

HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA
TEL : +82 31 639 8517 FAX : +82 31 639 8525

CERTIFICATION

Manufacture;
HARSPER CO.,LTD.

546-4. Ami-Ri Bubai-Eub, Ichon-City, Kyoungki-Do
Korea

HARSPER FRN : 00007-9131-06

Date of Issue : MARCH 23, 2004

Test Report No.: HCT-F04-0311

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

HCT FRN : 0005-8664-21

FCC ID :

O5XHP-420B

MODEL :

HP-4200B

Rule Part(s): Part 15 & 2; ET Docket 95-19
Equipment Class: FCC Class B Peripheral Device (JBP)
Standard(s): FCC Class B: 1998
EUT Type: PDP MONITOR
Max. Resolution(s): 852×480(@50KHz/ 60Hz)
Model(s): HP-4200B
Port/Connector(s): RS-232C JACK, DVI INPUT JACK, RGB PC INPUT JACK, PC SOUND, COMPONENT INPUT 1/2, AV INPYUT, OPICAL(SPDIF) DIGITAL AUDIOOUT JAK, S-VIDEO INPUT, ANT. IN, AC(POWER) INPUT, SPEAKER JACK, COMPOSITE(RCA) OUTPUT JACK/INPUT JACK 3.

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 C63.4-2001.

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.



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



HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.



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
4.1 DESCRIPTION OF TESTS (CONDUCTED)	6
4.3 DESCRIPTION OF TESTS (RADIATED)	7
5.1 LIST OF SUPPORT EQUIPMENT	8-9
6.1 TEST DATA (CONDUCTED)	10-13
7.1 TEST DATA (RADIATED)	14
8.1 SMPLE CALCULATIONS	15
9.1 TEST EQUIPMENT	16
10.1 TEST SOFTWARE USED	17
11.1 CONCLUSION	18

ATTACHMENT A:	FCC ID LABEL & LOCATION
ATTACHMENT B:	EXTERNAL PHOTOGRAPHS
ATTACHMENT C:	BLOCK DIAGRAM(S)
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:	HARSPER CO., LTD.
Address:	546-4. Ami-Ri, Bubai-Eub, Ichon-City, Kyoungki-Do Korea

- **FCC ID : O5XHP-420B**
- **Equipment Class: FCC Class B Peripheral Device (JBP)**
- **EUT Type: PDP MONITOR**
- **Model(s): HP-4200B**
- **Max. Resolution: 852×480(@50KHz/ 60Hz)**
- **Power Cord: Unshielded**
- **Rule Part(s): FCC Part 15 Subpart B**
- **Test Procedure(s): ANSI C63.4 (2001)**
- **Dates of Tests: NOVEMBER 03,2003~NOVEMBER 17,2003**
- **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 (ANSI C63.4-2001) was used in determining radiated and conducted emissions emanating from **HARSPER CO., LTD. PDP Monitor FCC ID: O5XHP-420B**

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 HARSPER CO.,LTD. (Model : HP-4200B) PDP Monitor

FCC ID: **O5XHP-420B**

Maximum Resolution(s): **852×480(@50KHz/ 60Hz)**

Dimensions: **1246mm(W) x 702mm(H) x 299mm(D)**

Power Supply: **AC 100-240V, 50/ 60Hz**

Connectivity: **TV 1,2 Input : RF/CATV (PAL/SECAM), S-Video Input : Mini Din 4Pin × 1Port**
Composite Input/Output : RCA × 5Port (AV INPUT 1/2/3, AV OUTPUT)
Component1,2 Input : RCA × 2Port(Y,Pb/Cb,Pr/Cr:480i,48p,576i,576p,720p,1080i)
PC Input : Mini D-Sub 15Pin × 1Port / HDTV Input
DVI Input : Mini D-Sub 29Pin × 1Port / HDTV Input
Audio In/OutPUT : RCA × 5Port
Speaker Output : Cinch type × 4Port(Setreo L/R), Head Phone Jack × 1Port
External Control Port : Mini D-Sub 9Pin × 1Port

