

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

## ***FCC Class B (Class II Permissive Change)***

**Applicant: LG Electronics Inc.**

**222, LG-ro, Jinwi-myeon, Pyeongtaek-si,**

**Gyeonggi-do, 451-713, Korea**

**Attn: Mr. Sung-Wook Yoon / Chief research engineer**

**Date of Issue: February 24, 2014**

**Order Number: GETEC-C1-14-085**

**Test Report Number: GETEC-E3-14-018**

**Test Site: GUMI COLLEGE EMC CENTER**

**FCC Registration Number: (100749, 443957)**

**FCC ID. : BEJPB60GJE**

**Applicant : LG Electronics Inc.**


**Rule Part(s) : FCC Part 15 Subpart B**  
**Equipment Class : Class B computing device peripheral (JBP)**  
**EUT Type : DLP PROJECTOR**  
**Type of Authority : Certification(Class II Permissive change)**  
**Model Name : PB60G-JE**  
**Trade Name : LG**

**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 ANSI C63.4 (2009) / Canadian standard ICES-003**

**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 vest 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,**

**Reviewed by,**

  
**Young-Jib Park, Engineer**  
**GUMI COLLEGE EMC CENTER**

  
**Jae-Hoon Jeong, Technical Manager**  
**GUMI COLLEGE EMC CENTER**





## CONTENTS

|   |           |
|---|-----------|
| <b>1. GENERAL INFORMATION .....</b>                           | <b>3</b>  |
| <b>2. INTRODUCTION .....</b>                                  | <b>4</b>  |
| <b>3. PRODUCT INFORMATION .....</b>                           | <b>5</b>  |
| <b>3.1 DESCRIPTION OF EUT.....</b>                            | <b>5</b>  |
| <b>3.2 SUPPORT EQUIPMENT / CABLES USED .....</b>              | <b>6</b>  |
| <b>3.3 MODIFICATION ITEM(S).....</b>                          | <b>7</b>  |
| <b>4. DESCRIPTION OF TESTS.....</b>                           | <b>8</b>  |
| <b>4.1 TEST CONDITION.....</b>                                | <b>8</b>  |
| <b>4.2 CONDUCTED EMISSION.....</b>                            | <b>9</b>  |
| <b>4.3 RADIATED EMISSION.....</b>                             | <b>10</b> |
| <b>5. CONDUCTED EMISSION.....</b>                             | <b>11</b> |
| <b>5.1 OPERATING ENVIRONMENT .....</b>                        | <b>11</b> |
| <b>5.2 TEST SET-UP .....</b>                                  | <b>11</b> |
| <b>5.3 MEASUREMENT UNCERTAINTY.....</b>                       | <b>11</b> |
| <b>5.4 LIMIT .....</b>  | <b>12</b> |
| <b>5.5 TEST EQUIPMENT USED.....</b>                           | <b>12</b> |
| <b>5.6 TEST DATA FOR CONDUCTED EMISSION .....</b>             | <b>12</b> |
| <b>6. RADIATED EMISSION .....</b>                             | <b>15</b> |
| <b>6.1 OPERATING ENVIRONMENT .....</b>                        | <b>15</b> |
| <b>6.2 TEST SET-UP .....</b>                                  | <b>15</b> |
| <b>6.3 MEASUREMENT UNCERTAINTY.....</b>                       | <b>15</b> |
| <b>6.4 LIMIT .....</b>  | <b>16</b> |
| <b>6.5 TEST EQUIPMENT USED.....</b>                           | <b>16</b> |
| <b>6.6 TEST DATA FOR RADIATED EMISSION.....</b>               | <b>16</b> |
| <b>7. SAMPLE CALCULATIONS.....</b>                            | <b>21</b> |
| <b>7.1 EXAMPLE 1 : .....</b>                                  | <b>21</b> |
| <b>7.2 EXAMPLE 2 : .....</b>                                  | <b>21</b> |
| <b>8. RECOMMENDATION &amp; CONCLUSION.....</b>                | <b>22</b> |
| <br>  |           |
| <b>APPENDIX A – ATTESTATION STATEMENT</b>                     |           |
| <b>APPENDIX B – INFORMATION OF CLASS II PERMISSIVE CHANGE</b> |           |
| <b>APPENDIX C – TEST SET-UP PHOTOGRAPHS</b>                   |           |





*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 Inc.**

**Applicant Address: 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea**

**Manufacturer: LG Electronics Inc.**

**Manufacturer Address: 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea**

**Contact Person: Mr. Sung-Wook Yoon, Chief research engineer**

**Tel Number: +82-31-610-9623**

|                             |  |
|-----------------------------|--|
| ● <b>FCC ID.</b>            | BEJPB60GJE   |
| ● <b>EUT Type</b>           | DLP PROJECTOR  |
| ● <b>Model Name</b>         | PB60G-JE, PB60A-JE<br>(*These model names are given in accordance with manufacturer's request that are not effect on EMC performance. All the electrical and mechanical characteristics are the same as basic model.*) |
| ● <b>Trade Name</b>         | LG   |
| ● <b>Serial Number</b>      | Prototype  |
| ● <b>Rule Part(s)</b>       | FCC Part 15 Subpart B  |
| ● <b>Type of Authority</b>  | Certification(Class II Permissive change)  |
| ● <b>Test Procedure(s)</b>  | ANSI C63.4 (2009) / Canadian standard ICES-003   |
| ● <b>Dates of Test</b>      | February 13 ~ 18, 2014   |
| ● <b>Place of Test</b>      | <b>GUMI COLLEGE EMC CENTER</b> (FCC Registration Number: 100749, 443957)<br>37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.  |
| ● <b>Test Report Number</b> | GETEC-E3-14-018  |
| ● <b>Date of Issue</b>      | February 24, 2014  |

**EUT Type: DLP PROJECTOR**

**FCC ID.: BEJPB60GJE**





## 2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc.**

### **DLP PROJECTOR (Model Name: PB60G-JE)**

These measurement tests were conducted at **GUMI COLLEGE 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 college 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 (2009)

