

# Electromagnetic Emission

## FCC MEASUREMENT REPORT

### Certification OF COMPLIANCE

#### FCC Part 15 Certification Measurement

This PDP Monitor, Model EPM-420A has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B :

**PRODUCT** : PDP Monitor  
**MODEL/TYPE NO** : EPM-420A  
**FCC ID** : OIOEPM-420  
**APPLICANT** : E-RAE Electronics Industry Co.,Ltd.  
371-51, Kasan-Dong, Keumcheon-Ku, Seoul,153-023, Korea  
Attn. :Yun Seok, Yoo / M/M Div, Chief Engineer  
**FCC CLASSIFICATION** : Class B personal computers and peripherals  
**FCC RULE PART(S)** : FCC Part 15 Subpart B  
**FCC PROCEDURE** : Certification  
**TRADE NAME** : E-RAE  
**TEST REPORT No.** : E02.0829.FCC.562N  
**DATES OF TEST** : August 27~ 28, 2002  
**DATES OF ISSUE** : August 29, 2002  
**TEST LABORATORY** : ETL Inc ( FCC Registration Number : 95422)  
#584 Sangwhal-ri, Kanam-myon, Yoju-kun, Kyonggi-do,  
469-880, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074

This PDP Monitor, Model EPM-420A has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B Class B personal computers and peripherals.

I attest to the accuracy of data. All measurements 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.

The results of testing in this report apply to the product / system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

*Yo Han, Park*

Yo Han, Park / Chief Engineer

**ETL Inc.**

**#584 Sangwhal-ri, Kanam-myon, Yoju-kun,  
Kyonggi-do, 469-880, Korea**



*This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the ETL, Inc.*

## **Table of Contents**

### **FCC Measurement Report**

- 1. Introduction**
- 2. Product Information**
- 3. Description of Tests**
- 4. Test Condition**
- 5. Test Results**
  - 5.1 Summary of Test Results**
  - 5.2 Conducted Emissions Measurement**
  - 5.3 Radiated Emissions Measurement**
- 6. Sample Calculations**
- 7. List of test Equipment used for Measurement**

- Appendix A. FCC ID Label and Location**
- Appendix B. Test Setup Photographs**
- Appendix C. External Photographs**
- Appendix D. Internal Photographs**
- Appendix E. Block Diagram**
- Appendix F. User Manual**
- Appendix G. Schematics**

# FCC MEASUREMENT REPORT

---

**Scope** – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

## General Information

**Applicant Name** : E-RAE Electronics Industry Co., Ltd.

**Address** : 371-51,Kasan-Dong,Keumcheon-Ku,Seoul,  
153-023 Korea

**Attention** : Yun Seok, Yoo / M/M Div, Chief Engineer

- **EUT Type** : PDP Monitor
- **Model Number** : EPM-420A
- **S/N** : N/A
- **Modulation** : N/A
- **FCC Rule Part(s)** : FCC Part 15 Subpart B
- **Test Procedure** : ANSI C63.4-1992
- **Dates of Tests** : August 27~ 28, 2002  
ETL Inc  
EMC Testing Lab (FCC Registration Number : 95422)
- **Place of Tests** : 584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,  
Kyounggi-Do, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No.** : E02.0829.FCC.562N

## 1. INTRODUCTION

---

The measurement test for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myun, Youju-kun, Kyounggi-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission(Registration Number : 95422 ).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-1992) was used in determining radiated and conducted emissions from the E-RAE Electronics Industry Co., Ltd. , Model : EPM-420A

## 2. PRODUCT INFORMATION

---

### 2.1 Equipment Description

The Equipment Under Test(EUT) is the PDP Monitor, EPM-420A of E-RAE Electronics Industry Co., Ltd.  
EPM-420A and EPM-420B are same models.

Only difference are Model name and Front cover design.

