

# LG Electronics Tianjin Appliance Co., Ltd.,

## EMC Center

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### **CLASS II PERMISSIVE CHANGE CERTIFICATION OF COMPLIANCE**

**Date of Issue: July 31, 2012**

**Test Report No: 12-LTE-M038**

**Test Site: LG Electronics Tianjin Appliance Co., Ltd.  
EMC Laboratory**

This class II permissive change is to use the alternative Noise Filter on the previous granted model MV2040KSDL, FCC ID: BEJV204FSA (Test Report No.: 10-LTE-M008) dated on 04/27/2010.

|                  |                                               |
|------------------|-----------------------------------------------|
| Applicant:       | LG Electronics Tianjin Appliance Co., Ltd.    |
| Regulation:      | FCC Part 18 – ISM Consumer Device             |
| Test Procedure:  | MP-5: 1986                                    |
| Equipment Class: | Industrial, Scientific, and Medical equipment |
| EUT Type:        | Microwave oven                                |
| Magnetron Type:  | 2M246 (LG)                                    |
| Noise Filter:    | EAM35001888                                   |
| Brand Name(s):   | LG                                            |
| Model No.:       | MV1840ASD (Buyer model: LMV1813SB)            |
| FCC ID:          | BEJV204FSA                                    |

This device has been verified to comply with the applicable requirements in the FCC Part 18 and was tested in accordance with the measurement procedures specified in MP-5: 1986.

I assure full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



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Dae-Woong Kim, Chief Research Engineer  
Home Appliance Company, EMC Center  
LG Electronics Inc.

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**CLASS II PERMISSIVE CHANGE REPORT FOR A MICROWAVE OVEN**

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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

|                        |                                    |
|------------------------|------------------------------------|
| <b>EUT Type:</b>       | Microwave oven                     |
| <b>Model No.:</b>      | MV1840ASD (Buyer model: LMV1813SB) |
| <b>FCC ID:</b>         | BEJV204FSA                         |
| <b>Rule Part:</b>      | FCC Part 18                        |
| <b>Test Procedure:</b> | MP-5: 1986                         |
| <b>Date of Test:</b>   | Jul 12, 2012 –Jul 31, 2012         |
| <b>Date of Issue:</b>  | Jul 31, 2012                       |
| <b>Test Result:</b>    | Pass                               |

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*This report must not be used by the client to claim product endorsement by any agency of the U.S. Government.*

*The EMC Center facilities has been placed on file and the name of our organization added to the FCC's list for the FCC Part 15 and 18 of the Commission's Rules under Registration Number 93197.*

Prepared by:



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Li Hong / Research Engineer  
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LG Electronics Tianjin Appliance Co., Ltd.

Reviewed by:



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Kwang-Mu Son / Chief Research Engineer  
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## 1. CLIENT INFORMATION

The EUT has been tested by request of:

|                  |                                                                                |
|------------------|--------------------------------------------------------------------------------|
| Company:         | 1. LG Electronics Inc. Cooking & Cleaning Division                             |
| (Manufacturer)   | 391-2, Ga Eum Jeong - Dong, Changwon City, Gyeong Nam,<br>641-711, Korea       |
|                  | 2. LG Electronics Tianjin Appliance Co., Ltd.                                  |
|                  | Xing Dian Road, Bei Chen Distr., Tianjin 300402,<br>People's Republic of China |
| Name of contact: | Feng Xinliang                                                                  |
| Telephone:       | +86-22-2690-3308                                                               |
| Fax:             | +86-22-2690-3643                                                               |

## 2. EQUIPMENT UNDER TEST (EUT)

EUT is the LG Electronics Inc. Microwave Oven as followings:

|                            |                                            |
|----------------------------|--------------------------------------------|
| Equipment:                 | Microwave oven                             |
| Model:                     | MV1840ASD (Buyer model: LMV1813SB)         |
| Brand name:                | LG                                         |
| Serial number:             | N/A                                        |
| Magnetron:                 | 2M246 by LG                                |
| Noise Filter:              | EAM35001888                                |
| RF Frequency:              | 2450 +/- 50 MHz                            |
| RF Power Output (IEC 705): | 1100 W                                     |
| Power Consumption          |                                            |
| Microwave Mode:            | 1600 W                                     |
| Rated Input Voltage:       | 120 V~, 60 Hz                              |
| Rated Input Current        |                                            |
| Microwave Mode:            | 14 A                                       |
| Cavity Volume:             | 1.8 Cu.ft                                  |
| Oven Type:                 | OTR / Household                            |
| Mode Stirrer:              | Turntable                                  |
| Power Cord:                | Shielded                                   |
| Outer Dimensions (inch)    | 29 15/16" (W) * 16 7/16" (H) * 15 5/8" (D) |

EMI suppression device(s) installed in production: See schematics (Appendix C)

EMI suppression device(s) added and/or modified during test: None

**This class II permissive change certification of compliance is to use alternative Noise Filter type EAM35001888 by YunLu on the previous granted model MV2040KSDL, FCC ID: BEJV204FSA (Test Report No.: 10-LTE-M008) dated on 04/27/2010.**

**The radiating source Magnetron and High Voltage Transformer was not changed, so we did not perform Radiated Emissions.**

### 3. TEST SITE

Measurement of radiated emissions from EUT was made at semi-anechoic chamber that has been in compliance with Federal Communications Commissions (FCC) requirements of clause 2.948 according to ANSI C63.4-2003 on June 2, 2009.