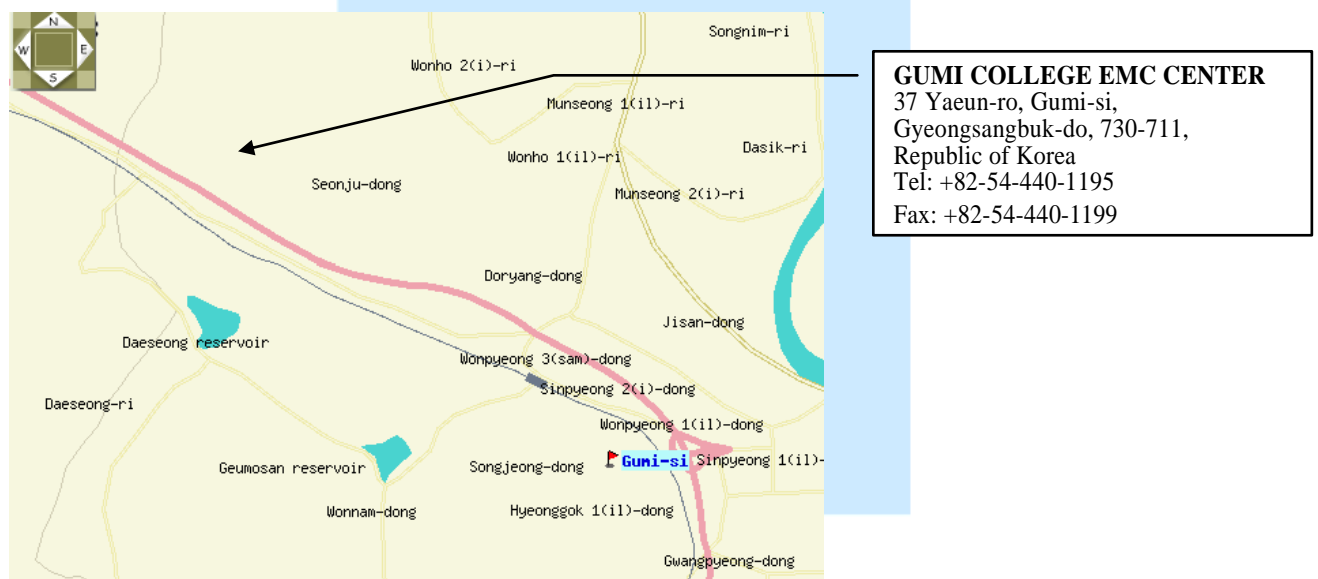


Fig 1. The map above shows the Gumi College in vicinity area.







### 3. Product Information

#### 3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics Inc.**  
**DLP PROJECTOR (Model Name: PB60G-JE) FCC ID.: BEJPB60GJE**

| MODELS                              | PB60G (PB60G-JE)  |                                 |
|-------------------------------------|---|---------------------------------|
| Resolution (Pixel)                  | 1280 (Horizontal) × 800 (Vertical)  |                                 |
| Aspect ratio                        | 16:10 (Horizontal:Vertical)   |                                 |
| Panel size (mm)                     | 11.623 (0.4 inch)   |                                 |
| Projection distance (Video size)    | 0.80 m - 3.25 m (63.5 cm - 254.0 cm)<br>31.4 inch - 127.9 inch (25 inch - 100 inch)   |                                 |
| Ratio of upward projection          | 100 %   |                                 |
| Working range of the remote control | 3 m (118.1 inch)  |                                 |
| Video input                         | NTSC M / PAL-B, D, G, H, I / PAL M / PAL N / PAL 60 / SECAM   |                                 |
| AC-DC Adaptor                       | 19.5 V  4.62 A / 19.0 V  3.42 A |                                 |
| Audio Output                        | 1 W + 1 W   |                                 |
| Height (mm)                         | 33.8 (without foot) (1.3 inch)  |                                 |
|                                     | 38.3 (with foot) (1.5 inch)   |                                 |
| Width (mm)                          | 158 (6.2 inch)  |                                 |
| Depth (mm)                          | 101.5 (4 inch)  |                                 |
| Weight (g)                          | 445 (1 lb)  |                                 |
| USB Device                          | 5 V, 0.5 A (Max.)   |                                 |
| Operation environment               | <b>Temperature</b>  |                                 |
|                                     | Operation   | 0 °C - 40 °C (32 °F - 104 °F)   |
|                                     | Storage   | -20 °C - 60 °C (-4 °F - 140 °F) |
|                                     | <b>Relative Humidity</b>  |                                 |
|                                     | Operation   | 0 % - 80 %                      |
|                                     | Storage   | 0 % - 85 %                      |

-. Maximum Frequency Range : 667 MHz

EUT Type: DLP PROJECTOR

FCC ID.: BEJPB60GJE





### 3.2 Support Equipment / Cables used

#### 3.2.1 Used Support Equipment

| Description      | Manufacturer                | Model Name       | S/N & FCC ID.                                    |
|------------------|-----------------------------|------------------|--|
| PC(Main board)   | ASROCK Inc.                 | 770iCafe         | S/N: 0AM0X3097310<br>FCC ID.: DoC                |
| Graphic card     | ASUSTEK COMPUTER Inc.       | GTX660-DC2O-2GD5 | S/N: CBC0YZ100131<br>FCC ID.: DoC                |
| PS2 keyboard     | COMPAQ                      | 166516-AD6       | S/N: B13BBOR391006D<br>FCC ID.: AQ6-23K15        |
| USB mouse        | Microsoft Corporation       | 1484             | S/N: 0352700289761<br>FCC ID: DoC                |
| DVD player       | ILIKE ELECTRONICS CO., LTD. | CVX-3800 Full-HD | S/N: CVX380020110110493<br>FCC ID.: Verification |
| Headphone        | PHILIPS                     | SBC HL140        | S/N: None<br>FCC ID.: N/A                        |
| USB memory stick | TRANSCEND INFORMATION INC.  | jetFlash700      | S/N: B01963 8059<br>FCC ID.: N/A                 |

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

#### 3.2.2 System configuration

| Description           | Manufacturer       | Model Name  | S/N & FCC ID.                       |
|-----------------------|--------------------|-------------|-------------------------------------|
| Adapter <sup>1)</sup> | APD                | DA-65G19    | S/N; None.<br>FCC ID.: Verification |
| IR Remote controller  | OHSUNG ELECTRONICS | MKJ50025109 | S/N; None.<br>FCC ID.: N/A          |

1) Input rating: AC (100 – 240) V ~, (50/60) Hz, 1.6 A / Output rating: DC 19 V, 3.42 A





### 3.2.3 Used Cable(s)

| Cable Name              | Condition                                 | Description                         |
|-------------------------|---|-------------------------------------|
| Power cable             | Connected to the EUT(Adapter)             | 1.00 m unshielded                   |
| Adaptor cable           | Connected to the EUT(Adapter) and EUT     | 1.50 m shielded with a ferrite core |
| HDMI (Digital) in cable | Connected to the EUT and PC               | 1.80 m shielded                     |
| RGB(Analog) in cable    | Connected to the EUT and PC               | 1.50 m shielded                     |
| AV in cable             | Connected to the EUT and DVD player       | 3.00 m shielded                     |
| Headphone cable         | Connected to the EUT and headphone        | 1.20 m shielded                     |
| USB                     | Connected to the EUT and USB memory stick | -                                   |

### 3.3 Modification Item(s)

- None





## 4. Description of tests

### 4.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

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

- Test Voltage / Frequency : AC 120 V / 60 Hz

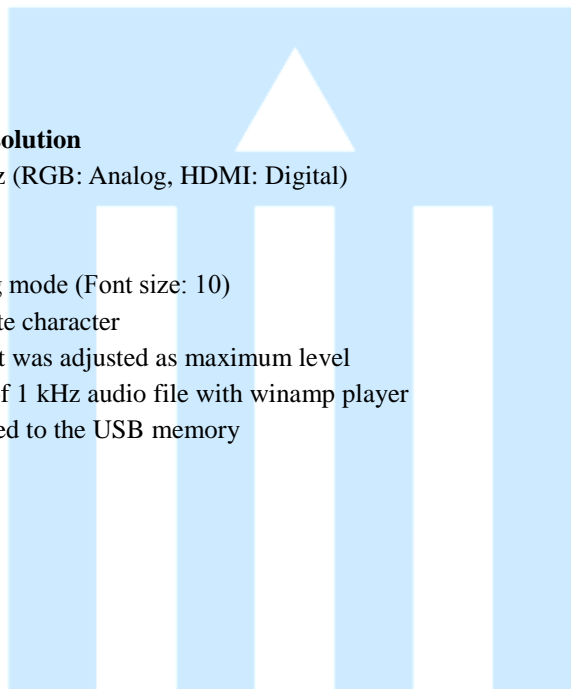
- Test Mode(s)

- **Monitor mode test resolution**

- 1 680 × 1 050 / 60 Hz (RGB: Analog, HDMI: Digital)

- **Operating test pattern**

- "H" character scrolling mode (Font size: 10)
- Black background white character
- Brightness and contrast was adjusted as maximum level
- Continuous playback of 1 kHz audio file with winamp player
- USB port was connected to the USB memory





## 4.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Registration No.: 100749)

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

The EUT is powered from the Rohde & Schwarz LISN (ESH2-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH3-Z5). 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.

