

EMI TEST REPORT

FCC CERTIFICATION

Applicant:

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

Date of Receipt: July 18, 2016

Date of Issue: August 25, 2016

Test Report No. HCT-E-1608-F023-1

HCT FRN: 0005866421

FCC ID :

ZNFH990

Rule Part(s) / Standard(s): FCC CFR 47 PART 15 Subpart B Class B
FCC Classification: JBP (Part 15 B – Class B Computing Device Peripheral)
EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN, NFC
Model Name: LG-H990
Additional Model Name: LG-H990TR, LG-H990ds
Test Port: USB Type C / Earphone Port
Date of Test: July 27, 2016 - August 01, 2016

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance)

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.

HCT certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By



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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1608-F023	August 16, 2016	Initial Release
HCT-E-1608-F023-1	August 25, 2016	2 ND Edition: Add of text Clause 1.4 Instrument Calibration



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ATTACHMENT: TEST SETUP PHOTOGRAPHS



1. GENERAL INFORMATION

1.1 Description of EUT

Equipment Under Test is manufactured by **LG Electronics MobileComm U.S.A., Inc.**
Its basic purpose is used for communications.

FCC ID	ZNFH990
Model Name	LG-H990
Additional Model Name	LG-H990TR, LG-H990ds
EUT Type	GSM/WCDMA/LTE Phone with Bluetooth, WLAN, NFC
TX Frequency	824.20 MHz to 848.80 MHz (GSM 850) 1 850.20 MHz to 1 909.80 MHz (GSM 1 900) 1 852.4 MHz to 1 907.6 MHz (WCDMA B2) 1712.4 MHz to 1752.6 MHz (WCDMA B4) 826.40 MHz to 846.60 MHz (WCDMA B5) 1 850 MHz to 1 910 MHz (LTE B2) 1 710 MHz to 1 755 MHz (LTE B4) 824 MHz to 849 MHz (LTE B5) 2 496 MHz to 2570 MHz (LTE B7) 699 MHz to 716 MHz (LTE B12) 704 MHz to 716 MHz (LTE B17) 2 496 MHz to 2 690 MHz (LTE B41)
RX Frequency	869.20 MHz to 893.80 MHz (GSM 850) 1 930.20 MHz to 1 989.80 MHz (GSM 1 900) 1 932.4 MHz to 1 987.6 MHz (WCDMA B2) 2 112.4 MHz to 2 152.6 MHz (WCDMA B4) 871.40 MHz to 891.60 MHz (WCDMA B5) 1 930 MHz to 1 990 MHz (LTE B2) 2 110 MHz to 2 155 MHz (LTE B4) 869 MHz to 894 MHz (LTE B5) 2 516 MHz to 2690 MHz (LTE B7) 729 MHz to 746 MHz (LTE B12) 734 MHz to 746 MHz (LTE B17) 2 496 MHz to 2 690 MHz (LTE B41)

1.2 Related Submittal(s) / Grant(s)

Original submittal only.



1.3 Test Facility

Test site is located at 74, SEOICHEON-RO, 578BEON-GIL, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, SOUTH KOREA. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014.

Measurement Facilities	Reg. No.
HCT FRN: 0005866421 Radiated Field strength measurement facility (3 m)	90661 (February 28, 2014)
HCT FRN: 0005866421 Radiated Field strength measurement facility (10 m)	90661 (February 28, 2014)

1.4 Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).



1.5 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Manufacturer	FCC ID / DoC	Connected To
EUT	LG-H990	LG	ZNFH990	Notebook PC, Earphone
USB cable	EAD63849201	Ningbo Broad	-	EUT, Notebook PC
Earphone	EAB64168751	I-SOUND	-	EUT
Notebook PC	ProBook6560b	HP	DoC	EUT, Notebook PC adaptor, RJ45 cable, Serial mouse
Notebook PC adaptor	Series PPP009L-E	LITE-ON TECHNOLOGY	-	Notebook PC
Gateway	TL-WR747N	TP-LINK	-	RJ45 cable, Gateway adaptor
Gateway adaptor	T120150-2H1	TP-LINK	-	Gateway
Serial mouse	Serial 2 button mouse	Radio shack	FSUGMZE3	Notebook PC
RJ45 cable	-	-	-	Notebook PC, Gateway
Micro SD card	16 GB	SanDisk	-	EUT



1.6 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	USB Type C	Y	Y	(P,D)1.0
	Earphone	N/A	Y	(D)1.1
Notebook PC	RJ 45	N/A	N	(D)2.5
	Serial (Mouse)	N/A	Y	(D)1.8
	DC in	N	N/A	(P)1.8
Gateway	DC in	N	N/A	(P)1.8

* The marked “(D)” means the data cable and “(P)” means the power cable.

