



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND NFC

MODEL NUMBER: LG870, LG-LG870, LGLG870

FCC ID: ZNFLG870

REPORT NUMBER: 13U14917-6

ISSUE DATE: APRIL 05, 2013

Prepared for

LG ELECTRONICS MOBILECOMM U.S.A., INC.

1000 SYLVAN AVENUE

ENGLEWOOD CLIFFS, NEW JERSEY 07632

Prepared by

UL CCS

47173 BENICIA STREET

FREMONT, CA 94538, U.S.A.

TEL: (510) 771-1000

FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

Revision History

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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 07632KOREA

EUT DESCRIPTION: TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND NFC

MODEL: LG870, LG-LG870, LGLG870

SERIAL NUMBER: NFC #1 (256691464000002151)

DATE TESTED: MARCH 21-28, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Pass

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

Tested By:



TIM LEE
WISE PROGRAM MANAGER
UL CCS

DOUG ANDERSON
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

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

UL CCS 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 measured at a distance of 3m and extrapolated to a corrected amplitude at a distance of 30m is 9.39dBuV/m.

5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was LG870FC.

The test utility software used during testing was the hidden menu NFC Function Test.

5.4. MODEL DIFFERNECE

All models, LG 870, LG-870, and LGLG870, are identical except for model designation.

5.5. WORST-CASE CONFIGURATION AND MODE

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

5.6. MODIFICATIONS

No modifications were made during testing.

5.7. 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 Electronics	MCS-01WR	EAY62768913	DoC
Headset	I-SOUND CO. LTD	HC-MYD-LG113	None	N/A

I/O CABLES

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

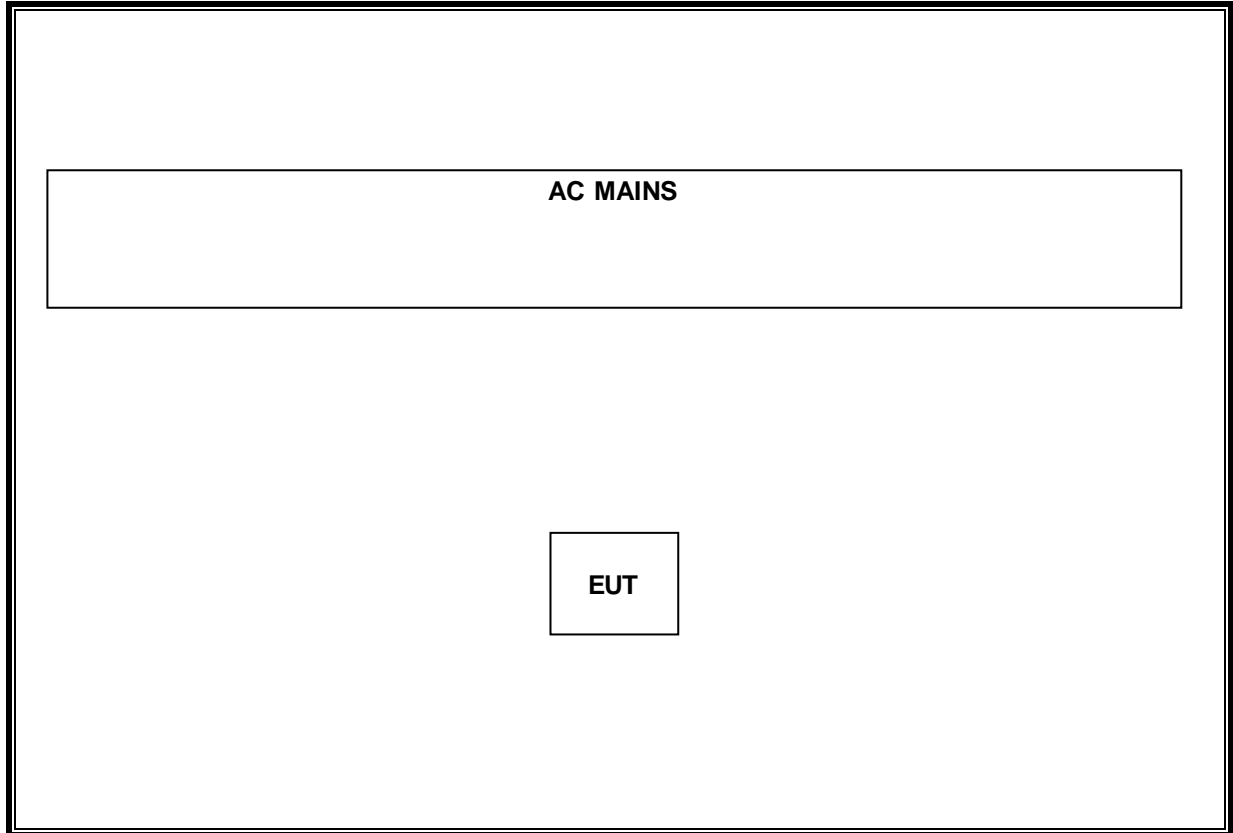
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Micro-USB	Shielded	1.15 m	None
2	Audio	1	Mini-Jack	Un-Shielded	1.05 m	None

