MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO.,LTD.

MODEL : P990

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 P990(refered to as the EUT in this report) is a 19"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 : KA3843B** **SAMSUNG : KA358** **PHILIPS : TDA4856** **MITSUBISH : M52743ASP** **NATIONAL : LM4202T** **MOTOROLA : MC68HC705BD9B** **MOTOROLA : LSC4388P2** **MATSUSHITA : AN5870K**
POWER REQUIREMENT	**100 - 240 VAC 50/60Hz 3A**
NUMBER OF LAYERS	**MAIN BOARD 1 LAYER** **CRT SOCKET BOARD 1 LAYER** **BNC BOARD 1 LAYER** **FRONT CONTROL BOARD 1 LAYER**
MAX. RESOLUTION	**1600 X 1200 NON-INTERLACED (@ 93.5 kHz/75 Hz)**
H-SYNC FREQUENCY RANGE	**30 kHz □ 95 kHz**
V-SYNC FREQUENCY RANGE	**50 Hz □ 150 Hz**
CRT SIZE	**19" (PANASONIC / Type : M46LNS180X18)**
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	P990	CKLP990	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	E4208515008
CRT SOCKET BOARD	HYUNDAI	E4208515002
BNC BOARD	HYUNDAI	E4208515004
FRONT CONTROL BOARD	HYUNDAI	E4208515003

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.

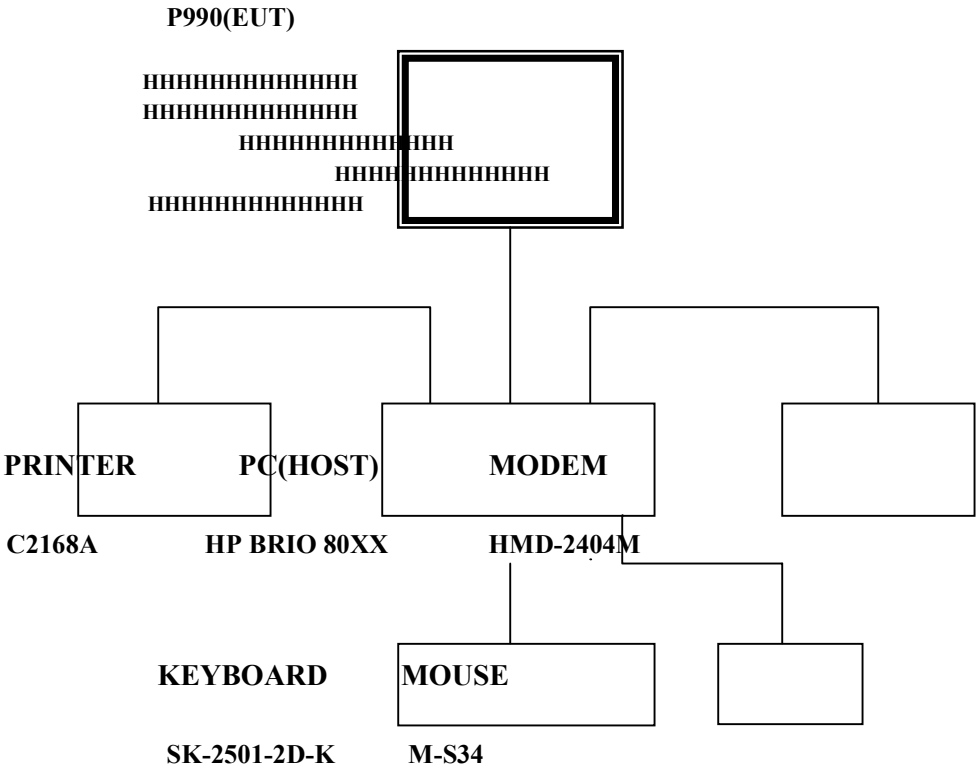
	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
PC(HOST)	N	N/A	N	N/A
COLOR MONITOR(EUT)	Y	PC END	Y	PC END
KEYBOARD	Y	PC END	Y	PC END
PARALLEL	N	N/A	Y	BOTH END
SERIAL	N	N/A	Y	BOTH END
MOUSE(PS/2)	N	N/A	Y	PC END

