

FCC TEST REPORT

for

47 CFR, Part 2, Part 15 Subpart B and CISPR PUB. 22

Equipment : Disk Array

Model No. : INDY 2230

FCC ID : NKF-INDY2230

Filing Type : Certification

Applicant : **MaxTronic International Co., Ltd.**
4F, No. 529, Chung Cheng Rd., Hsin Tien City, Taipei Hsien,
Taiwan, R.O.C.

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SPORTON International Inc.

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

Table of Contents

History of this test report	ii
CERTIFICATE OF COMPLIANCE.....	1
1. General Description of Equipment under Test.....	2
1.1 Applicant.....	2
1.2 Manufacturer	2
1.3 Basic Description of Equipment under Test	2
1.4 Feature of Equipment under Test	3
2. Test Configuration of Equipment under Test	4
2.1 Test Manner	4
2.2 Description of Test System	5
2.3 Connection Diagram of Test System	7
3. Test Software	8
4. General Information of Test.....	9
4.1 Test Facility	9
4.2 Test Voltage	9
4.3 Standard for Methods of Measurement.....	9
4.4 Test in Compliance with	9
4.5 Frequency Range Investigated	9
4.6 Test Distance	9
5. Test of Conducted Powerline	10
5.1 Major Measuring Instruments.....	10
5.2 Test Procedures.....	11
5.3 Typical Test Setup Layout of Conducted Powerline	12
5.4 Test Result of AC Powerline Conducted Emission	13
6. Test of Radiated Emission.....	15
6.1 Major Measuring Instruments.....	15
6.2 Test Procedures.....	16
6.3 Typical Test Setup Layout of Radiated Emission.....	17
6.4 Test Result of Radiated Emission	18
7. EMI Suppression Component List.....	23
8. Antenna Factor & Cable Loss	23
9. List of Measuring Equipment Used	25
10. Uncertainty of Test Site	26

History of this test report

Original Report Issue Date: Mar. 27, 2003

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 2, Part 15 Subpart B and CISPR PUB. 22

Equipment : Disk Array

Model No. : INDY 2230

FCC ID : NKF-INDY2230

Applicant : **MaxTronic International Co., Ltd.**
4F, No. 529, Chung Cheng Rd., Hsin Tien City, Taipei Hsien,
Taiwan, R.O.C.

I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** and the energy emitted by this equipment was ***passed*** both radiated and conducted emission limits. Testing was carried out on **Mar. 14, 2003** at **SPORTON International Inc. LAB.**


K. J. Lin
Manager

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

MaxTronic International Co., Ltd.
4F, No. 529, Chung Cheng Rd., Hsin Tien City,
Taipei Hsien, Taiwan, R.O.C.

1.2 Manufacturer

Same as 1.1.

1.3 Basic Description of Equipment under Test

Equipment	: Disk Array
Model No.	: INDY 2230
FCC ID	: NKF-INDY2230
Trade Name	: Arena
SCSI Cable x 2	: Shielded, 0.8m
RS232 Cable	: Shielded, 1.8m
Power Supply Type	: Switching
AC Power Input	: Non-Shielded, 1.8m, 3 pin

1.4 Feature of Equipment under Test

Interface	Host Bus: Ultra 160 LVD SCSI Disk Bus: Ultra ATA-100
Drives	Hot Swap, User Replaceable Up to Six 3.5" drives (1" height)
Maximum Fault Tolerant Capacity	>1.5 TB
Drive MTBF	>1000000 hrs
Host Requirement	Host Independent
Operating Systems	O/S Independent and Transparent
Data Rebuild	Automatic Data Regeneration
LCD Display Panel	2 x 16 Characters
Cooling Fans	7.5cm x 2 Turbin Fans 8cm x 2 DC Fans
Power Supply Capacity	Dual 250W Independent Power Supplies
AC Input Voltage	115 / 230V (+/-10%), 60/50Hz
Environmental	Relative Humidity: 0% to 85% Non-condensing Temperature Operating: 5C ~ 40C Temperature Storage: -25C ~ 60C
Dimensions	483 mm (H) x 465 mm (W) x 88 mm(D)
Weight	12 kgs (W/O Disk Drive)
Power	SH-250 SRD-P / 250W
HDD	Quantum / Fireball™EX
HDD	Seagate / ST36422A / 6.4GB
HDD	Seagate / ST313620A / 13.6GB
HDD	Seagate / ST36422A / 6.4GB

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 complete test system included HP PC, HITACHI Monitor, Genuine PS/2 Keyboard, LOGITECH PS/2 Mouse, HP Printer, ACEEX Modem, Arena Disk Array and EUT for EMI test.
- c. For Conduction test, the following test modes were performed:
 - Mode 1. Two Powers On
 - Mode 2. Only upper power on
 - Mode 3. Only lower power oncause "mode 1 & mode 2" generated the worst test result, they were reported as final data
- d. For Radiation test, the following test modes were performed:
 - Mode 1. Two Powers On
 - Mode 2. Only one power oncause "mode 1" generated the worst test result, it was reported as final data
- e. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 1000MHz.

