

Band Edge measurement for radiated emission in Ristricted Band(Radiated)

Turbo Mode (Channel 3) Peak data



Band Edge measurement for radiated emission in Ristricted Band(Radiated)

Turbo Mode (Channel 3) , Average data



6.7 RF Exposure Measurement [Section 15.407(f)(4) & 1.1307(b)]

Refer to SAR Test Report

6.8 Frequency Stability [Section 15.407(g)]

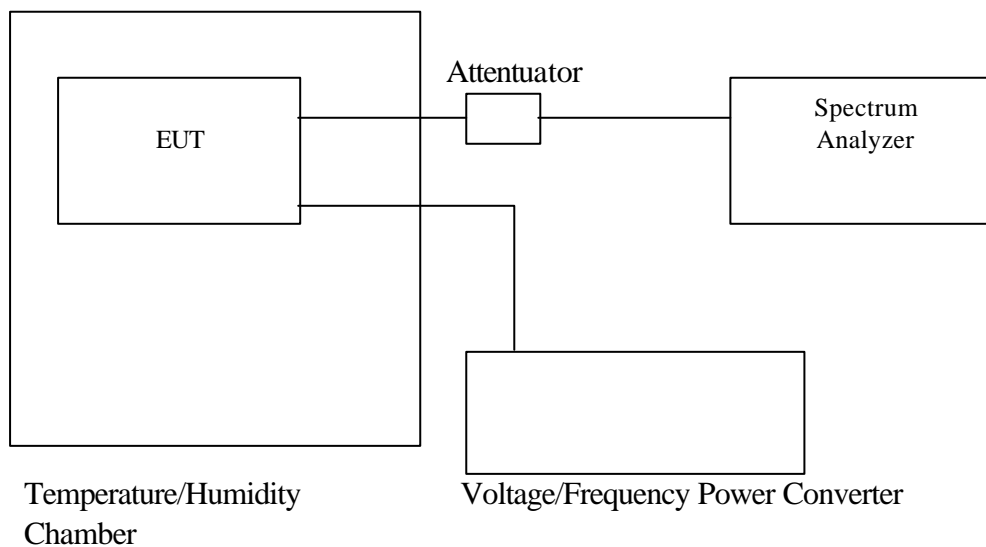
6.8.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% of the operating frequency over the operation temperature range of EUT (0°C - 35°C), and variation in the primary supply voltage from 85% to 115% of the rated supply voltage (115V AC) at 20°C.

6.8.2 Test Procedure

1. The EUT was placed in the Temperature/Humidity Chamber and powered by a Voltage/Frequency Power converter.
2. Connect the RF output of EUT to Spectrum. Turn on the EUT.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the chamber temperature to stabilize. Turn the EUT on and measure the operating frequency after 2, 5, 10 minutes.
5. Set the Voltage/Frequency Power Converter to 85% and 115% of supply voltage, then repeat step 2, 3, 4 respectively.
6. Repeat step 2, 3, 4, 5 with the temperature of chamber set to the lowest temperature.
7. Repeat step 2, 3, 4, 5 with the temperature of chamber set to 20°C

6.8.3 Test Setup



6.8.4 Test Data

| Operating Frequency: 5180MHz | | Limit: +/- 0.02% | | | | | |
|------------------------------|---------------------------|------------------|-----------|-----------|-----------|------------|-----------|
| Temp. (°C) | Power Supply (V AC) | 2 minutes | | 5 minutes | | 10 minutes | |
| | | (MHz) | (%) | (MHz) | (%) | (MHz) | (%) |
| 35 | 132 | 5179.9762 | -0.000459 | 5179.9769 | -0.000446 | 5179.9767 | -0.000450 |
| | 115 | 5179.9764 | -0.000456 | 5179.9766 | -0.000452 | 5179.9765 | -0.000454 |
| | 97 | 5179.9764 | -0.000456 | 5179.9769 | -0.000446 | 5179.9764 | -0.000456 |
| 0 | 132 | 5179.9857 | -0.000276 | 5179.9863 | -0.000264 | 5179.9859 | -0.000272 |
| | 115 | 5179.9853 | -0.000284 | 5179.9858 | -0.000274 | 5179.9856 | -0.000278 |
| | 97 | 5179.9854 | -0.000282 | 5179.9859 | -0.000272 | 5179.9855 | -0.000280 |
| 20 | 132 | 5180.0085 | 0.000164 | 5180.0091 | 0.000176 | 5180.0099 | 0.000191 |
| | 115 | 5180.0081 | 0.000156 | 5180.0088 | 0.000170 | 5180.0095 | 0.000183 |
| | 97 | 5180.0079 | 0.000153 | 5180.0075 | 0.000145 | 5180.0088 | 0.000170 |

