EMC COMPLIANCE TEST REPORT

Technical Statement of Conformity

in accordance with the council directive 2004/108/EC

The Product

Equipment Under Test	:	LED driver
Model Number	:	YD12-60-200
Product Series	:	YD12-40-300, YD12-35-350, YD12-24-500, YD12-12-1000
Report Number	:	HA140994-CE
Issue Date	:	27-DEC-2014
Test Result	:	Compliance

is produced by

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Verification

Applicant：	YOU DIAN Technology Co., Ltd.
Manufacturer：	YOU DIAN Technology Co., Ltd.
Equipment Under Test：	LED driver
Model No.：	YD12-60-200
Product Series：	YD12-40-300, YD12-35-350, YD12-24-500, YD12-12-1000
Sample Received Date：	19-DEC-2014

Test Standards：

Emission:	**Immunity:**
☒ EN 55015:2013	☒ EN 61547:2009
☒ IEC 61000-3-2:2005 +A1:2008 +A2:2009	☒ IEC 61000-4-2:2008
	☒ IEC 61000-4-3:2006+A1:2007+A2:2010
	☒ IEC 61000-4-4:2012
☒ IEC 61000-3-3:2013	☒ IEC 61000-4-5:2005
	☒ IEC 61000-4-6:2008
	☒ IEC 61000-4-8:2009
	☒ IEC 61000-4-11:2004

Remark:

This report details the results of the testing carried out on one sample. This report shows the EUT is technically compliant with the EN 55015 and EN 61547 official requirements. This report applies to the above sample only and shall not be reproduced in part without written approval of HongAn Technology Co., Ltd..

Documented by: Phoebe Chan **Date:** 27-DEC-2014

Phoebe Chan / ADM. Dept. Staff

Tested by: Ray Hang **Date:** 26-DEC-2014

Ray Hang/ ENG. Dept. Staff

Approved by: Adam Yang **Date:** 26-DEC-2014

Adam Yang / SEC. Manager

Summary of Test Result

Emission			
Test Standard	**Test Item**	**Test Result**	**Remark**
EN55015	Disturbance Voltage (Mains Terminals)	Pass	Highest Emission L: 0.99MHz, A.V.33.63dBuV, Margin -12.37 dB N: 0.59MHz, A.V.37.70dBuV, Margin -8.30 dB
EN55015	Radiated Electromagnetic Disturbances (9kHz~30MHz)	Pass	Loop Diameter: 2m Highest Emission X: 1.42MHz, 22.18dBuA, Margin-8.84dB Y: 1.45MHz, 22.87dBuA, Margin-7.90dB Z: 1.60MHz, 20.69dBuA, Margin-8.90dB
EN55015	Radio Disturbances (30MHz~300MHz)	Pass	Highest Emission H: 67.58MHz,19.10 dBuV, Margin-10.90 dB Antenna Height 387 cm, Turntable Angle 134° V: 83.82MHz, 22.68dBuV, Margin-7.32 dB Antenna Height 134 cm, Turntable Angle 298°
IEC61000-3-2	Harmonic	Pass	Refer to Page 28
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		± 4.20dB
Radiated Emission	9kHz~30MHz	± 3.98dB
	30MHz~300MHz	± 5.39dB

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

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	C	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 30% C	A	Pass
		Interruptions 100% B	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 EUT

Equipment Under Test	**:**	LED driver
Model Number	**:**	YD12-60-200
Product Series	**:**	YD12-40-300, YD12-35-350, YD12-24-500, YD12-12-1000
Applicant	**:**	YOU DIAN Technology Co., Ltd.
Address of Applicant	**:**	No.7, Ln. 3, Bao'an Rd., Yong'an Dist., Kaohsiung City 828, Taiwan (R.O.C.)
Manufacturer	**:**	YOU DIAN Technology Co., Ltd.
Address of Manufacturer	**:**	No.7, Ln. 3, Bao'an Rd., Yong'an Dist., Kaohsiung City 828, Taiwan (R.O.C.)
Power Supply	**:**	Input: 100-240Vac, 0.25A, 60 / 50Hz ☐Shielded ☒Non-Shielded ☐Detachable, ☒Un-Detachable, 1.8m ☐w Ferrite Core ☒w/o Ferrite Core Output: 40-60Vdc ☐Shielded ☒Non-Shielded ☐Detachable, ☒Un-Detachable, 0.2m ☐w Ferrite Core ☒w/o Ferrite Core
I/O Port	**:**	N/A
Data Cable	**:**	N/A
Description of EUT	**:**	**Dimensions :** 4 cm (L) X 6 cm (W) X 2.5 cm (H) **Position :** ☒Table-top / ☐Floor-standing **Immunity Test Requirements:** ☒For self-ballasted lamps ☐For independent auxiliaries ☐For luminaires **Intended Function :** The EUT is a LED driver. **Product Variance :** The applicant declares that the difference between the EUT and its product series is on the output voltage and output current.

1.2 Test Facility

All the Conducted and Radiated Emission Tests are performed at No. 15-1, Cweishuh Keng, Cweipin Village, Linkou, New Taipei City, Taiwan, R.O.C.

1.3 Test Instruments

1.3.1 Instruments Used for Emission Measurement

Instrument Name	Manufacture Mode	Model Number	Serial Number	Last Cal. Date	Next Cal. Date	Test Item
LISN	EMCO	3810/2NM	9702-1820	18-AUG-2014	18-AUG-2015	Conducted Emission
LISN	EMCO	3810/2NM	9702-1821	18-Aug-2014	18-Aug-2015	Conducted Emission
LISN	Rolf Heine Hochfrequenztechnik	NNB-4/32T	00001	04-Mar-2014	04-Mar-2015	Conducted Emission
RF Current Probe	FCC	F-33-4	53	17-May-2014	17-May-2015	Conducted Emission
Impedance Stabilization Network (ISN)	TESEQGMBH	ISN T800	30838	16-Jun-2014	16-Jun-2015	Conducted Emission
EMI Receiver	R&S	ESCI	100931	17-Jul-2014	17-Jul-2015	Conducted Emission, Radiation Emission
Spectrum Analyzer	R&S	FSL6	100323	23-Aug-2014	23-Aug-2015	Radiated Emission
Spectrum Analyzer	ADVANTEST	R3172	101202158	08-Aug-2014	08-Aug-2015	Radiated Emission
Preamplifier	CHASE	CPA 9231A	0405	23-Aug-2014	23-Aug-2015	Radiated Emission
Bilog Antenna	TESEQ	CBL6111D	25769	25-Feb-2014	25-Feb-2015	Radiated Emission
Bilog Antenna	TESEQ	CBL6111D	38521	01-Jul-2014	01-Jul-2015	Radiated Emission
Loop Antenna	LAPLACE	RF300	9048	23-Aug-2014	23-Aug-2015	Radiated Emission
Harmonics /Flicker Module	EMC PARTNER	Harmonics-1000	HAR1000-38	20-Mar-2014	20-Mar-2015	Harmonics

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.

1.3.2 Instruments Used for Immunity Measurement

Instrument Name	Manufacture Mode	Model Number	Serial Number	Last Cal. Date	Next Cal. Date	Test Item
ESD Simulator	KeyTek	MZ-15/EC	9805460	30-Jul-2014	30-Jul-2015	ESD
Power Generator, Mains Coupler/ Decoupler	KeyTek	EMC Pro	0002255	05-Mar-2014	05-Mar-2015	EFT. Surge, Magnetic Field, Dip
Wide Band Amplifier	ifi	CMX50	D019-0200	19-Feb-2014	19-Feb-2015	RS,CS
RF Amplifier	ar	15S1G3	306578	19-Feb-2014	19-Feb-2015	RS
Double-Ridged Waveguide Horn	EMCO	3115	9912-5992	13-May-2014	13-May-2015	RS
Signal Generator	HP	HP8648C	3623A03457	19-Feb-2014	19-Feb-2015	RS,CS
Bilog Antenna	EMCO	3142	9710-1221	19-Feb-2014	19-Feb-2015	RS
CDN	FCC	FCC-801-M3-32A	2019	21-Feb-2014	21-Feb-2015	CS
CDN	FCC	FCC-801-M3-32A	20116	21-Feb-2014	21-Feb-2015	CS
EM Injection clamp	FCC	F-2031-23mm	337	21-Feb-2014	21-Feb-2015	CS
Magnetic Field Immunity Loop	FCC	F-1000-4-819 /10-L-1M	9953	05-Mar-2014	05-Mar-2015	MF

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards..

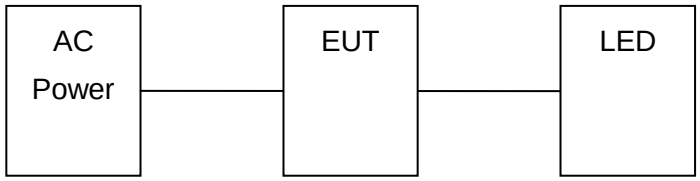
1.4 Test Methodology

All Emission Tests were performed according to the procedures specified in EN 55015.
All Immunity Tests were performed according to the procedures specified in EN 61547.

1.5 Auxiliary Equipments

No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Power Cord
01	Power Cable	N/A	N/A	N/A	N/A	Non-shielded1.8m,w/o core
02	15WLED	N/A	N/A	N/A	N/A	N/A

1.6 Block Diagram



1.7 Identifying the Final Test Mode

1. Operation Mode

Note: After pre-test, we identified that the Operation Mode 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 Decision of Final Test Mode

Operation Mode

1.9 Condition of Power Supply

AC 230 V; 60 Hz

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 shown in Sec. 1.8.

1.11 Immunity Performance Classification

Class	Class Criterion
A	During the test no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.
B	During the test the luminous intensity may change to any value. After the test the luminous intensity shall be restored to its initial value within 1 min. Regulating controls need not function during the test, but after the test the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.
C	During and after the test any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 mins, all functions shall return to normal if necessary by temporary interruption of the mains supply and / or operating the regulating control. Additional requirement for lighting equipment incorporating a starting device: After the test the lighting equipment is switched off. After half an hour it is switched on again. The lighting equipment shall start and operate as intended.

2 Disturbance Voltage Test

2.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

2.2 Test Arrangement and Procedure

- The EUT was placed on a non-conductive table which was 80 cm above the horizontal coupling plane. The rear of the EUT was 40 cm from the vertical coupling plane.
- The excess interface cables were folded at the cable center into a bundle no longer than 40 cm, so that the bundles were on the table.
- The EUT was connected to the main power through a L.I.S.N. This set up provided 50 ohm / 50 μH coupling impedance for the measuring equipment.
- All auxiliary equipment received power from a second L.I.S.N.
- The conducted emissions were measured between the Line Phase and the PE ground and between the Neutral Phase and the PE ground using an EMI Receiver.
- The values were recorded.

2.3 Disturbance Voltage Limit

Disturbance voltage limits at mains terminals

Frequency(MHz)	Limits(dBμV) a	
	Quasi-Peak	Average
0.009~0.05	110	---
0.05~0.15	90~80 b	---
0.15~0.5	66~56 b	56~46 b
0.5~5	56 c	46 c
5~30	60	50
a At the transition frequency, the lower limit applies. b The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0.5 MHz. c For electrodeless lamps and luminaries, the limit in the frequency range of 2.51 MHz to 3.0 MHz is 73 dB(μV) quasi-peak and 63 dB(μV) average.		
Note In Japan, the limits in the frequency range 6 kHz to 150 kHz do not apply.		

