



## CE EMC

# UPDATE TEST REPORT

For

**TP-LINK TECHNOLOGIES CO., LTD.**

**24-Port 10/100M Fast Ethernet Switch**

**Model No.: TL-SF1024, \*\*FSW-2450**

**Brand Name: TP-LINK, \*\*LevelOne**

**Revision: 01**

### **Description of Rev. 01:**

1. Applicant add a model name and a trade name, they are all identical except for the model name and the trade name just for marking purpose.  
(Please refer to the contents which have \*\* mark in this report)

**Approved by:**

**Reviewed by:**

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## TEST RESULT CERTIFICATION

**Equipment Under Test:** 24-Port 10/100M Fast Ethernet Switch

**Trade Name:** TP-LINK, \*\*LevelOne

**Model Number:** TL-SF1024, \*\*FSW-2450

**Serial Number:** N/A

**Applicant:** TP-LINK TECHNOLOGIES CO., LTD.  
BUILDING 7, SECTION 2, HONGHUALING INDUSTRIAL PARK, XILI,  
NANSHAN DISTRICT, SHENZHEN, P.R.C.

**Manufacturer:** TP-LINK TECHNOLOGIES CO., LTD.  
BUILDING 7, SECTION 2, HONGHUALING INDUSTRIAL PARK, XILI,  
NANSHAN DISTRICT, SHENZHEN, P.R.C.

**Type of Test:** EMC Directive 89/336/EEC for CE Marking

**Technical Standards:** EN 55022: 1998+A1:2000+A2:2003  
CISPR 22:1997+A1:2001+A2:2002  
AS/NZS CISPR 22:2002  
EN 61000-3-2: 2000  
EN 61000-3-3: 1995+A1:2001  
EN 55024: 1998+A1:2001+A2:2003  
CISPR 24: 1997+A1:2001+A2:2002  
(IEC 61000-4-2: 2001; IEC 61000-4-3: 2002;  
IEC 61000-4-4: 2001; IEC 61000-4-5: 2001;  
IEC 61000-4-6: 2001; IEC 61000-4-11: 2001)

**Report Number:** SZ070309B04-ET

**Date of test:** August 03~08 and August 31~September 01, 2005

**Deviation:** None

**Condition of Test** Normal

**Sample:**

The above equipment was tested by Compliance Certification Services (Shenzhen) Inc. for compliance with the requirements set forth in EMC Directive 89/336/EEC amended by 93/68/EEC and the Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment and the level of the immunity endurance of the equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.



## GENERAL INFORMATION

**Applicant:** TP-LINK TECHNOLOGIES CO., LTD.  
BUILDING 7, SECTION 2, HONGHUALING INDUSTRIAL PARK, XILI,  
NANSHAN DISTRICT, SHENZHEN, P.R.C.

**Contact Person:** Li Sai

**Manufacturer:** TP-LINK TECHNOLOGIES CO., LTD.  
BUILDING 7, SECTION 2, HONGHUALING INDUSTRIAL PARK, XILI,  
NANSHAN DISTRICT, SHENZHEN, P.R.C.

**Report Number:** SZ070309B04-ET

**Date of Test:** August 03~08 and August 31~September 01, 2005

**Equipment Under Test:** 24-Port 10/100M Fast Ethernet Switch

**Model Number:** TL-SF1024, \*\*FSW-2450

**Serial Number:** N/A

**Type of Test:** EMC Directive 89/336/EEC for CE Marking

**Technical Standards:** EN 55022: 1998+A1:2000+A2:2003  
CISPR 22:1997+A1:2001+A2:2002  
AS/NZS CISPR 22:2002  
EN 61000-3-2: 2000  
EN 61000-3-3: 1995+A1:2001  
EN 55024: 1998+A1:2001+A2:2003  
CISPR 24: 1997+A1:2001+A2:2002  
(IEC 61000-4-2: 2001; IEC 61000-4-3: 2002;  
IEC 61000-4-4: 2001; IEC 61000-4-5: 2001;  
IEC 61000-4-6: 2001; IEC 61000-4-11: 2001)

**Frequency Range  
(EN 55022):** 150kHz to 30MHz for Line Conducted Test  
30MHz to 1000MHz for Radiated Emission Test

**Test Site** Compliance Certification Services (Shenzhen) Inc.  
No. 5, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village,  
Guanlan Town, Baoan District, Shenzhen, China



## **SYSTEM DESCRIPTION**

### **EUT Test Program:**

Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.



## PRODUCT INFORMATION

<b>Housing Type:</b>	Metal
<b>EUT Power Rating:</b>	AC100V~240V/50Hz~60Hz Power Board NO.: KHD-04050II
<b>EUT Power Rating:</b>	AC100V~240V/50Hz~60Hz Power Board NO.: DSO-0121-03A
<b>Power During Test:</b>	AC230V/50Hz
<b>AC Input Cable:</b>	Un-shielded, 1.50m

*Note: The model names, trade names and their appearance are the same, but they are different in the circuit diagram design of the power board.(Please see the line conducted test data in page 20~21)*

### I/O Port of EUT:

I/O Port Type	Q'TY	Tested with
AC input	1	1
RJ-45 Port	24	24



## SUPPORT EQUIPMENT

No.	Equipment	Model #	Serial #	Trade Name	Data Cable	Power Cord
1)	PC1	DX6100	CNG436072R	HP	N/A	Unshielded 1.8m
2)	Monitor	15LABTX	0700-15LAB00-01	SKY WORTH	Shielded 1.5 m	Unshielded 1.8m
3)	Keyboard	KU-9985	2D41500055B	DELL	Shielded 1.8 m	N/A
4)	Mouse	M-S69	323614-001	HP	Shielded 1.8 m	N/A
5)	Printer	P310B	C41344000NK02520 275	EPSON	Shielded 1.5 m	Unshielded 1.8m
6)	Modem	SUPERFAX6.0	9013593	ACCEX	Shielded 1.5m	Unshielded 1.8m

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.





## **TEST FACILITY**

- Location:** No. 5, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District Shenzhen, China.
- Description:** There is one 3/10m open area test sites and one line conducted labs for final test.  
The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.
- Site Filing:** A site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046.
- Site Accreditation:** Accredited by Nemko ( Aut. No.: ELA106), VCCI(Registration No.: R-1996,C-2150), FCC ( Registration No.: 101879 and NVLAP(Lab code:200577-0) for EMC.
- Instrument Tolerance:** All measuring equipment is in accord with ANSI C63.4 and CISPR 22 requirements that meet industry regulatory agency and accreditation agency requirement.
- Ground Plane:** Two conductive reference ground planes were used during the Line Conducted Emission, one in vertical and the other in horizontal. The dimensions of these ground planes are as below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden test table on where the EUT and the support equipment were placed during test. The horizontal ground plane projected 50 cm beyond the footprint of the EUT system and distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal conductive ground plane extended at least 1m beyond the periphery of the EUT and the largest measuring antenna, and covered the entire area between the EUT and the antenna. It has no holes or gaps having longitudinal dimensions larger than one-tenth of a wavelength at the highest frequency of measurement up to 1GHz.



## TEST EQUIPMENT LIST

**Instrumentation:** The following list contains equipment used at Compliance Certification Services (Shenzhen) Inc. for testing. The equipment conforms to the CISPR 16-1 / ANSI C63.2 Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10kHz to 1.0GHz or above.

**Equipment used during the tests:**

**Open Area Test Site:** G

Open Area Test Site G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL. DUE
EMC Analyzer	Agilent	E7402	MY42000139	06/10/2005	06/09/2006
Amplifier	H.P.	8447D	2944A07999	06/10/2005	06/09/2006
Bi-log Antenna	EMCO	3142	9910-1436	06/10/2005	06/09/2006
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	06/10/2005	06/09/2006
System-Controller	CT	SC100	N/A	N/A	N/A
Turn Table	EMCO	2081-1.21	N/A	N/A	N/A
Antenna Tower	CT	N/A	N/A	N/A	N/A
DECOUPLING NETWORK	FISCHER CUSTOM	F-201-DCN -5-6MM	12	06/10/2005	06/09/2006

**Note:** The measure uncertainty is less than  $\pm 2.5078\text{dB}$ , which is evaluated as per the UKAS LAB34 and CISPR/A/291/CDV.

**Conducted Emission Test Site:** G

Conducted Emission Test Site G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL. DUE
Spectrum Analyzer	ADVANTEST	R3132	120901472	06/10/2005	06/09/2006
EMI Test Receiver	SCHAFFNER	SCR3501	401	02/27/2005	02/26/2006
LISN	EMCO	3825/2	1371	02/27/2005	02/26/2006
LISN	EMCO	3825/2	8901-1459	02/27/2005	02/26/2006

**Note:** The measure uncertainty is less than  $\pm 2.2318\text{dB}$ , which is evaluated as per the UKAS LAB34 and CISPR/A/291/CDV.

The calibrations of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.



