

MEASUREMENT / TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : B790+

This report concerns(check one) : Original grant ☒ Class change

Equipment type : CRT MONITOR

Deferred grant requested per 47 CFR 0.457(d)(1)() ? yes ☐ no ☒

If yes, defer until:

 agrees to notify the Commission by

of the intended date of announcement of the product so that the grant can be issued on that date.

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1. GENERAL INFORMATION

1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model (referred to as the EUT in this report) is a 17" COLOR CRT Monitor HOR. Freq. 93.8 KHz w/max. Resolution of 1600×1200 Non-Interlaced.

Product specification information described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	PLASTIC
LIST OF EACH OSC. OR XTAL. FREQ.(FREQ. 1MHz)	12 MHz
CHIPSET BRAND AND PART NO.	WELTREND SEMICO: 3205001327 NATIONAL SEMI: ULM431ACZT FAIRCHILD KOREA: ULM358N MICROCHIP: 3203000753 FAIRCHILD KOREA: UKA3842B PHILIPS ELECTRO: 3200001408 FAIRCHILD KOREA: UKA3843
POWER REQUIREMENT	100 - 240 VAC 50/60Hz 2.5A
NUMBER OF LAYERS	MAIN BOARD 1 LAYER CRT BOARD 1 LAYER
MAX. RESOLUTION	1600 X 1200 NON-INTERLACED (@93.8 KHz/75 Hz)
H-SYNC FREQUENCY RANGE	30KHz 95KHz
V-SYNC FREQUENCY RANGE	50 Hz 150Hz
LCD SIZE	17" (CRT Type :SAMSUNG M41QAQ261X152)

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
COLOR MONITOR (EUT)	HYUNDAI	B790+	CKLC7R06090	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	3COM CORPORATION	56K FAX MODEM	DoC	HOST
VIDEO CARD	DIAMOND	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 on May 22, 1997 and accepted dated July 25,1997(1300F2)

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	HYUNDAI	E4202517301
CRT BOARD	HYUNDAI	E4208617302

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(PS/2)	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(PS/2)	N	N/A	N	N/A

