



# PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA  
Tel. 410.290.6652 / Fax 410.290.6654  
<http://www.pctest.com>



## MEASUREMENT REPORT FCC PART 15.247 Bluetooth

**Applicant Name:**  
LG Electronics USA, Inc.  
1000 Sylvan Avenue  
Englewood Cliffs, NJ 07632  
United States

**Date of Testing:**  
3/21/2019-5/3/2019  
**Test Site/Location:**  
PCTEST Lab. Columbia, MD, USA  
**Test Report Serial No.:**  
1M1903070034-06-R1.ZNF

|                   |                                 |
|-------------------|---------------------------------|
| <b>FCC ID:</b>    | <b>ZNFV450VM</b>                |
| <b>APPLICANT:</b> | <b>LG Electronics USA, Inc.</b> |

|                                    |   |
|------------------------------------|---|
| <b>Application Type:</b>           | Class II Permissive Change                    |
| <b>Additional Model(s):</b>        | LMV450VM, V450VM                              |
| <b>Model:</b>                      | LM-V450VM                                     |
| <b>EUT Type:</b>                   | Portable Handset                              |
| <b>Frequency Range:</b>            | 2402 – 2480MHz                                |
| <b>Type of Modulation:</b>         | GFSK, $\pi/4$ -DQPSK, 8DPSK                   |
| <b>FCC Classification:</b>         | FCC Part 15 Spread Spectrum Transmitter (DSS) |
| <b>FCC Rule Part(s):</b>           | Part 15 Subpart C (15.247)                    |
| <b>Test Procedure(s):</b>          | ANSI C63.10-2013, KDB 648474 D03 v01r04       |
| <b>Class II Permissive Change:</b> | Please see FCC change document                |

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 ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M1903070034-06-R1.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.

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

Randy Ortanez  
President



|   |  |  |              |  |
|---|--|--|--------------|--|
| <b>FCC ID:</b> ZNFV450VM                          |  | <b>MEASUREMENT REPORT<br/>(Class II Permissive Change)</b> |              | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019 | <b>EUT Type:</b><br>Portable Handset                       | Page 1 of 22 |  |

## TABLE OF CONTENTS

|     |   |    |
|-----|---|----|
| 1.0 | INTRODUCTION .....  | 3  |
| 1.1 | Scope .....   | 3  |
| 1.2 | PCTEST Test Location .....                                  | 3  |
| 1.3 | Test Facility / Accreditations .....                        | 3  |
| 2.0 | PRODUCT INFORMATION .....                                   | 4  |
| 2.1 | Equipment Description .....                                 | 4  |
| 2.2 | Device Capabilities .....                                   | 4  |
| 2.3 | Test Configuration .....                                    | 4  |
| 2.4 | EMI Suppression Device(s)/Modifications .....               | 4  |
| 3.0 | DESCRIPTION OF TESTS .....                                  | 5  |
| 3.1 | Evaluation Procedure .....                                  | 5  |
| 3.2 | Radiated Emissions .....                                    | 5  |
| 3.3 | Environmental Conditions .....                              | 5  |
| 4.0 | ANTENNA REQUIREMENTS .....                                  | 6  |
| 5.0 | MEASUREMENT UNCERTAINTY .....                               | 7  |
| 6.0 | TEST EQUIPMENT CALIBRATION DATA .....                       | 8  |
| 7.0 | TEST RESULTS .....  | 9  |
| 7.1 | Summary .....   | 9  |
| 7.2 | Radiated Spurious Emission Measurements – Above 1GHz .....  | 10 |
| 7.3 | Radiated Restricted Band Edge Measurements .....            | 17 |
| 7.4 | Radiated Spurious Emissions Measurements – Below 1GHz ..... | 18 |
| 8.0 | CONCLUSION .....  | 22 |

|   |   |   |   |  |
|---|---|---|---|--|
| <b>FCC ID:</b> ZNFV450VM                          |  | <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset                      | Page 2 of 22  |  |

# 1.0 INTRODUCTION

## 1.1 Scope

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

## 1.2 PCTEST Test Location

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

## 1.3 Test Facility / Accreditations

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

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

|   |   |   |   |  |
|---|---|---|---|--|
| FCC ID: ZNFV450VM                                 |  | <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset                      | Page 3 of 22  |  |

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFV450VM**. The test data contained in this report pertains only to the emissions due to the EUT's Bluetooth transmitter.

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
  - A) The hopping sequence is pseudorandom
  - B) All channels are used equally on average
  - C) The receiver input bandwidth equals the transmit bandwidth
  - D) The receiver hops in sequence with the transmit signal
- 15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h): The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

**Test Device Serial No.:** 05862

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ac WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, 5G NR Bands n261/n260

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 00  | 2402            |
| :   | :               |
| 39  | 2441            |
| :   | :               |
| 78  | 2480            |

**Table 2-1. Frequency/ Channel Operations**

**Note:** This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 79 different channels in the 2400 – 2483.5MHz band.

### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was also used to reference the appropriate EUT setup for radiated spurious emissions testing. See Section 3.2 for radiated emissions test setups.

