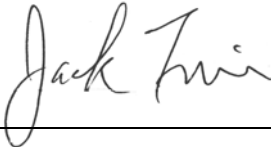



Report No.	T5415231	
Specifications	FCC Part 15, Class B	
Test Method	ANSI C63.4 1992	
Applicant	TVS ELECTRONICS LTD.	
Applicant address	Plot No.34, Developed Plots, South Phase Industrial Estate, Guindy, Chennai, Tamilnadu, India 600 032	
Items tested	Printer	
Model No.	PROTON (Sample # T54231)	
Results	Compliance (As detailed within this report)	
Date	04/19/2002 (month / day / year) (Sample received) 06/10/2002 (month / day / year) (Test)	
Prepared by		Project Engineer
Authorized by		General Manager (Frank Tsai)
Issue date	July 12, 2002	(month / day / year)
Modifications	Appendix C	
Tested by	Training Research Co., Ltd.	
Office at	1F, No. 255, Nan Yang Street, Hsichih, Taipei Hsien 221, Taiwan	
Open site at	No. 5-3, Lane 21, Yen Chiu Yuan Rd., Sec. 4, Taipei, Taiwan	

Conditions of issue :

- (1) **This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.**
- (2) **This report must not be used by the client to claim product endorsement by NVLAP or any agency of U.S. Government.**

★ **FCC ID : OSCPROTON**

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Chapter 1 Introduction

Description of EUT

This device is printing data equipment. It is designed to connect with a compatible computer via Universal Serial Bus interface.

Connections of EUT

- (1)The power port is connected with the AC power source by a power adaptor.
- (2)The USB port of EUT is connected with the USB port of personal computer.
- (3)The LAN jack is connected with a RJ45 cable terminal

Test method

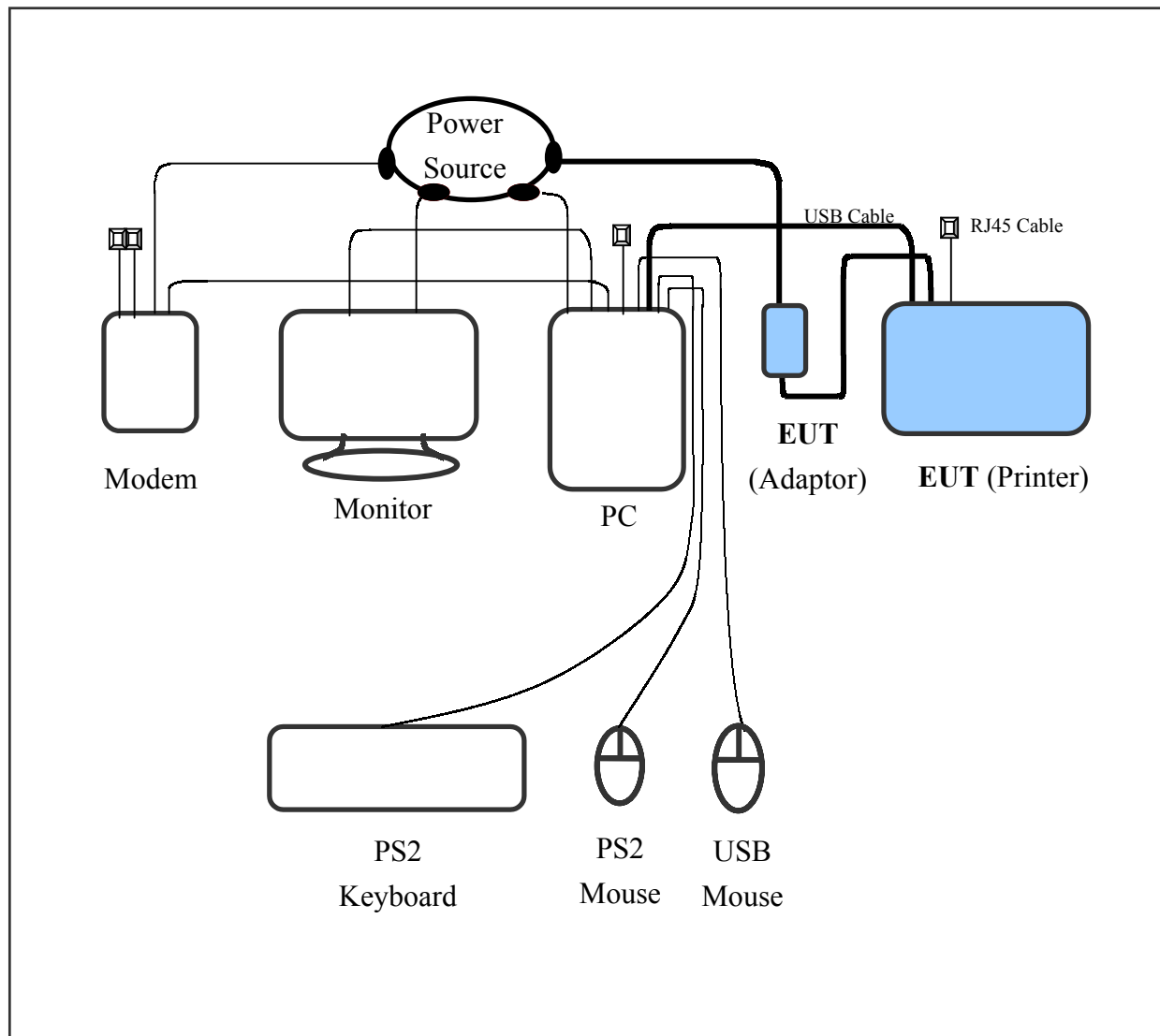
Pretest was found that the emission of operating mode is worse than standby mode. So, The final test is made at the operating mode.

