FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + Bluetooth & DTS/UNII a/b/g/n + NFC

MODEL NUMBER: LG-D631, D631, LGD631

FCC ID: ZNFD631

REPORT NUMBER: 14U17477-6

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Revision History

Rev.	Issue Date	Revisions	Revised By
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	**LG ELECTRONICS MOBILECOMM U.S.A., INC**
EUT DESCRIPTION:	**GSM/WCDMA/LTE Phone + Bluetooth & DTS/UNII a/b/g/n + NFC.**
MODEL:	**LG-D631, D631, LGD631**
SERIAL NUMBER:	**403KPMZ000323**
DATE TESTED:	**APRIL 4-12, 2014**

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	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.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, 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 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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 a GSM/WCDMA/LTE Phone + Bluetooth & DTS/UNII a/b/g/n + NFC.

5.2. MAXIMUM OUTPUT POWER

The testing was performed at 1meter. The transmitter maximum E-field at 30m distance is 10.98 dBuV/m which convert from the 1 meters data.

5.3. 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 was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Y-orientation while generating continuous emissions.

5.4. MODIFICATIONS

No modifications were made during testing.

5.5. 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-01WD	DB3Y0094515	N/A
Earphone	LG	N/A	N/A	N/A

I/O CABLES

Radiated Emissions above 30 MHz, AC Line Conducted Emissions :

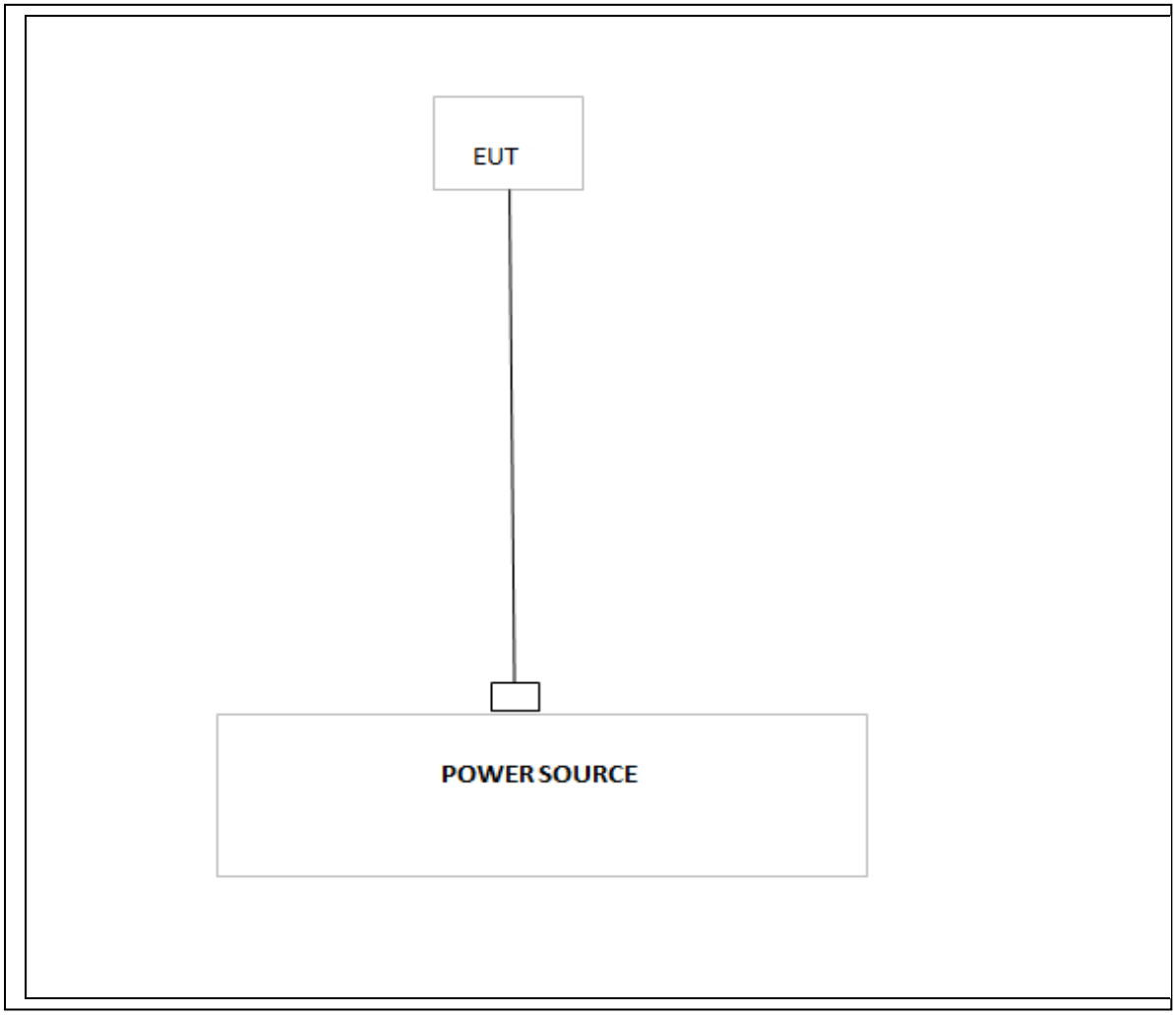
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Micro-USB	Shielded	1 m	None
2	Audio	1	Mini-Jack	Un-Shielded	1 m	None