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/120Hz)	

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/120Hz)	

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 :** DEC. 14. 1998

4. FINAL CONDUCETD AND RADIATED EMISSION TESTS SUMMARY

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

Humidity Level : 25% Temperature : 8 □
Limit apply to : FCC CFR 47, PART 15, SUBPART B
Type of Tests : CLASS B
Date : DEC. 15, 1998
Result : PASSED BY 8.3 dB

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EUT : 19" COLOR MONITOR
Operating Condition : 1600 X 1200 Non-Interlaced (Hf : 93.5 KHz, 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)
21.860	39.3	NEUTRAL	48	-8.7
22.050	39.3	NEUTRAL	48	-8.7
23.079	39.7	HOT	48	-8.3
24.579	39.7	NEUTRAL	48	-8.3
25.329	39.6	NEUTRAL	48	-8.4
27.020	39.5	NEUTRAL	48	-8.5
28.050	38.6	NEUTRAL	48	-9.4

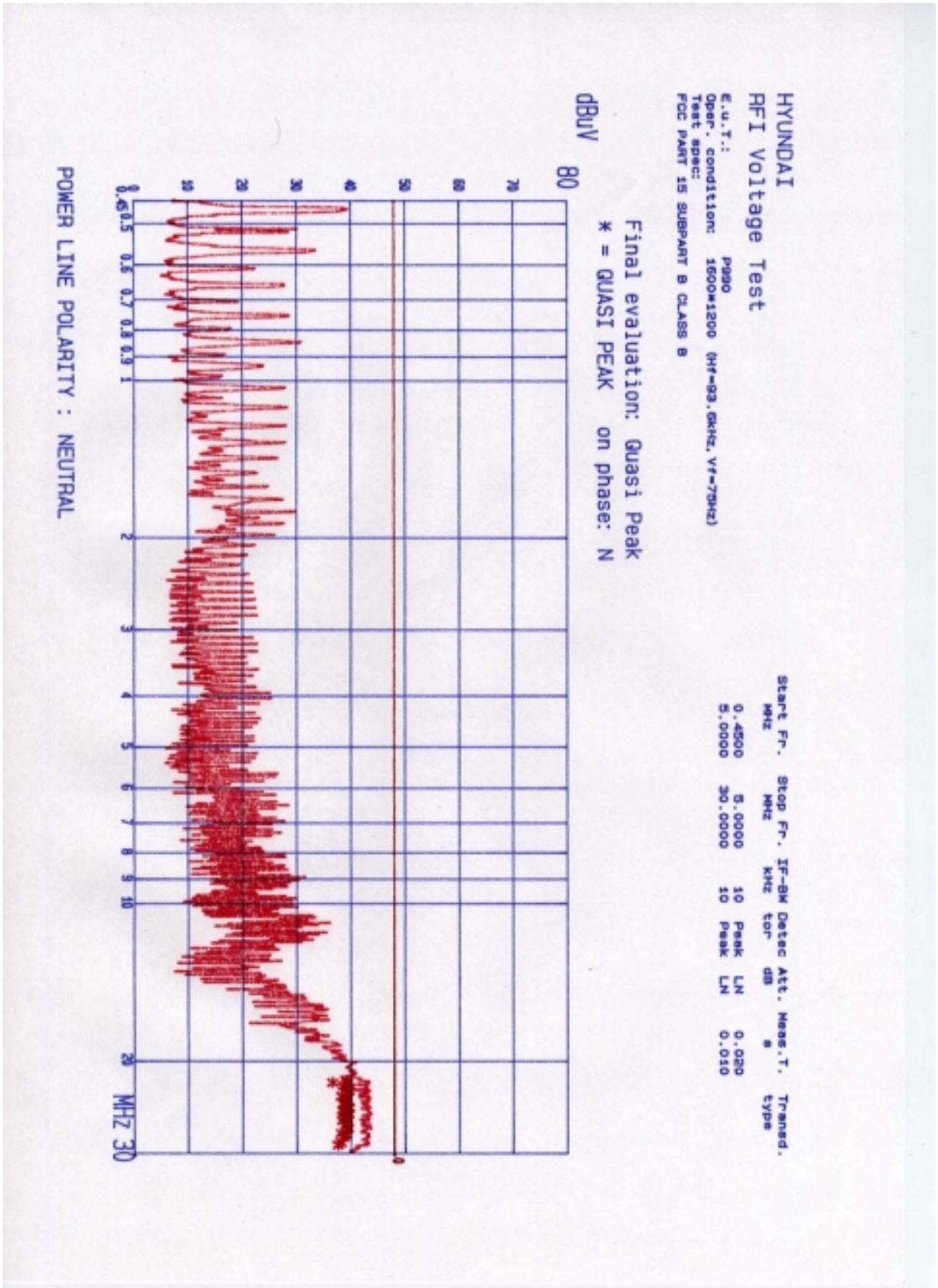
Line Conducted Emission Tabulated Data

