

CE TEST REPORT

according to

**European Standard EN 55 022:1994/A1:1995 Class A and
EN 61 000-3-2:1995, EN 61 000-3-3:1995, and
EN 50 082-1:1997 (EN 61 000-4-2:1995, EN 61 000-4-3:1996, EN 61 000-4-4:1995,
EN 61 000-4-5:1995, EN 61 000-4-6:1996, EN 61 000-4-8:1993, EN 61 000-4-11:1994)**

EQUIPMENT : IPC

MODEL NO. : IPC-610 series

**APPLICANT : ADVANTECH CO., LTD.
Fl.4, No. 108-3, Ming-Chuan Road,
Shing-Tien City, Taipei, Taiwan, R.O.C.**

- The test result refers exclusively to the test presented test model / sample.
- Without the written authorization of the test lab., the Test Report may not be copied.

SPORTON INTERNATIONAL INC.

6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.



TABLE OF CONTENT

| SECTION TITLE | PAGE |
|--|------|
| CERTIFICATE OF COMPLIANCE | 4 |
| 1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST | 5 |
| 1.1. APPLICANT | 5 |
| 1.2. MANUFACTURER | 5 |
| 1.3. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST | 5 |
| 1.4. FEATURE OF EQUIPMENT UNDER TEST | 5 |
| 2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST | 6 |
| 2.1. TEST MANNER | 6 |
| 2.2. DESCRIPTION OF TEST SYSTEM | 6 |
| 3. TEST SOFTWARE | 10 |
| 3.1. EMI TEST | 10 |
| 3.2. EMS TEST | 10 |
| 4. GENERAL INFORMATION OF TEST | 11 |
| 4.1. TEST FACILITY | 11 |
| 4.2. STANDARD FOR METHODS OF MEASUREMENT | 11 |
| 4.3. TEST IN COMPLIANCE WITH | 11 |
| 4.4. FREQUENCY RANGE INVESTIGATED | 11 |
| 4.5. TEST DISTANCE | 11 |
| 5. TEST OF CONDUCTED POWERLINE | 12 |
| 5.1. DESCRIPTION OF MAJOR TEST INSTRUMENTS | 12 |
| 5.2. TEST PROCEDURES | 13 |
| 5.3. TYPICAL TEST SETUP LAYOUT OF CONDUCTED POWERLINE | 14 |
| 5.4. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION | 15 |
| 5.5. PHOTOGRAPHS OF CONDUCTED POWERLINE TEST CONFIGURATION | 17 |
| 6. TEST OF RADIATED EMISSION | 18 |
| 6.1. DESCRIPTION OF MAJOR TEST INSTRUMENTS | 18 |
| 6.2. TEST PROCEDURES | 19 |
| 6.3. TYPICAL TEST SETUP LAYOUT OF RADIATED EMISSION | 20 |
| 6.4. TEST RESULT OF RADIATED EMISSION | 21 |
| 6.5. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION | 23 |
| 7. HARMONICS TEST | 24 |
| 7.1. STANDARD | 24 |
| 7.2. TEST PROCEDURE | 24 |
| 7.3. TEST EQUIPMENT SETTINGS | 24 |
| 7.4. TEST SETUP | 24 |
| 7.5. HARMONICS TEST | 25 |
| 8. VOLTAGE FLUCTUATIONS TEST | 27 |
| 8.1. STANDARD | 27 |
| 8.2. TEST PROCEDURE | 27 |
| 8.3. TEST EQUIPMENT SETTINGS | 27 |
| 8.4. TEST SETUP | 27 |



| | |
|--|--------------|
| 8.5. TEST RESULT OF VOLTAGE FLUCTUATION AND FLICKER TEST | 28 |
| 8.6. PHOTOGRAPHS OF HARMONICS TEST, VOLTAGE FLUCTUATION AND FLICKER TEST | 30 |
| 9. ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD) | 31 |
| 9.1. TEST SETUP | 31 |
| 9.2. TEST SETUP FOR TESTS PERFORMED IN LABORATORY | 32 |
| 9.3. ESD TEST PROCEDURE | 33 |
| 9.4. TEST SEVERITY LEVELS | 34 |
| 9.5. TEST POINTS | 35 |
| 9.6. PHOTOGRAPHS OF ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST | 37 |
| 10. RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) | 38 |
| 10.1. TEST SETUP | 38 |
| 10.2. TEST PROCEDURE | 39 |
| 10.3. TEST SEVERITY LEVELS | 40 |
| 10.4. PHOTO OF RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST | 41 |
| 11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT/BURST) | 42 |
| 11.1. TEST SETUP | 42 |
| 11.2. TEST ON POWER LINE | 43 |
| 11.3. TEST ON COMMUNICATION LINES | 43 |
| 11.4. TEST PROCEDURE | 44 |
| 11.5. TEST SEVERITY LEVELS | 45 |
| 11.6. PHOTO OF ELECTRICAL FAST TRANSIENT/BURST (EFT) IMMUNITY TEST | 46 |
| 12. SURGE IMMUNITY TEST | 47 |
| 12.1. TEST RECORD | 47 |
| 12.2. TEST LEVEL | 48 |
| 12.3. TEST PROCEDURE | 48 |
| 12.4. OPERATING CONDITION | 49 |
| 13. CONDUCTED DISTURBANCES INDUCED BY RADIO-FREQUENCY FIELD IMMUNITY TEST (CS) .. | 50 |
| 13.1. TEST LEVEL | 50 |
| 13.2. OPERATING CONDITION | 50 |
| 13.3. TEST PROCEDURE | 51 |
| 14. Power Frequency Magnetic Field immunity tests..... | 52 |
| 14.1. TEST RECORD | 52 |
| 14.2. TEST SETUP | 52 |
| 14.3. OPERATING CONDITION | 52 |
| 15. VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY TESTS | 53 |
| 15.1. TEST RECORD OF VOLTAGE INTERRUPTION | 53 |
| 15.2. TEST RECORD OF VOLTAGE DIPS | 53 |
| 15.3. TESTING REQUIREMENT AND PROCEDURE | 54 |
| 15.4. TEST CONDITIONS | 54 |
| 15.5. OPERATING CONDITION | 54 |
| 16. LIST OF MEASURING EQUIPMENT USED | 55 |
| 17. DECLARATION OF CONFORMITY AND THE CE MARK | 57 |
| APPENDIX A. Photographs of EUT | A1-A7 |

CERTIFICATE OF COMPLIANCE

according to

**European Standard EN 55 022:1994/A1:1995 Class A and
EN 61 000-3-2:1995, EN 61 000-3-3:1995, and
EN 50 082-1:1997 (EN 61 000-4-2:1995, EN 61 000-4-3:1996, EN 61 000-4-4:1995,
EN 61 000-4-5:1995, EN 61 000-4-6:1996, EN 61 000-4-8:1993, EN 61 000-4-11:1994)**

EQUIPMENT : IPC

MODEL NO. : IPC-610 series

**APPLICANT : ADVANTECH CO., LTD.
Fl.4, No. 108-3, Ming-Chuan Road,
Shing-Tien City, Taipei, Taiwan, R.O.C.**

I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 89/336/EEC**. The equipment was **passed** the test performed according to

**EUROPEAN STANDARD European Standard EN 55 022:1994/A1:1995 Class A and
EN 61 000-3-2:1995, EN 61 000-3-3:1995 and EN 50 082-1:1997**

**(EN 61 000-4-2:1995, EN 61 000-4-3:1996, EN 61 000-4-4:1995, EN 61 000-4-5:1995,
EN 61 000-4-6:1996, EN 61 000-4-8:1993, EN 61 000-4-11:1994).**

The test was carried out on **Feb. 04, 1999** at **SPORTON INTERNATIONAL INC. LAB.**


Lenore Chang

President

SPORTON International Inc.

6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei, Hsien, Taiwan, R.O.C.



1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

1.1. APPLICANT

ADVANTECH CO., LTD.
Fl.4, No. 108-3, Ming-Chuan Road,
Shing-Tien City, Taipei, Taiwan, R.O.C.

1.2. MANUFACTURER

Same as 1.1.

1.3. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

EQUIPMENT : IPC
MODEL NO. : IPC-610 series
TRADE NAME : ADVANTECH
DATA CABLE : Shielded
RS232 MOUSE DATA CABLE : Non-shielded,
POWER SUPPLY TYPE : Switching
INPUT POWER CORD : Non-shielded, 1.7m, 3pin
OUTPUT POWER CORD : Non-shielded, 1.7m, 3pin

1.4. FEATURE OF EQUIPMENT UNDER TEST

- VGA mode : 640x480, 31.5K
- Main Board : Advantech, PCA-6159
CPU : Pentium, MMX-233/66
Power Supply : Bestec, BPS-2504-4TU
- Main Board : ASUS, P2L97
CPU : Pentium II – 233/66
Power Supply : DELTA, DPS-200PB-103 A



2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1. TEST MANNER

- a. The SONY monitor, DELL keyboard, PRIMAX RS232 mouse, HP printer and ACEEX modem were connected to the EUT for EMI test. During testing, the interface cables and equipment positions were varied according to European Standard EN 55 022.
- b. The HP monitor, DELL keyboard, LOGITECH RS232 mouse, HP printer and ACEEX modem were connected to the EUT for EMS, Harmonics and Flicker test. According to European Standard EN 50 082-1, EN 61 000-3-2 and EN 61 000-3-3.

2.2. DESCRIPTION OF TEST SYSTEM

< EMI >

Support Device 1. --- MONITOR (SONY)

FCC ID : AK8GDM17SE2T
Model No. : GDM-17SE2T
Serial No. : SP1009
Data Cable : Shielded, 360 degree via metal backshells, 1.7m
Power Supply Type : Switching
Power Cord : Non-shielded

Support Device 2. --- KEYBOARD (DELL)

FCC ID : GYUM92SK
Model No. : AT101 (DE8M)
Serial No. : SP1021
Data Cable : Shielded, 360 degree via metal backshells, 1.9m

Support Device 3. --- RS232 MOUSE (PRIMAX)

FCC ID : EMJMU5GH
Model No. : MUS9H
Serial No. : SP1026
Data Cable : Non-shielded, 1.7m

Support Device 4. --- PRINTER (HP)

FCC ID : B94C2642X
Model No. : DESK JET 400
Serial No. : SP1040
Data Cable : Shielded, 360 degree via metal backshells, 1.35m
Power Supply Type : Linear, Adapter
Power Cord : Non-shielded

Support Device 5. -- MODEM (ACEEX)

FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear, AC Adapter
Power Cord : Non-shielded
Serial No. : SP1045
Data Cable : Shielded, 360 degree via metal backshells, 1.15m

**< EMS >****Support Device 1. --- MONITOR (HP)**

FCC ID : ACJ93312116
Model No. : D2807A
Serial No. : SP1010
Data Cable : Shielded, 360 degree via metal backshells, 1.7m
Power Supply Type : Switching
Power Cord : Non-shielded

Support Device 2. --- KEYBOARD (DELL)

FCC ID : GYUM92SK
Model No. : AT101 (DE8M)
Serial No. : SP1021
Data Cable : Shielded, 360 degree via metal backshells, 1.9m

Support Device 3. -- RS232 MOUSE (LOGITECH)

FCC ID : DZL210365
Model No. : M-M35
Serial No. : SP1032
Data Cable : Non-shielded, 1.9m

Support Device 4. --- PRINTER (HP)

FCC ID : B94C2642X
Model No. : DESK JET 400
Serial No. : SP1040
Data Cable : Shielded, 360 degree via metal backshells, 1.35m
Power Supply Type : Linear, Adapter
Power Cord : Non-shielded



CE TEST REPORT

REPORT NO. : C912505

Support Device 5. -- MODEM (ACEEX)

FCC ID : IFAXDM1414

Model No. : DM1414

Power Supply Type : Linear, AC Adapter

Power Cord : Non-shielded

Serial No. : SP1045

Data Cable : Shielded, 360 degree via metal backshells, 1.15m



3. TEST SOFTWARE

3.1. EMI TEST

An executive program, EMITEST.EXE under WIN98, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the floppy disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the modem.
- f. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from b to f.

