

## MEASUREMENT REPORT

### Part 96 LTE

**Applicant Name:**

LG Electronics USA, Inc.

1000 Sylvan Avenue

Englewood Cliffs, NJ 07632

United States

**Date of Testing:**

7/26 - 8/16/2019

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M1907250129-05-R3.ZNF

**FCC ID:**

**ZNFG850UM**

**IC:**

**2703C-G850UM**

**APPLICANT:**

**LG Electronics USA, Inc.**

**Application Type:**

Certification

**Model:**

LM-G850UM

**Additional Models:**

LM-G850QM, LM-G850QM6, LM-G850V, LM-G850UM2, LM-G850UM2X,  
LMG850UM, LMG850QM, LMG850QM6, LMG850V, LMG850UM2,  
LMG850UM2X, G850UM, G850QM, G850QM6, G850V, G850UM2,  
G850UM2X

**EUT Type:**

Portable Handset

**FCC Classification:**

Citizens Band End User Devices (CBE)

**FCC Rule Part(s):**

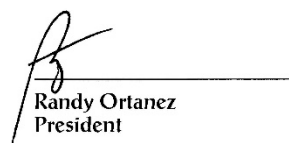
96

**Test Procedure(s):**

ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01,  
KDB 648474 D03 v01r04, KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0

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.

Note: This revised Test Report (S/N: 1M1907250129-05-R3.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.



Randy Ortanez  
President



|                                                   |                                                                                                                                   |                                                                                       |                                        |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> ZNFG850UM                          |  <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1907250129-05-R3.ZNF | <b>Test Dates:</b><br>7/26 - 8/16/2019                                                                                            | <b>EUT Type:</b><br>Portable Handset                                                  | Page 1 of 51                           |

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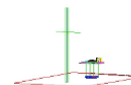
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## MEASUREMENT REPORT

### FCC Part 96



| Mode        | FCC Rule Part | Tx Frequency (MHz) | EIRP           |                  | Emission Designator | Modulation |
|-------------|---------------|--------------------|----------------|------------------|---------------------|------------|
|             |               |                    | Max. Power (W) | Max. Power (dBm) |                     |            |
| LTE Band 48 | 96            | 3552.5 - 3697.5    | 0.058          | 17.61            | 4M55G7D             | QPSK       |
| LTE Band 48 | 96            | 3552.5 - 3697.5    | 0.046          | 16.65            | 4M53W7D             | 16QAM      |
| LTE Band 48 | 96            | 3552.5 - 3697.5    | 0.036          | 15.58            | 4M53W7D             | 64QAM      |
| LTE Band 48 | 96            | 3555 - 3695        | 0.059          | 17.72            | 9M05G7D             | QPSK       |
| LTE Band 48 | 96            | 3555 - 3695        | 0.048          | 16.84            | 9M08W7D             | 16QAM      |
| LTE Band 48 | 96            | 3555 - 3695        | 0.037          | 15.67            | 9M04W7D             | 64QAM      |
| LTE Band 48 | 96            | 3557.5 - 3692.5    | 0.053          | 17.26            | 13M5G7D             | QPSK       |
| LTE Band 48 | 96            | 3557.5 - 3692.5    | 0.044          | 16.45            | 13M5W7D             | 16QAM      |
| LTE Band 48 | 96            | 3557.5 - 3692.5    | 0.039          | 15.94            | 13M5W7D             | 64QAM      |
| LTE Band 48 | 96            | 3560 - 3690        | 0.055          | 17.44            | 18M0G7D             | QPSK       |
| LTE Band 48 | 96            | 3560 - 3690        | 0.046          | 16.65            | 18M0W7D             | 16QAM      |
| LTE Band 48 | 96            | 3560 - 3690        | 0.034          | 15.35            | 18M0W7D             | 64QAM      |

#### EUT Overview (LTE B48)

|                                                   |                                                                                     |                                           |                                                                                       |                                        |
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## 1.0 INTRODUCTION

### 1.1 Scope

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

### 1.2 PCTEST Test Location

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

### 1.3 Test Facility / Accreditations

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

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

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFG850UM**. The test data contained in this report pertains only to the emissions due to the EUT's LTE Band 48 operation in the CBRS band.

**Test Device Serial No.:** 0022M, 0502M, 0510M, 0367M, 0650M

### 2.2 Device Capabilities

This device contains the following capabilities:

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

### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT placed on an authorized wireless charging pad (WCP) FCC ID: A3LEPPN920 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

### 2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

|                                                   |                                                                                     |                                               |                                                                                       |                                        |
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## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

### 3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

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

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

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

|                                            |                                                                                     |                                       |                                                                                       |                                 |
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## 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Contribution                     | Expanded Uncertainty ( $\pm$ dB) |
|----------------------------------|----------------------------------|
| Conducted Bench Top Measurements | 1.13                             |
| Radiated Disturbance (<1GHz)     | 4.98                             |
| Radiated Disturbance (>1GHz)     | 5.07                             |
| Radiated Disturbance (>18GHz)    | 5.09                             |

|                                            |                                                                                                                                   |                                                                                       |                                 |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

| Manufacturer    | Model        | Description                          | Cal Date  | Cal Interval | Cal Due   | Serial Number |
|-----------------|--------------|--------------------------------------|-----------|--------------|-----------|---------------|
| -               | LTX2         | Licensed Transmitter Cable Set       | 8/23/2018 | Annual       | 8/23/2019 | LTX2          |
| -               | LTX4         | Licensed Transmitter Cable Set       | 6/4/2019  | Annual       | 6/4/2020  | LTX4          |
| Agilent         | N9020A       | MXA Signal Analyzer                  | 4/20/2019 | Annual       | 4/20/2020 | US46470561    |
| Agilent         | N9030A       | PXA Signal Analyzer (44GHz)          | 6/12/2019 | Annual       | 6/12/2020 | MY52350166    |
| Com-Power       | PAM-103      | Pre-Amplifier (1-1000MHz)            | 9/17/2018 | Annual       | 9/17/2019 | 441119        |
| Emco            | 3115         | Horn Antenna (1-18GHz)               | 3/28/2018 | Biennial     | 3/28/2020 | 9704-5182     |
| EMCO            | 3160-09      | Small Horn (18 - 26.5GHz)            | 8/9/2018  | Biennial     | 8/9/2020  | 135427        |
| ETS-Lindgren    | TVA-11-422   | RF Power Amp                         | N/A       |              |           | QA1317001     |
| Mini Circuits   | PWR-SEN-4GHS | USB Power Sensor                     | 4/19/2019 | Annual       | 4/19/2020 | 11401010036   |
| Mini Circuits   | TS-PR26      | 18-26.5 GHz Pre-Amplifier            | 9/19/2018 | Annual       | 9/19/2019 | 100040        |
| Rohde & Schwarz | ESU26        | EMI Test Receiver (26.5GHz)          | 6/5/2019  | Annual       | 6/5/2020  | 100342        |
| Rohde & Schwarz | NC-100       | Torque Wrench (8" lb)                | 5/10/2018 | Biennial     | 5/10/2020 | N/A           |
| Rohde & Schwarz | 3816/2NM     | Line Impedance Stabilization Network | 6/18/2018 | Biennial     | 6/18/2020 | 114451        |
| Rohde & Schwarz | TS-PR26      | 18-26.5 GHz Pre-Amplifier            | 9/19/2018 | Annual       | 9/19/2019 | 100040        |
| Rohde & Schwarz | ESU26        | EMI Test Receiver (26.5GHz)          | 6/5/2019  | Annual       | 6/5/2020  | 100342        |
| Rohde & Schwarz | TS-PR40      | 26.5-40 GHz Pre-Amplifier            | 9/19/2018 | Annual       | 9/19/2019 | 100037        |
| Seekonk         | FSW67        | Signal / Spectrum Analyzer           | 5/6/2019  | Annual       | 5/6/2020  | 103200        |

**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

#### QAM Modulation

**Emission Designator = 8M45W7D**

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

### Spurious Radiated Emission – LTE Band

#### **Example: Middle Channel LTE Mode 2<sup>nd</sup> Harmonic (1564 MHz)**

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

|                                            |                                                                                     |                                       |                                                                                       |                                 |
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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: LG Electronics USA, Inc.  
 FCC ID: ZNFG850UM  
 FCC Classification: Citizens Band End User Devices (CBE)  
 Mode(s): LTE

| FCC Part Section(s) | Test Description                                        | Test Limit                                                                                                                                                                                                                                                                                                                                                                        | Test Condition | Test Result | Reference              |
|---------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|------------------------|
| 2.1049              | Occupied Bandwidth                                      | N/A                                                                                                                                                                                                                                                                                                                                                                               | CONDUCTED      | PASS        | Section 7.2            |
| 2.1046              | Transmitter Conducted Output Power                      | N/A                                                                                                                                                                                                                                                                                                                                                                               |                | PASS        | See RF Exposure Report |
| 2.1051<br>96.41(e)  | Out of Band Emissions                                   | -13 dBm/MHz at frequencies within 0-10MHz of channel edge<br>-25 dBm/MHz at frequencies greater than 10MHz above and below channel edge<br>-40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz                                                                                                                                                                           |                | PASS        | Section 7.3, 7.4       |
| 2.1055              | Frequency Stability                                     | Fundamental emissions stay within authorized frequency block                                                                                                                                                                                                                                                                                                                      |                | PASS        | Section 7.7            |
| 96.47               | End User Device Additional Requirements (CBSD Protocol) | End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.<br><br>An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD. |                | PASS        | Section 7.8            |

Table 7-1. Summary of Conducted Test Results

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| FCC Part Section(s) | Test Description                           | Test Limit   | Test Condition | Test Result | Reference   |
|---------------------|--------------------------------------------|--------------|----------------|-------------|-------------|
| 96.41(b)            | Equivalent Isotropic Radiated Power (EIRP) | 23 dBm/10MHz | RADIATED       | PASS        | Section 7.5 |
| 2.1053<br>96.41(e)  | Undesirable Emissions                      | -40 dBm/MHz  |                | PASS        | Section 7.6 |

**Table 7-2. Summary of Radiated Test Results**

**Notes:**

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 5.1.

|                                            |                                                                                     |                                       |                                                                                       |                                 |
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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

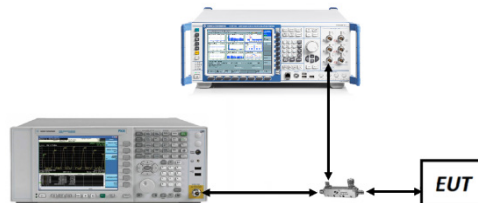
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

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

### Test Setup

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



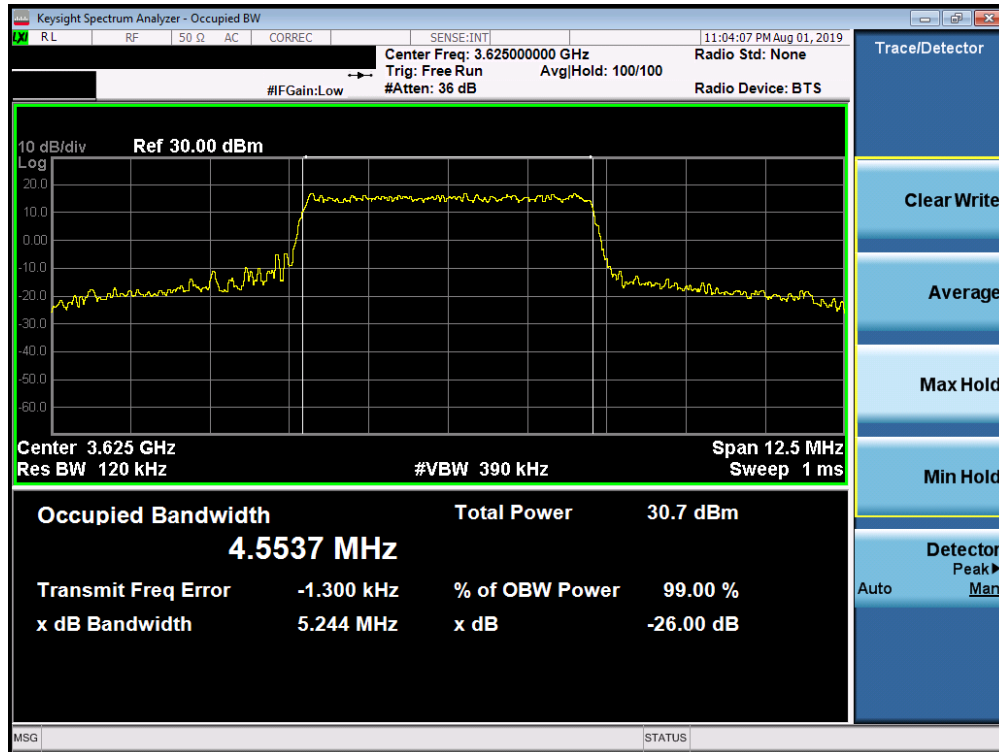
**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

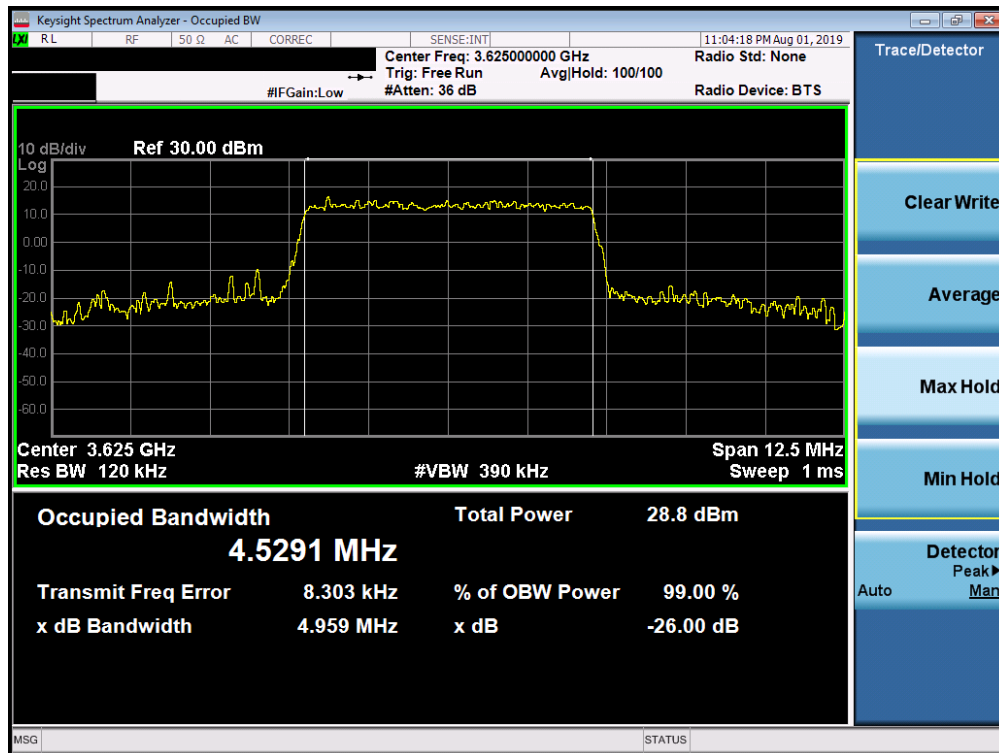
None.

|                                            |                                               |                                               |    |                                 |
|--------------------------------------------|-----------------------------------------------|-----------------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset                 |    | Page 12 of 51                   |

## Band 48

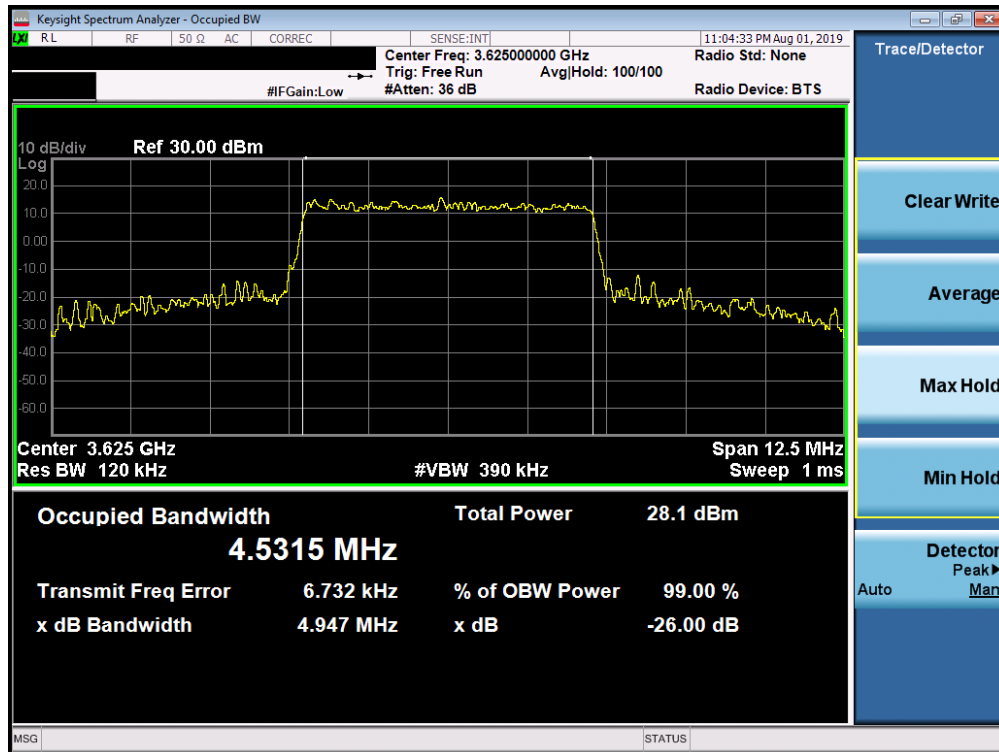


Plot 7-1. Occupied Bandwidth Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

