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MEASUREMENT REPORT FCC Part 22 & 90

Applicant Name:

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

Date of Testing:

1/21 - 2/15/2020

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M1912300226-04.ZNF

FCC ID:

ZNFV600TM

APPLICANT:

LG Electronics USA, Inc.

Application Type:

Class II Permissive Change

Model:

LM-V600TM

Additional Model(s):

LMV600TM, V600TM

EUT Type:

Portable Handset

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part:

§2.1049, §22(H), §90(S)

Test Procedure(s):


ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01,
KDB 648474 D03 v01r04

Class II Permissive Change:

Please see FCC change document

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. 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: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 1 of 18	

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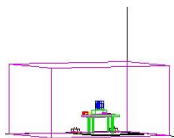
V 9.0 02/01/2019

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TABLE OF CONTENTS

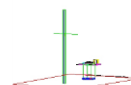
1.0	INTRODUCTION	4
1.1	Scope	4
1.2	PCTEST Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description	5
2.2	Device Capabilities.....	5
2.3	Test Configuration	5
2.4	EMI Suppression Device(s)/Modifications	5
3.0	DESCRIPTION OF TESTS	6
3.1	Evaluation Procedure	6
3.2	Radiated Power and Radiated Spurious Emissions	6
4.0	MEASUREMENT UNCERTAINTY	7
5.0	TEST EQUIPMENT CALIBRATION DATA	8
6.0	SAMPLE CALCULATIONS	9
7.0	TEST RESULTS.....	10
7.1	Summary.....	10
7.2	Radiated Power (ERP).....	11
7.3	Radiated Spurious Emissions Measurements	13
8.0	CONCLUSION.....	18

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 2 of 18	



MEASUREMENT REPORT

FCC Part 22(H) & 90



Mode	Tx Frequency (MHz)	Measurement	Max. Power (W)	Max. Power (dBm)	Modulation
LTE Band 26	821.5	ERP	0.058	17.66	QPSK
LTE Band 26	821.5	ERP	0.045	16.51	16-QAM
LTE Band 26	821.5	ERP	0.034	15.32	64-QAM
LTE Band 26	821.5	ERP	0.016	12.15	256-QAM

EUT Overview

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 3 of 18	

1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

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

1.3 Test Facility / Accreditations

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

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

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 4 of 18	

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFV600TM**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 22(H) and 90(S).

Test Device Serial No.: 04240, 04257

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, Multi-band LTE, 5G NR (n71, n66, n25, n2, n41(PC2)), 802.11b/g/n/ac/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) FCC ID: YZP-PWMAW815A while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

This device supports Dual Display (DD) Cover, which attaches to the device to provide a secondary display on the inside of the cover. The display was rotated through all possible orientations to determine worst case angle. The worst case radiated emission data with the Dual Display Cover is included in this report.

2.4 EMI Suppression Device(s)/Modifications

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

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 5 of 18	

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

\$2.1053, \$90.635, \$90(S)

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. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table 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. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d [\text{dBm}] = P_g [\text{dBm}] - \text{cable loss} [\text{dB}] + \text{antenna gain} [\text{dBd/dBi}]$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g [\text{dBm}] - \text{cable loss} [\text{dB}]$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10 \log_{10}(\text{Power} [\text{Watts}])$ specified in 90(S).

For fundamental radiated power measurements, the guidance of KDB 971168 D01 v03r01 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-E-2016.

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.

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 6 of 18	

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: ZNFV600TM	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 7 of 18

5.0 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
Agilent	E5515C	Wireless Communications Test Set	N/A			GB43193563
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
EMCO	3116	Horn Antenna (18-40GHz)	6/7/2018	Biennial	6/7/2020	9203-2178
Rohde & Schwarz	CMU200	Base Station Simulator	N/A			833855/0010
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	FSV40-N	Spectrum Analyzer (9K - 40GHz)	12/6/2019	Annual	12/6/2020	101814
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	TS-PR18	18-26.5 GHz Pre-Amplifier	1/31/2020	Annual	1/31/2021	100040
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	10/8/2019	Annual	10/8/2020	100037
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/11/2019	Annual	7/11/2020	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			165450
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 5-1. Test Equipment

Notes:

Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 8 of 18	

6.0 SAMPLE CALCULATIONS

Spurious Radiated Emission – BC10

Example: Channel 476 CDMA BC10 Mode 3rd Harmonic (2453.70MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 2453.70 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80) = 50.3 dBc.

