RF TEST REPORT

Test item	:	Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth, WLAN and NFC
Model No.	:	LG-E974, E974, LGE974
Order No.	:	DEMC1208-01562
Date of receipt	:	2012-08-22
Test duration	:	2012-08-24 ~ 2012-09-29
Date of issue	:	2012-10-02
Use of report	:	FCC Original Grant

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

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	FCC Part 15.225 Subpart C
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer J.J.LEE	N/A	Deputy General Manager Will Lee

CONTENTS

1. Equipment information

1.1 Equipment description

FCC Equipment Class	Low Power Communications Device Transmitter(DXX)
Equipment type	Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth, WLAN and NFC
Equipment model name	LG-E974
Equipment add model name	E974, LGE974
Equipment serial no.	Identical prototype
Frequency band	13.56MHz
Modulation type	ASK
Channel	1
Power	Li-ion polymer Battery: DC 3.8V AC-DC Adaptor: AC 120V 60Hz
Antenna type	Loop Antenna

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2. Information about test items

2.1 Test mode

Test mode	Continuous transmitting mode

Note: For this test mode, a test program was supported by manufacturer.

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested frequency

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	13.56	13.56
Middle Channel	-	-
Highest Channel	-	-

2.4 Tested environment

Temperature	:	23 ~ 26 °C
Relative humidity content	:	50 ~ 60 % R.H.
Details of power supply	:	Battery: DC 3.8 V AC 120V 60Hz

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Test Items				
2.1049	20 dB Bandwidth	N/A	Radiated	**C**
15.225 (a)	In-Band Emissions	15,848μN/m @ 30m 15.553 – 13.567 MHz		**C**
15.225 (b)	In-Band Emissions	334μN/m @ 30m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		**C**
15.225 (c)	In-Band Emissions	106μN/m @ 30m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		**C**
15.225 (d) 15.205 15.209	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		**C**
15.225 (e)	Frequency Stability Tolerance	±0.01% of operating frequency	Conducted	**C**
15.207	AC Conducted Emissions	EN 55022	AC Line Conducted	**C**
15.203	Antenna requirements	FCC Part 15.203	-	**C**

