

HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
 SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA
 TEL : +82 31 639 8518 FAX : +82 31 639 8525

TEST REPORT

Manufacture;
HYUNDAI IMAGEQUEST CO., LTD.

**SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI,
 KYOUNKI-DO, 467-701, KOREA**

HYUNDAI IMAGEQUEST FRN : 0005-8664-39

Date of Issue : September 10, 2005

Test Report No.: HCT-F05-0903

**Test Site: HYUNDAI CALIBRATION & CERTIFICATION
 TECHNOLOGIES CO., LTD.**

HCT FRN : 0005-8664-21

FCC ID :

PJIL17A00001

MODEL /TYPE:

L17T/L17A00000

Rule Part(s):	Part 15 & 2
Equipment Class:	FCC Class B Peripheral Device (JBP)
Standard(s):	FCC Class B: (CISPR 22)
EUT Type:	17" LCD Monitor
Max. Resolution(s):	1280 X 1024 (@/75Hz)
Model(s):	L17T
Port/Connector(s)	D-sub ,Audio in/out,S-Video,A/V input,TV Port
LCD Panel	SAMSUNG(LTM170EU-L21)

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Ki-Soo Kim

Report prepared by : Ki-Soo Kim
 Manager of EMC Tech. Part



TABLE OF CONTENTS

	PAGE
REPORT COVER	1
TABLE OF CONTENTS	2
1.1 SCOPE	3
2.1 INTRODUCTION (SITE DESCRIPTION)	4
3.1 PRODUCTION INFORMATION	5-6
4.1 DESCRIPTION OF TESTS (CONDUCTED)	7
4.3 DESCRIPTION OF TESTS (RADIATED)	8
5.1 LIST OF SUPPORT EQUIPMENT	9-10
6.1 TEST DATA (CONDUCTED)	11-15
7.1 TEST DATA (RADIATED)	16
8.1 SAMPLE CALCULATIONS	17
9.1 TEST EQUIPMENT	18
10.1 TEST SOFTWARE USED	19
11.1 CONCLUSION	20

ATTACHMENT A : **FCC ID LABEL & LOCATION**

ATTACHMENT B : **EXTERNAL PHOTOGRAPHS**

ATTACHMENT C : **BLOCK DIAGRAM**

ATTACHMENT D : **TEST SETUP PHOTOGRAPHS**

ATTACHMENT E : **USER'S MANUAL**

ATTACHMENT F : **INTERNAL PHOTOGRAPHS**

MEASUREMENT REPORT

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	HYUNDAI IMAGEQUEST
Address:	SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA

- **FCC ID : PJIL17A00001**

- Equipment Class: FCC Class B Peripheral Device (JBP)
- EUT Type: 17" LCD MONITOR
- Model(s): L17T
- Max. Resolution: 1280 X 1024 (@75Hz)
- Power Cord: Unshielded
- Rule Part(s): FCC Part 15 Subpart B
- Test Procedure(s): ANSI C63.4 (2003)
- Dates of Tests: August 18, 2005 ~ August 22, 2005
- Place of Tests: 254-1, MAEKOK-RI, HOBUP-MYUN, ICHON-SI, KYOUNGKI-DO, 467-701, KOREA

2.1 INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSIC63.4-2001) was used in determining radiated and conducted emissions emanating from **HYUNDAI IMAGEQUEST CO.,LTD. 17-inch LCD Monitor FCC ID: PJIL17A00001**

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 23, 2003 (Confirmation Number: EA90661)

3.1 PRODUCT INFORMATION

3.2 Equipment Description

Equipment Under Test (EUT) is the **HYUNDAI IMAGEQUEST CO.,Ltd.** (Model : **L17T**) **17-inch LCD Monitor**

FCC ID: PJIL17A00001

Maximum Resolution(s): 1280 X 1024 (@75Hz)

Dimensions: **372mm(W) x 3951mm(H) x 185mm(D)**

Power Supply: **DC 12V —— 3.5A**

Port(s)/Input Connector(s): 15-pin D-sub RGB connector,S-Video,A/V input,Audio in,TV Port

Cable(s): Shielded D-Sub (with ferrite on both ends), Audio cable(with ferrite on both ends)

