

## ***FCC EVALUATION REPORT FOR CERTIFICATION***

**Applicant: LG Electronics Inc.**

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

**Pyeongteak-si, Gyeonggi-do, Korea.**

**Attn: Mr. Sung-Wook Yoon, Chief research engineer**

**Date of Issue: May 11, 2012**

**Order Number: GETEC-C1-12-144**

**Test Report Number: GETEC-E3-12-051**

**Test Site: GUMI COLLEGE EMC CENTER**

**FCC Registration Number: (100749, 443957)**

**FCC ID. : BEJ47VX30AS**

**Applicant : LG Electronics Inc.**

**Rule Part(s) : FCC Part 15 Subpart B**  
**Equipment Class : Class B computing device peripheral (JBP)**  
**EUT Type : MONITOR SIGNAGE**  
**Type of Authority : Certification**  
**Model Name : 47VX30AS**  
**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 C63.4-2009 / 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,**



**Hyun Kim / Engineer**  
**GUMI COLLEGE EMC CENTER**



**Jae-Hoon Jeong, Senior Engineer**  
**GUMI COLLEGE EMC CENTER**



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*Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.*

## 1. General Information

**Applicant: LG Electronics Inc.**

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

**Manufacturer: LG Electronics Inc.**

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

**Contact Person: Mr. Sung-Wook Yoon, Chief research engineer**

**Tel Number: +82-31-610-9623**

- **FCC ID.** BEJ47VX30AS
- **EUT Type** MONITOR SIGNAGE
- **Model Name** 47VX30AS
- **Trade Name** LG
- **Serial Number** Prototype
- **Rule Part(s)** FCC Part 15 Subpart B
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2009) / Canadian standard ICES-003
- **Dates of Test** April 30 ~ May 2, 2012
- **Place of Test** **GUMI COLLEGE EMC CENTER** (FCC Registration Number: 100749, 443957)  
407, Bugok-Dong, Gumi-City, Gyungbok, 730-711, Republic of Korea
- **Test Report Number** GETEC-E3-12-051
- **Dates of Issue** May 11, 2012



## 2. Introduction

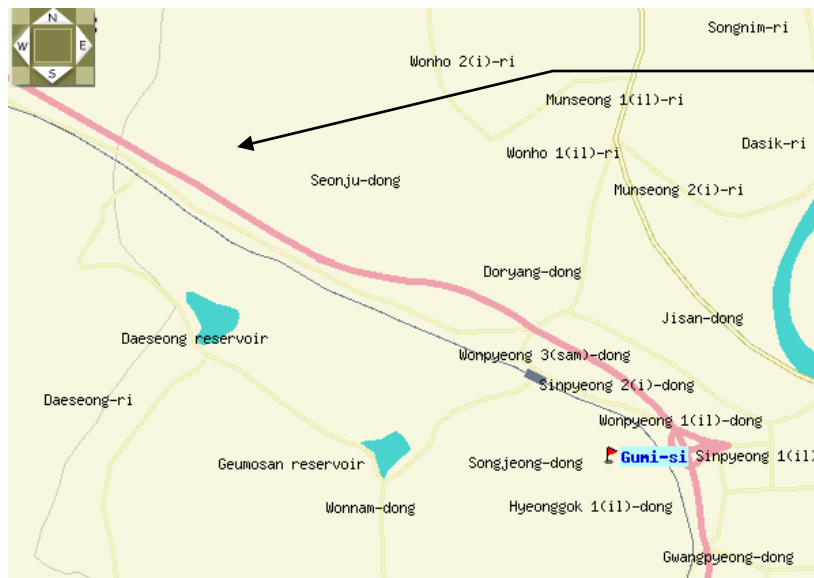
The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc.**

### **MONITOR SIGNAGE (Model Name: 47VX30AS)**

These measurement tests were conducted at **GUMI COLLEGE EMC CENTER**

The site address is 407, Bugok-Dong, Gumi-City, Gyungbok, 730-711, Republic of 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 (2009)



**GUMI COLLEGE EMC CENTER**  
407, Bugok-Dong, Gumi-City,  
Gyungbok, 730-711, Republic of Korea  
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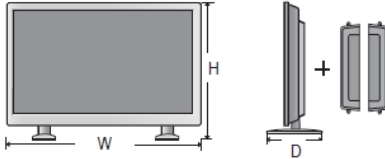
Fig 1. The map above shows the Gumi College in vicinity area.



### 3. Product Information

#### 3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics Inc. MONITOR SIGNAGE (Model Name: 47VX30AS) FCC ID.: BEJ47VX30AS**

LCD Panel	Screen Type	1192.87 mm Wide (47 inch) TFT (Thin Film Transistor) LCD (Liquid Crystal Display) Panel. Visible diagonal size : 1192.87 mm
	Pixel Pitch	0.5415 mm (H) x 0.5415 mm (V)
Video Signal	Max. Resolution	RGB : 1920 x 1080 @ 60 Hz HDMI/DVI/DP : 1920 x 1080 @ 60 Hz - It may not be supported depending on the OS or video card type.
	Recommended Resolution	RGB : 1920 x 1080 @ 60 Hz HDMI/DVI/DP : 1920 x 1080 @ 60 Hz - It may not be supported depending on the OS or video card type.
	Horizontal Frequency	RGB : 30 kHz to 83 kHz HDMI/DVI/DP : 30 kHz to 83 kHz
	Vertical Frequency	RGB : 56 Hz to 75 Hz HDMI/DVI/DP : 56 Hz to 60 Hz
	Synchronization Type	Separate Sync, Composite Sync, Digital
Input Connector	15-pin D-Sub type, HDMI (digital), RS-232C, LAN, DVI, Display port, USB	
Power	Rated Voltage	AC 100-240 V~ 50/60 Hz 3.0 A
	Power Consumption	On Mode : 180 W Typ. Sleep Mode : ≤ 1 W Off Mode : ≤ 0.5 W
Dimensions (Width x Height x Depth) / Weight		
	1079.5 mm x 697.7 mm x 298.3 mm / 24.4 kg	

- Maximum Frequency Range : 667 MHz



### 3.2 Support Equipment / Cables used

#### 3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
PC(Main board)	ASROCK	770iCafe	S/N: 0AM0X3097310 FCC ID.: DoC
Video card	Rextechnology Co., Ltd.	HD4850	S/N: L5H041947 FCC ID.: DoC
PS2 keyboard	COMPAQ	166516-AD6	S/N: B13BBOR391006D FCC ID.: AQ6-23K15
USB mouse	Microsoft Corporation	1484	S/N: 0352700289761 FCC ID: DoC
LCD monitor	Dell computer corporation	1800FP	S/N: KR-07R477-48324-33J-03WH FCC ID.: Verification
USB memory stick	SAMSUNG	SUM-LSM2	S/N: None. FCC ID.: DoC
Speaker	LG Electronics Inc.	SP-0000K	S/N: None. FCC ID.: N/A

*See "Appendix D – Test Setup Photographs" for actual system test set-up*

#### 3.2.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
IR remote controller	LG Electronics Inc.	AKB72915219	S/N: None. FCC ID.: N/A



### 3.2.3 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the EUT	1.80 m unshielded
RGB(Analog) in cable	Connected to the EUT and PC	1.80 m shielded
RGB(Analog) out cable	Connected to the EUT and LCD monitor	1.80 m shielded with two ferrite cores
DVI(Digital) in cable	Connected to the EUT and PC	1.80 m shielded with two ferrite cores
DVI(Digital) out cable	Connected to the EUT and LCD monitor	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
Audio(RGB/DVI) in cable	Connected to the EUT and PC	1.50 m shielded
RS-232C cable	Connected to the EUT(in port) and EUT(out port)	1.80 m shielded
Speaker out cable	Connected to the EUT and speaker	1.00 m shielded
LAN cable	Connected to the EUT and Network	10.00 m shielded

### 3.3 Modification Item(s)

- None



## 4. Description of tests

### 4.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency : AC 120 V / 60 Hz
  
- Test Mode(s)

#### -.. Monitor mode

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

Conducted emission: 1 920 × 1 080 / 60 Hz (RGB: Analog, DVI: Digital, HDMI: Digital, DP: 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
- .. Continuous playback of 1 kHz audio file with winamp player
- .. Connected to internet via LAN interface
- .. 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