| Operating Frequency: 5320 MHz | | Limit: +/- 0.02% | | | | | |
|-------------------------------|---------------------------|------------------|-----------|-----------|-----------|------------|-----------|
| Temp. (°C) | Power Supply (V AC) | 2 minutes | | 5 minutes | | 10 minutes | |
| | | (MHz) | (%) | (MHz) | (%) | (MHz) | (%) |
| 35 | 132 | 5319.9759 | -0.000453 | 5319.9766 | -0.000440 | 5319.9762 | -0.000447 |
| | 115 | 5319.9753 | -0.000464 | 5319.9762 | -0.000447 | 5319.9759 | -0.000453 |
| | 97 | 5319.9755 | -0.000461 | 5319.9763 | -0.000445 | 5319.9761 | -0.000449 |
| 0 | 132 | 5319.9825 | -0.000329 | 5319.9829 | -0.000321 | 5319.9827 | -0.000325 |
| | 115 | 5319.9829 | -0.000321 | 5319.9831 | -0.000318 | 5319.9826 | -0.000327 |
| | 97 | 5319.9823 | -0.000333 | 5319.9827 | -0.000325 | 5319.9823 | -0.000333 |
| 20 | 132 | 5320.0095 | 0.000179 | 5320.0101 | 0.000190 | 5320.0109 | 0.000205 |
| | 115 | 5320.0091 | 0.000171 | 5320.0098 | 0.000184 | 5320.0102 | 0.000192 |
| | 97 | 5320.0089 | 0.000167 | 5320.0096 | 0.000180 | 5320.0103 | 0.000194 |

7. Appendix

7.1 Appendix A: Measurement Procedure for Powerline Conducted Emissions

The EUT is set up in accordance with the suggested configuration given in ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996. The measurements are performed in a 3.5m x 3.4m x 2.5m shielded room, which referred as Conduction 01 test site, or a 3m x 3m x 2.3m test site, which referred as Conduction 02 test site. The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the Figure 1 of the ANSI C63.4-2001 or CISPR16. Power to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

If the EUT is supplied with a flexible power cord, the power cord length in excess of the distance separating the EUT from the LISN shall be folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm 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 not be longer than 1 meter. The excess power cord shall be bundled as described above. 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 interconnecting cables were arranged and moved to get the maximum according to ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996. 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.

7.2 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 are 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 or 10m EMC Chamber

The radiated emissions test will then be repeated on the open site or 10m EMC chamber 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 one of the 3 or 10 meter open field sites. Desktop EUT are 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 30 MHz and 1000MHz, the reading is recorded with peak detector or quasi-peak detector. For frequency above 1 GHz, the reading is recorded with peak detector or average detector with 1 MHz bandwidth.

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 C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.

