FCC EVALUATION REPORT FOR CERTIFICATION

FCC Class B (Class II Permissive Change)

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: August 4, 2011

Order Number: GETEC-C1-11-186

Test Report Number: GETEC-E3-11-088

Test Site: Gumi College EMC Center

FCC Registration Number: (100749, 443957)

FCC ID. : BEJHSTND-3411-G

Applicant : LG Electronics Inc.

Rule Part(s)	**: FCC Part 15 Subpart B**
Equipment Class	**: Class B computing device peripheral (JBP)**
EUT Type	**: LCD Monitor**
Type of Authority	**: Certification**
Model Name	**: HSTND-3411-G, LD4720tm**
Trade Name	**: HP, LG**
Class II Change(s)	**: Changed evaluation test frequency range**

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, Associate 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. Do-Hyung Kim, Chief research engineer
Tel Number: +82-31-610-9623

- **FCC ID.** BEJHSTND-3411-G
- **EUT Type** LCD Monitor
- **Model Name** HSTND-3411-G, LD4720tm
  The differences for all models are as follow:

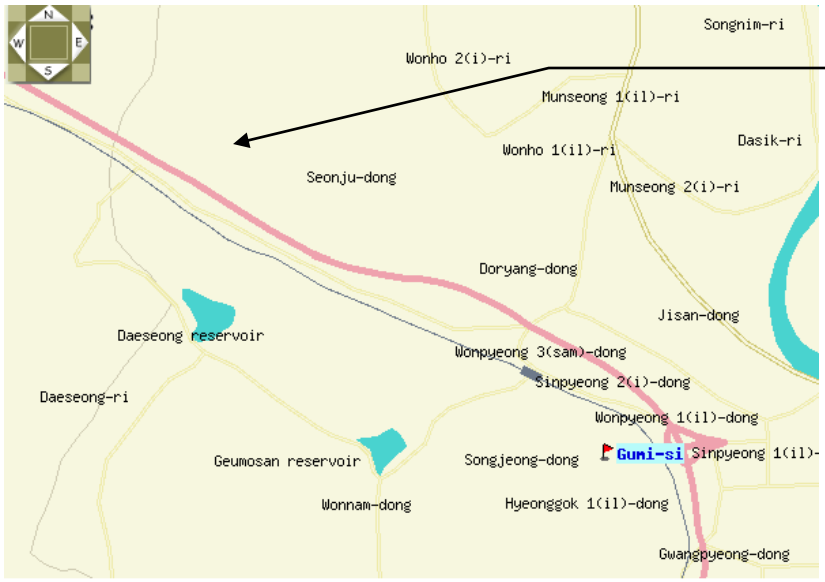
Model Name	Description
HSTND-3411-G	HP brand model name
LD4720tm	LG brand model name

- **Trade Name** HP, 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** June 7 ~ August 4, 2011
- **Place of Test** **Gumi College EMC Center** (FCC Registration Number: 100749, 443957)
  407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-11-088
- **Dates of Issue** August 4, 2011
- **Class II Change(s)** Changed evaluation test frequency range

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. LCD Monitor (Model Name: HSTND-3411-G, LD4720tm)**

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. LCD Monitor (Model Name: HSTND-3411-G, LD4720tm) FCC ID.: BEJHSTND-3411-G**

-. Display	: Type: TFT LCD panel Size: 119.28 cm (47 in) Viewable image size: 119.28 cm (47 in) Pixel pitch: 0.541 5 mm × 0.541 5 mm × RGB
-. Rated Voltage	: AC (100 – 240) V~, (50/60) Hz, 3.0 A
-. Power Consumption	: 270 W Typical
-. Resolution Maximum	: 1 920 × 1 080 @ 60 Hz
-. Horizontal Frequency	: 30 kHz to 83 kHz
-. Vertical Frequency	: 56 Hz to 75 Hz
-. Input Connector	: 15 pin D-Sub type, HDMI/DVI(Digital), RS-232C, Display Port, USB, LAN
-. Weight (With stand and speaker)	: 27.5 kg
-. Dimensions (With stand and speaker)	: 107.95 cm × 69.77 cm × 29.83 cm
-. Clock & Tune Frequency	: RGB (Analog) mode: 400 MHz, HDMI (Digital) mode: 1.2 GHz, DP (Digital) mode: 2.7 GHz

3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
PC	HEWLETT-PACKARD	FCLSA-0801	S/N: 2UA0330R2T FCC ID.: DoC
Video card	Advanced micro devices Inc.	C010	S/N: N/A FCC ID.: DoC
Monitor	LG Electronics Inc.	22LE5300-ZA	S/N: N/A FCC ID.: DoC
PS2 keyboard	YET Found ATE	SK-2880	S/N: BAUDR0HCPZ2811 FCC ID.: DoC
USB mouse	HEWLETT-PACKARD	M-UAE96	S/N: N/A FCC ID.: DoC
USB memory stick	SAMSUNG	SUM-PSB4	S/N: TBBB202478F FCC ID.: DoC

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.
Speaker	LG Electronics Inc.	HSP0000K	S/N: N/A FCC ID.: N/A
Stand	LG Electronics Inc.	HST1000K	S/N: N/A FCC ID.: N/A
IR remote controller	LG Electronics Inc.	AKB72915227	S/N: N/A 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) in cable	Connected to the EUT and PC	1.80 m shielded with two ferrite cores
HDMI(Digital) in cable	Connected to the EUT and PC	2.00 m shielded
DP(Digital) in cable	Connected to the EUT and PC	2.00 m shielded
DP(Digital) out cable	Connected to the EUT and monitor	3.10 m shielded
Audio(RGB/DVI) in cable	Connected to the EUT and PC	1.80 m shielded with a ferrite core
USB(Uplink) in cable	Connected to the EUT and PC	1.80 m shielded
Speaker(Left, Right) out cable	Connected to the EUT and speaker	0.90 m unshielded with two ferrite cores
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)

-. Monitor mode

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

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

1 024 × 768 / 60 Hz (RGB: Analog), 640 × 480 / 60 Hz (RGB: Analog)

-. "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
-. Activated touch function
-. Settings and control the display via the network from a PC
-. USB memory stick was connected to the USB port

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

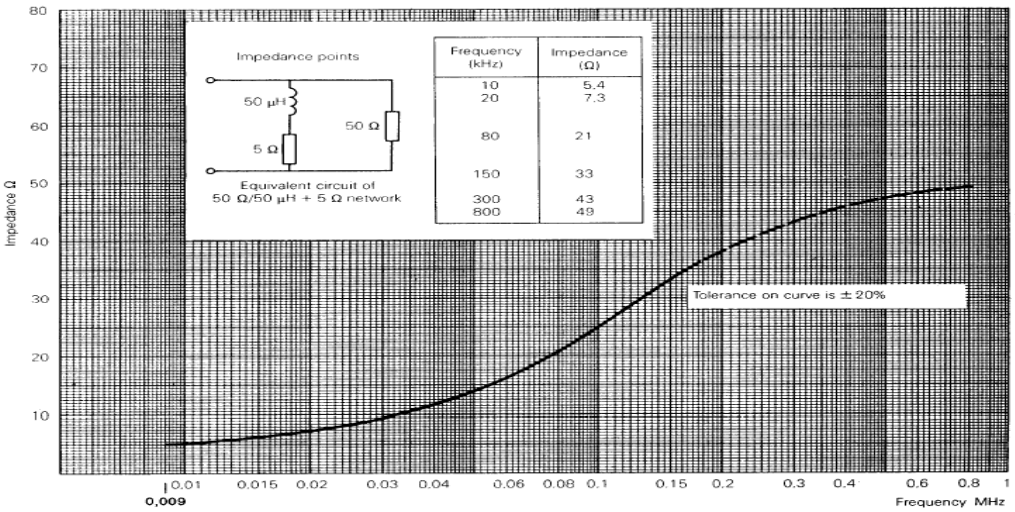


Fig 2. Impedance of LISN

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

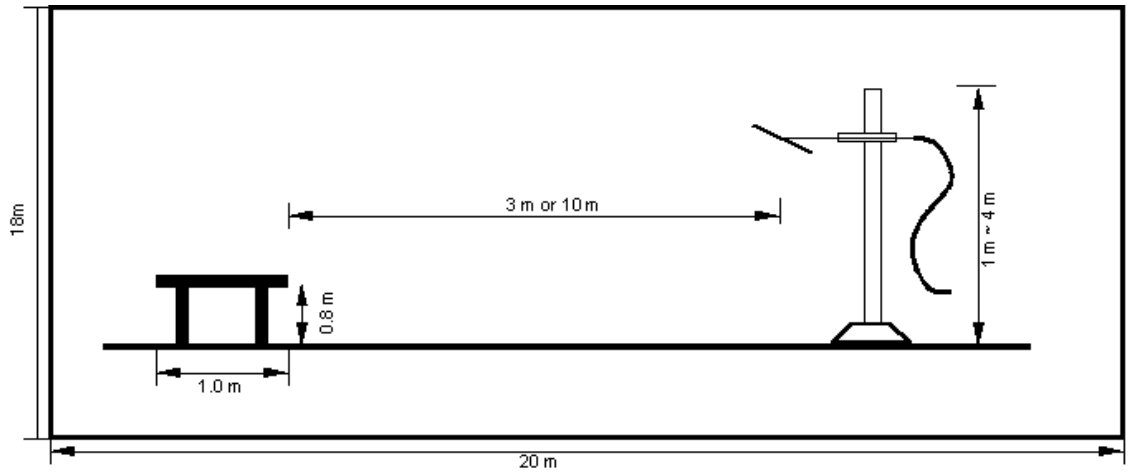


Fig 3. Dimensions of test site

5. Conducted Emission

5.1 Operating Environment

Temperature : 26 ℃
Relative Humidity : 47 % 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 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

