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 : May 11, 2010
Order Number: GETEC-C1-10-110
Test Report Number: GETEC-E3-10-052
Test Site: Gumi College EMC Center
FCC Registration Number: (100749, 443957)

FCC ID.: BEJBX503JD

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**
Model Name	**: BX503-JD, GX513-JD, BX503B-JD**
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 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,

Soon Hoon

Soon-Hoon Jeong, Engineer
GUMI College EMC center

Reviewed by,

Jae-Hoon Jeong, Senior Engineer
GUMI College EMC center

CONTENTS

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. Sang-Wook Lee, Chief research engineer
Tel Number: +82-31-610-9623

- **FCC ID.** BEJBX503JD
- **EUT Type** DLP PROJECTOR
- **Model Name** BX503-JD, GX513-JD, BX503G-JD
  The differences for all models are as follow:

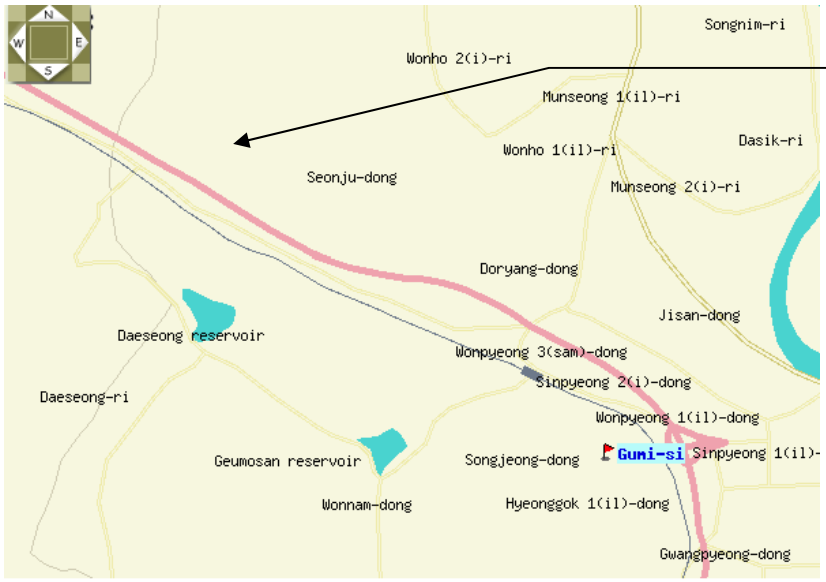
Model Name	Descreiption(color)
BX503-JD	White
GX513-JD	Silver
BX503B-JD	Black

- **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** April 16 ~ 21, 2010
- **Place of Test** **Gumi College EMC Center** (FCC Registration Number: 100749, 443957)
  407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-10-052
- **Dates of Issue** May 11, 2010

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. DLP PROJECTOR (Model Name: BX503-JD, GX513-JD, BX503G-JD)**

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. DLP PROJECTOR (Model Name: BX503-JD, GX513-JD, BX503G-JD) FCC ID.: BEJBX503JD**

MODEL	BX503 (BX503-JD) / BX403B (BX403B-JD)
Resolution	1024(Horizontal) x 768(Vertical)pixel
Horizontal / Vertical Ratio	4:3(horizontal:vertical)
DLP panel size	0.7 inches
Screen size (Projection distance)	Wide : 1.0 ~ 7.5m(40 ~ 296 inches)
	Tele : 1.2 ~ 8.7m(48 ~ 343 inches)
Projection off-set ratio	100%
Remote control distance	12m
Zoom ratio	1:1.2
Video compatibility	NTSC/PAL/SECAM/NTSC4.43/PAL-M/PAL-N
Power	AC 100 - 240V~ 50/60Hz, 4.3A
Height(mm/inches)	135.7/5.4 (without foot), 148.5/5.9 (with foot)
Breadth(mm/inches)	403.3/15.9
Length(mm/inches)	293.1/11.6
Weight(kg/pound)	5.9/0.3

-. Maximum Frequency range : 400 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
Key board	COMPAQ	166516-AD6	S/N: B13BBOR391006D FCC ID.: AQ6-23K15
PS2 mouse	LOGITECH	M-S69	S/N: 334684-108 FCC ID.: JNZ211443
Joy stick	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
Monitor	Dell Computer Corporation	1800FP	S/N: N/A FCC ID.: BEJLD803H

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.
None.	-	-	-

3.2.3 Used Cable(s)

Cable Name	**Condition**	**Description**
Power cable	Connected to the EUT	1.80 m unshielded
RGB(Analog) in cable	Connected to the EUT and PC	1.80 m shielded with two ferrite cores
RGB(Analog) out cable	Connected to the EUT and monitor	1.80 m shielded with two ferrite cores
HDMI/DVI(Digital) in cable	Connected to the EUT and PC	2.00 m shielded
USB(Service only) cable	Connected to the EUT and PC	1.80 m shielded
Video in cable	Connected to the EUT and DVD player	2.00 m shielded
RS-232C(Control) in cable	Connected to the EUT and PC	1.80 m shielded
LAN cable	Connected to the EUT and network	10.00 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)

-. Projection mode

Radiated emission: 1 400 × 1 050 / 60 Hz (RGB: Analog, HDMI/DVI: Digital)

Conducted emission: 1 400 × 1 050 / 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
-. Operated DDC function with the eZ manager software

* DDC is a communication channel over which the monitor automatically informs the host system (PC) about its capabilities

"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

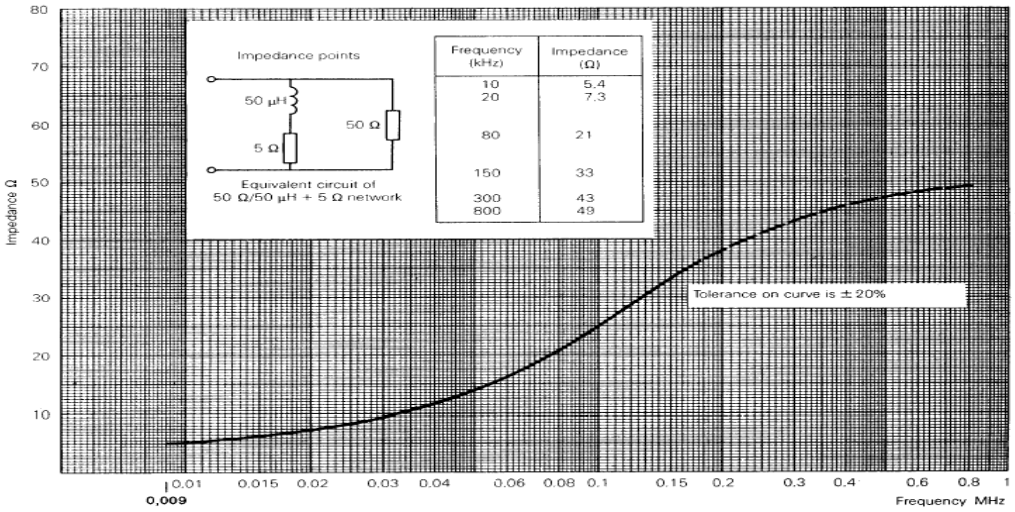


Fig 2. Impedance of LISN

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

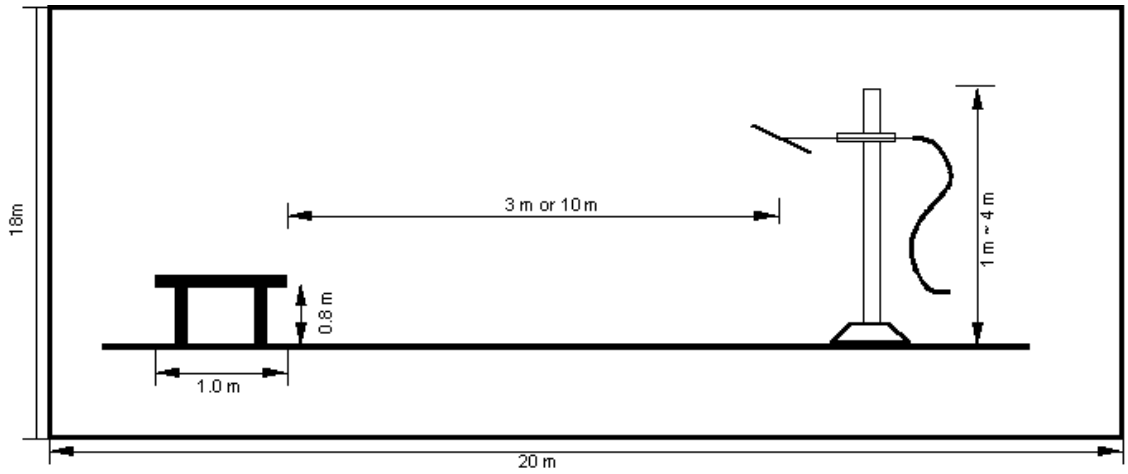


Fig 3. Dimensions of test site.

