

## PCTEST

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 (Low Energy)

#### **Applicant Name:**

LG Electronics USA, Inc. 1000 Sylvan Avenue Englewood Cliffs, NJ 07632 United States

### Date of Testing: 04/02 - 04/24/2020 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2003310054-05.ZNF

## FCC ID:

#### ZNFQ730VM

Certification

## **APPLICANT:**

## LG Electronics USA, Inc.

Application Type: Model: Additional Model(s):

EUT Type: Max. RF Output Power: Frequency Range: FCC Classification: FCC Rule Part(s): Test Procedure(s): LM-Q730VM LM-Q730QM, LM-Q730QM5, LM-Q730QM6, LM-Q730QN, LM-Q730UM, LMQ730VM, LMQ730QM, LMQ730QM5, LMQ730QM6, LMQ730QN, LMQ730UM, Q730VM, Q730QM, Q730QM5, Q730QM6, Q730QN, Q730UM Portable Handset 2.471 mW (3.93 dBm) Peak Conducted 2402 – 2480MHz Digital Transmission System (DTS) Part 15 Subpart C (15.247) ANSI C63.10-2013, KDB 558074 D01 v05r02

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 and KDB 558074 D01 v05r02. Test results reported herein relate only to the item(s) tested.

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

Randy Ortanez President



FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element		🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 1 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 1 of 54
© 2020 PCTEST				V 9.0 02/01/2019



## TABLE OF CONTENTS

1.0	INTI	RODUCTION	3
	1.1	Scope	3
	1.2	PCTEST Test Location	3
	1.3	Test Facility / Accreditations	3
2.0	PRC	DDUCT 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	DES	SCRIPTION OF TESTS	5
	3.1	Evaluation Procedure	5
	3.2	AC Line Conducted Emissions	5
	3.3	Radiated Emissions	6
	3.4	Environmental Conditions	6
4.0	ANT	FENNA REQUIREMENTS	7
5.0	MEA	ASUREMENT UNCERTAINTY	8
6.0	TES	T EQUIPMENT CALIBRATION DATA	9
7.0	TES	ST RESULTS	. 10
	7.1	Summary	10
	7.2	6dB Bandwidth Measurement – Bluetooth (LE)	11
	7.3	Output Power Measurement – Bluetooth (LE)	19
	7.4	Power Spectral Density – Bluetooth (LE)	27
	7.5	Conducted Emissions at the Band Edge	35
	7.6	Conducted Spurious Emissions	40
	7.7	Radiated Spurious Emission Measurements	45
	7.8	Radiated Restricted Band Edge Measurements	50
	7.9	Line-Conducted Test Data	51
8.0	COI	NCLUSION	. 54

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 2 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 2 of 54
© 2020 PCTEST				V 9.0 02/01/2019



## 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 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 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: ZNFQ730VM	PCTEST " Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 2 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset	Page 3 of 54
© 2020 PCTEST			V 9.0 02/01/2019



## 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFQ730VM**. The data found in this test report was taken with the EUT operating in Bluetooth low energy mode. While in low energy mode, the Bluetooth transmitter hops pseudo-randomly between 40 channels, three of which are "advertising channels". When the transmitter is hopping only between the three advertising channels, the EUT does not fall under the category of a "hopper" as defined in 15.247(a)(iii) which states that a "frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels." As operation on only the advertising channels does not qualify the EUT as a hopper, the EUT is certified as a DTS device in this mode. The data found in this report is representative of the device when it transmits on its advertising channels. Typical Bluetooth operation is covered under the DSS report found with this application.

Test Device Serial No.: 01987, 01995, 01961, 01979

### 2.2 Device 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, Multiband LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC

Ch.	Frequency (MHz)
0	2402
:	:
19	2440
:	:
39	2480

Table 2-1. Frequency / Channel Operations

### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013 and KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, and 7.6 for antenna port conducted emissions test setups.

## 2.4 EMI Suppression Device(s)/Modifications

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

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 4 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 4 of 54
© 2020 PCTEST				V 9.0 02/01/2019



## 3.0 DESCRIPTION OF TESTS

## 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

## 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz,  $50\Omega/50\mu$ H Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

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 RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.9. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

FCC ID: ZNFQ730VM	Pout to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga E of E4
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 5 of 54
© 2020 PCTEST	•	•		V 9.0 02/01/2019



## 3.3 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.

### 3.4 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: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo C of E4
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 6 of 54
© 2020 PCTEST	•	·		V 9.0 02/01/2019



## 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 antenna(s) 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: ZNFQ730VM	PCTEST* Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo Z of E4
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 7 of 54
© 2020 PCTEST				V 9.0 02/01/2019



## 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 (±dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: ZNFQ730VM	PCTEST * Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 9 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset	Page 8 of 54
© 2020 PCTEST			V 9.0 02/01/2019



## 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
-	WL25-1	Conducted Cable Set (25GHz)	10/30/2019	Annual	10/30/2020	WL25-1
-	WL40-1	Conducted Cable Set (40GHz)	10/30/2019	Annual	10/30/2020	WL40-1
-	WL25-2	Conducted Cable Set (25GHz)	6/3/2019	Annual	6/3/2020	WL25-2
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Anritsu	MA2411B	Pulse Power Sensor	8/14/2019	Annual	8/14/2020	1315051
Anritsu	ML2496A	Power Meter	11/6/2019	Annual	11/6/2020	1405003
Anritsu	MA2411B	Pulse Power Sensor	10/15/2019	Annual	10/15/2020	1339026
Anritsu	MA2411B	Pulse Power Sensor	8/27/2019	Annual	8/27/2020	1339027
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
Emco	3116	Horn Antenna (18 - 40GHz)	6/7/2018	Triennial	6/7/2021	9203-2178
Emco	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	00135427
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	6/18/2018	Biennial	6/18/2020	114451
Keysight Technologies	N9020A	MXA Signal Analyzer	4/29/2019	Annual	4/29/2020	MY54500644
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	6/3/2019	Annual	6/3/2020	NMLC-2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	5/6/2019	Annual	5/6/2020	103200
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	10/1/2019	Biennial	10/1/2021	310233
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

#### Note:

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.

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dava 0 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 9 of 54
© 2020 PCTEST		•		V 9.0 02/01/2019



## 7.0 TEST RESULTS

## 7.1 Summary

Company Name:	LG Electronics USA, Inc.
FCC ID:	ZNFQ730VM
FCC Classification:	Digital Transmission System (DTS)
Number of Channels:	<u>40</u>

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	> 500kHz		PASS	Section 7.2
15.247(b)(3)	Transmitter Output Power < 1 Watt			PASS	Sections 7.3
15.247(e)	Transmitter Power Spectral Density	< 8dBm / 3kHz Band		PASS	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Sections 7.7, 7.8
15.207	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen[8.8])	LINE CONDUCTED	PASS	Section 7.9

Table 7-1. Summary of Test Results

#### Notes:

- 1. All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.
- 2. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3. All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4. For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Bluetooth LE Automation," Version 3.6.
- 5. For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.3.1.

FCC ID: ZNFQ730VM	Poul to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 10 of 51
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 10 of 54
© 2020 PCTEST				V 9.0 02/01/2019



#### 7.2 6dB Bandwidth Measurement – Bluetooth (LE) §15.247(a.2); RSS-247 [5.2]

#### **Test Overview and Limit**

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies. All modes of operation were investigated and the worst case configuration results are reported in this section.

