

DATE: 17 March 1998

EMC Test Report

from

ITL (Product Testing) Ltd.

for


Guardian On Board, Ltd.

Equipment under test:

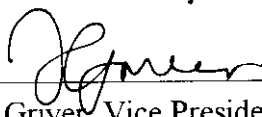
UPS

P4 Inboard

Prepared by:


I. Raz, EMC Laboratory Manager
ITL (Product Testing) Ltd.

Approved by:


Jon Griver, Vice President, Operations
ITL (Product Testing) Ltd.

*This report must not be reproduced, except in full, without the
written permission of I.T.L. (Product Testing) Ltd.*

This report relates only to item(s) tested.

Measurement/Technical Report for
Equipment under test:

This report concerns: Original Grant X Class II change

Class B verification _____ Class A verification__ Class I change

Equipment type: Sub-assembly of a digital device
Uninterrupted Power Supply Circuit Board

Request Issue of Grant: X Immediately upon completion of review

Limits used: CISPR 22 _____ Part 15 X

Measurement procedure used is ANSI C63.4-1992.

Application for Certification
prepared by:

Applicant for this device:
(different from "prepared by")

Ishaihou Raz
ITL (Product Testing) Ltd.
Or Yehuda 60251
Israel
Fax: +972-8-9797702
E-mail: standard@itl.co.il

Alex Prodensky
Guardian on Board, Ltd.
Nothorn In. Zone
P.O.B. 722
Ashkelon 78107
Israel
Fax: +972-(7) 671 7298
E-mail: support@guardian-ups.com

TABLE OF CONTENTS

Section	Title	Page
1.	General Information.....	4
2.	Product Labeling.....	7
3.	System Test Configuration.....	8
4.	Block Diagrams.....	10
5.	Conducted Measurement Photos.....	11
6.	Conducted Emission Data.....	12
7.	Photos of Tested EUT.....	22

Attachment 1: User Manual

1

General Information**1.1 Product Description**

See *NOTES below.

P4 Inboard (referred to as the EUT in this report) is a small internal UPS (Uninterruptible Power Supply) ISA/PCI card. It operates in "standby" mode producing 115 VAC when power failer occur.

Under normal operating conditions, power from the mains outlet ("Power In" in the diagram) is transferred to the PC through P4 Inboard (via the card's "Power Out" socket). monitors mains power and cleans the power supply, thus protecting the PC from spikes, surges and other power.

When a power failure occurs, "Transfer Switch" changes position and the "DC-to-AC Inverter" starts supplying AC power to the PC and the monitor. This process happens within approximately 4 milliseconds. When P4 Inboard is in this mode, a short audio beep is heard at specific time intervals (e.g. every 20 seconds). The PC, monitor and data lines will continue to work normally via P4 Inboard, until either regular mains input power returns or until P4 Inboard internal battery is exhausted.

About two minutes before shutdown (i.e. when P4 Inboard's battery power starts running out), the intermittent beep will change to a continuous tone, indicating that the user has about two minutes before power to the PC will be interrupted. This tells to the user that there is little time left to backup and shut down files and applications.

When the input power returns to normal, P4 Inboard automatically transfers the PC's power source back to the mains input. Simultaneously, P4 Inboard's battery starts recharging. P4 Inboard uses a proprietary "Smart Charger" to dramatically speed up battery recharge time.

P4 Inboard does not incorporate microprocessor technology thus operation frequency of the EUT does not exceed 100 KHz.

P4 Inboard obtains a special output socket option which can be interconected to PC's RS232.

Runing a standard power monitoring software PC is able to determin when power failer accores. This software is optional. P4 Inboard will work properly without it.

P4 Inboard can also protect the PC's phone, fax, modem and data lines from power problems, such as those caused by lightning striking phone cables.

***NOTES -**

- 1) After the product was tested at ITL on July 23, 1997, and before this report was issued, the manufacturer changed the product's name from "UPSide 400" to "P4 Inboard." The manufacturer declares that "UPSide 400" is identical to "P4 Inboard."
- 2) The manufacturer's photos of the tested product, that are in Section 7 of this report, were taken in April 1998. They show the product in a more advanced stage of development than it was in when it was tested by ITL.

