



## HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

CORP QA OFFICE / INT'L STANDARD CERTIFICATION TEAM  
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA  
TEL : +82 31 639 8518 FAX : +82 31 639 8525

## CERTIFICATION

**Manufacture;**  
**BTC Korea CO., LTD.**  
**BTC B'D, 307 Yangjae-Dong, Seocho-Ku,**  
**Seoul, KOREA (137-130)**

**Dates of Tests: FEB. 12, 2001**  
**Test Report No.: HCT-F01-0201**  
**Test Site: HYUNDAI CALIBRATION & CERTIFICATION**  
**TECHNOLOGIES CO., LTD.**

**FCC ID** : **LAKNF-1500MA**

**MODEL / TYPE :** **NF-1500MA**

**FCC Rule Part(s):** **Part 15 & 2; ET Docket 95-19**

**Classification:** **FCC Class B Peripheral Device (JBP)**

**Standard(s):** **FCC Class B: 1998 (CISPR 22)**

**Equipment(EUT) Type:** **15.1" LCD Monitor**

**Max Resolution:** **1024X768 Non-interlaced (@60KHz/ 75Hz)**

**Port/ Connector(s)** **15-pin D-sub VGA connector**

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.(See Test Report if any modifications were made for compliance)

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.

HYUNDAI certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse of 1988,21 U.S.C.853(a).

Ki-Soo Kim

Report prepared by : Ki-Soo Kim  
Manager of QA Office---



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## 1. GENERAL INFORMATION

### 1.1 Product Description

The **BTC Korea CO., LTD.** Model **NF-1500MA** (referred to as the EUT in this report) is a **15.1" LCD Monitor** **HOR. Freq. 60KHz w/max.** Resolution of **1024X768 Non-Interlaced**. Product specification information described herein was obtained from product data sheet or user's manual.

<b>CHASSIS TYPE</b>	<b>PLASTIC</b>
<b>LIST OF EACH OSC. OR XTAL. FREQ.(FREQ. 1MHz)</b>	<b>12MHz / 14.318MHZ</b>
<b>POWER REQUIREMENT</b>	<b>100 - 240 VAC 60/50Hz 1.5A</b>
<b>NUMBER OF LAYERS</b>	<b>MAIN BOARD 2 LAYER OSD BOARD 2 LAYER POWER BOARD 1 LAYER INVERTER BOARD 2 LAYER LCD MODULE BOARD 2 LAYER</b>
<b>MAX. RESOLUTION</b>	<b>1024X768 NON-INTERLACED(@60KHz/ 75 Hz)</b>
<b>H-SYNC FREQUENCY RANGE</b>	<b>24.6KHz 60KHz</b>
<b>V-SYNC FREQUENCY RANGE</b>	<b>56 Hz 75Hz</b>
<b>LCD SIZE</b>	<b>15.1" ( LCD Type : LG.PHILIPS LCD LM151X2)</b>

### 1.2 Related Submittal(s) / Grant(s)

**ORIGINAL SUBMITTAL ONLY**

### 1.3 Tested System Details

**The Model names for all equipment, plus descriptions used in the tested system (including inserted cards) are:**

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
MONITOR (EUT)	<b>BTC Korea CO., LTD.</b>	NF-1500MA	LAKNF-1500MA	HOST
PC(HOST)	H/P	DTPC-17	DoC	N/A
KEY BOARD	H/P	SK-2501-2D-K	GYUR385K	HOST
PRINTER	H/P	HP895C	DoC	HOST
MODEM	<b>3COM CORPORATION</b>	56K FAX MODEM	DoC	HOST
VIDEO CARD	<b>DIAMOND</b>	3D3000	DoC	HOST
MOUSE	H/P	M-S34	DZL211029	HOST

### 1.4 Test Methodology

**Both conducted and radiated testing were performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at an antenna to EUT distance of 10 meters.**

### 1.5 Test Facility

**The open area test site and conducted measurement facility used to collect the radiated data 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 C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 24,2000(Confirmation Number: EA90661)**

## 2.SYSTEM TEST CONFIGURATION

### 2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following components and I/O cards inside the E.U.T were used.

DEVICE TYPE	MANUFACTURE	MODEL/PART NUMBER
MAIN BOARD	BTC Korea CO., Ltd.	-
POWER BOARD	BTC Korea CO., Ltd.	EM00212003
OSD BOARD	BTC Korea CO., Ltd.	ELO00212003
INVERTOR BOARD	BTC Korea CO., Ltd.	PIN5104003
LCD BOARD	LG. PHILIPS	LM151X2

### 2.2 EUT exercise Software

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.

