



SPORTON LAB.

Certificate No: C900111

CERTIFICATE

● **EQUIPMENT : Rackmount Industrial Server PC**

MODEL NO. : SPC-520XX

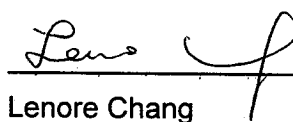
APPLICANT : Advantech Co., Ltd.

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



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
EN 55022:1994/A1:1995/A2:1997 Class A, EN61000-3-2:1995,
EN 61000-3-3:1995 and EN 50082-1:1997 (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 **Nov.
03, 1999 AT SPORTON INTERNATIONAL INC. LAB.**


Nov. 10, 1999
Lenore Chang
President

CE TEST REPORT

according to

**European Standard EN 55022:1994/A1:1995/A2:1997 Class A and
EN 61 000-3-2:1995, EN 61 000-3-3:1995, and EN 50082-1:1997
(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 : Rackmount Industrial Server PC

Model No. : SPC-520XX

**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.

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CERTIFICATE OF COMPLIANCE

according to

**European Standard EN 55022:1994/A1:1995/A2:1997 Class A and
EN 61 000-3-2:1995, EN 61 000-3-3:1995, and EN 50082-1:1997
(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 : Rackmount Industrial Server PC

Model No. : SPC-520XX

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 EN 55022:1994/A1:1995/A2:1997 Class A and EN 61000-3-2:1995, EN 61000-3-3:1995 and EN 50082-1:1997 (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 Nov. 03, 1999 at **SPORTON International Inc. LAB.** in Lin Kou.


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 : Rackmount Industrial Server PC
Model No. : SPC-520XX
Trade Name : Advantech
Power Supply Type : Switching
Power Cord : Non-Shielded, 1.8m, 3 pin

1.4. Feature of Equipment under Test

- 5U, 19 rackmount Industrial Server PC
- Accomodates 1 ISA/7 PCI/1 CPU backplanes or ATX mother board
- Provides ten front-accessable half-height disk drives for mass storage capacity, also can be installed the RAID disk array subsystem
- Can be equipped with a 400W ATX power supply or hot-swappable redundant 400 W ATX power supply to increase the system reliability
- Three 86 CFM hot-swappable cooling fans installed inside the chassis
- Three LED indicators display system status for power, fan failure and overheating within the chassis. Audible alarm included

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. During testing, the interface cables and equipment positions were varied according to european Standard EN 55022.
- b. The HITACHI Monitor, DELL PS/2 Keyboard, J-S earphone and GENIUS RS232 Mouse were connected to the EUT for EMI test.
- c. The HP Monitor, DELL PS/2 Keyboard, LOGITECH PS/2 Mouse and SKY. HANK Speaker were connected to the EUT for EMS test.
- d. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 1000MHz.

2.2. Description of Test System

< EMI >

Support Unit 1. -- Monitor (HITACHI)

| | |
|-------------------|---|
| FCC ID | : N/A |
| Model No. | : CM753ET |
| Power Supply Type | : Switching |
| Power Cord | : Non-Shielded |
| Serial No. | : SP0176 |
| Data Cable | : Shielded, 1.15m |
| Remark | : This support device was tested to comply with FCC standards and authorized under a declaration of conformity. |

Support Unit 2. -- PS/2 Keyboard (DELL)

| | |
|------------|------------------|
| FCC ID | : GYUM92SK |
| Model No. | : AT101(DE8M) |
| Serial No. | : SP0054 |
| Data Cable | : Shielded, 1.9m |

Support Unit 3. -- RS232 Mouse (GENIUS)

| | |
|------------|-----------------------|
| FCC ID | : FSUGMZE3 |
| Model No. | : Easy Mouse |
| Serial No. | : SP00182 |
| Data Cable | : Non-Shielded, 1.45m |

Support Unit 4. -- Earphone (J-S)

FCC ID : N/A
Model No. : HS-102
Serial No. : SP0028
Data Cable : Non-Shielded, 1.15m

< EMS >**Support Unit 1. -- Monitor (HP)**

FCC ID : ACJ93312116
Model No. : D2807A
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0053
Data Cable : Shielded, 1.7m

Support Unit 2. -- PS/2 Keyboard (DELL)

FCC ID : GYUM92SK
Model No. : AT101(DE8M)
Serial No. : SP0054
Data Cable : Shielded, 1.9m

Support Unit 3. -- PS/2 Mouse (Logitech)

FCC ID : DZL210472
Model No. : M-S35
Serial No. : SP0101
Data Cable : Non-Shielded, 1.8m

Support Unit 4. -- Speaker (SKY. Hank)

Model No. : MS-695
Power Cord : Non-Shielded
Serial No. : SP0182

Support Unit 4. -- Earphone (J-S)

FCC ID : N/A
Model No. : HS-102
Serial No. : SP0028
Data Cable : Non-Shielded, 1.15m

< EMS >**Support Unit 1. -- Monitor (HP)**

FCC ID : ACJ93312116
Model No. : D2807A
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0053
Data Cable : Shielded, 1.7m

Support Unit 2. -- PS/2 Keyboard (DELL)

FCC ID : GYUM92SK
Model No. : AT101(DE8M)
Serial No. : SP0054
Data Cable : Shielded, 1.9m

Support Unit 3. -- PS/2 Mouse (Logitech)

FCC ID : DZL210365
Model No. : M-M35
Serial No. : SP0101
Data Cable : Non-Shielded, 1.8m

Support Unit 4. -- Speaker (SKY. Hank)

Model No. : MS-695
Power Cord : Non-Shielded
Serial No. : SP0182

3. Test Software

< EMI >

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

< EMS >

Two executive programs, Media Player Program and CD Player Program under WIN98, were 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. 30-2, 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 61000-3-2.

Voltage Fluctuations Test : European Standard EN 61000-3-3.

EMS Test : European Standard EN50082-1.

(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 55022 Class A

Harmonics Test : European Standard EN 61000-3-2.

Voltage Fluctuations Test : European Standard EN 61000-3-3.

EMS Test : European Standard EN50082-1.

(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 1,000 MHz
- c. Radio frequency electromagnetic field immunity test : 80-1000 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 230V AC power and return leads of the EUT according to the methods defined in European Standard EN 55022 Clause 9. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 5.3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

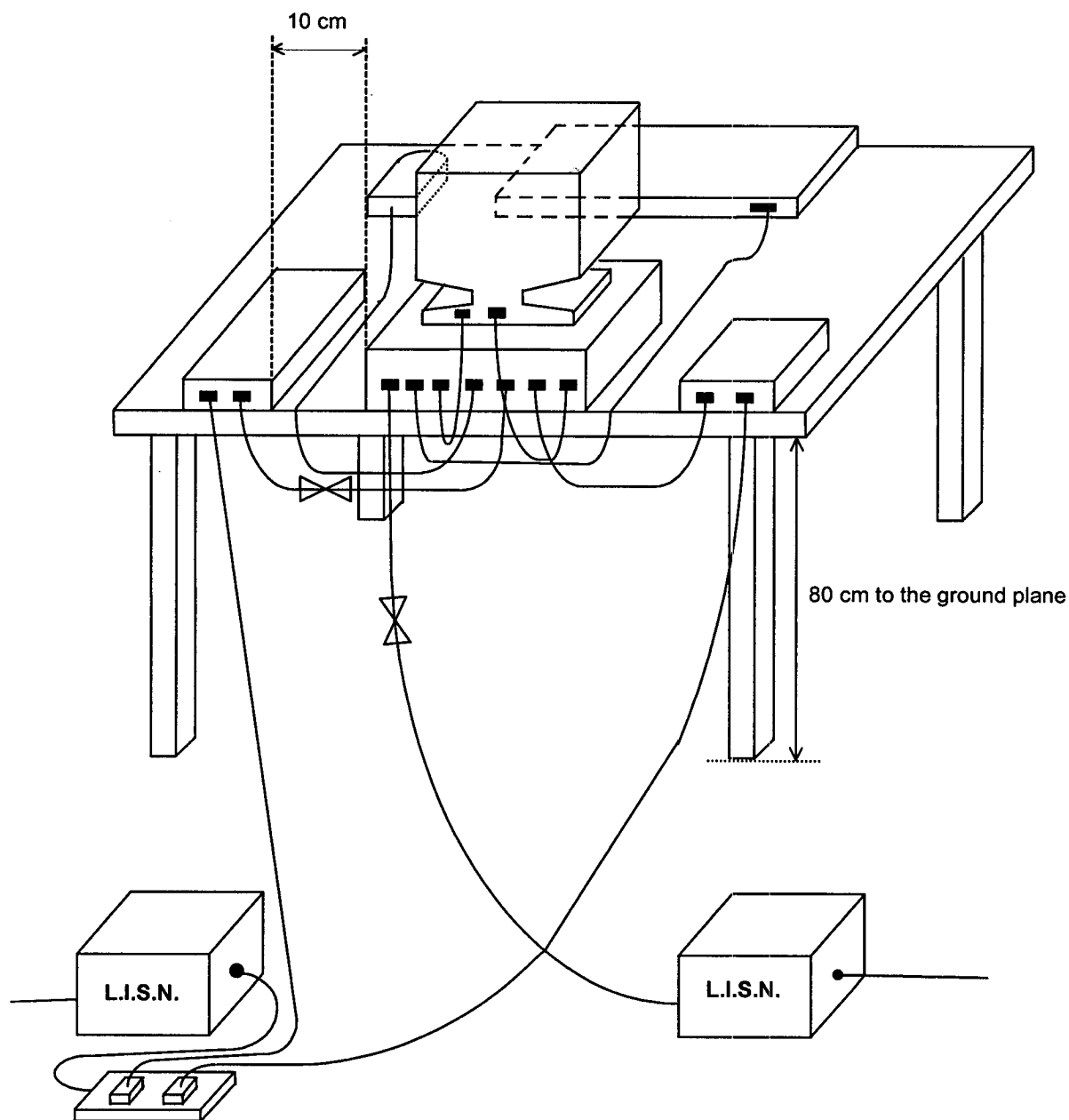
5.1. Description of Major Test Instruments

| | |
|-----------------|-----------|
| 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**

5.4.1. Test mode : AHA-2940U2W SCSI Card + Power (L)

- Frequency Range of Test : from 150 kHz to 30 MHz
- Temperature : 24°C
- Relative Humidity : 74 %
- Test Date : Oct. 27, 1999

