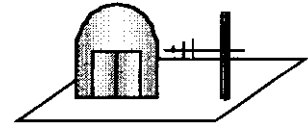


MEASUREMENT REPORT



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.

Company Name :	LG Electronics Inc.
Address:	19-1, Cheongho-Ri, Jinwuy-Myon Pyungtaek-Shi, Kyunggi-Do 451-713 KOREA
Attention:	Mr. Harris Ahn, General Manager Multimedia Standards Team

<ul style="list-style-type: none">· FCC ID· Trade Name· Model· EUT Type· Data Transfer Rate· Cable(s)· Rule Part(s)· Class· Test Procedure:· Dates of Tests:· Place of Tests:· Test Report S/N:	<p>BEJCRD-8322B</p> <p>LG or GoldStar</p> <p>CRD-8322B</p> <p>E - IDE Device - Internal CD-ROM Drive</p> <p>Max. 4800 k Bytes/sec (32x speed CD-ROM)</p> <p>Unshielded flat ribbon cable</p> <p>FCC Part 15 Subpart B</p> <p>B Digital Device / Peripheral (JBP)</p> <p>ANSI C63.4 (1992)</p>
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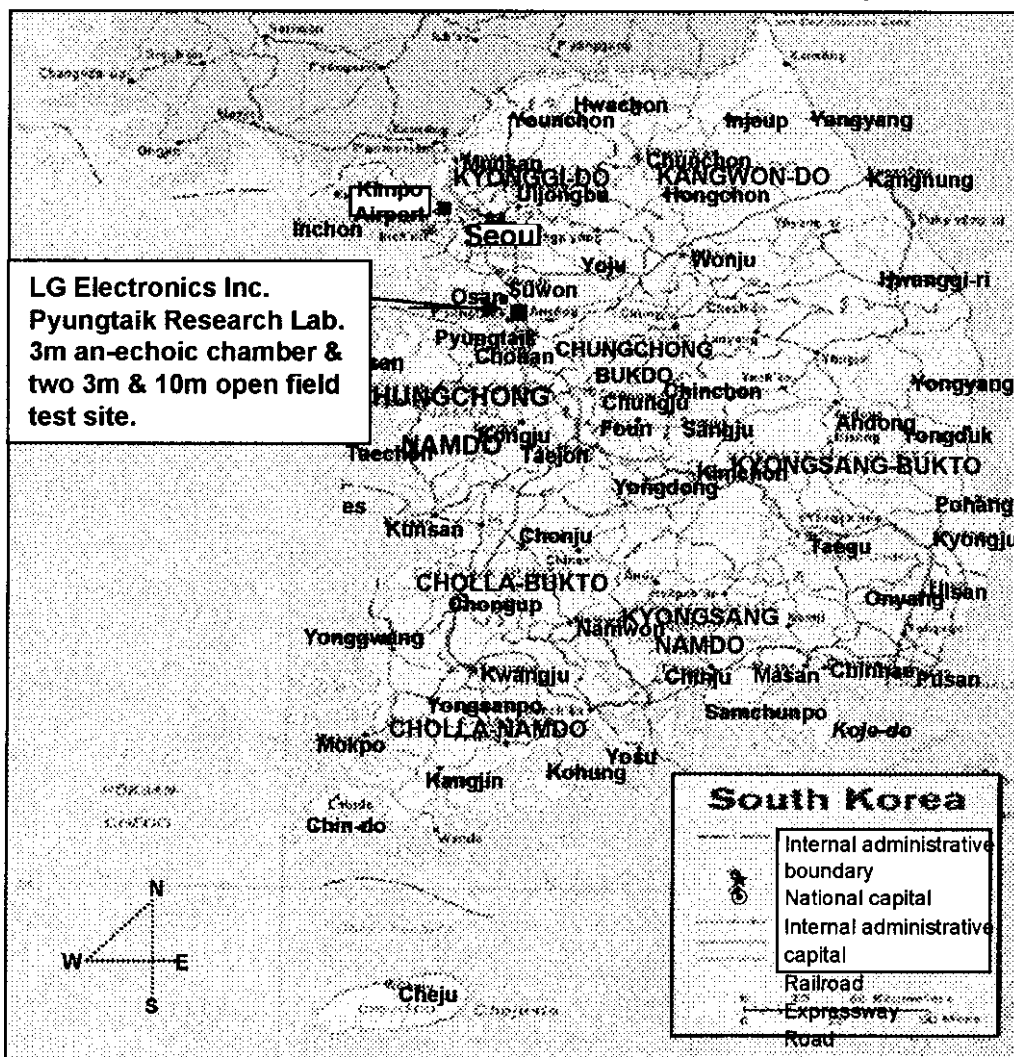
Introduction

