



## EMC Test Report



<b>Applicant :</b>	eten Technologies Inc.
<b>Address of Applicant :</b>	2F, No.6, Lane 497, Zhongzheng Road, Xindian Dist., New Taipei City 231, Taiwan, R.O.C.
<b>Equipment Under Test :</b>	24-Port 10/100/1000Base-T + 2-Port 10G SFP+ Stackable Layer 2+ Full Management High Power PoE Switch
<b>Model Number :</b>	PSG-6526XS
<b>Series :</b>	PSG-6528, PSG-652Y(Y=0~9)

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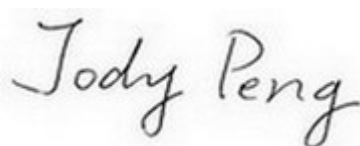
## Verification

**Applicant :** eten Technologies Inc.  
**Manufacturer :** eten Technologies Inc.  
**Equipment Under Test :** 24-Port 10/100/1000Base-T + 2-Port 10G SFP+  
 Stackable Layer 2+ Full Management High Power  
 PoE Switch  
**Model Number :** PSG-6526XS  
**Series :** PSG-6528, PSG-652Y(Y=0~9)  
**Sample Received Date :** 2013-11-14  
**Test Standard :**

Emission:	Immunity:
<input checked="" type="checkbox"/> EN 55022:2010 Class A	<input checked="" type="checkbox"/> EN 55024:2010
<input checked="" type="checkbox"/> IEC 61000-3-2:2005 +A1:2008+A2:2009	<input checked="" type="checkbox"/> IEC 61000-4-2:2008
<input checked="" type="checkbox"/> IEC 61000-3-3:2008	<input checked="" type="checkbox"/> IEC 61000-4-3:2006+A1:2007+A2:2010
	<input checked="" type="checkbox"/> IEC 61000-4-4:2004+A1:2010
	<input checked="" type="checkbox"/> IEC 61000-4-5:2005
	<input checked="" type="checkbox"/> IEC 61000-4-6:2008
	<input checked="" type="checkbox"/> IEC 61000-4-8:2009
	<input checked="" type="checkbox"/> IEC 61000-4-11:2004

### Remark:

This report details the results of the test carried out on one sample. This report shows the EUT is technically compliant with the EN 55022 and EN 55024 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 by:** \_\_\_\_\_ **Date:** 2013-11-25  
 Jody Peng/ ADM. Dept Staff



**Tested by:** \_\_\_\_\_ **Date:** 2013-11-22  
 George Hsu/ ENG. Dept. Staff



**Approved by:** \_\_\_\_\_ **Date:** 2013-11-25  
 Peter Chin/ Head of Laboratory

## Summary of Test Result – Emission

Test Standard	Test Item	Test Result	Remark
EN55022 Class A	Conducted Disturbance Test (at Mains Terminal)	Pass	Highest Emission L: 1.725MHz, Q.P.56.79dBuV, Margin -16.07 dB N: 1.725MHz, Q.P.55.68dBuV, Margin -17.20 dB
EN55022 Class A	Conducted Disturbance (at Telecommunic ation Ports)	Pass	Highest Emission Voltage: 2.931MHz, Q.P.63.11dBuV, Margin -14.26 dB A.V.63.25dBuV, Margin -1.12 dB
EN55022 Class A	Radiated Disturbance Test (Below 1GHz)	Pass	Highest Emission H: 253.100MHz, 60.17dBuV, Margin-1.43 dB Antenna Height 2.15 m, Turntable Angle 148° V: 127.000MHz, 53.11dBuV, Margin-2.88 dB Antenna Height 1 m, Turntable Angle 335°
EN55022 Class A	Radiated Disturbance Test (Above 1GHz)	Pass	Highest Emission H: 1035.000MHz, 53.16dBuV, Margin-11.97 dB Antenna Height 3.85 m, Turntable Angle 222° V: 1500.000MHz, 60.23dBuV, Margin-6.57 dB Antenna Height 1.99 m, Turntable Angle 347°
IEC61000-3-2	Harmonic	Pass	Refer to Page 27
IEC61000-3-3	Flicker	Pass	Refer to Page 30

## Measurement Uncertainty – Emission

The following measurement uncertainty has been calculated for Emission Tests performed on the EUT as specified in CISPR 16-4-2:

Test Item		Uncertainty
Conducted Emission		± 3.61dB
Radiated Emission	Below 1GHz	± 5.04dB
	Above 1GHz	± 4.97dB

This reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of  $k = 2$ , providing a level of confidence of approximately 95%.

## Summary of Test Result – Immunity

Test Standard	Test Item	Performance Criteria	Observed Result Class	Test Result
IEC61000-4-2	Electrostatic Discharge	B	A	Pass
IEC61000-4-3	Radiated Susceptibility	A	A	Pass
IEC61000-4-4	Electrical Fast Transient	B	A	Pass
IEC61000-4-5	Surge	B	A	Pass
IEC61000-4-6	Conducted Susceptibility	A	A	Pass
IEC61000-4-8	Magnetic Field	A	A	Pass
IEC61000-4-11	Voltage Dips and Interruption	Dips >95% B	A	Pass
		Dips 30% C	A	
		Interruptions >95% C	B	

## Measurement Uncertainty – Immunity

It has been demonstrated that the test equipments for the above Immunity Tests meet the specified requirements in the standard with at least a 95% confidence.

# 1 General Description

## 1.1 Description of Equipment Under Test (EUT)

<b>Equipment Under Test</b>	:	24-Port 10/100/1000Base-T + 2-Port 10G SFP+ Stackable Layer 2+ Full Management High Power PoE Switch
<b>Model Number</b>	:	PSG-6526XS
<b>Series</b>	:	PSG-6528, PSG-652Y(Y=0~9)
<b>Applicant</b> <b>Address of Applicant</b>	:	eten Technologies Inc. 2F, No.6, Lane 497, Zhongzheng Road, Xindian Dist., New Taipei City 231, Taiwan, R.O.C.
<b>Manufacturer</b> <b>Address of Manufacturer</b>	:	eten Technologies Inc. 2F, No.6, Lane 497, Zhongzheng Road, Xindian Dist., New Taipei City 231, Taiwan, R.O.C.
<b>Power Supply</b>	:	Input: 100-240Vac, 60 / 50Hz Output: 56Vdc, 4.46A, Max. 500W
<b>Data Cable</b>	:	<input checked="" type="checkbox"/> N/A
<b>Description of EUT</b>	:	<p><b>Dimensions</b> : 44 cm (L) X 33 cm (W) X 4.5 cm (H)</p> <p><b>Weight</b> : 4.8 Kg</p> <p><b>Highest Frequency of the Internal Source</b> : 125 MHz</p> <p><b>Position</b> : <input checked="" type="checkbox"/> Table-top / <input type="checkbox"/> Floor-standing</p> <p><b>Intended Function</b> : The EUT is a 24-Port 10/100/1000Base-T + 2-Port 10G SFP+ Stackable Layer 2+ Full Management High Power PoE Switch.</p> <p><b>Product Variance</b> : The manufacturer declares that the series products share the identical circuit design with the main test sample. The main test sample is the most sophisticated product with full functions. The series products have less function than the main test sample. Matrix only takes the responsibility to the main test sample.</p>



## 1.2 Test Facility

Conducted Emission, Harmonic, Flicker, Electrostatic Discharge, Electrical Fast Transient, Surge, Conducted Susceptibility, Voltage Dips and Interruptions Tests are performed at 2F, No.146, Jian Yi Rd., Chung-Ho District, New Taipei City, Taiwan, R.O.C.

Radiated Emission, Radiated Susceptibility, Magnetic Field Tests are performed at No. 15-1, Cweishuh Keng, Cweipin Village, Linkou, New Taipei City, Taiwan, R.O.C.

## 1.3 Test Instruments

### Instruments Used for Emission Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration Date	Application
L.I.S.N.	Mess Tec	NNB-2/16Z	03/1006	2013-05-12	Conducted Disturbance
L.I.S.N.	EMCIS	LN2-16	LN04023	2013-02-13	
Pulse Limiter	Mess Tec	PL10	N/A	2012-11-30	
RF Cable	N/A	N/A	N/A	2013-10-05	
Coupling AND Decoupling Network	SCHAFFNER	ISN T400	16832	2013-10-08	Conducted Disturbance at Telecommunication Port
RF Current Probe	FCC	F-33-4	53	2013-05-16	
EMI Receiver	R&S	ESCI	100615	2013-02-13	Conducted Disturbance Radiated Disturbance (Below 1GHz)
Bilog Antenna	Teseq GmbH	CBL6111D	25769	2013-02-06	Radiated Disturbance (Below 1GHz)
Pre-Amplifier	WIRELESS	FPA-6592G	60009	2013-07-08	
Spectrum Analyzer	R & S	FSL6	100564	2013-06-15	
RF Cable	MIYAZAKI	8D-F8	N/A	2013-02-08	
Double-Ridged Waveguide Horn	EMCO	3115	9912-5992	2013-05-14	Radiated Disturbance (Above 1GHz)
Preamplifier	HD	HD17187	004	2013-08-02	
Spectrum Analyzer	ADVANTEST	R3172	101202158	2013-06-23	
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104	197541/4	2013-08-02	
Programmable AC Source	Chroma	6520	2048	2013-01-31	Harmonic, Flicker
Universal Power Analyzer	Chroma	6630	0597	2013-01-31	

### Instruments Used for Immunity Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration Date	Application
ESD Simulator	Noiseken	TC-815R	ESS0868491	2012-12-14	Electrostatic Discharge
ESD Simulator	Noiseken	ESS-2002EX	ESS0868406	2012-12-14	
Antenna	EMCO	3142	9710-1221	2013-02-11	Radiated Immunity
Power Amplifier	IFI	CMX50	N/A	2013-02-07	
Signal Generator	R&S	SML03	103396	2013-02-01	
CDN	FRANKONIA	CDN M2+M3	A3011037	2013-07-08	Conducted Immunity
C.I. Test System	FRANKONIA	CIT-10/75	102C3208	2012-12-27	
Power Attenuator	FRANKONIA	75-A-FFN-06	0212	2012-12-27	
RF Cable	N/A	N/A	N/A	2012-11-30	
Antenna	FCC	F-1000-4-8/9/10-L-1M	9953	2013-03-02	Magnetic Field Disturbance
Advanced EMC Immunity Test System	KEYTEK	EMC PRO	0002255	2013-03-02	
Transient 2000	EMC PARTNER	TRA-2000	449	2013-11-09	Electrostatic Discharge, Fast Transient, Surge, Dips & Interruptions

Note: The instruments listed above are within their calibration period of 1 year.

#### 1.4 Test Methodology

All Emission Tests were performed according to the procedures specified in EN 55022.

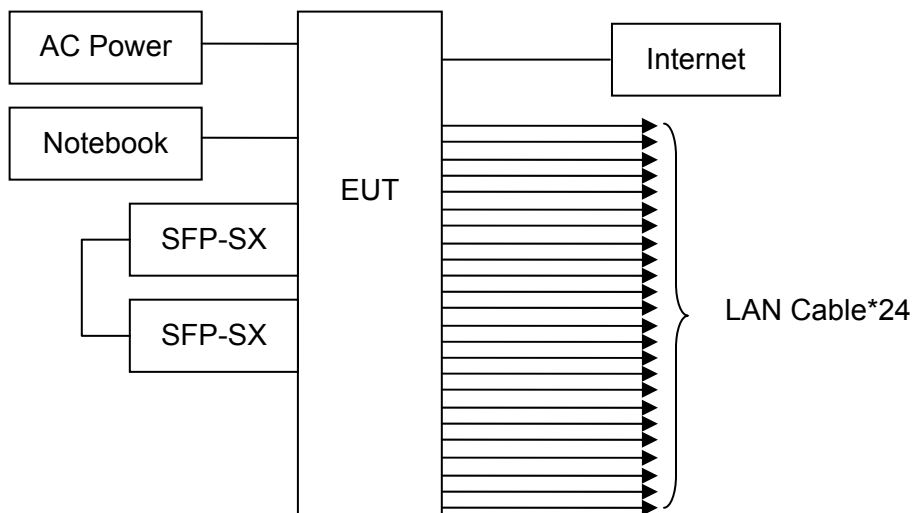
All Immunity Tests were performed according to the procedures specified in EN 55024.

### 1.5 Auxiliary Equipments

Provided by Matrix Test Lab.

No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Power Cord
1	Notebook	N61J	N61JV-021A520M	CE,FCC, C-TICK N13219, BSMI R31018	ASUS	N/A
2	SFP-SX	JS-S430LX	JS129190003	N/A	JUMBO-SUN	N/A
3	SFP-SX	JS-S430LX	JS129190004	N/A	JUMBO-SUN	N/A

### 1.6 Block Diagram



### 1.7 Identifying the Final Test Mode ( Worst Case )

1. Operation Mode : Run Ping IP testing program

Note: After pre-test, we identified that the Operation Mode (the worst case) was most likely to cause maximum disturbance and most likely to be susceptible to disturbance. Therefore, the Final EMC Assessment was performed for the worst case.

