

MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : P790

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**

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1. GENERAL INFORMATION

1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model P790(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)	6 MHz
CHIPSET BRAND AND PART NO.	SAMSUNG : LM7805 SAMSUNG : LM7812 SAMSUNG : KA3843 PHILIPS : TDA4856 PHILIPS : TDA4866 SANKEN : STRF6654A NATIONAL : LM2402 NATIONAL : LM358 MICRO CHIP : 24LC08 MOTOROLA : LSC4388 TOSHIBA : TLP621
POWER REQUIREMENT	100 - 240 VAC(Universal Power) 2.5A
NUMBER OF LAYERS	MAIN BOARD 1 LAYER CRT SOCKET BOARD 2 LAYER BNC BOARD 2 LAYER OSD BOARD 1 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 : M41KSX683X24)
VIDEO CONNECTOR TYPE	D-SUB 15-PIN, BNC

1.2 Related Submittal(s) / Grant(s)

ORIGINAL SUBMITTAL ONLY

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	P790	CKLP790	HOST
PC(HOST)	H/P	HP VECTRA 500	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	E4208615901
BNC BOARD	HYUNDAI	E4208615904
OSD BOARD	HYUNDAI	E4208615903
CRT SOCKET BOARD	HYUNDAI	E4208615902

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.

	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

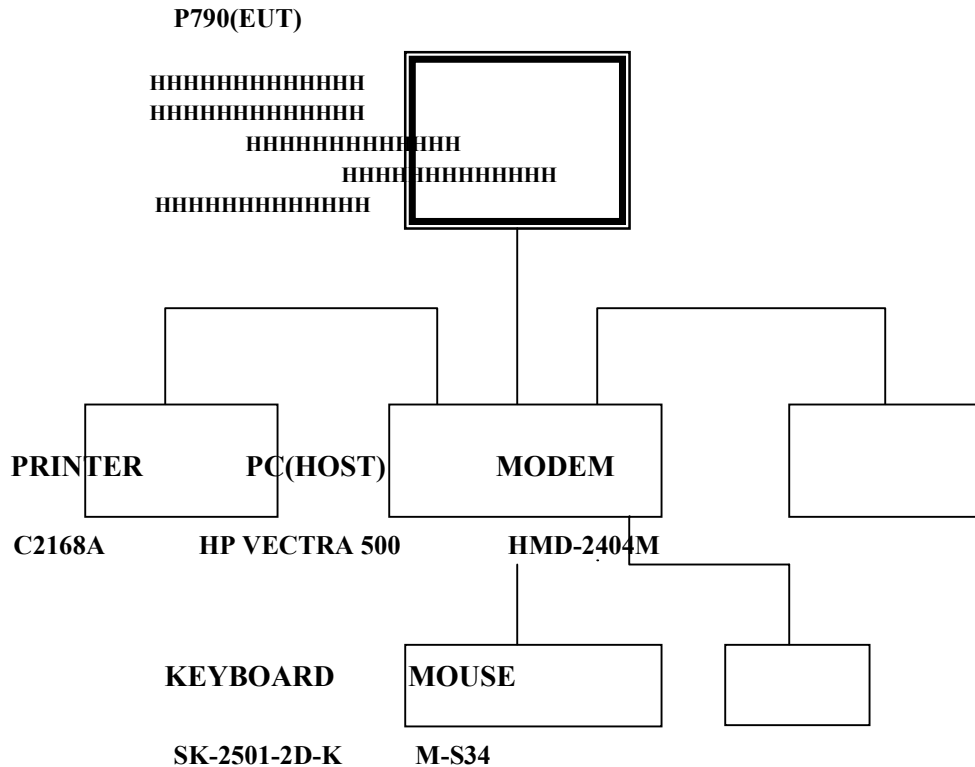
N/A

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]