1. Test Specification, Method & procedures

To determine the Radiated and Conducted Emission emanating from LG Electronics Inc. 32x E-IDE Internal CD-ROM Drive **FCC ID: BEJCRD-8322B**, The measurement procedure describer in American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9KHz to 40 GHz (ANSI C63.4-1992)was used.

2. Location of testing facility

It takes about an hour from Seoul by car. The distance is approximately 50km.



Note: The detailed description of measuring facility was found to be in compliance with Federal Communications Commission requirements of § 2.948 according to ANSI 63.4 on June 09,1997

Product Information

Equipment Description:

The Equipment Under test (EUT) is the LG Electronics, Inc. **Internal CD-ROM Drive**
FCC ID : BEJCRD-8322B
The Model of LG or GoldStar is CRD-8322B
The EUT is a 32-speed Enhanced-IDE CD-ROM reader unit.

Chipset(s)	Sony (CXD3022R) Sony (H8/3397)
Crystal / Oscillator(s)	33.86MHz, 16.93MHz
Max. Data Transfer Rate:	4800kBytes/sec (32xspeed CD-ROM)
Access Time:	Average 150ms (1/3 Stroke CD-ROM)
Data Capacity	553 MB(Mode 1), 635 MB(Mode 2)
Buffer Size:	128 kBytes
Features:	Headphone Jack, Volume (headphone), Disc Drawer, Play/Skip Button, Busy LED Indicator, Open/Close/Stop Button, Emergency Eject Hole
Connector(s)	Front Panel:Headphone Jack Rear panel : Digital Audio Output connector Analog Audio Output connector Master/Slave/CSEL Jumpers (3) 40-pin E-IDE interface connector Power-in connector
Cable(s)	Unshielded flat-ribbon data cable

EMI suppression device(s) installed in production:

* see schematics (Appendix B)

EMI suppression device(s) added and/or modify during testing:

*none

Description of Test

Conducted Emission

The measurement for power-line conducted emissions from EUT was made in 9m x 6m x 3m shielded enclosure manufactured by LINDEN RF ENCLOSURES. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6.

The EUT was placed on 1m. x 1.5m. Wooden table 80cm. High which is placed on the earth-grounded conducting surface larger than 2 square-meter. The vertical conducting surface was located 40cm to the EUT.

During conducted emissions measurement, The receiver (ESH-3, Rohde & Schwarz) that has a CISPR quasi-peak detector with 9 KHz bandwidth of 6 dB was utilized and scanned from 450 kHz to 30 MHz.

Kyoritsu Model KNW-407 and EMCO Model 3725/2 (10KHz-30MHz) 50 Ω /50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room. The EUT is powered from the Kyoritsu LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by LINDGREN shielded enclosure filter (120dB 150KHz-1GHz).

If the EUT is a DC-powered device, power will be driver from the source power supply it normally will be powered from and this supply lines will be connected to the Kyoritsu LISN.

All interconnecting cables more than 1 meter were shortened by non -inductive bundling back-and -forth form to a 1-meter length. Sufficient time for the EUT, support equipment, and test equipment was allowed the frequency producing the maximum EME from the EUT.

The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Appendix C. Each EME reported was calibrated using internal signal generator.