During testing, the EUT was operated at printing mode continuously.

The test placement as the photographs showed is the worst case emission placed. (If the emission is close to the ambient, the resolution BW and view resolution will be reduced and the data will be recorded by detection of maximum hold peak mode.)

The testing configuration of test setup is showing in the next page.

Configuration of Test Setup



Connections

PC:

*Serial Port --- an external modem

*Printer Port --- by a data cable terminal

*Monitor Port --- a monitor

*Keyboard Port --- a PS2 keyboard

*Mouse Port --- a PS2 mouse

*USB A Port --- a USB mouse

*USB B Port --- **EUT**

(Each port on PC is connected with suitable device)

EUT:

*Power adaptor x 1

*Power Cable of adaptor x 1

--- 173cm long, plastic, non-shielded, no ferrite core
(between AC source and adaptor)

--- 75cm long, non-shielded, with ferrite core [CF-130]
(between adaptor and printer)

*RJ45 Cable x 1

--- 1.5m long, non-shielded, no ferrite core

*USB Data Cable x 1

--- 120cm long, shielded, with ferrite core [CF-130]

List of Support Equipment

Conducted (Radiated) test:

PC : **HP Brio 85xx 6/350**
Model No. : D6928A
Serial No. : SG91801552
FCC ID : N/A, DoC (Declaration of Confirmation) Approved
檢磁 : 3872H013
Power type : 100 ~ 230VAC / 50 ~ 60Hz, 5A, Switching
Power cord : Non-shielded, 2.33m long, Plastic, No ferrite core

Monitor : **HP 15' Color Monitor**
Model No. : D2827A
Serial No. : KR91379759
FCC ID : C5F7NFCMC1518X
檢磁 : 3872B039
Power type : 110 ~ 240 VAC / 50 ~ 60 Hz, Switching
Power cord : Shielded, 1.83m long, No ferrite core
Data cable : Shielded, 1.46m long, with two ferrite cores

