

MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO., LTD

MODEL : A520

This report concerns(check one) : Original grant X Class II 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 X no

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

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1. GENERAL INFORMATION

1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model A520(referred to as the EUT in this Report) is a 15"COLOR Monitor HOR. Freq. 53.7KHz w/max. Resolution of 800 X 600 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 $\geq$ 1MHz)	8 MHz
CHIPSET BRAND AND PART NO.	SANKEN : STR-G6153T TOSHIBA : TLP621 TOSHIBA : TLP621 SAMSUNG : CURRENT PWM CONTROLLER NATIONAL : LM358N MICROCHIP : 24LC04B-P NATIONAL : LM7805CT PHILIPS : TDA4866 SIP PHILIPS : TDA4853 DIP SANSUNG : KA2141B DIP NATIONAL : LM2439T TO2 WELTREND : WT60P1 DIP OTP
POWER REQUIREMENT	100 – 240 VAC 50/60Hz(Universal Power) 2.0A ,75W
NUMBER OF LAYER	MAIN BOARD 1 LAYER CRT SOCKET BOARD 1 LAYER AUDIO POWER BOARD 1 LAYER SPEAKER MAIN BOARD 1 LAYER
MAX. RESOLUTION	800 X 600 NON-INTERLACED (@ 53.7KHz/85Hz)
H-SYNC FREQUENCY RANGE	30KHz ~ 54KHz
V- SYNC FREQUENCY RANGE	50Hz ~ 130Hz
CRT SIZE	15" (SAMSUNG / Type : M36QAW351X111)
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	A520	CKLA520	HOST
PC(HOST)	H/P	HP BRIO	DoC	N/A
KEY BOARD	H/P	SK-2501-2D-K	DZL211029	HOST
PRINTER	H/P	C6410A	DoC	HOST
MODEM	HYUNDAI	HM-2404	CKL8JHMD-2404M	HOST
VIDEO CARD	DIAMOND	STEATH 3D 3000	FTUPCI130208	HOST
MOUSE	H/P	M-S34	GYUR38SK	HOST
SPEAKER	DIAMOND	MILAND	-	MONITOR
MICRO-PHONE	SPC	BOOM MIC	-	MONITOR

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	E4208616501
CRT SOCKET BOARD	HYUNDAI	E4208616501
AUDIO POWER BOARD	HYUNDAI	E42087168**
SPEAKER MAIN BOARD	DIAMOND	9925

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/A	Y	1.5(P) , 1.5(D)
KEYBOARD	N/A	Y	1.0(D)
SERIAL	N/A	Y	1.5(P) , 1.5(D)
MOUSE(PS2)	N/A	Y	1.8(D)
SPEAKER	N	N	1.0(P) , 1.0(D)
MICRO-PHONE	N/A	N	1.5(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
SPEAKER	N	N/A	Y	MONITOR END
MICRO-PHONE	N	N/A	N	PC END