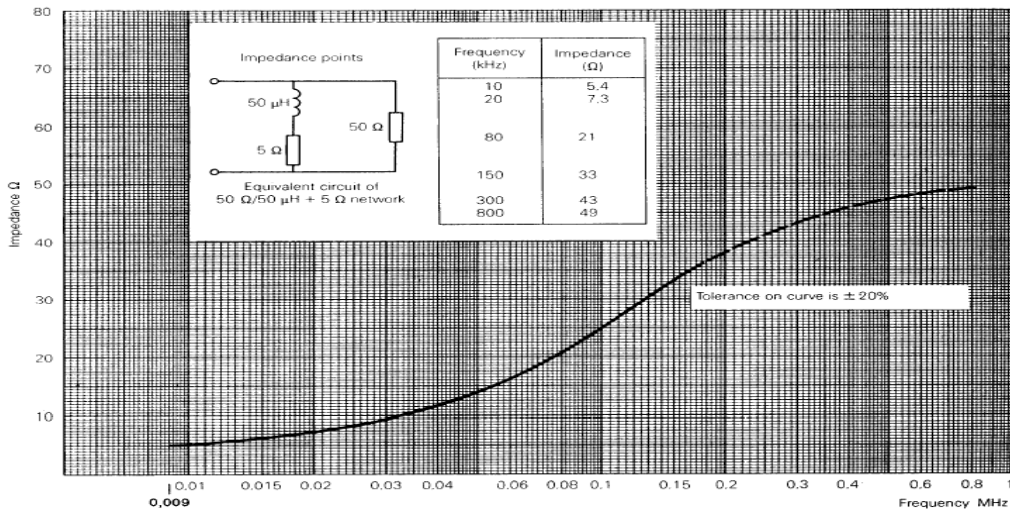


Fig 2. Impedance of LISN





### 4.3 Radiated Emission

Exploratory Radiated measurements were conducted at the 3m 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 1GHz were made at 3m Chamber (FCC Registration No.: 443957) or Open area test site (FCC Registration No.: 100749) that complies with CISPR 16/ANSI C63.4.

Above 1GHz final measurements were conducted at the 3m Chamber (FCC Registration No.: 443957) only.

For measurements above 1GHz, the bottom side of 3m 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 1GHz) and Peak & Average mode (Above 1GHz).

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.

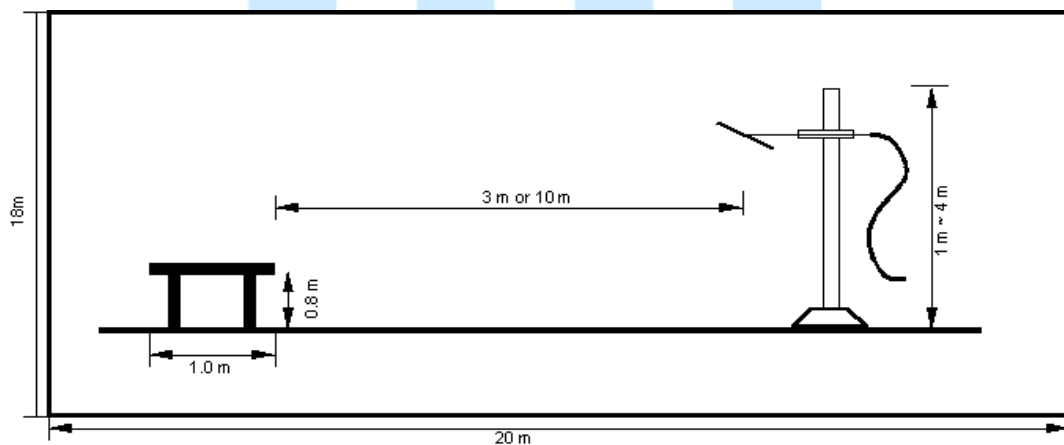


Fig 3. Dimensions of test site (Below 1GHz)

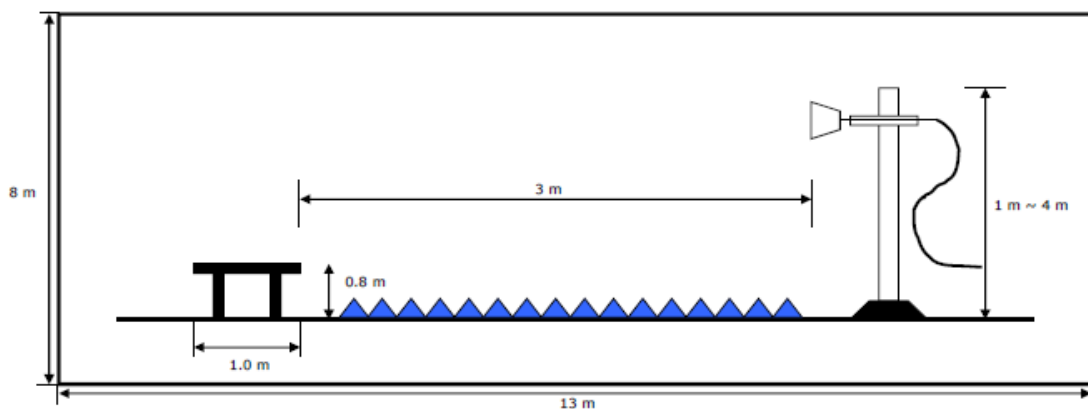


Fig 4. Dimensions of test site (Above 1GHz)





## 5. Conducted Emission

### 5.1 Operating Environment

Temperature : 21.0 °C  
Relative Humidity : 40.6 % R.H.

