



## MEASUREMENT REPORT FCC Part 24 & 27 LTE

**Applicant Name:**  
LG Electronics MobileComm U.S.A  
1000 Sylvan Avenue  
Englewood Cliffs, NJ 07632  
United States

**Date of Testing:**  
2/3-3/15/2016  
**Test Site/Location:**  
PCTEST Lab., Columbia, MD, USA  
**Test Report Serial No.:**  
0Y1602020284.ZNF

<b>FCC ID :</b>	<b>ZNFK428</b>
<b>APPLICANT:</b>	<b>LG ELECTRONICS MOBILECOMM U.S.A</b>

**Application Type:** Certification  
**FCC Classification:** PCS Licensed Transmitter Held to Ear (PCE)  
**FCC Rule Part(s):** §2; §24; §27  
**Test Procedure(s):** ANSI/TIA-603-C-2004, KDB 971168 v02r02  
**EUT Type:** Portable Handset  
**Model(s):** LGK428, LG-K428, K428, LG-MS428, LGMS428, MS428  
**Test Device Serial No.:** *identical prototype [S/N: 08440]*

Mode	Tx Frequency (MHz)	Emission Designator	Modulation	ERP/EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE Band 12	699.7 - 715.3	1M12G7D	QPSK	0.096	19.82
LTE Band 12	699.7 - 715.3	1M12W7D	16QAM	0.077	18.87
LTE Band 12	700.5 - 714.5	2M73G7D	QPSK	0.095	19.78
LTE Band 12	700.5 - 714.5	2M72W7D	16QAM	0.079	18.98
LTE Band 12	701.5 - 713.5	4M51G7D	QPSK	0.105	20.20
LTE Band 12	701.5 - 713.5	4M52W7D	16QAM	0.082	19.16
LTE Band 12	704 - 711	8M99G7D	QPSK	0.098	19.92
LTE Band 12	704 - 711	8M97W7D	16QAM	0.085	19.29
LTE Band 4	1710.7 - 1754.3	1M12G7D	QPSK	0.180	22.55
LTE Band 4	1710.7 - 1754.3	1M11W7D	16QAM	0.147	21.68
LTE Band 4	1711.5 - 1753.5	2M72G7D	QPSK	0.184	22.64
LTE Band 4	1711.5 - 1753.5	2M72W7D	16QAM	0.153	21.85
LTE Band 4	1712.5 - 1752.5	4M56G7D	QPSK	0.177	22.48
LTE Band 4	1712.5 - 1752.5	4M52W7D	16QAM	0.150	21.77
LTE Band 4	1715 - 1750	8M97G7D	QPSK	0.235	23.70
LTE Band 4	1715 - 1750	8M99W7D	16QAM	0.201	23.03
LTE Band 4	1717.5 - 1747.5	13M5G7D	QPSK	0.244	23.87
LTE Band 4	1717.5 - 1747.5	13M4W7D	16QAM	0.202	23.05
LTE Band 4	1720 - 1745	18M0G7D	QPSK	0.214	23.30
LTE Band 4	1720 - 1745	18M0W7D	16QAM	0.184	22.64
LTE Band 2	1850.7 - 1909.3	1M11G7D	QPSK	0.217	23.36
LTE Band 2	1850.7 - 1909.3	1M12W7D	16QAM	0.174	22.40
LTE Band 2	1851.5 - 1908.5	2M73G7D	QPSK	0.220	23.42
LTE Band 2	1851.5 - 1908.5	2M72W7D	16QAM	0.179	22.53
LTE Band 2	1852.5 - 1907.5	4M53G7D	QPSK	0.200	23.01
LTE Band 2	1852.5 - 1907.5	4M51W7D	16QAM	0.157	21.96
LTE Band 2	1855 - 1905	9M00G7D	QPSK	0.188	22.75
LTE Band 2	1855 - 1905	9M00W7D	16QAM	0.160	22.05
LTE Band 2	1857.5 - 1902.5	13M5G7D	QPSK	0.174	22.41
LTE Band 2	1857.5 - 1902.5	13M5W7D	16QAM	0.147	21.67
LTE Band 2	1860 - 1900	17M9G7D	QPSK	0.171	22.33
LTE Band 2	1860 - 1900	18M0W7D	16QAM	0.139	21.43

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

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

  
Randy Ortañez  
President



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<b>Test Report S/N:</b> 0Y1602020284.ZNF	<b>Test Dates:</b> 2/3-3/15/2016	<b>EUT Type:</b> Portable Handset		Page 1 of 99

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# MEASUREMENT REPORT

## FCC Part 24 & 27

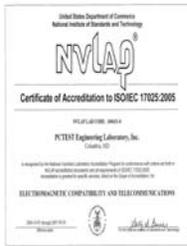
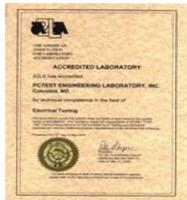


### §2.1033 General Information

**APPLICANT:** LG Electronics MobileComm U.S.A  
**APPLICANT ADDRESS:** 1000 Sylvan Avenue  
 Englewood Cliffs, NJ 07632, United States  
**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.  
**TEST SITE ADDRESS:** 7185 Oakland Mills Road, Columbia, MD 21045 USA  
**FCC RULE PART(S):** §2; §24; §27  
**BASE MODEL:** LGK428  
**FCC ID:** ZNFK428  
**FCC CLASSIFICATION:** PCS Licensed Transmitter Held to Ear (PCE)  
**FREQUENCY TOLERANCE:** ±0.00025 % (2.5 ppm)  
**Test Device Serial No.:** 08440  Production  Pre-Production  Engineering  
**DATE(S) OF TEST:** 2/3-3/15/2016  
**TEST REPORT S/N:** 0Y1602020284.ZNF

### Test Facility / Accreditations

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



- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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# 1.0 INTRODUCTION

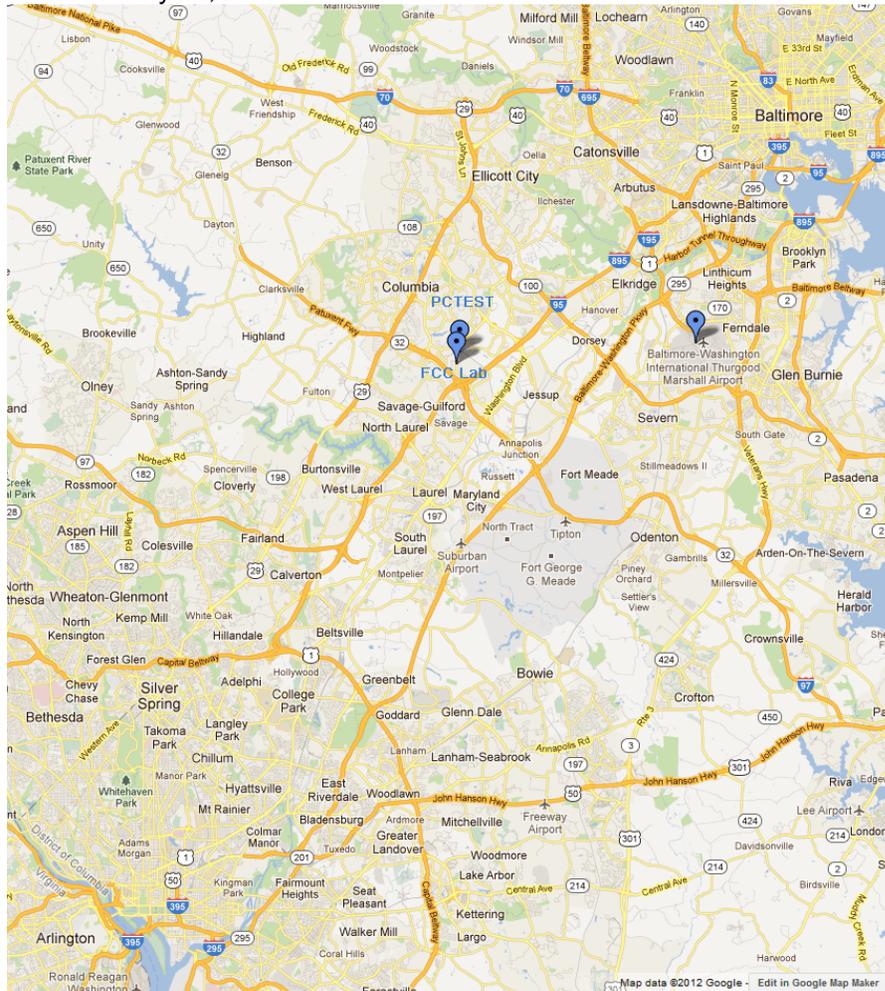
## 1.1 Scope

Measurement and determination of electromagnetic emissions (EME) 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 Industry Canada Certification and Engineering Bureau.

## 1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFK428**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

### 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, Bluetooth (1x, EDR, LE), NFC

### 2.3 Test Configuration

The LG Portable Handset FCC ID: ZNFK428 was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 v02r02. 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-C-2004) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168 v02r02) were used in the measurement of the **LG Portable Handset FCC ID: ZNFK428**.

### 3.2 Block A Frequency Range

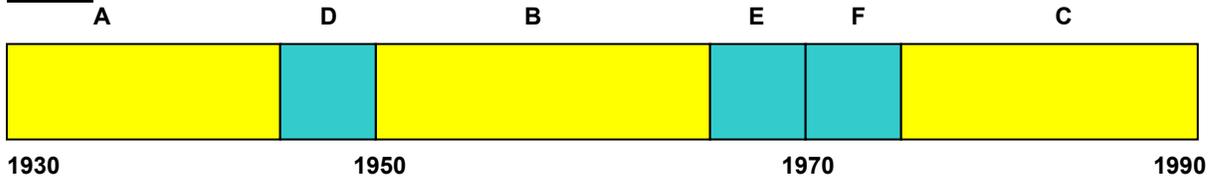
#### §27.5(c)

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.

### 3.3 PCS - Base Frequency Blocks

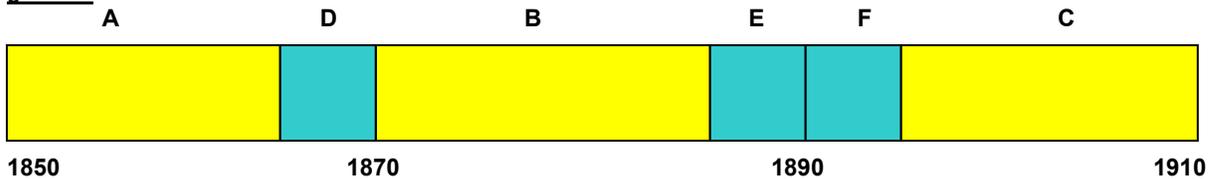
#### §24.229



BLOCK 1: 1930 – 1945 MHz (A)	BLOCK 4: 1965 – 1970 MHz (E)
BLOCK 2: 1945 – 1950 MHz (D)	BLOCK 5: 1970 – 1975 MHz (F)
BLOCK 3: 1950 – 1965 MHz (B)	BLOCK 6: 1975 – 1990 MHz (C)

### 3.4 PCS - Mobile Frequency Blocks

#### §24.229

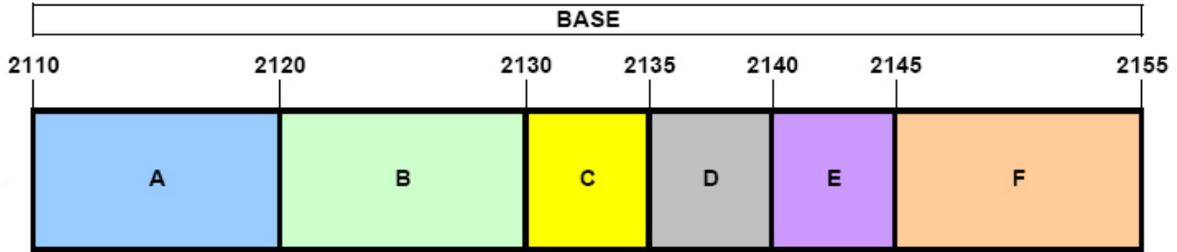


BLOCK 1: 1850 – 1865 MHz (A)	BLOCK 4: 1885 – 1890 MHz (E)
BLOCK 2: 1865 – 1870 MHz (D)	BLOCK 5: 1890 – 1895 MHz (F)
BLOCK 3: 1870 – 1885 MHz (B)	BLOCK 6: 1895 – 1910 MHz (C)

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### 3.5 AWS - Base Frequency Blocks

§27.5(h)

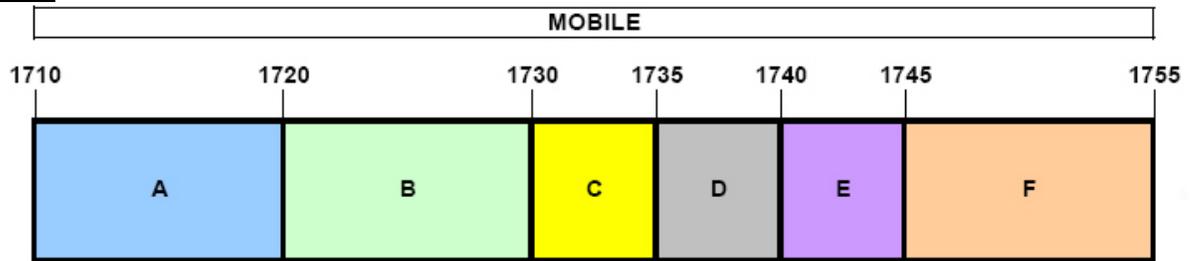


BLOCK 1: 2110 – 2120 MHz (A)  
 BLOCK 2: 2120 – 2130 MHz (B)  
 BLOCK 3: 2130 – 2135 MHz (C)

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

### 3.6 AWS - Mobile Frequency Blocks

§27.5(h)



BLOCK 1: 1710 – 1720 MHz (A)  
 BLOCK 2: 1720 – 1730 MHz (B)  
 BLOCK 3: 1730 – 1735 MHz (C)

BLOCK 4: 1735 – 1740 MHz (D)  
 BLOCK 5: 1740 – 1745 MHz (E)  
 BLOCK 6: 1745 – 1755 MHz (F)

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### 3.7 Radiated Power and Radiated Spurious Emissions

§2.1053 §24.232(c) §24.238(a) §27.50(c.10) §27.50(d.4) §27.53(g) §27.53(h)

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 Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz 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 below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It 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. A 78cm high PVC support structure is placed on top of the turntable. A 3/4" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

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.

Per the guidance of ANSI/TIA-603-C-2004, 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:

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

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  $P_g [dBm] - \text{cable loss} [dB]$ .

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

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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 data shown herein 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).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTX3	Licensed Transmitter Cable Set	6/12/2015	Annual	6/12/2016	LTX3
-	RE3	Radiated Emissions Cable Set	4/29/2015	Annual	4/29/2016	RE3
Agilent	8447D	Broadband Amplifier	6/12/2015	Annual	6/12/2016	2443A01900
Agilent	N9020A	MXA Signal Analyzer	11/5/2015	Annual	11/5/2016	US46470561
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Espec	ESX-2CA	Environmental Chamber	3/17/2015	Annual	3/17/2016	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/8/2014	Biennial	4/8/2016	125518
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	135427
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	10/22/2014	Biennial	10/22/2016	128338
K & L	11SH10-3075/U18000	High Pass Filter	7/18/2015	Annual	7/18/2016	11SH10-3075/U18000-2
K & L	13SH10-1000/U1000	N Type High Pass Filter	7/18/2015	Annual	7/18/2016	13SH10-1000/U1000-2
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	3/11/2015	Annual	3/11/2016	11401010036
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Mini-Circuits	TVA-11-422	RF Power Amp	N/A			QA1303002
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			102060
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/17/2015	Annual	7/17/2016	100348
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100040
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/18/2015	Biennial	11/18/2017	91052523RX
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/28/2014	Biennial	3/28/2016	A051107

**Table 5-1. Test Equipment**

**Notes:**

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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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

#### 16QAM 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 MobileComm U.S.A  
 FCC ID: ZNFK428  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Result	Reference
<b>TRANSMITTER MODE (TX)</b>					
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 24.238(a) 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		PASS	Section 7.3, 7.4
24.232(d)	Peak-Average Ratio	< 13 dB		PASS	Section 7.5
2.1046	Transmitter Conducted Output Power	N/A		PASS	See RF Exposure Report
2.1055. 24.235 27.54	Frequency Stability	Fundamental emissions stay within authorized frequency block (Part 24, 27)		PASS	Section 7.8
27.50(c.10)	Effective Radiated Power (Band 12)	< 3 Watts max. ERP	RADIATED	PASS	Section 7.6
24.232(c)	Equivalent Isotropic Radiated Power (Band 2)	< 2 Watts max. EIRP		PASS	Section 7.6
27.50(d.4)	Equivalent Isotropic Radiated Power (Band 4)	< 1 Watts max. EIRP		PASS	Section 7.6
2.1053 24.238(a) 27.53(g) 27.53(h)	Undesirable Emissions	> 43 + 10log <sub>10</sub> (P[Watts]) for all out-of-band emissions		PASS	Section 7.7

**Table 7-1. Summary of 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 4.0.

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## 7.2 Occupied Bandwidth

§2.1049

### 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

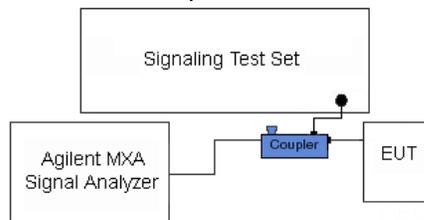
KDB 971168 v02r02 – Section 4.2

### 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.

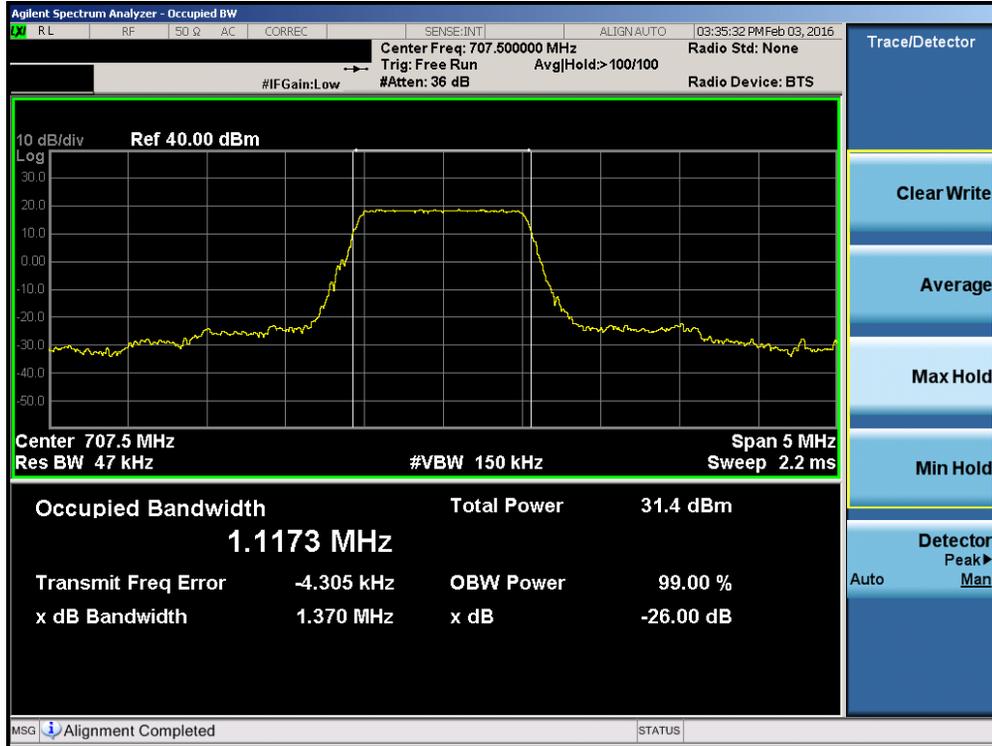


**Figure 7-1. Test Instrument & Measurement Setup**

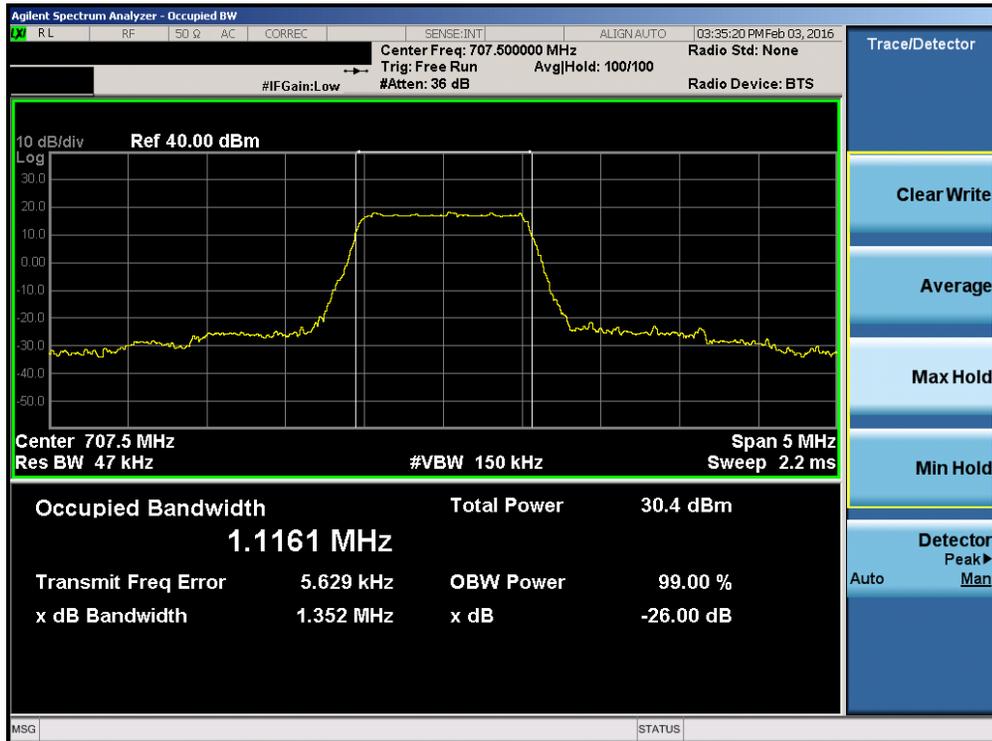
### Test Notes

None.

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Plot 7-1. Occupied Bandwidth Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

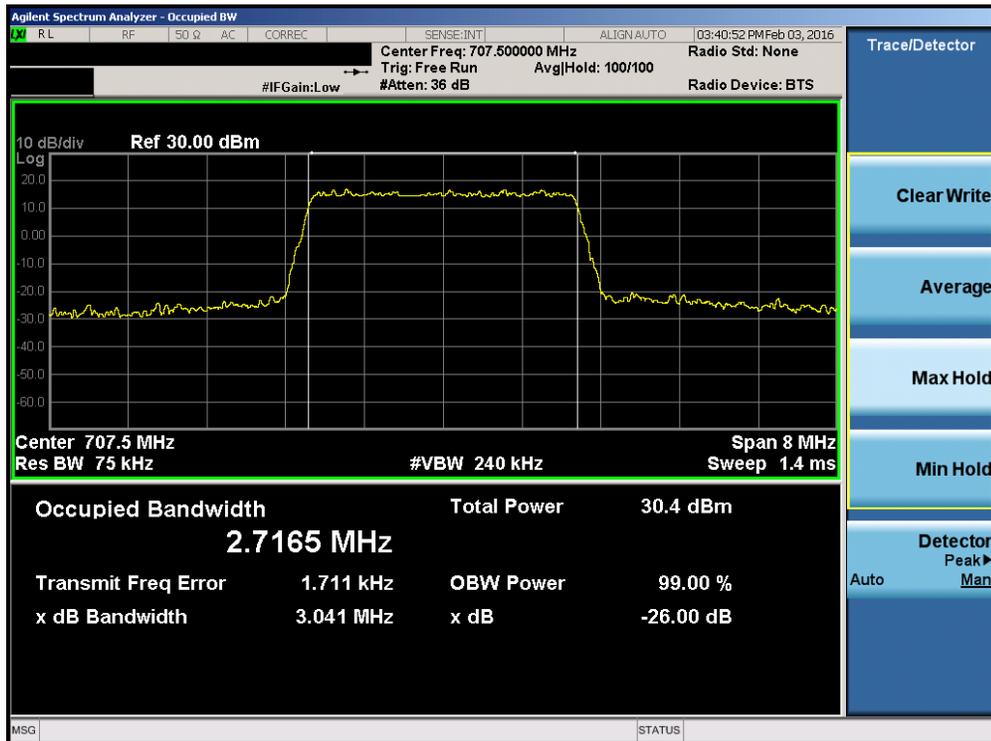


Plot 7-2. Occupied Bandwidth Plot (Band 12 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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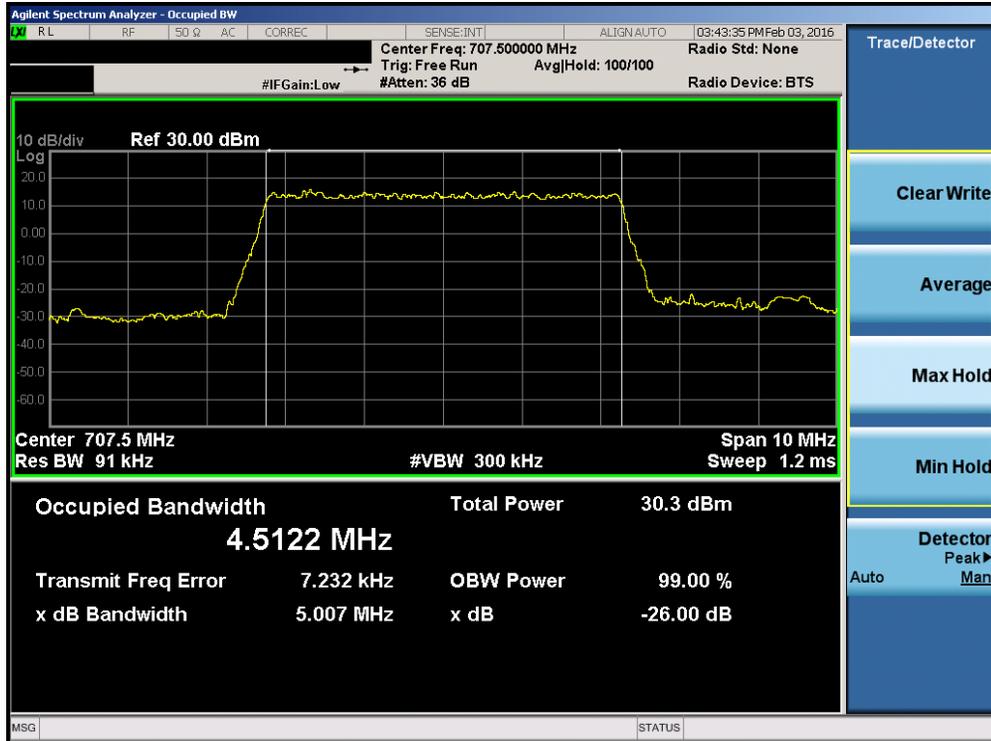


Plot 7-3. Occupied Bandwidth Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

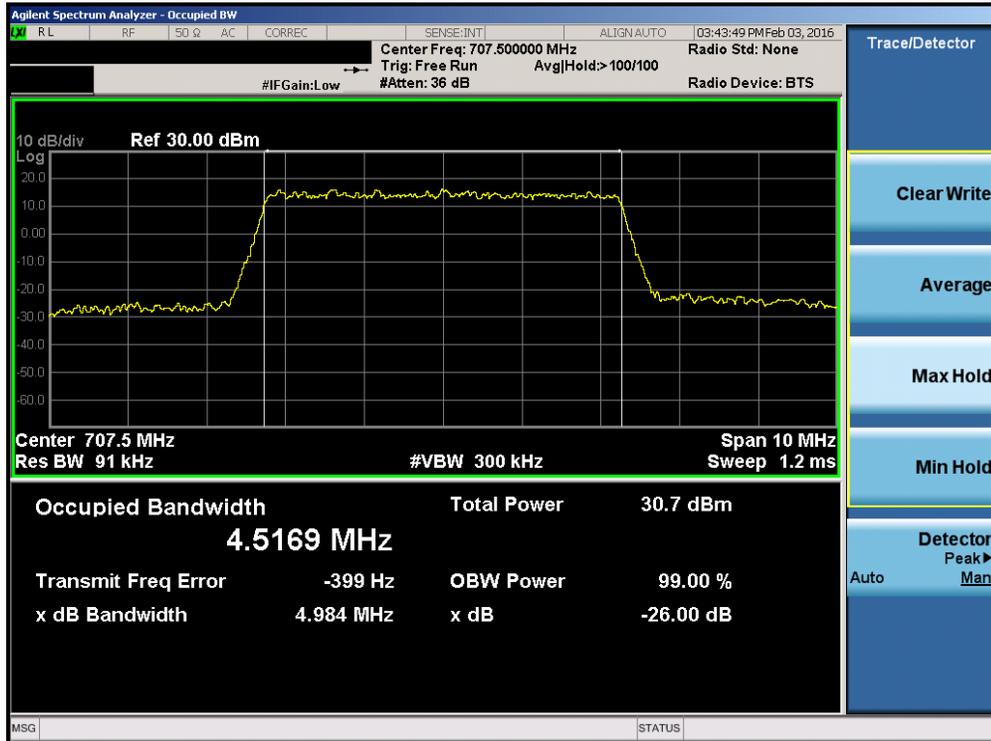


Plot 7-4. Occupied Bandwidth Plot (Band 12 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 15 of 99

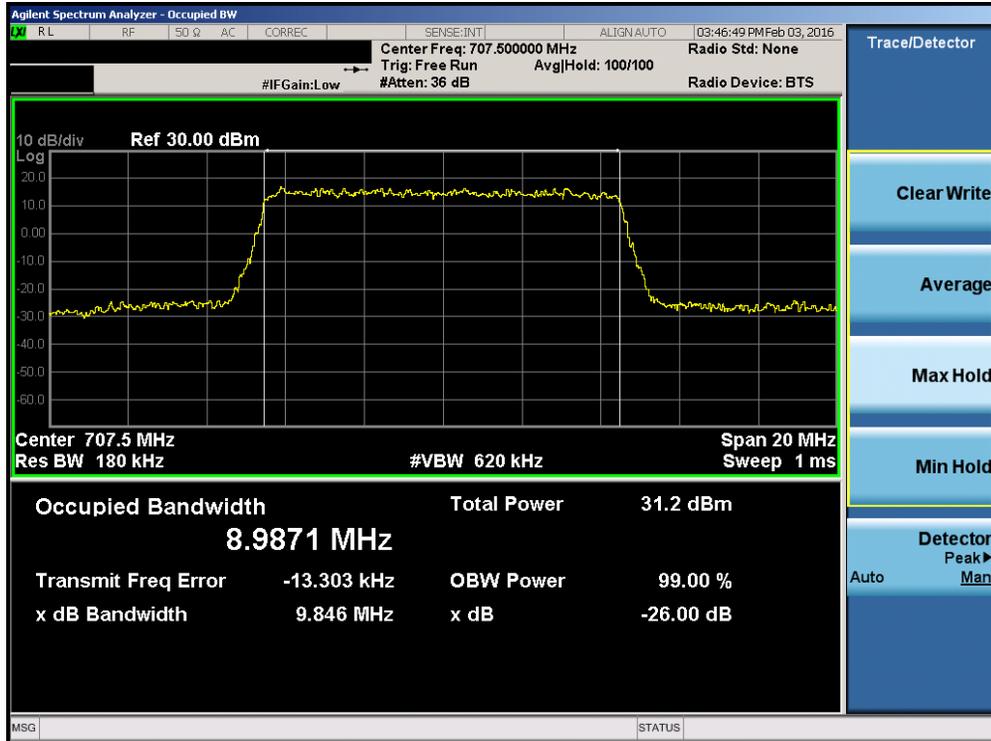


Plot 7-5. Occupied Bandwidth Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

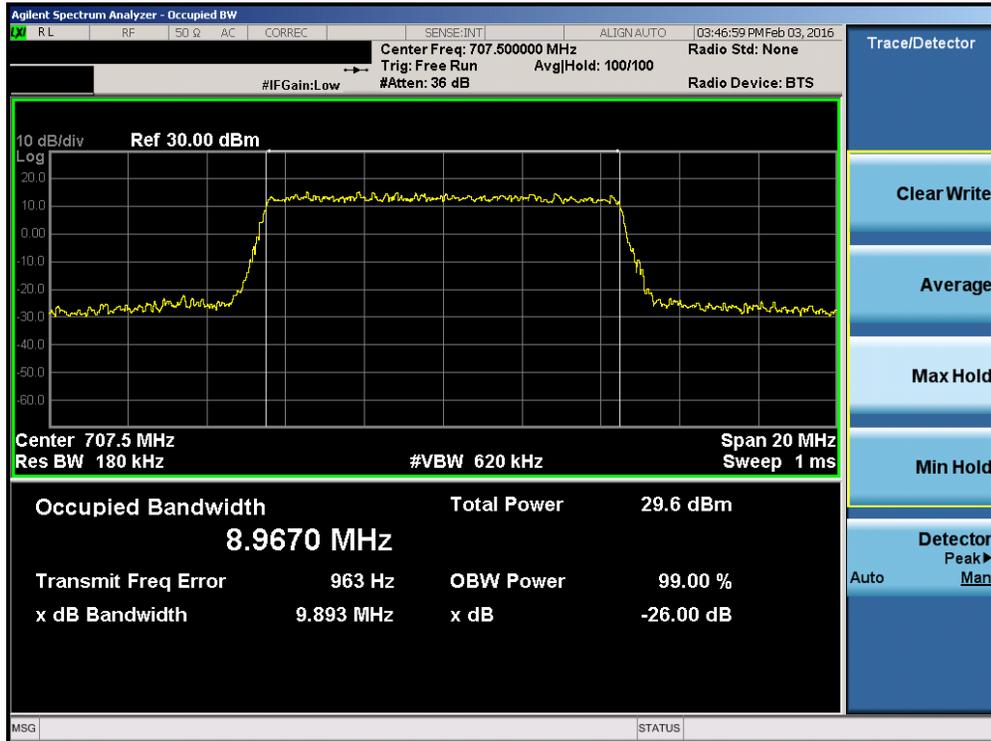


Plot 7-6. Occupied Bandwidth Plot (Band 12 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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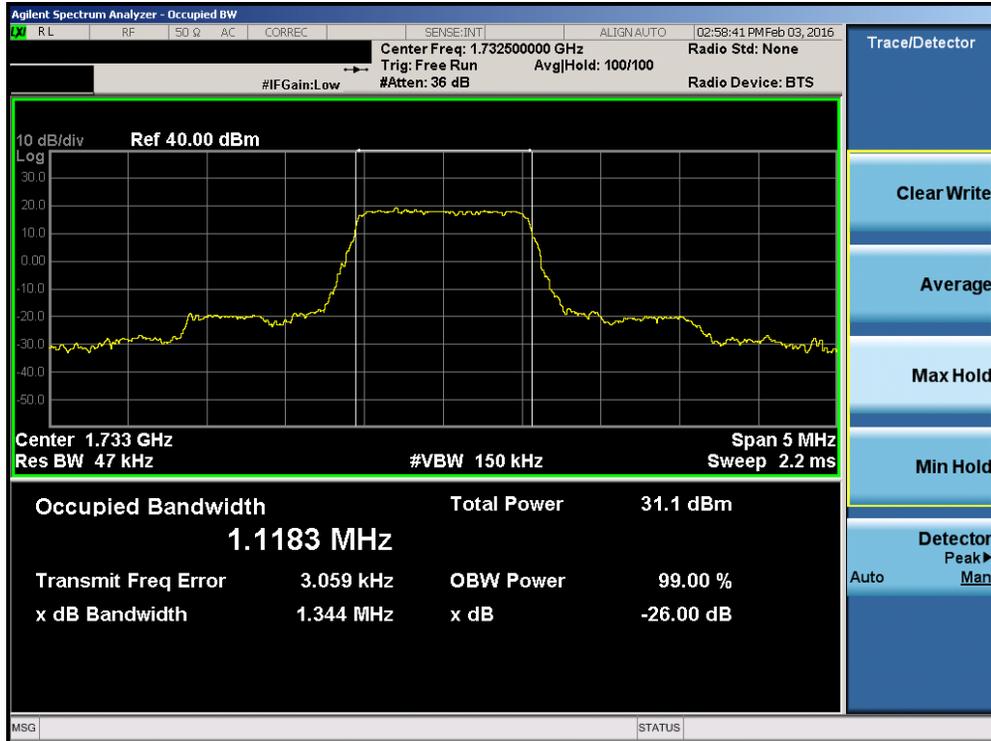


Plot 7-7. Occupied Bandwidth Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