1.7 Noise Suppression Parts on Cable. (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	USB Type C	N	N/A	Y	Both End
	Earphone	N	N/A	Y	Both End
Notebook PC	RJ 45	N	N/A	N	N/A
	Serial (Mouse)	N	N/A	Y	Notebook PC End



2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

[Conducted Emission Limits]

Frequency (MHz)	Resolution Bandwidth (kHz)	Quasi-Peak (dB(μV))	Average (dB(μV))
0.15 to 0.5	9	66 to 56*	56 to 46*
0.5 to 5	9	56	46
5 to 30	9	60	50

**Decreases with the logarithm of the frequency.*



2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014

- The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.(1 GHz to 40 GHz)

[Radiated Emission Limits]

Frequency (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB(μV)/m)
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Peak (dB(μV)/m)	Average (dB(μV)/m)
Above 1 000	3	74	54

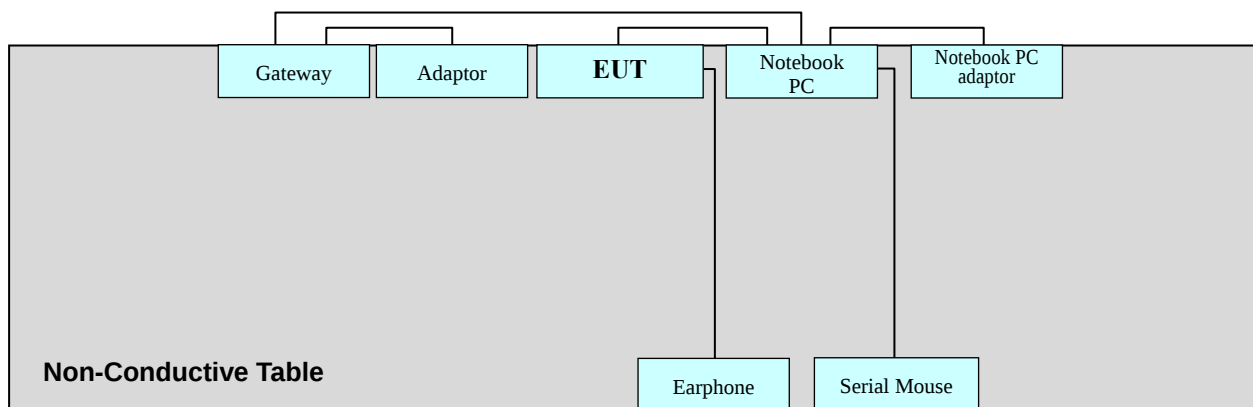


2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System



Power Line: 120 VAC, 60 Hz



3. PRELIMINARY TEST

3.1 Conducted Emission Test

It was tested Data Communication mode, after connecting all peripheral devices.

Operation Mode: ☒ Data Communication mode

3.2 Radiated Emission Test

It was tested Data Communication mode, after connecting all peripheral devices.

