PCTEST Engineering Laboratory, Inc.

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CERTIFICATE OF COMPLIANCE

LG Electronics Inc. – Cooking Appliance
391-2, Ga Eum Jeong-Dong, Changwon,
Gyeong Nam, 641-711, KOREA
Attention: Mr. Bo-Hoon Kim, Engineer

Dates of Tests: April 25-26, 2000
Test Report S/N: 18.200410157.BEJ
Test Site: PCTEST Lab., MD U.S.A.

FCC ID	**BEJV170XG**
APPLICANT	**LG ELECTRONICS INC.**

Rule Part(s):	**FCC Part 18**
Equipment Class:	**8CC (Part 18 Consumer Device)**
EUT Type:	**Microwave Oven**
RF Frequency:	**2.450 GHz**
RF Power Output:	**1000 Watts**
Power Consumption:	**1500 Watts**
Magnetron(s):	**LG 2M248J, LG 2M246**
Trade Name/Model(s):	***GoldStar© MV-174DC, MV-174TC, MV-174SC, MV-1715W, MV-1715B***
Original Grant Date:	***April 11, 2000***
Class II Change:	***Alternate Magnetron (LG 2M246)***

This equipment, with the Class II Permissive Change(s) described, has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified MP-5.

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.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President & Chief Engineer

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NVLAP®
Lab Code 100431-0

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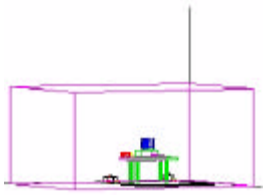
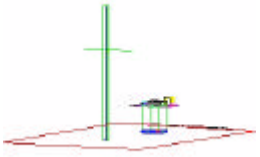
FCC Part 18 MEASUREMENT REPORT





1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Manufacturer:	**LG ELECTRONICS INC. – Changwon Plant**
Address:	**391-2, Ga Eum Jeong-Dong, Changwon-City, Gyeong Nam, 641-110, KOREA**
Contact Person:	**Mr. Bo Hoon Kim – Senior Engineer Cooking Appliance OBU**
Importer:	**LG ELECTRONICS INC. (Chicago Office)**
Address:	**6133 N. River Road, Suite 1100 Rosemont, IL 60018**
Attention:	**Mr. Peter Byun – General Manager**

- FCC ID: **BEJV170XG**
- Equipment Type: Microwave Oven
- RF Frequency: 2.450 GHz
- RF Power Output: 1000 Watts
- Power Consumption: 1350 Watts
- Trade Name: **GoldStar®**
- Model(s): **MV-174DC, MV-174TC, MV-174SC, MV-1715W, MV-1715B**
- Power Cord: Unshielded
- Rule Part(s): FCC Part 18 – ISM Consumer Device
- Test Procedure(s): MP-5
- Dates of Tests: April 25-26, 2000
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Original Grant Date: April 11, 2000
- **Class II Change: Alternate Magnetron (LG2M246)**

NVLAP Lab Code 100431-0

2.1 INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc.** ***(GoldStar Models: MV-174DC, MV-174TC, MV-174SC, MV-1715W, MV-1715B)*** **Microwave Oven FCC ID: BEJV170XG, with the Class II Permissive Change(s) described herein.**

These measurement tests were conducted at ***PCTEST Engineering Laboratory, Inc.*** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

2.2 PCTEST Location

The map at right shows the location of the PCTEST Lab, its proximity to the FCC Lab, the Columbia vicinity area, the Baltimore-Washington International (BWI) airport, and the city of Baltimore, and the Washington, D.C. area. (see Figure 1).