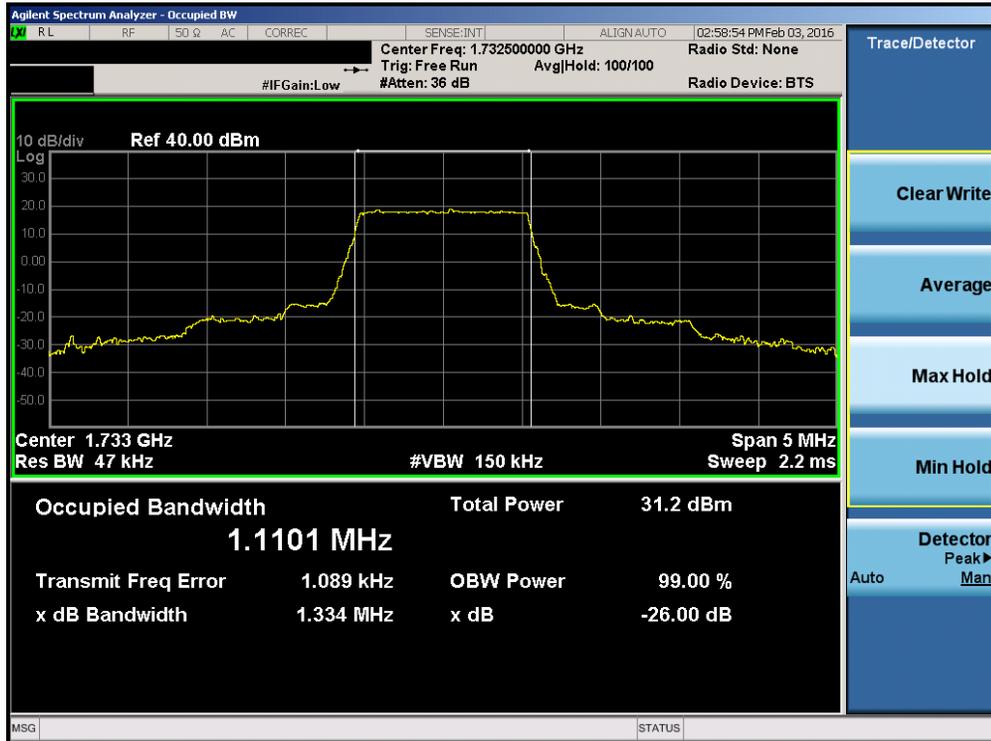


Plot 7-8. Occupied Bandwidth Plot (Band 12 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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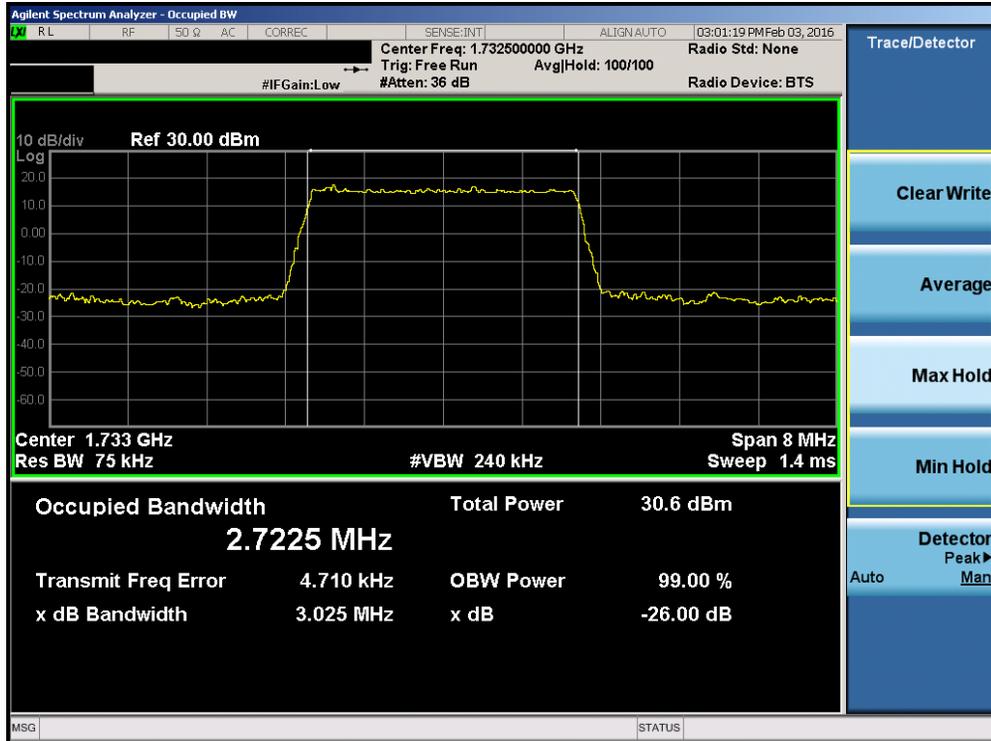


Plot 7-9. Occupied Bandwidth Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

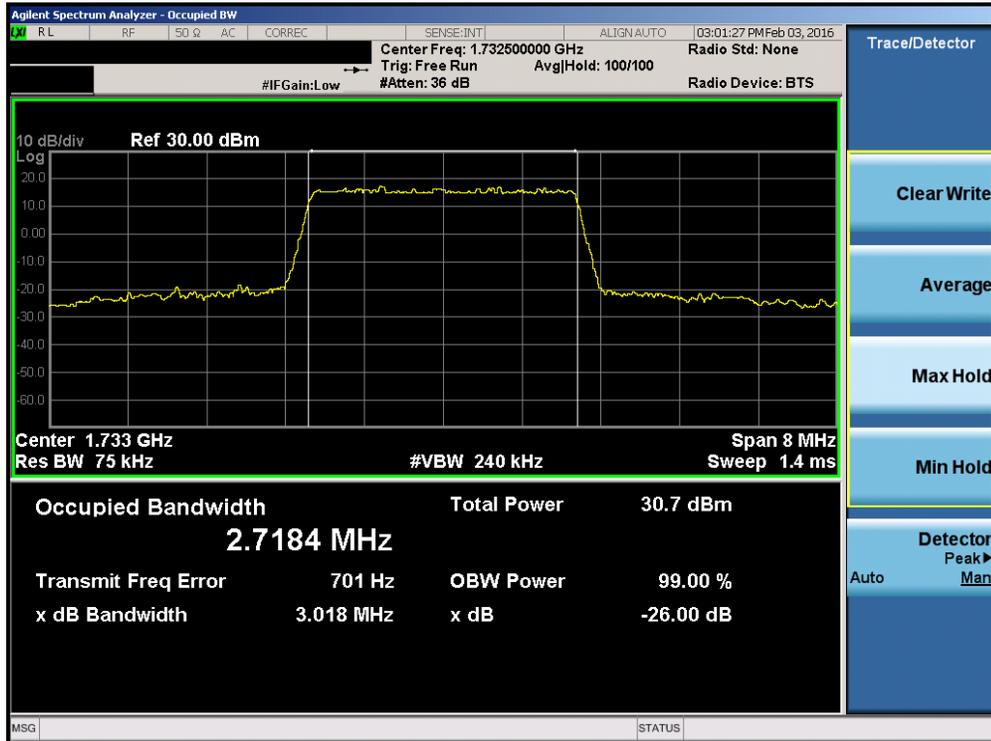


Plot 7-10. Occupied Bandwidth Plot (Band 4 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 18 of 99

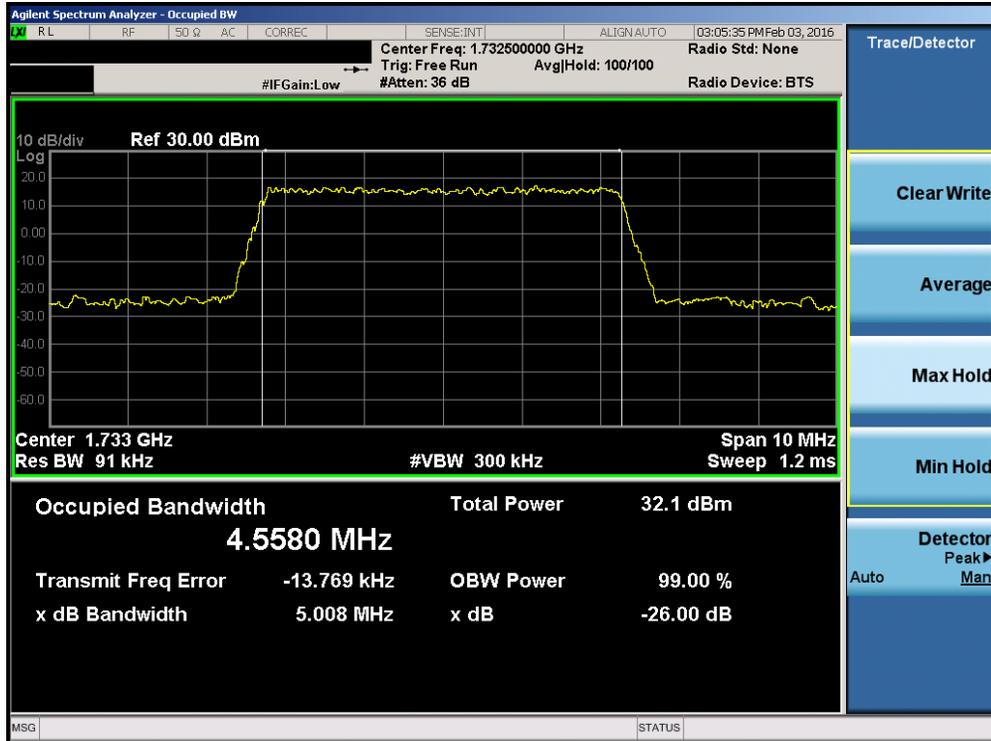


Plot 7-11. Occupied Bandwidth Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

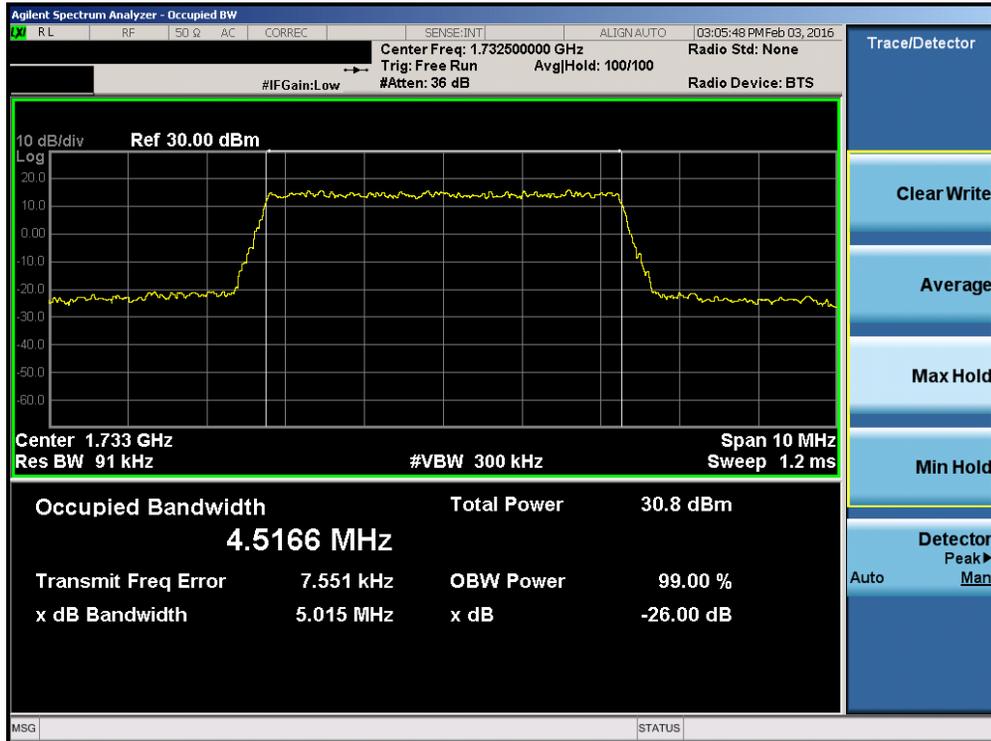


Plot 7-12. Occupied Bandwidth Plot (Band 4 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 19 of 99

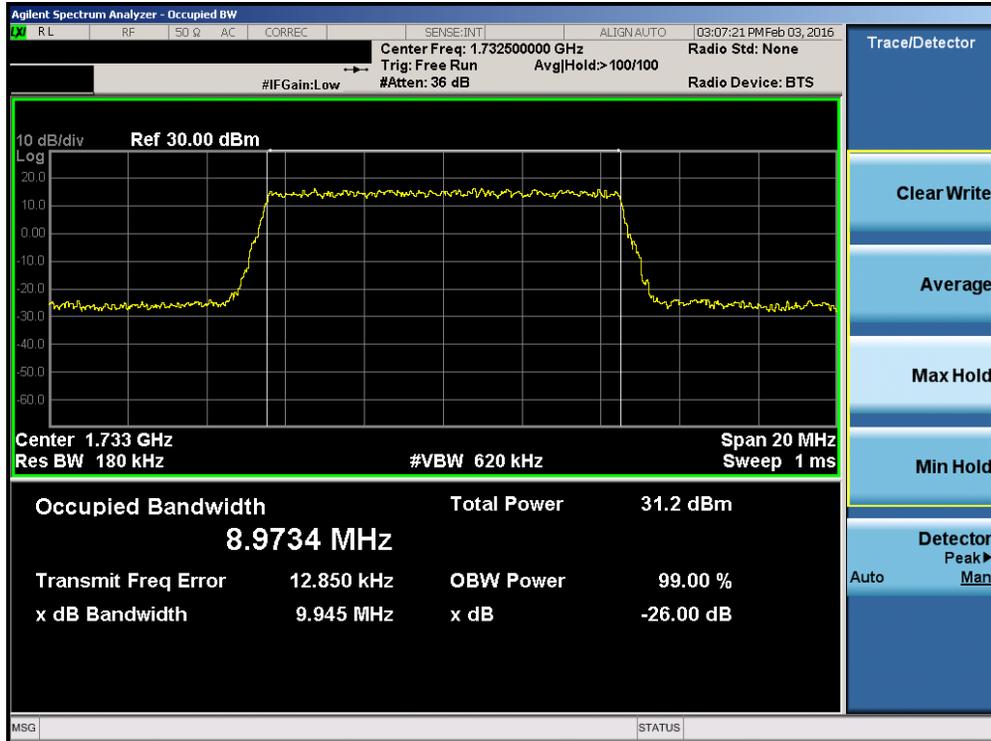


Plot 7-13. Occupied Bandwidth Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

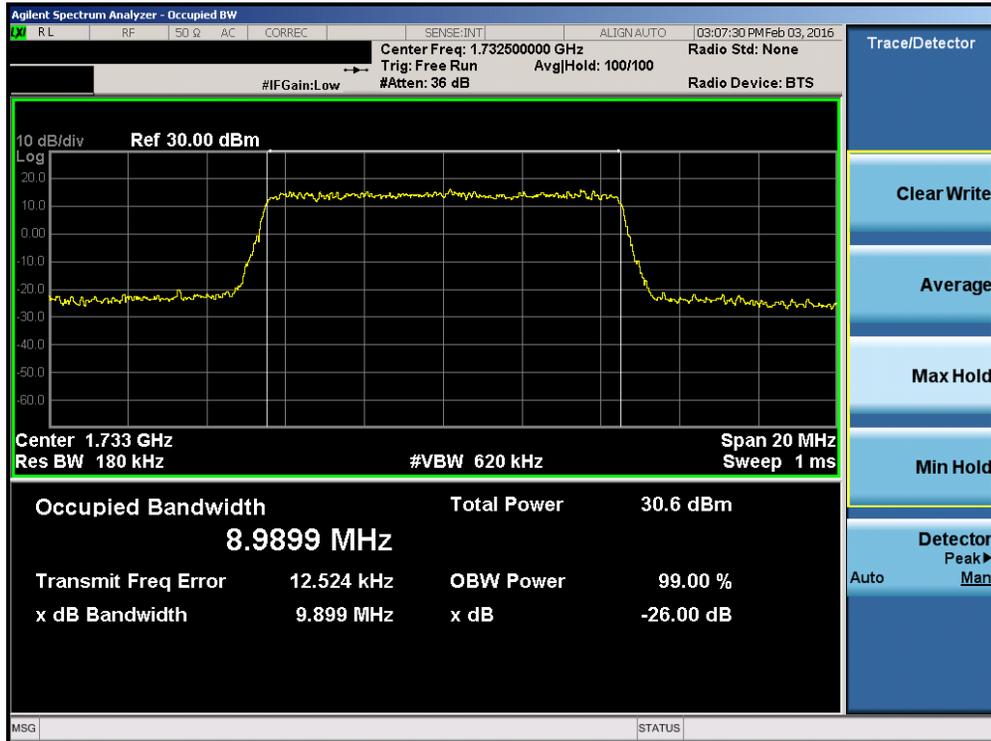


Plot 7-14. Occupied Bandwidth Plot (Band 4 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 20 of 99

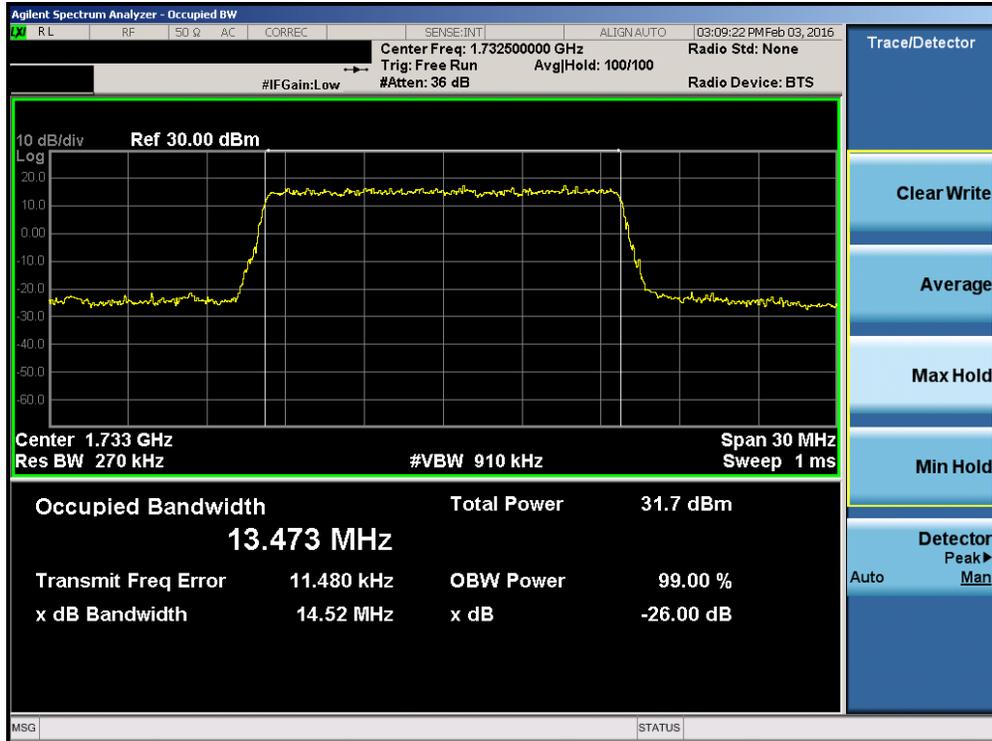


Plot 7-15. Occupied Bandwidth Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

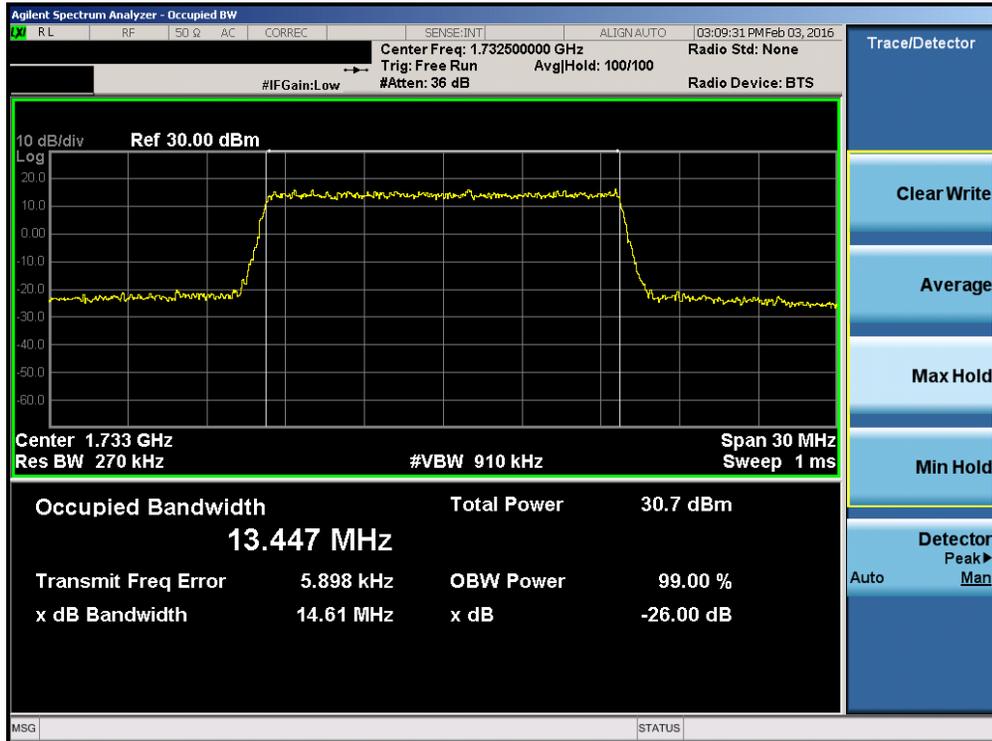


Plot 7-16. Occupied Bandwidth Plot (Band 4 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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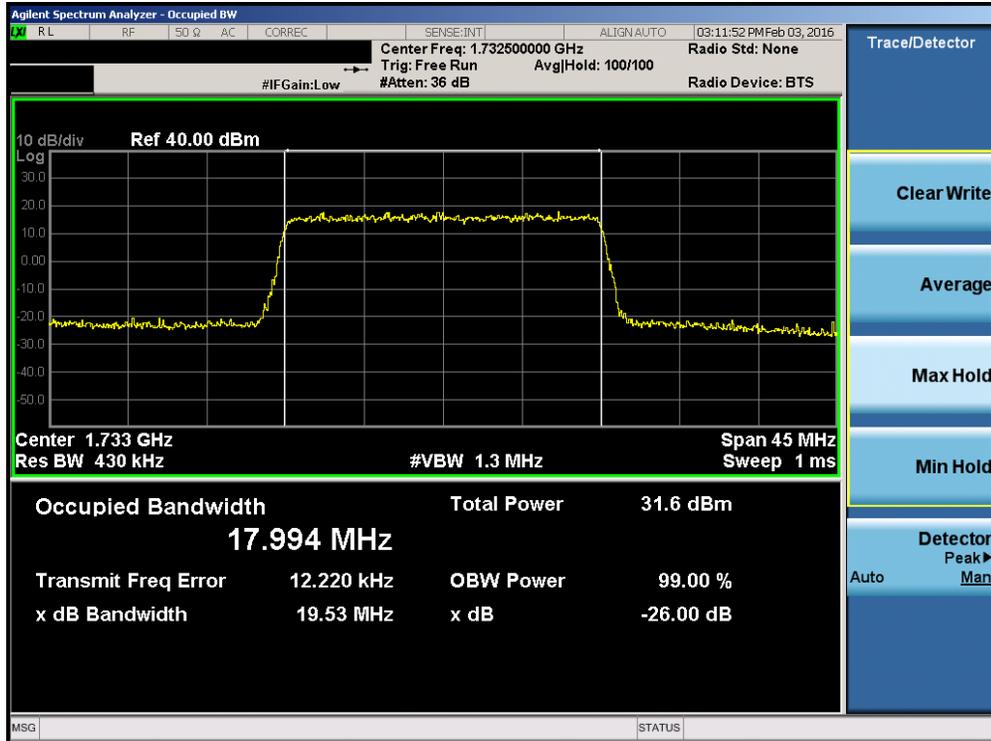


Plot 7-17. Occupied Bandwidth Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

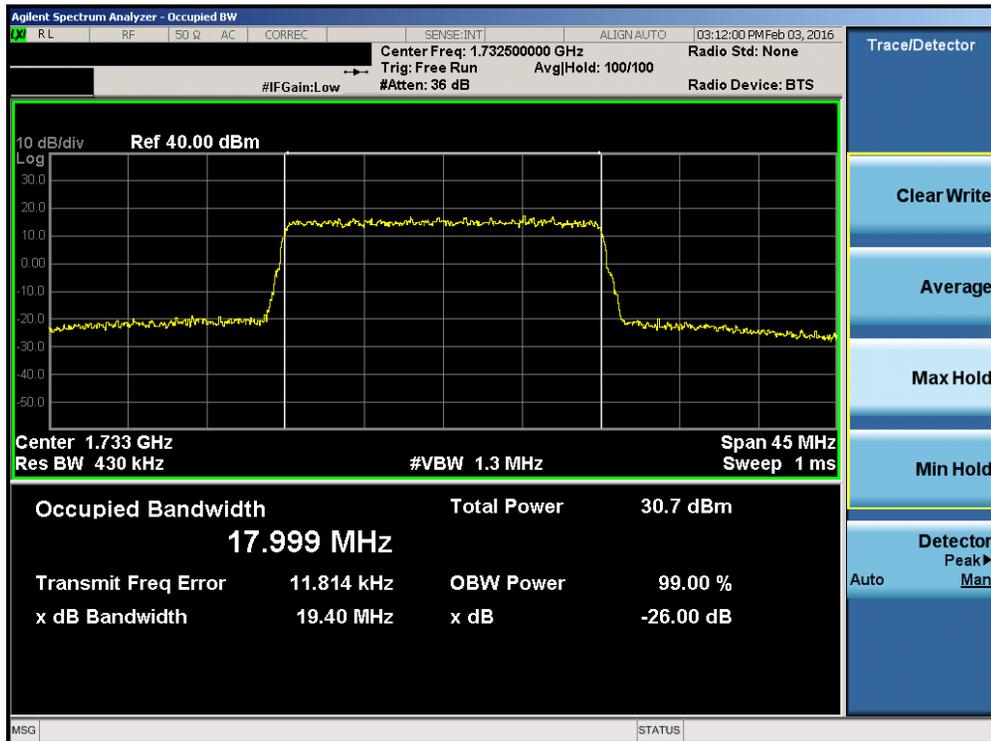


Plot 7-18. Occupied Bandwidth Plot (Band 4 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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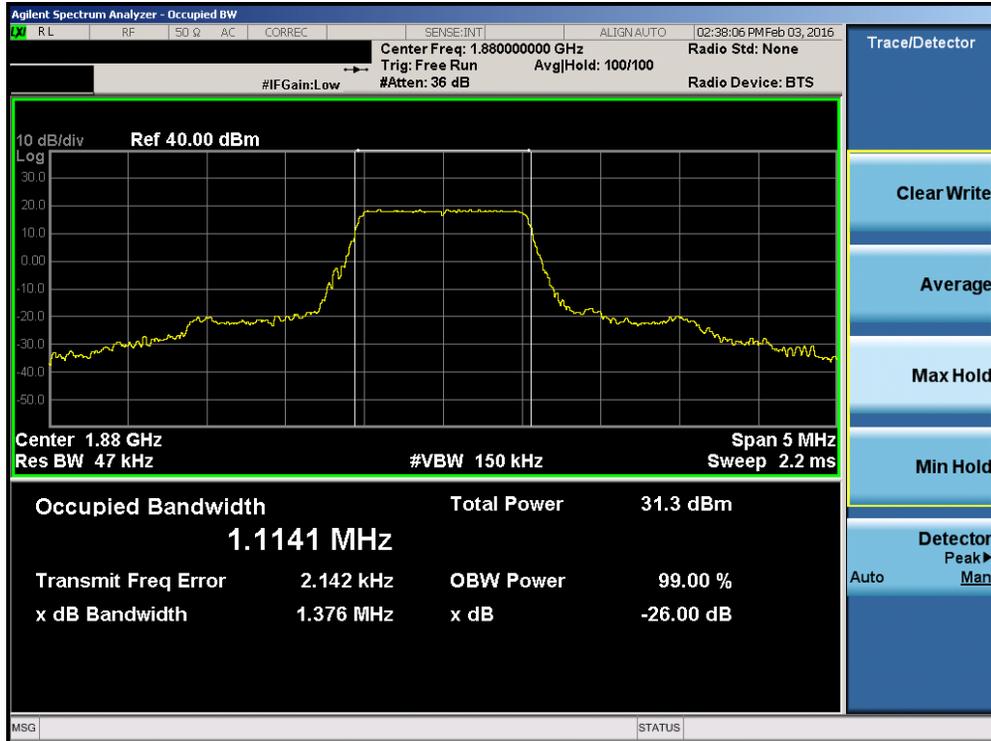


Plot 7-19. Occupied Bandwidth Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

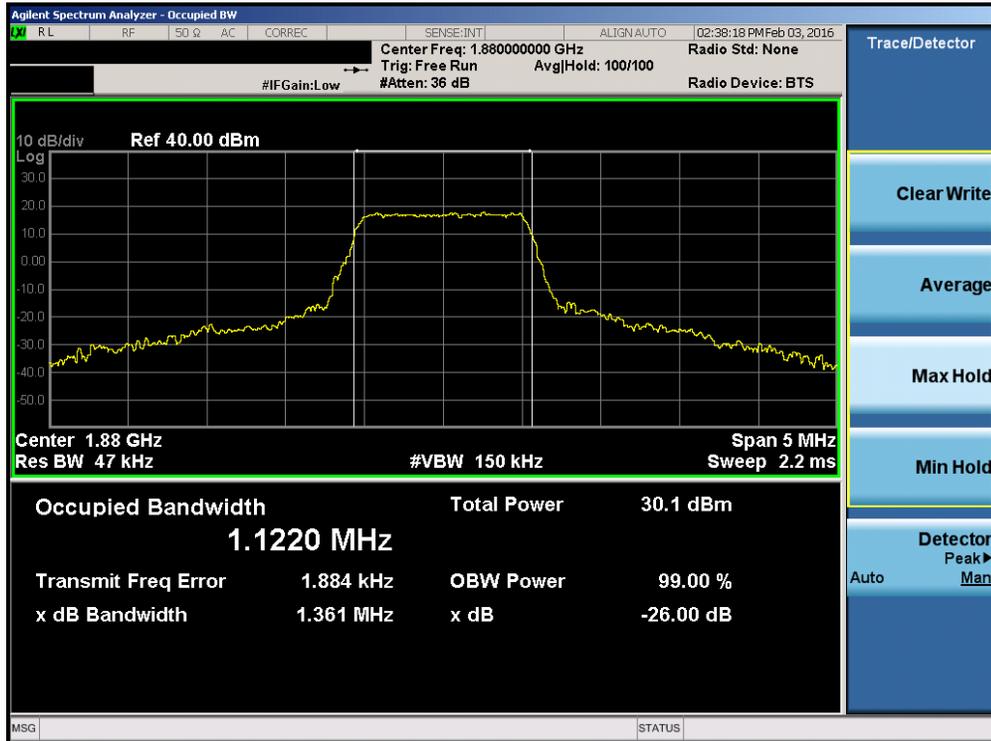


Plot 7-20. Occupied Bandwidth Plot (Band 4 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 23 of 99

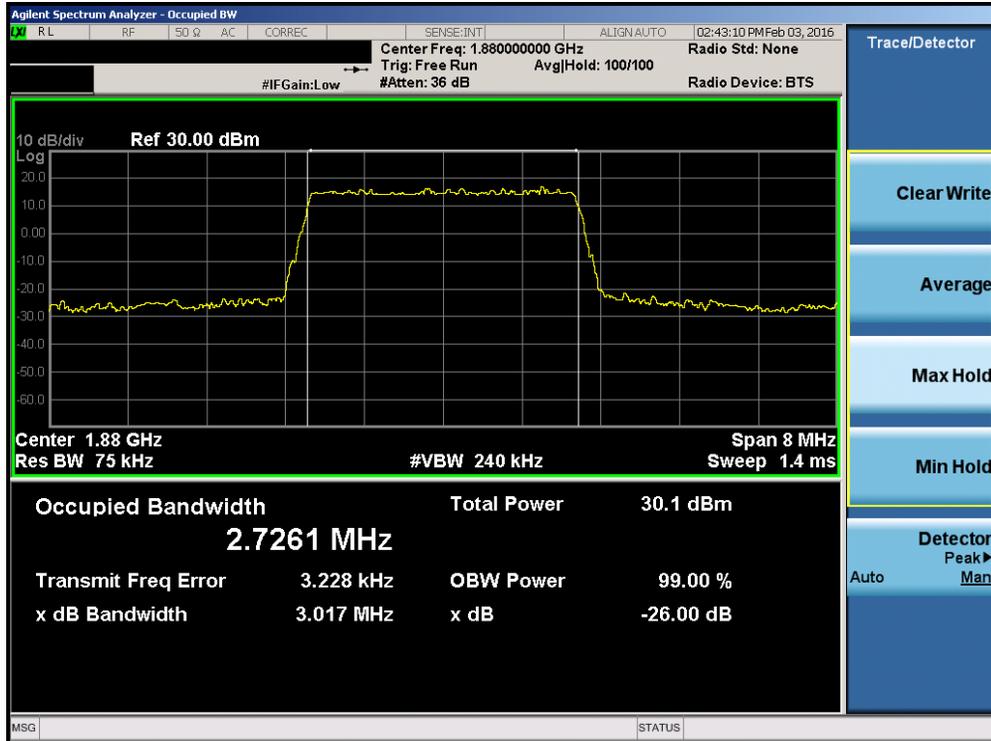


Plot 7-21. Occupied Bandwidth Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

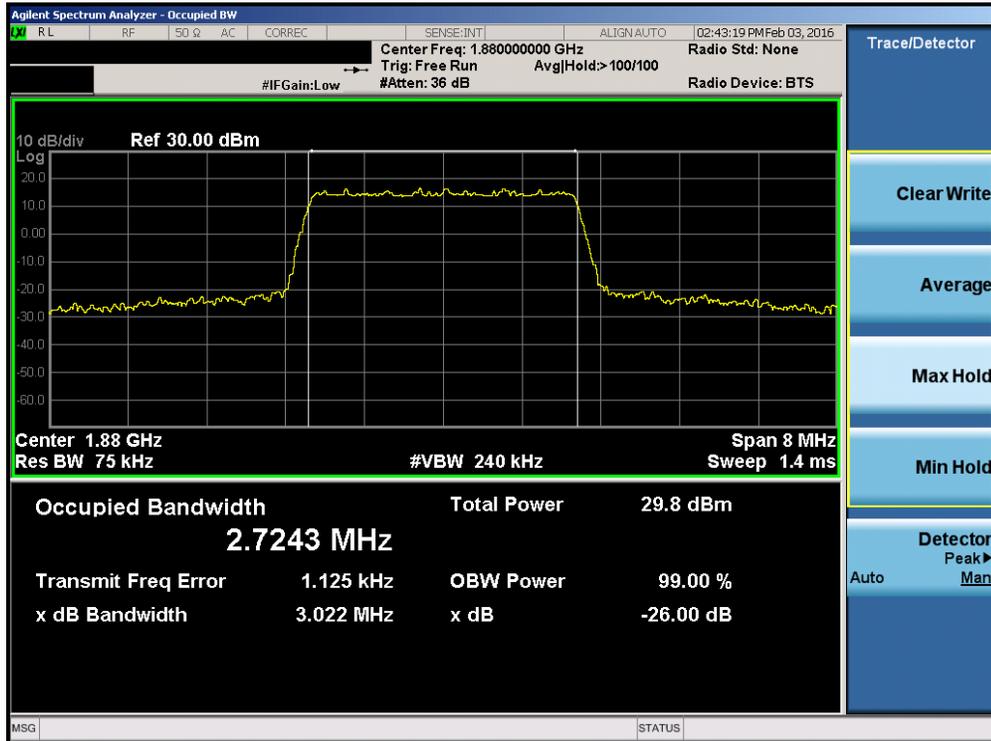


Plot 7-22. Occupied Bandwidth Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 24 of 99

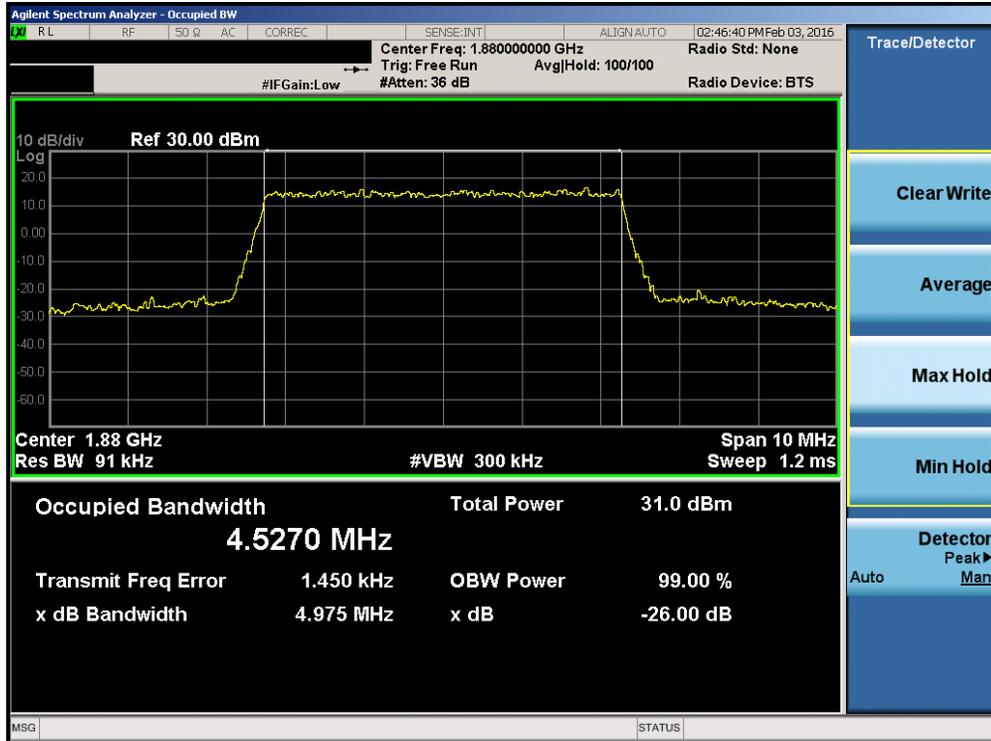


Plot 7-23. Occupied Bandwidth Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