3.1 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 : MAY. 19, 1999

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 : 26% Temperature : 24 °C
Limit apply to : FCC CFR 47, PART 15, SUBPART B
Type of Tests : CLASS B
Date : MAY. 20, 1999
Result : PASSED BY 14.4 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)
0.4693	27.6	HOT	48	-20.4
0.6560	29.6	NEUTRAL	48	-18.4
0.9371	26.5	HOT	48	-21.5
1.0304	33..6	HOT	48	-14.4
1.2186	28.7	HOT	48	-19.3
9.6600	26.7	HOT	48	-21.3
10.0399	26.4	NEUTRAL	48	-21.6

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

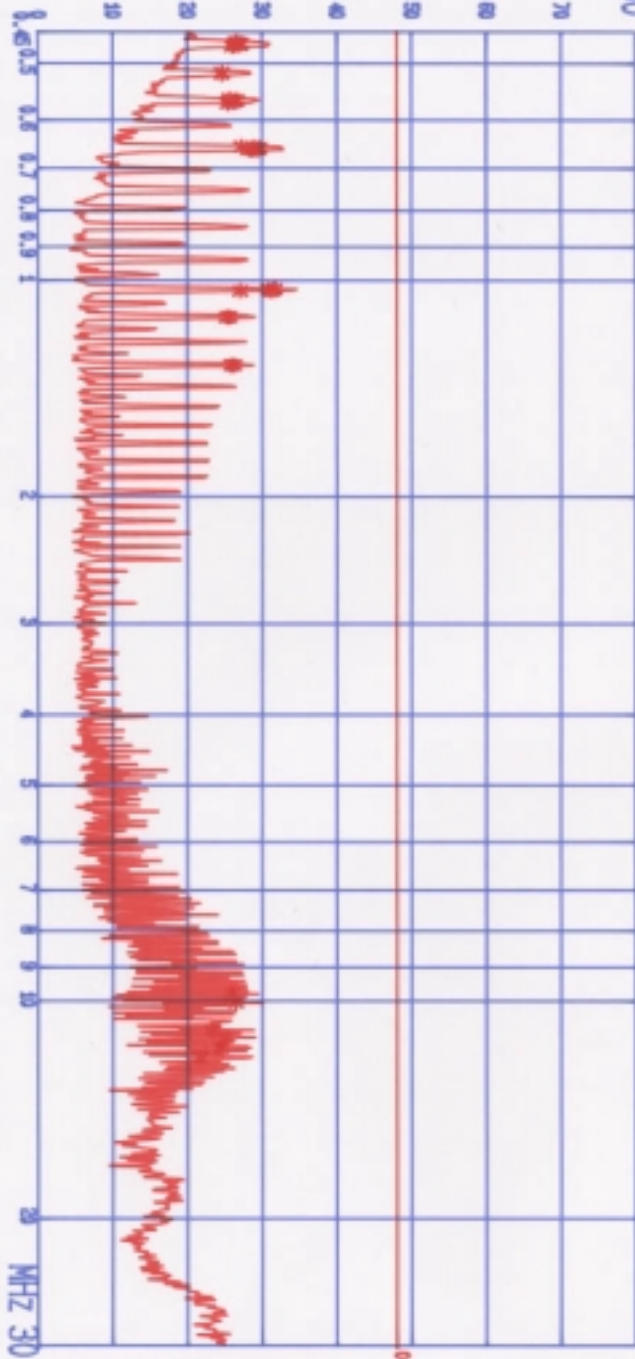
E.U.T.i P730
Oper. Condition: 1600W1200 (Mf: 89.8MHz, Vfr: 75Hz)
Test spec:
PCO PART 15 SUBPART B CLASS B

Start Fr. MHz	Stop Fr. MHz	IF-BW KHz	Detec Type	Att. dB	Meas. T. a	Trended. Type
0.4500	5.0000	10	Peak	LN	0.020	
5.0000	30.0000	10	Peak	LN	0.010	

dBuV

80

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



POWER LINE POLARITY: NEUTRAL

HYUNDAI RFI Voltage Test

E.U.T.: P730
 Oper. condition: 1500W1200 (44: 83.8MHz, Vt: 75Hz)
 Test spec:
 FCC PART 15 SUBPART B CLASS B