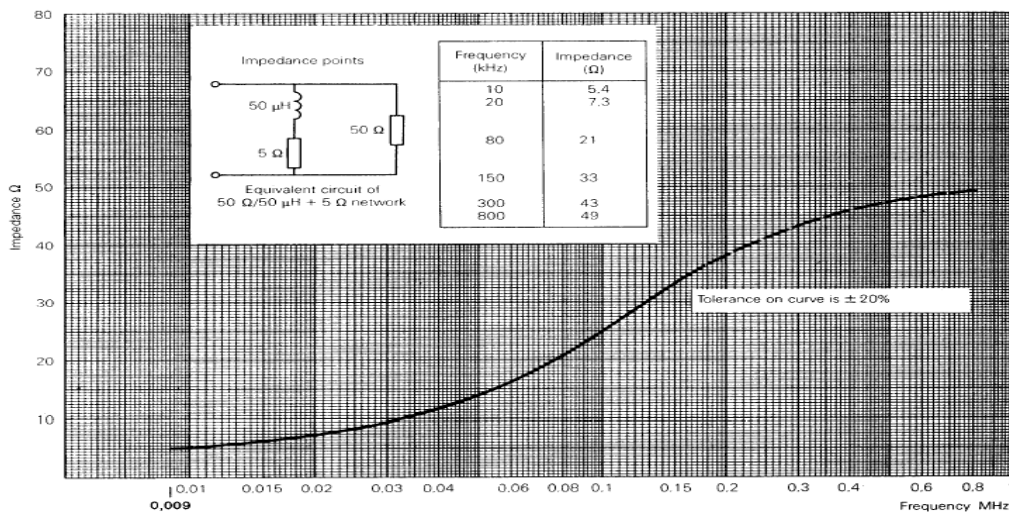


Fig 2. Impedance of LISN



### 4.3 Radiated Emission

Measurements (below 1 GHz) were made at Open area test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 m. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

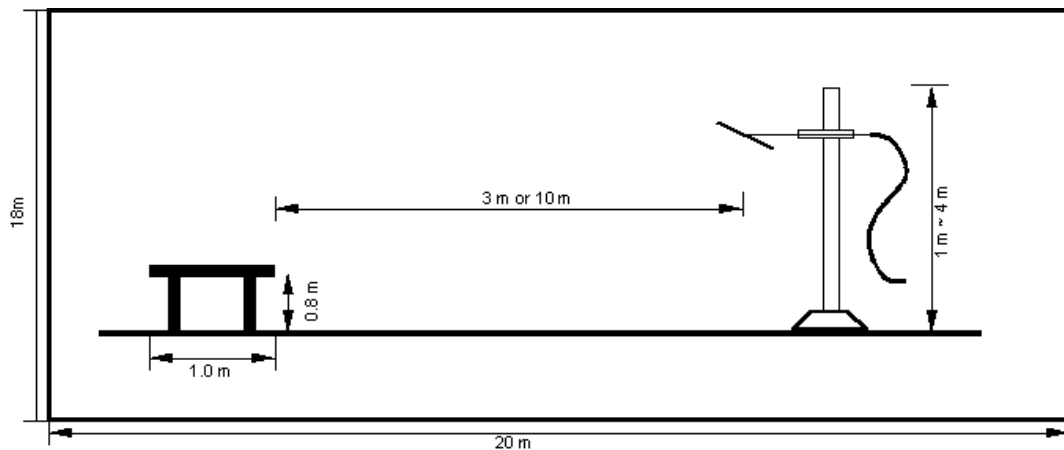


Fig 3. Dimensions of test site

The measurements (above 1 GHz) were made 3 m distance test site that complies to CISPR 16-1-4 (2007). In order to meet SVSWR Limit (Within 6 dB), the bottom side of test site was installed with absorbers. 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. The measurements were conducted with Average and Peak value.

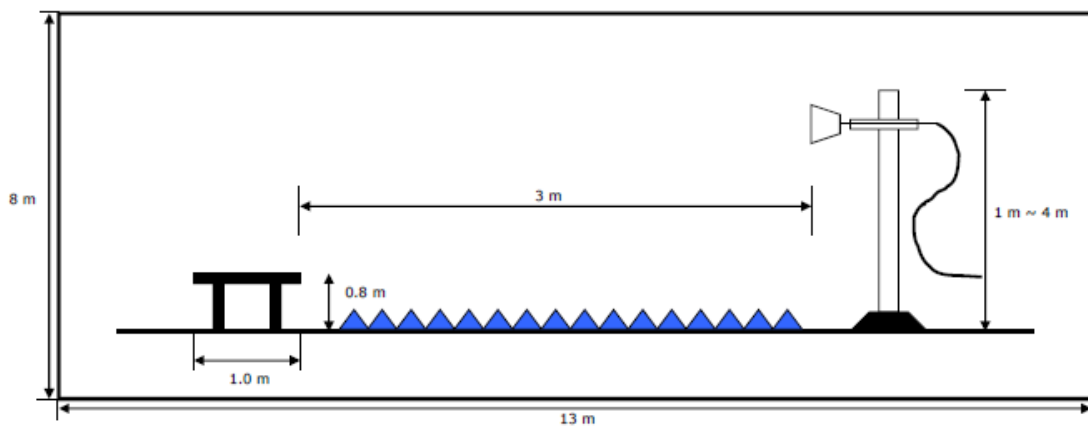


Fig 4. Dimensions of test site



## 5. Conducted Emission

### 5.1 Operating Environment

Temperature : 23.0 °C  
Relative Humidity : 37.0 % R.H.

### 5.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

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

### 5.3 Measurement Uncertainty

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

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

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	$\pm 2.74$ dB	Confidence level of approximately 95 % ( $k = 2$ )
Conducted emission (150 kHz ~ 30 MHz)	$\pm 4.25$ dB	Confidence level of approximately 95 % ( $k = 2$ )



#### 5.4 Limit

RFI Conducted	FCC Limit(dB $\mu$ V/m) Class B	
	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

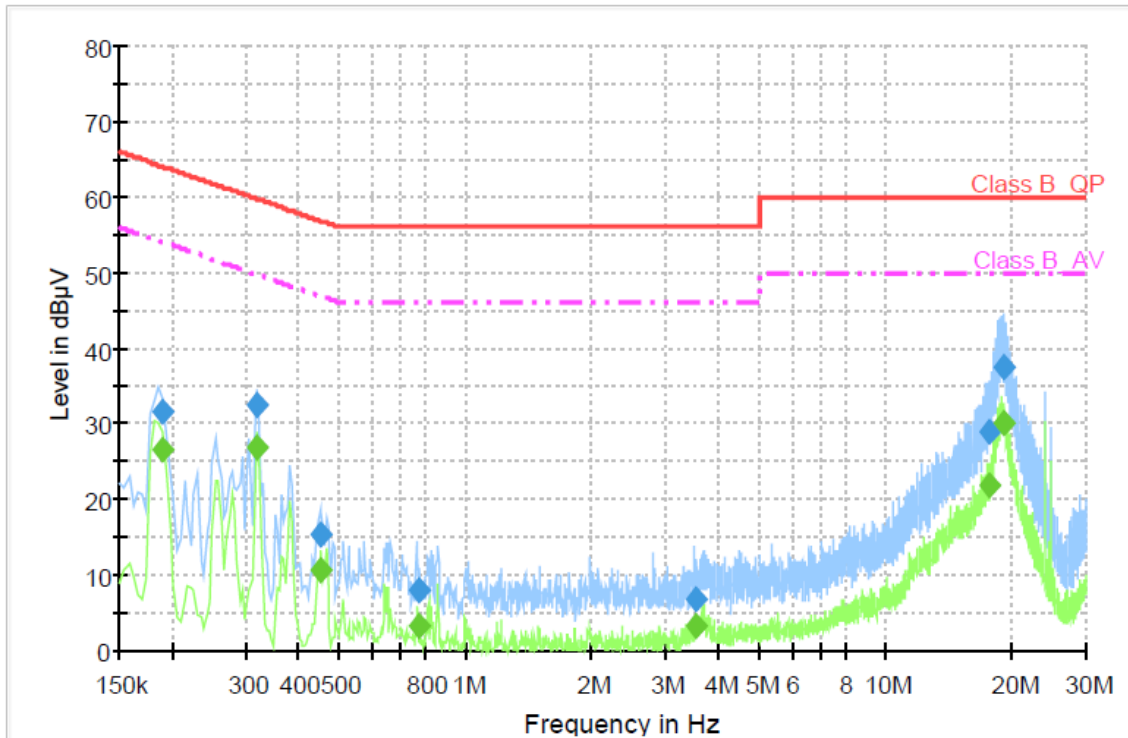
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 05. 2012
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 07. 2012
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 07. 2012
■ - ENY81-CA6	Rohde & Schwarz	ISN	101573	10. 19. 2012