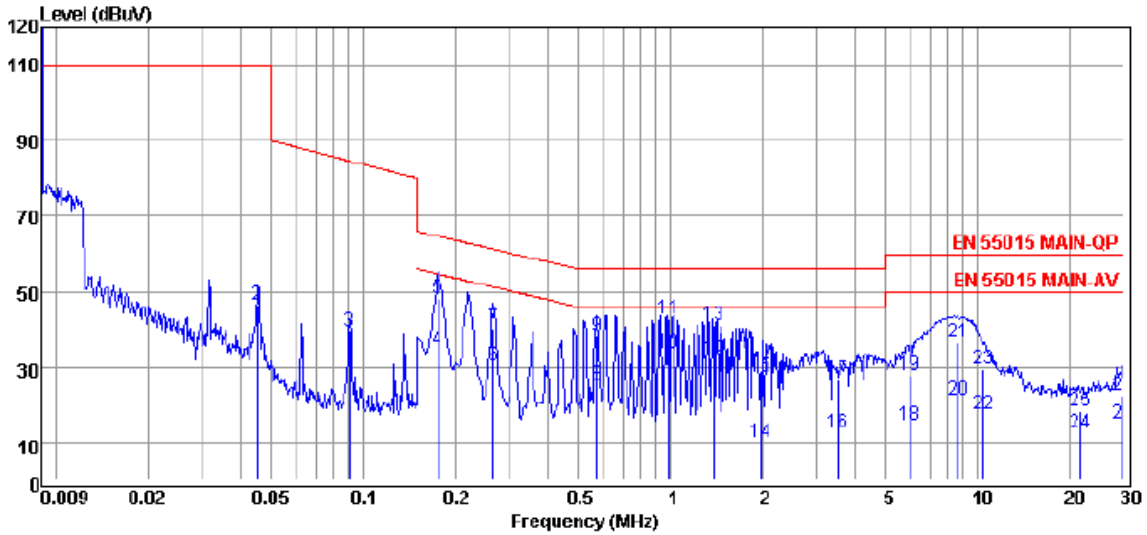
2.4 Test Result

PASS.

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

Disturbance Voltage Test Data

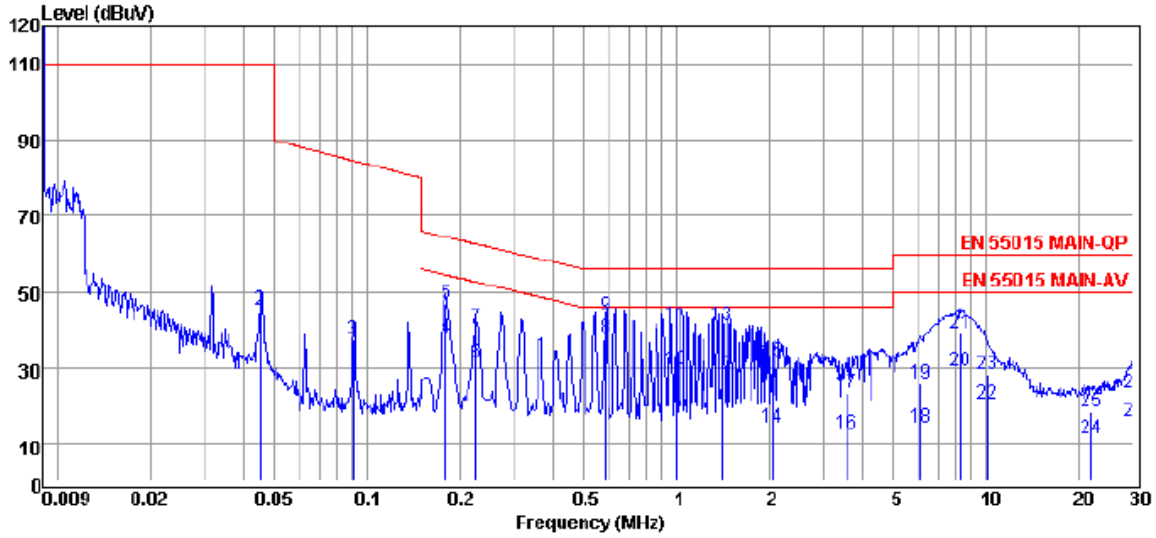
Test Date	:	24-DEC-2014	Power Line	:	Line
Temperature	:	25℃	Humidity	:	45%



No.	Freq MHz	Reading dBµV	C.F dB	Result dBµV	Limit dBµV	Margin dB	Power Line	Remark
1	0.01	68.10	0.96	69.06	110.00	-40.94	LINE	QP
2	0.05	46.10	0.40	46.50	110.00	-63.50	LINE	QP
3	0.09	39.30	0.23	39.53	84.59	-45.06	LINE	QP
4	0.18	34.40	0.17	34.57	54.72	-20.15	LINE	Average
5	0.18	47.90	0.17	48.07	64.72	-16.65	LINE	QP
6	0.27	30.20	0.16	30.36	51.27	-20.91	LINE	Average
7	0.27	40.20	0.16	40.36	61.27	-20.91	LINE	QP
8	0.58	25.30	0.19	25.49	46.00	-20.51	LINE	Average
9	0.58	38.00	0.19	38.19	56.00	-17.81	LINE	QP
10	0.99	33.40	0.23	33.63	46.00	-12.37	LINE	Average
11	0.99	42.40	0.23	42.63	56.00	-13.37	LINE	QP
12	1.39	31.80	0.27	32.07	46.00	-13.93	LINE	Average
13	1.39	40.70	0.27	40.97	56.00	-15.03	LINE	QP
14	1.97	9.70	0.32	10.02	46.00	-35.98	LINE	Average
15	1.97	27.10	0.32	27.42	56.00	-28.58	LINE	QP
16	3.50	12.10	0.42	12.52	46.00	-33.48	LINE	Average
17	3.50	26.00	0.42	26.42	56.00	-29.58	LINE	QP
18	6.04	14.09	0.60	14.69	50.00	-35.31	LINE	Average
19	6.04	27.19	0.60	27.79	60.00	-32.21	LINE	QP
20	8.69	20.50	0.72	21.22	50.00	-28.78	LINE	Average
21	8.69	35.90	0.72	36.62	60.00	-23.38	LINE	QP
22	10.44	16.69	0.80	17.49	50.00	-32.51	LINE	Average
23	10.44	28.49	0.80	29.29	60.00	-30.71	LINE	QP
24	21.61	11.30	1.23	12.53	50.00	-37.47	LINE	Average
25	21.61	17.10	1.23	18.33	60.00	-41.67	LINE	QP
26	29.82	12.60	2.37	14.97	50.00	-35.03	LINE	Average
27	29.82	20.20	2.37	22.57	60.00	-37.43	LINE	QP

Disturbance Voltage Test Data

Test Date	:	24-DEC-2014	Power Line	:	Neutral
Temperature	:	25℃	Humidity	:	45%



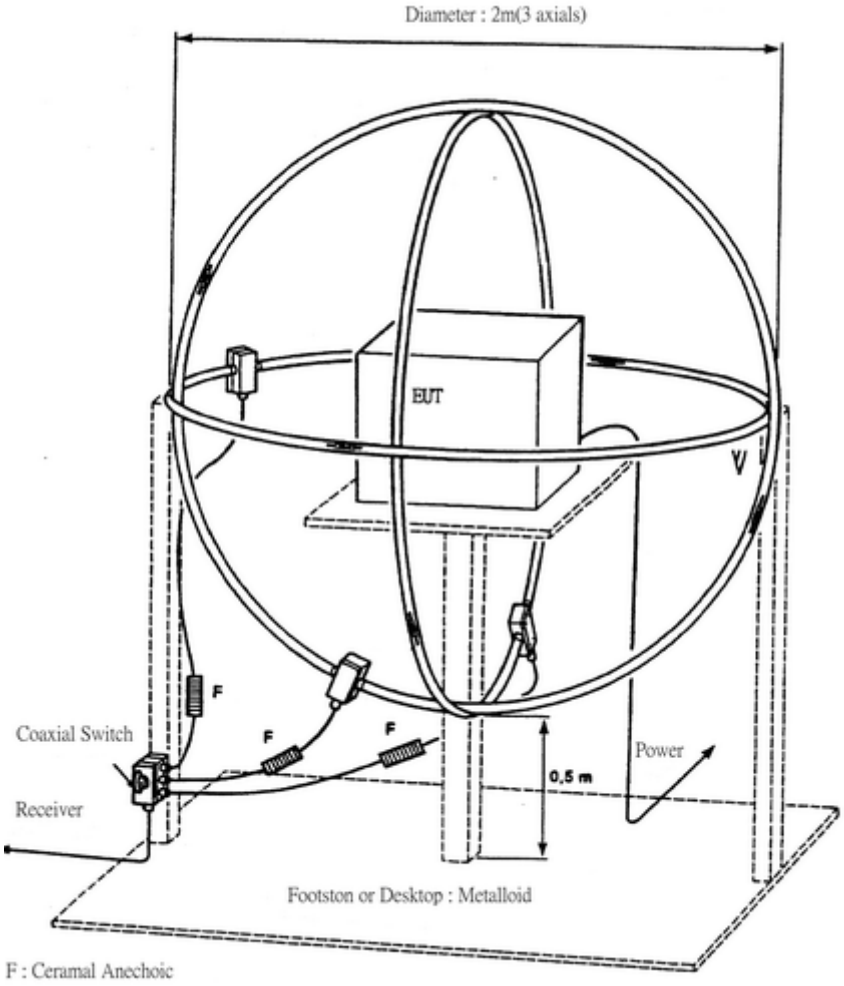
No.	Freq MHz	Reading dBµV	C.F dB	Result dBµV	Limit dBµV	Margin dB	Power Line	Remark
1	0.01	67.00	0.60	67.60	110.00	-42.40	NEUTRAL	QP
2	0.05	44.90	0.35	45.25	110.00	-64.75	NEUTRAL	QP
3	0.09	36.90	0.27	37.17	84.56	-47.39	NEUTRAL	QP
4	0.18	37.60	0.26	37.86	54.49	-16.63	NEUTRAL	Average
5	0.18	46.70	0.26	46.96	64.49	-17.53	NEUTRAL	QP
6	0.23	30.80	0.26	31.06	52.63	-21.57	NEUTRAL	Average
7	0.23	40.00	0.26	40.26	62.63	-22.37	NEUTRAL	QP
8	0.59	37.40	0.30	37.70	46.00	-8.30	NEUTRAL	Average
9	0.59	43.40	0.30	43.70	56.00	-12.30	NEUTRAL	QP
10	1.00	29.30	0.33	29.63	46.00	-16.37	NEUTRAL	Average
11	1.00	40.80	0.33	41.13	56.00	-14.87	NEUTRAL	QP
12	1.41	27.70	0.36	28.06	46.00	-17.94	NEUTRAL	Average
13	1.41	40.60	0.36	40.96	56.00	-15.04	NEUTRAL	QP
14	2.04	13.90	0.40	14.30	46.00	-31.70	NEUTRAL	Average
15	2.04	31.10	0.40	31.50	56.00	-24.50	NEUTRAL	QP
16	3.54	11.80	0.51	12.31	46.00	-33.69	NEUTRAL	Average
17	3.54	22.70	0.51	23.21	56.00	-32.79	NEUTRAL	QP
18	6.12	13.50	0.66	14.16	50.00	-35.84	NEUTRAL	Average
19	6.12	25.10	0.66	25.76	60.00	-34.24	NEUTRAL	QP
20	8.30	28.50	0.76	29.26	50.00	-20.74	NEUTRAL	Average
21	8.30	38.20	0.76	38.96	60.00	-21.04	NEUTRAL	QP
22	10.06	19.60	0.82	20.42	50.00	-29.58	NEUTRAL	Average
23	10.06	27.60	0.82	28.42	60.00	-31.58	NEUTRAL	QP
24	21.94	10.00	1.22	11.22	50.00	-38.78	NEUTRAL	Average
25	21.94	17.20	1.22	18.42	60.00	-41.58	NEUTRAL	QP
26	29.96	13.30	2.39	15.69	50.00	-34.31	NEUTRAL	Average
27	29.96	21.00	2.39	23.39	60.00	-36.61	NEUTRAL	QP

3 Radiated Electromagnetic Disturbance Test (9kHz~30MHz)

3.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

3.2 Test Arrangement and Procedure



- The EUT was placed in the centre of the antenna as shown above. The position is not critical.
- The induced current in the loop antenna is measured by means of a current prove (1 V/A) and the measuring receiver. By means of a coaxial switch, the three field directions were measured

3.3 Radiated Electromagnetic Disturbance Limit

☒ EN 55015

Frequency (MHz)	Limits(dB μA)		
	☒Loop Antenna Diameter 2m	☐Loop Antenna Diameter 3m	☐Loop Antenna Diameter 4m
0.009~0.07	88	81	75
0.07~0.15	88~58 b	81~51 b	75~45 b
0.15~3	58~22 b	51~15 b	45~9 b
3~30	22	15~16 c	9~12 c
a At the transition frequency, the lower limit applies. b Decreasing linearly with the logarithm of the frequency. For electrodeless lamps and luminaries, the limit in the frequency range of 2.2 MHz to 3 MHz is 58 dB(μA) for 2 m, 51 dB(μA) for 3 m and 45 dB(μA) for 4 m loop diameter. c Increasing linearly with the logarithm of the frequency.			
Note In Japan, the limits for frequencies 9 kHz to 150 kHz do not apply.			