## TEST EQUIPMENT LIST

<b>Power Harmonic &amp; Voltage Fluctuation/Flicker Measurement (61000-3-2&amp;-3-3)</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
Harmonic & Flicker Tester	SCHAFFNER	NSG 1007-5-400	54789	02/27/2005	02/26/2006

<b>ESD test (61000-4-2)</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
ESD 30 System	EM Test	ESD 30C	1202-17	10/26/2004	10/25/2005

<b>Radiated Electromagnetic Field immunity Measurement (61000-4-3)</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
Signal Generator	Maconi	2022D	119246/003	06/10/2005	06/09/2006
Power Amplifier	M2S	8113-800/250A	9801-179	06/10/2005	06/09/2006
Power Antenna	SCHAFFNER	CBL6140A	1204	06/10/2005	06/09/2006

<b>Fast Transients/Burst test (61000-4-4)/Surge(61000-4-5)/Voltage Dips &amp; Interruptions(61000-4-11)</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
Fast Transients/Burst Generator	SCHAFFNER	BEST EMC V2.7	200126-012S C	02/27/2005	02/26/2006

<b>CS test (61000-4-6)</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
Signal Generator	Maconi	2022D	119246/003	06/10/2005	06/09/2006
Power Amplifier	M2S	A00181/1000	9801-112	06/10/2005	06/09/2006
Clamp	MEB	KEZ-801	13602	06/10/2005	06/09/2006



## SECTION 1 EN 55022(LINE CONDUCTED AND RADIATED EMISSION) MEASUREMENT PROCEDURE (PRELIMINARY LINE CONDUCTED EMISSION TEST)

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per EN55022.
- 3) All I/O cables were positioned to simulate typical actual usage as per EN55022.
- 4) The EUT received AC230V/50Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5) All support equipments received power from a second LISN supplying power of AC230V/50Hz, if any.
- 6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7) Analyzer / Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- 8) During the above scans, the emissions were maximized by cable manipulation.
- 9) The following test mode(s) were scanned during the preliminary test:

Preliminary Conducted Emission Test			
Frequency Range Investigated		150KHz TO 30 MHz	
Mode of operation	Date	Data Report No.	Worst Mode
Normal (Power Board NO.: KHD-04050II)	2005-08-03	TL-SF1024_0(L,N)	<input checked="" type="checkbox"/>
Normal (Power Board NO.: DSO-0121-03A)	2005-08-31	TL-SF1024_0(L,N)	<input checked="" type="checkbox"/>

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.



## MEASUREMENT PROCEDURE (FINAL LINE CONDUCTED EMISSION TEST)

- 1) EUT and support equipment was set up on the test bench as per step 9 of the preliminary test.
- 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3) The test data of the worst case condition(s) was reported on the Summary Data page.

### Data Sample:

Freq. MHz	Peak Raw dBuV	Q.P. Raw dBuV	Average Raw dBuV	Q.P. Limit dBuV	Average Limit dBuV	Q.P. Margin dB	Average Margin dB	Note
XX.XXX	43.90	---	---	56.00	46.00	---	-2.10	L 1

Freq.	= Emission frequency in MHz
Raw dBuV	= Uncorrected Analyzer/Receiver reading
Limit dBuV	= Limit stated in standard
Margin dB	= Reading in reference to limit
Note	= Current carrying line of reading
“---“	= The emission level complied with the Average limits, with at least 2 dB margin, so no further recheck.



## LINE CONDUCTED EMISSION LIMIT

Frequency	Maximum RF Line Voltage	
	Q.P.( dBuV)	AVERAGE( dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

**\*\*Note:** The lower limit shall apply at the transition frequency.



## **MEASUREMENT PROCEDURE (PRELIMINARY RADIATED EMISSION TEST)**

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per EN 55022.
- 3) All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- 4) The EUT received AC230V/50Hz power through the outlet socket under the turntable. All support equipment received AC230V/50Hz power from socket under the turntable, if any.
- 5) The antenna was placed at 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
- 6) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- 7) The following test mode(s) were scanned during the preliminary test:

<b>Preliminary Radiated Emission Test</b>			
Frequency Range Investigated		30 MHz TO 1000 MHz	
Mode of operation	Date	Data Report No.	Worst Mode
Normal	2005-08-03	TL-SF1024_0(H,V)	<input checked="" type="checkbox"/>

Then, the EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for final testing.



## MEASUREMENT PROCEDURE (FINAL RADIATED EMISSION TEST)

- 1) EUT and support equipment were set up on the turntable as per step 7 of the preliminary test.
- 2) The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- 3) Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P./Peak reading is presented.
- 4) The test data of the worst case condition(s) was reported on the Summary Data page.

### Data Sample:

Freq. (MHz)	Raw Data (dBuV/m)	Corr. Factor (dB)	Emiss. Level ( dBuV/m )	Limits	Margin (dB)	Reading Type P/Q
xx.xxx	14.03	12.25	26.28	30.00	-3.72	P

Freq.	= Emission frequency in MHz
Raw Data (dBuV/m)	= Uncorrected Analyzer / Receiver reading
Corr. Factor (dB)	= Correction factors of antenna factor and cable loss
Emiss. Level	= Raw reading converted to dBuV/m and CF added
Limit dBuV/m	= Limit stated in standard
Margin dB	= Reading in reference to limit
P	=Peak Reading
Q	=Quasi-peak





## **RADIATED EMISSION LIMIT**

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m/ Q.P.)
30-230	10	30.00
230-1000	10	37.00

**\*\*Note:** The lower limit shall apply at the transition frequency.



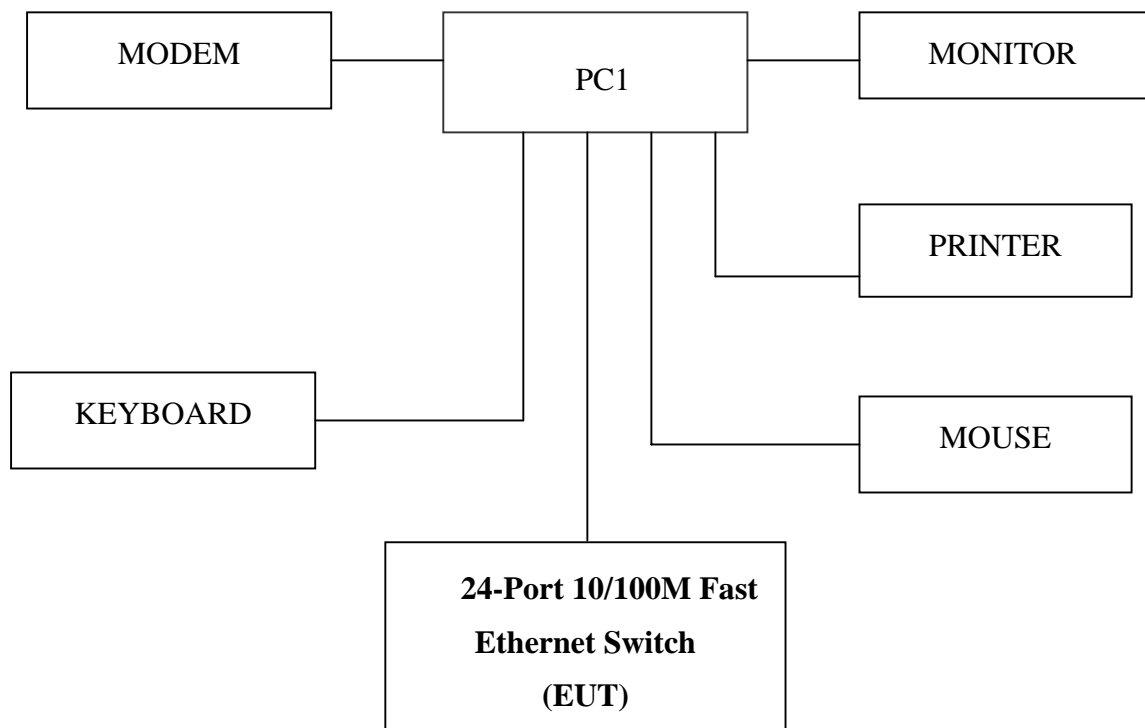
## BLOCK DIAGRAM OF TEST SETUP

### System Diagram of Connections between EUT and Simulators

**EUT:** 24-Port 10/100M Fast Ethernet Switch

**Trade Name:** TP-LINK

**Model Number:** TL-SF1024





## SUMMARY DATA (LINE CONDUCTED TEST)

**Model Number:** TL-SF1024

**Location:** Site G

**Tested by:** Jason

**Test Mode:** Normal (Power Board NO.: KHD-04050II)

**Test Results:** Passed

**Temperature:** 25°C

**Humidity:** 55%RH

(The chart below shows the highest readings taken from the final data)

