

FCC EVALUATION REPORT FOR CERTIFICATION

Applicant : LG Electronics Inc.

19-1, Cheongho-ri, Jinwi-myeon,

Pyeongteak-si, Gyeonggi-do, Korea.

Attn: Mr. Sang-Wook Lee, Chief research engineer

Date of Issue : October 1, 2009

Order Number: GETEC-C1-09-198

Test Report Number: GETEC-E3-09-112

Test Site: Gumi College EMC Center

FCC Registration Number: (100749, 443957)

FCC ID.: BEJAF115

Applicant: LG Electronics Inc.

Rule Part(s)	: FCC Part 15 Subpart B
Equipment Class	: Class B computing device peripheral (JBP)
EUT Type	: Full HD Projector
Type of Authority	: Certification
Model Name	: AF115
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 C63.4-2003 / 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 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,

Reviewed by,


Hyoung Seop Kim, Associate Engineer
GUMI College EMC center


Tae-Sig Park, Technical Manager
GUMI College 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 Inc.

Applicant Address: 19-1, Cheongho-ri, Jinwi-myeon, Pyeongteak-si, Gyeonggi-do, Korea.

Manufacturer: LG Electronics Inc.

Manufacturer Address: 299, Gongdan-dong, Gumi-si, Gyeongbuk, Korea.

Contact Person: Mr. Sang -Wook Lee, Chief research engineer

Tel Number: +82-54-460-7314

- **FCC ID.** BEJAF115
- **EUT Type** Full HD Projector
- **Model Name** AF115
- **Trade Name** LG
- **Serial Number** Prototype
- **Rule Part(s)** FCC Part 15 Subpart B
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2003) / Canadian standard ICES-003
- **Dates of Test** September 17, 2009
- **Place of Test** **Gumi College EMC Center** (FCC Registration Number: 100749, 443957)
407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-09-112
- **Dates of Issue** October 1, 2009



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 (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc. Full HD Projector (Model Name: AF115)**

These measurement tests were conducted at **Gumi College EMC Center**.

The site address is 407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.

This test site is one of the highest point of Gumi 1 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 on October 19, 1992



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. Full HD Projector (Model Name: AF115) FCC ID.: BEJAF115**

MODEL	AF115 (AF115-JS)
Resolution	1920(Horizontal) x 1080(Vertical)pixel
Horizontal / Vertical Ratio	16 : 9 (horizontal:vertical)
LCOS panel size	0.61 inches
Screen size	Wide : 30 ~ 300 inches(0.9 ~ 9.1m)
(Projection distance)	Tele : 30 ~ 300 inches(1.6 ~ 16.4m)
Projection off-set ratio	120%
Remote control distance	12m
Zoom ratio	1:1.8
Video compatibility	NTSC/PAL/SECAM/NTSC4.43/PAL-M/PAL-N/PAL 60
Power	AC 100 - 240V~50/60Hz, 3.0A-1.2A
Height(mm/inches)	173/6.8
Breadth(mm/inches)	366/14.4
Length(mm/inches)	447.5/17.6
Weight(kg/pound)	9.6/21.1

Operating Condition

Temperature

In operation : 32~104°F(0°C~40°C)
In storage and transit : -4~140°F(-20°C~60°C)

Humidity

In operation : 0~ 75% relative humidity by dry hygrometer
Not in operation : 0 ~ 85% relative humidity by dry hygrometer

Projector Lamp

Lamp model

AJ-LAF1

Lamp power consumption

220W

Maximum Frequency range:	153 MHz
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3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
PC	SAMSUNG	DB-P60	S/N: 729W97AP500001M FCC ID: DoC
Video card	SUMA	Geforce FX 7600GT	S/N: NE/7600GXTD21V407003711 FCC ID: DoC
Key-board	COMPAQ	166516-AD6	S/N: B13BBOR391006D FCC ID: AQ6-23K15
PS2 mouse	LOGITECH	M-S69	S/N: 334684-108 FCC ID: JNZ211443
Joystick	Microsoft	X05-92626	S/N: 9262600296169 FCC ID: DoC
DVD player	LG Electronics Inc	LC-954	S/N: 3850R-Z674K FCC ID: DoC
Printer	Hewlett Packard	970CXI	S/N: MY9B01F1FG FCC ID: DoC

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

3.2.2 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the EUT	1.8 m unshielded
Video(RGB)input cable	Connected to the EUT and PC	1.8 m shielded with two ferrite cores
Video(HDMI/DVI)cable	Connected to the EUT and PC	1.95 m shielded
Component cable	Connected to the EUT and DVD player	2.0 m shielded
Video input cable	Connected to the EUT and DVD player	1.8 m shielded
S-video cable	Connected to the EUT and DVD player	1.8 m shielded

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.

- Test Voltage / Frequency : AC 120 V / 60 Hz
- Test Mode(s)
 - . Projection mode
 - . Radiated emission: 1 920 * 1 080 / 60 Hz (RGB: Analog), 1 920 * 1 080 / 60 Hz (HDMI)
 - . Conducted emission: 1 920 * 1 080 / 60 Hz (RGB: Analog), 1 920 * 1 080 / 60 Hz (HDMI)
1 024 * 768 / 60 Hz (RGB: Analog), 640 * 480 / 60 Hz (RGB: Analog),
- Operating test pattern
 - . "H" character scrolling mode (Font size: 10)
 - . Black background white character
 - . Brightness and contrast was adjusted as maximum level



4.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure.

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, ESCS30).

The EMI test receiver was scanned from 150 kHz to 30 MHz with 20 ms sweep time to determine the frequency producing the maximum EME from the EUT. The frequency producing the maximum level was re-examined using Quasi-Peak mode of the EMI test receiver.

The bandwidth of Quasi-peak mode was set to 9 kHz. Each emission was maximized consistent with typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum diagram emission. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

Each EME reported was calibrated using the R/S signal generator

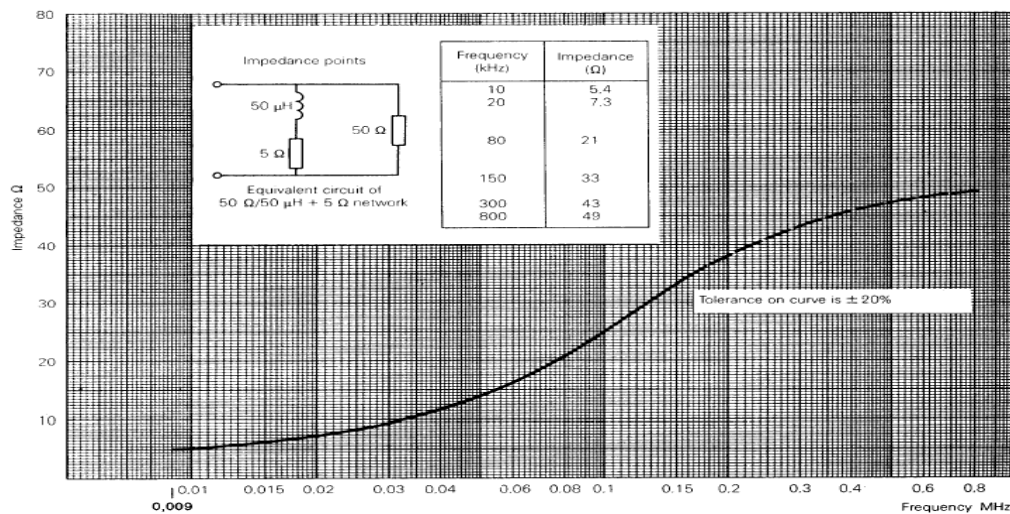


Fig 2. Impedance of LISN



4.3 Radiated Emission

Preliminary measurements were conducted 3 m semi anechoic chamber using broadband antennas to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The technology configuration, mode of operation and turntable azimuth with respect to antenna was note for each frequency found.

