



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

**GSM/CDMA/WCDMA/LTE Phone + Bluetooth &  
WLAN (2.4GHz & 5GHz) and NFC**

**MODEL NUMBER: LG-D820, LGD820 and D820**

**FCC ID: ZNFD820  
IC: 2703C-D820**

**REPORT NUMBER: 13U15420-5, Revision E**

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**NVLAP LAB CODE 200065-0**

Revision History

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--	07/17/13	Initial Issue	P. Kim
A	07/31/13	Updated report page 5 with proper sections.	P. Kim
B	08/01/13	Update typo on the section 5.2 with regards to distance.	P. Kim
C	08/05/13	Update typo on the section 7.1.1 with regards to distance and section 5.2 with updated typo.	P. Kim
D	09/13/13	Updated with 99% Bandwidth, new Section 7	P. Kim
E	09/16/13	Corrected 99% Bandwidth Summary Table Section 7	P. Kim

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** LG ELECTRONICS MOBILECOMM U.S.A., INC.  
1000 SYLVAN AVENUE  
ENGLEWOOD CLIFFS, NEW JERSEY 07632 U.S.A.

**EUT DESCRIPTION:** GSM/CDMA/WCDMA + LTE Phone Bluetooth, WLAN (2.4GHz & 5GHz) and NFC

**MODEL:** LG-D820, LGD820 and D820

**SERIAL NUMBER:** (00232D8CE056EEEAE) NFC RADIATED  
(0021EDF624E7C39B) CONDUCTED

**DATE TESTED:** JUNE 14 to 28, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Pass
INDUSTRY CANADA RSS-210 ISSUE 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Verification Services Inc. By:

Tested By:



PHILIP KIM  
WISE PROGRAM MANAGER  
UL Verification Services Inc.

ROLLY ALEGRE  
EMC ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4, ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2, FCC CFR 47 Part 2 and FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

## **5. EQUIPMENT UNDER TEST**

### **5.1. DESCRIPTION OF EUT**

The EUT is an LTE cell phone with WLAN, Bluetooth and NFC capability that is manufactured by LG Electronics.

### **5.2. MAXIMUM OUTPUT POWER**

The transmitter maximum E-field at 30m distance is 14.02 dBuV/m

### **5.3. SOFTWARE AND FIRMWARE**

Software version was 3.4.0-g9f6ebe1-00072-gcee1ab4b

The firmware used was M8974A-0.0.19.0.01.

### **5.4. WORST-CASE CONFIGURATION AND MODE**

The NFC function was tested at its' fundamental and only operational frequency of 13.56 MHz. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the Y-orientation(upward) was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Y-orientation while generating continuous emissions.

### **5.5. MODIFICATIONS**

No modifications were made during testing.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

**Radiated Emissions Above 30 MHz, AC Line Conducted Emissions and Frequency Stability:**

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	MCS.01WR	EAY62768913	N/A
Earphone	QuadBeat	LE 410	EAB62729001	N/A

