

PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT FCC Part 15.247 WLAN 802.11b/g/n

Applicant Name:

LG Electronics MobileComm U.S.A 1000 Sylvan Avenue Englewood Cliffs, NJ 07632 United States

Date of Testing:

12/29/2014 - 1/19/2015 **Test Site/Location:** PCTEST Lab, Columbia, MD, USA **Test Report Serial No.:** 0Y1412312361.ZNF

FCC ID:	ZNFL15G
APPLICANT:	LG Electronics MobileComm U.S.A
Application Type:	Class II Permissive Change
Model(s):	LGL15G, L15G, LG-L15G
EUT Type:	Portable Handset
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15.247
Test Procedure(s):	KDB 558074 v03r02
Class II Permissive Change:	Please see FCC change document
Original Grant Date:	1/7/2015

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 558074 v03r02. 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: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 1 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 1 of 19
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TABLE OF CONTENTS

FCC P/	ART ´	15.247 MEASUREMENT REPORT	. 3
1.0	INTF	RODUCTION	4
	1.1	SCOPE	4
	1.2	PCTEST TEST LOCATION	4
2.0	PRC	DDUCT INFORMATION	5
	2.1	EQUIPMENT DESCRIPTION	5
	2.2	DEVICE CAPABILITIES	5
	2.3	TEST CONFIGURATION	5
	2.4	EMI SUPPRESSION DEVICE(S)/MODIFICATIONS	5
3.0	DES	CRIPTION OF TEST	6
	3.1	EVALUATION PROCEDURE	6
	3.2	RADIATED EMISSIONS	6
	3.3	ENVIRONMENTAL CONDITIONS	6
4.0	ANT	ENNA REQUIREMENTS	7
5.0	TES	T EQUIPMENT CALIBRATION DATA	8
6.0	TES	T RESULTS	9
	6.1	SUMMARY	9
	6.2	RADIATED SPURIOUS EMISSION MEASUREMENTS ABOVE 1 GHZ	10
	6	2.1 RADIATED SPURIOUS EMISSION MEASUREMENTS	13
	Ũ	.2.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS	
7.0	CON		19

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 2 of 19
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Fage 2 01 19
© 2015 PCTEST Engineering Laboratory, Inc.				
				11/10





MEASUREMENT REPORT FCC Part 15.247



§ 2.1033 General Information

APPLICANT:	LG Electronics MobileComm U.S.A				
APPLICANT ADDRESS:	1000 Sylvan Avenue				
	Englewood Cliffs, NJ 07632, United States				
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.				
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA				
FCC RULE PART(S):	Part 15.247				
BASE MODEL:	LGL15G, L15G, LG-L15G				
FCC ID:	ZNFL15G				
FCC CLASSIFICATION:	Digital Transmission System (DTS)				
Test Device Serial No.:	29DEC-5				
DATE(S) OF TEST:	12/29/2014 - 1/19/2015				
TEST REPORT S/N:	0Y1412312361.ZNF				

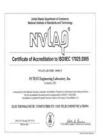
Test Facility / Accreditations

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



- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 3 of 19	
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Fage 5 01 19	
© 2015 PCTEST Engineering	2015 PCTEST Engineering Laboratory, Inc.				





INTRODUCTION 1.0

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 Industry Canada Certification and Engineering Bureau.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'I (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.

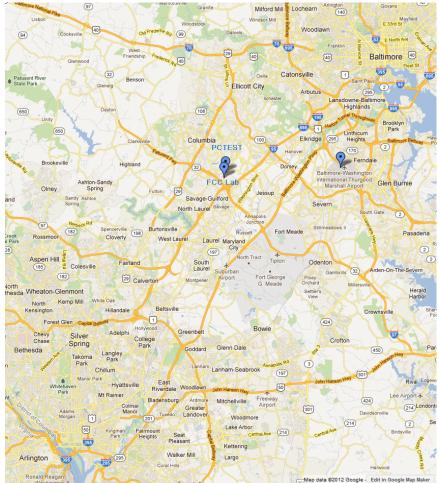


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 4 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 4 of 19
© 2015 PCTEST Engineering	Laboratory Inc.			V 1 31



PRODUCT INFORMATION 2.0

2.1 **Equipment Description**

The Equipment Under Test (EUT) is the LGE Portable Handset FCC ID: ZNFL15G. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

2.2 **Device Capabilities**

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1900 WCDMA/HSPA, 802.11b/g/n WLAN, Bluetooth (1x, EDR, LE)

