

# Engineering Physics / CEDT Research Hazards Safety Report

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## Potential Hazards:

### 1. Laser

- Class 3B Nd:YAG laser
- Peak wavelength is 355 nm (UV)
- Energy directly from the laser is at 30 microjoules per pulse. The laser's repetition rate is 1 KHz, so there is a 30 mW optical output, with a 1 mm beam diameter.
- The primary concern in operating this laser is an eye injury. The MPE for 1 second exposure is 2 microjoules/mm<sup>2</sup>. Thus, goggles of optical density of 2 or more are used.
- The laser's initial path is well controlled and it goes into an enclosed black box to be coupled to a fiber. The output beam from the fiber has an energy of 3 microjoules per pulse.

### 2. Voltage

One of the signal lines in the system transmits at 20 V. This is passed through a coaxial cable, so risk of electrocution by loose wiring is minimal.

### 3. Fire

Fire risk due to laser heating is minimal. There is a fire risk from the electrical connections.

### 4. Falling Objects

Items on shelves pose a potential hazard. In mobile cart with the laser, heavier components are kept in the lowest compartment to minimize risk.

## Standard Operating Procedures:

Prior to operating the system, ensure that all of the required training is completed. Most importantly, the laser safety class provided by EOHSS must be taken.

System specific operating procedure

1. Ensure the laser path leads to enclosed box before turning on the laser
2. Ensure all personal protective equipment is present, in good shape, and worn
3. Make sure that people in the room have the correct eye wear as well, or that there is no risk to them.
4. Make sure the laser is turned off prior to adjusting alignment

## General Operating Procedures:

- Obtain training for the laser by a senior lab personnel and ensure the system specific operating procedures are known

- All visitors must have protective eyewear and be accompanied by qualified laser personnel
- Minimum of 2 people are required for maintenance of high voltage lasers and maintenance can only be performed by qualified personnel
- Laser alignment should be conducted at the lowest possible power or using a separate low power laser
- Beams must propagate in the horizontal plane of the optical table when possible and avoid being at eye level with the beam by using a high chair or ensuring the beam is well contained
- Avoid skin exposure
- When the output is idle for longer than a brief period the laser should be blocked at the source
- Maintain high ambient light in the room so pupils remain constricted so as to further reduce the possibility of eye injury
- Keep protective covers of lasers on other than during maintenance

### **Emergency Procedures:**

In all of the below cases dialing 88 on campus will be recommended. However, more serious injuries would warrant calling 911 and receiving help as soon as possible (serious burn, loss of eyesight, etc). Do contact someone near you for assistance if possible and needed. All incidents should have an incident report filed with the department as soon as possible.

#### **1. Fire**

For immediate assistance in the case of an accident or a fire, dial 88 on campus to receive help and so that your supervisor can be contacted. If there is a large fire, alert surrounding staff, pull the fire alarm, and evacuate the building in addition to calling 88. During evacuation do not use elevators, use the stairs.

#### **2. Chemical Spill**

In case of chemical spill that you know is safe to deal with, acquire the appropriate spill kit and contain the spill to prevent it from travelling across the floor or exiting the lab. Cover the spill with the appropriate absorbent material. If the spill is too hazardous to deal with dial 88, tell everyone to evacuate the room, and evacuate yourself.

#### **3. Laser Incidents**

For accidents involving lasers, block the laser beam or turn off the laser to reduce/eliminate the possibility of causing further damage or harm to others. 88 should be called immediately, and the supervisor and EOHSS LSO designate should be contacted. All incidents should have an incident report filed with the department as soon as possible