



MEASUREMENT REPORT

FCC Part 22 & 27 LTE

Applicant Name:

LG Electronics MobileComm U.S.A

1000 Sylvan Avenue

Englewood Cliffs, NJ 07632

United States

Date of Testing:

2/17 - 2/23/2017

Test Site/Location:

PCTEST Lab., Columbia, MD, USA

Test Report Serial No.:

1M1701100019-03.ZNF

FCC ID :

ZNFVN220

APPLICANT:

LG ELECTRONICS MOBILECOMM U.S.A

Application Type:

Certification

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part(s):

§2; §22; §27

Test Procedure(s):

ANSI/TIA-603-D-2010, KDB 971168 D01 v02r02

EUT Type:

Portable Handset

Model:

LG-VN220

Additional Model(s):

LGVN220, VN220

Test Device Serial No.:

identical prototype [S/N: 03009, 02944]

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

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



Randy Ortanez
President



FCC ID: ZNFVN220	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	 LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 1 of 80

TABLE OF CONTENTS

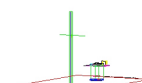
FCC PART 22 & 27 MEASUREMENT REPORT	3
1.0 INTRODUCTION	5
1.1 Scope	5
1.2 Testing Facility	5
2.0 PRODUCT INFORMATION	6
2.1 Equipment Description	6
2.2 Device Capabilities	6
2.3 Test Configuration	6
2.4 EMI Suppression Device(s)/Modifications	6
3.0 DESCRIPTION OF TESTS	7
3.1 Measurement Procedure	7
3.1 Block C Frequency Range	7
3.2 Cellular - Base Frequency Blocks	7
3.3 Cellular - Mobile Frequency Blocks	7
3.4 AWS - Base Frequency Blocks	7
3.5 AWS - Mobile Frequency Blocks	8
3.6 Radiated Power and Radiated Spurious Emissions	9
4.0 MEASUREMENT UNCERTAINTY	10
5.0 TEST EQUIPMENT CALIBRATION DATA	11
6.0 SAMPLE CALCULATIONS	12
7.0 TEST RESULTS	13
7.1 Summary	13
7.2 Occupied Bandwidth	14
7.3 Spurious and Harmonic Emissions at Antenna Terminal	27
7.4 Band Edge Emissions at Antenna Terminal	39
7.5 Radiated Power (ERP/EIRP)	61
7.6 Radiated Spurious Emissions Measurements	66
7.7 Frequency Stability / Temperature Variation	73
8.0 CONCLUSION	80

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 2 of 80



MEASUREMENT REPORT

FCC Part 22 & 27

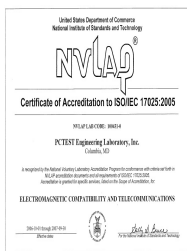


\$2.1033 General Information

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; §22; §27
BASE MODEL: LG-VN220
FCC ID: ZNFVN220
FCC CLASSIFICATION: PCS Licensed Transmitter Held to Ear (PCE)
FREQUENCY TOLERANCE: $\pm 0.00025\%$ (2.5 ppm)
Test Device Serial No.: 03009, 02944 ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST: 2/17 - 2/23/2017
TEST REPORT S/N: 1M1701100019-03.ZNF

Test Facility / Accreditations

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



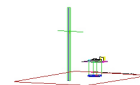
- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards 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.

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 3 of 80



MEASUREMENT REPORT

FCC Part 22 & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP/EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 13	27	779.5 - 784.5	0.131	21.17	4M55G7D	QPSK
LTE Band 13	27	779.5 - 784.5	0.100	19.99	4M52W7D	16QAM
LTE Band 13	27	782	0.129	21.12	8M96G7D	QPSK
LTE Band 13	27	782	0.090	19.55	8M98W7D	16QAM
LTE Band 5	22H	824.7 - 848.3	0.110	20.42	1M11G7D	QPSK
LTE Band 5	22H	824.7 - 848.3	0.090	19.55	1M12W7D	16QAM
LTE Band 5	22H	825.5 - 847.5	0.118	20.71	2M72G7D	QPSK
LTE Band 5	22H	825.5 - 847.5	0.093	19.71	2M72W7D	16QAM
LTE Band 5	22H	826.5 - 846.5	0.124	20.92	4M54G7D	QPSK
LTE Band 5	22H	826.5 - 846.5	0.098	19.93	4M50W7D	16QAM
LTE Band 5	22H	829 - 844	0.118	20.73	8M99G7D	QPSK
LTE Band 5	22H	829 - 844	0.093	19.71	8M99W7D	16QAM
LTE Band 4	27	1710.7 - 1754.3	0.353	25.48	1M12G7D	QPSK
LTE Band 4	27	1710.7 - 1754.3	0.288	24.60	1M12W7D	16QAM
LTE Band 4	27	1711.5 - 1753.5	0.365	25.62	2M73G7D	QPSK
LTE Band 4	27	1711.5 - 1753.5	0.297	24.72	2M72W7D	16QAM
LTE Band 4	27	1712.5 - 1752.5	0.392	25.94	4M51G7D	QPSK
LTE Band 4	27	1712.5 - 1752.5	0.322	25.08	4M52W7D	16QAM
LTE Band 4	27	1715 - 1750	0.374	25.73	8M97G7D	QPSK
LTE Band 4	27	1715 - 1750	0.302	24.80	8M96W7D	16QAM
LTE Band 4	27	1717.5 - 1747.5	0.390	25.91	13M5G7D	QPSK
LTE Band 4	27	1717.5 - 1747.5	0.318	25.02	13M5W7D	16QAM
LTE Band 4	27	1720 - 1745	0.369	25.67	18M0G7D	QPSK
LTE Band 4	27	1720 - 1745	0.298	24.74	18M0W7D	16QAM

EUT Overview

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 4 of 80

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.

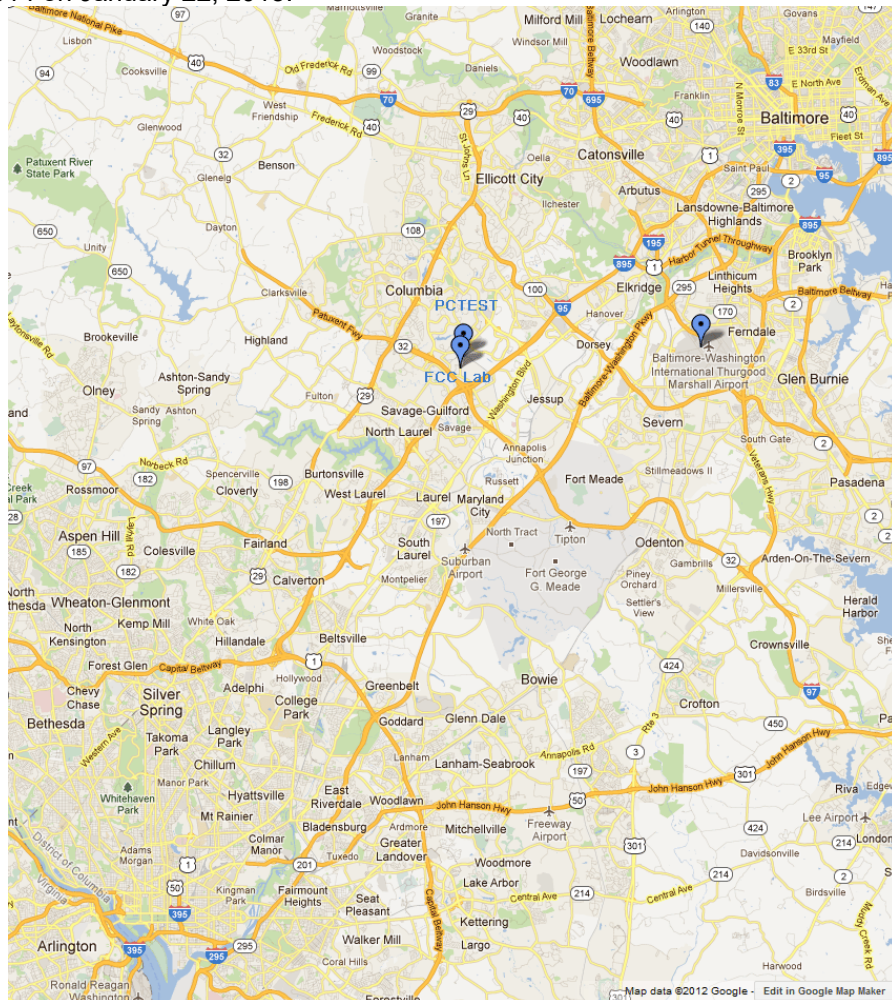


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 5 of 80

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFVN220**. 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, 850/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, Bluetooth (1x, EDR, LE)

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-D-2010 and KDB 971168 D01 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.

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 6 of 80

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-D-2010) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168 D01 v02r02) were used in the measurement of the EUT.

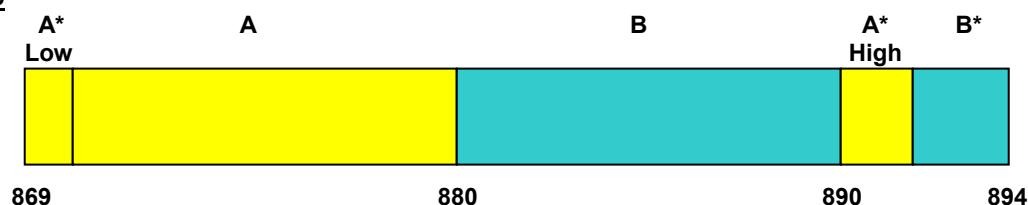
3.1 Block C Frequency Range

§27.5(b)(3)

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

3.2 Cellular - Base Frequency Blocks

§22.905



BLOCK 1: 869 – 880 MHz (A* Low + A)

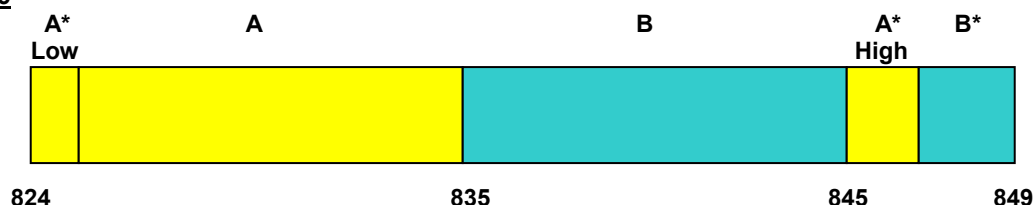
BLOCK 2: 880 – 890 MHz (B)

BLOCK 3: 890 – 891.5 MHz (A* High)

BLOCK 4: 891.5 – 894 MHz (B*)

3.3 Cellular - Mobile Frequency Blocks

§22.905



BLOCK 1: 824 – 835 MHz (A* Low + A)

BLOCK 2: 835 – 845 MHz (B)

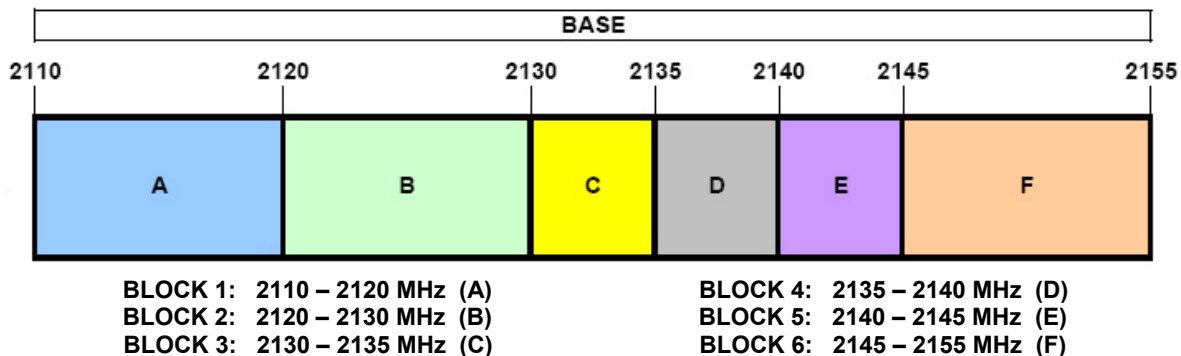
BLOCK 3: 845 – 846.5 MHz (A* High)

BLOCK 4: 846.5 – 849 MHz (B*)

3.4 AWS - Base Frequency Blocks

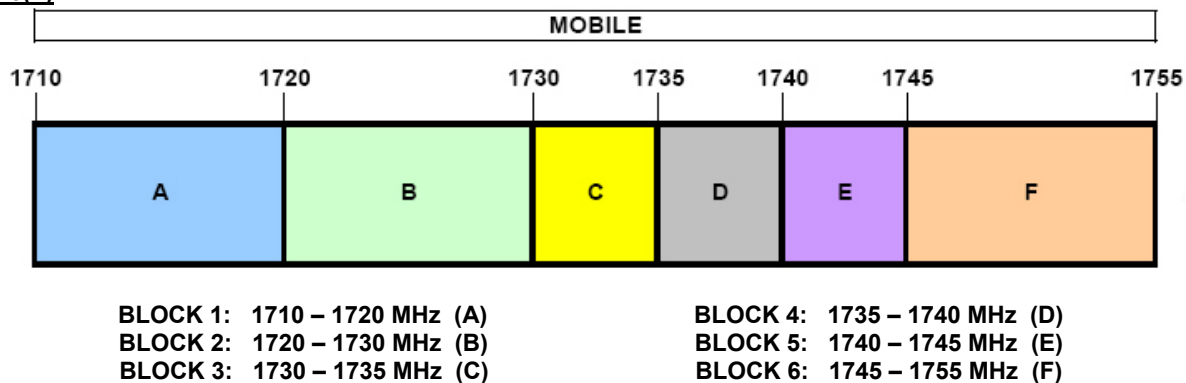
§27.5(h)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 7 of 80



3.5 AWS - Mobile Frequency Blocks

§27.5(h)



FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 8 of 80

3.6 Radiated Power and Radiated Spurious Emissions

§2.1053 §22.913(a.2) §22.917(a) §27.50(b.10) §27.50(d.4) §27.53(f) §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 Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 72.4cm high PVC support structure is placed on top of the turntable. A 3" (~7.6cm) sheet of high density polystyrene 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 D01 v02r02.

Per the guidance of ANSI/TIA-603-D-2010, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

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

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power [Watts]})$.

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 9 of 80

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_{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

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 10 of 80

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2006.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTX3	Licensed Transmitter Cable Set	7/12/2016	Annual	7/12/2017	N/A
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	3/4/2016	Annual	3/4/2017	RE1
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/1/2016	Annual	3/1/2017	MY52350166
Anritsu	MT8820C	Radio Communication Analyzer	4/14/2016	Annual	4/14/2017	6201240328
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	2/26/2016	Annual	2/26/2017	441112
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
Espec	ESX-2CA	Environmental Chamber	3/4/2016	Annual	3/4/2017	17620
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	8/28/2016	Biennial	8/28/2018	135427
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	4/26/2016	Biennial	4/26/2018	128338
K & L	11SH10-3075/U18000	High Pass Filter	7/11/2016	Annual	7/11/2017	11SH10-3075/U18000-2
K & L	13SH10-1000/U1000	N Type High Pass Filter	7/6/2016	Annual	7/6/2017	13SH10-1000/U1000-1
Mini-Circuits	PWR-SENS-4RMS	USB Power Sensor	3/4/2016	Annual	3/4/2017	11210140001
Mini-Circuits	SSG-4000HP	USB Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	TVA-11-422	RF Power Amp	N/A			QA1303002
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
PCTEST	-	EMC Switch System	7/6/2016	Annual	7/6/2017	NM2
Rohde & Schwarz	CMW500	Radio Communication Tester	10/20/2016	Annual	10/20/2017	100976
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	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	3/30/2016	Biennial	3/30/2018	9105-2404
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 5-1. Test Equipment

Notes:

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

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 11 of 80

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 2nd Harmonic (1564 MHz)

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

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 12 of 80

7.0 TEST RESULTS

7.1 Summary

Company Name: LG Electronics MobileComm U.S.A
 FCC ID: ZNFVN220
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 27.53(c) 27.53(h)	Out of Band Emissions	> 43 + 10log ₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions		PASS	Section 7.3, 7.4
2.1046	Transmitter Conducted Output Power	N/A		PASS	See RF Exposure Report
2.1055. 22.355 27.54	Frequency Stability	< 2.5 ppm (Part 22) and fundamental emissions stay within authorized frequency block (Part 24, 27)		PASS	Section 7.7
22.913(a.2)	Effective Radiated Power (Band 5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.5
27.50(b.10)	Effective Radiated Power (Band 13)	< 3 Watts max. ERP		PASS	Section 7.5
27.50(d.4)	Equivalent Isotropic Radiated Power (Band 4 66)	< 1 Watts max. EIRP		PASS	Section 7.5
2.1053 22.917(a) 27.53(c) 27.53(h)	Undesirable Emissions	> 43 + 10log ₁₀ (P[Watts]) for all out-of-band emissions		PASS	Section 7.6
27.53(f)	Undesirable Emissions (Band 13)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions less than 700Hz BW) For all emissions in the band 1559 – 1610 MHz		PASS	Section 7.6

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) 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 4.5.

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 13 of 80	

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 D01 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 $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

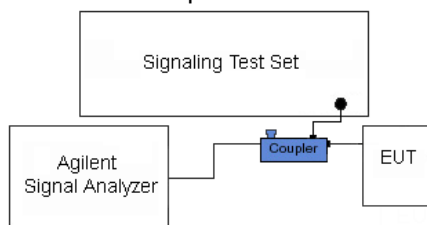
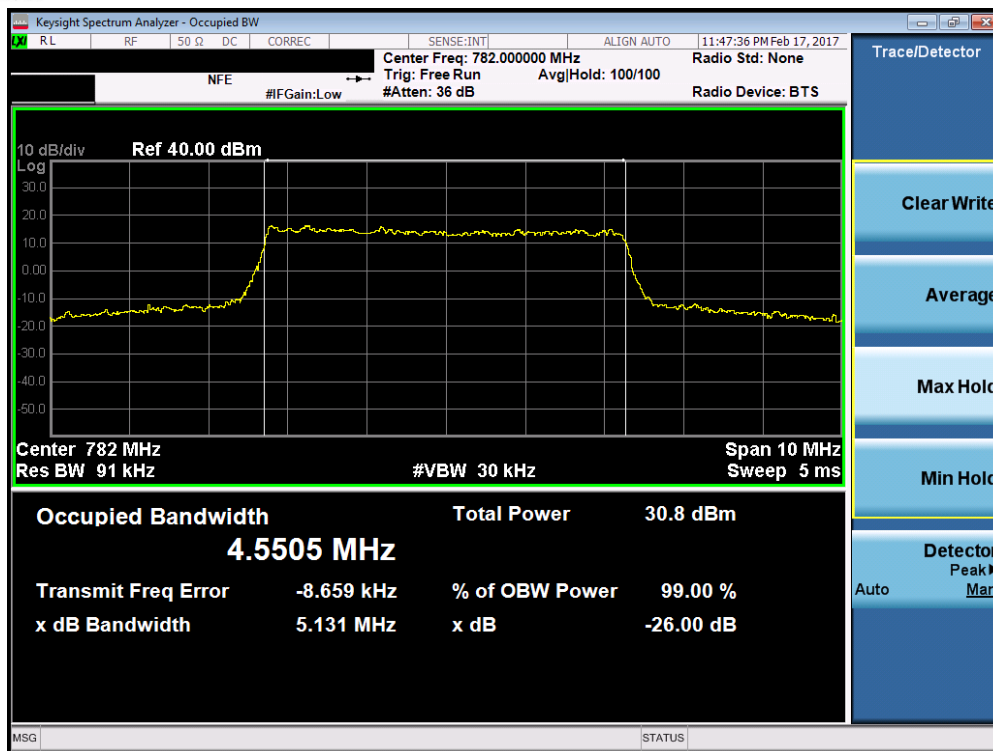


Figure 7-1. Test Instrument & Measurement Setup

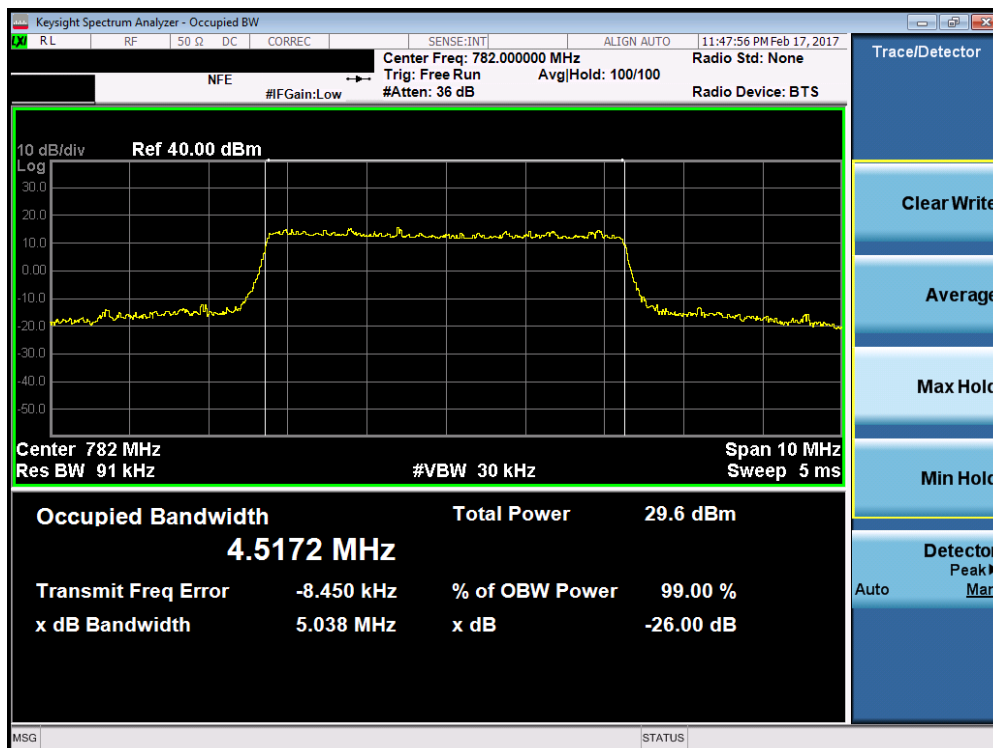
Test Notes

None.

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 14 of 80	

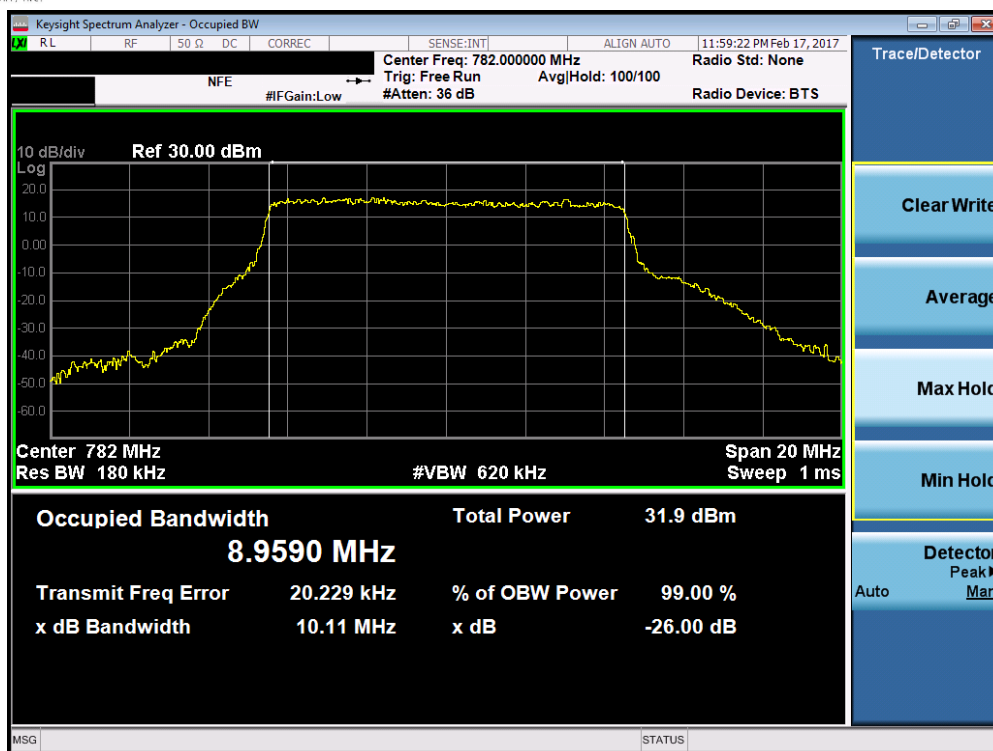


Plot 7-1. Occupied Bandwidth Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

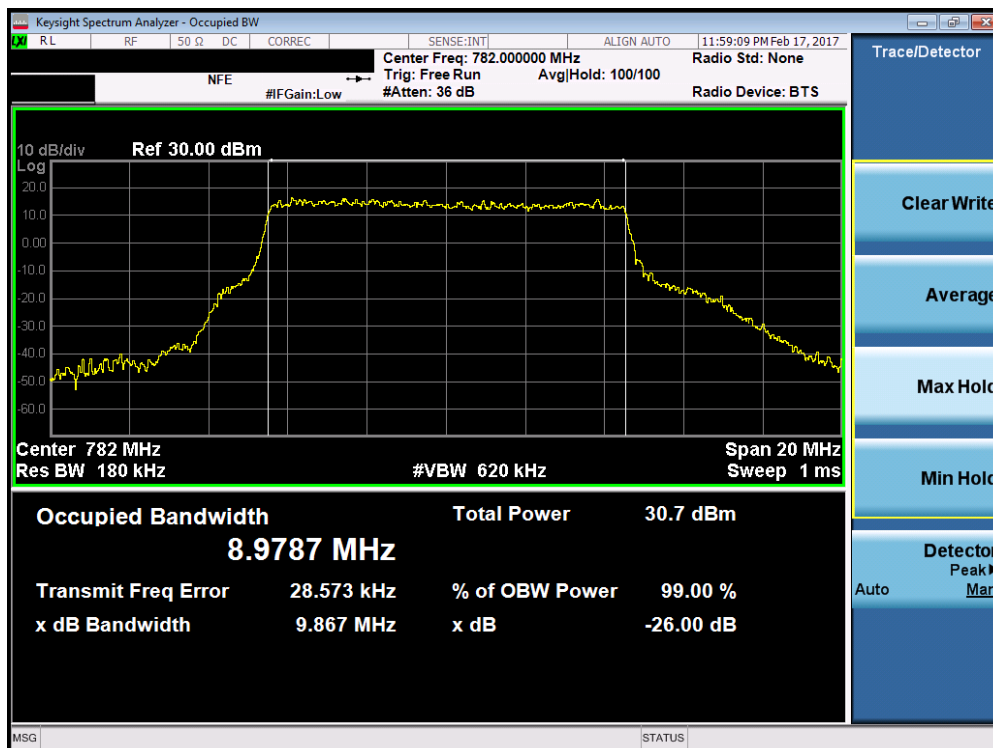


Plot 7-2. Occupied Bandwidth Plot (Band 13 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 15 of 80

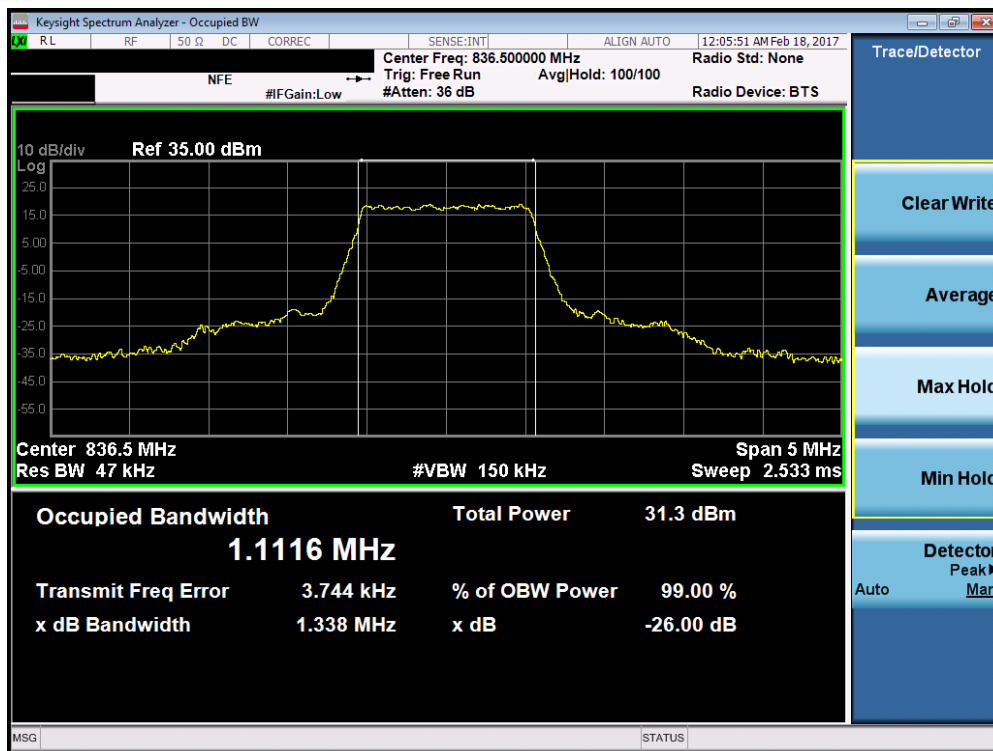


Plot 7-3. Occupied Bandwidth Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