### I/O CABLES

**Radiated Emissions above 30 MHz, AC Line Conducted Emissions :**

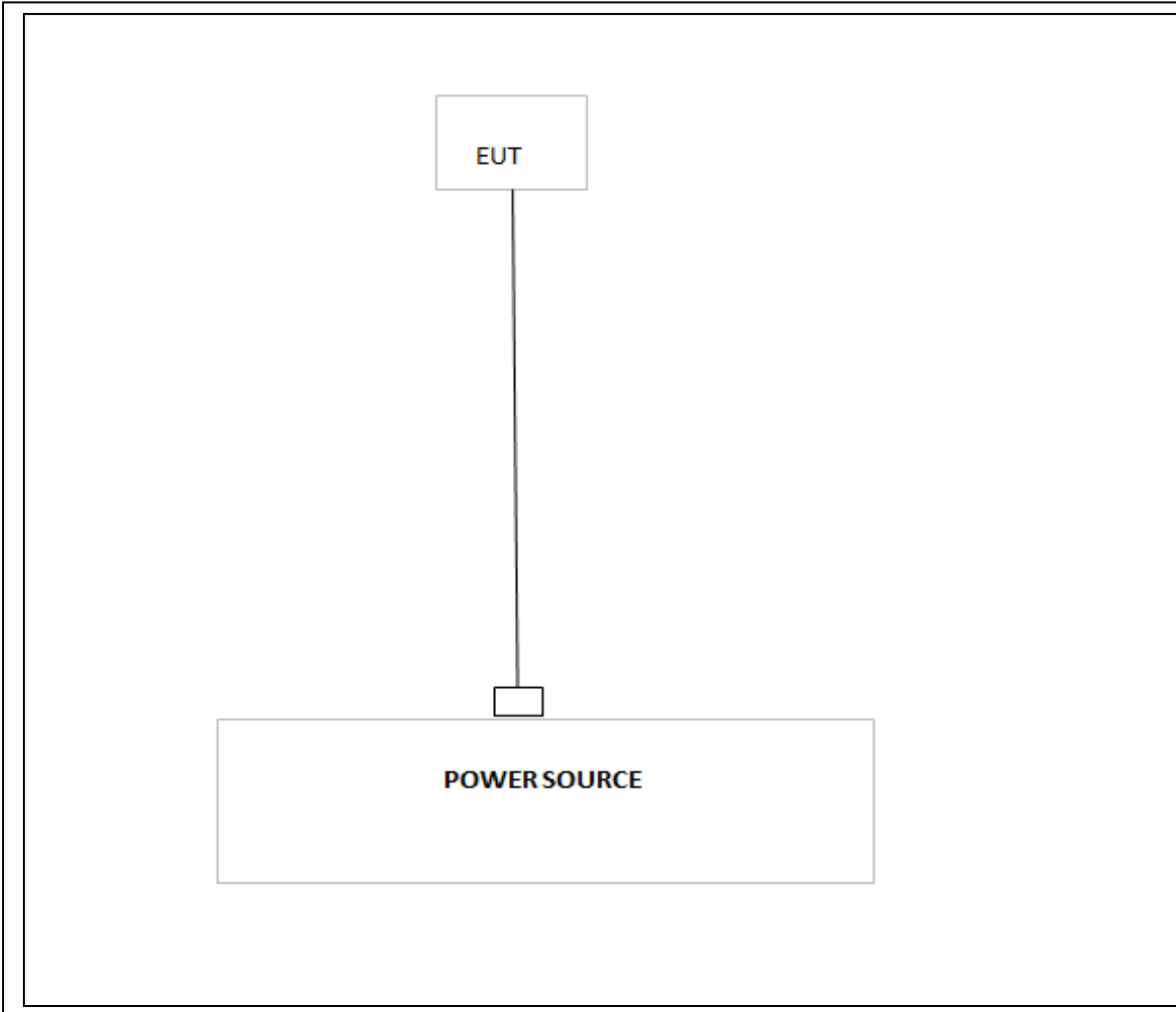
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Micro-USB	Shielded	1 m	None
2	Audio	1	Mini-Jack	Un-Shielded	1 m	None

### TEST SETUP

The EUT is a stand-alone device configured and tested in a worst-case setup.

