HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
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CERTIFICATION

Manufacture;
LG Electronics Inc.

50 Hyangjeong-dong, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 361-480, Korea

LG ELECTRONICS FRN : 0012281820

Date of Issue : NOVEMBER 30, 2004

Test Report No.: HCT-F04-1114

Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.
HCT FRN : 0005-8664-21

FCC ID : **SSNLGHUD**

MODEL : **LG HUD**

Rule Part(s):	**Part 15 & 2; ET Docket 95-19**
Equipment Class:	**FCC Class B Peripheral Device (JBP)**
Standard(s):	**FCC Class B: 1998 (CISPR 22)**
EUT Type:	**LG USB Drive**
Read Write Speed:	**Read 8MB/sec, Write 6MB/sec**
Model(s):	**LG HUD**
Port/Connector(s)	**USB Port, Carkit Port**

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 C63.4-2001.

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.

Ki Soo Kim

Report prepared by : Ki-Soo Kim
Manager of EMC Tech. Part

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MEASUREMENT REPORT

1.1 Scope

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

Applicant Name:	**LG Electronics Inc.**
Address:	**50 Hyangjeong-dong, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 361-480, Korea**

- **FCC ID : SSNLGHUD**
- Equipment Class: **FCC Class B Peripheral Device (JBP)**
- EUT Type: **LG USB Drive**
- Model(s): **LG HUD**
- Read Write Speed: **Read 8MB/sec, Write 6MB/sec**
- Port(s): **USB Port, Carkit Port**
- Data communication: **CDMA2000 1X EVDO 2.4Mbps, Program : PC Snyc (Mobile manufacturer providing)**
- Power : **USB Bus-power (4.4V – 5.5V)**
- Rule Part(s): **FCC Part 15 Subpart B**
- Test Procedure(s): **ANSI C63.4 (2001)**
- Dates of Tests: NOVEMBER 23, 2004 ~ NOVEMBER 27, 2004
- Place of Tests: 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO,467-701,KOREA

2.1 INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSIC63.4-2001) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc. LG USB Drive FCC ID : SSNLGHUD**

The open area test site and conducted measurement facility used to collect the radiateddata are located at the 254-1, MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4and CISPR Publication 22. Detailed description of test facility was submitted to the Commissionand accepted dated July 23,2003 (Confirmation Number: EA90661)

3.1 PRODUCT INFORMATION

3.2 Equipment Description

The **LG HUD** is a **LG USB Drive** made by **LG Electronics Inc**. in Korea. Refer to the user's manual for more information.

ITEM	SPECIFICATION
I/O Port	USB, Carkit Port
Dimension	

< Model Differences>
The difference(s) compared to the EUT is as follow:

	Capacity	Model Differences
Basic Model	LG HUD (1GB)	
Multiple Model	LG HUD (32MB) LG HUD (64MB) LG HUD (128MB) LG HUD (256MB) LG HUD (512MB)	Only type designation by a memory size of the EUT.

4.1 Description of Tests(Conducted & Radiated)

4.1.1 Powerline Conducted Emission (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.
The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was measured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the 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 the centre with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached. Each EME reported was calibrated using the Rohde & Schwarz SMX signal generator and are listed on Table 1. RFI Conducted FCC Class B

RFI CONDUCTED	FCC CLASS B Limits dB(uV/m)	
Freq. Range	CISPR 22 Quasi-Peak	CISPR 22 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		

Table 1. FCC CLASS B Conducted Emission Limits

4.1.2 Description of Tests(Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer 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 spectrum was scanned from 30 to 300 MHz using biconical antenna, 300 to 1000 MHz using log- periodic antenna, and above 1 GHz using linearly polarized horn antennas. Final measurements were made outdoors at 10-meter test range using Dipole antennas and EMI receiver. For frequencies above 1 GHz, horn antennas were used. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The EMI receiver detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz. The EUT, support equipment, and interconnecting cables were arranged to the configuration that produces the maximum EME emission found during preliminary scan. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Horizontal and vertical antenna polarizations were checked. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/ or support equipment, and powering the monitor the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

