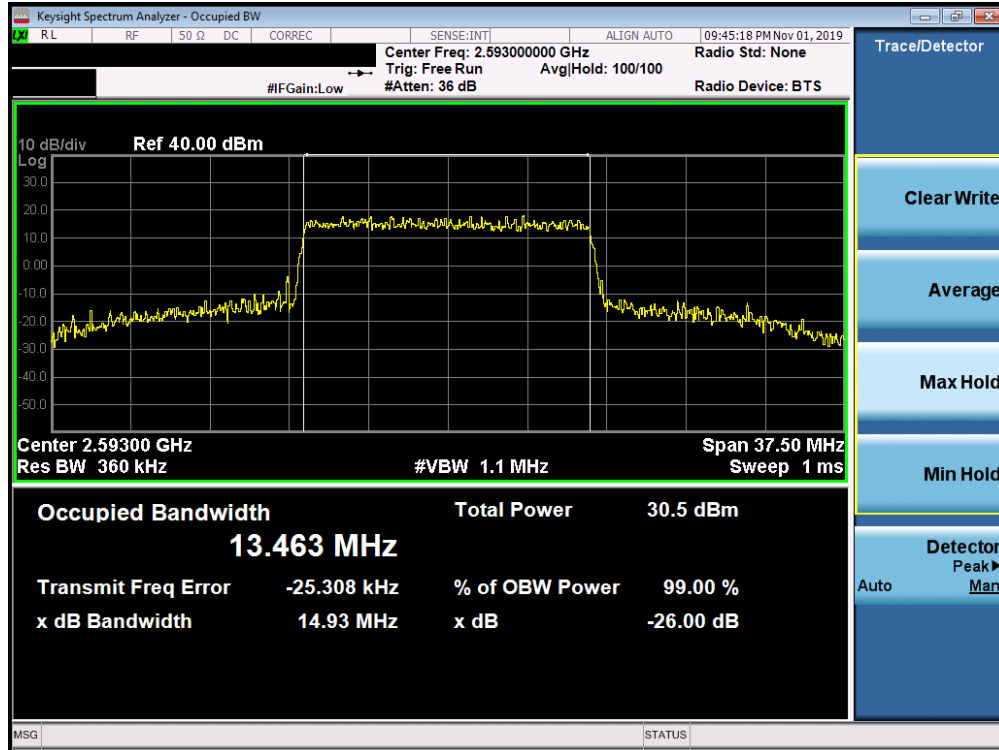


Plot 7-88. Occupied Bandwidth Plot (Band 41 (PC2) - 15.0MHz QPSK - Full RB Configuration)

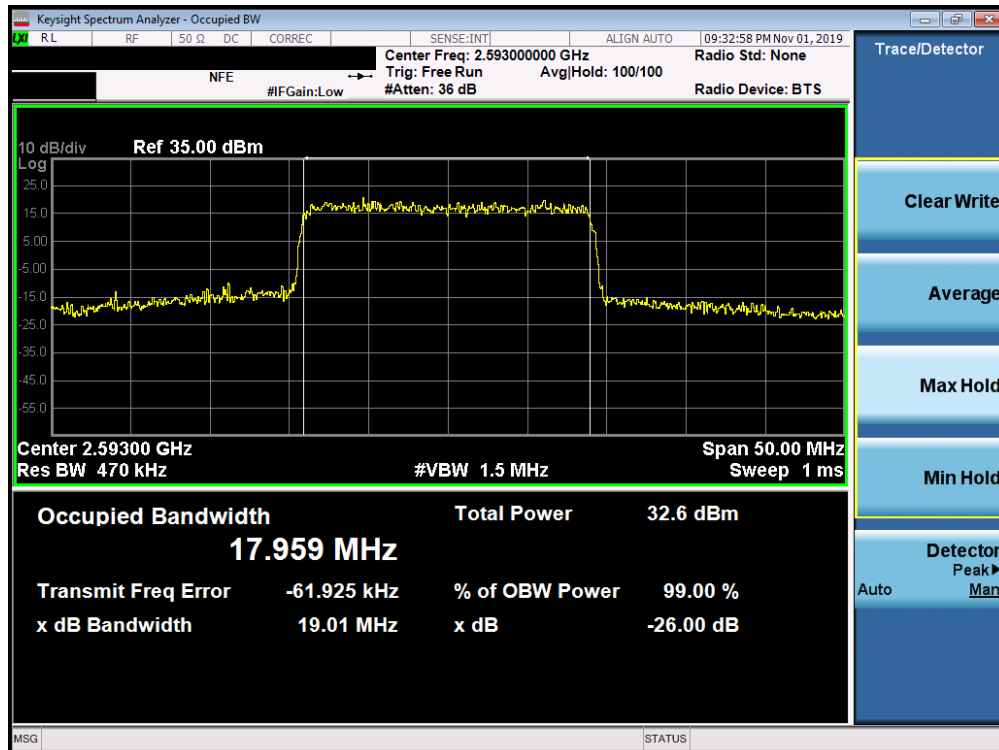


Plot 7-89. Occupied Bandwidth Plot (Band 41 (PC2) - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset	Page 62 of 250

