

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer : LG Electronics Inc.

642, Jinpyung-Dong, Gumi-Si

Gyeongsangbuk-Do, 730-360, Korea

Attn: Mr. Sang-Wook Lee, Chief research engineer

Date of Issue : July 4, 2007

Test Report No. : GETEC-E3-07-051

**Test Site : Gumi College EMC Center
(Registration No.: 100749)**

FCC ID.: BEJ23LS7DUK

Applicant.: LG Electronics Inc.


| | |
|--------------------------|----------------------------------------------------|
| Rule Part(s) | : FCC Part 15 Subpart B |
| Equipment Class | : Class B computing device peripheral (JBP) |
| EUT Type | : LCD TV |
| Type of Authority | : Certification |
| Model No. | : 23LS7D-UK |
| Trade name | : LG |


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

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

Tested by,

Reviewed by,


Jae-Hoon Jeong, Senior Engineer
GUMI College EMC center


Tae-Sig Park, Technical Manager
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: 642, Jinpyung-Dong, Gumi-Si, Gyeongsangbuk-do, Korea

Manufacturer: LG Electronics Inc.

Manufacturer Address: 642, Jinpyung-Dong, Gumi-Si, Gyeongsangbuk-do, Korea

Contact Person: Mr. Sang -Wook Lee, Chief research engineer

Tel No.: +82-54-470-5640

- **FCC ID** BEJ23LS7DUK
- **EUT Type** LCD TV
- **Model No.** 23LS7D-UK
- **Trade Name** LG
- **Serial No.** Proto type
- **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 27 ~ 28, 2007
- **Place of Test** **Gumi College EMC Center** (FCC Registration No.: 100749)
407, Bugok-Dong, Gumi-si, Gyeongsangbuk-Do, Korea
- **Test Report No.** GETEC-E3-07-051
- **Dates of Issue** July 4, 2007

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 9kHz to 40GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc. LCD TV (Model No.: 23LS7D-UK)**

These measurement tests were conducted at **Gumi College EMC Center**. The site address is 407, Bugok-Dong, Gumi-si, Gyeongsangbuk-Do, Korea This test site is one of the highest point of Gumi 1 college at about 200 kilometers away from Seoul city and 40 kilometers away from Daeje 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 on October 19, 1992

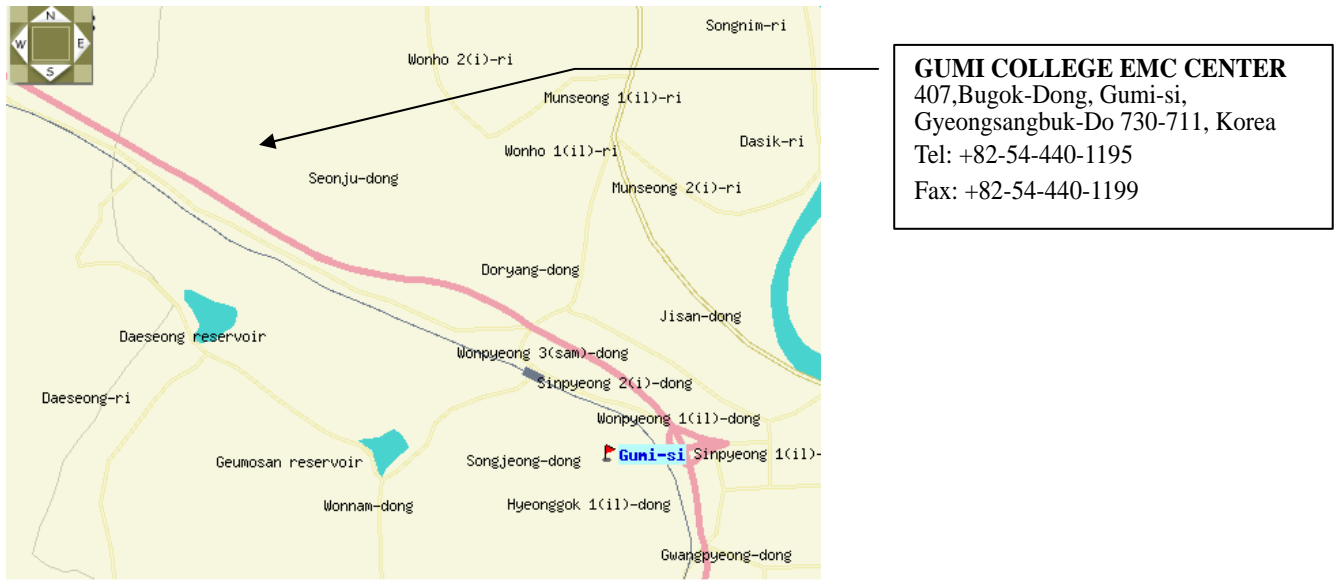


Fig 1. The map above shows the Gumi College in vicinity area.

3. Product Information

3.1 Description of EUT

The Equipment Under Test (EUT) is the **LG Electronics Inc. LCD TV (Model No.: 23LS7D-UK)**
FCC ID.: BEJ20LS7DUK

- Power Requirements : AC 100-240V, 50-60Hz
- Frequency Range(s) : H-Sync: 31.469 kHz – 47.776 kHz
V-Sync: 59.81Hz – 70.00Hz
- Television System : NTSC-M, ATSC, 64 & 256 QAM
- Dimension : 581.3 * 458.9 * 198.8 mm (W * H * D)
- Weight : 8.1 kg

