**MEASUREMENT REPORT**  
**FCC PART 15.407 DFS****Applicant Name:**LG Electronics USA, Inc.  
1000 Sylvan Avenue  
Englewood Cliffs, NJ 07632  
United States**Date of Testing:**

10/28 - 11/22/2019

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M1910280174-07-R1.ZNF

**FCC ID:****ZNFL455DL****APPLICANT:****LG Electronics USA, Inc.****Application Type:**

Certification

**Model:**

LG L455DL

**Additional Model(s):**LG-L455DL, LM-K400UM, LM-K400MM, LM-K400QM,  
LM-K400VPP, LM-K400QM5, LM-K400QM6, LGL455DL,  
LMK400UM, LMK400MM, LMK400QM, LMK400QM5, LMK400QM6,  
LMK400VPP, L455DL, K400UM, K400MM, K400QM, K400QM5,  
K400QM6, K400VPP**EUT Type:**

Client Only Device, No Radar Detection Capability

**Max. RF Output Power:**21.979 mW (13.42 dBm) Conducted  
(802.11a UNII Band 2C)**Frequency Range:**

5500 – 5720 MHz (UNII-2C Band)

**FCC Classification:**

Unlicensed National Information Infrastructure (UNII)

**FCC Rule Part(s):**

Part 15.407(UNII)

**Test Procedure(s):**

KDB 905462 D02 v02

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 KDB 905462 D02 v02 Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz Bands Incorporating Dynamic Frequency Selection. Test results reported herein relate only to the item(s) tested.

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

Note: This revised Test Report (S/N: 1M1910280174-07-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.

  
Randy Ortanez  
President

|                                                   |                                                                                     |                                              |                                                                                       |                                        |
|---------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> ZNFL455DL                          |  | <b>MEASUREMENT REPORT</b><br>(CERTIFICATION) |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1910280174-07-R1.ZNF | <b>Test Dates:</b><br>10/28 - 11/22/2019                                            | <b>EUT Type:</b><br>Portable Handset         |                                                                                       | Page 1 of 20                           |

## 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 | EUT Capabilities .....                                | 4  |
| 2.3 | Modifications .....                                   | 5  |
| 3.0 | Antenna requirements .....                            | 6  |
| 4.0 | TEST EQUIPMENT .....                                  | 7  |
| 5.0 | DESCRIPTION OF DYNAMIC FREQUENCY SELECTION TEST ..... | 8  |
| 5.1 | Applicability .....                                   | 8  |
| 5.2 | Requirements .....                                    | 9  |
| 5.3 | DFS Detection Threshold Values .....                  | 10 |
| 5.4 | DFS Response Requirements .....                       | 10 |
| 5.5 | Parameters of DFS Test Signals .....                  | 11 |
| 5.6 | Procedure .....                                       | 12 |
| 5.7 | System Calibration: .....                             | 13 |
| 6.0 | EUT TEST SETUP .....                                  | 15 |
| 7.0 | TEST RESULTS .....                                    | 16 |
| 7.1 | Summary .....                                         | 16 |
| 7.2 | Channel Loading .....                                 | 17 |
| 7.3 | Channel Move/ Closing Transmission Time .....         | 18 |
| 7.4 | Non-Occupancy Period .....                            | 19 |
| 8.0 | CONCLUSION .....                                      | 20 |

|                                                   |                                                                                     |                                               |                                                                                       |                                        |
|---------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> ZNFL455DL                          |  | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1910280174-07-R1.ZNF | <b>Test Dates:</b><br>10/28 - 11/22/2019                                            | <b>EUT Type:</b><br>Portable Handset          |                                                                                       | Page 2 of 20                           |

## 1.0 INTRODUCTION

### 1.1 Scope

This report has been prepared to demonstrate compliance with the requirements for Dynamic Frequency Selection (DFS) as stated in KDB 905462 D02 v02. Testing was performed on the **LG Portable Handset FCC ID: ZNFL455DL**. As of July 20, 2007 all devices operating in the 5250 – 5350 MHz and/or the 5470 – 5725 MHz bands must comply with the DFS requirements. As the EUT does not have radar detection capability it was evaluated as a Client Only Device. All test results reported herein are applicable to the sample selected for testing. The unit used for testing was supplied by LG Electronics USA, Inc.

### 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 and KDB 414788 D01 v01.

### 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 2041.02 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.

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         |                                                                                       | Page 3 of 20                    |

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFL455DL**.

