# FCC PART 15 CLASS B

# EMI MEASUREMENT AND TEST REPORT

FOR

## PREMIO COMPUTER, INC.

938 Radecki Court,
City of Industry, CA 91748

**Model: PREMIOMTP6D**

July 22, 1998

| **This Report Concerns:** | **Equipment Type:** |
|---|---|
| ☒ Original Report | Pentium® II Mid-Tower System - Personal Computer, ITE |

**Test Engineer:** Thomas Huang

**Test Date:** July 15, 1998

**Certified By:** John Y. Chan - Director, Compliance Engineering

**Prepared By:** Bay Area Compliance Laboratory Corporation
230 Commercial Street, Suite 2
Sunnyvale, CA 94086
(408) 732-9162

## TABLE OF CONTENTS

# 1 - GENERAL INFORMATION

## 1.1 Product Description for Equipment Under Test (EUT)

The *PREMIO COMPUTER, Inc.*, model PREMIOMTP6D or the "EUT" as referred to in this report is a Mid-Tower personal computer measuring 9.525"L x 7.5"W, which features the Premio Computer PREMIO 212F Motherboard. The system board utilizes the Intel 82440LX/82440EX chipset with Ultra I/O controller.

- The four-layered motherboard supports Intel Pentium® II processors from 200 to 333 MHz with integrated VRM, and is provided with a frequency synthesizer chip for CPU clock selection. The motherboard conforms to the MICRO- ATX form factor footprint. It has on-board support for four IDE hard drives, one floppy drives, one parallel port, two serial ports, two USB ports, PS/2 mouse and keyboard connectors.
- Other Motherboard features include Mode 0-4 PCI IDE; 3.3V unbuffered EDO (Extended Data Output) and SDRAM memory. Cache support for 512K in CPU support.
- Peripheral expansion capability includes two (2) 32-bit PCI slots, two (2) 16-bit ISA slots (one (1) shared PCI/ISA slot), and two (2) 168-pin DIMM memory socket.
- The EUT also includes a Mid-Tower chassis with plastic front bezel. The Mid-Tower chassis provides for eight (8) half-height bays (three (3) exposed 3.5 inch drive bays, and two (2) exposed 5.25 inch drive bays), and a 200 Watt ATX power supply.
- Additionally, the EUT was equipped with one (1) 3.5" floppy drive, one (1) 5.25" floppy drive.

## 1.2 Objective

This Class B report is prepared on behalf of PREMIO COMPUTER, Inc. in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules and to ICES-003 of the Canadian Interference-Causing Equipment Regulations.

The objective of the manufacturer is to demonstrate compliance with FCC Class B limits for conducted and radiated margin and to ICES-003 requirements for Information Technology Equipment.

## 1.3 Related Submittal(s)/Grant(s)

No Related Submittals

## 1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test sites at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-674 and R-657. The test sites has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1993, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167.

## 1.6 Test Equipment List

| Manufacturer | Description | Model | Serial Number | Cal. Due Data |
|---|---|---|---|---|
| HP | Spectrum Analyzer | 8568B | 2610A02165 | 2/6/99 |
| HP | Spectrum Analyzer | 8593B | 2919A00242 | 3/20/99 |
| HP | Amplifier | 8349B | 2644A02662 | 3/20/99 |
| HP | Quasi-Peak Adapter | 85650A | 917059 | 2/6/99 |
| HP | Amplifier | 8447E | 1937A01046 | 2/6/99 |
| A.H. System | Horn Antenna | SAS0200/571 | 261 | 2/27/99 |
| Com-Power | Log Periodic Antenna | AL-100 | 16005 | 1/2/99 |
| Com-Power | Biconical Antenna | AB-100 | 14012 | 1/2/99 |
| Solar Electronics | LISN | 8012-50-R-24-BNC | 968447 | 3/28/99 |
| Com-Power | LISN | LI-200 | 12208 | 12/20/98 |
| Com-Power | LISN | LI-200 | 12005 | 12/20/98 |
| BACL | Data Entry Software | DES1 | 0001 | 12/20/98 |

