

REPORT of MEASUREMENT
of ELECTROMAGNETIC INTERFERENCE TESTING

Issued: November 08, 1998

1. Name of Applicant: LG Electronics Inc.
2. Address of Applicant: 6133 North River Road Suite, 1100 (Riverway Plaza) Rosemont, IL 60018
3. Equipment Under Test: LG Electronics Inc., Microwave Oven Model MS-104XP
with Magnetron Type **2M246** by LG Electronics Inc..
4. Power Supply: 120 V ac, 60 Hz
5. Test Requirements: CFR Title 47, Part 18
6. Test Procedure: OST MP-5
7. Instrument Used: Hioki Digital Power High Test Model 3181-01
Holaday Industries Inc. Microwave Survey Meter Model 1700
Electro Metrics Field Intensity Meter Model EMC-30 MKIV
Electro Metrics Field Intensity Meter Model EMC-60 MKIV
Electro Metrics Metering Module CRM-30
Hewlett Packard Frequency Counter 5350A
Hewlett Packard Sweep Oscillator 8350B
8. Test Condition: The Equipment Under Test (EUT) was tested while operating at maximum
RF output power. Loads of water in a glass beaker was used in amount specified by
Test Procedure.

9. Results of Testing:

A. Input Power

Input Power was measured using a Wattmeter.

A 275 ml water load was placed in the center of the oven and the oven was operated at full output power for 6 minutes after which the reading was taken.

A 275 ml water load was chosen for its compatibility with the UL procedure used by manufacturers to determine our input ratings.

<u>Voltage</u>	<u>Current</u>	<u>Input Power</u>	<u>Manufacturer's Rating</u>
120 V ac, 60 Hz	14.25 A	1574 W	13.3 A

B. RF Power Output

The Calorimetric Method was used to determine maximum output power.

A 1000 ml water load was placed in the center of the oven.

A mercury thermometer was used to measure temperature rise.

<u>Quantity of Water</u>	<u>Starting Temperature</u>	<u>Final Temperature</u>	<u>Elapsed Time</u>
1000 ml	18.2 °C	40.5 °C	120 Sec

$$\text{Power (W)} = \frac{(4.2 \text{ Joules/Cal}) \times (\text{Volume in ml}) \times (\text{Temperature Rise})}{\text{Time in Seconds}}$$

$$\text{Power (W)} = \frac{4.2 \times 1000 \times 22.3}{120}$$

$$\text{Power (W)} = 780.5 \text{ Watts}$$

C. Frequency Measurements

The fundamental operating frequency was measured with a substitution method using the Electro Metrics receiver, Hewlett Packard Sweep Oscillator and Frequency Counter.

The receiver was turned to the maximum amplitude at the oven operating frequency.

The Sweep Oscillator was substituted for operating the antenna and turned to the same frequency as the receiver. The frequency of the generator was determined using the frequency counter.

The frequency was observed over a period of time, and with line voltage variation.

The maximum frequency permitted in Part 18 is maximum 2.500 GHz and the minimum 2.400 GHz.

No out-of-band frequency measurement was observed.

Variation of Frequency With Time (1000 ml reduced to 200 ml)

Maximum Frequency Observed: 2.461 GHz

Minimum Frequency Observed: 2.440 GHz

Variation of Frequency With Line Voltage (96 Volts to 150 Volts AC)

Maximum Frequency Observed: 2.459 GHz

Minimum Frequency Observed: 2.443 GHz

D. Microwave Leakage

Radiation leakage was measured in the as-received condition with the oven door closed using a microwave leakage meter.

No power greater than 0.12 mW/ was observed at any location on the enclosure of the oven.

A maximum of 1.0 mW/ is allowed in accordance with UL 923 standard.

Hence, microwave leakage in the as-received condition with the oven door closed, did not exceed the specified limit.

E. Radiated Emissions

Radiated emission was measured over a frequency range of 100 MHz to 10 GHz. For measurements the EUT was get set up in an Shielded Anechoic Chamber. The EUT was supported by a wood table, 1 m high in both cases, measurement above 1 GHz and below 1 GHz.

