

FCC EVALUATION REPORT FOR CERTIFICATION

Applicant: LG Electronics Inc.

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

Pyeongteak-si, Gyeonggi-do, Korea.

Attn: Mr. Do-Hyung Kim, Chief research engineer

Date of Issue: October 14, 2011

Order Number: GETEC-C1-11-235

Test Report Number: GETEC-E3-11-119

Test Site: Gumi College EMC Center

FCC Registration Number: (100749, 443957)

FCC ID. : BEJCF3DAJS

Applicant : LG Electronics Inc.

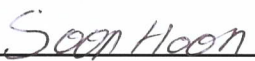
Rule Part(s)	: FCC Part 15 Subpart B
Equipment Class	: Class B computing device peripheral (JBP)
EUT Type	: LCOS PROJECTOR
Type of Authority	: Certification
Model Name	: CF3DA-JS
Trade Name	: LG

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,


Soon-Hoon, Jeong, Associate Engineer
GUMI College EMC center


Jae-Hoon Jeong, Senior Engineer
GUMI College EMC center



CONTENTS

1. GENERAL INFORMATION	3
2. INTRODUCTION	4
3. PRODUCT INFORMATION	5
3.1 DESCRIPTION OF EUT.....	5
3.2 SUPPORT EQUIPMENT / CABLES USED	6
3.3 MODIFICATION ITEM(S)	6
4. DESCRIPTION OF TESTS.....	7
4.1 TEST CONDITION.....	7
4.2 CONDUCTED EMISSION	8
4.3 RADIATED EMISSION.....	9
5. CONDUCTED EMISSION.....	10
5.1 OPERATING ENVIRONMENT	10
5.2 TEST SET-UP	10
5.3 MEASUREMENT UNCERTAINTY.....	10
5.4 LIMIT	11
5.5 TEST EQUIPMENT USED.....	11
5.6 TEST DATA FOR CONDUCTED EMISSION	11
6. RADIATED EMISSION	20
6.1 OPERATING ENVIRONMENT	20
6.2 TEST SET-UP	20
6.3 MEASUREMENT UNCERTAINTY.....	20
6.4 LIMIT	21
6.5 TEST EQUIPMENT USED.....	21
6.6 TEST DATA FOR RADIATED EMISSION	22
7. SAMPLE CALCULATIONS.....	26
7.1 EXAMPLE 1 :	26
7.2 EXAMPLE 2 :	26
8. RECOMMENDATION & CONCLUSION.....	27
 APPENDIX A – ATTESTATION STATEMENT	
APPENDIX B – ID SAMPLE LABEL & LOCATION	
APPENDIX C – BLOCK DIAGRAM	
APPENDIX D – TEST SET-UP PHOTOGRAPHS	
APPENDIX E – EXTERNAL PHOTOGRAPHS	
APPENDIX F – INTERNAL PHOTOGRAPHS	
APPENDIX G – USER’S MANUAL	



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

Contact Person: Mr. Do-Hyung Kim, Chief research engineer

Tel Number: +82-31-610-9623

- **FCC ID.** BEJCF3DAJS
- **EUT Type** LCOS PROJECTOR
- **Model Name** CF3DA-JS
- **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** October 6 ~ 10, 2011
- **Place of Test** **Gumi College EMC Center** (FCC Registration Number: 100749, 443957)
407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-11-119
- **Dates of Issue** October 14, 2011

EUT Type: LCOS PROJECTOR

FCC ID.: BEJCF3DAJS



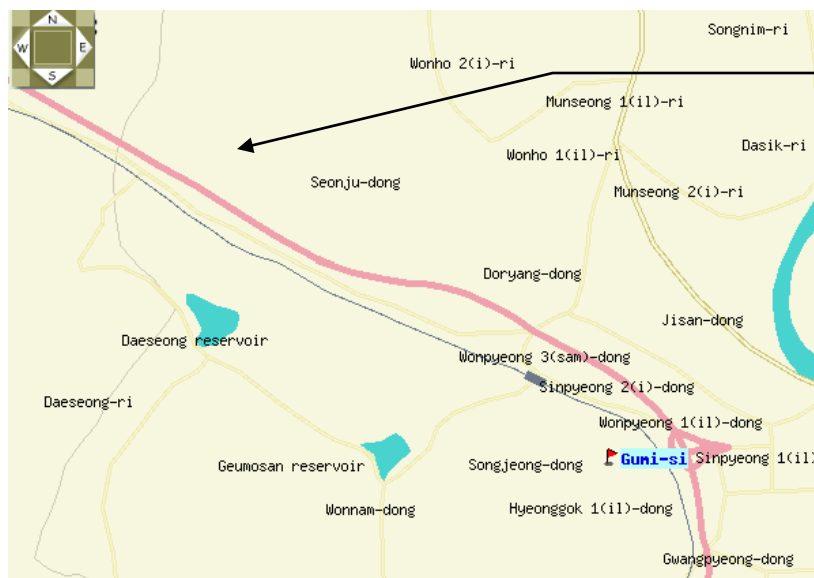
2. Introduction

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. LCOS PROJECTOR (Model Name: CF3DA-JS)**

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 (2003)



GUMI COLLEGE EMC CENTER
407, Bugok-dong, Gumi-si,
Gyeongbuk 730-711, Korea.
Tel: +82-54-440-1195
Fax: +82-54-440-1199

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. LCOS PROJECTOR (Model Name: CF3DA-JS)**
FCC ID.: BEJCF3DAJS

MODELS	CF3DA (CF3DA-JS)
Resolution	1920 (H) x 1080 (V) pixels
Aspect ratio	16:9 (H:V)
Panel size (mm)	15.4
Projection distance (Video size)	Wide: 0.88 m - 9.08 m (76.2 cm - 762.0 cm) Tele: 1.14 m - 11.8 m (76.2 cm - 762.0 cm)
Ratio of upward projection	100 %
Working range of the remote control	12 m
Video input	NTSC/PAL/SECAM/NTSC4.43/PAL-M/PAL-N/PAL-60
POWER	AC 110 V - 240 V - 50/60 Hz, 5.5 A
Height (mm)	190
Width (mm)	501
Length (mm)	560
Weight (kg)	21.1

- I/O Port : RGB IN, HDMI IN, RS-23C IN, VIDEO IN, COMPONENT IN,
CONTROL (RJ 45), USB(SVC ONLY)

- Maximum Frequency Range :667 MHz



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
PC	Hewlett-Packard	D530	S/N: CNG34800PY FCC ID.: DoC
Video card	ATI	ATI RV360(9600)	S/N: SN0402017176 FCC ID.: DoC
PS2 keyboard	COMPAQ	166516-AD6	S/N: B13BBOR391006D FCC ID.: AQ6-23K15
USB mouse	Great Pleasure Electronics Co., Ltd.	GP-M3100UE	S/N: 14036766 FCC ID.: DoC
DVD player	LG Electronics Inc.	LC-954	S/N: 3850R-Z674K FCC ID.: Verification

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.
IR remote controller	HANSUNG ELECTRONICS	AKB72913323	S/N: None. FCC ID.: N/A

3.2.3 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the EUT	1.80 m unshielded
RGB(Analog) cable	Connected to the EUT and PC	1.80 m shielded with two ferrite cores
HDMI/DVI(Digital) cable	Connected to the EUT and PC	2.00 m shielded
RS-232C (Control & service) cable	Connected to the EUT and PC	1.80 m shielded
Video in cable	Connected to the EUT and DVD player	1.50 m shielded
Component cable	Connected to the EUT and DVD player	2.00 m shielded
Control(RJ45) cable	Connected to the EUT and PC	3.00 m unshielded

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)

- . 3D projection mode

Radiated emission: 1 920 × 1 080 / 60 Hz (RGB: Analog, HDMI/DVI: Digital)

Conducted emission: 1 920 × 1 080 / 60 Hz (RGB: Analog, HDMI/DVI: Digital)

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

"The verification report for AV mode would be issued by LG Electronics Inc."