### 5.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 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)  | $\pm 2.74$ dB | Confidence level of approximately 95 % ( $k = 2$ ) |
| Conducted emission (150 kHz ~ 30 MHz) | $\pm 4.25$ dB | Confidence level of approximately 95 % ( $k = 2$ ) |





#### 5.4 Limit

| RFI Conducted     | FCC Limit(dB $\mu$ V/m) Class B |          |
|-------------------|---------------------------------|----------|
|                   | 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        | May 3. 2014        |
| ■ - ESH3-Z5 | Rohde & Schwarz | LISN              | 838979/020    | May 3. 2014        |
| ■ - ESH2-Z5 | Rohde & Schwarz | LISN              | 829991/009    | May 3. 2014        |
| □ - ISN T8  | TESEQ. GmbH     | ISN               | 24568         | Jul 10. 2014       |

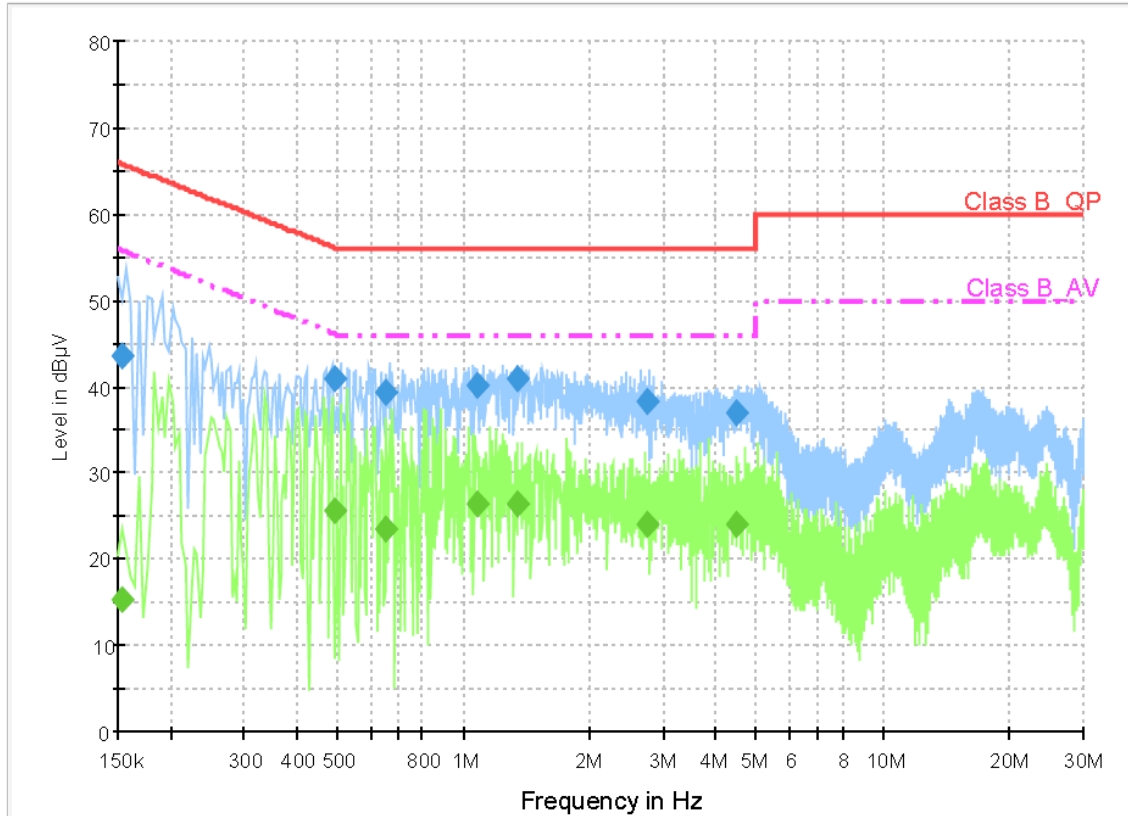
#### 5.6 Test data for Conducted Emission

- Test Date : February 18. 2014
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz
- Line : L1: Live, N: Neutral





- Operating condition: 1 680 × 1 080 / 60 Hz (RGB: Analog)



### Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|---------|
| 0.152962        | 43.5             | 1000.0          | 9.000           | GND | L1   | 10.0       | 22.3        | 65.8         |         |
| 0.495495        | 40.8             | 1000.0          | 9.000           | GND | N    | 10.0       | 15.3        | 56.1         |         |
| 0.652289        | 39.4             | 1000.0          | 9.000           | GND | N    | 10.0       | 16.6        | 56.0         |         |
| 1.079286        | 40.0             | 1000.0          | 9.000           | GND | N    | 10.1       | 16.0        | 56.0         |         |
| 1.339504        | 40.9             | 1000.0          | 9.000           | GND | N    | 10.1       | 15.1        | 56.0         |         |
| 2.739742        | 38.4             | 1000.0          | 9.000           | GND | L1   | 10.1       | 17.6        | 56.0         |         |
| 4.495760        | 37.0             | 1000.0          | 9.000           | GND | L1   | 10.0       | 19.0        | 56.0         |         |

### Final Result 2

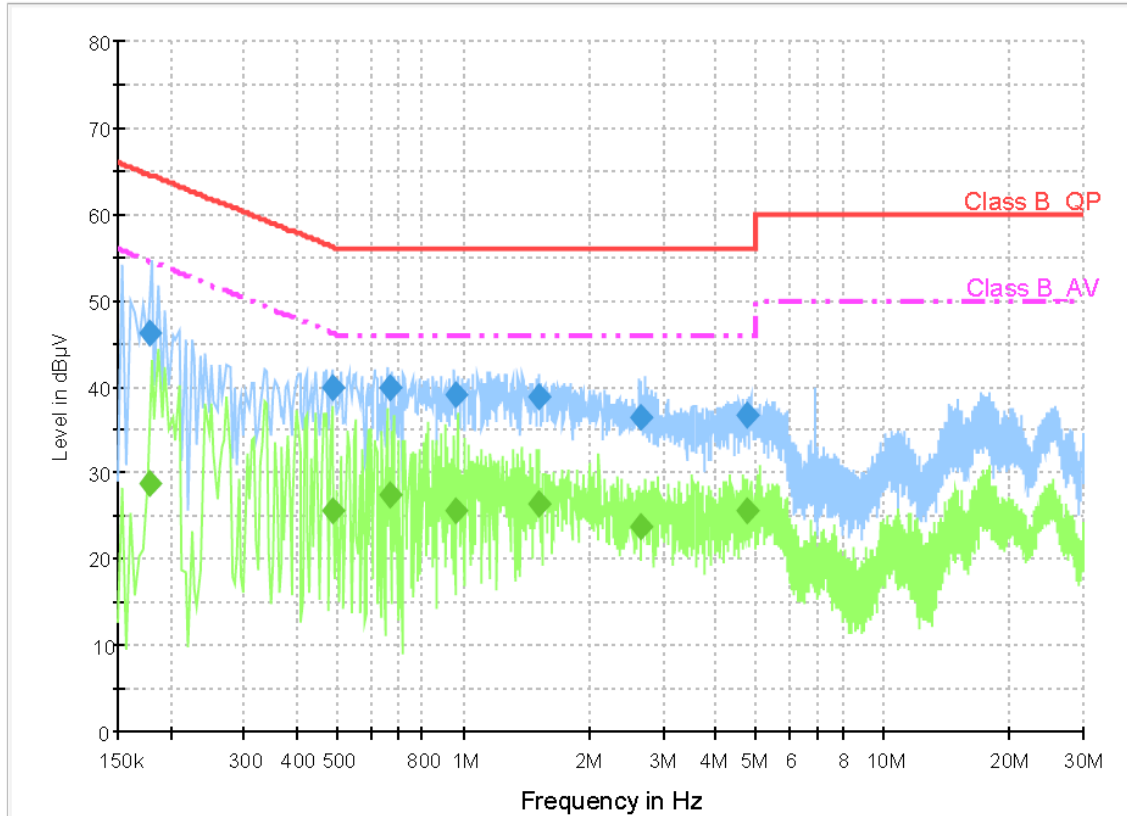
| Frequency (MHz) | CAverage (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|-----------------|-----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|---------|
| 0.152962        | 15.4            | 1000.0          | 9.000           | GND | L1   | 10.0       | 40.4        | 55.8         |         |
| 0.495495        | 25.7            | 1000.0          | 9.000           | GND | N    | 10.0       | 20.4        | 46.1         |         |
| 0.652289        | 23.5            | 1000.0          | 9.000           | GND | N    | 10.0       | 22.5        | 46.0         |         |
| 1.079286        | 26.4            | 1000.0          | 9.000           | GND | N    | 10.1       | 19.6        | 46.0         |         |
| 1.339504        | 26.3            | 1000.0          | 9.000           | GND | N    | 10.1       | 19.7        | 46.0         |         |
| 2.739742        | 24.0            | 1000.0          | 9.000           | GND | L1   | 10.1       | 22.0        | 46.0         |         |
| 4.495760        | 24.2            | 1000.0          | 9.000           | GND | L1   | 10.0       | 21.8        | 46.0         |         |

