

PHOTOMETRY LABORATORY (PHL)



Introduction

- Photometry lab at ICAT has state-of-the-art infrastructure to cater to the requirements of both Automotive and non-automotive lighting components.
- **ACCREDITATIONS:** The photometry lab at ICAT is accredited as per ISO 17025 by National Accreditation Board for Testing and Calibration Laboratories (NABL), ISO 9001 (IMS), ISO 14001 (for Environmental Management Systems), ISO 45001 (for Occupational Hazard & Safety).
- **CAPABILITY:** PHL is equipped with latest facilities capable of testing high end products like Intelligent lighting systems, PWM based LED luminaries, Special purpose warning lamps, Aviation lights, non – automotive lamps along with various Road safety products.

Capabilities

- Measurement of **spatial light intensity distribution** for automotive lighting and signaling devices, including headlamps, fog lamps, stop lamps, direction indicators, reversing lamps, and related systems.
- **Retro-reflection performance testing** of reflectors, reflective tapes, road markings, and similar materials.
- Measurement of **luminous flux** and **luminous efficacy** of various light sources, including incandescent, metal halide, HID, and LED lamps.
- **Headlamp installation** and **headlamp leveling device** performance testing.
- **Luminance measurement** of rear registration plate lamps, road surfaces, display screens, and other illuminated surfaces.
- **High Security Registration Plate (HSRP)** performance testing.
- **Lifetime and endurance testing** of lamps and bulbs.
- **Dimensional inspection and measurement** of bulbs and lighting components.
- Evaluation of **glare characteristics** and visual performance of lighting systems.
- Measurement of **reflectivity** and **light transmittance** of a wide range of materials.
- Performance testing of lamps under **controlled environmental conditions**, including variations in voltage, temperature, and humidity.
- **Colorimetric analysis** of lamps, lamp covers, and industrial materials such as plastics, textiles, and related products.
- Comprehensive **LED photometric and performance measurements**.
- **Ultraviolet (UV)** and **Infrared (IR)** radiation measurement and analysis.
- Photometry and Colorimetry of **Airfield Lamps, General Lighting Devices & Road Safety Devices**.



Key Projects Executed

- **Test Conducted:** To carry out White Light Optical Transmittance Test as per customer specification for Defence Vehicle Telescope on special request of the customer as a part of development exercise.



- **Test Conducted:** To carry out test for the presence of UV wavelength range at 3 different distances (30cm, 40cm & 50 cm) of a Surgical UV Device as a part of developmental exercise on specific request of the customer.



Standards / Regulations (National & International)

Tests Performed	Corresponding Standards (National / International)
Luminance Distribution (Photometric Characteristics) & Gradient of Luminance	AIS 10 (Part 3) (Rev. 1) AMD 2015
	AIS 12 (Part 4) (Rev. 1) AMD 2018
	AIS 62 (Rev. 1) AMD 2022
	ECE R50 Rev. 4
	ECE R4 Rev. 4
	UN Regulation No. 148 Rev. 1 Amd. 1
Co-efficient of Luminous Intensity	AIS 57 (Rev. 1) AMD 2019
	AIS 22 AMD 2013
	AIS 62 (Rev. 1) AMD 2022
	ECE R3 Rev. 5
	ECE R27 Rev 3
	UN Regulation No. 150 Amd. 6
	IRC 67 Cl. No. 6.7.1, 6.7.2, 6.7.3 and 6.7.4
	IRC 79 Cl no. 3,4,5 & 6
	IRC 35 Cl no. 5.1.2
	MoRTH Section 800 Cl no. 804
Co-efficient of retro reflection	ASTM D 4383 cl. 6.1 and 10.1
	IS/ISO 6742-2
	AIS 90
	AIS 89 AMD 2014
	AIS 88
	AIS 62
	ECE R104 Rev 1 Amd 4
	ECE R70 Rev. 1 Amd. 5
	ECE R69 Rev. 1 Amd. 1 Corr. 1
	IS 14221 (Part 1)
	UN Regulation No. 150 Amd. 6
	ASTM D 4956 Cl No.: 6.2,6.3 & 7

