FCC TEST REPORT

for

CISPR PUB.22 CLASS B

Equipment : VGA CARD

MODEL NO. : CARDEXpert VANTA

F C C I D : ICUVGA-GW909

Filing Type : Original Certification

APPLICANT : **GAINWARD CO., LTD.**
12F, #96, Hsin Tai Wu Rd., Sec. 1, Hsi-Chih,
Taipei Hsien, Taiwan, R.O.C.

- The test result refers exclusively to the test presented test model / sample.
- Without the written authorization of the test lab., the Test Report may not be copied.
- Certificate or Test Report must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of the U.S Government.

SPORTON INTERNATIONAL INC.

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

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CERTIFICATE NO. : F970906

CERTIFICATE OF COMPLIANCE

for

CISPR PUB.22 CLASS B

Equipment : VGA CARD

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F C C I D : ICUVGA-GW909

APPLICANT : **GAINWARD CO., LTD.**
12F, #96, Hsin Tai Wu Rd., Sec. 1, Hsi-Chih,
Taipei Hsien, Taiwan, R.O.C.

I **HEREBY** CERTIFY THAT :

The measurement shown in this report were made in accordance with the procedures given in **ANSI C63.4 -1992** and the energy emitted by this equipment was ***passed*** CISPR PUB.22 both radiated and conducted emissions class B limits. Testing was carried out on **Jul. 10, 1999** at **SPORTON INTERNATIONAL INC.** LAB.

Lenore Chang
President

SPORTON INTERNATIONAL INC.

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

1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

1.1. APPLICANT

GAINWARD CO., LTD.

12F, #96, Hsin Tai Wu Rd., Sec. 1, Hsi-Chih,

Taipei Hsien, Taiwan, R.O.C.

1.2. MANUFACTURER

Same as 1.1.

1.3. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment : VGA CARD

FCC ID : ICUVGA-GW909

Model no. : CARDEXpert VANTA

Trade namE : **CARDEXpert**

VGA Data cable : Shielded, 1.15m

LCD Data cable : Shielded, 1.75m

Power supply TYPE : N/A

Power cord : N/A

1.4. FEATURE OF EQUIPMENT UNDER TEST

- 66MHz AGP clock rate and AGP 4X/2X mode
- 250MHz Palette-DAC Supports up to 1600x1200@85Hz
- 64-bit Wide Frame Buffer Interface Supports up to 16 MB SDRAM
- LCD Resolution up to 1024x768 and Color Depths up to 16 Million

2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1. TEST MANNER

a. The EUT has been associated with personal computer and peripherals pursuant to ANSI C63.4-1992 and configuration operated in a manner, which tended to maximize its emission characteristics in a typical application.

b. The HITACHI monitor, DELL PS/2 keyboard, PRIMAX PS/2 mouse, HP printer, ACEEX modem, COMPAQ LCD monitor and EUT were connected to the F.I.C. P.C. for EMI test.

c. The following display resolution were investigated during the compliance test :
   1. CRT only, Horizontal frequency (640 x 480 to 1600 x 1200, 31.5Khz to 109KHz)
   2. Vertical frequency (60Hz to 100Hz)
   3. LCD only mode

d. According to the above tests, we listed the flowing display modes as the worst cases :
   1. CRT only mode, 1600 x 1200, 85K, 106Hz
   2. CRT only mode, 1280 x 1024, 109K, 100Hz
   3. LCD only mode, 1024x768, 48K, 60Hz

e. Frequency range investigated: Conduction 150 KHz to 30 MHz, Radiation 30 MHz to 2000MHz.

2.2. DESCRIPTION OF TEST SYSTEM

Support Device 1. --- P.C. (FIC)

FCC ID	: N/A
Model No.	: P2L97
Serial No.	: SP1005
Data Cable	: Shielded
Power Cord	: Non-shielded
Power Supply Type	: Switching

(Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.)