### 1.8 Final Test Mode

Operation Mode

## 1.9 Condition of Power Supply

AC 230V, 50Hz

## 1.10 EUT Configuration

1. Setup the EUT as shown in Sec.1.6 Block Diagram.
2. Turn on the power of all equipments.
3. Activate the selected Final Test Mode.

## 1.11 Immunity Performance Classification

Class	Class Criterion
A	The equipment shall continue to operate as intended without operator intervention. No 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.
C	Lost of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the user in accordance with the manufacturer's instructions.



## 2.3 Test Limit

EN 55022

Frequency (MHz)	<input checked="" type="checkbox"/> Class A		<input type="checkbox"/> Class B	
	Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 ~ 0.50	79	66	66 to 56	56 to 46
0.50 ~ 5.0	73	60	56	46
5.0 ~ 30	73	60	60	50

The EMI Receiver bandwidth was set at 9 kHz.

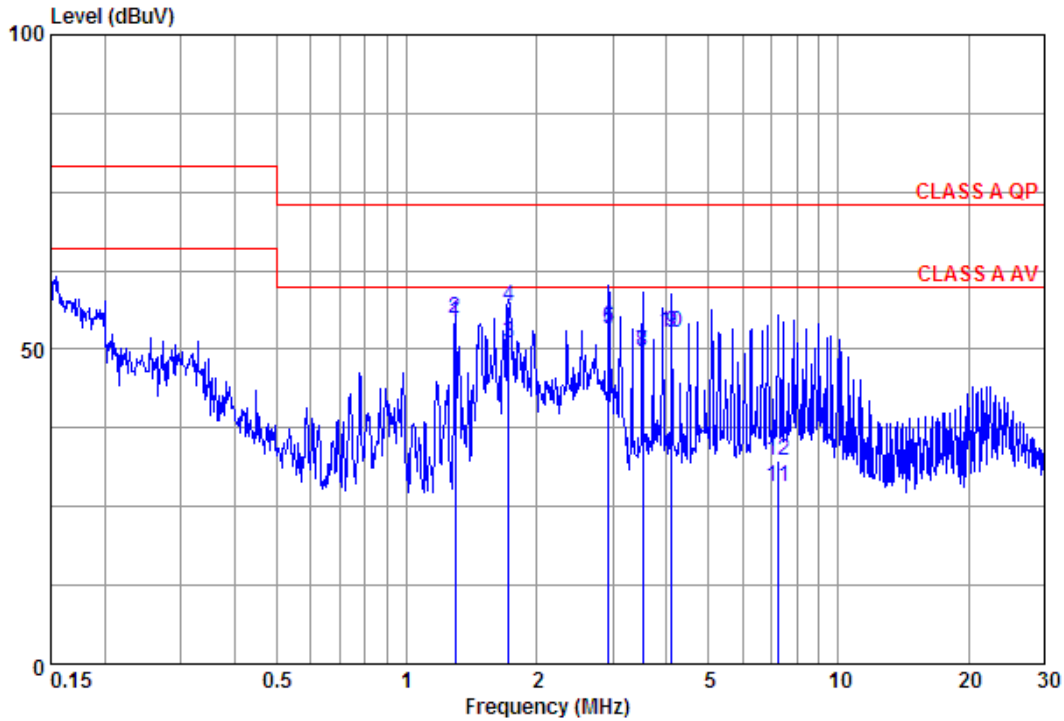
## 2.4 Test Result

**PASS**

The final test data are shown on the following page(s)

### Conducted Emission Test Data

Test Date : 2013-11-18 Power Line : Line  
 Temperature : 24.1°C Humidity : 37%



	Freq	Reading	C.F	Result	Limit	Margin	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	*	1.296	54.33	0.12	54.45	60.00	-5.55 Average
2		1.296	54.69	0.12	54.81	73.00	-18.19 QP
3		1.725	50.90	0.14	51.04	60.00	-8.96 Average
4	@	1.725	56.79	0.14	56.93	73.00	-16.07 QP
5		2.931	53.03	0.17	53.20	60.00	-6.80 Average
6		2.931	53.43	0.17	53.60	73.00	-19.40 QP
7		3.528	49.47	0.17	49.64	60.00	-10.36 Average
8		3.528	49.32	0.17	49.49	73.00	-23.51 QP
9		4.114	52.47	0.18	52.65	60.00	-7.35 Average
10		4.114	52.53	0.18	52.71	73.00	-20.29 QP
11		7.252	27.92	0.29	28.21	60.00	-31.79 Average
12		7.252	32.03	0.29	32.32	73.00	-40.68 QP

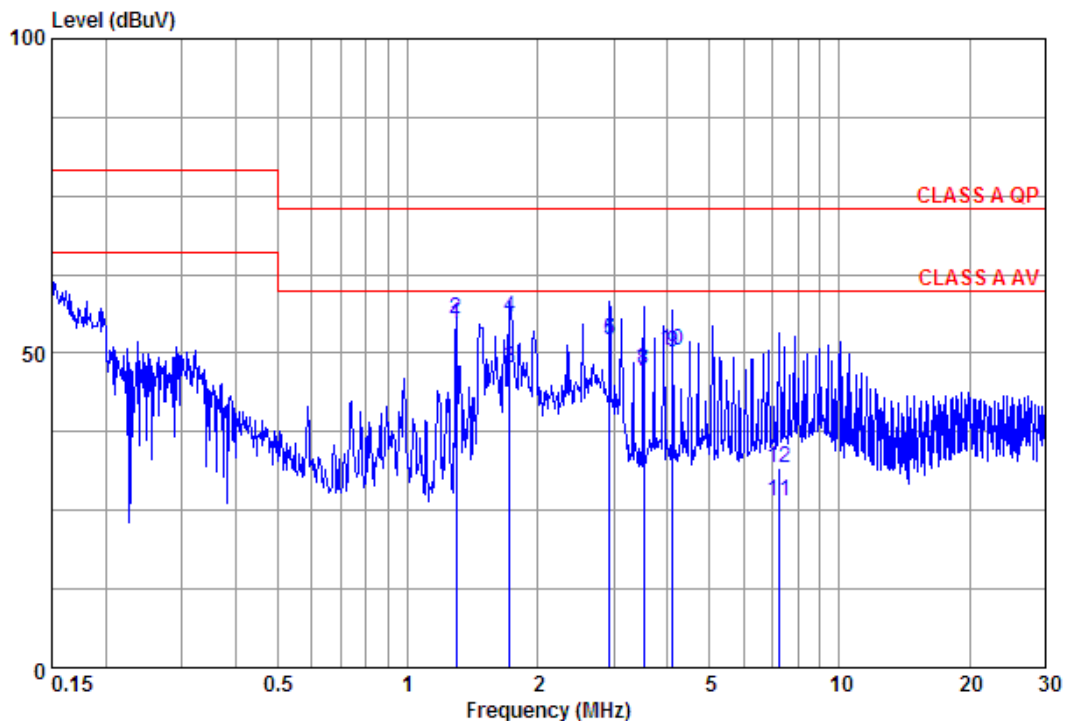
Result = Reading + C.F ; C.F = LISN Factor + Cable Loss

@ :Maximum QP \* :Maximum AVG x :Over Limit

Remark : All readings are Quasi-Peak and Average values.

### Conducted Emission Test Data

Test Date : 2013-11-18 Power Line : Neutral  
 Temperature : 24.1°C Humidity : 37%



	Freq	Reading	C.F	Result	Limit	Margin	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	+	1.296	54.48	0.10	54.58	60.00	-5.42 Average
2		1.296	55.31	0.10	55.41	73.00	-17.59 QP
3		1.725	47.60	0.12	47.72	60.00	-12.28 Average
4	@	1.725	55.68	0.12	55.80	73.00	-17.20 QP
5		2.931	51.81	0.16	51.97	60.00	-8.03 Average
6		2.931	51.89	0.16	52.05	73.00	-20.95 QP
7		3.528	46.94	0.17	47.11	60.00	-12.89 Average
8		3.528	47.23	0.17	47.40	73.00	-25.60 QP
9		4.114	49.87	0.18	50.05	60.00	-9.95 Average
10		4.114	50.12	0.18	50.30	73.00	-22.70 QP
11		7.252	26.19	0.29	26.48	60.00	-33.52 Average
12		7.252	31.49	0.29	31.78	73.00	-41.22 QP

Result = Reading + C.F ; C.F = LISN Factor + Cable Loss

@ :Maximum QP + :Maximum AVG x :Over Limit

Remark : All readings are Quasi-Peak and Average values.

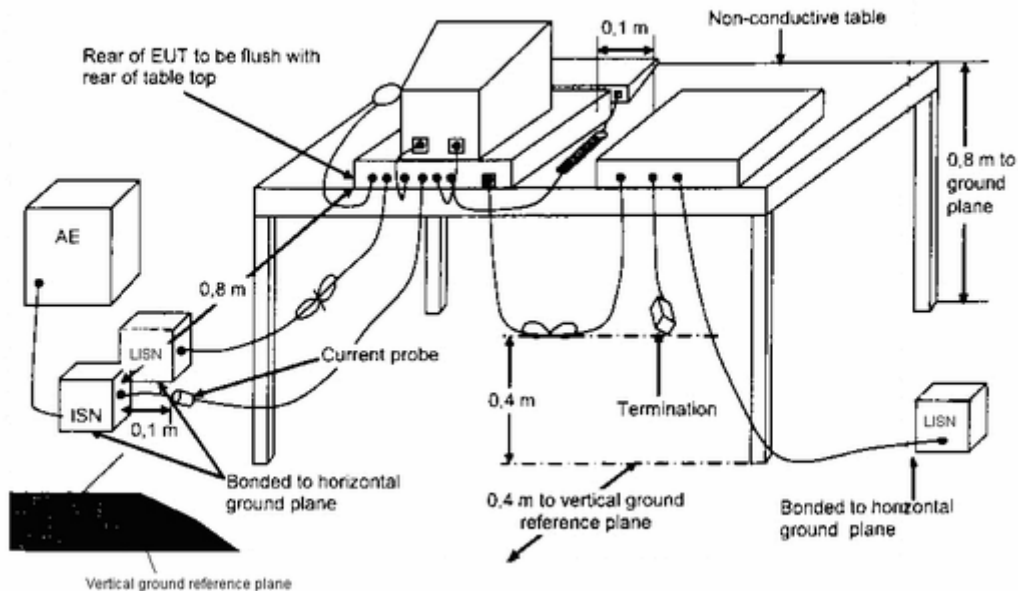


### 3 Conducted Disturbance Test (at Telecommunication Ports)

#### 3.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

#### 3.2 Test Arrangement and Procedure



#### Table-top Equipment

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network(LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/50 $\mu$ H of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40cm to the ground plane shall be folded back and forth in the center forming a bundle no longer than 40cm.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1m.
- ISN at least 80cm from nearest part of EUT chassis.
- The communication function of EUT was executed and ISN was connected between EUT and associated equipment and the ISN was connected directly to reference ground plane.

### 3.3 Conducted Limit

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15MHz to 30MHz for class A equipment.

Frequency (MHz)	Voltage Limits dB( $\mu$ V)		Current Limits dB( $\mu$ A)	
	Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 ~ 0.5	97 to 87	84 to 74	53 to 43	40 to 30
0.5 ~ 30	87	74	43	30

NOTE1: The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

NOTE2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150  $\Omega$  to the telecommunication port under test (conversion factor is  $20 \log_{10} 150/I=44\text{dB}$ )

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15MHz to 30MHz for class B equipment.