2.5 Equipment Modifications

N/A

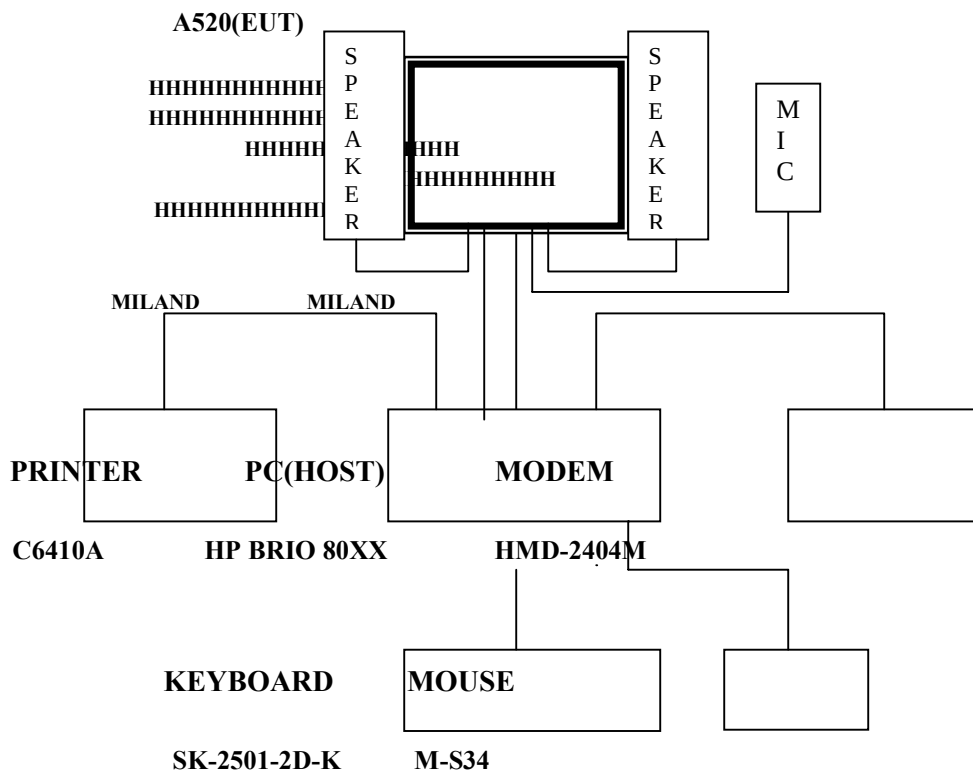
2.6 Configuration of Test system

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	1024 x 768 Non-Interlaced (48.36KHz/75Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (53.67KHz/85Hz)	X
Pentium 75 MHz	800 x 600 Non-Interlaced (46.88KHz/75Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (37.88KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (52.90KHz/100Hz)	

3.2 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 (48.36KHz/75Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (53.67KHz/85Hz)	X
Pentium 75 MHz	800 x 600 Non-Interlaced (46.88KHz/75Hz)	
Pentium 75 MHz	800 x 600 Non-Interlaced (37.88KHz/85Hz)	
Pentium 75 MHz	640 x 480 Non-Interlaced (52.90KHz/100Hz)	

Tested by SANG JUN, LEE

Date : OCT. 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 : 24% Temperature : 23 °C

Limit apply to : FCC CFR 47, PART 15, SUBPART B

Type of Tests : CLASS B

Date : OCT. 29, 1999

Result : PASSED BY 4.5 dB

EUT : 15" COLOR MONITOR

Operating Condition : 800 X 600 Non-Interlaced (Hf : 53.7KHz, Vf : 85Hz)

