

MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : B790S

This report concerns(check one) : Original grant **X** Class ☐ change

Equipment type : **MONITOR**

Deferred grant requested per 47 CFR 0.457(d)(1)(☐) ? yes___no **X**

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.

Transition Rules Request per 15.37? yes___ no **X**

If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR [10-1-91 Edition] provision.

Report prepared by : **BONG JAE, HUR - Manager of QA Office**

Company : HYUNDAI ELECTRONICS INDUSTRIES CO., LTD.

**Address : SAN 136-1, AMI-RI, BUBAL-EUB, ICHON-SI,
KYOUNGKI-DO, KOREA**

Phone No : 82-336-630-3280

Fax No : 82-336-630-3265

TABLE OF CONTENTS

PAGE

1. GENERAL INFORMATION.....	3
1.1 Product Description.....	3
1.2 Related submittal(s)/Grant(s).....	3
1.3 Tested System Details.....	4
1.4 Test Methodology.....	4
1.5 Test Facility.....	4
2. SYSTEM TEST CONFIGURATION.....	5
2.1 Justification.....	5
2.2 EUT Exercise Software.....	5
2.3 Cable Description.....	6
2.4 Noise Suppression Parts on Cable.....	6
2.5 Equipment Modifications.....	7
2.6 Configuration of Tested System.....	8
3. PRELIMINARY TESTS.....	9
3.1 Power line Conducted Emissions Tests.....	9
3.2 Radiated Emissions Tests.....	9
4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY.....	10
4.1 Conducted Emission Tests.....	10
4.2 Radiated Emission Tests.....	11
5. FIELD STRENGTH CALCULATION.....	12

ATTACHMENT A	ID Label / Location Info.
ATTACHMENT B.....	External Photos.
ATTACHMENT C	Block Diagram..
ATTACHMENT D	Test Setup Photos.
ATTACHMENT E	User's Manual.
ATTACHMENT F	Internal Photos.

1. GENERAL INFORMATION

1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model B790S(referred to as the EUT in this report) is a 17"COLOR Monitor HOR. Freq. 93.5kHz 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)	8 MHz
CHIPSET BRAND AND PART NO.	SAMSUNG : ULM358N SAMSUNG : ULM3842B SAMSUNG : UKA3843B PHILIPS : TDA4856 PHILIPS : TDA8354 Weltrend : WT6016 MITSUBISHI : M52743ASP N.S : LM2402 MYSON : MTV018
POWER REQUIREMENT	100 - 240 VAC(Universal Power) 2.5A
NUMBER OF LAYERS	MAIN BOARD 1 LAYER CRT SOCKET BOARD 2 LAYER
MAX. RESOLUTION	1600 X 1200 NON-INTERLACED (@ 93.5kHz/75Hz)
H-SYNC FREQUENCY RANGE	30 kHz □ 95 kHz
V-SYNC FREQUENCY RANGE	50 Hz □ 150 Hz
CRT SIZE	17" (HITACHI/ Type : M41LJY183X19)
VIDEO CONNECTOR TYPE	D-SUB 15-PIN

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	B790S	CKLB790S	HOST
PC(HOST)	H/P	HP BRIO 80XX	DoC	N/A
KEYBOARD	H/P	SK-2501-2D-K	DZL211029	HOST
PRINTER	H/P	C2168A	B94C2121X	HOST
MODEM	HYUNDAI	HMD-2404M	CKL8J7HMD-2404M	HOST
VIDEO CARD	DIAMOND	STEATH 3D 3000	FTUPCI130208	HOST
MOUSE	H/P	M-S34	GYUR38SK	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 3 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	E4208516101
CRT SOCKET BOARD	HYUNDAI	E4208516102

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	1.5(P)
COLOR MONITOR(EUT)	N	Y	1.5(P), 1.5(D)
PARALLEL	N	Y	1.5(P), 1.5(D)
KEYBOARD	N/A	Y	1.0(D)
SERIAL	N	Y	1.5(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.