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 9 of 18

7.0 TEST RESULTS

7.1 Summary

Company Name: LG Electronics USA, Inc.
 FCC ID: ZNFV600TM
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): CDMA / EvDO / LTE
 Band: Band Class 10 / Band 26

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a.2)	Effective Radiated Power (Band 26)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.2
2.1053 90(S).691(a)	Radiated Spurious Emissions	> 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions except > 50 + 10 log ₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge		PASS	Section 7.3

Table 7-1. Summary of Test Results

Notes:

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

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 10 of 18	

7.2 Radiated Power (ERP)

§22.913(a.2) §90.542(a)(7)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW $\geq 3 \times$ RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $\geq 2 \times$ span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 11 of 18	

Test Setup

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

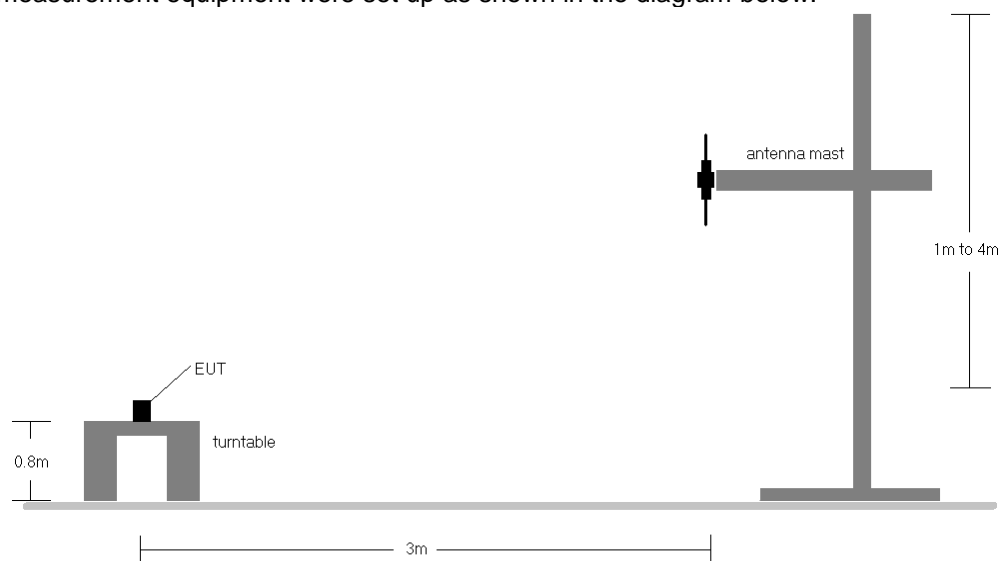


Figure 7-1. Radiated Test Setup <1GHz

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
821.50	15	QPSK	V	147	74	1 / 74	13.51	6.30	17.66	0.058	38.45	-20.79
821.50	15	16-QAM	V	147	74	1 / 74	12.36	6.30	16.51	0.045	38.45	-21.94
821.50	15	64-QAM	V	147	74	1 / 74	11.17	6.30	15.32	0.034	38.45	-23.13
821.50	15	256-QAM	V	147	74	1 / 74	8.00	6.30	12.15	0.016	38.45	-26.30
821.50	15	QPSK	H	221	84	1 / 74	12.94	6.70	17.49	0.056	38.45	-20.96
821.50	15 (WCP+DD)	QPSK	H	400	112	1 / 74	11.42	6.70	15.97	0.040	38.45	-22.48

Table 7-1. ERP Data (Band 26)

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 12 of 18

7.3 Radiated Spurious Emissions Measurements

§2.1053 §90(S).691(a)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset	Page 13 of 18	