The spectrum was scanned from 30 MHz to 1 000 MHz using bicornical log antenna (Schwarzbeck, VULB9160). Above 1 GHz, horn antenna (Schwarzbeck, BBHA9120D) was used.

Final measurements were made outdoors at 3 m /10 m test range.

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

Each frequency found during pre-scan measurements was re-examined and investigated using EMI test receiver. The detector function was set to CISPR quasi-peak mode average mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency or type of signal.

The EUT, support equipment and interconnecting cables were reconfigured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8 m high non-metallic 1.0 m × 1.5 m table.

The turntable containing the test sample was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission.

Each EME reported was calibrated using the R/S signal generator

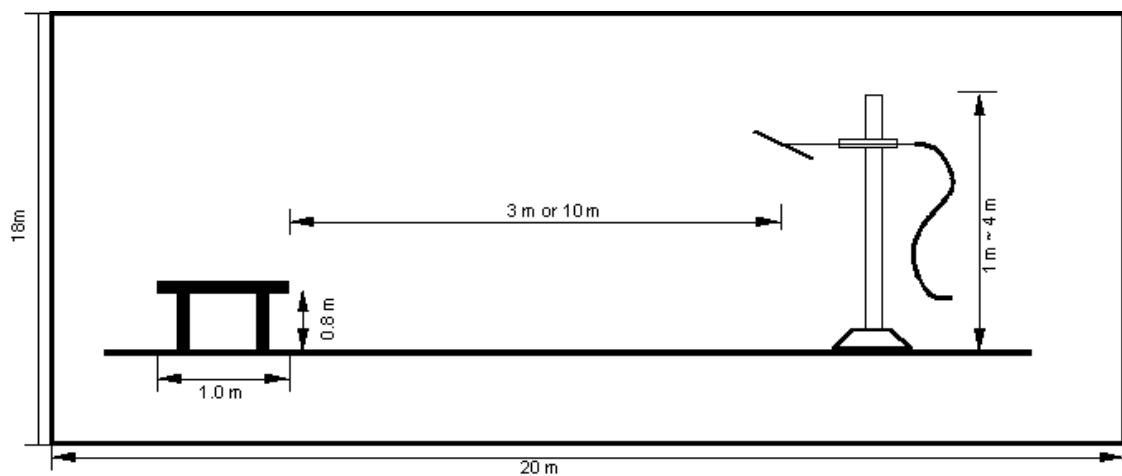


Fig 3. Dimensions of Open Site Test Area



5. Conducted Emission

5.1 Operating Environment

Temperature : 27 °C
Relative Humidity : 50 % 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.

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)	± 2.97 dB	Confidence levels of 95 % (k=2)
Conducted emission (150 kHz ~ 30 MHz)	± 4.05 dB	Confidence levels of 95 % (k=2)



5.4 Limit

RFI Conducted	FCC Limit(dB) 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
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 13. 2009
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 12. 2009
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 12. 2009
□ - ISN T8	TESEQ. GmbH	ISN	24568	10. 16. 2009

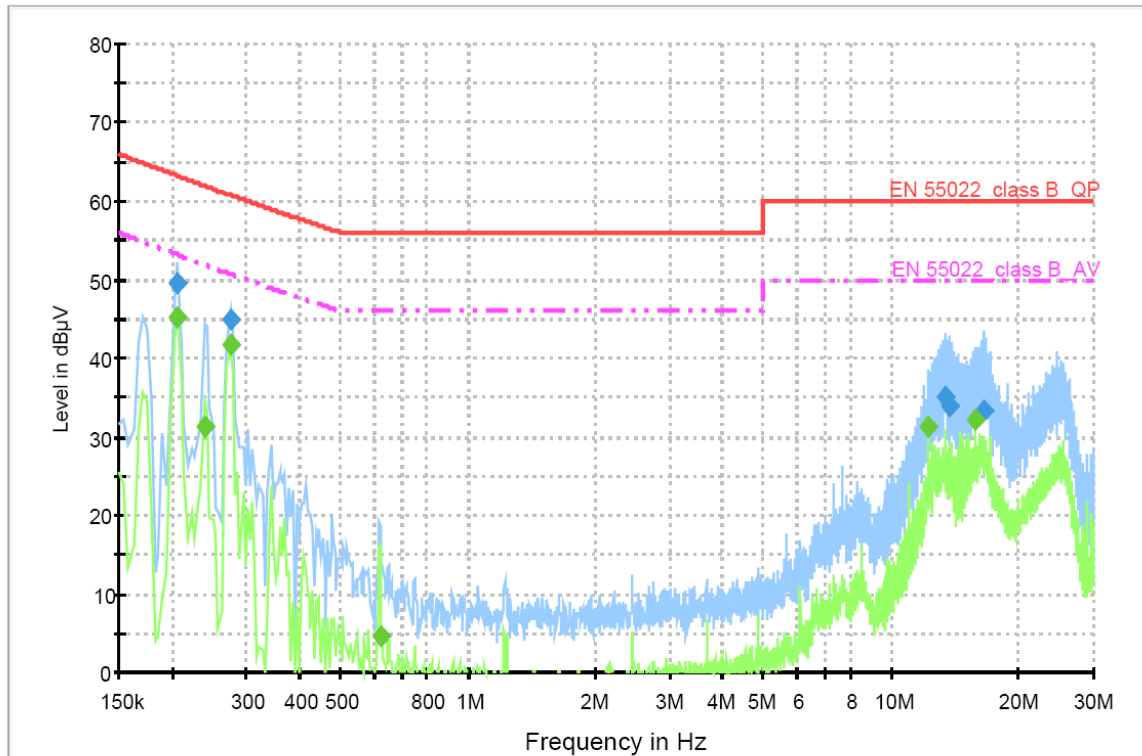
5.6 Test data for Conducted Emission

- . Test Date : September 17, 2009
- . Resolution Bandwidth : 9 kHz
- . Frequency Range : 0.15 MHz ~ 30 MHz



◆ Test resolution: 1 920 * 1 080 / 60 Hz (RGB: Analog mode)

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.206000	49.5	1000.000	9.000	GND	L1	9.9	13.7	63.2	
0.274000	45.0	1000.000	9.000	GND	L1	10.0	15.8	60.8	
13.458000	35.2	1000.000	9.000	GND	L1	10.5	24.8	60.0	
13.654000	34.0	1000.000	9.000	GND	L1	10.5	26.0	60.0	
16.518000	33.4	1000.000	9.000	GND	L1	10.7	26.6	60.0	

