

MEASUREMENT / TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : L50A

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

Equipment type : LCD 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 15" LCD Monitor HOR. Freq. 68.7 kHz w/max. Resolution of 1024×768 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)	14.318 MHz/ 12.0 MHz/ 16.0MHz
CHIPSET BRAND AND PART NO.	FAIRCHILD: 3202001505 SAMSUNG: 3203000879 HYUNDAI: 3203000757 MYSON: 3205001364 ANALOG DEVICE: 3200001402 AURORA: 3205001363 ALI: 3205001365
POWER REQUIREMENT	100 - 240 VAC 50/60Hz 1.5A
NUMBER OF LAYERS	MAIN BOARD 4 LAYER OSD BOARD 1 LAYER POWER BOARD 1 LAYER INVERTER BOARD 2 LAYER LCD MODULE BOARD 6 LAYER
MAX. RESOLUTION	1024 X 768 NON-INTERLACED (@ 68.7 kHz/85 Hz)
H-SYNC FREQUENCY RANGE	31.3 kHz 68.7kHz
V-SYNC FREQUENCY RANGE	43 Hz 85 Hz
LCD TYPE	15" (HYUNDAI / Type : HT15X11-200)

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
LCD MONITOR(EUT)	HYUNDAI	L50A	CKLL50A	HOST
PC(HOST)	COMPAQ	DESK Pro	DoC	N/A
KEYBOARD	H/P	SK-2502C	DoC	HOST
PRINTER	H/P	HP895C	DoC	HOST
MODEM	3 COM	56K FAX Modem	DoC	HOST
VIDEO CARD	ATI	ATI RAGE PRO	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	PART NUMBER
MAIN BOARD	HYUNDAI	3610400236
OSD BOARD	HYUNDAI	3010700732
POWER BOARD	HYUNDAI	CE92HMN
INVERTER BOARD	HYUNDAI	3041001030
LCD MODULE BOARD	HYUNDAI	HT15X11-200C4LO

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)
LCD MONITOR(EUT)	N	Y	1.8(P), 1.5(D)
PC(HOST)	N	N/A	1.8(P)
PRINTER	N	Y	2.0(P),1.5(D)
KEYBOARD	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.

	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
LCD MONITOR(EUT)	Y	BOTH END	Y	BOTH END
PC(HOST)	N	N/A	N	N/A
PRINTER	N	N/A	Y	BOTH END
KEYBOARD	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

