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EMI CERTIFICATION REPORT

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

Date of Receipt: June 05, 2014
Date of Issue: June 12, 2014
Test Report No. HCT-E-1406-F023
HCT FRN: 0005866421

FCC ID: **ZNFVK410**

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:	LTE Phone with WLAN and Bluetooth
Model Name:	LG-VK410
Additional Model Name:	LGVK410, VK410
Test Port:	USB / Earphone Port
Date of Test:	June 09, 2014 - June 10, 2014

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

Gyeong-Seon Kim
Test Engineer
EMC Team
Certification Division

Reviewed By

Sang-Jun Lee
Technical Manager
EMC Team
Certification Division

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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1406-F023	June 12, 2014	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-VK410
FCC ID	ZNFVK410
Additional Model	LGVK410, VK410
EUT Type	LTE Phone with WLAN and Bluetooth
TX Frequency	1 710 ㎒ to 1 755 ㎒ (LTE B4) 777 ㎒ to 787 ㎒ (LTE B13)
RX Frequency	2 110 ㎒ to 2 155 ㎒ (LTE B4) 746 ㎒ to 756 ㎒ (LTE B13)

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.
Radiated Field strength measurement facility (3 m)	90661 (February 28, 2014)
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-VK410	LG	ZNFVK410	Notebook PC, Earphone
USB cable	EAD62290205	Ningbo Broad	-	EUT, Notebook PC
USB cable	EAD62290206	CRESYN	-	EUT, Notebook PC
Earphone	EAB62209205	FOXLINK	-	EUT
Notebook PC	ProBook6560b	HP	DoC	EUT, Notebook PC adaptor
Notebook PC adaptor	PPP009D	DELTA Electronics (JIANGSU)LTD	-	Notebook PC
Gateway	MV440	Axesstel	PH7MV440	Notebook PC, Adaptor
Serial mouse	Serial 2 button mouse	Radio shack	FSUGMZE3	Notebook PC
Adaptor	DA-60M12	Yang Ming Industrial	-	Gateway
RJ45 cable	-	-	-	Notebook PC, Gateway
Micro SD card (8 GB)	-	SanDisk	-	EUT

※**NOTE:** This tablet device does not contain the minimum number of ports required for personal computer testing per ANSI C63.4, but the EUT is attached to a computer through its only available port, which represents worst case emissions. All other aspects of ANSI C63.4 testing requirements were maintained.

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	N	(D)1.1
Notebook PC	RJ 45	N/A	N	(D)1.5
	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	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, Clause 7

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).
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 ㎑ to 30 ㎒was searched.

[Conducted Emission Limits]

Frequency (㎒)	Resolution Bandwidth	Quasi-Peak(dB㎶)	Average(dB㎶)
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 3 m shield room. 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 ㎓.
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 ㎓.
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 ㎓)

[Radiated Emission Limits]

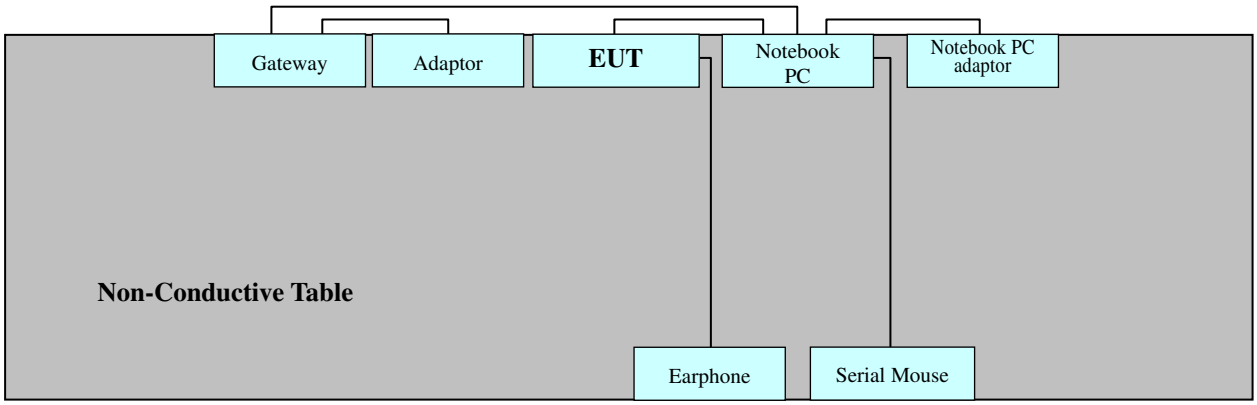
Frequency (㎒)	Antenna Distance (m)	Field Strength (㎶/m)	Quasi-Peak (dB㎶/m)
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0
Frequency (㎒)	**Antenna Distance (m)**	**Peak (dB㎶/m)**	**Average (dB㎶/m)**
Above 1 000	3	74	54