Frequency MHz	Exceeding values on phase: N		dB
	Peak dBV	g-Peak dBV	
0.4657	29.4	26.4	-21.5
0.4658	29.5	26.7	-21.2
0.4675	29.9	27.1	-20.8
0.4684	31.1	27.2	-20.7
0.4693	31.0	27.1	-20.8
0.4702	30.9	27.0	-20.9
0.4711	30.3	26.5	-21.4
0.4720	30.6	26.5	-21.0
0.5145	28.4	24.7	-23.2
0.5165	28.4	24.6	-23.3
0.5595	28.9	25.7	-22.2
0.5605	29.3	26.3	-21.6
0.5615	29.5	26.5	-21.3
0.5625	29.4	26.7	-21.2
0.5635	28.6	26.4	-21.5
0.5645	28.5	26.1	-21.8
0.5657	28.5	25.5	-22.4
0.5524	30.3	27.3	-20.6
0.5536	32.2	28.9	-19.0
0.5548	32.5	29.4	-18.5
0.5550	32.6	29.6	-18.3
0.5572	32.8	29.4	-18.5
0.5584	32.2	28.9	-19.0
0.5595	31.2	28.3	-19.6
1.0284	29.9	26.9	-17.0
1.0304	34.5	31.7	-16.2
1.0324	34.1	31.5	-16.3
1.0344	33.7	31.2	-16.7
1.0364	30.0	27.1	-20.8
1.1247	29.1	25.7	-22.2
1.1268	28.5	25.3	-22.6
1.3105	28.8	25.9	-22.0
1.3131	28.5	25.2	-21.7
10.7800	29.4	25.8	-22.1
10.0389	30.0	26.4	-21.5
10.9800	28.9	23.3	-24.5
11.2600	29.1	23.0	-22.9
11.6300	28.5	24.5	-23.4
11.9100	28.7	21.7	-26.2

M Limit exceeded

POWER LINE POLARITY: NEUTRAL

HYUNDAI

RFI Voltage Test

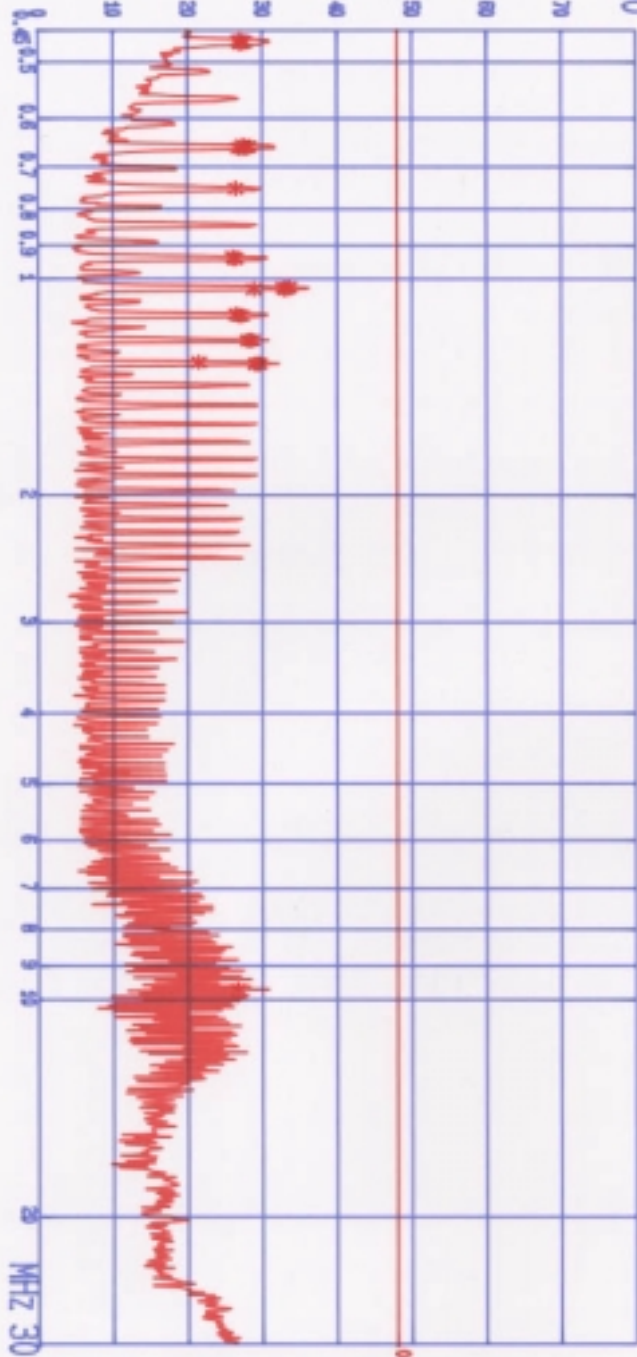
E.U.T.i P730
Oper. condition: 1600W1200 (Mf: 88.8MHz, Vfr: 75Hz)
Test spec:
PCO PART 15 SUBPART B CLASS B

