



**SPORTON LAB.**

Certificate No: EC402009

# CERTIFICATE

**EQUIPMENT :** Power Supplies

**MODEL NO. :** SS-400HT Active PFC, SS-500HT Active PFC,  
SS-600HT Active PFC

**APPLICANT :** **Sea Sonic Electronics Co., Ltd.**

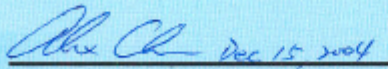
8F., #19, Alley 360, Sec. 1,  
Neihu Road, Neihu, Taipei, Taiwan, R.O.C.



**I HEREBY**

**CERTIFY THAT:**

THE MEASUREMENTS SHOWN IN THIS TEST REPORT WERE MADE IN ACCORDANCE WITH THE PROCEDURES GIVEN IN **EUROPEAN COUNCIL DIRECTIVE 89/336/EEC**. THE EQUIPMENT WAS **PASSED** THE TEST PERFORMED ACCORDING TO **European Standard EN 55022:1998+A1:2000+A2:2003 Class B, EN 61000-3-2:2000, EN 61000-3-3:1995+A1:2001 and EN 55024:1998+A1:2001+A2:2003 ( IEC 61000-4-2:2001, IEC 61000-4-3:2002, IEC 61000-4-4:1995+A1:2000+A2:2001, IEC 61000-4-5:2001, IEC 61000-4-6:1996+A1:2000, IEC 61000-4-8:2001, IEC 61000-4-11:2001 )**. THE TEST WAS CARRIED OUT ON Dec. 02, 2004 AT **SPORTON INTERNATIONAL INC. LAB.**

  
Dec 15, 2004

Alex Chen  
Manager

# CE EMC TEST REPORT

According to

**European Standard EN 55022:1998+A1:2000+A2:2003 Class B,  
EN 61000-3-2: 2000, EN 61000-3-3:1995+A1:2001 and  
EN 55024:1998+A1:2001+A2:2003 ( IEC 61000-4-2:2001,  
IEC 61000-4-3:2002, IEC 61000-4-4:1995+A1:2000+A2:2001,  
IEC 61000-4-5:2001, IEC 61000-4-6:1996+A1:2000,  
IEC 61000-4-8:2001, IEC 61000-4-11:2001 )**

Equipment : Power Supplies

Model No. : SS-400HT Active PFC, SS-500HT Active PFC,  
SS-600HT Active PFC

Applicant : **Sea Sonic Electronics Co., Ltd.**  
8F., #19, Alley 360, Sec. 1,  
Neihu Road, Neihu, Taipei, Taiwan, R.O.C.

- 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

<b>History of this test report .....</b>	<b>iii</b>
<b>CERTIFICATE OF COMPLIANCE.....</b>	<b>1</b>
<b>1. General Description of Equipment under Test.....</b>	<b>2</b>
1.1 Applicant.....	2
1.2 Manufacturer .....	2
1.3 Basic Description of Equipment under Test .....	2
1.4 Feature of Equipment under Test .....	2
<b>2. Test Configuration of Equipment under Test .....</b>	<b>4</b>
2.1 Test Manner .....	4
2.2 Description of Test System .....	4
<b>3. Test Software .....</b>	<b>7</b>
<b>4. General Information of Test.....</b>	<b>8</b>
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
<b>5. Test of Conducted Powerline .....</b>	<b>9</b>
5.1 Description of Major Test Instruments .....	9
5.2 Test Procedures.....	10
5.3 Typical Test Setup Layout of Conducted Powerline .....	11
5.4 Test Result of AC Powerline Conducted Emission .....	12
5.5 Photographs of Conducted Powerline Test Configuration .....	14
<b>6. Test of Radiated Emission.....</b>	<b>15</b>
6.1 Description of Major Test 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
6.5 Photographs of Radiated Emission Test Configuration .....	22
<b>7. Harmonics Test.....</b>	<b>23</b>
7.1 Standard.....	23
7.2 Test Procedure.....	23
7.3 Test Equipment Settings .....	23
7.4 Test Setup .....	23
7.5 Current Harmonics Test .....	24
<b>8. Voltage Fluctuations Test.....</b>	<b>25</b>
8.1 Standard.....	25
8.2 Test Procedure.....	25
8.3 Test Equipment Settings .....	25
8.4 Test Setup .....	25
8.5 Test Result Of Voltage Fluctuation And Flicker Test .....	26
8.6 Photographs Of Harmonics Test, Voltage Fluctuation And Flicker Test .....	27
<b>9. Electrostatic Discharge Immunity Test (ESD) .....</b>	<b>28</b>
9.1 Test Setup .....	28

9.2 Test Setup for Tests Performed in Laboratory .....	29
9.3 ESD Test Procedure .....	30
9.4 Test Severity Levels .....	31
9.5 Test Points .....	32
9.6 Photographs of Electrostatic Discharge Immunity Test .....	34
<b>10. Radio Frequency Electromagnetic Field Immunity Test (RS).....</b>	<b>35</b>
10.1 Test setup.....	35
10.2 Test Procedure.....	36
10.3 Test Severity Levels.....	36
10.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test .....	37
<b>11. Electrical Fast Transient/Burst Immunity Test (EFT/BURST) .....</b>	<b>38</b>
11.1 Test setup.....	38
11.2 Test on Power Line .....	39
11.3 Test on Communication Lines.....	39
11.4 Test Procedure.....	40
11.5 Test Severity Levels .....	41
11.6 Photographs of Electrical Fast Transient/Burst Immunity Test .....	42
<b>12. Surge Immunity Test .....</b>	<b>43</b>
12.1 Test Record.....	43
12.2 Test Level.....	44
12.3 Test Procedure.....	44
12.4 Photographs of Surge Immunity Test.....	46
<b>13. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test ( CS ).....</b>	<b>47</b>
13.1 Test Level.....	47
13.2 Test Procedure.....	48
13.3 Photographs of CS Immunity Test .....	49
<b>14. Power Frequency Magnetic Field Immunity Tests .....</b>	<b>50</b>
14.1 Test Record.....	50
14.2 Test Setup .....	50
14.3 Photographs of Power Frequency Magnetic Field Immunity Tests .....	51
<b>15. Voltage Dips and Voltage Interruption Immunity Tests .....</b>	<b>52</b>
15.1 Test Record of Voltage Interruption .....	52
15.2 Test Record of Voltage Dips .....	52
15.3 Testing Requirement and Procedure .....	53
15.4 Test Conditions .....	53
15.5 Photographs of Voltage Dips and Voltage Interruption Immunity Tests.....	54
<b>16. List of Measuring Equipment Used .....</b>	<b>55</b>
<b>17. Notice for Class A Product .....</b>	<b>57</b>
<b>18. Declaration of Conformity and the CE Mark .....</b>	<b>58</b>
<b>Appendix A. Photographs of EUT.....</b>	<b>A1 ~ A18</b>



### History of this test report

Original Report Issue Date: Dec. 15, 2004

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



## CERTIFICATE OF COMPLIANCE

According to

**European Standard EN 55022:1998+A1:2000+A2:2003 Class B,  
EN 61000-3-2: 2000, EN 61000-3-3:1995+A1:2001 and  
EN 55024:1998+A1:2001+A2:2003 ( IEC 61000-4-2:2001,  
IEC 61000-4-3:2002, IEC 61000-4-4:1995+A1:2000+A2:2001,  
IEC 61000-4-5:2001, IEC 61000-4-6:1996+A1:2000,  
IEC 61000-4-8:2001, IEC 61000-4-11:2001 )**

Equipment : Power Supplies

Model No. : SS-400HT Active PFC, SS-500HT Active PFC,  
SS-600HT Active PFC

Applicant : **Sea Sonic Electronics Co., Ltd.**  
8F., #19, Alley 360, Sec. 1,  
Neihu Road, Neihu, Taipei, Taiwan, R.O.C.

### I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 89/336/EEC**. The equipment was **passed** the test performed according to **European Standard EN 55022:1998+A1:2000+A2:2003 Class B, EN 61000-3-2:2000, EN 61000-3-3:1995+A1:2001 and EN 55024:1998+A1:2001+A2:2003 ( IEC 61000-4-2:2001, IEC 61000-4-3:2002, IEC 61000-4-4:1995+A1:2000+A2:2001, IEC 61000-4-5:2001, IEC 61000-4-6:1996+A1:2000, IEC 61000-4-8:2001, IEC 61000-4-11:2001 )**.

The test was carried out on **Dec. 02, 2004** 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

**Sea Sonic Electronics Co., Ltd.**

8F., #19, Alley 360, Sec. 1,

Neihu Road, Neihu, Taipei, Taiwan, R.O.C.

### 1.2 Manufacturer

**Dong Guan Sea Sonic Electronics Co., Ltd.**

Zheng Keng Industrial Park, Yu Wu District,

Dongcheng Dongguan City, Guangdong, CHINA.

### 1.3 Basic Description of Equipment under Test

Equipment : Power Supplies

Model No. : SS-400HT Active PFC, SS-500HT Active PFC, SS-600HT Active PFC

Trade Name : SEASONIC

Power Supply Type : Switching

AC Power Cord : Non-Shielded, 1.8m, 3 pin

### 1.4 Feature of Equipment under Test

#### < SS-400HT Active PFC >

AC Input	100-240Vac, 50/60Hz, 10A					
DC Output	+3.3V	+5V	+12V1	+12V2	-12V	+5Vsb
	30A	30A	14A	15A	0.8A	2A
	150W		348W		9.6W	10W
	400W (Max.)					

**< SS-500HT Active PFC >**

AC Input	100-240Vac, 50/60Hz, 10A					
DC Output	+3.3V	+5V	+12V1	+12V2	-12V	+5Vsb
	30A	30A	17A	16A	0.8A	2A
	180W		396W		9.6W	10W
	500W (Max.)					

**< SS-400HT Active PFC >**

AC Input	100-240Vac, 50/60Hz, 10A					
DC Output	+3.3V	+5V	+12V1	+12V2	-12V	+5Vsb
	30A	30A	18A	18A	0.8A	2A
	180W		432W		9.6W	10W
	600W (Max.)					



## 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 55022.
- b. The complete test system included COMPAQ Monitor, COMPAQ PS/2 Keyboard, COMPAQ PS/2 Mouse, HP Printer, ACEEX Modem, EUT and COMPAQ PC for EMI test.
- c. The complete test system included ViewSonic Monitor, DELL PS/2 Keyboard, DELL PS/2 Mouse, EUT and DELL PC for EMS test.
- d. The complete test system included PRODIGIT Electronic Load and EUT for Harmonics and Flickers test.
- e. Test Mode → **600W** ( for EMI & EMS & Harmonics and Flickers Test )
- f. Frequency range investigated: Conduction 150 KHz to 30 MHz, Radiation 30 MHz to 1000MHz.

### 2.2 Description of Test System

#### < EMI >

##### Support Unit 1. -- Monitor (COMPAQ)

FCC ID	: N/A
Model No.	: S510
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0004
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 2. -- PS/2 Keyboard (COMPAQ)

FCC ID	: N/A
Model No.	: 6511-VA
Serial No.	: SP0012
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 Mouse (COMPAQ)**

FCC ID : JNZ211443  
Model No. : M-S69  
Serial No. : SP0013  
Data Cable : Non-Shielded, 1.8m

**Support Unit 4. -- Printer (HP)**

FCC ID : B94C2642X  
Model No. : DJ400  
Power Supply Type : Linear  
Power Cord : Non-Shielded  
Serial No. : SP0018  
Data Cable : Braided-Shielded, 1.35m

**Support Unit 5. -- Modem (ACEEX)**

FCC ID : IFAXDM1414  
Model No. : DM1414  
Power Supply Type : Linear  
Power Cord : Non-Shielded  
Serial No. : SP0020  
Data Cable : Shielded, 1.15m

**Support Unit 6. -- Personal Computer (COMPAQ)**

FCC ID : N/A  
Model No. : Evo D380mx  
Power Supply Type : Switching  
Power Cord : Non-Shielded  
Serial No. : SP0002  
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

**< Harmonics & Flickers >****Support Unit 1. -- Electronic Load (PRODIGIT)**

Model No. : PAL-200  
Serial No. : SP0100  
: Full Load

**< EMS >****Support Unit 1. -- Monitor (View Sonic)**

FCC ID	: N/A
Model No.	: VCDTS21553-3J
Serial No.	: SP0034
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Data Cable	: Shielded, 1.5m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

**Support Unit 2. -- PS/2 Keyboard (DELL)**

FCC ID	: N/A
Model No.	: SK-8100
Serial No.	: SP0007
Data Cable	: Shielded, 1.9m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

**Support Unit 3. -- PS/2 Mouse (DELL)**

FCC ID	: N/A
Model No.	: M-SAW34
Serial No.	: SP0010
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. -- Personal Computer (DELL)**

FCC ID	: N/A
Model No.	: DHS
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0002
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

### 3. Test Software

#### **< EMI >**

Two executive programs, "EMCTEST.EXE & EMITEST.EXE" under WIN XP, which generate a complete line of continuously repeating "H" pattern were used as the test software.

The program were 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.

#### **< EMS >**

Two executive programs, "EMCTEST.EXE & EMITEST.EXE" under WIN XP, which generate a complete line of continuously repeating "H" pattern were used as the test software.

The program were 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 internal hard disk, and the hard disk reads and writes the message.
- e. Repeat the steps from c to d.

#### **< Harmonics & Flickers >**

→ No test software was used during testing.

## 4. General Information of Test

### 4.1 Test Facility

#### < EMI >

This test was carried out by SPORTON International Inc.

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. : Conduction : CO01-LK; Radiation : OS04-LK

#### < EMS >

This test was carried out by SPORTON International Inc.

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

### 4.2 Test Voltage

230V / 50Hz

### 4.3 Standard for Methods of Measurement

EMI Test ( Conduction and Radiation ) : European Standard EN 55022 Class B  
Harmonics Test : European Standard EN 61000-3-2.  
Voltage Fluctuations Test : European Standard EN 61000-3-3.  
EMS Test : European Standard EN 55024  
( ESD: IEC 61000-4-2, RS: IEC 61000-4-3, EFT: IEC 61000-4-4, Surge: IEC 61000-4-5,  
CS: IEC 61000-4-6, Power Frequency Magnetic Field: IEC 61000-4-8, Dips: IEC 61000-4-11 )

### 4.4 Test in Compliance with

EMI Test ( Conduction and Radiation ) : European Standard EN 55022 Class B  
Harmonics Test : European Standard EN 61000-3-2.  
Voltage Fluctuations Test : European Standard EN 61000-3-3.  
EMS Test : European Standard EN 55024  
( ESD: IEC 61000-4-2, RS: IEC 61000-4-3, EFT: IEC 61000-4-4, Surge: IEC 61000-4-5,  
CS: IEC 61000-4-6, Power Frequency Magnetic Field: IEC 61000-4-8, Dips: IEC 61000-4-11 )

### 4.5 Frequency Range Investigated

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

### 4.6 Test Distance

- The test distance of radiated emission test from antenna to EUT is 10 M.
- The test distance of radio frequency electromagnetic field immunity test from antenna to EUT is 3 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 European Standard EN 55022 Clause 9. 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.