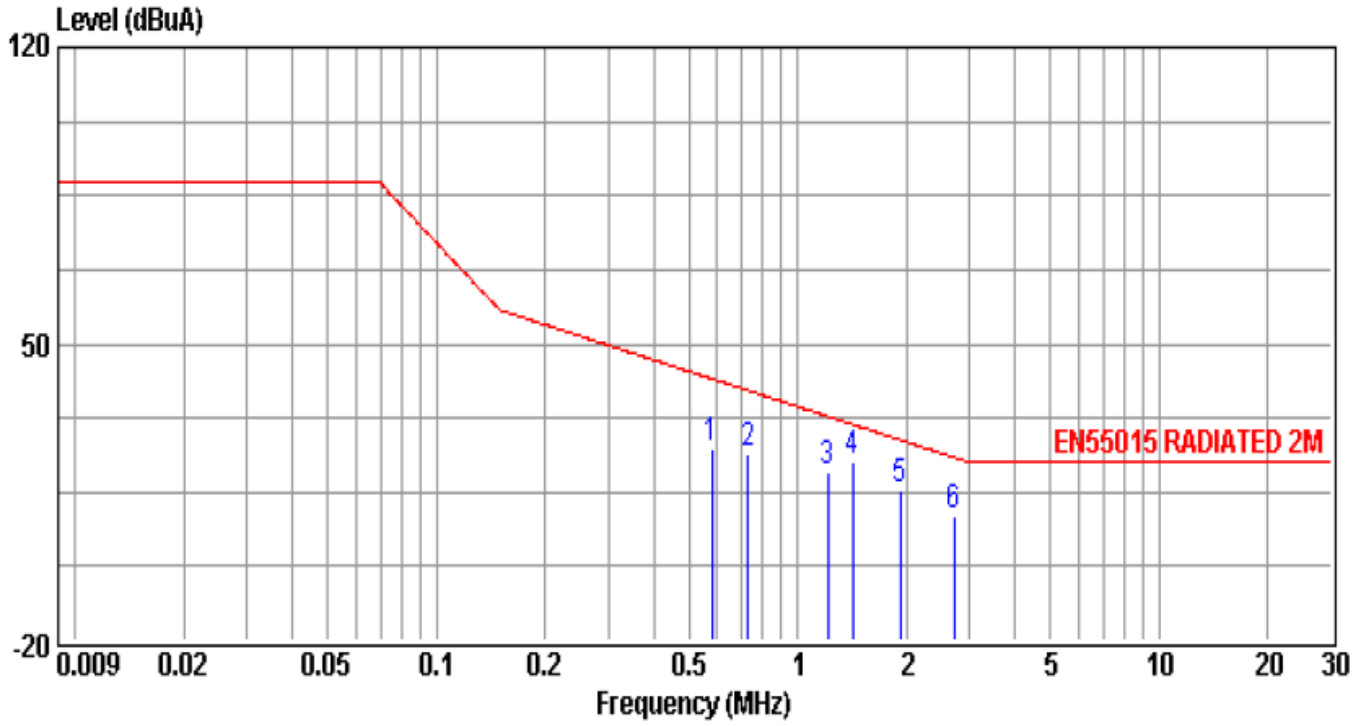
3.4 Test Result

PASS.

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

Radiated Electromagnetic Disturbance Test Data

Test Date	:	24-DEC-2014	Loop Mode	:	X axial
Temperature	:	25℃	Humidity	:	45%

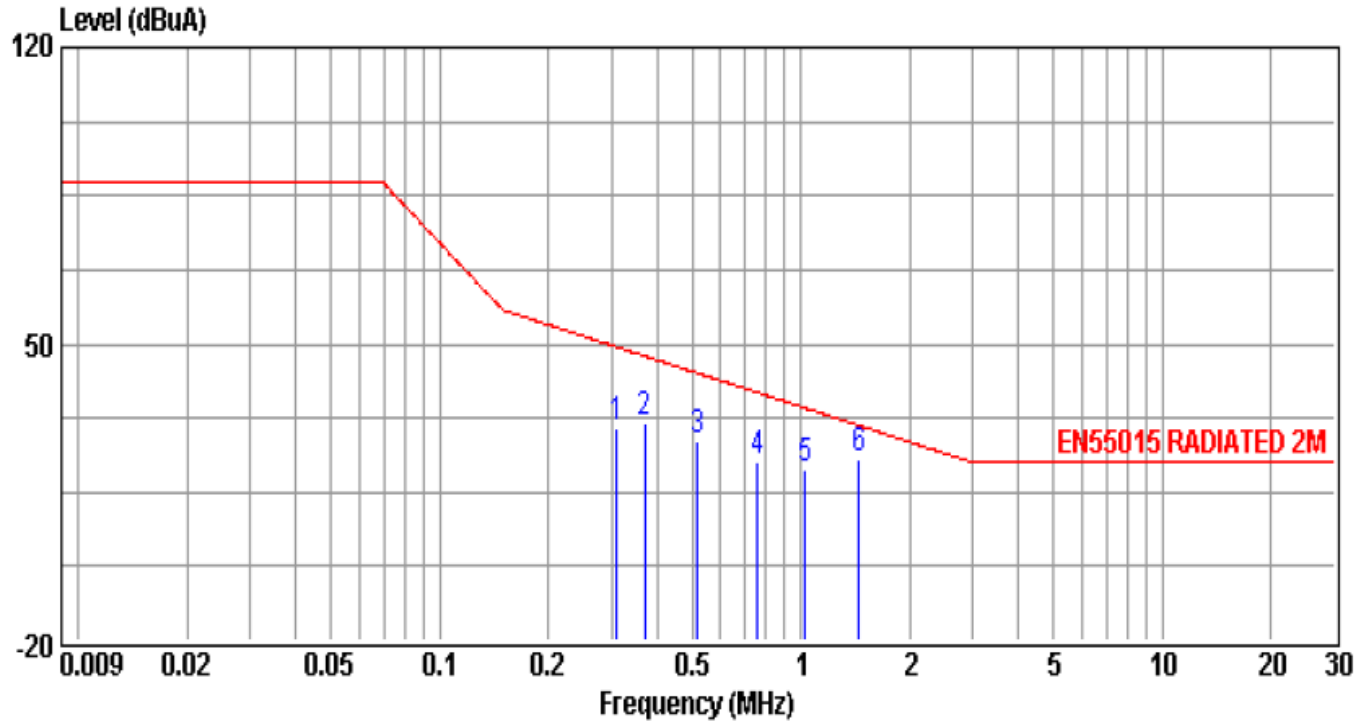


Freq	Reading	A.F	Result	Limit	Margin	Remark
MHz	dBμA	dB	dBμA	dBμA	dB	
0.58	25.05	0.04	25.09	41.79	-16.70	
0.73	23.78	0.05	23.83	39.02	-15.19	
1.21	19.66	0.07	19.73	32.95	-13.22	
1.42	22.10	0.08	22.18	31.02	-8.84	
1.93	15.39	0.09	15.48	27.33	-11.85	
2.71	9.43	0.11	9.54	23.25	-13.71	

Remark：All readings are Quasi-Peak values.

Radiated Electromagnetic Disturbances Test Data

Test Date	:	24-DEC-2014	Loop Mode	:	Y axial
Temperature	:	25℃	Humidity	:	45%

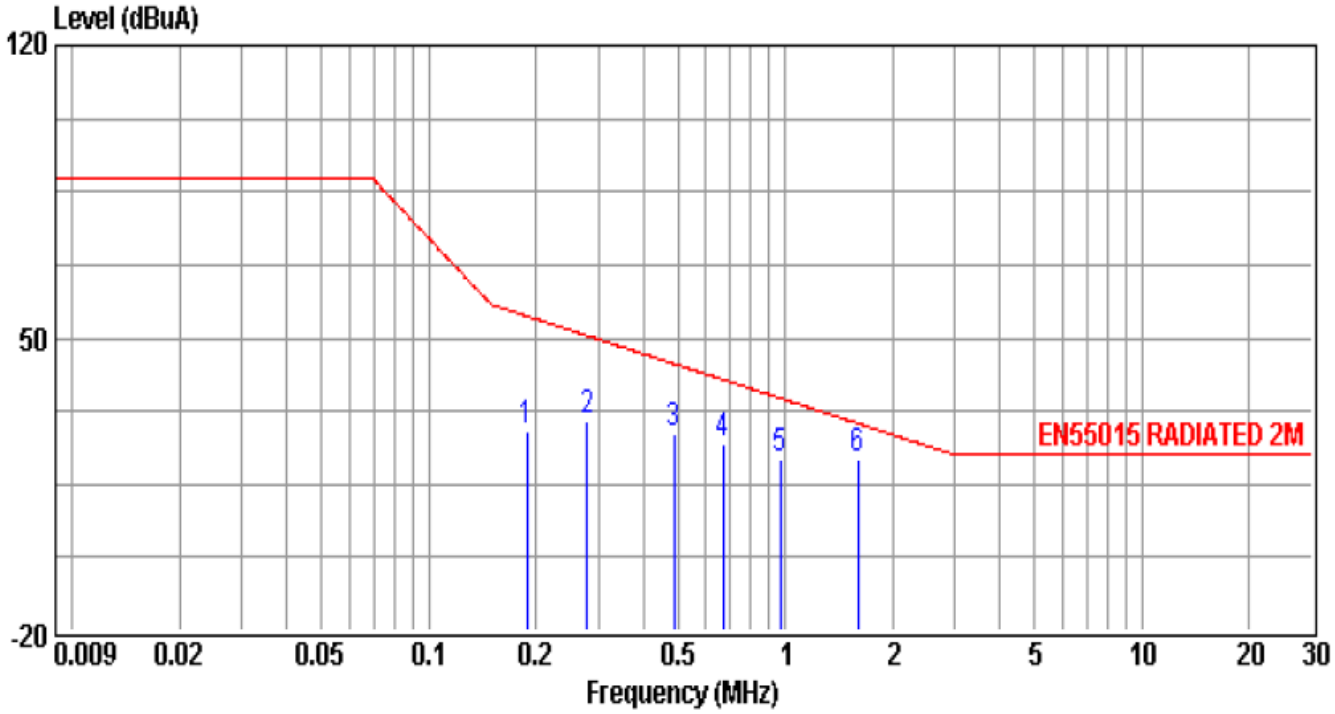


Freq	Reading	A.F	Result	Limit	Margin	Remark
MHz	dBμA	dB	dBμA	dBμA	dB	
0.31	30.01	0.02	30.03	49.34	-19.31	
0.37	31.12	0.03	31.15	47.21	-16.06	
0.52	26.93	0.04	26.97	43.11	-16.14	
0.76	22.00	0.05	22.05	38.54	-16.49	
1.03	20.06	0.06	20.12	34.88	-14.76	
1.45	22.79	0.08	22.87	30.77	-7.90	

Remark：All readings are Quasi-Peak values.