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 (㎒)	**Upper frequency of measurement range** (㎒)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 ㎓, 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

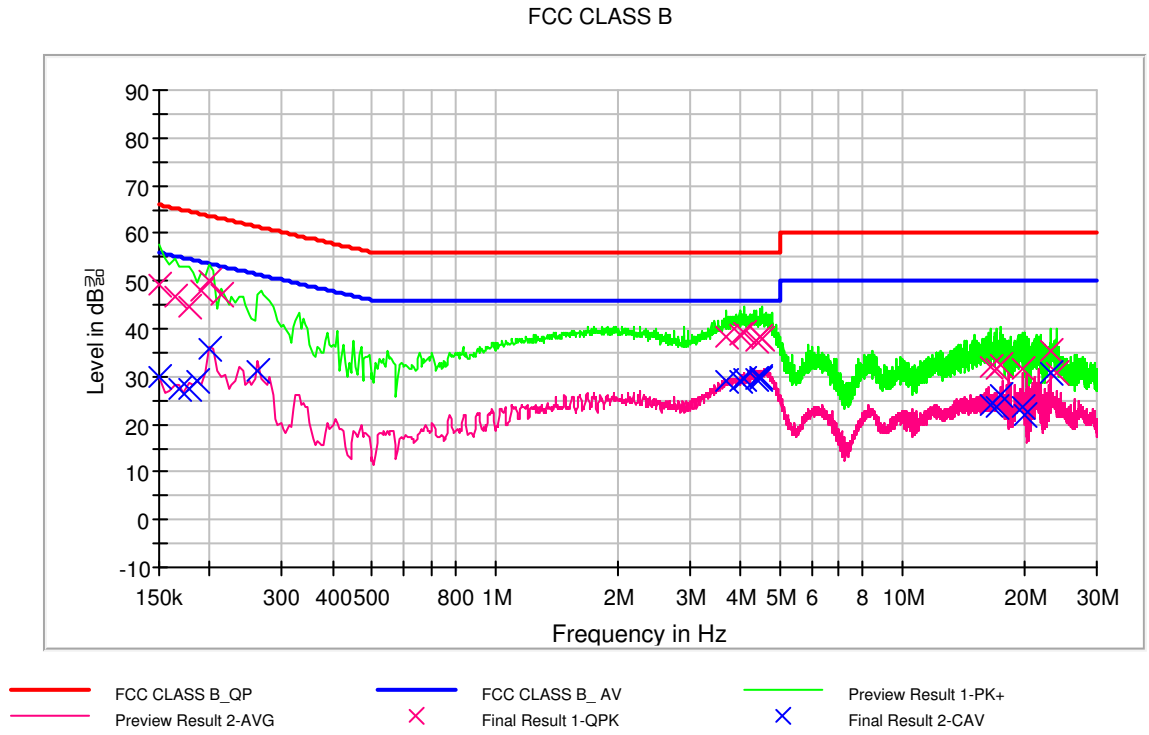
4.1 Conducted Emission Test

The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

Limit Apply to	: FCC PART 15 Subpart B Class B
Detector	: Quasi-Peak, CISPR-Average
6 dB Bandwidth	: 9 ㎑
Operation Mode	: Data Communication mode
USB Manufacturer	: CRESYN
	※The worst-case emissions are reported.
Temperature	: 24.4°C
Relative Humidity	: 49.9 %
Test Date	: June 10, 2014

※ NOTE: Refer to page 13 to page 18 for test data.