1.2 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

<u>Model No.</u>	<u>Serial No.</u>	<u>FCC ID</u>	<u>Description</u>	<u>Cable Description</u>
P4 Inboard	N/A	NNC1297V08	EUT Uninterruptible Power Supply	See "Cables connecting the EUT" below
2.1A	01213854	C3KKMP3	Mouse Microsoft	1.80 m. unshielded
DCM	LZQZ	E2KALTAM	Computer DEL Computer Corp	1.80 m. unshielded
Studioworks 56i	611K421286	BEJCS585	Monitor LG Electronics, Inc. (Goldstar)	1.20 m. shielded
SK-1000REW	M960935691	GYUR26SK	Keyboard DEL	1.20 m. shielded

Cables connecting the EUT

- (1) Telephone line cable,
1.80 m., unshielded
- (2) RS232
unshielded

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:1992. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the data is located at Kfar Bin Nun, Israel. This site has been fully described in reports dated April 10, 1995 and May 8, 1995, submitted to your office, and accepted in a letter dated May 23, 1995 (31040/SIT 1300F2).

3 System Test Configuration

3.1 Justification

The EUT was installed inside the PC (Dell Computer Corp.) and connected to the PC slot. Mains 115 VAC/60Hz was applied to the EUT's input. The PC and color monitor (LG Electronics Inc., Goldstar) were connected to the EUT's outlet. The mouse (Microsoft) and keyboard (Dell) were connected to the PC. The test was made in this particular way to simulate the actual work of the EUT.

3.2 EUT Exercise Software

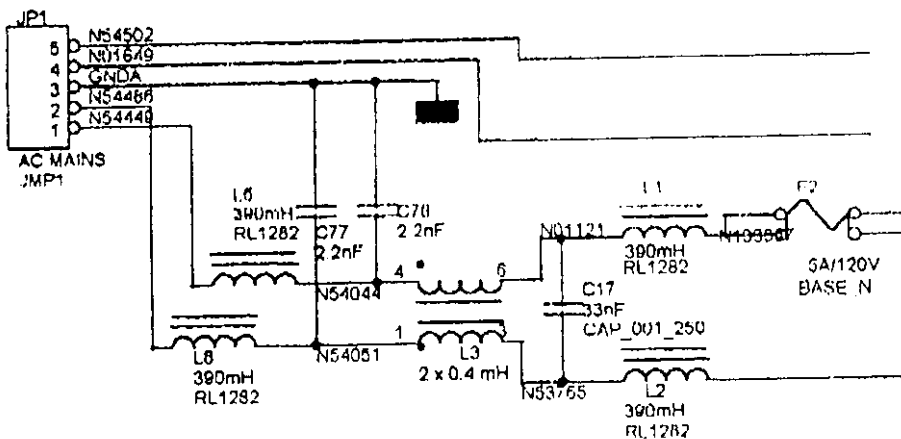
No special EUT exercise software was needed.

3.3 Special Accessories

No special accessories were needed to achieve compliance.

3.4 Equipment Modifications

Corrective actions that were done in order to pass FCC conductive emission test.



The following components were added between AC power line and P4 Inboard input:

Differential Chokes: L1, L2, L5, L6 with the value of 390 mH each.

Common Mode Chokes: L3 with the value of 2 x 0.4 mH

Y Capacitors: C77, C78 with the value of 2.2 nF each

X Capacitor: C17 with the value of 33 nF

The above modifications will be implemented in all production units.

3.5 Configuration of Tested System

The E.U.T. consists of a PCB placed in a slot of a PC. In case of power failure to the PC, the E.U.T. automatically supplies AC power to the PC for a time of 10 minutes maximum.

The E.U.T. was tested in charge and discharge modes.

The configuration of the tested system is described in Figure 3.1.

