

MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : S560

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**

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1. GENERAL INFORMATION

1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model S560(refered to as the EUT in this report) is a 15"COLOR Monitor HOR. Freq. 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)	8 MHz
CHIPSET BRAND AND PART NO.	HYUNDAI : 83003B SAMSUNG : KA38426 SAMSUNG : KA358 PHILIPS : TD4853 NATIONAL : LM2409T MOTOROLA : MC13281FTP MICROCHIP : 24LC04B
POWER REQUIREMENT	100 - 240 VAC 50/60Hz 1.3A
NUMBER OF LAYERS	MAIN BOARD 1 LAYER CRT SOCKET BOARD 1 LAYER
MAX. RESOLUTION	1024 X 768 NON-INTERLACED (@ 56kHz/70 Hz)
H-SYNC FREQUENCY RANGE	30 kHz □ 57 kHz
V-SYNC FREQUENCY RANGE	50 Hz □ 130 Hz
CRT SIZE	15" (SAMSUNG / Type : M34KUK35X07)
VIDEO CONNECTOR TYPE	D-SUB 15-PIN

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	S560	CKLS560	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
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)

2.1 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	E420501****
CRT SOCKET BOARD	HYUNDAI	E420501****

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

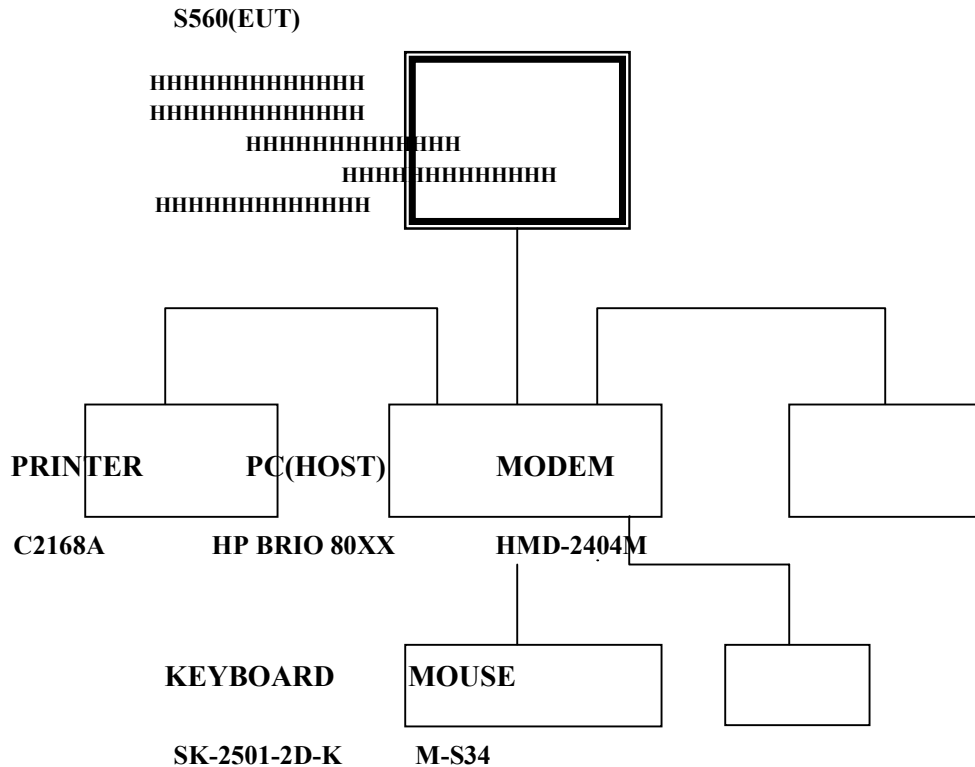
N/A

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	1024 x 768 Non-Interlaced (56.4kHz/70Hz)	X
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (43.2KHz/85Hz)	

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	1024 x 768 Non-Interlaced (56.4kHz/70Hz)	X
Pentium 75 MHz	800 x 600 Non-Interlaced (53.6KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (43.2KHz/85Hz)	

Tested by Sang Jun, Lee

Date : NOV. 22. 1998

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 : 23% Temperature : 10 °C
Limit apply to : FCC CFR 47, PART 15, SUBPART B
Type of Tests : CLASS B
Date : NOV. 23, 1998
Result : PASSED BY 9.7 dB