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

The sample was tested according to the following specification:
ANSI C-63.4-2003

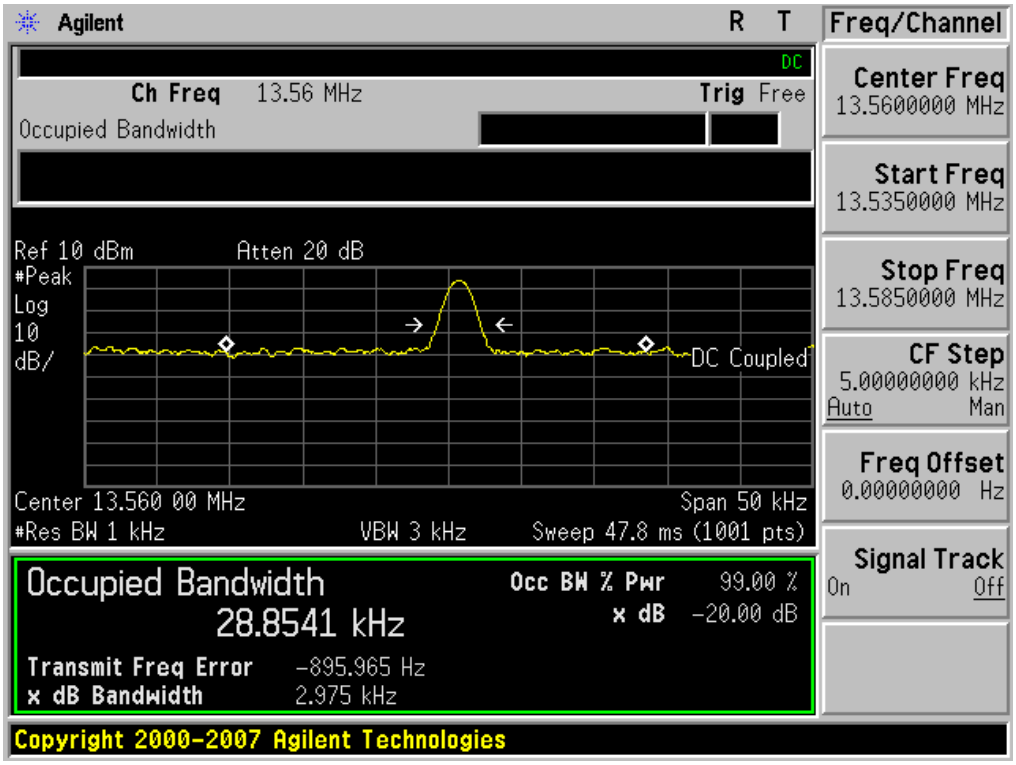
3.2 Transmitter requirements

3.2.1 20dB Bandwidth Measurement

- Procedure:

The 20dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

- Measurement Data: Comply



- **Minimum Standard: Part 2.1049**

None

3.2.2 In-Band Radiated Spurious Emission

- Procedure:

The EUT was placed on a 0.8m high wooden table inside a 10m semi anechoic chamber. An antenna was placed at 3 m distance from the EUT Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions. A loop antenna was used for this test item. And this test item was performed for both vertical and horizontal polarization.

- Measurement Data: Comply

Test Frequency Band [MHz]	Freq. [MHz]	EUT Posi.	Reading Level [dBuV]	T.F	Field Strength @3m [dBuV/m]	Field Strength @30m [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.110 ~ 13.410	13.349	Y	43.00	-13.90	29.10	-10.90	40.51	51.41
13.410 ~ 13.553	13.553	Y	52.50	-14.00	38.50	-1.50	50.47	51.97
13.553 ~ 13.567	13.560	Y	57.70	-14.00	43.70	3.70	84.00	80.30
13.567 ~ 13.710	13.668	Y	46.60	-14.00	32.60	-7.40	50.47	57.87
13.710 ~ 14.010	13.773	Y	43.80	-14.00	29.80	-10.20	40.51	50.71

Note 1. This test item was performed using a loop antenna.

Note 2. This test item was performed at 3m and the data were extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)2.

▪ Extrapolation Factor = 20 $\log_{10}(30/3)^2$ = 40dB

Note 3. All data were recorded using a spectrum analyzer employing a peak detector.
If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

Note 4. Sample Calculation.
Margin = Limit – Field Strength @ 30m / Field Strength @ 30m = Field Strength @ 3m – 40
Field Strength @ 3m = Reading + T.F / T.F = AF + CL – AG
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

- Minimum Standard: Part 15.225(a), (b), (c)

Frequency Band [MHz]	Limit	
	[uV/m]	[dBuV/m]
13.553-13.567	15,848	84.00
13.410-13.553 13.567-13.710	334	50.47
13.110-13.410 13.710-14.010	106	40.51

3.2.3 Radiated Spurious Emission Measurements, Out-of-Band

- Procedure:

The EUT was tested from 9kHz up to the 1GHz excluding the band 13.110-14.010MHz. All measurements were recorded with spectrum analyzer employing a peak detector for emissions below 30MHz. Above 30MHz a Quasi-peak detector was used. All out-of-band emissions must not exceed the limits §15.209. A loop antenna was used for searching for emissions below 30MHz.

- Measurement Data: Comply (refer to the next page)

- Minimum Standard: Part 15. 205, 209, 225(d)

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3.6 ~ 4.4	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		

▪ **FCC Part 15.205(b):**

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▪ **FCC Part 15.209(a):**

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	200	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.209(b):**

In the emission table above, the tighter limit applies at the band edges.

- Measurement Data:

Tested Frequency : **13.56MHz**

Measurement Distance : **3 Meters**

Frequency [MHz]	EUT Posi.	ANT Pol	Reading [dBuV]	T.F [dB/m]	Distance factor	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
28.760	Z	H	44.10	-15.70	40	-11.60	29.50	41.10
31.192	X	V	37.60	-4.50	N/A	33.10	40.0	6.90
67.796	X	H	36.20	-14.50	N/A	21.70	40.0	18.30
383.173	X	H	29.40	-5.70	N/A	23.70	46.0	22.30
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

Note 1. All measurements were recorded using a spectrum analyzer employing a peak detector for blew 30MHz and a Quasi-peak detector for above 30MHz.