## 2.3 Cable Description

	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
PC(HOST)	N	N/A	1.8(P)
MONITOR(EUT)	N	Y	1.8(P), 1.5(D)
PRINTER	N	Y	2.0(P), 1.5(D)
KEY BOARD	N/A	Y	2.0(D)
MODEM	N	Y	2.0(P), 1.5(D)
MOUSE	N/A	Y	1.8(D)

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

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

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
MONITOR(EUT)	Y	BOTH END	Y	BOTH END
PRINTER	N	N/A	Y	BOTH END
KEY BOARD	Y	PC END	N	N/A
MODEM	N	N/A	Y	BOTH END
MOUSE	N	N/A	N	N/A

## **2.5 Equipment Modifications**

**N/A**

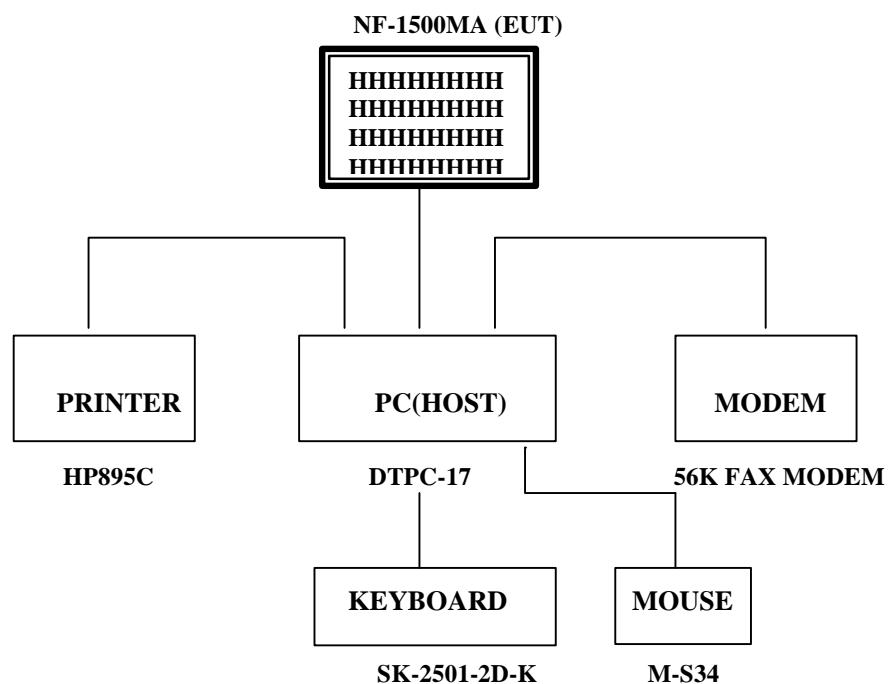
## 2.6 Configuration of Test system

**Line Conducted Test** : EUT was connected to LISN, all other supporting equipment were connected to another LISN.

Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

**Radiated Emission Test** : Preliminary Radiated Emissions tests were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating condition. Final Radiated Emission tests were conducted at 10 meter open area test site.

### [Configuration of Tested System]



### 3. PRELIMINARY TESTS

#### 3.1 AC Power line Conducted Emission Tests

During Preliminary Tests, the following operating mode were investigated

Processor Speed (MHz)	Video Resolution (w/max)		The worst operating condition
Pentium 350 MHz	1024 x 768	Non-Interlaced (60KHz/75Hz)	X
Pentium 350 MHz	800 x 600	Non-Interlaced (53.7 KHz/85Hz)	
Pentium 350 MHz	640 x 480	Non-Interlaced (31.5KHz/60Hz)	

#### 4.2 Radiated Emission Tests

Processor Speed (MHz)	Video Resolution (w/max)		The worst operating condition
Pentium 350 MHz	1024 x 768	Non-Interlaced (60KHz/75Hz)	X
Pentium 350 MHz	800 x 600	Non-Interlaced (53.7 KHz/85Hz)	
Pentium 350 MHz	640 x 480	Non-Interlaced (31.5 KHz/60Hz)	

**NOTE:**

The monitor(EUT) has video interface port(VGA 15 pin D-sub) to support various kinds of graphics adapters. So the test were performed with each video interface port. The final measurement was performed with VGA 15 pin D-sub video interface port that produce the worst case emission.