TEST SETUP

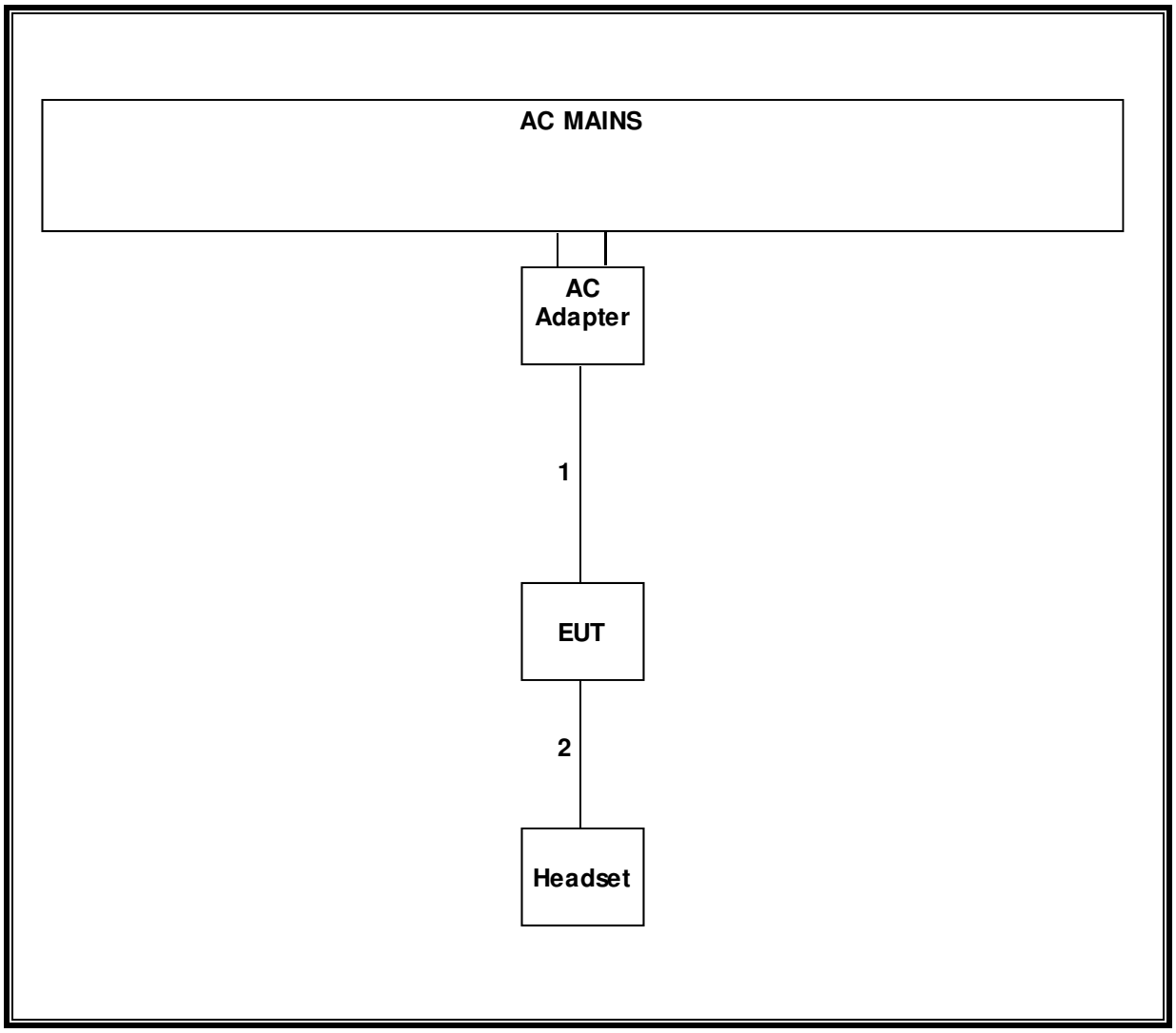
The EUT is a stand-alone device configured and tested in a worst-case setup.

