PM5350

S/UNI-® 155-ULTRA

S/UNI-ULTRA REFERENCE DESIGN EMI LAB TEST REPORT

ISSUE 1: MAY 1999

PMC-Sierra, Inc.
105 - 8555 Baxter Place
Burnaby BC Canada V5A 4V7
Phone 604.415.6000 FAX 604.415.6200

REVISION HISTORY

Issue No.	Issue Date	Details of Change
1	April 1999	Creation of Document

PMC-Sierra, Inc.
105 - 8555 Baxter Place
Burnaby BC Canada V5A 4V7
Phone 604.415.6000 FAX 604.415.6200

CONTENTS

Blank Page

1 OVERVIEW

This document contains the EMI Laboratory test results performed at an FCC accredited laboratory on the SUNI-ULTRA (PM5350) Reference Design PCB. For more information, please refer to document “SUNI-ULTRA REFERENCE DESIGN”, PMC-961062.

The enclosed Lab report is for the Rev 1 PCB of this reference design. However, these results can be taken as a very close indication of the performance of rev 2 since care has been taken to keep the EMC/EMI inhibiting features in tact. Also, there has been very little change that could adversely effect the EMI/EMC performance. There was no Rev 3 PCB built and due to the minor changes, it can be assumed that the EMI results will be similar.

2 STANDARD COMPLIANCE

The S/UNI-ULTRA Reference Design is designed to the following specifications:

- The ATM Forum ATM Physical Medium Dependent Interface Specification for 155 Mb/s over Twisted Pair Cable (AF-PHY-0015.000) Version 1.0
- ANSI/TIA/EIA-568-A Building Telecommunications Wiring Standards

Note 1: The phrase "ATM Forum specification" refers to the "AF-PHY-0053.000 ATM Forum ATM Physical Medium Dependent Interface Specification for 155 Mb/s over Twisted Pair Cable" specification.

The ATM Forum specification is a system level specification. The following sections highlight the factors that would impact each requirement.

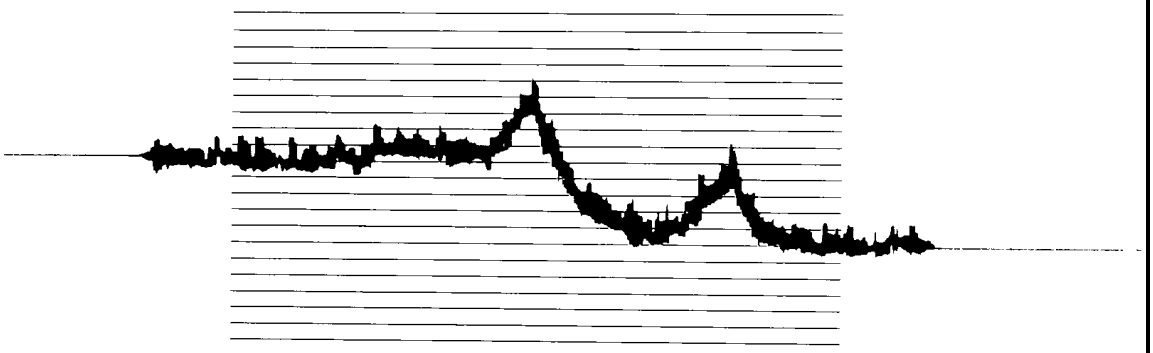
2.1 UTP-5 Emission Standard Compliance

To meet emission standards such as FCC Class B or CISPR, layout and component selection are critical. Compliance tests results on rev 1 of this reference design (also available on the Web) from an independent test lab attached in the appendix show that the rev 1 S/UNI-ULTRA Reference Design meets the following specifications:

- EN55022:1994 Radiated Emissions 30MHz - 1000MHz Class B
- EN55022:1994 Conducted Emissions 150KHz - 30MHz Class B
- IEC1000-4-2 Electrostatic Discharge Level B
- IEC1000-4-3 RF Electromagnetic Fields Level A
- IEC1000-4-4 Fast Transient/Burst Level B

These tests have not been verified on the revision Rev 2 of the reference design PCB or on the Rev 3 schematic changes.

3 APPENDIX A: EMI/EMC LAB TEST RESULTS



ACME TESTING

P.O. BOX 3 • ACME, WASHINGTON 98220 • (360) 595-2785

REPORT OF MEASUREMENTS

DEVICE:	PCI ATM UTP5 NETWORK INTERFACE CARD REV A PM 5350 I.C.
MODEL:	ATM UTP5
MANUFACTURER:	PMC-SIERRA, INC.
ADDRESS:	105 - 8555 BAXTER PLACE BURNABY, B.C. CANADA V5A 4V7

THE DATA CONTAINED IN THIS REPORT
WAS COLLECTED AND COMPILED BY:

JIM ERICSON
EMC ENGINEER

DANIEL B. STATON
EMC TECHNICIAN

ACME TESTING
2002 VALLEY HWY
P.O. BOX 3
ACME, WASHINGTON 98220-0003

TEST SITE:	2
REPORT NUMBER:	970004
DATE(S) TESTED:	14 & 15 JANUARY, 1996
WORK ORDER NUMBER:	4059

1

1. General

1.1 Purpose

The purpose of this report is to show compliance to Electromagnetic Emissions and Immunity requirements outlined in the referenced specifications. This report serves as the basis for the manufacturer's Declaration of Compliance.

1.2 Manufacturer

Company Name:	PMC-Sierra, Inc.
Contact:	Ying Sue
Street Address:	105 - 8555 Baxter Place
City/Province	Burnaby, British Columbia
Country/Postal Code:	Canada V5A 4V7
Telephone :	604 415-6000 Ext: 2601
Fax :	604 415-6206

1.3 Test location

Company:	Acme Testing
Street Address:	2002 Valley Highway
Mailing Address:	PO Box 3
City/State/Zip:	Acme, WA 98220-0003
Telephone:	1-888-ACMETES
Fax:	1-360-595-2722

1.4 Test Personnel

Daniel Staton
Jim Ericson

The measurements contained in this report were made in accordance with the referenced standards and all applicable Public Notices received prior to the date of testing. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

Paul G. Slavens
Chief EMC Engineer

Seal

2. Test Results Summary

Summary of Test Results

Test Specification	Test Description	Compliance Criteria	Status
EN 55022:1994	**Radiated Emissions** 30 MHz - 1000 MHz	**Class B**	**Pass**
EN 55022:1994	**Conducted Emissions** 150 kHz - 30 MHz	**Class B**	**Pass**
IEC 1000-4-2	**Electrostatic Discharge** +/-8 kV air discharge +/-4 kV contact discharge	**Level B**	**Pass**
IEC 1000-4-3	**RF Electromagnetic Fields** 3 Volts/meter 26 MHz - 1000 MHz, 1kHz AM, 80% depth	**Level A**	**Pass**
IEC 1000-4-4	**Fast Transient/Burst** (AC & DC Power Lines) +/-1 kV 5/50 nsec (t_r/t_d) pulses 2 min.	**Level B**	**Pass**
	Fast Transient/Burst (Signal & Control Lines > 3m) .5 kV 5/50 nsec pulses 2 min.	**Level B**	**Pass**

5

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device:	PCI ATM UTP5 Network Interface Card With Rev. A PM 5350 Integrated Circuit
Model Number:	ATM UTP5 (Card)
Serial Number:	2
FCC ID:	None
Power:	Computer PCI Bus
Grounding:	Computer PCI Bus

