

EMI TEST REPORT FCC CERTIFICATION

Applicant:

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

Date of Receipt: May 10, 2016

Date of Issue: May 26, 2016

Test Report No. HCT-E-1605-F028

HCT FRN: 0005866421

FCC ID :

ZNFUS610

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: Muti-band GSM/EDGE/WCDMA/LTE Phone with WLAN and Bluetooth
Model Name: LG-US610
Additional Model Name: LGUS610, US610, LG-K212, LGK212, K212
Test Port: Micro USB / Earphone Port
Date of Test: May 13, 2016 - May 24, 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 C63.4-2003. (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 denial 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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EMC Team
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Reviewed By



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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1605-F028	May 26, 2016	Initial Release



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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.

Model	LG-US610
Additional Model	LGUS610, US610, LG-K212, LGK212, K212
FCC ID	ZNFUS610
EUT Type	Muti-band GSM/EDGE/WCDMA/LTE Phone with WLAN and Bluetooth
TX Frequency	824.20 MHz to 848.80 MHz (GSM 850) 1 850.20 MHz to 1 909.80 MHz (GSM 1 900) 826.40 MHz to 846.60 MHz (WCDMA B5) 1 852.4 MHz to 1 907.6 MHz (WCDMA B2) 1712.4 MHz to 1752.6 MHz (WCDMA B4) 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) 699 MHz to 716 MHz (LTE B12) 777 MHz to 787 MHz (LTE B13) 704 MHz to 716 MHz (LTE B17) 1 850 MHz to 1 915 MHz (LTE B25)
RX Frequency	869.20 MHz to 893.80 MHz (GSM 850) 1 930.20 MHz to 1 989.80 MHz (GSM 1 900) 871.40 MHz to 891.60 MHz (WCDMA B5) 1 932.4 MHz to 1 987.6 MHz (WCDMA B2) 2 112.4 MHz to 2 152.6 MHz (WCDMA B4) 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) 729 MHz to 746 MHz (LTE B12) 746 MHz to 756 MHz (LTE B13) 734 MHz to 746 MHz (LTE B17) 1 930 MHz to 1 995 MHz (LTE B25)



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 C63.4-2003.

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 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-US610	LG	ZNFUS610	Notebook PC, Earphone
USB cable	EAD63769703	Cresyn	-	EUT, Notebook PC
USB cable	EAD63769701	KSD	-	EUT, Notebook PC
USB cable	EAD63769702	Ningbo Broad	-	EUT, Notebook PC
Earphone	EAB62209201	I-Sound	-	EUT
Notebook PC	ProBook6560b	HP	DoC	EUT, Notebook PC adaptor, RJ45 cable, Serial mouse
Notebook PC adaptor	PPP009D	DELTA Electronics (Jiangsu) LTD	-	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	Samsung	-	EUT



1.5 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	Micro USB	Y	Y	(P,D)1.2
	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.

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

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	Micro USB	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 C63.4-2003

- 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 C63.4-2003, Clause 8

- a. 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.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. 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.
- f. 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.
- g. The antenna height scans apply for both horizontal and vertical polarizations, except that for vertical polarization, the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the lowest antenna element clears the site reference ground plane by at least 25 cm. (below 1 GHz)

[Radiated Emission Limits]

Frequency (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V}/\text{m}$)	Quasi-Peak ($\text{dB}(\mu\text{V})/\text{m}$)
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 ($\text{dB}(\mu\text{V})/\text{m}$)	Average ($\text{dB}(\mu\text{V})/\text{m}$)
Above 1 000	3	74	54