3.2. EMS TEST

Two executive programs, EMITEST.EXE and WINFCC.EXE under WIN98, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the floppy disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the modem.
- f. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from b to f.

An executive program, CDPLAYER under WIN98, was executed during testing.



4. GENERAL INFORMATION OF TEST

4.1. TEST FACILITY

This test was carried out by SPORTON INTERNATIONAL INC.

Test Site Location : No. 30-1, Lin 6, Diing-Fwu Tsuen, Lin-Kou-Hsiang,
Taipei Hsien, Taiwan, R.O.C.

TEL : 886-2-2601-1640

FAX : 886-2-2601-1695

4.2. STANDARD FOR METHODS OF MEASUREMENT

EMI Test (conduction and radiation) : European Standard EN 55 022 Class A.

Harmonics Test : European Standard EN 61 000-3-2.

Voltage fluctuations Test : European Standard EN 61 000-3-3.

EMS Test : European Standard EN 50 082-1.

(ESD: EN 61 000-4-2, RS: EN 61 000-4-3, EFT: EN 61 000-4-4, SURGE: EN 61 000-4-5,

CS: EN 61 000-4-6, Power Frequency Magnetic Field: EN 61 000-4-8, DIPS: EN 61 000-4-11)

4.3. TEST IN COMPLIANCE WITH

EMI Test (conduction and radiation) : European Standard EN 55 022 Class A.

Harmonics Test : European Standard EN 61 000-3-2.

Voltage fluctuations Test : European Standard EN 61 000-3-3.

EMS Test : European Standard EN 50 082-1.

(ESD: EN 61 000-4-2, RS: EN 61 000-4-3, EFT: EN 61 000-4-4, SURGE: EN 61 000-4-5,

CS: EN 61 000-4-6, Power Frequency Magnetic Field: EN 61 000-4-8, DIPS: EN 61 000-4-11)

4.4. FREQUENCY RANGE INVESTIGATED

- a. Conducted emission test: from 150 KHz to 30 MHz
- b. Radiated emission test: from 30 MHz to 1000 MHz
- c. Radio frequency electromagnetic field immunity test : from 80 MHz to 1000 MHz.

4.5. TEST DISTANCE

The test distance of radiated emission test from antenna to EUT is 10 M.

The test distance of radio frequency electromagnetic field immunity test from antenna to EUT is 3 M.



5. TEST OF CONDUCTED POWERLINE

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz on the 230 VAC power and return leads of the EUT according to the methods defined in European Standard EN 55 022 Clause 9. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in Figure 5-3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

5.1. DESCRIPTION OF MAJOR TEST INSTRUMENTS

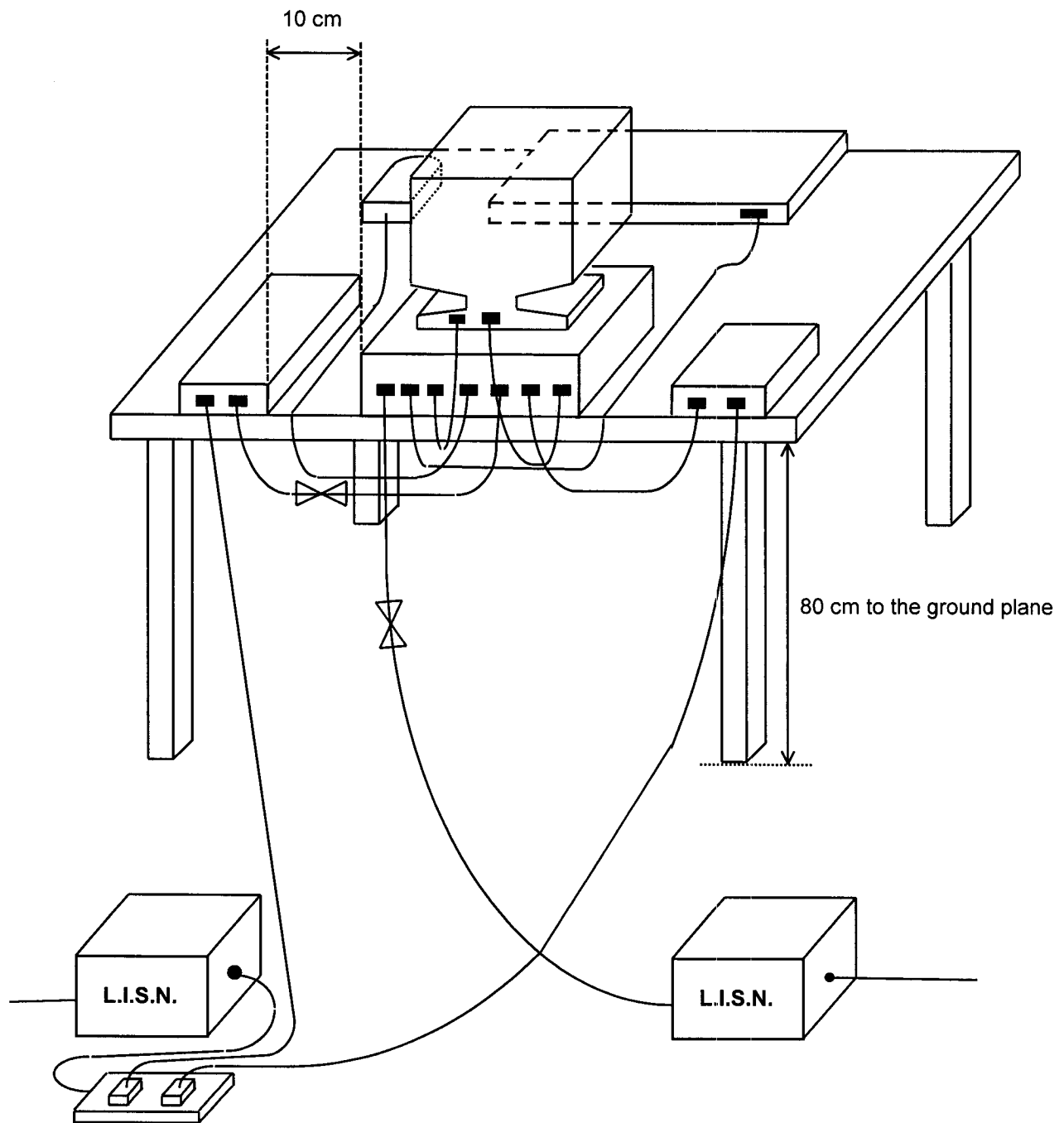
- Test Receiver (HP 8591EM)
 - Attenuation 0 dB
 - Start Frequency 0.15 MHz
 - Stop Frequency 30 MHz
 - Step MHz 0.007 MHz
 - IF Bandwidth 9 KHz

**5.2. TEST PROCEDURES**

- a. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The CISPR states that a 50 ohm , 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 KHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- i. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 6 dB margin will be retested one by one using the quasi-peak method and/or average methods and reported.



5.3. TYPICAL TEST SETUP LAYOUT OF CONDUCTED POWERLINE



**5.4. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION**

- Equipment meets the technical specifications of EN 55 022 (1994)
- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 21°C
- Relative Humidity : 62% RH
- Test Mode : AT POWER
- Test Date : Jan. 28, 1999

The Conducted Emission test was passed at Line 0.64 MHz / 57.60 dBuV.

| Frequency (MHz) | Line or Neutral | Meter Reading | | | | Limits | | | | Margin | |
|----------------------|-----------------------|------------------|------------------|----------------|----------------|------------------|------------------|----------------|----------------|----------------|----------------|
| | | Q.P. (dBuV) | A.V. (dBuV) | Q.P. (uV) | A.V. (uV) | Q.P. (dBuV) | A.V. (dBuV) | Q.P. (uV) | A.V. (uV) | Q.P. (dB) | A.V. (dB) |
| 0.19 | Line | 59.20 | 54.10 | 912.01 | 506.99 | 79.00 | 66.00 | 8912.51 | 1995.26 | -19.80 | -11.90 |
| 0.53 | Line | 57.50 | 54.20 | 749.89 | 512.86 | 73.00 | 60.00 | 4466.84 | 1000.00 | -15.50 | -5.80 |
| 0.64 | Line | 57.60 | 53.80 | 758.58 | 489.78 | 73.00 | 60.00 | 4466.84 | 1000.00 | -15.40 | -6.20 |
| 0.19 | Neutral | 59.30 | 53.50 | 922.57 | 473.15 | 79.00 | 66.00 | 8912.51 | 1995.26 | -19.70 | -12.50 |
| 0.53 | Neutral | 57.30 | 54.00 | 732.82 | 501.19 | 73.00 | 60.00 | 4466.84 | 1000.00 | -15.70 | -6.00 |
| 0.75 | Neutral | 56.70 | 52.60 | 683.91 | 426.58 | 73.00 | 60.00 | 4466.84 | 1000.00 | -16.30 | -7.40 |

Test Engineer :

Kenny Chuang

**5.4.1. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION**

- Equipment meets the technical specifications of EN 55 022 (1994)
- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 21°C
- Relative Humidity : 62% RH
- Test Mode : ATX POWER
- Test Date : Mar. 09, 1999

The Conducted Emission test was passed at Line 0.19 MHz / 49.30 dBuV.