### 4. CALIBRATIONS OF MEASURING INSTRUMENT

All measurement was made with instruments calibrated according to the recommendation by manufacturer. Measurement of radiated emissions and power line conducted emissions were made with instruments conforming to American National Standard Specification, ANSI C63.4-2003. The calibration of measuring instrument, including any accessories that may affect test results, was performed according to the recommendation by manufacturer.

### 5. DESCRIPTION OF TEST CONDITION

#### 5.1 Power line conducted emission measurements

Power line conducted emission measurements were based on the std. CISPR 11:2009+A1:2010.

##### 5.1.1 Shielded enclosure

The measurement for power-line emissions from EUT was made in shielded enclosure that provides sufficient shielding effectiveness enough not to affect test results.

##### 5.1.2 Detector function selection and bandwidth

During conducted emission measurement, a radio noise meter that has a CISPR quasi-peak detector with 10 kHz IF bandwidth of 6 dB was utilized.

##### 5.1.3 Frequency range to be scanned

For conducted emissions measurement, frequency range of 150 kHz to 30 MHz included, was investigated.

##### 5.1.4 Unit of measurement

Test results for conducted emissions are reported in micro-volt.

##### 5.1.5 Line impedance stabilization network (LISN)

A LISN with characteristics that conform to the requirements of ANSI C63.4-2003 was used for the measurement of conducted power-line radio noise; (50 micro-henries / 50 ohms). Chassis and earth-points for grounding of the LISN were earth-grounded.

##### 5.1.6 Test conditions and configuration of EUT

The EUT was configured and operated in all modes of operation so as to find the maximum enumeration of emissions from EUT.

The EUT has designed to use the public AC lines with rated AC voltage as specified in owner's manual and Installation's manual of EUT and filtered to meet the requirement. AC power was supplied to the EUT through LISN with characteristics described in 5.1.5 of part I of this report.

The EUT was placed on a 1 m×1.5 m×40 cm high wooden table which is placed on the earth-grounded conducting surface larger than 2 square meter. The vertical conducting surface was replaced with horizontal ground plane. Length of the power lead in excess of 80 cm horizontally separating the EUT from LISN was folded back-and-forth form at the center of the power cord not exceeding 40 cm in length.

The EUT was operated with a load of 1000 ml water which was initially at 20 °C ± 5 °C placed at the center of the load-carrying surface.

Each type of accessory provided by manufacturer or typically used and support equipment were connected to the EUT during measurement to the typical usage and applicable as nearly as practicable.

#### 5.1.7 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above-mentioned way.

The measurement uncertainty was calculated in accordance with NAMAS NIS 81: "The treatment of uncertainty in EMC measurement."

For calculated uncertainty of each item, refer the next page.

The measurement uncertainty was given with a confidence of 95%.

### 5.2 Radiated emissions measurement

#### 5.2.1 Test site

Measurement was made in semi-anechoic chamber as described at Clause 3 in this report.

#### 5.2.2 Detector function selection and bandwidth

In radiated emissions measurement, field strength meter that has CISPR quasi-peak and average detector was used. The bandwidth of the detector of instrument is 120 kHz for frequency range of 30 MHz – 1,000 MHz, and 1 MHz for frequency range of 1 GHz to 18 GHz. Emissions to be measured is detected in average mode.

#### 5.2.3 Unit of measurement

Test results of radiated emissions measurement are reported in microvolts per meter at the specific distance. Using the unit of dBμV on the test instrument, the indication unit was converted to field strength unit of μV/m as following method;

$$F / S = 10^{\{(R+AF+CF)/20\}} (\mu V/m)$$

here,

F / S: Field Strength in μV/m,

R: Meter Reading Level in dB(μV),

AF: Antenna Factor in dB/m

CF: Conversion Factor

\* 30 MHz ~ 1 GHz: CF = CL

\* Above 1 GHz: CF = CL – PG + FL + AL

CL: Cable Loss (dB)

FL: Filter Loss (dB)

PG: Preamplifier Gain (dB)

AL: Attenuator Loss (dB)

#### 5.2.4 Antennas

Measurements were made using calibrated biconilog antenna in range of 30 MHz to 1,000 MHz and horn antenna in range of 1 to 18 GHz to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization. The horizontal distance between the receiving antenna and the closest periphery of the EUT was 3 meters for horn antenna and 10 meters for biconilog antenna.