3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

| Description | Manufacturer | Model No. | S/N & FCC ID |
|---------------------|-----------------|-----------------|------------------------------------------|
| PC | Hewlett Packard | D530 | S/N: CNG34800PY FCC ID: DoC |
| Video card | ATI | ATI RV360(9600) | S/N: SN0402017176 FCC ID: DoC |
| Printer | Hewlett Packard | 970CXI | S/N: MY9B01F1FG FCC ID: DoC |
| Serial Mouse | LOGITECH | M-S69 | S/N: 334684-108 FCC ID: JNZ211443 |
| Key-board | COMPAQ | 166516-AD6 | S/N: B13BBOR391006D FCC ID: AQ6-23K15 |
| Joystick | Microsoft | X05-92626 | S/N: 9262600296169 FCC ID: DoC |
| DVD player | PIONEER | DV-525 | S/N: UEYD012398LL FCC ID: DoC |
| Headset | GOWOONSORI | GW-500M | S/N: N/A FCC ID: DoC |
| TV signal generator | COMPAQ | T60M099 | S/N: CNU33509W8 FCC ID: DoC |

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

3.2.2 Used Cable(s)

| Cable No. | Condition | Description |
|-----------------------|-------------------------------------------|--------------------------------------|
| Power cable | Connected to the EUT and Power supply | 1.8m unshielded |
| Video cable(D-sub) | Connected to the EUT and PC | 1.8m shielded with two ferrite cores |
| Video cable(HDMI) | Connected to the EUT and PC | 1.8m shielded with two ferrite cores |
| ANT cable | Connected to the EUT and signal generator | 10.0m shielded |
| S-Video cable | Connected to the EUT and DVD player | 1.8m shielded |
| AV in cable | Connected to the EUT and DVD player | 1.8m shielded |
| Component cable | Connected to the EUT and DVD player | 3.0m shielded |
| Component sound cable | Connected to the EUT and DVD player | 3.0m shielded |
| PC sound cable | Connected to the EUT and PC | 1.8m shielded |
| Headset cable | Connected to the EUT | 2.85m 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 120V / 60Hz
- Test Mode(s)
 - . Monitor mode
 - . Radiated emission : 1360*768/ 60Hz (Analog), 1360*768/ 60Hz (HDMI)
 - . Conducted emission: 1360*768/ 60Hz (Analog), 1360*768/ 60Hz (HDMI),
1024*768/60Hz (Analog), 640*480/60Hz (Analog)
- Operating test pattern
 - . "H" character scrolling mode (Font size: 10)
 - . Black background white character
 - . Brightness and contrast was adjusted as maximum level
 - . 1kHz sound tone with win-amp player

4.2 Conducted Emission

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

The EUT was placed on a non-conducting 1.0 by 1.5 meter table, which is 0.8 meters in height and 0.4 meters 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 30MHz with 20msec 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 – 40 centi-meters.

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

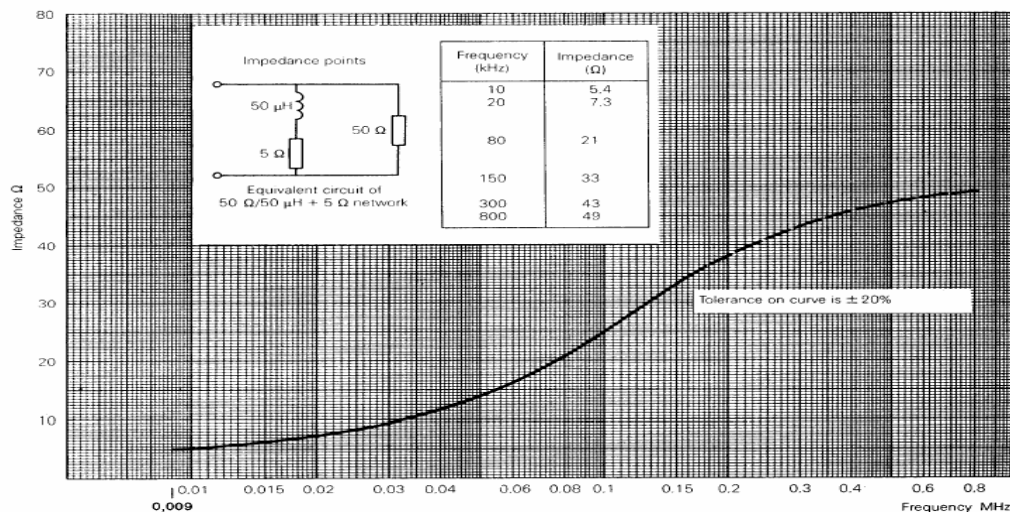


Fig 2. Impedance of LISN

4.3 Radiated Emission

Preliminary measurements were conducted 3m 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 to 1000MHz using bicornical log antenna (Schwarzbeck, VULB9160). Above 1GHz, horn antenna (Schwarzbeck, BBHA9120D) was used.

Final measurements were made outdoors at 3m/10m-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 1MHz 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 0.8m high non-metallic 1.0×1.5 meter 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