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, 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

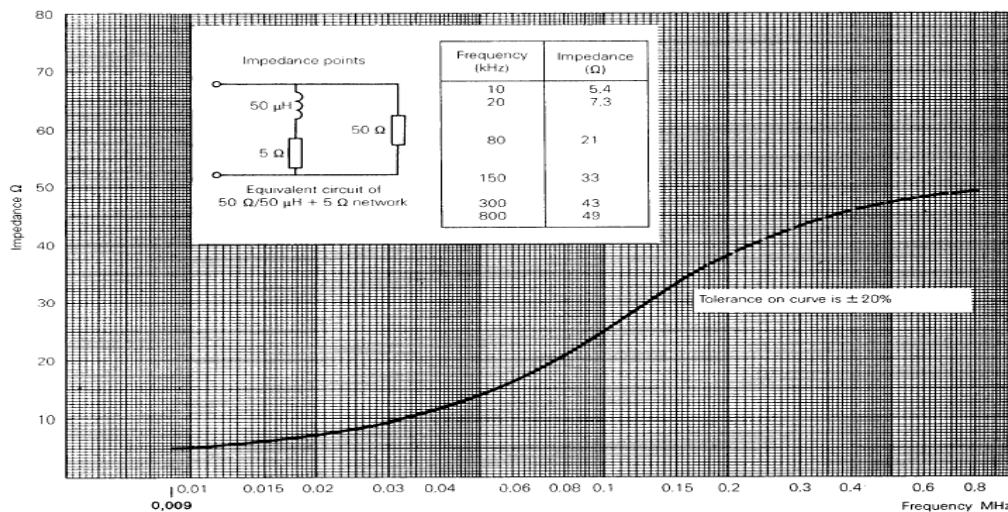


Fig 2. Impedance of LISN



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.

Final measurements were made 3 m chamber (FCC registration No.: 443957) and/or 10 m OATS (FCC registration No.: 100749).

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

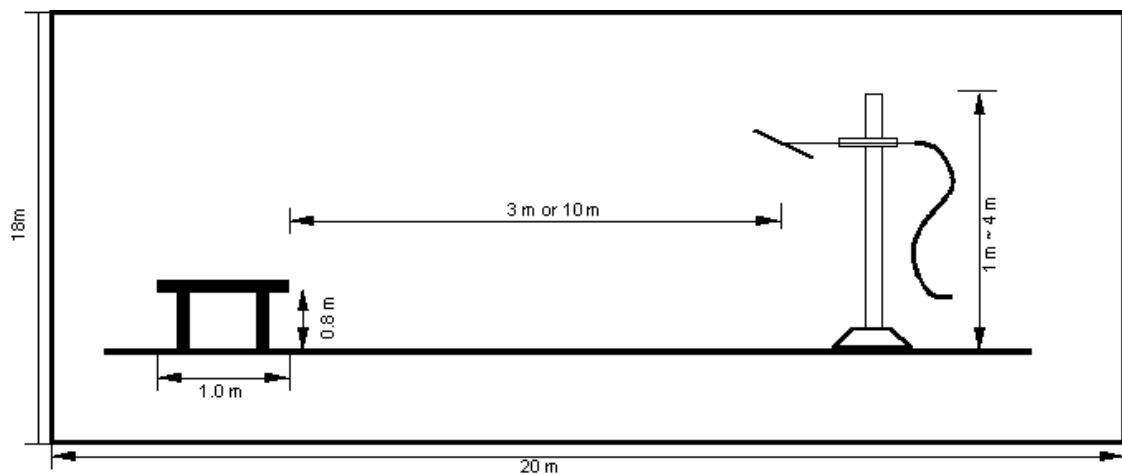


Fig 3. Dimensions of test site



5. Conducted Emission

5.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % 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)	± 2.71 dB	Confidence levels of 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	± 3.34 dB	Confidence levels of 95 % ($k = 2$)



5.4 Limit

RFI Conducted	FCC Limit(dB μ 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

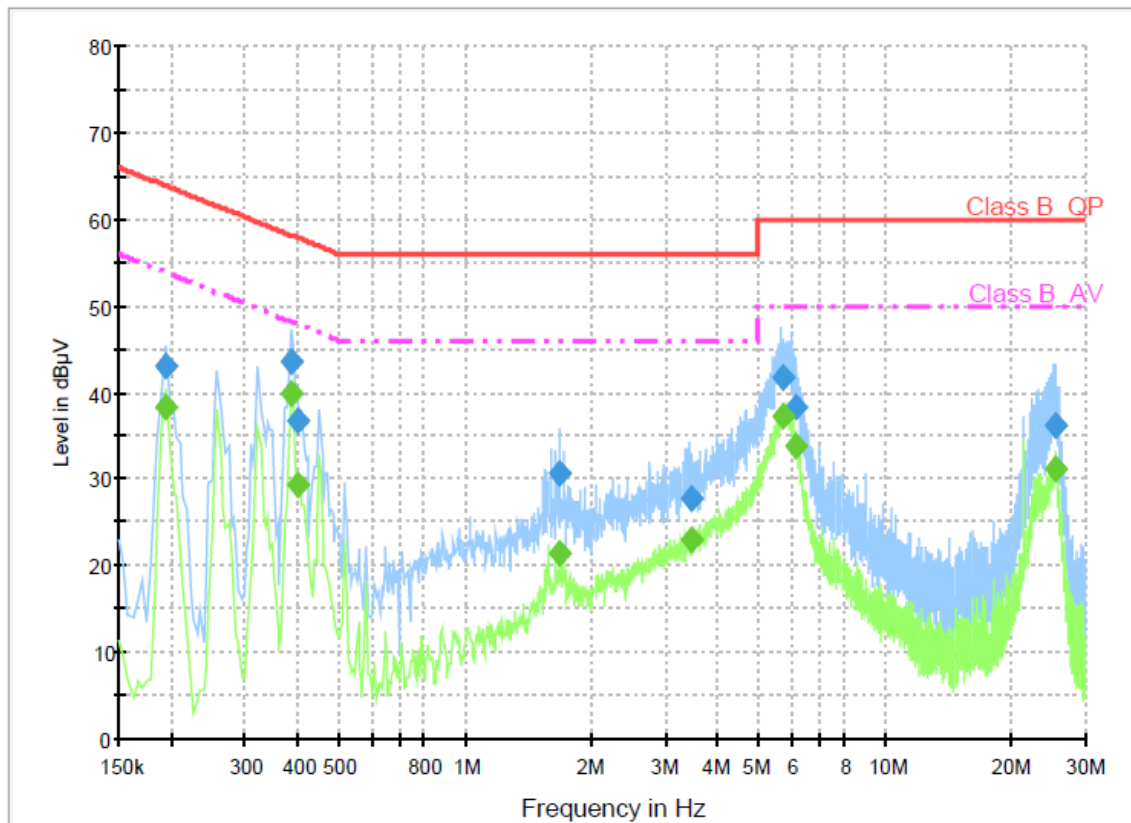
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 10. 2011
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 10. 2011
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 10. 2011
□ - ISN T8	TESEQ. GmbH	ISN	24568	11. 09. 2011

5.6 Test data for Conducted Emission

- Test Date : October 6, 2011
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz



◆ Operating condition: 1 920 × 1 080 / 60 Hz (RGB: Analog)