#### 5.2.5 Frequency range to be scanned

For radiated emissions measurements, the spectrum in the range of 30 to 1,000 MHz and above, if found, was investigated.

#### 5.2.6 Test conditions and configuration of EUT

The EUT was configured and operated in all modes of operation so as to find the maximum RF energy generated from EUT.

The power was furnished with rated (normal) AC 120 volts, as specified in the Owner's manual of EUT. The EUT was placed on a 1 m high non-metallic table. The turntable containing the system was rotated and the antenna height was varied 4 m to find the maximum RF energy detected from EUT.

Each type of accessory provided by manufacturer or typically used and support equipment were connected to the EUT during measurement to the typical usage and applicable as nearly as practicable.

#### 5.2.7 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in mentioned above way.

The measurement uncertainty was calculated in accordance with NAMAS NIS 81: "The treatment of uncertainty in EMC measurement."

For calculated uncertainty of each item, refer the next page.

The measurement uncertainty was given with a confidence of 95%.

< Fundamental Frequency Uncertainty (2,450 MHz) >

| Symbol         | Contribution                                                                                                           | Value (dB)           |      | Probability Distribution | Divisor | Standard Uncertainty              | Standard Uncertainty Squared |
|----------------|------------------------------------------------------------------------------------------------------------------------|----------------------|------|--------------------------|---------|-----------------------------------|------------------------------|
|                |                                                                                                                        |                      |      |                          |         | Horn Antenna<br>(Value / Divisor) |                              |
|                |                                                                                                                        | 3 m                  | 3 m  |                          |         |                                   |                              |
| V <sub>1</sub> | Ambient signals                                                                                                        |                      | 3 m  |                          | 1       | 0.00                              | 0.0                          |
| V <sub>2</sub> | Antenna factor calibration                                                                                             | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                              | 0.1                          |
| V <sub>3</sub> | Cable loss calibration                                                                                                 | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                              | 0.1                          |
| V <sub>4</sub> | Receiver specification                                                                                                 | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                              | 0.3                          |
| V <sub>5</sub> | Measurement distance variation                                                                                         | Tolerance            | 0.6  | rectangular              | 1.732   | 0.35                              | 0.1                          |
| V <sub>6</sub> | Site imperfections                                                                                                     | Tolerance            | 2.0  | rectangular              | 1.732   | 1.15                              | 1.3                          |
| V <sub>7</sub> | Mismatch                                                                                                               |                      |      |                          |         |                                   |                              |
|                | Receiver VRC: $J_1 = 0.33$<br>Antenna VRC: $J_0 = 0.20$<br>Uncertainty limits $20\text{Log}(1\pm J_1 J_0)$             | Tolerance            | 0.6  | U-shaped                 | 1.414   | 0.42                              | 0.2                          |
| V <sub>8</sub> | System repeatability (previous assessment of s(q <sub>k</sub> ) from 5 repeats, 1 reading on EUT Repeatability of EUT* |                      | 0.5  | Std Deviation            | 1       | 0.50                              | 0.3                          |
|                | Combined standard uncertainty u <sub>c</sub> (y)                                                                       |                      | 1.53 | normal                   |         |                                   |                              |
|                | Expanded uncertainty U                                                                                                 |                      | 3.06 | normal (k = 2)           |         |                                   |                              |

$$u_c(y) = \sqrt{\left(\frac{0.0}{1}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \frac{1.0^2 + 0.6^2 + 2.0^2}{3} + \frac{0.6^2}{2} + 0.5^2}$$

The level of confidence will be approximately 95%. (The coverage factor: k=2)

