UL & Photobiological Safety

Photobiological Safety North America – ANSI IESNA RP 27

All sources of illumination are characterized by an energy content distributed on a spectrum that can be defined as optical radiation.

The sources of illumination can emit both visible and invisible optical radiations composed of UV, IR, and, in the case of LED devices, blue light radiations.

Exposure to these optical radiations, distributed on a wide spectrum range, both in the visible and invisible field, may damage the skin and the eyes.

The primary aim of the photobiological safety standards is to protect the user from the harmful effects caused by optical radiations emitted by lighting devices installed in the rooms.

Within the European Union, the standards in the field of photobiological safety are IEC/EN 62471 and the more recent Technical Report IEC/TR 62778.

The American standard in the field of photobiological safety is ANSI IESNA RP 27.

UL Service

UL’s laboratory is equipped with the necessary instrumentation for the performance of radiometric detection in accordance with the European and American standards, namely IEC/EN 62471 and ANSI IESNA RP 27, for the definition of the optical radiation values in the spectrum comprised between 200 nm e 3000 nm, i.e. the level of UV, IR and blue light radiations. UL also has the necessary instrumentation to perform other measurements.

UL is also a certified testing laboratory for the IEC 62471 standard and can provide a complete test report to verify the photobiological effects and for the relevant group on the sources of lighting and on the lighting products in accordance with the IEC 62471 and ANSI RP 27 standards.

Effects of radiations on the human body
European Part IEC/EN 62471 – IEC/TR 62778

The evaluation of photobiological safety and, therefore, the various photobiological risks, as indicated also in the European Directive 2006/95/EC and in the Decree-Law No 81, shall be verified in accordance with the Safety Standard IEC/EN 62471.

Following the IEC/EN 62471 standard, by means of the appropriate radiometric measurements, it is possible to determine the various components of optical radiations and, therefore, to quantify and measure the amount of UV, infrared and blue light radiation emitted by the source of lighting which can be harmful for the skin and the eyes.

The measured values, together with the exposure times, determine the various “risk groups”:

- Risk group 0 – RG 0 (Risk free group)
- Risk group 1 – RG 1 (Low risk group)
- Risk group 2 – RG 2 (Medium risk group)
- Risk group 3 – RG 3 (High risk group even for short periods of exposure)

Lamps or LEDs or Lighting equipment for general purposes that fall within Risk Group 3 (RG 3) are not allowed.

IEC/TR 62778 Application of the IEC 62471 standard to lighting sources and equipment for blue light evaluation.

In 2012, answering to the market’s needs, the International Electrotechnical Committee published a new technical document named IEC/TR 62778 which allows some radiometric measurements performed on the source of illumination to be transferred to the final lighting device.

In particular, the document indicates that the photometric Radiancy measurements can be transferred from the LED module to the lighting device, since it has been demonstrated that Radiancy values, measured on a LED module, cannot be increased by the secondary optics (reflectors, screens) used in the lighting devices.

USA Part ANSI IESNA RP 27

The photobiological risk has been studied for many years in the United States. The European Standard IEC/EN 62471: 2006 is indeed based on the American document published in 2005.

The measurement methods, the spectral distribution limits (UV radiations infrared, blue light) and the radiometric values considered (irradiance and radiance) and the associated risks and exposure are very similar.

Some differences remain as regards the evaluation of the infrared IR and IR-A component.

The ANSI IESNA RP 27 document requires in particular that the lighting device manufacturer provides the user with all the necessary information for the use of said sources in a safety way.

The label must include a minimum content as for the precautions to be taken during the use of the device.

The document lays down that the device must carry a label containing at least the following information in a short or simplified form:

- A warning sign (caution)
- A reference to the potential risks (such as skin irritation, damage to the eyes)
- A list of precautions that must be taken to avoid such dangers (for example, the user must use a face shield to avoid looking at the lighting source)

A reference to the risk group to which the lamp belongs: ANSI RG1, RG2 ANSI, ANSI RG3, or RG-1, RG-2, RG-3

Lighting devices or lamps for general purposes belonging to RG 3 are not allowed.

The manufacturer of the device shall also provide, upon request, information on the spectral distribution throughout all the wavelength ranges comprised between 300 and 800 nm (extended to the range comprised between 200 nm and 1400 nm if the source produces harmful emissions within that field) in the following form:

1. power range of radiation, or
2. spectral radiance, or
3. spectral intensity, or
4. spectral irradiancy

The above-mentioned information is mandatory for the manufacturers of lighting devices, in order to optimize and provide for safe and efficient protection.