Note: The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of KDB 558074 v03r02. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Maximum Achievable Duty Cycles				
802 11 M	ada / Dand	Duty Cycle [%]		
802.11 Mode/Band		ANT1		
2.4GHz	b	99.43		
	g	94.95		
	n	94.86		

Data Rates Supported: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)

6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (g) 6.5/7.2Mbps, 13/14.4Mbps, 19.5/21.7Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 58.5/65Mbps, 65/72.2Mbps (n - 20MHz)

2.3 **Test Configuration**

The LGE Portable Handset FCC ID: ZNFL15G was tested per the guidance of KDB 558074 v03r02. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing. See Section 3.2 for radiated 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: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 5 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 5 of 19
© 2015 PCTEST Engineering	Laboratory, Inc.			V 1.31

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3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009), and the guidance provided in KDB 558074 v03r02 were used in the measurement of the LGE Portable Handset FCC ID: ZNFL15G.

Deviation from measurement procedure.....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz 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 below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the PVC supports to bring the total height of the table to 80cm.

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(b)(1) 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 0.8 meter high, 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, clock speed, mode of operation or video resolution, if applicable, 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.

3.3 Environmental Conditions

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

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 6 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 6 of 19
© 2015 PCTEST Engineering Laboratory Inc				

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

- The antennas of the Portable Handset are **permanently attached**.
- There are no provisions for connections to an external antenna.

Conclusion:

The LGE Portable Handset FCC ID: ZNFL15G unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

Table 4-1. Frequency/ Channel Operations

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 7 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 7 of 19
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5.0 TEST EQUIPMENT CALIBRATION DATA

Manufacturer Model Description Cal Date Cal Interval Cal Due Serial Number Radiated Emissions Cable Set (UHF/EHF) 5/29/2014 5/29/2015 RE1 Annual N/A 5/30/2014 5/30/2015 2443A01900 Agilent 8447D **Broadband Amplifier** Annual 4/16/2014 US42510244 Agilent E4448A PSA (3Hz-50GHz) Spectrum Analyzer Annual 4/16/2015 N9020A MXA Signal Analyzer 10/27/2014 10/27/2015 US46470561 Agilent Annual Agilent N9030A PXA Signal Analyzer (44GHz) 1/17/2014 Annual 1/17/2015 MY52350166 Emco 3115 Horn Antenna (1-18GHz) 1/30/2014 Biennial 1/30/2016 9704-5182 Active Loop Antenna (10k - 30 MHz) 6/24/2014 6/24/2016 267 Emco 6502 Biennial ETS Lindgren 3117 1-18 GHz DRG Horn (Medium) 4/8/2014 Biennial 4/8/2016 125518 ETS Lindgren 6/17/2014 6/17/2016 135427 3160-09 18-26.5 GHz Standard Gain Horn Biennial 11SH10-3075/U18000 5/2/2014 5/2/2015 K & L **High Pass Filter** Annual 2 100071 Rohde & Schwarz TS-PR18 1-18 GHz Pre-Amplifier 3/5/2014 Annual 3/5/2015 100040 Rohde & Schwarz TS-PR26 18-26.5 GHz Pre-Amplifier 3/12/2014 Annual 3/12/2015 Rohde & Schwarz ESU40 EMI Test Receiver (40GHz) 5/21/2014 Annual 5/21/2015 100348 Seekonk NC-100 Torque Wrench 5/16", 8" lbs 3/18/2014 Biennial 3/18/2016 N/A

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

 Table 5-1. Annual Test Equipment Calibration Schedule

Notes:

1. For equipment listed above that has a 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: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 9 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 8 of 19
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TEST RESULTS 6.0

6.1 Summary

Company Name:	LG Electronics MobileComm U.S.A		
FCC ID:	ZNFL15G		
FCC Classification:	Digital Transmission System (DTS)		

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference	
TRANSMITTER	MODE (TX)					
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	RADIATED	PASS	Sections 6.2, 6.2.2	
	Table 6-1. Summary of Test Results					

Notes:

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

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 0 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 9 of 19
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6.2 Radiated Spurious Emission Measurements Above 1 GHz §15.247(d) §15.205 & §15.209

Test Overview and Limit

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

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 6-2 per Section 15.209.

