Optical Safety: LASER Safety

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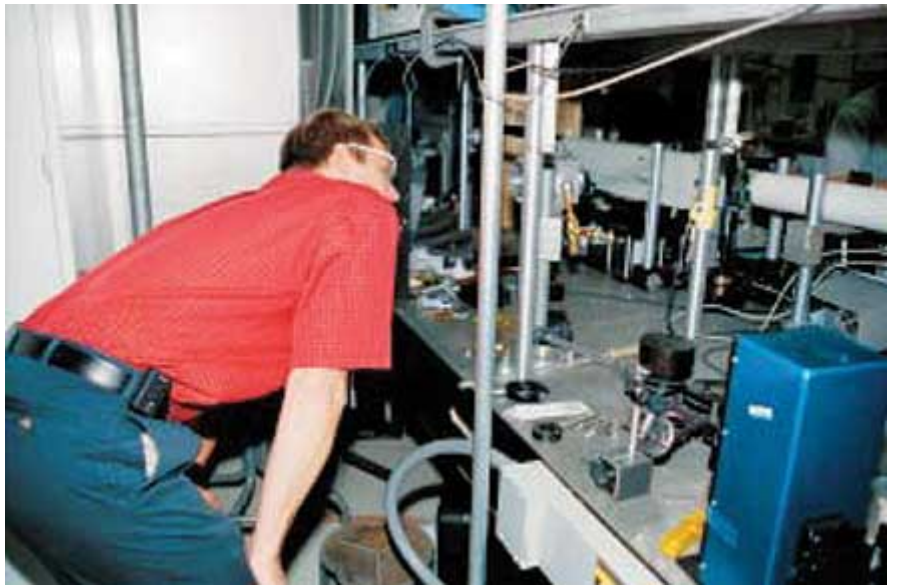
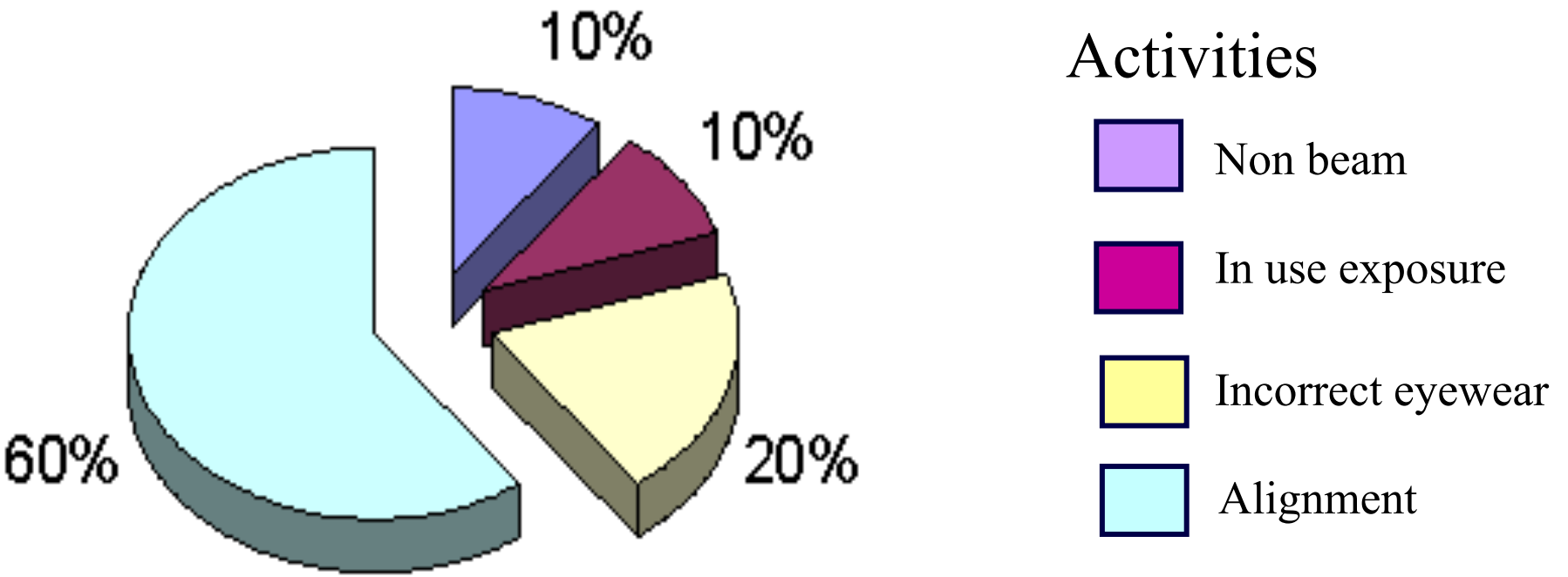
Laser Accidents