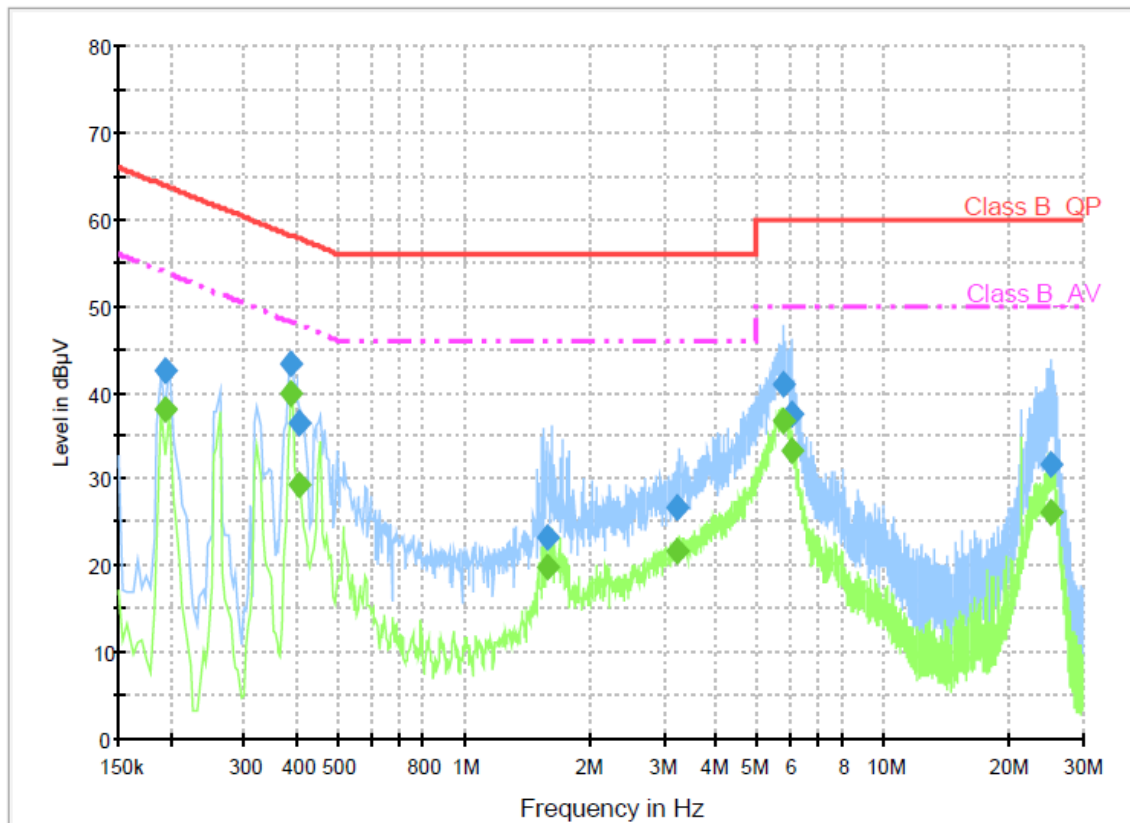
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	42.9	1000.0	9.000	GND	L1	10.1	20.9	63.9	
0.388000	43.5	1000.0	9.000	GND	L1	10.1	14.6	58.1	
0.400000	36.6	1000.0	9.000	GND	L1	10.1	21.2	57.9	
1.684000	30.5	1000.0	9.000	GND	L1	10.1	25.5	56.0	
3.460000	27.8	1000.0	9.000	GND	L1	10.3	28.2	56.0	
5.700000	41.7	1000.0	9.000	GND	L1	10.4	18.3	60.0	
6.132000	38.3	1000.0	9.000	GND	L1	10.4	21.7	60.0	
25.468000	36.1	1000.0	9.000	GND	L1	11.1	23.9	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.3	1000.0	9.000	GND	L1	10.1	15.6	53.9	
0.388000	39.8	1000.0	9.000	GND	L1	10.1	8.3	48.1	
0.400000	29.4	1000.0	9.000	GND	L1	10.1	18.5	47.9	
1.684000	21.4	1000.0	9.000	GND	L1	10.1	24.6	46.0	
3.460000	22.9	1000.0	9.000	GND	L1	10.3	23.1	46.0	
5.700000	37.3	1000.0	9.000	GND	L1	10.4	12.7	50.0	
6.132000	33.9	1000.0	9.000	GND	L1	10.4	16.1	50.0	
25.468000	31.0	1000.0	9.000	GND	L1	11.1	19.0	50.0	

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



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	42.6	1000.0	9.000	GND	N	10.1	21.3	63.9	
0.388000	43.3	1000.0	9.000	GND	N	10.1	14.8	58.1	
0.404000	36.6	1000.0	9.000	GND	N	10.1	21.2	57.8	
1.580000	23.2	1000.0	9.000	GND	N	10.1	32.8	56.0	
3.220000	26.7	1000.0	9.000	GND	N	10.2	29.3	56.0	
5.788000	41.0	1000.0	9.000	GND	N	10.4	19.0	60.0	
6.084000	37.5	1000.0	9.000	GND	N	10.4	22.5	60.0	
25.240000	31.6	1000.0	9.000	GND	N	10.7	28.4	60.0	

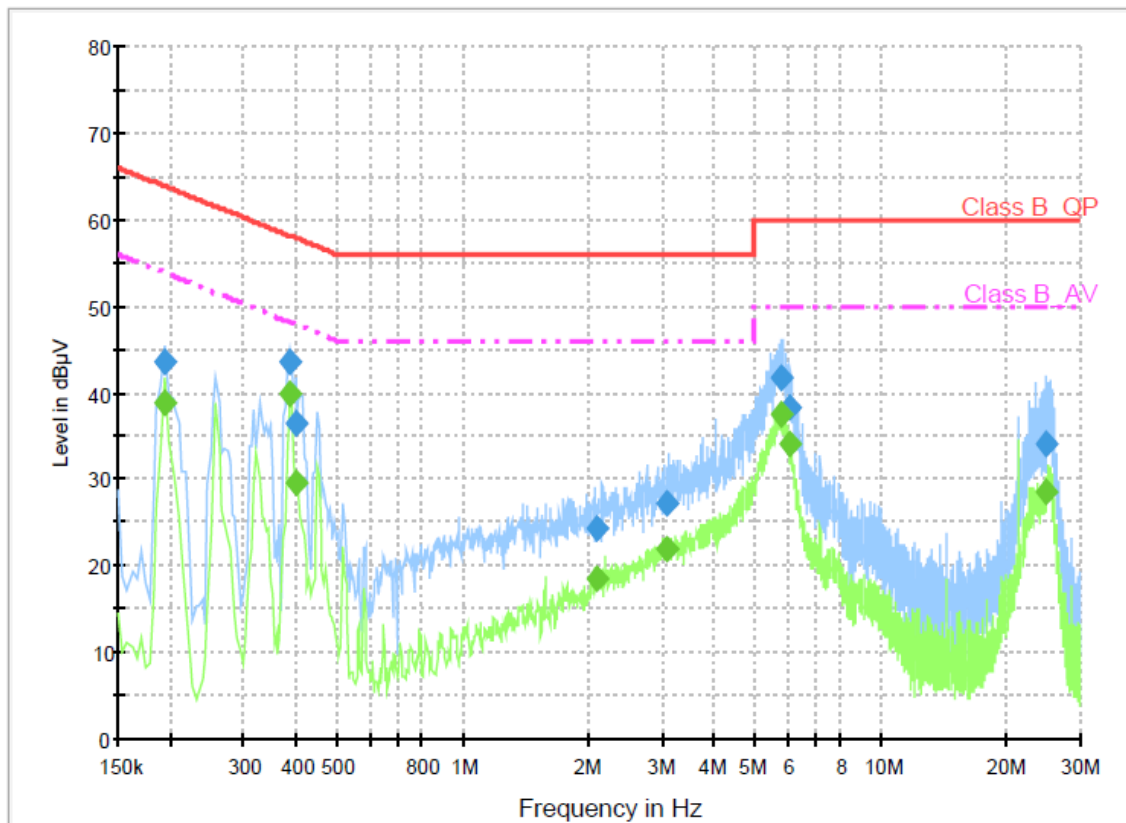
Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.1	1000.0	9.000	GND	N	10.1	15.8	53.9	
0.388000	39.8	1000.0	9.000	GND	N	10.1	8.3	48.1	
0.404000	29.2	1000.0	9.000	GND	N	10.1	18.5	47.8	
1.580000	19.8	1000.0	9.000	GND	N	10.1	26.2	46.0	
3.220000	21.8	1000.0	9.000	GND	N	10.2	24.2	46.0	
5.788000	36.7	1000.0	9.000	GND	N	10.4	13.3	50.0	
6.084000	33.2	1000.0	9.000	GND	N	10.4	16.8	50.0	
25.240000	26.3	1000.0	9.000	GND	N	10.7	23.7	50.0	