2.2 Description of Test System

Support Unit 1. -- Personal Computer (HP)

FCC ID	: N/A
Model No.	: DTPC-22
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0037
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (HITACHI)

FCC ID	: N/A
Model No.	: CM753ET
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0180
Data Cable	: Shielded, 1.15m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Keyboard (GENUINE)

FCC ID	: N/A
Model No.	: K288
Serial No.	: SP0054
Data Cable	: Shielded, 360 degree via metal backshells, 1.3m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 4. -- Printer (HP)

FCC ID : B94C2642X
Model No. : DeskJet 400
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0048
Data Cable : Braided-Shielded, 360 degree via metal backshells, 1.35m

Support Unit 5. -- PS/2 Mouse (LOGITECH)

FCC ID : DZL211029
Model No. : M-S34
Serial No. : SP0108
Data Cable : Shielded, 1.7m

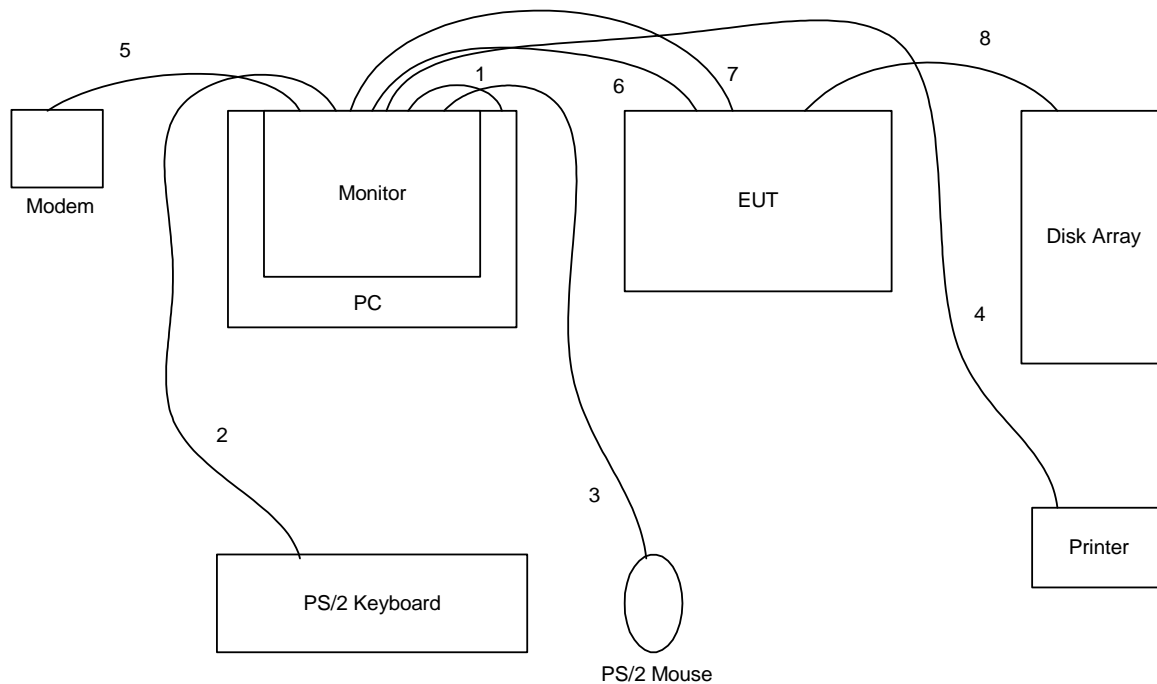
Support Unit 6. -- Modem (ACEEX)

FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0015
Data Cable : Shielded, 360 degree via metal backshells, 1.15m

Support Unit 7. -- Disk Array (Arena)

FCC ID : NKF-ARENAEXIII
Model No. : ARENA EXIII
Serial No. : SP0126

2.3 Connection Diagram of Test System



1. The I/O cable is connected from PC to the support unit 2.
2. The I/O cable is connected from PC to the support unit 3.
3. The I/O cable is connected from PC to the support unit 5.
4. The I/O cable is connected from PC to the support unit 4.
5. The I/O cable is connected from PC to the support unit 6.
6. The SCSI cable is connected from PC to the EUT.
7. The RS232 cable is connected from PC to the EUT.
8. The SCSI cable is connected from EUT to the support unit 7.

