

BioUp

Indoor melanopic lighting such as BioUp from Cooper Lighting Solutions includes a peak (the cyan part of the spectrum) that enhances our circadian rhythm without additional lights, higher lumen levels, and associated energy costs.

Light

Light is a radiant energy that is capable of exciting the retina and producing a visual sensation in humans. The visible portion of the electromagnetic spectrum extends from about 380 nm to about 780 nanometers (nm).

Broadband light. Visible electromagnetic radiation with a spectral power distribution with: 1) several peaks; or 2) particular wavelengths emphasized against a background of white electrical light or daylight. Such a light source could also be characterized as polychromatic.

Narrowband light. Visible electromagnetic radiation with a spectral power distribution that has a single peak with a half-peak bandwidth in the range of 15 to 90 nm, within one color appearance range.

Integrative lighting

Lighting integrating refers to both visual and non-visual effects, and producing physiological and/or psychological benefits upon humans. The term "human-centric lighting" is used with a similar meaning. Sometime including tunable white and enhancement of the cyan peak, referred as Melanopic Lighting.

Melanopic lighting

Melanopic lighting (also known as cyan lighting) is designed to mimic natural daylight and bring its benefits to people indoors, i.e., visual comfort, wellbeing, and performance.

Melanopic

Melanopic is related to the human ipRGC response due to its photopigment (melanopsin) and its characteristics in the context of ipRGC-influenced responses to light.

ipRGCs

ipRGCs (intrinsically photosensitive retinal ganglion cells) are photoreceptors not located at the back layer of the retina that operate using a photopigment called melanopsin and are principally responsible for the human body's neuroendocrine response to optical radiation are the fifth photoreceptor identified in the human retina. Their peak sensitivity to light is approximately 475 to 490 nm, a range perceived as blue-cyan. They do not directly contribute to image-formation aspects of vision.

Melanopsin

Melanopsin is an opsin-like protein, sensitive to light, with a peak sensitivity around 490 nm, and found in the very small proportion of human retinal ganglion cells that are directly photosensitive. Exposure to light, especially blue light, activates melanopsin which suppresses melatonin production.

Melatonin

Melatonin, an amine hormone, produced mainly by the pineal gland as a metabolic product of the neurotransmitter serotonin. Melatonin is the biochemical signal of darkness and helps to regulate circadian and circannual changes in physiology. It is implicated in the initiation of sleep and in the regulation of the sleep-wake cycle.

SCN

The suprachiasmatic nuclei (SCN), a tiny brain region near the eyes, acts as our body's master clock. Divided into light-sensitive and light-independent parts, the SCN regulates our internal rhythms, also known as chronotype, based on light exposure and keeps them in sync with the external day-night cycle. This master clock influences various bodily functions and entertainment, including hormone release, core temperature, and ultimately, our sleep-wake cycle. The rhythmicity of the central biological clock (pacemaker) in our brain is regulated by light, and this clock is especially sensitive to light of wavelengths between 450 nm and 530 nm.

Entrainment

The process of activating or providing a timing cue for a biological rhythm. Examples of entraining cues are light and meal timing.

Chronotype

Chronotype is a person's natural inclination with regard to the times of day when they prefer to sleep or when they are most alert or energetic. This preference can be driven by the timing of the internal 24-hour circadian clock, the rate of build-up and decline of homeostatic sleep pressure (sleepiness) due to the duration of time awake or time asleep, or in practice, a combination of both.

SPD

Spectral Power Distribution (SPD) in radiometry, photometry, and color science, describes the power per unit area per unit wavelength of an illumination. More generally, the term spectral power distribution can refer to the concentration, as a function of wavelength, of any radiometric or photometric quantity.

M/P

Melanopic/Photopic (M/P) ratios are entering lighting practice as a spectral metric for evaluating the health and wellbeing-related consequences of light, for alertness, relaxation, or sleep, for example. The M/P ratio simply compares that melanopic (ipRGC) potential to the light source's ability to produce light for daytime detail vision (photopic vision).

EML

Equivalent Melanopic Lux (EML) is a unit used to measure the biological impact of light on humans, particularly its effect on the circadian rhythm. EML is calculated based on the spectral power distribution of the light source and a standardized melanopic response function by considering impact of wavelengths on non-visual related ganglion cells. EML isn't about how bright a light feels to our eyes, but rather how much it activates the ipRGCs that influence our sleep-wake cycle. It has been replaced by m-EDI since it EML did not provide an SI unit for calculating lux.

MDER

MDER (Melanopic DER, Melanopic Daylight Efficacy Ratio) is defined by the CIE 026/E:2018 and is a spectral metric of the biological effect of an artificial light source compared to daylight (6500K). The melanopic-DER of a reference daylight spectrum is 1. When MDER < 1 This means you need more lights to achieve an equivalent circadian effect.

- Metric conversion: Melanopic Ratio (M/P) * 0.91 = m-DER.

m-EDI

m-EDI (Melanopic Equivalent Daylight Illuminance) is an improved version of the Equivalent Melanopic Lux (EML), a unit used to measure the biological impact of light on humans, particularly its effect on the circadian rhythm. M-EDI is the illuminance of standard daylight (D65), at a point, and refer to the light reaching the eye or the light stimulus based on how it stimulates one's photoreceptor, melanopsin-containing retinal ganglion cells. M-EDI is a specific type of EML calculated for a particular daylight spectrum, often representing a clear sky at midday (around 6500 Kelvin color temperature). CIE has proscribed the use of EML and has proposed an SI compliant quantity as its replacement. By expressing EML as M-EDI, we can compare the circadian effectiveness of an artificial light source to natural daylight, considered the ideal for our circadian system.

CS

CS (Circadian Stimulus) measures the impact of light exposure on an individual's melatonin levels and circadian rhythm. Often expressed in units like CS or Melanopic Lux hours (MEL). It essentially measures how effectively light exposure suppresses melatonin production and regulates our internal clock. There are various metrics used to quantify circadian stimulus, often based on a light source's intensity, spectral power distribution (color spectrum), and exposure duration. Ultimately, CS reflects how effectively the light exposure will suppress melatonin production, a hormone promoting sleepiness, and regulate your sleep-wake cycle. (Think of EML as a contributing factor to CS)

CIE D65

D65 is the spectral power distribution of standard daylight (CIE illuminant D65 [142]).

IES Light and Human Health committee

The IES Light and Human Health committee is working on summarizing state of the art research on the circadian, neuroendocrine and neurobehavioral effects of ocular light exposure; propose recommendations for the measurement, quantification and reporting of light in the context of these 'non-visual' responses to light; propose fundamental principles on the properties of light that should be considered in applications of light affecting circadian, neuroendocrine and neurobehavioral systems or more broadly, human physiology, behavior and health; review documents generated by the IES that are light and health related.

IES RP-46-24

Recommended Practice: Supporting the Physiological and Behavioral Effects of Lighting in Interior Daytime Environments.*

IES TM-18-18

Light and Human Health: An Overview of the Impact of Optical Radiation on Visual, Circadian, Neuroendocrine, and Neurobehavioral Responses.

CIE S 026/E:2018

CIE system for metrology of optical radiation for iprgc-influenced responses to light.