



# PCTEST ENGINEERING LABORATORY, INC.

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## MEASUREMENT REPORT FCC PART 15.247 / IC RSS-210 Bluetooth

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

**Date of Testing:**  
February 21, 2014  
**Test Site/Location:**  
PCTEST Lab. Columbia, MD, USA  
**Test Report Serial No.:**  
0Y1402170441.ZNF

<b>FCC ID:</b>	<b>ZNFVN280</b>
<b>APPLICANT:</b>	<b>LG Electronics MobileComm U.S.A</b>

**Application Type:** Class II Permissive Change  
**Model(s):** LG-VN280, LG-AN280, LG-UN280, LG-VN280PP, LG-AN280PP, LGUN280PP, LG280  
**EUT Type:** Portable Handset  
**Frequency Range:** 2402 – 2480MHz (Bluetooth for US)  
**Type of Modulation:** GFSK,  $\pi/4$ -DQPSK, 8DPSK  
**FCC Classification:** FCC Part 15 Spread Spectrum Transmitter (DSS)  
**FCC Rule Part(s):** Part 15 Subpart C (15.247)  
**IC Specification(s):** RSS-210 Issue 8  
**Test Procedure(s):** DA 00-705  
**Class II Permissive Change:** Please see FCC change documents.  
**Original Grant Date:** January 16, 2014

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 DA 00-705. 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



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<b>Test Report S/N:</b> 0Y1402170441.ZNF	<b>Test Dates:</b> February 21, 2014	<b>EUT Type:</b> Portable Handset	Page 1 of 16	

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# MEASUREMENT REPORT

## FCC Part 15.247

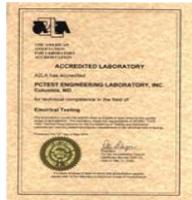


### § 2.1033 General Information

**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:** 6660-B Dobbin Road, Columbia, MD 21045 USA  
**FCC RULE PART(S):** Part 15 Subpart C (15.247)  
**IC SPECIFICATION(S):** RSS-210 Issue 8  
**BASE MODEL:** LG-VN280  
**FCC ID:** ZNFVN280  
**Test Device Serial No.:** A0000034ADEBBB     Production     Pre-Production     Engineering  
**FCC CLASSIFICATION:** FCC Part 15 Spread Spectrum Transmitter (DSS)  
**Method/System:** Frequency Hopping Spread Spectrum (FHSS)  
**DATE(S) OF TEST:** February 21, 2014  
**TEST REPORT S/N:** OY1402170441.ZNF

### Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) 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 (2451A-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 (2451A-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.

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# 1.0 INTRODUCTION

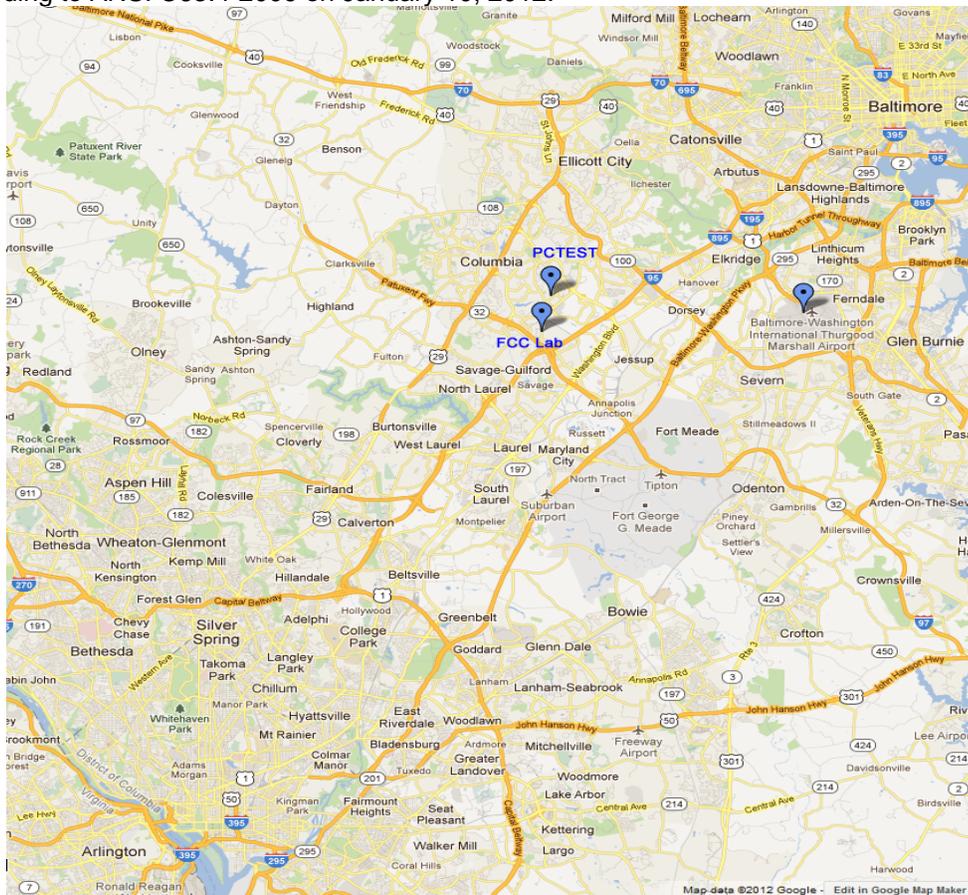
## 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission 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 Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