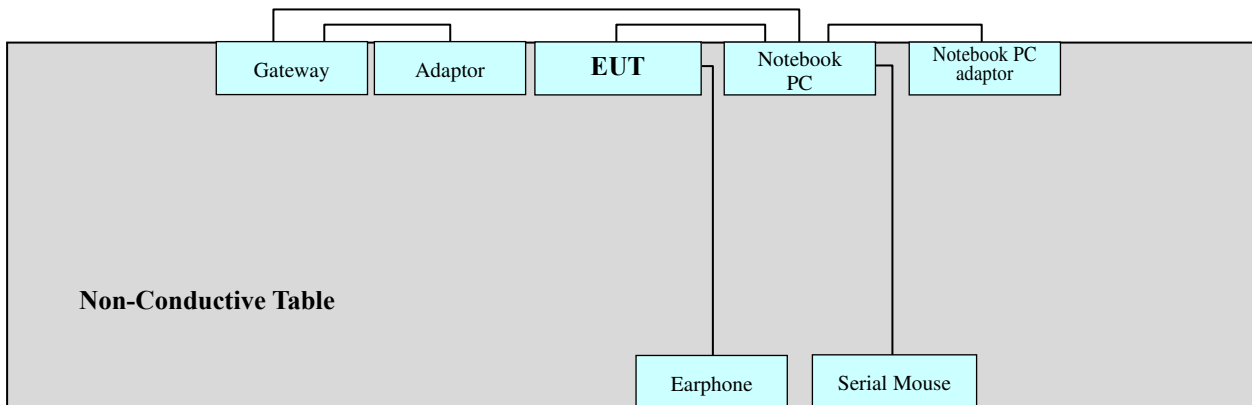


2.2.1 Frequency Range of Radiated Measurements

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:

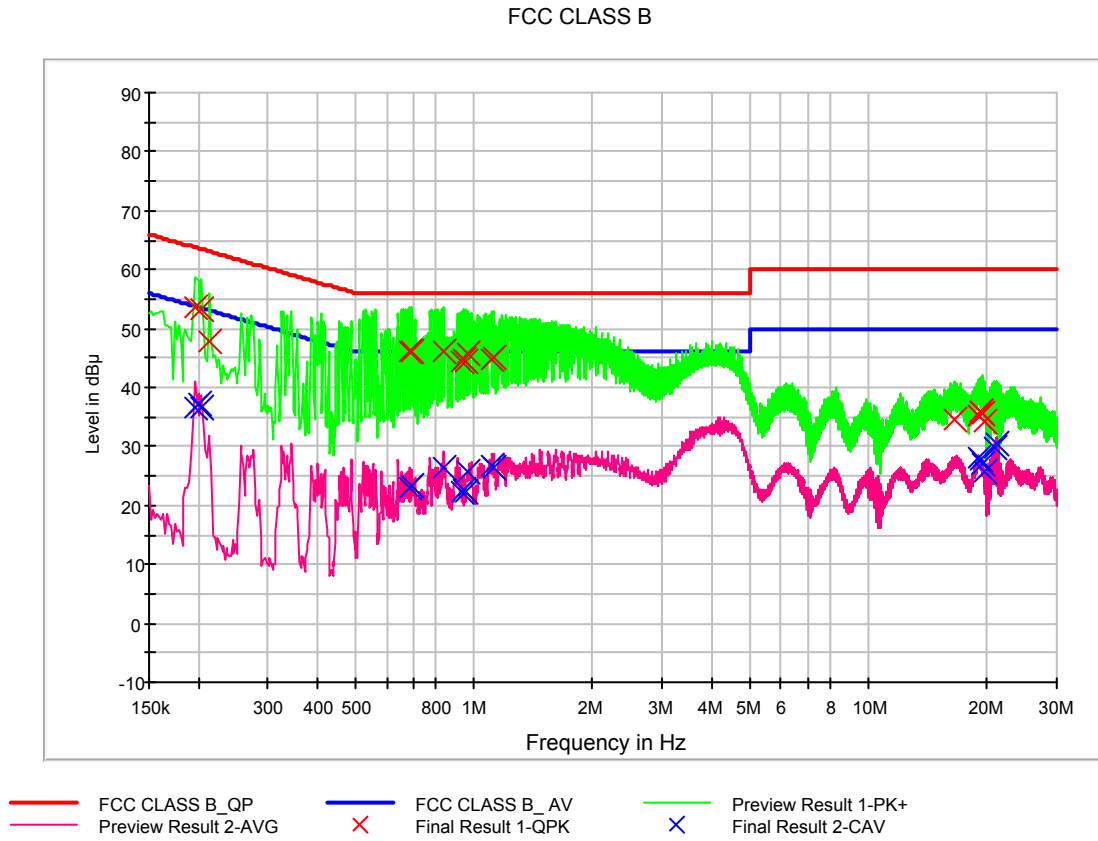
Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operation Mode	Data Communication mode
USB Cable of Worst Case	EAD63769701 (KSD)
Kind of Test Site	Shielded Room
Temperature	25.6 °C
Relative Humidity	40.7 %
Test Date	May 13, 2016