5. Conducted Emission

5.1 Operating Environment

Temperature : 24 ℃
Relative Humidity : 35 % 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)	± 2.69 dB	Confidence levels of 95 % (k = 2)
Conducted emission (150 kHz ~ 30 MHz)	± 4.16 dB	Confidence levels of 95 % (k = 2)

5.4 Limit

RFI Conducted	FCC Limit(dB μV/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

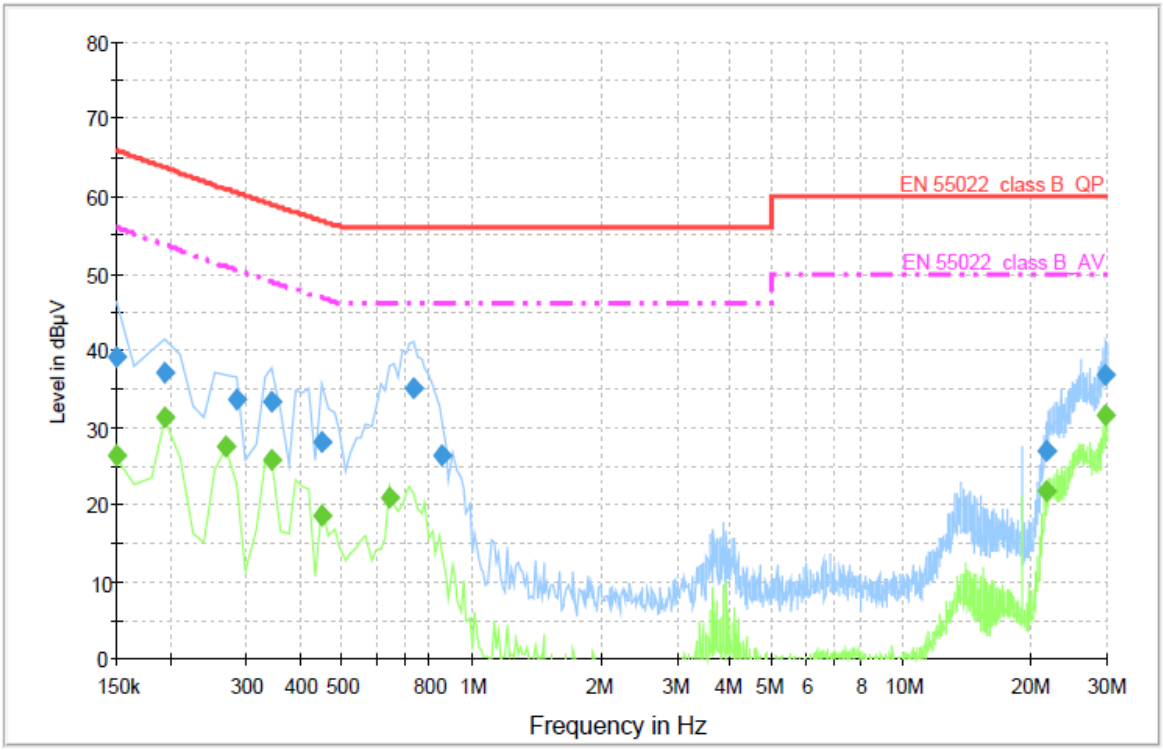
	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 10. 2010
■ -	ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 10. 2010
■ -	ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 10. 2010
■ -	ISN T8	TESEQ. GmbH	Impedance Network	24568	10. 16. 2010

5.6 Test data for Conducted Emission

-. Test Date : April 16, 2010
-. Resolution Bandwidth : 9 kHz
-. Frequency Range : 0.15 MHz ~ 30 MHz

♦ **Operating condition: 1 400 × 1 050 / 60 Hz (RGB: Analog)**

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

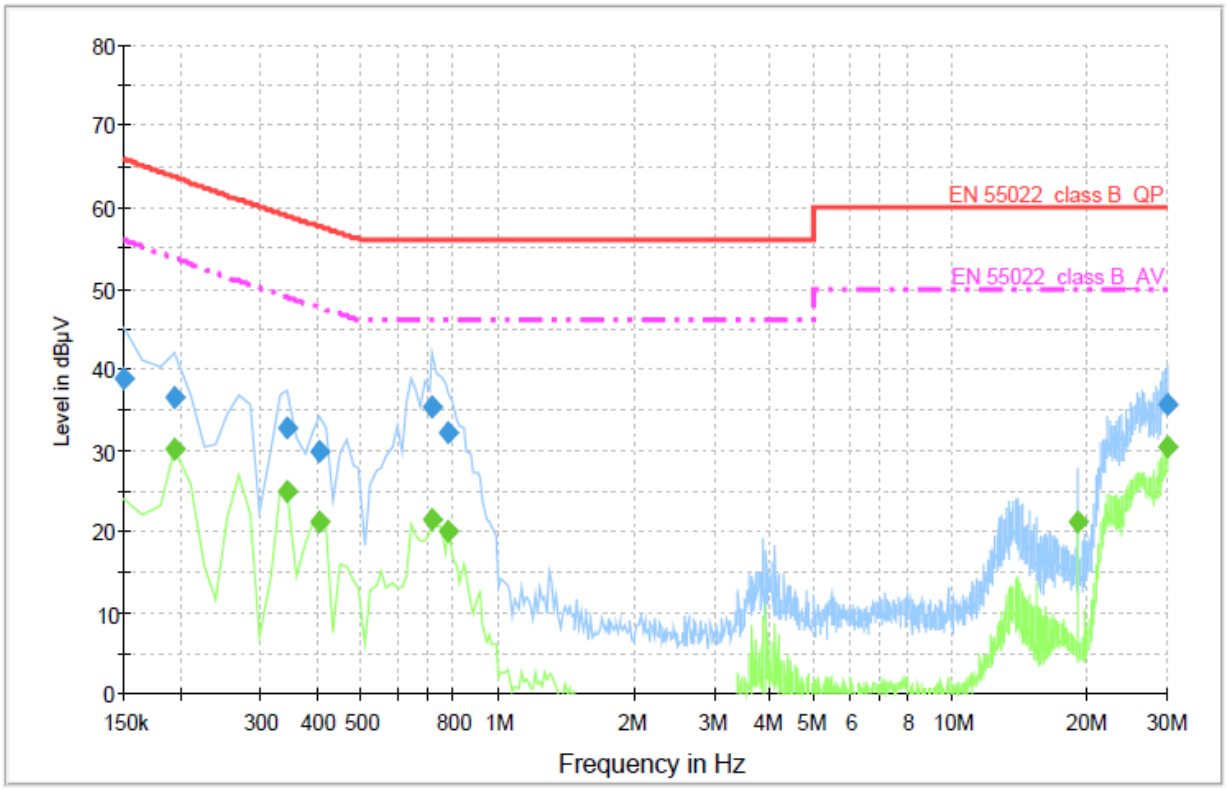
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	39.2	1000.000	9.000	GND	L1	10.0	26.8	66.0	
0.195000	37.0	1000.000	9.000	GND	L1	10.0	26.7	63.7	
0.285000	33.6	1000.000	9.000	GND	L1	10.0	26.9	60.5	
0.345000	33.4	1000.000	9.000	GND	L1	10.0	25.5	58.9	
0.450000	28.0	1000.000	9.000	GND	L1	10.0	28.8	56.8	
0.735000	34.9	1000.000	9.000	GND	L1	10.0	21.1	56.0	
0.855000	26.3	1000.000	9.000	GND	L1	10.0	29.7	56.0	
21.630000	27.0	1000.000	9.000	GND	L1	11.1	33.0	60.0	
29.820000	36.9	1000.000	9.000	GND	L1	11.5	23.1	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	26.4	1000.000	9.000	GND	L1	10.0	29.6	56.0	
0.195000	31.3	1000.000	9.000	GND	L1	10.0	22.4	53.7	
0.270000	27.5	1000.000	9.000	GND	L1	10.0	23.4	50.9	
0.345000	25.7	1000.000	9.000	GND	L1	10.0	23.2	48.9	
0.450000	18.5	1000.000	9.000	GND	L1	10.0	28.3	46.8	
0.645000	20.9	1000.000	9.000	GND	L1	10.0	25.2	46.0	
21.630000	21.7	1000.000	9.000	GND	L1	11.1	28.3	50.0	
29.820000	31.6	1000.000	9.000	GND	L1	11.5	18.4	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
0.150000	38.8	1000.000	9.000	GND	N	10.0	27.2	66.0	
0.195000	36.6	1000.000	9.000	GND	N	10.0	27.1	63.7	
0.345000	32.8	1000.000	9.000	GND	N	10.0	26.1	58.9	
0.405000	30.0	1000.000	9.000	GND	N	10.0	27.6	57.6	
0.720000	35.3	1000.000	9.000	GND	N	10.0	20.7	56.0	
0.780000	32.2	1000.000	9.000	GND	N	10.0	23.8	56.0	
29.955000	35.7	1000.000	9.000	GND	N	10.8	24.4	60.0	