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



◆ Operating condition: 1 024 × 768 / 60 Hz (RGB: Analog)



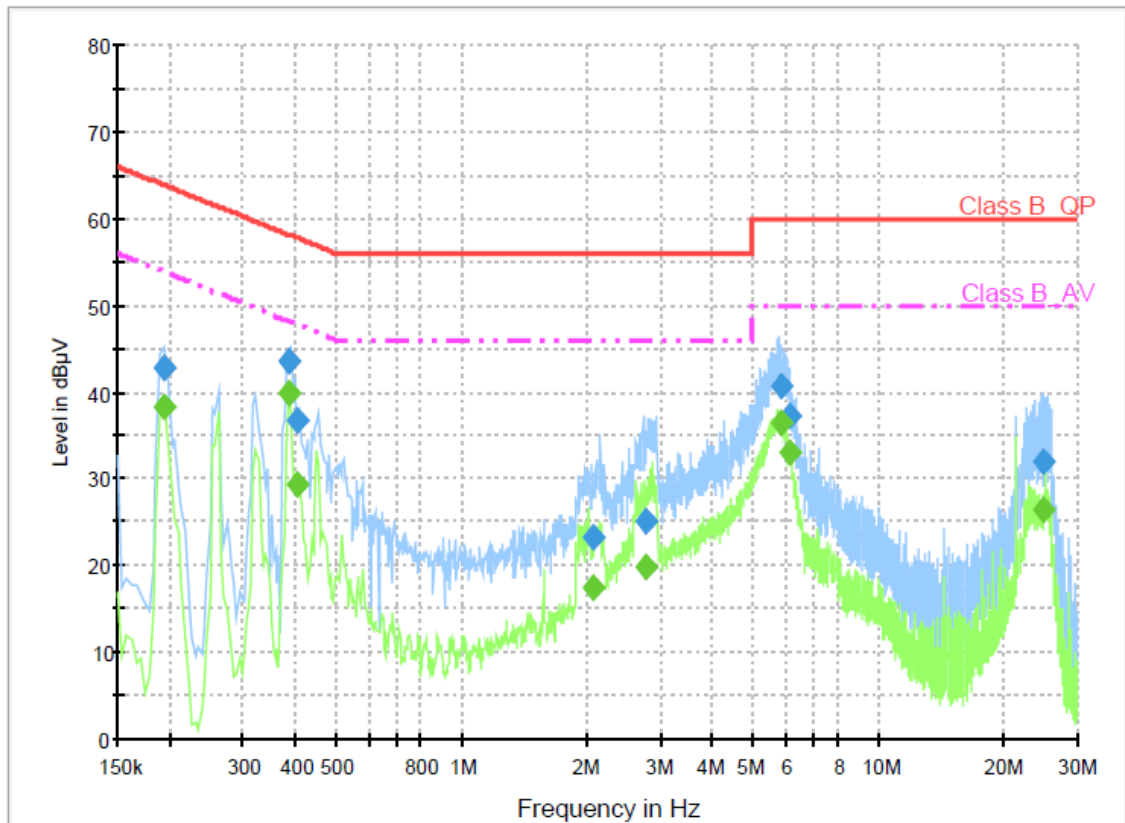
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	43.5	1000.0	9.000	GND	L1	10.1	20.4	63.9	
0.388000	43.5	1000.0	9.000	GND	L1	10.1	14.6	58.1	
0.400000	36.5	1000.0	9.000	GND	L1	10.1	21.4	57.9	
2.096000	24.4	1000.0	9.000	GND	L1	10.2	31.6	56.0	
3.076000	27.2	1000.0	9.000	GND	L1	10.2	28.8	56.0	
5.792000	41.7	1000.0	9.000	GND	L1	10.4	18.3	60.0	
6.096000	38.3	1000.0	9.000	GND	L1	10.4	21.7	60.0	
24.788000	33.9	1000.0	9.000	GND	L1	11.1	26.1	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.8	1000.0	9.000	GND	L1	10.1	15.1	53.9	
0.388000	39.9	1000.0	9.000	GND	L1	10.1	8.2	48.1	
0.400000	29.5	1000.0	9.000	GND	L1	10.1	18.4	47.9	
2.096000	18.4	1000.0	9.000	GND	L1	10.2	27.6	46.0	
3.076000	22.0	1000.0	9.000	GND	L1	10.2	24.0	46.0	
5.792000	37.4	1000.0	9.000	GND	L1	10.4	12.6	50.0	
6.096000	34.0	1000.0	9.000	GND	L1	10.4	16.0	50.0	
24.788000	28.6	1000.0	9.000	GND	L1	11.1	21.4	50.0	

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



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	42.7	1000.0	9.000	GND	N	10.1	21.2	63.9	
0.388000	43.4	1000.0	9.000	GND	N	10.1	14.7	58.1	
0.404000	36.8	1000.0	9.000	GND	N	10.1	21.0	57.8	
2.072000	23.3	1000.0	9.000	GND	N	10.2	32.7	56.0	
2.760000	25.1	1000.0	9.000	GND	N	10.2	30.9	56.0	
5.848000	40.7	1000.0	9.000	GND	N	10.4	19.3	60.0	
6.132000	37.3	1000.0	9.000	GND	N	10.4	22.7	60.0	
24.860000	32.0	1000.0	9.000	GND	N	10.7	28.0	60.0	

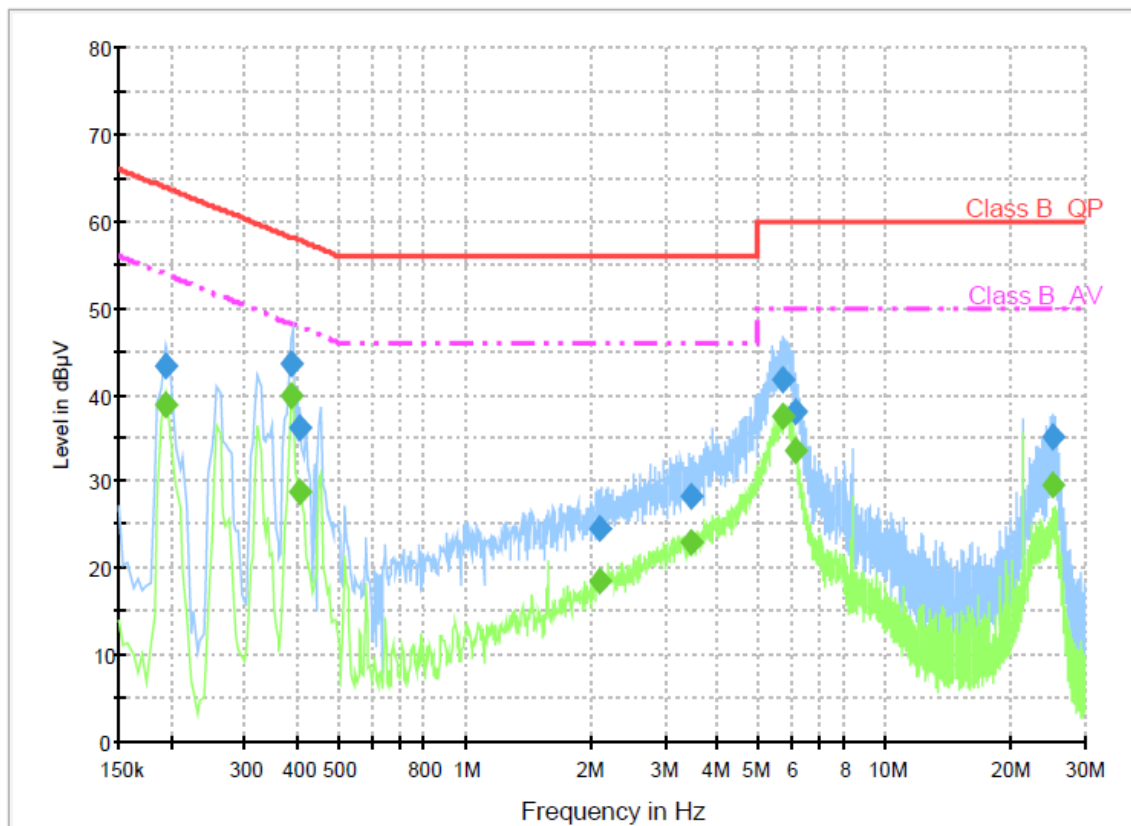
Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.2	1000.0	9.000	GND	N	10.1	15.7	53.9	
0.388000	39.8	1000.0	9.000	GND	N	10.1	8.3	48.1	
0.404000	29.4	1000.0	9.000	GND	N	10.1	18.4	47.8	
2.072000	17.5	1000.0	9.000	GND	N	10.2	28.5	46.0	
2.760000	19.9	1000.0	9.000	GND	N	10.2	26.1	46.0	
5.848000	36.5	1000.0	9.000	GND	N	10.4	13.5	50.0	
6.132000	33.0	1000.0	9.000	GND	N	10.4	17.0	50.0	
24.860000	26.4	1000.0	9.000	GND	N	10.7	23.6	50.0	