Note 2. Both Vertical and Horizontal polarities of the receiver antenna were evaluated with the worst case emissions being reported.

Note 3. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 4. Sample calculation

Margin = Limit – Field Strength

Field Strength = Reading + T.F – Distance factor

T.F = AF + CL – AG

Distance factor = 20log(Measurement distance / The measured distance)^2

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

3.2.4 Frequency Stability

- Procedure:

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

- Measurement Data: Comply

Operating Frequency : **13,560,719 Hz**

VOLTAGE (%)	POWER (VDC)	TEMP (℃)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.800	+23(ref)	13,560,719	0	0.000000
100%		-20	13,560,624	-95	-0.000701
100%		-10	13,560,642	-77	-0.000568
100%		0	13,560,669	-50	-0.000369
100%		+10	13,560,680	-39	-0.000288
100%		+20	13,560,737	18	0.000133
100%		+30	13,560,745	26	0.000192
100%		+40	13,560,669	-50	-0.000369
100%		+50	13,560,662	-57	-0.000420
85%	3.230	+23	13,560,745	26	0.000192
115%	4.370	+23	13,560,698	-21	-0.000155
BATT.ENDPOINT	3.200	+23	13,560,734	15	0.000111

- Minimum Standard: Part 15. 225(e)

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency.

3.2.5 AC Line Conducted Emissions

- Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.21(m). Emissions closest to the limit are measured in the quasi-peak and average detector mode with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

- Measurement Data: Comply (refer to the next page)

- Minimum Standard: FCC Part 15.207(a)

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

- Measurement Data:

Digital EMC

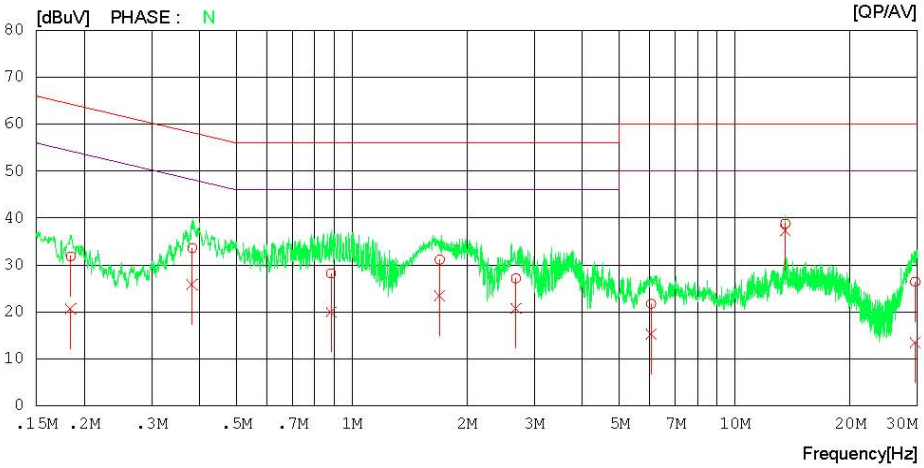
Results of Conducted Emission

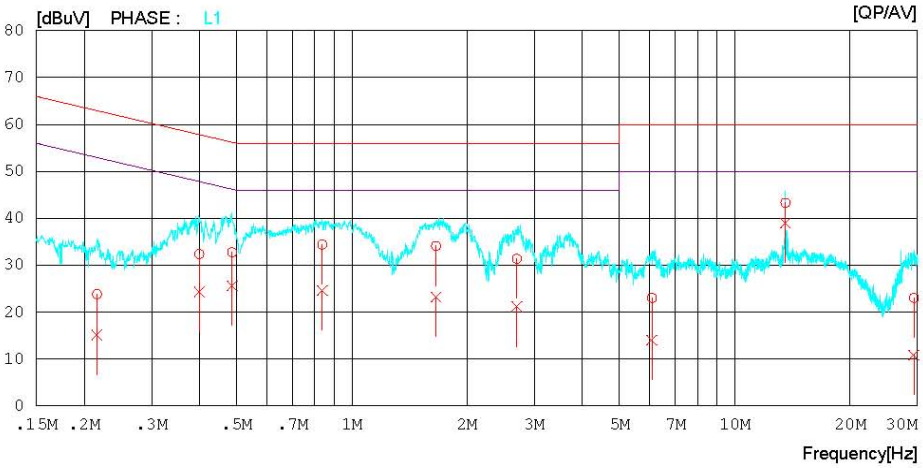
Digital EMC
Date : 2012-09-06

Model No.	:	LG-E974	Referrence No.	:	
Type	:		Power Supply	:	120 V 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	24 'C 50 % R.H.
Test Condition	:	NFC	Operator	:	J.J.LEE

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV





Results of Conducted Emission

Digital EMC
Date : 2012-09-06

Model No.	:	LG-E974	Referrence No.	:	
Type	:		Power Supply	:	120 V 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	24 'C 50 % R.H.
Test Condition	:	NFC	Operator	:	J.J.LEE

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.18446	31.6	20.4	0.2	31.8	20.6	64.3	54.3	32.5	33.7	N
2	0.38301	33.3	25.5	0.3	33.6	25.8	58.2	48.2	24.6	22.4	N
3	0.88349	27.9	19.7	0.3	28.2	20.0	56.0	46.0	27.8	26.0	N
4	1.69650	30.8	23.1	0.3	31.1	23.4	56.0	46.0	24.9	22.6	N
5	2.68300	26.8	20.4	0.3	27.1	20.7	56.0	46.0	28.9	25.3	N
6	6.04800	21.2	14.8	0.5	21.7	15.3	60.0	50.0	38.3	34.7	N
7	13.56000	37.9	36.5	0.9	38.8	37.4	60.0	50.0	21.2	12.6	N
8	29.60150	25.1	12.1	1.3	26.4	13.4	60.0	50.0	33.6	36.6	N
9	0.21600	23.6	14.9	0.2	23.8	15.1	63.0	53.0	39.2	37.9	L1
10	0.39999	32.1	24.0	0.3	32.4	24.3	57.9	47.9	25.5	23.6	L1
11	0.48693	32.6	25.4	0.2	32.8	25.6	56.2	46.2	23.4	20.6	L1
12	0.83750	34.1	24.3	0.3	34.4	24.6	56.0	46.0	21.6	21.4	L1
13	1.65950	33.8	22.9	0.3	34.1	23.2	56.0	46.0	21.9	22.8	L1
14	2.69650	31.1	20.9	0.3	31.4	21.2	56.0	46.0	24.6	24.8	L1
15	6.08300	22.6	13.6	0.5	23.1	14.1	60.0	50.0	36.9	35.9	L1
16	13.56100	42.4	38.1	0.9	43.3	39.0	60.0	50.0	16.7	11.0	L1
17	29.37400	21.7	9.6	1.3	23.0	10.9	60.0	50.0	37.0	39.1	L1

APPENDIX

TEST EQUIPMENT FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	11/09/30	12/09/30	30604493/021031
Digital Multimeter	H.P	34401A	12/03/05	13/03/05	3146A13475, US36122178
Vector Signal Generator	Rohde Schwarz	SMJ100A	12/01/09	13/01/09	100148
Thermo hygrometer	BODYCOM	BJ5478	12/01/13	13/01/13	090205-2
DC Power Supply	HP	6622A	12/03/05	13/03/05	3448A03760
LOOP Antenna	ETS	6502	10/10/29	12/10/29	3471
EMI TEST RECEIVER	R&S	ESU	12/01/09	13/01/09	100014
BILOG ANTENNA	SCHAFFNER	CBL 6112D	10/12/21	12/12/21	22609
Amplifier (22dB)	H.P	8447E	12/01/09	13/01/09	2945A02865
CVCF	NF Electronic	4420	12/03/06	13/03/06	304935/337980
RFI/FIELD Intensity Meter	Kyoritsu	KNM-2402	12/07/02	13/07/02	4N-170-3
EMI Test Receiver	R&S	ECSI	12/03/05	13/03/05	100364
ARTIFICIAL MAINS NETWORK	R&S	ESH2-Z5	11/09/30	12/09/30	828739/006