$$U = 2 u_c(y) = 2 \times 1.53 = \pm 3.1 \text{ dB}$$

< Radiated Emission Uncertainty (Above 1 GHz) >

| Symbol          | Contribution                                                                                                           | Value (dB)           |      | Probability Distribution | Divisor | Standard Uncertainty              | Standard Uncertainty Squared |
|-----------------|------------------------------------------------------------------------------------------------------------------------|----------------------|------|--------------------------|---------|-----------------------------------|------------------------------|
|                 |                                                                                                                        |                      |      |                          |         | Horn Antenna<br>(Value / Divisor) |                              |
|                 |                                                                                                                        |                      | 3 m  |                          |         | 3 m                               |                              |
| V <sub>1</sub>  | Ambient signals                                                                                                        |                      |      | -                        | 1       | 0.00                              | 0.0                          |
| V <sub>2</sub>  | Antenna factor calibration #1                                                                                          | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                              | 0.1                          |
| V <sub>3</sub>  | Antenna factor calibration #2                                                                                          | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                              | 0.1                          |
| V <sub>4</sub>  | Cable loss calibration                                                                                                 | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                              | 0.1                          |
| V <sub>5</sub>  | Receiver specification                                                                                                 | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                              | 0.3                          |
| V <sub>6</sub>  | Highpass filter                                                                                                        | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                              | 0.3                          |
| V <sub>7</sub>  | Measurement distance variation                                                                                         | Tolerance            | 0.6  | rectangular              | 1.732   | 0.35                              | 0.1                          |
| V <sub>8</sub>  | Site imperfections                                                                                                     | Tolerance            | 2.0  | rectangular              | 1.732   | 1.15                              | 1.3                          |
| V <sub>9</sub>  | Mismatch<br>Receiver VRC: $J_1 = 0.33$<br>Antenna VRC: $J_0 = 0.2$<br>Uncertainty limits $20\text{Log}(1\pm J_1 J_0)$  | Tolerance            | 0.6  | U-shaped                 | 1.414   | 0.42                              | 0.2                          |
| V <sub>10</sub> | System repeatability (previous assessment of s(q <sub>k</sub> ) from 5 repeats, 1 reading on EUT Repeatability of EUT* |                      | 0.5  | Std Deviation            | 1       | 0.50                              | 0.3                          |
|                 | Combined standard uncertainty u <sub>c</sub> (y)                                                                       |                      | 1.65 | normal                   |         |                                   |                              |
|                 | Expanded uncertainty U                                                                                                 |                      | 3.31 | normal (k = 2)           |         |                                   |                              |

$$u_c(y) = \sqrt{\left(\frac{0.0}{1}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \frac{1.0^2 + 1.0^2 + 0.6^2 + 2.0^2}{3} + \frac{0.6^2}{2} + 0.5^2}$$

The level of confidence will be approximately 95%. (The coverage factor: k=2)

$$U = 2 u_c(y) = 2 \times 1.65 = \pm 3.4 \text{ dB}$$

< Electric Field Strength Uncertainty (30 MHz – 1 GHz) >

| Symbol          | Contribution                                                                                                                               | Value (dB)           |      | Probability Distribution | Divisor | Standard Uncertainty                  | Standard Uncertainty Squared |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|--------------------------|---------|---------------------------------------|------------------------------|
|                 |                                                                                                                                            |                      |      |                          |         | UltraLog Antenna<br>(Value / Divisor) |                              |
|                 |                                                                                                                                            | 10 m                 | 10 m |                          |         |                                       |                              |
| V <sub>1</sub>  | Ambient signals                                                                                                                            |                      |      | Std Deviation            | 1       | 0.00                                  | 0.0                          |
| V <sub>2</sub>  | Antenna factor calibration                                                                                                                 | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                                  | 0.3                          |
| V <sub>3</sub>  | Cable loss calibration                                                                                                                     | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                                  | 0.1                          |
| V <sub>4</sub>  | Receiver specification                                                                                                                     | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                                  | 0.3                          |
| V <sub>5</sub>  | Antenna directivity                                                                                                                        | Tolerance            | 3.0  | rectangular              | 1.732   | 1.73                                  | 3.0                          |
| V <sub>6</sub>  | Antenna factor variation with height                                                                                                       | Tolerance            | 0.5  | rectangular              | 1.732   | 0.29                                  | 0.1                          |
| V <sub>7</sub>  | Antenna phase center variation                                                                                                             | Tolerance            | 0.2  | rectangular              | 1.732   | 0.1                                   | 0.0                          |
| V <sub>8</sub>  | Antenna factor frequency interpolation                                                                                                     | Tolerance            | 0.25 | rectangular              | 1.732   | 0.14                                  | 0.0                          |
| V <sub>9</sub>  | Measurement distance variation                                                                                                             | Tolerance            | 0.4  | rectangular              | 1.732   | 0.23                                  | 0.1                          |
| V <sub>10</sub> | Site imperfections                                                                                                                         | Tolerance            | 2.0  | rectangular              | 1.732   | 1.15                                  | 1.3                          |
| V <sub>11</sub> | Mismatch<br>Receiver VRC: $\Gamma_1 = 0.09$<br>Antenna VRC: $\Gamma_0 = 0.33$<br>Uncertainty limits $20\text{Log}(1\pm \Gamma_1 \Gamma_0)$ | Tolerance            | 0.3  | U-shaped                 | 1.414   | 0.21                                  | 0.0                          |
| V <sub>12</sub> | System repeatability (previous assessment of $s(q_k)$ from 5 repeats, 1 reading on EUT Repeatability of EUT*                               |                      | 0.5  | Std Deviation            | 1       | 0.50                                  | 0.3                          |
|                 | Combined standard uncertainty $u_c(y)$                                                                                                     |                      | 2.35 | normal                   | 2       |                                       |                              |
|                 | Expanded uncertainty U                                                                                                                     |                      | 4.70 | normal (k = 2)           | 2       |                                       |                              |

$$u_c(y) = \sqrt{\left(\frac{0.0}{1}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \frac{1.0^2 + 1.0^2 + 3.0^2 + 0.5^2 + 0.2^2 + 0.25^2 + 0.4^2 + 2.0^2 + 0.30^2 + 0.5^2}{3}}$$