The Conducted Emission test was passed at minimum margin NEUTRAL 0.150 MHz / 50.30 dBuV.

| Freq. (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) |
| 0.150 | L | 52.60 | 50.00 | 426.58 | 316.23 | 79.00 | 66.00 | 8912.51 | 1995.26 | -26.4 | -16.0 |
| 0.686 | L | 34.80 | 32.20 | 54.95 | 40.74 | 73.00 | 60.00 | 4466.84 | 1000.00 | -38.2 | -27.8 |
| 5.916 | L | 28.40 | 23.40 | 26.30 | 14.79 | 73.00 | 60.00 | 4466.84 | 1000.00 | -44.6 | -36.6 |
| 0.150 | N | 53.30 | 50.30 | 462.38 | 327.34 | 79.00 | 66.00 | 8912.51 | 1995.26 | -25.7 | -15.7 |
| 0.684 | N | 36.20 | 28.40 | 64.57 | 26.30 | 73.00 | 60.00 | 4466.84 | 1000.00 | -36.8 | -31.6 |
| 3.805 | N | 25.70 | 22.40 | 19.28 | 13.18 | 73.00 | 60.00 | 4466.84 | 1000.00 | -47.3 | -37.6 |

Test Engineer :

Kenny Chuang
KENNY CHUANG



5.4.2. Test mode : AHA-2940U2W SCSI Card + Power (R)

- Frequency Range of Test : from 150 kHz to 30 MHz
- Temperature : 24°C
- Relative Humidity : 74 %
- Test Date : Oct. 27, 1999

The Conducted Emission test was passed at minimum margin **LINE 0.158 MHz / 50.80 dBuV**.

| Freq. (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) |
| 0.158 | L | 53.30 | 50.80 | 462.38 | 346.74 | 79.00 | 66.00 | 8912.51 | 1995.26 | -25.7 | -15.2 |
| 0.879 | L | 33.50 | 30.60 | 47.32 | 33.88 | 73.00 | 60.00 | 4466.84 | 1000.00 | -39.5 | -29.4 |
| 8.335 | L | 23.60 | 19.30 | 15.14 | 9.23 | 73.00 | 60.00 | 4466.84 | 1000.00 | -49.4 | -40.7 |
| 0.159 | N | 53.50 | 50.50 | 473.15 | 334.97 | 79.00 | 66.00 | 8912.51 | 1995.26 | -25.5 | -15.5 |
| 0.877 | N | 32.60 | 29.10 | 42.66 | 28.51 | 73.00 | 60.00 | 4466.84 | 1000.00 | -40.4 | -30.9 |
| 5.868 | N | 24.50 | 18.40 | 16.79 | 8.32 | 73.00 | 60.00 | 4466.84 | 1000.00 | -48.5 | -41.6 |

Test Engineer :

Kenny Chuang
KENNY CHUANG



5.4.3. Test mode : SCSI Card + Power (L)

- Frequency Range of Test : from 150 kHz to 30 MHz
- Temperature : 24°C
- Relative Humidity : 74 %
- Test Date : Oct. 27, 1999

The Conducted Emission test was passed at minimum margin **NEUTRAL 0.150 MHz / 50.30 dBuV**.

| Freq. (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) |
| 0.150 | L | 52.60 | 50.00 | 426.58 | 316.23 | 79.00 | 66.00 | 8912.51 | 1995.26 | -26.4 | -16.0 |
| 0.686 | L | 34.80 | 32.20 | 54.95 | 40.74 | 73.00 | 60.00 | 4466.84 | 1000.00 | -38.2 | -27.8 |
| 5.916 | L | 28.40 | 23.40 | 17.38 | 14.79 | 73.00 | 60.00 | 4466.84 | 1000.00 | -44.6 | -36.6 |
| 0.150 | N | 53.30 | 50.30 | 462.38 | 327.34 | 79.00 | 66.00 | 8912.51 | 1995.26 | -25.7 | -15.7 |
| 0.684 | N | 36.20 | 28.40 | 64.57 | 26.30 | 73.00 | 60.00 | 4466.84 | 1000.00 | -36.8 | -31.6 |
| 3.805 | N | 25.70 | 22.40 | 19.28 | 13.18 | 73.00 | 60.00 | 4466.84 | 1000.00 | -47.3 | -37.6 |

Test Engineer :

Kenny Chuang
KENNY CHUANG



5.4.4. Test mode : SCSI Card + Power (R)

- Frequency Range of Test : from 150 kHz to 30 MHz
- Temperature : 24°C
- Relative Humidity : 74 %
- Test Date : Oct. 27, 1999

The Conducted Emission test was passed at minimum margin **LINE 0.158 MHz / 50.80 dBuV**.

| Freq. (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) |
| 0.158 | L | 53.30 | 50.80 | 462.38 | 346.74 | 79.00 | 66.00 | 8912.51 | 1995.26 | -25.7 | -15.2 |
| 0.879 | L | 33.50 | 30.60 | 47.32 | 33.88 | 73.00 | 60.00 | 4466.84 | 1000.00 | -39.5 | -29.4 |
| 8.335 | L | 23.60 | 19.30 | 15.14 | 9.23 | 73.00 | 60.00 | 4466.84 | 1000.00 | -49.4 | -40.7 |
| 0.159 | N | 53.50 | 50.50 | 473.15 | 334.97 | 79.00 | 66.00 | 8912.51 | 1995.26 | -25.5 | -15.5 |
| 0.877 | N | 32.60 | 29.10 | 42.66 | 28.51 | 73.00 | 60.00 | 4466.84 | 1000.00 | -40.4 | -30.9 |
| 5.868 | N | 24.50 | 18.40 | 16.79 | 8.32 | 73.00 | 60.00 | 4466.84 | 1000.00 | -48.5 | -41.6 |

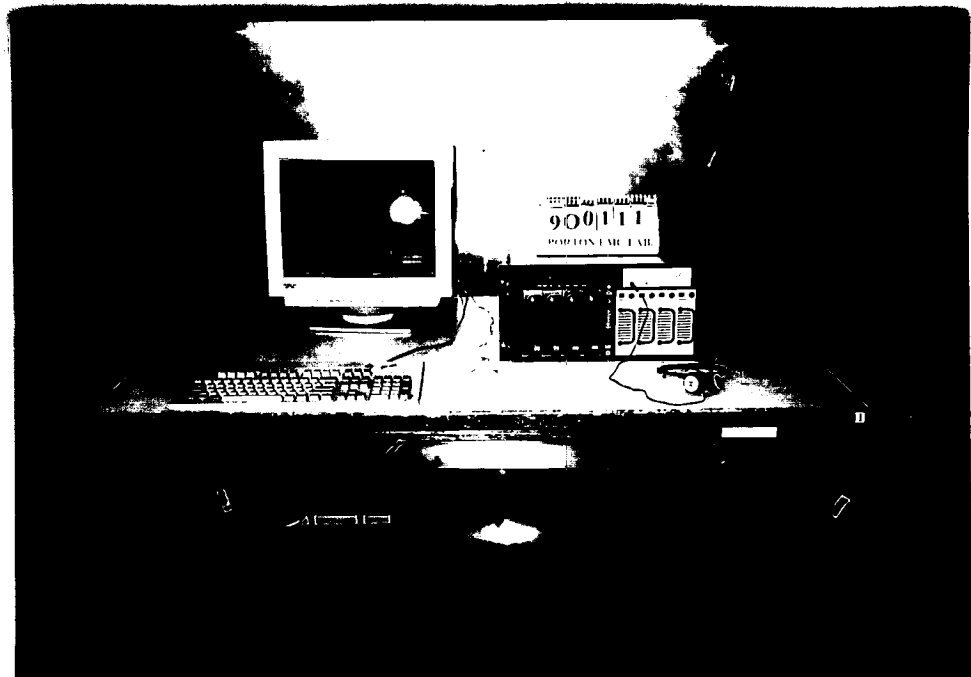
Test Engineer :

Kenny Chuang
KENNY CHUANG

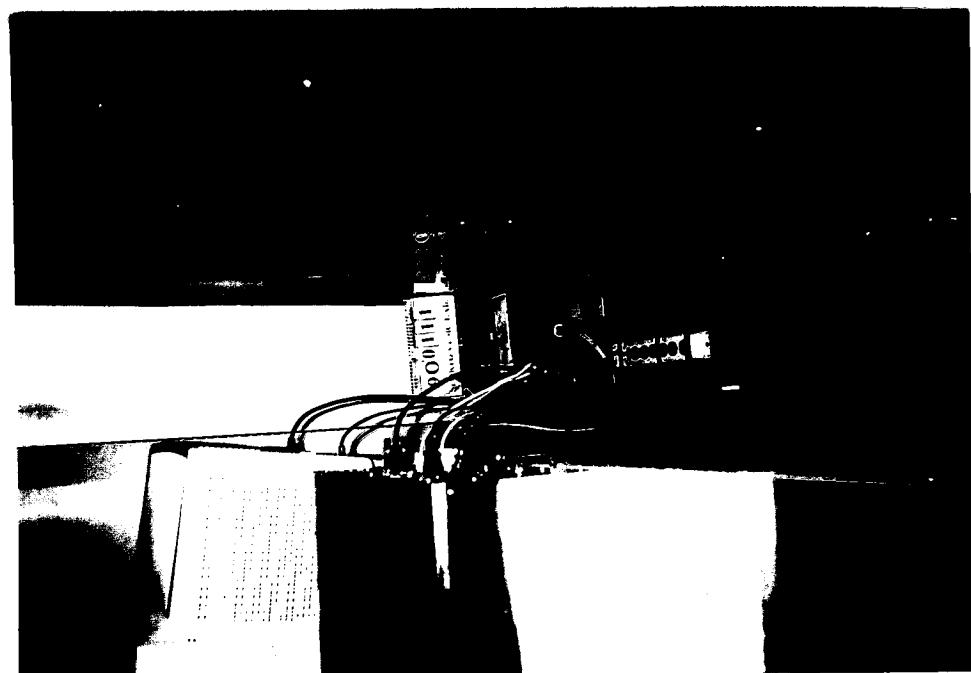
5.5. Photographs of Couducted Powerline Test Configuration

- The photographs show the configuration that generates the maximum emission.