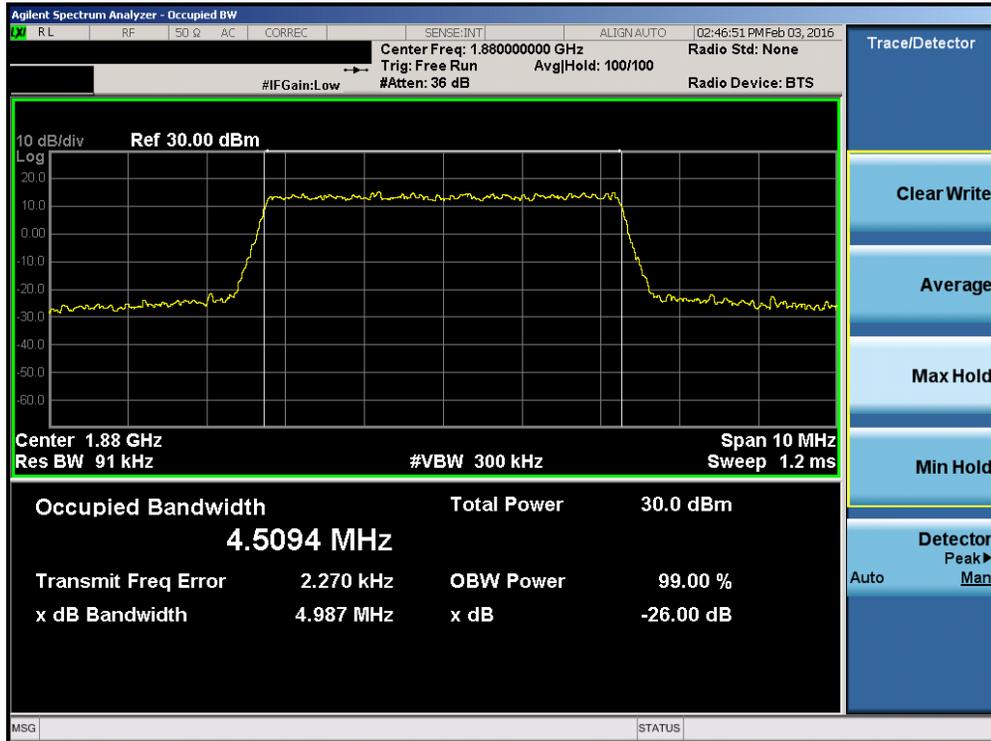


Plot 7-24. Occupied Bandwidth Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 25 of 99

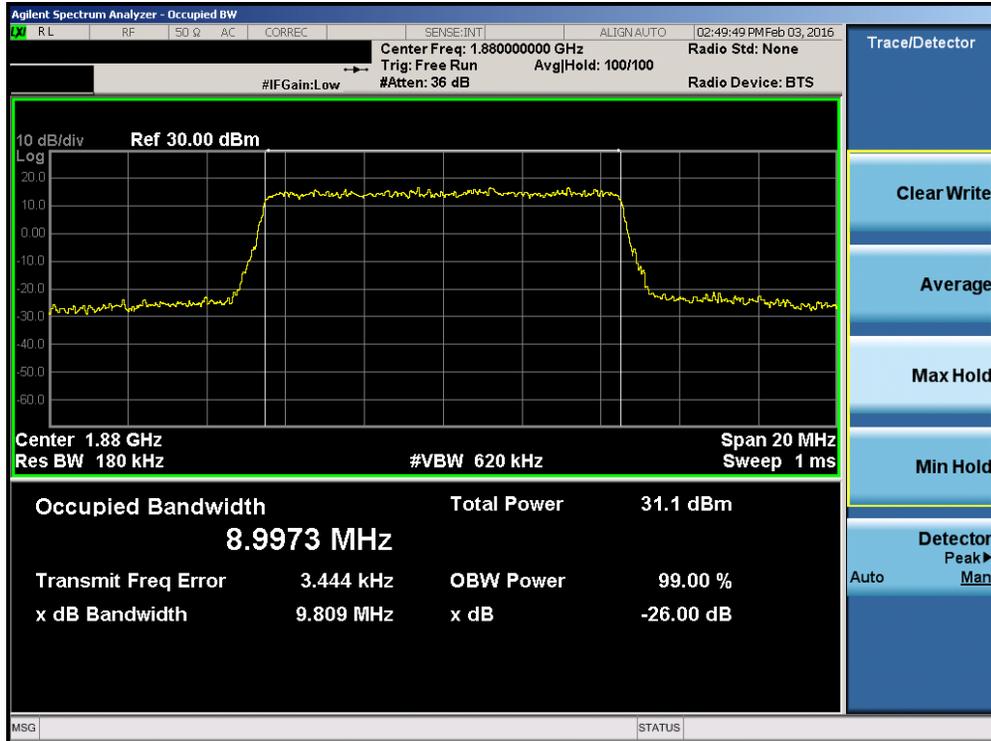


Plot 7-25. Occupied Bandwidth Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

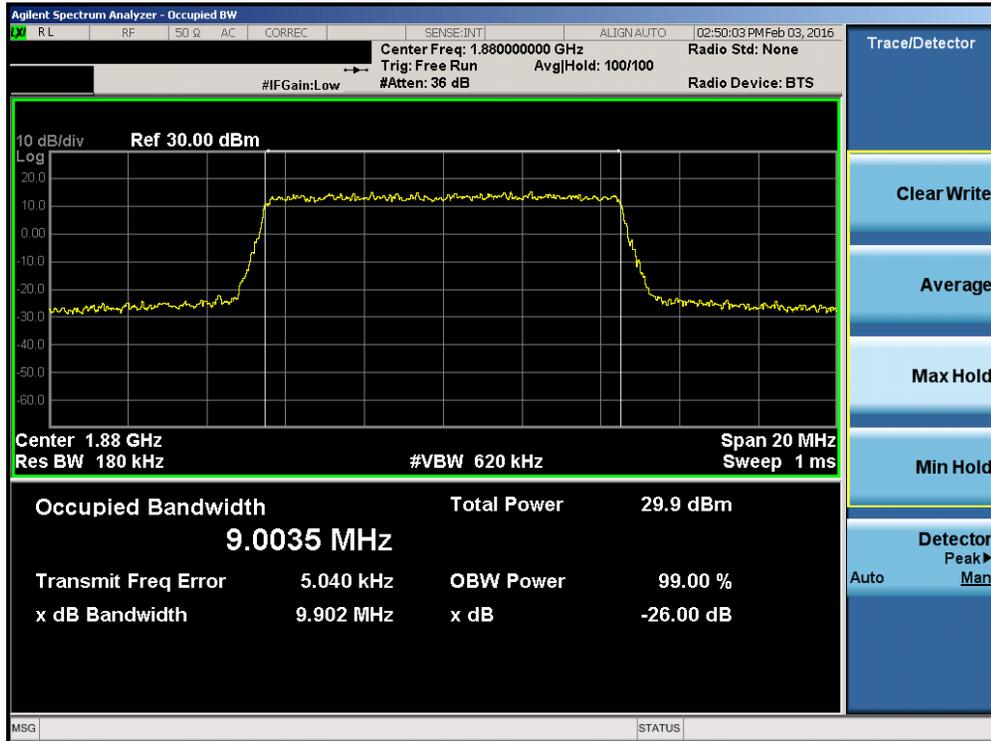


Plot 7-26. Occupied Bandwidth Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 26 of 99

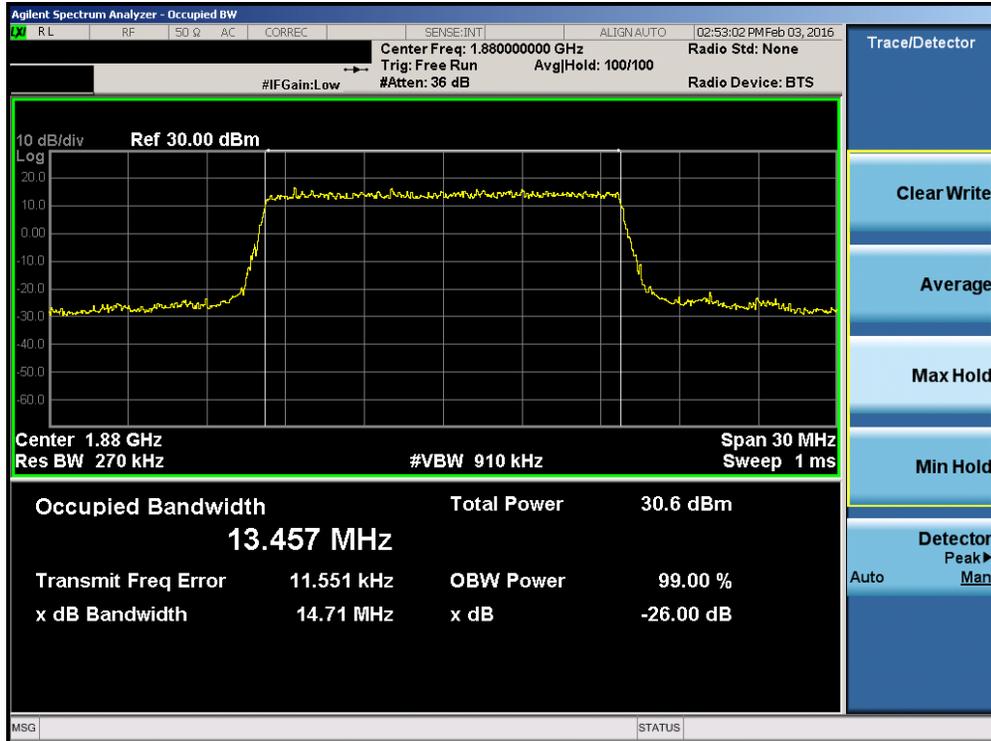


Plot 7-27. Occupied Bandwidth Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

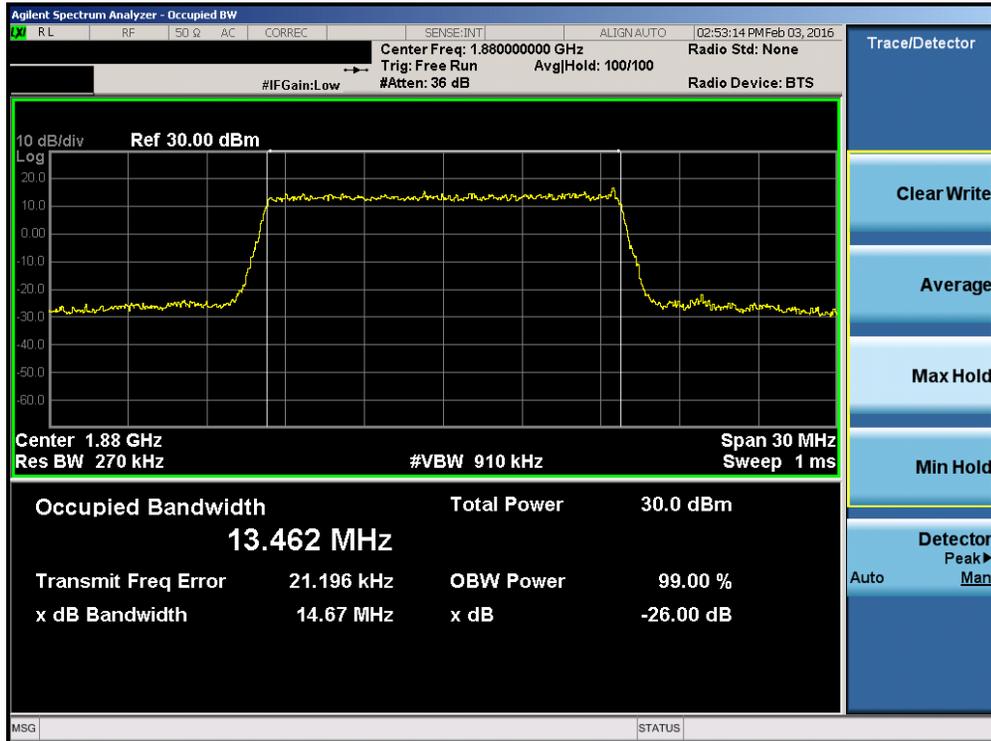


Plot 7-28. Occupied Bandwidth Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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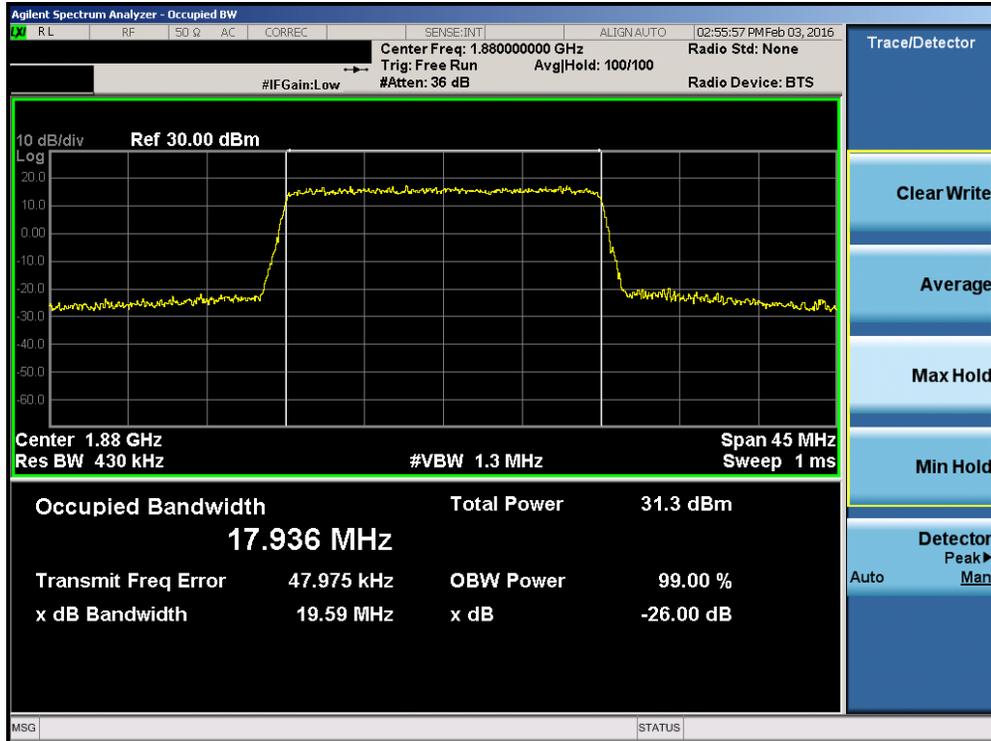


Plot 7-29. Occupied Bandwidth Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

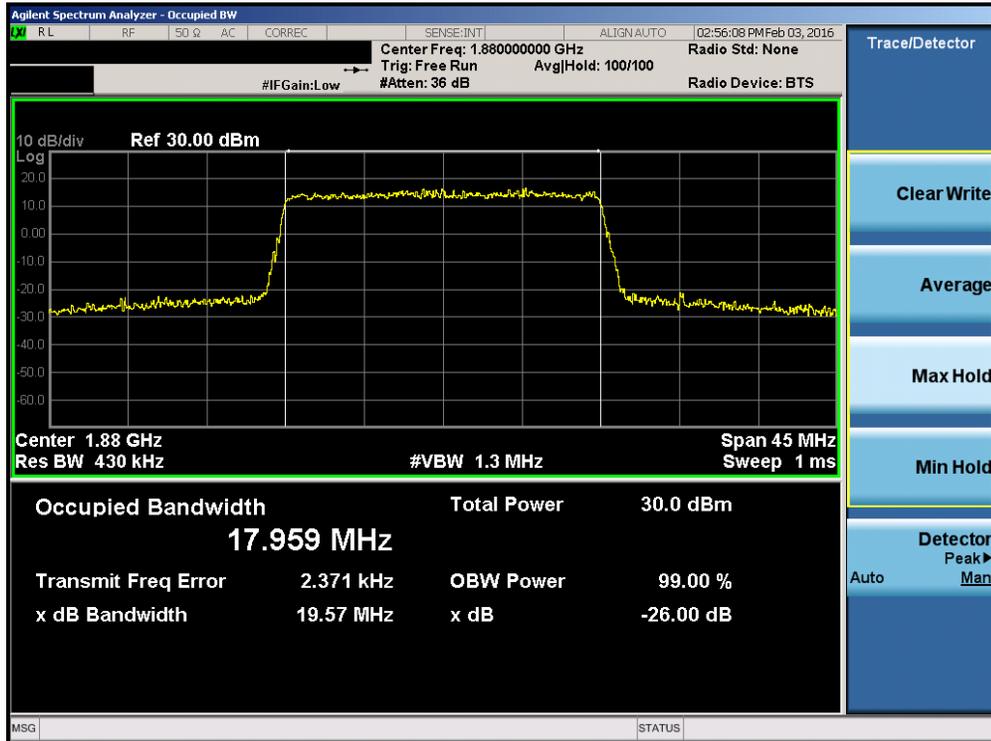


Plot 7-30. Occupied Bandwidth Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-31. Occupied Bandwidth Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-32. Occupied Bandwidth Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 29 of 99

### 7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §24.238(a) §27.53(g) §27.53(h)

#### 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.***

#### Test Procedure Used

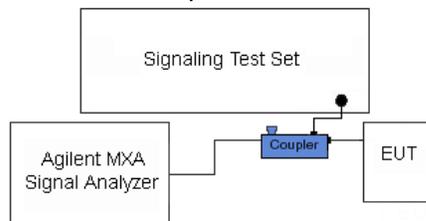
KDB 971168 v02r02 – Section 6.0

#### 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.

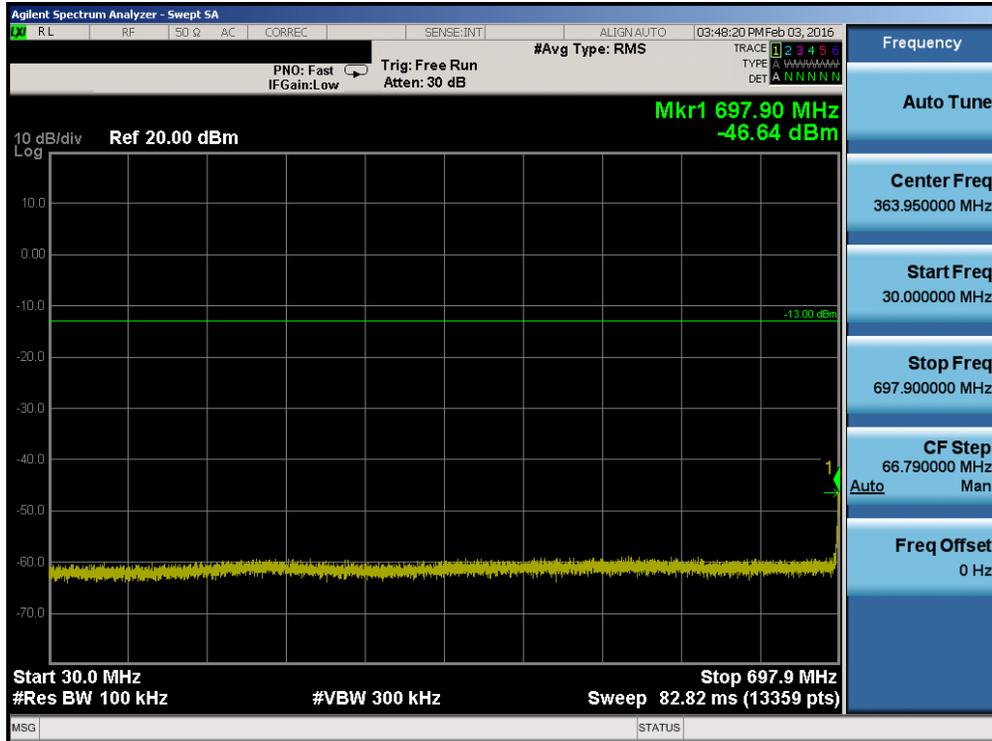


**Figure 7-2. Test Instrument & Measurement Setup**

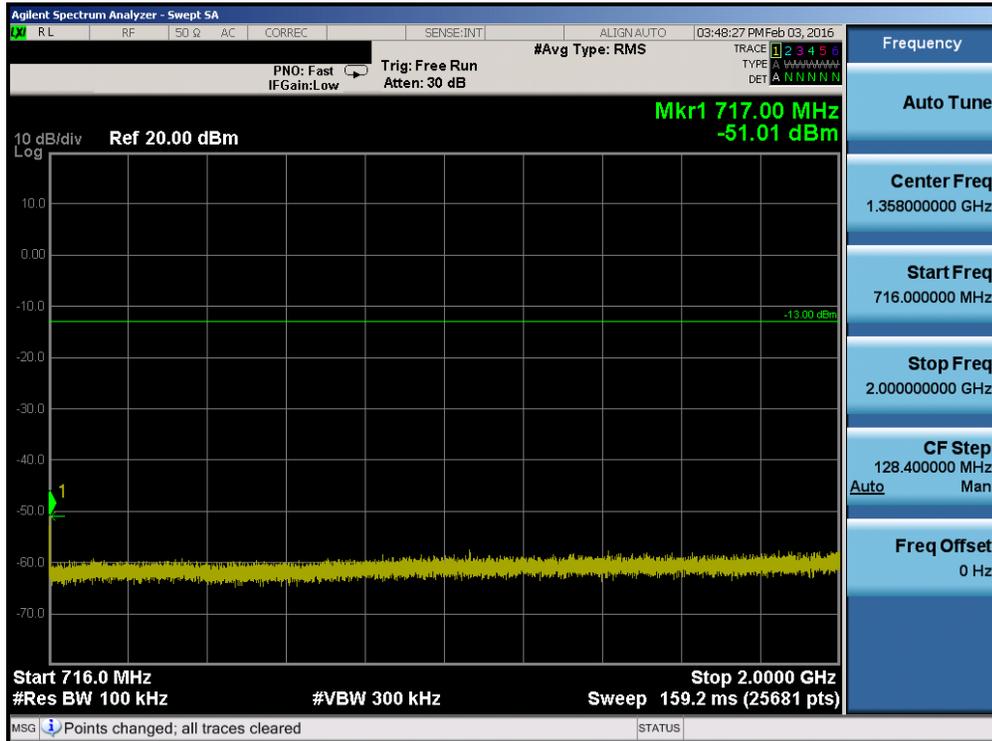
#### Test Notes

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 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: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 30 of 99

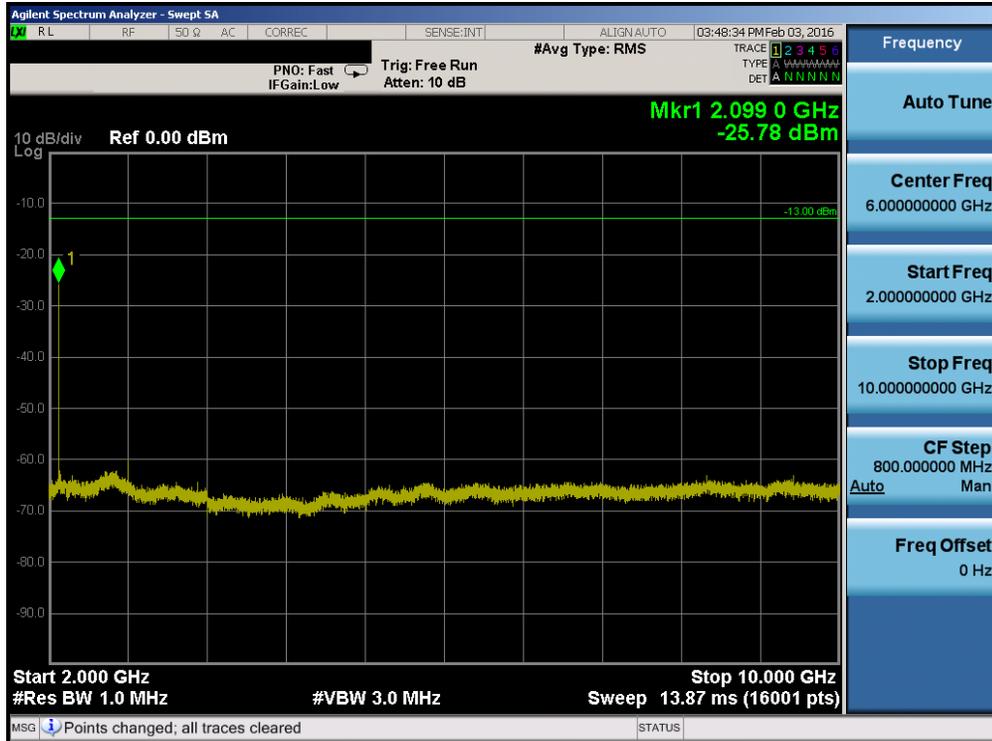


Plot 7-33. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0– Low Channel)

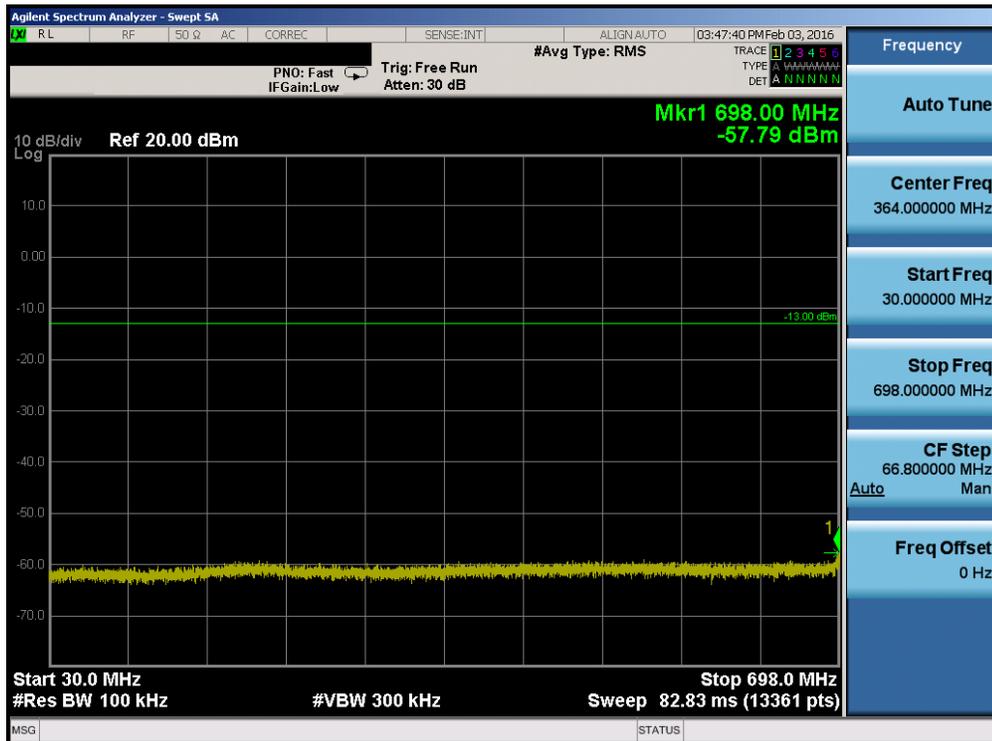


Plot 7-34. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 31 of 99

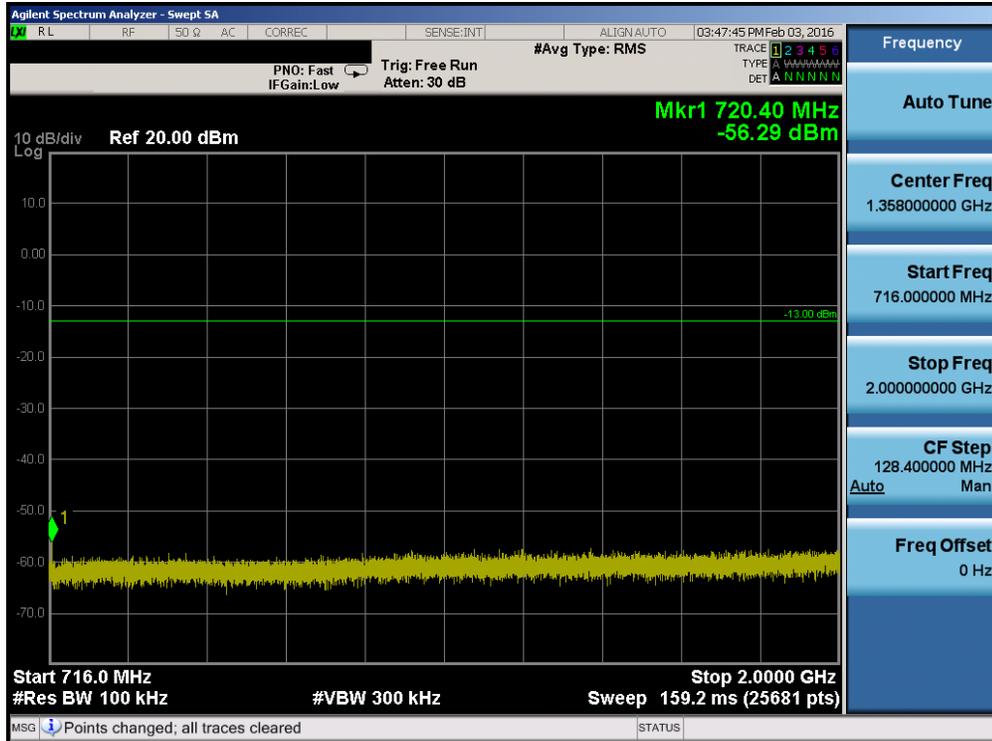


Plot 7-35. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

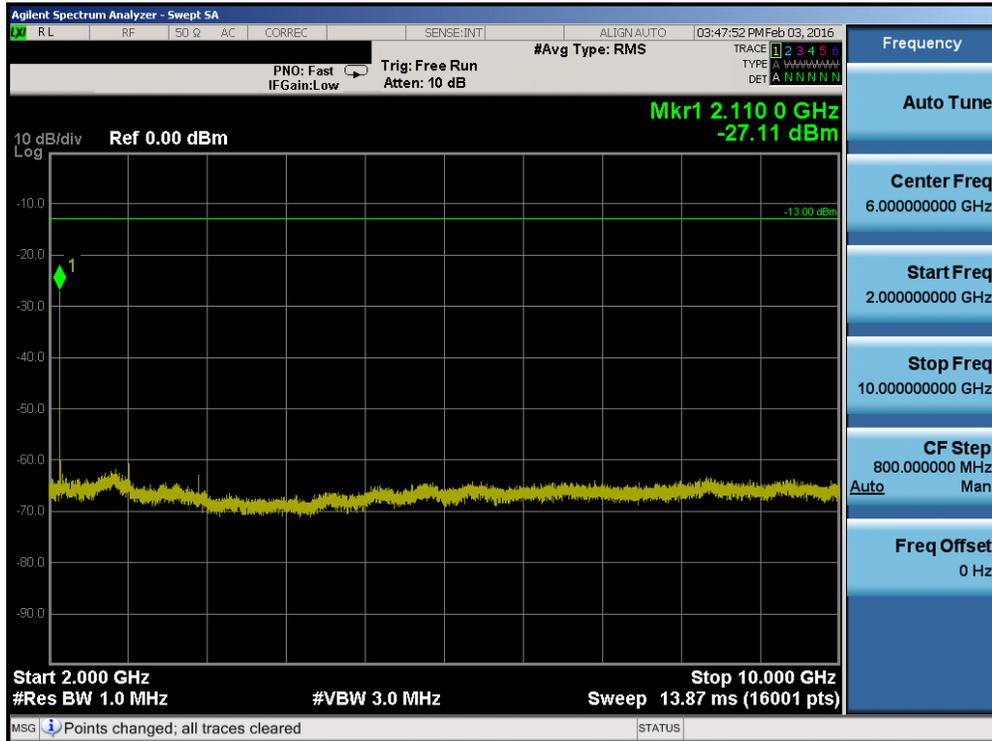


Plot 7-36. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 32 of 99

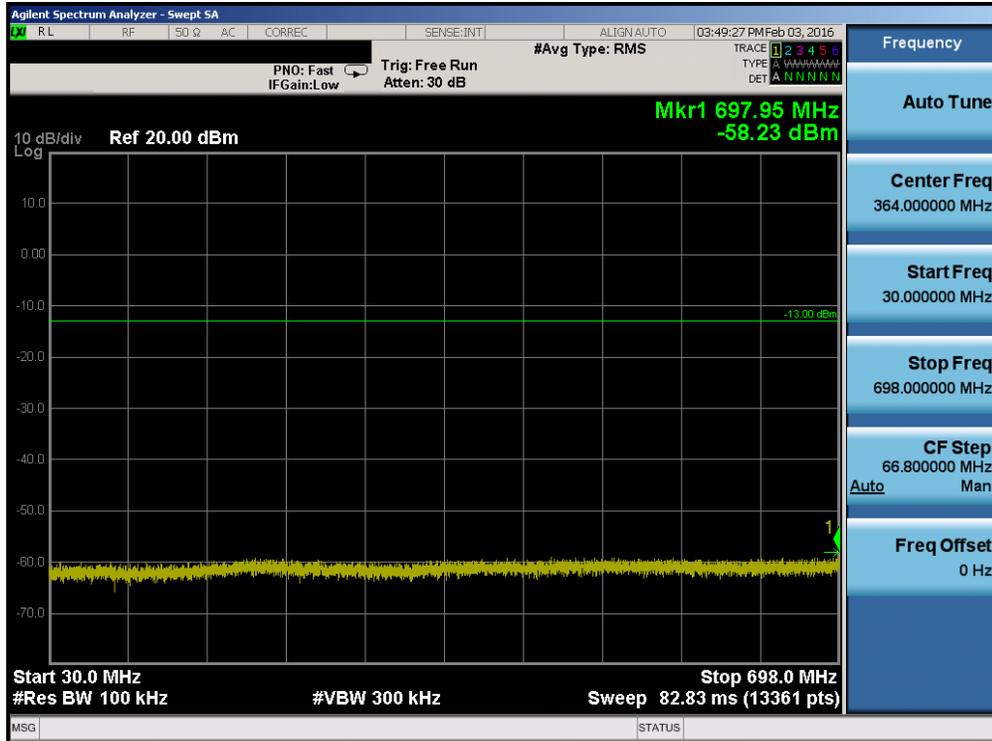


Plot 7-37. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

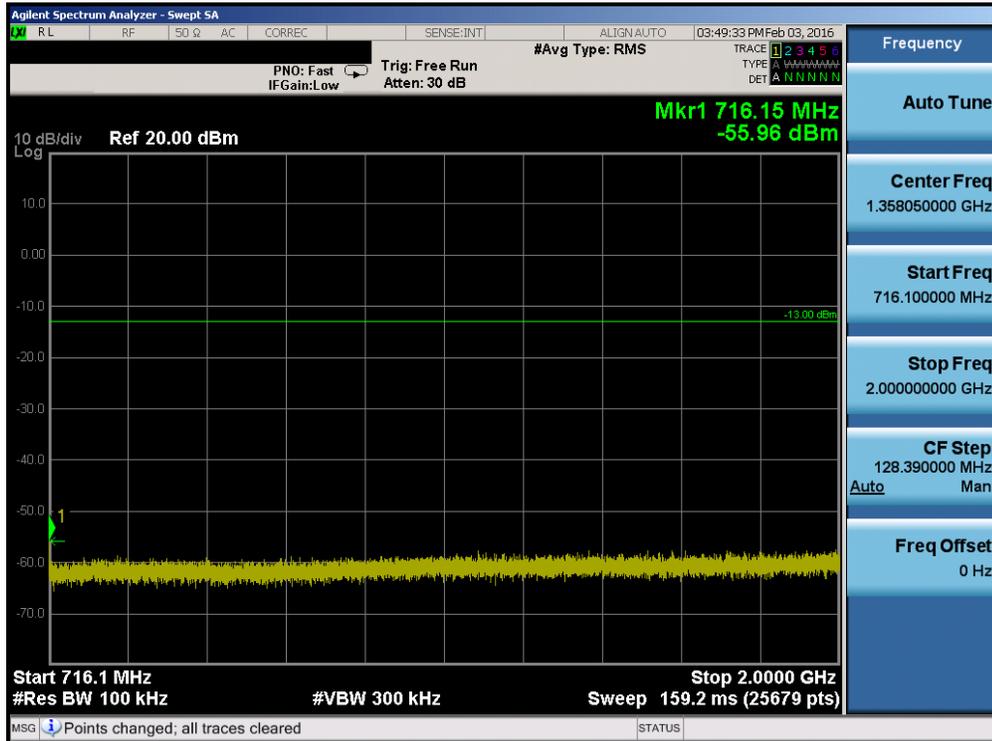


Plot 7-38. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 33 of 99

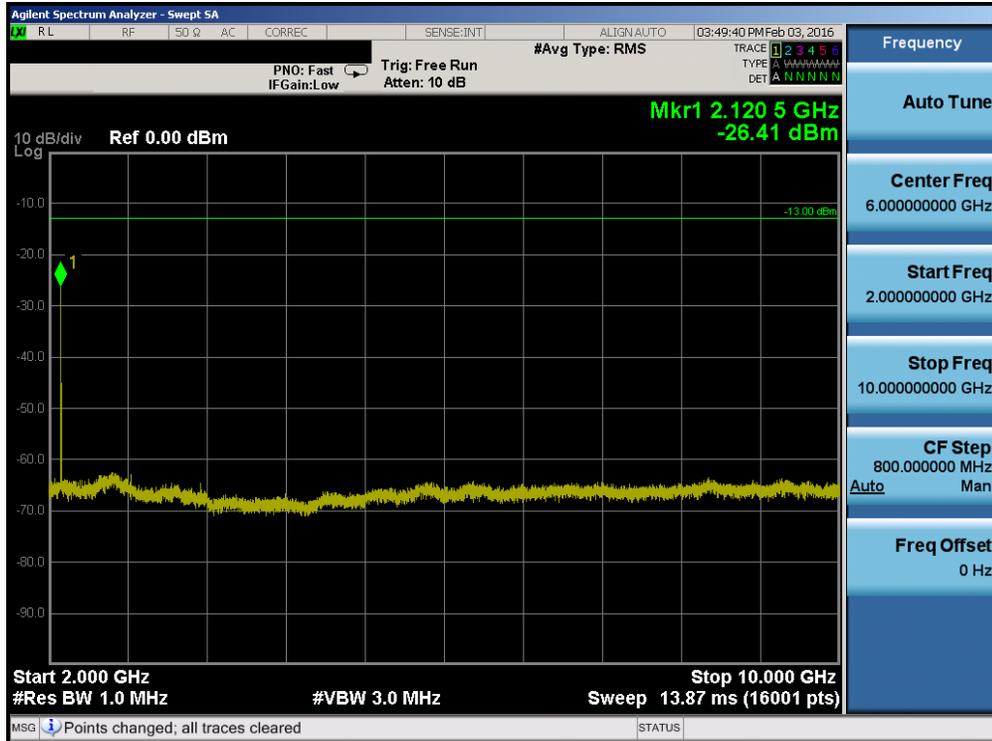


Plot 7-39. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 7-40. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 34 of 99

