



EMC TEST REPORT

Report No.: SET2015-09052

Product: LED Fire Rated Downlight

Model No: 5RS015-1, 5RS015-2, 5RS015-3, 5RS015-4, 5RS015-5

Brand Name: /

Applicant: Suzhou Radiant Lighting Technology Co.,Ltd

Issued by: CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

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Applicant.....: Suzhou Radiant Lighting Technology Co.,Ltd

Applicant Address.....: Jiatai Road West, Shuanglong Industrial Park,Fenghuang Town, Zhangjiagang City, Jiangsu ,China.

Manufacturer.....: Suzhou Radiant Lighting Technology Co.,Ltd

Manufacturer Address.....: Jiatai Road West, Shuanglong Industrial Park,Fenghuang Town, Zhangjiagang City, Jiangsu ,China.

Test Standards.....: **EN55015:2013** Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
EN 61547:2009 Equipment for general lighting purposes - EMC immunity requirements
EN61000-3-2:2014 Electromagnetic compatibility (EMC) -- Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)
EN61000-3-3:2013 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems

Test Result.....: Pass

Tested by: *Ou Yang Jie*
Jul.07.2015

 Signature, Date

Reviewed by.....: *Zhang Peng*
Jul.07.2015

 Signature, Date

Approved by.....: *Wu Lian*
Jul.07.2015

 Signature, Date



Table of Contents

Test Report	2
1 General Information	5
1.1 Description of EUT	5
1.2 Objective	6
1.3 Environmental Conditions	6
1.4 Measurement Uncertainty	6
1.5 Test Standards and Results	7
1.6 List of Equipments Used	8
2 Emission Test	9
2.1 EUT Setup and Operating Conditions	9
2.2 Mains Terminal Disturbance Voltage Measurement	9
2.2.1 Limits of Mains Terminal Disturbance Voltage	9
2.2.2 Test Procedure	9
2.2.3 Test Setup	10
2.2.4 Test Result	10
2.3 Radiated Electromagnetic Disturbance Measurement	12
2.3.1 Limits of Radiated Electromagnetic Disturbance	12
2.3.2 Test Procedure	12
2.3.3 Test Setup	13
2.3.4 Test Results	13
2.4 Radiated Disturbance Measurement	15
2.4.1 Limits of Radiated Disturbance	15
2.4.2 Test Setup	15
2.4.3 Test Result	16
2.5 Harmonic Current Measurement	18
2.5.1 Limits of Harmonic Current	18
2.5.2 Test Procedure	18
2.5.3 Test Setup	19
2.5.4 Test Result	19
2.6 Voltage Fluctuation and Flick Measurement	21
2.6.1 Limits of Voltage Fluctuation and Flick	21
2.6.2 Test Procedure	21
2.6.3 Test Result	21
3 Immunity Test	22
3.1 EUT Setup and Operating Conditions	22



3.2 Performance Criteria	22
3.3 Electrostatic Discharge Immunity Test	22
3.3.1 Test Specification	22
3.3.2 Test Procedure	23
3.3.3 Test Setup	24
3.3.4 Test Result	25
3.4 Radiated, Radio Frequency Electromagnetic Field Immunity Test	28
3.4.1 Test Specification	28
3.4.2 Test Procedure	28
3.4.3 Test Setup	29
3.4.4 Test Result	29
3.5 Electrical Fast Transient/Burst Immunity Test	30
3.5.1 Test Specification	30
3.5.2 Test Procedure	30
3.5.3 Test Setup	30
3.5.4 Test Result	31
3.6 Surge Immunity Test	32
3.6.1 Test Specification	32
3.6.2 Test Procedure	32
3.6.3 Test Setup	33
3.6.4 Test Result	33
3.7 Immunity to Conducted Disturbances Induced by RF Fields	34
3.7.1 Test Specification	34
3.7.2 Test Procedure	34
3.7.3 Test Setup	35
3.7.4 Test Result	35
3.8 Power Frequency Magnetic Field Immunity Test	36
3.8.1 Test Specification	36
3.8.2 Test Procedure	36
3.8.3 Test Setup	36
3.8.4 Test Result	37
3.9 Voltage Dips and Short Interruptions Immunity Test	38
3.9.1 Test Specification	38
3.9.2 Test Procedure	38
3.9.3 Test Setup	38
3.9.4 Test Result	38
Appendix I: Photographs of the EUT	39



1 General Information

1.1 Description of EUT

Product: LED Fire Rated Downlight

Model No.: 5RS015-5

Brand Name: /

Electrical Rating: 200-240VAC, 50/60Hz

NOTE:

1. For more detailed features about the EUT, please refer to the manufacture's specification or the user's manual.

For the emission tests ,the details of test mode are as follows:
--

Pre-test modes are as follows:

Test Mode	Test Sample	Note
Mode 1	5RS015-1	Normal Operation
Mode 2	5RS015-2	Normal Operation
Mode 3	5RS015-3	Normal Operation
Mode 4	5RS015-4	Normal Operation
Mode 5	5RS015-5	Normal Operation

From the above preliminary survey, Mode 5 was the worst case of all emission test modes. It was selected as representative model for the final test and its data were recorded in this report.

Final Test mode and recorded.

Test Item	Test Mode	Note
ElectroMagnetic Interference Test	Mode 5	Normal Operation
ElectroMagnetic Susceptibility Test	Mode 5	Normal Operation

1.2 List of configuration

Model No	Fuse wire	Inductance	Transformer	Function
5RS015-1	1W 10R	3.3mH	EE1621	Non dimmable
5RS015-2	1W 10R	3.3mH	EE1621	Non dimmable
5RS015-3	1W 47R	5.1mH	EE1619	dimmable
5RS015-4	1W 47R	5.1mH	EE1622	dimmable
5RS015-5	1W 47R	5.1mH	EE1622	dimmable

1.3 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-25°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

1.4 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

- Uncertainty of Mains terminal disturbance voltage, $U_c = \pm 3.6\text{dB}$
- Uncertainty of Radiated disturbance(30MHz – 300MHz), $U_c = \pm 4.7\text{dB}$
- Uncertainty of Radiated Emission(9KHz – 30MHz), $U_c = \pm 3.4\text{dB}$



1.5 Test Standards and Results

The EUT has been tested according to the following specifications:

EMISSION		
Standard	Test Type	Result
EN55015:2013	Mains terminal disturbance voltage	PASS
	Radiated Electromagnetic Disturbance Measurement(9kHz-30MHz)	PASS
	Radiated Electromagnetic Disturbance Measurement(30MHz-300MHz)	PASS
EN61000-3-2: 2014	Harmonic current emissions	PASS
EN61000-3-3: 2013	Voltage fluctuation & flicker	PASS
IMMUNITY (EN 61547:2009)		
Basic Standard	Test Type	Result
IEC 61000-4-2	Electrostatic discharge immunity	PASS
IEC 61000-4-3	Radiated, radio frequency electromagnetic field immunity	PASS
IEC 61000-4-4	Electrical fast transient/burst immunity	PASS
IEC 61000-4-5	Surge immunity	PASS
IEC 61000-4-6	Immunity to conducted disturbances induced by RF fields	PASS
IEC 61000-4-8	Power frequency magnetic field immunity	PASS
IEC 61000-4-11	Voltage dips and short interruptions immunity	PASS

NOTE: The latest versions of basic standards are applied.



1.6 List of Equipments Used

Description	Manufacturer	Model No.	Calibration Due Date	Serial No.
Test Receiver	Schwarzbeck	FCKL1528	Jun. 10. 2016	A0304230
Test Receiver	ROHDE&SCHWARZ	ESCI	Jun. 10. 2016	A0304260
LISN	ROHDE&SCHWARZ	ESH2-Z5	Jun. 10. 2016	A0304221
Loop Antenna	Schwarzbeck	HXYZ8170	Jun. 10. 2016	A0304232
Test Receiver	ROHDE&SCHWARZ	ESIB7	Jun. 10. 2016	A0501375
Broadband Ant.	CHASE	CBL6111A	Jun. 10. 2016	A9704202
Anechoic Chamber	Albatross	EMC 9*6*6 (m)	Mar. 09. 2016	A0412372
Antenna	Amplifier Research	AR AT1080	Jun. 10. 2016	A0304249
ESD Test System	EM TEST	ESD30C	Jul. 03. 2016	A0712513
EFT/Surge Test System	EM TEST	UCS500N7.7	Jun. 10. 2016	A130201094
	EM TEST	CNI503B9.3	Jun. 10. 2016	A130201095
Signal Generator	ROHDE&SCHWARZ	SML01	Jun. 10. 2016	A0502382
Power Amplifier	Amplifier Research	AR 150W1000	/	A0304247
Power Amplifier	Amplifier Research	AR 75A250A	Jun. 10. 2016	A0304255
Anechoic Chamber	Albatross	H-249	Mar. 07. 2016	A0304210
CDN	ROHDE&SCHWARZ	M3	Feb.20.2016	A0304306
Magnetic Field Tester	HAEFELY	MAG 100.1	Jun. 10. 2016	A0103109
Shield Room	Nanbo Tech	Site 3	Jun. 10. 2016	A9901141
Shield Room	Nanbo Tech	Site 2	Jun. 10. 2016	A0304210
Power Frequency Test System	CI	15003iX-400-CT S	Aug. 10. 2016	A0801521
Van der Hoofden Test-Head Protection Network	AFJ	VDH30	Jun. 10. 2016	A130301233

NOTE: Equipments listed above have been calibrated and are in the period of validation.

2 Emission Test

2.1 EUT Setup and Operating Conditions

The EUT was powered by 230V 50Hz AC Mains and operated at rating condition.

2.2 Mains Terminal Disturbance Voltage Measurement

2.2.1 Limits of Mains Terminal Disturbance Voltage

Frequency range	Limits (dB μ V)	
	Quasi-peak	Average
9kHz to 50kHz	110	--
50kHz to 150kHz	90 to 80	--
150kHz to 0.5MHz	66 to 56	56 to 46
0.5MHz to 5.0MHz	56	46
5.0MHz to 30MHz	60	50

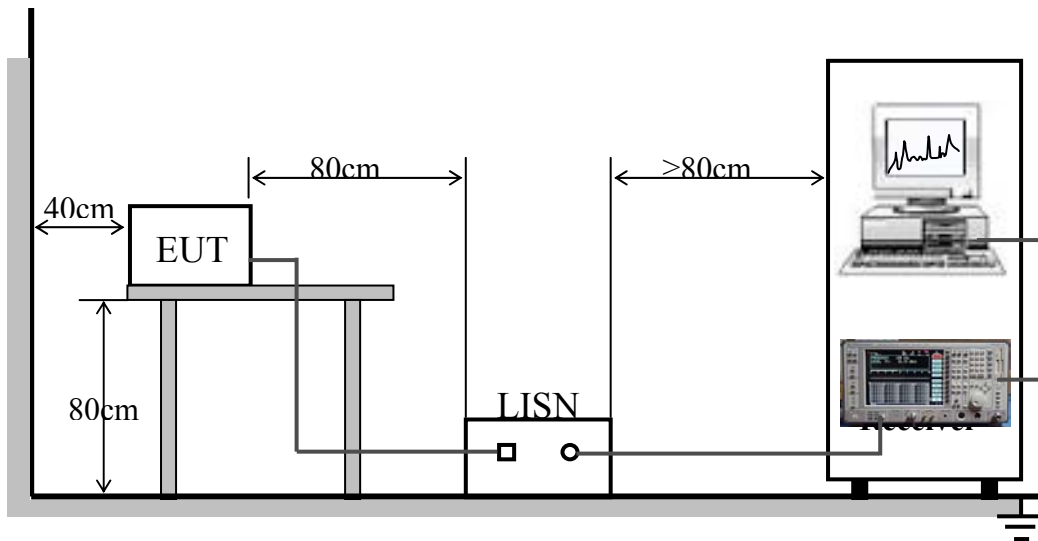
NOTE:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 50 kHz to 150 kHz and 150 kHz to 0.5MHz.

