

CE EMC TEST REPORT

according to

**EN 301 489-1 V1.4.1 (2002-08) and
EN 301 489-17 V1.2.1 (2002-08)**

Equipment : WIRELESS 11B USB ADAPTER

Model No. : UB11B, MS-6823

Applicant : **Micro-Star Int'l Co., Ltd.**
No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
- This test report is only applicable to European Community.

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.....	4
3. Test Software.....	7
4. General Information of Test.....	8
4.1 Test Facility.....	8
4.2 Test Voltage.....	8
4.3 Standard for Methods of Measurement.....	8
4.4 Test in Compliance with.....	8
4.5 Frequency Range Investigated.....	8
4.6 Test Distance.....	8
4.7 Summary of Test Results.....	9
5. Test of Conducted Powerline.....	10
5.1 Description of Major Test 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
5.5 Photographs of Conducted Powerline Test Configuration.....	15
6. Test of Radiated Emission.....	16
6.1 Description of Major Test Instruments.....	16
6.2 Test Procedures.....	17
6.3 Typical Test Setup Layout of Radiated Emission.....	18
6.4 Test Result of Radiated Emission.....	19
6.5 Photographs of Radiated Emission Test Configuration.....	23
7. Electrostatic Discharge Immunity Test (ESD).....	24
7.1 Test setup.....	24
7.2 Test Setup for Tests Performed in Laboratory.....	25
7.3 ESD Test Procedure.....	26
7.4 Test Severity Levels.....	27
7.5 Test Points.....	28
7.6 Photographs of Electrostatic Discharge Immunity Test.....	29
8. Radio Frequency Electromagnetic Field Immunity Test (RS).....	30
8.1 Test setup.....	30
8.2 Test Procedure.....	31
8.3 Test Severity Levels.....	31
8.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test.....	32
9. List of Measuring Equipment Used.....	33
10. Declaration of Conformity and the CE Mark.....	35
Appendix A. Photographs of EUT.....	A1 ~ A10

History of this test report

Original Report Issue Date: Aug. 25, 2003

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



CERTIFICATE OF COMPLIANCE

according to

**EN 301 489-1 V1.4.1 (2002-08) and
EN 301 489-17 V1.2.1 (2002-08)**

Equipment : WIRELESS 11B USB ADAPTER

Model No. : UB11B, MS-6823

Applicant : **Micro-Star Int'l Co., Ltd.**
No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan

I **HEREBY** CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 99/5/EC**. The equipment was **passed** the test performed according to **EN 301 489-1 V1.4.1 (2002-08) and EN 301 489-17 V1.2.1 (2002-08)**. The test was carried out on **Aug. 13, 2003** at **SPORTON International Inc. LAB**.

Alex Chen
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

Micro-Star Int'l Co., Ltd.
No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan

1.2 Manufacturer

1. Micro-Star Int'l Co., Ltd.
No. 488, Ban-Nan Rd., Jung-He City, Taipei Hsien, Taiwan
2. MSI COMPUTER (SHENZHEN) Co., Ltd.
Longma Information Technology Industrial Park, Shiyan, Tangtou Village, Shenzhen

1.3 Basic Description of Equipment under Test

Equipment : WIRELESS 11B USB ADAPTER
Model No. : UB11B, MS-6823
Trade Name : MSI
Power Supply Type : Form PC
AC Power Cord : N/A

1.4 Feature of Equipment under Test

Product Feature & Specification	
1. Host/Radio Interface	DSSS
2. Type of Modulation	DSSS (PBCC, CCK)
3. Number of Channels	13
4. Frequency Band	2.4 GHz
5. Carrier Frequency of each channel	2412MHz (5MHz)
6. Bandwidth of each channel	22MHz
7. Maximum Output Power to Antenna	16dBm
8. Antenna Type / Class and Gain	Chip Antenna, 2dBi
9. Function Type	Transceiver
10. Power Rating (DC/AC, Voltage)	DC 5V
11. Duty Cycle	44MHz
12. Basic function of product	WLAN 11B

2. Test Configuration of Equipment under Test

2.1 Test Manner

- a. During testing, the interface cables and equipment positions were varied according to European Standard EN 301 489-17.
- b. The complete test system included remote COMPAQ Notebook, HP PC, VIEWSONIC Monitor, LOGITECH PS/2 Keyboard, LOGITECH PS/2 Mouse, HP Printer, ACEEX Modem and EUT for EMI test.
- c. The complete test system included remote ASKEY AP, COMPAQ PC, VIEWSONIC Monitor, HP PS/2 Keyboard, LOGITECH PS/2 Mouse and EUT for EMS test.
- d. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 1000MHz.

2.2 Description of Test System

<EMI>

Support Unit 1. -- Personal Computer (HP) – for local workstation

FCC ID	: N/A
Model No.	: VECTRA VL420 DT
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0040
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC) – for local workstation

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0013
Data Cable	: Shielded, 360 degree via metal backshells, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Keyboard (LOGITECH) – for local workstation

FCC ID	: N/A
Model No.	: Y-SJ17
Serial No.	: SP0054
Data Cable	: Shielded, 360 degree via metal backshells, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 4. – PS/2 Mouse (LOGITECH) – for local workstation

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

Support Unit 5. -- Printer (HP) – for local workstation

FCC ID : B94C2642X
Model No. : DJ400
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0048
Data Cable : Shielded, 360 degree via metal backshells, 1.35m

Support Unit 6. -- Modem (ACEEX) – for local workstation

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. – Notebook (COMPAQ) – for remote workstation

FCC ID : N/A
Model No. : PRESARIO 1500
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0124
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

<EMS>

Support Unit 1. -- Personal Computer (COMPAQ) – for local workstation

FCC ID : N/A
Model No. : DeskPRO
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0040
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC) – for local workstation

FCC ID : N/A
Model No. : VCDTS21553-3J
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0034
Data Cable : Shielded, 1.7m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Keyboard (HP) – for local workstation

FCC ID : N/A
Model No. : SK-2502C
Serial No. : SP0054
Data Cable : Shielded, 1.8m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 4. -- PS/2 Mouse (LOGITECH) – for local workstation

FCC ID : N/A
Model No. : M-CAA43
Serial No. : SP0054
Data Cable : Shielded, 1.8m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 5. -- AP (ASKEY) – for remote workstation

FCC ID : H8N-RT211W
Model No. : RT211W
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0214

3. Test Software

<EMI>

An executive program, EMITEST.EXE under WIN XP, which generates 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, "Ping.exe" was executed to link with the remote workstation to receive and transmit data by wireless.

