Test Report

FOR

FCC Part 15 Subpart B & C

of

Wireless LAN Module

Model

MPCI3A-20/R
(Built in acer Notebook PC MS2101)

Applied by:

Wistron Corporation
21F,88, Sec.1, Hsin Tai Wu Rd., Hsichih
Taipei Hsieh 221
Taiwan, R. O. C.

Test Performed by:

(NVLAP Lab. Code: 200234-0)

International Standards Laboratory

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Report Number: ISL-02C081RFFCC **Test Date: 2002/11/11**
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

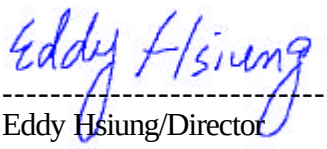
The electromagnetic interference tests which this report describes were conducted by an independent electromagnetic compatibility consultant, International Standards Laboratory in accordance with the test procedure specified in CFR 47 Part 15 Subpart C (Section 15.247), Subpart B and ANSI C63.4 Rules.

The test results contained in this report accurately represent the measurements of the EMC characteristics and the energy generated by sample equipment under test at the time of the test.

Equipment Tested:	Wireless LAN Module Model/ Type/ Machine Type: MPCI3A-20/R Applied by Wistron Corporation
Sample received Date:	2002/09/10
Final test Date :	2002/11/1
Temperature	23º C(Conduction Test); 31º C (Radiation Test)
Humidity:	56% (Conduction Test); 65% (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 B conducted and radiated emission limits of FCC Rules Part 15 Subpart B; and the limits of FCC Part 15 Subpart C (Section 15.247).

Approve & Signature



Eddy Hsiung/Director

Test results given in this report apply only to the specific sample(s) tested under stated test conditions. This report shall not be reproduced other than in full without the explicit written consent of ISL. This report totally contains 37 pages, including 1 cover page , 2 contents page, and 34 pages for the test description. This report mu st not be use to claim product endorsement by NVLAP or any agency of the U.S. Government.

This test data shown below is traceable to NIST or national or international standard. International Standards Laboratory certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

1.2 Description of Equipment Under Test (EUT)

Description:	Wireless LAN Module
Model No.:	MPCI3A-20/R
FCC ID:	PU5MPCI3A-20R
Frequency Range:	2.412~2.462 GHz
Support channel:	11 Channels
Modulation Skill	DBPSK(1Mbps), DQPSK(2Mbps), CCK(5.5/11Mbps)
Style Interface:	MINI-PCI
Antennas Type:	Left antenna: TM100 main made by Wistron NeWeb Corp. Right antenna: TM100 AUX made by Wistron NeWeb Corp.
Antenna Connected: Construction	The antenna is used to connected with the PCB inside the notebook . The user is not possible to change the antenna without disassembling the notebook.
Power Type:	5V DC (from Notebook PC)
Brand Name:	Wistron
Applicant:	Wistron Corporation 21F, 88, Sec. 1, Hsin Tai Wu Rd.,Hsichih, Taipei Hsien 221,Taiwan, R. O. C.

This device is a wireless lan card, and its operation frequency is from 2412MHz to 2462MHz. DSSS modulation is used, and there are 11 channels for data communication. The data rates are 1Mbps(DBPSK), 2Mbps(DQPSK), 5.5Mbps(CCK),and 11Mbps(CCK). The channels and the operation frequencies are listed below:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437		

1.3 Description of EUT and Support Equipment Included in Tests

The EUT is a Wireless LAN Module (Model: MPCI3A-20/R), which was tested with the following support units:

1. Acer Notebook PC	Model: MS2101
2. Acer USB Mouse	Model: MUSXT
3. Teac CD-R/RW	Model: CD-W24E
4. Philip Monitor	Model: 201P10
5. Firstline Headphone	Model: H1160.0
6. SONY radio cassette player	Model: WM-FX50

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

1.4 Test Standards and Procedure

Test Specification: FCC Part 15 subpart C (Section 15.247) and subpart B and/or CISPR 22/EN55022, RSS210

Test Procedure: ANSI C63.4, CFR 47 Sec. 15.247, as detailed in Appendices C , D.

1.5 Frequency and Channel

Channel	Frequency (GHz)
1	2.412
2	2.417
3	2.422
4	2.427
5	2.432
6	2.437
7	2.442
8	2.447
9	2.452
10	2.457
11	2.462

Note:The operating frequencies are in 2.412 GHz to 2.462GHz. According to FCC Part 15 Sec. 15.31 (m), all the items as followed in this testing report are need to test three frequencies: top: channel 1; middle: channel 7; bottom: channel 11.

1.6 General Test Conditions

During the test, the EUT was set in high power and continuously transmitting mode that Controlled by notebook computer. The channel 1, 7, 11 of EUT were all tested.

2. Powerline Conducted Emissions [Section 15.207]

2.1 EUT Configuration

The conducted emission test setups are in accordance with Figs 9, 10(a) and 10(b) of ANSI C63.4-1992, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996, and RSS210.

The EUT was set up in the shielded room on the non-conductive table which is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-1992.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides a 50 OHM terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

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.

2.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The powerline conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded.

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.