2.5 Equipment Modifications

N/A

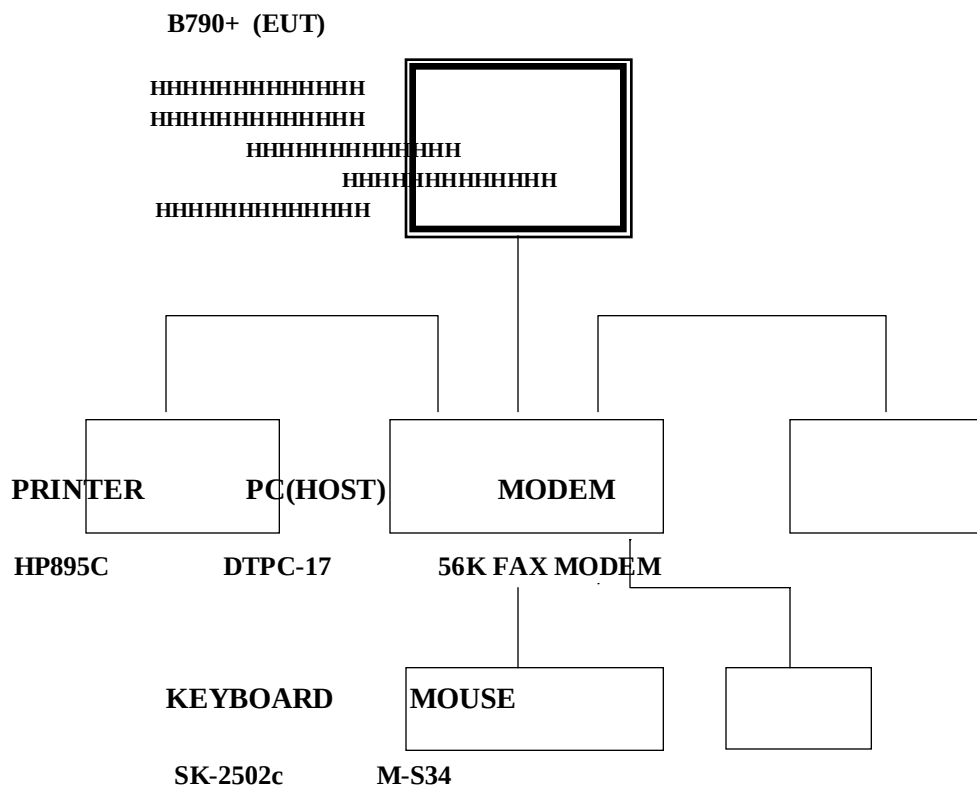
2.6 Configuration of Test system

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 (68.7KHz/85Hz)	
Pentium 350 MHz	800 x 600 Non-Interlaced (53.7 KHz/85Hz)	
Pentium 350 MHz	640 x 480 Non-Interlaced (50.6 KHz/100Hz)	
Pentium 350 MHz	1280x1024 Non-Interlaced (91.9 KHz/85Hz)	
Pentium 350 MHz	1600x1200 Non-Interlaced (93.8KHz/75Hz)	X

4.2 Radiated Emission Tests

Processor Speed (MHz)	Video Resolution (w/max)	The worst operating condition
Pentium 350 MHz	1024 x 768 Non-Interlaced (68.7KHz/85Hz)	
Pentium 350 MHz	800 x 600 Non-Interlaced (53.7 KHz/85Hz)	
Pentium 350 MHz	640 x 480 Non-Interlaced (50.6 KHz/100Hz)	
Pentium 350 MHz	1280x1024 Non-Interlaced (91.9 KHz/85Hz)	
Pentium 350 MHz	1600x1200 Non-Interlaced (93.8KHz/75Hz)	X

During Preliminary Tests, the following operating mode were investigated

Tested by KEUN HO, PARK / Engineer

Date : MAY 16, 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 : 35% Temperature : 22
 Limit apply to : CISPR 22
 Type of Tests : CLASS B
 Date : MAY 17, 2000
 Result : PASSED BY -4.3 dB
 EUT : 17" CRT MONITOR

Operating Condition : 1600 X1200 Non-Interlaced (Hf : 93.8 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 (Average)	
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
0.185	47.4	N	54.4	-7.0
0.374	42.4	N	48.6	-6.2
0.185	48.2	H	54.4	-6.2
0.282	45.0	H	50.8	-5.8
0.374	44.3	H	48.6	-4.3

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 : MAY 17, 2000

RFI Voltage Test

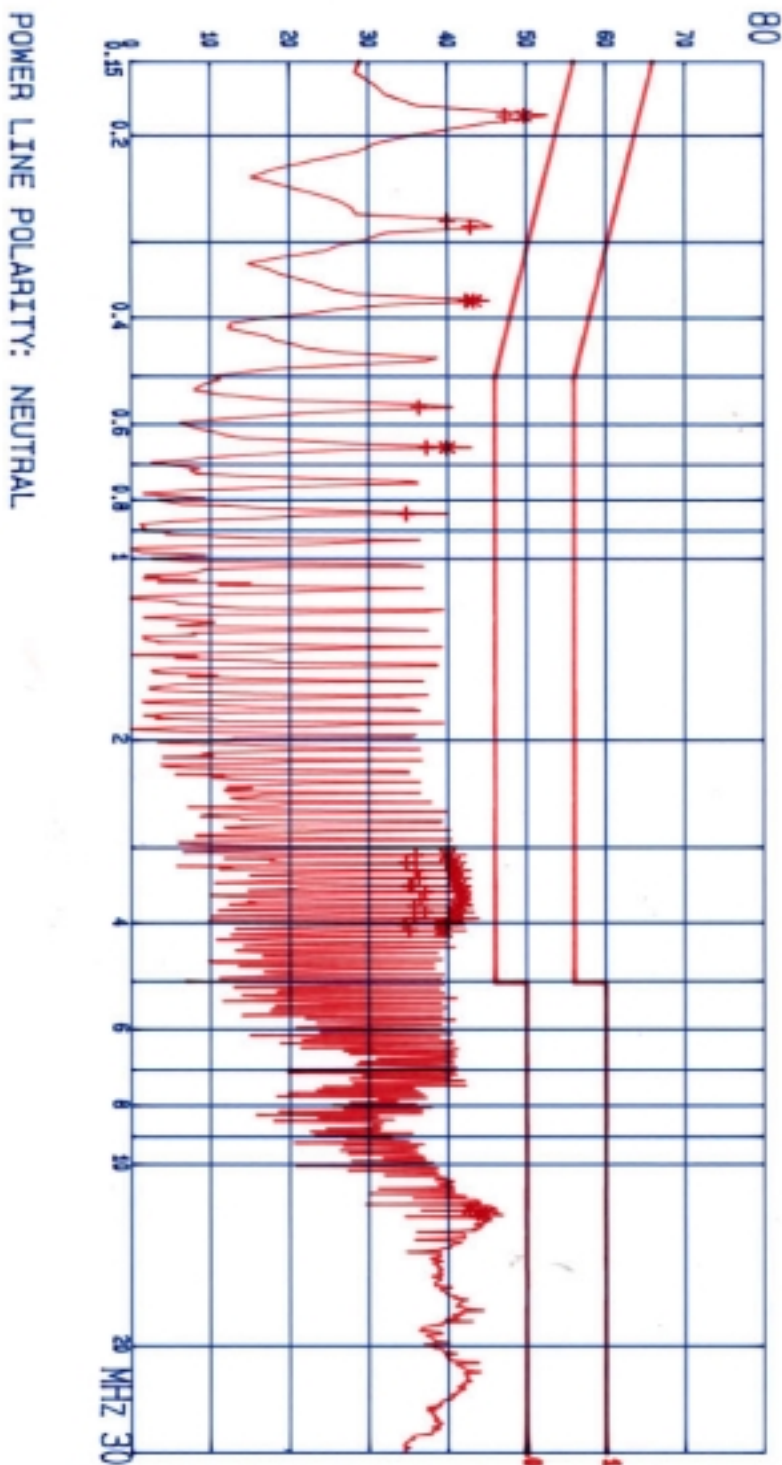
E.U.T. :
 Oper. Condition: 8790+
 Operator: 1600X1200 Hf: 93.8MHz Vt: 75Hz
 Test Spec: Keun Ho, Park
 CISPR 22 CLASS B

