

FCC PART 15 CLASS B EMI MEASUREMENT AND TEST REPORT

FOR

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FCC ID: PE3IP-240R

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This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Wireless Mouse Receiver I-pen Pro 240
Test Date: <u>October 06, 2003</u>	
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1. General Information

1.1 Test Facility

The open area test site (OATS) used by Thru Lab. & Engineering to collect radiated and conducted emissions measurement data is located in the 389 JeArm-Rhi, HyangNam-Myun, HwaSung-Gun, KyungKi-Do, Korea.

Test sites at Thru Lab. & Engineering has been fully described in reports submitted to the Federal Communication Commission and the details of the reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The test facility also complies with the radiated and AC line conducted test site criterion in ANSI C63.4-1992. The Federal Communications Commission has the reports on file and is listed under Registration Number 92583. The scope of the accreditation covers the FCC Method - 47 CFR Part 15 or 18 of the Commission's Rules.

1.2 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992. All radiated and conducted emission measurements were performed at Thru Lab. & Engineering. The radiated testing was performed at an antenna-to-EUT distance of 10 meters for Class A devices and 3 meters for Class B devices.

1.3 Test Equipment List

Description	Model No.	Serial No.	Manufacturer	Cal. Due	Used
EMI Test Receiver	ESVS 10	830489/001	Rodhe&Schwarz	04/25/2004	RE
Biconical Antenna	94455-1	0977	Eaton	04/25/2004	RE
Log Periodic Antenna	3146	2051	EMCO	04/25/2004	RE
Horn Antenna	SAS-571	414	A.H.Systems	05/09/2004	RE
Spectrum Analyzer	8566B	2311A02394	Hewlett Packard	03/17/2004	RE
Spectrum Display	85662A	2542A12429	Hewlett Packard	03/17/2004	RE
Quasi-Peak Adapter	85650A	2521A00887	Hewlett Packard	03/17/2004	RE
RF Preselector	85685A	2648A00504	Hewlett Packard	03/17/2004	RE
Spectrum Analyzer	R3261C	71720189	Advantest	04/25/2004	
LISN	KNW-242	8-923-2	Kyoritsu	N/A	
LISN	8012-50-R-24	8379121	Solar	N/A	
Plotter	7475A	2210A02802	Hewlett Packard	N/A	
Positioner Set	N/A	N/A	Dongsung Prec.	N/A	RE

1.4 Product Description for Equipment Under Test (EUT)

ISV Co.,Ltd. I-pen Pro or the "EUT" as referred to this report is Wireless Mouse

Main Features of EUT are:

Description		TX	RX
Frequency range	Transmitter	2402.76~2405.10MHz	
	Receiver		2402.76~2405.10MHz
Number of Channels		40 Channels	
Channel spacing		60Khz	
RF Output power		Less than 0.1mW	
Frequency Stability		Within ± 2.5 ppm	
Size	Transmitter	157 *13* 30(mm)	
	Receiver	108*49*42(mm)	
Type of Data modulation		FM(F3E)	

Supply Voltage	Transmitter	3.7VDC, 400mA Li-Polymer Battery	
	Receiver	5VDC USB Power	
Operating Temperature		0℃ ~50℃	

1.5 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
Host Computer	Satellite Pro 4280	Y901236401	Toshiba Corp	-
Wireless Mouse Receiver	I-pen Pro(Rx)	-	ISV Co.,Ltd..	EUT
VGA Monitor	PN-17CT	P225HVER510534	Samsung Electronics	17"
Keyboard	BTC-5560	K71200885	BTC Korea	PS/2
Printer	C2605	3221S66649	Hewlett Packard	300dpi
Modem	SM1200A1	71000230	Samsung Electronics	1200bps
Speaker	RP-SP10	6ACSA01550	Matsushita Electronic	-
MIC	ECM	None	-	-