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



◆ Operating condition: 640 × 480 / 60 Hz (RGB: Analog)



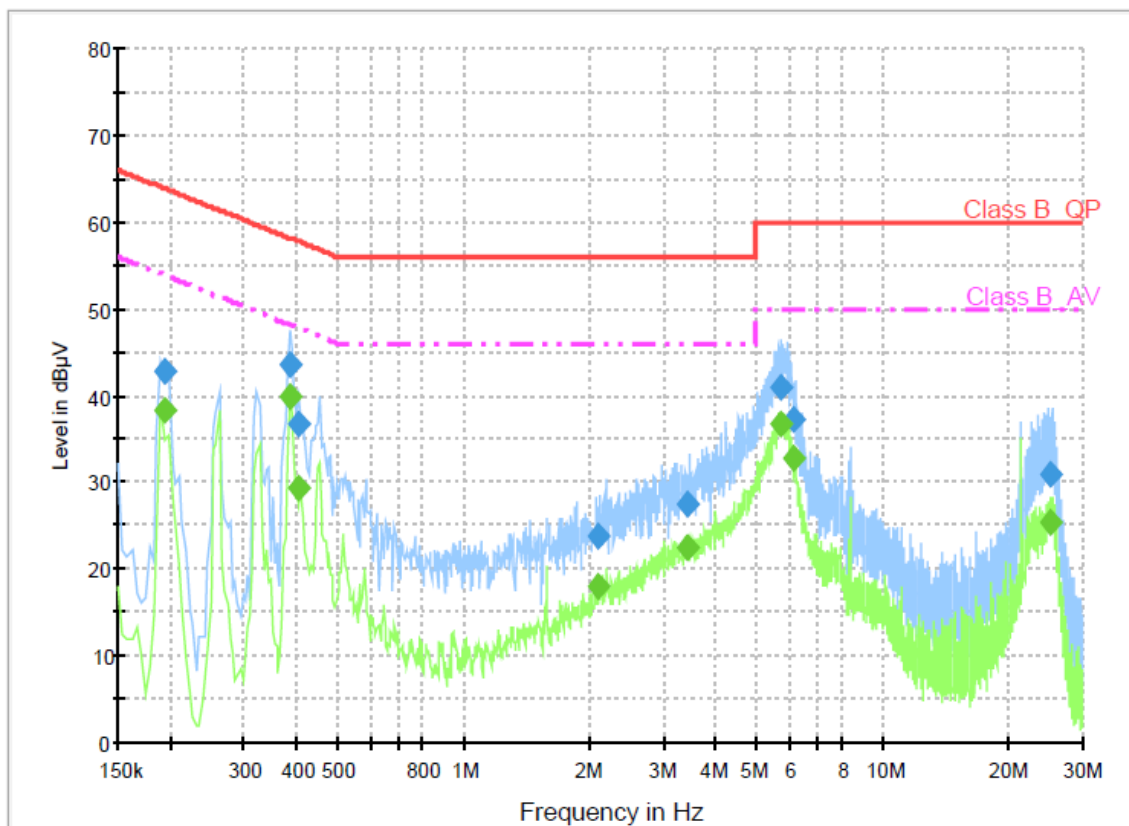
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	43.4	1000.0	9.000	GND	L1	10.1	20.5	63.9	
0.388000	43.5	1000.0	9.000	GND	L1	10.1	14.6	58.1	
0.404000	36.2	1000.0	9.000	GND	L1	10.1	21.6	57.8	
2.104000	24.6	1000.0	9.000	GND	L1	10.2	31.4	56.0	
3.444000	28.2	1000.0	9.000	GND	L1	10.3	27.8	56.0	
5.716000	41.8	1000.0	9.000	GND	L1	10.4	18.2	60.0	
6.128000	38.0	1000.0	9.000	GND	L1	10.4	22.0	60.0	
25.252000	35.0	1000.0	9.000	GND	L1	11.1	25.0	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.8	1000.0	9.000	GND	L1	10.1	15.1	53.9	
0.388000	39.9	1000.0	9.000	GND	L1	10.1	8.2	48.1	
0.404000	28.9	1000.0	9.000	GND	L1	10.1	18.9	47.8	
2.104000	18.5	1000.0	9.000	GND	L1	10.2	27.5	46.0	
3.444000	23.0	1000.0	9.000	GND	L1	10.3	23.0	46.0	
5.716000	37.5	1000.0	9.000	GND	L1	10.4	12.5	50.0	
6.128000	33.6	1000.0	9.000	GND	L1	10.4	16.4	50.0	
25.252000	29.6	1000.0	9.000	GND	L1	11.1	20.4	50.0	

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



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	42.7	1000.0	9.000	GND	N	10.1	21.2	63.9	
0.388000	43.5	1000.0	9.000	GND	N	10.1	14.6	58.1	
0.404000	36.6	1000.0	9.000	GND	N	10.1	21.2	57.8	
2.092000	23.6	1000.0	9.000	GND	N	10.2	32.4	56.0	
3.436000	27.3	1000.0	9.000	GND	N	10.3	28.7	56.0	
5.752000	40.9	1000.0	9.000	GND	N	10.4	19.1	60.0	
6.128000	37.2	1000.0	9.000	GND	N	10.4	22.8	60.0	
25.312000	30.9	1000.0	9.000	GND	N	10.7	29.1	60.0	