**Mode of Operation:**

|                                    |                                     |
|------------------------------------|-------------------------------------|
| Master Device                      | <input type="checkbox"/>            |
| Client Device (No radar detection) | <input checked="" type="checkbox"/> |
| Client Device with Radar Detection | <input type="checkbox"/>            |

Test Device Serial No.: 00392

### 2.2 EUT Capabilities

This device contains the following capabilities:

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

#### Band 2A

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 52  | 5260            |
| :   | :               |
| 56  | 5280            |
| :   | :               |
| 64  | 5320            |

#### Band 2C

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 100 | 5500            |
| :   | :               |
| 116 | 5580            |
| :   | :               |
| 144 | 5720            |

Table 2-1. 802.11a / 802.11n / 802.11ac (20MHz) Frequency / Channel Operations

#### Band 2A

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 54  | 5270            |
| :   | :               |
| 62  | 5310            |

#### Band 2C

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 102 | 5510            |
| :   | :               |
| 110 | 5550            |
| :   | :               |
| 142 | 5710            |

Table 2-2. 802.11n / 802.11ac (40MHz BW) Frequency / Channel Operations

#### Band 2A

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 58  | 5290            |

#### Band 2C

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 106 | 5530            |
| :   | :               |
| 138 | 5690            |

Table 2-3. 802.11ac (80MHz BW) Frequency / Channel Operations

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         |                                                                                       | Page 4 of 20                    |

## 2.3 Modifications

No modifications to the EUT were required in order to comply with the DFS specifications.

|                                            |                                                                                     |                                       |  |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|--|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         |  |                                                                                       | Page 5 of 20                    |

### 3.0 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: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         |                                                                                       | Page 6 of 20                    |

## 4.0 TEST EQUIPMENT

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

| Manufacturer | Model     | Description        | Cal Date  | Cal Interval | Cal Due   | Serial Number |
|--------------|-----------|--------------------|-----------|--------------|-----------|---------------|
| Agilent      | N9038A    | MXE EMI Receiver   | 7/11/2019 | Annual       | 7/11/2020 | MY51210133    |
| Aeroflex     | PXI 82531 | PXI RF Synthesizer | 2/18/2019 | Biennial     | 2/18/2021 | 1082329       |

**Table 4-1. Annual Test Equipment Calibration Schedule**

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         |                                                                                       | Page 7 of 20                    |

## 5.0 DESCRIPTION OF DYNAMIC FREQUENCY SELECTION TEST

### 5.1 Applicability

The following table from KDB 905462 D02 v02 lists the applicable requirements for the DFS testing. The device evaluated in this report is considered a client device without radar detection capability.

| Requirement                     | Operational Mode |                                |                             |
|---------------------------------|------------------|--------------------------------|-----------------------------|
|                                 | Master           | Client Without Radar Detection | Client With Radar Detection |
| Non-Occupancy Period            | Yes              | Not required                   | Yes                         |
| DFS Detection Threshold         | Yes              | Not required                   | Yes                         |
| Channel Availability Check Time | Yes              | Not required                   | Not required                |
| U-NII Detection Bandwidth       | Yes              | Not required                   | Yes                         |

Table 5-1. DFS Applicability

| Requirement                       | Operational Mode |                                |                             |
|-----------------------------------|------------------|--------------------------------|-----------------------------|
|                                   | Master           | Client Without Radar Detection | Client With Radar Detection |
| DFS Detection Threshold           | Yes              | Not required                   | Yes                         |
| Channel Closing Transmission Time | Yes              | Yes                            | Yes                         |
| Channel Move Time                 | Yes              | Yes                            | Yes                         |
| U-NII Detection Bandwidth         | Yes              | Not required                   | Yes                         |

Table 5-2. DFS Applicability During Normal Operation

| Additional requirements for devices with multiple bandwidth modes                                                                                                                                                                                                                                                                                            | Master Device or Client with Radar Detection | Client without Radar Detection                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|
| U-NII Detection Bandwidth and Statistical Performance Check                                                                                                                                                                                                                                                                                                  | All BW modes must be tested                  | Not required                                         |
| Channel Move Time and Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                      | Test using widest BW mode available          | Test using the widest BW mode available for the link |
| All other tests                                                                                                                                                                                                                                                                                                                                              | Any single BW mode                           | Not required                                         |
| <b>Note:</b> Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency. |                                              |                                                      |

Table 5-3. Additional Requirement for Devices with Multiple Bandwidth Modes

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         |                                                                                       | Page 8 of 20                    |



## 5.2 Requirements

Per KDB 905462 D02 v02 the following are the requirements for Client Devices:

- a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
- b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.
- c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.
- d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.
- e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes.  
Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shutdown (rather than moving channels), no beacons should appear.

Channel Move Time and Channel Closing Transmission Time requirements are listed in the following table.