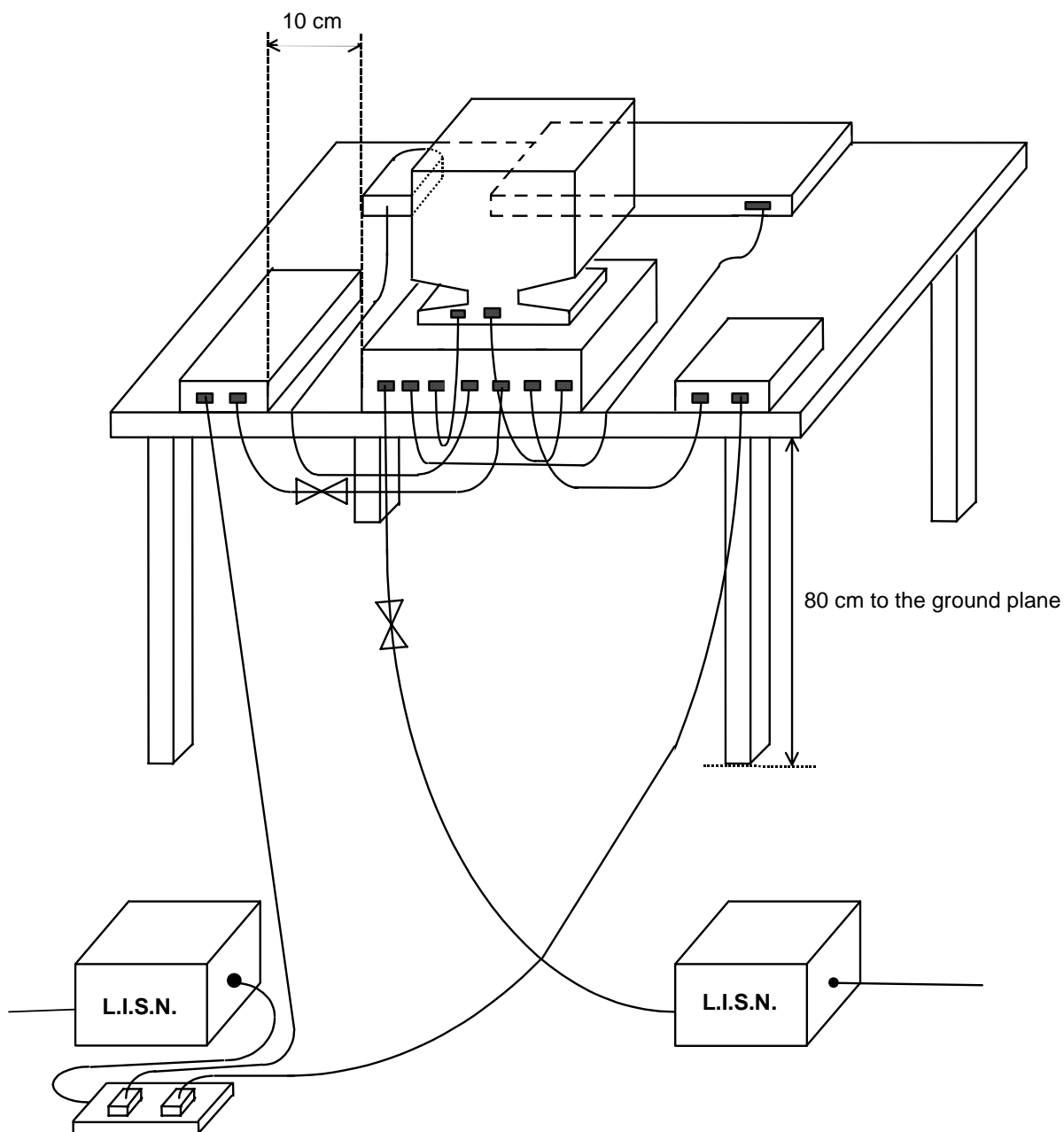
### 5.1 Description of Major Test Instruments

- 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. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The CISPR 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.

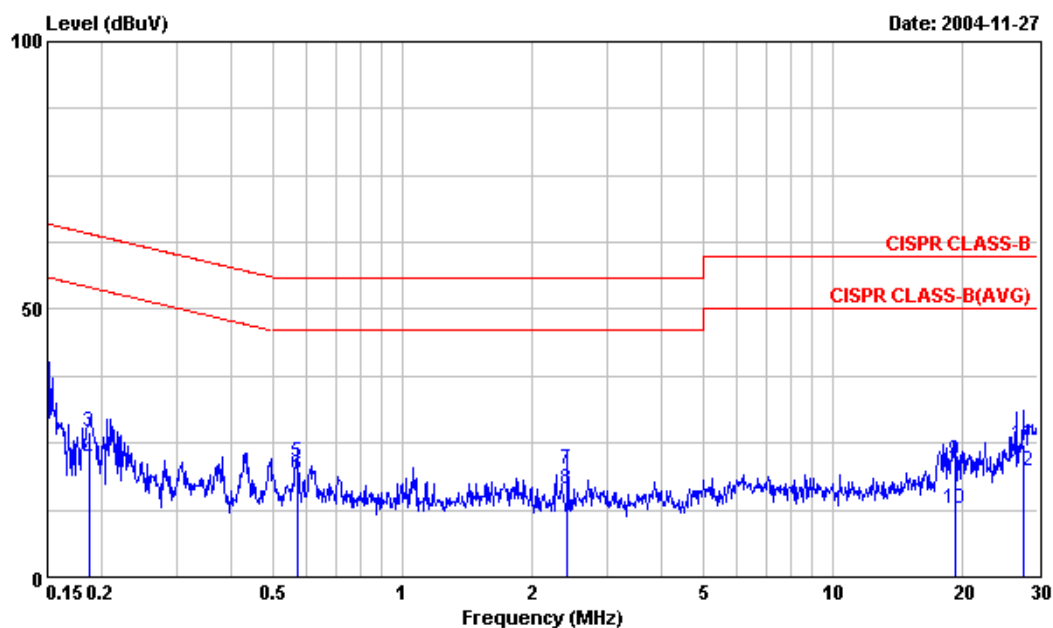
### 5.3 Typical Test Setup Layout of Conducted Powerline





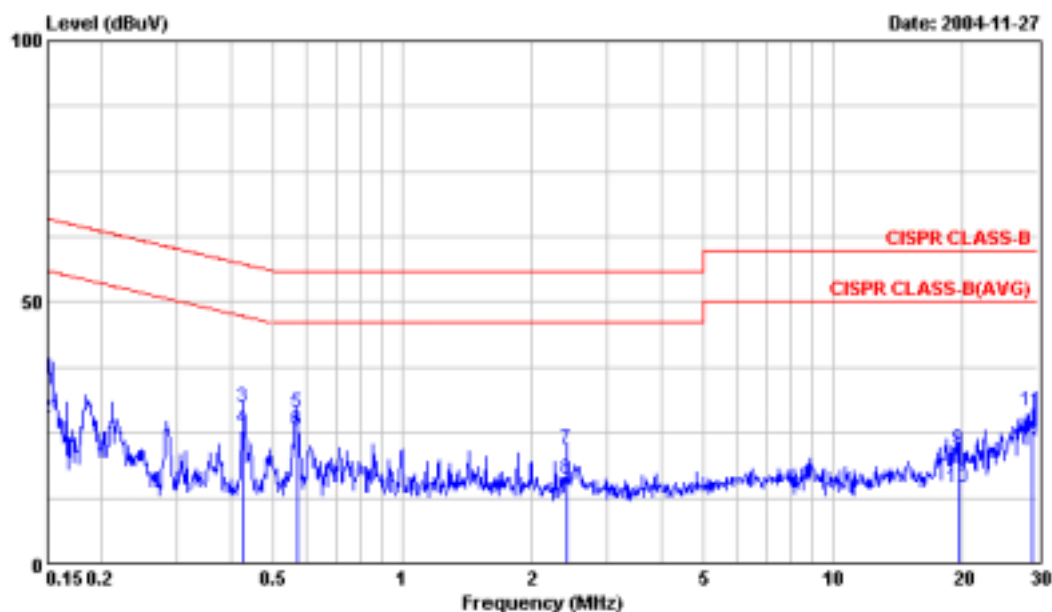
## 5.4 Test Result of AC Powerline Conducted Emission

- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 24°C
- Relative Humidity : 54%
- Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level
- 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 : CO01-LK  
 Condition : CISPR CLASS-B CO01 LISN 93-08-30 LINE  
 EUT : Power supplies  
 MODEL :  
 POWER : 230VAC  
 MEMO :

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBμV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBμV	dB	dBμV	dBμV	dB	dB	
1	0.150	36.52	-29.48	66.00	36.36	0.10	0.06	QP
2	0.150	28.41	-27.59	56.00	28.25	0.10	0.06	Average
3	0.188	27.00	-37.14	64.14	26.81	0.10	0.09	QP
4	0.188	21.82	-32.32	54.14	21.63	0.10	0.09	Average
5	0.570	21.34	-34.66	56.00	21.10	0.10	0.14	QP
6	0.570	19.03	-26.97	46.00	18.79	0.10	0.14	Average
7	2.420	19.96	-36.04	56.00	19.46	0.20	0.30	QP
8	2.420	16.25	-29.75	46.00	15.75	0.20	0.30	Average
9	19.330	21.89	-38.11	60.00	20.52	0.78	0.59	QP
10	19.330	12.77	-37.23	50.00	11.40	0.78	0.59	Average
11	27.710	24.65	-35.35	60.00	22.84	1.11	0.70	QP
12	27.710	19.65	-30.35	50.00	17.84	1.11	0.70	Average



Site : C001-LK  
Condition : CISPR CLASS-B C001 LISN 93-08-30 NEUTRAL  
EUT : Power supplies  
MODEL :  
POWER : 230VAC  
MEMO :

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
		dB		dBuV	dBuV	dB	dB	
1	0.150	36.58	-29.42	66.00	36.42	0.10	0.06	QP
2	0.150	27.69	-28.31	56.00	27.53	0.10	0.06	Average
3	0.428	29.86	-27.43	57.29	29.65	0.10	0.11	QP
4 @	0.428	25.68	-21.61	47.29	25.47	0.10	0.11	Average
5	0.570	28.86	-27.14	56.00	28.62	0.10	0.14	QP
6 @	0.570	25.26	-20.74	46.00	25.02	0.10	0.14	Average
7	2.423	21.89	-34.11	56.00	21.39	0.20	0.30	QP
8	2.423	16.12	-29.88	46.00	15.62	0.20	0.30	Average
9	19.610	21.87	-38.13	60.00	20.49	0.79	0.59	QP
10	19.610	14.51	-35.49	50.00	13.13	0.79	0.59	Average
11	29.280	28.97	-31.03	60.00	27.01	1.26	0.70	QP
12	29.280	23.53	-26.47	50.00	21.57	1.26	0.70	Average

Test Engineer :

Neil 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 55022, Clause 10. 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.

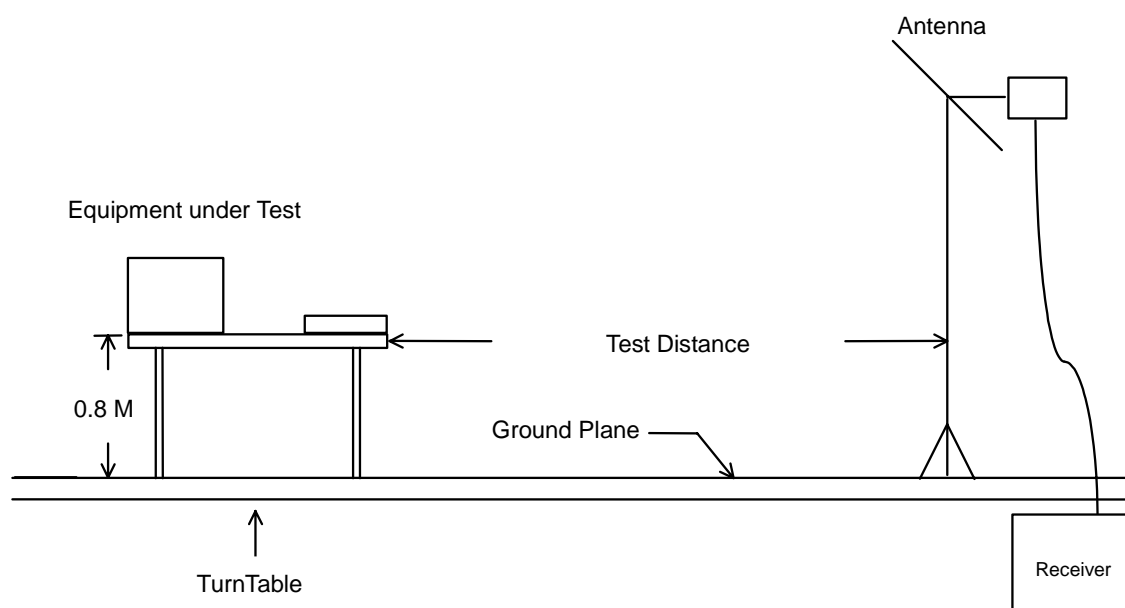
### 6.1 Description of Major Test Instruments

- Amplifier ( HP 87405A )
  - RF Gain 25 dB
  - Signal Input 10 MHz – 3 GHz
  
- Test Receiver ( HP 8546A )
  - Resolution Bandwidth 120 KHz
  - Frequency Band 9 K – 6.5 GHz
  - Quasi-Peak Detector ON for Quasi-Peak Mode  
OFF for Peak Mode
  
- Spectrum Analyzer ( HP 8560E )
  - Attenuation 10 dB
  - Start Frequency 30 MHz
  - Stop Frequency 1000 MHz
  - Resolution Bandwidth 120 KHz
  - Signal Input 30 MHz – 2.9 GHz

