

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. Myoung-Kyu Lee, Chief research engineer

Date of Issue : September 9, 2009

Order Number: GETEC-C1-09-191

Test Report Number: GETEC-E3-09-107

Test Site: Gumi College EMC Center

FCC Registration Number: (100749)

FCC ID.: BEJHSTND-2591-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-2591-G, LD4200tm
Trade Name	: HP
Class II Change(s)	: Addition to the touch screen function board

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003 / Canadian standard ICES-003

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Reviewed by,


Hyoung Seop Kim, Associate Engineer
GUMI College EMC center


Tae-Sig Park, Technical Manager
GUMI College EMC center



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)	7
4. DESCRIPTION OF TESTS.....	8
4.1 TEST CONDITION.....	8
4.2 CONDUCTED EMISSION	9
4.3 RADIATED EMISSION.....	10
5. CONDUCTED EMISSION.....	11
5.1 OPERATING ENVIRONMENT	11
5.2 TEST SET-UP	11
5.3 MEASUREMENT UNCERTAINTY.....	11
5.4 LIMIT	12
5.5 TEST EQUIPMENT USED.....	12
5.6 TEST DATA FOR CONDUCTED EMISSION	12
6. RADIATED EMISSION	21
6.1 OPERATING ENVIRONMENT	21
6.2 TEST SET-UP	21
6.3 MEASUREMENT UNCERTAINTY.....	21
6.4 LIMIT	22
6.5 TEST EQUIPMENT USED.....	22
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: 299, Gongdan-dong, Gumi-si, Gyeongbuk, Korea.

Contact Person: Mr. Myoung-Kyu Lee, Chief research engineer

Tel Number: +82-54-460-7314

- **FCC ID.** BEJHSTND-2591-G
- **EUT Type** LCD Monitor
- **Model Name** HSTND-2591-G, LD4200tm
- **Trade Name** HP
- **Serial Number** Prototype
- **Rule Part(s)** FCC Part 15 Subpart B
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2003) / Canadian standard ICES-003
- **Dates of Test** September 3 ~ 4, 2009
- **Place of Test** **Gumi College EMC Center** (FCC Registration No.: 100749)
407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-09-107
- **Dates of Issue** September 9, 2009
- **Class II Change(s)** Addition to the touch screen function board



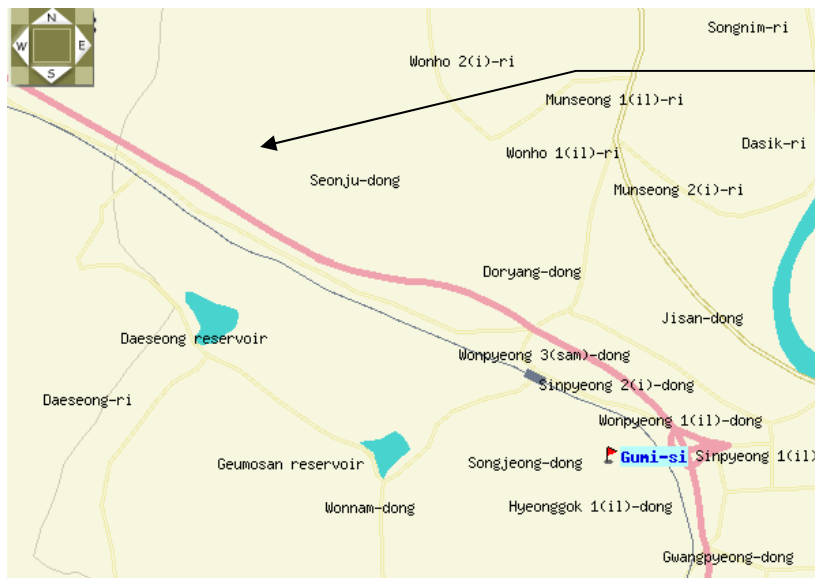
2. Introduction

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-2591-G)**

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 FCC §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-2591-G) FCC ID.: BEJHSTND-2591-G**

Power supply	AC (100-240) V, (50/60) Hz, 2.2 A
Input Connector	15- pin RGB type, HDMI(Digital), S-video, Composite Video, Component, RS-232C
Frequency Range(s)	Horizontal Frequency: (31.468- 79.980) kHz Vertical Frequency: (59.855-75.029) Hz
Speaker	SP-0000K (LG Electronics) Output power: 10 W Impedance: 8 Ω
Maximum Frequency	210 MHz
Dimensions	99.9 cm * 68.0 cm * 29.3 cm (W * H * D)
Weight	34.24 kg



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
PC	Hewlett Packard	m9425f	S/N: CNX84403CT FCC ID: DoC
Video card	NVIDIA	Geforce 9500 GS	S/N: MS-V133B0810370406 FCC ID: V133
DVD player	LG Electronics Inc.	LC-954	S/N: 3850R-Z674K FCC ID: DoC
PS2 mouse	Suzho ligitech electronics	M-S35	S/N: 340249-001 FCC ID: DILZ11029
PS2 keyboard	Hewlett Packard	5189	S/N: 5188-6077 FCC ID: DoC
Joystick	MICROSOFT	X05-92626	S/N: 9262600296169 FCC ID: DoC
Monitor	MAJESTIC	TM154	S/N: D07030CP01003 FCC ID: DoC

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



3.2.2 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the EUT	1.8 m unshielded
Control(RS-232C) cable	Connected to the EUT	1.2 m shielded with two ferrite cores
Video(HDMI/DVI) cable	Connected to the EUT and PC	1.95 m shielded
Video(RGB) input cable	Connected to the EUT and PC	1.8 m shielded with two ferrite cores
Video(RGB) output cable	Connected to the EUT and Monitor	1.8 m shielded with two ferrite cores
PC sound cable	Connected to the EUT and PC	1.8 m shielded with two ferrite cores
Component cable	Connected to the EUT and DVD player	3.0 m shielded
Component sound cable	Connected to the EUT and DVD player	3.0 m shielded
AV input cable	Connected to the EUT and DVD player	1.8 m shielded
AV output cable	Connected to the EUT and Monitor	5.0 m shielded
S-video cable	Connected to the EUT and DVD player	1.8 m shielded
Remote control input cable	Connected to the EUT and PC	1.8 m shielded
Upstream cable	Connected to the EUT and PC	1.8 m shielded with a ferrite core

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), 1 920 * 1 080 / 60 Hz (HDMI/DVI: Digital)
 - . Conducted emission: 1 920 * 1 080 / 60 Hz (RGB: Analog), 1 920 * 1 080 / 60 Hz (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
 - . 1 kHz sound tone with winamp player



4.2 Conducted Emission

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

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

The EUT is powered from the Rohde & Schwarz LISN (ESH2-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH3-Z5). Powers to the LISN are filtered by high-current high insertion loss power line filter.

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

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCS30).