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
PC(HOST)	N	N/A	N	N/A
COLOR MONITOR(EUT)	Y	PC END	Y	PC END
KEYBOARD	Y	PC END	Y	PC END
PARALLEL	N	N/A	Y	BOTH END
SERIAL	N	N/A	Y	BOTH END
MOUSE(PS/2)	N	N/A	Y	PC END

2.5 Equipment Modifications

N/A

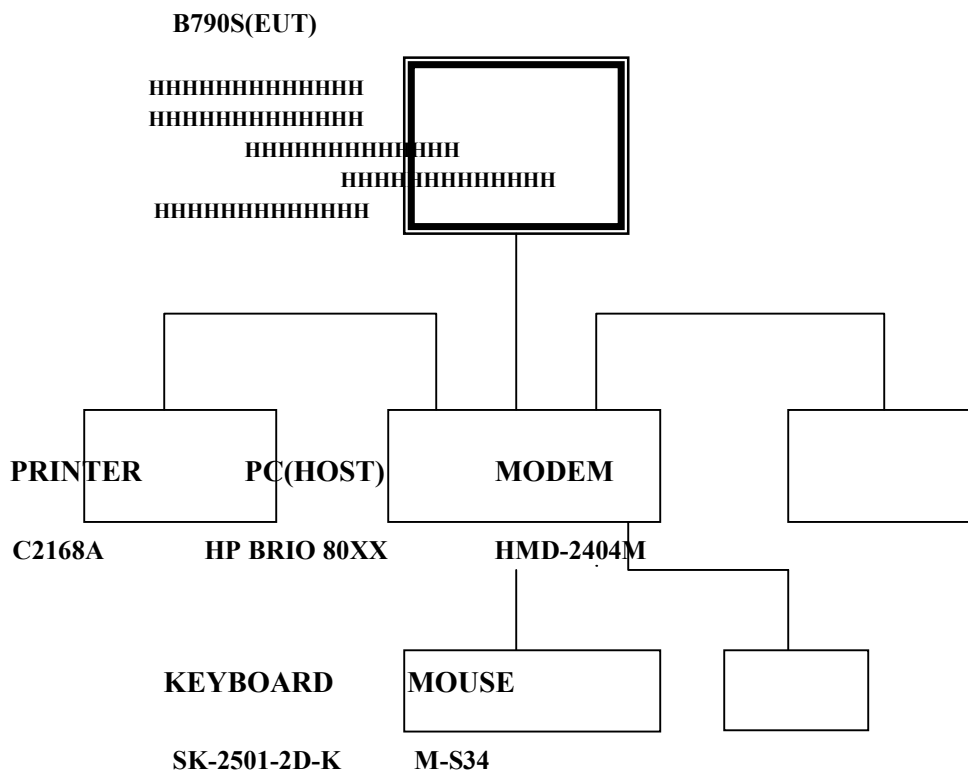
2.6 Configuration of Test system

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 3 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 75 MHz	1600 x 1200 Non-Interlaced (93.5KHz/75Hz)	X
Pentium 75 MHz	1280 x 1024 Non-Interlaced (91.1KHz/85Hz)	
Pentium 75 MHz	1024 x 768 Non-Interlaced (81.1KHz/100Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (63.6KHz/120z)	

4.2 Radiated Emission Tests

During Preliminary Tests, the following operating mode were investigated

Processor Speed (MHz)	Video Resolution (w/max)	The worst operating condition
Pentium 75 MHz	1600 x 1200 Non-Interlaced (93.5KHz/75Hz)	X
Pentium 75 MHz	1280 x 1024 Non-Interlaced (91.1KHz/85Hz)	
Pentium 75 MHz	1024 x 768 Non-Interlaced (81.1KHz/100Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (63.6KHz/120z)	

NOTE :

The monitor(EUT) has two(2) video interface port(VGA 15pin D-sub, 5 BNC) to support various kinds of graphics adapters. So the test were performed with each video interface port. The final measurement was performed with VGA 15pin D-sub video interface port that produce the worst case emission.

Tested by Sang Jun, Lee

Date : JUN. 28. 1999

4. FINAL CONDUCTED AND RADIATED EMISSION TESTS SUMMARY

4.1 Conducted Emissions Tests

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

Humidity Level : 30% Temperature : 22 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : JUN. 30, 1999
 Result : PASSED BY 10.1 dB

EUT : 17" COLOR MONITOR

Operating Condition : 1600 X 1200 Non-Interlaced (Hf : 93.5KHz, Vf : 75Hz)

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

Power Line Conducted Emissions			FCC Class B	
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
17.920	35.2	NEUTRAL	48	-12.8
18.860	35.8	NEUTRAL	48	-12.2
18.950	36.9	NEUTRAL	48	-11.1
19.140	37.6	NEUTRAL	48	-10.4
19.420	37.0	NEUTRAL	48	-11.0
20.360	37.9	NEUTRAL	48	-10.1
21.110	35.1	NEUTRAL	48	-12.9

Line Conducted Emissions Tabulated Data

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.
2. The limit for Class B device is 250 uV from 450 kHz to 30 MHz.

