



## EMC Testing Report



**Equipment Under Test :** BLOWER

**Model Number :** EXTRME EAGLE

**Serial No. :** AIR EAGLE, SUPER AIR EAGLE,  
AIR EAGLE PRO Q-VAC, AIR  
EAGLE PRO/W WACTHDOG, AIR  
EAGLE PRO TIMER, EAGLE-1PH,  
SUPER EAGLE-1.5, MINI EAGLE

**Applicant :** TOOL KING U.S.A. CO.

**Address of Applicant :** 1488 E. MISSION BLVD OMONA,  
CA. 91766

**Matrix Test Laboratory**  
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## Verification

**Applicant :** TOOL KING U.S.A. CO.  
**Manufacturer :** QUANZHOU TOOL KING MFG.CO.LTD  
**Equipment Under Test :** BLOWER  
**Model No. :** EXTRME EAGLE  
**Serial No. :** AIR EAGLE, SUPER AIR EAGLE,AIR EAGLE  
 PRO Q-VAC, AIR EAGLE PRO/W WACTHDOG,  
 AIR EAGLE PRO TIMER, EAGLE-1PH, SUPER  
 EAGLE-1.5, MINI EAGLE

**Test Standards :**

Emission:	Immunity:
<input checked="" type="checkbox"/> EN 61000-6-3:2001 A1:2004	<input checked="" type="checkbox"/> EN 61000-6-1:2001
<input checked="" type="checkbox"/> EN 61000-3-2:2001 A1+A2: 1998	<input checked="" type="checkbox"/> EN 61000-4-2
A14: 2000	<input checked="" type="checkbox"/> EN 61000-4-3
<input checked="" type="checkbox"/> EN 61000-3-3:1995 A1:2001	<input checked="" type="checkbox"/> EN 61000-4-4
	<input checked="" type="checkbox"/> EN 61000-4-5
	<input checked="" type="checkbox"/> EN 61000-4-6
	<input checked="" type="checkbox"/> EN 61000-4-11

**Remark:**

This report details the results of the testing carried out on one sample .The emission levels emanate from the device and the device endure and its performance criterion. This report shows the EUT is technically compliant with the EN 61000-6-3 and EN 61000-6-1 official requirements. This report applies to the above sample only and shall not be reproduced in part without written approval of Matrix Test Laboratory.

**Documented:**

**Date:** 2005-12-29

**Jody Peng**
**Test Engineer:**

**Date:** 2005-12-28

**Adam Yang**
**Approved:**

**Date:** 2005-12-29

**Peter Chin**

# 1 General Description

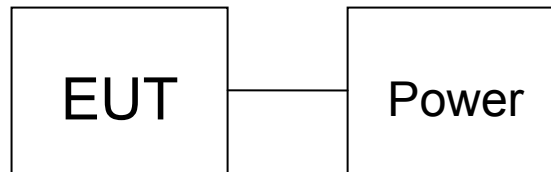
## 1.1 Description of EUT

<b>Equipment Under Test</b>	:	BLOWER
<b>Model Number</b>	:	EXTRME EAGLE
<b>Serial Number</b>	:	AIR EAGLE, SUPER AIR EAGLE,AIR EAGLE PRO Q-VAC, AIR EAGLE PRO/W WACTHDOG, AIR EAGLE PRO TIMER, EAGLE-1PH, SUPER EAGLE-1.5, MINI EAGLE
<b>Applicant</b>	:	TOOL KING U.S.A. CO.
<b>Address of Applicant</b>	:	1488 E. MISSION BLVD POMONA, CA. 91766
<b>Manufacturer</b>	:	QUANZHOU TOOL KING MFG.CO.LTD
<b>Address of Manufacturer</b>	:	TAI SHANG CHUANG YE GI DI, HUANG TANG TOWN, HUIANCOUNTY, FUJIAN CHINA
<b>Power Supply</b>	:	AC 230V 50Hz Power cord: <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/>Shielded           <input checked="" type="checkbox"/>Non-Shielded         </div> <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/>Detachable           <input checked="" type="checkbox"/>Un-detachable, 7m         </div> <input checked="" type="checkbox"/> w/o ferrite core
<b>Data Cable</b>	:	<input checked="" type="checkbox"/> N/A
<b>Description of EUT</b>	:	The manufacturer declares that the difference between serial products is on their housing design and fan type. Matrix only holds the responsibility on the main test sample.

## 1.2 Tested Supporting Units

N/A

## 1.3 Block Diagram



## 1.4 Immunity Performance Criterion

Criterion	Test description
A	The equipment shall continue to operate as intended without operator intervention, degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.
B	After the test, the equipment shall continue to operate as intended without operator intervention, degradation of performance or loss of function is allowed.
C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of controls by the user in accordance with the manufacturer's instructions.

## 1.5 Test Facility

<b>Site Description</b>	:	All tests are completed by Matrix Test Laboratory. Radiated emission is performed at HongAn's open-site.
<b>Name of Firm</b>	:	Matrix Test Laboratory
<b>Site Location</b>	:	2F, No 146, Jian Yi Rd, Chung-Ho City, Taipei Hsien, Taiwan, R.O.C.

### 1.5.1 Methods and Procedures

Both conducted and Radiated Emission Test was performed according to the procedures in EN 61000-6-3. Radiated Emission Test was performed at 10 meters distance from antenna to EUT. All immunity tests were performed according to the procedures in EN 61000-6-1

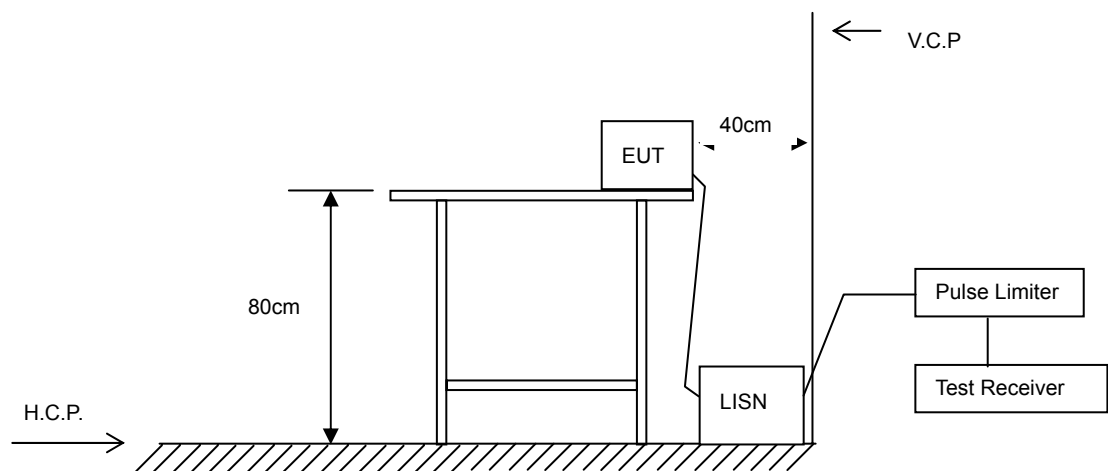
## 2 Conducted Emission Test

### 2.1 Test Instruments

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
EMI RECEIVER	AFJ	ER 55 CR/2.8	55309930144	2005-07-26
L.I.S.N.	Mess Tec	NNB-2/16Z	03/1006	2005-03-07
Pulse Limiter	Mess Tec	PL10	N/A	2005-07-27
RF CABLE	N/A	N/A	N/A	2005-03-14

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 2.2 Configuration of Instrument Setup



### 2.3 Conducted Limit

EN 61000-6-3:2004

Frequency (MHz)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 ~ 0.50	66 to 56	56 to 46
0.50 ~ 5.0	56	46
5.0 ~ 30	60	50

### 2.4 Set of Instrument

- 2.4.1 The EMI test receiver frequency range set from 150 KHz to 30 MHz.
- 2.4.2 The EMI test receiver bandwidth set at 9kHz.
- 2.4.3 The EMI test receiver detector set as Quasi-Peak (Q.P.) and Average (AV).