#### The minimum permissible 6dB bandwidth is 500 kHz.

#### **Test Procedure Used**

ANSI C63.10-2013 – Section 11.8.2 Option 2 KDB 558074 D01 v05r02 – Section 8.2

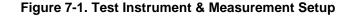
#### Test Settings

- 1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 100kHz
- 3. VBW  $\geq$  3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize

#### Test Setup

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





#### Test Notes

None

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 11 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 11 of 54
© 2020 PCTEST	•			V 9.0 02/01/2019



Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	0	LE	692.4	500	Pass
2440	125 kbps	19	LE	693.6	500	Pass
2480	125 kbps	39	LE	690.8	500	Pass
2402	500 kbps	0	LE	666.0	500	Pass
2440	500 kbps	19	LE	663.9	500	Pass
2480	500 kbps	39	LE	662.0	500	Pass
2402	1 Mbps	0	LE	699.0	500	Pass
2440	1 Mbps	19	LE	703.1	500	Pass
2480	1 Mbps	39	LE	698.2	500	Pass
2402	2 Mbps	0	LE	1156.0	500	Pass
2440	2 Mbps	19	LE	1157.0	500	Pass
2480	2 Mbps	39	LE	1158.0	500	Pass

Table 7-2. Conducted Bandwidth Measurements

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 12 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 12 of 54
© 2020 PCTEST				V 9.0 02/01/2019



Keysight Spectrum Analyzer - Occupied BW     RF 50 Ω DC		SENSE:INT		1 Apr 05, 2020	Trace/Detector
NFE	Trig: F	Freq: 2.402000000 GHz ree Run Avg Hold: 10 : 10 dB	Radio Std: 00/100 Radio Devi		Trace/Detector
15 dB/div Ref 15.00 dBm					
Log 0.00					Clear Write
-30.0					_
-60.0					Average
-90.0					
-120					Max Hold
Center 2.402 GHz #Res BW 100 kHz	#	VBW 300 kHz		an 2 MHz 3.333 ms	Min Hold
Occupied Bandwidth		Total Power	6.41 dBm		
1.0	610 MHz				Detector Peak▶
Transmit Freq Error	2.817 kHz	% of OBW Power	99.00 %	,	Auto <u>Man</u>
x dB Bandwidth	692.4 kHz	x dB	-6.00 dB		
MSG			STATUS		

Plot 7-1. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 0)



Plot 7-2. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 19)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 12 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 13 of 54
© 2020 PCTEST				V 9.0 02/01/2019



Keysight Spectrum Analyzer - Occupied B\	V				
K RF 50 Ω DC	🛶 Trig	SENSE:INT ter Freq: 2.480000000 GHz J: Free Run Avg Ho ten: 10 dB	Radio Id: 100/100	06 PM Apr 05, 2020 Std: None Device: BTS	Trace/Detector
15 dB/div Ref 15.00 dBr	n				
-15.0					Clear Write
-45.0					Average
-90.0					Max Hold
Center 2.48 GHz #Res BW 100 kHz		#VBW 300 kHz	Swee	Span 2 MHz p 3.333 ms	Min Hold
Occupied Bandwidt	<sup>th</sup> 0614 MHz	Total Power	6.56 dBm		Detector Peak▶
Transmit Freq Error x dB Bandwidth	1.709 kHz 690.8 kHz	% of OBW Pov x dB	ver 99.00 % -6.00 dB		Auto <u>Man</u>
MSG			STATUS		

Plot 7-3. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 39)



#### Plot 7-4. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 0)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 14 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 14 of 54
© 2020 PCTEST	•			V 9.0 02/01/2019

2020 PCTEST



NFE			Radio Std		Trace/Detector
15 dB/div Ref 15.00 dBm					
0.00 -15.0 -30.0					Clear Write
-45.0					Average
-105					Max Hold
Center 2.44 GHz #Res BW 100 kHz		BW 300 kHz	Sweep	oan 2 MHz 3.333 ms	Min Hold
Occupied Bandwidth 1.0	575 MHz	Total Power	10.7 dBm		Detecto Peak
Transmit Freq Error x dB Bandwidth	4.010 kHz 663.9 kHz	% of OBW Power x dB	99.00 % -6.00 dB	4	Auto <u>Mar</u>
MSG			STATUS		





Plot 7-6. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 39)

FCC ID: ZNFQ730VM	Pout to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 15 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	20 Portable Handset		Page 15 of 54	
© 2020 PCTEST	•	•		V 9.0 02/01/2019	



🦲 Keysight Spec						1							
<mark>XI</mark>	RF	50 Ω	DC	CORREC		SENSE:II		GHz		05:39:29 Radio Sto	M Apr 05, 2020	Trac	e/Detector
		1	NFE	#IFGain	Low:	Trig: Free Ru #Atten: 10 dB		g Hold: 100/	100	Radio De	vice: BTS		
15 dB/div	Ref	15.00	) dBr	n									
Log 0.00													
-15.0												(	Clear Write
-30.0													
-45.0													
-60.0													Average
-75.0													
-90.0													
-105													Max Hold
-120													
Center 2.4											an 2 MHz		
#Res BW	100 kH	z				#VBW	300 kHz			Sweep	3.333 ms		Min Hold
Occup	oied B	and	widi	th		То	tal Powe	r	9.79	dBm			
					4 MH	7							Detecto
_		_						_					Peak
Transm			or		.579 kl		of OBW I	Power		.00 %		Auto	Mar
x dB Ba	andwig	dth		6	99.0 kl	z xo	B		-6.0	00 dB			
ISG									STATUS				
30									STATUS				

Plot 7-7. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 0)

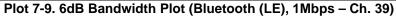


Plot 7-8. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 19)

FCC ID: ZNFQ730VM		MEASUREMENT REPORT (CERTIFICATION)	💽 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 16 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 16 of 54
© 2020 PCTEST				V 9.0 02/01/2019



Keysight Spectrum Analyzer -				-					- d ×
XI RF 5	0Ω DC	CORREC		480000000 GHz		Radio Sto	PM Apr 05, 2020 : None	Trace	e/Detector
	NFE	• #IFGain:Low	Trig: Free Run #Atten: 10 dB	Avg Hold	: 100/100	Radio De	vice: BTS		
		#IFGalli.LOW	millen. To up			rtudio De			
15 dB/div Ref 15	5.00 dB	m							
0.00									lear Write
-15.0									
-30.0									
-45.0									
-60.0									Average
-75.0									
-90.0									
-105									Max Hold
-120									
Center 2.48 GHz						Sr	an 2 MHz		
#Res BW 100 kHz			#VBW 3	00 kHz			3.333 ms		Min Hold
Occurried Dec	a aluari a	41-	Tot	al Power	0.0	6 dBm			
Occupied Bar					5.5	o ubili			
	1	.0563 N	IHZ						Detector Peak
Transmit Freq I	Error	2.606	ikHz %o	of OBW Powe	er 9	9.00 %		Auto	Mai
x dB Bandwidth	1	698.2	kHz xd	в	-6	.00 dB			
ISG					STATU	IS			





Plot 7-10. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: ZNFQ730VM	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 17 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset			
© 2020 PCTEST	<u>.</u>	·		V 9.0 02/01/2019	





Plot 7-11. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 19)



Plot 7-12. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 39)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 19 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 18 of 54
© 2020 PCTEST				V 9.0 02/01/2019



#### 7.3 Output Power Measurement – Bluetooth (LE) §15.247(b.3); RSS-247 [5.4(4)]

#### **Test Overview and Limits**

The transmitter antenna terminal of the EUT is connected to the input of a spectrum analyzer. Measurements are made while the EUT is operating at maximum power and at the appropriate frequencies.

