# EN55022 / CISPR 22 / EN55011 / CISPR 11
# AS/NZS 3548
# Class A

# EMI TEST REPORT

*of*

## Socket 370 CPU Board

*Model/ Type/ Machine Type*

## PCM-9576F

*Applied by:*

Advantech Co., Ltd.
FL.4, No. 108-3, Ming-Chuan Road
Shing-Tien City, Ta
Taiwan, R. O. C.

*Test Performed by:*

International Standards Laboratory
No. 21, Alley 37, Lane 122, Sec. 2
Hsiwan Rd. Hsichih
Taipei Hsien 22117
Taiwan, R.O.C.

Tel:(02)2646-2550
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**Report Number: ISL-01B022C Version: 0** **Test Date: 2001/03/15**
NVLAP Lab. Code: 200234-0; VCCI: R-341, C-354; NEMKO Aut. No: ELA 113; BSMI Lab. Code: SL2-IN-E-0013

**Contents of Report**

# 1. General

## 1.1 Certification of Accuracy of Test Data

The electromagnetic interference tests which this report describes were conducted by an independent electromagnetic compatibility consultant, International Standards Laboratory in accordance with the EN55011 / CISPR 11 ; EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997 test Procedure.

This test report accurately represents the test results generated by sample equipment under test at the time of the test.

| | | |
|---|---|---|
| **Equipment Tested**: | Socket 370 CPU Board | |
| | Model/ Type/ Machine Type: PCM-9576F | |
| | Applied by Advantech Co., Ltd. | |
| **Date of test**: | 2001/03/15 | |
| Temperature: | 25º C (Conduction Test); | 24º C (Radiation Test) |
| Humidity: | 55% (Conduction Test); | 80% (Radiation Test) |
| **Test Engineer**: | Alan Tsai | |

The results show that the sample equipment tested as described in this report is in compliance with the Class A conducted and radiated emission limits of EN55011 / CISPR 11 EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997 regulations.

Approve & Signature

L. Y. Soong/Director

Note: This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory

## 1.2 Product Information

| | |
|---|---|
| Description: | Socket 370 CPU Board |
| Condition: | Pre-Production |
| AC Power during Test: | 230VAC/50Hz |
| Model: | PCM-9576F |
| Serial Number: | N/A |
| Parallel Port: | one 25-pin |
| Serial Port: | four 9-pin |
| Keyboard Connector: | 6-pin |
| Mouse Connector: | 6-pin |
| USB Connector: | two 4-pin |
| LAN Connector: | one 4-pin |
| VGA Port: | one 15-pin |
| DRAM (Option): | 32 MB*1 |

Speed & CPU

| Speed | CPU |
|---|---|
| 66MHz | Celeron 466 MHz |

The worst data using CPU: Celeron 466 MHz, SPS: ADVAN TECH (Model: PS-55A), Hard Disk Driver: IBM (Model: DBCA-203240) 3.25GB in this test report.

EMI Noise Source:

Crystal: 14.318MHz (Y1), 32.768KHz (Y2), 25MHz (X1), 25MHz (X2), 25MHz (X3)

Clock Generator: U18

| | |
|---|---|
| Description: | Housing |
| Model: | N/A |
| Power Rating: | 100-240VAC,47-63 Hz,1-2.5 A |
| Power Supply Type: | ADVAN TECH (Model: PS-55A) |
| Hard Disk Driver: | IBM (Model: DBCA-203240) 3.25GB |
| Power Cord: | Non-shielded, Detachable |

## 1.3 Summary

### 1.3.1 Description of Equipment Under Test (EUT)

Description: Socket 370 CPU Board

Model/ Type/ Machine Type: PCM-9576F

Applicant: Advantech Co., Ltd.
FL.4, No. 108-3, Ming-Chuan Road
Shing-Tien City, Ta
Taiwan, R. O. C.

### 1.3.2 Description of EUT and Support Equipment Included in Tests

The EUT is a Socket 370 CPU Board (Model/ Type/ Machine Type: PCM-9576F), which was tested with the following support units:

| | |
|---|---|
| 1. Acer USB Mouse | Model: MUSXT |
| 2. Acer USB Keyboard | Model: 6511-P |
| 3. HP Printer | Model: 2225C |
| 4. Logitech Mouse | Model: M-S34 |
| 5. Aceex Modem | Model: DM1414 |
| 6. Aceex Modem | Model: DM1414 |
| 7. Aceex Modem | Model: DM1414 |
| 8. Aceex Modem | Model: DM1414 |
| 9. Acer Monitor | Model: 7377xe |
| 10.Acer Keyboard | Model: 6511-TW4C |
| 11.IBM Personal Computer | Model: IBM2170 |

A more detailed technical description of the support equipment is contained in Appendix E.

### 1.3.3 Test Procedure and Specification

The tests were performed in accordance with EN55011 / CISPR 11 EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997 regulations as detailed in the Appendix A & B and the individual test sections. The test instrument used is detailed in Appendix A. The specification used was the Class A limits of EN55011 / CISPR 11 EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997 regulations.

### 1.3.4 Tests Performed

1. Power main port conducted emissions in shielded room.
   See Part 2 of this report for details.
2. Telecommunication port conducted emissions in shielded room
   See Part 3 of this report for details.
3. Radiated emissions in 10-meter open area.
   See Part 4 of this report for details.

# 2. Power Main Port Conducted Emissions

## 2.1 Configuration and Procedure

### 2.1.1 EUT Configuration

The equipment under test was set up in the shielded room with the EUT 40cm away from the wall of the room. The EUT was placed on a non-conductive test table which is 80cm in height. Excess power cord was folded back and forth to form a 30cm by 40cm bundle. The distance between EUT and LISN is 80cm.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 2.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dß below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dß below the applicable average limits, the emissions were also measured with the average detectors.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

### 2.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 150KHz--30MHz |
| Detector Function: | Quasi-Peak / Average Mode |
| Resolution Bandwidth (RBW): | 9KHz |

## 2.2 Test Data: *CPU: Celeron 466MHz, Speed: 66MHz, SPS: ADVAN TECH (Model: PS-55A), Hard Disk Driver: IBM (Model: DBCA-203240) 3.25GB*