Operation Mode: ☒ Data Communication mode



4. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

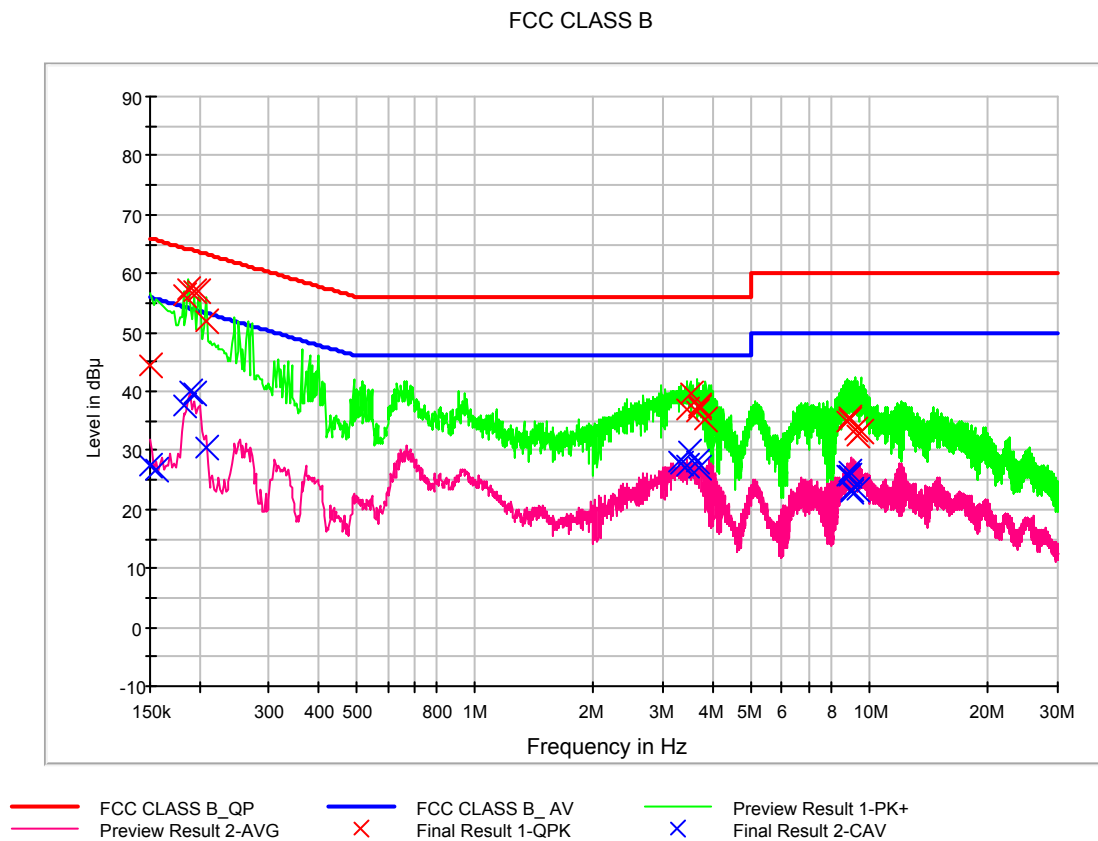
4.1 Conducted Emission Test

The test results of conducted emission at mains ports provide the following information:

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	Shielded Room
Temperature	23.1 °C
Relative Humidity	51.6 %
Test Date	August 01, 2016

- Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

**Figure 1: Spectral Diagrams, Conducted Emission, AC Main Port, Line (L1)**



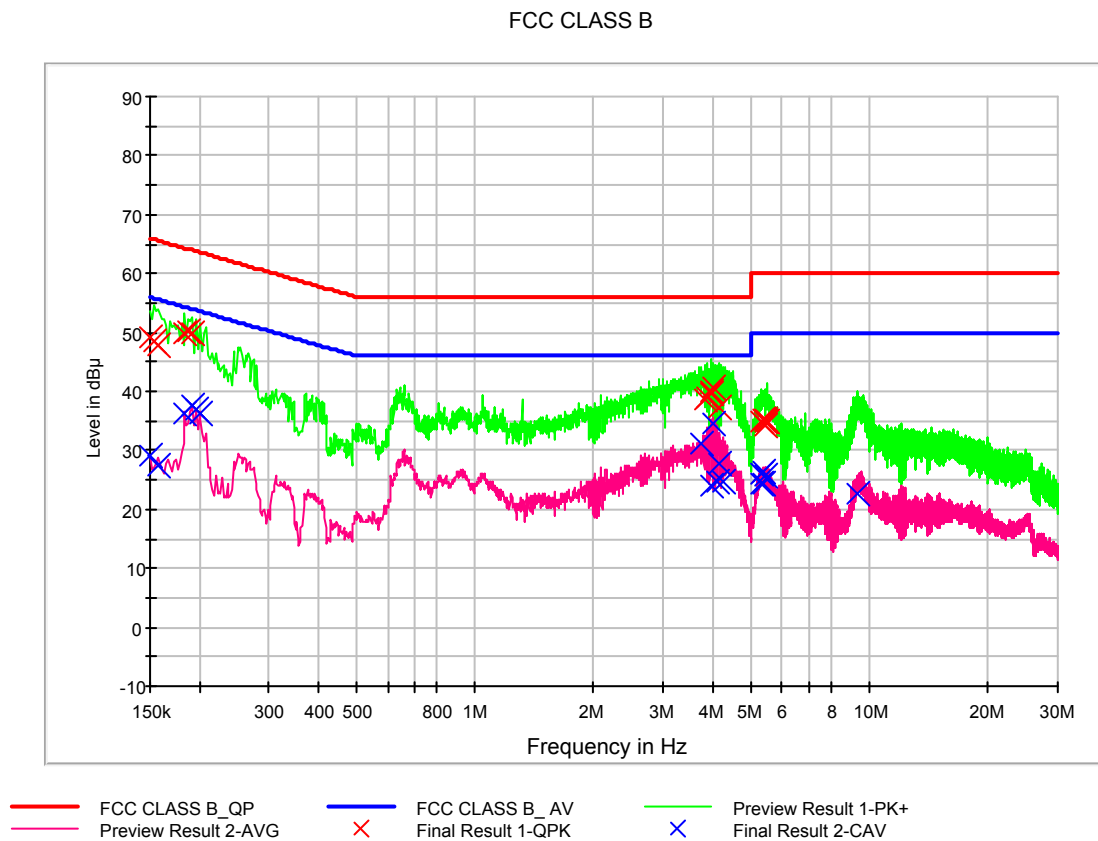
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	44.6	9.000	L1	9.7	21.4	66.0
0.182000	56.2	9.000	L1	9.6	8.2	64.4
0.188000	57.3	9.000	L1	9.6	6.9	64.1
0.194000	57.1	9.000	L1	9.6	6.7	63.9
0.198000	57.1	9.000	L1	9.6	6.6	63.7
0.208000	51.9	9.000	L1	9.6	11.3	63.3
3.436000	36.8	9.000	L1	9.8	19.2	56.0
3.508000	39.6	9.000	L1	9.8	16.4	56.0
3.644000	36.5	9.000	L1	9.8	19.5	56.0
3.686000	37.4	9.000	L1	9.8	18.6	56.0
3.712000	37.7	9.000	L1	9.8	18.3	56.0
3.850000	35.2	9.000	L1	9.8	20.8	56.0
8.784000	35.1	9.000	L1	10.0	24.9	60.0
8.840000	35.4	9.000	L1	10.0	24.6	60.0
8.934000	35.7	9.000	L1	10.0	24.3	60.0
9.210000	33.5	9.000	L1	10.0	26.5	60.0
9.352000	32.4	9.000	L1	10.0	27.6	60.0
9.480000	33.1	9.000	L1	10.0	26.9	60.0



CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	27.5	9.000	L1	9.7	28.5	56.0
0.156000	26.8	9.000	L1	9.6	28.9	55.7
0.182000	37.7	9.000	L1	9.6	16.7	54.4
0.190000	40.0	9.000	L1	9.6	14.0	54.0
0.194000	39.6	9.000	L1	9.6	14.3	53.9
0.208000	30.4	9.000	L1	9.6	22.9	53.3
3.304000	27.9	9.000	L1	9.8	18.1	46.0
3.342000	27.8	9.000	L1	9.8	18.2	46.0
3.436000	27.4	9.000	L1	9.8	18.6	46.0
3.506000	30.0	9.000	L1	9.8	16.0	46.0
3.644000	28.1	9.000	L1	9.8	17.9	46.0
3.686000	27.0	9.000	L1	9.8	19.0	46.0
8.784000	25.9	9.000	L1	10.0	24.1	50.0
8.840000	26.3	9.000	L1	10.0	23.7	50.0
8.868000	25.8	9.000	L1	10.0	24.2	50.0
8.942000	23.1	9.000	L1	10.0	27.0	50.0
9.008000	23.3	9.000	L1	10.0	26.7	50.0
9.352000	23.3	9.000	L1	10.0	26.7	50.0

**Figure 2: Spectral Diagrams, Conducted Emission, AC Main Port, Line (N)**



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	49.2	9.000	N	9.6	16.8	66.0
0.154000	48.6	9.000	N	9.6	17.2	65.8
0.158000	47.8	9.000	N	9.6	17.7	65.6
0.184000	49.8	9.000	N	9.6	14.5	64.3
0.188000	50.2	9.000	N	9.6	14.0	64.1
0.192000	49.8	9.000	N	9.6	14.2	63.9
3.816000	38.6	9.000	N	9.8	17.4	56.0
3.884000	38.9	9.000	N	9.8	17.1	56.0
3.954000	39.6	9.000	N	9.8	16.4	56.0
3.958000	40.1	9.000	N	9.8	15.9	56.0
4.020000	40.7	9.000	N	9.8	15.3	56.0
4.160000	37.2	9.000	N	9.8	18.8	56.0
5.326000	35.0	9.000	N	9.8	25.0	60.0
5.380000	35.4	9.000	N	9.8	24.6	60.0
5.410000	34.3	9.000	N	9.8	25.7	60.0
5.416000	35.1	9.000	N	9.8	24.9	60.0
5.422000	35.2	9.000	N	9.8	24.8	60.0
5.478000	34.8	9.000	N	9.8	25.2	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	29.2	9.000	N	9.6	26.8	56.0
0.158000	27.6	9.000	N	9.6	28.0	55.6
0.184000	36.2	9.000	N	9.6	18.1	54.3
0.192000	37.5	9.000	N	9.6	16.5	53.9
0.196000	36.9	9.000	N	9.6	16.9	53.8
0.200000	36.3	9.000	N	9.6	17.3	53.6
3.750000	31.3	9.000	N	9.8	14.7	46.0
3.982000	23.9	9.000	N	9.8	22.1	46.0
4.020000	34.6	9.000	N	9.8	11.4	46.0
4.110000	24.8	9.000	N	9.8	21.2	46.0
4.160000	27.7	9.000	N	9.8	18.3	46.0
4.232000	24.6	9.000	N	9.8	21.4	46.0
5.326000	26.1	9.000	N	9.8	23.9	50.0
5.334000	24.4	9.000	N	9.8	25.6	50.0
5.364000	24.4	9.000	N	9.8	25.6	50.0
5.380000	26.3	9.000	N	9.8	23.7	50.0
5.410000	25.6	9.000	N	9.8	24.4	50.0
9.304000	22.6	9.000	N	10.0	27.4	50.0