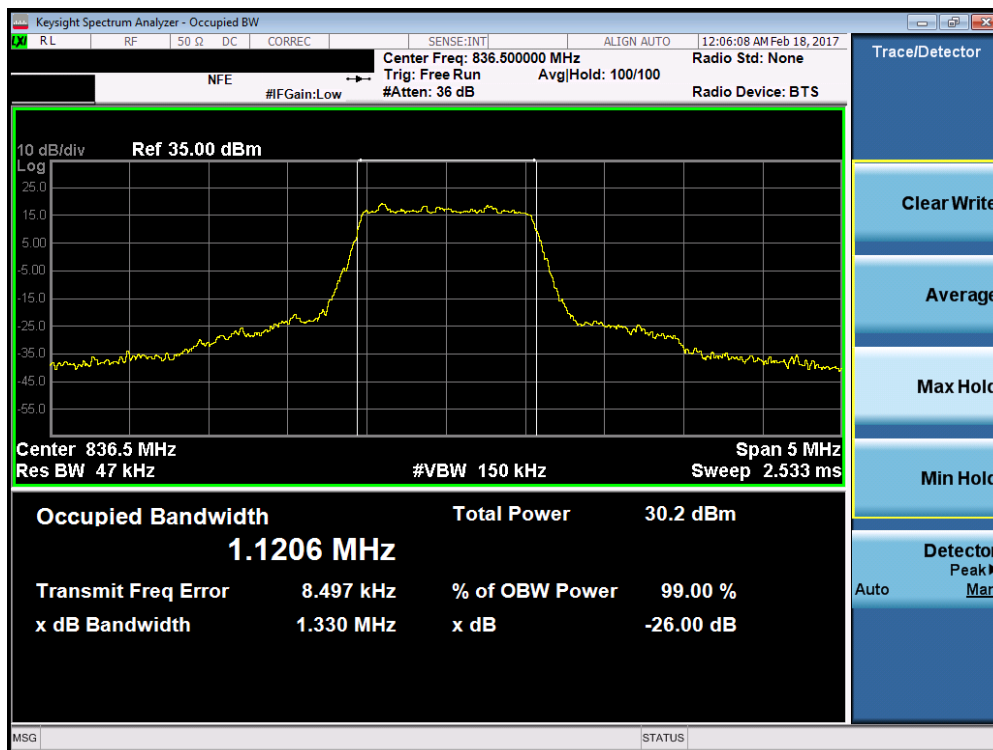


Plot 7-4. Occupied Bandwidth Plot (Band 13 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 16 of 80

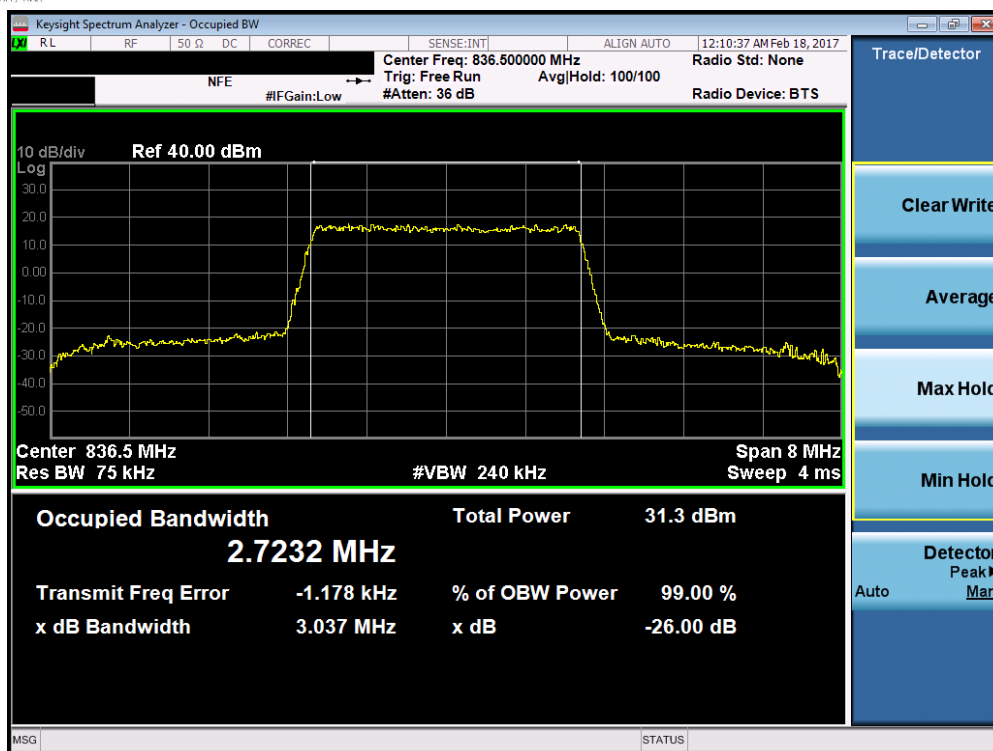


Plot 7-5. Occupied Bandwidth Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

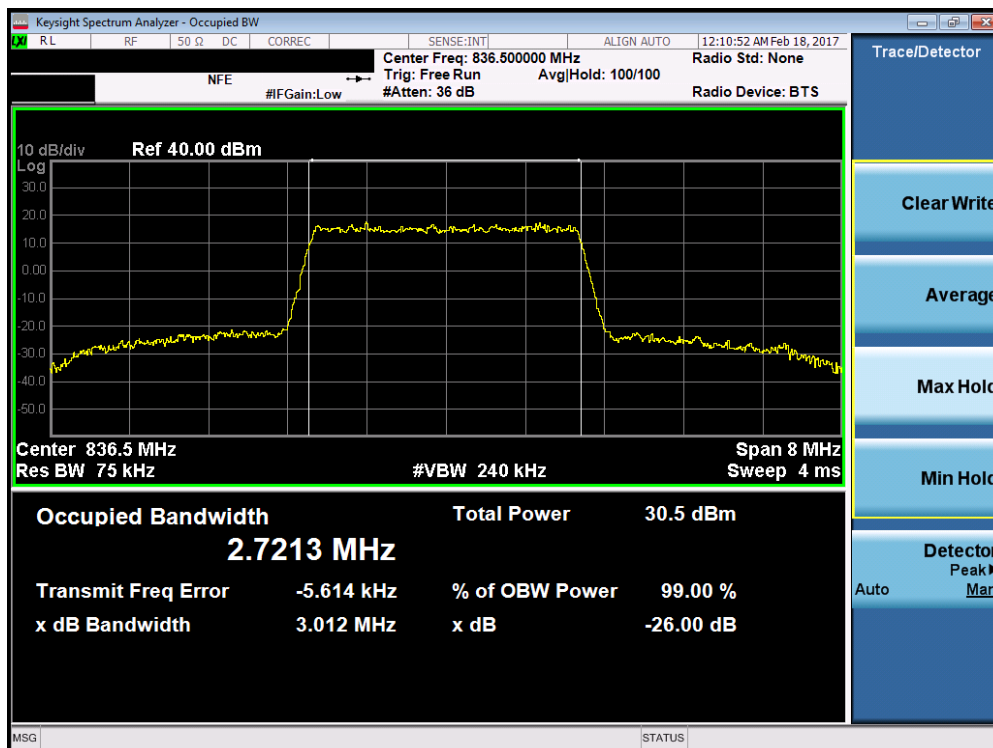


Plot 7-6. Occupied Bandwidth Plot (Band 5 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 17 of 80

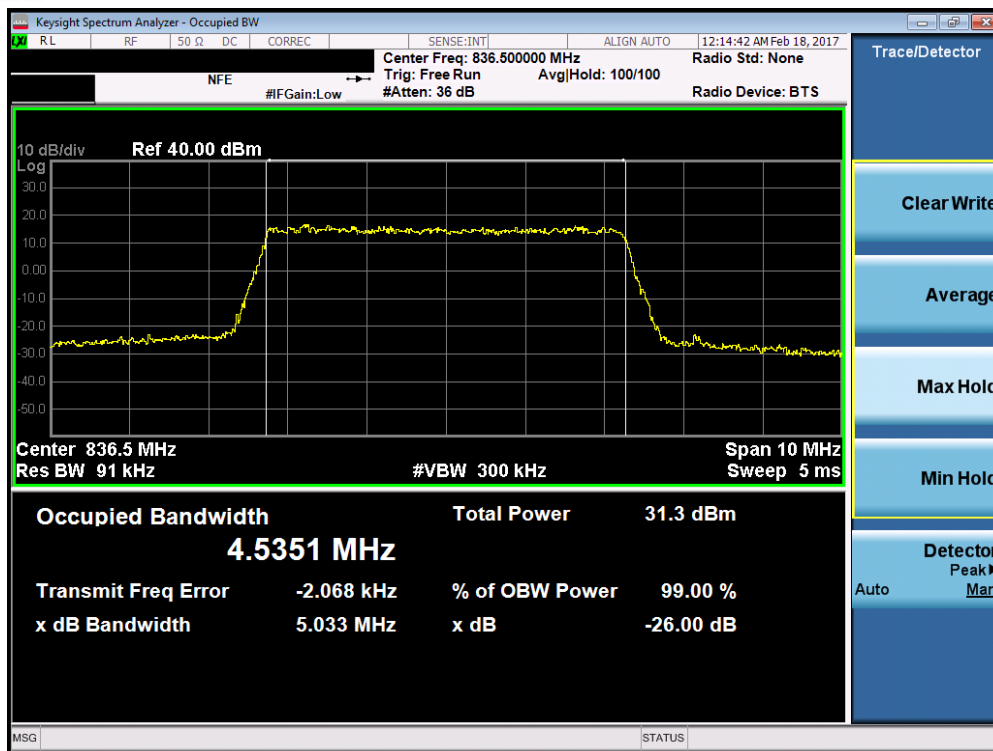


Plot 7-7. Occupied Bandwidth Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

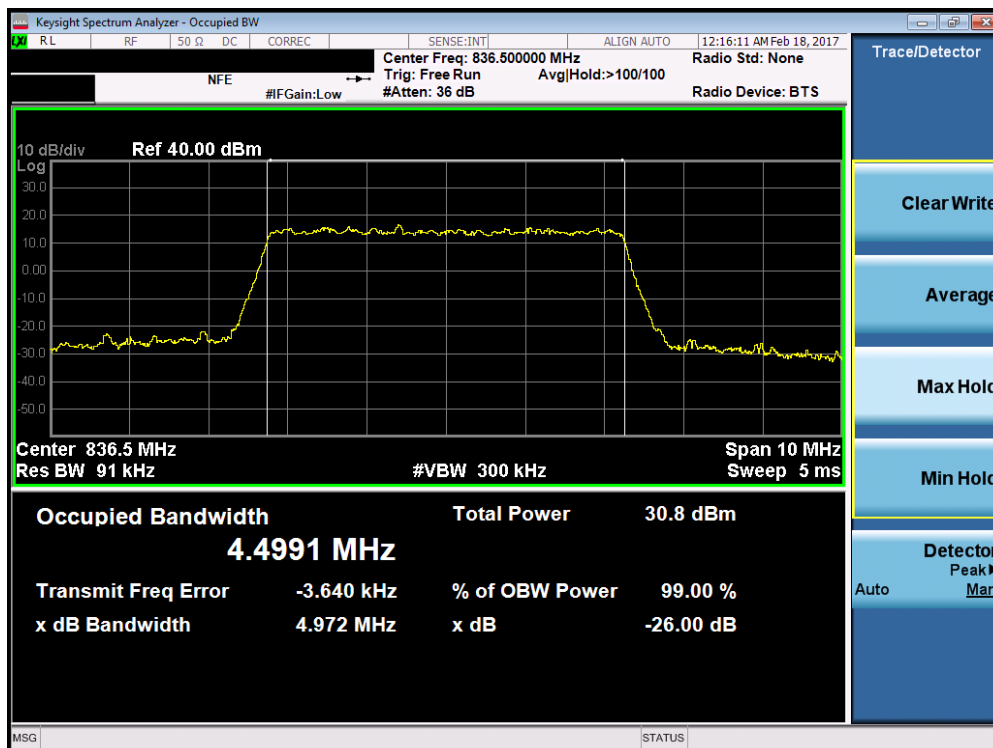


Plot 7-8. Occupied Bandwidth Plot (Band 5 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 18 of 80

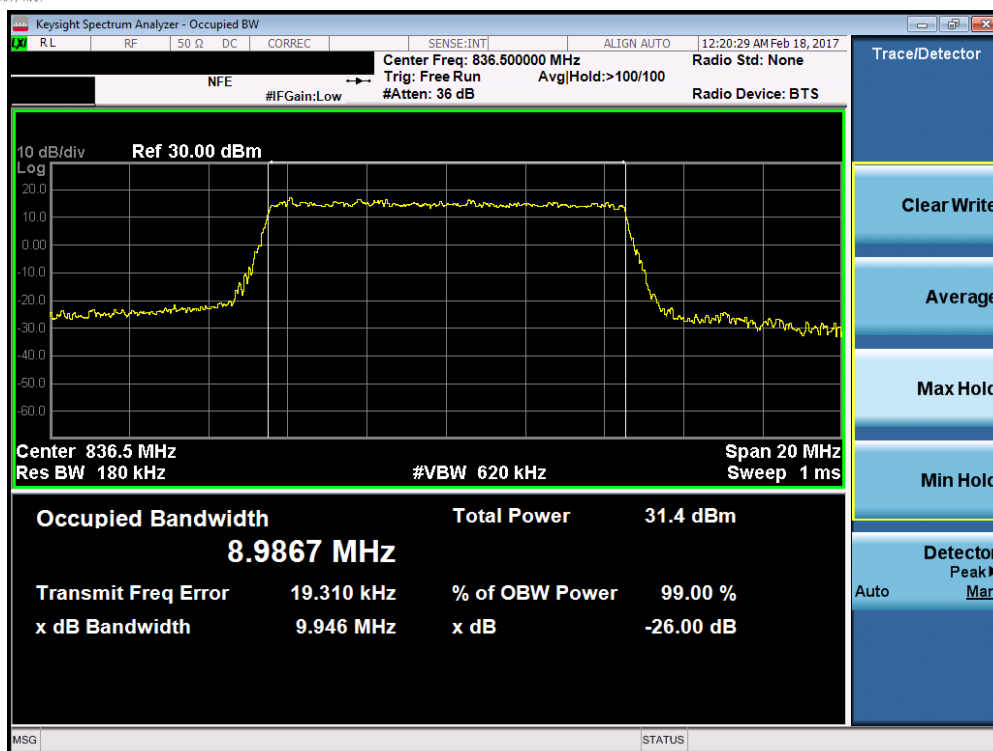


Plot 7-9. Occupied Bandwidth Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

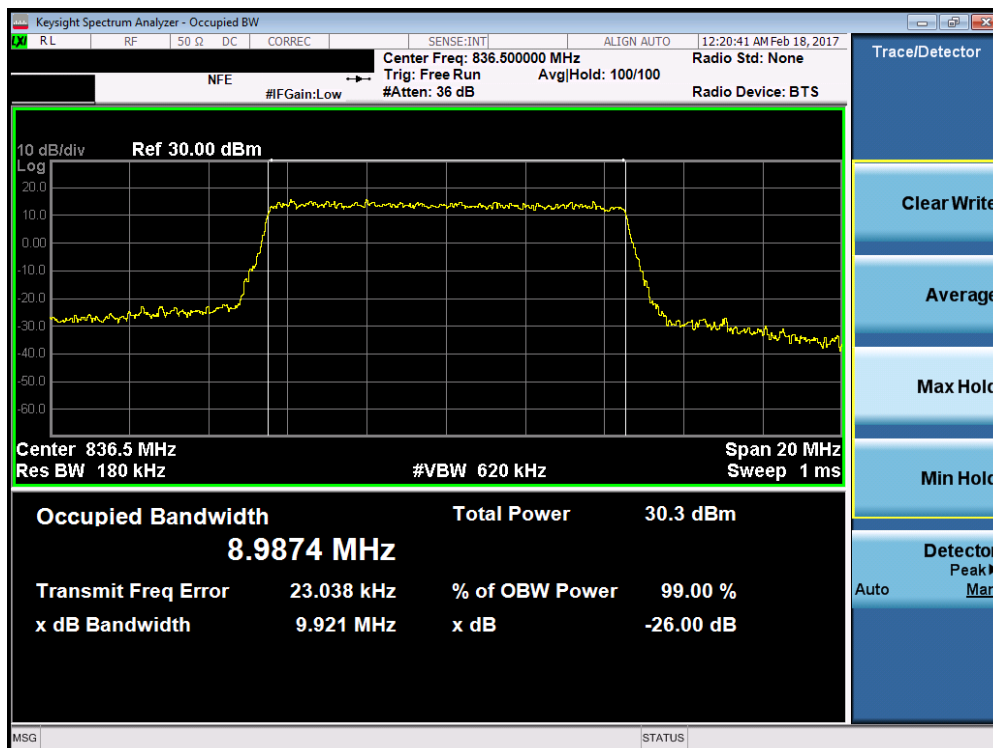


Plot 7-10. Occupied Bandwidth Plot (Band 5 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 19 of 80

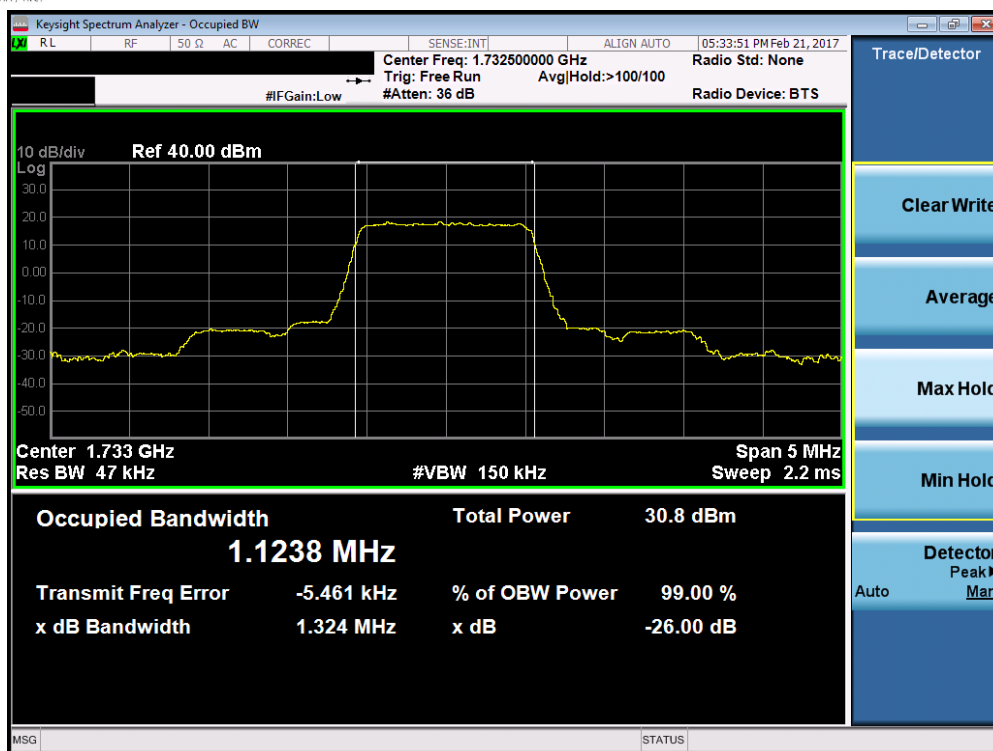


Plot 7-11. Occupied Bandwidth Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

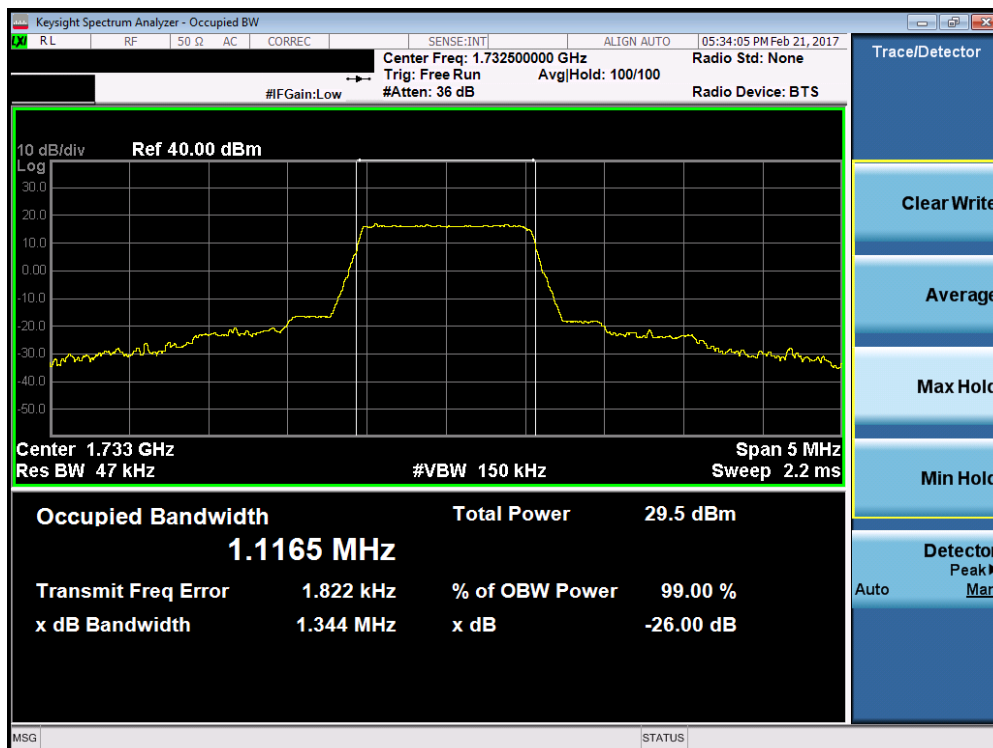


Plot 7-12. Occupied Bandwidth Plot (Band 5 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 20 of 80

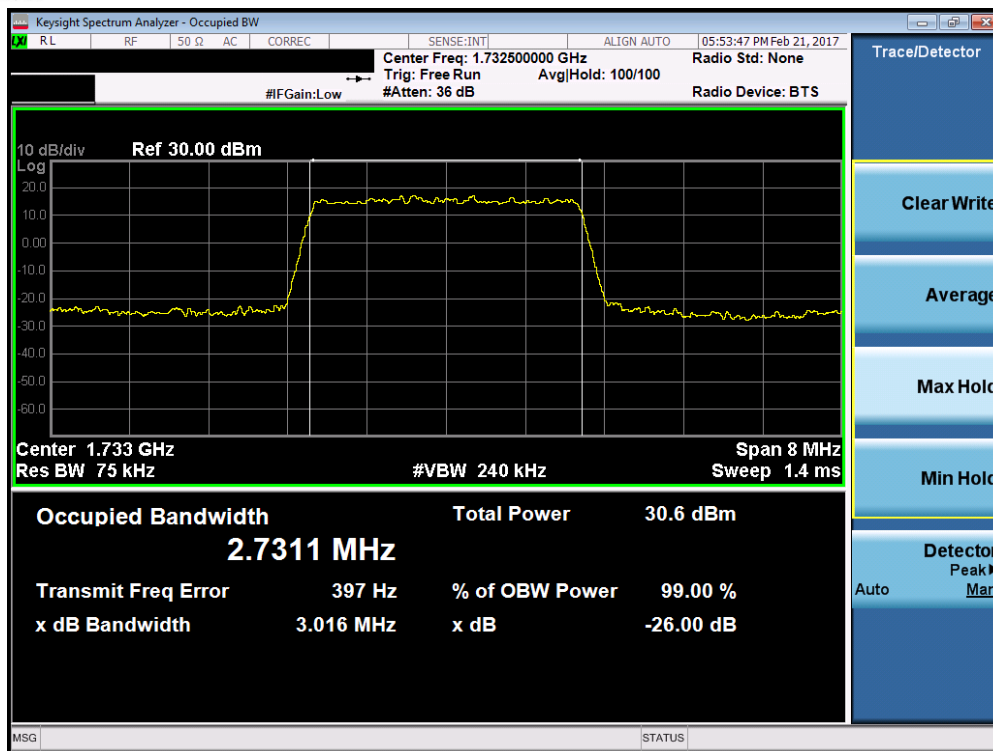


Plot 7-13. Occupied Bandwidth Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

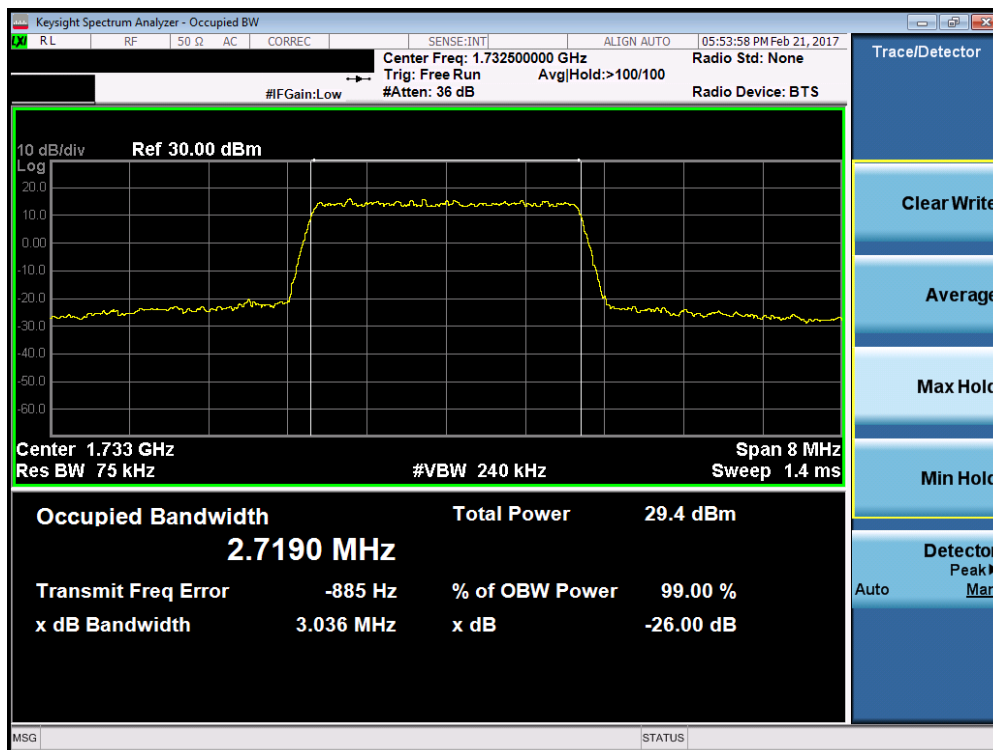


Plot 7-14. Occupied Bandwidth Plot (Band 4 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 21 of 80