Radiated Electromagnetic Disturbance Test Data

Test Date	:	24-DEC-2014	Loop Mode	:	Z axial
Temperature	:	25℃	Humidity	:	45%



Freq	Reading	A.F	Result	Limit	Margin	Remark
MHz	dBμA	dB	dBμA	dBμA	dB	
0.19	27.58	0.06	27.64	55.25	-27.61	
0.28	29.84	0.02	29.86	50.57	-20.71	
0.49	27.11	0.04	27.15	43.82	-16.67	
0.67	24.80	0.05	24.85	40.06	-15.21	
0.97	21.01	0.06	21.07	35.60	-14.53	
1.60	20.61	0.08	20.69	29.59	-8.90	

Remark：All readings are Quasi-Peak values.

4 Radio Disturbance Test (30MHz~300MHz)

4.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

4.2 Test Configuration and Procedure

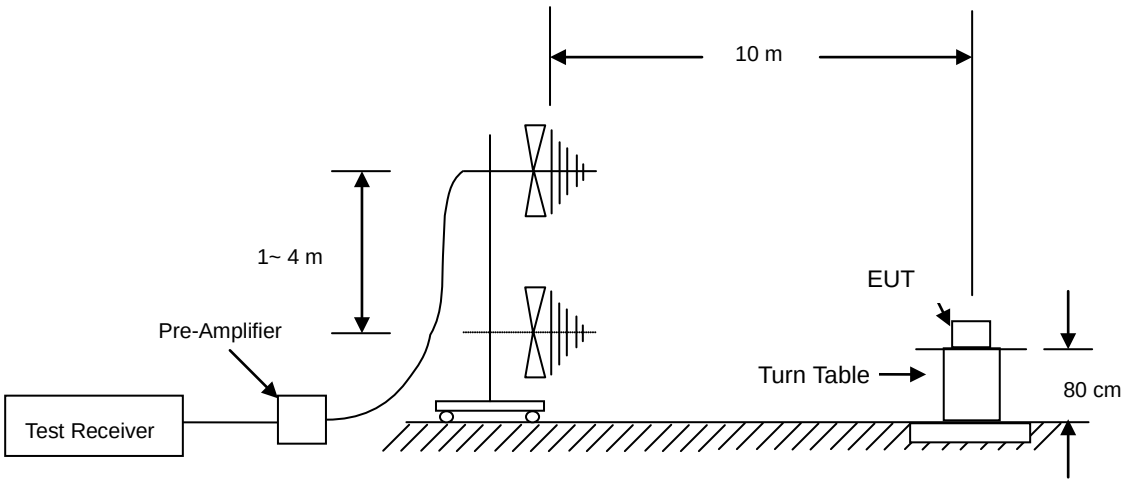


Table-top Equipment

- The EUT was place 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 4.3.
- The radiated emissions were measured when the Antenna-to-EUT polarization was set horizontally and vertically.
- The values were recorded.

4.3 Radio Disturbance Limit

☒ EN 55015

Frequency (MHz)	Quasi-peak Limits dB(μ V/m)
30~230	30
230~300	37
At the transition frequency, the lower limit applies.	

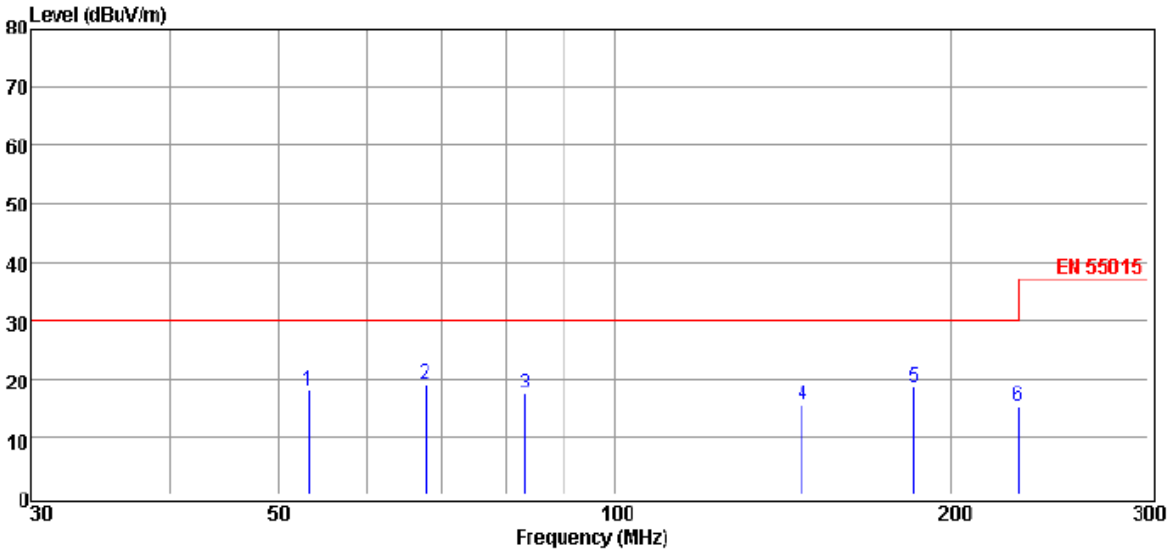
4.4 Test Result

PASS.

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

Radio Disturbance Test Data

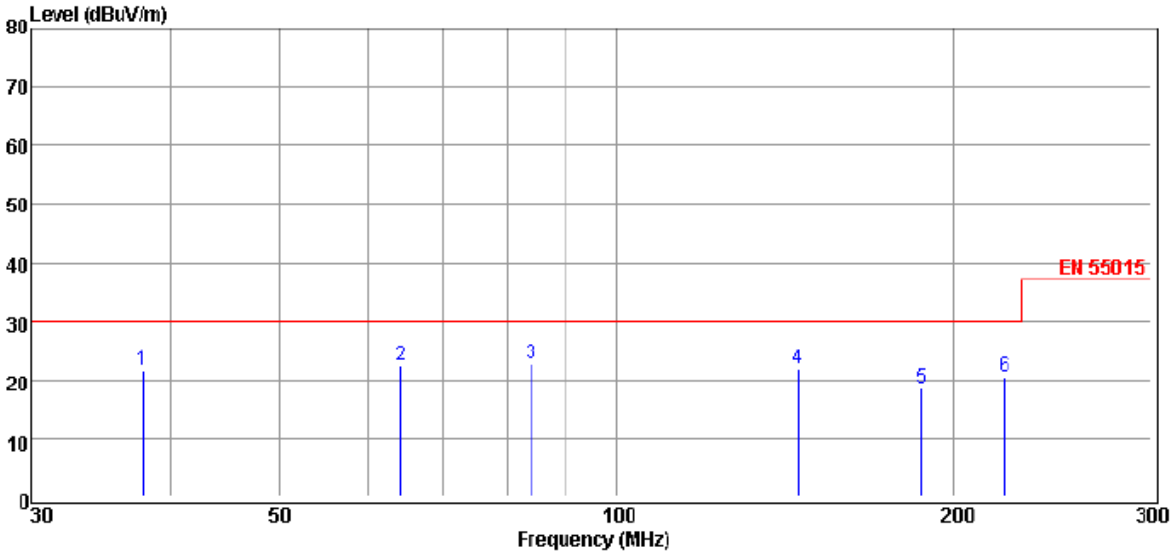
Test Date	:	24-DEC-2014	Polarization	:	Horizontal
Temperature	:	25℃	Humidity	:	45%



No.	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Antenna	Remark
	MHz	dBµV	dB	dBµV/m	dBµV/m	dB	cm	deg	Pol.	
1	53.14	40.17	-22.09	18.08	30.00	-11.92	368	207	HORIZONTAL	QP
2	67.58	42.51	-23.41	19.10	30.00	-10.90	387	134	HORIZONTAL	QP
3	83.01	38.76	-21.42	17.34	30.00	-12.66	391	288	HORIZONTAL	QP
4	147.17	32.89	-17.27	15.62	30.00	-14.38	375	157	HORIZONTAL	QP
5	185.18	38.59	-19.94	18.65	30.00	-11.35	368	220	HORIZONTAL	QP
6	229.73	34.08	-18.77	15.31	30.00	-14.69	378	106	HORIZONTAL	QP

Radio Disturbance Test Data

Test Date	:	24-DEC-2014	Polarization	:	Vertical
Temperature	:	25℃	Humidity	:	45%



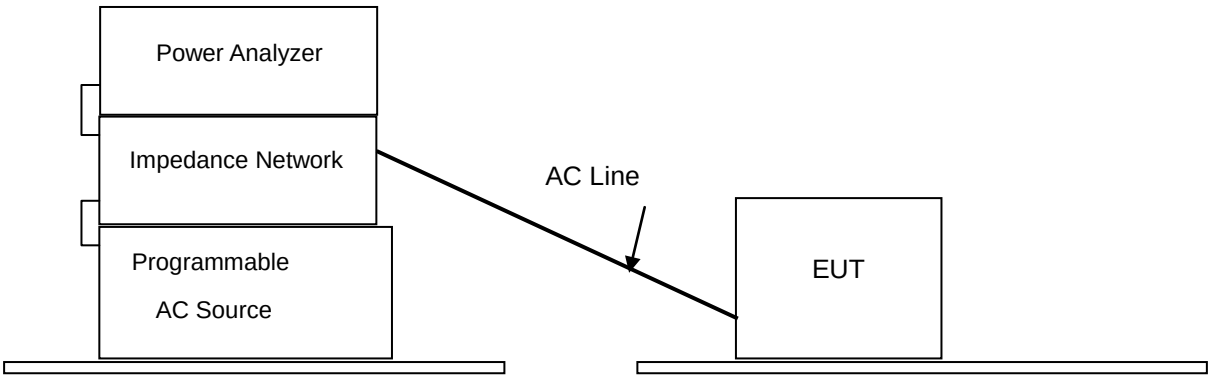
No.	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Antenna	Remark
	MHz	dBµV	dB	dBµV/m	dBµV/m	dB	cm	deg	Pol.	
1	37.71	36.47	-15.00	21.47	30.00	-8.53	121	101	VERTICAL	QP
2	64.22	46.15	-23.71	22.44	30.00	-7.56	105	175	VERTICAL	QP
3	83.82	44.10	-21.42	22.68	30.00	-7.32	134	298	VERTICAL	QP
4	145.06	39.10	-17.14	21.96	30.00	-8.04	129	109	VERTICAL	QP
5	187.10	38.64	-20.13	18.51	30.00	-11.49	109	146	VERTICAL	QP
6	221.66	39.45	-19.02	20.43	30.00	-9.57	143	201	VERTICAL	QP

5 Harmonic Current Emission Measurement

5.1 Instrument

Refer to Sec. 1.3 Test Instruments.

5.2 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.