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

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

2.4 Test Data:

Table 2.2.1 Power Line Conducted Emissions (Hot) Channel 1, 7, 11

	LISN	Quasi-Peak			Average		
Frequency (KHz/MHz)	Insertion Loss (dB)	Amplitude (dBuV)	Limit (dBuV)	Margin (dB)	Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
223.75KHz	0.20	52.78	63.89	-10.91	42.82	53.89	-10.88
233.46KHz	0.20	49.22	63.62	-14.20	21.93	53.62	-31.49
257.93KHz	0.20	47.06	62.92	-15.66	15.93	52.92	-36.79
326.63KHz	0.20	49.87	60.95	-10.88	12.54	50.95	-38.21
427.33KHz	0.20	45.34	58.08	-12.54	10.94	48.08	-36.93
455.59KHz	0.20	43.95	57.27	-13.12	8.07	47.27	-39.00
665.83KHz	0.20	46.27	56.00	-9.53	17.77	46.00	-28.03
1.3602MHz	0.24	21.23	56.00	-34.53	17.48	46.00	-28.29
2.5756MHz	0.30	19.88	56.00	-35.82	14.64	46.00	-31.06

Table 2.2.2 Power Line Conducted Emissions (Neutral) Channel 1, 7, 11

	LISN	Quasi-Peak			Average		
Frequency (KHz/MHz)	Insertion Loss (dB)	Amplitude (dBuV)	Limit (dBuV)	Margin (dB)	Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
224.38KHz	0.21	49.87	63.88	-13.79	42.81	53.88	-10.85
298.75KHz	0.25	38.03	61.75	-23.47	29.92	51.75	-21.58
377.38KHz	0.29	43.59	59.50	-15.62	34.57	49.50	-14.64
451.75KHz	0.30	34.40	57.38	-22.68	26.26	47.38	-20.82
530.38KHz	0.30	37.76	56.00	-17.94	31.67	46.00	-14.03
606.88KHz	0.30	33.64	56.00	-22.06	25.44	46.00	-20.26
687.63KHz	0.30	27.09	56.00	-28.61	22.64	46.00	-23.06
759.88KHz	0.30	32.14	56.00	-23.56	25.49	46.00	-20.21
836.38KHz	0.30	33.11	56.00	-22.59	29.44	46.00	-16.26
989.38KHz	0.30	30.75	56.00	-24.95	27.31	46.00	-18.39
1.3625MHz	0.30	26.81	56.00	-28.89	20.69	46.00	-25.01

* NOTE: During the test, the EMI receiver was set to Max. Hold then switch the EUT Channel between 1 , 7, 11 to get the maximum reading of all these channels.
Margin = Amplitude + Insertion Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

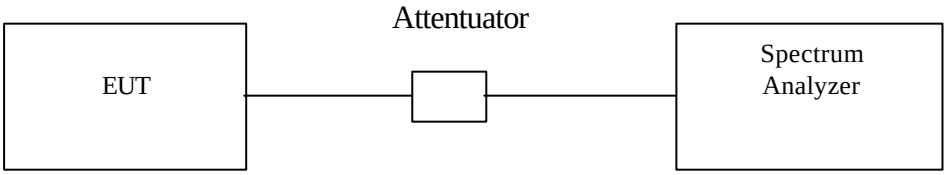
3. Bandwidth for DSSS [Section 15.247 (a)(2)]

3.1 Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer through an attenuator. The 6 dB bandwidth of the fundamental frequency was measured. The setting of spectrum analyzer is as follows

Equipment mode: Spectrum analyzer
Detector function: Peak mode
RBW: 100KHz
VBW: 100KHz

3.2 Test Setup



3.3 Test Data:

Table 3.3.1 6dB Bandwidth

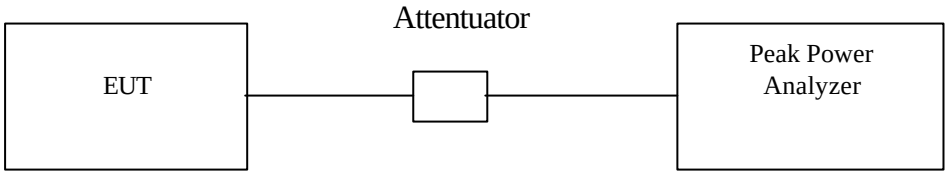
Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	9.43	0.5	Pass
7	2442	9.78	0.5	Pass
11	2462	9.99	0.5	Pass

4. DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

4.1 Test Procedure

1. The Transmitter output of EUT was connected to the peak power analyzer through an attenuator.

4.2 Test Setup



4.3 Test Data:

Table 4.3.1 Maxmum Peak Output Power

Chennel	Frequency (MHz)	Peak Power Output (dBm)	Limit (dBm)	Pass/Fail
1	2412	16.41	30	Pass
7	2442	16.41	30	Pass
11	2462	16.50	30	Pass

5. RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)(1) MPE]

5.1 Limits for Maximum Permissible Exposure (MPE)

A. Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (S) (mW/cm2)	Averagine Time (Minutes)
300-1500	----	-----	f/300	6
1500-100,000	----	-----	5	6

B. Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (S) (mW/cm2)	Averagine Time (Minutes)
300-1500	----	-----	f/1500	30
1500-100,000	----	-----	1.0	30

5.2 RF Exposure Calculations:

From FCC 1.1310, the maximum perissible RF exposure for an uncontrolled environment is 1 mW/cm2.