#### 5.6 Test data for Conducted Emission

- Test Date : May 2, 2012  
- Resolution Bandwidth : 9 kHz  
- Frequency Range : 0.15 MHz ~ 30 MHz  
- Line : L1: Live, N: Neutral



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



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	31.7	1000.0	9.000	GND	N	10.1	32.3	64.0	
0.320000	32.5	1000.0	9.000	GND	N	10.1	27.2	59.7	
0.452000	15.3	1000.0	9.000	GND	N	10.1	41.6	56.8	
0.772000	7.9	1000.0	9.000	GND	L1	10.1	48.1	56.0	
3.540000	6.9	1000.0	9.000	GND	L1	10.2	49.1	56.0	
17.620000	28.9	1000.0	9.000	GND	N	10.3	31.1	60.0	
19.116000	37.4	1000.0	9.000	GND	N	10.3	22.6	60.0	

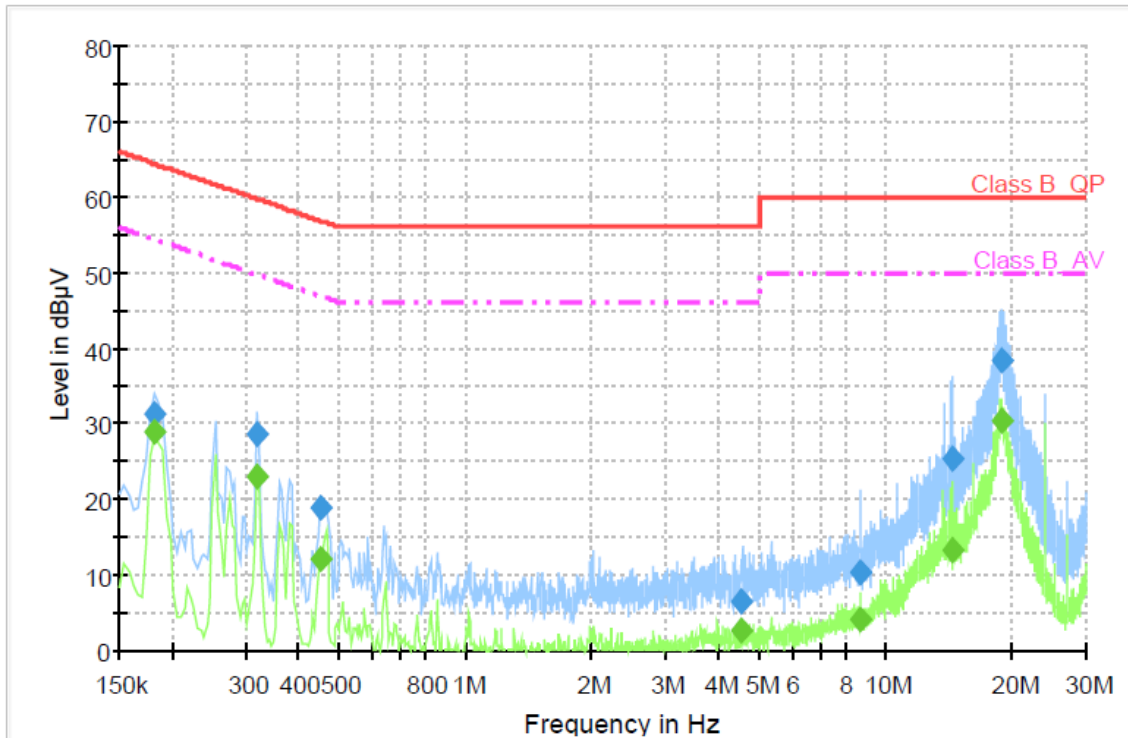
### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	26.6	1000.0	9.000	GND	N	10.1	27.5	54.0	
0.320000	26.8	1000.0	9.000	GND	N	10.1	22.9	49.7	
0.452000	10.6	1000.0	9.000	GND	N	10.1	36.2	46.8	
0.772000	3.3	1000.0	9.000	GND	L1	10.1	42.7	46.0	
3.540000	3.3	1000.0	9.000	GND	L1	10.2	42.7	46.0	
17.620000	21.8	1000.0	9.000	GND	N	10.3	28.2	50.0	
19.116000	30.0	1000.0	9.000	GND	N	10.3	20.0	50.0	

< Fig 5. Conducted emission result >



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



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.182000	31.4	1000.0	9.000	GND	L1	10.1	33.0	64.4	
0.320000	28.6	1000.0	9.000	GND	L1	10.1	31.1	59.7	
0.452000	18.8	1000.0	9.000	GND	N	10.1	38.0	56.8	
4.556000	6.5	1000.0	9.000	GND	N	10.3	49.5	56.0	
8.732000	10.3	1000.0	9.000	GND	L1	10.3	49.7	60.0	
14.448000	25.5	1000.0	9.000	GND	L1	10.3	34.5	60.0	
18.828000	38.4	1000.0	9.000	GND	L1	10.3	21.6	60.0	

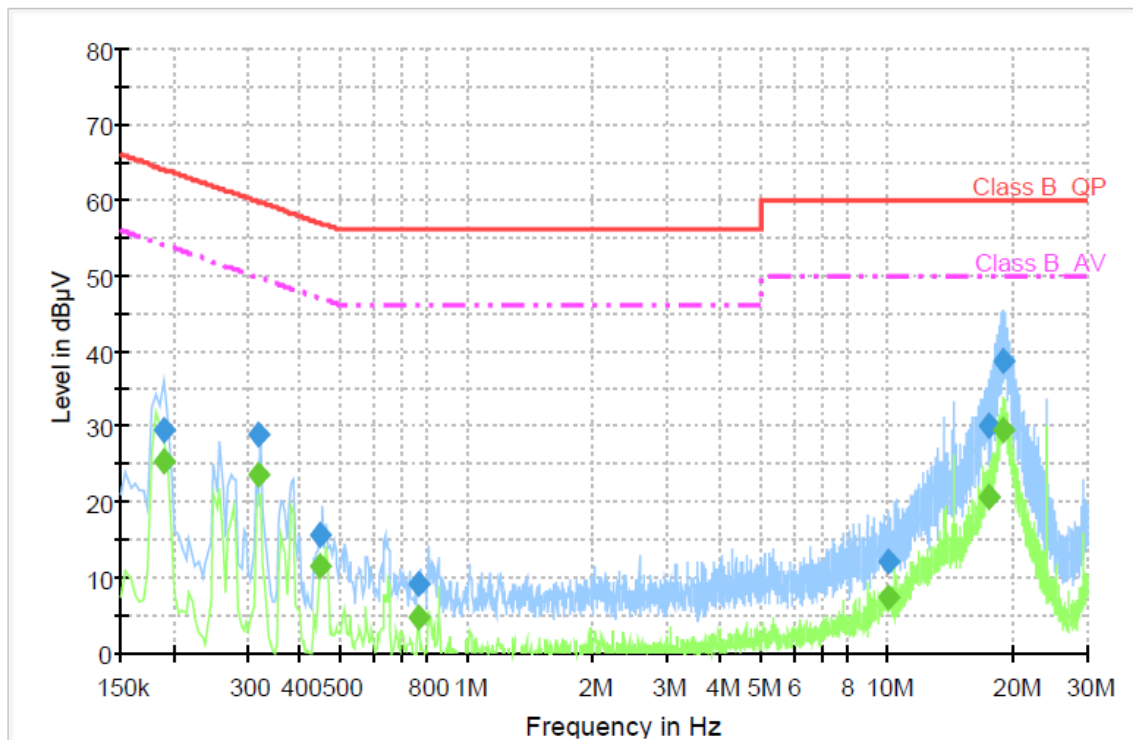
### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.182000	28.8	1000.0	9.000	GND	L1	10.1	25.6	54.4	
0.320000	23.2	1000.0	9.000	GND	L1	10.1	26.5	49.7	
0.452000	12.2	1000.0	9.000	GND	N	10.1	34.6	46.8	
4.556000	2.7	1000.0	9.000	GND	N	10.3	43.3	46.0	
8.732000	4.1	1000.0	9.000	GND	L1	10.3	45.9	50.0	
14.448000	13.4	1000.0	9.000	GND	L1	10.3	36.6	50.0	
18.828000	30.3	1000.0	9.000	GND	L1	10.3	19.7	50.0	