Frequency (MHz)	Voltage Limits dB( $\mu$ V)		Current Limits dB( $\mu$ A)	
	Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 ~ 0.5	84 to 74	74 to 64	40 to 30	30 to 20
0.5 ~ 30	74	64	30	20

NOTE1: The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

NOTE2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150  $\Omega$  to the telecommunication port under test (conversion factor is  $20 \log_{10} 150/I=44\text{dB}$ )

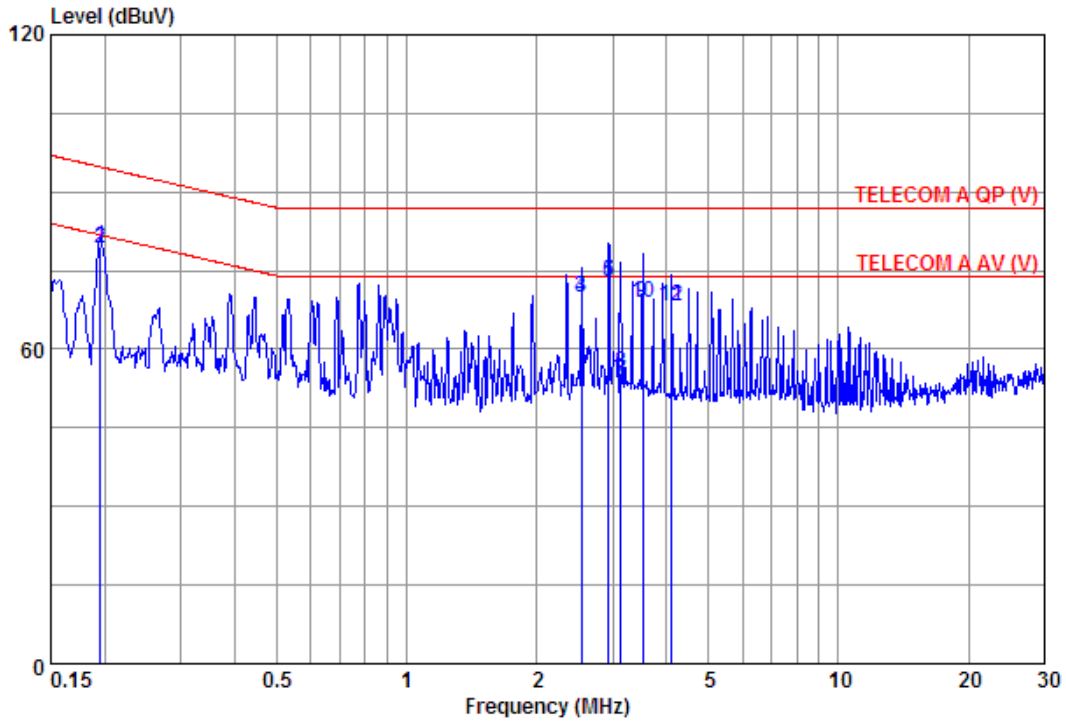
### 3.4 Test Result

**PASS**

The final test data are shown on the following page(s).

### Conducted Disturbance Test Data

Test Date : 2013-11-18 Measurement Method : Voltage  
 Temperature : 24.1°C Humidity : 37%



	Freq	Reading	C.F	Result	Limit	Margin	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.195	69.55	10.05	79.60	81.80	-2.20	Average
2	0.195	69.31	10.05	79.36	94.80	-15.44	QP
3	2.540	60.38	9.63	70.01	74.00	-3.99	Average
4	2.540	60.12	9.63	69.75	87.00	-17.25	QP
5	+ 2.931	63.25	9.63	72.88	74.00	-1.12	Average
6	@ 2.931	63.11	9.63	72.74	87.00	-14.26	QP
7	3.140	44.14	9.63	53.77	74.00	-20.23	Average
8	3.140	45.77	9.63	55.40	87.00	-31.60	QP
9	3.528	59.09	9.62	68.71	74.00	-5.29	Average
10	3.528	59.27	9.62	68.89	87.00	-18.11	QP
11	4.114	58.49	9.62	68.11	74.00	-5.89	Average
12	4.114	58.45	9.62	68.07	87.00	-18.93	QP

Result = Reading + C.F ; C.F = LISN Factor + Cable Loss

@ :Maximum QP + :Maximum AVG x :Over Limit

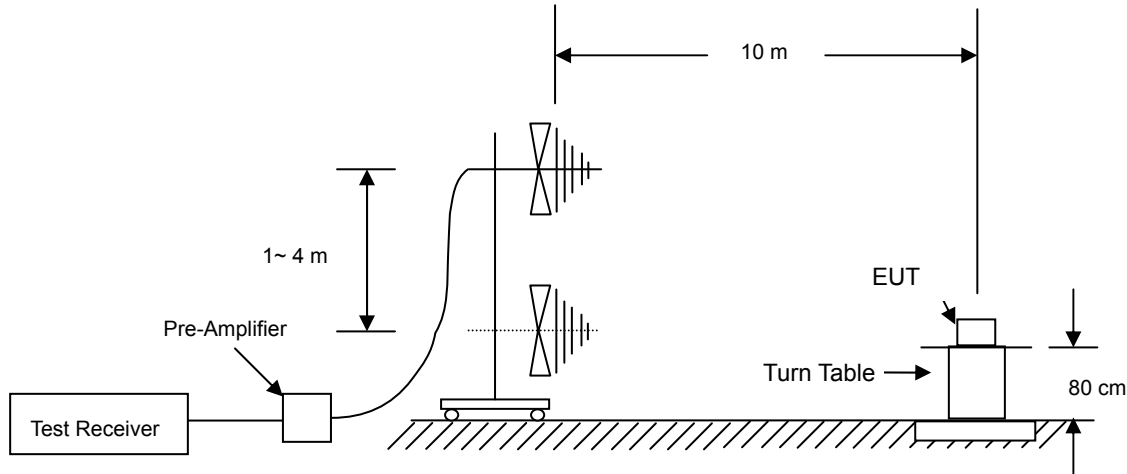
Remark : All readings are Quasi-Peak and Average values.

## 4 Radiated Disturbance Test – Below 1 GHz

### 4.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 4.2 Test Arrangement and Procedure



#### Table-top Equipment

- The EUT was placed on a non-conductive turntable which was 80 cm above the horizontal ground plane. The EUT was set 10 m away from the receiving antenna that was mounted on a non-conductive mast.
- Main cables draped to the ground plane and were routed to the mains power outlet. The mains power outlet was bonded to and did not protrude above the ground plane.
- The antenna was adjusted between 1 m and 4 m in height above the ground plane and the Antenna-to-EUT azimuth was also varied during the measurements to find the top 6 maximum meter readings within the frequency range limit as indicated in Sec 3.3.
- The radiated emissions were measured when the Antenna-to-EUT polarization was set horizontally and vertically.
- The values were recorded.

### 4.3 Test Limit

EN 55022

Frequency (MHz)	<input checked="" type="checkbox"/> Class A	<input type="checkbox"/> Class B
	Quasi-Peak (dBuV/m)	Quasi-Peak (dBuV/m)
30 ~ 230	40.0	30.0
230 ~ 1000	47.0	37.0

The EMI test receiver bandwidth was set at 120 kHz.

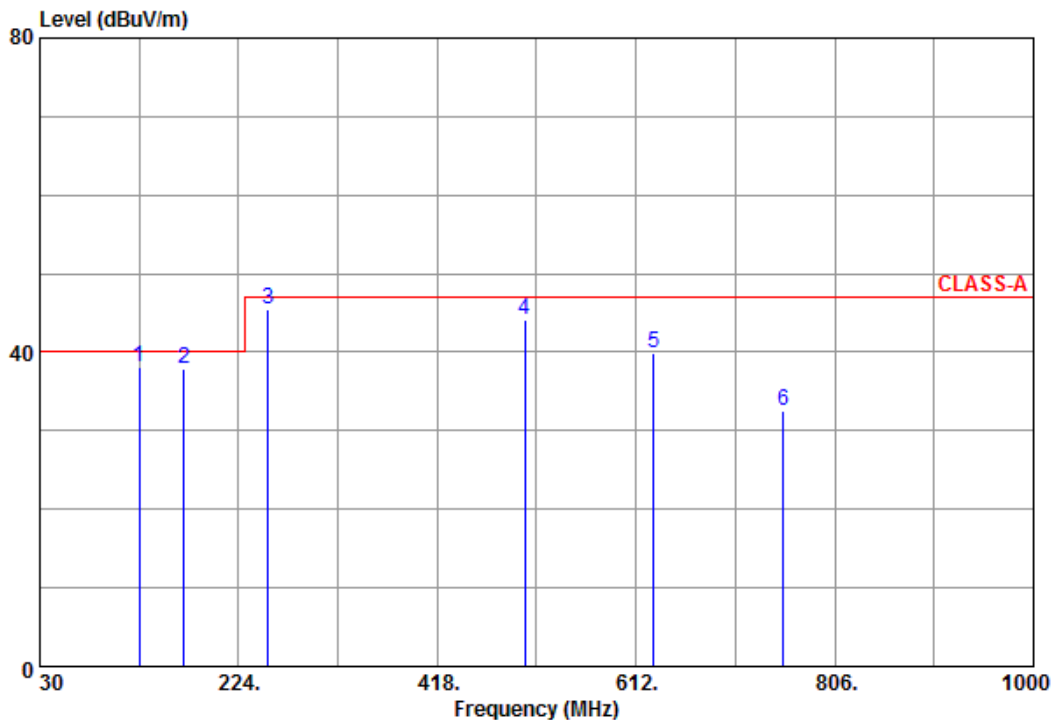
### 4.4 Test Result

**PASS**

The final test data are shown on the following page(s).

### Radiated Emission Test Data

Test Date : 2013-11-18 Polarization : Horizontal  
 Temperature : 24.1°C Humidity : 37%



Freq	Reading	C.F	Result	Limit	Margin	A/pos	T/pos	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB			
1	127.000	54.13	-15.99	38.14	40.00	-1.86	261	49
2	170.650	55.70	-17.84	37.86	40.00	-2.14	360	126
3 @	253.100	60.17	-14.60	45.57	47.00	-1.43	215	148
4	503.360	51.95	-7.78	44.17	47.00	-2.83	311	237
5	629.460	45.30	-5.49	39.81	47.00	-7.19	250	154
6	755.560	34.38	-1.93	32.45	47.00	-14.55	259	199

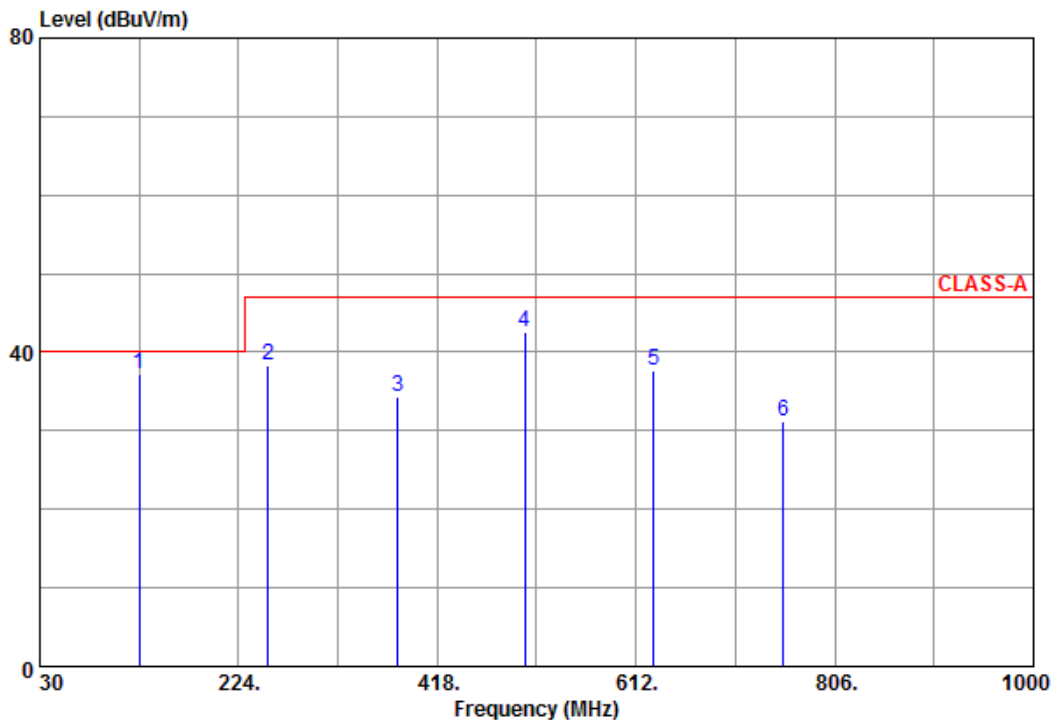
C.F = Antenna Factor + Cable Loss - Preamp gain  
 Result = Reading + C.F ; Margin = Result - Limit

@ :Maximum Data    x :Over Limit

Remark : All readings are Quasi-Peak values.