7.3 Appendix C: Test Equipment

7.3.1 Test Equipment List

| Location | Equipment Name | Brand | Model | S/N | Last Cal. Date | Next Cal. Date |
|-----------------|-----------------------------------|--------------------|----------------------------|--------------------------|----------------|----------------|
| Conduction | Digital Hygro-Thermometer Conduct | MicroLife | HT-2126G | ISL-Conducti on02 | 12/04/2002 | 12/04/2004 |
| Conduction | 50 Ohms Load Conduction 02 | EMCO | N/A | ISL-50ohms conduction 02 | 11/21/2002 | 11/21/2003 |
| Conduction | Coaxial Cable 1F-C2 | Harbourindu stries | RG400 | 1F-C2 | 06/03/2002 | 06/03/2003 |
| Conduction | EMI Receiver 02 | HP | 85460A | 3448A00183 | 08/21/2002 | 08/21/2003 |
| Conduction | ISN T4 | Schaffner | ISN T400 | 16593 | 08/20/2002 | 08/20/2004 |
| Conduction | ISN T4 02 | FCC | F-CMISN-C AT5 | 02003 | 12/17/2002 | 12/17/2003 |
| Conduction | CISPR22 Voltage Probe | FCC | F-CVP-1 | 68 | 12/18/2002 | 12/18/2003 |
| Conduction | Current Probe | Schaffner | SMZ 11 | 18030 | 01/09/2003 | 01/09/2004 |
| Conduction | LISN 01 | R&S | ESH2-Z5 | 890485/013 | 05/07/2002 | 05/07/2003 |
| Conduction | LISN 04 | EMCO | 3810/2 | 9604-1429 | 12/17/2002 | 12/16/2003 |
| Radiation | Digital Hygro-Thermometer Chmb 02 | MicroLife | HT-2126G | Chmb 02 | 12/04/2002 | 12/04/2004 |
| Radiation | Spectrum Analyzer 06 | Advantest | R3162 | 91700295 | 09/25/2002 | 09/24/2003 |
| Radiation | EMI Receiver 04 | AFJ | ER 55CR | 55390143233 | 10/28/2002 | 10/27/2003 |
| Radiation | BILOG Antenna 08 | Schaffner | CBL6112B | 2756 | 06/04/2002 | 06/04/2003 |
| Radiation | Coaxial Cable Chmb 02-10M | Belden | RG-8/U | Chmb 02-10M | 10/03/2002 | 10/03/2003 |
| Radiation | Microwave Cable Chmb 02 3M | HUBER+SU HNER AG. | Sucoflex 103 | 42731/3 & 42729/3 | 03/21/2002 | 03/21/2003 |
| Radiation | Temperature/ Humility Chamber | K. Son Ins. Tech. | THS-B4H ⁺ - 100 | 2287 | 03/01/2003 | 03/01/2004 |
| Radiation | Voltage/Frequency Power converter | EXTECH Electronics | CFC-105W | 780274 | 08/25/2003 | 08/25/2004 |
| Rad. Above 1Ghz | Spectrum Analyzer 07 | Advantest | R3182 | 110600649 | 10/17/2002 | 10/17/2003 |
| Rad. Above 1Ghz | Horn Antenna 02 | Com-Power | AH-118 | 10088 | 02/06/2003 | 02/05/2004 |
| Rad. Above 1Ghz | Horn Antenna 04 | Com-Power | AH-826 | 081-001 | 12/10/2002 | 12/09/2003 |
| Rad. above 1Ghz | Horn Antenna 05 | Com-Power | AH-640 | 100A | 09/13/2001 | 09/13/2003 |
| Rad. above 1Ghz | Microwave Cable Chmb 05 | HUBER+SU HNER AG. | Sucoflex 103 | 42726/3 & 42727/3 | 09/11/2002 | 09/11/2003 |

| Location | Equipment Name | Brand | Model | S/N | Last Cal. Date | Next Cal. Date |
|-----------------|---------------------|---------|----------------------------------|------------|----------------|----------------|
| Rad. Above 1Ghz | Preamplifier 02 | MITEQ | AFS44-00102 650-40-10P-4 4 | 728229 | 05/07/2002 | 05/07/2003 |
| Rad. Above 1Ghz | Preamplifier 09 | MITEQ | AFS44-00102 650-40-10P-4 4 | 858687 | 02/28/2003 | 02/28/2004 |
| Rad. Above 1Ghz | Preamplifier 10 | MITEQ | JS-26004000- 27-5A | 818471 | 02/28/2002 | 02/28/2004 |
| Rad. Above 1Ghz | Signal Generator 03 | Anritsu | MG3642A | 6200162550 | 02/10/2003 | 02/09/2004 |
| Rad. Above 1Ghz | Signal Generator 04 | Anritsu | MG3692A | 020311 | 02/06/2002 | 02/06/2004 |
| Rad. Above 1Ghz | Peak Power Analyzer | HP | 8990A | 3621A01269 | 12/09/2002 | 12/09/2003 |
| Rad. Above 1Ghz | Power Sensor Radar | HP | 84815A | 3318A01828 | 11/12/2001 | 11/12/2003 |