< Fig 6. Conducted emission result >



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



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	29.7	1000.0	9.000	GND	L1	10.1	34.4	64.0	
0.320000	29.0	1000.0	9.000	GND	L1	10.1	30.7	59.7	
0.448000	15.5	1000.0	9.000	GND	N	10.1	41.4	56.9	
0.768000	9.1	1000.0	9.000	GND	N	10.1	46.9	56.0	
10.076000	12.1	1000.0	9.000	GND	L1	10.3	47.9	60.0	
17.556000	30.1	1000.0	9.000	GND	L1	10.3	29.9	60.0	
18.924000	38.7	1000.0	9.000	GND	L1	10.3	21.3	60.0	

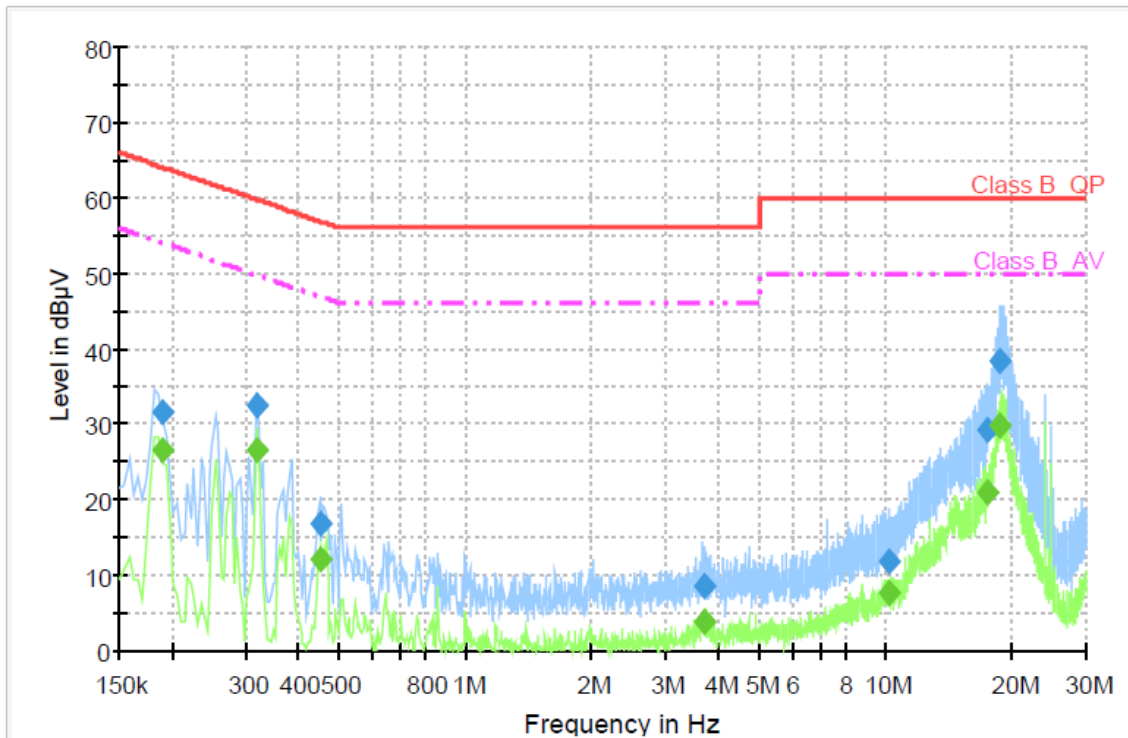
### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	25.5	1000.0	9.000	GND	L1	10.1	28.6	54.0	
0.320000	23.5	1000.0	9.000	GND	L1	10.1	26.2	49.7	
0.448000	11.5	1000.0	9.000	GND	N	10.1	35.4	46.9	
0.768000	4.6	1000.0	9.000	GND	N	10.1	41.4	46.0	
10.076000	7.3	1000.0	9.000	GND	L1	10.3	42.7	50.0	
17.556000	20.8	1000.0	9.000	GND	L1	10.3	29.2	50.0	
18.924000	29.5	1000.0	9.000	GND	L1	10.3	20.5	50.0	

< Fig 7. Conducted emission result >



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



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	31.5	1000.0	9.000	GND	L1	10.1	32.6	64.0	
0.320000	32.3	1000.0	9.000	GND	L1	10.1	27.4	59.7	
0.452000	16.9	1000.0	9.000	GND	N	10.1	39.9	56.8	
3.692000	8.6	1000.0	9.000	GND	L1	10.2	47.4	56.0	
10.160000	11.9	1000.0	9.000	GND	N	10.3	48.1	60.0	
17.428000	29.1	1000.0	9.000	GND	L1	10.3	30.9	60.0	
18.672000	38.5	1000.0	9.000	GND	N	10.3	21.5	60.0	

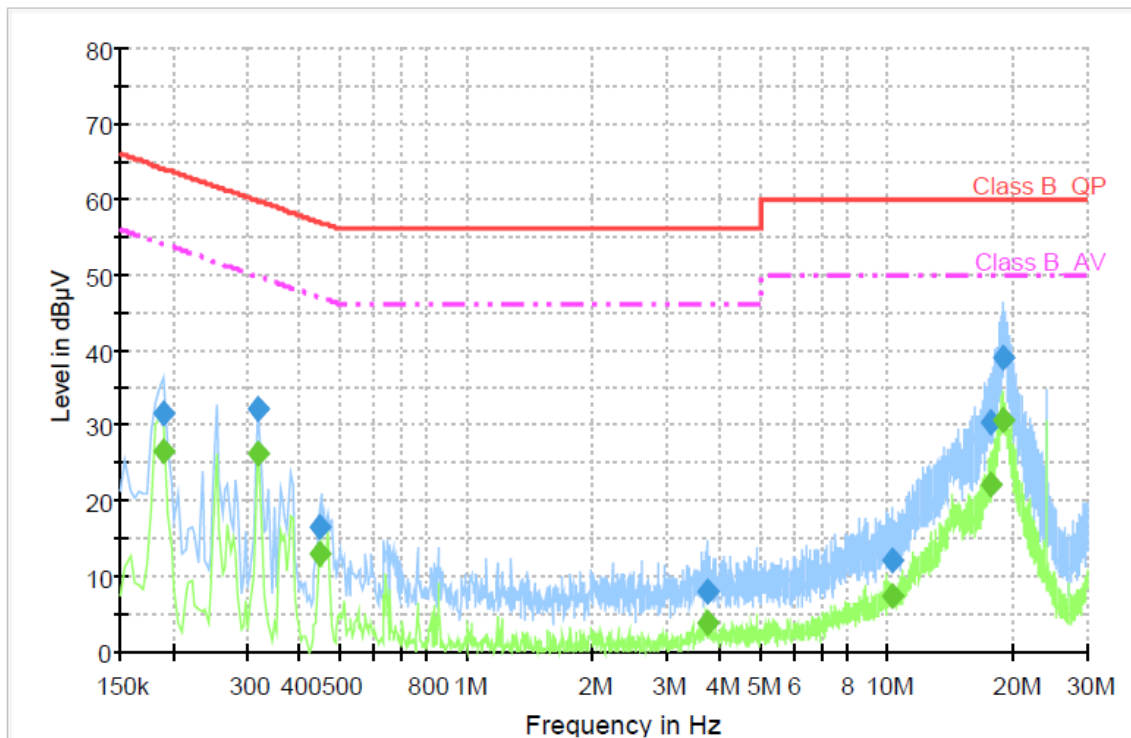
### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	26.4	1000.0	9.000	GND	L1	10.1	27.6	54.0	
0.320000	26.6	1000.0	9.000	GND	L1	10.1	23.1	49.7	
0.452000	12.1	1000.0	9.000	GND	N	10.1	34.8	46.8	
3.692000	4.0	1000.0	9.000	GND	L1	10.2	42.0	46.0	
10.160000	7.8	1000.0	9.000	GND	N	10.3	42.2	50.0	
17.428000	20.9	1000.0	9.000	GND	L1	10.3	29.1	50.0	
18.672000	30.0	1000.0	9.000	GND	N	10.3	20.0	50.0	

< Fig 8. Conducted emission result >



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



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	31.5	1000.0	9.000	GND	N	10.1	32.5	64.0	
0.320000	32.2	1000.0	9.000	GND	N	10.1	27.5	59.7	
0.448000	16.6	1000.0	9.000	GND	N	10.1	40.3	56.9	
3.732000	8.0	1000.0	9.000	GND	L1	10.2	48.0	56.0	
10.288000	12.2	1000.0	9.000	GND	N	10.3	47.8	60.0	
17.644000	30.5	1000.0	9.000	GND	N	10.3	29.5	60.0	
18.964000	38.9	1000.0	9.000	GND	L1	10.3	21.1	60.0	