**Table 2.2.1 Power Line Conducted Emissions (Hot)**

| | LISN | Quasi-Peak | | | Average | | |
|---|---|---|---|---|---|---|---|
| Frequency (KHz/MHz) | Insertion Loss (dB) | Amplitude (dBuV) | Limit (dBuV) | Margin (dB) | Amplitude (dBuV) | Limit (dBuV) | Margin (dB) |
| 206.20KHz | 0.20 | 45.58 | 79.00 | -33.22 | 32.79 | 66.00 | -33.01 |
| 345.35KHz | 0.20 | 36.78 | 79.00 | -42.02 | 26.42 | 66.00 | -39.38 |
| 415.25KHz | 0.20 | 33.08 | 79.00 | -45.72 | 21.40 | 66.00 | -44.40 |
| 553.88KHz | 0.20 | 26.17 | 73.00 | -46.63 | 15.47 | 60.00 | -44.33 |
| 622.98KHz | 0.20 | 24.10 | 73.00 | -48.70 | 13.24 | 60.00 | -46.56 |
| 679.88KHz | 0.20 | 20.07 | 73.00 | -52.73 | 15.14 | 60.00 | -44.66 |
| 726.18KHz | 0.20 | 19.37 | 73.00 | -53.43 | 14.61 | 60.00 | -45.19 |
| 755.73KHz | 0.20 | 18.05 | 73.00 | -54.75 | 7.08 | 60.00 | -52.72 |
| 821.83KHz | 0.20 | 17.70 | 73.00 | -55.10 | 11.16 | 60.00 | -48.64 |
| 970.00KHz | 0.20 | 19.92 | 73.00 | -52.88 | 14.37 | 60.00 | -45.43 |
| 5.2903MHz | 0.36 | 30.22 | 73.00 | -42.42 | 24.67 | 60.00 | -34.97 |
| 16.452MHz | 0.86 | 40.64 | 73.00 | -31.50 | 32.07 | 60.00 | -27.07 |
| 22.759MHz | 0.89 | 20.81 | 73.00 | -51.30 | 14.94 | 60.00 | -44.17 |
| 25.206MHz | 0.81 | 18.29 | 73.00 | -53.90 | 10.41 | 60.00 | -48.78 |

* NOTE: Margin = Amplitude + Insertion Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

Tested by:
Alan Tsai 2001/03/29
Alan Tsai

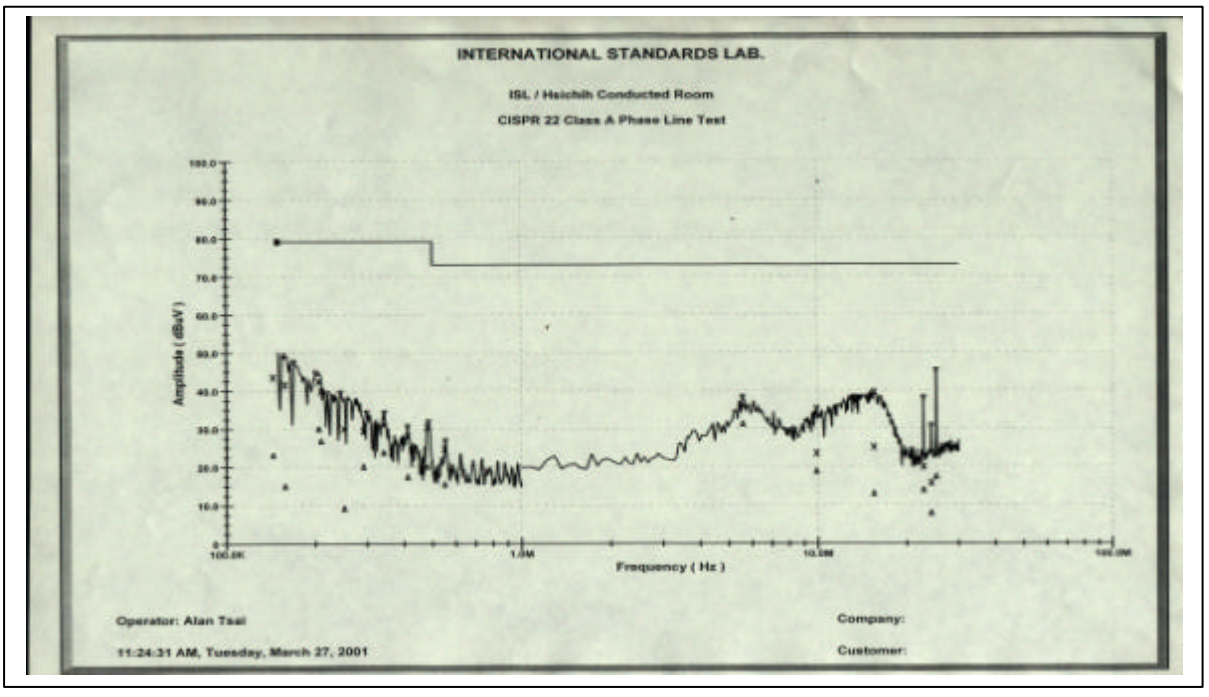


**Table 2.2.1 Power Line Conducted Emissions (Neutral)**

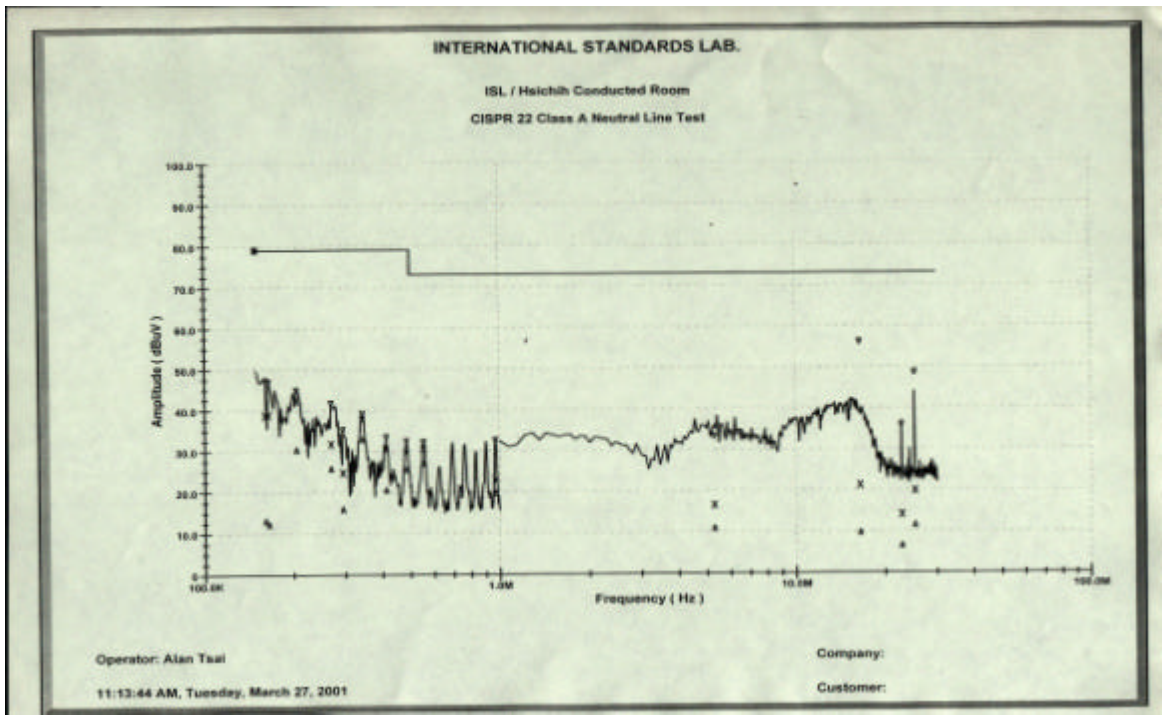
| | LISN | Quasi-Peak | | | Average | | |
|---|---|---|---|---|---|---|---|
| Frequency (KHz/MHz) | Insertion Loss (dB) | Amplitude (dBuV) | Limit (dBuV) | Margin (dB) | Amplitude (dBuV) | Limit (dBuV) | Margin (dB) |
| 205.25KHz | 0.20 | 44.59 | 79.00 | -34.21 | 32.56 | 66.00 | -33.24 |
| 275.38KHz | 0.24 | 40.29 | 79.00 | -38.47 | 32.83 | 66.00 | -32.94 |
| 345.50KHz | 0.27 | 38.98 | 79.00 | -39.75 | 31.16 | 66.00 | -34.57 |
| 415.63KHz | 0.30 | 33.05 | 79.00 | -45.65 | 25.79 | 66.00 | -39.91 |
| 485.75KHz | 0.30 | 30.94 | 79.00 | -47.76 | 26.72 | 66.00 | -38.98 |
| 553.75KHz | 0.30 | 32.30 | 73.00 | -40.40 | 27.50 | 60.00 | -32.20 |
| 698.25KHz | 0.30 | 21.05 | 73.00 | -51.65 | 17.25 | 60.00 | -42.45 |
| 762.00KHz | 0.30 | 31.39 | 73.00 | -41.31 | 29.18 | 60.00 | -30.52 |
| 904.38KHz | 0.30 | 24.68 | 73.00 | -48.02 | 21.62 | 60.00 | -38.08 |
| 972.38KHz | 0.30 | 28.00 | 73.00 | -44.70 | 25.87 | 60.00 | -33.83 |
| 5.2775MHz | 0.42 | 13.57 | 73.00 | -59.01 | 5.64 | 60.00 | -53.94 |
| 16.442MHz | 0.50 | 32.34 | 73.00 | -40.16 | 21.39 | 60.00 | -38.11 |
| 22.750MHz | 0.56 | 20.08 | 73.00 | -52.36 | 11.91 | 60.00 | -47.53 |
| 25.215MHz | 0.60 | 17.51 | 73.00 | -54.89 | 10.89 | 60.00 | -48.51 |

