LASER BEAM

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UC IRVINE LASER SAFETY NEWSLETTER

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The purpose of this newsletter is to keep laser operators on campus informed regarding laser safety news, bargains on laser safety equipment (including protective eyewear), methods for controlling laser hazards, lessons learned from laser accidents, and other tips to improve safety. These newsletters are distributed approximately every 6 months or whenever a laser safety issue with significant urgency arises. For past issues of this newsletter, please visit the UC Irvine Environmental Health & Safety website (www.ehs.uci.edu) and look under "Radiation & Laser Safety".

SELF-TRAINING IN LASER OPERATION

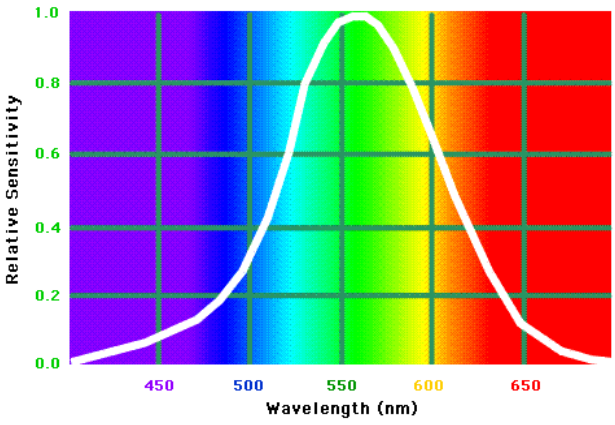
During my annual visits to laser laboratories on campus I always speak with the laser users there about the hands-on/on-the-job laser training that they have received, including the safety aspects of laser use. On several occasions, I have been told that laser supervisors provided little or no direct hands-on training regarding safe operation of the lasers. Apparently, this is because the supervisors themselves were trained this way – they were simply provided with the laser system equipment manuals and pointed in the direction of the lasers. This practice should be strongly discouraged. **Laser operations (such as beam alignments) can be very complex; generally, considerable training and hands-on experience are needed before new operators feel comfortable and capable of performing these manipulations safely.** The hazards attendant to this self-training practice and the substantial liability issues involved should be emphasized to laser supervisors who adhere to this philosophy.

Trainers need to keep in mind that trainees will likely adopt most if not all of the habits of the trainers. Thus, if the trainer is not good about wearing protective eyewear and following very safe practices, it is likely that the trainees will perpetuate their poor example and probably even pass on the poor safety habits to new laser users who they train.

GREEN LASER POINTERS – ARE THEY MORE DANGEROUS?

Laser hazards and laser safety classifications depend upon the wavelength of the laser radiation and the beam power. For wavelengths within the visible light spectrum where the cornea, aqueous humor, lens, and vitreous humor of the eye are relatively transparent, 1 milliwatt (mW) is the same power whether it is red, blue, or green light. There will be slight differences in damage threshold depending upon the wavelength (spot size on the retina, slightly different light absorption) but green is really not any more dangerous than red, mW per mW, for light that reaches the retina of the eye. **Since green light from laser pointers at 555 nanometers (nm) appears to be about 30 times brighter than red light at 670 nm from red laser pointers, the green laser may actually be slightly less of a hazard since you will likely respond to it faster (by way of the bright light aversion response/blink reflex).**

The maximum safe exposure levels for both red and green laser radiation are exactly the same (these are called Maximum Permissible Exposure [MPE] levels in the ANSI Laser Safety Standard). Thus, for laser safety purposes, if you have a 3 mW red laser pointer or a 3 mW green laser pointer, there is not much of a difference in safety. Since the green laser radiation is at a wavelength that is more readily seen, the green laser pointer will appear brighter even for the exactly same power. *See the retinal light sensitivity graph below with visible light wavelengths in nm.*



Note: **Some very powerful green laser pointers are currently manufactured. If you will be acquiring one for use in presentations, etc., make sure that you buy one that is a Class 3a laser (beam power < 5 mW).** Those are safe for general use and the only way you can permanently damage your eye with one is if you intentionally stare into the beam for a prolonged period of time. However, much more powerful Class 3b green laser pointers (5 mW > power < 500 mW) are made which can do some serious damage to human and animal retinas. *Regardless of the beam power, be sure to never use a laser as a toy, and don't not let children play with them.*

MEMORABLE QUOTE

"There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

Mark Twain, American Writer

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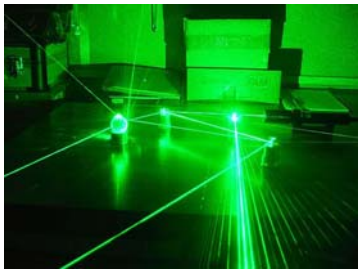

AVOIDING STRAY LASER RADIATION

Below are some tips regarding minimizing stray laser radiation in your laboratory:

- Remove unused optics from anywhere near the laser beam. They can easily be sources of stray radiation off of the optical table.
- Remove anything shiny from your hands and lower arms. This includes wristwatches, rings, bracelets, etc. There have been laser accidents reported at other institutions in which laser radiation reflected off of shiny items on hands and struck persons in the labs in the eye.
- Be careful when using shiny tools such as flat-head screwdrivers near laser beams.
- To the extent possible, isolate laser use areas from other areas of the lab using laser curtains or beam barriers.

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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!