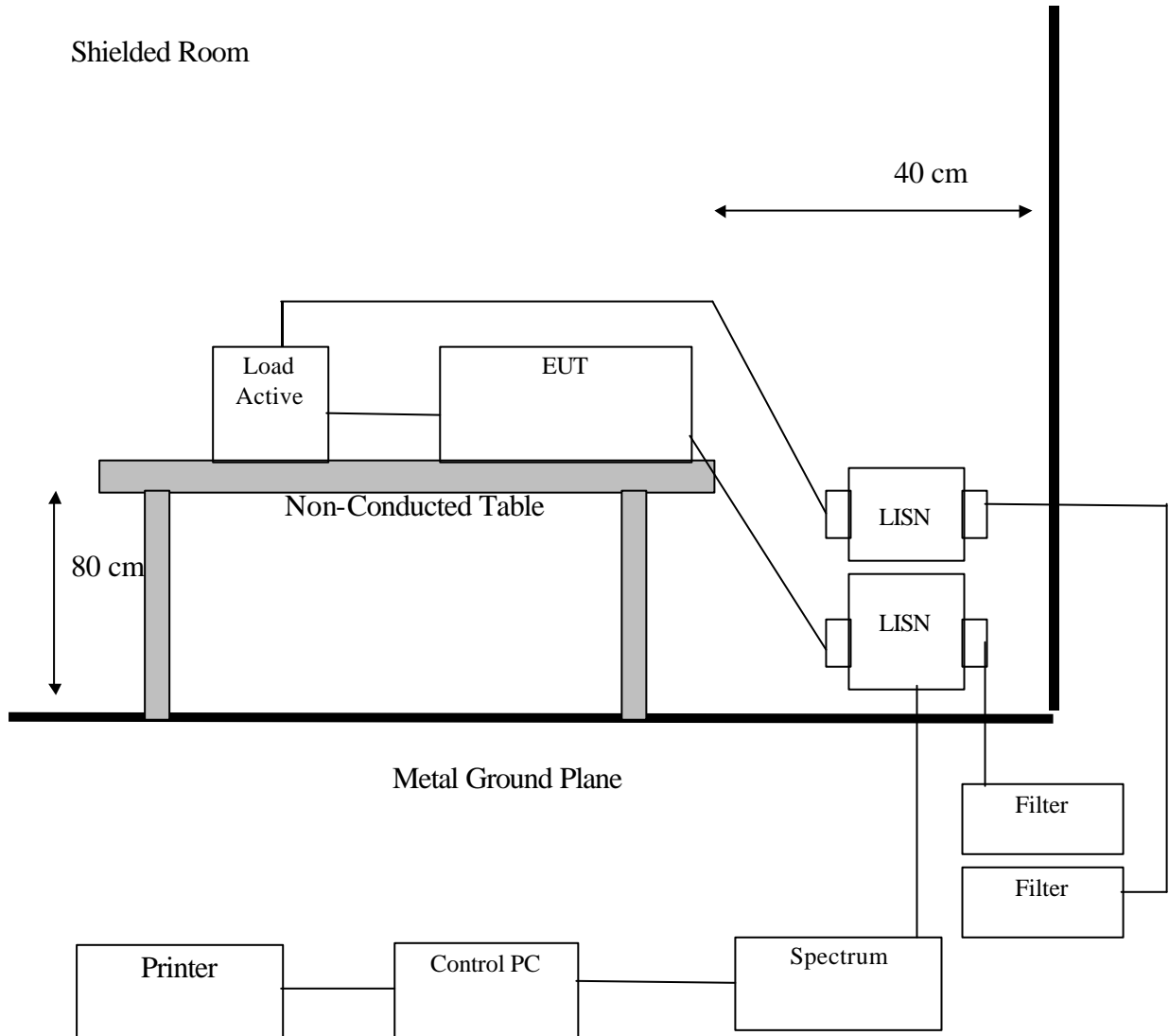
Note: Calibration traceable to NIST or national or international standards.