### 2.5 Test Mode

- 2.5.1 The test mode for preliminary test as following:
  - Mode : Operation mode.



## 2.6 Test Configuration

- 2.6.1 The EUT was placed on a non-conductive table whose total height equaled 80cm and vertical conducting plane located 40cm to the rear of the EUT.
- 2.6.2 The EUT was connected to the main power through Line Impedance Stabilization Networks . This setup provided a 50ohm /50 $\mu$ H coupling impedance for the measuring equipment. The auxiliary equipment was also connected to the main power through a LISN that provided a 50ohm/50 $\mu$ H coupling impedance with 50ohm termination.
- 2.6.3 The conducted disturbance was measured between the phase lead and the reference ground, and between the neutral lead and reference ground. The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 2.6.4 The identification of the frequency of highest disturbance with respect to the limit was found by investigating disturbances at a number of significant frequencies. The probable frequency of maximum disturbance had been found and that the associated cable and EUT configuration and mode of operation had been identified.

## 2.7 Configuration of EUT

- 2.7.1 Setup the EUT and simulate as shown section 1.3.
- 2.7.2 Turn on the power of all equipment.
- 2.7.3 Activate the operation mode.
- 2.7.4 Measure the Line phase and record value.
- 2.7.5 Change into Neutral phase and record value.

## 2.8 Test Result

**PASS.**

The final tests data as shown on following page. The other preliminary tests data as shown on Appendix 1.

### Conducted Emission Test Data

Date of Tested : 2005-12-26 Power Line : Line  
 Temperature : 23 Humidity : 41%  
 Test Mode : Operation mode.

Frequency (MHz)	Factor (dB)	Reading (dBuV)		Measurement (dBuV)		Limits (dBuV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.660	0.06	42.18	39.95	42.24	40.01	56.00	46.00	-13.76	-5.99
0.850	0.06	29.12	20.02	29.18	20.08	56.00	46.00	-26.82	-25.92
1.300	0.07	29.32	26.63	29.39	26.70	56.00	46.00	-26.61	-19.30
2.610	0.09	30.40	21.95	30.49	22.04	56.00	46.00	-25.51	-23.96
3.110	0.11	36.00	21.93	36.11	22.04	56.00	46.00	-19.89	-23.96
3.170	0.11	32.72	24.86	32.83	24.97	56.00	46.00	-23.17	-21.03

Remark :

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss

### Conducted Emission Test Data

Date of Tested : 2005-12-26 Power Line : Neutral  
 Temperature : 23 Humidity : 41%  
 Test Mode : Operation mode.

Frequency (MHz)	Factor (dB)	Reading (dBuV)		Measurement (dBuV)		Limits (dBuV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.660	6.00	31.50	27.01	37.50	33.01	56.00	46.00	-18.50	-12.99
3.030	0.11	31.76	19.44	31.87	19.55	56.00	46.00	-24.13	-26.45
3.060	0.11	28.14	18.86	28.25	18.97	56.00	46.00	-27.75	-27.03
3.110	0.11	28.28	19.11	28.39	19.22	56.00	46.00	-27.61	-26.78
3.130	0.11	30.93	19.35	31.04	19.46	56.00	46.00	-24.96	-26.54
3.210	0.11	29.03	17.37	29.14	17.48	56.00	46.00	-26.86	-28.52

Remark :

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

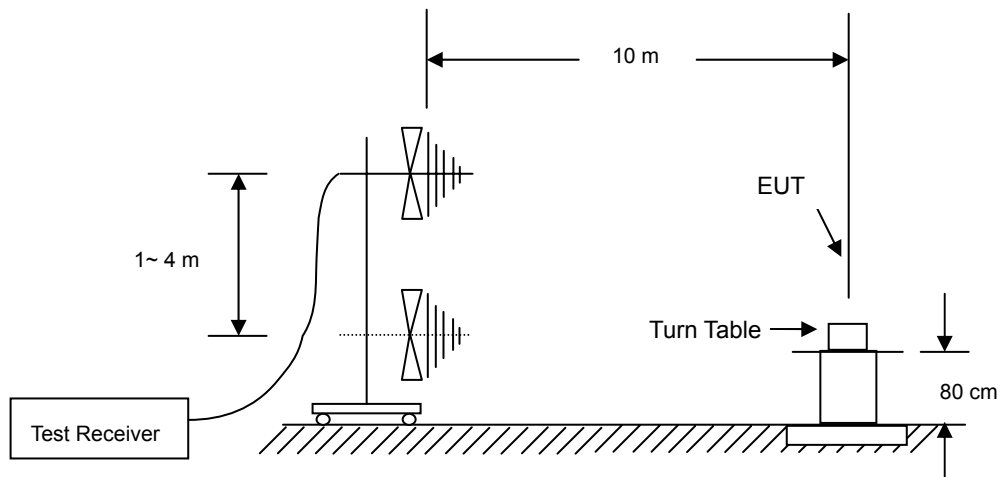
### 3 Radiated Emission Test

#### 3.1 Test Instruments

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
SPECTRUM ANALYZER	HP	8595E	3829A03763	2005-07-19
Antenna	FRANKONIA	BTA-H	030001H	2005-03-25
Pre-Amplifier	Schaffner	CPA9231A	N/A	2005-04-24
RF Cable	MIYAZAKI	8D-F8	N/A	2005-04-30
EMI RECEIVER	AFJ	ER 55 CR/2.8	55309930144	2005-07-26

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

#### 3.2 Configuration of Instrument Setup



#### 3.3 Radiated Limit

EN 61000-6-3:2004

Frequency (MHz)	Quasi-Peak (dBuV/m)
30 ~ 230	30.0
230 ~ 1000	37.0

#### 3.4 Set of Instrument

- 3.4.1 The EMI test receiver frequency range set from 30 MHz to 1000 MHz.
- 3.4.2 The EMI test receiver bandwidth set at 120 kHz.
- 3.4.3 The EMI test receiver detector set as Quasi-Peak (Q.P.).

#### 3.5 Test Mode

- 3.5.1 The test mode for preliminary test as following:

- Mode: Operation mode.

### 3.6 Test Configuration

- 3.6.1 The EUT was placed on a non-conductive table whose total height equaled 80cm. The turntable can rotate 360 degree to determine the position of the maximum emission level.
- 3.6.2 The EUT was set 10 meters away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.
- 3.6.3 The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 3.6.4 The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

### 3.7 Configuration of EUT

- 3.7.1 Setup the EUT and simulates as shown section 1.3.
- 3.7.2 Turn on the power of all equipment.
- 3.7.3 Activate the operation mode.
- 3.7.4 Measure the horizontal polarization and record the value.
- 3.7.5 Change into vertical polarization and record the value.

### 3.8 Test Result

**PASS.**

The final tests data as shown on following page.