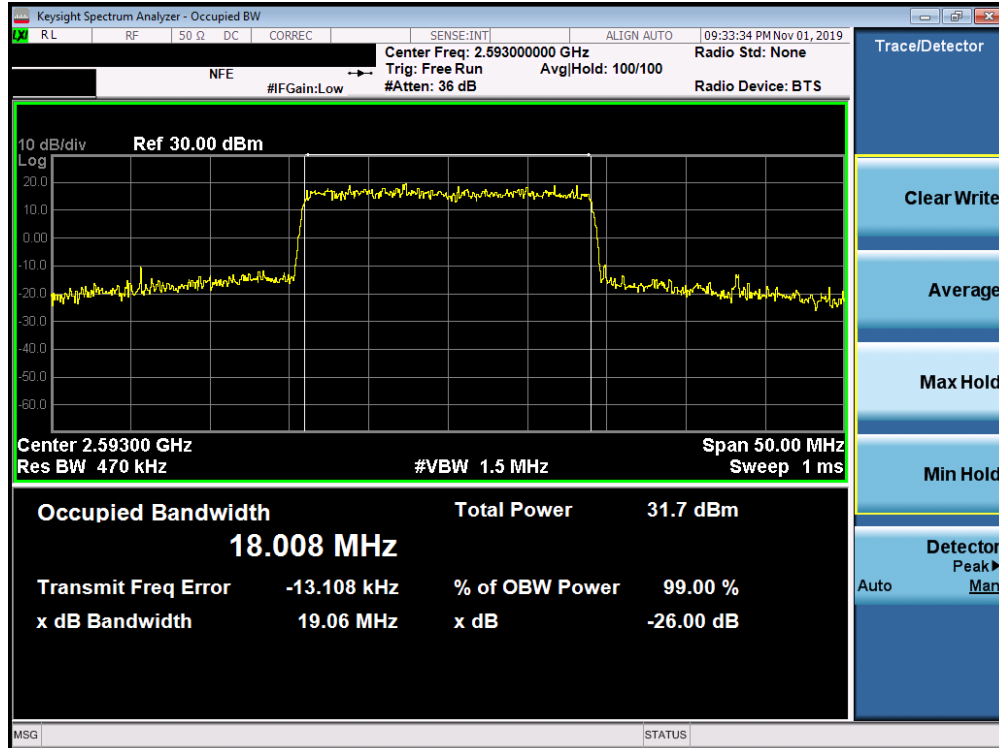


Plot 7-90. Occupied Bandwidth Plot (Band 41 (PC2) - 15.0MHz 64-QAM - Full RB Configuration)

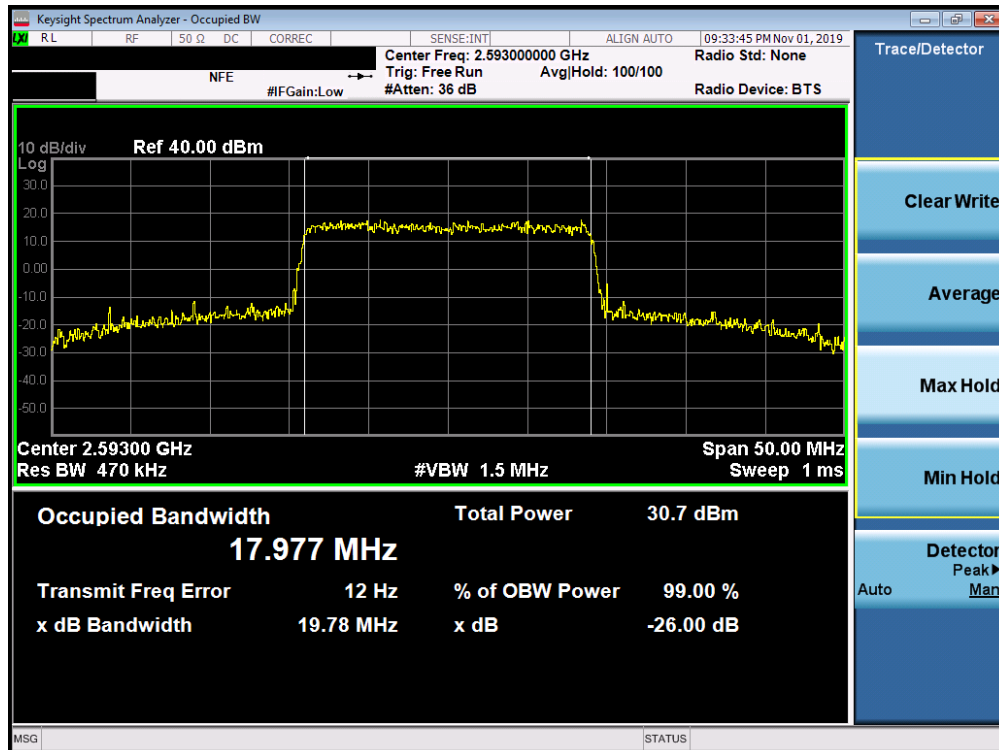


Plot 7-91. Occupied Bandwidth Plot (Band 41 (PC2) - 20.0MHz QPSK - Full RB Configuration)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 63 of 250