### 2.2 General Specification

- Chassis Type : Plastic & Metal
- List of Each OSC. Or X-Tal. Freq. ( $\geq 1$ MHz) : X-TAL – 14.31819, 20.25, 18.432MHz
- Number of Layers : Main I, II – 4Layer, Power V – 1Layer,  
All other boards are 2Layer
- Chipset Brand & Part No. : DALLAS / DS232AS SO-16, ARROW KOREA / AD9888KS-100  
THINE / THC63DV151, SAMSUNG / K4S643232E TSSOP(II)  
PHILIPS / 74F541D SOP-20, NASCO / VPC3230D-B3  
GENESIS KOREA / FLI2220, TI / SN74LV273A SOP-14
- Aspect : 16:9
- Screen Size(H\*V) : 920.1\*518.4mm
- Resolution : 852\*480(Wide VGA)
- Cell pitch (H\*V) : 0.36(H)\*1.08(V)mm
- Displayable Colours : 16.77M(256\*256\*256)
- Brightness : 300cd/m<sup>2</sup> (w/o filter: 540cd/m<sup>2</sup>)
- Contrast : 500:1(w/o filter:600:1)
- Colour Temperature : 8500
- Viewing Angle : 160 °
- Input signal : NTSC, PAL-M, PAL-N, PAL, SECAM, SD, HD, VGA~XGA
- RGB Input : D-sub 15
- AC INPUT : AC100-240V~, 50/60Hz, 3.0A
- Power Consumption : 340W

### 3. DESCRIPTION OF TESTS

---

#### 3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50 /50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located inside a shielded room 1m X 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the side wall of the shielded room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from the another EMCO LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner  $\phi$  1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMCO LISN. Non-inductive bundling to a 1m length shortened all interconnecting cables more than 1m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the R3261A Spectrum Analyzer to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

### 3. DESCRIPTION OF TESTS

---

#### 3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determined the frequency producing the max. emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using SchwarzBeck Log-Bicon antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 10-meters. The test equipment was placed on a wooden turn-table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. 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 max. emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

## 4. TEST CONDITION

### 4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

### 4.2 EUT operation

Operating Mode	The worst operating condition
Stand-by Mode	
1024 X 768 85Hz, Full "H" pattern display Mode	O
800 X 600 85Hz, Full "H" pattern display Mode	
640 X 480 85Hz, Full "H" pattern display Mode	

O : Worst case investigated during the Test

### 4.3 Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

#### EUT – PDP Monitor

FCC ID : OIOEPM-420  
Model Name : EPM-420A  
Serial No. : N/A  
Manufacturer : E-RAE Electronics Industry Co., Ltd.  
Power Supply Type : Switching  
Power Cord : Non-Shielded, Detachable, 2.8m  
Data port : 1.5m Unshielded A/V RCA cable, 3.0m Shielded 15pin D-sub Cable  
1.5m Shielded S-VHS Cable, 3.0m Unshielded Speaker Cable.

#### Support Unit 1-Persnal computer (DELL)

FCC ID : N/A (DoC)  
Model Name : MMP  
Serial No. : 2LL11S  
Manufacturer : DELL  
Power Supply Type : Switching  
Power Cord : Non-shielded, Detachable: 1.2m  
Data port : Shielded, Detachable:1.5m

#### Support Unit 2-Keybaord (DELL)

FCC ID : N/A (DoC)  
Model Name : SK-8000  
Serial No. : 2965  
Manufacturer : DELL  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.5m





FCC ID : OIOEPM-420  
Report No: E02.0829.FCC.562N  
Date of issue: August 29, 2002

**Support Unit 3-Mouse (LOGITECH)**

FCC ID : DZL211029  
Model Name : M-S34  
Serial No. : LZC01002314  
Manufacturer : LOGITECH  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : None-Shielded, 1.2m

**Support Unit 7- DVD PLAYER (AlphaCast)**

FCC ID : N/S  
Model Name : DVDP-M100  
Serial No. : N/A  
Manufacturer : AlphaCast  
Power Supply Type : DC 12V From Adaptor  
Power Cord : Non-Shield, 1.5m  
Data port : Shielded, 1.5m

## 5. TEST RESULTS

---

### 5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

The data collected shows that the **E-RAE Electronics Industry Co., Ltd. PDP Monitor, EPM-420A** complies with