Testing was conducted at PCTEST Engineering Laboratory, Inc. facility located in New Concept Business Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. 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 January 10, 2012.



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

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFVN280**. The test data contained in this report pertains only to the emissions due to the EUT's Bluetooth transmitter.

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

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA (BC0, BC1), Bluetooth (1x, EDR)

### 2.3 Test Configuration

The LG Portable Handset FCC ID: ZNFVN280 was tested per the guidance of DA 00-705. See Section 3.2 radiated emissions test setups.

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

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

### 2.5 Labeling Requirements

Per 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

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## 3.0 DESCRIPTION OF TEST

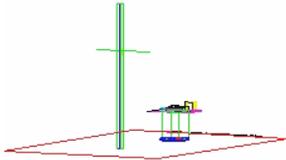
### 3.1 Evaluation Procedure

The measurement procedure described in the "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" (DA 00-705) were used in the measurement of the **LG Portable Handset FCC ID: ZNFVN280**.

Deviation from measurement procedure.....None

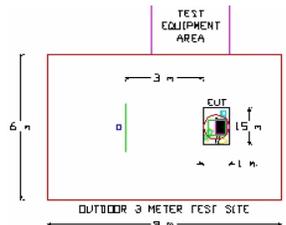
FCC ID: ZNFVN280		FCC Pt. 15.247 BLUETOOTH TEST REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
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### 3.2 Radiated Emissions



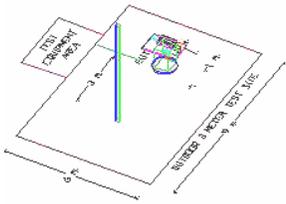
**Figure 3-1. 3-Meter Test Site**

The radiated test facilities consisted of an indoor semi-anechoic chamber used for exploratory measurements and an open area test site (OATS) used for final measurements. 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 higher than the upper frequency range of the broadband antenna used for testing, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used.



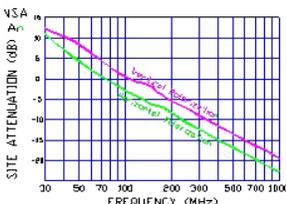
**Figure 3-2. Dimensions of Outdoor Test Site**

Exploratory measurements were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies 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 a 0.8 meter high non-metallic 1 x 1.5 meter table (see Figure 3-3). 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, turntable azimuth, and receive antenna height was noted for each frequency found. To record the exploratory measurements, the analyzers' detector function was set to peak mode and the bandwidth was set to 100kHz.