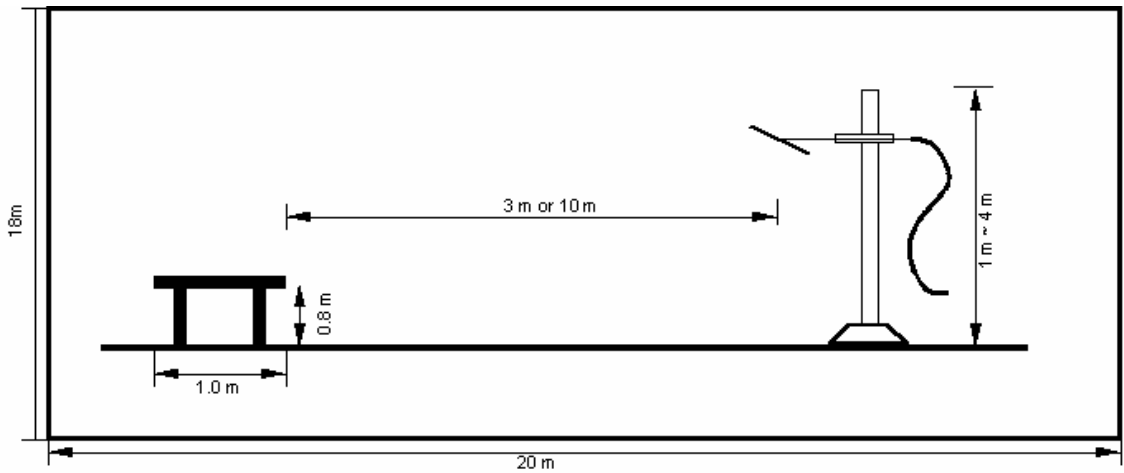


Fig 3. Dimensions of Open Site Test Area

5. Conducted Emission

5.1 Operating environment

Temperature : 23°C
Relative humidity : 41 %

5.2 Test set-up

The conducted emission measurements were performed in the shielded room.

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

| Contribution | Probability Distribution | Uncertainty (±dB) | |
|-----------------------------------------------------------|--------------------------|-------------------|--------------------|
| | | Power Port | Communication port |
| Receiver specification | Rectangular | 0.50 | 0.50 |
| LISN coupling specification | Rectangular | 1.50 | |
| ISN coupling specification | Rectangular | | 1.50 |
| Mismatch | U-shaped | | |
| LISN VRC : $\Gamma_{l=}$ 0.20 | | 0.05 | 0.05 |
| ISN VRC : $\Gamma_{l=}$ 0.20 | | -0.05 | -0.05 |
| ATT VRC(IN) : $\Gamma_{g=}$ 0.03 | | | |
| Uncertainty limits $20\log(1\pm \Gamma_{l=} \Gamma_{g=})$ | | | |
| Mismatch | U-shaped | | |
| Receiver VRC : $\Gamma_{l=}$ 0.09 | | 0.09 | 0.09 |
| ATT VRC : $\Gamma_{g=}$ 0.11 | | -0.09 | -0.09 |
| Uncertainty limits $20\log(1\pm \Gamma_{l=} \Gamma_{g=})$ | | | |
| System repeatability | Std Deviation | 0.55 | 0.55 |
| Cable and input attenuator calibration | Normal (k=2) | 0.08 | 0.08 |
| Repeatability of EUT | | | |
| Combined standard uncertainty $U_c(y)$ | Normal | 1.07 | 1.07 |
| | | -1.07 | -1.07 |
| Extended uncertainty U | Normal (k=2) | 2.15 | 2.15 |
| | | -2.15 | -2.15 |

5.4 Limit

| RFI Conducted | FCC Limit(dB) Class B | |
|-----------------|-----------------------|----------|
| Freq. Range | Quasi-Peak | Average |
| 150kHz – 0.5MHz | 66 – 56* | 56 – 46* |
| 0.5MHz – 5MHz | 56 | 46 |
| 5MHz – 30MHz | 60 | 50 |

*Limits decreases linearly with the logarithm of frequency.

5.5 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Due to calibration |
|-----|--------------|-----------------|--------------------------|---------------|--------------------|
| ■ - | ESCS30 | Rohde & Schwarz | EMI test receiver | 839809/003 | 11. 27. 2007 |
| ■ - | ESH3-Z5 | Rohde & Schwarz | Artificial mains network | 838979/020 | 12. 09. 2007 |
| ■ - | ESH2-Z5 | Rohde & Schwarz | Artificial mains network | 829991/009 | 12. 09. 2007 |

5.6 Test data for power line conducted emission

- Test Date : June 28, 2007
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15MHz ~ 30MHz

◆ Test resolution: 1360*768/60Hz (Analog)

| Frequency (MHz) | Insertion Loss | Cable Loss | Pol. | Quasi-Peak[dBuV] | | | Average[dBuV] | | | Margin[dBuV] | |
|-----------------|----------------|------------|------|------------------|---------|--------|---------------|---------|--------|--------------|---------|
| | | | | Limit | Reading | Result | Limit | Reading | Result | Quasi | Average |
| 0.214 | 0.11 | -0.22 | N | 63.05 | 42.8 | 42.69 | 53.05 | 41.4 | 41.29 | 20.36 | 11.76 |
| 0.358 | 0.12 | -0.14 | N | 58.77 | 35.3 | 35.27 | 48.77 | 34.1 | 34.07 | 23.50 | 14.70 |
| 0.498 | 0.12 | -0.17 | N | 56.03 | 36.5 | 36.45 | 46.03 | 35.2 | 35.15 | 19.59 | 10.89 |
| 0.642 | 0.13 | -0.23 | N | 56.00 | 37.5 | 37.40 | 46.00 | 36.3 | 36.20 | 18.60 | 9.80 |
| 0.786 | 0.13 | -0.23 | N | 56.00 | 37.7 | 37.60 | 46.00 | 37.5 | 37.40 | 18.40 | 8.60 |
| 0.930 | 0.13 | -0.23 | N | 56.00 | 37.5 | 37.40 | 46.00 | 36.6 | 36.50 | 18.60 | 9.50 |
| 1.070 | 0.13 | -0.24 | N | 56.00 | 37.9 | 37.79 | 46.00 | 37.6 | 37.49 | 18.21 | 8.51 |
| 1.214 | 0.12 | -0.25 | N | 56.00 | 37.7 | 37.57 | 46.00 | 37.6 | 37.47 | 18.43 | 8.53 |
| 1.358 | 0.12 | -0.26 | N | 56.00 | 37.3 | 37.15 | 46.00 | 36.9 | 36.75 | 18.85 | 9.25 |
| 1.498 | 0.11 | -0.27 | N | 56.00 | 37.0 | 36.84 | 46.00 | 36.5 | 36.34 | 19.16 | 9.66 |
| 2.214 | 0.09 | -0.28 | N | 56.00 | 35.6 | 35.41 | 46.00 | 35.5 | 35.31 | 20.59 | 10.69 |
| 3.998 | 0.09 | -0.14 | N | 56.00 | 36.1 | 36.05 | 46.00 | 36.0 | 35.95 | 19.95 | 10.05 |
| 4.426 | 0.09 | -0.15 | N | 56.00 | 36.2 | 36.14 | 46.00 | 36.1 | 36.04 | 19.86 | 9.96 |
| 6.138 | 0.21 | -0.17 | L1 | 60.00 | 34.5 | 34.54 | 50.00 | 34.4 | 34.44 | 25.46 | 15.56 |
| 7.354 | 0.09 | -0.06 | N | 60.00 | 30.4 | 30.43 | 50.00 | 30.2 | 30.23 | 29.57 | 19.77 |