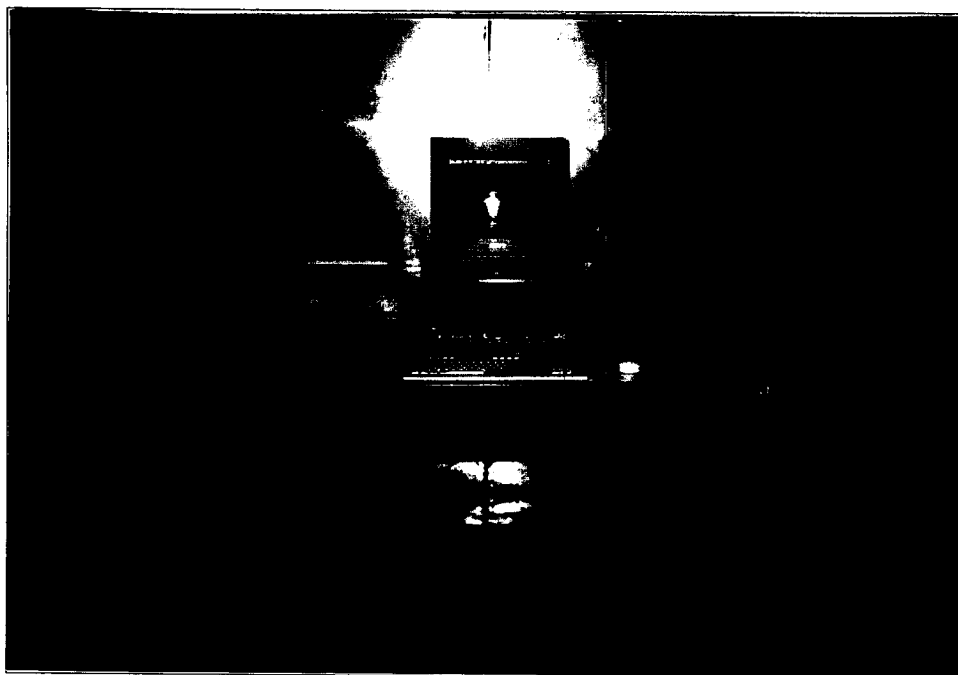
| Frequency (MHz) | Line or Neutral | Meter Reading | | | | Limits | | | | Margin | |
|----------------------|-----------------------|------------------|------------------|----------------|----------------|------------------|------------------|----------------|----------------|----------------|----------------|
| | | Q.P. (dBuV) | A.V. (dBuV) | Q.P. (uV) | A.V. (uV) | Q.P. (dBuV) | A.V. (dBuV) | Q.P. (uV) | A.V. (uV) | Q.P. (dB) | A.V. (dB) |
| 0.19 | Line | 49.30 | 49.10 | 291.74 | 285.10 | 79.00 | 66.00 | 8912.51 | 1995.26 | -29.70 | -16.90 |
| 0.29 | Line | 43.00 | 42.50 | 141.25 | 133.35 | 79.00 | 66.00 | 8912.51 | 1995.26 | -36.00 | -23.50 |
| 25.08 | Line | 36.30 | 29.50 | 65.31 | 29.85 | 73.00 | 60.00 | 4466.84 | 1000.00 | -36.70 | -30.50 |
| 0.19 | Neutral | 48.60 | 48.20 | 269.15 | 257.04 | 79.00 | 66.00 | 8912.51 | 1995.26 | -30.40 | -17.80 |
| 0.29 | Neutral | 42.60 | 42.00 | 134.90 | 125.89 | 79.00 | 66.00 | 8912.51 | 1995.26 | -36.40 | -24.00 |
| 25.08 | Neutral | 37.20 | 31.40 | 72.44 | 37.15 | 73.00 | 60.00 | 4466.84 | 1000.00 | -35.80 | -28.60 |

Test Engineer : Kenny Chuang

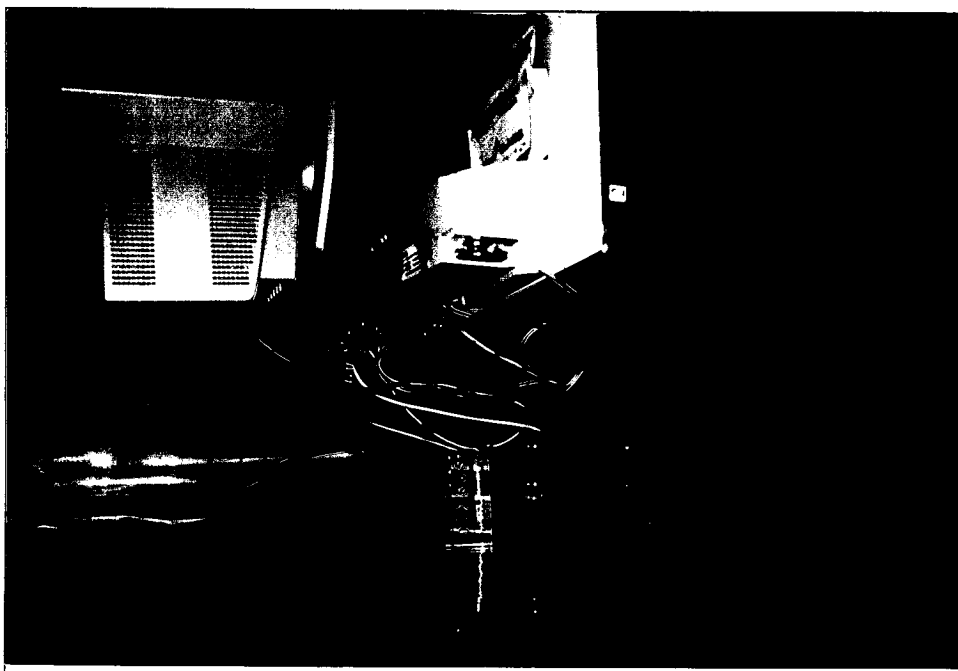
Kenny Chuang

5.5. PHOTOGRAPHS OF CONDUCTED POWERLINE TEST CONFIGURATION

FRONT VIEW



REAR VIEW



6. TEST OF RADIATED EMISSION

Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 KHz according to the methods defines in European Standard EN 55 022, Clause 10. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in Figure 6-3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1. DESCRIPTION OF MAJOR TEST INSTRUMENTS

- Amplifier (HP 8447D)
 - Attenuation 0 dB
 - RF Gain 25 dB
 - Signal Input 0.1 MHz to 1.3 GHz

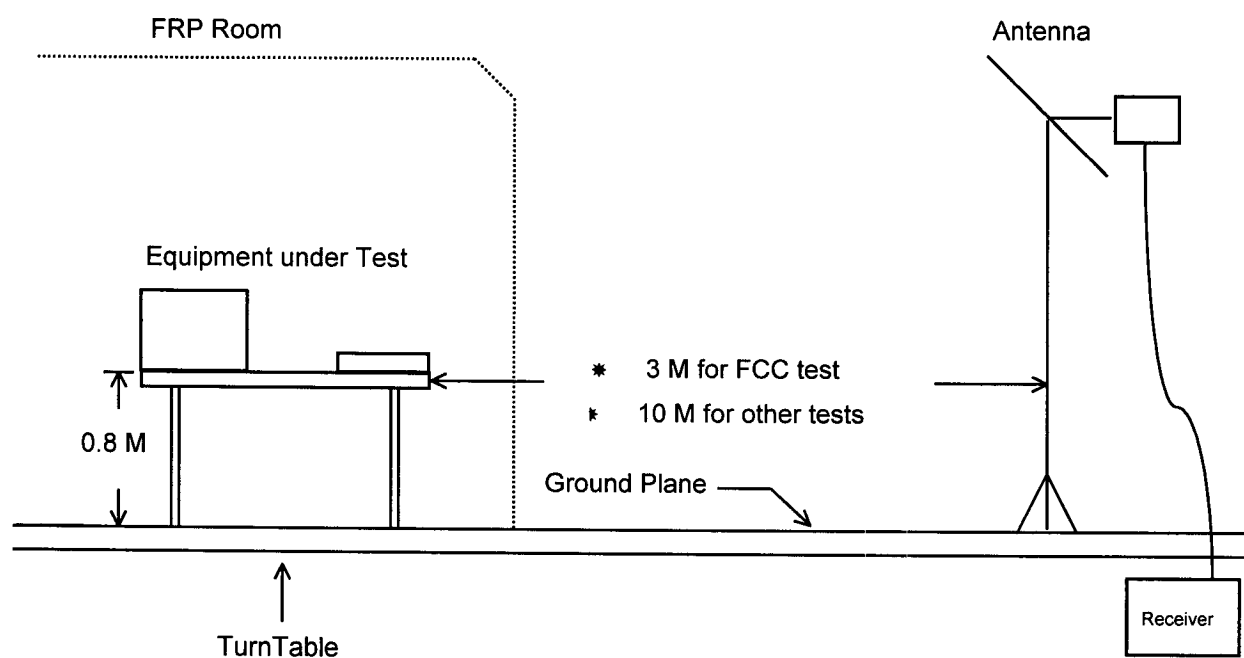
- Spectrum Analyzer (HP 8560E)
 - Attenuation 0 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 30 Hz to 2.9 GHz

- Test Receiver (R&S ESVP)
 - Resolution Bandwidth 120 KHz
 - Frequency Band 30 MHz to 1 GHz
 - Quasi-Peak Detector ON for Quasi-Peak Mode
OFF for Peak Mode

6.2. TEST PROCEDURES

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 6 dB margin will be repeated one by one using the quasi-peak method and reported.

6.3. TYPICAL TEST SETUP LAYOUT OF RADIATED EMISSION



**6.4. TEST RESULT OF RADIATED EMISSION**

- Equipment meets the technical specifications of EN 55022 (1994)
- Frequency Range of Test : from 30 MHz to 1000 MHz
- Test Distance : 10 M
- Temperature : 26°C
- Relative Humidity : 55 % RH
- Test Mode : AT POWER
- Test Date : Jan. 27, 1999

- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Sample Calculation at 184.14 MHz
Corrected Reading = 9.02 + 2.06 + 24.90 = 35.98 (dBuV/m)

The Radiated Emission test was passed at

Horizontal 433.33 MHz / 43.39 dBuV ,

Antenna Height 4.0 Meter , Turntable Degree 60°.

| Frequency | Antenna | Cable | Reading | Limits | | Emission | Level | Margin | |
|-----------|---------|--------|----------|----------|--------|----------|--------|--------|-------|
| Polarity | Factor | Loss | | | | | | | |
| (MHz) | (dB/m) | (dB) | (dBuV) | (dBuV/m) | (uV/m) | (dBuV/m) | (uV/m) | (dB) | |
| 184.14 | H | 9.02 | 2.06 | 24.90 | 40.00 | 100 | 35.98 | 62.95 | -4.02 |
| 215.75 | H | 9.35 | 2.43 | 22.70 | 40.00 | 100 | 34.48 | 52.97 | -5.52 |
| 301.03 | H | 13.62 | 2.90 | 23.64 | 47.00 | 224 | 40.17 | 101.98 | -6.83 |
| 433.33 | H | 16.97 | 3.60 | 22.82 | 47.00 | 224 | 43.39 | 147.74 | -3.61 |
| 301.03 | V | 13.62 | 2.90 | 24.97 | 47.00 | 224 | 41.50 | 118.85 | -5.50 |
| 432.54 | V | 16.95 | 3.60 | 21.97 | 47.00 | 224 | 42.52 | 133.66 | -4.48 |

Test Engineer : Jack Deng

Jack Deng

**6.4. TEST RESULT OF RADIATED EMISSION**

- Equipment meets the technical specifications of EN 55022 (1994)
- Frequency Range of Test : from 30 MHz to 1000 MHz
- Test Distance : 10 M
- Temperature : 26°C
- Relative Humidity : 55 % RH
- Test Mode : ATX POWER
- Test Date : Mar. 09, 1999

- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Sample Calculation at 229.60 MHz
Corrected Reading = 9.92 + 2.52 + 20.37 = 32.81 (dBuV/m)

The Radiated Emission test was passed at

Vertical 53.12 MHz / 36.90 dBuV ,

Antenna Height 2.0 Meter , Turntable Degree 190°.

| Frequency | Antenna | Cable | Reading | Limits | Emission | Level | Margin | | |
|-----------|---------|--------|----------|----------|----------|----------|--------|--------|-------|
| Polarity | Factor | Loss | | | | | | | |
| (MHz) | (dB/m) | (dB) | (dBuV) | (dBuV/m) | (uV/m) | (dBuV/m) | (uV/m) | (dB) | |
| 229.60 | H | 9.92 | 2.52 | 20.37 | 40.00 | 100 | 32.81 | 43.70 | -7.19 |
| 46.66 | V | 9.40 | 1.20 | 25.38 | 40.00 | 100 | 35.98 | 62.95 | -4.02 |
| 48.36 | V | 8.69 | 1.20 | 25.54 | 40.00 | 100 | 35.43 | 59.09 | -4.57 |
| 53.12 | V | 7.00 | 1.20 | 28.70 | 40.00 | 100 | 36.90 | 69.98 | -3.10 |
| 335.20 | V | 14.44 | 3.04 | 21.53 | 47.00 | 224 | 39.02 | 89.33 | -7.98 |
| 600.80 | V | 20.01 | 4.10 | 18.05 | 47.00 | 224 | 42.16 | 128.23 | -4.84 |