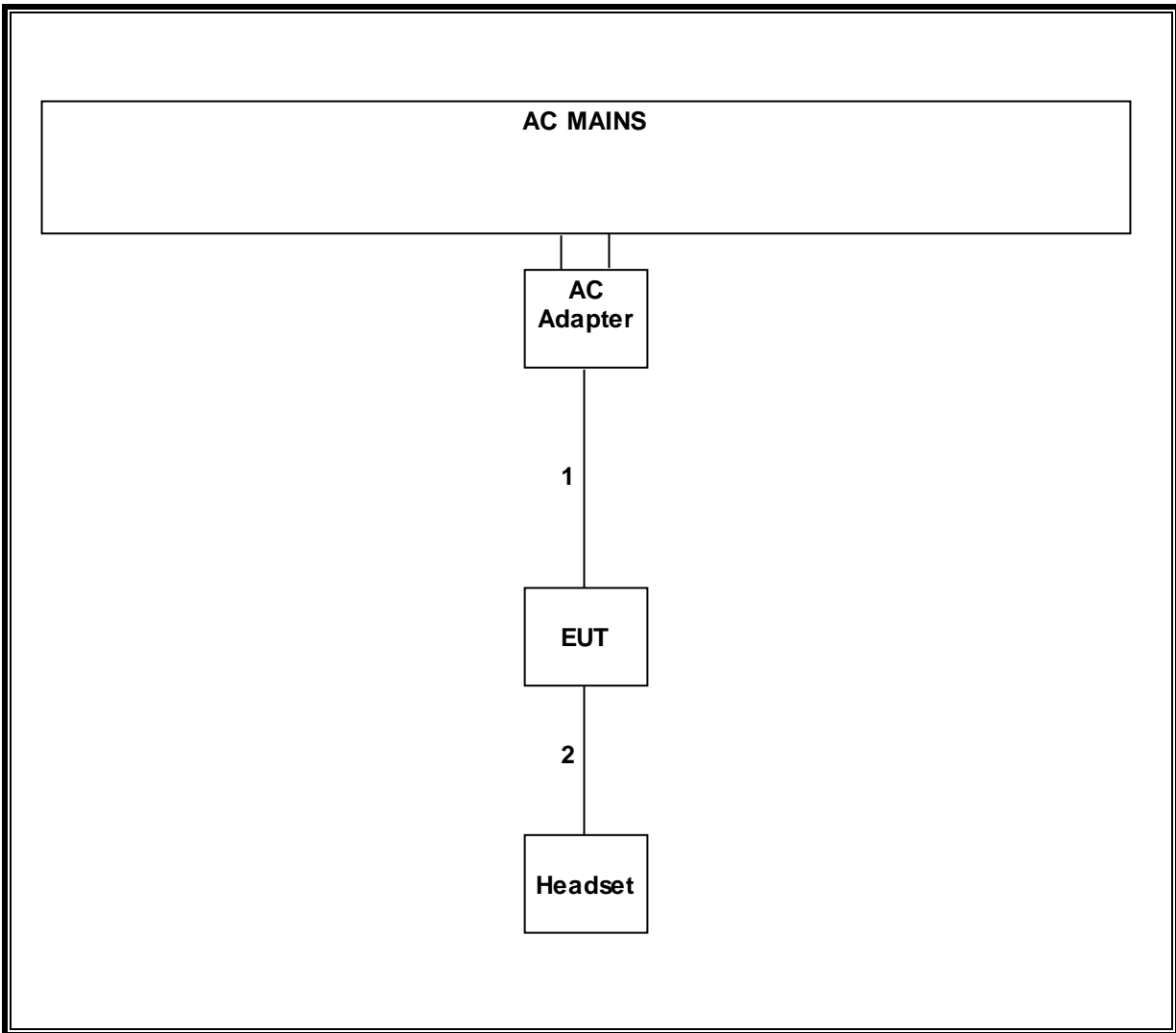
**SETUP DIAGRAM FOR TESTS**

**Radiated Emissions Below 30 MHz:**





**Radiated Emissions Above 30 MHz, AC Line Conducted Emissions :**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
ESA-E Spectrum Analyzer, 9kHz-26.5 GHz	Agilent / HP	E4407B	C01098	03/29/12	04/04/14
Antenna, Loop, 30 MHz	EMCO	6502	C00593	02/10/11	02/20/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	03/23/12	03/23/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/21/12	01/21/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/12	08/08/13
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14
DMM	Fluke	77-11	N02303	10/31/11	10/31/13
Digital Thermometer	Tektronix	DTM920	None	05/21/12	10/21/13
Temperature Chamber	CSZ	2PHS-8-3	T267	03/04/13	03/04/14