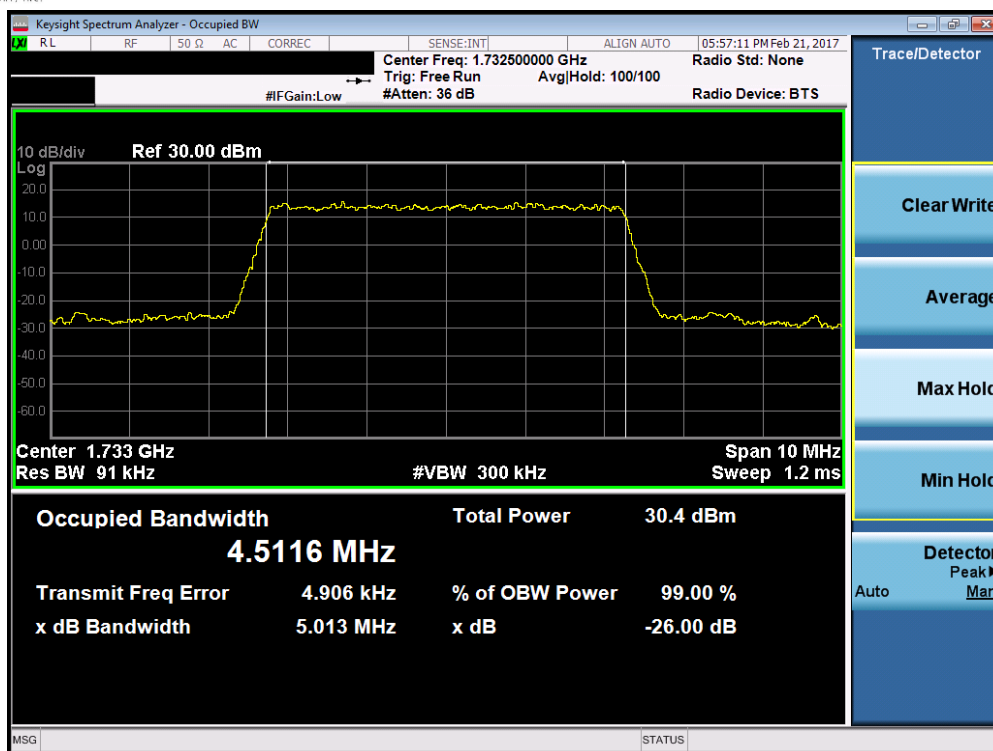


Plot 7-15. Occupied Bandwidth Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

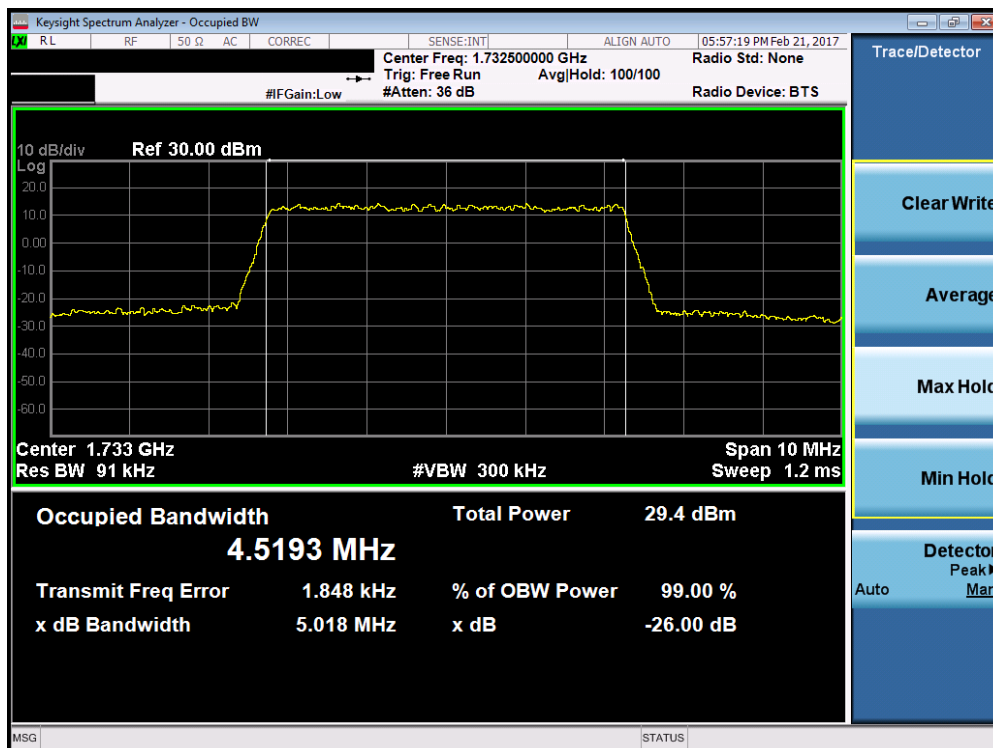


Plot 7-16. Occupied Bandwidth Plot (Band 4 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 22 of 80

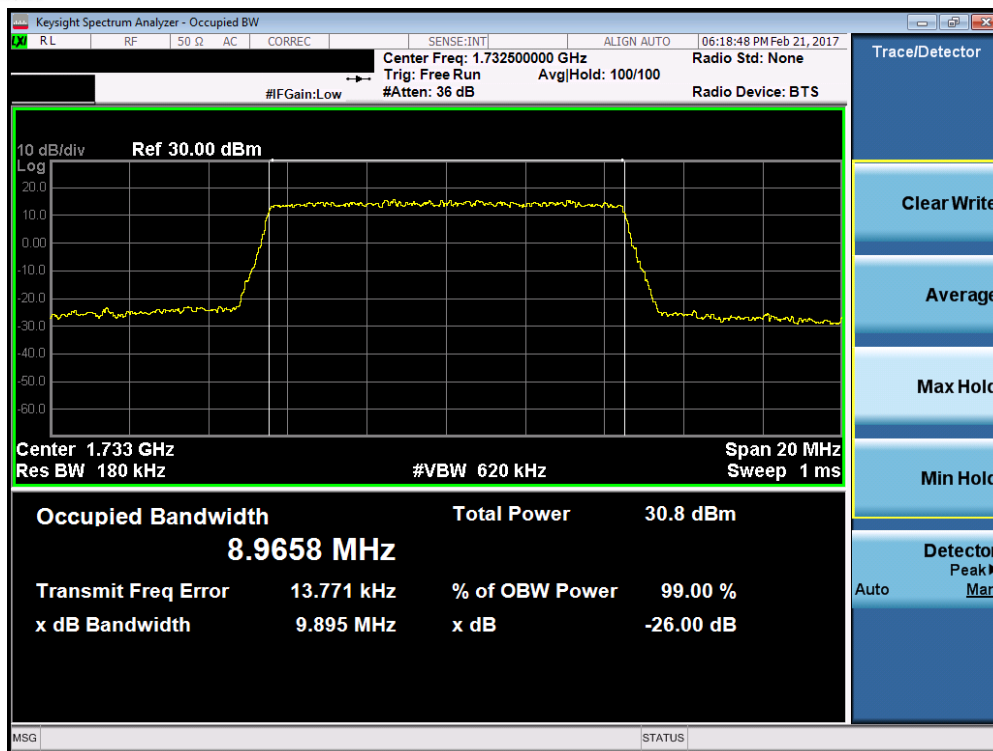


Plot 7-17. Occupied Bandwidth Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

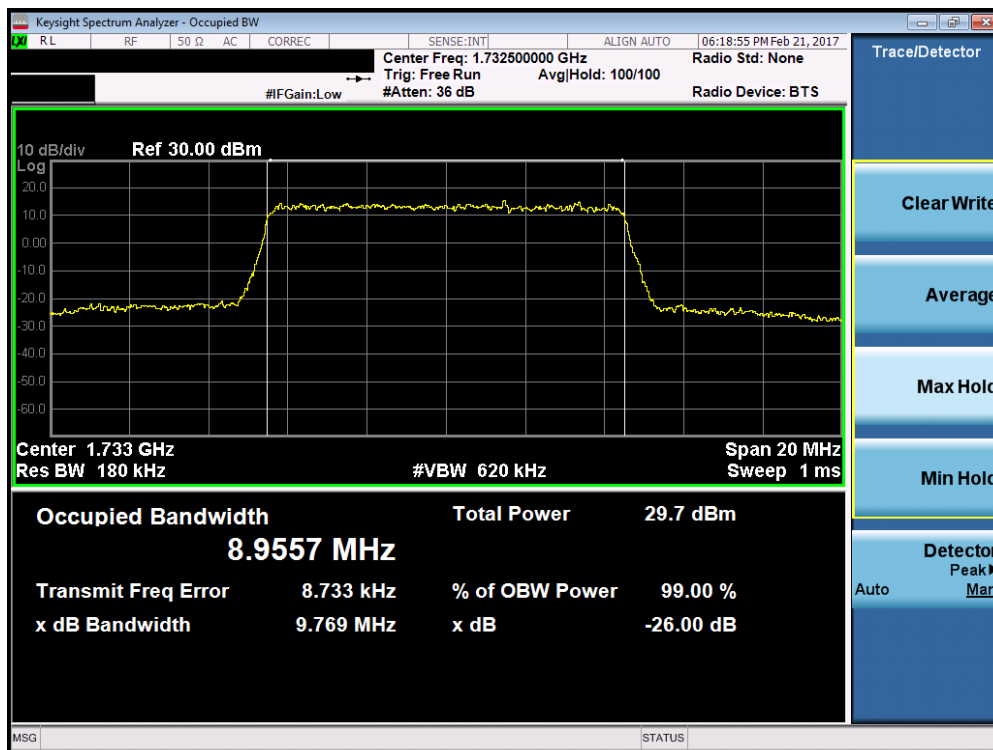


Plot 7-18. Occupied Bandwidth Plot (Band 4 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 23 of 80

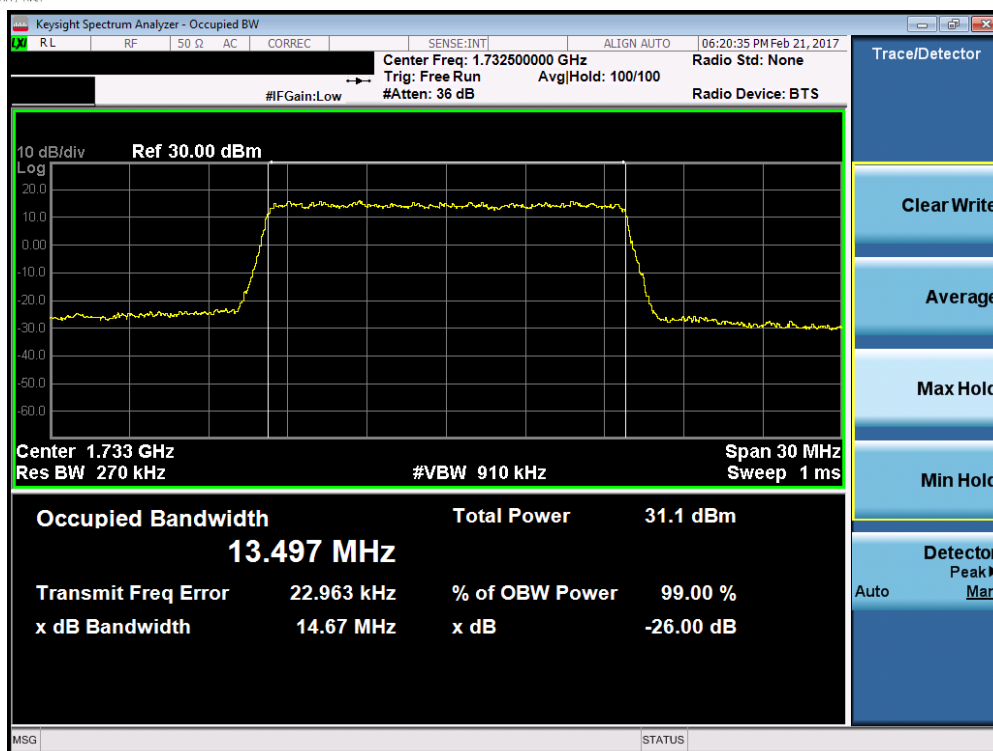


Plot 7-19. Occupied Bandwidth Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

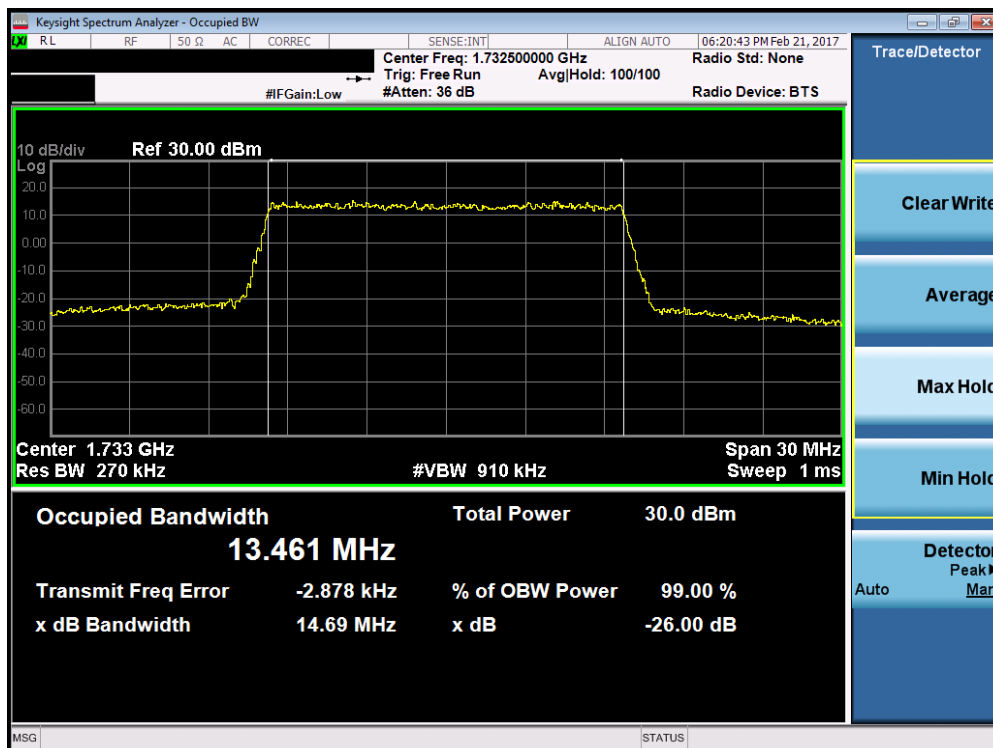


Plot 7-20. Occupied Bandwidth Plot (Band 4 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 24 of 80

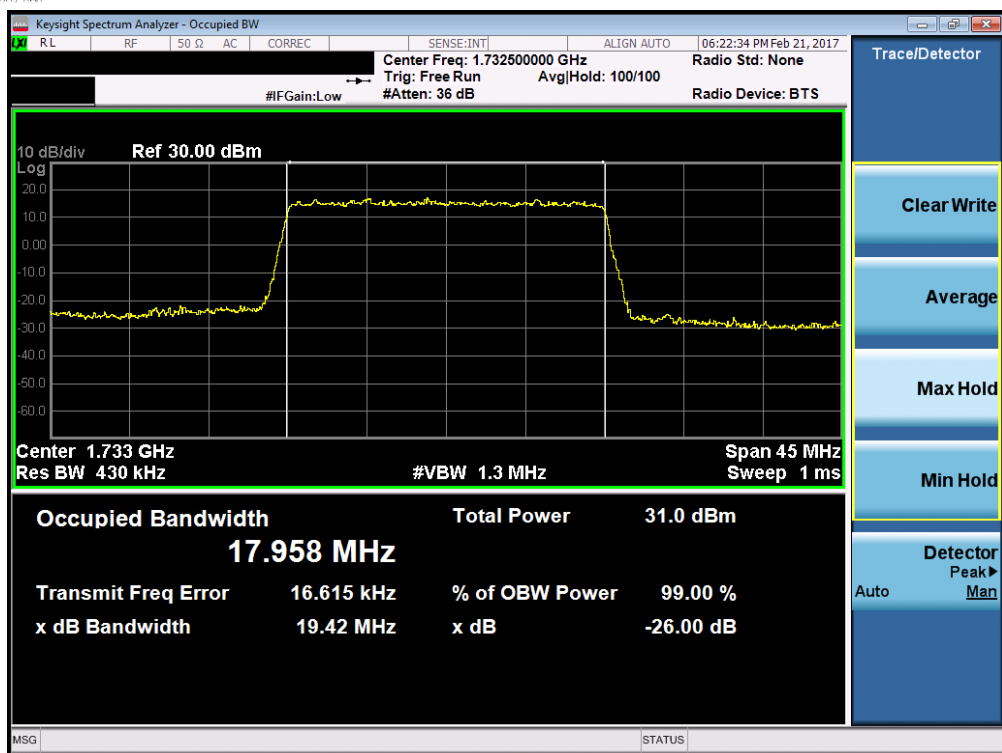


Plot 7-21. Occupied Bandwidth Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

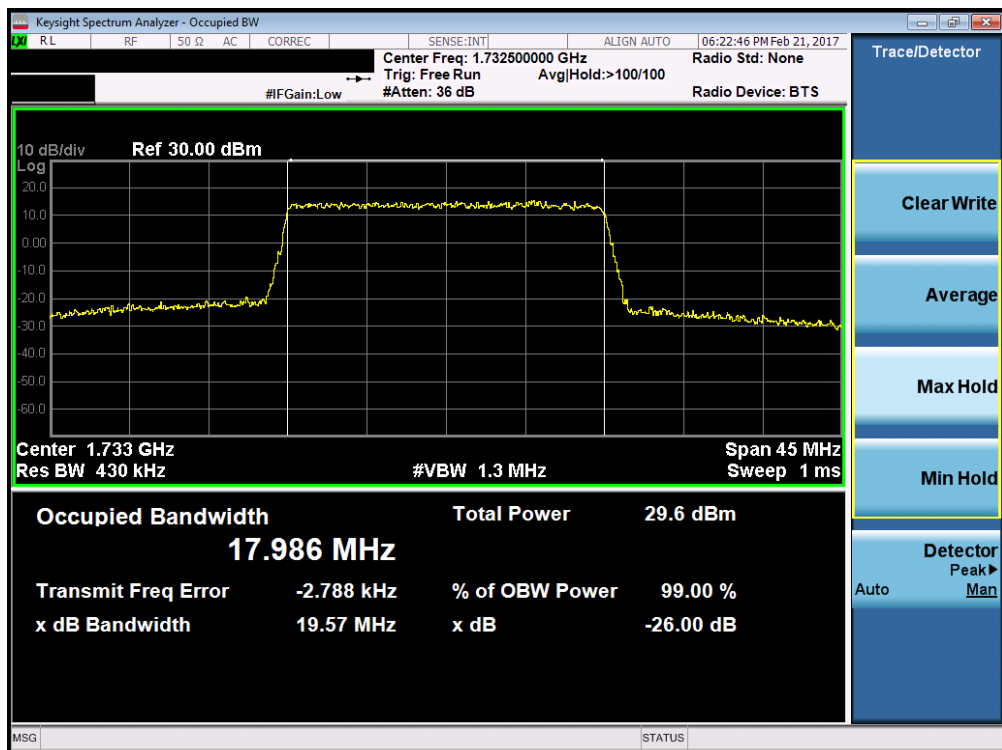


Plot 7-22. Occupied Bandwidth Plot (Band 4 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 25 of 80



Plot 7-23. Occupied Bandwidth Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-24. Occupied Bandwidth Plot (Band 4 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 26 of 80

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §22.917(a) §27.53(c.2) §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 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

Test Procedure Used

KDB 971168 D01 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.

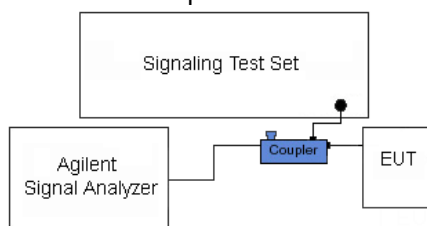
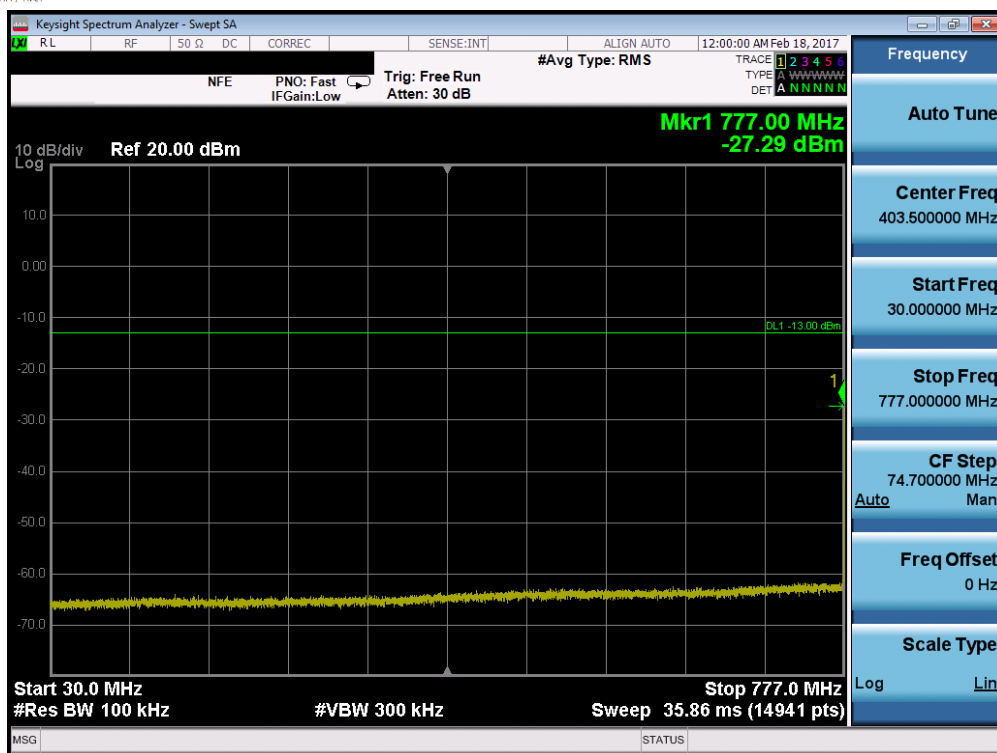


Figure 7-2. Test Instrument & Measurement Setup

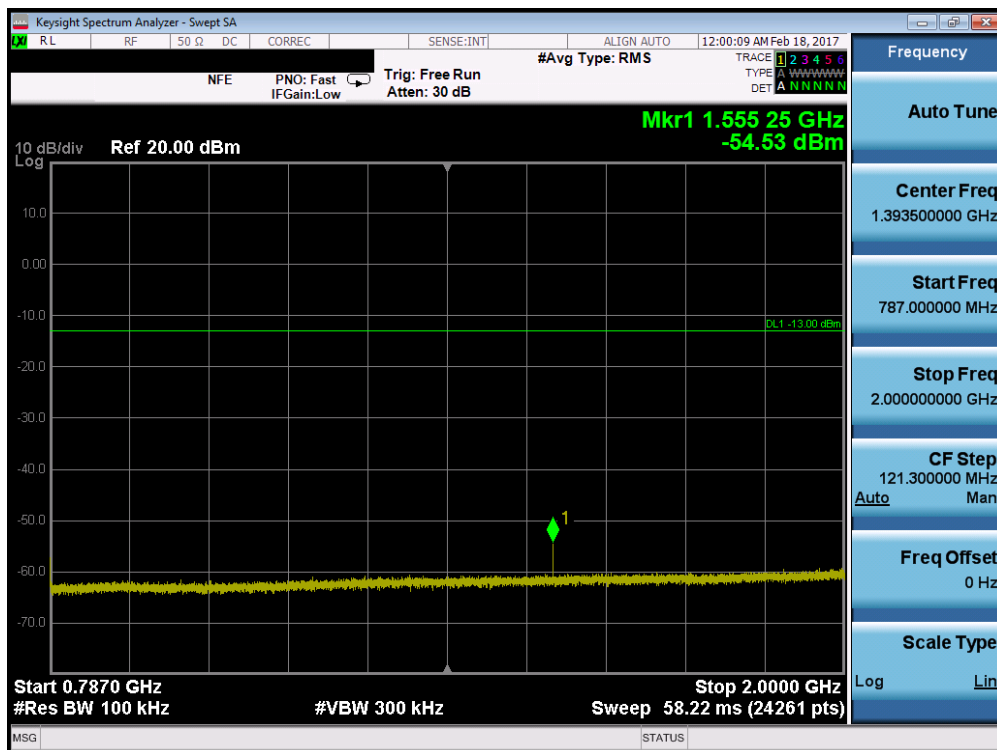
Test Notes

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: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 27 of 80

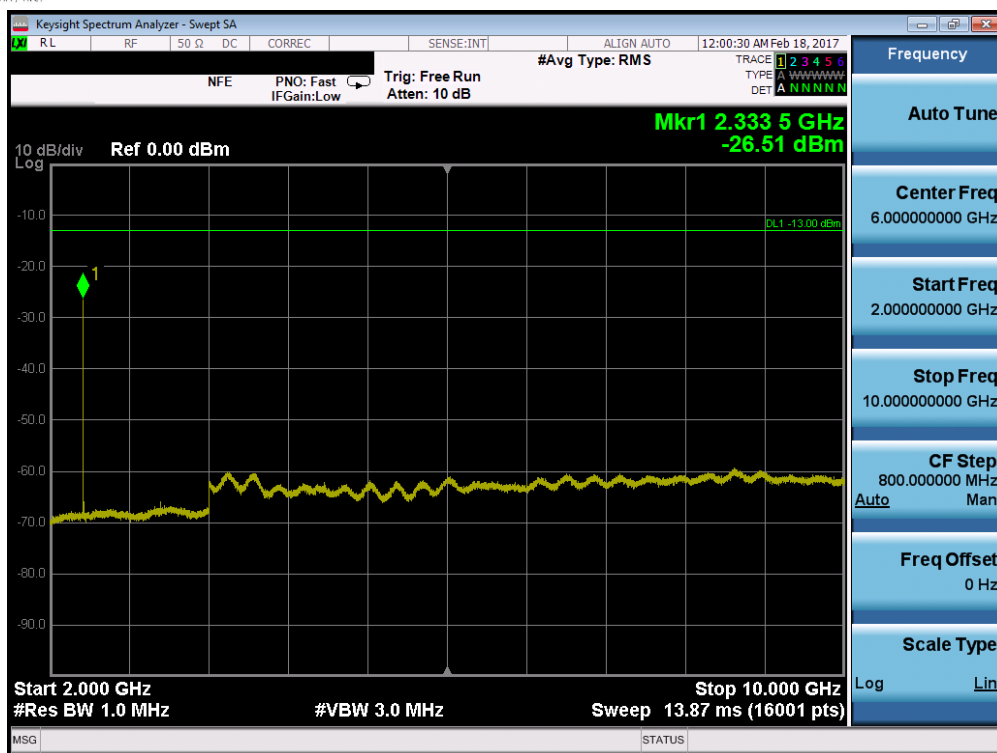


Plot 7-25. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0)