3.2 EUT Peripherals for Emissions

Device	Manufacturer	Model Number	FCC ID
Personal Computer	Gateway 2000	P5-133	HWYTGRP5166BATC
Monitor	Sony (Gateway)	CPD-15F23	AK8CPD15SF1
Keyboard	Gateway2000	C21960000X-XX-XXX	D7J196001-XX
Mouse	NEC	M-S28-6MD	DL210472
Printer	Hewlett Packard	2276A	S48X22276X

6

3.3 Description of Interface Cables for Emissions

EUT/LOOPBACK (UTP5 CABLE)

Shielded	Unshielded	Flat	Round	Length	Ferrite
NO	YES	NO	YES	65m	NO

PERSONAL COMPUTER/MONITOR

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	1m	YES

PERSONAL COMPUTER/KEYBOARD

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	2m	NO

PERSONAL COMPUTER/MOUSE

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	2m	NO

PERSONAL COMPUTER/PRINTER

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	1m	NO

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

3.4 The Mode of Operation During Tests for Emissions

Transmitting & Receiving PRBS23 data, at full bandwidth.

3.5 Modifications Required for Emissions Compliance

The EUT required no modifications during testing to bring the product into compliance.

7

3.6 EUT Peripherals for Immunity

Device	Manufacturer	Model Number	FCC ID
Personal Computer	Gateway 2000	P5-133	HWYTGRP5166BATC
Monitor	Sony (Gateway)	CPD-15F23	AK8CPD15SF1
Keyboard	Gateway2000	C21960000X-XX-XXX	D7J196001-XX
Mouse	NEC	M-S28-6MD	DL210472

3.7 Description of Interface Cables for Immunity

EUT/LOOPBACK (UTP5 CABLE)

Shielded	Unshielded	Flat	Round	Length	Ferrite
NO	YES	NO	YES	4m	NO

PERSONAL COMPUTER/MONITOR

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	1m	YES

PERSONAL COMPUTER/KEYBOARD

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	2m	NO

PERSONAL COMPUTER/MOUSE

Shielded	Unshielded	Flat	Round	Length	Ferrite
YES	NO	NO	YES	2m	NO

3.8 The Mode of Operation During Tests for Immunity

Transmitting & Receiving PRBS23 data, at full bandwidth.

3.9 Modifications Required for Immunity Compliance

The EUT required no modifications during testing to bring the product into compliance.

4. Radiated Emissions Tests

Test Requirement: EN 55022:1994

Test Procedure: EN 55022:1994

4.1 Test Equipment

⇒ Spectrum Analyzer: Hewlett Packard 85668, Serial Number 06499-00168, Calibration due Date: March 1997

⇒ RF Preselector: Hewlett Packard 85685, Serial Number A00106, Calibration due Date: March 1997

⇒ Quasi Peak Adapter: Hewlett Packard 85650, Serial Number A0327, Calibration due Date: March 1997

⇒ Line Impedance Stabilization Network: EMCO 3825-2, Serial Number 1601, Calibration due Date: June 1997

⇒ Active Loop H-Field Antenna (10 kHz to 30 MHz): EMCO 6502, Serial Number 2016, Calibration due Date: June 1997

⇒ Broadband Biconical Antenna (20 MHz to 200 MHz): EMCO 3110, Serial Number 1115, Calibration due Date: June 1997

⇒ Broadband Log Periodic Antenna (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2853, Calibration due Date: June 1997

⇒ Roberts Dipole Antenna Set (30 MHz to 1000 MHz): Compliance Design A 100

⇒ Active Monopole E-Field Antenna (10 kHz to 30 MHz): A.H. Systems 2057, Serial Number 112

⇒ EUT Turntable Position Controller: EMCO 1061-3M 9003-1441

⇒ Antenna Mast: EMCO 1051 9002-1457

⇒ 2 GHz to 10 GHz Low Noise Preamplifier: Milliwave 593-2898, Serial Number 2494, Calibration due Date: June 1997

4.2 Purpose

The purpose of this test is to evaluate the radiated electromagnetic interference characteristics of the EUT.

4.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. EUT emissions are also maximized by manipulating the system cables.

Radiated Emissions Test Characteristics	
Frequency range	30 - 1000 MHz
Test distance	3 meters
Test instrumentation resolution bandwidth	120 kHz
Receive antenna scan height	1 - 4 meters
Receive antenna polarization	Vertical/Horizontal

4.4 Test Results

PRODUCT EMISSIONS

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg	CORR FACTOR dB
1	31.201	40.0	30.7	-9.3	QP	V	107	264	18.0
2	31.985	40.0	33.1	-6.9	QP	V	107	263	17.9
3	40.628	40.0	28.2	-11.8	QP	V	107	265	15.6
4	65.260	40.0	31.0	-9.0	QP	V	107	234	7.8
5	151.089	40.0	35.2	-4.8	QP	H	205	210	16.5
6	156.066	40.0	36.7	-3.3	QP	H	211	197	16.8
7	163.994	40.0	36.0	-4.0	QP	H	191	230	17.2
8	216.008	40.0	33.6	-6.4	QP	V	100	101	13.4
9	219.980	40.0	29.7	-10.3	QP	V	100	108	13.4
10	229.071	40.0	31.8	-8.2	QP	V	100	66	13.3
11	531.826	47.0	41.7	-5.3	QP	V	100	153	21.7

Only the 11 (eleven) highest amplitude emissions are listed above. For detailed plots and listings of all emissions from 30 MHz - 1 GHz, please refer to the accompanying data in the list of attachments.

10

5. Conducted Emissions Tests

Test Requirement: EN 55022:1994

Test Procedure: EN 55022:1994

5.1 Test Equipment

⇒ Spectrum Analyzer: Hewlett Packard 85668, Serial Number 06499-00168, Calibration due Date: March 1997

⇒ RF Preselector: Hewlett Packard 85685, Serial Number A00106, Calibration due Date: March 1997

⇒ Quasi Peak Adapter: Hewlett Packard 85650, Serial Number A0327, Calibration due Date: March 1997

⇒ Line Impedance Stabilization Network: EMCO 3825-2, Serial Number 1601, Calibration due Date: June 1997

5.2 Purpose

The purpose of this test is to evaluate the level of conducted noise the EUT imposes on the A/C mains.

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, final conducted measurements are taken. Conducted measurements are made on each current carrying conductor with respect to ground.

Conducted Emissions Test Characteristics	
Frequency range	.15 - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

11

5.4 Test Results

A summary of the highest amplitude emissions are listed below. For detailed plots of all emissions from .15 MHz - 30 MHz, please refer to the accompanying data in the list of attachments.

LINE 1

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	0.1893	43.7
2	0.2255	44.1
3	0.2831	41.0
4	0.3748	38.1
5	0.4511	34.9
6	0.4731	34.9

LINE 2

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	0.1883	43.4
2	0.2267	45.3
3	0.2816	40.3
4	0.3748	37.5
5	0.4534	35.9
6	0.5203	36.2

12

6. Electrostatic Discharge (ESD) Immunity

Test Requirement: EN50082-1:1992

Test Method: IEC 1000-4-2

6.1 Test Equipment

⇒ ESD Simulator: Haefely Trench PESD 1600, Serial Number H60168, Calibration due Date: March 1997

6.2 Purpose

The purpose of this test is to demonstrate the EUT's immunity to Electrostatic Discharge.