The level of confidence will be approximately 95%. (The coverage factor: k=2)

$$U = 2 u_c(y) = 2 \times 2.35 = \pm 4.7 \text{ dB}$$

< Line Conducted Uncertainty >

| Symbol         | Contribution                                                                                                                    | Value (dB)           |      | Probability Distribution | Divisor | Standard Uncertainty (dB)             | Standard Uncertainty Squared |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------|------|--------------------------|---------|---------------------------------------|------------------------------|
|                |                                                                                                                                 |                      |      |                          |         | 150 kHz - 30 MHz<br>(Value / Divisor) |                              |
| V <sub>1</sub> | Receiver specification                                                                                                          | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                                  | 0.3                          |
| V <sub>2</sub> | LISN coupling specification                                                                                                     | Tolerance            | 1.0  | rectangular              | 1.732   | 0.58                                  | 0.3                          |
| V <sub>3</sub> | Cable and input attenuator calibration                                                                                          | Expanded Uncertainty | 0.5  | normal (k = 2)           | 2       | 0.25                                  | 0.1                          |
| V <sub>4</sub> | Mismatch<br>Receiver VRC: $\eta_1 = 0.09$<br>LISN VRC: $\eta_0 = 0.8$<br>Uncertainty limits $20\text{Log}(1 \pm \eta_1 \eta_0)$ | Tolerance            | 0.6  | U-shaped                 | 1.414   | 0.42                                  | 0.180                        |
| V <sub>5</sub> | System repeatability (previous assessment of $s(q_k)$ from 10 repeats, 1 reading on EUT)                                        |                      | 0.35 | standard deviation       | 1       | 0.35                                  | 0.12                         |
|                | Combined standard uncertainty $u_c(y)$                                                                                          |                      | 1.02 | normal                   |         |                                       |                              |
|                | Expanded uncertainty U                                                                                                          |                      | 2.03 | normal (k = 2)           |         |                                       |                              |

$$u_c(y) = \sqrt{\frac{1.0^2 + 1.0^2}{3} + \left(\frac{0.5}{2}\right)^2 + \frac{0.6^2 + 0.35^2}{2}} = \text{dB}$$

The level of confidence will be approximately 95%. (The coverage factor: k=2)

$$U = 2 u_c(y) = 2 \times 1.02 = \pm 2.1 \text{ dB}$$

## 6. MEASURING INSTRUMENT

| Instrument              | Model                      | Cal. Due date    | Serial No. | Control No. |
|-------------------------|----------------------------|------------------|------------|-------------|
| EMI Receiver            | ESIB26                     | April 12, 2013   | 100328     | 05-IRE-01   |
| Horn Antenna            | 3115 (EMKO)                | April 19, 2013   | 00049219   | 05-IRE-06   |
| Biconilog Ant.          | 3142C(EMKO)                | August 28, 2012  | 00056884   | 05-IRE-07   |
| High Pass Filter        | WHKX4.5<br>/18GHz-10SS     | April 12, 2013   | 2          | 05-IRE-02   |
| Pre-amplifier           | 83006A                     | April 12, 2013   | MY39500565 | 05-IRE-12   |
| EMI Receiver            | ESCI                       | April 12, 2013   | 100213     | 05-IRE-01   |
| Dual device controllers | 2090                       | -                | -          | 05-IRE-11   |
| LISN                    | ESH2-Z5 (R&S)              | April 12, 2013   | 100136     | 05-ICE-06   |
| Microwave Cable         | Sucoflex 106               | -                | 35105/6    | -           |
| Microwave Cable         | Sucoflex 106               | -                | 35111/6    | -           |
| Microwave Cable         | Sucoflex 106               | -                | 35109/6    | -           |
| Microwave Cable         | RG400/11BNC/11<br>BNC/3000 | -                | HSCN200520 | -           |
| Antenna Master          | 2070-2 (EMKO)              | -                | N/A        | 05-IRE-10   |
| Semi Anechoic Chamber   | -                          | -                | -          | 05-CFA-01   |
| Shield Screen Room      | -                          | -                | -          | 05-CFA-02   |
| Microwave Survey Meter  | Holaday HI-1710            | January 16, 2013 | 93395      | M-FJZ020    |

## 7. TEST DATA

### 7.1 Input Power

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

#### 1) Magnetron type: 2M246 by LG

| <u>Mode</u> | <u>Input Voltage</u> | <u>Current [A]</u> | <u>Power Consumption</u><br>[W] | <u>Manufacturer</u><br><u>Rating [A]</u> |
|-------------|----------------------|--------------------|---------------------------------|------------------------------------------|
| Microwave   | 120 Vac, 60 Hz       | 15.6               | 1,811                           | 14.0                                     |

### 7.2 RF Power Output Measurement according to MP-5.

The Calorimetric Method was used to determine maximum output power. A 1,000 ml water load was placed in the center of the oven. A mercury thermometer was used to measure temperature rise. The test method was described in MP-5.