## 7. OCCUPIED BANDWIDTH

### RULE PART(S)

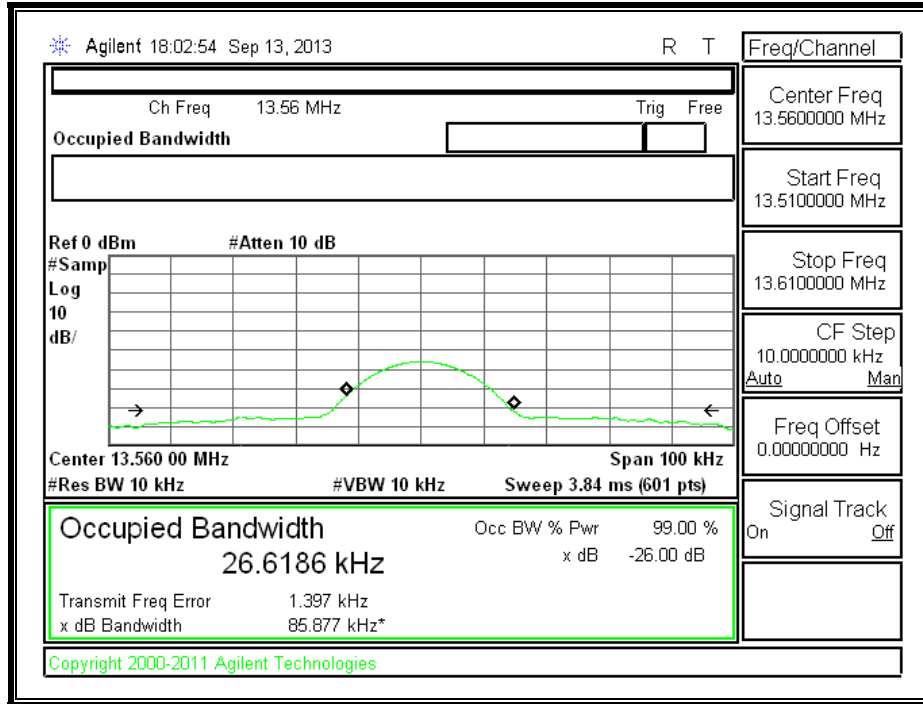
IC RSS 210 Issue 8

### LIMITS

For reporting purposes only

### RESULTS

Channel	Frequency (KHz)	99% Bandwidth (KHz)
Low	13.56	26.619



## 8. RADIATED EMISSION TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMIT

§15.225

IC RSS-210, Section 2.6 (Transmitter)

IC RSS-GEN, Section 6 (Receiver)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

### **TEST PROCEDURE**

ANSI C63.4

The EUT is an intentional radiator that incorporates a digital device. The highest fundamental frequency generated or used in the device is 13.56 MHz. The frequency range was investigated from 0.15 MHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater (1000MHz)

