

EMI CERTIFICATION REPORT

Applicant:

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

Date of Receipt: January 12, 2016**Date of Issue: January 27, 2016****Test Report No. HCT-E-1601-F047-1****HCT FRN: 0005866421****FCC ID :****ZNFL81AL**

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 BT and WLAN
Model Name: LGL81AL
Additional Model Name: LG-L81AL, L81AL, LG-K540, LGK540, K540
Test Port: USB / Earphone Port
Date of Test: January 18, 2016 – January 20, 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 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-1601-F047	January 22, 2016	Initial Release
HCT-E-1601-F047-1	January 27, 2016	Added the additional model names.



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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	LGL81AL
FCC ID	ZNFL81AL
Additional Model	LG-L81AL, L81AL, LG-K540, LGK540, K540
EUT Type	GSM/WCDMA/LTE Phone with BT and WLAN
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 850) 1 852.4 MHz to 1 907.6 MHz (WCDMA 1 900) 1712.4 MHz to 1752.6 MHz (WCDMA 1 700) 1 850.7 MHz to 1 909.3 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) 704 MHz to 716 MHz (LTE B17)
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 850) 1 932.4 MHz to 1 987.6 MHz (WCDMA 1 900) 2 112.4 MHz to 2 152.6 MHz (WCDMA 1 700) 1 930.00 MHz to 1 990.00 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) 734 MHz to 746 MHz (LTE B17)



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	LGL81AL	LG	ZNFL81AL	USB cable, Earphone
USB cable	EAD62377924	KSD	-	EUT, Notebook PC
Earphone	EAB62209304	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)1.0
	Earphone	N/A	Y	(D)1.0
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	EUT End
	Earphone	N	N/A	Y	EUT 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

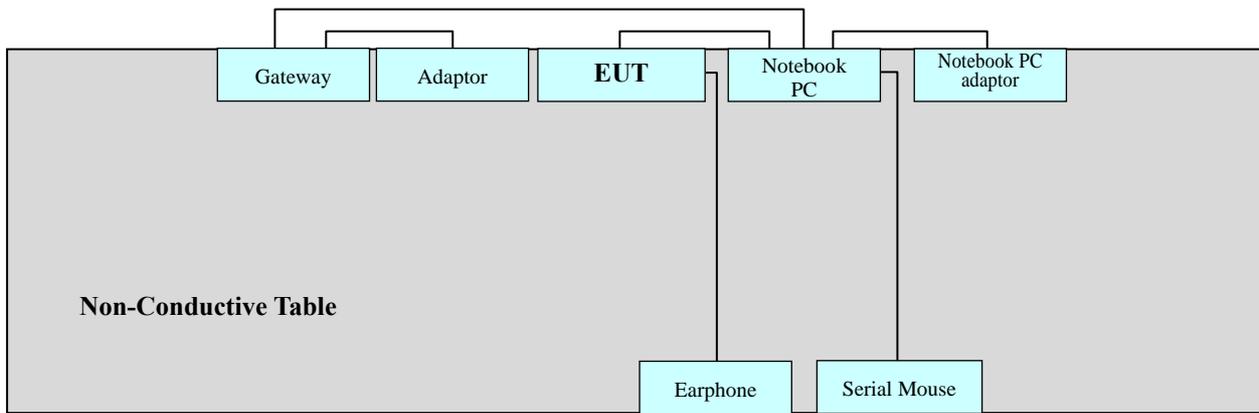


2.2.1 Frequency Range of Radiated Measurements

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:

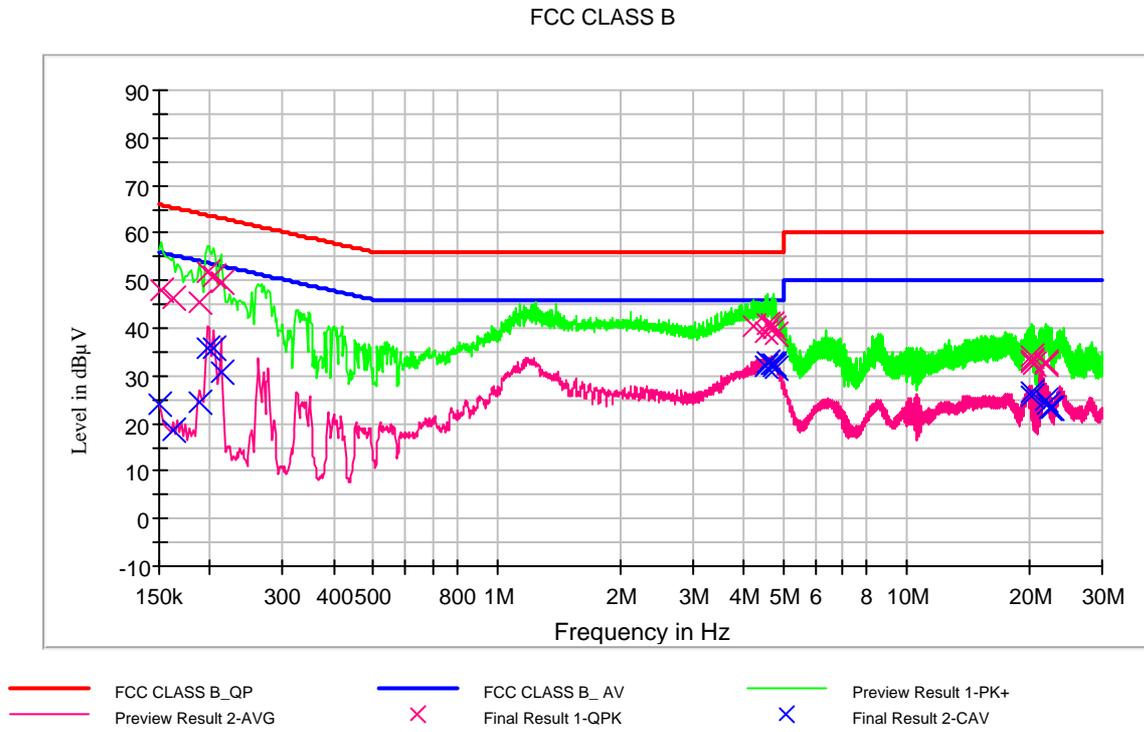
Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	Shielded Room
Temperature	20.3 °C
Relative Humidity	31.4 %
Test Date	January 20, 2016

- 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)
0.152000	48.0	9.000	L1	9.6	17.9	65.9
0.162000	46.2	9.000	L1	9.6	19.2	65.4
0.188000	45.5	9.000	L1	9.6	18.6	64.1
0.196000	51.8	9.000	L1	9.6	12.0	63.8
0.204000	51.1	9.000	L1	9.6	12.3	63.4
0.212000	49.5	9.000	L1	9.6	13.6	63.1
4.244000	40.4	9.000	L1	9.8	15.6	56.0
4.532000	39.1	9.000	L1	9.9	16.9	56.0
4.598000	40.9	9.000	L1	9.9	15.2	56.0
4.668000	40.8	9.000	L1	9.9	15.2	56.0
4.740000	40.0	9.000	L1	9.9	16.0	56.0
4.812000	38.6	9.000	L1	9.9	17.4	56.0
20.106000	33.9	9.000	L1	10.3	26.1	60.0
20.122000	33.0	9.000	L1	10.3	27.0	60.0
20.236000	33.4	9.000	L1	10.3	26.6	60.0
20.320000	32.4	9.000	L1	10.3	27.6	60.0
21.794000	32.7	9.000	L1	10.3	27.3	60.0
21.934000	32.5	9.000	L1	10.3	27.5	60.0