The times when accidents happen:

- During maintenance
  - Use improper laser protective eyewear
  - Place reflective objects into or near the beam path
  - Alter the beam path
  - Bypass interlocks
  - Turn on laser accidentally
  - Turn on laser beam accidentally
- During alignment
- Failure to pay attention to work

Laser Accidents by Percentage



Laser Classifications

Class 1

- Exempt lasers or laser systems that cannot, under normal operation conditions, produce a hazard
- Example: Compact disc player

Laser Classifications

Class 2 (low power) and Class 2M

- Low power visible lasers or lasers systems which, because of normal human aversion responses, do not normally present a hazard, but may present some potential for hazard if viewed directly for extended periods of time
- Example – most alignment lasers should be Class 2

Laser Classifications

Class 3 (medium power; Class 3R & Class 3B)

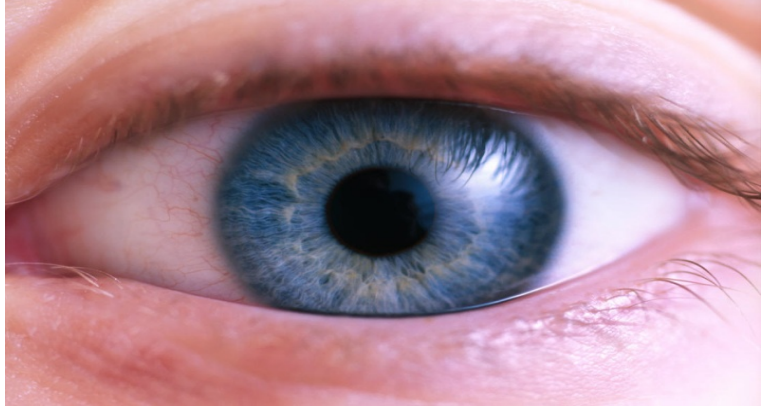
- Lasers are hazardous under direct and specular reflection viewing. Diffusive reflection are not normally hazards.
- Example – HeNe up to 5 mW total power

Laser Classifications

Class 4 (High Power)

- Both direct and scattered beams can cause eye and skin damage. These lasers can ignite flammable materials, and also may produce LGACs (Laser Generated Airborne Contaminants) and hazardous plasma radiation
- Example – High power Argon Ion lasers

Laser Hazard – Eye



- Both acute and chronic exposure
- Corneal, optical nerve, retinal injury, lens damage
- Vision damage is usually severe and may result in blindness
- Direct viewing of the laser source and its reflections should be avoided
- Eye tissues are susceptible to various forms of laser radiation and should be protected by appropriate eye protection