Start F.	Stop F.	IF-BW	Detec	Att.	Meas.T.	Transd.
MHz	MHz	KHz	Cor	dB	a	type
0.4500	5.0000	10	Peak	LN	0.020	
5.0000	30.0000	10	Peak	LN	0.010	

dBuV

80

Final evaluation: Quasi Peak
* = QUASI PEAK on phase: L1



POWER LINE POLARITY: HOT

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RFI Voltage Test

E.U.T.: P730
 Oper. condition: 1600W1200 (Hf: 93.60Hz, Vrf: 75Hz)
 Test spec:
 FCC PART 15 SUBPART B CLASS B

Exceeding values on phase: L1			
Frequency MHz	Peak dBV	2-Peak dBV	2-Peak dB-Margin
0.4657	30.6	26.9	-21.1
0.4666	30.5	27.2	-20.9
0.4675	31.1	27.5	-20.5
0.4684	30.5	27.7	-20.4
0.4693	31.1	27.6	-20.4
0.4702	30.4	27.5	-20.7
0.4711	29.5	27.0	-21.0
0.4720	30.5	27.4	-20.6
0.4729	30.4	27.9	-20.1
0.4738	32.1	28.2	-19.8
0.4747	30.6	27.9	-20.1
0.4756	31.6	27.5	-20.5
0.4765	30.0	26.8	-21.2
0.4774	29.5	26.5	-21.5
0.4783	28.9	26.0	-22.0
0.4792	30.6	26.5	-21.5
0.4801	29.4	26.5	-21.5
0.4810	29.4	26.5	-21.5
0.4819	29.4	26.5	-21.5
0.4828	29.4	26.5	-21.5
0.4837	29.4	26.5	-21.5
0.4846	29.4	26.5	-21.5
0.4855	29.4	26.5	-21.5
0.4864	29.4	26.5	-21.5
0.4873	29.4	26.5	-21.5
0.4882	29.4	26.5	-21.5
0.4891	29.4	26.5	-21.5
0.4900	29.4	26.5	-21.5
0.4909	29.4	26.5	-21.5
0.4918	29.4	26.5	-21.5
0.4927	29.4	26.5	-21.5
0.4936	29.4	26.5	-21.5
0.4945	29.4	26.5	-21.5
0.4954	29.4	26.5	-21.5
0.4963	29.4	26.5	-21.5
0.4972	29.4	26.5	-21.5
0.4981	29.4	26.5	-21.5
0.4990	29.4	26.5	-21.5
0.5000	29.4	26.5	-21.5
0.5009	29.4	26.5	-21.5
0.5018	29.4	26.5	-21.5
0.5027	29.4	26.5	-21.5
0.5036	29.4	26.5	-21.5
0.5045	29.4	26.5	-21.5
0.5054	29.4	26.5	-21.5
0.5063	29.4	26.5	-21.5
0.5072	29.4	26.5	-21.5
0.5081	29.4	26.5	-21.5
0.5090	29.4	26.5	-21.5
0.5100	29.4	26.5	-21.5
0.5109	29.4	26.5	-21.5
0.5118	29.4	26.5	-21.5
0.5127	29.4	26.5	-21.5
0.5136	29.4	26.5	-21.5
0.5145	29.4	26.5	-21.5
0.5154	29.4	26.5	-21.5
0.5163	29.4	26.5	-21.5
0.5172	29.4	26.5	-21.5
0.5181	29.4	26.5	-21.5
0.5190	29.4	26.5	-21.5
0.5200	29.4	26.5	-21.5
0.5209	29.4	26.5	-21.5
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0.5309	29.4	26.5	-21.5
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0.5327	29.4	26.5	-21.5
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0.5572	29.4	26.5	-21.5