Figure 1: Spectral Diagrams, Conducted Emission, Phase (L1)



※ 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

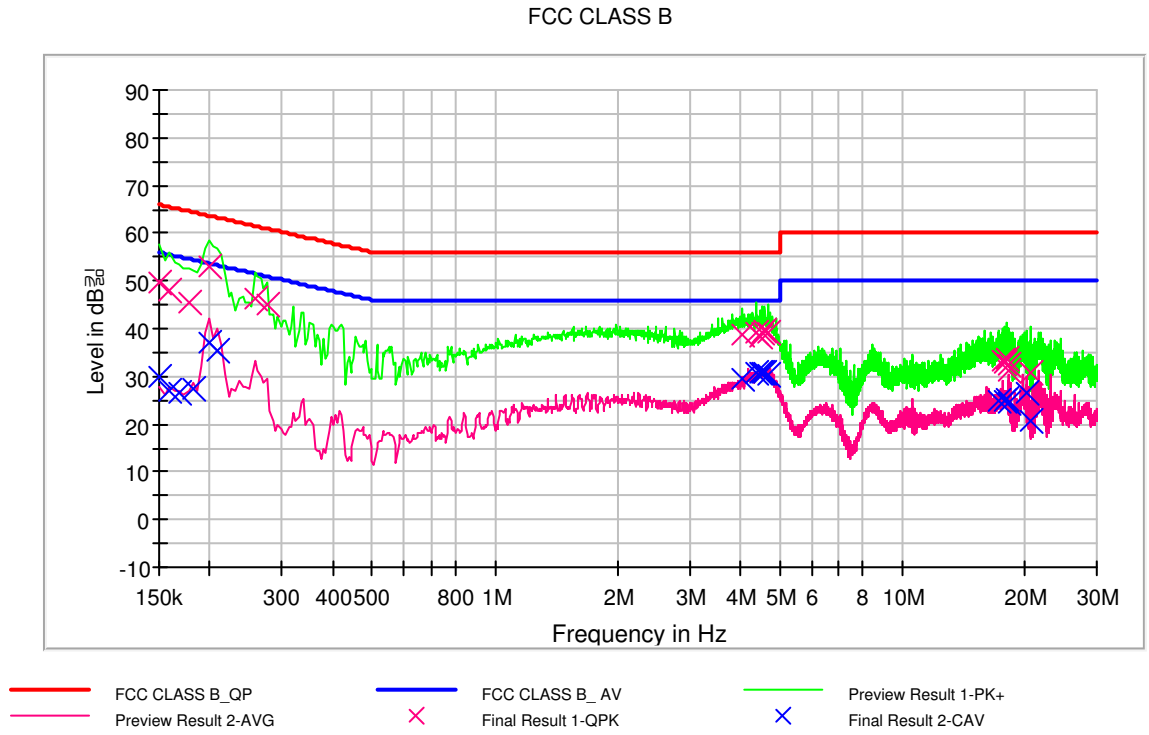
Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	49.2	9.000	L1	9.7	16.8	66.0
0.163500	46.9	9.000	L1	9.7	18.4	65.3
0.177000	44.8	9.000	L1	9.7	19.8	64.6
0.190500	48.0	9.000	L1	9.7	16.0	64.0
0.199500	50.2	9.000	L1	9.7	13.4	63.6
0.213000	47.3	9.000	L1	9.7	15.8	63.1
3.681500	38.3	9.000	L1	10.0	17.8	56.0
3.978500	38.7	9.000	L1	10.0	17.3	56.0
4.104500	39.0	9.000	L1	10.1	17.0	56.0
4.392500	37.7	9.000	L1	10.1	18.3	56.0
4.460000	38.4	9.000	L1	10.1	17.6	56.0
4.532000	38.1	9.000	L1	10.1	17.9	56.0
16.497500	31.9	9.000	L1	10.7	28.1	60.0
16.997000	31.5	9.000	L1	10.8	28.5	60.0
17.388500	32.4	9.000	L1	10.8	27.6	60.0
19.832000	31.6	9.000	L1	10.9	28.4	60.0
23.130500	35.4	9.000	L1	11.1	24.6	60.0
23.864000	30.9	9.000	L1	11.1	29.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	30.0	9.000	L1	9.7	26.0	56.0
0.168000	27.2	9.000	L1	9.7	27.9	55.1
0.177000	27.5	9.000	L1	9.7	27.1	54.6
0.186000	29.1	9.000	L1	9.7	25.1	54.2
0.199500	35.9	9.000	L1	9.7	17.7	53.6
0.262500	31.2	9.000	L1	9.7	20.2	51.4
3.681500	29.0	9.000	L1	10.0	17.0	46.0
3.978500	29.0	9.000	L1	10.0	17.0	46.0
4.104500	29.6	9.000	L1	10.1	16.4	46.0
4.392500	29.5	9.000	L1	10.1	16.5	46.0
4.460000	30.1	9.000	L1	10.1	15.9	46.0
4.482500	29.4	9.000	L1	10.1	16.6	46.0
16.497500	24.1	9.000	L1	10.7	25.9	50.0
16.997000	23.8	9.000	L1	10.8	26.2	50.0
17.388500	26.1	9.000	L1	10.8	23.9	50.0
19.832000	23.5	9.000	L1	10.9	26.5	50.0
19.989500	22.1	9.000	L1	10.9	27.9	50.0
23.130500	30.8	9.000	L1	11.1	19.2	50.0