- 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)
0.196000	53.7	9.000	L1	9.6	10.1	63.8
0.204000	53.1	9.000	L1	9.6	10.3	63.4
0.214000	47.9	9.000	L1	9.6	15.2	63.0
0.686000	46.3	9.000	L1	9.7	9.7	56.0
0.696000	46.1	9.000	L1	9.7	9.9	56.0
0.840000	46.1	9.000	L1	9.7	9.9	56.0
0.926000	44.4	9.000	L1	9.7	11.6	56.0
0.938000	44.8	9.000	L1	9.7	11.2	56.0
0.948000	44.5	9.000	L1	9.7	11.5	56.0
0.960000	45.6	9.000	L1	9.7	10.4	56.0
1.114000	44.8	9.000	L1	9.7	11.2	56.0
1.126000	45.1	9.000	L1	9.7	10.9	56.0
16.482000	34.5	9.000	L1	10.2	25.5	60.0
18.966000	35.4	9.000	L1	10.2	24.6	60.0
19.242000	36.1	9.000	L1	10.2	23.9	60.0
19.314000	35.9	9.000	L1	10.2	24.1	60.0
19.456000	35.5	9.000	L1	10.2	24.5	60.0
19.592000	34.3	9.000	L1	10.2	25.7	60.0

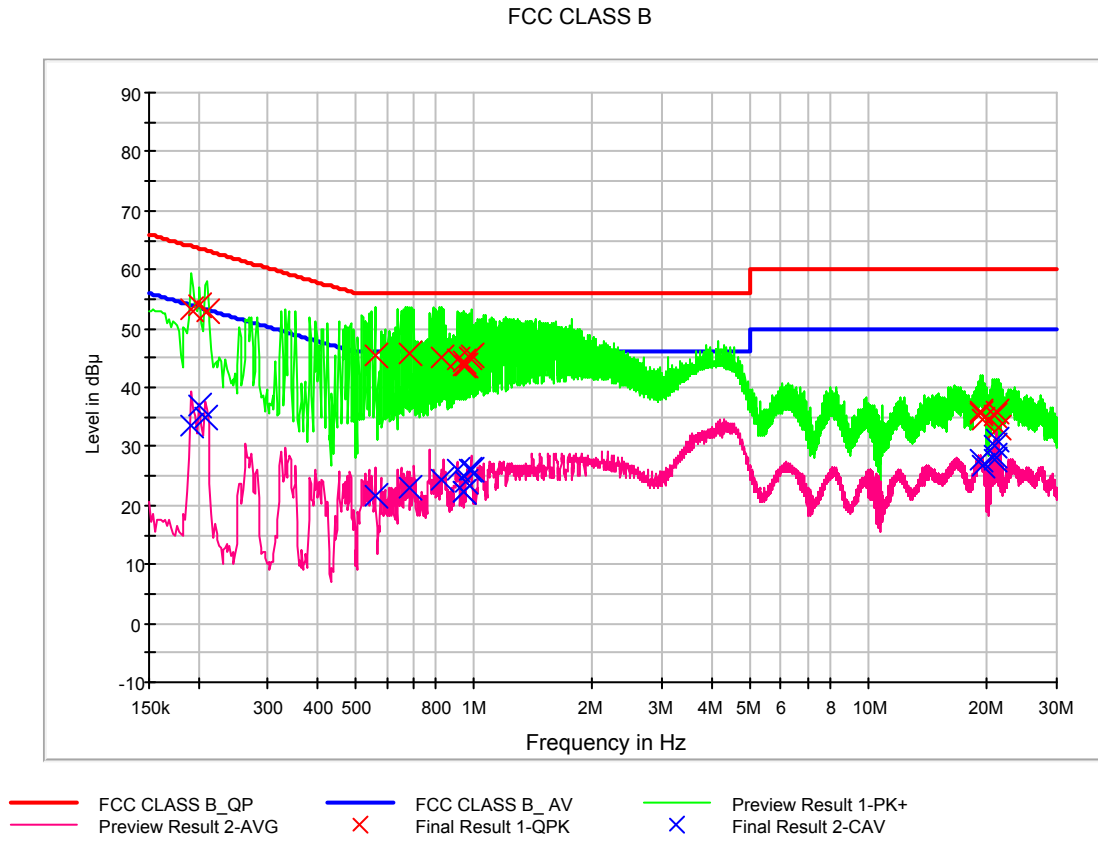


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.196000	36.8	9.000	L1	9.6	17.0	53.8
0.200000	37.2	9.000	L1	9.6	16.4	53.6
0.204000	36.7	9.000	L1	9.6	16.8	53.4
0.686000	23.1	9.000	L1	9.7	22.9	46.0
0.696000	23.2	9.000	L1	9.7	22.8	46.0
0.840000	26.4	9.000	L1	9.7	19.6	46.0
0.926000	22.1	9.000	L1	9.7	23.9	46.0
0.938000	22.6	9.000	L1	9.7	23.4	46.0
0.948000	22.2	9.000	L1	9.7	23.8	46.0
0.960000	25.8	9.000	L1	9.7	20.2	46.0
1.114000	26.8	9.000	L1	9.7	19.2	46.0
1.126000	26.5	9.000	L1	9.7	19.5	46.0
18.966000	28.1	9.000	L1	10.2	21.9	50.0
19.314000	27.8	9.000	L1	10.2	22.2	50.0
19.456000	27.1	9.000	L1	10.2	23.0	50.0
19.592000	25.8	9.000	L1	10.2	24.2	50.0
20.864000	29.9	9.000	L1	10.3	20.1	50.0
21.070000	30.6	9.000	L1	10.3	19.4	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)