Frequency	Field Strength [μV/m]	Measured Distance [Meters]	
Above 960.0 MHz	500	3	

Table 6-2. Radiated Limits

Test Procedures Used

KDB 558074 v03r02 - Section 12.1, 12.2.7

Test Settings

Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 v03r02

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = power average (RMS)
- 5. Number of measurement points = 1001 (Number of points must be $\geq 2 \times \text{span/RBW}$)
- 6. Sweep time = auto
- 7. Trace (RMS) averaging was performed over at least 100 traces

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 v03r02

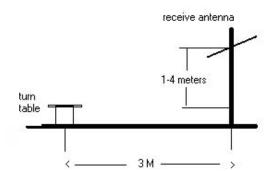
- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = peak
- 5. Sweep time = auto couple
- 6. Trace mode = max hold
- 7. Trace was allowed to stabilize

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 10 of 19
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 10 01 19
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Test Setup

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



3 Meter EMC Chamber

Figure 6-1. Test Instrument & Measurement Setup

Test Notes

- 1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 v03r02 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 are below the limit shown in Table 6-10.
- 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.
- 6. 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.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level [dBuV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m] 0
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] 0
- Margin [dB] = Field Strength Level $[dB\mu V/m]$ Limit $[dB\mu V/m]$ Ο

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 11 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 11 of 19
© 2015 PCTEST Engineering	Laboratory Inc.			V 1 31



Radiated Band Edge Measurement Offset

• The amplitude offset shown in the radiated restricted band edge plots in Section 6.8 was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + 10 dB Attenuator) – Preamplifier Gain

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕑 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 12 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 12 of 19
© 2015 PCTEST Engineering I	aboratory, Inc.	•		V 1.31



6.2.1 Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01
Channel:	01

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	-104.11	Avg	Н	40.56	43.45	53.98	-10.53
4824.00	-98.49	Peak	Н	40.56	49.07	73.98	-24.91
12060.00	-115.79	Avg	Н	46.44	37.65	53.98	-16.33
12060.00	-104.57	Peak	Н	46.44	48.87	73.98	-25.11

Table 6-3. Radiated Measurements

Worst Case Mode: Worst Case Transfer Rate: Distance of Measurements: Operating Frequency: Channel:

8	02.11b
1	Mbps
3	Meters
24	437MHz
0	6

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	-105.31	Avg	Н	40.57	42.26	53.98	-11.72
4874.00	-99.11	Peak	Н	40.57	48.46	73.98	-25.52
7311.00	-108.74	Avg	Н	42.89	41.15	53.98	-12.83
7311.00	-99.78	Peak	Н	42.89	50.11	73.98	-23.87
12185.00	-115.68	Avg	Н	46.56	37.88	53.98	-16.10
12185.00	-102.99	Peak	Н	46.56	50.57	73.98	-23.41

Table 6-4. Radiated Measurements

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 12 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 13 of 19
2015 PCTEST Engineering Laboratory, Inc.				



Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	-105.83	Avg	Н	40.56	41.73	53.98	-12.25
4924.00	-98.86	Peak	Н	40.56	48.70	73.98	-25.28
7386.00	-110.46	Avg	Н	42.98	39.52	53.98	-14.46
7386.00	-100.91	Peak	Н	42.98	49.07	73.98	-24.91
12310.00	-113.44	Avg	Н	46.72	40.28	53.98	-13.70
12310.00	-102.05	Peak	Н	46.72	51.67	73.98	-22.31

Table 6-5. Radiated Measurements

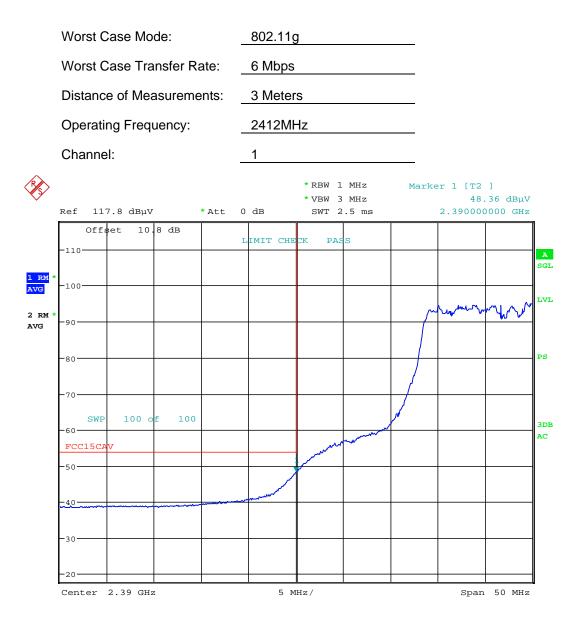
FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 14 of 19
© 2015 PCTEST Engineering Laboratory, Inc.				