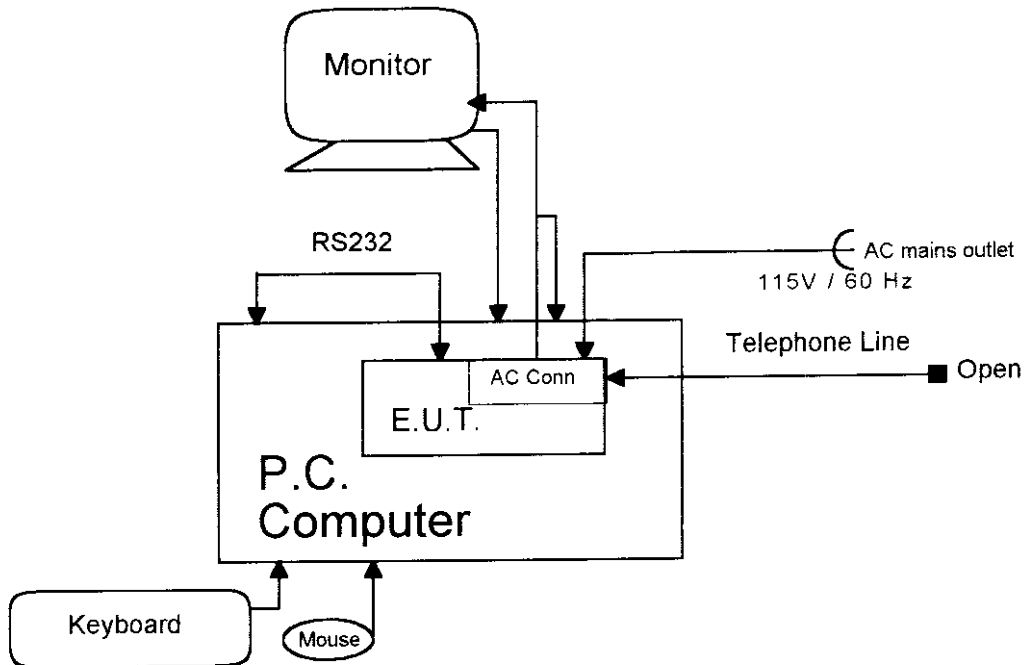


Figure 3.1 Configuration of Tested System

6

Conducted Emission Data**6.1 Test Procedure**

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimise background noise interference, the conducted emission testing was performed inside a shielded room (see section 3), with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 μ Hn Line Impedance Stabilisation Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The centre of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission.

The emission voltages at the LISN's outputs were measured using a computerised receiver, complying to CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

6.2 Measured Data

JUDGEMENT: Passed by 0.6 db μ V

The EUT met the requirements of the specification.

The details of the highest emissions are given in Figures 6.1 to 6.8.

TEST PERSONNEL:

Tester Signature: _____

DATE: _____

Typed/Printed Name _____

I. Raz

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Phase** Detector: **Quasi-peak**

Remarks: **Discharge**

Frequency (MHz)	Meas. Level (dB μ V)		Specification (dB μ V)	Pass/Fail	Margin (dB)
	Peak	Quasi- Peak			
0.56	39.7	35.9	48.0	Pass	-12.1
0.94	34.9	32.0	48.0	Pass	-16.0
1.13	34.4	33.2	48.0	Pass	-14.8
10.66	32.8	29.7	48.0	Pass	-18.3
27.31	35.2	31.7	48.0	Pass	-16.3
29.48	35.8	32.1	48.0	Pass	-15.9

Figure 6.1 Conducted Emission: Phase.

Detectors: Peak, Quasi-peak

TEST PERSONNEL:

Tester Signature: _____

DATE: _____

Typed/Printed Name: _____

I. Raz

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Neutral** Detector: **Quasi-peak**Remarks: **Discharge**

Frequency (MHz)	Meas. Level (dB μ V)		Specification (dB μ V)	Pass/Fail	Margin (dB)
	Peak	Quasi- Peak			
0.66	40.0	37.0	48.0	Pass	-11.1
0.75	37.8	35.7	48.0	Pass	-12.3
1.50	35.5	34.8	48.0	Pass	-13.2
4.42	33.6	32.4	48.0	Pass	-15.6
8.78	31.2	25.6	48.0	Pass	-22.4
28.05	36.1	32.9	48.0	Pass	-15.2
29.36	35.5	32.1	48.0	Pass	-15.9

Figure 6.2 Conducted Emission: Neutral.

Detectors: Peak, Quasi-peak.