Figure 2: Spectral Diagrams, Conducted Emission, Phase (N)



※ 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

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	49.8	9.000	N	9.7	16.2	66.0
0.159000	48.1	9.000	N	9.7	17.4	65.5
0.177000	45.3	9.000	N	9.7	19.3	64.6
0.199500	53.2	9.000	N	9.7	10.4	63.6
0.258000	46.1	9.000	N	9.7	15.4	61.5
0.276000	45.1	9.000	N	9.7	15.8	60.9
4.041500	38.6	9.000	N	10.1	17.4	56.0
4.392500	39.3	9.000	N	10.1	16.7	56.0
4.496000	38.4	9.000	N	10.1	17.6	56.0
4.532000	39.0	9.000	N	10.1	17.0	56.0
4.604000	39.4	9.000	N	10.1	16.6	56.0
4.676000	39.1	9.000	N	10.1	16.9	56.0
17.690000	33.2	9.000	N	10.7	26.8	60.0
17.910500	32.9	9.000	N	10.7	27.1	60.0
17.996000	33.7	9.000	N	10.7	26.3	60.0
18.248000	32.4	9.000	N	10.7	27.6	60.0
18.324500	31.3	9.000	N	10.7	28.7	60.0
20.547500	30.8	9.000	N	10.8	29.2	60.0

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	30.0	9.000	N	9.7	26.0	56.0
0.159000	26.9	9.000	N	9.7	28.6	55.5
0.168000	26.7	9.000	N	9.7	28.4	55.1
0.181500	27.4	9.000	N	9.7	27.0	54.4
0.199500	37.1	9.000	N	9.7	16.5	53.6
0.208500	35.5	9.000	N	9.7	17.8	53.3
4.041500	29.4	9.000	N	10.1	16.6	46.0
4.392500	30.7	9.000	N	10.1	15.3	46.0
4.496000	30.6	9.000	N	10.1	15.4	46.0
4.532000	30.9	9.000	N	10.1	15.1	46.0
4.604000	30.9	9.000	N	10.1	15.1	46.0
4.676000	30.5	9.000	N	10.1	15.5	46.0
17.285000	24.8	9.000	N	10.7	25.2	50.0
17.910500	24.9	9.000	N	10.7	25.1	50.0
17.996000	25.2	9.000	N	10.7	24.8	50.0
18.140000	24.3	9.000	N	10.7	25.7	50.0
20.201000	26.7	9.000	N	10.8	23.3	50.0
20.547500	20.8	9.000	N	10.8	29.2	50.0

4.2 Radiated Emission Test

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

-For Measurement Below 1 ㎓

Limit Apply to : FCC PART 15 Subpart B Class B

Detector : Quasi-Peak
6 ㏈ Bandwidth: RBW 120 ㎑, VBW 300 ㎑

Operation Mode : Data Communication mode
USB Cable Manufacture : Ningbo Broad
※The worst-case emissions are reported.