EUT : 15" COLOR MONITOR
Operating Condition : 1024 X 768 Non-Interlaced (Hf : 56.4 KHz, Vf : 70Hz)
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)
0.563	33.6	NEUTRAL	48	-14.3
3.835	33.2	HOT	48	-14.9
4.002	33.6	HOT	48	-14.5
14.940	30.0	NEUTRAL	48	-17.9
15.000	35.5	HOT	48	-12.5
22.500	38.3	NEUTRAL	48	-9.7
26.28	30.2	NEUTRAL	48	-17.7

Line Conducted Emission 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**

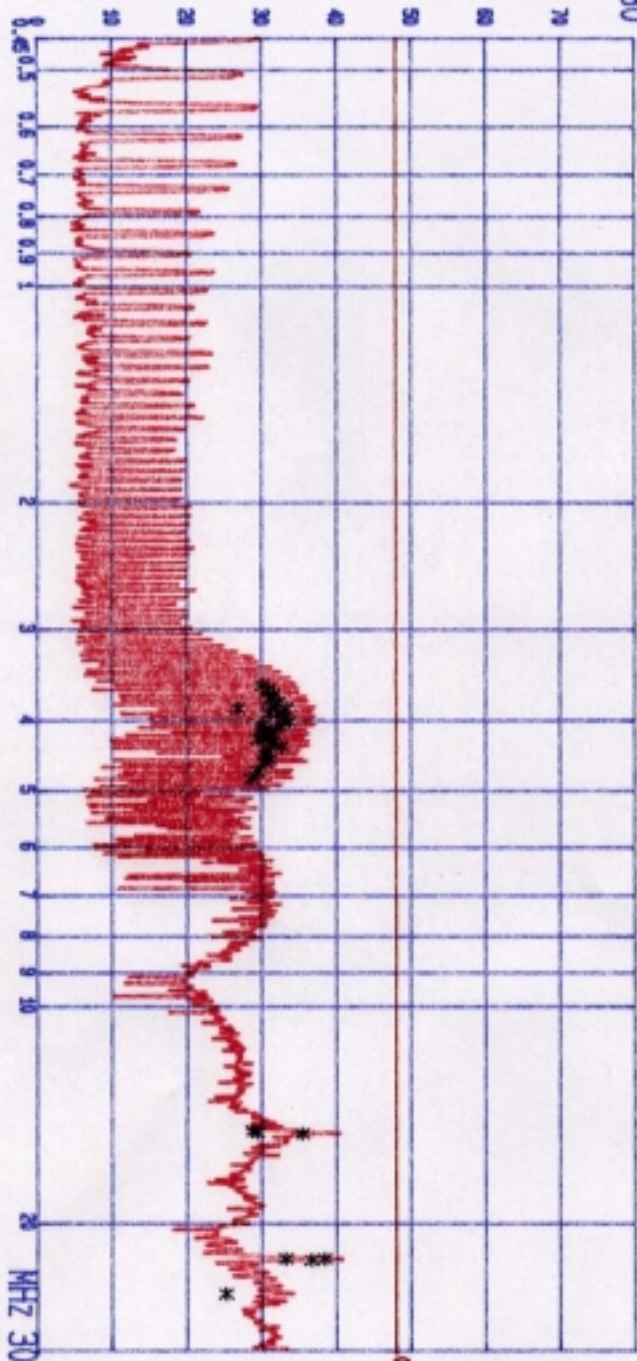
E.U.T.: S560
Oper. conditions: 1024 * 768 Dnt-26.0KHz, Vt=70Hz
Test spec:
FCC PART 15 SUBPART B CLASS B

Start Fr. MHz	Stop Fr. MHz	IF-BW kHz	Detec type	Att. dB	Meas.T. s	Trend.
0.4300	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



HYUNDAI

RFI Voltage Test

E.U.T.: S560
 Oper. condition: 1024 M 768 Off-56.0KHz, V_F=70Hz
 Test spec:
 FCC PART 15 SUBPART B CLASS B