## 1.7 Equipment Under Test (EUT)

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| PREMIO COMPUTER, Inc. | Pentium® II Mid-Tower System | PREMIOMTP6D | M9806070721 | IW2 PREMIOMTP6D |

## 1.8 EUT Configuration List Details

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Premio | Motherboard | 212F | M9806070721 | None |
| PREMIO | Power Supply | TG-2006B | 7464109 | None |
| TEAC | 3.5" Floppy Drive | FD-235HF | 6247068 | None |
| N/A | Chassis | Mid Tower | None | None |

## 1.9 Support Equipment

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Compaq | Keyboard | 104 WN | BO3C80A39E4G6K | AQ6-MTN41Z15DIP |
| Compaq | Mouse | MUS9J | B01920H67E0071I | EMJMUSJJ |
| Citizen Watch Ltd. | Printer | LSP-10 | 5047999-92 | DLK66TLSP-10 |
| ViewSonic | Monitor | 705A | 1912600348 | FVI7035AC1 |
| EVEREX | Modem | EV-945 | None | E3E5UVEV-945 |
| Labtec | Speaker 1 Pair | SS-11 | None | None |
| GE | Tape | 3053808 | None | None |
| TELEX | Microphone | None | None | None |
| A.H. Systems | Joystick | None | None | None |

## 1.10 External I/O Cabling

| Cable Description | Length (M) | Port/From | To |
|---|---|---|---|
| Shielded Keyboard Cable | 1.6 | Keyboard Port/EUT | Compaq Keyboard |
| Unshielded mouse cable | 2.0 | Mouse Port/EUT | Compaq mouse |
| Shielded Printer Cable | 2.0 | Parallel/EUT | Citizen Printer |
| Shielded Serial Cable | 1.5 | Serial 1/EUT | EVEREX Modem |
| Shielded USB Cablex2 | 1.5 | USB Ports/EUT | Terminators |
| Shielded Video Cable | 1.8 | Video Out Port/EUT | Viewsonic Monitor |
| Shielded Audio Cable | 1.5 | Audio Out Port/EUT | Speakers |
| Shielded Audio Cable | 1.0 | Audio in Port/EUT | Tape |
| Unshielded Cable | 1.5 | Line in Port/EUT | MIC |
| Shielded Cable | 1.0 | Game Port/EUT | Joystick |

# 2 - SYSTEM TEST CONFIGURATION

## 2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

The following I/O ports were provided by the motherboard: two serial ports, one parallel port, two USB port, one PS/2 keyboard port, one PS/2 mouse port, one floppy interface connector, and one IDE interface connectors. The CD-ROM drive provideds the audio out jack and the Network card provide the AUX, BNC and RJ45 TP connector.

The parallel port (LPT1), two serial ports (COM1 and COM2), PS/2 mouse and keyboard ports, two USB ports, TP port, BNC port, and audio jack were also tested along with a 200 Watt power supply.

Since the fundamental frequency is the same with all processor speeds, 66MHz BUS in this case, the EUT was tested with the Intel Pentium® II 333MHz CPU to represent worst case results.

The BUS and processor speeds were achieved by installing the appropriate processor and changing the jumper settings on the motherboard. Following is the supported BUS and processor speeds:

**Intel Pentium® II:**
66 MHz BUS for 333MHz processor.

## 2.2 EUT Exercise Software

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 software, GWBASIC 2Modem, contained on the hard drive, is started in a DOS window under the Windows 95 operating system. Once loaded, the program sequentially exercises each system component.

The sequence used is as follows:

1) Lines of Hs scrolls across the VGA monitor
2) The printer outputs Hs
3) The two modems receive Hs
4) Send a signal to the two USB cables, which were terminated by a 100 ohms resistor.

The complete cycle takes approximately 5 - 10 seconds and the process is continuously repeated.