Tests Performed	Corresponding Standards (National / International)
Colour Coordinates	IS/ISO 6742-2
	AIS 159
	ISO 7591-1982
	AIS 159
	ISO 7591-1982
	AIS 10 (Part 5) (Rev. 1)
	ECE R48 Rev. 14 Amd. 3
	AIS 57 (Rev. 1) AMD 2019
	AIS 22 AMD 2013
	AIS 62 (Rev. 1) AMD 2022
	ECE R3 Rev. 5
	ECE R27 Rev 3
	UN Regulation No. 150 Amd. 6
	AIS 90
	AIS 89 AMD 2014
	AIS 88
	AIS 62
	ECE R104 Rev 1 Amd 4
	ECE R70 Rev. 1 Amd. 5
	ECE R69 Rev. 1 Amd. 1 Corr. 1
	IS 14221 (Part 1)
	UN Regulation No. 150 Amd. 6
	AIS 12 (Part 4) (Rev. 1) (Amd. 3)
	IRC 67 Cl. No. 8
	ICAO Annex 14 Vol. I Ed. 8th (Appendix 1, Cl. 2.1, 2.2, 2.3, 2.4)
	ASTM D 4383 cl. 6.3 and 10.3
	ASTM D 4280 Cl 6.2.4 and 9.3

Tests Performed	Corresponding Standards (National / International)
Dimension Measurement	ECE R99 Annex 1 (Rev. 3) (Amd. 5)
	ECE R37 Annex 1 (Rev. 8)
	AIS 34 (Part 1) (Amd. 2014) & (Part 2) (Annex A)
	AIS 130 (Amd 1)
	ECER 128 (Annex 1) (Amd 11)
Electrical and Photometric Characteristics	AIS 034 (Part 1) (Rev. 1) AMD 2014
	ECE R37 Rev. 8
	AIS 130
	UN Regulation No. 128 Amd 11
Gloss Measurement	ASTM E 430
	ASTM D 2457 Ed. 1
	ISO 2813 (Reviewed 2019)
	NIST Pub. SP 250 70
Illumination (Light Distribution)	ASTM D 523
	AIS 012 (Part1) (Rev. 1) AMD 2014
	AIS 012 (Part3) (Rev. 1)
	AIS 062 (Rev. 1) AMD 2022
	ECE R19 Rev. 8
	ECE R119 Rev. 3
	UN Regulation No. 149 Rev. 1 Amd 1

Tests Performed	Corresponding Standards (National / International)
Illumination area	AIS 010 (Part3) (Rev. 1) AMD 2015
	AIS 012 (Part5) (Rev. 1)
	AIS 062 (Rev. 1) AMD 2022
	ECE R50 Rev. 4
	ECE R6 Rev. 5 Amd. 3
	UN Regulation No. 148 Rev 1 Amd. 1
	AIS 12 (Part 2) (Rev. 1) AMD 2018
	AIS 62 (Rev.1) AMD 2022
	ECE R38 Rev 4
	UN Regulation No. 148 Rev. 1 Amd. 1
	AIS 10 (Part 3) (Rev. 1)
	AIS 12 (Part 7) (Rev.1) AMD 2017
	AIS 62 (Rev.1) AMD 2011
	ECE R50 Rev. 4
	ECE R23 Rev. 5
	UN Regulation No. 148 Rev. 1 Amd.1
	AIS 10 (Part 3) (Rev. 1) AMD 2015
	AIS 12 (Part 6) (Rev. 1) AMD 2013
	AIS 12 (Part 8) (Rev. 1) AMD 2019
	AIS 12 (Part 10) (Rev. 1) AMD 2017
	AIS 12 (Part 9) (Rev. 1) AMD 2019
	AIS 62 (Rev. 1) AMD 2022
	ECE R7 Rev 7
	ECE R77 Rev. 4
	ECE R87 Rev. 4
	ECE R91 Rev. 4
	UN Regulation No. 148 Rev. 1 Amd. 1