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

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

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

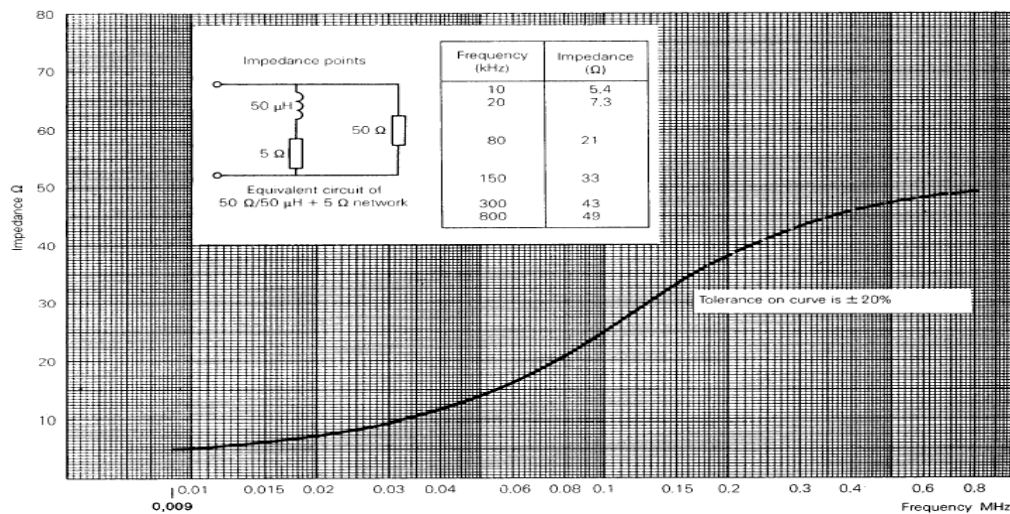


Fig 2. Impedance of LISN



4.3 Radiated Emission

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

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

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

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

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

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

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

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

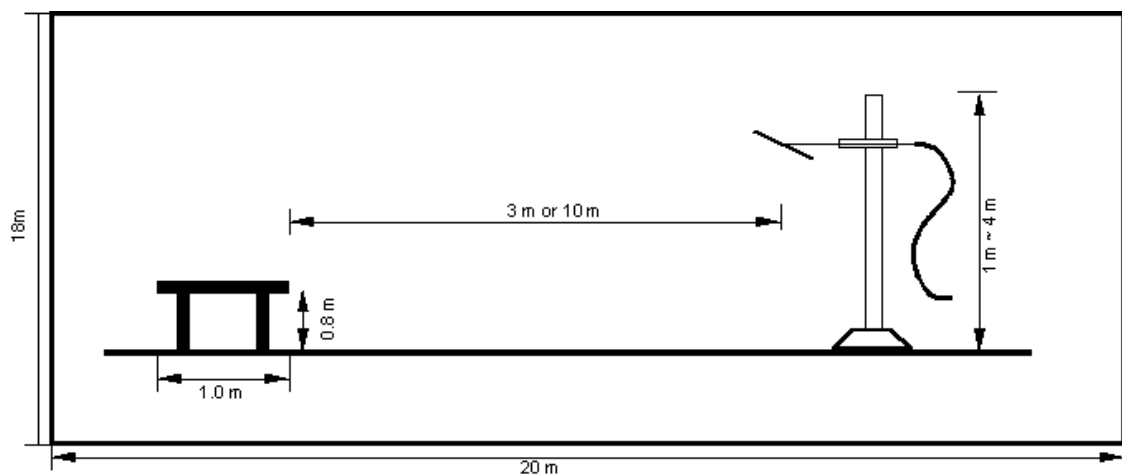


Fig 3. Dimensions of Open Site Test Area



5. Conducted Emission

5.1 Operating Environment

Temperature : 27 °C
Relative Humidity : 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.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

5.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement."

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	± 2.97 dB	Confidence levels of 95 % (k=2)
Conducted emission (150 kHz ~ 30 MHz)	± 4.05 dB	Confidence levels of 95 % (k=2)



5.4 Limit

RFI Conducted	FCC Limit(dB) Class B	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

5.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 13. 2009
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 12. 2009
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 12. 2009

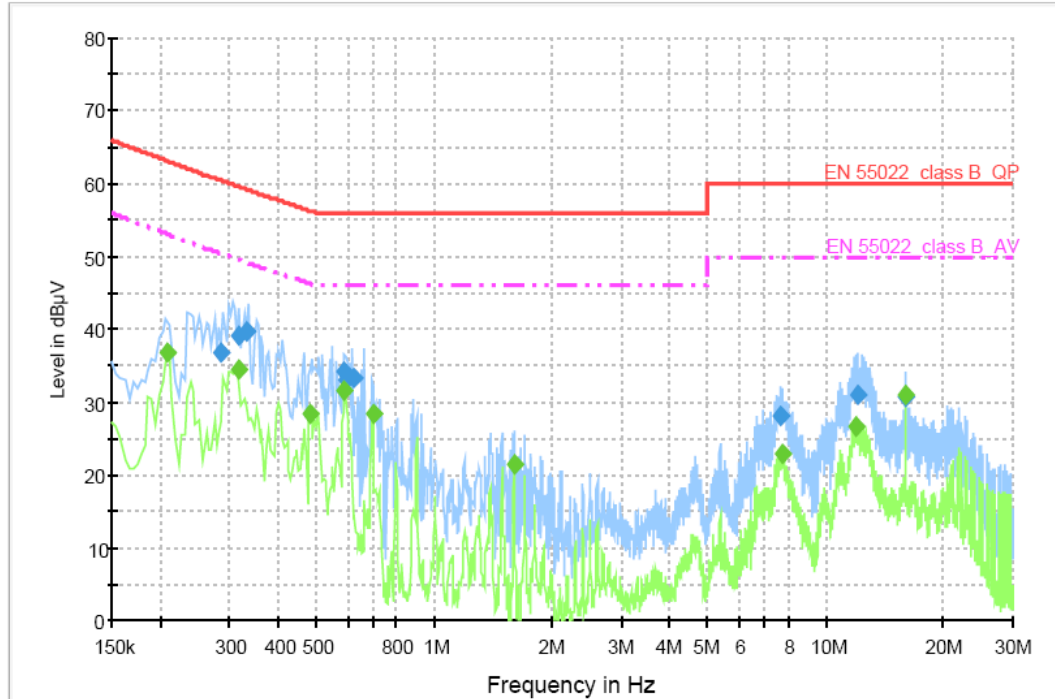
5.6 Test data for Conducted Emission

- . Test Date : September 3, 2009
- . Resolution Bandwidth : 9 kHz
- . Frequency Range : 0.15 MHz ~ 30 MHz