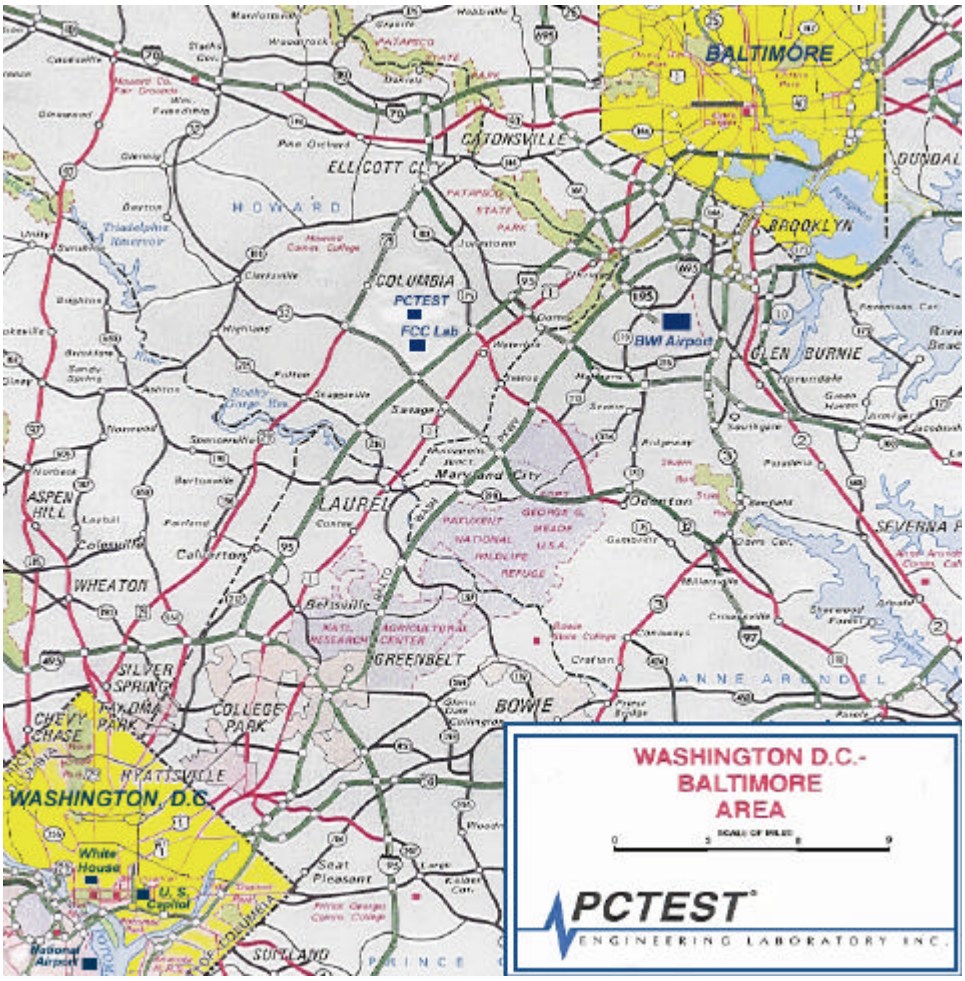


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

3.1 Product Information

3.2 Equipment Description

The Equipment Under Test (EUT) is the **LG Electronics Inc.** ***(GoldStar Model: MV-174DC , MV-174TC, MV-174SC, MV-1715W, MV-1715B)*** **Microwave Oven FCC ID: BEJV170XG with the Class II Permissive Change(s) described (use of alternate magnetron).**

Magnetron (New):	**LG 2M246**
RF Frequency:	2.450 GHz
RF Power Output:	1000 Watts
Power Consumption:	1500 Watts
Power Supply:	120V AC

4.1 TEST DATA

A. Input Power

The input power was measured using a RMS wattmeter. A 275ml. water load in a polypropylene beaker is placed in the center of the oven. The 275ml. of water was chosen for its compatibility with UL procedure to determine input ratings. The oven was operated at full output power for 6 minutes. The reading was taken after 6 minutes at full power.

Voltage (VAC)	Current (Amps)	Power Consumption (Watts)	Manufacturers Rating (Amps)
109.8	13.98	1496	13.0

B. Power Output

The calorimetric method was used in determining the maximum output power. The test method described in MP-5 and IEC Publication 705/1988. A 1000ml. of water in a beaker was placed in the center of the oven. The oven was operated at full power.

$$P(W) = \frac{4.187 \times Q \times DT}{t}$$

[DT = Temperature Rise in °C]
[Q = Quantity of Water in ml.]
[t = Operation Time in sec.]

Quantity of Water Q = 1000ml. = 1 liter

Starting Temp. = 20°C

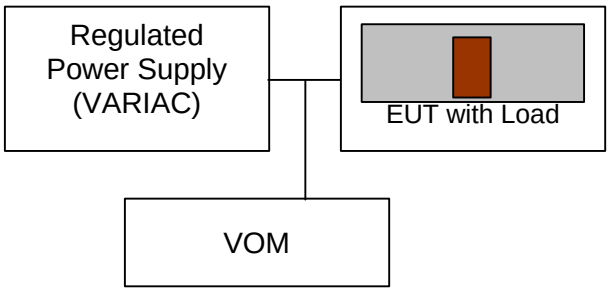
Time = 120 sec.