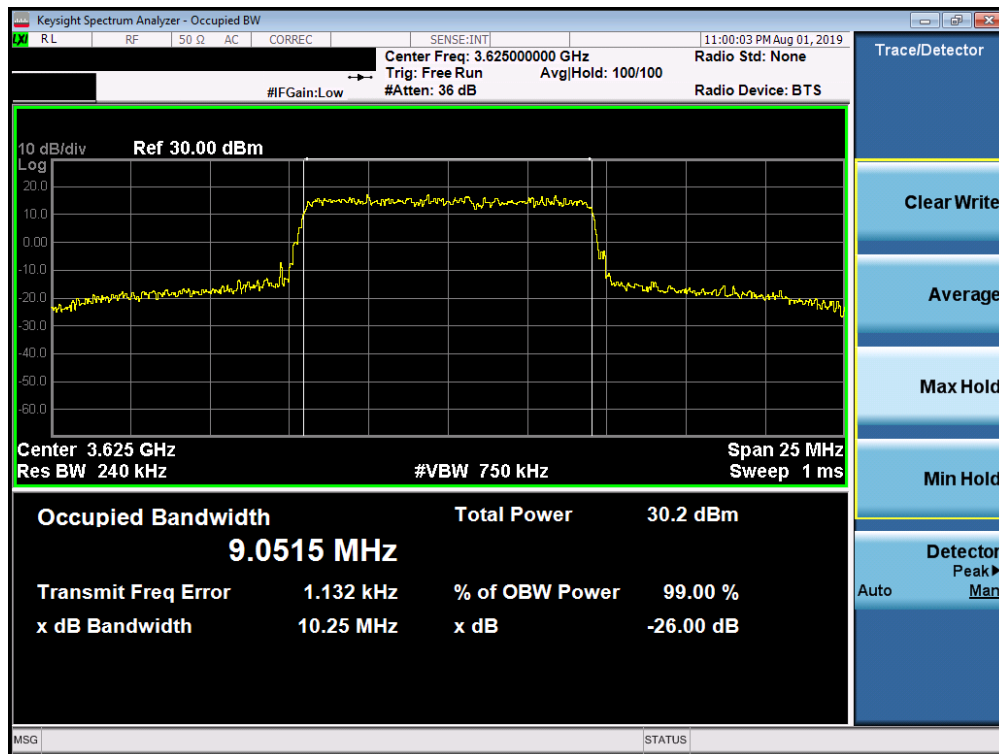


Plot 7-2. Occupied Bandwidth Plot (Band 48 - 5.0MHz 16-QAM - Full RB Configuration)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
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| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 13 of 51                   |

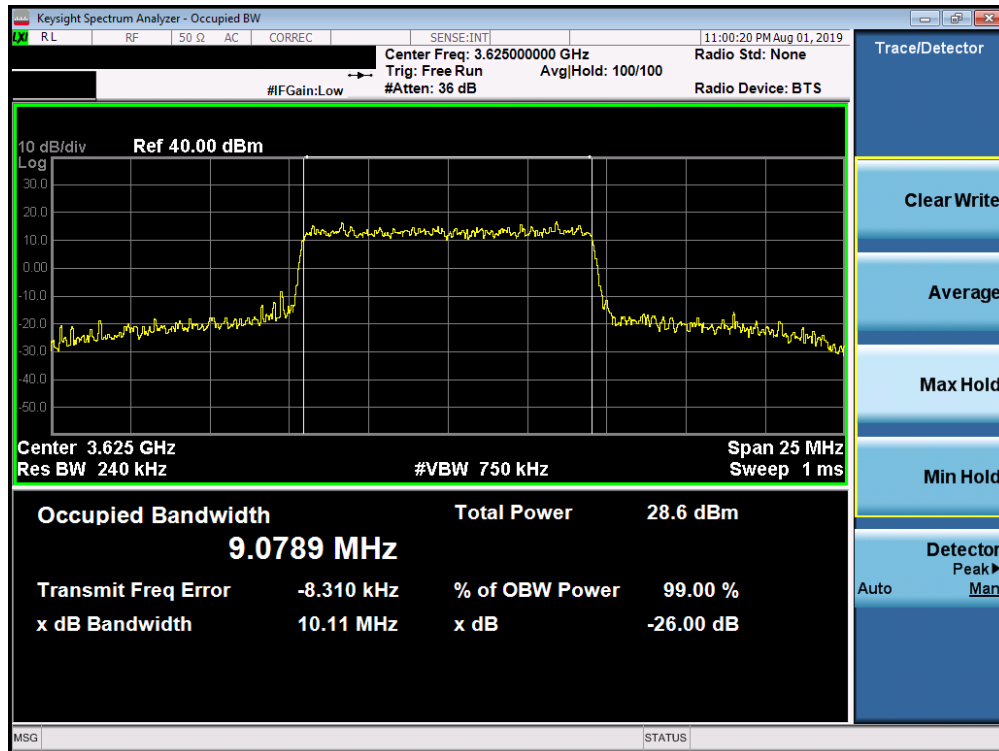


Plot 7-3. Occupied Bandwidth Plot (Band 48 - 5.0MHz 64-QAM - Full RB Configuration)

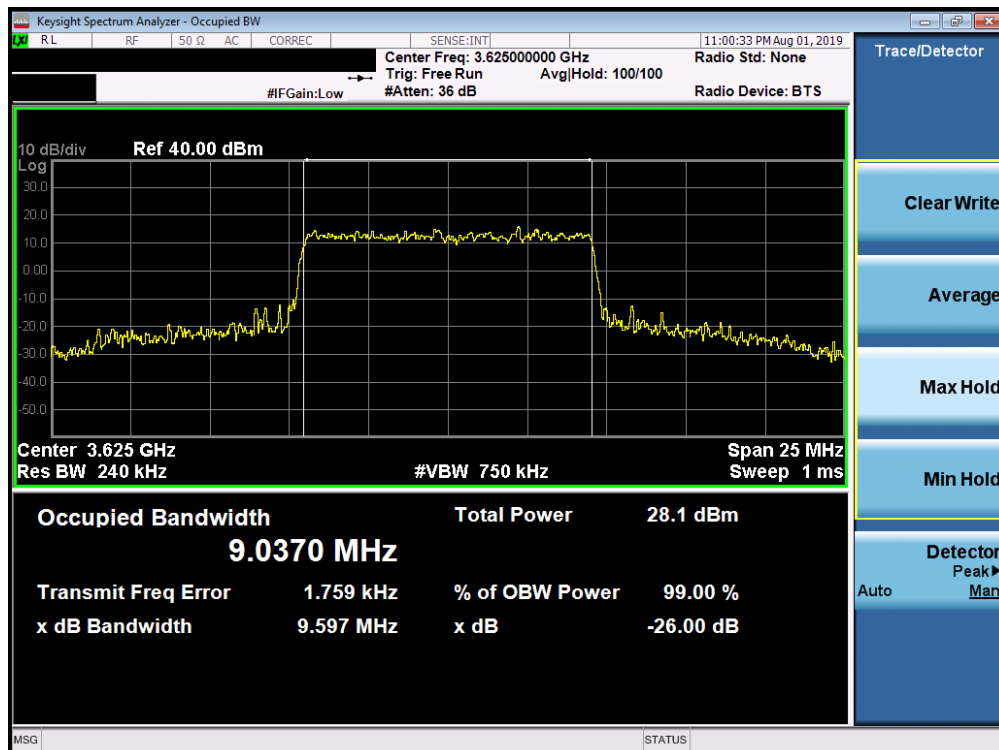


Plot 7-4. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |           |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|-----------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | <b>LG</b> | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |           | Page 14 of 51                   |

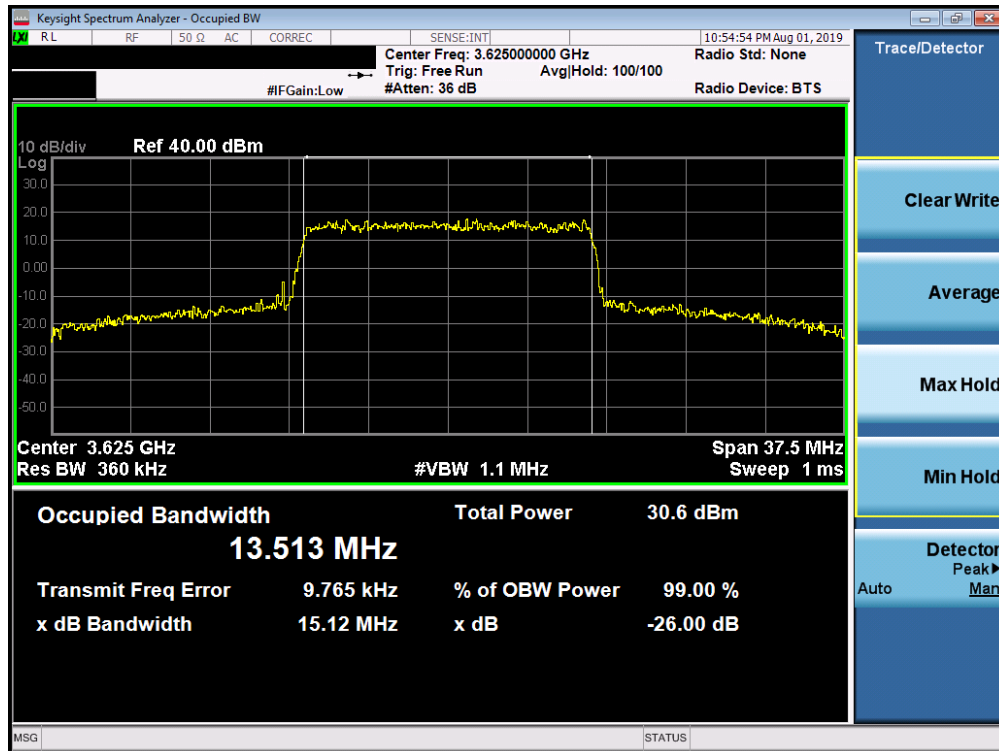


Plot 7-5. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)



Plot 7-6. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)

|                                            |                                              |                               |                                        |
|--------------------------------------------|----------------------------------------------|-------------------------------|----------------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT</b><br>(CERTIFICATION) |                               | <b>Approved by:</b><br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019              | EUT Type:<br>Portable Handset | Page 15 of 51                          |

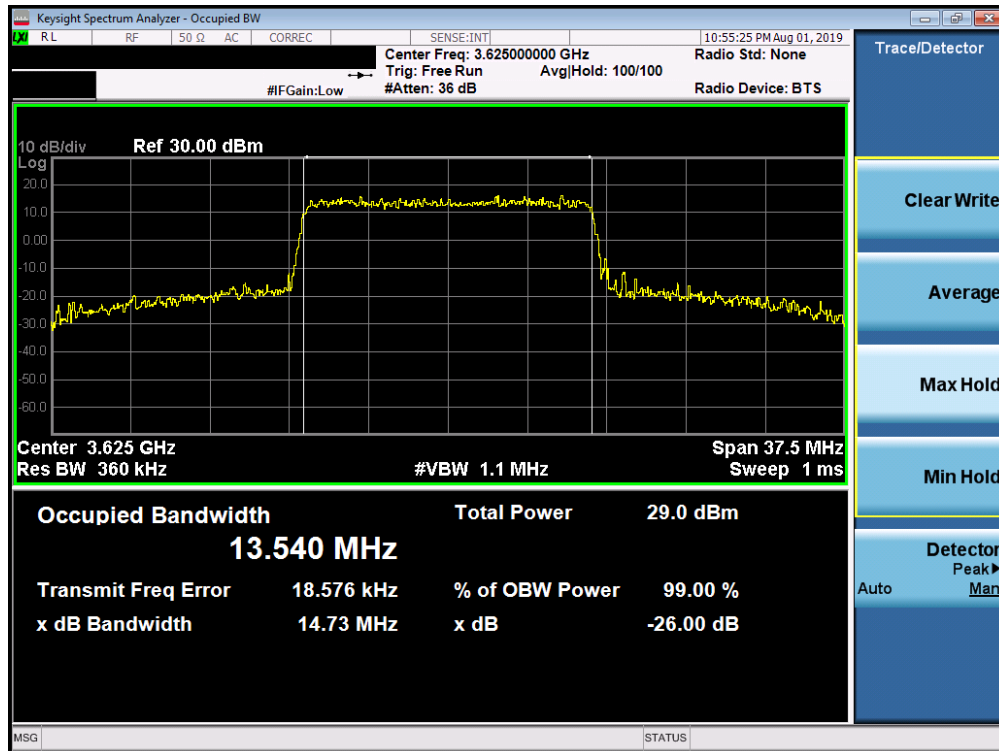


Plot 7-7. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

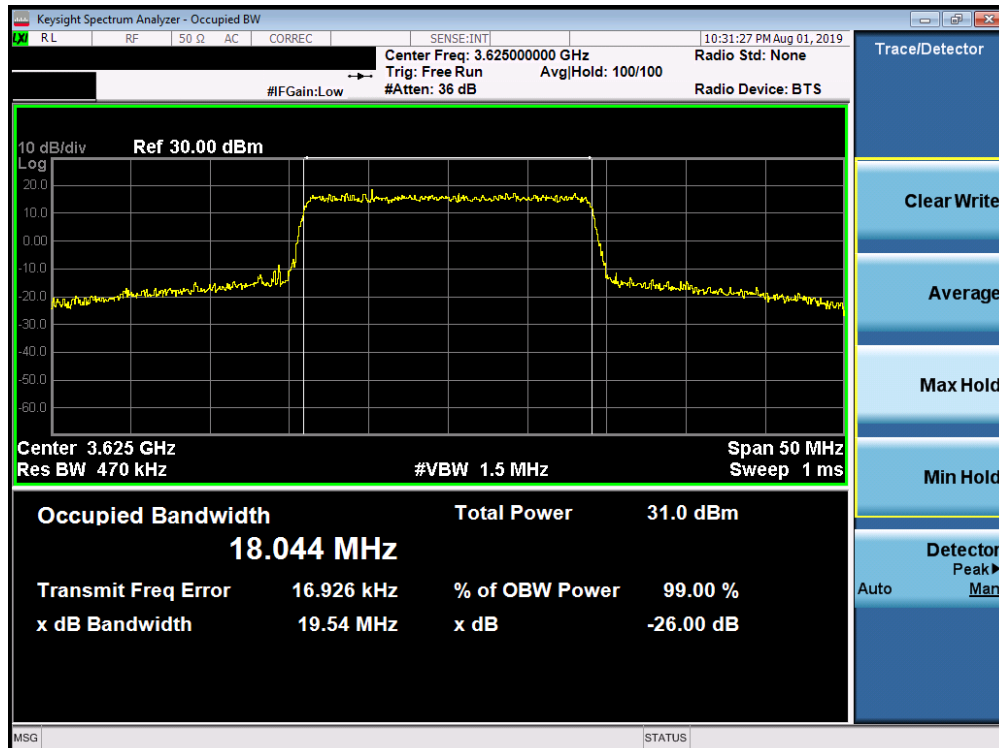


Plot 7-8. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)

|                                            |                                               |                                       |           |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|-----------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | <b>LG</b> | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |           | Page 16 of 51                   |

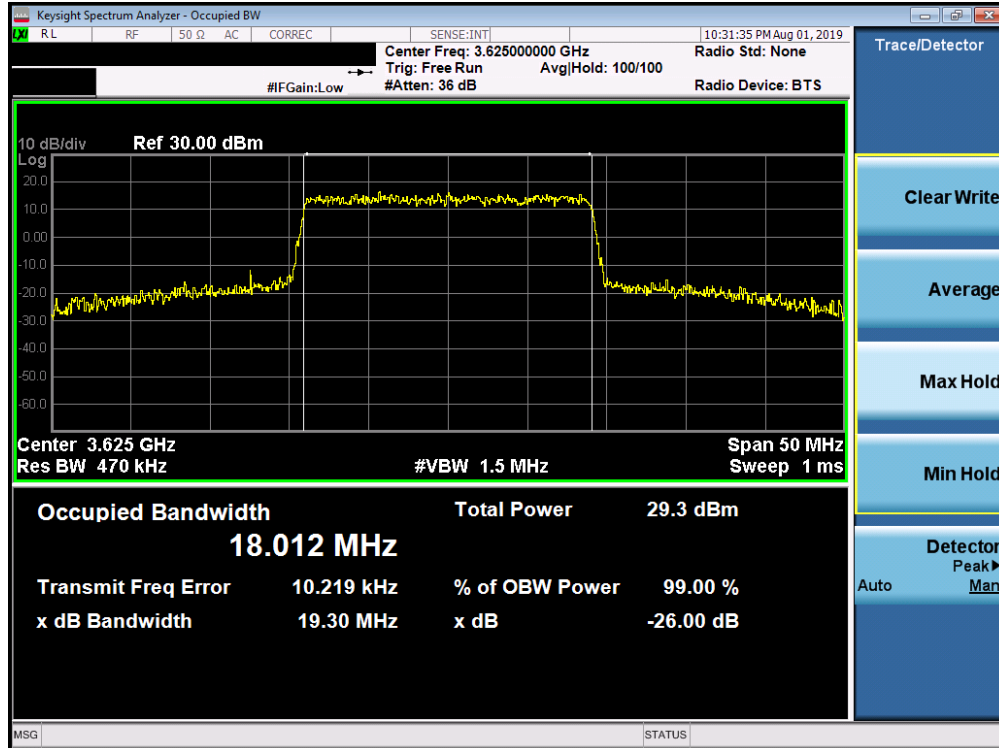


Plot 7-9. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)