Tests Performed	Corresponding Standards (National / International)
Intensity of Light Emitted (Light Distribution)	AIS 010 (Part3) (Rev. 1) AMD 2015
	AIS 012 (Part5) (Rev. 1)
	AIS 062 (Rev. 1) AMD 2022
	ECE R50 Rev. 4
	ECE R6 Rev. 5 Amd. 3
	UN Regulation No. 148 Rev 1 Amd. 1
	AIS 12 (Part 2) (Rev. 1) AMD 2018
	AIS 62 (Rev.1) AMD 2022
	ECE R38 Rev 4
	UN Regulation No. 148 Rev. 1 Amd. 1
	AIS 10 (Part 3) (Rev. 1)
	AIS 12 (Part 7) (Rev.1) AMD 2017
	AIS 62 (Rev.1) AMD 2011
	ECE R50 Rev. 4
	ECE R23 Rev. 5
	UN Regulation No. 148 Rev. 1 Amd.1
	AIS 10 (Part 3) (Rev. 1) AMD 2015
	AIS 12 (Part 6) (Rev. 1) AMD 2013
	AIS 12 (Part 8) (Rev. 1) AMD 2019
	AIS 12 (Part 10) (Rev. 1) AMD 2017
	AIS 12 (Part 9) (Rev. 1) AMD 2019
	AIS 62 (Rev. 1) AMD 2022
	ECE R7 Rev 7
	ECE R77 Rev. 4
	ECE R87 Rev. 4
	ECE R91 Rev. 4
	UN Regulation No. 148 Rev. 1 Amd. 1

Tests Performed	Corresponding Standards (National / International)
Light Distribution in a) driving beam b) passing beam	AIS 127
	ECE R123 Rev.2
	UN Regulation No. 149 Rev. 1 Amd 1
	AIS 10 (Part 1,2 and 4) (Rev. 1)
	AIS 062 (Rev. 1) AMD 2022
	ECE R112 Rev. 4
	ECE R113 Rev. 5
	ECE R98 Rev. 4
	UN Regulation No. 149 Rev. 1 Amd 1
Luminous Intensity Measurement	ICAO Annex 14 Vol. I Ed. 8th
Photometric and Electrical parameters of LED (Non-Automotive) Luminaires	LM 79-08, IS 10322 (Part 5, Sec 1 to 7), IS 16102 (Part 2), IS 16103 (Part 2), IEC 62722-1, IS 16107 Sec-2 (Part 1) & IS 16106
Measurements of luminance factor by day	AIS 159
	ISO 7591-1982
Minimum value of Co-efficient of retro reflection	AIS 159
	ISO 7591-1982
Retro Reflectivity	ASTM D 4280 Cl 6.2.1 and 9.1
Uniformity of retro-reflection on area of 5 x 5 cm	AIS 159
	ISO 7591-1982

Compliance / Lab Accreditations / Recognitions:

- ISO 9001, ISO 14001 & ISO 45001 certified
- ISO/IEC 17025 accredited

PHL conducts tests as per international standards like AIS, ECER, SAE, ASTM, LM 79, FAA and ICAO. PHL also supports components manufacturer to get their product certified for European & American countries etc.



Upcoming Test Facilities

- **ROBOTIC ARM BASED TYPE A GONIOPHOTOMETER**



- **HANDHELD RETROREFLECTOMETER & COLORIMETER**



Our Customer Base

Applus⁺
IDIADA



LUMAX



Suprajit



MARUTI SUZUKI



Hero

Our Customer Base



Projects and publications

Project Title:

Investigation on methods of reducing headlight glare and enhance forward visibility in automobiles (DHI).