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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.284000	36.7	1000.000	9.000	GND	L1	10.0	23.8	60.5	
0.316000	39.2	1000.000	9.000	GND	L1	10.0	20.4	59.6	
0.332000	39.7	1000.000	9.000	GND	L1	10.0	19.5	59.2	
0.588000	34.3	1000.000	9.000	GND	L1	10.0	21.7	56.0	
0.596000	32.9	1000.000	9.000	GND	L1	10.0	23.1	56.0	
0.624000	33.3	1000.000	9.000	GND	L1	10.0	22.7	56.0	
7.648000	28.0	1000.000	9.000	GND	L1	10.3	32.0	60.0	
12.140000	31.0	1000.000	9.000	GND	L1	10.4	29.0	60.0	
16.008000	30.7	1000.000	9.000	GND	L1	10.7	29.3	60.0	

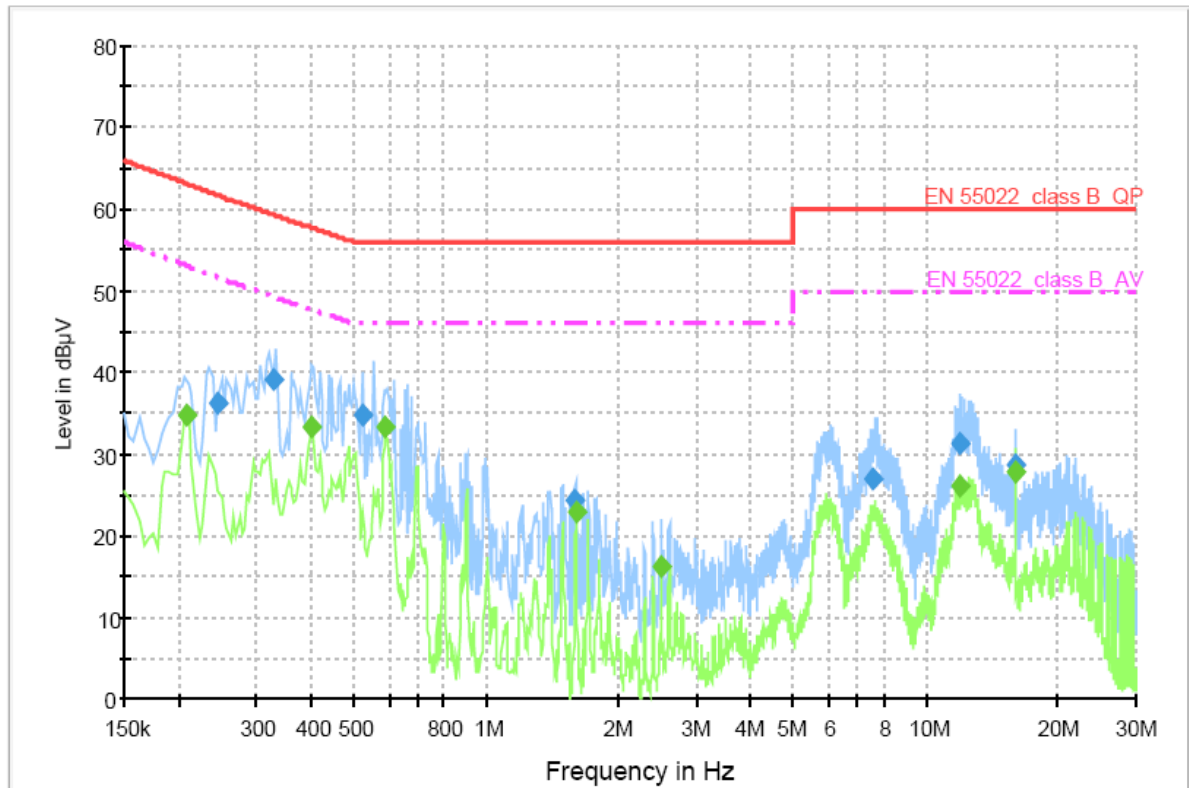
Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.208000	36.7	1000.000	9.000	GND	L1	9.9	16.4	53.1	
0.316000	34.4	1000.000	9.000	GND	L1	10.0	15.2	49.6	
0.484000	28.3	1000.000	9.000	GND	L1	10.0	17.9	46.2	
0.588000	31.5	1000.000	9.000	GND	L1	10.0	14.5	46.0	
0.696000	28.4	1000.000	9.000	GND	L1	10.0	17.6	46.0	
1.596000	21.4	1000.000	9.000	GND	L1	10.1	24.6	46.0	
7.720000	23.0	1000.000	9.000	GND	L1	10.3	27.0	50.0	
11.956000	26.6	1000.000	9.000	GND	L1	10.4	23.4	50.0	
16.008000	31.1	1000.000	9.000	GND	L1	10.7	18.9	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
0.244000	36.2	1000.000	9.000	GND	N	10.0	25.6	61.8	
0.328000	39.1	1000.000	9.000	GND	N	10.0	20.2	59.3	
0.520000	34.8	1000.000	9.000	GND	N	10.0	21.2	56.0	
1.592000	24.4	1000.000	9.000	GND	N	10.1	31.6	56.0	
7.592000	27.1	1000.000	9.000	GND	N	10.3	32.9	60.0	
11.960000	31.2	1000.000	9.000	GND	N	10.4	28.8	60.0	
16.008000	28.7	1000.000	9.000	GND	N	10.6	31.4	60.0	

Final Measurement Detector 2

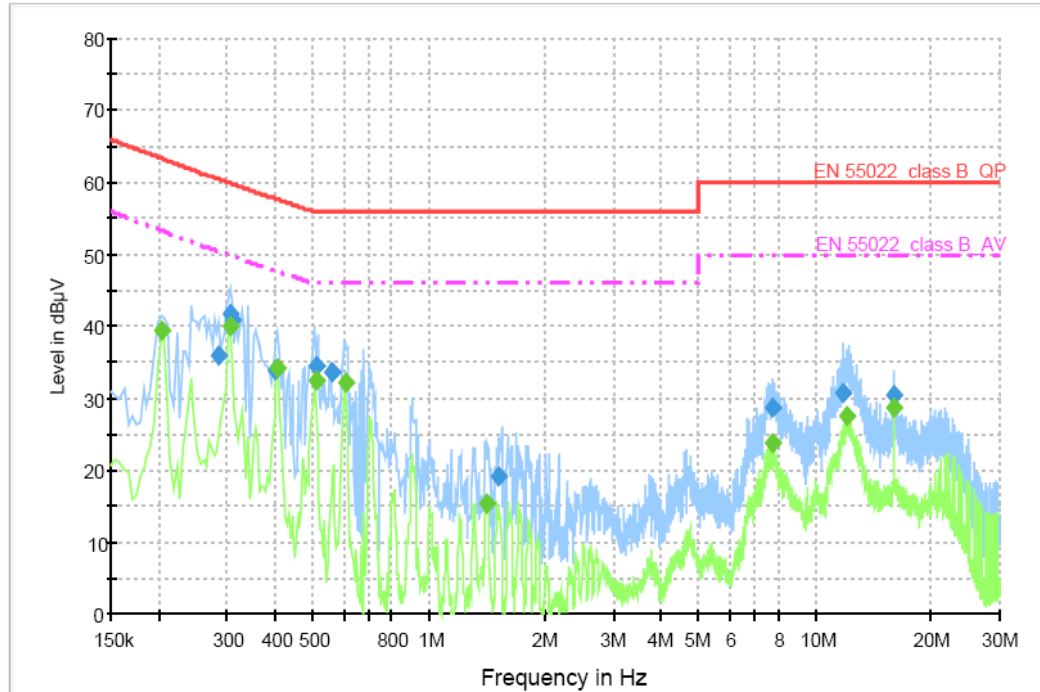
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.208000	34.9	1000.000	9.000	GND	N	9.9	18.2	53.1	
0.400000	33.4	1000.000	9.000	GND	N	10.0	14.3	47.7	
0.588000	33.3	1000.000	9.000	GND	N	10.0	12.7	46.0	
1.596000	22.8	1000.000	9.000	GND	N	10.1	23.2	46.0	
2.496000	16.1	1000.000	9.000	GND	N	10.1	29.9	46.0	
11.956000	26.1	1000.000	9.000	GND	N	10.4	23.9	50.0	
16.008000	27.8	1000.000	9.000	GND	N	10.6	22.2	50.0	