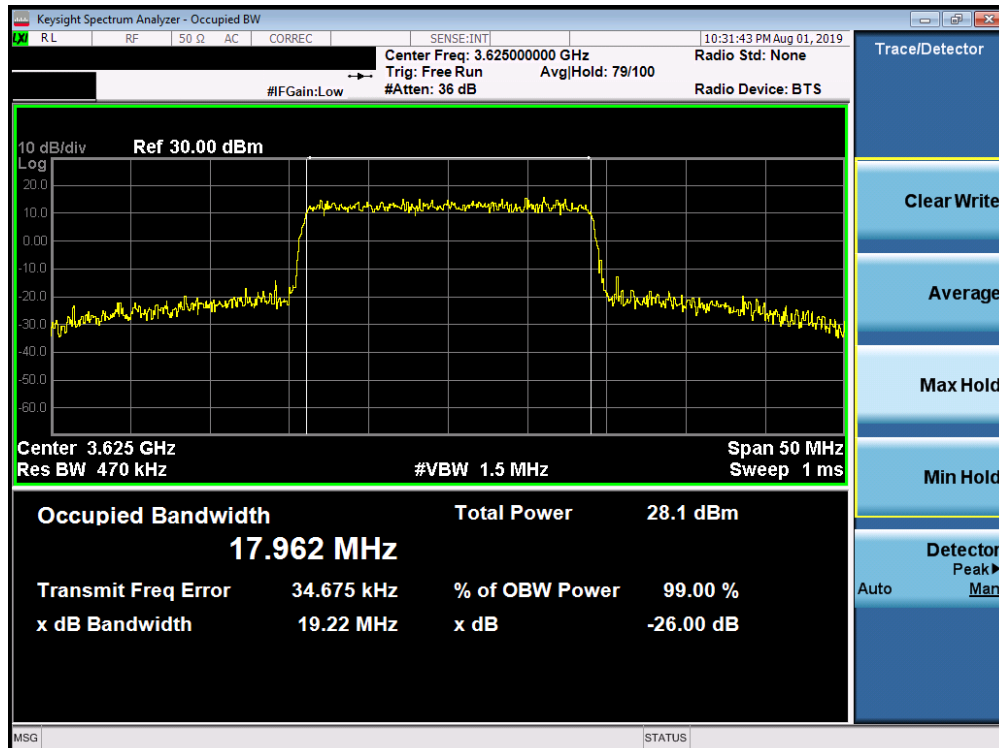


Plot 7-10. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |           |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|-----------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | <b>LG</b> | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |           | Page 17 of 51                   |



Plot 7-11. Occupied Bandwidth Plot (Band 48 - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (Band 48 - 20.0MHz 64-QAM - Full RB Configuration)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 18 of 51                   |

### 7.3 Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §96.41(e)

#### 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 conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.***

#### Test Procedure Used

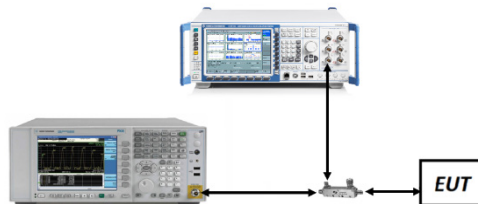
KDB 971168 D01 v03r01 – Section 6.0

#### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 \* the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = Max Hold
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.



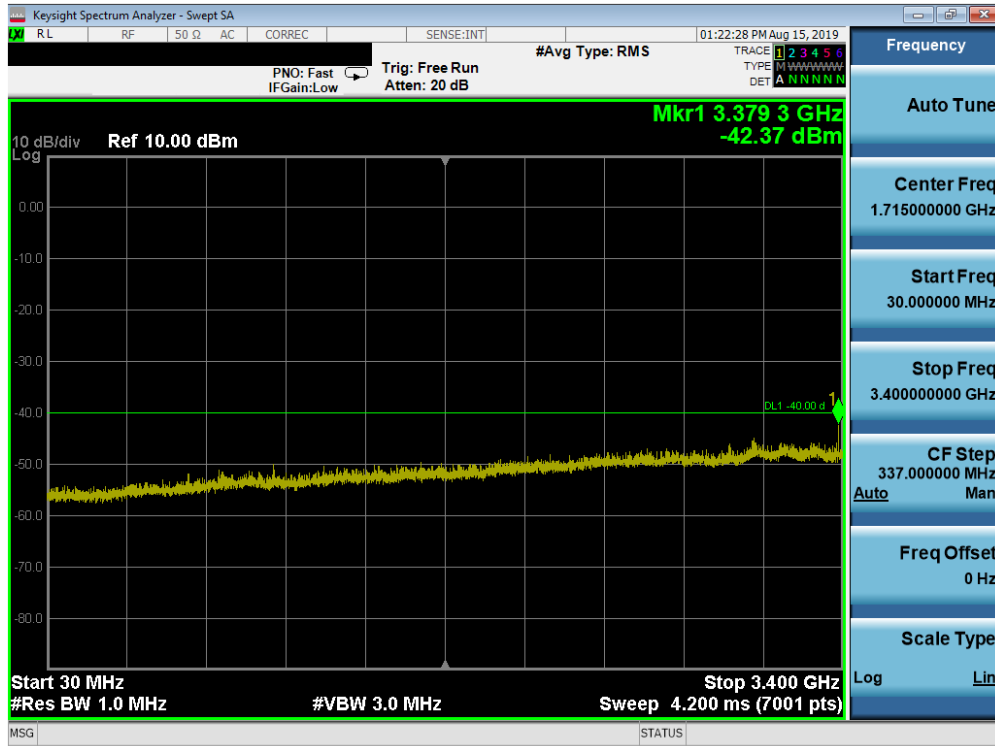
**Figure 7-2. Test Instrument & Measurement Setup**

#### Test Notes

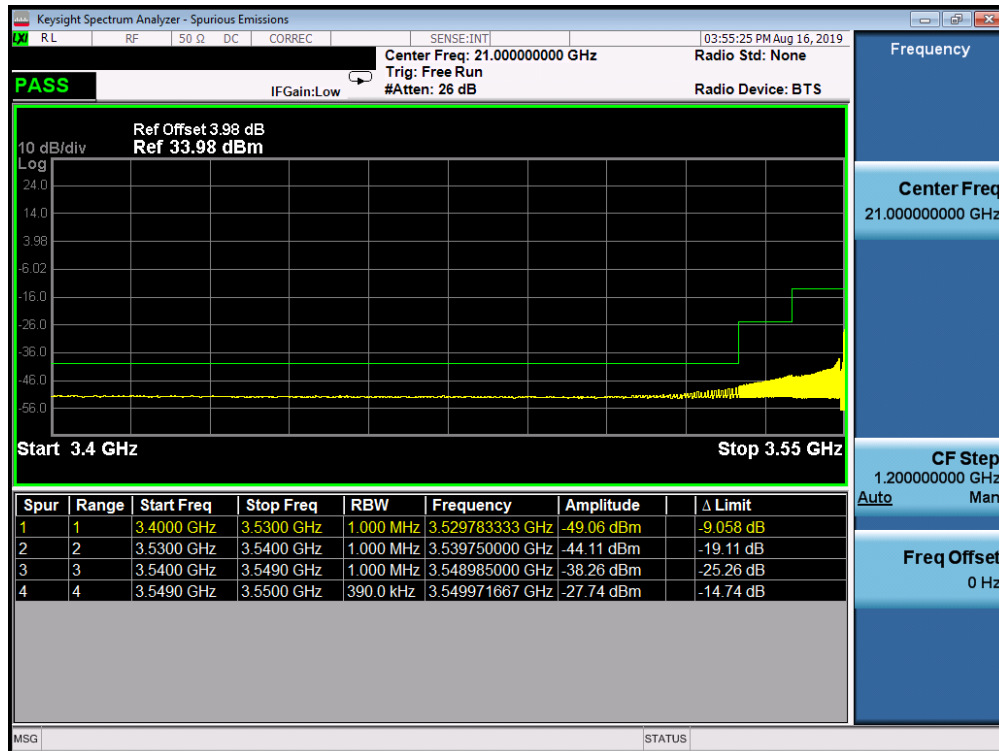
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the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

|                                            |                                               |                                               |    |                                 |
|--------------------------------------------|-----------------------------------------------|-----------------------------------------------|----|---------------------------------|
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| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset                 |    | Page 19 of 51                   |

## Band 48

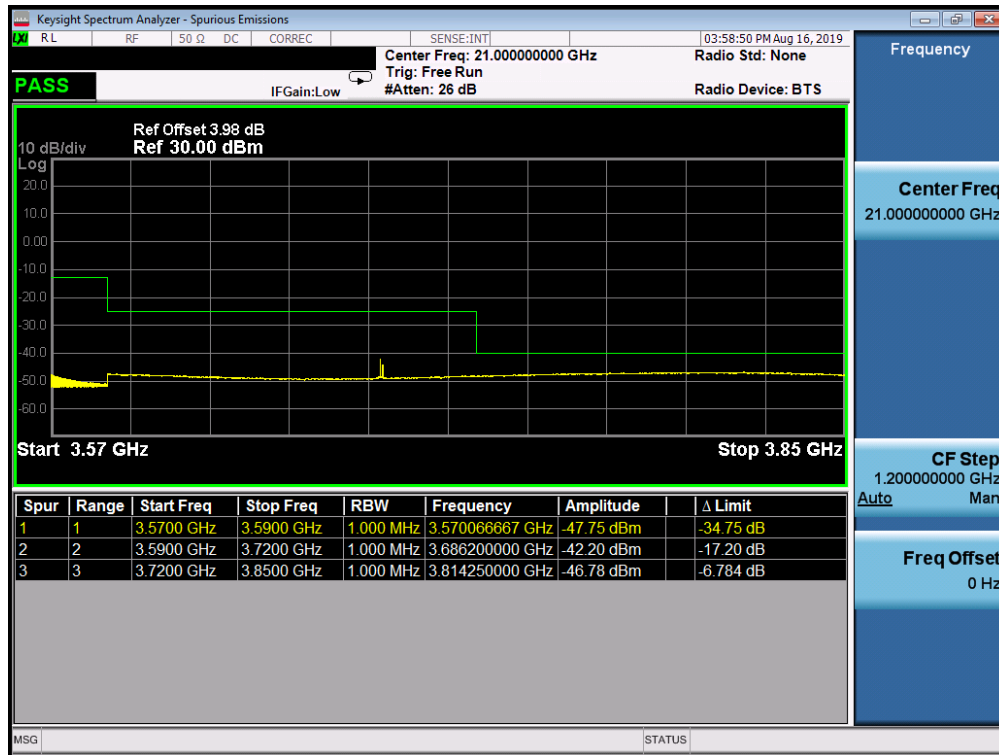


Plot 7-13. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

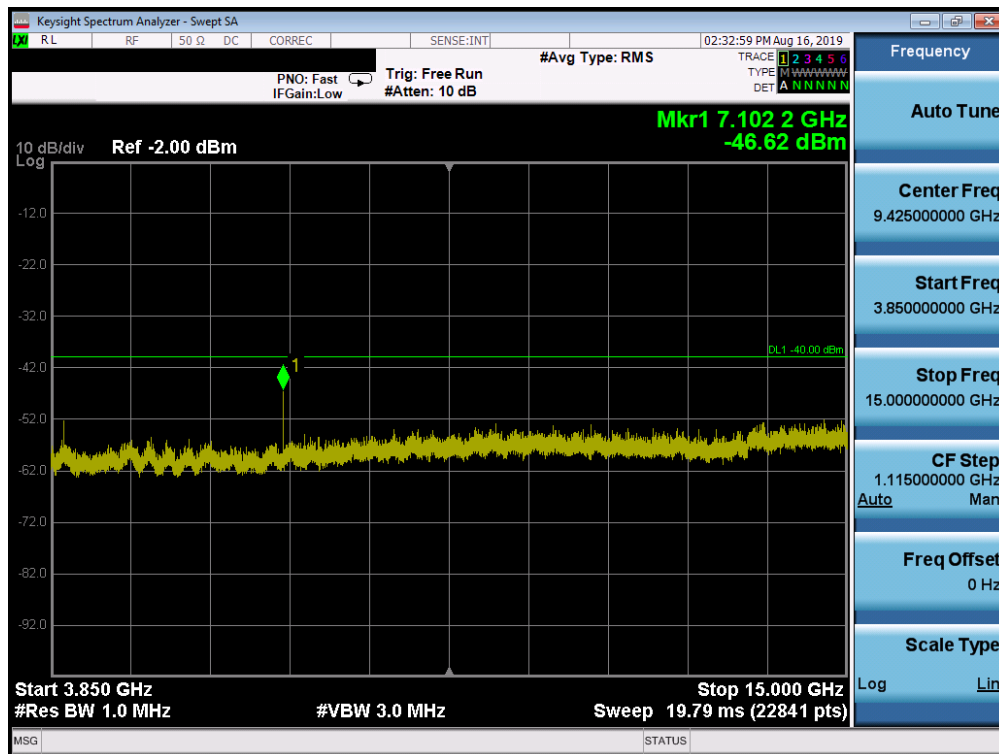


Plot 7-14. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 20 of 51                   |

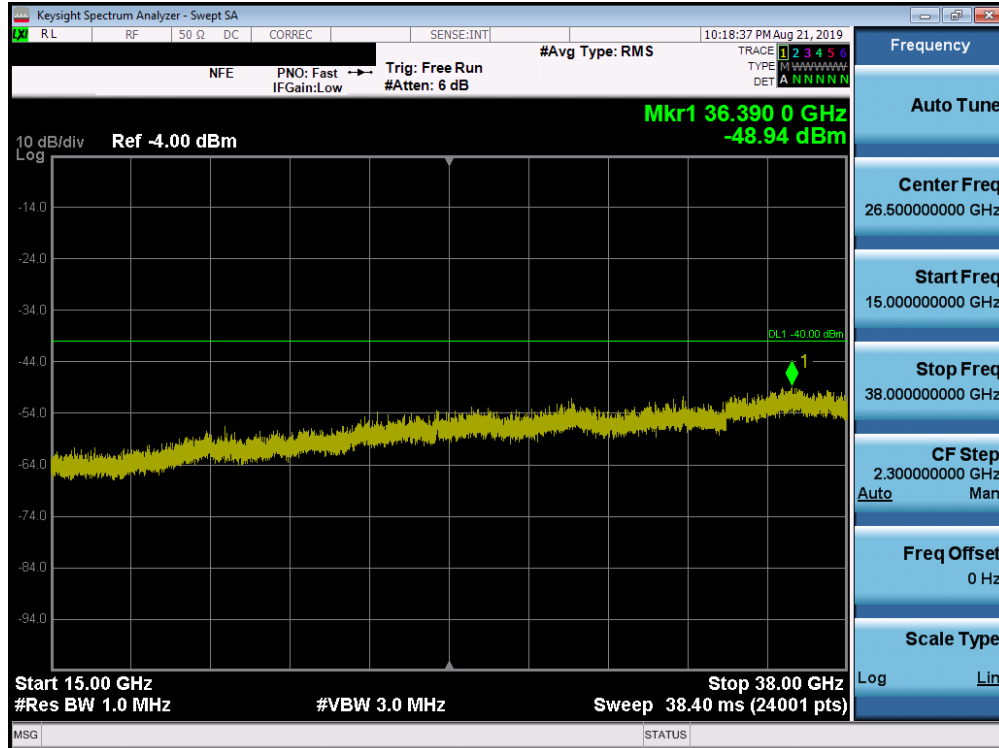


Plot 7-15. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

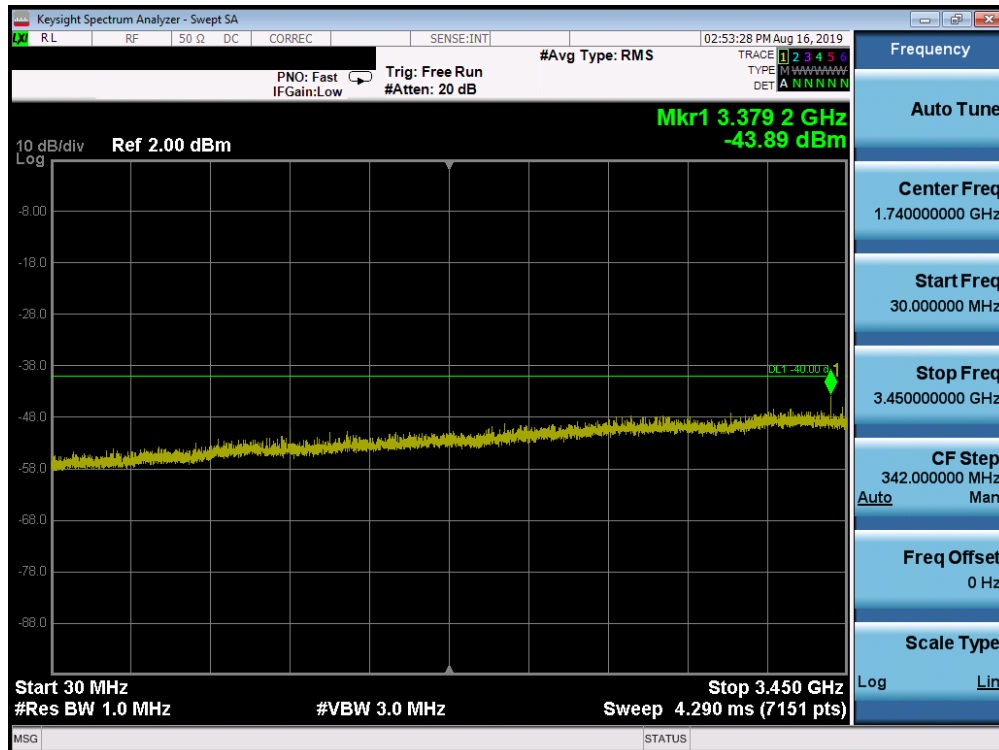


Plot 7-16. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

|                                            |                                              |                               |                                        |
|--------------------------------------------|----------------------------------------------|-------------------------------|----------------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT</b><br>(CERTIFICATION) |                               | <b>Approved by:</b><br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019              | EUT Type:<br>Portable Handset | Page 21 of 51                          |

