

Challenges in SSL Design and Photometric testing

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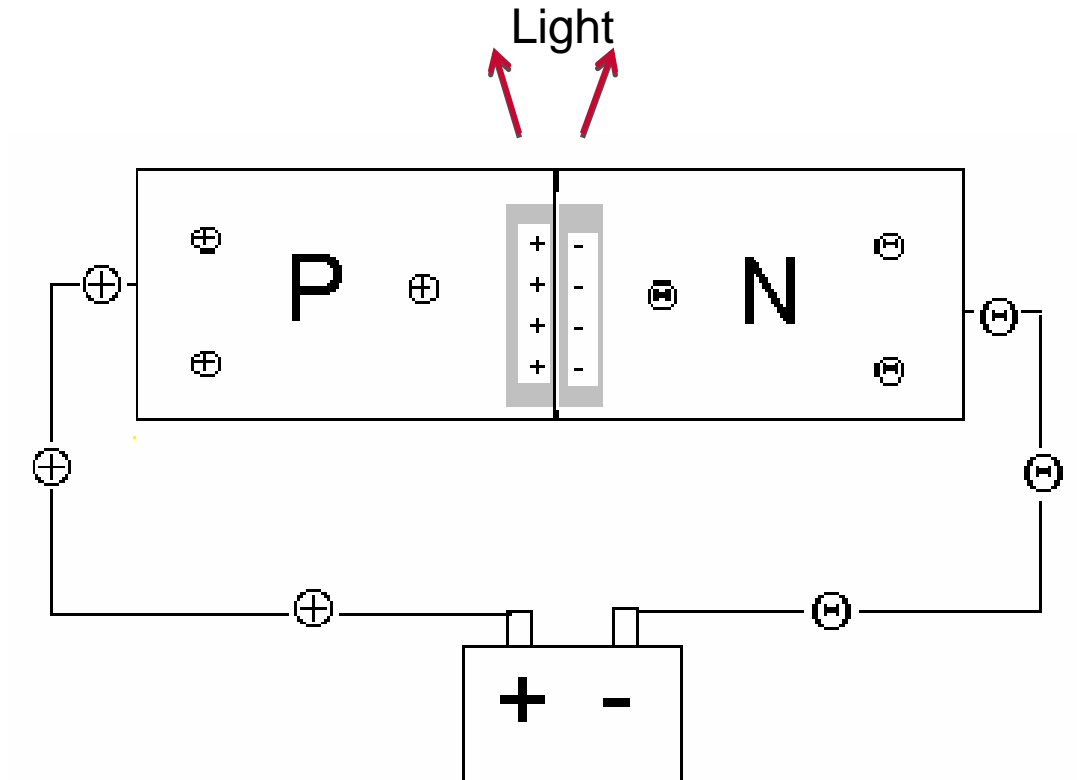


Agenda

- **Introduction**
- **Challenges in SSL design**
- **Photometric testing**
- **UL facilities**
- **Question and Answer**



Introduction



Challenges

LED Module

Control Gear

Optics

Thermal
management

LED Module



(Standards LED)



(Super Flux LED)



(Power LED)

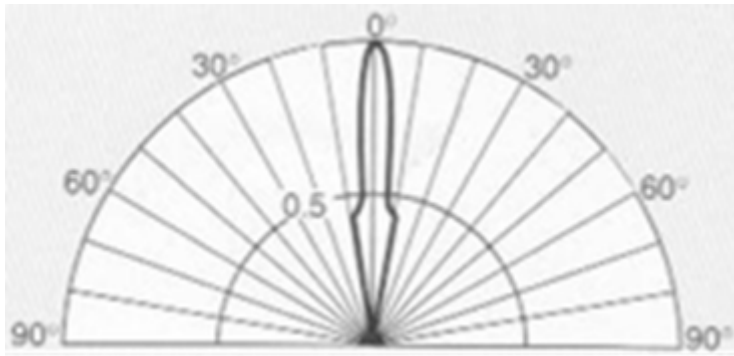


(High power LED)