<EMS>

During testing, "Network Neighborhood" under WIN XP was executed to link with the remote workstation to receive and transmit data by wireless.

4. General Information of Test

4.1 Test Facility

<EMI>

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-318-0055

Test Site No. : CO01-HY, 10CH02-HY

<EMS>

Test Site Location : No. 52, Hwa Ya 1St Road, Hwa Ya Technology Park,
Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
TEL: 886-3-3273456
FAX: 886-3-3180055

4.2 Test Voltage

230V/50Hz

4.3 Standard for Methods of Measurement

EMI Test : European Standard EN 301 489-1 V.1.4.1 (2002-08)
: European Standard EN 301 489-17 V.1.2.1 (2002-08)
EMS Test : European Standard EN 301 489-1 V.1.4.1 (2002-08)
: European Standard EN 301 489-17 V.1.2.1 (2002-08)
(ESD: IEC 61000-4-2, RS: IEC 61000-4-3)

4.4 Test in Compliance with

EMI Test : European Standard EN 301 489-1 V.1.4.1 (2002-08)
: European Standard EN 301 489-17 V.1.2.1 (2002-08)
EMS Test : European Standard EN 301 489-1 V.1.4.1 (2002-08)
: European Standard EN 301 489-17 V.1.2.1 (2002-08)
(ESD: IEC 61000-4-2, RS: IEC 61000-4-3)

4.5 Frequency Range Investigated

- a. Conducted emission test: from 150 kHz to 30 MHz
- b. Radiated emission test: from 30 MHz to 1,000 MHz
- c. Radio frequency electromagnetic field immunity test: 80-1000 MHz, 1400-2000 MHz.

4.6 Test Distance

- a. The test distance of radiated emission test from antenna to EUT is 10 M.
- b. The test distance of radio frequency electromagnetic field immunity test from antenna to EUT is 3 M.



4.7 Summary of Test Results

4.7.1 Emission Tests

Measurement	Reference Clause(s)	Test	Reference standard
Radiated emission	8.2	Passed	EN 55022/A1:2000 class B
Conducted emission	8.3/8.4	Passed	EN 55022/A1:2000 class B

4.7.2 Immunity Tests

Measurement	Reference Clause(s)	Test	Reference standard
Electrostatic discharge	9.3	Passed	EN 61000-4-2:1995/A1:1998
RF electro-magnetic Field (80-1000MHz, 1400-2000MHz)	9.2	Passed	EN 61000-4-3:1996/A1:1998

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 European Standard EN 301 489-17. 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 producing maximum conducted emissions.

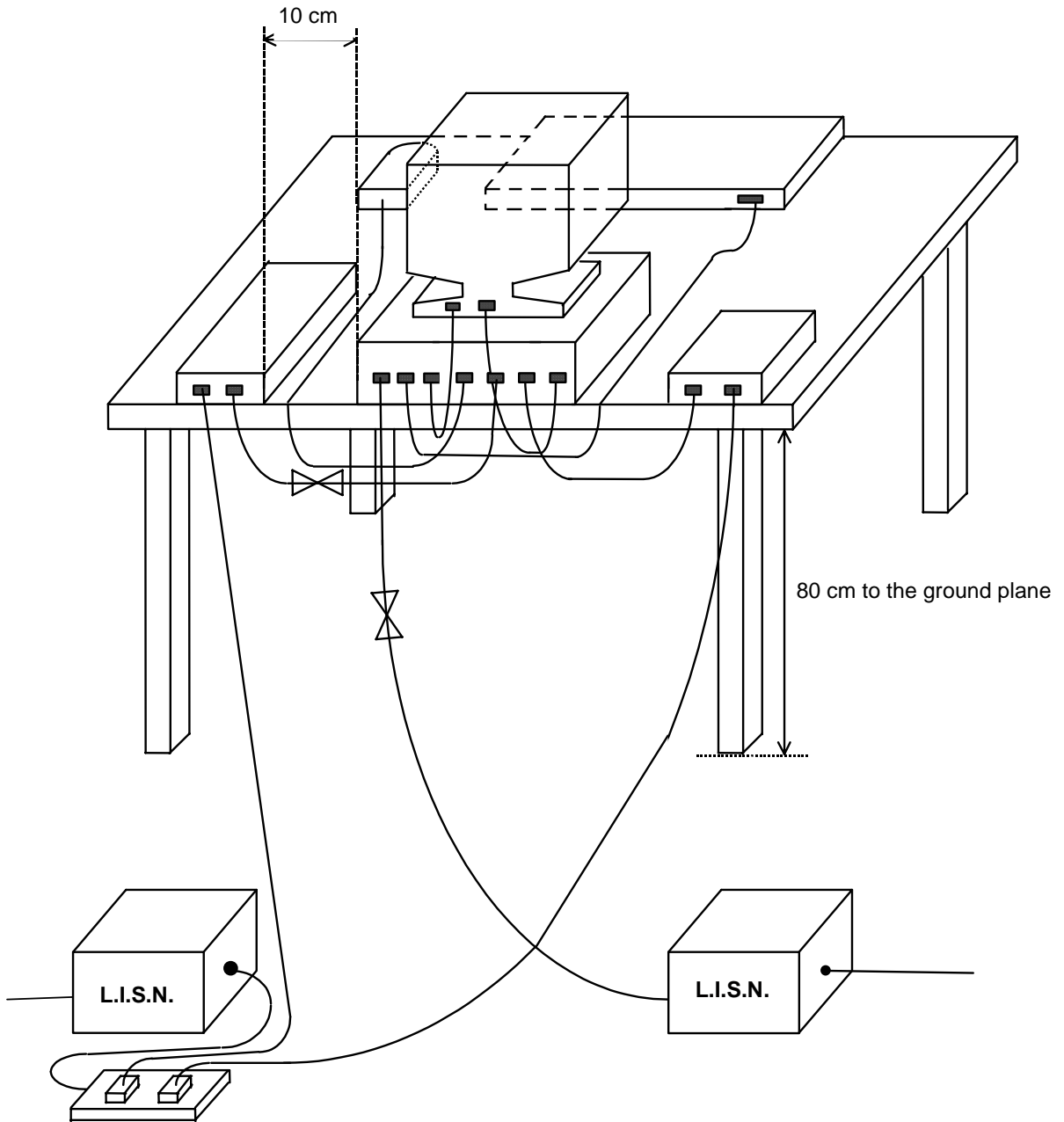
5.1 Description of Major Test Instruments