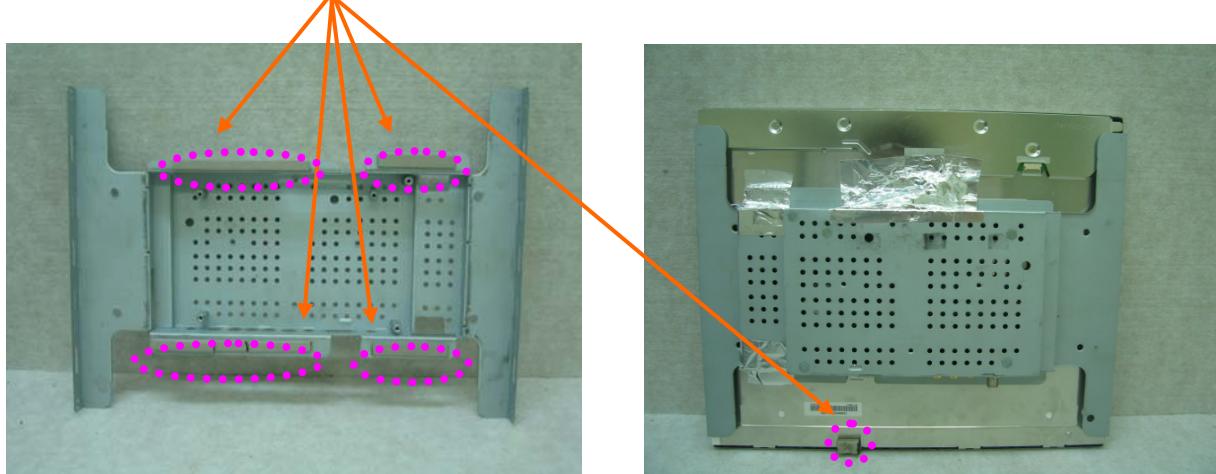
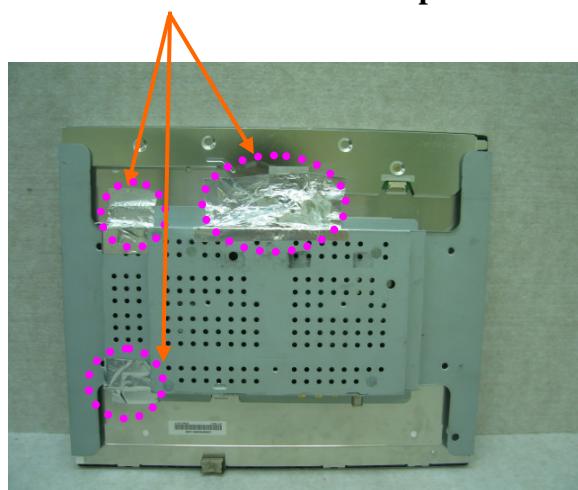
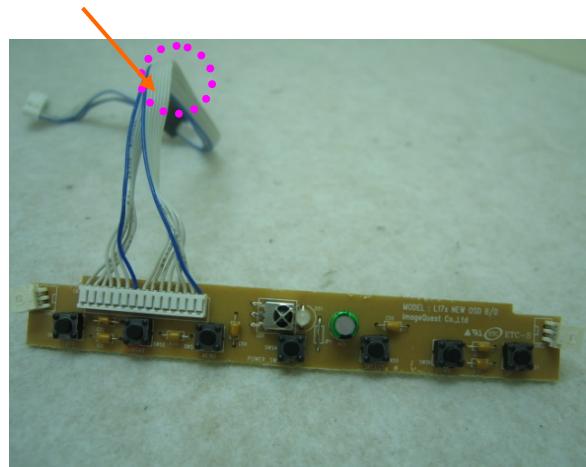
Weight (Net):4.5Kg unpacked,6.0 packed

Power Consumption : **40Watts**

Weight (Net): **3.2Kg**

EMI Suppression Devices:

Modifications were made to the device. Please refer to the next page.