Test Setup

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

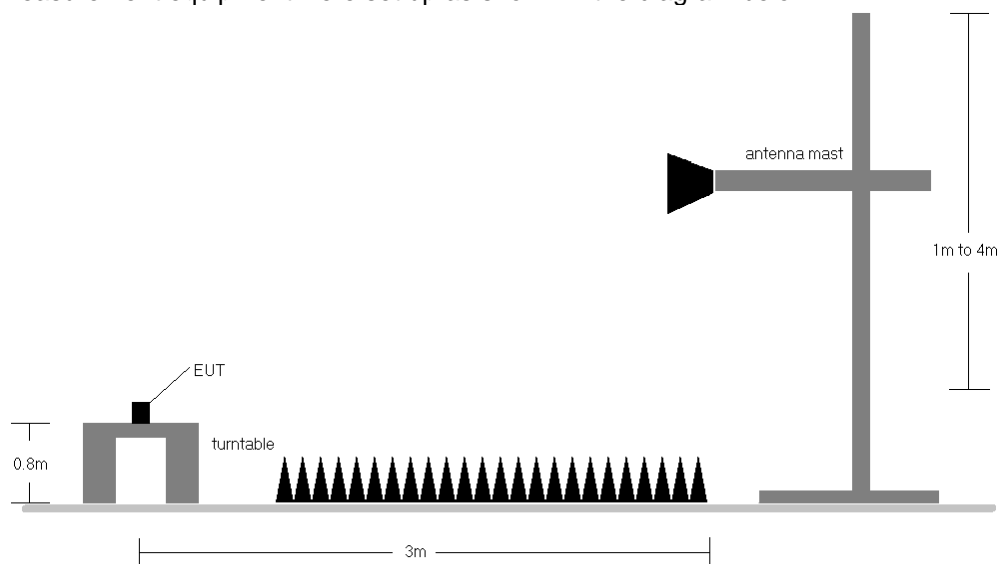


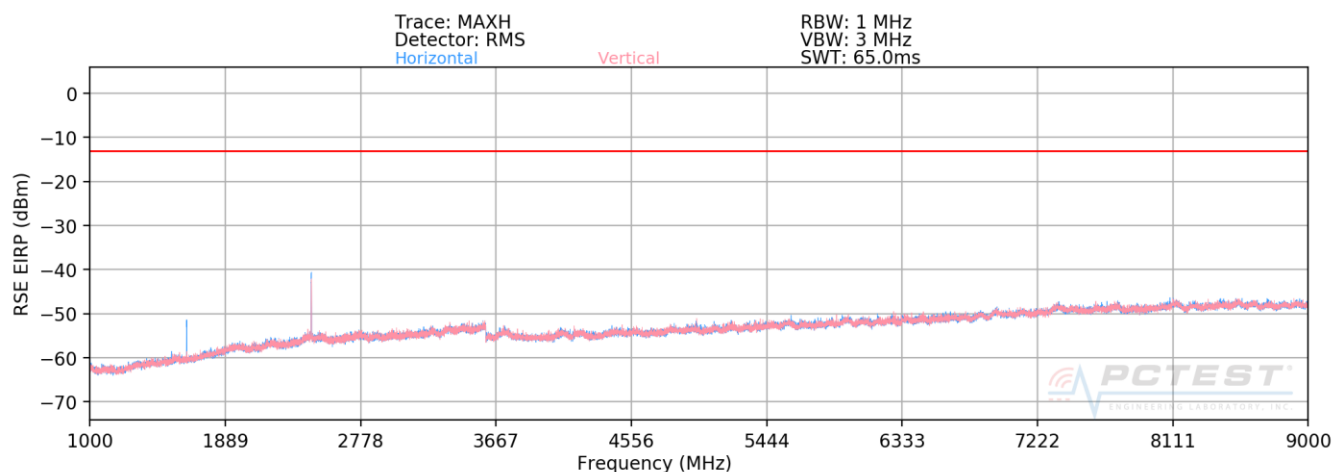
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.
2. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.
3. This unit was tested with its standard battery.
4. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
5. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 14 of 18

CDMA BC10



Plot 7-2. Radiated Spurious Plot (CDMA BC10)