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 Due**
ESA-E Spectrum Analyzer, 9kHz-26.5 GHz	Agilent / HP	E4407B	C01098	04/04/15
Antenna, Loop, 30 MHz	EMCO	6502	C00593	02/20/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	03/23/15
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/21/15
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
DMM	Fluke	77-11	N02303	10/31/14
Digital Thermometer	Tektronix	DTM920	None	10/21/14
Temperature Chamber	CSZ	2PHS-8-3	T267	03/04/15

7. RADIATED EMISSION TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMIT

§15.225
IC RSS-210, Annex 2, Section A2.6 (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 C63.4-2009

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^{th} 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 **1 Meter Distance Measurement At Open Field**

Company: LG
Project #: 14U17477
Model #: LG-D631
Tester: R. Alegre
Date: 4/4/14

Frequency (MHz)	PK (dBu/V)	QP (dBu/V)	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: Y position worst												
13.56	59.51		N/A	10.56	-59.08	10.98	N/A	84.00	N/A	-73.0	N/A	Fundamental @ 1m Dist
13.45	46.42		N/A	10.55	-59.08	-2.12	N/A	50.48	N/A	-52.6	N/A	13.41MHz-13.553MHz
13.66	44.59		N/A	10.57	-59.08	-3.93	N/A	50.48	N/A	-54.4	N/A	13.567MHz-13.71MHz
13.34	42.81		N/A	10.53	-59.08	-5.74	N/A	40.51	N/A	-46.3	N/A	13.110-13.410MHz
13.77	39.62		N/A	10.53	-59.08	-5.74	N/A	40.51	N/A	-46.3	N/A	13.71-14.01MHz
5.00	21.95		N/A	10.2	-59.08	-26.93	N/A	29.54	N/A	-56.5	N/A	9k-13.11MHz
21.12	25.04		N/A	10.08	-59.08	-23.97	N/A	29.54	N/A	-53.5	N/A	14.01MHz-30MHz
Loop Antenna Face off: Y position												
13.56	52.34		N/A	10.56	-59.08	3.81	N/A	84.00	N/A	-80.2	N/A	Fundamental @ 1m Dist
13.45	32.21		N/A	10.55	-59.08	-16.33	N/A	50.48	N/A	-66.8	N/A	13.41MHz-13.553MHz
13.66	30.41		N/A	10.57	-59.08	-18.11	N/A	50.48	N/A	-68.6	N/A	13.567MHz-13.71MHz
13.34	32.45		N/A	10.53	-59.08	-16.10	N/A	40.51	N/A	-56.6	N/A	13.110-13.410MHz
13.77	32.23		N/A	10.58	-59.08	-16.28	N/A	40.51	N/A	-56.8	N/A	13.71-14.01MHz
5.00	19.88		N/A	10.2	-59.08	-29.00	N/A	29.54	N/A	-58.5	N/A	9k-13.11MHz
21.12	21.54		N/A	10.08	-59.08	-27.47	N/A	29.54	N/A	-57.0	N/A	14.01MHz-30MHz