Measured by : Sang Jun, Lee / Engineer

HYUNDAI

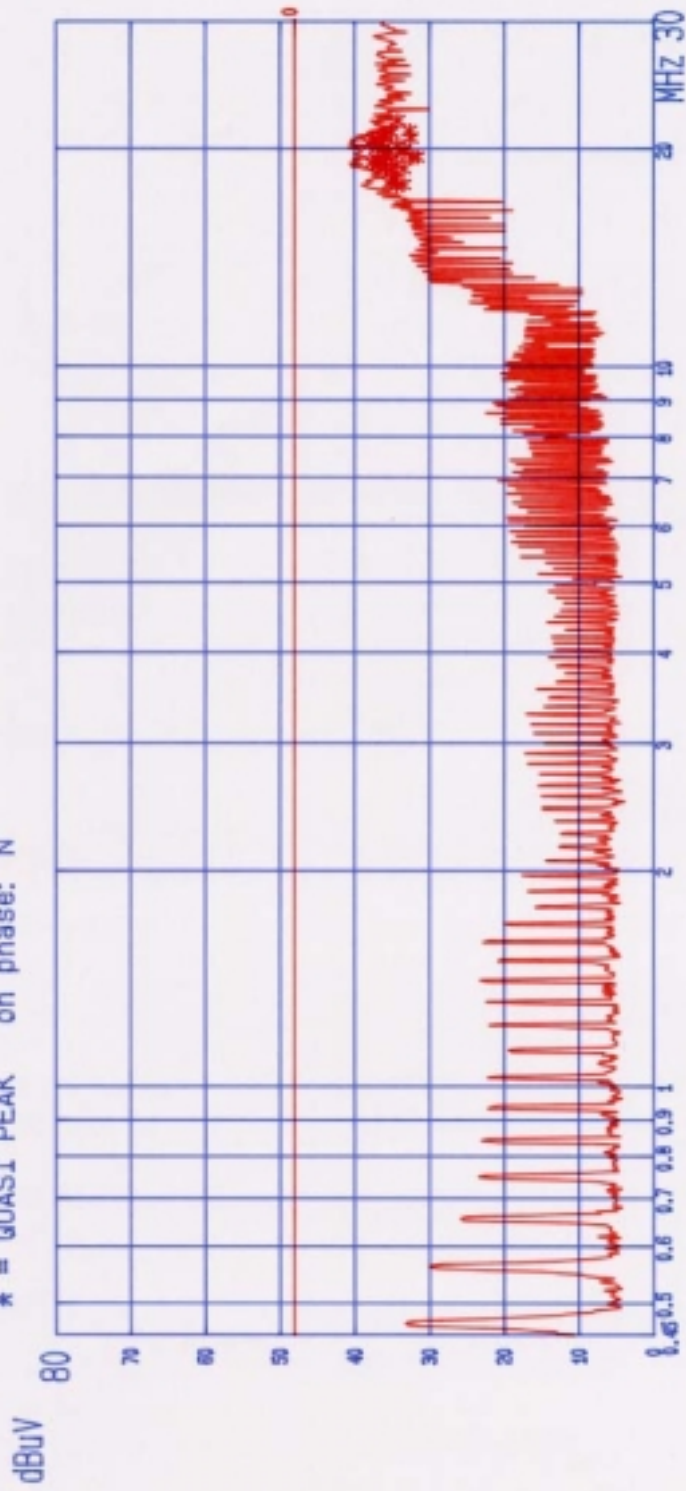
RFI Voltage Test

E.U.T.i: 87908
Oper. conditions: 1600m1500 (Mf: 93.7MHz, Vf: 75Hz)
Test spec:
FCC PART 15 SUBPART B CLASS B

Start Fr. MHz	Stop Fr. MHz	IF-BW kHz	Detec tor	Att. dB	Meas.T. type
0.4500	5.0000	10	Peak	LN	0.020
5.0000	50.0000	10	Peak	LN	0.010

Final evaluation: Quasi Peak

* = QUASI PEAK on phase: N



POWER LINE POLARITY: NEUTRAL

HYUNDAI RFI Voltage Test

E.U.T.i
Oper. condition: 1500W1500 (Mf: 93.7KHz, Vt: 75Hz)
Test spec:
FCC PART 15 SUBPART B CLASS B