Tested by Keun- Ho Park / Engineer

Date : FEB. 2, 2000

## 4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY

### 4.1 Conducted Emission Test

The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

Humidity Level	: 36%	Temperature : 12
Limit apply to	: CISPR 22	
Type of Tests	: CLASS B	
Date	: FEB. 8, 2000	
Result	: PASSED BY -7.8 dB	
EUT	: 15.1" LCD MONITOR	

Operating Condition : 1024X768 Non-Interlaced (Hf : 60 KHz, Vf : 75Hz)

Detector : CISPR Quasi-Peak (6 dB Bandwidth : 9 KHz)  
CISPR Average(6 dB Bandwidth : 9 KHz)

#### Line Conducted Emission Tabulated Data

Power Line Conducted Emissions			CISPR 22		
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)	Detector Mode
0.565	38.2	H	46.0	-7.8	Average
0.168	40.5	H	55.0	-14.5	Average
1.640	33.3	H	46.0	-12.7	Average
2.090	32.8	H	46.0	-13.2	Average

#### NOET:

1. All video modes and resolutions were investigated and the worst-case emissions are reported  
Other video modes & resolution were tested and found to be in compliance.

Measured by : Keun-Ho Park / Engineer

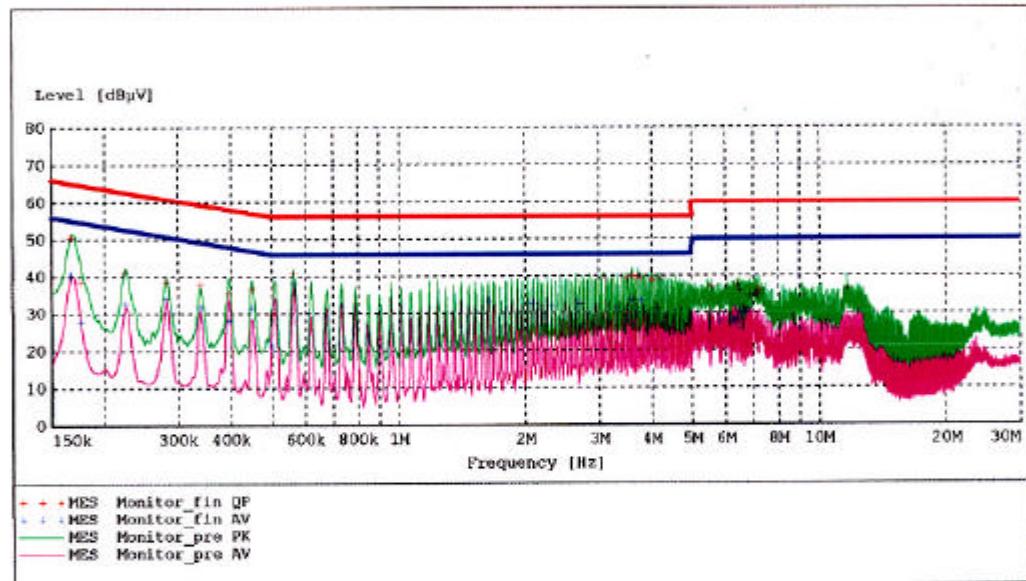
Date : FEB. 8, 2000

**HYUNDAI C-TECH. CO., LTD. EMC LAB**  
**San 136-1, Ami-Ri-Bubal-Eub, Ichon-Si, Kyongki-Do**

EUT: NF-1500MA  
 Manufacturer: BTC CO., LTD  
 Operating Condition: 1024X768 Hf:60KHz Vf:75Hz  
 Test Site: Shield Room  
 Operator: Keun-Ho Park  
 Test Specification: CISPR 22 CLASS B  
 Comment: HOT  
 Start of Test: 2/8/01 / 10:05:11AM

**SCAN TABLE: "MIC CLASS B"**

Short Description:			KN22 CLASS B Voltage			
Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Transducer
150.0 kHz	500.0 kHz	3.0 kHz	MaxPeak	100.0 ms	9 kHz	C/E FACTOR
			Average			
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	C/E FACTOR
			Average			