Power Consumption : **380Watts**

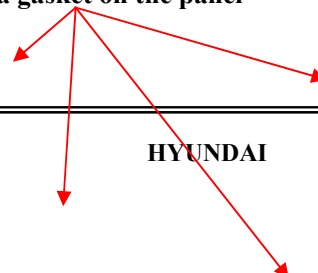
Weight (Net):**41.5Kg**

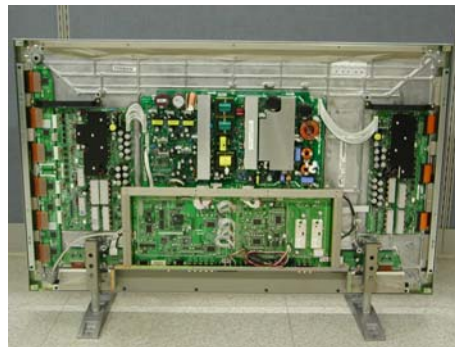
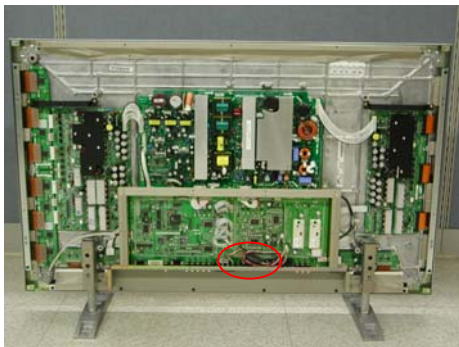
EMI Suppression Devices:

Modifications were made to the device.

1. Apply a ferrite Core to the Main Board

2. Attach a gasket on the panel





4.1 Description of Tests(Conducted & Radiated)

4.2 Powerline Conducted Emission (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 measured 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 centre 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	FCC 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. FCC CLASS B Conducted Emission 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[μV/m]	FCC Limit @ 10m.* Quasi – Peak dB [μV/m]	CISPR Limit @ 10m. Quasi-Peak dB [μV/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
MONITOR (EUT)	HARSPER CO., LTD.	HP-4200W	O5XHP-420W	P.C
P.C	H.P	HP Pavilion 700	DoC	EUT
KEY BOARD	H.P	5181	DoC	P.C
MOUSE	Microsoft	Intellimouse optical USB and PS/2 compatible	DoC	P.C
PRINTER	H/P	C6410A	DoC	P.C

Cable Termination	Component port 75Ω S-Video Port 75Ω Video Port 75Ω Audio Port 30 KΩ
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5.2 Cable Description

		Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
PDP Monitor (EUT)	Power	N	N/A	1.8(P),
	Video	N/A	Y	1.6(D)
	Audio	N/A	Y	1.6(D)
	RS-232C	N/A	Y	1.7(D)
	Component	N/A	Y	1.6(D)
	Speaker	N/A	N	3.0(D)
	Dsub	N/A	Y	1.8(D)
	DVI	N/A	Y	1.8(D)
	S-video	N/A	Y	1.6(D)
PC		N	N/A	1.8(P)
KEY BOARD		N/A	N/A	1.8(D)
MOUSE		N/A	Y	1.8(D)
PRINTER		N	Y	1.8(P),1.8(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
PDP Monitor (EUT)	Video	N	N/A	Y	BOTH END
	Audio	N	N/A	Y	BOTH END
	RS-232C	N	N/A	Y	BOTH END
	Component	N	N/A	Y	BOTH END
	Speaker	Y	EUT END	N	N/A
	Dsub	Y	BOTH END	Y	BOTH END
	DVI	Y	BOTH END	Y	BOTH END
	S-video	N	N/A	Y	BOTH END
PC		N	N/A	N/A	N/A
KEYBOARD		N	N/A	Y	PC END
MOUSE		N	N/A	Y	PC END
PRINTER		Y	BOTH END	Y	BOTH END