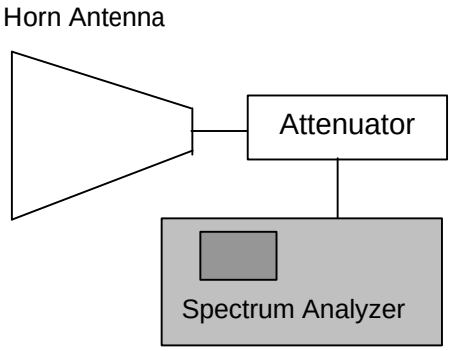
Final Temp. = 49.2 °C

$$\text{Power (W)} = \frac{4.187 \times 1000 \times 29.2}{120}$$

Power (W) = 1018.0 Watts

C. Frequency Measurements





(1) Frequency vs. Load variation test

Initial Load 1000ml Final Load 200ml
Fundamental Freq. 2.450GHz
Limit 2.4GHz<2.5GHz

Minimum Frequency Observed: 2.415 GHz

Maximum Frequency Observed: 2.462 GHz

CONCLUSION: PASS

(2) Frequency vs. Line Voltage variation test

Variation of line voltage from 80% (96 Volts) to 125% (150 Volts)
Load 1000ml
Fundamental Freq. 2.450GHz
Limit 2.4GHz<2.5GHz

Minimum Frequency Observed: 2.410 GHz

Maximum Frequency Observed: 2.474 GHz

CONCLUSION: PASS

D. Power Density Safety Check

The power density was checked to ensure that the power is not greater than 1.0mW/cm^2 at any location of the oven. The 1.0mW/cm^2 is in accordance with CDRH and UL 923 specifications.

A microwave survey meter was placed on all sides, bottom, and top of the oven.
No power greater than 0.10mW/cm^2 was observed and did not exceed the specified limits.

CONCLUSION: PASS

4.1 TEST DATA (Continued)

E. Radiated Emissions

Preliminary measurements were made inside an anechoic chamber at 1 meter to determine the emission characteristics of the EUT. The EUT is configured and operated in a manner which produces the maximum emission in a typical configuration. Final measurements were made outdoors at our 3-meter test site.

FREQ. (GHz)	AFCL (dB)	Load (ml)	Load Location	Meter Reading (dBμV)	F/S @ 3m. (dBμV)	F/S @ 3m. (μV/m)	FCC Limit* @ 300m (μV/m)	F/S @ 300m (μV/m)
2.648	39.7	700	Center	27.7	67.4	2344.2	43.3	23.4
3.318	42.6	700	Center	25.3	67.6	2398.8	43.3	23.9
3.700	44.4	700	Center	21.9	66.3	2065.3	43.3	20.6
4.915	47.8	700	Perimeter	12.7	60.5	1059.2	43.3	10.5
5.613	49.8	300	Center	17.4	67.2	2290.8	43.3	22.9
6.175	50.8	300	Perimeter	11.8	62.6	1348.9	43.3	13.4
7.413	53.8	700	Center	15.1	68.9	2786.1	43.3	27.8
8.605	56.0	700	Perimeter	9.8	65.8	1949.8	43.3	19.4
8.920	56.8	300	Center	7.4	64.2	1621.8	43.3	16.2
9.180	57.2	300	Perimeter	6.7	63.9	1566.7	43.3	15.6
9.820	58.4	700	Center	10.2	68.6	2691.5	43.3	26.9

Table 1. Radiated Measurements at 3-meters.

NOTES:

1. ***Measurements using Average detector (RBW=1MHz, VBW=10Hz)***
2. ***AFCL= Antenna Factor and Cable Loss***
3. ***F/S = Field Strength***
4. ***Limit per 18.305 = $25^{0}\overline{Power/500}$***

5.1 Accuracy of Measurement

5.2 Measurement Uncertainty Calculations:

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994).