Plot 7-92. Occupied Bandwidth Plot (Band 41 (PC2) - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-93. Occupied Bandwidth Plot (Band 41 (PC2) - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	<b>LG</b>	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 64 of 250

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

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

### Test Procedure Used

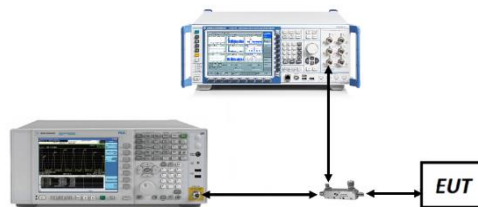
KDB 971168 D01 v03r01 – Section 6.0

### 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
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.



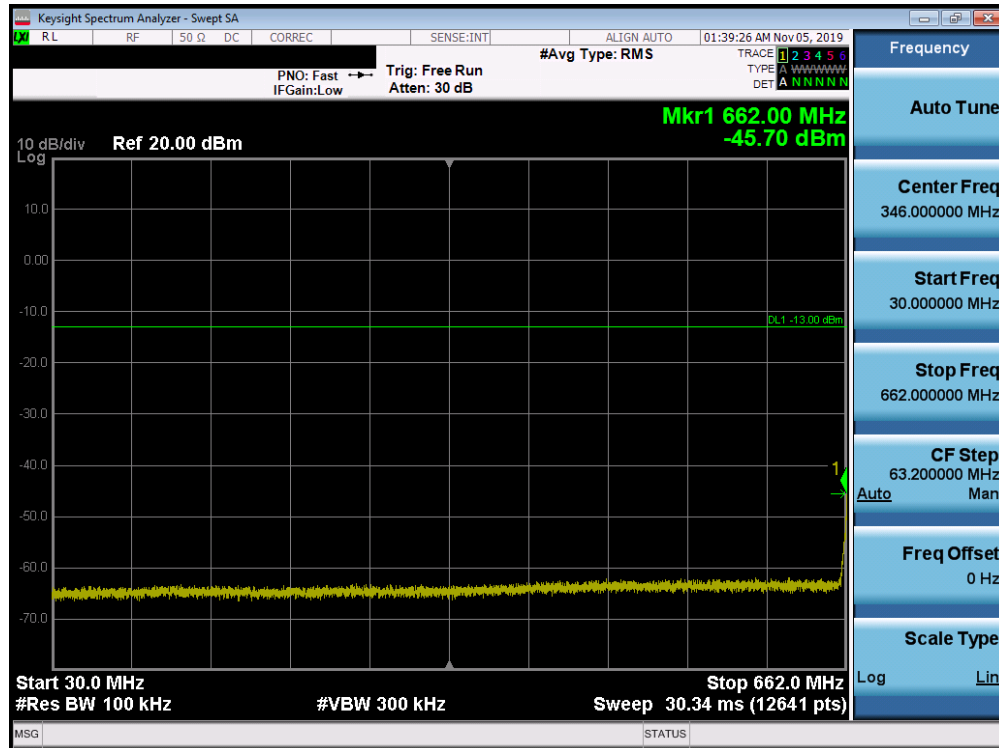
**Figure 7-2. Test Instrument & Measurement Setup**