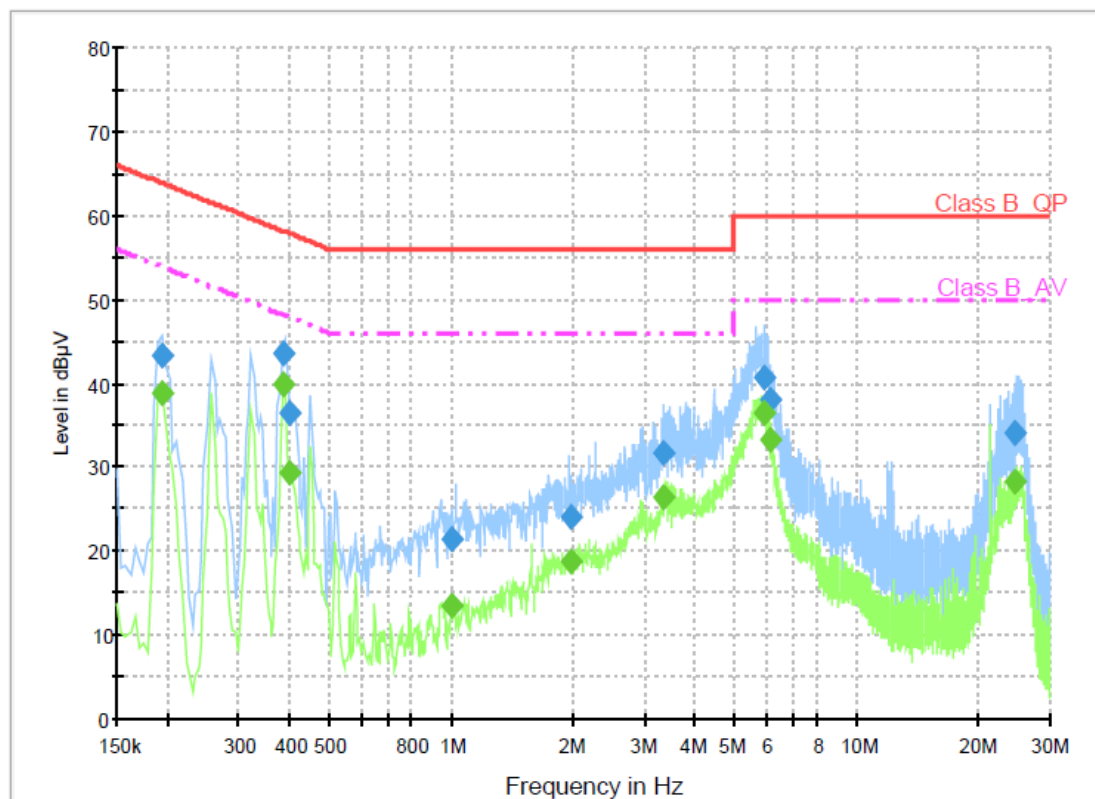
Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.2	1000.0	9.000	GND	N	10.1	15.7	53.9	
0.388000	39.9	1000.0	9.000	GND	N	10.1	8.2	48.1	
0.404000	29.3	1000.0	9.000	GND	N	10.1	18.4	47.8	
2.092000	17.9	1000.0	9.000	GND	N	10.2	28.1	46.0	
3.436000	22.4	1000.0	9.000	GND	N	10.3	23.6	46.0	
5.752000	36.7	1000.0	9.000	GND	N	10.4	13.3	50.0	
6.128000	32.7	1000.0	9.000	GND	N	10.4	17.3	50.0	
25.312000	25.3	1000.0	9.000	GND	N	10.7	24.7	50.0	

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



◆ Operating condition: 1 920 × 1 080 / 60 Hz (HDMI/DVI: Digital)



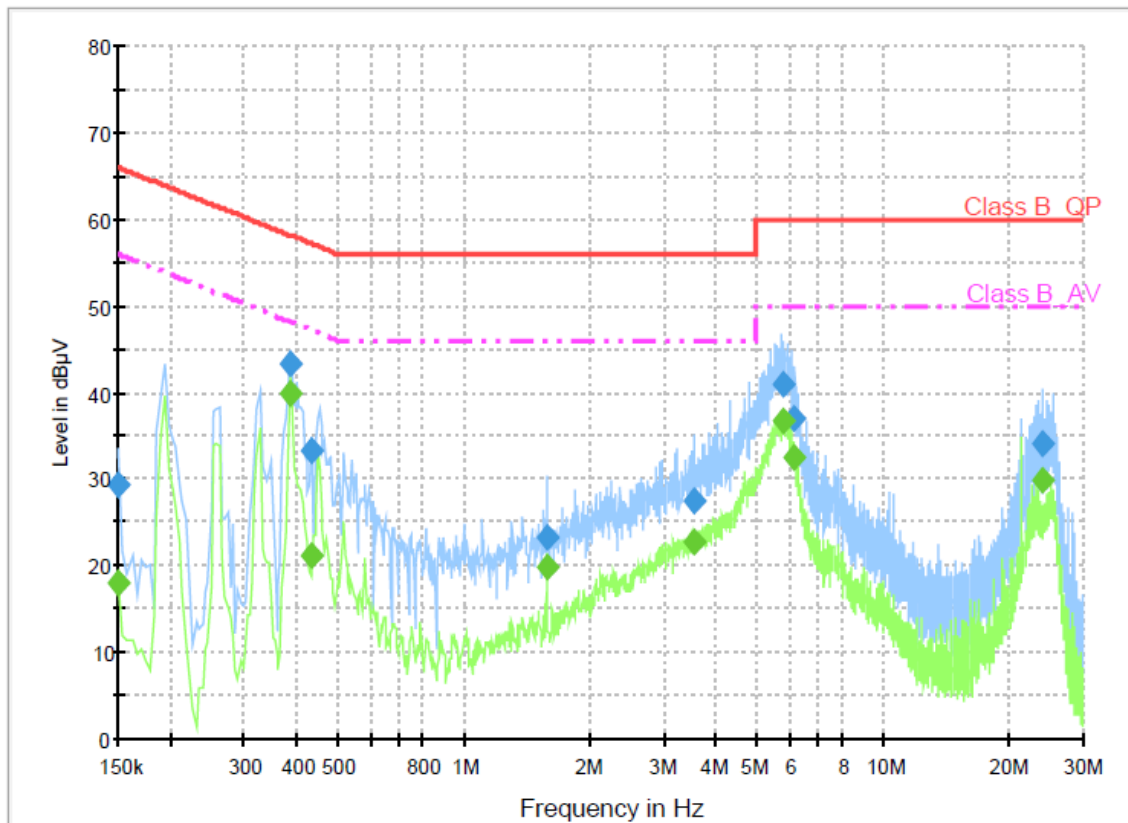
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	43.4	1000.0	9.000	GND	L1	10.1	20.4	63.9	
0.388000	43.5	1000.0	9.000	GND	L1	10.1	14.6	58.1	
0.400000	36.4	1000.0	9.000	GND	L1	10.1	21.5	57.9	
1.008000	21.3	1000.0	9.000	GND	L1	10.1	34.7	56.0	
1.972000	24.0	1000.0	9.000	GND	L1	10.1	32.0	56.0	
3.352000	31.6	1000.0	9.000	GND	L1	10.2	24.4	56.0	
5.912000	40.7	1000.0	9.000	GND	L1	10.4	19.3	60.0	
6.124000	37.9	1000.0	9.000	GND	L1	10.4	22.1	60.0	
24.728000	34.0	1000.0	9.000	GND	L1	11.1	26.0	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.194000	38.8	1000.0	9.000	GND	L1	10.1	15.1	53.9	
0.388000	39.8	1000.0	9.000	GND	L1	10.1	8.3	48.1	
0.400000	29.3	1000.0	9.000	GND	L1	10.1	18.5	47.9	
1.008000	13.6	1000.0	9.000	GND	L1	10.1	32.4	46.0	
1.972000	18.7	1000.0	9.000	GND	L1	10.1	27.3	46.0	
3.352000	26.4	1000.0	9.000	GND	L1	10.2	19.6	46.0	
5.912000	36.5	1000.0	9.000	GND	L1	10.4	13.5	50.0	
6.124000	33.3	1000.0	9.000	GND	L1	10.4	16.8	50.0	
24.728000	28.4	1000.0	9.000	GND	L1	11.1	21.6	50.0	

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



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	29.3	1000.0	0.200	GND	N	10.1	36.7	66.0	
0.388000	43.4	1000.0	9.000	GND	N	10.1	14.7	58.1	
0.436000	33.2	1000.0	9.000	GND	N	10.1	24.0	57.1	
1.580000	23.4	1000.0	9.000	GND	N	10.1	32.6	56.0	
3.564000	27.6	1000.0	9.000	GND	N	10.3	28.4	56.0	
5.764000	40.9	1000.0	9.000	GND	N	10.4	19.1	60.0	
6.140000	37.0	1000.0	9.000	GND	N	10.4	23.0	60.0	
24.012000	34.0	1000.0	9.000	GND	N	10.7	26.0	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	18.1	1000.0	9.000	GND	N	10.1	37.9	56.0	
0.388000	39.8	1000.0	9.000	GND	N	10.1	8.3	48.1	
0.436000	21.1	1000.0	9.000	GND	N	10.1	26.0	47.1	
1.580000	19.9	1000.0	9.000	GND	N	10.1	26.1	46.0	
3.564000	22.6	1000.0	9.000	GND	N	10.3	23.4	46.0	
5.764000	36.7	1000.0	9.000	GND	N	10.4	13.3	50.0	
6.140000	32.6	1000.0	9.000	GND	N	10.4	17.4	50.0	
24.012000	29.7	1000.0	9.000	GND	N	10.7	20.3	50.0	

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



6. Radiated Emission

6.1 Operating Environment

Temperature : 18.0 °C
Relative Humidity : 31.0 % R.H.