Radiated Emission

Preliminary measurements were performed in the 3m an-echoic chamber using broadband antennas, EMI receiver (ESMI, Rohde & Schwarz) to determine the emissions characteristics of the EUT. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found. The receiver was scanned from 30 to 1000MHz using bi-log antenna. Above 1 GHz, a horn antenna is used.

Final measurements were made at 3-meter open area test site using broadband bi-log antenna in range of 30 - 1000 MHz, which is correlatable to levels obtained with a tuned dipole antenna. For emissions above 1000 MHz, horn antenna may be used. Measurements were also made for both horizontal and vertical polarization. The horizontal distance between the receiving antenna and the closest periphery of the EUT was 3 meters as described in 8.2.3 of ANSI C 63.4-1992.

Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field strength meter (ESVP, Rohde & Schwarz) and the bandwidth of the receiver was set to 120kHz or 1 MHz depending on the frequency or type of signal.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 80 Cm high non-metallic 1x 1.5 meter table. Each Type of accessory provided by manufacture or typical used and support equipment, and interconnecting cables were connected to the EUT during measurement to the typical usage and applicable nearly as practicable.

The turn table containing the system was rotated and antenna height was varied 1 to 4 meters to find worst-case emissions from EUT.

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 from the floor mounted outlet box and the computer aux AC outlet, if applicable, and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Appendix C. Each EME reported was calibrated using internal signal generator.

Support Equipment Used

1. HP Pavilion Computer (with ATI On-Board Video)	FCC-DoC Model:8140 1.8 m. unshielded power cord	S/N:US72953145
IPC Sound Card	FCC ID :K33IFISP32?	
LG Electronics CD-ROM Drive	FCC ID : BEJCRD-8322B 0.6 m. shielded audio cable 0.5 m. unshielded input cable(terminated) 0.5 m. unshielded IDE flat cable FCC ID:n/a (Model: n/a)	(EUT) S/N: none
LG Earphone	1.0 m. shielded wire	
2. LG Electronics Monitor	FCC ID: BEJSC546 1.8 m. unshielded power cord 1.0 m. shielded cable (bundled)	S/N:611KG00002
3. HP Printer	FCC UD: BS46XU2225C 1.8 m. unshielded power cord 1.0 m. shielded cable (bundled)	S/N: 2540S40053
4. Epson Modem	FCC ID: BKM552C202A 1.8 m. unshielded DC power cord 1.2 m. shielded cable (bundled)	S/N:010173
5. HP Mouse	FCC ID: DZL211029 2.0 m. shielded cable	S/N: LZA72566942
6. HP Keyboard	FCC Doc Model:SK-2505 2.0 m. shielded cable	S/N: M970655122

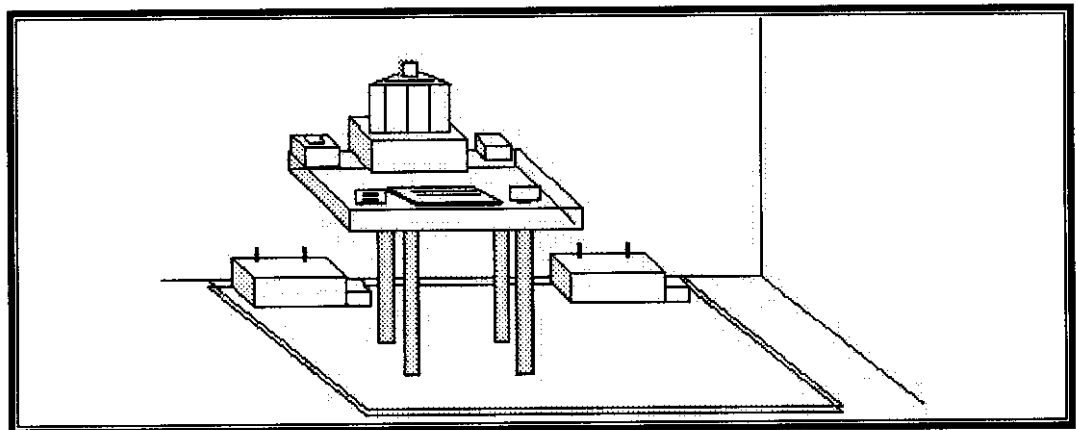


Fig. 10 System Setup.
(See Appendix C - Test Photographs for actual system setup.)

