

FCC PART 15 CLASS B EMI MEASUREMENT AND TEST REPORT

FOR

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Kyonggi-Do 422-819, KOREA

MODEL: NLM155A1

Issued Date: February 2, 2001
Report No.: THRU-F010202B

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: LCD Monitor NLM155A1
Test Date: February 1, 2001	
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1 - General Information

1.1 Test Facility

The open area test site used by Thru Lab. & Engineering to collect radiated and conducted emissions measurement data is located in the 389 JeArm-Rhi, HyangNam-Myun, HwaSung-Gun, KyungKi-Do, Korea.

Test sites at Thru Lab. & Engineering has been fully described in reports submitted to the Federal Communication Commission and the details of the reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The test facility also complies with the radiated and AC line conducted test site criterion in ANSI C63.4-1992.

The Federal Communications Commission has the reports on file and is listed under Registration Number 92583. Thru Lab. & Engineering is a Test Facility. The scope of the accreditation covers the FCC Method - 47 CFR Part 15 or 18 of the Commission's Rules.

1.2 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, 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.

All radiated and conducted emissions measurements were performed at Thru Lab. & Engineering. The radiated testing was performed at an antenna-to-EUT distance of 10 meters for Class A devices and 3 meters for Class B devices.

1.3 Test Equipment List

Description	Model Number	Serial Number	Manufacturer	Cal. Due Date
EMI Test Receiver	ESVS 10	830489/001	Rohde & Schwarz	2001.05.17.
Spectrum Analyzer	R3261C	71720189	Advantest	2001.10.04.
Biconical Antenna	94455-1	0977	Eaton	2001.05.17.
Log Periodic Antenna	3146	2051	EMCO	2001.05.17.
Dipole Antenna Set	TDA25/TDS25.1/2	176/200/200	Electro Metrics	2001.10.4.
LISN	KNW-242	8-923-2	Kyoritsu	None
LISN	8012-50-R-24	8379121	Solar	None
Plotter	7475A	2210A 02802	Hewlett Packard	None
Signal Generator	SMS	8721651100	Rohde & Schwarz	None

1.4 Product Description for Equipment Under Test (EUT)

Newcomm World Co., Ltd.'s NLM155A1 or the "EUT" as referred to in this report is a display device which transforms analogue signals of graphic inputs (video signals of VGA, SVGA and XGA) into digital signals and displays them on LCD panel. The user can select OSD Menu items by using external keypad to adjust each value of monitor for the best display.

Main Features of EUT are:

- Resolution: 1024×768 XGA
- Color: 262,144 colors
- Brightness: 200 cd/m²
- Contrast Ratio: 200:1 typical
- Frequency: Horizontal: 30~70 kHz, Vertical: 56~85 Hz
- Signal Level: 0.7 Vp-p
- Panel Type: Amorphous Si TFT-LCD
- Diagonal Length: 15.1" (383.54 mm)
- Power Voltage: AC 100~240V, 60/50Hz, DC 12V/4.5A
- Power Consumption: Standard: 30 watts, Save Mode: 5 watts
- Audio Output: 2 + 2 watts at 1kHz

1.5 Equipment Under Test (EUT)

Description	Model Number	Serial Number	Manufacturer	Remarks
LCD Monitor	NLM155A1	none	Newcomm World	15.1" TFT

1.6 Support Equipment

Description	Model Number	Serial Number	Manufacturer	Remarks
Host Computer	ART586C	TRL0080730	Art Computer	ATX
Keyboard	BTC-5560	K71200885	BTC Korea	PS/2
Mouse	Mouse 2.0	02873445	Microsoft Corp.	PS/2
Printer	C2605	3221S66649	Hewlett Packard	300dpi
Modem	SM1200A1	71000230	Samsung Electronics	1200bps
Zip Drive	Z100USB	PSBL35F137	Iomega Corp.	USB
Power Supply	LSE9901B1260	2K2400470	Lishin International	for Monitor
Monitor	NLM155A1	none	Newcomm World	EUT