### Radiated Emission Test Data

Test Date : 2013-11-18 Polarization : Vertical  
 Temperature : 24.1°C Humidity : 37%



Freq	Reading	C.F	Result	Limit	Margin	A/pos	T/pos	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB			
1 @ 127.000	53.11	-15.99	37.12	40.00	-2.88	100	335	
2 253.100	52.92	-14.60	38.32	47.00	-8.68	110	127	
3 379.200	45.47	-11.14	34.33	47.00	-12.67	125	24	
4 503.360	50.45	-7.78	42.67	47.00	-4.33	121	182	
5 629.460	43.06	-5.49	37.57	47.00	-9.43	108	119	
6 755.560	33.02	-1.93	31.09	47.00	-15.91	159	323	

C.F = Antenna Factor + Cable Loss - Preamp gain  
 Result = Reading + C.F ; Margin = Result - Limit

@ :Maximum Data x :Over Limit

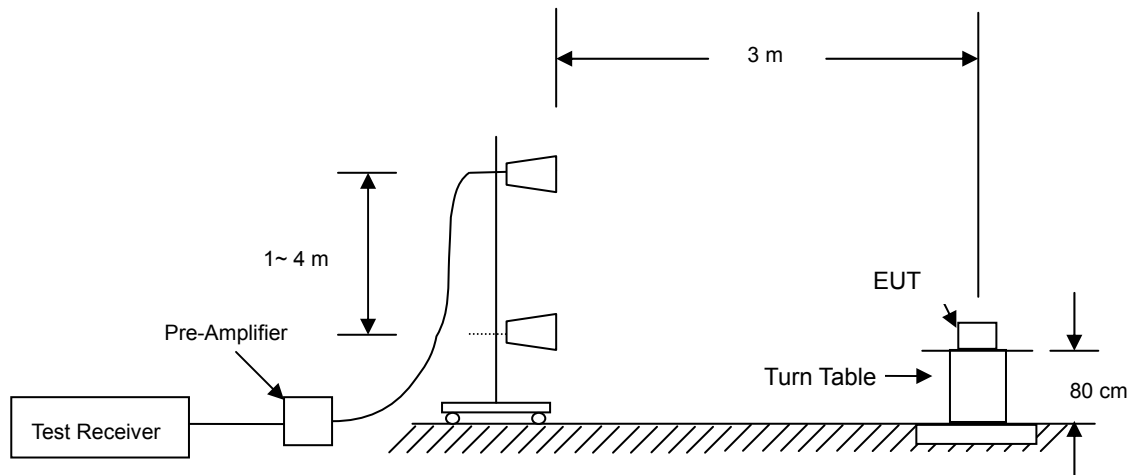
Remark : All readings are Quasi-Peak values.

## 5 Radiated Disturbance Test – Above 1 GHz

### 5.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 5.2 Test Configuration and Procedure



#### Table-top Equipment

- The EUT was placed on a non-conductive turntable which was 80cm above the horizontal ground plane. The EUT was set 3m away from the receiving antenna that was mounted on a non-conductive mast.
- Main cables draped to the ground plane and were routed to the mains power outlet. The mains power outlet was bonded to and did not protrude above the ground plane.
- The antenna was adjusted between 1m and 4m in height above the ground plane and the Antenna-to-EUT azimuth was also varied during the measurements to find the top 6 maximum meter readings within the frequency range limit as indicated in Sec 4.3.
- The radiated emissions were measured when the Antenna-to-EUT polarization was set horizontally and vertically.
- The values were recorded.

### 5.3 Test Limit

EN55022 Class A ITE at a measurement distance of 3m

Frequency GHz	Average limit dB( $\mu$ V/m)	Peak limit dB( $\mu$ V/m)
1 to 3	56	76
3 to 6	60	80

NOTE The lower limit applies at the transition frequency.

EN55022 Class B ITE at a measurement distance of 3m

Frequency GHz	Average limit dB( $\mu$ V/m)	Peak limit dB( $\mu$ V/m)
1 to 3	50	70
3 to 6	54	74

NOTE The lower limit applies at the transition frequency.

### 5.4 Test Result

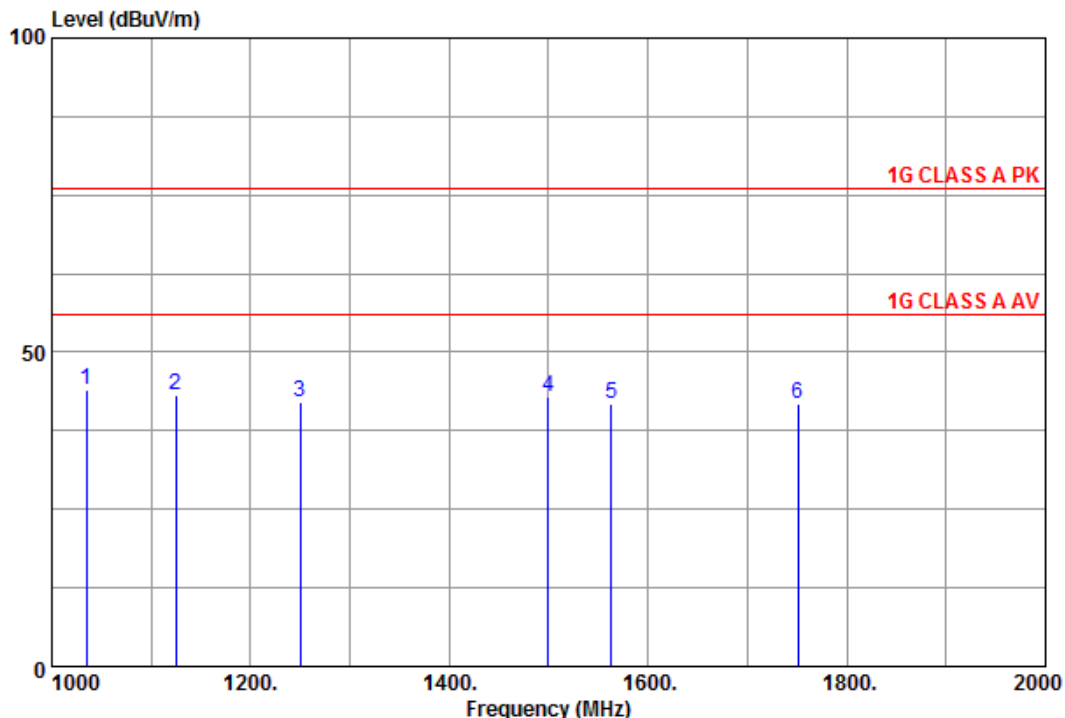
**PASS**

The final tests data are shown on the following page(s).



### Radiated Emission Test Data

Test Date : 2013-11-18 Polarization : Horizontal  
 Temperature : 24.1°C Humidity : 37%



Freq	Reading	C.F	Result	Limit	Margin	A/pos	T/pos	Remark
MHz	dBuV	dB	dBuV/m	dBuV/m	dB			
1 @1035.000	53.16	-9.13	44.03	56.00	-11.97	385	222	Peak
2 1125.000	52.57	-9.43	43.14	56.00	-12.86	257	3	Peak
3 1250.000	52.01	-9.94	42.07	56.00	-13.93	216	10	Peak
4 1500.000	53.74	-10.80	42.94	56.00	-13.06	387	269	Peak
5 1563.000	52.21	-10.54	41.67	56.00	-14.33	320	192	Peak
6 1751.000	51.49	-9.83	41.66	56.00	-14.34	389	195	Peak

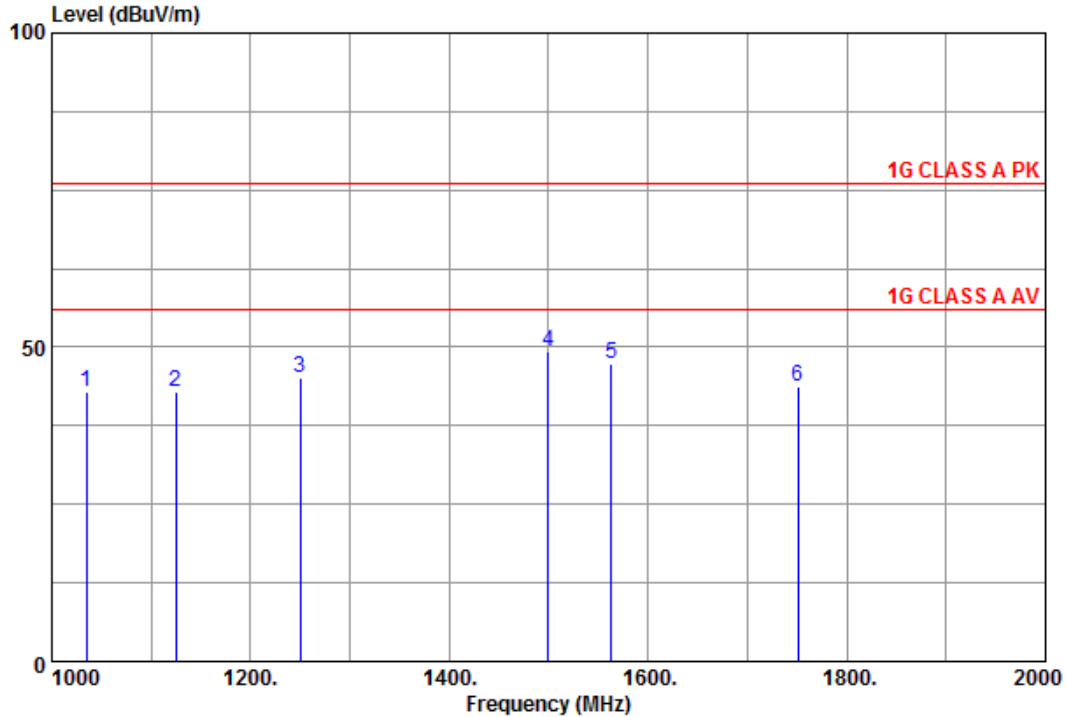
C.F = Antenna Factor + Cable Loss - Preamp gain  
 Result = Reading + C.F ; Margin = Result - Limit

@ :Maximum Data    x :Over Limit

Remark : All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.

### Radiated Emission Test Data

Test Date : 2013-11-18 Polarization : Vertical  
 Temperature : 24.1°C Humidity : 37%



	Freq	Reading	C.F	Result	Limit	Margin	A/pos	T/pos	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB			
1	1035.000	52.09	-9.13	42.96	56.00	-13.04	116	164	Peak
2	1125.000	52.24	-9.43	42.81	56.00	-13.19	110	161	Peak
3	1250.000	54.98	-9.94	45.04	56.00	-10.96	190	307	Peak
4	@1500.000	60.23	-10.80	49.43	56.00	-6.57	199	347	Peak
5	1563.000	57.76	-10.54	47.22	56.00	-8.78	189	143	Peak
6	1751.000	53.53	-9.83	43.70	56.00	-12.30	118	284	Peak

C.F = Antenna Factor + Cable Loss - Preamp gain  
 Result = Reading + C.F ; Margin = Result - Limit

@ :Maximum Data    x :Over Limit

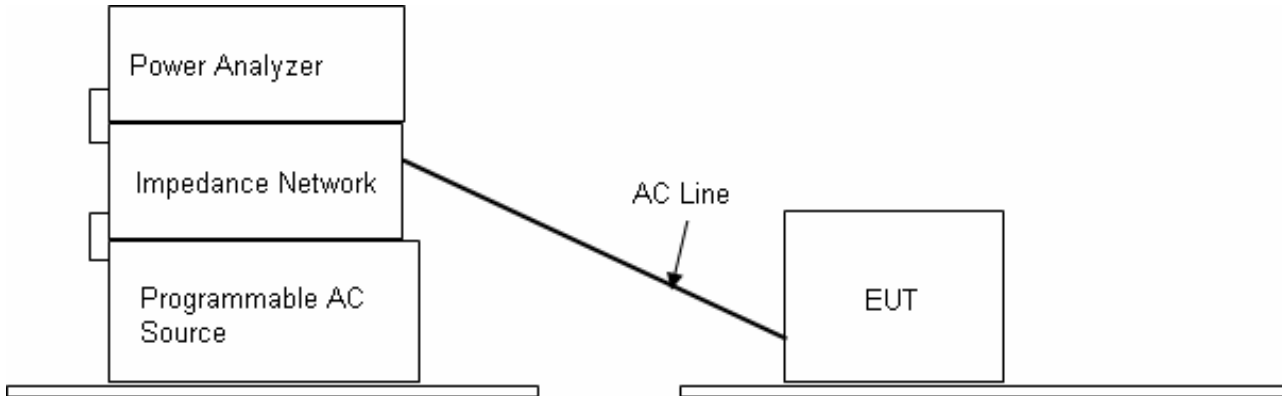
Remark : All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.

## 6 Harmonic Current Emission Measurement

### 6.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 6.2 Test Configuration and Procedure



- The EUT was set in series with the Power Analyzer through an Impedance Network for the measurement of harmonic currents.
- The supply voltage and frequency setting on the Programmable AC Source was programmed as the rated voltage and frequency of the EUT.
- Classify the EUT class in accordance with the IEC61000-3-2 for the purpose of harmonic current limitation. The measurement was automatically performed by test software. The test result was collected and analyzed by the computer.

### 6.3 EUT Operation Condition

Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

## 6.4 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
$15 \leq n \leq 39$	$0.15 * 15 / n$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 * 8 / n$

## 6.5 Test Result

**PASS**

The measured result is shown on the following page(s).