The results of measurements above 1 GHz are shown on Data Page 1. Maximum readings were recorded after variations in antenna polarization, antenna height, EUT orientation, load location, and load volume. Readings were taken with the antenna 3 meters away from the EUT. Field intensity was then extrapolated to a 300 meters distance by multiplying by a factor of 0.01 as described in Section 2.2.6 of MP-5.

No over-limit radiated emissions were discovered.

The results of measurements below 1 GHz are found on Data Page 2 and 3. They represent horizontal and vertical antenna polarization at 3 meters respectively.

10. Test Engineer:



Mr. S. G. Park

Reviewed By:



Mr. S. Y. Kim

LABORATORY MEASUREMENTS ABOVE 1 GHz

Data Page 1

Date Tested: Dec. 02, 1998

Equipment Under Test (EUT): Microwave Oven Model MS-104XP

Mode of Operating (DUT): Maximum RF Power

Test Requirements: CFR Title 47, Part 18

Test Equipment: Electro-Metrics FIM. EMC-60MKIV

Antenna: Double Ridged Guide Antenna RGA-180

Detector Mode: Average

Bandwidth: 1 MHz

Measurement Distance: 3 meters

FREQ. (GHz)	Antenna Factor (dB)	Cable Factor (dB)	Load (ml)	Load Locating	Meter Reading (dBμV)	Field Intensity @ 3 m dBμV/m	Field Intensity @ 3 m (μV/m)	Field Intensity @ 300 m (μV/m)	FCC Limit @ 300 m (μV/m)
2.39	29.4	0.6	700	Center	21.8	51.5	375.8	3.76	31.2
2.51	29.6	0.6	700	Center	16.1	46.0	199.5	2.00	31.2
4.90	34.4	0.9	700	Center	25.6	60.1	1011.6	10.12	31.2
4.90	34.4	0.9	700	RF	29.3	63.8	1548.8	15.49	31.2
4.90	34.4	0.9	300	Center	26.7	61.2	1148.1	11.48	31.2
4.90	34.4	0.9	300	RF	30.3	64.8	1737.8	17.38	31.2
7.35	36.8	1.2	700	Center	4.10	41.0	112.2	1.12	31.2
7.35	36.8	1.2	700	RF	8.30	45.2	181.9	1.82	31.2
7.35	36.8	1.2	300	Center	6.90	43.8	154.8	1.55	31.2
7.35	36.8	1.2	300	RF	8.60	45.5	188.4	1.88	31.2
9.80	38.0	1.5	700	Center	3.70	43.0	141.2	1.41	31.2

Note: RF = Right Front Corner

5/7 Model MS-104XE with LG. Magnetron

FCC ID : BEJS100XE

LABORATORY MEASUREMENTS BELOW 1 GHz
Data Page 2

Date Tested: Dec. 02, 1998

Manufacturer: LG Electronics Inc.

Product Type: Household Microwave Oven

Model No.: MS-104XP

Mode of Operating: Maximum RF Power

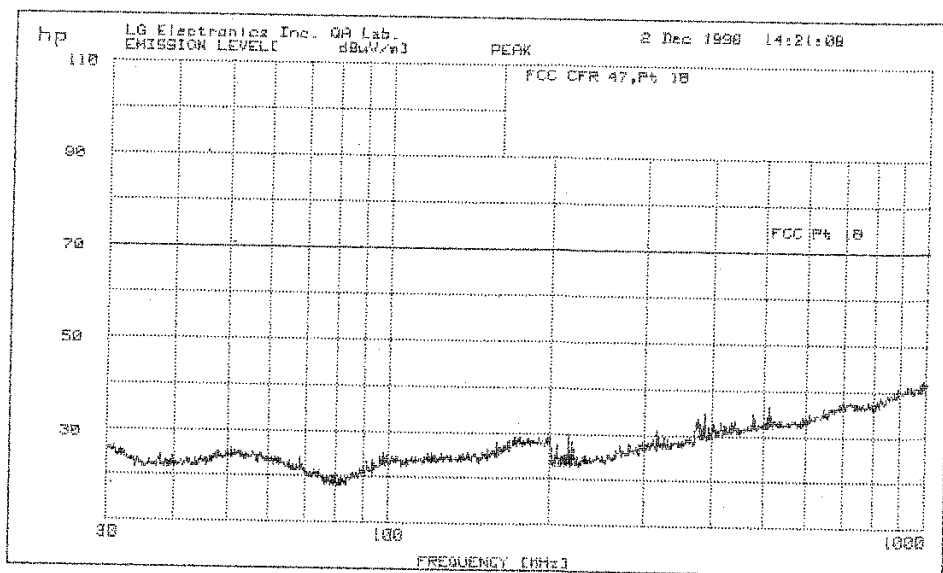
Test Requirements: CFR Title 47, Part 18