1.7 Host System Configuration

Description	Model Number	Serial Number	Manufacturer	Remarks
Power Supply	ST-250GL	S008016533	Seventeam Electronics	250W
Motherboard	Richmond AGP	LA700937	Sambo Computer	ATX
Video Adapter	Delphino 128	DP128A03282	Dooiin Electronics	AGP
Hard Drive	PLS-31084A	JQXG917701	Samsung Electronics	1.08GB
Floppy Drive	SFD-321D/T	J2YD611113	Samsung Electronics	3.5"
CD-ROM Drive	SCR-831	63PH400104	Samsung Electronics	8X
CPU	Pentium MMX	None	Intel Corp.	233MHz
Memory	SDRAM	None	Samsung Electronics	64MB
Host Chassis	ART586C	TRL0080730	Art Computer	Middle Tower

1.8 External I/O Cabling

Description	Length(m)	Port/From	To/Port	Remarks
Video Cable	1.2	VGA/Host	Monitor/Dsub	Shielded
Keyboard Cable	1.8	Keyboard/Host	Keyboard	Shielded
Mouse Cable	2.0	Mouse/Host	Mouse	Shielded
Printer Cable	1.5	Parallel/Host	Printer/Centronics	Shielded
Modem Cable	2.0	Serial/Host	Modem/RS232	Shielded
USB Cable	1.0	USB/Host	Zip Drive/USB	Shielded

2 - System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user). Worst case conducted and radiated emissions are presented in section 3.5 and section 4.6 of this report.

The test was performed with a AGP video adapter for the final qualification test. The Video Input connector (VGA/DB15) provided by the EUT, Video port (VGA/DB15), PS/2 Keyboard/Mouse ports (miniDIN), Parallel port (LPT/DB25), Serial port (COM/DB9) and USB port provided by the host computer were also tested.

2.2 EUT Exercise

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, GWBASIC contained on a floppy diskette, is starting on the XGA (1024x768) display mode running Windows 98 operating system. Once exercising program software loaded, the program sequentially exercises each system component.

The sequence used is as follows:

- (1) Lines of "H"s are printed on the monitor.
- (2) The printer outputs "H"s.
- (3) A signal was sent to the COM port and USB port.

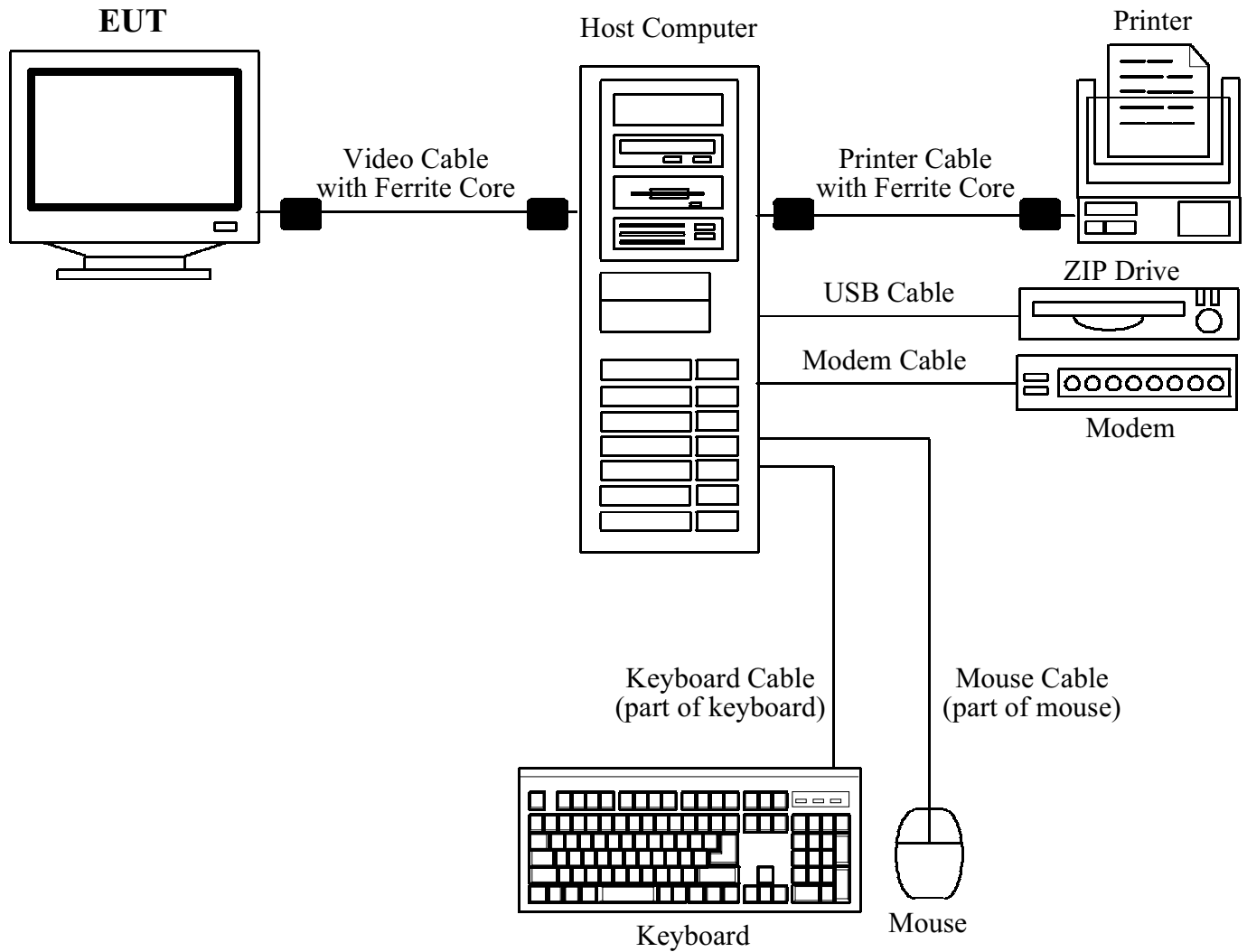
2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied or by use respective component manufacturers. The Printer, Modem and Monitor featured shielded metal connectors.