3. Test Software

An executive programs, EMITEST.EXE under WIN 2000, which generate a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the hard 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 c to f.

At the same time, "WINTHRAX" was executed to read and write data from Disk Array to EUT.

4. General Information of Test

4.1 Test Facility

Test Site Location : No. 30-2, Lin 6, Diing-Fwu Tsuen, Lin-Kou-Hsiang,
Taipei Hsien, Taiwan, R.O.C.
TEL : 886-2-2601-1640
FAX : 886-2-2601-1695
Test Site No. : CO01-LK, OS06-LK

4.2 Test Voltage

115V/ 60Hz

4.3 Standard for Methods of Measurement

ANSI C63.4-1992

4.4 Test in Compliance with

CISPR PUB. 22 and FCC Part 15, Subpart B Class B

4.5 Frequency Range Investigated

- a. Conduction: from 150 kHz to 30 MHz
- b. Radiation : from 30 MHz to 1000 MHz

4.6 Test Distance

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

5. Test of Conducted Powerline

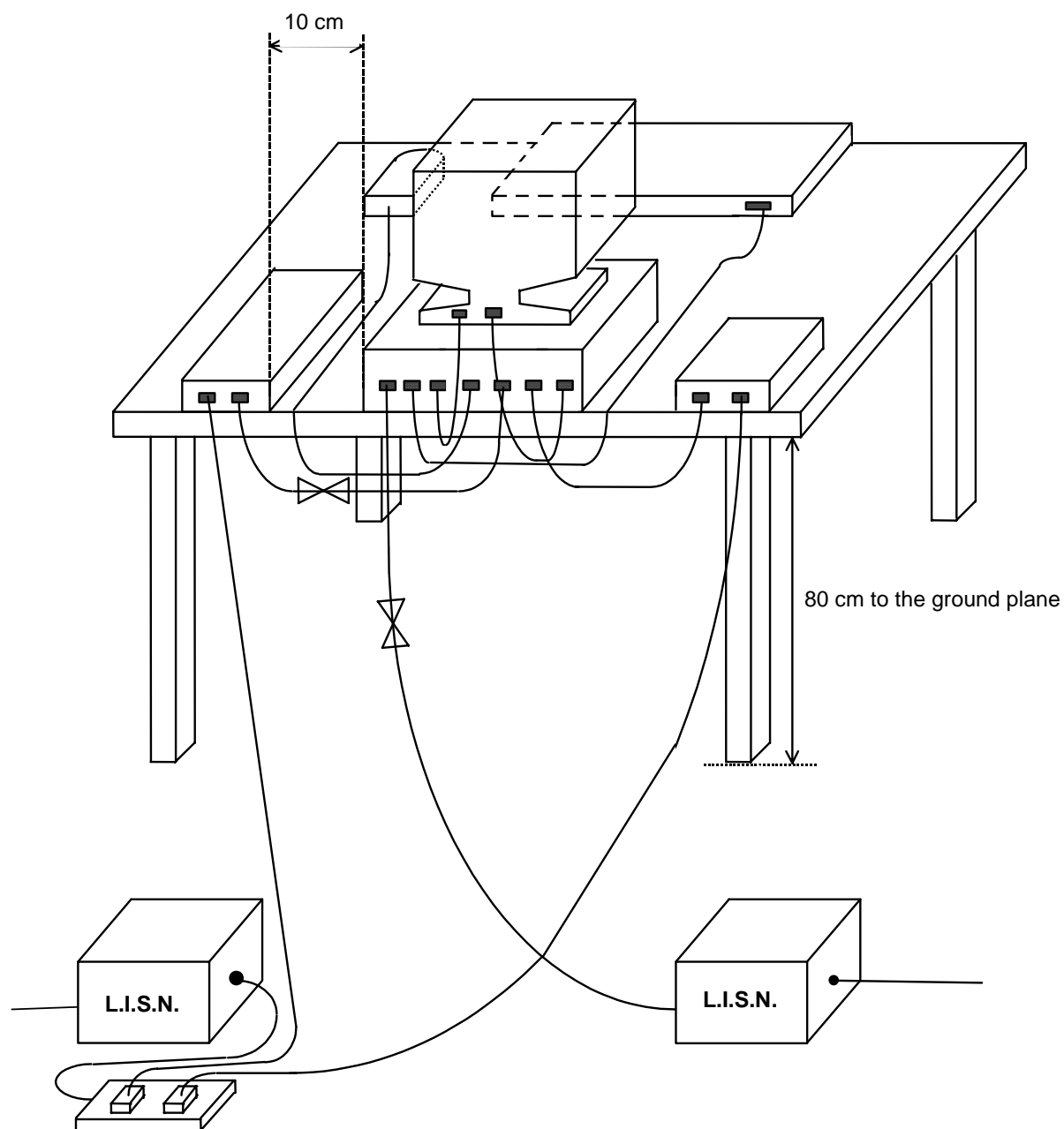
Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz and return leads of the EUT according to the methods defined in ANSI C63.4-1992 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 5.3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