2.2.2 Test Procedure

- a. The EUT was placed 0.8 meters from the conducting wall of shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provide 50 Ω /50 μ H of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 9 kHz to 30MHz was searched. Emission levels over 10dB under the prescribed limits are not reported.

2.2.3 Test Setup



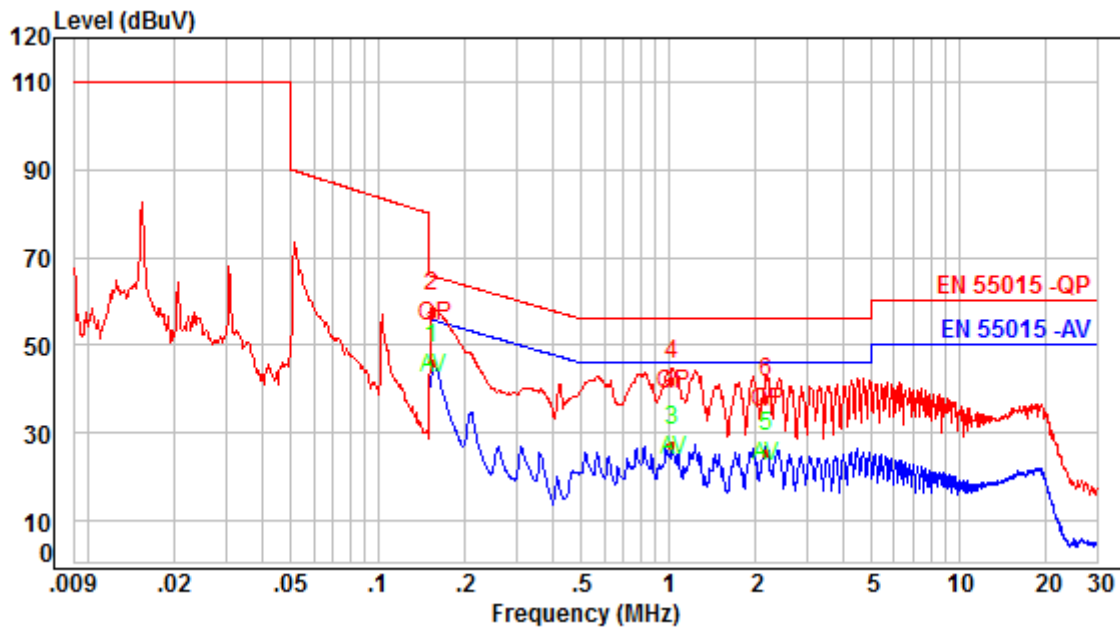
For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

2.2.4 Test Result

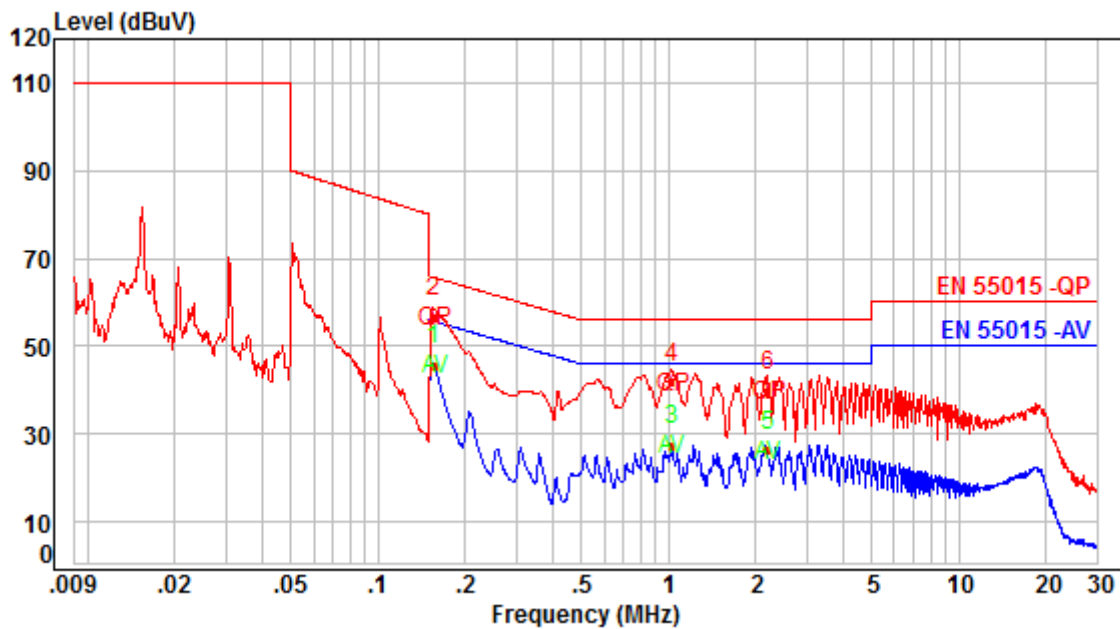
Line	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
L	0.1540	9.66	36.41	46.07	55.7	9.71	Average
L	0.1540	9.66	47.91	57.57	65.7	8.21	QP
L	1.0270	9.74	17.6	27.34	46	18.66	Average
L	1.0270	9.74	32.3	42.04	56	13.96	QP
L	2.1550	9.78	15.9	25.68	46	20.32	Average
L	2.1550	9.78	28.1	37.88	56	18.12	QP
N	0.1560	9.58	36.1	45.68	55.6	9.99	Average
N	0.1560	9.58	47.2	56.78	65.6	8.89	QP
N	1.0210	9.74	17.7	27.44	46	18.56	Average
N	1.0210	9.74	32.2	41.94	56	14.06	QP
N	2.1900	9.76	16.51	26.27	46	19.73	Average
N	2.1900	9.76	30.01	39.77	56	16.23	QP

1. QP and AV are abbreviations of the quasi-peak and average individually.
2. If the emission levels measured with QP detector are lower than AV limits, there is unnecessary to measure with AV detector.

1. Mains terminal disturbance voltage, L phase



2. Mains terminal disturbance voltage, N phase



2.3 Radiated Electromagnetic Disturbance Measurement

2.3.1 Limits of Radiated Electromagnetic Disturbance

Frequency range (MHz)	QP Limits(dB μ V), for loop antenna with a diameter of 2m
0.009 to 0.07	88
0.07 to 0.15	88 to 58
0.15 to 3.0	58 to 22
3.0 to 30	22

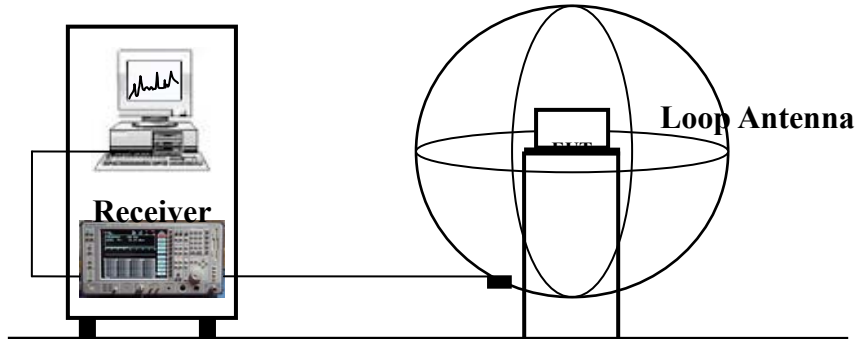
Notes:

- (1) The lower limit shall apply at the transition frequency.
- (2) The limit decreases linearly with the logarithm of the frequency in the range 70 kHz to 150 kHz and 0.15MHz to 3MHz.

2.3.2 Test Procedure

- a. The magnetic component of radiated electromagnetic disturbance is measured by means of a loop antenna.
- b. The induced current in the loop antenna is measured by means of a current probe (1V/A) and the CISPR measuring receiver. By means of a coaxial switch, the three field directions are measured in sequence.
- c. The EUT was placed in the center of the loop antenna, on an insulated table.

2.3.3 Test Setup

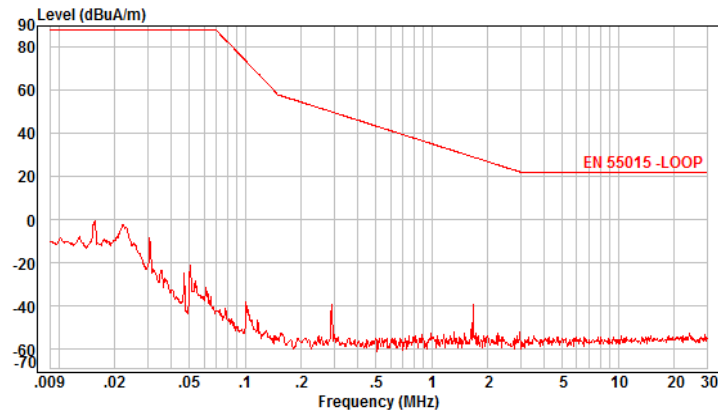


For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

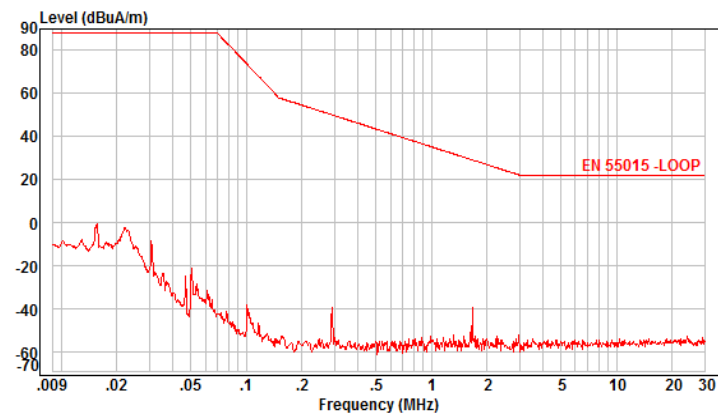
2.3.4 Test Results

No.	Antenna Direction	Frequency (MHz)	QP Limits (dB A)	Emission Level (dB)
1	X/Y/Z	0.009 to 0.07	88	<10
2	X/Y/Z	0.07 to 0.15	50.09	<10
3	X/Y/Z	0.15 to 3.0	88	<10
4	X/Y/Z	3.0 to 30	88	<10

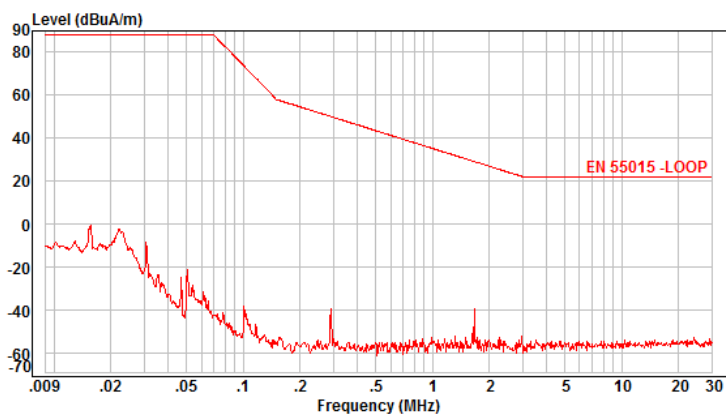
1. Radiated electromagnetic disturbance, loop antenna direction: X



2. Radiated electromagnetic disturbance, loop antenna direction: Y



3. Radiated electromagnetic disturbance, loop antenna direction: Z



2.4 Radiated Disturbance Measurement

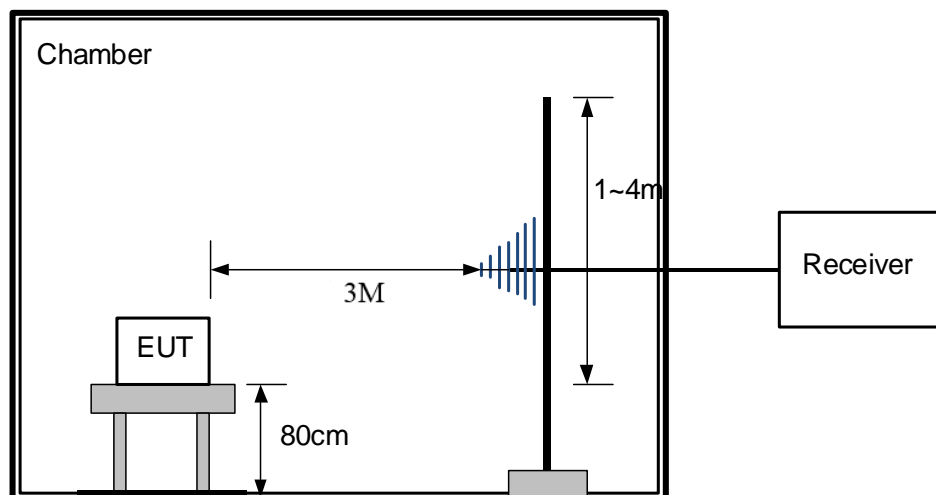
2.4.1 Limits of Radiated Disturbance

Frequency range (MHz)	Quasi peak limits(dB μ V/m), for Class B ITE, at 3m measurement distance
30 to 230	40
230 to 1000	47

Notes:

- (1) The lower limit shall apply at the transition frequency.