Support Device2. --- MONITOR (HITACHI)

FCC ID	: M9U9705C97BMD
Model No.	: CM-803ET
Serial No.	: SP1012
Data Cable	: Shielded, 360 degree via metal backshells, 1.15m
Power Supply Type	: Switching
Power Cord	: Non-shielded

Support Device 3. --- PS/2 KEYBOARD (DELL)

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

Support Device 4. --- PS/2 MOUSE (PRIMAX)

FCC ID	: EMJMUSJQ
Model No.	: MUS9J
Serial No.	: SP1025
Data Cable	: Shielded, 360 degree via metal backshells,1.7m

Support Device 5. --- PRINTER (HP)

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

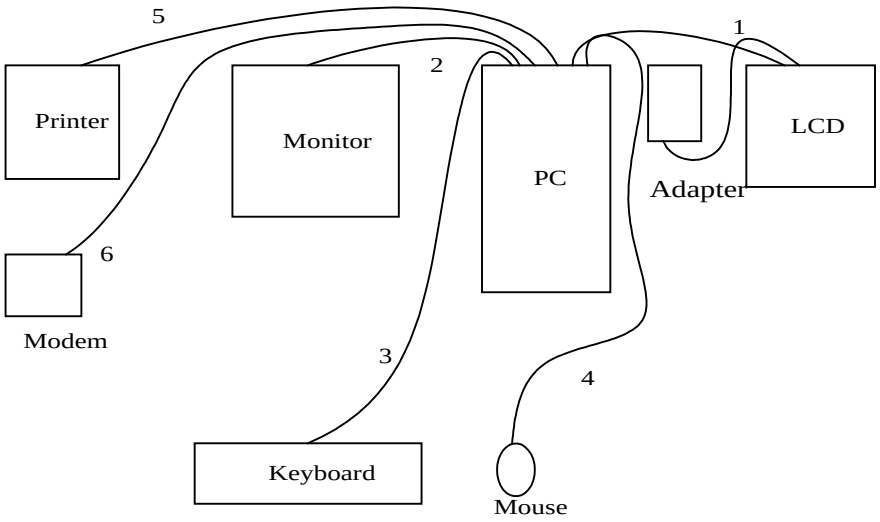
Support Device 6. --- MODEM (ACEEX)

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

Support Device 7. --- LCD MONITOR (COMPAQ)

FCC ID	: N/A
Model No.	: FP500
Serial No.	: SP1089
Data Cable	: Shielded, 1.75m
Power Supply Type	: Switching
Power Cord	: Non-shielded

2.3. CONNECTION DIAGRAM OF TEST SYSTEM



1. The I/O cable is connected from the EUT to the support device 7.
2. The I/O cable is connected from the EUT to the support device 2.
3. The I/O cable is connected from the support device 1 to the support device 3.
4. The I/O cable is connected from the support device 1 to the support device 4.
5. The I/O cable is connected from the support device 1 to the support device 5.
6. The I/O cable is connected from the support device 1 to the support device 6.

3. TEST SOFTWARE

An executive programs, WINFCC under WIN98, which generates a complete line of continuously repeating " H " pattern were used as the test software.

The programs were executed as follows :

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

4. GENERAL INFORMATION OF TEST

4.1. TEST FACILITY

This test was carried out by SPORTON INTERNATIONAL INC. in an openarea test site.

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

TEL : 886-2-2601-1640

FAX : 886-2-2601-1695

4.2. STANDARD FOR METHODS OF MEASUREMENT

ANSI C63.4-1992

4.3 .TEST IN COMPLIANCE WITH

CISPR PUB.22 CLASS B

4.4. FREQUENCY RANGE INVESTIGATED

a. Conduction : from 150 KHz to 30 MHz

b. Radiation : from 30 MHz to 2000 MHz.

4.5. TEST DISTANCE

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

5. TEST OF CONDUCTED POWERLINE

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz on the 115 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-1992 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in Figure 5-3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

5.1. MAJOR MEASURING INSTRUMENTS

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

5.2. TEST PROCEDURES

a. The EUT was placed 0.4 meter from the conducting wall of the shielding room and was kept at least 80 centimeters from any other grounded conducting surface.

b. Connect EUT to the power mains through a line impedance stabilization network (LISN).

c. All the support units are connect to the other LISN.

d. The LISN provides 50 ohm coupling impedance for the measuring instrument.

e. The FCC states that a 50 ohm , 50 microhenry LISN should be used.