6.3 Test Procedures

For tabletop equipment, the test set-up consists of a 1.6 meters by 0.8 meter non-conductive table, 0.8 meter above the reference ground plane that is 2.6 meters by 1.8 meters wide and 3.2 millimeters thick. The top of the non-conductive table is covered with a sheet of aluminum 1.6 meters by 0.8 meter wide and 3.2 millimeters thick. This sheet of aluminum is referred to as the Horizontal Coupling Plane or HCP. The EUT is placed on the HCP, which is covered by an insulating material 0.1mm thick. The HCP is bonded to the reference ground plane through two 470 kΩ resistors. The test setup also consists of a 0.5 meter by 0.5 meter wide and 3.2 millimeters thick vertical sheet of aluminum. This vertical sheet of aluminum is referred to as the Vertical Coupling Plane or VCP. The VCP is also bonded to the reference ground plane with two 470 kΩ resistors. For floor-standing equipment, the EUT is placed on a non-conductive support, 0.1 meter above the reference groundplane.

Direct air discharges were applied to the EUT at all points that would accept a discharge at each voltage. Indirect air discharges were applied via the HCP at a distance of 0.1 meter from the front, back, left, and right sides of the EUT. Indirect air discharges were applied via the VCP at a distance of 0.1 meter from the front, back, left, and right sides of the EUT.

The discharge voltage of the ESD generator is stepped up to the obligatory level to account for the non-linear current/voltage relationship of electronic devices and to better isolate any failures. At least 10 discharges of each polarity are applied to each location.

13

6.4 Performance Criteria

Performance criterion A: The equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion B: The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. However, during the test, degradation of performance is allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion C: Temporary loss of function is allowed provided the function is self recoverable or can be restored by the operation of the controls.

6.5 Test Results

Electrostatic Discharge Immunity Test
Direct Air Discharge

Location of Discharge	Voltage + /- k V	Performance Criteria	Status
UTP5 Card Panel	2,4,8	B	Pass
UTP5 Card Connector	2,4,8	B	Pass*

* No discharge occurred.

14

Electrostatic Discharge Immunity Test
Indirect Air Discharge

Location of Discharge	Voltage +/- k V	Performance Criteria	Status
Front side - HCP	2,4,8	B	Pass
Back side - HCP	2,4,8	B	Pass
Left side - HCP	2,4,8	B	Pass
Right side - HCP	2,4,8	B	Pass

Electrostatic Discharge Immunity Test
Indirect Air Discharge

Location of Discharge	Voltage +/- k V	Performance Criteria	Status
Front side - VCP	2,4,8	B	Pass
Back side - VCP	2,4,8	B	Pass
Left side - VCP	2,4,8	B	Pass
Right side - VCP	2,4,8	B	Pass

Electrostatic Discharge Immunity Test
Contact Discharge

Location of Discharge	Voltage +/- k V	Performance Criteria	Status
UTP5 Card Panel	2,4	B	Pass
UTP5 Card Connector	2,4	B	Pass*

* No discharge occurred.

15

7. Radio-Frequency Electromagnetic Fields Immunity

Test Requirement: EN50082-1:1992

Test Method: IEC 1000-4-3

7.1 Test Equipment

⇒ Signal Generator: Wavetek 2500, Serial Number 0014004, Calibration due Date: March 1997

⇒ Radio Frequency Amplifier: Instruments For Industry, Inc. SMX100, Serial Number 1417-1295

⇒ Isotropic Field Monitor: Amplifier Research FM 2000, Serial Number 17489

⇒ Isotropic Field Probe: Amplifier Research FP 2031, Serial Number 17510, Calibration due Date: March 1997

⇒ Antenna: EMCO Broadband Biconilog (26 -1000 MHz), Serial Number 1218, Calibration due Date: July 1997

7.2 Purpose

The purpose of this test is to demonstrate the EUT's immunity to radiated radio frequency electromagnetic fields.

7.3 Test Procedures

The ferrite-lined shielded room is precalibrated to determine the drive signal necessary to establish the obligatory field strength. The EUT is placed on a non-conductive table at a distance of 0.8 meter above the reference ground plane located at the end of the ferrite-lined shielded room. Generally speaking, the EUT's performance inside the room is visually monitored using a video camera. The antenna is placed 3 meters away from the EUT in a vertical polarization. The isotropic field probe is placed with the EUT. The signal generator frequency is slowly swept from 26 MHz to 1000 MHz by control of computer. Sweep speed is 0.0015 decades/second or slower. Should any performance degradation of the EUT occur during the test, the frequency sweep is stopped, and the unit's threshold of susceptibility is determined. The antenna is then placed in the horizontal polarization and the sweep from 26 MHz to 1000 MHz is repeated. The test is repeated for all four sides of the unit.

Radio-Frequency Electromagnetic Fields Immunity Test Characteristics	
Step size	1% of previous frequency
Dwell time	0.0015 decades/second
Modulation	1 kHz AM 80% depth
Field strength	3 Volts/meter
Frequency	26 - 1000 MHz

7.4 Performance Criteria

Performance criterion A: The equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion B: The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. However, during the test, degradation of performance is allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion C: Temporary loss of function is allowed provided the function is self recoverable or can be restored by the operation of the controls.

7.5 Test Results

Radio-Frequency Electromagnetic Fields Immunity
IEC 1000-4-3

Location	Field Strength	Performance Criteria	Status
Front	3 Volts/meter	A	Pass
Back	3 Volts/meter	A	Pass
Left	3 Volts/meter	A	Pass
Right	3 Volts/meter	A	Pass

17

8. Electrical Fast Transient/Burst Immunity

Test Requirement: EN50082-1:1992

Test Method: IEC 1000-4-4

8.1 Test Equipment

⇒ Electrical Fast Transient/Burst Generator: Haefely Trench PEFT Junior, Serial Number 083 762-16, Calibration due Date: March 1997

⇒ Capacitive Coupling Clamp: Haefely Trench 093 506.1, Serial Number 083 754-04

8.2 Purpose

The purpose of this test is to demonstrate the EUT's immunity to electrical fast transients/burst.

8.3 Test Procedures

For tabletop equipment, the EUT is placed on a non-conductive table, 0.8 meter above the reference ground plane. For floor-standing equipment, the EUT is placed on a non-conductive support, 0.1 meter above the reference groundplane. The Electrical Fast Transient/Burst Generator is bonded to the reference groundplane. The power cord of the EUT is plugged into the power receptacle on the Electrical Fast Transient/Burst Generator. With the interference pulses decoupled from the main power lines, the EUT is powered through the Electrical Fast Transient/Burst Generator. Positive polarity interference pulses of the obligatory amplitude are coupled to one power line of the EUT via the Electrical Fast Transient/Burst Generator's internal coupling network. With the interference pulses on, the EUT is observed for 2 minutes to detect any degradation in the immunity performance of the EUT. Using the same procedure, negative pulses are coupled to the same power line of the EUT. The EUT is evaluated for the remaining power line and for the protective earth line also. After each line is evaluated separately, they are all evaluated simultaneously.