Temperature : 24.3°C
Relative Humidity : 51.0 %
Test Date : June 09, 2014

Frequency (MHz)	Reading (dBuV)	Polarity (H/V)	Antenna Height (m)	Correction Factor		Limit (dBuV/m)	Total Level (dBuV/m)	Margin (dB)
				Antenna (dB/m)	Cable (dB)			
84.6	20.7	H	3.5	7.8	3.7	40.0	32.2	7.8
266.5	16.9	H	1.3	12.3	4.4	46.0	33.6	12.4
624.9	13.5	V	1.0	20.0	5.4	46.0	38.9	7.1

※ Calculation Formula:

1. Polarity H = Horizontal, Polarity V = Vertical
2. Total Level = Reading (Receiver Reading) + Correction Factor
3. Margin = Limit - Total Level

-For Measurement Above 1 ㎓

Limit Apply to : FCC PART 15 Subpart B Class B

Detector : Peak mode: Peak (RBW: 1 ㎒, VBW: 3 ㎒)
Average mode: Peak (RBW: 1 ㎒, VBW: 10 ㎐)

Highest Operating Frequency : 1.2 ㎓

※ This product was tested up to the 5th harmonic above frequency.

Operation Mode : Data Communication mode

USB Cable Manufacture : CRESYN

※The worst-case emissions are reported.

Temperature : 24.4°C

Relative Humidity : 49.9 %

Test Date : June 10, 2014

Frequency (㎓)	Polarity (H/V)	Antenna Height (m)	Correction Factor	Reading (dBuV)	Peak		
					Total Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.3328	V	1.0	-14.2	61.7	47.5	74	26.5
1.9999	V	1.0	-12.7	68.7	56.0	74	18.0
2.6558	V	1.1	-9.0	55.8	46.8	74	27.2

Frequency (㎓)	Polarity (H/V)	Antenna Height (m)	Correction Factor	Reading (dBuV)	CAverage		
					Total Level (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1.3328	V	1.0	-14.2	43.4	29.2	54	24.8
1.9999	V	1.0	-12.7	51.0	38.3	54	15.7
2.6558	V	1.1	-9.0	41.5	32.5	54	21.5

※ Calculation Formula:

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

5. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	CAL Date
Conducted Emission					
☒ EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	01.24. 2014
☒ LISN	EMCO	3816/2SH	9706-1070	1 year	04.07. 2014
☒ LISN	Rohde & Schwarz	ENV216	100073	1 year	01.29. 2014
☐ EMI Test Receiver	Rohde & Schwarz	ESCI	100033	1 year	06.23. 2013
☐ LISN	Rohde & Schwarz	ESH3-Z5	100282	1 year	07.03. 2013
☐ Attenuator	Rohde & Schwarz	ESH3-Z2	357.8810.352	1 year	07.03. 2013
☒ Software	Rohde & Schwarz	EMC32	-	-	-
Radiated Emission					
-For measurement below 1 ㎓					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	04.07. 2014
☒ Trilog Antenna	Schwarzbeck	VULB9160	3301	2 year	12.17. 2012
☒ Antenna master	HD GmbH	MA240	240/520	N/A	-
☒ Turn Table	HD GmbH	2090	9702/1224	N/A	-
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	07.01. 2013
☐ Trilog Antenna	Schwarzbeck	VULB9168	185	2 year	04.16. 2013
☐ 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 ㎓					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	04.07. 2014
☒ Antenna master	HD GmbH	MA240	240/520	N/A	-
☒ Turn Table	HD GmbH	2090	9702/1224	N/A	-
☒ Power Amplifier	CERNEX	CBLU1183540	21691	1 year	07.24. 2013
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	12.13. 2012
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	07.01. 2013
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☐ Antenna master	INNCO Systems	MA4000-EP	MA4000/283	N/A	-
☐ Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170124	2 year	10.30. 2013
☐ Power Amplifier	CERNEX	CBL18265035	22966	1 year	07.24. 2013
☐ Power Amplifier	CERNEX	CBL26405040	19660	1 year	04.04. 2014
☒ Software	Rohde & Schwarz	EMC32	-	-	-

6. CONCLUSION

The data collected shows that the **EUT type: LTE Phone with WLAN and Bluetooth, Model: LG-VK410** complies with §15.107 and §15.109 of the FCC rules.