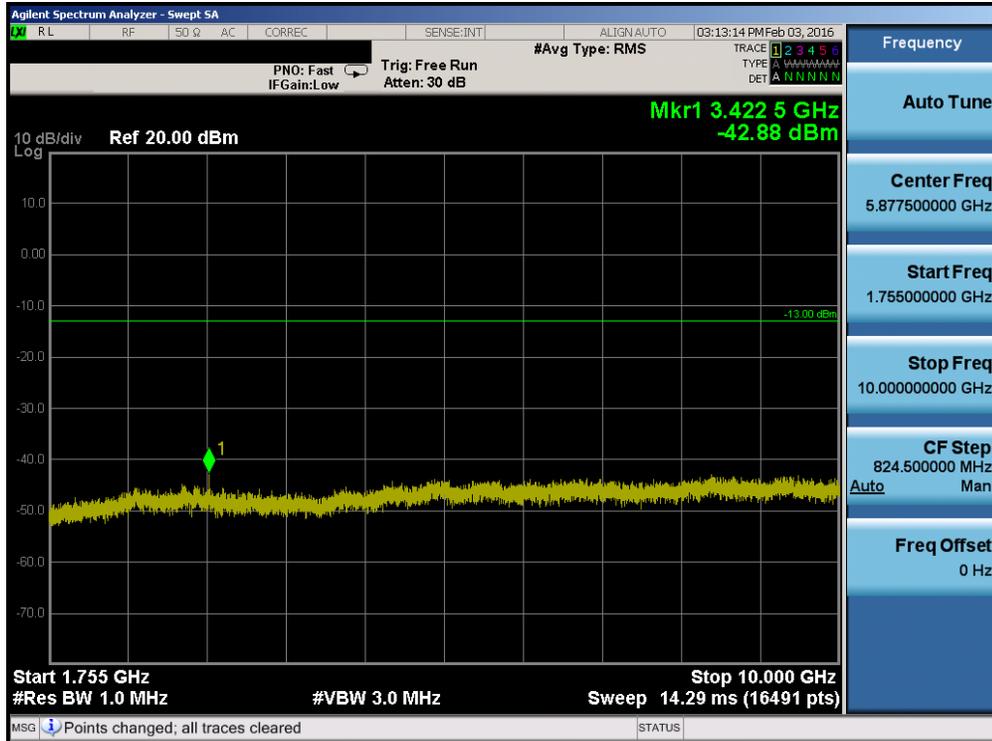


Plot 7-41. Conducted Spurious Plot (Band 12 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

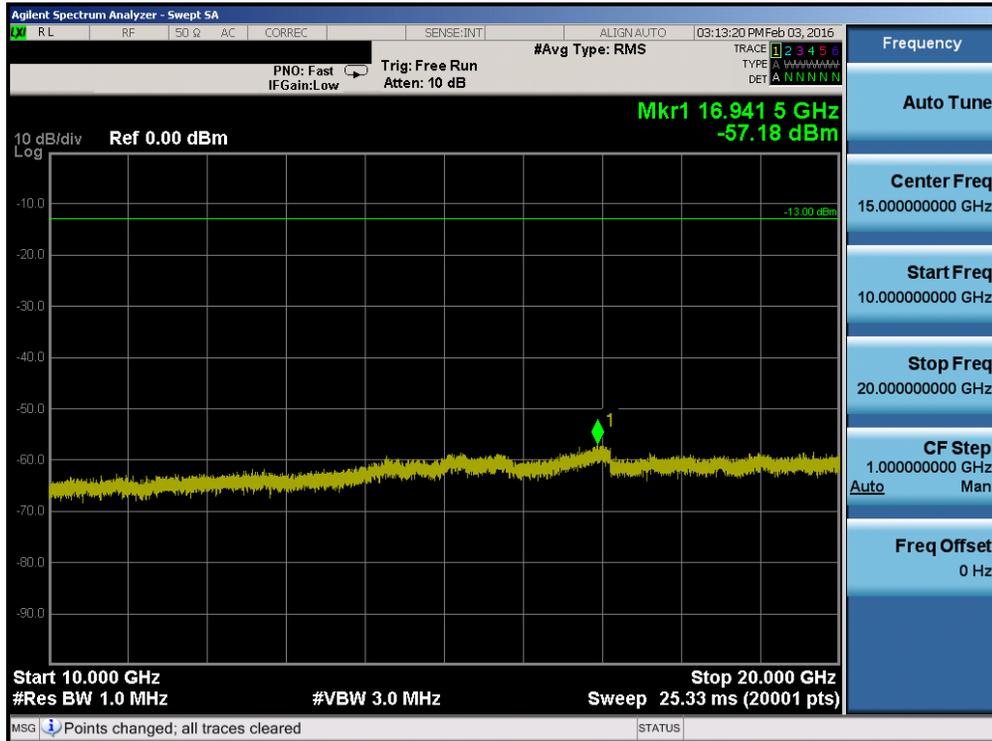


Plot 7-42. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0– Low Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-43. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

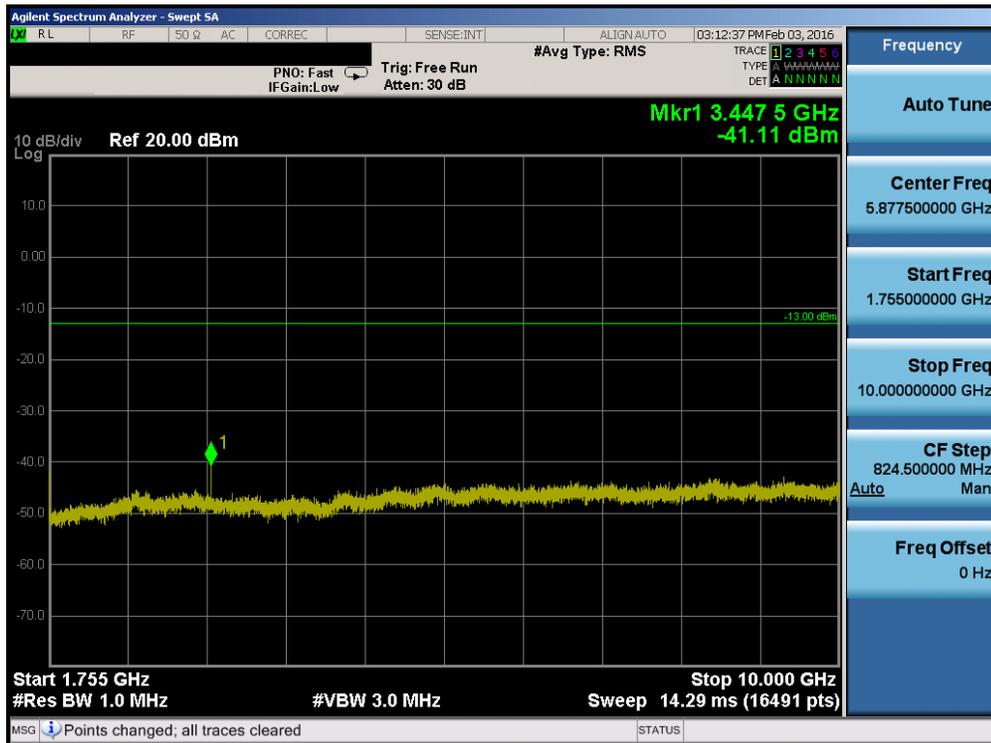


Plot 7-44. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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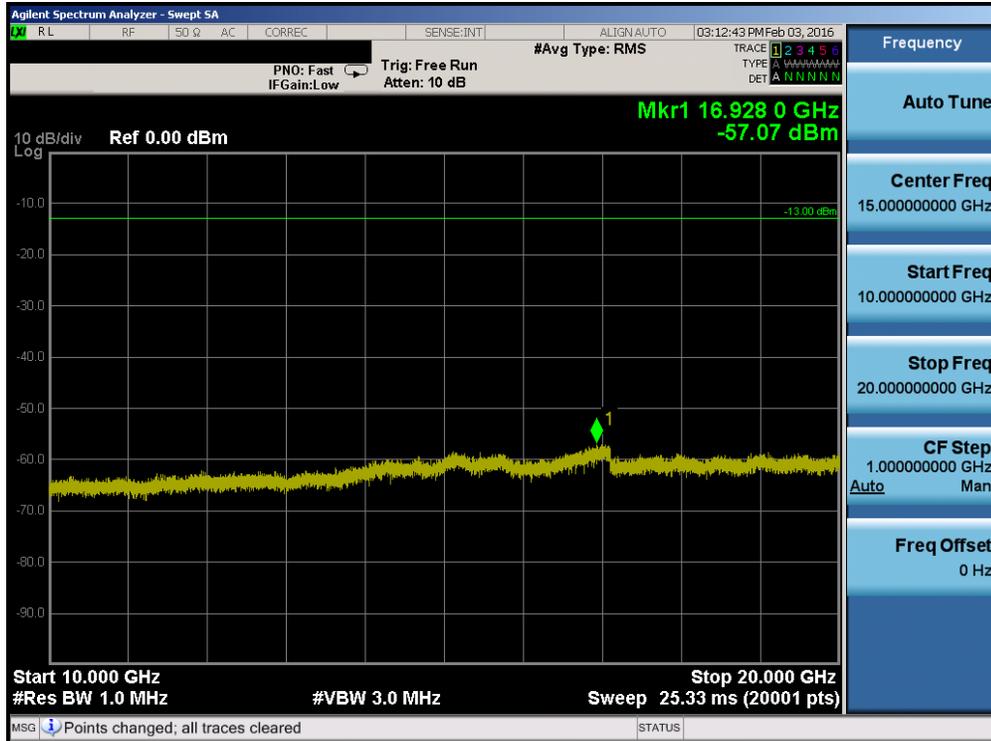


Plot 7-45. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

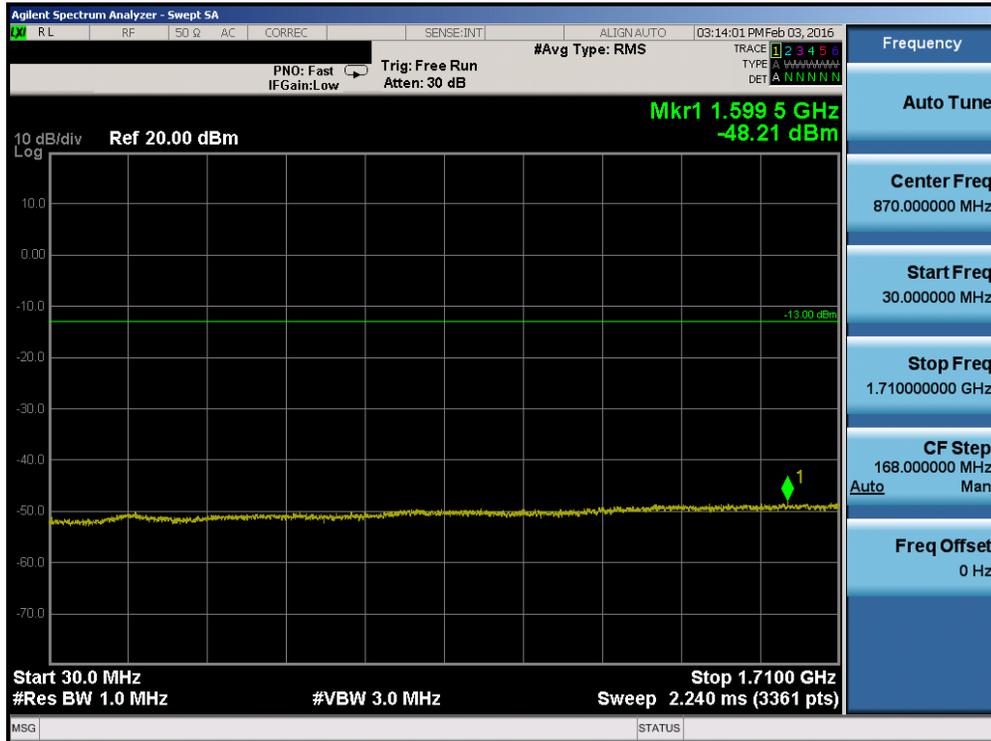


Plot 7-46. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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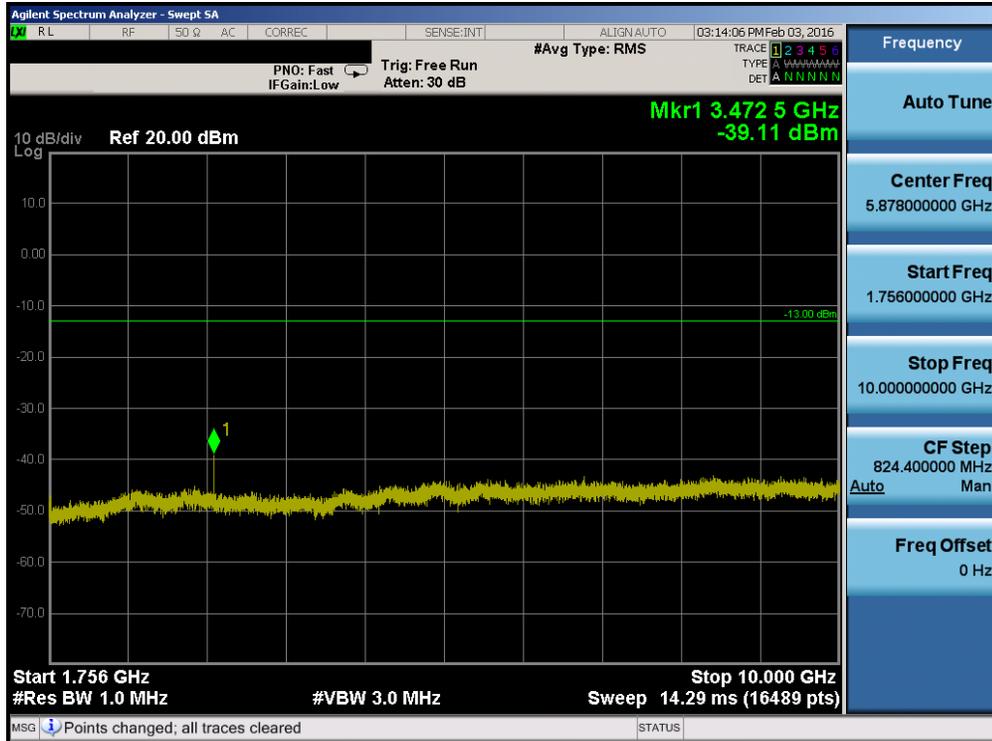


Plot 7-47. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

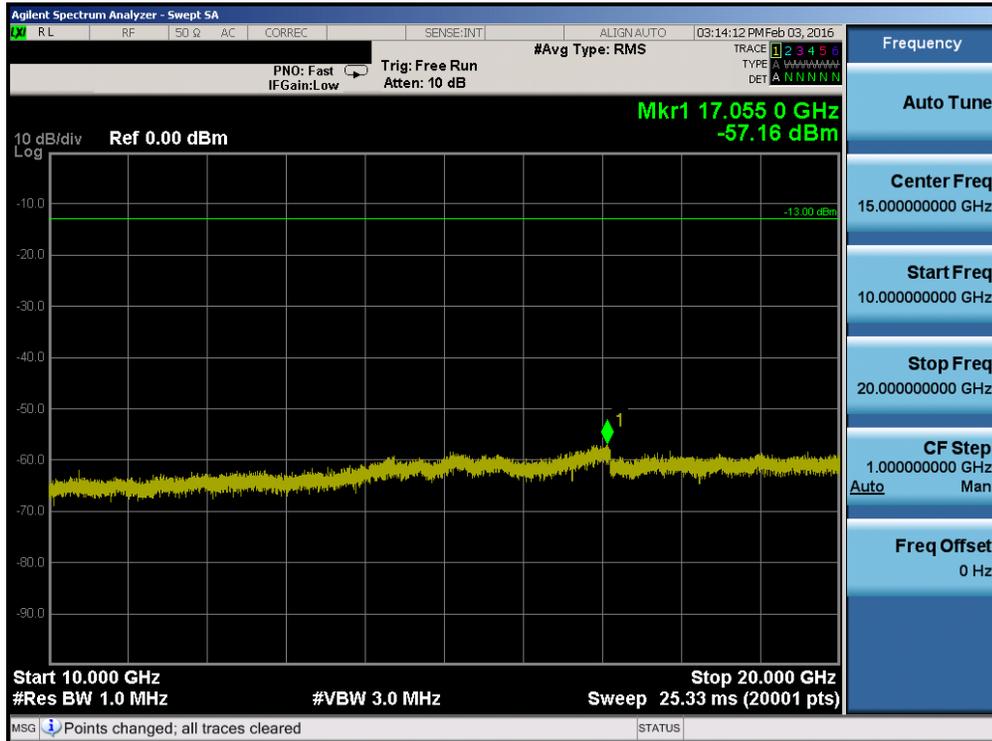


Plot 7-48. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-49. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 7-50. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## 7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §24.238(a) §27.53(g) §27.53(h)

### Test Overview

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.***

### Test Procedure Used

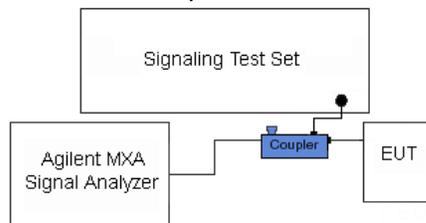
KDB 971168 v02r02 – Section 6.0

### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3.  $RBW \geq 1\%$  of the emission bandwidth
4.  $VBW \geq 3 \times RBW$
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/RBW$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

### Test Setup

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



**Figure 7-3. Test Instrument & Measurement Setup**

### Test Notes

Per 24.238(a) 27.53(h) 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 to demonstrate compliance with the out-of-band emissions limit. 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.

Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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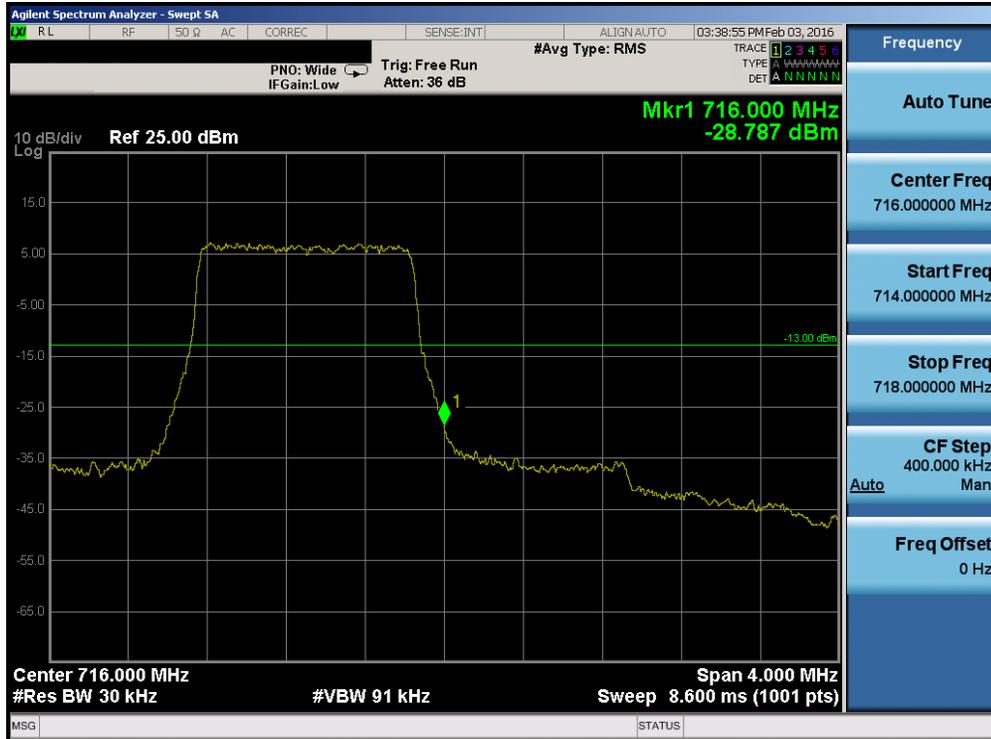


Plot 7-51. Lower Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-52. Lower Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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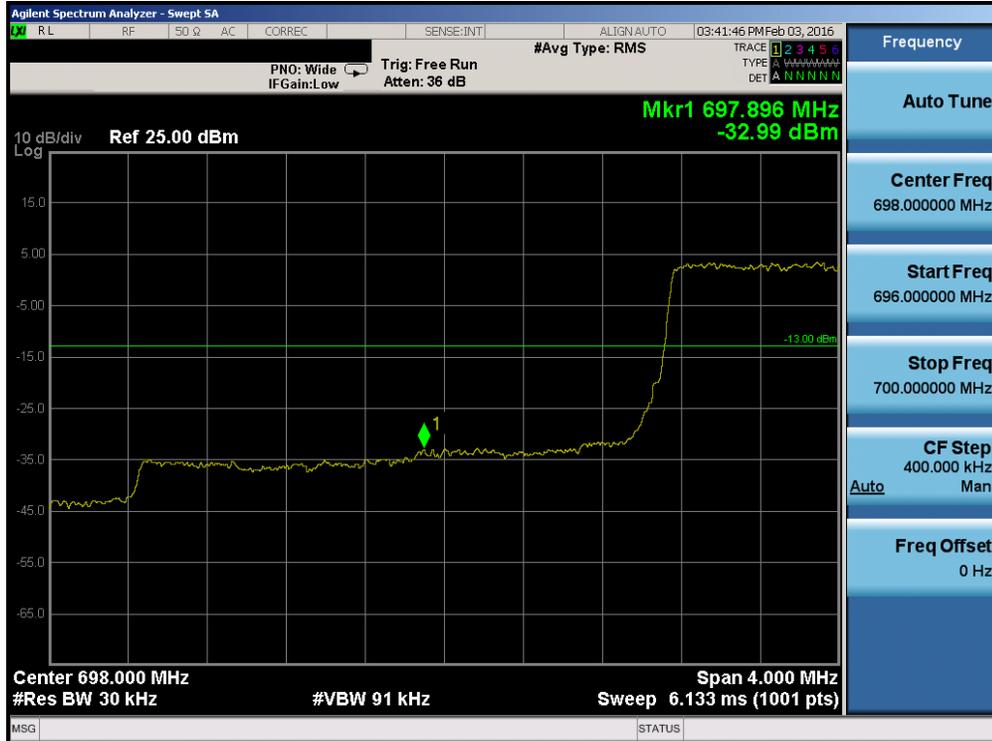


Plot 7-53. Upper Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)



Plot 7-54. Upper Extended Band Edge Plot (Band 12 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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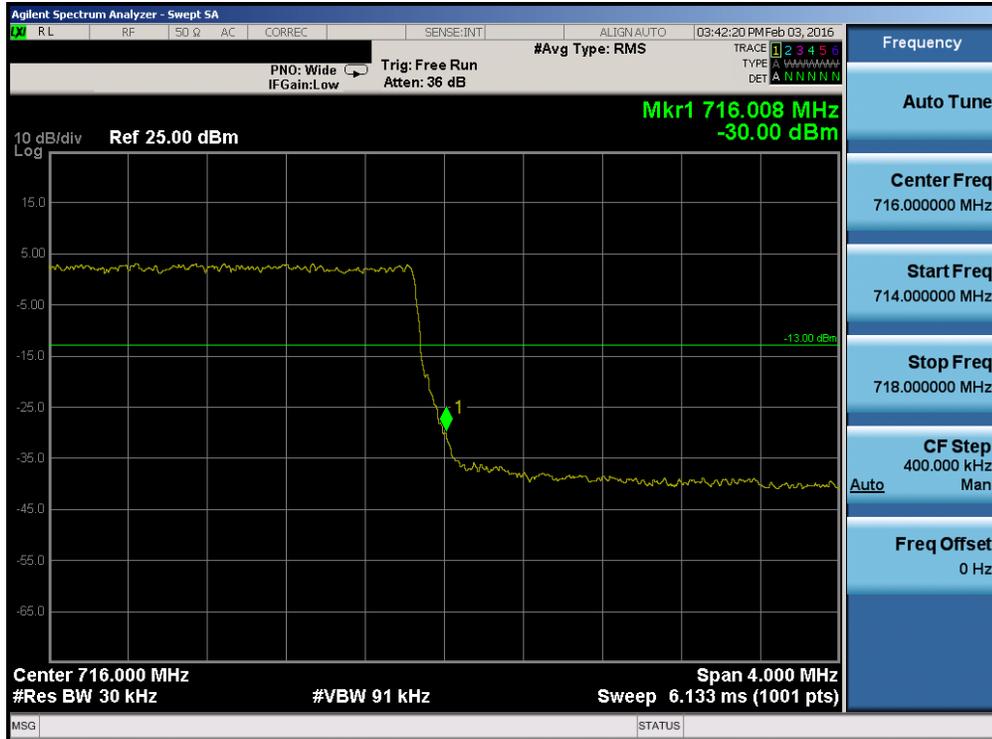


Plot 7-55. Lower Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)



Plot 7-56. Lower Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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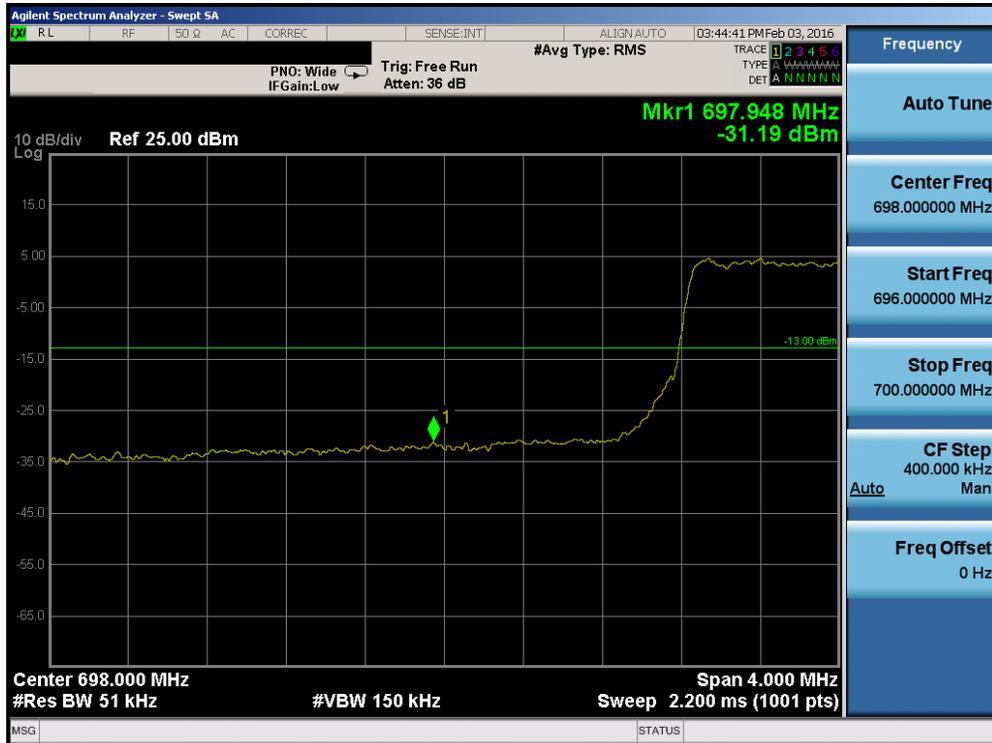


Plot 7-57. Upper Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

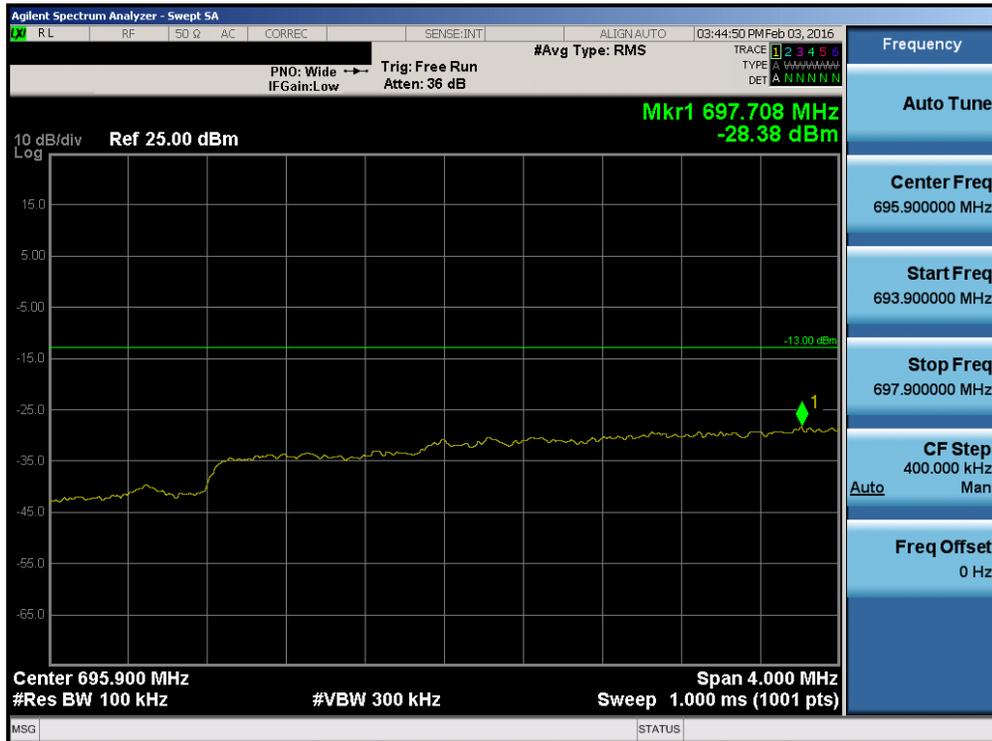


Plot 7-58. Upper Extended Band Edge Plot (Band 12 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-59. Lower Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

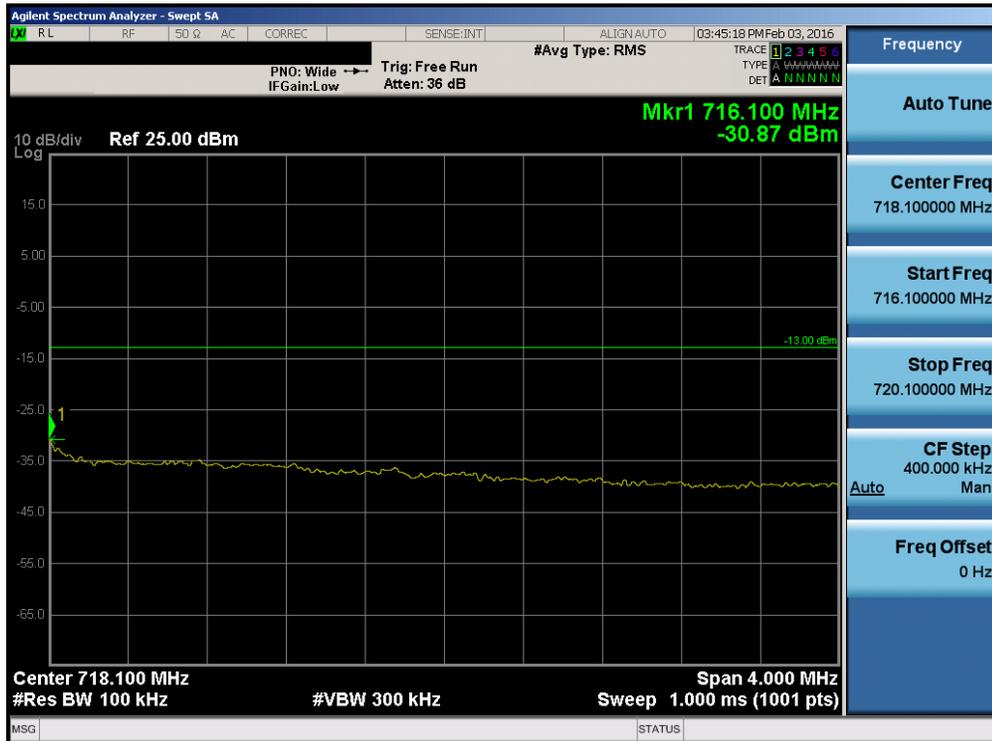


Plot 7-60. Lower Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-61. Upper Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

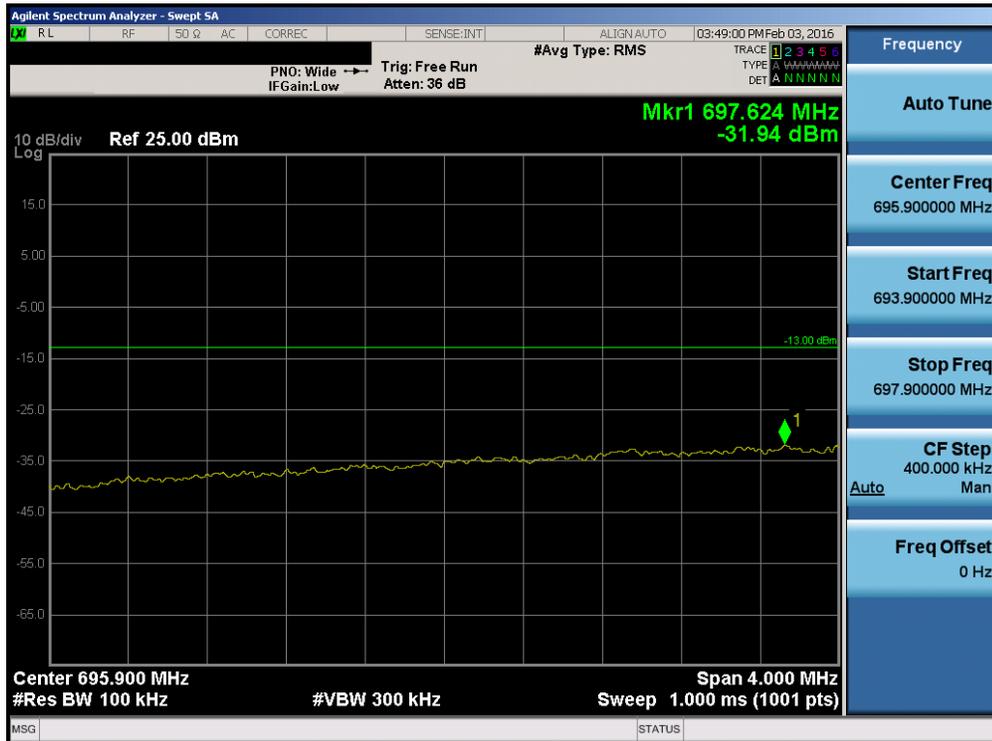


Plot 7-62. Upper Extended Band Edge Plot (Band 12 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-63. Lower Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