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 55022, 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 section 6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

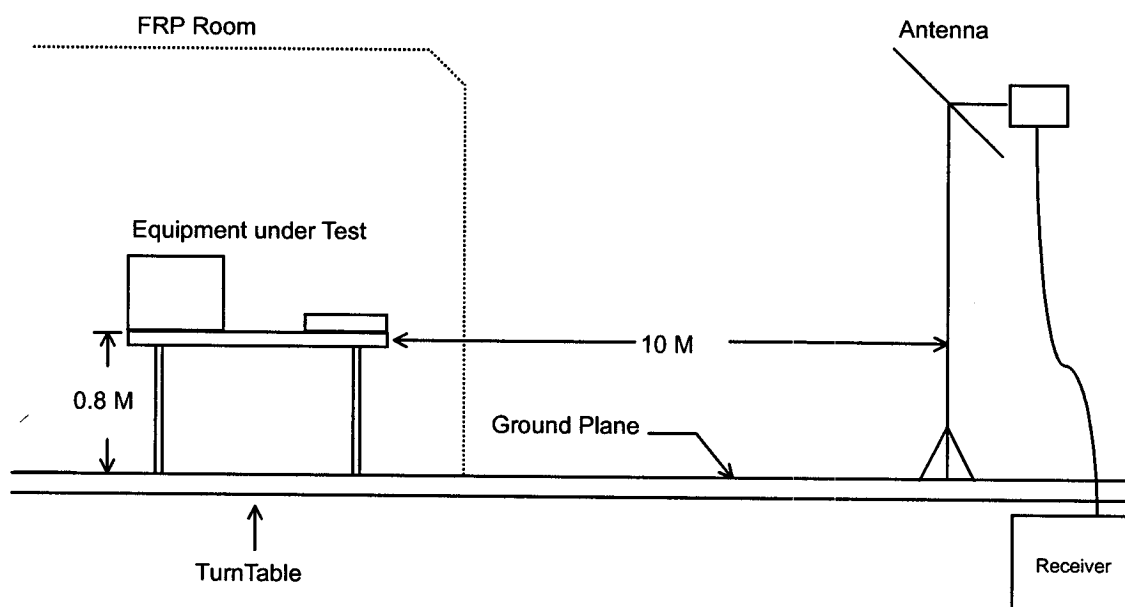
6.1. Description of Major Test Instruments

| | |
|----------------------|---|
| Amplifier | (HP 87405A) |
| Attenuation | 0 dB |
| RF Gain | 25 dB |
| Signal Input | 10 MHz to 3 GHz |
| Spectrum Analyzer | (HP 8560E) |
| Attenuation | 0 dB |
| Start Frequency | 30 MHz |
| Stop Frequency | 1,000 MHz |
| Resolution Bandwidth | 1 MHz |
| Video Bandwidth | 1 MHz |
| Signal Input | 30 Hz to 2.9 GHz |
| Receiver | (R&S ESCS30) |
| Resolution Bandwidth | 120 KHz |
| Frequency Band | 30 MHz to 2.75 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

6.4.1. Test mode : AHA-2940U2W SCSI Card

- Frequency Range of Test : from 30 MHz to 1000 MHz
- Test Distance : 10 M
- Temperature : 27°C
- Relative Humidity : 63 %
- Test Date : Oct. 19, 1999
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin:

VERTICAL 116.154 MHz / 36.99 dBuV Antenna Height 1 Meter , Turntable Degree 212 °.

| Frequency (MHz) | Polarity | Antenna Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Limits | | Emission (dBuV) | Level (uV) | Margin (dB) |
|--------------------|----------|---------------------------|-----------------------|-------------------|--------|--------|--------------------|---------------|----------------|
| | | | | | (dBuV) | (uV) | | | |
| 116.154 | V | 11.79 | 2.47 | 22.73 | 40.00 | 100.00 | 36.99 | 70.71 | -3.01 |
| 119.268 | V | 11.91 | 2.36 | 22.18 | 40.00 | 100.00 | 36.45 | 66.45 | -3.55 |
| 34.152 | H | 17.00 | 1.33 | 16.38 | 40.00 | 100.00 | 34.71 | 54.39 | -5.29 |
| 168.054 | H | 9.74 | 3.03 | 24.04 | 40.00 | 100.00 | 36.81 | 69.26 | -3.19 |
| 169.265 | H | 9.58 | 3.16 | 22.91 | 40.00 | 100.00 | 35.65 | 60.60 | -4.35 |
| 224.800 | H | 10.56 | 3.58 | 21.26 | 40.00 | 100.00 | 35.40 | 58.88 | -4.60 |

Test Engineer : Benny Lee
Benny Lee

6.4.2. Test mode : SCSI Card

- Frequency Range of Test : from 30 MHz to 1000 MHz
- Test Distance : 10 M
- Temperature : 27°C
- Relative Humidity : 63 %
- Test Date : Oct. 21, 1999
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin:

VERTICAL 200.000 MHz / 36.36 dBuV Antenna Height 1 Meter , Turntable Degree 210 °.

| Frequency (MHz) | Polarity | Antenna Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Limits | | Emission (dBuV) | Level (uV) | Margin (dB) |
|--------------------|----------|---------------------------|-----------------------|-------------------|--------|--------|--------------------|---------------|----------------|
| | | | | | (dBuV) | (uV) | | | |
| 57.200 | V | 7.30 | 1.87 | 22.96 | 40.00 | 100.00 | 32.13 | 40.41 | -7.87 |
| 171.100 | V | 9.50 | 3.16 | 21.33 | 40.00 | 100.00 | 33.99 | 50.06 | -6.01 |
| 200.000 | V | 9.52 | 3.34 | 23.50 | 40.00 | 100.00 | 36.36 | 65.77 | -3.64 |
| 57.710 | H | 7.03 | 1.96 | 20.47 | 40.00 | 100.00 | 29.46 | 29.72 | -10.54 |
| 216.000 | H | 10.20 | 3.44 | 17.33 | 40.00 | 100.00 | 30.97 | 35.36 | -9.03 |
| 440.000 | H | 16.94 | 4.67 | 14.78 | 47.00 | 223.87 | 36.39 | 65.99 | -10.61 |

Test Engineer : Benny Lee
Benny Lee

6.5. Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW



7. HARMONICS TEST

7.1. STANDARD

- Product Standard : EN 61000-3-2 (1995)

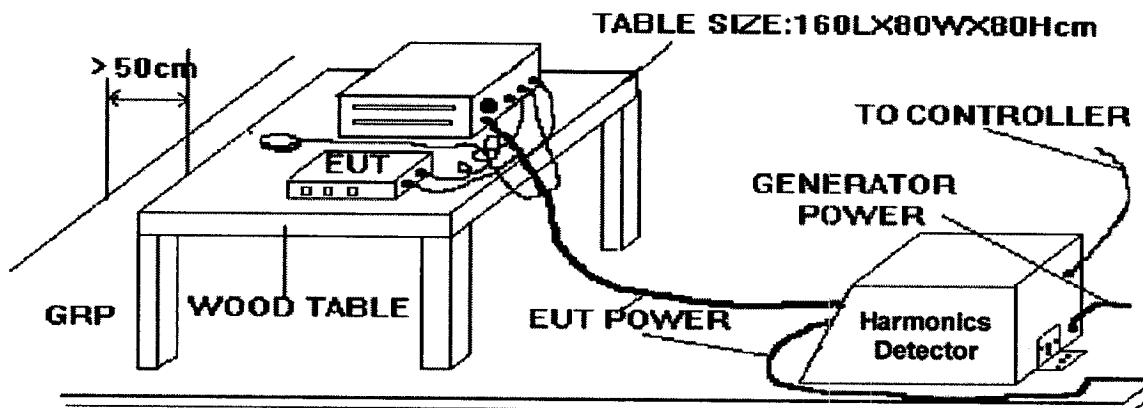
7.2. TEST PROCEDURE

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 seconds
- Test Duration : 2.00 minutes
- Class determination Pre-test Duration : 10.00 seconds

7.4. TEST SETUP



7.5. CURRENT HARMONICS TEST

7.5.1. TEST DATA OF CURRENT HARMONICS

- FINAL TEST RESULT : **PASS**
- Fundamental Current : 0.254 A
- Real Power : 57.5 W
- Power Factor : 0.490
- Percent in Envelope : 100.0 %
- Temperature : 25 °C
- Relative Humidity : 56 % RH
- Test Date : Nov. 03, 1999

