



PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
<http://www.pctest.com>



SAR EVALUATION REPORT

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

Date of Testing:
10/5/2017
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
1M1710060267-01-R1.ZNF

FCC ID: ZNFV30A

APPLICANT: LG ELECTRONICS MOBILECOMM U.S.A., INC.


DUT Type: Portable Handset
Application Type: Class II Permissive Change
FCC Rule Part(s): CFR §2.1093
Model: LG-H931
Additional Model(s): LGH931, H931, LG-H933, LGH933, H933, LG-VS996, LGVS996, VS996, LG-US998, LGUS998, US998
Permissive Change(s): Enabling TDWR channels

Note: This revised Test Report (S/N: 1M1710060267-01-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

The following test data was evaluated for the current test report. Please refer to RF Exposure Technical Report S/N 1M1707180221-01-R1.ZNF for original compliance evaluation.



This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.4 of this report; for North American frequency bands only.

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. Test results reported herein relate only to the item(s) tested.


Randy Ortanez
President





The SAR Tick is an initiative of the Mobile Manufacturers Forum (MMF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MMF. Further details can be obtained by emailing: sartick@mmfai.info.

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 1 of 11	

T A B L E O F C O N T E N T S



1	DEVICE UNDER TEST	3
2	FCC MEASUREMENT PROCEDURES.....	5
3	RF CONDUCTED POWERS	6
4	EQUIPMENT LIST.....	8
5	CONCLUSION.....	9
6	REFERENCES	10

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 2 of 11	

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
Cell. CDMA/EVDO	Voice/Data	824.70 - 848.31 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset		Page 3 of 11

1.2 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications for 5 GHz WLAN. See RF Exposure Technical Report S/N 1M1707180221-01-R1.ZNF for complete maximum and nominal output power specifications.

Mode / Band		Modulated Average (dBm)		
		20 MHz Bandwidth		
		Antenna 1	Antenna 2	MIMO
IEEE 802.11a (5 GHz)	Maximum	17.0	16.5	19.7
	Nominal	16.0	15.5	18.7
IEEE 802.11n (5 GHz)	Maximum	17.0	16.5	19.7
	Nominal	16.0	15.5	18.7
IEEE 802.11ac (5 GHz)	Maximum	17.0	16.5	19.7
	Nominal	16.0	15.5	18.7

Mode / Band		Modulated Average (dBm)								Modulated Average - MIMO (dBm)			
		40 MHz Bandwidth											
		Antenna 1				Antenna 2				MIMO			
		Ch 38	Ch 46, 54	Ch 62, 102	Ch 110 - 159	Ch 38	Ch 46, 54	Ch 62, 102	Ch 110 - 159	Ch 38	Ch 46, 54	Ch 62, 102	Ch 110 - 159
IEEE 802.11n (5 GHz)	Maximum	14.0	16.0	14.0	16.0	13.5	15.5	13.5	15.5	16.7	18.7	16.7	18.7
	Nominal	13.0	15.0	13.0	15.0	12.5	14.5	12.5	14.5	15.7	17.7	15.7	17.7
IEEE 802.11ac (5 GHz)	Maximum	14.0	16.0	14.0	16.0	13.5	15.5	13.5	15.5	16.7	18.7	16.7	18.7
	Nominal	13.0	15.0	13.0	15.0	12.5	14.5	12.5	14.5	15.7	17.7	15.7	17.7



Mode / Band		Modulated Average (dBm)						Modulated Average - MIMO (dBm)		
		80 MHz Bandwidth								
		Antenna 1			Antenna 2			MIMO		
		Ch 42	Ch 58	Ch 106 - 155	Ch 42	Ch 58	Ch 106 - 155	Ch 42	Ch 58	Ch 106 - 155
IEEE 802.11ac (5 GHz)	Maximum	13.0	11.0	13.0	12.5	10.5	12.5	15.7	13.7	15.7
	Nominal	12.0	10.0	12.0	11.5	9.5	11.5	14.7	12.7	14.7

1.3 SAR Test Exclusion

Additional SAR measurements were not required based on the conducted power measurements and the SAR Test configuration and channel selection requirements outlined in FCC KDB 248227 D01v02r02, Section 5. Please see RF Exposure Technical Report S/N 1M1707180221-01-R1.ZNF for full SAR compliance evaluation.