Final evaluation: Quasi Peak/average

* = QUASI PEAK + = AVERAGE

dBuV

Start Freq.	Stop Freq.	IF-BW	Detector	Att.	Meas. T.	Traced.
MHz	MHz	KHz	type	dB	μ	type
0.1500	5.0000	10	Peak	LD	0.010	
5.0000	30.0000	10	Peak	LN	0.010	



RFI Voltage Test

E.U.T.: 8790+
 Oper. Condition: 1800X1200 Hz; 93.8KHz V#: 75Hz
 Operator: Keun Ho, Park
 Test Spec:
 CISPR 22 CLASS B

Start Fr. Stop Fr. IF-BW Detec Att. Meas. T. Transd.
 MHz MHz KHz for dB s type
 0.1500 5.0000 10 Peak LD 0.010
 5.0000 30.0000 10 Peak LN 0.010

POWER LINE POLARITY: NEUTRAL

Query Peak values			
Frequency MHz	Peak dBuV	G-Peak dBuV	G-Peak Margin dB
0.1850	52.8	49.8	-14.4
0.3740	45.4	43.4	-15.2
0.6540	43.3	40.1	-15.8
0.9800	42.5	40.0	-15.9
3.1810	42.5	40.7	-15.2
3.8790	43.0	41.1	-14.8
3.3700	43.1	41.1	-14.8
3.4610	43.1	41.4	-14.6
3.5590	43.1	41.8	-14.2
3.6500	43.1	42.0	-13.9
3.7480	43.2	41.4	-14.6
3.8390	43.4	41.0	-14.9
3.9300	44.1	41.0	-14.9
4.0279	42.2	39.4	-16.5
4.1190	42.4	39.5	-16.4
11.8950	46.2	42.9	-17.0
11.9850	46.4	44.0	-15.9
12.1750	47.0	44.6	-15.3
Average Values			
Frequency MHz	Peak dBuV	Average dBuV	Average Margin dB
0.1850	52.8	47.4	-7.0
0.2760	43.7	40.0	-11.0
0.2829	45.9	43.1	-7.7
0.3740	45.4	42.4	-8.2
0.5629	40.9	36.5	-8.5
0.6540	43.3	37.5	-8.5
0.8430	40.2	34.8	-11.2
3.0900	42.5	36.0	-10.0
3.1810	42.5	34.8	-11.2
3.2790	43.0	36.0	-10.0
3.3700	43.1	36.4	-9.6
3.4610	43.1	35.7	-10.3
3.4680	41.7	35.2	-10.8
3.5590	43.1	37.2	-8.8
3.6500	43.1	36.7	-9.3
3.7480	43.2	35.9	-10.1
3.8390	43.4	37.2	-8.8
3.9300	44.1	35.8	-10.2
4.0279	42.2	34.5	-11.4
4.1190	42.4	35.5	-10.7
* Limit exceeded			