FREQ MHz	PEAK RAW dBuV	Q.P. RAW dBuV	AVG RAW dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.150	62.37	61.06	44.46	66.00	56.00	-4.94	-11.54	L1
0.220	52.62	51.25	38.10	63.99	53.99	-12.74	-15.89	L1
11.306	53.81	51.64	48.08	60.00	50.00	-8.36	-1.92	L1
12.268	55.79	53.09	48.40	60.00	50.00	-6.91	-1.60	L1
13.390	53.13	49.48	44.31	60.00	50.00	-10.52	-5.69	L1
0.224	52.21	50.82	40.06	63.88	53.88	-13.06	-13.82	L2
9.142	45.03	43.19	39.47	60.00	50.00	-16.81	-10.53	L2
10.200	47.91	46.00	42.59	60.00	50.00	-14.00	-7.41	L2
11.242	53.91	51.80	47.91	60.00	50.00	-8.20	-2.09	L2
12.509	55.68	52.08	46.12	60.00	50.00	-7.92	-3.88	L2
13.470	53.22	50.27	45.24	60.00	50.00	-9.73	-4.76	L2

L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

**\*\*NOTE:** "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.



## SUMMARY DATA

### (LINE CONDUCTED TEST)

**Model Number:** TL-SF1024**Location:** Site G**Tested by:** Jason**Test Mode:** Normal (Power Board NO.: DSO-0121-03A)**Test Results:** Passed**Temperature:** 25°C**Humidity:** 55%RH

(The chart below shows the highest readings taken from the final data)

FREQ MHz	PEAK RAW dBuV	Q.P. RAW dBuV	AVG RAW dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.213	50.75	---	---	64.20	54.20	---	-3.45	L1
0.565	37.98	---	---	56.00	46.00	---	-8.02	L1
0.921	37.78	---	---	56.00	46.00	---	-8.22	L1
3.178	42.66	---	---	56.00	46.00	---	-3.34	L1
11.739	44.94	---	---	60.00	50.00	---	-5.06	L1
15.683	45.26	---	---	60.00	50.00	---	-4.74	L1
0.213	52.75	51.34	38.31	64.20	54.20	-12.86	-15.89	L2
0.283	48.91	---	---	62.19	52.19	---	-3.28	L2
0.568	42.39	---	---	56.00	46.00	---	-3.61	L2
0.854	39.66	---	---	56.00	46.00	---	-6.34	L2
3.090	24.35	15.69	---	56.00	46.00	-40.31	-21.65	L2
16.020	46.51	---	---	60.00	50.00	---	-3.49	L2

*L1 = Line One (Hot side) / L2 = Line Two (Neutral side)***\*\*NOTE:** “---” denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.



## SUMMARY DATA (RADIATED EMISSION TEST)

**Model Number:** TL-SF1024

**Location:** Site G

**Tested by:** Jason

**Polar:** Vertical / Horizontal– 10m

**Test Mode:** Normal

**Test Results:** Passed

**Temperature:** 25°C

**Humidity:** 55%RH

(The chart below shows the highest readings taken from the final data)

Frequency Range Investigated (30 MHz TO 1000 MHz)							
Freq (MHz)	Meter Reading (dBuV/m)	C.F. (dBuV/m)	Corrected Reading (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Reading Type P/Q	Pol. H/V
150.230	13.26	10.69	23.95	30.00	-6.05	P	V
187.150	14.50	8.53	23.03	30.00	-6.97	P	V
212.300	11.30	13.37	24.67	30.00	-5.33	P	V
250.050	16.24	12.89	29.13	37.00	-7.87	Q	V
499.600	9.48	22.57	32.05	37.00	-4.95	P	V
623.750	7.62	21.49	29.11	37.00	-7.89	P	V
124.640	13.26	8.70	21.96	30.00	-8.04	P	H
212.310	12.00	13.83	24.83	30.00	-5.17	P	H
225.030	8.66	15.27	23.93	30.00	-6.07	P	H
250.000	15.27	15.24	30.51	37.00	-6.49	Q	H
623.750	7.18	22.93	30.11	37.00	-6.89	P	H
658.830	4.37	22.24	26.61	37.00	-10.39	P	H

*C.F.(Correction Factor)=Antenna Factor + Cable Loss – Amplifier Gain ( + Attenuator 6Db)*

*Corrected Reading = Metering Reading + C.F.*

*Margin=Corrected Reading – Limits*

*P=Peak Reading*

*H=Horizontal Polarization/Antenna*

*Q=Quasi-peak*

*V=Vertical Polarization/Antenna*

*Comments: N/A*



## SECTION 2 EN 61000-3-2 & EN 61000-3-3 (POWER HARMONICS & VOLTAGE FLUCTUATION / FLICKER)

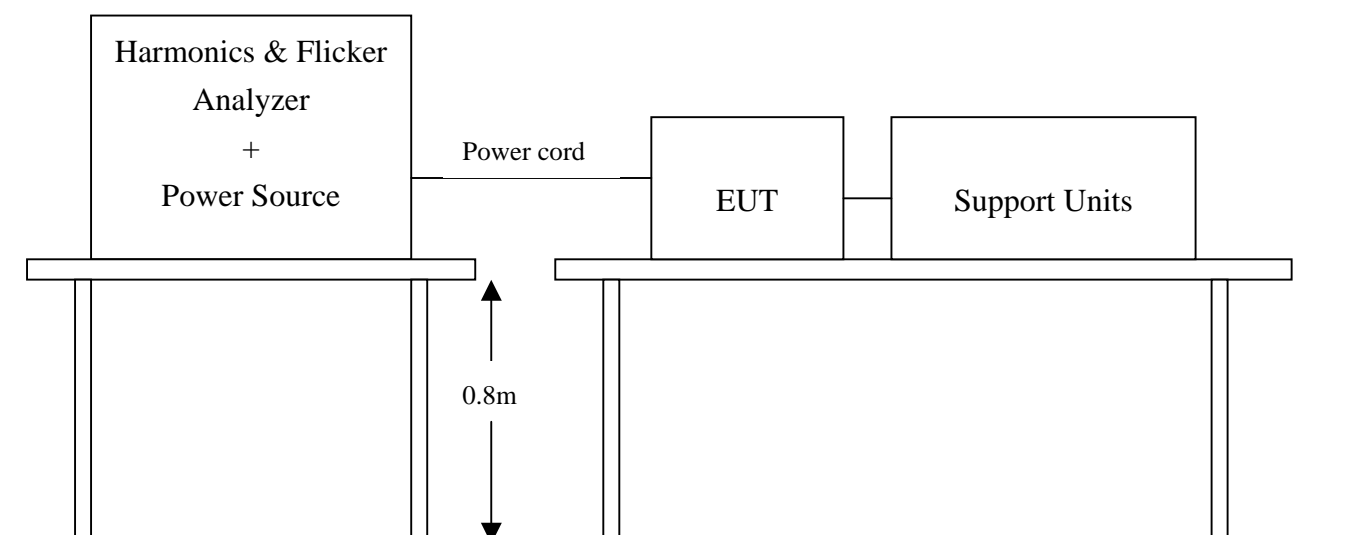
### POWER HARMONICS MEASUREMENT

**Port** : AC mains  
**Basic Standard** : EN 61000-3-2 : 2000  
**Limits** : ☒ CLASS A ; ☐ CLASS D  
**Tester** : Jason  
**Temperature** : 25°C  
**Humidity** : 55%

### VOLTAGE FLUCTUATION/FLICKER MEASUREMENT

**Port** : AC mains  
**Basic Standard** : EN 61000-3-3: 1995+A1: 2001  
**Limits** : §5 of EN 61000-3-3  
**Tester** : Jason  
**Temperature** : 25°C  
**Humidity** : 55%

### Block Diagram of Test Setup:



### Result:

Please see the attached test data



## Harmonics – Class-A per A-14 (Run time)

EUT: 24-Port 10/100M Fast Ethernet Switch

Tested by: Jason

Test category: Class-A per A-14 (European limits)

Test Margin: 100

Test date: 05-08-04

Start time: 14:13:16

End time: 14:15:58

Test duration (min): 2.5

Data file name: H-001250.cts\_data

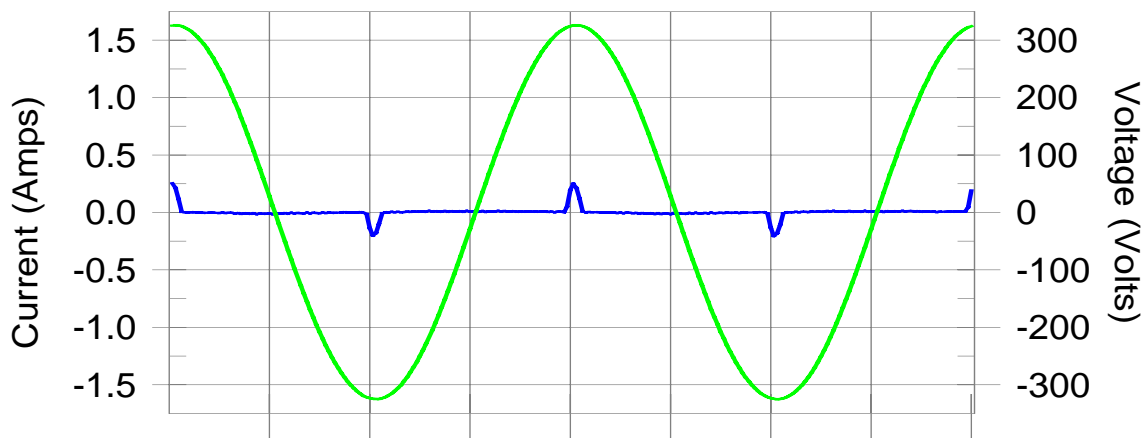
Comment: TL-SF1024

Customer: TP-LINK TECHNOLOGIES CO., LTD.