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

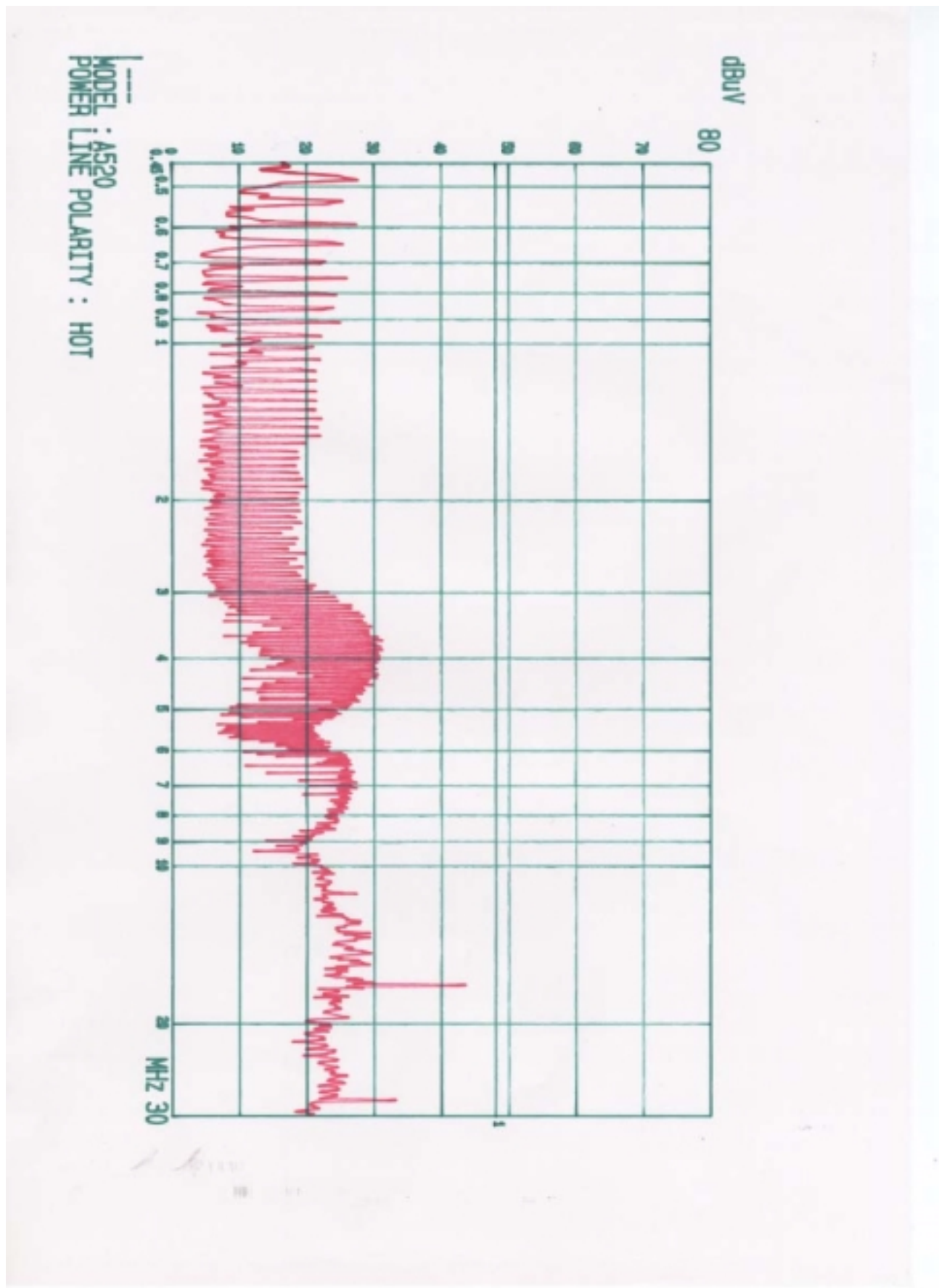
Power Line Conducted Emissions			FCC Class B	
Frequency (MHz)	Amplitude (dBuV)	Conductor	Limit (dBuV)	Margin (dB)
3.691	29.4	HOT	48	-18.6
3.831	29.4	HOT	48	-18.6
4.014	27.8	HOT	48	-20.2
4.288	28.0	HOT	48	-20.0
14.62	28.0	HOT	48	-20.0
16.85	43.5	NEUTRAL	48	-4.5
28.05	31.0	HOT	48	-17.0