## 6.2 Test Procedures

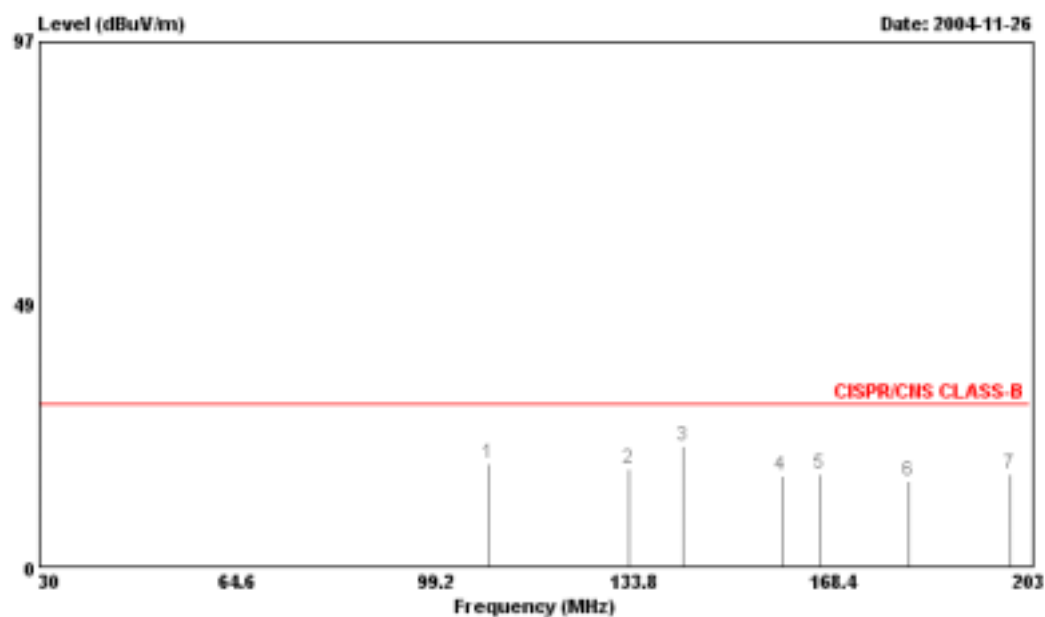
- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 10 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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 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



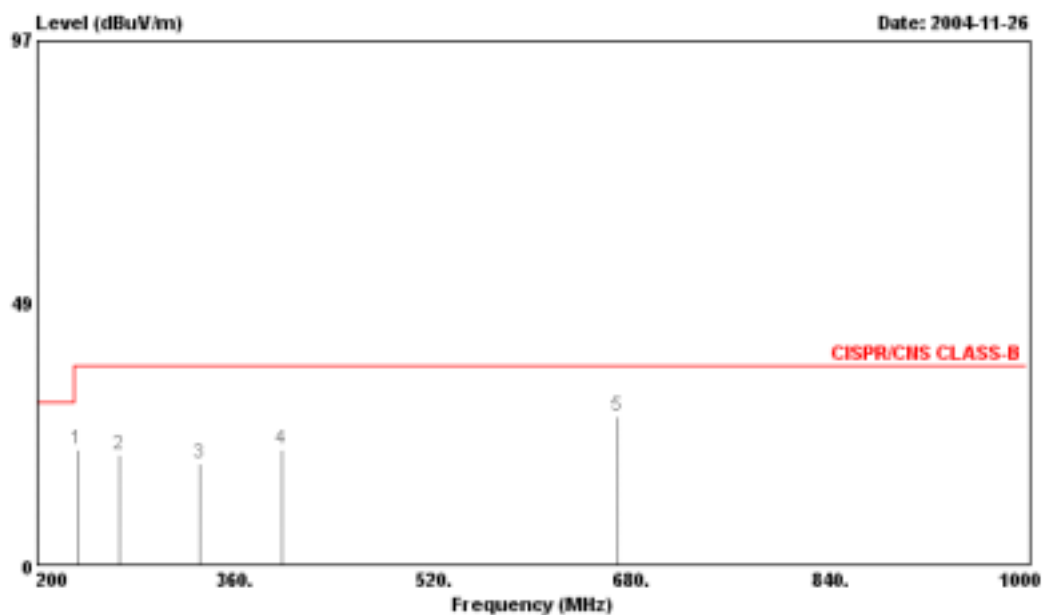
## 6.4 Test Result of Radiated Emission

- Frequency Range of Test : from 30 MHz to 1000 MHz
- Temperature : 23°C
- Relative Humidity : 62%
- 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 a frame in the following data



Site : LK-OS04  
Condition : CISPR/CNS CLASS-B 10m CHASE2288-930610 HORIZONTAL  
EUT : S.P.S  
POWER : 230VAC  
MODEL :  
MEMO : FULL SYSTEM

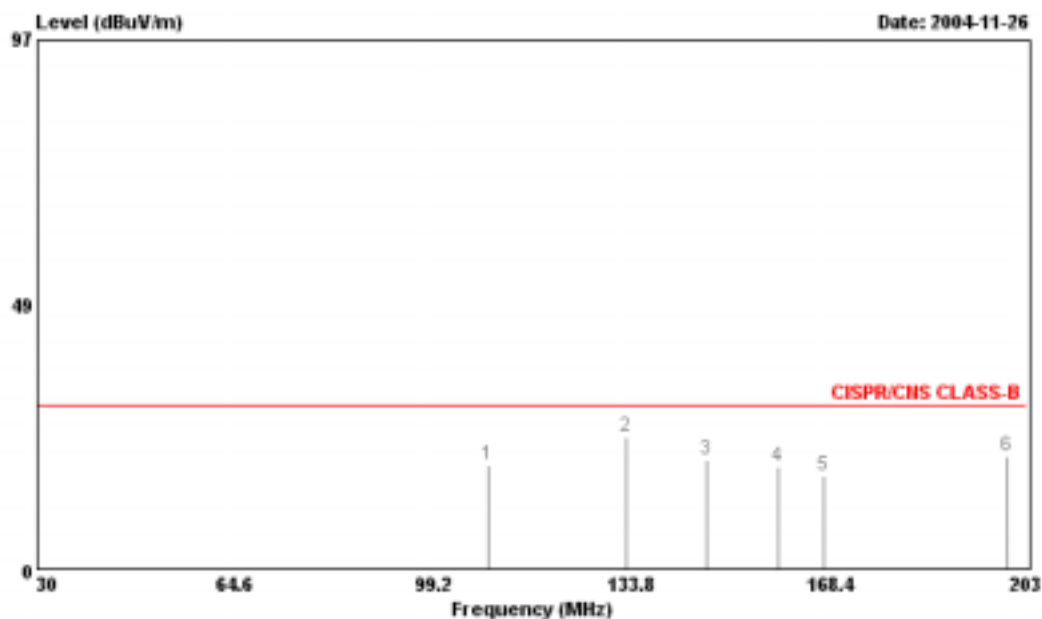
	Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	dB	dBuV/m	Level	Factor	Loss	Factor	Pos	Pos
					dBuV	dB/m	dB	dB	cm	deg
1	108.540	19.16	-10.84	30.00	30.59	12.13	1.34	24.90	Peak	---
2	133.110	18.00	-12.00	30.00	29.49	11.91	1.50	24.90	Peak	---
3	142.450	22.20	-7.80	30.00	34.26	11.34	1.50	24.90	Peak	---
4	159.750	16.89	-13.11	30.00	30.30	9.99	1.50	24.90	Peak	---
5	166.320	17.01	-12.99	30.00	30.82	9.59	1.50	24.90	Peak	---
6	181.890	15.74	-14.26	30.00	30.01	9.10	1.53	24.90	Peak	---
7	199.710	17.26	-12.74	30.00	31.53	8.96	1.67	24.90	Peak	---



Site : LK-OS04  
 Condition : CISPR/CNS CLASS-B 10m CHASE2288-930610 HORIZONTAL  
 EUT : S.P.S  
 POWER : 230VAC  
 MODEL :  
 MEMO : FULL SYSTEM

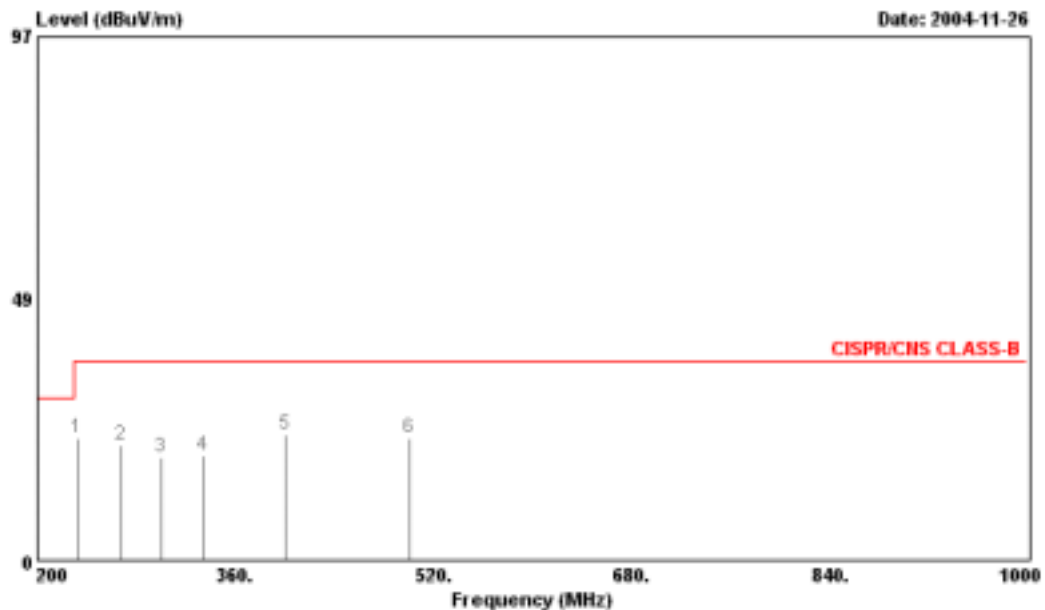
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	232.800	21.22	-15.78	37.00	33.50	10.84	1.78	24.90	Peak	---	---
2	266.400	20.45	-16.55	37.00	31.18	12.28	1.89	24.90	Peak	---	---
3	331.200	18.75	-18.25	37.00	27.16	14.28	2.21	24.90	Peak	---	---
4	398.400	21.38	-15.62	37.00	27.33	16.45	2.50	24.90	Peak	---	---
5	668.800	27.59	-9.41	37.00	30.17	19.08	3.37	25.03	Peak	---	---





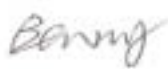
Site : LK-OS04  
 Condition : CISPR/CNS CLASS-B 10m CHASE2288-930610 VERTICAL  
 EUT : S.P.S  
 POWER : 230VAC  
 MODEL :  
 MEMO : FULL SYSTEM

	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	108.720	19.08	-10.92	30.00	30.51	12.13	1.34	24.90	Peak	---	---
2 @	132.940	24.35	-5.65	30.00	35.84	11.91	1.50	24.90	Peak	100	241
3	146.950	20.13	-9.87	30.00	32.64	10.89	1.50	24.90	Peak	---	---
4	159.580	18.82	-11.18	30.00	32.23	9.99	1.50	24.90	Peak	---	---
5	167.540	17.27	-12.73	30.00	31.14	9.53	1.50	24.90	Peak	---	---
6	199.540	20.75	-9.25	30.00	35.02	8.96	1.67	24.90	Peak	---	---



Site : LK-OS04  
Condition : CISPR/CNS CLASS-B 10m CHASE2288-930610 VERTICAL  
EUT : S.P.S  
POWER : 230VAC  
MODEL :  
MEMO : FULL SYSTEM

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	232.800	22.55	-14.45	37.00	34.83	10.84	1.78	24.90	Peak	---
2	268.000	21.18	-15.82	37.00	31.83	12.34	1.91	24.90	Peak	---
3	300.000	19.20	-17.80	37.00	28.83	13.27	2.00	24.90	Peak	---
4	333.600	19.35	-17.65	37.00	27.69	14.34	2.22	24.90	Peak	---
5	400.800	23.43	-13.57	37.00	29.33	16.49	2.51	24.90	Peak	---
6	501.600	22.49	-14.51	37.00	26.92	17.73	2.84	25.00	Peak	---

Test Engineer : 

Benny Lee

## 6.5 Photographs of Radiated Emission Test Configuration

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

FRONT VIEW



REAR VIEW



## 7. Harmonics Test

### 7.1 Standard

- Standard : EN 61000-3-2:2000

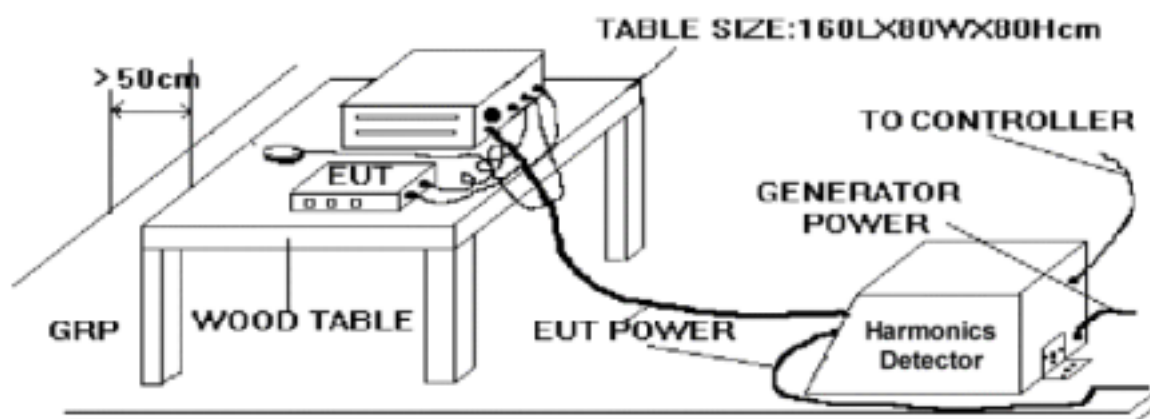
### 7.2 Test Procedure

The measured values of the harmonics components of the input current, including line current and neutral current, shall be compared with the limits given in Clause 7 of EN 61000-3-2.