Test Data

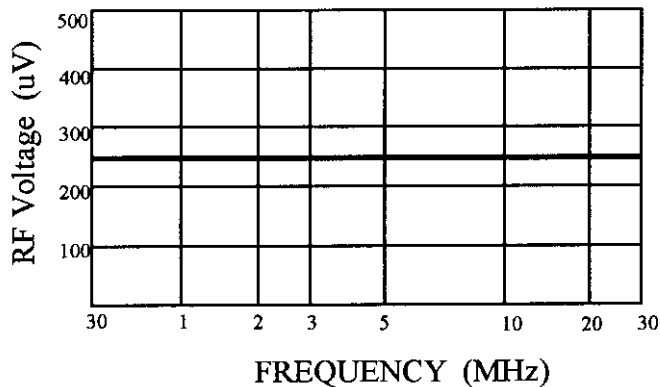
Conducted Emissions

Freq. (MHz)	Level* (dBuV)	Pol. (H/V)	F/S (uV/m)	Limit (uV/m)	Margin*** (dB)
0.65	30.2	A	32.4	250	-17.8
1.18	31.1	A	35.9		-16.9
1.62	32.0	A	39.8		-16.0
2.58	30.2	A	32.4		-17.8
7.90	36.2	B	64.6		-11.8
15.76	33.2	B	45.7		-14.8

Table 1. Conducted Emissions Measurements

(See Data under PLOTS- Next Pages)

Sample Calculation at 7.90 MHz : $10^{(36.2)/20} = 64.6 \text{ uV}$
 Margin : $36.2 - 47.96 = -11.8$