The Minimum Allowable Distance ,R, of EUT is calculated as follows:

Friis Transmission Formula: $Pd = (Pout*G)/(4* ð*R^2)$

$R= [(Pout*G)/(4* ð*Pd)]^{1/2}$

Where Pd = power density in mW/cm^2 = $1mW/ cm^2$

G = antenna numeric gain = Log^{-1}(dB gain/10) = 1.995 (refer to antenna spec. in appendix M)

Pout = output power to antenna in mW (Refer to table 4.3.1)

ð = 3.1416

Since the host equipment is notebook computer, the normal use distance is more than 20cm, the suitable standrad for RF exporsure is §1.1307(b)(1) MPE test. According to the result of 4.3.1, the calulated minimum allowance distance of EUT is listed below:

Table 5.2.1 MPE Minimum Allowance Distance of EUT

Channel	Frequency (MHz)	Maximum output power (mW)	Minimum Allowance Distance (cm)
1	2412	43.75	2.63
7	2442	43.75	2.63
11	2462	44.67	2.66

The minimum allowable distance is very close to the enclosure of the antenna and also very far away from the human being under normal use condition. So, the RF exposure warning or SAR Measurement is not needed.

6. Radiated Emission Measurement [Section [15.247(c)(4)]

6.1 EUT Configuration

The radiated emissions test setups are in accordance with Figs 10(c) and 10(d) of ANSI C63.4-1992, CFR 47 Part 15 Subpart C; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996, and RSS210.

The equipment under test was set up on the 3 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 host equipment of EUT is a Notebook 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.

6.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. We found the maximum readings by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured.

30M to 1GHz: The highest emissions between 30 MHz to 1000 MHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission.

1G to 12GHz: The highest emissions between 1GHz to 12GHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. For the harmonic frequency, RBW and VBW were set to the 100KHz.

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

Frequency Range A:	30MHz--1000MHz
Detector Function:	Quasi-Peak Mode
Bandwidth (RBW):	120KHz
Frequency Range B:	1GHz–25GHz
Detector Function:	Peak Mode
Bandwidth (RBW):	1 MHz

6.4 Test Data:.

Table 6.4.1 30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 1

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 (°)
194.9	24.9	8.85	2.59	0	36.33	43.5	-7.17	150	144
298.69	22.18	13.57	3.21	0	38.96	46	-7.04	100	187
300.63	22.05	13.61	3.22	0	38.88	46	-7.12	100	160
325.85	25.2	14.01	3.37	0	42.58	46	-3.42	100	270
390.84	21.4	15.79	3.75	0	40.93	46	-5.07	100	22
782.72	15.54	20.13	5.55	0	41.22	46	-4.78	100	187

Table 6.4.2 30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 1

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 (°)
199.75	24.1	8.99	2.63	0	35.72	43.5	-7.78	198	227
260.86	25.88	12.89	2.99	0	41.76	46	-4.24	149	242
300.63	25.92	13.61	3.22	0	42.75	46	-3.25	149	215
325.85	25.59	14.01	3.37	0	42.97	46	-3.03	149	215
677.96	13.19	19	5.07	0	37.26	46	-8.74	100	283
782.72	14.41	20.13	5.55	0	40.09	46	-5.91	149	215

* 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: 1GHz–25GHz

Table 6.4.3 30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 7

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 (°)
199.75	28.69	8.99	2.63	0	40.31	43.5	-3.19	150	228
260.86	25.86	12.89	2.99	0	41.74	46	-4.26	150	90
455.83	20.41	16.46	4.06	0	40.93	46	-5.07	150	117
716.76	16.51	19.4	5.25	0	41.16	46	-4.84	100	78
782.72	17.42	20.13	5.55	0	43.11	46	-2.89	100	188
847.71	11.23	20.58	5.79	0	37.59	46	-8.41	100	271

Table 6.4.4 30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 7

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 (°)
199.75	23.48	8.99	2.63	0	35.1	43.5	-8.4	148	325
298.69	22.39	13.57	3.21	0	39.17	46	-6.83	148	215
325.85	22.86	14.01	3.37	0	40.24	46	-5.76	148	215
586.78	15.62	18.83	4.65	0	39.1	46	-6.9	100	282
716.76	14.55	19.4	5.25	0	39.2	46	-6.8	148	215
782.72	14.52	20.13	5.55	0	40.21	46	-5.79	148	215

* 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: 1GHz–25GHz

Table 6.4.5 30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 11

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 (°)
199.75	28.17	8.99	2.63	0	39.79	43.5	-3.71	150	200
260.86	20.87	12.89	2.99	0	36.74	46	-9.26	100	188
597.45	14.04	18.81	4.7	0	37.55	46	-8.45	249	337
716.76	17.67	19.4	5.25	0	42.32	46	-3.68	201	243
847.71	15.47	20.58	5.79	0	41.84	46	-4.16	201	270
912.7	9.86	20.68	6.01	0	36.54	46	-9.46	100	270