1. Attach a gasket on the main frame to contact the LCD panel**2. Attach aluminum tape on the frame and LCD Rear panel.****3. Apply a ferrite Core to the OSD cable.**

4.1 Description of Tests(Conducted)

4.2 Powerline Conducted RFI (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.

The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was remeasured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the center with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached. Each EME reported was calibrated using the Rohde & Schwarz SMX signal generator and are listed on Table 1. RFI Conducted FCC Class B

RFI CONDUCTED		CISPR 22 CLASS B Limits dB(uV/m)	
Freq. Range	CISPR 22 Quasi-Peak	CISPR 22 Average	
150kHz - 0.5MHz	66-56**		56-46**
0.5MHz - 5MHz	56		46
5MHz - 30MHz	60		50

**Limits decreases linearly with the logarithm of frequency

Table 1. RFI Conducted Limits

4.3 Description of Tests(Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The spectrum was scanned from 30 to 300 MHz using biconical antenna, 300 to 1000 MHz using log- periodic antenna, and above 1 GHz using linearly polarized horn antennas. Final measurements were made outdoors at 10-meter test range using Dipole antennas and EMI receiver. For frequencies above 1 GHz, horn antennas were used. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The EMI receiver detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz. The EUT, support equipment, and interconnecting cables were arranged to the configuration that produces the maximum EME emission found during preliminary scan. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Horizontal and vertical antenna polarizations were checked. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/ or support equipment, and powering the monitor the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

ITE Radiated Limits			
Frequency (MHz)	FCC Limit @ 3m. Quasi- Peak dB[μ V/m]	FCC Limit @ 10m.* Quasi – Peak dB [μ V/m]	CISPR Limit @ 10m. Quasi-Peak dB [μ V/m]
30-88	40.0	29.5	30.0
88-216	43.5	33.0	30.0
216-230	46.0	35.6	30.0
230-960	46.0	35.6	37.0
960-1000	54.0	43.5	37.0
> 1000	54.0	43.5	No Specified Limit
* Limit extrapolated 20 dB/decade			

Table 2. Radiated Class B limits @ 10-meters

5.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
LCD MONITOR TV(EUT)	HYUNDAI IMAGEQUEST CO., LTD.	L17T	PJIL17A00001	P.C
P.C	H/P	HP Pavilion 8921	DoC	N/A
Mouse	Microsoft	IntelliMouse Optical USB and PS/2 Compatible	DoC	P.C
Serial Mouse	Logitech	M-M28	DoC	P.C
Keyboard	H/P	5181	DoC	P.C
Printer	H/P	C4569A	DoC	P.C
Head-set	HYUNDAI	JPD-914MV	DoC	P.C

5.2 Cable Description

		Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
LCD Monitor TV (EUT)	Power	N	N/A	1.8(P)
	D Sub	N/A	Y	1.8(D)
	Audio in	N/A	Y	1.8(D)
	S-Video	N/A	Y	1.8(D)
	Video	N/A	Y	1.8(D)
	Antenna	N/A	Y	3.0(D)
	Head-set	N/A	Y	2.7(D)
PC		N	N/A	1.8(P)
Key Board		N/A	Y	1.8(D)
Mouse		N/A	Y	1.8(D)
Serial Mouse		N/A	Y	1.8(D)
Printer		N	Y	1.8(P,D)

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

5.3 Noise Suppression Parts on Cable. (I/O CABLE)

		Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
LCD Monitor TV (EUT)	D Sub	Y	BOTH END	Y	BOTH END
	Audio in	Y	BOTH END	Y	BOTH END
	S-Video	Y	BOTH END	Y	BOTH END
	Video	N	N/A	Y	BOTH END
	Antenna	N	N/A	Y	BOTH END
	Head-set	N	N/A	Y	EUT END
PC		N	N/A	N/A	N/A
Key Board		N	N/A	Y	PC END
Mouse		Y	PC END	Y	PC END
Serial Mouse		N	N/A	Y	PC END
Printer		N	N/A	Y	BOTH END