*Comment : Pol : L1 (Live), N(Neut)
 Insertion Loss : Insertion Loss of LISN
 Cable Loss : Cable Loss + Pulse Limiter Insertion loss value

◆ Test resolution: 1360*768/60Hz (HDMI)

| Frequency (MHz) | Insertion Loss | Cable Loss | Pol. | Quasi-Peak[dBuV] | | | Average[dBuV] | | | Margin[dBuV] | |
|--------------------|-------------------|---------------|------|------------------|---------|--------|---------------|---------|--------|--------------|---------|
| | | | | Limit | Reading | Result | Limit | Reading | Result | Quasi | Average |
| 0.214 | 0.11 | -0.22 | N | 63.05 | 43.0 | 42.89 | 53.05 | 42.9 | 42.79 | 20.16 | 10.26 |
| 0.358 | 0.12 | -0.14 | N | 58.77 | 35.3 | 35.27 | 48.77 | 34.2 | 34.17 | 23.50 | 14.60 |
| 0.498 | 0.12 | -0.17 | N | 56.03 | 36.7 | 36.65 | 46.03 | 35.4 | 35.35 | 19.39 | 10.69 |
| 0.518 | 0.14 | -0.18 | L1 | 56.00 | 27.3 | 27.26 | 46.00 | 27.1 | 27.06 | 28.74 | 18.94 |
| 0.642 | 0.13 | -0.23 | N | 56.00 | 37.6 | 37.50 | 46.00 | 36.4 | 36.30 | 18.50 | 9.70 |
| 0.786 | 0.13 | -0.23 | N | 56.00 | 37.9 | 37.80 | 46.00 | 37.8 | 37.70 | 18.20 | 8.30 |
| 0.926 | 0.13 | -0.23 | N | 56.00 | 37.5 | 37.40 | 46.00 | 36.8 | 36.70 | 18.60 | 9.30 |
| 1.070 | 0.13 | -0.24 | N | 56.00 | 38.0 | 37.89 | 46.00 | 37.5 | 37.39 | 18.11 | 8.61 |
| 1.214 | 0.12 | -0.25 | N | 56.00 | 37.8 | 37.67 | 46.00 | 37.6 | 37.47 | 18.33 | 8.53 |
| 1.358 | 0.12 | -0.26 | N | 56.00 | 37.4 | 37.25 | 46.00 | 37.1 | 36.95 | 18.75 | 9.05 |
| 2.570 | 0.16 | -0.22 | L1 | 56.00 | 35.6 | 35.54 | 46.00 | 35.4 | 35.34 | 20.46 | 10.66 |
| 3.714 | 0.17 | -0.14 | L1 | 56.00 | 35.0 | 35.03 | 46.00 | 34.3 | 34.33 | 20.97 | 11.67 |
| 6.142 | 0.21 | -0.17 | L1 | 60.00 | 34.4 | 34.44 | 50.00 | 34.2 | 34.24 | 25.56 | 15.76 |
| 7.642 | 0.22 | -0.03 | L1 | 60.00 | 29.3 | 29.49 | 50.00 | 29.1 | 29.29 | 30.51 | 20.71 |

*Comment : Pol : L1 (Live), N(Neut)

Insertion Loss : Insertion Loss of LISN

Cable Loss : Cable Loss + Pulse Limiter Insertion loss value

◆ Test resolution: 1024*768/60Hz (Analog)

| Frequency (MHz) | Insertion Loss | Cable Loss | Pol. | Quasi-Peak[dBuV] | | | Average[dBuV] | | | Margin[dBuV] | |
|--------------------|-------------------|---------------|------|------------------|---------|--------|---------------|---------|--------|--------------|---------|
| | | | | Limit | Reading | Result | Limit | Reading | Result | Quasi | Average |
| 0.210 | 0.11 | -0.22 | N | 63.21 | 39.5 | 39.39 | 53.21 | 39.4 | 39.29 | 23.82 | 13.92 |
| 0.214 | 0.11 | -0.22 | N | 63.05 | 42.8 | 42.69 | 53.05 | 42.6 | 42.49 | 20.36 | 10.56 |
| 0.358 | 0.12 | -0.14 | N | 58.77 | 35.2 | 35.17 | 48.77 | 34.1 | 34.07 | 23.60 | 14.70 |
| 0.498 | 0.12 | -0.17 | N | 56.03 | 36.7 | 36.65 | 46.03 | 35.4 | 35.35 | 19.39 | 10.69 |
| 0.642 | 0.13 | -0.23 | N | 56.00 | 37.5 | 37.40 | 46.00 | 36.2 | 36.10 | 18.60 | 9.90 |
| 0.786 | 0.14 | -0.23 | L1 | 56.00 | 37.3 | 37.21 | 46.00 | 37.1 | 37.01 | 18.79 | 8.99 |
| 0.926 | 0.13 | -0.23 | N | 56.00 | 37.8 | 37.70 | 46.00 | 37.1 | 37.00 | 18.30 | 9.00 |
| 1.070 | 0.13 | -0.24 | N | 56.00 | 37.9 | 37.79 | 46.00 | 37.5 | 37.39 | 18.21 | 8.61 |
| 1.214 | 0.12 | -0.25 | N | 56.00 | 37.5 | 37.37 | 46.00 | 36.6 | 36.47 | 18.63 | 9.53 |
| 1.354 | 0.14 | -0.26 | L1 | 56.00 | 37.3 | 37.18 | 46.00 | 37.0 | 36.88 | 18.82 | 9.12 |
| 1.498 | 0.11 | -0.27 | N | 56.00 | 37.3 | 37.14 | 46.00 | 36.7 | 36.54 | 18.86 | 9.46 |
| 1.782 | 0.10 | -0.30 | N | 56.00 | 36.4 | 36.20 | 46.00 | 36.2 | 36.00 | 19.80 | 10.00 |
| 2.710 | 0.09 | -0.19 | N | 56.00 | 35.7 | 35.60 | 46.00 | 35.5 | 35.40 | 20.40 | 10.60 |
| 3.282 | 0.09 | -0.14 | N | 56.00 | 36.3 | 36.25 | 46.00 | 36.2 | 36.15 | 19.75 | 9.85 |
| 6.134 | 0.09 | -0.17 | N | 60.00 | 33.4 | 33.32 | 50.00 | 32.2 | 32.12 | 26.68 | 17.88 |
| 7.346 | 0.09 | -0.06 | N | 60.00 | 28.3 | 28.33 | 50.00 | 28.1 | 28.13 | 31.67 | 21.87 |

