

# MEASUREMENT/TECHNICAL REPORT

HYUNDAI ELECTRONICS INDUSTRIES CO., LTD

MODEL : V770

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.

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Company : HYUNDAI ELECTRONICS INDUSTRIES CO., LTD.

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# 1. GENERAL INFORMATION

## 1.1 Product Description

The Hyundai Electronics Industries Co., Ltd. Model V770(referred to as the EUT in this Report) is a 17"COLOR Monitor HOR. Freq. 64KHz w/max. Resolution of 1280 X 1024Non-Interlaced

Product specification information described herein was obtained from product data sheet or user's manual.

|                                              |                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CHASSIS TYPE                                 | PLASTIC(OUT SIDE), METAL(INSIDE)                                                                                                                                                                                                                                                                   |
| LIST OF EACH OSC. OR XTAL. FREQ.(FREQ. 1MHz) | 12 MHz                                                                                                                                                                                                                                                                                             |
| CHIPSET BRAND AND PART NO.                   | STMICROELECTRO: UUC3842N<br>SAMSUNG ELEC.: ULM7805CT<br>PHILIPS H.K: TDA4857<br>NATIONAL SEMICO: LM458<br>WELTREND: WT62PI-N40<br>SAMSUNG ELEC.: KS24C081C<br>PHILIPS H.K: TDA4866<br>SAMSUNG ELEC.:KA2500<br>MYSON TECH: MTV021 9LANGUAGE<br>NATIONAL SEMICO: LM2437T<br>NATIONAL SEMICO: LM2439T |
| POWER REQUIREMENT                            | 100 – 240 VAC 50/60Hz(Universal Power) 1.3A , 75W                                                                                                                                                                                                                                                  |
| NUMBER OF LAYER                              | MAIN BOARD 1 LAYER<br>CRT SOCKET BOARD 1 LAYER                                                                                                                                                                                                                                                     |
| MAX. RESOLUTION                              | 1280 X 1024 NON-INTERLACED (@ 64KHz/60Hz)                                                                                                                                                                                                                                                          |
| H-SYNC FREQUENCY RANGE                       | 30KHz ~ 70KHz                                                                                                                                                                                                                                                                                      |
| V- SYNC FREQUENCY RANGE                      | 50Hz ~ 150Hz                                                                                                                                                                                                                                                                                       |
| CRT SIZE                                     | 17" (SAMSUNG CRT / Type : M41QAR361X114 )                                                                                                                                                                                                                                                          |
| 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          | V770          | CKLV770      | HOST         |
| PC(HOST)            | H/P              | DTPC-17       | DoC          | N/A          |
| KEY BOARD           | H/P              | SK-2501-2D-K  | GYUR385K     | HOST         |
| PRINTER             | H/P              | HP895C        | DoC          | HOST         |
| MODEM               | 3COM CORPORATION | 56K FAX MODEM | DoC          | HOST         |
| VIDEO CARD          | MATROX           | MIL2P/4G      | 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 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     | E4208516901       |
| CRT SOCKET BOARD | HYUNDAI     | E4208616902       |

### 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

|                               | <b>Power Cord<br/>Shielded (Y/N)</b> | <b>I/O Cable Shielded<br/>(Y/N)</b> | <b>Length (M)</b>      |
|-------------------------------|--------------------------------------|-------------------------------------|------------------------|
| <b>PC(Host)</b>               | <b>N</b>                             | <b>N/A</b>                          | <b>1.8(P)</b>          |
| <b>COLOR<br/>MONITOR(EUT)</b> | <b>N</b>                             | <b>Y</b>                            | <b>1.5(P) , 1.5(D)</b> |
| <b>PARALLEL</b>               | <b>N</b>                             | <b>Y</b>                            | <b>1.5(P) , 1.5(D)</b> |
| <b>KEYBOARD</b>               | <b>N/A</b>                           | <b>Y</b>                            | <b>1.0(D)</b>          |
| <b>SERIAL</b>                 | <b>N</b>                             | <b>Y</b>                            | <b>1.5(P) , 1.5(D)</b> |
| <b>MOUSE(PS2)</b>             | <b>N/A</b>                           | <b>Y</b>                            | <b>1.8(D)</b>          |

