



Laser use can create intense concentrations of heat, ultraviolet, infrared, and reflected light radiation. Unprotected laser exposure may result in eye injuries including retinal burns, cataracts, and permanent blindness. An appropriate eye protection must be used at all times when working with lasers. The selection of laser protection should depend upon the lasers in use and the operating conditions.

CLASSIFICATION OF LASERS and HAZARDS: Wavelength and power determine the Class of the laser. Totally enclosing the beam in an interlocked enclosure lowers the hazard Class. The table below summarizes the different laser Classes and their hazards:

Class 1	Eye safe Lasers (no label needed). Considered incapable of causing injury to eyes and skin; not a fire hazard. Class 1 lasers are not encountered in a research setting.
Class 2 & 2a	Safe through the aversion response. Lasers in the visible spectrum that will not cause eye injury due to aversion response of eye (blinking or turning away from the beam). Although low hazard but NOT intended to be viewed directly
Class 3a & 3b	Intrabeam and specular reflection hazard. Lasers in the UV-visible-IR spectra capable of causing injury through intrabeam viewing or specular reflection for <0.25 seconds.
Class 4	Diffuse reflection and fire hazards. Class 4 lasers present the same hazards of Class 3 lasers, but have more output power. Due to the increased power, <i>diffuse</i> reflections cause both eye and skin damage. They also present fire hazards

BEAM HAZARDS: Always protect the eyes from exposure to laser beams. Choose laser goggles with wavelength-specific lenses and opaque non-lens components. **Eye exposure is most likely to occur during beam alignment.** NEVER UNDER ANY CIRCUMSTANCES LOOK DIRECTLY INTO THE LASER BEAM.

Spectrum	Effect of exposure on eye	Effect of exposure on skin
200 – 400 nm: Ultraviolet	Corneal Photokeratitis; Cataract	Erythema; increased pigmentation; accelerating aging; cancer
400 – 780 nm: Visible	Retinal injury (acoustic, thermal, or photochemical)	Photosensitive skin reactions; skin burn
780 – 3000 nm: Near Infrared	Retinal burn; cataract	Skin burn
3000 – 10 ⁶ nm: Far Infrared	Corneal burns	Skin burn

NON-BEAM HAZARDS:

ELECTRICAL HAZARDS

Learn rescue procedures for helping victims of apparent electric shock: kill the circuit; have someone call for emergency aid; remove the victim with a *non-conductor* if he is still in contact with the energized circuit; initiate artificial respiration immediately and continue until emergency medical personnel arrive.

Precautions to take:

- ❑ Install Ground Fault Interrupters (GFI) in laboratories in which lasers are used.
- ❑ Provide enclosures to prevent accidental contact with terminals, cables, and exposed electrical contacts. Provide a *grounded* metal enclosure that is locked/interlocked.
- ❑ Remove nearby flammable/combustible materials to limit fuel in the event of fire.
- ❑ Never handle electrical equipment when hands, feet, or body are wet or perspiring or when standing on a wet floor.
- ❑ With high voltages, regard all floors as *conductive* and *grounded* unless covered with a well maintained, dry rubber matting of a type suitable for electrical work.
- ❑ When possible, use only one hand when working on a circuit or control device.
- ❑ Avoid wearing rings, metallic watchbands, and other metallic objects.

OTHER HAZARDS: Always consider other hazards such as compressed gases, explosion, fire, x-ray radiation, laser dyes and solvents and mechanical hazards. Pay special consideration to ergonomic issues to avoid injury.

EMERGENCIES:

Serious eye damage can happen very quickly. If exposure occurs, call CU Public Safety at (212) **854-2797 or x99 (ROLM)** for the Columbia Area Volunteer Ambulance (CAVA) for transportation to St. Luke's/Roosevelt. Report all incidents to your Supervisor, fill out Incident Form and notify EH&RS as well.