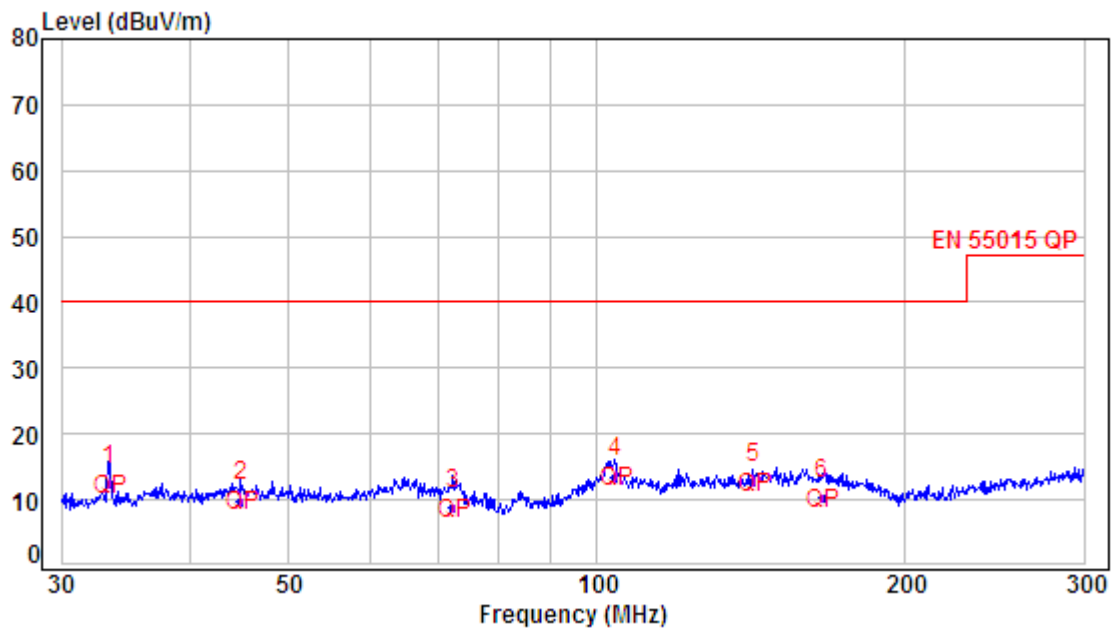
2.4.2 Test Setup



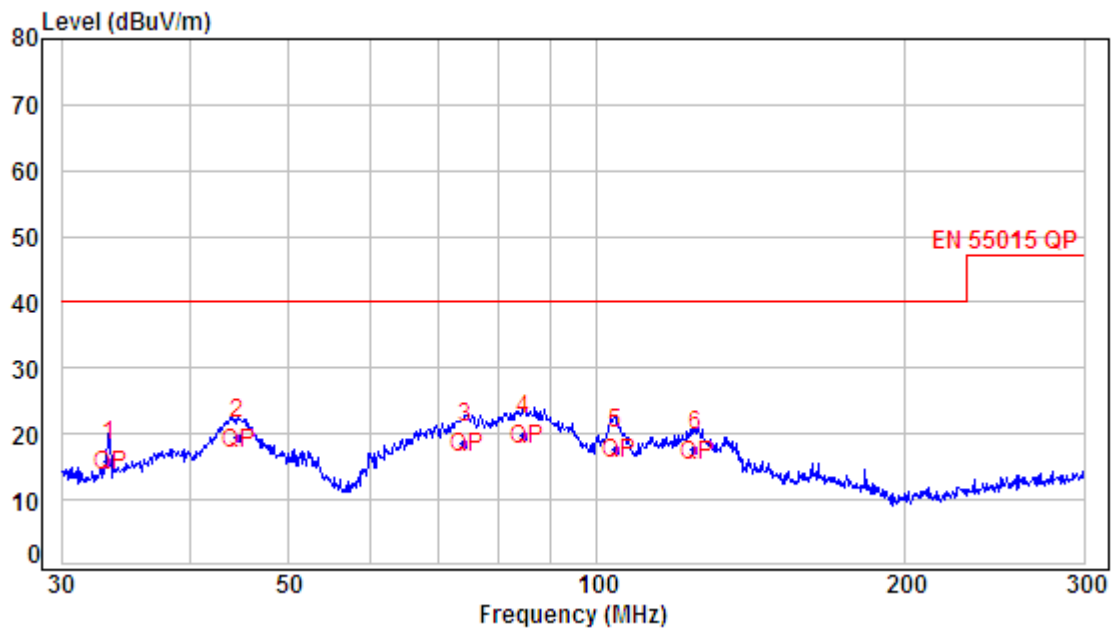


2.4.3 Test Result

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)
H	33.352	-13.83	26.2	12.37	40	27.63	QP	200	123
H	44.784	-13.15	22.9	9.75	40	30.25	QP	200	100
H	72.297	-15.09	23.9	8.81	40	31.19	QP	100	112
H	104.261	-14.2	27.61	13.41	40	26.59	QP	300	360
H	142.273	-10.9	23.6	12.7	40	27.3	QP	200	12
H	166.005	-10.57	20.89	10.32	40	29.68	QP	200	34
V	33.275	-13.83	29.79	15.96	40	24.04	QP	100	227
V	44.476	-13.15	32.6	19.45	40	20.55	QP	100	40
V	74.323	-15.53	34.2	18.67	40	21.33	QP	100	300
V	84.942	-16.63	36.4	19.77	40	20.23	QP	100	280
V	104.501	-14.17	31.9	17.73	40	22.27	QP	100	70
V	124.773	-12.24	29.81	17.57	40	22.43	QP	100	190



Radiation disturbances, antenna polarization: Horizontal (30MHz-300MHz)



Radiation disturbances, antenna polarization: Vertical (30MHz-300MHz)

2.5 Harmonic Current Measurement

2.5.1 Limits of Harmonic Current

Limits for Class C Equipment	
Harmonics Order n	Max. permissible harmonic current expressed as percentage of the input current at the fundamental frequency(A)
2	2
3	$30 \times \lambda^*$
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3

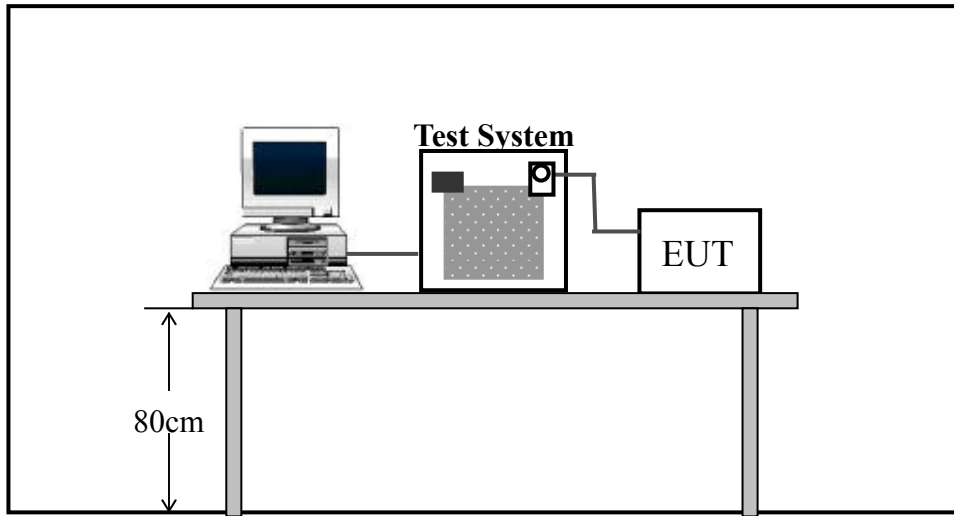
NOTE:

1. According to section 5 of EN61000-3-2: 2006, the EUT is Class C equipment.

2.5.2 Test Procedure

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- b. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the necessary for the EUT to be exercised.

2.5.3 Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

2.5.4 Test Result

Test category: Class-C per Ed. 3.2 (2009) (European limits) Test Margin: 100

Test date: 2015/6/19 Start time: 14:58:48 End time: 15:01:40

Test duration (min): 2.5 Data file name: H-000129.cts_data

Comment: Comments

Customer: Customer

Test Result: Pass Source qualification: Normal

THC(A): 0.008 I-THD(%): 21.1 POHC(A): 0.000 POHC Limit(A): 0.004

Highest parameter values during test:

V_RMS (Volts):	230.28	Frequency(Hz):	50.00
I_Peak (Amps):	0.090	I_RMS (Amps):	0.039
I_Fund (Amps):	0.038	Crest Factor:	2.380
Power (Watts):	8.3	Power Factor:	0.927

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	0.001	N/A	0.000	0.001	N/A	Pass
3	0.006	0.011	48.4	0.007	0.017	38.5	Pass
4	0.000						
5	0.003	0.004	N/A	0.000	0.006	N/A	Pass



6	0.000						
7	0.003	0.003	N/A	0.000	0.004	N/A	Pass
8	0.000						
9	0.002	0.002	N/A	0.000	0.003	N/A	Pass
10	0.000						
11	0.002	0.001	N/A	0.000	0.002	N/A	Pass
12	0.000						
13	0.001	0.001	N/A	0.000	0.002	N/A	Pass
14	0.000						
15	0.001	0.001	N/A	0.000	0.002	N/A	Pass
16	0.000						
17	0.001	0.001	N/A	0.000	0.002	N/A	Pass
18	0.000						
19	0.001	0.001	N/A	0.000	0.002	N/A	Pass
20	0.000						
21	0.001	0.001	N/A	0.000	0.002	N/A	Pass
22	0.000						
23	0.001	0.001	N/A	0.000	0.002	N/A	Pass
24	0.000						
25	0.000	0.001	N/A	0.000	0.002	N/A	Pass
26	0.000						
27	0.000	0.001	N/A	0.000	0.002	N/A	Pass
28	0.000						
29	0.000	0.001	N/A	0.000	0.002	N/A	Pass
30	0.000						
31	0.000	0.001	N/A	0.000	0.002	N/A	Pass
32	0.000						
33	0.000	0.001	N/A	0.000	0.002	N/A	Pass
34	0.000						
35	0.000	0.001	N/A	0.000	0.002	N/A	Pass
36	0.000						
37	0.000	0.001	N/A	0.000	0.002	N/A	Pass
38	0.000						
39	0.000	0.001	N/A	0.000	0.002	N/A	Pass
40	0.000						

Note: Dynamic limits were applied for this test. The highest harmonics values in the above table may not occur at the same window as the maximum harmonics/limit ratio.