5.3 EUT Operation Condition

Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45％RH	1026mbar

5.4 Test Limit

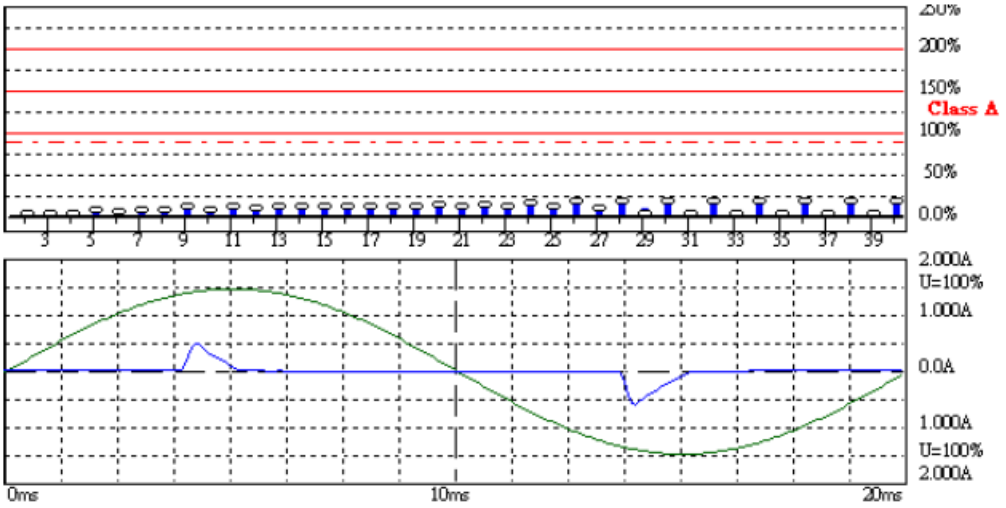
Class A Equipment

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 ≤ n ≤ 39	0.15 * 15 / n
Even harmonics	
2	1.08
4	0.43
6	0.30
8 ≤ n ≤ 40	0.23 * 8 / n

5.5 Test Result

PASS

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




```
Urms =   227.6V   Freq =   50.000   Range:   2 A
Irms =   0.123A   Ipk  =   0.614A   cf    =   4.992
P    =   12.71W   S    =   28.00VA  pf    =   0.454
THDi =   191 %    THDu =   0.10 %   Class A

Test - Time :    10min    ( 100 %)

Test completed, Result: PASSED
```

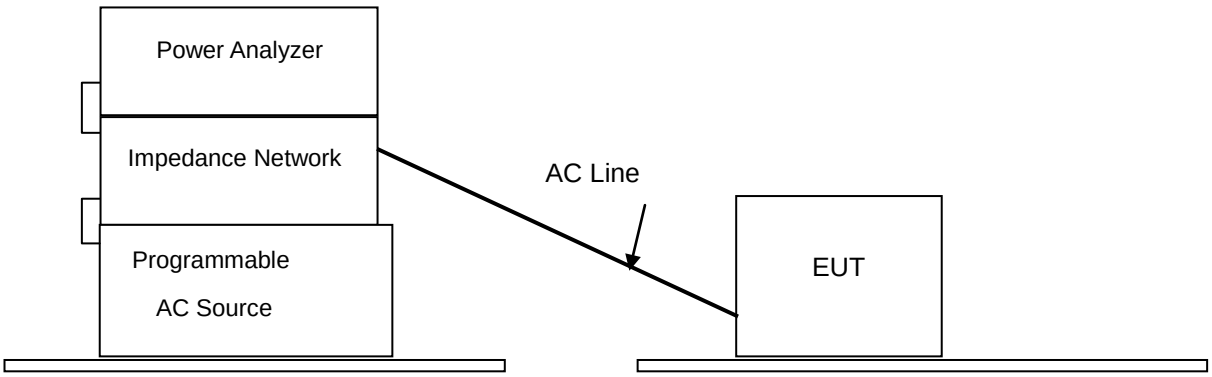
Order	Freq. [Hz]	Iavg [A]	Irms [A]	Imax [A]	Limit [A]	Status
1	50	0.0602	0.0587	0.0651		
2	100	0.0106	0.0106	0.0107	1.0800	
3	150	0.0541	0.0526	0.0583	2.3000	
4	200	0.0105	0.0106	0.0106	0.4300	
5	250	0.0498	0.0487	0.0532	1.1400	
6	300	0.0104	0.0105	0.0106	0.3000	
7	350	0.0438	0.0431	0.0460	0.7700	
8	400	0.0104	0.0105	0.0106	0.2300	
9	450	0.0366	0.0364	0.0376	0.4000	
10	500	0.0105	0.0106	0.0106	0.1840	
11	550	0.0291	0.0292	0.0293	0.3300	
12	600	0.0105	0.0106	0.0107	0.1533	
13	650	0.0220	0.0223	0.0223	0.2100	
14	700	0.0105	0.0107	0.0109	0.1314	
15	750	0.0160	0.0165	0.0165	0.1500	
16	800	0.0106	0.0109	0.0109	0.1150	
17	850	0.0118	0.0122	0.0123	0.1324	
18	900	0.0106	0.0110	0.0110	0.1022	
19	950	0.0096	0.0098	0.0099	0.1184	
20	1000	0.0106	0.0110	0.0111	0.0920	
21	1050	0.0088	0.0088	0.0090	0.1071	
22	1100	0.0104	0.0110	0.0111	0.0836	
23	1150	0.0082	0.0083	0.0083	0.0978	
24	1200	0.0103	0.0110	0.0110	0.0767	
25	1250	0.0074	0.0074	0.0076	0.0900	
26	1300	0.0101	0.0109	0.0109	0.0708	
27	1350	0.0060	0.0062	0.0063	0.0833	
28	1400	0.0098	0.0106	0.0107	0.0657	
29	1450	0.0000	0.0048	0.0048	0.0776	
30	1500	0.0095	0.0105	0.0105	0.0613	
31	1550	0.0000	0.0031	0.0032	0.0726	
32	1600	0.0090	0.0100	0.0101	0.0575	
33	1650	0.0000	0.0016	0.0018	0.0682	
34	1700	0.0086	0.0096	0.0096	0.0541	
35	1750	0.0000	0.0009	0.0016	0.0643	
36	1800	0.0080	0.0090	0.0092	0.0511	
37	1850	0.0000	0.0011	0.0015	0.0608	
38	1900	0.0074	0.0084	0.0085	0.0484	
39	1950	0.0000	0.0016	0.0017	0.0577	
40	2000	0.0067	0.0077	0.0078	0.0460	

6 Voltage Fluctuations and Flicker 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 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.

6.3 EUT Operation Condition

Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45%RH	1026mbar

6.4 Test Limit

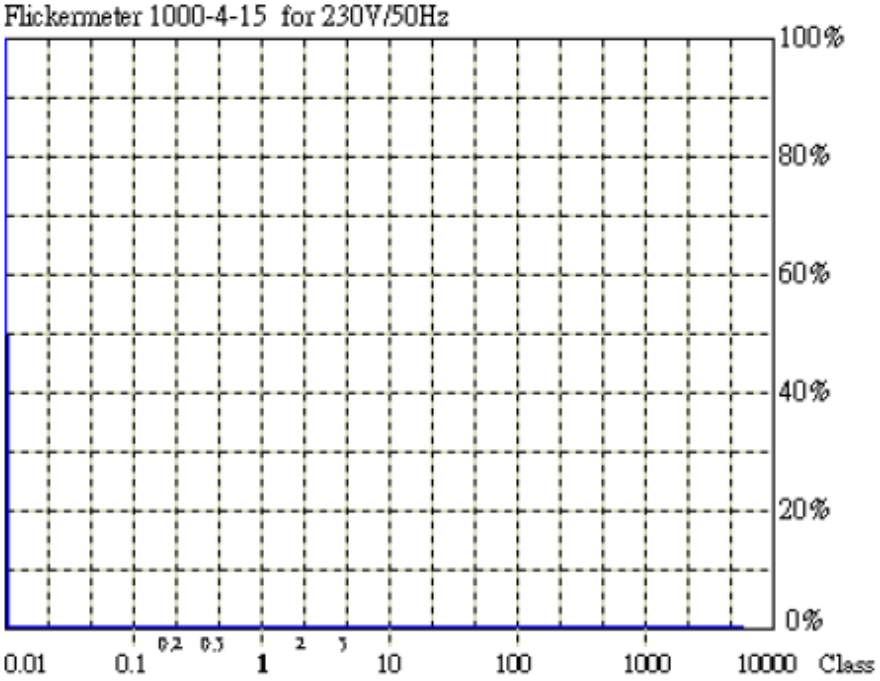
Test Item	Limit	Remark
P_{st}	1.0	P_{st} means short-term flicker indicator. T_p=10 min
P_{lt}	0.65	P_{lt} means long-term flicker indicator. T_p=2 hrs
d_t (%)	3.3	For more than 500ms
d_{max} (%)	4	d_{max} means relative maximum voltage change.
d_c (%)	3.3	d_c means relative steady-state voltage change.

6.5 Test Result

PASS

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

Flickermeter 1000-4-15 for 230V/50Hz



Actual Flicker (Fli):	**0.00**
Short-term Flicker (Pst):	**0.07**
Limit (Pst):	1.00
Long-term Flicker (Plt):	**0.07**
Limit (Plt):	0.65
Maximum Relative Volt. Change (dmax):	**0.00%**
Limit (dmax):	4.00%
Relative Steady-state Voltage Change (dc):	**0.00%**
Limit (dc):	3.30%
Maximum Interval exceeding 3.30% (dt):	**0.00ms**
Limit (dt>Lim):	500ms

```
Urms =  227.6V  Freq =  49.987  Range:  2 A
Irms =  0.129A  Ipk  =  0.724A  cf    =  5.614
P    =  12.42W  S    =  29.33VA pf    =  0.423

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

LIN (Line Impedance Network) :   L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

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

Test completed, Result: PASSED

Plt  =  0.072

        Pst     dmax    dc      dt>Lim
                [%]     [%]     [ms]
1       0.072   0.000   0.000   0.000
```

7 Electrostatic Discharge Immunity Test

7.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

7.2 Test Configuration and Procedure

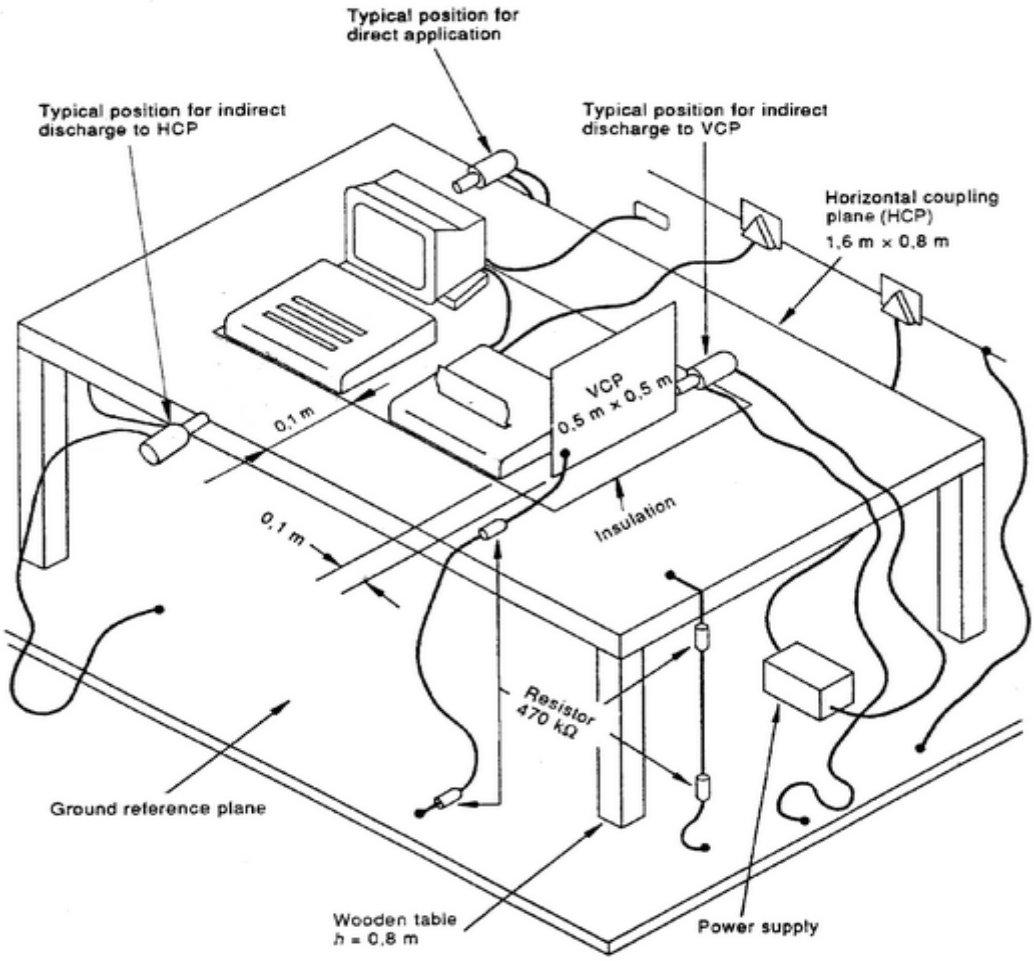


Table-top Equipment

- 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.