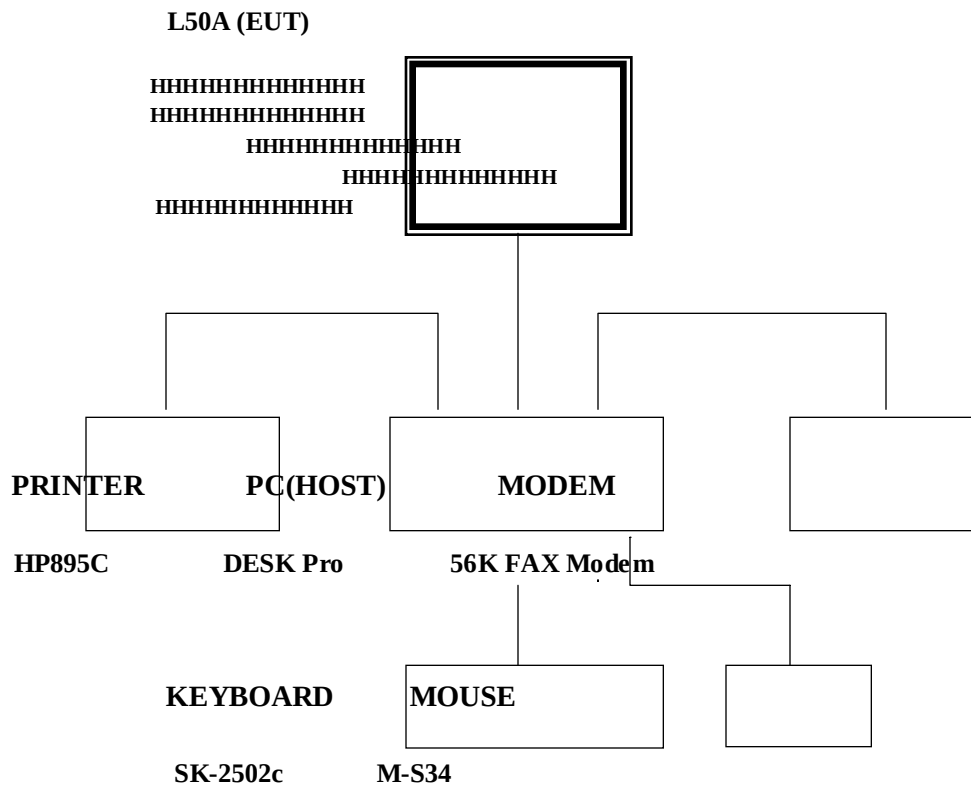
2.6 Configuration of Test system

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 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 350 MHz	1024 x 768 Non-Interlaced (68.7kHz/85Hz)	X
Pentium 350 MHz	800 x 600 Non-Interlaced (53.6 kHz/85Hz)	
Pentium 350 MHz	640 x 480 Non-Interlaced (43.3 KHz/85Hz)	
Pentium 350 MHz	640 x 350 Non-Interlaced (31.5 KHz/70Hz)	

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 350 MHz	1024 x 768 Non-Interlaced (68.7kHz/85Hz)	X
Pentium 350 MHz	800 x 600 Non-Interlaced (53.6 kHz/85Hz)	
Pentium 350 MHz	640 x 480 Non-Interlaced (43.3 KHz/85Hz)	
Pentium 350 MHz	640 x 350 Non-Interlaced (31.5 KHz/70Hz)	

Tested by Keun-Ho Park

Date : SEP. 1, 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 : 34% Temperature : 24
 Limit apply to : CISPR 22
 Type of Tests : CLASS B
 Date : SEP. 4, 2000
 Result : PASSED BY -9.4dB
 EUT : 15" LCD MONITOR

Operating Condition : 1024 X 768 Non-Interlaced (Hf : 68.7 KHz, Vf : 85Hz)

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
21.29	40.6	N	50	-9.4	Average
3.02	44.6	N	56	-11.4	Quasi-Peak
3.28	44.5	N	56	-11.5	Quasi-Peak
14.72	37.4	N	50	-12.6	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