*Comment : Pol : L1 (Live), N(Neut)

Insertion Loss : Insertion Loss of LISN

Cable Loss : Cable Loss + Pulse Limiter Insertion loss value

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

| Frequency (MHz) | Insertion Loss | Cable Loss | Pol. | Quasi-Peak[dBuV] | | | Average[dBuV] | | | Margin[dBuV] | |
|--------------------|-------------------|---------------|------|------------------|---------|--------|---------------|---------|--------|--------------|---------|
| | | | | Limit | Reading | Result | Limit | Reading | Result | Quasi | Average |
| 0.178 | 0.10 | -0.19 | N | 64.58 | 46.4 | 46.31 | 54.58 | 30.9 | 30.81 | 18.27 | 23.77 |
| 0.214 | 0.11 | -0.22 | N | 63.05 | 42.3 | 42.19 | 53.05 | 41.2 | 41.09 | 20.86 | 11.96 |
| 0.290 | 0.13 | -0.18 | L1 | 60.52 | 32.1 | 32.05 | 50.52 | 31.2 | 31.15 | 28.48 | 19.38 |
| 0.490 | 0.12 | -0.17 | N | 56.17 | 34.9 | 34.85 | 46.17 | 34.8 | 34.75 | 21.32 | 11.42 |
| 0.518 | 0.12 | -0.18 | N | 56.00 | 27.5 | 27.44 | 46.00 | 25.0 | 24.94 | 28.56 | 21.06 |
| 0.630 | 0.13 | -0.23 | N | 56.00 | 34.3 | 34.20 | 46.00 | 34.2 | 34.10 | 21.80 | 11.90 |
| 0.770 | 0.13 | -0.23 | N | 56.00 | 32.9 | 32.80 | 46.00 | 32.1 | 32.00 | 23.20 | 14.00 |
| 1.190 | 0.12 | -0.25 | N | 56.00 | 27.9 | 27.78 | 46.00 | 22.0 | 21.88 | 28.22 | 24.12 |
| 1.330 | 0.12 | -0.26 | N | 56.00 | 27.5 | 27.36 | 46.00 | 19.1 | 18.96 | 28.64 | 27.04 |
| 1.750 | 0.10 | -0.30 | N | 56.00 | 21.8 | 21.60 | 46.00 | 11.2 | 11.00 | 34.40 | 35.00 |
| 2.170 | 0.09 | -0.29 | N | 56.00 | 27.5 | 27.30 | 46.00 | 19.1 | 18.90 | 28.70 | 27.10 |
| 3.498 | 0.09 | -0.14 | N | 56.00 | 24.9 | 24.85 | 46.00 | 18.1 | 18.05 | 31.15 | 27.95 |
| 4.622 | 0.09 | -0.15 | N | 56.00 | 29.2 | 29.14 | 46.00 | 23.3 | 23.24 | 26.86 | 22.76 |
| 6.162 | 0.09 | -0.17 | N | 60.00 | 22.5 | 22.42 | 50.00 | 17.7 | 17.62 | 37.58 | 32.38 |
| 7.842 | 0.09 | -0.01 | N | 60.00 | 25.7 | 25.78 | 50.00 | 18.0 | 18.08 | 34.22 | 31.92 |

*Comment : Pol : L1 (Live), N(Neut)

Insertion Loss : Insertion Loss of LISN

Cable Loss : Cable Loss + Pulse Limiter Insertion loss value

6. Radiated Emission

6.1 Operating environment

Temperature : 27°C
Relative humidity : 41 %

6.2 Test set-up

A preliminary scan with peak mode was performed in the semi anechoic chamber and found frequency for open area test site.

The formal radiated emission was measured at 3m/10m-distance open area test site.