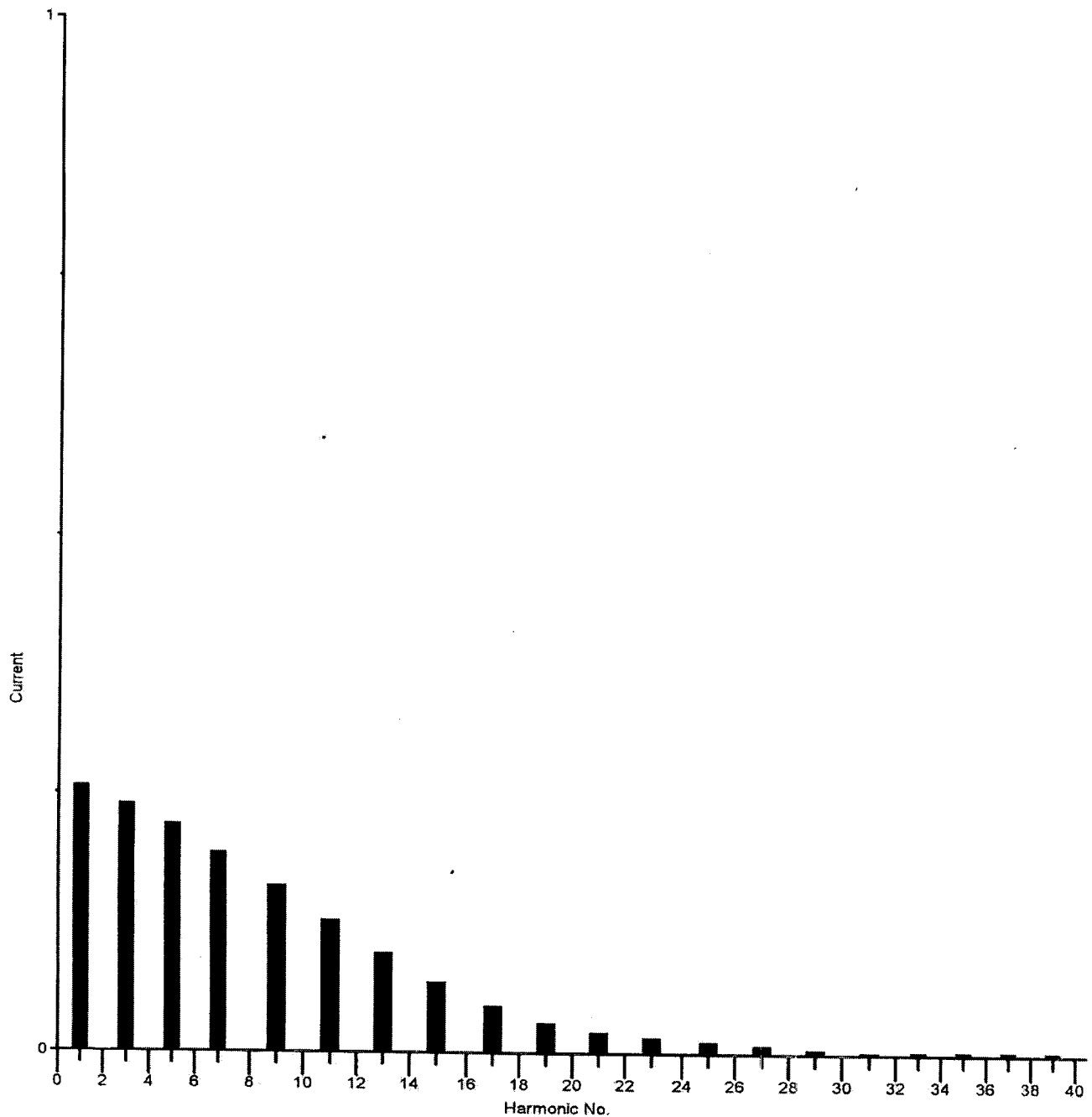
| Harmonic Number | Standard Limit (A rms) | Max. Span Values (A rms) | Harmonic Number | Standard Limit (A rms) | Max. Span Values (A rms) |
|-----------------|------------------------|--------------------------|-----------------|------------------------|--------------------------|
| 1 | Fund | 0.2581 | 21 | 0.1070 | 0.0215 |
| 2 | 1.0800 | 0.0018 | 22 | 0.0840 | 0.0002 |
| 3 | 2.3000 | 0.2402 | 23 | 0.0980 | 0.0166 |
| 4 | 0.4300 | 0.0005 | 24 | 0.0770 | 0.0003 |
| 5 | 1.1400 | 0.2209 | 25 | 0.0900 | 0.0131 |
| 6 | 0.3000 | 0.0006 | 26 | 0.0710 | 0.0003 |
| 7 | 0.7700 | 0.1941 | 27 | 0.0830 | 0.0094 |
| 8 | 0.2300 | 0.0007 | 28 | 0.0660 | 0.0003 |
| 9 | 0.4000 | 0.1623 | 29 | 0.0780 | 0.0058 |
| 10 | 0.1840 | 0.0007 | 30 | 0.0610 | 0.0003 |
| 11 | 0.3300 | 0.1293 | 31 | 0.0730 | 0.0037 |
| 12 | 0.1530 | 0.0008 | 32 | 0.0580 | 0.0003 |
| 13 | 0.2100 | 0.0974 | 33 | 0.0680 | 0.0044 |
| 14 | 0.1310 | 0.0007 | 34 | 0.0540 | 0.0001 |
| 15 | 0.1500 | 0.0694 | 35 | 0.0640 | 0.0053 |
| 16 | 0.1150 | 0.0006 | 36 | 0.0510 | 0.0003 |
| 17 | 0.1320 | 0.0468 | 37 | 0.0610 | 0.0053 |
| 18 | 0.1020 | 0.0004 | 38 | 0.0480 | 0.0003 |
| 19 | 0.1180 | 0.0309 | 39 | 0.0580 | 0.0044 |
| 20 | 0.0920 | 0.0003 | 40 | 0.0460 | 0.0003 |

Test Engineer :

Betty Wu
Betty Wu

7.5.2. TEST GRAPH OF HARMONICS

Harmonics



8. VOLTAGE FLUCTUATIONS TEST

8.1. STANDARD

- Product Standard : EN 61000-3-3 (1995)

8.2. TEST PROCEDURE

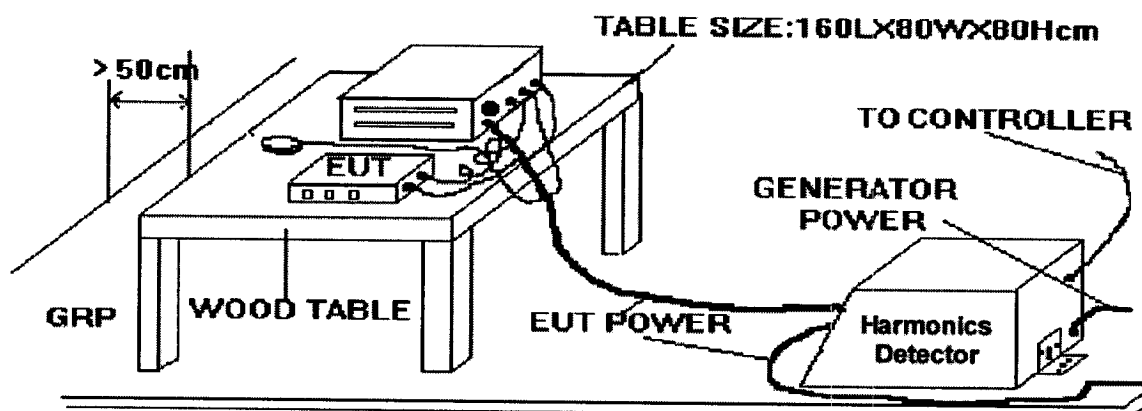
The equipment shall be tested under the conditions of **Clause 5**.

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 : 25 °C
- Relative Humidity : 56% RH
- Test Date : Nov. 03, 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 |

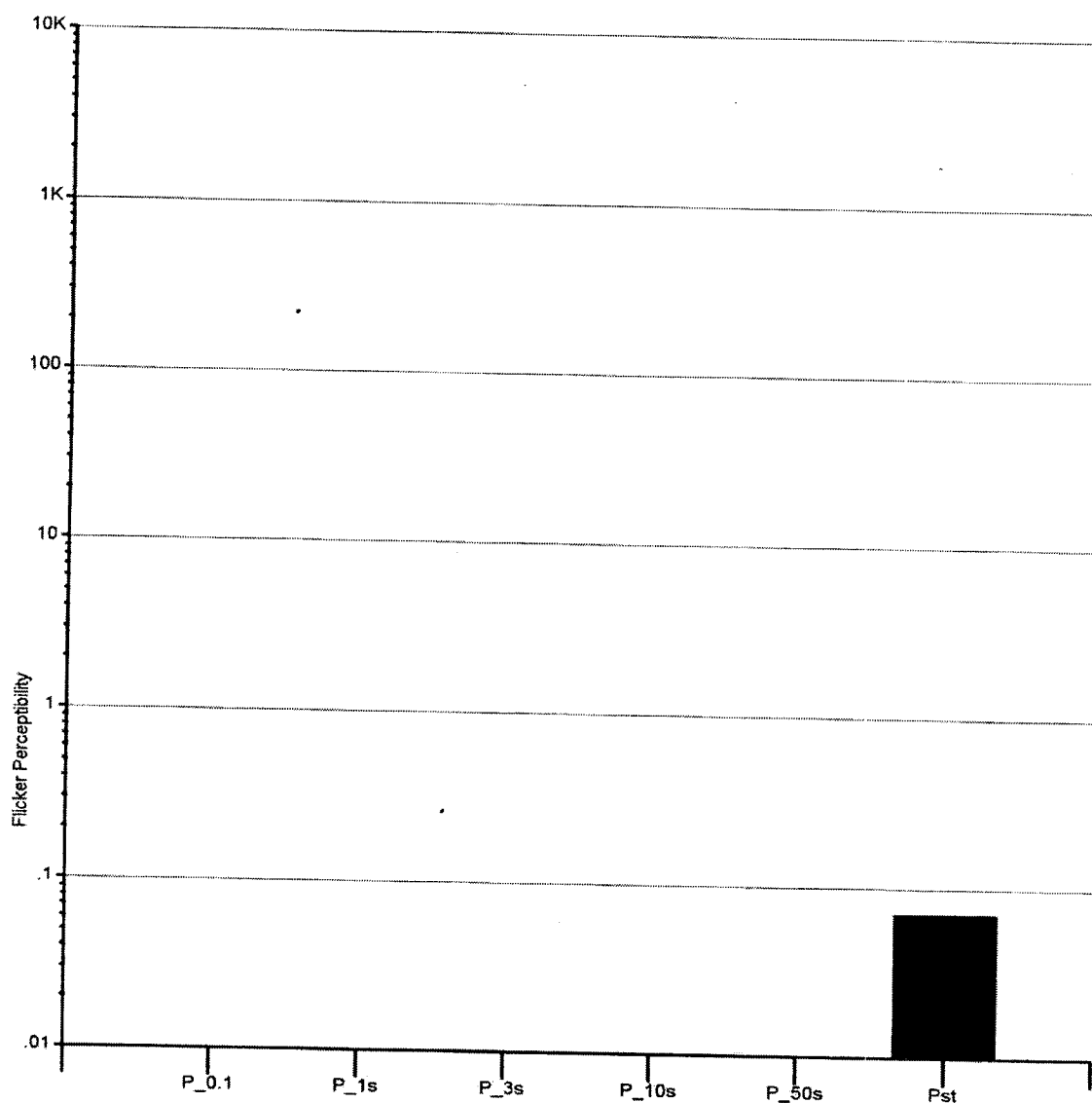
Test Engineer :