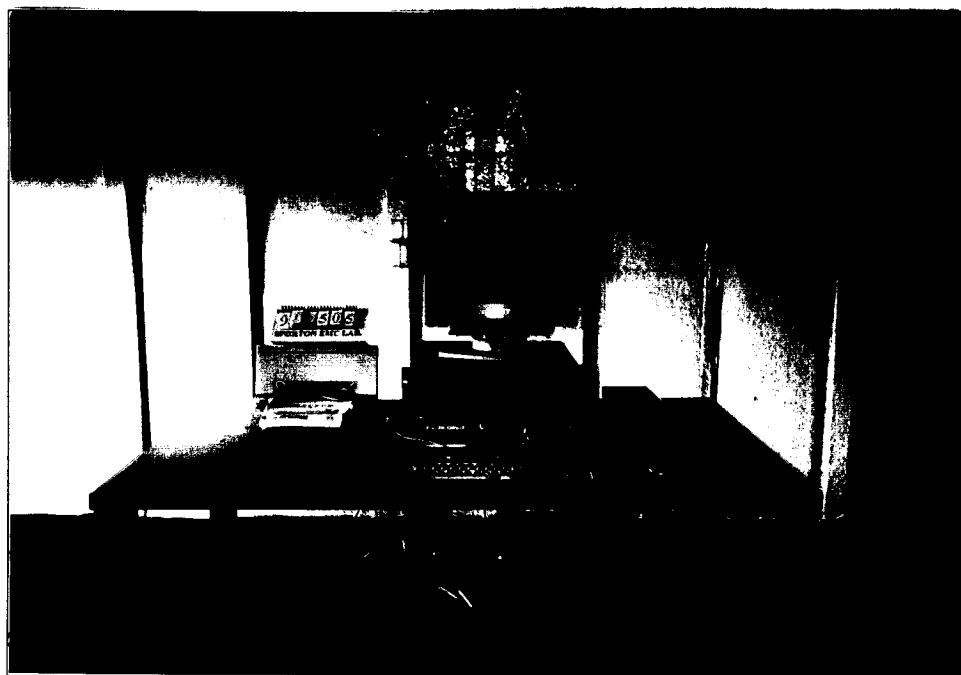
Test Engineer : Jack Deng

Jack Deng

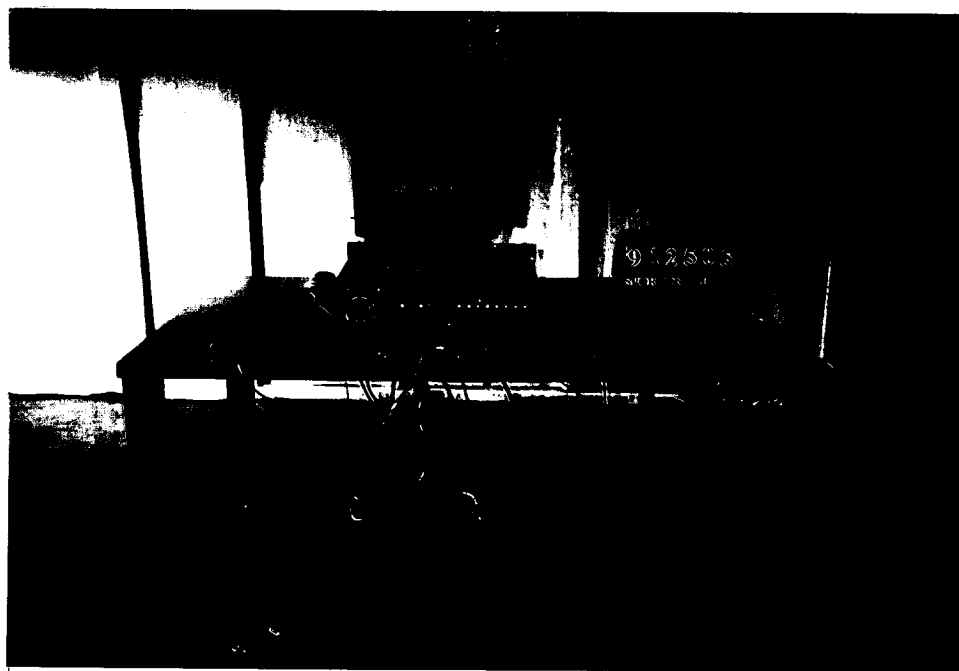


6.5. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION

FRONT VIEW



REAR VIEW





7. HARMONICS TEST

7.1. STANDARD

- Product Standard : EN 61 000-3-2 (1995)

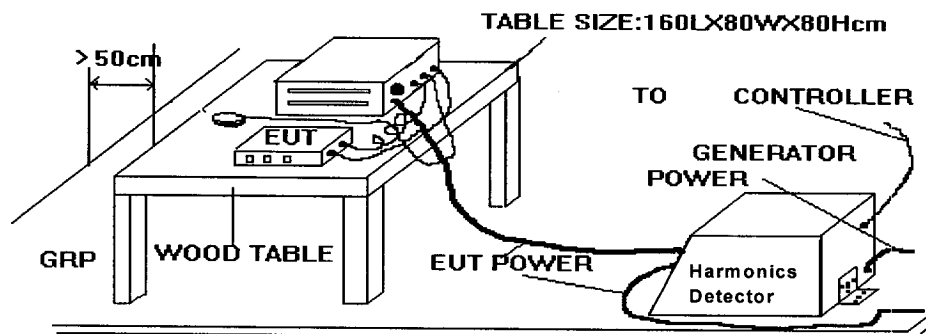
7.2. TEST PROCEDURE

The measured values of the harmonics components of the input current, including line current and neutral current, shall be compared with the limits given in Clause 4.

7.3. TEST EQUIPMENT SETTINGS

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Device Class : A
- Current Measurement Range : High
- Measurement Delay : 10.0 second
- Test Duration : 2.00 minutes
- Class determination Pre-test Duration : 10.00 seconds

7.4. TEST SETUP



7.5. HARMONICS TEST

7.5.1. TEST DATA OF HARMONICS

- **FINAL TEST RESULT : PASS**
- Fundamental Current : 0.202 A
- Real Power : 44.1 W
- Power Factor : 0.456
- Percent in Envelope : 100.0%
- Temperature : 24 °C
- Relative Humidity : 57 % RH
- Test Date : Feb. 01, 1999

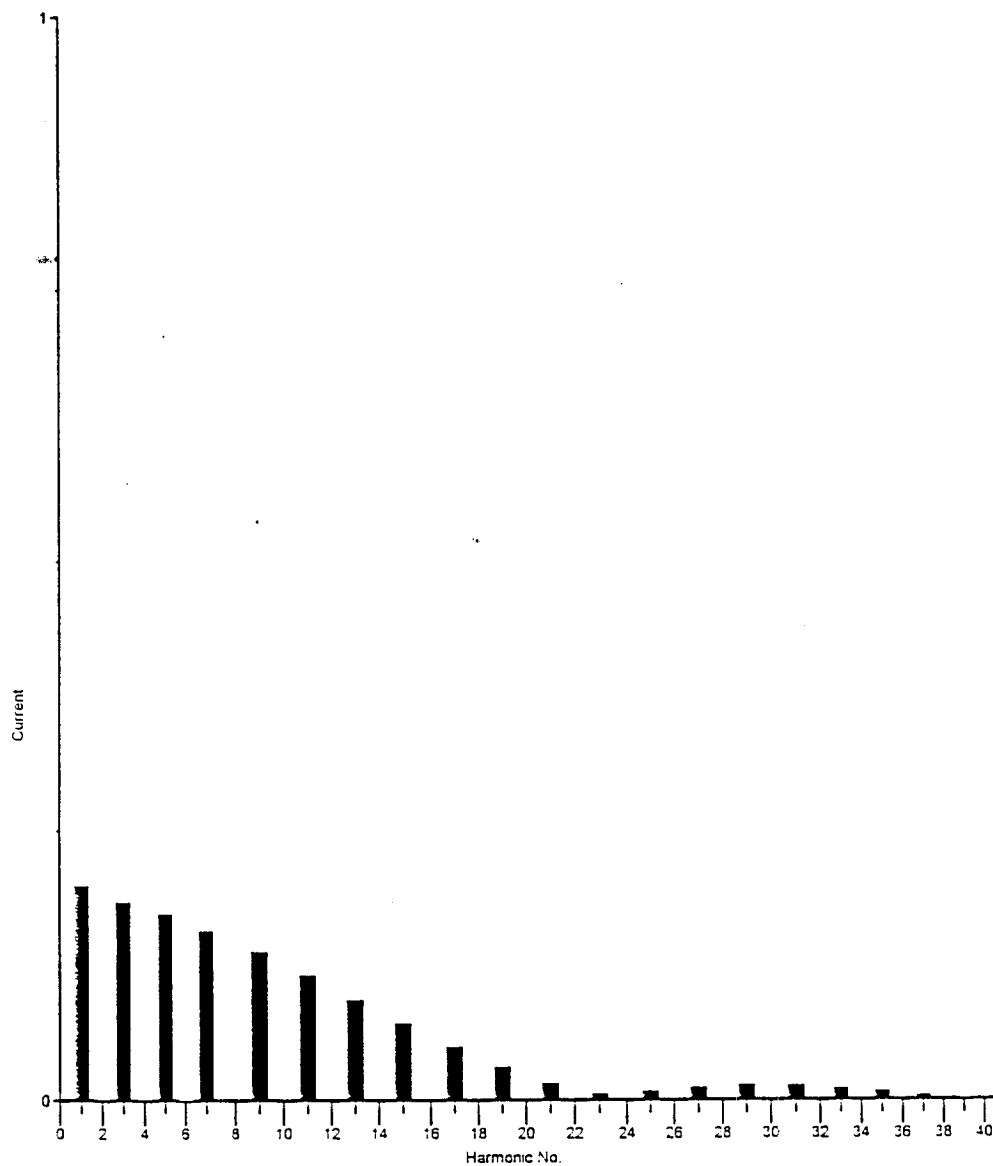
| Harmonic Number | Standard Limit (A rms) | Max. Span Values (A rms) | Harmonic Number | Standard Limit (A rms) | Max. Span Values (A rms) |
|-----------------|------------------------|--------------------------|-----------------|------------------------|--------------------------|
| 1 | Fund | 0.2039 | 21 | 0.1070 | 0.0178 |
| 2 | 1.0800 | 0.0019 | 22 | 0.0840 | 0.0005 |
| 3 | 2.3000 | 0.1889 | 23 | 0.0980 | 0.0074 |
| 4 | 0.4300 | 0.0012 | 24 | 0.0770 | 0.0005 |
| 5 | 1.1400 | 0.1770 | 25 | 0.0900 | 0.0093 |
| 6 | 0.3000 | 0.0012 | 26 | 0.0710 | 0.0004 |
| 7 | 0.7700 | 0.1604 | 27 | 0.0830 | 0.0135 |
| 8 | 0.2300 | 0.0009 | 28 | 0.0660 | 0.0005 |
| 9 | 0.4000 | 0.1407 | 29 | 0.0780 | 0.0152 |
| 10 | 0.1840 | 0.0009 | 30 | 0.0610 | 0.0004 |
| 11 | 0.3300 | 0.1185 | 31 | 0.0730 | 0.0146 |
| 12 | 0.1530 | 0.0009 | 32 | 0.0580 | 0.0004 |
| 13 | 0.2100 | 0.0952 | 33 | 0.0680 | 0.0125 |
| 14 | 0.1310 | 0.0006 | 34 | 0.0540 | 0.0004 |
| 15 | 0.1500 | 0.0721 | 35 | 0.0640 | 0.0095 |
| 16 | 0.1150 | 0.0007 | 36 | 0.0510 | 0.0004 |
| 17 | 0.1320 | 0.0509 | 37 | 0.0610 | 0.0060 |
| 18 | 0.1020 | 0.0006 | 38 | 0.0480 | 0.0003 |
| 19 | 0.1180 | 0.0329 | 39 | 0.0580 | 0.0025 |
| 20 | 0.0920 | 0.0005 | 40 | 0.0460 | 0.0002 |