Test Equipment: Electro-Metrics FIM EMC-30MKIV
Electro-Metrics Metering Module CRM-30

Detector Mode: Peak

Measurement Distance: 3 meters

Antenna: Electro-Metrics Biconical Antenna BIA-25, Log Periodic Antenna LPA-25



LG MGT. HOR.

ANT. POL.: HORIZONTAL

6/7 Model MS-104XE with LG. Magnetron

FCC ID : BEJS100XE

Issued: Dec. 08, 1998

LABORATORY MEASUREMENTS BELOW 1 GHz
Data Page 3

Date Tested: Dec. 02, 1998

Manufacturer: LG Electronics Inc.

Product Type: Household Microwave Oven

Model No.: MS-104XP

Mode of Operating: Maximum RF Power

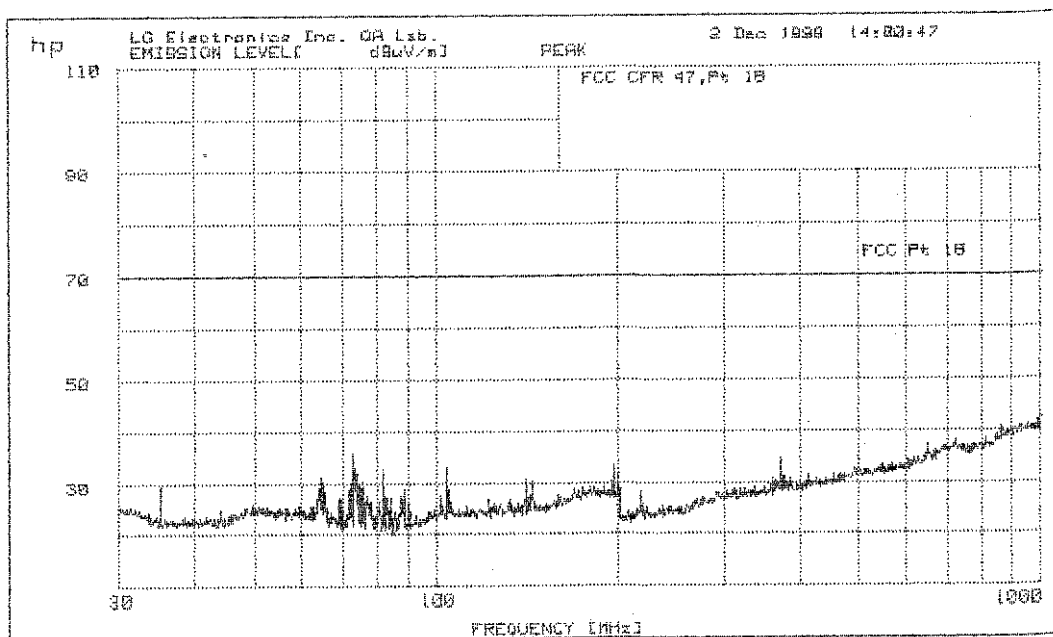
Test Requirements: CFR Title 47, Part 18

Test Equipment: Electro-Metrics FIM EMC-30MKIV
Electro-Metrics Metering Module CRM-30

Detector Mode: Peak

Measurement Distance: 3 meters

Antenna: Electro-Metrics Biconical Antenna BIA-25, Log Periodic Antenna LPA-25



LG MGT VERT.

