

## ***FCC EVALUATION REPORT FOR CERTIFICATION***

**Applicant: LG Electronics USA.****1000 Sylvan Avenue,****Englewood Cliffs New Jersey United States 07632****Attn: Kyung-Su Han/ Director****Date of Issue: Feb. 03, 2017****Order Number: GETEC-C1-16-514****Test Report Number: GETEC-E3-16-070****Test Site: GUMI UNIVERSITY EMC CENTER****FCC Registration Number: (269701)****FCC ID. : BEJS133FZ****Applicant : LG Electronics USA.**

|                          |                                                        |
|--------------------------|--------------------------------------------------------|
| <b>Rule Part(s)</b>      | <b>: FCC Part 18</b>                                   |
| <b>Equipment Class</b>   | <b>: Industrial, Scientific, and Medical equipment</b> |
| <b>EUT Type</b>          | <b>: Microwave Oven</b>                                |
| <b>Type of Authority</b> | <b>: Certification</b>                                 |
| <b>Model Name</b>        | <b>: MS1335GIS</b>                                     |
| <b>Trade Name</b>        | <b>: LG</b>                                            |

**This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in MP-5 (1986).**

**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.**

**Tested by,**

**Sang Hyun Park / Associate Engineer  
GUMI UNIVERSITY EMC CENTER**

**Reviewed by,**

**Jae-Hoon Jeong / Technical Manager  
GUMI UNIVERSITY EMC CENTER**



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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 technical rules and regulations of the Federal Communications Commission.

## 1. General Information

**Applicant: LG ELECTRONICS USA.**

**Applicant Address: 1000 Sylvan Avenue,**

**Englewood Cliffs New Jersey United States 07632**

**Manufacturer: LG ELECTRONICS TIANJIN APPLIANCES Co., Ltd.**

**Manufacturer Address: 300402, Xing dian Road. Beichen District, Tianjin, China**

**Contact Person: Sung-gun Cho/ Research Engineer**

**Telephone Number: +82-55-260-3966**

|                      |                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| ● FCC ID             | BEJS133FZ                                                                                                                                               |
| ● EUT Type           | Microwave Oven                                                                                                                                          |
| ● Equipment Class    | Industrial, Scientific, and Medical equipment                                                                                                           |
| ● Model Name         | MS1335GIS                                                                                                                                               |
| ● Trade Name         | LG                                                                                                                                                      |
| ● Serial Number      | Prototype                                                                                                                                               |
| ● Rule Part(s)       | FCC Part 18                                                                                                                                             |
| ● Type of Authority  | Certification                                                                                                                                           |
| ● Test Procedure(s)  | MP-5 (1986)                                                                                                                                             |
| ● Dates of Test      | Dec. 28 , 2016 ~ Jan. 12, 2017                                                                                                                          |
| ● Place of Test      | <b>GUMI UNIVERSITY EMC CENTER</b><br>(FCC Test Firm Registration Number: 269701)<br>37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea. |
| ● Test Report Number | GETEC-E3-16-070                                                                                                                                         |
| ● Date of Issue      | Feb. 03, 2017                                                                                                                                           |

**EUT Type: Microwave Oven**

**FCC ID.: BEJS133FZ**





## 2. Introduction

The measurement procedure described in FCC methods of measurements of radio noise emissions from industrial, scientific, and medical equipment (MP-5: 1986) was used in determining radiated and conducted emissions emanating from **LG ELECTRONICS USA. Microwave Oven (Model Name: MS1335GIS)**

These measurement tests were conducted at **GUMI UNIVERSITY EMC CENTER**

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.

This test site is one of the highest point of Gumi UNIVERSITY at about 200 km away from Seoul city and 40 km away from Daegu city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 (2014)

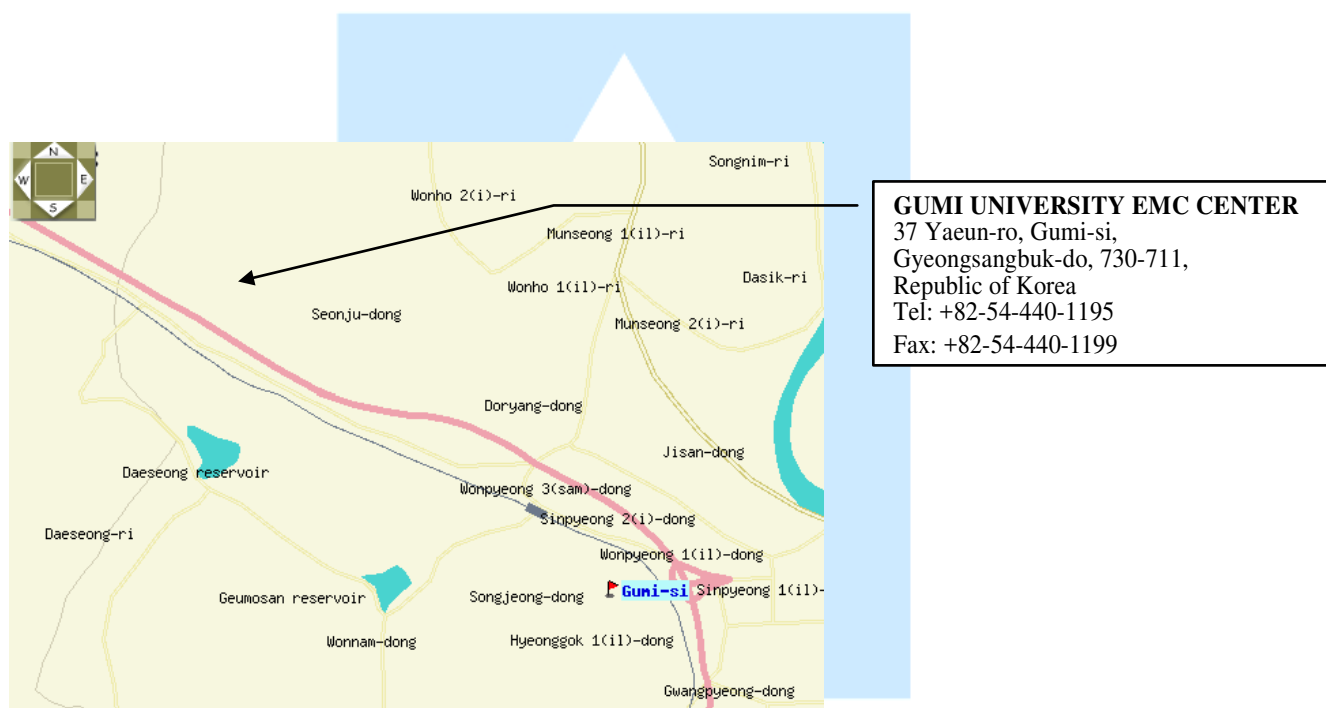


Fig 1. The map above shows the Gumi UNIVERSITY in vicinity area.