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

## 2.4 Noise Suppression Parts on Cable.

|                               | <b>Ferrite Bead<br/>(Y/N)</b> | <b>Location</b> | <b>Metal Hood<br/>(Y/N)</b> | <b>Location</b> |
|-------------------------------|-------------------------------|-----------------|-----------------------------|-----------------|
| <b>PC(HOST)</b>               | <b>N</b>                      | <b>N/A</b>      | <b>N</b>                    | <b>N/A</b>      |
| <b>COLOR<br/>MONITOR(EUT)</b> | <b>Y</b>                      | <b>PC END</b>   | <b>Y</b>                    | <b>PC END</b>   |
| <b>KEYBOARD</b>               | <b>Y</b>                      | <b>PC END</b>   | <b>Y</b>                    | <b>PC END</b>   |
| <b>PARALLEL</b>               | <b>N</b>                      | <b>N/A</b>      | <b>Y</b>                    | <b>BOTH END</b> |
| <b>SERIAL</b>                 | <b>N</b>                      | <b>N/A</b>      | <b>Y</b>                    | <b>BOTH END</b> |
| <b>MOUAE(PS/2)</b>            | <b>N</b>                      | <b>N/A</b>      | <b>Y</b>                    | <b>PC END</b>   |

## 2.5 Equipment Modifications

**N/A**

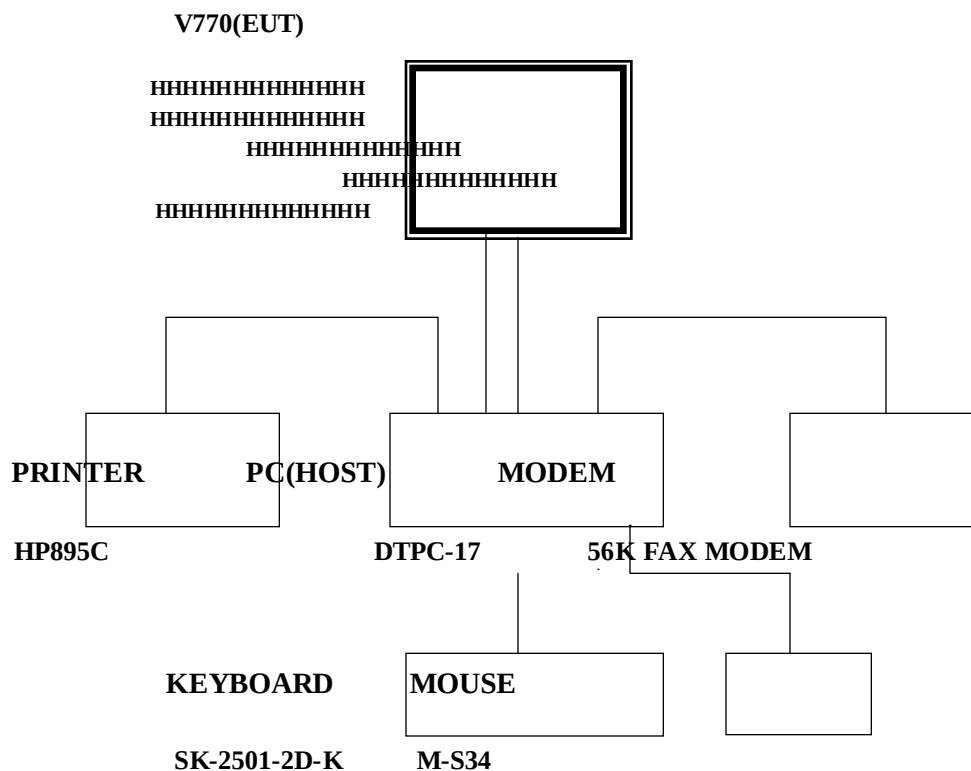
## **2.6 Configuration of Test system**

**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 10 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        | 1280 x 1024 Non-Interlaced (63.99KHz/60Hz) |                               |
| Pentium 75 MHz        | 1024 x 768 Non-Interlaced (68.67KHz/85Hz)  | X                             |
| Pentium 75 MHz        | 800 x 600 Non-Interlaced (63.70KHz/120Hz)  |                               |
| Pentium 75 MHz        | 800 x 600 Non-Interlaced (63.92KHz/100Hz)  |                               |
| Pentium 75 MHz        | 640 x 480 Non-Interlaced (43.27KHz/85Hz)   |                               |

### 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        | 1280 x 1024 Non-Interlaced (63.99KHz/60Hz) |                               |
| Pentium 75 MHz        | 1024 x 768 Non-Interlaced (68.67KHz/85Hz)  | X                             |
| Pentium 75 MHz        | 800 x 600 Non-Interlaced (63.70KHz/120Hz)  |                               |
| Pentium 75 MHz        | 800 x 600 Non-Interlaced (63.92KHz/100Hz)  |                               |
| Pentium 75 MHz        | 640 x 480 Non-Interlaced (43.27KHz/85Hz)   |                               |

Tested by KEUN HO, PARK

Date : FEB. 18, 2000

## 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 : 22%                      Temperature : 21  
 Limit apply to : CISPR 22  
 Type of Tests : CLASS B  
 Date : FEB. 22, 2000  
 Result : PASSED BY -5.8 dB(Average)

=====

EUT : 17" COLOR MONITOR  
 Operating Condition : 1024 X 768 Non-Interlaced (Hf : 68.7KHz, Vf : 85Hz)  
 Detector : CISPR Quasi-Peak (6 dB Bandwidth : 9 KHz)