7.3.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

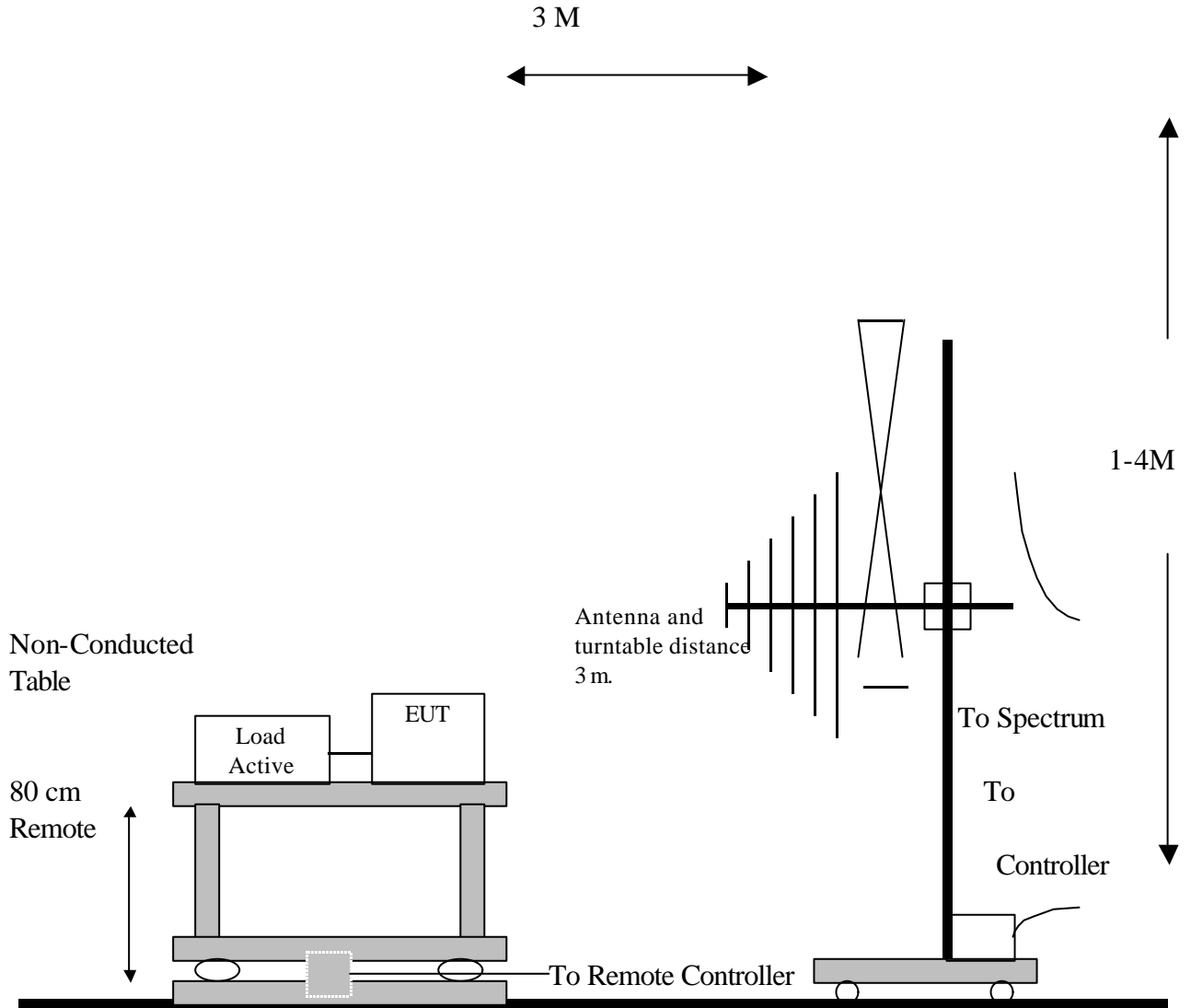
| Radiation/Conduction | Filename | Version | Issued Date |
|----------------------|----------|---------|-------------|
| Conduction | Tile.exe | 1.12E | 7/7/2000 |
| Radiation | Tile.exe | 1.12C | 6/16/2000 |

7.4 Appendix D: Layout of EUT and Support Equipment

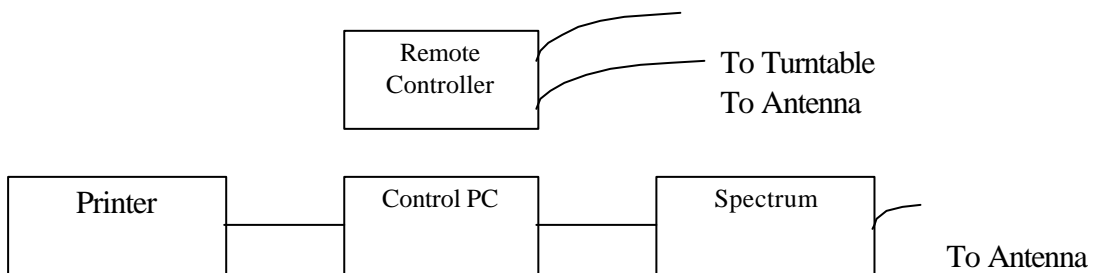
7.4.1 General Conducted Test Configuration