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



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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.284000	35.9	1000.000	9.000	GND	L1	10.0	24.6	60.5	
0.304000	41.7	1000.000	9.000	GND	L1	10.0	18.2	59.9	
0.308000	40.9	1000.000	9.000	GND	L1	10.0	18.9	59.8	
0.400000	33.9	1000.000	9.000	GND	L1	10.0	23.8	57.7	
0.508000	34.4	1000.000	9.000	GND	L1	10.0	21.6	56.0	
0.560000	33.5	1000.000	9.000	GND	L1	10.0	22.5	56.0	
1.512000	19.1	1000.000	9.000	GND	L1	10.1	36.9	56.0	
7.712000	28.8	1000.000	9.000	GND	L1	10.3	31.2	60.0	
11.836000	30.7	1000.000	9.000	GND	L1	10.4	29.4	60.0	
16.008000	30.4	1000.000	9.000	GND	L1	10.7	29.6	60.0	

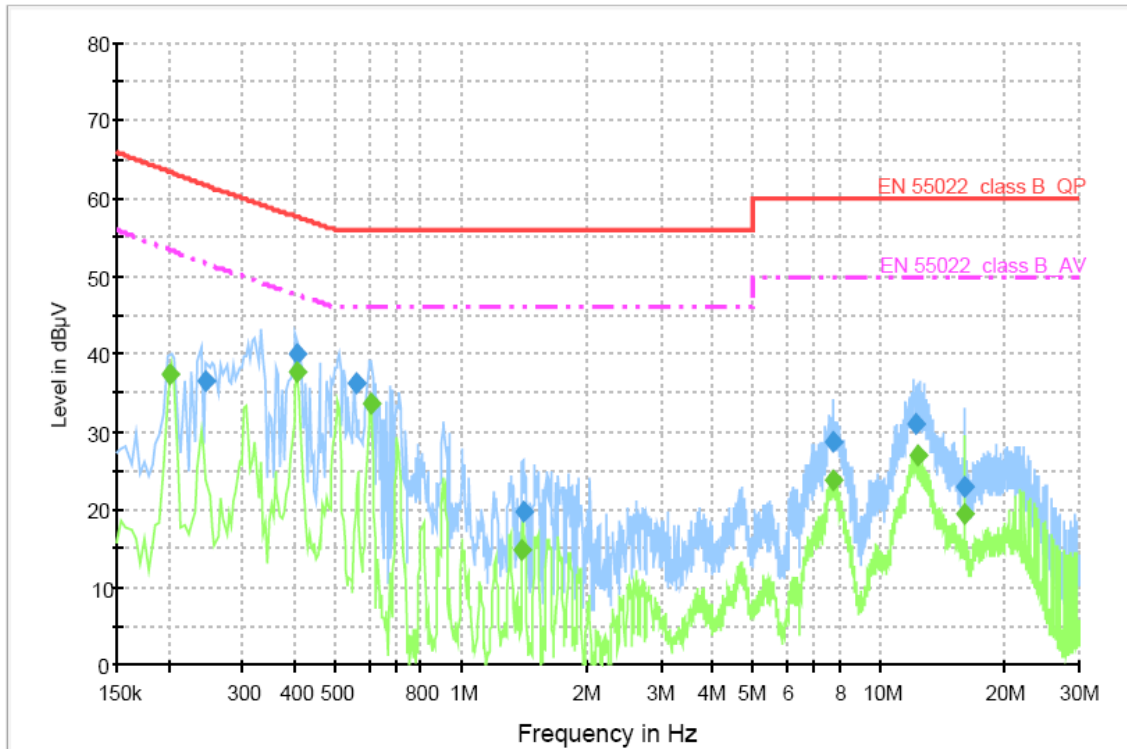
Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	39.4	1000.000	9.000	GND	L1	9.9	13.9	53.3	
0.304000	40.1	1000.000	9.000	GND	L1	10.0	9.8	49.9	
0.404000	34.2	1000.000	9.000	GND	L1	10.0	13.4	47.6	
0.508000	32.3	1000.000	9.000	GND	L1	10.0	13.7	46.0	
0.608000	32.0	1000.000	9.000	GND	L1	10.0	14.0	46.0	
1.408000	15.3	1000.000	9.000	GND	L1	10.0	30.7	46.0	
7.724000	23.7	1000.000	9.000	GND	L1	10.3	26.3	50.0	
12.136000	27.5	1000.000	9.000	GND	L1	10.4	22.5	50.0	
16.008000	28.7	1000.000	9.000	GND	L1	10.7	21.3	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
0.244000	36.6	1000.000	9.000	GND	N	10.0	25.2	61.8	
0.404000	40.1	1000.000	9.000	GND	N	10.0	17.6	57.7	
0.564000	36.3	1000.000	9.000	GND	N	10.0	19.7	56.0	
1.416000	19.7	1000.000	9.000	GND	N	10.1	36.3	56.0	
7.712000	28.8	1000.000	9.000	GND	N	10.3	31.2	60.0	
12.160000	31.1	1000.000	9.000	GND	N	10.4	28.9	60.0	
16.008000	23.0	1000.000	9.000	GND	N	10.6	37.0	60.0	