* No more emissions were found up to 30MHz

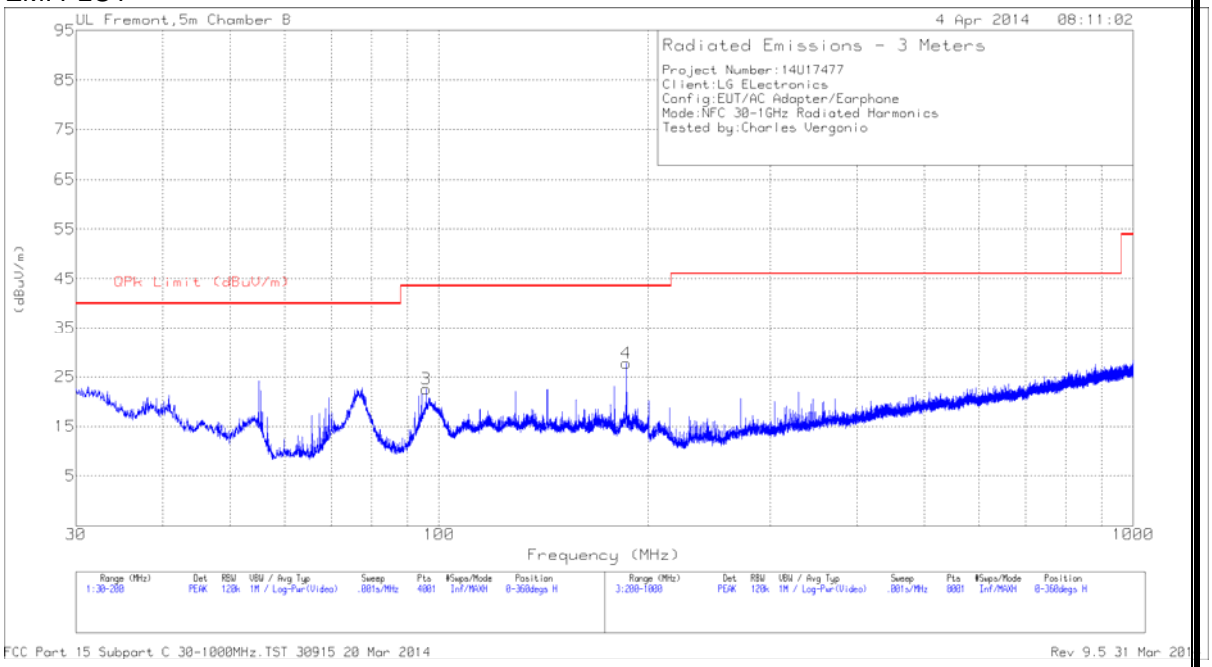
Note: The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.

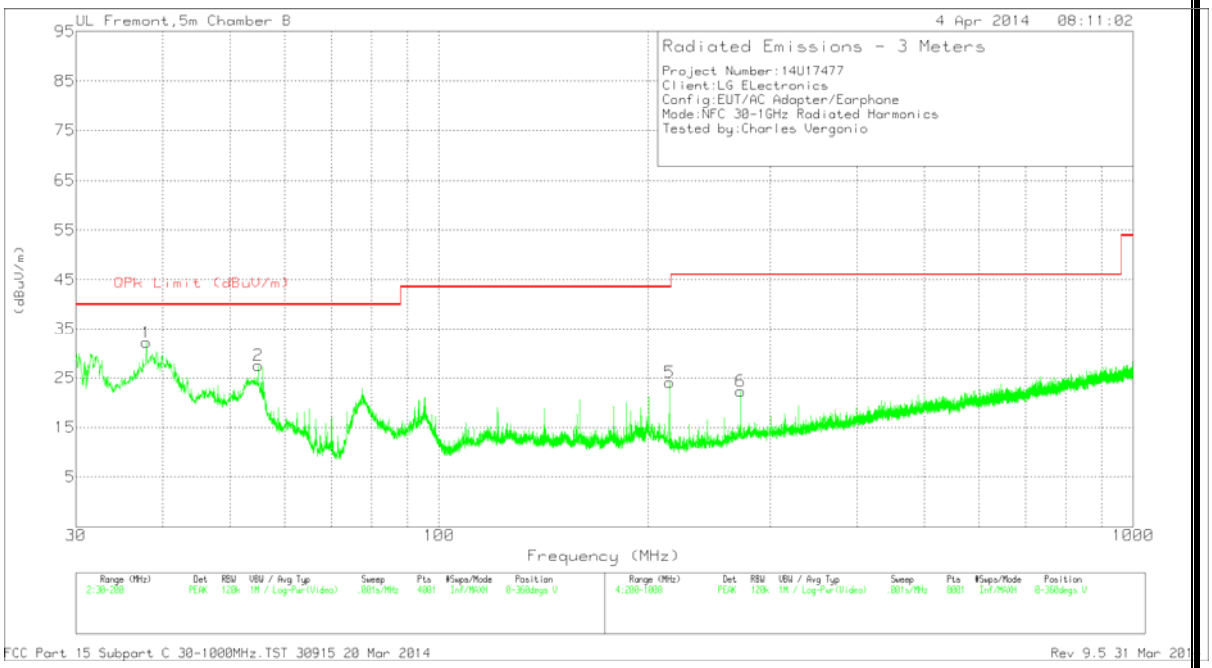
P.K. = Peak
Q.P. = Quasi Peak Reading
A.F. = Antenna factor