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.: P990
Oper. condition: 1600*1200 (Hf=93.6kHz, 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. s
Transd. 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
dBuV
80
70
60
50
40
30
20
10
0
0.45 0.5 0.6 0.7 0.8 0.9 1 2 3 4 5 6 7 8 9 10 20 30 MHz
POWER LINE POLARITY : NEUTRAL

HYUNDAI

RFI Voltage Test

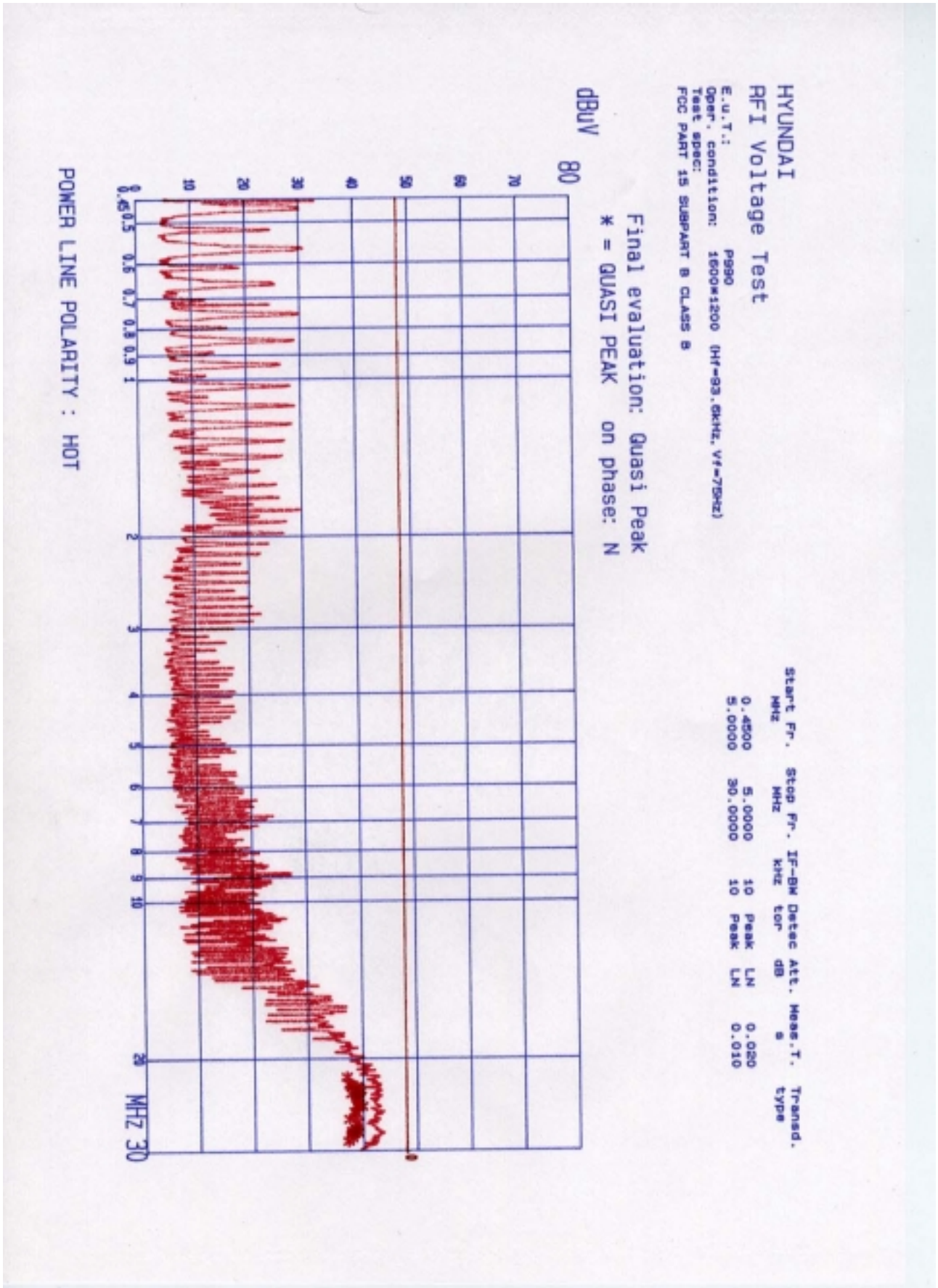
E.U.T.: P990
Oper. condition: 1600*1200 (Hf=93.6kHz, Vf=75Hz)
Test spec:
FCC PART 15 SUBPART B CLASS B