- Test Receiver (R&S ESCS 30)
 - Attenuation 10 dB
 - Start Frequency 0.15 MHz
 - Stop Frequency 30 MHz
 - IF Bandwidth 9 KHz

5.2 Test Procedures

- a. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. Connect Telecommunication port to ISN (Impedance Stabilization Network)
- d. All the support units are connect to the other LISN.
- e. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- f. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
- g. Both sides of AC line were checked for maximum conducted interference.
- h. The frequency range from 150 kHz to 30 MHz was searched.
- i. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

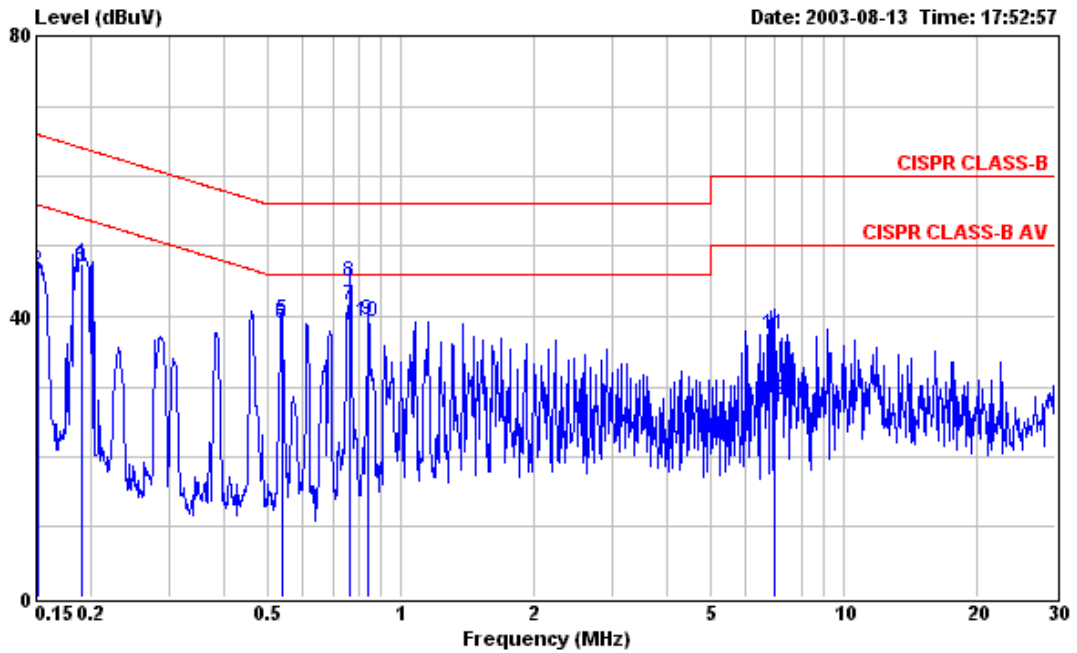
5.3 Typical Test Setup Layout of Conducted Powerline



5.4 Test Result of AC Powerline Conducted Emission

- Frequency Range of Test: from 0.15 MHz to 30 MHz
- Temperature: 27.8 °C
- Relative Humidity: 58 %
- **Test Line: live**
- All emissions not reported here are more than 10 dB below the prescribed limit.

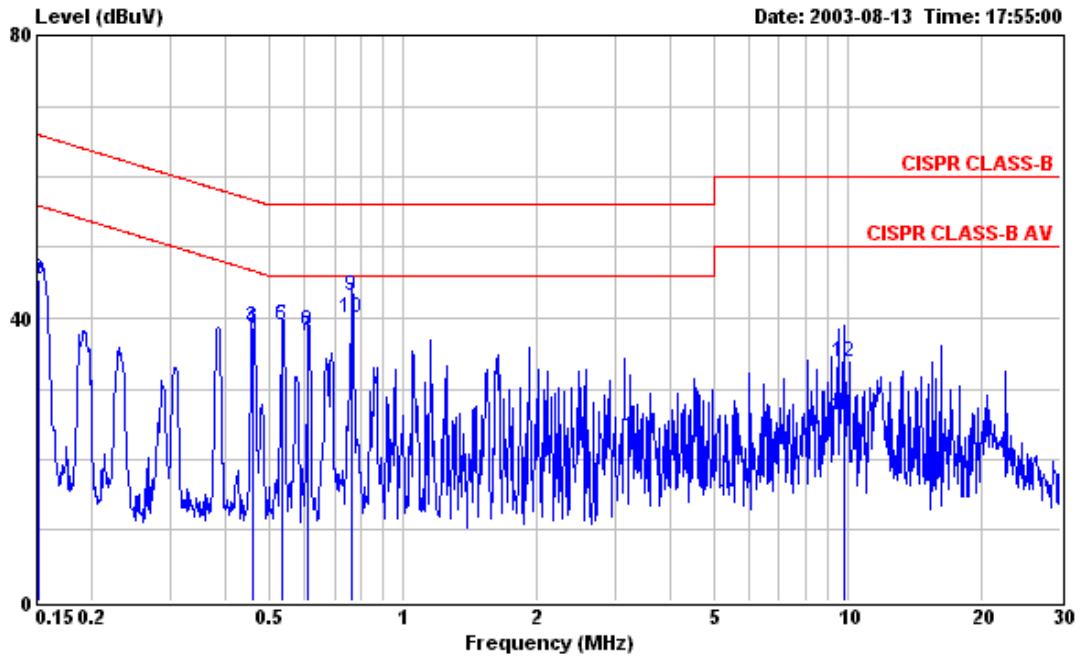
The test was passed at the minimum margin that marked by a frame in the following data



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 LINE
 EUT : USB adapter
 Power : 230V/50Hz
 Model : MS-6823
 Memo : MODE 1