ITE Radiated Limits			
Frequency (MHz)	**FCC Limit @ 3m. Quasi-Peak dB[μV/m]**	**FCC Limit @ 10m.* Quasi – Peak dB [μV/m]**	**CISPR Limit @ 10m. Quasi-Peak dB [μV/m]**
30-88	**40.0**	**29.5**	**30.0**
88-216	**43.5**	**33.0**	**30.0**
216-230	**46.0**	**35.6**	**30.0**
230-960	**46.0**	**35.6**	**37.0**
960-1000	**54.0**	**43.5**	**37.0**
> 1000	**54.0**	**43.5**	**43.5**
*** Limit extrapolated 20 dB/decade**			

Table 2. Radiated Class B limits @ 10-meters

5.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
LG USB Drive (EUT)	LG Electronics Inc.	LG HUD	SSNLGHUD	P.C
P.C	COMPAQ	EVO D32 OuT	DoC	EUT
MONITOR	IMAGE QUEST	L510	DoC	P.C
MONITOR ADAPTOR	C&C TECH	CE92HM	DoC	MONITOR
KEY BOARD	H.P	5181	DoC	P.C
MOUSE	Microsoft	IntelliMouse optical USB and PS/2 compatible	DoC	P.C
SERIAL MOUSE	LOGITECH	M-M28	DoC	P.C
PRINTER	H.P	C4569A	DoC	P.C
MOBILE PHONE	PANTECH & CURITEL	C500	-	EUT

5.2 Cable Description

	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
LG USB Drive	N/A	N/A	-
PC	N	N/A	1.8(P)
MONITOR	N	Y	1.8(P),1.5(D)
KEY BOARD	N/A	Y	1.8(D)
MOUSE	N/A	Y	1.8(D)
PRINTER	N	Y	1.8(P),1.8(D)
SERIAL MOUSE	N/A	Y	1.6(D)
MOBILE PHONE	N/A	N/A	-

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

5.3 Noise Suppression Parts on Cable. (I/O CABLE)

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
LG USB Drive	N	N/A	Y	PC END
MONITOR	Y	BOTH END	Y	BOTH END
KEY BOARD	N	N/A	Y	P.C END
MOUSE	Y	MOUSE END	Y	P.C END
PRINTER	N	N/A	Y	BOTH END
SERIAL MOUSE	N	N/A	Y	P.C END
MOBILE PHONE	N	N/A	N	N/A

6.1 CONDUCTED TEST DATA

HCT
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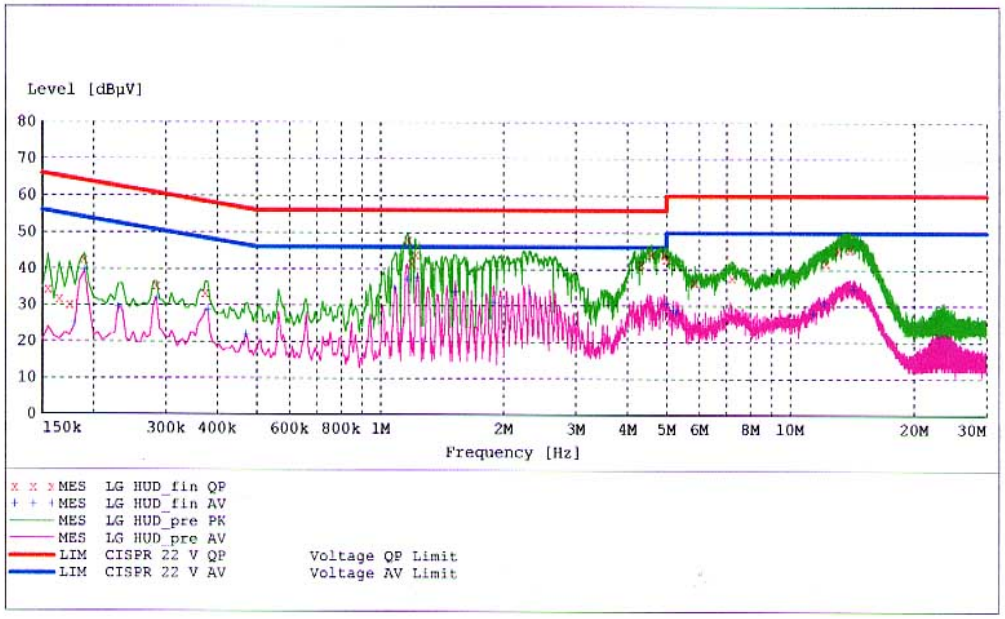
```
EUT:                    LG HUD  (1G)
Manufacturer:           LG Electronics Inc.
Operating Condition:    NORMAL
Test Site:              SHIELD ROOM
Operator:               KH-KIM
Test Specification:     KN 22 CLASS B
Comment:                N
```