Test Result: Pass

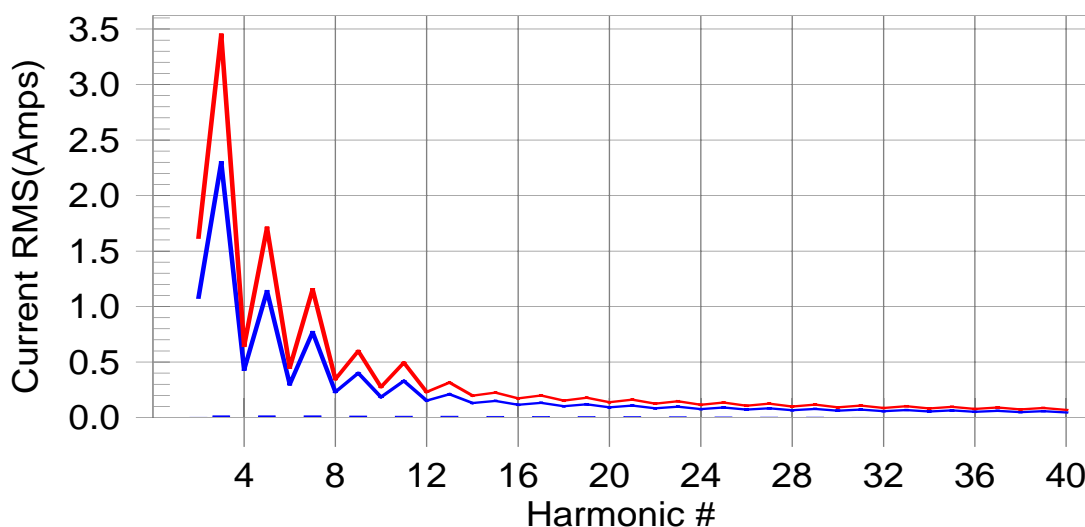
Source qualification: Normal

### Current & voltage waveforms



### Harmonics and Class A limit line

### European Limits



Test result: Pass

Worst harmonic was #17 with 5.10 % of the limit.



## Current Test Result Summary (Run time)

EUT: 24-Port 10/100M Fast Ethernet Switch

Tested by: Jason

Test category: Class-A per A-14 (European limits)

Test Margin: 100

Test date: 05-08-04

Start time: 14:13:16

End time: 14:15:58

Test duration (min): 2.5

Data file name: H-001250.cts\_data

Comment: TL-SF1024

Customer: TP-LINK TECHNOLOGIES CO., LTD.

Test Result: Pass

Source qualification: Normal

Highest parameter values during test:

V\_RMS (Volts): 230.20

I\_Peak (Amps): 0.255

I\_Fund (Amps): 0.018

Power (Watts): 4

I\_RMS (Amps): 0.046

Crest Factor: 5.589

Power Factor: 0.389

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	0.1	0.002	1.620	0.15	Pass
3	0.016	2.300	0.7	0.017	3.450	0.48	Pass
4	0.001	0.430	0.2	0.002	0.645	0.29	Pass
5	0.015	1.140	1.3	0.016	1.710	0.91	Pass
6	0.001	0.300	0.2	0.002	0.450	0.37	Pass
7	0.015	0.770	1.9	0.015	1.155	1.29	Pass
8	0.001	0.230	0.3	0.002	0.345	0.44	Pass
9	0.014	0.400	3.5	0.014	0.600	2.36	Pass
10	0.001	0.184	0.4	0.002	0.276	0.54	Pass
11	0.013	0.330	4.0	0.013	0.495	2.69	Pass
12	0.001	0.153	0.4	0.001	0.230	0.58	Pass
13	0.012	0.210	5.8	0.012	0.315	3.92	Pass
14	0.001	0.131	0.5	0.001	0.197	0.65	Pass
15	0.011	0.150	7.4	0.011	0.225	5.01	Pass
16	0.001	0.115	0.5	0.001	0.173	0.69	Pass
17	0.010	0.132	7.6	0.010	0.199	5.10	Pass
18	0.000	0.102	0.5	0.001	0.153	0.72	Pass
19	0.009	0.118	7.5	0.009	0.178	5.04	Pass
20	0.000	0.092	0.5	0.001	0.138	0.71	Pass
21	0.008	0.107	7.2	0.008	0.161	4.83	Pass
22	0.000	0.084	0.5	0.001	0.125	0.69	Pass
23	0.006	0.098	6.6	0.007	0.147	4.50	Pass
24	0.000	0.077	0.4	0.001	0.115	0.65	Pass
25	0.005	0.090	6.0	0.005	0.135	4.05	Pass
26	0.000	0.071	0.4	0.001	0.106	0.60	Pass
27	0.004	0.083	5.2	0.004	0.125	3.51	Pass
28	0.000	0.066	0.3	0.001	0.099	0.55	Pass
29	0.003	0.078	4.2	0.003	0.116	2.92	Pass
30	0.000	0.061	0.3	0.000	0.092	0.48	Pass
31	0.002	0.073	3.3	0.002	0.109	2.26	Pass
32	0.000	0.058	0.3	0.000	0.086	0.41	Pass
33	0.002	0.068	2.4	0.002	0.102	1.64	Pass
34	0.000	0.054	0.3	0.000	0.081	0.37	Pass
35	0.001	0.064	1.5	0.001	0.096	1.06	Pass
36	0.000	0.051	0.2	0.000	0.077	0.34	Pass
37	0.001	0.061	0.9	0.001	0.091	0.64	Pass
38	0.000	0.048	0.3	0.000	0.073	0.37	Pass
39	0.001	0.058	0.9	0.001	0.087	0.66	Pass
40	0.000	0.046	0.3	0.000	0.069	0.40	Pass





## Voltage Source Verification Data (Run time)

EUT: 24-Port 10/100M Fast Ethernet Switch

Tested by: Jason

Test category: Class-A per A-14 (European limits)

Test Margin: 100

Test date: 05-08-04

Start time: 14:13:16

End time: 14:15:58

Test duration (min): 2.5

Data file name: H-001250.cts\_data

Comment: TL-SF1024

Customer: TP-LINK TECHNOLOGIES CO., LTD.

Test Result: Pass

Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 230.20

I\_Peak (Amps): 0.255

I\_RMS (Amps): 0.046

I\_Fund (Amps): 0.018

Crest Factor: 5.589

Power (Watts): 4

Power Factor: 0.389

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.181	0.460	39.22	OK
3	0.461	2.071	22.25	OK
4	0.091	0.460	19.78	OK
5	0.033	0.921	3.55	OK
6	0.093	0.460	20.23	OK
7	0.031	0.690	4.53	OK
8	0.039	0.460	8.45	OK
9	0.013	0.460	2.90	OK
10	0.024	0.460	5.14	OK
11	0.019	0.230	8.08	OK
12	0.017	0.230	7.57	OK
13	0.016	0.230	6.90	OK
14	0.011	0.230	4.66	OK
15	0.013	0.230	5.46	OK
16	0.012	0.230	5.16	OK
17	0.017	0.230	7.59	OK
18	0.014	0.230	6.30	OK
19	0.012	0.230	5.16	OK
20	0.011	0.230	4.60	OK
21	0.012	0.230	5.11	OK
22	0.007	0.230	2.89	OK
23	0.012	0.230	5.11	OK
24	0.008	0.230	3.45	OK
25	0.010	0.230	4.21	OK
26	0.012	0.230	5.01	OK
27	0.010	0.230	4.18	OK
28	0.011	0.230	4.74	OK
29	0.006	0.230	2.44	OK
30	0.008	0.230	3.50	OK
31	0.007	0.230	3.02	OK
32	0.007	0.230	2.99	OK
33	0.006	0.230	2.61	OK
34	0.004	0.230	1.78	OK
35	0.005	0.230	2.18	OK
36	0.004	0.230	1.63	OK
37	0.003	0.230	1.38	OK
38	0.002	0.230	1.05	OK
39	0.005	0.230	2.05	OK
40	0.004	0.230	1.84	OK



## Flicker Test Summary (Run time)

EUT: 24-Port 10/100M Fast Ethernet Switch

Tested by: Jason

Test category: All parameters (European limits)