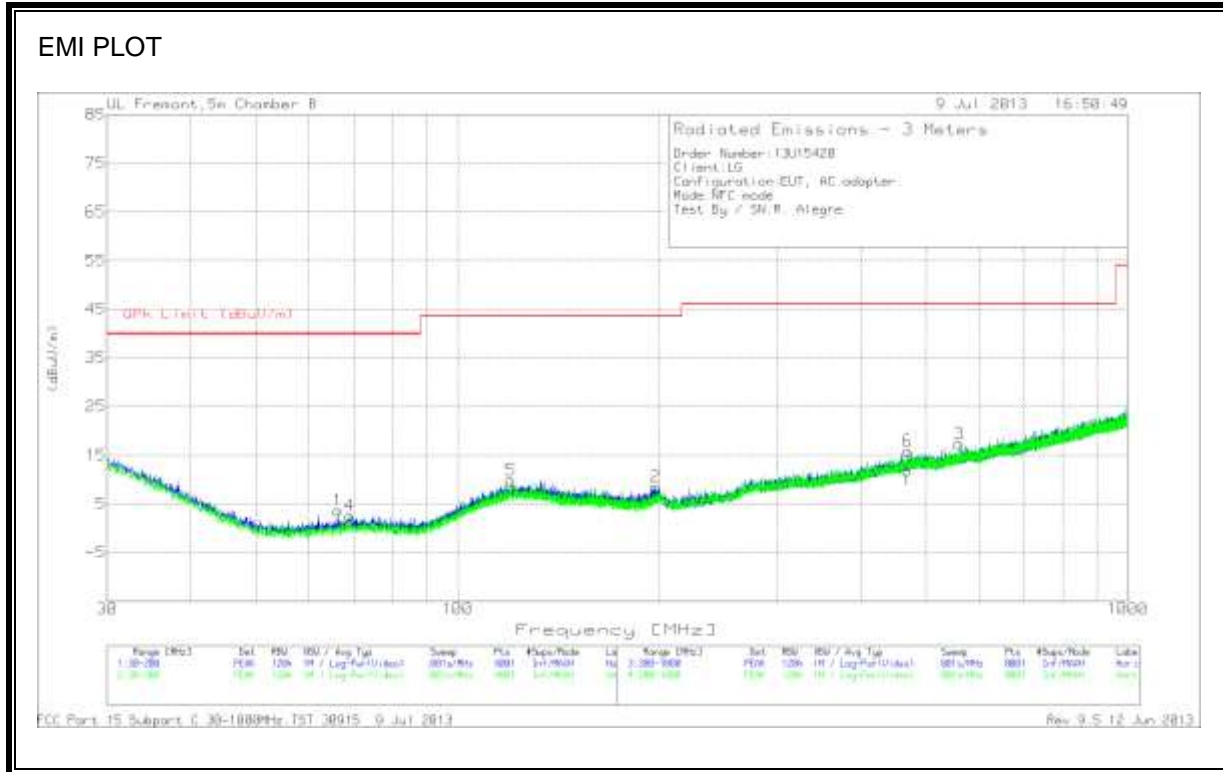
### **RESULTS**

No non-compliance noted:

### 8.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

FCC Part 15, Subpart B & C      3 Meter Distance Measurement At Open Field												
Company: LG												
Project #: 13U15420												
Model #: M20_M30												
Tester: R. Alegre												
Date: 08/5/13												
Frequency (MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	AF (dB/m)	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
<b>Loop Antenna Face on: Z position worst</b>												
13.56	43.46		N/A	10.56	-40.00	14.02	N/A	84.00	N/A	-70.0	N/A	Fundamental @ 3m Dist
13.48	30.56		N/A	10.56	-40.00	-0.66	N/A	50.48	N/A	-51.1	N/A	13.41MHz-13.553MHz
13.64	28.78		N/A	10.56	-40.00	-0.66	N/A	50.48	N/A	-51.1	N/A	13.567MHz-13.71MHz
13.15	32.47		N/A	10.52	-40.00	2.99	N/A	40.51	N/A	-37.5	N/A	13.110-13.410MHz
13.84	37.28		N/A	10.58	-40.00	7.86	N/A	40.51	N/A	-32.6	N/A	13.71-14.01MHz
4.27	42.13		N/A	10.2	-40.00	12.33	N/A	29.54	N/A	-17.2	N/A	9k-13.11MHz
27.04	34.63		N/A	9.055	-40.00	3.69	N/A	29.54	N/A	-25.9	N/A	14.01MHz-30MHz
<b>Loop Antenna Face off: Z position</b>												
13.56	38.75		N/A	10.56	-40.00	9.31	N/A	84.00	N/A	-74.7	N/A	Fundamental @ 3m Dist
13.47	31.48		N/A	10.55	-40.00	2.03	N/A	50.48	N/A	-48.5	N/A	13.41MHz-13.553MHz
13.65	34.96		N/A	10.57	-40.00	5.53	N/A	50.48	N/A	-45.0	N/A	13.567MHz-13.71MHz
13.38	32.17		N/A	10.54	-40.00	2.71	N/A	40.51	N/A	-37.8	N/A	13.110-13.410MHz
13.84	36.93		N/A	10.58	-40.00	7.51	N/A	40.51	N/A	-33.0	N/A	13.71-14.01MHz
7.21	38.21		N/A	10.2	-40.00	8.41	N/A	29.54	N/A	-21.1	N/A	9k-13.11MHz
27.12	37.12		N/A	9.046	-40.00	6.17	N/A	29.54	N/A	-23.4	N/A	14.01MHz-30MHz
* No more emissions were found up to 30MHz												
<u>Note:</u> The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.												
P.K. = Peak												
Q.P. = Quasi Peak Reading												
A.F. = Antenna factor												
Rev. 10.23.09												