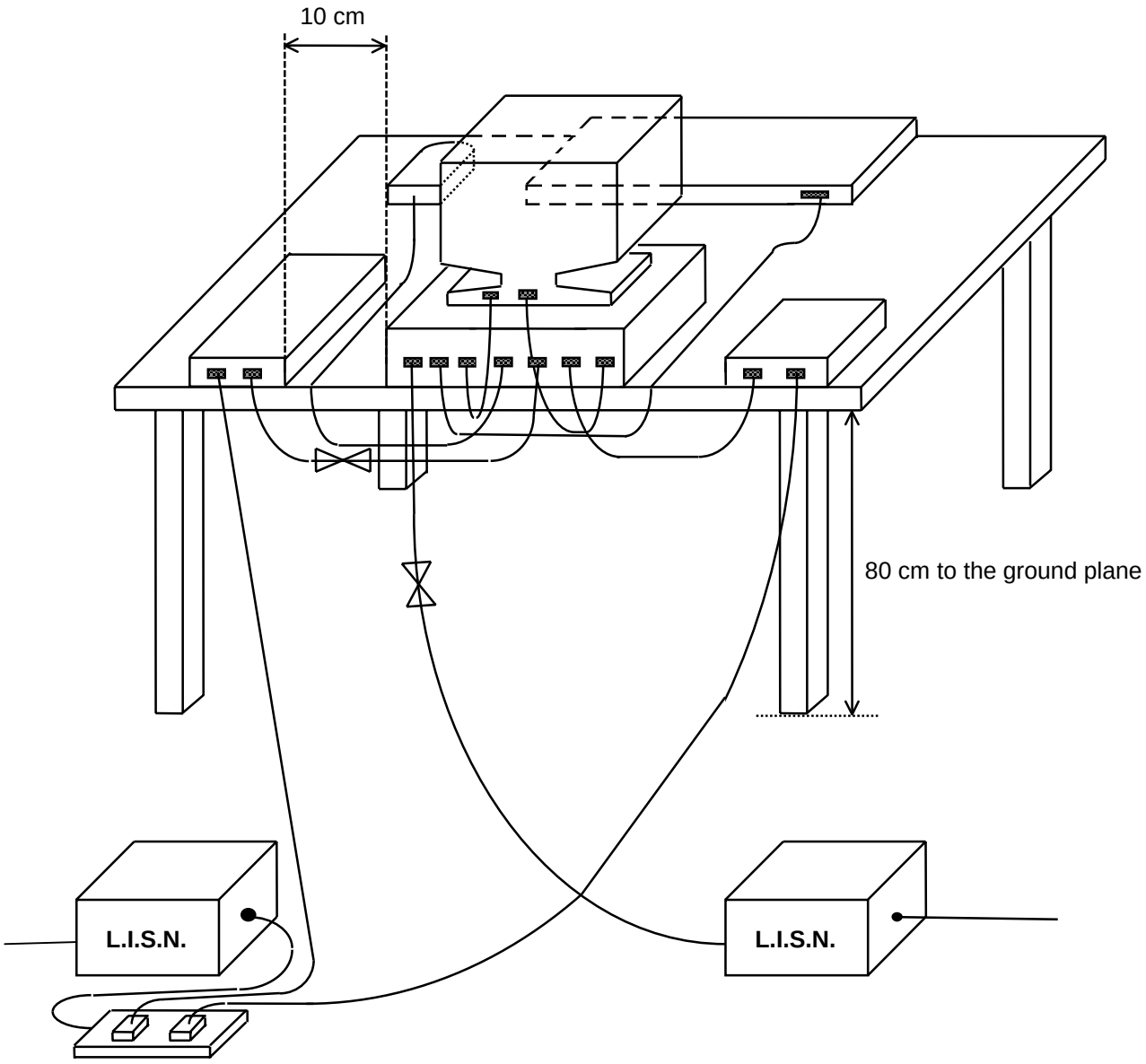
f. Both sides of AC line were checked for maximum conducted interference.

g. The frequency range from 150 KHz to 30 MHz was searched.

h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

i. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported otherwise the emissions which do not have 6 dB margin will be retested on by one using the quasi-peak method and reported.