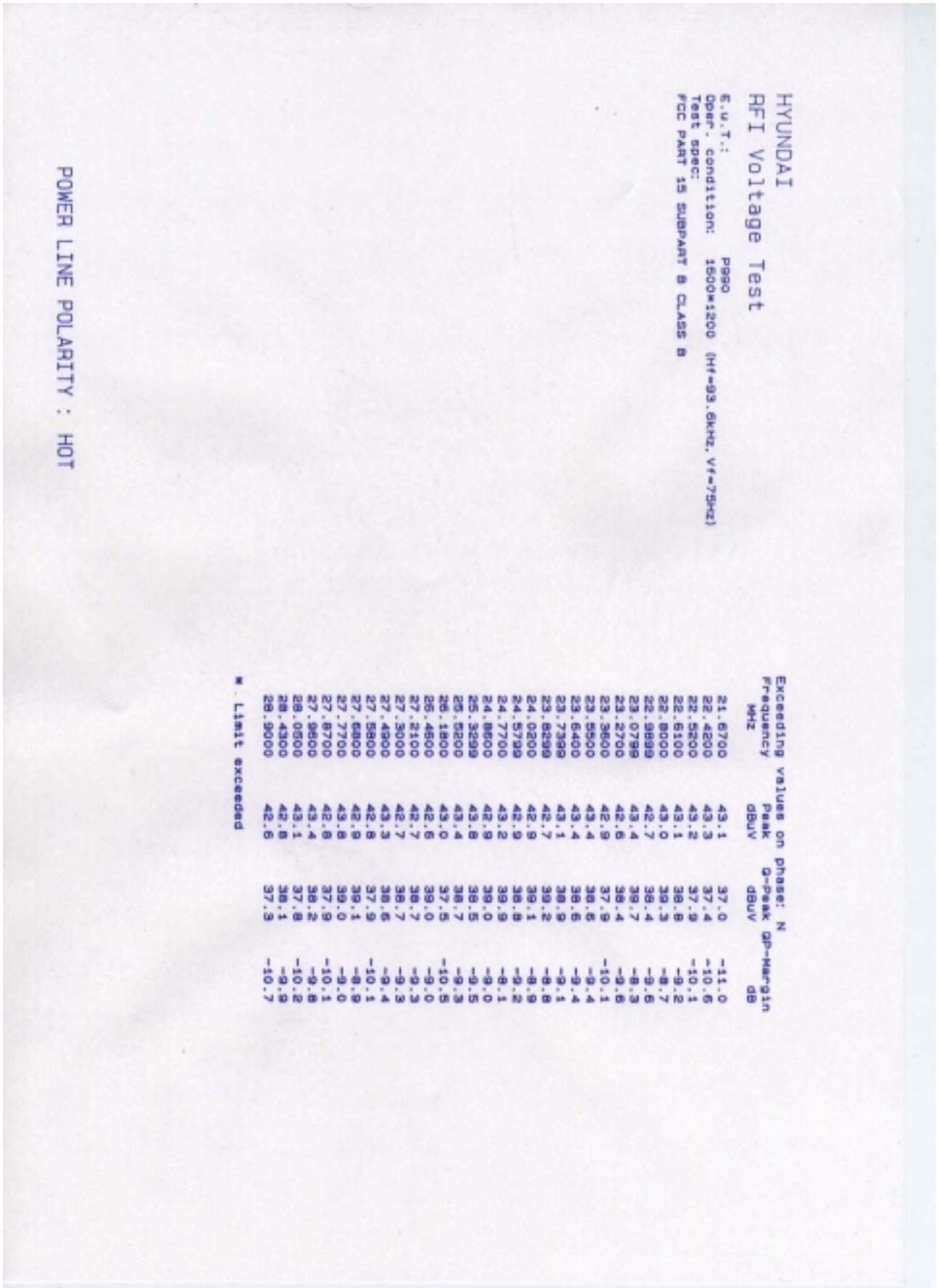
Exceeding values on phase: N

Frequency MHz	Peak dBuV	Q-Peak dBuV	QP-Margin dB
21.8600	43.5	39.3	-8.7
21.9500	43.4	36.6	-11.4
22.0500	43.2	39.3	-8.7
22.3299	43.3	38.6	-9.4
22.6100	43.3	39.1	-8.9
22.8000	43.7	39.6	-8.4
23.0799	43.2	39.2	-8.8
23.3600	43.4	38.3	-9.7
23.6400	43.6	39.1	-8.9
23.7399	43.3	39.1	-8.9
23.8299	43.4	39.0	-9.0
24.0200	43.3	39.2	-8.8
24.1100	43.3	38.6	-9.4
24.4899	43.4	39.5	-8.5
24.5799	43.6	39.7	-8.3
24.8600	43.2	38.4	-9.6
25.0500	43.4	38.8	-9.2
25.2399	43.6	39.4	-8.6
25.3299	43.8	39.6	-8.4
25.5200	43.4	38.8	-9.2
25.7100	43.5	39.2	-8.8
25.8000	43.3	38.9	-9.1
25.9899	43.5	38.5	-9.5
26.4600	43.6	39.2	-8.8
26.5500	43.4	39.0	-9.0
26.9300	43.8	39.5	-8.5
27.0200	43.6	39.5	-8.5
27.5800	43.2	38.2	-9.8
27.6800	43.5	39.2	-8.8
27.7700	43.2	39.1	-8.9
28.0500	43.4	38.6	-9.4
28.7100	43.4	38.2	-9.8
28.9900	43.2	37.6	-10.4

