

Laser Safety Standard Operating Procedure

Forward:

This procedure shall be read and signed annually by all persons who use class 3B and 4 lasers or laser systems listed in this Standard Operating Procedure. This procedure shall also be reviewed every six months by the Permittee or Laboratory Laser Safety Supervisor to ensure it reflects the most current conditions. Changes in the operating procedure shall be forwarded to the University Laser Safety Department for review.

Laboratory information:

Laboratory PI name:		Date:	
Department:		Revision:	
Building and room:		Author:	

Contact information:

Laboratory LSS:		Contact phone:	
University LSO:		Contact phone:	
Maintenance or repair:		Contact phone:	

Medical emergencies:

1. Call 911 for medical emergencies and shut down all laser operations.
2. Notify the laboratory LSS and university LSO of all laser-related injuries and near misses as soon as possible.

Laser description & parameters:

Make:		Wavelength (nm):	
Model:		Power output (W)	
Serial number:		Beam diameter (mm)	
Class:		Beam divergence (1/e²) (mrad)	
Cont. or pulsed:		Duration (ns) and rate (Hz)	

Hazards & controls:

Check if applicable	Hazard	Controls
<input type="checkbox"/>	High voltage	The building manager and facilities electrical shop shall be consulted prior to operation or maintenance involving high voltage exposure including any adjustments needed.
<input type="checkbox"/>	Capacitors	Any capacitors will be enclosed within a protective panel during operation and fully discharged prior to maintenance.
<input type="checkbox"/>	Unenclosed beam access to beam	The beam is contained within a curtained or similarly enclosed area. The outside door will also be closed as a secondary protection. Appropriate laser eyewear protection shall be worn in all areas with open and accessible laser radiation.
<input type="checkbox"/>	Fumes or vapors	Any fumes or vapors generated during operation will be exhausted through a fume hood or local ventilation apparatus.
<input type="checkbox"/>	Ultraviolet radiation or blue light	Appropriate barriers and Personal Protective Equipment to protect skin and eyes from UV rays and eyes from blue light will be in place upon consultation with EHS if needed. This may include lab coats, eyewear, gloves, face shields or topical sunblock applications.
<input type="checkbox"/>	Compressed gases	Compressed gases will be properly secured and labeled. Safety caps will be in place for unused cylinders. Flammable and oxidizing cylinders shall be stored at least 20 feet apart unless specifically required for an experiment upon consultation with EHS.
<input type="checkbox"/>	Hazardous chemicals or waste	No hazardous waste is expected to be made during ordinary operation. If hazardous waste is generated, additional approval may be required and all waste properly handled, labeled and stored per EHS guidelines.
<input type="checkbox"/>	Housekeeping	The beam path and surrounding areas will be kept free of clutter and obstructions. Hand clearing of clutter from the optical table and beam area will be performed prior to each laser operation.
<input type="checkbox"/>	Reflective material in beam path	The open beam paths will be kept free of clutter to prevent inadvertent ignition of materials, specular, diffuse reflections and laser generated airborne contaminants.
<input type="checkbox"/>	Fire	A fire extinguisher is located within a few steps of the table. Laser operators will ensure familiarity with its location and complete appropriate fire extinguisher training from EHS. Beam blocks will be used to

		absorb laser energy capable of generating hazardous levels of heat.
<input type="checkbox"/>	Laser at eye level of person sitting or standing	The laser is mounted below the eye level of a person sitting normally. Beam blocks and additional barriers will be used to prevent the cohesive beam from travelling beyond the limits of the optical table.
<input type="checkbox"/>	Infrared lasers	Invisible lasers will be properly blocked and attenuated.
<input type="checkbox"/>	Correct eyewear	Appropriate EHS approved laser eyewear protection with labelling of wavelength and optical density will be present and worn by all lab personnel working in rooms with accessible laser radiation. The eyewear will be made readily available prior to entering a nominal hazard zone at the door or curtain entrance, properly maintained, cleaned and stored per manufacturers recommendations. Eyewear will be self-inspected and documented semi-annually.
<input type="checkbox"/>	Secured laser	Lasers shall be secured to the operating surface during operation to prevent movement of the beam while the laser is on. The method of securing should be robust enough that if the laser is incidentally bumped or contacted, the beam does not lose contact with the target surface.