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 lying flat on an authorized wireless charging pad (WCP) FCC ID: EP-N5100 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.

|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      | Page 4 of 22  |                                 |

## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT.

Deviation from measurement procedure.....None

### 3.2 Radiated 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. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

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.

### 3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

|  |   |                               |   |                                 |
|--|---|-------------------------------|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |                               |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset |   | Page 5 of 22                    |

## 4.0 ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antennas of the EUT are **permanently attached**.
- There are no provisions for connection to an external antenna.

**Conclusion:**

The EUT complies with the requirement of §15.203.

|   |   |   |   |  |
|---|---|---|---|--|
| FCC ID: ZNFV450VM                                 |  | <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset                      | Page 6 of 22  |  |

## 5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

|  |  |   |                                 |
|--|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          | <br><b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019  | EUT Type:<br>Portable Handset   | Page 7 of 22                    |

## 6.0 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 |
|-----------------|---------------|--------------------------------------|------------|--------------|------------|---------------|
| -               | WL25-2        | Conducted Cable Set (25GHz)          | 8/23/2018  | Annual       | 8/23/2019  | WL25-2        |
| Anritsu         | MA2411B       | Pulse Power Sensor                   | 7/18/2018  | Annual       | 7/18/2019  | 1339027       |
| Anritsu         | ML2496A       | Power Meter                          | 7/18/2018  | Annual       | 7/18/2019  | 1405003       |
| Agilent         | N9038A        | MXE EMI Receiver                     | 6/11/2018  | Annual       | 6/11/2019  | MY51210133    |
| Com-Power       | AL-130        | 9kHz - 30MHz Loop Antenna            | 10/10/2017 | Biennial     | 10/10/2019 | 121034        |
| 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    | 3816/2NM      | Line Impedance Stabilization Network | 6/18/2018  | Biennial     | 6/18/2020  | 114451        |
| Huber + Suhner  | Sucoflex 102A | 40GHz Radiated Cable Set             | 8/23/2018  | Annual       | 8/23/2019  | 251425001     |
| Pasternack      | NMLC-2        | Line Conducted Emissions Cable (NM)  | 8/23/2018  | Annual       | 8/23/2019  | NMLC-2        |
| Rohde & Schwarz | TC-TA18       | Vivaldi Antenna                      | 8/17/2018  | Biennial     | 8/17/2020  | 101072        |
| Rohde & Schwarz | SFUNIT-Rx     | Shielded Filter Unit                 | 6/18/2018  | Annual       | 6/18/2019  | 102134        |
| Rohde & Schwarz | FSW67         | Signal / Spectrum Analyzer           | 8/17/2018  | Annual       | 8/17/2019  | 103200        |
| Rohde & Schwarz | ESU26         | EMI Test Receiver (26.5GHz)          | 5/21/2018  | Annual       | 5/21/2019  | 100342        |
| Rohde & Schwarz | ESU40         | EMI Test Receiver (40GHz)            | 8/9/2018   | Annual       | 8/9/2019   | 100348        |
| Rohde & Schwarz | TS-PR26       | 18-26.5 GHz Pre-Amplifier            | 9/19/2018  | Annual       | 9/19/2019  | 100040        |
| Sunol           | JB5           | Bi-Log Antenna (30M - 5GHz)          | 4/19/2018  | Biennial     | 4/19/2020  | A051107       |
| Sunol           | DRH-118       | Horn Antenna (1-18GHz)               | 8/11/2017  | Biennial     | 8/11/2019  | A050307       |

**Table 6-1. Annual Test Equipment Calibration Schedule**

**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.

|  |   |   |   |                                 |
|--|---|---|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                             | Page 8 of 22  |                                 |

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: LG Electronics USA, Inc.  
 FCC ID: ZNFV450VM  
 Method/System: Frequency Hopping Spread Spectrum (FHSS)  
 Number of Channels: 79

| FCC Part Section(s) | RSS Section(s) | Test Description  | Test Limit  | Test Condition | Test Result | Reference                             |
|---------------------|----------------|---|---|----------------|-------------|---------------------------------------|
| 15.205<br>15.209    | RSS-Gen [8.9]  | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-247 limits) | RADIATED       | PASS        | Section 7.2, Section 7.3, Section 7.4 |

**Table 7-1. Summary of Test Results**

**Notes:**

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

|   |   |                                      |   |  |
|---|---|--------------------------------------|---|--|
| FCC ID: ZNFV450VM                                 |  <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |                                      |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset | Page 9 of 22  |  |

## 7.2 Radiated Spurious Emission Measurements – Above 1GHz

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

### Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

***All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-2 per Section 15.209 and RSS-Gen (8.9).***

| Frequency       | Field Strength<br>[ $\mu\text{V/m}$ ] | Measured Distance<br>[Meters] |
|-----------------|---------------------------------------|-------------------------------|
| Above 960.0 MHz | 500                                   | 3                             |