Laser Hazard – Skin

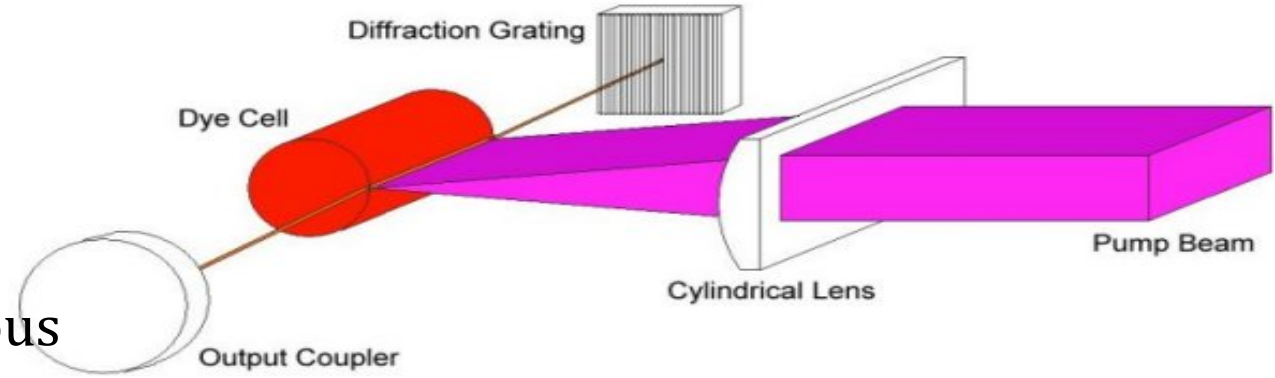
- Burns, skin cancer, and acceleration of skin aging are possible from exposure to laser radiation
- Chronic exposure can cause increased pigmentation
- Photosensitive reactions may occur

Laser Hazard – Hazardous Materials

- Reaction induced by lasers can release hazardous particulate and gaseous products
- Ignition of gases or fumes from the laser
- Engineering controls (i.e. ventilation) should be used
- All hazardous materials must be properly used, stored and controlled
- Obtain MSDS for all materials
- Wear lab coat, eye protection and gloves

Laser Hazard - Dyes and Solutions

- Vary greatly in toxicity
- Some are flammable
- All dyes must be treated as hazardous chemicals
- Obtain MSDS for all dyes and solvents
- Use and store all dyes and solvents in accordance with the Institute's Chemical Hygiene Plan
- Wear lab coat, eye protection and gloves



CCOHS **MSDS** Material Safety Data sheets

IDENTIFICATION

MSDS Record Number:	4311897
Product Name(s):	Dye 26, 97% (Stabilized, tunable infrared laser dye)
Product Identification:	MSDS Key: 96303 CAS No.: 76871-75-5 Catalog No.: AC409400000
Currency Note:	This MSDS is provided directly from the Fisher Scientific Canada website through an arrangement with CCOHS.

MANUFACTURER/SUPPLIER INFORMATION

Company:	FISHER SCIENTIFIC LIMITED
Address:	112 Colonnade Road Nepean, Ontario Canada K2E 7L6 TELEPHONE: 800-234-7437 or 613-226-3273 (Customer Service Centre, Open from 07:30am to 07:30pm - EST Monday to Friday) 800-267-6633 (Instrument Service) FAX: 800-463-2996 WEBSITE: www.fishersci.ca
Emergency	800-424-9300 (CHEMTREC)

Laser Hazard – Electrical Hazards

- Lethal electrical hazards are particularly present when high-power laser systems are used
- Fire Hazard

General Safety Practices While Working

- **Wear appropriate protective eyewear**
- **Use minimum power/energy required for project**
- **Enclose beam as much as possible**
- **Reduce laser output with shutters/attenuators**
- **Terminate laser beam with beam trap**
- **Use diffuse reflective screens, remote viewing systems, etc., during alignment if possible**
- **Remove unnecessary objects from vicinity of laser**
- **Locate beam at waist level or below. Keep beam path away from eye level (sitting or standing)**
- **Don't put your body parts (particularly your eyes) in the beam path!**
- **Avoid reflection caused by jewelry, wrist watch etc.**

Engineering safety practices

- Beam enclosures whenever practical. This will significantly reduce the need for other engineering or administrative controls
- Activation warning system outside the control area
- Window and door barriers (typically curtains at the doorways)
- Ventilation
- Panic button

Curtains, Screens & Roller Blinds

Portable laser blocking screens

Portable laser blocking screens connected together to form an interlocked enclosure

Laser blocking screens guarding a laser system

Personal Protective Equipment Control Measures

- **Appropriate eyewear**
- Eyewear must be for the appropriate laser wavelength, attenuate the beam to safe levels, yet be comfortable enough to wear
- **Gloves**
- **Special Clothing**

Thank You