Keyboard : **HP**
Model No. : SK-2501K
Serial No. : MR81008879
FCC ID : GYUR38SK
檢磁 : 3862A621
Power type : By PC
Data cable : Shielded, 1.73m long, with ferrite core

Mouse : **HP**
Model No. : M-S34
Serial No. : LZB90910464
FCC ID : DZL211029
檢磁 : 4862A011
Power type : By PC
Power cord : Non-shielded, 1.88m long, No ferrite core

Modem : ACEEX

Model No. : XDM-56V14
FCC ID : IFAXDM-56V14
Power type : Linear
Power cord : Non-shielded, 1.9m long, No ferrite cord
Data cable : RS232, Shielded, 1.2m long, No ferrite core
RJ11C x 2, 7' long non-shielded, No ferrite core

USB Optic Mouse : Logitech Inc

Model No. : M-BJ58
Serial No. : LNA20901985
FCC ID : Doc Approved
檢磁 : 3902A701
Power type : By PC
Data Cable : Shielded, 1.80m long, Plastic, No ferrite core

Chapter 2 Conducted Emission Test

Test condition and setup

All the equipment is placed and setup according to ANSI C63.4—1992.

The EUT is assembled on a wooden table, which is 80 cm high, is placed 40 cm from the back-wall, which is a vertical conducting plane. One LISN is for EUT, the other LISN is for support equipment. They are all placed on the conductive ground. The EUT's LISN connect a line switch box for selecting L1 or L2, then connect to a preamplifier and spectrum.

The spectrum scans from 450KHz to 30MHz. Conducted emission levels are detected at maximum peak mode. But if the maximum peak mode failed, it will be measured by CISPR's quasi-peak detection mode.

While testing, there is the worst-emission plot printed at peak detection mode, and there are more than 6 highest emissions relative to limit recorded. The plot is kept as the original data, not included in test report.

List of test Instrument

Instrument Name	Model No.	Brand	Serial No.	<u>Calibration Date</u>	
				Last time	Next time
Spectrum analyzer	8591EM	H P	3710A01203	05/29/02	05/29/03
Pre-selector (<30MHz)	AMP-01	TRC	REP-001	08/09/01	08/09/02
LISN (EUT)	TRC LISN01	TRC	LISN-01	08/21/01	08/21/02
LISN (Support E.)	LISN-01	TRC	9912-01, 02	12/13/01	12/13/02

The level of confidence of 95%, the uncertainty of measurement of conducted emission is ± 2.4 dB.

Test Result: Pass (Appendix A)

Chapter 3 Radiated Emission Test

Test condition and setup

Pretest: Prior to the final test (OATS test), the EUT is placed in a shielded enclosure, and scan from 30MHz to 1GHz. This is done to ensure the radiation is exactly emitted from the EUT. **Final test:** Final radiation measurements are made on a **3 – meter, open-field** test site. The EUT is placed on a nonconductive table, which is 0.8m height, the top surface is 1.0 x 1.5 meter. The entire placement is according to ANSI C63.4—1992.

The spectrum is examined from 30 MHz to 1000 MHz measured by HP spectrum. The range Antenna is used to measure frequency from 30 MHz to 1GHz. The final test is used the spectrum analyzer. Measure more than six top marked frequencies generated from pretest by computer step by step at each frequency. The EUT is rotated 360 degrees, and antenna is raised and lowered from 1 to 4 meters to find the maximum emission levels. The antenna is used with both horizontal and vertical polarization.

Appropriated preamplifier which is made by TRC is used for improving sensitivity and precautions is taken to avoid overloading. The spectrum analyzer's 6dB bandwidth is set to 120 KHz, and the EUT is measured at quasi-peak mode.

If the emission is close to the frequency band of ambient, the tester will recheck the data and the corrected data will be written in the test data sheet. If the emission is just within the ambient, the data from shielded room will be taken as the final data.