Any I/O cables on the EUT equal to or exceeding three meters in length are also subjected to interference pulses. The I/O cables are placed inside the capacitive coupling clamp, with the clamp bonded to the ground plane less than 1 meter from the EUT. The Electrical Fast Transient/Burst Generator then provides positive polarity interference pulses of 0.5 kV amplitude to the capacitive coupling clamp. With the interference pulses on, the EUT is observed for 2 minutes to detect any degradation in the immunity performance of the EUT. The immunity performance of the EUT is then evaluated with negative polarity interference pulses of 0.5 kV amplitude.

Electrical Fast Transient\Burst Immunity Test Characteristics	
Output voltage to power line	1.0 kilovolts
Output voltage to I/O lines	0.5 kilovolts
Polarity of interference pulses	Negative/Positive
Repetition rate of interference pulses	5.0 kHz
Duration of interference pulses	15.0 ms
Period of interference pulses	300.0 ms

8.4 Performance Criteria

Performance criterion A: The equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion B: The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. However, during the test, degradation of performance is allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion C: Temporary loss of function is allowed provided the function is self recoverable or can be restored by the operation of the controls.

19

8.5 Test Results

Electrical Fast Transient/Burst Immunity Test
IEC 1000-4-4
Power Lines

Coupling Path	Voltage + /- k V	Performance Criteria	Status
Line 1	0.5,1.0	B	Pass
Line 2	0.5,1.0	B	Pass
Protective Earth	0.5,1.0	B	Pass
Line 1/Line 2/Protective Earth	0.5,1.0	B	Pass

Electrical Fast Transient/Burst Immunity Test
IEC 1000-4-4
I/O Cables

Coupling Path	Voltage + /- k V	Performance Criteria	Status
UTP5 Loopback Cable	0.5	B	Pass

