CIRCADIAN® Light for the 24/7 Workplace

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RPI-LESA and IES
Transforming Healthcare and Well-Being through Lighting Workshop

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Key concern of 24/7 Employers: Mitigating health risks of bio-active light at night

CIRCADIAN® Mission: Health, Safety and Productivity of 24/7 Workforce

Global leader in 24/7 workforce performance, health and safety solutions for 30 years

Serves over 50% of the Fortune 500 and many international 24/7 companies

Helps establish government policy and industry standards for the 24/7 workforce
Comparison of Two Methods for Assessing Circadian Bio-Active Spectrum

**CONVENTIONAL METHOD**

- Darkened Laboratory Setting
- People with Fixed Stare into Box (like ophthalmology examination)
- Short Pulses of Light (<90 minutes)
- Monochromatic Light
- Dilated Pupils
- Melatonin Suppression (short term)

**CIRCADIAN – FULL NIGHT SHIFT EXPOSURE**

- Well-Lit Room with workplace standard levels of 540 Lux (50-fc) at tabletop
- People freely Moving & Working
- Light exposure for Full 12-Hour Night Shifts
- Polychromatic White Light (using multiple SPDs)
- Normal pupils (No dilator drugs used)
- Total Melatonin Release (30 minute intervals all night)
Multiple SPDs of polychromatic white light tested for 24/7 human effectiveness

- **Controlled for:** Daytime Light Exposure, Work Schedule, Illumination (Lux), Diet and Environment
- **Simulation:** 24/7 day and night work shifts
  Full length 12-hour shifts

- Sleep Lab facility including EEG
- Blood tests (lipids, cardiac markers)
- Glucose Tolerance tests (Diabetes)
- 24 hour urine melatonin collection
- Salivary Melatonin 30 minute intervals
- Blood pressure
- Alertness & performance tests
- Mood and Depression scale test
- Human Subject testing under IRB approval

**LED product development guided and optimized by medical research**
Night Safe Light Standard: Bio-Active Irradiance Less than 5%
Bio-Active Blue Depleted Night LED vs. Conventional LED

Blue-Depleted White Light at Night Restores Melatonin

![Image of a room with blue-depleted white light]

Graph showing the comparison of Melatonin levels (pg/ml) over time of day between Night Spectrum LED and Conventional LED.

- **Night Spectrum LED**
  - Melatonin levels are higher and more synchronized with the biological day.

- **Conventional LED**
  - Melatonin levels are lower and less synchronized with the biological day.

**Time of Day**

- X-axis: 20:00 to 08:00
  - 20:00 to 22:00: Lower Melatonin levels.
  - 00:00 to 04:00: Melatonin levels peak.
  - 04:00 to 08:00: Melatonin levels decrease.

**Melatonin (pg/ml)**

- Y-axis: 0 to 12
  - 0 pg/ml to 12 pg/ml: Melatonin levels range from lower to higher.

**Key Points**

- Blue-depleted white light at night can restore melatonin levels.
- Conventional LED does not achieve the same effectiveness.

**Legend**

- Night Spectrum LED: Pink line with error bars.
- Conventional LED: Blue line with error bars.
Potential Impact of Fivefold Increase in Overnight Melatonin

**Breast Cancer Risk**
- Fivefold increase in nocturnal melatonin leads to a 60% decrease in breast cancer risk.

**Diabetes Risk**
- Fivefold increase in nocturnal melatonin leads to a 45% decrease in diabetes risk.

*Sources*
- Schernhammer & Hankinson (2009), PMID: 19124483
- Obayashi et al. (2013), PMID: 24328728