ANT. POL.: VERTICAL

7/7 Model MS-104XP with LG. Magnetron

FCC ID : BEJS100XE

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2. Address of Applicant: 6133 North River Road Suite, 1100 (Riverway Plaza) Rosemont, IL 60018
3. Equipment Under Test: LG Electronics Inc., Microwave Oven Model MS-104XP
with Magnetron Type **2M248J** by Toshiba Hokuto Electronics Corp.
4. Power Supply: 120 V ac, 60 Hz
5. Test Requirements: CFR Title 47, Part 18
6. Test Procedure: OST MP-5
7. Instrument Used: Hioki Digital Power High Test Model 3181-01
Holaday Industries Inc. Microwave Survey Meter Model 1700
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Electro Metrics Metering Module CRM-30
Hewlett Packard Frequency Counter 5350A
Hewlett Packard Sweep Oscillator 8350B
8. Test Condition: The Equipment Under Test (EUT) was tested while operating at maximum
RF output power. Loads of water in a glass beaker was used in amount specified by
Test Procedure.

1/7 Model MS-104XP with Toshiba Magnetron

9. Results of Testings:

A. Input Power

Input Power was measured using a Wattmeter.

A 275 ml water load was placed in the center of the oven and the oven was operated at full output power for 6 minutes after which the reading was taken.

A 275 ml water load was chosen for its compatibility with the UL procedure used by manufacturers to determine our input ratings.

<u>Voltage</u>	<u>Current</u>	<u>Input Power</u>	<u>Manufacturer's Rating</u>
120 V ac, 60 Hz	14.03 A	1568 W	13.3 A

B. RF Power Output

The Calorimetric Method was used to determine maximum output power.

A 1000 ml water load was placed in the center of the oven.

A mercury thermometer was used to measure temperature rise.

<u>Quantity of Water</u>	<u>Starting Temperature</u>	<u>Final Temperature</u>	<u>Elapsed Time</u>
1000 ml	21.0 °C	43.6°C	120 Sec

$$\text{Power (W)} = \frac{(4.2 \text{ Joules/Cal}) \times (\text{Volume in ml}) \times (\text{Temperature Rise})}{\text{Time in Seconds}}$$

$$\text{Power (W)} = \frac{4.2 \times 1000 \times 22.6}{120}$$

$$\text{Power (W)} = 791 \text{ Watts}$$

2/7 Model MS-104XP with Toshiba Magnetron

FCC

ID

:

BEJS100XE

C. Frequency Measurements

The fundamental operating frequency was measured with a substitution method using the Electro Metrics receiver, Hewlett Packard Sweep Oscillator and Frequency Counter.

The receiver was turned to the maximum amplitude at the oven operating frequency.

The Sweep Oscillator was substituted for operating the antenna and turned to the same frequency as the receiver. The frequency of the generator was determined using the frequency counter.

The frequency was observed over a period of time, and with line voltage variation.

The maximum frequency permitted in Part 18 is maximum 2.500 GHz and the minimum 2.400 GHz.

No out-of-band frequency measurement was observed.

Variation of Frequency With Time (1000 ml reduced to 200 ml)

Maximum Frequency Observed: 2.456 GHz

Minimum Frequency Observed: 2.441 GHz

Variation of Frequency With Line Voltage (96 Volts to 150 Volts AC)

Maximum Frequency Observed: 2.461 GHz

Minimum Frequency Observed: 2.445 GHz

D. Microwave Leakage

Radiation leakage was measured in the as-received condition with the oven door closed using a microwave leakage meter.

No power greater than 0.14 mW/ was observed at any location on the enclosure of the oven.

A maximum of 1.0 mW/ is allowed in accordance with UL 923 standard.

Hence, microwave leakage in the as-received condition with the oven door closed, did not exceed the specified limit.

E. Radiated Emissions

Radiated emission was measured over a frequency range of 100 MHz to 10 GHz. For measurements the EUT was get set up in an Shielded Anechoic Chamber. The EUT was supported by a wood table, 1 m high in both cases, measurement above 1 GHz and below 1 GHz.