**Figure 3-3. Turntable and System Setup**

Final measurements were made on the OATS at 3 meter test range using calibrated, linearly polarized broadband or horn antennas (see Figure 3-1). The measurement area is situated on an 18 meter x 20 meter galvanized 1/2" hardware cloth as the conducting ground plane. This material is sewn together in sections 4 feet wide and 60 feet long. A total of eighteen sections are required to cover the entire measurement area. Sections are laid across the width of the pad, overlapped 1" and sewn and soldered together at intervals of 3" (7.6 cm.) The terrain of the test site is reasonably flat and level. Power and cable to the test site are buried 18" deep into the ground outside the perimeter of the site. An all-weather non-metallic housing is situated on a 2 x 3 meter area adjacent to the measurement area to house the test equipment (see Figure 3-2). The test set-up was again placed on top of the same a 0.8 meter high non-metallic 1 x 1.5 meter table on the OATS as used for exploratory measurements in the indoor chamber. The test set-up was re-configured to the same setup that was previously determined through exploratory measurements to have produced the worst case emissions. The spectrum analyzer was set to the frequencies found to have caused the highest radiated disturbances with respect to the limit during preliminary radiated measurements. The turntable containing the system 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. For the EUT positioning, "H" is defined with the EUT lying flat on the test surface, "H2" is defined with the EUT standing up on its side, and "V" is defined with the EUT standing upright.



**Figure 3-4. Normalized Site Attenuation Curves (H&V)**

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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 LG Portable Handset are **permanently attached**.
- There are no provisions for connection to an external antenna.

### Conclusion:

The **LG Portable Handset FCC ID: ZNFVN280** unit complies with the requirement of §15.203.

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

**Table 4-1. Frequency/ Channel Operations**

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	3/29/2013	Annual	3/29/2014	N/A
-	RE2	Radiated Emissions Cable Set (VHF/UHF)	3/29/2013	Annual	3/29/2014	N/A
Agilent	8447D	Broadband Amplifier	5/31/2013	Annual	5/31/2014	1937A03348
Agilent	8449B	(1-26.5GHz) Pre-Amplifier	4/17/2013	Annual	4/17/2014	3008A00985
Agilent	N9038A	MXE EMI Receiver	1/3/2014	Annual	1/3/2015	MY51210133
Agilent	N9030A	PXA Signal Analyzer (26.5GHz)	4/18/2013	Annual	4/18/2014	MY49432391
Emco	3116	Horn Antenna (18 - 40GHz)	1/20/2012	Triennial	1/20/2015	9203-2178
Emco	6502	Active Loop Antenna (10k - 30 MHz)	5/31/2012	Biennial	5/31/2014	267
Emco	3816/2	Line Impedance Stabilization Network	2/12/2013	Biennial	2/12/2015	9707-1079
Mini-Circuits	VHF-3100+	High Pass Filter	1/29/2014	Annual	1/29/2015	31144
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	1/28/2014	Annual	1/28/2015	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	N/A		N/A	836536/0005
Sunol	DRH-118	Horn Antenna (1 - 18GHz)	6/19/2013	Biennial	6/19/2015	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107

**Table 5-1. Annual Test Equipment Calibration Schedule**

**Note:**

Equipment used for signaling with a calibration date of "N/A" shown in this list was only used for maintaining a link between the piece of equipment and the EUT. This equipment was not used to make direct calibrated measurements.

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## 6.0 TEST RESULTS

### 6.1 Summary

Company Name: LG Electronics MobileComm U.S.A  
 FCC ID: ZNFVN280  
 Method/System: Frequency Hopping Spread Spectrum (FHSS)  
 Number of Channels: 79

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
<b>TRANSMITTER MODE (Tx)</b>						
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-210 table 3 limits)	RADIATED	PASS	Section 6.2, Section 6.3

**Table 6-1. Summary of Test Results**

**Notes:**

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

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## 6.2 Radiated Spurious Emission Measurements

§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

Frequency	Field Strength [ $\mu\text{V/m}$ ]	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 6-2. Radiated Limits**

### Sample Calculation

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

### Duty Cycle Correction Factor Calculation

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

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**Test Notes**

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-2.
2. No significant radiated emissions were found in the 2310 - 2390MHz restricted band.
3. Average measurements > 1GHz using RBW = 1MHz and VBW = 1kHz  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz. Both average and peak measurements were made using a peak detector.
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested with its standard battery.
6. The spectrum is measured from 9kHz to the 10<sup>th</sup> harmonic and the worst-case emissions are reported. Emissions whose levels were not within 20dB of the respective limits were not reported.
7. Average levels at -135 dBm and peak levels at -125dBm represent the analyzer noise floor and signify that no emission was detected.