Test Rule Parts	Measurement Required	Result
15.107(e)	Conducted Emissions Measurement	Passed by -3.15dB
15.109(e)	Radiated Emissions Measurement	Passed by -3.28dB

technical requirements of above rules part 15.107 and 15.109 Class B Limits and CISPR Publication 22.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

## 5. TEST RESULTS

### 5.2 Conducted Emissions Measurement

EUT	PDP Monitor / EPM-420A (SN:N/A)
Limit apply to	CISPR Pub.22 (1997) Class B
Test Date	August 27, 2002
Operating Condition	1024*768 85Hz, Full "H" Pattern display Mode
Environment Condition	Humidity Level : 51 %RH, Temperature : 24
Result	Passed by - 3.15dB

### Conducted Emission Test Data

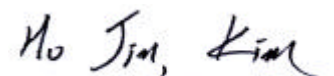
The following table shows the highest levels of conducted emissions on both polarization of live and neutral line.

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

Frequency [MHz]	Reading [dB $\mu$ V]		Phase (*H/**N)	Limit [dB $\mu$ V]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Q.Peak	Average
0.150	55.60	51.50	H	66.00	56.00	10.40	4.50
0.172	57.40	50.00	H	64.86	54.86	7.46	4.86
0.200	60.01	50.46	H	63.61	53.61	3.51	3.15
0.398	42.60	-	N	57.89	47.89	15.29	-
0.800	42.80	-	N	56.00	46.00	13.20	-
1.70	42.82	-	N	56.00	46.00	13.18	-
4.60	42.54	-	N	56.00	46.00	13.46	-
5.60	44.00	-	N	60.00	50.00	16.00	-
15.26	54.70	-	H	60.00	50.00	5.30	-
23.48	40.50	-	H	60.00	50.00	19.50	-

#### NOTES :

1. \* H : HOT Line , \*\*N : Neutral Line
2. Margin value = Limit - Reading
3. Measurement were performed at the HOST AC Power Inlet in the frequency band of 150kHz ~ 30MHz according to the CISPR 22 Class B
4. If the Reading Quasi-Peak value is bellow the Average Limit, Do not test Average Mode.