The EUT was placed on a non-conductive turntable approximately 0.8 meters above the ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 and 4.0 meters 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%.

| Contribution | Probability Distribution | Uncertainty (dB) | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|---------------|-------------------|---------------|
| | | Biconical Ant. | | Log-periodic Ant. | |
| | | 3m | 10m | 3m | 10m |
| Ambient signal | | | | | |
| Antenna factor calibration | Normal (k=2) | 0.50 | 0.50 | 0.50 | 0.50 |
| Receiver specification | Rectangular | 0.50 | 0.50 | 0.50 | 0.50 |
| Antenna directivity | Rectangular | 0.25 | 0.00 | 1.50 | 0.25 |
| Antenna phase center variation | Rectangular | 0.00 | 0.00 | 1.00 | 0.20 |
| Antenna factor frequency interpolation | Rectangular | 0.25 | 0.25 | 0.25 | 0.25 |
| Measure distance variation | Rectangular | 0.60 | 0.40 | 0.60 | 0.40 |
| Site imperfections | Rectangular | -2.00 | -2.40 | 2.50 | 2.40 |
| Mismatch Receiver VRC : $\Gamma_l = 0.09$ Antenna VRC : $\Gamma_g = 0.43$ (Bi) 0.23 (Lp) Uncertainty limits $20\log(1 \pm \Gamma_l \Gamma_g)$ | U-shaped | 0.33 -0.35 | 0.33 -0.35 | 0.18 -0.18 | 0.18 -0.18 |
| System repeatability | Std Deviation | 0.82 | 0.82 | 0.79 | 0.79 |
| Cable loss calibration | Normal (k=2) | 0.09 | 0.09 | 0.09 | 0.09 |
| Combined standard uncertainty $U_c(y)$ | Normal | 1.54 -1.54 | 1.70 -1.70 | 2.03 -2.03 | 1.68 -1.68 |
| Extended uncertainty U | Normal (k=2) | 3.09 -3.09 | 3.39 -3.40 | 4.05 -4.05 | 3.36 -3.36 |

6.4 Limit

| Frequency (MHz) | FCC Limit @ 3m. dB μ V/m | CISPR Limit @ 10m. 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 – 1000 | 54.0 | 37.0 |
| > 1000 | 54.0 | No Specified limit |

6.5 Test equipment used

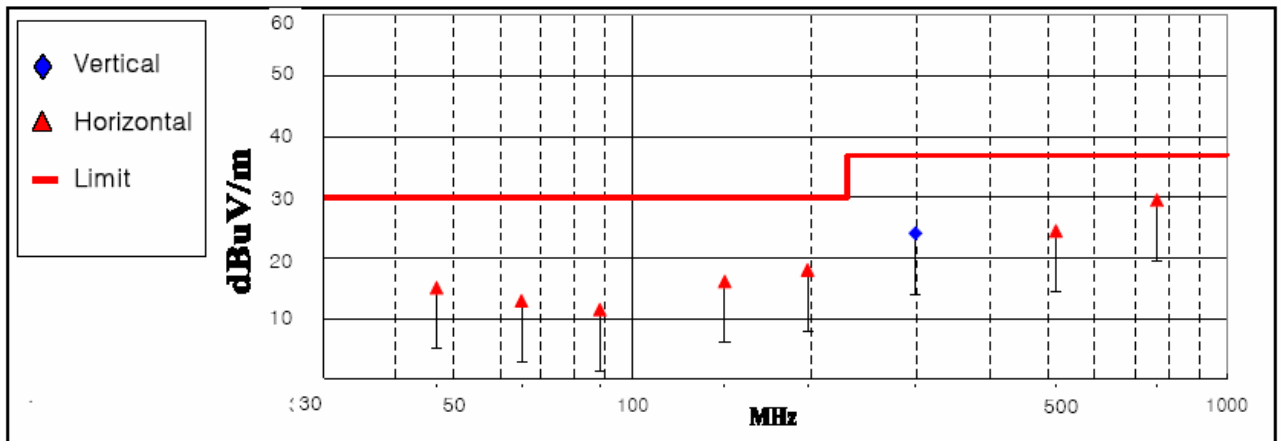
| Model Number | Manufacturer | Description | Serial Number | Due to Calibration |
|------------------------------|-----------------|----------------------|---------------|--------------------|
| ■ - ESCS30 | Rohde & Schwarz | EMI test receiver | 839809/003 | 11. 27. 2007 |
| ■ - ESI | Rohde & Schwarz | EMI test receiver | 830482/010 | 12. 14. 2007 |
| ■ - HK116 | Rohde & Schwarz | Biconical ANT | 826861/018 | 11. 27. 2007 |
| ■ - HL223 | Rohde & Schwarz | Log-periodic antenna | 829228/011 | 11. 27. 2007 |
| ■ - 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 |
| ■ - BBHA9120D | Schwarzbeck | Horn ANT | 207 | 11. 20. 2007 |
| ■ - AFS44-00101800-25-10P-44 | MITEQ | Preamplifier | 1258943 | N/A |

6.6 Test data for radiated emission

- Test Date : June 27, 2007
- Resolution bandwidth : 120 kHz / 1MHz
- Frequency range : 30MHz ~ 2000MHz
- Measurement distance : 10m / 3m

◆ Operating Condition: 1360*768/60Hz (Analog)
 Detector mode: Quasi- peak detector mode