5.1 Major Measuring Instruments

- EMC Analyzer (HP 8591EM)
 - Attenuation 10 dB
 - Start Frequency 0.15 MHz
 - Stop Frequency 30 MHz
 - IF Bandwidth 9KHz

5.2 Test Procedures

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room 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.




5.4 Test Result of AC Powerline Conducted Emission

5.4.1 Test Mode: Mode 1

- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 21°C
- Relative Humidity : 66%
- Test Date : Mar. 14, 2003
- All emissions not reported here are more than 10 dB below the prescribed limit.

The test was passed at the minimum margin that marked under gray area in the following table

Frequency (MHz)	Line or Neutral	Meter Reading		Limits		Margin	
		Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dB)	A.V. (dB)
0.193	N	48.70	44.80	63.90	53.90	-15.20	-9.10
0.387	N	34.40	29.80	58.13	48.13	-23.73	-18.33
0.478	N	33.20	29.40	56.38	46.38	-23.18	-16.98
12.004	N	39.00	32.20	60.00	50.00	-21.00	-17.80
14.772	N	30.50	22.50	60.00	50.00	-29.50	-27.50
23.423	N	28.90	20.90	60.00	50.00	-31.10	-29.10
0.193	L	50.20	47.10	63.92	53.92	-13.72	-6.82
0.258	L	39.90	38.90	61.49	51.49	-21.59	-12.59
0.386	L	37.70	33.90	58.15	48.15	-20.45	-14.25
12.002	L	37.10	28.20	60.00	50.00	-22.90	-21.80
15.027	L	29.70	22.60	60.00	50.00	-30.30	-27.40
23.198	L	28.20	19.50	60.00	50.00	-31.80	-30.50

Test Engineer : 

Neil Huang

5.4.2 Test Mode: Mode 2

- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 21°C
- Relative Humidity : 66%
- Test Date : Mar. 14, 2003
- All emissions not reported here are more than 10 dB below the prescribed limit.

The test was passed at the minimum margin that marked under gray area in the following table

Frequency (MHz)	Line or Neutral	Meter Reading		Limits		Margin	
		Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dB)	A.V. (dB)
0.194	L	49.70	47.20	63.88	53.88	-14.18	-6.68
0.323	L	36.90	35.80	59.64	49.64	-22.74	-13.84
0.386	L	38.70	35.10	58.15	48.15	-19.45	-13.05
12.003	L	34.90	28.60	60.00	50.00	-25.10	-21.40
14.789	L	31.10	20.50	60.00	50.00	-28.90	-29.50
23.579	L	28.60	20.30	60.00	50.00	-31.40	-29.70
0.193	N	49.60	48.30	63.89	53.89	-14.29	-5.59
0.322	N	36.10	34.90	59.65	49.65	-23.55	-14.75
0.387	N	34.00	32.40	58.13	48.13	-24.13	-15.73
12.240	N	34.50	19.60	60.00	50.00	-25.50	-30.40
14.800	N	30.50	22.20	60.00	50.00	-29.50	-27.80
23.124	N	28.90	21.50	60.00	50.00	-31.10	-28.50

Test Engineer :



Neil Huang

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 1,000 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 section 6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1 Major Measuring Instruments