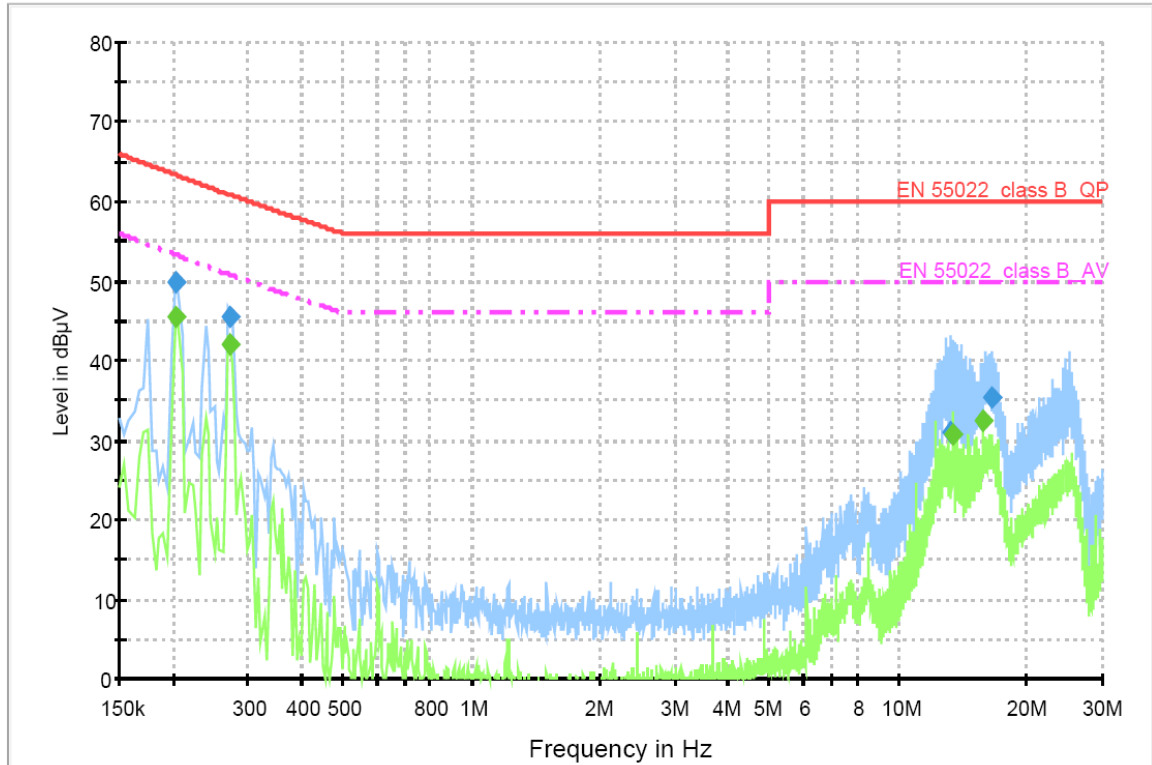
Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.206000	45.2	1000.000	9.000	GND	L1	9.9	8.0	53.2	
0.238000	31.4	1000.000	9.000	GND	L1	10.0	20.5	51.9	
0.274000	41.6	1000.000	9.000	GND	L1	10.0	9.2	50.8	
0.622000	4.6	1000.000	9.000	GND	L1	10.0	41.4	46.0	
12.194000	31.2	1000.000	9.000	GND	L1	10.4	18.8	50.0	
15.854000	32.0	1000.000	9.000	GND	L1	10.6	18.0	50.0	

< Fig 4. Conducted emission result (Live line)>



Voltage with 4-Line-LISN_N



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	49.8	1000.000	9.000	GND	N	9.9	13.5	63.3	
0.272000	45.4	1000.000	9.000	GND	N	10.0	15.5	60.9	
13.320000	30.9	1000.000	9.000	GND	N	10.5	29.1	60.0	
16.580000	35.5	1000.000	9.000	GND	N	10.6	24.5	60.0	

Final Measurement Detector 2

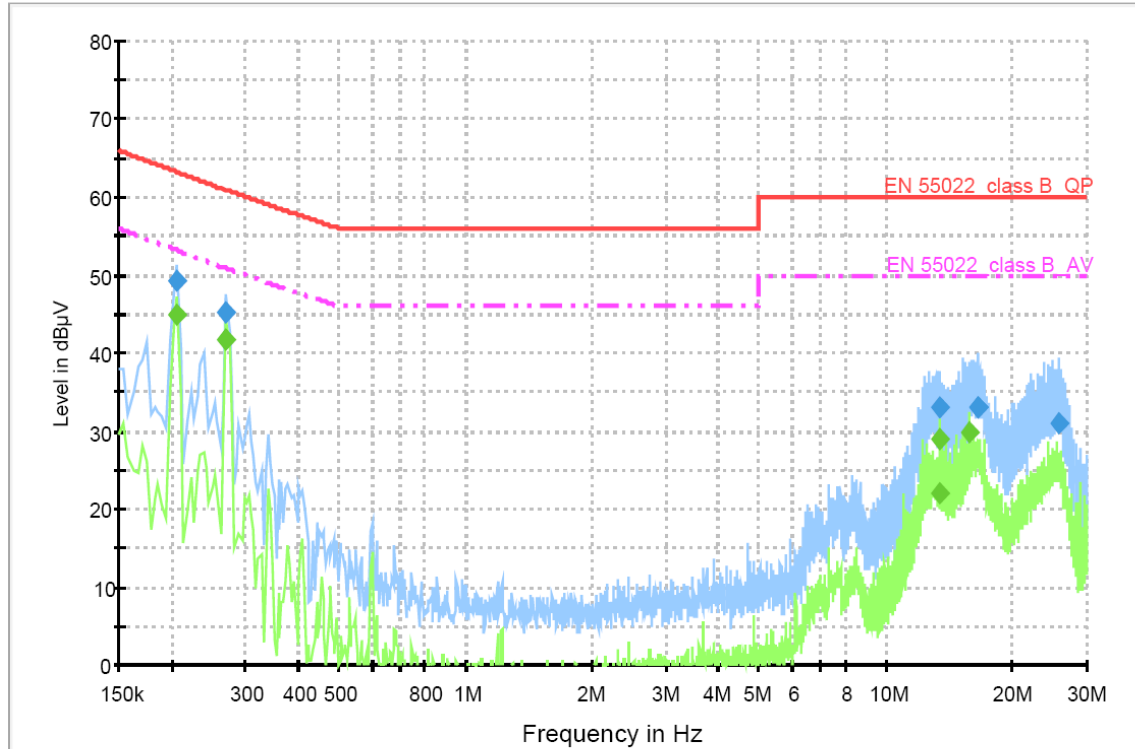
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	45.5	1000.000	9.000	GND	N	9.9	7.8	53.3	
0.272000	42.0	1000.000	9.000	GND	N	10.0	8.8	50.8	
13.416000	30.7	1000.000	9.000	GND	N	10.5	19.3	50.0	
15.852000	32.4	1000.000	9.000	GND	N	10.6	17.6	50.0	

< Fig 5. Conducted emission result (Neutral line)>



◆ Test resolution: 1 920 * 1 080 / 60 Hz (HDMI mode)

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.206000	49.3	1000.000	9.000	GND	L1	9.9	13.9	63.2	
0.270000	45.2	1000.000	9.000	GND	L1	10.0	15.7	60.9	
13.418000	33.0	1000.000	9.000	GND	L1	10.5	27.0	60.0	
16.470000	33.1	1000.000	9.000	GND	L1	10.7	26.9	60.0	
16.610000	33.0	1000.000	9.000	GND	L1	10.7	27.0	60.0	
25.654000	31.1	1000.000	9.000	GND	L1	11.0	28.9	60.0	