### 3. Product Information

#### 3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics USA.**

**Microwave Oven (Model Name: MS1335GIS) FCC ID.: BEJS133FZ**

|    |                                           |                                                                                                                                       |
|----|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Equipment Class                           | ISM Consumer Device, Part 18                                                                                                          |
| 2  | Equipment name                            | Microwave oven                                                                                                                        |
| 3  | Trade name                                | LG                                                                                                                                    |
| 4  | Model number                              | LG-MS1335GIS, Buyer-LMC1375SB,<br>LG-MS1335GIH, Buyer-LMC1375SW<br>LG- MS1235GIS, Buyer- LMC1275SB<br>LG- MS1235GIH, Buyer- LMC1275SW |
| 5  | Manufacturer                              | LG Electronics Tianjin Appliances Co., Ltd.<br>300402, Xing dian Road, Beichen District, Tianjin, China                               |
| 6  | FCC ID                                    | BEJS133FZ                                                                                                                             |
| 7  | Serial number &<br>Manufacturer data      | Proto type, not provided yet                                                                                                          |
| 8  | Date of original grant                    | NA                                                                                                                                    |
| 9  | Rated RF power output                     | 1200 W                                                                                                                                |
| 10 | Rated power consumption<br>Microwave mode | 1250 W                                                                                                                                |
| 11 | Rated current<br>Microwave mode           | 10.4 A                                                                                                                                |
| 12 | Overall dimensions (inch)                 | 21-7/16 X 12-1/8 X 17 (W x H x D)                                                                                                     |
| 13 | Cavity dimensions (inch)                  | 15-9/16 X 10-5/16 X 16 (W x H x D)                                                                                                    |
| 14 | Cavity volume                             | 1.3 cu.ft / 1.2 cu.ft                                                                                                                 |
| 15 | Magnetron                                 | 2M286                                                                                                                                 |
| 16 | Mode of Stirrer                           | Turntable                                                                                                                             |
| 17 | Measurement facility                      | LG                                                                                                                                    |
| 18 | Frequency range in MHz                    | 2450 ±50 MHz                                                                                                                          |

- For model name information, refer to "Appendix J = application letter"

**EUT Type: Microwave Oven**

**FCC ID.: BEJS133FZ**





### 3.2 Support Equipment / Cables used

#### 3.2.1 Used Support Equipment

| Description    | Manufacturer        | Model Name | S/N & FCC ID.                   |
|----------------|---------------------|------------|---------------------------------|
| Microwave Oven | LG ELECTRONICS USA. | MS1335GIS  | S/N: None<br>FCC ID.: BEJS133FZ |

See "Appendix D – Test Setup Photographs" for actual system test set-up

#### 3.2.2 System configuration

| Description | Manufacturer | Model Name | S/N & FCC ID. |
|-------------|--------------|------------|---------------|
| -           | -            | -          | -             |

#### 3.2.3 Used Cable(s)

| Cable Name  | Condition                                | Description       |
|-------------|------------------------------------------|-------------------|
| Power cable | Connected to the EUT and AC power source | 0.95 m Unshielded |

### 3.3 Modification Item(s)

- None



## 4. Description of tests

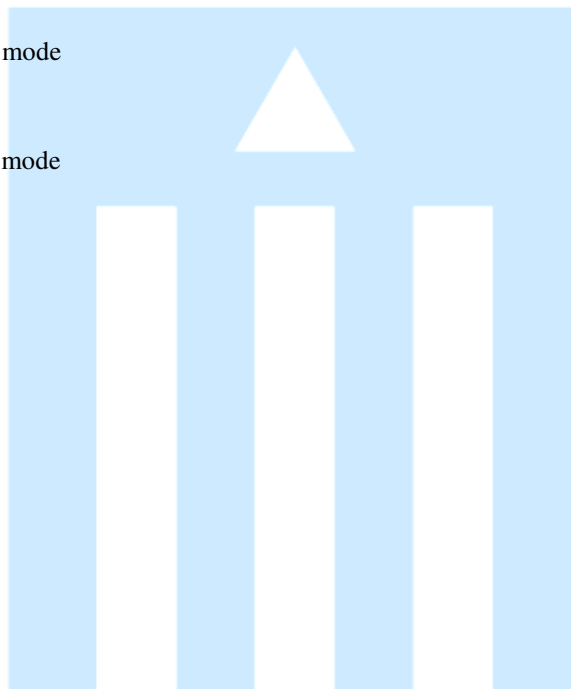
### 4.1 Test Condition

The EUT was operated at maximum (continuous) RF output power. The loads consisted of water in a glass beaker in the amounts specified in the test procedure.

The test conditions of the noted test mode(s) in this test report are;

- Test Voltage / Frequency : AC 120 V / 60 Hz
- Test Mode(s)

- **Conducted Emission**
  - Continuous RF output mode
- **Radiated Emission**
  - Continuous RF output mode





## 4.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Test Firm Registration No.: 269701)

The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.4 m in height and 0.8 m away from the vertical wall of the shielded enclosure.

The EUT is powered from the Rohde & Schwarz LISN (ENV216) and the support equipment is powered from the Rohde & Schwarz LISN (ENV216). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCI).

Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and Average mode.

The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

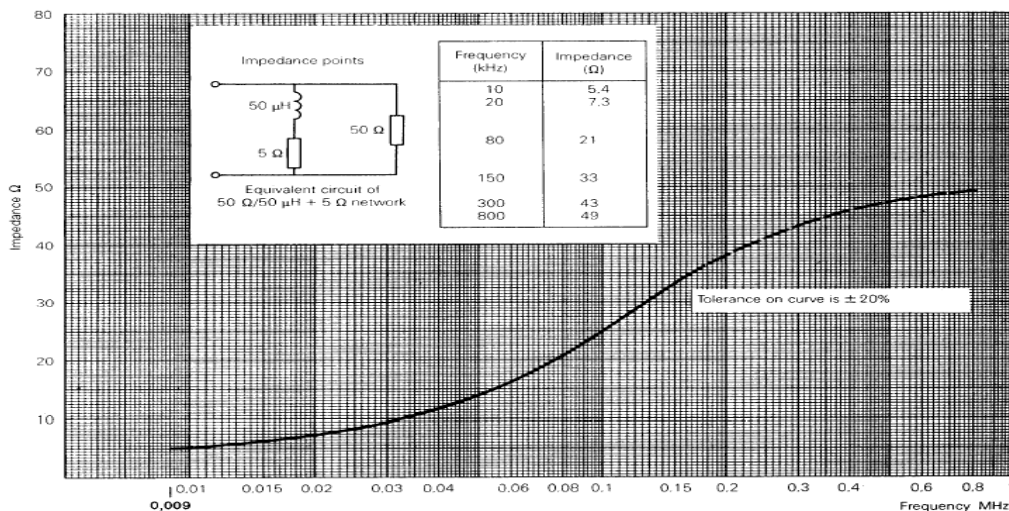


Fig 2. Impedance of LISN



### 4.3 Radiated Emission

Exploratory Radiated measurements were conducted at the 3 m or 10 m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements of below 1 GHz were made at 3 m or 10 m Chamber (FCC Test Firm Registration No.: 269701) or Open area test site (FCC Test Firm Registration No.: 269701) that complies with CISPR 16

Above 1 GHz final measurements were conducted at the 3m Chamber (FCC Test Firm Registration No.: 269701) only.