Additional controls:

Check if applicable	Control	Comments
<input type="checkbox"/>	Entryway door interlocks or controls	Entry to the lab is restricted to authorized and properly trained lab personnel only with an active keypad lock or equivalent security. Laser signs or placards are provided at the entrance to the laser control area or nominal hazard zone. A laser curtain or equivalent barrier is provided at the nominal hazard zone perimeter.
<input type="checkbox"/>	Laser enclosure interlocks	Any laser enclosure interlocks will be engineered to fail safe and require manual re-activation if defeated. They shall be inspected and documented semi-annually.
<input type="checkbox"/>	Laser enclosure interlocks	Fail-safe or redundant interlocks shall be provided if they can be removed or displaced during operation and still allow access to class 3B or 4 laser radiation. Warning labels shall be provided near the interlock if it can be defeated or by-passed.
<input type="checkbox"/>	Panic button emergency stop	Either an emergency e-stop button shall be provided or the master key or power switch shall be designated at the emergency stop as applicable and clearly labeled as such.

<input type="checkbox"/>	Beam stops	The beam terminates in a half-cinder block capable of absorbing an immense amount of heat.
<input type="checkbox"/>	Master switch, i.e., operated by key or computer code	The laser is only operable via a switch key. When the key is in standby mode, the laser is inactive.

Personal Protective Equipment

List all eyewear that is authorized to be used with the laser described in this SOP. Eyewear should be adequately labeled to prevent a user from wearing the wrong pair during laser operations. It is the responsibility of the PI to ensure users are trained on which eyewear to use when operating different lasers. It is the responsibility of the laser user to wear the provided eyewear when lasers are in use.

Serial	Make	Model	Wavelength(nm)	OD
1				
2				
3				
4				
5				

Eyewear self-inspection

The following check shall be done semi-annually by the laser users. Unfit eyewear that does not meet these basic inspection criteria shall be retired and removed from service immediately.

Item	Comments	Date or initial
Adequate pairs of eyewear for all personnel present while the laser is in operation.		
Eyewear is specific to the wavelength in use.		
Eyewear Optical Density is appropriate for full range of power of the operating system including alignment and full power operations.		
Fits snugly for all users with minimal space between the frame and the users face. Eyewear should be worn on the bridge of the nose and it should make contact with the forehead.		
Labeled for wavelength and OD. Labels should be readily legible and apply to the wavelength of the laser in use.		
Free of damage excessive scratches. Damaged eyewear shall be retired immediately and removed from use. Eyewear with scratches shall not be used if the damage alters the integrity of		

the lens or impedes the user from seeing adequately.		
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Operating procedures

All class 3B and 4 lasers and laser systems shall have a documented operating procedure that provides the end user the necessary instruction for completing their experiment safely. The operating procedure shall include instructions for all times it is necessary for the laser to be powered on including normal operation, alignments, service and repairs as applicable. The procedure shall incorporate all safety measures including when to don and doff eyewear, room securement, signs and warning labels, housekeeping and other control measures identified in the hazard section above. This procedure shall be updated to reflect current operations prior to commencing the experiment. Substitution of alternate controls shall require review and approval by the university LSO and shall be documented in this SOP.

- A. Initial preparation of lab environment for normal operation, i.e., key position, warning light on, interlock activated, identification of personnel and others:
 - 1.
 - 2.
 - 3.

- B. Target area preparation:
 - 1.
 - 2.
 - 3.

- C. Operation procedures are as follows:
 - 1.
 - 2.
 - 3.

- D. Shutdown procedures for this laser are as follows:
 - 1.
 - 2.
 - 3.

- E. Special procedures, e.g., alignment, safety tests, interlock bypass, emergency and so forth:
 - 1.
 - 2.
 - 3.