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "LG HUD_fin QP"
11/23/04 8:16PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.155000	34.30	10.1	66	31.4	1	---
0.165000	31.70	10.1	65	33.5	1	---
0.175000	30.10	10.1	65	34.6	1	---
0.190000	42.70	10.1	64	21.3	1	---
0.285000	35.30	10.1	61	25.4	1	---
0.375000	33.20	10.1	58	25.2	1	---
1.170000	48.10	10.1	56	7.9	1	---
1.195000	41.50	10.1	56	14.5	1	---
1.220000	44.00	10.2	56	12.0	1	---
4.335000	41.40	10.3	56	14.6	1	---
4.595000	44.10	10.3	56	11.9	1	---
4.945000	44.20	10.3	56	11.8	1	---
5.000000	42.90	10.3	56	13.1	1	---
5.855000	36.50	10.3	60	23.5	1	---

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MEASUREMENT RESULT: "LG HUD_fin QP"
(continued)

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
7.235000	37.70	10.3	60	22.3	1	---
12.230000	41.80	10.4	60	18.2	1	---
13.085000	45.20	10.5	60	14.8	1	---
14.035000	45.60	10.5	60	14.4	1	---

MEASUREMENT RESULT: "LG HUD_fin AV"
11/23/04 8:16PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.180000	25.00	10.1	55	29.5	1	---
0.190000	39.90	10.1	54	14.1	1	---
0.230000	29.50	10.1	52	22.9	1	---
0.285000	31.90	10.1	51	18.8	1	---
0.380000	28.90	10.1	48	19.4	1	---
0.470000	22.20	10.1	47	24.3	1	---
1.085000	34.80	10.1	46	11.2	1	---
1.165000	37.20	10.1	46	8.8	1	---
1.230000	37.80	10.2	46	8.2	1	---
1.525000	33.80	10.2	46	12.2	1	---
1.895000	31.00	10.3	46	15.0	1	---
2.315000	33.70	10.3	46	12.3	1	---
5.000000	30.50	10.3	46	15.5	1	---
5.190000	28.90	10.3	50	21.1	1	---
5.270000	28.30	10.3	50	21.7	1	---
11.375000	28.10	10.4	50	21.9	1	---
12.115000	30.70	10.4	50	19.3	1	---
14.270000	34.80	10.5	50	15.2	1	---