< Fig 5. Conducted emission result >





- Operating condition: 1 680 × 1 080 / 60 Hz (HDMI: Digital)



### Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|---------|
| 0.179350        | 46.1             | 1000.0          | 9.000           | GND | L1   | 10.0       | 18.4        | 64.5         |         |
| 0.489666        | 39.9             | 1000.0          | 9.000           | GND | N    | 10.0       | 16.3        | 56.2         |         |
| 0.665014        | 39.8             | 1000.0          | 9.000           | GND | N    | 10.0       | 16.2        | 56.0         |         |
| 0.956414        | 39.0             | 1000.0          | 9.000           | GND | N    | 10.0       | 17.0        | 56.0         |         |
| 1.506470        | 38.8             | 1000.0          | 9.000           | GND | N    | 10.1       | 17.2        | 56.0         |         |
| 2.638258        | 36.4             | 1000.0          | 9.000           | GND | L1   | 10.1       | 19.6        | 56.0         |         |
| 4.759521        | 36.8             | 1000.0          | 9.000           | GND | L1   | 10.0       | 19.2        | 56.0         |         |

### Final Result 2

| Frequency (MHz) | CAverage (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|-----------------|-----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|---------|
| 0.179350        | 28.7            | 1000.0          | 9.000           | GND | L1   | 10.0       | 25.8        | 54.5         |         |
| 0.489666        | 25.7            | 1000.0          | 9.000           | GND | N    | 10.0       | 20.5        | 46.2         |         |
| 0.665014        | 27.3            | 1000.0          | 9.000           | GND | N    | 10.0       | 18.7        | 46.0         |         |
| 0.956414        | 25.6            | 1000.0          | 9.000           | GND | N    | 10.0       | 20.4        | 46.0         |         |
| 1.506470        | 26.4            | 1000.0          | 9.000           | GND | N    | 10.1       | 19.6        | 46.0         |         |
| 2.638258        | 23.6            | 1000.0          | 9.000           | GND | L1   | 10.1       | 22.4        | 46.0         |         |
| 4.759521        | 25.5            | 1000.0          | 9.000           | GND | L1   | 10.0       | 20.5        | 46.0         |         |

< Fig 6. Conducted emission result >





## 6. Radiated Emission

### 6.1 Operating Environment

Temperature : 22.3 °C  
 Relative Humidity : 34.4 % R.H.

### 6.2 Test Set-up

A preliminary and final measurement was at 3 m anechoic chamber.  
 The EUT was placed on a non-conductive turntable approximately 0.8 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(Anechoic chamber)                             | Uncertainty | Remark   |
|--|-------------|--|
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)      | ± 4.66 dB   | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)    | ± 4.44 dB   | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)   | ± 4.73 dB   | Confidence level of approximately 95 % ( $k = 2$ ) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal) | ± 4.77 dB   | Confidence level of approximately 95 % ( $k = 2$ ) |
| Test Items(Anechoic Chamber)                             | Uncertainty | Remark   |
| Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m)           | ± 4.89 dB   | Confidence level of approximately 95 % ( $k = 2$ ) |





#### 6.4 Limit

| Frequency (MHz) | FCC Limit @ 3 m. dB $\mu$ V/m | CISPR Limit @ 10 m. dB $\mu$ V/m |
|-----------------|-------------------------------|----------------------------------|
| 30 ~ 88         | 40.0                          | 30.0                             |
| 88 ~ 216        | 43.5                          | 30.0                             |
| 216 ~ 230       | 46.0                          | 30.0                             |
| 230 ~ 960       | 46.0                          | 37.0                             |
| 960 ~ 1 000     | 54.0                          | 37.0                             |
| > 1 000         | 54.0                          | No Specified limit               |

#### 6.5 Test Equipment used

| Model Name                    | Manufacturer    | Description            | Serial Number | Due to Calibration |
|-------------------------------|-----------------|------------------------|---------------|--------------------|
| ■ - ESCS30                    | Rohde & Schwarz | EMI Test Receiver      | 839809/003    | May 03. 2014       |
| ■ - VULB9160                  | Schwarzbeck     | Broadband Test Antenna | 3193          | Mar. 15. 2014      |
| ■ - HD100                     | HD GmbH         | Position Controller    | 100/692/01    | N/A                |
| ■ - DS415S                    | HD GmbH         | Turntable              | 415/657/01    | N/A                |
| ■ - MA240                     | HD GmbH         | Antenna Mast           | 240/565/01    | N/A                |
| ■ - ESIB26                    | Rohde & Schwarz | EMI Test Receiver      | 830482/010    | May 2. 2014        |
| ■ - BBHA9120D                 | Schwarzbeck     | Horn Antenna           | 597           | Feb 28. 2015       |
| ■ - MCU066                    | maturo GmbH     | Position Controller    | 1390306       | N/A                |
| ■ - TT2.5SI                   | maturo GmbH     | Turntable              | 1390307       | N/A                |
| ■ - AM 4.0                    | maturo GmbH     | Antenna Mast           | 1390308       | N/A                |
| ■ - AFS 44 00101800-25-10P-44 | MITEQ           | Preamplifier           | 1258943       | Jan 15. 2015       |

#### 6.6 Test data for Radiated Emission

- Test Date : February 13 ~ 14. 2014
- Measurement Distance : 3 m
- Note : The EUT was tested made up 18 GHz, because, it was required from the client