* Limit exceeded

POWER LINE POLARITY : NEUTRAL


HYUNDAI
RFI Voltage Test
E.U.T.: P990
Oper. condition: 1600*1200 (Hf=93.6kHz, Vf=75Hz)
Test spec:
FCC PART 15 SUBPART B CLASS B
Start Fr. MHz
Stop Fr. MHz
IF-BW Detec Att. Meas.T. Transd.
kHz tor dB s 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
dBuV
80
70
60
50
40
30
20
10
0
0.45 0.5 0.6 0.7 0.8 0.9 1
2 3 4 5 6 7 8 9 10 20 30 MHz
POWER LINE POLARITY : HOT



HYUNDAI

RFI Voltage Test

E.u.T.: P990
Oper. condition: 1600*1200 (Hf=93.6kHz, Vf=75Hz)
Test spec:
FCC PART 15 SUBPART B CLASS B

Exceeding values on phase: N

Frequency MHz	Peak dBuV	QP-Peak dBuV	QP-Margin dB
21.6700	43.1	37.0	-11.0
22.4200	43.3	37.4	-10.6
22.5200	43.2	37.9	-10.1
22.6100	43.1	38.8	-9.2
22.8000	43.0	39.3	-8.7
22.9899	42.7	38.4	-9.6
23.0799	43.4	39.7	-8.3
23.2700	42.6	38.4	-9.6
23.3600	42.9	37.9	-10.1
23.5500	43.4	38.6	-9.4
23.6400	43.4	38.6	-9.4
23.7399	43.1	38.9	-9.1
23.8299	42.7	39.2	-8.8
24.0200	42.9	39.1	-8.9
24.5799	42.9	38.8	-9.2
24.7700	43.2	39.9	-8.1
24.8600	42.9	39.0	-9.0
25.3299	43.8	38.5	-9.5
25.5200	43.4	38.7	-9.3
26.1800	43.0	37.5	-10.5
26.4600	42.6	39.0	-9.0
27.2100	42.7	38.7	-9.3
27.3000	42.7	38.7	-9.3
27.4900	43.3	38.6	-9.4
27.5800	42.8	37.9	-10.1
27.5800	42.9	39.1	-8.9
27.7700	43.8	39.0	-9.0
27.8700	42.8	37.9	-10.1
27.9600	43.4	38.2	-9.8
28.0500	43.1	37.8	-10.2
28.4300	42.8	38.1	-9.9
28.9000	42.6	37.3	-10.7

* : Limit exceeded

POWER LINE POLARITY : HOT

4.2 Radiated Emission Test

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

Humidity Level : 20 % Temperature : 4 □
Limit apply to : FCC CFR 47, PART 15, SUBPART B
Type of Tests : CLASS B
Date : DEC. 15, 1998
Result : PASSED BY 4.0 dB

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EUT : 19" 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	17.5	V	15.2	32.7	40.0	-7.3
141.5	22.1	V	15.9	38.0	43.5	-5.5
202.2	19.0	H	19.6	38.6	43.5	4.9
262.9	20.1	H	20.5	40.6	46.0	-5.4
364.1	21.6	H	19.8	41.4	46.0	-4.6
371.1	20.5	H	20.0	40.5	46.0	-5.5
505.8	19.6	H	22.2	41.8	46.0	-4.2
586.7	16.6	V	23.4	40.0	46.0	-6.0
607.0	17.4	H	23.8	41.2	46.0	-4.8
627.2	17.9	H	24.1	42.0	46.0	-4.0
647.4	17.3	V	24.7	42.0	46.0	-4.0
667.6	15.3	H	24.9	40.2	46.0	-5.8
748.6	15.4	V	26.1	41.5	46.0	-4.5
829.5	11.9	V	27.6	39.5	46.0	-6.5
930.6	10.9	V	29.1	40.0	46.0	-6.0
950.9	11.1	V	29.5	40.6	46.0	-5.4

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

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 dBuV/m

Level in uV/m = Common Antilogarithm [(30 dBuV/m)/20] = 31.6 uV/m