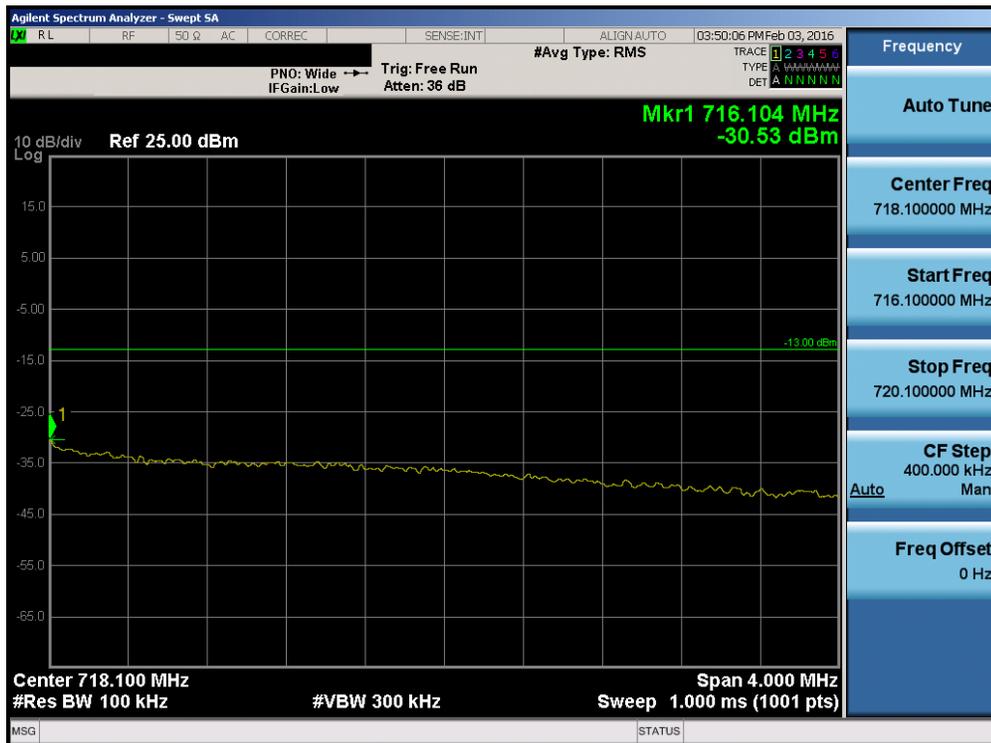


Plot 7-64. Lower Extended Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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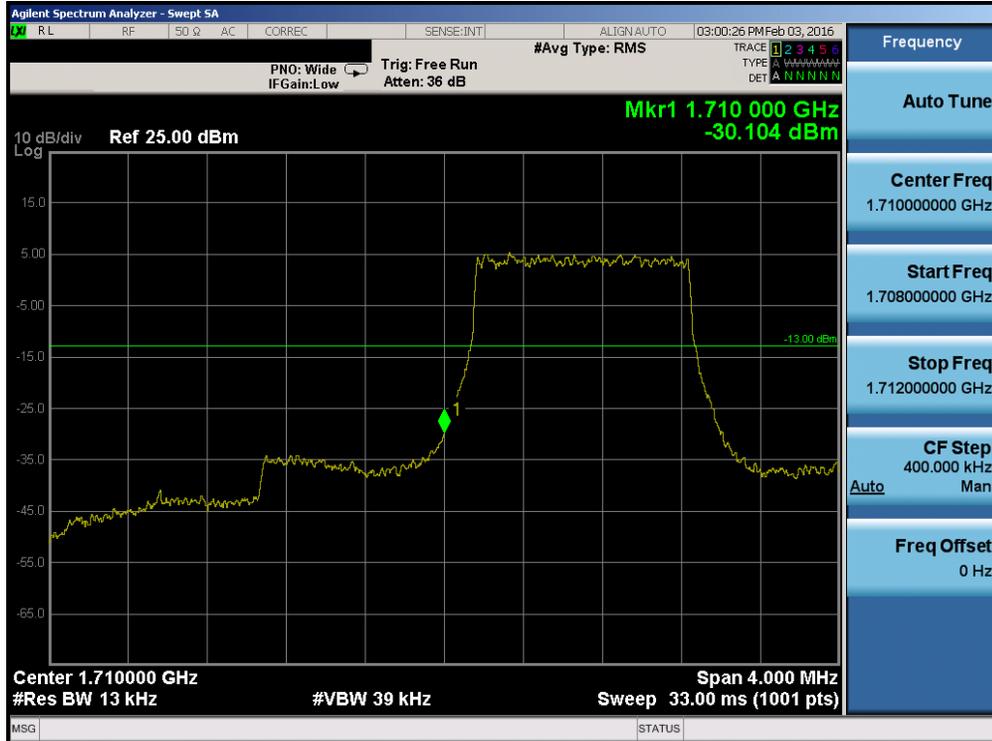


Plot 7-65. Upper Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

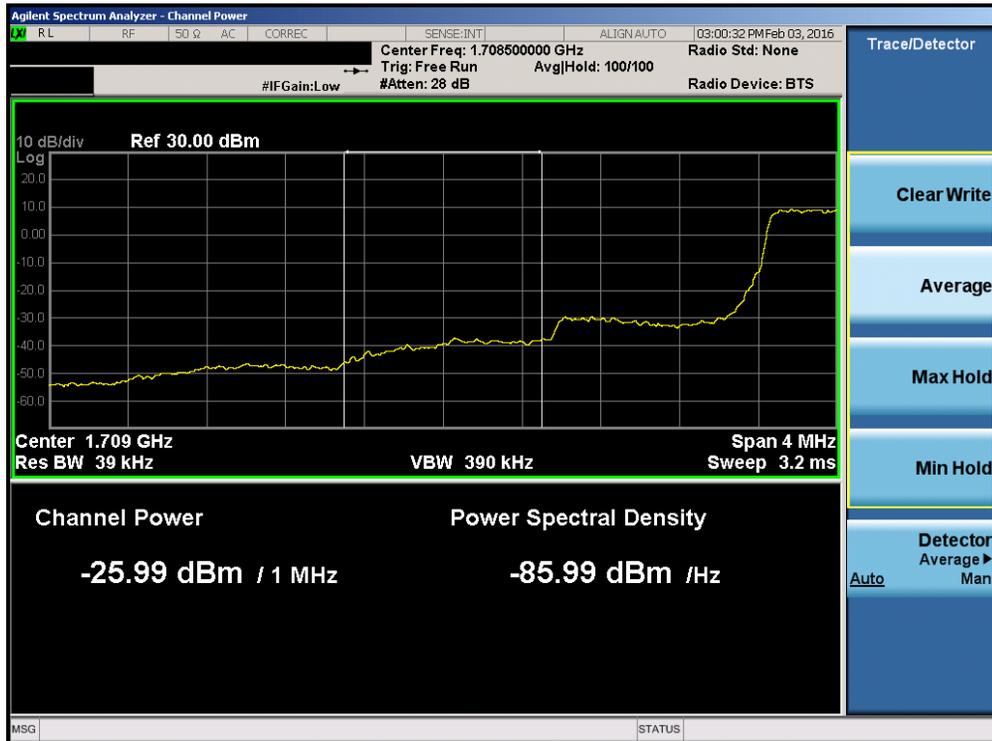


Plot 7-66. Upper Extended Band Edge Plot (Band 12 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-67. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

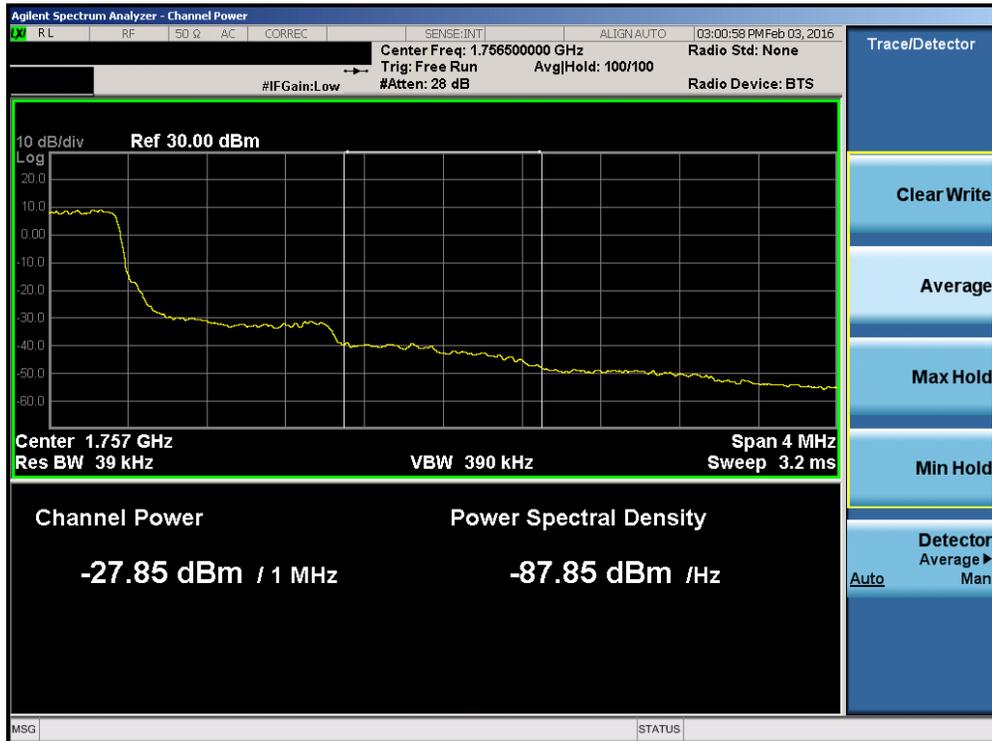


Plot 7-68. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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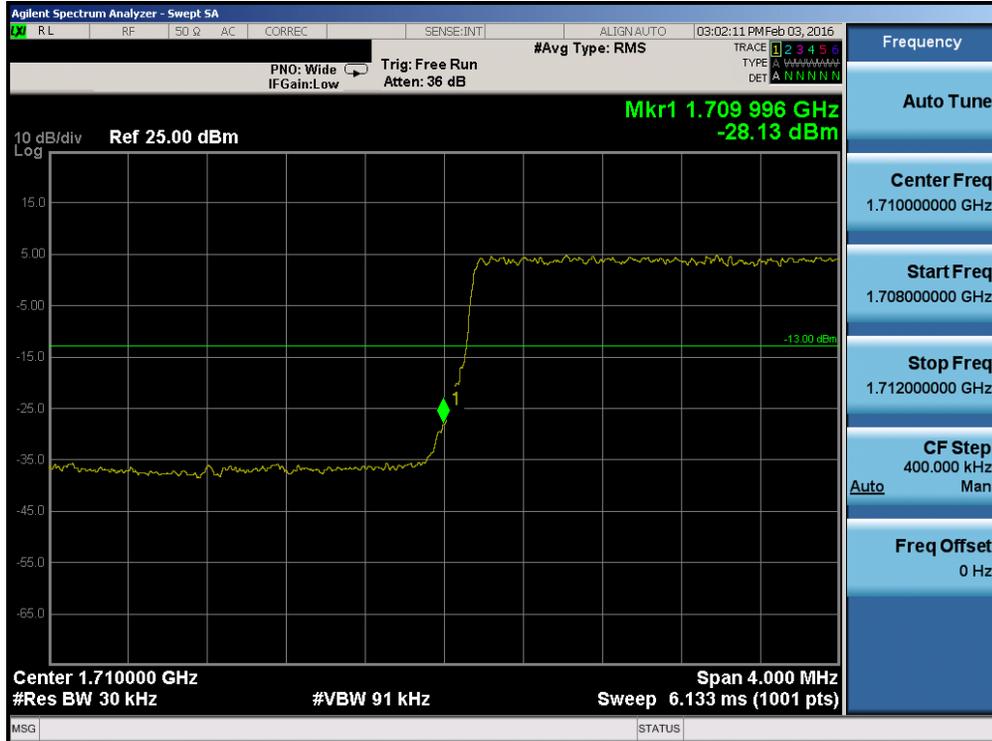


Plot 7-69. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

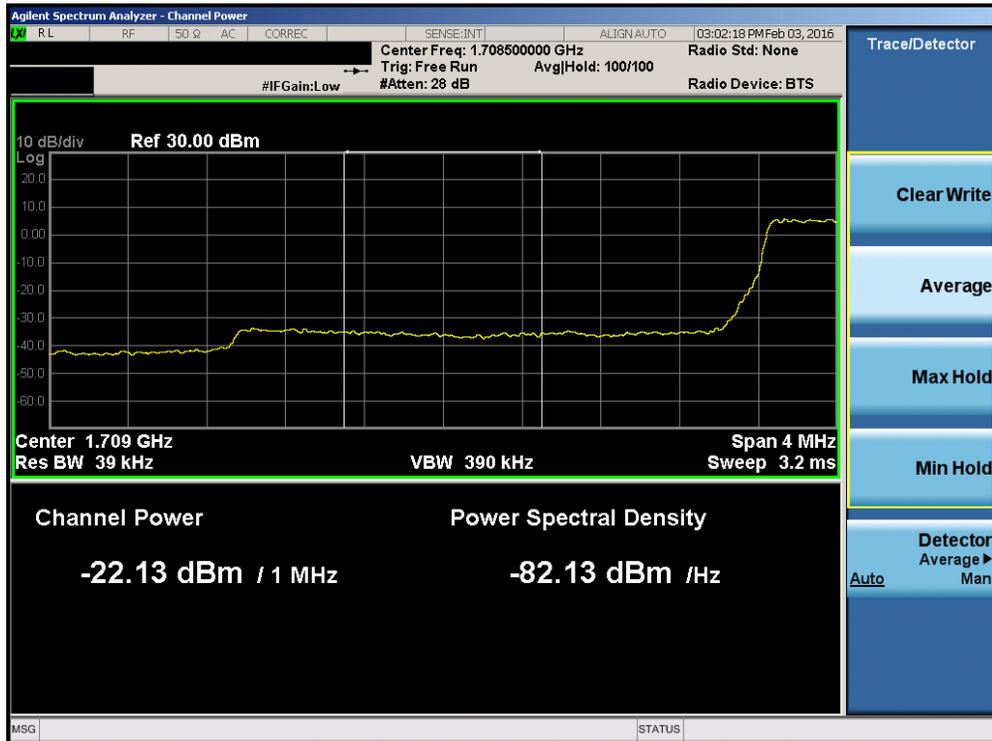


Plot 7-70. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFK428	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-71. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

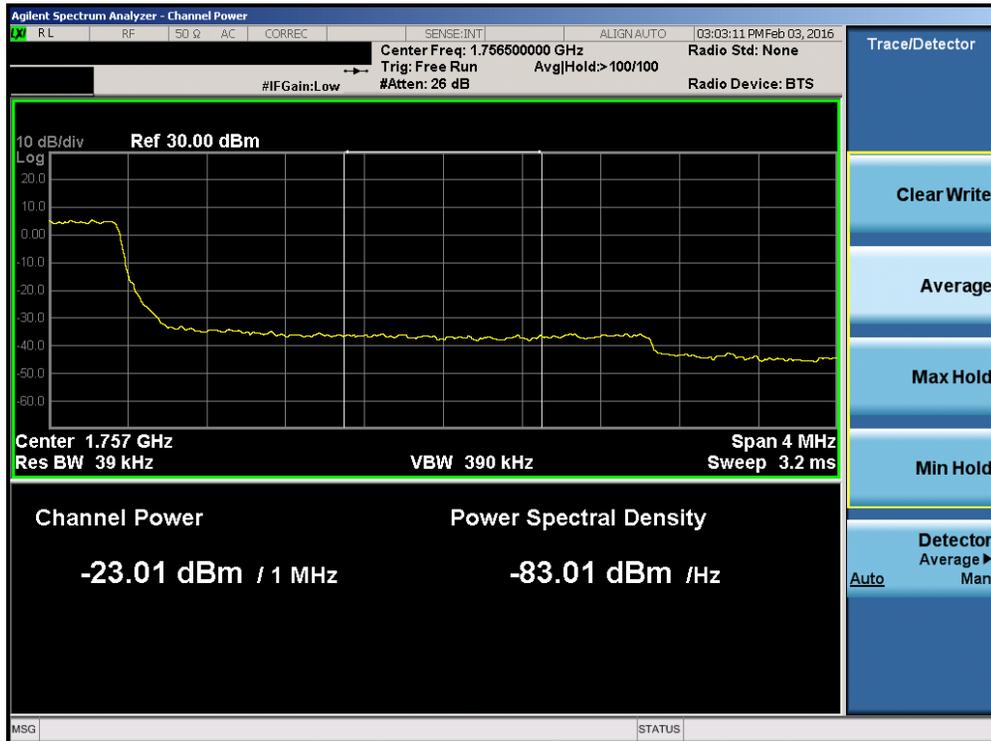


Plot 7-72. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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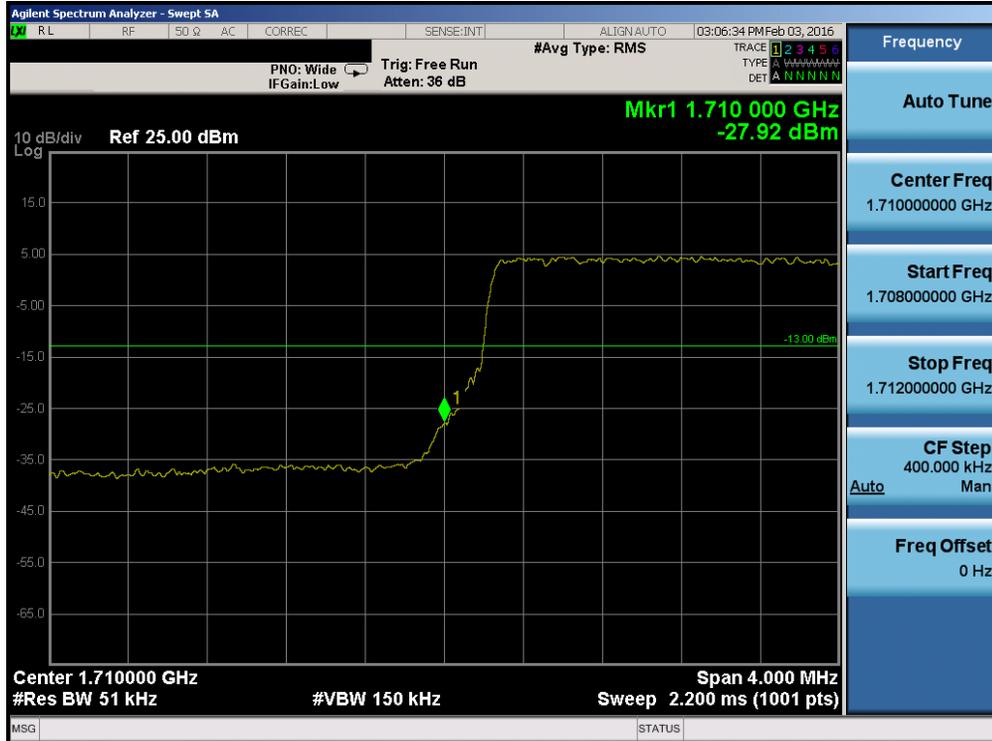


Plot 7-73. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

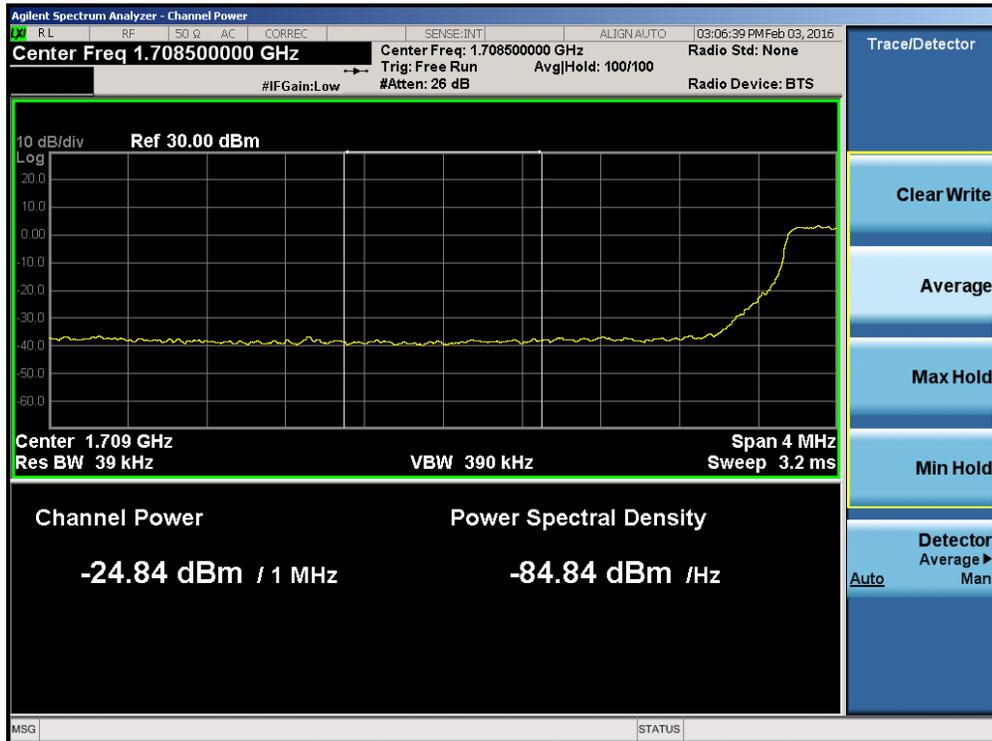


Plot 7-74. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-75. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

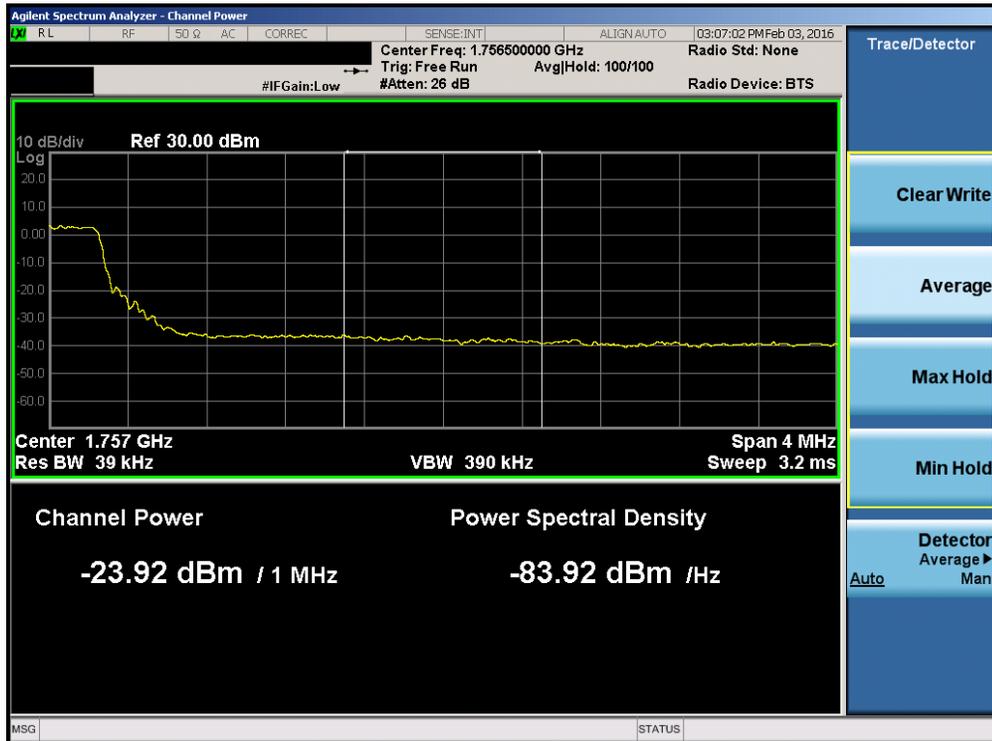


Plot 7-76. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-77. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

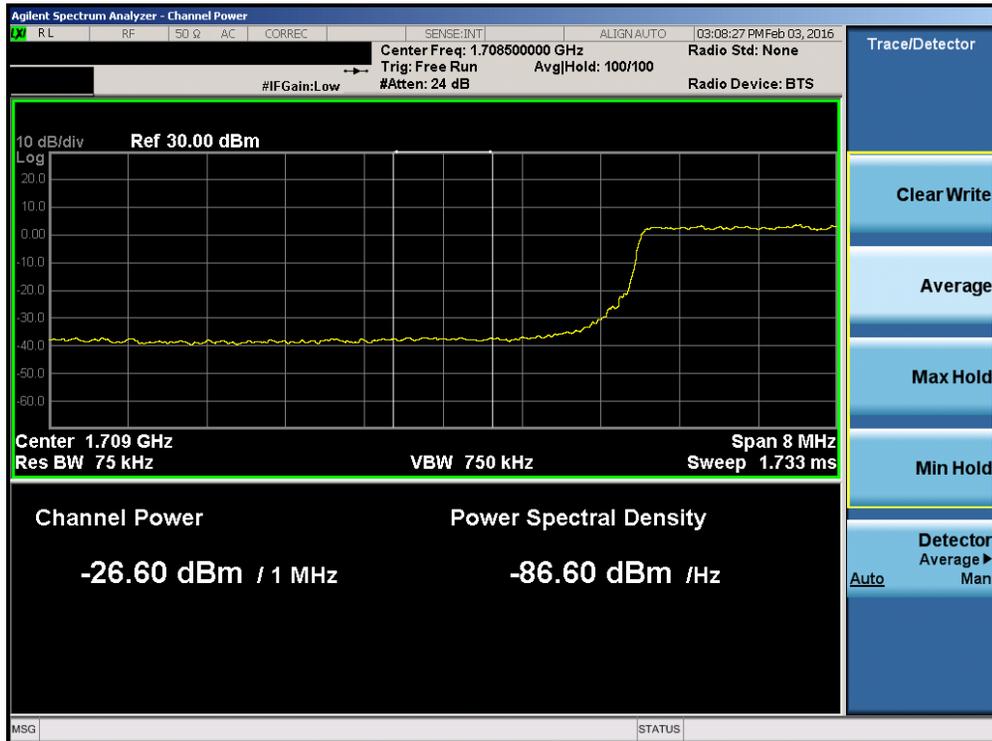


Plot 7-78. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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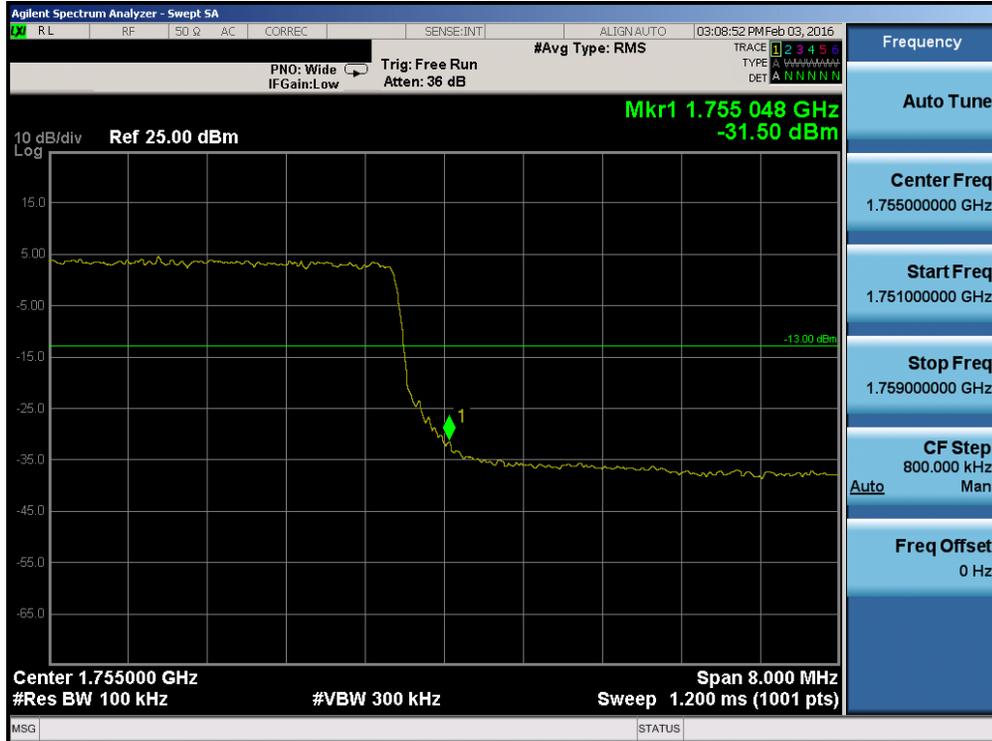


Plot 7-79. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

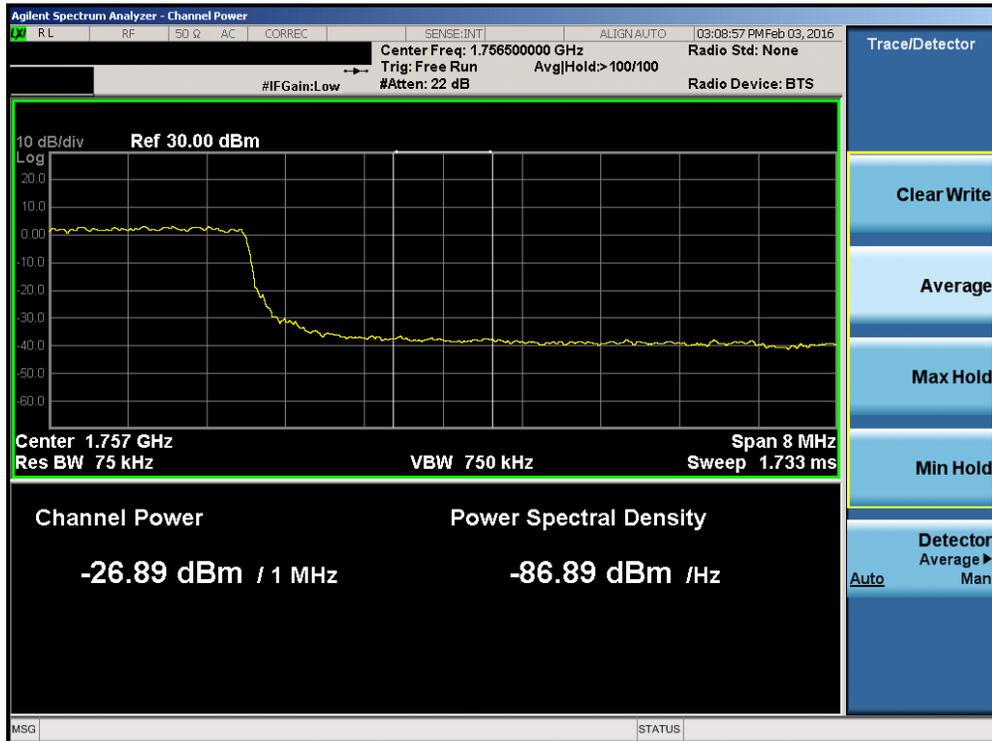


Plot 7-80. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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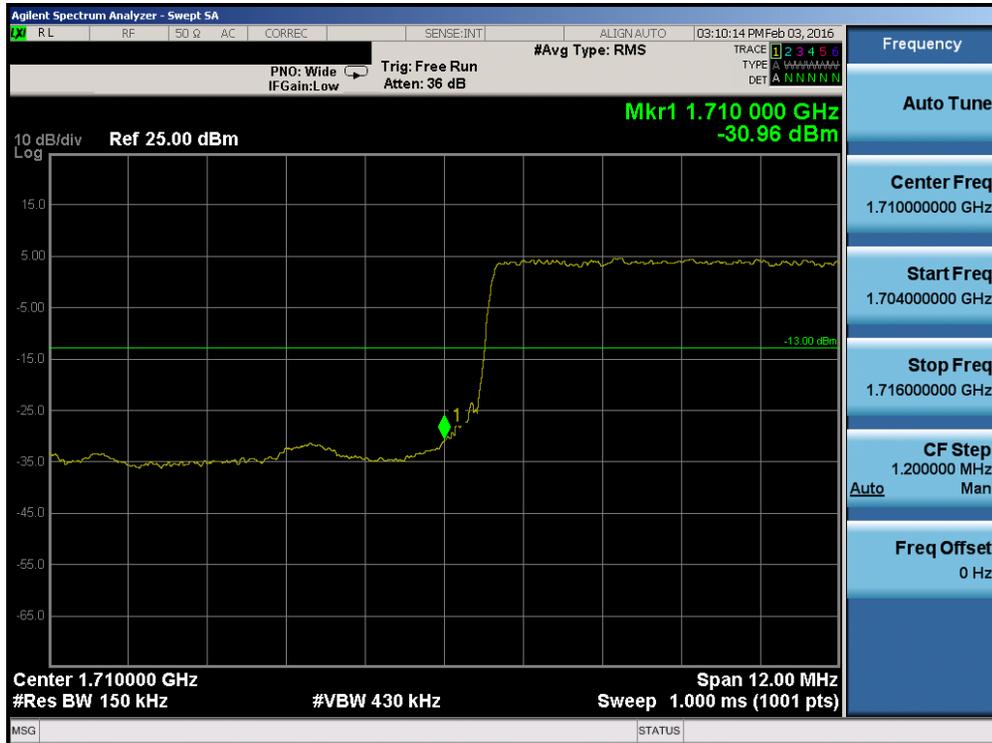


Plot 7-81. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

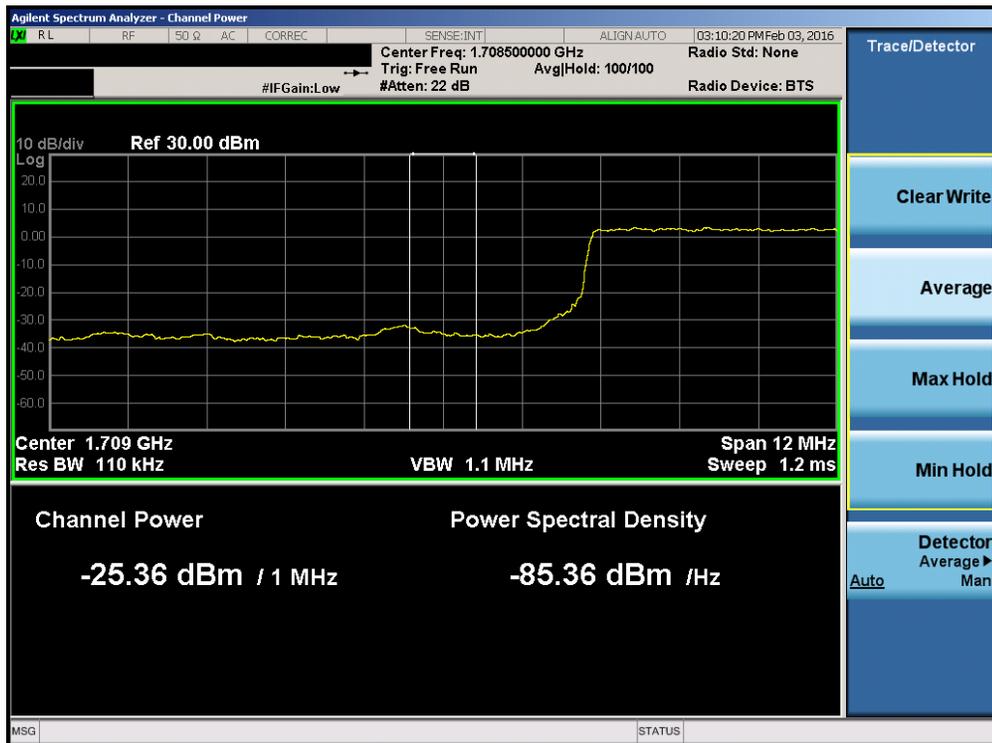


Plot 7-82. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-83. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

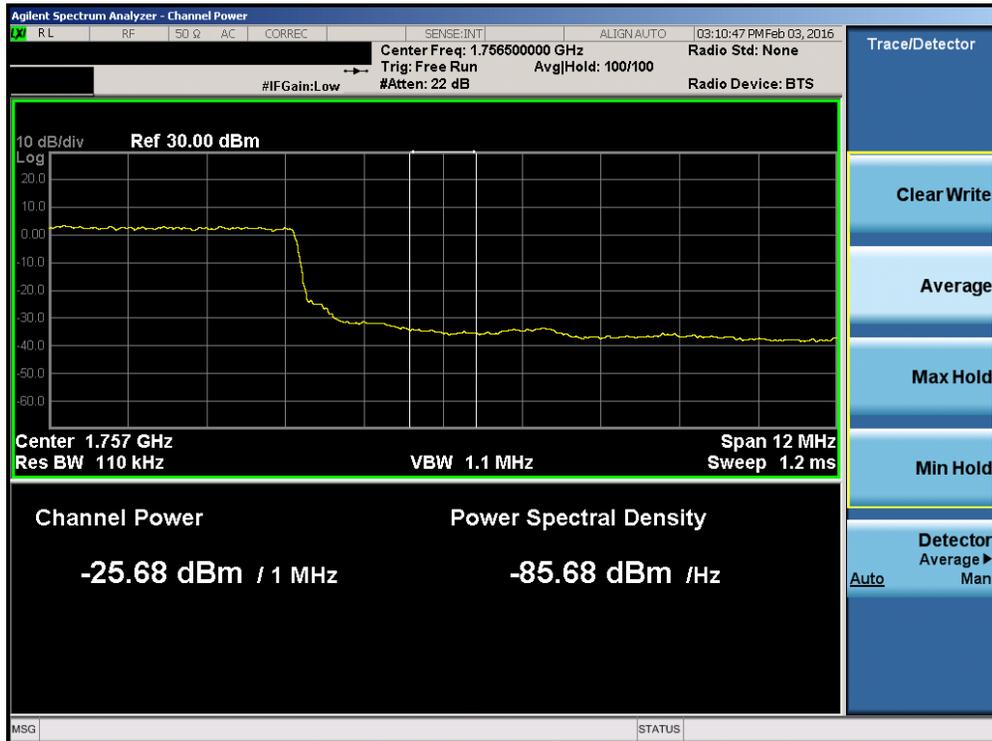


Plot 7-84. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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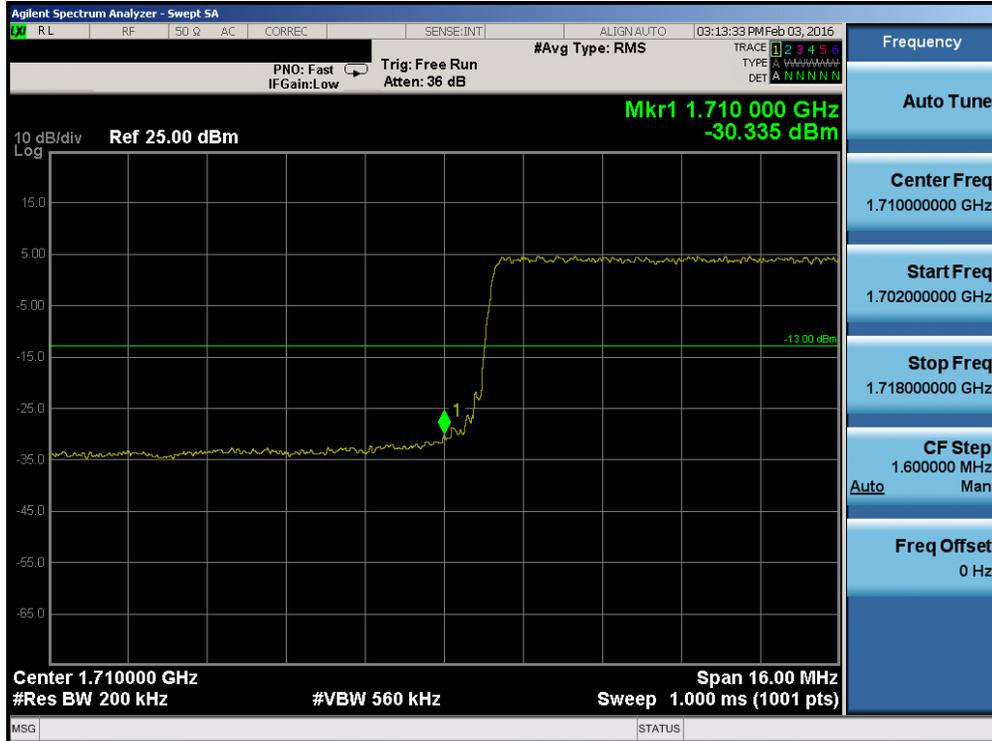