For measurements above 1GHz, the bottom side of 3 m chamber was installed with absorbers in order to meet SVSWR Limit.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1 GHz) and Average mode (Above 1 GHz).

The measurements were performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.

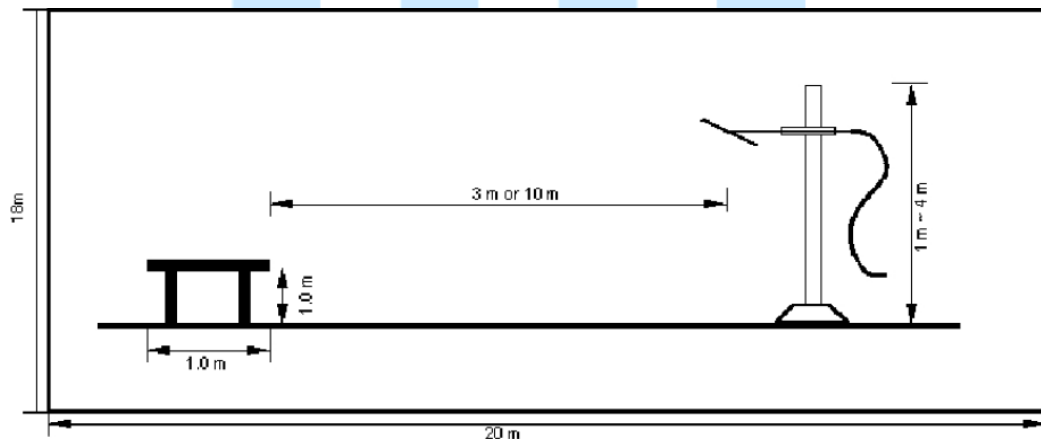


Fig 3. Dimensions of test site (Below 1 GHz)

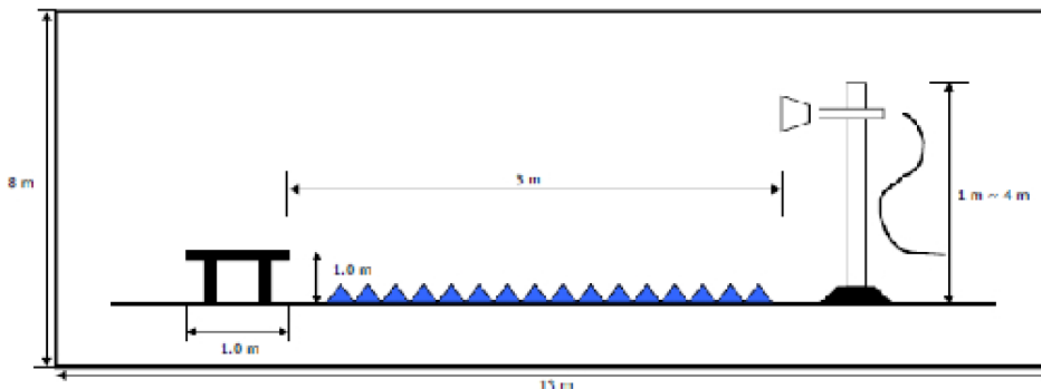


Fig 4. Dimensions of test site (Above 1 GHz)



## 5. Conducted Emission

### 5.1 Operating Environment

Temperature : 22.6 °C  
Relative Humidity : 39.8 % R.H.

### 5.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.4 m heights above the floor, 0.8 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

### 5.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement."

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

| Test Items                            | Uncertainty | Remark                                             |
|---------------------------------------|-------------|----------------------------------------------------|
| Conducted emission (9 kHz ~ 150 kHz)  | 3.85 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Conducted emission (150 kHz ~ 30 MHz) | 3.32 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



#### 5.4 Limit

| RFI Conducted                                               | FCC Limit(dB $\mu$ V/m) Class B |          |
|-------------------------------------------------------------|---------------------------------|----------|
| Freq. Range                                                 | Quasi-Peak                      | Average  |
| 150 kHz ~ 0.5 MHz                                           | 66 ~ 56*                        | 56 ~ 46* |
| 0.5 MHz ~ 5 MHz                                             | 56                              | 46       |
| 5 MHz ~ 30 MHz                                              | 60                              | 50       |
| *Limits decreases linearly with the logarithm of frequency. |                                 |          |

#### 5.5 Test Equipment used

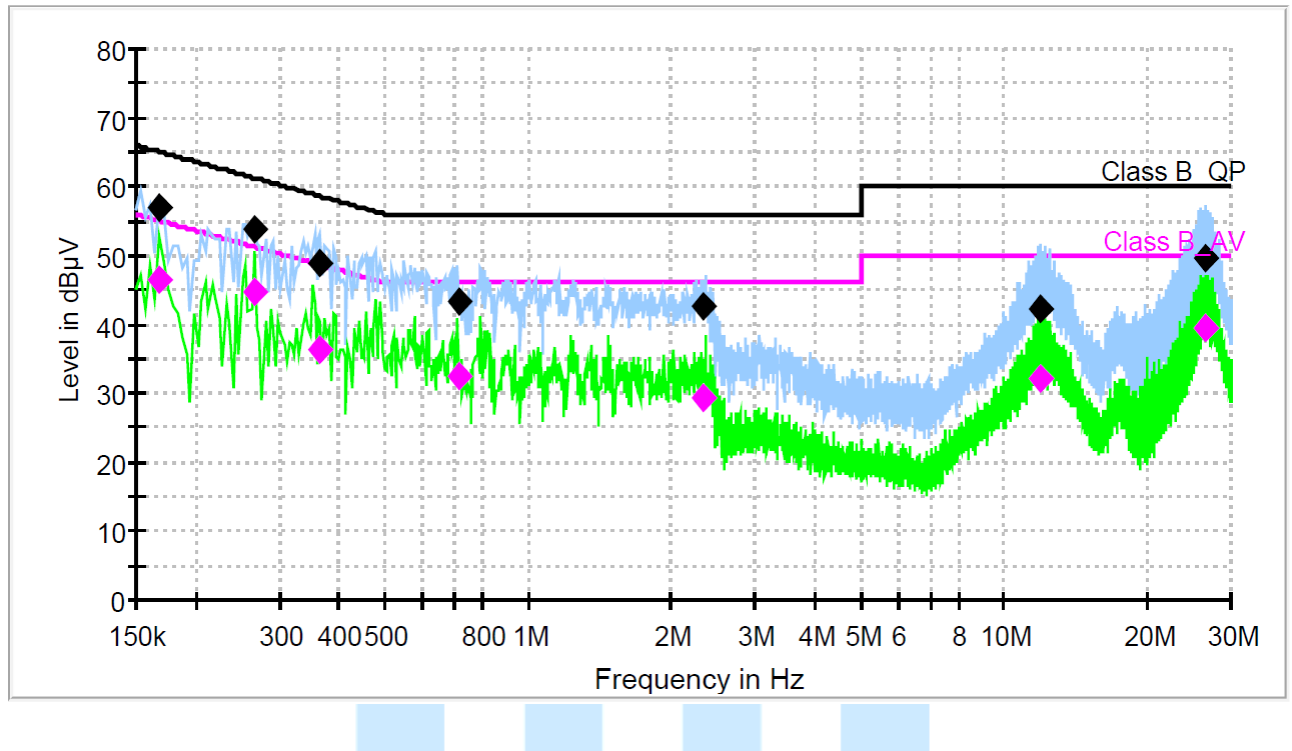
| Model Name       | Manufacturer    | Description       | Serial Number | Due to Calibration |
|------------------|-----------------|-------------------|---------------|--------------------|
| ■ - ESCI         | Rohde & Schwarz | EMI Test Receiver | 100237        | Apr. 18, 2017      |
| ■ - ENV216 (EUT) | Rohde & Schwarz | LISN              | 100173        | Apr. 19, 2017      |
| □ - ENV216 (A.E) | Rohde & Schwarz | LISN              | 100172        | Apr. 19, 2017      |
| □ - ESH2-Z5      | Rohde & Schwarz | LISN              | 829991/009    | Apr. 19, 2017      |
| □ - ESH3-Z2      | Rohde & Schwarz | Pulse limiter     | 357.8810.52   | Apr. 19, 2017      |
| □ - ISN T8       | TESEQ.GmbH      | ISN               | 24568         | Apr. 22, 2017      |
| ■ - EMC 32       | Rohde & Schwarz | Software          | Ver 8.53      | N/A                |