Table 6.4.6 30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 11

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 (°)
400.54	23.35	16.1	3.8	0	43.26	46	-2.74	100	117
455.83	17.56	16.46	4.06	0	38.08	46	-7.92	100	117
521.79	16.21	18.22	4.36	0	38.79	46	-7.21	100	172
651.77	15.35	19	4.95	0	39.3	46	-6.7	100	90
716.76	17.52	19.4	5.25	0	42.17	46	-3.83	100	145
847.71	11.28	20.58	5.79	0	37.65	46	-8.35	100	117

* 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: 1GHz–25GHz

Table 6.4.7 1GHz~ 25GHz Open Field Radiated Emissions (Horizontal) Channel 1

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 (°)
*2412.2	109	30.24	10.16	47.37	102.02	--	--	146	112
4823.9	49.3	33.9	14.61	49.21	48.59	54	-5.41	142	123
7235.8	40.29	39.88	17.9	48.01	50.06	54	-3.94	115	127

" * " : Fundamental Frequency

Table 6.4.8 1GHz~25GHz Open Field Radiated Emissions (Vertical) Channel 1

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 (°)
*2412.2	109.59	30.24	10.16	47.37	102.61	--	--	120	228
4823.9	49.59	33.9	14.61	49.21	48.88	54	-5.12	122	229
7235.9	40.45	39.88	17.9	48.01	50.22	54	-3.78	122	226

" * " : Fundamental Frequency

* 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: 1GHz–25GHz

Table 6.4.9 1GHz~ 25GHz Open Field Radiated Emissions (Horizontal) Channel 7

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 (°)
*2442.2	107.38	30.22	10.24	47.4	100.44	--	--	106	190
4883.9	47.73	34.14	14.62	49.24	47.24	54	-6.76	103	162
7326.2	40.83	39.68	17.95	47.88	50.58	54	-3.42	103	162

" * " : Fundamental Frequency

Table 6.4.10 1GHz~25GHz Open Field Radiated Emissions (Vertical) Channel 7

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 (°)
*2442.1	108.66	30.22	10.24	47.4	101.72	--	--	158	112
4883.9	51.52	34.14	14.62	49.24	51.03	54	-3.97	127	265
7326.1	40.36	39.68	17.95	47.88	50.11	54	-3.89	126	264

" * " : Fundamental Frequency

* 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: 1GHz–25GHz

Table 6.4.11 1GHz~ 25GHz Open Field Radiated Emissions (Horizontal) Channel 11

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 (°)
*2462.2	108.09	30.22	10.29	47.42	101.17	--	--	172	21
4924	47.91	34.3	14.63	49.26	47.57	54	-6.43	137	18
7385.9	40.66	39.55	17.98	47.79	50.4	54	-3.6	137	128

" * " : Fundamental Frequency

Table 6.4.12 1GHz~25GHz Open Field Radiated Emissions (Vertical) Channel 11

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 (°)
*2462.2	109.55	30.22	10.29	47.42	102.63	--	--	125	263
4923.9	51.88	34.3	14.63	49.26	51.54	54	-3.46	127	264
7385.8	41.06	39.55	17.98	47.79	50.8	54	-3.2	128	263

" * " : Fundamental Frequency

* 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: 1GHz–25GHz

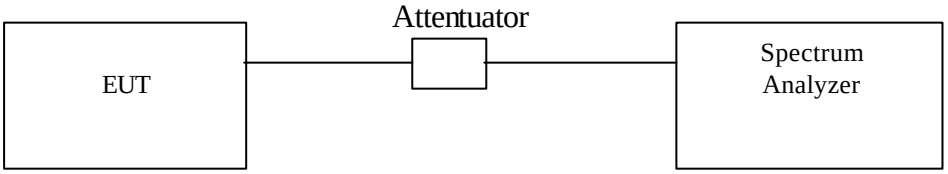
7. DSSS Peak Power Spectral Density [Section 15.247(d)]

7.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer through an attenuator.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   RBW: 3KHz
   VBW: 10KHz
   Span: 300KHz
   Center frequency: fundamental frequency tested.
   Sweep time= 100 sec.

2. Using Peak Search to read the peak power after Maximun Hold function is completed.

7.2 Test Setup



7.3 Test Data:

Table 7.3.1 Maxmum Peak Output Power Density

Chennel	Frequency (MHz)	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	2412	-9.12	8	Pass
7	2442	-9.08	8	Pass
11	2462	-9.16	8	Pass

8. Processing Gain of a Direct Sequence Spread Spectrum

Due to the output power of this product <100mW, the processing gain did not be cared.

9. Appendix

9.1 Appendix A: Warning Labels

Label Requirements

An intentional radiator device subject to certification by the FCC shall carry a warning label which includes the following statement:

The sample label shown shall be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.