### 7.3 Test Equipment Settings

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Device Class : A
- Current Measurement Range : High
- Measurement Delay : 10.0 seconds
- Test Duration : 2.00 minutes
- Class determination Pre-test Duration : 10.00 seconds

### 7.4 Test Setup





## 7.5 Current Harmonics Test

### 7.5.1 Test Data Of Current Harmonics

- FINAL TEST RESULT : **PASS**
- Temperature : 23°C
- Relative Humidity : 53%
- Test Date : Dec. 02, 2004

Operator : JASON  
Unit : POWER SUPPLIES  
Serialnumber.: SS-600HT ACTIVE PFC  
Remarks :

Urms = 230.1V Freq = 50.000 Range: 5 A  
Irms = 2.068A Ipk = 3.252A cf = 1.573  
P = 462.6W Pap = 475.8VA pf = 0.972  
THDi = 13.7 % THDu = 0.10 % Class A

Test - Time : 2min ( 100 %)

Test completed, Result: PASSED

Order	Freq.	Iavg	Iavg%	Irms	Irms%	Imax	Imax%	Limit
Status								
1	50	2.0480	99.041	2.0477	99.026	2.0480	99.041	
2	100	0.0000	0.0000	0.0027	0.1328	0.0027	0.1328	1.0800
3	150	0.2667	12.898	0.2670	12.913	0.2670	12.913	2.3000
4	200	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.4300
5	250	0.0580	2.8040	0.0583	2.8188	0.0583	2.8188	1.1400
6	300	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.3000
7	350	0.0427	2.0661	0.0427	2.0661	0.0427	2.0661	0.7700
8	400	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.2300
9	450	0.0305	1.4758	0.0305	1.4758	0.0305	1.4758	0.4000
10	500	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.1840
11	550	0.0214	1.0331	0.0217	1.0478	0.0217	1.0478	0.3300
12	600	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.1533
13	650	0.0208	1.0035	0.0208	1.0035	0.0208	1.0035	0.2100
14	700	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.1314
15	750	0.0195	0.9445	0.0195	0.9445	0.0195	0.9445	0.1500
16	800	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.1150
17	850	0.0180	0.8707	0.0180	0.8707	0.0180	0.8707	0.1324
18	900	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.1022
19	950	0.0000	0.0000	0.0098	0.4723	0.0098	0.4723	0.1184
20	1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0920
21	1050	0.0000	0.0000	0.0046	0.2214	0.0049	0.2361	0.1071
22	1100	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.0836
23	1150	0.0000	0.0000	0.0067	0.3247	0.0070	0.3394	0.0978
24	1200	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.0767
25	1250	0.0000	0.0000	0.0058	0.2804	0.0058	0.2804	0.0900
26	1300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0708
27	1350	0.0000	0.0000	0.0070	0.3394	0.0070	0.3394	0.0833
28	1400	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.0657
29	1450	0.0000	0.0000	0.0040	0.1919	0.0040	0.1919	0.0776
30	1500	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.0613
31	1550	0.0000	0.0000	0.0034	0.1623	0.0034	0.1623	0.0726
32	1600	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.0575
33	1650	0.0000	0.0000	0.0101	0.4870	0.0104	0.5018	0.0682
34	1700	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.0541
35	1750	0.0000	0.0000	0.0027	0.1328	0.0031	0.1476	0.0643
36	1800	0.0000	0.0000	0.0000	0.0000	0.0003	0.0148	0.0511
37	1850	0.0000	0.0000	0.0076	0.3689	0.0079	0.3837	0.0608
38	1900	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.0484
39	1950	0.0000	0.0000	0.0061	0.2952	0.0064	0.3099	0.0577
40	2000	0.0000	0.0000	0.0003	0.0148	0.0003	0.0148	0.0460

Test Engineer :

Jason Jiang

## 8. Voltage Fluctuations Test

### 8.1 Standard

- Standard : EN 61000-3-3:1995+A1: 2001

### 8.2 Test Procedure

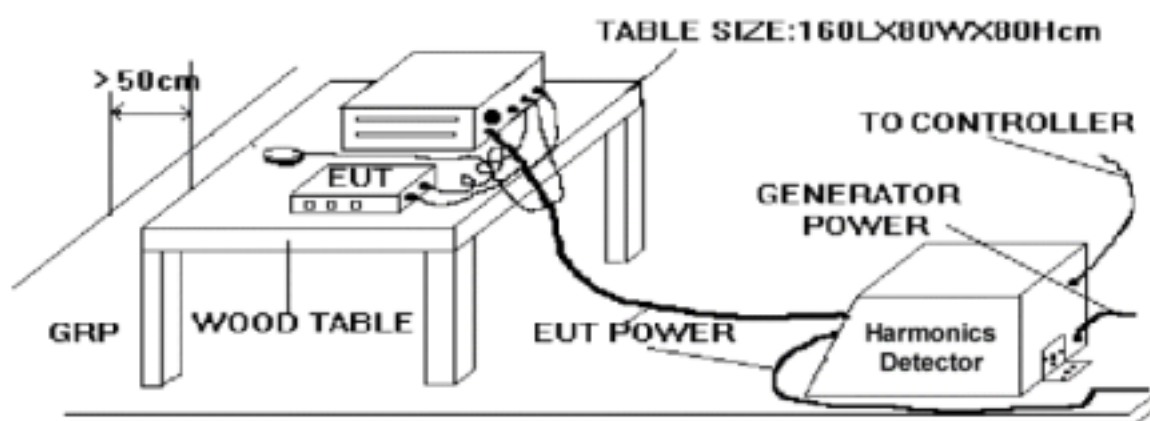
The equipment shall be tested under the conditions of **Clause 5**.

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of  $\pm 8\%$  is achieved during the whole assessment procedure.

### 8.3 Test Equipment Settings

- Line Voltage : 230 V
- Line Frequency : 50 Hz
- Measurement Delay : 10.0 seconds
- Pst Integration Time : 10 minutes
- Pst Integration Periods : 1
- Test Duration : 00:10:00 minutes

### 8.4 Test Setup



## 8.5 Test Result Of Voltage Fluctuation And Flicker Test

### 8.5.1 Test Data Of Voltage Fluctuation And Flicker

- FINAL TEST RESULT : **PASS**
- Temperature : 23°C
- Relative Humidity : 53%
- Test Date : Dec. 02, 2004

Urms = 230.1V    Freq = 50.000    Range: 5A  
 Irms = 2.068A    Ipk = 3.259A    cf = 1.576  
 P = 462.94W    Pap = 475.8VA    pf = 0.973

Test - Time : 1 x 10min = 10min ( 100 %)

LIN (Line Impedance Network) : Soft LIN 0.24 Ohm +j 0.15 Ohm N: 0.16 Ohm + j 0.10 Ohm

Limits :    Plt : 0.65    Pst : 1.00  
              dmax : 4.00 %    dc : 3.30 %  
              dtLim : 3.30 %    dt>Lim: 500ms

Plt = 0.072

	Pst	P50s	P10s	P3s	P1s	P0.1s	dmax	dc	dt>Lim
1	0.072	0.010	0.010	0.010	0.010	0.010	0.000	0.010	0.000

Test Engineer :

*Jason*

Jason Jiang

## 8.6 Photographs Of Harmonics Test, Voltage Fluctuation And Flicker Test

FRONT VIEW



REAR VIEW

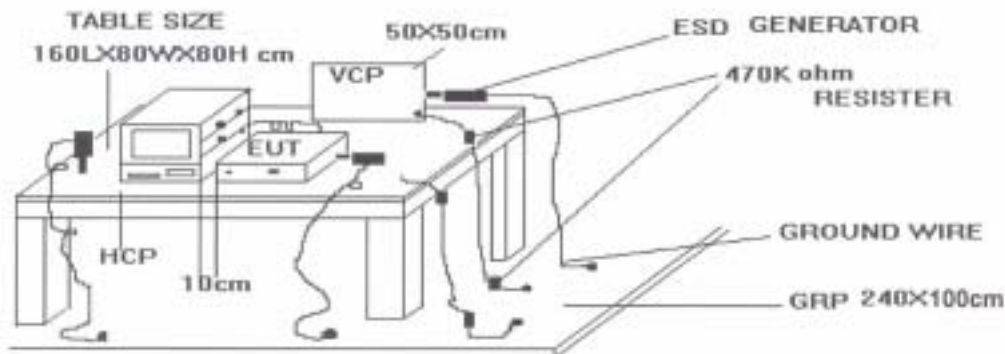




## 9. Electrostatic Discharge Immunity Test (ESD)

- FINAL TEST RESULT : **PASS**
- Pass Performance Criteria : **B**
- Required performance criteria : B
- Basic Standard : IEC 61000-4-2:2001
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Level : 3 for air discharge  
: 2 for contact discharge
- Test Voltage :  $\pm 2 / \pm 4 / \pm 8$  KV for air discharge  
:  $\pm 2 / \pm 4$  KV for contact discharge
- Temperature : 23°C
- Relative Humidity : 51%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004
- Observation : *During the test, the EUT was interfered. After the test, the equipment continued to operate as intended without operator intervention operate.*

### 9.1 Test Setup



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 follow 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.

## **9.2 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.

### 9.3 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 both air discharge and contact discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On preselected points at least 25 single discharges (in the most sensitive polarity) shall be applied on contact discharge.
- 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 :
  - 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.
  - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
  - The contact discharge test shall not be applied to such surfaces.
- h. 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.

## 9.4 Test Severity Levels

### 9.4.1 Contact Discharge

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

Remark : "X" is an open level.

### 9.4.2 Air Discharge

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

Remark : "X" is an open level.

## 9.5 Test Points

### 9.5.1 Test Result of Air Discharge

Test Point	Voltage	Tested No.
Power Switch	$\pm 2 / \pm 4 / \pm 8$ KV	BY 10
AC Socket	$\pm 2 / \pm 4 / \pm 8$ KV	BY 10

9.5.2 Test Result of Contact Discharge

Polarity	Voltage	Tested No.
Horizontal(At Front)	$\pm 2 / \pm 4$ KV	BY 25
Horizontal (At Left)	$\pm 2 / \pm 4$ KV	BY 25
Horizontal (At Right)	$\pm 2 / \pm 4$ KV	BY 25
Horizontal (At Rear)	$\pm 2 / \pm 4$ KV	BY 25
Vertical (At Front)	$\pm 2 / \pm 4$ KV	BY 25
Vertical (At Left)	$\pm 2 / \pm 4$ KV	BY 25
Vertical (At Right)	$\pm 2 / \pm 4$ KV	BY 25
Vertical (At Rear)	$\pm 2 / \pm 4$ KV	BY 25
Case	$\pm 2 / \pm 4$ KV	BY 25
Screw	$\pm 2 / \pm 4$ KV	BY 25

Test Engineer :

*Jason*

Jason Jiang

## 9.6 Photographs of Electrostatic Discharge Immunity Test

FRONT VIEW



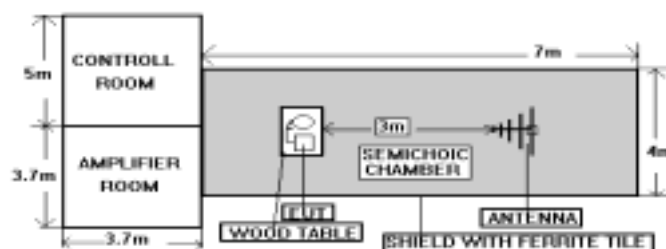
REAR VIEW



## 10. Radio Frequency Electromagnetic Field Immunity Test (RS)

- FINAL TEST RESULT : **PASS**
- Pass Performance Criteria : **A**
- Required performance criteria : A
- Basic Standard : IEC 61000-4-3:2002
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Level : 2
- Frequency Range : 80-1000 MHz
- Field Strength : 3 V/m (Modulated 80% AM)
- Temperature : 23°C
- Relative Humidity : 53%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004
- Observation : Normal

### 10.1 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.



## 10.2 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 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 generating antenna facing each of four sides 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, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of  $1.5 \times 10^{-3}$  decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

## 10.3 Test Severity Levels

Frequency Band : 80-1000 MHz

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

Remark : "X" is an open class.

Test Engineer : Jason  
Jason Jiang

#### 10.4 Photographs of Radio Frequency Electromagnetic Field Immunity Test

FRONT VIEW



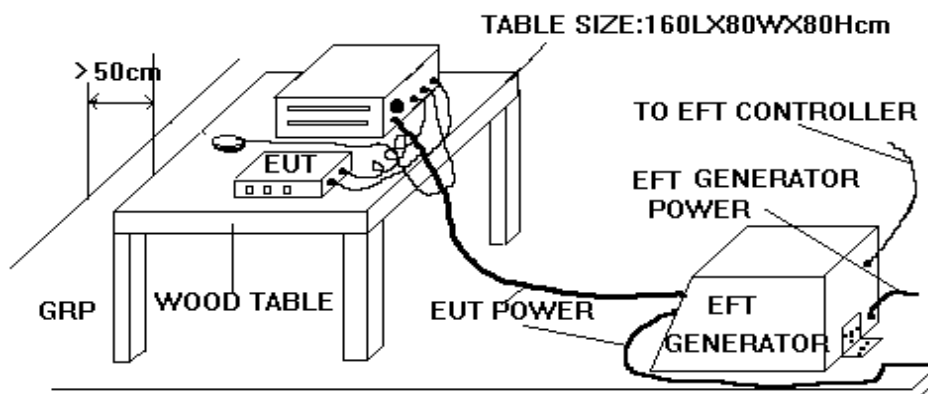
REAR VIEW



## 11. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)

- FINAL TEST RESULT : **PASS**
- Pass Performance Criteria : **B**
- Required performance criteria : B
- Basic Standard : IEC 61000-4-4:1995+A1:2000+A2:2001
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Level : on Power Supply -- 2
- Test Voltage : on Power Supply --  $\pm 0.5 / \pm 1.0$  KV
- Temperature : 23°C
- Relative Humidity : 51%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004
- Observation : *During the test, the EUT was interfered. After the test, the equipment continued to operate as intended without operator intervention operate.*

### 11.1 Test setup



The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1m thick. If the EUT is table-top equipment, it was located approximately 0.8m above the GRP.. The GRP. 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. It shall project beyond the EUT by at least 0.1m on all sides and connected to the protective earth. 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. The minimum distance between the EUT and other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. Using the coupling clamp, the minimum distance between the coupling plates and all other conductive structures, except the GRP. beneath the EUT, was more than 0.5 m. The length of the signal and power lines between the coupling device and the EUT was 1m or less.

## **11.2 Test on Power Line**

- a. The EFT/B-generator was located on the GRP.. The length from the EFT/B-generator to the EUT as not exceed 1 m.
- b. The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

## **11.3 Test on Communication Lines**

- a. The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP..
- b. The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

#### **11.4 Test Procedure**

- a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
  - ambient temperature: 15 to 35 ;
  - relative humidity : 45% to 75%;
  - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)..
- b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.
- c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.
- d. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
  - Normal performance within the specification limits.
  - Temporary degradation or loss of function or performance which is self-recoverable.
  - Temporary degradation or loss of function or performance which requires operator intervention or system reset.
  - Degradation or loss of function which is not recoverable due to damage of equipment (components).

## 11.5 Test Severity Levels

The following test severity levels are recommended for the fast transient/burst test :

Open circuit output test voltage $\pm 10\%$		
Level	On Power Supply	On I/O signal, data and control line
1	0.5 KV	0.25 KV
2	1.0 KV	0.50 KV
3	2.0 KV	1.00 KV
4	4.0 KV	2.00 KV
X	Specified	Specified

Remark : " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.