0.5581	29.4	26.5	-21.5
0.5590	29.4	26.5	-21.5
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0.5609	29.4	26.5	-21.5
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0.5636	29.4	26.5	-21.5
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0.5663	29.4	26.5	-21.5
0.5672	29.4	26.5	-21.5
0.5681	29.4	26.5	-21.5
0.5690	29.4	26.5	-21.5
0.5700	29.4	26.5	-21.5
0.5709	29.4	26.5	-21.5
0.5718	29.4	26.5	-21.5
0.5727	29.4	26.5	-21.5
0.5736	29.4	26.5	-21.5
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0.5763	29.4	26.5	-21.5
0.5772	29.4	26.5	-21.5
0.5781	29.4	26.5	-21.5
0.5790	29.4	26.5	-21.5
0.5800	29.4	26.5	-21.5
0.5809	29.4	26.5	-21.5
0.5818	29.4	26.5	-21.5
0.5827	29.4	26.5	-21.5
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0.6090	29.4	26.5	-21.5
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0.6109	29.4	26.5	-21.5
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0.6190	29.4	26.5	-21.5
0.6200	29.4	26.5	-21.5
0.6209	29.4	26.5	-21.5
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0.6336	29.4	26.5	-21.5
0.6345	29.4	26.5	-21.5
0.6354	29.4	26.5	-21.5
0.6363	29.4	26.5	-21.5
0.6372	29.4	26.5	-21.5
0.6381	29.4	26.5	-21.5
0.6390	29.4	26.5	-21.5
0.6400	29.4	26.5	-21.5
0.6409	29.4	26.5	-21.5
0.6418	29.4	26.5	-21.5
0.6427	29.4	26.5	-21.5
0.6436	29.4	26.5	-21.5
0.6445	29.4	26.5	-21.5
0.6454	29.4	26.5	-21.5
0.6463	29.4	26.5	-21.5
0.6472	29.4	26.5	-21.5
0.6481	29.4	26.5	-21.5
0.6490	29.4	26.5	-21.5
0.6500	29.4	26.5	-21.5
0.6509	29.4	26.5	-21.5
0.6518	29.4	26.5	-21.5
0.6527	29.4	26.5	-21.5
0.6536	29.4	26.5	-21.5
0.6545	29.4	26.5	-21.5
0.6554	29.4	26.5	-21.5
0.6563	29.4	26.5	-21.5
0.6572	29.4	26.5	-21.5
0.6581	29.4	26.5	-21.5
0.6590	29.4	26.5	-21.5
0.6600	29.4	26.5	-21.5
0.6609	29.4	26.5	-21.5
0.6618	29.4	26.5	-21.5
0.6627	29.4	26.5	-21.5
0.6636	29.4	26.5	-21.5
0.6645	29.4	26.5	-21.5
0.6654	29.4	26.5	-21.5
0.6663	29.4	26.5	-21.5
0.6672	29.4	26.5	-21.5
0.6681	29.4	26.5	-21.5
0.6690	29.4	26.5	-21.5
0.6700	29.4	26.5	-21.5
0.6709	29.4	26.5	-21.5
0.6718	29.4	26.5	-21.5
0.6727	29.4	26.5	-21.5
0.6736	29.4	26.5	-21.5
0.6745	29.4	26.5	-21.5
0.6754	29.4	26.5	-21.5
0.6763	29.4	26.5	-21.5
0.6772	29.4	26.5	-21.5