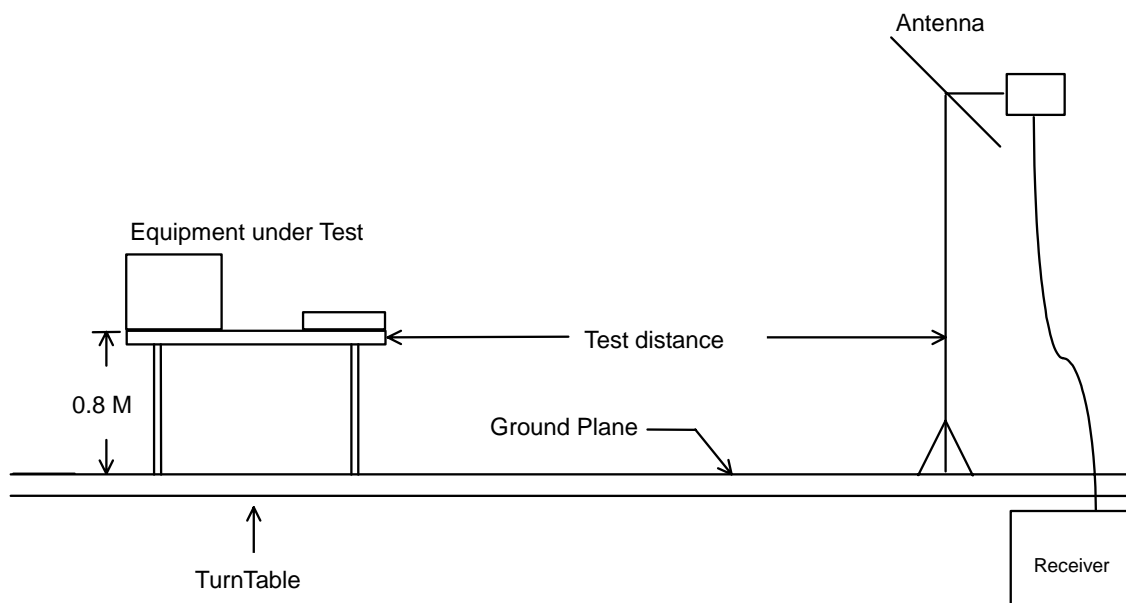
- Spectrum Analyzer (R&S FSP7)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 9 KHz to 7 GHz

- Amplifier (HP 8447D)
 - RF Gain 25 dB
 - Signal Input 100KHz -1.3GHz

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 3 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 3 dB margin will be repeated one by one using the quasi-peak method and reported.