Project Lead: Dr. Madhusudan Joshi / Mr. Girish Singh

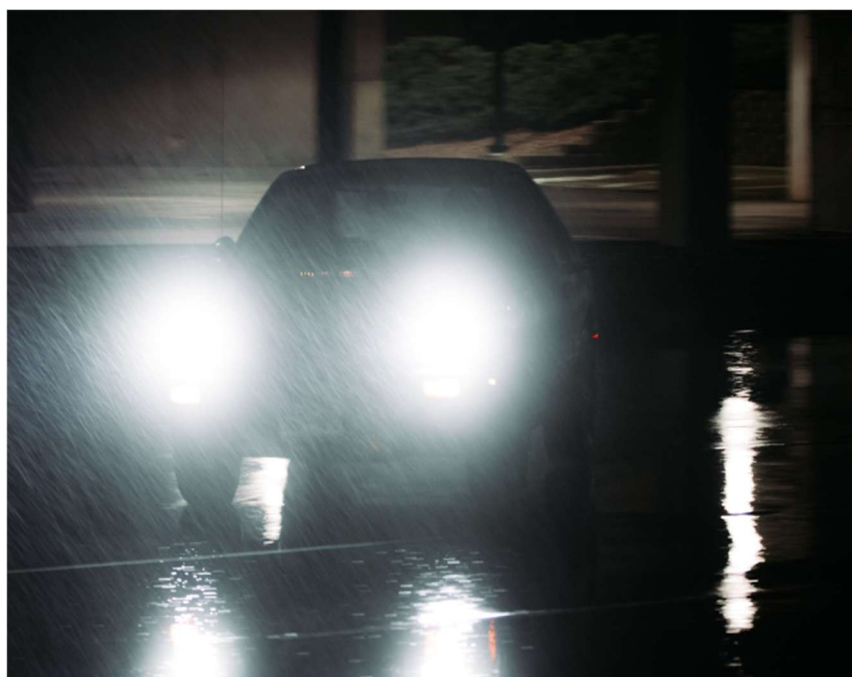
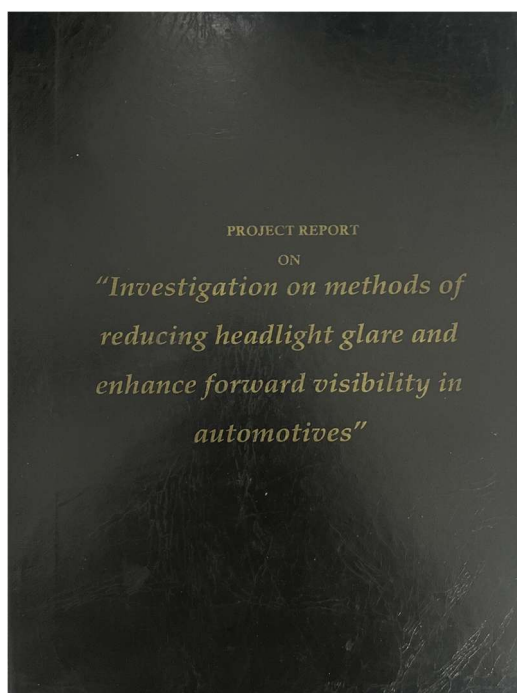
Project Cost: INR 4 Cr.

Project Funding: By Ministry of Heavy Industries, Govt. of India

Project Duration: 29 Months

Project Objective:

To explore the methods to reduce the intensity of the glare sources and alternate methods to reduce the amount of light entering the on-coming driver's eye. Special attention would be given to polarized head lighting system.



Projects and publications

Technical Paper Publication Title: Effect of Circadian Interior Automobile Lighting on Commuters (SAE).

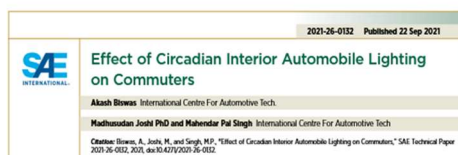
Author: Mr. Akash Biswas

Co-Author: Dr. Madhusudan Joshi & Mr. Mahendar Pal

Paper No.: 2021-26-0132

Abstract:

Advanced research in melatonin induced driving suggests increased sleepiness and low concentration during driving leading to a larger risk of accidents. Thus, this research puts forward a study of the effects of abnormal circadian disorder during commuting and whether or how can it be improved with substantial lighting tweaks and exposé of the drivers to tune able blue light just before the drive.



Abstract

Chronobiological studies elaborate the working of a biological clock, "the built-in timing device" in an organism and similarly define the creation of circadian rhythm of a human being. The Suprachiasmatic Nucleus (SCN) in the hypothalamus of a human brain detects changes in the surrounding environment through the eyes and tends to affect this circadian rhythm which in turn affects human behavior, hormonal cycles, sleep deprivation and even driving or daily commute. Melatonin released due to the photopic and isopic signals received by the brain controls the amount of "alertness" or "sleepiness" in commuters which can assist in improved efficiency and prevent accidents while driving. Since inadequate lighting scenarios can not only affect the optical activity and visual orientations it does also affect the non-visual sensory activities by inadvertently disorienting the circadian rhythm.