Exceeding values on phase: N			
Frequency MHz	Peak dBμV	G-Peak dBμV	GP-Margin dB
3.5565	34.6	30.0	-18.1
3.6121	35.0	30.8	-17.5
3.6685	35.1	31.7	-16.4
3.7186	35.0	31.5	-16.6
3.7258	35.0	31.2	-16.8
3.7787	35.3	32.3	-16.8
3.8357	37.2	33.2	-14.9
3.8431	34.3	26.9	-21.2
3.8981	35.9	32.3	-16.8
3.8985	35.7	31.1	-17.0
3.9488	37.2	33.1	-16.0
4.0028	36.9	33.6	-14.5
4.0575	37.2	32.4	-15.7
4.0634	36.0	30.0	-18.1
4.1130	36.0	30.1	-16.0
4.1210	35.9	31.3	-15.8
4.1692	35.5	30.9	-17.2
4.1773	35.1	31.9	-16.8
4.2262	35.9	31.0	-17.1
4.2344	34.7	29.5	-18.6
4.2840	35.5	31.4	-16.7
4.3425	35.4	32.6	-15.5
4.4018	35.3	30.9	-17.2
4.4532	34.9	30.4	-17.7
4.5141	35.4	31.0	-17.1
4.5670	35.2	30.4	-17.7
4.6837	34.2	28.5	-18.8
4.7941	34.2	28.7	-18.4
14.8900	34.5	28.9	-19.2
14.9400	34.9	29.5	-18.6
15.0000	40.7	35.5	-12.6
22.4400	38.2	33.2	-14.9
22.4500	40.8	38.4	-9.7
22.5000	40.9	36.7	-11.4
25.0400	34.4	25.3	-22.8

* Limit exceeded

POWER LINE POLARITY : HOT

HYUNDAI RFI Voltage Test

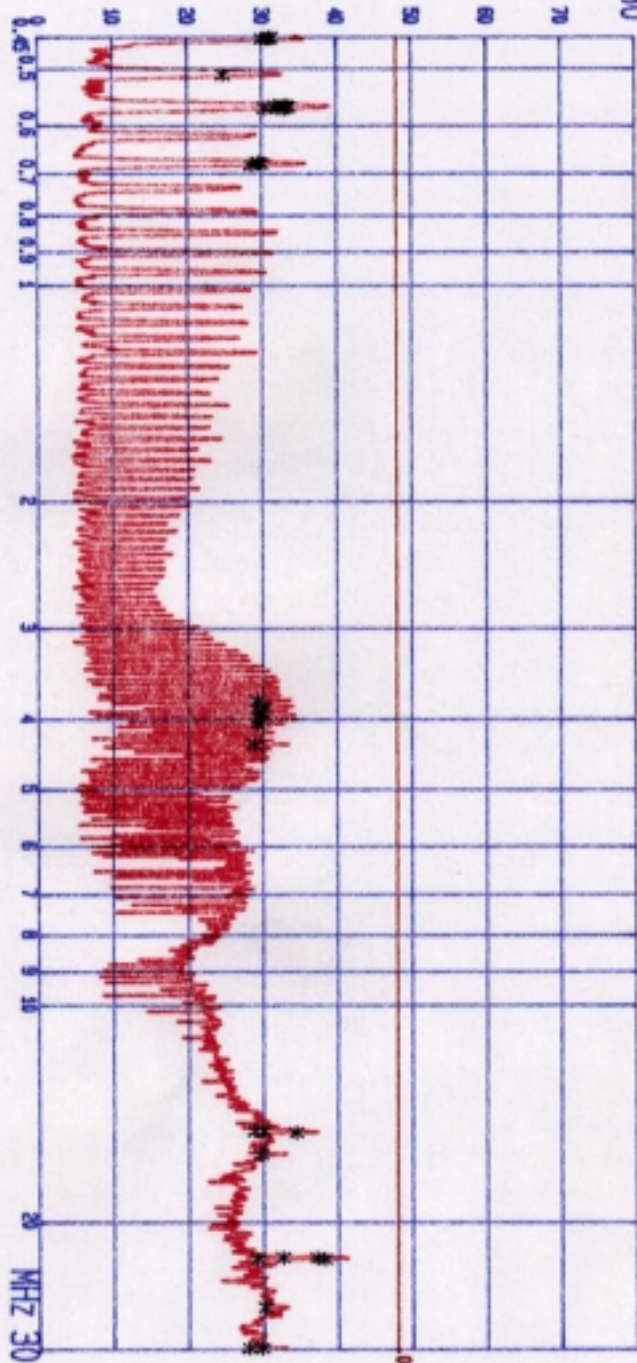
E.U.T.: S560
Oper. condition: 1024 * 768 0Hz-55.0MHz. V_f=70Hz
Test spec:
FCC PART 15 SUBPART B CLASS B