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Value                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Non-occupancy period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Minimum 30 minutes                                                                                        |
| Channel Availability Check Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 60 seconds                                                                                                |
| Channel Move Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10 seconds<br>See Note 1.                                                                                 |
| Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.<br>See Notes 1 and 2. |
| U-NII Detection Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.                                   |
| <b>Note 1:</b> <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.<br><b>Note 2:</b> The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.<br><b>Note 3:</b> During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. |                                                                                                           |

**Table 5-4: DFS Response Requirements**

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         | Page 9 of 20                                                                          |                                 |

### 5.3 DFS Detection Threshold Values

The DFS detection thresholds are defined for Master devices and Client Devices with In-service monitoring. These detection thresholds are listed in the following table.

| Maximum Transmit Power                                                                                                                                                                                                                                                                                                                                                                                  | Value<br>(See Notes 1 and 2) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| ≥ 200 milliwatt                                                                                                                                                                                                                                                                                                                                                                                         | -64 dBm                      |
| < 200 milliwatt                                                                                                                                                                                                                                                                                                                                                                                         | -62 dBm                      |
| <p>Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p>Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.</p> |                              |

**Table 5-5: Detection Thresholds for Master Devices and Client Devices with Radar Detection**

### 5.4 DFS Response Requirements

DFS response requirements for Master and Client Devices are listed in the following table.

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Value                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Non-occupancy period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Minimum 30 minutes                                                                                       |
| Channel Availability Check Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 60 seconds                                                                                               |
| Channel Move Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10 seconds<br>See Note1                                                                                  |
| Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.<br>See Note 1 and 2. |
| U-NII Detection Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Minimum 100% of the U- NII 99% transmission power bandwidth.<br>See Note 3.                              |
| <p><b>Note 1:</b> Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst</p> <p><b>Note 2:</b> The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.</p> <p>frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.</p> |                                                                                                          |

**Table 5-6: DFS Response Requirements**

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         | Page 10 of 20                                                                         |                                 |

## 5.5 Parameters of DFS Test Signals

As the EUT is a Client Device with no Radar Detection only one type radar pulse is required for the testing. Radar Pulse type 1 was used in the evaluation of the Client device for the purpose of measuring the Channel Move Time and the Channel Closing Transmission Time. Table 5-7 lists the parameters for the Short Pulse Radar Waveforms. A plot of the Radar Pulse Type 1 used for testing is included in Section 5.7 of this report.

| Radar Type                                                                                                                                  | Pulse Width (μsec) | PRI (μsec)                                                                                                                                                                                                                                                 | Number of Pulses                                                                                                              | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------|
| 0                                                                                                                                           | 1                  | 1425                                                                                                                                                                                                                                                       | 18                                                                                                                            | See Note 1                                 | See Note 1               |
| 1                                                                                                                                           | 1                  | Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a<br>Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A | $\text{Roundup} \left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{PRI_{\mu\text{sec}}} \right) \right\}$ | 60%                                        | 30                       |
| 2                                                                                                                                           | 1-5                | 150-230                                                                                                                                                                                                                                                    | 23-29                                                                                                                         | 60%                                        | 30                       |
| 3                                                                                                                                           | 6-10               | 200-500                                                                                                                                                                                                                                                    | 16-18                                                                                                                         | 60%                                        | 30                       |
| 4                                                                                                                                           | 11-20              | 200-500                                                                                                                                                                                                                                                    | 12-16                                                                                                                         | 60%                                        | 30                       |
| Aggregate (Radar Types 1-4)                                                                                                                 |                    |                                                                                                                                                                                                                                                            |                                                                                                                               | 80%                                        | 120                      |
| <b>Note 1:</b> Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. |                    |                                                                                                                                                                                                                                                            |                                                                                                                               |                                            |                          |

**Table 5-7: Parameters for Short Pulse Radar Waveforms**

| Radar Type | Pulse Width (μsec) | Chirp Width (MHz) | PRI (μsec) | Number of Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|-------------------|------------|----------------------------|------------------|--------------------------------------------|--------------------------|
| 5          | 50 - 100           | 5 - 20            | 1000-2000  | 1 - 3                      | 8 - 20           | 80%                                        | 30                       |

**Table 5-8. Parameters for Long Pulse Radar Waveforms**

| Radar Type | Pulse Width (μsec) | PRI (μsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|------------|----------------|--------------------|--------------------------------|--------------------------------------------|--------------------------|
| 6          | 1                  | 333        | 9              | 0.333              | 300                            | 70%                                        | 30                       |

**Table 5-9. Parameters for Frequency Hopping Radar Waveforms**

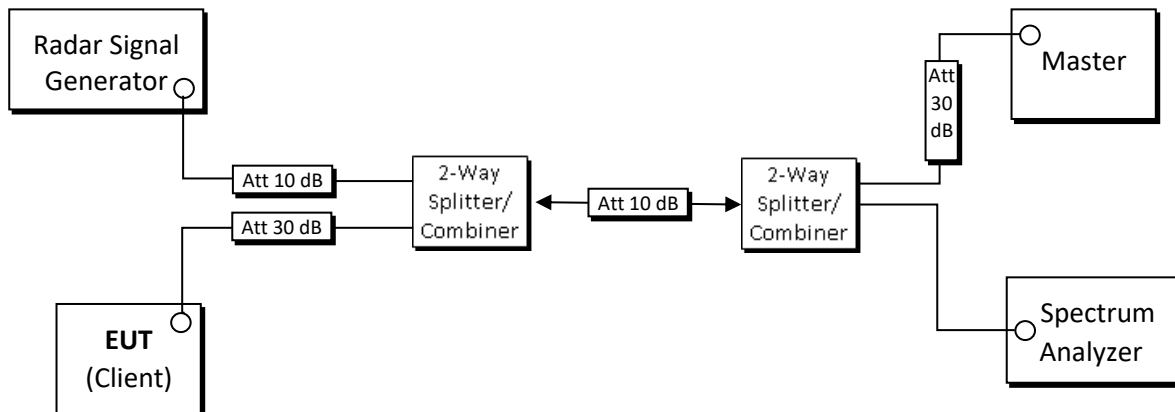
|                                            |                                                                                     |                               |                                    |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------|------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  |                               | MEASUREMENT REPORT (CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1-ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset |                                    |                                                                                       | Page 11 of 20                   |

