

Electromagnetic Emission

F C C M E A S U R E M E N T R E P O R T

Certification OF COMPLIANCE FCC Part 15 Verification Measurement

PRODUCT : Thermal Printer
MODEL/TYPE NO : PORTI-SC30
FCC ID : QDDPORTI-SC30
APPLICANT : WOOSIM SYSTEM Inc.
#501, Daerung Technotown 3th, 448, Gasan-dong,
Geumchun -gu, Seoul, Korea
Attn. : Ki Yoon,Kim / Engineer of R&D Center
FCC CLASSIFICATION : FCC Part 15 Subpart B
FCC RULE PART(S) : Part 15 Class B Computing Device Peripheral (JBP)
FCC PROCEDURE : Certification
TRADE NAME : WOOSIM SYSTEM
TEST REPORT No. : E02.1122.FCC.792N
DATES OF TEST : November 20, 2002
DATES OF ISSUE : November 22, 2002
TEST LABORATORY : ETL Inc (FCC Registration Number : 95422)
#584 Sangwhal-ri, Kanam-myun, Youju-kun, 469-880
Kyounggi-do, Korea
Tel : (031) 885-0072 Fax : (031) 885-0074

This Thermal Printer, Model PORTI-SC30 has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been show to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part 15, Computer peripheral Devices.

I attest to the accuracy of data. All measurement herein are 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.



Name : Yo Han, Park

Title : Chief Engineer of EMC Team



E-RAE Testing Laboratory Inc.
#584 Sangwhal-ri, Kanam-myun, Youju-kun, 469-880 Kyounggi-do, Korea

Table of Contents

ATTACHMENT A: COVER LETTER(S)

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 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 : WOOSIM SYSTEM Inc.
Address : #501, Daerung Technotown 3th, 448, Gasan-dong, Geumchun –gu, Seoul, Korea
Attention : Ki Yoon, Kim / Engineer of R&D Center

- **EUT Type :** Thermal Printer
- **Model Number :** PORTI- SC30
- **FCC Identifier :** QDDPORTI-SC30
- **S/N :** NONE
- **Modulation :** NONE
- **FCC Rule Part(s) :** FCC Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-1992
- **FCC Classification :** Part 15 Class B Computing Device Peripheral (JBP)
- **Dates of Tests :** November 20, 2002
- **Place of Tests :**
ETL Inc
EMC Testing Lab (FCC Registration Number : 95422)
584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,
Kyounggi-Do, Korea
Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No. :** E02.1122.FCC.792N

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, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 22. The ETL has site descriptions on file with the FCC for 3 and 10 meters 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 Model : PORTI-SC30

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test(EUT) is the WOOSIM SYSTEM Inc.PORTI-SC30

Please refer to Users manual

2.2 General Specification

- Chassis Type : Plastic
- List of Each OSC. Or X-Tal. Freq. (>=1MHz) : X-TAL – 25.8MHz, 3.6864MHz
- Chipset Brand & Part No. : 4066 – ST, SP232ACN – SIPEX, 74HC32 – TI, 74HC14 – TI
: M37702S1BFP – MITSUBISHI, MM74HC573MTC – PHILIPS
: HSDL7001 – AGILENT, 39SF040 – SST, KA3100D – FAIRCHILD
: HY628100BLLG-70 – HYNIX, F2F2000 – ZEPETRONIX
: 213-032-702 – METHODE, KIA7042AF – KEC, TL431CS – S&E
: KTC3265 – KEC, HSDL3000 – AGILENT
- Number of Layers : Main board – 4Layers, Sub board – 2 Layers
- Printing method : Direct thermal line printing
- Characters per line : 80cpl
- Characters size : 9 * 24dots, 16 * 24dots (Korean characters)
- Resolution : 203dpi, 8dots/mm
- Print width : 4-inch (104 mm, 832dots)
- Printing sped : 40 mm/sec
- Dimensions : 138 * 88 * 24 mm(Standard model)
- Weight : 340g
- Interface : Serial (RS-232C), IrDA Ver1.0 (SIR) (Standard model)
- Paper supplied : Thermal roll paper(118mm wide, 25)
- Barcode supplied : PDF417(2-dimension), Code128, Code39, I2/5, Code93
: UPC, EAN, KAN, JAN, CODABAR
- Receive buffer size : 10K bytes
- Note : Printing speed may be slower, depending on the data transmission

Speed and the combination of control commands.