1.6 Support Equipment

Description	Model Number	Serial Number	Manufacturer	Remarks
Main Board	FSM7SS0	93J571272Y2	Toshiba Corporation	Japan
Hard Drive	MK6014MAP	Y9860027G	Toshiba Corporation	Japan
Floppy Drive	JU-226A202FC	00002445	Panasonic	China
CD-ROM Drive	CD-244E	0485644	TEAC Corporation	Indonesia
CPU	Pentium III	none	Intel Corporation	550MHz
Memory	SDRAM	none	Toshiba Corporation	192MB
Note book Chassis	Satellite Pro 4280	Y9012364 1	Toshiba Corporation	Note Book

1.7 External I/O Cabling

Description	Length (m)	Port/From	Port/To	Remarks
Video Cable	1.2	VGA/Host	Dsub/Monitor	Shielded
Keyboard Cable	1.8	Keyboard/Host	Keyboard	Shielded
Printer Cable	1.5	Parallel/Host	Printer/Centronics	Shielded
Modem Cable	2.0	Serial/Host	Modem/RS232	Shielded
Speaker Cable	1.0	SPKR/Host	Speaker	Shielded
MIC Cabal	1.0	MIC/Host	Microphone	Shielded
USB Cable	1.0	USB/Host	EUT/USB	Shielded
Ear-Phone Cable	1.5	EAR/EUT	Ear-Phone	Unshielded
Microphone Cable	1.5	MIC/EUT	Microphone	Unshielded

2. System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user). Worst case conducted and radiated emissions are presented in section 3.5 and section 4.6 of this report.

The test was performed as below.

1. Connect EUT and Note Book Computer with USB Cable.
2. Opening mouse Control on Windows 2000,

2.2 EUT Exercise

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, supplied by the client, running on Windows 2000 operating system .

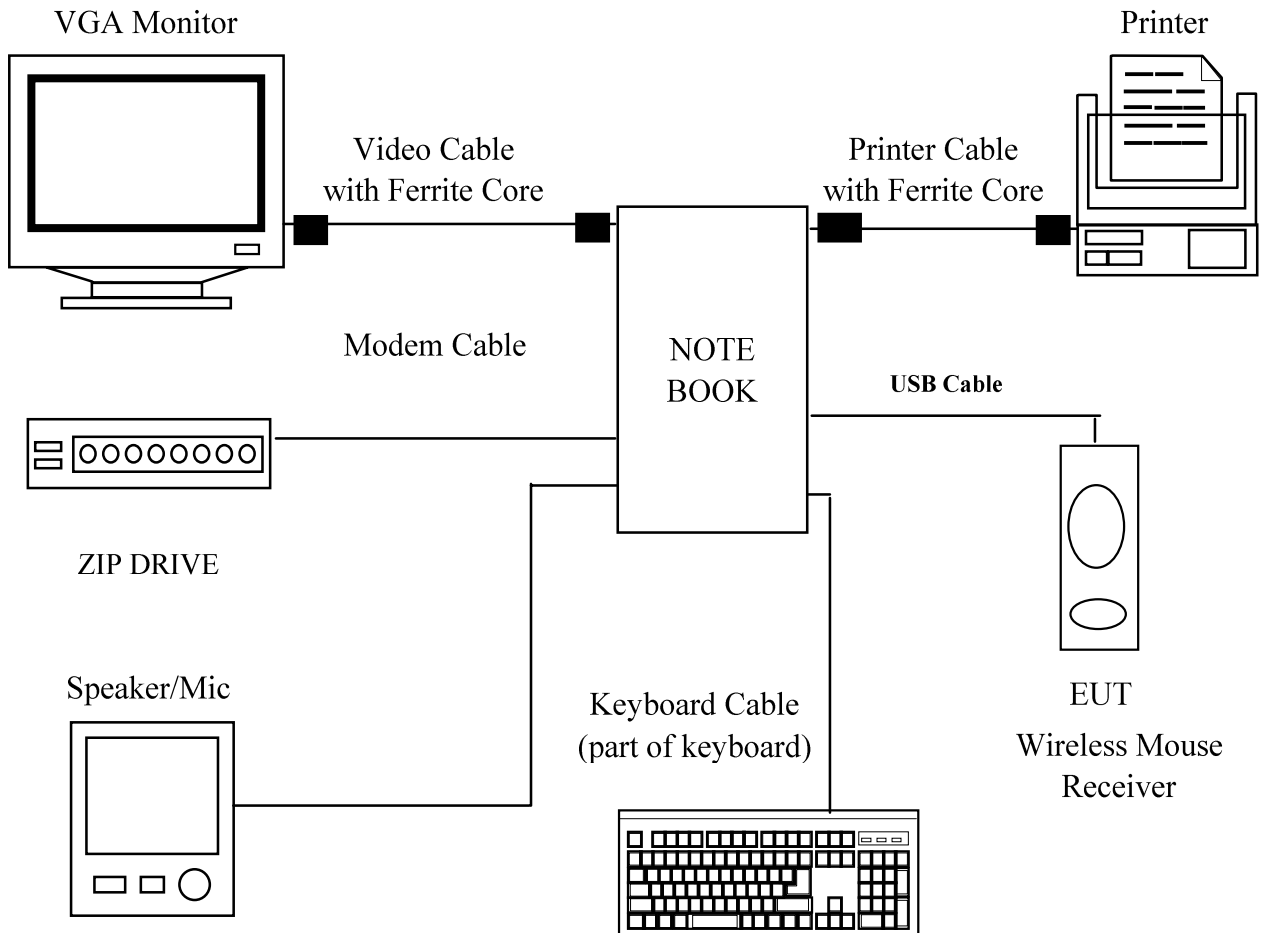
2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are non-shielded as normally supplied or by use respective component manufacturers.