7.3 Test Result

7.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45%RH	1020mbar

7.3.2 Observation of Direct Discharge

Test Points: 1. Surface of Case. 2. Junction of Case.

Type of Discharge	Test Specifications				Performance Required by EN 61547	Observed Result	Verdict
	Test Level	Polarity	Test Point	Number of Discharge			
Air Discharge	2,4,8 (kV)	±	1~2	20/ per point	B	A	Pass
Contact Discharge	2,4 (kV)	±	1~2	20/ per point	B	A	Pass
Remark:	1. No change of the luminous intensity was observed						
	2. No change of the luminous intensity was observed						
Note:	The selected points were marked with red labels on the EUT.						

7.3.3 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 EN 61547	Observed Result	Verdict
	Test Level	Polarity	Test Point	Number of Discharge			
HCP Application	2,4 (kV)	±	1~4	20/ per point	B	A	Pass
VCP Application	2,4 (kV)	±	1~4	20/ per point	B	A	Pass
Remark:	1. No change of the luminous intensity was observed						
	2. No change of the luminous intensity was observed						
Note:	The selected points were marked with red labels on the EUT.						

PASS

The test result shows that the EUT compliant with the test requirement specified in EN 61547.

8 Radio-frequency, Electromagnetic Field Immunity Test

8.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

8.2 Test Configuration and Procedure

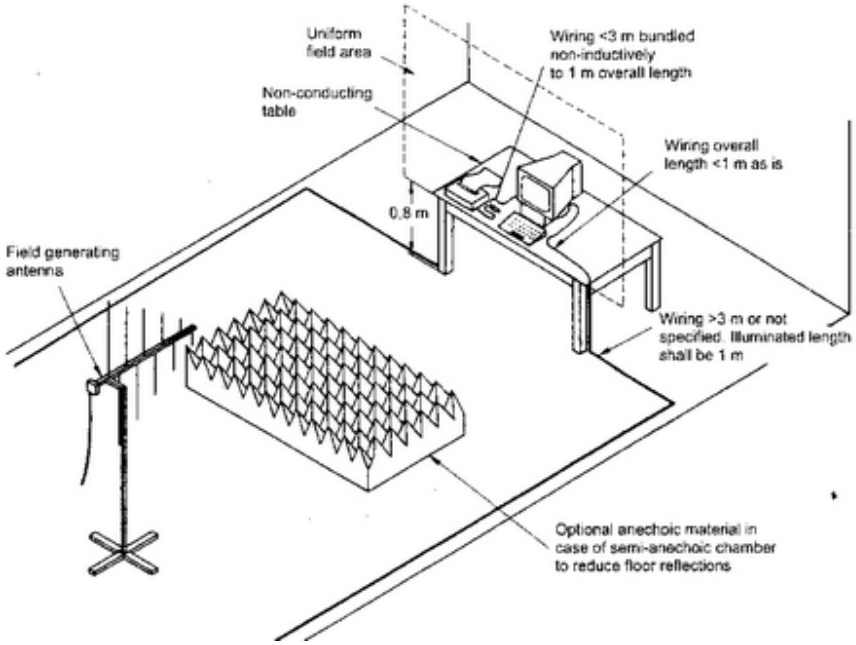


Table-top Equipment

- 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..

8.3 Test Result

8.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45%RH	1020mbar

8.3.2 Observation of Test

Type of Modulation	Test Specifications			Performance Required by EN61547	Observed Result	Verdict
	Field Strength	Frequency Range	Modulation			
Amplitude Modulation	3V/m	80 to 1000 MHz	80%AM, 1kHz, sinewave	A	A	Pass
Remark	No change of the luminous intensity was observed					

PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 61547.

9 Electrical Fast Transient/Burst Immunity Test

9.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

9.2 Test Configuration and Procedure

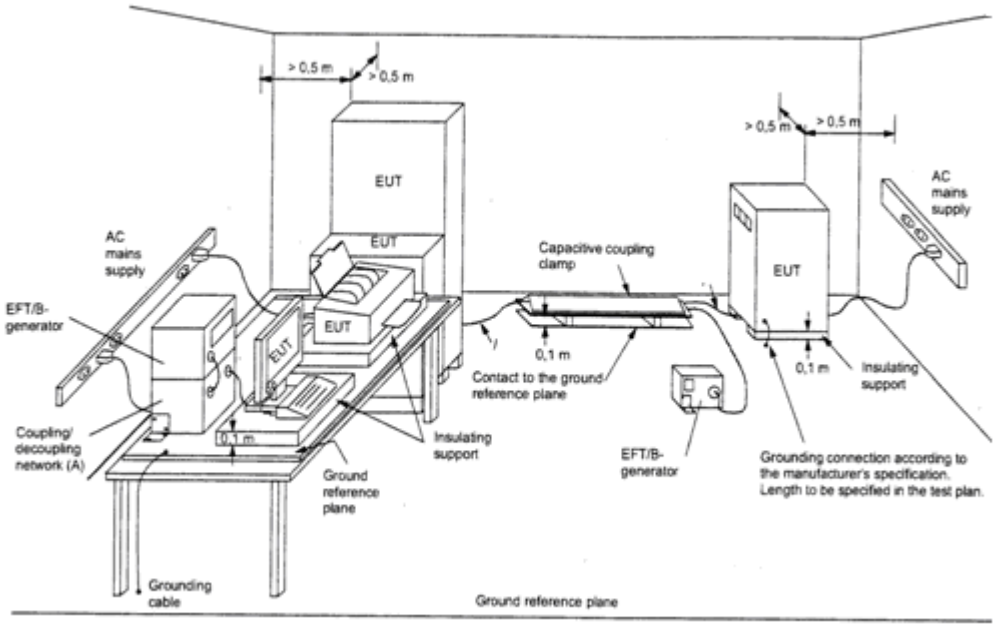


Table-top Equipment

- 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 lies 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.

9.3 Test Result

9.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45%RH	1024mbar

9.3.2 Observation of Power Supply Port

Coupling Selection	Test Specifications				Performance Required by EN61547	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 change of the luminous intensity was observed						

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

There is no I/O and communication cable greater than 3 meters long; therefore, no test has been required.

PASS

The test result shows that the EUT compliant with the test requirement specified in EN 61547.

10 Surge Immunity Test

10.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

10.2 Test Configuration and Procedure

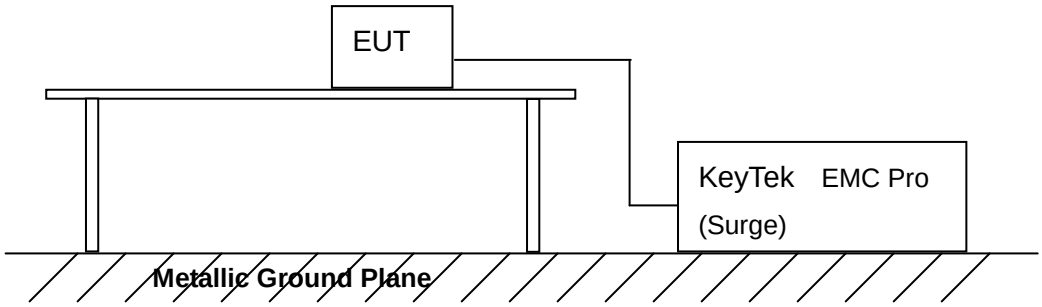


Table-top Equipment

- 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 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.

10.3 Test Result

10.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45％RH	1020mbar

10.3.2 Observation of Power Supply Port

Coupling Selection	Test Specifications			Performance Required by EN 61547	Observed Result	Verdict
	Voltage (kV)	Min. of Surge at Each Polarity	Repetition Rate (per min)			
L ►N	±0.5	5	1	C	A	Pass
Remark	No change of the luminous intensity was observed.					
Note	The Voltage changes occur at 0º crossover point(Phase Shifting:0º,180º,360º)					

10.3.3 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

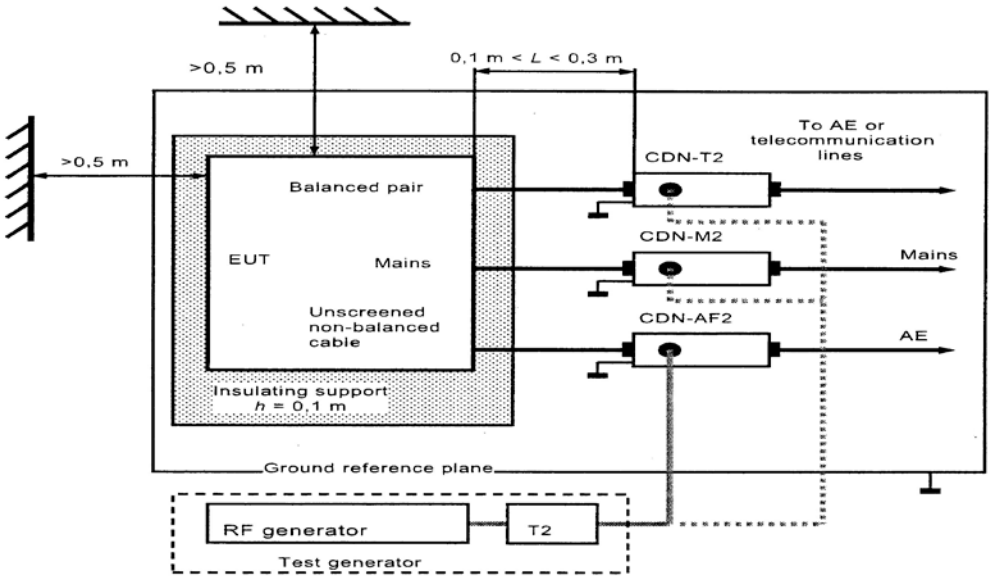
The test result shows that the EUT compliant with the test requirement specified in EN 61547.

11 Radio-frequency, Conducted Disturbances Immunity Test

11.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

11.2 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 Ω 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.

11.3 Test Result

11.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45%RH	1020mbar

11.3.2 Observation of Test

Type of Modulation	Test Specifications			Performance Required by EN 61547	Observed Result	Verdict
	Voltage Level (emf) U_0	Frequency Range	Modulation			
Amplitude Modulation	3V/ 130dBμV	0.15 to 80MHz	80%AM, 1kHz, sine wave	A	A	Pass
Remark	No change of the luminous intensity was observed.					

PASS

The test result shows that the EUT compliant with the test requirement specified in EN 61547.