0.6781	29.4	26.5	-21.5
0.6790	29.4	26.5	-21.5
0.6800	29.4	26.5	-21.5
0.6809	29.4	26.5	-21.5
0.6818	29.4	26.5	-21.5
0.6827	29.4	26.5	-21.5
0.6836	29.4	26.5	-21.5
0.6845	29.4	26.5	-21.5
0.6854	29.4	26.5	-21.5
0.6863	29.4	26.5	-21.5
0.6872	29.4	26.5	-21.5
0.6881	29.4	26.5	-21.5
0.6890	29.4	26.5	-21.5
0.6900	29.4	26.5	-21.5
0.6909	29.4	26.5	-21.5
0.6918	29.4	26.5	-21.5
0.6927	29.4	26.5	-21.5
0.6936	29.4	26.5	-21.5
0.6945	29.4	26.5	-21.5
0.6954	29.4	26.5	-21.5
0.6963	29.4	26.5	-21.5
0.6972	29.4	26.5	-21.5
0.6981	29.4	26.5	-21.5
0.6990	29.4	26.5	-21.5
0.7000	29.4	26.5	-21.5
0.7009	29.4	26.5	-21.5
0.7018	29.4	26.5	-21.5
0.7027	29.4	26.5	-21.5
0.7036	29.4	26.5	-21.5
0.7045	29.4	26.5	-21.5
0.7054	29.4	26.5	-21.5
0.7063	29.4	26.5	-21.5
0.7072	29.4	26.5	-21.5
0.7081	29.4	26.5	-21.5
0.7090	29.4	26.5	-21.5
0.7100	29.4	26.5	-21.5
0.7109	29.4	26.5	-21.5
0.7118	29.4	26.5	-21.5
0.7127	29.4	26.5	-21.5
0.7136	29.4	26.5	-21.5
0.7145	29.4	26.5	-21.5
0.7154	29.4	26.5	-21.5
0.7163	29.4	26.5	-21.5
0.7172	29.4	26.5	-21.5
0.7181	29.4	26.5	-21.5
0.7190	29.4	26.5	-21.5
0.7200	29.4	26.5	-21.5
0.7209	29.4	26.5	-21.5
0.7218	29.4	26.5	-21.5
0.7227	29.4	26.5	-21.5
0.7236	29.4	26.5	-21.5
0.7245	29.4	26.5	-

4.2 Radiated Emissions Tests

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

Humidity Level : 23 % Temperature : 24 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : MAY. 19, 1999
 Result : PASSED BY 5.0 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	19.5	V	15.2	34.7	40.0	-5.3
60.7	26.1	V	8.9	35.0	40.0	-5.0
80.9	26.1	V	8.0	34.1	40.0	-5.9
162.0	19.3	V	17.5	36.8	43.5	-6.7
202.2	16.0	V	19.6	35.6	43.5	-7.9
242.7	18.7	V	20.5	39.2	46.0	-6.8
343.9	20.8	H	19.2	40.0	46.0	-6.0
364.1	19.3	H	19.8	39.1	46.0	-6.9
404.6	18.9	V	20.4	39.3	46.0	-6.7
505.7	17.0	V	22.2	39.2	46.0	-6.8
526.0	15.9	V	22.5	38.4	46.0	-7.6
546.2	17.4	V	22.6	40.0	46.0	-6.0
667.3	15.3	H	24.9	40.2	46.0	-5.8
748.1	12.8	V	26.1	38.9	46.0	-7.1
808.7	11.7	H	27.2	38.9	46.0	-7.1
869.3	8.1	H	28.1	36.2	46.0	-9.8

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.

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

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