



UCI LASER SAFETY NEWSLETTER

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The purpose of this newsletter is to keep laser operators on the UCI campus informed regarding laser safety news, bargains on laser safety equipment (including protective eyewear), novel/inexpensive methods for controlling laser hazards, lessons learned (laser accidents), tips to improve safety, etc. These Newsletters are distributed approximately every 6 months, or whenever a laser safety issue with substantial immediacy arises.



LASER ALIGNMENT SAFETY HINTS

Most laser accidents occur while lasers are being aligned. That is because it is during the alignment process that optical elements such as mirrors need to be manipulated - thus increasing the likelihood of stray radiation - and also because protective eyewear is often not worn during the alignment of visible beam lasers because it is deemed to be necessary to see the beam in order to locate and properly position it.

Below are several simple ways in which you can greatly reduce the likelihood that you will suffer a serious eye injury while aligning a laser:



1. IF POSSIBLE, ALIGN HIGH-POWER LASERS (ESPECIALLY THOSE WITH *INVISIBLE BEAMS*) USING LOW-POWER, VISIBLE-BEAM LASERS.

Rather than undertake a risky alignment procedure using a high power laser, it is far better to use a low power visible-beam laser, such as a HeNe or diode laser (e.g., a *laser pointer*), to perform the alignment. The beams from these lasers are relatively harmless, and they are well suited for the visual alignment process.

2. WHEN PERFORMING AN ALIGNMENT PROCEDURE, REDUCE THE LASER POWER AS MUCH AS POSSIBLE -- IDEALLY, TO AN AVERAGE POWER OF 5 MILLIWATTS OR LESS.

Doing this in effect converts your laser into a laser pointer with regards to emitted power. An alignment can be done very safely this way, and if a stray radiation incident does occur (laser radiation escapes from the plane of the optical table), the chance that an eye injury could result from this is essentially zero.

3. WEAR ALIGNMENT-TYPE PROTECTIVE EYEWEAR WHEN ALIGNING VISIBLE BEAM LASERS.

Several distributors sell protective eyewear specifically designed for use during the alignment of high power visible laser beams. **This eyewear has insufficient optical density to make the beam completely invisible and *totally* protect the wearer, but a high enough optical density such that the consequences of eye exposures, should they occur, would be greatly reduced.** The optical density of alignment eyewear is normally on the order of 2, meaning that only 1% of the radiation can pass through the eyewear.

Please note then that alignment eyewear will often not be totally protective and higher optical density eyewear is generally needed to provide complete protection. If you would like more information on alignment eyewear, contact Rick Mannix at rcmannix@uci.edu, or at x4-6098.

4. USE SAFE ALTERNATIVE MEANS OF LOCATING LASER BEAMS.

Several alternative methods are commonly used to locate laser beams. Among them are beam cards and infrared viewing scopes. Specially-treated paper cards capable of locating visible and infrared beams are available from some laser safety supply distributors, and regular white paper can often be used to locate ultraviolet radiation (via blue fluorescence off the white paper where it is struck by the beam). Several vendors sell the infrared scopes, which are very useful devices.



MEMORABLE QUOTE

Genius is one percent inspiration and ninety-nine percent perspiration.

Thomas Alva Edison (1847-1931)

NON-BEAM HAZARDS

While most of the injuries related to the use of lasers have been eye injuries, all of the laser-related fatalities have been due to non-beam hazards, such as those described below:

1. Electrical Hazards

There have been at least 15 deaths in the United States during the past 20 years caused by *electrocutions* that have occurred while laser high voltage power supplies have been serviced or repaired. A great deal of care must be exercised during such work, and **only qualified, experienced personnel may undertake these tasks.**

It is always best to use the “*buddy system*” when work is performed on a high voltage power supply. If this is done, somebody else will be present to assist in case of an accident, and that person can free the injured person from the energized circuit and call 911. Ideally, the standby person will have been trained in **Cardiopulmonary Resuscitation (CPR)** and can render that aid, if needed.

2. Toxic Gases

Excimer lasers employ the use of F₂ or Cl₂ gas in their active laser media. These gases are very irritating and toxic. The gas cylinders should always be stored in ventilated gas cabinets. If that is not possible, then sufficient care must be taken to ensure that the cylinders are not leaking. In some cases, F₂ or Cl₂ gas alarms might need to be utilized.

3. Toxic dyes and solvents

Liquid dye lasers involve the use of potentially hazardous dyes and the organic solvents which are used to dissolve them. **Many of the dyes are toxic, mutagenic, and/or carcinogenic.** These dyes must always be prepared in a properly functioning fume hood by a person wearing appropriate protective attire (safety glasses, a labcoat, and disposable gloves).

4. Fire hazards

High power visible and infrared laser beams can ignite flammable materials. Care must be taken to ensure that fire *proof/fire resistant materials* are used in all structures that can be struck by these laser beams. Flammable solvents must not be used or stored near these lasers.

5. Laser-generated air contaminants

Particles and gases can be emitted when high power laser beams strike some surfaces. Some of these emissions can be very toxic. **Local exhaust systems should be used to aspirate these air contaminants to keep them from being inhaled by personnel.** In some cases, respirators might need to be worn to provide adequate protection.

MEMORABLE QUOTES



**If I have seen further it is by standing on the shoulders of Giants.
*Isaac Newton (1642-1727)***

**If I have not seen as far as others, it is because giants were standing
on my shoulders.
*Hal Abelson (unknown)***



**If you have any questions concerned with laser safety, please contact Rick Mannix
of EH&S (x4-6098; rcmannix@uci.edu).**

 **BE SAFE!!!**