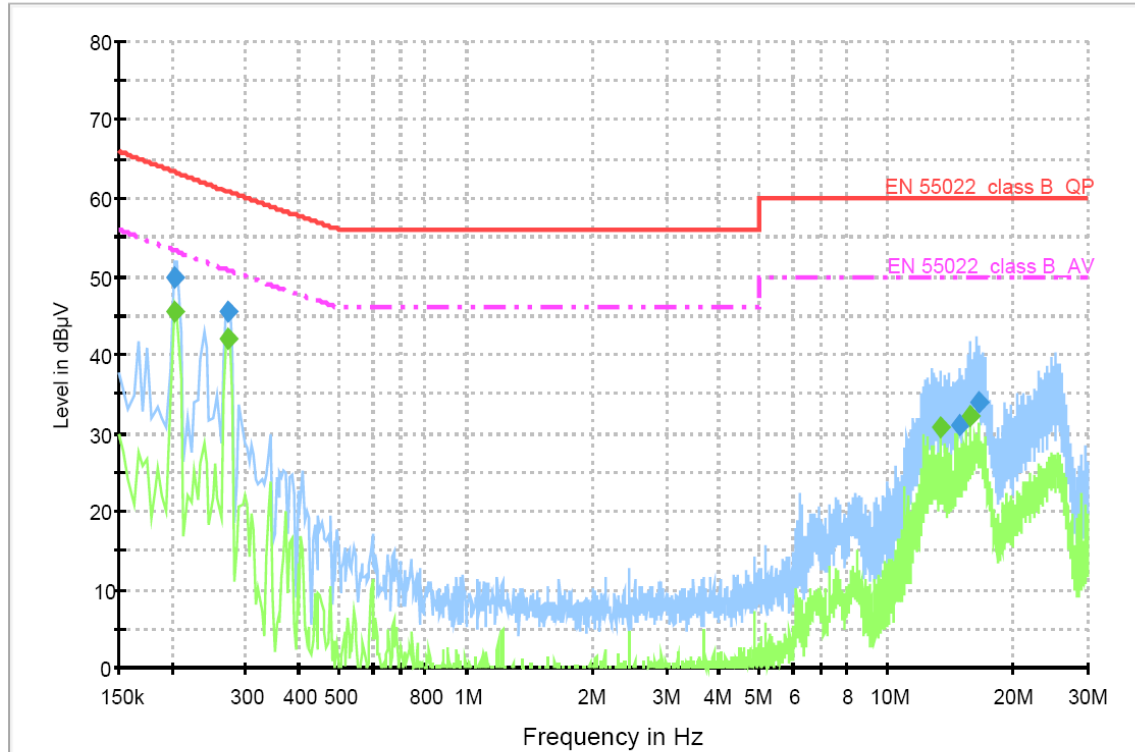
Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.206000	45.0	1000.000	9.000	GND	L1	9.9	8.2	53.2	
0.270000	41.9	1000.000	9.000	GND	L1	10.0	9.0	50.9	
13.418000	28.9	1000.000	9.000	GND	L1	10.5	21.1	50.0	
13.434000	22.0	1000.000	9.000	GND	L1	10.5	28.0	50.0	
15.858000	29.9	1000.000	9.000	GND	L1	10.6	20.1	50.0	

< Fig 6. Conducted emission result (Live line)>



Voltage with 4-Line-LISN_N



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	49.8	1000.000	9.000	GND	N	9.9	13.5	63.3	
0.272000	45.5	1000.000	9.000	GND	N	10.0	15.4	60.9	
14.908000	31.1	1000.000	9.000	GND	N	10.6	28.9	60.0	
16.460000	34.0	1000.000	9.000	GND	N	10.6	26.0	60.0	

Final Measurement Detector 2

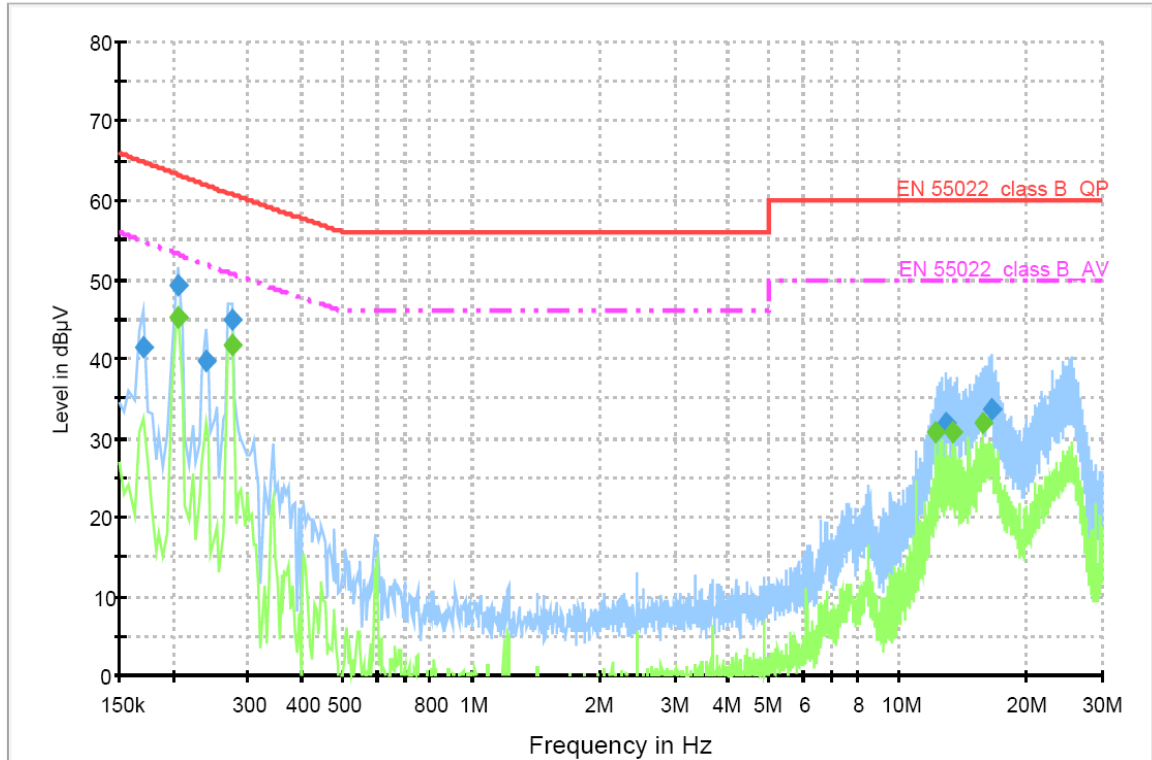
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	45.5	1000.000	9.000	GND	N	9.9	7.8	53.3	
0.272000	42.2	1000.000	9.000	GND	N	10.0	8.6	50.8	
13.416000	30.7	1000.000	9.000	GND	N	10.5	19.3	50.0	
15.856000	32.1	1000.000	9.000	GND	N	10.6	17.9	50.0	