6.1 LINE-CONDUCTED TEST DATA

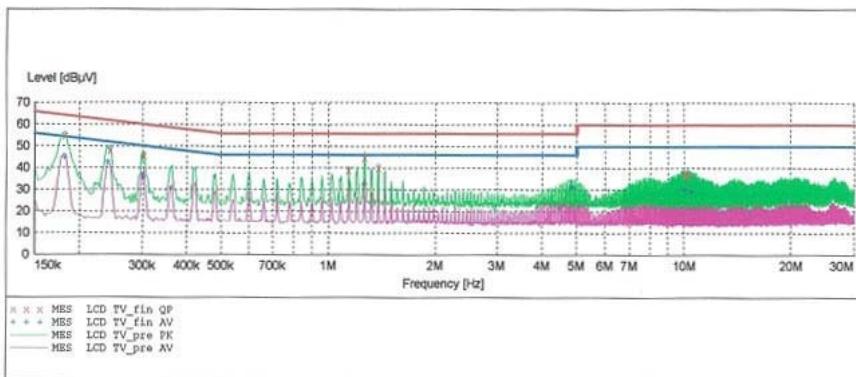
HCT

EMC TEST LAB

EUT: L17T
 Manufacturer: HYUNDAI IMAGEQUEST
 Operating Condition: 1280 X 1024 75Hz
 Test Site: SHIELD ROOM
 Operator: GS, KIM
 Test Specification: CISPR 22 CLASS B
 Comment: H

SCAN TABLE: "CISPR 22 Voltage"

Short Description:		CISPR 22 Voltage					
Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak	10.0 ms	9 kHz	None	
			Average				
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None	
			Average				
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None	
			Average				



MEASUREMENT RESULT: "LCD TV_fin QP"

8/18/2005 2:39PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.182600	54.80	10.1	64	9.6	---	---
0.242600	48.40	10.1	62	13.6	---	---
0.302600	45.60	10.1	60	14.6	---	---
1.140000	39.10	10.1	56	16.9	---	---
1.260000	44.90	10.2	56	11.1	---	---
1.380000	40.20	10.2	56	15.8	---	---
9.960000	37.50	10.4	60	22.5	---	---
10.200000	37.90	10.4	60	22.1	---	---
10.320000	37.00	10.4	60	23.0	---	---

MEASUREMENT RESULT: "LCD TV_fin AV"

8/18/2005 2:39PM

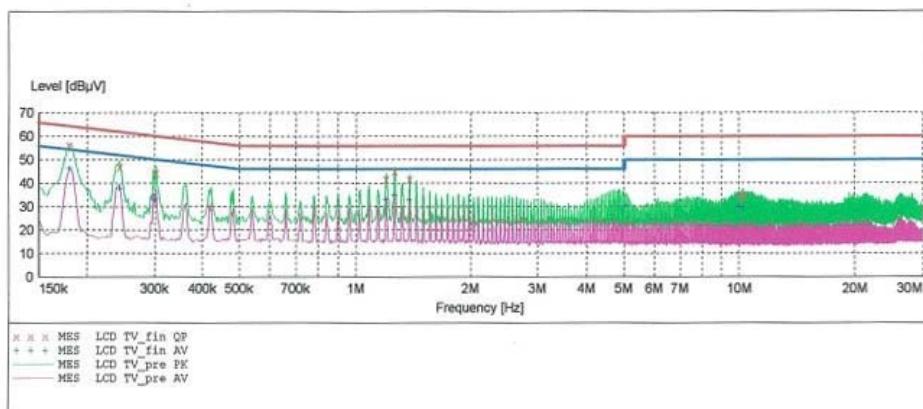
Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.182600	44.90	10.1	54	9.4	---	---
0.240100	42.80	10.1	52	9.3	---	---
0.302600	35.90	10.1	50	14.3	---	---
1.260000	32.70	10.2	46	13.3	---	---
4.860000	31.40	10.3	46	14.6	---	---
4.920000	31.30	10.3	46	14.7	---	---
10.020000	30.50	10.4	50	19.5	---	---
10.140000	30.30	10.4	50	19.7	---	---
10.560000	29.40	10.4	50	20.6	---	---

HCT
EMC TEST LAB

EUT: L17T
 Manufacturer: HYUNDAI IMAGEQUEST
 Operating Condition: 1280 X 1024 75Hz
 Test Site: SHIELD ROOM
 Operator: GS, KIM
 Test Specification: CISPR 22 CLASS B
 Comment: N

SCAN TABLE: "CISPR 22 Voltage"

CISPR 22 Voltage						
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width			Time	Bandw.
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			


MEASUREMENT RESULT: "LCD TV_fin QP"

