

EMI CERTIFICATION REPORT

Applicant:

LG Electronics MobileComm U.S.A., Inc.

1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Date of Receipt: June 09, 2014**Date of Issue:** June 24, 2014**Test Report No.** HCT-E-1406-F051**HCT FRN:** 0005866421**FCC ID:****ZNFD221C**

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 Phone with Bluetooth4.0, WIFI802.11 b/g/n (2.4GHz HT20, HT40), VoIP, Hotspot support
Model Name: LG-D221c
Additional Model Name: LGD221c, D221c
Test Port: USB / Earphone Port
Date of Test: June 16, 2014 - June 19, 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 denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1406-F051	June 24, 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-D221c
FCC ID	ZNFD221C
Additional Model	LGD221c, D221c
EUT Type	GSM, WCDMA Phone with Bluetooth4.0, WIFI802.11 b/g/n (2.4GHz_HT20, HT40), VoIP, Hotspot support
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)
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)

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-D221c	LG	ZNFD221C	Notebook PC, Earphone
USB cable	EAD62377902	Ningbo Broad	-	EUT, Notebook PC
Earphone	EAB62808211	I-Sound	-	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)	-	Transcend	-	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	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).
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	Quasi-Peak(dB μ V)	Average(dB μ V)
0.15 to 0.5	9 kHz	66 to 56*	56 to 46*
0.5 to 5	9 kHz	56	46
5 to 30	9 kHz	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 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 ($\mu V/m$)	Quasi-Peak (dB $\mu V/m$)
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 $\mu V/m$)	Average (dB $\mu V/m$)
Above 1 000	3	74	54