< Fig 7. Conducted emission result (Neutral line)>



◆ Test resolution: 1 024 * 768 / 60 Hz (RGB: Analog mode)

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.170000	41.4	1000.000	9.000	GND	L1	9.9	23.5	64.9	
0.206000	49.4	1000.000	9.000	GND	L1	9.9	13.8	63.2	
0.238000	39.8	1000.000	9.000	GND	L1	10.0	22.2	62.0	
0.274000	45.0	1000.000	9.000	GND	L1	10.0	15.8	60.8	
12.938000	31.8	1000.000	9.000	GND	L1	10.5	28.2	60.0	
16.466000	33.5	1000.000	9.000	GND	L1	10.7	26.5	60.0	

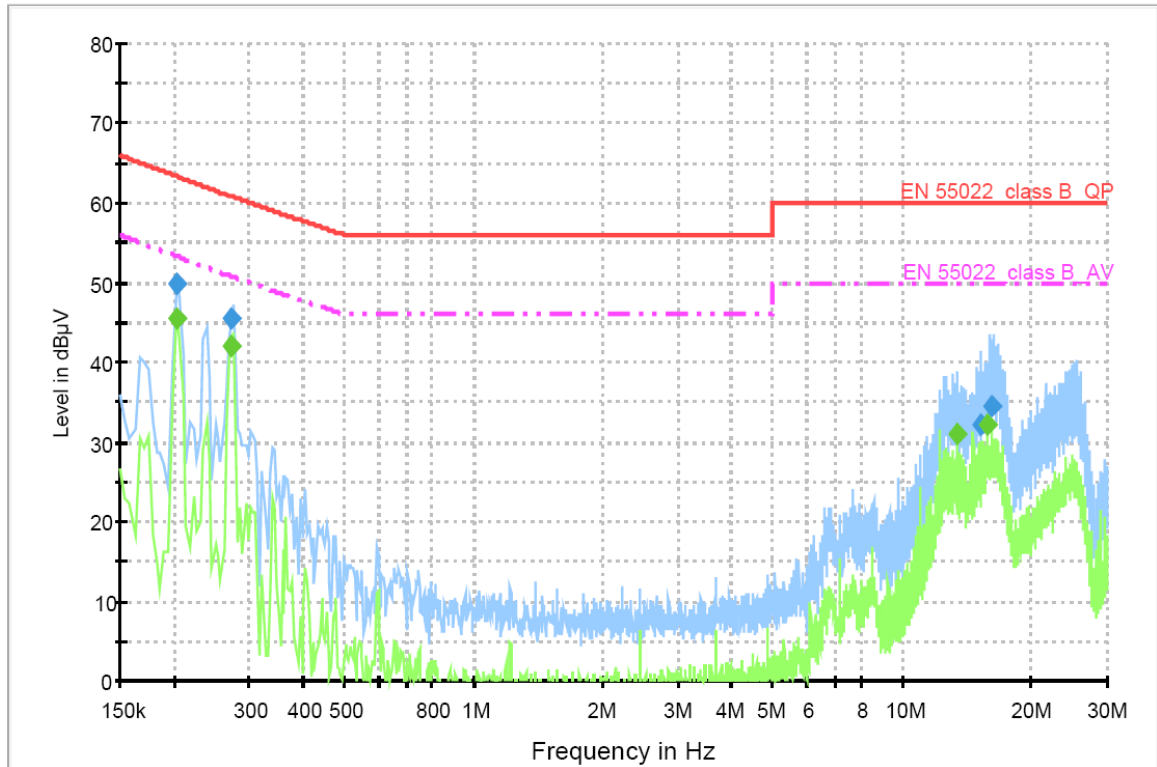
Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.206000	45.1	1000.000	9.000	GND	L1	9.9	8.1	53.2	
0.274000	41.6	1000.000	9.000	GND	L1	10.0	9.2	50.8	
12.194000	30.7	1000.000	9.000	GND	L1	10.4	19.3	50.0	
13.414000	30.8	1000.000	9.000	GND	L1	10.5	19.2	50.0	
15.854000	31.9	1000.000	9.000	GND	L1	10.6	18.1	50.0	

< Fig 8. Conducted emission result (Live line)>



Voltage with 4-Line-LISN_N



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	49.9	1000.000	9.000	GND	N	9.9	13.4	63.3	
0.272000	45.4	1000.000	9.000	GND	N	10.0	15.5	60.9	
15.172000	32.1	1000.000	9.000	GND	N	10.6	27.9	60.0	
16.252000	34.5	1000.000	9.000	GND	N	10.6	25.5	60.0	

Final Measurement Detector 2

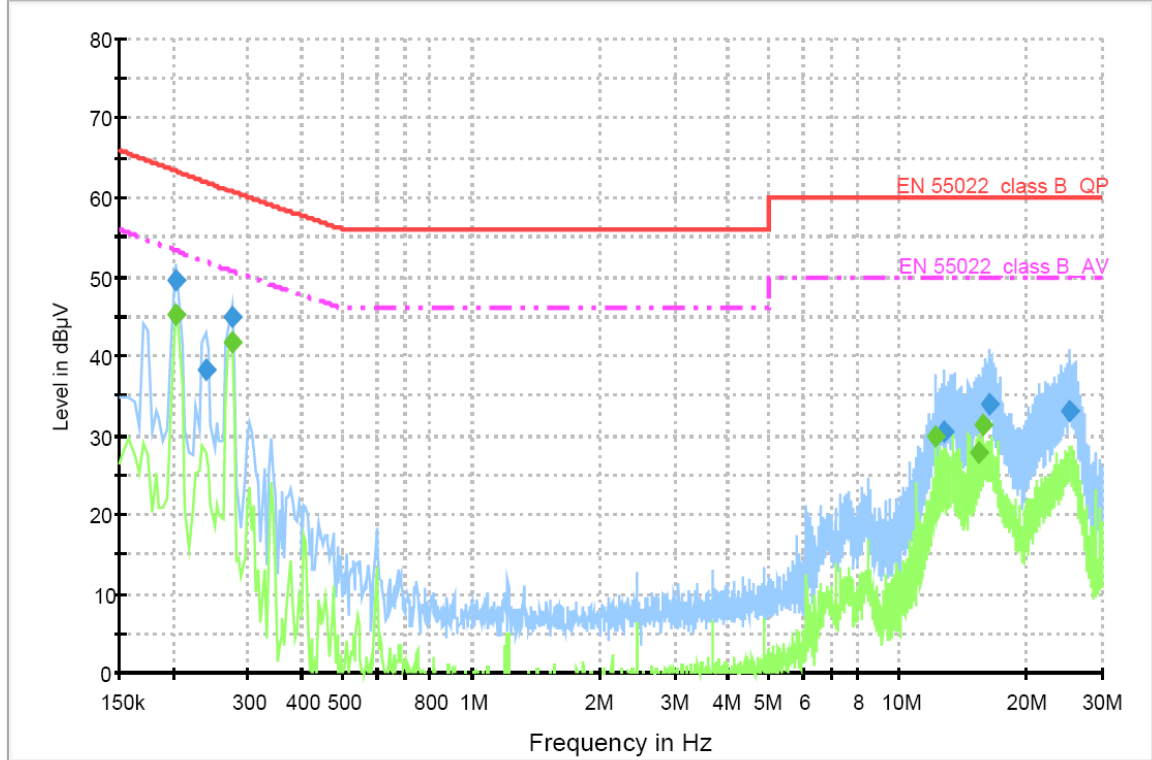
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	45.5	1000.000	9.000	GND	N	9.9	7.8	53.3	
0.272000	42.2	1000.000	9.000	GND	N	10.0	8.6	50.8	
13.416000	31.1	1000.000	9.000	GND	N	10.5	18.9	50.0	
15.856000	32.1	1000.000	9.000	GND	N	10.6	17.9	50.0	