2.6 Voltage Fluctuation and Flick Measurement

2.6.1 Limits of Voltage Fluctuation and Flick

Test Item	Limit	Note
P_{st}	1.0	P_{st} means Short-term flicker indicator
P_{lt}	0.65	P_{lt} means long-term flicker indicator
T_{dt}	500mS	T_{dt} means maximum time that d_t exceeds 3%
$d_{max}(\%)$	4%	d_{max} means maximum relative voltage change.
$D_c(\%)$	3.3%	d_c means relative steady-state voltage change.

2.6.2 Test Procedure

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal conditions
- During the flick measurement, the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

2.6.3 Test Result

Test Specification

Test Frequency:	50Hz	Test Voltage:	230VAC 50Hz
Waveform:	Sine	Test Time:	10 minutes(P_{st}); 2 hours (P_{lt})

Test Result

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.064	1.0	Pass
P_{lt}	0.028	0.65	Pass
$T_{dt(s)}$	0.00	500mS	Pass
$d_{max}(\%)$	0.00%	4%	Pass
$d_c(\%)$	0.00%	3.3%	Pass

3 Immunity Test

3.1 EUT Setup and Operating Conditions

Same as 2.1

3.2 Performance Criteria

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.
Criterion 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 minute. 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.
Criterion 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 minutes, all functions shall return to normal if necessary be 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 switch off. After half an hour it is switched on again. The lighting equipment shall start and operate as intended.

3.3 Electrostatic Discharge Immunity Test

3.3.1 Test Specification

Basic Standard:	IEC 61000-4-2
Discharge Impedance	330Ω / 150 pF
Discharge Voltage:	Air Discharge: 8 kV Contact Discharge: 4 kV
Polarity:	Positive / Negative
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single discharge
Discharge Period:	1-second minimum
Criterion:	B

3.3.2 Test Procedure

The discharges shall be applied in two ways:

- a. Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three contact test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

- b. Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled selected test point for each such area.

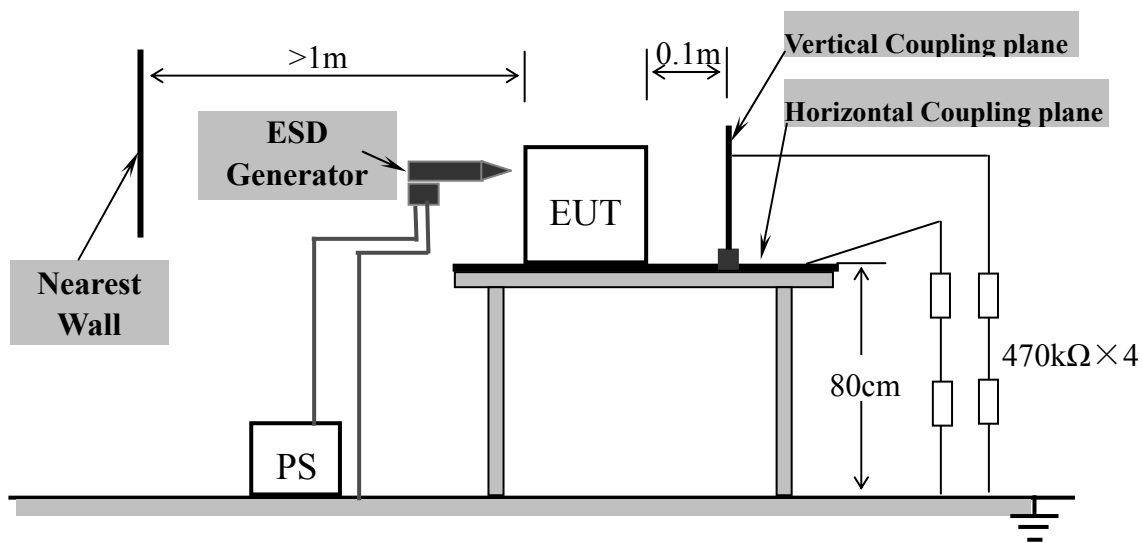
The basic test procedure was in accordance with IEC 61000-4-2:

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were completed.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned

vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m×0.5m) was placed vertically to and 0.1 meters from the EUT.

3.3.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.



3.3.4 Test Result

EUT	LED Fire Rated Downlight	Model	5RS015-5
Test Site	shield room 3	Test Mode	Mode 1
CPU	/	Software	/
Start of Test	2015.06.19	Environmental Conditions	25°C, 57% RH
Uncertainties	±0.2%	Tested by	Odin

Air Discharge (10 Discharges @ Per Test Point)

Test Location	Test Level (kV) & Test Result criterion										Performance criterion	Result	Observation
	+2	-2	+4	-4	+8	-8	+12	-12	+15	-15			
1	A	A	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1

Contact Discharge (25 Discharges @ Per Test Point)

Test Location	Test Level (kV) & Test Result criterion								Performance criterion	Result	Observation
	+2	-2	+4	-4	+6	-6	+8	-8			
2	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
3	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
4	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
5	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
6	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
7	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
8	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
9	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
10	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
11	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
12	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1



**Horizontal Coupling (25 Discharges @ Per Test Point)**

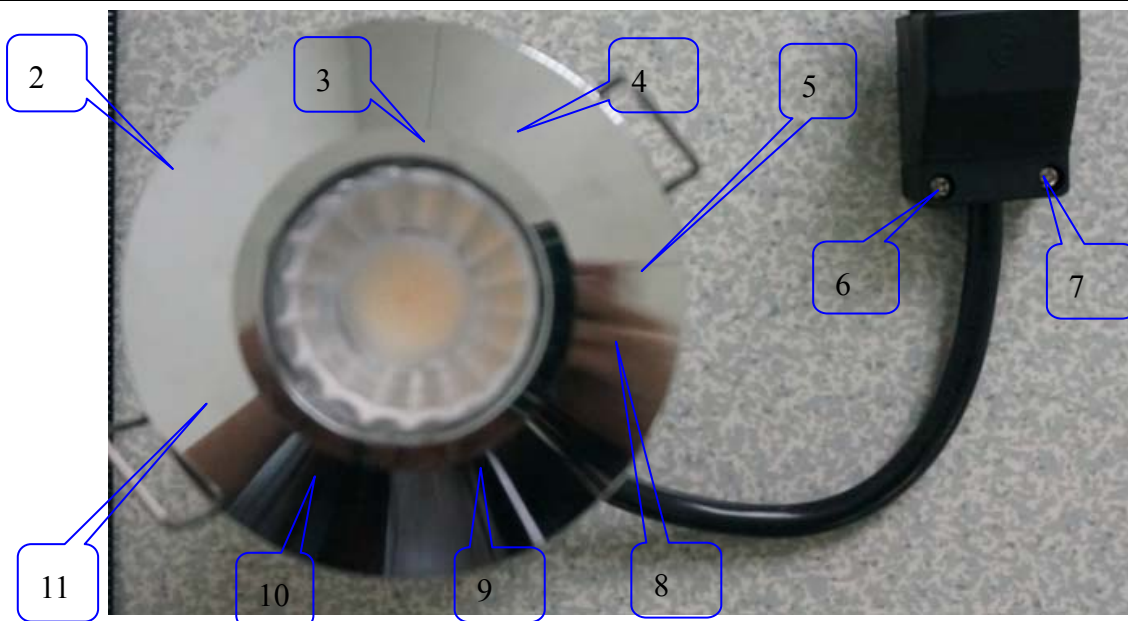
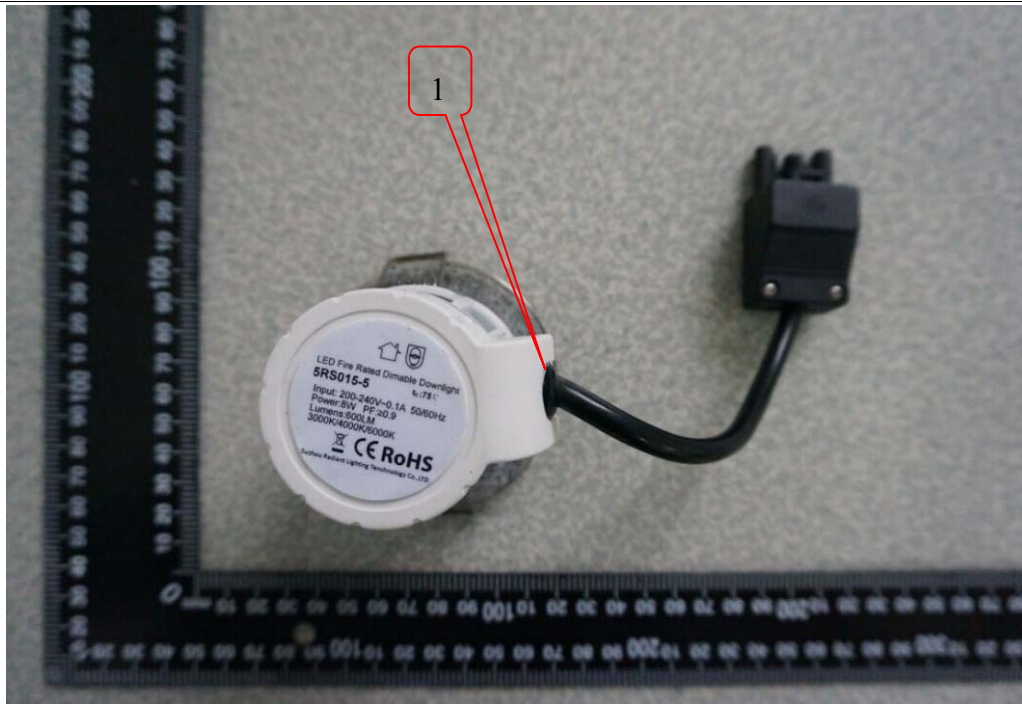
Test Location	Test Level (kV) & Test Result criterion								Performance criterion	Result	Observation
	+2	-2	+4	-4	+6	-6	+8	-8			
Front	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
Rear	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
Left	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
Right	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1

Vertical Coupling (25 Discharges @ Per Test Point)

Test Location	Test Level (kV) & Test Result criterion								Performance criterion	Result	Observation
	+2	-2	+4	-4	+6	-6	+8	-8			
Front	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
Rear	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
Left	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1
Right	A	A	A	A	N/A	N/A	N/A	N/A	B	Pass	Note1

NOTE:

1. The EUT continued to operate as intended. No degradation of performance was observed.
2.  For Air Discharge
3.  For Contact Discharge

Test Location Photos**NOTE:**

- (1). The EUT continued to operate as intended. No degradation of performance was observed.
- (2). The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.