## 5.6 Procedure

### DFS Test Setup:

|                                 |                                     |
|---------------------------------|-------------------------------------|
| <b>Radiated DFS Test Setup</b>  | <input type="checkbox"/>            |
| <b>Conducted DFS Test Setup</b> | <input checked="" type="checkbox"/> |

KDB 905462 D02 v02 describes a radiated test setup and a conducted test setup. The conducted test setup was used for this testing. Figure 5-1 shows the typical test setup. In Band 2C, one channel selected between 5500 and 5720 MHz was chosen for testing.



**Figure 5-1. Conducted Test Setup for DFS**

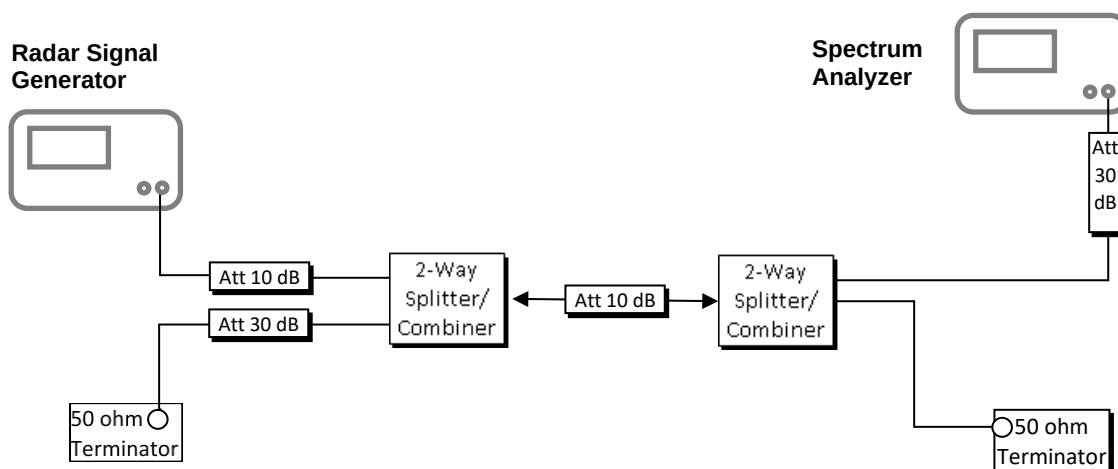
1. The “Aeroflex PXI DFS Radar Simulator and Analyzer Test Suite” is setup to provide a simulated radar pulse at the frequency that the Master and Client are operating. A Type 0 radar pulse was used.
2. The Client Device (EUT) is set up per the diagram in Figure 5-1 and communications between the Master device and the Client is established.
3. An MPEG or data file that is typical for the device is streamed from the Master to the Client to properly load the network.
4. The “Aeroflex PXI DFS Radar Simulator and Analyzer Test Suite” is set to record and display 12 seconds of time, starting from where the simulated radar is generated. This time domain plot captures any transmissions occurring up to and after 10sec. Aggregate time is computed to ensure compliance. (Note: the channel may be different since the Master and Client have changed channels due to the detection of the initial radar pulse.)
5. After the initial radar burst the channel is monitored for 10 minutes to ensure no transmissions or beacons occur. A second monitoring setup is used to verify that the Master and Client have both moved to different channels.

|                                                   |                                               |                                               |           |                                        |
|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------|----------------------------------------|
| <b>FCC ID:</b> ZNFL455DL                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> | <b>LG</b> | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1910280174-07-R1.ZNF | <b>Test Dates:</b><br>10/28 - 11/22/2019      | <b>EUT Type:</b><br>Portable Handset          |           | Page 12 of 20                          |

## 5.7 System Calibration:

The following equipment setup was used to calibrate the Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process, there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz.

The signal generator amplitude is adjusted so that the power level measured at the spectrum analyzer is equal to the DFS detection threshold -64 dBm. The required conducted threshold at the antenna port is  $-64\text{dBm} + \text{EUT Antenna Gain (dBi)} + 1\text{dB} = -63\text{ dBm}$  (Section 7.2).