Test Engineer :

*Jason*

Jason Jiang

## 11.6 Photographs of Electrical Fast Transient/Burst Immunity Test

FRONT VIEW



REAR VIEW



## 12. Surge Immunity Test

- FINAL TEST RESULT : **PASS**
- Pass performance Criteria : **B**
- Required performance criteria : B
- Basic Standard : IEC 61000-4-5:2001
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Surge wave form (Tr/Th) : 1, 2/50 ( 8/20 )  $\mu$  s
- Level : 3
- Test Voltage :  $\pm 1.0 / \pm 2.0$  KV
- Temperature : 23°C
- Relative Humidity : 51%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004
- Observation : *During the test, the EUT was interfered. After the test, the equipment continued to operate as intended without operator intervention operate.*

### 12.1 Test Record

Voltage (KV)	Test Location	Polarity	Phase Angle			
			0°	90°	180°	270°
<b>1 KV</b>	<b>L - N</b>	+	B	B	B	B
		-	B	B	B	B
<b>2 KV</b>	<b>L - PE</b>	+	B	B	B	B
		-	B	B	B	B
	<b>N - PE</b>	+	B	B	B	B
		-	B	B	B	B

⊕ Remark : PE = DC output GND



## 12.2 Test Level

Level	Open-circuit test voltage, $\pm 10\%$ , KV
1	0.5
2	1.0
3	2.0
4	4.0
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

## 12.3 Test Procedure

- a. Climatic conditions  
The climatic conditions shall comply with the following requirements :
  - ambient temperature : 15 to 35
  - relative humidity : 10 % to 75 %
  - atmospheric pressure : 86 kPa to 106 kPa ( 860 mbar to 1060 mbar )
- b. Electromagnetic conditions  
The electromagnetic environment of the laboratory shall not influence the test results.
- c. The test shall be performed according the test plan that shall specify the test set-up with
  - generator and other equipment utilized;
  - test level ( voltage/current );
  - generator source impedance;
  - internal or external generator trigger;
  - number of tests : at least five positive and five negative at the selected points;
  - repetition rate : maximum 1/min.
  - inputs and outputs to be tested;
  - representative operating conditions of the EUT;
  - sequence of application of the surge to the circuit;
  - phase angle in the case of a.c. power supply;
  - actual installation conditions, for example :
    - AC : neutral earthed,
    - DC : ( + ) or ( - ) earthed to simulated the actual earthing conditions.



- d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the A.C. voltage wave ( positive and negative ).
- e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
- f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.
- g. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worstcase voltage breakdown level ( let-through level ) of the primary protection.
- h. If the actual operating signal sources are not available, the may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according the a test plan.
- i. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test a previously unstressed equipment shall be used to the protection devices shall be replaced.

Test Engineer :

Jason Jiang

## 12.4 Photographs of Surge Immunity Test

FRONT VIEW



REAR VIEW



### 13. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test ( CS )

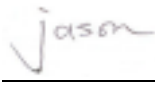
- FINAL TEST RESULT : **PASS**
- Pass performance Criteria : **A**
- Required performance criteria : A
- Basic Standard : IEC 61000-4-6:1996+A1:2000
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Level : 2
- Test Voltage : 3 V rms ( Modulated, 1KHz, 80%, AM )
- Frequency Range : 0.15 MHz to 80 MHz
- Dwell time : 2.9 seconds
- Frequency step size : 1 %
- Coupling mode : CDN-M3
- Temperature : 23°C
- Relative Humidity : 52%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004
- Observation : Normal

#### 13.1 Test Level

Level	Voltage Level ( EMF ),
1	1 V
2	3 V
3	10 V
x	Specified
NOTE - x is an open class. This level can be specified in the product specification.	

### 13.2 Test Procedure

- a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- b. This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
- c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- d. The frequency range is swept from 150 KHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1KHz sinewave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed  $1.5 \times 10^{-3}$  decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- e. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency(ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- f. An alternative test procedure may be adopted, wherein the frequency range is swept incrementally, with a step size not exceeding 4% of the start ad thereafter 4% of the preceding frequency value. The test level should be at least twice the value of the specified test level.
- g. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.
- h. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.
- i. The use of special exercising programs is recommended.
- j. Testing shall be performed according to a Test Plan, which shall be included in the test report.
- k. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.

Test Engineer :   
Jason Jiang

### 13.3 Photographs of CS Immunity Test

FRONT VIEW



REAR VIEW



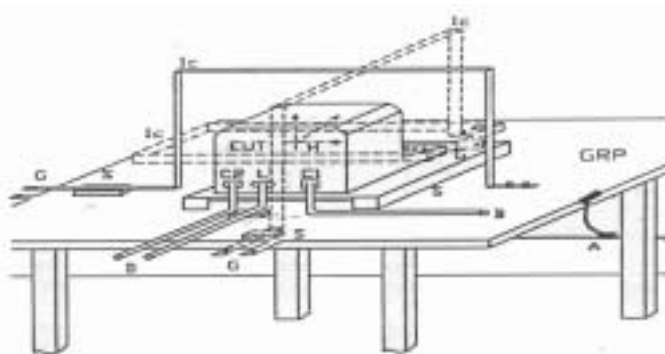
## 14. Power Frequency Magnetic Field Immunity Tests

- FINAL TEST RESULT : **PASS**
- Pass performance Criteria : **A**
- Required performance criteria : A
- Basic Standard : IEC 61000-4-8:2001
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Temperature : 23°C
- Relative Humidity : 53%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004
- Observation : Normal

### 14.1 Test Record

Power Frequency Magnetic Field	Testing duration	Coil Orientation
50Hz, 1A/m	1.0 Min	X-axis
50Hz, 1A/m	1.0 Min	Y-axis
50Hz, 1A/m	1.0 Min	Z-axis

### 14.2 Test Setup



- |                            |                                 |
|----------------------------|---------------------------------|
| GRP : Ground plane         | C1 : Power supply circuit       |
| A : Safety earth           | C2 : Signal circuit             |
| S : Insulating support     | L : Communication line          |
| EUT : Equipment under test | B : To power supply source      |
| Lc : Induction coil        | D : To signal source, simulator |
| E : Earth terminal         | G : To the test generator       |

Test Engineer : Jason

Jason Jiang

### 14.3 Photographs of Power Frequency Magnetic Field Immunity Tests

FRONT VIEW



REAR VIEW





## 15. Voltage Dips and Voltage Interruption Immunity Tests

- FINAL TEST RESULT : **PASS**
- Pass performance Criteria : **C** for Voltage Interruption, **A** for Voltage Dips
- Required performance criteria : C for voltage interruption, B/C for voltage dips
- Basic Standard : IEC 61000-4-11:2001
- Product Standard : EN 55024:1998+A1:2001+A2:2003
- Temperature : 23°C
- Relative Humidity : 52%
- Atmospheric Pressure : 98.7 kPa
- Test Date : Dec. 02, 2004

### 15.1 Test Record of Voltage Interruption

Voltage ( V )	Phase Angle		% Reduction	Duration ( Periods )	Observation
	0 °	180 °			
230	C	C	>95%	250	<i>After the interruption, the power of EUT was off. The power of the EUT must be reset by the operator.</i>

### 15.2 Test Record of Voltage Dips

Voltage ( V )	Phase Angle		% Reduction	Duration ( Periods )	Observation
	0 °	180 °			
230	A	A	30	25	<i>Normal</i>
230	A	A	>95 %	0.5	<i>Normal</i>

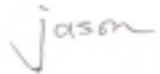
### 15.3 Testing Requirement and Procedure

The test was based on IEC 61000-4-11:2001

### 15.4 Test Conditions

1. Source voltage and frequency : 230V / 50Hz, Single phase.
2. Test of interval : 10 sec.
3. Level and duration : Sequency of 3 dips/interrupts.
4. Voltage rise (and fall) time : 1 ~ 5  $\mu$ s.
5. Test severity :

Voltage dip and Interrupt reduction (%)	Test Duration (ms)
30	500
60	100
100	10
100	80
100	5000

Test Engineer : 

Jason Jiang

## 15.5 Photographs of Voltage Dips and Voltage Interruption Immunity Tests

FRONT VIEW



REAR VIEW



## 16. List of Measuring Equipment Used

< EMI >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver	R&S	ESCS 30	836858/024	9 KHz - 2.75 GHz	Jul. 09, 2004	Conduction (CO01-LK)
LISN	Rolf Hoine	NNB-2/16Z	98087	9KHz ~ 30MHz	Aug. 30, 2004	Conduction (CO01-LK)
LISN	Rolf Hoine	NNB-2/16Z	98009	9KHz ~ 30MHz	Aug. 30, 2004	Conduction (CO01-LK)
RF Cable-CON	Suhner Switzerland	RG223/U	CB017	9KHz~30MHz	Dec. 18, 2003	Conduction (CO01-LK)
Open Area Test Site	SPORTON	OATS-10	OS04-LK	30MHz~1GHz 10m, 3m	Aug. 07, 2004	Radiation (OS04-LK)
Spectrum Analyzer	HP	8560E	3710A01187	9kHz – 1.8GHz	Oct. 01, 2004	Radiation (OS04-LK)
Amplifier	HP	87405A	3207A01437	10MHz – 3GHz	Aug. 31, 2004	Radiation (OS04-LK)
Receiver	HP	8546A	3325A00108	9 K – 6.5 GHz	Jan .14 .2004	Radiation (OS04-LK)
Bilog Antenna	CHASE	CBL6112B	2288	30MHz -2GHz	Jun. 10, 2004	Radiation (OS04-LK)
Turn Table	EMCO	2080	9711-2021	0 ~ 360 degree	N/A	Radiation (OS04-LK)
Antenna Mast	EMCO	2075	9711-2115	1 m- 4 m	N/A	Radiation (OS04-LK)
RF Cable-R10m	BELDEN	RG8/U	CB011	30MHz~1GHz	Jan. 08, 2004	Radiation (OS04-LK)
RF Cable-R03m	BELDEN	RG8/U	CB012	30MHz~1GHz	Jan. 08, 2004	Radiation (OS04-LK)

Calibration Interval of instruments listed above is one year.

**< EMS >**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	EM test	ESD30C P30C	1101-21	Air: 0 KV - 25 KV Contact: 0 KV -25KV	Aug. 02, 2004	ESD
Antenna	CHASE	CBL6121A	1027	26 MHz - 1 GHz	Dec. 08, 2003	RS
Field Strength Monitoring Antennas (Probe)	AR	FP3000A	16077	0.1 MHz - 1 GHz	Aug. 12, 2004	RS
RS immunity Test system	HP	EMS test System	2062	80 MHz - 1 GHz 3V/m, 10v/m	Dec. 08, 2003	RS
Amplifier	AR	100W 1000M3	16060	80 MHz - 1 GHz	Dec. 08, 2003	RS
Power Meter	EMC Automation	438A	3513U04050	100 KHz -4.2 GHz	Dec. 08, 2003	RS
Signal Generator	HP	8648A	3426A00771	100 KHz - 1 GHz	Dec. 04, 2003	RS
Power Sensor	HP	8481D	3318A13140	100 KHz - 1 GHz	Dec. 08, 2003	RS
Power Sensor	HP	8482A	3318A26464	100 KHz - 1 GHz	Dec. 08, 2003	RS
Attenuator	HP	8491A	53603	100 KHz - 1 GHz	Dec. 08, 2003	RS
EFT Generator	EMC PARTNER	TRANSIENT -2000	TRA2000-376	0KV - 4.4 KV	Apr. 29, 2004	EFT
Harmonic/Flicker Test System	EMC PARTNER	Harmonics -1000	HAR1000-41	4000VA 16A PEAK	Nov. 24, 2004	Harmonics, Flicker
Surge Generator	EMC PARTNER	TRANSIENT -2000	TRA2000-376	0 KV -6 KV/2 0KV-500V/12	Apr. 29, 2004	Surge
Conducted Immunity Test System Amplifier	FRANKONIA	CIT-10/75	1999010443	100KHz ~ 266MHz	Apr. 08, 2004	CS
Coupling and Decoupling Network	SCHAFFNER	CDN M016	16676	150KHz ~ 230MHz	Apr. 17, 2004	CS
Magnetic Generator	FCC (KEYTEK)	F-1000-4-8-G- 125A	03007	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Apr. 13, 2004	Magnetic
Magnetic field Immunity Loop	FCC (KEYTEK)	F-1000-4-8/9/10 -L-M	03003	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Apr. 13, 2004	Magnetic
DIP Generator	EMC -PARTNER	TRANSIENT -2000	TRA2000-376	230VA/50Hz/60Hz 0%Open/5S 0%Short/5S 40%0.10S 70%/0.01S	Apr. 29, 2004	DIP

# Calibration Interval of instruments listed above is one year.

## 17. Notice for Class A Product

**This Notice is for class A product only. If the Equipment under Test is a class B product, this notice should be disregarded.**

Class A ITE is a category of all other ITE which satisfies the class A ITE limits but not the class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use:

**Warning**

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## **18. Declaration of Conformity and the CE Mark**