Plot 7-85. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

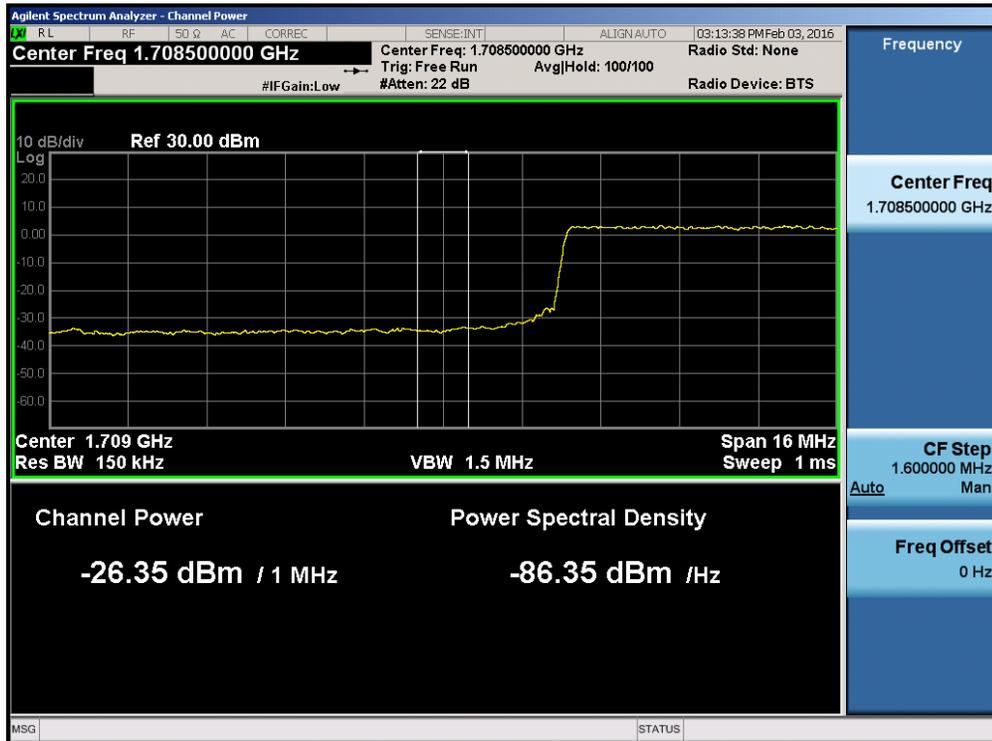


Plot 7-86. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
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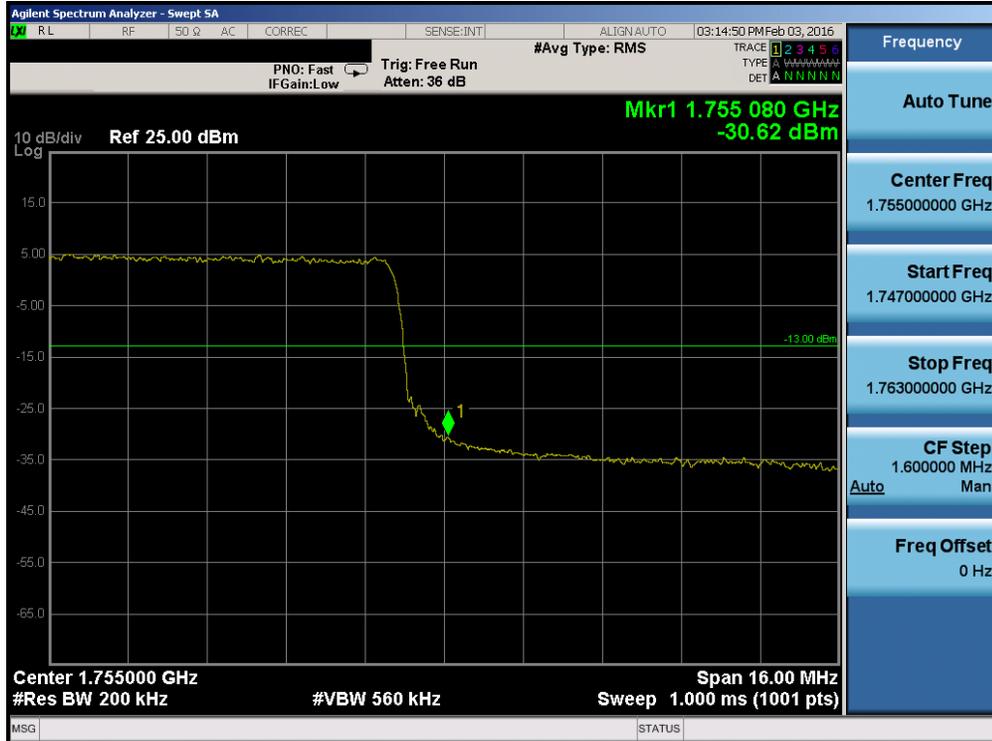


Plot 7-87. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

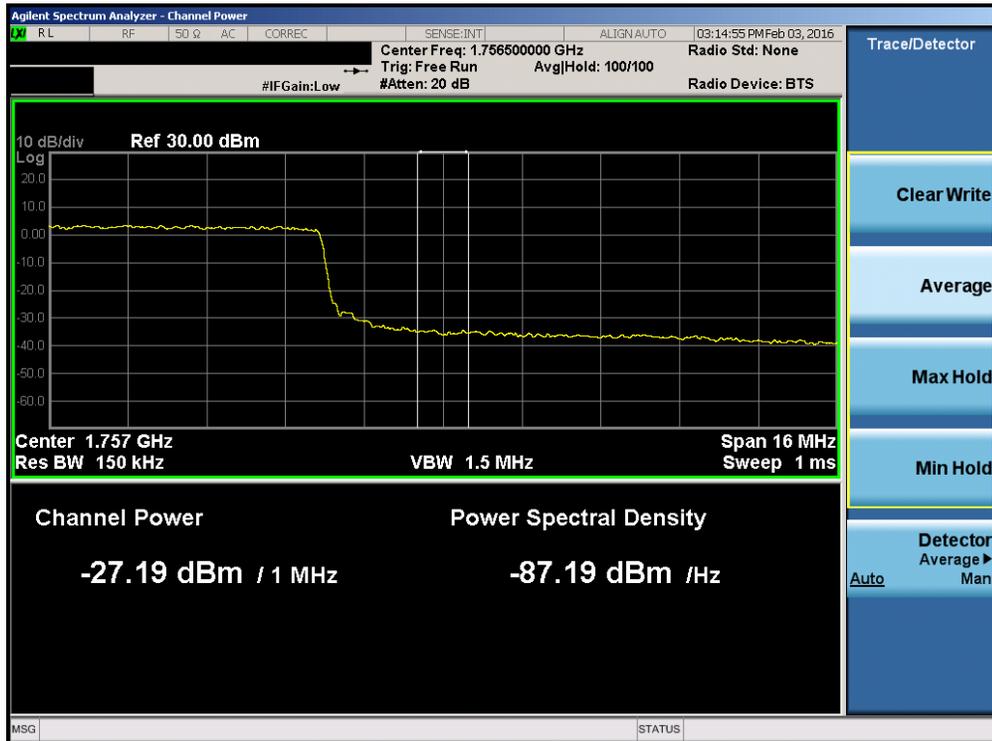


Plot 7-88. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-89. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

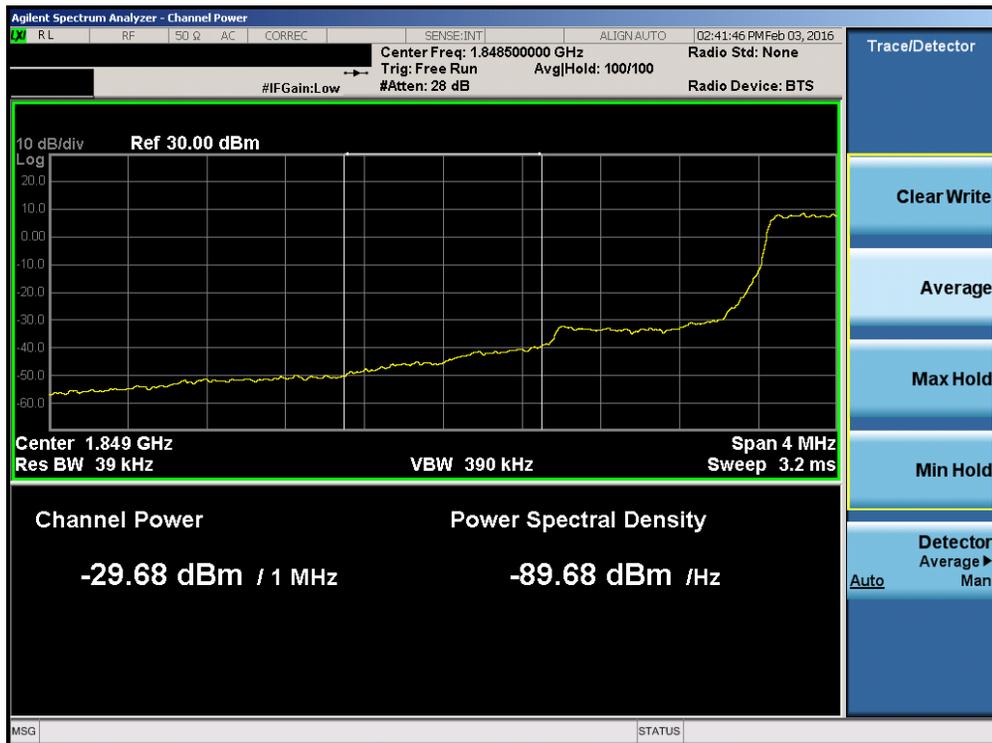


Plot 7-90. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-91. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

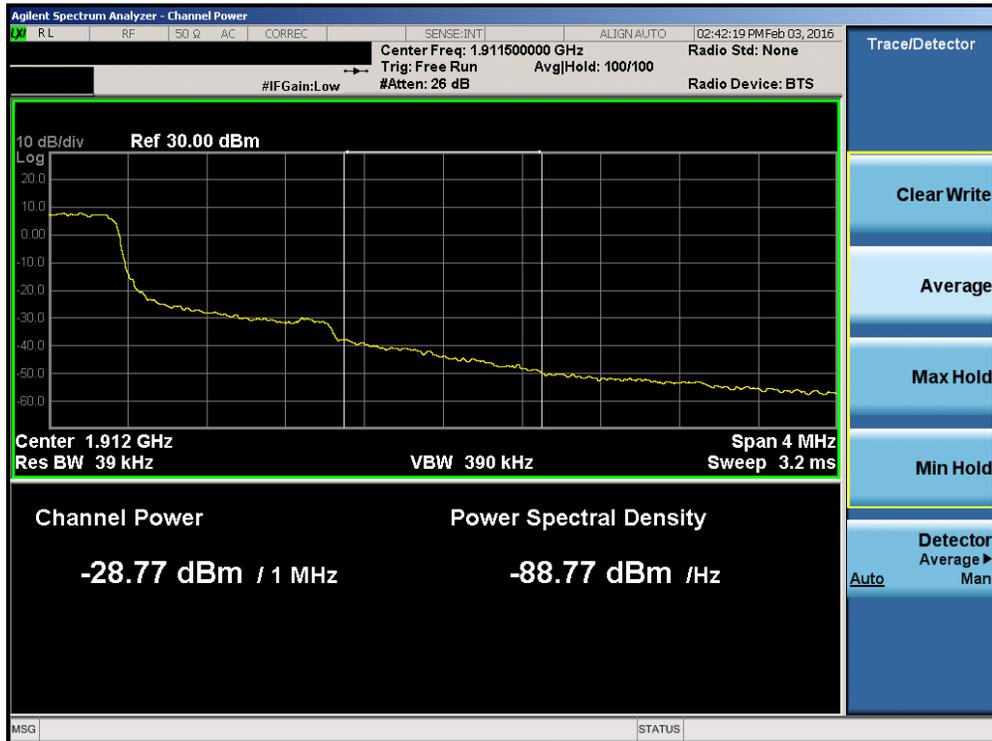


Plot 7-92. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 61 of 99

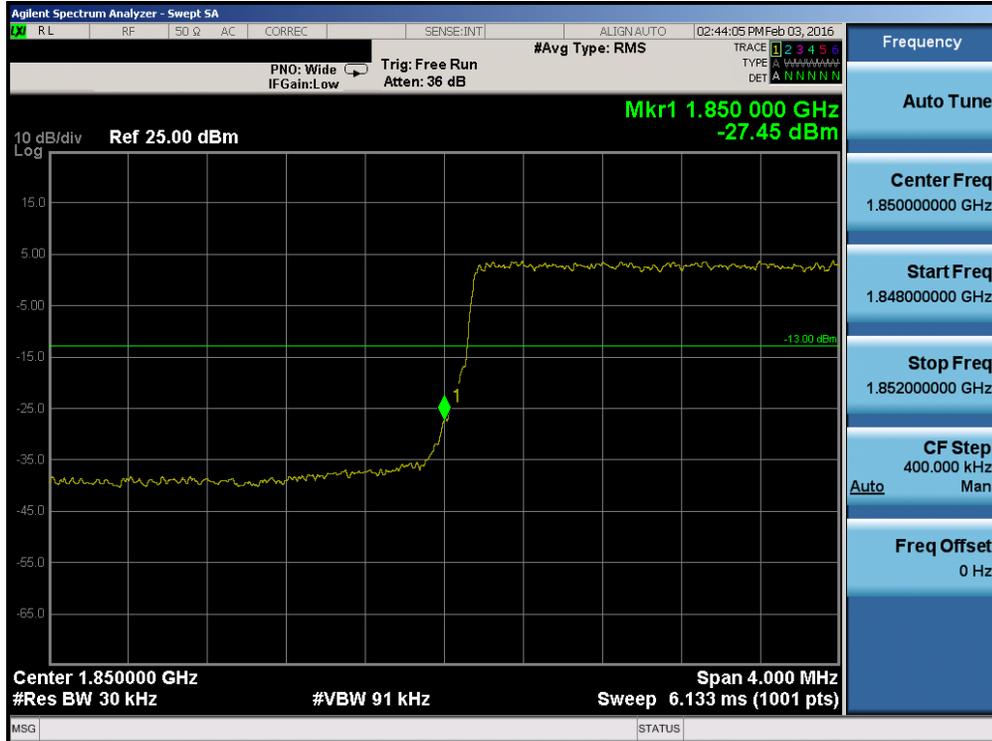


Plot 7-93. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

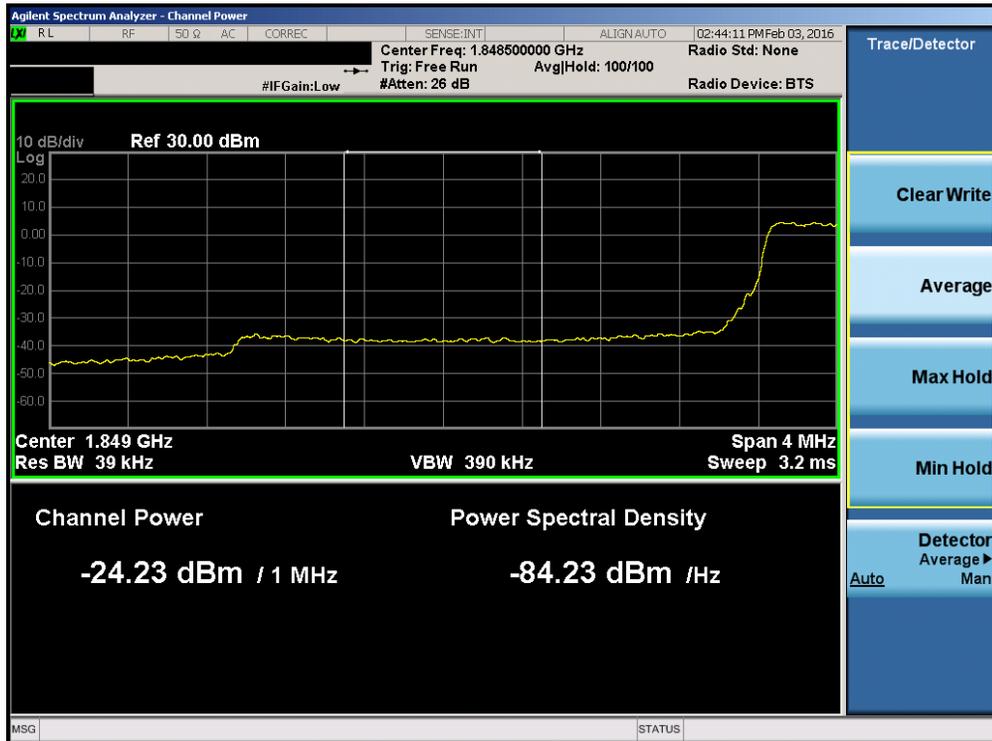


Plot 7-94. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 62 of 99

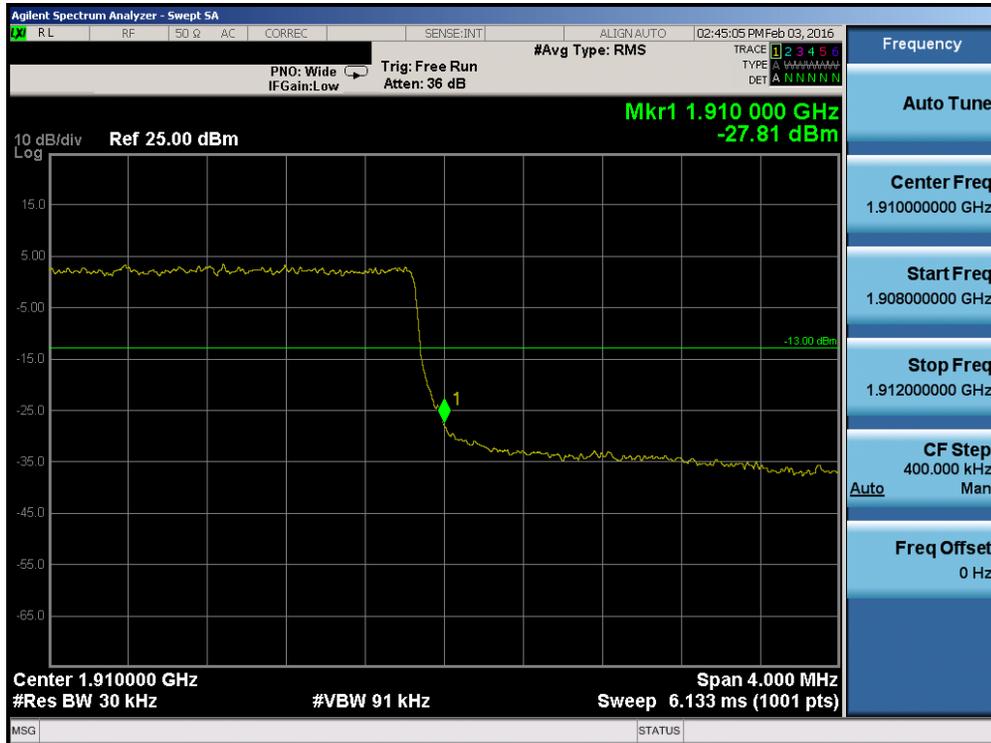


Plot 7-95. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

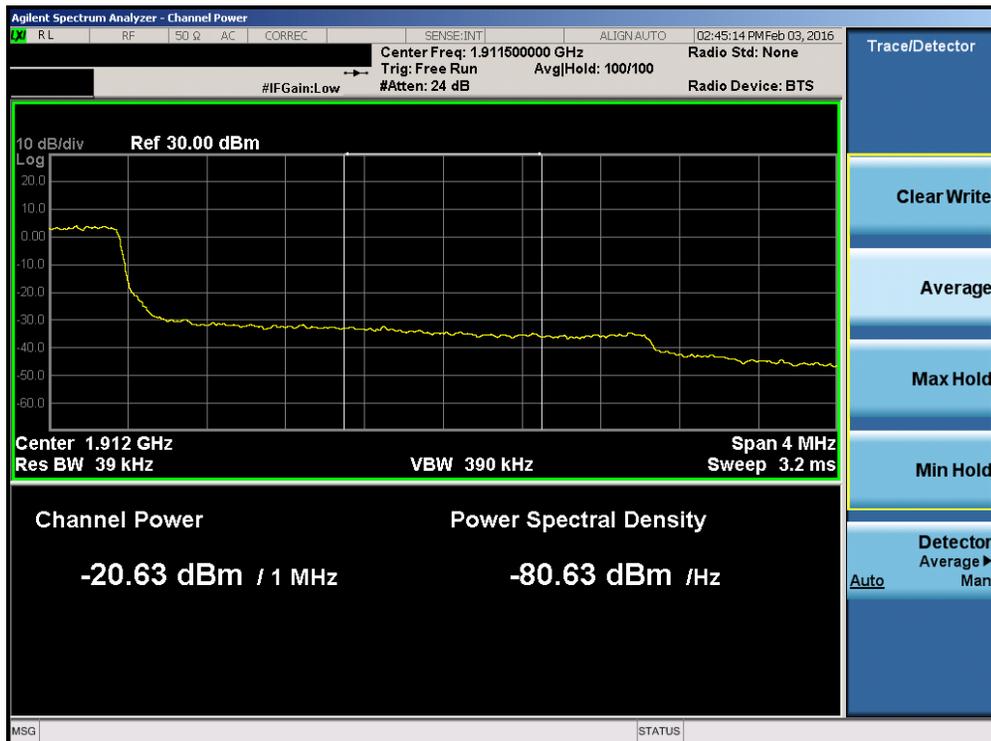


Plot 7-96. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 63 of 99



Plot 7-97. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

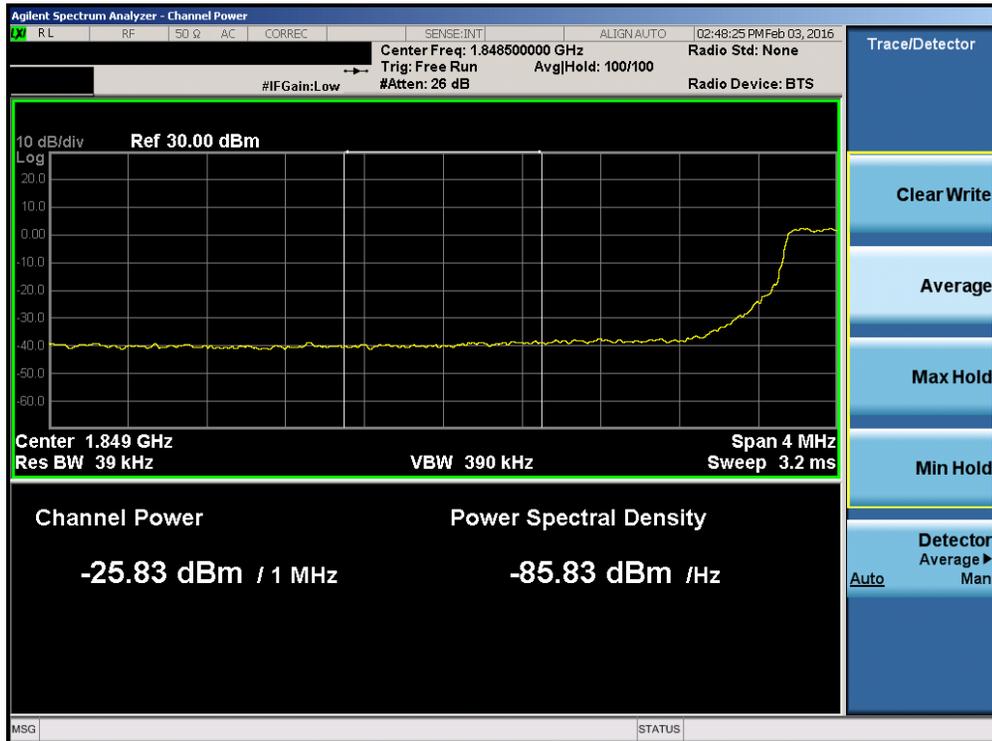


Plot 7-98. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 64 of 99



Plot 7-99. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

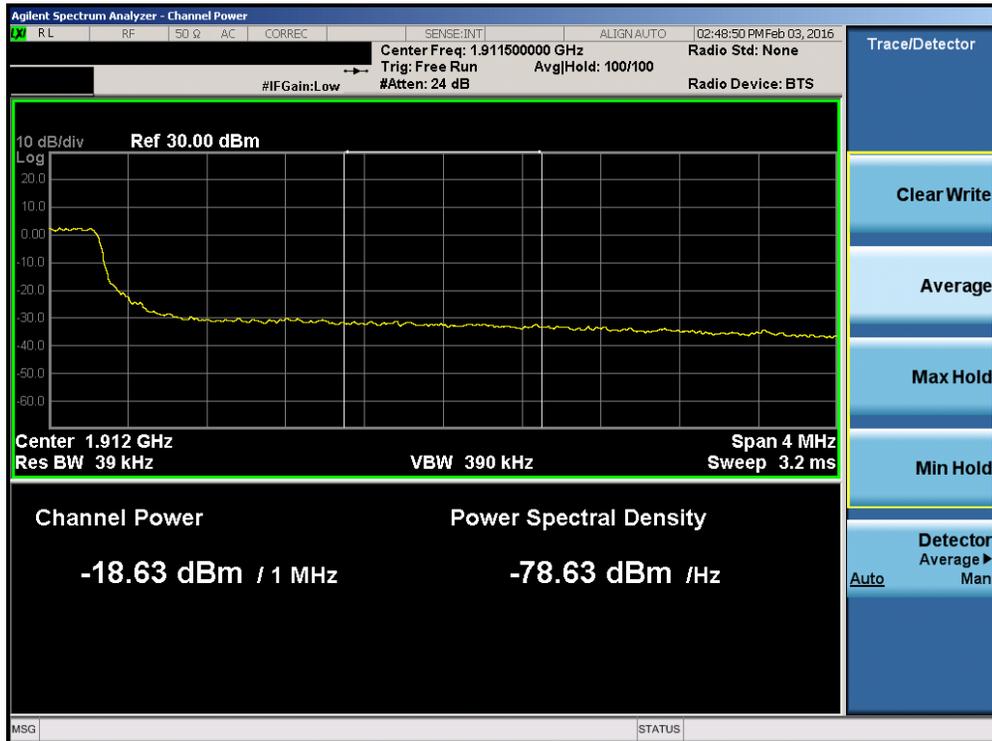


Plot 7-100. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 65 of 99



Plot 7-101. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

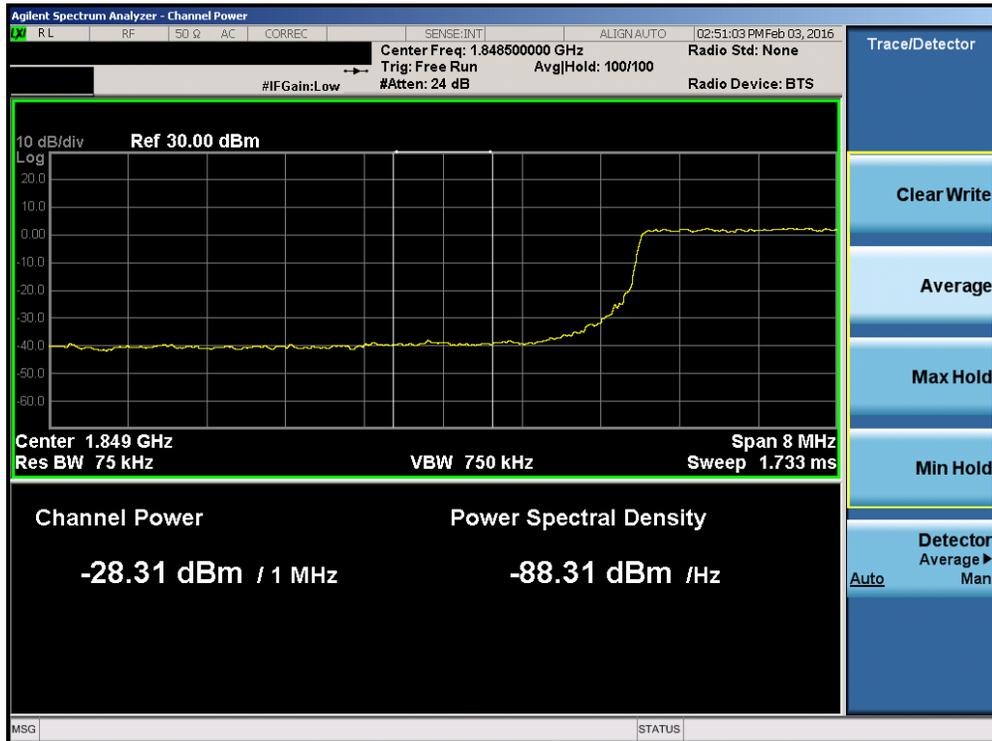


Plot 7-102. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 66 of 99

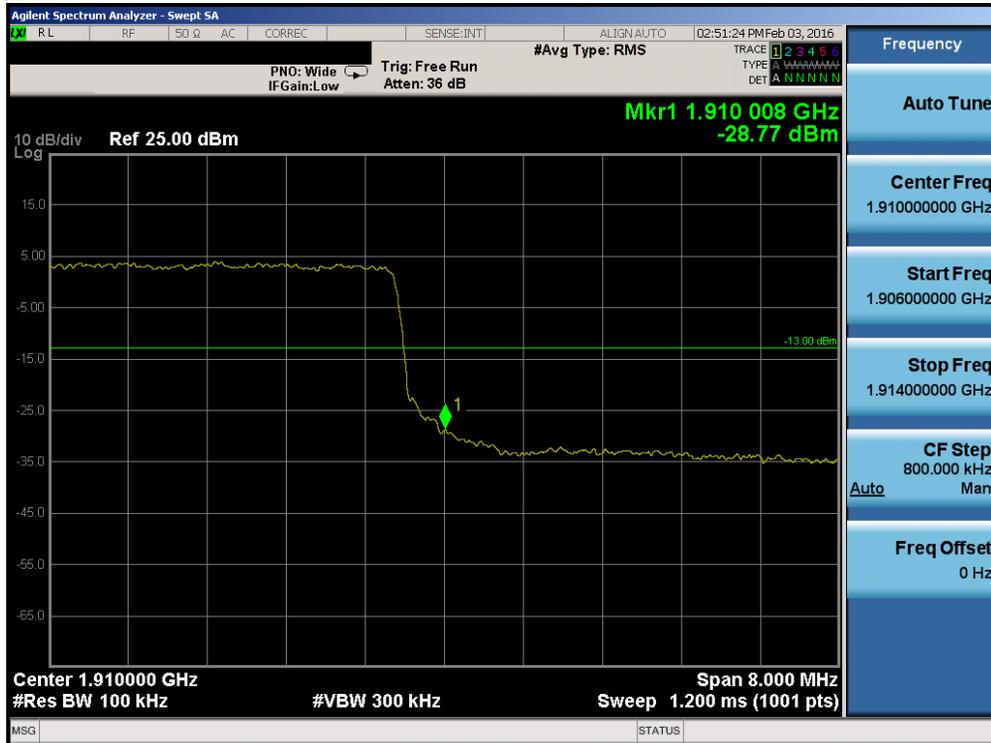


Plot 7-103. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

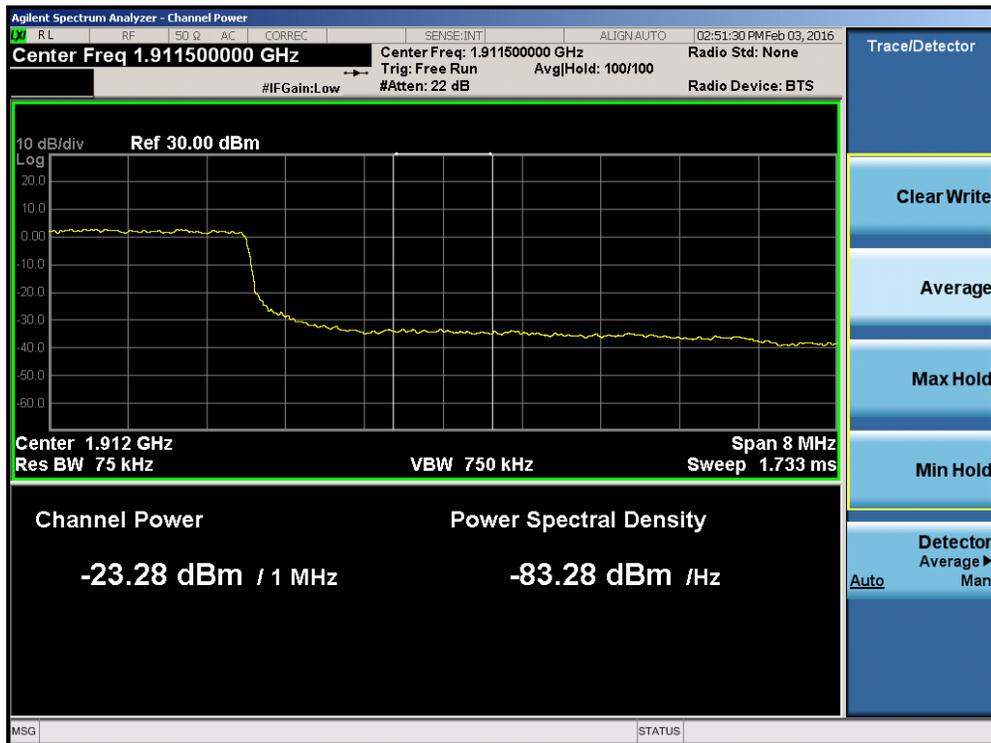


Plot 7-104. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFK428	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 67 of 99