Final Measurement Detector 2

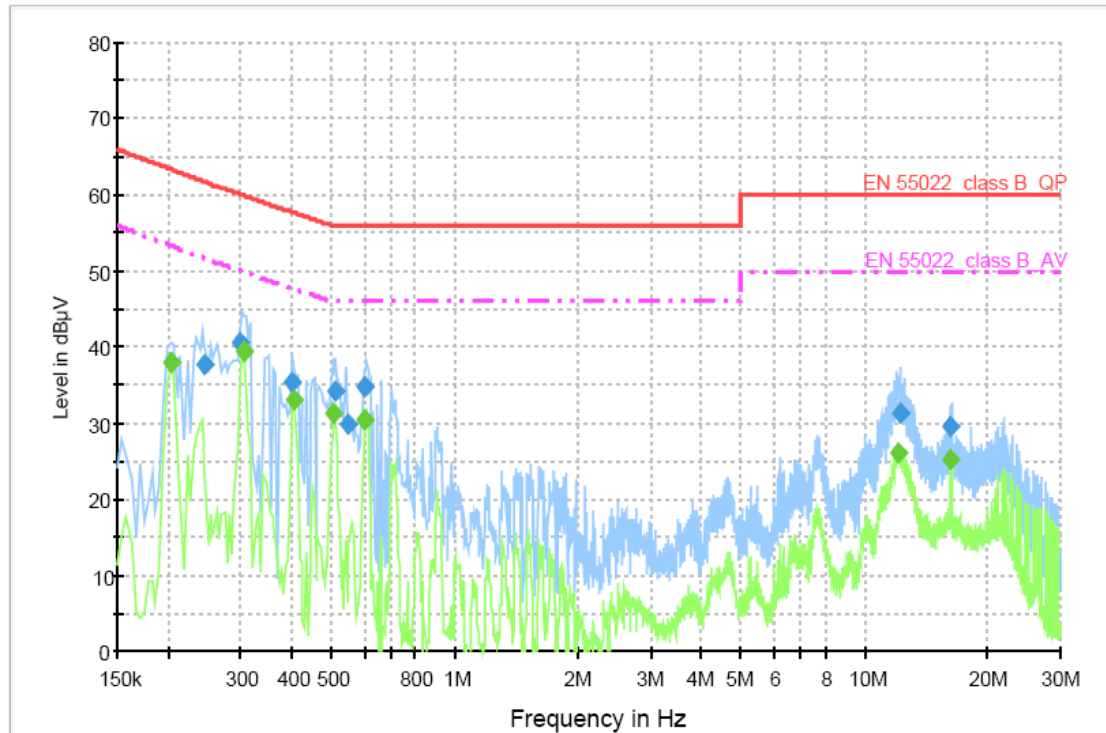
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.200000	37.5	1000.000	9.000	GND	N	9.9	15.9	53.4	
0.404000	37.7	1000.000	9.000	GND	N	10.0	9.9	47.6	
0.608000	33.7	1000.000	9.000	GND	N	10.0	12.3	46.0	
1.400000	14.9	1000.000	9.000	GND	N	10.1	31.1	46.0	
7.720000	23.7	1000.000	9.000	GND	N	10.3	26.3	50.0	
12.312000	26.9	1000.000	9.000	GND	N	10.4	23.1	50.0	
16.008000	19.4	1000.000	9.000	GND	N	10.6	30.6	50.0	

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



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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.244000	37.7	1000.000	9.000	GND	L1	10.0	24.1	61.8	
0.300000	40.7	1000.000	9.000	GND	L1	10.0	19.3	60.0	
0.400000	35.3	1000.000	9.000	GND	L1	10.0	22.4	57.7	
0.508000	34.2	1000.000	9.000	GND	L1	10.0	21.8	56.0	
0.548000	29.9	1000.000	9.000	GND	L1	10.0	26.1	56.0	
0.600000	34.8	1000.000	9.000	GND	L1	10.0	21.2	56.0	
12.228000	31.3	1000.000	9.000	GND	L1	10.4	28.7	60.0	
16.256000	29.7	1000.000	9.000	GND	L1	10.7	30.3	60.0	

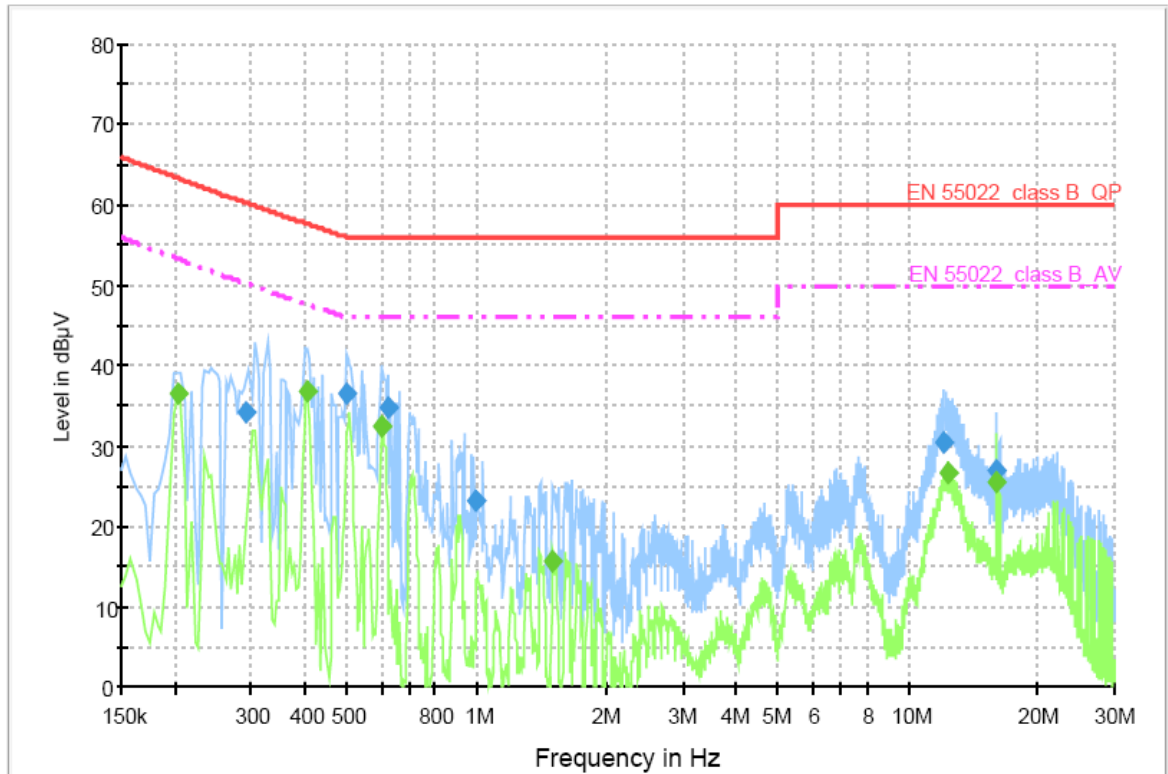
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.204000	38.1	1000.000	9.000	GND	L1	9.9	15.2	53.3	
0.304000	39.4	1000.000	9.000	GND	L1	10.0	10.5	49.9	
0.404000	33.0	1000.000	9.000	GND	L1	10.0	14.6	47.6	
0.504000	31.2	1000.000	9.000	GND	L1	10.0	14.8	46.0	
0.604000	30.5	1000.000	9.000	GND	L1	10.0	15.5	46.0	
12.052000	26.2	1000.000	9.000	GND	L1	10.4	23.8	50.0	
16.256000	25.1	1000.000	9.000	GND	L1	10.7	24.9	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
0.292000	34.2	1000.000	9.000	GND	N	10.0	26.1	60.3	
0.500000	36.6	1000.000	9.000	GND	N	10.0	19.4	56.0	
0.620000	34.8	1000.000	9.000	GND	N	10.0	21.2	56.0	
0.988000	23.2	1000.000	9.000	GND	N	10.0	32.8	56.0	
12.012000	30.5	1000.000	9.000	GND	N	10.4	29.5	60.0	
16.008000	27.0	1000.000	9.000	GND	N	10.6	33.0	60.0	