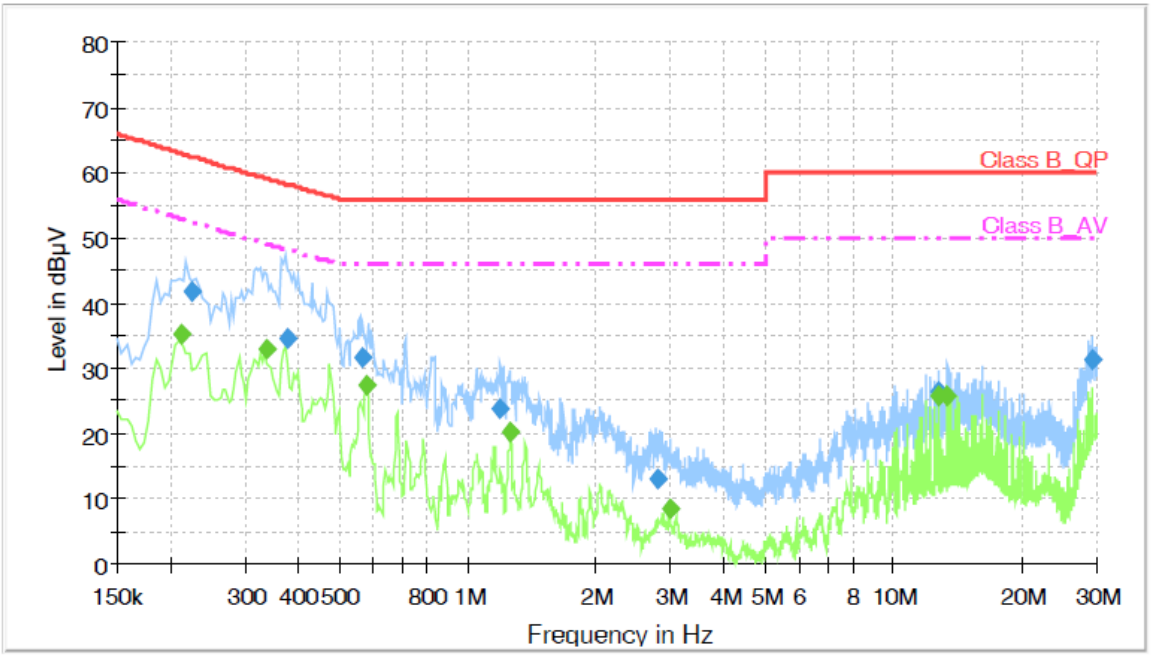
	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 10. 2011
■ -	ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 10. 2011
■ -	ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 10. 2011
■ -	ISN T8	TESEQ. GmbH	ISN	24568	11. 09. 2011

5.6 Test data for Conducted Emission

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

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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

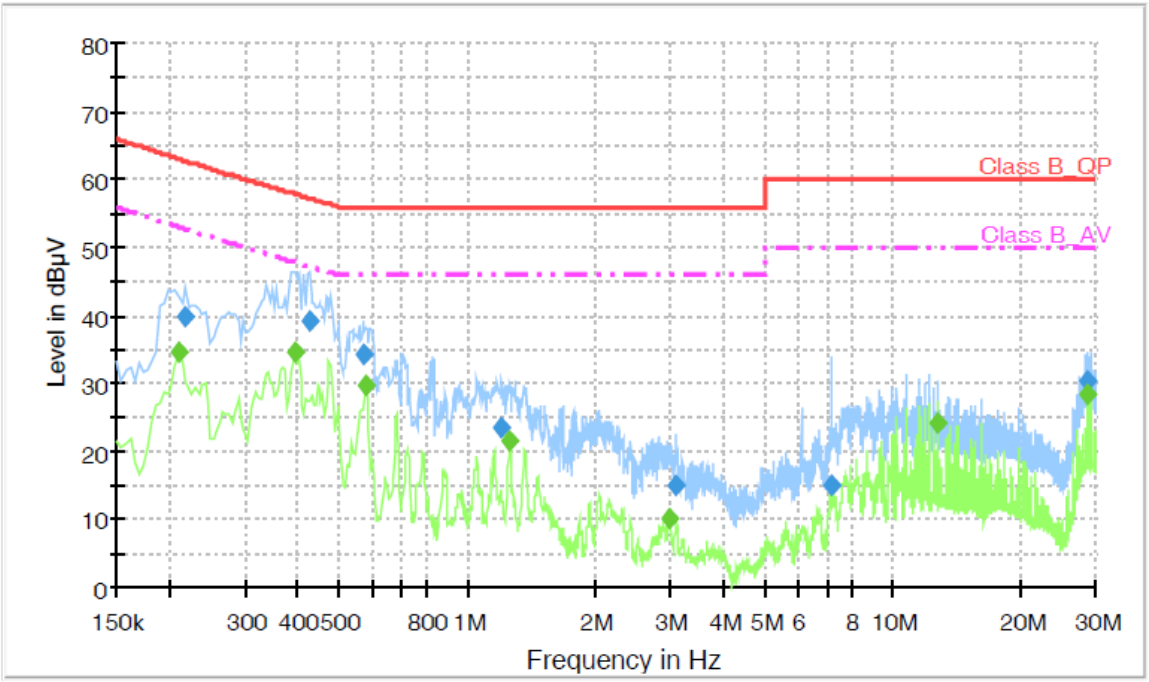
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.224000	41.6	1000.000	9.000	GND	L1	10.1	20.9	62.5	
0.376000	34.7	1000.000	9.000	GND	L1	10.1	23.5	58.2	
0.564000	31.8	1000.000	9.000	GND	L1	10.1	24.2	56.0	
1.184000	23.8	1000.000	9.000	GND	L1	10.1	32.2	56.0	
2.808000	13.1	1000.000	9.000	GND	L1	10.2	42.9	56.0	
12.808000	26.5	1000.000	9.000	GND	L1	10.7	33.5	60.0	
29.232000	31.2	1000.000	9.000	GND	L1	11.2	28.8	60.0	

Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.212000	35.4	1000.000	9.000	GND	L1	10.1	17.5	52.9	
0.336000	33.1	1000.000	9.000	GND	L1	10.1	16.0	49.1	
0.580000	27.6	1000.000	9.000	GND	L1	10.1	18.4	46.0	
1.260000	20.2	1000.000	9.000	GND	L1	10.1	25.8	46.0	
2.992000	8.5	1000.000	9.000	GND	L1	10.2	37.5	46.0	
12.808000	25.7	1000.000	9.000	GND	L1	10.7	24.3	50.0	
13.420000	25.8	1000.000	9.000	GND	L1	10.8	24.2	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
0.218000	39.7	1000.000	9.000	GND	N	10.1	23.0	62.7	
0.426000	39.0	1000.000	9.000	GND	N	10.1	18.2	57.2	
0.570000	34.2	1000.000	9.000	GND	N	10.1	21.8	56.0	
1.206000	23.4	1000.000	9.000	GND	N	10.1	32.6	56.0	
3.086000	15.1	1000.000	9.000	GND	N	10.2	40.9	56.0	
7.174000	15.0	1000.000	9.000	GND	N	10.4	45.0	60.0	
28.686000	30.3	1000.000	9.000	GND	N	10.7	29.7	60.0	