5.3. TYPICAL TEST SETUP LAYOUT OF CONDUCTED POWERLINE



5.4. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION

- All emissions not reported here are more than 10 dB below the prescribed limit.
- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 25
- Relative Humidity : 52% RH
- Test Mode : CRT only mode, 1600 x 1200, 85K, 106Hz
- Test Date : Jul. 10, 1999

The Conducted Emission test was passed at LINE 0.23 MHz / 46.80 dBuV.

Frequency	Line	Meter Reading				Limits				Margin	
	or	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.
(MHz)	Neutral	(dBuV)	(dBuV)	(uV)	(uV)	(dBuV)	(dBuV)	(uV)	(uV)	(dB)	(dB)
0.23	L	49.30	46.80	291.74	218.78	62.49	52.49	1332.47	421.36	-13.19	-5.69
0.49	L	33.20	31.50	45.71	37.58	56.21	46.21	646.48	204.43	-23.01	-14.71
16.00	L	30.80	28.10	34.67	25.41	60.00	50.00	1000.00	316.23	-29.20	-21.90
0.23	N	50.00	46.60	316.23	213.80	62.47	52.47	1328.59	420.14	-12.47	-5.87
0.49	N	33.30	31.70	46.24	38.46	56.21	46.21	646.42	204.42	-22.91	-14.51
16.00	N	30.40	27.70	33.11	24.27	60.00	50.00	1000.00	316.23	-29.60	-22.30

Test Engineer :

Kenny Chuang

5.4.1. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION

- All emissions not reported here are more than 10 dB below the prescribed limit.
- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 25
- Relative Humidity : 52% RH
- Test Mode : CRT only mode, 1280x1024, 100Hz, 109K
- Test Date : Jul. 10, 1999

The Conducted Emission test was passed at <u>LINE 0.23 MHz / 46.50 dBuV</u>.

Frequency	Line	Meter Reading				Limits				Margin	
	or	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.
(MHz)	Neutral	(dBuV)	(dBuV)	(uV)	(uV)	(dBuV)	(dBuV)	(uV)	(uV)	(dB)	(dB)
0.23	L	48.90	46.50	278.61	211.35	62.60	52.60	1348.25	426.36	-13.70	-6.10
0.48	L	33.60	32.10	47.86	40.27	56.32	46.32	654.77	207.06	-22.72	-14.22
16.00	L	32.50	29.50	42.17	29.85	60.00	50.00	1000.00	316.23	-27.50	-20.50
0.23	N	49.40	45.40	295.12	186.21	62.51	52.51	1334.70	422.07	-13.11	-7.11
0.48	N	33.30	31.70	46.24	38.46	56.26	46.26	650.04	205.56	-22.96	-14.56
16.00	N	32.40	29.40	41.69	29.51	60.00	50.00	1000.00	316.23	-27.60	-20.60

Test Engineer :

Kenny Chuang

5.4.2. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION

- All emissions not reported here are more than 10 dB below the prescribed limit.
- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 25
- Relative Humidity : 52% RH
- Test Mode : LCD only mode, 1024x768, 60Hz, 48K
- Test Date : Jul. 10, 1999

The Conducted Emission test was passed at <u>LINE 0.23 MHz / 49.10 dBuV</u>.