ANALYZER 6630

2013.11.15 16:50:51

### Current Harmonics

Setup: CLASSA Gen setting: 1(1) U : 230.05 V fu: 50.000 Hz  
 Live Analysed periods: 4 I : 311.7 mA P: 41.2 W  
 Module: M1 Limit: Class A (IEC1000) I1: 284.4 mA  
 Note:  
 THD=44.46 % (PF=0.574) PASSED

No	A	Lim A	No	A	Lim A	No	A	Lim A
1	0.284		15	0.009	0.150	29	0.004	0.078
2	0.000	1.000	16	0.000	0.115	30	0.001	0.061
3	0.115	2.300	17	0.003	0.132	31	0.005	0.073
4	0.000	0.430	18	0.000	0.102	32	0.001	0.058
5	0.040	1.140	19	0.005	0.118	33	0.008	0.068
6	0.000	0.300	20	0.001	0.092	34	0.001	0.054
7	0.007	0.770	21	0.006	0.107	35	0.004	0.064
8	0.001	0.230	22	0.001	0.084	36	0.001	0.051
9	0.019	0.400	23	0.002	0.098	37	0.002	0.061
10	0.001	0.184	24	0.001	0.077	38	0.001	0.048
11	0.015	0.330	25	0.007	0.090	39	0.003	0.058
12	0.000	0.153	26	0.001	0.071	40	0.001	0.046
13	0.009	0.210	27	0.008	0.083			
14	0.000	0.131	28	0.001	0.066			

Current range: 1 Ap

Next measure

Change to bar graph

Relative current

Write to disk



Appl: CLASSA&B

(1212\_00)

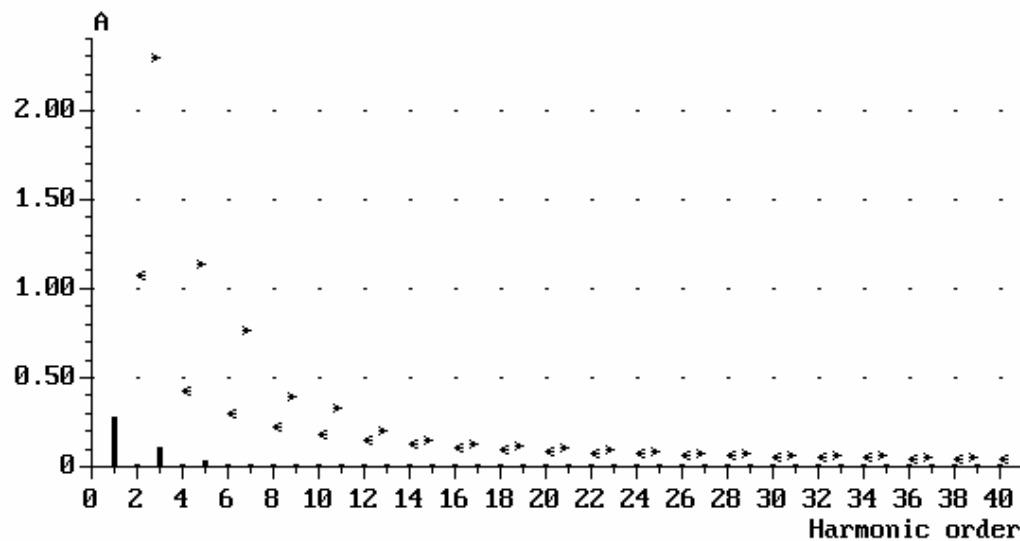


ANALYZER 6630

2013.11.15 16:51:05

### Current Harmonics

Setup: CLASSA Gen setting: 1(1) U : 230.05 V fu: 50.000 Hz  
 Live Analysed periods: 4 I : 311.7 mA P: 41.2 W  
 Module: M1 Limit: Class A (IEC1000) I1: 284.4 mA  
 Note:  
 THD=44.46 % (PF=0.574) PASSED



Next measure

Change to table

Relative current

Log scale

Write to disk



Appl: CLASSA&B

(1212\_01)

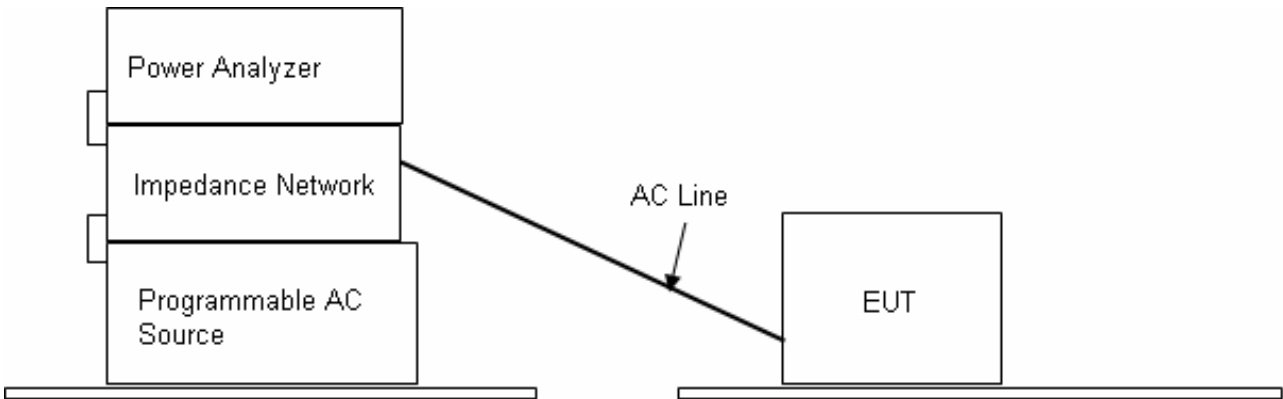
Note: The EUT power level is below 75watts therefore has no defined limits.

## 7 Voltage Fluctuations and Flicker Measurement

### 7.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 7.2 Test Configuration and Procedure



- The EUT was set in series with the Power Analyzer through an Impedance Network for the measurement of Flicker Voltage.
- The supply voltage and frequency setting on the Programmable AC Source was programmed as the rated voltage and frequency of the EUT.
- The measurement was automatically performed by test software. The test result was collected and analyzed by the computer.

### 7.3 EUT Operation Condition

Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

### 7.4 Test Limit

Test Item	Limit	Remark
Pst	1.0	Pst means short-term flicker indicator. $T_p=10$ min
Plt	0.65	Plt means long-term flicker indicator. $T_p=2$ hrs
dt (%)	3.3	For more than 500ms
dmax (%)	4	dmax means relative maximum voltage change.
dc (%)	3.3	dc means relative steady-state voltage change.

### 7.5 Test Result

**PASS**

The measured result is shown on the following page(s).



ANALYZER 6630

2013.11.15 17:06:55

# Extreme Flicker-I M1

Note:

Numerical Reference Impedance  
 U: 230.1 V I: 310.5 mA f: 50.000 Hz PF: 0.576

EVALUATION:-----

Type of observation period	Short	Long	Limit
Observation time	10	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 1 (1) short term cycles

PASSED

Measurement completed

Appl: CLASSA&B

(1311\_00)

Next measure

Extreme time graph

Change to histogram

Write to disk

Select module



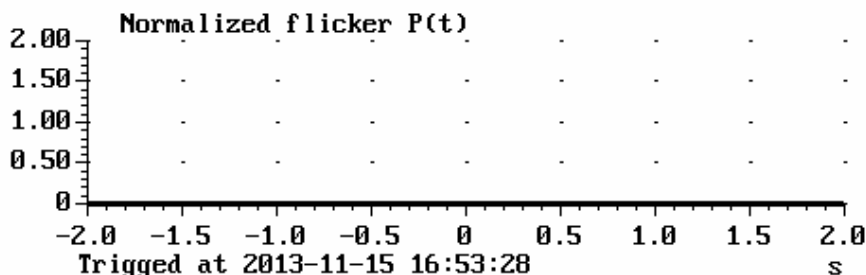
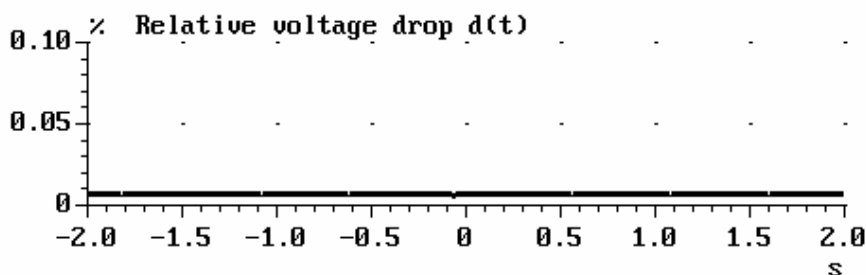
ANALYZER 6630

2013.11.15 17:07:12

# Extreme Flicker-I M1

Note:

Numerical Reference Impedance  
 U: 230.1 V I: 310.5 mA f: 50.000 Hz PF: 0.576



Appl: CLASSA&B

(13113\_00)

Next measure

Change to table

Refresh time graph

Write to disk

Select module

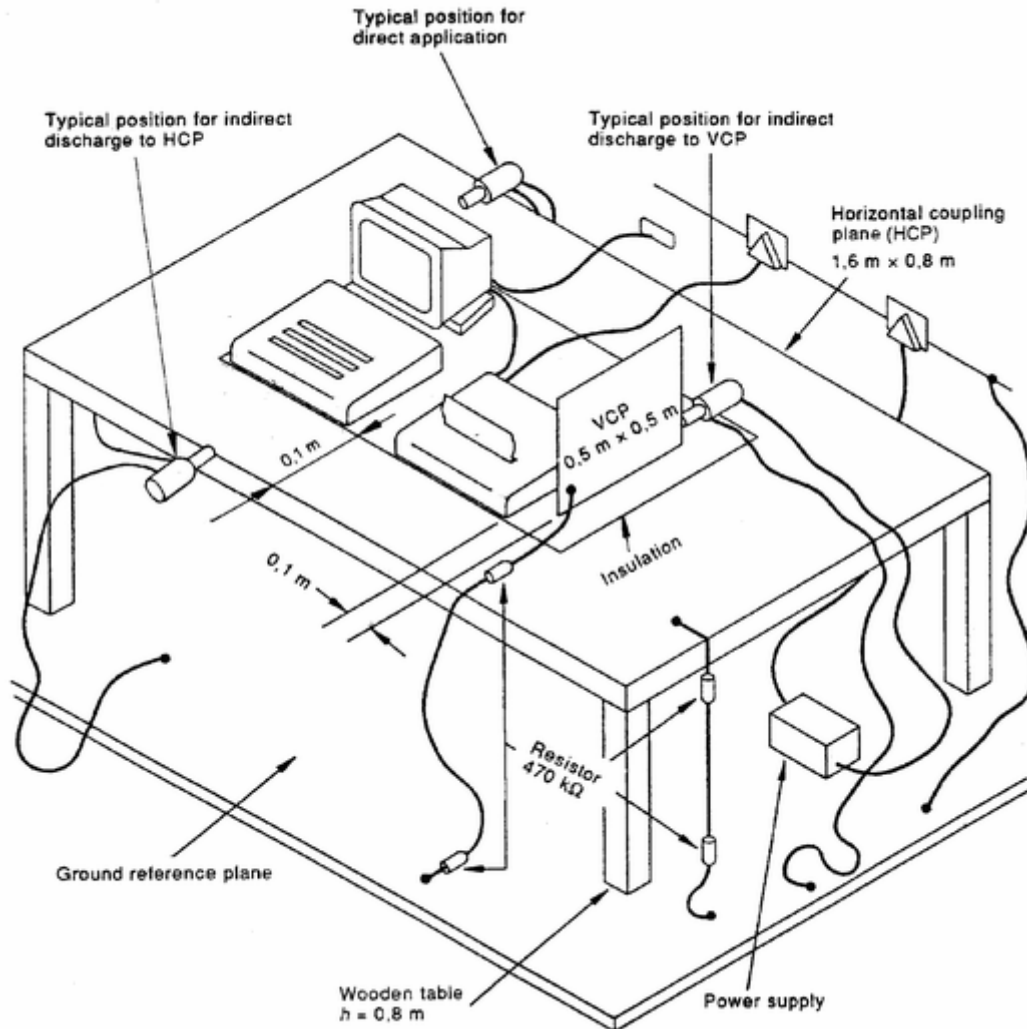


## 8 Electrostatic Discharge Immunity Test

### 8.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 8.2 Test Configuration and Procedure



#### Table-top Equipment

- The EUT was located on a 0.8 m high wooden table standing on the ground reference plane with a 1.6 \* 0.8 m horizontal coupling plane on the top. The EUT and cables was isolated from the coupling plane by an insulating support 0.5 mm thick.
- In Contact Discharge, the EUT was exposed to minimum 200 discharges, 100 each at negative and positive polarity on the selected test points ( the selected test points were marked with red labels on the EUT )
- In Air Discharge, the EUT exposed to minimum of 10 single discharges on the selected test points.
- The result was observed and analyzed.