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

### **18.1 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.

### **18.2 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.

### **18.3 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).

### **18.4 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.



## APPENDIX A. Photographs of EUT



402009-01.JPG

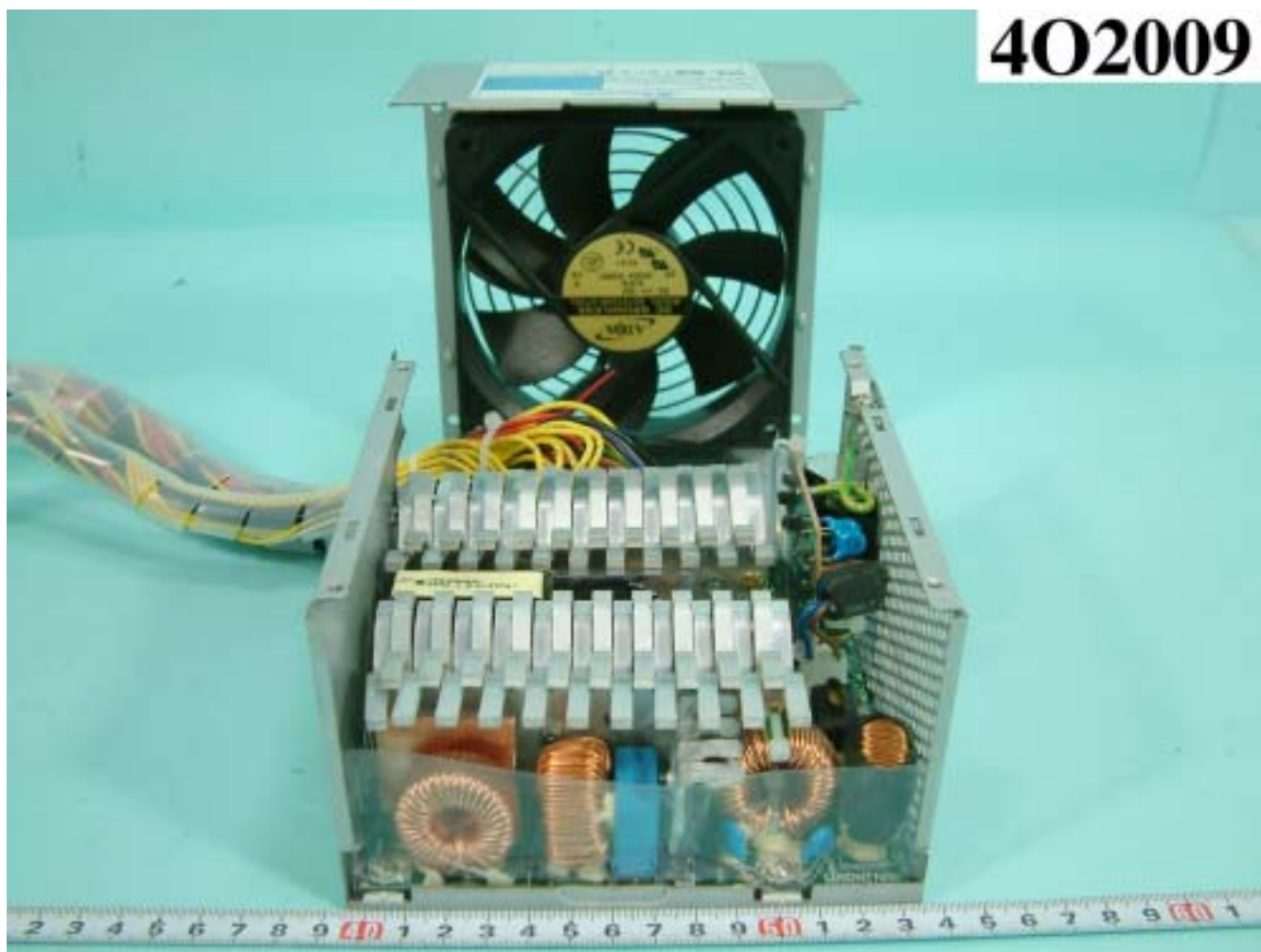




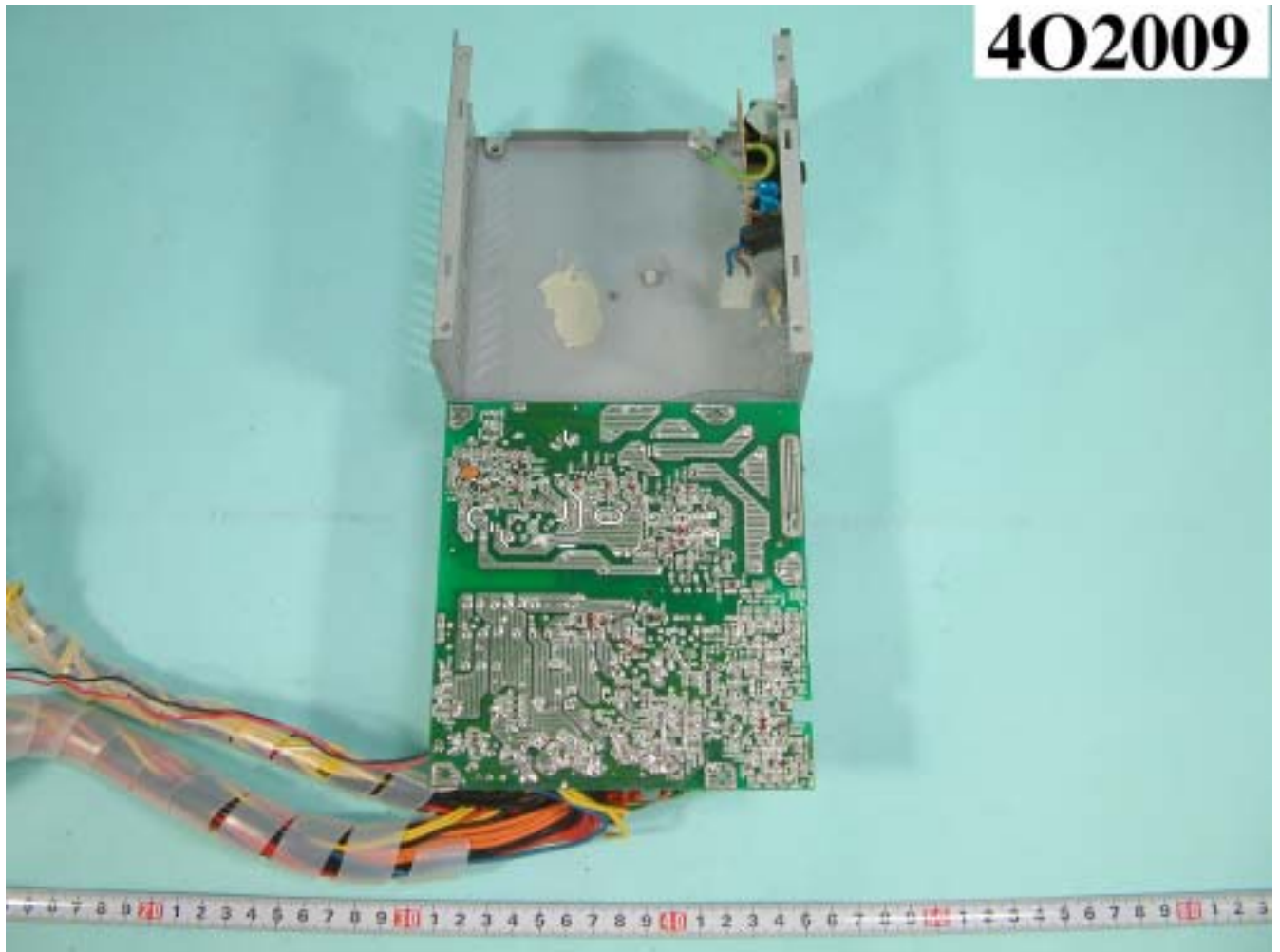
402009-02.JPG



402009-03.JPG

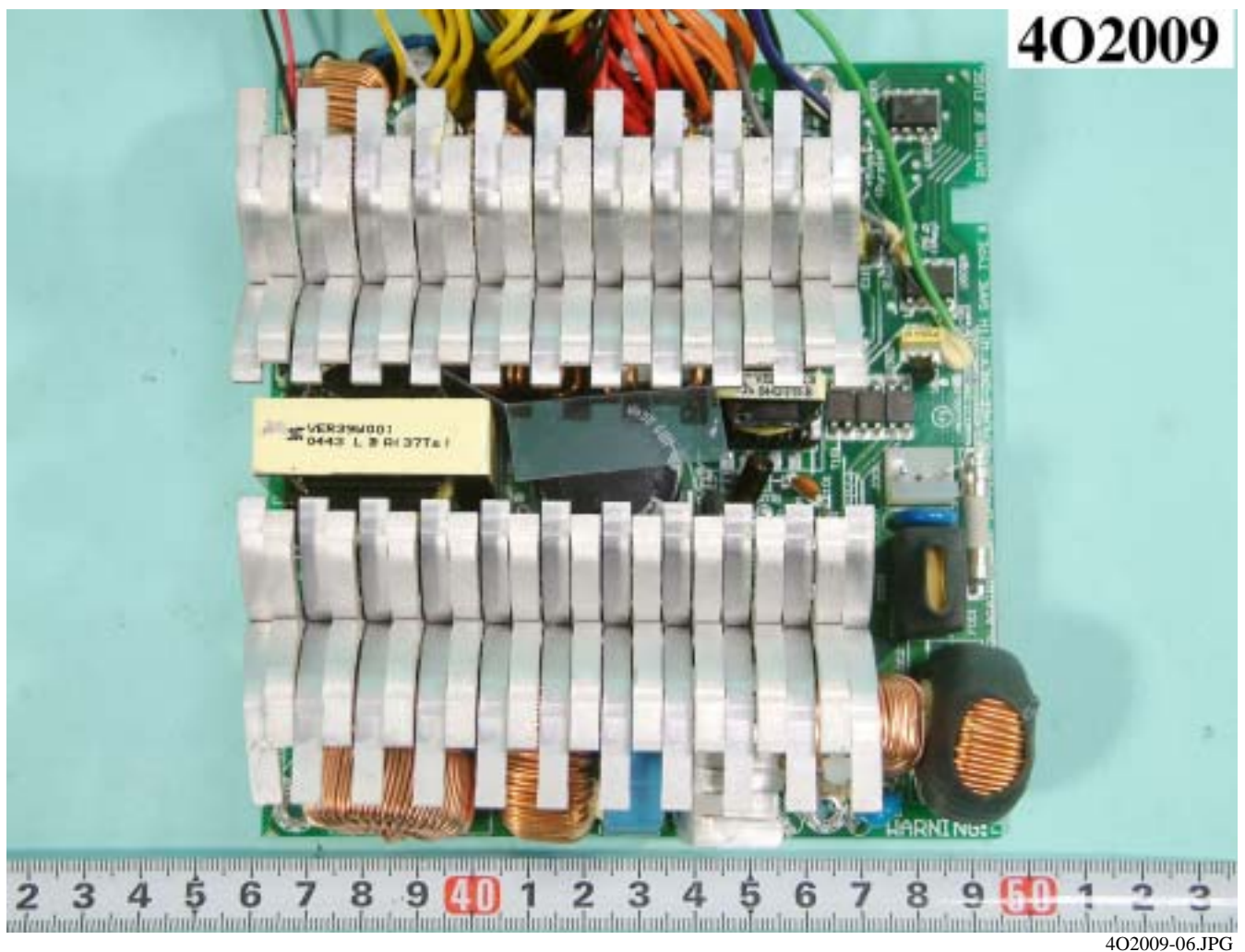


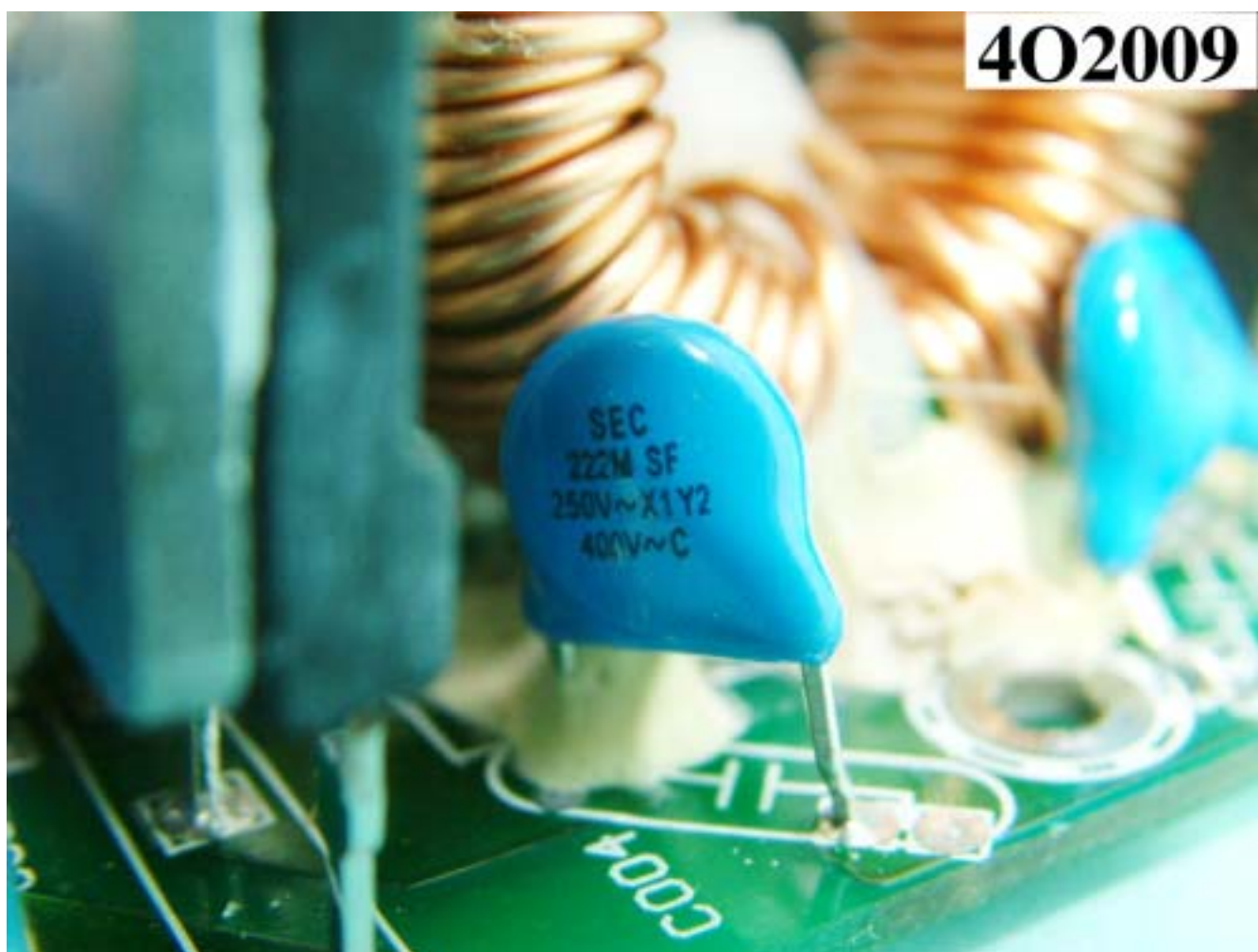
4O2009-04.JPG



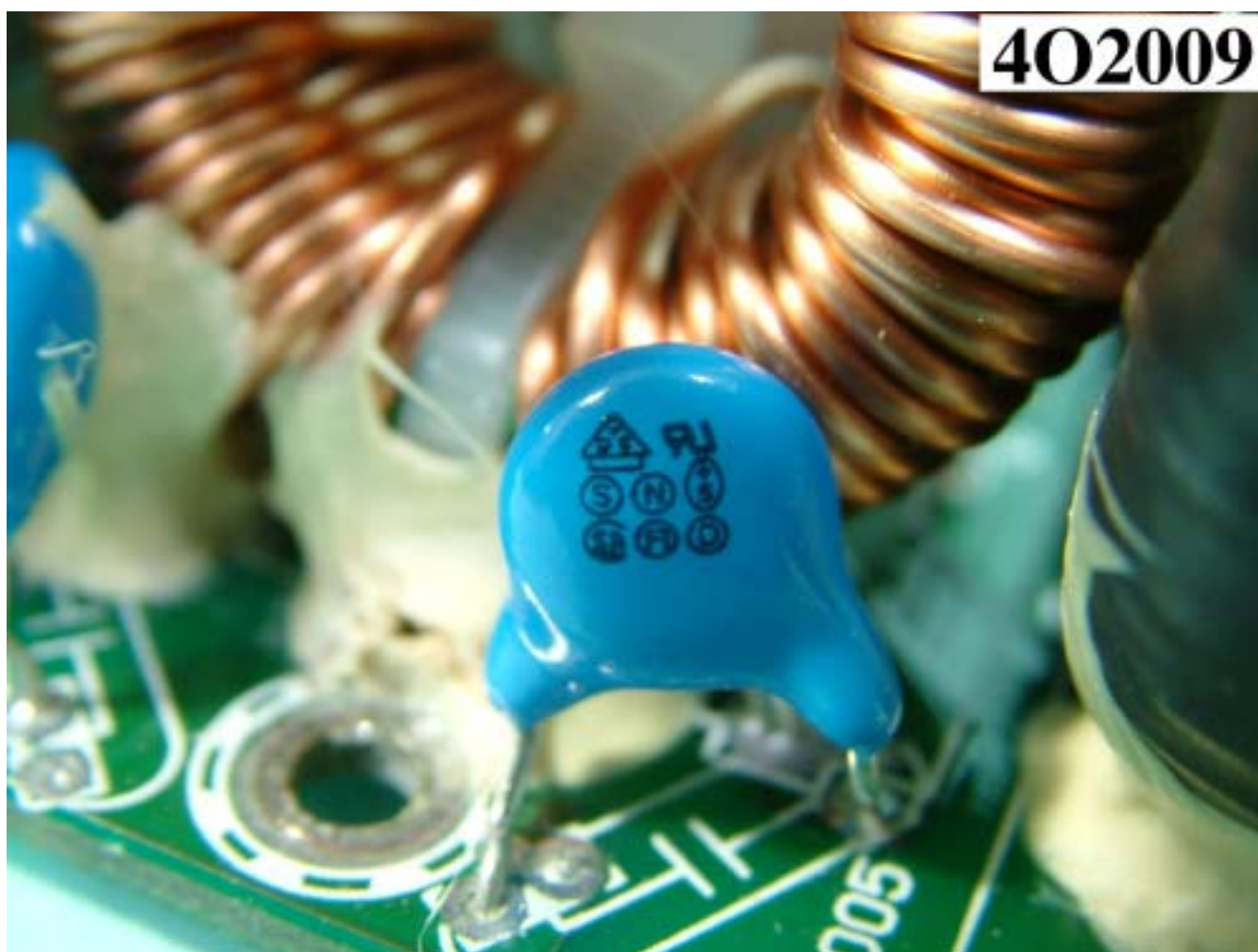
402009-05.JPG





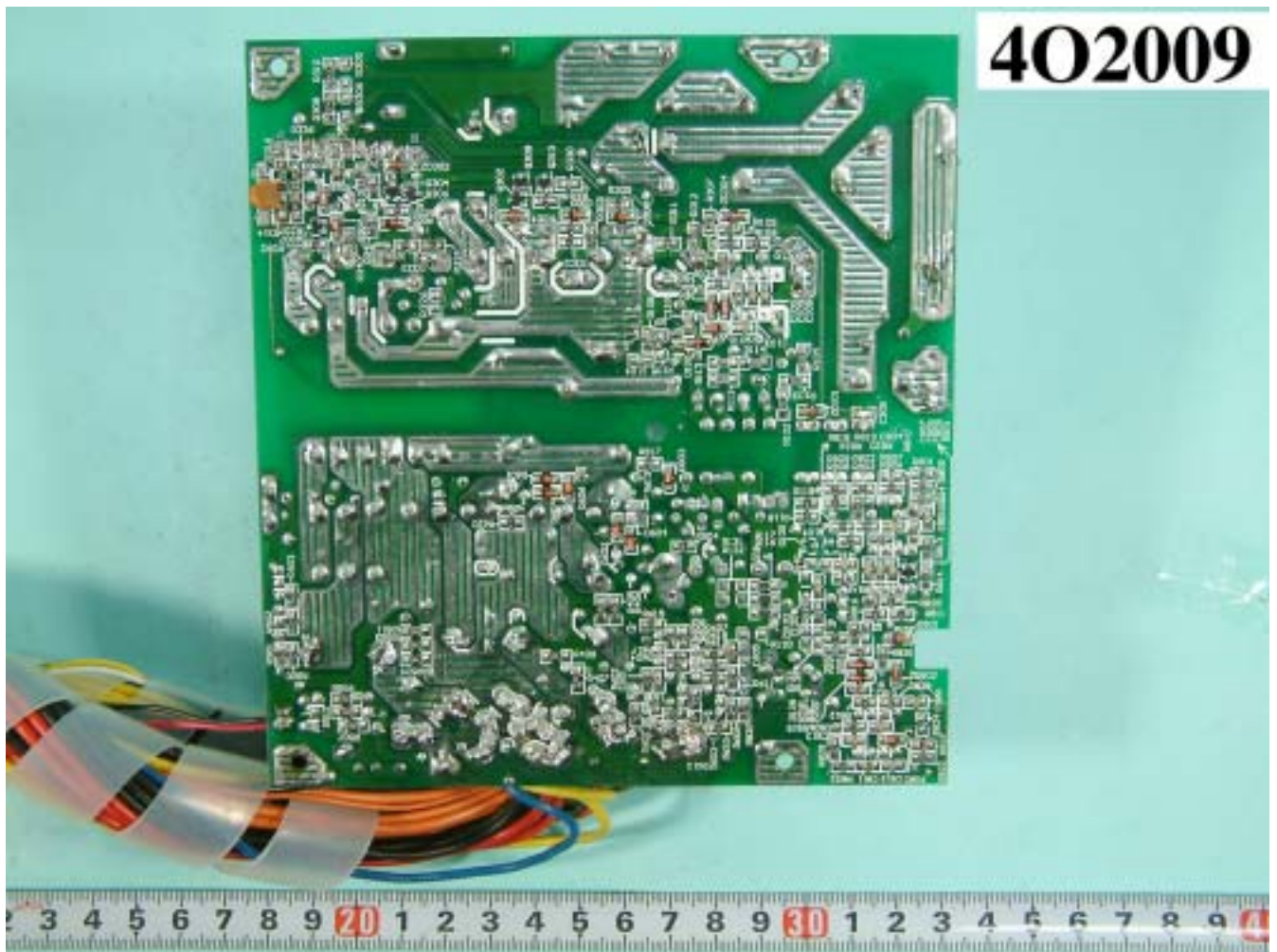


4O2009-07.JPG



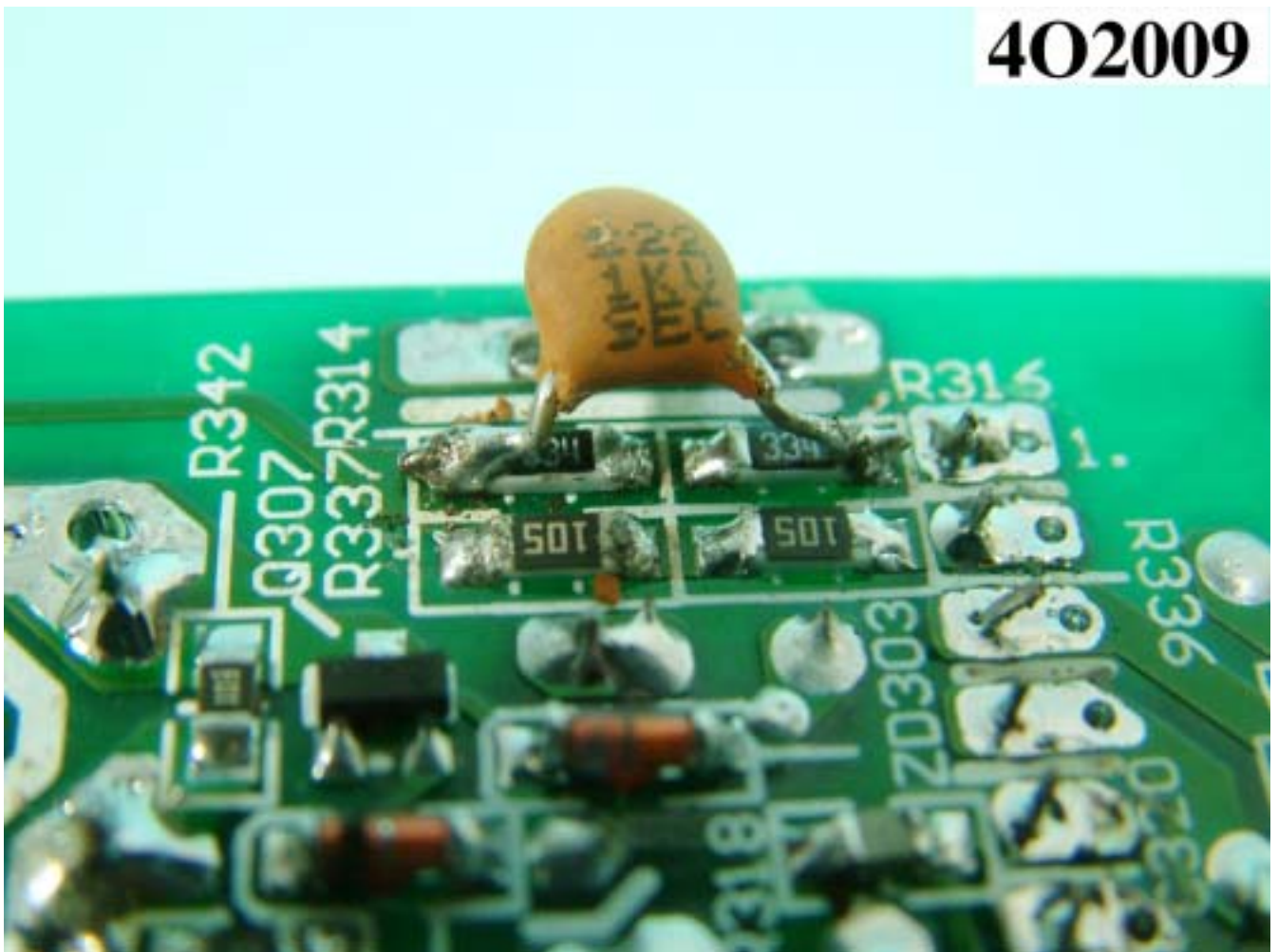
402009-08.JPG