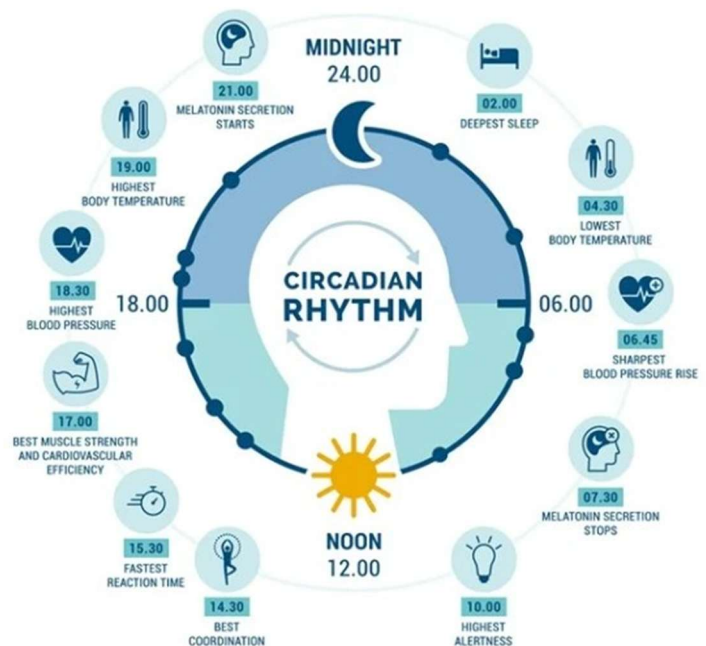
Advanced research in melatonin induced driving suggests increased sleepiness and low concentration during driving leading to a larger risk of accidents. Thus circadian lighting which is already 'a thing' in the general lighting scheme can be used in automobile interiors to control the secretion of excessive melatonin thus in turn re-orienting the circadian rhythm. Blue LEDs represented by certain cove design formation at various wavelengths are used inside the automobile where commuters get to expose themselves to assist their sleepiness readings. To measure sleepiness two standard scales namely "Stanford Sleepiness Scale" (SSS) and "Karolinska Sleepiness Scale" (KSS) is used and cross verified. Exposure to blue light even before the drive activity using "Intensity Tuning", "Color Tuning" and "Stimulus Tuning" is used to analyze and study the outcomes and thus discuss the effects which suggests refined efficiency in commute at low risks.

Introduction

Illuminance holds a primal factor for change in mood, aesthetics and even bodily growth in a human being along with the wide flora and fauna on earth. Natural and manmade contribute to the development of different active and lethargic moods in a human being. Lighting has been considered for having chrono-biological influence on the human body through the secretion of melatonin. This inhibition changes of the cycle processes called circadian rhythms or sleep time thus in due course changing body temperature and pressure fluctuations, palpitations etc. This inhibition is triggered by activating "intrinsically photosensitive Retinal Ganglion Cells" (ipRGCs) which act as photoreceptors to the pineal gland.

As commonly known melatonin secretion helps us to fall asleep whereas melatonin inhibition keeps us active but the influential factors on this process were not well known. The primary factors which are involved in the melatonin inhibition process by light are wavelength, intensity and time of exposure. Maximum melatonin inhibition occurs at wavelengths within the blue region. The higher the intensity and the time of exposure of the light, the higher the inhibition.

Automotive lighting has a sphere for development in this intriguing field of research of new technologies. Incorporation of Human Centric Lighting (HCL) into automobiles could be the next big thing which could bring in revolutionary changes in about health and safety of the driver in near future. Introduction of tune-able blue light technology (LED) can bring in developments in this field. Diving into the study of circadian rhythm and thus facilitating and integrating human centric lighting into the core structure of a car takes us to the basics and initiation of HCL itself. To start with the Suprachiasmatic Nucleus (SCN) it can be clearly identified as the detector to photometric changes in the environment. Neurons within the SCN generates signals for activities in a 24-hour rhythm. At mid-day, the firing rate for actions reaches a maximum, and, during the night, it falls again. While, how most of the gene expression cycle connects to the neural firing remains unknown it was found that many SCN neurons are sensitive to light stimulation via the retina, secretion of melatonin can decrease firing activity of these neurons, thus indicating towards the fact that melatonin receptors present in the SCN mediate in the cyclic workings of the SCN.



Events and International Recognition

• International Symposium on Lighting (ISoL)

The International Symposium on Lighting (ISL), hosted by the International Centre for Automotive Technology (ICAT), is a premier technical forum that brings together experts from the automotive, lighting, electronics, and regulatory sectors. The symposium serves as a platform for knowledge exchange on emerging technologies, global standards, regulatory developments, testing methodologies, and innovations in automotive lighting.