## 2.3 Special Accessories

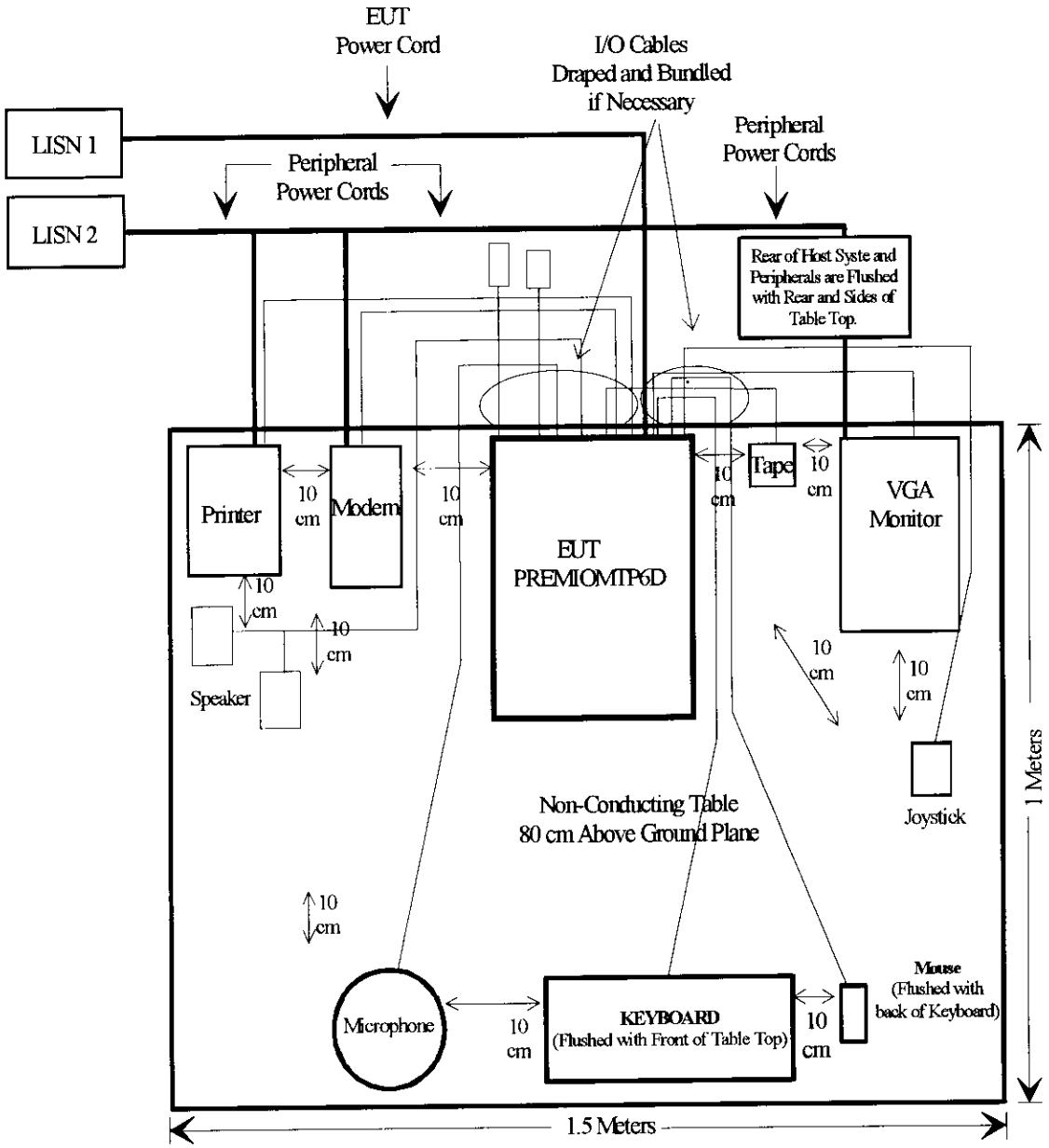
As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied by INMAC, Y.C. Cable, Monster Cable and from their respective support equipment manufacturers. The printer, the modem and VGA monitor featured shielded metal connectors.

