PROTECTIVE EYEWEAR→ NOT ALWAYS THE ANSWER

The last line of defense for protection against dangerous laser radiation is the use of protective eyewear. Eyewear is needed when engineering controls like beam enclosures, beam isolation, beam barriers, and beam stops are not sufficient to adequately control laser hazards. Unfortunately, there are some instances in which protective eyewear selection is a challenge, and occasionally, not a viable option at all.

Recently I learned of an experiment to be conducted in the School of Engineering which will involve two laser systems operating at the same time with the two beams combined. One laser is a 1.5 Watt Argon laser emitting radiation at 488 nm (blue light) and 514 nm (green light). The other laser is a 1.5 Watt solid state laser emitting radiation at 655 nm (red light). Since blue, green and red light would effectively need to be eliminated by protective eyewear, the only visible light that would remain would be orange and yellow light. I could not find any available single pair of protective eyewear that would work for this application.

One solution would be to obtain one pair of laser glasses that is sufficiently protective for the red light, and another pair that is sufficiently protective for the blue and green light, and then wear them both at the same time – one pair over the other pair. I was able to identify two pairs of eyewear to meet these specifications. The main problem with this solution is that since only orange and yellow light is transmitted through the two pairs of laser glasses, the visible light transmission is on the order of about 10% or even less, similar to dark sunglasses. Since quite a bit of laser work on campus is conducted under dim room lights conditions, there could be tripping/falling hazards if the laser user cannot safely navigate in the lab with such limited vision.
Another laser system for which laser eyewear is not practical is the “white light laser”, which emits radiation across the entire visible light spectrum.

Thus, there are some instances in which the use of protective eyewear is not possible. In those cases, it is necessary to augment engineering controls such as beam enclosure and beam isolation to adequately control laser hazards.

UNATTENDED LASER SYSTEMS

It can be very dangerous to leave laser systems operating and unattended. This is especially the case for open-beam setups and systems that emit invisible laser radiation – such as very dangerous near-infrared laser radiation.

There have been incidents reported on campus in which Facilities Management staff and janitorial personnel have entered laser labs and encountered laser systems operating with nobody present to instruct them about the hazards. People not trained in laser hazards can easily enter into dangerous areas where eye or skin exposures can occur.

If you must leave a laser system running when nobody is present, always post “Do Not Enter” signs on the lab doors to keep visitors away, and notify others in your research group that they must not enter the laser area without proper precautions, such as the use of protective eyewear.
REPORT ALL LASER INCIDENTS!

It is vitally important to report any incidents/accidents that involve lasers to your supervisor. These include: eye exposures, including flashes of light into your eye even if there doesn’t seem to be any discomfort or blind spot associated with it; skin burns; unauthorized use of a laser system; unauthorized entry into a lab during laser use (such as by janitorial staff); electrical shock; tripping in the dark; stray reflected light noticed on the walls or ceiling; and persons working with lasers and not wearing protective eyewear. If an injury is suspected, report the incident to the UC Irvine Laser Safety Officer, as well (Rick Mannix, 949-824-6098, rcmannix@uci.edu). Accidents, injuries, and safety-related incidents or concerns can also be reported to EH&S online at this web link: https://www.ehs.uci.edu/apps/hr/index.jsp.

Once incidents such as those mentioned above are reported, corrective actions need to be taken immediately. In the case of an injury, a medical examination and treatment are needed (http://www.ehs.uci.edu/MedEmergPoster.pdf). If there was stray laser radiation noted, the source of the stray radiation needs to be eliminated. If unauthorized personnel have entered the laser use area, warning signage needs to be augmented. If an electrical shock occurred, no matter how minor, the electrical problem/s must be fixed. If tripping is an issue, tripping hazards on the floor need to be removed. If persons are not wearing protective eyewear, they need to be instructed that eyewear is required if there is a reasonable likelihood of eye exposure to a harmful level of laser radiation. All laser incidents provide lessons-learned opportunities in that other people in your lab and in other campus labs can learn from the mistakes that were made and not repeat them.

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MEMORABLE QUOTE

"In physics, you don't have to go around making trouble for yourself -- nature does it for you."

Frank Wilczek (1951-) American Physicist

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If you have any questions concerning laser safety, please contact Rick Mannix from EH&S (949-824-6098; rcmannix@uci.edu).

BE SAFE!