6.3 Typical Test Setup Layout of Radiated Emission

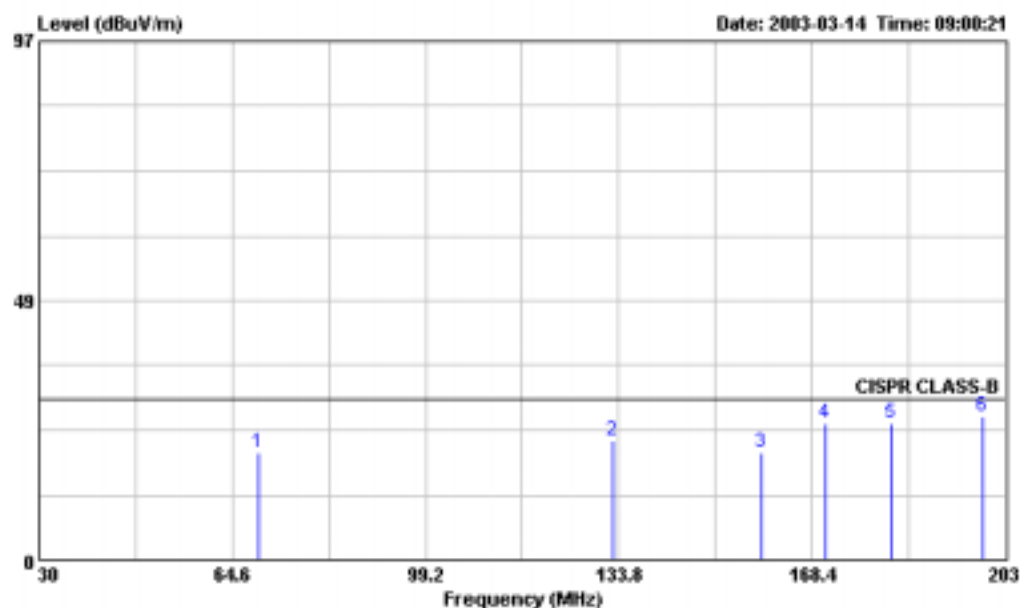


6.4 Test Result of Radiated Emission

6.4.1 Test Mode: Mode 1

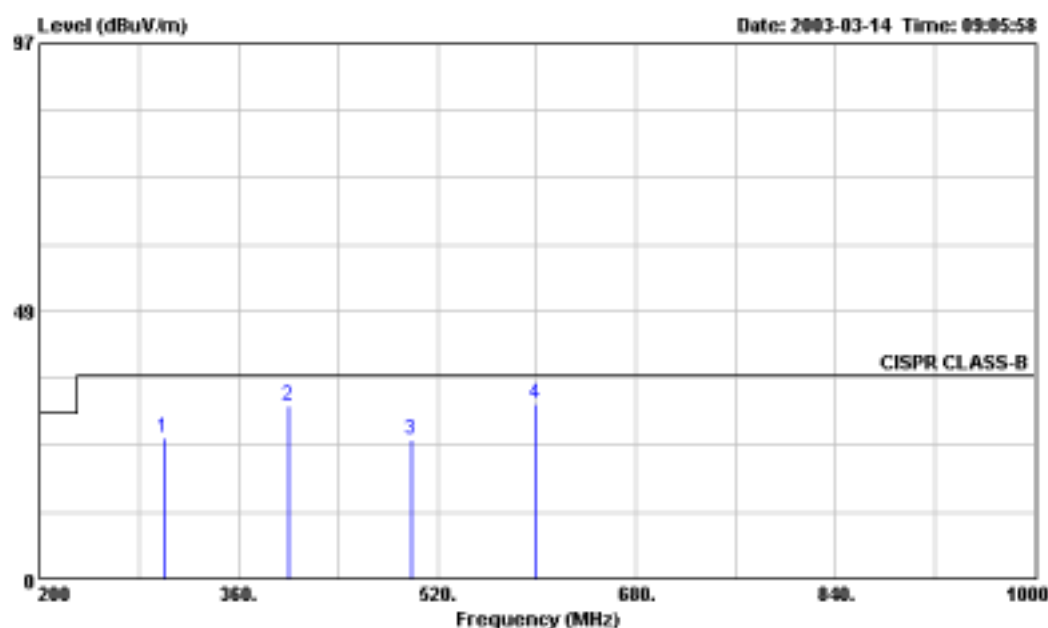
- Frequency Range of Test : from 30 MHz to 1000 MHz
- Test Distance : 10 M
- Temperature : 21°C
- Relative Humidity : 63 %
- Test Date : Mar. 12, 2003
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The test was passed at the minimum margin that marked by the frame in the following test record



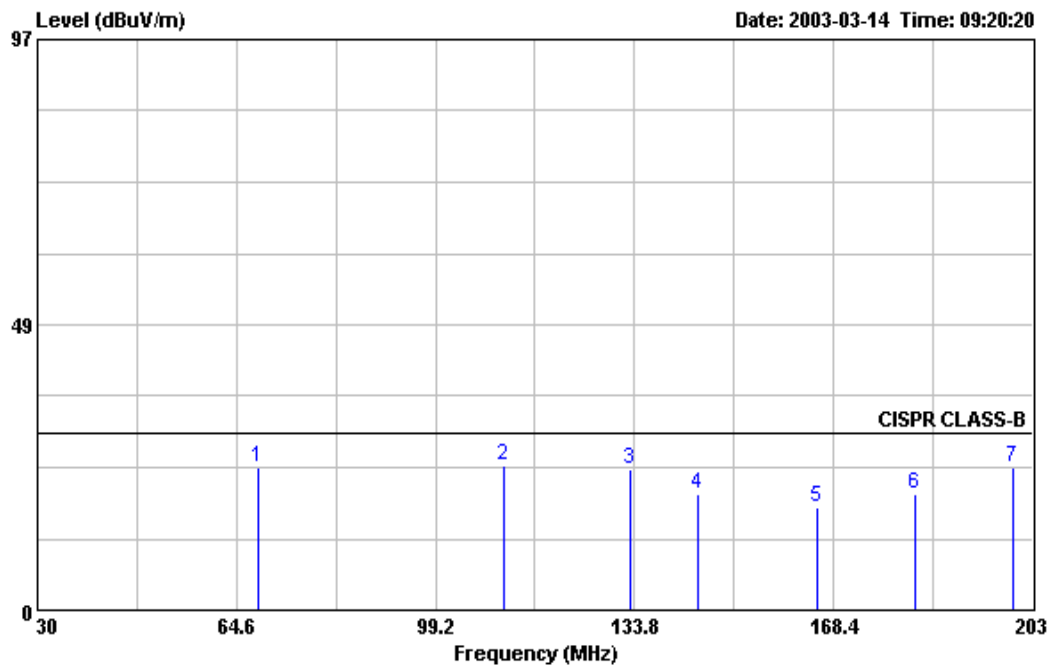
Site : OS06-LK
 Condition : CISPR CLASS-B 10m OS6CBL6111C2722-9201 HORIZONTAL 400cm 360deg
 EUT : RAID平納式
 POWER : 110VAC
 MEMO :

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB/m	dB	dB	cm	deg	
1	69.160	20.10	-9.90	30.00	41.34	-21.24	5.18	1.14	27.56	---	---	Peak
2	132.770	22.45	-7.55	30.00	37.38	-14.93	11.11	1.33	27.37	---	---	Peak
3	159.450	20.16	-9.84	30.00	36.19	-16.03	9.76	1.47	27.26	---	---	Peak
4	170.730	25.62	-4.38	30.00	42.60	-16.98	8.74	1.50	27.22	---	---	Peak
5	182.700	25.57	-4.43	30.00	43.14	-17.57	8.07	1.53	27.17	---	---	Peak
6	199.120	26.68	-3.32	30.00	44.14	-17.46	8.08	1.57	27.11	400	177	OT