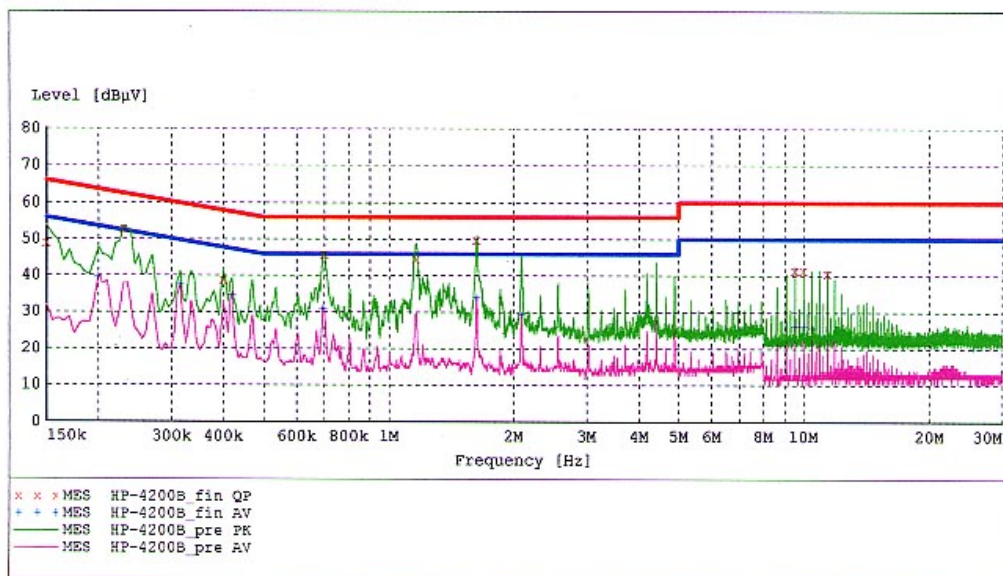
6.1 CONDUCTED TEST DATA

HYUNDAI C-TECH
EMC TESTING Laboratory

EUT: HP-4200B
 Manufacturer: HARSPER
 Operating Condition: 1280 X 1024 60Hz
 Test Site: SHIELD ROOM
 Operator: JP-HONG
 Test Specification: CISPR 22 CLASS B
 Comment: H
 Start of Test: 3/12/04 / 5:31:16PM

SCAN TABLE: "CISPR 22 Voltage"

Short Description:			CISPR 22 Voltage			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency	Width				
150.0 kHz	500.0 kHz	5.0 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			


MEASUREMENT RESULT: "HP-4200B_fin QP"

3/12/04 5:34PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	49.00	10.1	66	17.0	1	---
0.230000	53.00	10.1	62	9.4	1	---
0.400000	38.90	10.1	58	19.0	1	---
0.700000	45.90	10.2	56	10.1	1	---
1.165000	44.40	10.1	56	11.6	1	---
1.630000	49.80	10.2	56	6.2	1	---
9.535000	41.40	10.4	60	18.6	1	---
10.000000	41.40	10.4	60	18.6	1	---
11.395000	40.60	10.4	60	19.4	1	---

MEASUREMENT RESULT: "HP-4200B_fin AV"

3/12/04 5:34PM

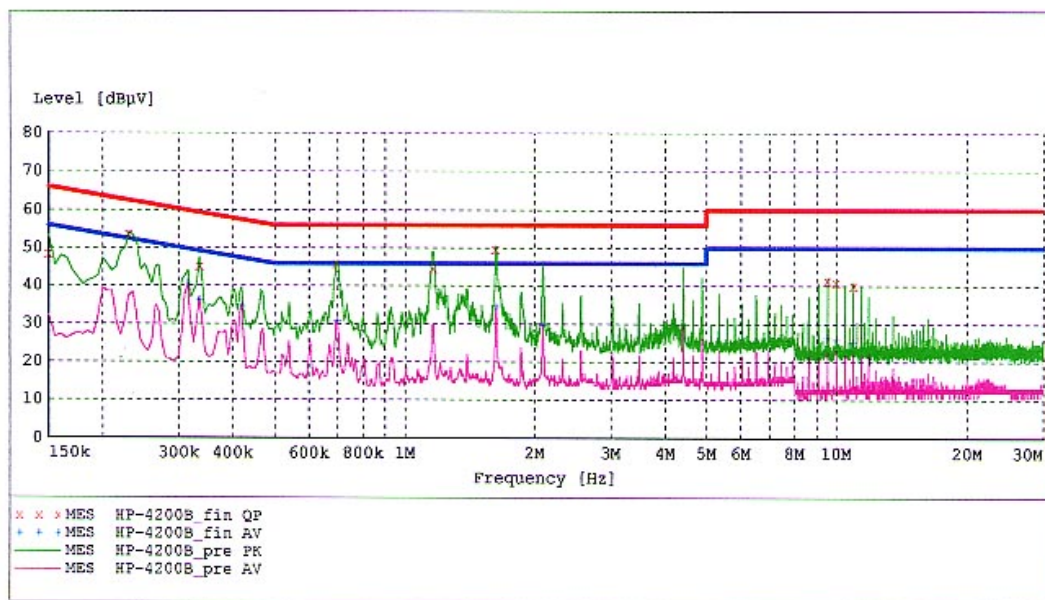
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.200000	39.80	10.1	54	13.8	1	---
0.315000	37.80	10.1	50	12.0	1	---
0.420000	34.70	10.1	47	12.7	1	---
0.695000	31.00	10.2	46	15.0	1	---
1.630000	34.30	10.2	46	11.7	1	---
2.090000	29.40	10.3	46	16.6	1	---
9.535000	26.30	10.4	50	23.7	1	---
10.000000	26.30	10.4	50	23.7	1	---
10.465000	25.60	10.4	50	24.4	1	---

HYUNDAI C-TECH EMC TESTING Laboratory

EUT: HP-4200B
Manufacturer: HARSPER
Operating Condition: 1280 X 1024 60Hz
Test Site: SHIELD ROOM
Operator: JP-HONG
Test Specification: CISPR 22 CLASS B
Comment: N
Start of Test: 3/12/04 / 5:23:44PM

SCAN TABLE: "CISPR 22 Voltage"