### 8.3 Test Result

#### 8.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

#### 8.3.2 Observation of Direct Discharge

Test Points: 1. Surface of Case. 2. Junction of Case. 3. PoE Ports. 4. SFP-SX Ports. 5. Screws.  
6. AC Power Port. 7. LED Indicators. 8. Digital Display.

Type of Discharge	Test Specifications				Performance Required by EN55024	Observed Result	Verdict
	Test Level	Polarity	Test Point	Number of Discharge			
Air Discharge	2,4,8 (kV)	±	1~8	20/ per point	B	A	Pass
Contact Discharge	2,4 (kV)	±	1~5	50/ per point	B	A	Pass
Remarks: 1. No temporary degradation or loss of function has been observed throughout the entire time interval of air discharge. 2. No temporary degradation or loss of function has been observed throughout the entire time interval of contact discharge.							

The Performance Requirement Class Criterion is defined in Sec. 1.11.

#### 8.3.3 Observation of Indirect Discharge

Test Points: 1. Front Side. 2. Rear Side. 3. Left Side. 4. Right Side.

Type of Discharge	Test Specifications				Performance Required by EN55024	Observed Result	Verdict
	Test Level	Polarity	Test Point	Number of Discharge			
HCP Application	2,4 (kV)	±	1~4	50/ per point	B	A	Pass
VCP Application	2,4 (kV)	±	1~4	50/ per point	B	A	Pass
Remarks: 1. No temporary degradation or loss of function has been observed throughout the entire time interval of HCP application. 2. No temporary degradation or loss of function has been observed throughout the entire time interval of VCP application.							

The Performance Requirement Class Criterion is defined in Sec. 1.11.

## PASS

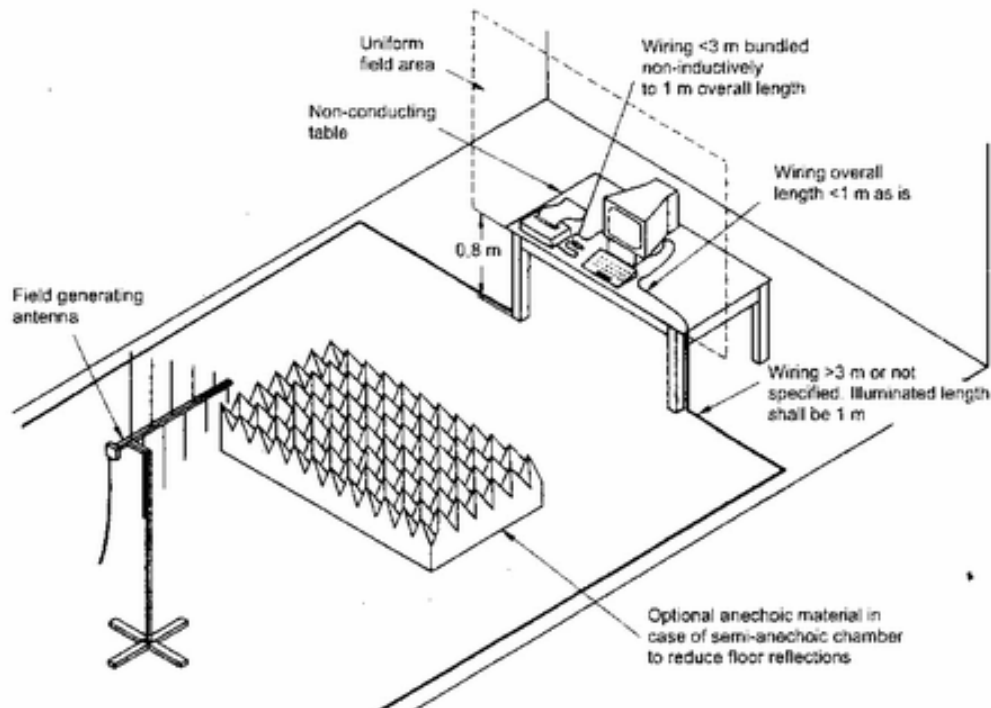
The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.

## 9 Radio-frequency, Electromagnetic Field Immunity Test

### 9.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 9.2 Test Configuration and Procedure



#### Table-top Equipment

- The field calibration was executed to create a uniform field area (UFA), 3 m away from the antenna, to ensure the validity of the test results.
- The EUT was placed on a non-conductive table 0.8 m high in the UFA.
- The EUT was then connected to power and signal wires according to relevant installation instruction.
- The EUT was positioned so that the four sides of the EUT were exposed to the electromagnetic field in sequence. In each position, the performance of the EUT was investigated and monitored by a CCD camera..

### 9.3 Test Result

#### 9.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

#### 9.3.2 Observation of Test

Type of Modulation	Test Specifications			Performance Required by EN55024	Observed Result	Verdict
	Field Strength	Frequency Range	Modulation			
Amplitude Modulation	3V/m	80 to 1000MHz	80%, 1KHz, sinusoidal	A	A	Pass
Remark:	No temporary degradation or loss of function has been observed throughout the entire test.					

The Performance Requirement Class Criterion is defined in Sec. 1.11.

## PASS

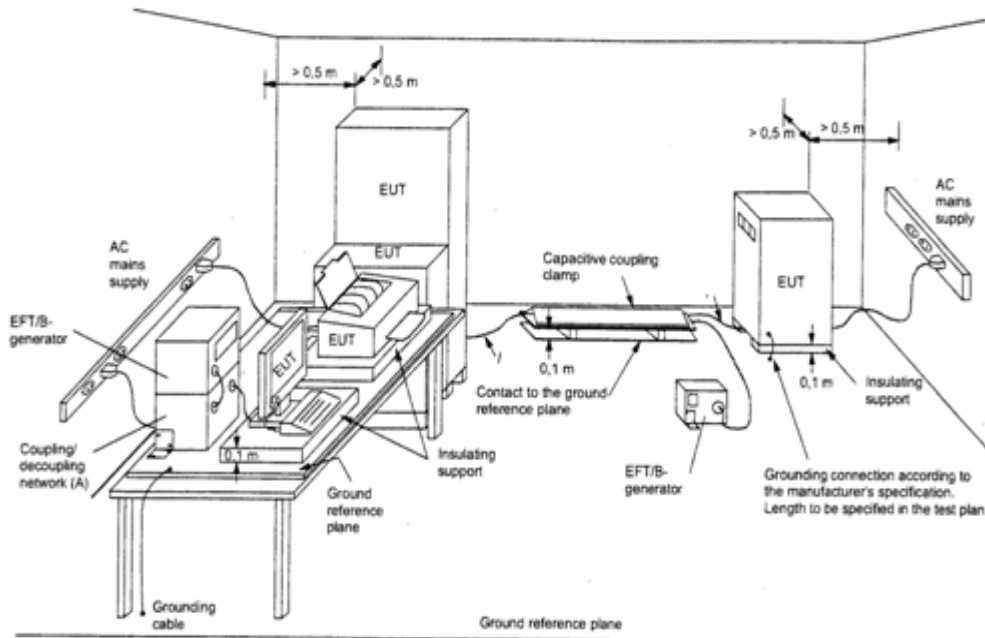
The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.

## 10 Electrical Fast Transient Test

### 10.1 Test Instrument

Refer to Sec. 1.3 Test Instruments.

### 10.2 Test Configuration and Procedure



#### Table-top Equipment

- The EUT was placed on a table of 0.8 m height above the 1 \* 1 m metallic ground reference plane, which projected beyond the EUT by at least 0.1 m on all sides.
- The ground plane was connected to the protective earth.
- The distance between the EUT and all other conductive structures, except the ground plane 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 0.5 m.
- All cables to the EUT were placed on the insulation support 0.1 m above the ground reference plane.
- The EUT was connected to the power mains through a coupling device that directly coupled the EFT interference signal. Each of the Line, Neutral and Protective Earth conductors was injected with burst for 1 minute. The test time was broken down into six 10 s bursts separated by a 10 s pause for avoiding synchronization. Both voltage polarities were applied for each test level.
- Operating condition was shown on the monitor and observed.

### 10.3 Test Result

#### 10.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

#### 10.3.2 Observation of Power Supply Port

Coupling Selection	Test Specifications				Performance Required by EN 55024	Observed Result	Verdict
	Voltage (kV)	Test Duration (Sec)	Repetition Rate (kHz)	Tr/ Td (nS)			
L	±1	60	5	5/50	B	A	Pass
N	±1	60	5	5/50	B	A	Pass
PE	±1	60	5	5/50	B	A	Pass
L + N	±1	60	5	5/50	B	A	Pass
L + PE	±1	60	5	5/50	B	A	Pass
N + PE	±1	60	5	5/50	B	A	Pass
L + N +PE	±1	60	5	5/50	B	A	Pass
Remark: No temporary degradation or loss of function has been observed throughout the entire test.							

The Performance Requirement Class Criterion is defined in Sec. 1.11.

#### 10.3.3 Observation of I/O, communication ports (Applicable only to cable length >3m)

There was no I/O and communication cable longer than 3 meter; therefore, no test has been required.

### **PASS**

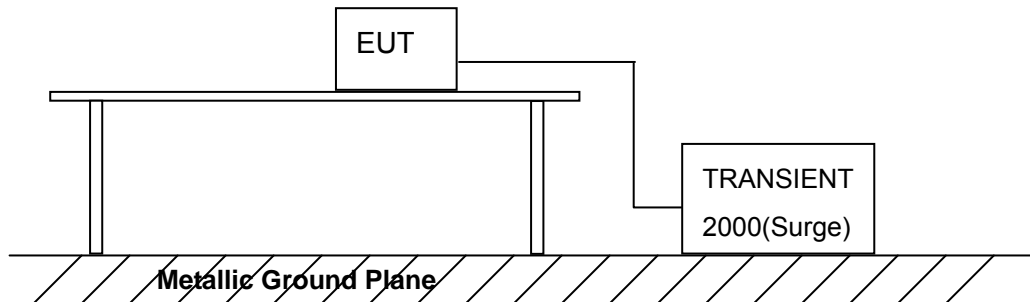
**The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.**

## 11 Surge Immunity Test

### 11.1 Test Instrument

Refer to Sec. 1.3 Test Instruments.

### 11.2 Test Configuration and Procedure



#### Table-top Equipment

- The EUT was placed on a table of 0.8 m height above the 1 \* 1 m metallic ground reference plane, which projected beyond the EUT by at least 0.1 m on all sides.
- The ground plane was connected to the protective earth.
- The length of power cord between the coupling device and the EUT is less than 2 m (provided by the manufacturer).
- 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).
- 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.
- Operating condition was shown on the monitor and observed.

### 11.3 Test Result

#### 11.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

#### 11.3.2 Observation of Power Supply Port

Coupling Selection	Test Specifications			Performance Required by EN 55024	Observed Result	Verdict
	Voltage (kV)	Min. of Surge at Each Polarity	Repetition Rate (per min)			
L ► N	±0.5, 1	5	1	B	A	Pass
L ► PE	±0.5, 1,2	5	1	B	A	Pass
N ► PE	±0.5, 1,2	5	1	B	A	Pass
Remark:	No temporary degradation or loss of function has been observed throughout the entire test.					
Note	Phase Shifting:0°,90°,180°,270°,360°					

The Performance Requirement Class Criterion is defined in Sec. 1.11.