**Figure 5-2. Radar Waveform Calibration**

|                                                   |                                               |                                               |           |                                        |
|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------|----------------------------------------|
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| <b>Test Report S/N:</b><br>1M1910280174-07-R1.ZNF | <b>Test Dates:</b><br>10/28 - 11/22/2019      | <b>EUT Type:</b><br>Portable Handset          |           | Page 13 of 20                          |

### Radar Waveform Calibration Plot:

The conducted plots of the Radar Pulse Signals (Type 0) are given below after performing the system calibration as described in Section 5.7.

### Short Pulse Radar Type 0:

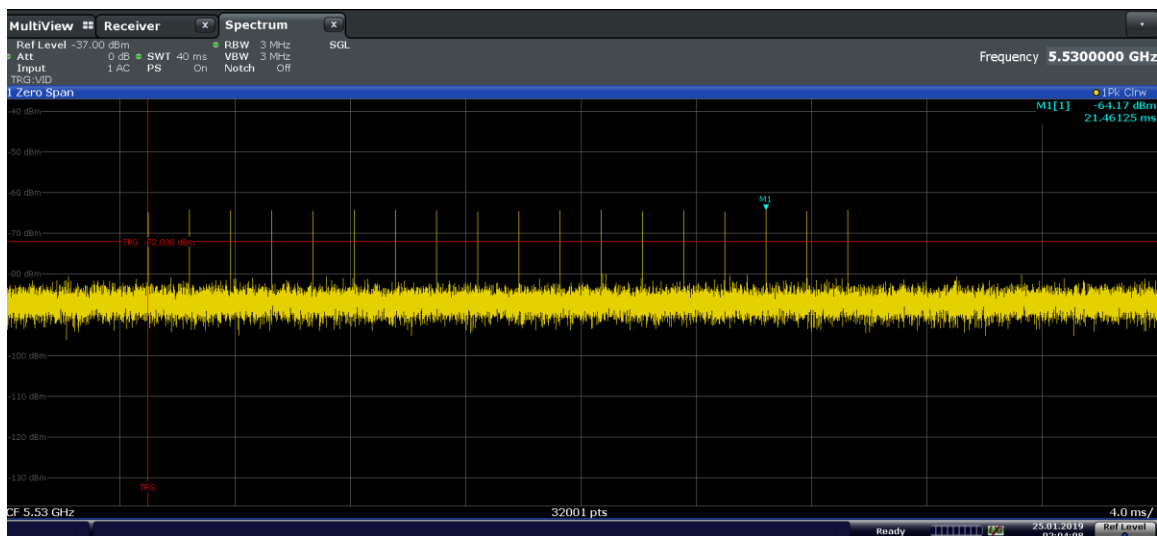


Figure 5-3. 5530MHz – Radar Pulse Type 0 (80MHz)

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFL455DL                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019             | EUT Type:<br>Portable Handset         |    | Page 14 of 20                   |

## 6.0 EUT TEST SETUP

Client is connected to Master (AP) via WLAN network and plays a video test file “6 ½ Magic Hours” in a Server (Laptop). This Server is connected to the Master (AP) via ethernet cable. The Vivaldi antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

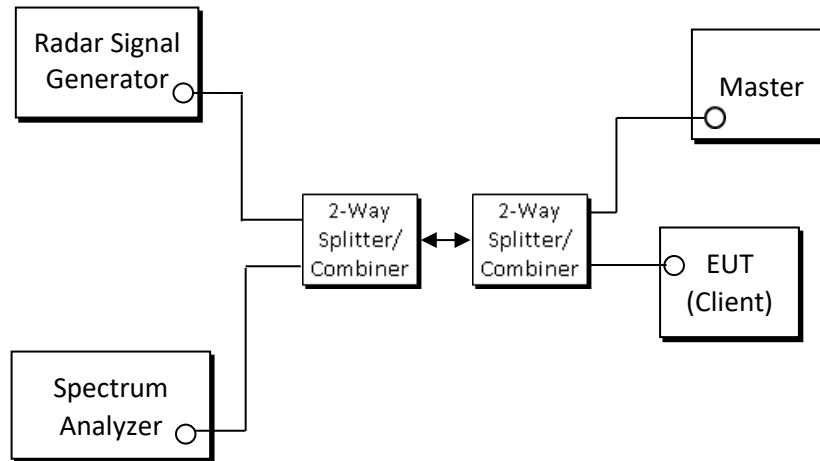


Figure 6-1. Test Setup

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFL455DL                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019             | EUT Type:<br>Portable Handset         |    | Page 15 of 20                   |