Start F _r . MHz	Stop F _r . MHz	IF-BW KHz	Data for	Att. dB	Meas.T. s	Transd. 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



HYUNDAI RFI Voltage Test

E.U.T.: 5560
 Oper. condition: 1024 * 768 (Hf=55.0MHz, Vt=70Hz)
 Test spec:
 FCC PART 15 SUBPART B CLASS B

Exceeding values on phase: N			
Frequency MHz	Peak dBuV	Q-Peak dBuV	Q-Margin dB
0.4500	34.7	31.3	-16.8
0.4508	36.6	31.2	-16.7
0.4516	36.6	31.3	-16.6
0.4524	34.5	31.0	-16.8
0.4532	35.9	30.7	-17.2
0.4540	34.9	30.0	-17.9
0.5088	35.8	34.8	-25.1
0.5095	37.7	34.8	-18.0
0.5615	39.6	33.0	-14.9
0.5629	38.1	33.5	-14.4
0.5635	39.2	33.5	-14.3
0.5645	38.1	33.5	-14.4
0.5657	35.4	33.1	-14.8
0.5668	37.7	32.3	-15.6
0.5679	35.9	30.4	-17.5
0.6747	32.9	29.6	-18.3
0.6760	36.0	30.0	-17.9
0.6773	33.3	29.9	-18.0
0.6798	34.3	29.7	-19.2
3.7767	33.8	29.2	-18.7
3.8367	34.2	30.2	-17.7
3.8981	33.4	29.4	-18.5
3.9488	34.4	29.7	-18.2
4.0028	34.7	29.9	-18.0
4.0675	33.1	29.3	-18.6
4.3425	33.5	28.9	-19.0
14.9400	33.9	30.0	-17.9
14.9500	35.1	28.8	-19.1
15.0000	37.4	34.5	-15.4
16.0700	33.3	29.7	-18.2
22.4400	39.8	32.6	-18.3
22.4500	40.8	37.2	-10.7
22.5000	41.4	38.3	-9.6
22.5600	33.0	29.2	-16.7
26.2800	33.5	30.2	-17.7
29.9400	33.2	29.8	-18.1
29.9500	32.9	28.0	-19.9

* Limit exceeded

POWER LINE POLARITY : NEUTRAL

4.2 Radiated Emissions Tests

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

Humidity Level : 20 % Temperature : 4 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : NOV. 23, 1998
 Result : PASSED BY 5.0 dB

EUT : 15" COLOR MONITOR

Operating Condition : 1024 X 768 Non-Interlaced (Hf : 56.4 kHz, Vf : 70 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)
30.1	13.8	V	18.8	32.6	40.0	-7.4
45.1	18.1	V	13.7	31.8	40.0	-8.2
67.8	25.3	V	7.2	32.5	40.0	-7.5
180.0	16.1	H	18.7	34.8	43.5	-8.7
187.8	16.2	H	19.0	35.2	43.5	-8.3
196.9	16.4	H	19.6	36.0	43.5	-7.5
202.9	15.3	H	19.7	35.0	43.5	-8.5
263.1	19.5	V	20.5	40.0	46.0	-6.0
270.6	17.1	H	21.0	38.1	46.0	-7.9
278.1	16.7	V	21.3	38.0	46.0	-8.0
285.6	18.4	V	21.6	40.0	46.0	-6.0
300.7	19.8	V	18.3	38.1	46.0	-7.9
315.7	22.3	H	18.7	41.0	46.0	-5.0
330.7	21.1	H	19.1	40.2	46.0	-5.8
353.3	20.4	H	19.6	40.0	46.0	-6.0
443.5	16.0	H	21.1	37.1	46.0	-8.9

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 : 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.

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

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