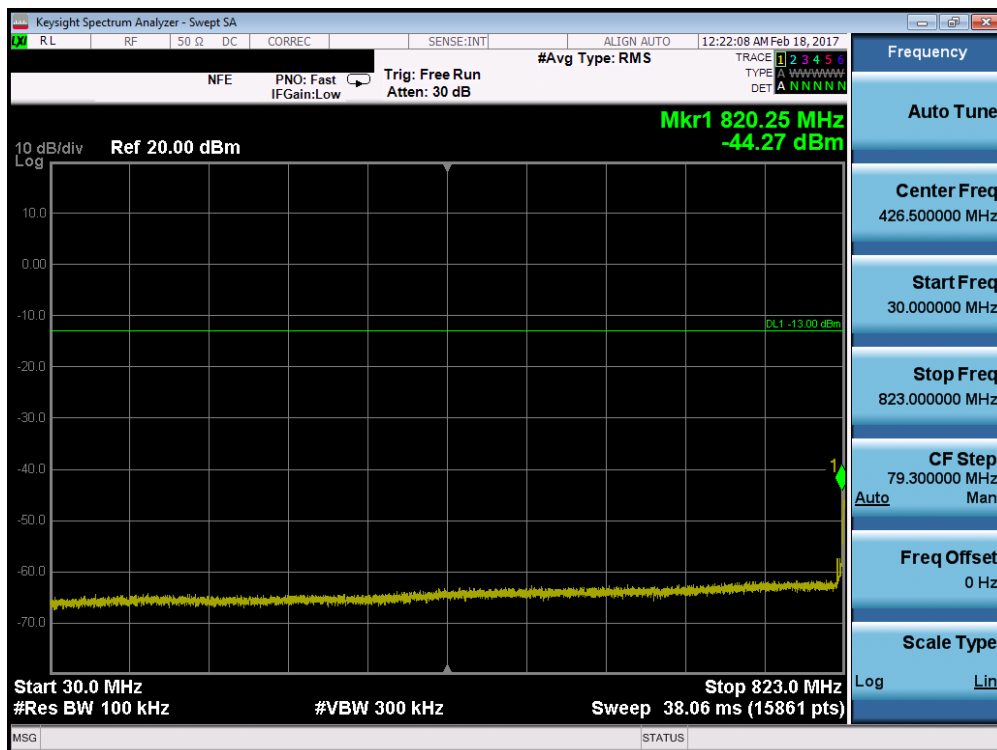


Plot 7-26. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 28 of 80

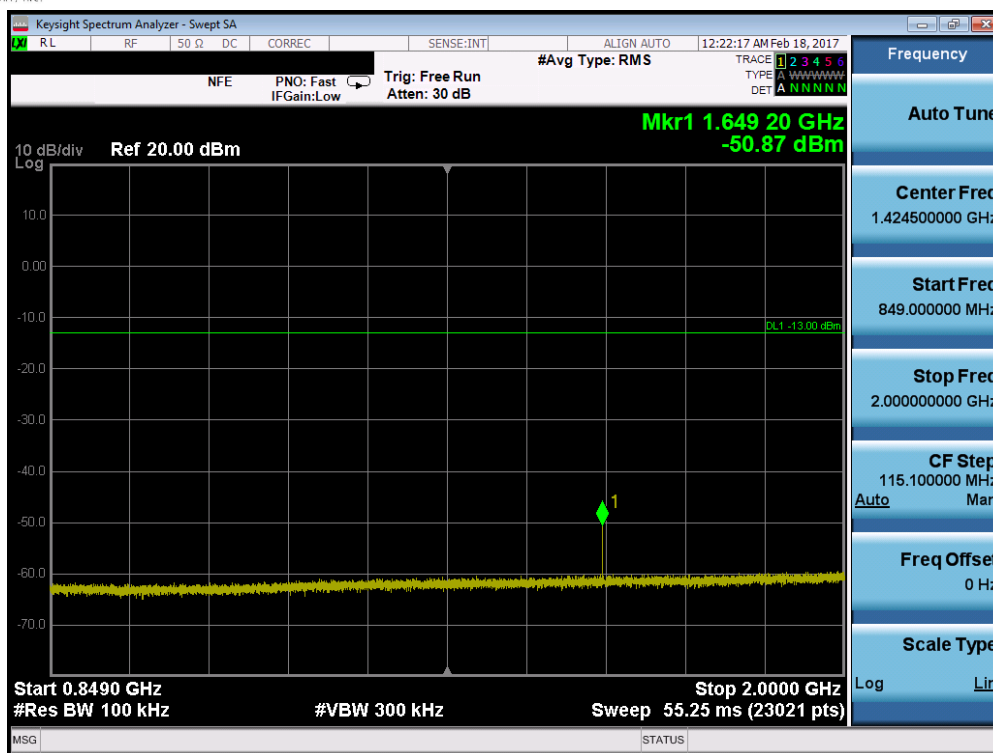


Plot 7-27. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0)

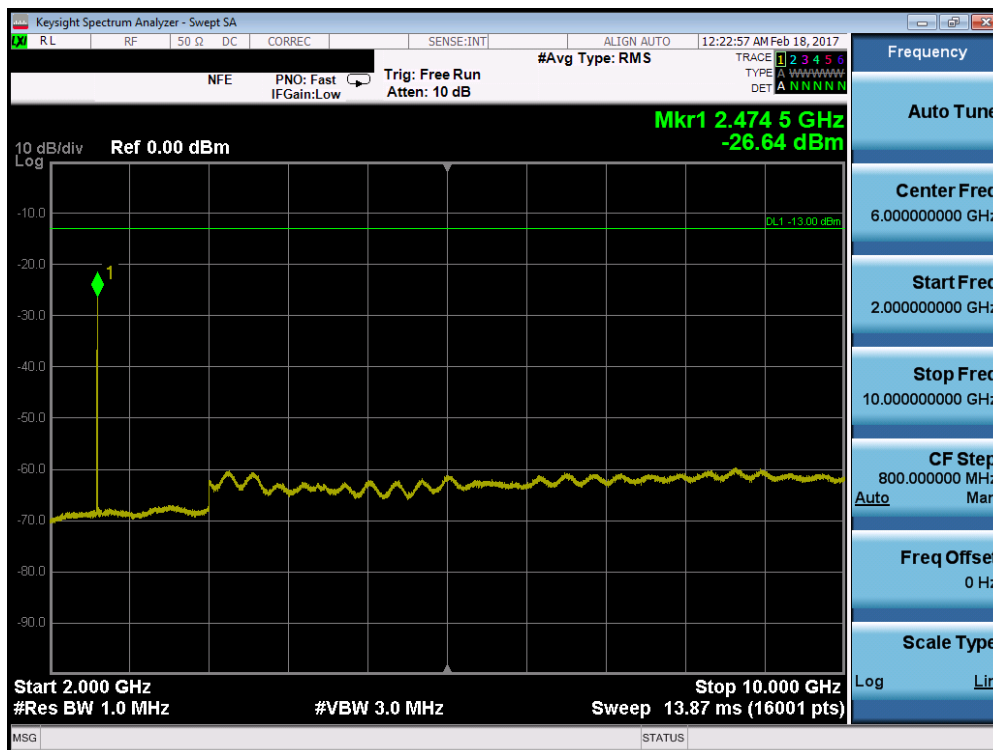


Plot 7-28. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0– Low Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 29 of 80

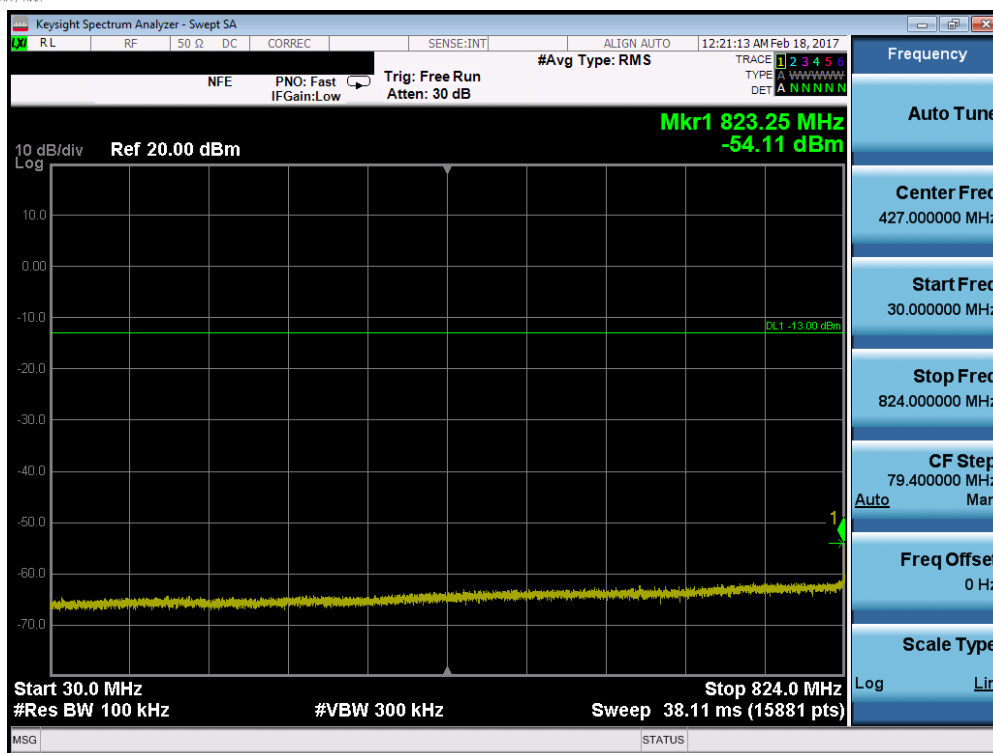


Plot 7-29. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

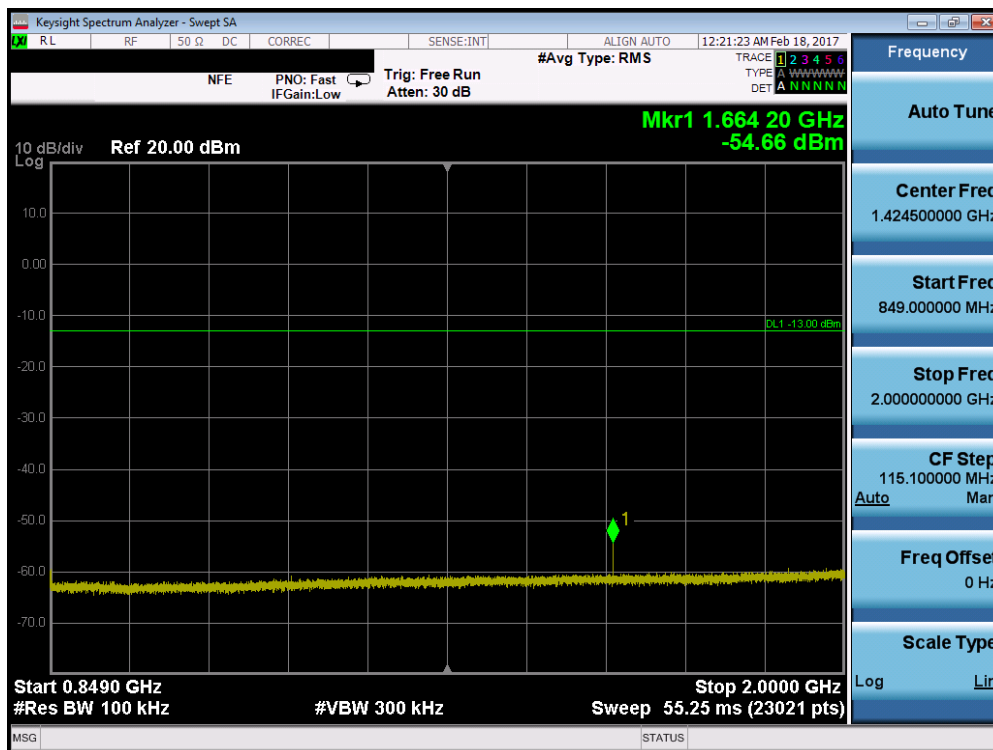


Plot 7-30. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 30 of 80

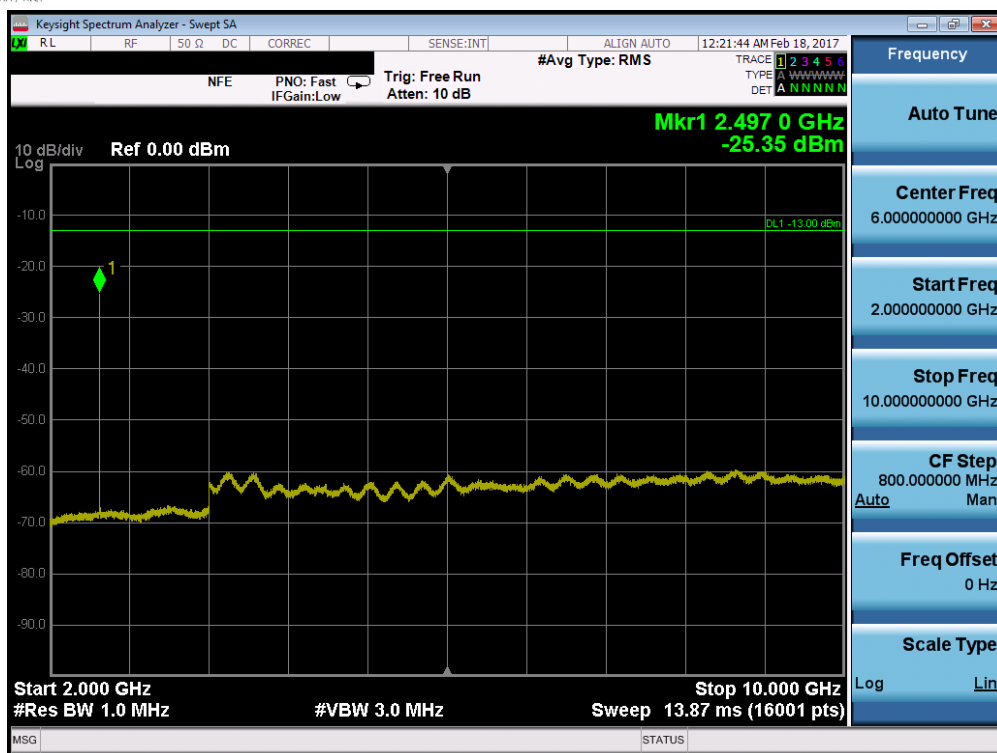


Plot 7-31. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

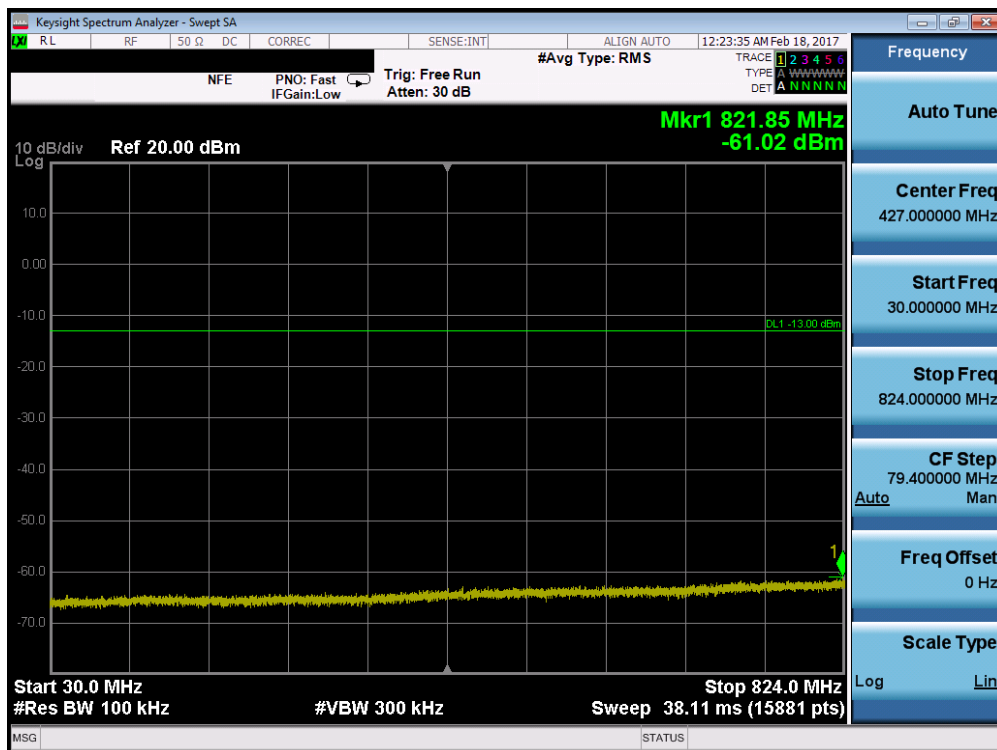


Plot 7-32. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 31 of 80

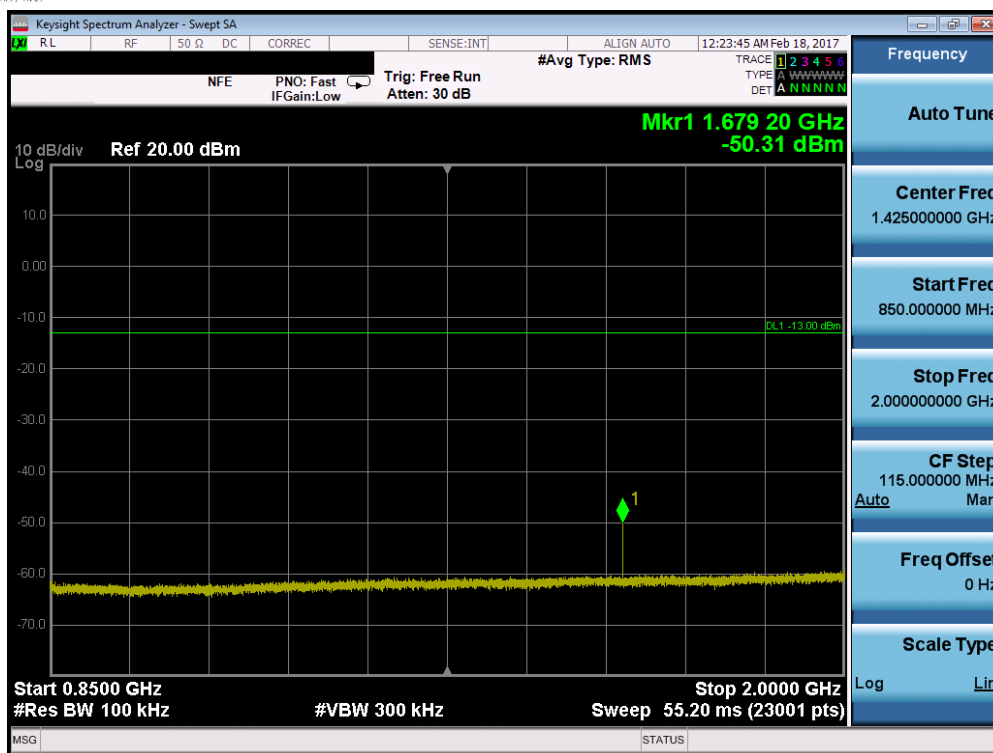


Plot 7-33. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

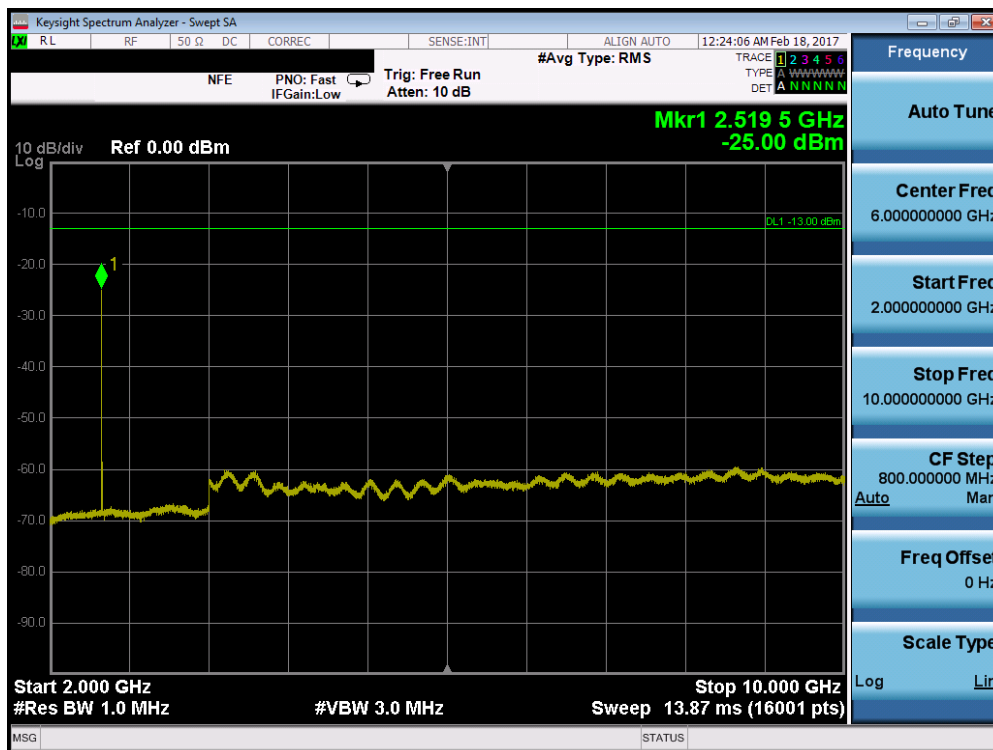


Plot 7-34. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 32 of 80

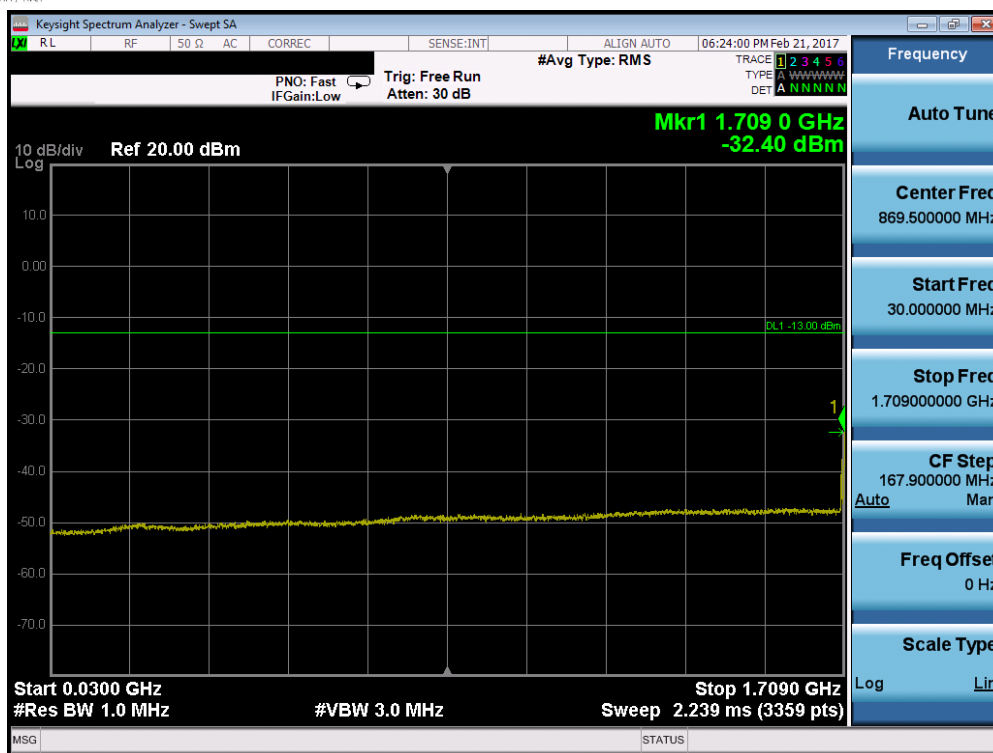


Plot 7-35. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

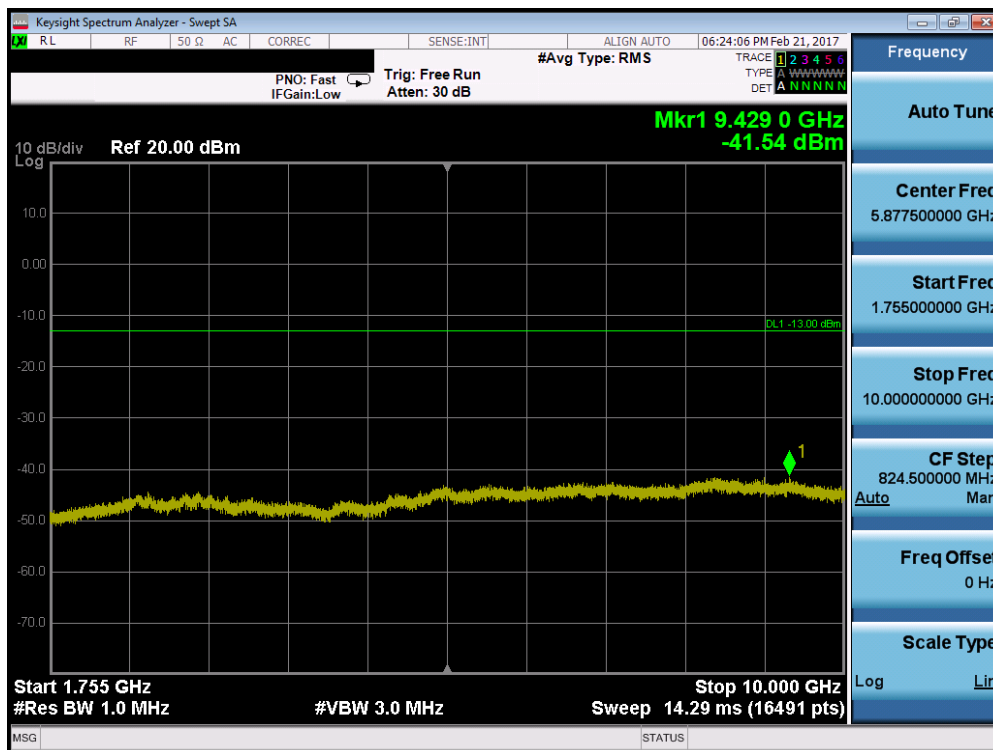


Plot 7-36. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 33 of 80

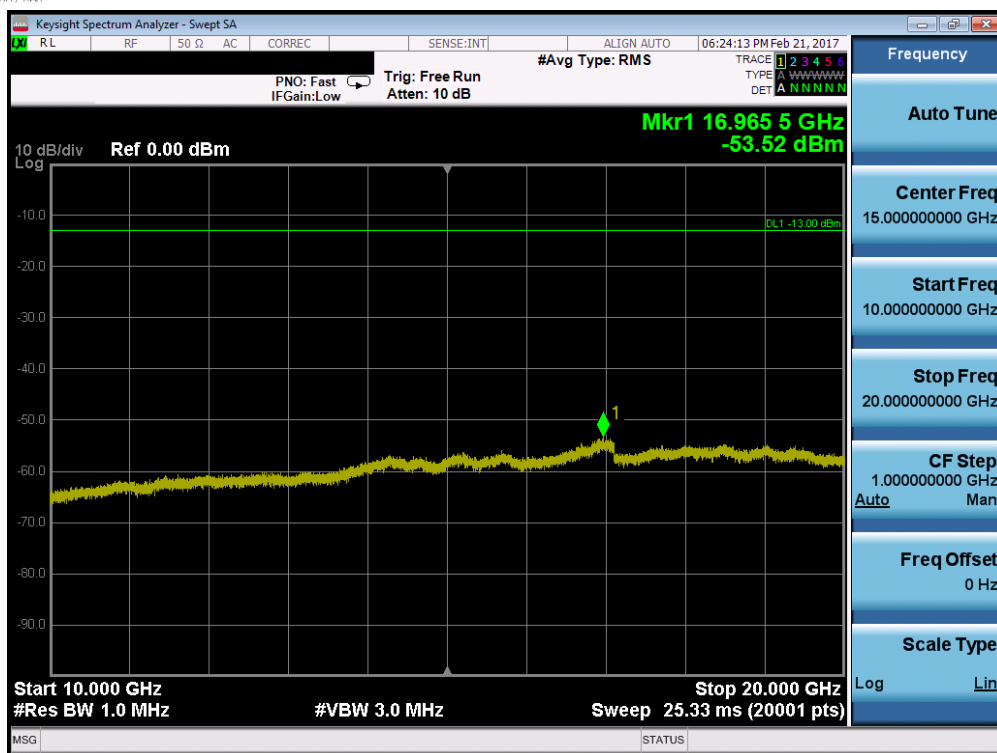


Plot 7-37. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0– Low Channel)