### Radiated Emission Test Data

Date of Tested : 2005-12-26      Polarization : Horizontal  
 Temperature : 23      Humidity : 41%  
 Test Mode : Operation mode.

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
165.8	8.78	17.32	26.1	30	-3.9
194.49	13.84	14.36	28.2	30	-1.8
224	13.1	12.1	25.2	30	-4.8
236.1	12.6	18.4	31	37	-6
301.6	13.29	16.31	29.6	37	-7.4
500.5	17.65	14.95	32.6	37	-4.4

Remark : All readings are Quasi-Peak values.

### Radiated Emission Test Data

Date of Tested : 2005-12-26      Polarization : Vertical  
 Temperature : 23      Humidity : 41%  
 Test Mode : Operation mode.

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
73.54	9.92	14.58	24.5	30	-5.5
119.7	8.49	18.81	27.3	30	-2.7
134.3	9.45	18.45	27.9	30	-2.1
158.2	9.48	14.92	24.4	30	-5.6
172.72	8.91	17.29	26.2	30	-3.8
211.42	13.57	14.83	28.4	30	-1.6

Remark : All readings are Quasi-Peak values.

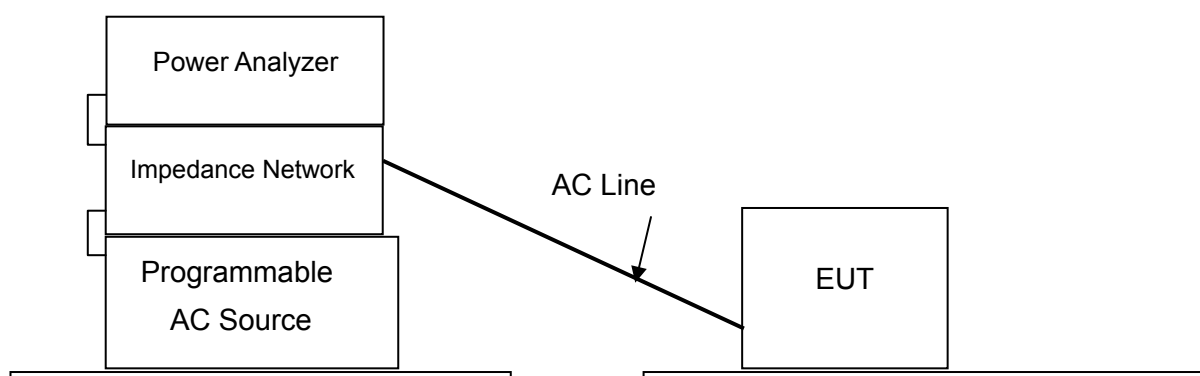
## 4 Harmonic Current Emission Measurement

### 4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
Programmable AC Source	Chroma	6520	2048	2005-05-17
Universal Power Analyzer	Chroma	6630	0597	2005-05-24

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 4.2 Configuration of Instrument Setup



### 4.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 4.4 Test Limit

Class A Equipment

Harmonic order (n)	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 30$	$0.15 * 15 / n$

Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 * 8 / n$

## 4.5 Test Mode

4.5.1 The test mode for measured as following:

- Mode: Operation mode.

## 4.6 Test Configuration

- 4.6.1 The EUT with power analyzer in series and supplied from a power source with the same nominal voltage and frequency as the rated supply voltage.
- 4.6.2 Set the output of the power analyzer to the rated voltage and frequency of EUT (230V, 50Hz).
- 4.6.3 Classified the EUT class by the “check wave” form” function. The measurement was automatic performed by test software. The test result was collected and analyzed by the computer.

## 4.7 Configuration of EUT

- 4.7.1 Setup the EUT and simulates as shown section 1.3.
- 4.7.2 Turn on the power of all equipment.
- 4.7.3 Activate the operation mode.

## 4.8 Test Result

**PASS.**

The measured result as shown on following page.

**Chroma**

ANALYZER 6630

2005.12.27 15:21:05

**Current Harmonics**

Setup: CLASS A

Live

Module: M1

Gen setting: 1(1)

Analysed periods: 4

Limit: Class A (Standard)

Note:

THD=2.31 % (PF=0.976)

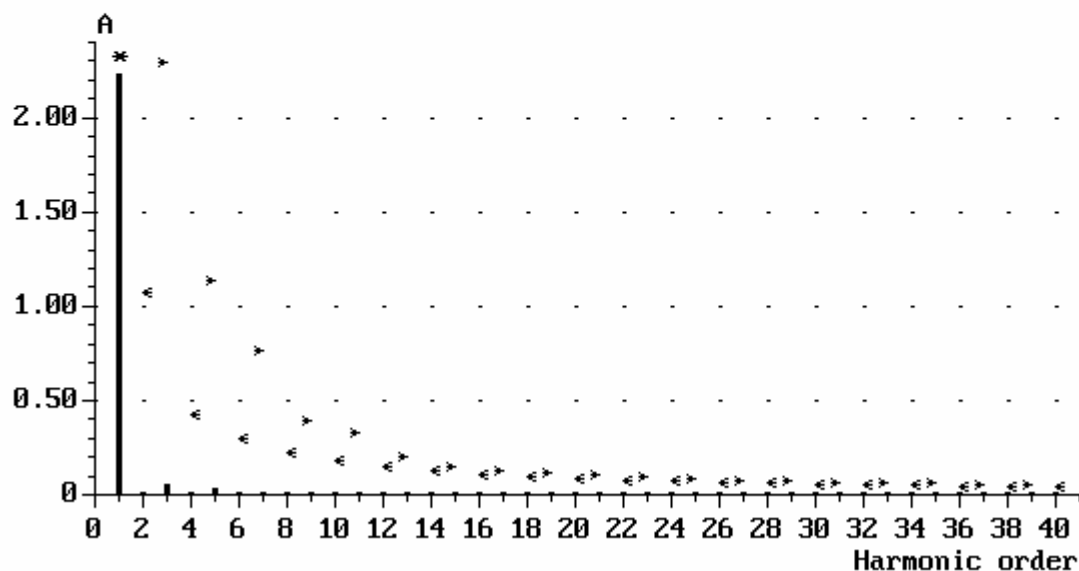
U : 229.39 V

I : 3.126 A

P: 0.700 kW

I1: 3.125 A

PASSED



Appl: CLASS A

(1212\_01)

Next  
measureChange to  
tableRelative  
currentLog  
scaleWrite to  
disk**Chroma**

ANALYZER 6630

2005.12.27 15:20:31

**Current Harmonics**

Setup: CLASS A

Live

Module: M1

Gen setting: 1(1)

Analysed periods: 4

Limit: Class A (Standard)

Note:

THD=2.31 % (PF=0.976)

U : 229.39 V

I : 3.126 A

P: 0.700 kW

I1: 3.125 A

PASSED

No	A	Lim A	No	A	Lim A	No	A	Lim A
1	3.125		15	0.003	0.150	29	0.000	0.078
2	0.005	1.080	16	0.001	0.115	30	0.000	0.061
3	0.057	2.300	17	0.001	0.132	31	0.000	0.073
4	0.002	0.430	18	0.001	0.102	32	0.000	0.058
5	0.041	1.140	19	0.001	0.118	33	0.000	0.068
6	0.001	0.300	20	0.000	0.092	34	0.000	0.054
7	0.014	0.770	21	0.000	0.107	35	0.000	0.064
8	0.000	0.230	22	0.000	0.084	36	0.000	0.051
9	0.007	0.400	23	0.000	0.098	37	0.000	0.061
10	0.000	0.184	24	0.000	0.077	38	0.000	0.048
11	0.005	0.330	25	0.000	0.090	39	0.000	0.058
12	0.000	0.153	26	0.000	0.071	40	0.000	0.046
13	0.004	0.210	27	0.000	0.083			
14	0.001	0.131	28	0.000	0.066			