7.4.2 General Radiation Test Configuration



Metal Full Soldered Ground Plane



7.5 Appendix E: Description of Support Equipment

7.5.1 Description of Support Equipment

Support Unit 1.

| | |
|--------------------|---------------------------|
| Description: | Acer USB Keyboard |
| Model Number: | 6511-UV |
| Serial Number: | N/A |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | N/A (comply with FCC DOC) |

Support Unit 2.

| | |
|--------------------|--|
| Description: | HP Printer (for parallel interface port) |
| Model Number: | C2642A |
| Serial Number: | TH84T1N3J3 |
| Power Supply Type: | AC Adaptor (HP Model: C2175A) |
| Power Cord: | Non-shielded, Detachable |
| Data Cable: | Shielded, Detachable, With Metal Hood |
| FCC ID: | B94C2642X |

Support Unit 3.

| | |
|--------------------|-----------------------|
| Description: | Acer USB Speaker |
| Model Number: | 90.38H12.001 |
| Serial Number: | 401677 |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | (Comply with FCC DOC) |

Support Unit 4.

| | |
|--------------------|----------------------------|
| Description: | SONY radio cassette player |
| Model Number: | WM-FX50 |
| Serial Number: | N/A |
| Power Supply Type: | N/A |
| Power Cord: | N/A |

Support Unit 5.

| | |
|--------------------|--------------------|
| Description: | Logitech USB Mouse |
| Model Number: | M-u48a |
| Serial Number: | LZE02050204 |
| Power Supply Type: | N/A |
| Power Cord: | N/A |
| FCC ID: | JNZ211360 |

Support Unit 6.

| | |
|----------------|-----------------------------|
| Description: | Acer Monitor |
| Model: | G781 |
| Serial Number: | 999007101214400445T7AA31T |
| Power Cord: | Non-shielded, Detachable |
| FCC ID: | (Comply with FCC Standards) |

7.5.2 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 audio signal to the speaker.
- D. Receive audio signal from walkman.
- E. Send H pattern to the video port device (Monitor).
- F. Repeat the above steps.

| | Filename | Issued Date |
|----------|-------------|-------------|
| Monitor | HH.bat | 8/20/1991 |
| Printer1 | Wordpad.exe | 11/11/1999 |

7.5.3 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 |
| Monitor Data Cable | Monitor to PC VGA port | 1.6M | Shielded, Un-detachable | Metal Head |
| USB Mouse Data Cable | USB Mouse to PC USB port | 1.8M | Shielded, Un-detachable | Metal Head |
| Audio-in Data Cable | Walkman to PC Line In Port | 1.5M | Non-shielded, Detachable | Plastic Head |
| USB Speaker Data Cable | USB Speaker to PC USB port | 1.5M | Shielded, Un-detachable | Metal Head |
| USB Speaker Data Cable | USB Speaker to PC Line out port | 1.5M | Non-shielded, Un-detachable | Plastic Head |
| Printer Data Cable | Printer to PC Parallel port | 1.5M | Shielded, Detachable | Metal Head |
| USB Keyboard Data Cable | USB Keyboard to PC USB port | 1.8M | Shielded, Undetachable | Metal Head |

7.6 Appendix F: Accuracy of Measurement

Test Site: Conduction 02

| Item | Source of Uncertainty | Probability Distribution | Total Uncertainties (dB) | | Standard Uncertainty (dB) | |
|------|--|--------------------------|--------------------------|--------------|---------------------------|-------|
| | | | k | Value | k | Value |
| 1 | Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT) | Normal | k=2 | 0.104 | k=1 | 0.052 |
| 2 | Random Effects: (Assessment from 20 random observations; 1 reading on EUT) | Normal | k=2 | 0.330 | k=1 | 0.165 |
| 3 | Receiver Calibration | Rectangular | k=1.73 | 1.000 | k=1 | 0.577 |
| 4 | LISN Factor Calibration | Normal | k=2 | 1.200 | k=1 | 0.600 |
| 5 | Cable Loss Calibration | Normal | k=2 | 1.000 | k=1 | 0.500 |
| 6 | Combined Standard Uncertainty Uc(y) | Normal | | | k=1 | 0.850 |
| 7 | Total Uncertainty @95% mim. Confidence Level | Normal | k=2 | 1.701 | | |

Measurement Uncertainty Calculations:

$$U_c(y) = \text{square root} (u_1 (y)^2 + u_2 (y)^2 + \dots + u_n (y)^2)$$

$$U = 2 * U_c (y)$$

Note: The measurement Uncertainties mentioned above also refer to NIS 81-1994 of NAMAS :
The treatment of Uncertainty in EMC Measurement.