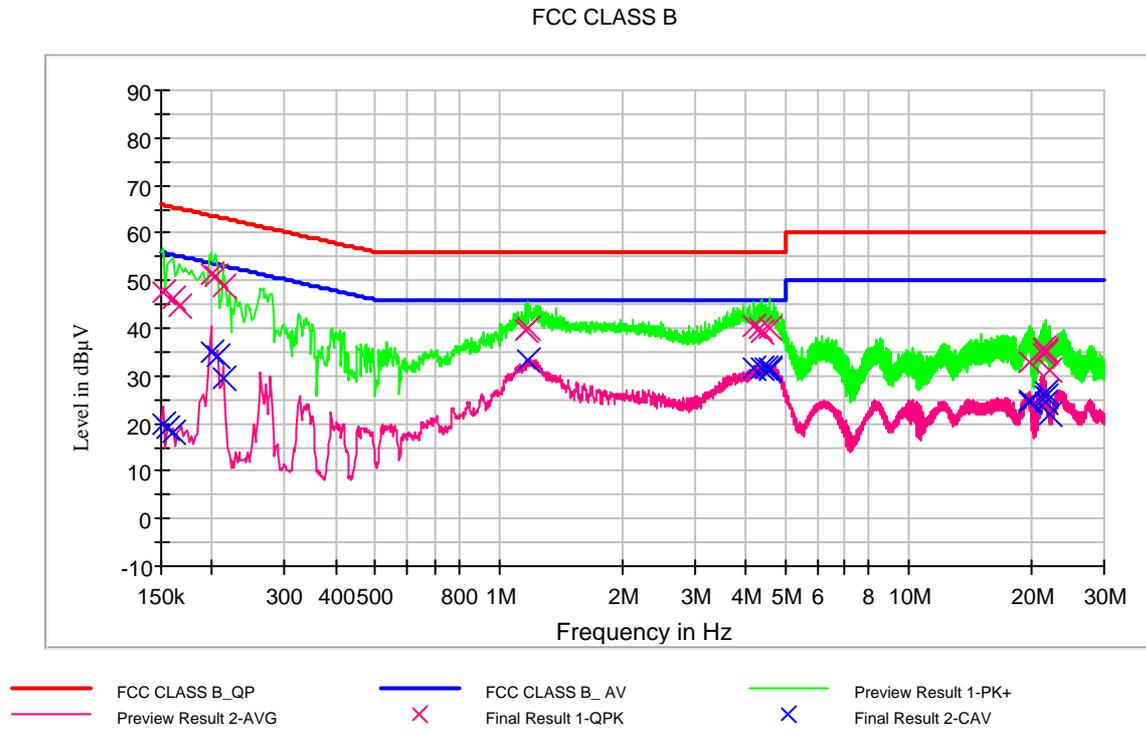


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	24.0	9.000	L1	9.7	32.0	56.0
0.162000	18.7	9.000	L1	9.6	36.7	55.4
0.188000	24.3	9.000	L1	9.6	29.8	54.1
0.196000	35.8	9.000	L1	9.6	18.0	53.8
0.204000	35.7	9.000	L1	9.6	17.7	53.4
0.212000	30.7	9.000	L1	9.6	22.4	53.1
4.532000	32.2	9.000	L1	9.9	13.8	46.0
4.598000	32.7	9.000	L1	9.9	13.4	46.0
4.672000	32.4	9.000	L1	9.9	13.6	46.0
4.740000	32.5	9.000	L1	9.9	13.5	46.0
4.744000	32.1	9.000	L1	9.9	13.9	46.0
4.812000	31.4	9.000	L1	9.9	14.6	46.0
20.106000	26.7	9.000	L1	10.3	23.3	50.0
20.172000	25.6	9.000	L1	10.3	24.4	50.0
21.934000	24.9	9.000	L1	10.3	25.1	50.0
22.142000	24.2	9.000	L1	10.3	25.8	50.0
22.338000	23.1	9.000	L1	10.3	26.9	50.0
22.498000	23.1	9.000	L1	10.3	26.9	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)
0.152000	47.5	9.000	N	9.6	18.4	65.9
0.160000	46.1	9.000	N	9.6	19.4	65.5
0.166000	44.7	9.000	N	9.6	20.5	65.2
0.198000	51.4	9.000	N	9.6	12.3	63.7
0.204000	50.9	9.000	N	9.6	12.5	63.4
0.212000	48.8	9.000	N	9.6	14.3	63.1
1.166000	39.6	9.000	N	9.7	16.4	56.0
1.176000	40.0	9.000	N	9.7	16.0	56.0
4.170000	40.3	9.000	N	9.8	15.7	56.0
4.312000	40.2	9.000	N	9.8	15.8	56.0
4.386000	39.3	9.000	N	9.8	16.7	56.0
4.596000	39.8	9.000	N	9.8	16.2	56.0
19.660000	32.9	9.000	N	10.3	27.1	60.0
21.346000	35.8	9.000	N	10.3	24.2	60.0
21.424000	34.4	9.000	N	10.3	25.6	60.0
21.564000	35.2	9.000	N	10.3	24.8	60.0
21.704000	34.9	9.000	N	10.3	25.1	60.0
22.130000	31.2	9.000	N	10.3	28.8	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	19.9	9.000	N	9.6	36.0	55.9
0.156000	19.2	9.000	N	9.6	36.5	55.7
0.160000	18.2	9.000	N	9.6	37.3	55.5
0.198000	35.0	9.000	N	9.6	18.7	53.7
0.206000	34.2	9.000	N	9.6	19.2	53.4
0.212000	29.4	9.000	N	9.6	23.7	53.1