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: LG Electronics USA, Inc.  
 FCC ID: ZNFL455DL  
 FCC Classification: Unlicensed National Information Infrastructure (UNII)

|                                   | Parameter                         | Measured                                                   | Limit                                                           | Result |
|-----------------------------------|-----------------------------------|------------------------------------------------------------|-----------------------------------------------------------------|--------|
| 5470 – 5725 MHz<br>UNII – 2C Band | Channel Move Time                 | 0.13 s                                                     | 10 seconds                                                      | Pass   |
|                                   | Channel Closing Transmission Time | < 200ms<br>+ 0.00 ms (aggregate)                           | 200ms + aggregate of<br>60ms over remaining<br>10 second period | Pass   |
|                                   | Client beacon test                | Monitored for 30<br>minutes with no client<br>transmission | No client transmission<br>occurred                              | Pass   |

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

#### Notes:

- 1) The EUT was found to be compliant with the requirements for DFS as required for a Client Device per Part 15.407(h), RSS-247 and KDB 905462 D02 v02.
- 2) Automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The list is given below,
  - DFS threshold count v1.1
  - DFS Radar Simulator and Analyzer v2.8 (Aeroflex Inc.)
  - iPerf Software

|                                            |                                                                                     |                                       |                                                                                       |                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: ZNFL455DL                          |  | MEASUREMENT REPORT<br>(CERTIFICATION) |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019                                                   | EUT Type:<br>Portable Handset         | Page 16 of 20                                                                         |                                 |



## 7.2 Channel Loading

### Channel Loading Notes:

Per KDB 905462 D02 v02, timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, you can zero span the spectrum analyzer and approximate the transmission time.

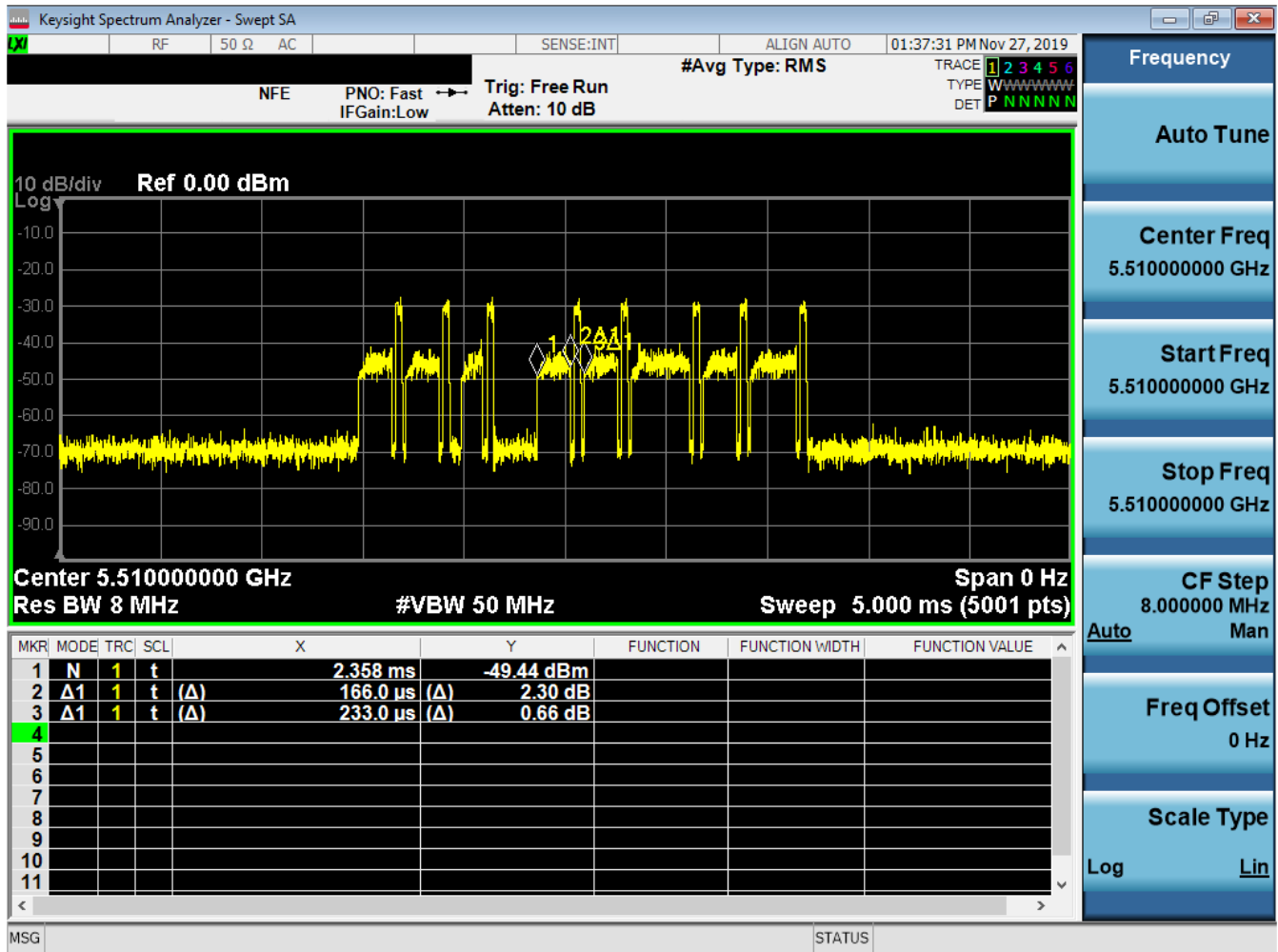


Figure 7-1. Band 2C Period

$$\text{Channel Loading} = \text{Pulse Width} / \text{Period} = 166.0 \mu\text{s} / 233.0 \mu\text{s} = 71.24 \%$$