FCC ID: PU5MPCI3A-20R
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

9.2 Appendix B: Measurement Procedure for Powerline Conducted Emissions

The EUT is set up in accordance with the suggested configuration given in ANSI C63.4-1992, 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 x 3 x 2.3 (m) Condutction test site. The EUT was placed on a non-conduction 1.0 x 1.5 (m) table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance vs. Frequency Characteristic in accordance with the Figure 1 of the ANSI C63.4-1992, CFR 47 Part 15 Subpart B; or EN55022:1994 /A1:1995 /A2: 1997; CISPR 22:1993/A1:1995/A2:1996. 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 C63.4-1992, 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.

9.3 Appendix C: 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 EUTs 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 preselected 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 EUTs 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 and with the 120 kHz 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 C63.4-1992, and/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.

During the open site measurements, the peaks are selected, the scan frequency span width is reduced to 0--1MHz, 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.

9.4 Appendix D: Test Equipment

9.4.1 Test Equipment List

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction	50 Ohms Load Conduction 02	EMCO	N/A	ISL-50ohms conduction 02	11/21/2001	11/21/2002
Conduction	50 Ohms Load Conduction 02	EMCO	N/A	ISL-50ohms conduction 02	11/21/2001	11/21/2002
Conduction	Coaxial Cable 1F-C2	Harbourindustries	RG400	1F-C2	06/03/2002	06/03/2003
Conduction	Digital Hygro-Thermometer Conduct	MicroLife	HT-2126G	ISL-Conduction02	12/16/2001	12/16/2003
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	LISN 01	R&S	ESH2-Z5	890485/013	05/07/2002	05/07/2003
Conduction	LISN 03	R&S	ESH3-Z5 831.5518.52	828874/D10	10/31/2002	10/31/2003
Radiation	Spectrum Analyzer 08	Advantest	R3132	111000867	11/21/2001	11/21/2002
Radiation	EMI Receiver 05	AFJ	ER 55CR	55390143234	11/07/2002	11/07/2003
Radiation	BILOG Antenna 08	Schaffner	CBL6112B	2756	06/04/2002	06/04/2003
Radiation	Microwave Cable Chmb 02 3M	HUBER+SUHNER AG.	Sucoflex 103	42731/3 & 42729/3	03/21/2002	03/21/2003
Radiation	Coaxial Cable Chmb 02-10M	Belden	RG-8/U	Chmb 02-10M	01/14/2002	01/14/2003
Radiation	Digital Hygro-Thermometer Chmb 02	MicroLife	HT-2126G	Chmb 02	02/07/2002	02/07/2003
Rad. Above 1Ghz	Horn Antenna 02	Com-Power	AH-118	10088	02/25/2002	02/25/2003
Rad. Above 1Ghz	Horn Antenna 04	Com-Power	AH-826	081-001	10/17/2002	10/17/2003
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+SUHNER AG.	Sucoflex 103	42726/3 & 42727/3	09/11/2002	09/11/2003
Rad. Above 1Ghz	Preamplifier 02	MITEQ	AFS44-00102650-40-10P-44	728229	05/07/2002	05/07/2003
Rad. Above 1Ghz	Preamplifier 09	MITEQ	AFS44-00102650-40-10P-44	858687	02/28/2002	02/28/2003

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
RF	Peak Power Analyzer	HP	8990A	3621A01269	11/05/2001	11/05/2004
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	02/05/2002	02/05/2003
Rad. Above 1Ghz	Signal Generator 04	Anritsu	MG3692A	020311	02/06/2002	02/06/2004
Rad. Above 1Ghz	Spectrum Analyzer 07	Advantest	R3182	110600649	10/17/2002	10/17/2003