* NOTE: Margin = Amplitude + Insertion Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

Tested by:

Alan Tsai 2001/03/29

Alan Tsai



# 3. Telecommunication Port Conducted Emissions

## 3.1 Configuration and Procedure

### 3.1.1 EUT Configuration

The equipment under test was set up in the shielded room with the EUT 40cm away from the wall of the room. The EUT was placed on a non-conductive test table which is 80cm in height. Excess power cord was folded back and forth to form a 30cm by 40cm bundle. The distance between EUT and CDN is 80cm. CDN is connected to the reference ground plane.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 3.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The content of the software consist of both periodic and pseudo-random messages.
The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

### 3.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 150KHz--30MHz |
| Detector Function: | Quasi-Peak / Average Mode |
| Resolution Bandwidth (RBW): | 9KHz |

## 3.2 Test Data: LAN

**Table 3.2.1 Telecommunication Port Conducted Emission**

| | ISN | Quasi-Peak | | | Average | | |
|---|---|---|---|---|---|---|---|
| Frequency (KHz/MHz) | Loss (dB) | Amplitude (dBuV) | Limit (dBuV) | Margin (dB) | Amplitude (dBuV) | Limit (dBuV) | Margin (dB) |
| 193.63KHz | 5.89 | 49.76 | 95.75 | -40.11 | 48.09 | 82.75 | -28.78 |
| 242.30KHz | 5.89 | 48.45 | 94.36 | -40.03 | 46.86 | 81.36 | -28.62 |
| 274.50KHz | 5.89 | 48.50 | 93.44 | -39.06 | 47.84 | 80.44 | -26.72 |
| 342.10KHz | 5.88 | 49.19 | 91.51 | -36.44 | 45.65 | 78.51 | -26.98 |
| 387.65KHz | 5.88 | 43.88 | 90.21 | -40.45 | 40.56 | 77.21 | -30.77 |
| 431.85KHz | 5.88 | 35.81 | 88.95 | -47.26 | 34.02 | 75.95 | -36.05 |
| 483.80KHz | 5.88 | 44.73 | 87.46 | -36.85 | 40.52 | 74.46 | -28.06 |
| 485.18KHz | 5.88 | 43.90 | 87.42 | -37.64 | 39.23 | 74.42 | -29.31 |
| 528.78KHz | 5.88 | 32.94 | 87.00 | -48.18 | 29.30 | 74.00 | -38.82 |
| 544.83KHz | 5.88 | 33.14 | 87.00 | -47.98 | 31.39 | 74.00 | -36.73 |
| 581.53KHz | 5.88 | 38.74 | 87.00 | -42.38 | 32.98 | 74.00 | -35.14 |
| 1.2123MHz | 5.87 | 34.55 | 87.00 | -46.58 | 29.96 | 74.00 | -38.18 |
| 5.0246MHz | 5.88 | 28.64 | 87.00 | -52.48 | 12.60 | 74.00 | -55.53 |
| 5.4356MHz | 5.88 | 36.89 | 87.00 | -44.23 | 32.22 | 74.00 | -35.90 |
| 5.5901MHz | 5.88 | 22.35 | 87.00 | -58.77 | 17.97 | 74.00 | -50.15 |
| 6.2619MHz | 5.88 | 36.44 | 87.00 | -44.68 | 31.50 | 74.00 | -36.62 |
| 7.4801MHz | 5.89 | 23.35 | 87.00 | -57.76 | 17.76 | 74.00 | -50.36 |
| 9.5224MHz | 5.90 | 22.16 | 87.00 | -58.94 | 2.42 | 74.00 | -65.68 |
| 16.357MHz | 5.93 | 41.40 | 87.00 | -39.67 | 31.12 | 74.00 | -36.95 |
| 22.627MHz | 5.96 | 12.41 | 87.00 | -68.63 | 5.83 | 74.00 | -62.21 |
| 25.084MHz | 5.97 | 25.06 | 87.00 | -55.97 | 17.52 | 74.00 | -50.51 |

* NOTE: Margin = Amplitude + Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

Tested by:

Alan Tsai 2001/03/19

Alan Tsai

# 4. Open Field Radiated Emissions

## 4.1 Configuration and Procedure

### 4.1.1 EUT Configuration

The radiated emissions test setups are in accordance with EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997.

The equipment under test was set up on the 10 meter open field test non-conductive table 80cm above ground, same as conducted Excess data cable was folded back and forth to form a 30cm by 40cm bundle.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

### 4.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The maximum readings were found by vary the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

The highest emissions were also analyzed in details by operating the spectrum analyzer in fixed tuned quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the antenna height was varied between one and four meters, and the turntable was slowly rotated, to maximize the emission.