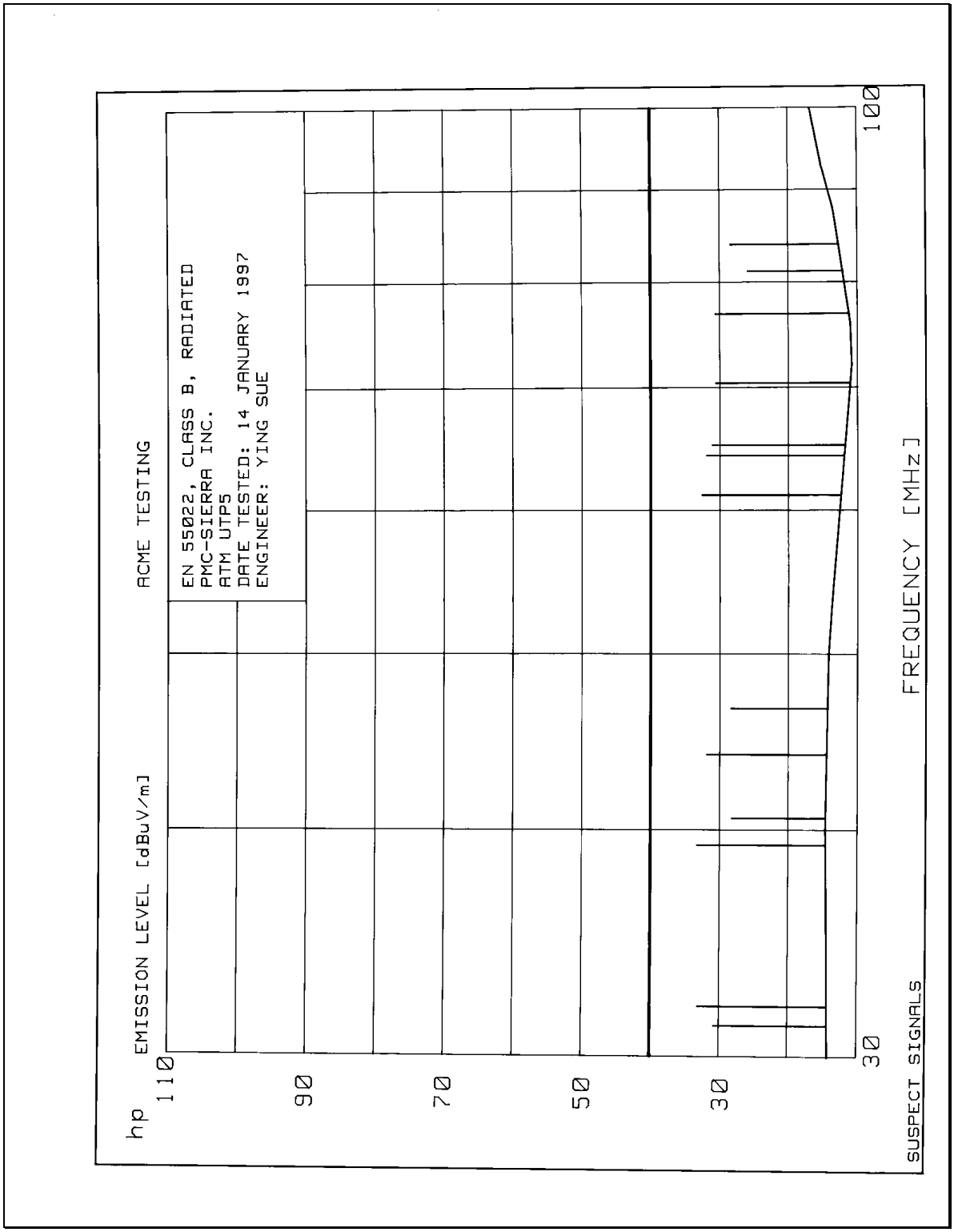
9. Miscellaneous Comments and Notes

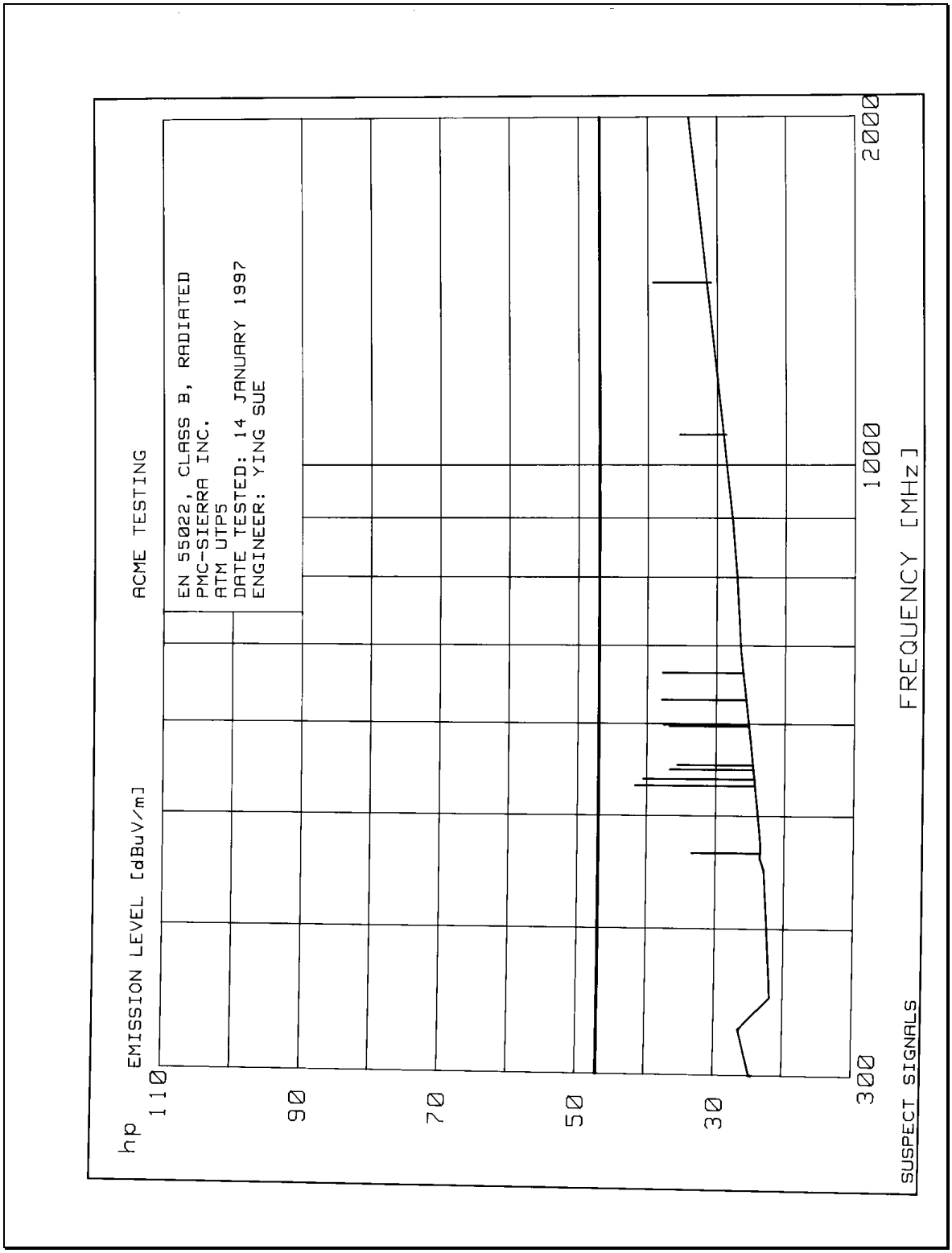
Radiated Emissions were tested to 2GHz, because the EUT has a 155.52MHz clock, and they wanted to see signals up to the 10^{th} harmonic.

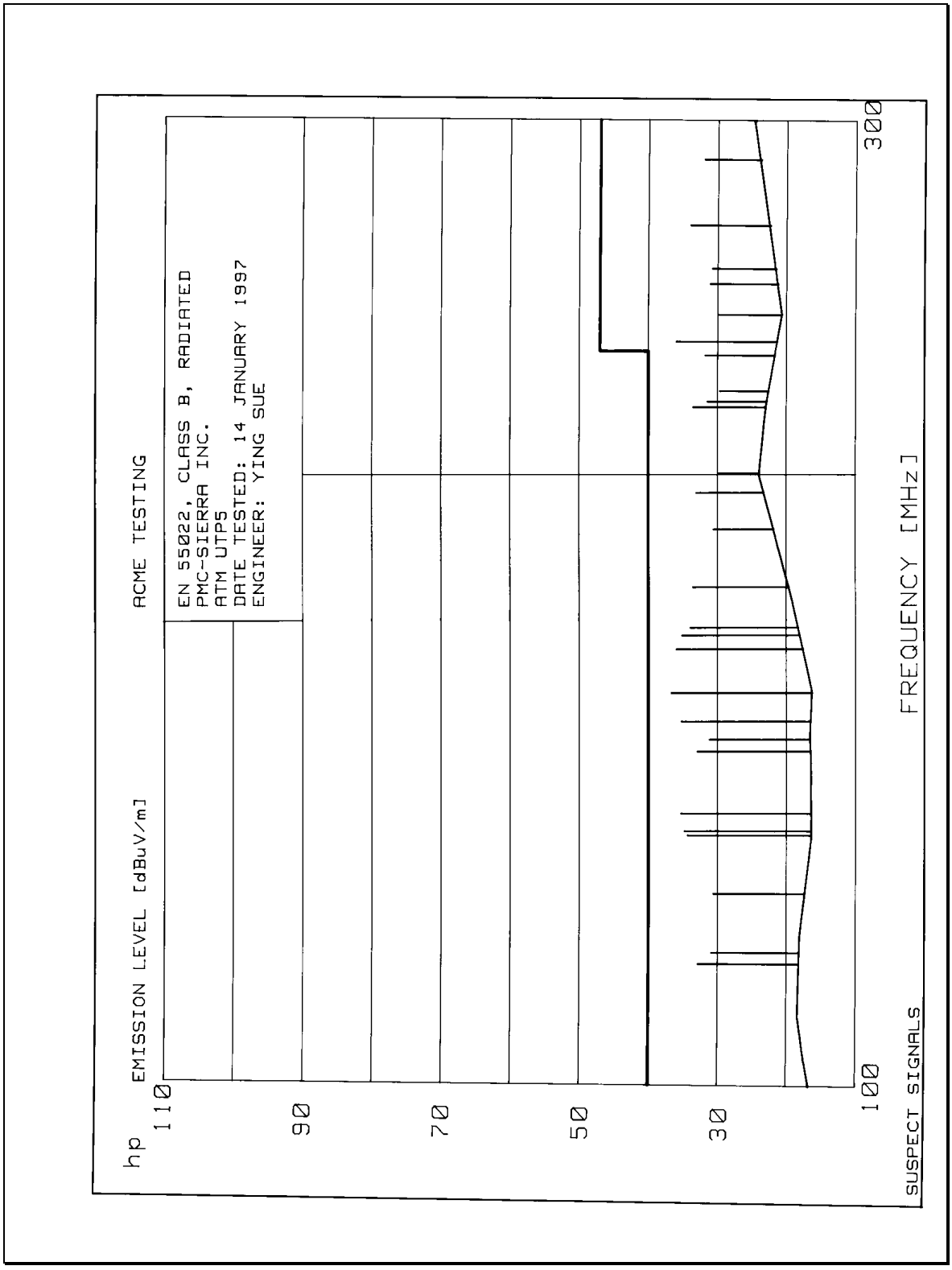
10. List of Attachments

1. Plots of all radiated emissions.
2. List of all radiated emissions.
3. Plots of all conducted emissions.
4. Photographs of test set-ups.