Test Engineer : Bruce Huang
Bruce Huang



7.5.2. TEST GRAPH OF HARMONICS

Harmonics



Span: 0.00.02.00.00

912505.STA

Cursor: 0.00.02.00.00



8. VOLTAGE FLUCTUATIONS TEST

8.1. STANDARD

- Product Standard : EN 61 000-3-3 (1995)

8.2. TEST PROCEDURE

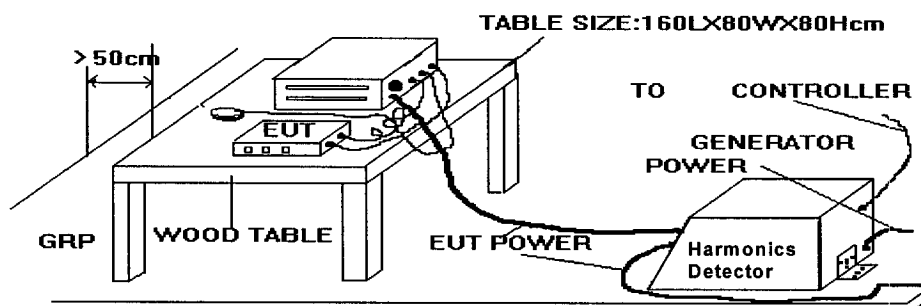
The equipment shall be tested under the conditions of **Clause 5**.

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of $\pm 8\%$ is achieved during the whole assessment procedure.

8.3. TEST EQUIPMENT SETTINGS

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Measurement Delay : 10.0 seconds
- Pst Integration Time : 10 minutes
- Pst Integration Periods : 1
- Test Duration : 00:10:00 minutes

8.4. TEST SETUP



**8.5. TEST RESULT OF VOLTAGE FLUCTUATION AND FLICKER TEST****8.5.1. TEST DATA OF VOLTAGE FLUCTUATION AND FLICKER**

- **FINAL TEST RESULT : PASS**
- Temperature : 24 °C
- Relative Humidity : 57 % RH
- Test Date : Feb. 01, 1999

| | Pst | Plt | Dc (%) | Dmax (%) | Dt (%) |
|---------|-------|------|----------|------------|----------|
| Reading | 0.070 | 0.00 | 0.00 | 0.00 | 0.00 |
| Limit | 0.65 | 1.0 | 3.0 | 4.0 | 3.0 |

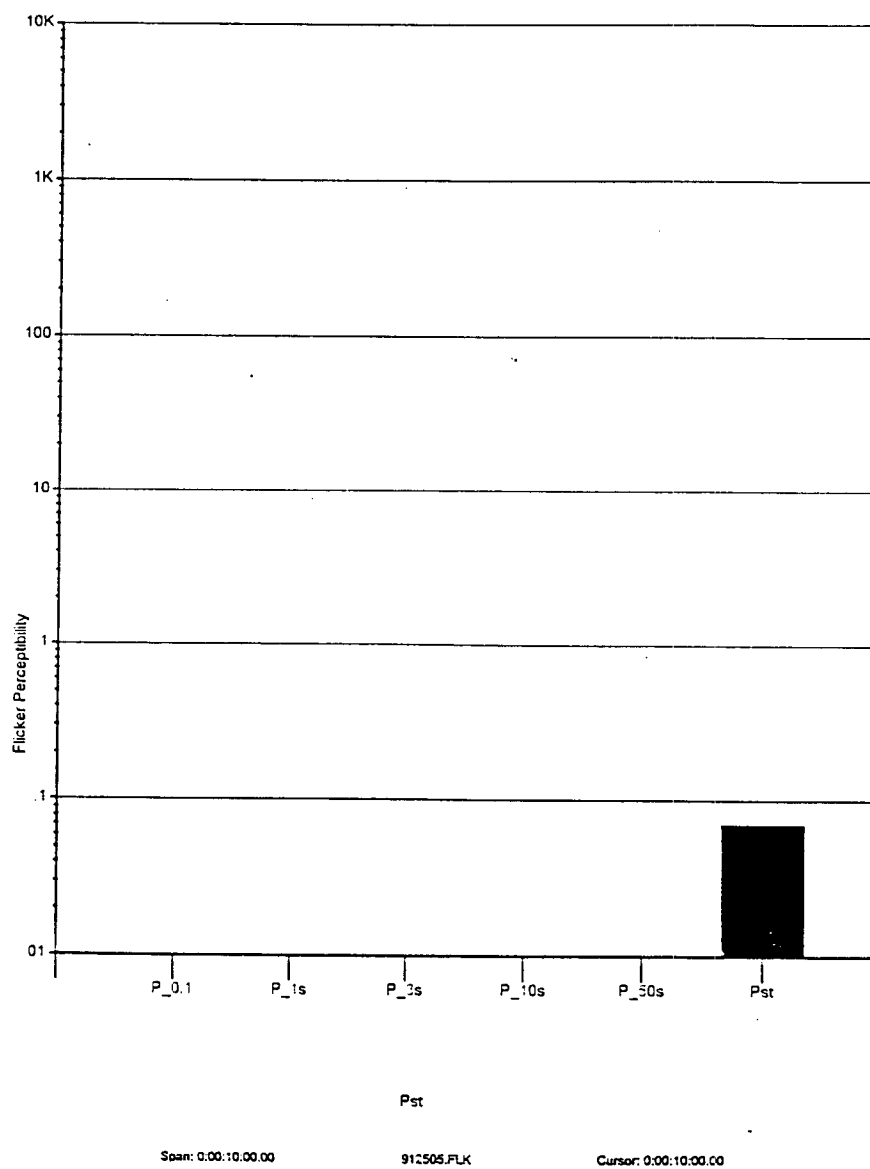
Test Engineer :

Bruce Huang



8.5.2. TEST GRAPH OF VOLTAGE FLUCTUATION AND FLICKER

Pst Histogram



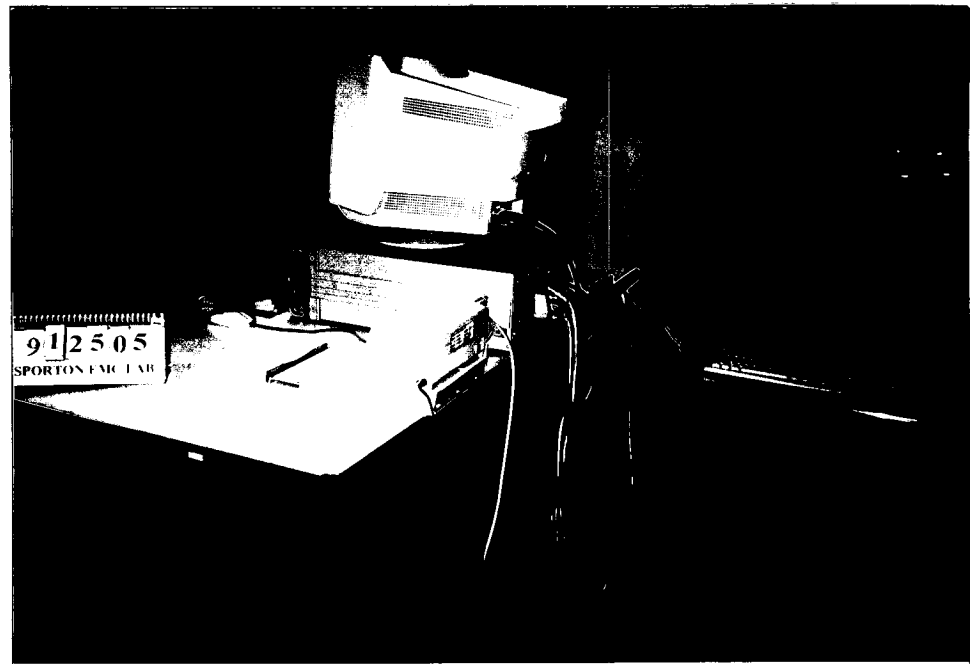


8.6. PHOTOGRAPHS OF HARMONICS TEST, VOLTAGE FLUCTUATION AND FLICKER TEST

FRONT VIEW



REAR VIEW





9. ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

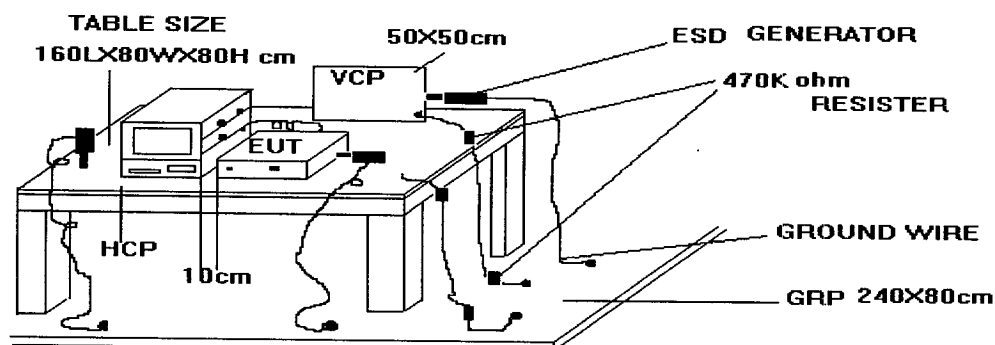
FINAL TEST RESULT : PASS

- Basic Standard : EN 61 000-4-2 (1995)
- Generic Standard : EN 50 082-1 (1997)
- Performance Criteria : B

(Remark : During testing at $\pm 8\text{KV}$ (air discharge) on the com 1 and printer port, the mouse were disturbed for seconds. After stopping tested it were worked normally.)

- Level : 3 for Air discharge,
2 for Contact discharge
- Tested Voltage : $\pm 2 / \pm 4 / \pm 8 \text{ KV}$ for Air discharge,
 $\pm 2 / \pm 4 \text{ KV}$ for Contact discharge
- Temperature : 23°C
- Relative Humidity : 55 %
- Test Date : Feb. 01, 1999

9.1. TEST SETUP





The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the follow manner :

- (a) CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- (b) AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

9.2. TEST SETUP FOR TESTS PERFORMED IN LABORATORY

A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm ,minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the SPORTON EMC LAB. we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall , where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resister located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

**9.3. ESD TEST PROCEDURE**

- a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
 - ambient temperature : 15°C to 35°C;
 - relative humidity : 30% to 60%;
 - atmospheric pressure : 68 KPa (680 mbar) to 106 KPa (1060 mbar).
- b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
- d. The test shall be performed with single discharges. On preselected points at least ten single discharges (in the most sensitive polarity) shall be applied.
- e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
 - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - The contact discharge test shall not be applied to such surfaces.
- h. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

**9.4. TEST SEVERITY LEVELS****9.4.1. Contact discharge**

| Level | Test Voltage (KV) of Contact discharge |
|-------|--|
| 1 | ± 2 |
| 2 | ± 4 |
| 3 | ± 6 |
| 4 | ± 8 |
| X | Specified |

Remark : "X" is an open level.

9.4.2. Air discharge

| Level | Test Voltage (KV) of Air Discharge |
|-------|------------------------------------|
| 1 | ± 2 |
| 2 | ± 4 |
| 3 | ± 8 |
| 4 | ± 15 |
| X | Specified |

Remark : "X" is an open level.