0.192000	53.2	9.000	N	9.6	10.8	63.9
0.202000	53.8	9.000	N	9.6	9.7	63.5
0.210000	52.8	9.000	N	9.6	10.4	63.2
0.562000	45.4	9.000	N	9.6	10.6	56.0
0.684000	45.9	9.000	N	9.6	10.1	56.0
0.828000	45.1	9.000	N	9.7	11.0	56.0
0.904000	44.7	9.000	N	9.7	11.3	56.0
0.938000	44.3	9.000	N	9.7	11.7	56.0
0.944000	43.9	9.000	N	9.7	12.1	56.0
0.956000	43.8	9.000	N	9.7	12.2	56.0
0.972000	45.1	9.000	N	9.7	10.9	56.0
0.982000	45.5	9.000	N	9.7	10.5	56.0
19.178000	35.6	9.000	N	10.2	24.4	60.0
19.312000	35.7	9.000	N	10.3	24.3	60.0
19.466000	34.6	9.000	N	10.3	25.4	60.0
20.768000	35.3	9.000	N	10.3	24.7	60.0
21.226000	35.8	9.000	N	10.3	24.2	60.0
21.370000	33.1	9.000	N	10.3	26.9	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.192000	33.5	9.000	N	9.6	20.5	53.9
0.200000	37.0	9.000	N	9.6	16.6	53.6
0.208000	35.0	9.000	N	9.6	18.3	53.3
0.562000	21.7	9.000	N	9.6	24.3	46.0
0.684000	23.1	9.000	N	9.6	22.9	46.0
0.828000	24.4	9.000	N	9.7	21.6	46.0
0.904000	26.0	9.000	N	9.7	20.0	46.0
0.938000	22.4	9.000	N	9.7	23.6	46.0
0.944000	22.2	9.000	N	9.7	23.8	46.0
0.956000	24.0	9.000	N	9.7	22.0	46.0
0.970000	26.2	9.000	N	9.7	19.8	46.0
0.982000	26.0	9.000	N	9.7	20.0	46.0
19.312000	27.7	9.000	N	10.3	22.3	50.0
19.532000	26.6	9.000	N	10.3	23.4	50.0
20.768000	27.7	9.000	N	10.3	22.3	50.0
20.832000	28.5	9.000	N	10.3	21.5	50.0
20.940000	30.0	9.000	N	10.3	20.0	50.0
21.154000	31.0	9.000	N	10.3	19.0	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
USB Cable of Worst Case	EAD63769701 (KSD)
Kind of Test Site	3 m semi anechoic chamber
Temperature	25.2 °C
Relative Humidity	44.1 %
Test Date	May 14, 2016