V 1.31 11/19/2014



6.2.2 Radiated Restricted Band Edge Measurements §15.205 §15.209

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



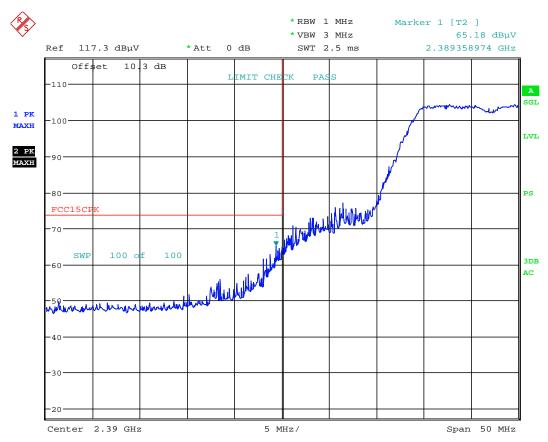
Date: 30.DEC.2014 00:53:32



FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 15 of 19
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Fage 13 01 19
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Antenna-1 Radiated Restricted Band Edge Measurements §15.205 §15.209



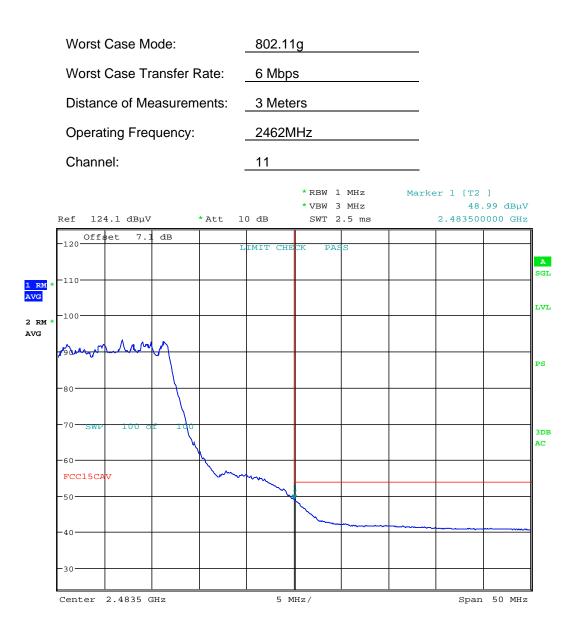
Date: 30.DEC.2014 00:54:24

Plot 6-2. Radiated Restricted Lower Band Edge Measurement (Peak)

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 16 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 16 of 19
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Antenna-1 Radiated Restricted Band Edge Measurements §15.205 §15.209



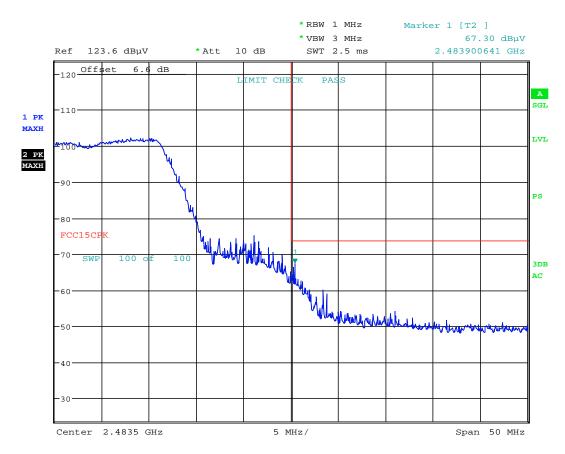
Date: 19.JAN.2015 23:50:22

Plot 6-3. Radiated Restricted Upper Band Edge Measurement (Average)

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕑 LG	Reviewed by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dego 17 of 10
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 17 of 19
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Antenna-1 Radiated Restricted Band Edge Measurements §15.205 §15.209



Date: 19.JAN.2015 23:51:01

Plot 6-4. Radiated Restricted Upper Band Edge Measurement (Peak)

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 19 of 10	
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 18 of 19	
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CONCLUSION 7.0

The data collected relate only the item(s) tested and show that the LGE Portable Handset FCC ID: ZNFL15G is in compliance with Part 15C of the FCC Rules.

FCC ID: ZNFL15G		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)	🕒 LG	Reviewed by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Page 19 of 19	
0Y1412312361.ZNF	12/29/2014 - 1/19/2015	Portable Handset		Page 19 01 19	
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