

Sample Standard Operating Procedure

Class 4 Laser Development Lab



I. Scope

- A. This document provides safety guidance for laser operators and spectators within the laser controlled area.
- B. Procedures reflected herein are in accordance with applicable regulation parameters impacting the operation of the laser laboratory.

II. Responsibilities

- A. _____ is responsible for the safety of this laboratory operation in conformance with this Standard Operating Procedure (SOP). In his/her absence, _____ shall assume these responsibilities.
- B. Only trained laboratory personnel and maintenance personnel from manufacturers may energize the laser or laser system

III. Laser Descriptions

- A. Ti:Sapphire Laser (class 4):
 - 1. Wavelength: 800 nm
 - 2. Maximum Average Power: 1 W
 - 3. Beam Diameter: 1.5 mm
 - 4. Beam Divergence: 0.81 mrad
- B. Nd:YAG Laser (class 4):
 - 1. Fundamental Wavelength: 1064 nm Double Wavelength: 532 nm
 - 2. Maximum Average Power: 2.5 W Maximum Average Power: 1 W
 - 3. Beam Diameter: 1.2 mm Beam Diameter: 1.0 mm
 - 4. Beam Divergence: 1.24 mrad Beam Divergence: 0.75 mrad

IV. Hazards

- A. The primary hazard associated with these lasers is an eye hazard from direct or reflected beams. Invisible, open beams may be present and must be controlled by the laser operator. Diffuse reflections may be a hazard, but the Diffuse Reflection NHZ is typically less than 20 cm.

V. Control Measures

- A. Eyewear
 - 1. Approved laser safety eyewear with the following optical densities is available in the laboratory:
 - a. Ti:Saph @ 800 nm OD 7
 - b. Nd:YAG @ 1064 nm OD >5.5
 - c. Nd:YAG @ 532 nm OD >5.5
 - 2. All personnel in the Laser Controlled Area are required to wear the appropriate eyewear during laser operation except in the following circumstances.
 - a. During sample change eyewear may be removed if the laser shutter is closed.
 - b. During work at the computer workstation eyewear may be removed for brief periods after authorization by the LSO if the person who will work without eyewear has performed a safety

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check to verify that there are no stray reflections in the area of the workstation immediately before removing eyewear. If IR beams are in use, a thorough safety check using an IR viewer is required.

B. Additional Laser Control Measures

1. The Laser Controlled Area is bounded by a laser barrier curtain. Only Authorized Laser Operators and approved visitors are allowed inside the Laser Controlled Area during laser operation. Visitors may enter the Laser Controlled Area only upon approval of the laser operator after they have received a safety briefing.
2. Laser beams will be initiated in a controlled manner with the beam terminated on a specific target or a diffuse reflecting surface. Safety checks will be performed regularly and following any optical path change to confirm that no stray reflections leave the laser tables.
3. Only Authorized Laser Operators are allowed in the Laser Controlled Area during laser and optical alignment. Alignment will be accomplished using the lowest practical power. A safety check must be performed after beam alignment. All stray reflections will be blocked as near their source as possible with diffuse reflecting beam blocks.

VI. Beam Alignments

1. Secure all entrances into the laser area.
2. Locate all equipment and materials needed prior starting alignment.
3. Use laser protective eyewear with proper OD and wavelength for alignment. Use skin covers (lab coat, gloves, and UV face shield) to protect users from UV laser beam scatter.
4. Intrabeam viewing must always be avoided. Whenever possible use a low power alignment laser (class 2 or 3A), if none is available, use the lowest beam power available.
5. If there are others in the room make sure they are aware of the alignment in progress.
6. Keep optical table(s) clear of objects which may cause unwanted reflections. Close laser shutter if entering the beam path is necessary.
7. Insure all beam blocks, enclosures, and beam barriers are replaced when the alignment is complete.

VII. Laser Controlled Areas

1. The laser hazards associated with this laboratory have been analyzed, and the controls specified for these hazards will reduce the risk to employees and the environment to acceptable levels.
2. All entries into the laser controlled area must be posted with the proper warning sign.
 - a. Do not rely on closed doors as adequate security. Use key locks or activated interlocks on doorways into the laser area.
 - b. When the laser is energized, all entrances into the laser controlled area must be secured to prevent unauthorized access. If there is a "laser on" indicator it must be used.
3. An emergency procedure sign must be posted inside the laser controlled area along with this laser safety plan/standard operating procedures near the laser or laser system.

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	University of Wyoming Safety
	Web: www.uwyo.edu/safety/
	Phone: (307) 766-3277 Email: uwehs@uwyo.edu
	Regulated Materials Management Center Phone: (307)766-3698 Fax: (307)766-3699 Email: HAZMAT@uwyo.edu

4. The laser beam shall be contained in the immediate area using non-reflective and non-flammable beam blocks and/or partitions.
5. It is the discretion of the laser operator to allow or deny entry into the laser area while the laser is energized.
6. If there are windows in the laser area, they must be blocked with opaque material that is non-reflective and non-flammable.
7. If possible position the laser so it is not at standing or sitting eye level.
8. If the laser/laser system is key operated; do not leave the key in the laser when the experiment is finished.

VIII. Non-beam Hazards

1. When working with high voltage, the “buddy” system should always be used. Trained CPR laboratory personnel are highly recommended.
2. Attention should be given to protect against fire, especially with class 4 laser/laser system. Flammable solvents may be used in laser dyes or to clean components. Fire extinguishers (charged properly) should be kept in the laser area and staff should know how to use them.
3. Good general house keepings can greatly improve safety from physical hazards. Cables should be secured to keep trip hazards to a minimum.

IX. Laser Maintenance

1. Only properly trained personnel may service laser systems.
2. All enclosures, interlocks, and safety devices must be replaced and verified operational prior to returning the laser to regular use.

X. Training

- A. Individuals who use this equipment are required to take the UW EHS Laser Safety Class and shall be trained to recognize the intrinsic hazards, are aware of basic safety information that relates to their job duties, and know the safe operating requirement for this activity.
- B. All operating personnel shall read and understood this standard operating procedure (SOP) and all applicable references stated in this SOP. Signatures of all authorized operators are required at the end of this SOP.

XI. Emergency Procedures

1. In an event of a laser emergency, turn off all lasers and notify the Laser Safety Officer.
2. In an event of fire or other emergency, evacuate and notify the UW Police department by dialing 911.

XII. Additional Safety Measures

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Standard Operating Procedure Signature Form

The responsible individual shall verify and document that personnel working under the direction of this SOP understand and agree to comply with the safety plan before beginning work.

All individual listed below affirm that they have read and agreed to comply with the attached SOP.

Name	Signature	Date