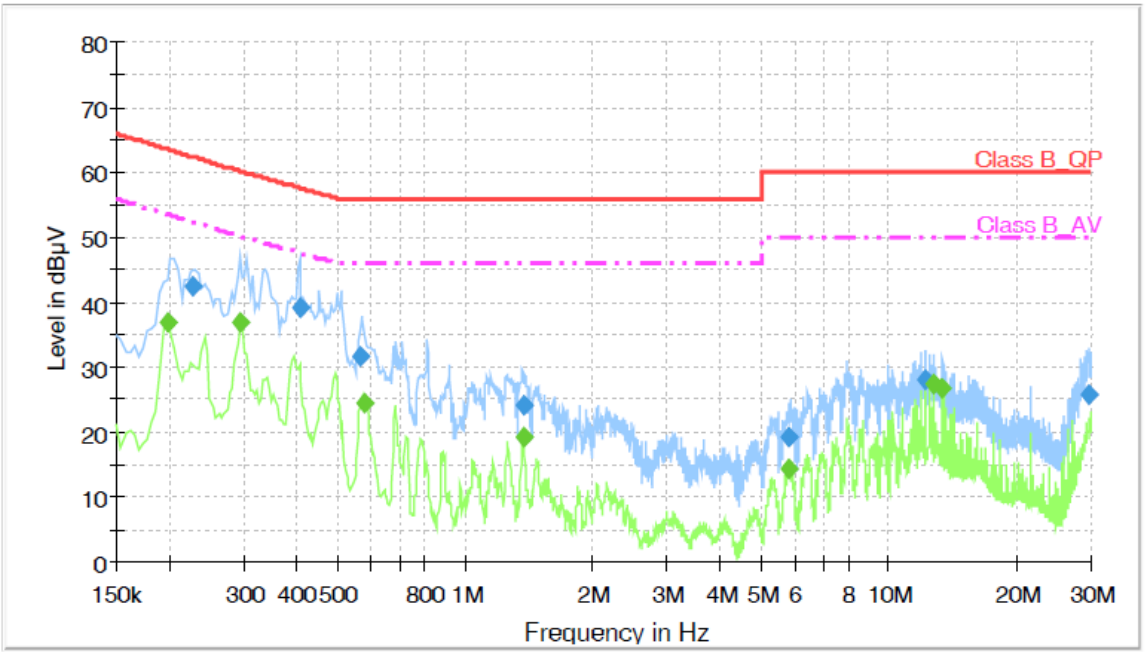
Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.210000	34.6	1000.000	9.000	GND	N	10.1	18.4	53.0	
0.394000	34.6	1000.000	9.000	GND	N	10.1	13.2	47.8	
0.578000	29.8	1000.000	9.000	GND	N	10.1	16.2	46.0	
1.262000	21.5	1000.000	9.000	GND	N	10.1	24.5	46.0	
2.998000	10.1	1000.000	9.000	GND	N	10.2	35.9	46.0	
12.810000	24.1	1000.000	9.000	GND	N	10.6	25.9	50.0	
28.686000	28.3	1000.000	9.000	GND	N	10.7	21.8	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

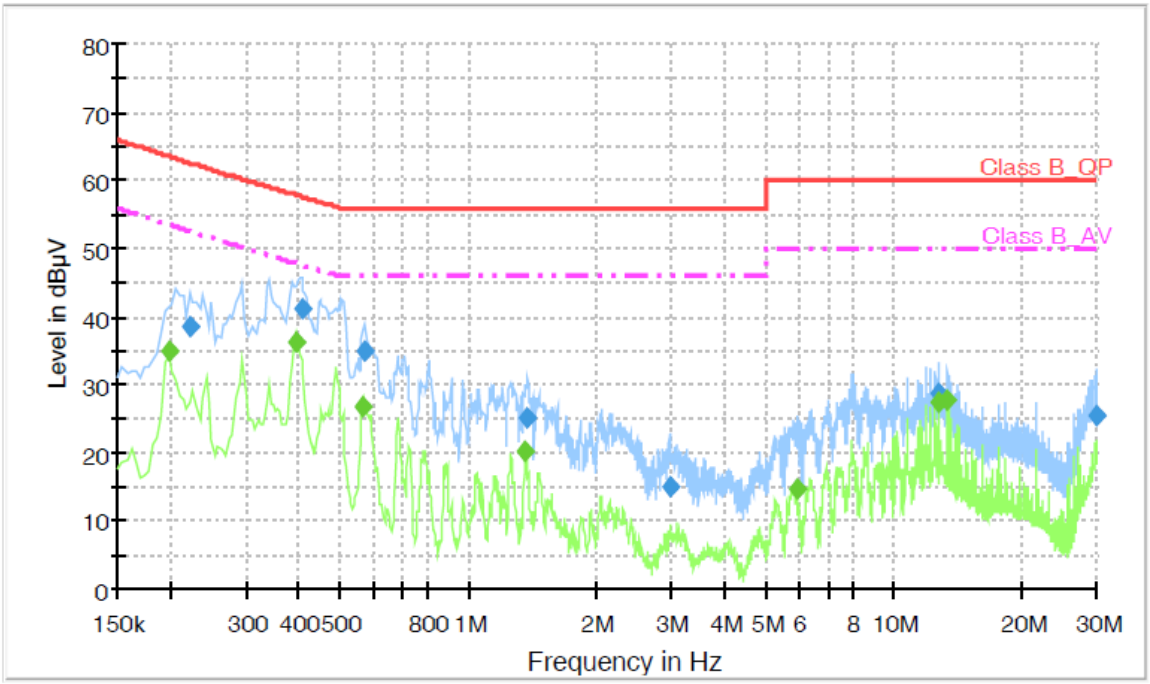
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.228000	42.4	1000.000	9.000	GND	L1	10.1	19.9	62.3	
0.408000	39.2	1000.000	9.000	GND	L1	10.1	18.4	57.6	
0.564000	31.6	1000.000	9.000	GND	L1	10.1	24.4	56.0	
1.380000	24.2	1000.000	9.000	GND	L1	10.1	31.8	56.0	
5.796000	19.1	1000.000	9.000	GND	L1	10.4	40.9	60.0	
12.136000	28.0	1000.000	9.000	GND	L1	10.7	32.0	60.0	
29.508000	25.8	1000.000	9.000	GND	L1	11.3	34.2	60.0	

Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.198000	37.0	1000.000	9.000	GND	L1	10.1	16.5	53.5	
0.296000	37.0	1000.000	9.000	GND	L1	10.1	13.1	50.1	
0.576000	24.6	1000.000	9.000	GND	L1	10.1	21.4	46.0	
1.368000	19.1	1000.000	9.000	GND	L1	10.1	26.9	46.0	
5.804000	14.2	1000.000	9.000	GND	L1	10.4	35.8	50.0	
12.748000	27.4	1000.000	9.000	GND	L1	10.7	22.6	50.0	
13.420000	26.8	1000.000	9.000	GND	L1	10.8	23.2	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
0.222000	38.5	1000.000	9.000	GND	N	10.1	24.1	62.6	
0.406000	41.1	1000.000	9.000	GND	N	10.1	16.5	57.6	
0.570000	35.0	1000.000	9.000	GND	N	10.1	21.0	56.0	
1.382000	25.0	1000.000	9.000	GND	N	10.1	31.0	56.0	
2.974000	15.2	1000.000	9.000	GND	N	10.2	40.8	56.0	
12.806000	28.9	1000.000	9.000	GND	N	10.6	31.1	60.0	
29.910000	25.6	1000.000	9.000	GND	N	10.7	34.4	60.0	

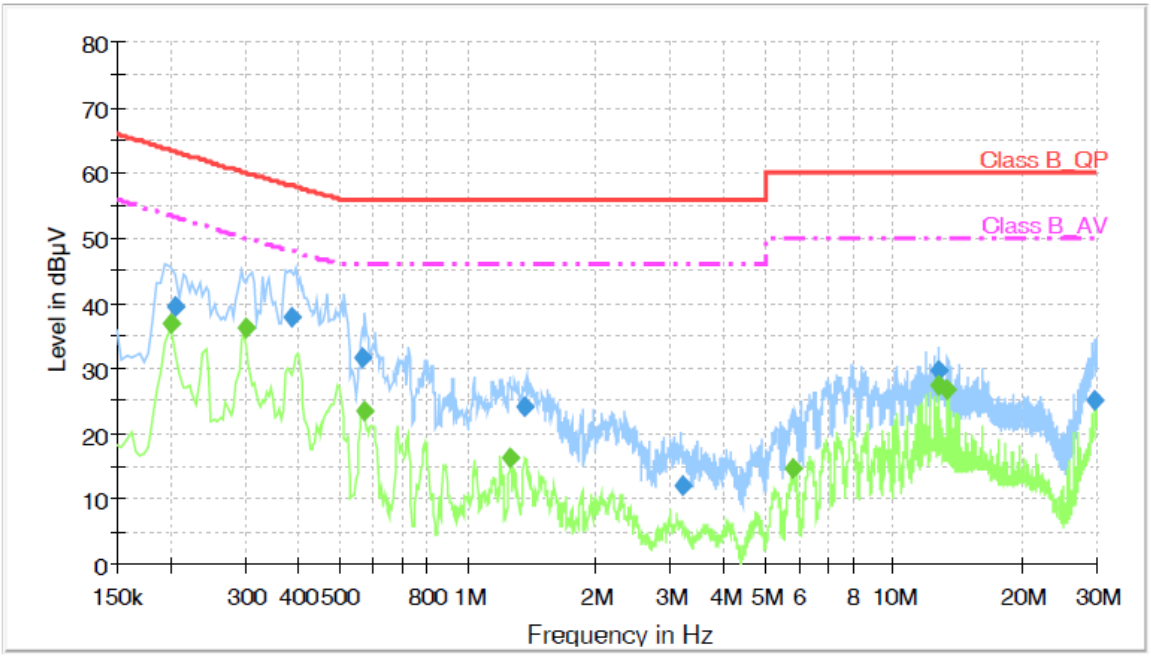
Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.198000	34.9	1000.000	9.000	GND	N	10.1	18.6	53.5	
0.394000	36.2	1000.000	9.000	GND	N	10.1	11.6	47.8	
0.566000	26.7	1000.000	9.000	GND	N	10.1	19.3	46.0	
1.366000	20.3	1000.000	9.000	GND	N	10.1	25.7	46.0	
5.906000	14.8	1000.000	9.000	GND	N	10.4	35.2	50.0	
12.750000	27.3	1000.000	9.000	GND	N	10.6	22.7	50.0	
13.418000	27.6	1000.000	9.000	GND	N	10.7	22.4	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