- Battery : Rechargeable 7.2V DC 1.4A (Li-ion)
- Battery duration : 1 hour continuous printing
- AC adaptor. : Input (85 ~ 240V AC50~60Hz)
: Output (8.6V DC), 4hour full charge time
- Enviroment conditions : Temperature : 0 ~40 (operating)
: -10 ~ 50 (storage)
: Humydity : 30%80% (operating)
: -10 ~ 50 (storage)
- MCBF : Mechanical : 37000000 nines
- Characters size : Head : Approximately 50Km

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 another EMCO LISN. Power to the LISN is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 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 ANSI C63.4-1992. 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 Test Setup photos.

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	X
Printing Mode	O
Communication Mode	X

O : Worst case investigated during the Test

4.3 Support Equipment Used

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

EUT – Thermal Printer (WOOSIM SYSTEM)

FCC ID : QDDPORTI-SC30
Model Name : PORTI-SC30
Serial No. : N/A
Manufacturer : WOOSIM SYSTEM Inc.
Power Supply Type : DC 8.6V From Adaptor
Power Cord : Non-shielded, Undetachable: 1.5m
Data Cable : Shielded, 1.0m

Support Unit 1-Personal computer (DELL)

Support Unit 2-Keyboard (DELL)

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

Support Unit 3- Printer (SINDORICOH)

FCC ID : N/A
Model Name : Color Inkjet Printer Colorcap 330
Serial No. : 11-030098
Manufacturer : LEMARK INTERNATIONAL
Power Supply Type : Switching
Power Cord : Non-shielded, Detachable: 1.2m
Data Cable : Shielded, Detachable:1.5m

Support Unit 4-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 : Shielded, 1.2m

Support Unit 5- Monitor (E-RAE)

FCC ID : OIOELM-150
Model Name : ELM-150B
Serial No. : N/A
Manufacturer : E-RAE Electronics Industry Co., Ltd.
Power Supply Type : DC12V From Adaptor
Power Cord : Non-shielded, Detachable: 1.2m
Data Cable : Shielded 15pin D-sub, 1.5m

Support Unit 6- USB Mouse (N/A)

FCC ID : N/A
Model Name : HL898W
Serial No. : HL08011837
Manufacturer : N/A
Power Supply Type : N/A
Power Cord : N/A
Data Cable : Shielded, 1.2m

Support Unit 7- EAR MIC (JETECH)

FCC ID : N/A
Model Name : JE101
Serial No. : N/A
Manufacturer : JETECH
Power Supply Type : N/A
Power Cord : N/A
Data Cable : 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 test collected shows that the WOOSIM SYSTEM Inc., PORTI-SC30 complies with technical requirements of the FCC Part 15 Subpart B, Class B Computing Device Peripheral (JBP).

Test Rule Parts	Measurement Required	Result
Part 15.107(e)	Conducted Emissions Measurement	Passed by -3.40dB
Part 15.109(e)	Radiated Emissions Measurement	Passed by -7.14dB

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	Thermal Printer / PORTI-SC30 (SN: N/A)
Limit apply to	FCC Part 15.107(e)
Test Date	November 20, 2002
Operating Condition	Continuous Printing Mode
Environment Condition	Humidity Level : 41 %RH, Temperature : 22
Result	Passed by -3.40dB

Conducted Emission Test Data

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

Detector mode : FCC Part 15.107(e) Quasi-Peak mode (6dB Bandwidth : 9 KHz)

Frequency (MHz)	Reading [dB μ V]		Phase H / N]	Limit (dB μ V)		Margin (dB μ V)	
	Q.Peak	Average		Q.Peak	Average	Q.Peak	Average
0.530	44.60	-	H	48.0	-	3.40	-
0.640	42.10	-			-	5.90	-
0.950	42.20	-			-	5.80	-
1.060	43.80	-			-	4.20	-
1.170	43.40	-			-	4.60	-
2.670	42.10	-			-	5.90	-
7.130	44.20	-			-	3.80	-
8.190	34.60	-			-	13.4	-
14.29	35.60	-			-	12.4	-
28.08	34.90	-			-	13.1	-
The other frequencies have -3.40dB margin at least							