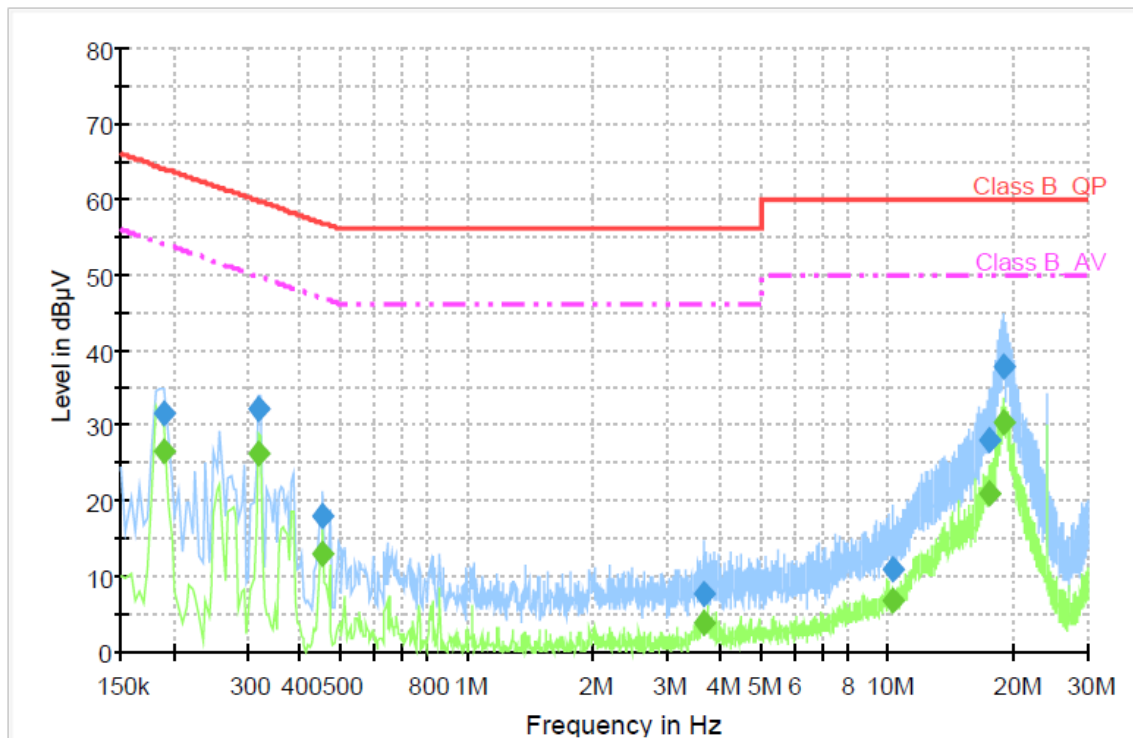
### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	26.6	1000.0	9.000	GND	N	10.1	27.4	54.0	
0.320000	26.4	1000.0	9.000	GND	N	10.1	23.3	49.7	
0.448000	12.9	1000.0	9.000	GND	N	10.1	34.0	46.9	
3.732000	3.9	1000.0	9.000	GND	L1	10.2	42.1	46.0	
10.288000	7.4	1000.0	9.000	GND	N	10.3	42.6	50.0	
17.644000	22.1	1000.0	9.000	GND	N	10.3	27.9	50.0	
18.964000	30.8	1000.0	9.000	GND	L1	10.3	19.2	50.0	

< Fig 9. Conducted emission result >



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



### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	31.5	1000.0	9.000	GND	N	10.1	32.6	64.0	
0.320000	32.1	1000.0	9.000	GND	L1	10.1	27.6	59.7	
0.452000	18.1	1000.0	9.000	GND	N	10.1	38.7	56.8	
3.652000	7.8	1000.0	9.000	GND	L1	10.2	48.2	56.0	
10.264000	11.1	1000.0	9.000	GND	L1	10.3	48.9	60.0	
17.508000	28.1	1000.0	9.000	GND	L1	10.3	31.9	60.0	
18.976000	37.8	1000.0	9.000	GND	L1	10.3	22.2	60.0	

### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	26.5	1000.0	9.000	GND	N	10.1	27.5	54.0	
0.320000	26.3	1000.0	9.000	GND	L1	10.1	23.4	49.7	
0.452000	13.0	1000.0	9.000	GND	N	10.1	33.9	46.8	
3.652000	3.8	1000.0	9.000	GND	L1	10.2	42.2	46.0	
10.264000	6.9	1000.0	9.000	GND	L1	10.3	43.1	50.0	
17.508000	20.9	1000.0	9.000	GND	L1	10.3	29.1	50.0	
18.976000	30.5	1000.0	9.000	GND	L1	10.3	19.5	50.0	

< Fig 10. Conducted emission result >



## 6. Radiated Emission

### 6.1 Operating Environment

Temperature : 22.0 °C  
Relative Humidity : 44.0 % R.H.

### 6.2 Test Set-up

A preliminary scan with peak mode was performed in the semi anechoic chamber and found frequency for test site. The formal radiated emission was measured at 10 m distance open area test site and 3 m distance anechoic chamber. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 6.3 Measurement Uncertainty

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

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

Test Items(Open Area Test Site)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 10 m, Vertical)	± 4.96 dB	Confidence level of approximately 95 % ( $k = 2$ )
Radiated emission (30 MHz ~ 300 MHz, 10 m, Horizontal)	± 3.44 dB	Confidence level of approximately 95 % ( $k = 2$ )
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Vertical)	± 3.74 dB	Confidence level of approximately 95 % ( $k = 2$ )
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Horizontal)	± 3.88 dB	Confidence level of approximately 95 % ( $k = 2$ )



#### 6.4 Limit

Frequency (MHz)	FCC Limit @ 3 m. dB $\mu$ V/m	CISPR Limit @ 10 m. dB $\mu$ 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. 05. 2012
■ - HK116	Rohde & Schwarz	Biconical Antenna	826861/018	01. 29. 2014
■ - HL223	Rohde & Schwarz	Log Periodic Antenna	829228/011	01. 29. 2014
■ - 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. 05. 2012
■ - BBHA9120D	Schwarzbeck	Horn ANT	597	01. 23. 2013
■ - MCU066	maturu GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturu GmbH	Turntable	1390307	N/A
■ - AM 4.0	maturu GmbH	Antenna Mast	1390308	N/A
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2012

#### 6.6 Test data for Radiated Emission

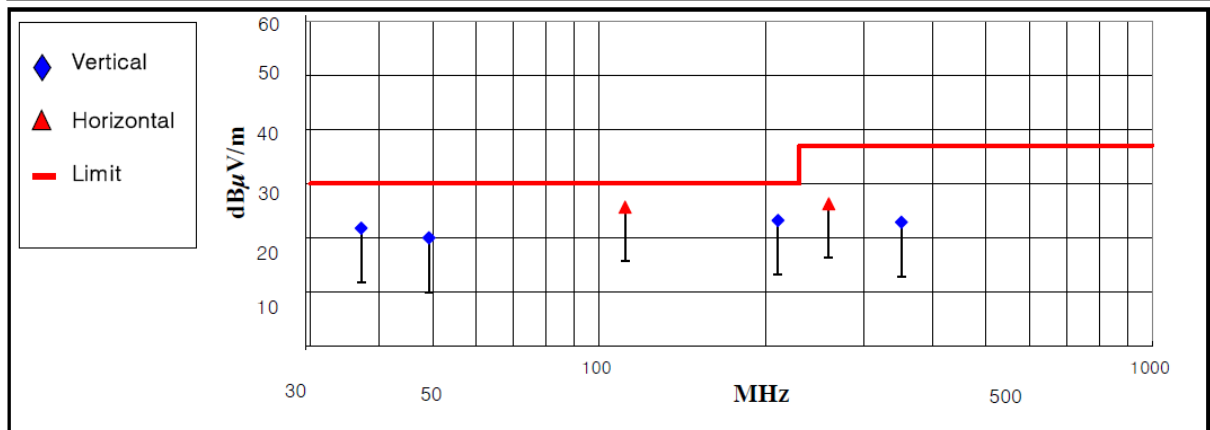
- Test Date : April 30 ~ May 2, 2012
- Measurement Distance : 3 m
- Note : The highest frequency of the internal source of the EUT is between 500 MHz and 1 000 MHz (667 MHz). The measurement was made up to 5 000 MHz
- Measurement

Frequency range	30 MHz ~ 1 GHz	Above 1 GHz
Detector mode	Quasi peak	Peak / Average
Resolution bandwidth	120 kHz	1 MHz