12 Power Frequency Magnetic Field Immunity Test

12.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

12.2 Test Configuration and Procedure

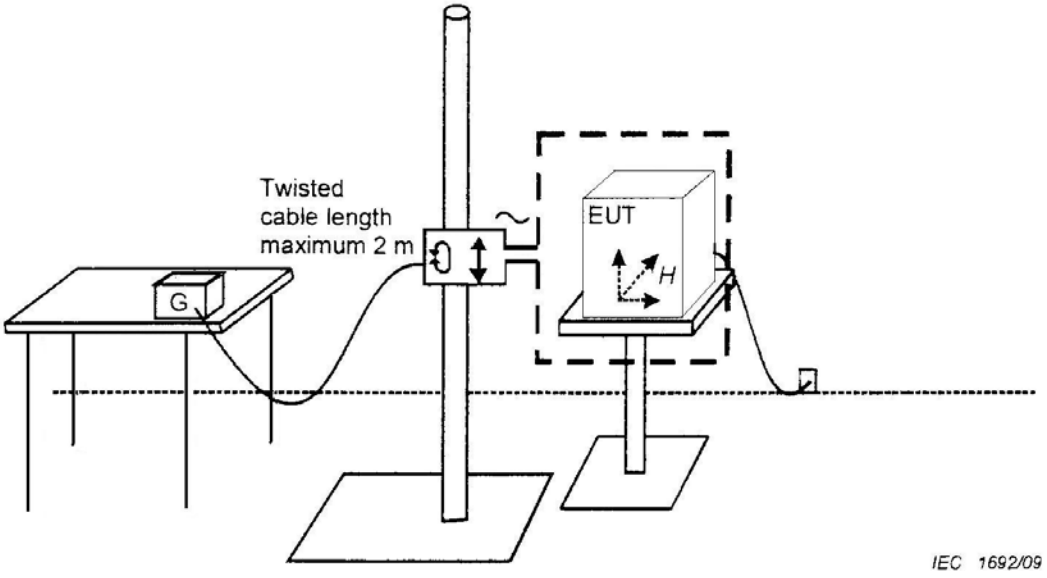


Table-top Equipment

- 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.

12.3 Test Result

12.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
25℃	45%RH	1020mbar

12.3.2 Observation of Test

Level (A/m)	Frequency (Hz)	Performance Required by EN 61547	Observed Result	Verdict
3	50	A	A	Pass
Remark	No change of the luminous intensity was observed.			

PASS

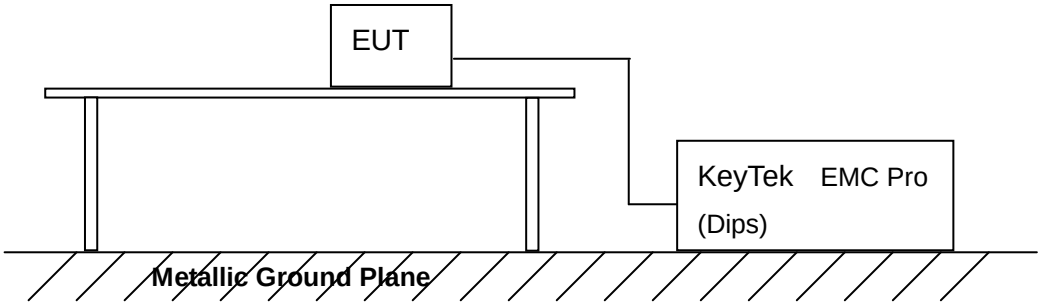
The test result shows that the EUT compliant with the test requirement specified in EN 61547.

13 Voltage Dips, Short Interruptions Immunity Test

13.1 Test Instruments

Refer to Sec. 1.3 Test Instruments.

13.2 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.

13.3 Test Result

13.3.1 Environment Condition

Temperature	Humidity	Atmospheric Pressure
20℃	45%RH	1020mbar

13.3.2 Observation of Power Supply Port

Voltage Dips

Voltage Reduction (%)	Test Specifications			Performance Required by EN 61547	Observed Result	Verdict (Pass/Fail)
	No. of Periods	No. of Reductions at Each Duration	Interval between Duration (sec.)			
30	10	3	≥ 10	C	A	Pass
Remark No change of the luminous intensity was observed.						

Voltage Interruption

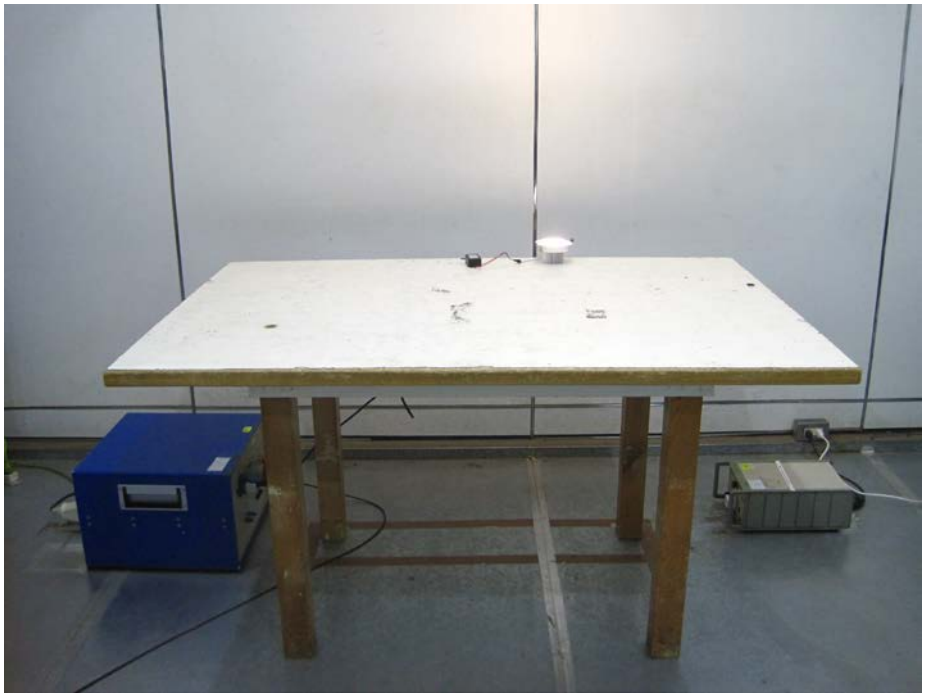
Voltage Reduction (%)	Test Specifications			Performance Required by EN 61547	Observed Result	Verdict (Pass/Fail)
	No. of Periods	No. of Reductions at Each Duration	Interval between Duration (sec.)			
100	0.5	3	≥ 10	C	B	Pass
Remark: When testing Interruption on all phase shifting the EUT temporarily lost its function. After testing, it was self-recoverable.						

PASS

The test result shows that the EUT compliant with the test requirement specified in EN 61547.

14 Photographs of Test

14.1 Disturbance Voltage Test



Front View

Rear View

14.2 Radiated Electromagnetic Disturbances Test (9kHz~30MHz)

Front View

Rear View

14.3 Radio Disturbance Test (30MHz~300MHz)

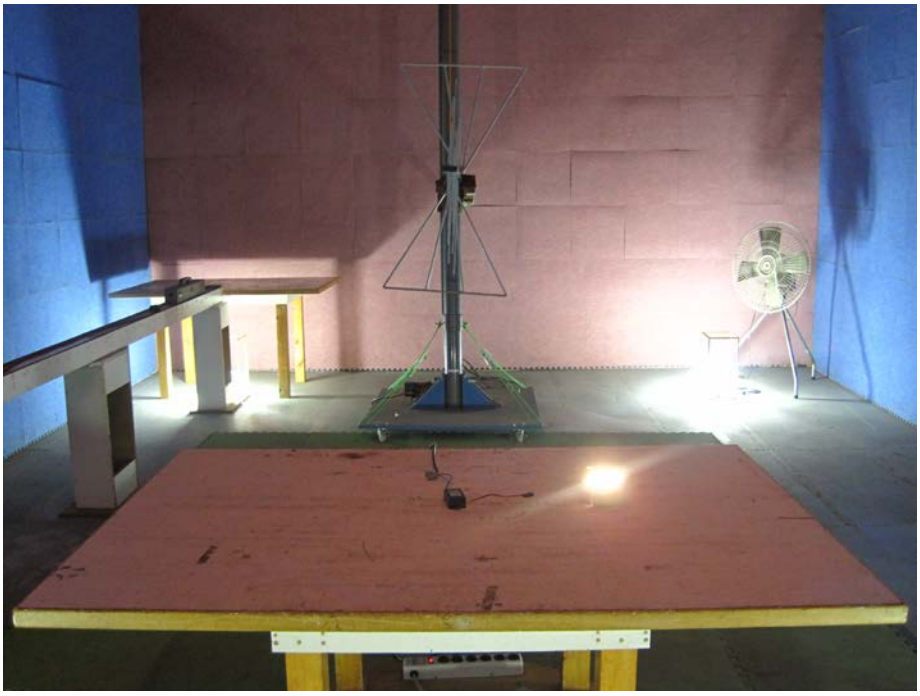
Front View

Rear View

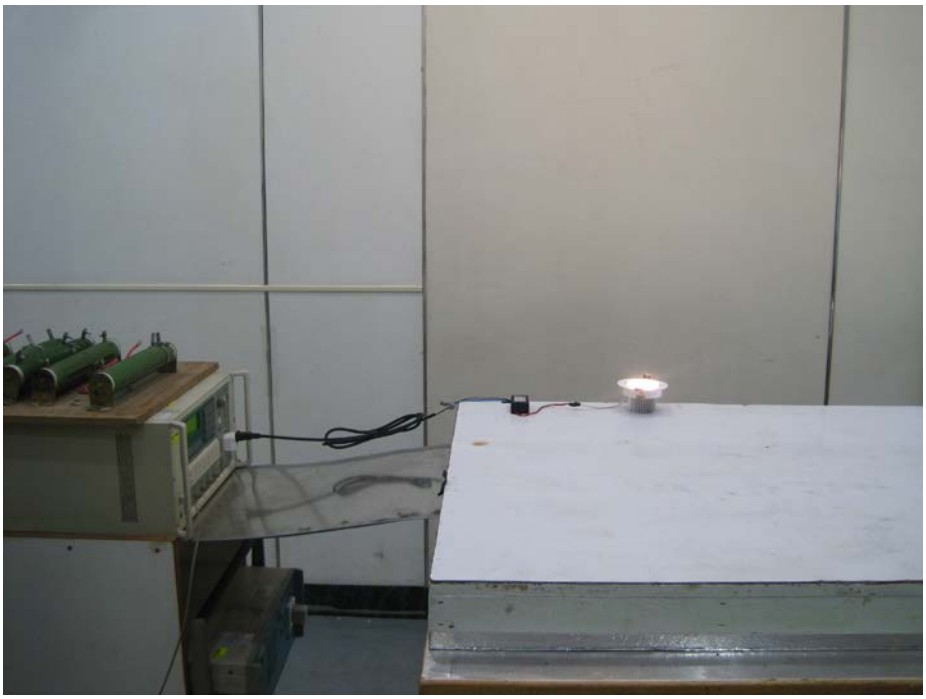
14.4 Harmonic Current & Voltage Fluctuations and Flicker Measurement