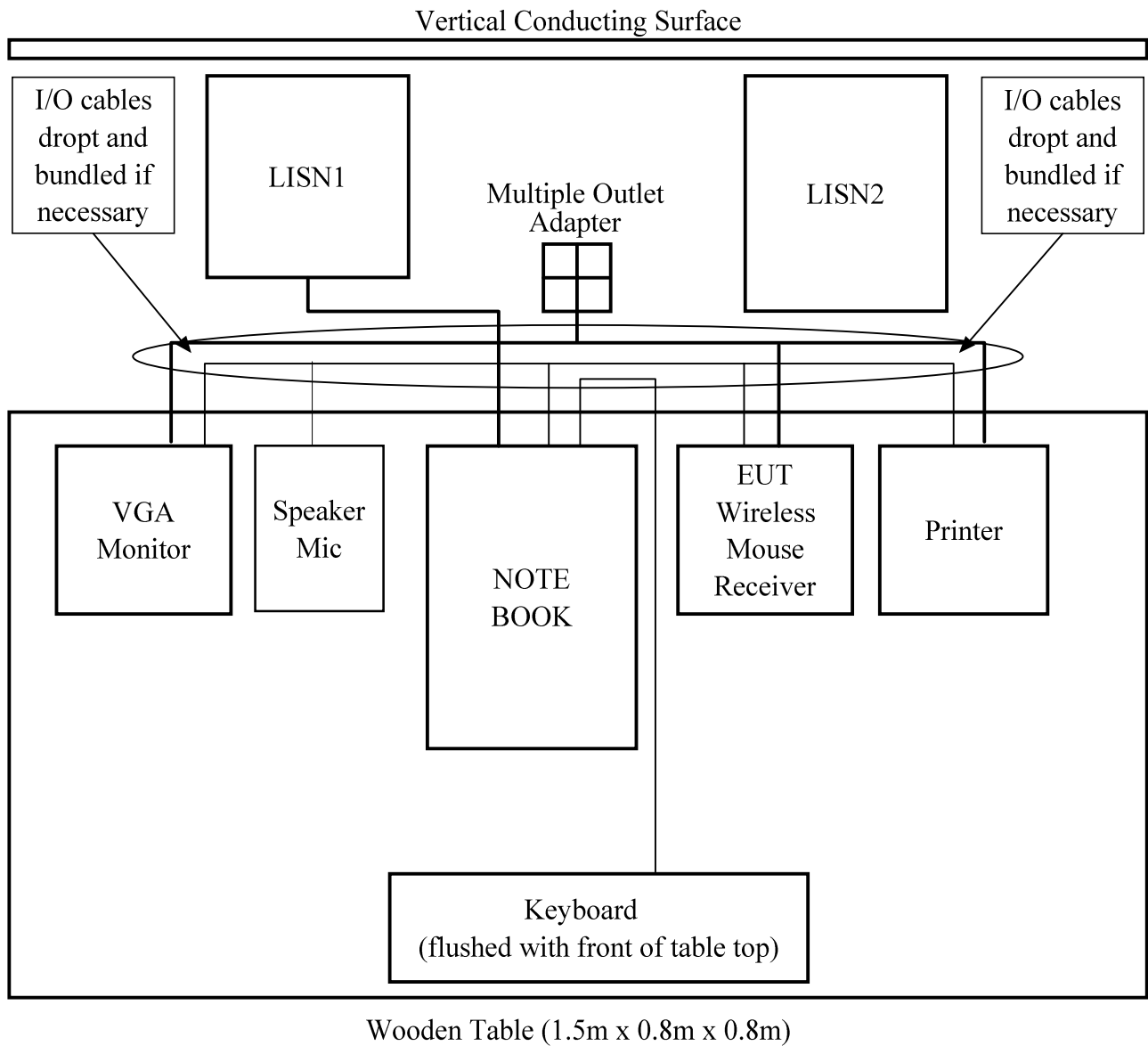
2.4 Block Diagram

The EUT block diagram is presented in Appendix B as reference.

2.5 Configuration of Test System



2.6 Conducted Emission Test Setup Block Diagram



3. Conducted Emission Test

3.1 EUT Setup

The measurement was performed in the screen room of test site, using the setup in accordance with ANSI C63.4-1992 conducted emission measurement procedure.

The EUT was connected with RS-232 cable to Input of Host Computer. The host computer was placed on the center and back edge of the test table. The printer, modem were placed on one side of the host computer with the Monitor and EUT on the other side. The rear of the host computer and all support equipments were flushed with the rear and sides of the tabletop. The keyboard was placed in front of the host computer, flushed with the front of the tabletop.

Spacing between the peripherals was approximately 10 centimeters.

3.2 Test Equipment Setup

The spectrum analyzer was configured during the conduction test in as follows:

Start Frequency	150kHz
Stop Frequency	30MHz
Resolution Bandwidth	9kHz
Sweep Time	Auto
Detector Mode	QP

3.3 Test Procedure

During the conducted emission test, the host computer power cord was connected to the auxiliary outlet of the LISN1 and all other peripherals power cords were connected to the multiple outlet adapter of the LISN2.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6dB bandwidth was set to 9kHz. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 150kHz to 30MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP". The conducted emission test was performed with the EUT exercise program loaded, and the emissions were scanned between 150kHz to 30MHz on the LINE side and NEUTRAL side, herein referred to as L and N, respectively.

3.4 Summary of Test Results

According to the data in section 3.5, the EUT complied with the FCC Part 15.107(b) standards, and had the worst margin reading of:

-21.8dB at 0.156MHz in the LINE side with Toshiba Corporation AC Adaptor, Model PA2444U AC Adaptor

3.5 Conducted Emission Test Data

Line Conducted Emission				CISPR22 Class B		
Frequency (MHz)	Amplitude (dBuV)	Phase Hot/Neutral	Detector QP/AV/PK	Applicable Limit		Margin (dB)
				QP (dBuV)	AV (dBuV)	
0.156	44.2	N	PK	66.0	56.0	-21.8
0.170	29.9	L	PK	65.5	55.5	-35.6
0.208	29.7	N	PK	65.0	54.5	-35.3
0.330	31.7	N	PK	63.6	52.8	-31.9
0.403	33.0	L	PK	63.2	50.2	-30.2
0.461	28.9	N	PK	62.1	49.2	-33.2
0.521	30.1	L	PK	56.0	46.0	-25.9
0.642	29.8	L	PK	56.0	46.0	-26.2
1.003	29.4	L	PK	56.0	46.0	-26.6
1.289	29.6	N	PK	56.0	46.0	-26.4
3.426	33.9	L	PK	56.0	46.0	-22.1
4.021	34.0	L	PK	56.0	46.0	-22.0
6.579	29.4	L	PK	60.0	50.0	-30.6
7.264	29.8	L	PK	60.0	50.0	-30.2
8.007	27.9	N	PK	60.0	50.0	-32.1
9.148	31.1	N	PK	60.0	50.0	-28.9
10.989	31.5	L	PK	60.0	50.0	-28.5
14.028	28.0	N	PK	60.0	50.0	-32.0