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

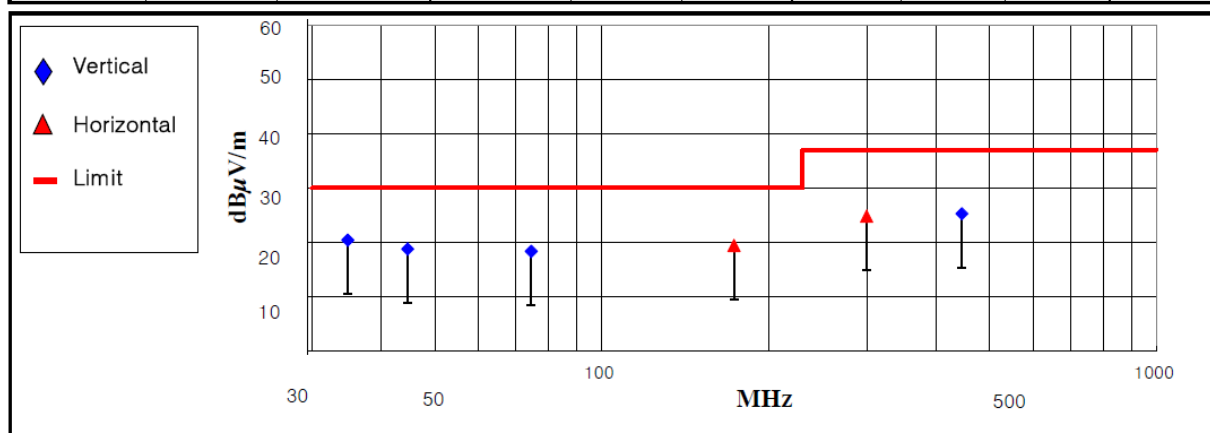
Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)					
37.12	9.26	11.35	1.13	21.74	30.00	8.26	V	101	145
49.21	9.22	9.18	1.56	19.96	30.00	10.04	V	100	51
111.35	12.81	10.09	2.71	25.61	30.00	4.39	H	146	253
210.38	4.99	14.36	3.82	23.17	30.00	6.83	V	103	210
259.83	5.91	15.97	4.36	26.24	37.00	10.76	H	100	102
351.56	3.21	14.46	5.18	22.85	37.00	14.15	V	151	159



< Fig 11. Radiated emission result (30 MHz ~ 1 000 MHz) >

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

Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)					
34.83	7.38	11.84	1.17	20.39	30.00	9.61	V	100	126
44.65	7.38	10.03	1.33	18.74	30.00	11.26	V	103	144
74.60	8.12	8.10	2.10	18.32	30.00	11.68	V	100	352
173.06	2.94	13.04	3.42	19.40	30.00	10.60	H	100	177
300.02	0.29	19.72	4.77	24.78	37.00	12.22	H	100	158
445.51	2.36	16.93	5.95	25.24	37.00	11.76	V	100	179

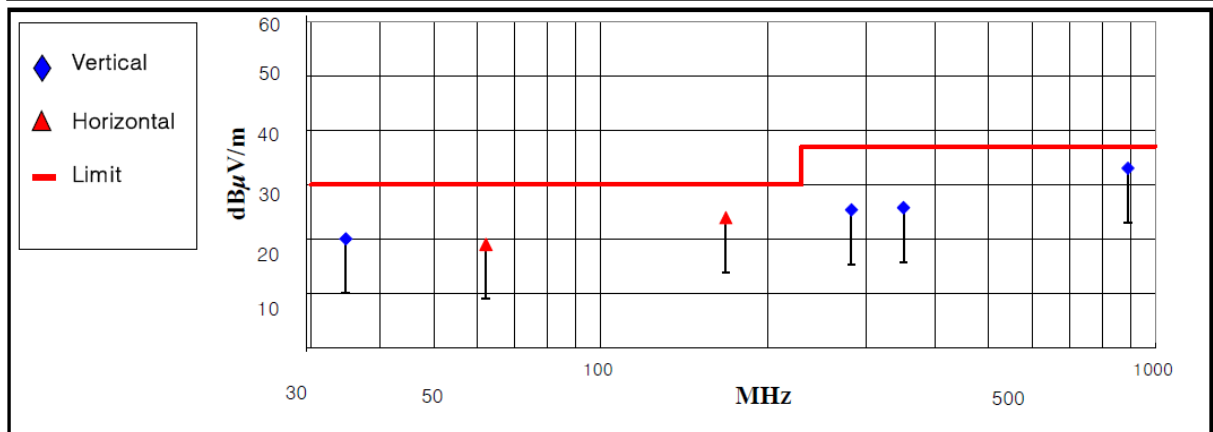


< Fig 12. Radiated emission result (30 MHz ~ 1 000 MHz) >



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

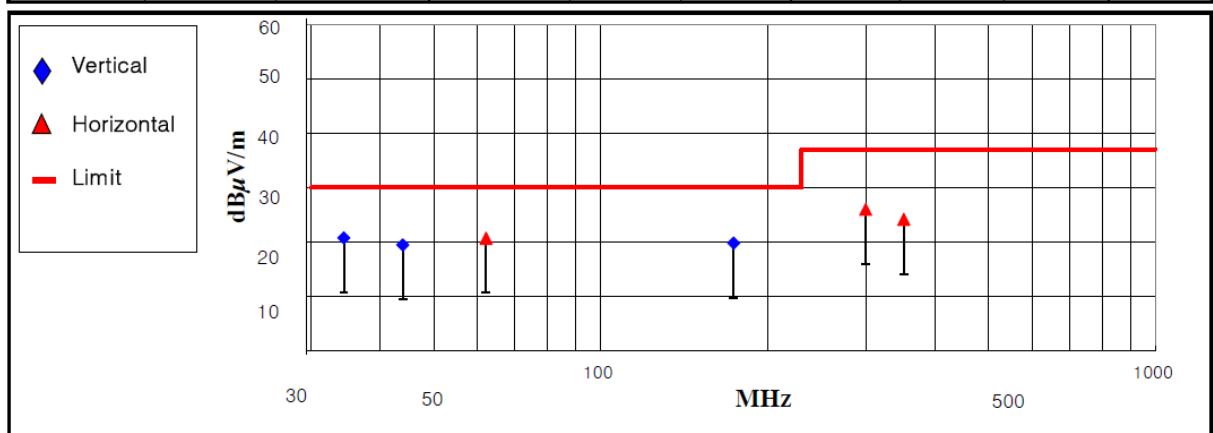
Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)					
34.71	6.96	11.88	1.17	20.01	30.00	9.99	V	100	88
62.08	9.30	7.83	1.85	18.98	30.00	11.02	H	152	5
168.02	7.58	12.94	3.37	23.89	30.00	6.11	H	153	241
282.91	2.61	18.13	4.60	25.34	37.00	11.66	V	144	133
351.12	6.12	14.44	5.18	25.74	37.00	11.26	V	121	175
890.98	2.25	21.90	8.83	32.98	37.00	4.02	V	199	162