**MEASUREMENT RESULT: "Monitor\_fin QP"**

2/8/01 10:12AM

Frequency MHz	Level dBpV	Transd dB	Limit dBpV	Margin dB	Line	PE
0.168000	50.60	0.5	65	14.5	1	---
0.177000	38.70	0.5	65	25.9	1	---
0.225000	41.30	0.5	63	21.3	1	---
0.282000	38.70	0.5	61	22.1	1	---
0.339000	38.00	0.5	59	21.2	1	---
0.396000	35.50	0.5	58	22.4	1	---
0.450000	36.60	0.5	57	20.3	1	---
0.500000	29.50	0.5	56	26.5	1	---
0.565000	40.90	0.5	56	15.1	1	---
3.105000	39.30	0.6	56	16.7	1	---
3.500000	39.50	0.7	56	16.5	1	---
3.615000	40.00	0.7	56	16.0	1	---
3.725000	39.80	0.7	56	16.2	1	---
3.785000	39.60	0.7	56	16.4	1	---

Page 1/2 2/8/01 10:12AM Monitor

**MEASUREMENT RESULT: "Monitor\_fin QP"**  
(continued)

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
4.010000	39.00	0.7	56	17.0	1	---
4.180000	39.20	0.8	56	16.8	1	---
5.535000	37.10	0.9	60	22.9	1	---
6.385000	37.60	1.0	60	22.4	1	---
6.495000	36.10	1.0	60	23.9	1	---
6.840000	34.80	1.0	60	25.2	1	---
7.060000	35.30	1.1	60	24.7	1	---
7.130000	34.90	1.1	60	25.1	1	---
7.235000	36.30	1.1	60	23.7	1	---
11.705000	36.60	1.3	60	23.4	1	---

**MEASUREMENT RESULT: "Monitor\_fin AV"**

2/8/01 10:12AM

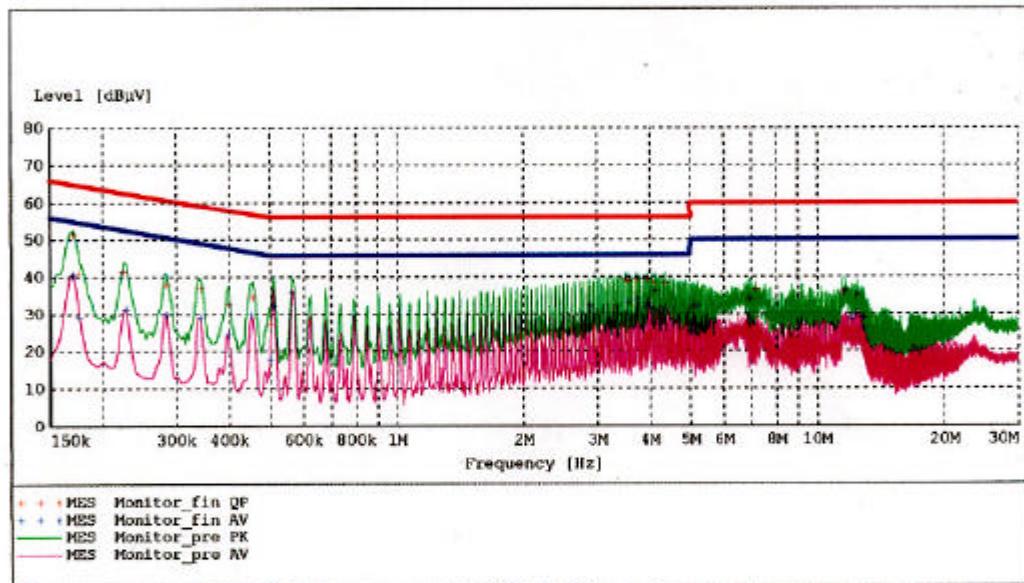
Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.168000	40.50	0.5	55	14.5	1	---
0.177000	27.80	0.5	55	26.8	1	---
0.225000	33.00	0.5	53	19.6	1	---
0.282000	34.00	0.5	51	16.0	1	---
0.339000	31.90	0.5	49	17.4	1	---
0.396000	28.10	0.5	48	19.8	1	---
0.450000	31.70	0.5	47	15.2	1	---
0.500000	21.40	0.5	46	24.6	1	---
0.565000	38.20	0.5	46	7.8	1	---
1.640000	33.30	0.5	46	12.7	1	---
2.090000	32.80	0.6	46	13.2	1	---
2.315000	32.00	0.6	46	14.0	1	---
2.710000	32.60	0.6	46	13.4	1	---
3.560000	33.40	0.7	46	12.6	1	---
3.615000	33.70	0.7	46	12.3	1	---
3.785000	33.40	0.7	46	12.6	1	---
5.820000	27.70	1.0	50	22.3	1	---
6.270000	28.10	1.0	50	21.9	1	---
6.325000	27.40	1.0	50	22.6	1	---
6.440000	28.60	1.0	50	21.4	1	---
6.495000	29.80	1.0	50	20.2	1	---
6.610000	30.20	1.0	50	19.8	1	---
6.665000	30.90	1.0	50	19.1	1	---
6.780000	29.80	1.0	50	20.2	1	---