Test Site: Chamber 02-3M

| Item | Source of Uncertainty | Probability Distribution | Total Uncertainties (dB) | | Standard Uncertainty (dB) | |
|------|--|--------------------------|--------------------------|--------------|---------------------------|-------|
| 1 | Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT) | Normal | k=2 | 0.067 | k=1 | 0.034 |
| 2 | Random Effects: (Assessment from 20 random observations; 1 reading on EUT) | Normal | k=2 | 0.103 | k=1 | 0.052 |
| 3 | Receiver Calibration | Rectangular | k=1.73 | 1.000 | k=1 | 0.577 |
| 4 | Antenna Factor Calibration | Normal | k=2 | 1.700 | k=1 | 0.850 |
| 5 | Cable Loss Calibration | Normal | k=2 | 1.000 | k=1 | 0.500 |
| 6 | Combined Standard Uncertainty Uc(y) | Normal | | | k=1 | 1.029 |
| 7 | Total Uncertainty @95% mim. Confidence Level | Normal | k=2 | 2.059 | | |

Measurement Uncertainty Calculations:

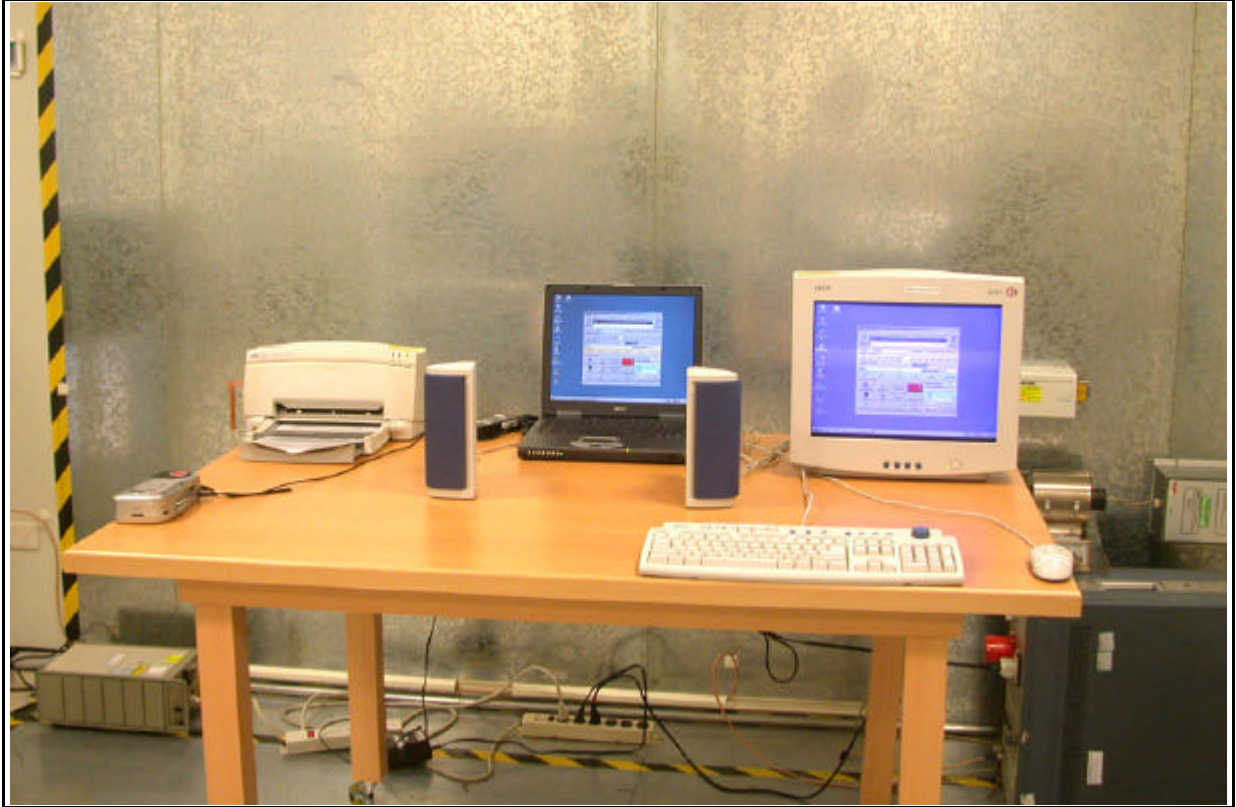
$$Uc(y) = \text{square root} (u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2)$$

$$U = 2 * Uc(y)$$

Note: The measurement Uncertainties mentioned above also refer to NIS 81-1994 of NAMAS :
The treatment of Uncertainty in EMC Measurement.