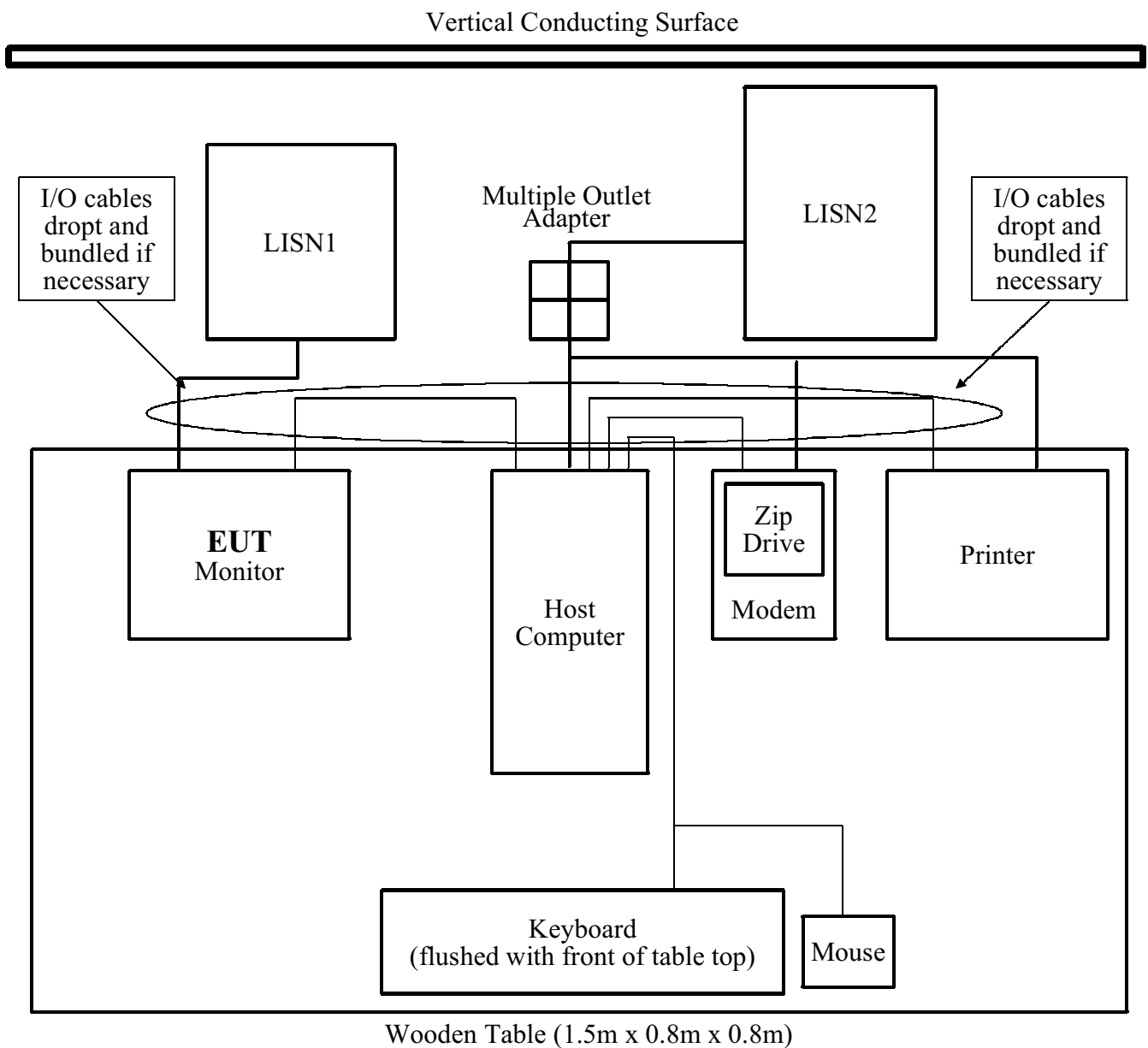
2.4 Schematics/Block Diagram

The EUT schematic or block diagram is presented in Appendix B as reference.

2.5 Configuration of Test System



2.6 Conducted Emissions Test Setup Block Diagram



3 - Conducted Emissions Test

3.1 EUT Setup

The measurement was performed in the screen room of test site, using the setup in accordance with ANSI C63.4-1992 conducted emissions measurement procedure.

The host computer was placed on the center and back edge of the test table. The EUT (LCD Monitor) was placed on one side of the host computer with the modem, zip drive and printer on the other side. The rear of the EUT and all support equipments were flushed with the rear and sides of the tabletop. The keyboard was placed in front of the host computer, flushed with the front of the tabletop. The mouse was placed flushed with the back of the keyboard.

Spacing between the peripherals was approximately 10 centimeters.

3.2 Test Equipment Setup

The spectrum analyzer was configured during the conduction test in as follows:

Start Frequency	450kHz
Stop Frequency	30MHz
Sweep Speed	Auto
IF Bandwidth	100kHz
Video Bandwidth	100kHz

3.3 Test Procedure

During the conducted emissions test, the EUT power cord was connected to the auxiliary outlet of the LISN1, and host computer power cord and all other peripherals power cords were connected to the multiple outlet adapter of the LISN2.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emissions was found to be marginal (less than -4dBuV). Quasi-peak readings are distinguished with a "QP".