Frequency	Line	Meter Reading				Limits				Margin	
	or	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.
(MHz)	Neutral	(dBuV)	(dBuV)	(uV)	(uV)	(dBuV)	(dBuV)	(uV)	(uV)	(dB)	(dB)
0.23	L	49.10	46.10	285.10	201.84	62.48	52.48	1330.04	420.60	-13.38	-6.38
0.49	L	32.60	30.80	42.66	34.67	56.24	46.24	648.84	205.18	-23.64	-15.44
19.80	L	37.80	32.30	77.62	41.21	60.00	50.00	1000.00	316.23	-22.20	-17.70
0.23	N	49.60	45.40	302.00	186.21	62.44	52.44	1323.86	418.64	-12.84	-7.04
0.49	N	33.40	31.80	46.77	38.90	56.22	46.22	647.44	204.74	-22.82	-14.42
19.79	N	37.50	32.00	74.99	39.81	60.00	50.00	1000.00	316.23	-22.50	-18.00

Test Engineer :

Kenny Chuang

5.5. PHOTOGRAPHS OF CONDUCTED POWERLINE TEST CONFIGURATION

- The photographs show the configuration that generates the maximum emission.
- Test Mode : CRT only mode

VGA mode

FRONT VIEW

REAR VIEW

SIDE VIEW

5.5.1. PHOTOGRAPHS OF CONDUCTED POWERLINE TEST CONFIGURATION

- The photographs show the configuration that generates the maximum emission.
- Test Mode : LCD only mode

VGA mode

FRONT VIEW

REAR VIEW

SIDE VIEW

6. TEST OF RADIATED EMISSION

Radiated emissions from 30 MHz to 2000 MHz were measured with a bandwidth of 120 KHz according to the methods defines in ANSI C63.4-1992. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in Figure 6-3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1. MAJOR MEASURING INSTRUMENTS

- Amplifier (HP 87405A)

Attenuation	0 dB
RF Gain	20 dB
Signal Input	10 MHz to 3 GHz

- Spectrum Analyzer (HP 8594A)

Attenuation	0 dB
Start Frequency	30 MHz
Stop Frequency	2000 MHz
Resolution Bandwidth	1 MHz
Video Bandwidth	1 MHz
Signal Input	9 KHz to 2.9 GHz

6.2. TEST PROCEDURES

a. The EUT was placed on a rotatable table top 0.8 meter above ground.

b. The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.

c. The table was rotated 360 degrees to determine the position of the highest radiation.

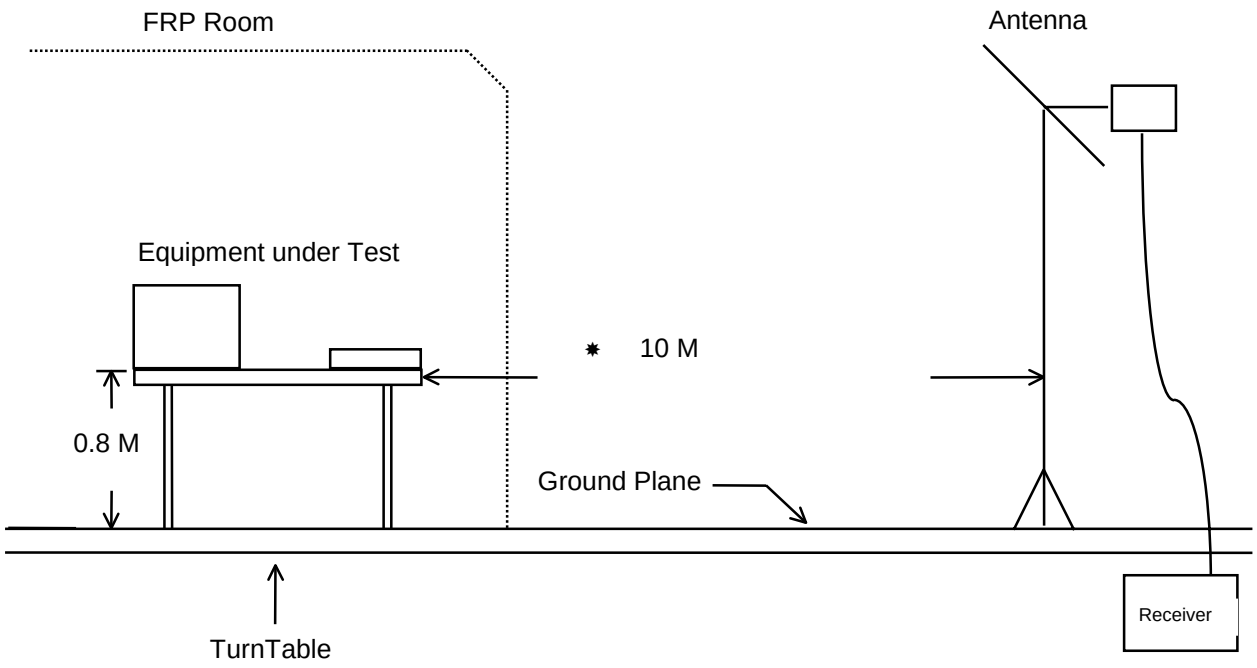
d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.