#### The maximum permissible conducted output power is 1 Watt.

#### Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.1 KDB 558074 D01 v05r02 – Section 8.3.1.1

#### **Test Settings**

- 1. RBW = 3MHz
- 2. VBW = 50MHz
- 3. Span  $\ge$  3 x RBW
- 4. Sweep = auto couple
- 5. Detector = Peak
- 6. Trace mode = max hold
- 7. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

#### Test Notes

None

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 10 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 19 of 54	
© 2020 PCTEST	•	·		V 9.0 02/01/2019	



Frequency	Data Rate	Channel	Bluetooth	Peak Condu	cted Power
[MHz]	[Mbps]	No.	Mode	[dBm]	[mW]
2402	125 kbps	0	LE	2.95	1.973
2440	125 kbps	19	LE	3.89	2.449
2480	125 kbps	39	LE	3.37	2.174
2402	500 kbps	0	LE	2.99	1.988
2440	500 kbps	19	LE	3.90	2.456
2480	500 kbps	39	LE	3.42	2.197
2402	1 Mbps	0	LE	2.99	1.989
2440	1 Mbps	19	LE	3.91	2.462
2480	1 Mbps	39	LE	3.42	2.197
2402	2 Mbps	0	LE	3.00	1.994
2440	2 Mbps	19	LE	3.93	2.471
2480	2 Mbps	39	LE	3.47	2.223

Table 7-3. Conducted Output Power Measurements (Bluetooth (LE))

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	.G	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 20 of 54	
© 2020 PCTEST		·		V 9.0 02/01/2019	



🦲 Keysight Sp	ectrum Analy:									-			
L <u>XI</u>	RF	50 Ω D	00   00	RREC			NSE:INT	#Avg Typ	e: RMS	TRAC	M Apr 04, 2020	F	equency
		NFE		PNO: Fas Gain:Lo		Trig: Fre Atten: 2				DE			A
10 dB/div Log	Ref 10	.00 dBr	n						Mkr	1 2.402 2.9	24 GHz 52 dBm		Auto Tune
												(	Center Freq
0.00												2.40	2000000 GHz
-10.0													Start Freq
-20.0												2.39	7000000 GHz
-30.0												0.40	Stop Freq
-40.0												2.40	7000000 GHz
-50.0													CF Step .000000 MH2
-60.0												<u>Auto</u>	Mar
-70.0													Freq Offset
-80.0													0 Hz
													Scale Type
Center 2.4 #Res BW				#	VBW	8.0 MHz	2		Sweep 1	Span 1 .000 ms (	0.00 MHz 1001 pts)	Log	Lin
MSG									STATUS				

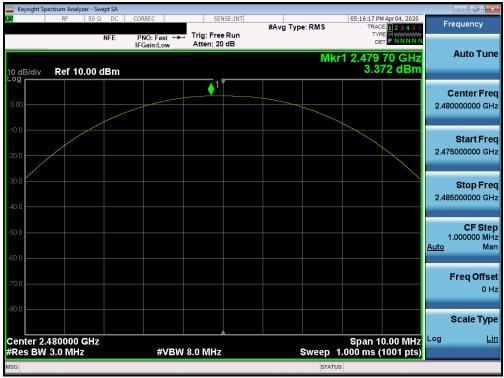
Plot 7-13. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 0)



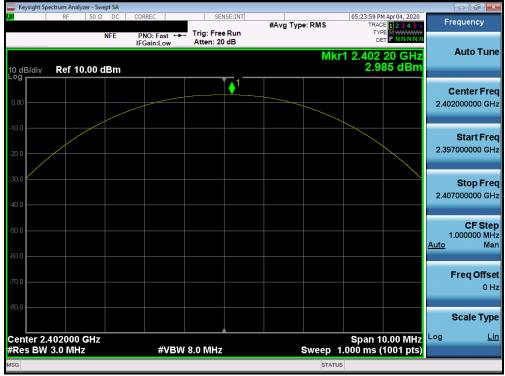
Plot 7-14. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 19)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 21 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	/2020 Portable Handset		Page 21 of 54	
© 2020 PCTEST	•	·		V 9.0 02/01/2019	





Plot 7-15. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 39)



Plot 7-16. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 0)

FCC ID: ZNFQ730VM	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 22 of 54
© 2020 PCTEST	•	•		V 9.0 02/01/2019



🔤 Keysight Spe	ctrum Analyzer - Sw										
LXI	RF 50 Ω	2 DC	CORREC	SE	NSE:INT	#Avg Typ	e: RMS		Apr 04, 2020	F	requency
		NFE	PNO: Fast IFGain:Low	↔ Trig: Free Atten: 20				TYF De			Auto Tune
10 dB/div Log	Ref 10.00	dBm					Mk	r1 2.440 3.9	15 GHz 03 dBm		Auto Tulle
209					<b>(</b> 1					(	Center Freq
0.00			And the second se							2.44	0000000 GHz
-10.0											Start Freq
-20.0										2.43	5000000 GHz
-30.0											Stop Freq
-40.0										2.44	5000000 GHz
-50.0											CF Step 1.000000 MHz
-60.0										<u>Auto</u>	Man
-70.0											Freq Offset
											0 Hz
-80.0											Scale Type
Center 2.4 #Res BW	40000 GHz		#\/E	3W 8.0 MHz			Sween_/	Span 1 1.000 ms (	0.00 MHz	Log	Lin
MSG	5.0 WH12		#VL				Sweep		roor pts)		

Plot 7-17. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 19)



Plot 7-18. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 39)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 23 of 54
© 2020 PCTEST	·			V 9.0 02/01/2019



Keysight Spectrum Analyzer - Swept SA				
RF 50 Ω DC C	ORREC SENSE:	INT #Avg Type: RMS	05:25:58 PM Apr 04, 2020 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast ++ Trig: Free Ru FGain:Low Atten: 20 dE	un 3		Auto Tune
10 dB/div Ref 10.00 dBm		M	r1 2.402 18 GHz 2.987 dBm	Auto Tulle
	<b></b>	1		Center Freq
0.00				2.402000000 GHz
-10.0				Start Freq
-20.0				2.397000000 GHz
-30.0				<b>Stop Freq</b> 2.407000000 GHz
-40.0				2.407000000 GHz
-50.0				CF Step 1.000000 MHz
-60.0				<u>Auto</u> Man
-70.0				Freq Offset
-80.0				0 Hz
-60.0				Scale Type
Center 2.402000 GHz #Res BW 3.0 MHz	#VBW 8.0 MHz	Sween	Span 10.00 MHz 1.000 ms (1001 pts)	Log <u>Lin</u>
MSG		STAT		

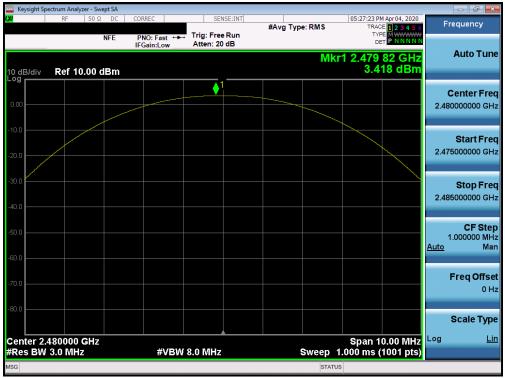
Plot 7-19. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 0)