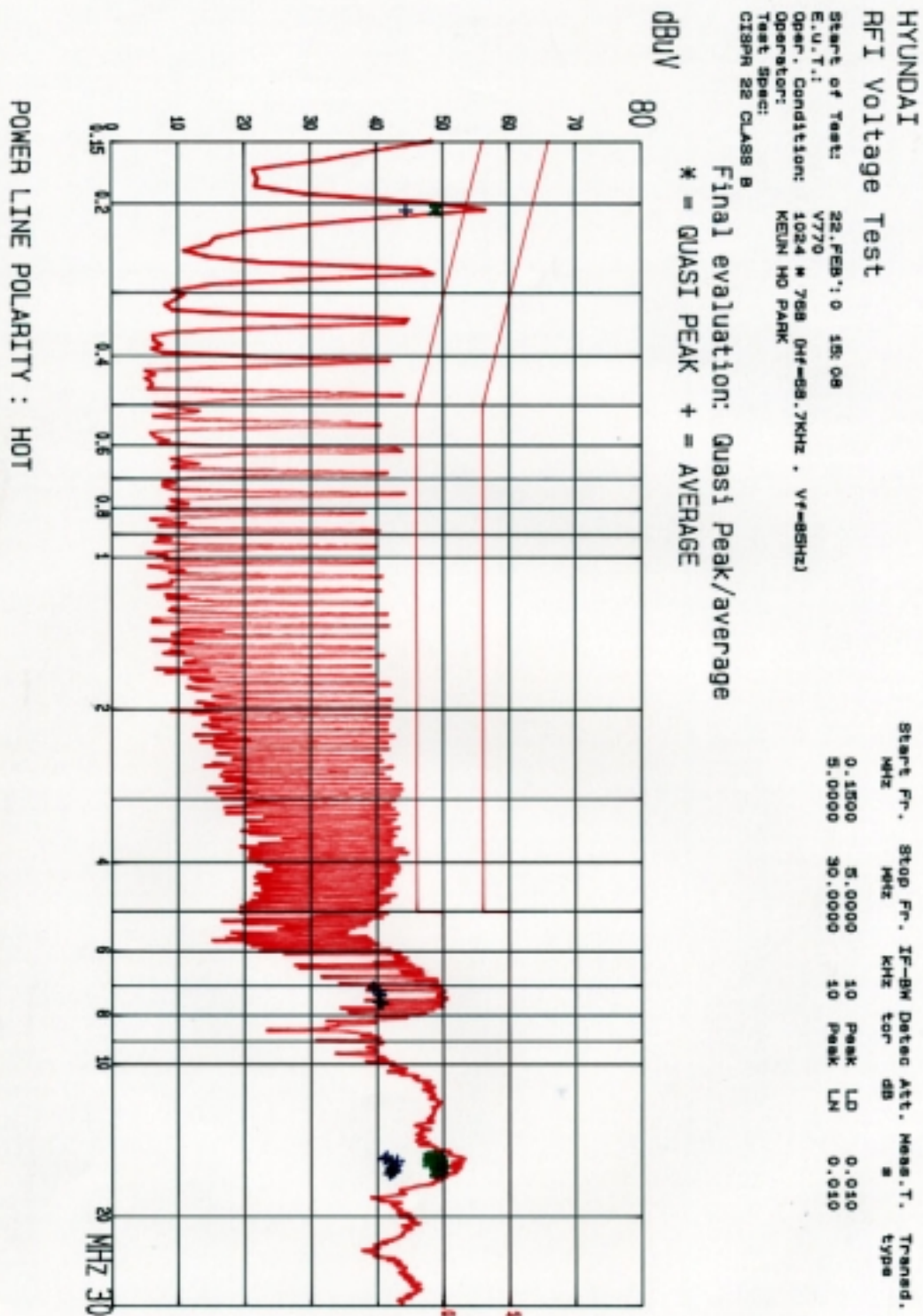
| Frequency<br>(MHz) | Quasi Peak(dBuV) |       |       | Average(dBuV) |       |       | Power Line<br>(H/N) |
|--------------------|------------------|-------|-------|---------------|-------|-------|---------------------|
|                    | LEVEL            | LIMIT | Magin | LEVEL         | LIMIT | Magin |                     |
| 16.15              | 49.6             | 60.0  | -1.04 | 42.2          | 50.0  | -7.8  | H                   |
| 15.87              | 49.4             | 60.0  | -10.6 | 42.8          | 50.0  | -7.2  | H                   |
| 6.91               | 50.4             | 60.0  | -9.4  | 44.2          | 50.0  | -5.8  | N                   |
| 7.18               | 49.9             | 60.0  | -10.1 | 44.0          | 50.0  | -6.0  | N                   |
| 7.52               | 48.9             | 60.0  | -11.1 | 43.9          | 50.0  | -6.1  | N                   |
| 11.29              | 49.1             | 60.0  | -10.9 | 43.8          | 50.0  | -6.2  | N                   |