TEST SETUP

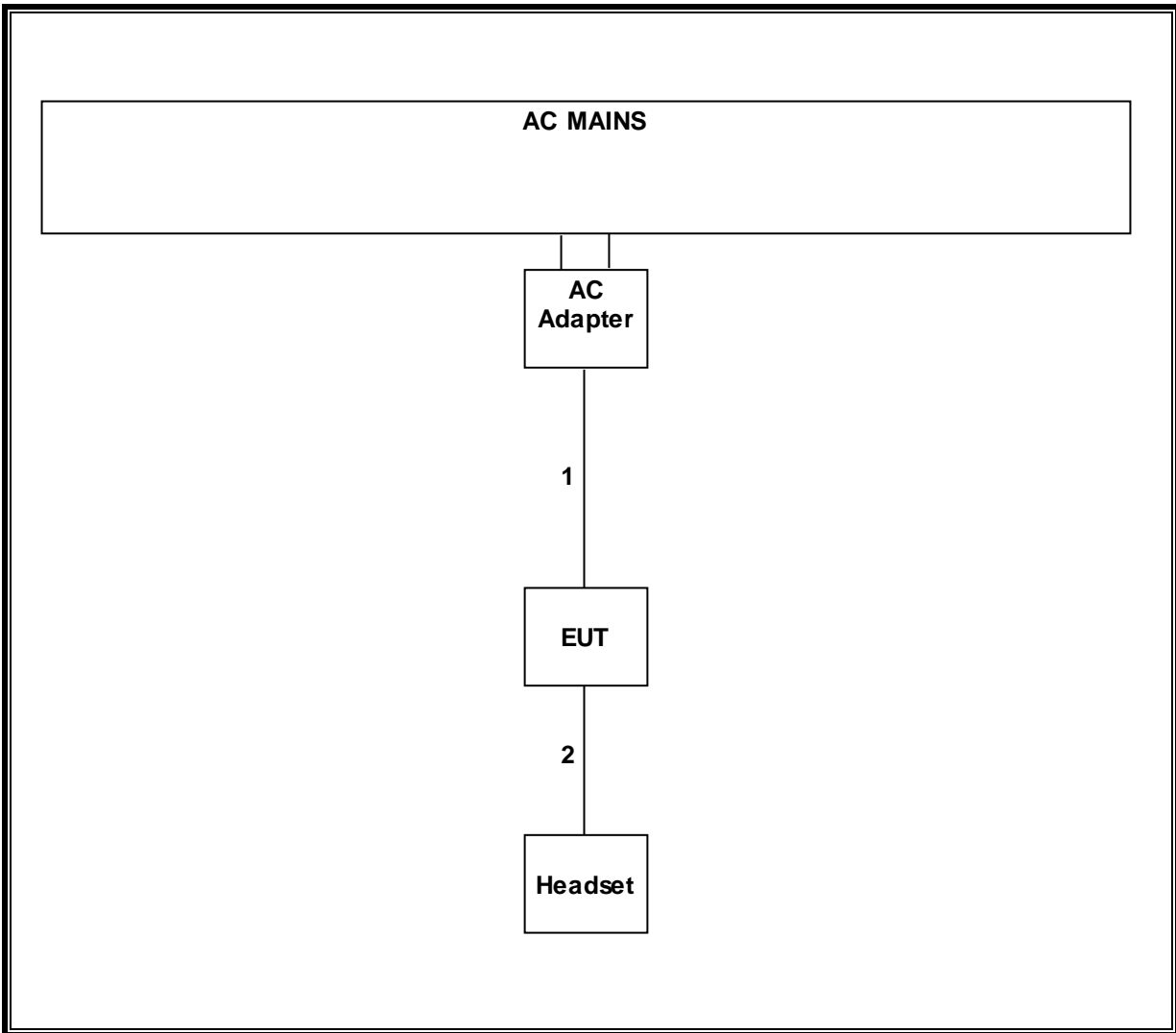
The EUT is a stand-alone device configured and tested in a worst-case setup.