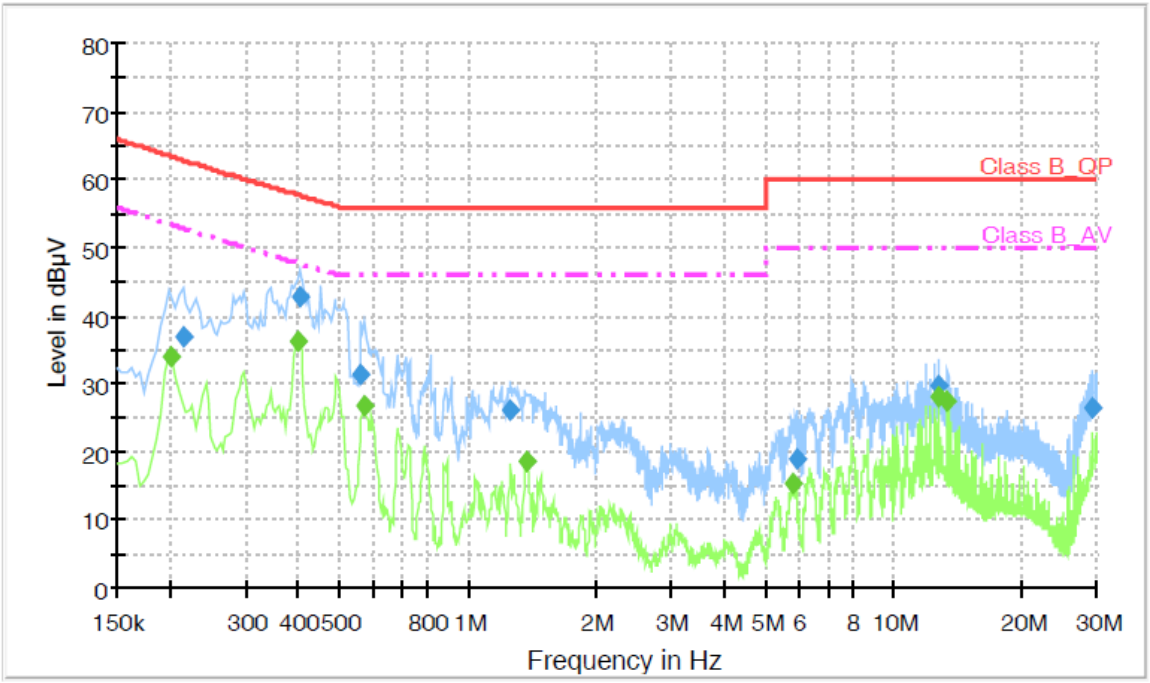
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.206000	39.4	1000.000	9.000	GND	L1	10.1	23.8	63.2	
0.388000	37.9	1000.000	9.000	GND	L1	10.1	20.1	58.0	
0.568000	31.6	1000.000	9.000	GND	L1	10.1	24.4	56.0	
1.360000	24.1	1000.000	9.000	GND	L1	10.1	31.9	56.0	
3.204000	12.0	1000.000	9.000	GND	L1	10.2	44.0	56.0	
12.808000	29.6	1000.000	9.000	GND	L1	10.7	30.4	60.0	
29.640000	25.2	1000.000	9.000	GND	L1	11.3	34.8	60.0	

Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.200000	36.8	1000.000	9.000	GND	L1	10.1	16.6	53.4	
0.300000	36.2	1000.000	9.000	GND	L1	10.1	13.8	50.0	
0.572000	23.4	1000.000	9.000	GND	L1	10.1	22.6	46.0	
1.256000	16.2	1000.000	9.000	GND	L1	10.1	29.8	46.0	
5.784000	14.6	1000.000	9.000	GND	L1	10.4	35.4	50.0	
12.808000	27.4	1000.000	9.000	GND	L1	10.7	22.6	50.0	
13.420000	26.7	1000.000	9.000	GND	L1	10.8	23.3	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
0.214000	36.8	1000.000	9.000	GND	N	10.1	26.1	62.9	
0.402000	42.6	1000.000	9.000	GND	N	10.1	15.1	57.7	
0.562000	31.2	1000.000	9.000	GND	N	10.1	24.8	56.0	
1.258000	26.1	1000.000	9.000	GND	N	10.1	29.9	56.0	
5.922000	18.8	1000.000	9.000	GND	N	10.4	41.2	60.0	
12.746000	29.6	1000.000	9.000	GND	N	10.6	30.4	60.0	
29.234000	26.4	1000.000	9.000	GND	N	10.7	33.6	60.0	

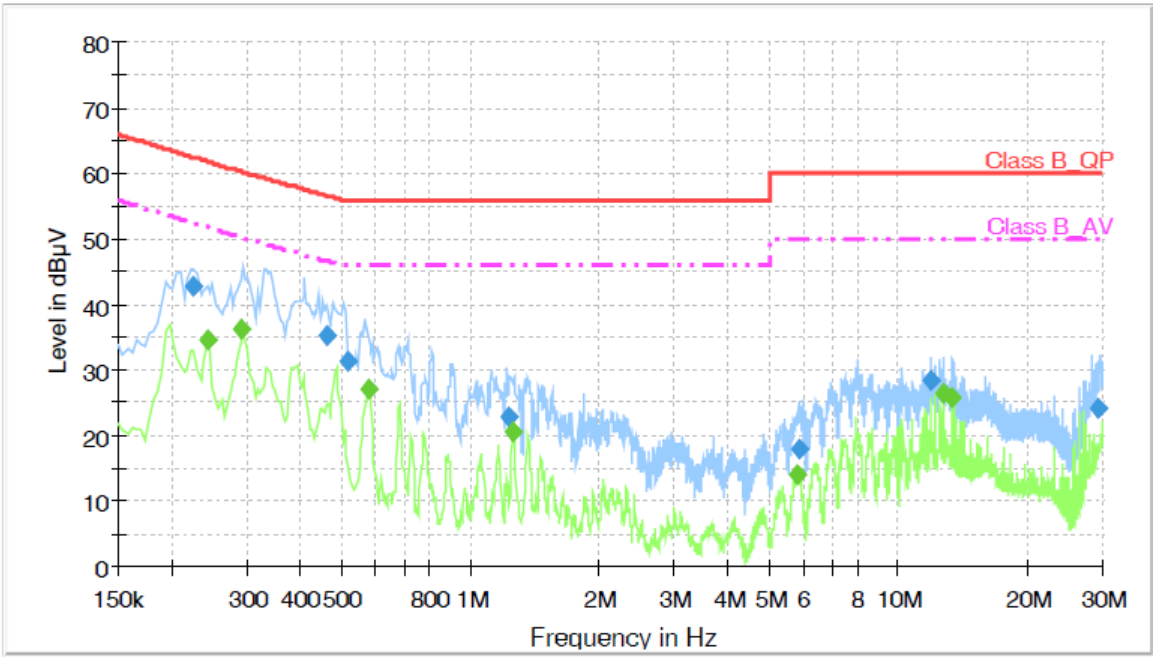
Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.202000	33.9	1000.000	9.000	GND	N	10.1	19.4	53.3	
0.398000	36.4	1000.000	9.000	GND	N	10.1	11.3	47.7	
0.570000	26.8	1000.000	9.000	GND	N	10.1	19.2	46.0	
1.370000	18.5	1000.000	9.000	GND	N	10.1	27.5	46.0	
5.786000	15.5	1000.000	9.000	GND	N	10.4	34.5	50.0	
12.746000	28.0	1000.000	9.000	GND	N	10.6	22.0	50.0	
13.418000	27.4	1000.000	9.000	GND	N	10.7	22.6	50.0	

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

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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