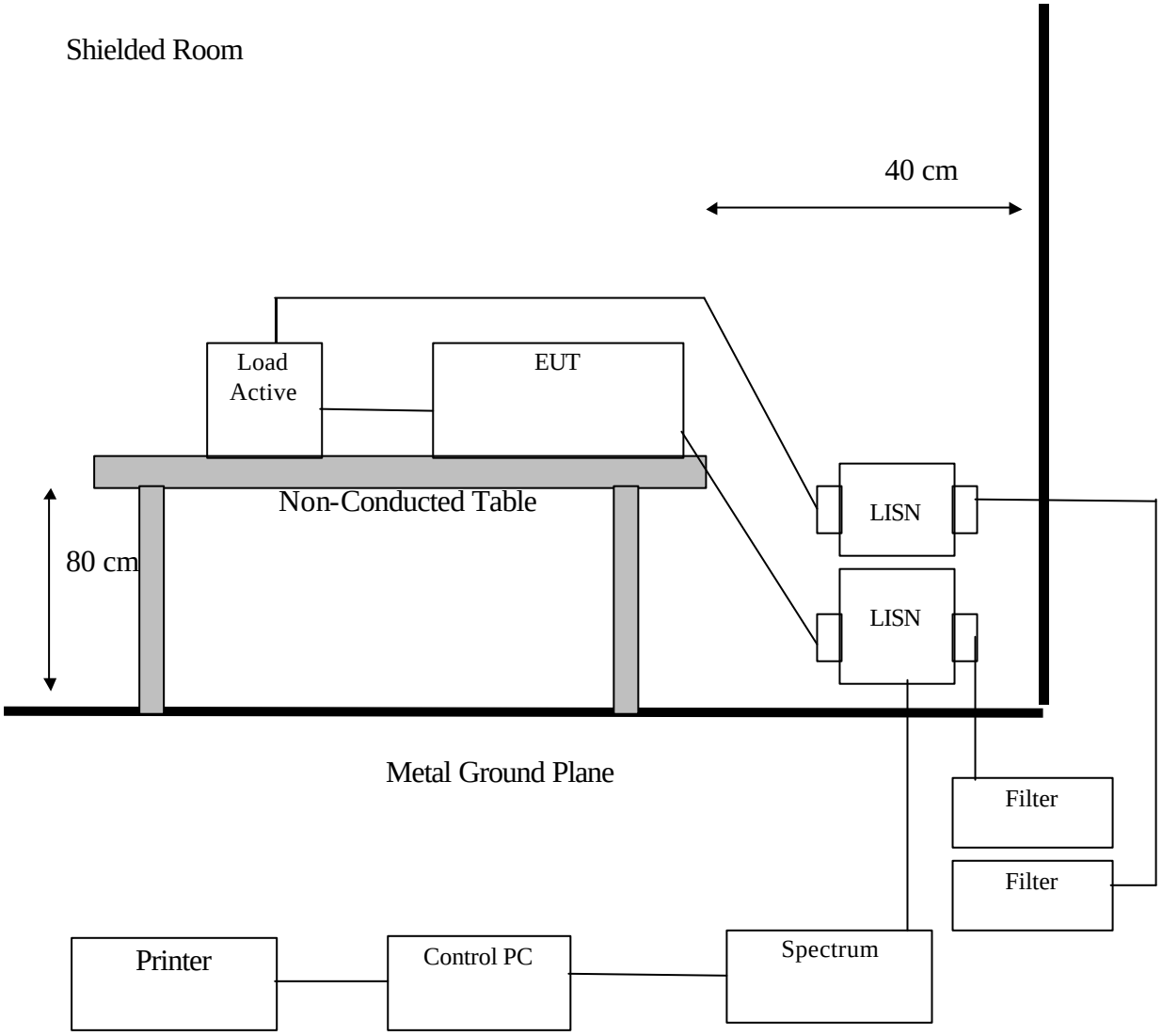
Note: Calibration traceable to NIST or national or international standards.

9.4.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

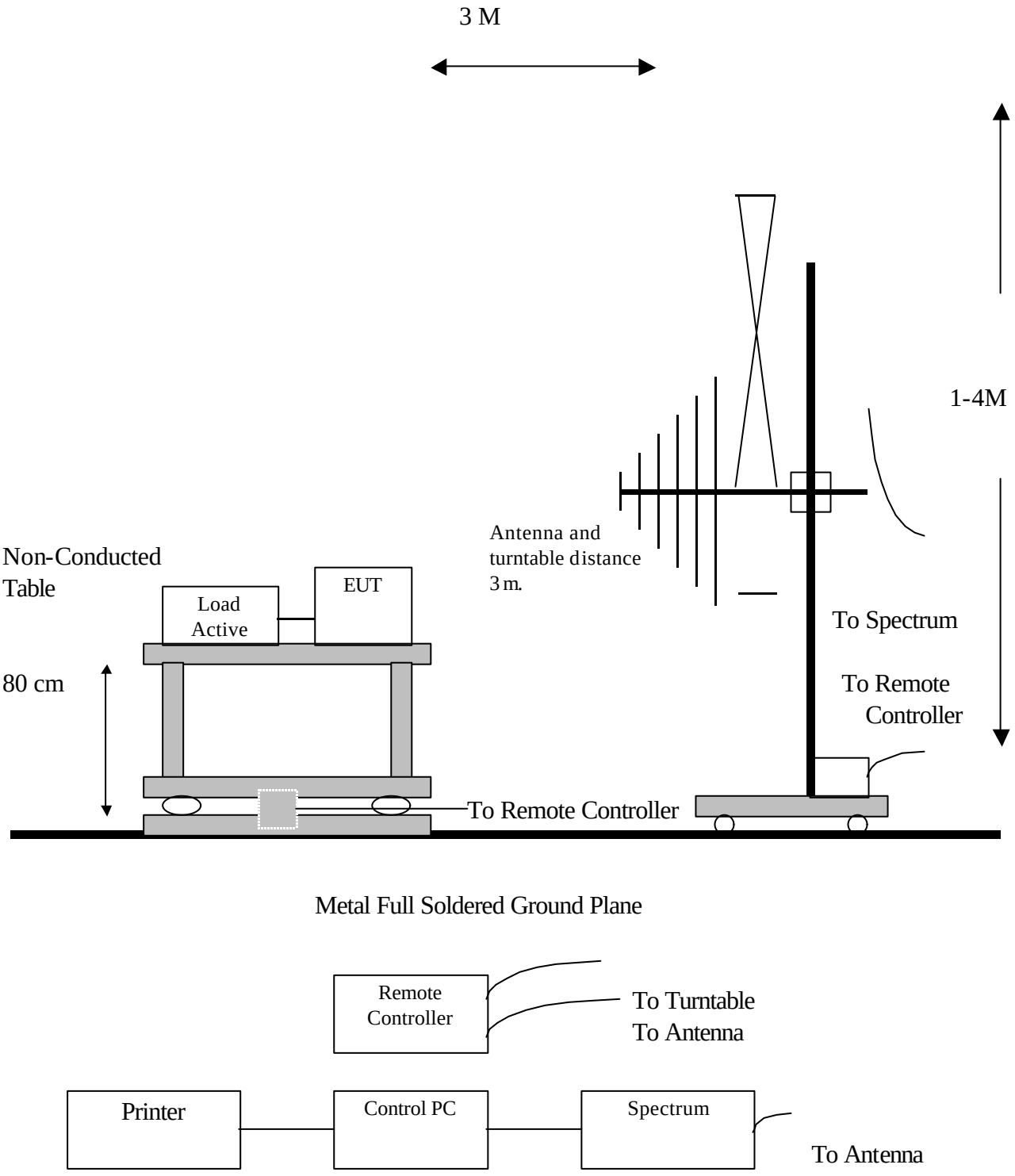
Radiation/Conduction	Filename	Version	Issued Date
Conduction	Tile.exe	1.12E	7/7/2000
Radiation	Tile.exe	1.12C	6/16/2000