Line Conducted Emissions Tabulated Data

**NOTE:**

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 : KUN HO, PARK / Engineer



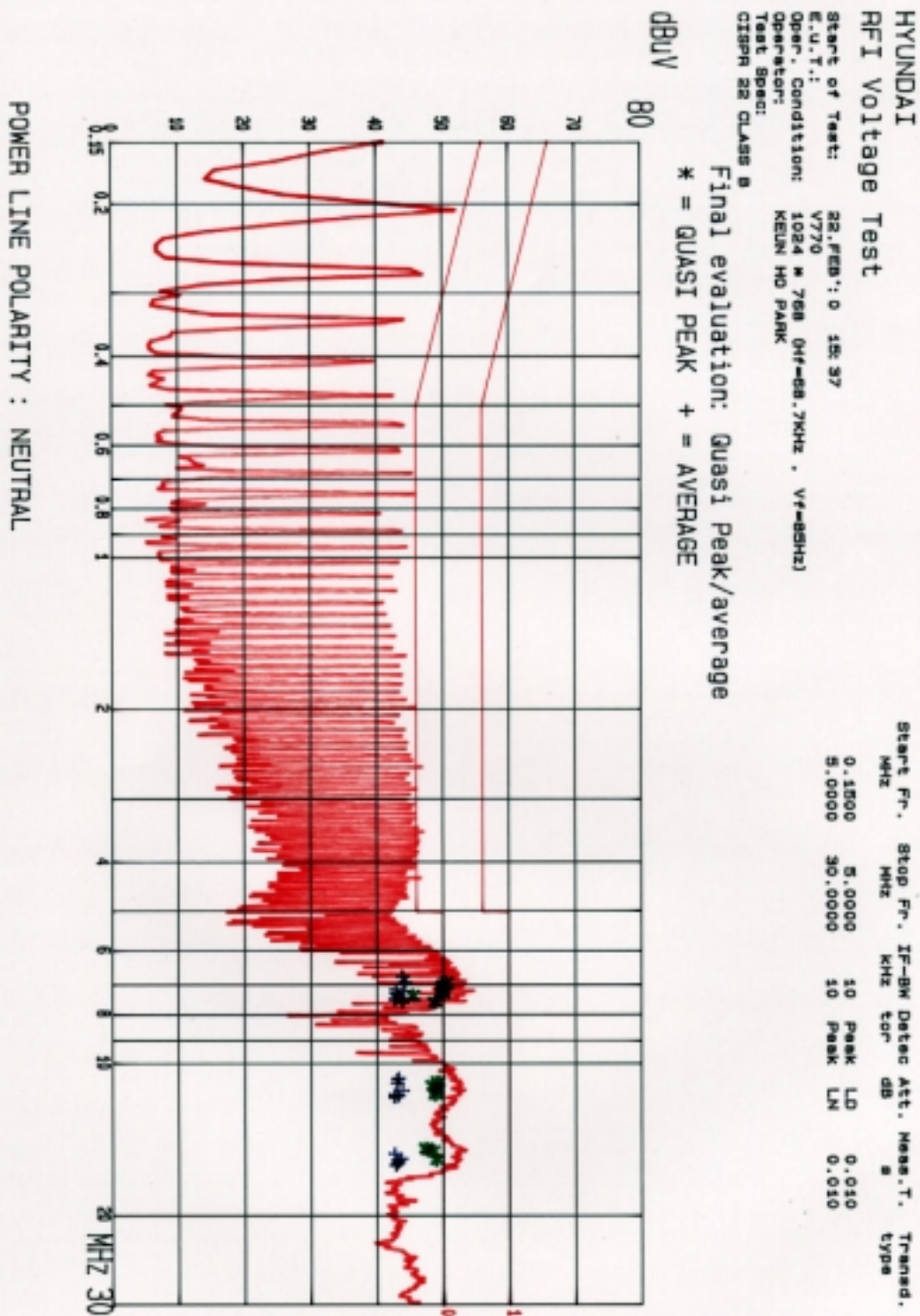
# HYUNDAI RFI Voltage Test

Start of Test: 22.FEB'00 15:08  
 E.U.T.: V770  
 Oper. Condition: 1024 M 768 (H=68.7MHz, V=65Hz)  
 Operator: KEUN HO PARK  
 Test Spec: CISPR 22 CLASS B