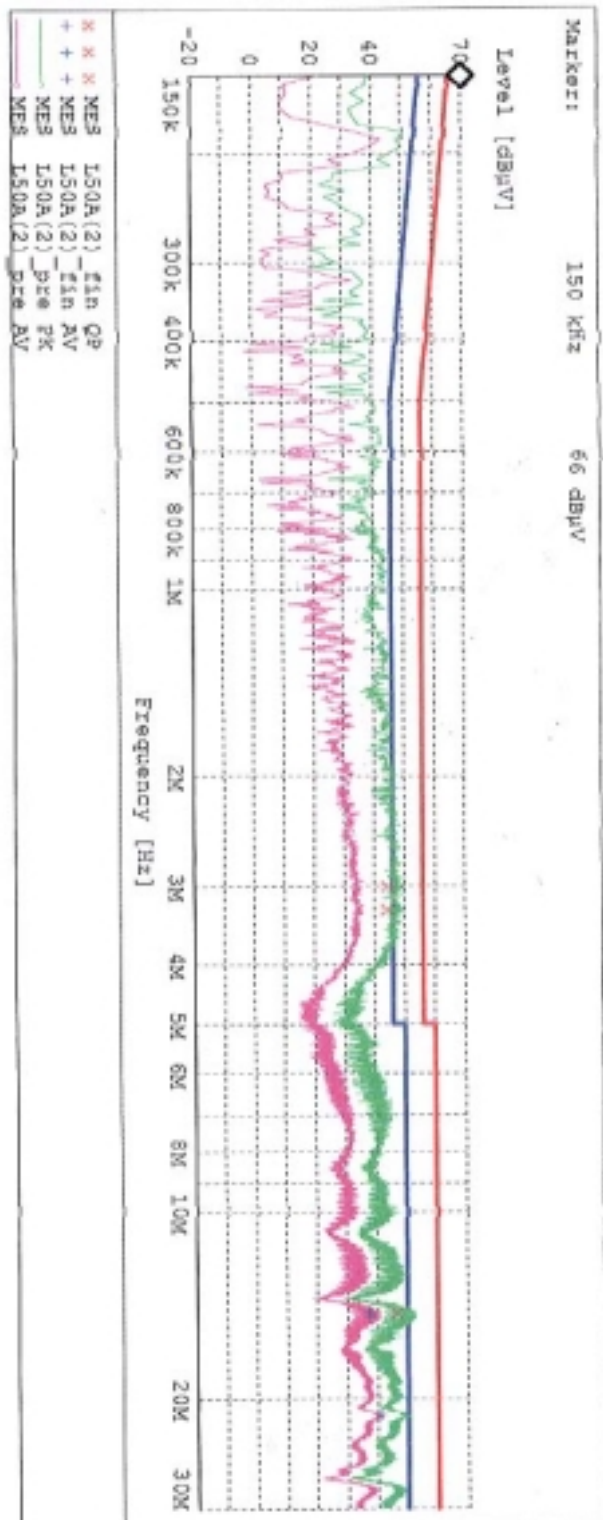
Date : SEP. 1, 2000

HYUNDAI C-TECH

EUT: 150A
Manufacturer: HYUNDAI ELECTRONICS INS.CO.,LTD.
Operating Condition: 1024x768 85Hz
Test Site:
Operator: KM PARK
Test Specification: CISPR 22
Comment: ✓
Start of Test: 9/1/00 / 12:45:48AM

SCAN TABLE: "EN 55022 V SJ"

Short Description:	EN 55022 Voltage	IF	Transducer
Start	Stop	Step	Detector Meas.
Frequency	Frequency	Width	Time
150.0 KHz	30.0 MHz	5.0 KHz	MaxPeak 10.0 ms
			Average 9 KHz



MEASUREMENT RESULT: "L50A(2)_fin OP"

9/1/00 12:48PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Line	PS
3.020000	44.60	1.1	56	11.4	1	---
3.285000	44.50	1.1	56	11.5	1	---
14.585000	46.80	2.0	60	13.2	1	---

MEASUREMENT RESULT: "L50A(2)_fin AV"

9/1/00 12:48PM

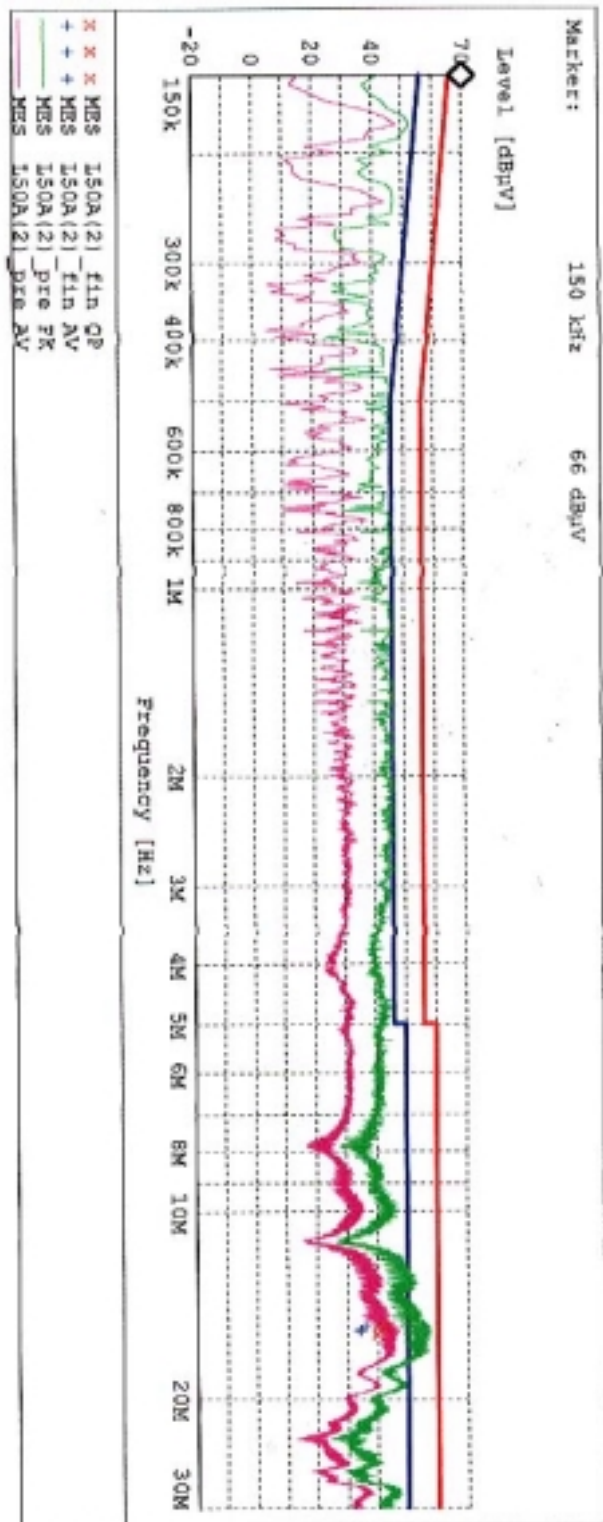
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Line	PS
14.520000	37.00	2.0	50	13.0	1	---
14.725000	37.40	2.0	50	12.6	1	---
21.290000	40.60	2.4	50	9.4	1	---