SETUP DIAGRAM FOR TESTS

Radiated Emissions Below 30 MHz:



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



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
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01161	05/02/12	05/02/13
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	03/06/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/21/12	03/23/14
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	05/21/13
Temperature Chamber 1.25 cu ft (Rental unit)	Tenney Engineering	TJR-A	13916871	05/07/12	05/07/13

7. RADIATED EMISSION TEST RESULTS

7.1. 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 19.2 MHz. The frequency range was investigated from 30 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater (1000MHz)

RESULTS

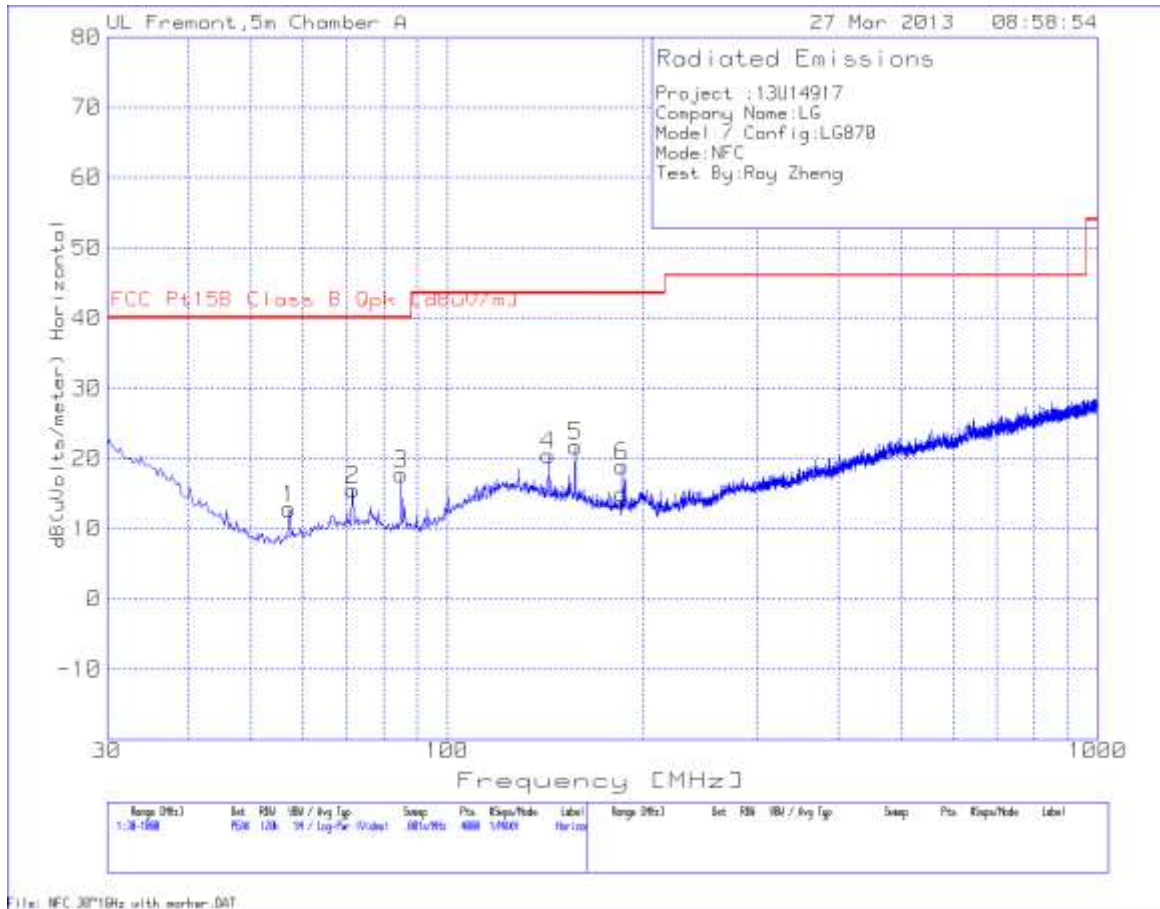
No non-compliance noted:

7.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

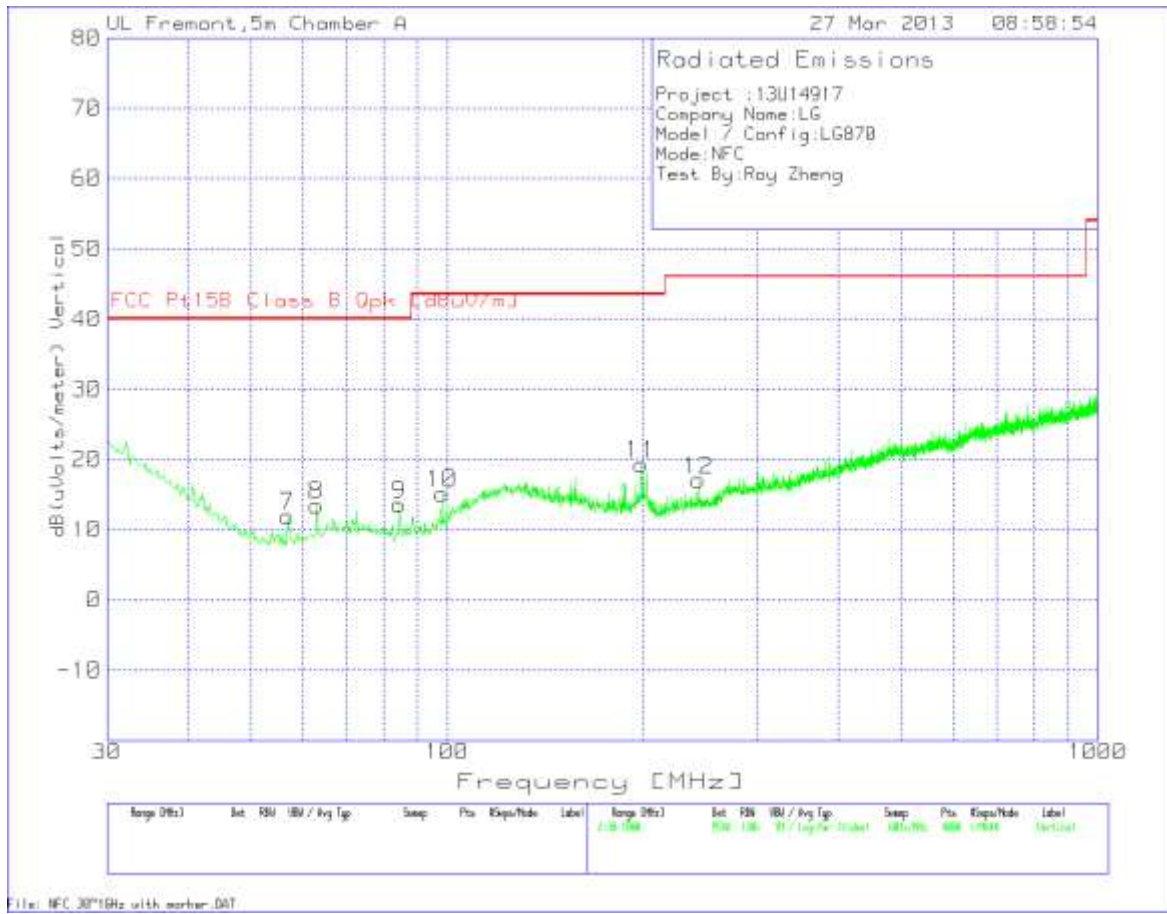
FCC Part 15, Subpart B & C												3 Meter Distance Measurement At Open Field	
Company: LG Electronics													
Project #: 13U14917													
Model #: LG870 / Worst-Case Z-Orientation													
Tester: Doug Anderson													
Date: 03/21/13													
Frequency (Mhz)	PK (dBuV)	QP (dBuV)	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	
Loop Antenna Face On:													
13.56	38.83		N/A	10.56	-40.00	9.39	N/A	84.00	N/A	-74.6	N/A	Fundamental @ 3m Dist	
13.41	23.54		N/A	10.54	-40.00	-5.92	N/A	50.48	N/A	-56.4	N/A	13.41-13.553MHz Spurious @ 3m	
13.553	33.42		N/A	10.56	-40.00	3.98	N/A	50.48	N/A	-46.5	N/A	13.41-13.553MHz Spurious @ 3m	
13.567	34.41		N/A	10.56	-40.00	4.97	N/A	50.48	N/A	-45.5	N/A	13.567-13.73mHz Spurious @ 3m	
13.71	21.93		N/A	10.57	-40.00	-7.50	N/A	40.51	N/A	-48.0	N/A	13.567-13.73mHz Spurious @ 3m	
13.11	14.99		N/A	10.51	-40.00	-14.50	N/A	40.51	N/A	-55.0	N/A	13.110-13.43mHz Spurious @ 3m	
13.41	23.54		N/A	10.54	-40.00	-5.92	N/A	40.51	N/A	-46.4	N/A	13.110-13.43mHz Spurious @ 3m	
13.71	21.93		N/A	10.57	-40.00	-7.50	N/A	40.51	N/A	-48.0	N/A	13.710-14.03mHz Spurious @ 3m	
14.01	18.95		N/A	10.6	-40.00	-10.45	N/A	29.54	N/A	-40.0	N/A	13.710-14.03mHz Spurious @ 3m	