Current range: 10 Ap

Appl: CLASS A

(1212\_00)

Next  
measureChange to  
bar graphRelative  
currentWrite to  
disk



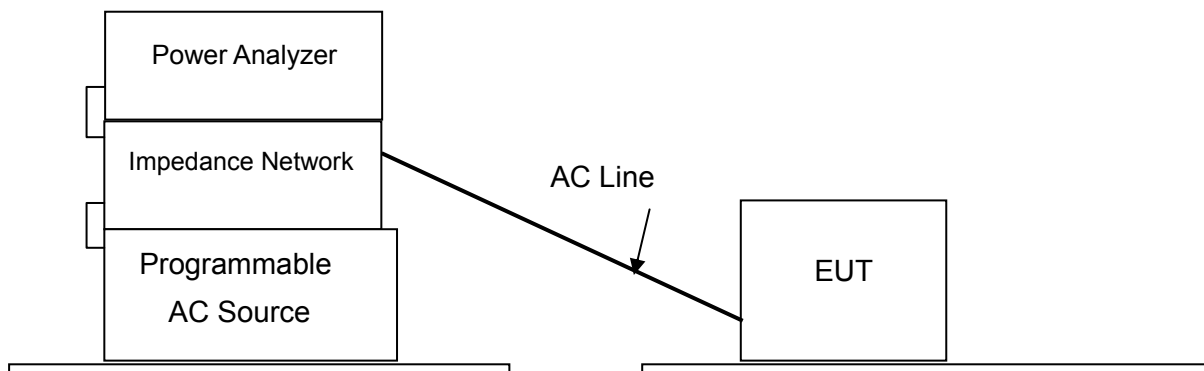
## 5 Voltage Fluctuations and Flicker Measurement

### 5.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
Programmable AC Source	Chroma	6520	2048	2005-05-17
Universal Power Analyzer	Chroma	6630	0597	2005-05-24

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 5.2 Configuration of Instrument Setup



### 5.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 5.4 Test Limit

The following limits apply:

- the value of  $P_{st}$  shall not be greater than 1.0;
- the value of  $P_{lt}$  shall not be greater than 0.65;
- the relative steady-state voltage change,  $d_c$ , shall not exceed 3%;
- the maximum relative voltage change,  $d_{max}$ , shall not exceed 4%;
- the value of  $d(t)$  during a voltage change shall not exceed 3% for more than 200 ms.

### 5.5 Test Mode

5.5.1 The test mode for measured as following:

- Mode: Operation mode.

## 5.6 Test Configuration

- 5.6.1 The EUT with power analyzer in series and supplied from a power source with the same nominal voltage and frequency as the rated supply voltage.
- 5.6.2 Set the output of the power analyzer to the rated voltage and frequency of EUT (230V, 50Hz).
- 5.6.3 Select the test time of observation period for short-term ( $T_p = 10$  min) and long-term ( $T_p = 2$  hrs).  
The test result was collected and analyzed by the computer.

## 5.7 Configuration of EUT

- 5.7.1 Setup the EUT and simulates as shown section 1.3.
- 5.7.2 Turn on the power of all equipment.
- 5.7.3 Activate the operation mode.

## 5.8 Test Result

**PASS.**

The measured result as shown on following page.

**Chroma**

ANALYZER 6630

2005.12.27 15:36:55

**Extreme Flicker-I M1**

Note:

Numerical Reference Impedance

U: 229.5 V I: 2.980 A f: 50.000 Hz PF: 0.979

EVALUATION:-----

Type of observation period	Short	Long	Limit
Observation time	1	10 min	
Maximum relative voltage change	dmax:	0.00 %	4
Max rel steady state voltage change	dc:	0.00 %	3
Duration of d(t) > 3 %	t:	0.00 s	0.2
Short term flicker severity	Pst:	0.00	1.00
Long term flicker severity	Plt:	---	0.65

Based on 10 (10) short term cycles

Next  
measureExtreme  
time graphChange to  
histogramWrite to  
diskSelect  
module

PASSED

Measurement completed

Appl: CLASS A

(1311\_00)

**Chroma**

ANALYZER 6630

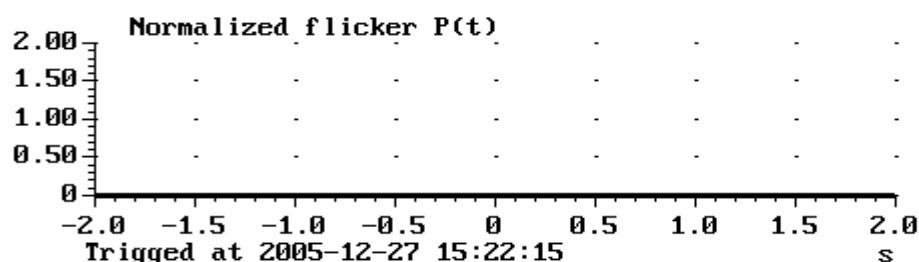
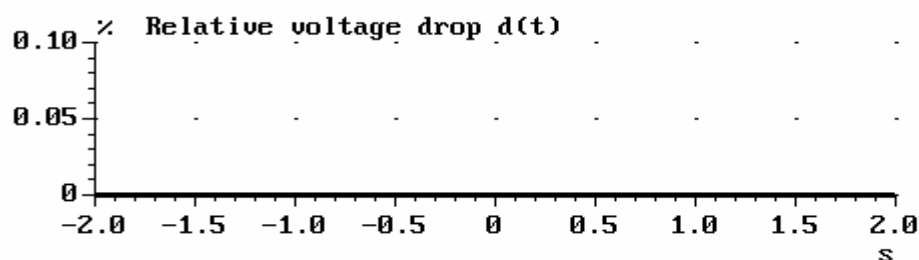
2005.12.27 15:42:05

**Extreme Flicker-I M1**

Note:

Numerical Reference Impedance

U: 229.5 V I: 2.980 A f: 50.000 Hz PF: 0.979

Next  
measureChange to  
tableRefresh  
time graphWrite to  
diskSelect  
module

Appl: CLASS A

(13113\_00)

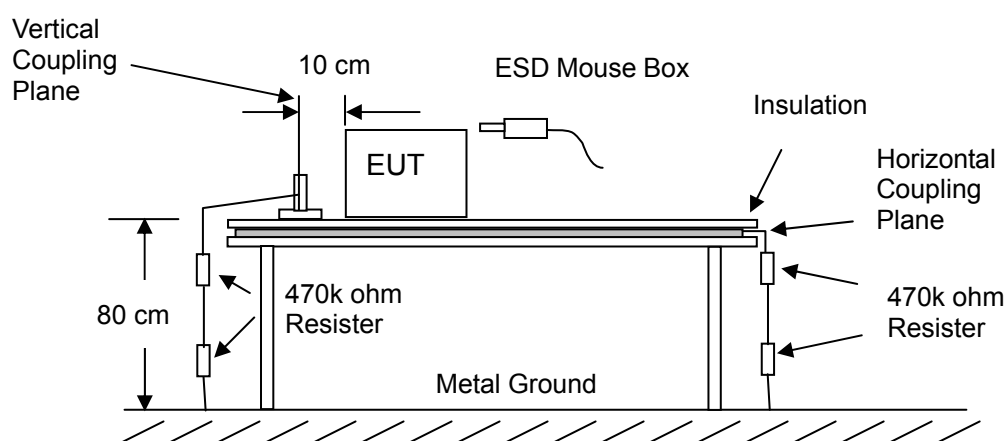
## 6 Electrostatic Discharge Immunity Test