#### 5.6 Test data for Conducted Emission

- Test Date : Jan. 04, 2017  
 - Resolution Bandwidth : 9 kHz  
 - Frequency Range : 0.15 MHz ~ 30 MHz  
 - Line : L1: Live, N: Neutral



- Operating condition: Continuous RF output mode
- Black(◆) marker: Quasi Peak detector ; Pink(◆) marker: Average detector
- Black line: Peak value ; Pink line: Average value



#### Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.168650        | 56.9             | 1000.0          | 9.000           | Off    | N    | 9.6        | 8.1         | 65.0         |         |
| 0.265669        | 53.8             | 1000.0          | 9.000           | Off    | N    | 9.6        | 7.5         | 61.3         |         |
| 0.366219        | 48.9             | 1000.0          | 9.000           | Off    | N    | 9.7        | 9.6         | 58.6         |         |
| 0.716688        | 43.5             | 1000.0          | 9.000           | Off    | N    | 9.7        | 12.5        | 56.0         |         |
| 2.338438        | 42.7             | 1000.0          | 9.000           | Off    | L1   | 9.7        | 13.3        | 56.0         |         |
| 11.960525       | 42.3             | 1000.0          | 9.000           | Off    | L1   | 9.9        | 17.7        | 60.0         |         |
| 26.520938       | 49.5             | 1000.0          | 9.000           | Off    | L1   | 10.1       | 10.5        | 60.0         |         |

#### Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.168650        | 46.4            | 1000.0          | 9.000           | Off    | N    | 9.6        | 8.6         | 55.0         |         |
| 0.265669        | 44.9            | 1000.0          | 9.000           | Off    | N    | 9.6        | 6.4         | 51.3         |         |
| 0.366219        | 36.4            | 1000.0          | 9.000           | Off    | N    | 9.7        | 12.2        | 48.6         |         |
| 0.716688        | 32.5            | 1000.0          | 9.000           | Off    | N    | 9.7        | 13.5        | 46.0         |         |
| 2.338438        | 29.3            | 1000.0          | 9.000           | Off    | L1   | 9.7        | 16.7        | 46.0         |         |
| 11.960525       | 32.0            | 1000.0          | 9.000           | Off    | L1   | 9.9        | 18.0        | 50.0         |         |
| 26.520938       | 39.4            | 1000.0          | 9.000           | Off    | L1   | 10.1       | 10.6        | 50.0         |         |

< Fig 5. Graph of continuous disturbance >



## 6. Radiated Emission

### 6.1 Operating Environment

Temperature : 22.2 °C  
Relative Humidity : 42.5 % R.H.

### 6.2 Test Set-up

A preliminary and final measurement was at 3 m & 10 m anechoic chamber.  
The EUT was placed on a non-conductive turntable approximately 1.0 m above the ground plane.  
The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.  
This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 6.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

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

| Test Items(3 m Anechoic Chamber)                         | Uncertainty | Remark                                             |
|----------------------------------------------------------|-------------|----------------------------------------------------|
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)      | 4.78 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)    | 4.77 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)   | 5.06 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal) | 5.03 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m)           | 5.42 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (1 000 MHz ~ 18 000 MHz, 3 m)          | 5.64 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Test Items(10 m Anechoic Chamber)                        | Uncertainty | Remark                                             |
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)      | 4.36 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)    | 4.37 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)   | 4.49 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal) | 4.47 dB     | Confidence level of approximately 95 % ( $k = 2$ ) |

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



#### 6.4 Limit

| Equipment                                           | Operating frequency                        | RF Power generated by equipment (watts) | Field strength limit (μV/m)                                                                       | Distance (meters)                     |
|-----------------------------------------------------|--------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------|
| Any type unless otherwise specified (miscellaneous) | Any ISM frequency                          | Below 500<br>500 or more                | 25<br>$25 \times \text{SQRT}(\text{power}/500)$                                                   | 300<br><sup>1</sup> 300               |
|                                                     | <b><u>Any non-ISM frequency</u></b>        | <b><u>Below 500</u></b><br>500 or more  | <b><u>15</u></b><br>$15 \times \text{SQRT}(\text{power}/500)$                                     | <b><u>300</u></b><br><sup>1</sup> 300 |
| Industrial heaters and RF stabilized arc welders    | On or below 5,725 MHz<br>Above 5,725 MHz   | Any<br>Any                              | 10<br>(2)                                                                                         | 1,600<br>(2)                          |
| Medical diathermy                                   | Any ISM frequency<br>Any non-ISM frequency | Any<br>Any                              | 25<br>15                                                                                          | 300<br>300                            |
| Ultrasonic                                          | Below 490 kHz                              | Below 500<br>500 or more                | $2,400/\text{F}(\text{kHz})$<br>$2,400/\text{F}(\text{kHz}) \times \text{SQRT}(\text{power}/500)$ | 300<br><sup>3</sup> 300               |
|                                                     | 490 to 1,600 kHz<br>Above 1,600 kHz        | Any<br>Any                              | $24,000/\text{F}(\text{kHz})$<br>15                                                               | 30<br>30                              |
| Induction cooking ranges                            | Below 90 kHz<br>On or above 90 kHz         | Any<br>Any                              | 1,500<br>300                                                                                      | <sup>4</sup> 30<br><sup>4</sup> 30    |