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

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

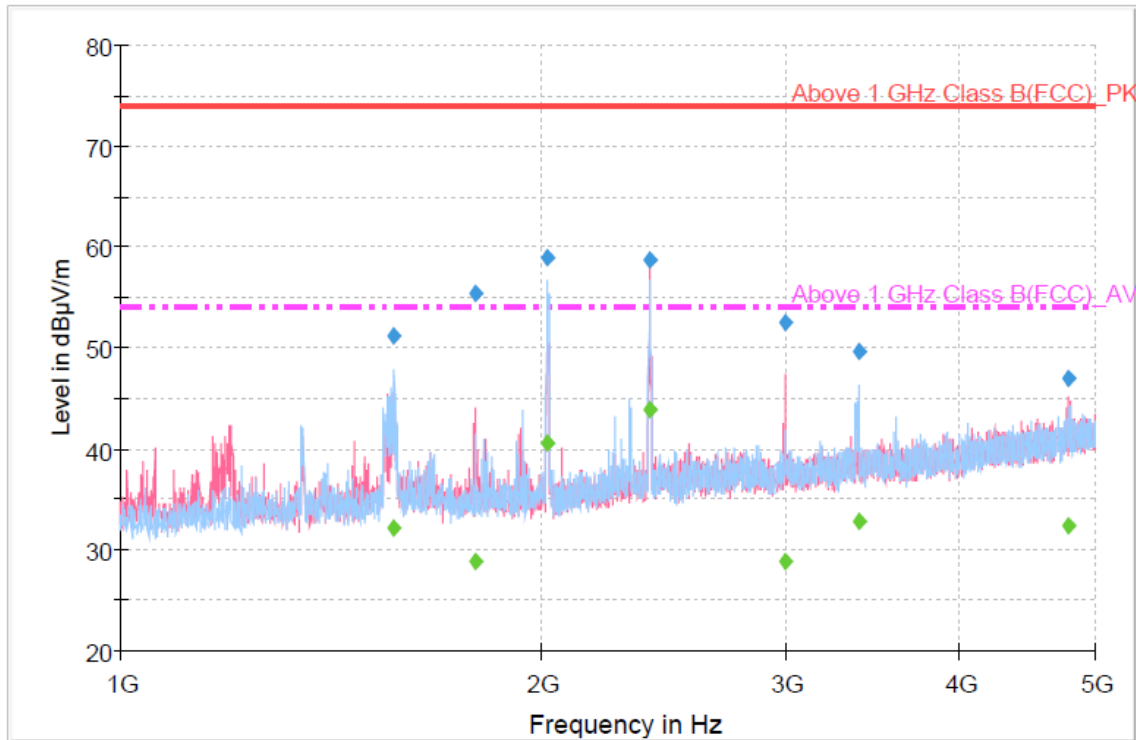
Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)					
34.42	7.58	11.96	1.17	20.71	30.00	9.29	V	108	145
43.95	7.99	10.14	1.29	19.42	30.00	10.58	V	102	169
62.12	10.97	7.83	1.85	20.65	30.00	9.35	H	199	160
173.52	3.29	13.04	3.43	19.76	30.00	10.24	V	100	159
300.09	1.52	19.67	4.77	25.96	37.00	11.04	H	100	152
351.56	4.49	14.46	5.18	24.13	37.00	12.87	H	100	254



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



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



### Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1571.380000	51.3	1000.0	1000.000	100.0	H	211.0	-8.4	22.7	74.0
1800.020000	55.4	1000.0	1000.000	100.0	V	145.0	-7.8	18.6	74.0
2021.060000	58.9	1000.0	1000.000	100.0	H	295.0	-7.5	15.1	74.0
2395.200000	58.7	1000.0	1000.000	100.0	V	233.0	-5.5	15.3	74.0
2998.340000	52.5	1000.0	1000.000	100.0	V	282.0	-4.2	21.5	74.0
3381.280000	49.7	1000.0	1000.000	100.0	H	273.0	-3.3	24.3	74.0
4790.080000	46.9	1000.0	1000.000	150.0	V	200.0	0.4	27.1	74.0

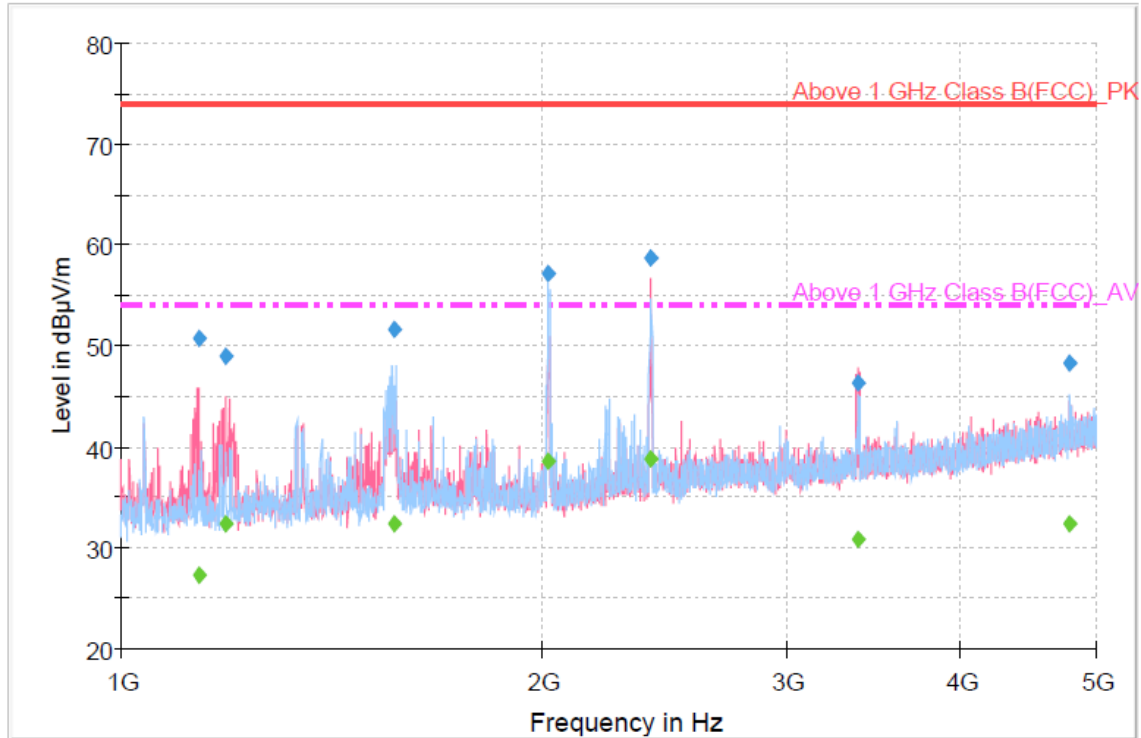
### Final Result 2

Frequency (MHz)	CAverage (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1571.380000	32.2	1000.0	1000.000	100.0	H	211.0	-8.4	21.8	54.0
1800.020000	28.9	1000.0	1000.000	100.0	V	145.0	-7.8	25.1	54.0
2021.060000	40.5	1000.0	1000.000	100.0	H	295.0	-7.5	13.5	54.0
2395.200000	44.0	1000.0	1000.000	100.0	V	233.0	-5.5	10.0	54.0
2998.340000	28.9	1000.0	1000.000	100.0	V	282.0	-4.2	25.1	54.0
3381.280000	32.9	1000.0	1000.000	100.0	H	273.0	-3.3	21.1	54.0
4790.080000	32.5	1000.0	1000.000	150.0	V	200.0	0.4	21.5	54.0

< Fig 15. Radiated emission result (1 000 MHz ~ 5 000 MHz) >



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



### Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1137.060000	50.7	1000.0	1000.000	100.0	V	151.0	-10.5	23.3	74.0
1188.100000	49.0	1000.0	1000.000	100.0	V	196.0	-10.1	25.0	74.0
1571.140000	51.8	1000.0	1000.000	100.0	H	216.0	-8.4	22.2	74.0
2020.980000	57.2	1000.0	1000.000	100.0	H	277.0	-7.5	16.8	74.0
2400.300000	58.8	1000.0	1000.000	100.0	V	237.0	-5.5	15.2	74.0
3373.320000	46.3	1000.0	1000.000	123.0	V	266.0	-3.4	27.7	74.0
4787.580000	48.3	1000.0	1000.000	100.0	H	279.0	0.4	25.7	74.0