### 6.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
ESD Mouse Box	EMC PARTNER	ESD MOUSE	ESD101-301	2005-08-01
TRANSIENT 2000	EMC PARTNER	TRA-2000	449	2005-08-01

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 6.2 Configuration of Instrument Setup



### 6.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 6.4 Test Levels & Test Require

#### 6.4.1 Test Levels

Level	Contact discharge (kV)	Air discharge (kV)
1	±2	±2
2	±4	±4
3	±6	±8
4	±8	±15
X	Special	Special

- 6.4.2 Air discharge:  $\pm 8$  kV
- 6.4.3 Contact discharge:  $\pm 4$  kV
- 6.4.4 HCP discharge:  $\pm 4$  kV
- 6.4.5 VCP discharge:  $\pm 4$  kV
- 6.4.6 Performance criterion: B

## 6.5 Test Mode

- 6.5.1 The Test Mode as following:
  - Mode: Operation mode.

## 6.6 Test Configuration

- 6.6.1 Contact discharges to the conductive surfaces and coupling planes:

During the test, the time interval between successive single discharges should be longer than one second. One of the test points subjected to at least 50 indirect discharges to the center of the front edge of the Horizontal Coupling Plane (HCP). There were at least 50 single discharges with positive or negative polarities at the other same selected point.

There are also at least 200 indirect discharges to the Vertical Coupling Plane (VCP).

In case of contact discharge, the tip of the discharge electrode was touched the EUT before the discharge switch was operated.

The HCP was placed under the EUT. The discharge gun should be held perpendicular to the HCP and at a distance of 0.1 meter from the edge of EUT. The tip of the discharge electrode was touched the coupling plane before the discharge switch was operated.

The coupling plane of dimensions 0.5x0.5 meters was placed parallel to the EUT. The distance between the coupling plane and the surface of EUT was 0.1 meter. The discharge electrode was touched the coupling plane before the discharge switch was operated.

- 6.6.2 Air discharge at insulating surfaces:

There were minimum of 10 single air discharges to the selected test point.

- 6.6.3 The selected points, performed with electrostatic discharge were marked with red labels on the EUT. The ESD generator (gun) was held perpendicular to the surface to which the discharge was applied.

## 6.7 Configuration of EUT

- 6.7.1 Setup the EUT and simulates as shown section 1.3.
- 6.7.2 Turn on the power of all equipment.
- 6.7.3 Activate the operation mode.

## 6.8 Test Result

### A. Observation

Test points: 1. Junction of case. 2. Screw. 3. Switch.

Direct Application			Test Results	
Discharge Level (KV)	Polarity ( $\pm$ )	Test Point	Contact Discharge	Air Discharge
8	$\pm$	1~3	N/A	A
4	$\pm$	2	A	N/A

Note: Definition of the test result should be referring to 1.4 Performance Criterion.

### B. Observation

Test points: 1. Front side. 2. Rear side. 3. Left side. 4. Right side.

Indirect Application			Test Results	
Discharge Level (KV)	Polarity ( $\pm$ )	Test Point	Horizontal Coupling	Vertical Coupling
4	$\pm$	1-4	A	A

Note: Definition of the test result should be referring to 1.4 Performance Criterion.

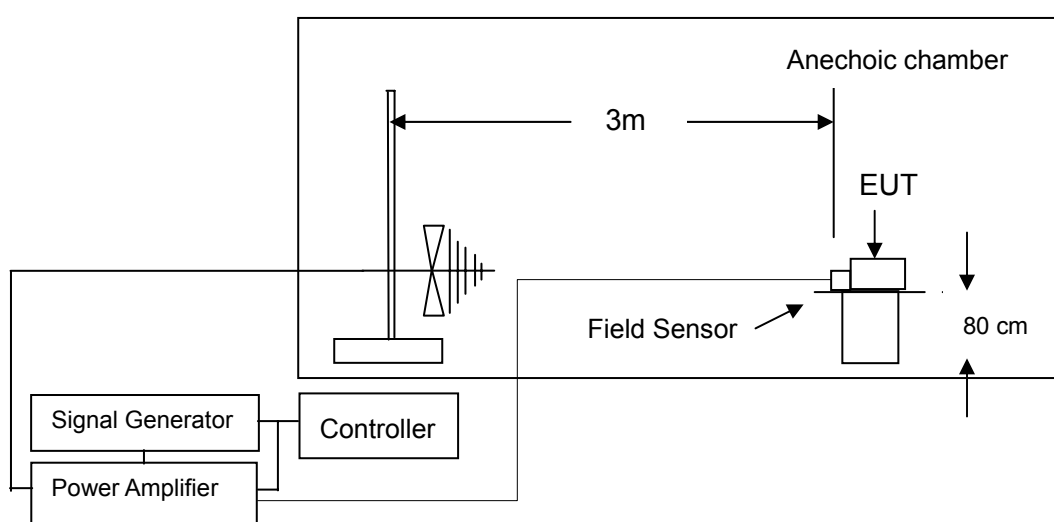
## 7 Radio-frequency, Electromagnetic field Immunity Test

### 7.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
Signal Generator	HP	8648C	N/A	2005-11-22
Power Amplifier	IFI	CMX50	N/A	2005-10-15
Field Probe	EMCO	7201	N/A	2005-10-05
Power Antenna	EMCO	3142	N/A	2005-10-15

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 7.2 Configuration of Instrument Setup



### 7.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 7.4 Test Levels & Test Require

#### 7.4.1

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

- 7.4.2 Frequency range: **80 to 1000** MHz, Field strength: **3** V/m (modulated, r.m.s.), 80% AM (1kHz),  
Performance criterion: **A**

## 7.5 Test Mode

- 7.5.1 The Test Mode as following:
- Mode: Operation mode.

## 7.6 Test Configuration

- 7.6.1 Before testing, the intensity of the established field strength was checked by placing the field sensor at a calibration grid point, and with the field generating antenna and cables in the same positions as used for the calibration, the forward and reverse power were measured. The forward power needed to give the calibrated field was evaluated.
- 7.6.2 After the calibration had been verified, the test field was then generated using the values obtained from the calibration. The EUT and the auxiliary equipment were placed on a table with 0.8 meters height. The EUT was initially placed with one face coincidence with the calibration plane at a distance of 3 meters away from the illuminating antenna (the same as used for the field calibration). Both horizontal and vertical polarizations of the antenna and four sides of the EUT were set for the radiated field immunity test.
- 7.6.3 In order to survey the performance of the EUT, a CCD camera was used to monitor the EUT performance.

## 7.7 Configuration of EUT

- 7.7.1 Setup the EUT and simulates as shown section 1.3.
- 7.7.2 Turn on the power of all equipment.
- 7.7.3 Activate the operation mode.