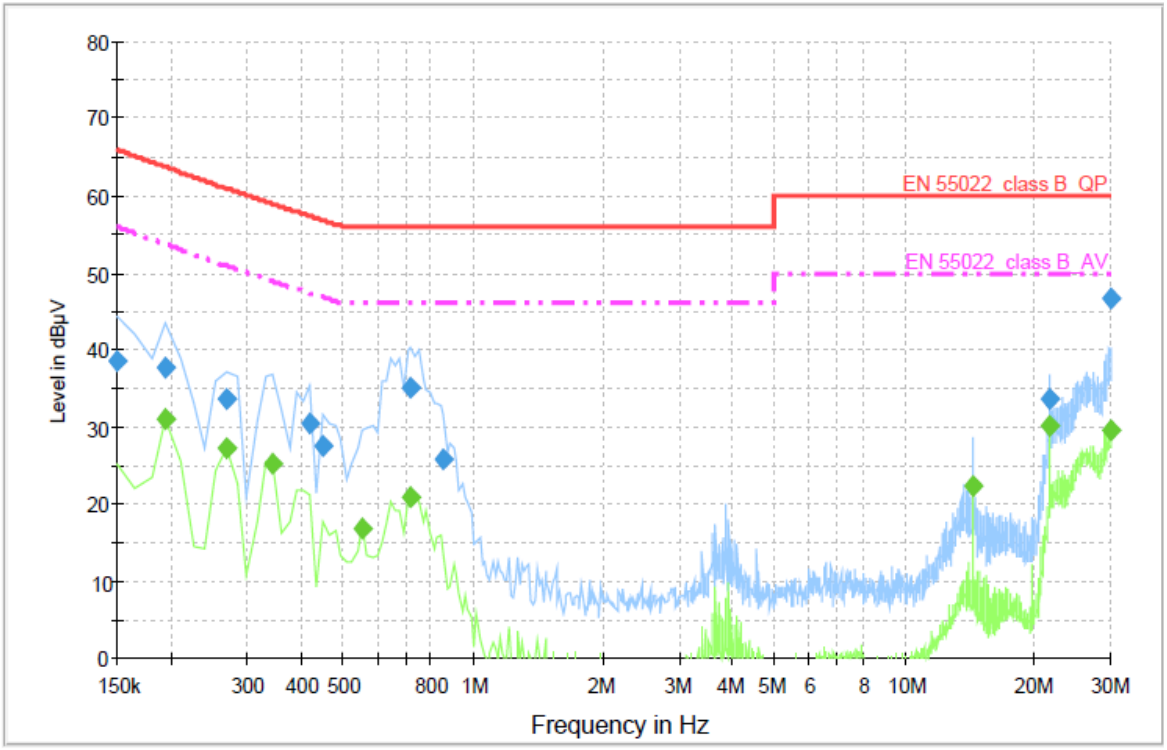
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.195000	30.2	1000.000	9.000	GND	N	10.0	23.5	53.7	
0.345000	24.9	1000.000	9.000	GND	N	10.0	24.0	48.9	
0.405000	21.0	1000.000	9.000	GND	N	10.0	26.6	47.6	
0.720000	21.5	1000.000	9.000	GND	N	10.0	24.5	46.0	
0.780000	19.9	1000.000	9.000	GND	N	10.0	26.1	46.0	
18.990000	21.2	1000.000	9.000	GND	N	10.7	28.8	50.0	
29.955000	30.5	1000.000	9.000	GND	N	10.8	19.5	50.0	

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

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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

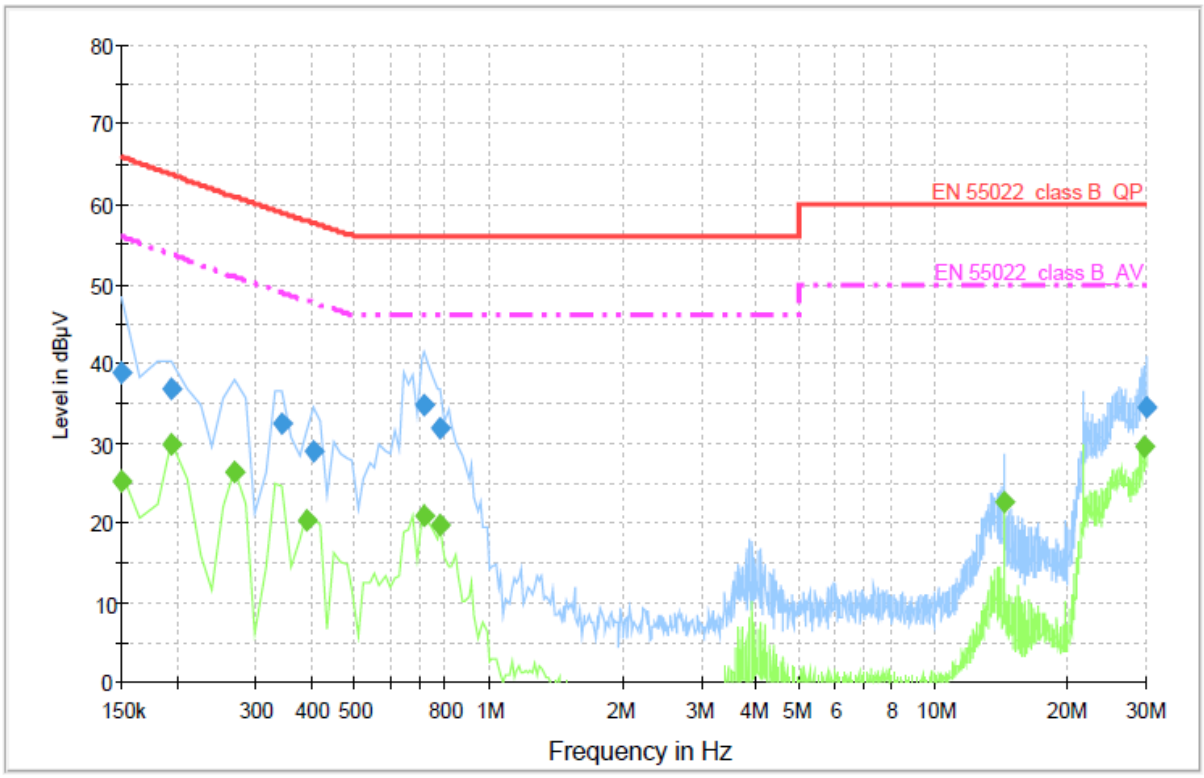
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	38.5	1000.000	9.000	GND	L1	10.0	27.5	66.0	
0.195000	37.6	1000.000	9.000	GND	L1	10.0	26.1	63.7	
0.270000	33.5	1000.000	9.000	GND	L1	10.0	27.4	60.9	
0.420000	30.4	1000.000	9.000	GND	L1	10.0	26.9	57.3	
0.450000	27.6	1000.000	9.000	GND	L1	10.0	29.2	56.8	
0.720000	35.1	1000.000	9.000	GND	L1	10.0	20.9	56.0	
0.855000	25.8	1000.000	9.000	GND	L1	10.0	30.2	56.0	
21.600000	33.6	1000.000	9.000	GND	L1	11.1	26.4	60.0	
30.000000	46.5	1000.000	9.000	GND	L1	11.5	13.5	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.195000	31.1	1000.000	9.000	GND	L1	10.0	22.6	53.7	
0.270000	27.1	1000.000	9.000	GND	L1	10.0	23.8	50.9	
0.345000	25.3	1000.000	9.000	GND	L1	10.0	23.6	48.9	
0.555000	16.8	1000.000	9.000	GND	L1	10.0	29.2	46.0	
0.720000	20.9	1000.000	9.000	GND	L1	10.0	25.1	46.0	
14.415000	22.2	1000.000	9.000	GND	L1	10.7	27.8	50.0	
21.600000	30.1	1000.000	9.000	GND	L1	11.1	19.9	50.0	
29.955000	29.5	1000.000	9.000	GND	L1	11.5	20.5	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
0.150000	38.8	1000.000	9.000	GND	N	10.0	27.2	66.0	
0.195000	36.8	1000.000	9.000	GND	N	10.0	26.9	63.7	
0.345000	32.5	1000.000	9.000	GND	N	10.0	26.4	58.9	
0.405000	28.9	1000.000	9.000	GND	N	10.0	28.7	57.6	
0.720000	34.7	1000.000	9.000	GND	N	10.0	21.3	56.0	
0.780000	31.9	1000.000	9.000	GND	N	10.0	24.1	56.0	
29.955000	34.6	1000.000	9.000	GND	N	10.8	25.4	60.0	