| Quasi Peak values |             | G-Peak GP-Margin |       |
|-------------------|-------------|------------------|-------|
| Frequency<br>MHz  | Peak<br>dBV | dBV              | dB    |
| 0.2060            | 58.5        | 49.1             | -14.5 |
| 15.2620           | 51.7        | 48.8             | -11.5 |
| 15.3320           | 51.8        | 48.7             | -11.5 |
| 15.3950           | 52.8        | 48.1             | -11.8 |
| 15.4550           | 53.2        | 48.0             | -11.0 |
| 15.5350           | 51.8        | 48.5             | -10.5 |
| 15.6050           | 52.5        | 48.2             | -10.8 |
| 15.6880           | 52.2        | 48.0             | -12.0 |
| 15.8080           | 51.8        | 48.7             | -10.5 |
| 15.8780           | 52.8        | 48.4             | -10.8 |
| 15.9480           | 52.0        | 48.3             | -10.7 |
| 16.0810           | 52.3        | 48.5             | -10.7 |
| 16.1510           | 52.6        | 48.6             | -10.4 |
| 16.2210           | 51.8        | 48.3             | -10.7 |
| 16.4240           | 52.1        | 49.1             | -10.8 |
| Average values    |             | Average-Margin   |       |
| Frequency<br>MHz  | Peak<br>dBV | Average<br>dBV   | dB    |
| 0.2060            | 58.5        | 44.4             | -9.2  |
| 7.0510            | 49.3        | 39.5             | -10.5 |
| 7.1840            | 50.2        | 40.2             | -9.8  |
| 7.3240            | 49.7        | 40.4             | -9.6  |
| 7.5270            | 50.0        | 40.2             | -9.8  |
| 7.5970            | 49.4        | 40.6             | -8.4  |
| 15.3320           | 51.8        | 41.5             | -8.5  |
| 15.3950           | 52.8        | 41.5             | -8.5  |
| 15.4550           | 53.2        | 41.0             | -9.0  |
| 15.5350           | 51.8        | 43.0             | -7.0  |
| 15.6050           | 52.5        | 42.1             | -7.8  |
| 15.6880           | 52.2        | 42.1             | -7.8  |
| 15.8080           | 51.8        | 42.8             | -7.2  |
| 15.8480           | 52.0        | 42.5             | -7.5  |
| 15.0810           | 52.3        | 42.5             | -7.5  |
| 16.1510           | 52.6        | 42.2             | -7.8  |
| 16.2210           | 51.8        | 42.1             | -7.9  |
| 16.3540           | 51.5        | 42.6             | -7.4  |
| 16.4240           | 52.1        | 42.3             | -7.7  |
| 16.4940           | 51.5        | 41.8             | -8.2  |

\* Limit exceeded

POWER LINE POLARITY : HOT





# HYUNDAI RFI Voltage Test

Start of Test: 22.FEB'00 15:37  
 E.U.T.: V770  
 Oper. Condition: 1024 M 768 (HF=88.7KHz, VF=85Hz)  
 Operator: KEUN HO PARK  
 Test Spec: CISPR 22 CLASS B

| Quasi Peak values |              | G-Peak          |                      | GP-Margin |  |
|-------------------|--------------|-----------------|----------------------|-----------|--|
| Frequency<br>MHz  | Peak<br>dBuV | dBuV            | dB                   |           |  |
| 6.9110            | 53.4         | 50.5            | -9.4                 |           |  |
| 6.9810            | 53.2         | 50.1            | -9.8                 |           |  |
| 7.0810            | 53.1         | 50.1            | -9.8                 |           |  |