### Test Notes

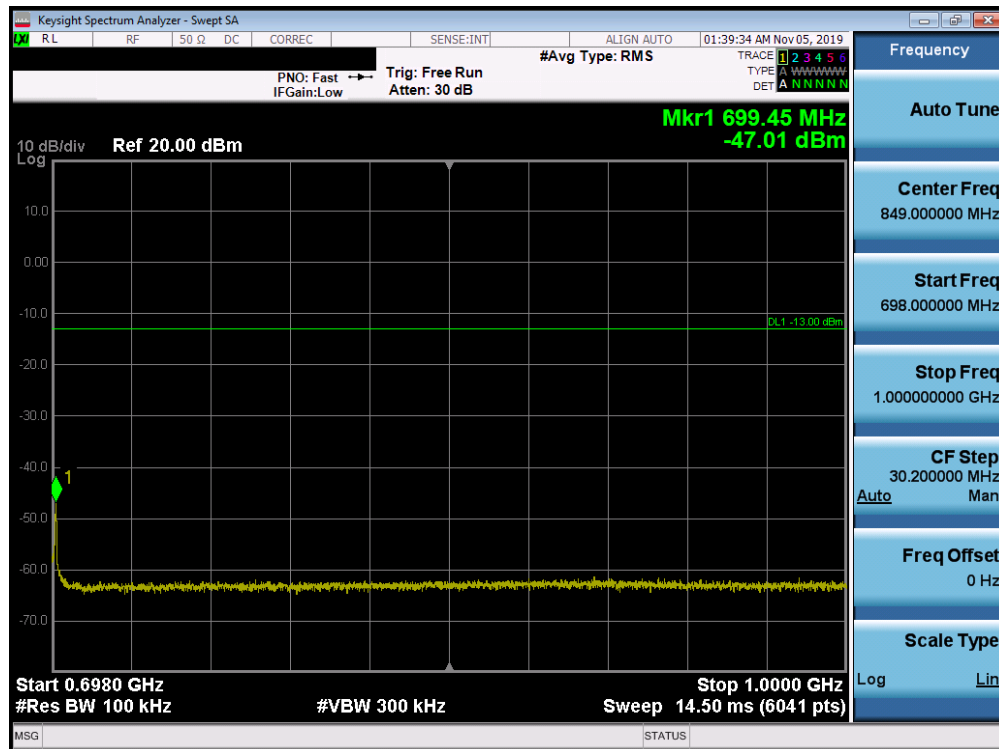
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent 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: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	LG	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/209	EUT Type: Portable Handset		Page 65 of 250