Test Engineer : H. J. Kim

## 5. TEST RESULTS

### Line: HOT Line

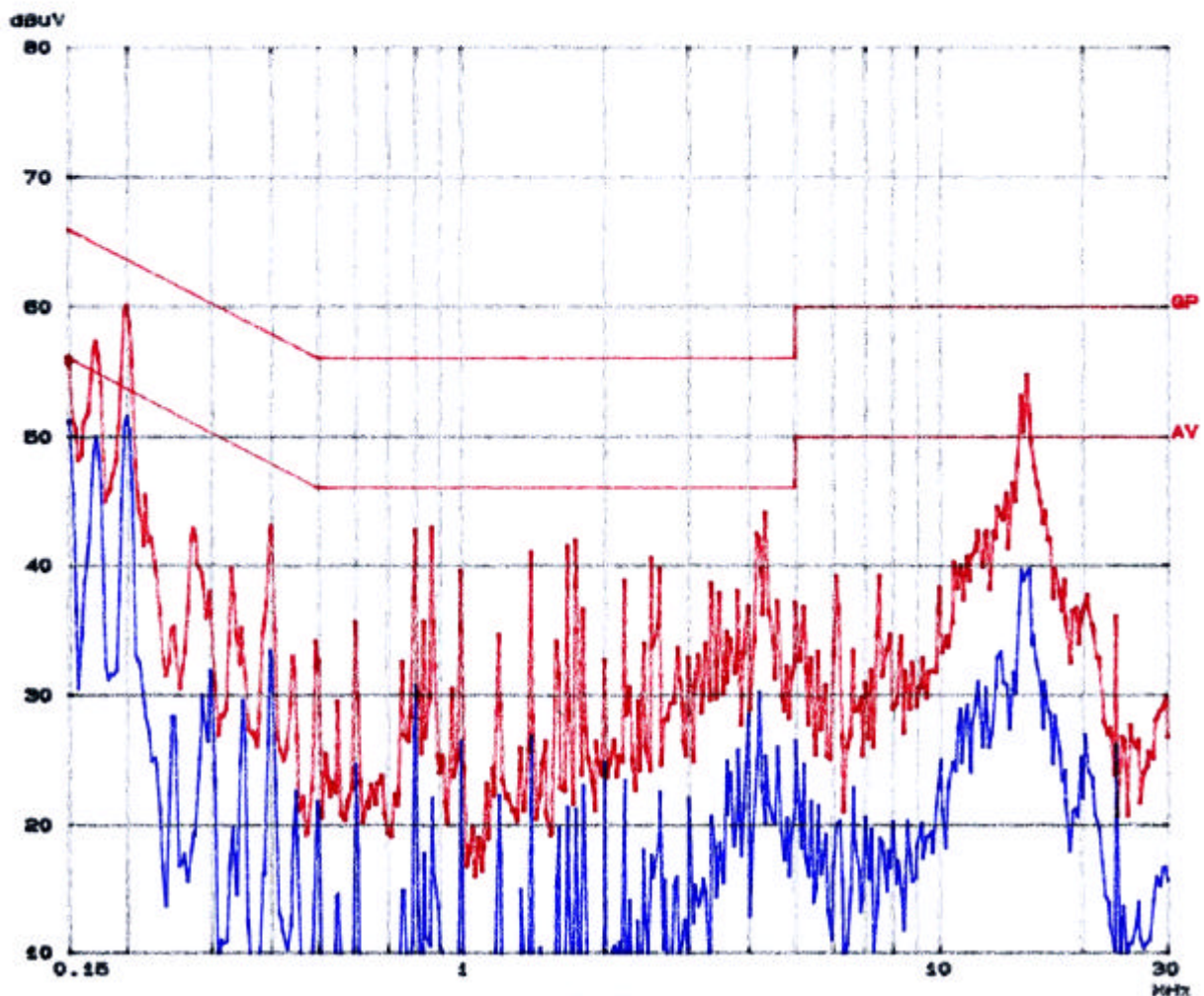
ETL Inc.  
CONDUCTED EMISSION

EUT: EPM-420A  
Manuf: ERAE ELECTRONICS  
Comment: HOT

#### Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	2k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x GP / + AV  
 Meas Time: 1 s  
 Subranges: 50  
 Acc Margin: 3dB  
 Transducer No. 1 Start 150k Stop 30M Name EN55022