9.5 Appendix E: Layout of EUT and Support Equipment

9.5.1 General Conducted Test Configuration



9.5.2 General Radiation Test Configuration



9.6 Appendix F: Description of Support Equipment

9.6.1 Description of Support Equipment

Support Unit 1.

Description：	Notebook PC
Condition:	Pre-Production
Model：	MS2101
Brand:	acer
Serial Number：	N/A
AC-DC Adaptor：	LiteOn (Model: PA-1500-02) 2 Pins
Hard Disk Driver:	IBM (Model: IC25N010ATDF80199) 10.0 GB
SDRAM:	INFINEON (Model: HYS64V16220GDL-7.5) 128MB
CD-ROM Driver:	AOpen(Model:SC-924U) (Optional module)
FDD Driver:	Y-E Data(Model:YD-8U10 B-Color) (Optional module)
Modem Module:	Ambit (Model: T60M283.00 3A)
Wireless LAN Module:	EUT
USB Connector:	two 4-pin
VGA Port:	one 15-pin
LAN Connector:	one 8-pin
Modem Connector:	one 4-pin
1394 Port:	one 4-pin
PCMCIA Slot:	one 68-pin
Line Out Port:	one
Line In Port:	one
Power Jack:	one AC-IN port
LCD:	TOSHIBA 10.4” (Model: TLM10C321K)
Display:	LCD & CRT (1024 X 768)
Maximum Resolution:	LCD & CRT (1024 X 768)
Battery:	SANYO (Model: BTP-42C1)
Power Cord:	Shielded, Detachable (3 pins)
CPU:	Pentium III 850MHz

Support Unit 2.

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 3.

Description:	Portable USB 2.0 CD-R/RW
Model Number:	TEAC CD-W24E
Serial Number:	N/A
AC Adapter:	Delta (Model: ADP-12NB)
Power Cord:	Shielded, Detachable (3-Pin)
FCC ID:	(comply with FCC DOC)

Support Unit 4.

Description:	Philips Monitor
Model:	201P10
Serial Number:	TY100134004889
Power Cord:	Non-shielded, Detachable
FCC ID:	(Comply with FCC Standards)

Support Unit 5.

Description:	Firstline Headphone
Model Number:	H1160.0
Serial Number:	N/A
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	N/A

Support Unit 6.

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

9.6.2 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 Plastic Hood
USB Mouse Data Cable	Mouse to PC USB port	1.8M	Shielded, Undetachable	Metal Head without Hood
USB CD R/RW Data Cable	USB CD R/RW to PC USB Port	0.8M	Shielded, Detachable	Metal Head
Monitor Data Cable	Monitor to PC VGA Port	1.6M	Shielded, Un-detachable	Metal Head
Audio-in Data Cable	Walkman to PC Line In Port	2M	Non-shielded, Detachable	Plastic Head
Headphone Data Cable	Headphone to PC Line Out Port	1.2M	Non-shielded, Un-detachable	Plastic Head

9.7 Appendix G: Accuracy of Measurement

Test Site: Conduction 02

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	0.104	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:

Uc (y) = square root (u_1 (y)^2 + u_2 (y)^2 + ...+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.

Test Site: Chamber 02-10M

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	0.134	k=1	0.067
2	Random Effects: (Assessment from 20 random observations; 1 reading on EUT)	Normal	k=2	0.206	k=1	0.103
3	Receiver Calibration	Rectangular	k=1.73	1.000	k=1	0.577
4	Antenna Factor Calibration	Normal	k=2	1.400	k=1	0.700
5	Cable Loss Calibration	Normal	k=2	1.000	k=1	0.500
6	Combined Standard Uncertainty Uc(y)	Normal			k=1	0.916
7	**Total Uncertainty @95% mim. Confidence Level**	**Normal**	**k=2**	**1.831**		

Measurement Uncertainty Calculations:

Uc (y) = square root (u_1 (y)^2 + u_2 (y)^2 + ...+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.