## 2.4 Block Diagram

There is not block diagram available at the time of testing.

The system has only one full speed. In the full-speed mode, the 14.3MHz crystal on the motherboard drives the frequency synthesizer to produce the 66MHz BUS clock to the CPU and other components on the motherboard. Internally, the CPU is running at 333MHz.

## 2.6 Test Setup Block Diagram



## 2.7 Equipment Modifications

No modification(s) to the EUT were necessary to comply with the applicable limits:

# 3 - CONDUCTED EMISSIONS TEST DATA

## 3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is $\pm$2.4 dB.

## 3.2 EUT Setup

The measurement was performed at the **O**pen **A**rea **T**est **S**ite, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the FCC Class B limits.

The EUT was connected to a 110 VAC / 60 Hz power source and it was placed center and the back edge of the test table. The VGA monitor and the tape were placed on one side of EUT, printer and the modem were on the other side. A pair of speakers was placed directly in front of the printer and the modem. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

The keyboard was placed directly in front of the EUT, flushed with the front of the tabletop. The PS/2 mouse and the joystick were place next to the keyboard on one side, the Microphone was on the other side. The mouse was flushed with the back of the keyboard.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped over edge of the test table and bundle when necessary.

## 3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conducted emission test:

| | |
|---|---|
| Start Frequency | 450 kHz |
| Stop Frequency | 30 MHz |
| Sweep Speed | Auto |
| IF Bandwidth | 100 kHz |
| Video Bandwidth | 100 kHz |
| Quasi-Peak Adapter Bandwidth | 9 kHz |
| Quasi-Peak Adapter Mode | Normal |

## 3.4 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first LISN with the VGA monitor and all support equipment power cords connected to the second.

Since the fundamental frequency is the same with all processor speeds, 66MHz BUS in this case, the EUT was tested using the Intel Pentium® II 333 MHz CPU with the PREMIO (TG-2006-B) 200 Watt power supply to represent worst case results for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 3.6 of this report.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (less than -4 dB$\mu$V). Quasi-peak readings are distinguished with a "**Qp**".

## 3.5 Summary of Test Results

According to the data in section 3.6, the EUT complied with the FCC Conducted margin for a Class B device and these test results is deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, with the *worst* margin reading of:

**-1.6 dBμV** at **0.570 MHz** in the ***Line*** mode for the **PREMIO, *TG-2006-B*** power supply

## 3.6 Conducted Emissions Test Data

### 3.6.1 Final Test Data for PREMIO Power Supply, model TG-2006-B with Intel Pentium® II 333 MHz CPU, 0.45 - 30 MHz.

| LINE CONDUCTED EMISSIONS | | | | FCC CLASS B | |
|---|---|---|---|---|---|
| Frequency | Amplitude | Detector | Phase | Limit | Margin |
| MHz | dBμV | Qp/Ave/Peak | Line/Neutral | dBμV | dB |
| 0.570 | 46.4 | QP | Line | 48 | -1.6 |
| 0.570 | 46.4 | QP | Neutral | 48 | -1.6 |
| 13.630 | 45.5 | QP | Line | 48 | -2.5 |
| 13.630 | 45.0 | QP | Neutral | 48 | -3.0 |
| 15.340 | 38.2 | QP | Neutral | 48 | -9.8 |
| 15.520 | 35.0 | QP | Line | 48 | -13.0 |

## 3.7 Plot of Conducted Emissions Test Data

Plot of Conducted Emissions test data for the PREMIO power supply, model TG-2006-B with Intel Pentium® II 333 MHz processor is presented in Appendix B of this report as reference.

# 4 - RADIATED EMISSION DATA

## 4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

## 4.2 EUT Setup

The radiated emission tests were performed in the open area 3 meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the FCC Class B limits.