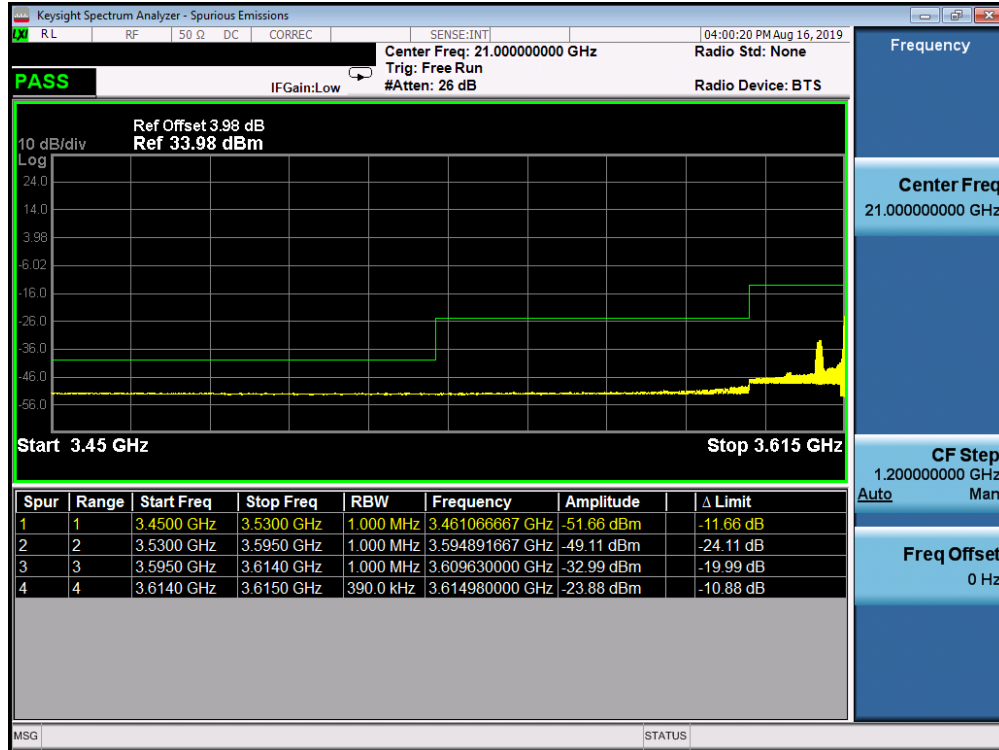


Plot 7-17. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

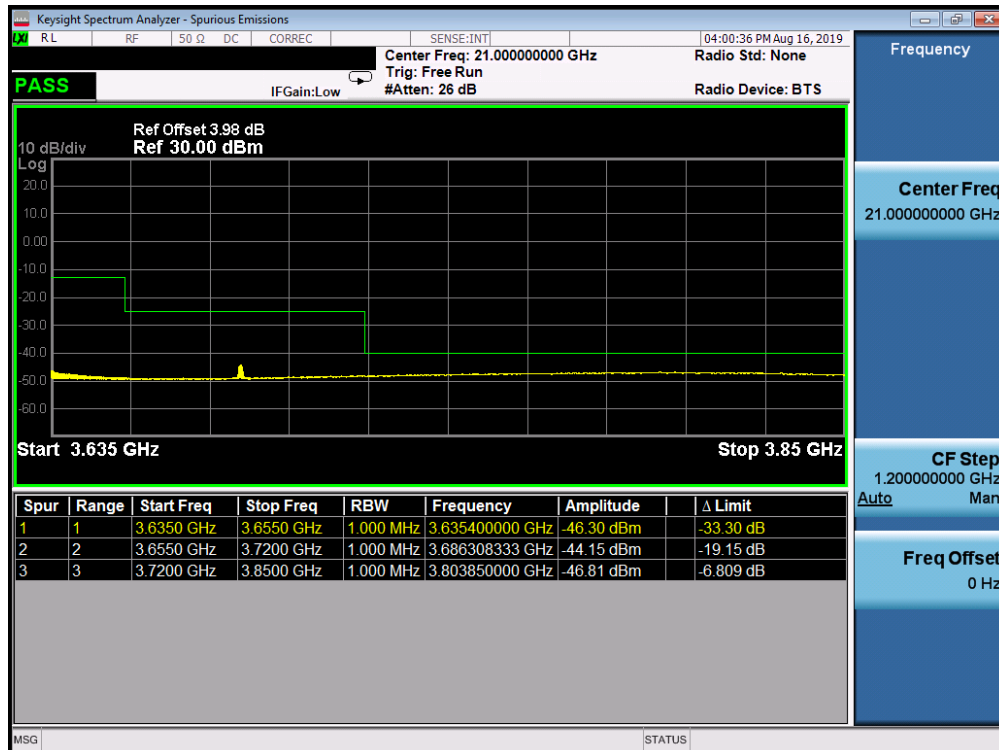


Plot 7-18. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 22 of 51                   |

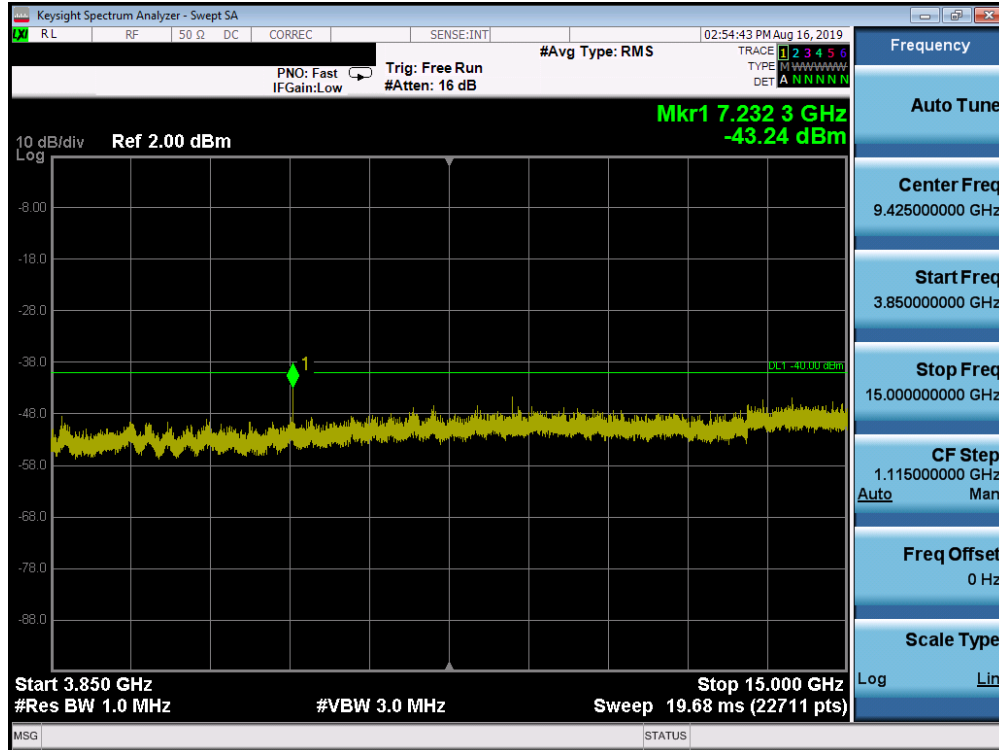


Plot 7-19. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

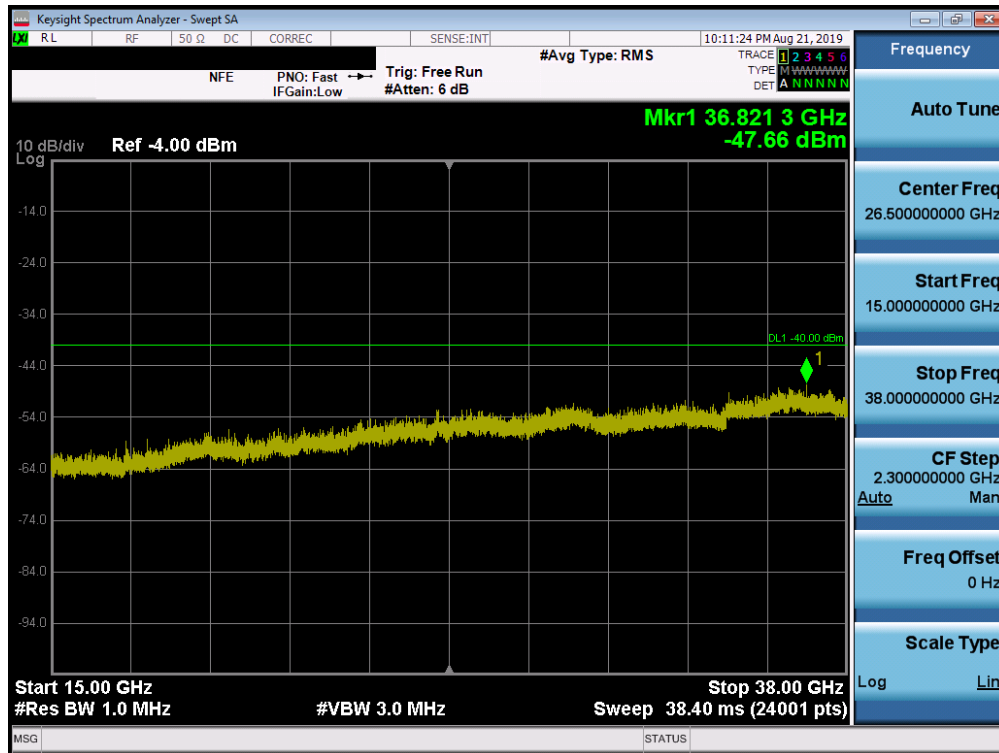


Plot 7-20. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

|                                            |                                              |                               |  |                                 |
|--------------------------------------------|----------------------------------------------|-------------------------------|--|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT</b><br>(CERTIFICATION) |                               |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019              | EUT Type:<br>Portable Handset |  | Page 23 of 51                   |

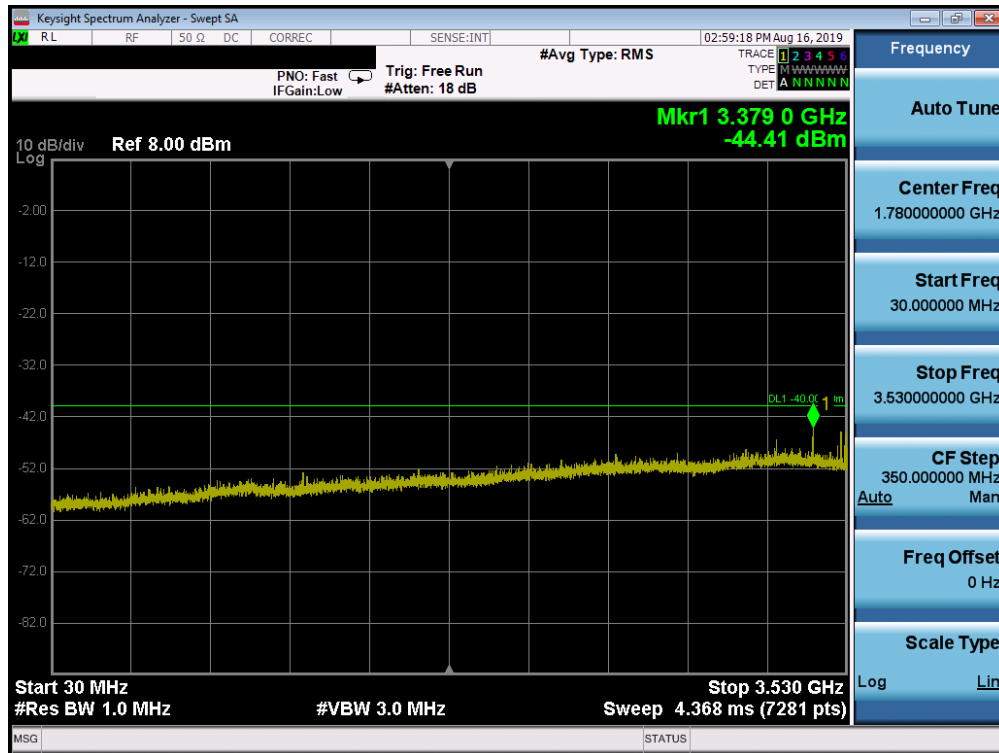


Plot 7-21. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

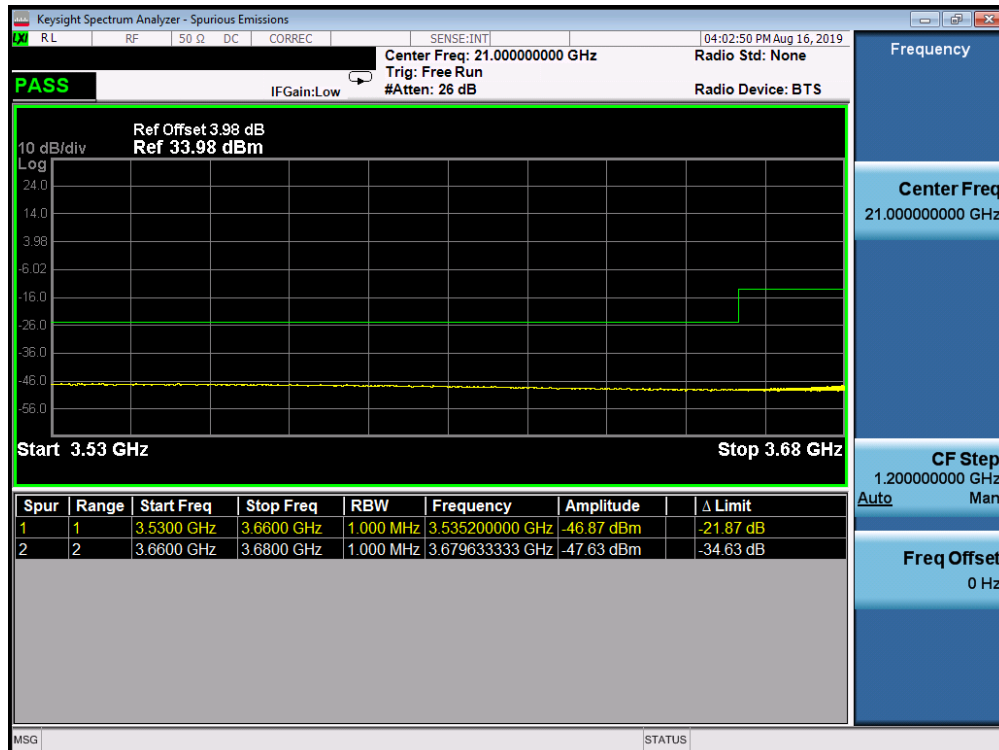


Plot 7-22. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 24 of 51                   |

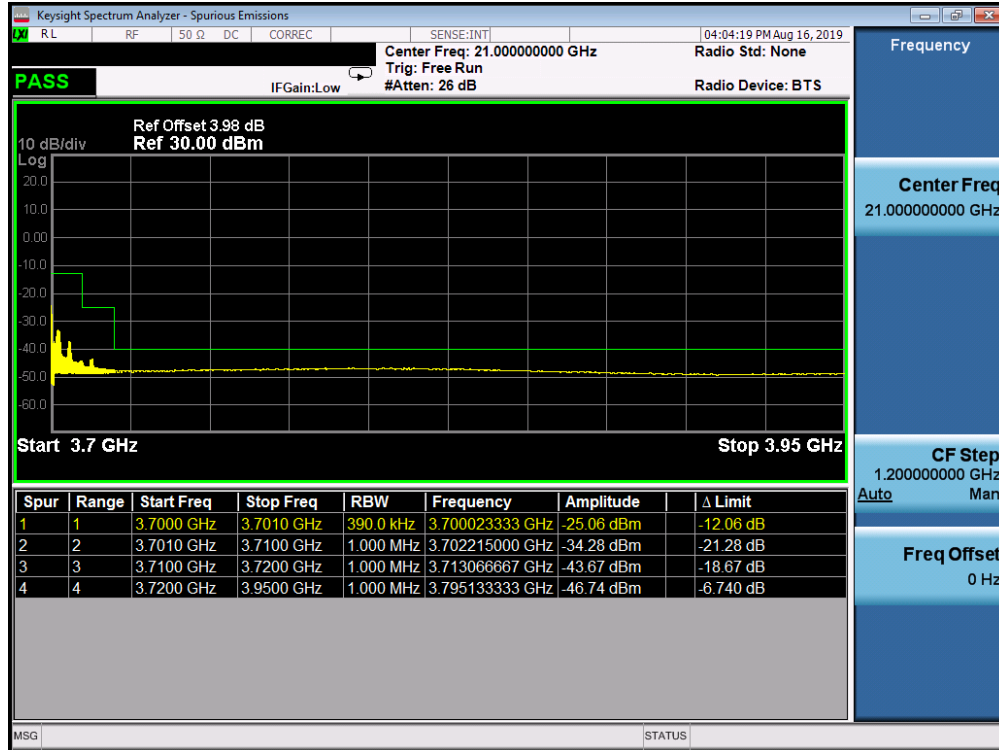


Plot 7-23. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

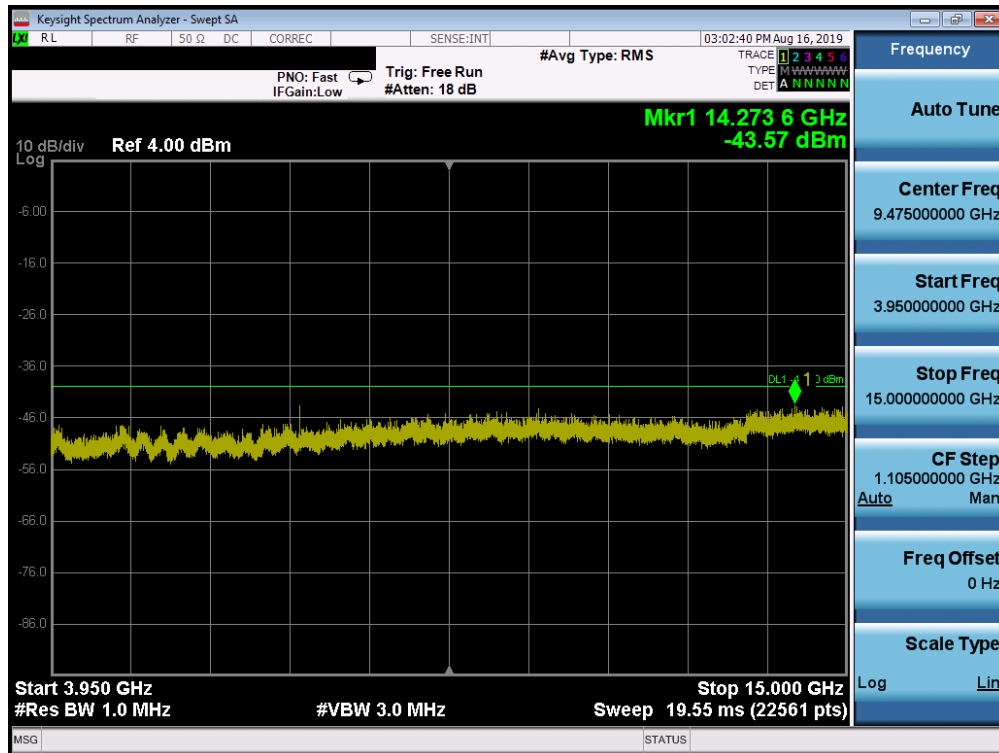


Plot 7-24. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 25 of 51                   |