9.5. TEST POINTS

9.5.1. TEST RESULT OF AIR DISCHARGE

| TEST POINT | VOLTAGE | TESTED NO. | OBSERVATION | RESULT |
|-----------------|----------------------------|------------|-------------|--------|
| CASE | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| SCREW | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| BRACKET | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| FAN | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| VGA PORT | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| PRINTER PORT | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| COM1 PORT | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| LED | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| POWER SW | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| RESET SW | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| POWER INPUT | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| LINE IN/OUT | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |
| K/B (PS/2) PORT | $\pm 2 / \pm 4 / \pm 8$ KV | BY 10 | NORMAL | PASS |



9.5.2. TEST RESULT OF CONTACT DISCHARGE

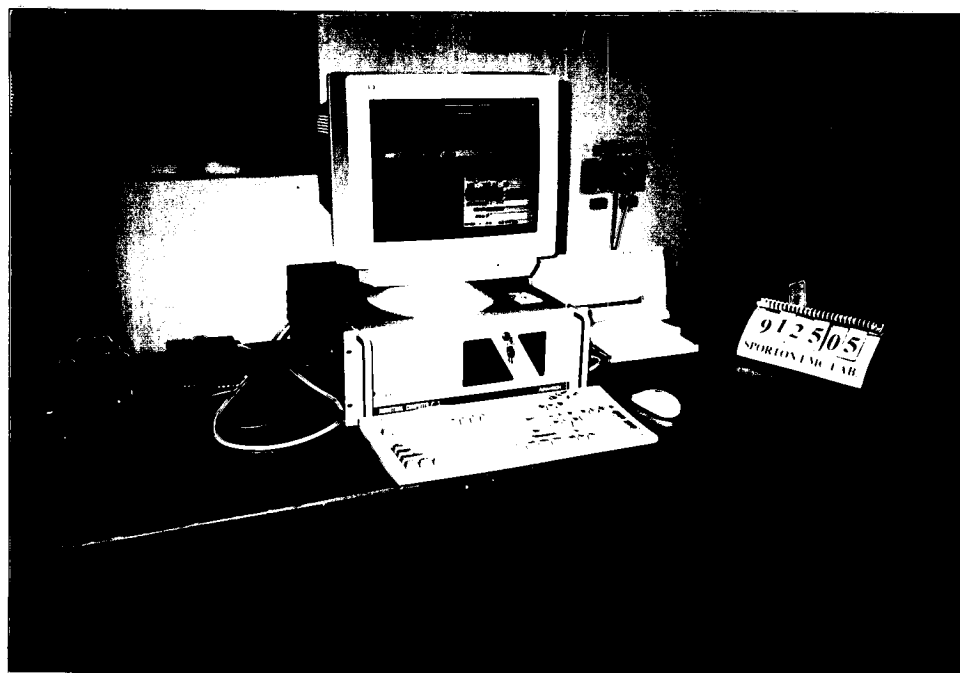
| POLARITY | VOLTAGE | TESTED NO. | OBSERVATION | RESULT |
|-----------------------|--------------------|------------|-------------|--------|
| HORIZONTAL(AT FRONT) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| HORIZONTAL (AT LEFT) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| HORIZONTAL (AT RIGHT) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| HORIZONTAL (AT REAR) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| VERTICAL (AT FRONT) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| VERTICAL (AT LEFT) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| VERTICAL (AT RIGHT) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| VERTICAL (AT REAR) | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| CASE | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| SCREW | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| BRACKET | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| VGA PORT | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| PRINTER PORT | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| COM1 PORT | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |
| K/B (PS/2) PORT | $\pm 2 / \pm 4$ KV | BY 10 | NORMAL | PASS |

Test Engineer :

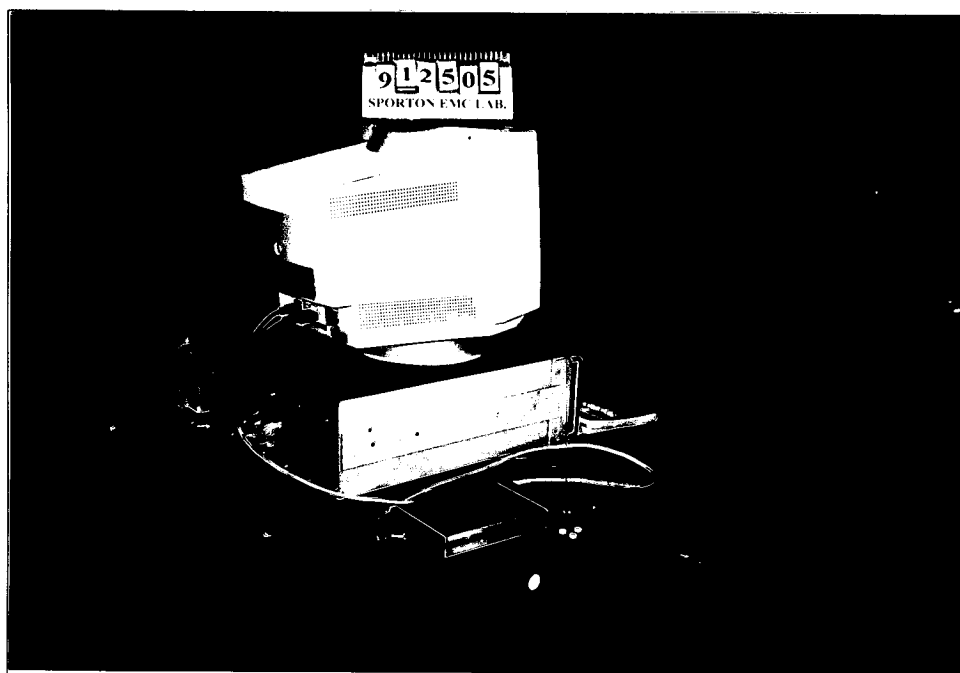
Bruce Huang

9.6. PHOTOGRAPHS OF ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

FRONT VIEW

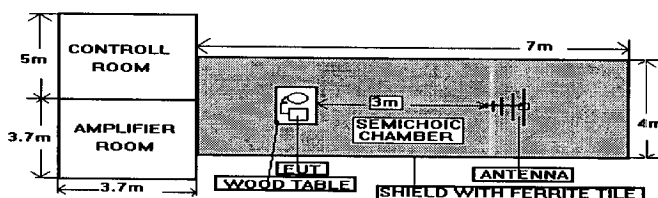


REAR VIEW



**10. RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)****FINAL TEST RESULT : PASS**

- Basic Standard : EN 61 000-4-3 (1996)
- Generic Standard : EN 50 082-1 (1997)
- Performance Criteria : A
- Level : 2
- Frequency Range : 80 to 1000 MHz
- Field Strength : 3 V/m
(Modulated 80 % AM)
- Temperature : 25 °C
- Relative Humidity : 56 %
- Test Date : Feb. 01, 1999

10.1. TEST SETUP

NOTE : The SPORTON 7m x 4m x 4m semichoice chamber is compliance with the sixteen points uniform field requirement as stated in IEC 1000-4-3 Section 6.2

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semichoice chamber.

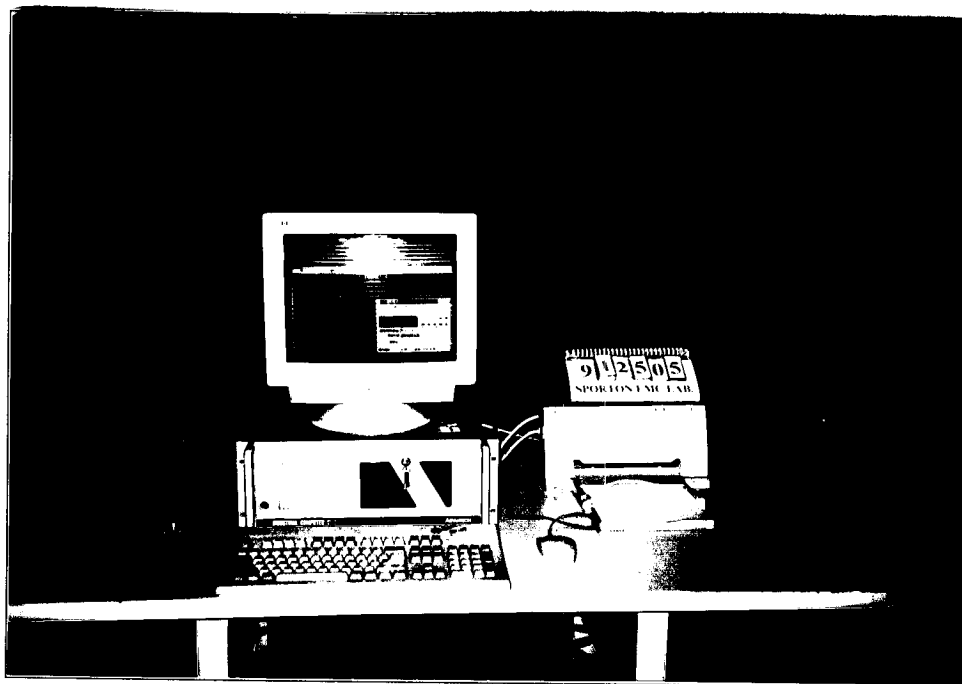
**10.2. TEST PROCEDURE**

- a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
- b. The bilog antenna which is enabling the complete frequency range of 80 MHz to 1000 Mhz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
- c. The test is normally performed with the antenna facing the most sensitive side of the EUT. The polarization of the field generated by the biconical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.
- d. At each of the above conditions, the frequency range is swept from 80 MHz to 1000 MHz , pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of $1.5 * 10^{-3}$ decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

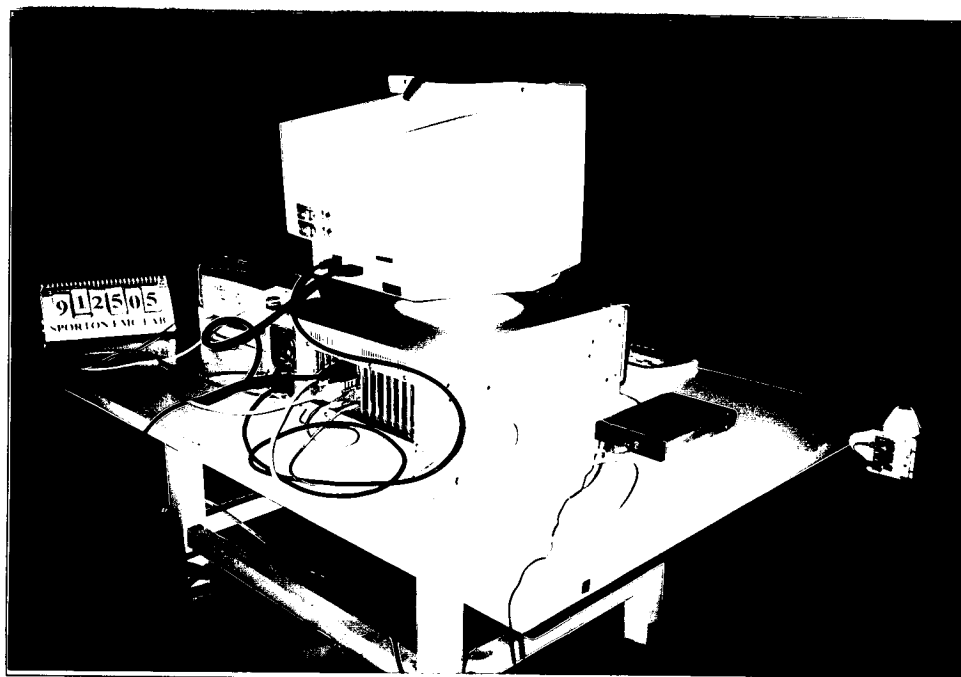


10.4. PHOTO OF RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

FRONT VIEW



REAR VIEW

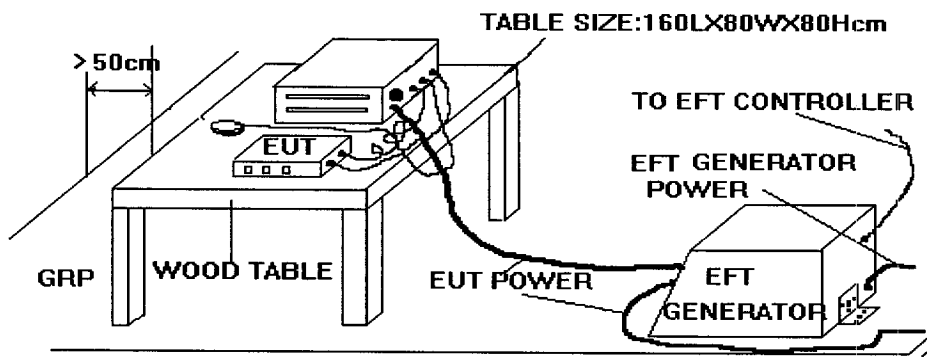


**11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT/BURST)****FINAL TEST RESULT : PASS**

- Basic Standard : EN 61 000-4-4 (1995)
- Generic Standard : EN 50 082-1 (1997)
- Performance Criteria : B