The conducted emissions test was performed with EUT exercise program loaded, and the emissions were scanned between 0.45MHz to 30MHz on the LINE side and NEUTRAL side, herein referred to as L and N, respectively. The final test data for this test configuration is recorded in the table listed under section 3.5 of this report.

3.4 Summary of Test Results

According to the data in section 3.5, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin reading of:

-16.1dB at 1.172MHz in the LINE side with the Lishin International, Model LSE9901B1260 power supply.

3.5 Conducted Emissions Test Data

Line Conducted Emissions				FCC Part15 Class B		
Frequency (MHz)	Amplitude (dBuV)	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit		Margin (dB)
				(dBuV/m)	(uV/m)	
0.457	25.6	QP	L	48.0	250	-22.4
0.534	25.5	QP	L	48.0	250	-22.5
0.600	27.6	QP	N	48.0	250	-20.4
0.835	26.1	QP	L	48.0	250	-21.9
0.914	28.0	QP	L	48.0	250	-20.0
1.001	28.4	QP	N	48.0	250	-19.6
1.712	31.9	QP	L	48.0	250	-16.1
1.278	33.1	QP	L	48.0	250	-14.9
4.685	30.3	QP	L	48.0	250	-17.7
5.180	29.9	QP	N	48.0	250	-18.1
13.547	27.8	QP	N	48.0	250	-20.2
16.665	28.2	QP	L	48.0	250	-19.8

3.6 Plot of Conducted Emissions Test Data

Plot(s) of conducted emissions test data for the Lishin International, Model LSE9901B1260 power supply is presented in Appendix A of this report as reference.