8/18/2005 2:42PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.180100	56.20	10.1	65	8.3	---	---
0.242600	47.20	10.1	62	14.8	---	---
0.302600	44.80	10.1	60	15.4	---	---
1.200000	41.90	10.1	56	14.1	---	---
1.260000	45.30	10.2	56	10.7	---	---
1.380000	41.70	10.2	56	14.3	---	---
10.140000	34.60	10.4	60	25.4	---	---
10.200000	35.10	10.4	60	24.9	---	---
10.260000	35.00	10.4	60	25.0	---	---

MEASUREMENT RESULT: "LCD TV_fin AV"

8/18/2005 2:42PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line ---	PE ---
0.180100	46.30	10.1	55	8.2	---	---
0.242600	38.00	10.1	52	14.0	---	---
0.302600	33.20	10.1	50	17.0	---	---
1.200000	33.30	10.1	46	12.7	---	---
1.260000	34.80	10.2	46	11.2	---	---
1.380000	32.90	10.2	46	13.1	---	---
5.040000	30.40	10.3	50	19.6	---	---
10.020000	29.90	10.4	50	20.1	---	---
10.260000	29.60	10.4	50	20.4	---	---

NOTES:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The CISPR RFI conducted limits are listed on Table 1 (Page 7).
3. Line H = Phase Line N = Neutral Line

** Measurements using CISPR quasi-peak mode.

7.1 RADIATED TEST DATA

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss Db	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
43.4	6.4	11.9	1.4	V	19.7	30.0	10.3
86.2	8.4	7.7	2.1	V	18.2	30.0	11.8
122.8	8.1	11.7	2.5	V	22.3	30.0	7.7
170.3	5.0	12.1	3.0	H	20.1	30.0	9.9
181.7	7.3	11.1	3.0	V	21.4	30.0	8.6
213.3	6.5	10.0	3.3	V	19.8	30.0	10.2
267.1	11.3	11.9	3.7	H	26.9	37.0	10.1
328.4	12.6	13.5	4.2	H	30.3	37.0	6.7
345.5	10.7	13.8	4.3	V	28.8	37.0	8.2
428.7	10.8	16.1	4.7	H	31.6	37.0	5.4
541.1	6.7	18.0	5.3	V	30.0	37.0	7.0
603.2	3.3	19.4	5.6	V	28.3	37.0	8.7

Radiated Measurements at 10-meters.

1280 X 1024 (@75Hz)

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported.
2. The radiated limits are listed on Table 2 (Page 8).

** AFCL = Antenna Factor (Roberts dipole) and Cable Loss .

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

8.1 Sample Calculations

$$\text{dB } \mu\text{V} = 20 \log_{10} (\text{mV/m})$$

8.2 Example 1:

@ 180.1 KHz

Class B limit	= 64.5 dB μ V
Reading	= 56.2 dB μ V (calibrated level)
Margin	= 56.2 - 64.5 = - 8.3 dB μ V

= 8.3 dB below limit

8.3 Example 2:

@ 428.7MHz

Class B limit	= 37 dB μ V/m
Reading	= 10.8 dB μ V/m (calibrated level)
Antenna Factor + Cable Loss	= 20.8 dB
Total	= 31.6 dB μ V/m
Margin	= 31.6 - 37.0 = - 5.4
	= 5.4 dB below limit

9.1 Test Equipment

<u>Type</u>	<u>Manufacture</u>	<u>Model Number</u>	<u>CAL Due Date</u>
EMI Test Receiver	Rohde & Schwarz	ESVS30	2006.07.01
EMI Test Receiver	Rohde & Schwarz	ESCI	2006.09.13
LISN	Rohde & Schwarz	ESH2-Z5	2006.04.26
LISN	EMCO	703125	200604.26
TRILOG Antenna	Schwarzbeck	9160	2006.03.31
Antenna Position Tower	HD	MA240	N/A
Turn Table	EMCO	1050	N/A
Power Analyzer	Voltech	PM 3300	2006.03.22
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2005.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A
PULSE LIMITER	Rohde & Schwarz	ESH3-Z2	2005.11.16

10.1 Test Software Used

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.

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

Actual program used is the "H" pattern in Notepad under Windows environment. All resolution modes (1280×1024, 1024×768, 800×600, 640×480, 720×400) were investigated and tested

11.1 Conclusion

The data collected shows that the HYUNDAI IMAGEQUEST CO., LTD. 17-inch LCD Monitor **FCC ID: PJIL17A00001** complies with §15.107 and §15.109 of the FCC Rules.