27.12	14.64		N/A	9.046	-40.00	-16.31	N/A	29.54	N/A	-45.9	N/A	Harmonic @ 3m, Noise Floor	
Loop Antenna Face Off:													
13.56	34.82		N/A	10.56	-40.00	5.38	N/A	84.00	N/A	-78.6	N/A	Fundamental @ 3m Dist	
13.41	20.58		N/A	10.54	-40.00	-8.88	N/A	50.48	N/A	-59.4	N/A	13.41-13.553MHz Spurious @ 3m	
13.553	29.79		N/A	10.56	-40.00	0.35	N/A	50.48	N/A	-50.1	N/A	13.41-13.553MHz Spurious @ 3m	
13.567	30.29		N/A	10.56	-40.00	0.85	N/A	50.48	N/A	-49.6	N/A	13.567-13.73mHz Spurious @ 3m	
13.71	19.27		N/A	10.57	-40.00	-10.16	N/A	40.51	N/A	-50.7	N/A	13.567-13.73mHz Spurious @ 3m	
13.11	14.96		N/A	10.51	-40.00	-14.53	N/A	40.51	N/A	-55.0	N/A	13.110-13.43mHz Spurious @ 3m	
13.41	20.58		N/A	10.54	-40.00	-8.88	N/A	40.51	N/A	-49.4	N/A	13.110-13.43mHz Spurious @ 3m	
13.71	19.27		N/A	10.57	-40.00	-10.16	N/A	40.51	N/A	-50.7	N/A	13.710-14.03mHz Spurious @ 3m	
14.01	19.97		N/A	10.6	-40.00	-9.43	N/A	29.54	N/A	-39.0	N/A	13.710-14.03mHz Spurious @ 3m	
27.12	14.69		N/A	9.046	-40.00	-16.26	N/A	29.54	N/A	-45.9	N/A	Harmonic @ 3m, Noise Floor	
* No more emissions were found up to 30MHz													
Note: 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 Read													
A.F. = Antenna factor													
Rev. 10.23.09													

7.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project :	13U14917
Company Name:	LG
Model / Config:	LG870
Mode:	NFC
Test By:	Roy Zheng