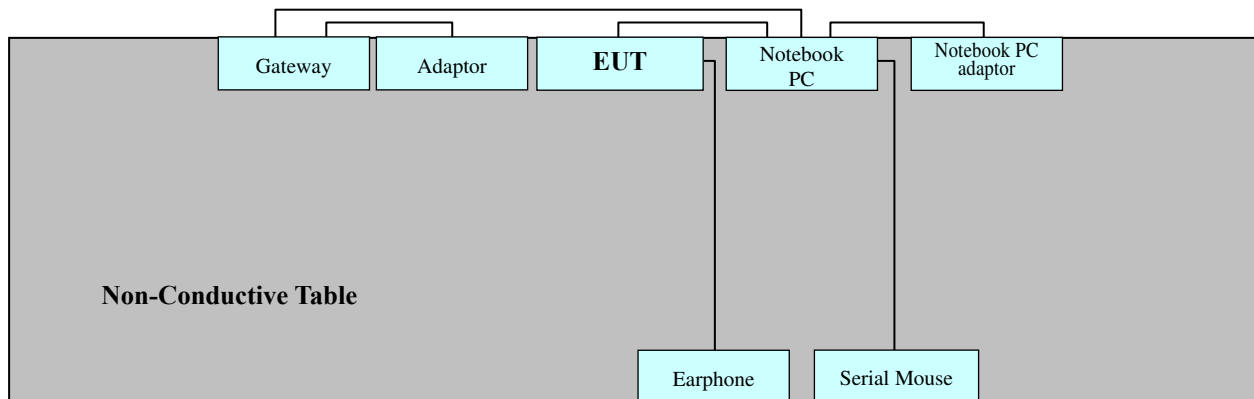


2.2.1 Frequency Range of Radiated Measurements

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

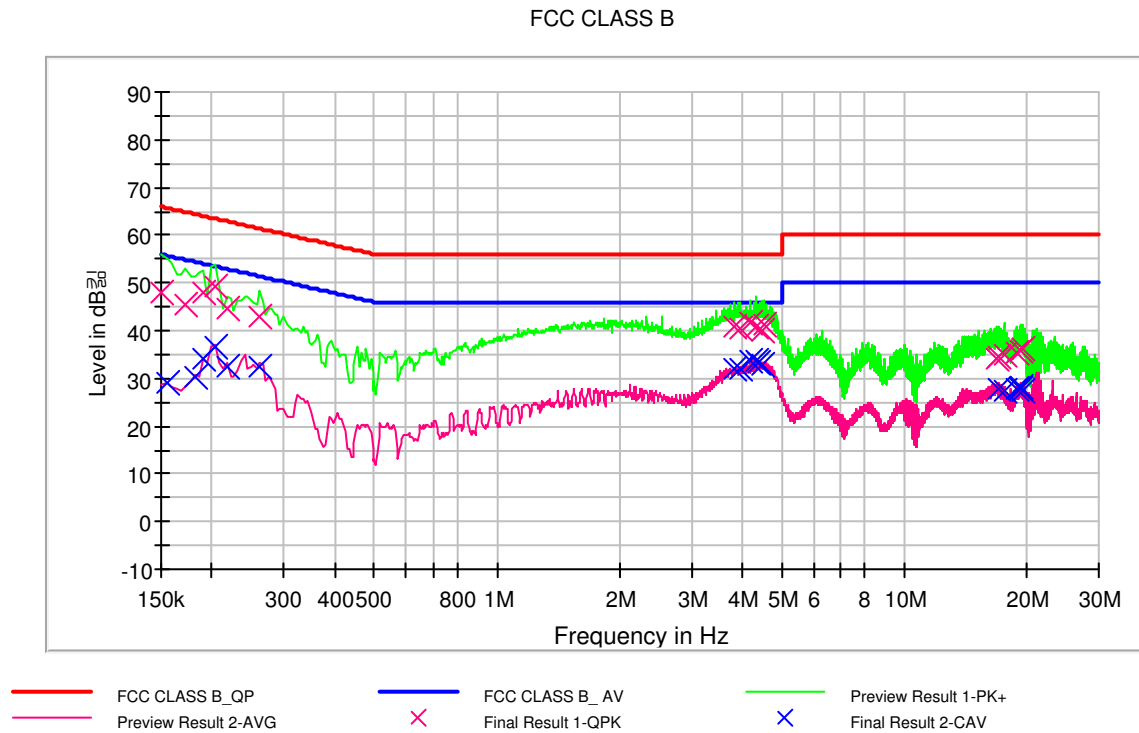
The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

Limit Apply to	: FCC PART 15 Subpart B Class B
Detector	: Quasi-Peak, CISPR-Average
6 dB Bandwidth	: 9 kHz
Operation Mode	: Data Communication mode
Temperature	: 23.6 °C
Relative Humidity	: 48.1 %
Test Date	: June 16, 2014

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



Figure 1: Spectral Diagrams, Conducted Emission, AC Mains (0.15 - 30)MHz, Line (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



QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	48.1	9.000	L1	9.7	17.9	66.0
0.172500	45.4	9.000	L1	9.7	19.4	64.8
0.190500	48.0	9.000	L1	9.7	16.0	64.0
0.204000	49.4	9.000	L1	9.7	14.0	63.4
0.217500	44.5	9.000	L1	9.7	18.4	62.9
0.262500	43.1	9.000	L1	9.7	18.3	61.4
3.816500	40.8	9.000	L1	10.0	15.2	56.0
3.960500	40.4	9.000	L1	10.0	15.6	56.0
4.167500	41.7	9.000	L1	10.1	14.3	56.0
4.311500	41.0	9.000	L1	10.1	15.0	56.0
4.455500	39.9	9.000	L1	10.1	16.1	56.0
4.523000	41.4	9.000	L1	10.1	14.6	56.0
16.893500	34.1	9.000	L1	10.7	25.9	60.0
16.961000	34.7	9.000	L1	10.8	25.3	60.0
17.523500	34.8	9.000	L1	10.8	25.2	60.0
18.954500	35.4	9.000	L1	10.9	24.6	60.0
19.220000	35.9	9.000	L1	10.9	24.1	60.0
19.431500	36.1	9.000	L1	10.9	23.9	60.0