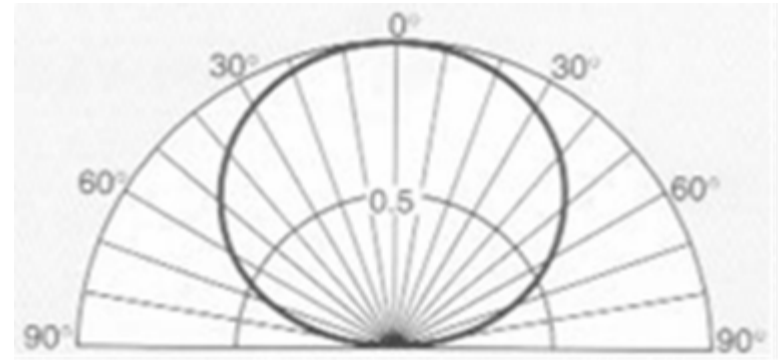


LED Module

Beam Pattern



(Viewing angle 10°)



(Viewing angle 120°)

Colour spectrum



Control gear

- Deliver constant DC voltage and current to LED module.
- Ripple free DC output voltage waveform
- Protection to LEDs against over voltage, low voltage and short circuit current.
- Deliver required input current to LED module.
- Should not generate harmonic in its supply current and EMI otherwise as low as possible. Meet following requirements
 - 1) Harmonic Emission limits and related power quality– IEC 61000-3-2
 - 2) Safety
 - UL8750
 - IEC 60950 Part 1
- It should be efficient, compact in size and lighter in weight.



Optics

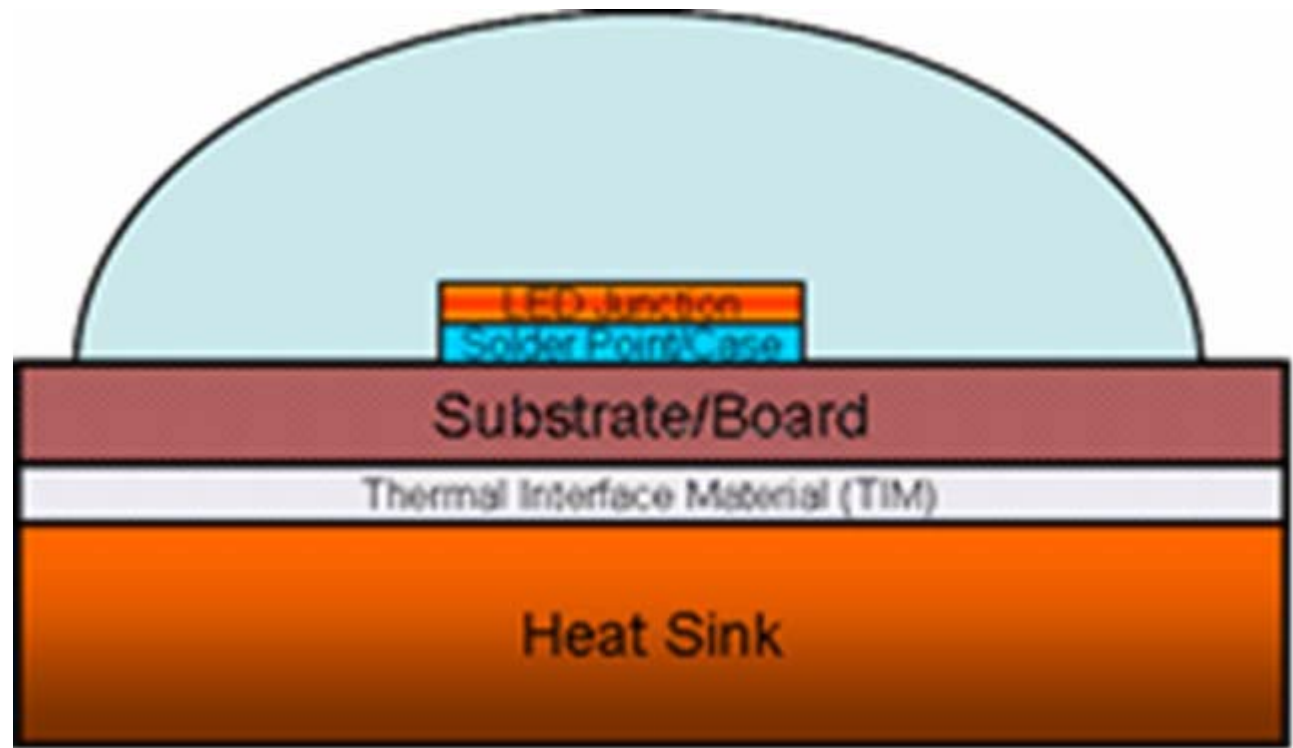
- Selection of optics (reflector or diffuser or lenses) depend on the type of the application for e.g office , Home , Shop , Corridor etc.
- Lenses or reflectors are used to change the path of light depending upon the need of specific application.
- The light is focus at one location using lens and also a concentrated beam of parallel rays produced using lens or specially designed reflector.
- The spread of light rays evenly on the surface can be achieve by use of different lenses and reflectors.