7.7 Appendix G: Photographs of EUT Configuration Test Set Up

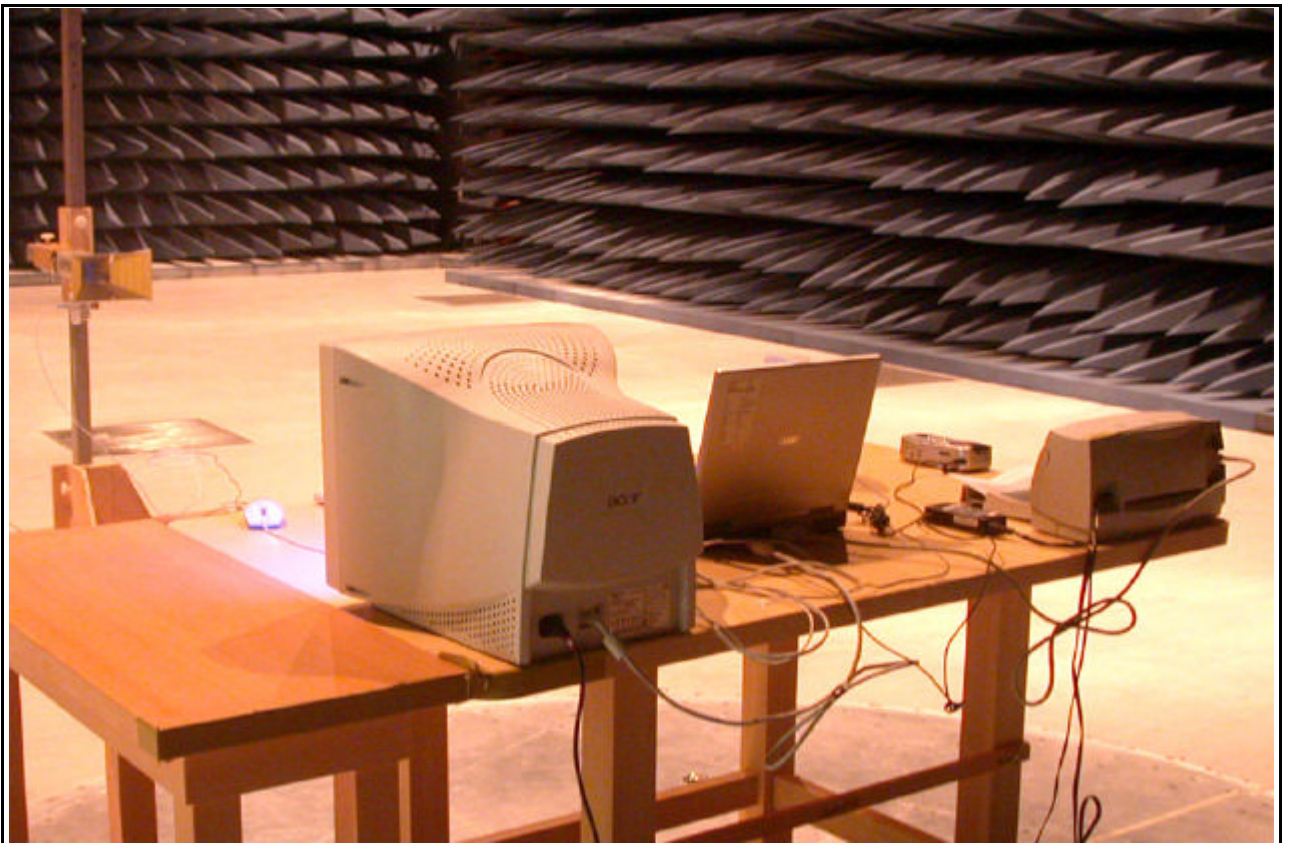
The Front View of Highest Conducted Set-up For EUT



The Front View of Highest Radiated Set-up For EUT



The Back View of Highest Radiated Set-up For EUT



7.8 Appendix H: Antenna Spec.

Please refer to the attached file.