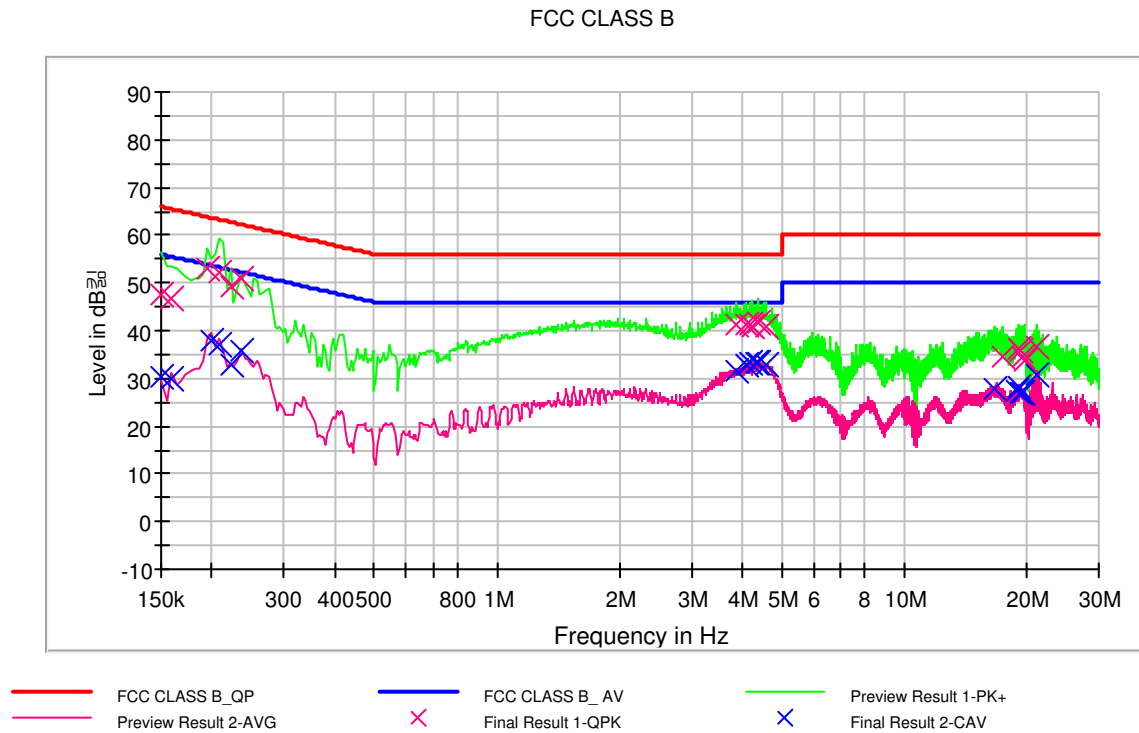


CAverage Final Result

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154500	28.9	9.000	L1	9.7	26.9	55.8
0.181500	30.5	9.000	L1	9.7	23.9	54.4
0.190500	34.2	9.000	L1	9.7	19.8	54.0
0.204000	36.8	9.000	L1	9.7	16.6	53.4
0.217500	32.6	9.000	L1	9.7	20.3	52.9
0.262500	32.5	9.000	L1	9.7	18.9	51.4
3.843500	31.9	9.000	L1	10.0	14.1	46.0
3.956000	32.0	9.000	L1	10.0	14.0	46.0
4.167500	33.6	9.000	L1	10.1	12.4	46.0
4.311500	33.6	9.000	L1	10.1	12.4	46.0
4.379000	33.4	9.000	L1	10.1	12.6	46.0
4.455500	33.0	9.000	L1	10.1	13.0	46.0
16.961000	28.0	9.000	L1	10.8	22.0	50.0
17.523500	27.2	9.000	L1	10.8	22.8	50.0
18.914000	27.8	9.000	L1	10.9	22.2	50.0
19.220000	28.0	9.000	L1	10.9	22.0	50.0
19.355000	27.8	9.000	L1	10.9	22.2	50.0
19.503500	27.4	9.000	L1	10.9	22.6	50.0



Figure 2: Spectral Diagrams, Conducted Emission, AC Mains (0.15 - 30)MHz, Line (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



QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	47.6	9.000	N	9.7	18.4	66.0
0.159000	46.6	9.000	N	9.7	18.9	65.5
0.195000	52.9	9.000	N	9.7	10.9	63.8
0.208500	52.2	9.000	N	9.7	11.1	63.3
0.222000	49.3	9.000	N	9.7	13.4	62.7
0.235500	51.1	9.000	N	9.7	11.2	62.3
3.884000	41.1	9.000	N	10.0	14.9	56.0
4.100000	41.3	9.000	N	10.1	14.7	56.0
4.167500	41.3	9.000	N	10.1	14.7	56.0
4.239500	41.0	9.000	N	10.1	15.0	56.0
4.379000	41.6	9.000	N	10.1	14.4	56.0
4.590500	40.9	9.000	N	10.1	15.1	56.0
17.447000	34.5	9.000	N	10.7	25.5	60.0
19.076000	36.0	9.000	N	10.8	24.0	60.0
19.215500	35.6	9.000	N	10.8	24.4	60.0
19.584500	34.7	9.000	N	10.8	25.3	60.0
19.643000	33.6	9.000	N	10.8	26.4	60.0
21.051500	36.5	9.000	N	10.9	23.5	60.0