Plot 7-105. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

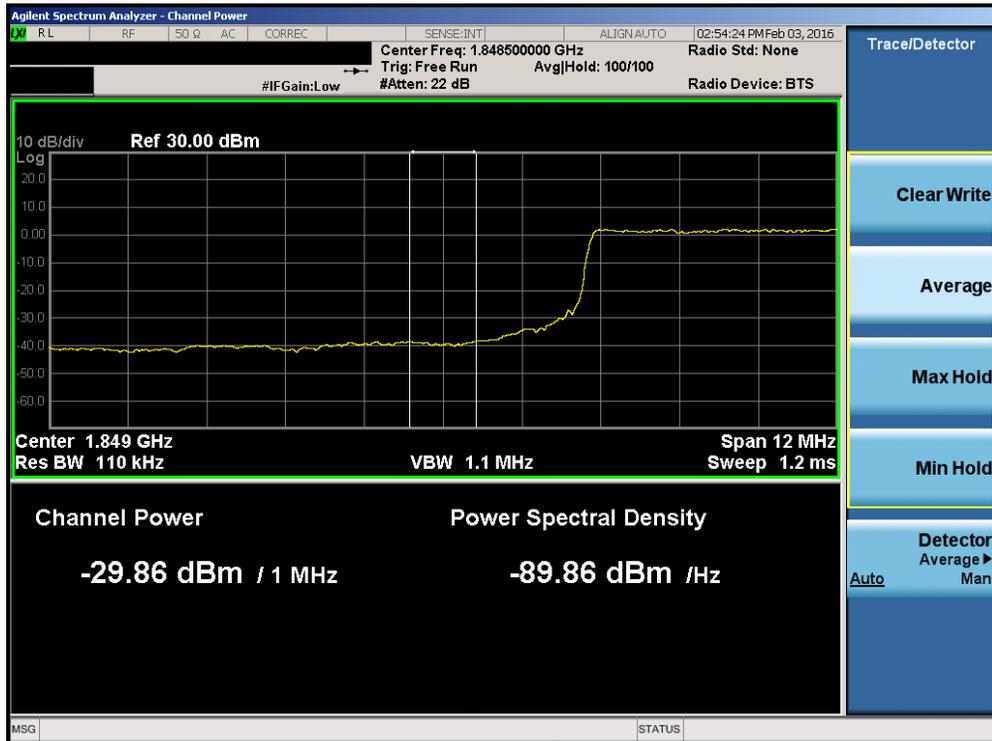


Plot 7-106. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 68 of 99



Plot 7-107. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

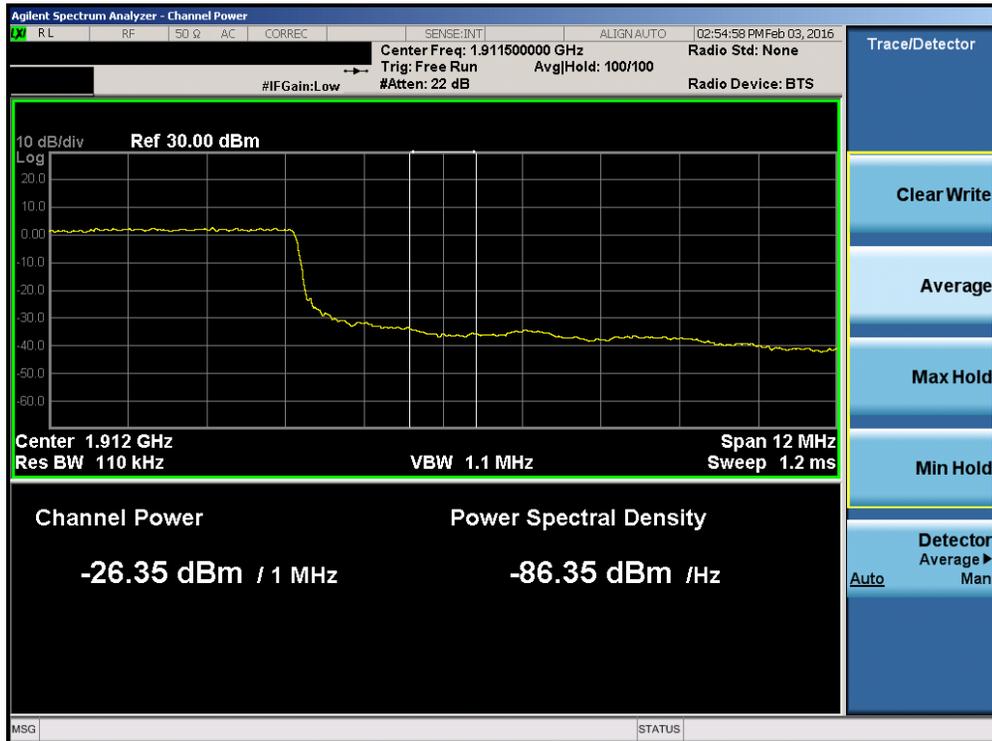


Plot 7-108. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 69 of 99

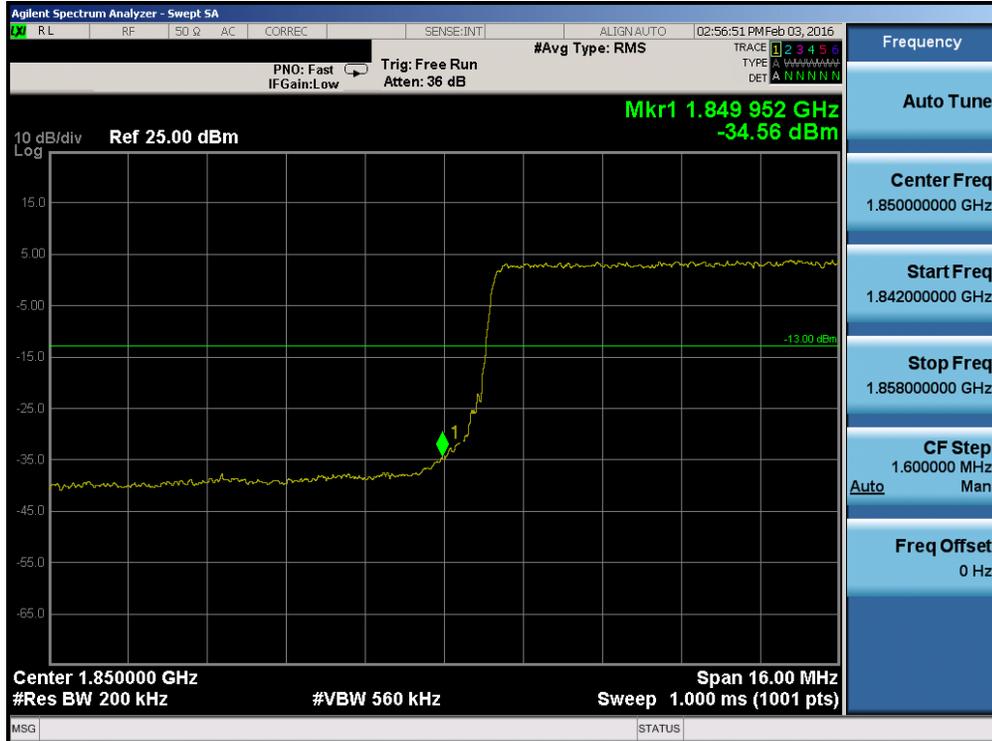


Plot 7-109. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

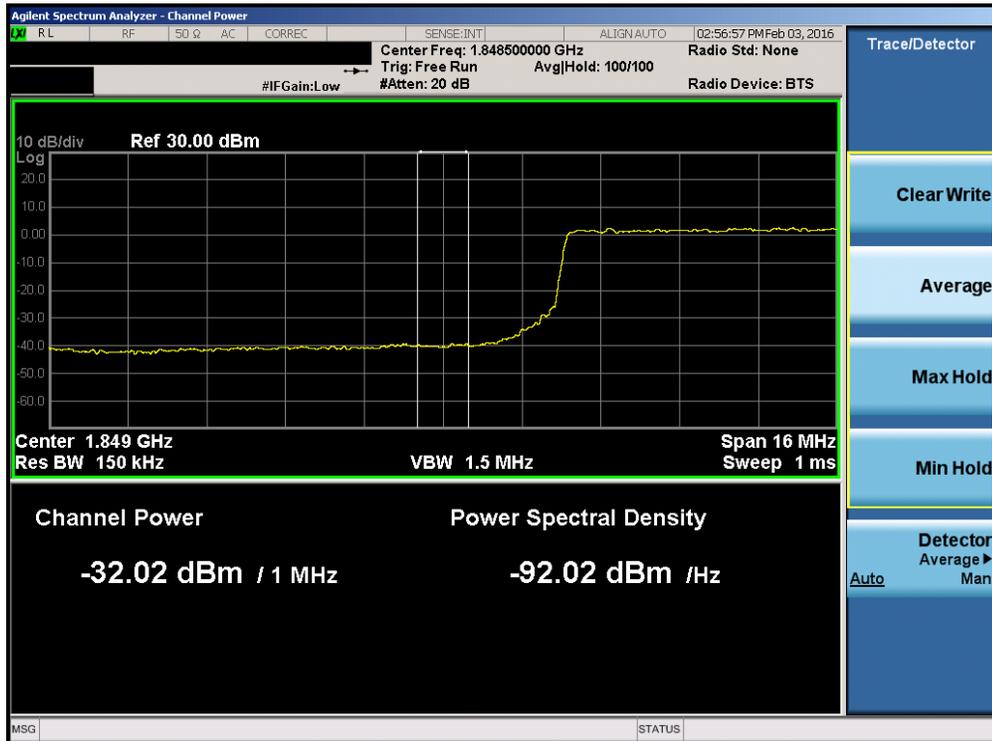


Plot 7-110. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 70 of 99

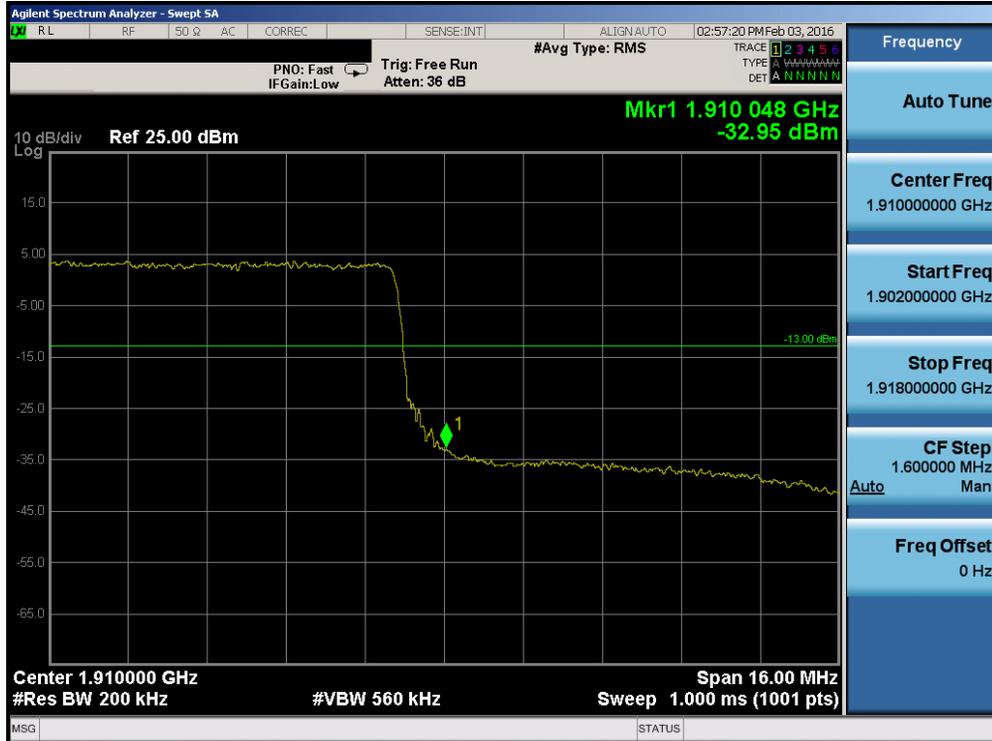


Plot 7-111. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

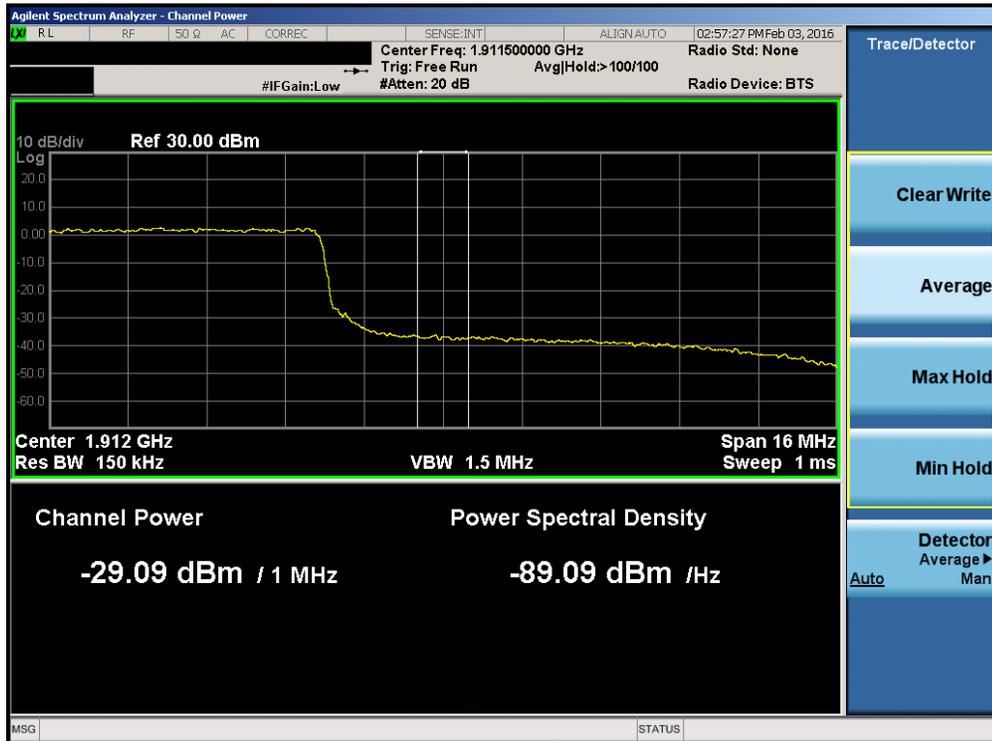


Plot 7-112. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 71 of 99



Plot 7-113. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-114. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 72 of 99

## 7.5 Peak-Average Ratio

### §24.232(d)

#### Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

#### Test Procedure Used

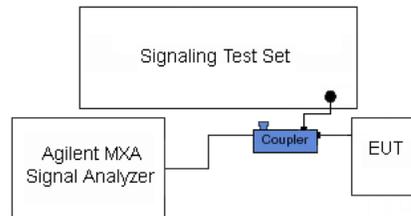
KDB 971168 v02r02 – Section 5.7.1

#### Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

#### Test Setup

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

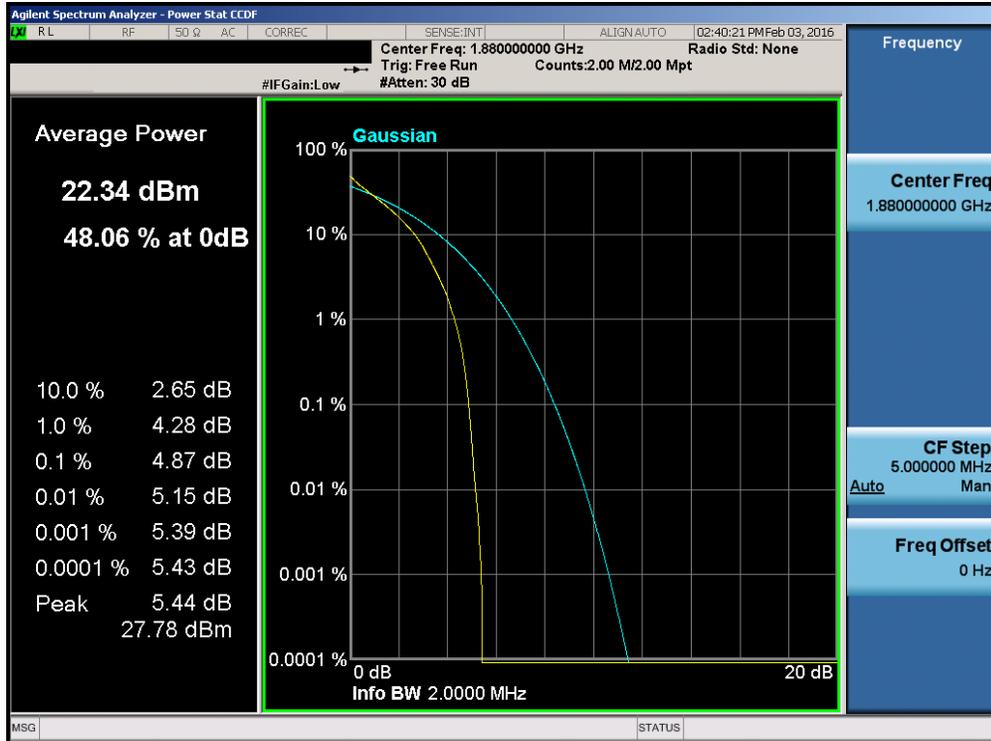


**Figure 7-4. Test Instrument & Measurement Setup**

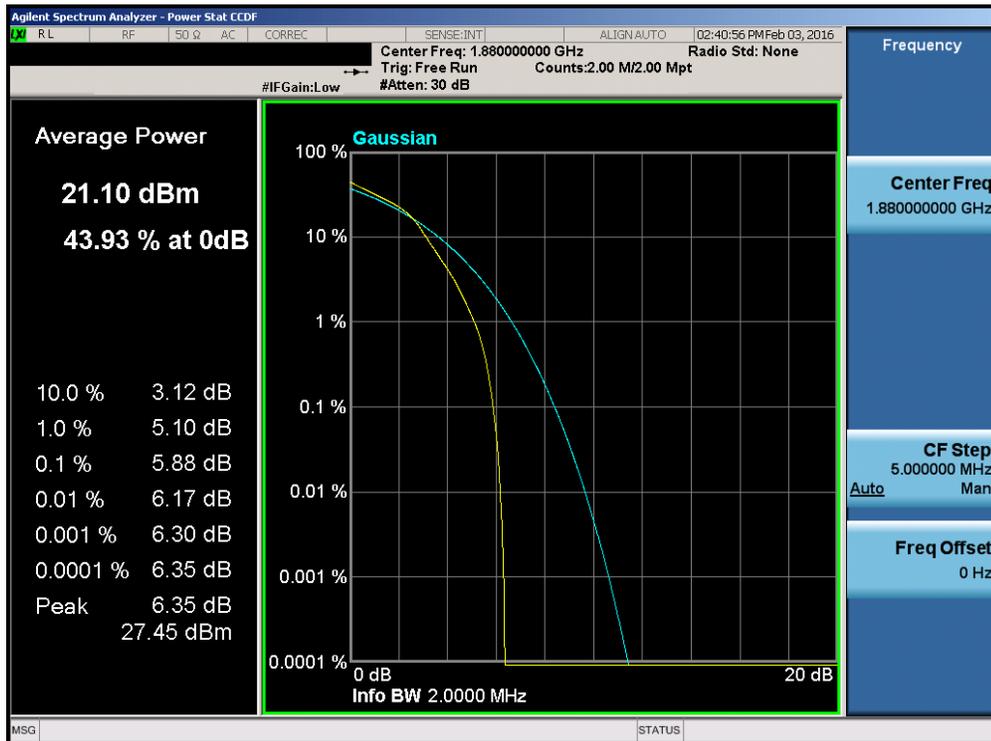
#### Test Notes

None.

FCC ID: ZNFK428	 <b>FCC Pt. 24 &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b> 		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset	Page 73 of 99

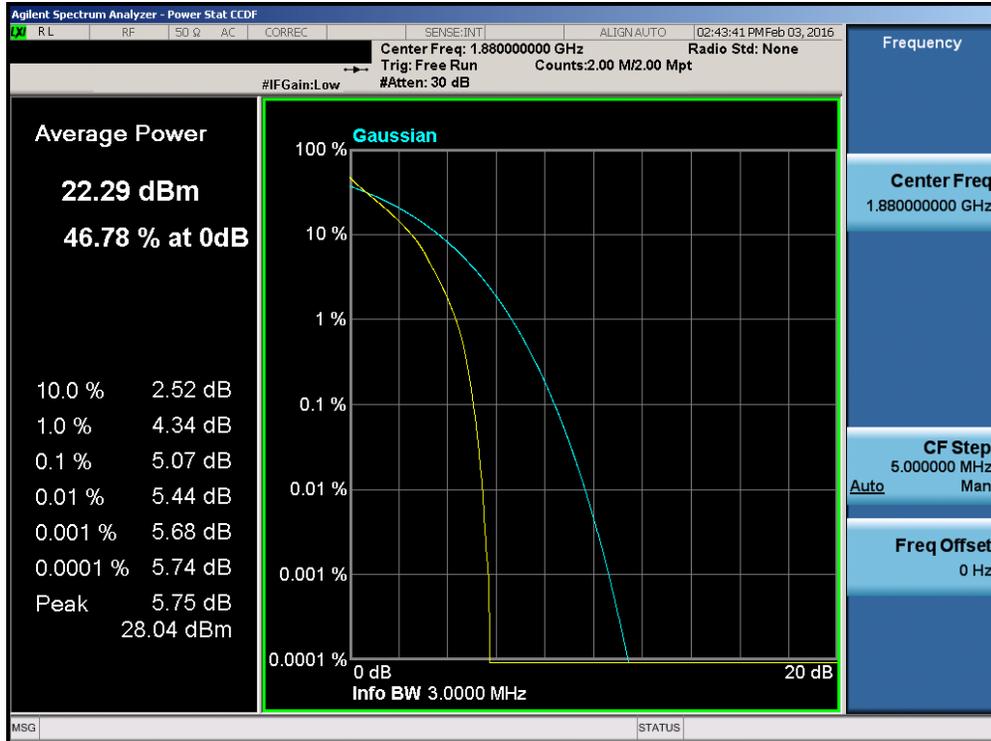


Plot 7-115. PAR Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

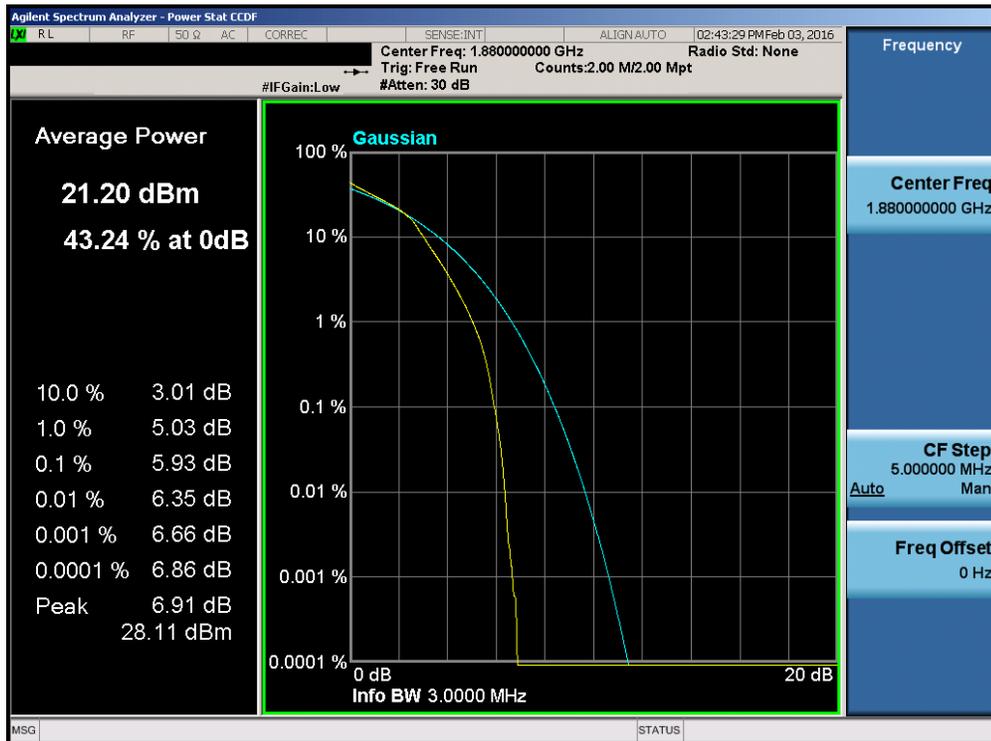


Plot 7-116. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 74 of 99

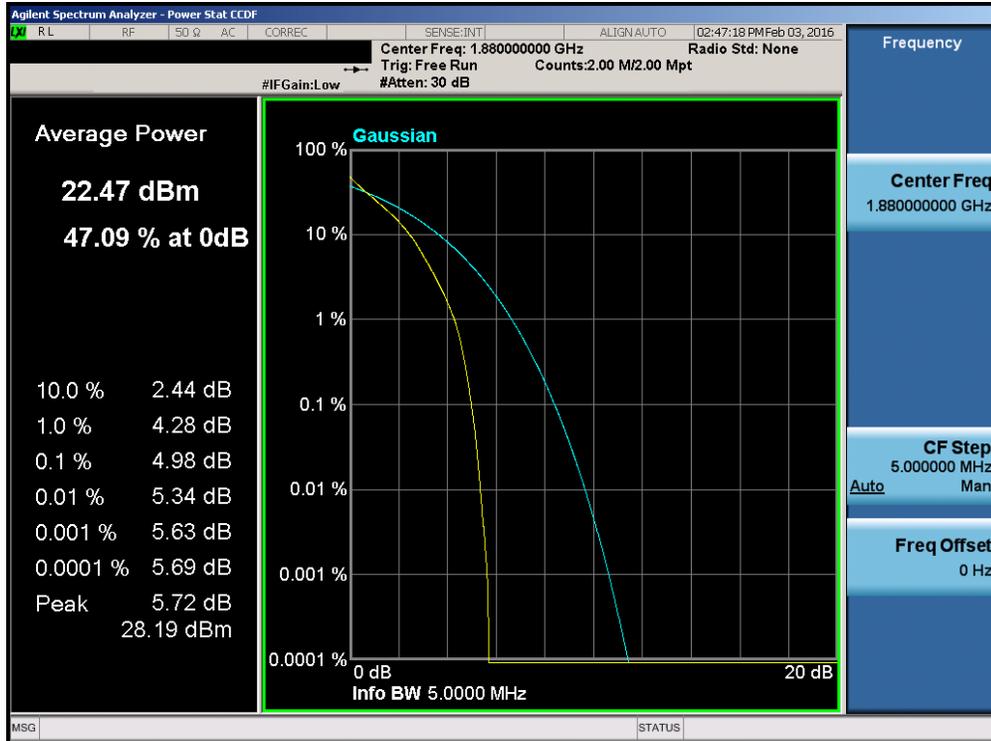


Plot 7-117. PAR Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

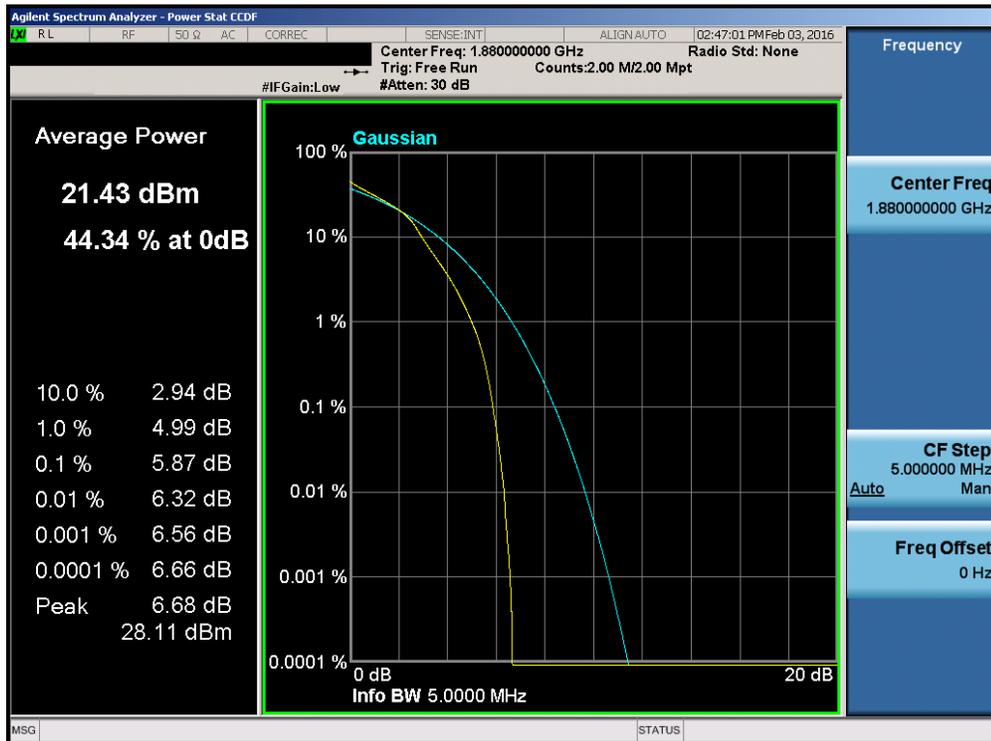


Plot 7-118. PAR Plot (Band 2 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 75 of 99

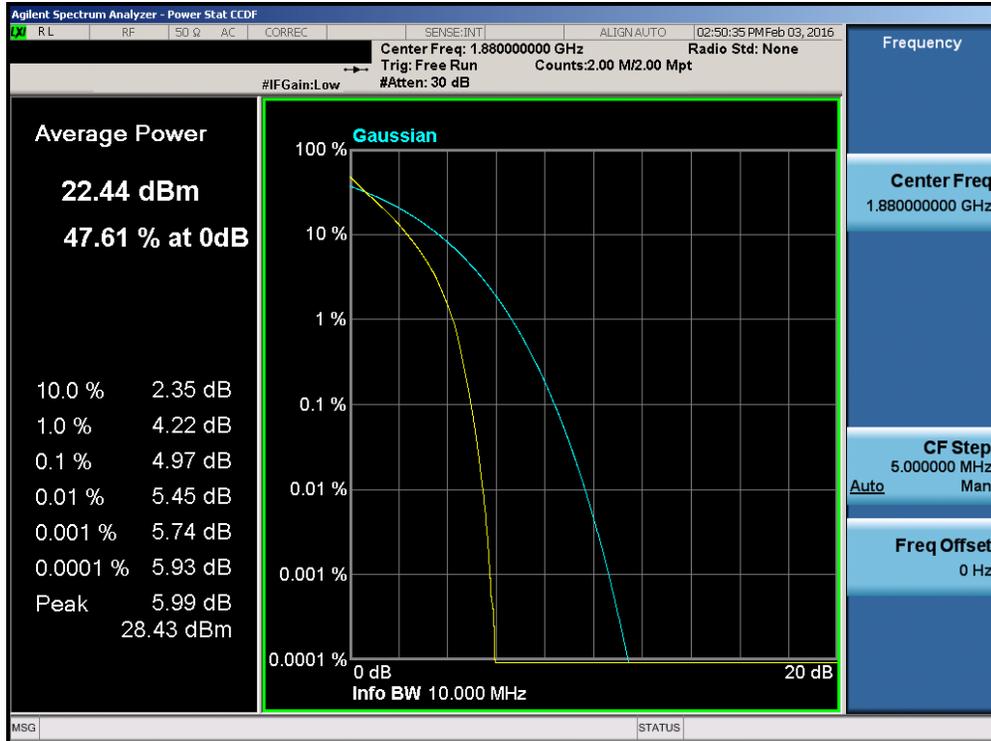


Plot 7-119. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

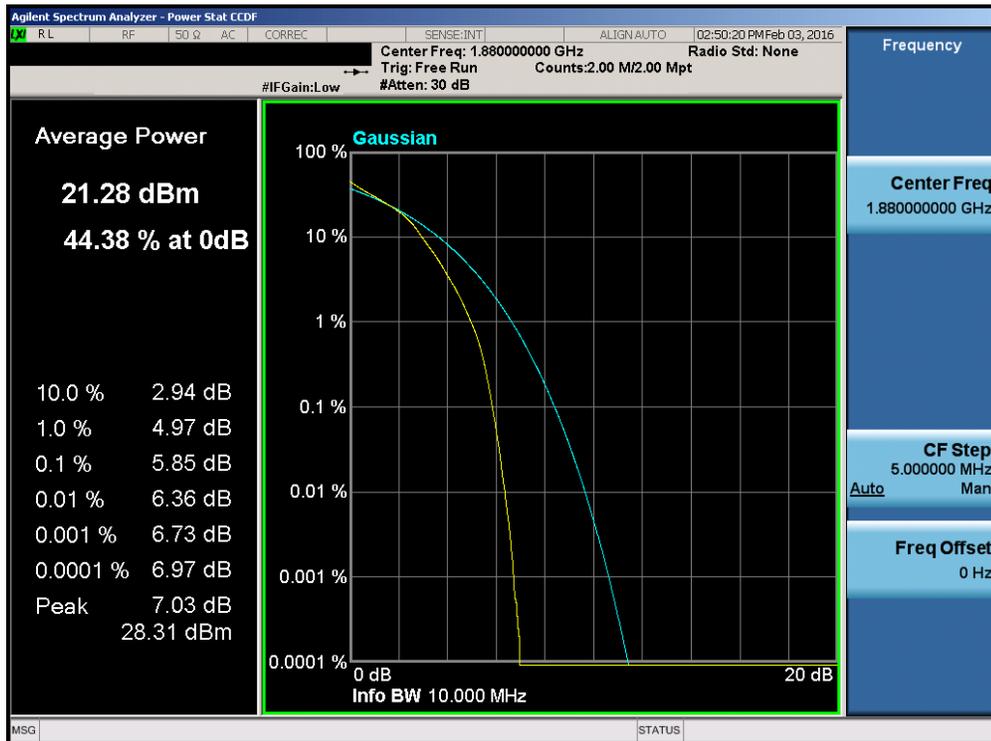


Plot 7-120. PAR Plot (Band 2 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 76 of 99

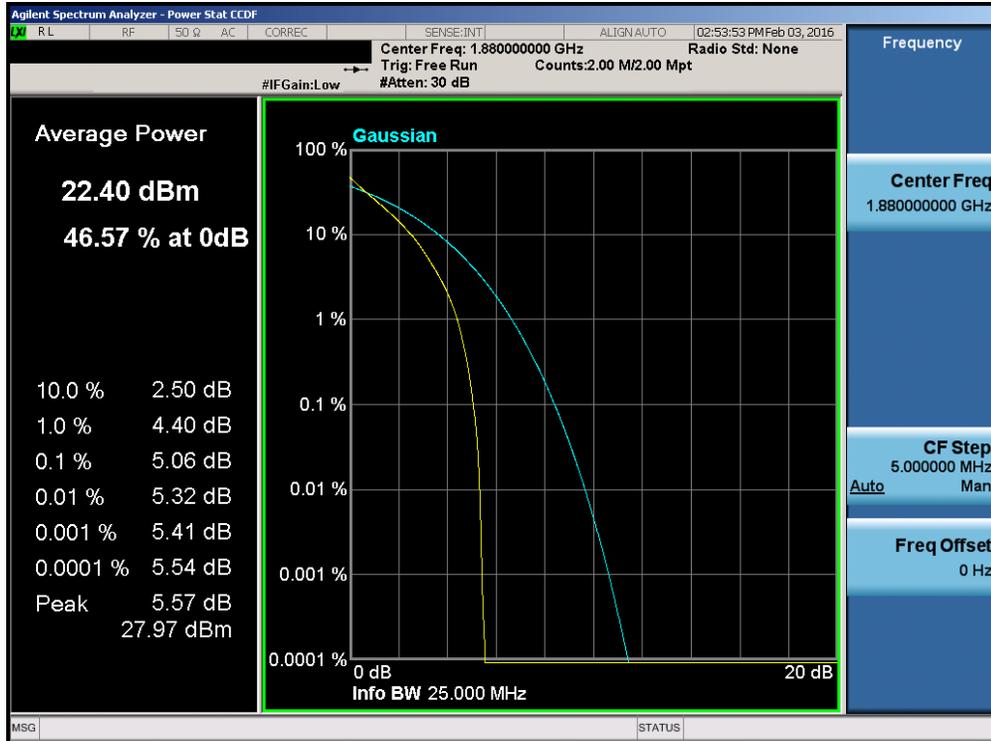


Plot 7-121. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

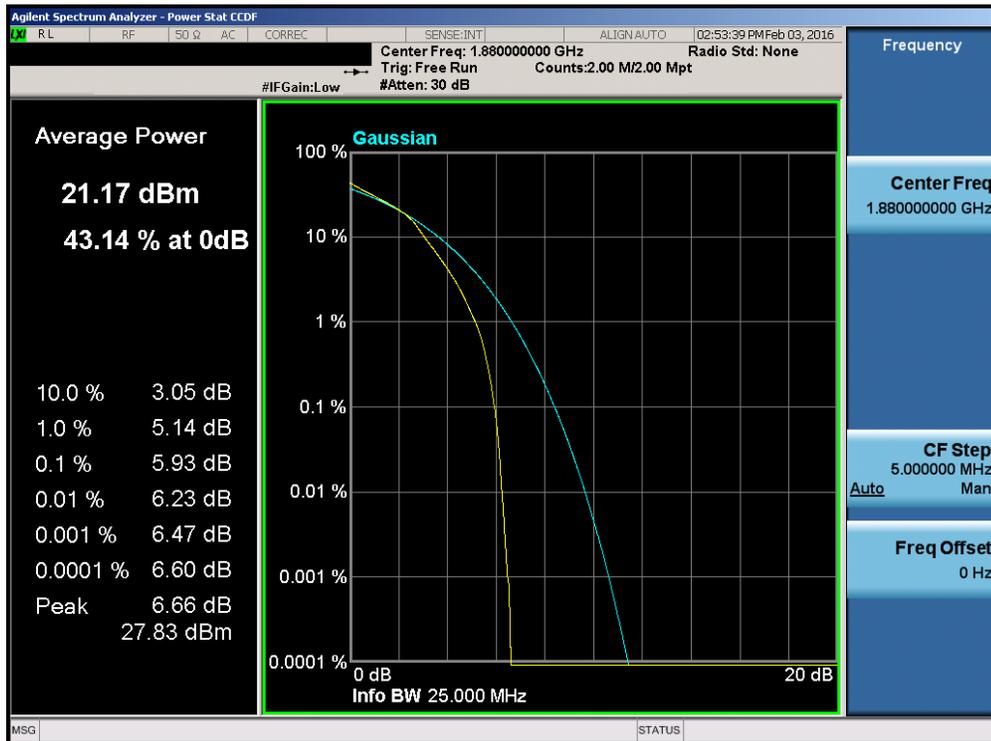


Plot 7-122. PAR Plot (Band 2 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 77 of 99