Test Margin: 100

Test date: 05-08-04

Start time: 14:19:22

End time: 14:29:36

Test duration (min): 10

Data file name: F-001251.cts\_data

Comment: TL-SF1024

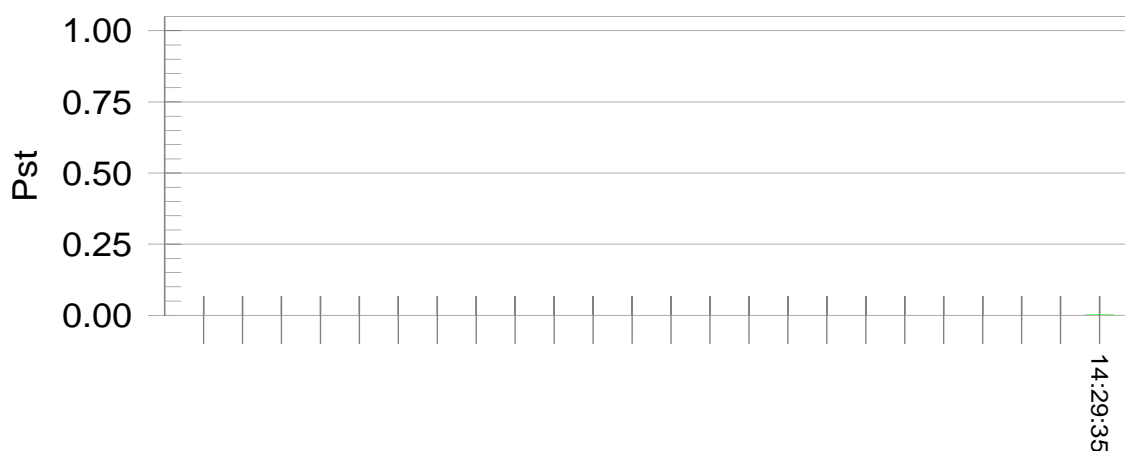
Customer: TP-LINK TECHNOLOGIES CO., LTD.

Test Result: Pass

Status: Test Completed

Pst, and limit line

European Limits



Time is too short for Plt plot

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.08		
Highest dt (%):	0.00	Test limit (%):	3.30 Pass
Highest dc (%):	0.00	Test limit (%):	3.30 Pass
Highest dmax (%):	0.00	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.001	Test limit:	1.000 Pass
Highest Plt (2 hr. period):	0.001	Test limit:	0.650 Pass

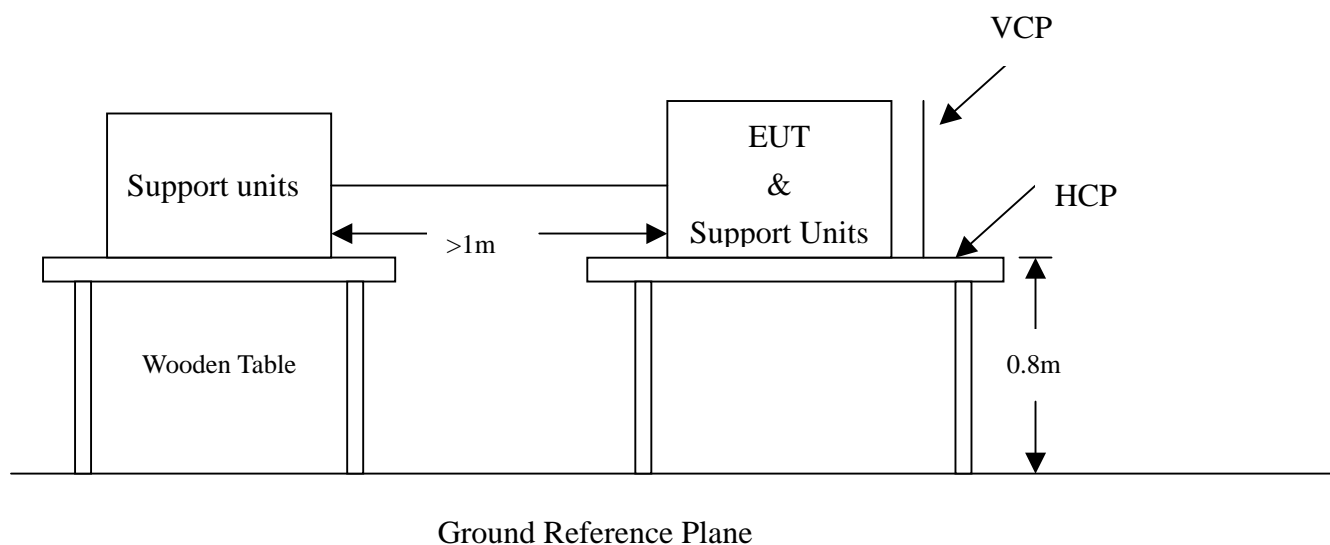
## SECTION 3 IEC 61000-4-2 (ELECTROSTATIC DISCHARGE)

### ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

**Port** : Enclosure  
**Basic Standard** : IEC 61000-4-2: 2001  
**Test Level** :  $\pm 8$  Kv (Air Discharge)  
 $\pm 4$  Kv (Contact Discharge)  
**Performance Criterion:** B ( Standard require )  
**Tester** : Jason  
**Temperature/Humidity:** 25°C/55%

#### **Block Diagram of Test Setup:**

( The 470 k ohm resistors are installed per standard requirement )





### **Test Procedure:**

1. The EUT was located 0.1 m minimum from all side of the HCP.
2. The support units were located 1 m minimum away from the EUT.
3. Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.
4. Active the communication function if the EUT with such port(s).
5. As per the requirement of EN 55024; applying direct contact discharge at the sides other than front of EUT at minimum 50 discharges (25 positive and 25 negative) if applicable, can't be applied direct contact discharge side of EUT then the indirect discharge shall be applied. One of the test points shall be subjected to at least 50 indirect discharge (contact) to the front edge of horizontal coupling plane.
6. Other parts of EUT where it is not possible to perform contact discharge then selecting appropriate points of EUT for air discharge, a minimum of 10 single air discharges shall be applied.
7. The application of ESD to the contact of open connectors is not required.
8. Putting a mark on EUT to show tested points. The following test condition was followed during the tests.

**Note:** As per the A2 to IEC 61000-4-2, a bleed resistor cable is connected between the EUT and HCP during the test.

The electrostatic discharges were applied as follows:

Amount of Discharges	Voltage	Coupling	Result (Pass/Fail)
Mini 25 /Point	$\pm 2\text{Kv}$ ; $\pm 4\text{Kv}$	Contact Discharge	Pass
Mini 25 /Point	$\pm 2\text{Kv}$ ; $\pm 4\text{Kv}$	Indirect Discharge HCP (Front)	Pass
Mini 25 /Point	$\pm 2\text{Kv}$ ; $\pm 4\text{Kv}$	Indirect Discharge VCP (Left)	Pass
Mini 25 /Point	$\pm 2\text{Kv}$ ; $\pm 4\text{Kv}$	Indirect Discharge VCP (Back)	Pass
Mini 25 /Point	$\pm 2\text{Kv}$ ; $\pm 4\text{Kv}$	Indirect Discharge VCP (Right)	Pass
Mini 10 /Point	$\pm 2\text{Kv}$ ; $\pm 4\text{Kv}$ ; $\pm 8\text{Kv}$	Air Discharge	No Discharge Point