### 4.1.3 Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 30MHz--1000MHz |
| Detector Function: | Quasi-Peak Mode |
| Resolution Bandwidth (RBW): | 120KHz |
| | |
| Frequency Range: | Above 1000MHz |
| Detector Function: | Peak Mode |
| Resolution Bandwidth (RBW): | 1MHz |

## 4.2 Test Data:.*CPU: Celeron 466MHz, Speed: 66MHz, SPS: ADVAN TECH (Model: PS-55A), Hard Disk Driver: IBM (Model: DBCA-203240) 3.25GB*

**Table 4.2.1 Open Field Radiated Emissions (Horizontal)**

| Meter Reading | | Correction Factor | | | Corrected Emissions | | | Antenna | Turntable |
|---|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Ampl. (dBuV) | Ant. (dB/m) | Cable (dB) | Pre-Ampl. (dB) | Ampl. (dBuV/m) | Limit (dBuV/m) | Margin* (dB) | Height (cm) | Position (°) |
| 33.377 | 19.75 | 15.57 | 0.98 | 0.00 | 36.30 | 40.00 | -3.70 | 400.00 | 110.00 |
| 81.496 | 26.46 | 6.84 | 1.57 | 0.00 | 34.88 | 40.00 | -5.12 | 400.00 | 227.00 |
| 114.10 | 12.52 | 11.48 | 1.90 | 0.00 | 25.90 | 40.00 | -14.10 | 400.00 | 243.00 |
| 146.73 | 22.34 | 10.33 | 2.18 | 0.00 | 34.85 | 40.00 | -5.15 | 400.00 | 334.00 |
| 179.34 | 17.62 | 8.62 | 2.53 | 0.00 | 28.77 | 40.00 | -11.23 | 400.00 | 0.00 |
| 631.73 | 12.52 | 19.11 | 5.03 | 0.00 | 36.65 | 47.00 | -10.35 | 235.00 | 200.00 |
| 735.60 | 10.20 | 20.11 | 5.71 | 0.00 | 36.02 | 47.00 | -10.98 | 188.00 | 194.00 |

* NOTE: Margin = Corrected Amplitude – Limit
Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
BILOG Antenna Distance: 10 meter, Frequency: under 1000MHz
Horn Antenna Distance: 3 meter, Frequency: 1000MHz–~~18~~GHz

Tested by:
Alan Tsai 2001/03/29
Alan Tsai

## Table 4.2.2 Open Field Radiated Emissions (Vertical)

| Meter Reading | | Correction Factor | | | Corrected Emissions | | | Antenna | Turntable |
|---|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Ampl. (dBuV) | Ant. (dB/m) | Cable (dB) | Pre-Ampl. (dB) | Ampl. (dBuV/m) | Limit (dBuV/m) | Margin* (dB) | Height (cm) | Position (°) |
| 33.389 | 20.47 | 15.57 | 0.98 | 0.00 | 37.02 | 40.00 | -2.98 | 100.00 | 67.00 |
| 81.504 | 24.81 | 6.85 | 1.57 | 0.00 | 33.23 | 40.00 | -6.77 | 158.00 | 67.00 |
| 114.11 | 15.72 | 11.48 | 1.90 | 0.00 | 29.10 | 40.00 | -10.90 | 200.00 | 355.00 |
| 146.72 | 22.01 | 10.33 | 2.18 | 0.00 | 34.52 | 40.00 | -5.48 | 100.00 | 138.00 |
| 179.35 | 17.92 | 8.62 | 2.53 | 0.00 | 29.07 | 40.00 | -10.93 | 100.00 | 160.00 |
| 472.86 | 11.88 | 16.78 | 4.30 | 0.00 | 32.96 | 47.00 | -14.04 | 100.00 | 39.00 |
| 735.55 | 12.64 | 20.11 | 5.71 | 0.00 | 38.46 | 47.00 | -8.54 | 100.00 | 241.00 |

* NOTE: Margin = Corrected Amplitude – Limit
Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
BILOG Antenna Distance: 10 meter, Frequency: under 1000MHz
Horn Antenna Distance: 3 meter, Frequency: 1000MHz–~~18~~GHz

Tested by:
Alan Tsai 2001/03/19
Alan Tsai

# 5. Appendix

## 5.1 Appendix A: Measurement Procedure for Main Power Port Conducted Emissions

The EUT is set up in accordance with the suggested configuration given in EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997. The measurements are performed in a 7.6 x 5.7 x 5 (m) shielded room. The EUT was placed on a non-conduction table, which is 0.8 meters above an earth-grounded floor, 0.4 meters in the back away from the metal wall and 0.8 meter at least in the front, left and right away from the metal wall.

Power to the EUT was provided through the LISN which has the Impedance (50 Ohm/50uH) vs. Frequency Characteristic as defined in Sub-clause 8.3.3, Section Two, of CISPR 16. Power to the LISN was filtered to eliminate ambient signal interference and this filter was bonded to ground. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered through a ganged, metal power outlet box which is bonded to the ground. AC input power for the auxiliary power outlets was obtained from the same filtered source that provides input power to the LISN.

If the EUT is supplied with a flexible power cord, if the power cord length in excess of 1 m, the excess cable shall be bundled at approximate center of the power cord with the bundles 30 cm to 40 cm in length. If the EUT is provided with a permanently coiled power cord, bundling of the cord is not required. If the EUT is supplied without a power cord, the EUT shall be connected to the LISN by a power cord of the type specified by the manufacturer which shall be 1 meter in length. If a non-flexible power cord is provided with the EUT, it shall be cut to the length necessary to attach the EUT to the LISN and shall not be bundled.

The EUT, any support equipment, and any interconnecting cables were arranged and moved to get the maximum according to EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997. Both the line of power cord, hot and neutral, were measured.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

## 5.2 Appendix A: Measurement Procedure for Communication Port Conducted Emissions

The EUT is set up in accordance with the suggested configuration given in EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997. The measurements are performed in a 7.6 x 5.7 x 5 (m) shielded room. The EUT was placed on a non-conduction table, which is 0.4 meters away from the reference ground wall and 0.8 meters above the reference ground floor. CDN is placed and connected to the reference ground floor.

The EUT, any support equipment, and any interconnecting cables were arranged and moved to get the maximum according to EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997.

Power to the EUT was provided through the LISN which has the Impedance (50 Ohm/50uH) vs. Frequency Characteristic as defined in Sub-clause 8.3.3, Section Two, of CISPR 16. Power to the LISN was filtered to eliminate ambient signal interference and this filter was bonded to ground. Peripheral equipment to provide a functional system (support equipment) for EUT testing was powered through a ganged, metal power outlet box bonded to the ground. AC input power for the auxiliary power outlets was obtained from the same filtered source that provides input power to the LISN.

If the EUT is supplied with a flexible power cord, if the power cord length in excess of 1 m, the excess cable shall be bundled at approximate center of the power cord with the bundles 30 cm to 40 cm in length. If the EUT is provided with a permanently coiled power cord, bundling of the cord is not required. If the EUT is supplied without a power cord, the EUT shall be connected to the LISN by a power cord of the type specified by the manufacturer which shall be 1 meter in length. If a non-flexible power cord is provided with the EUT, it shall be cut to the length necessary to attach the EUT to the LISN and shall not be bundled.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information could be useful in reducing their amplitude.

## 5.3 Appendix B: Test Procedure for Radiated Emissions

### Preliminary Measurements in the Anechoic Chamber

The radiated emissions are initially measured in the anechoic chamber at a measurement distance of 3 meters. Desktop EUT is placed on a wooden stand 0.8 meter in height. The measurement antenna is 3 meters from the EUT. The test setup in anechoic chamber is the same as open site. The turntable rotated 360°C. The antenna height is varied from 1-2.5m. The primary objective of the radiated measurements in the anechoic chamber is to identify the frequency spectrum in the absence of the electromagnetic environment existing on the open test site. The frequencies can then be pre-selected on the open test site to obtain the corresponding amplitude. The initial scan is made with the spectrum analyzer in automatic sweep mode. The spectrum peaks are then measured manually to determine the exact frequencies.