21



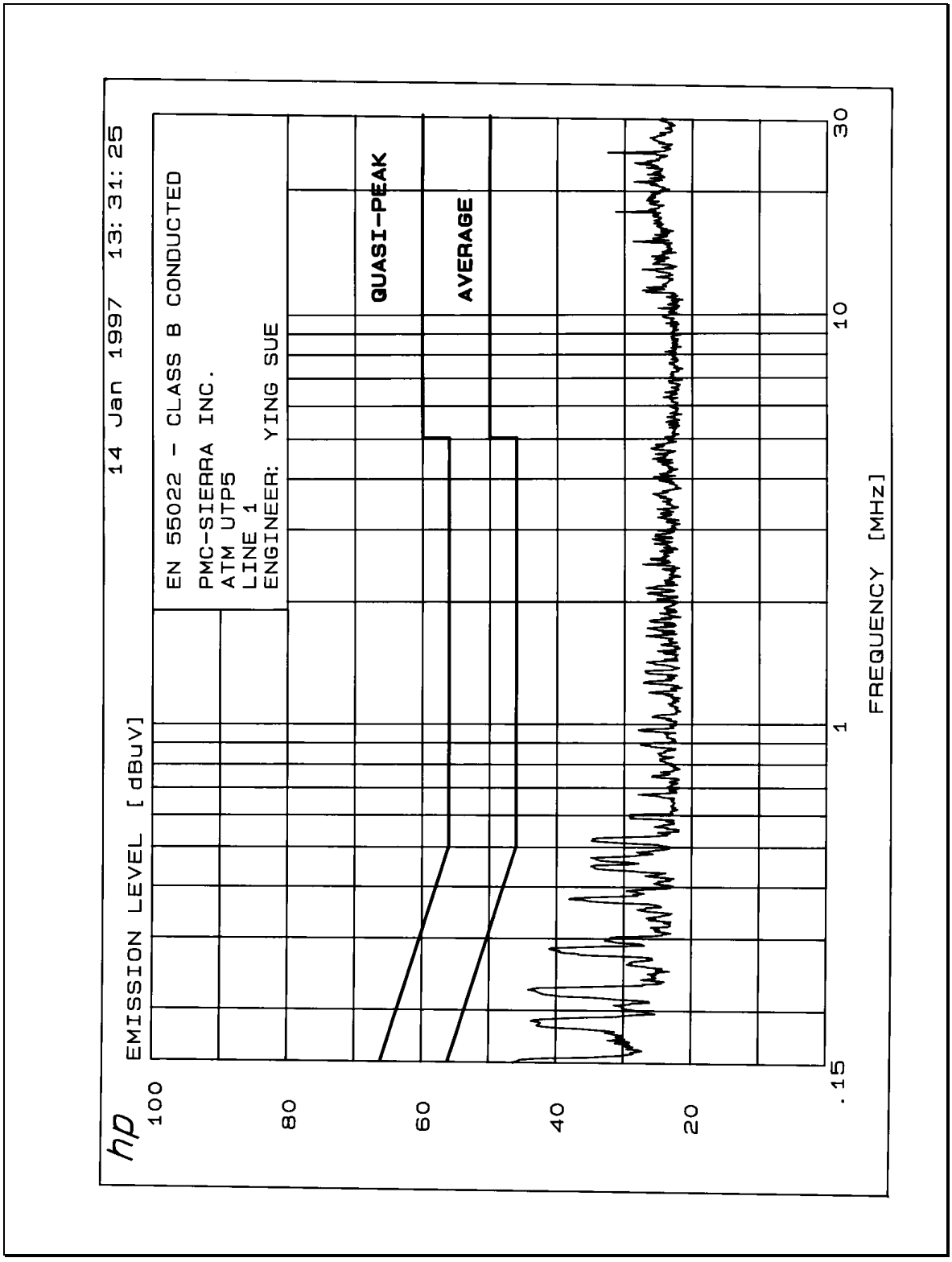


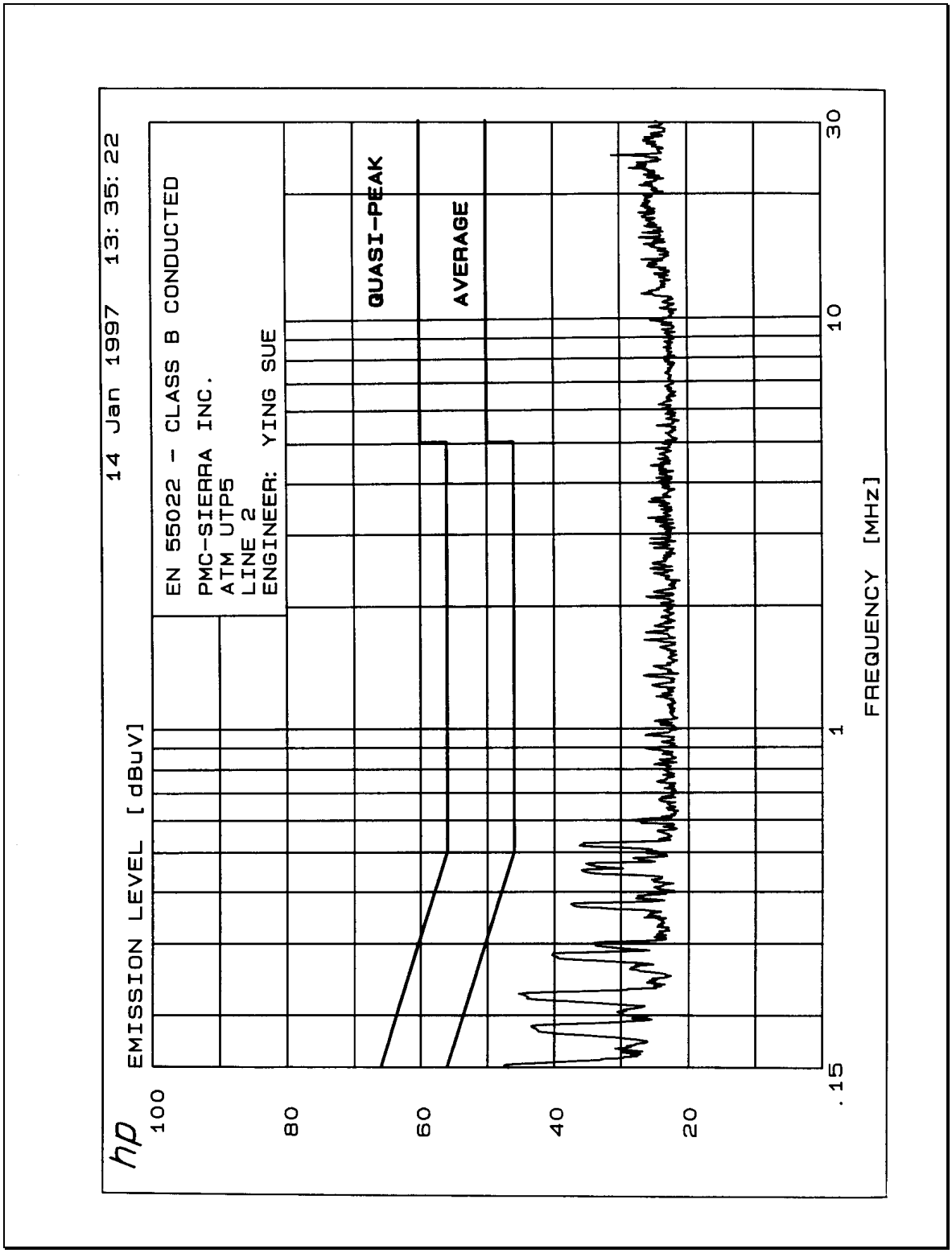


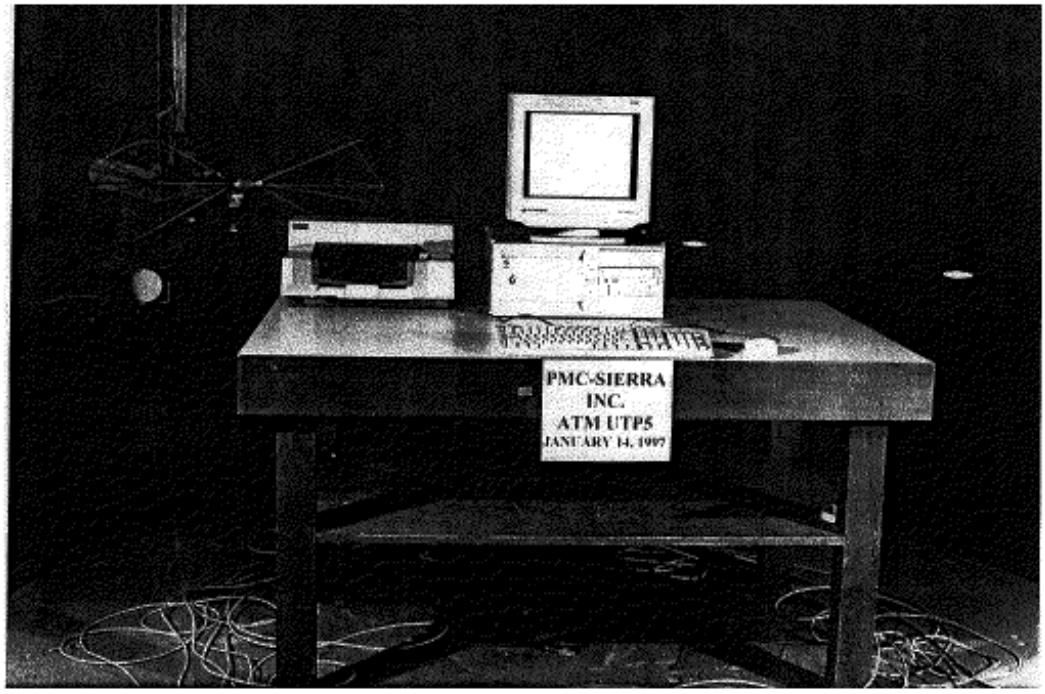
ACME TESTING 16 Jan 1997 13:19:46
ALL SUSPECTS

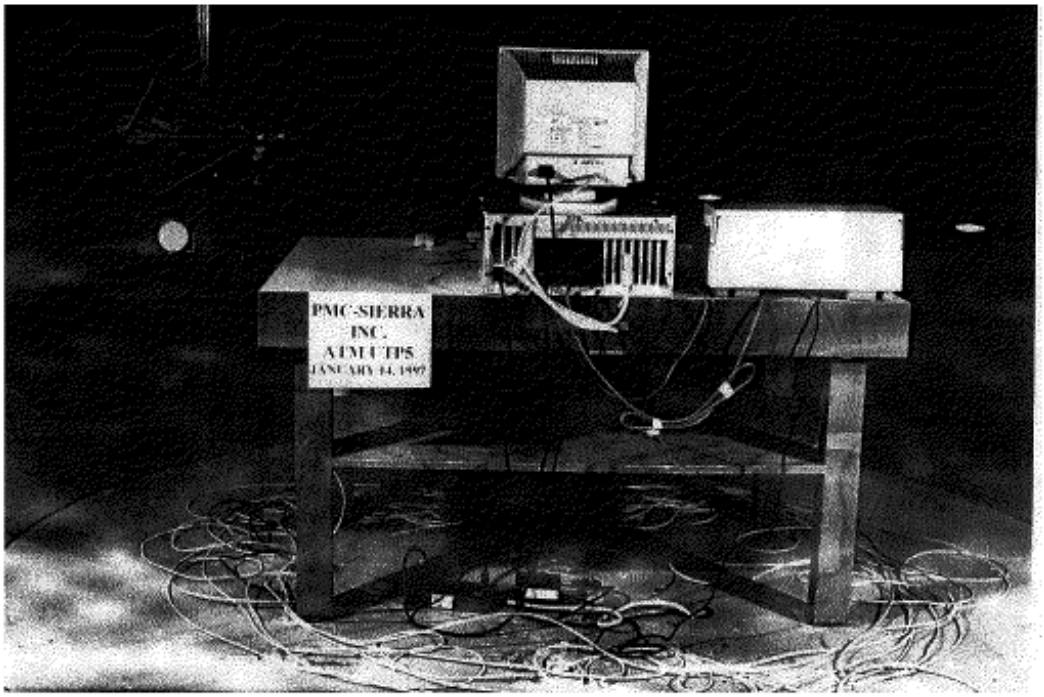
	No	FREQ MHz	BND	PEAK LIM	PEAK ABS	ANT P	AZ cm	AZ deg	COMMENTS
*	1	31.201	1	-3	36.9	V	107	264	
*	2	31.985	1	-2	38.1	V	107	263	
	3	39.27	1	-7	33.2	V	107	258	
*	4	40.628	2	-4	36.1	V	107	265	
	5	44.06	2	-8	31.8	V	107	233	
	6	46.73	2	-12	28.3	V	107	233	
	7	61.24	4	-7	32.6	V	107	233	
	8	64.39	4	-8	31.9	V	107	233	
*	9	65.260	4	-4	35.9	V	107	234	
	10	70.47	4	-9	30.6	V	107	233	
	11	76.93	6	-9	30.6	V	107	254	
	12	81.22	6	-14	25.9	V	107	254	
	13	84.05	6	-12	28.4	V	107	254	
	14	114.62	11	-7	32.9	H	171	289	
	15	116.11	11	-9	30.9	H	171	289	
	16	124.07	12	-9	30.6	H	238	233	
	17	132.632	13	-6	34.4	H	239	84	
	18	133.281	13	-5	34.8	H	239	84	
	19	135.990	13	-5	35.3	H	146	239	
	20	146.007	15	-7	33.0	H	146	239	
	21	148.015	16	-9	31.2	H	146	239	
*	22	151.089	16	-2	38.5	H	205	210	