| 7.1840            | 54.6         | 49.9            | -10.0                |           |  |
| 7.2540            | 53.2         | 50.0            | -9.9                 |           |  |
| 7.3170            | 53.3         | 49.4            | -14.5                |           |  |
| 7.5270            | 53.4         | 48.9            | -11.0                |           |  |
| 10.8900           | 52.6         | 48.3            | -10.6                |           |  |
| 11.0830           | 52.6         | 48.5            | -11.4                |           |  |
| 11.1530           | 52.6         | 48.0            | -10.9                |           |  |
| 11.2929           | 53.3         | 49.1            | -10.8                |           |  |
| 11.4960           | 52.7         | 48.6            | -11.1                |           |  |
| 14.7790           | 52.6         | 47.5            | -12.4                |           |  |
| 14.8490           | 52.7         | 47.7            | -12.2                |           |  |
| 14.9190           | 53.4         | 48.5            | -11.4                |           |  |
| 15.0050           | 52.6         | 48.0            | -10.9                |           |  |
| Average values    |              |                 |                      |           |  |
| Frequency<br>MHz  | Peak<br>dBuV | Average<br>dBuV | Average-Margin<br>dB |           |  |
| 6.7060            | 52.4         | 43.8            | -6.2                 |           |  |
| 6.9110            | 53.4         | 44.2            | -5.8                 |           |  |
| 7.1140            | 51.6         | 42.8            | -7.2                 |           |  |
| 7.1840            | 54.6         | 44.0            | -8.0                 |           |  |
| 7.2540            | 53.2         | 42.9            | -7.1                 |           |  |
| 7.3240            | 52.4         | 43.3            | -6.7                 |           |  |
| 7.4570            | 52.3         | 42.7            | -7.3                 |           |  |
| 7.5270            | 53.4         | 43.8            | -6.1                 |           |  |
| 10.6770           | 51.6         | 43.2            | -6.8                 |           |  |
| 10.7470           | 51.8         | 43.0            | -7.0                 |           |  |
| 10.9500           | 51.8         | 43.0            | -7.0                 |           |  |
| 11.2929           | 53.3         | 43.8            | -6.2                 |           |  |
| 11.4960           | 52.7         | 42.7            | -7.3                 |           |  |
| 11.5660           | 52.2         | 43.2            | -6.8                 |           |  |
| 11.6359           | 51.6         | 42.7            | -7.3                 |           |  |
| 15.1220           | 52.0         | 42.6            | -7.4                 |           |  |
| 15.4050           | 51.9         | 43.6            | -6.4                 |           |  |
| 15.6050           | 52.6         | 43.1            | -6.9                 |           |  |
| 15.7380           | 52.2         | 43.3            | -6.7                 |           |  |
| 15.9480           | 51.7         | 42.9            | -7.1                 |           |  |
| Limit exceeded    |              |                 |                      |           |  |