#### - Measurement

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

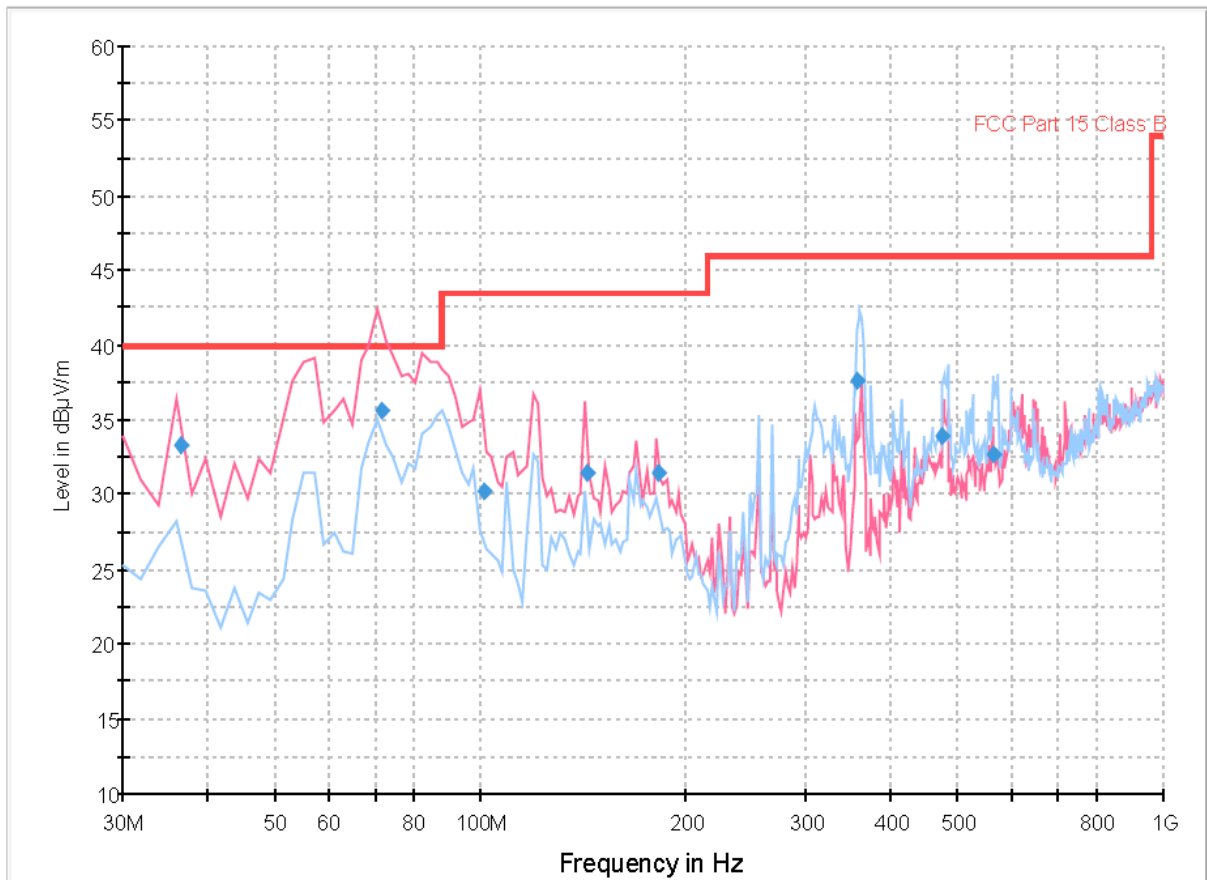
EUT Type: DLP PROJECTOR

FCC ID.: BEJPB60GJE





- Operating condition: 1 680 × 1 050 / 60 Hz (RGB: Analog)



### Final Result 1

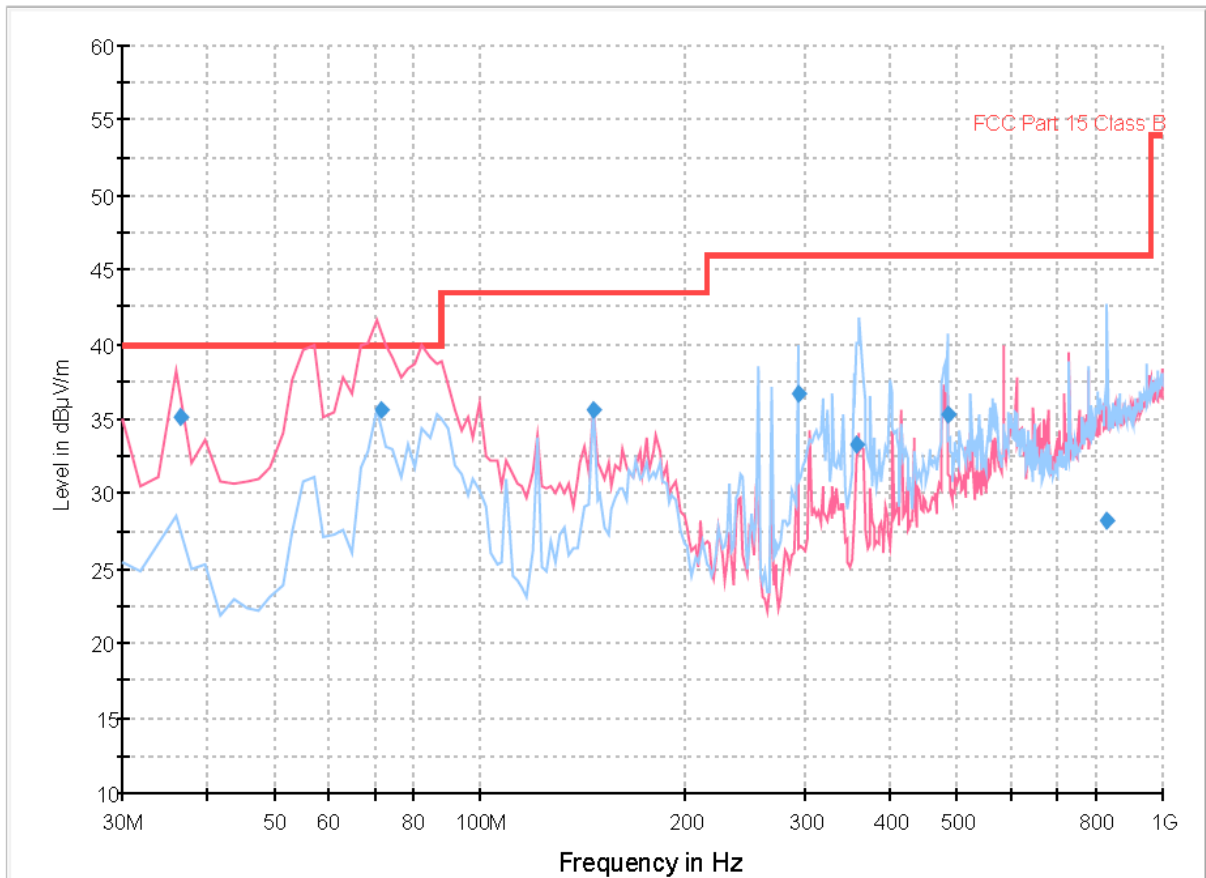
| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 36.575663       | 33.3               | 1000.0          | 100.000         | 100.0       | V            | 19.0          | 11.8       | 6.7         | 40.0           |
| 71.651143       | 35.7               | 1000.0          | 100.000         | 100.0       | V            | 330.0         | 11.4       | 4.3         | 40.0           |
| 101.240460      | 30.3               | 1000.0          | 100.000         | 100.0       | V            | 250.0         | 10.7       | 13.3        | 43.5           |
| 143.776991      | 31.5               | 1000.0          | 100.000         | 100.0       | V            | 47.0          | 14.9       | 12.0        | 43.5           |
| 182.802747      | 31.4               | 1000.0          | 100.000         | 100.0       | V            | 181.0         | 13.4       | 12.1        | 43.5           |
| 356.809422      | 37.7               | 1000.0          | 100.000         | 100.0       | H            | 100.0         | 18.6       | 8.3         | 46.0           |
| 476.148240      | 34.0               | 1000.0          | 100.000         | 100.0       | H            | 156.0         | 21.7       | 12.0        | 46.0           |
| 562.491577      | 32.7               | 1000.0          | 100.000         | 100.0       | H            | 15.0          | 23.9       | 13.3        | 46.0           |