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10. Test Engineer:



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LABORATORY MEASUREMENTS ABOVE 1 GHz

Data Page 1

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Mode of Operating (DUT): Maximum RF Power

Test Requirements: CFR Title 47, Part 18

Test Equipment: Electro-Metrics FIM. EMC-60MKIV

Antenna: Double Ridged Guide Antenna RGA-180

Detector Mode: Average

Bandwidth: 1 MHz

Measurement Distance: 3 meters

FREQ. (GHz)	Antenna Factor (dB)	Cable Factor (dB)	Load (ml)	Load Locating	Meter Reading (dBμV)	Field Intensity @ 3 m dBμV/m	Field Intensity @ 3 m (μV/m)	Field Intensity @ 300 m (μV/m)	FCC Limit @ 300 m (μV/m)
2.39	29.4	0.6	700	Center	15.1	44.8	173.8	1.74	31.4
2.51	29.6	0.6	700	Center	13.6	43.5	149.6	1.50	31.4
32.5	34.4	0.9	700	Center	20.9	55.4	588.8	5.89	31.4
4.90	34.4	0.9	700	RF	23.0	57.5	749.9	7.50	31.4
4.90	34.4	0.9	300	Center	21.9	56.4	660.7	6.61	31.4
4.90	34.4	0.9	300	RF	23.7	58.2	812.8	8.13	31.4
7.35	36.8	1.2	700	Center	10.0	46.9	221.3	2.21	31.4
7.35	36.8	1.2	700	RF	10.3	47.2	229.1	2.29	31.4
7.35	36.8	1.2	300	Center	10.6	47.5	237.1	2.37	31.4
7.35	36.8	1.2	300	RF	12.0	48.9	278.6	2.79	31.4
9.80	38.0	1.5	700	Center	8.30	47.6	239.8	2.40	31.4

Note: RF = Right Front Corner

5/7 Model MS-104XP with Toshiba Magnetron

FCC ID : BEJS100XE

Issued: December 08, 1998

LABORATORY MEASUREMENTS BELOW 1 GHz
Data Page 2

Date Tested: Dec.02, 1998

Manufacturer: LG Electronics Inc.

Product Type: Household Microwave Oven

Model No.: MS-104XP

Mode of Operating: Maximum RF Power

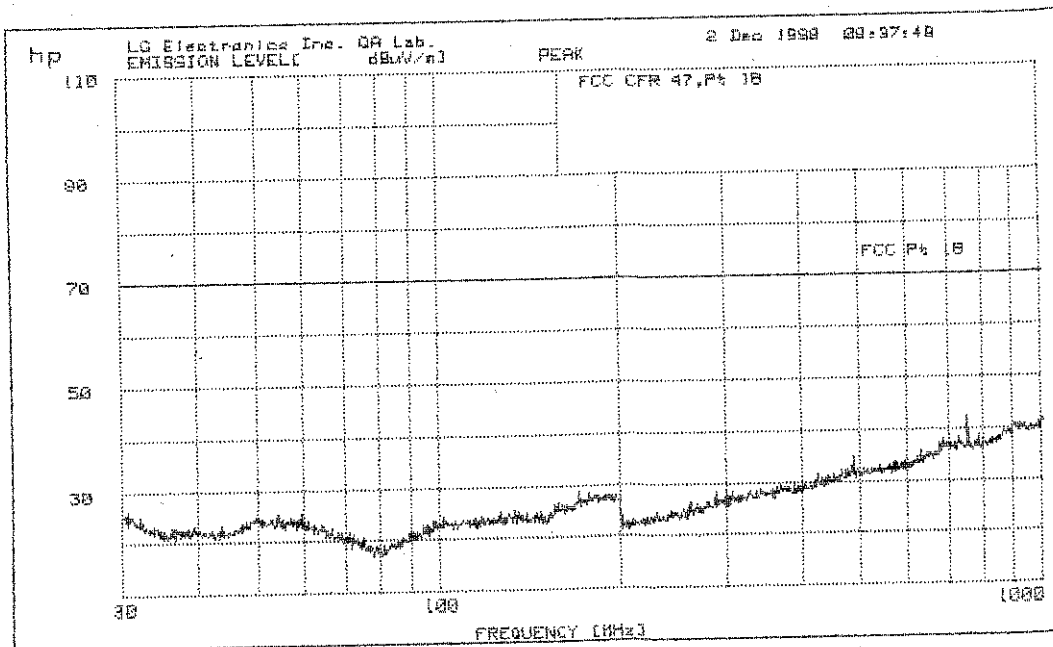
Test Requirements: CFR Title 47, Part 18