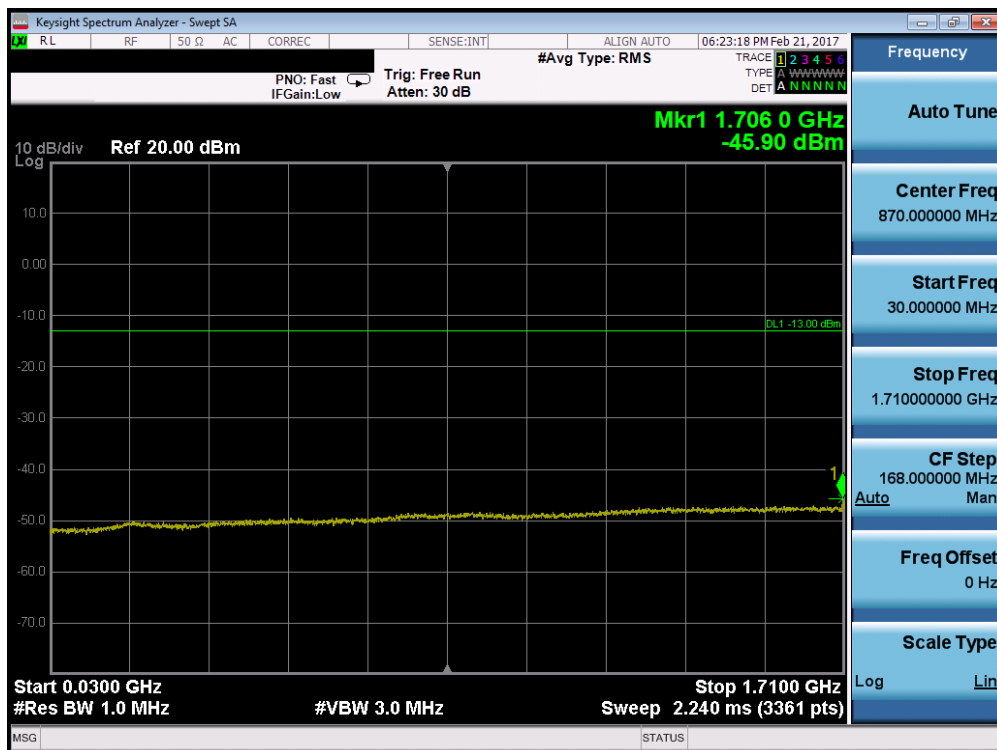


Plot 7-38. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 34 of 80

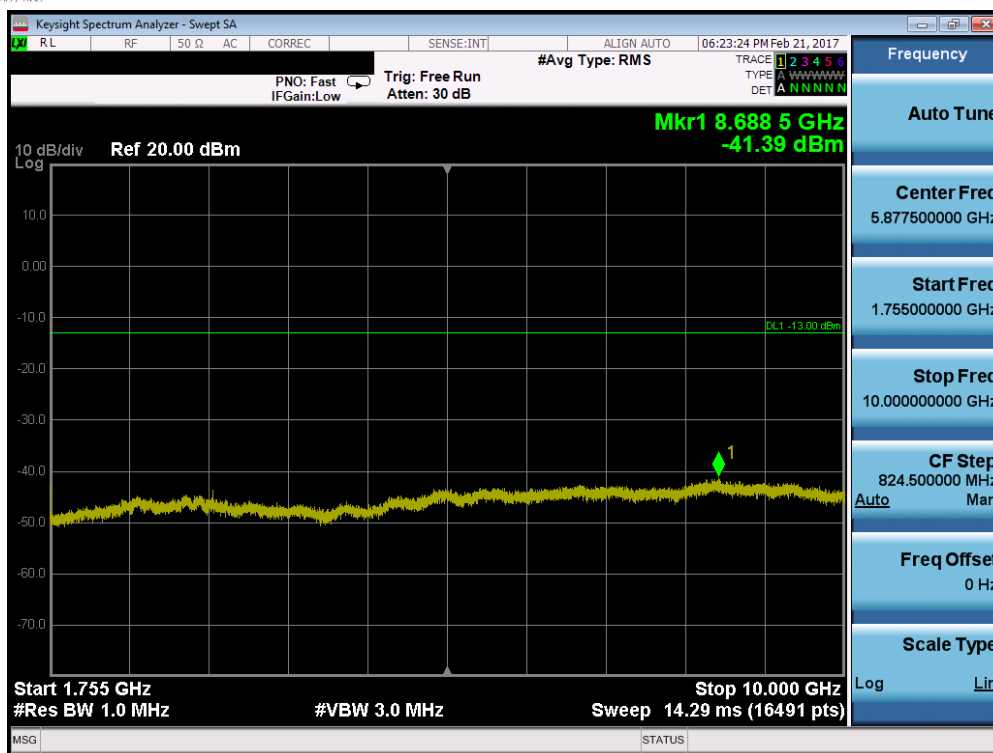


Plot 7-39. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

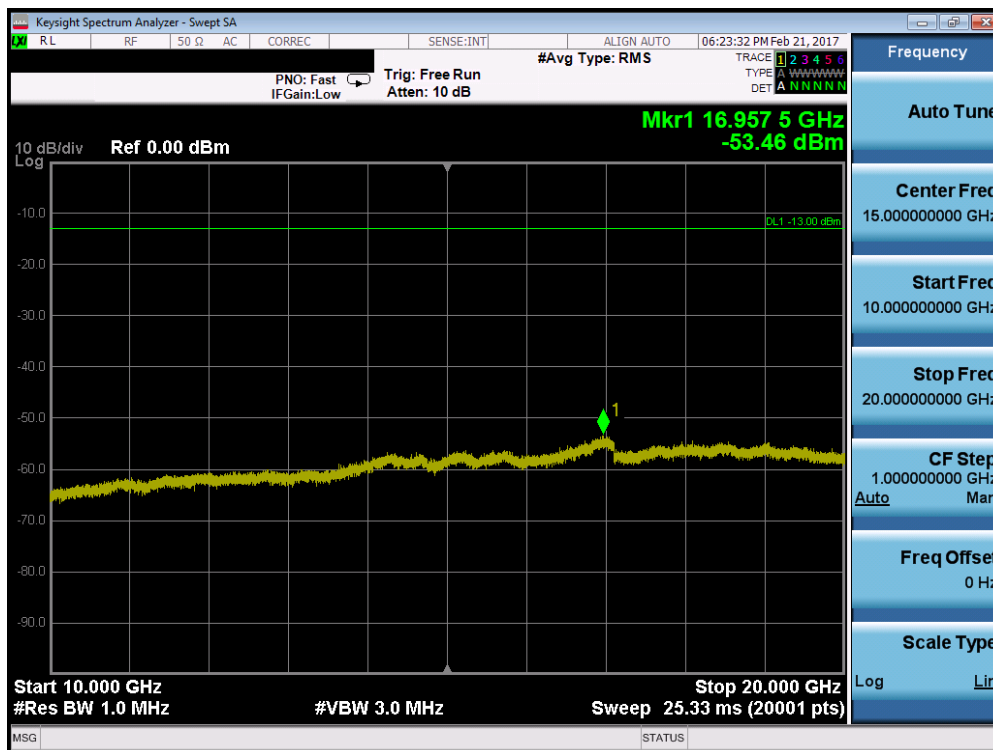


Plot 7-40. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 35 of 80

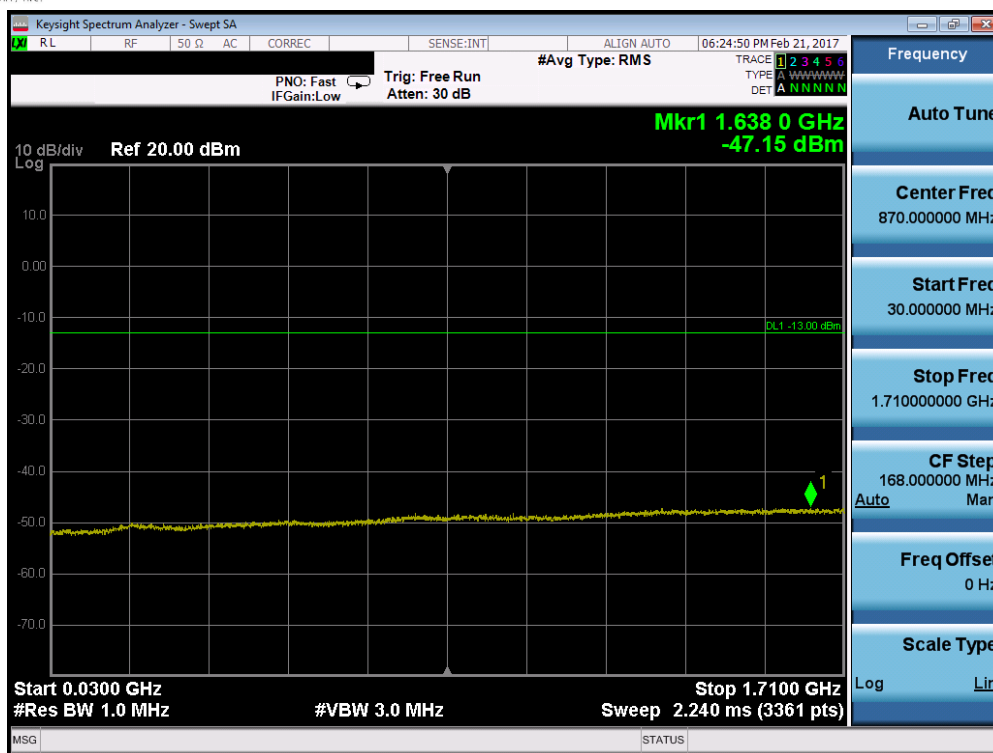


Plot 7-41. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

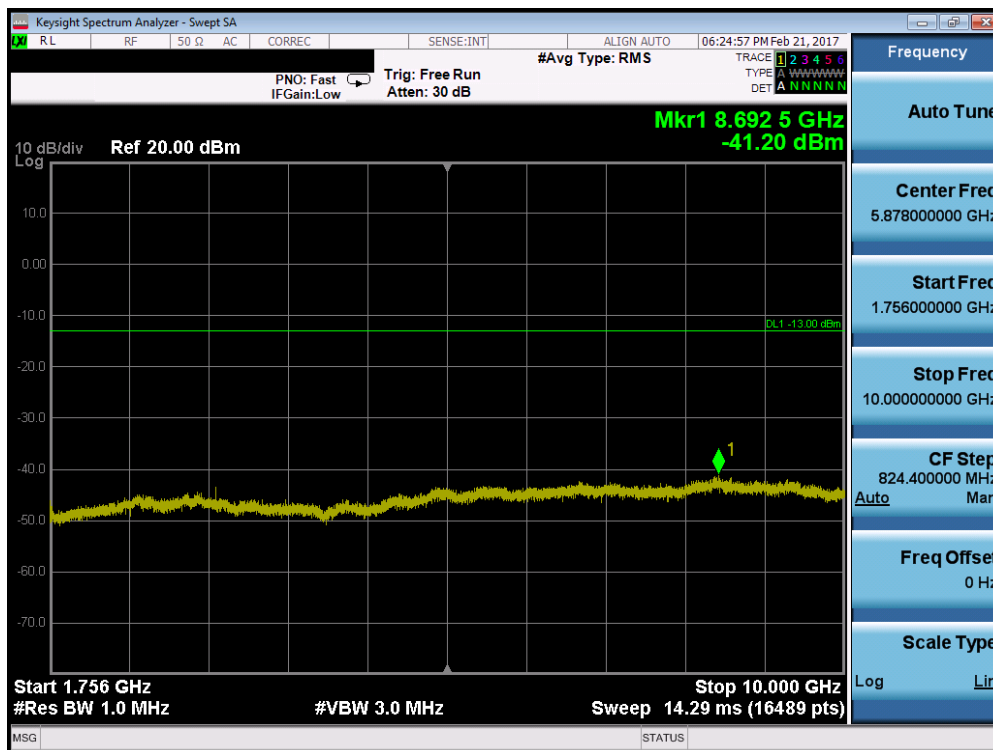


Plot 7-42. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 36 of 80

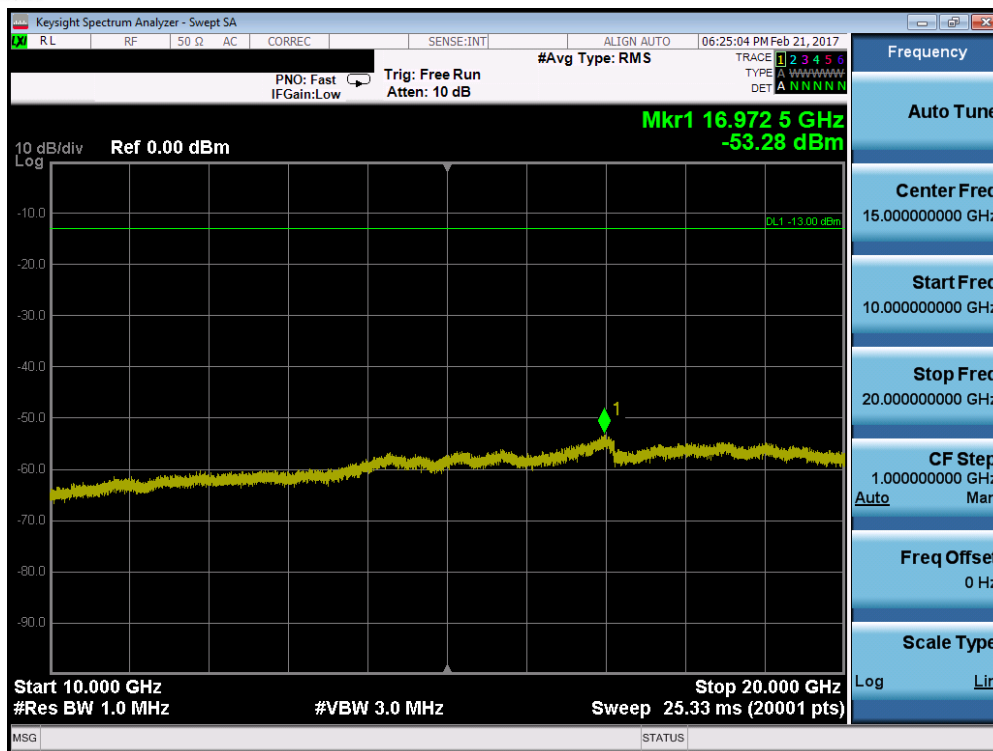


Plot 7-43. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



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

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 37 of 80



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

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 38 of 80

© 2017 PCTEST Engineering Laboratory, Inc.

V 6.2

01/09/2016

© 2015 PCTEST Engineering Laboratory, Inc. All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTESTLAB.COM.

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §27.53(c) §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 D01 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 $\geq 2 \times$ 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.

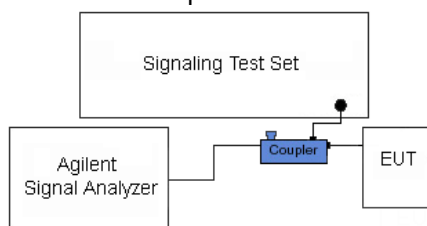


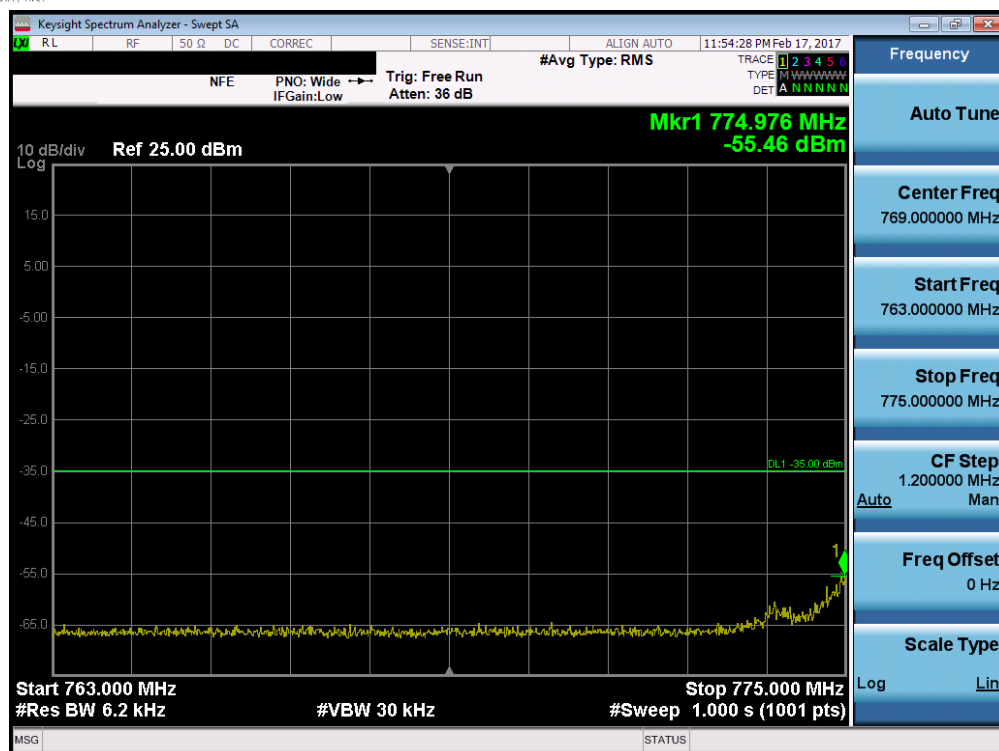
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

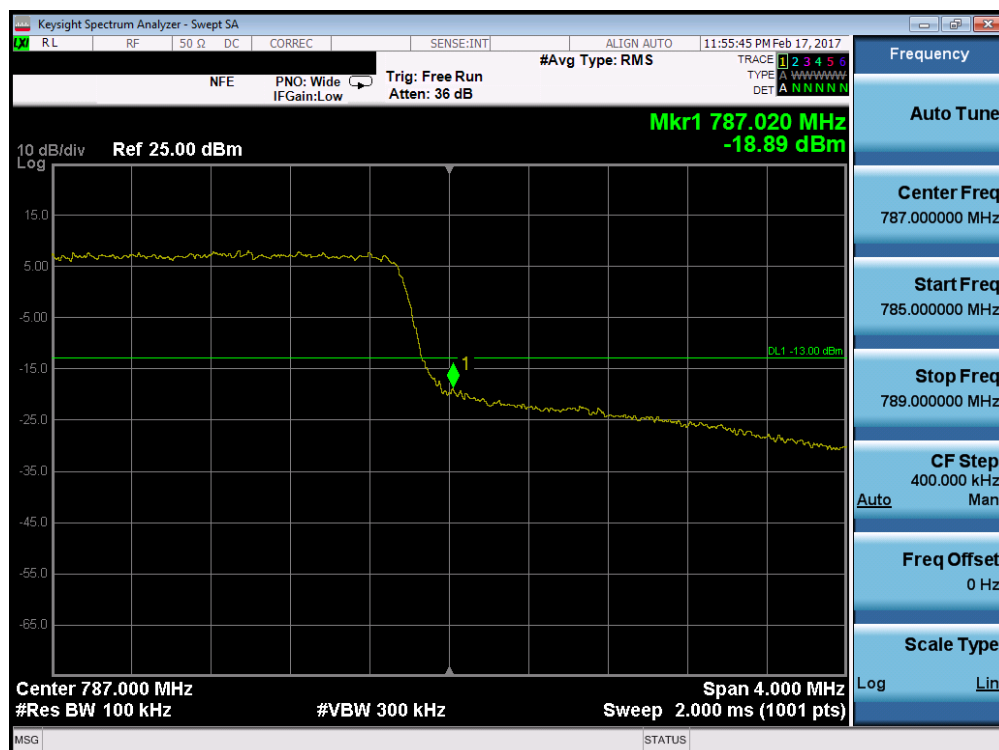
Per 22.917(b) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The 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(c.5) for operations in the 776-788 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: ZNFVN220	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 39 of 80

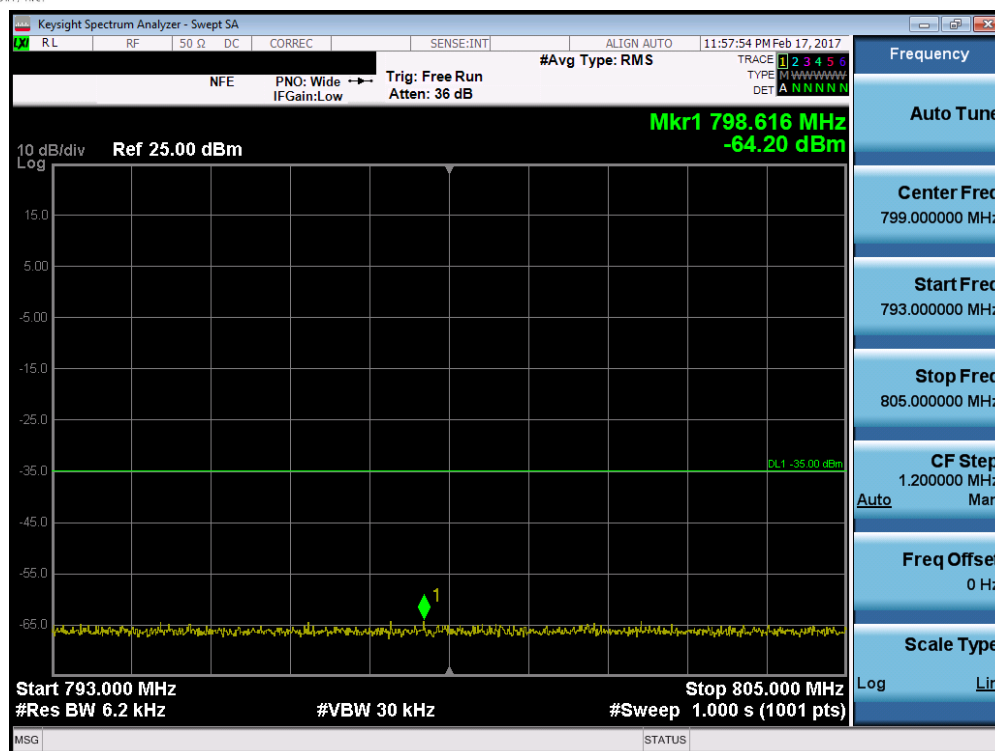


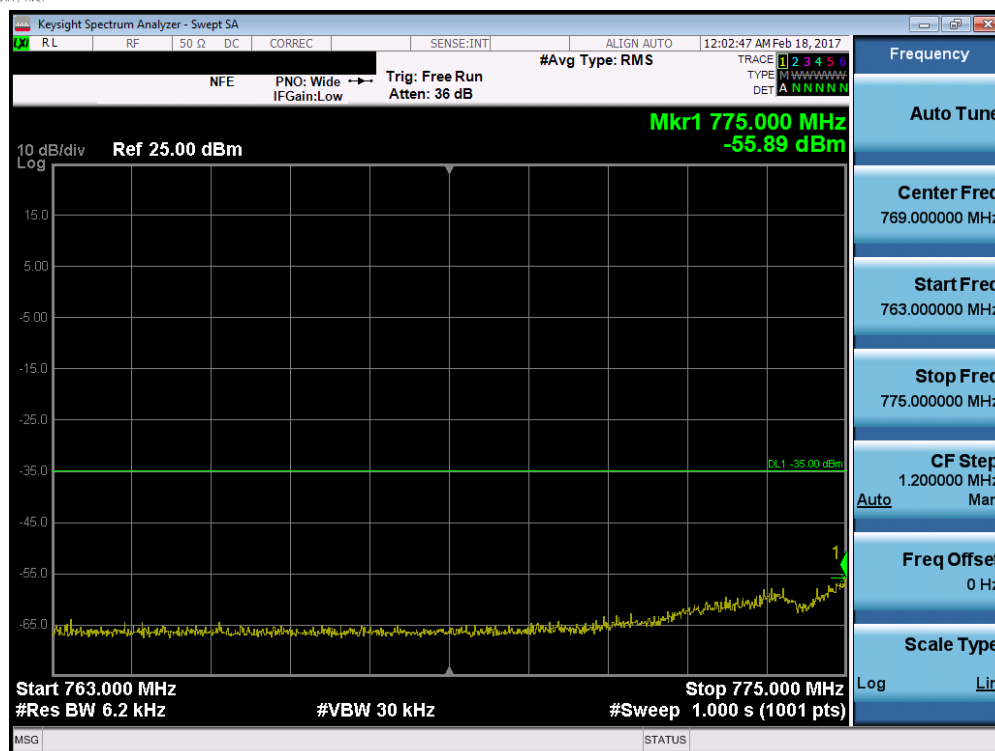
Plot 7-47. Lower Emission Mask Edge Plot (Band 13 - 5.0MHz QPSK - RB Size 25)



Plot 7-48. Upper Band Edge Plot (Band 13 - 5.0MHz QPSK - RB Size 25)

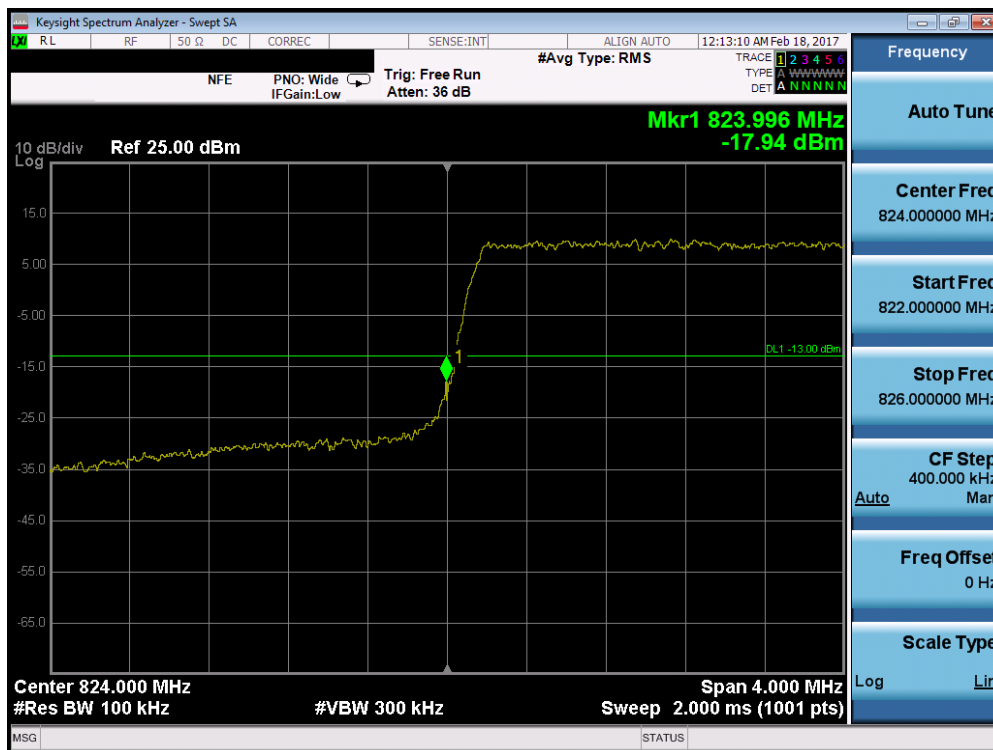
FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 41 of 80