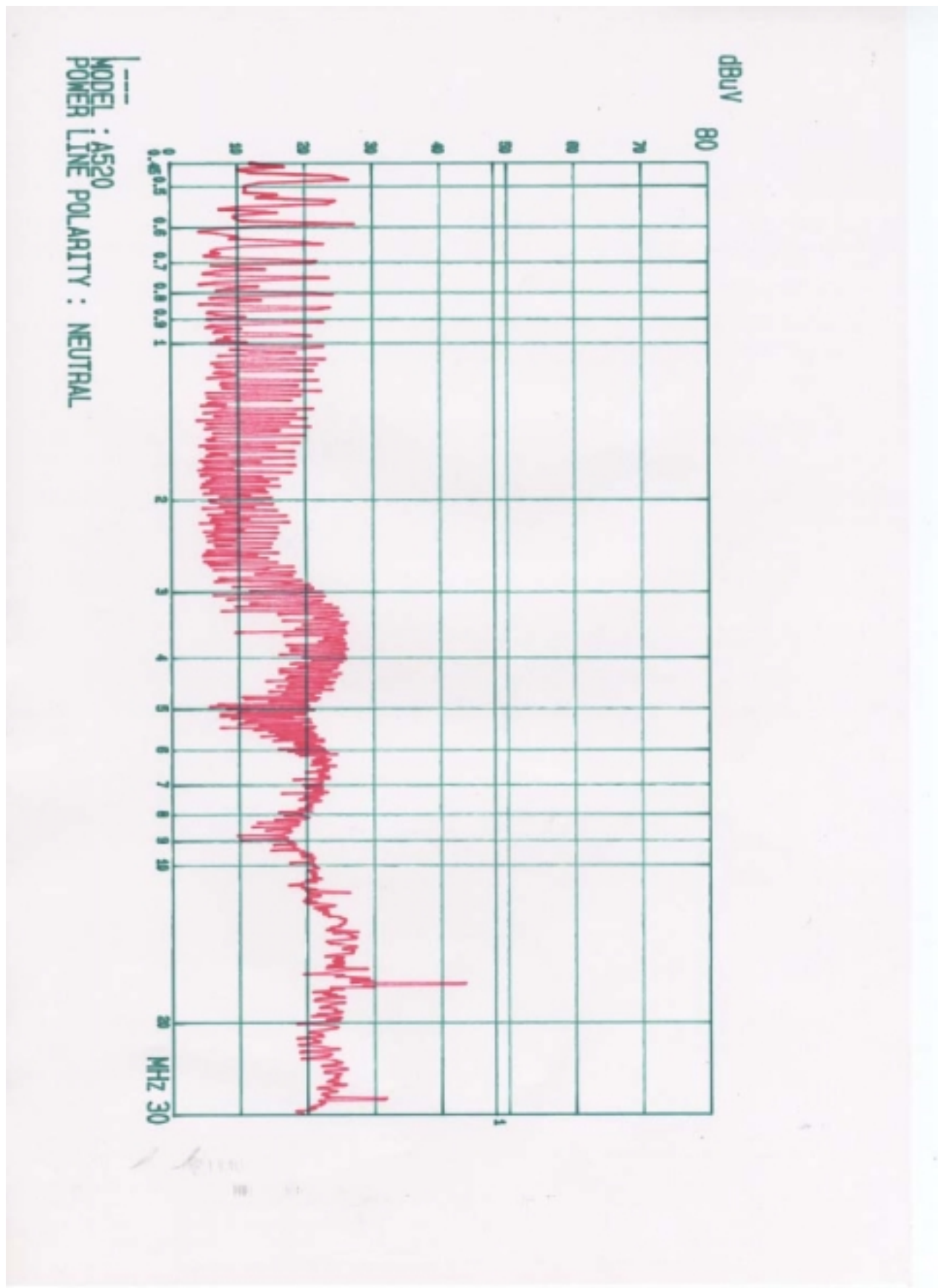
Line Conducted Emissions Tabulated Data

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





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 : 22 °C
 Limit apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Tests : CLASS B
 Date : OCT. 29, 1999
 Result : PASSED BY 4.0 dB

EUT : 15" COLOR MONITOR

Operating Condition : 800 X 600 Non-Interlaced (Hf : 53.7KHz, Vf : 85Hz)

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)
33.8	17.4	V	17.1	34.5	40.0	-5.5
39.3	14.8	V	15.2	30.0	40.0	-10.0
45.0	21.3	V	13.7	35.0	40.0	-5.0
61.8	27.2	V	8.6	35.8	40.0	-4.2
67.3	28.6	V	7.4	36.0	40.0	-4.0
73.1	27.0	V	6.7	33.7	40.0	-6.3
163.1	16.2	H	17.6	33.8	43.5	-9.7
185.6	15.6	H	18.9	34.5	43.5	-9.0
191.2	14.6	H	19.2	33.8	43.5	-9.7
196.7	17.2	H	19.6	36.8	43.5	-6.7
208.0	15.7	H	19.9	35.6	43.5	-7.9
224.8	15.7	V	20.8	36.5	46.0	-9.5
365.8	15.6	H	19.9	35.5	46.0	-10.5

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.

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

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