## 7.8 Test Result

The performance criterion after tested as following:

Frequency range: **80 to 1000** MHz, Field strength: **3** V/m (modulated, r.m.s.),  
80% AM (1kHz), Performance criterion: ☒ **A** ☐ **B** ☐ **C**



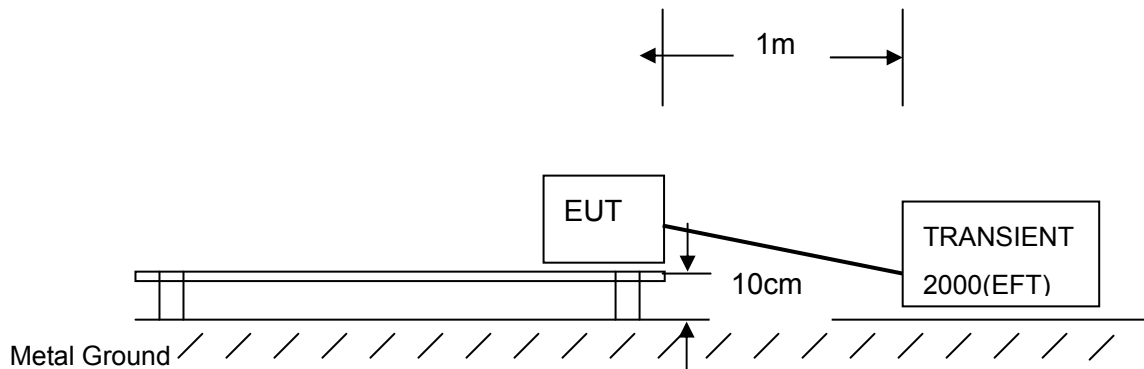
## 8 Electrical Fast Transient/Burst Immunity Test

### 8.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
TRANSIENT 2000	EMC PARTNER	TRA-2000	449	2005-08-01

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 8.2 Configuration of Instrument Setup



### 8.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 8.4 Test Levels& Test Require

#### 8.4.1

Level	On power supply port, PE		On I/O signal, data and control ports	
	Voltage Peak (kV)	Repetition rate (kHz)	Voltage Peak (kV)	Repetition rate (kHz)
1	±0.5	5	±0.25	5
2	±1	5	±0.5	5
3	±2	5	±1	5
4	±4	2.5	±2	5
X	Special	Special	Special	Special

8.4.2 5 kHz Repetition frequency

8.4.3 Performance criterion: B

8.4.4 ☒ ±0.5kV input ac power ports

☐ ±0.5 kV for Signal, telecommunication, input d.c. Power ports.

## 8.5 Test Mode

- 8.5.1 The Test Mode as following:
- Mode : Operation mode.

## 8.6 Test Configuration

- 8.6.1 The EUT and the auxiliary equipment were placed on a wooden table of 0.8 meters height. The size of ground plane is greater than 1m x1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth.
- 8.6.2 The EUT was connected to the power mains through a coupling device that directly couples the EFT interference signal. Each of the Line, Neutral and Protective Earth (PE) conductors was impressed with burst noise for 1 minute. Both the voltage polarities were applied for each test level. The length of power cord between the coupling device and the EUT was less than 1 meter.

## 8.7 Configuration of EUT

- 8.7.1 Setup the EUT and simulates as shown section 1.3.
- 8.7.2 Turn on the power of all equipment.
- 8.7.3 Activate the operation mode.

## 8.8 Test Result

Observation

Inject Line	Voltage KV	Inject Method	Result
L	±0.5	Direct	A
N	±0.5	Direct	A
PE	±0.5	Direct	A
L + N	±0.5	Direct	A
L + PE	±0.5	Direct	A
N + PE	±0.5	Direct	A
L + N +PE	±0.5	Direct	A

Note: Definition of the test result should be referring to 1.4 Performance Criterion.

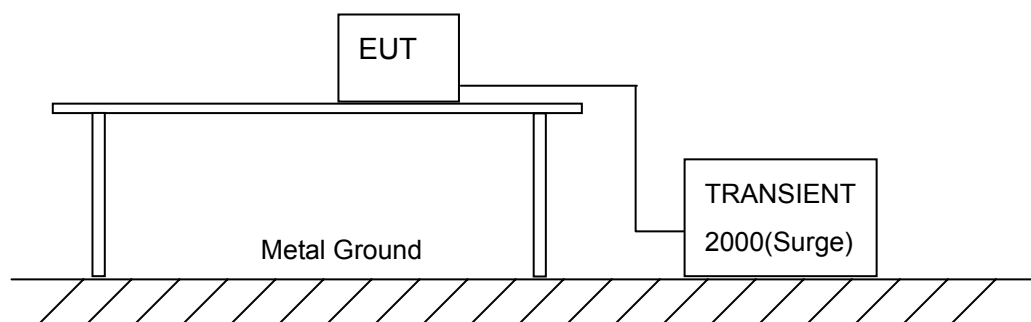
## 9 Surge Immunity Test

### 9.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
TRANSIENT 2000	EMC PARTNER	TRA-2000	449	2005-08-01

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 9.2 Configuration of Instrument Setup



### 9.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 9.4 Test Levels & Test Require

#### 9.4.1

Level	Open-circuit test voltage (kV)
1	±0.5
2	±1.0
3	±2.0
4	±4.0
X	Special

9.4.2 ☒ Line to line: ±0.5kV(peak) test voltage

9.4.3 ☒ Line to earth (ground): ±0.5kV(peak) test voltage

9.4.4 ☐ Input dc power ports: ±0.5kV(peak) line to earth

9.4.5 ☐ Signal and telecommunication ports: ±1.0kV(peak) line to earth

9.4.6 Performance criterion: **B**

## 9.5 Test Mode

9.5.1 The Test Mode as following:

- Mode: Operation mode.

## 9.6 Test Configuration

- 9.6.1 The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m x1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer).
- 9.6.2 The EUT was connected to the power mains through a coupling device that directly couples the Surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- 9.6.3 The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

## 9.7 Configuration of EUT

- 9.7.1 Setup the EUT and simulates as shown section 1.3.
- 9.7.2 Turn on the power of all equipment.
- 9.7.3 Activate the operation mode.

## 9.8 Test Result

Phase Angle : 0, 90, 180, 270

Observation Description

Test Point	Polarity(±)	Test Level (KV)	Observation
L – PE	±	0.5	A
N - PE	±	0.5	A
L - N	±	0.5	A
DC Power Port	±	1	N/A
Signal Port	±	0.5	N/A

Note: Definition of the test result should be referring to 1.4 Performance Criterion.

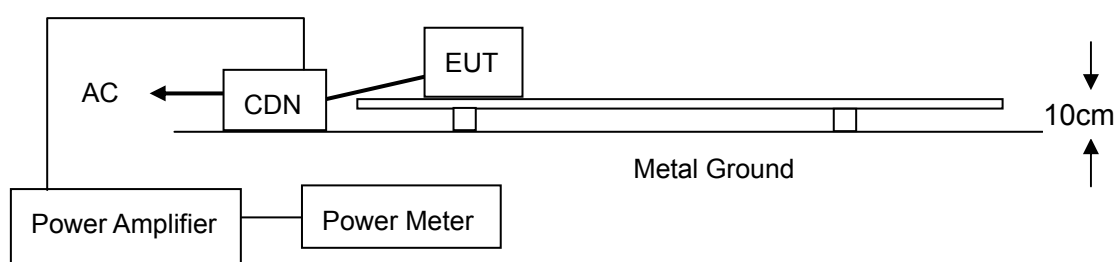
## 10 Radio-frequency, Conducted Disturbances Immunity Test

### 10.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
CDN	FRANKONIA	CDN M2+M3	A3011037	2005-08-02
C.I. TEST SYSTEM	FRANKONIA	CIT-10/75	102C3208	2005-08-02
POWER METER	FRANKONIA	75-A-FFN-06	0212	N/A
RF CABLE	N/A	N/A	N/A	2005-03-14

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 10.2 Configuration of Instrument Setup



### 10.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 10.4 Test Levels & Test Require

#### 10.4.1

Level	Voltage Level (V)
1	1
2	3
3	10
X	Special

10.4.2 Frequency Range is from 0.15 to 80MHz.

10.4.3 Field strength: 3 V/m (modulated, r.m.s.), 80% AM (1kHz)

10.4.4 Performance criterion: A

### 10.5 Test Mode

10.5.1 The Test Mode as following:

- Mode: Operation mode.