#### 1) Magnetron type: 2M246 by LG

$$\text{Power [W]} = \frac{(4.187 \text{ Joules/Cal}) * (\text{Volume in ml}) * (\text{Temperature Rise})}{\text{Time in Seconds}}$$

| <u>Quantity of Water</u> | <u>Starting Temperature</u> | <u>Final Temperature</u> | <u>Elapsed Time</u> |
|--------------------------|-----------------------------|--------------------------|---------------------|
| 1,000 ml                 | 10.0 °C                     | 30.0 °C                  | 120 Sec             |

$$\text{Power [W]} = \frac{4.187 * 1,000 * 20.0}{120}$$

$$\text{Power [W]} = 697.8 \text{ Watts}$$

### 7.3 RF Power Output Measurement according to IEC 60705.

The test was performed according to the IEC Publication 60705/1999.

A cylindrical container of borosilicate glass was used. It has a maximum thickness of 3 mm, external diameter of approximately 190 mm and height of approximately 90 mm.

Water having an initial temperature of  $10\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$  and quantity of  $1000\text{ g} \pm 5\text{ g}$  was used.

Before starting the measurement, measure the initial temperature of water.

And then the container was placed in the center of the oven. The oven was operated until attaining temperature of water as  $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  and then measured the final water temperature.

A mercury thermometer was used to measure temperature rise. The RF output power was calculated as below formula.

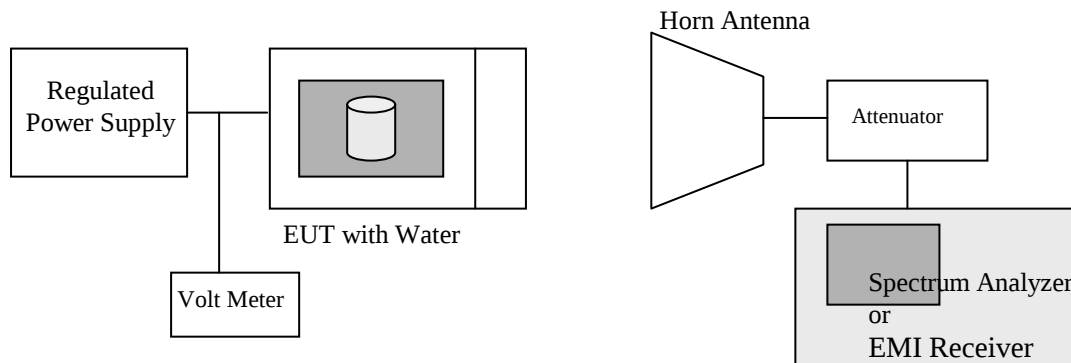
$$\text{Power [W]} = \frac{(4.187) * M_w * (T_2 - T_1) + 0.55 * M_c * (T_2 - T_0)}{t}$$

#### 1) Magnetron type: 2M246 by LG

|                                                                               |       |
|-------------------------------------------------------------------------------|-------|
| $M_w$ : Mass of the water, in grams                                           | 1000  |
| $M_c$ : Mass of the container, in grams                                       | 496.4 |
| $T_2$ : Final temperature of the water, in $^{\circ}\text{C}$                 | 19.7  |
| $T_1$ : Initial temperature of the water, in $^{\circ}\text{C}$               | 10.0  |
| $T_0$ : Ambient temperature, in $^{\circ}\text{C}$                            | 17.4  |
| $t$ : Heating time in seconds, excluding the magnetron filament heat-up time. | 38.0  |

$$\text{Power [W]} = \frac{4.187 * 1,000 * 9.7 + 0.55 * 496.4 * (2.3)}{38.0} = 1085.3 \text{ Watts}$$

## 7.4 Frequency measurements



### 1) Magnetron type: 2M246 by LG

#### (1) Frequency vs Line Voltage Variation Test

Variation of line voltage from 80 % (96 V) to 125 % (150 V)

Load: 1,000 ml

Fundamental Frequency: 2,450 MHz

Limit:  $2.4 \text{ GHz} < f < 2.5 \text{ GHz}$

Maximum Frequency Observed: 2,458 MHz

Minimum Frequency Observed: 2,452 MHz

**Result:** Pass

#### (2) Frequency vs Load Variation Test

*Frequency was measured at the rated input voltage (AC 120 V).*

Initial Load: 1,000 ml

Final Load: 200 ml

Fundamental Frequency: 2,450 MHz

Limit:  $2.4 \text{ GHz} < f < 2.5 \text{ GHz}$

Maximum Frequency Observed: 2,461 MHz

Minimum Frequency Observed: 2,446 MHz

**Result:** Pass

## 7.5 Power Density Safety Check

The power density was checked to ensure that the power is not greater than 1.0 mW/cm<sup>2</sup> at any location of the oven. The 1.0 mW/cm<sup>2</sup> is in accordance with CDRH and UL923 standard.