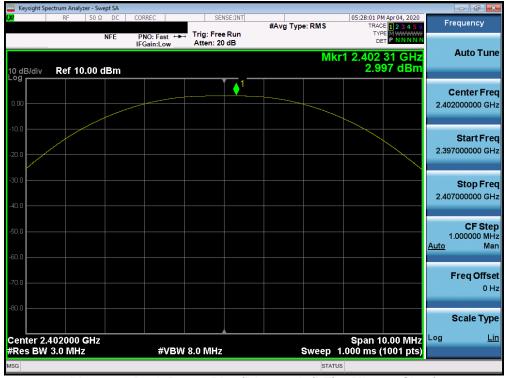
Plot 7-20. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 19)

FCC ID: ZNFQ730VM	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 24 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 24 of 54
© 2020 PCTEST				V 9.0 02/01/2019





Plot 7-21. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 39)



Plot 7-22. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: ZNFQ730VM	PCTEST *	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 25 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 25 of 54
© 2020 PCTEST	•	•		V 9.0 02/01/2019



		DC NFE	CORREC PNO: Fast		NSE:INT	#Avg Typ			4 Apr 04, 2020	Fred	quency
		NFE		Trig: Fre			e: RMS	TRAC	E 1 2 3 4 5 6	1100	luency
			IFGain:Low								
10 dB/div Re	ef 10.00 c	dBm					Mkr	1 2.440 3.9	20 GHz 28 dBm	Å	luto Tune
					<b>(</b> )1					Ce	enter Fred
0.00										2.4400	00000 GHz
10.0											Start Fred
-20.0										2.4350	00000 GHz
-30.0											Stop Fred
-40.0										2.4450	00000 GHz
-50.0										10	CF Step
-60.0										<u>Auto</u>	Mar
-70,0										Fi	req Offse
											0 H:
-80.0										S	cale Type
Center 2.440					<u> </u>			Span 1	0.00 191112	Log	Lin
#Res BW 3.0	IVIFI2		#V	BW 8.0 MHz			Sweep 1		1001 pts)		

Plot 7-23. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 19)



Plot 7-24. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 39)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	💽 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 26 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 26 of 54
© 2020 PCTEST				V 9.0 02/01/2019



## 7.4 Power Spectral Density – Bluetooth (LE)

<u>§15.247(e); RSS-247 [5.2]</u>

#### **Test Overview and Limit**

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies.

#### The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

#### Test Procedure Used

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission

#### **Test Settings**

- 1. Analyzer was set to the center frequency of the DTS channel under investigation
- 2. Span = 1.5 times the DTS channel bandwidth
- 3. RBW = 3kHz
- 4. VBW = 1MHz
- 5. Detector = peak
- 6. Sweep time = auto couple
- 7. Trace mode = max hold
- 8. Trace was allowed to stabilize

#### Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

#### Test Notes

None

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	G	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 27 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 27 of 54
© 2020 PCTEST				V 9.0 02/01/2019



Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	0	LE	-2.69	8.0	-10.69
2440	125 kbps	19	LE	-1.77	8.0	-9.77
2480	125 kbps	39	LE	-2.50	8.0	-10.50
2402	500 kbps	0	LE	-2.82	8.0	-10.82
2440	500 kbps	19	LE	-1.90	8.0	-9.90
2480	500 kbps	39	LE	-2.60	8.0	-10.60
2402	1 Mbps	0	LE	-11.49	8.0	-19.49
2440	1 Mbps	19	LE	-10.58	8.0	-18.58
2480	1 Mbps	39	LE	-11.33	8.0	-19.33
2402	2 Mbps	0	LE	-14.07	8.0	-22.07
2440	2 Mbps	19	LE	-13.14	8.0	-21.14
2480	2 Mbps	39	LE	-13.85	8.0	-21.85

Table 7-4. Conducted Power Density Measurements

FCC ID: ZNFQ730VM	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕚 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 20 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 28 of 54
© 2020 PCTEST				V 9.0 02/01/2019





Plot 7-25. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 0)

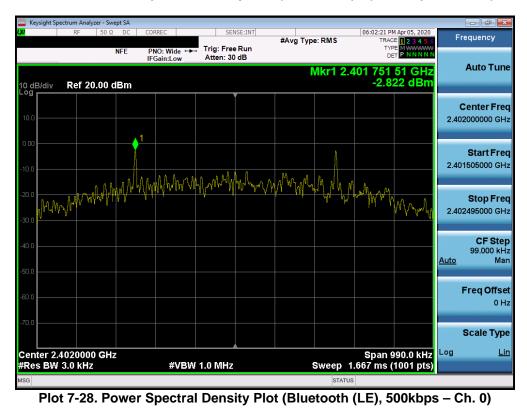


FCC ID: ZNFQ730VM	Froud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 29 of 54
© 2020 PCTEST	-			V 9.0 02/01/2019



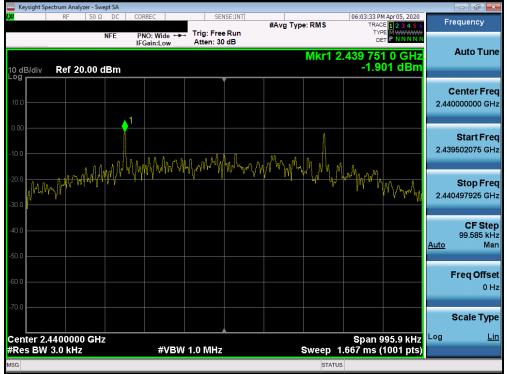


Plot 7-27. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 39)

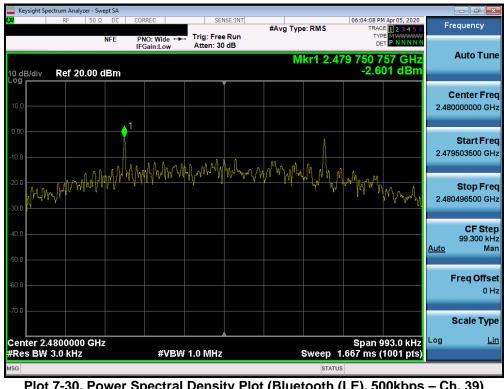


PCTEST MEASUREMENT REPORT Approved by: FCC ID: ZNFQ730VM 🕞 LG (CERTIFICATION) ud to be part of 📵 e Quality Manager EUT Type: Test Report S/N: Test Dates: Page 30 of 54 1M2003310054-05.ZNF 04/02 - 04/24/2020 Portable Handset © 2020 PCTEST V 9.0 02/01/2019





Plot 7-29. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 19)



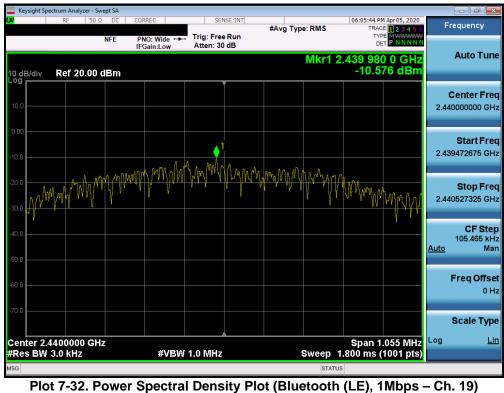
Plot 7-30. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 39)

FCC ID: ZNFQ730VM	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 24 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset	Page 31 of 54
© 2020 PCTEST		•	V 9.0 02/01/2019