## Band 71

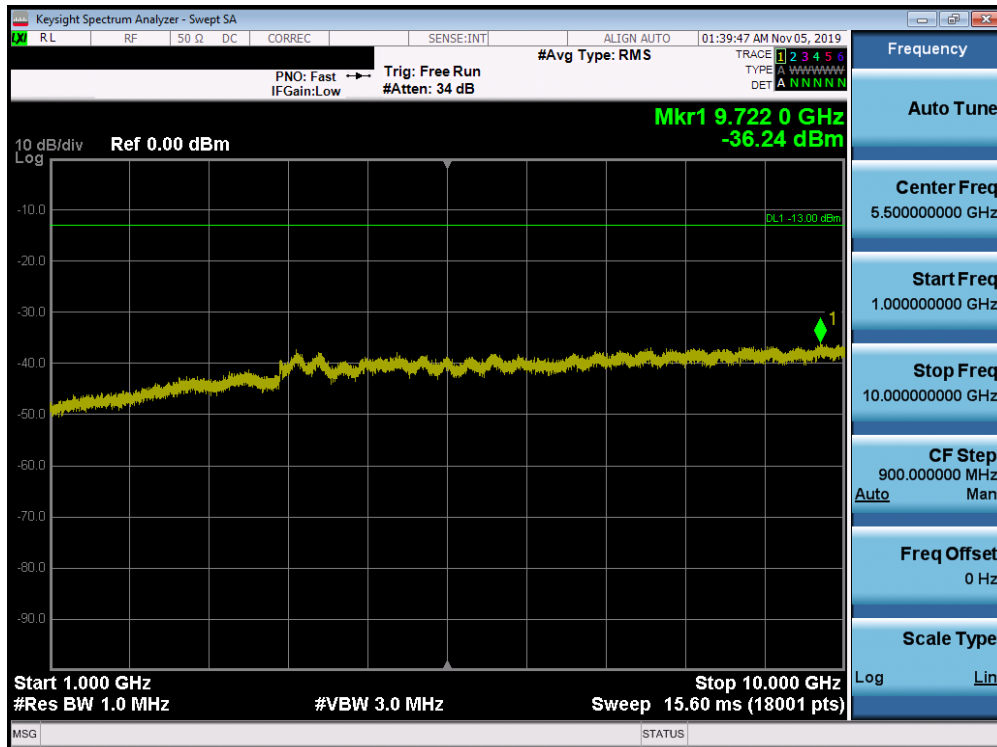


Plot 7-94. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

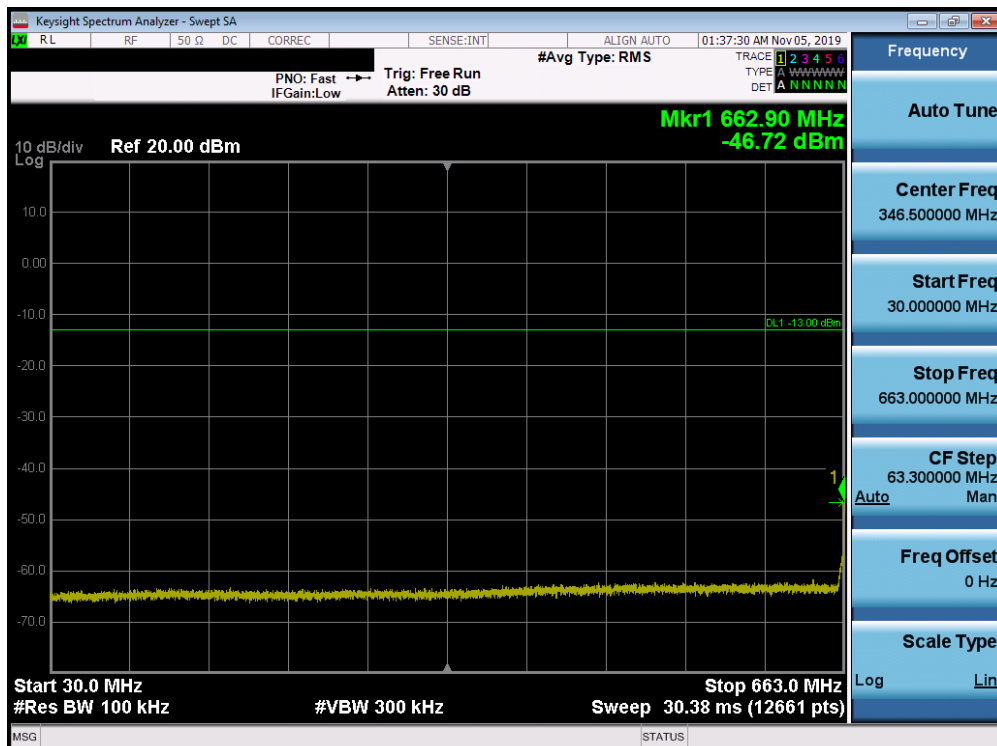


Plot 7-95. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 66 of 250



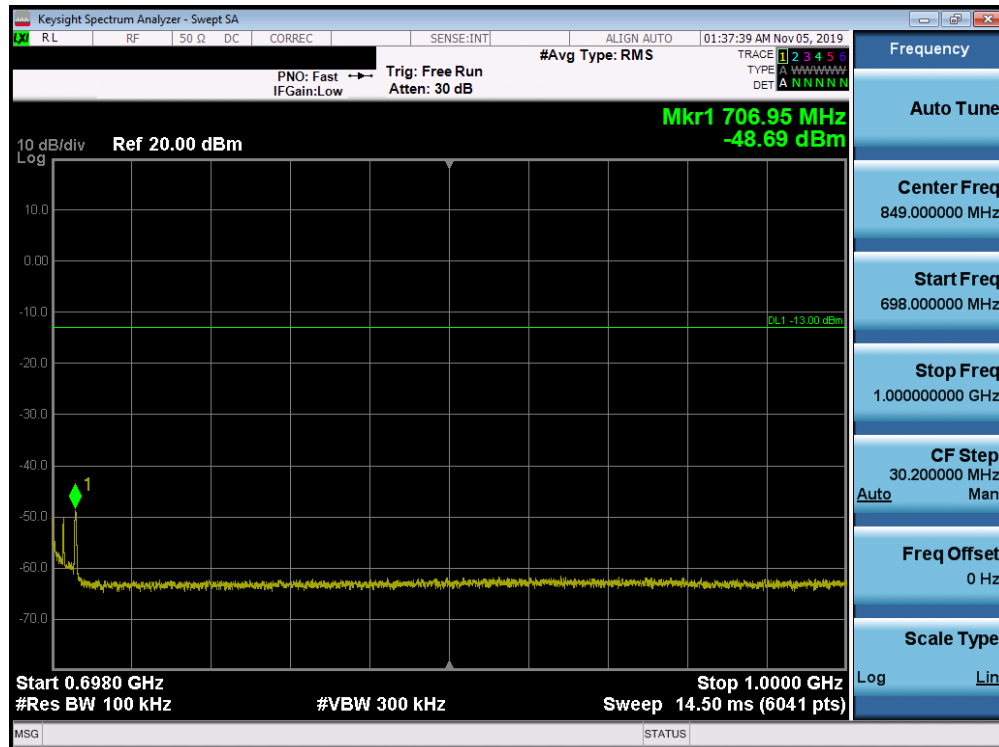
Plot 7-96. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