### 8.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz





Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cb/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
66.2525	24.48	PK	7.6	-28.4	3.68	40	-36.32	0-360	200	H
197.62	23.46	PK	12.1	-27	8.56	43.52	-34.96	0-360	300	H
69.0575	23.16	PK	7.8	-28.4	2.56	40	-37.44	0-360	100	V
120.1425	23.72	PK	13.9	-27.8	9.82	43.52	-33.7	0-360	100	V
559.8	24.63	PK	18.4	-25.7	17.33	46.02	-28.69	0-360	100	H
469.1	24.51	PK	17.3	-26	15.81	46.02	-30.21	0-360	300	V

PK - Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 9 Jul 2013 Rev 9.5 12 Jun 2013

## 9. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207  
IC RSS-GEN, Section 7.2.2

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Notes:  
1. The lower limit shall apply at the transition frequencies  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### TEST PROCEDURE

ANSI C63.4

### RESULTS

No non-compliance noted:

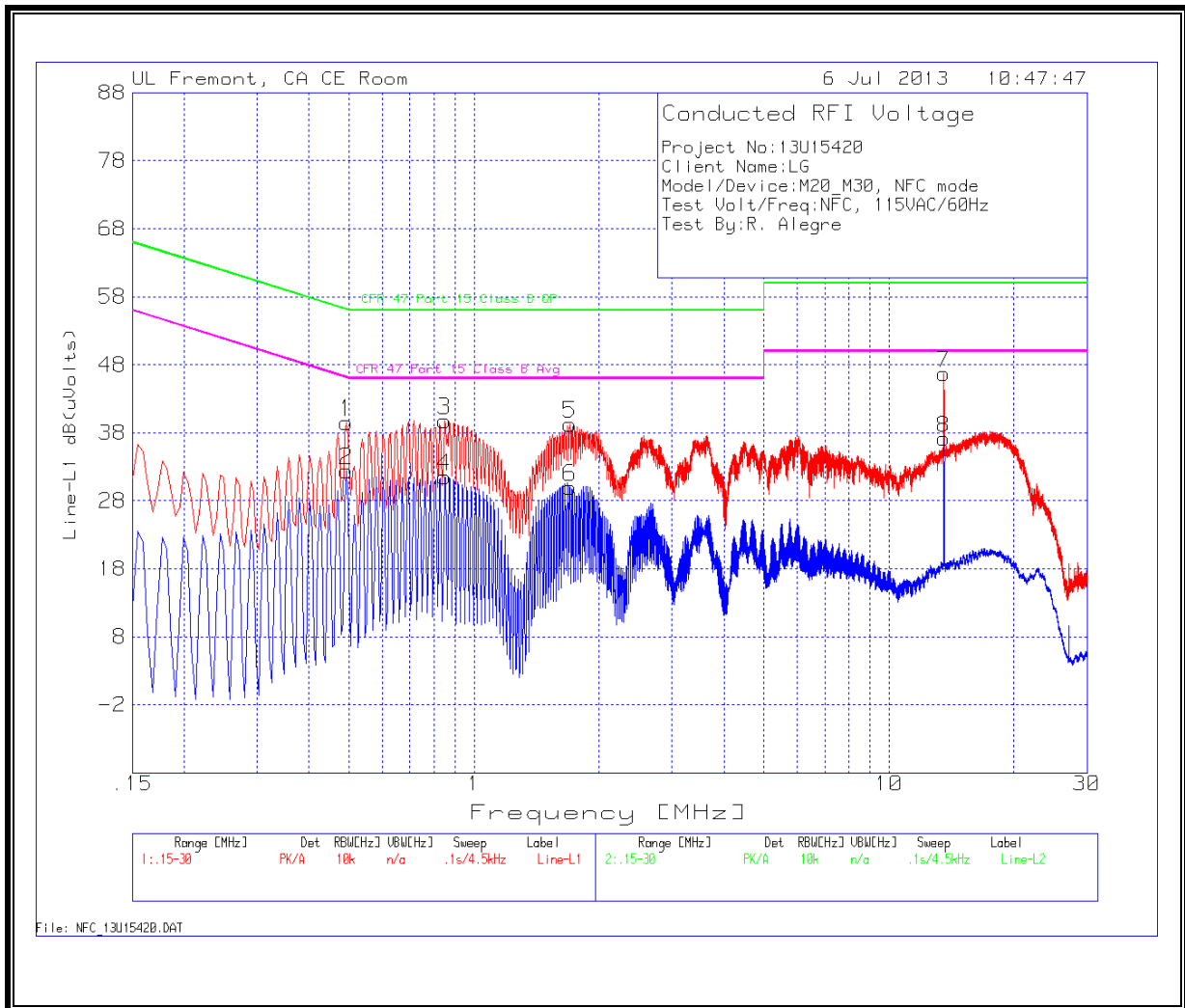
**6 WORST EMISSIONS**

Project No:13U15420  
 Client Name:LG  
 Model/Device:M20\_M30, NFC mode  
 Test Volt/Freq:NFC, 115VAC/60Hz  
 Test By:R. Alegre