|                                            |                                              |                               |  |                                 |
|--------------------------------------------|----------------------------------------------|-------------------------------|--|---------------------------------|
| FCC ID: ZNFL455DL                          | <b>MEASUREMENT REPORT</b><br>(CERTIFICATION) |                               |  | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019            | EUT Type:<br>Portable Handset |  | Page 17 of 20                   |

## 7.3 Channel Move/ Closing Transmission Time

### Move Time and Aggregate Time Notes:

1. Trigger Threshold was configured to only capture client pulses. The pulses shown in the plots below have been determined to be from the Master AP.
2. Marker Info and Aggregate time results are shown on the right side of the plots below.

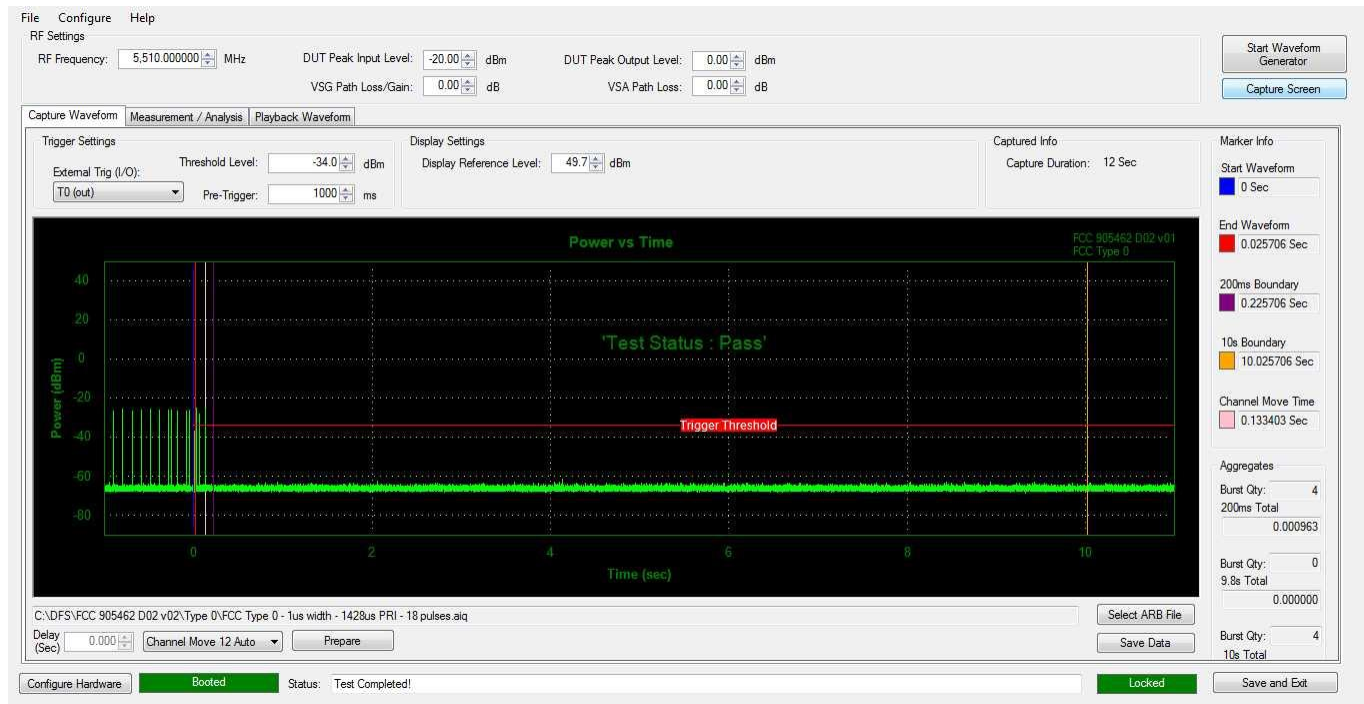


Figure 7-2. Band 2C Move Time and Aggregate Time

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFL455DL                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019             | EUT Type:<br>Portable Handset         |    | Page 18 of 20                   |

## 7.4 Non-Occupancy Period

### Notes:

No frequency transmission detected during the Non-Occupancy Period of 30 minutes monitoring.