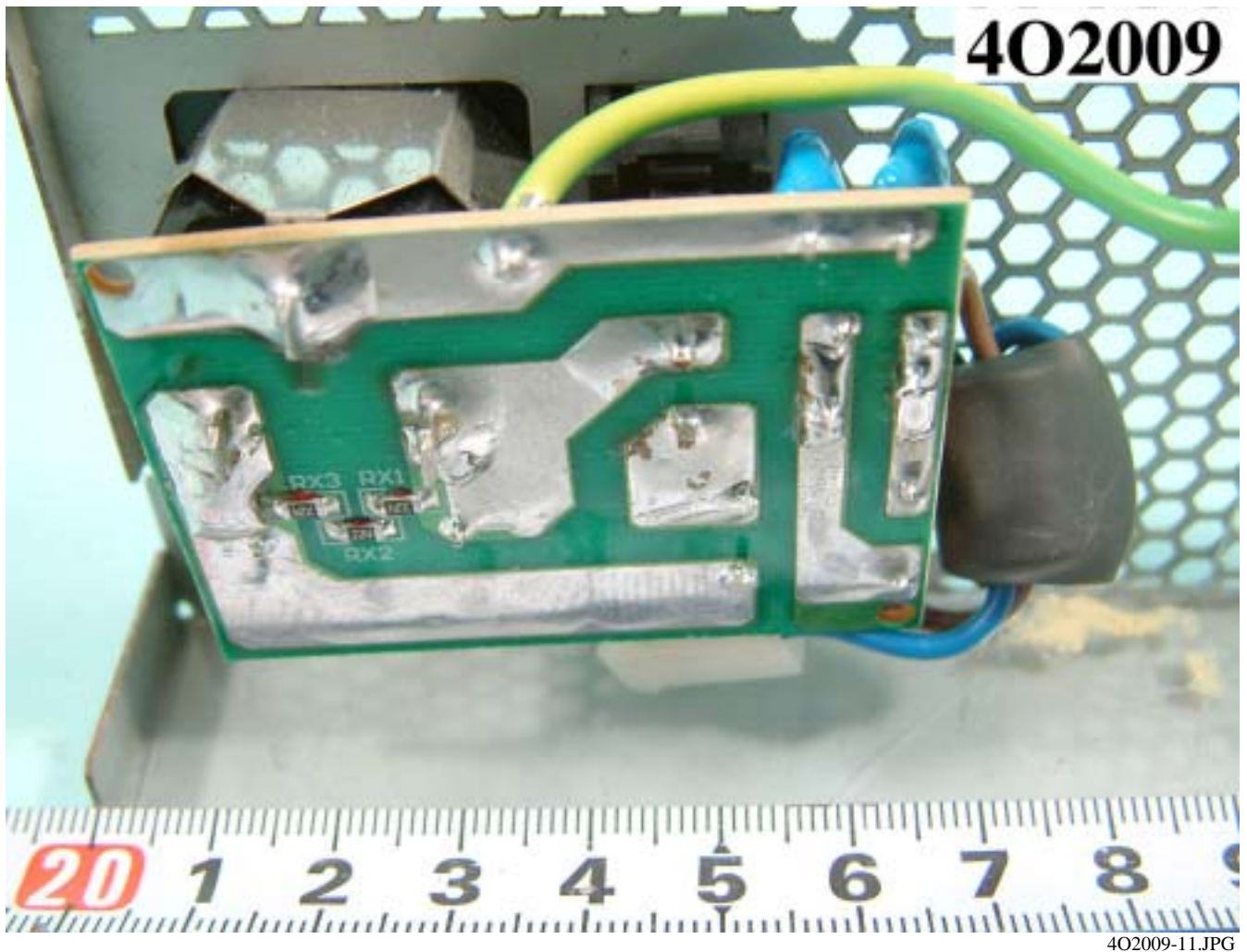
402009-09.JPG

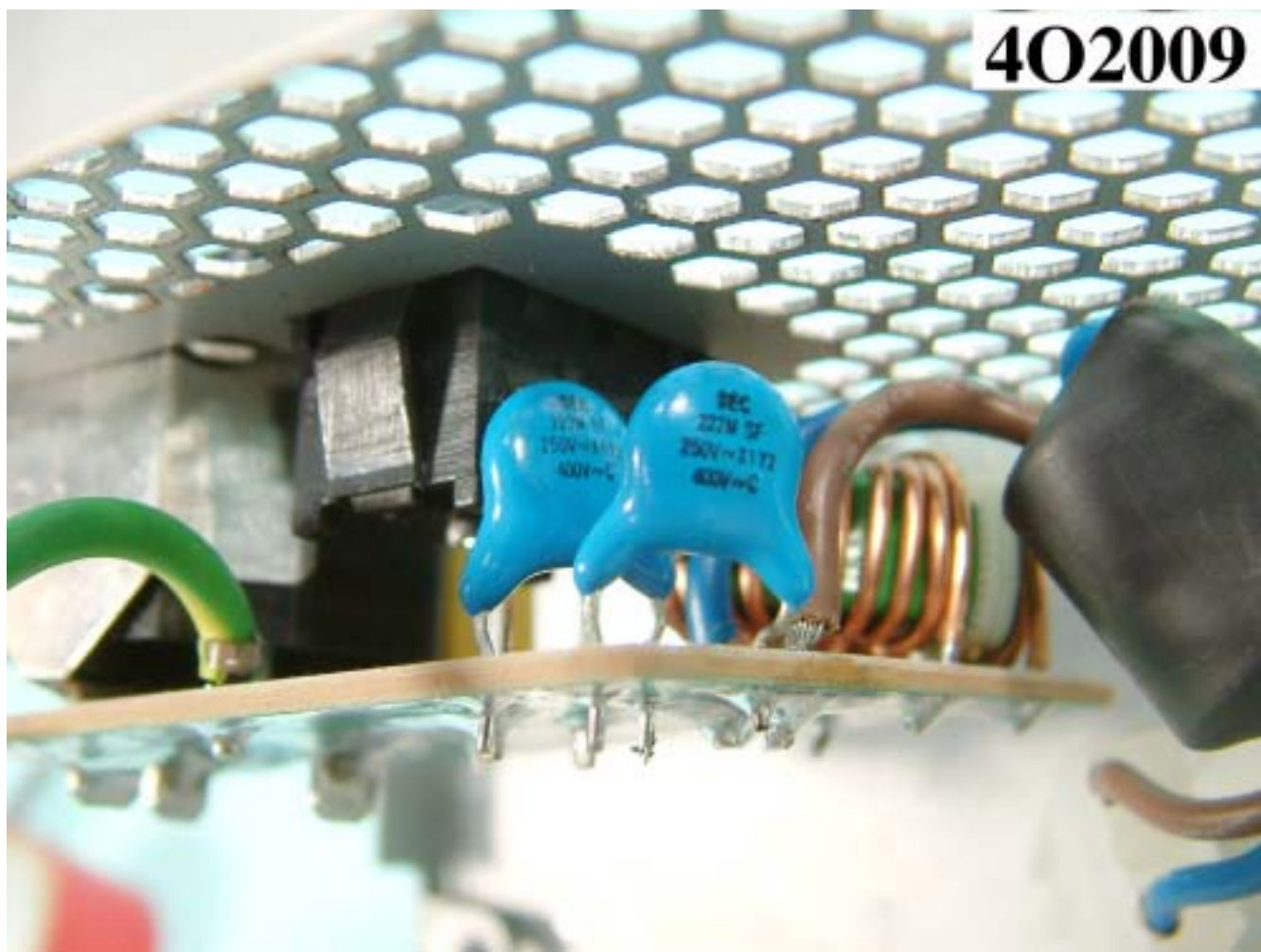




**4O2009**

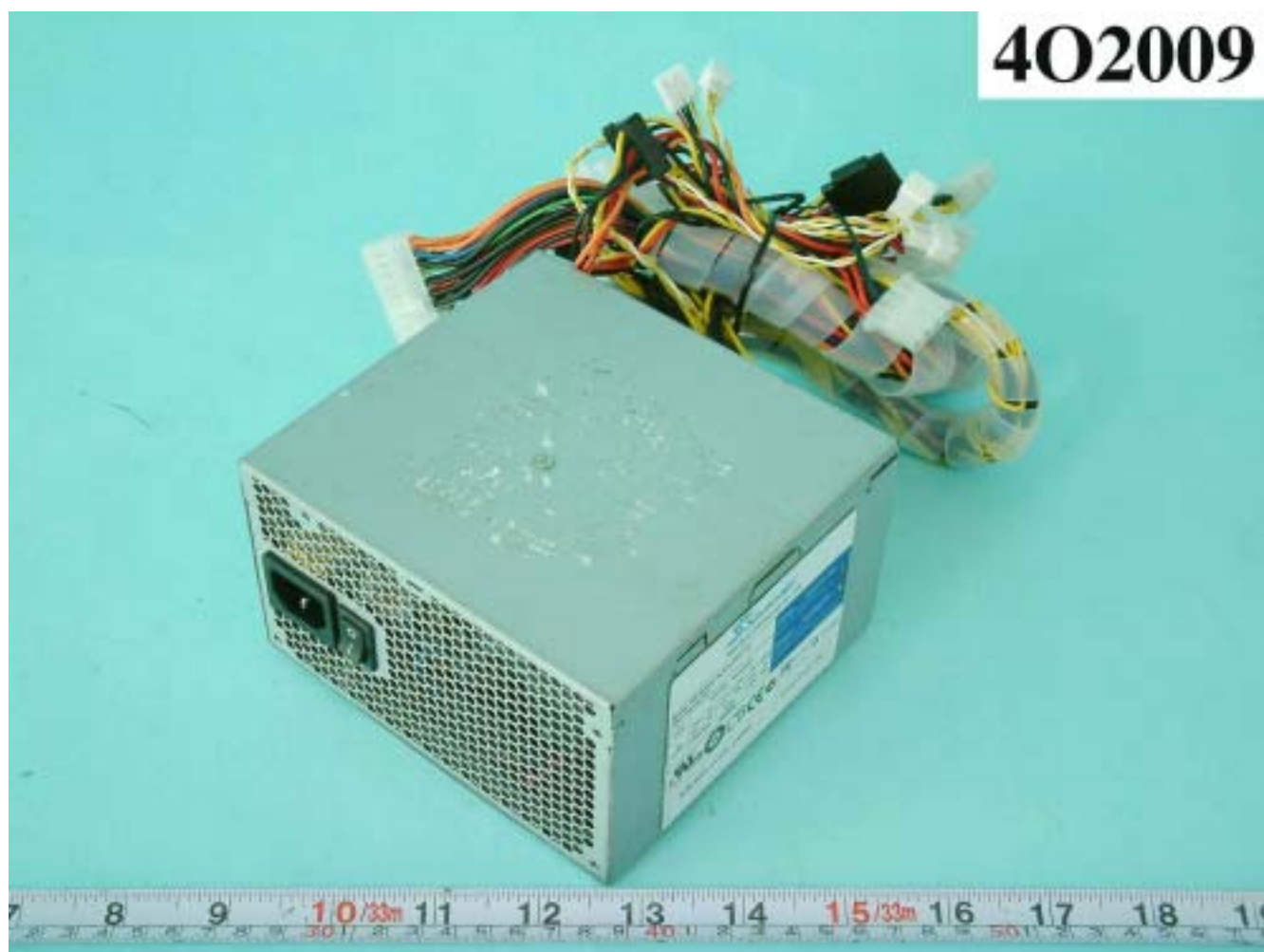
4O2009-10.JPG



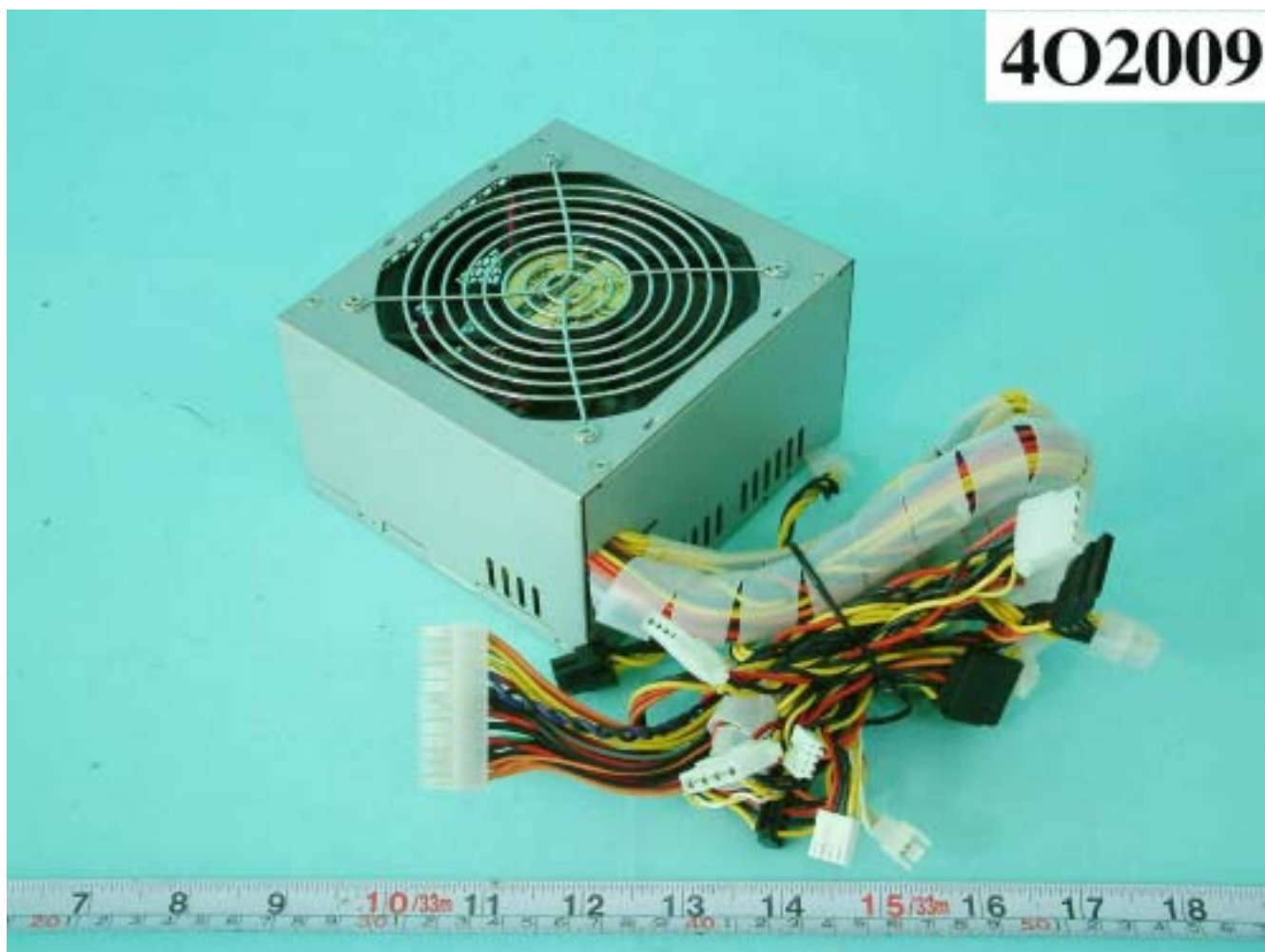


402009-12.JPG





402009-13.JPG



402009-14.JPG



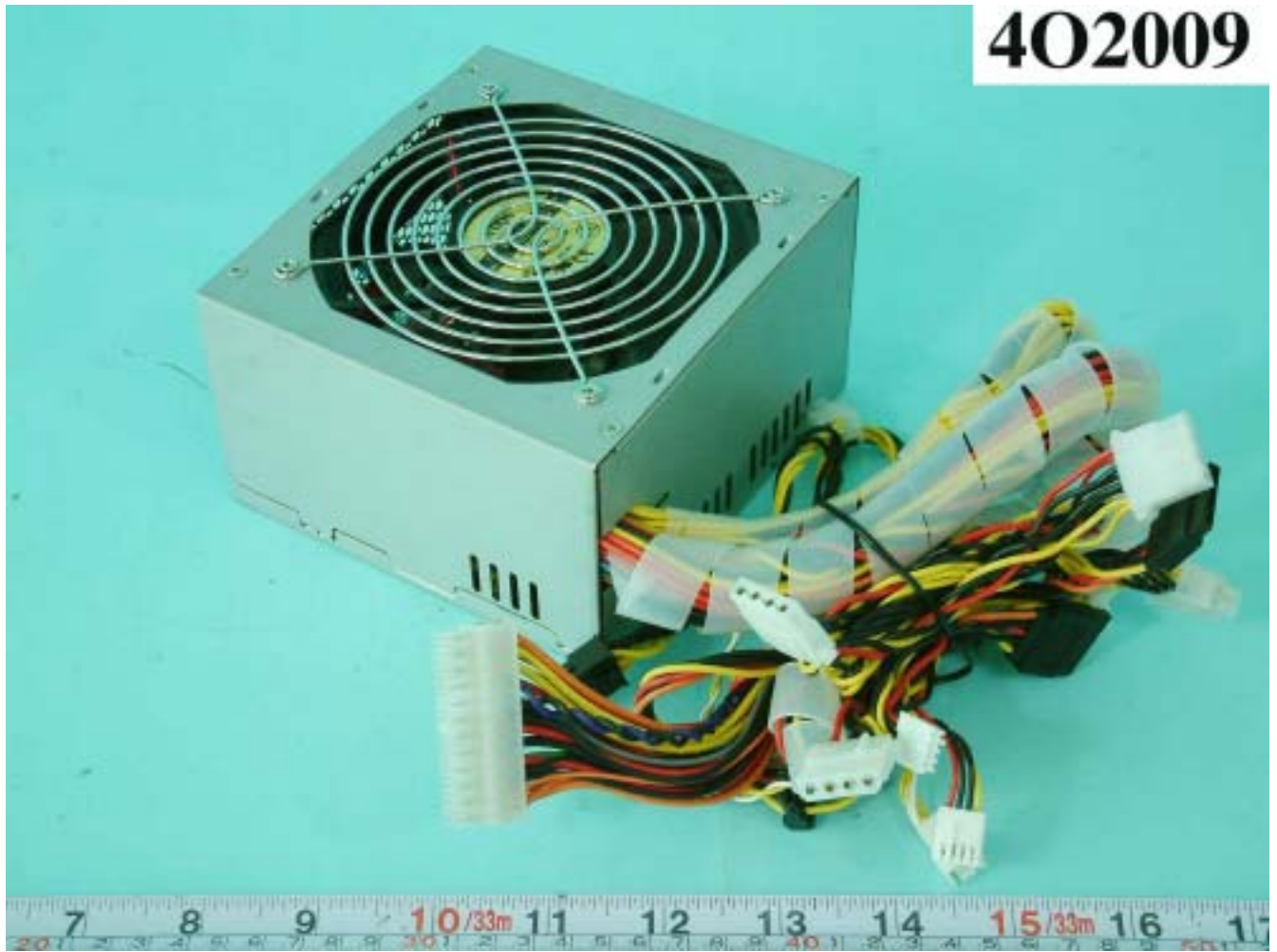
402009-15.JPG



**402009**

402009-16.JPG





402009-17.JPG





402009-18.JPG