4 - Radiated Emissions Test

4.1 EUT Setup

The radiated emissions tests were performed in the open area test site, using the setup in accordance with ANSI C63.4-1992 radiated emissions measurement procedure.

The host computer was placed on the center of the test table. The EUT (LCD Monitor) was placed on one side of the host computer with the modem, zip drive and printer on the other side. The keyboard was placed in front of the host computer, flushed with the front of the tabletop. The mouse was placed flushed with the front of the keyboard.

Spacing between the peripherals was approximately 10 centimeters.

4.2 Test Equipment Setup

During the radiated emissions test, the EMI test receiver was set with the following configurations:

Start Frequency	Manual
Stop Frequency	Manual
IF Bandwidth	120kHz
Sweep Time	10msec
Sweep Speed	Auto

4.3 Test Procedure

For the radiated emissions test, the EUT and all support equipments power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to verify that the EUT complied with all installation combination.

The radiated emissions test was performed with EUT exercise program loaded, and the emissions were scanned between 30MHz to 1000MHz. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum emission levels. Measurements were taken using both HORIZONTAL and VERTICAL antenna polarization. The final test data for this test configuration is recorded in the table listed under section 4.6 of this report.

4.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude is calculated by adding the antenna and cable Correction Factor from the Indicated Amplitude reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Amplitude} + \text{Antenna Correction Factor} + \text{Cable Correction Factor}$$

The Margin column of the data table in section 4.6 indicates the degree of compliance with the applicable limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Applicable Limit}$$

4.5 Summary of Test Results

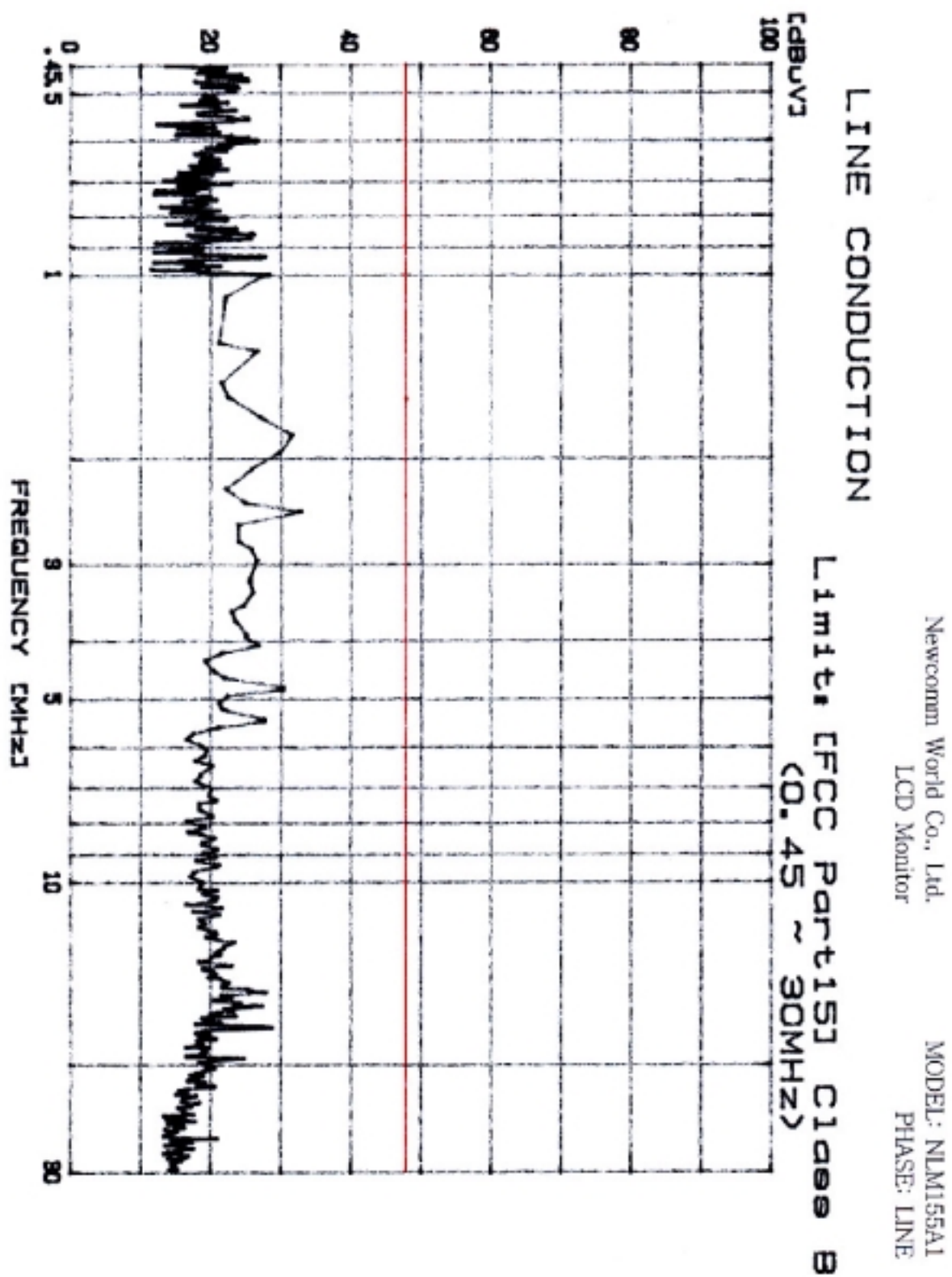
According to the data in section 4.6, the EUT complied with the FCC Part 15 Class B standards, and had the worst margin of:

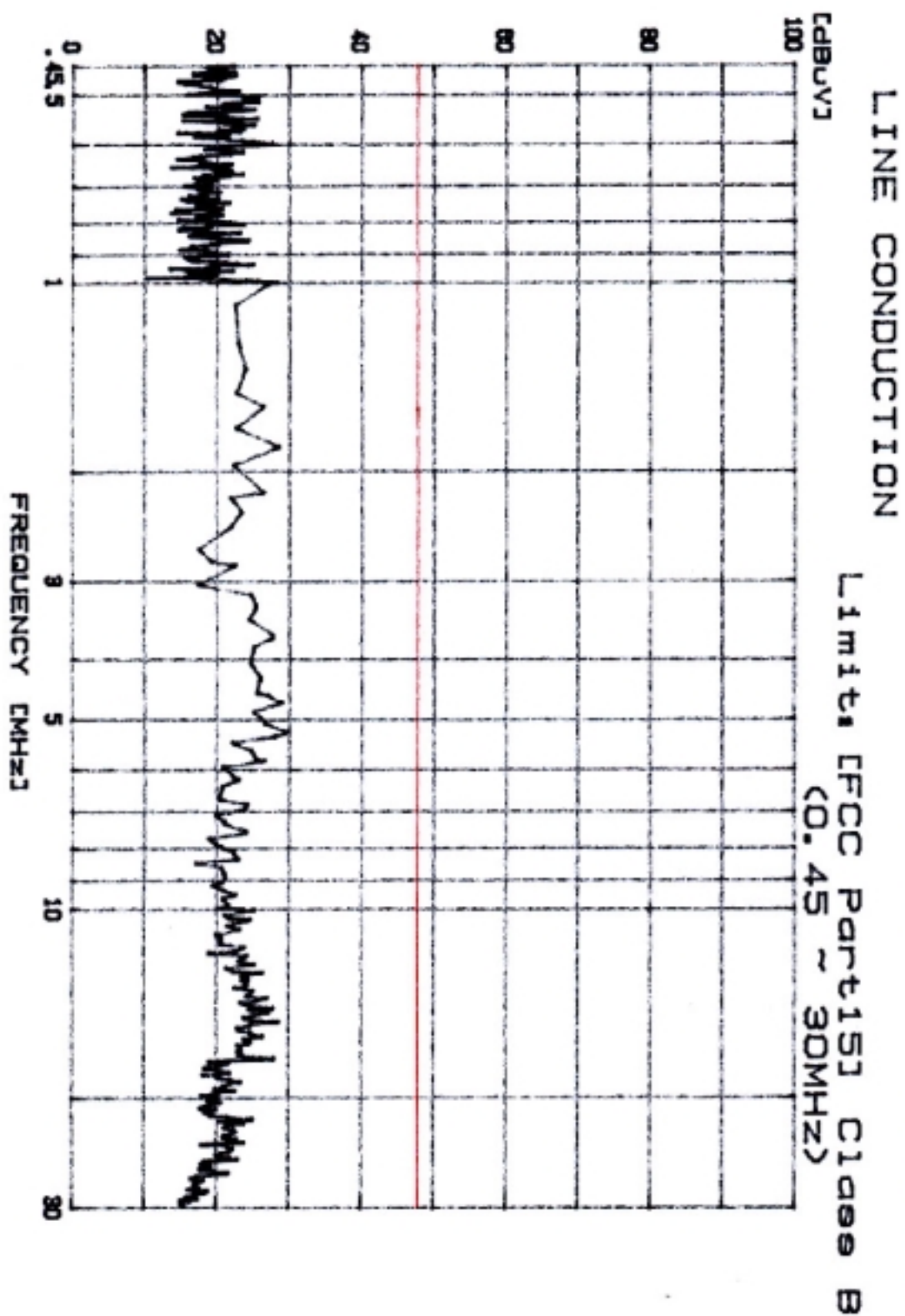
-3.0dB at 582.80MHz in the VERTICAL polarization at an antenna-to-EUT distance of 3 meters.