Betty Wu

 Betty Wu

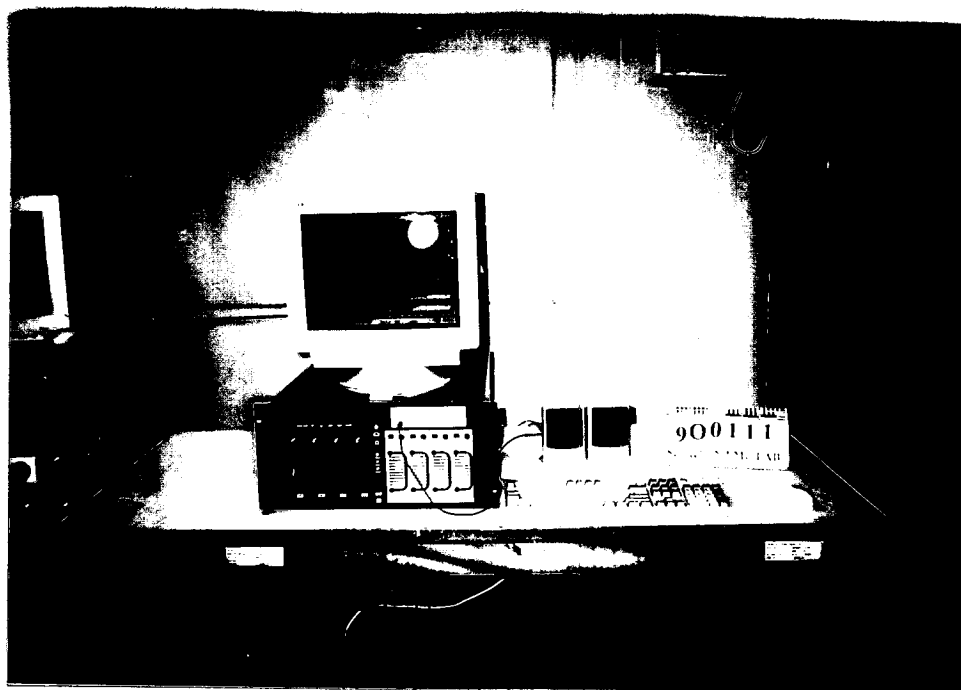
8.5.2. TEST GRAPH OF VOLTAGE FLUCTUATION AND FLICKER

Pst Histogram

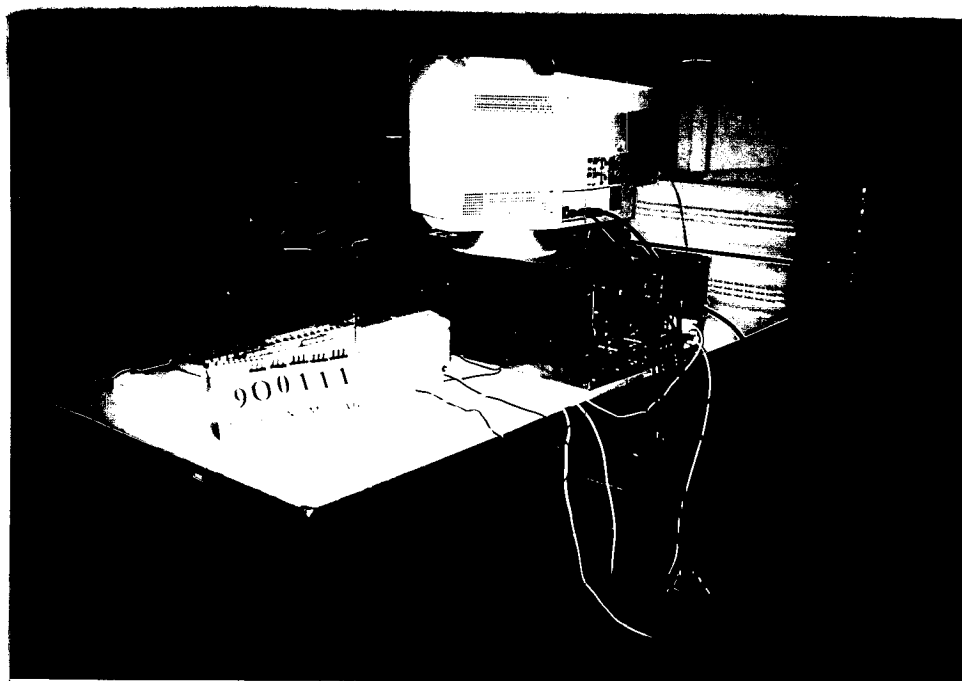


8.6. PHOTOGRAPHS OF HARMONICS TEST, VOLTAGE FLUCTUATION AND FLICKER TEST

FRONT VIEW



REAR VIEW

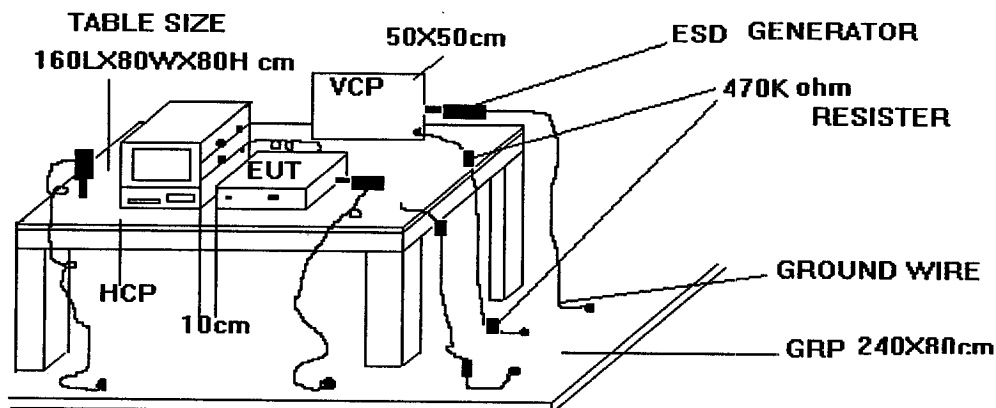




9. Electrostatic Discharge Immunity Test (ESD)

- Pass Performance Criteria : B
- Remark : During testing, the image on then screen was flicked caused by disturbed.
- Basic Standard : EN 61 000-4-2:1995
- Generic Standard : EN50082-1:1997
- Level : 3 for air discharge,
2 for contact discharge
- Tested voltage : $\pm 2 / \pm 4 / \pm 8$ KV for air discharge,
 $\pm 2 / \pm 4$ KV for contact discharge
- Temperature : 26 °C
- Relative Humidity : 58 %
- Test Date : Oct. 29, 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 resistor 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 |
| 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 |

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 |

Test Engineer :

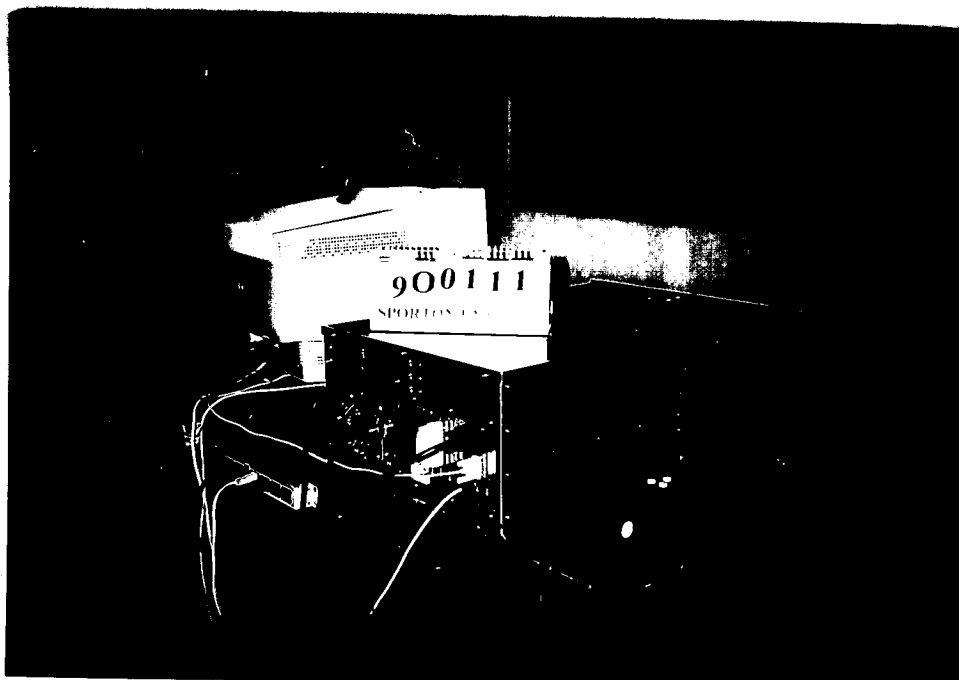
Betty Wu
Betty Wu

9.6. Photographs of Electrostatic Discharge Immunity Test

FRONT VIEW



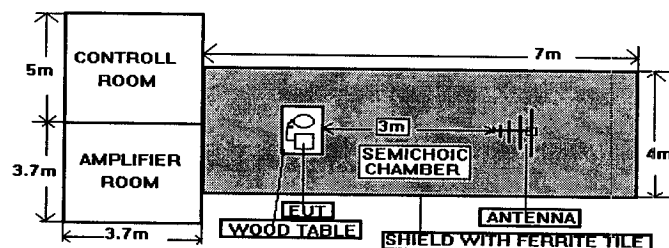
REAR VIEW



10. Radio Frequency Electromagnetic Field Immunity Test (RS)

- Pass Performance Criteria : A
- Basic Standard : EN 61 000-4-3:1996
- Generic Standard : EN50082-1:1997
- Level : 2
- Frequency Range : 80-1000 MHz
- Field Strength : 3 V/m (Modulated 80% AM)
- Temperature : 26 °C
- Relative Humidity : 57 %
- Test Date : Oct. 29, 1999

10.1. Test setup



NOTE : The SPORTON 7m x 4m x 4m semicoic 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 semicoic chamber.



10.2. Test Procedure

- 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.
- The bilog antenna which is enabling the complete frequency range of 80-1000 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.
- 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.
- At each of the above conditions, the frequency range is swept 80-1000 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.