e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.

f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 6 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported otherwise the emissions which do not have 6 dB margin will be repeated one by one using the quasi-peak method and reported.

6.3. TYPICAL TEST SETUP LAYOUT OF RADIATED EMISSION



6.4. TEST RESULT OF RADIATED EMISSION

- Equipment meets the technical specifications of CISPR PUB.22
- Frequency Range of Test : from 30 MHz to 2000 MHz
- Test Distance : 10 M
- Temperature : 29
- Relative Humidity : 71 % RH
- Test Mode : CRT only mode, 1600x1200, 85Hz, 106K
- Test Date : Jul. 09, 1999

- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading = Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

Vertical 68.65 MHz / 25.90 dBuV

Antenna Height 1.0 Meter , Turntable Degree 56°

Frequency	Polarity	Antenna Factor	Cable Loss	Reading	Limits		Emission	Level	Margin
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)
45.56	V	10.47	0.78	11.51	30.00	32	22.76	13.74	-7.24
68.65	V	5.56	0.90	19.44	30.00	32	25.90	19.72	-4.10
184.07	V	9.15	1.54	12.54	30.00	32	23.23	14.50	-6.77
45.56	H	10.47	0.78	14.01	30.00	32	25.26	18.32	-4.74
549.60	H	19.74	2.40	8.15	37.00	71	30.29	32.70	-6.71
640.00	H	19.88	2.88	7.10	37.00	71	29.86	31.12	-7.14

Test Engineer :

Terry Chang

6.4.1. TEST RESULT OF RADIATED EMISSION

- Equipment meets the technical specifications of CISPR PUB.22
- Frequency Range of Test : from 30 MHz to 2000 MHz
- Test Distance : 10 M
- Temperature : 29
- Relative Humidity : 71 % RH
- Test Mode : CRT only mode, 1280x1024, 100Hz, 109K
- Test Date : Jul. 09, 1999

- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading = Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

Vertical 229.11 MHz / 24.82dBuV

Antenna Height 1.0 Meter , Turntable Degree 119°

Frequency	Polarity	Antenna Factor	Cable Loss	Reading	Limits		Emission	Level	Margin
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)
38.55	V	14.38	0.70	7.70	30.00	32	22.78	13.77	-7.22
57.19	V	6.23	0.88	16.72	30.00	32	23.83	15.54	-6.17
153.63	V	10.51	1.33	11.92	30.00	32	23.76	15.42	-6.24
229.11	V	11.25	1.61	11.96	30.00	32	24.82	17.42	-5.18
153.63	H	10.51	1.33	10.92	30.00	32	22.76	13.74	-7.24
228.80	H	11.25	1.61	9.86	30.00	32	22.72	13.68	-7.28

Test Engineer :

Terry Chang

6.4.2. TEST RESULT OF RADIATED EMISSION

- Equipment meets the technical specifications of CISPR PUB.22
- Frequency Range of Test : from 30 MHz to 2000 MHz
- Test Distance : 10 M
- Temperature : 29
- Relative Humidity : 71 % RH
- Test Mode : LCD out only mode, 1024x768, 60Hz, 48K
- Test Date : Jul. 09, 1999

- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading = Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