TEST PERSONNEL:

Tester Signature: _____

DATE: _____

Typed/Printed Name: _____

I. Raz

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Phase** Detector: **Quasi-peak**

Remarks: **Discharge**

10:53:37 04 DEC 1997

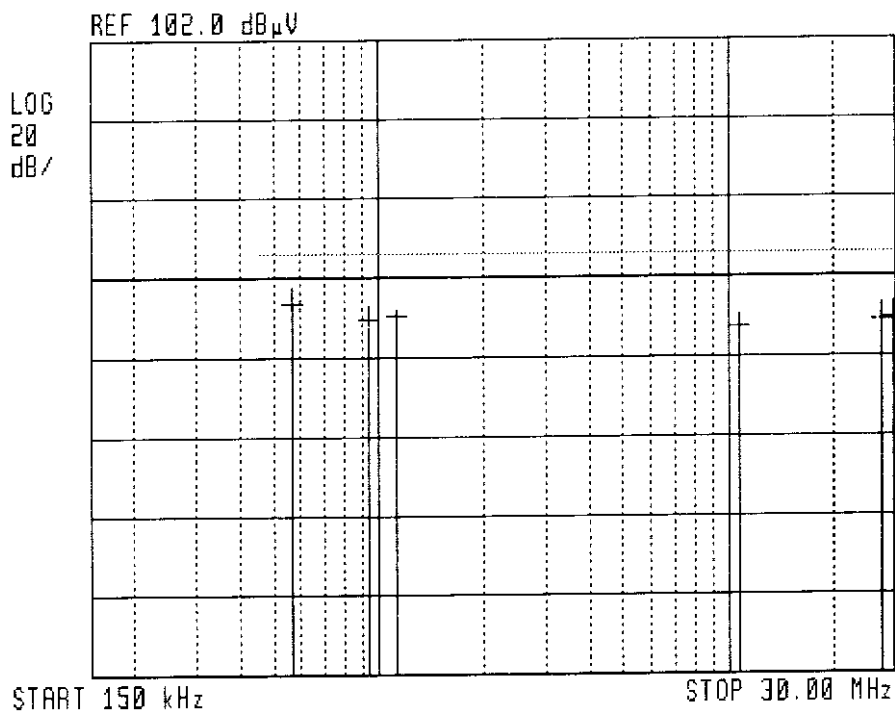


Figure 6.3 Conducted Emission: Phase. Detectors: Peak, Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Conducted Emission

E.U.T Description: UPS


Type: P4 Inboard

Serial number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Neutral.** Detector: **Quasi-peak**

Remarks: **Discharge**

 10:34:34 04 DEC 1997

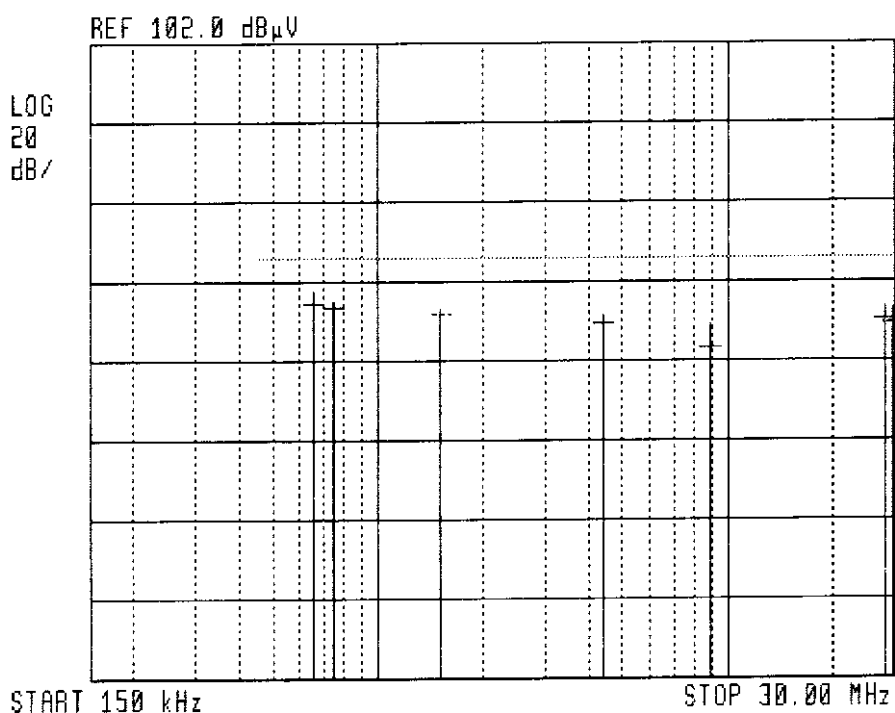


Figure 6.4 Conducted Emission: Neutral. Detectors: Peak, Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Phase** Detector: **Quasi-peak**

Remarks: **With Monitor, Charge**

Frequency (MHz)	Meas. Level (dB μ V)		Specification (dB μ V)	Pass/Fail	Margin (dB)
	Peak	Quasi- Peak			
0.50	45.9	43.8	48.0	Pass	-4.2
0.60	34.8	33.5	48.0	Pass	-14.5
13.33	29.6	27.4	48.0	Pass	-20.6
20.61	5.8	0.6	48.0	Pass	-47.4
24.0	28.4	26.3	48.0	Pass	-21.7
24.72	13.9	9.1	48.0	Pass	-38.9

Figure 6.5 Conducted Emission: Phase.