	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.152	46.15	-19.74	65.89	46.01	0.10	0.04	QP
2	0.152	46.53	-9.36	55.89	46.39	0.10	0.04	Average
3	0.190	46.98	-17.06	64.04	46.84	0.10	0.04	QP
4	0.190	47.61	-6.43	54.04	47.47	0.10	0.04	Average
5	0.538	39.49	-6.51	46.00	39.29	0.10	0.10	Average
6	0.538	38.93	-17.07	56.00	38.73	0.10	0.10	QP
7	0.767	41.47	-4.53	46.00	41.29	0.10	0.08	Average
8	0.767	44.85	-11.15	56.00	44.67	0.10	0.08	QP
9	0.844	39.43	-6.57	46.00	39.26	0.10	0.07	Average
10	0.844	39.32	-16.68	56.00	39.15	0.10	0.07	QP
11	6.971	37.41	-22.59	60.00	37.00	0.16	0.25	QP
12	6.971	28.14	-21.86	50.00	27.73	0.16	0.25	Average

Test Line: Neutral



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : USB adapter
 Power : 230V/50Hz
 Model : MS-6823
 Memo : MODE 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.152	44.89	-21.00	65.89	44.75	0.10	0.04	QP
2	0.152	45.41	-20.48	65.89	45.27	0.10	0.04	QP
3	0.459	38.65	-8.06	46.71	38.44	0.10	0.11	Average
4	0.459	38.47	-18.24	56.71	38.26	0.10	0.11	QP
5	0.535	38.91	-17.09	56.00	38.71	0.10	0.10	QP
6	0.535	39.09	-6.91	46.00	38.89	0.10	0.10	Average
7	0.611	37.51	-18.49	56.00	37.32	0.10	0.09	QP
8	0.611	38.12	-7.88	46.00	37.93	0.10	0.09	Average
9	0.767	43.02	-12.98	56.00	42.84	0.10	0.08	QP
10	0.767	39.95	-6.05	46.00	39.77	0.10	0.08	Average
11	9.803	26.30	-23.70	50.00	25.79	0.20	0.31	Average
12	9.803	33.65	-26.35	60.00	33.14	0.20	0.31	QP

Test Engineer: John
 John Huang

5.5 Photographs of Conducted Powerline Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW



6. Test of Radiated Emission

Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in European Standard EN 301 489-17. The EUT was placed on a nonmetallic stand, 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 Description of Major Test Instruments

- Amplifier (SCHAFFNER CPA9231A)
 - RF Gain 30 dB
 - Signal Input 9 KHz to 2 GHz

- 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

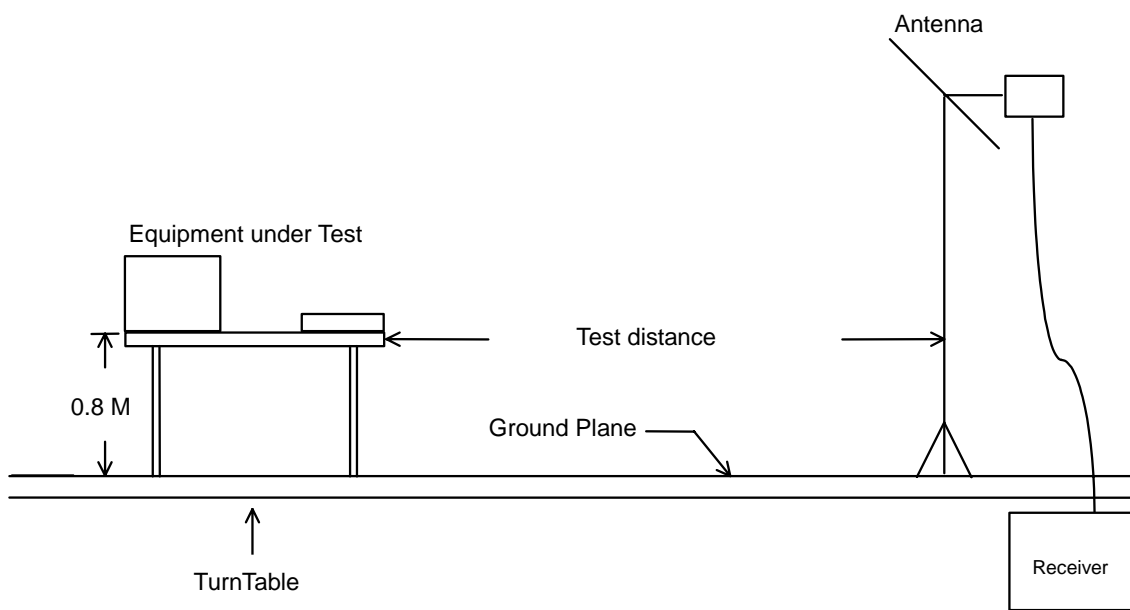
- Test Receiver (R&S ESI7)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 20 Hz to 7 GHz



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 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.

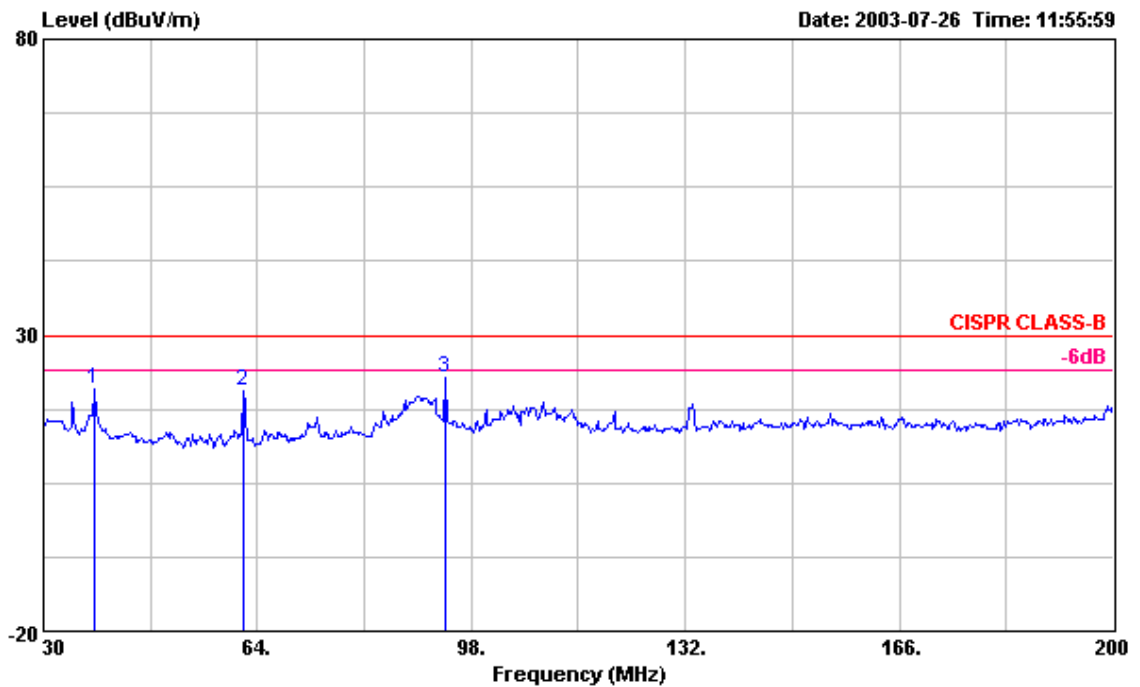
6.3 Typical Test Setup Layout of Radiated Emission