3.4 Radiated, Radio Frequency Electromagnetic Field Immunity Test

3.4.1 Test Specification

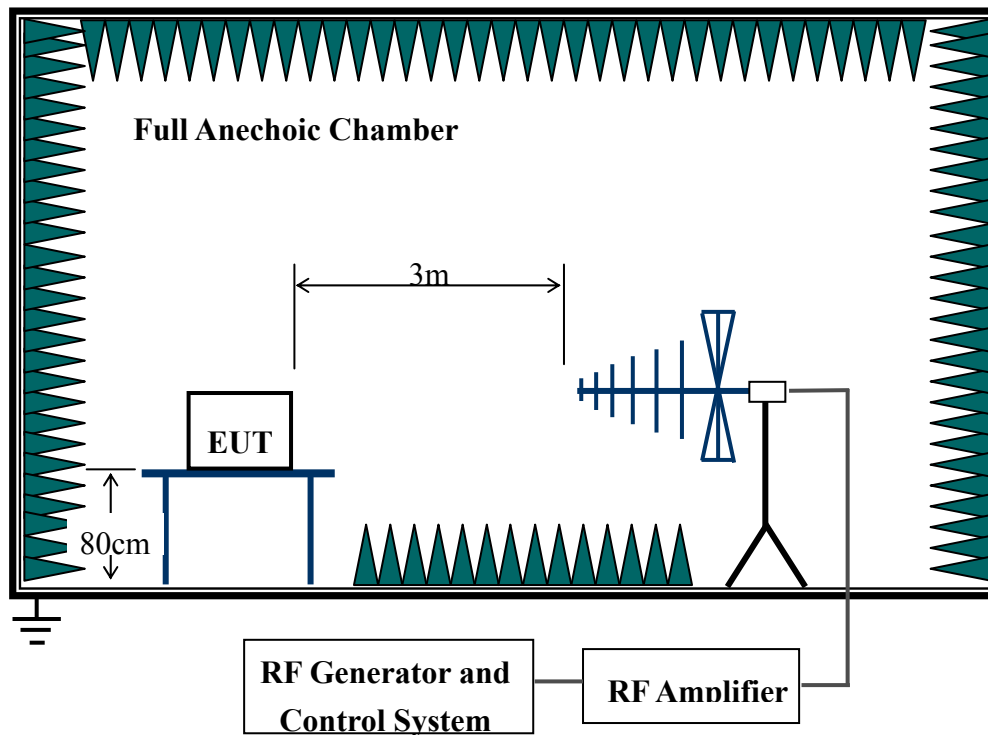
Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz – 1000MHz
Field Strength:	3V/m
Modulation:	1kHz sine wave, 80%, AM modulation
Frequency Step:	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance:	3m
Antenna Height:	1.5m
Dwell Time:	3 seconds
Criterion:	A

3.4.2 Test Procedure

The test procedure was in accordance with IEC 61000-4-3.

- a. The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b. The frequency range is swept from 80 MHz to 1000MHz with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The field strength level was 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

3.4.3 Test Setup



3.4.4 Test Result

Frequency	Polarity	Azimuth	Field Strength (V/m)	Observation	Performance Criterion
80-1000 MHz	V&H	0	3	Note(1)	A
80-1000 MHz	V&H	90	3	Note(1)	A
80-1000 MHz	V&H	180	3	Note(1)	A
80-1000 MHz	V&H	270	3	Note(1)	A

NOTE:

- (1). The EUT continued to operate as intended. No degradation of performance was observed.
- (2). The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.

3.5 Electrical Fast Transient/Burst Immunity Test

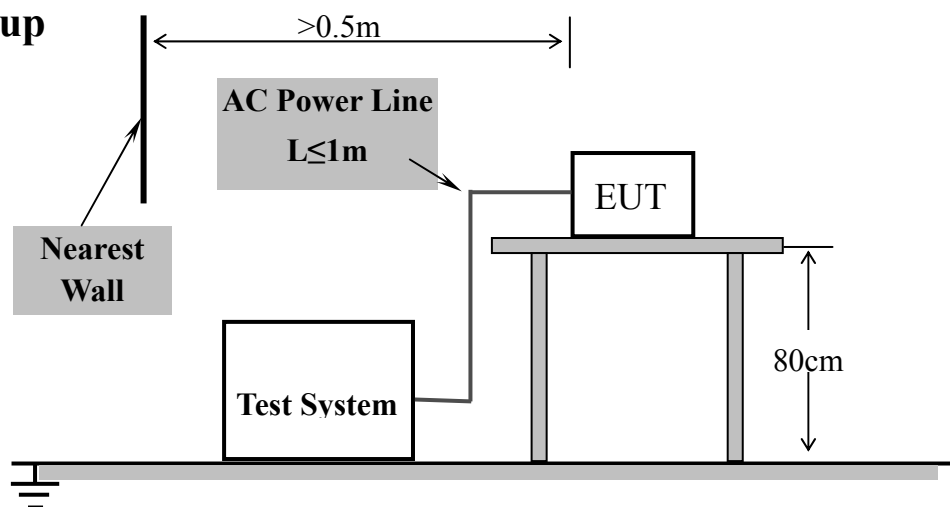
3.5.1 Test Specification

Basic Standard:	IEC 61000-4-4
Test Voltage:	a.c. power ports: 1 kV
Polarity:	Positive/Negative
Impulse Frequency:	5kHz
Impulse wave shape:	5/50ns
Burst Duration:	15ms
Burst Period:	300ms
Test Duration:	Not less than 2 min.
Criterion:	B

3.5.2 Test Procedure

- The EUT was tested with 1000 volt discharges to the AC power input leads.
- Both positive and negative polarity discharges were applied.
- The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

3.5.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.



3.5.4 Test Result

Test Point	Polarity	Test Level (kV)	Observation	Performance Criterion
a.c. power port	+/-	0.5	Note (1)	B

NOTE:

- (1). The EUT continued to operate as intended. No degradation of performance was observed.
- (2). The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.

3.6 Surge Immunity Test

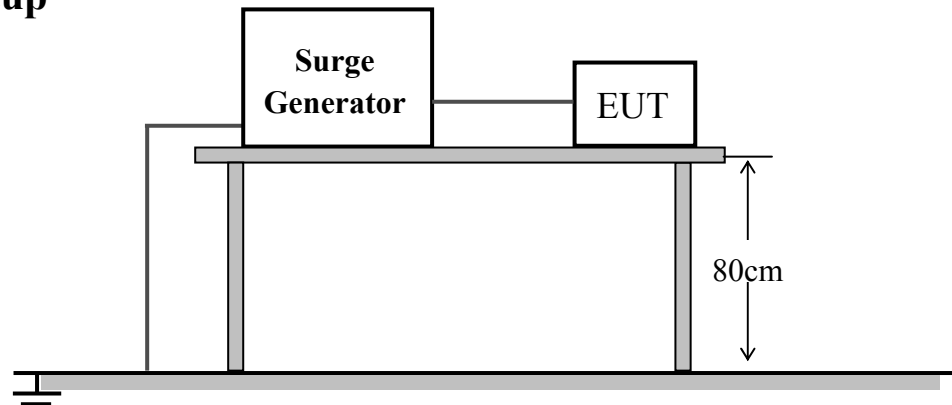
3.6.1 Test Specification

Basic Standard:	IEC 61000-4-5
Waveform:	Voltage 1.2/50 μ s
Test Voltage:	Power port, line to line 0.5 kV
Polarity:	Positive/Negative
Repetition Rate:	60sec
Times:	5 times/each condition.
Criterion:	C

3.6.2 Test Procedure

- a. The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m \times 1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer).
- b. 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).
- c. 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.

3.6.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

3.6.4 Test Result

Coupling Line	Polarity	Voltage (kV)	Observation	Performance Criterion
a.c. power, line to line	+/-	0.5	Note (2)	B

NOTE:

- (1). The EUT continued to operate as intended. No degradation of performance was observed.
- (2). The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.



3.7 Immunity to Conducted Disturbances Induced by RF Fields

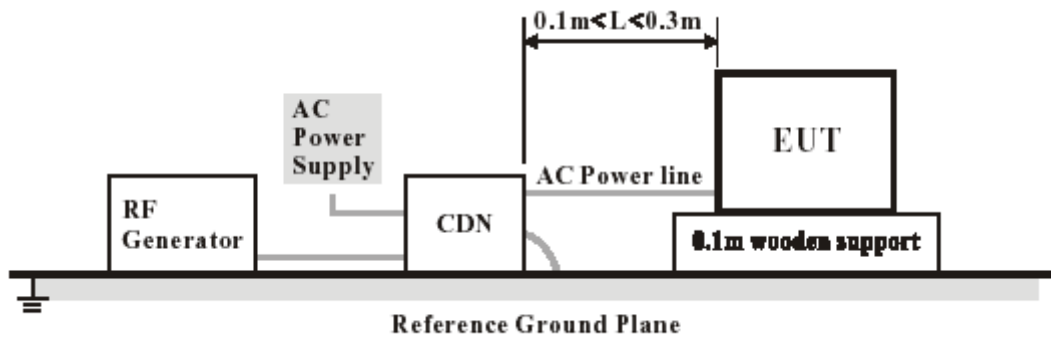
3.7.1 Test Specification

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz – 80 MHz
Field Strength:	3V
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1% of fundamental
Coupled Cable:	a.c. power ports
Criterion:	A

3.7.2 Test Procedure

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.
- c. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate shall not exceed 1.5×10^{-3} decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.
- d. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.
- e. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

3.7.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.

3.7.4 Test Result

Test Point	Frequency	Field Strength (Vrms)	Observation	Performance criterion
a.c. power port	0.15 – 80 MHz	3	Note(1)	A

NOTE:

- (1). The EUT continued to operate as intended. No degradation of performance was observed.
- (2). The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.

3.8 Power Frequency Magnetic Field Immunity Test

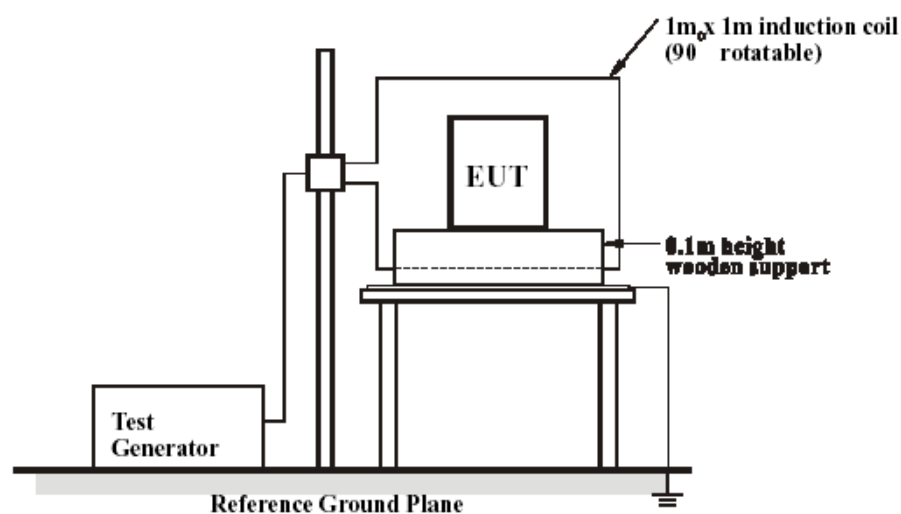
3.8.1 Test Specification

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	3A/m
Observation Time:	2 minute
Inductance Coil:	Rectangular type, 1m×1m
Criterion:	A

3.8.2 Test Procedure

- The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m thick insulating support.
- The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

3.8.3 Test Setup



For the actual test configuration, please refer to Appendix II: Photographs of the Test Configuration.



3.8.4 Test Result

Direction	Field Strength(A/m)	Observation	Comply with Criterion
X	3	Note(1)	A
Y	3	Note(1)	A
Z	3	Note(1)	A

NOTE:

- (1). The EUT continued to operate as intended. No degradation of performance was observed.
- (2). The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.

3.9 Voltage Dips and Short Interruptions Immunity Test

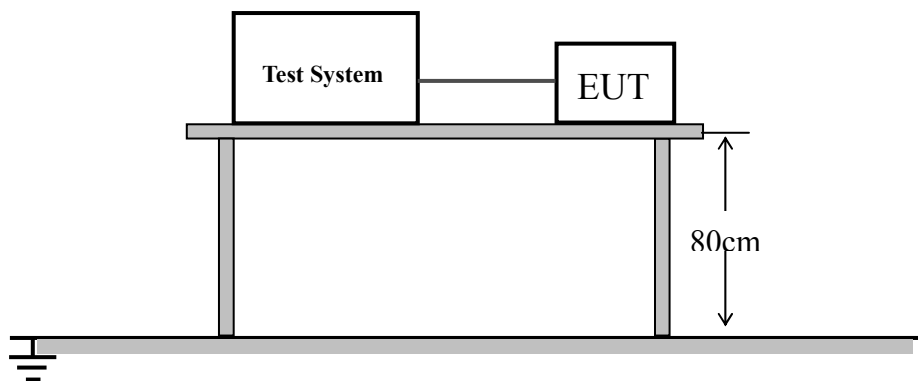
3.9.1 Test Specification

Basic Standard:	IEC 61000-4-11
Voltage Dips:	30% reduction, 10 periods Criterion: B
Voltage interruptions	100% reduction, 0.5 periods Criterion: B

3.9.2 Test Procedure

- The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.
- The EUT was tested for (I) 30% voltage dip of supplied voltage with duration of 200ms, (II) 100% voltage dip of supplied voltage and duration 10ms. Both of the dip tests were carried out for a sequence of three voltage dips with intervals of 10 seconds.
- Voltage reductions occur at 0 degree crossover point of the voltage waveform. The performance of the EUT was checked after the voltage dip or interruption.