Detectors: Peak, Quasi-peak

TEST PERSONNEL:

Tester Signature: _____ DATE: _____

Typed/Printed Name: _____ I. Raz _____

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Neutral** Detector: **Quasi-peak**

Remarks: **With Monitor, Charge**

Frequency (MHz)	Meas. Level (dB μ V)		Specification (dB μ V)	Pass/Fail	Margin (dB)
	Peak	Quasi- Peak			
0.50	46.4	44.3	48.0	Pass	-3.7
0.60	35.8	34.0	48.0	Pass	-14.0
13.33	29.5	27.2	48.0	Pass	-20.8
14.4	29.8	27.2	48.0	Pass	-20.8
24.00	28.7	27.1	48.0	Pass	-20.9
24.72	14.2	9.9	48.0	Pass	-38.1

Figure 6.6 Conducted Emission: Neutral.

Detectors: Peak, Quasi-peak.

TEST PERSONNEL:

Tester Signature: _____

DATE: _____

Typed/Printed Name: _____

I. Raz

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Phase** Detector: **Quasi-peak**

Remarks: **With Monitor, Charge**

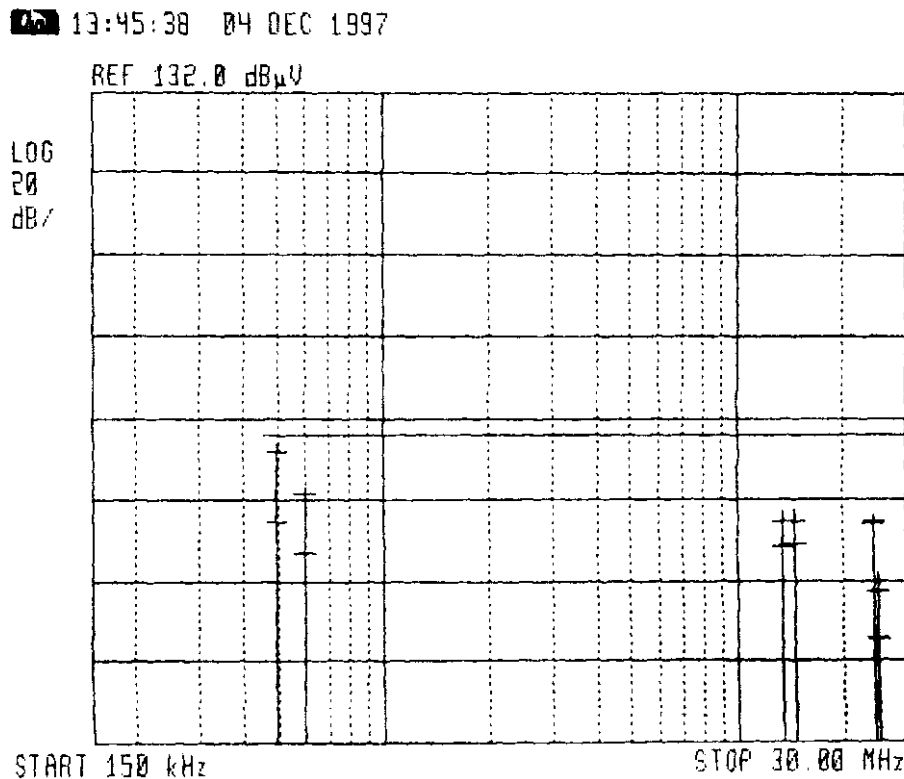


Figure 6.7 Conducted Emission: Phase. Detectors: Peak, Quasi-peak

Note:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

Conducted Emission

E.U.T Description: UPS

Type: P4 Inboard

Serial number: Not designated

Specification: F.C.C., Part 15, Subpart B: Class B

Lead: **Neutral** Detector: **Quasi-peak**

Remarks: **With Monitor, Charge**

Ap 13:41:52 04 DEC 1997

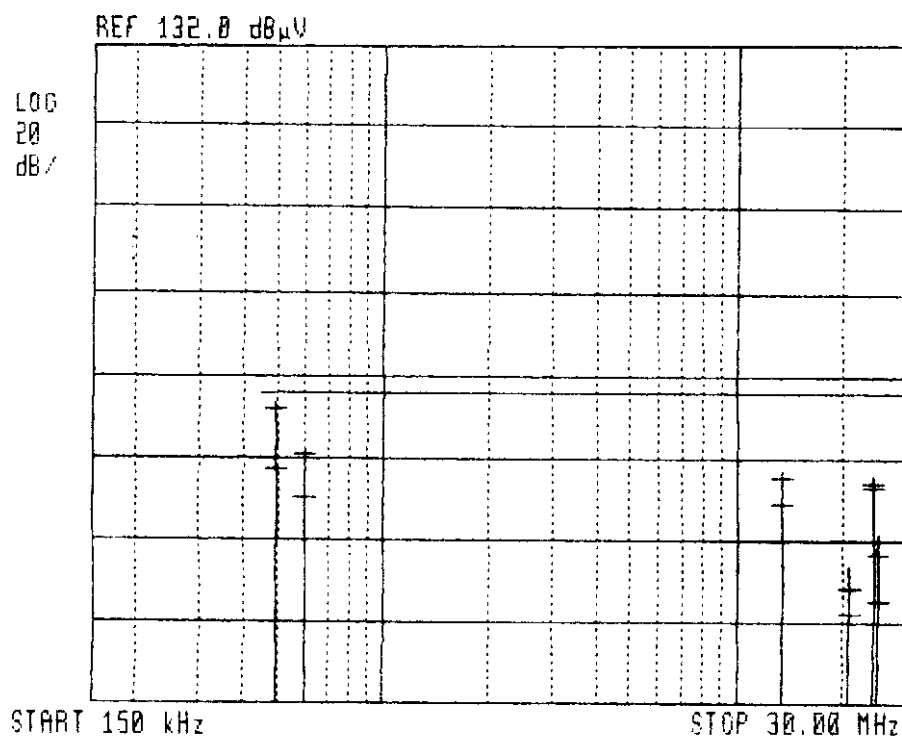


Figure 3 Conducted Emission: Neutral. Detectors: Peak, Quasi-peak

Note:

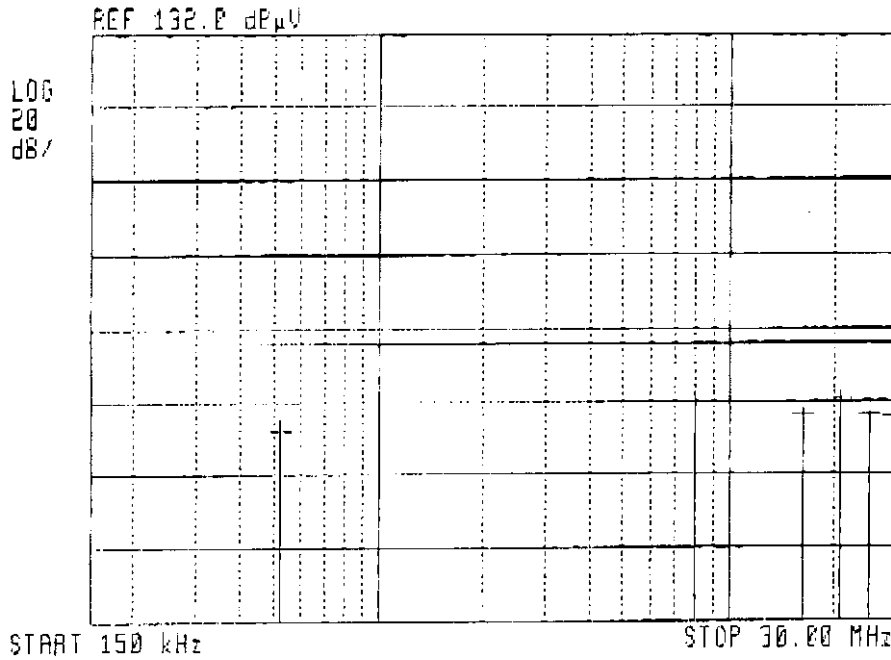
1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μ V).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