NOTES :

1. * H : HOT Line , **N : Neutral Line
2. Margin value = Limit – Reading
3. Measurement were performed at the DC Power Supply Inlet in the frequency band of 0.450MHz ~ 30MHz according to the FCC Part 15.107(e)



Test Engineer : H. J. Kim

5. TEST RESULTS

Line: HOT Line

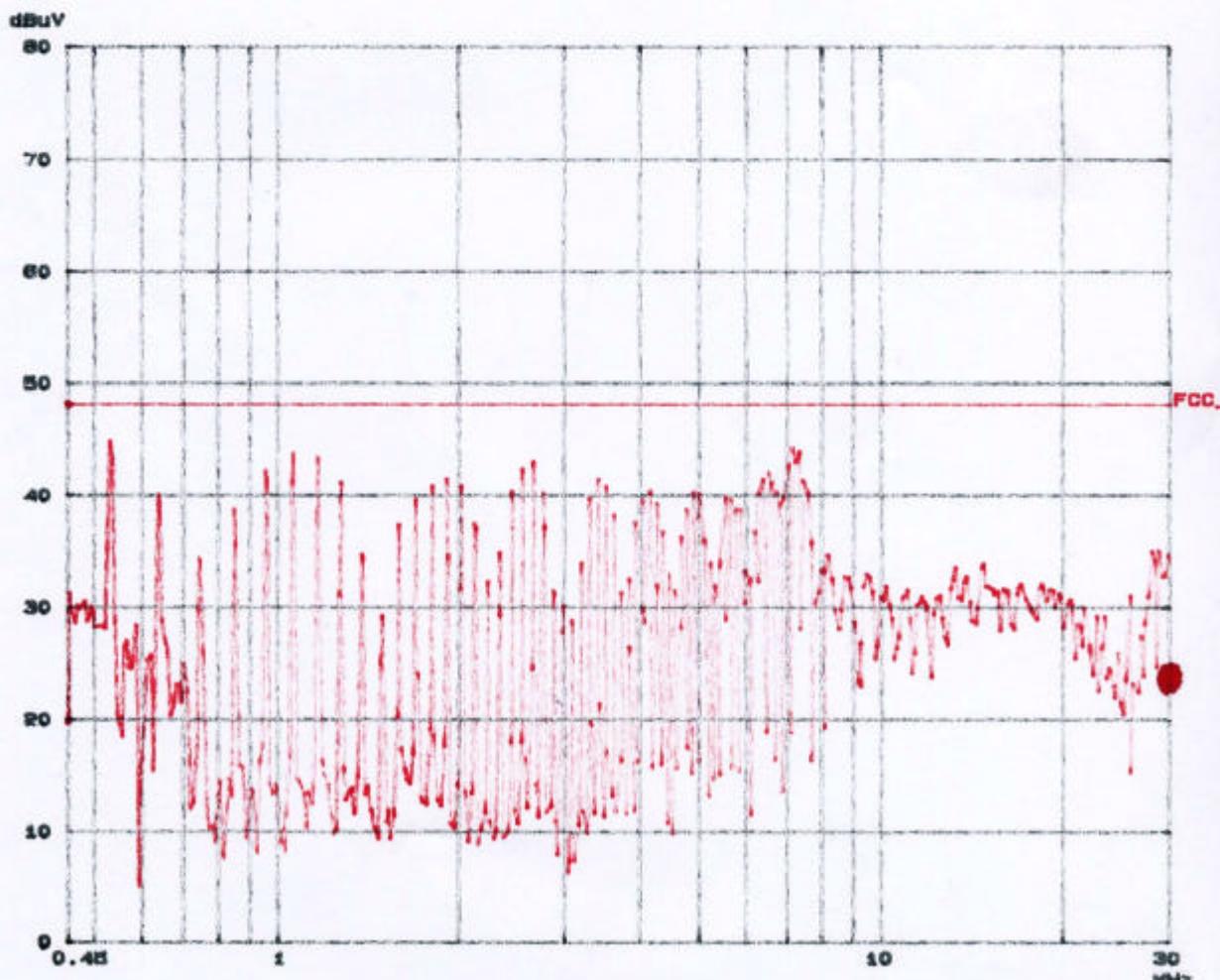
ETL INC. CONDUCTED EMISSION

EUT: PORTI-SC30
Manuf: WOOSIM SYSTEM Inc.
Test Spec: FCC CLASS B
Comment: HOT

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpAmp
450K	500K	2K	10K	PK	20ms	AUTO	LN OFF	60dB
500K	5M	5K	10K	PK	20ms	AUTO	LN OFF	60dB
5M	30M	10K	10K	PK	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP Transducer No. Start Stop Name
Meas. Time: 1 s 1 100K 30M EN55022
Subranges: 50
Acc Margin: 3dB