## 10.6 Test Configuration

- 10.6.1 The EUT was placed on a table of 0.1 m height.
- 10.6.2 The EUT was connected to the power mains through a Coupling and Decoupling Networks (CDN).
- 10.6.3 The test was 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 were terminated by a 50  $\Omega$  terminator.
- 10.6.4 The frequency range was swept from 150kHz to 80MHz.using the signal levels established during the setting process, and without the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to switch coupling devices as necessary. The rate of sweep was less than  $1.5 \times 10^{-3}$  decades/s. And the step size of the frequency sweep was also less than 1% of the start and thereafter 1% of the preceding frequency value. The dwell time at each frequency was more than the time necessary for the EUT to be excited, and able to respond.

## 10.7 Configuration of EUT

- 10.7.1 Setup the EUT and simulates as shown section 1.3.
- 10.7.2 Turn on the power of all equipment.
- 10.7.3 Activate the operation mode.

## 10.8 Test Result

Cable Description	Frequency(MHz)	Observation
AC Input	0.15 - 80	A
DC Input	0.15 - 80	N/A

Note: Definition of the test result should be referring to 1.4 Performance Criterion.

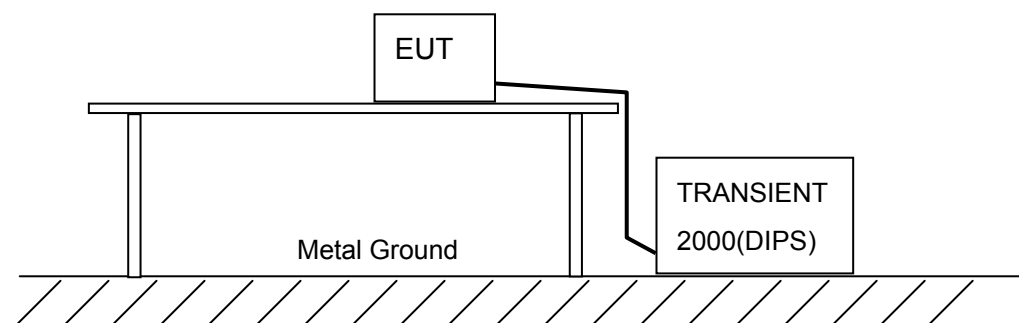
## 11 Voltage Dips, Short Interruptions Immunity Test

### 11.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Date of Calibration
TRANSIENT 2000	EMC PARTNER	TRA-2000	449	2005-08-01

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

### 11.2 Configuration of Instrument Setup



### 11.3 EUT Operation Condition

Environment:

Temperature	Humidity	Atmospheric Pressure
24	49%RH	1009mbar

### 11.4 Test Levels & Test Require

11.4.1	Level (% $U_T$ )	Voltage dip & short interruptions (% $U_T$ )	Duration (in period)
	0	100	0.5
			1
			5
	40	60	10
			25
	70	30	50
			x

11.4.2 30% reduction (Voltage Dips), 0.5 period, Performance criterion: A

11.4.3 60% reduction (Voltage Dips), 5 period, Performance criterion: A

11.4.4 > 95% reduction (Voltage Interruptions), 250 period, Performance criterion: C

## 11.5 Test Mode

11.5.1 The Test Mode as following:

- Mode: Operation mode.

## 11.6 Test Configuration

- 11.6.1 The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.
- 11.6.2 The EUT was tested for ( ) 95% voltage dip of supplied voltage with a duration of 10ms, ( ) 30% voltage dip of supplied voltage and duration 500ms. Both of the dip tests were carried out for a sequence of three voltage dips with intervals of 10 seconds.
- 11.6.3 A 95% voltage interruption of supplied voltage with duration of 5000ms was followed, which was a sequence of three voltage interruptions with intervals of 10 seconds.
- 11.6.4 Voltage reduction was controlled at 0°, 90° and 270° of the voltage phase angle. The performance of the EUT was checked after the voltage dip or interruption.

## 11.7 Configuration of EUT

- 11.7.1 Setup the EUT and simulates as shown section 1.3.
- 11.7.2 Turn on the power of all equipment.
- 11.7.3 Activate the operation mode.

## 11.8 Test Result

Observation

Phase Angle: 0, 90, 180, 270 degree

Voltage( %Ut)	Duration of Dropout (period)	Observation
30(Dip)	0.5	A
60(Dip)	5	A
>95(Interruptions)	250	C

Note: Definition of the test result should be referring to 1.4 Performance Criterion.