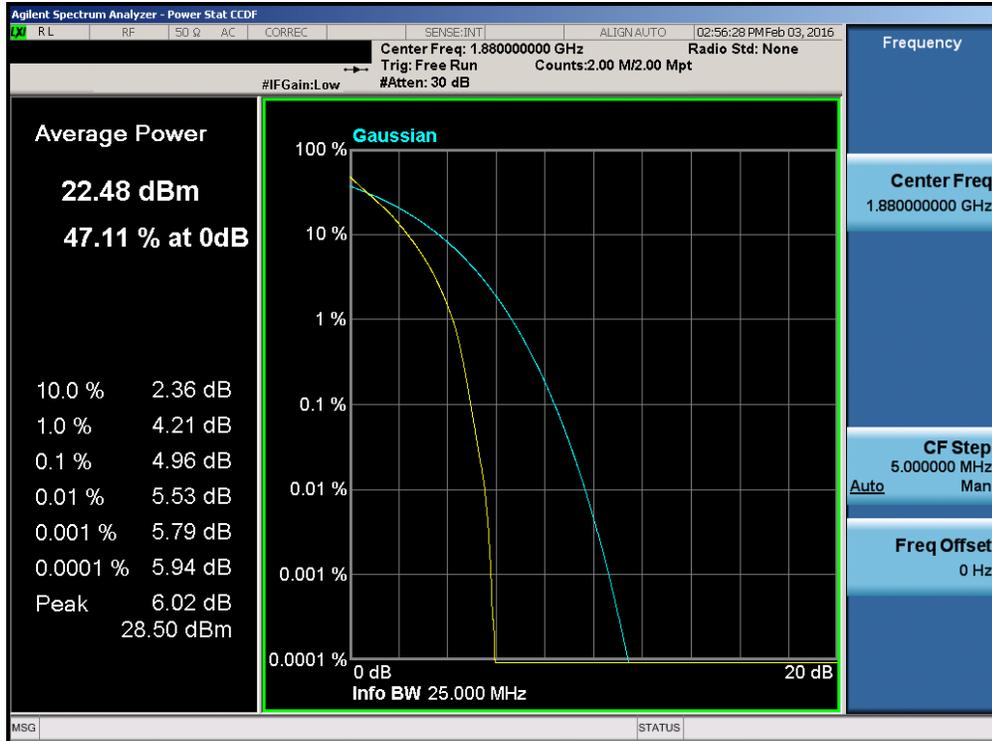


Plot 7-123. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

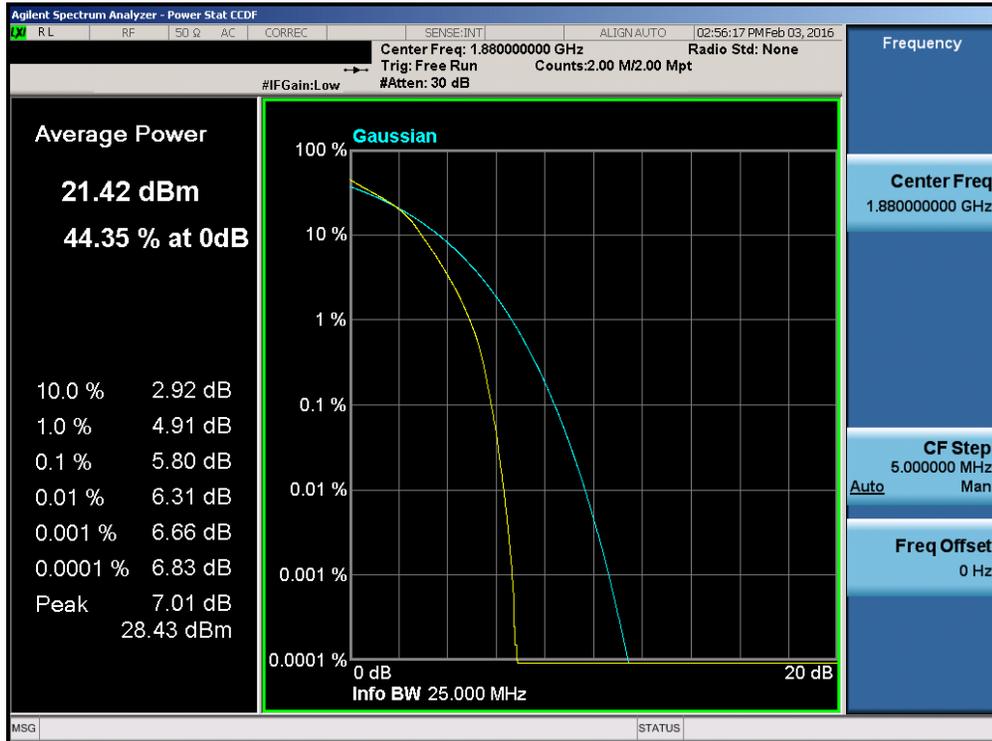


Plot 7-124. PAR Plot (Band 2 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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Plot 7-125. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-126. PAR Plot (Band 2 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 79 of 99

## 7.6 Radiated Power (ERP/EIRP)

§24.232(c.2) §27.50(c.10) §27.50(d.4)

### Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 v02r02 – Section 5.2.1

ANSI/TIA-603-C-2004 – Section 2.2.17

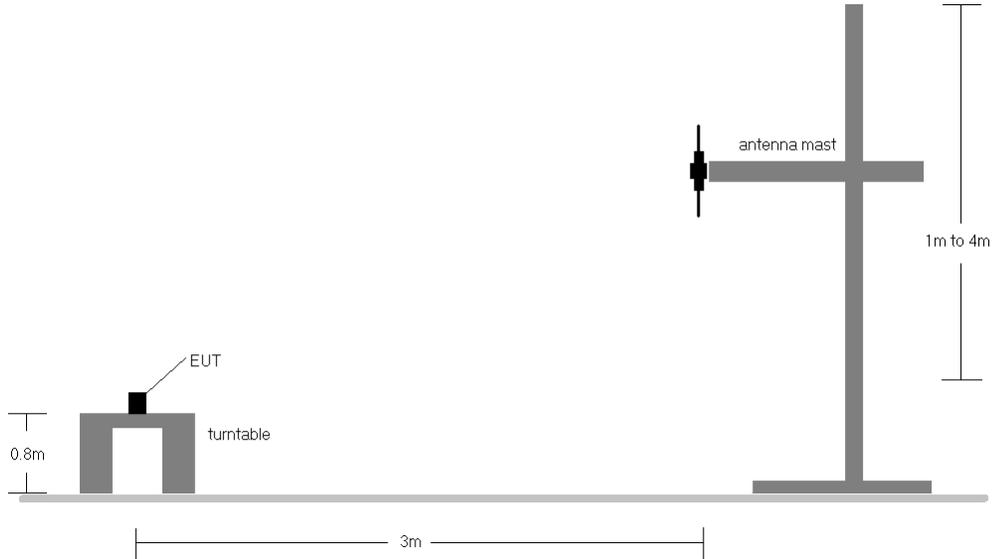
### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $\geq$  2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

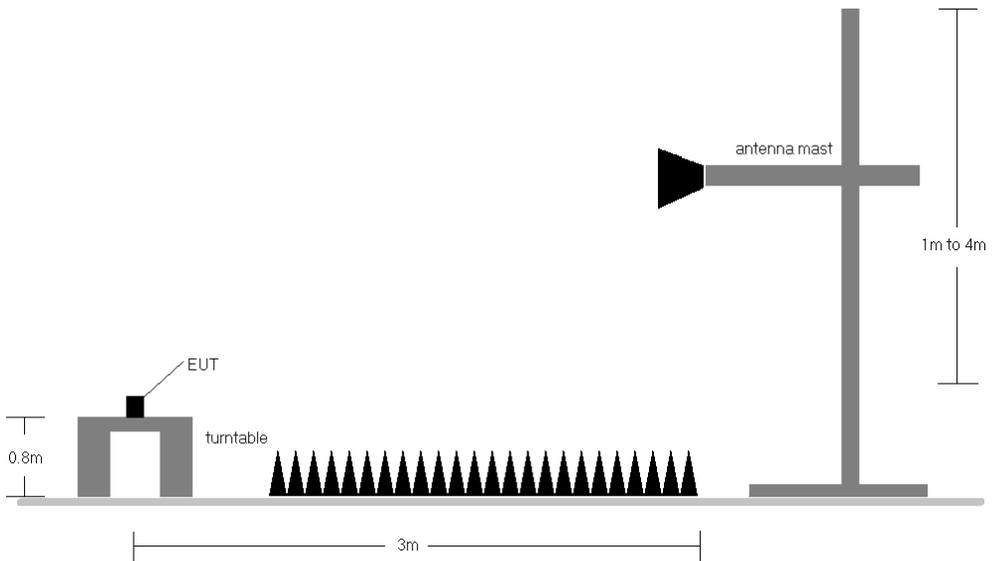
FCC ID: ZNFK428	 <b>FCC Pt. 24 &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b>		 <b>Reviewed by:</b> Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset	Page 80 of 99

### Test Setup

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



**Figure 7-5. Radiated Test Setup <1GHz**



**Figure 7-6. Radiated Test Setup >1GHz**

### Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.

FCC ID: ZNFK428		FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset		Page 81 of 99

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	234	0	1 / 5	16.94	2.88	19.82	34.77	-14.95
707.50	1.4	QPSK	H	234	0	1 / 5	16.94	2.88	19.82	34.77	-14.95
715.30	1.4	QPSK	H	234	0	1 / 0	16.39	3.06	19.45	34.77	-15.32
699.70	1.4	16-QAM	H	234	0	1 / 5	15.91	2.88	18.79	34.77	-15.98
707.50	1.4	16-QAM	H	234	0	1 / 0	15.90	2.88	18.78	34.77	-15.99
715.30	1.4	16-QAM	H	234	0	1 / 0	15.81	3.06	18.87	34.77	-15.90
700.50	3	QPSK	H	234	258	1 / 14	17.06	2.72	19.78	34.77	-14.99
707.50	3	QPSK	H	234	258	1 / 0	16.81	2.88	19.69	34.77	-15.08
714.50	3	QPSK	H	234	258	1 / 0	16.42	3.04	19.46	34.77	-15.31
700.50	3	16-QAM	H	234	258	1 / 14	16.01	2.72	18.73	34.77	-16.04
707.50	3	16-QAM	H	234	258	1 / 0	15.84	2.88	18.72	34.77	-16.05
714.50	3	16-QAM	H	234	258	1 / 0	15.94	3.04	18.98	34.77	-15.79
701.50	5	QPSK	H	234	351	1 / 24	16.67	2.75	19.42	34.77	-15.35
707.50	5	QPSK	H	234	351	1 / 0	16.96	2.88	19.84	34.77	-14.93
713.50	5	QPSK	H	234	351	1 / 0	17.18	3.02	20.20	34.77	-14.57
701.50	5	16-QAM	H	234	351	1 / 24	15.64	2.75	18.39	34.77	-16.38
707.50	5	16-QAM	H	234	351	1 / 24	15.46	2.88	18.34	34.77	-16.43
713.50	5	16-QAM	H	234	351	1 / 0	16.14	3.02	19.16	34.77	-15.61
704.00	10	QPSK	H	234	2	1 / 49	16.39	2.80	19.19	34.77	-15.58
707.50	10	QPSK	H	234	2	1 / 49	17.04	2.88	19.92	34.77	-14.85
711.00	10	QPSK	H	234	2	1 / 0	16.48	2.96	19.44	34.77	-15.33
704.00	10	16-QAM	H	234	2	1 / 49	15.73	2.80	18.53	34.77	-16.24
707.50	10	16-QAM	H	234	2	1 / 49	16.41	2.88	19.29	34.77	-15.48
711.00	10	16-QAM	H	234	2	1 / 49	15.75	2.96	18.71	34.77	-16.06

**Table 7-2. ERP Data (Band 12)**

FCC ID: ZNFK428	 <b>FCC Pt. 24 &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b> 		Reviewed by: Quality Manager
Test Report S/N: 0Y1602020284.ZNF	Test Dates: 2/3-3/15/2016	EUT Type: Portable Handset	Page 82 of 99

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	H	110	197	1 / 0	12.39	9.67	22.06	30.00	-7.94
1732.50	1.4	QPSK	H	110	197	1 / 0	13.02	9.53	22.55	30.00	-7.45
1754.30	1.4	QPSK	H	110	197	1 / 0	12.63	9.39	22.02	30.00	-7.98
1710.70	1.4	16-QAM	H	110	197	1 / 5	11.67	9.67	21.34	30.00	-8.66
1732.50	1.4	16-QAM	H	110	197	1 / 0	12.15	9.53	21.68	30.00	-8.32
1754.30	1.4	16-QAM	H	110	197	1 / 0	11.90	9.39	21.29	30.00	-8.71
1711.50	3	QPSK	H	110	197	1 / 0	12.45	9.67	22.12	30.00	-7.88
1732.50	3	QPSK	H	110	197	1 / 0	13.11	9.53	22.64	30.00	-7.36
1753.50	3	QPSK	H	110	197	1 / 0	12.83	9.40	22.23	30.00	-7.77
1711.50	3	16-QAM	H	110	197	1 / 0	11.70	9.67	21.37	30.00	-8.63
1732.50	3	16-QAM	H	110	197	1 / 0	12.32	9.53	21.85	30.00	-8.15
1753.50	3	16-QAM	H	110	197	1 / 0	11.85	9.40	21.25	30.00	-8.75
1712.50	5	QPSK	H	112	201	1 / 0	12.46	9.66	22.12	30.00	-7.88
1732.50	5	QPSK	H	112	201	1 / 0	12.89	9.53	22.42	30.00	-7.58
1752.50	5	QPSK	H	112	201	1 / 0	13.08	9.40	22.48	30.00	-7.52
1712.50	5	16-QAM	H	112	201	1 / 0	11.47	9.66	21.13	30.00	-8.87
1732.50	5	16-QAM	H	112	201	1 / 0	12.24	9.53	21.77	30.00	-8.23
1752.50	5	16-QAM	H	112	201	1 / 0	12.01	9.40	21.41	30.00	-8.59
1715.00	10	QPSK	H	114	272	1 / 0	14.06	9.64	23.70	30.00	-6.30
1732.50	10	QPSK	H	114	272	1 / 0	12.91	9.53	22.44	30.00	-7.56
1750.00	10	QPSK	H	114	272	1 / 0	13.85	9.42	23.27	30.00	-6.73
1715.00	10	16-QAM	H	114	272	1 / 0	13.19	9.64	22.83	30.00	-7.17
1732.50	10	16-QAM	H	114	272	1 / 0	12.37	9.53	21.90	30.00	-8.10
1750.00	10	16-QAM	H	114	272	1 / 0	13.61	9.42	23.03	30.00	-6.97
1717.50	15	QPSK	H	110	267	1 / 0	13.85	9.63	23.48	30.00	-6.52
1732.50	15	QPSK	H	110	267	1 / 74	14.15	9.53	23.68	30.00	-6.32
1747.50	15	QPSK	H	110	267	1 / 0	14.44	9.43	23.87	30.00	-6.13
1717.50	15	16-QAM	H	110	267	1 / 74	13.16	9.63	22.79	30.00	-7.21
1732.50	15	16-QAM	H	110	267	1 / 0	13.52	9.53	23.05	30.00	-6.95
1747.50	15	16-QAM	H	110	267	1 / 0	13.35	9.43	22.78	30.00	-7.22
1720.00	20	QPSK	H	221	173	1 / 99	13.69	9.61	23.30	30.00	-6.70
1732.50	20	QPSK	H	221	173	1 / 99	13.18	9.53	22.71	30.00	-7.29
1745.00	20	QPSK	H	221	173	1 / 0	13.80	9.45	23.25	30.00	-6.75
1720.00	20	16-QAM	H	221	173	1 / 99	12.87	9.61	22.48	30.00	-7.52
1732.50	20	16-QAM	H	221	173	1 / 0	12.73	9.53	22.26	30.00	-7.74
1745.00	20	16-QAM	H	221	173	1 / 0	13.19	9.45	22.64	30.00	-7.36

**Table 7-3. EIRP Data (Band 4)**

FCC ID: ZNFK428	 <b>FCC Pt. 24 &amp; 27 LTE MEASUREMENT REPORT (CERTIFICATION)</b> 		Reviewed by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	246	289	1 / 5	12.58	9.21	21.79	33.01	-11.22
1880.00	1.4	QPSK	H	246	289	3 / 2	14.09	9.27	23.36	33.01	-9.65
1909.30	1.4	QPSK	H	246	289	1 / 5	13.56	9.36	22.92	33.01	-10.09
1850.70	1.4	16-QAM	H	246	289	1 / 5	11.94	9.21	21.15	33.01	-11.86
1880.00	1.4	16-QAM	H	246	289	1 / 5	13.13	9.27	22.40	33.01	-10.61
1909.30	1.4	16-QAM	H	246	289	1 / 5	13.04	9.36	22.40	33.01	-10.61
1851.50	3	QPSK	H	251	288	1 / 14	13.10	9.21	22.31	33.01	-10.70
1880.00	3	QPSK	H	251	288	1 / 14	14.15	9.27	23.42	33.01	-9.59
1908.50	3	QPSK	H	251	288	1 / 14	13.78	9.36	23.14	33.01	-9.87
1851.50	3	16-QAM	H	251	288	1 / 14	12.33	9.21	21.54	33.01	-11.47
1880.00	3	16-QAM	H	251	288	1 / 14	13.26	9.27	22.53	33.01	-10.48
1908.50	3	16-QAM	H	251	288	1 / 14	12.80	9.36	22.16	33.01	-10.85
1852.50	5	QPSK	H	250	274	1 / 24	12.32	9.22	21.54	33.01	-11.47
1880.00	5	QPSK	H	250	274	1 / 24	13.74	9.27	23.01	33.01	-10.00
1907.50	5	QPSK	H	250	274	1 / 24	13.47	9.35	22.82	33.01	-10.19
1852.50	5	16-QAM	H	250	274	1 / 0	12.22	9.22	21.44	33.01	-11.57
1880.00	5	16-QAM	H	250	274	1 / 24	12.64	9.27	21.91	33.01	-11.10
1907.50	5	16-QAM	H	250	274	1 / 24	12.61	9.35	21.96	33.01	-11.05
1855.00	10	QPSK	H	256	262	1 / 49	13.24	9.22	22.46	33.01	-10.55
1880.00	10	QPSK	H	256	262	1 / 49	13.36	9.27	22.63	33.01	-10.38
1905.00	10	QPSK	H	256	262	1 / 49	13.41	9.34	22.75	33.01	-10.26
1855.00	10	16-QAM	H	256	262	1 / 49	12.39	9.22	21.61	33.01	-11.40
1880.00	10	16-QAM	H	256	262	1 / 0	12.78	9.27	22.05	33.01	-10.96
1905.00	10	16-QAM	H	256	262	1 / 49	12.43	9.34	21.77	33.01	-11.24
1857.50	15	QPSK	H	247	126	1 / 74	13.18	9.23	22.41	33.01	-10.60
1880.00	15	QPSK	H	247	126	1 / 74	12.94	9.27	22.21	33.01	-10.80
1902.50	15	QPSK	H	247	126	1 / 74	11.77	9.33	21.10	33.01	-11.91
1857.50	15	16-QAM	H	247	126	1 / 74	12.44	9.23	21.67	33.01	-11.34
1880.00	15	16-QAM	H	247	126	1 / 74	11.87	9.27	21.14	33.01	-11.87
1902.50	15	16-QAM	H	247	126	1 / 74	11.14	9.33	20.47	33.01	-12.54
1860.00	20	QPSK	H	261	246	1 / 99	13.10	9.23	22.33	33.01	-10.68
1880.00	20	QPSK	H	261	246	1 / 0	12.78	9.27	22.05	33.01	-10.96
1900.00	20	QPSK	H	261	246	1 / 99	11.64	9.31	20.95	33.01	-12.06
1860.00	20	16-QAM	H	261	246	1 / 99	12.20	9.23	21.43	33.01	-11.58
1880.00	20	16-QAM	H	261	246	1 / 0	12.12	9.27	21.39	33.01	-11.62
1900.00	20	16-QAM	H	261	246	1 / 99	10.62	9.31	19.93	33.01	-13.08

**Table 7-4. EIRP Data (Band 2)**

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## 7.7 Radiated Spurious Emissions Measurements

§2.1053 §24.238(a) §27.53(g) §27.53(h)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 v02r02 – Section 5.8

ANSI/TIA-603-C-2004 – Section 2.2.12

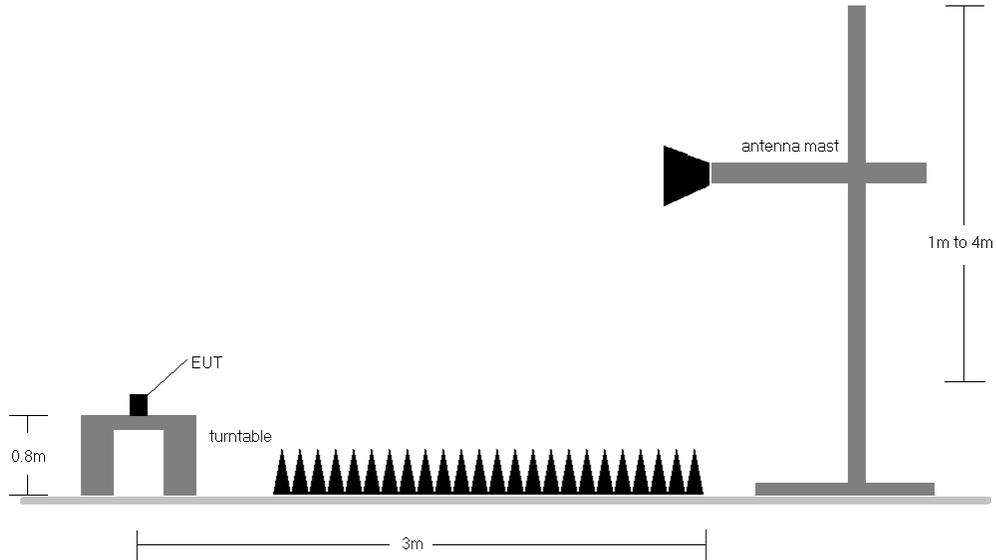
### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq$  3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq$  2 x span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

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**Test Setup**

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



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

**Test Notes**

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The “-“ shown in the following RSE tables are used to denote a noise floor measurement.

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OPERATING FREQUENCY: 701.50 MHz  
 CHANNEL: 23035  
 MEASURED OUTPUT POWER: 19.42 dBm = 0.087 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  32.42 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1403.00	H	-	-	-56.62	2.43	-54.19	73.6
2104.50	H	-	-	-54.71	2.95	-51.76	71.2

Table 7-5. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY: 707.50 MHz  
 CHANNEL: 23095  
 MEASURED OUTPUT POWER: 19.84 dBm = 0.096 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  32.84 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1415.00	H	-	-	-56.43	2.59	-53.85	73.7
2122.50	H	-	-	-53.98	3.02	-50.97	70.8

Table 7-6. Radiated Spurious Data (Band 12 – Mid Channel)

FCC ID: ZNFK428			FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 713.50 MHz  
 CHANNEL: 23155  
 MEASURED OUTPUT POWER: 20.20 dBm = 0.105 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 5.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  33.20 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1427.00	H	-	-	-56.86	2.74	-54.12	74.3
2140.50	H	-	-	-54.20	3.08	-51.12	71.3

Table 7-7. Radiated Spurious Data (Band 12 – High Channel)

OPERATING FREQUENCY: 1717.50 MHz  
 CHANNEL: 20025  
 MEASURED OUTPUT POWER: 23.48 dBm = 0.223 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 15.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.48 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3435.00	H	204	172	-54.05	8.20	-45.85	69.3
5152.50	H	174	186	-43.40	10.30	-33.10	56.6
6870.00	H	149	21	-44.81	11.43	-33.38	56.9
8587.50	H	169	236	-51.08	13.03	-38.05	61.5
10305.00	H	141	214	-47.14	13.24	-33.91	57.4
12022.50	H	-	-	-51.18	13.12	-38.07	61.5

Table 7-8. Radiated Spurious Data (Band 4 – Low Channel)

FCC ID: ZNFK428	 FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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OPERATING FREQUENCY: 1732.50 MHz  
 CHANNEL: 20175  
 MEASURED OUTPUT POWER: 23.68 dBm = 0.233 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 15.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.68 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3465.00	H	224	157	-53.00	8.29	-44.72	68.4
5197.50	H	158	200	-41.61	10.35	-31.26	54.9
6930.00	H	158	29	-42.83	11.49	-31.35	55.0
8662.50	H	152	219	-50.11	13.02	-37.09	60.8
10395.00	H	152	198	-46.36	13.16	-33.20	56.9
12127.50	H	-	-	-49.34	13.10	-36.23	59.9

**Table 7-9. Radiated Spurious Data (Band 4 – Mid Channel)**

OPERATING FREQUENCY: 1747.50 MHz  
 CHANNEL: 20325  
 MEASURED OUTPUT POWER: 23.87 dBm = 0.244 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 15.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.87 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3495.00	H	229	143	-53.28	8.37	-44.91	68.8
5242.50	H	178	181	-42.06	10.35	-31.71	55.6
6990.00	H	175	44	-44.82	11.53	-33.28	57.2
8737.50	H	145	219	-52.29	13.02	-39.27	63.1
10485.00	H	151	184	-48.26	13.05	-35.21	59.1
12232.50	H	-	-	-50.32	13.14	-37.18	61.1

**Table 7-10. Radiated Spurious Data (Band 4 – High Channel)**

FCC ID: ZNFK428	 FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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OPERATING FREQUENCY: 1851.50 MHz  
 CHANNEL: 18615  
 MEASURED OUTPUT POWER: 22.31 dBm = 0.170 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 3.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  35.31 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3703.00	H	216	327	-49.38	8.40	-40.99	63.3
5554.50	H	112	325	-42.06	10.57	-31.49	53.8
7406.00	H	103	238	-37.89	12.06	-25.83	48.1
9257.50	H	113	25	-46.69	13.22	-33.48	55.8
11109.00	H	113	256	-41.40	13.25	-28.15	50.5

Table 7-11. Radiated Spurious Data (Band 2 – Low Channel)

OPERATING FREQUENCY: 1880.00 MHz  
 CHANNEL: 18900  
 MEASURED OUTPUT POWER: 23.42 dBm = 0.220 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 3.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.42 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3760.00	H	206	321	-48.16	8.38	-39.77	63.2
5640.00	H	110	320	-42.00	10.70	-31.30	54.7
7520.00	H	108	233	-38.73	12.10	-26.62	50.0
9400.00	H	106	38	-49.33	13.19	-36.14	59.6
11280.00	H	110	269	-44.00	13.31	-30.69	54.1

Table 7-12. Radiated Spurious Data (Band 2 – Mid Channel)

FCC ID: ZNFK428			FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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OPERATING FREQUENCY: 1908.50 MHz  
 CHANNEL: 19185  
 MEASURED OUTPUT POWER: 23.14 dBm = 0.206 W  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 3.0 MHz  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  36.14 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3817.00	H	215	322	-48.13	8.40	-39.74	62.9
5725.50	H	114	329	-42.47	10.76	-31.71	54.9
7634.00	H	111	242	-39.51	12.21	-27.30	50.4
9542.50	H	111	35	-46.11	13.19	-32.93	56.1
11451.00	H	95	265	-42.08	13.33	-28.75	51.9

Table 7-13. Radiated Spurious Data (Band 2 – High Channel)

FCC ID: ZNFK428	 FCC Pt. 24 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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## 7.8 Frequency Stability / Temperature Variation

§2.1055 §24.235 §27.54

### Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

***For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

### Test Procedure Used

ANSI/TIA-603-C-2004

### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

### Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

### Test Notes

None

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## Band 12 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 707,500,000 Hz  
 CHANNEL: 23790  
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	707,500,114	114	0.0000161
100 %		- 30	707,499,913	-87	-0.0000123
100 %		- 20	707,500,119	119	0.0000168
100 %		- 10	707,500,149	149	0.0000211
100 %		0	707,500,023	23	0.0000033
100 %		+ 10	707,500,016	16	0.0000023
100 %		+ 20	707,500,030	30	0.0000042
100 %		+ 30	707,499,891	-109	-0.0000154
100 %		+ 40	707,500,054	54	0.0000076
100 %		+ 50	707,500,107	107	0.0000151
BATT. ENDPOINT	3.40	+ 20	707,499,914	-86	-0.0000122

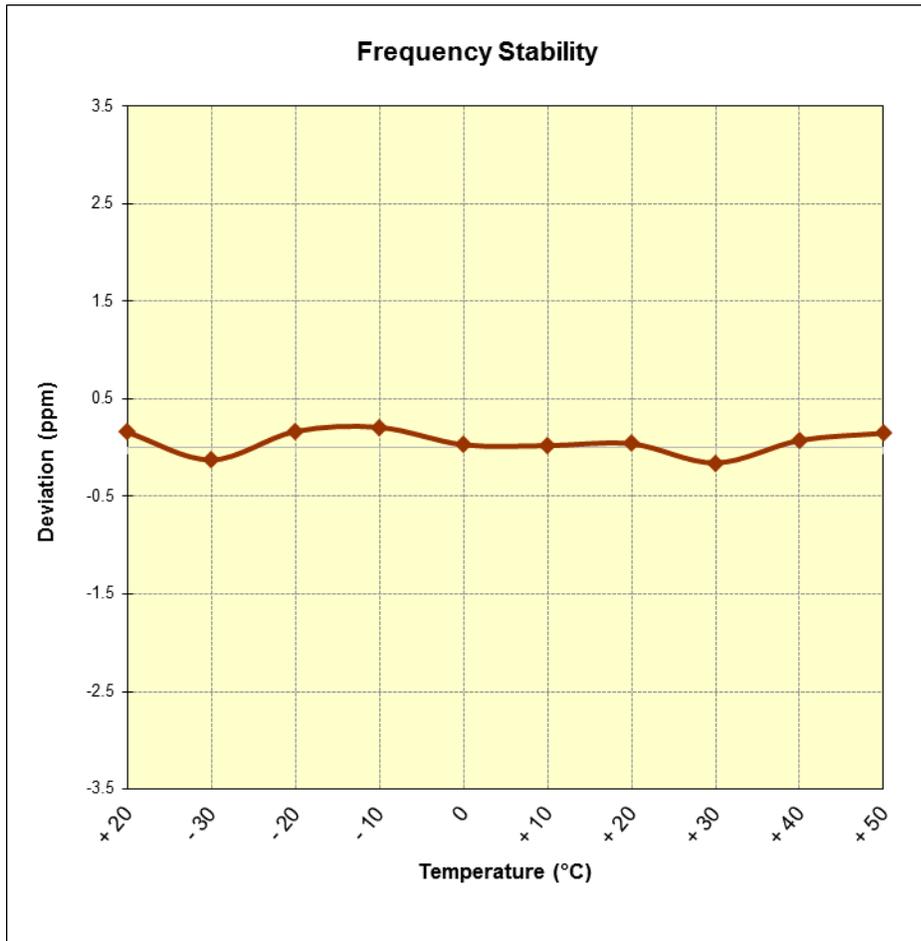
**Table 7-14. Frequency Stability Data (Band 12)**

**Note:**

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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**Band 12 Frequency Stability Measurements**  
**§2.1055 §27.54**



**Figure 7-8. Frequency Stability Graph (Band 12)**

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## Band 4 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY: 1,732,500,000 Hz  
 CHANNEL: 20175  
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,732,499,873	-127	-0.0000073
100 %		- 30	1,732,500,091	91	0.0000053
100 %		- 20	1,732,499,911	-89	-0.0000051
100 %		- 10	1,732,499,985	-15	-0.0000009
100 %		0	1,732,500,143	143	0.0000083
100 %		+ 10	1,732,500,080	80	0.0000046
100 %		+ 20	1,732,499,892	-108	-0.0000062
100 %		+ 30	1,732,500,030	30	0.0000017
100 %		+ 40	1,732,500,045	45	0.0000026
100 %		+ 50	1,732,499,904	-96	-0.0000055
BATT. ENDPOINT	3.40	+ 20	1,732,499,947	-53	-0.0000031

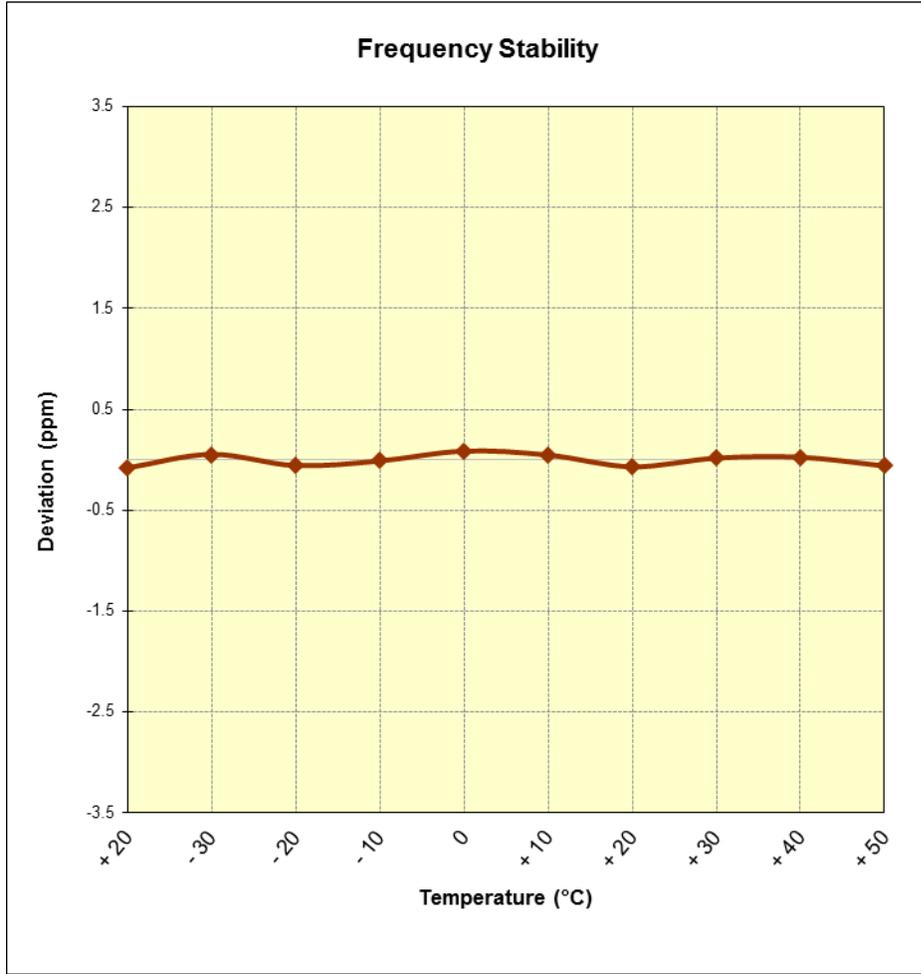
Table 7-15. Frequency Stability Data (Band 4)

**Note:**

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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**Band 4 Frequency Stability Measurements**  
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**Figure 7-9. Frequency Stability Graph (Band 4)**

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## Band 2 Frequency Stability Measurements

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OPERATING FREQUENCY: 1,880,000,000 Hz  
 CHANNEL: 18900  
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,879,999,870	-130	-0.0000069
100 %		- 30	1,880,000,028	28	0.0000015
100 %		- 20	1,879,999,897	-103	-0.0000055
100 %		- 10	1,880,000,041	41	0.0000022
100 %		0	1,880,000,013	13	0.0000007
100 %		+ 10	1,880,000,010	10	0.0000005
100 %		+ 20	1,880,000,068	68	0.0000036
100 %		+ 30	1,880,000,056	56	0.0000030
100 %		+ 40	1,880,000,031	31	0.0000016
100 %		+ 50	1,879,999,998	-2	-0.0000001
BATT. ENDPOINT	3.40	+ 20	1,879,999,872	-128	-0.0000068

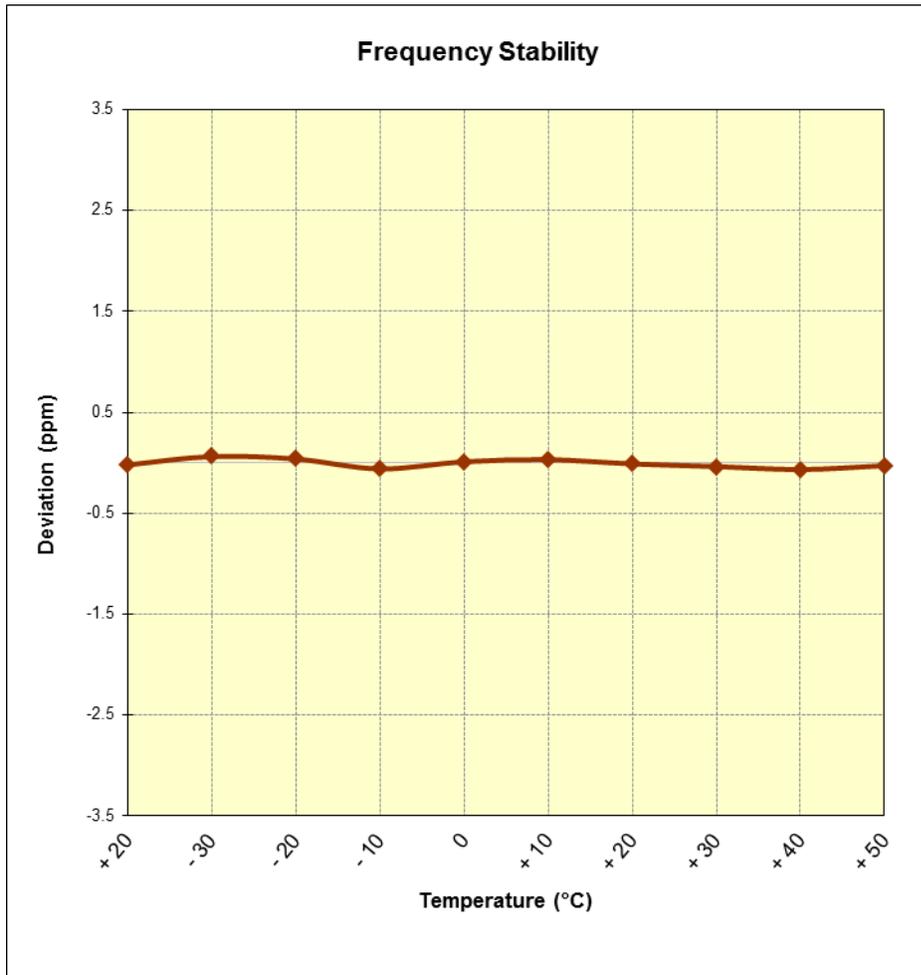
Table 7-16. Frequency Stability Data (Band 2)

**Note:**

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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**Band 2 Frequency Stability Measurements**  
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**Figure 7-10. Frequency Stability Graph (Band 2)**

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFK428** complies with all the requirements of Parts 24 & 27 of the FCC rules for LTE operation only.

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