(Remark : During testing at $\pm 1\text{KV}$ on L1, L2, PE, RS232 mouse and PS/2 keyboard were disturbed for seconds. After stopping tested it were worked normally.)

- Level : on Power Supply -- 2
- Test Voltage : on Power Supply -- $\pm 0.5 / 1.0 \text{ KV}$
- Temperature : 24°C
- Relative Humidity : 57 %
- Test Date : Feb. 01, 1999

11.1. TEST SETUP



The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1m thick. If the EUT is table-top equipment, it was located approximately 0.8m above the GRP.. The GRP. was a metallic sheet (copper or aluminum) of 0.25 mm ,minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. It shall project beyond the EUT by at least 0.1m on all sides and connected to the protective earth. In the SPORTON EMC LAB. we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system. The EUT was arranged and connected according to its functional requirements. The minimum distance between the EUT and other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. Using the coupling clamp, the minimum distance between the coupling plates and all other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. The length of the signal and power lines between the coupling device and the EUT was 1m or less.

11.2. TEST ON POWER LINE

- a. The EFT/B-generator was located on the GRP.. The length from the EFT/B-generator to the EUT as not exceed 1 m.
- b. The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

11.3. TEST ON COMMUNICATION LINES

- a. The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP..
- b. The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.



11.4. TEST PROCEDURE

- a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements :
 - ambient temperature : 15°C to 35°C;
 - relative humidity : 45% to 75%;
 - atmospheric pressure : 68 KPa (680 mbar) to 106 KPa (1060 mbar).
- b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
- c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.
- d. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
 - Normal performance within the specification limits.
 - Temporary degradation or loss of function or performance which is selfrecoverable.
 - Temporary degradation or loss of function or performance which requires operator intervention or system reset.
 - Degradation or loss of function which is not recoverable due to damage of equipment (components).

**11.5. TEST SEVERITY LEVELS**

The following test severity levels are recommended for the fast transient/burst test :

| Open circuit output test voltage $\pm 10\%$ | | |
|---|-----------------|--------------------------------------|
| Level | On Power Supply | On I/O signal, data and control line |
| 1 | ± 0.5 KV | ± 0.25 KV |
| 2 | ± 1.0 KV | ± 0.50 KV |
| 3 | ± 2.0 KV | ± 1.00 KV |
| 4 | ± 4.0 KV | ± 2.00 KV |
| X | Specified | Specified |

Remark : " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

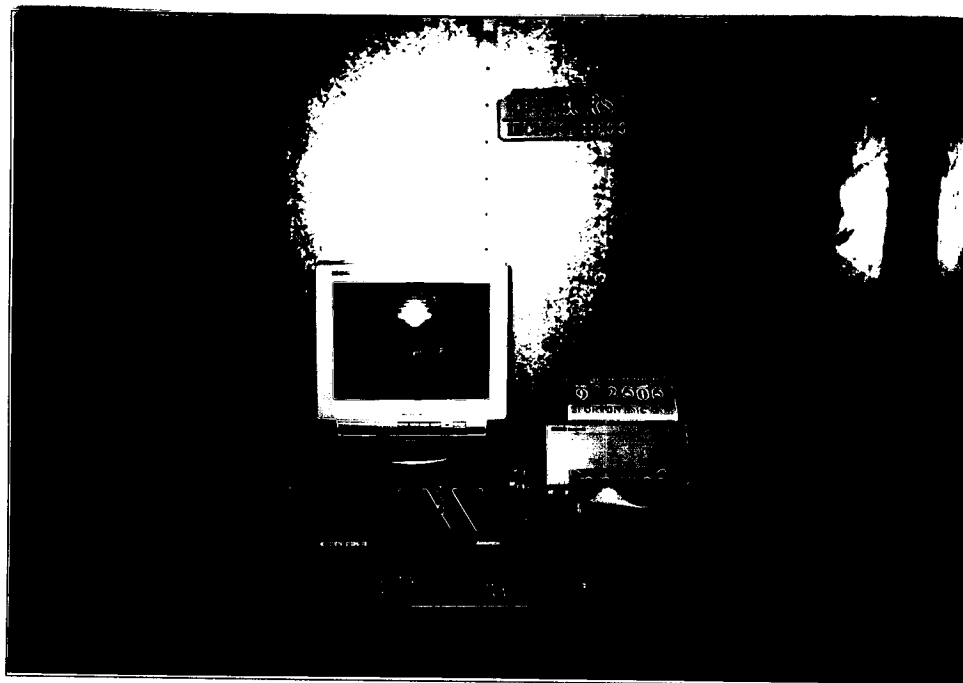
Test Engineer : Bruce Huang

Bruce Huang

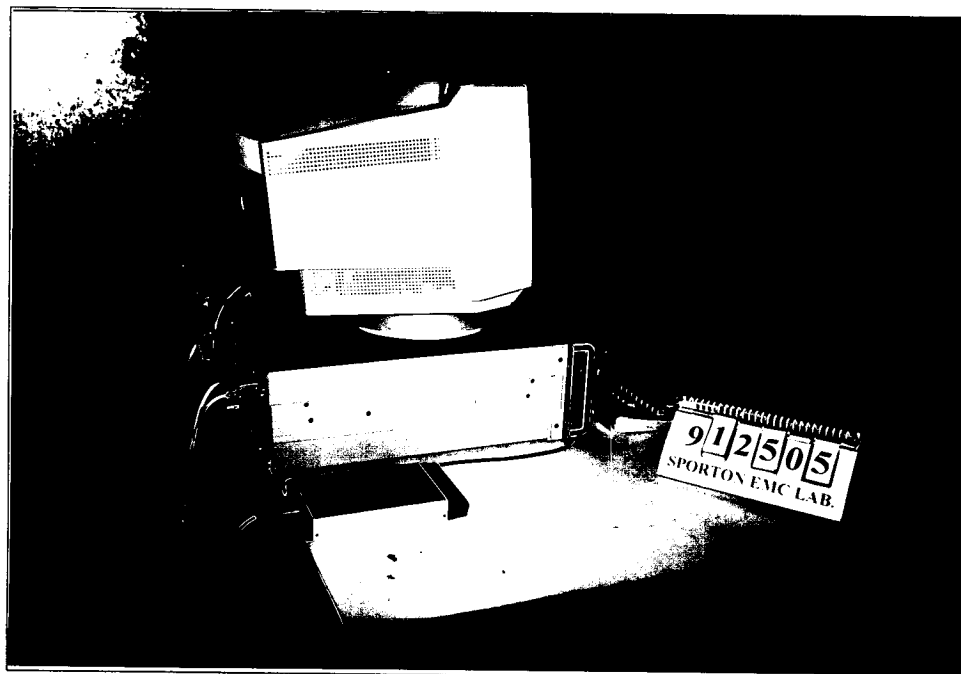


11.6. PHOTO OF ELECTRICAL FAST TRANSIENT/BURST (EFT) IMMUNITY TEST

FRONT VIEW



REAR VIEW





12. SURGE IMMUNITY TEST

- **Pass** performance Criteria : A
- Basic Standard : EN 61 000-4-5 (1995)
- Generic Standard : EN 50 082-1 (1997)
- Input Voltage, Frequency : 230Vac, 50Hz
- Level : 2
- Test Voltage : ± 1.0 KV
- Temperature : 15 ° C
- Relative Humidity : 54 %
- Test Date : Feb. 04, 1999

12.1. TEST RECORD

| Voltage (KV) | Test Location | Polarity | Phase Angle | | | Test Result |
|----------------|---------------|----------|-------------|-----|------|-------------|
| | | | 0° | 90° | 270° | |
| 1 KV | L - N | + | A | A | A | <u>PASS</u> |
| | | - | A | A | A | <u>PASS</u> |
| 1 KV | L - PE | + | A | A | A | <u>PASS</u> |
| | | - | A | A | A | <u>PASS</u> |
| | N - PE | + | A | A | A | <u>PASS</u> |
| | | - | A | A | A | <u>PASS</u> |
| | L, N - PE | + | A | A | A | <u>PASS</u> |
| | | - | A | A | A | <u>PASS</u> |

Remark : PE = DC output GND

**12.2. TEST LEVEL**

| Level | Open-circuit test voltage, $\pm 10\%$, KV |
|---|--|
| 1 | 0.5 |
| 2 | 1.0 |
| 3 | 2.0 |
| 4 | 4.0 |
| x | Specified |
| NOTE - x is an open class. This level can be specified in the product specification. | |

12.3. TEST PROCEDURE**a. Climatic conditions**

The climatic conditions shall comply with the following requirements :

- ambient temperature : 15 °C to 35 °C
- relative humidity : 10 % to 75 %
- atmospheric pressure : 86 kPa to 106 kPa (860 mbar to 1060 mbar)

b. Electromagnetic conditions

The electromagnetic environment of the laboratory shall not influence the test results.

c. The test shall be performed according the test plan that shall specify the test set-up with

- generator and other equipment utilized;
- test level (voltage/current);
- generator source impedance;
- internal or external generator trigger;
- number of tests : at least five positive and five negative at the selected points;
- repetition rate : maximum 1/min.
- inputs and outputs to be tested;
- representative operating conditions of the EUT;
- sequence of application of the surge to the circuit;



- phase angle in the case of a.c. power supply;
- actual installation conditions, for example :
 - AC : neutral earthed,
 - DC : (+) or (-) earthed to simulated the actual earthing conditions.
- d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
- e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
- f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.
- g. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worstcase voltage breakdown level (let-through level) of the primary protection.
- h. If the actual operating signal sources are not available, they may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according to a test plan.
- i. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test a previously unstressed equipment shall be used to the protection devices shall be replaced.