10.3. Test Severity Levels

Frequency Band : 80-1000 MHz

| Level | Test field strength (V/m) |
|-------|---------------------------|
| 1 | 1 |
| 2 | 3 |
| 3 | 10 |
| X | Specified |

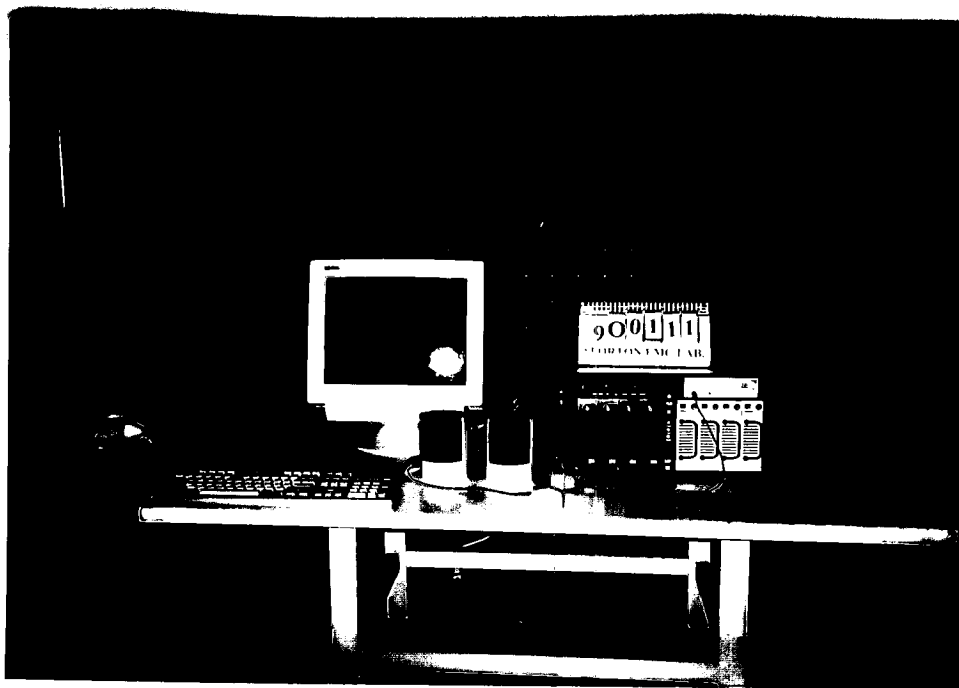
Remark : "X" is an open class.

Test Engineer :

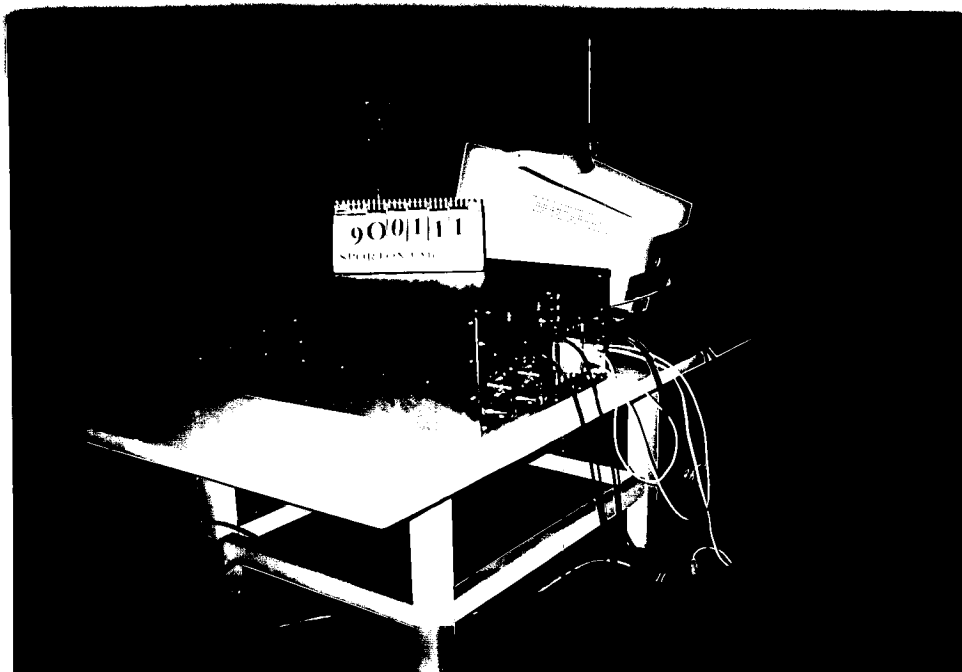
Betty Wu
Betty Wu

10.4. Photographs of Radio Frequency Electromagnetic Field Immunity Test

FRONT VIEW



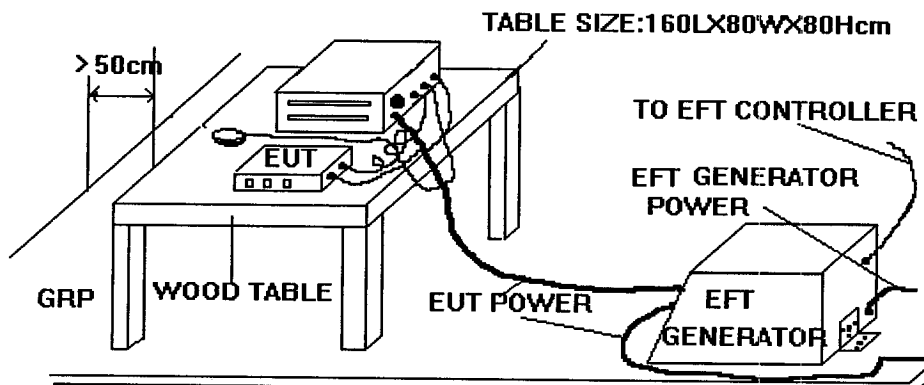
REAR VIEW



11. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)

- Pass Performance Criteria : B
- Remark : During testing, the image on then screen was flicked caused by disturbed.
- Basic Standard : EN 61 000-4-4:1995
- Generic Standard : EN50082-1:1997
- Level : on Power Supply -- 2
- Tested voltage : on Power Supply -- 0.5/1.0 KV
- Temperature : 25°C
- Relative Humidity : 56%
- Test Date : Oct. 29, 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 self-recoverable.
 - 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 : Betty Wu
Betty Wu

11.6. Photographs of Electrical Fast Transient/BURST Immunity Test

FRONT VIEW



REAR VIEW



12. SURGE IMMUNITY TEST

- **Pass** performance Criteria : **A**
- Basic Standard : EN 61 000-4-5 (1995)
- Generic Standard : EN50082-1:1997
- Input Voltage, Frequency : 230Vac, 50Hz
- Level : 3
- Test Voltage : $\pm 1.0/2.0$ KV
- Temperature : 26 ° C
- Relative Humidity : 57 %
- Test Date : Oct. 29, 1999

12.1. TEST RECORD

| Voltage (KV) | Test Location | Polarity | Phase Angle | | | | Test |
|----------------|---------------|----------|-------------|-----|------|------|-------------|
| | | | 0° | 90° | 180° | 270° | Result |
| 1 KV | L - N | + | A | A | A | A | <u>PASS</u> |
| | | - | A | A | A | A | <u>PASS</u> |
| 2 KV | L - PE | + | A | A | A | A | <u>PASS</u> |
| | | - | A | A | A | A | <u>PASS</u> |
| | N - PE | + | A | A | A | A | <u>PASS</u> |
| | | - | A | A | A | A | <u>PASS</u> |
| | LN - PE | + | A | A | A | A | <u>PASS</u> |
| | | - | A | 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, the may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according the 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.

12.5. OPERATING CONDITION

Full system

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 : EN50082-1:1997
- 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 : 26° C
- Relative Humidity : 67 %
- Test Date : Nov. 01, 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

Full system

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.

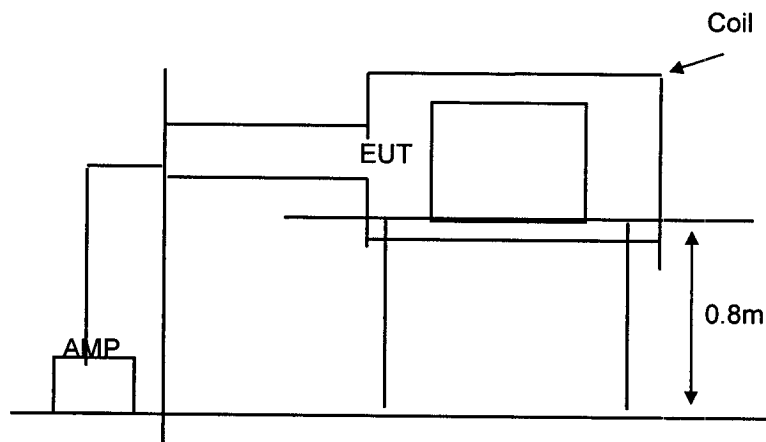
**14. Power Frequency Magnetic Field immunity tests**

- **Pass** performance Criteria : A
- Basic Standard : EN 61000-4-8 (1993)
- Generic Standard : EN50082-1:1997
- Input Voltage, Frequency : AC 230V, 50Hz
- Temperature : 26 °C
- Relative Humidity : 57 %
- Test Date : Nov. 03, 1999

14.1. TEST RECORD

| Power Frequency Magnetic Field | Testing duration | Coil Orientation | Results | Remark |
|-----------------------------------|---------------------|---------------------|---------|--------|
| 50Hz, 3A/m | 1.0 Min | X-axis | Pass | Normal |
| 50Hz, 3A/m | 1.0 Min | Y-axis | Pass | Normal |
| 50Hz, 3A/m | 1.0 Min | Z-axis | Pass | Normal |

14.2. TEST SETUP



14.3. OPERATING CONDITION

Full system

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

- **Pass** performance Criteria : C
- Basic Standard : EN 61 000-4-11 (1994)
- Generic Standard : EN50082-1:1997
- Input Voltage, Frequency : AC 230V, 50Hz
- Temperature : 25 °C
- Relative Humidity : 56 %
- Test Date : Oct. 29, 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 | B | B | B | B | B | B | B | B | 30 | 10 ms |
| 230 | B | B | B | B | B | B | B | B | 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 :

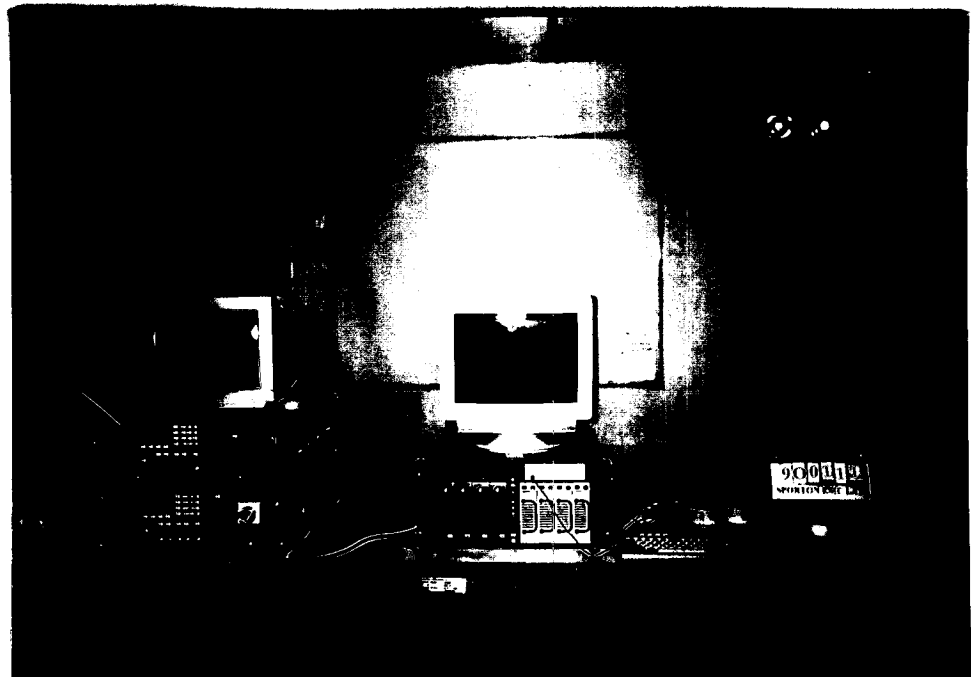
| Voltage dip and Interrupt reduction (%) | Test Duration (ms) |
|--|-----------------------|
| 30 | 500 |
| 60 | 100 |
| 100 | 10 |
| 100 | 80 |
| 100 | 5000 |