Short Description:		CISPR 22 Voltage				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency	Width				
150.0 kHz	500.0 kHz	5.0 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			



MEASUREMENT RESULT: "HP-4200B_fin QP"

3/12/04 5:26PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	48.50	10.1	66	17.5	1	---
0.230000	53.50	10.1	62	8.9	1	---
0.335000	45.20	10.1	59	14.1	1	---
0.695000	46.00	10.2	56	10.0	1	---
1.165000	44.60	10.1	56	11.4	1	---
1.625000	49.70	10.2	56	6.3	1	---
9.535000	41.50	10.4	60	18.5	1	---
10.000000	41.00	10.4	60	19.0	1	---
10.930000	40.20	10.4	60	19.8	1	---

MEASUREMENT RESULT: "HP-4200B_fin AV"

3/12/04 5:26PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.315000	40.70	10.1	50	9.2	1	---
0.335000	36.40	10.1	49	12.9	1	---
0.420000	34.90	10.1	47	12.5	1	---
0.700000	30.90	10.2	46	15.1	1	---
1.630000	34.70	10.2	46	11.3	1	---
2.090000	29.60	10.3	46	16.4	1	---
9.535000	26.40	10.4	50	23.6	1	---
10.000000	25.90	10.4	50	24.1	1	---
10.930000	25.40	10.4	50	24.6	1	---

7.1 RADIATED TEST DATA

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
34.00	15.6	17.3	1.3	V	34.2	40	-5.8
66.68	24.9	6.7	1.8	V	33.4	40	-6.6
180.00	11.4	15.9	3.0	H	30.3	43.5	-13.2
199.85	15.4	16.2	3.2	V	34.8	43.5	-8.7
320.00	23.0	16.3	4.1	V	43.4	46	-2.6
376.00	19.0	16.7	4.5	V	40.2	46	-5.8
377.55	20.3	16.7	4.5	V	41.5	46	-4.5

Radiated Measurements at 3-meters.

NOTES:

1. All modes(PC, Video, S-Video, DVI, TV mode) of operation were investigated, and the worst-case emissions are reported.
2. The radiated limits are listed on Table 2 (Page 7).

** 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

$$\text{dB } \square = 20 \log_{10} (\square)$$

$$\text{dB } \square = \text{dBm} + 107$$

8.2 Example 1:

@ 20.3 MHz

Class B limit	=	250 μV = 47.96 dB μV
Reading	=	- 67.8 dBm (calibrated level)
Convert to db μV	=	- 67.8 + 107 = 39.2 dB μV
$10^{(39.2/20)}$	=	91.2 μV
Margin	=	39.2 - 47.96 = - 8.76
	=	8.8 dB below limit

8.3 Example 2:

@ 66.7 MHz

Class B limit	=	100 $\mu\text{V/m}$ = 40.0 dB $\mu\text{V/m}$
Reading	=	- 76.0 dBm (calibrated level)
Convert to db $\mu\text{V/m}$	=	- 76.0 + 107 = 31.0 dB $\mu\text{V/m}$
Antenna Factor + Cable Loss	=	5.8 dB
Total	=	36.8 dB $\mu\text{V/m}$
Margin	=	36.8 - 40.0 = - 3.2
	=	3.2 dB below limit

9.1 Test Equipment

<u>Type</u>	<u>Manufacture</u>	<u>Model Number</u>	<u>CAL Date</u>
EMI Test Receiver	Rohed & Schwarz	ESI40	2003.11.16
EMI Test Receiver	Rohed & Schwarz	ESVS30	2003.07.16
LISN	Rohed & Schwarz	ESH2-Z5	2004.08.21
LISN	EMCO	3825/2	2004.02.24
Amplifier	Hewlett-Packard	8447E	2003.08.23
Absorbing Clamp	Rohed & Schwarz	MDS-21	2003.04.24
Dipole Antennas	Schwarzbeck	VHAP	2003.07.24
Dipole Antennas	Schwarzbeck	UHAP	2003.07.24
Biconical Antenna	Schwarzbeck	VHA9103	2003.07.23
Log-Periodic Antenna	Schwarzbeck	UHALP9107	2003.07.23
Antenna Position Tower	HD	MA240	N/A
Turn Table	EMCO	1050	N/A
Power Analyzer	Voltech	PM 3300	2003.02.15
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360AMX	2002.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A

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 Display “ H “ Pattern , White Pattern , 100/0/75/0 Colour bars, 1000 Hz Audio signal. All resolution modes were investigated and tested

11.1 Conclusion

The data collected shows that the HARSPER CO., LTD. PDP Monitor **FCC ID: O5XHP-420B**. complies with §15.107 and §15.109 of the FCC Rules.