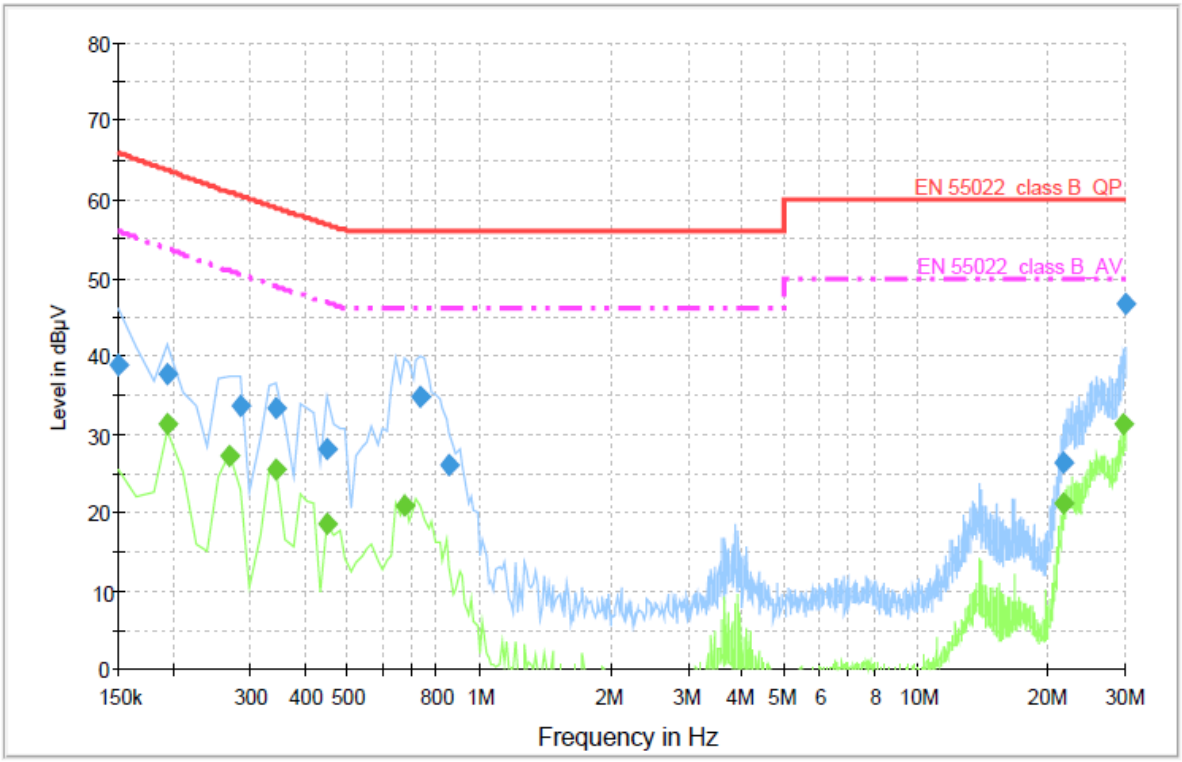
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	25.2	1000.000	9.000	GND	N	10.0	30.8	56.0	
0.195000	30.0	1000.000	9.000	GND	N	10.0	23.7	53.7	
0.270000	26.5	1000.000	9.000	GND	N	10.0	24.4	50.9	
0.390000	20.4	1000.000	9.000	GND	N	10.0	27.5	47.9	
0.720000	20.8	1000.000	9.000	GND	N	10.0	25.2	46.0	
0.780000	19.7	1000.000	9.000	GND	N	10.0	26.3	46.0	
14.415000	22.6	1000.000	9.000	GND	N	10.5	27.4	50.0	
29.760000	29.6	1000.000	9.000	GND	N	10.8	20.4	50.0	

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

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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