< Fig 7. Radiated emission result (30 MHz ~ 1 000 MHz) >





- Operating condition: 1 680 × 1 050 / 60 Hz (HDMI: Digital)



**Final Result 1**

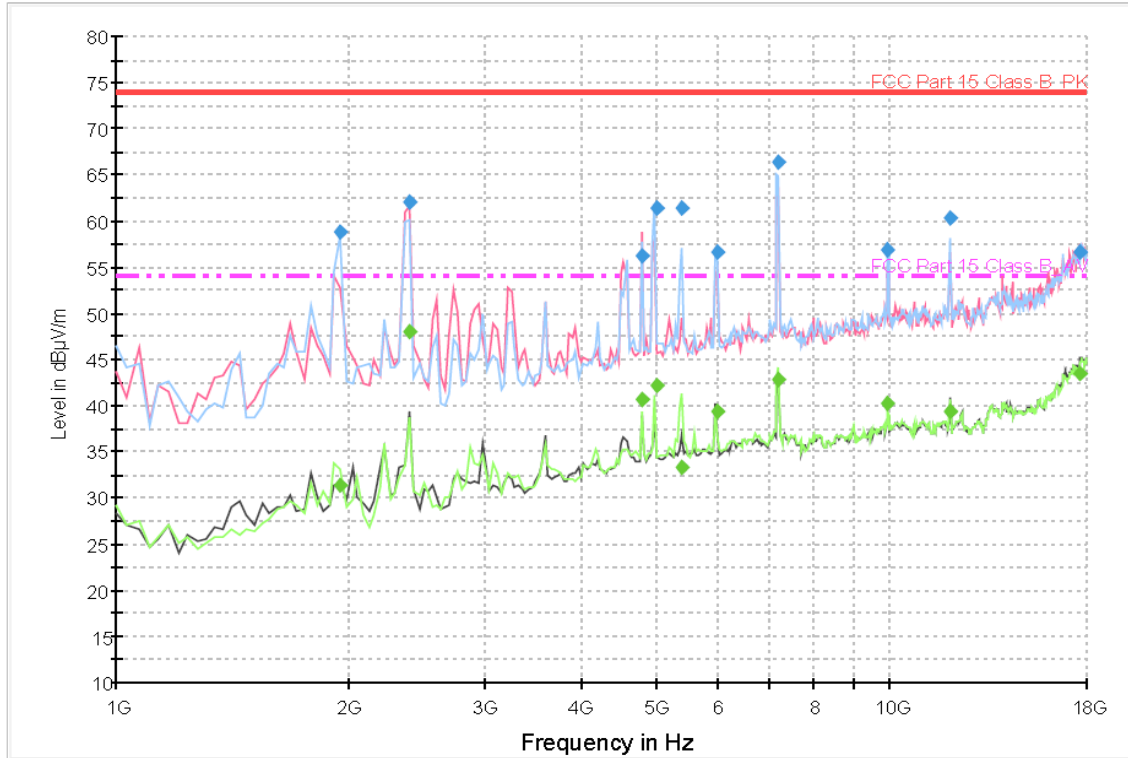
| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|--------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 36.575663       | 35.1               | 1000.0          | 100.000         | 100.0       | V            | 15.0          | 11.8       | 4.9         | 40.0           |
| 71.651143       | 35.7               | 1000.0          | 100.000         | 100.0       | V            | 57.0          | 11.4       | 4.3         | 40.0           |
| 146.247267      | 35.7               | 1000.0          | 100.000         | 200.0       | H            | 288.0         | 14.9       | 7.8         | 43.5           |
| 292.514350      | 36.7               | 1000.0          | 100.000         | 200.0       | H            | 244.0         | 16.6       | 9.4         | 46.0           |
| 356.729422      | 33.3               | 1000.0          | 100.000         | 100.0       | H            | 105.0         | 18.6       | 12.7        | 46.0           |
| 483.988240      | 35.2               | 1000.0          | 100.000         | 200.0       | H            | 52.0          | 21.9       | 10.8        | 46.0           |
| 825.749764      | 28.2               | 1000.0          | 100.000         | 200.0       | H            | 296.0         | 28.7       | 17.8        | 46.0           |

< Fig 8. Radiated emission result (30 MHz ~ 1 000 MHz) >





- Operating condition: 1 680 × 1 050 / 60 Hz (RGB: Analog)
- Green marker: Average detector (trace: green, black), Blue marker: Peak detector (trace: red, blue)



### Final Result 1

| Frequency (MHz) | MaxPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1954.3078       | 58.8             | 1000.0          | 1000.000        | 100.0       | H            | 13.0          | -8.8       | 15.2        | 74.0           |
| 2397.5936       | 62.2             | 1000.0          | 1000.000        | 100.0       | V            | 219.0         | -7.5       | 11.8        | 74.0           |
| 4797.9631       | 56.3             | 1000.0          | 1000.000        | 100.0       | V            | 271.0         | 1.0        | 17.7        | 74.0           |
| 4995.1719       | 61.4             | 1000.0          | 1000.000        | 100.0       | H            | 218.0         | 1.2        | 12.6        | 74.0           |
| 5391.9896       | 61.5             | 1000.0          | 1000.000        | 100.0       | H            | 176.0         | 1.8        | 12.5        | 74.0           |
| 5991.5479       | 56.7             | 1000.0          | 1000.000        | 100.0       | H            | 211.0         | 2.9        | 17.3        | 74.0           |
| 7201.5327       | 66.5             | 1000.0          | 1000.000        | 200.0       | H            | 242.0         | 6.1        | 7.5         | 74.0           |
| 9964.7198       | 56.9             | 1000.0          | 1000.000        | 100.0       | H            | 127.0         | 11.9       | 17.1        | 74.0           |
| 11966.3399      | 60.4             | 1000.0          | 1000.000        | 100.0       | H            | 194.0         | 12.2       | 13.6        | 74.0           |
| 17656.9186      | 56.6             | 1000.0          | 1000.000        | 200.0       | V            | 192.0         | 19.0       | 17.4        | 74.0           |