List of test Instrument

Instrument Name	Model No.	Brand	Serial No.	Calibration Date	
				Last time	Next time
Spectrum analyzer	8591EM	H P	3710A01203	05/29/02	05/29/03
Pre-selector (>30MHz)	AMP-01	TRC	REP-001	10/02/01	10/02/02
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
RF Pre-selector	AMP-01	TRC	REP-002	10/02/01	10/02/02
Bi-log Antenna	VULB9160	M. E.	3064	07/12/01	07/12/02
Antenna (30M-2GHz)	3142	EMCO	9610-1094	10/02/01	10/02/02
Open test side (Antenna, Amplify, cable calibrated together)				05/20/02	05/20/03

The level of confidence of 95% , the uncertainty of measurement of radiated emission is ± 4.96 dB .

Test Result: Pass (Appendix B)

Appendix A

Conducted Emission Test Result

Testing room : Temperature : 26 ° C Humidity : 68 % RH

Line 1

<i>Frequency (KHz)</i>	<i>READING AMPLITUDE</i>			<i>LIMIT</i>		<i>Margin (dB)</i>
	<i>Peak (dBμV)</i>	<i>Quasi-Peak (dBμV)</i>	<i>Average (dBμV)</i>	<i>Quasi-Peak (dBμV)</i>	<i>Average (dBμV)</i>	
464.00	34.83	---	---	48.00	---	-13.17
545.00	35.19	---	---	48.00	---	-12.81
778.00	34.14	---	---	48.00	---	-13.86
8040.00	34.91	---	---	48.00	---	-13.09
8480.00	40.04	---	---	48.00	---	-7.96
8750.00	40.74	---	---	48.00	---	-7.26
8940.00	40.69	---	---	48.00	---	-7.31
9390.00	44.09	---	---	48.00	---	-3.91
10210.00	40.46	---	---	48.00	---	-7.54
11040.00	37.32	---	---	48.00	---	-10.68

Line 2

<i>Frequency (KHz)</i>	<i>READING AMPLITUDE</i>			<i>LIMIT</i>		<i>Margin (dB)</i>
	<i>Peak (dBμV)</i>	<i>Quasi-Peak (dBμV)</i>	<i>Average (dBμV)</i>	<i>Quasi-Peak (dBμV)</i>	<i>Average (dBμV)</i>	
5190.00	36.82	---	---	48.00	---	-11.18
8260.00	37.88	---	---	48.00	---	-10.12
8640.00	40.93	---	---	48.00	---	-7.07
9070.00	44.05	---	---	48.00	---	-3.95
9390.00	45.39	---	---	48.00	---	-2.61
9580.00	48.54	41.70	---	48.00	---	-6.30
10440.00	44.28	---	---	48.00	---	-3.72
11190.00	44.13	---	---	48.00	---	-3.87
12010.00	43.59	---	---	48.00	---	-4.41
12540.00	41.22	---	---	48.00	---	-6.78

****The reading amplitudes are all under limit.***

Appendix B

Test Conditions:

Testing room : Temperature : 26 ° C Humidity : 68 % RH
 Testing site : Temperature : 28 ° C Humidity : 81 % RH

Radiated Emission Test Result (Ant.-Horizontal)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
112.929	44.30	1.00	257	-13.25	31.05	43.50	-12.45
119.990	46.20	4.00	12	-12.66	33.54	43.50	-9.96
165.638	43.90	1.00	44	-11.03	32.87	43.50	-10.63
172.299	47.30	1.00	152	-11.64	35.66	43.50	-7.84
176.830	49.90	4.00	38	-12.12	37.78	43.50	-5.72
181.442	49.40	1.00	72	-12.56	36.84	43.50	-6.66
288.013	40.90	1.00	267	-9.33	31.57	46.00	-14.43
336.001	39.80	1.00	55	-8.00	31.80	46.00	-14.20
384.003	40.10	1.00	302	-6.10	34.00	46.00	-12.00
498.840	40.00	1.00	297	-3.08	36.92	46.00	-9.08