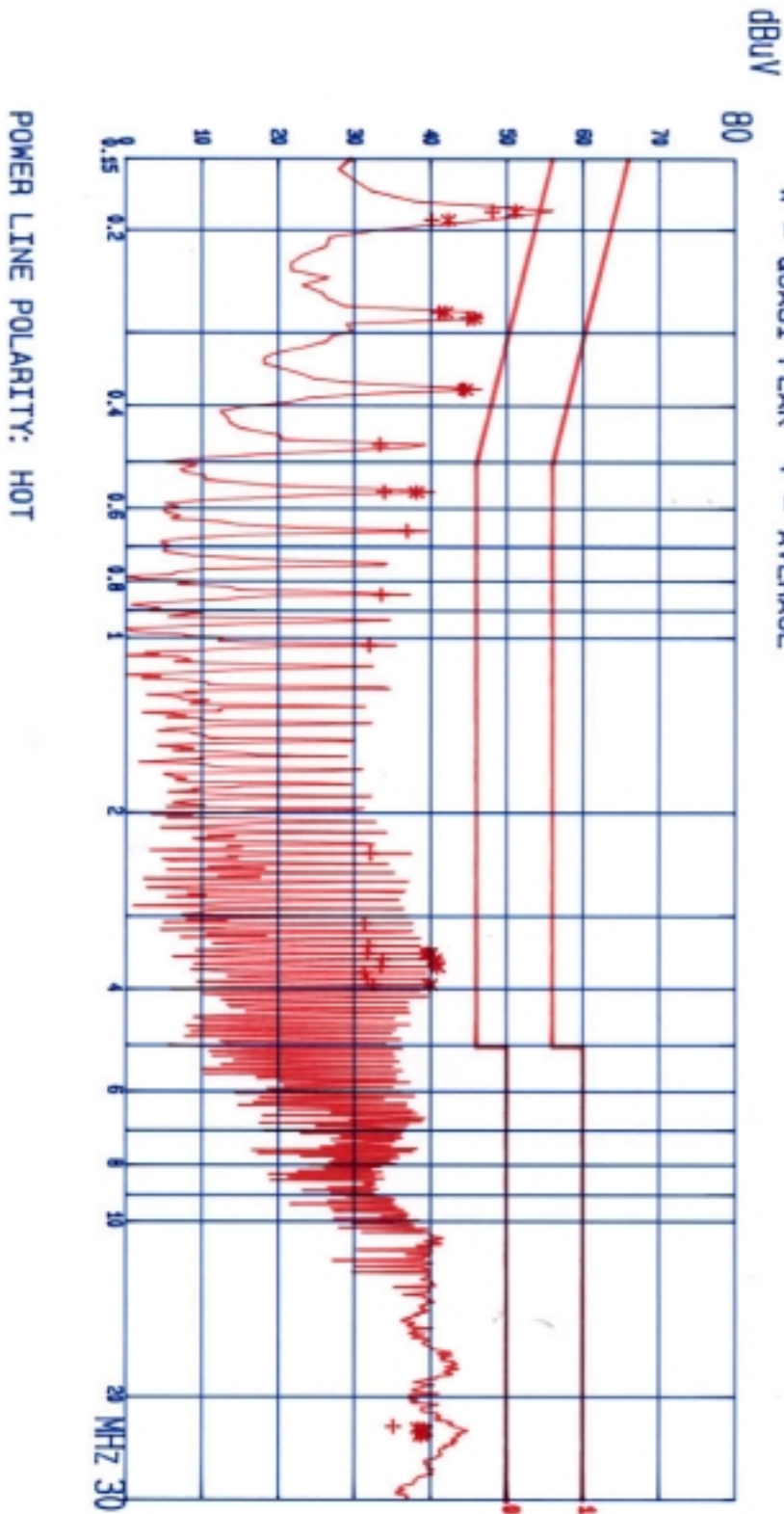
RFI Voltage Test

E.U.T.: 8790+
 Oper. Condition: 1800X1200 Mfr: 99.8KHz Vfr: 78Hz
 Operator: Keun Ho, Park
 Test Spec: CISPR 22 CLASS B