Vertical 84.55MHz / 25.72 dBuV

Antenna Height 1.0 Meter , Turntable Degree 217°

Frequency	Polarity	Antenna Factor	Cable Loss	Reading	Limits		Emission	Level	Margin
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)
45.39	V	10.47	0.78	13.41	30.00	32	24.66	17.10	-5.34
84.55	V	8.27	0.98	16.47	30.00	32	25.72	19.32	-4.28
196.04	V	8.88	1.48	13.28	30.00	32	23.64	15.21	-6.36
207.20	V	9.44	1.51	13.72	30.00	32	24.67	17.12	-5.33
213.60	V	9.93	1.60	13.83	30.00	32	25.36	18.54	-4.64
227.20	V	11.09	1.63	10.95	30.00	32	23.67	15.26	-6.33

Test Engineer :

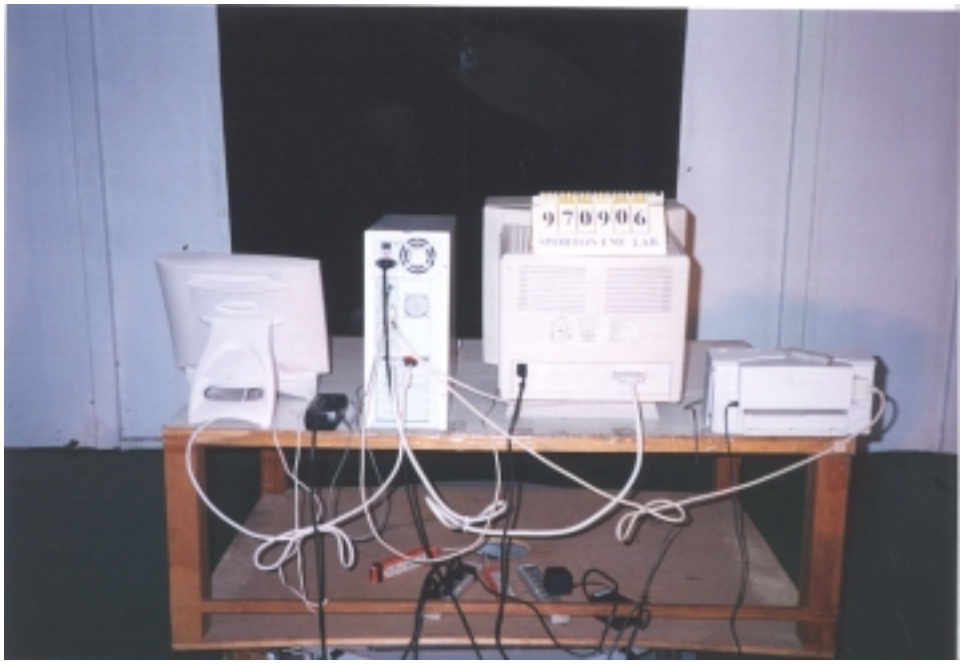
Terry Chang

6.5. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION

- The photographs show the configuration that generates the maximum emission.
- Test Mode : CRT only mode