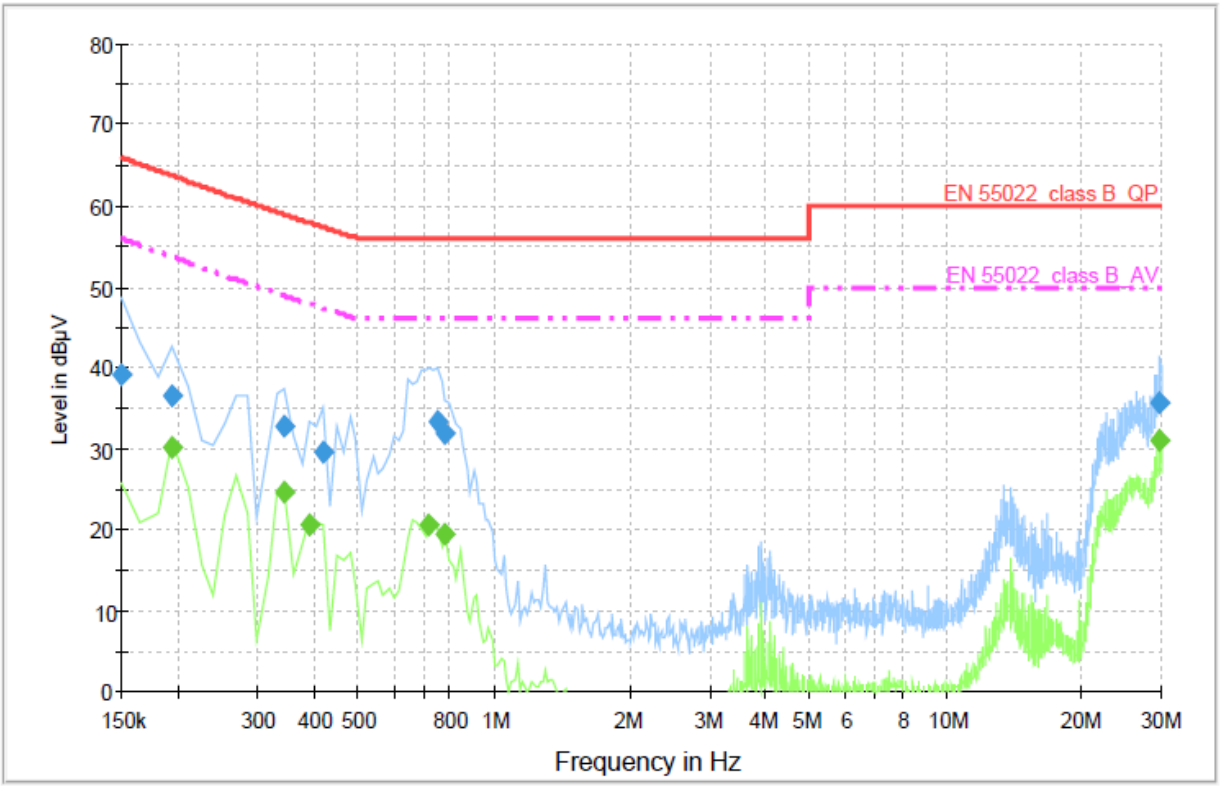
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	38.9	1000.000	9.000	GND	L1	10.0	27.1	66.0	
0.195000	37.7	1000.000	9.000	GND	L1	10.0	26.0	63.7	
0.285000	33.7	1000.000	9.000	GND	L1	10.0	26.8	60.5	
0.345000	33.4	1000.000	9.000	GND	L1	10.0	25.5	58.9	
0.450000	28.0	1000.000	9.000	GND	L1	10.0	28.8	56.8	
0.735000	34.7	1000.000	9.000	GND	L1	10.0	21.3	56.0	
0.855000	26.1	1000.000	9.000	GND	L1	10.0	29.9	56.0	
21.630000	26.5	1000.000	9.000	GND	L1	11.1	33.5	60.0	
30.000000	46.6	1000.000	9.000	GND	L1	11.5	13.4	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.195000	31.2	1000.000	9.000	GND	L1	10.0	22.5	53.7	
0.270000	27.3	1000.000	9.000	GND	L1	10.0	23.6	50.9	
0.345000	25.5	1000.000	9.000	GND	L1	10.0	23.4	48.9	
0.450000	18.4	1000.000	9.000	GND	L1	10.0	28.4	46.8	
0.675000	20.8	1000.000	9.000	GND	L1	10.0	25.2	46.0	
21.630000	21.3	1000.000	9.000	GND	L1	11.1	28.7	50.0	
29.820000	31.4	1000.000	9.000	GND	L1	11.5	18.6	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
0.150000	39.1	1000.000	9.000	GND	N	10.0	26.9	66.0	
0.195000	36.6	1000.000	9.000	GND	N	10.0	27.1	63.7	
0.345000	32.7	1000.000	9.000	GND	N	10.0	26.2	58.9	
0.420000	29.6	1000.000	9.000	GND	N	10.0	27.7	57.3	
0.750000	33.4	1000.000	9.000	GND	N	10.0	22.6	56.0	
0.780000	31.9	1000.000	9.000	GND	N	10.0	24.1	56.0	
29.820000	35.6	1000.000	9.000	GND	N	10.8	24.4	60.0	

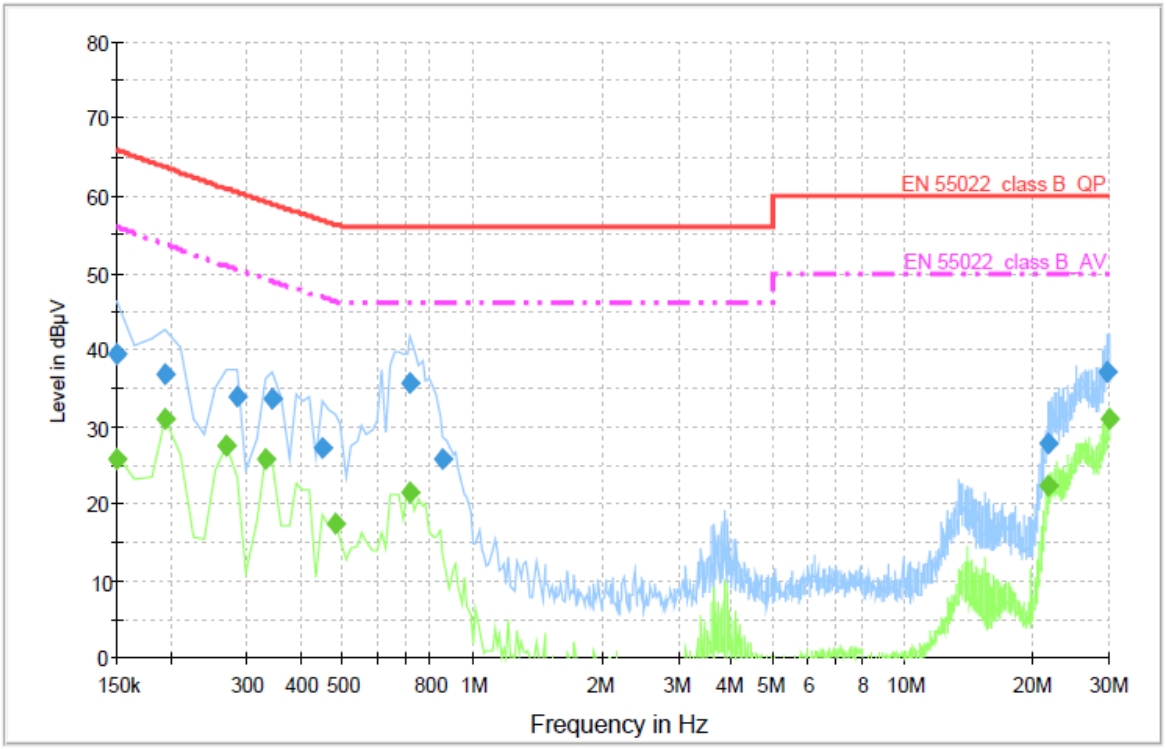
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.195000	30.1	1000.000	9.000	GND	N	10.0	23.6	53.7	
0.345000	24.8	1000.000	9.000	GND	N	10.0	24.1	48.9	
0.390000	20.7	1000.000	9.000	GND	N	10.0	27.2	47.9	
0.720000	20.7	1000.000	9.000	GND	N	10.0	25.3	46.0	
0.780000	19.5	1000.000	9.000	GND	N	10.0	26.5	46.0	
29.820000	31.0	1000.000	9.000	GND	N	10.8	19.0	50.0	