Keysight Sp	ectrum Analy												
	RF	50 Ω		CORREC			ISE:INT	#Avg Typ	e: RMS	TRAC	M Apr 05, 2020 E 1 2 3 4 5 6	F	requency
10 dB/div Log	Ref 2	۱ 0.00 dl	NFE Bm	PNO: W IFGain:	/ide ↔ Low	Trig: Free Atten: 30			Mkr1 2	.401 98	0 1 GHz 87 dBm		Auto Tune
10.0													Center Free 2000000 GH
-10.0					<u>م</u> ار م	1 4 a. Mar	A 1. r. A	A an 10.41	<b>b</b> = 0			2.40	Start Free 1475750 GH
-20.0 -30.0	1/1/1/1/1/				Ŷ	<u> </u>		Alman Ala		MMMMM	MMAA	2.40	<b>Stop Fre</b> 2524250 GH
40.0												<u>Auto</u>	<b>CF Ste</b> 104.850 kH Ma
60.0													Freq Offse 0 H
													Scale Typ
Center 2. ¢Res BW					#VBW	1.0 MHz			Sweep 1	Span 1 .800 ms (	.049 MHz 1001 pts)	Log	Li
ISG									STATUS	5			

Plot 7-31. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 0)



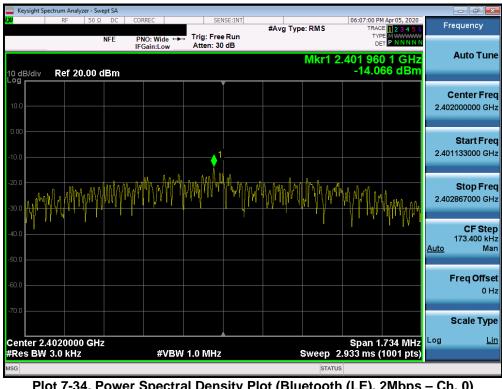
Flot 7-52. Fower Spectral Density Flot (Bidelooth (LE), Thisps – Ch. 19)

FCC ID: ZNFQ730VM	Proud to be part of (6) element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 22 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset	Page 32 of 54
© 2020 PCTEST			V 9.0 02/01/2019



Keysight Spectrum Analyzer - Swept SA					- F ×
🗙 RF 50 Ω DC	CORREC	SENSE:INT	#Avg Type: RMS	06:06:20 PM Apr 05, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWW	Frequency
NFE	PNO: Wide ↔ IFGain:Low	Trig: Free Run Atten: 30 dB	Mkr1 2	2.479 980 1 GHz -11.331 dBm	Auto Tune
10.0					Center Freq 2.480000000 GHz
-10.0	- and Admontal	1 4 0.0 Millin 0 0. 0. 0.	10-10 m-1		Start Freq 2.479476350 GHz
-20.0 -30.0	haddy y y h h			MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM	<b>Stop Freq</b> 2.480523650 GHz
-40.0					CF Step 104.730 kH <u>Auto</u> Mar
-60.0					Freq Offse 0 H:
					Scale Type
Center 2.4800000 GHz #Res BW 3.0 kHz	#VBW	1.0 MHz		Span 1.047 MHz 1.800 ms (1001 pts)	Log <u>Lin</u>
MSG			STATU	IS	

Plot 7-33. Power Spectral Density Plot (Bluetooth (LE), 1Mbps - Ch. 39)



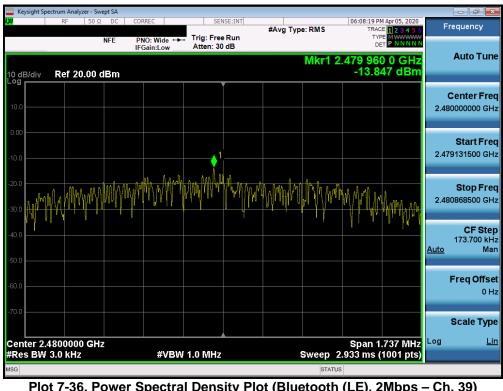
Plot 7-34. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 0)

FCC ID: ZNFQ730VM	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 33 of 54	
© 2020 PCTEST				V 9.0 02/01/2019	



🔤 Keysight Spectrum Analyzer - Swept SA 👘					
RF 50 Ω DC	CORREC	SENSE:INT	#Avg Type: RMS	06:07:38 PM Apr 05, 2020 TRACE 1 2 3 4 5 6	Frequency
NFE 10 dB/div Ref 20.00 dBm	PNO: Wide ↔ IFGain:Low	Trig: Free Run Atten: 30 dB	Mkr1 :	2.439 960 1 GHz -13.143 dBm	Auto Tune
10.0					Center Freq 2.440000000 GHz
-10.0					Start Freq 2.439132250 GHz
-20.0 -30.0					<b>Stop Freq</b> 2.440867750 GHz
-40.0					CF Step 173.550 kH: <u>Auto</u> Mar
-60.0					Freq Offset 0 Hz
					Scale Type
Center 2.4400000 GHz #Res BW 3.0 kHz	#VBW	1.0 MHz		Span 1.736 MHz 2.933 ms (1001 pts)	Log <u>Lin</u>
MSG			STATU	JS	

Plot 7-35. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 19)



Plot 7-36. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 39)

FCC ID: ZNFQ730VM	PCTEST Froud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 24 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 34 of 54	
© 2020 PCTEST				V 9.0 02/01/2019	



# 7.5 Conducted Emissions at the Band Edge §15.247(d); RSS-247 [5.5]

#### **Test Overview and Limit**

For the following out of band conducted spurious emissions plots at the band edge, the EUT was set to transmit at maximum power with the largest packet size available. These settings produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth.

#### **Test Procedure Used**

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.7.2

#### Test Settings

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. RBW = 100kHz
- 4. VBW = 300kHz
- 5. Detector = Peak
- 6. Number of sweep points ≥ 2 x Span/RBW
- 7. Trace mode = max hold
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

#### Test Notes

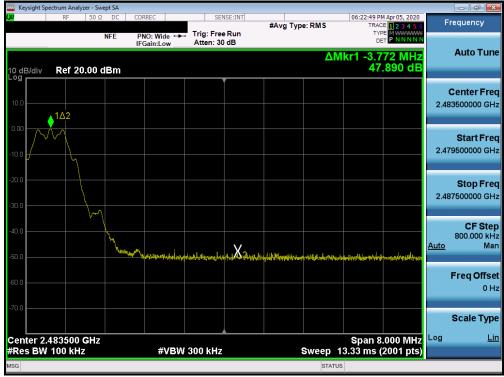
#### None

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 25 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 35 of 54
© 2020 PCTEST		·		V 9.0 02/01/2019



	n Analyzer - Swe		2222	051	05 MIT			00.00.40.0		_	
F	RF 50 Ω	NFE P	RREC NO:Wide ↔ Gain:Low			#Avg Typ	e: RMS	TRAC	M Apr 05, 2020 DE <b>1 2 3 4 5 6</b> PE M T P N N N N	F	requency
0 dB/div Re	ef 20.00 d		Gam.Low	, talen. oo			ΔΝ	/lkr1 4.2 48	288 MHz .248 dB		Auto Tun
og 10.0							<u>_</u> 1∆2				<b>Center Fre</b> 00000000 G⊦
0.0						<u>م</u>	M	4		2.39	<b>Start Fre</b> 96000000 GH
0.0						Da l				2.40	<b>Stop Fre</b> 04000000 GF
0.0		X <sub>24-14</sub>	(dittained		amelun			¶/*`\	Value and	<u>Auto</u>	CF Ste 800.000 kl Ma
0.0		ann Alle Marchelle	ler tuler frei verste	and and the second second							Freq Offs 0
0.0											Scale Typ
enter 2.400 Res BW 100 s			#VBW	300 kHz			Sweep 1		.000 MHz 2001 pts)	Log	L

Plot 7-37. Band Edge Plot (Bluetooth (LE), 125kbps - Ch. 0)