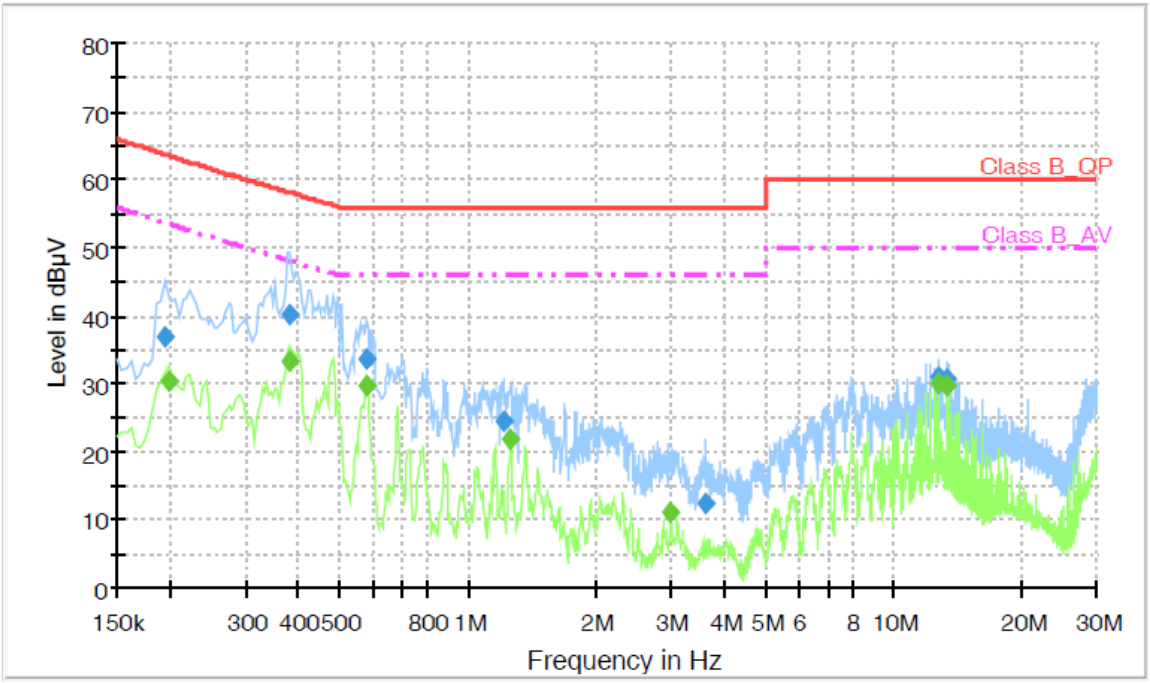
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.224000	42.8	1000.000	9.000	GND	L1	10.1	19.7	62.5	
0.460000	35.3	1000.000	9.000	GND	L1	10.1	21.3	56.6	
0.516000	31.3	1000.000	9.000	GND	L1	10.1	24.7	56.0	
1.224000	22.8	1000.000	9.000	GND	L1	10.1	33.2	56.0	
5.856000	18.1	1000.000	9.000	GND	L1	10.4	41.9	60.0	
11.892000	28.4	1000.000	9.000	GND	L1	10.6	31.6	60.0	
29.480000	24.0	1000.000	9.000	GND	L1	11.3	36.0	60.0	

Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.242000	34.5	1000.000	9.000	GND	L1	10.1	17.3	51.8	
0.292000	36.2	1000.000	9.000	GND	L1	10.1	14.0	50.2	
0.580000	27.1	1000.000	9.000	GND	L1	10.1	18.9	46.0	
1.260000	20.7	1000.000	9.000	GND	L1	10.1	25.3	46.0	
5.784000	14.1	1000.000	9.000	GND	L1	10.4	35.9	50.0	
12.748000	26.6	1000.000	9.000	GND	L1	10.7	23.4	50.0	
13.360000	25.7	1000.000	9.000	GND	L1	10.7	24.3	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
0.194000	36.8	1000.000	9.000	GND	N	10.1	26.9	63.7	
0.382000	40.2	1000.000	9.000	GND	N	10.1	17.9	58.1	
0.578000	33.6	1000.000	9.000	GND	N	10.1	22.4	56.0	
1.210000	24.5	1000.000	9.000	GND	N	10.1	31.5	56.0	
3.606000	12.4	1000.000	9.000	GND	N	10.3	43.6	56.0	
12.746000	31.0	1000.000	9.000	GND	N	10.6	29.0	60.0	
13.358000	30.6	1000.000	9.000	GND	N	10.7	29.4	60.0	

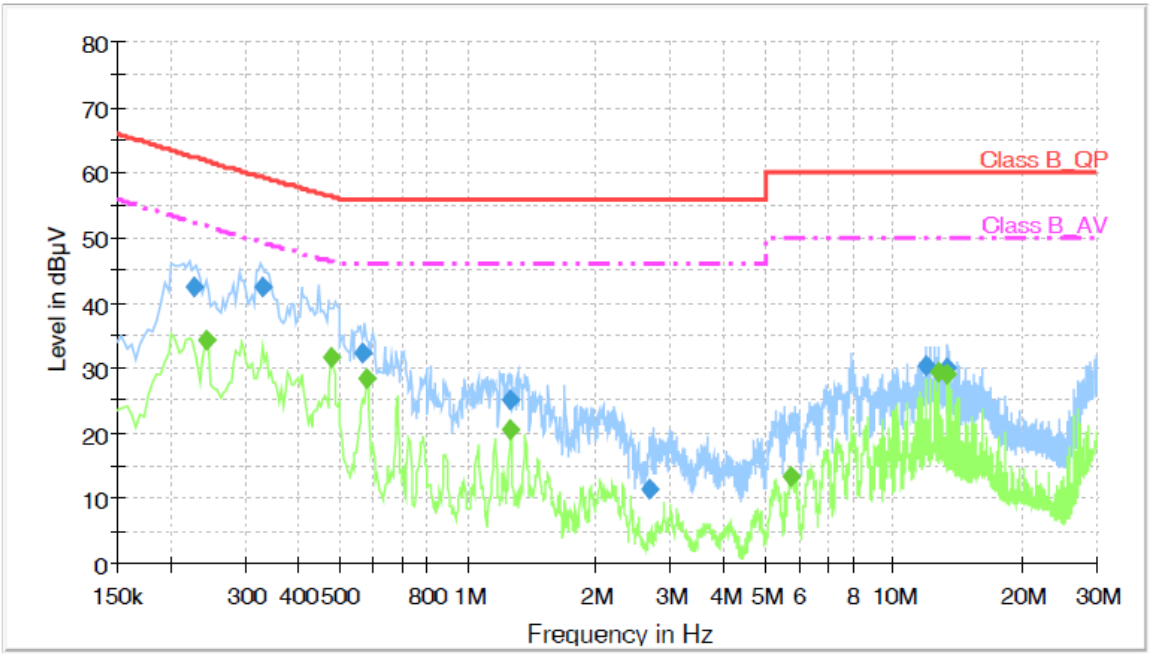
Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.198000	30.3	1000.000	9.000	GND	N	10.1	23.2	53.5	
0.382000	33.4	1000.000	9.000	GND	N	10.1	14.7	48.1	
0.578000	29.6	1000.000	9.000	GND	N	10.1	16.4	46.0	
1.262000	22.0	1000.000	9.000	GND	N	10.1	24.0	46.0	
2.998000	11.1	1000.000	9.000	GND	N	10.2	34.9	46.0	
12.746000	30.1	1000.000	9.000	GND	N	10.6	19.9	50.0	
13.418000	29.7	1000.000	9.000	GND	N	10.7	20.3	50.0	

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

♦ Operating condition: 1 920 × 1 080 / 60 Hz (DP: Digital)

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

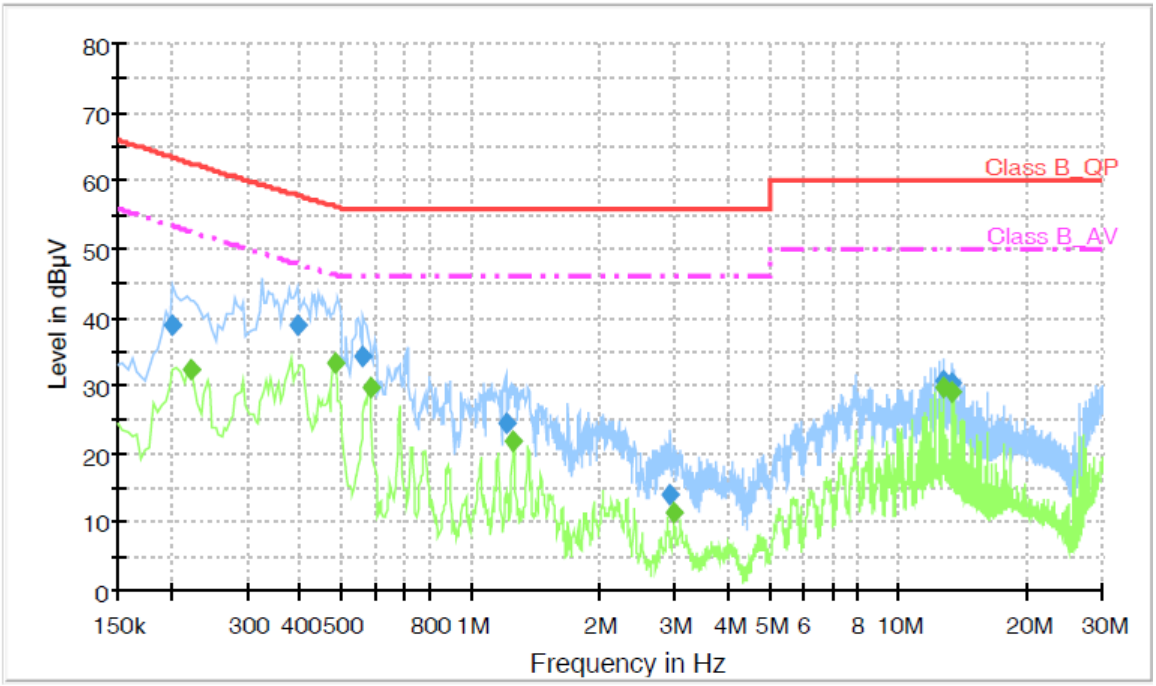
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.228000	42.3	1000.000	9.000	GND	L1	10.1	20.0	62.3	
0.328000	42.4	1000.000	9.000	GND	L1	10.1	16.9	59.3	
0.564000	32.2	1000.000	9.000	GND	L1	10.1	23.8	56.0	
1.264000	25.3	1000.000	9.000	GND	L1	10.1	30.7	56.0	
2.684000	11.3	1000.000	9.000	GND	L1	10.2	44.7	56.0	
11.892000	30.2	1000.000	9.000	GND	L1	10.6	29.8	60.0	
13.420000	30.1	1000.000	9.000	GND	L1	10.8	29.9	60.0	

Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.244000	34.4	1000.000	9.000	GND	L1	10.1	17.3	51.7	
0.480000	31.6	1000.000	9.000	GND	L1	10.1	14.7	46.3	
0.580000	28.3	1000.000	9.000	GND	L1	10.1	17.7	46.0	
1.264000	20.7	1000.000	9.000	GND	L1	10.1	25.3	46.0	
5.772000	13.2	1000.000	9.000	GND	L1	10.4	36.8	50.0	
12.748000	29.5	1000.000	9.000	GND	L1	10.7	20.5	50.0	
13.420000	29.0	1000.000	9.000	GND	L1	10.8	21.0	50.0	

< Fig 12. 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
0.202000	38.9	1000.000	9.000	GND	N	10.1	24.5	63.4	
0.394000	38.9	1000.000	9.000	GND	N	10.1	19.0	57.9	
0.562000	34.4	1000.000	9.000	GND	N	10.1	21.6	56.0	
1.210000	24.4	1000.000	9.000	GND	N	10.1	31.6	56.0	
2.938000	14.1	1000.000	9.000	GND	N	10.2	41.9	56.0	
12.810000	30.7	1000.000	9.000	GND	N	10.6	29.3	60.0	
13.358000	30.4	1000.000	9.000	GND	N	10.7	29.6	60.0	

Final Measurement Detector 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.222000	32.2	1000.000	9.000	GND	N	10.1	20.3	52.5	
0.482000	33.4	1000.000	9.000	GND	N	10.1	12.9	46.3	
0.582000	29.7	1000.000	9.000	GND	N	10.1	16.3	46.0	
1.262000	21.9	1000.000	9.000	GND	N	10.1	24.1	46.0	
2.994000	11.4	1000.000	9.000	GND	N	10.2	34.6	46.0	
12.746000	29.8	1000.000	9.000	GND	N	10.6	20.2	50.0	
13.358000	29.2	1000.000	9.000	GND	N	10.7	20.8	50.0	

< Fig 13. Conducted emission result (Neutral line) >

6. Radiated Emission

6.1 Operating Environment

Temperature : 27 ℃
Relative Humidity : 35 % 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, 10 m, Vertical)	± 4.03 dB	Confidence levels of 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Horizontal)	± 3.96 dB	Confidence levels of 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Vertical)	± 4.01 dB	Confidence levels of 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Horizontal)	± 3.88 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
■ -	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

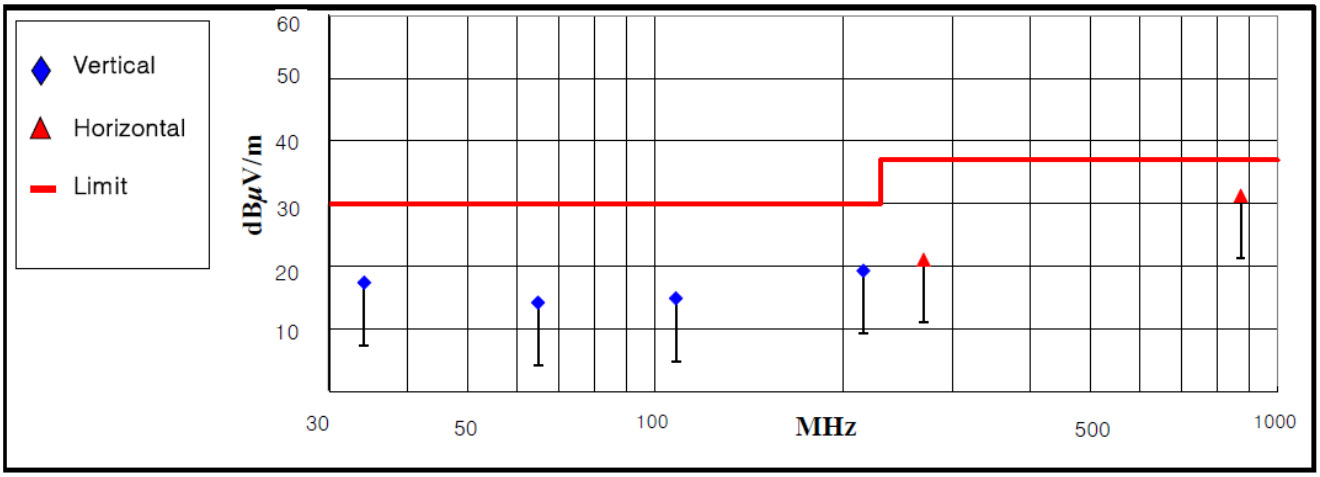
6.6 Test data for Radiated Emission

-. Test Date : June 7 ~ August 4, 2011
-. Resolution Bandwidth : 120 kHz / 1 MHz
-. Detector Mode : Quasi-Peak detector mode / Peak detector mode, Average detector mode
-. Measurement Distance : 10 m / 3 m
-. Note :

Test mode	Clock & tune frequency	Test frequency
RGB (Analog) mode	400 MHz	30 MHz to 2 GHz
HDMI (Digital) mode	1.2 GHz	30 MHz to 6 GHz
DP (Digital) mode	2.7 GHz	30 MHz to 18 GHz

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

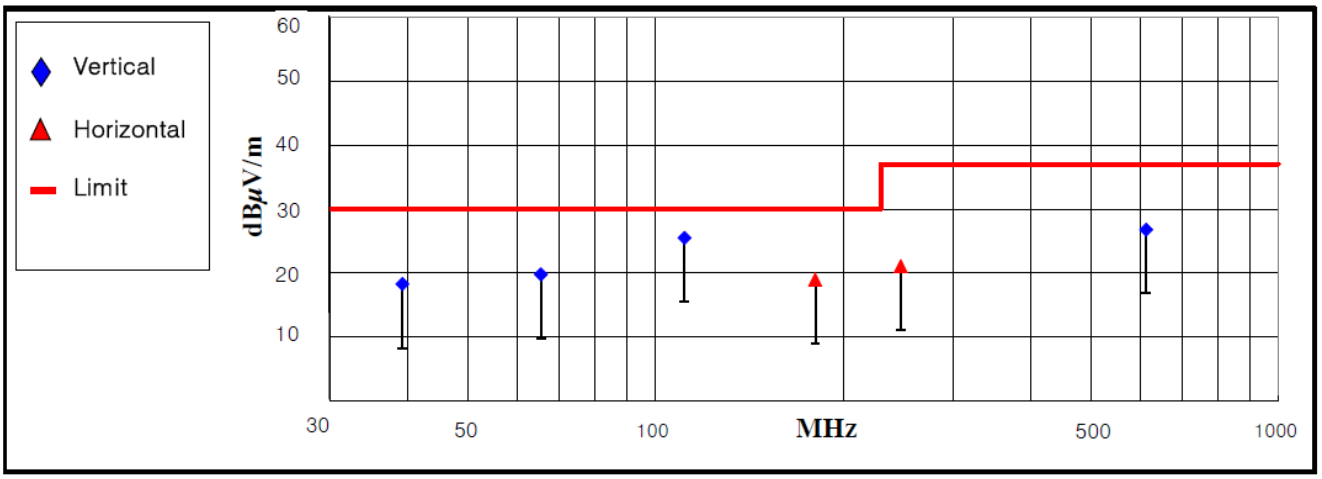
Frequency (MHz)	Measurement Level				Limit (dBμV/m)	Margin (dB)	Positioning System		
	Reading Value(dBμV)	Antenna Factor(dB/m)	Cable Loss(dB)	Test Result (dBμV/m)			Pol. (H/V)	Height (cm)	Angle (°)
34.10	3.96	12.04	1.40	17.40	30.00	12.60	V	100	273
64.83	3.85	8.36	1.99	14.20	30.00	15.80	V	100	156
107.99	2.09	10.18	2.63	14.90	30.00	15.10	V	128	81
216.03	1.24	14.13	3.93	19.30	30.00	10.70	V	100	311
270.01	1.59	15.07	4.44	21.10	37.00	15.90	H	193	180
871.80	0.64	21.84	8.82	31.30	37.00	5.70	H	199	15