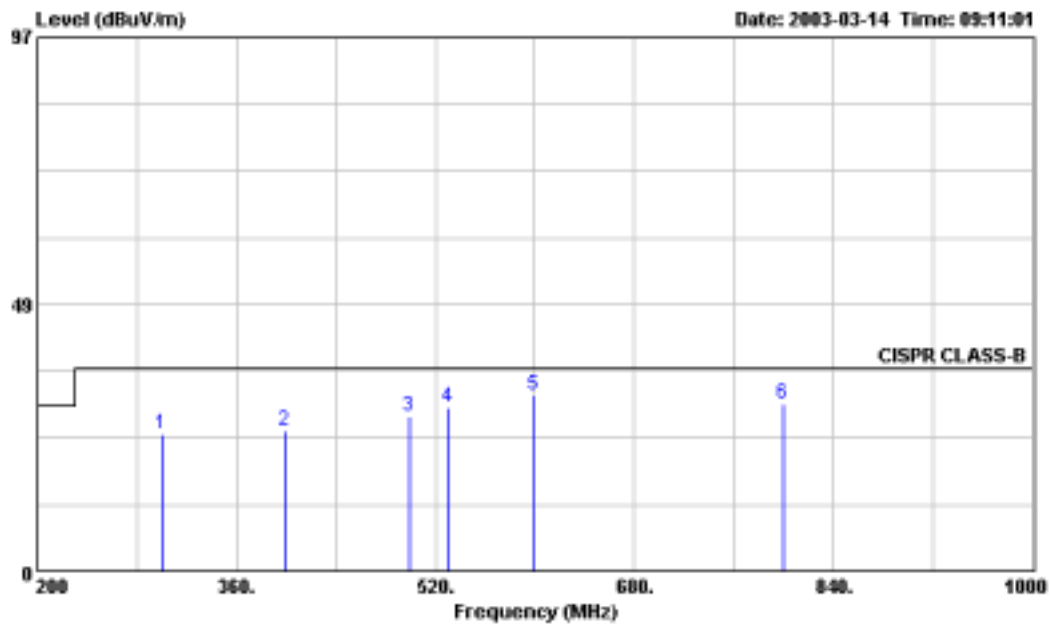
Site : OS06-LK
 Condition : CISPR CLASS-B 10m OS6CBL6111C2722-9201 HORIZONTAL 400cm 360deg
 EUT : RAID 平躺式
 POWER : 110VAC
 MEMO :

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg	
1	299.800	25.40	-11.60	37.00	37.30	-11.90	13.00	2.00	26.90	---	Peak
2	399.800	31.30	-5.70	37.00	40.66	-9.36	15.80	2.33	27.49	---	Peak
3	499.000	25.18	-11.82	37.00	32.77	-7.59	17.79	2.61	27.99	---	Peak
4 @	599.600	31.68	-5.32	37.00	37.69	-6.01	19.50	2.89	28.40	---	Peak



Site : OS06-LK
 Condition : CISPR CLASS-B 10m OS6CBL6111C2722-9201 VERTICAL 400cm 360deg
 EUT : RAID 平躺式
 POWER : 110VAC
 MEMO :

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg	
1	68.300	24.32	-5.68	30.00	45.73	-21.41	5.05	1.10	27.56	---	Peak
2	111.050	24.48	-5.52	30.00	40.24	-15.76	10.51	1.19	27.46	---	Peak
3	133.110	23.94	-6.06	30.00	38.87	-14.93	11.11	1.33	27.37	---	Peak
4	144.740	19.69	-10.31	30.00	34.83	-15.14	10.78	1.40	27.32	---	Peak
5	165.514	17.43	-12.57	30.00	34.02	-16.59	9.16	1.49	27.24	---	Peak
6	182.700	19.84	-10.16	30.00	37.41	-17.57	8.07	1.53	27.17	---	Peak
7	199.460	24.09	-5.91	30.00	41.61	-17.52	8.02	1.57	27.11	---	Peak



Site : OS06-LK
 Condition : CISPR CLASS-B 10m OS6CBL6111C2722-9201 VERTICAL 400cm 360deg
 EUT : RAID 平躺式
 POWER : 110VAC
 MEMO :