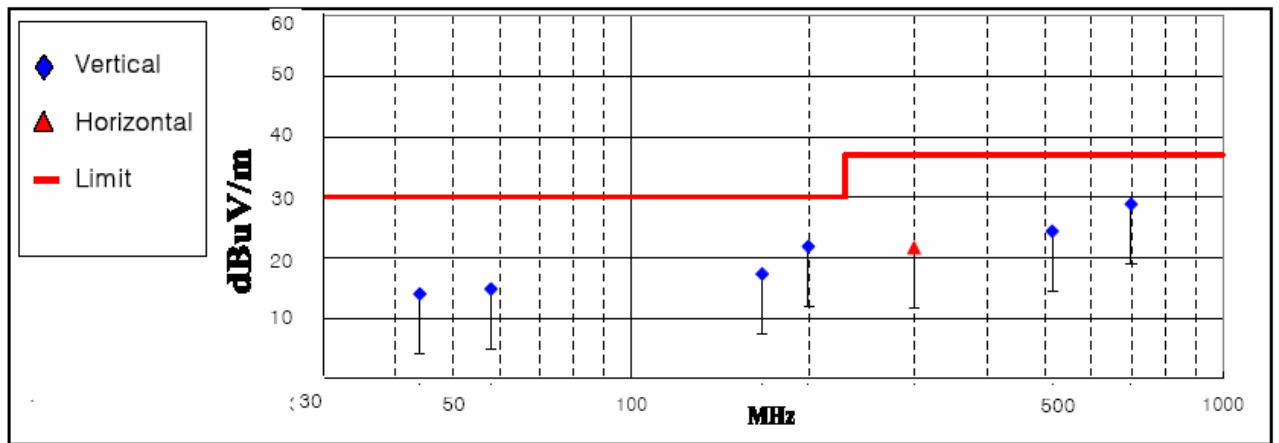
| Frequency (MHz) | Measurement Level | | | | Limit (dBuV/m) | Margin (dBuV/m) | Positioning System | | |
|-----------------|-------------------|------------|----------|-------------|----------------|-----------------|--------------------|-------------|-------------|
| | Reading | Antenna | Cable | Test Result | | | Pol. (H/V) | Height (cm) | Angle (deg) |
| | Value(dBuV) | Factor(dB) | Loss(dB) | (dBuV/m) | | | | | |
| 46.88 | 3.5 | 9.69 | 1.94 | 15.1 | 30.0 | 14.9 | H | 302 | 341 |
| 65.12 | 2.9 | 7.96 | 2.15 | 13.0 | 30.0 | 17.0 | H | 300 | 212 |
| 88.16 | 0.2 | 8.73 | 2.56 | 11.5 | 30.0 | 18.5 | H | 312 | 165 |
| 143.09 | 0.8 | 12.11 | 3.29 | 16.2 | 30.0 | 13.8 | H | 300 | 172 |
| 197.23 | 0.5 | 13.71 | 3.86 | 18.1 | 30.0 | 11.9 | H | 315 | 160 |
| 299.30 | 0.4 | 18.65 | 5.10 | 24.1 | 37.0 | 12.9 | V | 135 | 198 |
| 515.82 | 0.1 | 17.62 | 6.73 | 24.5 | 37.0 | 12.5 | H | 399 | 125 |
| 763.04 | 0.3 | 21.00 | 8.28 | 29.6 | 37.0 | 7.4 | H | 317 | 20 |



< Fig 4. Radiated emission result (30MHz ~ 1000MHz)>

- ◆ Operating Condition: 1360*768/60Hz (HDMI)
- Detector mode: Quasi- peak detector mode

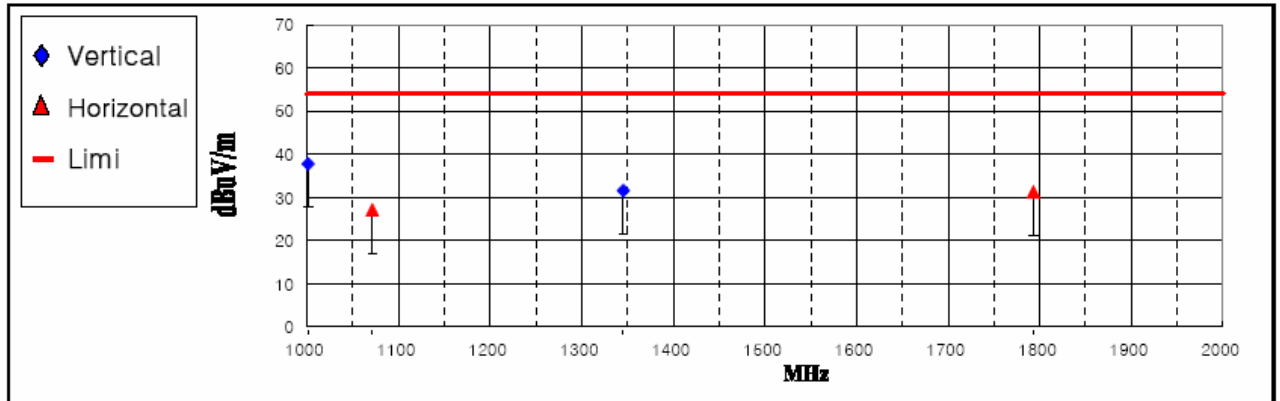
| Frequency (MHz) | Measurement Level | | | | Limit (dBuV/m) | Margin (dBuV/m) | Positioning System | | |
|-----------------|-------------------|------------|----------|-------------|----------------|-----------------|--------------------|-------------|-------------|
| | Reading | Antenna | Cable | Test Result | | | Pol. (H/V) | Height (cm) | Angle (deg) |
| | Value(dBuV) | Factor(dB) | Loss(dB) | (dBuV/m) | | | | | |
| 43.96 | 2.0 | 10.09 | 1.88 | 14.0 | 30.0 | 16.0 | V | 100 | 101 |
| 58.03 | 4.4 | 8.37 | 2.08 | 14.8 | 30.0 | 15.2 | V | 111 | 95 |
| 199.24 | 4.2 | 13.77 | 3.89 | 21.9 | 30.0 | 8.1 | V | 108 | 292 |
| 166.53 | 1.0 | 12.79 | 3.53 | 17.3 | 30.0 | 12.7 | V | 120 | 21 |
| 300.68 | 3.9 | 12.71 | 5.11 | 21.7 | 37.0 | 15.3 | H | 367 | 229 |
| 514.96 | 0.1 | 17.61 | 6.72 | 24.4 | 37.0 | 12.6 | V | 145 | 344 |
| 699.71 | 0.3 | 20.67 | 7.90 | 28.9 | 37.0 | 8.1 | V | 129 | 49 |