### Measurements on the Open Site

The radiated emissions test will then be repeated on the open site to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of 10 meter open field sites for frequency between 30Mhz~1Ghz and 3 meter open field sites for frequency above 1Ghz. Desktop EUT is set up on a wooden stand 0.8 meter above the ground.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. Both reading are recorded with the quasi-peak detector with 120KHz bandwidth for frequency between 30Mhz and 1Ghz. The readings are recorded with peak detector and with the 1 MHz bandwidth for frequency above 1Ghz.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum according to ANSI C63.4-1992, and/or EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.

During the open site measurements, the peaks are selected, the scan frequency span width is reduced, the audible modulation is monitored with a loudspeaker and the quasi-peak reading or peak is recorded at the indicated frequency and at the specified bandwidth.

## 5.4 Appendix C: Test Equipment

### 5.4.1 Test Equipment List

| Use For | Equipment | Brand | Model | Start Service Date | Last Cal. Date | Next Cal. Date |
|---|---|---|---|---|---|---|
| R | EMI Receiver | R&S | ESMI; rev. 02.80<br>S/N: 849182/003 | Nov. 09, 1999 | Oct. 23, 2000 | Apr. 22, 2001 |
| R | EMI Receiver | HP | 8546A;<br>S/N: 3520A00236 | Oct. 28, 2000 | Oct. 27, 2000 | Oct. 27, 2001 |
| R | BILOG Antenna | Chase | CBL6112B<br>S/N: 2487 | Nov. 23, 1998 | Nov. 03, 2000 | Nov. 02, 2001 |
| R | Horn Antenna | EMCO | 3115<br>S/N: 9504-4462 | Nov. 06, 1999 | Dec. 02, 2000 | Dec.01, 2001 |
| R | Pre Amplifier | R&S | ESMI-Z7 | 1045.5020 | Apr. 06, 2000 | Apr. 06, 2001 |
| R | Coaxial Cables | RICHTEC | TWB4001<br>S/N: 3F-10M | Aug. 31, 1995 | Jul. 24, 2000 | Jul. 24, 2001 |
| R | Coaxial Cables | RICHTEC | 9913<br>S/N: 3F-3M | Dec. 20, 1998 | Jan. 18, 2001 | Jan. 18, 2002 |
| R | Thermo-Hygro Meter | CRECER | HD-30<br>S/N: ISL-C-001 | Nov. 26, 1999 | Nov. 28, 2000 | Nov. 27, 2001 |
| C | EMI Receiver | HP | 8546A;<br>S/N: 3441A00208 | Sep. 08, 1997 | Dec. 13, 2000 | Dec. 13, 2001 |
| C | LISN 1 | R & S | ESH2-Z5<br>S/N: 890485/013 | Dec. 15, 1988 | Oct. 27, 2000 | Oct. 27, 2001 |
| C | LISN 2 | EMCO | 3825/2<br>S/N: 1407 | Oct. 20, 1990 | Oct. 27, 2000 | Oct. 27, 2001 |
| C | Terminator | RICHTEC | S/N: ISL-T-001 | Oct. 19, 1999 | Apr. 29, 2000 | Apr. 28, 2001 |
| C | Terminator | RICHTEC | S/N: ISL-T-002 | Oct. 19, 1999 | Apr. 29, 2000 | Apr. 28, 2001 |
| C | ISN | Schaffner | ISN T400 | Mar. 13, 2001 | Sep. 11, 2000 | Sep. 11, 2001 |
| C | Coaxial Cables | RICHTEC | RG400<br>S/N: 1F-C1 | Aug. 31, 1995 | Feb. 28, 2001 | Feb. 28, 2002 |
| C | Coaxial Cables | RICHTEC | RG400<br>S/N: 1F-C2 | Aug. 31, 1995 | Feb. 28, 2001 | Feb. 28, 2002 |
| C | Digital Thermo-Hygro Meter | MICROLIFE | S/N: ISL-C-002 | Nov. 26, 1999 | Nov. 28, 2000 | Nov. 27, 2001 |

Note:

Calibration traceable to NIST or national or international standards.

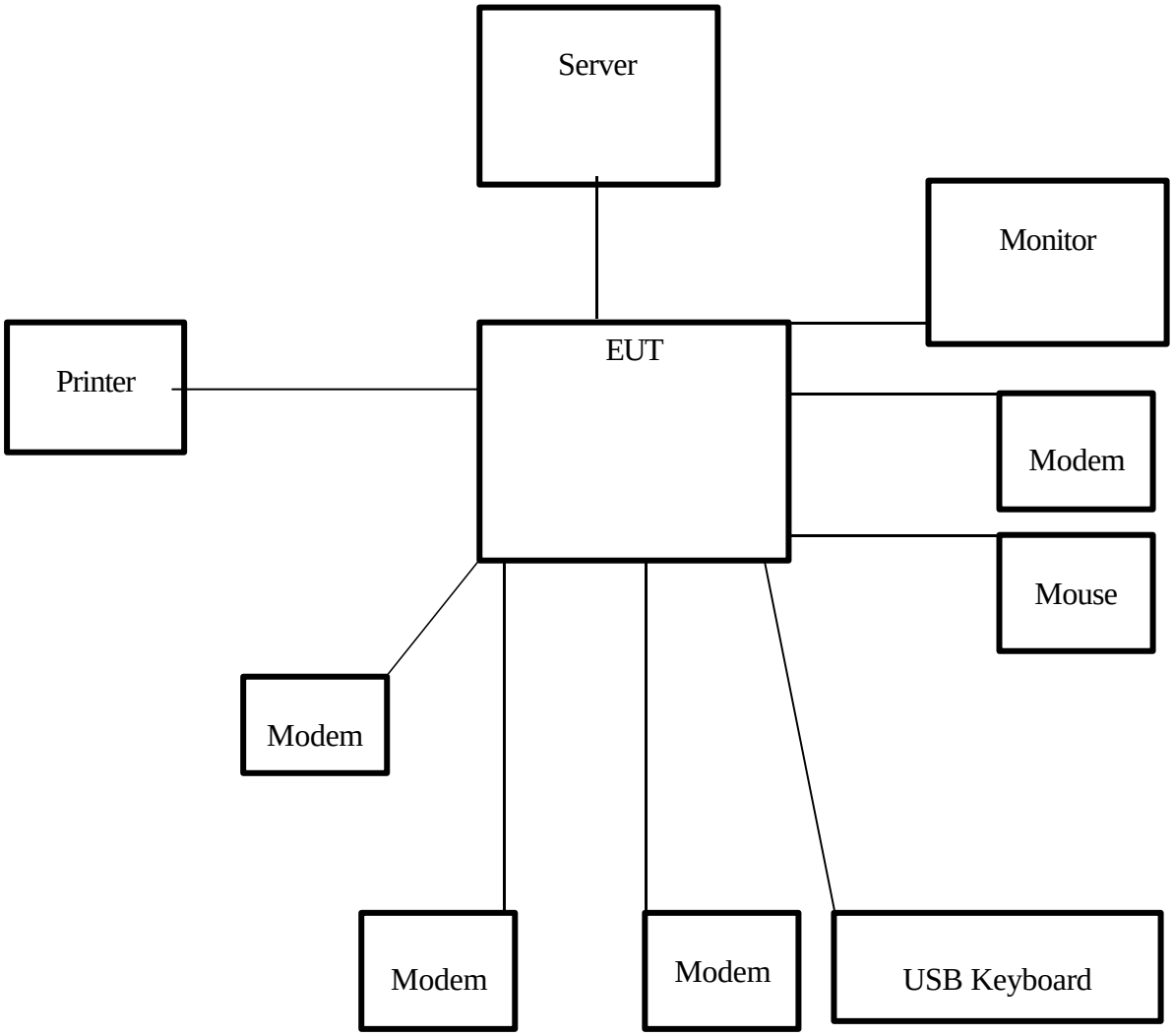
The *Use For* column with *C* means the equipment is used for the measurement of conducted emission.