15.5. OPERATING CONDITION

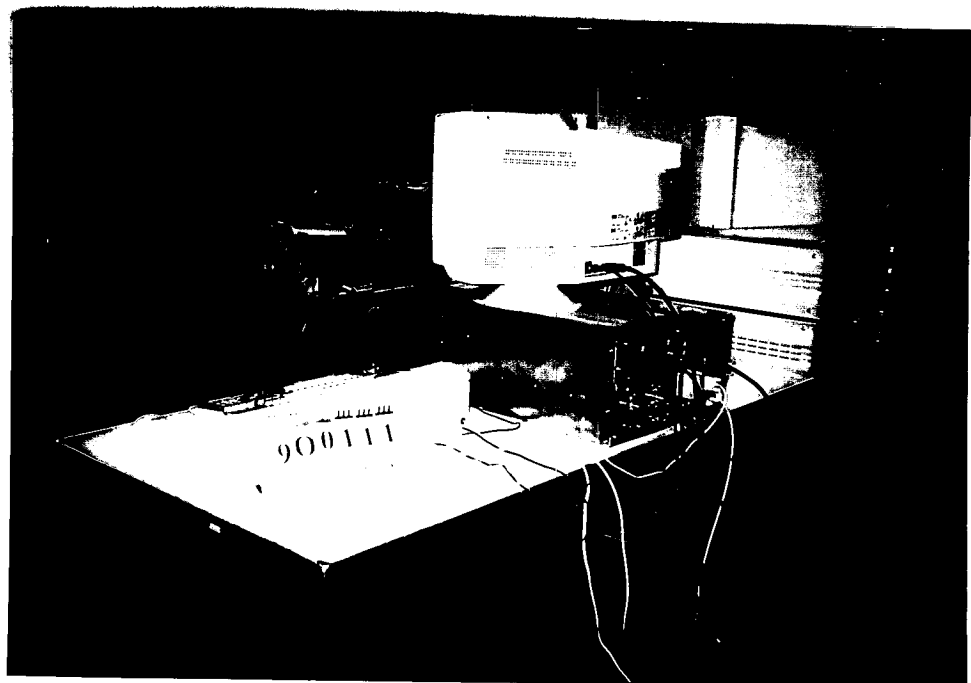
Full system

15.6. Photographs of VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE IMMUNITY TESTS

FRONT VIEW



REAR VIEW



16. Antenna Factor & Cable Loss

| Frequency (MHz) | Antenna Factor (dB) | Cable Loss (dB) |
|-----------------|---------------------|-----------------|
| 30 | 18.6 | 1.3 |
| 35 | 16.6 | 1.3 |
| 40 | 15.1 | 1.5 |
| 45 | 11.9 | 1.5 |
| 50 | 9.2 | 1.5 |
| 55 | 7.8 | 1.7 |
| 60 | 6.5 | 2.2 |
| 65 | 6.6 | 2.2 |
| 70 | 6.8 | 2.2 |
| 75 | 7.0 | 2.2 |
| 80 | 7.3 | 2.2 |
| 85 | 8.5 | 2.2 |
| 90 | 9.7 | 2.2 |
| 95 | 10.4 | 2.2 |
| 100 | 11.1 | 2.2 |
| 110 | 11.6 | 2.4 |
| 120 | 11.9 | 2.3 |
| 130 | 11.3 | 2.5 |
| 140 | 11.0 | 2.7 |
| 150 | 10.4 | 2.7 |
| 160 | 10.4 | 2.8 |
| 170 | 9.5 | 3.2 |
| 180 | 9.6 | 3.0 |
| 190 | 9.6 | 3.2 |
| 200 | 9.5 | 3.3 |
| 220 | 10.4 | 3.5 |
| 240 | 11.2 | 3.5 |
| 260 | 12.0 | 4.2 |
| 280 | 13.0 | 4.0 |
| 300 | 13.8 | 4.0 |
| 320 | 14.4 | 4.0 |
| 340 | 14.9 | 4.2 |
| 360 | 15.5 | 4.2 |
| 380 | 16.0 | 4.8 |
| 400 | 16.6 | 4.8 |
| 450 | 17.0 | 4.9 |
| 500 | 17.5 | 5.5 |
| 550 | 18.3 | 5.3 |
| 600 | 19.0 | 5.7 |
| 650 | 18.1 | 6.0 |
| 700 | 17.2 | 6.7 |
| 750 | 17.3 | 6.3 |
| 800 | 17.5 | 6.7 |
| 850 | 20.1 | 6.5 |
| 900 | 22.7 | 7.3 |
| 950 | 22.5 | 7.3 |
| 1000 | 22.2 | 7.7 |

LKOP1

17. List of Measuring Equipment Used

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|-----------------------------------|--------------|------------|-------------|-----------------|------------------|------------|
| EMC Receiver (site 1) | HP | 8591EM | 3536A00672 | 9 KHz – 1.8 GHz | Aug. 30, 1999 | Conduction |
| LISN (EUT) (site 1) | EMCO | 3850/2 | 9510-1035 | 50 ohm / 50 uH | Oct. 22, 1999 | Conduction |
| LISN (Support Unit) (site 1) | KYORITSU | KNW-407 | 8-693-10 | 50 ohm / 50 uH | Oct. 22, 1999 | Conduction |
| EMI Filter (site 1) | CORCOM | MRI-2030 | N/A | 480 VAC / 30 A | N/A | Conduction |
| Amplifier (Site 1) | HP | 87405A | 3207A01431 | 10MHz – 3.0GHz | Jun. 24, 1999 | Radiation |
| Spectrum Analyzer (site 1) | HP | 8560E | 3728A03186 | 30Hz – 2.9GHz | Sep. 06, 1999 | Radiation |
| Receiver (Site 1) | R&S | ESCS30 | 70-213-4258 | 9KHz - 2.75GHz | Dec. 18, 1998 | Radiation |
| Bilog Antenna (Site 1) | CHASE | CBL6112A | 2288 | 30MHz -2GHz | Jul. 12, 1999 | Radiation |
| Half-wave dipole antenna (site 1) | EMCO | 3121C | 9705-1285 | 28 M - 1GHz | May 18, 1999 | Radiation |
| Turn Table (site 1) | EMCO | 1060-1.211 | 9507-1805 | 0 ~ 360 degree | N/A | Radiation |
| Antenna Mast (site 1) | EMCO | 2075 | 9806-2160 | 1 m - 4 m | N/A | Radiation |



18. Notice for Class A Product

Class A ITE is a category of all other ITE which satisfies the class A ITE limits but not the class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use:

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

| Instrument | Manufacturer | Model No. | Characteristics | Calibration Date | Remark |
|------------------------------|-------------------------------|----------------|--------------------------|------------------|--------------------|
| ESD Simulator | KEYTEK | MZ-15/EC | 0 KV - 15 KV | Apr. 16, 1999 | ESD |
| OMNI-Tip | KEYTEK | TPC-2 | 0 KV - 15 KV | Jul. 23, 1999 | ESD |
| Amplifier | AR | 100W 1000M3 | 80 MHz - 1 GHz | N/A | RS |
| Isotropic Field Probe | AR | FP3000A | 10 KHz - 1 GHz | Jun. 19, 1999 | 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, 1999 | RS |
| Signal Generator | R&S | SMX | 100 KHz - 1 GHz | Nov. 08, 1998 | RS |
| Antenna | CHASE | CBL6121A | 26 MHz - 1 GHz | Jun. 12, 1999 | RS |
| Amplifier | AR | 75W 75A220 | 25MHz - 300MHz | Jun. 14, 1999 | RS |
| EFT Generator | KEYTEK | CE-40 | 0 KV - 4.4 KV | Jul. 09, 1999 | EFT |
| Harmonic/Flicker Test System | HP | 6843A | 4800VA 90A / 48A PEAK | Nov. 15, 1998 | Harmonics, Flicker |
| Combination Wave Generator | EMC PARTNER AG Switzerland | MIG0603IN2 | 6 KV, 3 KA | Feb. 05, 1999 | SURGE |
| CDN | FCC | Fcc-801-M3-25 | N/A | Oct. 05, 1999 | CS |
| EMC Immunity Tester | EMC PARTNER AG Switzerland | TRANSIENT 1000 | 0 ~ 260 rms, 16A | Feb. 02, 1999 | DIP |

19. Declaration of Conformity and the CE Mark

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

19.1. 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.

19.2. 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.

19.3. 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).

19.4. 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.