Marker No.	Test Frequency	Meter Reading	Detector	T185 Antenna Factor dB/m	T64 preamp/cable loss [dB]	dB(uV/s/meter)	FCC Pt15B Class B Qpk [dBuV/m]	Margin (dB)	Height [cm]	Polarity
Horizontal 30 - 1000MHz										
1	57.1396	33.32	PK	6.9	-27.4	12.82	40	-27.18	300	Horz
2	71.6787	34.67	PK	8.1	-27.2	15.57	40	-24.43	400	Horz
3	85.0062	37.39	PK	7.5	-27.1	17.79	40	-22.21	300	Horz
4	143.1626	34.32	PK	12.8	-26.7	20.42	43.52	-23.1	200	Horz
5	157.4594	36.12	PK	12.2	-26.6	21.72	43.52	-21.8	100	Horz
6	186.053	34.26	PK	10.9	-26.3	18.86	43.52	-24.66	100	Horz
Vertical 30 - 1000MHz										
7	56.8973	32.38	PK	6.9	-27.4	11.88	40	-28.12	200	Vert
8	62.9553	33.37	PK	7.4	-27.3	13.47	40	-26.53	200	Vert
9	84.5216	33.14	PK	7.5	-27.1	13.54	40	-26.46	200	Vert
10	98.0914	32.62	PK	9.6	-27.1	15.12	43.52	-28.4	200	Vert
11	198.8958	33.41	PK	12.1	-26.2	19.31	43.52	-24.21	200	Vert
12	243.2401	31.43	PK	11.6	-26	17.03	46.02	-28.99	300	Vert

8. 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 μ 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 μ 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

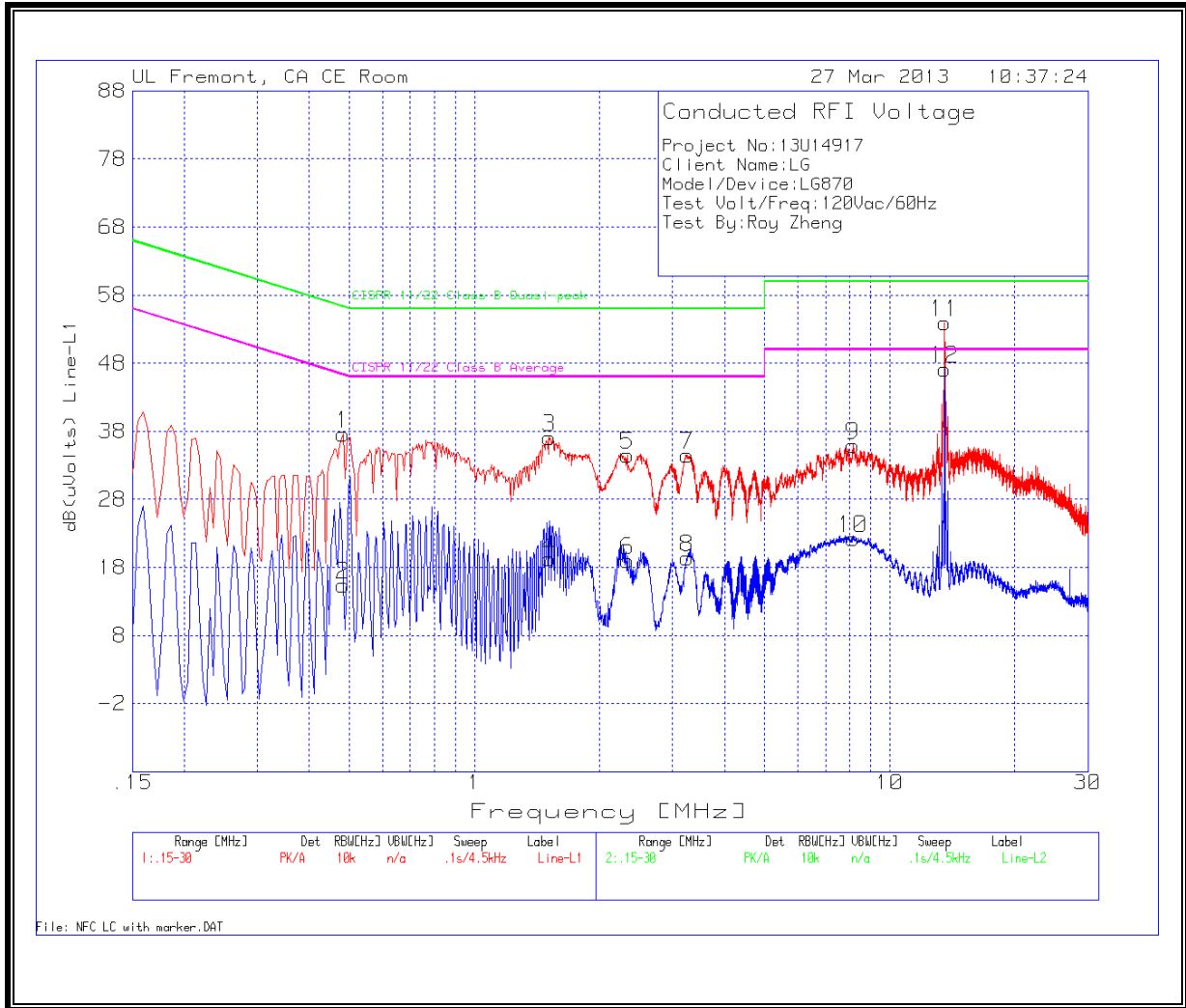
No non-compliance noted:

6 WORST EMISSIONS

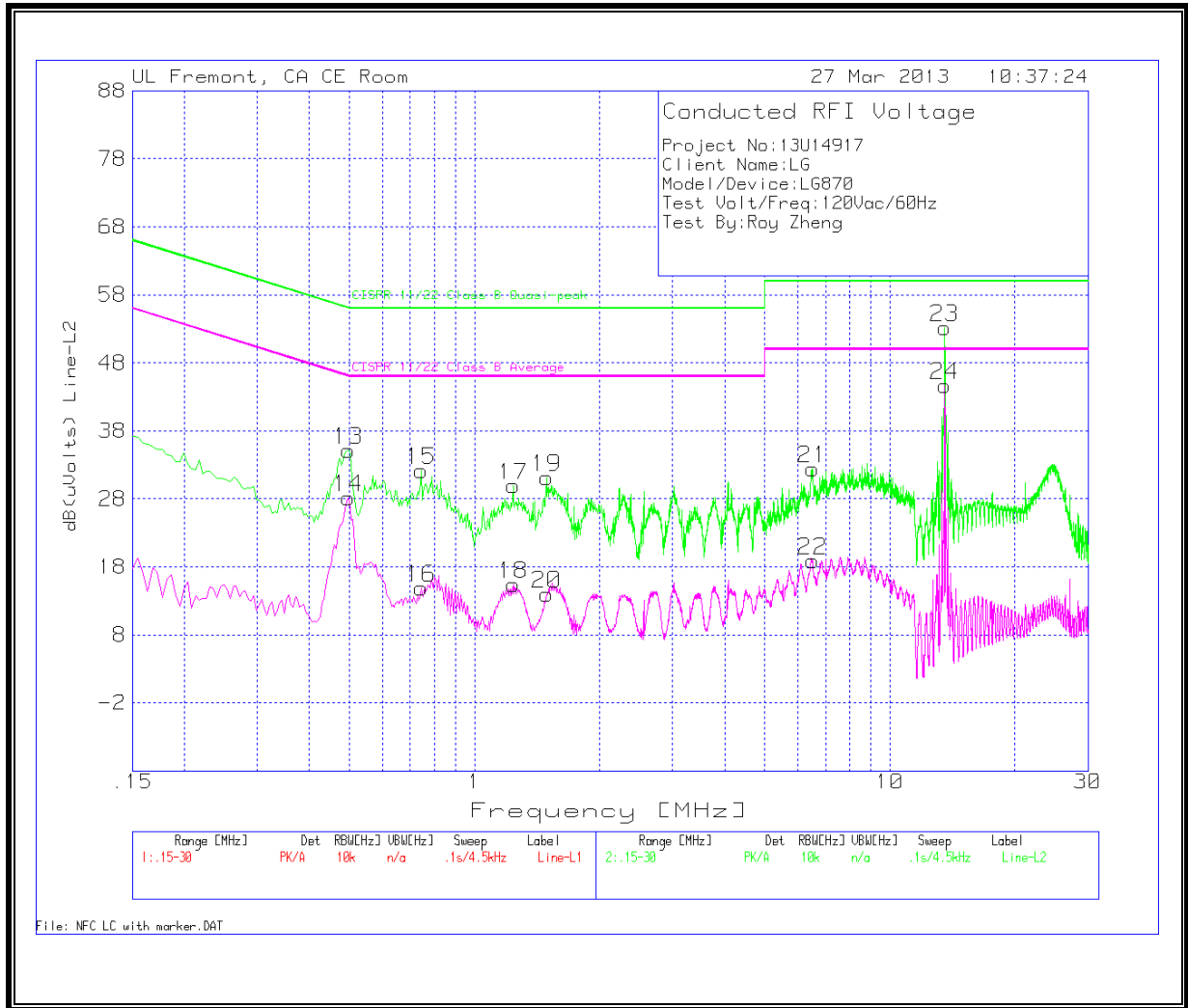
Project No:	13U14917
Client Name:	LG
Model/Device:	LG870
Test Volt/Freq:	120Vac/60Hz
Test By:	Roy Zheng

Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin
Line-L1 .15 - 30MHz									
0.483	37.49	PK	0.1	0	37.59	56.3	-18.71	-	-
0.483	15.36	Av	0.1	0	15.46	-	-	46.3	-30.84
1.5135	36.91	PK	0.1	0.1	37.11	56	-18.89	-	-
1.5135	19.03	Av	0.1	0.1	19.23	-	-	46	-26.77
2.3325	34.26	PK	0.1	0.1	34.46	56	-21.54	-	-
2.3325	18.88	Av	0.1	0.1	19.08	-	-	46	-26.92
3.246	34.26	PK	0.1	0.1	34.46	56	-21.54	-	-
3.246	19.25	Av	0.1	0.1	19.45	-	-	46	-26.55
8.1735	35.68	PK	0.1	0.1	35.88	60	-24.12	-	-
8.1735	22.04	Av	0.1	0.1	22.24	-	-	50	-27.76
13.56	53.61	PK	0.2	0.2	54.01	60	-5.99	-	-
13.56	46.76	Av	0.2	0.2	47.16	-	-	50	-2.84
Line-L2 .15 - 30MHz									
0.4965	35.08	PK	0.1	0	35.18	56.1	-20.92	-	-
0.4965	28.09	Av	0.1	0	28.19	-	-	46.1	-17.91
0.744	32.13	PK	0.1	0	32.23	56	-23.77	-	-
0.744	14.78	Av	0.1	0	14.88	-	-	46	-31.12
1.239	29.72	PK	0.1	0.1	29.92	56	-26.08	-	-
1.239	15.17	Av	0.1	0.1	15.37	-	-	46	-30.63
1.491	30.99	PK	0.1	0.1	31.19	56	-24.81	-	-
1.491	13.83	Av	0.1	0.1	14.03	-	-	46	-31.97
6.5085	32.28	PK	0.1	0.1	32.48	60	-27.52	-	-
6.5085	18.67	Av	0.1	0.1	18.87	-	-	50	-31.13
13.56	52.79	PK	0.2	0.2	53.19	60	-6.81	-	-
13.56	44.29	Av	0.2	0.2	44.69	-	-	50	-5.31

LINE 1 RESULTS



LINE 2 RESULTS



9. 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 13.560318 MHz @ 20°C				
Limit: ± 100 ppm = 135.603 kHz				
Power Supply (Vac)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
115.00	50	13.5601510	0.123	± 100
115.00	40	13.5604840	-0.122	± 100
115.00	30	13.5599840	0.246	± 100
115.00	20	13.5603180	0.000	± 100
115.00	10	13.5603980	-0.059	± 100
115.00	0	13.5604650	-0.108	± 100
115.00	-10	13.5601980	0.088	± 100
115.00	-20	13.5602650	0.039	± 100
97.15	20	13.5599840	0.246	± 100
132.25	20	13.5606150	-0.219	± 100