OPERATING FREQUENCY: 817.90 MHz
MODULATION SIGNAL: CDMA
DISTANCE: 3 meters
LIMIT: -13.00 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1635.80	V	388	287	-69.80	3.59	-66.20	-53.2
2453.70	V	100	244	-65.05	4.17	-60.88	-47.9
3271.60	V	-	-	-67.54	5.69	-61.85	-48.8
4089.50	V	-	-	-69.07	7.52	-61.55	-48.5

Table 7-2. CDMA BC10 Radiated Spurious Data (Ch. 476)

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 15 of 18

OPERATING FREQUENCY: 823.10 MHz

MODULATION SIGNAL: CDMA

DISTANCE: 3 meters

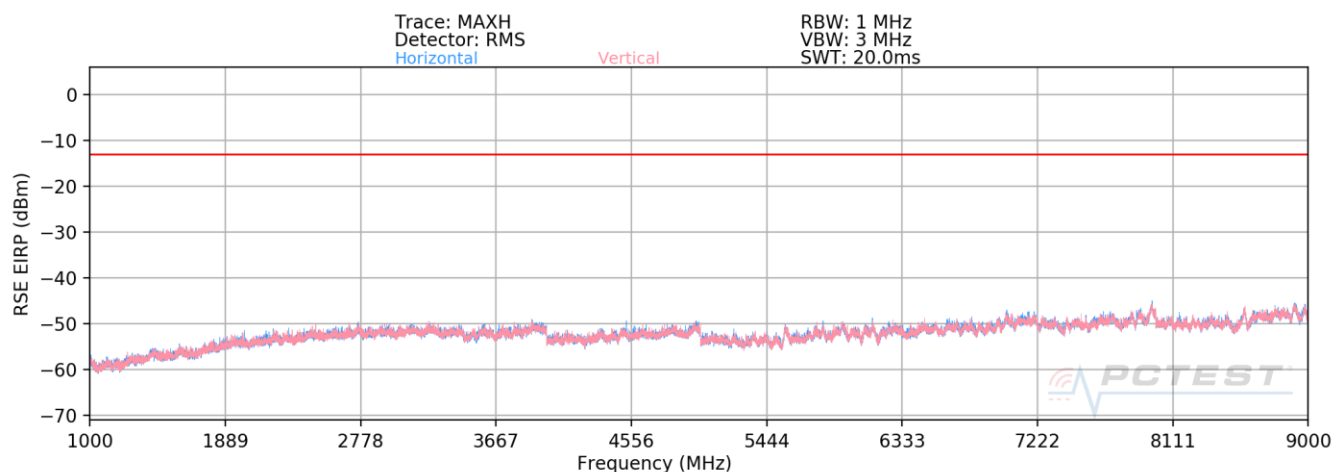
LIMIT: -13.00 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1646.20	V	377	296	-69.73	3.60	-66.12	-53.1
2469.30	V	113	243	-64.10	4.21	-59.90	-46.9
3292.40	V	-	-	-68.19	5.76	-62.44	-49.4
4115.50	V	-	-	-68.81	7.58	-61.23	-48.2

Table 7-3. CDMA BC10 Radiated Spurious Data (Ch. 684)

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 16 of 18

LTE Band 26



Plot 7-3. Radiated Spurious Plot (Band 26)

OPERATING FREQUENCY: 821.50 MHz
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 15.0 MHz
 DISTANCE: 3 meters
 LIMIT: -13.00 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1643.00	V	-	-	-68.94	3.04	-65.89	-52.9
2464.50	V	103	333	-63.86	3.76	-60.10	-47.1
3286.00	V	-	-	-67.69	5.99	-61.70	-48.7
4107.50	V	-	-	-69.38	7.62	-61.76	-48.8

Table 7-4. Radiated Spurious Data (LTE Band 26 – Mid Channel)

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 17 of 18

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFV600TM** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

FCC ID: ZNFV600TM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1912300226-04.ZNF	Test Dates: 1/21 - 2/15/2020	EUT Type: Portable Handset		Page 18 of 18