*	23	156.066	16	0	39.9	H	211	197	
*	24	163.994	17	-1	38.7	H	191	230	
	25	166.61	17	-5	35.1	H	197	233	
	26	168.08	17	-6	33.9	H	197	233	
	27	176.02	18	-6	33.6	H	197	233	
	28	188.06	18	-9	30.6	H	197	233	
	29	196.07	18	-7	33.1	H	197	233	
	30	200.48	19	-10	29.9	V	100	308	
*	31	216.008	20	-2	38.0	V	100	101	
	32	217.38	20	-9	31.5	V	100	109	
*	33	219.980	20	-3	37.2	V	100	108	
*	34	229.071	20	-4	36.2	V	100	66	
	35	232.69	20	-11	36.0	V	100	60	
	36	240.00	21	-17	30.0	V	100	211	
	37	248.69	21	-16	31.1	V	100	257	
	38	253.03	21	-16	30.8	V	100	94	
	39	265.96	21	-13	34.0	V	100	94	
	40	286.86	21	-15	32.0	V	100	94	
	41	465.34	25	-14	33.5	V	100	194	
*	42	531.826	26	-3	44.4	V	100	153	
	43	538.793	26	-6	40.5	V	100	154	
	44	549.2	26	-10	36.7	V	100	156	
	45	554.1	26	-11	35.6	V	100	156	
	46	598.315	27	-10	36.8	V	105	88	
	47	600.1	27	-9	37.6	V	100	91	
	48	630.2	27	-9	38.0	V	100	91	
	49	664.8	27	-9	37.9	V	100	91	
	50	1063.	30	-12	35.5	H	100	193	
	51	1439.	30	-8	39.3	H	100	196	