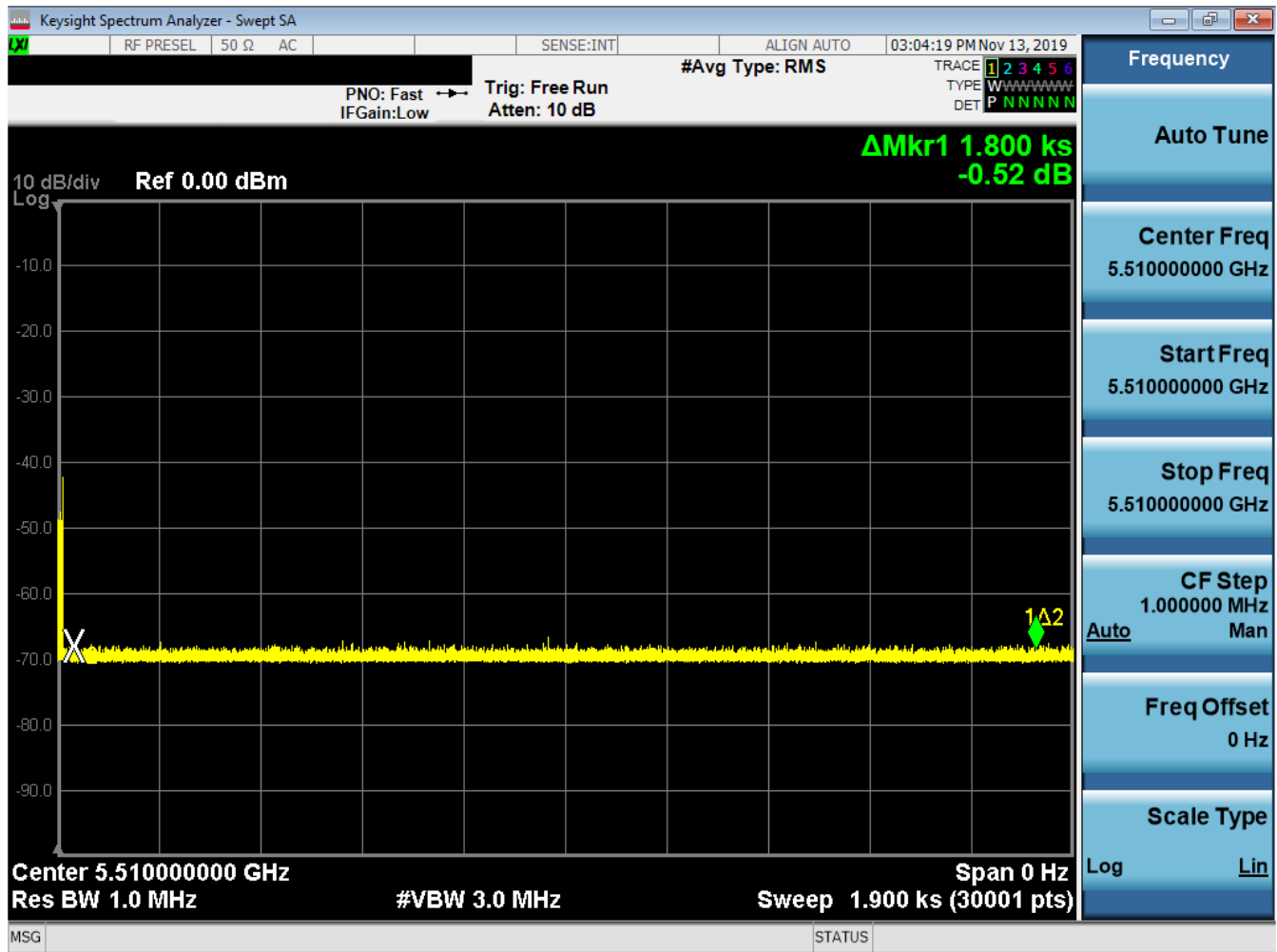


Figure 7-3. Band 2C Client Beacon Test – Monitoring live spectrum – Elapse time 30 minutes

|                                            |                                               |                                       |    |                                 |
|--------------------------------------------|-----------------------------------------------|---------------------------------------|----|---------------------------------|
| FCC ID: ZNFL455DL                          | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | MEASUREMENT REPORT<br>(CERTIFICATION) | LG | Approved by:<br>Quality Manager |
| Test Report S/N:<br>1M1910280174-07-R1.ZNF | Test Dates:<br>10/28 - 11/22/2019             | EUT Type:<br>Portable Handset         |    | Page 19 of 20                   |

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFL455DL** is in compliance with the DFS requirements for a Client Device without radar detection in accordance with Part 15.407 of the FCC Rules.

|                                                   |                                                                                                                                   |                                               |                                                                                                 |                                        |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> ZNFL455DL                          |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  <b>LG</b> | <b>Approved by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>1M1910280174-07-R1.ZNF | <b>Test Dates:</b><br>10/28 - 11/22/2019                                                                                          | <b>EUT Type:</b><br>Portable Handset          | Page 20 of 20                                                                                   |                                        |