Table 7-2. Radiated Limits

### Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

### Test Settings

#### Average Field Strength Measurements per Section 4.1.4.2.3 of ANSI C63.10-2013

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 1kHz  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds
4. Averaging type was set to RMS to ensure that video filtering was applied in the power domain
5. Detector = peak
6. Sweep time = auto
7. Trace mode = max hold
8. Trace was allowed to stabilize

#### Peak Field Strength Measurements per Section 4.1.4.2.2 of ANSI C63.10-2013

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in Table 7-3 below
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

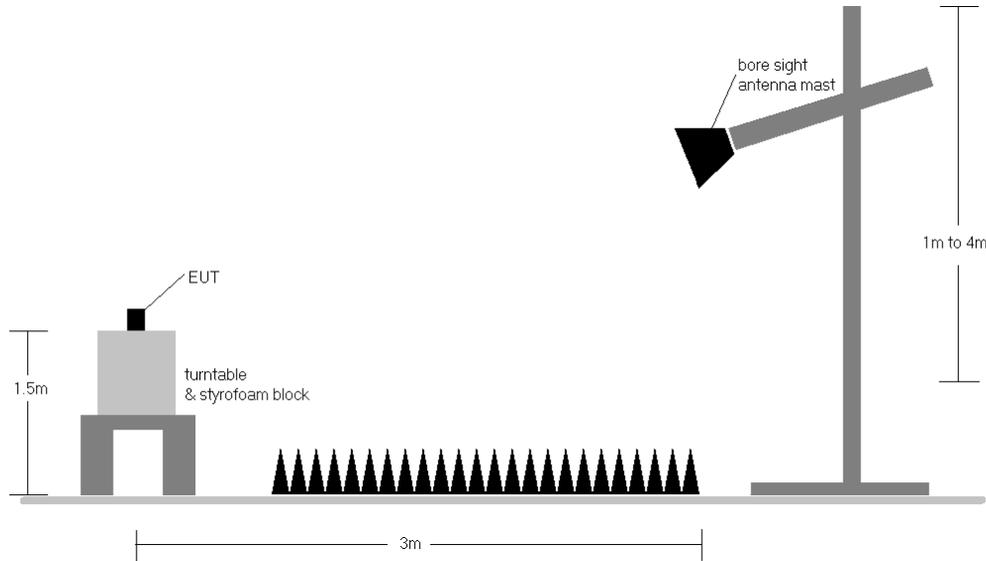
|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      | Page 10 of 22   |                                 |

| Frequency    | RBW          |
|--------------|--------------|
| 9 – 150kHz   | 200 – 300Hz  |
| 0.15 – 30MHz | 9 – 10kHz    |
| 30 – 1000MHz | 100 – 120kHz |
| > 1000MHz    | 1MHz         |

**Table 7-3. RBW as a Function of Frequency**

**Test Setup**

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



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

**Test Notes**

1. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-2.
2. No significant radiated emissions were found in the 2310 - 2390MHz restricted band.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10<sup>th</sup> harmonic and the worst-case emissions are reported.
6. The duty cycle correction factor was not applied to noise floor measurements.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      | Page 11 of 22   |                                 |

**Sample Calculation**

- Field Strength Level  $_{[dB\mu V/m]} = \text{Analyzer Level }_{[dBm]} + 107 + \text{AFCL }_{[dB/m]} + \text{Duty Cycle Correction }_{[dB]}$
- $\text{AFCL }_{[dB/m]} = \text{Antenna Factor }_{[dB/m]} + \text{Cable Loss }_{[dB]}$
- $\text{Margin }_{[dB]} = \text{Field Strength Level }_{[dB\mu V/m]} - \text{Limit }_{[dB\mu V/m]}$

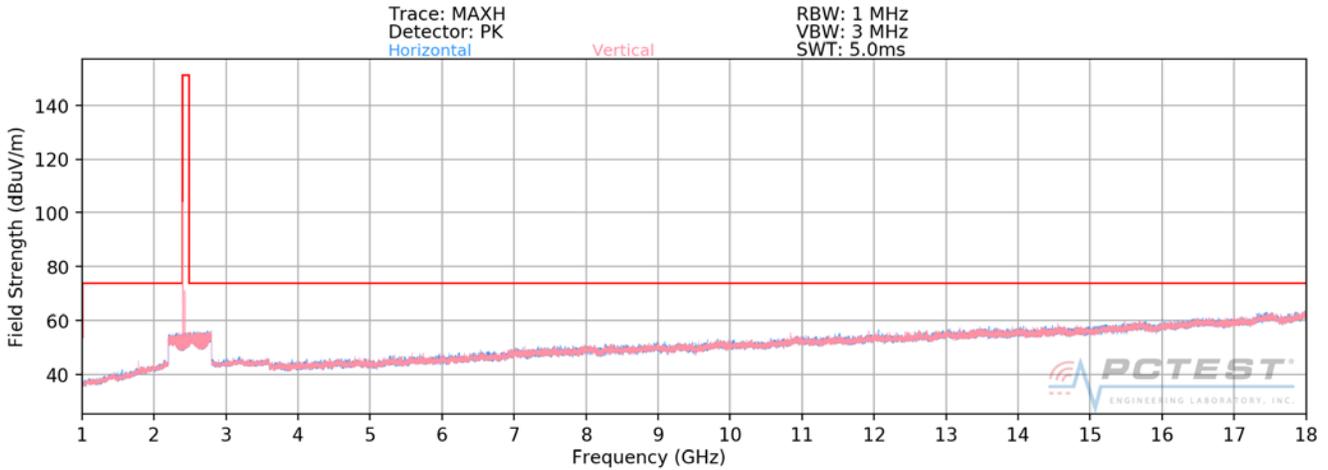
**Duty Cycle Correction Factor Calculation**