The *Use For* column with *R* means the equipment is used for the measurement of conducted emission.

### 5.4.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

| Radiation/Conduction | Filename | Version | Issued Date |
|---|---|---|---|
| Conduction | Tile.exe | 1.12E | 7/7/2000 |
| Radiation | Tile.exe | 1.12C | 6/16/2000 |

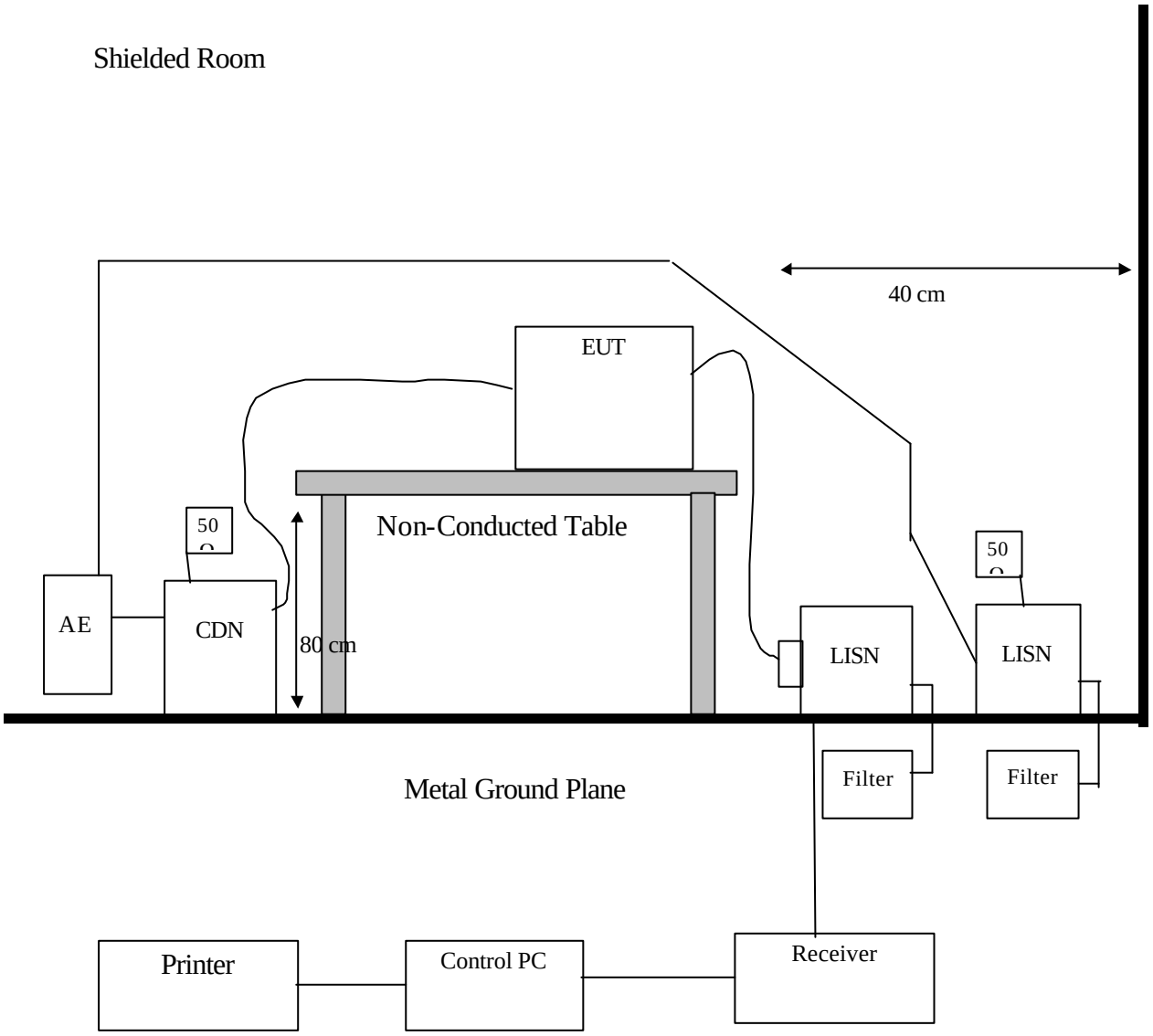
## Layout of EUT and Support Equipments



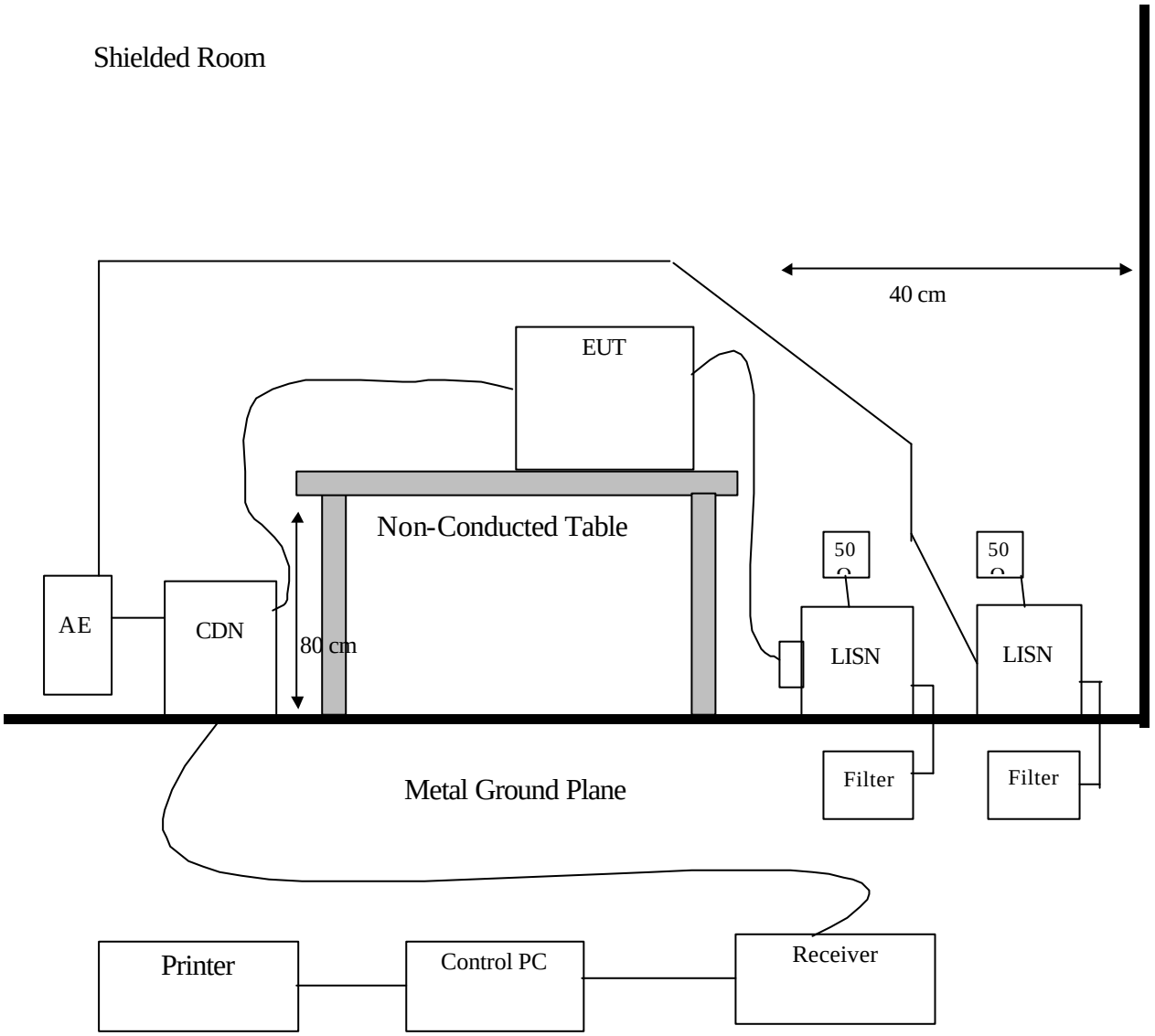

Note: Please refer to Appendix D & E for detailed information of EUT and Support Units.

**Appendix D: Layout of EUT and Support Equipment**

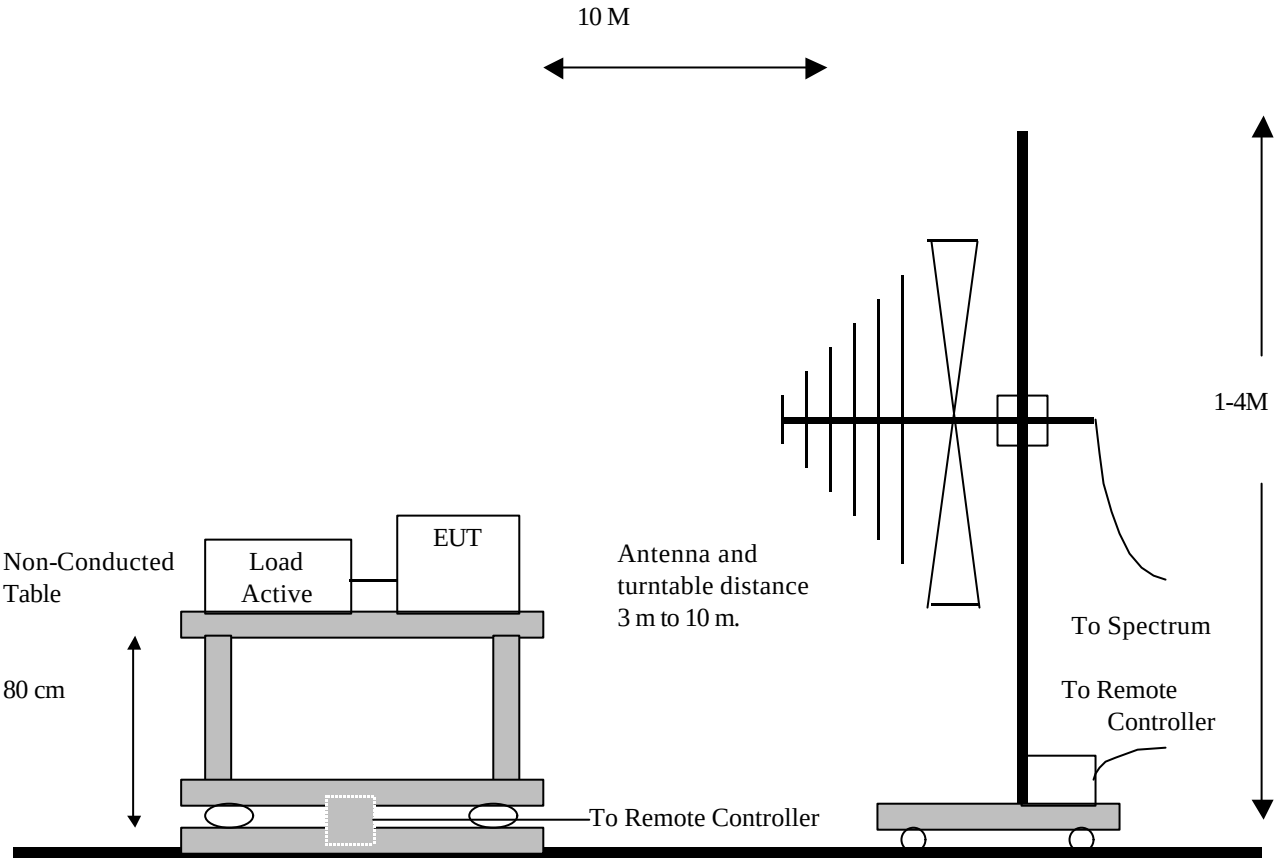