1.4 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)

FCC ID: ZNFV30A	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 4 of 11	

2 FCC MEASUREMENT PROCEDURES

2.1 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

2.1.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.



A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

2.1.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

2.1.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset		Page 5 of 11

3 RF CONDUCTED POWERS



3.1 WLAN Conducted Powers

**Table 3-1
5 GHz WLAN Ant 1 Maximum RF Power**

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
5180	36	16.76	16.54	16.55
5200	40	16.72	16.51	16.51
5220	44	16.68	16.50	16.54
5240	48	16.61	16.40	16.38
5260	52	16.57	16.39	16.38
5280	56	16.52	16.50	16.58
5300	60	16.54	16.35	16.39
5320	64	16.66	16.45	16.42
5500	100	16.66	16.50	16.49
5580	116	16.81	16.61	16.60
5600	120	16.49	16.39	16.24
5620	124	16.47	16.38	16.39
5640	128	16.49	16.16	16.21
5660	132	16.68	16.47	16.49
5720	144	16.73	16.51	16.55
5745	149	16.76	16.57	16.51
5785	157	16.75	16.56	16.58
5825	165	16.80	16.89	16.60

**Table 3-2
5 GHz WLAN Ant 2 Maximum RF Power**

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
5180	36	16.40	16.18	16.18
5200	40	16.46	16.23	16.19
5220	44	16.48	16.31	16.24
5240	48	16.49	16.26	16.29
5260	52	16.48	16.31	16.27
5280	56	16.48	16.24	16.25
5300	60	16.45	16.24	16.25
5320	64	16.49	16.30	16.27
5500	100	16.38	16.20	16.17
5580	116	16.49	16.28	16.23
5600	120	15.78	15.61	15.61
5620	124	15.73	15.81	15.89
5640	128	15.72	15.72	15.31
5660	132	16.44	16.31	16.25
5720	144	16.47	16.23	16.24
5745	149	16.45	16.30	16.28
5785	157	16.47	16.30	16.28
5825	165	16.34	16.39	16.41

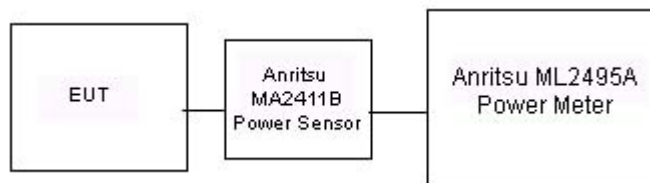
FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 6 of 11	

**Table 3-3
5 GHz WLAN MIMO 802.11n Maximum Average RF Power**



5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5180	36	16.54	16.18	19.37
5200	40	16.51	16.23	19.38
5220	44	16.50	16.31	19.42
5240	48	16.40	16.26	19.34
5260	52	16.39	16.31	19.36
5280	56	16.50	16.24	19.38
5300	60	16.35	16.24	19.31
5320	64	16.45	16.30	19.39
5500	100	16.50	16.20	19.36
5580	116	16.61	16.28	19.46
5600	120	16.39	15.61	19.03
5620	124	16.38	15.81	19.11
5640	128	16.16	15.72	18.96
5660	132	16.47	16.31	19.40
5720	144	16.51	16.23	19.38
5745	149	16.57	16.30	19.45
5785	157	16.56	16.30	19.44
5825	165	16.89	16.39	19.66

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured. Additional channels were evaluated for conducted power measurements per manufacturer request.





**Figure 3-1
Power Measurement Setup**

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 7 of 11	

4 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1339018
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	22313

CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 8 of 11	



5

CONCLUSION

5.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.



Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset		Page 9 of 11



6

REFERENCES

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.
- [2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.
- [3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.
- [4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.
- [5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
- [6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
- [8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.
- [9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
- [10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.
- [11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.
- [12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
- [14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.
- [15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.
- [16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.
- [17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset		Page 10 of 11

- [18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.
- [19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.
- [20] IEC 62209-1, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz), July 2016.
- [21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.
- [22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015
- [23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07
- [24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01
- [25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04
- [26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04
- [27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02
- [28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02
- [29] Anexo à Resolução No. 533, de 10 de Setembro de 2009.
- [30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

FCC ID: ZNFV30A		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1710060267-01-R1.ZNF	Test Dates: 10/5/2017	DUT Type: Portable Handset	Page 11 of 11	