6.4 Test Result of Radiated Emission

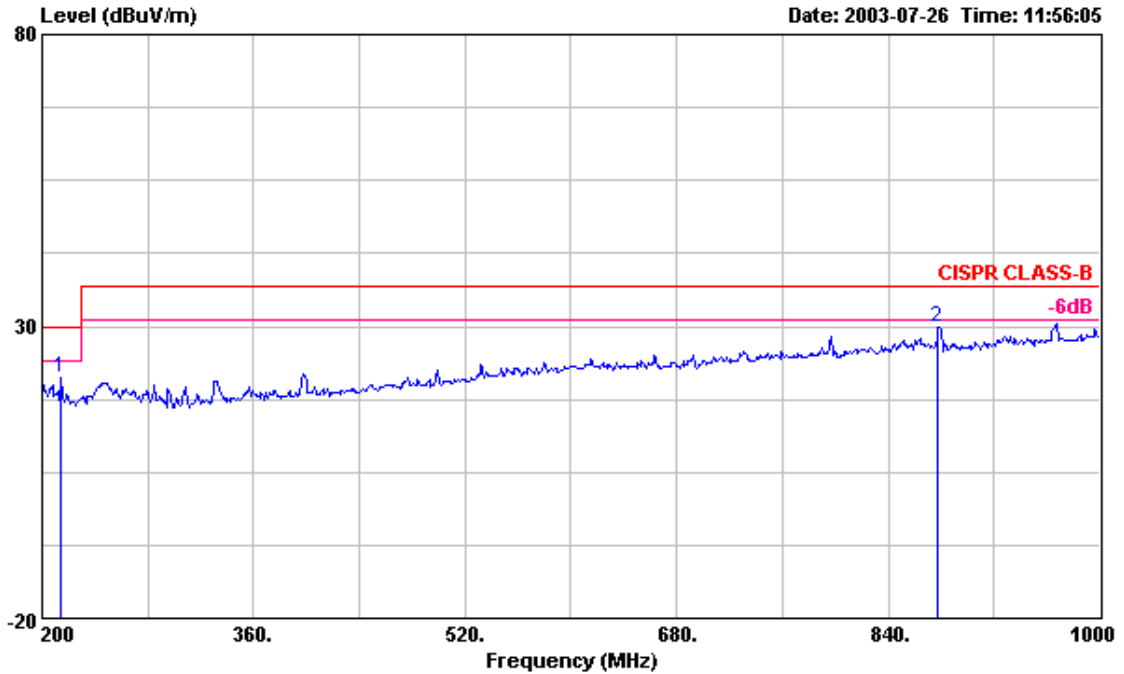
- Frequency Range of Test: from 30 MHz to 1000 MHz
- Test Distance: 10M
- Temperature: 26°C
- Relative Humidity: 67 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

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



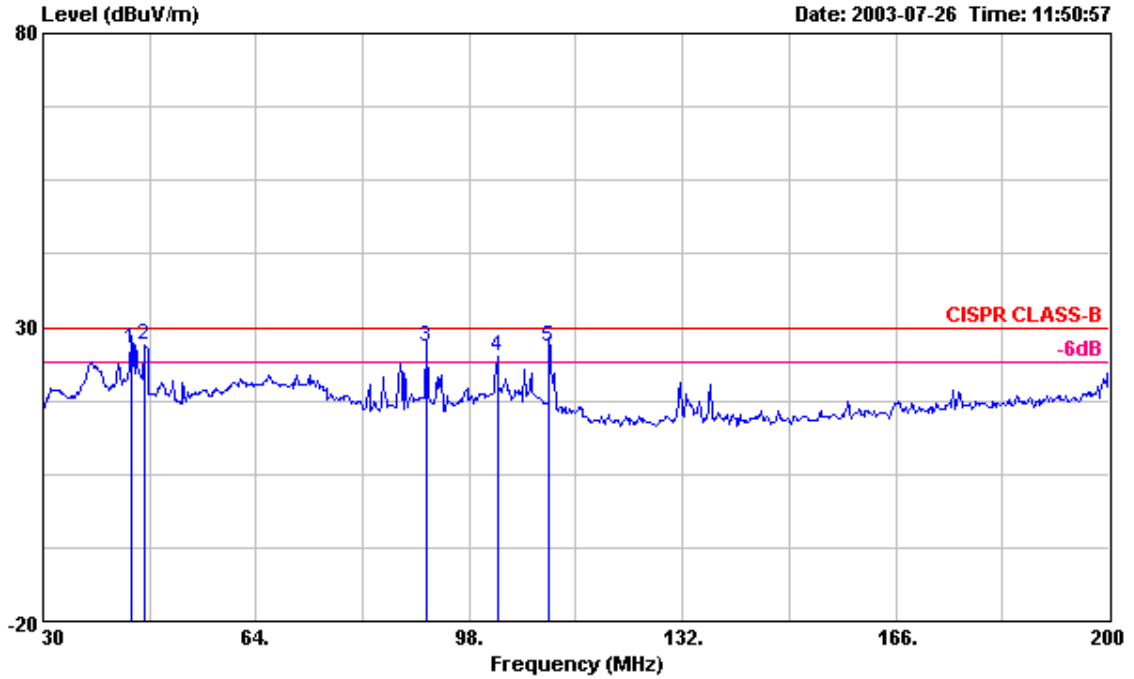
Site : 10CH02-HY
 Condition : CISPR CLASS-B 10m BICO-VHBB9124-287 HORIZONTAL
 EUT : WIRELESS 11B USB ADAPTOR
 power : 230V/50Hz
 memo : MS-6823