Final evaluation: Quasi Peak/average

* = QUASI PEAK + = AVERAGE

Start Fr. MHz	Stop Fr. MHz	IF-BW kHz	Detec type	Att. dB	Meas.T. dB	Trended. type
0.1500	5.0000	10	Peak	LD	0.010	
5.0000	30.0000	10	Peak	LN	0.010	



RFI Voltage Test

E.U.T.: 8790+
 Oper. Condition: 1800X1200 Mf: 93.8KHz Vf: 75Hz
 Operator: Keun Ho, Park
 Test Spec:
 CIPPR 22 CLASS B

Start Fr. Stop Fr. IF-BW Detect Att. Meas.T. Trend.
 MHz MHz kHz for dB s type
 0.1850 5.0000 10 Peak LD 0.010
 5.0000 30.0000 10 Peak LN 0.010

POWER LINE POLARITY: HOT

Quasi Peak values		Peak		Q-Peak		Q-Peak	
Frequency	dBV	dBV	dB	dBV	dB	dB	dB
MHz							
0.1850	56.3	51.2	-13.1				
0.1920	48.3	42.4	-21.5				
0.2760	45.7	42.0	-16.9				
0.2829	47.0	45.9	-14.8				
0.3740	48.9	44.6	-13.9				
0.5629	40.6	38.2	-17.7				
3.4810	40.1	40.1	-15.8				
3.4880	40.0	39.7	-16.2				
3.5590	41.9	40.6	-15.3				
3.6500	41.7	41.1	-14.8				
3.9300	40.6	40.1	-15.8				
22.6610	44.1	38.5	-21.4				
22.8500	44.2	39.0	-20.9				
22.9480	43.1	39.4	-20.5				
23.0390	44.5	39.0	-20.9				
23.4100	44.0	38.8	-21.1				
Average values							
Frequency	Peak	Average	Average	Average	Average	Average	Average
MHz	dBV	dBV	dB	dB	dB	dB	dB
0.1850	56.3	48.2	-6.2				
0.1920	48.3	40.3	-13.7				
0.2760	45.7	41.3	-9.7				
0.2829	47.0	45.0	-5.8				
0.3740	48.9	44.3	-4.3				
0.4650	39.5	33.4	-15.2				
0.5629	40.6	34.1	-11.9				
0.6540	39.8	37.1	-8.9				
0.8430	37.4	33.7	-12.3				
1.0320	35.6	32.0	-14.0				
2.3410	37.6	32.3	-14.6				
3.0900	37.6	31.4	-14.7				
3.3700	38.8	32.0	-14.0				
3.4810	40.1	31.9	-14.1				
3.5590	41.9	33.6	-12.2				
3.6500	41.7	33.6	-12.4				
3.7480	39.6	31.5	-14.5				
3.8390	39.9	31.9	-14.1				
3.9300	40.6	32.7	-13.3				
22.6700	43.2	35.3	-14.7				
* Limit exceeded							

4.2 Radiated Emissions Tests

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

Humidity Level : 30 % Temperature : 20

Limit apply to : CISPR 22

Type of Tests : CLASS B

Date : MAY 17, 2000

Result : PASSED BY -3.7 dB

EUT : 17" COLOR MONITOR

Operating Condition : 1600 X 1200 Non-Interlaced (Hf :93.8 kHz, Vf : 75 Hz)

Detector : CISPR Quasi-Peak (6 dB Bandwidth : 120 KHz)

Radiated Emissions		Ant.	Correction Factors	Total	CISPR 22	
Freq. (MHz)	Ampl. (dBuV)	Pol.	Antenna & Cable Loss (dB/m)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
40.4	10.2	V	15.4	25.6	30.0	-4.4
60.6	15.2	V	9.2	24.4	30.0	-5.6
101.1	13.3	V	11.6	24.9	30.0	-5.1
134.6	10.4	V	15.9	26.3	30.0	-3.7
161.8	4.6	H	17.9	22.5	30.0	-7.5
343.9	7.5	V	19.7	27.2	37.0	-9.8
364.1	8.2	V	20.3	28.5	37.0	-8.5
384.3	5.1	V	20.7	25.8	37.0	-11.2
404.6	6.2	V	21.0	27.2	37.0	-9.8
424.8	6.8	V	21.5	28.3	37.0	-8.7
445.0	9.1	V	21.9	31.0	37.0	-6.0
505.7	4.8	V	22.9	27.7	37.0	-9.3

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.

Measured by : KEUN HO, PARK / Engineer

Date : MAY 17, 2000

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.

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

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