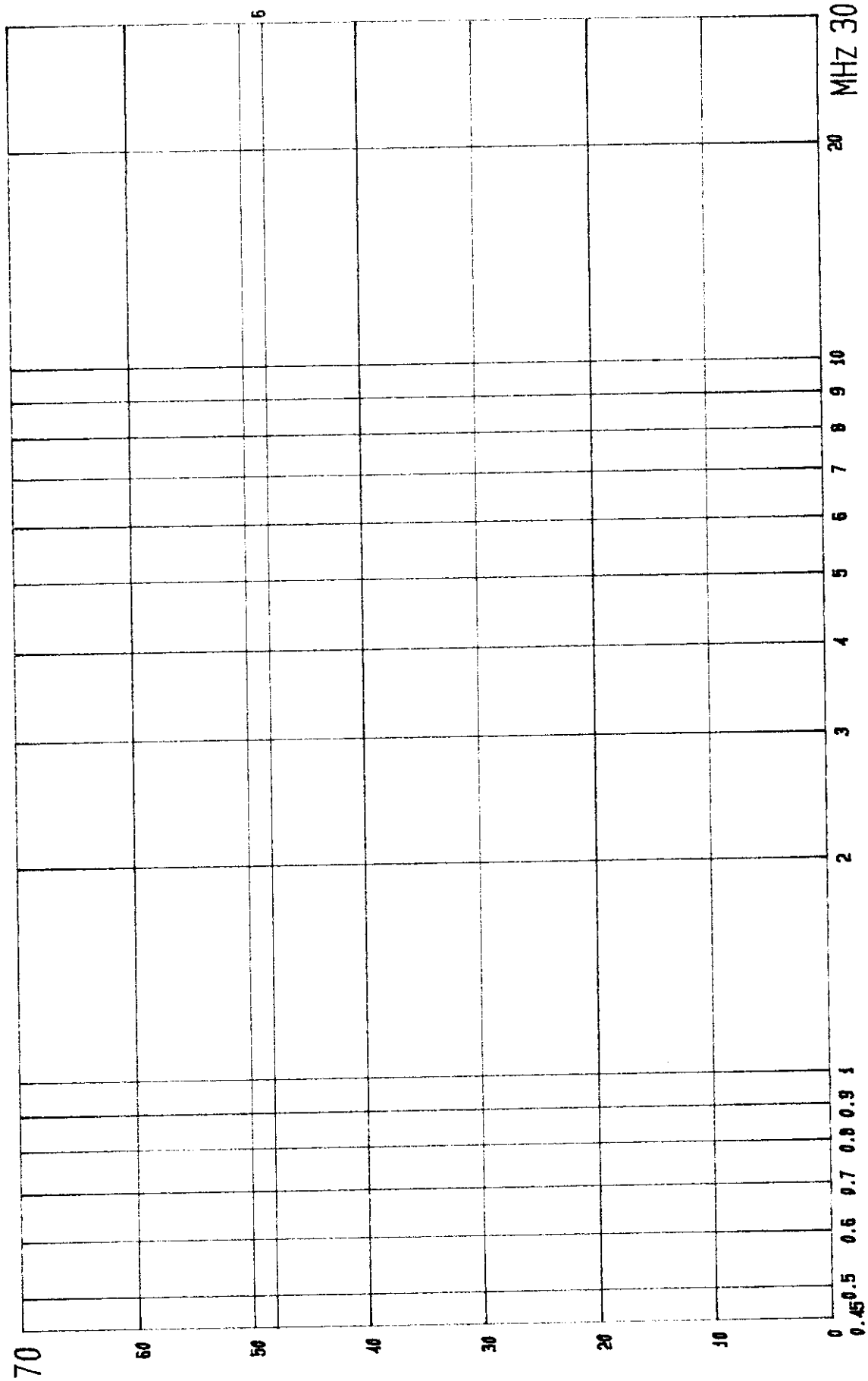
NOTES:

1. All modes of operations were investigated and worst- case emissions are reported.
2. The limit for Class B device is 250 μV from 450khz to 30MHz.
3. Line A = Phase Line B = Neutral

Fig. 11. Limits

* All readings are calibrated by internal signal generator.
 ** Measurements using CISPR quasi-peak mode.