< Fig 9. Conducted emission result (Neutral line)>



◆ Test resolution: 640 * 480 / 60 Hz (RGB: Analog mode)

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.202000	49.6	1000.000	9.000	GND	L1	9.9	13.8	63.4	
0.238000	38.4	1000.000	9.000	GND	L1	10.0	23.6	62.0	
0.274000	44.9	1000.000	9.000	GND	L1	10.0	15.9	60.8	
12.794000	30.4	1000.000	9.000	GND	L1	10.5	29.6	60.0	
16.442000	33.8	1000.000	9.000	GND	L1	10.7	26.2	60.0	
25.322000	33.0	1000.000	9.000	GND	L1	11.0	27.0	60.0	

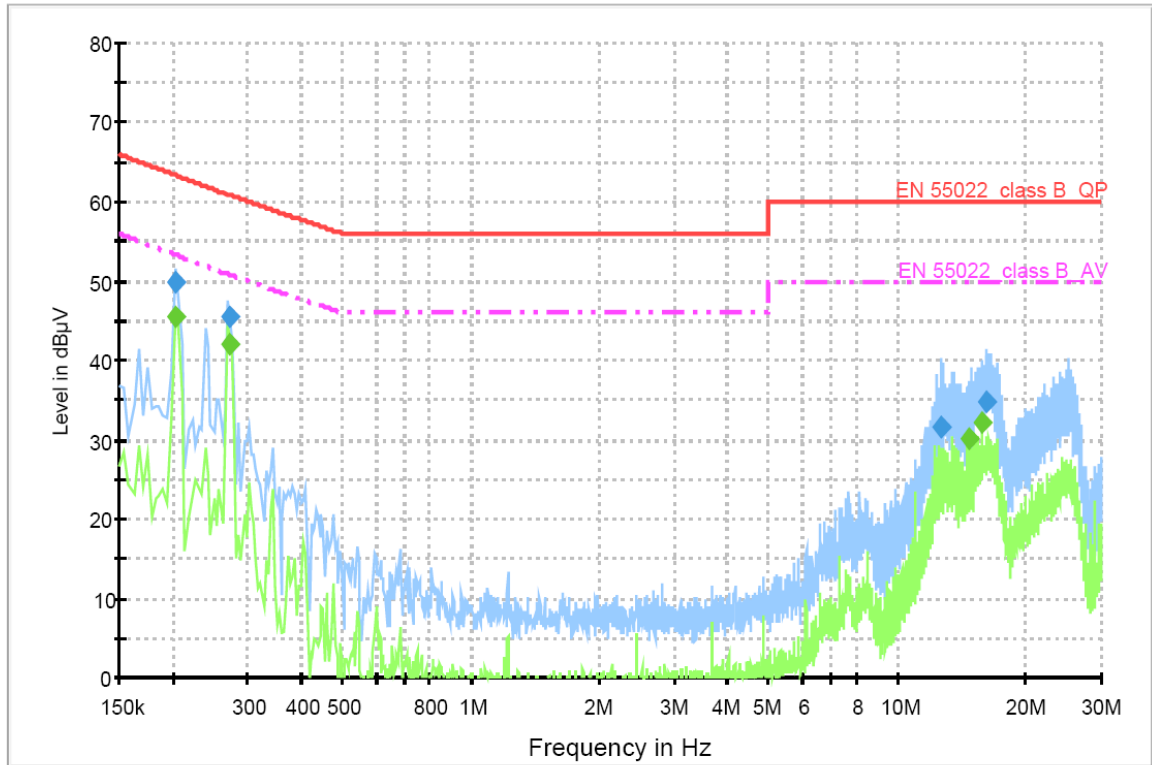
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.202000	45.1	1000.000	9.000	GND	L1	9.9	8.2	53.3	
0.274000	41.6	1000.000	9.000	GND	L1	10.0	9.2	50.8	
12.198000	29.7	1000.000	9.000	GND	L1	10.4	20.3	50.0	
15.338000	27.9	1000.000	9.000	GND	L1	10.6	22.1	50.0	
15.858000	31.3	1000.000	9.000	GND	L1	10.6	18.7	50.0	

< Fig 10. Conducted emission result (Live line)>



Voltage with 4-Line-LISN_N



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	49.8	1000.000	9.000	GND	N	9.9	13.5	63.3	
0.272000	45.4	1000.000	9.000	GND	N	10.0	15.5	60.9	
12.648000	31.6	1000.000	9.000	GND	N	10.4	28.4	60.0	
16.200000	34.7	1000.000	9.000	GND	N	10.6	25.3	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	45.5	1000.000	9.000	GND	N	9.9	7.8	53.3	
0.272000	42.2	1000.000	9.000	GND	N	10.0	8.6	50.8	
14.636000	30.1	1000.000	9.000	GND	N	10.5	19.9	50.0	
15.856000	32.0	1000.000	9.000	GND	N	10.6	18.0	50.0	

< Fig 11. Conducted emission result (Neutral line)>



6. Radiated Emission

6.1 Operating Environment

Temperature : 21 °C
Relative Humidity : 50 % R.H.

6.2 Test Set-up

A preliminary scan with peak mode was performed in the semi anechoic chamber and found frequency for open area test site.

The formal radiated emission was measured at 3 m / 10 m distance open area test site.

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	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 3.54 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 3.49 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 3.85 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.76 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Vertical)	± 3.21 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Horizontal)	± 3.32 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Vertical)	± 3.77 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Horizontal)	± 3.84 dB	Confidence levels of 95 % (k=2)



6.4 Limit

Frequency (MHz)	FCC Limit @ 3 m. dB μ V/m	CISPR Limit @ 10 m. dB μ 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
■ - ESI	Rohde & Schwarz	EMI test receiver	830482/010	12. 14. 2009
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3193	12. 11. 2009
■ - BBHA9120D	Schwarzbeck	Horn ANT	207	12. 26. 2009
■ - MCU066	maturo GmbH	MCU066	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	11. 11. 2009