3.6 Plot of Conducted Emission Test Data

Plot(s) of conducted emission test data for the Toshiba Corporation AC Adaptor, Model PA2444U AC Adaptor is presented in Appendix A of this report as reference.

4. Radiated Emission Test

4.1 EUT Setup

The radiated emission tests were performed in the open area test site, using the setup in accordance with ANSI C63.4-1992 radiated emission measurement procedure.

The VGA monitor with EUT and all peripherals were placed on the test table same as section 3.1..

Spacing between the peripherals was approximately 10 centimeters.

4.2 Test Equipment Setup

During the radiated emission test, the EMI test receiver was set with the following configurations:

Start Frequency	30MHz
Stop Frequency	1000MHz
IF Bandwidth	120kHz
Sweep Time	10msec
Detector Mode	QP

and above 1GHz-5GHz, Horn Atten was used.

4.3 Test Procedure

For the radiated emission test, the host computer and all support equipments power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to verify that the EUT complied with all installation combination.

The radiated emission test was performed with EUT exercise program loaded, and the emissions were scanned between 30MHz to 1000MHz and 1000MHz to 5000MHz. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum emission levels. Measurements were taken using both HORIZONTAL and VERTICAL antenna polarization. The final test data for this test configuration is recorded in the table listed under section 4.6 of this report.

4.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude is calculated by adding the antenna and cable Correction Factor from the Indicated Amplitude reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Amplitude} + \text{Antenna Factor} + \text{Cable Factor}$$

The Margin column of the data table in section 4.6 indicates the degree of compliance with the applicable limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Applicable Limit}$$

4.5 Summary of Test Results

According to the data in section 4.6, the EUT complied with the FCC Part 15.109(b) standards, and had the worst margin reading of:

-7.8dB at 135.19 MHz in the VERTICAL polarization at an antenna-to-EUT distance of 3 meters.

4.6 Radiated Emission Test Result Data

Indicated		Antenna		Correction Factor		Corrected Amplitude	FCC Part15 Class B		
Frequency (MHz)	Amplitude (dBuV/m)	Polar. (H/V)	Height (m)	Ant. (dB)	Cable (dB)	(dBuV/m)	Applicable Limit		Margin (dB)
							(dBuV/m)	(uV/m)	
36.86	9.1	H		12.9	0.8	22.8	40.0	100	-17.2
61.44	20.0	H		7.1	1.1	28.2	40.0	100	-11.8
86.64	16.0	V		9.6	1.5	27.1	40.0	100	-12.9
110.49	15.4	V		11.0	1.7	28.1	43.5	150	-15.4
118.26	16.1	V		10.9	1.8	28.8	43.5	150	-14.7
135.19	19.2	H		14.1	2.4	35.7	43.5	150	-7.8
185.05	9.3	H		10.8	2.6	22.7	43.5	150	-20.8
206.00	7.4	H		11.7	3.1	22.2	43.5	150	-21.3
245.76	11.4	H		11.7	3.1	26.2	46.0	200	-19.8
251.91	7.6	H		12.1	3.1	22.8	46.0	200	-23.2
320.38	4.2	H		15.8	3.6	23.6	46.0	200	-22.4
516.10	3.6	H		17.8	5.0	26.4	46.0	200	-19.6
527.98	10.1	V		17.8	5.1	33.0	46.0	200	-13.0
794.42	5.4	V		21.4	6.7	33.5	46.0	200	-12.5
800-5000	-	-	-	-	-	-	54.0	500	-
-	-	-	-	-	-	-	54.0	500	-

Appendix A - Plot of Conducted Emission Test Data