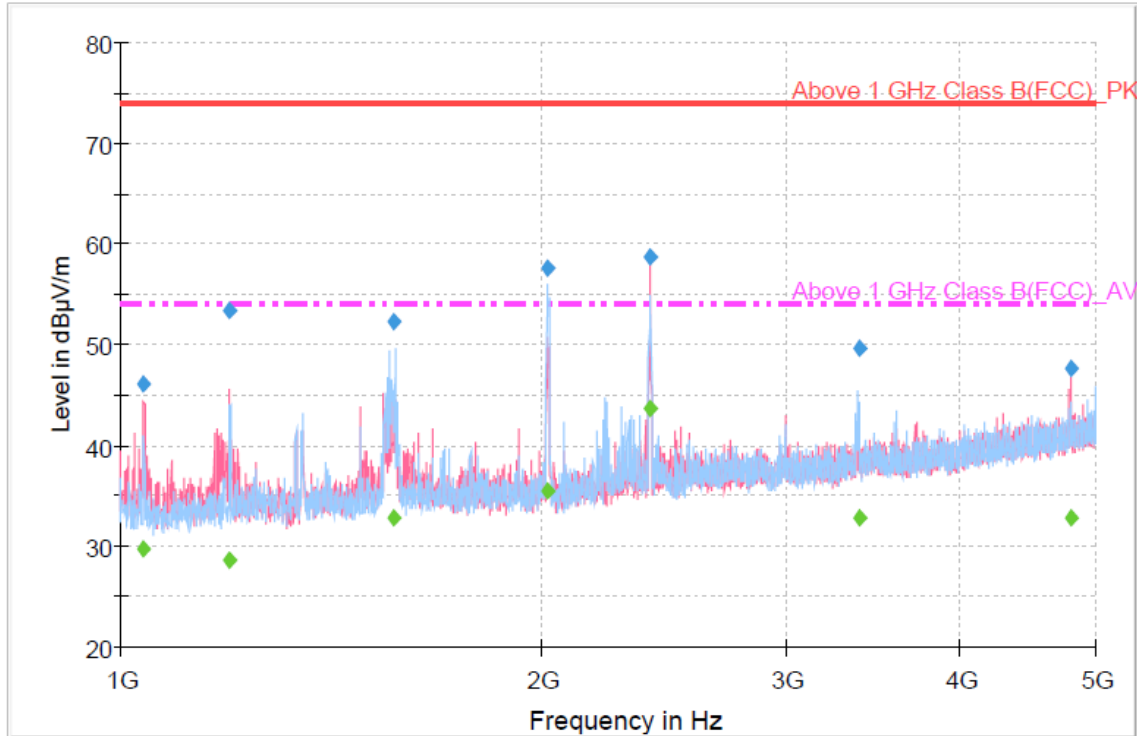
### Final Result 2

Frequency (MHz)	CAverage (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1137.060000	27.3	1000.0	1000.000	100.0	V	151.0	-10.5	26.7	54.0
1188.100000	32.4	1000.0	1000.000	100.0	V	196.0	-10.1	21.6	54.0
1571.140000	32.5	1000.0	1000.000	100.0	H	216.0	-8.4	21.5	54.0
2020.980000	38.5	1000.0	1000.000	100.0	H	277.0	-7.5	15.5	54.0
2400.300000	38.7	1000.0	1000.000	100.0	V	237.0	-5.5	15.3	54.0
3373.320000	30.7	1000.0	1000.000	123.0	V	266.0	-3.4	23.3	54.0
4787.580000	32.5	1000.0	1000.000	100.0	H	279.0	0.4	21.5	54.0

< Fig 16. Radiated emission result (1 000 MHz ~ 5 000 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)
1039.620000	46.2	1000.0	1000.000	200.0	V	134.0	-11.2	27.8	74.0
1197.020000	53.4	1000.0	1000.000	100.0	V	198.0	-10.0	20.6	74.0
1571.140000	52.3	1000.0	1000.000	100.0	H	218.0	-8.4	21.7	74.0
2020.420000	57.6	1000.0	1000.000	100.0	H	277.0	-7.5	16.4	74.0
2395.280000	58.7	1000.0	1000.000	100.0	V	233.0	-5.5	15.3	74.0
3381.960000	49.8	1000.0	1000.000	100.0	H	278.0	-3.3	24.2	74.0
4795.500000	47.7	1000.0	1000.000	100.0	V	204.0	0.4	26.3	74.0

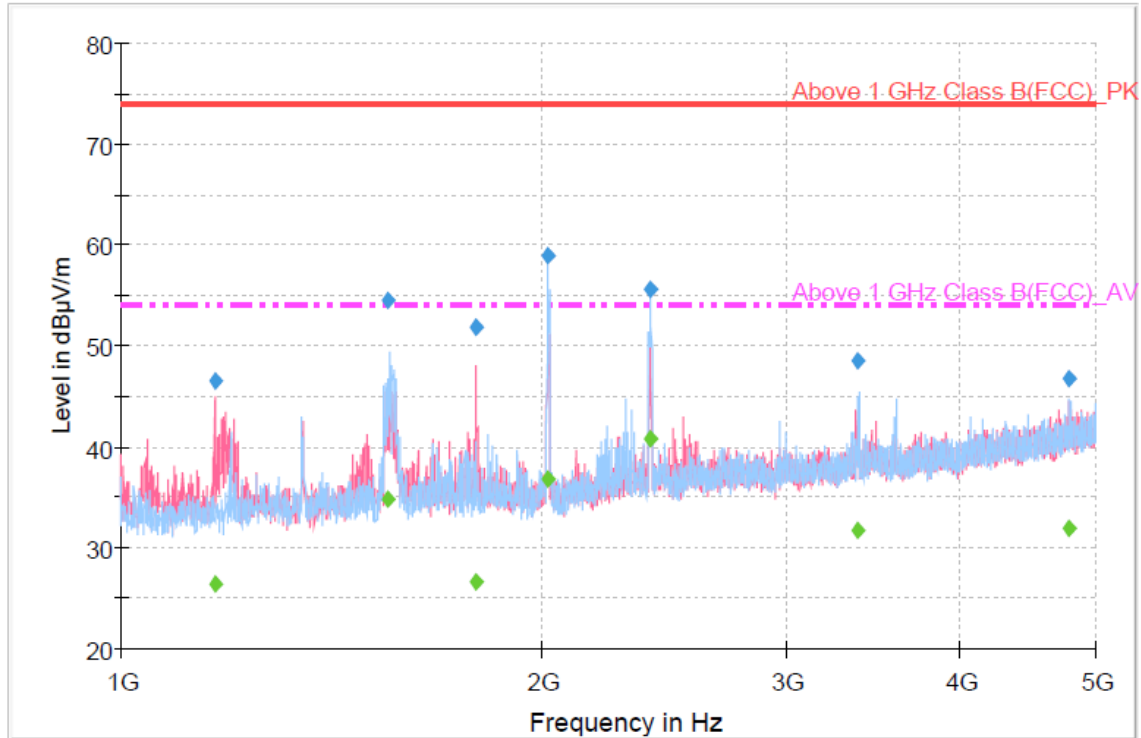
### Final Result 2

Frequency (MHz)	CAverage (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1039.620000	29.8	1000.0	1000.000	200.0	V	134.0	-11.2	24.2	54.0
1197.020000	28.7	1000.0	1000.000	100.0	V	198.0	-10.0	25.3	54.0
1571.140000	32.8	1000.0	1000.000	100.0	H	218.0	-8.4	21.2	54.0
2020.420000	35.6	1000.0	1000.000	100.0	H	277.0	-7.5	18.4	54.0
2395.280000	43.8	1000.0	1000.000	100.0	V	233.0	-5.5	10.2	54.0
3381.960000	32.9	1000.0	1000.000	100.0	H	278.0	-3.3	21.1	54.0
4795.500000	32.7	1000.0	1000.000	100.0	V	204.0	0.4	21.3	54.0

< Fig 17. Radiated emission result (1 000 MHz ~ 5 000 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)
1169.440000	46.5	1000.0	1000.000	100.0	V	159.0	-10.3	27.5	74.0
1555.540000	54.6	1000.0	1000.000	100.0	H	214.0	-8.5	19.4	74.0
1798.320000	51.9	1000.0	1000.000	111.0	V	179.0	-7.8	22.1	74.0
2020.400000	59.0	1000.0	1000.000	100.0	H	297.0	-7.5	15.0	74.0
2394.920000	55.6	1000.0	1000.000	100.0	H	215.0	-5.5	18.4	74.0
3377.940000	48.6	1000.0	1000.000	100.0	H	277.0	-3.3	25.4	74.0
4786.760000	46.9	1000.0	1000.000	100.0	H	284.0	0.4	27.1	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)
1169.440000	26.5	1000.0	1000.000	100.0	V	159.0	-10.3	27.5	54.0
1555.540000	34.8	1000.0	1000.000	100.0	H	214.0	-8.5	19.2	54.0
1798.320000	26.7	1000.0	1000.000	111.0	V	179.0	-7.8	27.3	54.0
2020.400000	36.7	1000.0	1000.000	100.0	H	297.0	-7.5	17.3	54.0
2394.920000	40.8	1000.0	1000.000	100.0	H	215.0	-5.5	13.2	54.0
3377.940000	31.8	1000.0	1000.000	100.0	H	277.0	-3.3	22.2	54.0
4786.760000	32.0	1000.0	1000.000	100.0	H	284.0	0.4	22.0	54.0

< Fig 18. Radiated emission result (1 000 MHz ~ 5 000 MHz) >



## 7. Sample Calculations

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

### 7.1 Example 1 :

#### ■ 20.3 MHz

Class B Limit	= 250 $\mu\text{V}$ = 48 dB $\mu\text{V}$
Reading	= 39.2 dB $\mu\text{V}$
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 $\mu\text{V}$
Margin	= 48 dB $\mu\text{V}$ - 39.2 dB $\mu\text{V}$
	= 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 $\mu\text{V}$
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. MONITOR SIGNAGE (Model Name: 47VX30AS)** was complies with §15.107 and 15.109 of the FCC Rules.

- The end -