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## Radiated Spurious Emission Measurements (Cont'd)

§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 2Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2402MHz  
 Channel: 0

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4804.00	-107.83	Avg	H	41.25	-22.50	17.92	53.98	-36.06
4804.00	-96.47	Peak	H	41.25	0.00	51.78	73.98	-22.20
12010.00	-135.00	Avg	H	64.67	0.00	36.67	53.98	-17.30
12010.00	-125.00	Peak	H	64.67	0.00	46.67	73.98	-27.30

**Table 6-3. Radiated Measurements**

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 2Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2441MHz  
 Channel: 39

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4882.00	-105.48	Avg	H	41.71	-22.50	20.74	53.98	-33.24
4882.00	-96.14	Peak	H	41.71	0.00	52.57	73.98	-21.40
7323.00	-135.00	Avg	H	48.46	0.00	20.46	53.98	-33.52
7323.00	-125.00	Peak	H	48.46	0.00	30.46	73.98	-43.52
12205.00	-135.00	Avg	H	73.11	0.00	45.11	53.98	-8.87
12205.00	-125.00	Peak	H	73.11	0.00	55.11	73.98	-18.87

**Table 6-4. Radiated Measurements**

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**Radiated Spurious Emission Measurements (Cont'd)**  
**§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)**

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 2Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2480MHz  
 Channel: 78

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4960.00	-107.13	Avg	H	42.10	-22.50	19.47	53.98	-34.50
4960.00	-96.52	Peak	H	42.10	0.00	52.58	73.98	-21.40
7440.00	-135.00	Avg	H	48.50	0.00	20.50	53.98	-33.48
7440.00	-125.00	Peak	H	48.50	0.00	30.50	73.98	-43.48
12400.00	-135.00	Avg	H	73.10	0.00	45.10	53.98	-8.88
12400.00	-125.00	Peak	H	73.10	0.00	55.10	73.98	-18.88

**Table 6-5. Radiated Measurements**

FCC ID: ZNFVN280		FCC Pt. 15.247 BLUETOOTH TEST REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1402170441.ZNF	Test Dates: February 21, 2014	EUT Type: Portable Handset		Page 14 of 16

### 6.3 Radiated Restricted Band Edge Measurements §15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

Worst Case Mode: Bluetooth  
 Worst Case Data Rate: 2Mbps  
 Measurement Distance: 3 Meters  
 Operating Frequency: 2480MHz  
 Channel: 78

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2483.55	-107.03	Avg	H	35.94	-22.50	13.40	53.98	-40.58
2483.55	-96.58	Peak	H	35.94	0.00	46.35	73.98	-27.63
2484.24	-106.03	Avg	H	35.94	-22.50	14.42	53.98	-39.56
2484.24	-95.77	Peak	H	35.94	0.00	47.17	73.98	-26.80
2485.98	-109.07	Avg	H	35.95	-22.50	11.38	53.98	-42.59
2485.98	-96.55	Peak	H	35.95	0.00	46.40	73.98	-27.58

**Table 6-6. Radiated Restricted Band Edge Measurements at 3-meters**

FCC ID: ZNFVN280		FCC Pt. 15.247 BLUETOOTH TEST REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1402170441.ZNF	Test Dates: February 21, 2014	EUT Type: Portable Handset	Page 15 of 16	

## 7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFVN280** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-210 of the Industry Canada Rules.

<b>FCC ID:</b> ZNFVN280		<b>FCC Pt. 15.247 BLUETOOTH TEST REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Reviewed by:</b> Quality Manager
<b>Test Report S/N:</b> 0Y1402170441.ZNF	<b>Test Dates:</b> February 21, 2014	<b>EUT Type:</b> Portable Handset		Page 16 of 16