#### Notes:

- \* Limit (at 300 m) =  $25 * (\text{RF Power}/500)^{1/2}$  [μV/m]
- \* Field Strength below 1,000 MHz (at 300 m) [μV/m] =  $10^{[(\text{Field strength at } 10\text{m}(\text{dBuV/m})-29.5)/20]}$
- \* Field Strength above 1,000 MHz (at 300 m) [μV/m] =  $K * 10^{[(\text{Field strength at } 3\text{m}(\text{dBuV/m})/20]}$



## 6.5 Test Equipment used

| Model Name                    | Manufacturer           | Description             | Serial Number              | Due to Calibration |
|-------------------------------|------------------------|-------------------------|----------------------------|--------------------|
| □ - ESIB26                    | Rohde & Schwarz        | EMI Test Receiver       | 830482/010                 | Apr. 18, 2017      |
| ■ - ESU40                     | Rohde & Schwarz        | EMI Test Receiver       | 100266                     | Jul. 20, 2017      |
| ■ - BBHA9120D                 | Schwarzbeck            | Horn ANT                | 207                        | Oct. 14, 2017      |
| ■ - 3160-09                   | ETS LINDGREN           | Horn ANT                | 218457                     | Feb. 11, 2017      |
| ■ - MCU066                    | maturio GmbH           | Position Controller     | 1390306                    | N/A                |
| ■ - TT2.5SI                   | maturio GmbH           | Turntable               | 1390307                    | N/A                |
| ■ - AM 4.0                    | maturio GmbH           | Antenna Mast            | 1390308                    | N/A                |
| ■ - AFS 44 00101800-25-10P-44 | MITEQ                  | Preamplifier            | 1258943                    | Dec. 06, 2017      |
| ■ - SCU-F1826-G47-BZ42-CSS(F) | Rohde & Schwarz        | Preamplifier            | 10003                      | Dec. 09, 2017      |
| ■ - WHKX3.0/18G-10SS          | WAINWRIGHT INSTRUMENTS | High pass filter        | SN31                       | Apr. 19, 2017      |
| ■ - ESR7                      | Rohde & Schwarz        | EMI Test Receiver       | 101382                     | Apr. 18, 2017      |
| ■ - VULB9160                  | Schwarzbeck            | Broad Band Test Antenna | 3193                       | Mar. 28, 2018      |
| ■ - 87405A                    | Agilent                | Preamplifier            | MY39500777                 | Dec. 06, 2017      |
| ■ - CO3000                    | Innco system GmbH      | Position Controller     | CO03000/779/<br>33050314/L | N/A                |
| ■ - DT3000                    | Innco system GmbH      | Turntable               | 1280314                    | N/A                |
| ■ - MA4000-EP                 | Innco system GmbH      | Antenna Mast            | 4420314                    | N/A                |

## 6.6 Test data for Radiated Emission

- Test Date : Dec. 29, 2016 ~ Jan. 12, 2017  
- Measurement Distance : 3 m, 10 m  
- Note : -

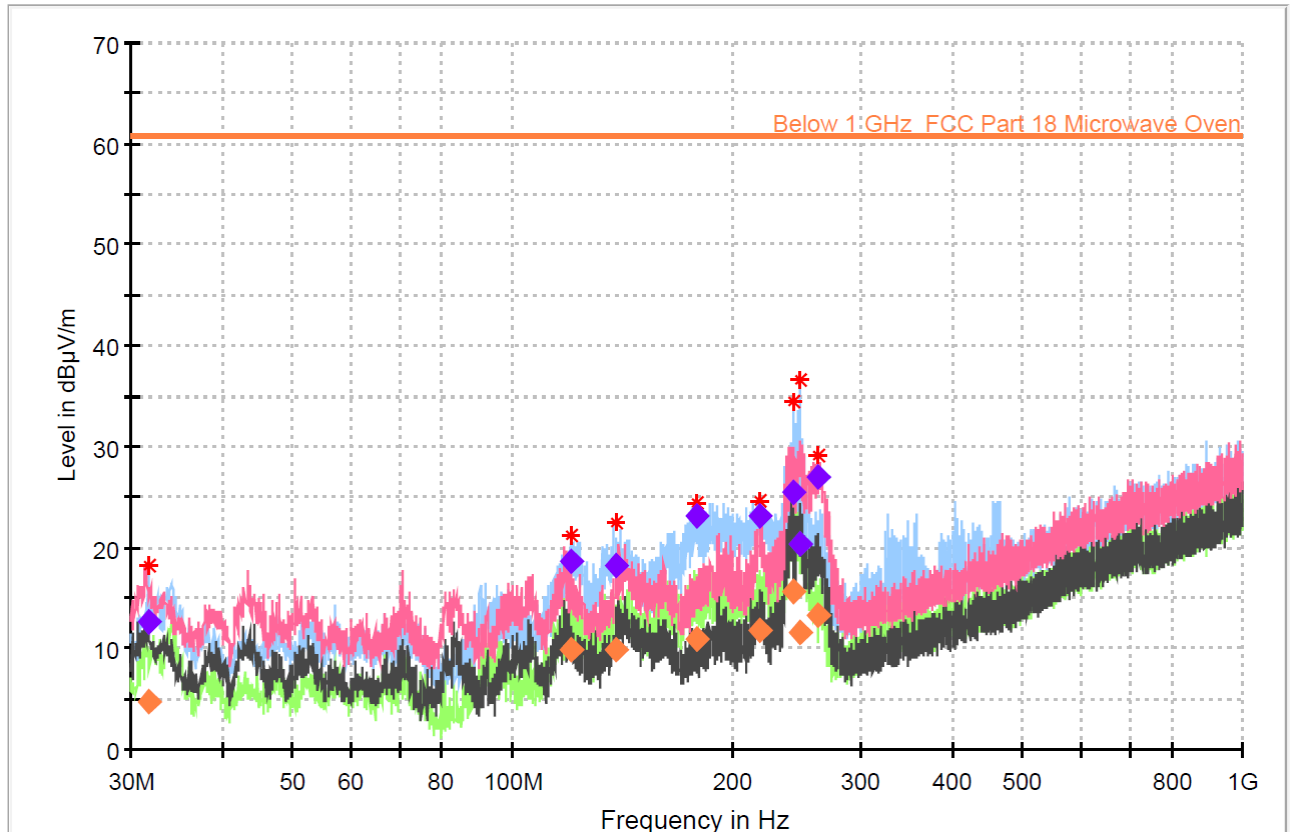
- Measurement

|                      |                       |                  |
|----------------------|-----------------------|------------------|
| Frequency range      | 30 MHz ~ 1 GHz @ 10 m | Above 1 GHz @ 3m |
| Detector mode        | Quasi peak            | Peak / Average   |
| Resolution bandwidth | 120 kHz               | 1 MHz            |



