Health & Safety – Optical Radiation

– when common sense isn't enough

In the physics lab, the teacher is demonstrating the photoelectric effect using a UV sterilising wand (Figure 1) bought for a few pounds from the internet. Her colleague prefers to use a halogen car headlight bulb. Next door, a biology colleague uses a blacklight (Figure 2) clamped in a stand to examine the effect of ultraviolet light on yeast. Downstairs, an English teacher looks on as a third year delivers her solo talk, illustrated by slides projected on to an interactive whiteboard. Nearby, a geographer uses a laser pointer to indicate the area on a map where an earthquake recently occurred. It's an everyday story of optical radiation in schools, but which of the above teachers are putting themselves or their pupils at risk?

The answer could be "all of them" or "none of them", depending on the control measures adopted by the teachers. One problem is that common sense isn't always enough when it comes to keeping safe and meeting legal directives [1]. For example, halogen headlights produce UV light but this is not usually a safety issue because they are generally behind glass covers in cars. If they are not, they need to be shrouded so that observers are not irradiated by light that is potentially damaging to their skin or eyes. A blacklight (*Figure 2*), which is often used to show up security markings, gives out a different type of radiation from that emitted by a sterilising wand. The latter is far more hazardous to the skin or cornea.

The SSERC team has just finished drafting guidance to schools on using optical radiation safely [4]. All common school sources are covered. Our advice is based on information in British Standards [2] and from the Health Protection Agency's work [3]. Assessments have involved examining not just the irradiance of sources, but also the spectral distribution (*Figure 3*) of the light emitted and the dimensions of the lamp too.

The results of this work will be available in a downloadable document on our science3-18.org website [4]. Some of the advice may be surprising. When we repeated the HPA's assessment of a blue Lumiled LED, for instance, we too found that, were a pupil to stare directly at it, the exposure limit for retinal damage would be reached in around 30 seconds. Not only that, the effect is cumulative, so the limit would be breached, for example, by two exposures of 20 seconds each within an 8 hour period. We say this not to instil panic, rather to encourage teachers to have a look at our advice and continue to do safe, engaging, intriguing work with optical radiation.

Figure 1 *- A UV sterilising wand. It's cheap, but is it safe?*

Figure 2 *- Don't do this if the black light is switched on!*

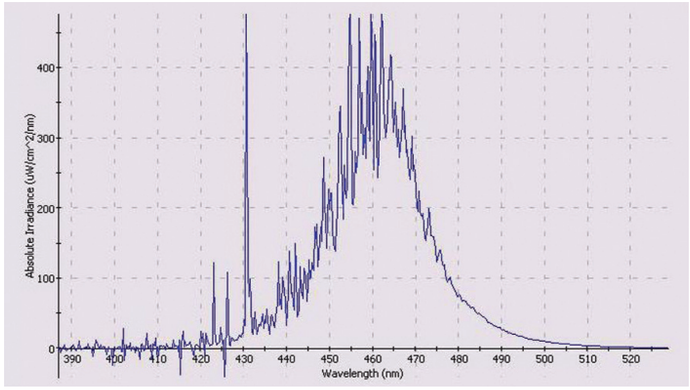

Figure 3 *- Spectral distribution of light from a blue Lumiled LED.*

References

[1] DIRECTIVE 2006/25/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation)

[2] BS EN 62471:2008 Photobiological safety of lamps and lamp systems

[3] A Non-Binding Guide to the Artificial Optical Radiation Directive 2006/25/EC, Radiation Protection Division, Health Protection Agency

[4] http://www.sserc.org.uk/members/SafetyNet/Physics/SSERC_Optical_radiation_safe_use.pdf