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

♦ **Operating condition: 1 400 × 1 050 / 60 Hz (HDMI/DVI: Digital)**

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

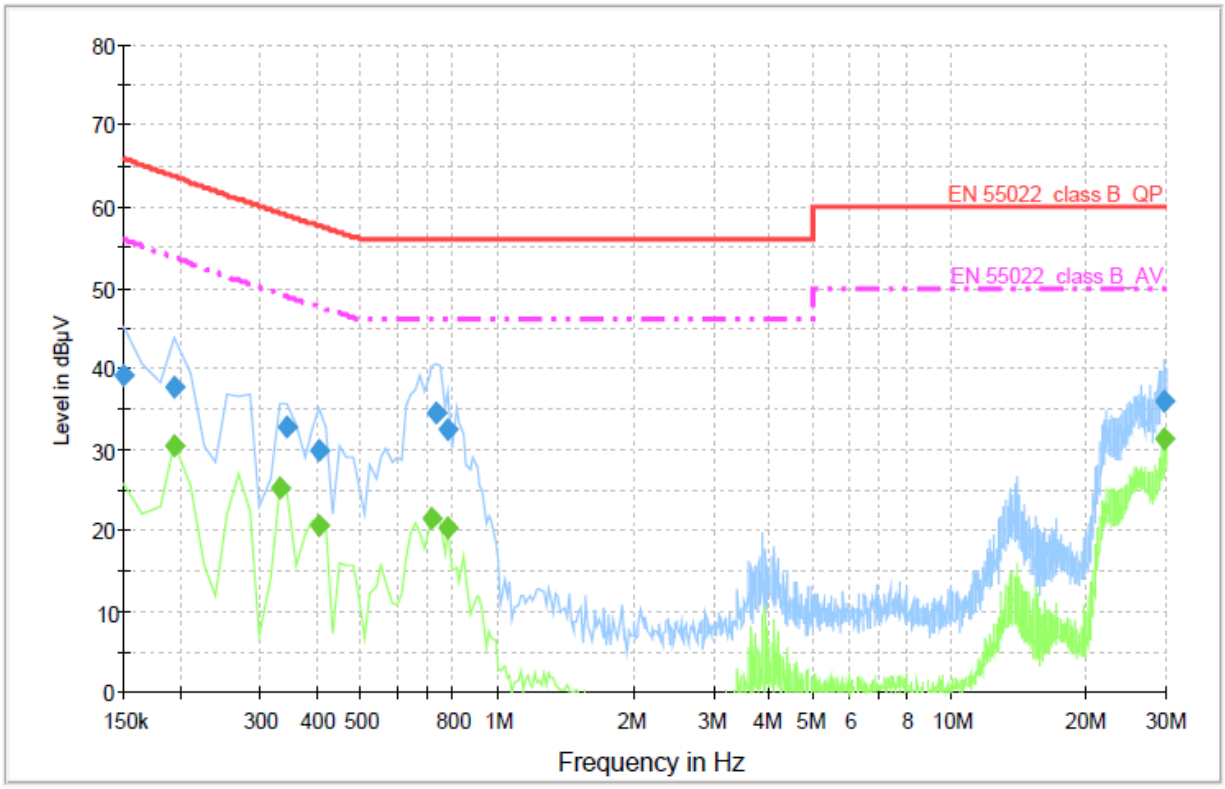
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	39.6	1000.000	9.000	GND	L1	10.0	26.4	66.0	
0.195000	36.8	1000.000	9.000	GND	L1	10.0	26.9	63.7	
0.285000	33.9	1000.000	9.000	GND	L1	10.0	26.6	60.5	
0.345000	33.6	1000.000	9.000	GND	L1	10.0	25.3	58.9	
0.450000	27.4	1000.000	9.000	GND	L1	10.0	29.4	56.8	
0.720000	35.7	1000.000	9.000	GND	L1	10.0	20.3	56.0	
0.855000	25.8	1000.000	9.000	GND	L1	10.0	30.2	56.0	
21.630000	27.8	1000.000	9.000	GND	L1	11.1	32.2	60.0	
29.820000	37.1	1000.000	9.000	GND	L1	11.5	22.9	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	25.9	1000.000	9.000	GND	L1	10.0	30.1	56.0	
0.195000	31.0	1000.000	9.000	GND	L1	10.0	22.7	53.7	
0.270000	27.6	1000.000	9.000	GND	L1	10.0	23.3	50.9	
0.330000	25.9	1000.000	9.000	GND	L1	10.0	23.3	49.2	
0.480000	17.5	1000.000	9.000	GND	L1	10.0	28.8	46.3	
0.720000	21.5	1000.000	9.000	GND	L1	10.0	24.5	46.0	
21.630000	22.3	1000.000	9.000	GND	L1	11.1	27.7	50.0	
29.880000	31.1	1000.000	9.000	GND	L1	11.5	18.9	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
0.150000	39.2	1000.000	9.000	GND	N	10.0	26.8	66.0	
0.195000	37.7	1000.000	9.000	GND	N	10.0	26.0	63.7	
0.345000	32.8	1000.000	9.000	GND	N	10.0	26.1	58.9	
0.405000	29.7	1000.000	9.000	GND	N	10.0	27.9	57.6	
0.735000	34.4	1000.000	9.000	GND	N	10.0	21.6	56.0	
0.780000	32.5	1000.000	9.000	GND	N	10.0	23.5	56.0	
29.760000	35.9	1000.000	9.000	GND	N	10.8	24.1	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.195000	30.4	1000.000	9.000	GND	N	10.0	23.3	53.7	
0.330000	25.1	1000.000	9.000	GND	N	10.0	24.1	49.2	
0.405000	20.7	1000.000	9.000	GND	N	10.0	26.9	47.6	
0.720000	21.3	1000.000	9.000	GND	N	10.0	24.7	46.0	
0.780000	20.3	1000.000	9.000	GND	N	10.0	25.7	46.0	
29.820000	31.3	1000.000	9.000	GND	N	10.8	18.7	50.0	

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

6. Radiated Emission

6.1 Operating Environment

Temperature : 24 ℃
Relative Humidity : 43 % 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(Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 4.32 dB	Confidence levels of 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 4.21 dB	Confidence levels of 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 3.96 dB	Confidence levels of 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.97 dB	Confidence levels of 95 % (k = 2)

6.4 Limit

Frequency (MHz)	FCC Limit @ 3 m. dB μV/m	CISPR Limit @ 10 m. dB μV/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

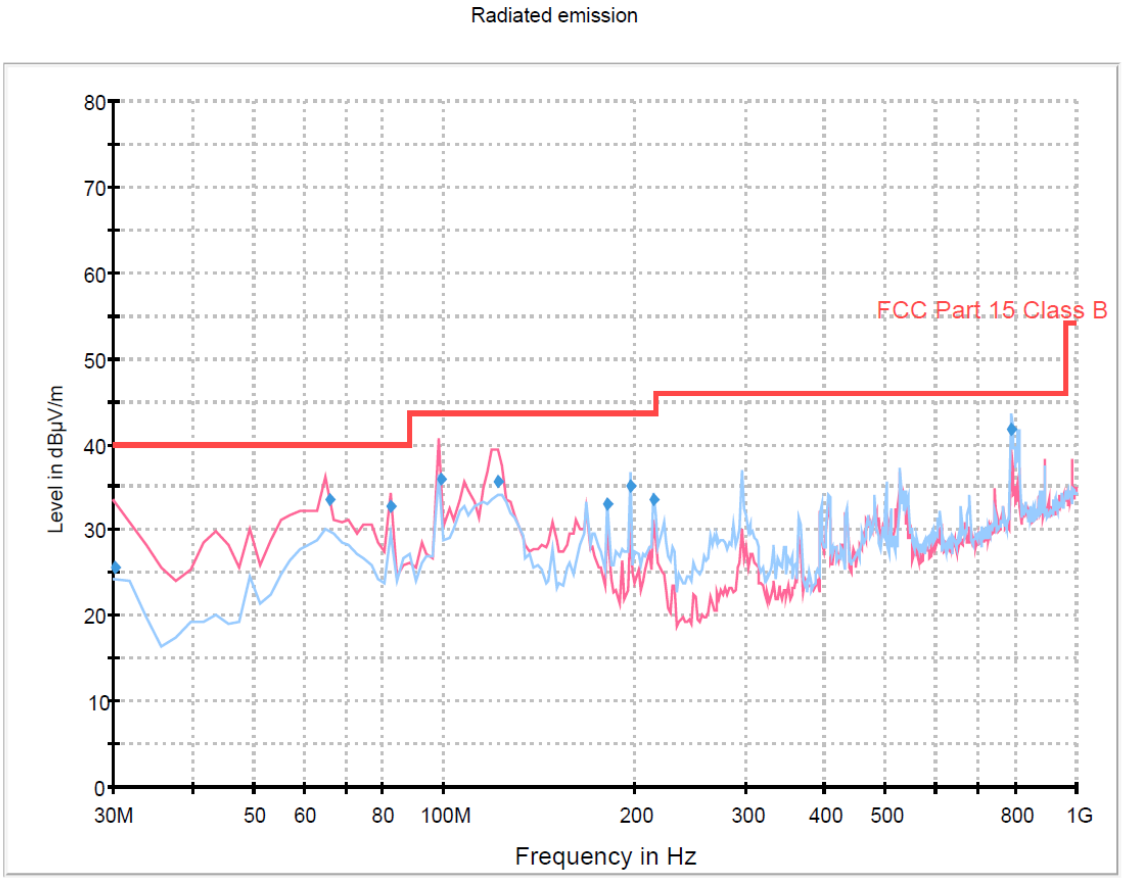
6.5 Test Equipment used

	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 11. 2010
■ -	VULB9160	Schwarzbeck	Broadband Test Antenna	3193	03. 11. 2012
■ -	BBHA9120D	Schwarzbeck	Horn ANT	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. 2010