- Channel hop rate = 800 hops/second (AFH Mode)
- Adjusted channel hop rate for DH5 mode = 133.33 hops/second
- Time per channel hop =  $1 / 133.33 \text{ hops/second} = 7.50 \text{ ms}$
- Time to cycle through all channels =  $7.50 \times 20 \text{ channels} = 150 \text{ ms}$
- Number of times transmitter hits on one channel =  $100 \text{ ms} / 150 \text{ ms} = 1 \text{ time(s)}$
- Worst case dwell time = 7.5 ms
- Duty cycle correction factor =  $20\log_{10}(7.5\text{ms}/100\text{ms}) = -22.5 \text{ dB}$

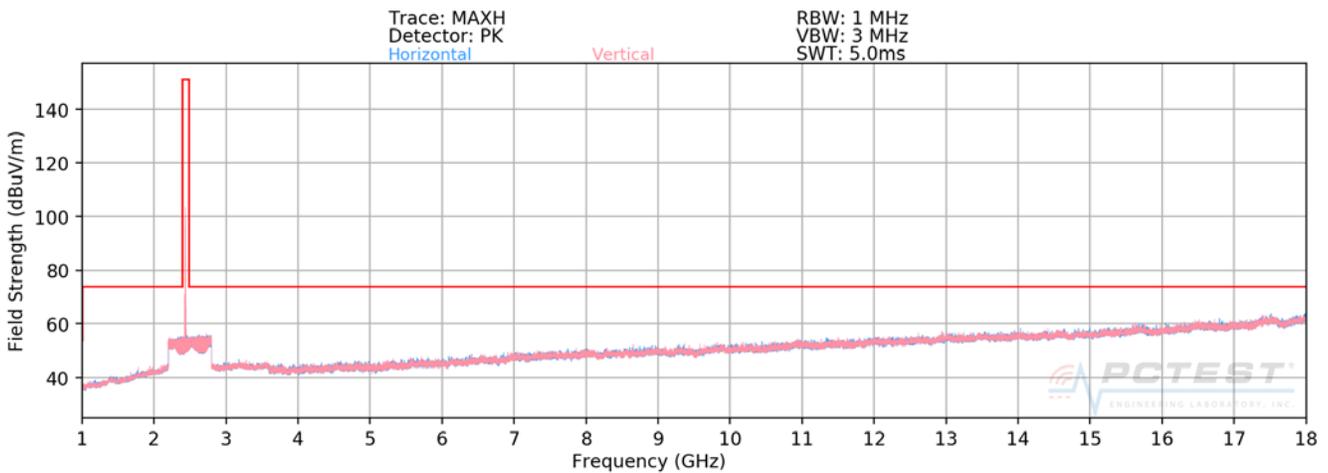
|   |   |                                      |  |
|---|---|--------------------------------------|--|
| FCC ID: ZNFV450VM                                 |  <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |                                      |  <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset | Page 12 of 22  |

## Radiated Spurious Emission Measurements

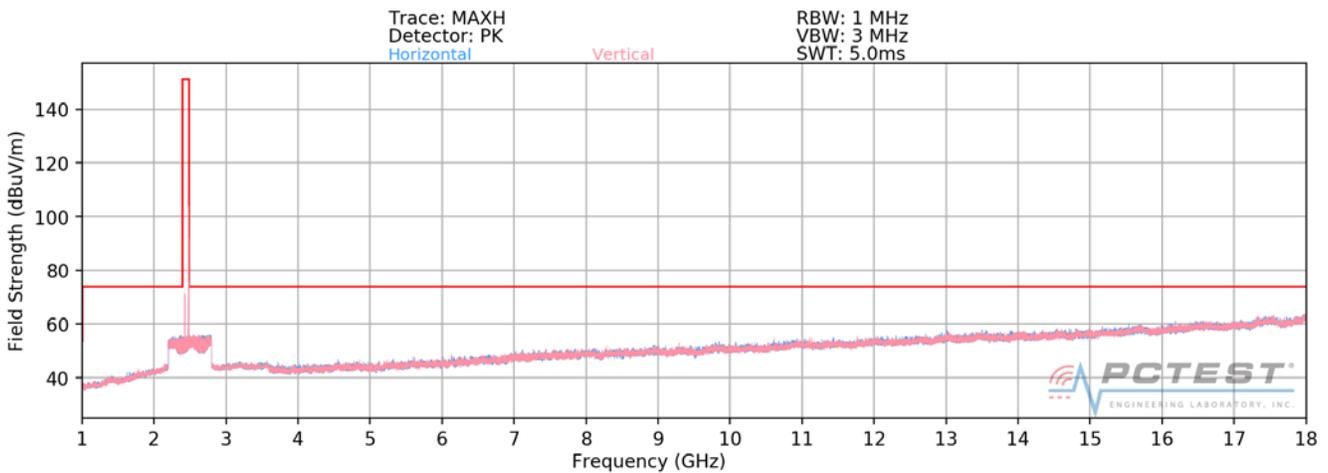
§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]