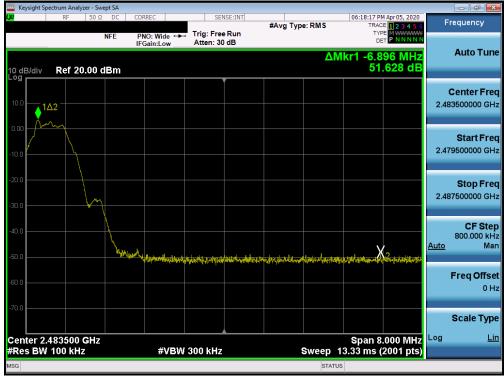
Plot 7-38. Band Edge Plot (Bluetooth (LE), 125kbps – Ch. 39)

FCC ID: ZNFQ730VM	PCTEST *	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 26 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 36 of 54
© 2020 PCTEST	•	•		V 9.0 02/01/2019



Keysight Spectrum Ana							
RF	50 Ω DC	CORREC	SENSE:INT	#Avg Type: F		11:03 PM Apr 05, 2020 TRACE 1 2 3 4 5 6 TYPE M WWWW DET P N N N N	Frequency
	NFE	IFGain:Low	Atten: 30 dB				A
) dB/div Ref 2	0.00 dBm				ΔMkr	1 3.276 MHz 51.515 dB	Auto Tui
			Ť				Center Fre
0.0					1Δ2		2.40000000 GI
.00				/	my		
							Start Fre
D.0							2.396000000 G
D.0							
0.0				$\sim$		h	<b>Stop Fr</b> 2.404000000 G
0.0							CF Ste 800.000 k
		Xa	المتعطي المراجع	w/		winnerthe .	<u>Auto</u> M
0.0 <b>Androcompany</b>	anteria data da anterio da anterio Anterio da anterio da an	en die ein die der die ein die gestellen die gestellen die gestellen die gestellen die gestellen die gestellen Geschieder die gestellen die	1/ AUL AVID A CONTRACT OF A			1 1/14	
D.O							Freq Offs 0
							•
D.O							Scale Ty
enter 2.400000 Res BW 100 kF		#VBW	300 kHz	Sv	s veep 13.3	pan 8.000 MHz 3 ms (2001 pts)	
G					STATUS		

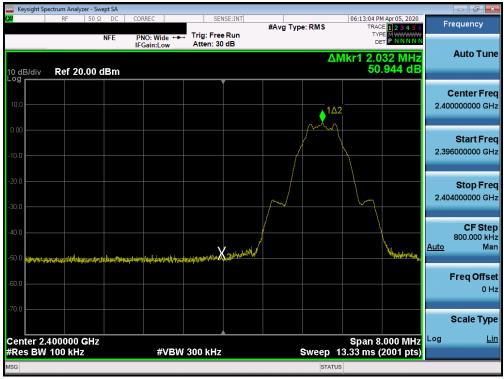
Plot 7-39. Band Edge Plot (Bluetooth (LE), 500kbps - Ch. 0)



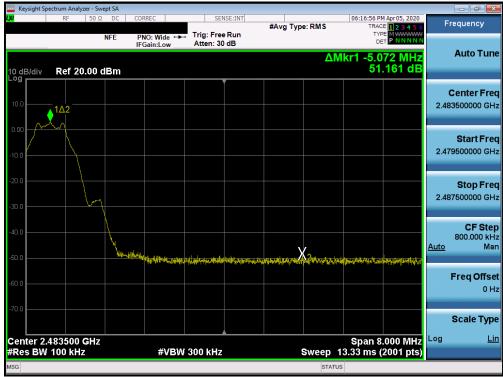
Plot 7-40. Band Edge Plot (Bluetooth (LE), 500kbps - Ch. 39)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 27 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 37 of 54
© 2020 PCTEST		•		V 9.0 02/01/2019





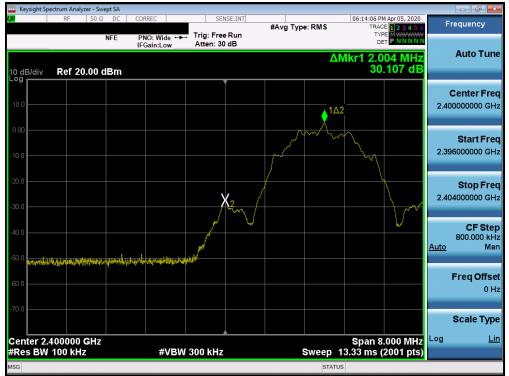
Plot 7-41. Band Edge Plot (Bluetooth (LE), 1Mbps - Ch. 0)



Plot 7-42. Band Edge Plot (Bluetooth (LE), 1Mbps - Ch. 39)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 20 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 38 of 54
© 2020 PCTEST				V 9 0 02/01/2019





Plot 7-43. Band Edge Plot (Bluetooth (LE), 2Mbps - Ch. 0)



Plot 7-44. Band Edge Plot (Bluetooth (LE), 2Mbps - Ch. 39)

FCC ID: ZNFQ730VM	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 20 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 39 of 54
© 2020 PCTEST				V 9.0 02/01/2019



### 7.6 Conducted Spurious Emissions §15.247(d); RSS-247 [5.5]

#### **Test Overview and Limit**

For the following out of band conducted spurious emissions plots, the EUT was set to transmit at maximum power with the largest packet size available. The worst case spurious emissions were found in this configuration.

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the procedure in Section 8.5 of KDB 558074 D01 v05r02 and Section 11.11.3 of ANSI C63.10-2013.

#### Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.5

#### Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep time = auto couple
- 7. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-5. Test Instrument & Measurement Setup

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 40 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 40 of 54
© 2020 PCTEST				V 9.0 02/01/2019



#### Test Notes

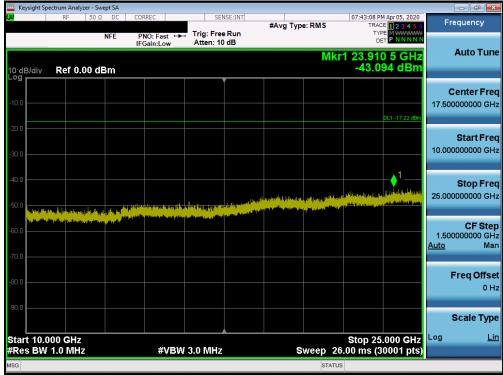
- 1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.
- 2. The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.
- 3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

(	1			
FCC ID: ZNFQ730VM	<u> @PCTEST</u>		Approved by:	
	Proud to be part of @ element	(CERTIFICATION)	Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 41 of 54	
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset	Page 41 of 54	
© 2020 PCTEST			V 9.0 02/01/2019	



Keysight Sp	ectrum Analyzer							
	RF 5	0 Ω DC	CORREC	SENS	#Avg Run	Type: RMS	07:28:18 PM Apr 05, 2020 TRACE 1 2 3 4 5 6 TYPE M WWWW	Frequency
			IFGain:Low	Atten: 30 d	В	M	r1 9.687 9 GHz	Auto Tur
0 dB/div og	Ref 20.0	0 dBm					-31.320 dBm	
								Center Fre
10.0								5.015000000 GI
0.00								Start Fre
10.0								30.000000 Mi
							DL1 -17.22 dBm	
20.0								Stop Fre
30.0							1	10.00000000 GH
10.0			and a state of the second					CF Ste
with the star		all to a	La. Longia de la					997.000000 M Auto M
50.0 <b>(</b>								
io.o								Freq Offs
<sup>70.0</sup>								
0.0								Scale Ty
tart 30 N	/IHz						Stop 10.000 GHz 3.00 ms (30001 pts)	Log <u>L</u>
Res BW	1.0 MHz		#VB	W 3.0 MHz		Sweep 18	3.00 ms (30001 pts)	