#### 11.3.3 Observation of other supply/ signal lines: (Applicable only to ports which according to the manufacturer's specification may connect directly to outdoor cables)

N/A

**PASS**

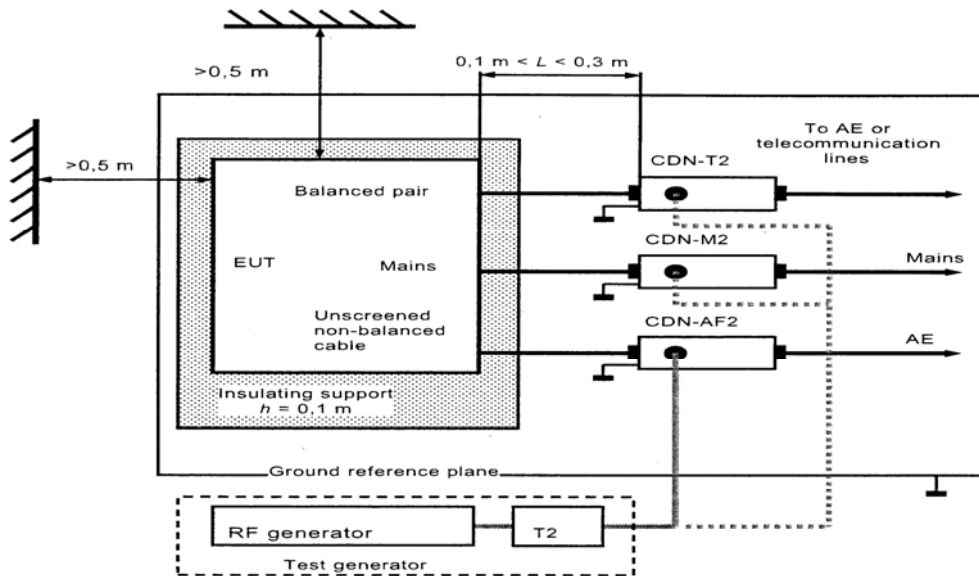
**The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.**

## 12 Radio-frequency, Conducted Disturbances Immunity Test

### 12.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 12.2 Test Configuration and Procedure



- The EUT was placed on an insulating support of 0.1 m height above a ground reference plane. All cables exiting the EUT was supported at a height of 30 mm above the ground reference plane.
- The EUT was connected to the power mains through a Coupling and Decoupling Networks (CDN).
- The CDN was located 0.3 m from the EUT as indicated in the diagram above.
- The test was performed with the test generator connected to each of the CDN in turn while the other non-excited RF input ports of the coupling devices were terminated by a 50  $\Omega$  terminator.
- The conducted disturbance was applied on the EUT from 150 kHz to 80 MHz using the signal levels established during the setting process. .
- Operating condition was shown on the monitor and observed.



## 12.3 Test Result

### 12.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

### 12.3.2 Observation of Test

Type of Modulation	Test Specifications			Performance Required by EN 55024	Observed Result	Verdict
	Voltage Level (emf) $U_0$	Frequency Range	Modulation			
Amplitude Modulation	3V/ 130dB $\mu$ V	0.15 to 80MHz	80%, 1kHz, sinusoidal	A	A	Pass
Remark:	No temporary degradation or loss of function has been observed throughout the entire test.					

The Performance Requirement Class Criterion is defined in Sec. 1.11.

### 12.3.3 Observation of I/O, communication ports (Applicable only to cable length >3m)

There was no I/O and communication cable longer than 3 meter; therefore, no test has been required.

## **PASS**

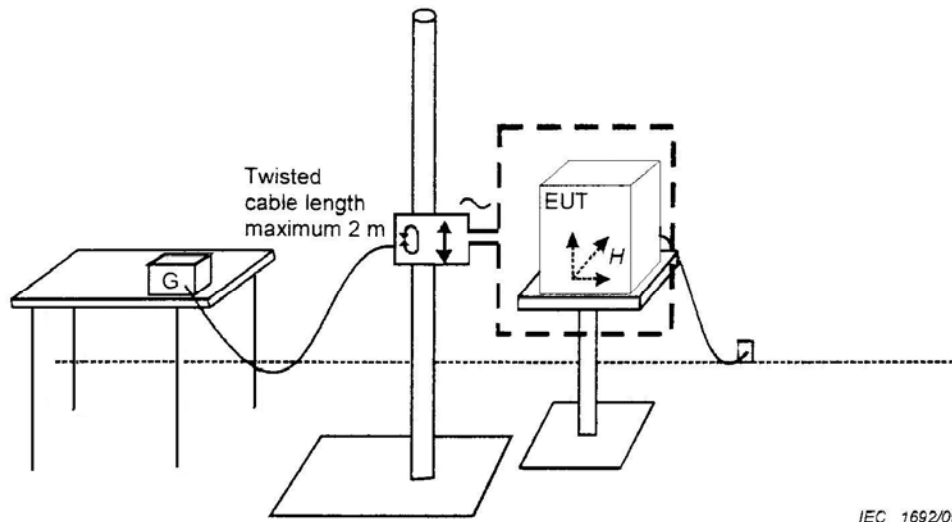
**The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.**

## 13 Power Frequency Magnetic Field Immunity Test

### 13.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

### 13.2 Test Configuration and Procedure



#### Table-top Equipment

- The EUT was placed on a non-magnetic metal ground plane of 0.25 mm thickness with the interposition of a 0.1 m thickness insulating support. The ground plane was connected to the protected earth.
- The EUT was placed at the center of the 1 \* 1 m induction coil with the test generator placed within 3 m distance.
- The test was operated by moving and shifting the induction coil to expose to the test field.
- The operation condition was observed and analyzed.
- The induction coil was then rotated by 90° to expose the EUT to the test field with different orientations and the same procedure.

### 13.3 Test Result

#### 13.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
21.5°C	40%RH	1019mbar

#### 13.3.2 Observation of Test

Level (A/m)	Frequency (Hz)	Performance Required by EN55024	Observed Result	Verdict
1	50	A	A	Pass
Remark:	No temporary degradation or loss of function has been observed throughout the entire test.			

The Performance Requirement Class Criterion is defined in Sec. 1.11.

## PASS

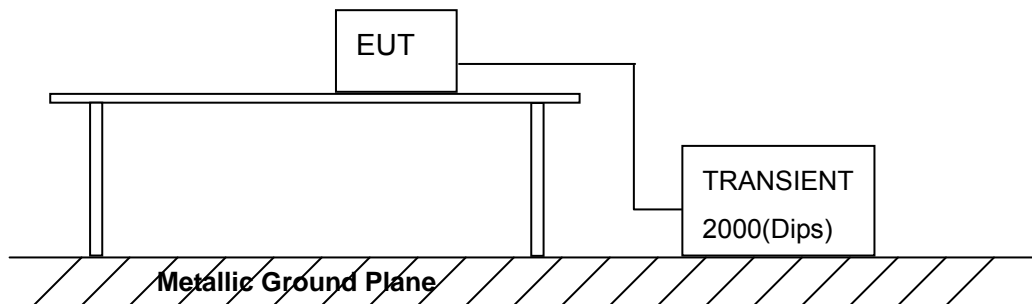
The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.

## 14 Voltage Dips, Short Interruptions Immunity Test

### 14.1 Test Instrument

Refer to Sec. 1.3 Test Instruments.

### 14.2 Test Configuration and Procedure



- The EUT was tested with ( I ) >95% voltage dip of supplied voltage with a duration of 10 ms ( II ) 30% voltage dip of supplied voltage with duration 500 ms ( III ) A 95% voltage interruption of supplied voltage with duration of 5000 ms,
- For each selected combination of test level and duration with a sequence of three dips / interruptions with intervals of 10 s.
- For Voltage Dips, changes in supply voltage occurred at zero crossings of the voltage.
- For Short Interruptions, changes in supply voltage also occurred at zero crossings of the voltage.
- The performance of the EUT was monitored and recorded.

### 14.3 Test Result

#### 14.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
24.1°C	37%RH	1017mbar

#### 14.3.2 Observation of Power Supply Port

##### Voltage Dips

Voltage Reduction (%)	Test Specifications			Performance Required by EN 55024	Observed Result	Verdict
	Duration Periods	No. of Reductions	Interval between Each Duration (sec.)			
>95	0.5	3	≥ 10	B	A	Pass
30	25	3	≥ 10	C	A	Pass
Remarks: 1. No temporary degradation or loss of function has been observed throughout the entire test. 2. No temporary degradation or loss of function has been observed throughout the entire test.						
Note Phase Shifting:0°,180°, 360°						

##### Voltage Interruptions

Voltage Reduction (%)	Test Specifications			Performance Required by EN 55024	Observed Result	Verdict
	Duration Periods	No. of Reductions	Interval between Each Duration (sec.)			
>95	250	3	≥ 10	C	B	Pass
Remark: When testing Voltage Dip with residual voltage 4% of normal power supply, the EUT shut down automatically. After testing, the EUT recovered its function.						
Note Phase Shifting:0°,180°, 360°						

The Performance Requirement Class Criterion is defined in Sec. 1.11.

## PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 55024.

## 15 Photographs of Test

### 15.1 Conducted Disturbance Test (at Mains Terminals)



Front View



Rear View

## 15.2 Telecommunication Port Conducted Test



### 15.3 Radiated Disturbance Test – Below 1 GHz



Front View



Rear View



## 15.4 Radiated Disturbance Test – Above 1 GHz



Front View



Rear View

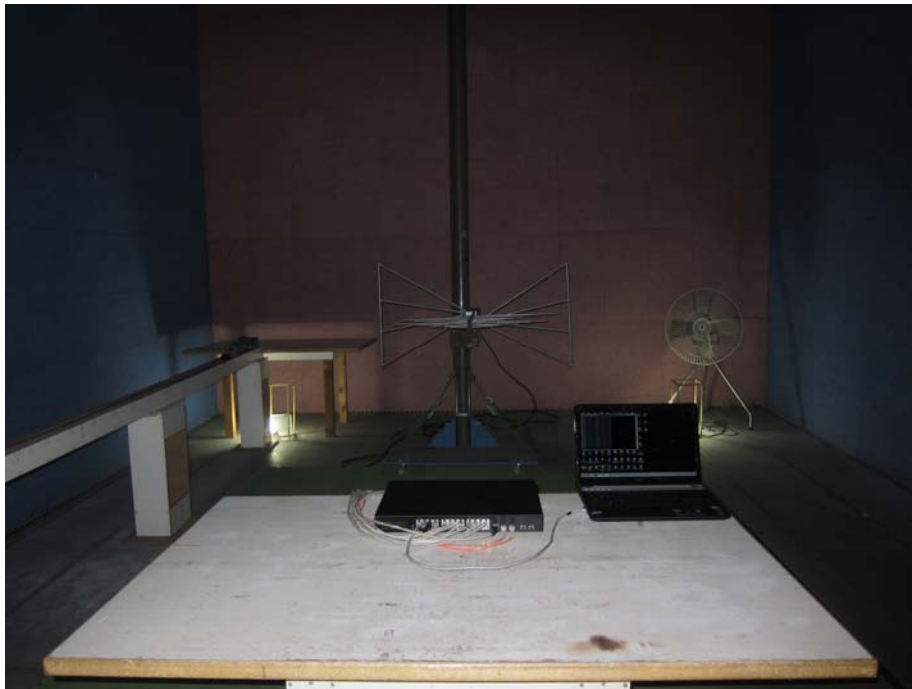
## 15.5 Harmonic Current & Voltage Fluctuations and Flicker Measurement



## 15.6 Electrostatic Discharge Immunity Test



## 15.7 Radio-frequency, Electromagnetic Field Immunity Test



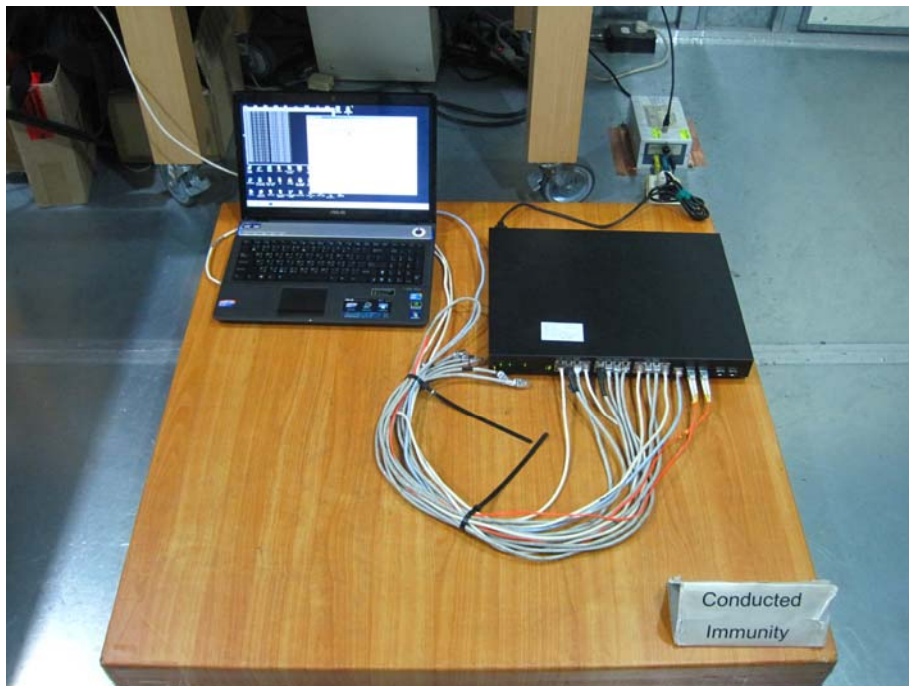
## 15.8 Electrical Fast Transient / Burst Immunity Test