**The discharge points to EUT, please refer to attached pages.**

**(Blue arrow mark for contact discharge, red arrow mark for air discharge.)**



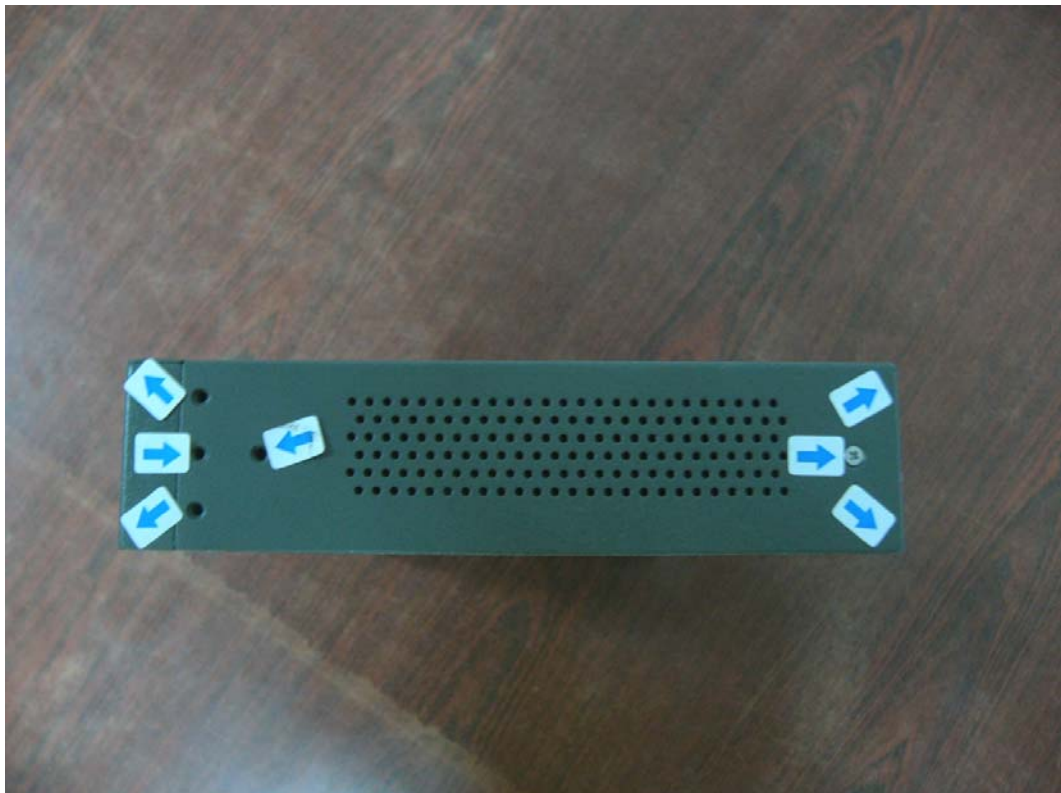
**Performance & Result:**

- ☐ **Criterion A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
- ☒ **Criterion B:** The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- ☐ **Criterion C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

☒ **PASS**

☐ **FAIL**

## ***Discharge Points of EUT***



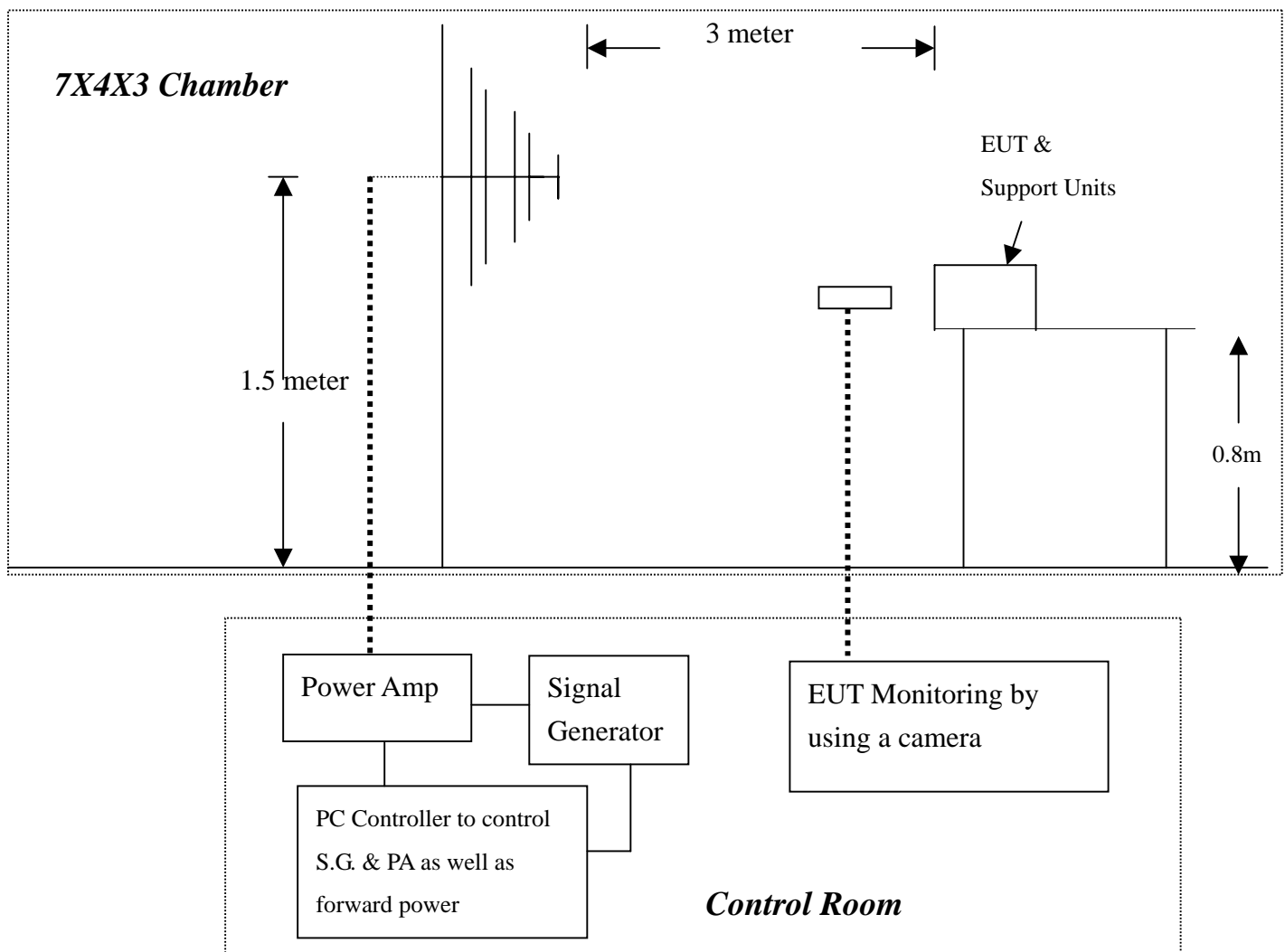


## SECTION 4 IEC 61000-4-3 (RADIATED ELECTROMAGNETIC FIELD )

### RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

**Port** : Enclosure  
**Basic Standard** : IEC 61000-4-3:2002  
**Requirements** : 3 V/m with 80% AM. 1kHz Modulation.  
**Performance Criterion** : A ( Standard require )  
**Tester** : Jason  
**Temperature** : 25°C  
**Humidity** : 55%

#### Block Diagram of Test Setup:





**Test Procedure:**

1. The EUT was located at the edge of supporting table keep 3 meter away from transmitting antenna, it just the calibrated square area of field uniformity. The support units were located outside of the uniformity area, but the cable(s) connected with EUT were exposed to the calibrated field as per IEC 61000-4-3.
2. Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.
3. Setting the testing parameters of RS test software per IEC 61000-4-3.
4. Performing the pre-test at each side of with double specified level (3V/m) at 1% steps.
5. From the result of pre-test in step 5, choose the worst side of EUT for final test from 80 MHz to 1000 MHz at 1% steps.
6. Recording the test result in following table.
7. It is not necessary to perform test as per annex A of EN 55024 if the EUT doesn't belong to TTE product.

**IEC 61000-4-3 test conditions:**

Test level : 3V/m

Steps : 1 % of fundamental

Dwell Time : 1 sec

Range (MHz)	Field	Modulation	Polarity	Position (°)	Result (Pass/Fail)
80-1000	3V/m	Yes	H	Front	Pass
80-1000	3V/m	Yes	V	Front	Pass
80-1000	3V/m	Yes	H	Right	Pass
80-1000	3V/m	Yes	V	Right	Pass
80-1000	3V/m	Yes	H	Back	Pass
80-1000	3V/m	Yes	V	Back	Pass
80-1000	3V/m	Yes	H	Left	Pass
80-1000	3V/m	Yes	V	Left	Pass

**Performance & Result:**

☒ **Criterion A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.

☐ **Criterion B:** The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.

☐ **Criterion C:** Temporary loss of function is allowed, provided the functions self-recoverable or can be restored by the operation of controls.

☒ **PASS**☐ **FAIL**

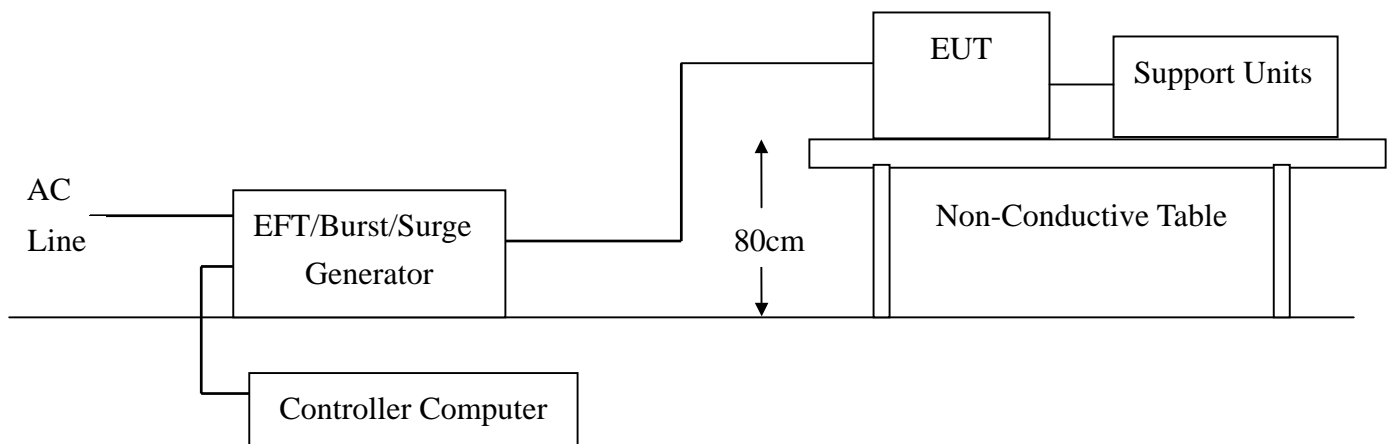


## SECTION 5 IEC 61000-4-4 (FAST TRANSIENTS/BURST)

### FAST TRANSIENTS/BURST IMMUNITY TEST

<b>Port</b>	: On Power Supply Lines
<b>Basic Standard</b>	: IEC 61000-4-4: 2001
<b>Requirements</b>	: +/-1KV for Power Supply Lines
<b>Performance Criterion</b>	: B ( Standard require )
<b>Tester</b>	: Jason
<b>Temperature</b>	: 25°C
<b>Humidity</b>	: 55%