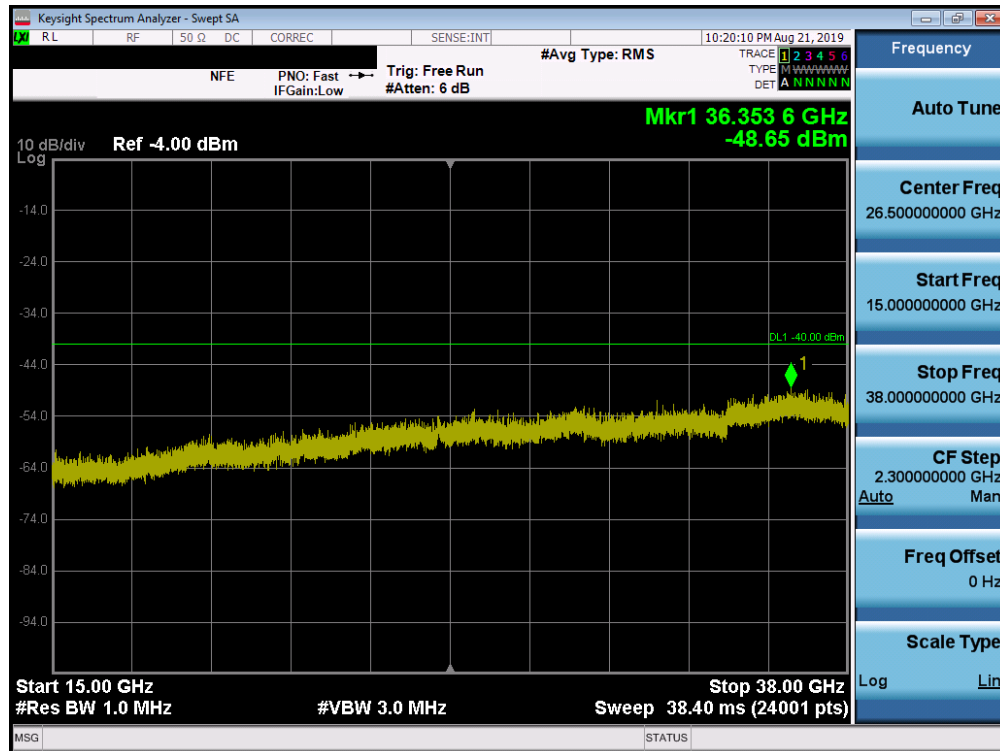


Plot 7-25. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 – High Channel)



Plot 7-26. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 26 of 51                   |



Plot 7-27. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 27 of 51                   |

## 7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §96.41(e)

### 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 conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.***

***The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.***

### Test Procedure Used

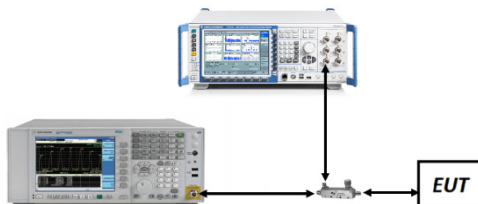
KDB 971168 D01 v03r01 – Section 6.0

### 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 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq$  2 x 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.

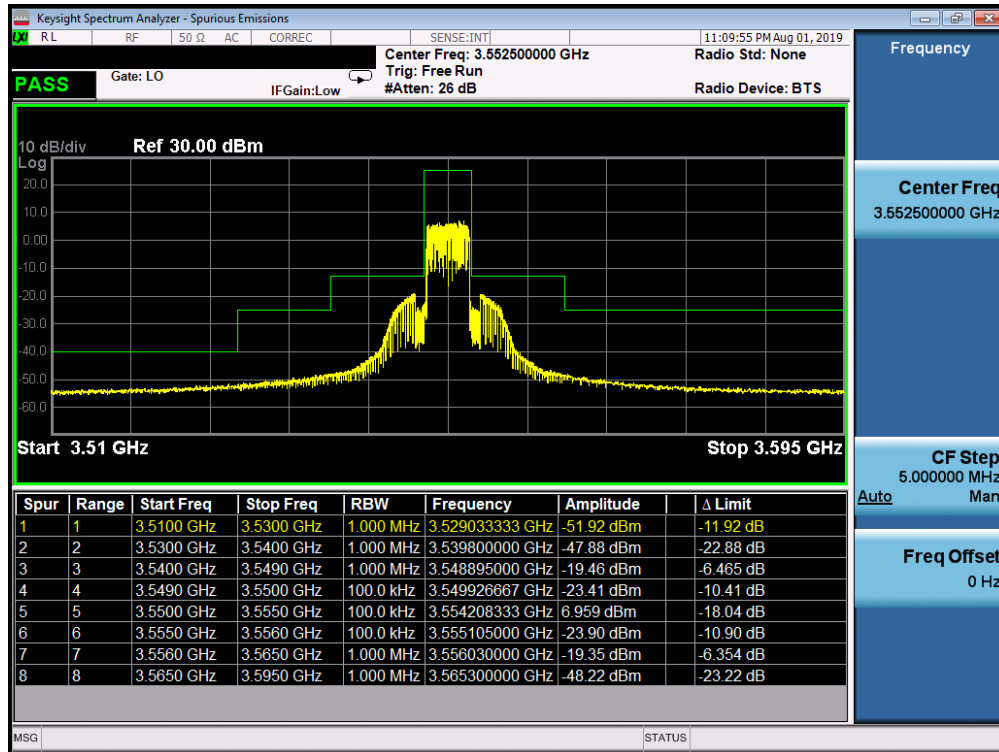


**Figure 7-3. Test Instrument & Measurement Setup**

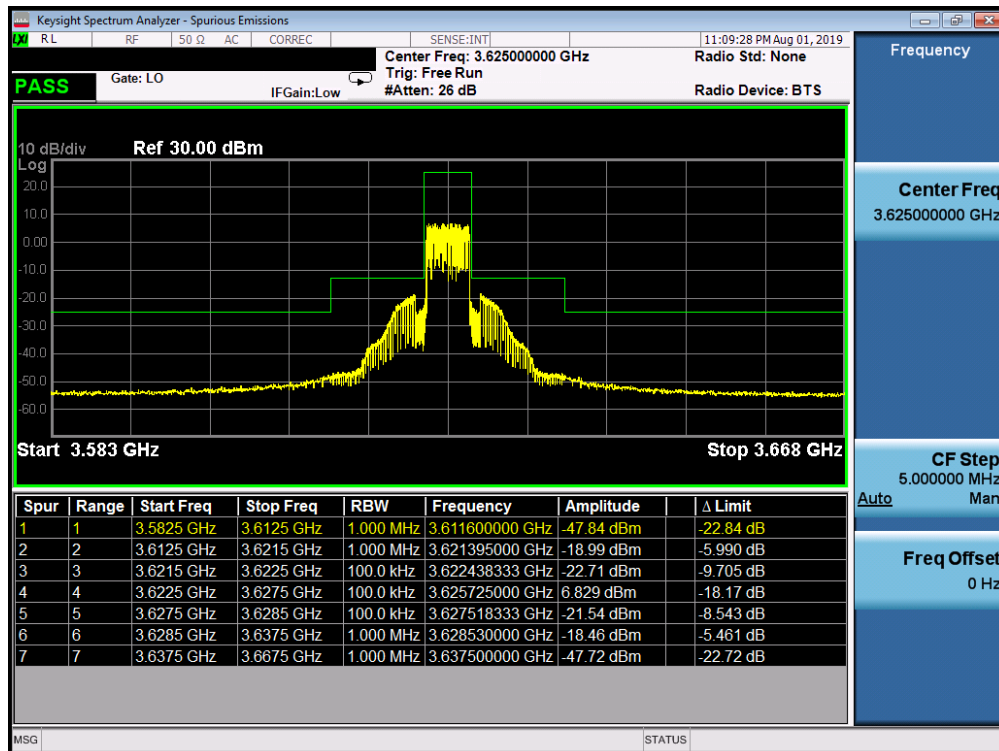
### Test Notes

|                                            |                                               |                                               |    |                                 |
|--------------------------------------------|-----------------------------------------------|-----------------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset                 |    | Page 28 of 51                   |

## Band 48

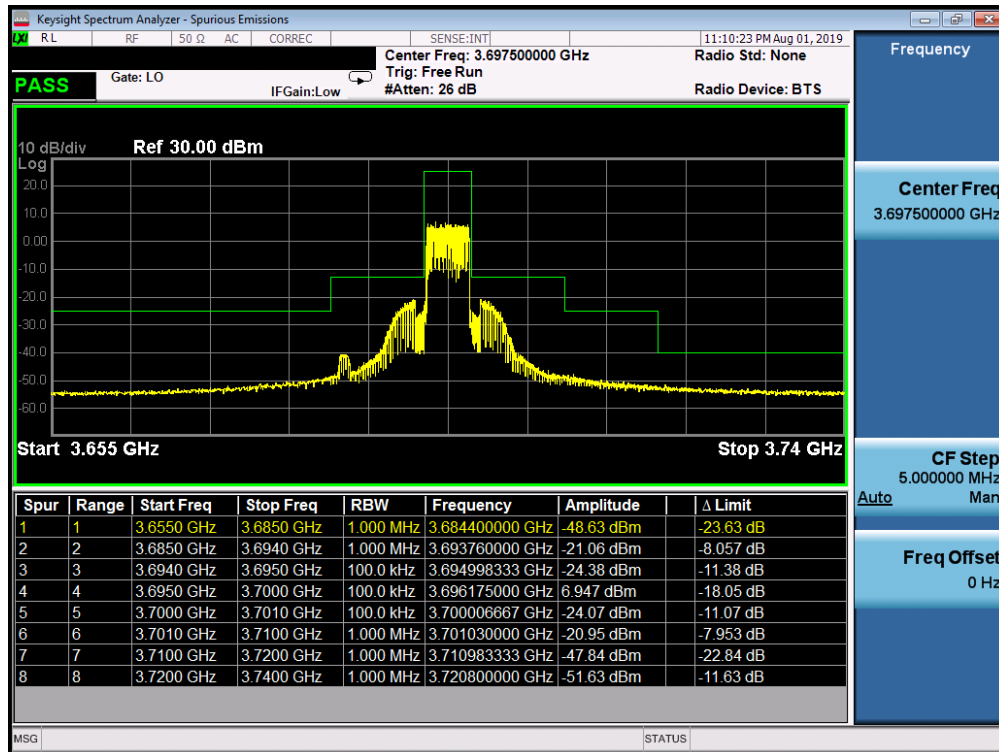


Plot 7-28. Lower Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

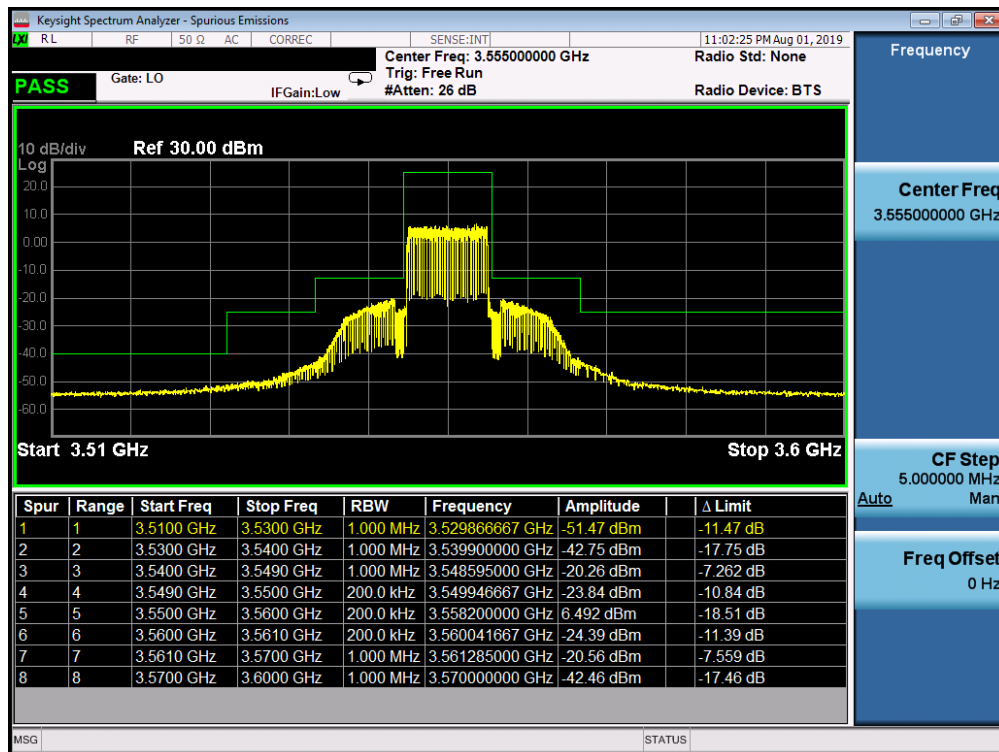


Plot 7-29. Mid Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 29 of 51                   |

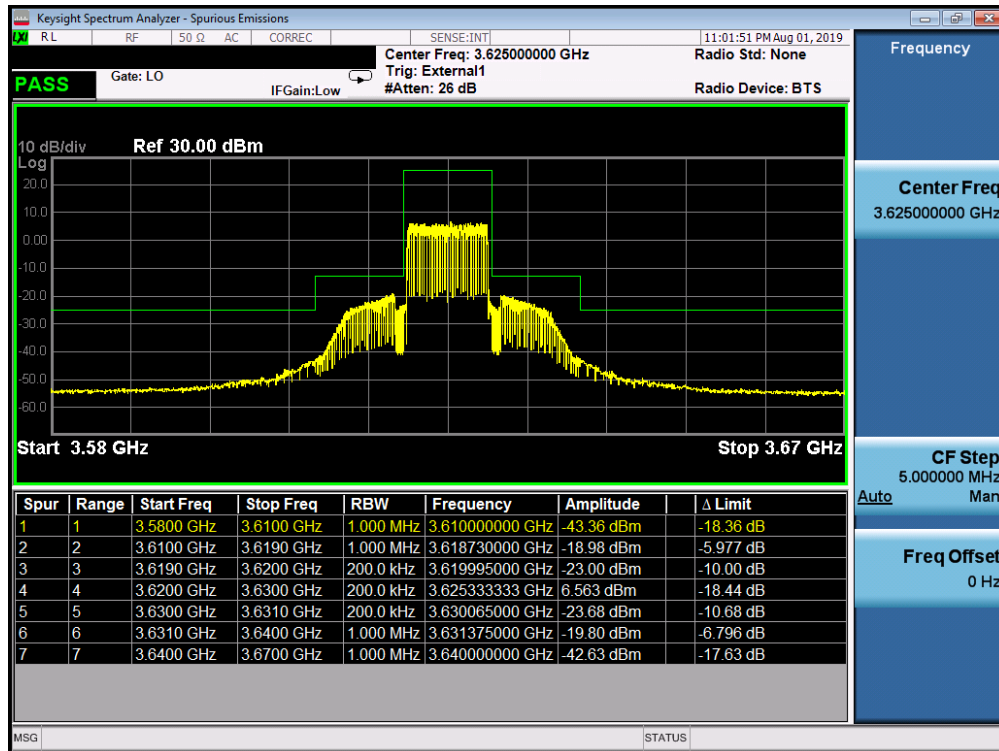


Plot 7-30. Upper Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

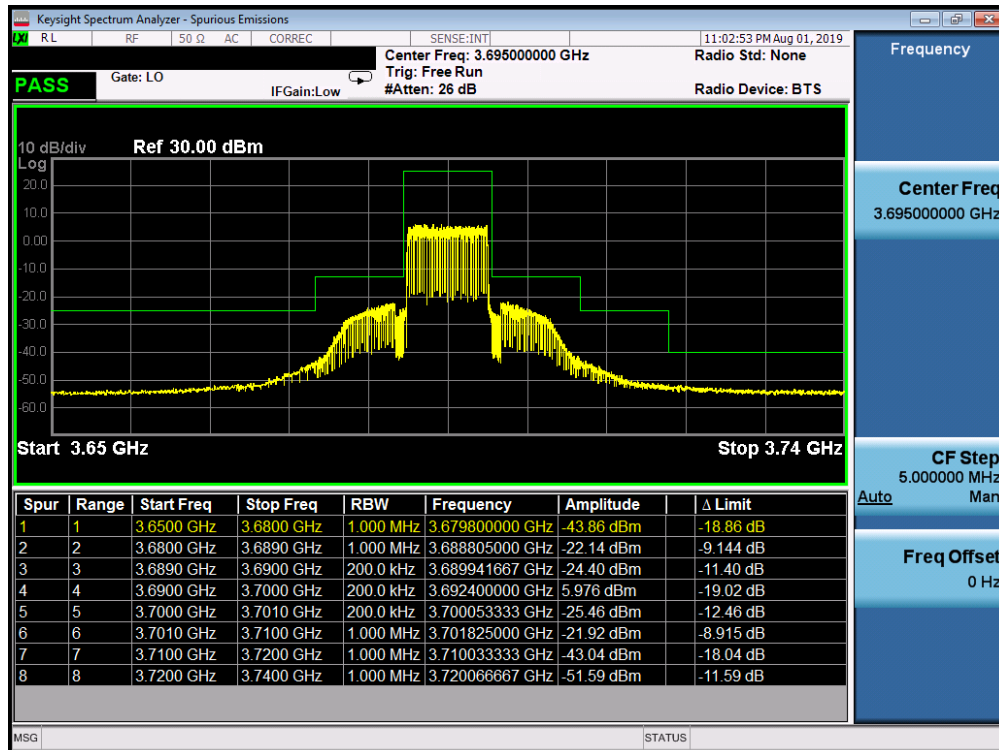


Plot 7-31. Lower Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |  |  |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|--|--|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) |  |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |  |  | Page 30 of 51                   |

