



FAQ on LED Lighting

With the phasing-out of incandescent lamps in many countries, the introduction of new LED based light sources and luminaires sometimes raises questions by the public on LED lighting. This FAQ answers questions often asked on LED lighting, questions on blue light hazard, question on other alleged health issues and questions on LED street lighting.

Part 1: General Questions

1. What is LED lighting?

LED lighting is a lighting technology based on light emitting diodes. Other conventional lighting technologies are: incandescent lighting, halogen lighting, fluorescent lighting and high intensity discharge lighting. LED lighting has several advantages over conventional lighting: LED lighting is energy efficient, dimmable, controllable and tunable.

2. What is correlated color temperature CCT?

Correlated Color Temperature (CCT) is a mathematical calculation derived from the Spectral Power Distribution (SPD) of a light source. Lighting in general and LED lighting specifically is available in various color temperatures. The color temperature is defined in degrees Kelvin, a warm (yellowish) light is around 2700K, moving to neutral white at around 4000K, and to cool (bluish) white around 6500K or more.

3. Which CCT is better?

There is no better or worse in CCT, only different. Different situations require solutions tailored to the environment. People around the world have different personal and cultural preferences.

4. Which CCT is natural?

Daylight is around 6500K and moonlight is around 4000K. Both are very natural color temperatures, each at their own time of the day or night.

5. Is there a difference in energy efficiency for the different CCT?

The energy efficiency difference between cooler and warmer color temperatures are relatively small, especially as compared to the significant efficiency gained by transitioning from conventional lighting to LED lighting.

6. Does LED lighting cause more discomfort glare?

Small bright light sources might appear glarier than large illuminated surfaces. LED luminaires with proper optics designed for the application do not cause more glare than other luminaires.

Part 2: Questions on Blue Light Hazard

7. What is blue light hazard?

IEC defines blue-light hazard as 'the potential for a photochemical-induced retinal injury resulting from electromagnetic radiation exposure at wavelengths primarily between 400 and 500 nm.'

It is well known that light, be it natural or artificial, can have an effect on the eyes. When our eyes are exposed to a strong light source for a long time, the blue light component of the spectrum can damage a part of the retina. Staring at a solar eclipse for a long time without any eye protection is a recognized case.

This happens quite rarely though, as people have a natural reflex mechanism to look away from bright light sources and will instinctively avert their eyes. The determining factors for the amount of photochemical damage of the retina are based on the luminance of the light source, its spectral distribution and the length of time over which the exposure has taken place.

8. Does LED lighting produce more blue light than other lighting?

LED lamps do not produce more blue light than other types of lamps of the same color temperature. The idea that LED lamps emit dangerous levels of blue light, is a misunderstanding. When they were first introduced, most LED products tended to have cooler color temperatures. Some have mistakenly concluded that this was a built-in characteristic of LED. Nowadays, LED lamps are available in all color temperatures, from warm white to cool, and are safe to use for the purpose for which they were designed. Products made by Lighting Europe members comply with the applicable European safety standards.

9. Which safety standards apply for radiation from light sources in the EU?

The General Product Safety Directive 2001/95/EC and the Low Voltage Directive 2014/35/EU requires as safety principles that with light sources and luminaires no danger from radiation can occur. In Europe, EN 62471 is the product safety standard for lamps and lamp systems and is harmonized under the European safety directives EN 62471, which is based on the international IEC 62471 standard, classifies light sources into Risk Groups 0, 1, 2 and 3 (from 0 = no risk through to 3 = high risk) and provides for cautions and warnings for consumers if needed. Typical consumer products are in the lowest risk categories and are safe for use.

10. How should the risk group classification for the Blue Light Hazard be determined?

The document IEC TR 62778 gives guidance on how to determine the risk group classification for lighting products. It also gives guidance on how to determine the risk group classification for lighting components, such as LEDs and LED modules and on how that risk group classification can be transferred to the final product. Making it possible to assess the final product based on the measurement of its components without the need for additional measurements.

11. Does LED lighting become dangerous over lifetime due to the ageing of the phosphor?

European safety standards classify products into risk categories. Typical consumer products are in the lowest risk category. The classification into risk groups does not change over the

lifetime of the product. Besides, although yellow phosphor degrades, the amount of blue light from an LED product will not change.

It is not expected that the absolute amount of blue light radiated from an LED will increase due to degradation over life of the yellow phosphor. The photo biological risk will not increase beyond the risk established at the beginning of the product lifecycle.

12. Which people are more sensitive to blue light hazard?

A child's eye is more sensitive than an adult's eye. However, lighting products used in homes, offices, stores and schools do not produce intense and harmful levels of blue light. This can be said for various product technologies, such as LED-, compact or linear fluorescent- or halogen lamps or luminaires.

LED lamps do not produce more blue light than other types of lamps of the same color temperature. People with blue light sensitivity (such as lupus) should consult their health care provider for special guidance on lighting.