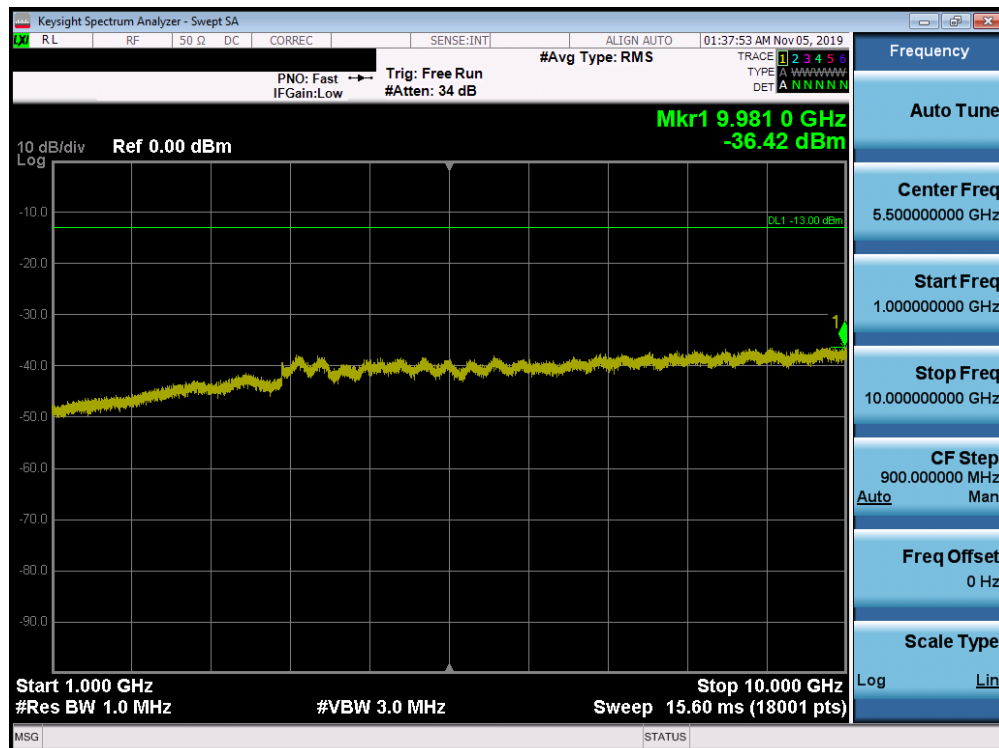
Plot 7-97. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 67 of 250