< Fig 14. Radiated emission result (30 MHz ~ 1 000 MHz) >

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

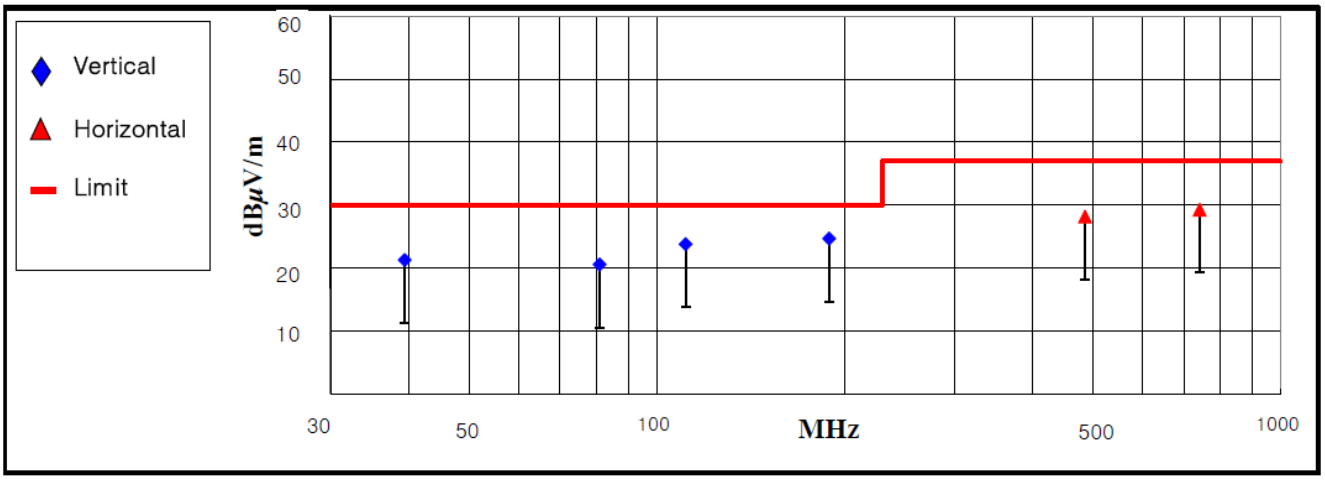
Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading Value(dBμ V)	Antenna Factor(dB/m)	Cable Loss(dB)	Test Result (dBμ V/m)			Pol. (H/V)	Height (cm)	Angle (°)
39.24	5.28	11.52	1.50	18.30	30.00	11.70	V	220	145
65.48	9.39	8.41	2.00	19.80	30.00	10.20	V	100	177
111.34	12.35	10.47	2.68	25.50	30.00	4.50	V	105	353
180.45	1.88	13.59	3.53	19.00	30.00	11.00	H	226	256
247.52	3.47	13.39	4.24	21.10	37.00	15.90	H	211	200
613.40	0.51	19.17	7.12	26.80	37.00	10.20	V	193	0



< Fig 15. Radiated emission result (30 MHz ~ 1 000 MHz) >

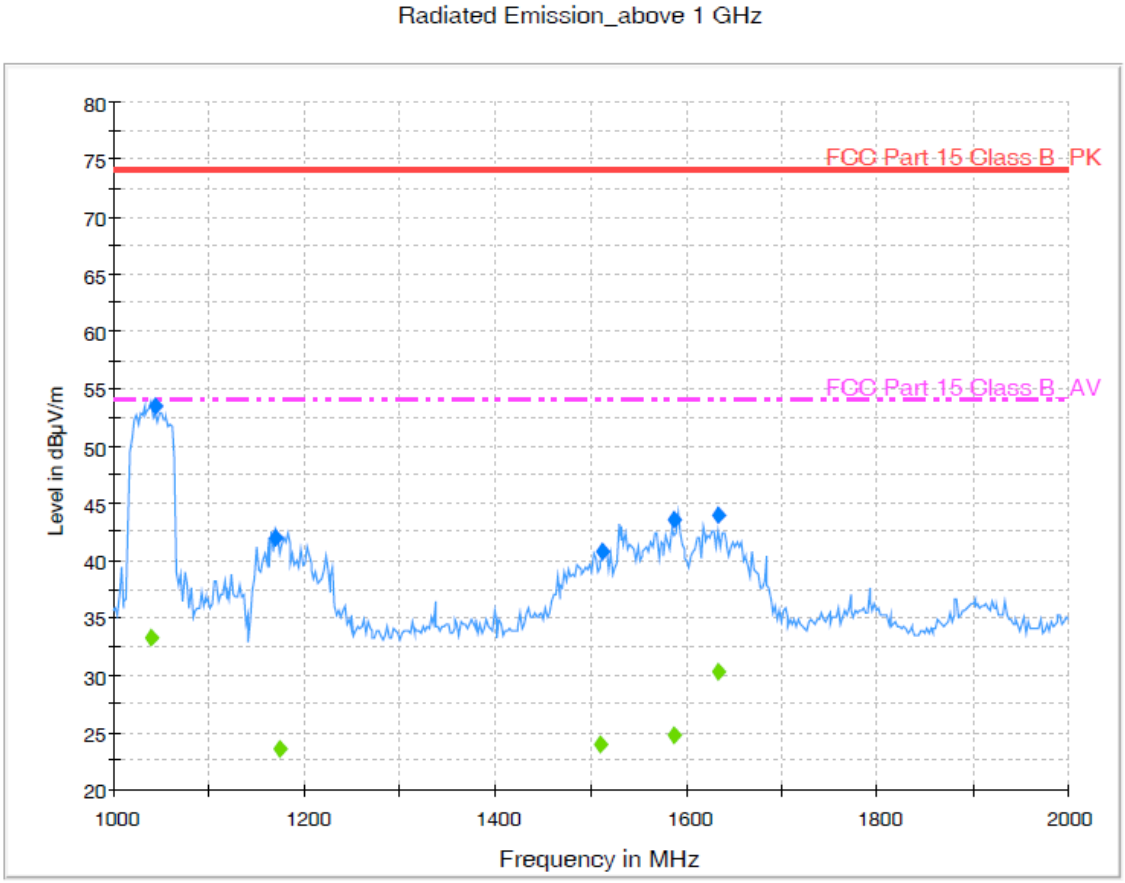
♦ Operating Condition: 1 920 × 1 080 / 60 Hz (DP: Digital)

Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading Value(dBμ V)	Antenna Factor(dB/m)	Cable Loss(dB)	Test Result (dBμ V/m)			Pol. (H/V)	Height (cm)	Angle (°)
39.44	8.27	11.52	1.51	21.30	30.00	8.70	V	100	156
80.99	9.88	8.46	2.26	20.60	30.00	9.40	V	100	132
111.26	10.65	10.47	2.68	23.80	30.00	6.20	V	130	17
189.02	7.08	13.99	3.63	24.70	30.00	5.30	V	100	15
486.04	4.64	17.35	6.21	28.20	37.00	8.80	H	220	140
742.49	0.62	20.68	8.00	29.30	37.00	7.70	H	193	236