CAverage Final Result

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	30.4	9.000	N	9.7	25.6	56.0
0.159000	29.7	9.000	N	9.7	25.8	55.5
0.199500	37.9	9.000	N	9.7	15.7	53.6
0.208500	36.9	9.000	N	9.7	16.4	53.3
0.222000	32.8	9.000	N	9.7	19.9	52.7
0.235500	35.7	9.000	N	9.7	16.6	52.3
3.884000	31.5	9.000	N	10.0	14.5	46.0
4.100000	32.8	9.000	N	10.1	13.2	46.0
4.167500	33.1	9.000	N	10.1	12.9	46.0
4.352000	33.3	9.000	N	10.1	12.7	46.0
4.379000	33.2	9.000	N	10.1	12.8	46.0
4.590500	32.7	9.000	N	10.1	13.3	46.0
16.601000	27.7	9.000	N	10.7	22.3	50.0
18.887000	27.3	9.000	N	10.8	22.7	50.0
19.076000	28.1	9.000	N	10.8	21.9	50.0
19.242500	27.0	9.000	N	10.8	23.0	50.0
19.584500	26.9	9.000	N	10.8	23.1	50.0
21.051500	30.7	9.000	N	10.9	19.3	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 GHz

Limit Apply to	: FCC PART 15 Subpart B Class B
Detector	: Quasi-Peak 6 dB Bandwidth: RBW 120 kHz, VBW 300 kHz
Operation Mode	: Data Communication mode
Temperature	: 24.0°C
Relative Humidity	: 45.9 %
Test Date	: June 18, 2014

Frequency (MHz)	Quasi Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
60.782204	24.2	113.0	V	230.0	15.3	15.8	40.0
125.010501	29.9	130.0	V	318.0	15.9	13.6	43.5
265.570421	34.1	130.0	H	106.0	16.7	11.9	46.0
375.012024	35.5	121.0	V	322.0	19.9	10.5	46.0
625.029659	40.3	100.0	V	199.0	25.4	5.7	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

Limit Apply to : 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 - 6 GHz

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

Operation Mode : Data Communication mode

Temperature : 23.0°C

Relative Humidity : 46.2 %

Test Date : June 19, 2014

Frequency (MHz)	Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
1327.505010	49.2	100.0	V	113.0	-10.1	24.8	74.0
1995.340681	55.9	100.0	V	214.0	-9.7	18.1	74.0
2664.078156	49.8	113.0	V	213.0	-6.8	24.2	74.0

Frequency (MHz)	CAverage (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
1327.505010	30.3	100.0	V	113.0	-10.1	23.7	54.0
1995.340681	37.9	100.0	V	214.0	-9.7	16.1	54.0
2664.078156	31.5	113.0	V	213.0	-6.8	22.5	54.0

※ Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak 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	01.24. 2014
☒ LISN	EMCO	3816/2SH	9706-1070	1 year	04.07. 2014
☒ LISN	Rohde & Schwarz	ENV216	100073	1 year	01.29. 2014
☐ 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 GHz

☒ 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	-
☒ 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	-
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.18.2014
☐ 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 GHz

☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	04.07. 2014
☒ 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	-
☐ Power Amplifier	CERNEX	CBLU1183540	21691	1 year	07.24. 2013
☒ Power Amplifier	CERNEX	CBLU5183530	24348	1 year	06.11.2014
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	12.13. 2012
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.18.2014
☐ 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: GSM, WCDMA Phone with Bluetooth4.0, WIFI802.11 b/g/n(2.4GHz_HT20, HT40), VoIP, Hotspot support, FCC ID: ZNFD221C, Model: LG-D221c** complies with §15.107 and §15.109 of the FCC rules.