6.6 Test data for Radiated Emission

-. Test Date : April 21, 2010
-. Resolution Bandwidth : 120 kHz / 1 MHz
-. Frequency Range : 30 MHz ~ 2 000 MHz
-. Measurement Distance : 3 m
-. Note : The highest frequency of the internal source of the EUT is between 108 MHz and 500 MHz (400 MHz). The measurement was made up to 2 000 MHz

♦ Operating Condition: 1 400 × 1 050 / 60 Hz (RGB: Analog)
Detector mode: Quasi- peak detector mode

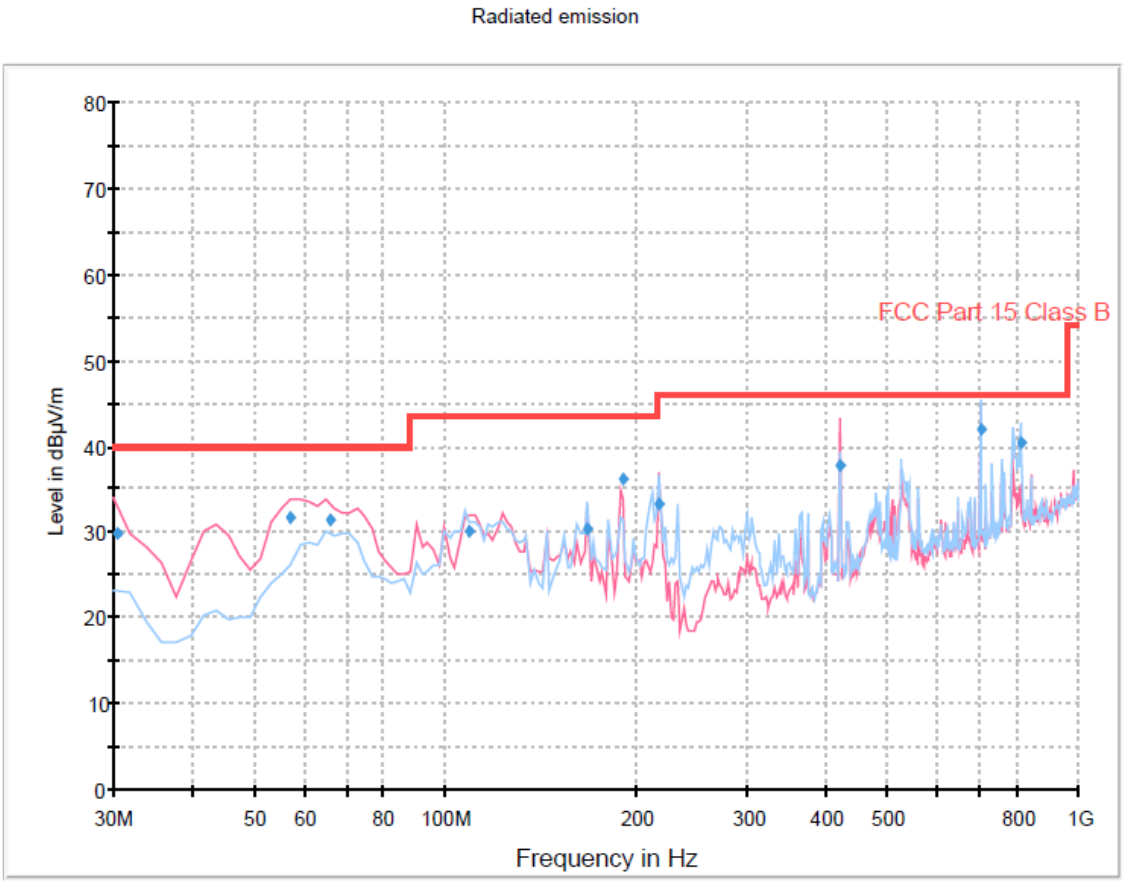


Final Result [1]

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.255511	25.6	1000.0	120.000	100.0	V	263.0	11.2	14.4	40.0
66.039078	33.4	1000.0	120.000	100.0	V	53.0	11.9	6.6	40.0
82.500000	32.8	1000.0	120.000	119.0	V	11.0	9.0	7.2	40.0
99.019038	36.0	1000.0	120.000	162.0	V	256.0	10.9	7.5	43.5
121.377755	35.6	1000.0	120.000	100.0	V	95.0	13.5	7.9	43.5
181.500000	32.9	1000.0	120.000	231.0	H	88.0	12.7	10.6	43.5
198.019038	35.2	1000.0	120.000	163.0	H	76.0	11.5	8.3	43.5
214.504008	33.4	1000.0	120.000	147.0	H	50.0	12.1	10.1	43.5
788.698397	41.8	1000.0	120.000	100.0	H	0.0	27.0	4.2	46.0

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

♦ Operating Condition: 1 400 × 1 050 / 60 Hz (HDMI/DVI: Digital)
Detector mode: Quasi- peak detector mode

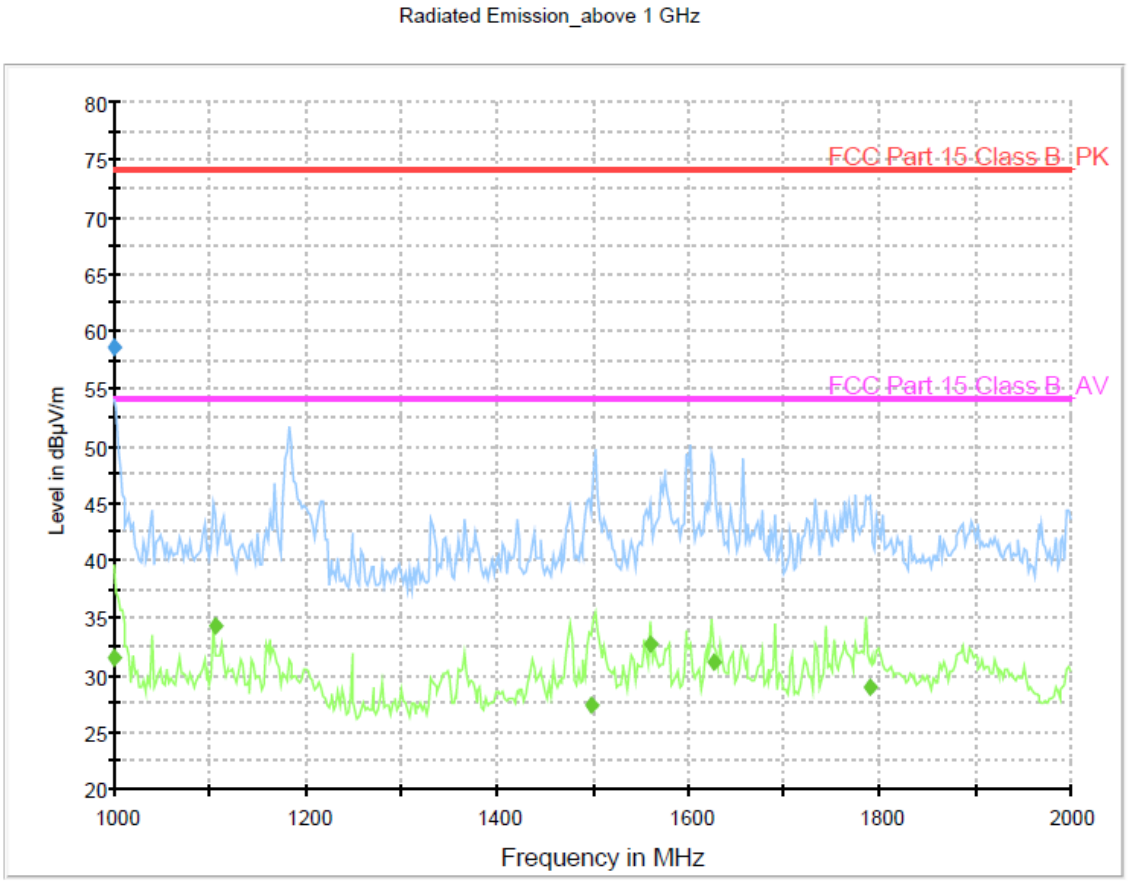


Final Result [1]