4.6 Radiated Emissions Test Result Data

Indicated		Antenna		Table	Correction Factor		Corrected Amplitude	FCC Part15 Class B		
Freq. (MHz)	Ampl. (dBuV/m)	Polar. (H/V)	Height (m)	Angle (deg.)	Ant. (dB)	Cable (dB)	(dBuV/m)	Applicable Limit		Margin (dB)
								(dBuV/m)	(uV/m)	
60.62	16.7	H	4.0	180	6.7	0.9	24.3	40.0	100	-15.7
66.10	23.9	H	1.3	310	5.4	1.0	30.3	40.0	100	-9.7
70.06	23.2	V	1.5	300	4.8	1.0	29.0	40.0	100	-11.0
79.07	16.9	V	2.6	270	6.9	1.1	24.9	40.0	100	-15.1
82.22	16.2	H	2.3	310	7.5	1.1	24.8	40.0	100	-15.2
86.53	15.1	H	2.0	130	8.7	1.2	25.0	40.0	100	-15.0
125.36	13.1	V	1.3	270	11.8	1.5	26.4	43.5	150	-17.1
144.01	9.5	V	1.5	180	15.8	1.7	27.0	43.5	150	-16.5
179.94	10.6	V	1.4	90	14.7	2.0	27.3	43.5	150	-16.2
193.34	12.8	V	1.2	180	15.5	2.0	30.3	43.5	150	-13.2
200.45	17.1	V	1.0	360	10.9	2.1	30.1	43.5	150	-13.4
211.92	13.8	V	1.0	30	11.2	2.2	27.2	43.5	150	-16.3
370.87	22.7	V	1.5	180	14.4	3.1	40.2	46.0	200	-5.8
476.83	16.3	V	1.6	90	17.6	3.6	37.5	46.0	200	-8.5
492.73	15.1	V	1.4	40	18.1	3.6	36.8	46.0	200	-9.2
556.30	18.8	V	1.0	30	17.5	3.8	40.1	46.0	200	-5.9
582.80	20.8	V	1.0	360	18.3	3.9	43.0	46.0	200	-3.0
609.27	16.4	V	1.1	350	18.9	4.1	39.4	46.0	200	-6.6

Appendix A - Plot of Conducted Emissions Test Data





Appendix B - EUT Schematics/Block Diagram

Appendix C - User's Manual