Rev. 10.23.09

7.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz

EMI PLOT





Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 37.905	45.76	PK	15.2	-28.8	32.16	40	-7.84	0-360	101	V
6	* 272	35.64	PK	13	-26.3	22.34	46.02	-23.68	0-360	101	V
2	54.905	49.09	PK	7	-28.6	27.49	40	-12.51	0-360	101	V
3	95.875	41.48	PK	9.2	-28.1	22.58	43.52	-20.94	0-360	300	H
4	186.145	43.52	PK	11.3	-27.1	27.72	43.52	-15.8	0-360	101	H
5	214.8	40.45	PK	10.4	-26.8	24.05	43.52	-19.47	0-360	200	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
FCC Part 15 Subpart C 30-1000MHz.TST 30915 20 Mar 2014

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 50µH/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 (dBµV)	
	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 C63.4-2009

RESULTS

No non-compliance noted:

6 WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers

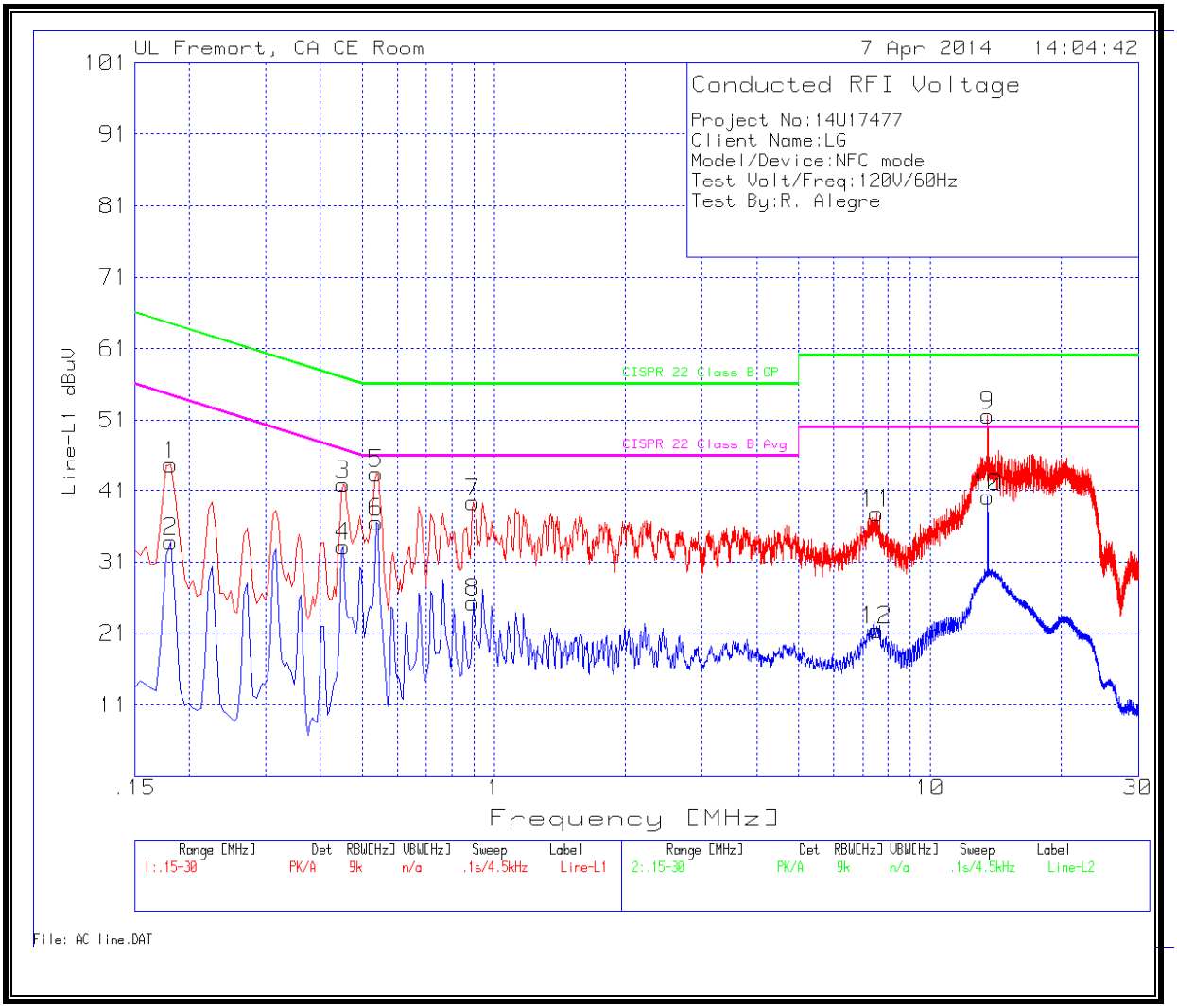
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.1815	43.63	PK	1.1	0	44.73	64.4	-19.67	-	-
2	.1815	32.78	Av	1.1	0	33.88	-	-	54.4	-20.52
3	.4515	41.5	PK	.4	0	41.9	56.8	-14.9	-	-
4	.4515	32.74	Av	.4	0	33.14	-	-	46.8	-13.66
5	.537	43.24	PK	.3	0	43.54	56	-12.46	-	-
6	.537	36.26	Av	.3	0	36.56	-	-	46	-9.44
7	.897	38.92	PK	.3	.1	39.32	56	-16.68	-	-
8	.897	24.98	Av	.3	.1	25.38	-	-	46	-20.62
11	7.5615	37.55	PK	.2	.1	37.85	60	-22.15	-	-
12	7.5615	21.17	Av	.2	.1	21.47	-	-	50	-28.53
9	13.56	51.24	PK	.2	.2	51.64	60	-8.36	-	-
10	13.56	39.69	Av	.2	.2	40.09	-	-	50	-9.91