Exceeding Frequency MHz	values on Peak dBuV	phase: N 0-peak dBuV	GP-Margin dB
17.7300	38.4	34.5	-13.4
17.8229	39.1	33.4	-14.5
17.9200	38.3	30.2	-12.7
18.1100	38.5	34.5	-13.3
18.2000	37.8	34.8	-13.1
18.6700	37.8	35.0	-12.9
18.7600	38.2	33.5	-14.4
18.8600	39.2	35.8	-12.1
18.9500	40.4	36.9	-11.0
19.0500	38.8	34.4	-13.5
19.1400	40.7	37.6	-10.3
19.2300	39.7	36.5	-11.4
19.3229	39.2	36.2	-11.7
19.4200	40.3	37.0	-10.9
19.5100	37.9	32.3	-15.5
19.5200	38.0	31.6	-16.3
19.6100	39.4	35.9	-12.0
19.7000	40.0	35.7	-12.2
19.8000	39.3	33.4	-14.5
19.8900	39.0	35.5	-12.4
19.9800	39.3	33.5	-14.4
20.0799	39.8	36.1	-11.6
20.1700	40.8	36.6	-11.1
20.2700	38.2	34.3	-13.5
20.3600	40.5	37.9	-10.0
20.4500	40.6	37.0	-10.9
20.5500	40.0	36.9	-11.0
20.6400	40.4	37.5	-10.4
20.7300	38.4	32.4	-15.5
20.8229	39.6	36.3	-11.5
20.9200	39.3	35.9	-12.0
21.1100	38.3	35.1	-12.8
21.2000	37.8	32.7	-15.2
21.8600	37.9	34.2	-13.7

* Limit exceeded

POWER LINE POLARITY: NEUTRAL

HYUNDAI

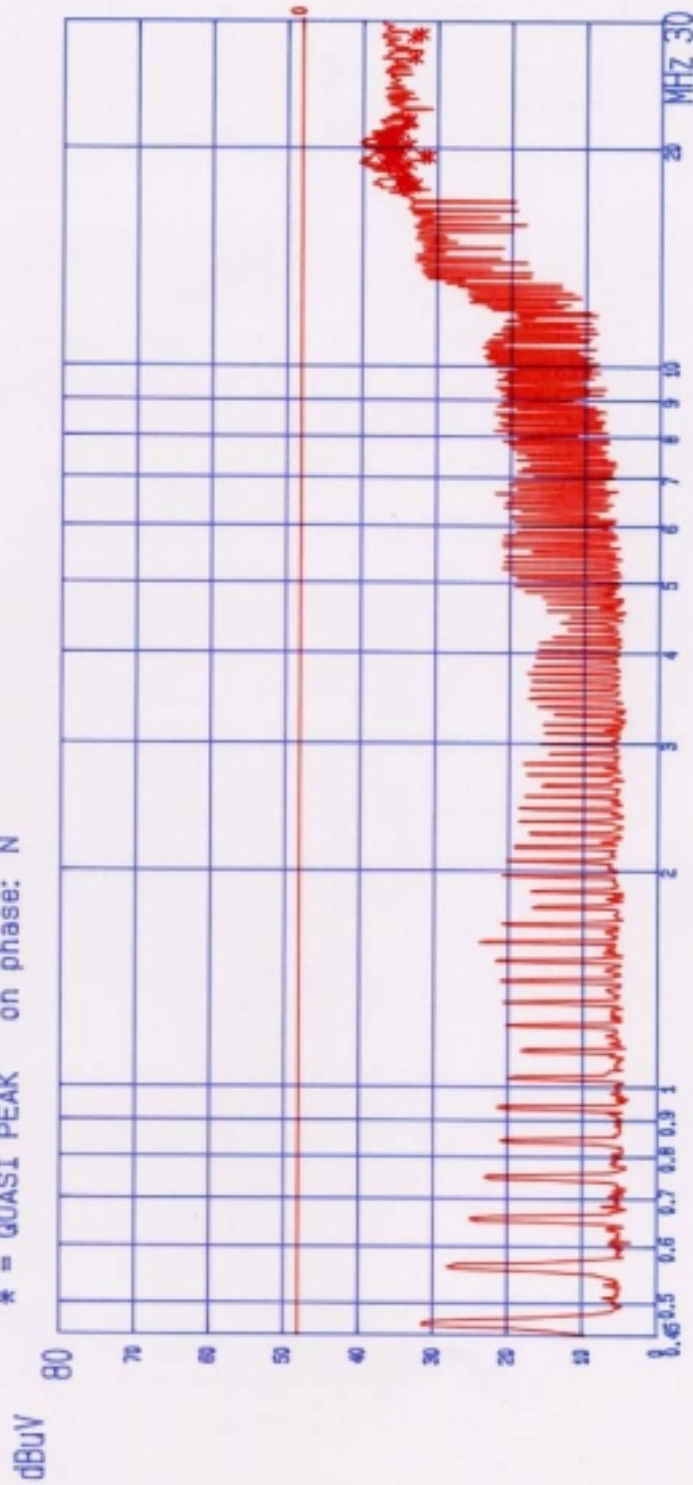
RFI Voltage Test

E.U.T.i: B790S
Oper. condition: 1500W1200 (Mf: 93.7MHz, Vt: 75Hz)
Test spec:
FCC PART 15 SUBPART B CLASS B