dBuV

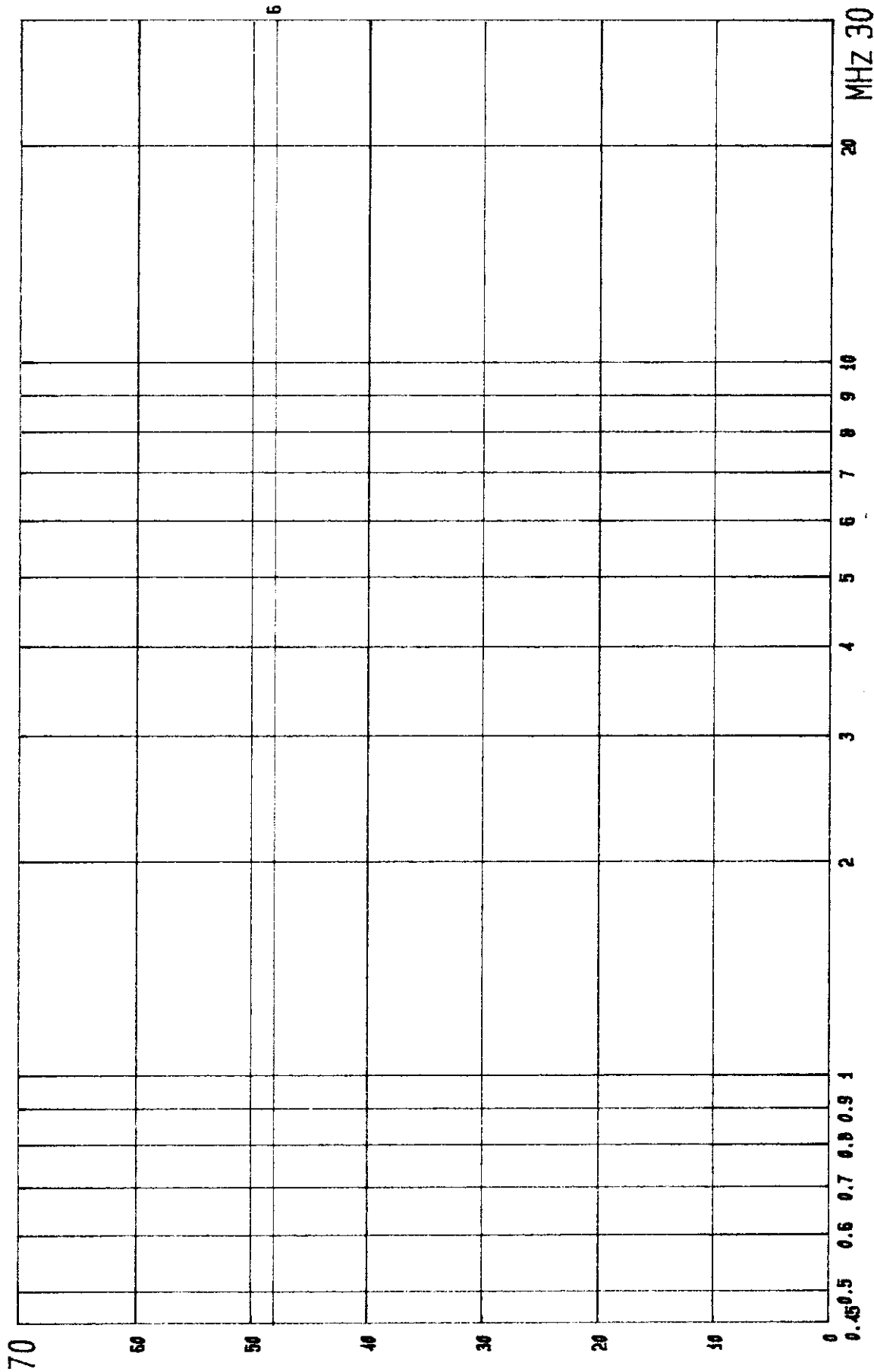


CONDUCTED EMISSIONS TEST

MODEL: CAD-8322B (INT. CD-ROM)
FCC ID: BEJCAD-8322B

LINE B

dBuV



CONDUCTED EMISSIONS TEST

MODEL: CRD-8322B (INT. CD-ROM)
FCC ID: BEJCRD-8322B

LINE A

Test Data

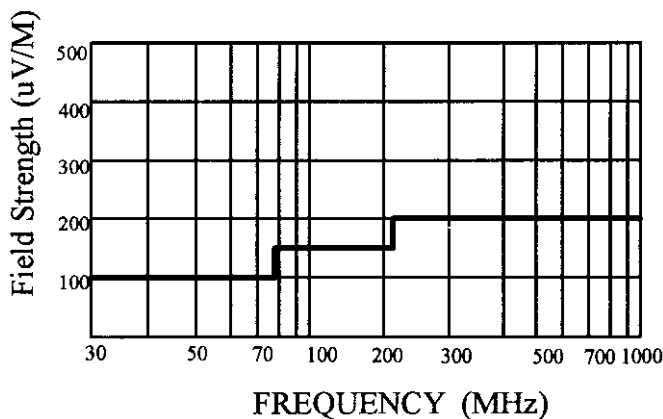
Radiated Emissions

Freq. (MHz)	Level* (dBuV)	AFCL** (dB)	Pol. (H/V)	F/S (uV/m)	Limit (uV/m)	Margin*** (dB)
233.9	20.6	15.5	H	63.8	200	-9.9
267.6	21.1	16.0	V	71.6	150	-6.4
400.6	12.5	19.8	H	41.2	150	-11.2
535.8	13.1	23.1	V	64.6	200	-9.8
580.9	12.9	24.9	H	77.6	200	-8.2
829.8	8.5	28.3	V	69.2	200	-9.2

Table 1. Radiated Measurements at 3-meters.