Line-L2 .15 - 30MHz

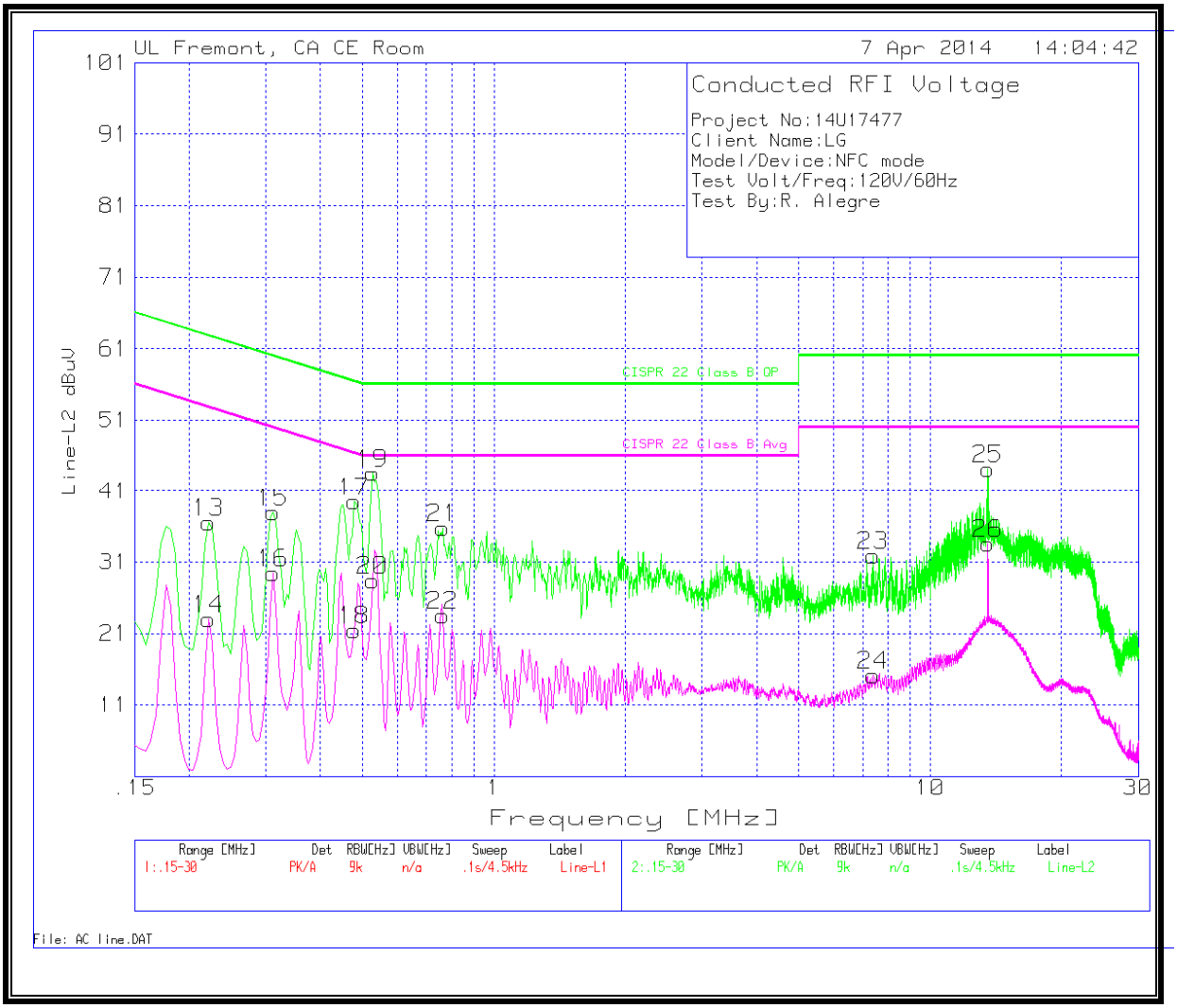
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
13	.222	35.65	PK	.9	0	36.55	62.7	-26.15	-	-
14	.222	22.05	Av	.9	0	22.95	-	-	52.7	-29.75
15	.312	37.32	PK	.6	0	37.92	59.9	-21.98	-	-
16	.312	28.85	Av	.6	0	29.45	-	-	49.9	-20.45
17	.4785	39.05	PK	.4	0	39.45	56.4	-16.95	-	-
18	.4785	21.03	Av	.4	0	21.43	-	-	46.4	-24.97
19	.528	43.26	PK	.3	0	43.56	56	-12.44	-	-
20	.528	28.1	Av	.3	0	28.4	-	-	46	-17.6
21	.762	35.42	PK	.3	0	35.72	56	-20.28	-	-
22	.762	23.23	Av	.3	0	23.53	-	-	46	-22.47
23	7.413	31.56	PK	.2	.1	31.86	60	-28.14	-	-
24	7.413	14.86	Av	.2	.1	15.16	-	-	50	-34.84

LINE 1 RESULTS



LINE 2 RESULTS



9. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±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 C63.4 Section 13

RESULTS

No non-compliance noted.

Reference Frequency: EUT Channel 13.560000 MHz @ 20ºC Limit: ± 100 ppm = 135.604 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5604270	-0.006	± 100
3.80	40	13.5604200	-0.001	± 100
3.80	30	13.5604260	-0.005	± 100
3.80	***20***	***13.5604190***	***0.000***	***± 100***
3.80	10	13.5604240	-0.004	± 100
3.80	0	13.5604310	-0.009	± 100
3.80	-10	13.5604320	-0.010	± 100
3.80	-20	13.5604350	-0.012	± 100
3.5(end volt)	20	13.5604250	-0.004	± 100
4.3	20	13.5604300	-0.008	± 100