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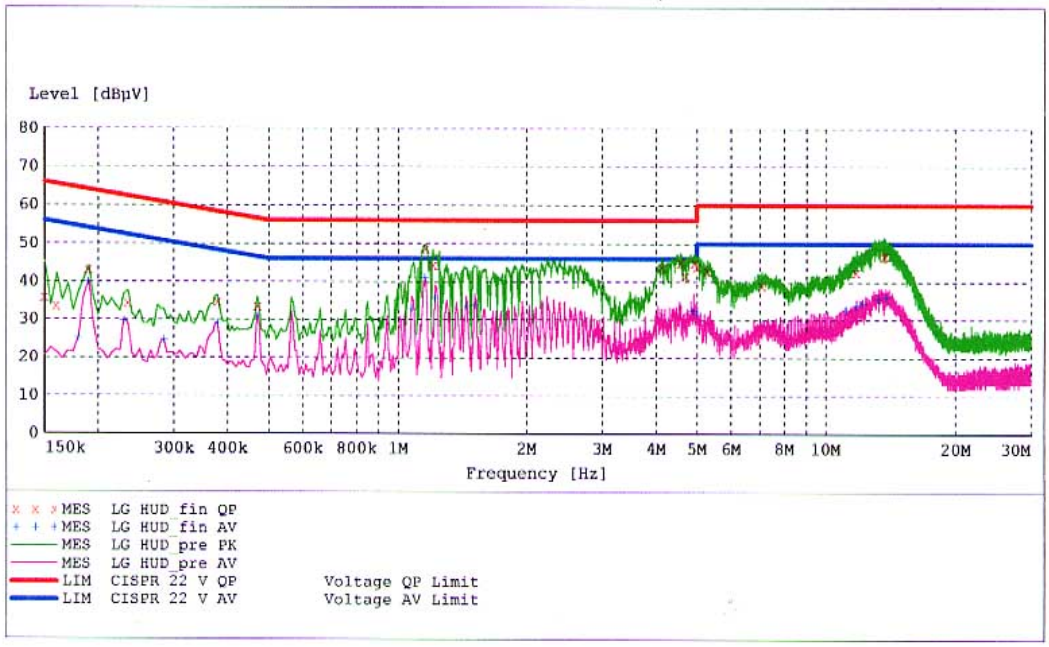
EMC TESTING Laboratory

EUT:	LG HUD (1G)
Manufacturer:	LG Electronics Inc.
Operating Condition:	NORMAL
Test Site:	SHIELD ROOM
Operator:	KH-KIM
Test Specification:	KN 22 CLASS B
Comment:	H

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "LG HUD_fin QP"

11/23/04 8:10PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	35.90	10.1	66	30.1	1	---
0.160000	33.60	10.1	66	31.8	1	---
0.190000	43.30	10.1	64	20.7	1	---
0.235000	34.40	10.1	62	27.9	1	---
0.380000	34.60	10.1	58	23.7	1	---
0.470000	33.50	10.1	57	23.0	1	---
1.165000	48.70	10.1	56	7.3	1	---
1.210000	44.30	10.1	56	11.7	1	---
4.155000	43.80	10.3	56	12.2	1	---
4.580000	45.00	10.3	56	11.0	1	---
4.705000	41.50	10.3	56	14.5	1	---
4.945000	45.00	10.3	56	11.0	1	---
5.000000	43.90	10.3	56	12.1	1	---
5.285000	43.00	10.3	60	17.0	1	---

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MEASUREMENT RESULT: "LG HUD_fin QP"
(continued)

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
7.095000	39.00	10.3	60	21.0	1	---
11.800000	42.60	10.4	60	17.4	1	---
13.690000	46.60	10.5	60	13.4	1	---
13.755000	47.00	10.5	60	13.0	1	---

MEASUREMENT RESULT: "LG HUD_fin AV"
11/23/04 8:10PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.180000	25.20	10.1	55	29.3	1	---
0.190000	40.00	10.1	54	14.0	1	---
0.230000	29.70	10.1	52	22.8	1	---
0.285000	24.70	10.1	51	25.9	1	---
0.380000	29.10	10.1	48	19.2	1	---
0.470000	31.00	10.1	47	15.5	1	---
1.080000	32.90	10.1	46	13.1	1	---
1.160000	41.10	10.1	46	4.9	1	---
1.225000	35.70	10.2	46	10.3	1	---
1.445000	33.70	10.2	46	12.3	1	---
1.515000	33.80	10.2	46	12.2	1	---
4.910000	32.50	10.3	46	13.5	1	---
5.000000	31.80	10.3	46	14.2	1	---
11.140000	32.90	10.4	50	17.1	1	---
11.800000	33.80	10.4	50	16.2	1	---
12.175000	34.40	10.4	50	15.6	1	---
13.290000	35.60	10.5	50	14.4	1	---
13.790000	36.00	10.5	50	14.0	1	---