The EUT was connected to a 110 VAC / 60 Hz power source and it was placed center and the back edge of the test table. The VGA monitor and the tape were placed on one side of EUT, printer and the modem were on the other side. A pair of speakers was placed directly in front of the printer and the modem. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

The keyboard was placed directly in front of the EUT, flushed with the front of the tabletop. The PS/2 mouse and the joystick were place next to the keyboard on one side, the Microphone was on the other side. The mouse was flushed with the back of the keyboard.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped over edge of the test table and bundle when necessary.

## 4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, since the internal processor speed operates between 108-500 MHz, the system was tested to 2000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

| | |
|---|---|
| Start Frequency | 30 MHz |
| Stop Frequency | 2000 MHz |
| Sweep Speed | Auto |
| IF Bandwidth | 100 KHz |
| Video Bandwidth | 1 MHz |
| Quasi-Peak Adapter Bandwidth | 120 kHz |
| Quasi-Peak Adapter Mode | Normal |
| Resolution Bandwidth | 1MHz |

## 4.4 Test Procedure

For the radiated emissions test, both the EUT and VGA monitor and all support equipment power cords was connected to the AC floor outlet since the power supply (TG-2006-B) used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (less than -4 dBμV), and are distinguished with a "**Qp**" in the data table.

Since the fundamental frequency is the same with all processor speeds, 66MHz BUS in this case, the EUT was tested using the Intel Pentium® II 333 MHz CPU at 66 MHz BUS speed to represent worst case results for the final qualification test. . Therefore, these results were used for final test data recorded in the table listed under section 4.7 of this report as reference.

The parallel port (LPT1), two serial ports (COM1 and COM2), two USB ports, TP port, BNC port, PS/2 mouse and keyboard ports were also tested.

## 4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

## 4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Class B standards and these test results is deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, and had the worst margin of:

**-9.4 dBμV** at **312.05 MHz** in the **Vertical** polarization with the Intel Pentium® II 333 MHz CPU at 66 MHz BUS.

**-8.4 dBμV** at **312.05 MHz** in the **Vertical** polarization with the Intel Pentium® II 333 MHz CPU at 66 MHz BUS – ***After Maximize procedure***.