3.9.3 Test Setup



3.9.4 Test Result

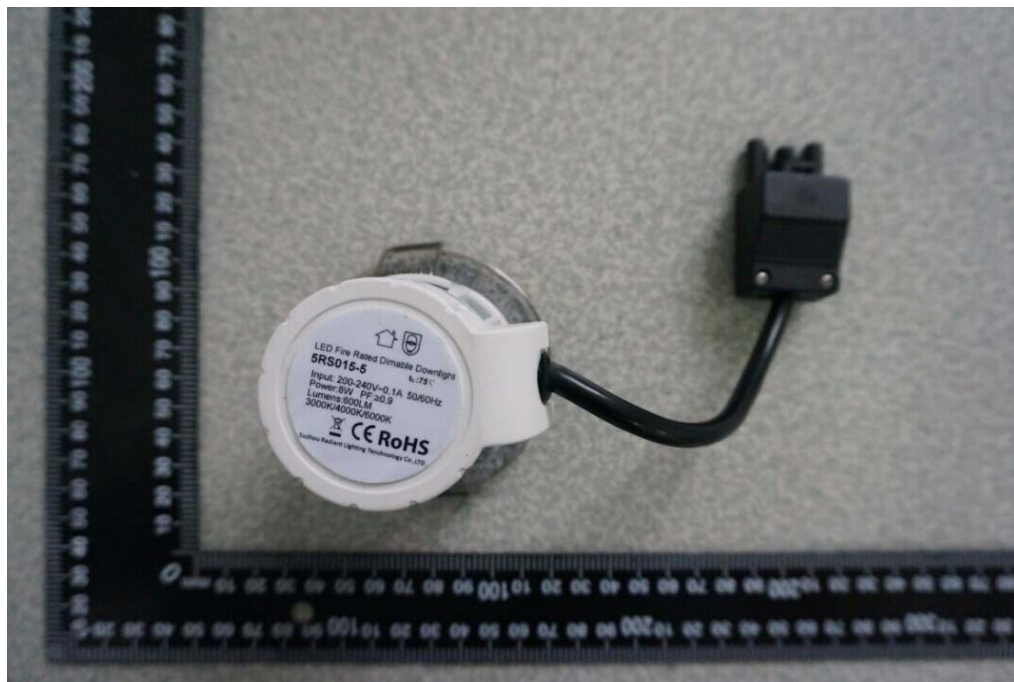
Test Mode	Voltage Reduction	Duration (Period)	Observation	Comply with Criterion
Voltage dips	30%	10	Note (2)	B
Voltage interruptions	100%	0.5	Note (2)	B

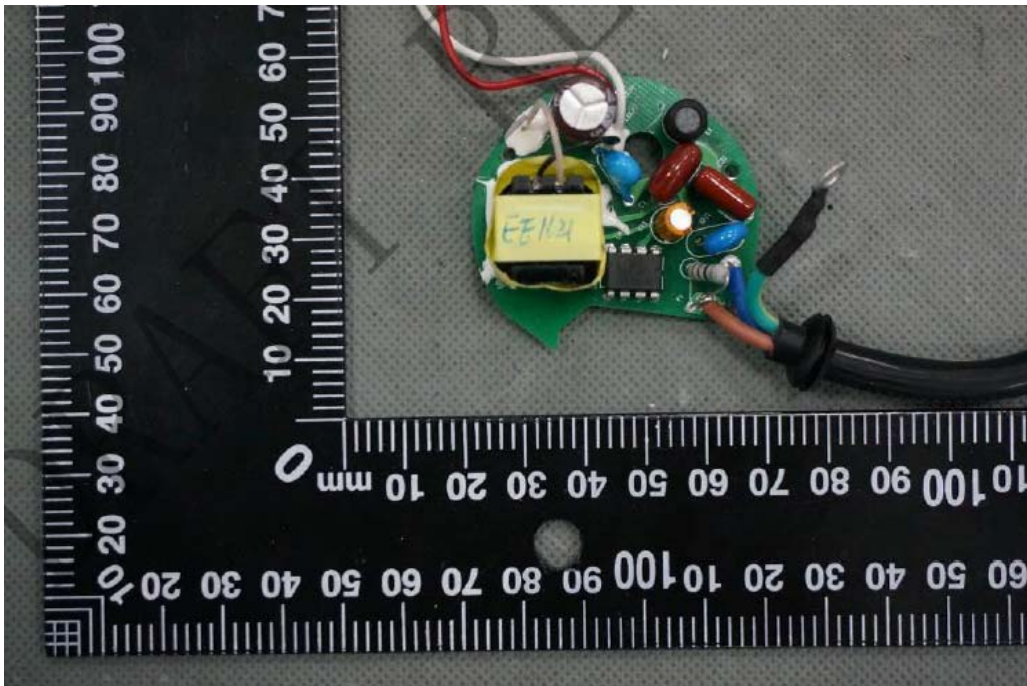
Note:

- The EUT continued to operate as intended. No degradation of performance was observed.
- The luminous intensity decreased and flickered during the test. After the test the luminous intensity self restored within 1 minute, no other degradation of performance or loss of function was observed.