< Fig 5. Radiated emission result (30MHz ~ 1000MHz)>

- ◆ Operating Condition: 1360*768/60Hz (Analog)
- ◆ Detector mode: Peak detector mode / Average detector mode

| Frequency (MHz) | Measurement Level | | | | | | AV Limit (dBuV/m) | Margin (dBuV/m) | Positioning System | | |
|-----------------|---------------------|---------|---------|---------------|----------------------|---------|-------------------|-----------------|--------------------|-------------|-------------|
| | Reading Value(dBuV) | | AF (dB) | AMP / CL (dB) | Test Result (dBuV/m) | | | | Pol. (H/V) | Height (cm) | Angle (deg) |
| | Peak | Average | | | Peak | Average | | | | | |
| 1001.20 | 55.3 | 37.3 | 22.7 | -22.2 | 55.8 | 37.8 | 54.0 | 16.2 | V | 108 | 170 |
| 1071.20 | 45.5 | 26.2 | 22.9 | -22.0 | 46.4 | 27.1 | 54.0 | 26.9 | H | 300 | 195 |
| 1345.20 | 45.1 | 29.2 | 23.9 | -21.5 | 47.5 | 31.6 | 54.0 | 22.4 | V | 112 | 180 |
| 1793.20 | 40.7 | 26.6 | 25.4 | -20.8 | 45.4 | 31.3 | 54.0 | 22.7 | H | 311 | 188 |

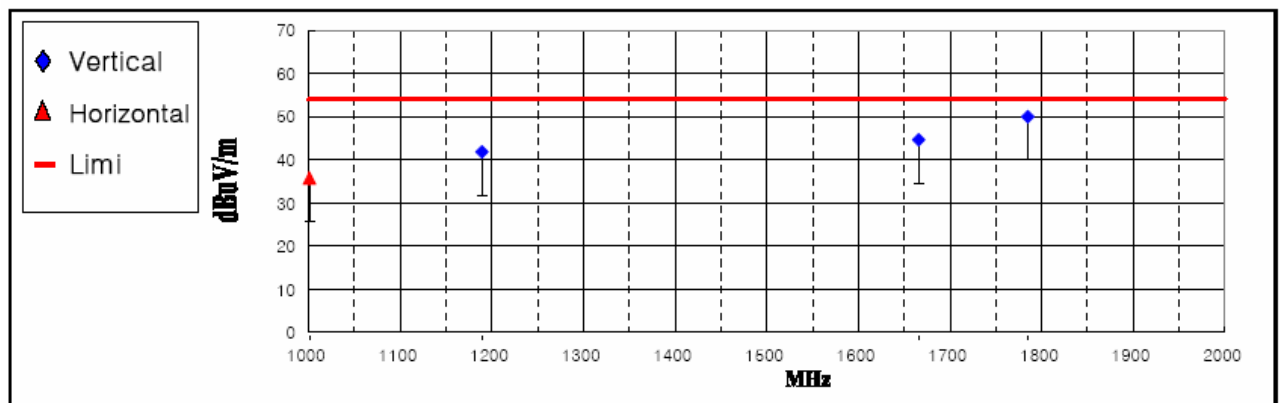


*Comment :AMP/CL : Cable loss + AMP gain

< Fig 6. Radiated emission result (1000MHz ~ 2000MHz)>

- ◆ Operating Condition: 1360*768/60Hz (HDMI)
- ◆ Detector mode: Peak detector mode / Average detector mode

| Frequency (MHz) | Measurement Level | | | | | | AV Limit (dBuV/m) | Margin (dBuV/m) | Positioning System | | |
|-----------------|---------------------|---------|---------|---------------|----------------------|---------|-------------------|-----------------|--------------------|-------------|-------------|
| | Reading Value(dBuV) | | AF (dB) | AMP / CL (dB) | Test Result (dBuV/m) | | | | Pol. (H/V) | Height (cm) | Angle (deg) |
| | Peak | Average | | | Peak | Average | | | | | |
| 1000.80 | 55.9 | 35.3 | 22.7 | -22.2 | 56.4 | 35.8 | 54.0 | 18.2 | H | 398 | 170 |
| 1189.20 | 51.9 | 40.2 | 23.3 | -21.7 | 53.5 | 41.8 | 54.0 | 12.2 | V | 110 | 185 |
| 1665.60 | 58.3 | 40.5 | 25.0 | -20.9 | 62.4 | 44.6 | 54.0 | 9.4 | V | 115 | 173 |
| 1784.80 | 60.5 | 45.4 | 25.4 | -20.8 | 65.1 | 50.0 | 54.0 | 4.0 | V | 100 | 191 |



*Comment :AMP/CL : Cable loss + AMP gain

< Fig 7. Radiated emission result (1000MHz ~ 2000MHz)>

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 | = | - 67.8 dBm(Calibrated level) | | |
| Convert to dB μV | = | - 67.8 dBm + 107 | = | 39.2 dB μV |
| $10^{(39.2\text{dB}\mu\text{V}/20)}$ | = | 91.2 μV | | |
| Margin | = | 39.2 – 48 | = | -8.8 |
| | = | 8.8 dB below Limit | | |

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 | = | - 76.0 dBm(Calibrated level) | | |
| Convert to dB $\mu\text{V}/\text{m}$ | = | - 76.8 dBm + 107 | = | 31.0 dB $\mu\text{V}/\text{m}$ |
| Antenna Factor + Cable Loss | = | 5.8 dB | | |
| | | Total | = | 36.8 dB $\mu\text{V}/\text{m}$ |
| Margin | = | 36.8 – 40.0 | = | -3.2 |
| | = | 3.2 dB below Limit | | |

8. Recommendation & conclusion

The data collected shows that the **LG Electronics Inc. LCD TV (Model No.: 23LS7D-UK)** was complies with § 15.107 and 15.109 of the FCC Rules.