**HYUNDAI C-TECH. CO., LTD. EMC LAB**  
**San 136-1, Ami-Ri-Bubal-Eub, Ichon-Si, Kyongki-Do**

EUT: NF-1500MA  
 Manufacturer: BTC CO., LTD  
 Operating Condition: 1024X768 Hf:60KHz Vf:75Hz  
 Test Site: Shield Room  
 Operator: Keun-Ho Park  
 Test Specification: CISPR 22 CLASS B  
 Comment: NEUTRAL  
 Start of Test: 2/8/01 / 9:46:17AM

**SCAN TABLE: "MIC CLASS B"**

KN22 CLASS B Voltage						
Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Transducer
150.0 kHz	500.0 kHz	3.0 kHz	MaxPeak	100.0 ms	9 kHz	C/E FACTOR
			Average			
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	C/E FACTOR
			Average			

**MEASUREMENT RESULT: "Monitor\_fin QP"**

2/8/01 9:59AM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.171000	51.40	0.5	65	13.5	1	---
0.177000	41.10	0.5	65	23.5	1	---
0.225000	41.40	0.5	63	21.3	1	---
0.285000	38.00	0.5	61	22.7	1	---
0.342000	37.00	0.5	59	22.2	1	---
0.399000	32.80	0.5	58	25.1	1	---
0.456000	34.90	0.5	57	21.8	1	---
0.500000	27.10	0.5	56	28.9	1	---
3.515000	39.30	0.7	56	16.7	1	---
3.570000	38.90	0.7	56	17.1	1	---
3.740000	39.50	0.7	56	16.5	1	---
3.910000	39.50	0.7	56	16.5	1	---
3.965000	39.30	0.7	56	16.7	1	---
4.080000	38.70	0.7	56	17.3	1	---

**MEASUREMENT RESULT: "Monitor\_fin QP"**  
(continued)

Frequency MHz	Level dB <sub>μ</sub> V	Transd dB	Limit dB <sub>μ</sub> V	Margin dB	Line	PE
4.140000	36.40	0.8	56	19.6	1	---
4.365000	38.40	0.8	56	17.6	1	---
5.000000	31.50	0.9	56	24.5	1	---
5.100000	32.30	0.9	60	27.7	1	---
5.215000	32.30	0.9	60	27.7	1	---
6.915000	34.20	1.1	60	25.8	1	---
7.130000	36.70	1.1	60	23.3	1	---
11.495000	35.80	1.3	60	24.2	1	---
11.705000	36.40	1.3	60	23.6	1	---
12.450000	35.20	1.4	60	24.8	1	---

**MEASUREMENT RESULT: "Monitor\_fin AV"**

2/8/01 9:59AM

Frequency MHz	Level dB <sub>μ</sub> V	Transd dB	Limit dB <sub>μ</sub> V	Margin dB	Line	PE
0.171000	40.60	0.5	55	14.3	1	---
0.177000	29.30	0.5	55	25.4	1	---
0.228000	31.50	0.5	53	21.1	1	---
0.285000	30.10	0.5	51	20.5	1	---
0.342000	29.30	0.5	49	19.8	1	---
0.399000	24.50	0.5	48	23.4	1	---
0.453000	29.90	0.5	47	17.0	1	---
0.500000	18.00	0.5	46	28.0	1	---
0.510000	32.40	0.5	46	13.6	1	---
0.565000	35.90	0.5	46	10.1	1	---
2.890000	32.40	0.6	46	13.6	1	---
3.570000	33.30	0.7	46	12.7	1	---
3.740000	33.90	0.7	46	12.1	1	---
3.910000	31.80	0.7	46	14.2	1	---
3.965000	33.00	0.7	46	13.0	1	---
4.080000	31.30	0.7	46	14.7	1	---
5.000000	27.70	0.9	46	18.3	1	---
5.045000	25.20	0.9	50	24.8	1	---
5.325000	27.40	0.9	50	22.6	1	---
9.150000	26.80	1.2	50	23.2	1	---
12.130000	28.80	1.3	50	21.2	1	---
12.450000	30.30	1.4	50	19.7	1	---
12.875000	28.90	1.4	50	21.1	1	---
12.980000	26.10	1.4	50	23.9	1	---