6.3 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration	
				Last Cal.	Period
LISN	Fischer	FCC-LISN-2A	127	Feb.8, 1997	1 year
LISN	Fischer	FCC-LISN-2A	128	Feb.8, 1997	1 year
Receiver	HP	85420E/85422E	3427A00103/34	Oct. 26, 1997	1 year
Printer	HP	ThinkJet2225	2738508357	N/A	N/A

P4 INBOARD , S/N 1100006
 PHASE LINE
 CHARGE. NONE

10:29:27 AUG 03, 1998



Last Hrd
Key Menu

SPAN

EXIT
GRAPH

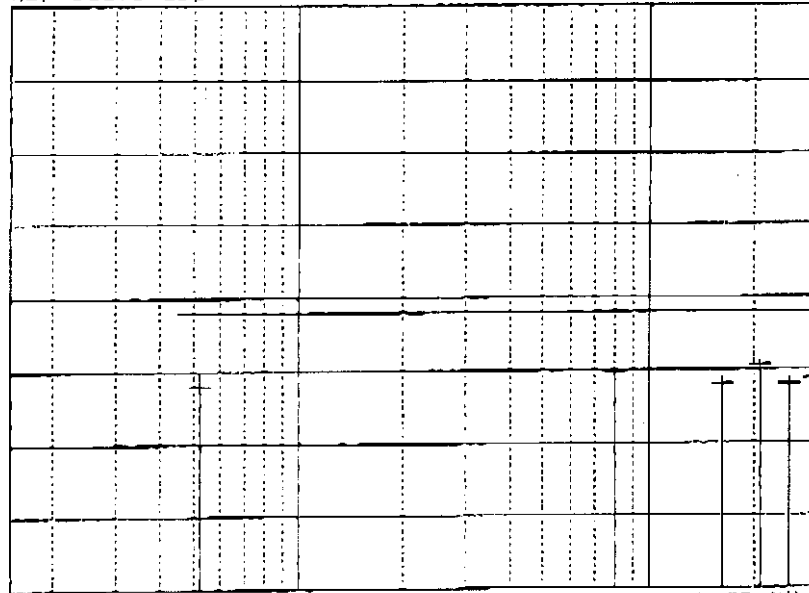
Signal Number	Frequency (MHz)	Peak (dBμV)	QP (dBμV)	QP Delta L 1 (dB)	Avg (dBμV)	Av Delta L 2 (dB)	Corr (dB)
1	0.520736	27.9	25.0	-23.0			0.0
2	7.988575	34.8	32.6	-15.4			0.0
3	16.034385	30.0	28.6	-19.4			0.0
4	20.645413	34.0	33.2	-14.8			0.0
5	24.774165	29.2	28.5	-19.5			0.0
6	28.883835	30.4	28.1	-19.9			0.0