Optics

- The diffusers are used to hide light source and soft light distribution.
- Different type of lenses are available ,the one which can mounted on the top of LED chip and other is one which is mounted at smaller distance away from the LED to change path of rays.
- The lenses are made up of PC (polycarbonate) or PMMA (Poly(methyl methacrylate) material.
- The very important aspects of optic design are amount of light required , color of light , area where light required and where not required.



Thermal Management



- Adhesive
- Heat sink:
- Material
- Shape :
- Surface Finish -
- Mounting method-
- PCB (Printed Circuit Board)MCPCB - MCPCB (Metal Core PCB)
- Separation

Hence for designing a good SSL product all the individual components of SSL product has to be efficient and challenges are there for design of good optics and thermal management system.

Photometric Testing

Specification:

SSL product performance checked by conducting absolute photometry as per IES LM 79.

Parameters

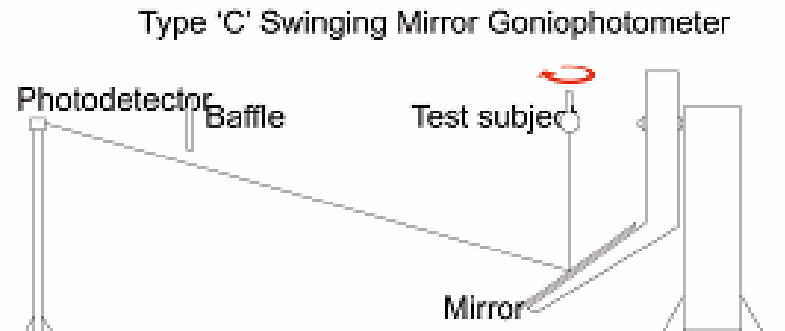
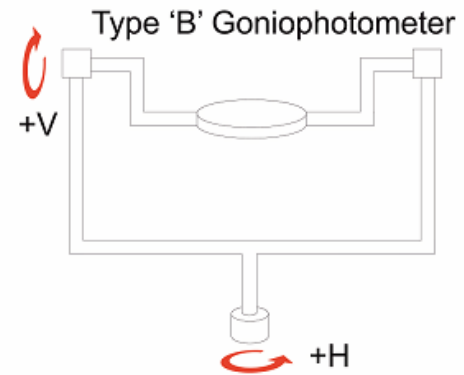
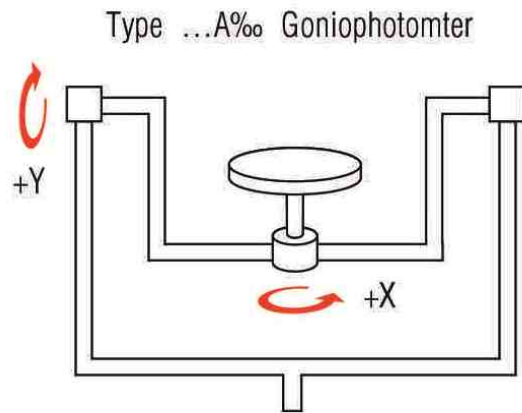
- Total luminous flux (lumens),
- Luminous efficacy (lm/W),
- Luminous intensity (candelas) in one or more directions,
- Chromaticity coordinates,
- Correlated color temperature, and color rendering index.