-, 30 MHz ~ 1 GHz

- Operating condition: Continuous RF output mode
- Violet(◆) marker: Quasi Peak detector ; Orange(◆) marker: Average detector  
Orange line: Average value



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV/m) | CAverage (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 31.646          | ---                | 4.74              | 60.72          | 55.98       | 1000.0          | 120.000         | 214.7       | V   | 8.0           | -13.1      |
| 31.646          | 12.55              | ---               | 60.72          | 48.17       | 1000.0          | 120.000         | 214.7       | V   | 8.0           | -13.1      |
| 120.431         | ---                | 9.76              | 60.72          | 50.96       | 1000.0          | 120.000         | 372.2       | H   | 237.0         | -11.4      |
| 120.431         | 18.66              | ---               | 60.72          | 42.06       | 1000.0          | 120.000         | 372.2       | H   | 237.0         | -11.4      |
| 138.281         | 18.28              | ---               | 60.72          | 42.44       | 1000.0          | 120.000         | 400.2       | H   | 257.0         | -10.2      |
| 138.281         | ---                | 9.76              | 60.72          | 50.96       | 1000.0          | 120.000         | 400.2       | H   | 257.0         | -10.2      |
| 178.757         | ---                | 11.02             | 60.72          | 49.70       | 1000.0          | 120.000         | 400.1       | H   | 69.0          | -10.8      |
| 178.757         | 23.03              | ---               | 60.72          | 37.69       | 1000.0          | 120.000         | 400.1       | H   | 69.0          | -10.8      |
| 217.668         | 23.13              | ---               | 60.72          | 37.59       | 1000.0          | 120.000         | 400.1       | H   | 341.0         | -11.6      |
| 217.668         | ---                | 11.72             | 60.72          | 49.00       | 1000.0          | 120.000         | 400.1       | H   | 341.0         | -11.6      |
| 242.774         | 25.46              | ---               | 60.72          | 35.26       | 1000.0          | 120.000         | 135.1       | H   | 124.0         | -10.5      |
| 242.774         | ---                | 15.71             | 60.72          | 45.01       | 1000.0          | 120.000         | 135.1       | H   | 124.0         | -10.5      |
| 248.398         | ---                | 11.62             | 60.72          | 49.10       | 1000.0          | 120.000         | 225.1       | H   | 288.0         | -10.2      |
| 248.398         | 20.33              | ---               | 60.72          | 40.39       | 1000.0          | 120.000         | 225.1       | H   | 288.0         | -10.2      |
| 262.372         | 26.93              | ---               | 60.72          | 33.79       | 1000.0          | 120.000         | 106.8       | V   | 100.0         | -9.7       |
| 262.372         | ---                | 13.26             | 60.72          | 47.46       | 1000.0          | 120.000         | 106.8       | V   | 100.0         | -9.7       |

< Fig 6. Radiated emission result (30 MHz ~ 1 000 MHz) >



-. 1 GHz ~ 26 GHz

| Freq [GHz] | Pol. | Load [mL] | Load Location | Reading [dBμV] | Limit [dBμV/m] @ 3m | Margin [dB] |
|------------|------|-----------|---------------|----------------|---------------------|-------------|
| 2.383      | H    | 700       | Center        | 65.90          | 71.18               | 5.28        |
| 2.396      | V    | 700       | Rt. Front     | 63.70          | 71.18               | 7.48        |
| 2.396      | V    | 300       | Center        | 61.70          | 71.18               | 9.48        |
| 2.399      | H    | 300       | Rt. Front     | 66.80          | 71.18               | 4.38        |
| 19.512     | V    | 300       | Rt. Front     | 49.80          | 71.18               | 21.38       |
| 19.526     | H    | 300       | Rt. Front     | 52.10          | 71.18               | 19.08       |

Notes:

- 1) Load for measurement of radiation on second and third harmonic: Two loads, one of 700 and the other of 300 mL, of water were used. Each load was tested both with the beaker located in the center of the oven and with it in the corner.
- 2) Load for all other measurements: 700 mL of water, with the beaker located in the center of the oven.
- 3) The tests were made with average detector for frequency range of 1 GHz to 26 GHz.



## 7. Input Power

### 7.1 Operating Environment

Temperature : 22.8 °C  
Relative Humidity : 35.3 % R.H.

### 7.2 Test Set-up

Test 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.

### 7.3 Test Equipment used

| Model Name | Manufacturer | Description     | Serial Number | Due to Calibration |
|------------|--------------|-----------------|---------------|--------------------|
| ■ - 360AMX | Pacific      | AC power source | 0438          | N/A                |
| ■ - PM6000 | Voltech      | Power analyzer  | 100006700132  | Mar. 04, 2017      |

### 7.4 Test data for Input Power

-. Test Date : Dec. 28, 2016  
-. Test condition : Continuous RF output mode (Load: 275 mL)  
-. Measurement

|           |                 |             |                       |                         |
|-----------|-----------------|-------------|-----------------------|-------------------------|
| Mode      | Input Voltage   | Current [A] | Power Consumption [W] | Manufacturer Rating [A] |
| Microwave | AC 120 V, 60 Hz | 12.61       | 1 415.0               | 10.4                    |



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

### 8.1 Operating Environment

Temperature : 19.4 °C  
Relative Humidity : 47.8 % R.H.

### 8.2 Test Set-up

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

### 8.3 Test Equipment used

| Model Name | Manufacturer | Description     | Serial Number | Due to Calibration |
|------------|--------------|-----------------|---------------|--------------------|
| ■ - 360AMX | Pacific      | AC power source | 0438          | N/A                |
| ■ - PM6000 | Voltech      | Power analyzer  | 100006700132  | Mar. 04, 2017      |

### 8.4 Test data for RF Power Output Measurement according to MP-5

-. Test Date : Dec. 28, 2016  
-. Test condition : Continuous RF output mode (Load: 1 000 mL)  
-. Measurement

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

|                   |                      |                   |              |
|-------------------|----------------------|-------------------|--------------|
| Quantity of Water | Starting Temperature | Final Temperature | Elapsed Time |
| 1 000 mL          | 9.6 °C               | 39.7 °C           | 120 Sec      |

$$\text{Power [W]} = \frac{4.187 \times 1\,000 \times 30.1}{120}$$

Power [W] = 1 050.24 Watts



## 9. Frequency Measurement

### 9.1 Operating Environment

Temperature : 23.3 °C  
Relative Humidity : 34.6 % R.H.