5. TEST RESULTS

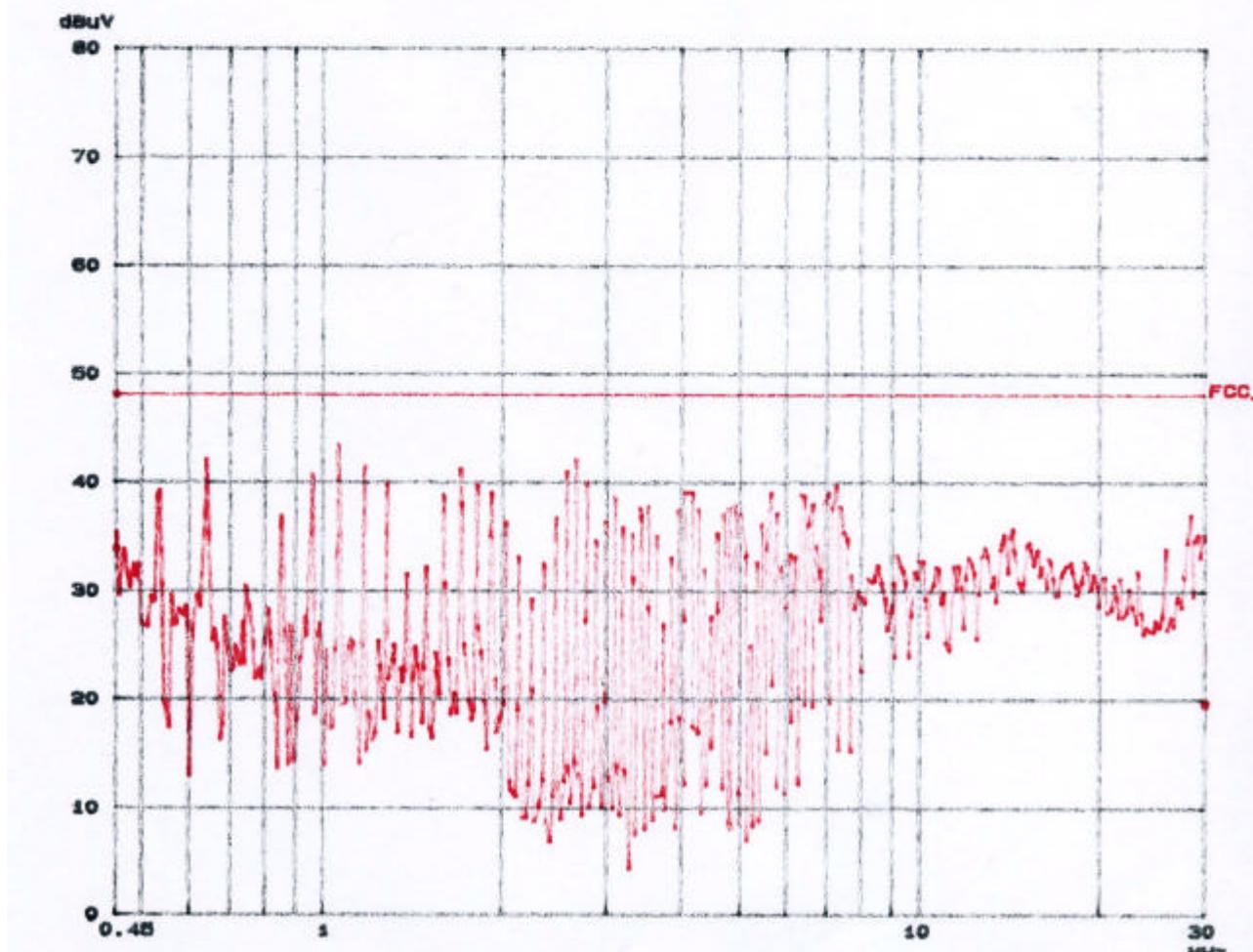
Line: Neutral Line

ETL INC. CONDUCTED EMISSION

EUT: PORT1-SC30
Manuf: WOOSIM SYSTEM Inc.
Test Spec: FCC CLASS B
Comment: NEUTRAL

Scan Settings (3 Ranges)				Receiver Settings						
Frequencies				Detector			M-Time	Atten	Preamp	OpAmp
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpAmp		
450K	500K	2K	10K	PK	20ms	AUTO	LN	OFF	60dB	
500K	5M	5K	10K	PK	20ms	AUTO	LN	OFF	60dB	
5M	30M	10K	10K	PK	20ms	AUTO	LN	OFF	60dB	

Final Measurement:		x QP	Transducer	No.	Start	Stop	Name
Meas Time:	1 s			1	100K	30M	
Subranges:	50						EN55022
Acc Margin:	3dB						



5. TEST RESULTS

5.3 Radiated Emissions Measurement

EUT	Thermal Printer / PORTI-SC30 (SN: N/A)
Limit apply to	FCC Part 15.109(e)
Test Date	November 20, 2002
Operating Condition	Printing Mode
Environment Condition	Humidity Level : 41 %RH, Temperature : 22
Result	Passed by -7.14dB

Radiated Emission Test Data

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

Detector mode : FCC Part 15.109(e) Quasi-Peak mode (6dB Bandwidth : 120 kHz)

Measurement Distance : 3 meters

Frequency [MHz]	Reading [dB μ V]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Result [dB μ V/m]	Limit [dB μ V]	Margin [dB μ V/m]
30.54	19.55	V	11.91	1.40	32.86	40.00	7.14
51.60	16.30	V	11.89	1.80	29.99		10.01
150.28	14.66	V	12.76	3.00	30.42	43.50	13.08
154.80	18.69	V	12.76	3.00	34.45		9.05
198.63	16.42	H	9.93	3.80	30.15		13.35