Plot 7-55. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

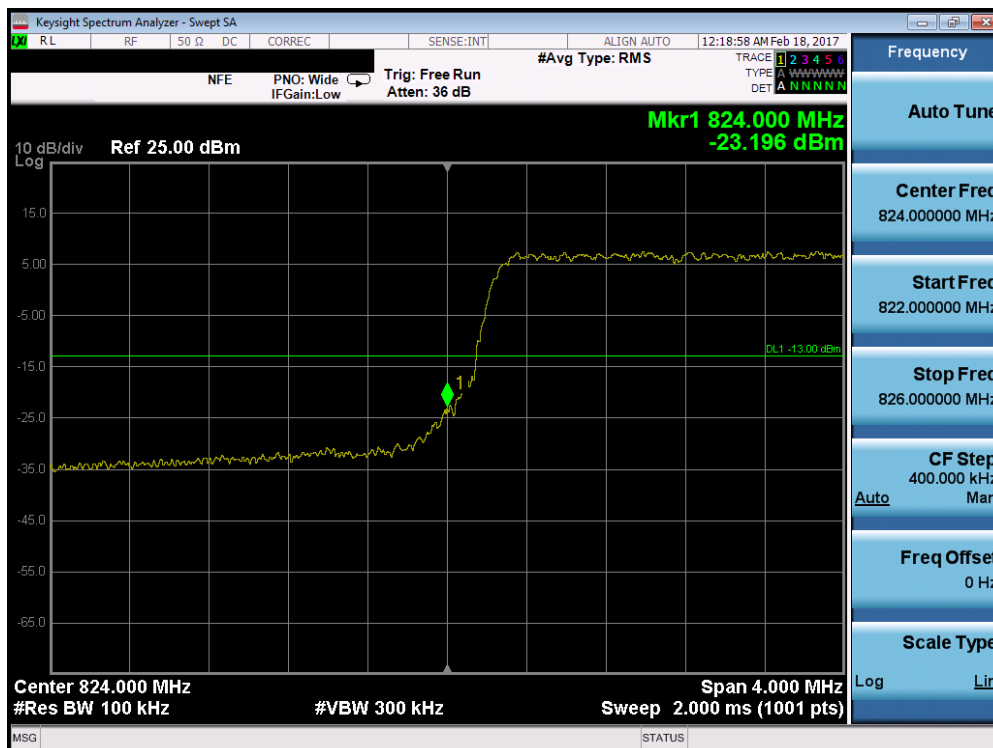


Plot 7-56. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 45 of 80

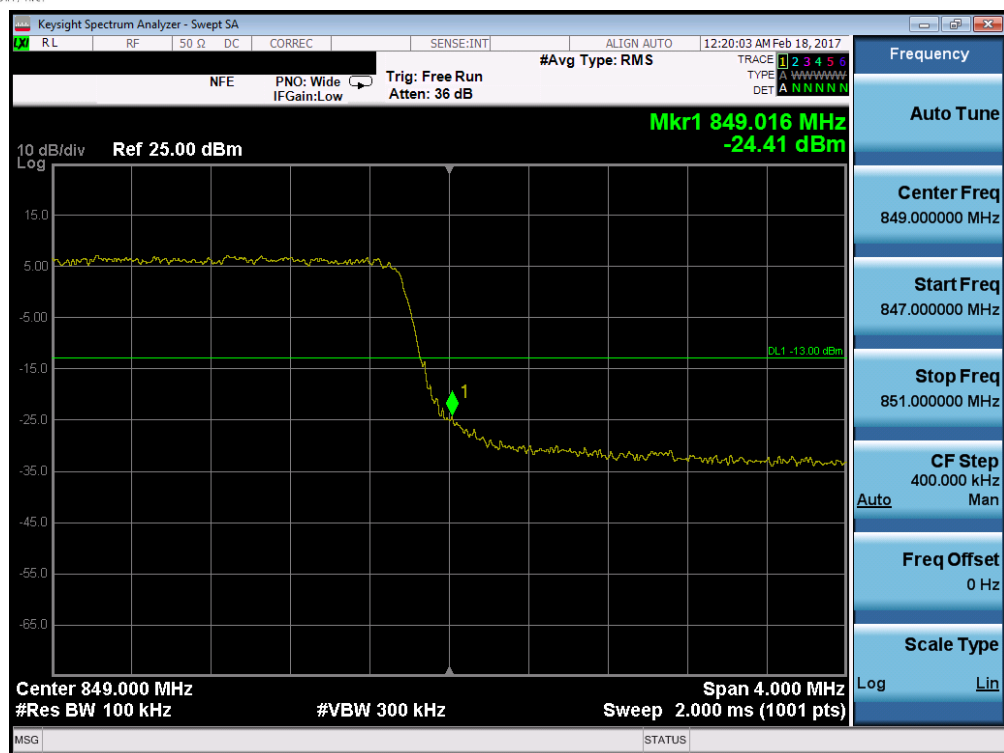


Plot 7-57. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

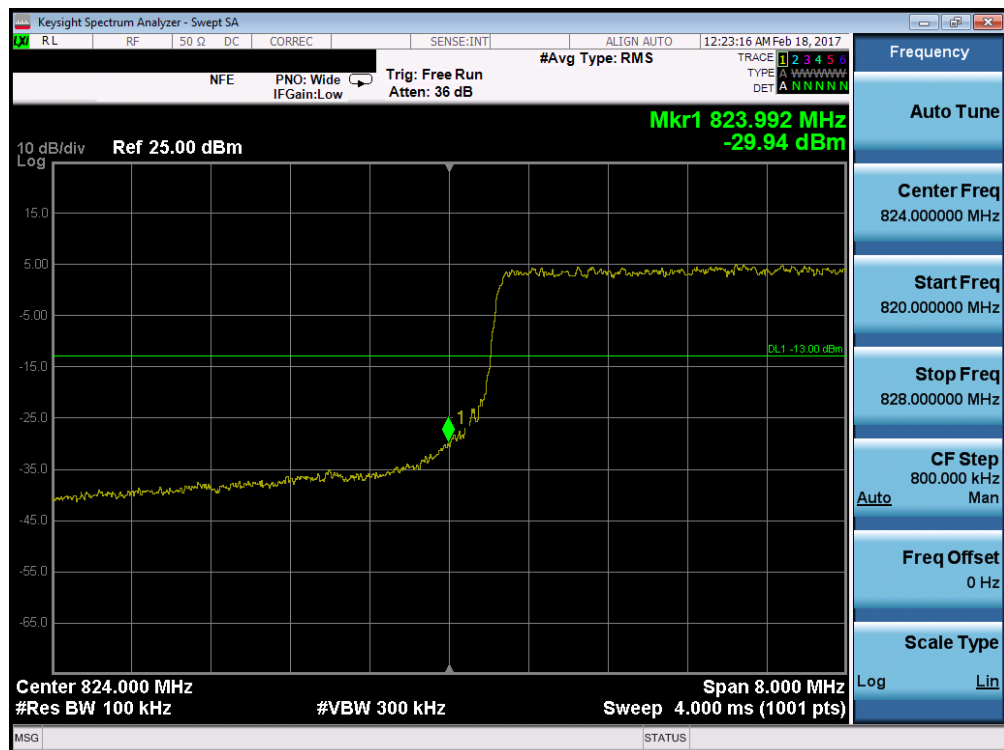


Plot 7-58. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 46 of 80

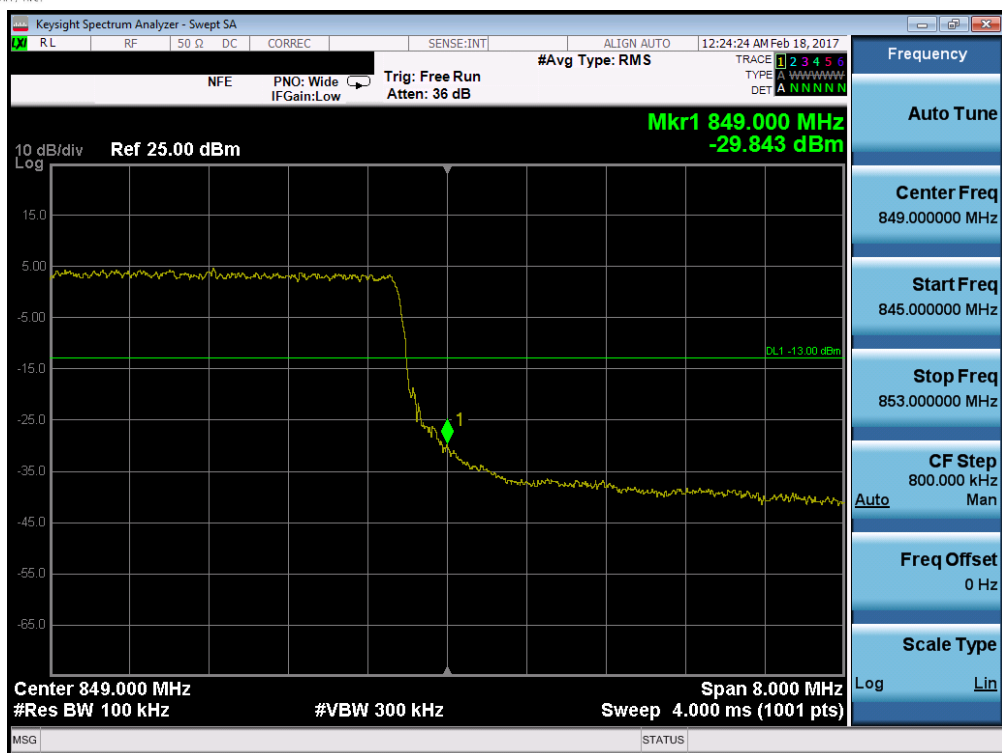


Plot 7-59. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

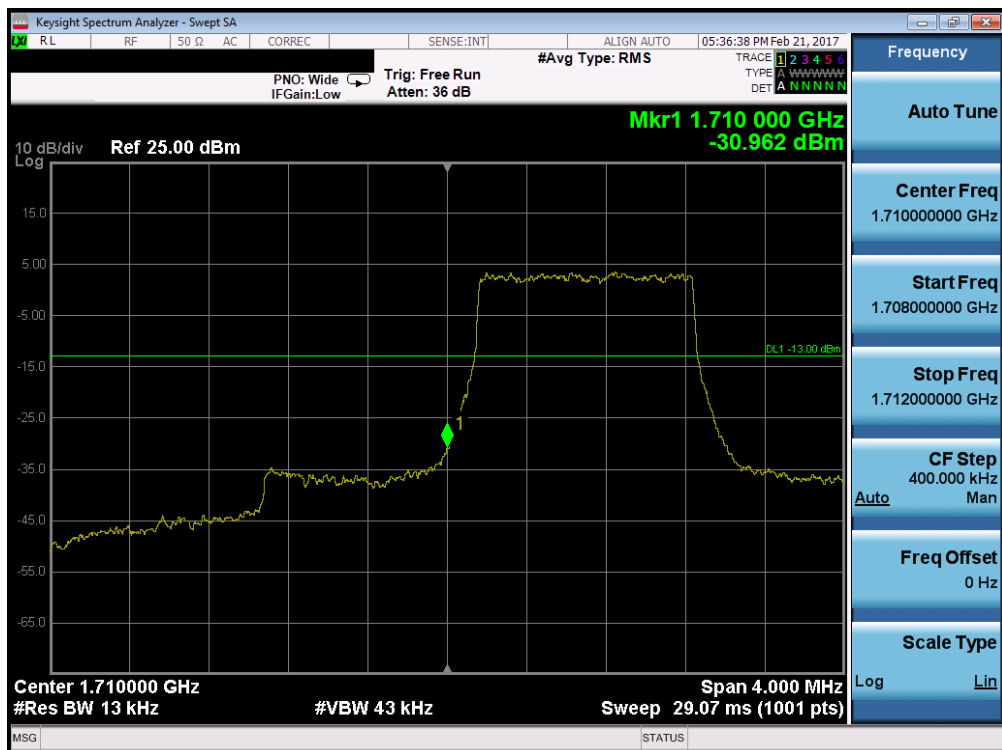


Plot 7-60. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 47 of 80

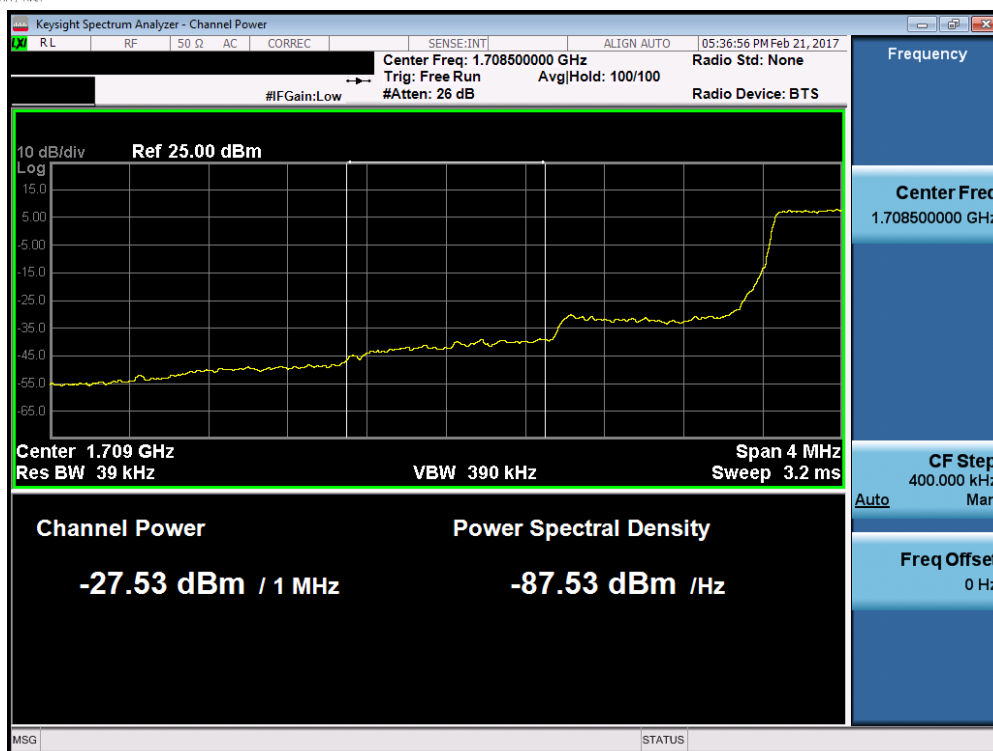


Plot 7-61. Upper Band Edge Plot (Band 5 - 10.0MHz QPSK - RB Size 50)

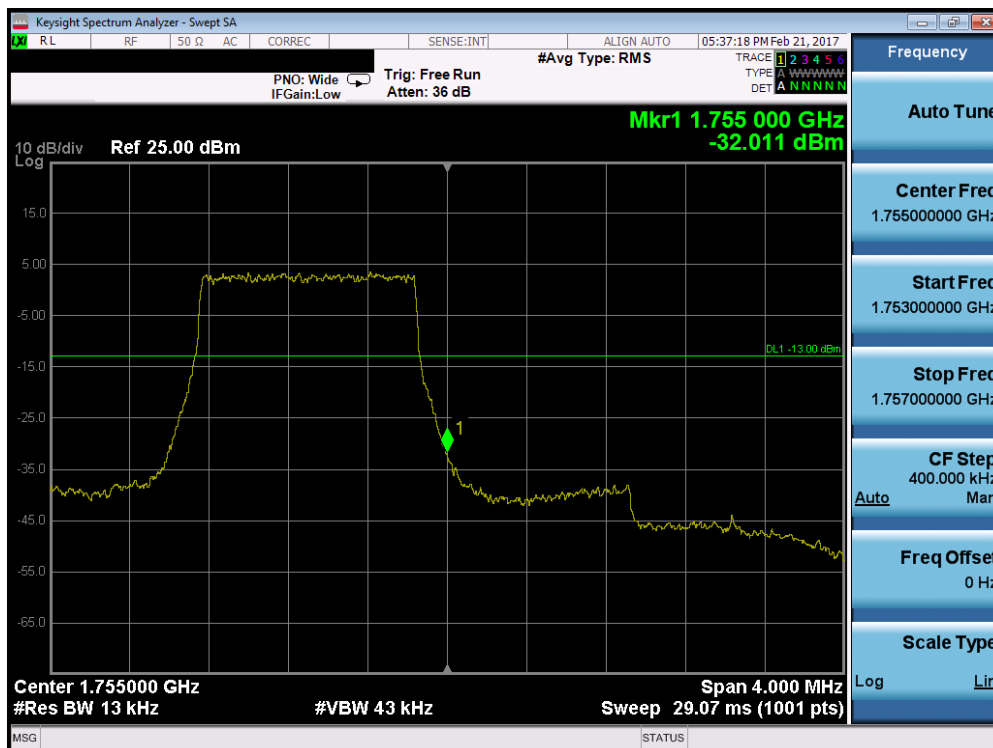


Plot 7-62. Lower Band Edge Plot (Band 4 - 1.4MHz QPSK - RB Size 6)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 48 of 80

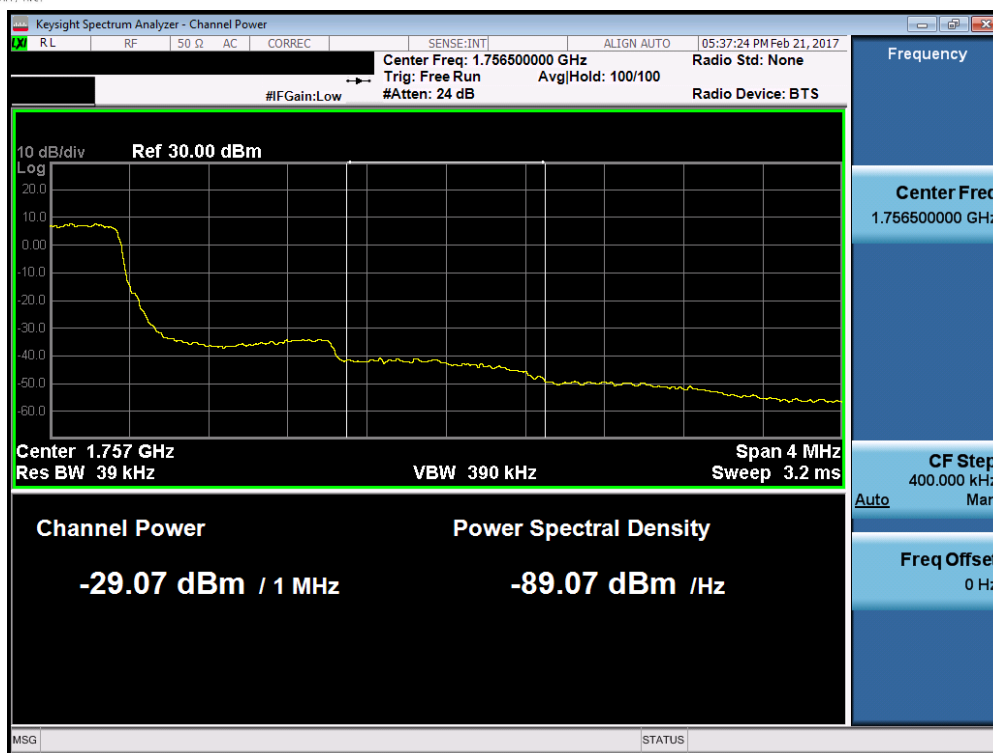


Plot 7-63. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

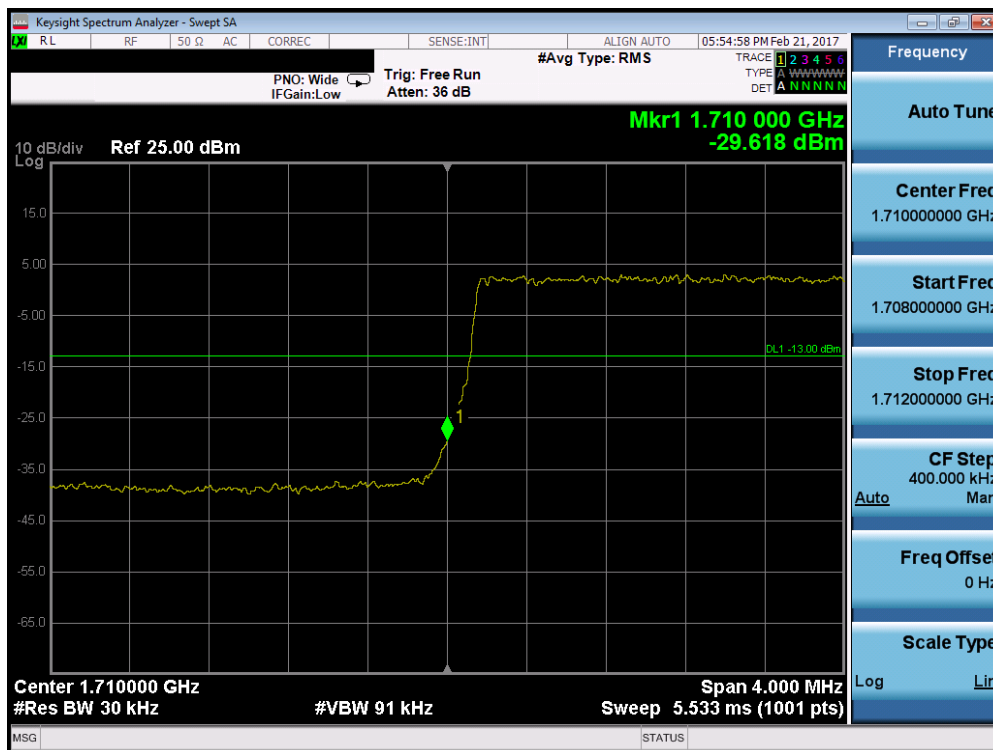


Plot 7-64. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 49 of 80

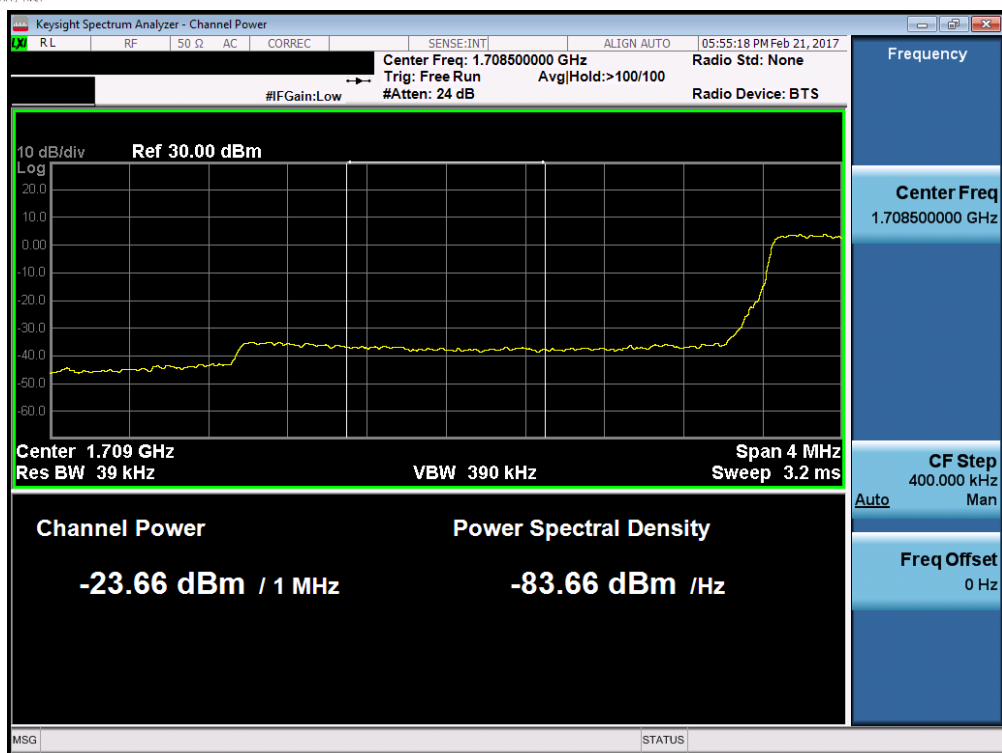


Plot 7-65. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-66. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 50 of 80

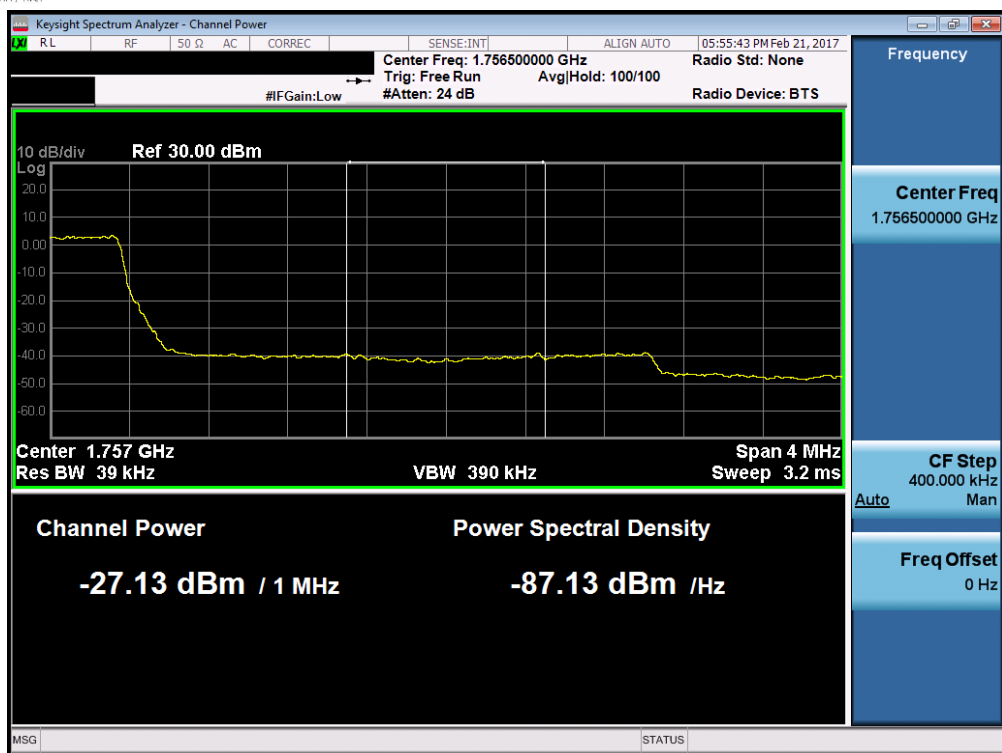


Plot 7-67. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

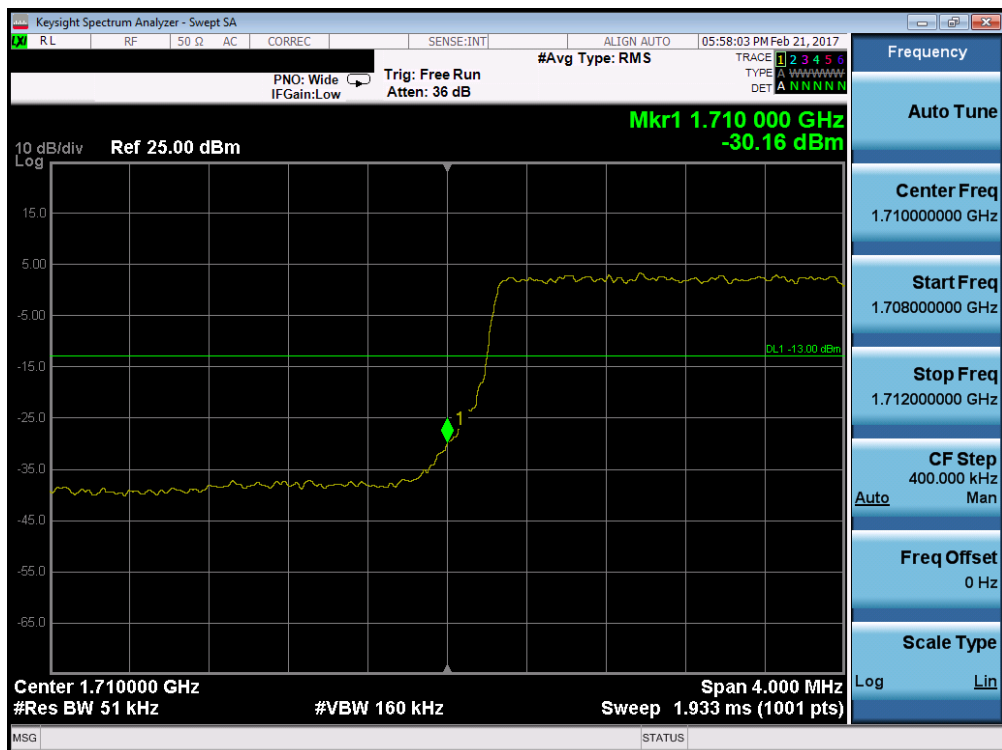


Plot 7-68. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 51 of 80



Plot 7-69. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

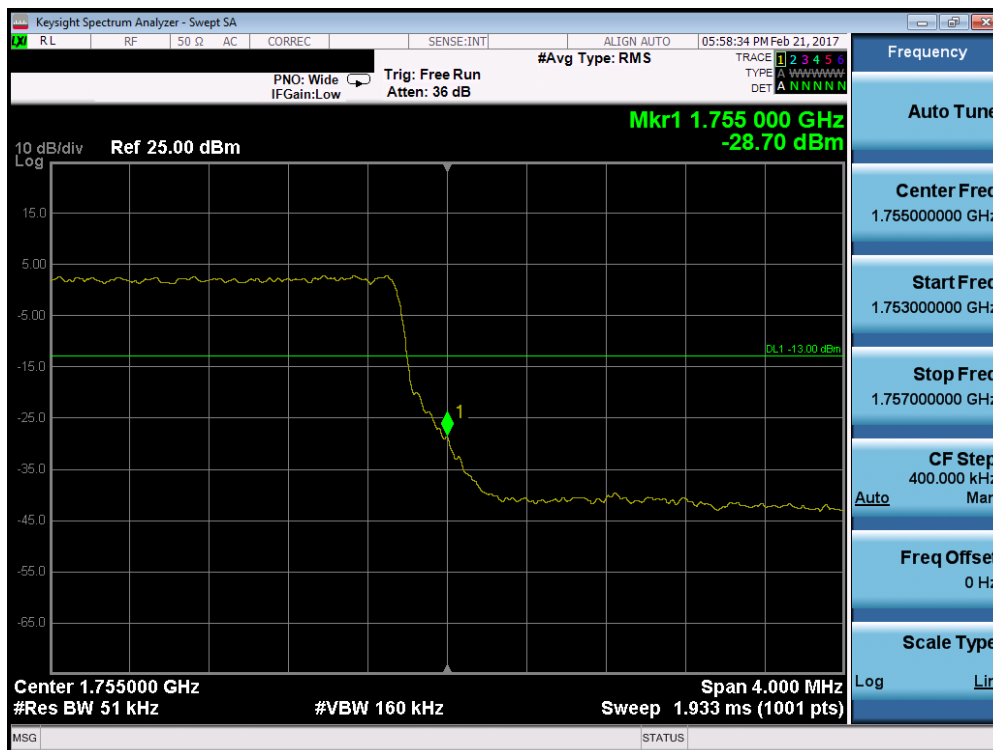


Plot 7-70. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 52 of 80



Plot 7-71. Lower Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - RB Size 25)