Frequency (MHz)	Quasi Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
32.903888	27.4	100.0	V	98.0	14.9	12.6	40.0
44.607214	28.2	100.0	V	55.0	15.8	11.8	40.0
58.758317	34.0	100.0	V	136.0	15.5	6.0	40.0
63.486092	35.3	100.0	V	165.0	15.0	4.7	40.0
68.185000	33.0	150.0	H	346.0	14.4	7.0	40.0
266.514309	33.0	175.0	V	6.0	16.9	13.0	46.0

- 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	1.3 GHz
Testing Frequency Range	1 GHz to 6.5 GHz
Operation Mode	Data Communication mode
USB Cable of Worst Case	EAD63769703 (Cresyn)
Kind of Test Site	3 m semi anechoic chamber
Temperature	22.9 °C
Relative Humidity	43.0 %
Test Date	May 24, 2016

Frequency (MHz)	Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1330.511022	50.5	100.0	V	117.0	-9.8	23.5	74.0
1399.949900	50.2	184.0	V	27.0	-9.6	23.8	74.0
1999.749499	51.8	100.0	V	242.0	-8.4	22.2	74.0
2058.466934	50.0	100.0	V	219.0	-8.2	24.0	74.0

Frequency (MHz)	CAverage (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1330.511022	31.4	100.0	V	117.0	-9.8	22.6	54.0
1399.949900	48.1	184.0	V	27.0	-9.6	5.9	54.0
1999.749499	35.5	100.0	V	242.0	-8.4	18.5	54.0
2058.466934	34.0	100.0	V	219.0	-8.2	20.0	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>					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	12.28.2015
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ESH3-Z5	100282	1 year	06.11.2015
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ENV216	100073	1 year	12.28.2015
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
<input checked="" type="checkbox"/> Trilog Antenna	Schwarzbeck	VULB9160	3301	2 year	11.17.2014
<input checked="" type="checkbox"/> Antenna master	HD GmbH	MA240	240/520	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
<input checked="" type="checkbox"/> Turn Table	EMCO	1060-2M	-	N/A	-
<input checked="" type="checkbox"/> Turn Table controller	EMCO	2090	9702-1224	N/A	-
<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.05.2015
<input type="checkbox"/> Antenna master	INNCO Systems	MA4000-EP	MA4000/283	N/A	-
<input type="checkbox"/> Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-
-For measurement above 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
<input checked="" type="checkbox"/> Antenna master	HD GmbH	MA240	240/520	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
<input checked="" type="checkbox"/> Turn Table	EMCO	1060-2M	-	N/A	-
<input checked="" type="checkbox"/> Turn Table controller	EMCO	2090	9702-1224	N/A	-
<input type="checkbox"/> Power Amplifier	CERNEX	CBLU1183540	21691	1 year	07.06.2015
<input checked="" type="checkbox"/> Power Amplifier	CERNEX	CBLU5183530	24348	1 year	06.15.2015
<input checked="" type="checkbox"/> Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	10.07.2014
<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.05.2015
<input type="checkbox"/> Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-



6. CONCLUSION

The data collected shows that the **EUT Type: Multi-band GSM/EDGE/WCDMA/LTE Phone with WLAN and Bluetooth, Model: LG-US610, FCC ID: ZNFUS610** complies with §15.107 and §15.109 of the FCC rules.