237.00	14.60	H	10.27	4.00	28.87	46.00	17.13
257.99	18.80	H	11.00	4.20	34.00		12.00
283.90	11.64	H	12.19	4.50	28.33		17.67
335.39	12.51	H	13.18	4.70	30.39		15.61
412.79	11.05	H	15.04	5.40	31.49		14.51

The other frequencies have -7.14 dB margin at least

NOTE :

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss
3. Margin value = Limit - Emission Level
4. The measurement was performed for the frequency range 30MHz ~1000MHz according to the FCC Part 15.109(e)



Test Engineer : H. J. Kim

ETL Inc.

#584 Sangwhal-ri, Kanam-myon,
 Yeoju-kun, Kyounggi-do,
 469-880, Korea

WOOSIM SYSTEM Inc.
 Thermal Printer
 Model : PORTI-SC30

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 : @ 0.530 MHz

Class B Limit	= 251.19 uV	= 48.00 dBuV
Reading	= 44.60 dBuV	
Convert to uV	= 169.82 uV	
Margin	= 44.60 - 48.00	= - 3.40
		= - 3.40 dB below Limit

Example 2 : @30.54MHz

Class B Limit	= 100 uV	= 40.0 dBuV/m
Reading	= 19.55dBuV	
Antenna Factor + Cable Loss		= 13.31dB
Total		= 32.86 dBuV/m
Margin	= 32.86 - 40.0	= - 7.14
		= - 7.14 dB 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	03-10-23
<input checked="" type="checkbox"/>	Spectrum Analyzer	HP E7402A	HP	US39110107	03-05-16
<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	03-06-21
<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 type="checkbox"/>	Thermo Hygrograph	3-3122	ISUZU	3312201	02-12-20
<input type="checkbox"/>	BaroMeter	-	Regulus	-	-