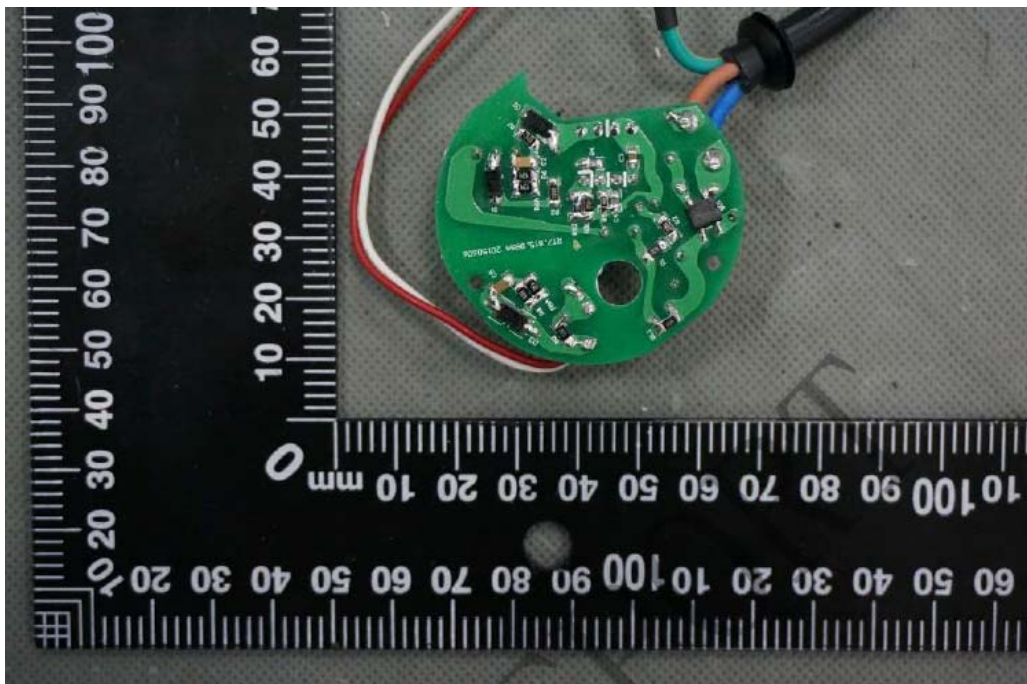
Appendix I: Photographs of the EUT

1. Appearance

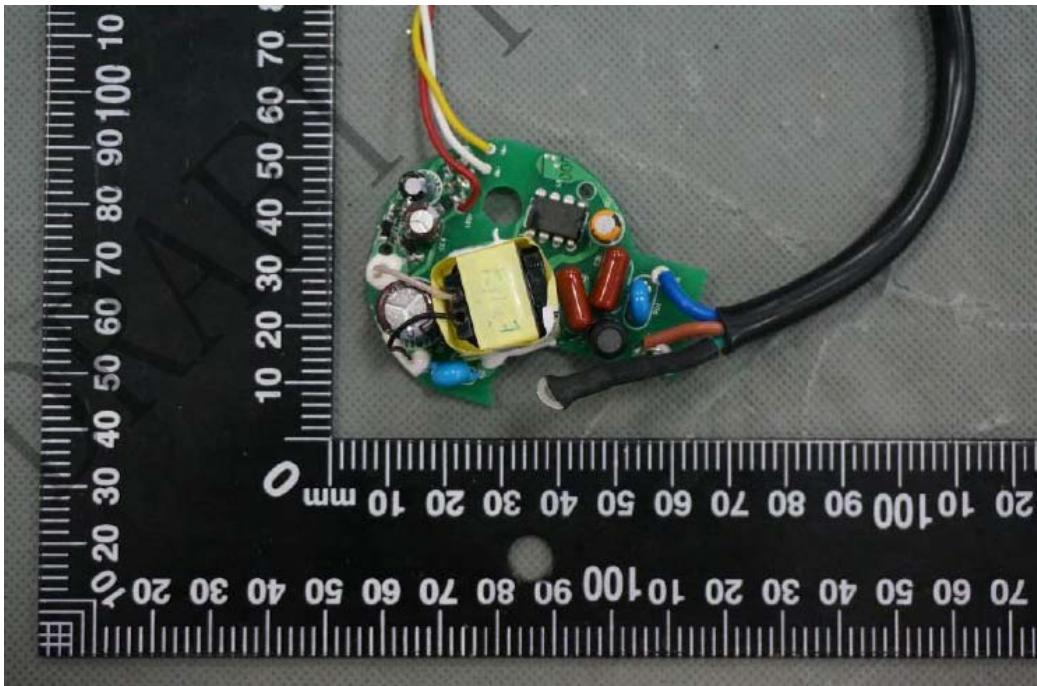




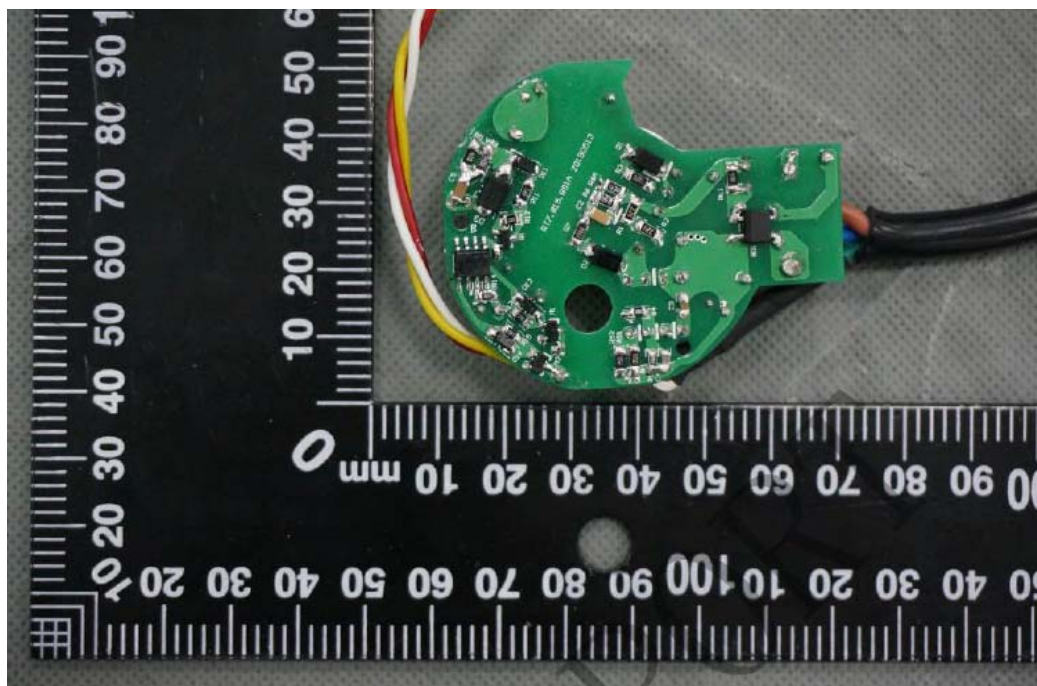
RT7.815.B99A 20150606



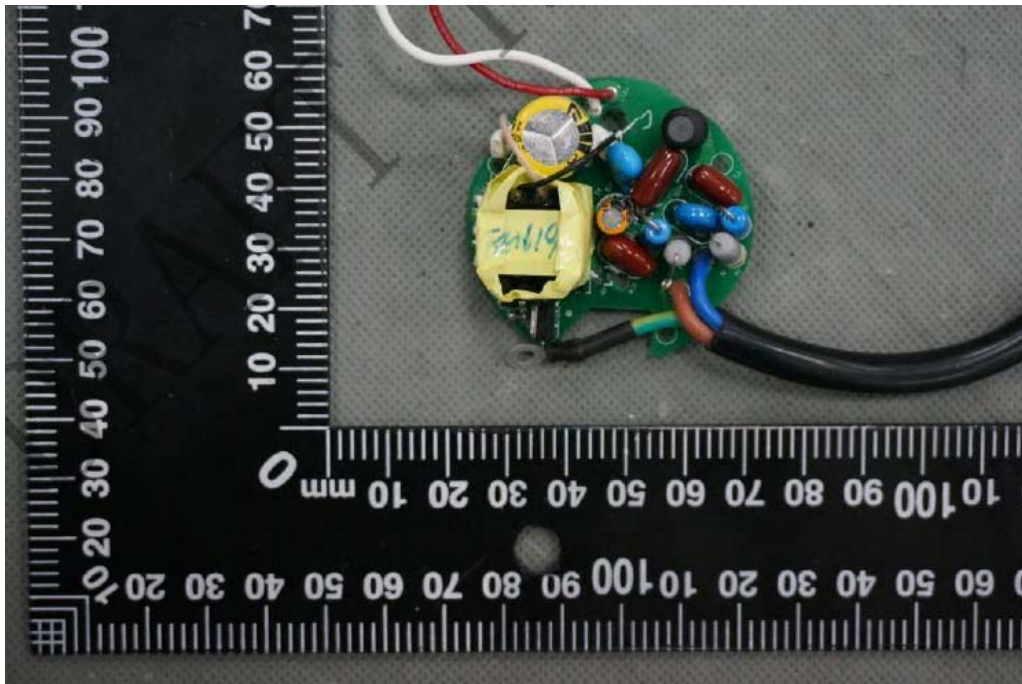
RT7.815.B99A 20150606



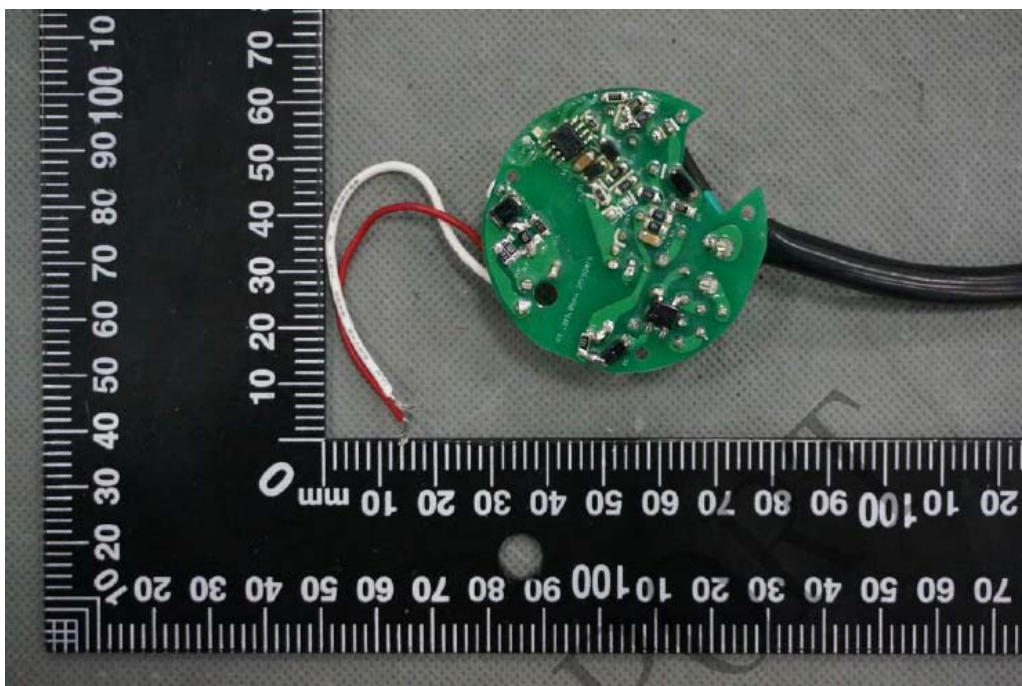
RT7.815.B91A 20150513



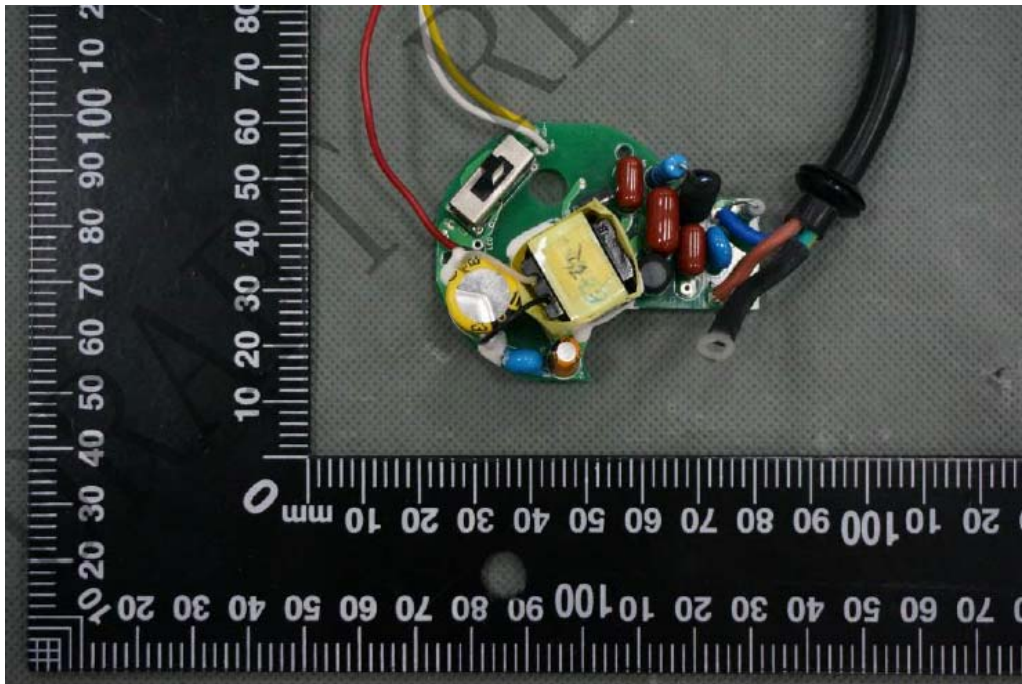
RT7.815.B91A 20150513



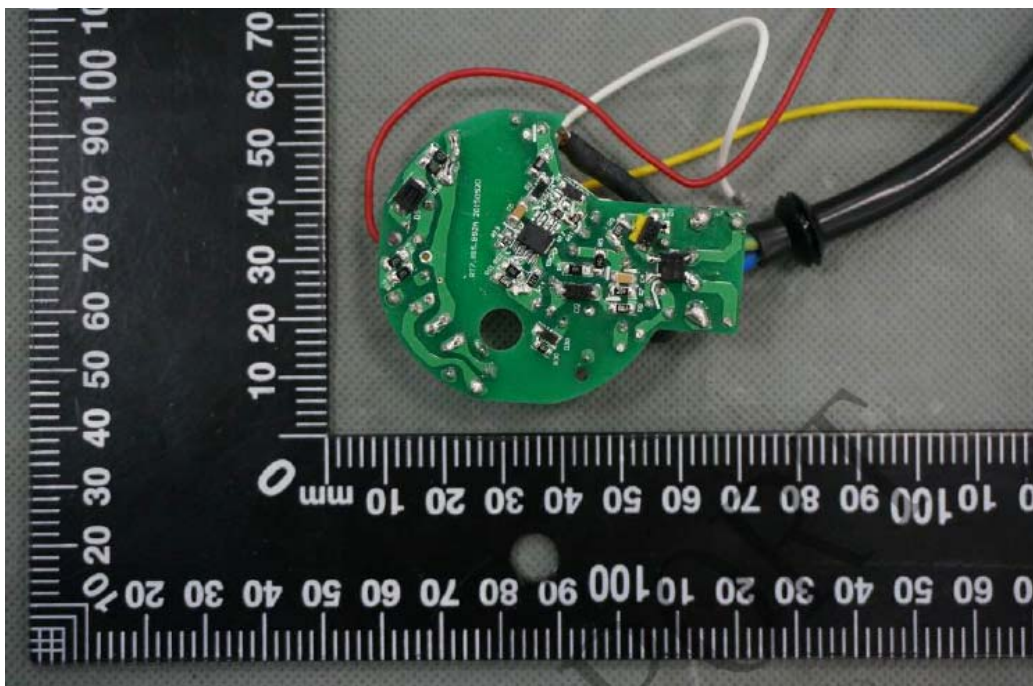
RT7.815.B86A 20150415



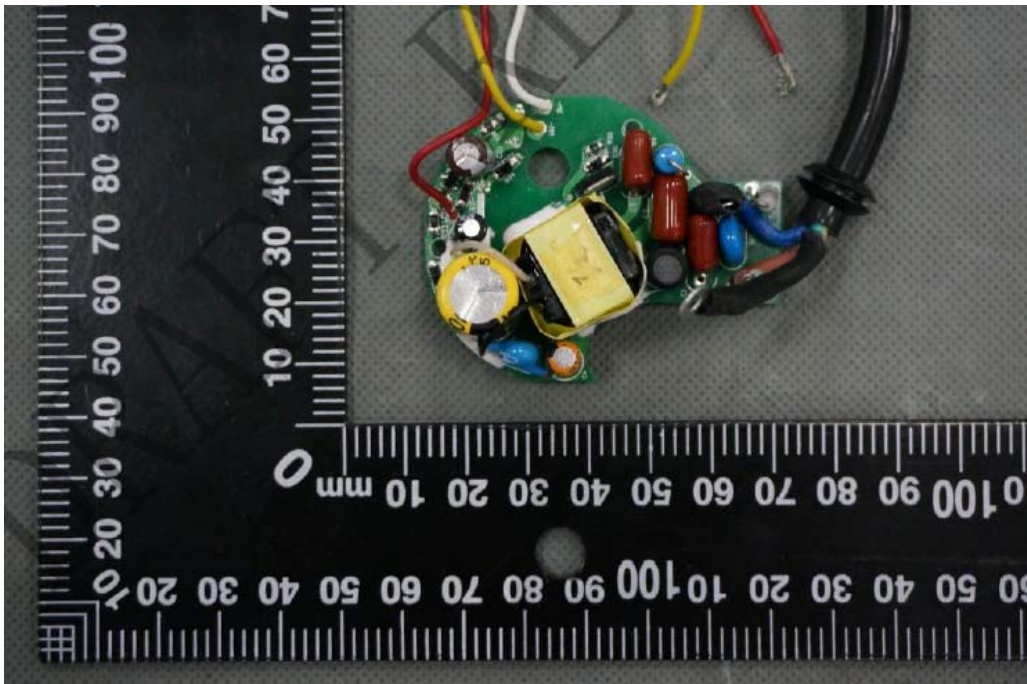
RT7.815.B86A 20150415



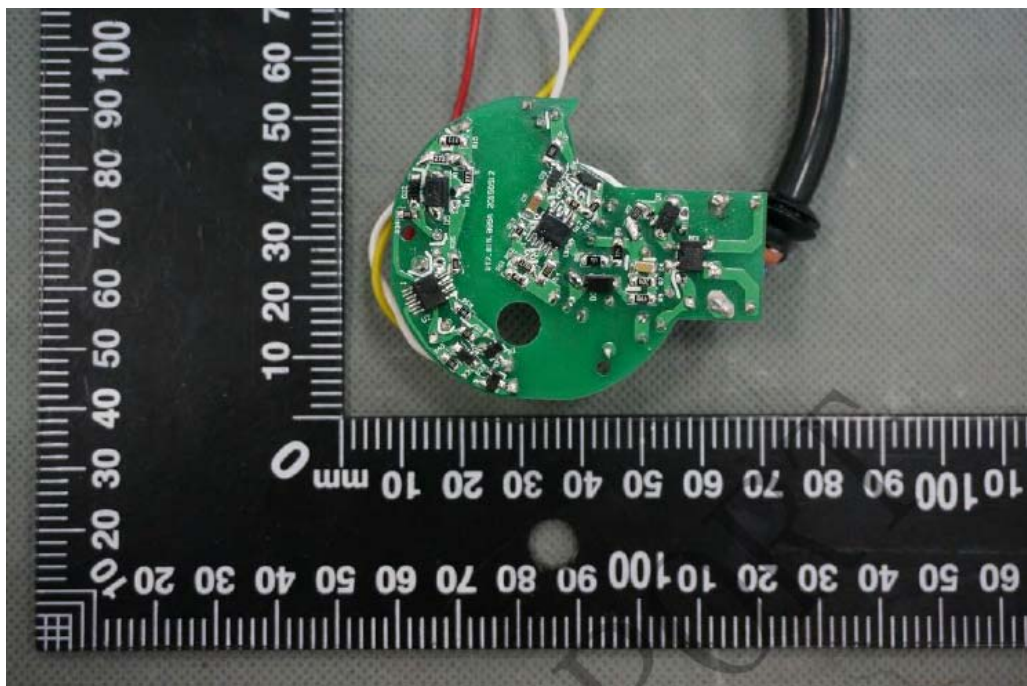
RT7.815.B92A 20150520



RT7.815.B92A 20150520