**Plot 7-1. Radiated Spurious Plot above 1GHz (BT- Ch. 0)**



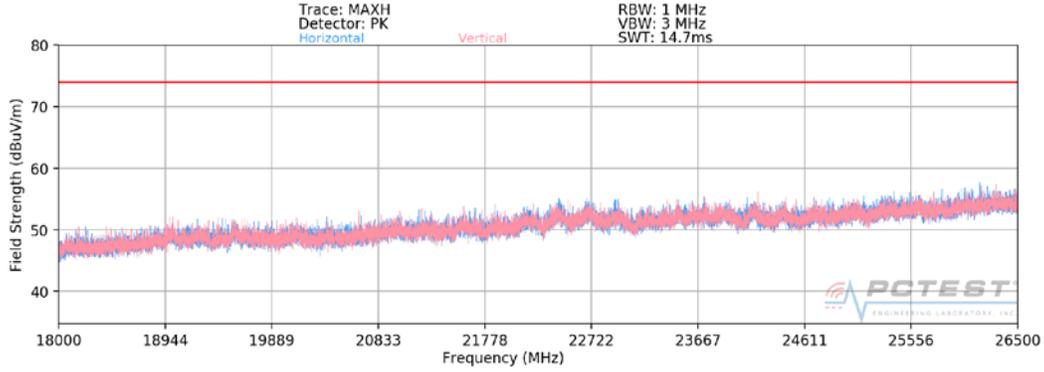
**Plot 7-2. Radiated Spurious Plot above 1GHz (BT- Ch. 39)**



**Plot 7-3. Radiated Spurious Plot above 1GHz (BT- Ch. 78)**

|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      |   | Page 13 of 22                   |

**Radiated Spurious Emissions Measurements (Above 18GHz)**  
**§15.209; RSS-Gen [8.9]**



**Plot 7-4. Radiated Spurious Plot above 18GHz**

|   |   |  |  |
|---|---|--|--|
| <p>FCC ID: ZNFV450VM</p>                                  | <p align="center"><b>MEASUREMENT REPORT</b><br/><b>(Class II Permissive Change)</b></p> |  | <p><b>Approved by:</b><br/>Quality Manager</p> |
| <p><b>Test Report S/N:</b><br/>1M1903070034-06-R1.ZNF</p> | <p><b>Test Dates:</b><br/>3/21/2019-5/3/2019</p>  | <p><b>EUT Type:</b><br/>Portable Handset</p> | <p>Page 14 of 22</p>                           |

## Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 1 Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2402MHz  
 Channel: 0

| Frequency [MHz] | Detector | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|-----------------|----------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|----------------|-------------|
| 4804.00         | Avg      | H               | -                   | -                          | -80.01               | 3.31        | 30.30                   | 53.98          | -23.68      |
| 4804.00         | Peak     | H               | -                   | -                          | -67.27               | 3.31        | 43.04                   | 73.98          | -30.94      |
| 12010.00        | Avg      | H               | -                   | -                          | -72.30               | 15.35       | 50.05                   | 53.98          | -3.93       |
| 12010.00        | Peak     | H               | -                   | -                          | -71.45               | 15.35       | 50.90                   | 73.98          | -23.08      |

Table 7-4. Radiated Measurements

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 1 Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2441MHz  
 Channel: 39

| Frequency [MHz] | Detector | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|-----------------|----------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|----------------|-------------|
| 4882.00         | Avg      | H               | -                   | -                          | -79.89               | 3.68        | 30.79                   | 53.98          | -23.19      |
| 4882.00         | Peak     | H               | -                   | -                          | -67.42               | 3.68        | 43.26                   | 73.98          | -30.72      |
| 7323.00         | Avg      | H               | -                   | -                          | -81.70               | 8.76        | 34.06                   | 53.98          | -19.92      |
| 7323.00         | Peak     | H               | -                   | -                          | -69.49               | 8.76        | 46.27                   | 73.98          | -27.71      |
| 12205.00        | Avg      | H               | -                   | -                          | -84.14               | 15.14       | 38.00                   | 53.98          | -15.97      |
| 12205.00        | Peak     | H               | -                   | -                          | -72.04               | 15.14       | 50.10                   | 73.98          | -23.87      |

Table 7-5. Radiated Measurements

|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      | Page 15 of 22   |                                 |

## Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 1 Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2480MHz  
 Channel: 78

| Frequency [MHz] | Detector | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|-----------------|----------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|----------------|-------------|
| 4960.00         | Avg      | H               | -                   | -                          | -79.64               | 3.76        | 31.12                   | 53.98          | -22.86      |
| 4960.00         | Peak     | H               | -                   | -                          | -66.46               | 3.76        | 44.30                   | 73.98          | -29.68      |
| 7440.00         | Avg      | H               | -                   | -                          | -80.83               | 8.57        | 34.74                   | 53.98          | -19.24      |
| 7440.00         | Peak     | H               | -                   | -                          | -68.28               | 8.57        | 47.29                   | 73.98          | -26.69      |
| 12400.00        | Avg      | H               | -                   | -                          | -83.77               | 15.31       | 38.54                   | 53.98          | -15.43      |
| 12400.00        | Peak     | H               | -                   | -                          | -71.17               | 15.31       | 51.14                   | 73.98          | -22.83      |

Table 7-6. Radiated Measurements

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 1 Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2480MHz  
 Channel: 78

| Frequency [MHz] | Detector | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|-----------------|----------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|----------------|-------------|
| 4960.00         | Avg      | H               | -                   | -                          | -80.13               | 3.76        | 30.63                   | 53.98          | -23.35      |
| 4960.00         | Peak     | H               | -                   | -                          | -66.86               | 3.76        | 43.90                   | 73.98          | -30.08      |
| 7440.00         | Avg      | H               | -                   | -                          | -81.50               | 8.57        | 34.07                   | 53.98          | -19.91      |
| 7440.00         | Peak     | H               | -                   | -                          | -68.73               | 8.57        | 46.84                   | 73.98          | -27.14      |
| 12400.00        | Avg      | H               | -                   | -                          | -84.24               | 15.31       | 38.07                   | 53.98          | -15.90      |
| 12400.00        | Peak     | H               | -                   | -                          | -71.74               | 15.31       | 50.57                   | 73.98          | -23.40      |

Table 7-7. Radiated Measurements with WCP

|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      | Page 16 of 22   |                                 |

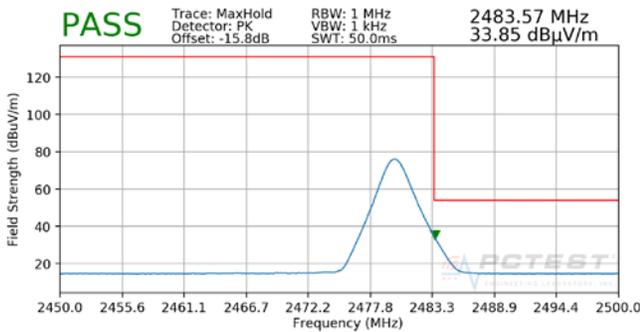
### 7.3 Radiated Restricted Band Edge Measurements §15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting. Two different amplitude offsets were used depending on whether peak or average measurements were measured. The average measurements use a duty cycle correction factor (DCCF).

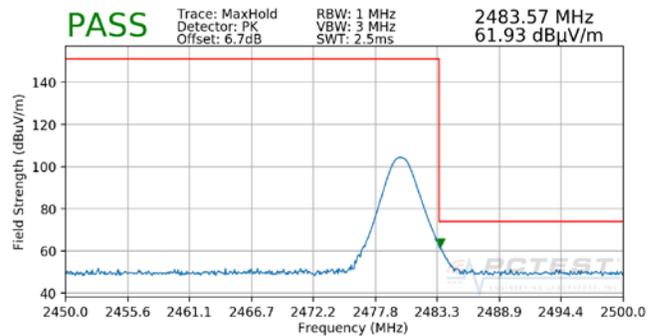
The amplitude offset shown in the following plots for average measurements was calculated using the formula:

$$\text{Offset (dB)} = (\text{Antenna Factor} + \text{Cable Loss} + \text{Attenuator}) - \text{Preamplifier Gain} + \text{DCCF}$$

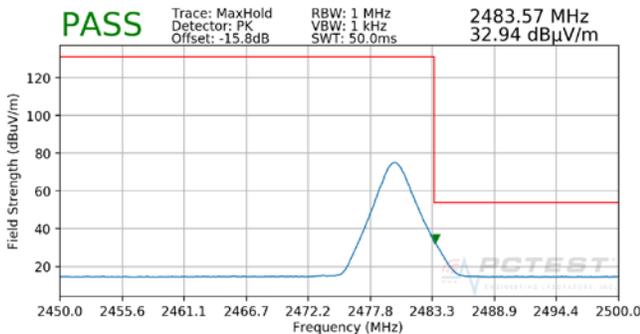
|                       |           |
|-----------------------|-----------|
| Worst Case Mode:      | Bluetooth |
| Worst Case Data Rate: | 1 Mbps    |
| Measurement Distance: | 3 Meters  |
| Operating Frequency:  | 2480MHz   |
| Channel:              | 78        |