NOTES:

1. **All modes of operation were investigated and the worst-case emissions are reported.**
2. **The CISPR RFI conducted limits are listed on Table 1 (Page 6).**

** Measurements using CISPR quasi-peak mode.

7.1 RADIATED TEST DATA

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB/m	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB/m
39.9	14.2	11.5	1.3	V	**27.0**	30	-3.0
50.1	12.4	12.4	1.5	V	**26.3**	30	-3.7
96.8	14.6	8.6	2.2	H	**25.4**	30	-4.6
144.0	8.5	12.9	2.6	V	**24.0**	30	-6.0
192.0	9.0	10.2	3.1	H	**22.3**	30	-7.7
199.8	11.9	9.7	3.2	V	**24.8**	30	-5.2
240.0	15.7	11.0	3.5	V	**30.2**	37	-6.8
279.8	15.4	12.3	3.8	H	**31.5**	37	-5.5
336.0	12.5	13.7	4.2	H	**30.4**	37	-6.6
359.8	11.4	14.1	4.4	V	**29.9**	37	-7.1
433.0	9.8	16.3	4.8	H	**30.9**	37	-6.1
466.4	9.4	16.9	4.9	H	**31.2**	37	-5.8

Radiated Measurements at 10-meters.

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported.

2. The radiated limits are listed on Table 2 (Page 8).

** AFCL = Antenna Factor (Roberts dipole) and Cable Loss .

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

8.1 Sample Calculations

dB □ = **20 log** $_{10}$ **(**□**)**

dB □ = **dBm + 107**

8.2 Example 1:

@ 0.51 MHz

Class B limit	=	56 dB □
Reading	=	46.1 dB □ (calibrated level)
Margin	=	46.1 - 56 = - 9.9 dB □
	=	**9.9 dB below limit**

8.3 Example 2:

@ 716.1 MHz

Class B limit	=	37 dB □
Reading	=	3.3 dB □ (calibrated level)
Antenna Factor + Cable Loss	=	28.7 dB □
Total	=	32 dB □
Margin	=	32 - 37 = - 6.2 dB □
	=	**6.2 dB below limit**

9.1 Test Equipment

Type	Manufacture	Model Number	CAL Due Date
EMI Test Receiver	Rohde & Schwarz	ESI40	2005.11.16
EMI Test Receiver	Rohde & Schwarz	ESVS30	2005.07.15
LISN	Rohde & Schwarz	ESH2-Z5	2005.07.28
LISN	EMCO	3825/2SH	2005.08.10
Tri-Log Antennas	Schwarzbeck	VULB9160	2005.04.06
Antenna Position Tower	HD	MA240	N/A
Turn Table	EMCO	1050	N/A
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360AMX	2005.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A

10.1 Test Software Used

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disc, was inserted into drive A and is auto starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is :(1) Display test, (2) RS 232 test (3) Key board test,(4) Printer test,(5) FDD test,(6) HDD test. The complete cycle takes about 20 seconds and is repeated continuously. As the keyboard and mouse are strictly input devices, no data is transmitted to them during test. They are however, continuously scanned for data input activity. The video resolution modes setup and change program was used during the radiated and conducted emission testing.

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

11.1 Conclusion

The data collected shows that the **LG Electronics Inc. LG USB Drive FCC ID : SSNLGHUD** complies with §15.107 and §15.109 of the FCC Rules.