



Seeking Global End-Product Incoherent Optical Radiation Standards - Safety requirements, test methods, engineering controls, and marking

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Underwriters Laboratories Inc. (UL) Globally Certifies Residential and Commercial Products for Safety

- **The UL Mark stands for Underwriters Laboratories (UL), an independent, not-for-profit, nongovernmental organization that was formed in 1894 to help reduce injury, loss of life, and property damage.**
- **UL investigates and tests thousands of types of products, materials, constructions, and systems to evaluate their electrical, fire, and injury risks; their burglary or fire resistance; or their ability to detect, control , or limit fires.**
- **Behind the UL Mark is a global team of nearly 6,000 engineers, scientists, ,chemists, technicians, field representatives, and support staff – a team dedicated to public safety.**

Underwriters Laboratories Inc. (UL) Globally Certifies Residential and Commercial Products for Safety

- 20 billion UL marks appear on products annually
- UL conducted 97,915 evaluation of more than 19,000 different types of products
- UL has developed more than 1,000 safety standards
- 62 facilities worldwide constitute the UL family of companies



LEDs are Appearing Everywhere

- **UL certifies products that utilize LEDs**
- **These products are in many industries**
- **Luminaires, medical equipment, laboratory and measuring equipment, audio / video, signs, industrial controls, and ITE are just a few.**
- **Many of these industries currently use different optical radiation safety documents.**

Optical Radiation Safety Documents

- ❖ **The existing optical radiation documents are similar but not exactly interchangeable.**
- ❖ **ACGIH TLVs and BEIs, ANSI/IESNA RP 27 series, CIE IEC 62471 CIE S009, IEC 60825-9**
- ❖ ***No end-product standards***

Optical Radiation Safety Documents

- ❖ **ACGIH TLVs & BEIs are simply time vs. exposure levels**
- ❖ **RP 27 series expands upon ACGIH, adds lab practice, categorization, general labels**
- ❖ **IEC 62471 is similar to RP 27 series but an IEC format**
- ❖ **IEC 60825-9 similar to 62471 but early version with less information**

Optical Radiation Safety Documents

- ❖ **There are no product-specific testing methodologies**
- ❖ **There are no specific labeling and marking requirements**
- ❖ **There are no specific engineering controls**
- ❖ **There are no uniform permissible exposure times**

Optical Radiation Measurements

- **Radiance**
 - $\text{W/cm}^2/\text{sr}$
 - $\text{Lm/m}^2/\text{sr}$
 - cd/cm^2
 - nit
- **Irradiance**
 - W/cm^2
 - Lm/m^2
 - lux
 - foot candles
- **Power**
 - W
 - Lm
 - J
 - Lm·second
 - wavelength specific
 - erg
 - talbot
- **Intensity**
 - W/sr
 - Lm/sr
 - W (isotropic)
 - candela

Optical Radiation Source Measurements

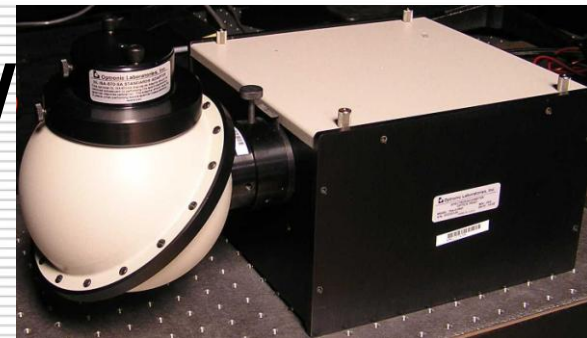
- ✓ **Discrete source**
 - ✓ LED
 - ✓ Light bulb

- ✓ **Multiple sources**
 - ✓ LED array
 - ✓ Multiple lamp luminaire

- ✓ **In a product**
 - ✓ Direct radiation
 - ✓ Reflected radiation
 - ✓ Partial obstruction
 - ✓ Source orientation, variation

Instrumentation

- Radiometer
 - Detectors
- Spectroradiometer
 - Scanning
 - CCD
 - Wavelength resolution / bandwidth



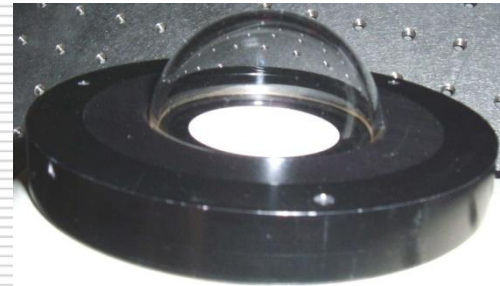
Input Optics

- Diffusers



- Filters

- Cosine correction



- Protective optics

- Monochromators

- Single
- Double



Correlation Testing

- **Manufacturers need to measure the “same” radiation levels that UL measures for certification.**
- **In the majority of the cases, the end-product levels are measured.**
- **Considerations need to be made for variations in all of the previously mentioned measurement parameters.**

Measurement Harmonization

- **UL & manufacturers need to take the same measurements using the same methods - no surprises.**

UL's Harmonization Effort

- **UL is comparing the requirements of 4 radiation safety documents.**
- ✓ **UL needs to survey OEM and end-product manufacturers to determine current measurement parameters and safety documents.**

UL's Harmonization Effort

➤ UL's Manufacturer Questionnaire

- ✓ Safety Standard(s)

- ✓ Test Methodology

- ✓ Laboratory conditions

UL's Harmonization Effort

- **UL would like to correlate the output of LEDs to traditional sources with regard to optical radiation hazards.**
- ✓ **This could provide a baseline - perhaps defining exempt parameters?**

UL's Harmonization Goal

- **UL is not looking to invent any new optical radiation safety requirements.**
- **UL's goal is to establish a specific set of requirements with specific test methods.**
- **OEM and end-product manufacturers response will help shape these parameters.**



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Thank You for Your Attention

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