Plot 7-45. Conducted Spurious Plot (Bluetooth (LE), 1Mbps - Ch. 0)



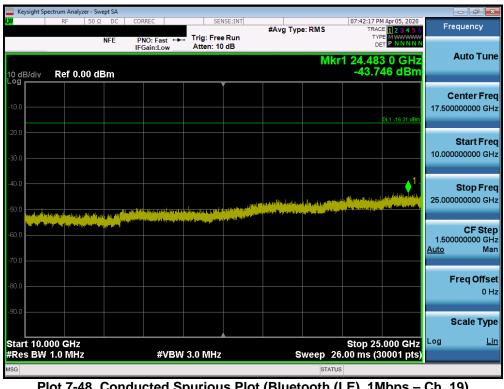
Plot 7-46. Conducted Spurious Plot (Bluetooth (LE), 1Mbps - Ch. 0)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element		🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 42 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 42 of 54
© 2020 PCTEST	•	•		V 9.0 02/01/2019



🔤 Keysight Sp	ectrum Analyzer											
LXI	RF	50Ω DC	CORR	EC	SEI	NSE:INT	#Avg Typ	e: RMS		M Apr 05, 2020 CE 1 2 3 4 5 6	Fre	quency
		NFE		D: Fast ↔ ain:Low	Trig: Free Atten: 30				TY			
10 dB/div Log	Ref 20.0	00 dBm						Μ	kr1 9.80 -31.3	4 9 GHz 82 dBm		Auto Tune
10.0												e <b>nter Freq</b> 000000 GHz
-10.0										DL1 -16.31 dBm		Start Freq 000000 MHz
-20.0						14			set and a decide	Malification and		<b>Stop Freq</b> 000000 GHz
-40.0											997.0 <u>Auto</u>	<b>CF Step</b> 000000 MHz Man
-60.0											F	r <b>eq Offset</b> 0 Hz
-70.0											S Log	cale Type
Start 30 M #Res BW				#VBW	3.0 MHz		8	weep 1	Stop 10 8.00 ms (3		LUg	Lin
MSG								STAT	US			

Plot 7-47. Conducted Spurious Plot (Bluetooth (LE), 1Mbps - Ch. 19)



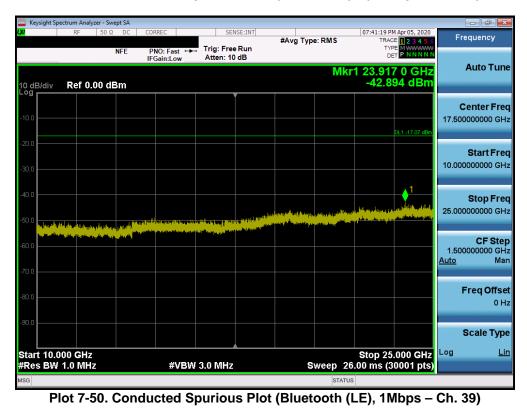
Plot 7-48. Conducted Spurious Plot (Bluetooth (LE), 1Mbps – Ch. 19)

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 42 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 43 of 54
© 2020 PCTEST	·	·		V 9.0 02/01/2019



🔤 Keysight Sp	ectrum Analyzer										
LXI	RF	50Ω DC	CORREC	S	ENSE:INT	#Avg Type	RMS	07:31:51 PM	123456	Fre	equency
		NFE	PNO: Fast IFGain:Lov								
							М	kr1 9.816	9 GHz		Auto Tune
10 dB/div Log	Ref 20.0	)0 dBm						-30.58	1 dBm		
										С	enter Freq
10.0										5.015	000000 GHz
0.00											
											Start Freq
-10.0										30.	000000 MHz
-20.0								D	L1 -17.07 dBm		Stop Erog
									1	10.000	Stop Freq 000000 GHz
-30.0							and taxa and a conflicted	and the second difference	PHALE-ALE-ALE-A		
-40.0		And in the second second	PARTA DE LA CARACTERIA	a di karangan karang Karangan karangan kara			الله منافر بال	a disanting pites and	office and the second		CF Step
the second second	and a straight	Augure and a factor								Auto	000000 MHz Man
-50.0											
-60.0										F	req Offset
											0 Hz
-70.0										9	Scale Type
Start 30 N #Res BW			#V	BW 3.0 MH	z	Sv	veep 1	Stop 10.0 8.00 ms (30		Log	<u>Lin</u>
MSG							STATU	_			

Plot 7-49. Conducted Spurious Plot (Bluetooth (LE), 1Mbps - Ch. 39)



PCTEST (? MEASUREMENT REPORT Approved by: 🕒 LG FCC ID: ZNFQ730VM (CERTIFICATION) Quality Manager Proud to be part of 📵 el EUT Type: Test Report S/N: Test Dates: Page 44 of 54 1M2003310054-05.ZNF 04/02 - 04/24/2020 Portable Handset © 2020 PCTEST V 9.0 02/01/2019



## 7.7 Radiated Spurious Emission Measurements §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 7-5 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/m]	Measured Distance [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 7-5. Radiated Limits

#### **Test Procedures Used**

ANSI C63.10-2013 – Section 6.6.4.3

KDB 558074 D01 v05r02 - Section 8.6, 8.7

#### Test Settings

#### Average Field Strength Measurements

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3kHz > 1/T
- 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 run for at least 50 times (1/duty cycle) traces

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 45 at 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 45 of 54
© 2020 PCTEST	-	•		V 9.0 02/01/2019



#### Peak Field Strength Measurements

- 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 7-6 below
- 3. VBW = 3MHz
- 4. Detector = peak
- 5. Sweep time = auto couple
- 6. Trace mode = max hold
- 7. Trace was allowed to stabilize

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

Table 7-6. RBW as a Function of Frequency

#### Test Setup

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

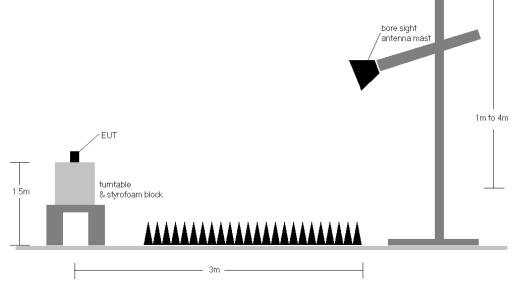


Figure 7-6. Radiated Test Setup >1GHz

FCC ID: ZNFQ730VM	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 4C of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 46 of 54
© 2020 PCTEST				V 9.0 02/01/2019



#### Test Notes

- The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v05r02 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
- 2. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-5.
- 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 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- Average measurements were recorded using a VBW of 3kHz, per Section 4.1.4.2.3 of ANSI C63.10-2013, since 1/T is equal to just under 3kHz. This method was used because the EUT could not be configured to operate with a duty cycle > 98%. Both average and peak measurements were made using a peak detector
- 7. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 8. No significant radiated band edge emissions were found in the 2310 2390MHz restricted band.
- 9. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

#### Sample Calculations

#### **Determining Spurious Emissions Levels**

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

#### Radiated Band Edge Measurement Offset

• The amplitude offset shown in the radiated restricted band edge plots in Section 7.8 was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 47 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 47 of 54
© 2020 PCTEST				V 9.0 02/01/2019