1.176000	33.1	9.000	N	9.7	12.9	46.0
4.170000	31.6	9.000	N	9.8	14.4	46.0
4.384000	31.5	9.000	N	9.8	14.5	46.0
4.454000	31.6	9.000	N	9.8	14.4	46.0
4.596000	31.5	9.000	N	9.8	14.5	46.0
4.600000	31.2	9.000	N	9.8	14.8	46.0
19.660000	24.5	9.000	N	10.3	25.5	50.0
19.828000	24.7	9.000	N	10.3	25.3	50.0
21.558000	26.7	9.000	N	10.3	23.3	50.0
21.564000	25.8	9.000	N	10.3	24.2	50.0
21.638000	24.6	9.000	N	10.3	25.4	50.0
22.130000	21.7	9.000	N	10.3	28.3	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	20.4 °C
Relative Humidity	31.5 %
Test Date	January 18, 2016

Frequency (MHz)	Quasi Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
55.950541	30.6	100.0	V	113.0	15.7	9.4	40.0
85.452745	31.5	292.0	H	94.0	11.6	8.5	40.0
266.554309	34.4	100.0	H	136.0	16.9	11.6	46.0
600.018036	36.8	100.0	H	233.0	25.6	9.2	46.0
800.013026	36.4	100.0	H	217.0	28.4	9.6	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	1.2 GHz
Testing Frequency Range	1 GHz to 6 GHz
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	20.4 °C
Relative Humidity	31.5 %
Test Date	January 18, 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)
1329.509018	51.0	100.0	V	125.0	-9.8	23.0	74.0
1400.050100	50.1	192.0	V	28.0	-9.6	23.9	74.0
1998.847695	56.1	100.0	V	218.0	-8.4	17.9	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)
1329.509018	32.8	100.0	V	125.0	-9.8	21.2	54.0
1400.050100	47.7	192.0	V	28.0	-9.6	6.3	54.0
1998.847695	37.0	100.0	V	218.0	-8.4	17.0	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	04.01.2015
<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	04.01.2015
<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: GSM/WCDMA/LTE Phone with BT and WLAN, Model: LGL81AL, FCC ID: ZNFL81AL** complies with §15.107 and §15.109 of the FCC rules.