### Block Diagram of Test Setup:





## **Test Procedure:**

1. The EUT and support units were located on a wooden table 0.8 m away from ground reference plane.
2. A 1.0 meter long power cord was attached to EUT during the test.
3. The length of communication cable between communication port and clamp was keeping within 1 meter.
4. Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.
5. Related peripherals work during the test.
6. Recording the test result as shown in following table.

### **Test conditions:**

Impulse Frequency: 5kHz

Tr/Th: 5/50ns

Burst Duration: 15ms

Burst Period: 300ms

Inject Line	Voltage Kv	Inject Method	Result (Pass/Fail)
L	+/- 1	Direct	Pass
N	+/- 1	Direct	Pass
L+N	+/- 1	Direct	Pass
PE	+/- 1	Direct	Pass
L+PE	+/- 1	Direct	Pass
N+PE	+/- 1	Direct	Pass
L+N+PE	+/- 1	Direct	Pass

## **Performance & Result:**

- ☒ **Criterion A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
- ☐ **Criterion B:** The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- ☐ **Criterion C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

☒ **PASS**

☐ **FAIL**



## SECTION 6 IEC 61000-4-5 ( SURGE IMMUNITY )

### SURGE IMMUNITY TEST

**Port** : On Power Supply Lines

**Basic Standard** : IEC 61000-4-5: 2001

**Requirements** : +/- 1kV (Line to Line)

: +/- 2kV (Line to Ground)

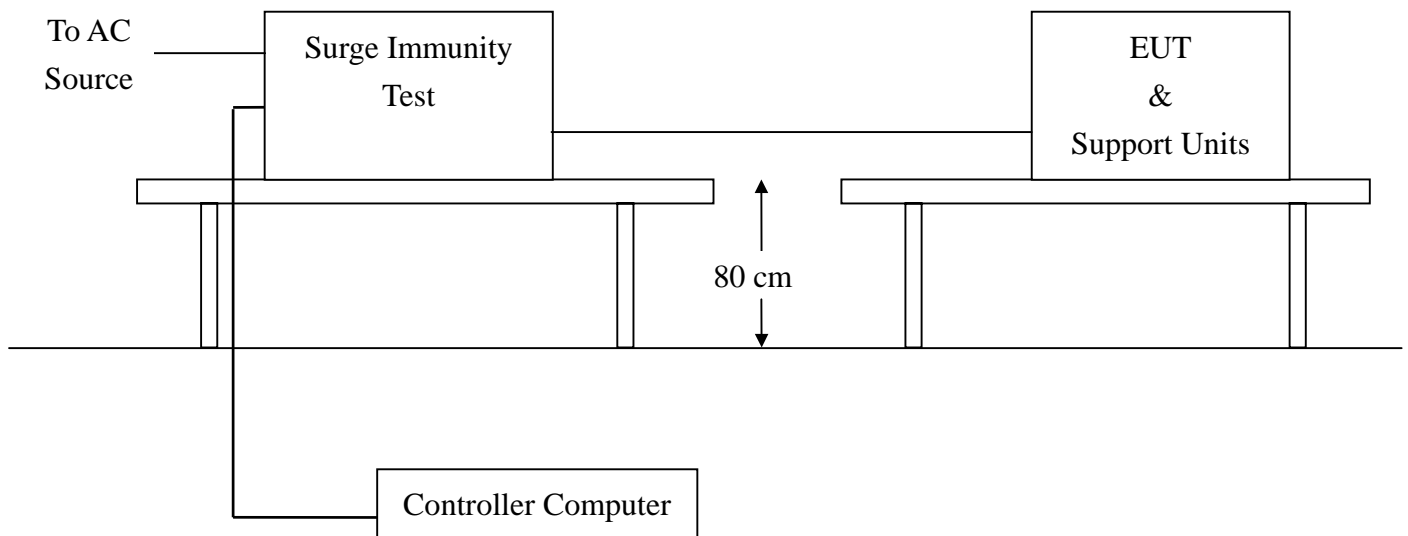
**Performance Criterion** :B ( Standard require )

**Tester** : Jason

**Temperature** : 25°C

**Humidity** : 55%

### Block Diagram of Test Setup:





### **Test Procedure:**

1. The EUT and support units were located on a wooden table 0.8 m away from ground floor.
2. Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.
3. Recording the test result as shown in following table.

### **Test conditions:**

Voltage Waveform : 1.2/50  $\mu$ s  
Current Waveform : 8/20  $\mu$ s  
Polarity : Positive/Negative  
Phase angle : 0°, 90°, 270°  
Number of Test : 5

Coupling Line	Voltage (kV)	Polarity	Coupling Method	Result (Pass/Fail)
L1-L2	1	Positive	Capacitive	Pass
L1-PE	2	Positive	Capacitive	Pass
L2-PE	2	Positive	Capacitive	Pass
L1-L2	1	Negative	Capacitive	Pass
L1-PE	2	Negative	Capacitive	Pass
L2-PE	2	Negative	Capacitive	Pass

### **Performance & Result:**

- ☒ **Criterion A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
- ☐ **Criterion B:** The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- ☐ **Criterion C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

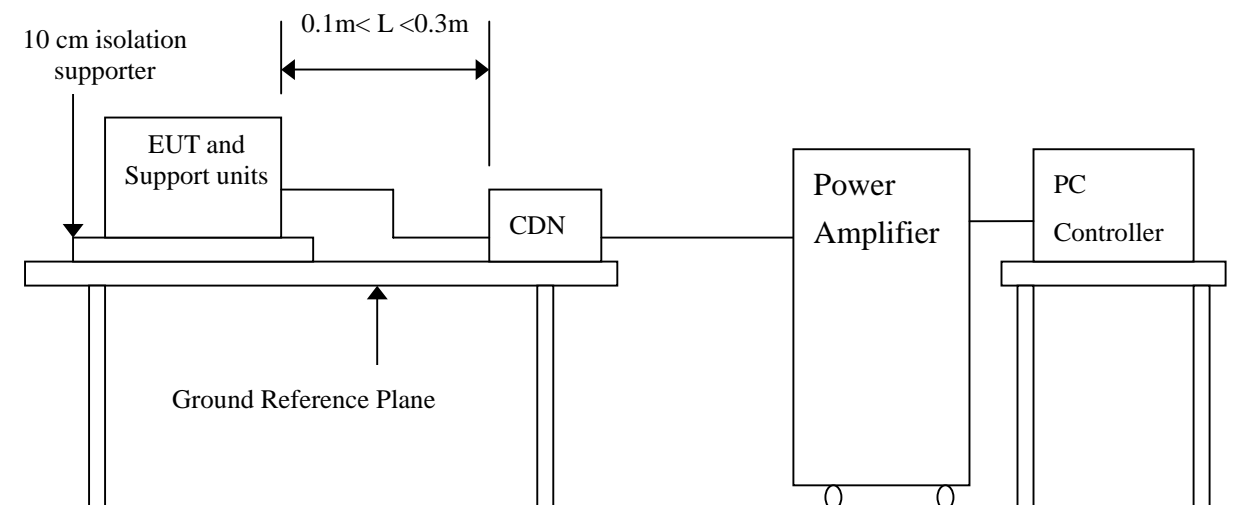
☒ **PASS**

☐ **FAIL**

## SECTION 7 IEC 61000-4-6(CONDUCTED DISTURBANCE/INDUCED BY RADIO-FREQUENCY FIELD)

**Port** : On Power Supply Lines  
**Basic Standard** : IEC 61000-4-6: 2001  
**Requirements** : 3V with 80% AM. 1kHz Modulation  
**Injection Method** : CDN  
**Performance Criterion** : A (Standard require)  
**Tester** : Jason  
**Temperature** : 25°C  
**Humidity** : 55%

### Block Diagram of Test Setup:





## **Test Procedure:**

1. The EUT and support units were located at a ground reference plane with the interposition of a 0.1 m thickness insulating support and the CDN was located on GRP directly.
2. Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.
3. Related peripherals work during the test.
4. Setting the testing parameters of CS test software per IEC 61000-4-6.
5. Recording the test result in following table.