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB/m	dB	dB	cm	deg	
1	299.800	24.80	-12.20	37.00	36.70	-11.90	13.00	2.00	26.90	---	---	Peak
2	399.000	25.49	-11.51	37.00	34.88	-9.39	15.77	2.33	27.49	---	---	Peak
3	499.000	28.08	-8.92	37.00	35.67	-7.59	17.79	2.61	27.99	---	---	Peak
4	531.000	29.87	-7.13	37.00	36.70	-6.83	18.57	2.72	28.12	---	---	Peak
5 @	599.400	31.88	-5.12	37.00	37.89	-6.01	19.50	2.89	28.40	---	---	Peak
6	799.800	30.49	-6.51	37.00	33.17	-2.68	22.10	3.42	28.20	---	---	Peak

Test Engineer :

Jason

Jason Chang

7. EMI Suppression Component List

1. To add cores LF-65 on two SCSI cables.
(As the Internal photo No.9)
2. To add core LF-65 on RS-232 cable.
(As the Internal photo No.36)

8. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	18.50	0.67
35	15.73	0.71
40	13.15	0.76
45	10.35	0.80
50	7.80	0.84
55	5.93	0.88
60	4.85	0.91
65	4.75	0.96
70	5.30	1.19
75	6.15	1.12
80	7.02	1.05
85	7.68	1.05
90	8.30	1.08
95	9.00	1.11
100	9.53	1.13
110	10.40	1.18
120	10.95	1.24
130	11.13	1.31
140	10.94	1.38
150	10.43	1.43
160	9.68	1.48
170	8.83	1.50
180	8.15	1.53
190	8.13	1.55
200	8.03	1.57
220	8.55	1.66
240	10.82	1.75
260	12.73	1.83
280	12.43	1.92
300	13.00	2.00
320	13.40	2.07
340	14.10	2.14
360	14.70	2.20
380	15.20	2.27
400	15.80	2.33
450	17.00	2.46
500	17.80	2.61
550	19.75	2.78
600	19.50	2.89
650	20.35	3.06
700	21.10	3.16
750	22.30	3.51
800	22.10	3.42
850	23.40	3.49
900	23.20	3.64
950	24.96	3.69
1000	25.10	3.91

9. List of Measuring Equipment Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Analyzer	HP	8591EM	3710A01187	9KHz ~ 1.8GHz	Sep. 23, 2002	Conduction (CO01-LK)
LISN	Telemeter	NNB-2/16Z	98009	9KHz ~ 30MHz	Dec.17, 2002	Conduction (CO01-LK)
LISN	Telemeter	NNB-2/16Z	98087	9KHz ~ 30MHz	Dec. 17, 2002	Conduction (CO01-LK)
Spectrum Analyzer	R&S	FSP7	100642	9KHz ~ 7GHz	May 27, 2002	Radiation (OS06-LK)
Amplifier	HP	8447D	2944A08290	100KHz -1.3GHz	Jan. 14, 2003	Radiation (OS06-LK)
Bilog Antenna	SCHAFFNER	CBL6111C	2722	30MHz -1GHz	Jun. 14, 2002	Radiation (OS06-LK)
Half-wave dipole antenna	R&S	HZ12 HZ13	83924403 83924503	30MHz - 1GHz	Sep. 23, 2002	Radiation (OS06-LK)
Turn Table	EMCO	1670	N/A	0 ~ 360 degree	N/A	Radiation (OS06-LK)
Antenna Mast	EMCO	2070-2	2263	1 m- 4 m	N/A	Radiation (OS06-LK)

* Calibration Interval of instruments listed above is one year.

10. Uncertainty of Test Site

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2.5
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	0.2
combined standard uncertainty Ue(y)	normal	±1.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.4

$$U = \{(0.3/2)^2 + (2.5^2 + 1.5^2 + 0.2^2)/3 + (0.2)^2/2\}^{1/2} = 1.7$$

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m	10m
Antenna factor calibration	normal(k=2)	±1.6	±1.6
cable loss calibration	normal(k=2)	±0.3	±0.3
RCV/SPA specification	rectangular	±2.5	±2.5
Antenna Directivity	rectangular	±3	±0.5
Antenna Factor V.S. Height	rectangular	±2	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25	±0.25
site imperfection	rectangular	±2	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	±0.54	±0.54
combined standard uncertainty Ue(y)	normal	±2.9	±2.4
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.8	±4.8

$$U = \{(1.6/2)^2 + (0.3/2)^2 + (3^2 + 0.5^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}^{1/2} = 2.4 \text{ for 10m test distance}$$

$$U = \{(1.6/2)^2 + (0.3/2)^2 + (3^2 + 3^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}^{1/2} = 2.9 \text{ for 3m test distance}$$