### Final Result 2

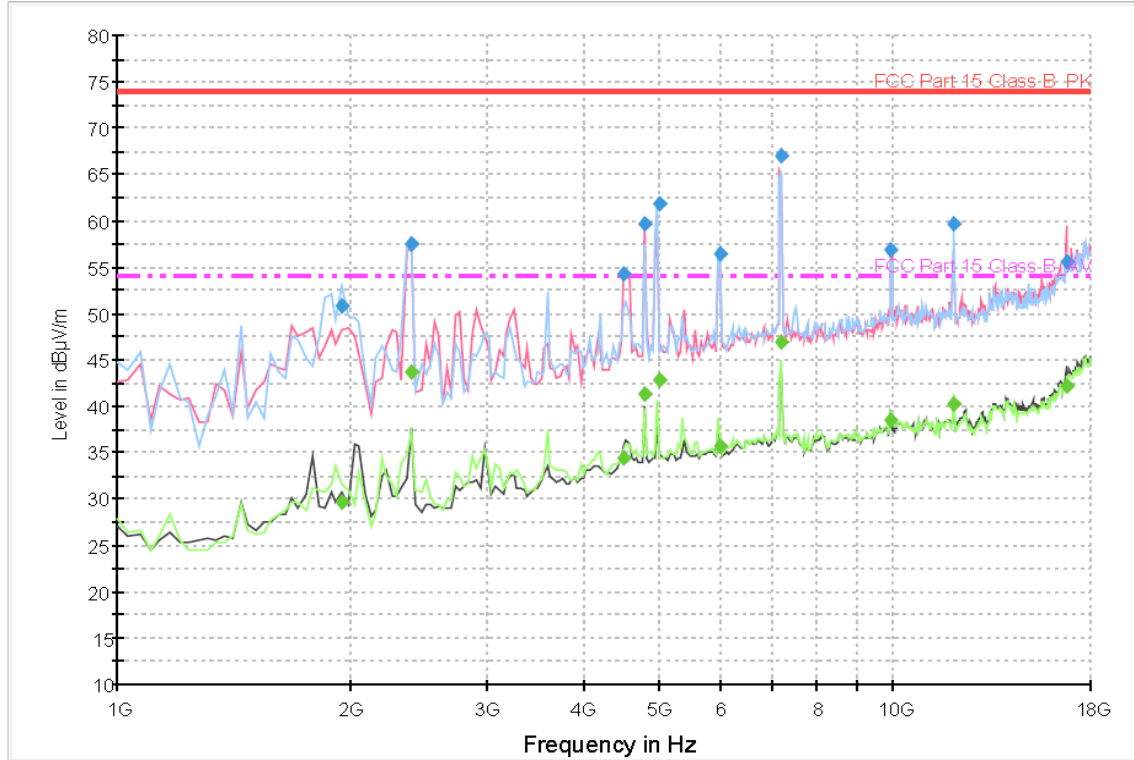
| Frequency (MHz) | CAverage (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|-------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1954.3078       | 31.5              | 1000.0          | 1000.000        | 100.0       | H            | 13.0          | -8.8       | 22.5        | 54.0           |
| 2397.5936       | 48.1              | 1000.0          | 1000.000        | 100.0       | V            | 219.0         | -7.5       | 5.9         | 54.0           |
| 4797.9631       | 40.7              | 1000.0          | 1000.000        | 100.0       | V            | 271.0         | 1.0        | 13.3        | 54.0           |
| 4995.1719       | 42.2              | 1000.0          | 1000.000        | 100.0       | H            | 218.0         | 1.2        | 11.8        | 54.0           |
| 5391.9896       | 33.4              | 1000.0          | 1000.000        | 100.0       | H            | 176.0         | 1.8        | 20.6        | 54.0           |
| 5991.5479       | 39.4              | 1000.0          | 1000.000        | 100.0       | H            | 211.0         | 2.9        | 14.6        | 54.0           |
| 7201.5327       | 42.8              | 1000.0          | 1000.000        | 200.0       | H            | 242.0         | 6.1        | 11.2        | 54.0           |
| 9964.7198       | 40.2              | 1000.0          | 1000.000        | 100.0       | H            | 127.0         | 11.9       | 13.8        | 54.0           |
| 11966.3399      | 39.5              | 1000.0          | 1000.000        | 100.0       | H            | 194.0         | 12.2       | 14.5        | 54.0           |
| 17656.9186      | 43.5              | 1000.0          | 1000.000        | 200.0       | V            | 192.0         | 19.0       | 10.5        | 54.0           |

< Fig 9. Radiated emission result (1 000 MHz ~ 18 000 MHz) >





- Operating condition: 1 680 × 1 050 / 60 Hz (HDMI: Digital)
- Green marker: Average detector (trace: green, black), Blue marker: Peak detector (trace: red, blue)



### Final Result 1

| Frequency (MHz) | MaxPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1948.7078       | 50.9             | 1000.0          | 1000.000        | 100.0       | H            | 43.0          | -8.8       | 23.1        | 74.0           |
| 2398.7936       | 57.6             | 1000.0          | 1000.000        | 100.0       | V            | 218.0         | -7.4       | 16.4        | 74.0           |
| 4509.8862       | 54.2             | 1000.0          | 1000.000        | 100.0       | V            | 145.0         | 0.6        | 19.8        | 74.0           |
| 4793.5631       | 59.6             | 1000.0          | 1000.000        | 100.0       | V            | 275.0         | 1.0        | 14.4        | 74.0           |
| 4991.9719       | 61.9             | 1000.0          | 1000.000        | 100.0       | H            | 220.0         | 1.2        | 12.1        | 74.0           |
| 5982.3479       | 56.5             | 1000.0          | 1000.000        | 100.0       | H            | 162.0         | 2.9        | 17.5        | 74.0           |
| 7181.5327       | 67.0             | 1000.0          | 1000.000        | 100.0       | V            | 250.0         | 6.1        | 7.0         | 74.0           |
| 9955.9880       | 56.9             | 1000.0          | 1000.000        | 200.0       | V            | 184.0         | 11.9       | 17.1        | 74.0           |
| 11971.2080      | 59.7             | 1000.0          | 1000.000        | 100.0       | H            | 202.0         | 12.2       | 14.3        | 74.0           |
| 16754.7471      | 55.6             | 1000.0          | 1000.000        | 100.0       | V            | 209.0         | 17.4       | 18.4        | 74.0           |

### Final Result 2

| Frequency (MHz) | CAverage (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) |
|-----------------|-------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|----------------|
| 1948.7078       | 29.8              | 1000.0          | 1000.000        | 100.0       | H            | 43.0          | -8.8       | 24.2        | 54.0           |
| 2398.7936       | 43.8              | 1000.0          | 1000.000        | 100.0       | V            | 218.0         | -7.4       | 10.2        | 54.0           |
| 4509.8862       | 34.5              | 1000.0          | 1000.000        | 100.0       | V            | 145.0         | 0.6        | 19.5        | 54.0           |
| 4793.5631       | 41.2              | 1000.0          | 1000.000        | 100.0       | V            | 275.0         | 1.0        | 12.8        | 54.0           |
| 4991.9719       | 42.8              | 1000.0          | 1000.000        | 100.0       | H            | 220.0         | 1.2        | 11.2        | 54.0           |
| 5982.3479       | 35.8              | 1000.0          | 1000.000        | 100.0       | H            | 162.0         | 2.9        | 18.2        | 54.0           |
| 7181.5327       | 46.9              | 1000.0          | 1000.000        | 100.0       | V            | 250.0         | 6.1        | 7.1         | 54.0           |
| 9955.9880       | 38.5              | 1000.0          | 1000.000        | 200.0       | V            | 184.0         | 11.9       | 15.5        | 54.0           |
| 11971.2080      | 40.2              | 1000.0          | 1000.000        | 100.0       | H            | 202.0         | 12.2       | 13.8        | 54.0           |
| 16754.7471      | 42.3              | 1000.0          | 1000.000        | 100.0       | V            | 209.0         | 17.4       | 11.7        | 54.0           |

< Fig 10. Radiated emission result (1 000 MHz ~ 18 000 MHz) >





## 7. Sample Calculations

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

### 7.1 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

### 7.2 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





## 8. Recommendation & Conclusion

The data collected shows that the **LG Electronics Inc. DLP PROJECTOR (Model Name: PB60G-JE)** was complies with §15.107 and 15.109 of the FCC Rules.

- The end -