***A microwave survey meter was placed on all sides, door and viewing, bottom, top and rear. No power greater than 0.41 mW/cm<sup>2</sup> was observed and did not exceed the specified limits.***

### 1) Magnetron type: 2M246 by LG

Maximum Leakage Microwave Observed: 0.41 mW/cm<sup>2</sup>

**Result:** Pass

## 7.6 Conducted emissions (Section 18.307)

Conducted emission was measured at a frequency range 150 kHz to 30 MHz. The Power Line disturbance voltage was measured with the equipment under test (EUT) in a shielded room. The EUT was connected to a line impedance stabilization network (LISN) placed on the floor. The EUT was placed on a non-metallic table 0.4 m above the metallic, grounded floor. The distance to other metallic surfaces was at least 0.8 m.

The line conducted emission measurement procedure and test configuration is based on CISPR 11: 2009+A1:2010.

Amplitude measurements were performed with a quasi-peak detector and, if required, with an average detector.

Below data are the highest levels in Microwave mode.

An overview sweep performed with peak detector is included in the APPENDIX A (Test Plot).

### 1) Magnetron type: 2M246 by LG

| Frequency<br>[MHz] | Quasi-Peak                     |                              |                | Average                        |                              |                | Result |
|--------------------|--------------------------------|------------------------------|----------------|--------------------------------|------------------------------|----------------|--------|
|                    | Disturbance<br>Level<br>[dBuV] | Permitted<br>Limit<br>[dBuV] | Margin<br>[dB] | Disturbance<br>Level<br>[dBuV] | Permitted<br>Limit<br>[dBuV] | Margin<br>[dB] |        |
| 0.156              | 49.4                           | 65.7                         | -16.3          | 20.8                           | 55.7                         | -34.9          | PASS   |
| 0.565              | 43.1                           | 56.0                         | -12.9          | 30.9                           | 46.0                         | -15.1          | PASS   |
| 16.059             | 33.8                           | 60.0                         | -26.2          | 13.9                           | 50.0                         | -36.1          | PASS   |

Remark: 1. "<<" means that disturbance level is lower than 20 dB below the limit.

◆ 150 kHz ~ 30 MHz (Magnetron type: 2M246 by LG)

- Operating Mode: Maximum RF Power Output
- Detect Mode: Quasi-Peak(+)/Average(x), Scan Mode: Peak

RBW 9 kHz Marker 1 [T1]  
MT 100 ms 59.50 dBμV  
Att 10 dB PREAMP OFF 156.06000000 kHz