13. Is all blue light bad for you?

Blue light is important to our health and well-being, especially during day-time. However, too much blue before you go to sleep will keep you awake. Therefore, it is all a matter of having the right light, at the right place and at the right time.

Part 3: Questions on other alleged health issues

14. Does LED lighting impact the circadian rhythm of people?

All lighting can support or disturb the circadian rhythm of people, when applied right or wrong respectively. It is a matter of having the right light, at the right place and at the right time.

15. Does LED lighting cause sleep problems?

All lighting can support or disturb the circadian rhythm of people, when applied right or wrong respectively. In this regard, having too much blue before you go to sleep, will keep you awake. It is therefore a matter of striking a balance between the right light, at the right place and at the right time.

16. Does LED lighting cause fatigue or headaches?

LED lighting immediately reacts to variations in the electricity supply. These variations can have multiple root causes, such as the light source, the driver, the dimmer, mains voltage fluctuations. The unwanted light output modulations are called temporal light artefacts: flicker and stroboscopic effect. Inferior quality LED lighting might cause unacceptable levels of flicker and stroboscopic effect which may then cause fatigue and headaches and other health issues. Decent quality LED lighting does not have this problem.

17. Does LED lighting cause cancer?

Sunlight contains UV-A and UV-B radiation and it is confirmed that UV lighting can cause sunburn and even skin cancer when too much radiation has been received. People protect themselves by wearing clothes, using sun creams or staying in the shadow.

The safety standards as mentioned above contain also limits for UV radiation from artificial lighting. Products made by LightingEurope members comply with the applicable European safety standards.

The majority of LED lighting for general lighting purposes does not contain any UV radiation. There are few LED products on the market that are making use of UV LEDs as their primary pump wavelength (similar to fluorescent lamps). These products should be checked versus the threshold limit.

There is no scientific evidence that shows radiation other than UV causes any cancer. There are studies that show shift workers have an increased risk to develop cancer due to the disturbance of their circadian rhythm. The lighting used when working at night is not a cause for the increased risk, merely simply a correlation because people cannot perform their tasks in the dark.

Part 4: Questions on LED street lighting

18. Does LED street lighting changes the atmosphere of an illuminated location?

LED street lighting is available in all color temperatures, from warm white light, to neutral white light and cool white light. Depending on the previous illumination (with conventional lighting) people might be used to a certain color temperature and thus notice a difference when LED lighting of another color temperature is installed. You can keep the existing atmosphere by choosing a similar CCT. The atmosphere can be further improved by a proper lighting design.

19. What is light pollution?

Light pollution is a broad term that refers to multiple problems, all of which are caused by inefficient, unappealing, or (arguably) unnecessary use of artificial light. Specific categories of light pollution include light trespass, over-illumination, glare, light clutter, and sky glow.

Light pollution is a major side-effect of urbanization.

20. Does LED lighting cause more light pollution than other lighting?

The use of LED lighting does not lead to more light pollution, not when the lighting application is well-designed. On the contrary, when applying well-designed LED street lighting you can be sure to effectively control scatter and glare while having far greater impact on reducing high angle brightness and light pollution. Proper optics for LED street lighting will direct the light only to the location where it is needed and not in other directions. Dimming of LED street lighting when traffic is low (in the middle of the night) further reduces light pollution. Therefore, proper designed LED street lighting causes less light pollution.

21. Does LED street lighting cause sleep problems?

The disruptive effect of light on sleep depends heavily on the amount of light, the timing, and duration of light exposure. Typical street lighting illuminance is around 40 lux at street level. Research shows that that the typical human light exposure produced by LED street lighting is too low to affect the hormone levels governing our sleep behavior.

22. Does LED street lighting cause sleep problems when you sleep in your bedroom?

Typical street lighting illuminance is around 40 lux at street level. Light levels of street lighting entering your bedroom are less when you close your curtains. Research has shown that closed

eyelids will further attenuate the light reaching the eye by at least 98%. Thus, when sleeping with our curtains and eyes closed, light exposure produced by LED street lighting is far too low to affect the hormone levels governing our sleep behavior.

23. Does LED street lighting cause circadian disturbances?

No. If properly designed and applied, LED lighting will provide its advantages and you can avoid potential unwanted side effects.

24. Does LED street lighting cause an increased health risk to pedestrians?

LED street lighting causes no increased health risk to pedestrians compared to other light sources. LED and other types of street lighting create more safety for pedestrians as car drivers are more likely to see the pedestrians in time which enables them to avoid accidents.

25. Does LED street lighting cause an increased risk of cancer to pedestrians?

There is no indication that LED or any other type of street lighting can cause any increased risk of cancer to pedestrians. The light intensity that pedestrians get from typical street lighting is relatively low and the typical exposure duration is also short.