## 15.9 Surge Immunity Test



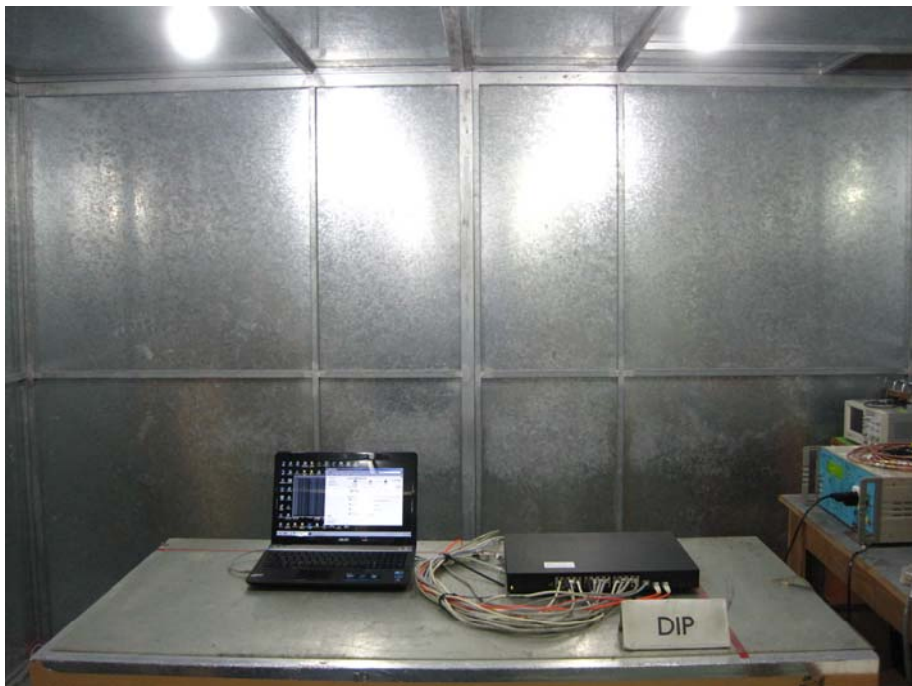
## 15.10 Radio-frequency, Conducted Disturbances Immunity Test



### 15.11 Power Frequency Magnetic Field Immunity Test



### 15.12 Voltage Dips, Short Interruptions Immunity Test



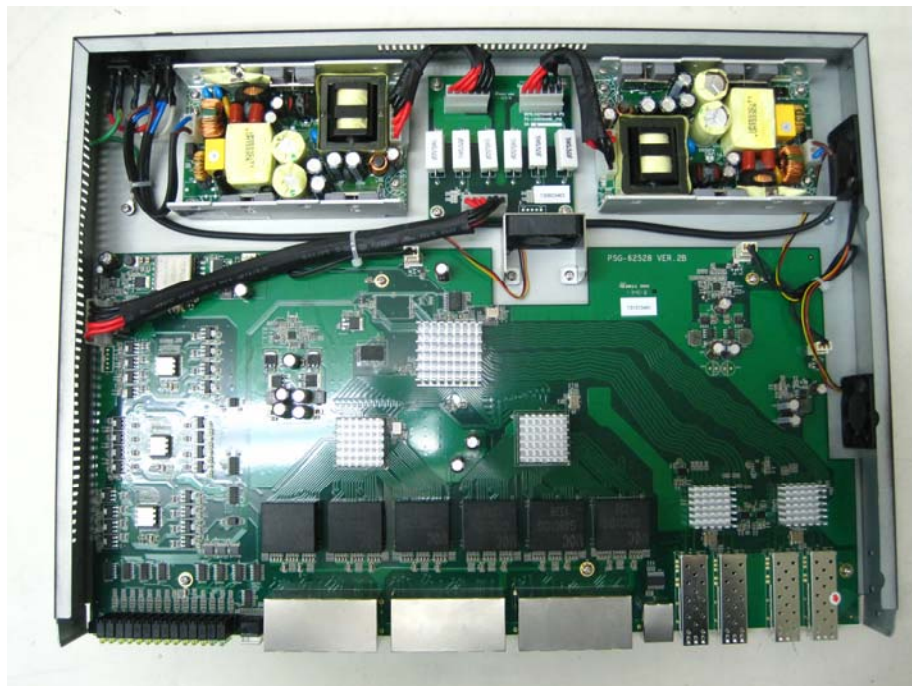
## 16 Photographs of EUT



Front View of the EUT



Rear View of the EUT



Inside View of the EUT



Front View of the PCB 1

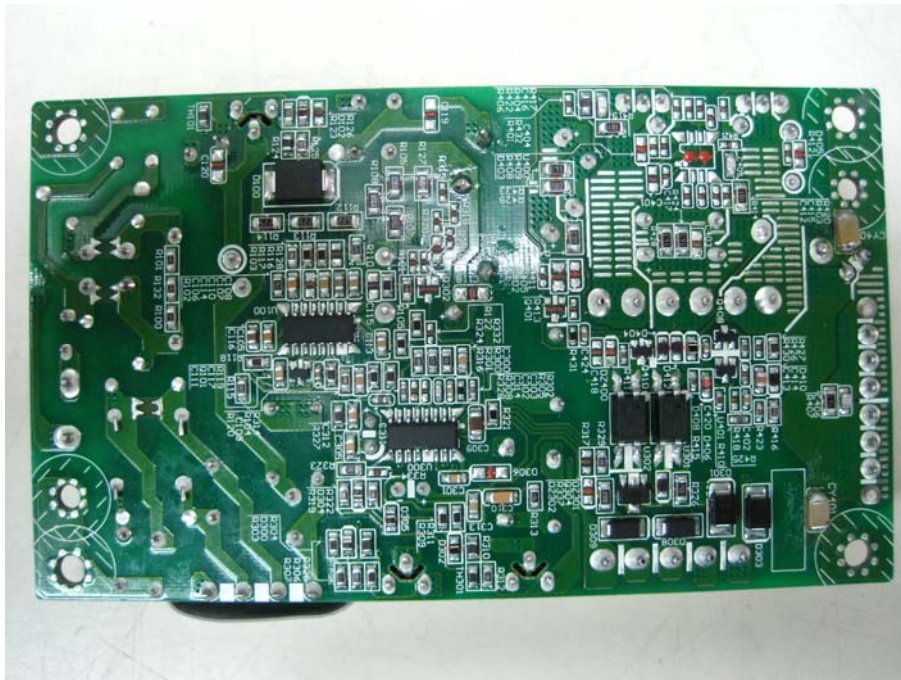


Rear View of the PCB 1

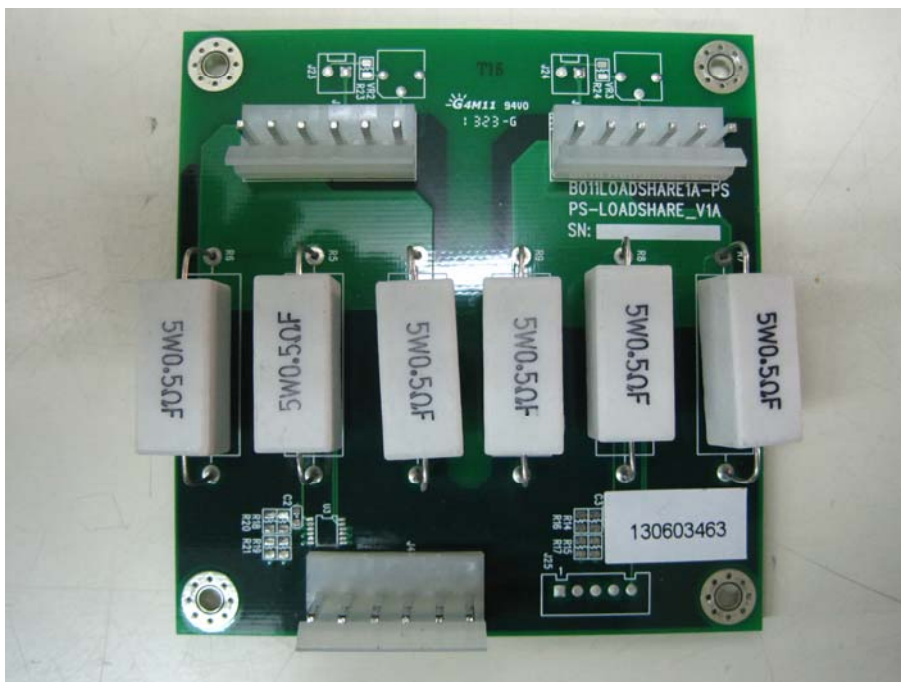


Front View of the PCB 2

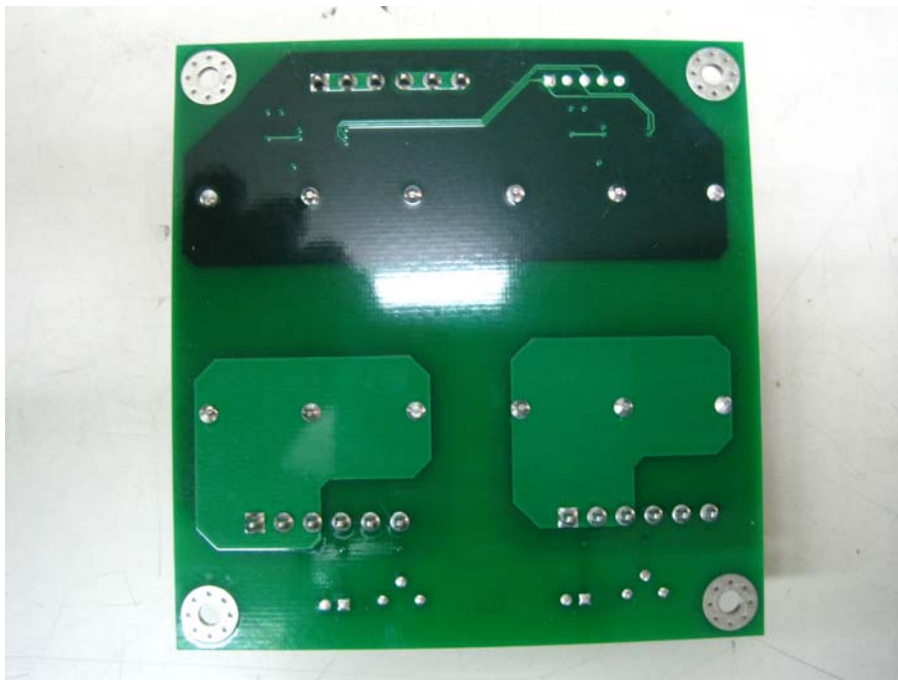




Rear View of the PCB 2



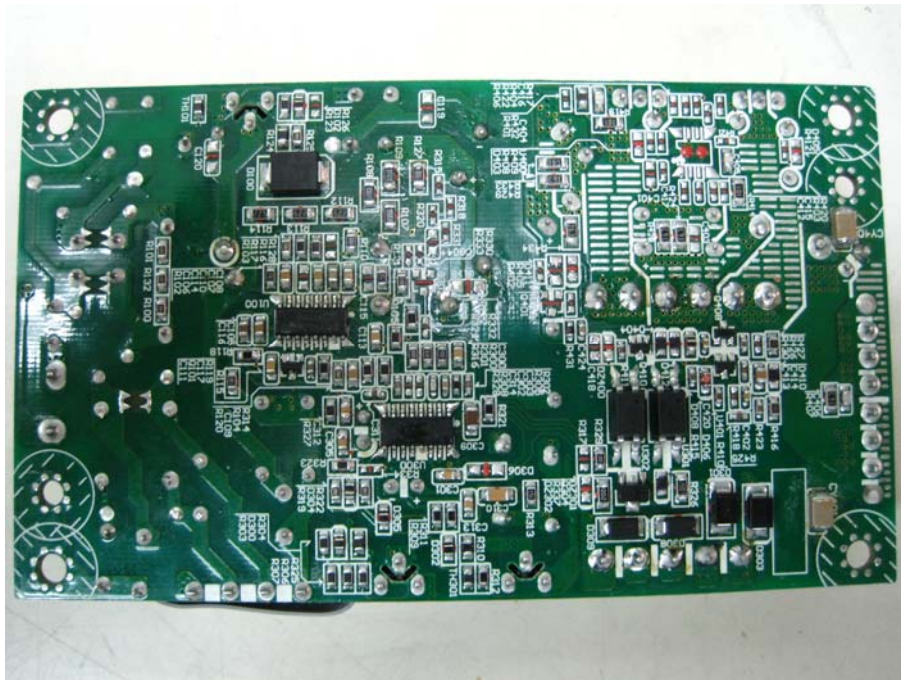
Front View of the PCB 3



Rear View of the PCB 3



Front View of the PCB 4



Rear View of the PCB 4



View of the Power Supply



View of the Power Cable

## 17 Photographs of ESD Test Points



View of ESD Test Points



View of ESD Test Points



View of ESD Test Points



View of ESD Test Points