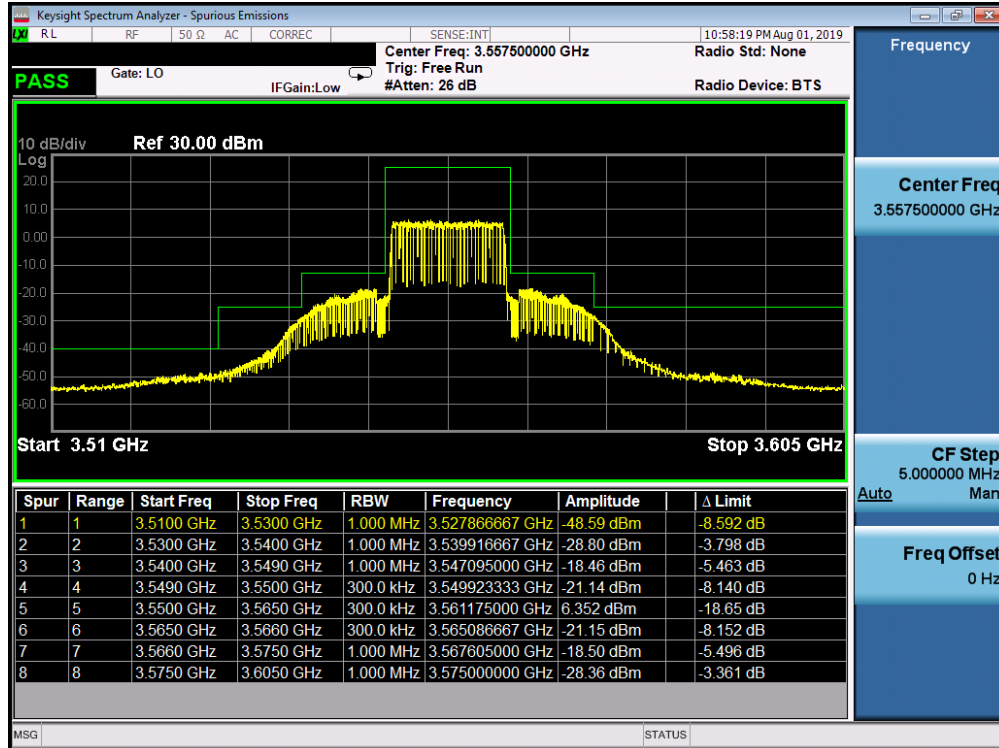


Plot 7-32. Mid Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

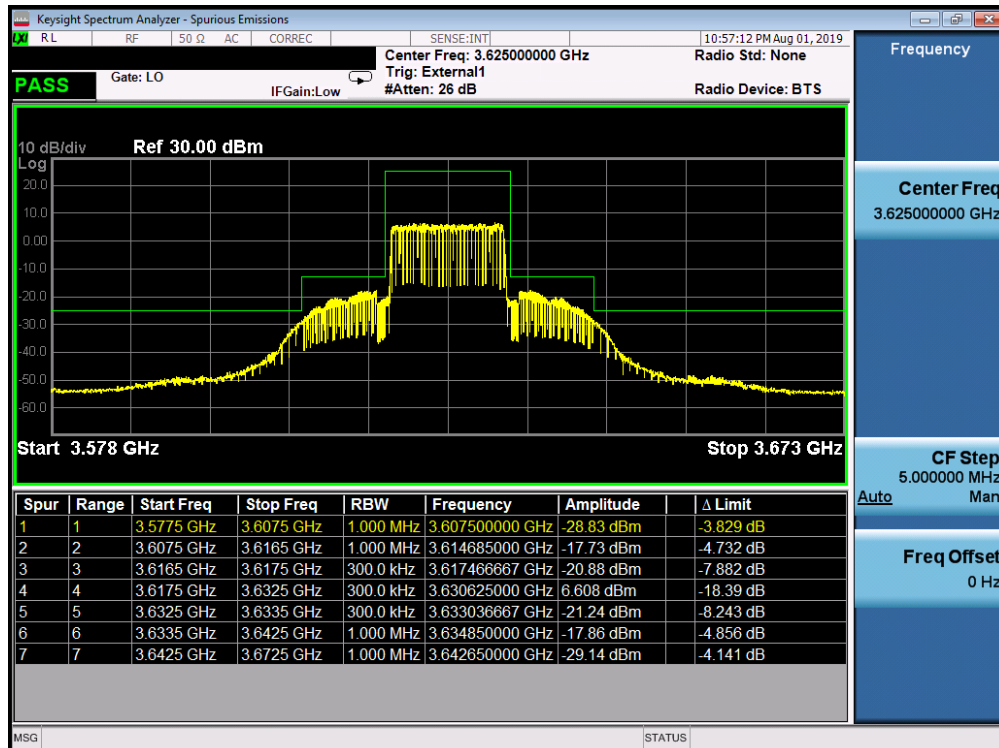


Plot 7-33. Upper Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                               |  |               |                                 |
|--------------------------------------------|-----------------------------------------------|-----------------------------------------------|--|---------------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | LG            | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset                 |  | Page 31 of 51 |                                 |

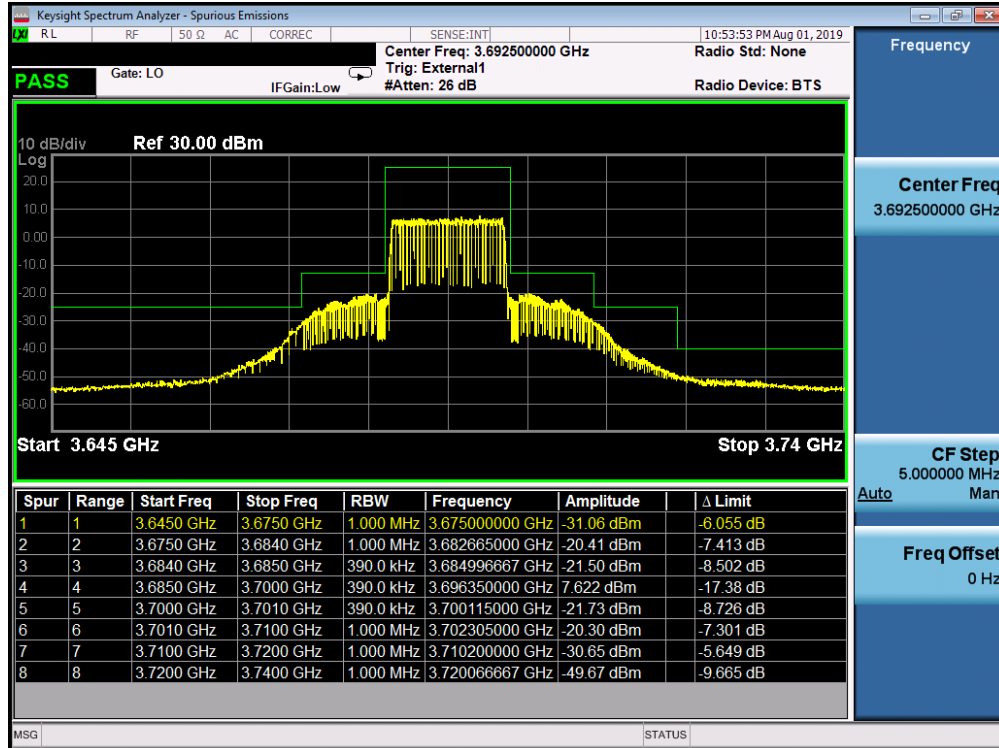


Plot 7-34. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

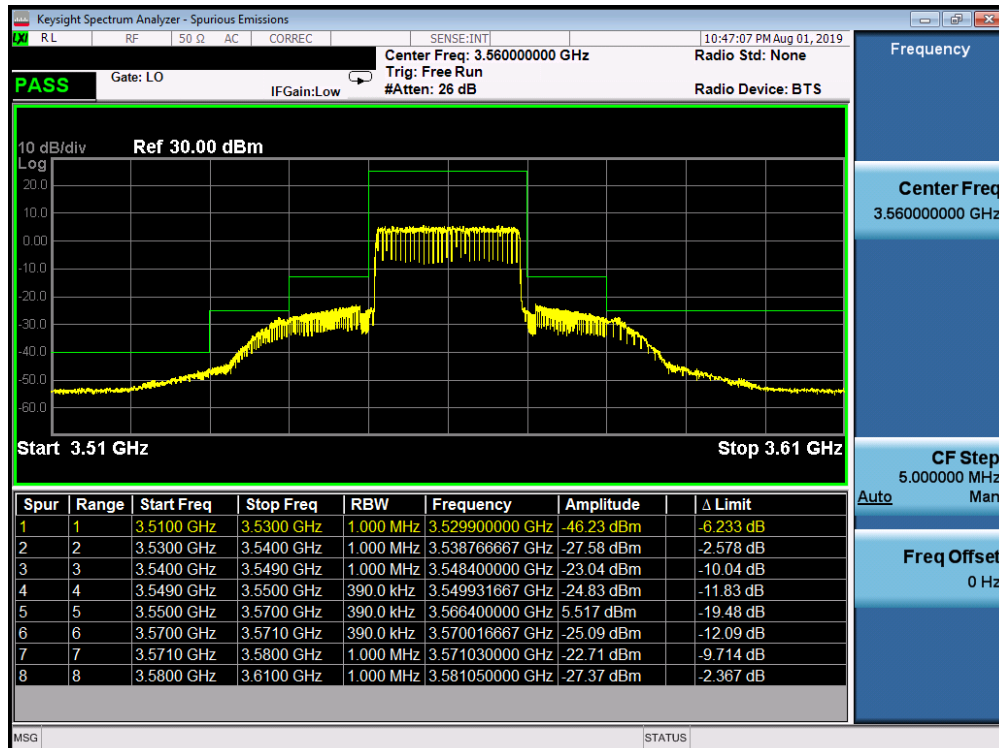


Plot 7-35. Mid Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 32 of 51                   |

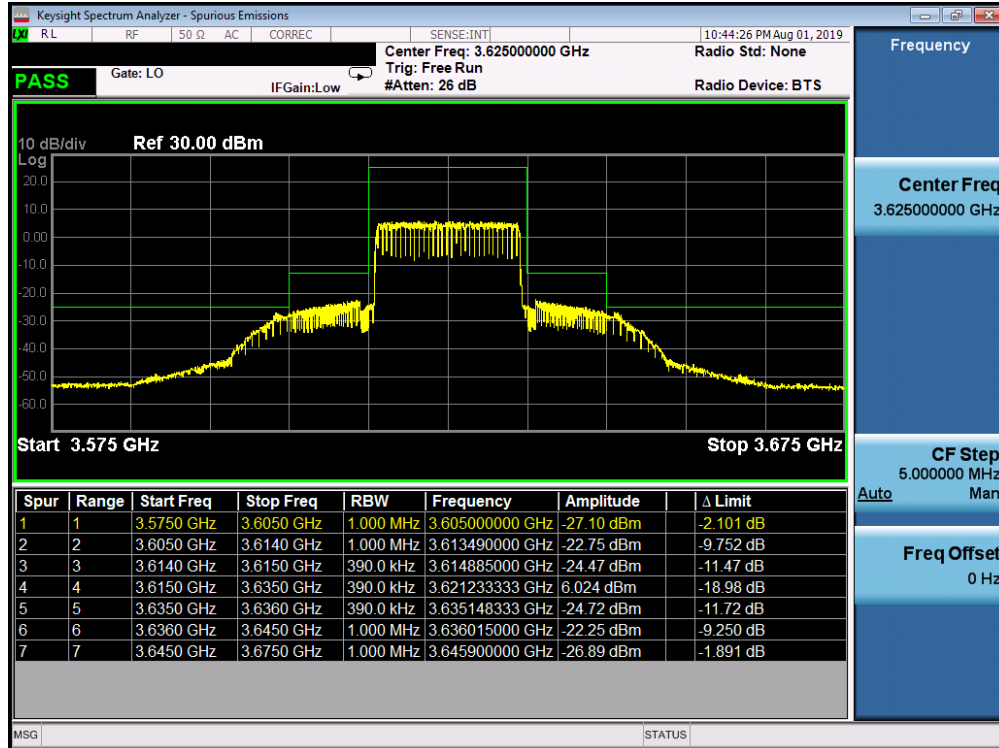


Plot 7-36. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

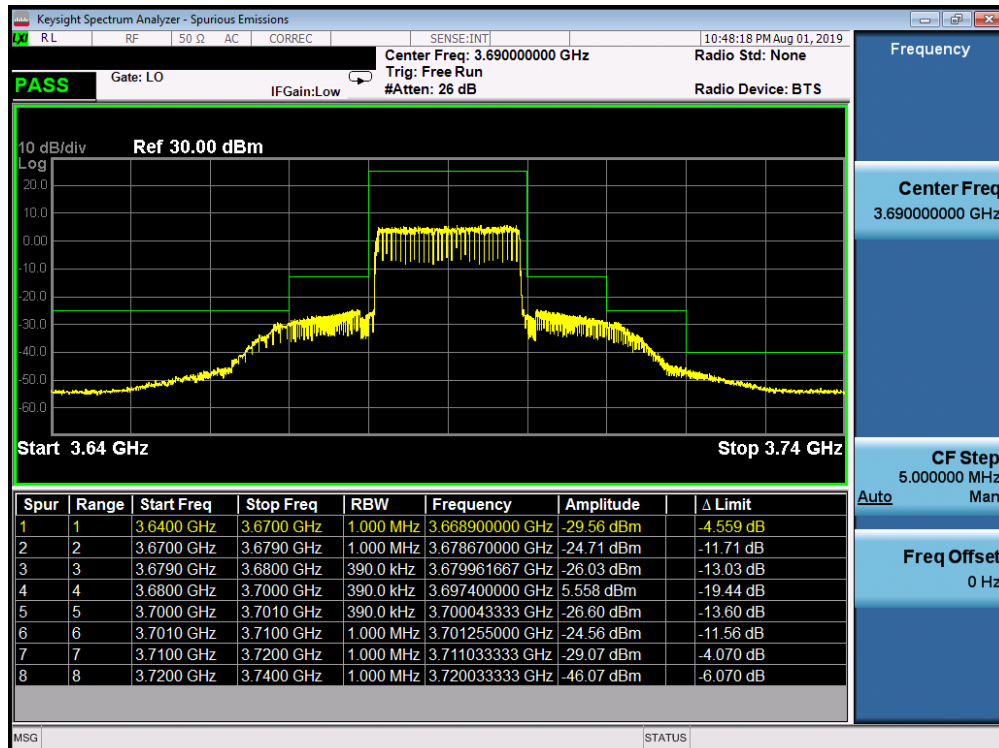


Plot 7-37. Lower Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |    | Page 33 of 51                   |



Plot 7-38. Mid Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-39. Upper Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

|                                            |                                               |                                       |  |  |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|--|--|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) |  |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset         |  |  | Page 34 of 51                   |

## 7.5 Radiated Power (EIRP)

### §96.41(b)

#### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. 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 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