### 5.4.3 General Power Main Port Conducted Test Configuration



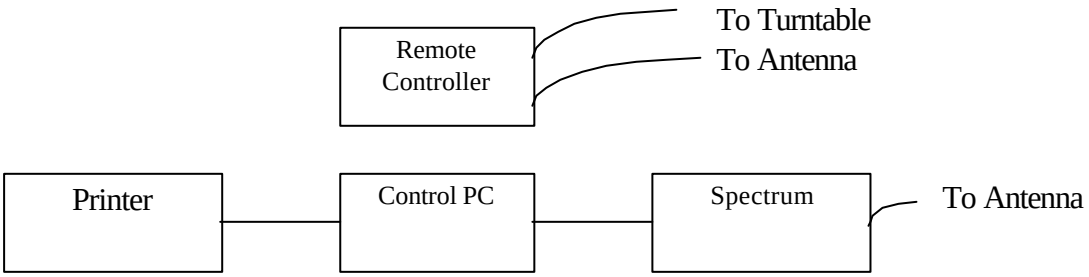
### 5.4.4 General Telecommunication Port Conducted Emission Test Configuration



### 5.4.5 General Radiation Test Configuration




Metal Full Soldered Ground Plane



### 5.5 Appendix E: Description of Support Equipment

# Support Unit 1.

| | |
|---|---|
| Description: | Acer USB Mouse |
| Model Number: | MUSXT |
| Serial Number: | 81130159 |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | (comply with FCC DOC) |

# Support Unit 2.

| | |
|---|---|
| Description: | Acer USB Keyboard |
| Model Number: | 6511-P |
| Serial Number: | 9152P0701183I31025S00000 |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | JVP6511-P |