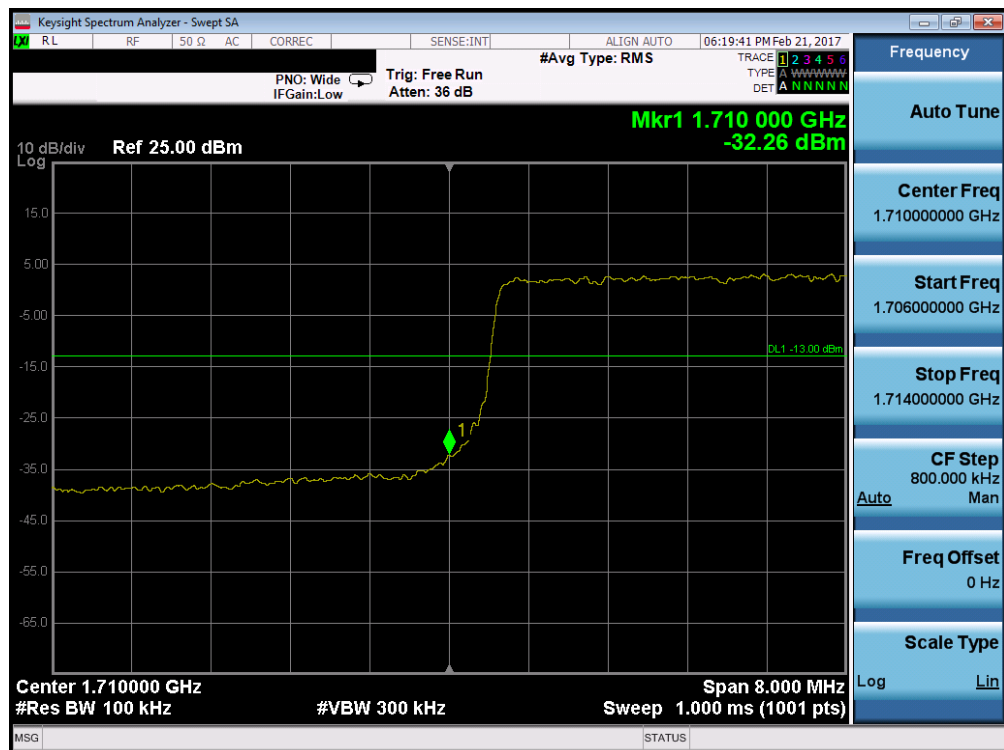


Plot 7-72. Upper Band Edge Plot (Band 4 - 5.0MHz QPSK - RB Size 25)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 53 of 80

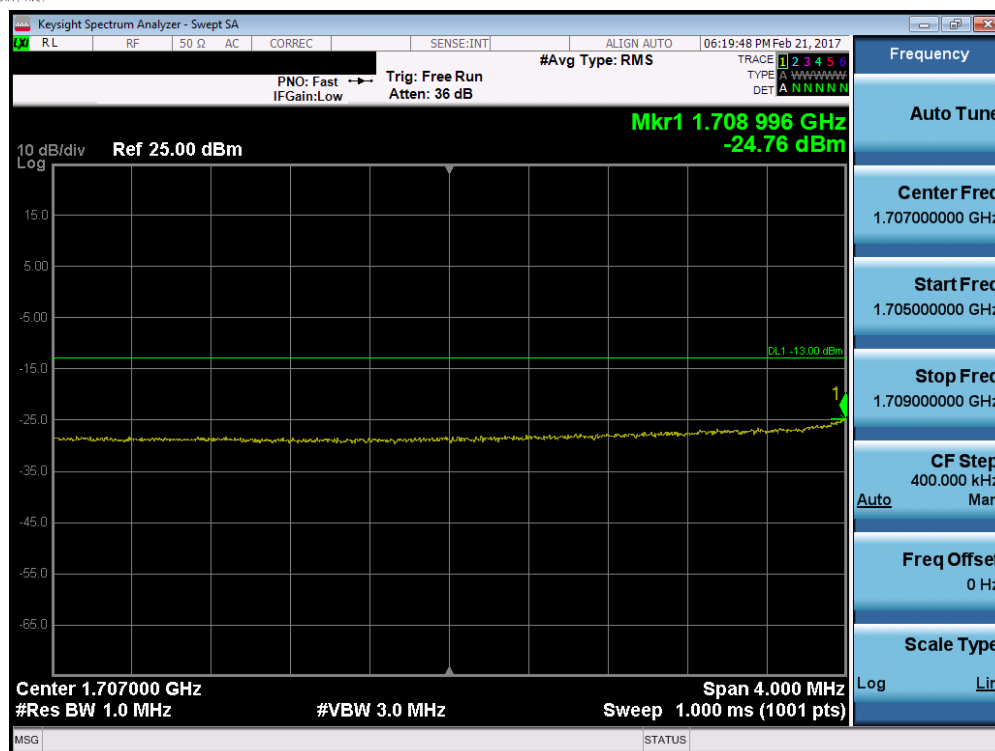


Plot 7-73. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

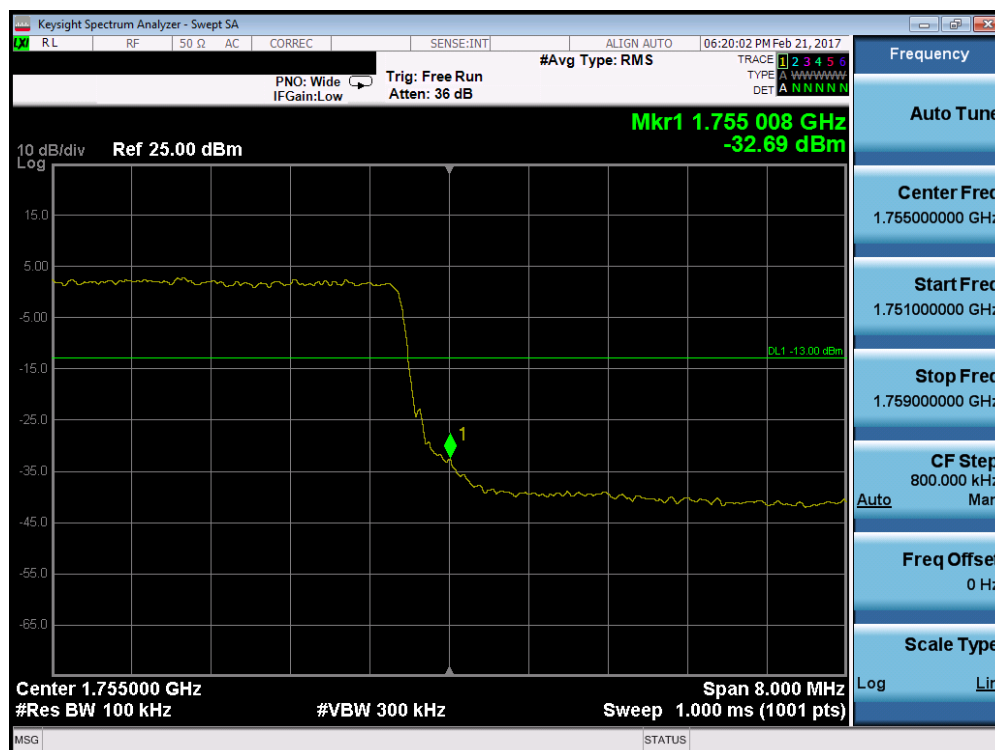


Plot 7-74. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 54 of 80

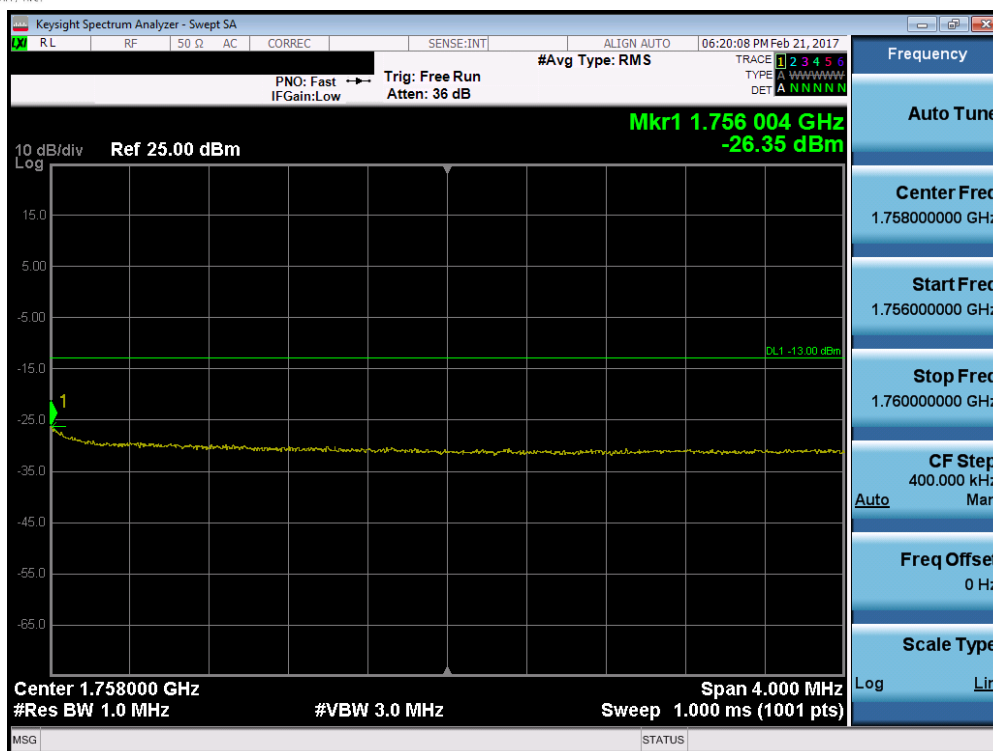


Plot 7-75. Lower Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - RB Size 50)

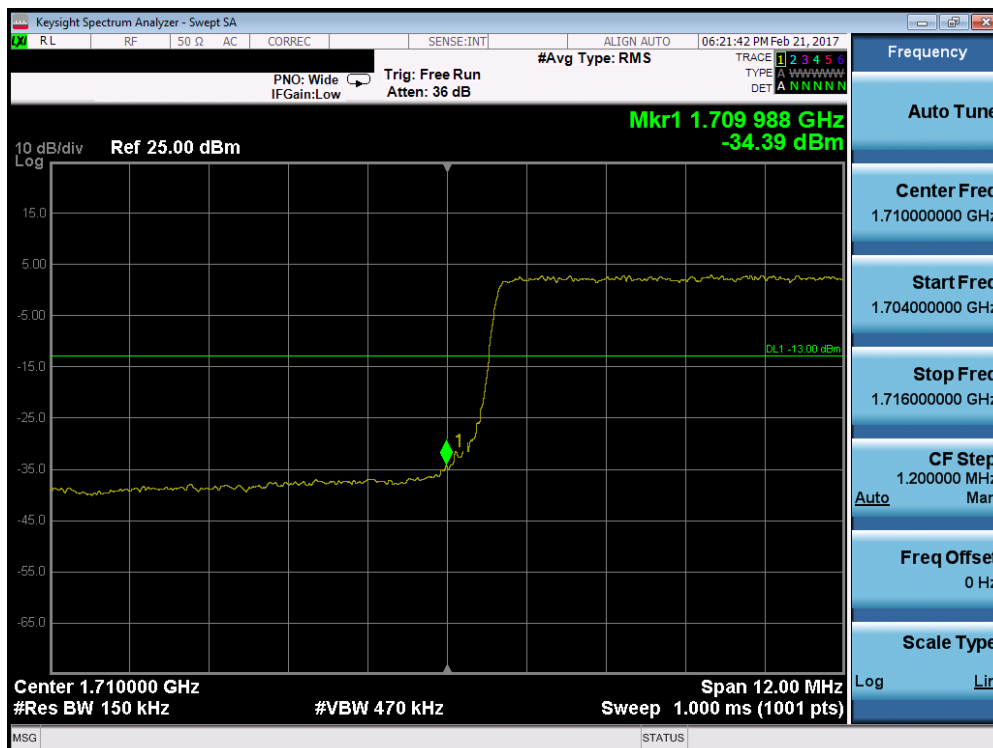


Plot 7-76. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - RB Size 50)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 55 of 80

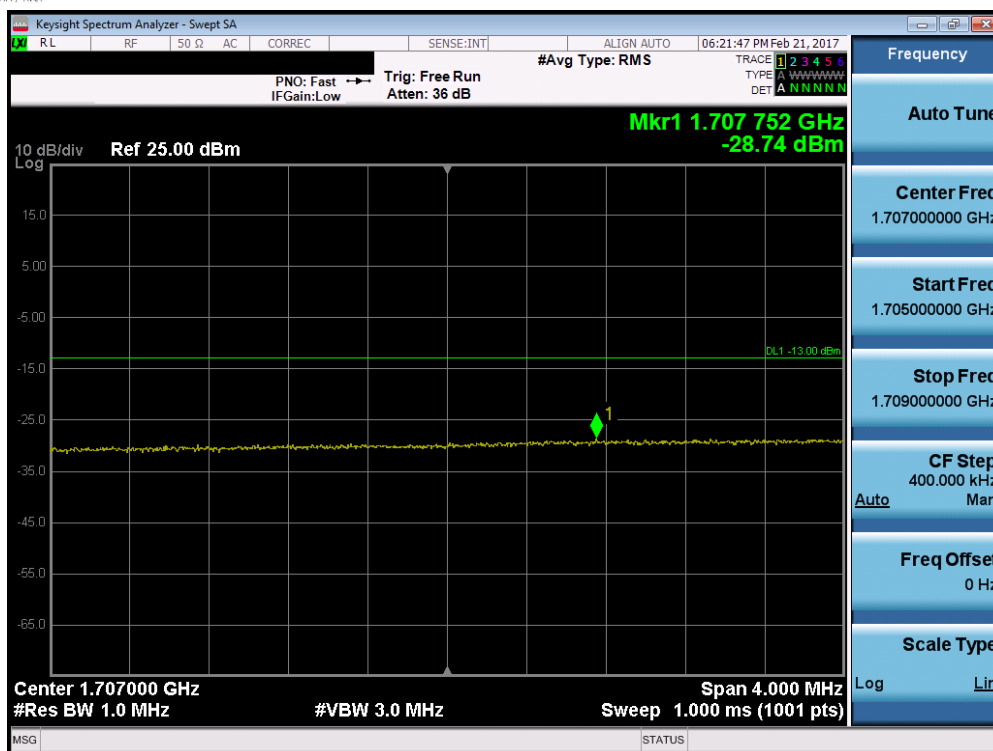


Plot 7-77. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

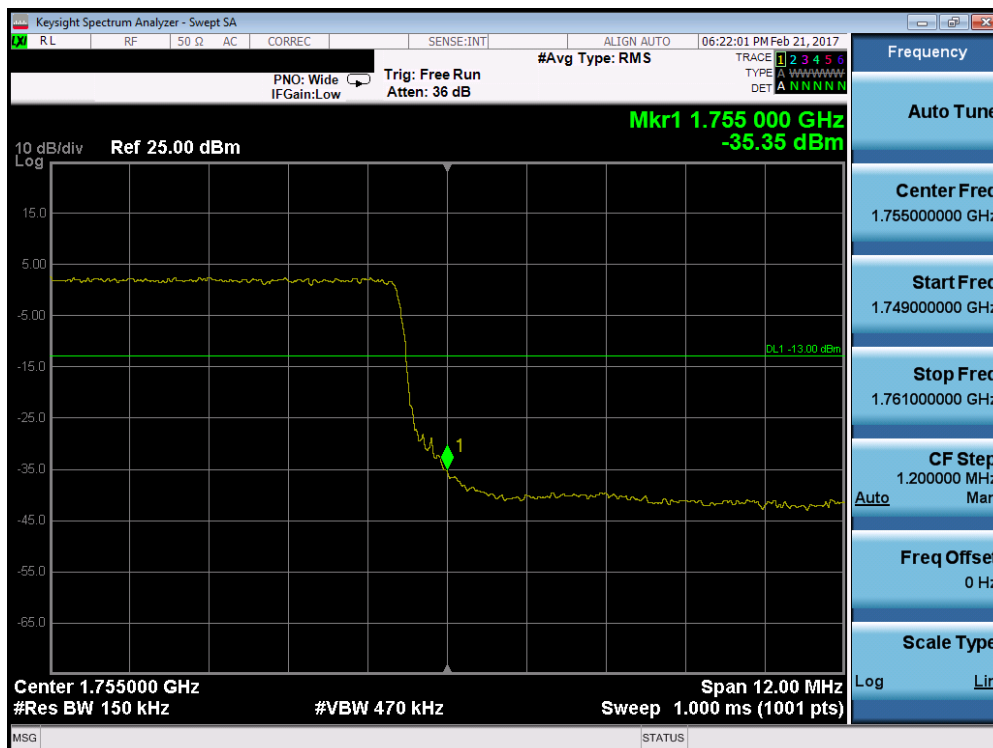


Plot 7-78. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 56 of 80

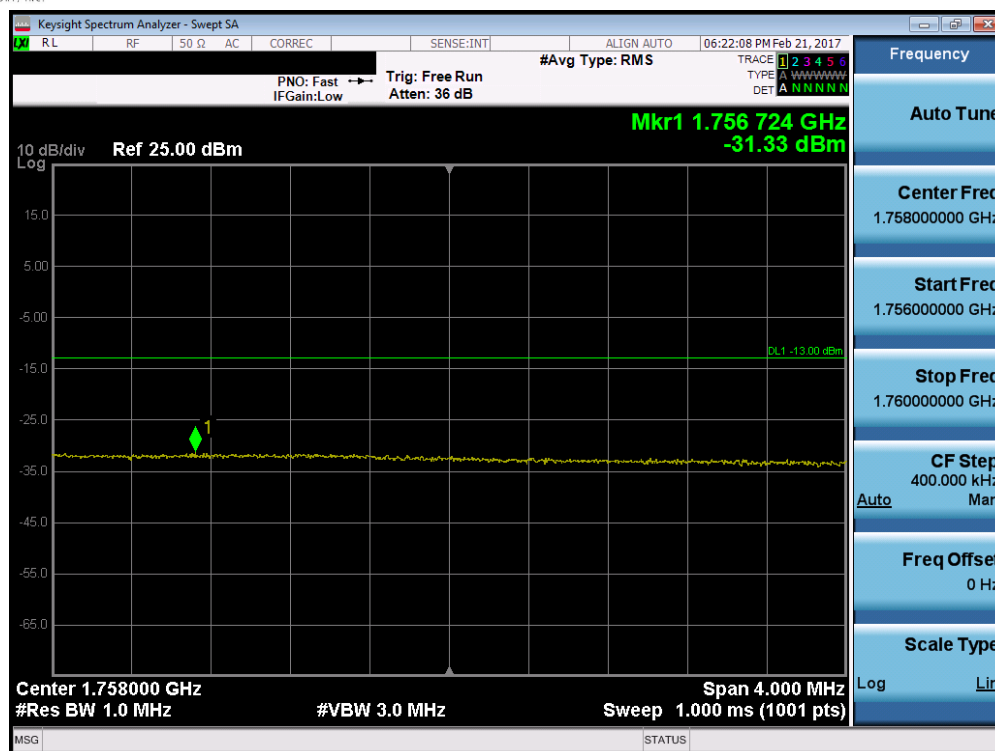


Plot 7-79. Lower Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - RB Size 75)

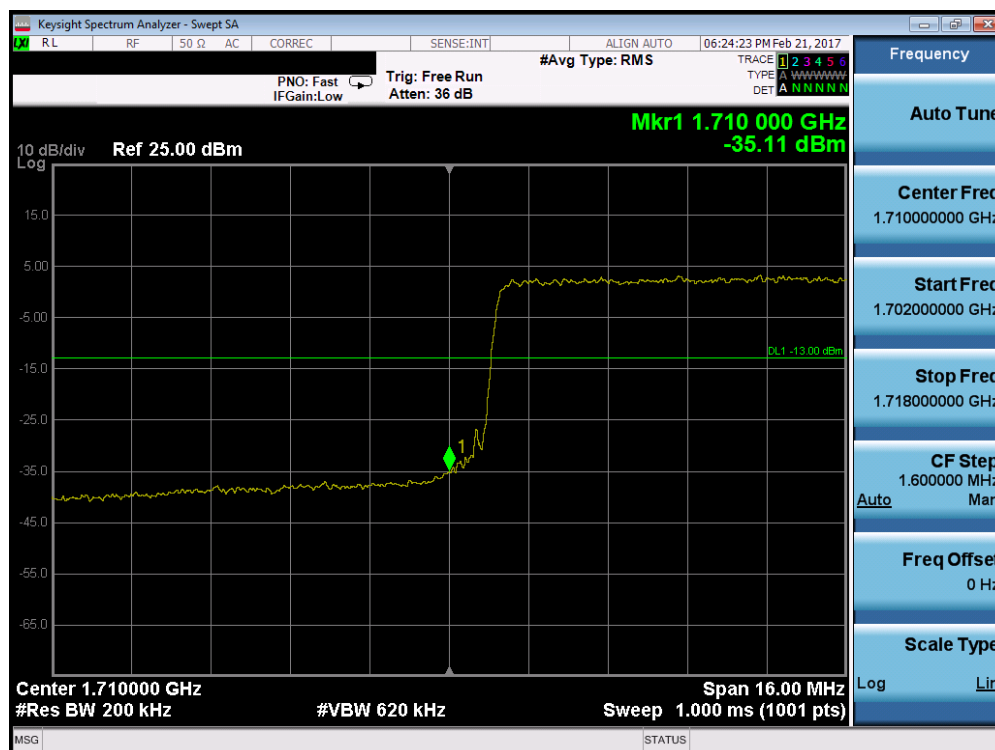


Plot 7-80. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - RB Size 75)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 57 of 80

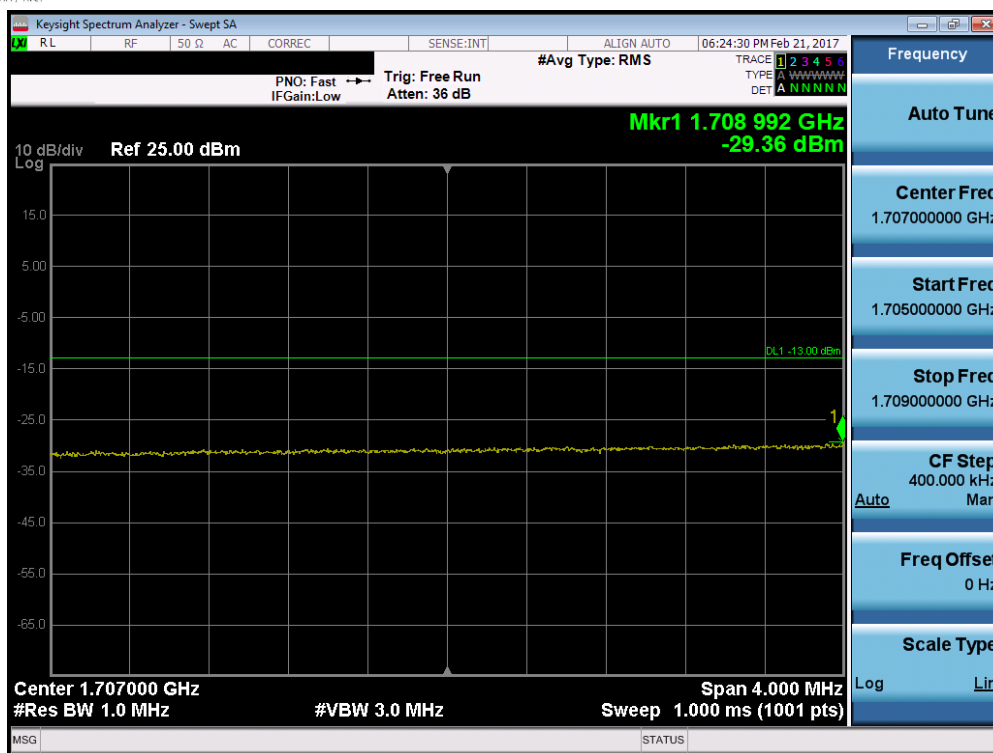


Plot 7-81. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 7-82. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 58 of 80

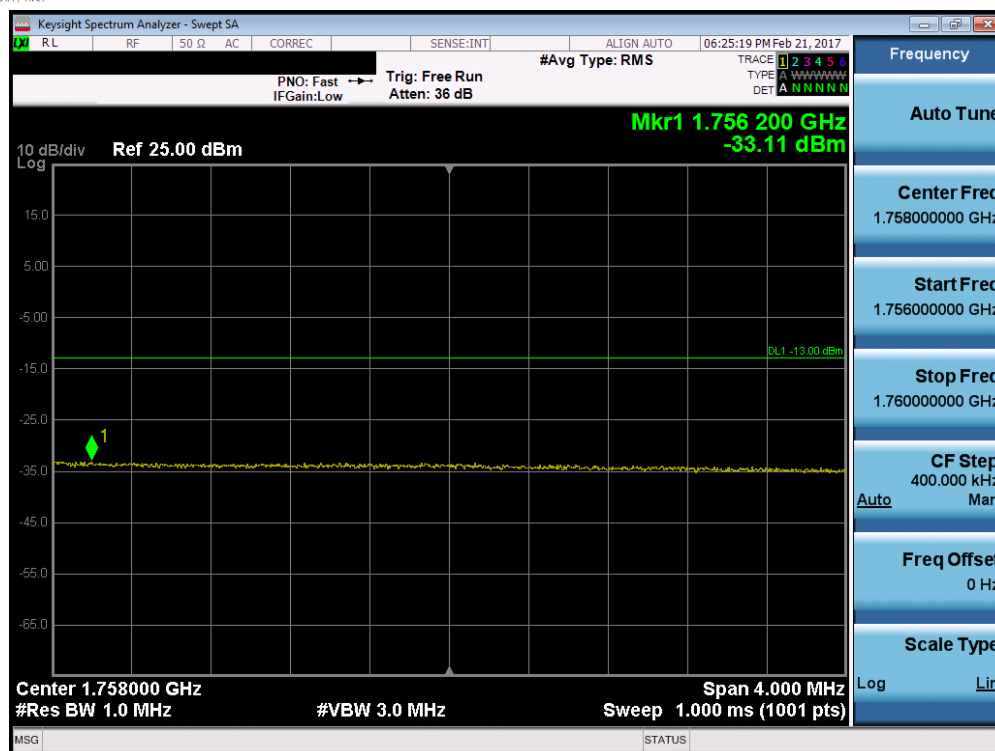


Plot 7-83. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-84. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 59 of 80



Plot 7-85. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFVN220	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 60 of 80

7.5 Radiated Power (ERP/EIRP)

§22.913(a.2) §24.232(c.2) §27.50(b.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-D-2010 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 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – 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 $\geq 3 \times$ RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $\geq 2 \times$ 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: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 61 of 80

Test Setup

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

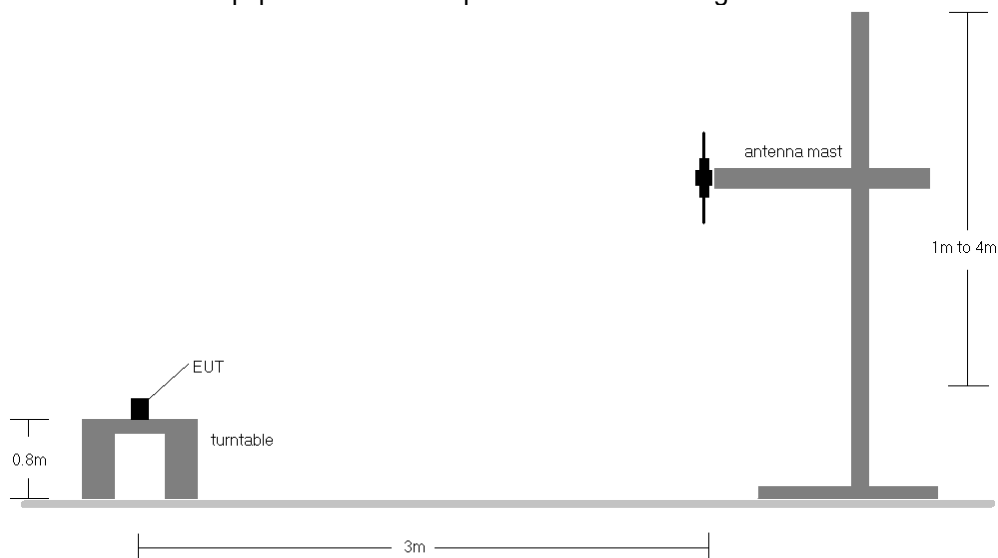


Figure 7-4. Radiated Test Setup <1GHz

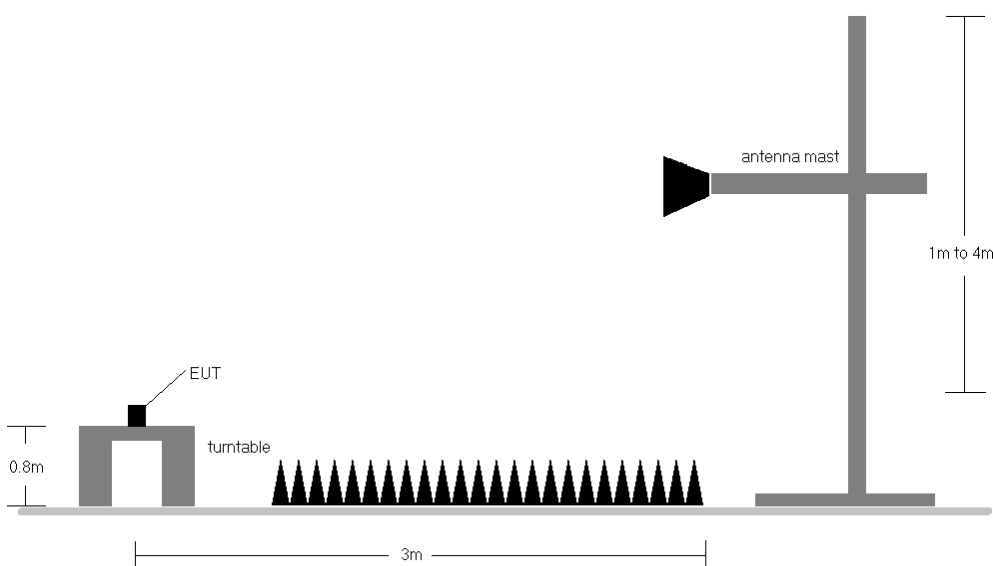


Figure 7-5. Radiated Test Setup >1GHz

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: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 62 of 80