12.4. OPERATING CONDITION

Access I/O port and CD-ROM



13. CONDUCTED DISTURBANCES INDUCED BY RADIO-FREQUENCY FIELD IMMUNITY TEST (CS)

- **Pass** performance Criteria : **A**
- Basic Standard : EN 61 000-4-6 (1996)
- Generic Standard : EN 50 082-1 (1997)
- Input Voltage, Frequency : AC 230V, 50Hz
- Level : 2
- Test Voltage : 3 V/rms (Modulated, 1KHz, 80%, AM)
- Frequency Range : 0.15 MHz to 80 MHz
- Temperature : 15° C
- Relative Humidity : 54 %
- Test Date : Feb. 04, 1999

13.1. TEST LEVEL

| Level | Voltage Level (EMF), |
|---|------------------------|
| 1 | 1 V |
| 2 | 3 V |
| 3 | 10 V |
| x | Specified |
| NOTE - x is an open class. This level can be specified in the product specification. | |

13.2. OPERATING CONDITION

Access I/O port and CD-ROM

**13.3. TEST PROCEDURE**

- a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- b. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
- c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- d. Filters shall be used to prevent (higher order or sub-) harmonics form disturbing the EUT. A High-Pass Filter. 100KHz, (HPF) may be required with the test generator. The band stop characteristics of the Low-Pass Filters (LPF) shall be sufficient to suppress the harmonics down to the immunity level required within that band. These filters shall be inserted with the test generator before setting the test level.
- e. The frequency range is swept from 150 KHz to 230 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1KHz sinewave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- f. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency(ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- g. An alternative test procedure may be adopted, wherein the frequency range is swept incrementally, with a step size not exceeding 4% of the start ad thereafter 4% of the preceding frequency value. The test level should be at least twice the value of the specified test level.
- h. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.
- i. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.
- j. The use of special exercising programs is recommended.
- k. Testing shall be performed according to a Test Plan, which shall be included in the test report.
- l. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.



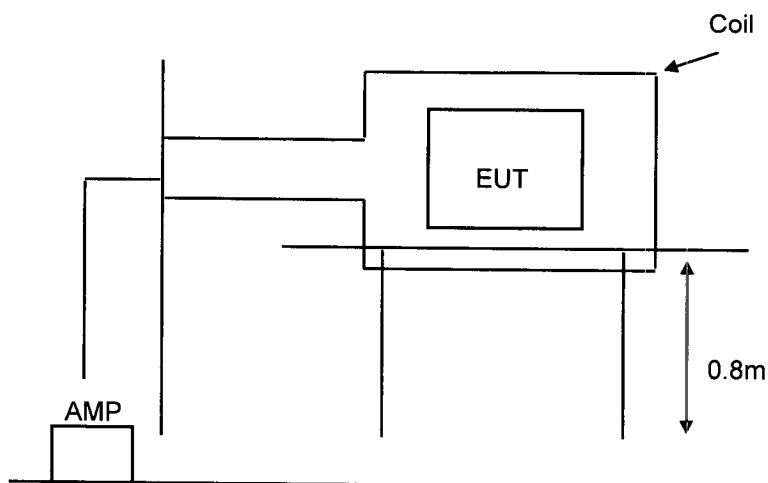
14. Power Frequency Magnetic Field immunity tests

- **Pass** performance Criteria : A
- Basic Standard : EN 61000-4-8 (1993)
- Generic Standard : EN 500 82-1 (1992)
- Input Voltage, Frequency : AC 230V, 50Hz
- Temperature : 15 °C
- Relative Humidity : 54 %
- Test Date : Feb. 04, 1999

14.1. TEST RECORD

| Power Frequency Magnetic Field | Testing duration | Coil Orientation | Results | Remark |
|-----------------------------------|---------------------|---------------------|---------|--------|
| 50Hz, 2A/m | 1.0 Min | X-axis | Pass | Normal |
| 50Hz, 2A/m | 1.0 Min | Y-axis | Pass | Normal |
| 50Hz, 2A/m | 1.0 Min | Z-axis | Pass | Normal |

14.2. TEST SETUP



14.3. OPERATING CONDITION

Access I/O port and CD-ROM

**15. VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY TESTS**

- **Pass** performance Criteria : C
- Basic Standard : EN 61 000-4-11 (1994)
- Generic Standard : EN 50 082-1 (1997)
- Input Voltage, Frequency : AC 230V, 50Hz
- Temperature : 15 °C
- Relative Humidity : 54 %
- Test Date : Feb. 04, 1999

15.1. TEST RECORD OF VOLTAGE INTERRUPTION

| Voltage (V) | Phase Angle | | | | | | | | % Reduction (in % U _T) | Duration (in periods of the rated frequency) |
|------------------|-------------|------|------|-------|-------|-------|-------|-------|--|---|
| | 0 ° | 45 ° | 90 ° | 135 ° | 180 ° | 225 ° | 270 ° | 315 ° | | |
| 230 | C | C | C | C | C | C | C | C | >95% | 5000ms |

15.2. TEST RECORD OF VOLTAGE DIPS

| Voltage (V) | Phase Angle | | | | | | | | % Reduction (in % U _T) | Duration (in periods of the rated frequency) |
|------------------|-------------|------|------|-------|-------|-------|-------|-------|--|---|
| | 0 ° | 45 ° | 90 ° | 135 ° | 180 ° | 225 ° | 270 ° | 315 ° | | |
| 230 | A | A | A | A | A | A | A | A | 30 | 10 ms |
| 230 | C | C | C | C | C | C | C | C | 60 | 100 ms |

**15.3. TESTING REQUIREMENT AND PROCEDURE**

The test was based on EN 61 000-4-11 (1994)

15.4. TEST CONDITIONS

1. Source voltage and frequency : 230V / 50Hz, Single phase.
2. Phase shifting : 0, 45, 90, 135, 180, 225, 270, 315 degrees.
3. Test of interval : 10 sec.
4. Level and duration : Sequency of 3 dips/interrupts.
5. Voltage rise (and fall) time : 1 ~ 5 μ s.
6. Test severity :

| Voltage dip and Interrupt reduction (%) | Test Duration (ms) |
|--|-------------------------------|
| 30 | 500 |
| 60 | 100 |
| 100 | 10 |
| 100 | 80 |
| 100 | 5000 |

15.5. OPERATING CONDITION

Access I/O port and CD-ROM

16. LIST OF MEASURING EQUIPMENT USED**[CE-EMI]**

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|--------------------------------------|--------------|-----------|------------|-----------------|------------------|------------|
| EMC Receiver (site 2) | HP | 8591EM | 3710A01187 | 9 KHz - 1.8 GHz | Sep. 18, 1998 | Conduction |
| LISN (EUT) (site 2) | Telemeter | NNB-2/16Z | 98009 | 50 ohm / 50 uH | Jan. 22, 1999 | Conduction |
| LISN (Support Unit) (site 2) | EMCO | 3810/2NM | 9703-1839 | 50 ohm / 50 uH | Jul. 06, 1998 | Conduction |
| Spectrum Analyzer (Site 4) | HP | 8560E | 3728A03185 | 30Hz - 2.9GHz | Sep. 09, 1998 | Radiation |
| Amplifier (Site 4) | HP | 8447D | 294409072 | 100K -1.3GHz | Sep. 04, 1998 | Radiation |
| Test Receiver (Site 4) | R&S | ESVP | 893610/003 | 20MHz - 1.3GHz | Apr. 13, 1998 | Radiation |
| Bilog Antenna (Site 4) | CHASE | CBL6112A | 2288 | 30MHz -2GHz | Jul. 14, 1998 | Radiation |
| Half-wave dipole antenna (Site 4) | EMCO | 3121C | 9705-1285 | 28 M - 1GHz | May 19, 1998 | Radiation |
| Turn Table (site 4) | EMCO | 2080 | 9711-1090 | 0 ~ 360 degree | N/A | Radiation |
| Antenna Mast (site 4) | EMCO | 2075 | 9711-2114 | 1 m- 4 m | N/A | Radiation |

※ The column of Remark indicates that the instruments used for conduction ("C") or radiation ("R") test.

[CE-EMS]

| Instrument | Manufacturer | Model No. | Characteristics | Calibration Date | Remark |
|------------------------------|----------------|---------------|--------------------------|------------------|--------------------|
| ESD Simulator | KEYTEK | MZ-15/EC | 0 KV - 15 KV | Apr. 17, 1998 | ESD |
| OMNI-Tip | KEYTEK | TPC-2 | 0 KV - 15 KV | Jul. 24, 1998 | ESD |
| Amplifier | AR | 100W 1000M3 | 80 MHz - 1 GHz | N/A | RS |
| Isotropic Field Probe | AR | FP3000A | 10 KHz - 1 GHz | Jun. 20, 1998 | RS |
| IEEE-488 Interface | AR | CP3000 | N/A | N/A | RS |
| System Interface | EMC Automation | 200 | HP-IB INTERFACE | N/A | RS |
| Power Meter | EMC Automation | 438A | 100 KHz -4.2 GHz | N/A | RS |
| Video Camera controller | EMC Automation | VCC-01 | N/A | N/A | RS |
| Signal Generator | HP | 8648A | 100 KHz - 1 GHz | Sep. 10, 1998 | RS |
| Signal Generator | R&S | SMX | 100 KHz - 1 GHz | Nov. 08, 1998 | RS |
| Antenna | CHASE | CBL6121A | 26 MHz - 1 GHz | Jun. 14, 1998 | RS |
| Amplifier | AR | 75W 75A220 | 25MHz - 300MHz | Jun. 14, 1998 | RS |
| EFT Generator | KEYTEK | CE-40 | 0 KV - 4.4 KV | Jul. 10, 1998 | EFT |
| Capacitive Clamp | KEYTEK | CE-40-CCL | 0 KV - 2 KV | Jun. 24, 1998 | EFT |
| Harmonic/Flicker Test System | HP | 6843A | 4800VA 90A / 48A PEAK | Nov. 15, 1998 | Harmonics, Flicker |
| MAGNETIC FIELD TESTER | HAEFELY | MAG100J | N/A | Aug. 26, 1998 | MAGNETIC |
| Signal Generator | R&S | Smy01 | N/A | Jul. 30, 1998 | CS |
| Power Amplifier | KALMUS | 757LC | N/A | N/A | CS |
| CDN | FCC | Fcc-801-M3-25 | N/A | Oct. 06, 1998 | CS |
| MAINS INTERFERENCE SIMULATOR | HAEFELY | Pline 1610 | N/A | Aug. 23, 1998 | DIP |
| Control Center | KEYTEK | E103 | N/A | Sep. 03, 1998 | SURGE |
| Surge Combination Wave | KEYTEK | E501a | N/A | Sep. 03, 1998 | SURGE |
| Surge Coupler/ Decoupler | KEYTEK | E551 | N/A | Sep. 03, 1998 | SURGE |

17. DECLARATION OF CONFORMITY AND THE CE MARK

There are three possible procedures pertaining to the declaration of conformity :

17.1. Conformity testing and declaration of conformity by the manufacturer or his authorized representative established within the Community or by an importer.

- Article 10 (1) of the EMC Directive,
- § 3 (1) no. 2a of the EMC Act.

17.2. Declaration of conformity issued by the manufacturer or his authorized representative established within the Community or by an importer following testing of the product and issued of an *EC certificate of conformity by a competent body.*

- Article 10 (2) of the EMC Directive,
- § 3 (1) no. 2b of the EMC Act.

17.3. Declaration of conformity issued by the manufacturer or his authorized representative established within the Community or by an importer following *testing and certification of the product by a notified body.*

- Article 10 (5) of the EMC Directive,
- § 3 (1) no. 2b of the EMC Act (radio transmitting installations).

17.4. Specimen For The CE Marking Of Electrical / Electronical Equipment

The components of the CE marking shall have substantially the same vertical dimension, which may not be less than 5 mm.



APPENDIX A. Photographs of EUT