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	37.990	20.82	-9.18	30.00	36.02	11.42	0.78	27.40	Peak	---	---
2	61.790	20.52	-9.48	30.00	37.06	9.86	1.00	27.40	Peak	---	---
3	93.750	22.86	-7.14	30.00	38.66	10.41	1.19	27.40	Peak	---	---



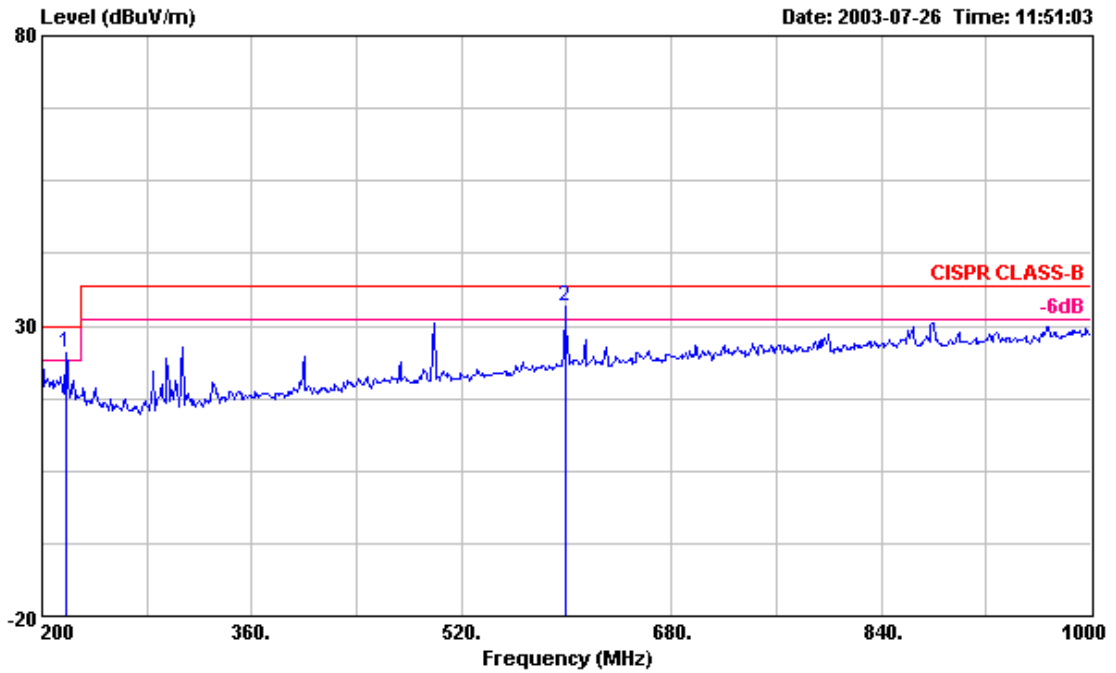
Site : 10CH02-HY
 Condition : CISPR CLASS-B 10m LOG-9111-207 HORIZONTAL
 EUT : WIRELESS 11B USB ADAPTOR
 power : 230V/50Hz
 memo : MS-6823

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor		Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	214.400	21.29	-8.71	30.00	34.27	14.95	2.40	30.33	Peak	---	---
2	877.600	29.90	-7.10	37.00	33.70	21.21	4.93	29.94	Peak	---	---



Site : 10CH02-HY
 Condition : CISPR CLASS-B 10m BICO-VHBB9124-287 VERTICAL
 EUT : WIRELESS 11B USB ADAPTOR
 power : 230V/50Hz
 memo : MS-6823

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	44.110	26.46	-3.54	30.00	42.63	10.40	0.83	27.40	QP	100	0
2	46.150	26.84	-3.16	30.00	42.81	10.56	0.87	27.40	Peak	100	26
3	91.030	26.80	-3.20	30.00	42.56	10.46	1.18	27.40	QP	100	0
4	102.420	24.96	-5.04	30.00	40.15	10.95	1.26	27.40	Peak	---	---
5	110.750	26.63	-3.37	30.00	42.08	10.67	1.28	27.40	QP	102	22



Site : 10CH02-HY
 Condition : CISPR CLASS-B 10m LOG-9111-207 VERTICAL
 EUT : WIRELESS 11B USB ADAPTOR
 power : 230V/50Hz
 memo : MS-6823

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	218.400	25.28	-4.72	30.00	37.92	15.28	2.42	30.34	Peak	---	---
2	599.200	33.39	-3.61	37.00	39.81	19.75	4.03	30.20	Peak	---	---

Test Engineer: Jason
 Jason Chang

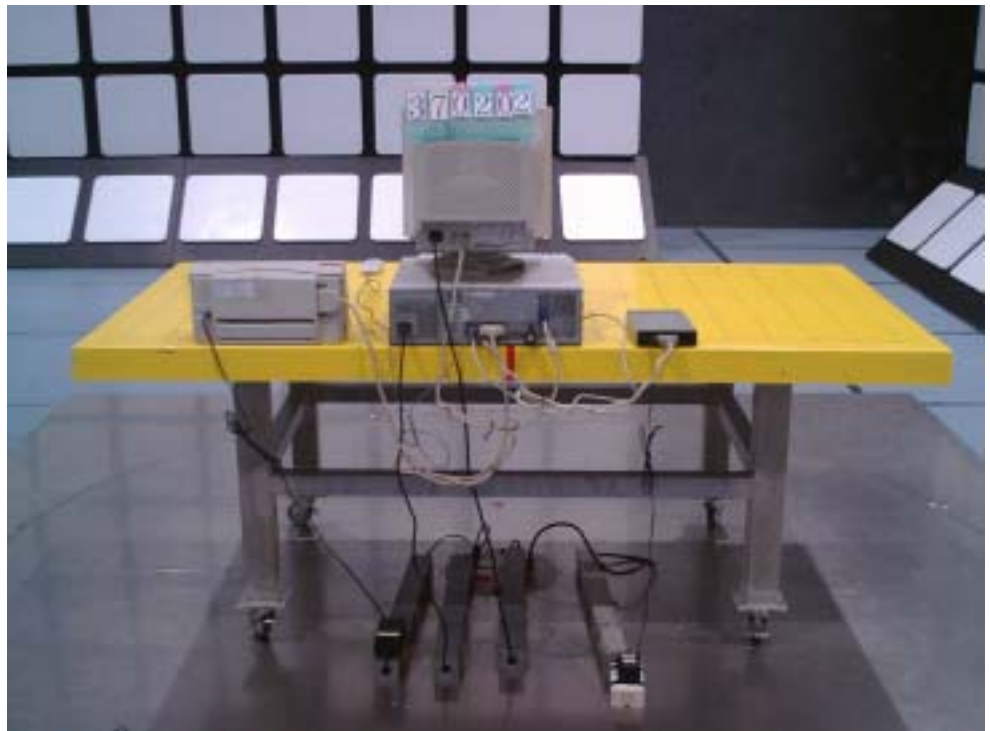
6.5 Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