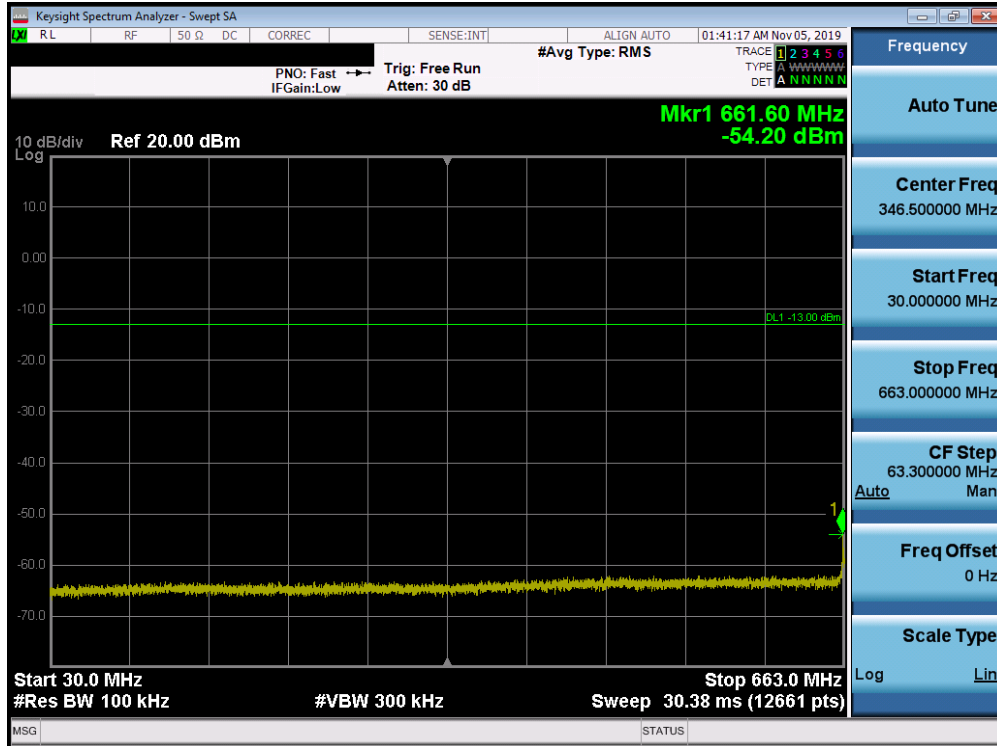


Plot 7-98. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

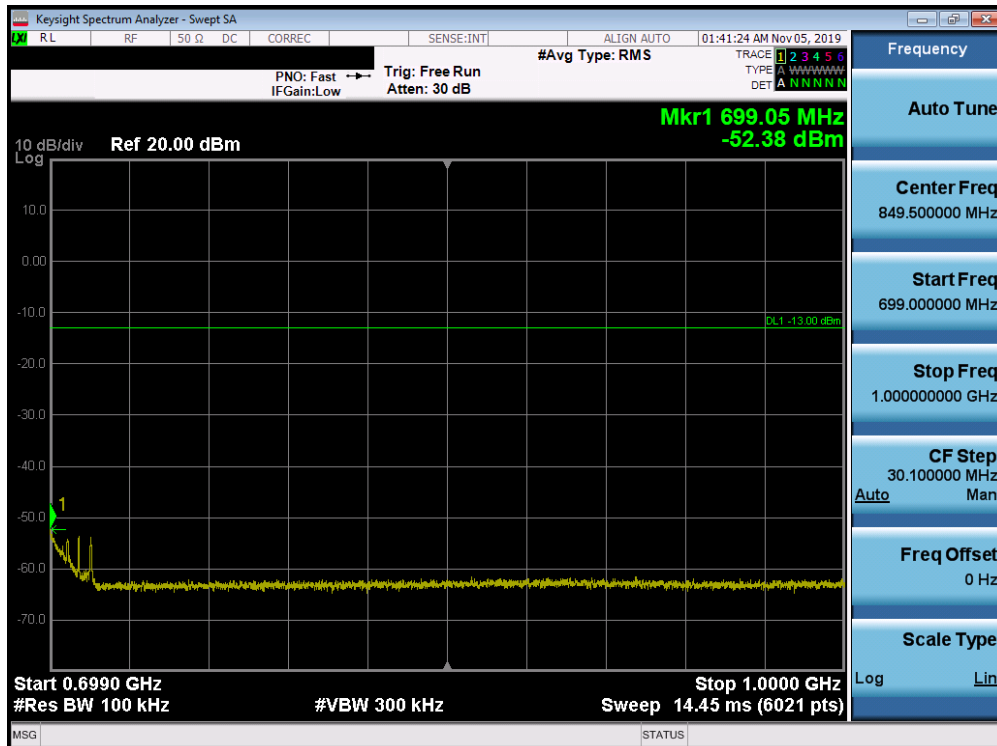


Plot 7-99. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/2019	EUT Type: Portable Handset		Page 68 of 250

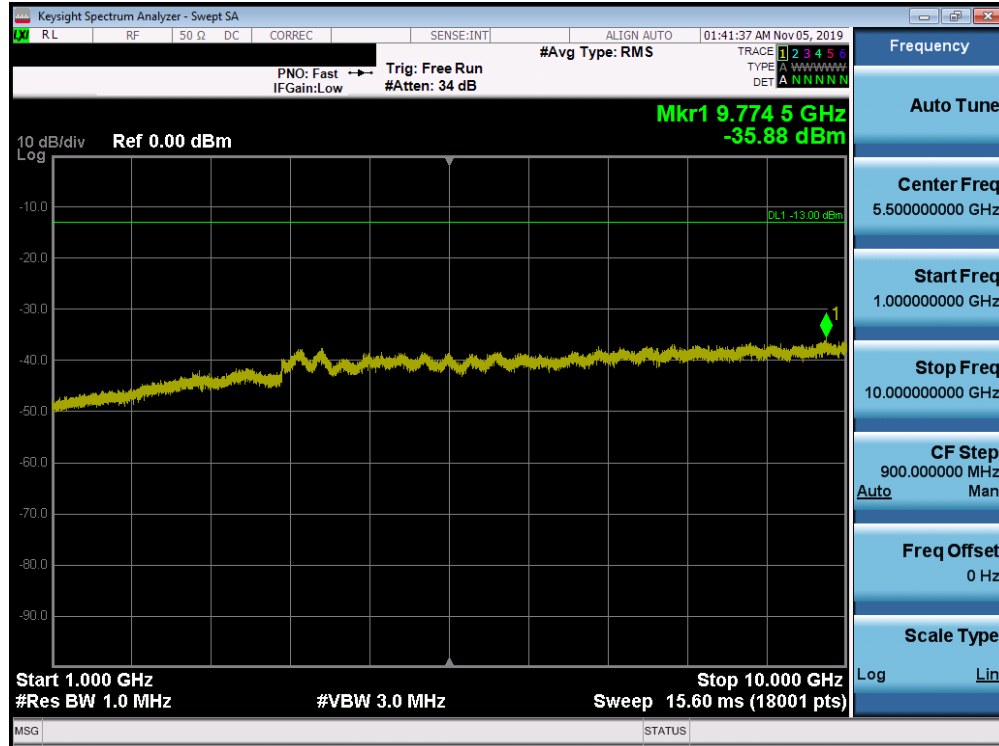


Plot 7-100. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-101. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