## 5.TEST RESULTS

### Line: Neutral Line

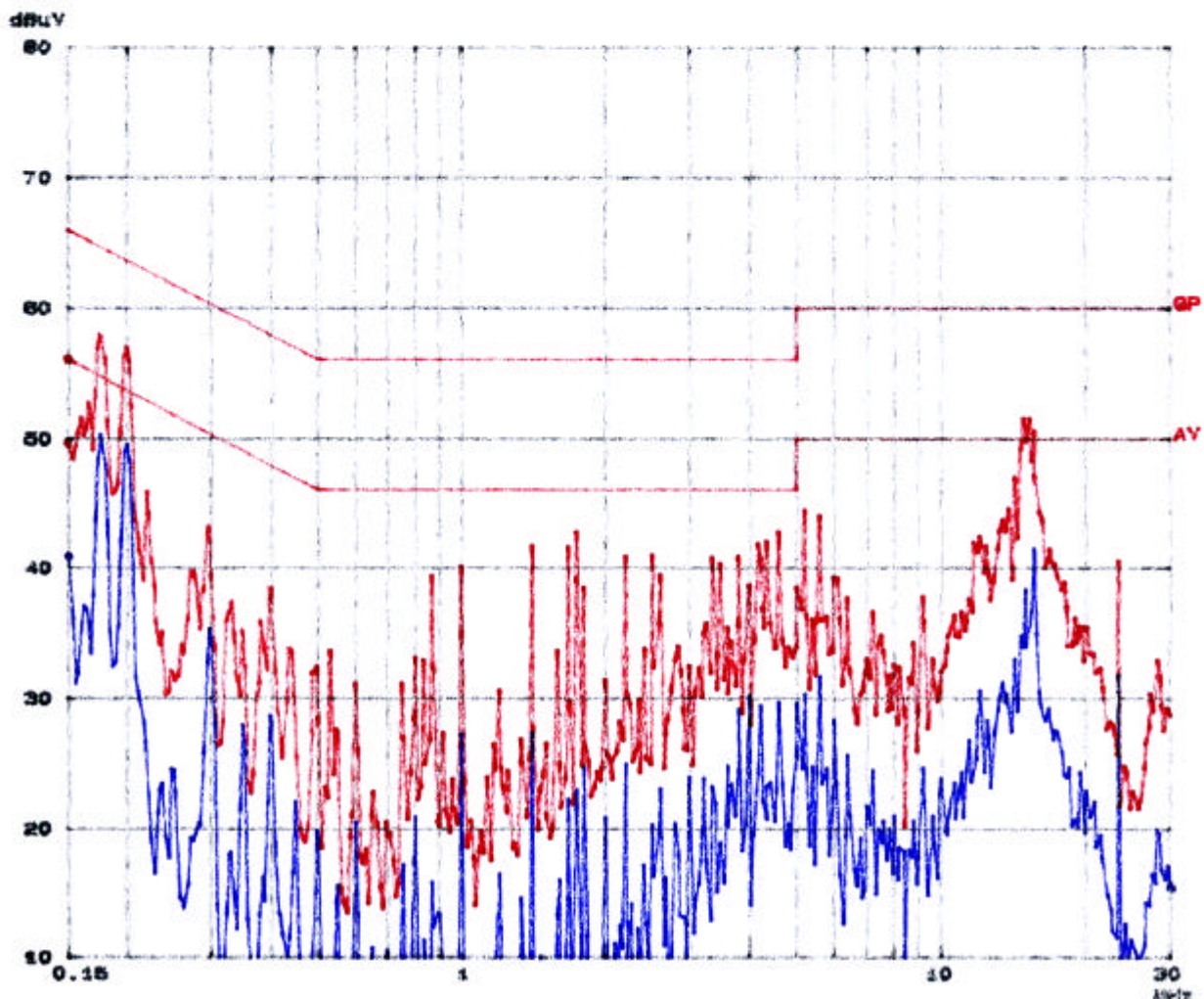
ETL Inc.  
CONDUCTED EMISSION

EUT: EPM-420A  
Manuf: ERAE ELECTRONICS  
Comment: NEUTRAL

#### Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	2k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x GP / + AV  
 Meas Time: 1 s  
 Subranges: 50  
 Acc Margin: 3dB  
 Transducer No. 1 Start 150k Stop 30M Name EN85022





## 5. TEST RESULTS

### 5.3 Radiated Emissions Measurement

EUT	PDP Monitor / EPM-420A (SN:N/A)
Limit apply to	CISPR Pub.22 (1997) Class B
Test Date	August 28, 2002
Operating Condition	1024*768 Full "H" Pattern display Mode
Environment Condition	Humidity Level : 49 %RH, Temperature : 24
Result	Passed by - 3.28 dB

### Radiated Emission Test Data

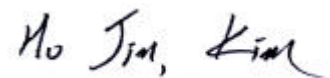
The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

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

Frequency [MHz]	Reading [dB $\mu$ V]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Emission Level [Db $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
30.00	12.82	V	11.91	1.40	26.13	30.00	3.87
53.00	10.93	V	11.89	1.80	24.62	30.00	5.38
189.02	10.79	V	10.81	3.70	25.30	30.00	4.70
257.71	10.20	H	11.00	4.20	25.40	37.00	11.60
378.04	12.18	H	14.32	5.30	31.80	37.00	5.20
463.63	5.76	H	16.88	5.70	28.34	37.00	8.66
472.54	7.21	H	16.88	5.70	29.79	37.00	7.21
535.75	3.26	H	17.31	6.30	26.87	37.00	10.13
661.59	7.28	H	19.34	7.10	33.72	37.00	3.28
756.10	3.51	H	21.44	7.60	32.55	37.00	4.45