(See Data under Graphics- Next Pages)

* Sample Calculation at 580.9 MHz : $10^{\{(12.9 + 24.9)/20\}} = 77.6 \text{ uV}$
 Margin : $(12.9 + 24.9) - 46.0 = -8.2$



NOTES:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The radiated limits are shown on Figure 11. Above 1GHz the limit is 100uV/m.

Fig. 12. Limits at 3meters

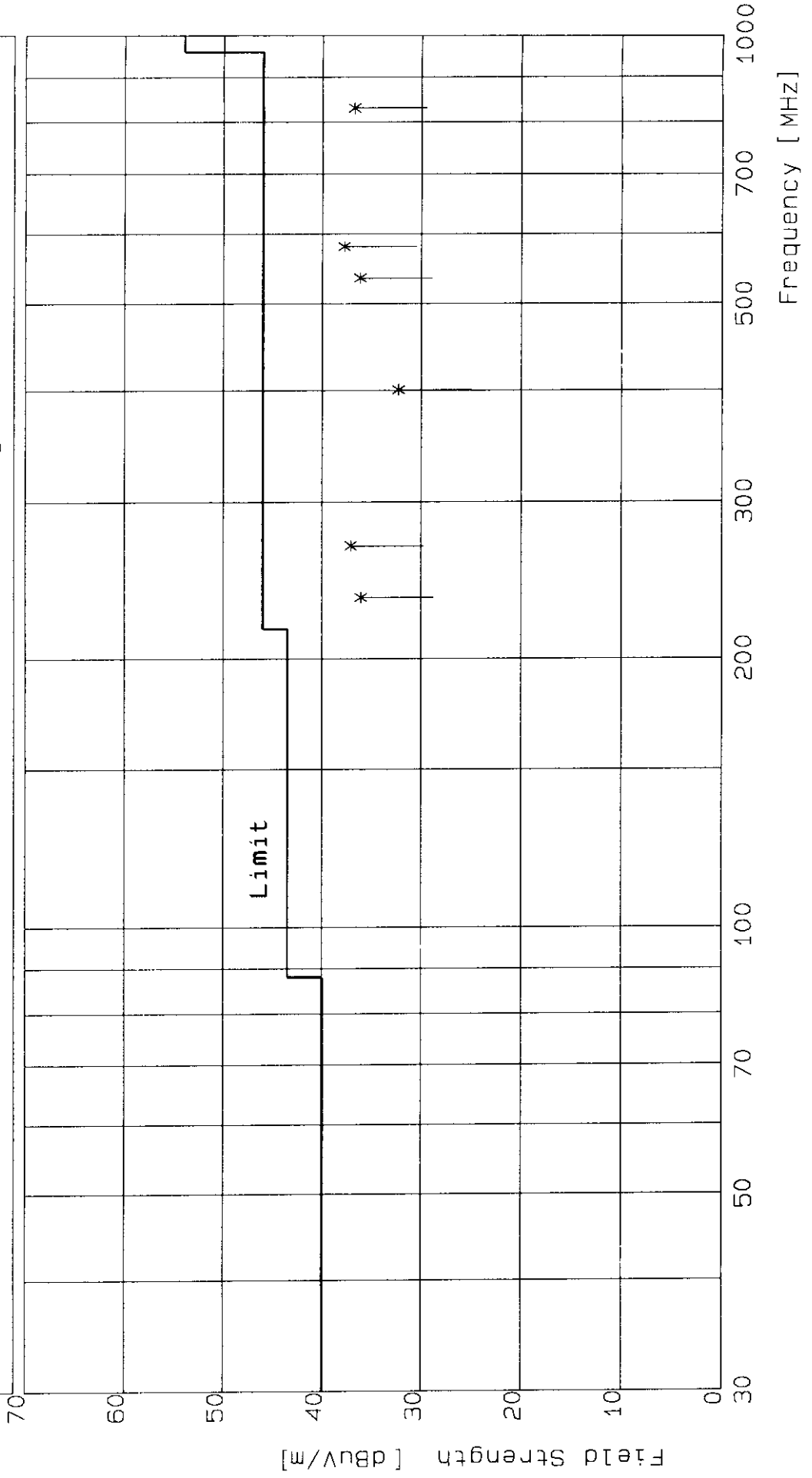
* All readings are calibrated by internal signal generator.
 ** AFCL = Antenna Factor and Cable Loss.
 *** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