## 4.7 Radiated Emissions Test Result Data

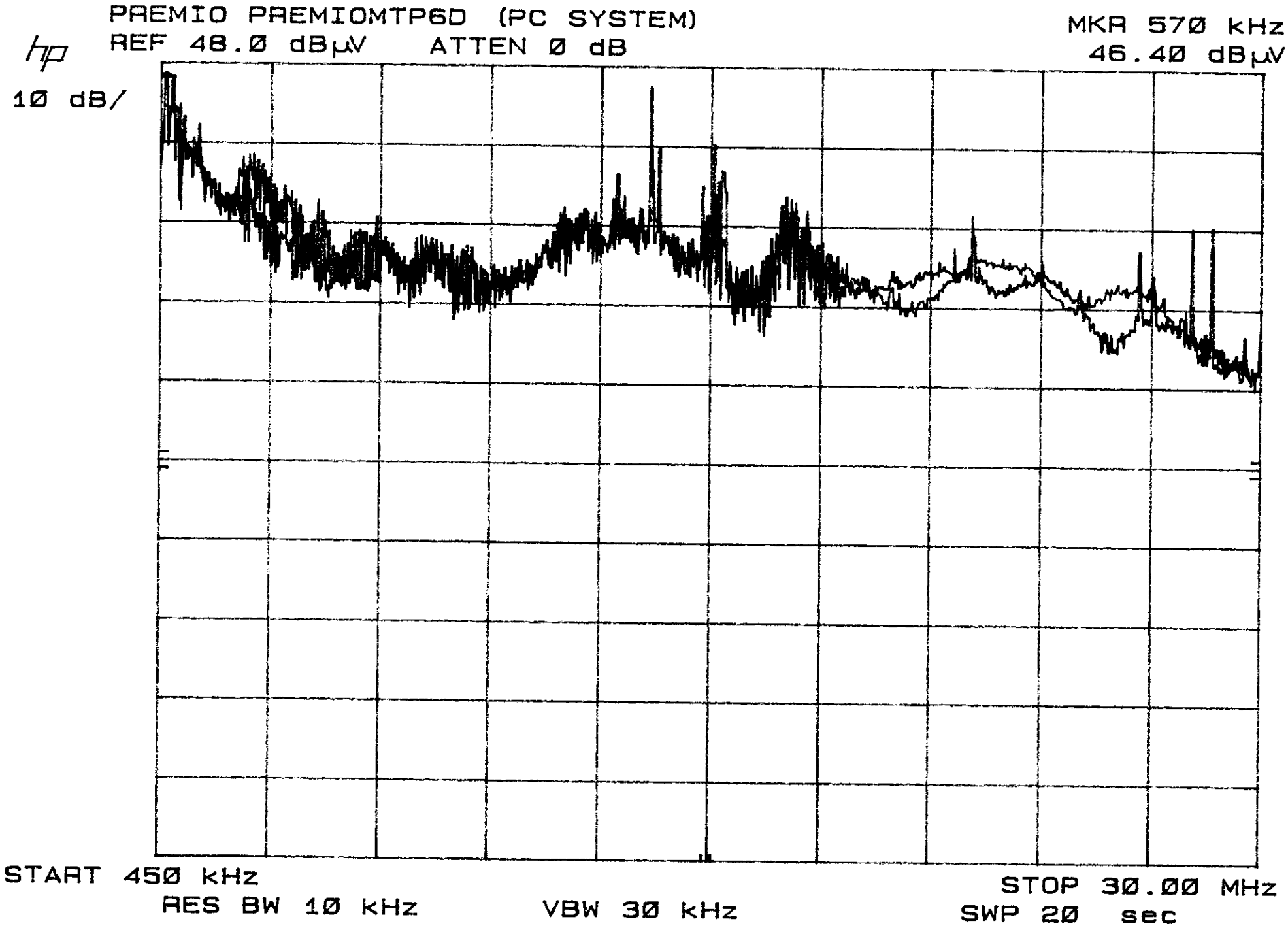
### 4.7.1 Test Data for Intel Pentium® II 333 MHz CPU at 66 MHz BUS, 30 to 2000 MHz.