Start Fr. Stop Fr. IF-BW Detec Att. Meas.T. Traced.
MHz MHz kHz tor dB μ type

0.4500 5.0000 10 Peak LN 0.020
5.0000 30.0000 10 Peak LN 0.010

Final evaluation: Quasi Peak
* = QUASI PEAK on phase: N



POWER LINE POLARITY: HOT

HYUNDAI

RFI Voltage Test

E.U.T.: 87908
 Oper. conditions: 1600W1200 (Mf: 88.70Hz, Vt: 75Hz)
 Test spec
 FCC PART 15 SUBPART B CLASS B

Exceeding Frequency MHz	values on phase: N Peak dBuV	Q-Peak dBuV	GP-Margin dB
17.6400	37.6	33.5	-14.5
17.7300	37.5	34.2	-13.8
17.8200	37.4	33.1	-14.9
17.9200	38.6	35.0	-13.0
18.0100	38.3	34.2	-13.8
18.1100	37.8	34.5	-13.5
18.2000	37.9	34.6	-13.4
18.6700	38.7	34.6	-13.4
18.8600	38.9	35.3	-12.7
18.9500	39.6	36.4	-11.5
19.0500	37.8	33.9	-14.1
19.1400	40.5	37.1	-10.9
19.2300	40.3	36.0	-12.0
19.3200	39.1	35.8	-12.2
19.4200	40.0	36.6	-11.4
19.5100	38.0	31.8	-16.2
19.5200	38.9	31.2	-16.8
19.6100	38.8	35.8	-12.2
19.7000	38.6	35.7	-12.3
19.8900	38.5	35.2	-12.8
20.0700	39.4	35.3	-12.7
20.1700	39.9	36.3	-11.7
20.2700	38.2	33.8	-14.2
20.3600	40.2	37.6	-10.4
20.4500	40.2	36.7	-11.3
20.5500	39.4	36.5	-11.5
20.6400	39.9	37.3	-10.8
20.8200	38.6	36.0	-12.0
20.9200	38.6	35.7	-12.3
21.1100	38.6	34.8	-13.2
21.6700	37.4	34.0	-14.0
21.8600	37.6	33.8	-14.2
22.7400	37.4	33.1	-14.9
23.5200	37.4	33.2	-14.8
23.6000	37.4	32.2	-15.8

* Limit exceeded

POWER LINE POLARITY: HOT

4.2 Radiated Emissions Tests

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

Humidity Level : 27 % Temperature : 28 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : JUN. 30, 1999
 Result : PASSED BY 4.5 dB

EUT : 17" COLOR MONITOR

Operating Condition : 1600 X 1200 Non-Interlaced (Hf : 93.5 KHz, Vf : 75 Hz)

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

Radiated Emissions		Ant.	Correction Factors	Total	FCC Class B	
Freq. (MHz)	Ampl. (dBuV)	Pol.	Antenna & Cable Loss (dB/m)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
40.4	18.0	V	15.2	33.2	40.0	-6.8
242.7	20.1	V	20.5	40.6	46.0	-5.4
262.9	20.5	V	20.5	41.0	46.0	-5.0
343.9	21.7	H	19.2	40.9	46.0	-5.1
361.1	20.9	V	19.8	40.7	46.0	-5.3
384.4	20.9	H	20.1	41.0	46.0	-5.0
404.6	20.7	V	20.4	41.1	46.0	-4.9
424.8	20.6	V	20.9	41.5	46.0	-4.5
465.3	19.0	V	21.6	40.6	46.0	-5.4
485.5	19.1	V	21.9	41.0	46.0	-5.0
505.7	18.8	V	22.2	41.0	46.0	-5.0
546.2	17.8	V	22.6	40.4	46.0	-5.6
566.4	17.9	V	23.1	41.0	46.0	-5.0
586.6	17.7	V	23.4	41.1	46.0	-4.9
667.5	15.3	V	24.9	40.2	46.0	-5.8
708.0	15.4	V	25.6	41.0	46.0	-5.0

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 : Sang Jun, Lee / Engineer

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.

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

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