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# UC IRVINE LASER SAFETY NEWSLETTER

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VOLUME VIII, #2

June 2008

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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](http://www.ehs.uci.edu)) and look under "Radiation & Laser Safety".*

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## INSERTING OPTICS INTO A LASER BEAM

**Always be sure to block the laser beam before inserting new optics such as mirrors into the beam path.** The process of inserting an optic directly into a beam can often produce unwanted reflections that can potentially injure the laser operator or other persons in the room. There was a case at a university in the eastern United States a few years ago in which a person 30 feet away from an optical table was struck in an eye by laser radiation reflected off a mirror inserted directly into a beam by a co-worker. If the emergent beam diameter (at the laser aperture) is 1 cm and the beam divergence is 1 milliradian, the beam diameter at 914.4 cm (30 feet away) would be:

$$\text{Beam diameter} = 1 \text{ cm} + (914.4 \text{ cm}) (1 \times 10^{-3} \text{ radian}) = 1.9 \text{ cm}$$

*Thus, the beam diameter would have less than doubled in diameter from the aperture diameter after traversing a 30 foot distance!* Therefore, do not believe that people who are far across the room from your optical table are safe from laser radiation generated at your workstation.



## LASER SAFETY REFRESHER TRAINING

All new laser users on campus are required to take the *Laser Safety [Online]* course which is offered via the UC Irvine Training & Employee Development website ([www.ted.uci.edu](http://www.ted.uci.edu)). Persons who are still operating lasers here 5 years later are required to review the online course again as a refresher. However, there is a test-out option for each module of the course so that if desired, people can skip to the competency assessment at the end of each module. If a passing score is achieved on the assessment for that module, then it is not necessary to view the slides in the module. *But EH&S highly recommends that the entire course be viewed as a reminder of some very important laser safety principles.*

Persons who previously attended a classroom-type *Laser Safety Seminar* are advised to take the *Laser Safety [Online] Course* since it contains updated laser safety information and goes into much greater detail on some important aspects of laser safety than was included in the seminar. The 5 laser accidents which occurred here since 1994 are described in the final module so that laser users here can learn from the mistakes that were made by others and won't repeat them.

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### MEMORABLE QUOTE

**"Almost all really new ideas have a certain aspect of foolishness when they are first produced."**

Alfred North Whitehead (1861 - 1947); English Mathematician



## MIXING UP SUNGLASSES AND LASER SAFETY EYEWEAR

**Do not bring sunglasses into your laser lab that look anything like your laser safety eyewear.** That can potentially cause very serious problems. People who are wearing eyewear that they believe to be protective which in reality is not can lead to unsafe acts since the person believes he/she is adequately protected!

The eyewear above on the left is \$39 fitover-type sunglasses (fits over regular prescription glasses). It passes about 15% of visible light, implying that it has an optical density of less than 1 for the visible light spectrum. The eyewear on the right is \$210 Nd:YAG laser eyewear with an optical density greater than 6 at all of the Nd:YAG harmonics (266 nm, 355 nm, 532 nm, 1064 nm). You can see that the two pairs of glasses look nearly identical.

Before putting on laser eyewear, always check to make sure it is sufficiently protective for your laser application. *The wavelengths at which protection is afforded and the related optical densities (ODs) are always imprinted on the eyewear.* The sunglasses above only say “UVA and UVB protection” on them. Since they are polycarbonate, they would likely be protective for ultraviolet-emitting lasers (200 nm < wavelength < 380 nm). But it is much safer to use laser safety eyewear that has been fully tested to ensure that it is adequately protective for your ultraviolet laser.

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## EMERGENCY MEDICAL TREATMENT

If you have a laser accident on campus which you suspect could have damaged your eyesight, please refer to the *UC Irvine Injuries & Medical Treatment* document at the link below. The daytime and after-hours/weekend medical treatment centers differ depending upon whether you are a graduate student, an undergraduate student, or an employee (including a student employee). *Keep in mind that if an eye injury is suspected someone else needs to transport you for treatment since your vision has been affected.*

<http://www.ehs.uci.edu/MedEmergPoster.pdf>

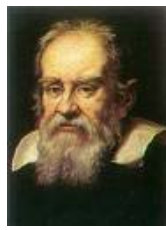


## **STRAY LASER RADIATION – AVOID SAFETY PROBLEMS!**

Laser radiation which leaves the plane of the optical table either vertically or horizontally is called “stray laser radiation”. It can injure the laser operator and/or others in the room. Below are some simple steps to follow to avoid stray radiation:

- ❖ Never direct laser beams in an upwardly direction unless there is a beam block above the beam and the upward beam path is short (not enough room for a person to get his/her eyes into the beam).
- ❖ Never direct a laser beam across an aisle or walkway.
- ❖ Remove unneeded reflective optics such as unused mirrors from the optical table.
- ❖ Be careful when using shiny tools such as polished wrenches and screwdrivers near the beam.
- ❖ Keep everything potentially reflective off of your hands and lower arms during laser operation. This includes rings, wristwatches, bracelets, etc.
- ❖ Enclose as much of the laser radiation generated as possible with beam barriers installed around the optical table.

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### **MEMORABLE QUOTE**

" You cannot teach a man anything; you can only help him find it within himself."

*Galileo Galilei (1564-1642); Italian Physicist and Astronomer*

June 2008



Card Style



Disc/Wand



Bench Mount

## INDIRECT BEAM DETECTION

There are several products available which allow for the indirect visualization of laser beams. Among them are laser alignment phosphor products such as those pictured above. Depending upon the type of phosphor chosen, these products can be useful for detecting ultraviolet, visible or infrared laser radiation. They often come in three varieties as shown – a card style, a disc/wand style, and a bench mount style. Two of the major advantages of using these products are:

- ❖ The laser operator is not relying on his/her eyes to view a laser beam, which in many cases is unsafe.
- ❖ The phosphorescence from the sensitive surface of the products is at a different wavelength than the laser beam wavelength, meaning it is often possible to wear protective eyewear and still see the beam via the phosphorescence.

Some websites pertaining to these products are listed below. Other similar products are also available:

<http://www.edmundoptics.com/onlinecatalog/displayproduct.cfm?productid=1613>

<http://www.appscintech.com/products/visualize.html>

[http://www.laser2000.co.uk/test\\_&\\_measurement.php?sub=23](http://www.laser2000.co.uk/test_&_measurement.php?sub=23)

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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](mailto:rcmannix@uci.edu)).**

 **BE SAFE!**