### **Test conditions:**

Frequency Range : 0.15MHz-80MHz

Frequency Step : 1% of fundamental

Dwell Time : 1 sec

Range (MHz)	Field	Modulation	Result (Pass/Fail)
0.15-80	3V	Yes	Pass

## **Performance & Result:**

- ☒ **Criterion A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.
- ☐ **Criterion B:** The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- ☐ **Criterion C:** Temporary loss of function is allowed, provided the functions self-recoverable or can be restored by the operation of controls.

☒ **PASS**

☐ **FAIL**

## SECTION 8 IEC 61000-4-11 (VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS )

### VOLTAGE DIPS / SHORT INTERRUPTIONS

**Port** : On Power Supply Lines

**Basic Standard** : IEC 61000-4-11: 2001

**Requirement** : PHASE ANGLE 0, 45, 90, 135, 180, 225, 270, 315 degrees

Voltage Dips	Test Level % $U_T$	Reduction (%)	Duration ( periods )	Performance Criterion
	<5	>95	0.5	B
	70	30	25	C

Voltage Interruptions	Test Level % $U_T$	Reduction (%)	Duration ( periods )	Performance Criterion
	<5	>95	250	C

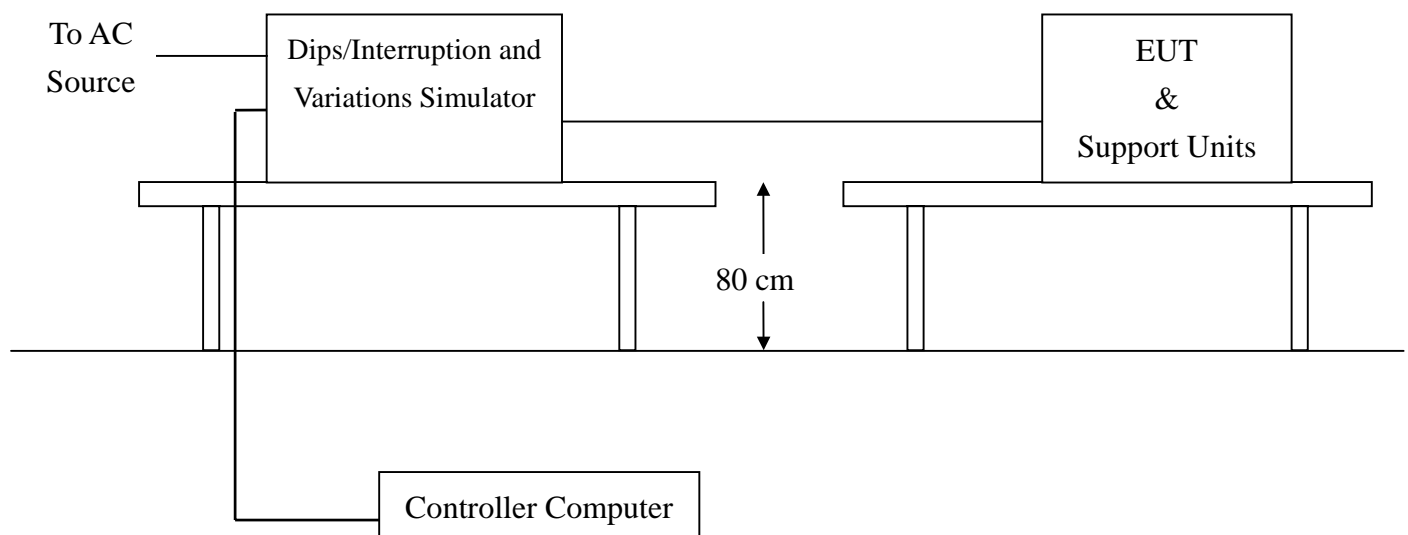
**Test Interval** : Min. 10 sec.

**Tester** : Jason

**Temperature** : 25°C

**Humidity** : 55%

### Block Diagram of Test Setup:







### **Test Procedure:**

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Set up EUT with the auxiliary equipments in windows XP. Then run the start menu to ping 192.168.1.1 -t, and make sure the EUT works normally during the test.
3. Setting the parameter of tests and then Perform the test software of test simulator.
4. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
5. Recording the test result in test record form.

### **Test conditions:**

The duration with a sequence of three dips/interruptions with interval of 10 s minimum  
( Between each test event )

### **Voltage Dips:**

Test Level % U <sub>T</sub>	Reduction (%)	Duration ( periods)	Observation	Meet Performance Criterion
0	100	0.5	Normal	A
70	30	25	Normal	A

### **Voltage Interruptions:**

Test Level % U <sub>T</sub>	Reduction (%)	Duration ( periods)	Observation	Meet Performance Criterion
0	100	250	EUT interrupt shortly, and can recover by itself.	B

### **Performance & Result:**

**Criterion A:** The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.

**Criterion B:** The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.

**Criterion C:** Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.

☒ **PASS**

☐ **FAIL**



## **APPENDIX 1**

### **PHOTOGRAPHS OF TEST SETUP**

## **LINE CONDUCTED EMISSION TEST (EN 55022)**



## **RADIATED EMISSION TEST (EN 55022)**







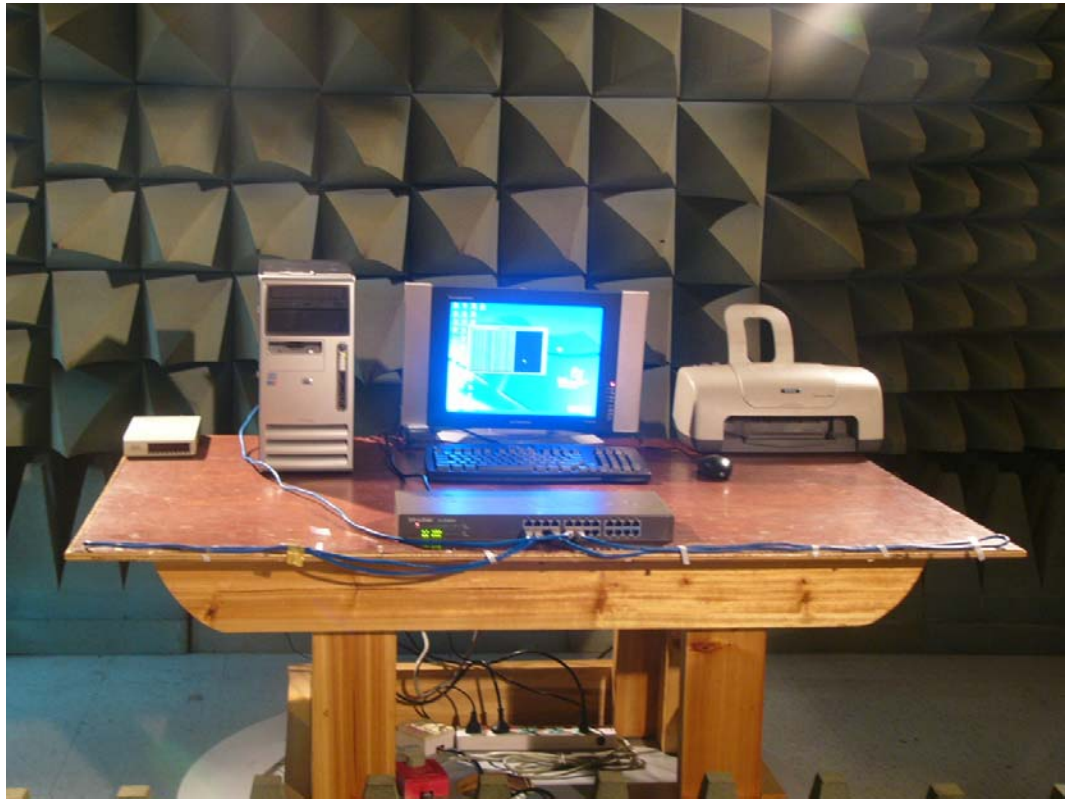
## **POWER HARMONIC & VOLTAGE FLUCTUATION / FLICKER TEST (EN 61000-3-2, EN 61000-3-3)**



## **ELECTROSTATIC DISCHARGE TEST (IEC 61000-4-2)**



## **RADIATED ELECTROMAGNETIC FIELD (IEC 61000-4-3)**



**FAST TRANSIENTS/BURST TEST (IEC 61000-4-4)**  
**SURGE IMMUNITY TEST (IEC 61000-4-5)**  
**VOLTAGE DIPS / INTERRUPTION TEST (IEC 61000-4-11)**





## **CONDUCTED DISTURBANCE, INDUCED BY RADIO-FREQUENCY FIELDS TEST (IEC 61000-4-6)**