#### NOTES :

- \* H : Horizontal polarization , \*\* V : Vertical polarization
- Emission Level = Reading + Antenna factor + Cable loss
- Margin value = Limit - Emission Level
- The measurement was performed for the frequency range 30MHz ~ 1000MHz according to the CISPR 22 Class B



Test Engineer : H. J. Kim

## 6. SAMPLE CALCULATION

---

### Sample 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

$$dB(\mu V/m) = 20 \log_{10} (\mu V / m) : \text{Equation 1}$$

$$dB\mu V = dBm + 107 : \text{Equation 2}$$

Example 1 : @ 0.200MHz

Class B Limit	=	479.18 $\mu V$	=	53.61dB $\mu V$
Reading	=	50.46 dB $\mu V$		
Convert to $\mu V$	=	333.42 $\mu V$		
Margin	=	50.46 – 53.61 = -3.15 dB $\mu V$		
	=	-3.15 dB $\mu V$ below Limit		

Example 2 : @ 31.05MHz

Class B Limit	=	70.7 $\mu V$	=	37.00 dB $\mu V$
Reading	=	7.28 dB $\mu V$		
Antenna Factor + Cable Loss	=	19.34 + 7.10	=	26.44dB $\mu V$
Total	=	33.72dB $\mu V$		
Margin	=	33.72 – 37.00 = -3.28 dB $\mu V$		
	=	-3.28 dB $\mu V$ below Limit		

## 7. TEST EQUIPMENT LIST

### List of Test Equipments Used for Measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Due Date
<input checked="" type="checkbox"/>	Spectrum Analyzer	R3261A	Advantest	21720033	02-10-26
<input checked="" type="checkbox"/>	Receiver	ESVS 10	R & S	835165/001	03-04-06
<input checked="" type="checkbox"/>	EMI Test Receiver	ESHS 30	R & S	040190/002	03-03-19
<input checked="" type="checkbox"/>	Preamplifier	HP8447D	HP	2944A07626	03-01-10
<input type="checkbox"/>	Preamplifier	HP 8347A	HP	2834A00544	02-05-23
<input checked="" type="checkbox"/>	LISN	3825/2	EMCO	9006-1669	02.12.27
<input checked="" type="checkbox"/>	LISN	3825/2	EMCO	9208-1995	02.12.27
<input checked="" type="checkbox"/>	TriLog Antenna	VULB9160	Schwarz Beck	3082	02-06-19
<input type="checkbox"/>	LogBicon	VULB9165	Schwarz Beck	2023	02-06-19
<input type="checkbox"/>	Dipole Antenna	VHAP	Schwarz Beck	964	03-05-03
<input type="checkbox"/>	Dipole Antenna	VHAP	Schwarz Beck	965	03-05-03
<input type="checkbox"/>	Dipole Antenna	UHAP	Schwarz Beck	949	03-05-03
<input type="checkbox"/>	Dipole Antenna	UHAP	Schwarz Beck	950	03-05-03
<input type="checkbox"/>	Broad band Horn Antenna	BBHA 9120 D	Schwarz Beck	277	02-11-03
<input checked="" type="checkbox"/>	Turn-Table	DETT-03	Daeil EMC	-	N/A
<input checked="" type="checkbox"/>	Antenna Master	DEAM-03	Daeil EMC	-	N/A
<input type="checkbox"/>	Plotter	7440A	H.P	2725A 75722	N/A
<input checked="" type="checkbox"/>	Chamber	DTEC01	DAETONG	-	N/A
<input checked="" type="checkbox"/>	Impedance Matching Pad	6001.01.A	SUNNER	3252	02-09-22
<input type="checkbox"/>	Thermo Hygograph	3-3122	ISUZU	3312201	02-12-20
<input type="checkbox"/>	BaroMeter	-	Regulus	-	-