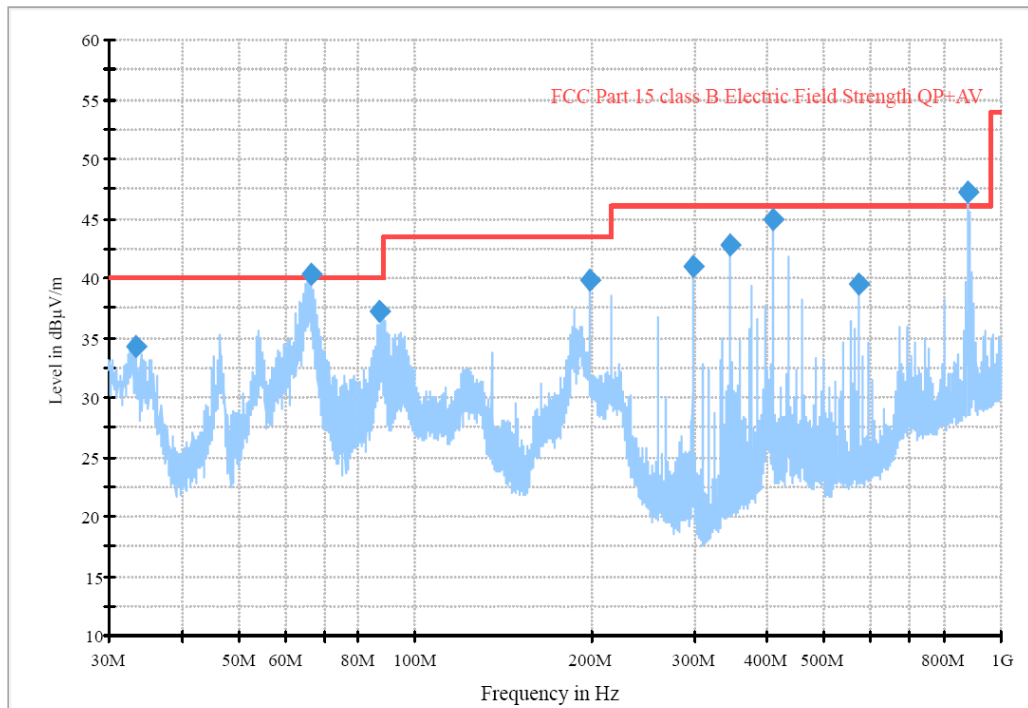


6.6 Test data for Radiated Emission

- Test Date : September 17, 2009
- Resolution Bandwidth : 120 kHz/ 1 MHz
- Frequency Range : 30 MHz ~ 2 000 MHz
- Measurement Distance : 3 m

- ◆ Operating Condition: 1 920 * 1 080 / 60 Hz (RGB: Analog mode)
- Detector mode: Quasi- peak detector mode

FCC_ESIB_Direct_RE with Scans



Final Result 1

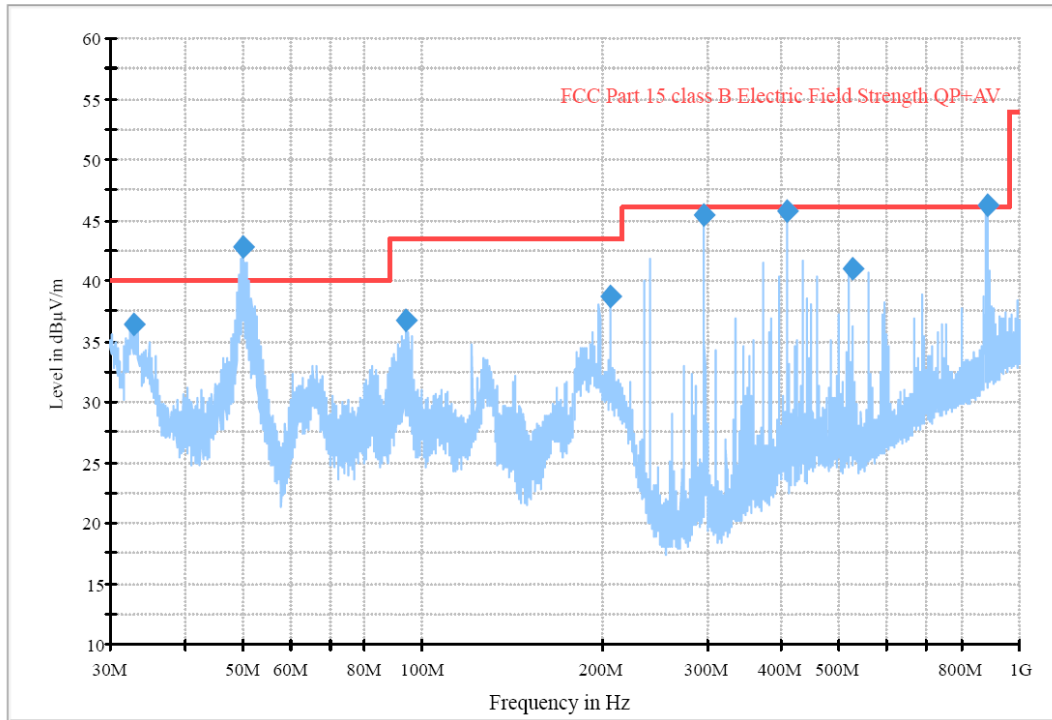
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Q.P
33.300000	34.3	1000.0	120.000	116.0	V	135.0	10.4	9.99	40.00	30.01
66.300000	40.3	1000.0	120.000	130.0	V	182.0	9.6	6.00	40.00	34.00
87.110000	37.2	1000.0	120.000	151.0	V	327.0	11.2	9.22	40.00	30.78
198.260000	39.8	1000.0	120.000	155.0	H	91.0	14.8	6.10	43.50	37.40
297.400000	40.9	1000.0	120.000	100.0	H	109.0	16.2	6.68	46.00	39.32
344.300000	42.8	1000.0	120.000	200.0	V	270.0	17.3	15.75	46.00	30.25
408.900000	44.9	1000.0	120.000	100.0	H	17.0	18.5	4.38	46.00	41.62
572.300000	39.5	1000.0	120.000	100.0	V	180.0	22.1	19.52	46.00	26.48
880.950000	47.3	1000.0	120.000	100.0	H	10.0	28.3	4.83	46.00	41.17

< Fig 12. Radiated emission result (30 MHz ~ 1 000 MHz)>



- ◆ Operating Condition: 1 920 * 1 080 / 60 Hz (HDMI mode)
Detector mode: Quasi- peak detector mode