HYUNDAI C-TECH

EUT: L50A
Manufacturer: HYUNDAI ELECTRONICS INS.CO.,LTD.
Operating Condition: 1024x768 85Hz
Test Site:
Operator: KE PARK
Test Specification: CISPR 22
Comment: H
Start of Test: 9/1/00 / 12:30:48PM

SCAN TABLE: "EN 55022 V SJ"

Short Description:	EN 55022 Voltage	IF	Transducer
Start	Stop	Step	Detector
Frequency	Frequency	Width	Time
150.0 KHz	30.0 MHz	5.0 KHz	MaxPeak 10.0 ms
			9 KHz
			C/E FACTOR
			Average



MEASUREMENT RESULT: "L50A(2)_fin OP"

9/1/00 12:44PM

Frequency MHz	Level dBuV	Trend dB	Limit dBuV	Margin dB	Line	PS
15.385000	42.70	2.0	60	17.3	1	---
15.590000	40.90	2.0	60	19.1	1	---
15.775000	40.50	2.0	60	19.5	1	---

MEASUREMENT RESULT: "L50A(2)_fin AV"

9/1/00 12:44PM

Frequency MHz	Level dBuV	Trend dB	Limit dBuV	Margin dB	Line	PS
15.315000	35.50	2.0	50	14.5	1	---
15.530000	34.00	2.0	50	16.0	1	---
15.590000	33.60	2.0	50	16.4	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 : 25 % Temperature : 25

Limit apply to : CISPR 22

Type of Tests : CLASS B

Date : SEP. 4, 2000

Result : PASSED BY -3.5 dB

EUT : 15" COLOR MONITOR

Operating Condition : 1024 X 768 Non-Interlaced (Hf : 68.7 kHz, Vf : 85 Hz)

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

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB/m	ANT POL. (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
53.0	15.12	9.78	1.50	V	26.4	30.0	-3.6
71.2	18.99	5.71	1.80	V	26.5	30.0	-3.5
133.3	9.05	14.25	2.50	V	25.8	30.0	-4.2
200.1	5.92	15.78	3.00	V	24.7	30.0	-5.3
376.9	8.25	16.55	4.10	V	28.9	37.0	-8.1
471.2	7.41	17.99	4.80	V	30.2	37.0	-6.8
502.6	5.60	18.60	4.90	V	29.1	37.0	-7.9
518.3	6.44	18.86	5.00	V	30.3	37.0	-6.7
564.4	2.87	19.83	5.30	H	28.0	37.0	-9.0
565.4	3.26	19.84	5.30	V	28.4	37.0	-8.6
589.0	1.53	20.17	5.60	H	27.3	37.0	-9.7
589.8	5.43	20.17	5.60	V	31.2	37.0	-5.8
596.8	3.66	20.24	5.70	V	29.6	37.0	-7.4
596.8	2.46	20.24	5.70	H	28.4	37.0	-8.6

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 : SEP. 4, 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.

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

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