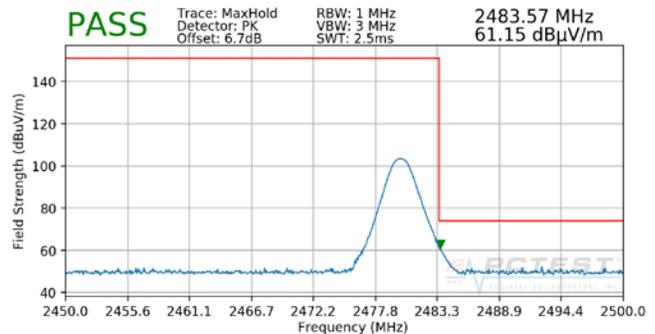
**Plot 7-5. Radiated Restricted Upper Band Edge Measurement (Average)**



**Plot 7-6. Radiated Restricted Upper Band Edge Measurement (Peak)**



**Plot 7-7. Radiated Restricted Upper Band Edge Measurement with WCP (Average)**



**Plot 7-8. Radiated Restricted Upper Band Edge Measurement with WCP (Peak)**

|  |                                     |  |    |                                 |
|--|-------------------------------------|--|----|---------------------------------|
| FCC ID: ZNFV450VM                          | PCTEST ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(Class II Permissive Change) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      |    | Page 17 of 22                   |

## 7.4 Radiated Spurious Emissions Measurements – Below 1GHz §15.209; RSS-Gen [8.9]

### Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

**All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-8 per Section 15.209 and RSS-Gen (8.9).**

| Frequency         | Field Strength<br>[ $\mu\text{V/m}$ ] | Measured Distance<br>[Meters] |
|-------------------|---------------------------------------|-------------------------------|
| 0.009 – 0.490 MHz | 2400/F (kHz)                          | 300                           |
| 0.490 – 1.705 MHz | 24000/F (kHz)                         | 30                            |
| 1.705 – 30.00 MHz | 30                                    | 30                            |
| 30.00 – 88.00 MHz | 100                                   | 3                             |
| 88.00 – 216.0 MHz | 150                                   | 3                             |
| 216.0 – 960.0 MHz | 200                                   | 3                             |
| Above 960.0 MHz   | 500                                   | 3                             |

**Table 7-8. Radiated Limits**

### Test Procedures Used

ANSI C63.10-2013

### Test Settings

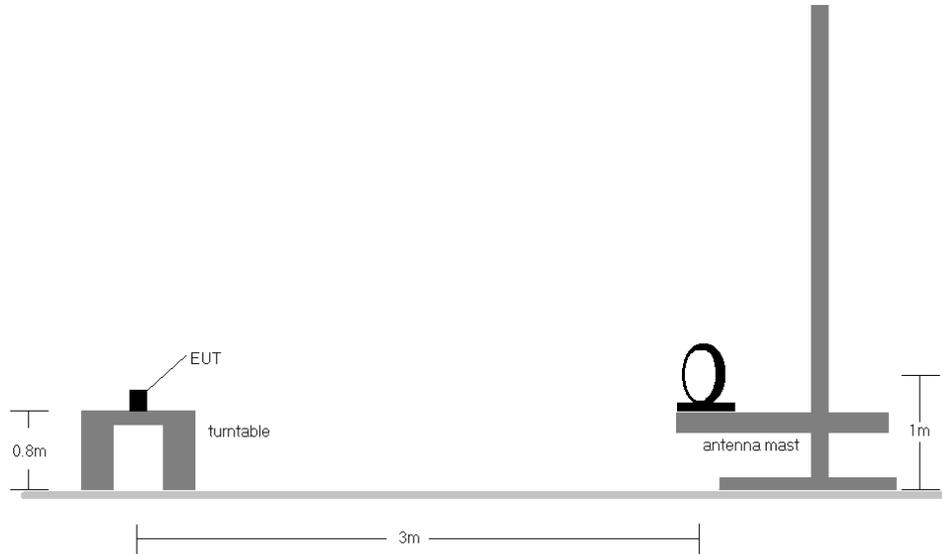
#### Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

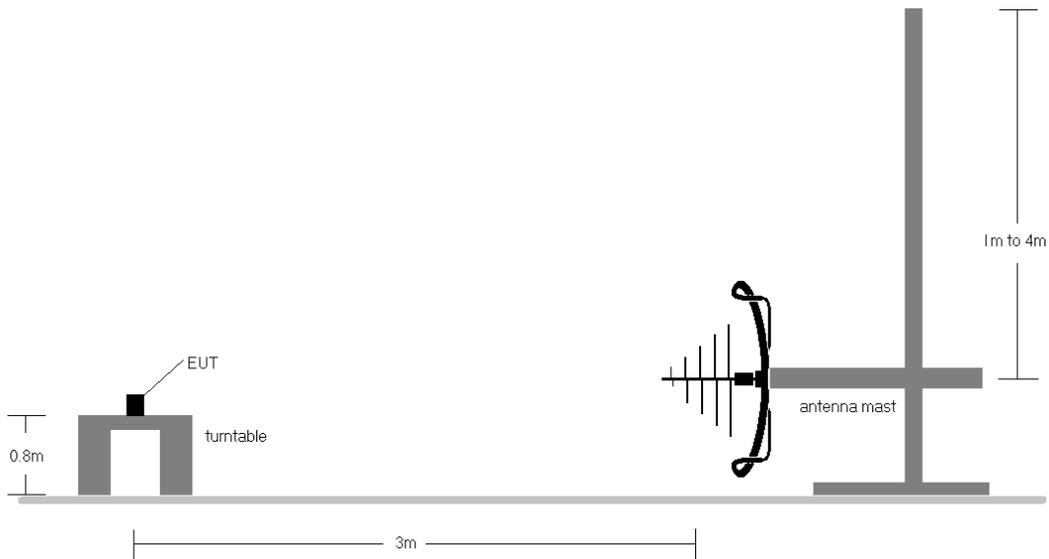
|  |   |  |   |                                 |
|--|---|--|---|---------------------------------|
| FCC ID: ZNFV450VM                          |  | MEASUREMENT REPORT<br>(Class II Permissive Change) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1903070034-06-R1.ZNF | Test Dates:<br>3/21/2019-5/3/2019   | EUT Type:<br>Portable Handset                      | Page 18 of 22   |                                 |