P4 IN BOARD , S/N 11 00006
 NEUTRAL LINE
 CHARGE, NONE

10:57:31 AUG 03, 1998

REF 132.0 dBuV

LOG
20
dB/



START 150 kHz

STOP 30.00 MHz

Last Hrd
Key Menu

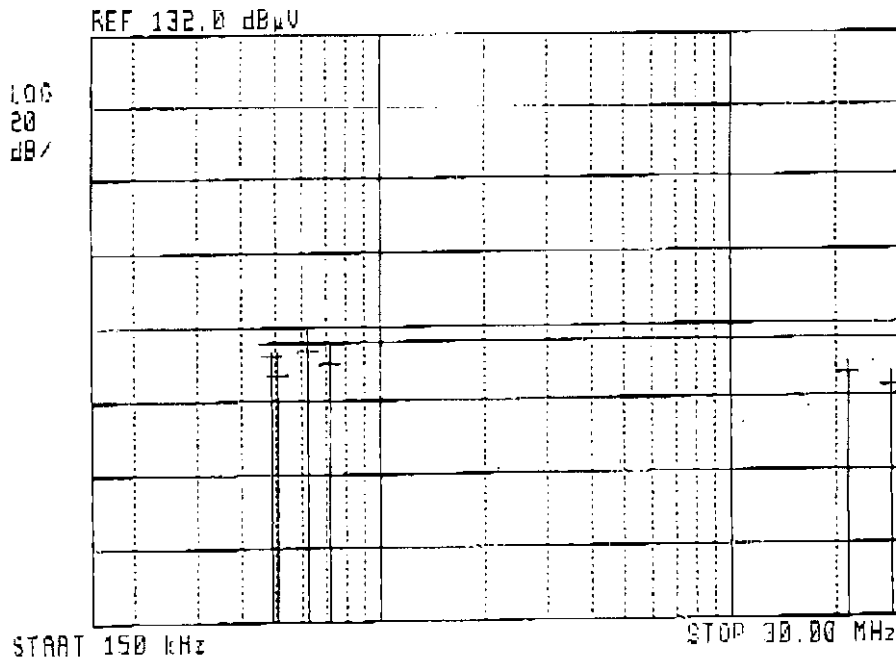
SPAN

EXIT
GRAPH

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avd (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.525618	31.5	28.4	-19.6			0.0
2	7.989075	33.6	31.4	-16.6			0.0
3	16.035138	29.9	28.6	-19.4			0.0
4	20.606450	34.9	34.1	-13.5			0.0
5	24.726033	30.1	28.4	-19.6			0.0
6	28.851268	31.4	30.2	-17.8			0.0

P4 INBOARD, S/N 1100006
 NEUTRAL LINE
 DISCHARGE, MODE

11:16:28 AUG 03, 1998



Last Hrd
Key Menu

SPAN

EXIT
GRAPH

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.489359	45.7	44.7	-3.3			0.0
2	0.506911	45.8	39.3	-8.7			0.0
3	0.616911	50.9	45.7	-3.3			0.0
4	0.716911	48.0	42.3	-5.7			0.0
5	21.457217	41.8	39.0	-8.9			0.0
6	28.217563	39.1	35.3	-12.6			0.0

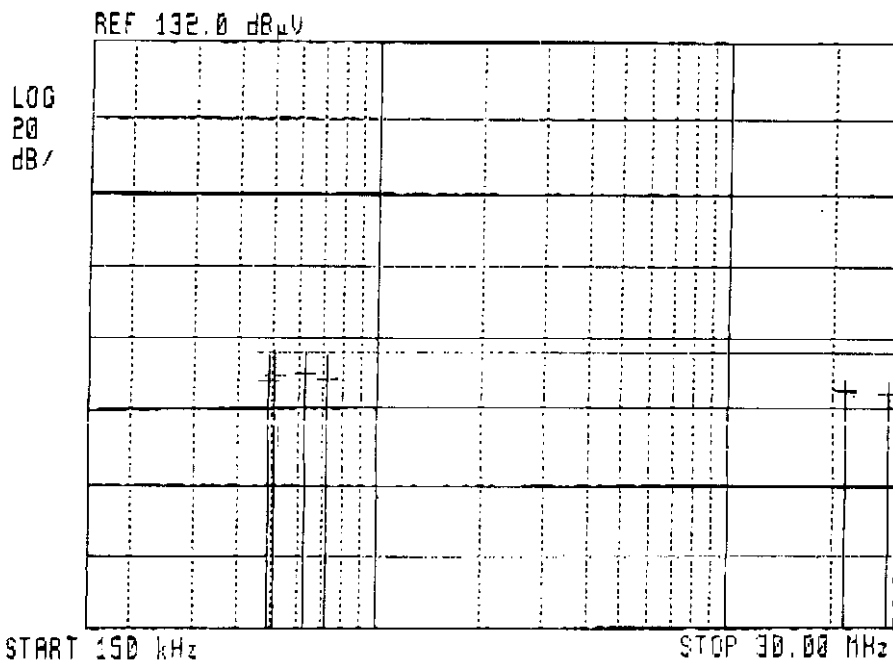
P4 IN BOARD

S/N 1100006

PHASE LINE

DISCHARGE MODE

11:51:59 AUG 03, 1998



Last Hrd
Key Menu

SPAN

EXIT
GRAPH

Signal Number	Frequency (MHz)	Peak (dBμV)	QP (dBμV)	QP Delta L 1 (dB)	Avg (dBμV)	Av Delta L 2 (dB)	Corr (dB)
1	0.489368	47.3	40.3	-7.7			0.0
2	0.506911	48.9	41.8	-6.2			0.0
3	0.616911	48.5	42.6	-5.4			0.0
4	0.716911	47.7	40.7	-7.3			0.0
5	21.457217	41.0	38.0	-10.1			0.0
6	28.217563	40.4	38.8	-11.2			0.0