# Support Unit 3.

| | |
|---|---|
| Description: | HP Printer<br>(for parallel interface port) |
| Model Number: | 2225C |
| Serial Number: | N/A |
| Power Supply Type: | Switching<br>(AC to AC Xfmr, Wall Mounted Type) |
| Power Cord: | Nonshielded, Detachable<br>With Grounding Pin |
| FCC ID: | DSI6XU2225 |

# Support Unit 4.

| | |
|---|---|
| Description: | Logitech Mouse |
| Model Number: | M-SAH |
| Serial Number: | LZB81251703 |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | DZL211029 |

# Support Unit 5.

| | |
|---|---|
| Description: | Aceex Modem<br>(for serial interface port 1) |
| Model Number: | DM1414 |
| Serial Number: | 960092566 |
| Power Supply Type: | Linear, Power Adapter<br>( AC to AC Xfmr, Wall Mounted Type ) |
| Power Cord: | Nonshielded, Without Grounding Pin |
| FCC ID: | IFAXDM1414 |

# Support Unit 6.

| | |
|---|---|
| Description: | Aceex Modem<br>(for serial interface port 2) |
| Model Number: | DM1414 |
| Serial Number: | 960092574 |
| Power Supply Type: | Linear, Power Adapter<br>( AC to AC Xfmr, Wall Mounted Type ) |
| Power Cord: | Nonshielded, Without Grounding Pin |
| FCC ID: | IFAXDM1414 |

# Support Unit 7.

| | |
|---|---|
| Description: | Aceex Modem<br>(for serial interface port 3) |
| Model Number: | DM1414 |
| Serial Number: | 960063772 |
| Power Supply Type: | Linear, Power Adapter<br>( AC to AC Xfmr, Wall Mounted Type ) |
| Power Cord: | Nonshielded, Without Grounding Pin |
| FCC ID: | IFAXDM1414 |

# Support Unit 8.

| | |
|---|---|
| Description: | Aceex Modem<br>(for serial interface port 4) |
| Model Number: | DM1414 |
| Serial Number: | 960063771 |
| Power Supply Type: | Linear, Power Adapter<br>( AC to AC Xfmr, Wall Mounted Type ) |
| Power Cord: | Nonshielded, Without Grounding Pin |
| FCC ID: | IFAXDM1414 |

# Support Unit 9.

| | |
|---|---|
| Description: | Acer Monitor |
| Model: | 7377xe |
| Serial Number: | 999027100501700055P644E1 P |
| Power Supply Type: | Switching |
| Power Cord: | Nonshielded, Detachable |
| FCC ID: | (Comply with FCC DOC) |

# Support Unit 10.

| | |
|---|---|
| Description: | Acer Keyboard |
| Model Number: | 6511-TW4C |
| Serial Number: | 916600704C83D11076S00000 |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | JVPKBS-WIN |

# Support Unit 11.

| | |
|---|---|
| Description: | Personal Computer |
| Model: | IBM 2170 |
| Serial No.: | N/A |
| Power Supply Type : | Switching<br>Delta (Model: DPS-145PB-80A) |
| Hard Disk Drive: | Maxtor (Model: 91303D6) 13.3GB |
| Floppy Driver: | Panasonic (Model: JU256A276P ) |
| CD-ROM Drive: | AOpen (Model: CD-940E/TKU PRO) |
| ZIP Driver: | Iomega (Model:Z100ATAPI) |
| LAN Card | Accton (Model: EN1207D-TX1) |
| FDD/HDD Controller and<br>VGA port/ Parallel/<br>Serial port: | Built on Motherboard |
| VGA port: | one 15-pin |
| Parallel Port: | one 25-pin |
| Serial Port: | one 9-pin |
| Keyboard Connector: | 6-pin |
| Mouse Connector: | 6-pin |
| USB Connector: | two 4-pin |
| Game Port: | one 15-pin |
| Speaker Port: | one |
| Microphone Port: | one |
| Line In Port: | one |
| Power Cord: | Nonshielded, Detachable |
| FCC ID: | N/A (comply witch FCC DOC) |

## 5.6 Appendix F: Software for Controlling Support Unit

### 5.6.1 Software for Controlling Support Unit

Test programs exercising various part of EUT were used. The programs were executed as follows:

A. Read and write to the disk drives.
B. Send H pattern to the parallel port device (Printer).
C. Send H pattern to the serial port device (Modem 1).
D. Send H pattern to the serial port device (Modem 2).
E. Send H pattern to the serial port device (Modem 3).
F. Send H pattern to the serial port device (Modem 4).
G. Send H pattern to the video port device (Monitor).
H. Send H pattern to server and receive H pattern from server.
I. Repeat the above steps.

| | Filename | Issued Date |
|---|---|---|
| LAN | EMC.exe | 11/22/1996 |
| Monitor | HH.bat | 8/20/1991 |
| Modem 1 | Hm.bat | 8/20/1991 |
| Modem 2 | Hm.bat | 8/20/1991 |
| Modem 3 | Hm.bat | 8/20/1991 |
| Modem 4 | Hm.bat | 8/20/1991 |
| Printer1 | Wordpad.exe | 11/11/1999 |

### 5.6.2 I/O Cable Condition of EUT and Support Units

| Description | Path | Cable Length | Cable Type | Connector Type |
|---|---|---|---|---|
| AC Power Cord | 110V (~240V) to AC Power Cord Inlet (3-pin) | 1.8M | Nonshielded, Detachable | Plastic Head<br>Plastic Hood |
| Server Data Cable | Server to EUT LAN port | 33 feet | Shielded, Detachable | RJ-45, with Metal Head, Metal Hood |
| Keyboard Data Cable | Keyboard to PC Keyboard port | 1.8M | Shielded, Undetachable | Metal Head<br>Plastic Hood |
| Monitor Data Cable | Monitor to PC VGA port | 1.6M | Shielded, Detachable | Metal Head<br>Plastic Hood |
| Modem Data Cable | Modem to PC COM 1 port | 1.5M | Shielded, Detachable | Metal Head<br>Metal Hood |
| Modem Data Cable | Modem to PC COM 2 port | 1.5M | Shielded, Detachable | Metal Head<br>Metal Hood |
| Modem Data Cable | Modem to PC COM 3 port | 1.5M | Shielded, Detachable | Metal Head<br>Metal Hood |
| Modem Data Cable | Modem to PC COM 4 port | 1.5M | Shielded, Detachable | Metal Head<br>Metal Hood |
| Mouse Data Cable | Mouse to PC Mouse port | 1.8M | Shielded, Undetachable | Metal Head<br>without Hood |
| Printer Data Cable | Printer to PC Parallel port | 1.5M | Shielded, Detachable | Metal Head<br>Plastic Hood |
| USB Keyboard Data Cable | Keyboard to PC USB port | 1.8M | Shielded, Undetachable | Metal Head<br>Plastic Hood |
| USB Mouse Data Cable | Mouse to PC USB port | 1.8M | Shielded, Undetachable | Metal Head<br>without Hood |

## 5.7 Appendix G: Photographs of EUT Configuration Test Set Up

**According to ANSI C63.4-1992 / EN55022:1998; CISPR 22:1997; AS/NZS 3548:1995 /A1:1997 /A2:1997:**

Front View of Highest Main Power Port Conducted Emission and Telecommunication Port Conducted Emission

Front View of Highest Radiated Emission Test.

Back View of Highest Radiated Emission Test.