M 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 : 15  
 Limit apply to : CISPR 22  
 Type of Tests : CLASS B  
 Date : FEB. 24, 2000  
 Result : PASSED BY -4.0 dB

=====

EUT : 17" COLOR MONITOR

Operating Condition : 1024 X768 Non-Interlaced (Hf : 68.7KHz, Vf : 85Hz)

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

| Radiated Emissions |                 | Ant. | Correction Factors             | Total             | FCC Class B       |                |
|--------------------|-----------------|------|--------------------------------|-------------------|-------------------|----------------|
| Freq.<br>(MHz)     | Ampl.<br>(dBuV) | Pol. | Antenna & Cable Loss<br>(dB/m) | Ampl.<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) |
| 32.5               | 8.0             | V    | 17.5                           | 25.5              | 30.0              | -4.5           |
| 46.7               | 12.2            | V    | 13.1                           | 25.3              | 30.0              | -4.7           |
| 90.9               | 9.9             | V    | 10.1                           | 20.0              | 30.0              | -10.0          |
| 115.4              | 12.3            | V    | 13.7                           | 26.0              | 30.0              | -4.0           |
| 115.7              | 9.3             | H    | 13.8                           | 23.1              | 30.0              | -6.9           |
| 144.1              | 9.8             | V    | 16.5                           | 26.3              | 30.0              | -3.7           |
| 145.2              | 3.9             | H    | 16.6                           | 20.5              | 30.0              | -9.5           |
| 188.3              | 5.3             | V    | 19.4                           | 24.7              | 30.0              | -5.3           |
| 198.4              | 4.7             | V    | 20.1                           | 24.8              | 30.0              | -5.2           |
| 198.4              | 1.6             | H    | 20.1                           | 21.7              | 30.0              | -8.3           |
| 267.8              | 4.5             | H    | 21.3                           | 25.8              | 37.0              | -11.2          |
| 268.4              | 4.3             | H    | 21.3                           | 25.6              | 37.0              | -11.4          |
| 273.1              | 4.7             | H    | 21.6                           | 26.3              | 37.0              | -10.7          |
| 333.3              | 3.3             | H    | 19.5                           | 22.8              | 37.0              | -14.2          |
| 378.8              | 5.3             | H    | 20.6                           | 25.9              | 37.0              | -11.1          |
| 473.3              | 2.0             | H    | 22.5                           | 24.5              | 37.0              | -12.5          |

### 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 : KEUN HO, PARK / 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.

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

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