FCC_ESIB_Direct_RE with Scans



Final Result 1

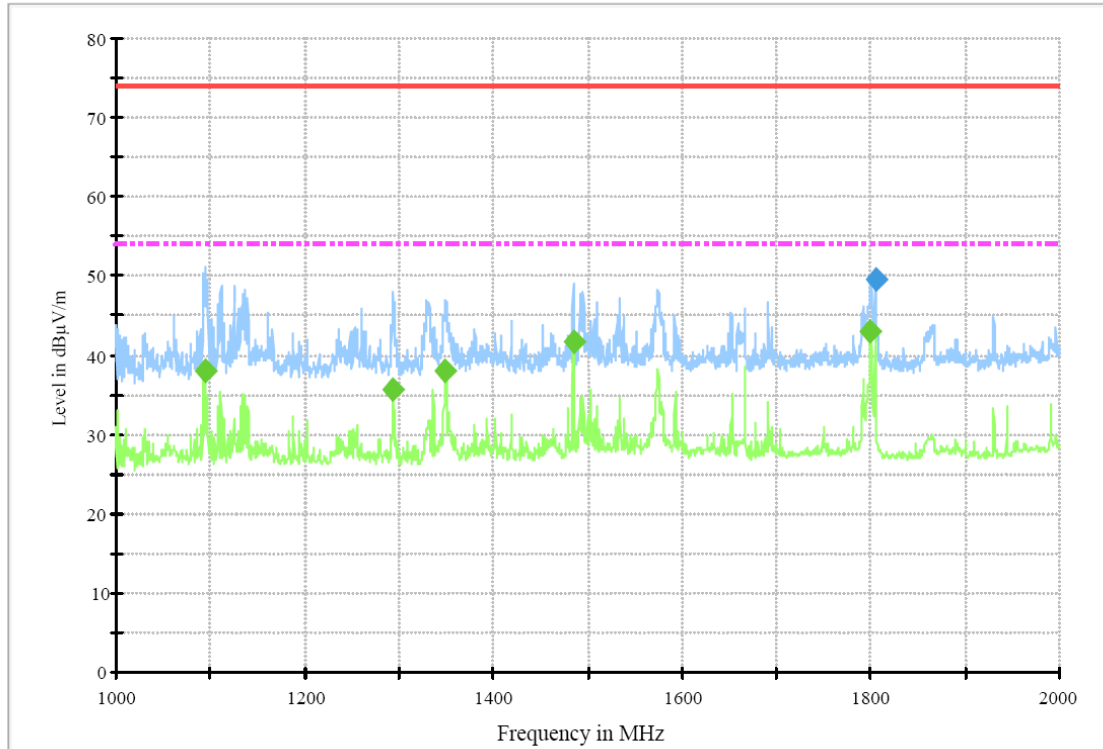
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Q.P
33.000000	36.4	1000.0	120.000	100.0	H	101.0	12.8	9.95	40.00	30.05
50.020000	42.8	1000.0	120.000	100.0	H	55.0	13.8	5.72	40.00	34.28
93.810000	36.8	1000.0	120.000	169.0	H	0.0	10.5	12.27	43.50	31.23
206.850000	38.6	1000.0	120.000	162.0	V	103.0	12.5	12.97	43.50	30.53
297.020000	45.5	1000.0	120.000	100.0	V	38.0	16.6	4.05	46.00	41.95
408.370000	45.8	1000.0	120.000	100.0	V	0.0	20.1	4.12	46.00	41.88
524.100000	40.9	1000.0	120.000	200.0	V	180.0	23.0	15.88	46.00	30.12
881.390000	46.2	1000.0	120.000	100.0	H	0.0	31.0	10.47	46.00	35.53

< Fig 13. Radiated emission result (30 MHz ~ 1 000 MHz)>



- ◆ Operating Condition: 1 920 * 1 080 / 60 Hz (RGB: Analog mode)
Detector mode: Peak detector mode / Average detector mode

FCC_ESIB_Preamplifier_RE with Scans



Final Result 1

Frequency (MHz)	MaxPeak-MaxHold (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
1804.800000	49.5	150.0	V	0.0	-13.1	24.5	74.0	

Final Result 2

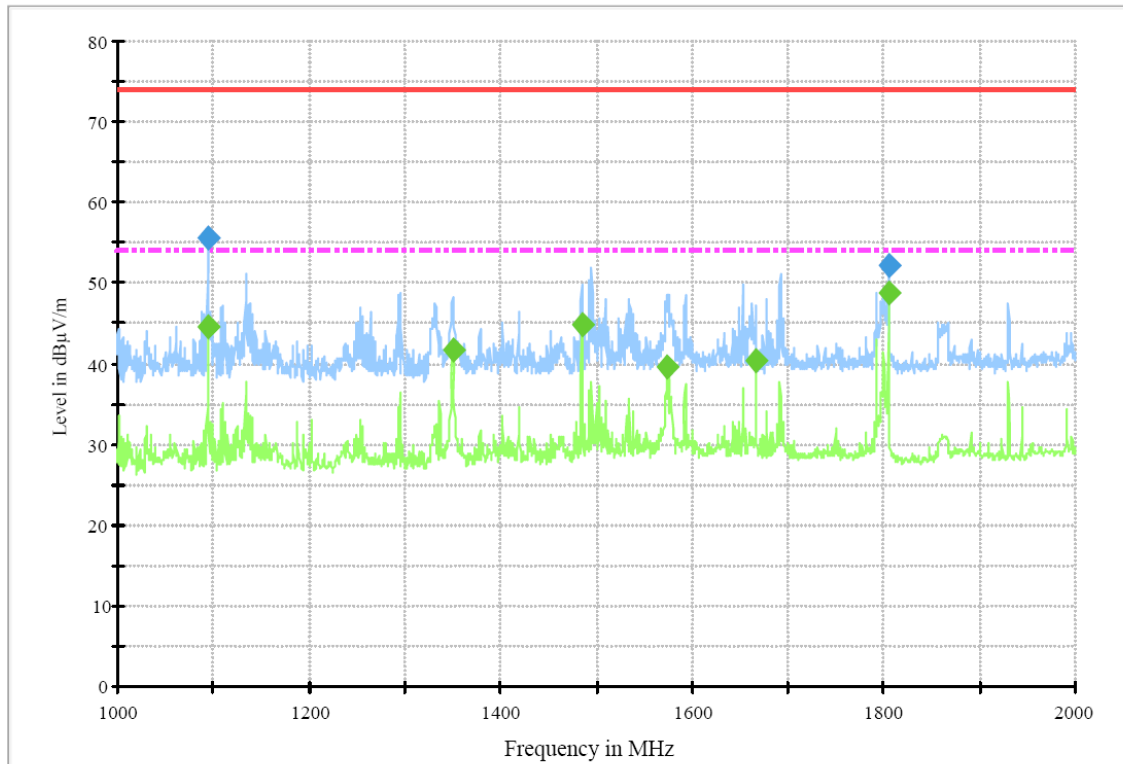
Frequency (MHz)	Average-MaxHold (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
1094.000000	37.9	100.0	V	0.0	-15.5	16.1	54.0	
1294.400000	35.8	150.0	V	0.0	-14.5	18.2	54.0	
1349.600000	38.0	200.0	V	270.0	-14.4	16.0	54.0	
1485.200000	41.6	150.0	V	180.0	-14.2	12.4	54.0	
1800.000000	43.1	150.0	H	0.0	-13.1	10.9	54.0	

< Fig 14. Radiated emission result (1 000 MHz ~ 2 000 MHz)>



- ◆ Operating Condition: 1 920 * 1 080 / 60 Hz (HDMI mode)
Detector mode: Peak detector mode / Average detector mode

FCC_ESIB_Preamplifier with Scans



Final Result 1

Frequency (MHz)	MaxPeak-MaxHold (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
1095.200000	55.5	100.0	V	0.0	-15.5	18.5	74.0	
1805.200000	52.2	150.0	V	0.0	-13.1	21.8	74.0	

Final Result 2

Frequency (MHz)	Average-MaxHold (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
1095.200000	44.5	100.0	V	0.0	-15.5	9.5	54.0	
1350.000000	41.8	200.0	V	270.0	-14.4	12.2	54.0	
1485.200000	44.8	100.0	V	180.0	-14.2	9.2	54.0	
1574.800000	39.6	150.0	V	180.0	-13.8	14.4	54.0	
1666.800000	40.4	100.0	V	0.0	-13.6	13.6	54.0	
1805.200000	48.8	150.0	V	0.0	-13.1	5.2	54.0	

< Fig 15. Radiated emission result (1 000 MHz ~ 2 000 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 μV = 48 dB μV
Reading	= 39.2 dB μV
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV = 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 μV
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. Full HD Projector (Model Name: AF115)** was complies with §15.107 and 15.109 of the FCC Rules.