# Radiated Spurious Emission Measurements §15.205 §15.209 §15.247(d); RSS-Gen [8.9]

Bluetooth Mode:	LE
Distance of Measurements:	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	Н	-	-	-77.76	3.17	32.41	53.98	-21.57
4804.00	Peak	Н	-	-	-66.17	3.17	44.00	73.98	-29.98
12010.00	Avg	Н	-	-	-79.53	14.84	42.31	53.98	-11.67
12010.00	Peak	н	-	-	-67.77	14.84	54.07	73.98	-19.91

 Table 7-7. Radiated Measurements @ 3 meters

Bluetooth Mode:LEDistance of Measurements:3 MetersOperating Frequency:2440MHzChannel:19

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]
4880.00	Avg	н	-	-	-77.91	3.51	32.60	53.98	-21.37
4880.00	Peak	Н	-	-	-66.63	3.51	43.88	73.98	-30.09
7320.00	Avg	Н	-	-	-78.75	7.69	35.94	53.98	-18.04
7320.00	Peak	Н	-	-	-67.06	7.69	47.63	73.98	-26.35
12200.00	Avg	Н	-	-	-79.54	14.19	41.65	53.98	-12.33
12200.00	Peak	Н	-	-	-68.57	14.19	52.62	73.98	-21.36

Table 7-8. Radiated Measurements @ 3 meters

FCC ID: ZNFQ730VM	Poul to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 40 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 48 of 54
© 2020 PCTEST	•			V 9 0 02/01/2019



# Radiated Spurious Emission Measurements §15.205 §15.209 §15.247(d); RSS-Gen [8.9]

Bluetooth Mode:	LE
Distance of Measurements:	3 Meters
Operating Frequency:	2480MHz
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]
4960.00	Avg	Н	-	-	-77.65	3.09	32.44	53.98	-21.54
4960.00	Peak	Н	-	-	-66.13	3.09	43.96	73.98	-30.02
7440.00	Avg	Н	-	-	-78.47	8.58	37.11	53.98	-16.87
7440.00	Peak	н	-	-	-67.05	8.58	48.53	73.98	-25.45
12400.00	Avg	Н	-	-	-79.44	13.45	41.01	53.98	-12.97
12400.00	Peak	Н	-	-	-68.15	13.45	52.30	73.98	-21.68

Table 7-9. Radiated Measurements @ 3 meters

FCC ID: ZNFQ730VM	PCTEST Froud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 40 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 49 of 54
© 2020 PCTEST	•	·		V 9.0 02/01/2019



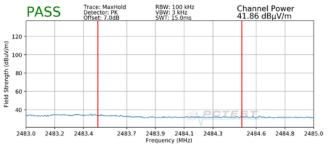
## 7.8 Radiated Restricted Band Edge Measurements §15.209; RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

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

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	LE
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



Plot 7-51. Radiated Restricted Upper Band Edge Measurement (Average)



Plot 7-52. Radiated Restricted Upper Band Edge Measurement (Peak)

FCC ID: ZNFQ730VM	PCTEST *	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage E0 of E4
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 50 of 54
© 2020 PCTEST	•			V 9.0 02/01/2019



#### 7.9 Line-Conducted Test Data §15.207; RSS-Gen [8.8]

#### **Test Overview and Limit**

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN 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 conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

### All conducted emissions must not exceed the limits shown in the table below, per Section 15.207 and RSS-Gen (8.8).

Frequency of emission (MHz)	Conducted Limit (dBµV)		
	Quasi-peak	Average	
0.15 – 0.5	66 to 56*	56 to 46*	
0.5 - 5	56	46	
5 - 30	60	50	

Table 7-10. Conducted Limits

\*Decreases with the logarithm of the frequency.

#### **Test Procedures Used**

ANSI C63.10-2013, Section 6.2

#### Test Settings

#### **Quasi-Peak Field Strength Measurements**

- 1. Analyzer center frequency was set to the frequency of the spurious emission of interest
- 2. RBW = 9kHz (for emissions from 150kHz 30MHz)
- 3. Detector = quasi-peak
- 4. Sweep time = auto couple
- 5. Trace mode = max hold
- 6. Trace was allowed to stabilize

#### Average Field Strength Measurements

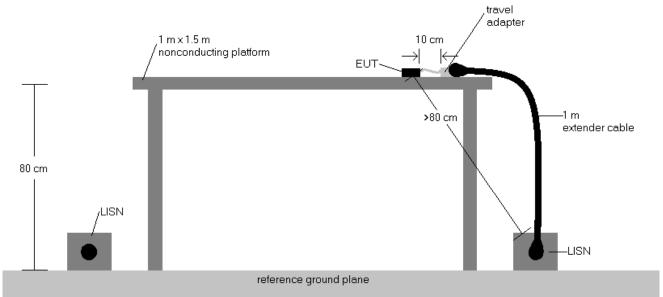
- 1. Analyzer center frequency was set to the frequency of the spurious emission of interest
- 2. RBW = 9kHz (for emissions from 150kHz 30MHz)
- 3. Detector = RMS
- 4. Sweep time = auto couple
- 5. Trace mode = max hold
- 6. Trace was allowed to stabilize

FCC ID: ZNFQ730VM	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 51 of 54
© 2020 PCTEST				V 9 0 02/01/2019



#### Test Setup

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



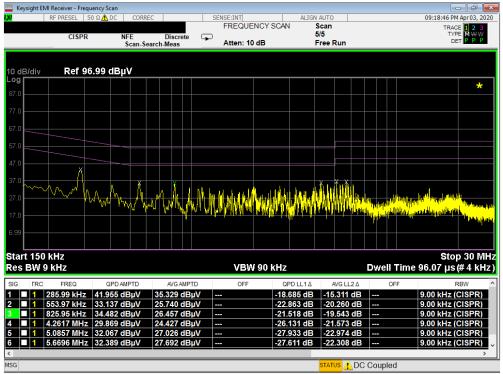


#### Test Notes

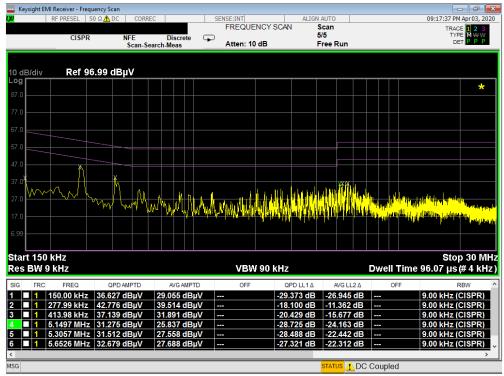
- All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
- 2. The limit for an intentional radiator from 150kHz to 30MHz are specified in Part 15.207 and RSS-Gen (8.8).
- 3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
- 4. QP/AV Level (dB $\mu$ V) = QP/AV Analyzer/Receiver Level (dB $\mu$ V) + Corr. (dB)
- 5. Margin (dB) = QP/AV Limit (dB $\mu$ V) QP/AV Level (dB $\mu$ V)
- 6. Traces shown in plot are made using a peak detector.
- 7. Deviations to the Specifications: None.

FCC ID: ZNFQ730VM		MEASUREMENT REPORT (CERTIFICATION)	💽 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 52 of 54
© 2020 PCTEST				V 9.0 02/01/2019









Plot 7-54. Line Conducted Plot with Bluetooth LE (N)

FCC ID: ZNFQ730VM	PCTEST *	MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 52 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset		Page 53 of 54
© 2020 PCTEST	•	•		V 9.0 02/01/2019



### 8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFQ730VM** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.

FCC ID: ZNFQ730VM	PCTEST*	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 54 of 54
1M2003310054-05.ZNF	04/02 - 04/24/2020	Portable Handset	Page 54 of 54
© 2020 PCTEST	•		V 9.0 02/01/2019