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.550100	29.9	1000.0	120.000	100.0	V	94.0	11.3	10.1	40.0
57.067134	31.8	1000.0	120.000	100.0	V	103.0	12.8	8.2	40.0
66.183367	31.5	1000.0	120.000	124.0	V	103.0	11.9	8.5	40.0
109.009018	30.2	1000.0	120.000	169.0	H	49.0	12.1	13.3	43.5
168.019038	30.4	1000.0	120.000	253.0	H	298.0	14.2	13.1	43.5
190.766533	36.2	1000.0	120.000	106.0	V	322.0	12.0	7.3	43.5
217.946894	33.3	1000.0	120.000	100.0	V	339.0	12.2	12.7	46.0
420.375752	37.7	1000.0	120.000	273.0	V	339.0	19.9	8.3	46.0
700.728457	42.0	1000.0	120.000	149.0	H	199.0	25.1	4.0	46.0
811.656313	40.4	1000.0	120.000	100.0	H	0.0	27.3	5.6	46.0

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

♦ Operating Condition: 1 400 × 1 050 / 60 Hz (RGB: Analog)
Green trace: Average detector, Blue trace: Peak detector



Final Result 1

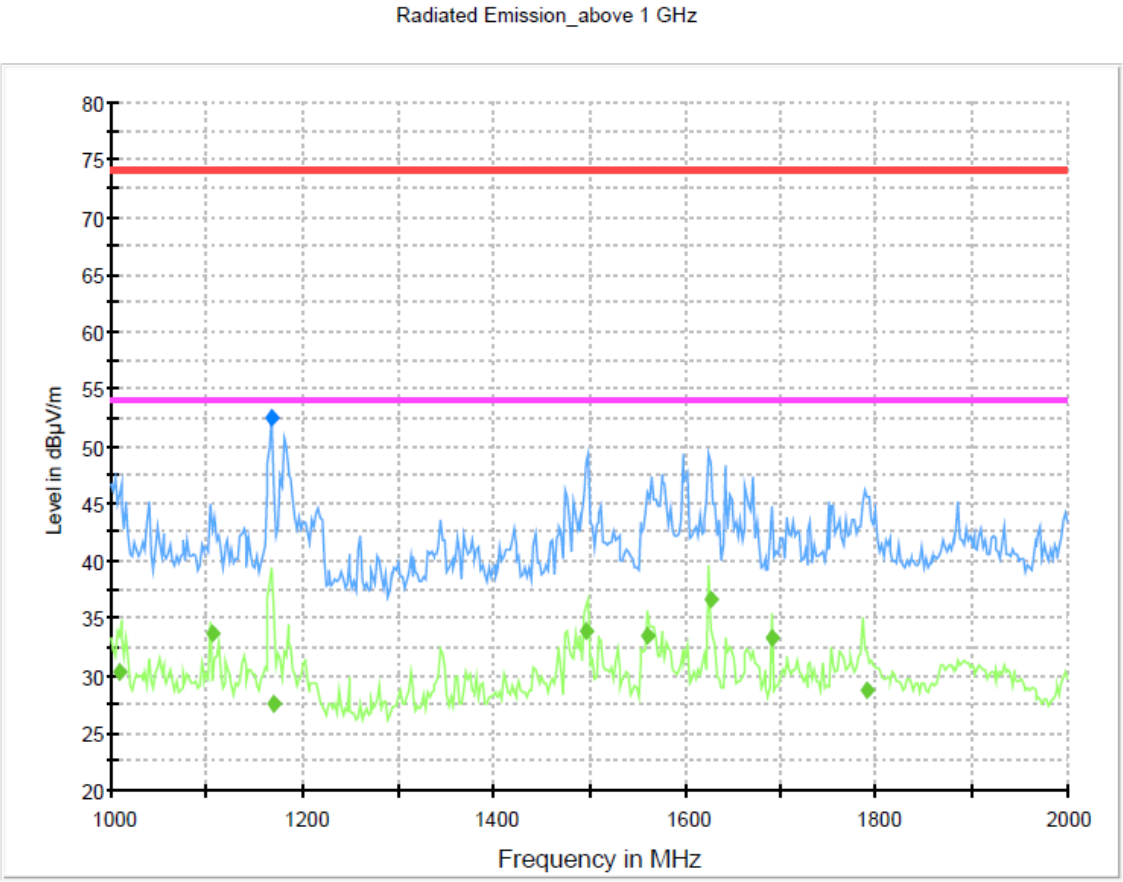
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	58.7	100.0	1000.000	165.0	V	24.0	-15.9	15.3	74.0

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	31.5	100.0	1000.000	158.0	V	24.0	-15.9	22.5	54.0
1105.608417	34.3	100.0	1000.000	137.0	V	190.0	-15.3	19.7	54.0
1498.406012	27.4	100.0	1000.000	202.0	V	130.0	-14.3	26.6	54.0
1560.522245	32.7	100.0	1000.000	100.0	V	190.0	-13.9	21.3	54.0
1625.850501	31.0	100.0	1000.000	203.0	H	256.0	-13.6	23.0	54.0
1789.771142	28.8	100.0	1000.000	113.0	V	177.0	-13.2	25.2	54.0

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

♦ Operating Condition: 1 400 × 1 050 / 60 Hz (HDMI/DVI: Digital)
Green trace: Average detector, Blue trace: 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)
1168.336673	52.5	100.0	1000.000	100.0	H	97.0	-15.1	21.5	74.0

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1008.220040	30.3	100.0	1000.000	141.0	V	51.0	-15.9	23.7	54.0
1105.608417	33.7	100.0	1000.000	100.0	V	206.0	-15.3	20.3	54.0
1170.536673	27.6	100.0	1000.000	137.0	H	97.0	-15.1	26.4	54.0
1495.597996	33.9	100.0	1000.000	100.0	H	144.0	-14.3	20.1	54.0
1560.522245	33.4	100.0	1000.000	100.0	V	193.0	-13.9	20.6	54.0
1625.850501	36.7	100.0	1000.000	100.0	H	137.0	-13.6	17.3	54.0
1690.782766	33.2	100.0	1000.000	129.0	V	144.0	-13.6	20.8	54.0
1789.771142	28.7	100.0	1000.000	113.0	V	177.0	-13.2	25.3	54.0

< Fig 15. Radiated emission result (1 000 MHz ~ 2 000 MHz)>

7. Sample Calculations

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

7.1 Example 1 :

■ **20.3 MHz**

Class B Limit = 250 μV = 48 dBμV

Reading = 39.2 dBμV

$10^{(39.2dB\mu V/20)}$ = 91.2 μV

Margin = 48 dBμV - 39.2 dBμV

= 8.8 dB

7.2 Example 2 :

■ **66.7 MHz**

Class B Limit = 100 μV/m = 40.0 dBμV/m

Reading = 31.0 dBμV

Antenna Factor + Cable Loss = 5.8 dB

Total = 36.8 dBμV/m

Margin = 40.0 dBμV/m – 36.8 dBμV/m

= 3.2 dB

8. Recommendation & Conclusion

The data collected shows that the **LG Electronics Inc. DLP PROJECTOR (Model Name: BX503-JD)** was complies with §15.107 and 15.109 of the FCC Rules.