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
779.50	5	QPSK	H	0	200	1 / 0	21.65	-0.57	21.08	34.77	-13.69
782.00	5	QPSK	H	0	196	1 / 24	21.65	-0.58	21.07	34.77	-13.70
784.50	5	QPSK	H	0	196	1 / 24	21.76	-0.59	21.17	34.77	-13.60
779.50	5	16-QAM	H	0	200	1 / 0	20.49	-0.57	19.92	34.77	-14.85
782.00	5	16-QAM	H	0	196	1 / 24	20.57	-0.58	19.99	34.77	-14.78
784.50	5	16-QAM	H	0	196	1 / 24	20.50	-0.59	19.91	34.77	-14.86
782.00	10	QPSK	H	0	200	1 / 49	21.70	-0.58	21.12	34.77	-13.65
782.00	10	16-QAM	H	0	200	1 / 49	20.13	-0.58	19.55	34.77	-15.22
784.50	5	QPSK	V	48	92	1 / 74	20.72	-0.59	20.13	34.77	-14.64

Table 7-2. ERP Data (Band 13)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 63 of 80	

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	0	198	1 / 0	21.05	-0.75	20.30	38.45	-18.15
836.50	1.4	QPSK	H	0	198	1 / 0	21.26	-0.84	20.42	38.45	-18.03
848.30	1.4	QPSK	H	0	207	1 / 0	20.99	-0.94	20.05	38.45	-18.40
824.70	1.4	16-QAM	H	0	198	1 / 0	20.17	-0.75	19.42	38.45	-19.03
836.50	1.4	16-QAM	H	0	198	1 / 0	20.39	-0.84	19.55	38.45	-18.90
848.30	1.4	16-QAM	H	0	207	1 / 0	20.05	-0.94	19.11	38.45	-19.34
825.50	3	QPSK	H	0	203	1 / 14	21.20	-0.75	20.45	38.45	-18.01
836.50	3	QPSK	H	0	200	1 / 0	21.55	-0.84	20.71	38.45	-17.74
847.50	3	QPSK	H	0	197	1 / 0	21.51	-0.93	20.58	38.45	-17.87
825.50	3	16-QAM	H	0	203	1 / 14	20.23	-0.75	19.48	38.45	-18.98
836.50	3	16-QAM	H	0	200	1 / 0	20.55	-0.84	19.71	38.45	-18.74
847.50	3	16-QAM	H	0	197	1 / 0	20.49	-0.93	19.56	38.45	-18.89
826.50	5	QPSK	H	0	197	1 / 24	21.46	-0.76	20.70	38.45	-17.75
836.50	5	QPSK	H	0	199	1 / 0	21.76	-0.84	20.92	38.45	-17.53
846.50	5	QPSK	H	0	197	1 / 0	21.43	-0.92	20.51	38.45	-17.94
826.50	5	16-QAM	H	0	197	1 / 24	20.42	-0.76	19.66	38.45	-18.79
836.50	5	16-QAM	H	0	199	1 / 0	20.77	-0.84	19.93	38.45	-18.52
846.50	5	16-QAM	H	0	197	1 / 0	20.43	-0.92	19.51	38.45	-18.94
829.00	10	QPSK	H	0	200	1 / 49	21.21	-0.78	20.43	38.45	-18.02
836.50	10	QPSK	H	0	200	1 / 0	21.57	-0.84	20.73	38.45	-17.72
844.00	10	QPSK	H	0	197	1 / 0	21.22	-0.90	20.32	38.45	-18.13
829.00	10	16-QAM	H	0	200	1 / 49	20.24	-0.78	19.46	38.45	-18.99
836.50	10	16-QAM	H	0	200	1 / 0	20.55	-0.84	19.71	38.45	-18.74
844.00	10	16-QAM	H	0	197	1 / 0	20.25	-0.90	19.35	38.45	-19.10
836.50	5	QPSK	V	37	221	1 / 0	20.76	-0.84	19.92	38.45	-18.53

Table 7-3. ERP Data (Band 5)

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 			Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 64 of 80

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Positioner Azimuth [degree]	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	0	281	1 / 0	19.92	5.56	25.48	30.00	-4.52
1732.50	1.4	QPSK	H	0	281	1 / 0	20.00	5.41	25.41	30.00	-4.59
1754.30	1.4	QPSK	H	0	281	1 / 0	19.60	5.26	24.86	30.00	-5.14
1710.70	1.4	16-QAM	H	0	281	1 / 0	19.04	5.56	24.60	30.00	-5.40
1732.50	1.4	16-QAM	H	0	281	1 / 0	19.10	5.41	24.51	30.00	-5.49
1754.30	1.4	16-QAM	H	0	281	1 / 0	18.69	5.26	23.95	30.00	-6.05
1711.50	3	QPSK	H	0	278	1 / 0	20.07	5.55	25.62	30.00	-4.38
1732.50	3	QPSK	H	0	281	1 / 0	20.04	5.41	25.45	30.00	-4.55
1753.50	3	QPSK	H	0	274	1 / 14	19.62	5.26	24.88	30.00	-5.12
1711.50	3	16-QAM	H	0	278	1 / 0	19.17	5.55	24.72	30.00	-5.28
1732.50	3	16-QAM	H	0	281	1 / 0	19.18	5.41	24.59	30.00	-5.41
1753.50	3	16-QAM	H	0	274	1 / 14	18.68	5.26	23.94	30.00	-6.06
1712.50	5	QPSK	H	0	280	1 / 0	20.39	5.55	25.94	30.00	-4.06
1732.50	5	QPSK	H	0	285	1 / 0	20.25	5.41	25.66	30.00	-4.34
1752.50	5	QPSK	H	0	285	1 / 24	20.00	5.27	25.27	30.00	-4.73
1712.50	5	16-QAM	H	0	280	1 / 0	19.53	5.55	25.08	30.00	-4.92
1732.50	5	16-QAM	H	0	285	1 / 0	19.31	5.41	24.72	30.00	-5.28
1752.50	5	16-QAM	H	0	285	1 / 0	18.98	5.27	24.25	30.00	-5.75
1715.00	10	QPSK	H	0	280	1 / 0	20.20	5.53	25.73	30.00	-4.27
1732.50	10	QPSK	H	0	288	1 / 0	20.25	5.41	25.66	30.00	-4.34
1750.00	10	QPSK	H	0	288	1 / 0	19.74	5.29	25.03	30.00	-4.97
1715.00	10	16-QAM	H	0	280	1 / 0	19.27	5.53	24.80	30.00	-5.20
1732.50	10	16-QAM	H	0	288	1 / 0	19.33	5.41	24.74	30.00	-5.26
1750.00	10	16-QAM	H	0	288	1 / 0	18.81	5.29	24.10	30.00	-5.90
1717.50	15	QPSK	H	0	291	1 / 0	20.40	5.51	25.91	30.00	-4.09
1732.50	15	QPSK	H	0	282	1 / 0	20.22	5.41	25.63	30.00	-4.37
1747.50	15	QPSK	H	0	285	1 / 0	20.05	5.31	25.36	30.00	-4.64
1717.50	15	16-QAM	H	0	291	1 / 0	19.51	5.51	25.02	30.00	-4.98
1732.50	15	16-QAM	H	0	282	1 / 0	19.32	5.41	24.73	30.00	-5.27
1747.50	15	16-QAM	H	0	285	1 / 0	19.13	5.31	24.44	30.00	-5.56
1720.00	20	QPSK	H	0	284	1 / 0	20.18	5.49	25.67	30.00	-4.33
1732.50	20	QPSK	H	0	284	1 / 0	20.19	5.41	25.60	30.00	-4.40
1745.00	20	QPSK	H	0	279	1 / 0	20.08	5.32	25.40	30.00	-4.60
1720.00	20	16-QAM	H	0	284	1 / 0	19.25	5.49	24.74	30.00	-5.26
1732.50	20	16-QAM	H	0	284	1 / 0	19.33	5.41	24.74	30.00	-5.26
1745.00	20	16-QAM	H	0	279	1 / 0	19.11	5.32	24.43	30.00	-5.57
1712.50	5	QPSK	V	31	187	1 / 0	19.74	5.63	25.37	30.00	-4.63

Table 7-4. EIRP Data (Band 4)

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 			Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 65 of 80

7.6 Radiated Spurious Emissions Measurements

\$2.1053 \$22.917(a) \$27.53(c) \$27.53(f) \$27.53(h)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 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 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 66 of 80	

Test Setup

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

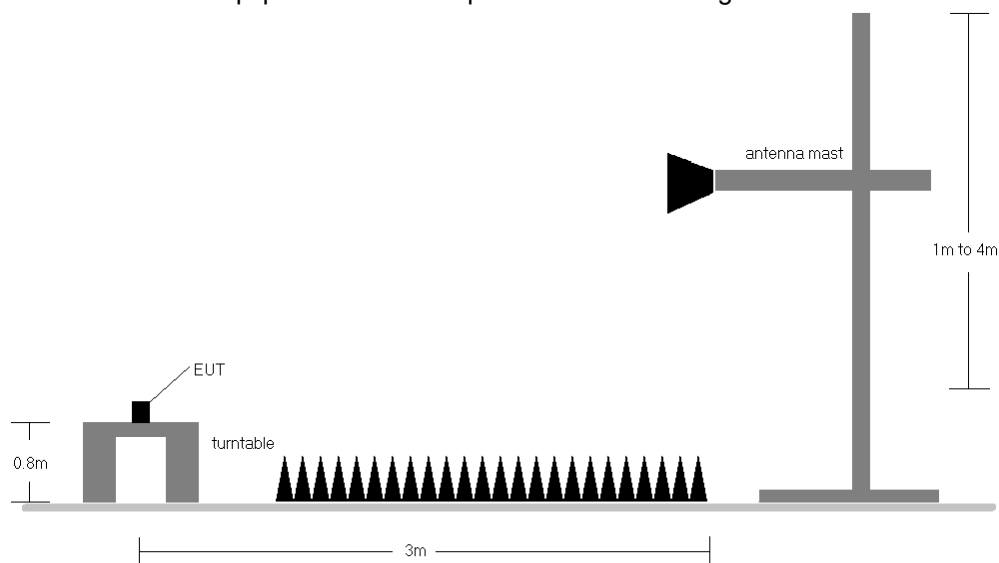


Figure 7-6. Test Instrument & Measurement Setup

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.

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 67 of 80

OPERATING FREQUENCY: 779.50 MHz
 CHANNEL: 23205
 MEASURED OUTPUT POWER: 21.08 dBm = 0.128 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 34.08 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]
2338.50	H	110	206	-59.45	7.35	-52.10	73.2
3118.00	H	-	-	-71.10	7.19	-63.91	85.0
3897.50	H	-	-	-69.56	7.31	-62.25	83.3

Table 7-5. Radiated Spurious Data (Band 13 – Low Channel)

OPERATING FREQUENCY: 782.00 MHz
 CHANNEL: 23230
 MEASURED OUTPUT POWER: 21.07 dBm = 0.128 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 34.07 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]
2346.00	H	130	212	-58.28	7.33	-50.95	72.0
3128.00	H	-	-	-69.48	7.20	-62.28	83.3
3910.00	H	-	-	-68.00	7.34	-60.66	81.7

Table 7-6. Radiated Spurious Data (Band 13 – Mid Channel)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 68 of 80

OPERATING FREQUENCY: 784.50 MHz
 CHANNEL: 23255
 MEASURED OUTPUT POWER: 21.17 dBm = 0.131 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 34.17 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]
2353.50	H	110	173	-56.13	7.30	-48.83	70.0
3138.00	H	-	-	-69.30	7.21	-62.08	83.3
3922.50	H	-	-	-67.36	7.37	-59.99	81.2

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

MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.00 MHz
 DISTANCE: 3 meters
 NARROWBAND EMISSION LIMIT: -50 dBm
 WIDEBAND EMISSION LIMIT: -40 dBm/MHz

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]	Margin [dB]
1559.00	H	157	55	-61.77	6.55	-55.22	-15.2
1564.00	H	141	48	-61.84	6.57	-55.27	-15.3

Table 7-8. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 69 of 80

OPERATING FREQUENCY: 826.50 MHz
 CHANNEL: 20425
 MEASURED OUTPUT POWER: 20.70 dBm = 0.117 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 33.70 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]
1653.00	H	110	278	-61.95	6.70	-55.25	76.0
2479.50	H	110	161	-65.73	7.54	-58.19	78.9
3306.00	H	-	-	-69.22	7.38	-61.84	82.5
4132.50	H	-	-	-68.27	8.10	-60.17	80.9

Table 7-9. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY: 836.50 MHz
 CHANNEL: 20525
 MEASURED OUTPUT POWER: 20.92 dBm = 0.124 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 33.92 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]
1673.00	H	119	263	-63.69	6.70	-56.99	77.9
2509.50	H	110	182	-64.71	7.63	-57.08	78.0
3346.00	H	-	-	-69.32	7.51	-61.81	82.7
4182.50	H	-	-	-68.63	8.23	-60.40	81.3

Table 7-10. Radiated Spurious Data (Band 5 – Mid Channel)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 70 of 80

OPERATING FREQUENCY: 846.50 MHz
 CHANNEL: 20625
 MEASURED OUTPUT POWER: 20.51 dBm = 0.112 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 33.51 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]
1693.00	H	127	195	-61.10	6.70	-54.41	74.9
2539.50	H	110	111	-63.80	7.60	-56.20	76.7
3386.00	H	-	-	-69.34	7.65	-61.69	82.2
4232.50	H	-	-	-67.77	8.37	-59.39	79.9

Table 7-11. Radiated Spurious Data (Band 5 – High Channel)

OPERATING FREQUENCY: 1712.50 MHz
 CHANNEL: 19975
 MEASURED OUTPUT POWER: 25.94 dBm = 0.392 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 38.94 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]
3425.00	H	110	110	-55.48	9.87	-45.61	71.5
5137.50	H	110	46	-65.09	10.76	-54.33	80.3
6850.00	H	-	-	-61.07	11.67	-49.40	75.3
8562.50	H	-	-	-56.94	11.06	-45.88	71.8

Table 7-12. Radiated Spurious Data (Band 4 – Low Channel)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 71 of 80

OPERATING FREQUENCY: 1732.50 MHz
 CHANNEL: 20175
 MEASURED OUTPUT POWER: 25.66 dBm = 0.368 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 38.66 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	110	10	-58.16	9.91	-48.25	73.9
5197.50	H	110	37	-64.63	10.75	-53.89	79.5
6930.00	H	-	-	-60.65	11.76	-48.89	74.5
8662.50	H	-	-	-56.88	11.00	-45.88	71.5

Table 7-13. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY: 1752.50 MHz
 CHANNEL: 20375
 MEASURED OUTPUT POWER: 25.27 dBm = 0.337 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 38.27 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]
3505.00	H	110	37	-57.29	9.95	-47.34	72.6
5257.50	H	122	83	-65.38	10.71	-54.67	79.9
7010.00	H	-	-	-61.55	11.83	-49.72	75.0
8762.50	H	-	-	-56.67	10.96	-45.71	71.0

Table 7-14. Radiated Spurious Data (Band 4 – High Channel)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset		Page 72 of 80

7.7 Frequency Stability / Temperature Variation

\$2.1055 \$22.355 \$27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. 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 $\pm 0.00025\%$ (± 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-D-2010

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

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 73 of 80

Band 13 Frequency Stability Measurements

\$2.1055 \$27.54

OPERATING FREQUENCY: 782,000,000 Hz

CHANNEL: 23230

REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	782,000,038	38	0.0000049
100 %		- 30	782,000,003	3	0.0000004
100 %		- 20	782,000,059	59	0.0000075
100 %		- 10	781,999,850	-150	-0.0000192
100 %		0	781,999,940	-60	-0.0000077
100 %		+ 10	782,000,116	116	0.0000148
100 %		+ 20	782,000,177	177	0.0000226
100 %		+ 30	782,000,307	307	0.0000393
100 %		+ 40	782,000,108	108	0.0000138
100 %		+ 50	781,999,862	-138	-0.0000176
BATT. ENDPOINT	3.40	+ 20	782,000,159	159	0.0000203

Table 7-15. Frequency Stability Data (Band 13)

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 74 of 80

Band 13 Frequency Stability Measurements

§2.1055 §27.54

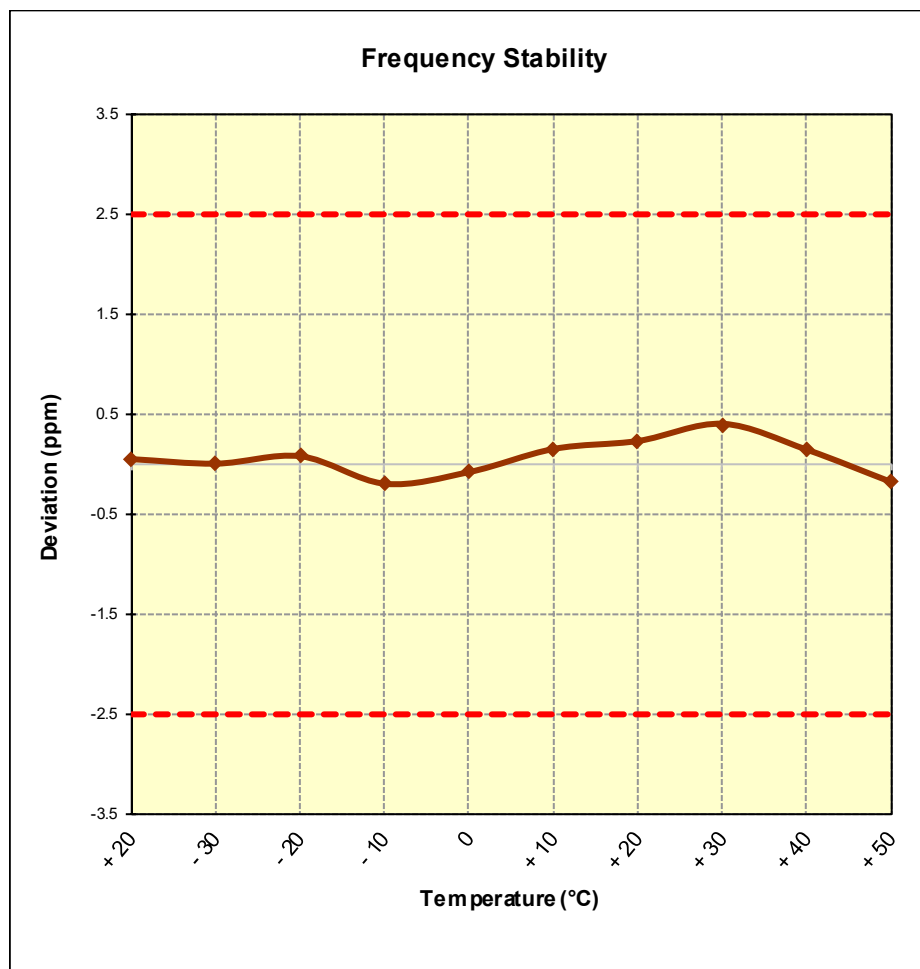


Figure 7-7. Frequency Stability Graph (Band 13)

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		 Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	

Band 5 Frequency Stability Measurements

§2.1055 §22.355

OPERATING FREQUENCY: 836,500,000 Hz

CHANNEL: 20525

REFERENCE VOLTAGE: 3.80 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	836,500,083	83	0.0000099
100 %		- 30	836,499,802	-198	-0.0000237
100 %		- 20	836,500,098	98	0.0000117
100 %		- 10	836,500,096	96	0.0000115
100 %		0	836,500,026	26	0.0000031
100 %		+ 10	836,500,459	459	0.0000549
100 %		+ 20	836,500,154	154	0.0000184
100 %		+ 30	836,500,095	95	0.0000114
100 %		+ 40	836,500,051	51	0.0000061
100 %		+ 50	836,499,956	-44	-0.0000053
BATT. ENDPOINT	3.40	+ 20	836,500,040	40	0.0000048

Table 7-16. Frequency Stability Data (Band 5)

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 76 of 80	

Band 5 Frequency Stability Measurements

§2.1055 §22.355

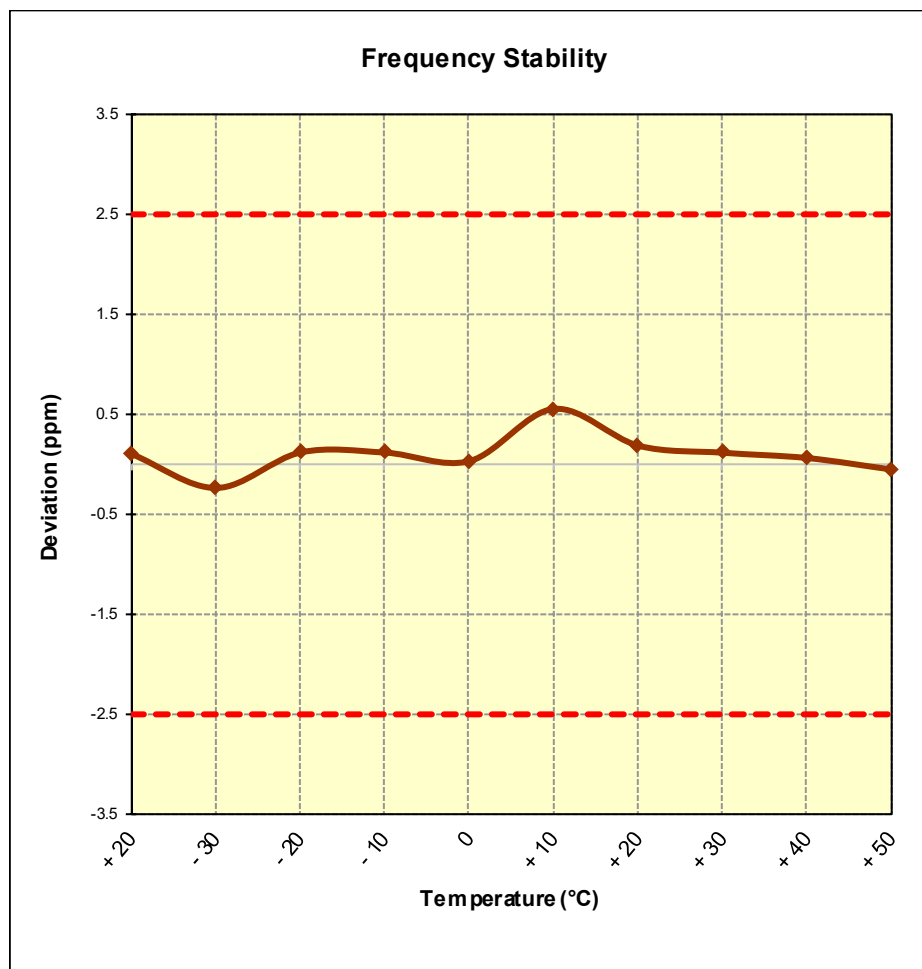


Figure 7-8. Frequency Stability Graph (Band 5)

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		 Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	

© 2017 PCTEST Engineering Laboratory, Inc.

V 6.2
01/09/2016

© 2015 PCTEST Engineering Laboratory, Inc. All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTESTLAB.COM.

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)	1,732,500,060	60	0.0000035
100 %		- 30	1,732,500,232	232	0.0000134
100 %		- 20	1,732,499,833	-167	-0.0000096
100 %		- 10	1,732,499,966	-34	-0.0000020
100 %		0	1,732,499,618	-382	-0.0000220
100 %		+ 10	1,732,500,372	372	0.0000215
100 %		+ 20	1,732,500,050	50	0.0000029
100 %		+ 30	1,732,499,720	-280	-0.0000162
100 %		+ 40	1,732,499,814	-186	-0.0000107
100 %		+ 50	1,732,500,185	185	0.0000107
BATT. ENDPOINT	3.40	+ 20	1,732,499,887	-113	-0.0000065

Table 7-17. 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.

FCC ID: ZNFVN220	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 78 of 80

Band 4 Frequency Stability Measurements

\$2.1055 \$27.54

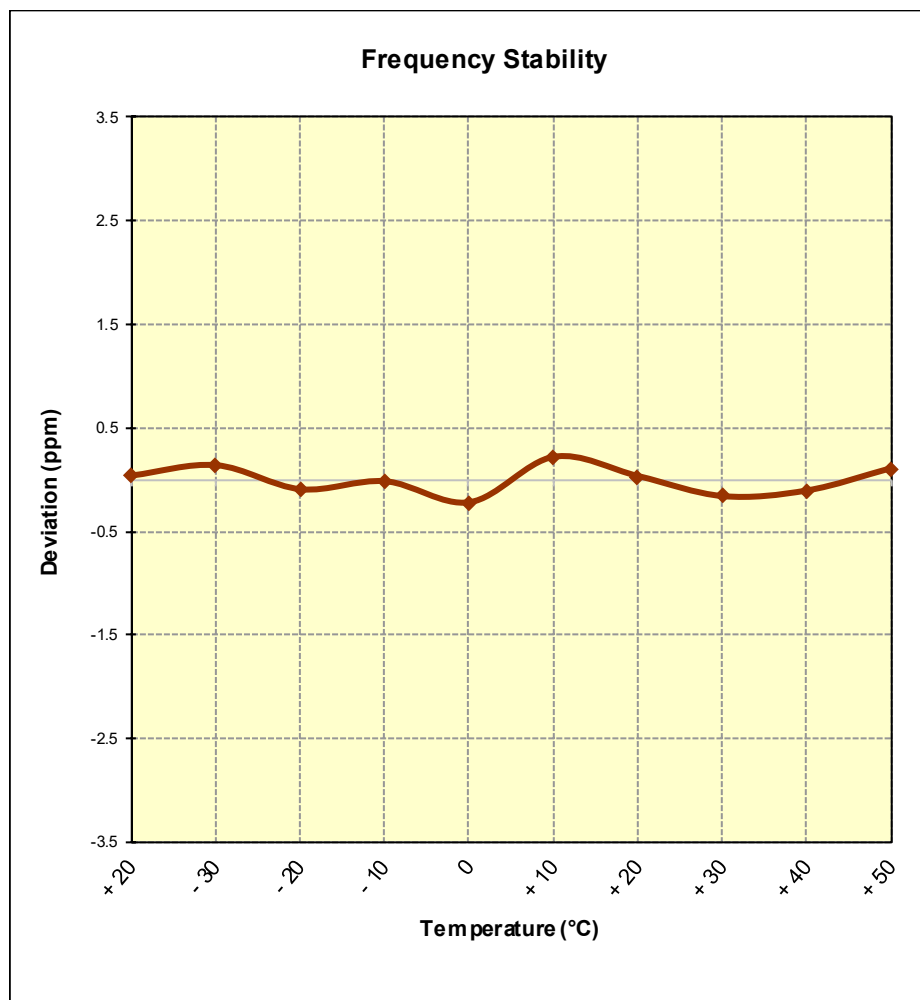


Figure 7-9. Frequency Stability Graph (Band 4)

FCC ID: ZNFVN220	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset	Page 79 of 80

© 2017 PCTEST Engineering Laboratory, Inc.

V 6.2

01/09/2016

© 2015 PCTEST Engineering Laboratory, Inc. All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTESTLAB.COM.

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFVN220** complies with all the requirements of Parts 22 & 27 of the FCC rules for LTE operation only.

FCC ID: ZNFVN220		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1701100019-03.ZNF	Test Dates: 2/17 - 2/23/2017	EUT Type: Portable Handset			Page 80 of 80

© 2017 PCTEST Engineering Laboratory, Inc.

V 6.2

01/09/2016

© 2015 PCTEST Engineering Laboratory, Inc. All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTESTLAB.COM.