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 this campus informed regarding laser safety news, bargains on laser safety equipment (including protective eyewear), novel/inexpensive 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".

LASER ACCIDENT EMERGENCY PROCEDURES

In the event that you or somebody else in your laser laboratory suffers an eye injury or a serious skin injury, please follow the procedures below:

- Immediately turn off the laser involved, unplug it, and quickly post a prominent notice stating *"Do not use – laser accident"* or an equivalent cautionary statement to ensure it is not used again until it can be determined that it is safe.

- Keep the injured person calm. If a retinal injury is suspected and there is bleeding inside of the eye, keep the injured person in an upright seated position.

Note: Symptoms of thermal injuries caused by visible and infrared laser beams are apparent right after the exposure. However, symptoms of photochemical injuries caused by ultraviolet laser beams take time to develop just as they do following overexposures to the sun (sunburns). The full extent of this type of injury might not be known for up to 24 hours.

- Arrange for transportation of the seriously injured person for medical evaluation and treatment. The victim might be in shock or have impaired vision so self-transportation is a bad idea. See the *UC Irvine Injuries and Medical Treatment* flyer (http://www.ehs.uci.edu/MedEmergPoster.pdf) for locations of emergency medical treatment. Call 911 if necessary.
- If the Principal Investigator responsible for the laser involved in the accident is not present at the time of the injury, he/she must be notified as soon as possible.
- Finally, contact me, Rick Mannix, the UC Irvine Laser Safety Officer (949-824-6098 office; 949-293-7021 cell), so that I can conduct an investigation of the accident and certify that the laser system is safe to operate again. I can be reached off-hours through the UC Irvine Police (949-824-5222).

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CLEAR LASER SAFETY GLASSES

Some lenses for protective laser safety glasses are so dark that it can be difficult to navigate laser laboratories and perform studies while wearing them particularly if the experiments are performed under dim light conditions, which is sometimes the case. This is generally not a concern when ultraviolet-emitting lasers (190 nm < λ < 380 nm) and far-infrared lasers (λ > 3000 nm) are used since the glasses for those applications are often clear or nearly so. But lens darkness can be a problem particularly when visible-beam lasers and near-infrared lasers are operated.

Some laser eyewear vendors sell clear protective eyewear to address this problem. Unfortunately, the advanced technology used in constructing the clear lenses tends to make the eyewear more expensive to purchase than eyewear with standard darker lenses. Clear and high visibility eyewear options can be found by clicking on the links below or contact me for more information about clear laser safety glasses.

http://www.lase-rshield.com/uvexlgt.html#clt

http://www.glendale-laser.com/whatsnew/whatsnew.asp?id=9

http://www.cascadelaser.com/PDF%20files/safety_eyewear.pdf



MEMORABLE QUOTE

"If it's green or wriggles, it's biology.
If it stinks, it's chemistry.
If it doesn't work, it's physics..."

Anonymous

LASER OPERATIONS WHEN TIRED OR RUSHED

There have been four laser accidents on the UC Irvine campus since 1994. Perhaps surprisingly all four occurred outside of normal work hours. Three accidents occurred at night or in the evening and one happened on a Saturday. Two possible explanations for this are that the persons were either tired due to the lateness of the hour or were rushing to finish a laser experiment in order to enjoy the remainder of the evening or weekend with family or friends, or to just relax.

Never operate lasers when you are tired or cannot concentrate adequately for some other reason including preoccupation with another problem, being ill and taking alertness-affecting medication, consumption of alcohol, etc. For example, it would not be a good idea to operate a laser if you were just awake all night studying for a final exam.

Before initiating a laser experiment make sure that you have the time to complete it safely. If insufficient time is available and you will need to take unauthorized and unsafe shortcuts to complete it during the session, wait for another day/time to conduct the study.

FIRE SAFETY REGARDING BEAM CONTAINMENT

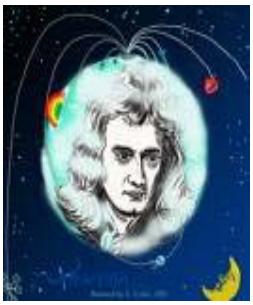
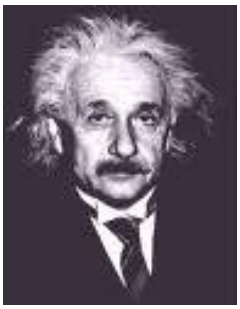
Never use ignitable materials such as posterboard, cardboard, or wood for beam containment when operating high power (> 1 Watt) visible or infrared lasers. This includes materials for beam barriers, beam stops and beam enclosures particularly when the containment material can be exposed to an irradiance of 10 Watts/cm^2 or greater. We have had two small fires on campus related to the use of improper beam containment materials but fortunately both fires were quickly extinguished without any damage to the laboratories or equipment. The best material to use for high power beam containment is metal painted jet black. Ideally, the metal should be roughed with steel wool prior to painting in order to texture the surface to absorb and diffuse laser beams.

The "Cadillac" of laser barrier materials is Ever-Guard® supplied by Ketek. It is lightweight metal painted jet black and dimpled throughout to diffuse laser beams; it can handle 1200 Watts/cm^2 for several minutes with no melting:

http://www.kenteklaserstore.com/ever-guard-barriers_309.aspx

This material is expensive (~ \$35/ft^2) but a similar barrier can be fabricated in your laboratory or in one of the campus machine shops for a considerably reduced cost. I have a small sample of Ever-Guard® if you would like to try to duplicate it.

Ultraviolet beams (λ < 380 nm) do not present the risk of fires since they interact with materials photochemically rather than thermally. Metal beam containment is not needed for those beams.


MEMORABLE QUOTE

We live in a Newtonian world of Einsteinian physics ruled by Frankenstein logic.

David Russell

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

✌ **BE SAFE!**