FRONT VIEW

REAR VIEW

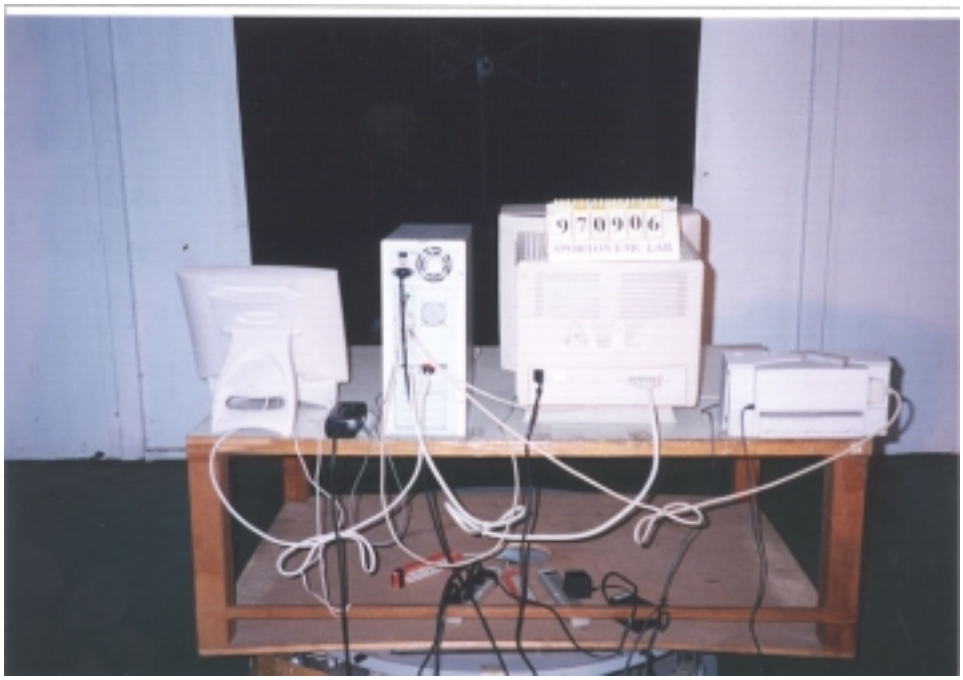


6.5.1. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION

- The photographs show the configuration that generates the maximum emission.
- Test Mode : LCD only mode

FRONT VIEW

REAR VIEW



7. ANTENNA FACTOR AND CABLE LOSS

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	17.9	0.6
35	16.1	0.7
40	14.0	0.7
45	10.5	0.8
50	7.9	0.7
55	6.7	0.8
60	5.5	1.0
65	5.5	0.9
70	5.6	0.9
75	6.5	1.0
80	7.5	0.9
85	8.5	1.0
90	9.4	1.0
95	10.4	1.1
100	11.5	1.1
110	12.1	1.2
120	12.6	1.2
130	12.0	1.3
140	11.6	1.3
150	10.5	1.3
160	10.5	1.4
170	9.8	1.4
180	9.2	1.5
190	9.0	1.6
200	8.8	1.4
220	10.5	1.7
240	12.2	1.5
260	13.1	1.8
280	13.2	1.8
300	13.4	1.9
320	13.4	1.9
340	13.4	2.0
360	13.9	2.2
380	14.9	2.1
400	15.6	2.1
450	16.4	2.3
500	16.6	2.5
550	19.7	2.4
600	19.3	2.8
650	20.0	2.9
700	19.5	2.9
750	18.5	2.7
800	17.8	3.5
850	18.3	3.3
900	20.5	3.2
950	21.4	4.5
1000	21.2	3.5
2000	31.57	6.2

8. LIST OF MEASURING INSTRUMENTS USED

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration	Remark
EMC Receiver (site 2)	HP	8591EM	3710A01187	9 KHz - 18 GHz	Sep. 15, 1998	Conduction
LISN (EUT) (site 2)	Telemeter	NNB-2/16Z	98009	50 ohm / 50 uH	Jan. 21, 1999	Conduction
LISN (Support Unit) (site 2)	EMCO	3810/2NM	9703-1839	50 ohm / 50 uH	Jul. 05, 1999	Conduction
Amplifier (Site 5)	HP	87405A	3207A01437	10MHz –3.0GHz	Jun. 25, 1999	Radiation
Spectrum Analyzer (Site 5)	HP	8594A	3051A00172	9KHz –2.9GHz	Apr. 16, 1999	Radiation
Bilog Antenna (Site 5)	CHASE	CBL6112A	2287	30MHz -2GHz	Jan. 07, 1999	Radiation
Half-wave dipole antenna (Site 5)	EMCO	3121C	9705-1285	28 M - 1GHz	May 18, 1999	Radiation
Turn Table (site 5)	EMCO	2080	9711-2021	0 ~ 360 degree	N/A	Radiation
Antenna Mast (site 5)	EMCO	2075	9711-2115	1 m- 4 m	N/A	Radiation

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