### 9.2 Test Equipment used

| Model Name                    | Manufacturer    | Description         | Serial Number | Due to Calibration |
|-------------------------------|-----------------|---------------------|---------------|--------------------|
| □ - ESIB26                    | Rohde & Schwarz | EMI Test Receiver   | 830482/010    | Apr. 18, 2017      |
| ■ - ESU40                     | Rohde & Schwarz | EMI Test Receiver   | 100266        | Jul. 20, 2017      |
| ■ - BBHA9120D                 | Schwarzbeck     | Horn ANT            | 207           | Oct. 14, 2017      |
| □ - 3160-09                   | ETS LINDGREN    | Horn ANT            | 218457        | Feb. 11, 2017      |
| ■ - MCU066                    | maturio GmbH    | Position Controller | 1390306       | N/A                |
| ■ - TT2.5SI                   | maturio GmbH    | Turntable           | 1390307       | N/A                |
| ■ - AM 4.0                    | maturio GmbH    | Antenna Mast        | 1390308       | N/A                |
| ■ - AFS 44 00101800-25-10P-44 | MITEQ           | Preamplifier        | 1258943       | Dec. 06, 2017      |
| □ - SCU-F1826-G47-BZ42-CSS(F) | Rohde & Schwarz | Preamplifier        | 10003         | Dec. 09, 2017      |

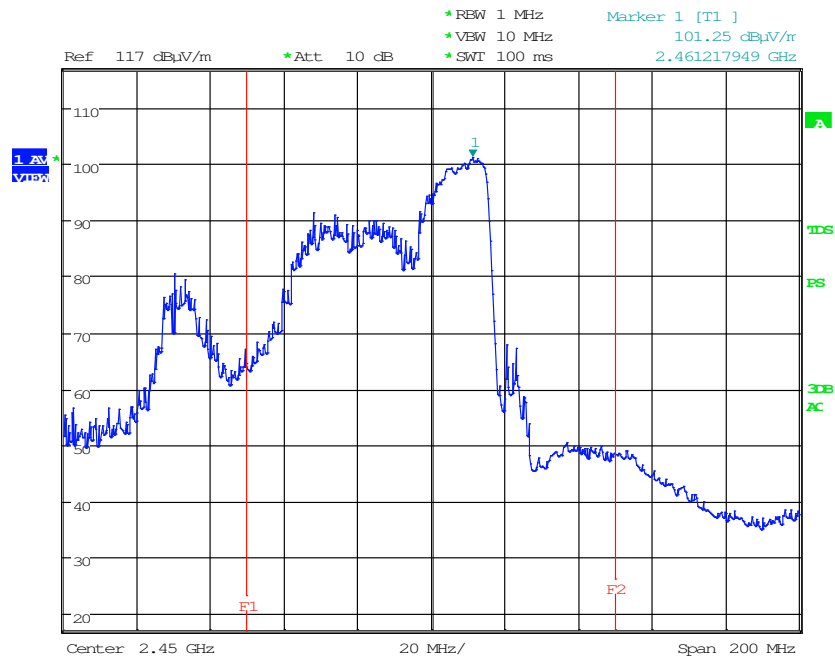
### 9.3 Test data for Frequency Measurement

#### 9.3.1 Line Voltage Variation Test

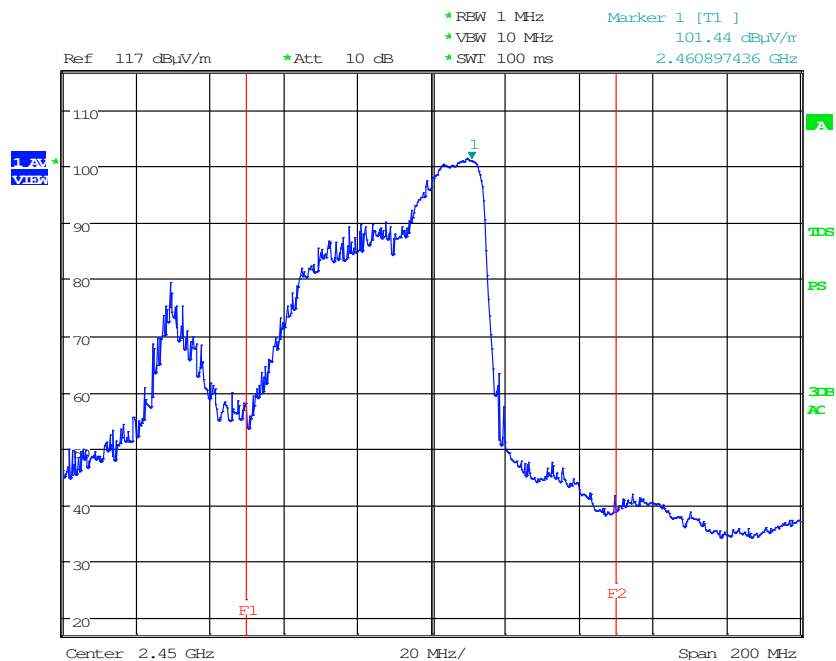
- Test Date : Dec. 30, 2016  
- Test condition : Continuous RF output mode  
- Test Voltage : AC 96 V, 60 Hz and AC 150 V, 60 Hz  
- Load : 1 000 mL  
- Fundamental Frequency : 2 450 MHz  
- Limit : 2.4 GHz < f < 2.5 GHz  
- Measurement : Maximum Frequency Observed – 2.461 GHz  
Minimum Frequency Observed – 2.460 GHz

#### 9.3.2 Load Variation Test

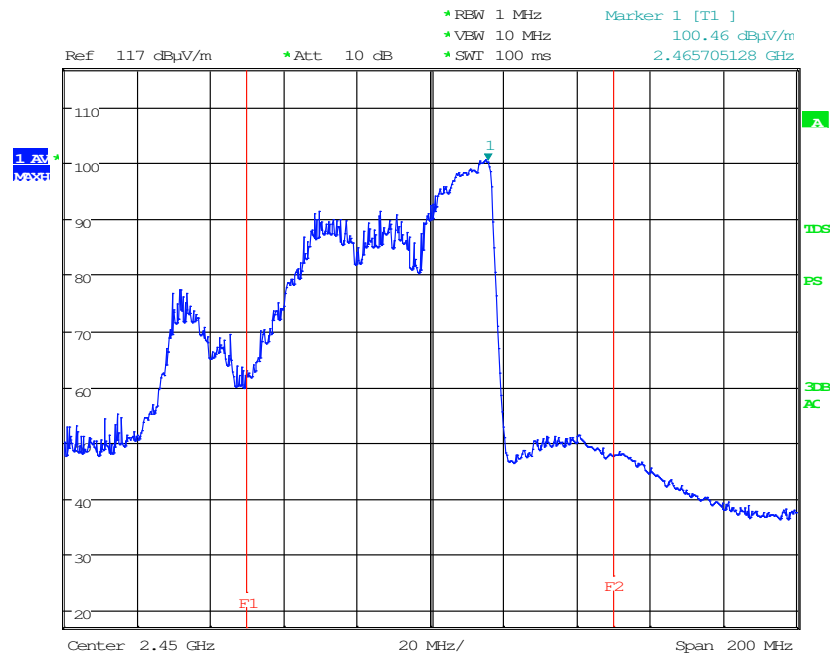
- Test Date : Dec. 30, 2016  
- Test condition : Continuous RF output mode  
- Test Voltage : AC 120 V, 60 Hz  
- Initial Load : 1 000 mL  
- Final Load : 200 mL  
- Fundamental Frequency : 2 450 MHz  
- Limit : 2.4 GHz < f < 2.5 GHz  
- Measurement : Maximum Frequency Observed – 2.478 GHz  
Minimum Frequency Observed – 2.463 GHz