### Test Setup

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



**Figure 7-2. Radiated Test Setup < 30Mhz**



**Figure 7-3. Radiated Test Setup < 1GHz**

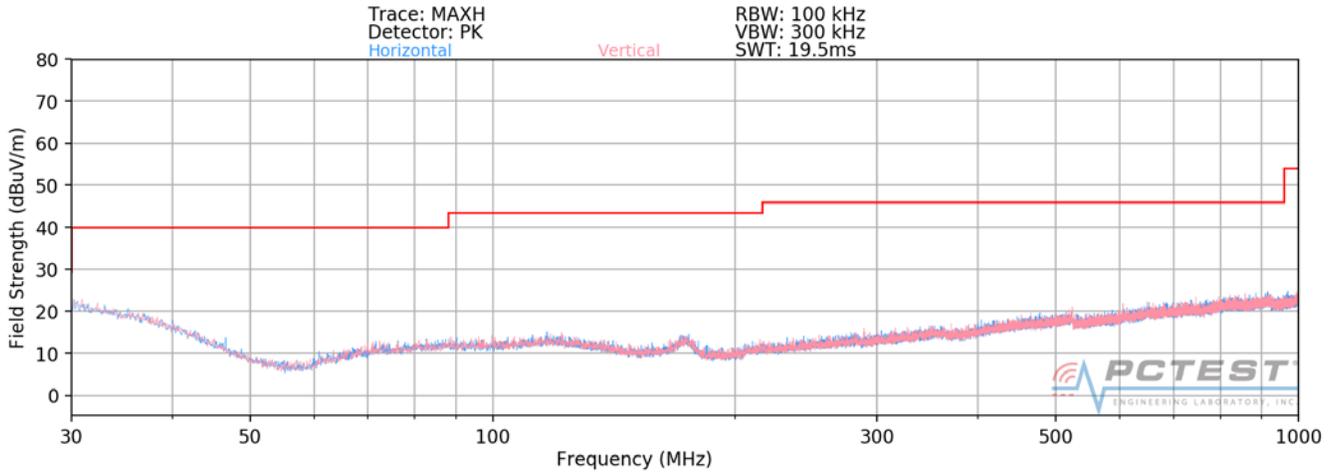
|   |   |   |   |  |
|---|---|---|---|--|
| <b>FCC ID:</b> ZNFV450VM                          |  | <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset                      | Page 19 of 22   |  |

**Test Notes**

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limit shown in Table 7-8.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

|   |   |                                      |  |
|---|---|--------------------------------------|--|
| FCC ID: ZNFV450VM                                 |  <b>MEASUREMENT REPORT</b><br>(Class II Permissive Change) |                                      |  <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019  | <b>EUT Type:</b><br>Portable Handset | Page 20 of 22  |

**Radiated Spurious Emissions Measurements (Below 1GHz)**  
**§15.209; RSS-Gen [8.9]**



**Plot 7-9. Radiated Spurious Plot below 1GHz**

|   |  |  |  |
|---|--|--|--|
| <p>FCC ID: ZNFV450VM</p>                                  | <p><b>MEASUREMENT REPORT</b><br/><b>(Class II Permissive Change)</b></p> |  | <p><b>Approved by:</b><br/>Quality Manager</p> |
| <p><b>Test Report S/N:</b><br/>1M1903070034-06-R1.ZNF</p> | <p><b>Test Dates:</b><br/>3/21/2019-5/3/2019</p>                         | <p><b>EUT Type:</b><br/>Portable Handset</p> | <p>Page 21 of 22</p>                           |

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFV450VM** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.

|   |  |                                      |   |  |
|---|--|--------------------------------------|---|--|
| FCC ID: ZNFV450VM                                 |  <b>MEASUREMENT REPORT<br/>(Class II Permissive Change)</b> |                                      |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1903070034-06-R1.ZNF | <b>Test Dates:</b><br>3/21/2019-5/3/2019   | <b>EUT Type:</b><br>Portable Handset |   | Page 22 of 22                          |