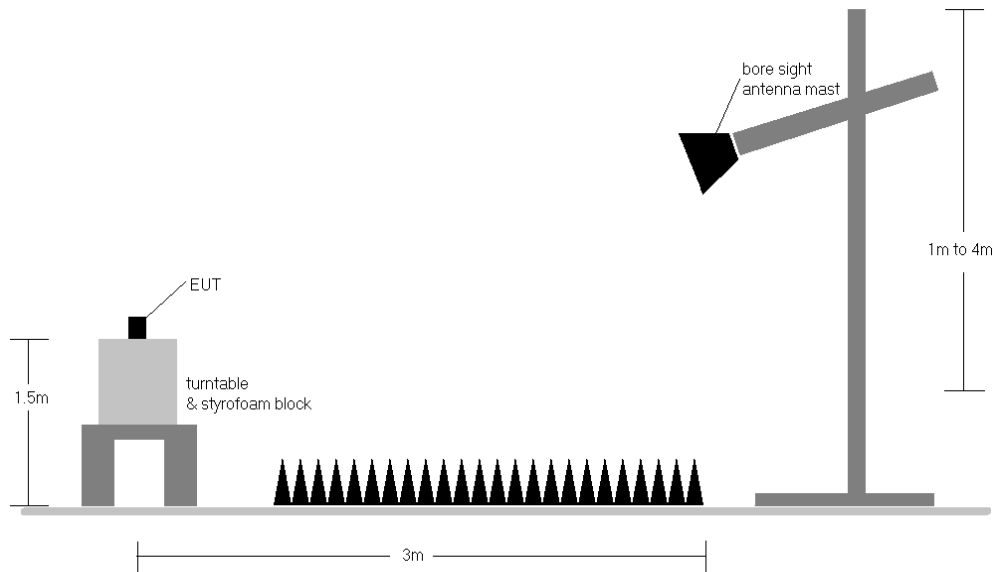
#### Test Settings

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 set equal to 10MHz.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                     | EUT Type:<br>Portable Handset         |                                                                                       | Page 35 of 51                   |

## Test Setup

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



**Figure 7-4. 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.
- 3) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

|                                                   |                                               |                                               |    |                                        |
|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------|----|----------------------------------------|
| FCC ID: ZNFG850UM                                 | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> | LG | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1907250129-05-R3.ZNF | <b>Test Dates:</b><br>7/26 - 8/16/2019        | <b>EUT Type:</b><br>Portable Handset          |    | Page 36 of 51                          |

| 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/10MHz] | EIRP [Watts/10MHz] | EIRP Limit [dBm/10MHz] | Margin [dB] |
|-----------------|-------------------------|--------|-----------------|---------------------|----------------------------|----------------|------------------------|-----------------|------------------|--------------------|------------------------|-------------|
| 3552.50         | 5                       | QPSK   | V               | 107                 | 331                        | 1 / 24         | 10.38                  | 7.23            | <b>17.61</b>     | 0.058              | 23.00                  | -5.39       |
| 3625.00         | 5                       | QPSK   | V               | 110                 | 327                        | 1 / 24         | 9.99                   | 6.96            | 16.95            | 0.050              | 23.00                  | -6.05       |
| 3697.50         | 5                       | QPSK   | V               | 101                 | 337                        | 1 / 0          | 9.19                   | 6.41            | 15.60            | 0.036              | 23.00                  | -7.40       |
| 3552.50         | 5                       | 16-QAM | V               | 107                 | 331                        | 1 / 24         | 9.42                   | 7.23            | <b>16.65</b>     | 0.046              | 23.00                  | -6.35       |
| 3552.50         | 5                       | 64-QAM | V               | 107                 | 331                        | 1 / 24         | 8.35                   | 7.23            | <b>15.58</b>     | 0.036              | 23.00                  | -7.42       |
| 3555.00         | 10                      | QPSK   | V               | 101                 | 329                        | 1 / 49         | 10.50                  | 7.22            | <b>17.72</b>     | <b>0.059</b>       | 23.00                  | -5.28       |
| 3625.00         | 10                      | QPSK   | V               | 107                 | 325                        | 1 / 49         | 10.59                  | 6.96            | 17.55            | 0.057              | 23.00                  | -5.45       |
| 3695.00         | 10                      | QPSK   | V               | 111                 | 344                        | 1 / 0          | 9.41                   | 6.43            | 15.84            | 0.038              | 23.00                  | -7.16       |
| 3625.00         | 10                      | 16-QAM | V               | 107                 | 325                        | 1 / 49         | 9.88                   | 6.96            | <b>16.84</b>     | 0.048              | 23.00                  | -6.16       |
| 3625.00         | 10                      | 64-QAM | V               | 107                 | 325                        | 1 / 49         | 8.71                   | 6.96            | <b>15.67</b>     | 0.037              | 23.00                  | -7.33       |
| 3557.50         | 15                      | QPSK   | V               | 110                 | 331                        | 1 / 74         | 10.04                  | 7.22            | <b>17.26</b>     | 0.053              | 23.00                  | -5.74       |
| 3625.00         | 15                      | QPSK   | V               | 100                 | 318                        | 1 / 0          | 7.94                   | 6.96            | 14.90            | 0.031              | 23.00                  | -8.10       |
| 3692.50         | 15                      | QPSK   | V               | 103                 | 348                        | 1 / 74         | 10.43                  | 6.45            | 16.88            | 0.049              | 23.00                  | -6.12       |
| 3557.50         | 15                      | 16-QAM | V               | 110                 | 331                        | 1 / 74         | 9.23                   | 7.22            | <b>16.45</b>     | 0.044              | 23.00                  | -6.55       |
| 3557.50         | 15                      | 64-QAM | V               | 110                 | 331                        | 1 / 74         | 8.72                   | 7.22            | <b>15.94</b>     | 0.039              | 23.00                  | -7.06       |
| 3560.00         | 20                      | QPSK   | V               | 101                 | 336                        | 1 / 99         | 7.12                   | 7.21            | 14.33            | 0.027              | 23.00                  | -8.67       |
| 3625.00         | 20                      | QPSK   | V               | 106                 | 322                        | 1 / 99         | 10.09                  | 6.96            | 17.05            | 0.051              | 23.00                  | -5.95       |
| 3690.00         | 20                      | QPSK   | V               | 101                 | 349                        | 1 / 0          | 10.97                  | 6.47            | <b>17.44</b>     | 0.055              | 23.00                  | -5.56       |
| 3690.00         | 20                      | 16-QAM | V               | 101                 | 349                        | 1 / 0          | 10.18                  | 6.47            | <b>16.65</b>     | 0.046              | 23.00                  | -6.35       |
| 3690.00         | 20                      | 64-QAM | V               | 101                 | 349                        | 1 / 0          | 8.88                   | 6.47            | <b>15.35</b>     | 0.034              | 23.00                  | -7.65       |
| 3555.00         | 10                      | QPSK   | H               | 264                 | 4                          | 1 / 49         | 8.91                   | 6.85            | 15.76            | 0.038              | 23.00                  | -7.24       |
| 3555.00         | 10 (WCP)                | QPSK   | V               | 399                 | 38                         | 1 / 49         | 6.50                   | 7.22            | 13.72            | 0.024              | 23.00                  | -9.28       |

**Table 7-3. EIRP Data (Band 48)**

|                                            |                                                                                                                                                                                                                     |                               |                                 |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          |  <b>MEASUREMENT REPORT (CERTIFICATION)</b>  |                               | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                                                                                                                                                     | EUT Type:<br>Portable Handset | Page 37 of 51                   |

## 7.6 Radiated Spurious Emissions Measurements

\$2.1053 \$96.41(e)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 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.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

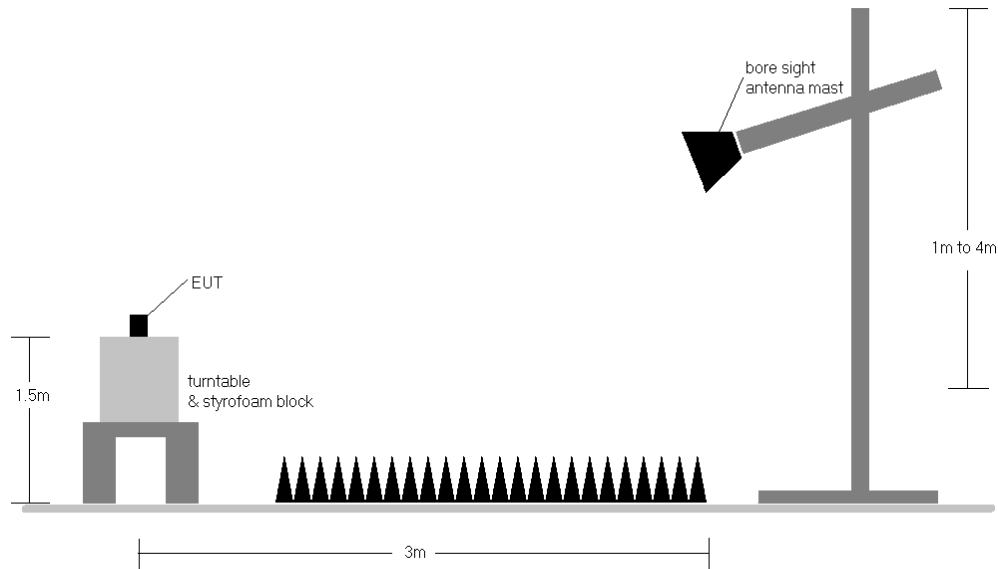
### Test Settings

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: ZNFG850UM                          |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) |  LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                                                                   | EUT Type:<br>Portable Handset         |                                                                                          | Page 38 of 51                   |

## Test Setup

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



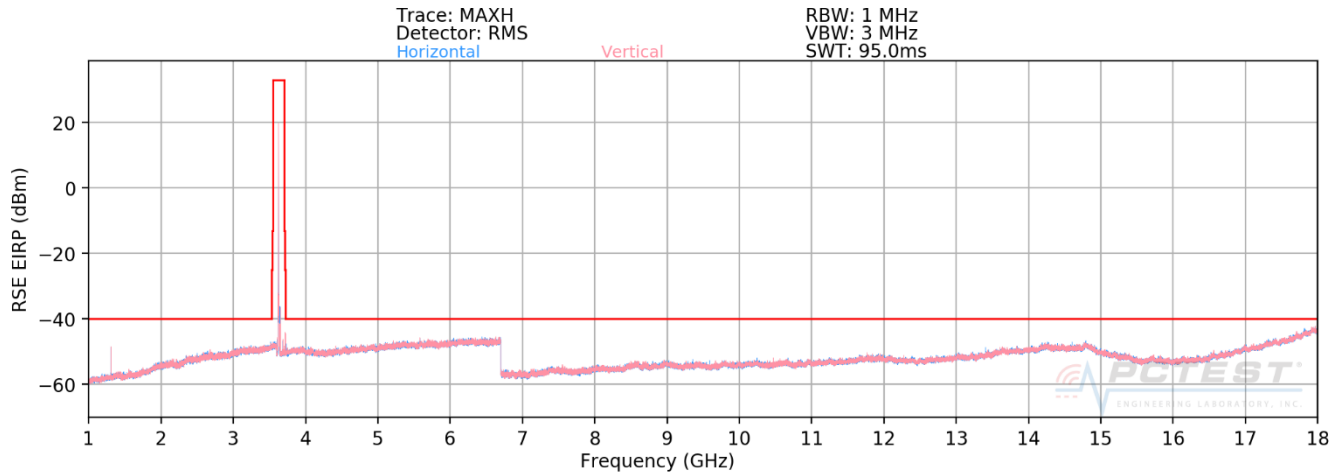
**Figure 7-5. Test Instrument & Measurement Setup**

## Test Notes

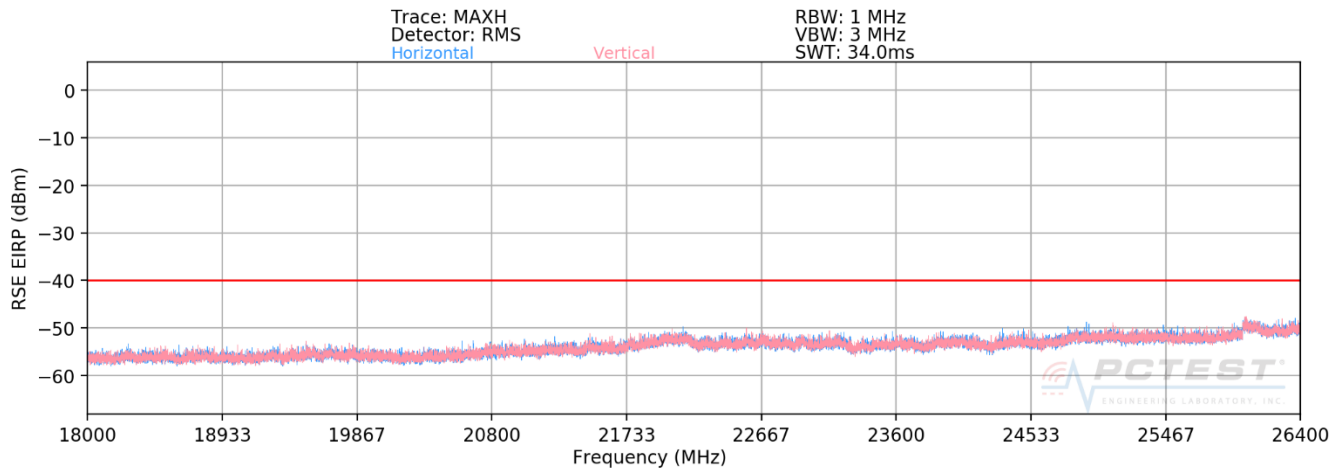
- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with 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: ZNFG850UM                                 | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> | LG | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1907250129-05-R3.ZNF | <b>Test Dates:</b><br>7/26 - 8/16/2019        | <b>EUT Type:</b><br>Portable Handset          |    | Page 39 of 51                          |

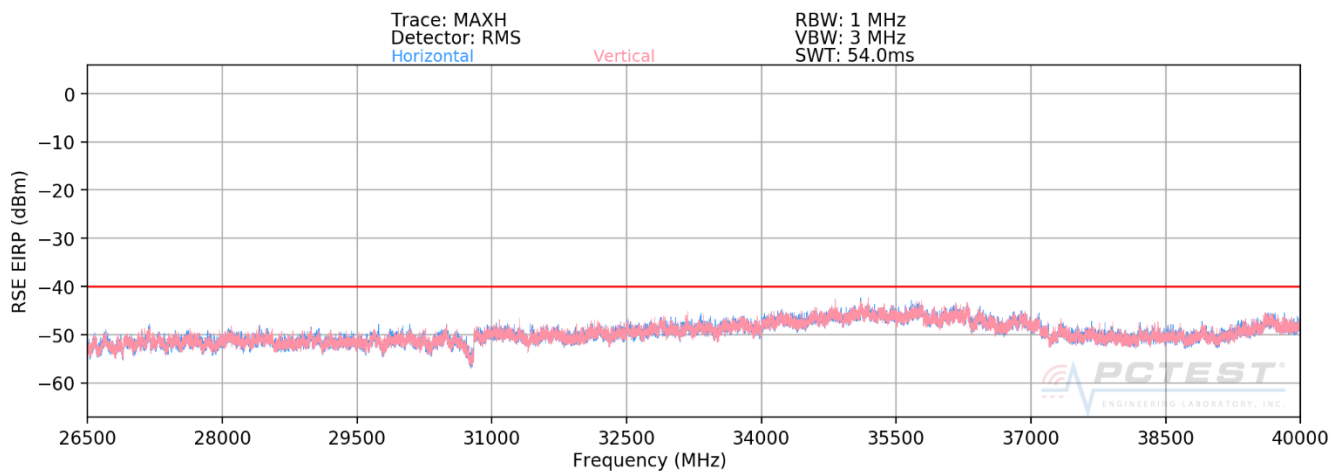
## Band 48



**Plot 7-40. Radiated Spurious Plot 1 - 18GHz (Band 48)**



**Plot 7-41. Radiated Spurious Plot 18 - 26.5GHz (Band 48)**



**Plot 7-42. Radiated Spurious Plot 26.5 - 40GHz (Band 48)**

|                                            |                                               |                                               |    |                                 |
|--------------------------------------------|-----------------------------------------------|-----------------------------------------------|----|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset                 |    | Page 40 of 51                   |

OPERATING FREQUENCY: 3560.00 MHz  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm

| 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] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------------------|-------------------------------|-------------------------------|-------------|
| 7120.00         | H               | -                   | -                          | -70.65                           | 11.71                         | -58.95                        | -18.9       |
| 10680.00        | H               | -                   | -                          | -68.73                           | 12.55                         | -56.18                        | -16.2       |

Table 7-4. Radiated Spurious Data (Band 48 – Low Channel)

OPERATING FREQUENCY: 3625.00 MHz  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm

| 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] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------------------|-------------------------------|-------------------------------|-------------|
| 7250.00         | H               | -                   | -                          | -69.98                           | 11.32                         | -58.66                        | -18.7       |
| 10875.00        | H               | -                   | -                          | -68.90                           | 12.71                         | -56.19                        | -16.2       |

Table 7-5. Radiated Spurious Data (Band 48 – Mid Channel)

OPERATING FREQUENCY: 3690.00 MHz  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm

| 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] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------------------|-------------------------------|-------------------------------|-------------|
| 7380.00         | H               | -                   | -                          | -68.69                           | 10.96                         | -57.73                        | -17.7       |
| 11070.00        | H               | -                   | -                          | -68.52                           | 12.72                         | -55.79                        | -15.8       |

Table 7-6. Radiated Spurious Data (Band 48 – High Channel)

|                                            |                                                                                     |                                    |  |  |  |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------|--|--|--|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          |  | MEASUREMENT REPORT (CERTIFICATION) |  |  |  |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                     | EUT Type:<br>Portable Handset      |  |  |  | Page 41 of 51                                                                         |                                 |

OPERATING FREQUENCY: 3690.00 MHz  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm

| 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] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------------------|-------------------------------|-------------------------------|-------------|
| 7380.00         | H               | -                   | -                          | -68.91                           | 10.96                         | -57.95                        | -17.9       |
| 11070.00        | H               | -                   | -                          | -69.02                           | 12.72                         | -56.29                        | -16.3       |