Contribution (Line Conducted)	Probability Distribution	Uncertainty (± dB) 9kHz-150MHz	150-30MHz
Receiver specification	Rectangular	1.5	1.5
LISN coupling specification	Rectangular	1.5	1.5
Cable and input attenuator calibration	Normal (k=2)	0.3	0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8 (9kHz) 0.2 (30MHz) Uncertainty limits 20Log(1 ± Γ_1 Γ_R)	U-Shaped	0.2	0.35
System repeatability	Std. deviation	0.2	0.05
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	1.26	1.30
Expanded uncertainty	Normal (k=2)	2.5	2.6

Calculations for 150kHz to 30MHz:

$$u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)} = \pm\sqrt{\frac{1.5^2 + 1.5^2}{3} + (\frac{0.5}{2})^2 + 0.35} = \pm 1.298\text{dB}$$

$U = 2U_c(y) = \pm 2.6\text{dB}$

Contribution (Radiated Emissions)	Probability Distribution	Uncertainties (± dB) 3 m	10 m
Ambient Signals		-	-
Antenna factor calibration	Normal (k=2)	± 1.0	± 1.0
Cable loss calibration	Normal (k=2)	± 0.5	± 0.5
Receiver specification	Rectangular	± 1.5	±1.5
Antenna directivity	Rectangular	+ 0.5 / - 0	+ 0.5
Antenna factor variation with height	Rectangular	± 2.0	± 0.5
Antenna phase centre variation	Rectangular	0.0	± 0.2
Antenna factor frequency interpolation	Rectangular	±. 0.25	± 0.25
Measurement distance variation	Rectangular	± 0.6	± 0.4
Site imperfections	Rectangular	± 2.0	± 2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67 (Bi) 0.3 (Lp) Uncertainty limits 20Log(1 ± Γ_1 Γ_R)	U-Shaped	+ 1.1 - 1.25	± 0.5
System repeatability	Std. Deviation	± 0.5	± 0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+ 2.19 / - 2.21	+ 1.74 / - 1.72
Expanded uncertainty U	Normal (k=2)	+ 4.38 / - 4.42	+ 3.48 / - 3.44

Calculations for 3m biconical antenna. Coverage factor of k=2 will ensure that the level of confidence will be approximately 95%, therefore:

$U = 2u_c(y) = 2 \times \pm 2.19 = \pm 4.38\text{dB}$

6.1 Test Equipment

Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/09/00	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/09/00	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	06/03/00	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/00	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	08/09/00	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/00	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/01	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/01	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/00	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/00	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/01	0194-04082
RG58 Coax Test Cable	No. 167		n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)		2820A00300
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design 1295, 1332, 0355		
Log-Spiral Antenna (3)	Ailtech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		
Ailtech Dipoles	DM-105A (1 set)		33448-111
EMCO LISN	3816/2		1079
EMCO LISN	3816/2		1077
EMCO LISN	3725/2		2009
Microwave Preamplifier 40dB Gain	HP 83017A (0.5-26.5GHz)		3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Ailtech/Eaton Receiver	NM37/57A-SL		0792-03271
Spectrum Analyzer	HP 8594A		3051A00187
Spectrum Analyzer (2)	HP 8591A		3034A01395, 3108A02053
Modulation Analyzer	HP 8901A		2432A03467
NTSC Pattern Generator	Leader 408		0377433
Noise Figure Meter	HP 8970B		3106A02189
Noise Figure Meter	Ailtech 7510		TE31700
Noise Generator	Ailtech 7010		1473
Microwave Survey Meter	Holaday Model 1501 (2.450GHz)		80931
Digital Thermometer	Extech Instruments 421305		426966
Attenuator	HP 8495A (0-70dB) DC-4GHz		
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)		
Shielded Screen Room	RF Lindgren Model 26-2/2-0		6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81		R2437 (PCT278)
Environmental Chamber	Associated Systems Model 1025 (Temperature/Humidity)		PCT285

* Calibration traceable to the National Institute of Standards and Technology (NIST).

7.1 Conclusion

The data collected shows that the **LG Electronics Inc.** ***(GoldStar Model: MV-174DC , MV-174TC, MV-174SC, MV-1715W, MV-1715B)*** **Microwave Oven FCC ID: BEJV170XG, with the Class II Permissive Change(s) described (use of alternate magnetron),** continues to comply with Part 18 of the FCC Rules.