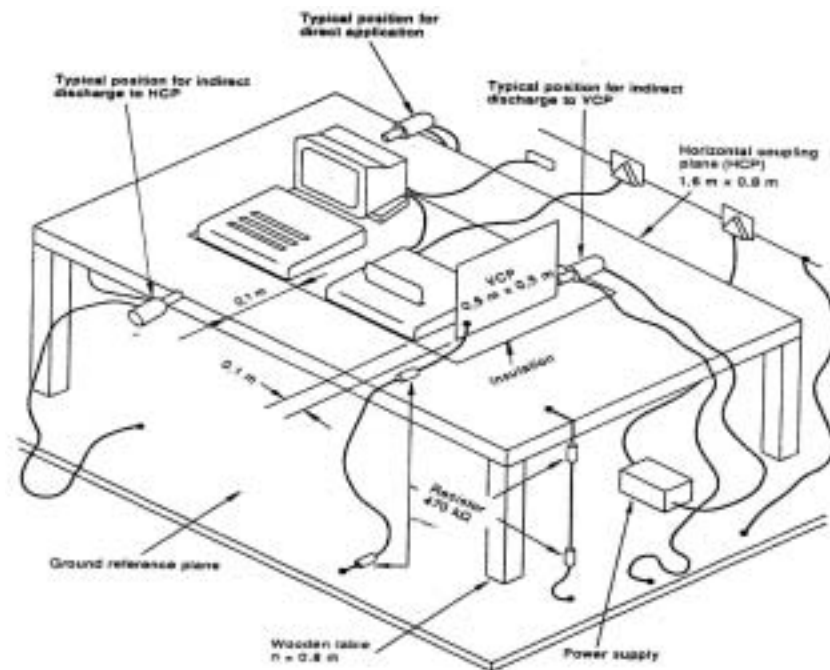
REAR VIEW



7. Electrostatic Discharge Immunity Test (ESD)

- FINAL TEST RESULT : **PASS**
- Pass Performance Criteria : CT/CR
- Required performance criteria: TT/TR
- Basic Standard : EN 61000-4-2:1995/A1:1998
- Product Standard : EN 301 489-17
- Level : 3 for air discharge,
: 2 for contact discharge
- Tested voltage : $\pm 2 / \pm 4 / \pm 8$ KV for air discharge,
: $\pm 2 / \pm 4$ KV for contact discharge
- Temperature : 25 °C
- Relative Humidity : 55 %
- Atmospheric Pressure : 98.7kPa
- Test Date : Aug. 04, 2003
- Observation : Normal

7.1 Test setup



The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the following manner :

- a. CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
- b. AIR DISCHARGE at insulating surfaces.

The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

7.2 Test Setup for Tests Performed in Laboratory

A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the SPORTON EMC LAB., we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. And any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resistor located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

7.3 ESD Test Procedure

- a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
 - ambient temperature: 15 to 35 ;
 - relative humidity : 30% to 60%;
 - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).
- b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
- c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.
- d. The test shall be performed with single discharges. On preselected points at least ten single discharges (in the most sensitive polarity) shall be applied.
- e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
- f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
- g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :
 - h. If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
 - i. Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
 - j. The contact discharge test shall not be applied to such surfaces.
- k. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

7.4 Test Severity Levels

7.4.1 Contact Discharge

Level	Test Voltage (KV) of Contact discharge
1	±2
2	±4
3	±6
4	±8
X	Specified

Remark : "X" is an open level.

7.4.2 Air Discharge

Level	Test Voltage (KV) of Air Discharge
1	±2
2	±4
3	±8
4	±15
X	Specified

Remark : "X" is an open level.

7.5 Test Points

7.5.1 Test Result of Air Discharge

Test Point	Voltage	Tested No.
EUT's Case	$\pm 2 / \pm 4 / \pm 8$ KV	BY 10

7.5.2 Test Result of Contact Discharge

Polarity	Voltage	Tested No.
Horizontal (At Front)	$\pm 2 / \pm 4$ KV	BY 10
Horizontal (At Left)	$\pm 2 / \pm 4$ KV	BY 10
Horizontal (At Right)	$\pm 2 / \pm 4$ KV	BY 10
Horizontal (At Rear)	$\pm 2 / \pm 4$ KV	BY 10
Vertical (At Front)	$\pm 2 / \pm 4$ KV	BY 10
Vertical (At Left)	$\pm 2 / \pm 4$ KV	BY 10
Vertical (At Right)	$\pm 2 / \pm 4$ KV	BY 10
Vertical (At Rear)	$\pm 2 / \pm 4$ KV	BY 10
EUT's Case	$\pm 2 / \pm 4$ KV	BY 10
EUT's USB Port	$\pm 2 / \pm 4$ KV	BY 10