RADIATED EMISSIONS (30-1000MHZ)

Model No. : CRD-8322B FCC ID No. : BEJCRD-8322B

Test distance : 3 m

Remark : All other emissions are non-significant



Test Equipment

Type	Model	Cal. Due Date	S/N
EMI measurement system	R&S, ESMI	08/29/98	846064/004
Test receiver	R&S, ESVP	07/05/98	840688/020
Test receiver	R&S, ESH-3	07/05/98	860950/013
Spectrum monitor	R&S, EZM		862304/008
Spectrum monitor	R&S, EZM		862304/006
Spectrum analyzer	HP8568B	07/03/98	3107A01571
Quasi-peak adaptor	HP85650A	07/03/98	3107A01517
RF Pre-selector	HP85685A	07/03/98	3107A01237
Pre-amplifier	HP8447F(BNC- type)	07/03/98	2805A02879
Pre-amplifier	HP8447F(N-type)	07/01/98	3113A05259
Pre-amplifier	HP8447C(N-type)	07/03/98	1937A00732
RF Signal Generator	Fluke, 6060B	07/03/98	5655209
IRE STD. Signal Generator	Shibasoku, VG40A	03/05/98	M-56221002
TV CH. Signal Generator	Shibasoku, 363US		M-14817005
TV CH. Signal Generator	Shibasoku, 363VS		M-12762002
NTSC Pattern Generator	Leader, LCG-400	01/14/98	705008
VITS Generator	Anritsu, MG318A	10/03/98	M11122
VITS Generator	Anritsu, MG318A	02/23/98	M10478
Tuned Dipole Antenna	EMCO, 3121C	04/16/98	9160-620
Tuned Dipole Antenna	EMCO, 3121C	04/16/98	9160-621
VHF Dipole Antenna	S/B, VHA9103		N/A
UHF Dipole Antenna	S/B, UHA9105		N/A
Bi-Log Antenna	Chase, CBL611A	08/27/98	1838
Bi-Log Antenna	Chase, CBL611	04/16/98	1235
Biconical Antenna	S/B, BBA9106	01/27/98	N/A
Biconical Antenna	S/B, BBA9106	01/27/98	N/A
Log-periodic Antenna	S/B, UHAL9107	01/27/98	N/A
Log-periodic Antenna	S/B, UHAL9107	01/27/98	N/A
Horn Antenna	S/B, BBA 9102-B		106
IEC-106 Antenna	HFU2-Z4		N/A
Absorbing Clamp	R&S, MDS21		860846/004
Absorbing Clamp	R&S, MDS21		301116/072
LISN	Kyoritsu, KNW-407	04/14/98	8-6555-4
LISN	Shibasoku, 563		55416001
LISN	S/B, NSLK8126		862770/013
LISN	EMCO,3825/2	04/10/98	881741/014

Recommendation/Conclusion

The data collected that the LG Electronics, Inc. (Goldstar Model : CRD-8322B) E-IDE Internal DVD-ROM Drive **FCC ID: BEJCRD-8322B** complies with § 15.017 and 15.109 of FCC Rules. The highest emission observed was at 7.90 MHz for conducted emissions with a margin of -11.8dB, and at 267.6 MHz for radiated emissions with a margin -6.4dB.