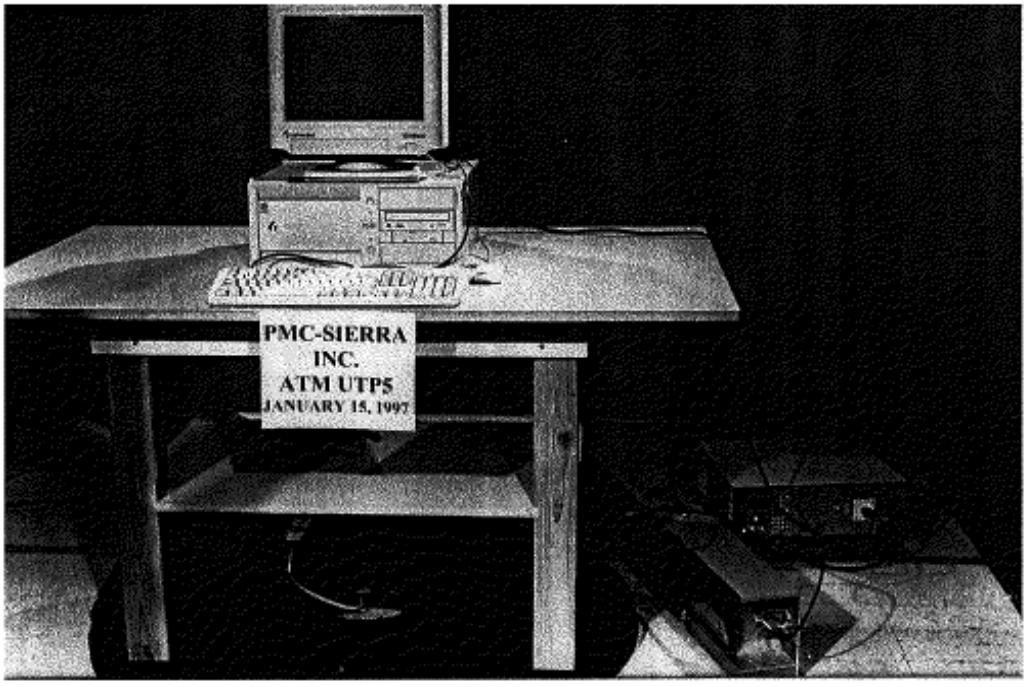
* denotes a Final List signal

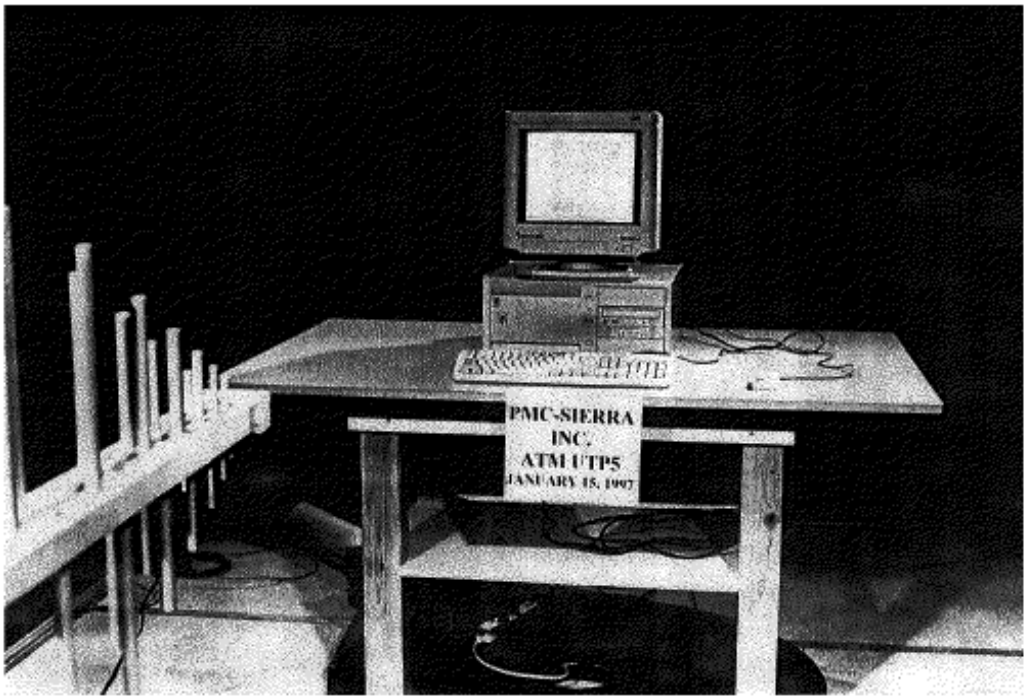


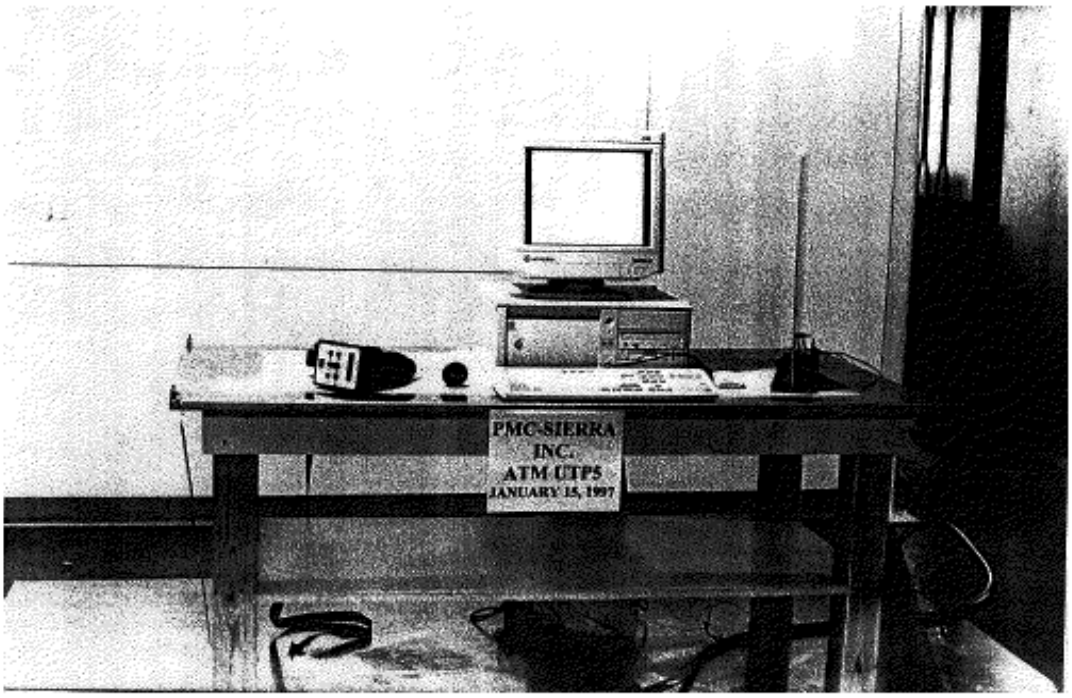












PMC-Sierra, Inc.
105-8555 Baxter Place
Burnaby, BC
Canada V5A 4V7

Tel: (604) 415-6000
Fax: (604) 415-6200

Document Information: document@pmc-sierra.com
Corporate Information: info@pmc-sierra.com
Applications Information: apps@pmc-sierra.com
Web Site: http://www.pmc-sierra.com

PMC-990512 R1 Issue date: May 1999