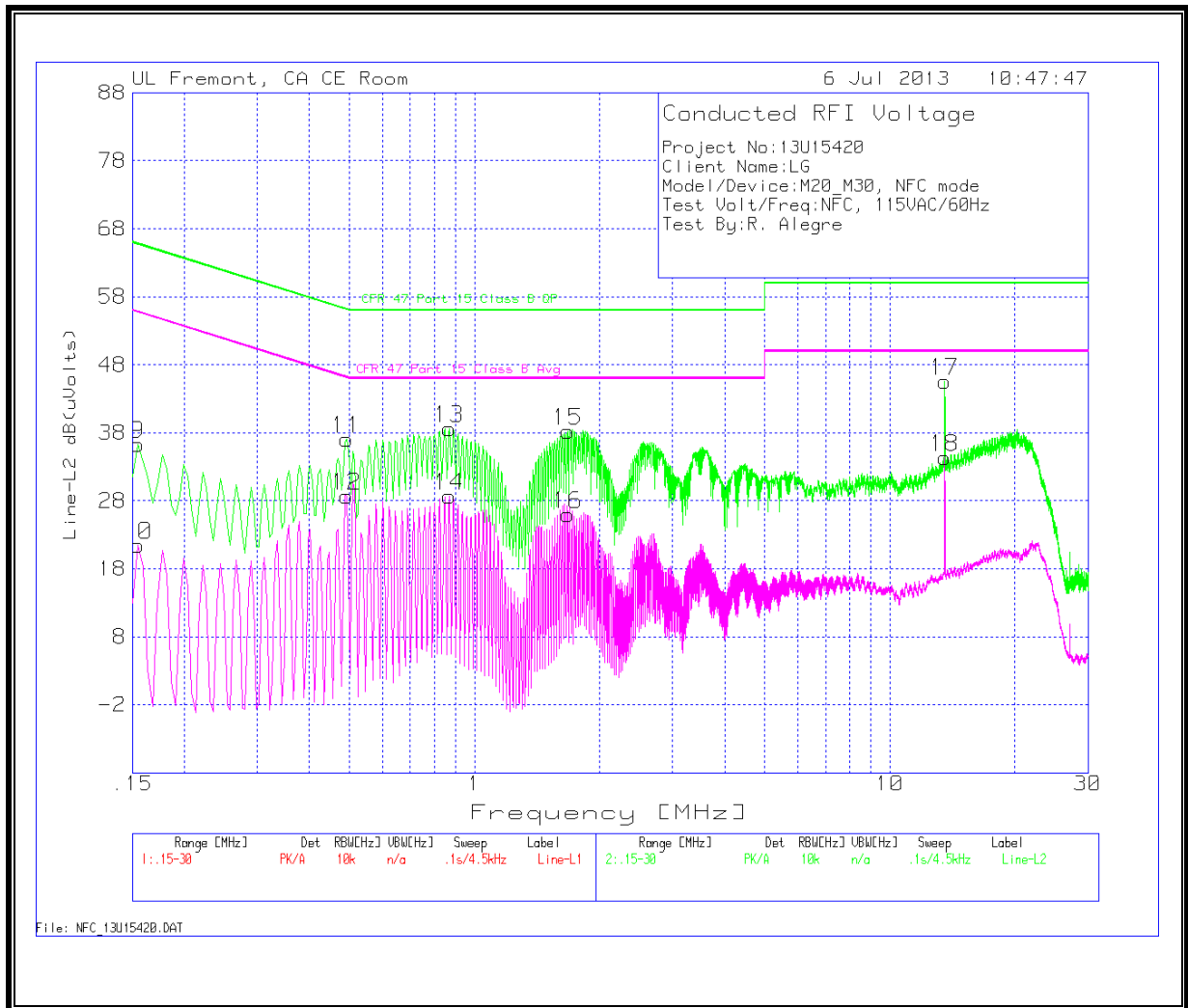
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
<b>Line-L1 .15 - 30MHz</b>									
0.492	39.43	PK	0.1	0	39.53	56.1	-16.57	-	-
0.492	32.39	Av	0.1	0	32.49	-	-	46.1	-13.61
0.8475	39.64	PK	0.1	0	39.74	56	-16.26	-	-
0.8475	31.43	Av	0.1	0	31.53	-	-	46	-14.47
1.7025	39.07	PK	0.1	0.1	39.27	56	-16.73	-	-
1.7025	29.84	Av	0.1	0.1	30.04	-	-	46	-15.96
13.56	46.28	PK	0.2	0.2	46.68	60	-13.32	-	-
13.56	36.74	Av	0.2	0.2	37.14	-	-	50	-12.86
<b>Line-L2 .15 - 30MHz</b>									
0.1545	36.2	PK	0.1	0	36.3	65.8	-29.5	-	-
0.1545	21.38	Av	0.1	0	21.48	-	-	55.8	-34.32
0.492	37.02	PK	0.1	0	37.12	56.1	-18.98	-	-
0.492	28.63	Av	0.1	0	28.73	-	-	46.1	-17.37
0.87	38.5	PK	0.1	0	38.6	56	-17.4	-	-
0.87	28.63	Av	0.1	0	28.73	-	-	46	-17.27
1.6755	38.03	PK	0.1	0.1	38.23	56	-17.77	-	-
1.6755	25.73	Av	0.1	0.1	25.93	-	-	46	-20.07
13.56	45.23	PK	0.2	0.2	45.63	60	-14.37	-	-
13.56	34.02	Av	0.2	0.2	34.42	-	-	50	-15.58

PK - Peak detector  
 QP - Quasi-Peak detector

**LINE 1 RESULTS**



**LINE 2 RESULTS**



## 10. FREQUENCY STABILITY

### LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2

### RESULTS

No non-compliance noted.

Reference Frequency: EUT Channel 13.5605000 MHz @ 20°C				
Limit: $\pm 100$ ppm = 135.600 kHz				
Power Supply (Vac)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
115.00	50	13.5600410	-0.011	$\pm 100$
115.00	40	13.5600420	-0.012	$\pm 100$
115.00	30	13.5600470	-0.015	$\pm 100$
<b>115.00</b>	<b>20</b>	<b>13.5600260</b>	<b>0.000</b>	<b><math>\pm 100</math></b>
115.00	10	13.5600480	-0.016	$\pm 100$
115.00	0	13.5600510	-0.018	$\pm 100$
115.00	-10	13.5600740	-0.035	$\pm 100$
115.00	-20	13.5600760	-0.037	$\pm 100$
97.15	20	13.5600480	-0.016	$\pm 100$
132.25	20	13.5600530	-0.020	$\pm 100$