9.8 Appendix H: Photographs of EUT Configuration Test Set Up

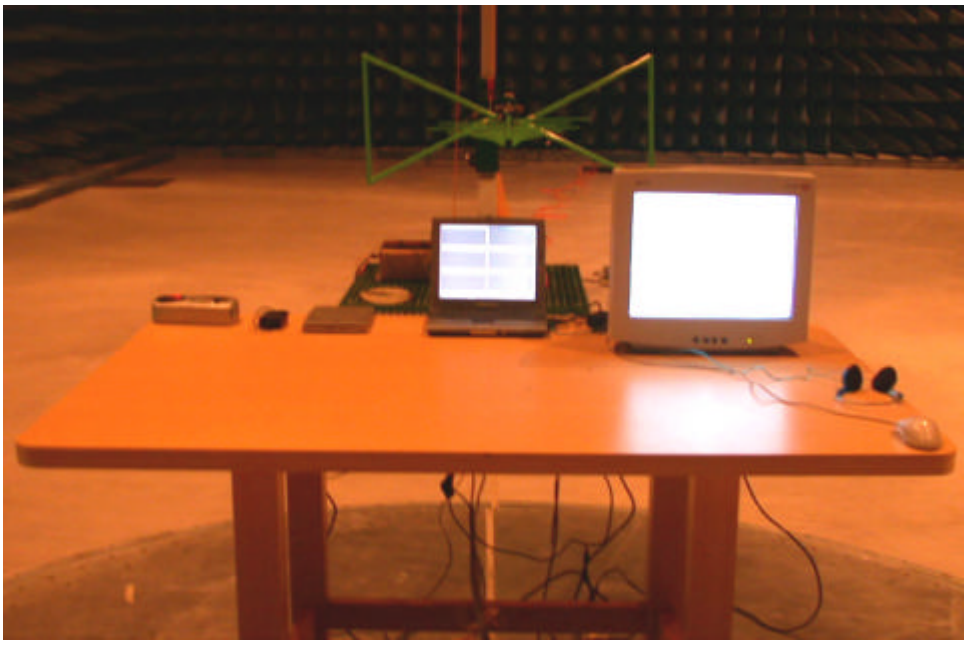
According to ANSI C63.4-1992; or EN55022:1994/ A1:1995/ A2:1997; CISPR 22:1993/A1:1995/A2:1996:

The measurement results along with the appropriate limits for comparison shall be presented in tabular form. If an alternate test method is used, the test report must identify that method and justification for its use shall be provided. Instrumentation, instrument attenuator and bandwidth settings, detector function, EUT arrangements, a sample calculation with all conversion factors and all other pertinent details shall be included along with the measurement results. When automatic scan techniques are used, an explanation of how each emission from the EUT was maximized shall be included in the test report along with the scan rate used to obtain each level.

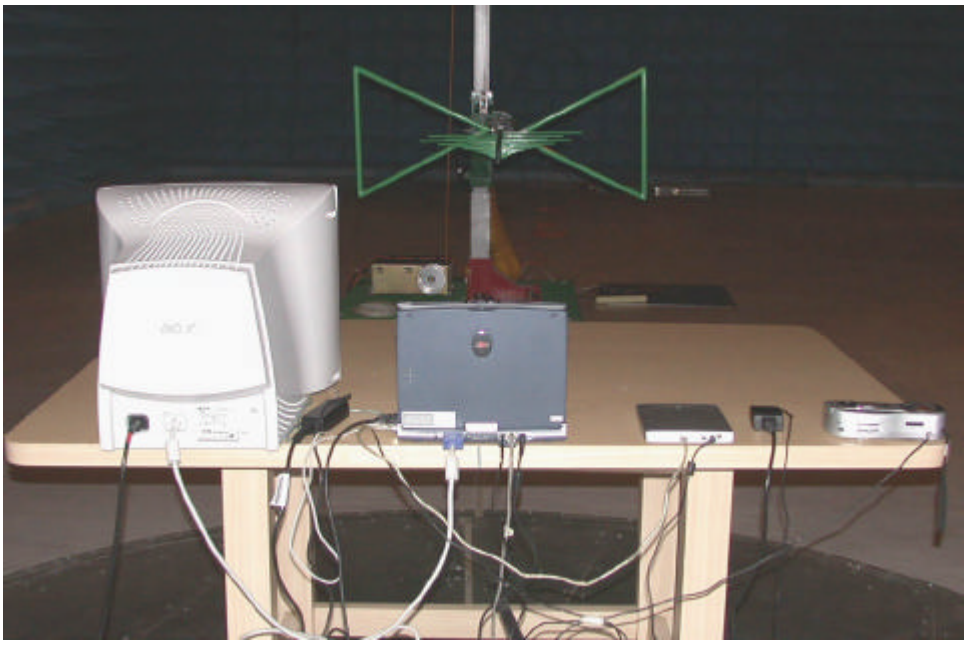
The justification for selecting a particular EUT configuration and particular length of interface cable to produce maximized emissions must be documented in the test report. Photographs clearly showing the test set-up and interface cable arrangement for the highest radiated and line conducted emission measured shall be included.

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



9.9 Appendix I: Antenna Spec.

Please refer to the attached file.