Final Measurement Detector 2

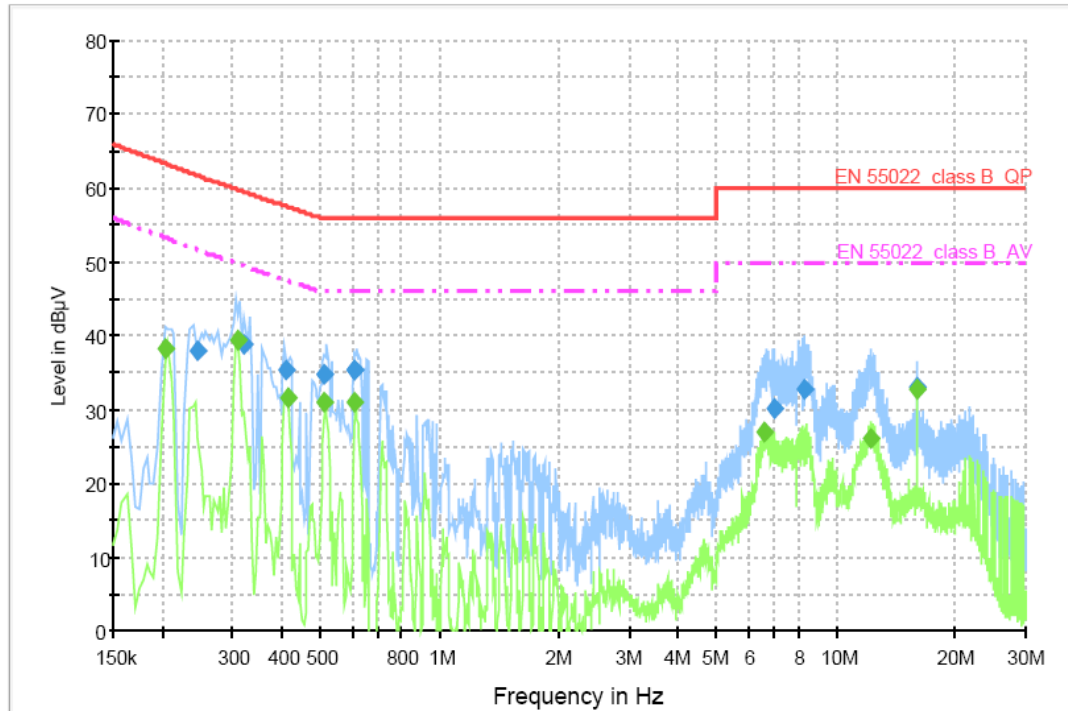
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	36.6	1000.000	9.000	GND	N	9.9	16.7	53.3	
0.404000	36.8	1000.000	9.000	GND	N	10.0	10.8	47.6	
0.604000	32.3	1000.000	9.000	GND	N	10.0	13.7	46.0	
1.500000	15.8	1000.000	9.000	GND	N	10.1	30.2	46.0	
12.316000	26.6	1000.000	9.000	GND	N	10.4	23.4	50.0	
16.008000	25.6	1000.000	9.000	GND	N	10.6	24.4	50.0	

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



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

Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.244000	38.0	1000.000	9.000	GND	L1	10.0	23.8	61.8	
0.320000	38.9	1000.000	9.000	GND	L1	10.0	20.6	59.5	
0.408000	35.4	1000.000	9.000	GND	L1	10.0	22.2	57.6	
0.508000	34.9	1000.000	9.000	GND	L1	10.0	21.1	56.0	
0.608000	35.3	1000.000	9.000	GND	L1	10.0	20.7	56.0	
0.612000	35.5	1000.000	9.000	GND	L1	10.0	20.5	56.0	
6.980000	30.1	1000.000	9.000	GND	L1	10.2	29.9	60.0	
8.320000	32.7	1000.000	9.000	GND	L1	10.3	27.3	60.0	
16.008000	33.2	1000.000	9.000	GND	L1	10.7	26.8	60.0	