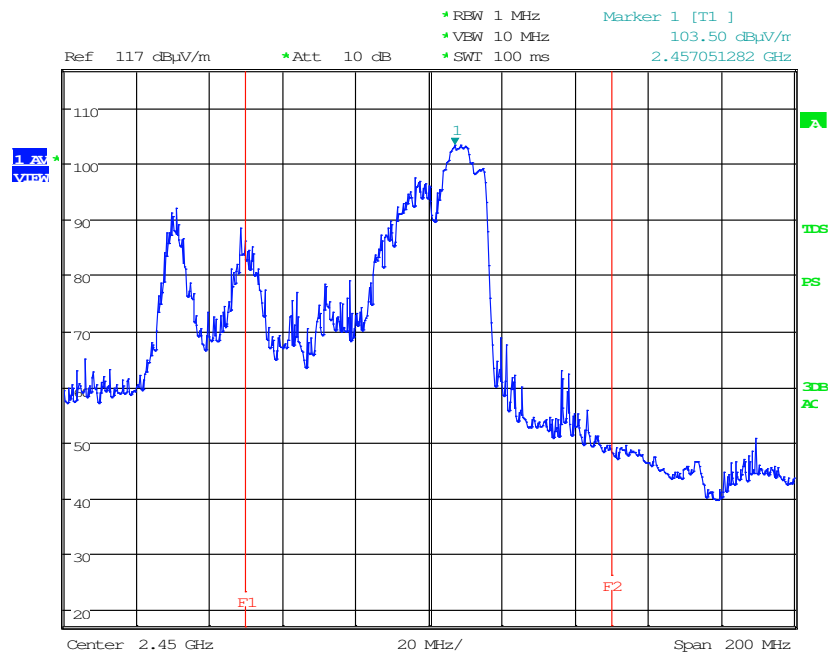
< Fig 7. Frequency Measurements (Maximum Frequency Observed: 2.461 GHz) >



< Fig 8. Frequency Measurements (Minimum Frequency Observed: 2.460 GHz) >



< Fig 9. Frequency Measurements (Maximum Frequency Observed: 2.465 GHz) >



< Fig 10. Frequency Measurements (Minimum Frequency Observed: 2.457 GHz) >



## 10. Power Density Safety Check

### 10.1 Test Set-up

The power density was checked to ensure that the power is not greater than  $1.0 \text{ mW/cm}^2$  at any location of the oven. The  $1.0 \text{ mW/cm}^2$  is in accordance with CDRH and UL923 standard.

*A microwave survey meter was placed on all sides, door and viewing, bottom, top and rear.*

*The leakage microwave and did not exceed the specified limits.*

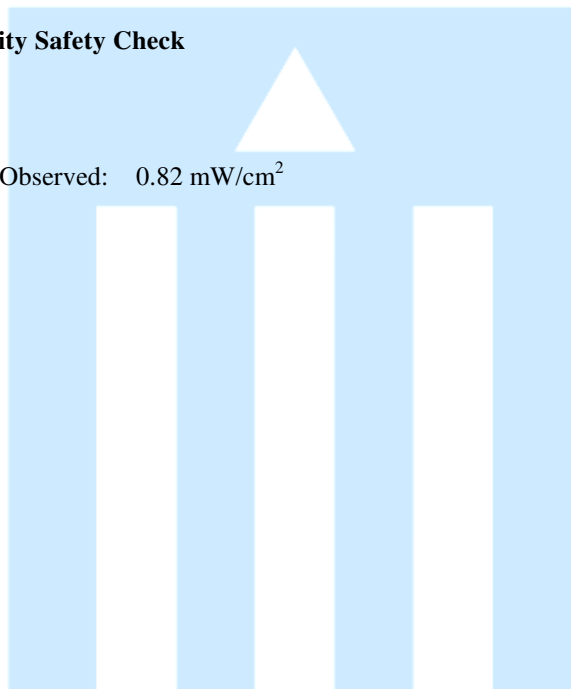
### 10.2 Test Equipment used

| Model Name  | Manufacturer | Description            | Serial Number | Due to Calibration |
|-------------|--------------|------------------------|---------------|--------------------|
| ■ - Holaday | ETS LINDGREN | Microwave Survey Meter | FJZ431 HA     | Jul. 30 2017       |

### 10.3 Test data for Power Density Safety Check

-. Measurement

Maximum Leakage Microwave Observed:  $0.82 \text{ mW/cm}^2$





## 11. Sample Calculations

$$\begin{aligned}\text{dB}\mu\text{V} &= 20 \text{ Log}_{10}(\mu\text{V}/\text{m}) \\ \text{dB}\mu\text{V} &= \text{dBm} + 107 \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)}\end{aligned}$$

### 11.1 Example 1 :

#### ■ 20.3 MHz

|                                      |                                               |
|--------------------------------------|-----------------------------------------------|
| Class B Limit                        | = 250 $\mu\text{V}$ = 48 dB $\mu\text{V}$     |
| Reading                              | = 39.2 dB $\mu\text{V}$                       |
| $10^{(39.2\text{dB}\mu\text{V}/20)}$ | = 91.2 $\mu\text{V}$                          |
| Margin                               | = 48 dB $\mu\text{V}$ - 39.2 dB $\mu\text{V}$ |
|                                      | = 8.8 dB                                      |

### 11.2 Example 2 :

#### ■ 66.7 MHz

|                             |                                                                   |
|-----------------------------|-------------------------------------------------------------------|
| Class B Limit               | = 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$     |
| Reading                     | = 31.0 dB $\mu\text{V}$                                           |
| Antenna Factor + Cable Loss | = 5.8 dB                                                          |
| Total                       | = 36.8 dB $\mu\text{V}/\text{m}$                                  |
| Margin                      | = 40.0 dB $\mu\text{V}/\text{m}$ - 36.8 dB $\mu\text{V}/\text{m}$ |
|                             | = 3.2 dB                                                          |



## 12. Recommendation & Conclusion

The data collected shows that the **LG ELECTRONICS USA. Microwave Oven (Model Name: MS1335GIS)** was complies with §18.305, 18.307, 18.309 and 18.311 of the FCC Rules.

- The end -