## 4.2 Radiated Emissions Tests

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Humidity Level	: 35 %	Temperature : 8
Limit apply to	: CISPR 22	
Type of Tests	: CLASS B	
Date	: FEB. 5, 2001	
Result	: PASSED BY -3.6 dB	

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EUT	: 15" LCD MONITOR
Operating Condition	: 1024X768 Non-Interlaced (Hf :60 kHz, Vf : 75 Hz)
Detector	: CISPR Quasi-Peak (6 dB Bandwidth : 120 KHz)

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dB	Margin dB
73.6	16.45	5.85	1.80	V	24.1	30.0	-5.9
118.4	8.69	12.91	2.30	V	23.9	30.0	-6.1
130.4	6.89	14.11	2.50	V	23.5	30.0	-6.5
150.0	7.74	14.76	2.60	V	25.1	30.0	-4.9
195.9	7.86	15.54	3.00	V	26.4	30.0	-3.6
196.9	6.04	15.56	3.00	H	24.6	30.0	-5.4
260.7	5.24	17.76	3.60	V	26.6	37.0	-10.4
326.1	9.48	16.02	3.90	V	29.4	37.0	-7.6
521.8	6.60	18.90	5.10	V	30.6	37.0	-6.4
524.0	2.86	18.94	5.10	H	26.9	37.0	-10.1
579.3	1.95	20.05	5.40	H	27.4	37.0	-9.6
590.7	2.72	20.18	5.70	V	28.6	37.0	-8.4

**NOTE:**

1. All video modes and resolutions were investigated and the worst-case emissions are reported.
2. Other video modes & resolution were tested and found to be in compliance.
3. The EUT was test up to 2GHz and no significant emission was found.

Measured by : Keun-Ho Park / Engineer

Date : FEB. 5, 2001

## 5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 21.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The 30 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dBuV/m}$$

Level in uV/m = Common Antilogarithm  $[(30 \text{ dBuV/m})/20] = 31.6 \text{ uV/m}$

## 6. LIST OF TEST EQUIPMENT

<u>TYPE</u>	<u>MANUFACTURE</u>	<u>MODEL</u>	
<u>CAL.</u>	<u>DATE</u>		
EMI Test Receiver	Rohde & Schwarz	ESH3	2000.6.29
EMI Test Receiver	Rohde & Schwarz	ESVP	2000.2.14
EMI Test Receiver	Rohde & Schwarz	ESI40	2000.1.18
EMI Test Receiver	Rohde & Schwarz	ESVS30	2000.6.29
Spectrum Monitor	Rohde & Schwarz	EZM	N.A
Graphic Plotter	Rohde & Schwarz	DOP2	N.A
Printer	Rohde & Schwarz	PDN	N.A
Spectrum Analyzer	H.P	8591EM	2000.7.11
LISN	EMCO	3825/2	2000.10.13
LISN	Rohde & Schwarz	ESH2-Z5	2000.7.14
Amplifier	Hewlett-Packard	8447E	2001.3.6
Dipole Antennas	Rohde & Schwarz	VHAP	2000.6.29
Dipole Antennas	Rohde & Schwarz	UHAP	2000.6.29
Biconical Antenna	Rohde & Schwarz	BBA-9106	2000.6.29
Log-Periodic Antenna	Rohde & Schwarz	UHALP-9107	2000.6.29
Antenna Position Tower	EMCO	1051-12	N.A
Turn Table	EMCO	1060-06	N.A
Line Filter	KEENE	ULW 2X30-60	N.A
Power Analyzer	Voltech	PM 3300	2000.12.20
Reference Network Impedance	Voltech	IEC 555	N.A
AC Power Source	PACIFIC	Magnetic Module	N.A
AC Power Source	PACIFIC	360AMX	N. A