Test Engineer: Kero
Kero Kao

7.6 Photographs of Electrostatic Discharge Immunity Test

FRONT VIEW



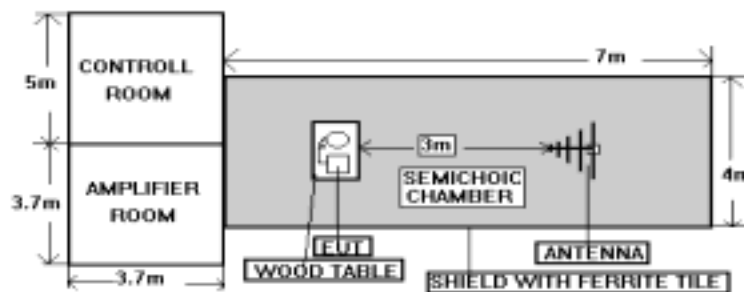
REAR VIEW



8. Radio Frequency Electromagnetic Field Immunity Test (RS)

- FINAL TEST RESULT : **PASS**
- Pass Performance Criteria : CT/CR
- Required performance criteria: CT/CR
- Basic Standard : EN 61000-4-3:1996/A1:1998
- Product Standard : EN 301 489-17
- Level : 2
- Frequency Range : 80-1000 MHz, 1400~2000 MHz
- Field Strength : 3 V/m (Modulated 80% AM)
- Temperature : 25 °C
- Relative Humidity : 54 %
- Atmospheric Pressure : 98.7kPa
- Test Date : Aug. 04, 2003
- Observation : Normal

8.1 Test setup



NOTE : The SPORTON 7m x 4m x 4m semichoice chamber is compliance with the sixteen points uniform field requirement as stated in IEC 1000-4-3 Section 6.2.

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semichoice chamber.

8.2 Test Procedure

- a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
- b. The bilog antenna which is enabling the complete frequency range of 80-1000 MHz, 1400-2000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.
- c. The test is normally performed with the antenna facing the most sensitive side of the EUT. The polarization of the field generated by the biconical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.
- d. At each of the above conditions, the frequency range is swept 80-1000 MHz, 1400-2000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of 1.5×10^{-3} decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

8.3 Test Severity Levels

Frequency Band: 80-1000 MHz, 1400-2000 MHz

Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified

Remark : "X" is an open class.

Test Engineer: *Kero*
Kero Kao

8.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test

FRONT VIEW



REAR VIEW



9. List of Measuring Equipment Used

<EMI>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 12, 2003	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Jan. 07, 2003	Conduction (CO01-HY)
50 ohm BNC type Terminal	NOBLE	50ohm	TM009	50 ohm	Apr. 24, 2003	Conduction (CO01-HY)
10m Semi Anechoic Chamber	TDK	SAC-10M	10CH02-HY	30MHz~1GHz 10m, 3m	Mar. 15, 2003	Radiation (10CH02-HY)
Spectrum Analyzer	R&S	FSP7	100644/007	9KHz – 7GHz	May 26, 2003	Radiation (10CH02-HY)
Receiver	R&S	ESI7	838496/008	20Hz – 7GHz	Feb. 11, 2003	Radiation (10CH02-HY)
Biconical Antenna	SCHWARZBECK	VHBB 9124	287	30MHz –200MHz	Jan. 09, 2003	Radiation (10CH02-HY)
Log Antenna	SCHWARZBECK	VUSLP 9111	207	200MHz -1GHz	Jan. 09, 2003	Radiation (10CH02-HY)
Amplifier	SCHAFFNER	CPA9231A	3565	9KHz – 2GHz	Aug. 13, 2002	Radiation (10CH02-HY)
Amplifier	SCHAFFNER	CPA9231A	3566	9KHz – 2GHz	Aug. 13, 2002	Radiation (10CH02-HY)
Turn Table	HD	DS 430	430/360	0 ~ 360 degree	N/A	Radiation (10CH02-HY)
Antenna Mast	HD	MA240	240/664	1 m - 4 m	N/A	Radiation (10CH02-HY)
Antenna Mast	HD	MA240	240/667	1 m - 4 m	N/A	Radiation (10CH02-HY)
RF Cable-R10m	Jye Bao	RG142	CB027-INSIDE	30MHz~1GHz	Jan. 08, 2003	Radiation (10CH02-HY)
RF Cable-R10m	Suhner Switzerland + BELDEN	RG223/U + RG8/U	CB026-DOOR	30MHz~1GHz	Jan. 08, 2003	Radiation (10CH02-HY)

Calibration Interval of instruments listed above is one year.

**<EMS>**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	KEYTEK	MZ-15/EC	9503213	Air: 0 KV - 15 KV Contact: 0 KV -8KV	Apr. 24, 2003	ESD
Antenna	CHASE	CBL6121A	1027	26 MHz - 1 GHz	Mar. 06, 2003	RS
RS immunity Test system	HP	EMS test System	2062	80 MHz - 1 GHz 3V/m 10v/m	Nov. 26, 2002	RS
Amplifier	AR	100W 1000M3	16060	80 MHz - 1 GHz	Nov. 27, 2002	RS
Power Meter	EMC Automation	438A	3513U04050	100 KHz -4.2 GHz	Nov. 26, 2002	RS
Signal Generator	HP	8648A	3426A00771	100 KHz - 1 GHz	Jan. 17, 2003	RS
Power Sensor	HP	8481D	3318A13140	100 KHz - 1 GHz	Nov. 26, 2002	RS
Power Sensor	HP	8482A	3318A26464	100 KHz - 1 GHz	Nov. 26, 2002	RS
Attenuator	HP	8491A	53603	100 KHz - 1 GHz	Nov. 26, 2002	RS

Calibration Interval of instruments listed above is one year.

10. Declaration of Conformity and the CE Mark

There are three possible procedures pertaining to the declaration of conformity:

10.1 Conformity Testing and Declaration of Conformity by the Manufacturer or His Authorized Representative Established within the Community or by an Importer.

- Article 10 (1) of the EMC Directive,
- § 3 (1) no. 2a of the EMC Act.

10.2 Declaration of Conformity Issued by the Manufacturer or His Authorized Representative Established within the Community or by an Importer Following Testing of the Product and Issued of an EC certificate of conformity by a competent body.

- Article 10 (2) of the EMC Directive,
- § 3 (1) no. 2b of the EMC Act.

10.3 Declaration of Conformity Issued by the Manufacturer or His Authorized Representative Established within the Community or by an Importer Following Testing and Certification of the Product by a Notified Body.

- Article 10 (5) of the EMC Directive,
- § 3 (1) no. 2b of the EMC Act (radio transmitting installations).

10.4 Specimen For The CE Marking Of Electrical / Electronical Equipment

The components of the CE marking shall have substantially the same vertical dimension, which may not be less than 5 mm.