RT7.815.B89A 20150512



RT7.815.B89A 20150512

Appendix II: Photographs of the Test Configuration

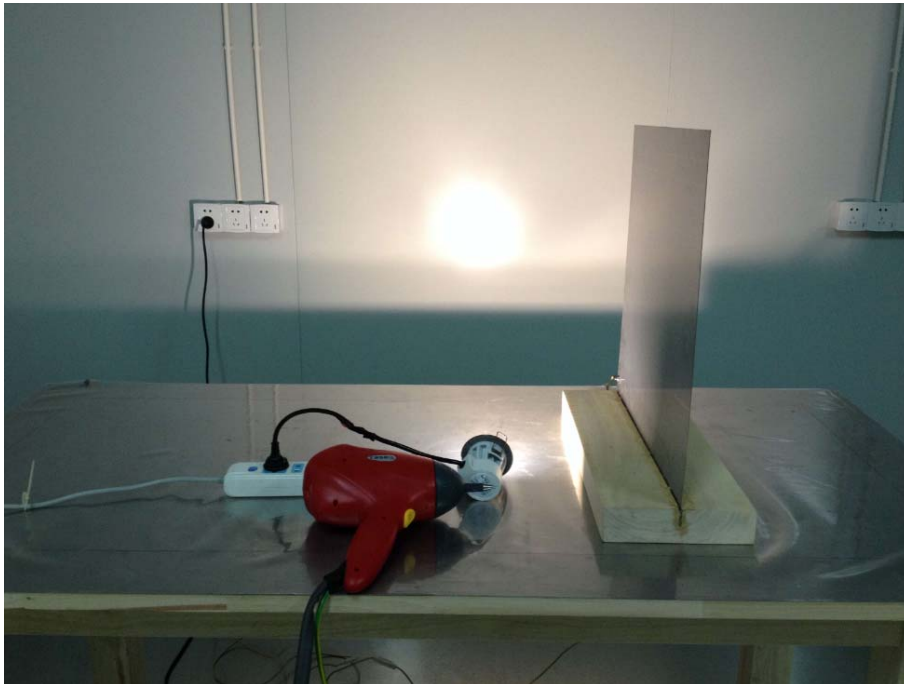
Mains Terminal Disturbance Voltage Measurement



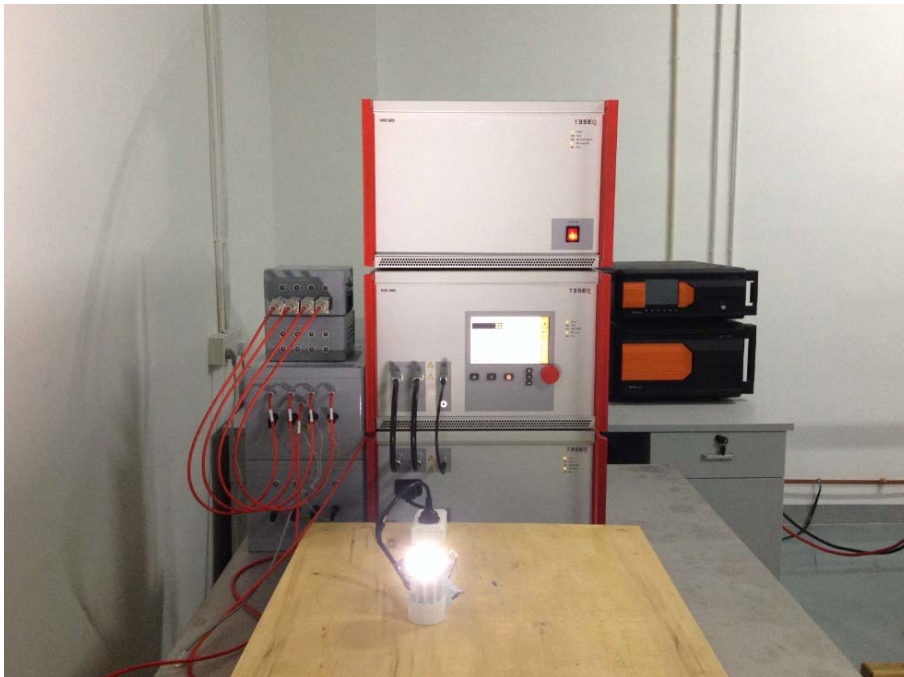
Radiated Electromagnetic Disturbance, Magnetic Component



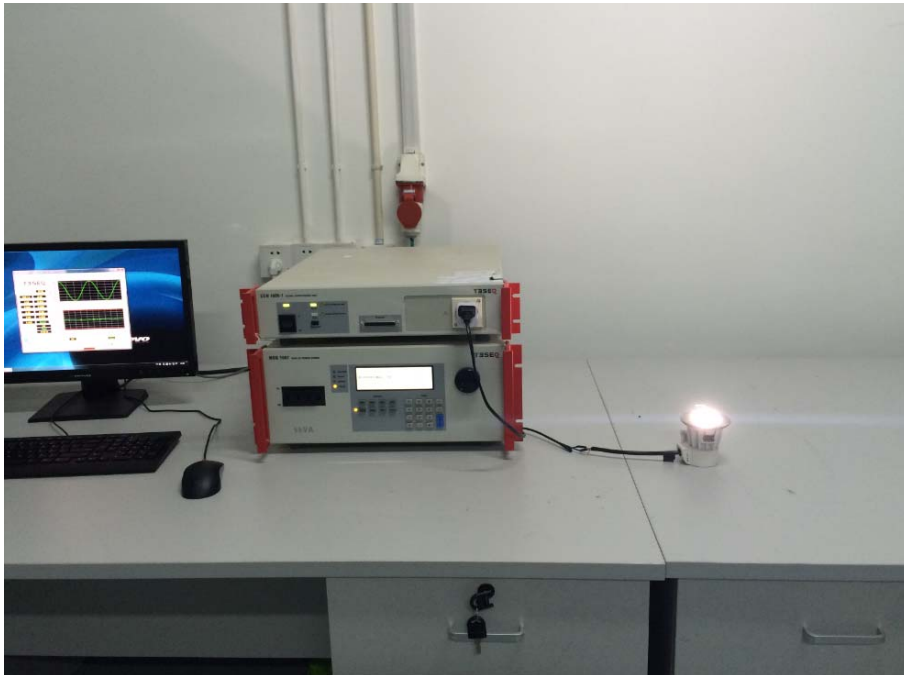
Electrostatic Discharge Immunity Test



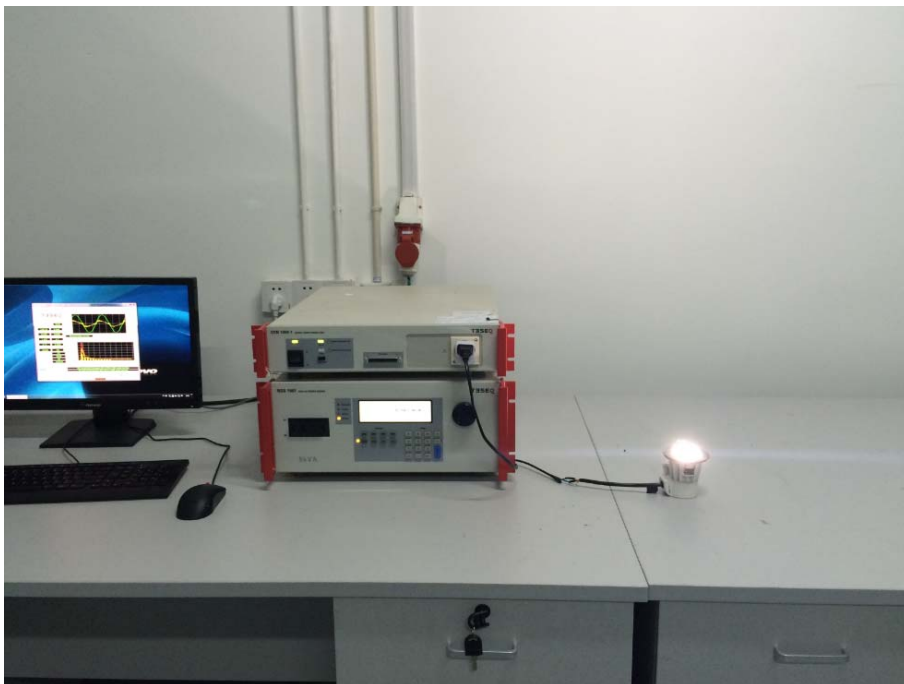
Surge immunity, Electrical fast transient burst immunity , Voltage dips and short interruptions immunity Test



Flicker



Harmonic



Power Frequency Magnetic Field Immunity



End of Report