## 12 Photographs of Test

### 12.1 Power Line Conducted Test



Front View



Rear View

## 12.2 Radiated Emission Test



Front View



Rear View

### 12.3 Harmonic current & Voltage Fluctuations and Flicker Measurement



### 12.4 Electrostatic Discharge Immunity Test



## 12.5 Electrical Fast Transient/ Burst Immunity Test

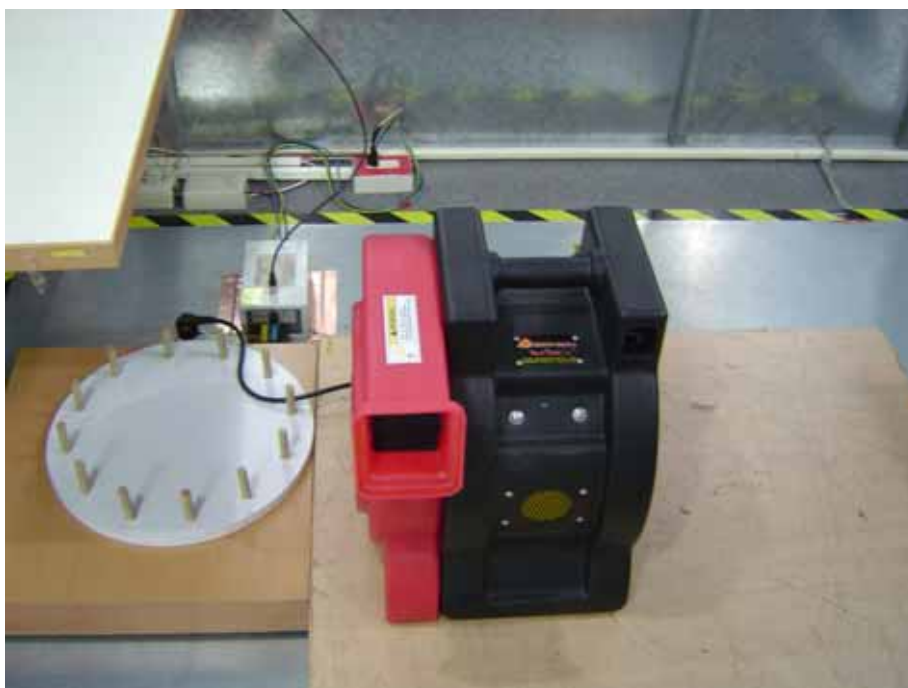


## 12.6 Surge immunity Test





## 12.7 Radio-frequency, Conducted Disturbances Immunity Test



## 12.8 Voltage Dips, Short Interruptions Immunity Test



## 13 Photographs of EUT



Front View of EUT



Rear View of EUT



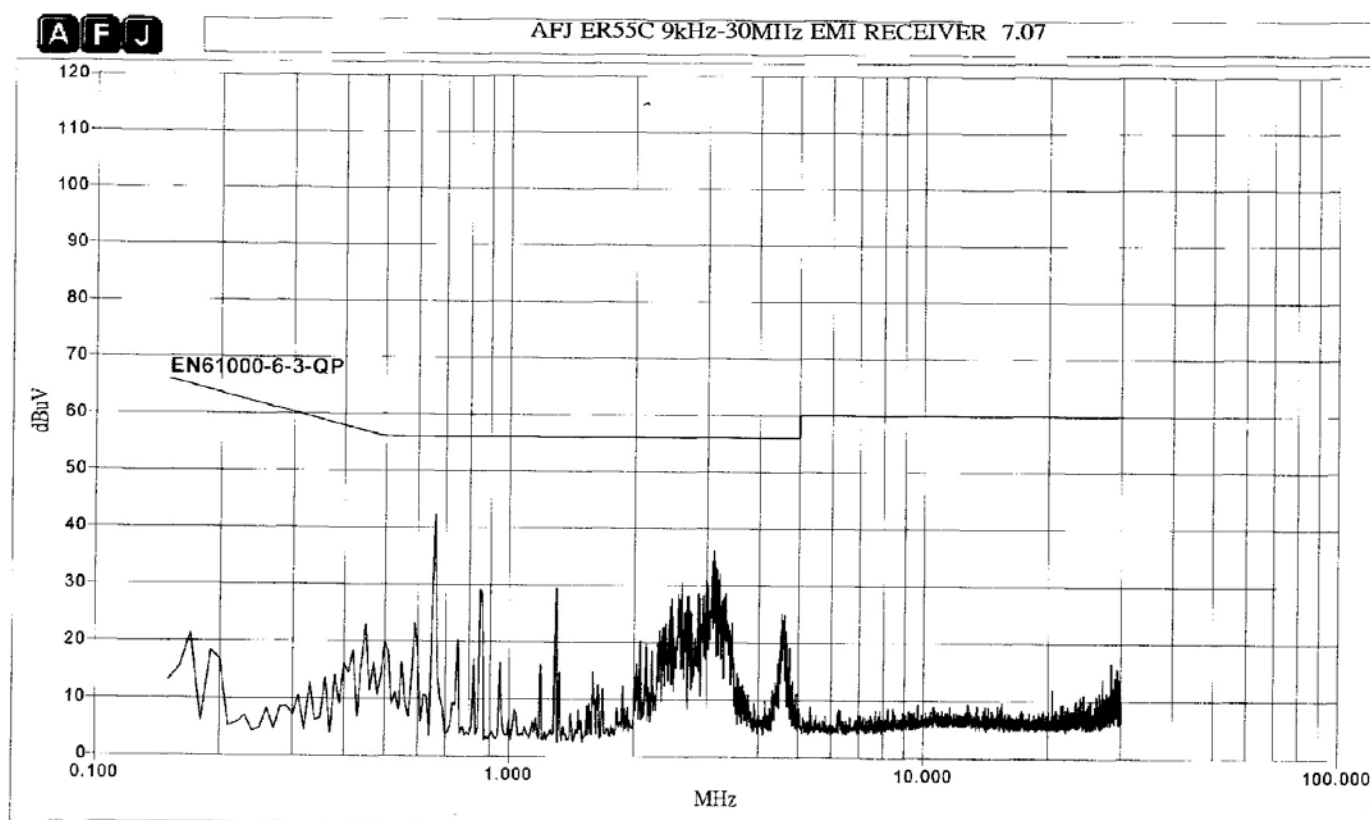
Inside view of EUT



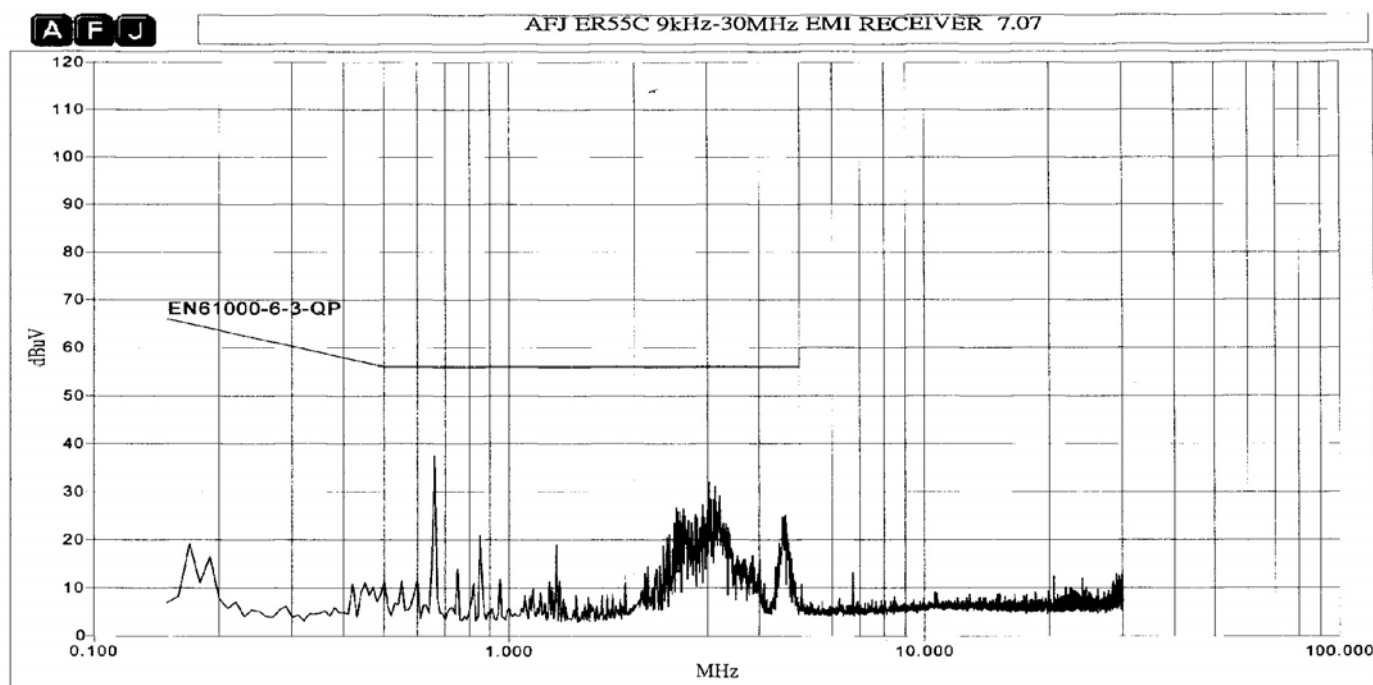
View of EUT's Motor

## Appendix 1 – Conducted Emission Test Waveform

### A1.1 Mode : Operation mode



Line



Neutral