6.2 Test Set-up

A preliminary scan with peak mode was performed in the semi anechoic chamber and found frequency for test site. The formal radiated emission was measured at 10 m distance open area test site and 3 m distance 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(Open area test site)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 4.03 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 3.96 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 4.01 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.88 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
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 10. 2011
■ - HK116	Rohde & Schwarz	Biconical Antenna	832639/007	03. 15. 2012
■ - HL223	Rohde & Schwarz	Log Periodic Antenna	835998/004	03. 15. 2012
■ - 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	12. 11. 2011
■ - BBHA9120D	Schwarzbeck	Horn Antenna	207	12. 22. 2011
■ - 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	11. 12. 2011

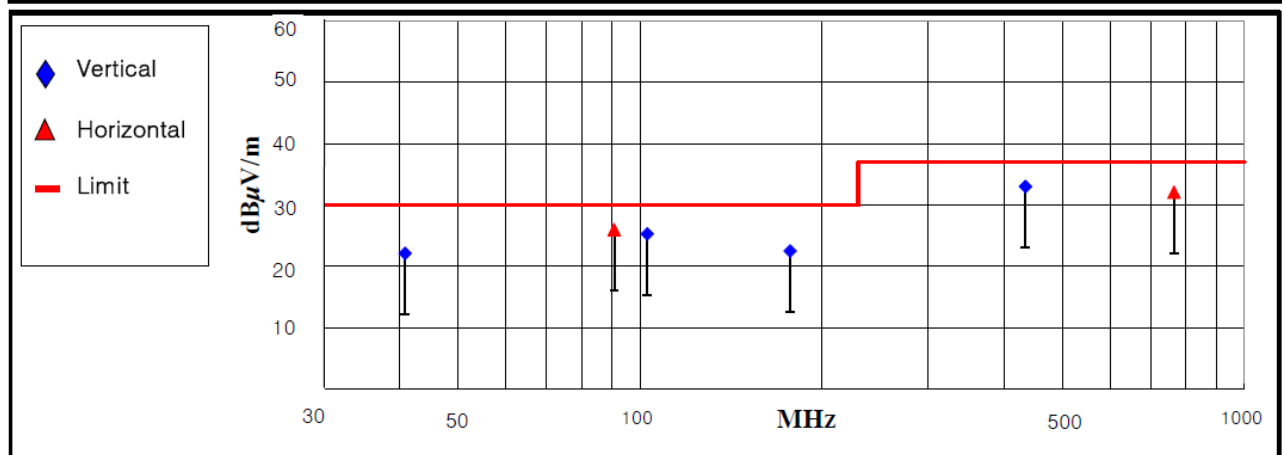


6.6 Test data for Radiated Emission

- Test Date : October 10, 2011
- Resolution Bandwidth : 120 kHz/1 MHz
- Frequency Range : 30 MHz ~ 5 000 MHz
- Measurement Distance : 3 m
- Note : The highest frequency of the internal source of the EUT is between 500 MHz and 1 000 MHz (667 MHz). The measurement was made up to 5 000 MHz

◆ Operating Condition: 1 920 × 1 080 / 60 Hz (RGB: Analog)

Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol.	Height	Angle
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)			(H/V)	(cm)	(°)
40.86	9.31	11.25	1.54	22.10	30.00	7.90	V	100	192
90.64	14.90	8.69	2.41	26.00	30.00	4.00	H	223	270
102.83	13.00	9.73	2.57	25.30	30.00	4.70	V	106	273
177.29	5.63	13.37	3.50	22.50	30.00	7.50	V	100	7
434.51	10.52	16.67	5.81	33.00	37.00	4.00	V	175	69
765.23	3.03	20.93	8.14	32.10	37.00	4.90	H	100	180

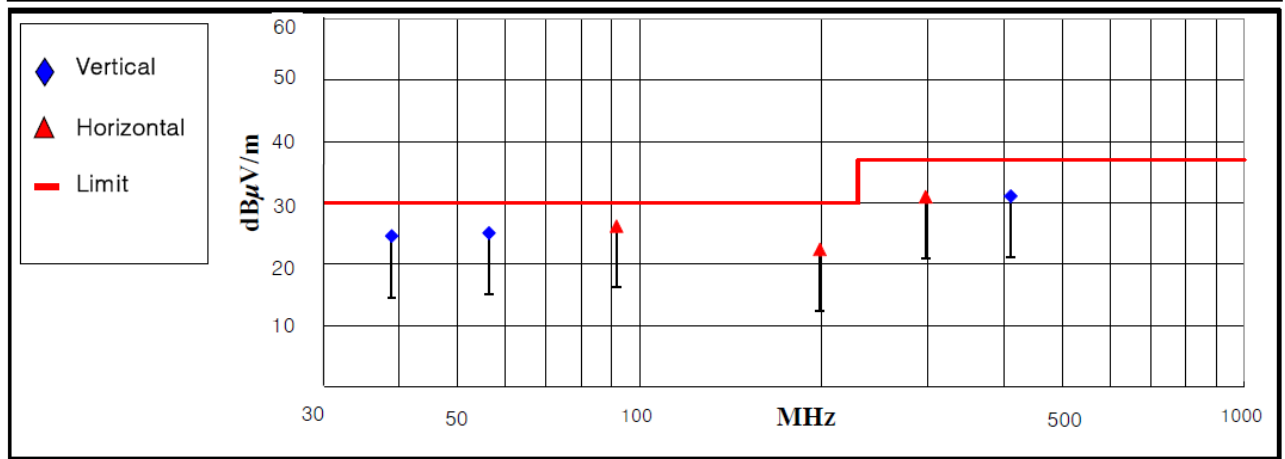


< Fig 12. Radiated emission result (30 MHz ~ 1 000 MHz) >



◆ Operating Condition: 1 920 × 1 080 / 60 Hz (HDMI/DVI: Digital)