< Fig 16. Radiated emission result (30 MHz ~ 1 000 MHz) >

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



Final Result 1

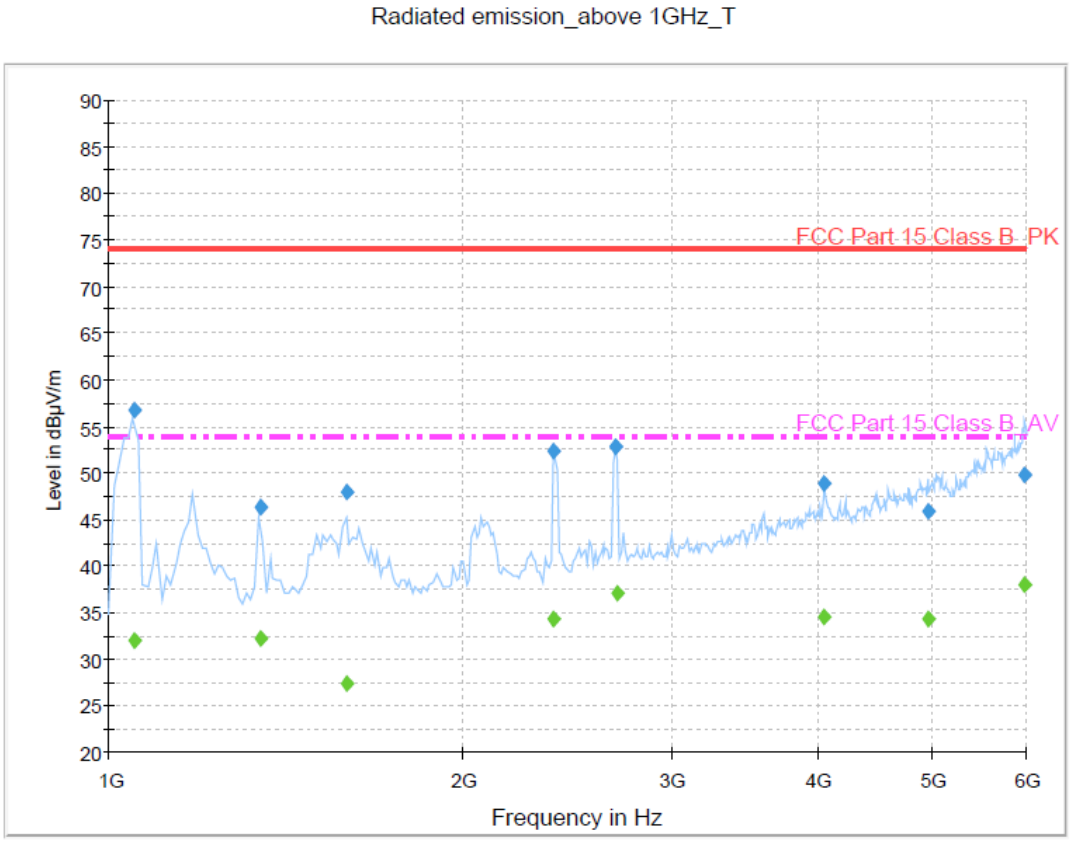
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1043.080160	53.5	100.0	1000.000	100.0	V	182.0	-14.3	20.5	74.0
1168.940681	42.0	100.0	1000.000	100.0	V	166.0	-13.8	32.0	74.0
1512.030060	40.7	100.0	1000.000	100.0	V	177.0	-13.0	33.3	74.0
1586.982365	43.6	100.0	1000.000	150.0	V	183.0	-12.7	30.4	74.0
1633.466533	44.1	100.0	1000.000	100.0	V	164.0	-12.6	30.0	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)
1039.480160	33.2	100.0	1000.000	100.0	V	195.0	-14.3	20.8	54.0
1175.340681	23.5	100.0	1000.000	100.0	V	171.0	-13.8	30.5	54.0
1510.030060	24.0	100.0	1000.000	100.0	V	183.0	-13.0	30.0	54.0
1586.182365	24.7	100.0	1000.000	246.0	V	188.0	-12.7	29.3	54.0
1633.466533	30.3	100.0	1000.000	100.0	V	164.0	-12.6	23.7	54.0

< Fig 17. Radiated emission result (1 000 MHz ~ 2 000 MHz) >

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



Final Result 1

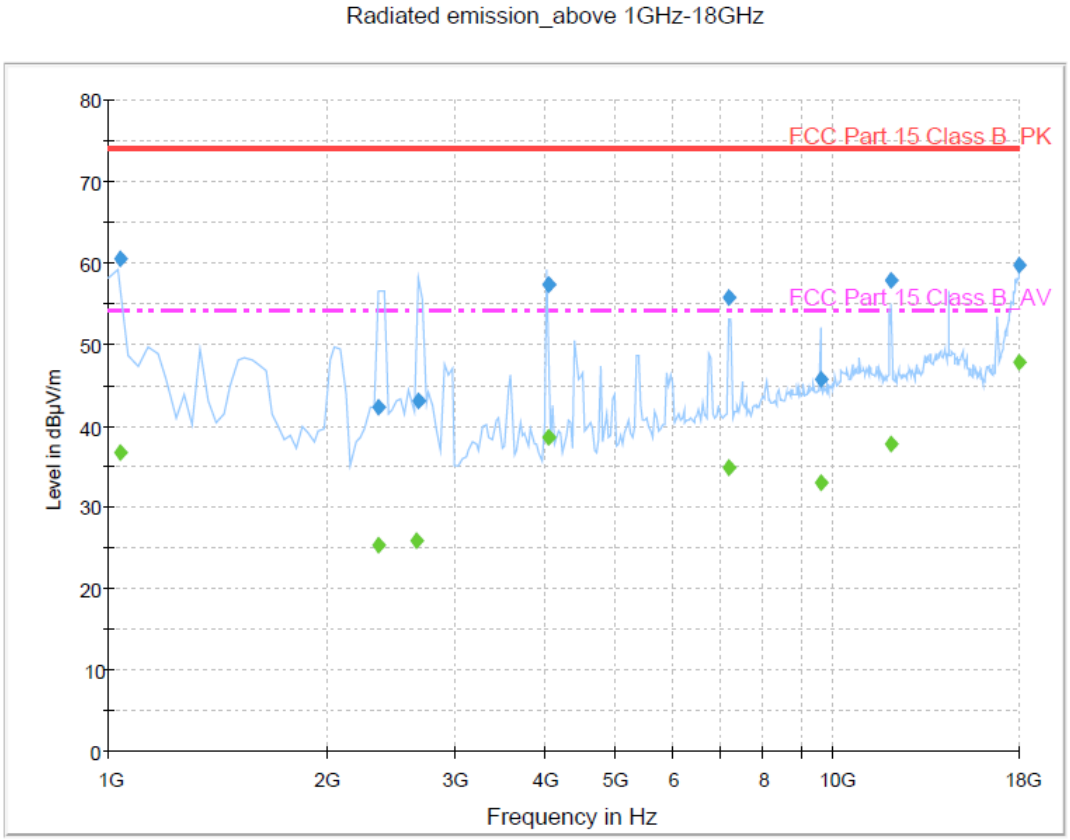
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1051.500200	56.7	1000.0	1000.000	100.0	H	139.0	-15.0	17.3	74.0
1345.681363	46.4	1000.0	1000.000	200.0	V	138.0	-13.8	27.6	74.0
1591.782365	48.0	1000.0	1000.000	100.0	V	214.0	-12.9	26.0	74.0
2387.365531	52.3	1000.0	1000.000	115.0	V	159.0	-9.9	21.7	74.0
2694.786774	52.8	1000.0	1000.000	117.0	V	146.0	-8.7	21.2	74.0
4048.692184	48.8	1000.0	1000.000	100.0	V	179.0	-3.1	25.2	74.0
4947.295792	46.0	1000.0	1000.000	150.0	V	10.0	-1.1	28.0	74.0
5980.159920	49.9	1000.0	1000.000	150.0	V	40.0	2.2	24.1	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)
1050.300200	32.1	1000.0	1000.000	100.0	H	139.0	-15.0	21.9	54.0
1345.681363	32.3	1000.0	1000.000	200.0	V	138.0	-13.8	21.7	54.0
1591.782365	27.4	1000.0	1000.000	100.0	V	214.0	-12.9	26.6	54.0
2387.765531	34.3	1000.0	1000.000	115.0	V	159.0	-9.9	19.7	54.0
2697.186774	37.0	1000.0	1000.000	116.0	V	146.0	-8.6	17.0	54.0
4047.892184	34.5	1000.0	1000.000	100.0	V	179.0	-3.1	19.5	54.0
4945.295792	34.2	1000.0	1000.000	100.0	V	11.0	-1.1	19.8	54.0
5984.959920	38.1	1000.0	1000.000	100.0	V	10.0	2.3	15.9	54.0

< Fig 18. Radiated emission result (1 000 MHz ~ 6 000 MHz) >

♦ Operating Condition: 1 920 × 1 080 / 60 Hz (DP: 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)
1037.468	60.5	1000.0	1000.000	100.0	H	144.0	-12.2	13.5	74.0
2359.325	42.2	1000.0	1000.000	166.0	H	202.0	-10.4	31.8	74.0
2669.939	43.1	1000.0	1000.000	127.0	V	138.0	-9.8	30.9	74.0
4037.064	57.2	1000.0	1000.000	100.0	V	145.0	-7.0	16.8	74.0
7168.133	55.6	1000.0	1000.000	188.0	H	53.0	2.3	18.4	74.0
9589.370	45.7	1000.0	1000.000	115.0	H	80.0	8.9	28.3	74.0
11999.408	57.7	1000.0	1000.000	137.0	H	25.0	10.3	16.3	74.0
17997.400	59.6	1000.0	1000.000	165.0	H	168.0	21.2	14.4	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)
1039.068	36.6	1000.0	1000.000	100.0	H	145.0	-12.2	17.4	54.0
2357.725	25.3	1000.0	1000.000	188.0	H	202.0	-10.4	28.7	54.0
2666.739	25.8	1000.0	1000.000	100.0	V	149.0	-9.8	28.2	54.0
4037.064	38.6	1000.0	1000.000	100.0	V	145.0	-7.0	15.4	54.0
7170.933	34.9	1000.0	1000.000	187.0	H	53.0	2.3	19.1	54.0
9590.170	33.0	1000.0	1000.000	100.0	H	84.0	8.9	21.0	54.0
11999.008	37.8	1000.0	1000.000	126.0	H	30.0	10.3	16.2	54.0
18000.000	47.8	1000.0	1000.000	199.0	H	153.0	21.2	6.2	54.0

< Fig 19. Radiated emission result (1 000 MHz ~ 18 000 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. LCD Monitor (Model Name: HSTND-3411-G, LD4720tm)** was complies with §15.107 and 15.109 of the FCC Rules.