Test Equipment: Electro-Metrics FIM EMC-30MKIV
Electro-Metrics Metering Module CRM-30

Detector Mode: Peak

Measurement Distance: 3 meters

Antenna: Electro-Metrics Biconical Antenna BIA-25, Log Periodic Antenna LPA-25



Toshiba MGT. HOR.

ANT. POL.: HORIZONTAL

6/7 Model MS-104XP with Toshiba Magnetron

FCC ID : BEJS100XE

Issued: December 08 1998

LABORATORY MEASUREMENTS BELOW 1 GHz
Data Page 3

Date Tested: Dec. 02, 1998

Manufacturer: LG Electronics Inc.

Product Type: Household Microwave Oven

Model No.: MS-104XP

Mode of Operating: Maximum RF Power

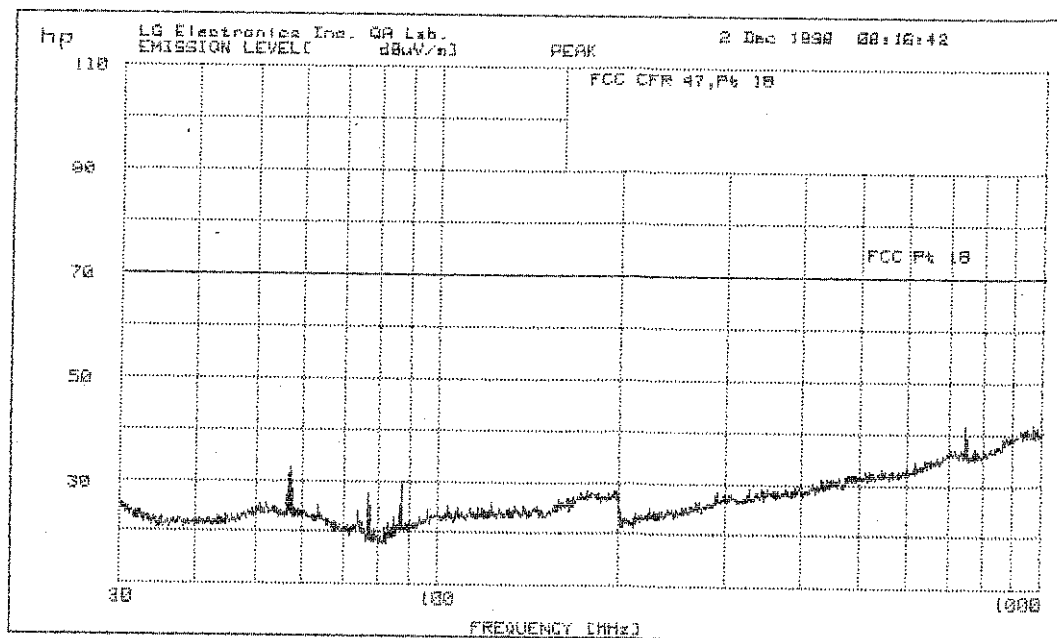
Test Requirements: CFR Title 47, Part 18

Test Equipment: Electro-Metrics FIM EMC-30MKIV
Electro-Metrics Metering Module CRM-30

Detector Mode: Peak

Measurement Distance: 3 meters

Antenna: Electro-Metrics Biconical Antenna BIA-25, Log Periodic Antenna LPA-25



Toshiba MGT. VERT.

ANT. POL.: VERTICAL

7/7 Model MS-104XP with Toshiba Magnetron

FCC ID : BEJS100XE