**Table 7-7. Radiated Spurious Data with WCP (Band 48 – High Channel)**

|                                            |                                                                                                                                                                                                                     |                               |                                 |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          |  <b>MEASUREMENT REPORT (CERTIFICATION)</b>  |                               | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                                                                                                                                                     | EUT Type:<br>Portable Handset | Page 42 of 51                   |

## 7.7 Frequency Stability / Temperature Variation

### \$2.1055

#### Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. 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 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

#### Test Procedure Used

ANSI/TIA-603-E-2016

#### 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: ZNFG850UM                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                     | EUT Type:<br>Portable Handset         |                                                                                       | Page 43 of 51                   |

## Band 48 Frequency Stability Measurements

OPERATING FREQUENCY: 3,625,000,000 Hz

CHANNEL: 55990

REFERENCE VOLTAGE: 4.39 VDC

| VOLTAGE (%)    | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|----------------|-------------|-----------|----------------|-----------------|---------------|
| 100 %          | 4.39        | - 30      | 3,624,999,797  | -203            | -0.0000056    |
| 100 %          |             | - 20      | 3,625,000,137  | 137             | 0.0000038     |
| 100 %          |             | - 10      | 3,625,000,320  | 320             | 0.0000088     |
| 100 %          |             | 0         | 3,624,999,849  | -151            | -0.0000042    |
| 100 %          |             | + 10      | 3,625,000,282  | 282             | 0.0000078     |
| 100 %          |             | + 20      | 3,624,999,997  | -3              | -0.0000001    |
| 100 %          |             | + 30      | 3,625,000,111  | 111             | 0.0000031     |
| 100 %          |             | + 40      | 3,624,999,749  | -251            | -0.0000069    |
| 100 %          |             | + 50      | 3,624,999,907  | -93             | -0.0000026    |
| BATT. ENDPOINT | 2.20        | + 20      | 3,624,999,975  | -25             | -0.0000007    |

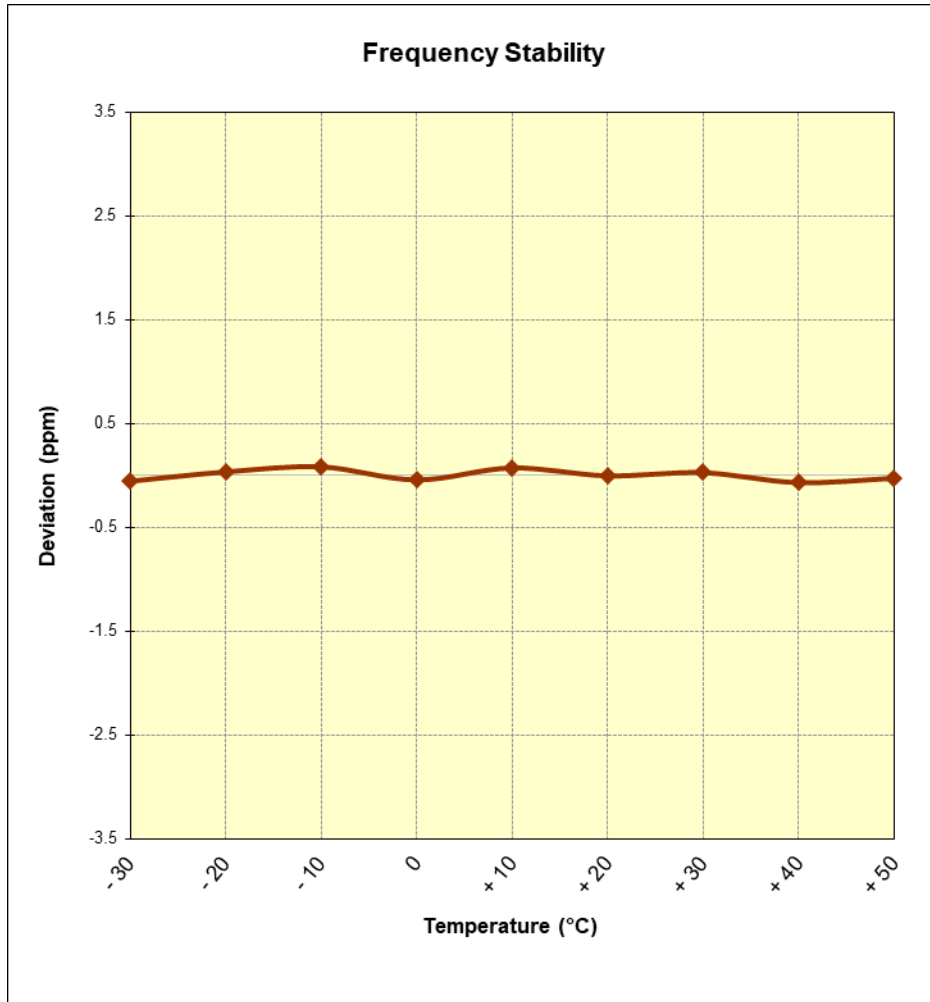
Table 7-8. Frequency Stability Data (Band 48)

### 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: ZNFG850UM                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                     | EUT Type:<br>Portable Handset         | Page 44 of 51                                                                         |                                 |

## Band 48 Frequency Stability Measurements



**Figure 7-6. Frequency Stability Graph (Band 48)**

|                                                   |                                                                                     |                                               |                                                                                       |                                        |
|---------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> ZNFG850UM                          |  | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1907250129-05-R3.ZNF | <b>Test Dates:</b><br>7/26 - 8/16/2019                                              | <b>EUT Type:</b><br>Portable Handset          |                                                                                       | Page 45 of 51                          |

## 7.8 End User Device Additional Requirement (CBSD Protocol)

### §96.47

#### Test Overview and Limit

End user device additional requirements (CBSD Protocol) are tested per the test procedures listed below. During testing, the EUT is connected to a certified CBSD (Ruckus FCC ID: S9GQ910US00) as a companion device to show compliance with Part 96.47.

***End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.***

***An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.***

#### Test Procedure Used

KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0.

#### Test Setup/Method

The EUT was connected via an RF cable to a certified CBSD and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

1. Run#1:
  - a. Setup WINNF.PT.C.HBT.1 with 3610MHz – 3620MHz.
  - b. Enable AP service from Ruckus Cloud management.
  - c. Check EUT Tx frequency.
  - d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
  - a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz.
  - b. Enable AP service from Ruckus Cloud management.
  - c. Check EUT Tx frequency.
  - d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

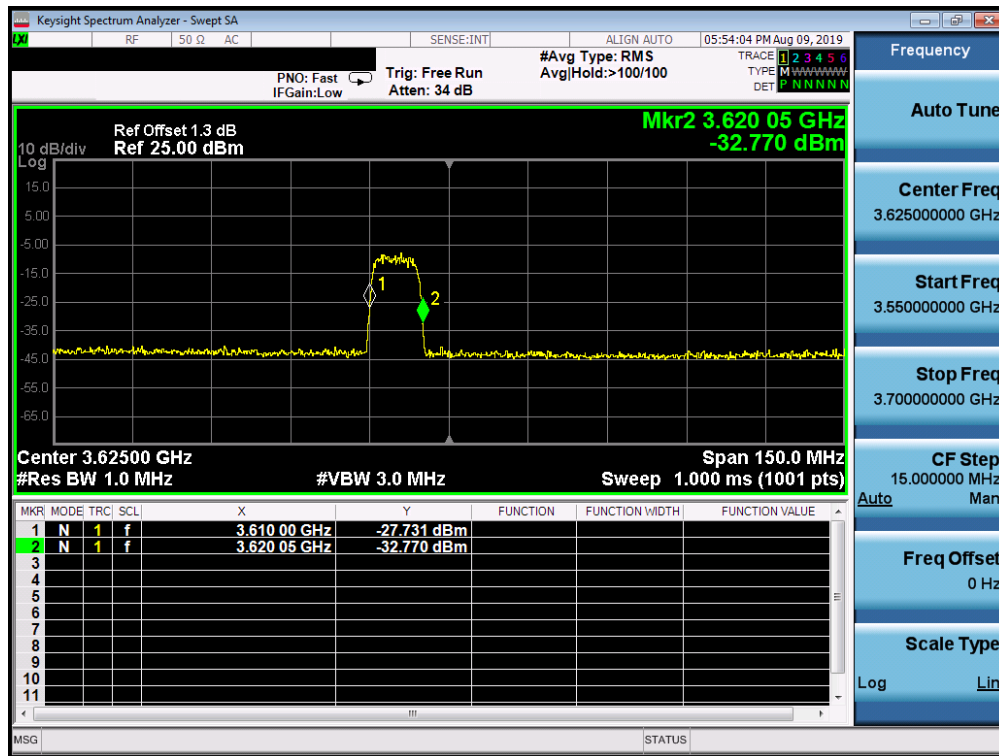
#### Test Notes

The EUT is an End User Device.

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                     | EUT Type:<br>Portable Handset         |                                                                                       | Page 46 of 51                   |

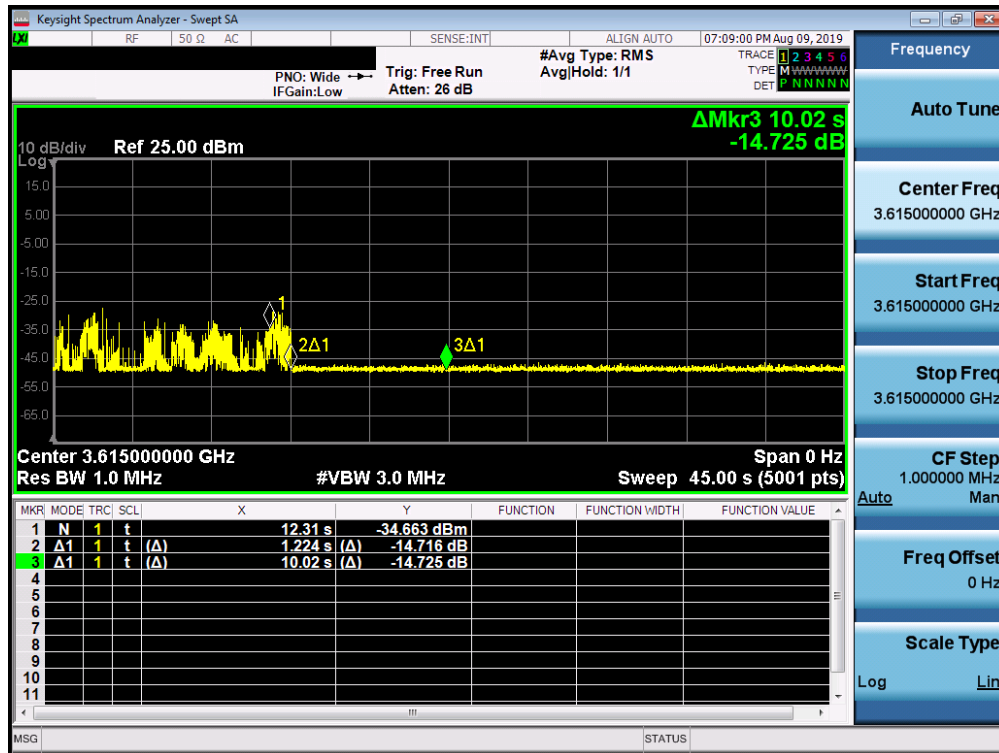
## Run#1:

- Tx frequency set: 3610 – 3620MHz.



Plot 7-43. Run#1 End User Device Frequency of Operations

|                                            |                                              |                               |                                        |
|--------------------------------------------|----------------------------------------------|-------------------------------|----------------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT</b><br>(CERTIFICATION) |                               | <b>Approved by:</b><br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019              | EUT Type:<br>Portable Handset |                                        |
|                                            |                                              |                               | Page 47 of 51                          |



Plot 7-44. Run#1 End User Device Discontinues Operations within 10s

### Note:

Marker 1: CBSD sends instructions to discontinue LTE operations.

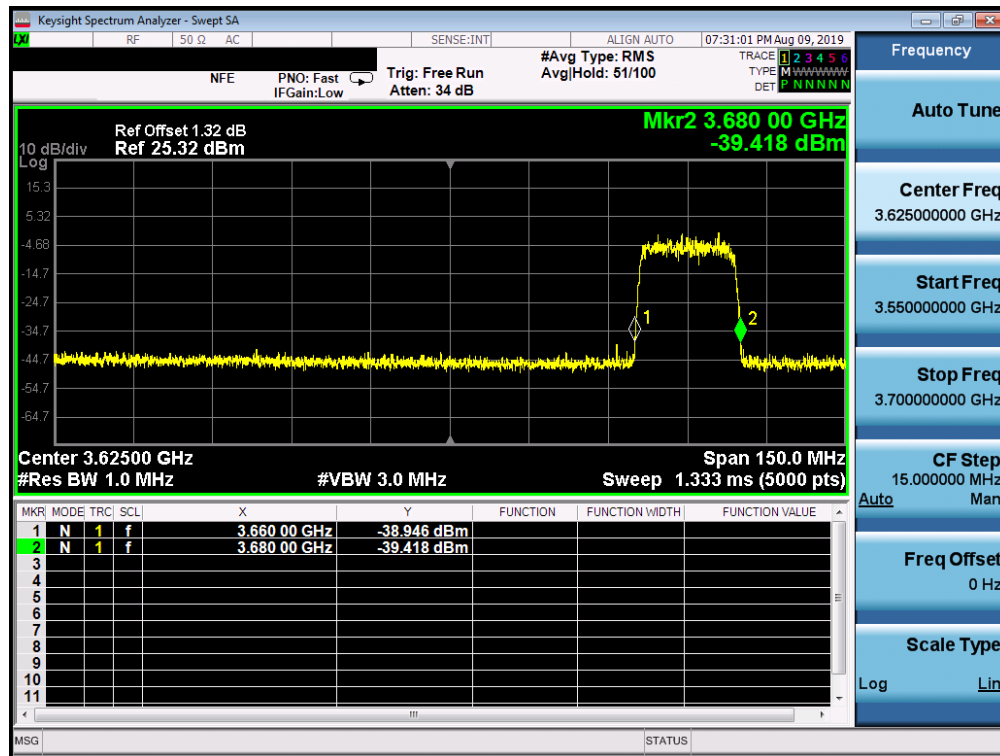
Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

|                                            |                                               |                               |                                 |
|--------------------------------------------|-----------------------------------------------|-------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |                               | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019               | EUT Type:<br>Portable Handset |                                 |
|                                            |                                               |                               | Page 48 of 51                   |

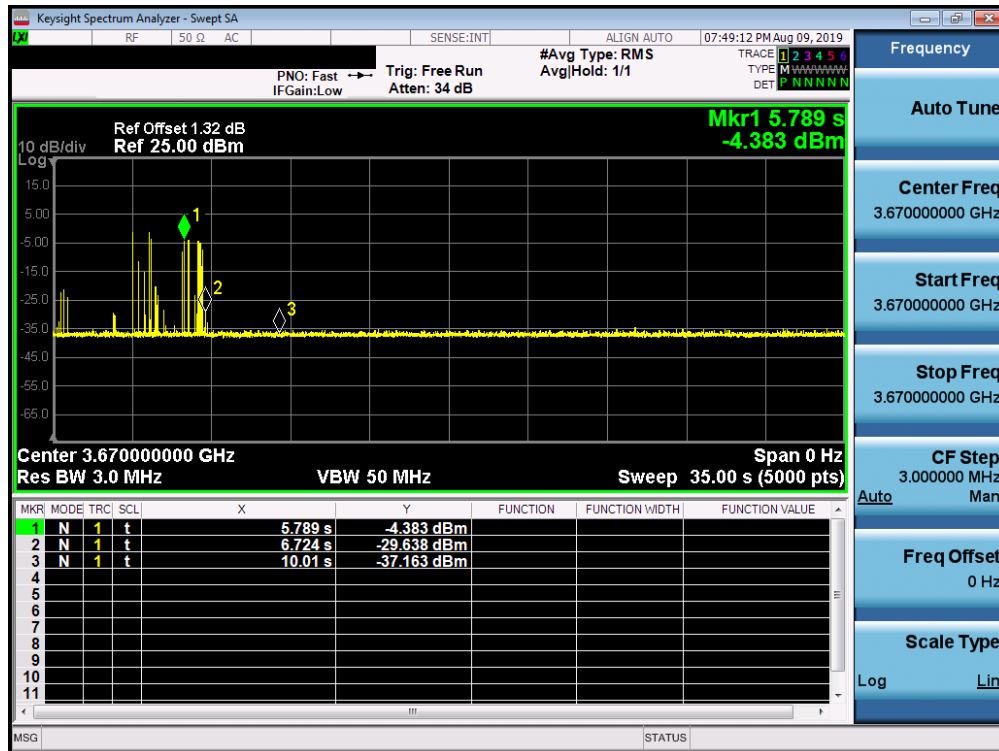
## Run#2:

- Tx frequency set: 3660 – 3680MHz.



Plot 7-45. Run#2 End User Device Frequency of Operations

|                                            |                                           |                               |                                 |
|--------------------------------------------|-------------------------------------------|-------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT (CERTIFICATION)</b> |                               | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019           | EUT Type:<br>Portable Handset |                                 |
|                                            |                                           |                               | Page 49 of 51                   |



Plot 7-46. Run#2 End User Device Discontinues Operations within 10s

**Note:**

Marker 1: CBSD sends instructions to discontinue LTE operations.

Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

|                                            |                                           |                               |                                 |
|--------------------------------------------|-------------------------------------------|-------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          | <b>MEASUREMENT REPORT (CERTIFICATION)</b> |                               | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019           | EUT Type:<br>Portable Handset | Page 50 of 51                   |

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFG850UM** complies with all of the End User Device requirements of Part 96 of the FCC Rules.

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFG850UM                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1907250129-05-R3.ZNF | Test Dates:<br>7/26 - 8/16/2019                                                     | EUT Type:<br>Portable Handset         |                                                                                       | Page 51 of 51                   |