14.5 Electrostatic Discharge Immunity Test

14.6 Radio-frequency, Electromagnetic Field Immunity Test

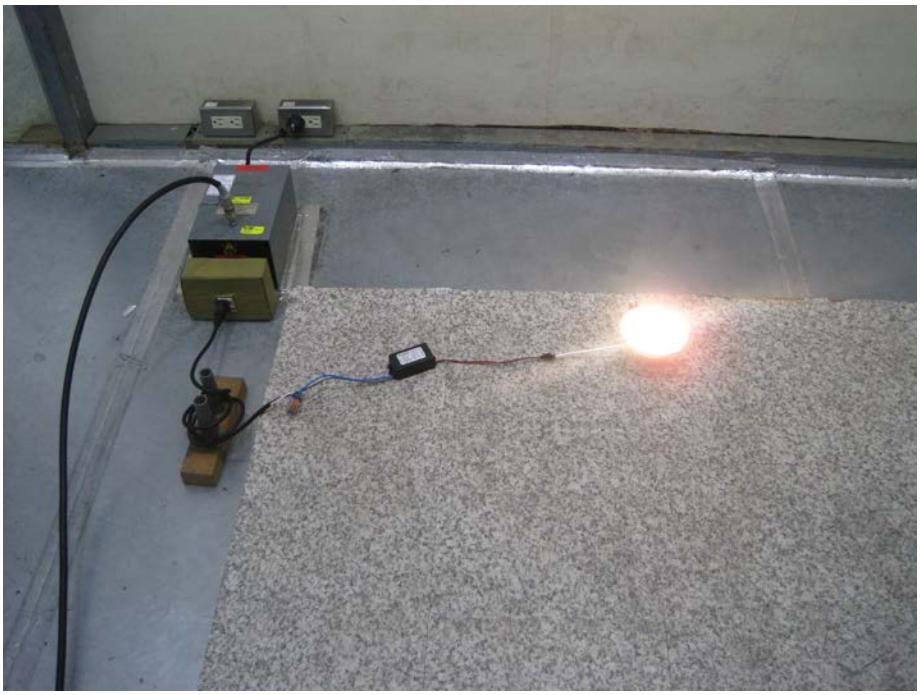


14.7 Electrical Fast Transient / Burst Immunity Test



14.8 Surge Immunity Test

14.9 Radio-frequency, Conducted Disturbances Immunity Test

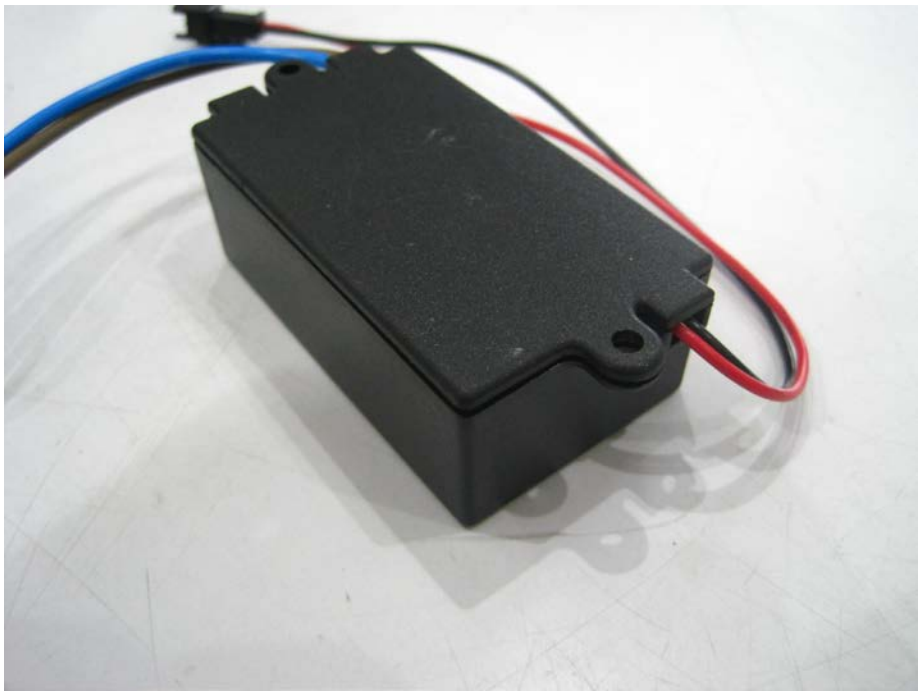


14.10 Power Frequency Magnetic Field Immunity Test

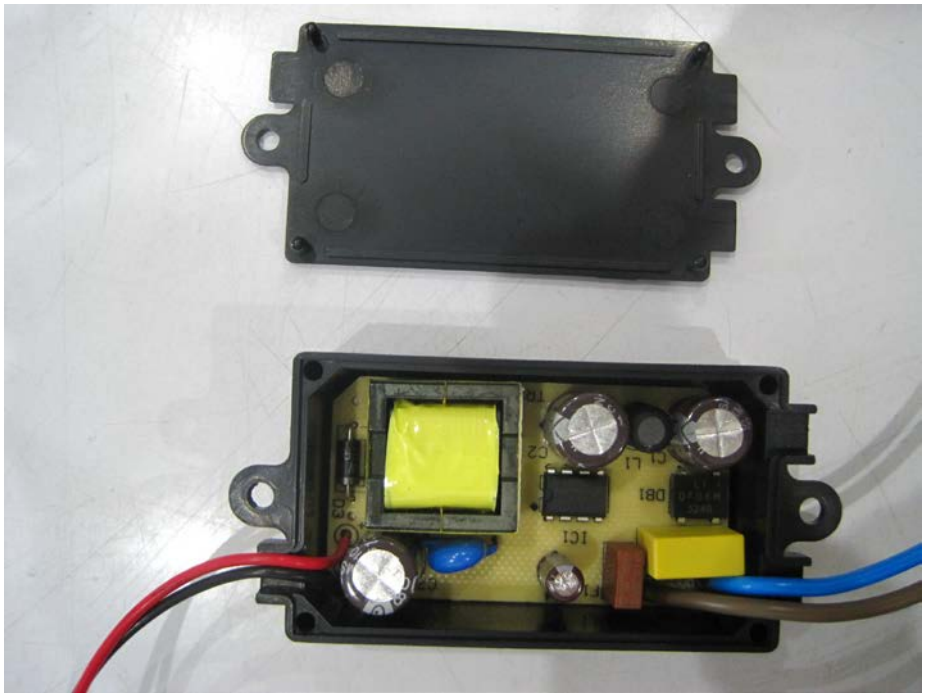
14.11 Voltage Dips, Short Interruptions Immunity Test

15 Photographs of EUT

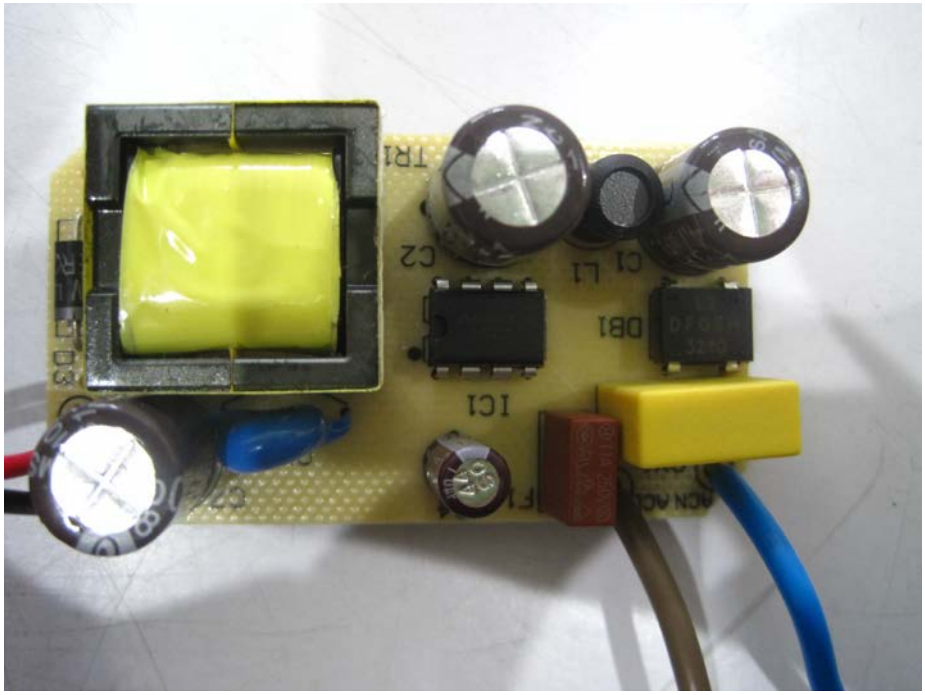
View of the EUT 1



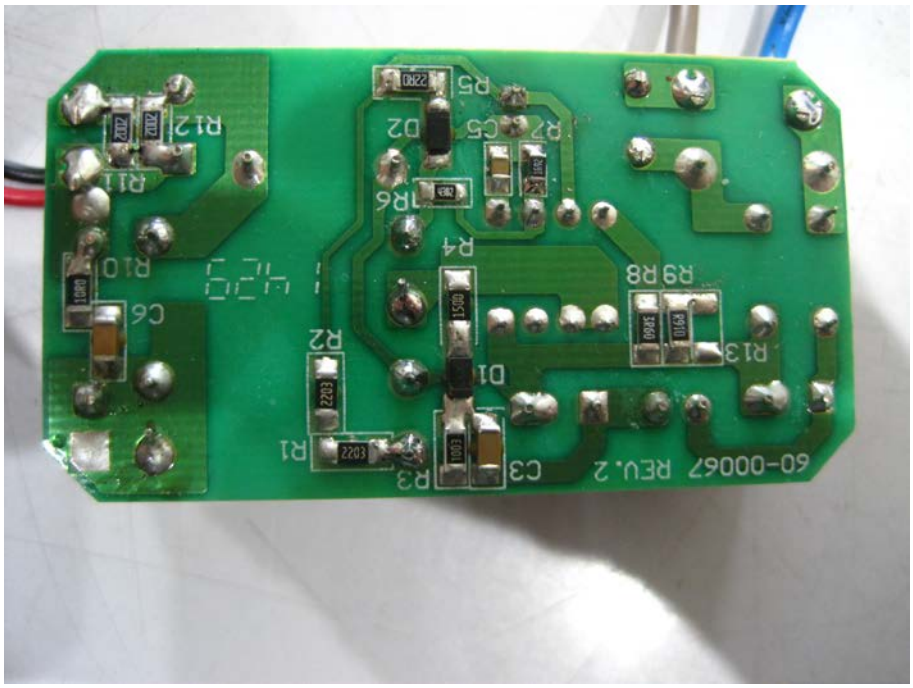
View of the EUT 2



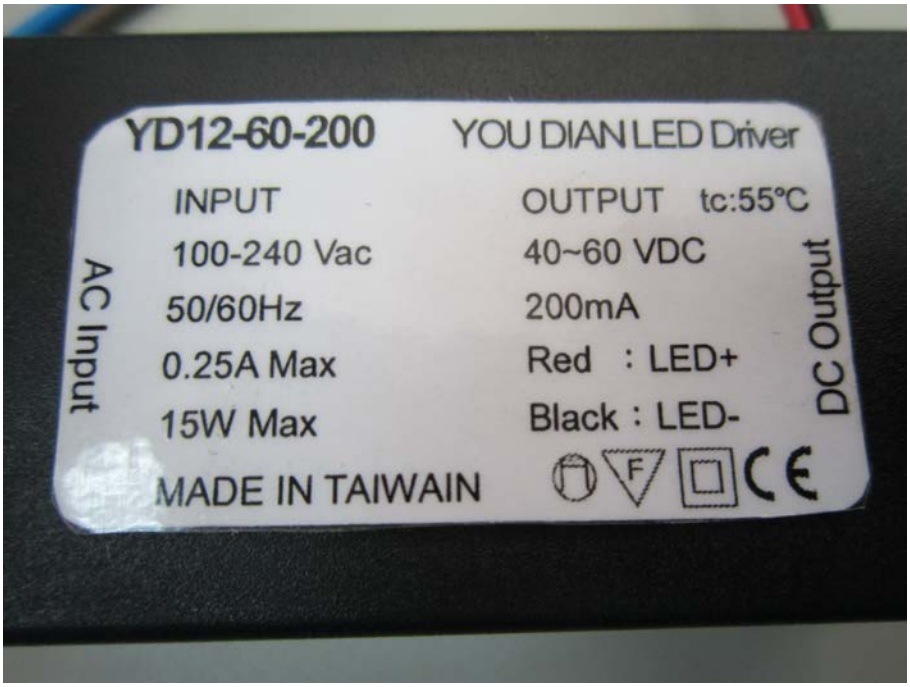
Inside View of the EUT



Front View of the PCB



Rear View of the PCB



View of the EUT's Label

16 Photographs of ESD Test Points

View of ESD Test Points