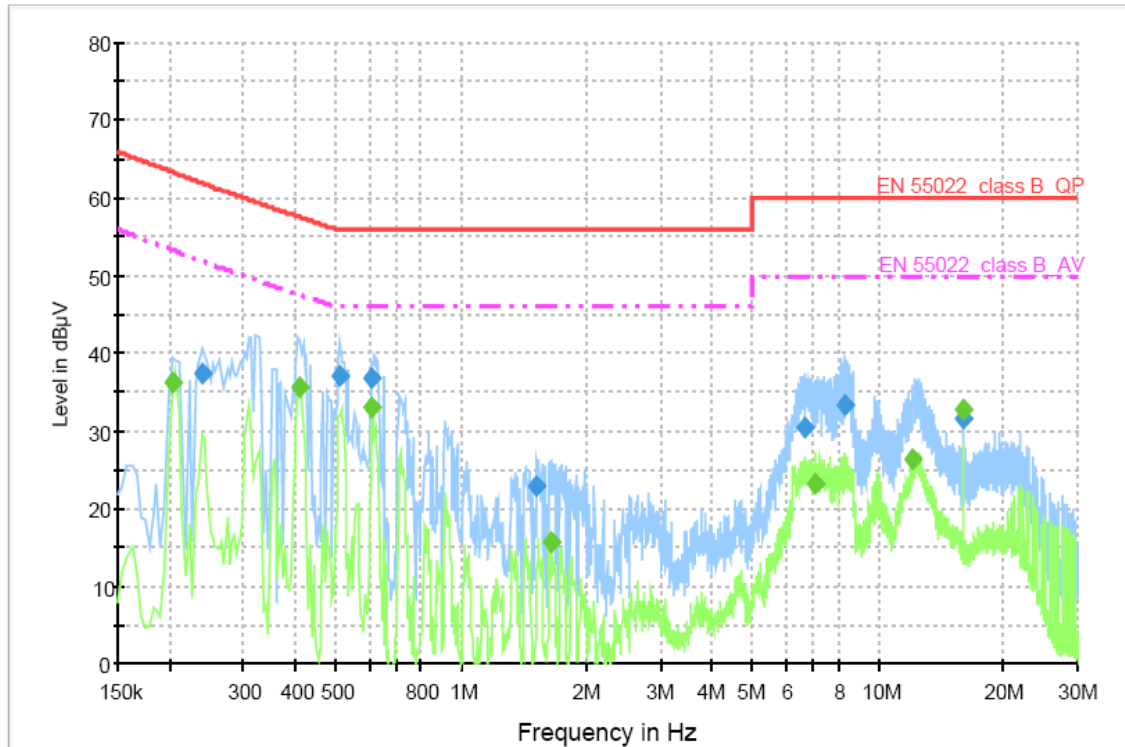
Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	38.1	1000.000	9.000	GND	L1	9.9	15.2	53.3	
0.308000	39.5	1000.000	9.000	GND	L1	10.0	10.3	49.8	
0.412000	31.5	1000.000	9.000	GND	L1	10.0	16.0	47.5	
0.512000	31.0	1000.000	9.000	GND	L1	10.0	15.0	46.0	
0.612000	31.1	1000.000	9.000	GND	L1	10.0	14.9	46.0	
6.564000	27.1	1000.000	9.000	GND	L1	10.2	22.9	50.0	
12.228000	26.2	1000.000	9.000	GND	L1	10.4	23.8	50.0	
16.008000	32.8	1000.000	9.000	GND	L1	10.7	17.2	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
0.240000	37.3	1000.000	9.000	GND	N	10.0	24.6	61.9	
0.508000	37.2	1000.000	9.000	GND	N	10.0	18.8	56.0	
0.608000	36.9	1000.000	9.000	GND	N	10.0	19.1	56.0	
1.520000	22.8	1000.000	9.000	GND	N	10.1	33.2	56.0	
6.648000	30.5	1000.000	9.000	GND	N	10.2	29.5	60.0	
8.304000	33.4	1000.000	9.000	GND	N	10.3	26.6	60.0	
16.008000	31.5	1000.000	9.000	GND	N	10.6	28.5	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.204000	36.3	1000.000	9.000	GND	N	9.9	17.0	53.3	
0.408000	35.5	1000.000	9.000	GND	N	10.0	12.1	47.6	
0.612000	33.0	1000.000	9.000	GND	N	10.0	13.0	46.0	
1.632000	15.8	1000.000	9.000	GND	N	10.1	30.2	46.0	
7.048000	23.2	1000.000	9.000	GND	N	10.2	26.8	50.0	
12.136000	26.5	1000.000	9.000	GND	N	10.4	23.5	50.0	
16.008000	32.8	1000.000	9.000	GND	N	10.6	17.2	50.0	

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



6. Radiated Emission

6.1 Operating Environment

Temperature : 29 °C
Relative Humidity : 53 % 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	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 3.54 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 3.49 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 3.85 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.76 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Vertical)	± 3.21 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Horizontal)	± 3.32 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Vertical)	± 3.77 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Horizontal)	± 3.84 dB	Confidence levels of 95 % (k=2)



6.4 Limit

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

6.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 13. 2009
■ - HK116	Rohde & Schwarz	Biconical ANT	832639/007	12. 28. 2009
■ - HL223	Rohde & Schwarz	Log-periodic antenna	835998/004	12. 28. 2009
■ - BBHA9120D	Schwarzbeck	Horn ANT	207	12. 26. 2009
■ - 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
■ - AFS 44 00101800- 25-10P-44	MITEQ	Preamplifier	1258943	11. 11. 2009

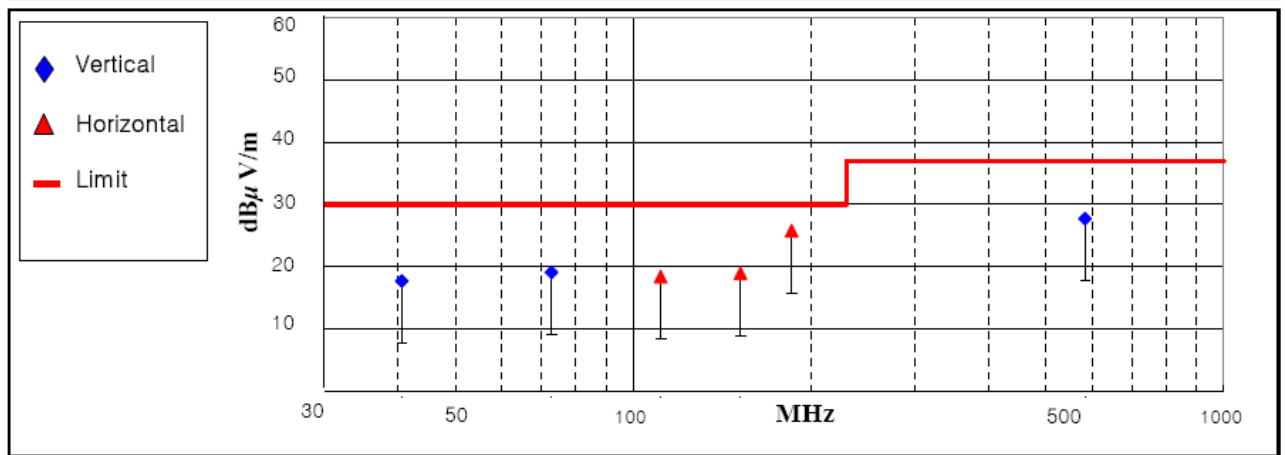
6.6 Test data for Radiated Emission

- . Test Date : September 4, 2009
- . Resolution bandwidth : 120 kHz / 1 MHz
- . Frequency range : 30 MHz ~ 2 000 MHz
- . Measurement distance : 10 m / 3 m



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

Frequency (MHz)	Measurement Level				Limit (dB μ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol.	Height	Angle
	Value(dB μ V)	Factor(dB/m)	Loss(dB)	(dB μ V/m)			(H/V)	(cm)	(°)
40.59	5.46	10.29	1.90	17.65	30.00	12.35	V	102	199
72.78	8.84	7.64	2.54	19.02	30.00	10.98	V	100	13
111.35	5.15	10.19	3.02	18.36	30.00	11.64	H	260	22
152.10	3.56	11.71	3.65	18.92	30.00	11.08	H	120	302
185.59	8.72	12.99	4.05	25.76	30.00	4.24	H	156	105
582.22	2.13	17.93	7.59	27.65	37.00	9.35	V	242	201