Photometric Testing

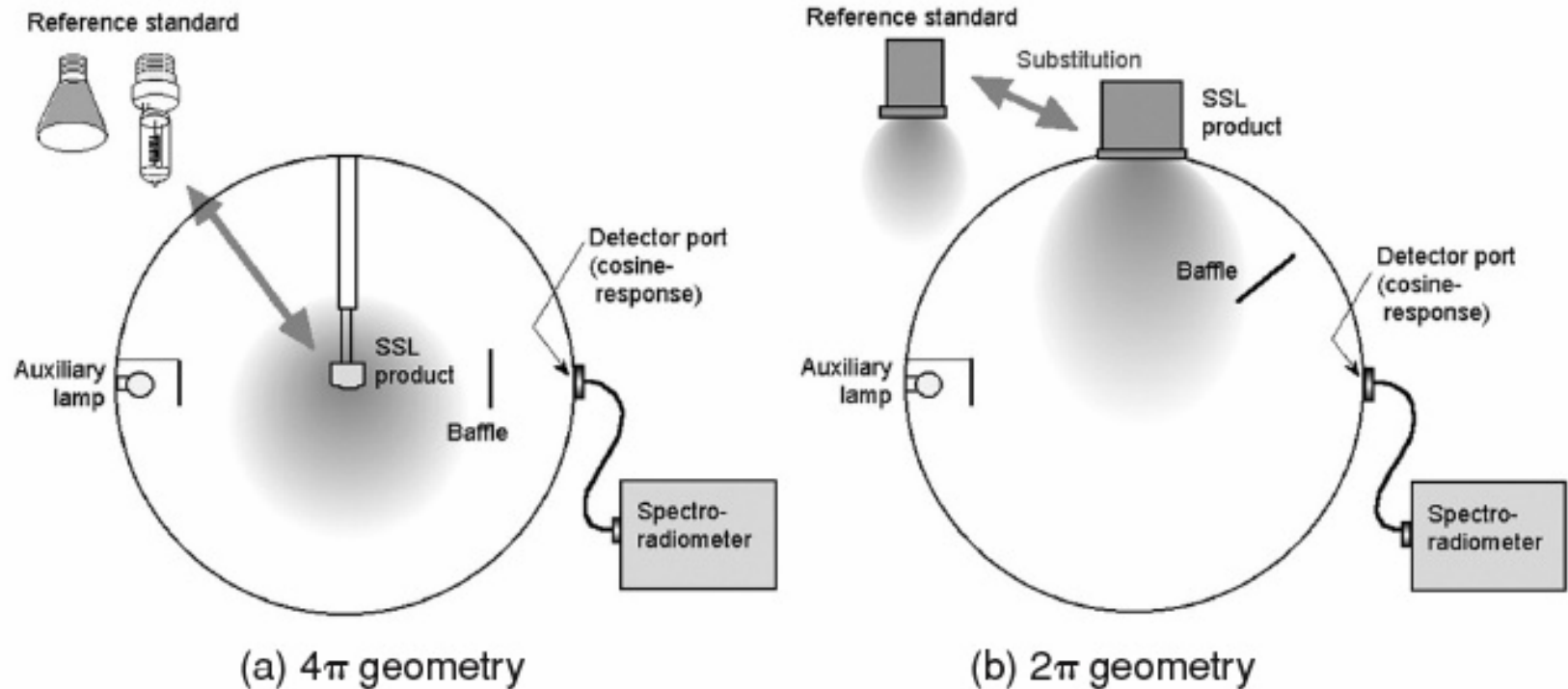
Equipment :

There are three primary types of Goniophotometers, however; Only 'C' type Goniophotometers are approved under IES standards.