Note:

1. Margin = Amplitude – limit, *if margin is minus means under limit.*
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain)

Test Conditions:

Testing room : Temperature : 26 ° C Humidity : 68 % RH
Testing site : Temperature : 28 ° C Humidity : 81 % RH

Radiated Emission Test Result (Ant.-Vertical)

Frequency	Reading Amplitude	Ant. Height	Table	Correction Factors	Corrected Amplitude	Class B Limit	Margin
MHz	dBμV	m	degree	dB/m	dBμV/m	dBμV/m	dB
31.200	49.50	1.00	238	-15.32	34.18	40.00	-5.82
37.980	48.30	1.00	0	-14.42	33.88	40.00	-6.12
42.019	48.00	1.00	221	-13.98	34.02	40.00	-5.98
48.004	50.30	1.00	148	-13.89	36.41	40.00	-3.59
62.321	46.60	1.00	202	-14.28	32.32	40.00	-7.68
68.715	48.70	1.00	131	-15.40	33.30	40.00	-6.70
80.000	46.30	4.00	35	-16.77	29.53	40.00	-10.47
160.316	42.70	1.00	47	-10.59	32.11	43.50	-11.39
336.003	44.10	1.00	12	-8.00	36.10	46.00	-9.90
384.003	42.10	1.00	0	-6.10	36.00	46.00	-10.00

Appendix C

List of Modifications

Printer EMI Solution:

1. Casing Connect to GND for USB B-Type
2. The DC Jack +5V to GND by a 0.01 μ F and 220 μ F / 16V Capacitor
3. The DC Jack +15V to GND by a 0.01 μ F and 470 μ F / 25V Capacitor
4. The USB B-Type D+ to GND by a 22PF Capacitor
5. The USB B-Type D- to GND by a 22PF Capacitor
6. The USB B-Type VCC to GND by a 0.01 μ F and 100 μ F / 25V Capacitor
7. The USB Connect GND to Housing GND by a 22 AWG wire
8. The DC Jack connect to adapter by a Round cable suppression core
(Factory: Crown Ferrite Enterprise Co. Type: CF-130B)
which is nearly right side of USB B Type connect
9. The reel motor GND to Housing GND by a 22 AWG wire
10. The ink motor GND to Housing GND by a 22 AWG wire
11. The PC USB connect to print USB connect by a Round cable suppression core
(Factory: Crown Ferrite Enterprise Co. Type: CF-130B)
which is nearly right side of PC USB connect
12. The DC Jack +5V 220 μ F / 16V Capacitor to System +5V by a Winding Type Filter
(Factory: Crown Ferrite Enterprise Co. Type: B2-TIB2-24)
which is nearly left side of DC Jack
13. The DC Jack +15V 470 μ F / 25V Capacitor to System +15V by a Winding Type Filter
(Factory: Crown Ferrite Enterprise Co. Type: B2-TIB2-24)
which is nearly left side of DC Jack
14. The USB B-Type VCC 100 μ F / 25V Capacitor to System USB VCC by a Winding Type Filter
(Factory: Crown Ferrite Enterprise Co. Type: B2-TIB2-24)
which is nearly left side of USB B Type
15. USB Cable change to sheltered cable



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E-mail: report@trclab.com.tw

Adapter EMI Solution:

- 16. The adapter +5V out to DGND by a 0.01 μ F capacitor ✓
- 17. The adapter +15V out to DGND by a 0.01 μ F capacitor ✓
- 18. The adapter AGND to DGND by a 1000pF capacitor ✓


Statement of Applicant:

I acknowledge that the modifications made to the EUT for compliance during testing will be incorporated into mass production units.

Mfg.: TVS ELECTRONICS LTD.

By :

Signature


28/6/2002

Date: June 13, 2002

X - Not Acceptable

✓ - Acceptable