dBμV

1 PH  
MAXH

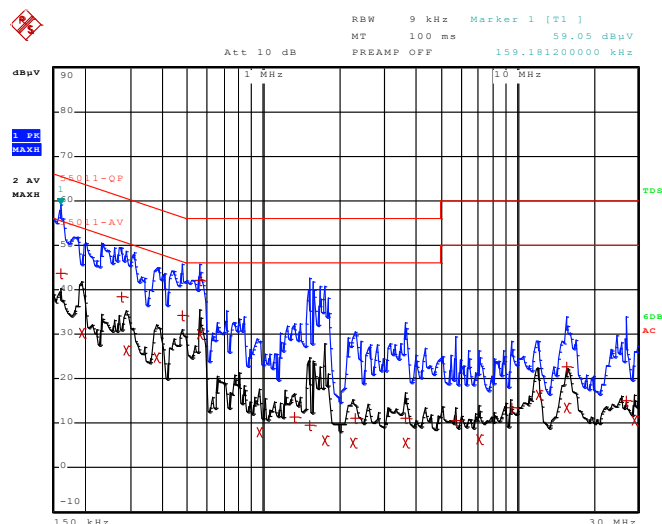
2 AV  
MAXH

1 MHz 10 MHz

-60 dBμV -50 dBμV -40 dBμV -30 dBμV -20 dBμV -10 dBμV -10 dBμV

150 kHz 30 MHz

**<Phase: N>**

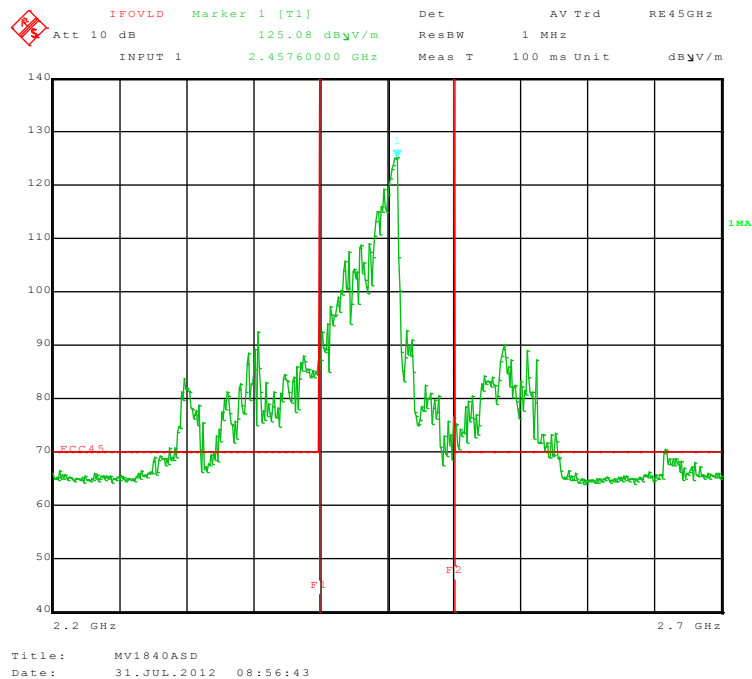


14 / 24

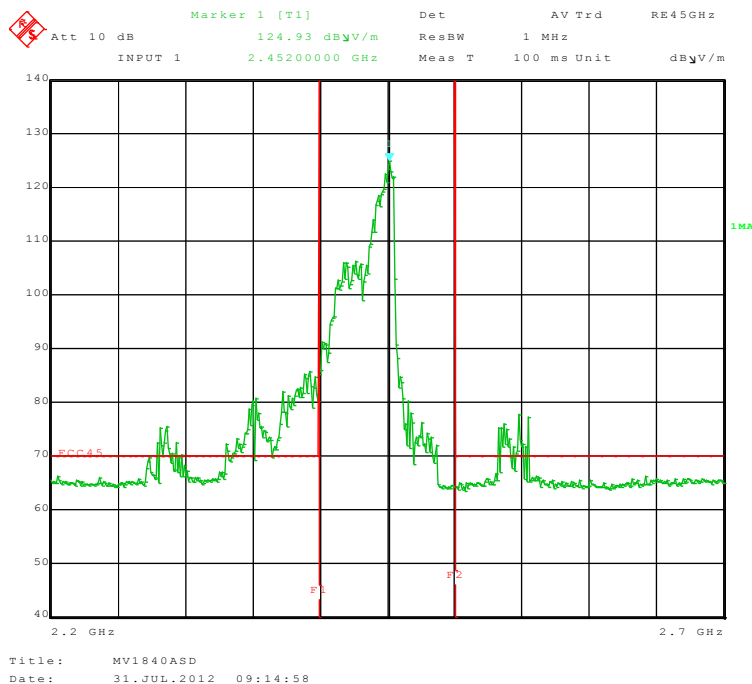
◆ Voltage Variation (Magnetron type: 2M246 by LG)

Detect Mode: Average, Scan Mode: Peak

<Maximum Frequency Observed: 2,458 MHz>



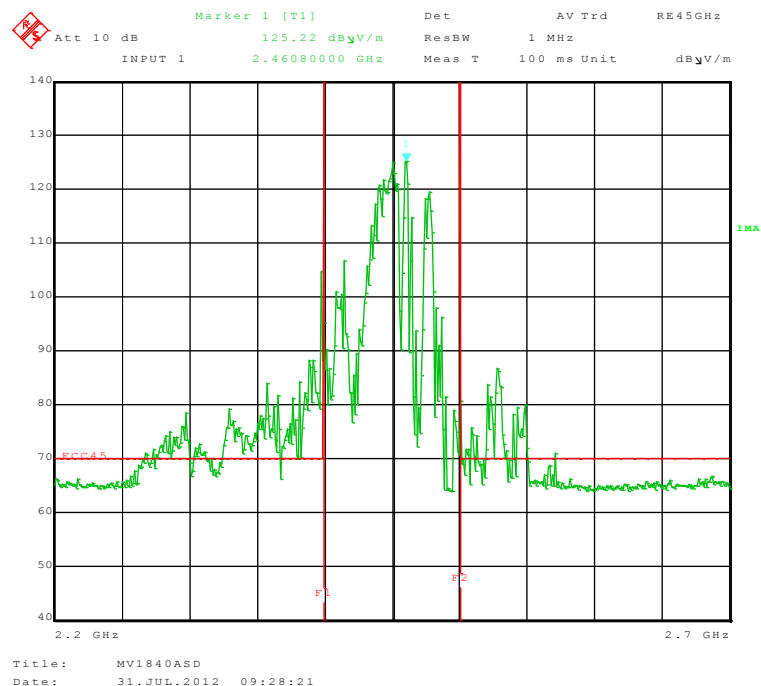
<Minimum Frequency Observed: 2,452 MHz>



◆ Load Variation (Magnetron type: 2M246 by LG)

Detect Mode: Average, Scan Mode: Peak

<Maximum Frequency Observed: 2,461MHz >



< Minimum Frequency Observed: 2,446MHz >