To = *File*

Form Modular Impulse Generator Surge Immunity Test Results

Sporton EMC LAB Corp

Date: *8/10/99*

| | |
|---|------------------------------|
| Applicant : <i>Boji Advantech</i> | FILE NO : <i>C, L 908111</i> |
| EUT : <i>RAID Subsystems</i> | Temperature : <i>26</i> °C |
| Input Voltage : <i>AC DC 270V 50 Hz</i> | Humidity : <i>57</i> % |
| Working Condition : _____ | Test Mode : _____ |

Input And Output AC Power Port

| Location | Polarity | Phase Angle | No of Pulse | Pulse Voltage(KV) | | Result |
|----------|----------|-------------|-------------|-------------------|-----------|----------------|
| | | | | EN50082-1 | EN50082-2 | |
| L-N | + | 0 | 5 | 1 | 0.5 | Pass Fail Note |
| | + | 90 | 5 | 1 | 0.5 | Pass Fail Note |
| | + | 180 | 5 | 1 | 0.5 | Pass Fail Note |
| | + | 270 | 5 | 1 | 0.5 | Pass Fail Note |
| | - | 0 | 5 | 1 | 0.5 | Pass Fail Note |
| | - | 90 | 5 | 1 | 0.5 | Pass Fail Note |
| | - | 180 | 5 | 1 | 0.5 | Pass Fail Note |
| | - | 270 | 5 | 1 | 0.5 | Pass Fail Note |
| L-PE | + | 0 | 5 | 2 | 1 | Pass Fail Note |
| | + | 90 | 5 | 2 | 1 | Pass Fail Note |
| | + | 180 | 5 | 2 | 1 | Pass Fail Note |
| | + | 270 | 5 | 2 | 1 | Pass Fail Note |
| | - | 0 | 5 | 2 | 1 | Pass Fail Note |
| | - | 90 | 5 | 2 | 1 | Pass Fail Note |
| | - | 180 | 5 | 2 | 1 | Pass Fail Note |
| | - | 270 | 5 | 2 | 1 | Pass Fail Note |
| N-PE | + | 0 | 5 | 2 | 1 | Pass Fail Note |
| | + | 90 | 5 | 2 | 1 | Pass Fail Note |
| | + | 180 | 5 | 2 | 1 | Pass Fail Note |
| | + | 270 | 5 | 2 | 1 | Pass Fail Note |
| | - | 0 | 5 | 2 | 1 | Pass Fail Note |
| | - | 90 | 5 | 2 | 1 | Pass Fail Note |
| | - | 180 | 5 | 2 | 1 | Pass Fail Note |
| | - | 270 | 5 | 2 | 1 | Pass Fail Note |
| L, N-PE | + | 0 | 5 | 2 | 1 | Pass Fail Note |
| | + | 90 | 5 | 2 | 1 | Pass Fail Note |
| | + | 180 | 5 | 2 | 1 | Pass Fail Note |
| | + | 270 | 5 | 2 | 1 | Pass Fail Note |
| | - | 0 | 5 | 2 | 1 | Pass Fail Note |
| | - | 90 | 5 | 2 | 1 | Pass Fail Note |
| | - | 180 | 5 | 2 | 1 | Pass Fail Note |
| | - | 270 | 5 | 2 | 1 | Pass Fail Note |

DC Input And DC Output Power Port

| Location | Polarity | Phase Angle | No of Pulse | Pulse Voltage(KV) | | Result |
|-------------------|----------|-------------|-------------|-------------------|-----------|----------------|
| | | | | EN55014-2 | EN50082-1 | |
| Differential Mode | + | - | | | 0.5 | Pass Fail Note |
| | - | - | | | 0.5 | Pass Fail Note |
| Common Mode | + | - | | | 0.5 | Pass Fail Note |
| | - | - | | | 0.5 | Pass Fail Note |

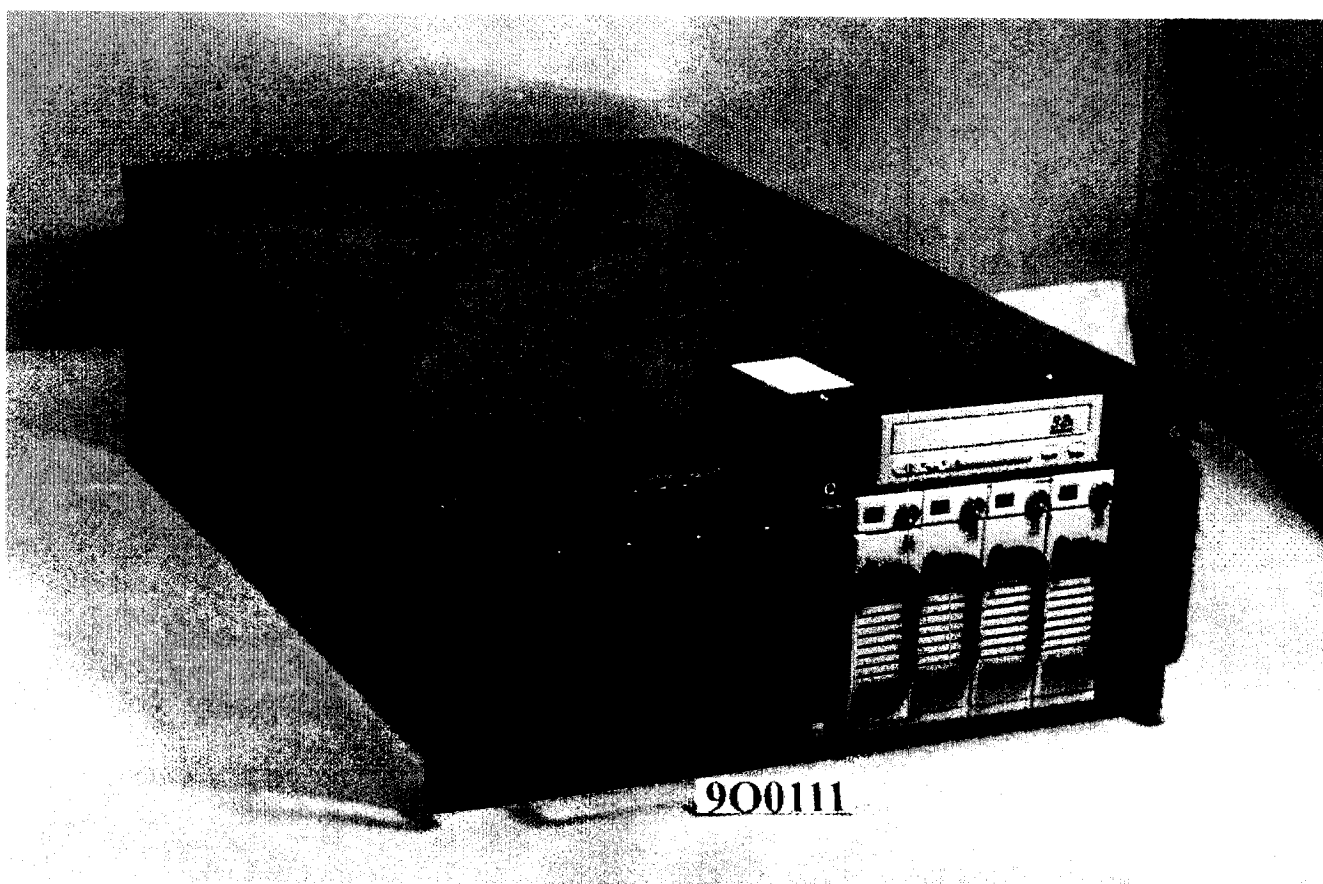
Note :

Measurement Equipment : MIG

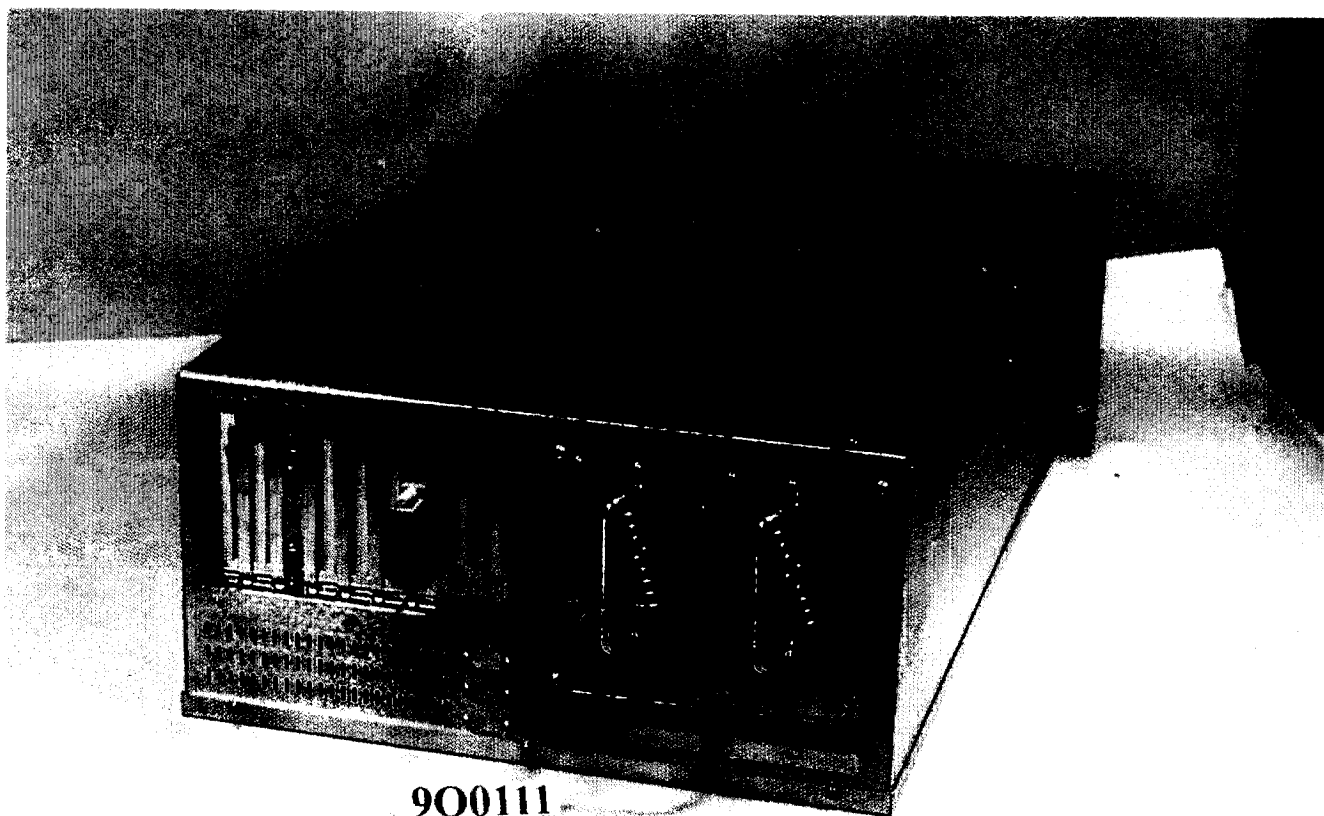
Surge Simulator Mode : MIG0603-IN 2

Engineer : *[Signature]*

APPENDIX A. Photographs of EUT



900111-01.JPG



900111-02.JPG