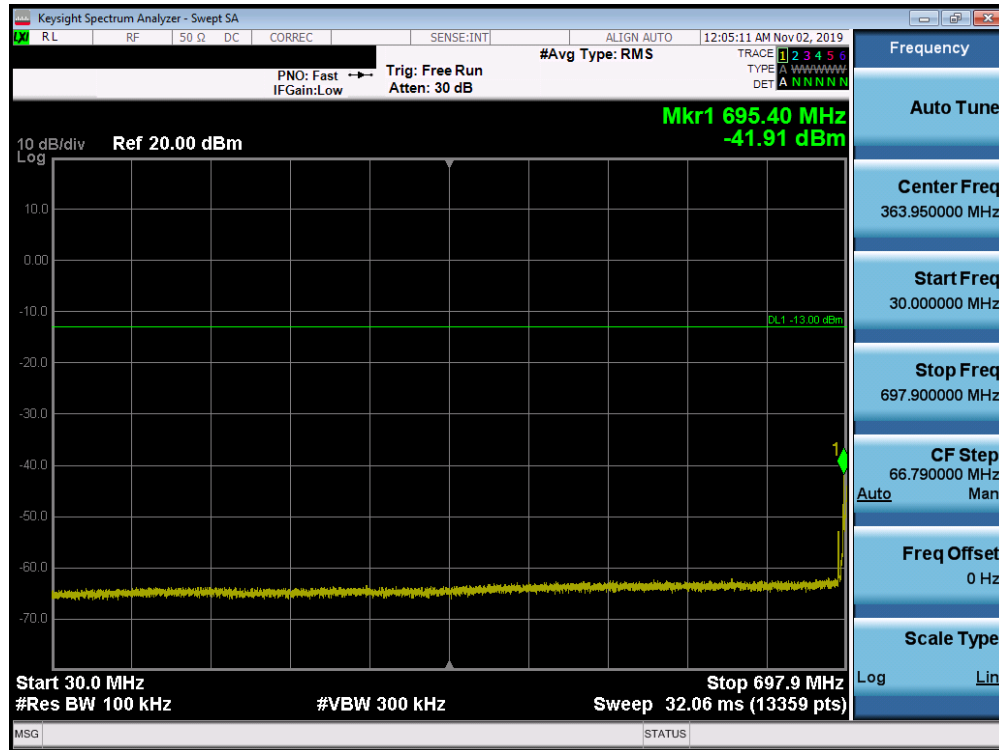
FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 69 of 250



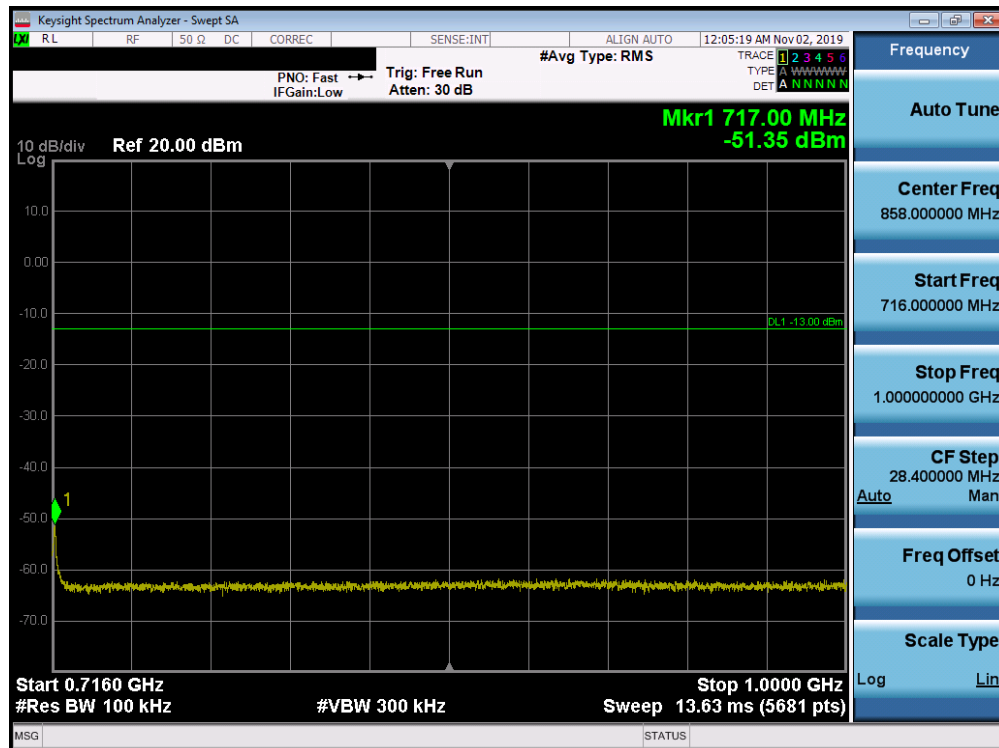
Plot 7-102. Conducted Spurious Plot (Band 71 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: ZNFL455DL	<b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2.ZNF	Test Dates: 10/28 – 11/26/209	EUT Type: Portable Handset		Page 70 of 250

## Band 12



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



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

FCC ID: ZNFL455DL	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1910280174-03-R2-ZNF	Test Dates: 10/28 - 11/26/2019	EUT Type: Portable Handset		Page 71 of 250