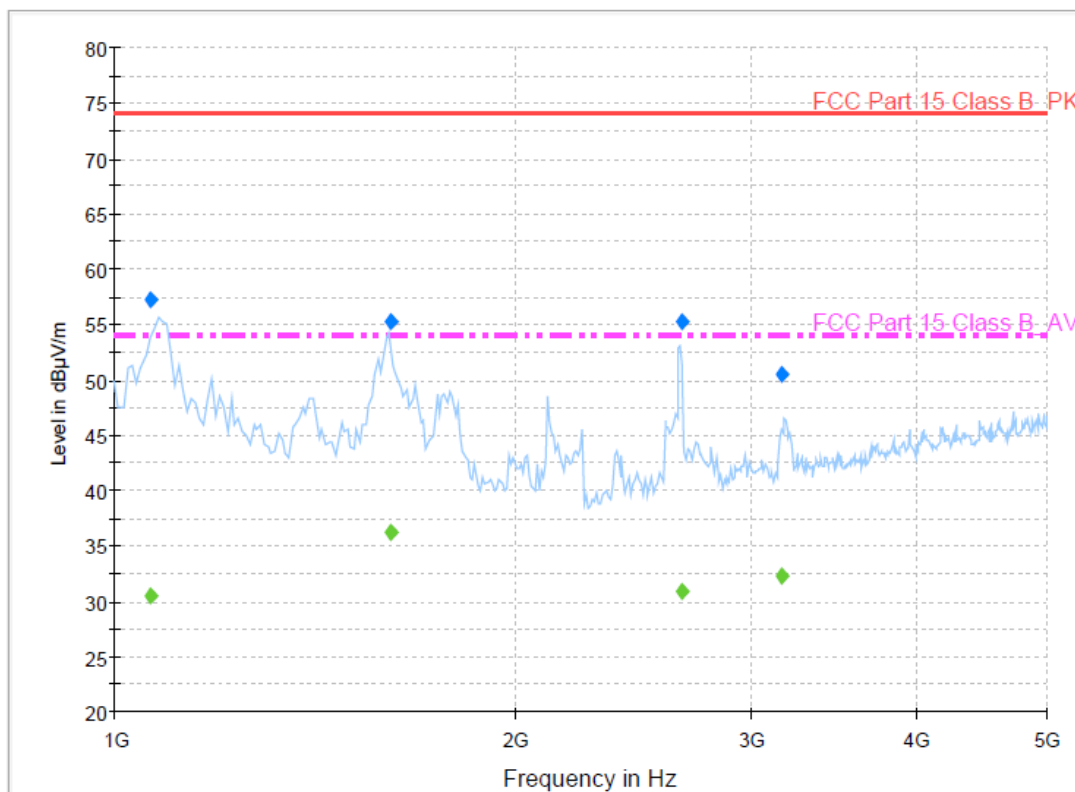
Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol.	Height	Angle
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)			(H/V)	(cm)	(°)
38.92	11.57	11.53	1.50	24.60	30.00	5.40	V	100	357
56.37	14.75	8.51	1.84	25.10	30.00	4.90	V	100	133
91.59	15.01	8.77	2.42	26.20	30.00	3.80	H	199	304
198.59	4.21	14.44	3.75	22.40	30.00	7.60	H	224	143
297.02	8.89	17.42	4.69	31.00	37.00	6.00	H	126	20
411.23	9.12	16.36	5.62	31.10	37.00	5.90	V	157	73



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



- ◆ Operating Condition: 1 920 × 1 080 / 60 Hz (RGB: Analog)
Green marker: Average detector, Blue marker: Peak detector



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)
1064.360321	57.2	1000.0	1000.000	100.0	V	347.0	-14.4	16.8	74.0
1610.618437	55.2	1000.0	1000.000	100.0	V	219.0	-12.6	18.8	74.0
2663.118637	55.2	1000.0	1000.000	100.0	H	214.0	-8.1	18.8	74.0
3170.960721	50.6	1000.0	1000.000	100.0	V	277.0	-6.1	23.4	74.0

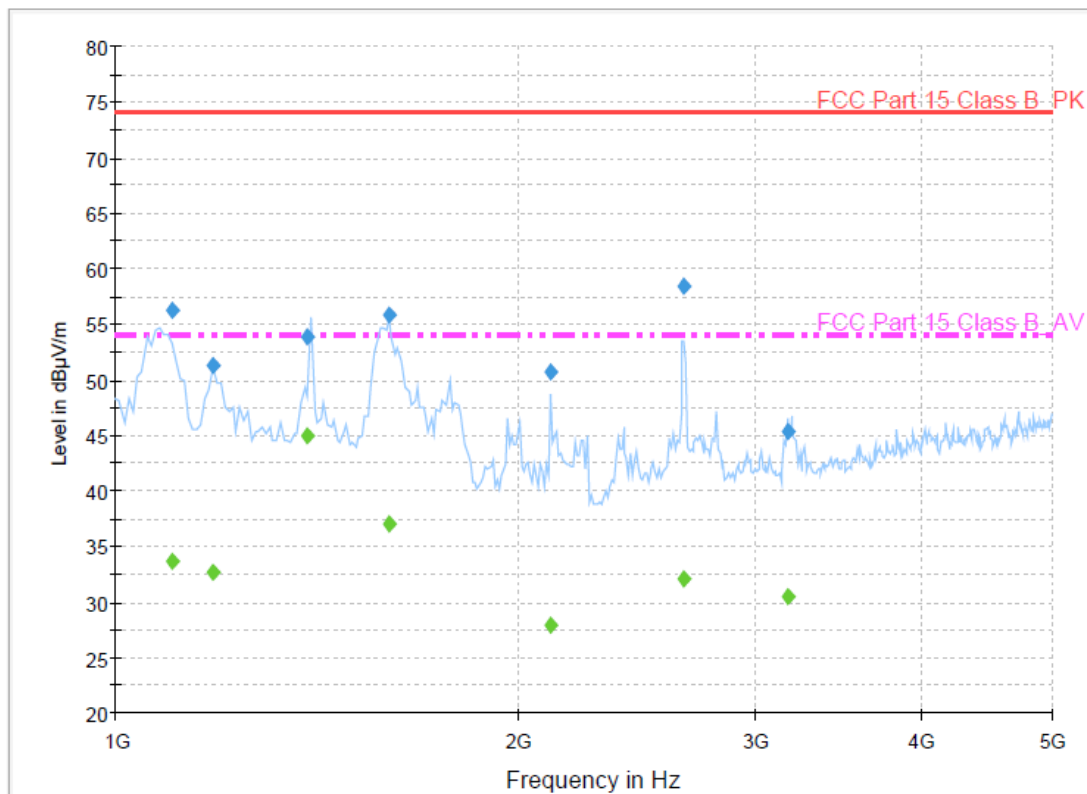
Final Result 2

Frequency (MHz)	CAverage (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1064.360321	30.4	1000.0	1000.000	1000.0	1000	100.0	-14.3	23.6	54.0
1610.618437	36.3	1000.0	1000.000	1000.0	1000	100.0	-13.4	17.7	54.0
2663.118637	30.8	1000.0	1000.000	1000.0	1000	100.0	-14.1	23.2	54.0
3170.960721	32.3	1000.0	1000.000	1000.0	1000	100.0	-12.6	21.7	54.0

< Fig 14. Radiated emission result (1 000 MHz ~ 5 000 MHz) >



- ◆ Operating Condition: 1 920 × 1 080 / 60 Hz (HDMI/DVI: Digital)
Green marker: Average detector, Blue marker: Peak detector



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)
1102.360321	56.3	1000.0	1000.000	100.0	V	348.0	-14.3	17.7	74.0
1184.968738	51.3	1000.0	1000.000	177.0	V	246.0	-14.1	22.7	74.0
1389.801603	53.8	1000.0	1000.000	100.0	H	189.0	-13.4	20.2	74.0
1602.602405	55.8	1000.0	1000.000	100.0	V	133.0	-12.6	18.2	74.0
2113.228457	50.6	1000.0	1000.000	100.0	V	213.0	-10.9	23.4	74.0
2655.118637	58.4	1000.0	1000.000	100.0	H	144.0	-8.2	15.6	74.0
3181.792786	45.3	1000.0	1000.000	126.0	V	201.0	-6.1	28.7	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)
1102.360321	33.7	1000.0	1000.000	100.0	V	348.0	-14.3	20.3	54.0
1184.968738	32.8	1000.0	1000.000	177.0	V	246.0	-14.1	21.2	54.0
1389.801603	45.0	1000.0	1000.000	100.0	H	189.0	-13.4	9.0	54.0
1602.602405	37.0	1000.0	1000.000	100.0	V	133.0	-12.6	17.0	54.0
2113.228457	27.9	1000.0	1000.000	100.0	V	213.0	-10.9	26.1	54.0
2655.118637	32.1	1000.0	1000.000	100.0	H	144.0	-8.2	21.9	54.0
3181.792786	30.5	1000.0	1000.000	126.0	V	201.0	-6.1	23.5	54.0

< Fig 15. Radiated emission result (1 000 MHz ~ 5 000 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. LCOS PROJECTOR (Model Name: CF3DA-JS)** was complies with §15.107 and 15.109 of the FCC Rules.