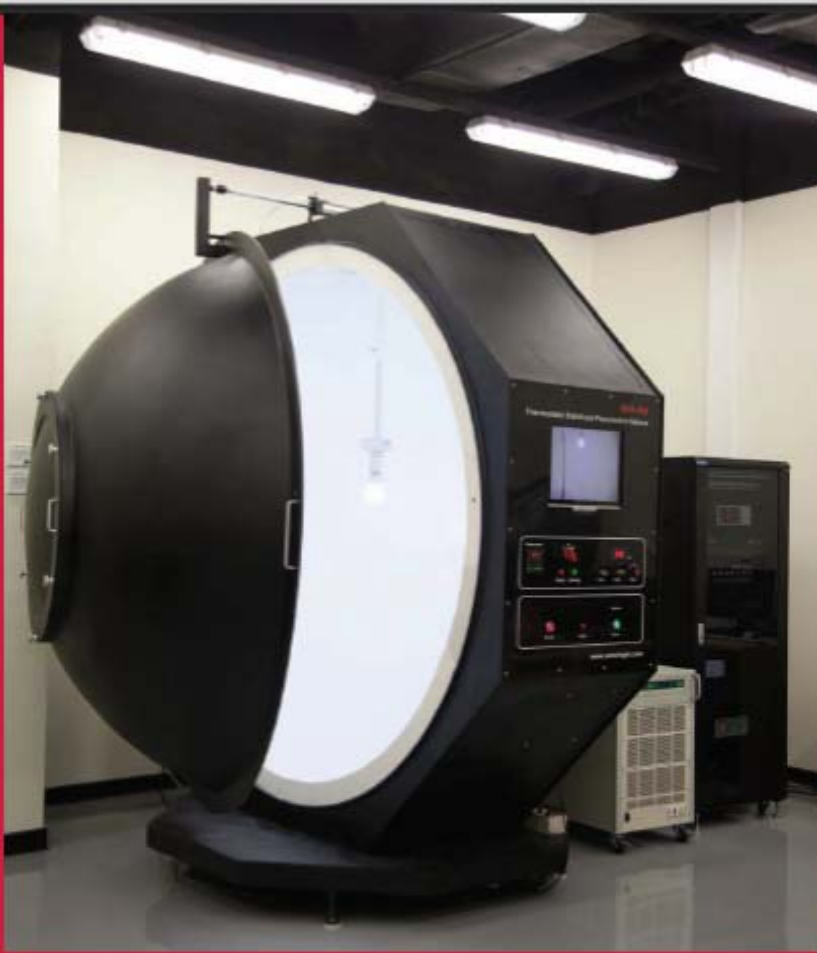
Photometric Testing

Integrating Sphere:



UL Manesar , Facilities Photometry Lab

(Thermostatic Integrating Sphere)



Features:

Computerized measurements of following parameters

- Spectroradiometric
- Colorimetric
- Spectral power distribution, Chromaticity coordinates,
- CCT , CRI
- Luminous flux,
- Electrical (Current, voltage, wattage, power factor etc)

UL is delighted to announce the Inauguration of

ENERGY EFFICIENCY LABORATORY

on December 21st 2011, 11:30am

at No. 413, Sector 8, Industrial Model Town (IMT)

Manesar, Gurgaon, Haryana - 122050

CHIEF GUEST

Dr. Ajay Mathur, Director General

Bureau of Energy Efficiency, Government of India



Requesting your esteemed presence on this occasion.

Photometry Lab (Goniophotometer)

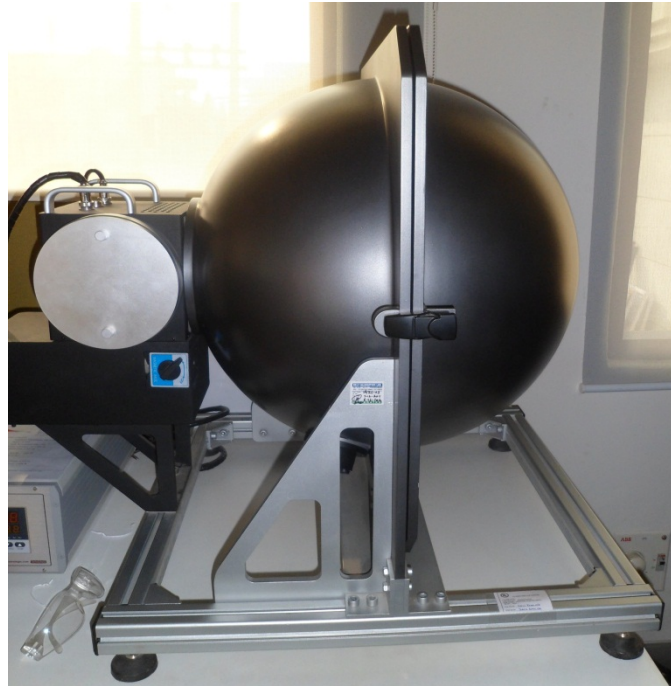


Principle:

The mirror rotates around the luminaire and reflects all the light intensity signal from every direction to the fixed photo detector, thus to achieve the measurement of the spatial intensity distribution curve on different flats. The instrument is fully satisfied with the test requirements on the directional properties of light distribution made by LM79-0, EST and ERP meanwhile, it is recommended by CIE70.



Photometry Lab (Thermostatic Integrating Sphere for LED chip)



Computerized spectroradiometric and colorimetric parameters measurement like spectral power distribution, chromaticity coordinates, correlated color temperature, color rendering index, color tolerance, color difference of LED Chip at different junction temperature (15°C to 85°C)

Photometry Lab (Life Test Racks)



Fully atomized life test racks for the LED bulbs, CFL , TFL which are designed by UL. Individual lamp is monitor throughout its life during testing in the life test and actual life of lamp is capture in case of failure. The monitoring of life test area and report generation is customized as per standards need. The racks operate under the controlled electrical power supply (voltage, frequency) on UPS and controlled environmental conditions specified in the standards.

Environmental Lab (Environmental chambers)



This Lab is having high performance Environmental test Chambers with fully automatic control , dust chamber and rain test apparatus and Hot ovens. The products like luminaires , Lamps , Electrical / Electronic components , enclosures etc performance can be assessed under various environmental stresses like high temperature , low temperature , dusty environment and rainy environment.

The different sizes of environmental chambers accommodate test objects of different sizes and tests as per

- Cold
- Dry heat
- Change of temp
- Damp Heat, Steady State
- Damp heat, steady state (unsaturated pressurized vapour)
- Damp Heat, Cyclic
- Damp Heat, Steady State

Temperature : (-)40 C to 180 C \pm 1 C
Relative Humidity : 10 % to 95% \pm 3 %
Ramp rate : 10 K per minute



Environmental Lab (Dust Chamber and Rain Test set up)



Lab has largest dust chamber of size (3 m x 2 m x 3m , l x d x h) and rain test apparatus to test enclosures for degree of protection against dust and water. This facilities will help manufactures for design and verification of their products for the IP rating in accordance with **IEC:60529/IS:12063**. The electrical enclosures like electrical panel , control box , distribution box , motors , etc can be tested for the protection against ingress of dust (1st numeral 1X/2X/3X/4X/5X/6X) and water (2nd Numeral: X3/X4/X5/X6).

Refrigerator Lab (Dust Chamber and Rain Test set up)



Feature:

Six test benches

Programmable controls - to suit R&D testing requirement.

Hydro Carbon Refrigerant compatibility

This Lab is having test chamber as per ISO 15002 with temperature environment control system and a refrigerator cooling performance test system. The system is fully automatically controlled, capable of automatic measurement and recording and analysis of test results and data. The system is intended for the operating conditions tests (temperature, humidity,) suitable for 6 Refrigerators with size 50l to 750l. The verification testing of house hold refrigerator can be performed for the energy efficiency requirement

- As per BEE star rating scheme ,
- As per EPA Energy star scheme and various other nations energy efficiency labeling system.
- The system meets the conditions as per the national standards IS 15750, IS: 1476, ASNZ 4474 , IEC: 62552:2007.



How can UL help you

- **North America Market Access** – ANSI/DOE-Energy Star/Lighting Fact requirements
- **European Market Access** – CE Marking, ENEC, GS, Photobiological testing , CB Scheme and other certification schemes
- **Complete solution for** - Safety, EMI/EMC, Photometry, Environmental as per EN/International and IS Standard, developmental purpose, customized requirement
- **Training as per Global and local standards**– Including a large catalog of Web based training
- **Consultancy and turn-key lab set up support** – Including supply of world class high quality Type C Goniophotometer from UL-LSI



THANK YOU.