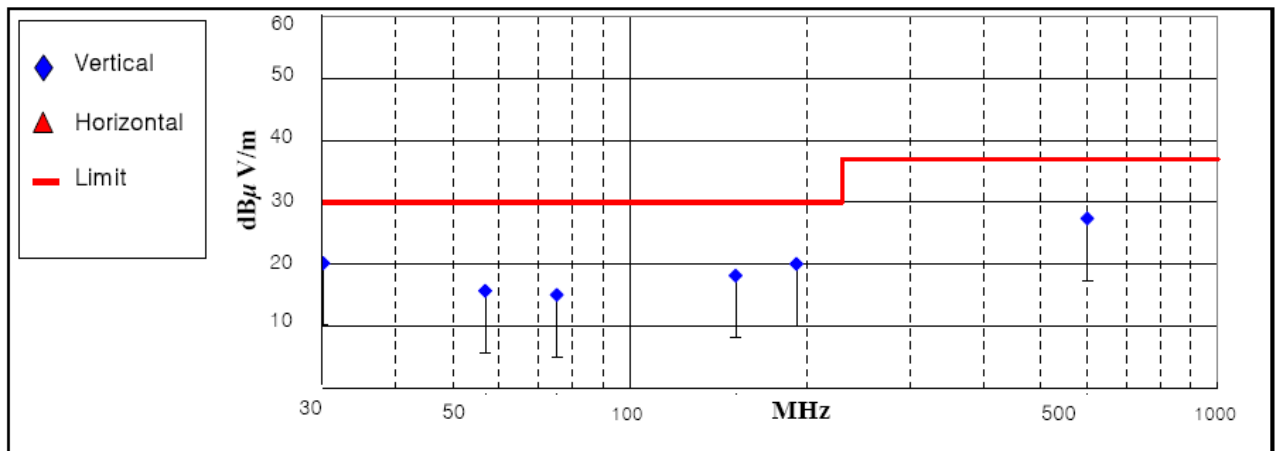


< Fig 12. Radiated emission result (30 MHz ~ 1 000 MHz)>



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

Frequency (MHz)	Measurement Level				Limit (dB μ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol.	Height	Angle
	Value(dB μ V)	Factor(dB/m)	Loss(dB)	(dB μ V/m)			(H/V)	(cm)	(°)
30.10	5.10	13.39	1.63	20.12	30.00	9.88	V	100	310
56.79	5.19	8.21	2.25	15.65	30.00	14.35	V	103	15
75.22	4.70	7.74	2.58	15.02	30.00	14.98	V	116	33
151.45	2.79	11.69	3.64	18.12	30.00	11.88	V	126	350
192.21	2.61	13.28	4.14	20.03	30.00	9.97	V	101	202
600.00	1.55	18.07	7.75	27.37	37.00	9.63	V	162	31

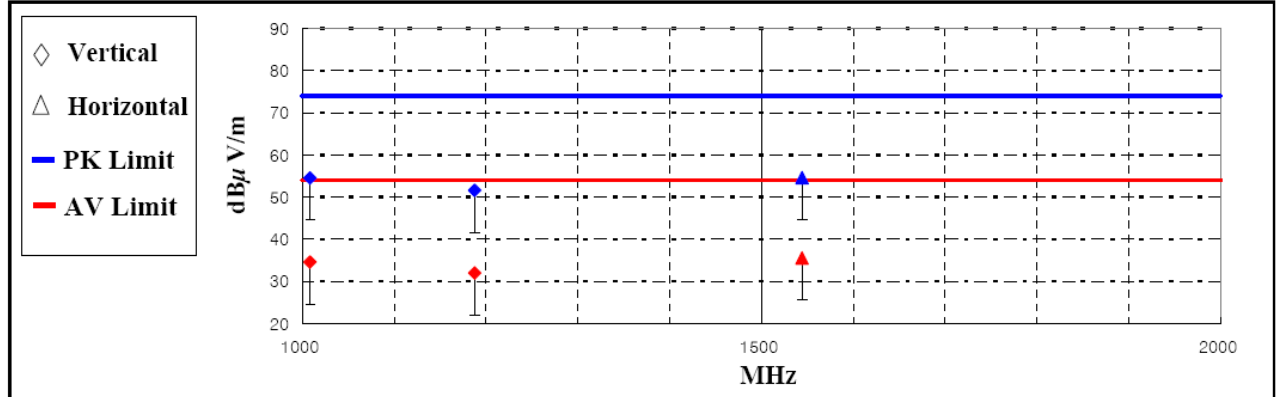


< Fig 13. Radiated emission result (30 MHz ~ 1 000 MHz)>



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

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
1008.00	70.62	50.72	24.88	-41.00	54.50	34.60	74.00	54.00	19.50	19.40	V	160	25
1187.60	67.02	47.42	25.20	-40.62	51.60	32.00	74.00	54.00	22.40	22.00	V	245	188
1544.00	68.79	49.69	25.80	-39.99	54.60	35.50	74.00	54.00	19.40	18.50	H	102	32

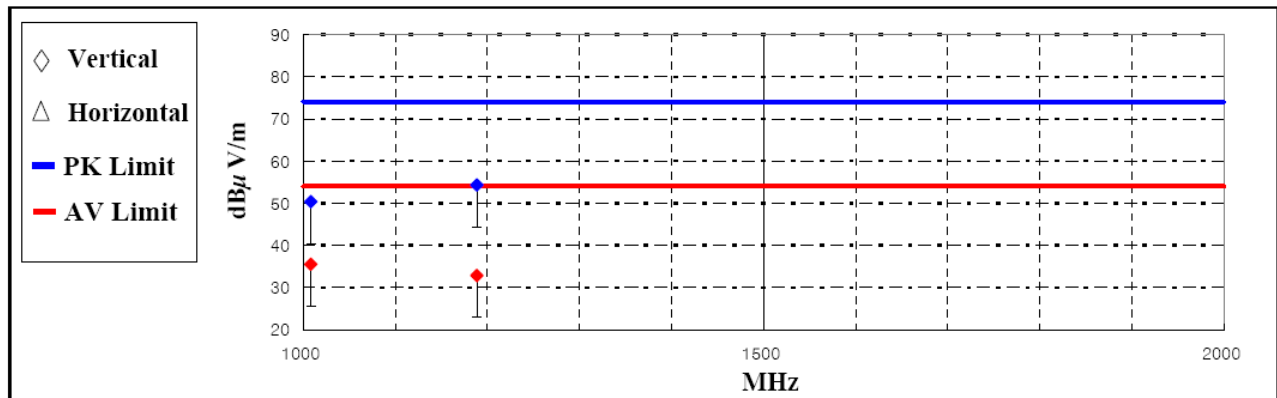


*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

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

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

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	(H/V)	(cm)	(°)		
1008.00	66.52	51.62	24.88	-41.00	50.40	35.50	74.00	54.00	23.60	18.50	V	162	33
1188.40	69.71	48.31	25.20	-40.61	54.30	32.90	74.00	54.00	19.70	21.10	V	155	190



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

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



7. Sample Calculations

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

7.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dB μV
Reading	= 39.2 dB μV
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV = 8.8 dB

7.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$
Reading	= 31.0 dB μV
Antenna Factor + Cable Loss = 5.8 dB	
Total	= 36.8 dB $\mu\text{V}/\text{m}$
Margin	= 40.0 dB $\mu\text{V}/\text{m}$ – 36.8 dB $\mu\text{V}/\text{m}$ = 3.2 dB



8. Recommendation & Conclusion

The data collected shows that the **LG Electronics Inc. LCD Monitor (Model Name: HSTND-2591-G)** was complies with §15.107 and 15.109 of the FCC Rules.