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTE AMPLITUDE | FCC CLASS B | |
|---|---|---|---|---|---|---|---|---|---|---|
| Freqency MHz | Ampl. dBμV/m | Angle Degree | Height Meter | Polar H/V | Antenna dBμV/m | Cable dB | Amp. dB | Corr. Ampl. dBμV/m | Limit dBμV/m | Margin dB |
| 312.05 | 40.7 | 270 | 1.8 | V | 13.2 | 5.7 | 23.0 | 36.6 | 46.0 | -9.4 |
| 57.78 | 37.9 | 150 | 1.6 | V | 10.3 | 2.7 | 21.8 | 29.1 | 40.0 | -10.9 |
| 312.05 | 37.5 | 270 | 1.3 | H | 14.2 | 5.7 | 23.0 | 34.4 | 46.0 | -11.6 |
| 212.19 | 32.1 | 270 | 1.8 | V | 17.3 | 4.9 | 22.4 | 31.9 | 43.5 | -11.6 |
| 57.75 | 34.6 | 90 | 1.6 | H | 10.0 | 2.7 | 21.8 | 25.5 | 40.0 | -14.5 |
| 504.08 | 29.9 | 270 | 1.8 | H | 17.5 | 7.5 | 23.6 | 31.3 | 46.0 | -14.7 |
| 504.08 | 30.2 | 290 | 1.9 | V | 15.9 | 7.5 | 23.6 | 30.0 | 46.0 | -16.0 |
| 212.19 | 28.4 | 270 | 1.5 | H | 16.3 | 4.9 | 22.4 | 27.2 | 43.5 | -16.3 |
| 360.04 | 31.1 | 250 | 1.5 | V | 14.3 | 6.5 | 22.5 | 29.4 | 46.0 | -16.6 |
| 115.56 | 34.3 | 90 | 1.5 | V | 10.7 | 3.1 | 21.3 | 26.8 | 43.5 | -16.7 |
| 360.05 | 29.9 | 270 | 1.4 | H | 14.9 | 6.5 | 22.5 | 28.8 | 46.0 | -17.2 |
| 455.97 | 29.0 | 300 | 1.8 | V | 15.8 | 7.4 | 23.5 | 28.7 | 46.0 | -17.3 |
| 266.98 | 25.9 | 90 | 1.5 | V | 19.1 | 5.4 | 22.2 | 28.2 | 46.0 | -17.8 |
| 288.84 | 25.1 | 80 | 1.8 | H | 19.7 | 5.6 | 22.3 | 28.1 | 46.0 | -17.9 |
| 336.05 | 29.7 | 90 | 1.6 | H | 14.4 | 6.1 | 22.6 | 27.6 | 46.0 | -18.4 |
| 137.74 | 30.7 | 0 | 1.7 | H | 11.7 | 3.8 | 21.2 | 25.0 | 43.5 | -18.5 |
| 137.49 | 29.9 | 120 | 1.2 | V | 11.8 | 3.8 | 21.2 | 24.3 | 43.5 | -19.2 |
| 300.69 | 30.1 | 270 | 1.5 | V | 13.0 | 5.9 | 22.6 | 26.4 | 46.0 | -19.6 |
| 266.98 | 25.3 | 0 | 1.6 | H | 17.8 | 5.4 | 22.2 | 26.3 | 46.0 | -19.7 |
| 300.66 | 28.9 | 290 | 2.0 | H | 13.9 | 5.9 | 22.6 | 26.1 | 46.0 | -19.9 |
| 327.97 | 28.7 | 250 | 1.6 | V | 13.5 | 6.0 | 22.7 | 25.5 | 46.0 | -20.5 |

### 4.7.2 *Maximized* Final Test Data for Intel Pentium® II 333 MHz CPU at 66 MHz BUS, 30 to 2000 MHz.

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTE AMPLITUDE | FCC CLASS B | |
|---|---|---|---|---|---|---|---|---|---|---|
| Freqency MHz | Ampl. dBµV/m | Angle Degree | Height Meter | Polar H/V | Antenna dBµV/m | Cable dB | Amp. dB | Corr. Ampl. dBµV/m | Limit dBµV/m | Margin dB |
| 312.05 | 41.7 | 240 | 1.9 | V | 13.2 | 5.7 | 23.0 | 37.6 | 46.0 | -8.4 |
| 57.78 | 38.8 | 300 | 3.2 | V | 10.3 | 2.7 | 21.8 | 30.0 | 40.0 | -10.0 |
| 212.19 | 33.3 | 260 | 2.8 | V | 17.3 | 4.9 | 22.4 | 33.1 | 43.5 | -10.4 |
| 312.05 | 38.1 | 270 | 1.5 | H | 14.2 | 5.7 | 23.0 | 35.0 | 46.0 | -11.0 |
| 57.75 | 37.7 | 270 | 2.9 | H | 10.0 | 2.7 | 21.8 | 28.6 | 40.0 | -11.4 |
| 504.08 | 31.5 | 0 | 1.7 | H | 17.5 | 7.5 | 23.6 | 32.9 | 46.0 | -13.1 |

# Appendix B – PLOT OF CONDUCTED EMISSION TEST DATA


PREMIO PREMIOMTP6D (PC SYSTEM)
REF 48.0 dBµV ATTEN 0 dB
MKR 570 kHz
46.40 dBµV
10 dB/
START 450 kHz
RES BW 10 kHz
VBW 30 kHz
STOP 30.00 MHz
SWP 20 sec