4.2 Radiated Emission Test

The test results of radiated emission provide the following information:

-For Measurement Below 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.5 °C
Relative Humidity	51.6 %
Test Date	July 27, 2016

Frequency (MHz)	Quasi Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
36.591663	27.8	100.0	V	180.0	21.9	12.2	40.0
43.767214	27.6	115.0	V	46.0	22.6	12.4	40.0
54.046653	32.6	100.0	V	136.0	22.8	7.4	40.0
58.758317	30.5	100.0	V	185.0	22.5	9.5	40.0
63.486092	30.5	400.0	H	16.0	22.0	9.5	40.0
84.188858	29.7	350.0	H	84.0	18.2	10.3	40.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak



-For Measurement Above 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Operating Frequency	2.15 GHz
Testing Frequency Range	1 GHz to 10.75 GHz
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.5 °C
Relative Humidity	51.6 %
Test Date	July 27, 2016

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1330.010020	48.7	117.8	V	113.0	-9.1	25.3	74.0
1400.050100	50.7	100.0	V	353.0	-8.9	23.3	74.0
2088.326654	45.5	119.9	V	194.0	-7.9	28.5	74.0
2599.649299	48.7	350.0	V	217.0	-5.4	25.3	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1330.010020	30.9	117.8	V	113.0	-9.1	23.1	54.0
1400.050100	48.0	100.0	V	353.0	-8.9	6.0	54.0
2088.326654	30.7	119.9	V	194.0	-7.9	23.3	54.0
2599.649299	32.4	350.0	V	217.0	-5.4	21.6	54.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage



5. LIST OF TEST EQUIPMENT

<u>Type</u>	<u>Manufacturer</u>	<u>Model Name</u>	<u>Serial Number</u>	<u>Calibration Cycle</u>	<u>CAL Date</u>
<u>Conducted Emission</u>					
☒ EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	12.28.2015
☒ LISN	Rohde & Schwarz	ESH3-Z5	100282	1 year	06.09.2016
☒ LISN	Rohde & Schwarz	ENV216	100073	1 year	12.28.2015
☒ Software	Rohde & Schwarz	EMC32	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
☐ Trilog Antenna	Schwarzbeck	VULB9160	3301	2 year	11.17.2014
☒ Trilog Antenna	Schwarzbeck	VULB9168	255	2 year	04.15.2015
☒ Antenna master	HD GmbH	MA240	240/520	N/A	-
☒ Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
☒ Turn Table	EMCO	1060-2M	-	N/A	-
☒ Turn Table controller	EMCO	2090	9702-1224	N/A	-
☒ Attenuator 6dB	HP	8491A	24257	1 year	03.23.2016
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	05.27.2016
☐ Antenna master	INNCO Systems	MA4000-EP	MA4000/283	N/A	-
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-
-For measurement above 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
☐ Antenna master	HD GmbH	MA240	240/520	N/A	-
☐ Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
☒ Antenna master	INNCO Systems	MA4000-XP-ET	48709515	N/A	-
☒ Antenna master controller	INNCO Systems	CO 3000	CO 3000/870/ 35990515	N/A	-
☒ Turn Table	EMCO	1060-2M	-	N/A	-
☒ Turn Table controller	EMCO	2090	9702-1224	N/A	-
☐ Power Amplifier	CERNEX	CBLU1183540	21691	1 year	07.04.2016
☒ Power Amplifier	CERNEX	CBLU5183530	24348	1 year	06.07.2016
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	10.07.2014
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	05.27.2016
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-



6. CONCLUSION

The data collected shows that the **EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN, NFC, Model: LG-H990, FCC ID: ZNFH990** complies with §15.107 and §15.109 of the FCC rules.