



Date Issued: May 17, 2021	Page No.: 1	Document No.: SOP-Radiation-02
Revision: 3.0	Subject: Laser Safety Standard Procedure	

1. Introduction

This Standard Procedure (SOP) outlines the basic safety rules to be considered by an authorized user working with laser and laser products class 3B and 4 to eliminate the exposure to beam and non-beam hazards. In addition to this SOP a specific procedure for the operation of a laser and laser system must be prepared and implemented by the laboratory supervisor as per Appendix II of Queen's Laser Safety Manual.

This procedure is part of Queen's Laser Safety Program and shall be reviewed annually by all persons who use Class 3B & 4 lasers or laser systems. Changes in the operating procedure shall be forwarded to EHS – Laser Safety for review and approval.

A copy of this procedure must be posted by the LCA and available to all laboratory laser workers.

2. Scope

The Laser Safety Procedure applies to employees, students and visitors operating or working in proximity to Class 3b or Class 4 lasers in either a teaching or research laboratory.

3. Applicable legislations, Standards, Guidelines.

This procedure conforms to the requirements of the Ontario Ministry of Labour, the American National Standard ANSI Z136.1–2022 *Safe Use of Lasers*, ANSI Z136.8–2021 *Safe Use of Lasers in Research, Development, or Testing*, and ANSI Z136.5–2020 *Safe Use of Lasers in Educational Institutions*.

4. Responsibilities

4.1 Laser Safety Officer (LSO)

- Review annually the content of this procedure against ANSI standards, guidelines and legislations, and update accordingly
- Communicate any changes in its content to Laboratory Supervisors
- Inspect annually the implementation of safety practices in Laser Controlled Areas and recommend corrective actions in response to non-compliances.

4.2 Laser Supervisors



Date Issued: May 17, 2021	Page No.: 2	Document No.: SOP-Radiation-02
Revision: 3.0	Subject: Laser Safety Standard Procedure	

- Ensure that laser workers have been trained in the safe operation of the lasers or laser systems.
- Ensure that laser workers prior to operating or working in proximity to Class 3b or Class 4 lasers participate in the Laser Safety Program Training (provided by EH&S) and complete the Laser Worker Registration Form.
- Report known or suspected accidents to the Laser Safety Officer.
- Ensure that lasers under their control are not operated or modified without approval by the Laser Safety Officer.
- Ensure that all administrative and engineering controls are followed.
- Ensure that Standard Operating Procedures (SOP's) are written and available to Laser Workers under their supervision.

4.3 Laser Workers

- Will participate in the Laser Safety Training Course through the Department of Environmental Health and Safety.
- Will comply with regulations and standards prescribed by the Laser Safety Officer and the laser supervisor.
- Will be familiar with standard operation procedures (SOP's) and specific safety hazards of lasers which they are operating.
- Will not operate a Class 3b or Class 4 laser unless authorized by the laser supervisor.
- Will report known or suspected accidents to their laser supervisor and the Laser Safety Officer.
- Will ensure that all spectators are properly informed of and protected from all potential laser hazards.

5. Definitions

Class 3b Lasers: Lasers that present an eye and skin hazard if viewed directly. This includes both intrabeam viewing and specular reflections. Class 3b lasers do not produce a hazardous diffuse reflection except when viewed at close proximity.

Class 4 Lasers: Lasers that present an eye hazard from direct, specular and diffuse reflections. In addition, such lasers may be fire hazards and produce skin burns.

Laser Controlled Area (LCA) is any area, permanent or temporary, that contains hazardous laser operations, and where the potential for exposure to laser radiation exist.

Temporary Laser Controlled Area: Where removal of panels or protective housings, overriding of protective housing interlocks, or entry into the NHZ becomes necessary (such as for



Date Issued: May 17, 2021	Page No.: 3	Document No.: SOP-Radiation-02
Revision: 3.0	Subject: Laser Safety Standard Procedure	

service), and the accessible laser radiation exceeds the applicable MPE, a temporary laser-controlled area shall be set up. This control area shall provide all safety requirements for all personnel, both within and without and a sign shall be posted outside the temporary laser-controlled area to warn of the potential hazard.

6. Safety precautions

6.1 General Laser Safety Rules

- Lasers shall be operated, maintained or serviced only by authorized personnel.
- Operate the laser in an area designed for laser operation (LCA).
- Remove any jewellery and reflective objects from yourself before operating a laser or laser system.
- Do not look directly into a laser beam
- Do not look at specular reflections of the laser beam
- Consider the use of remote viewing methods when possible.
- Eye protection is to be worn when engineering or other procedural and administrative controls are inadequate to eliminate potential exposure.
- Do not leave an operating laser unattended
- All optics are to be securely fastened to the table.
- Beware of high voltage when the case or enclosure of an operating laser is open.
- Spectators shall not be permitted within a laser control area unless appropriate supervisory approval has been obtained, and appropriate protective measures are taken.
- Do not intentionally or inadvertently track vehicles or aircrafts with the laser beam
- Disconnect the laser from the power source or otherwise, deactivate the laser when not in use.

6.2 Laser Protective Eyewear Requirements

1. Laser Protective Eyewear (LPE) is to be available and worn in by all personnel within the Nominal Hazard Zone (NHZ) of Class 3B and Class 4 lasers where the exposures above the Maximum Permissible Exposure (MPE) can occur.
2. The attenuation factor (optical density) of the laser protective eyewear at each laser wavelength shall be specified by the Laser Safety Officer (LSO).
3. All laser protective eyewear shall be clearly labelled with the optical density and the wavelength for which protection is afforded.
4. Laser protective eyewear shall be inspected for damage prior to use. All damaged PPE should be removed and replaced immediately.
5. LPE should be stored properly
6. A mean of disinfection prior and after each use should be available in case LPE are shared between laboratory personnel.



Date Issued: May 17, 2021	Page No.: 4	Document No.: SOP-Radiation-02
Revision: 3.0	Subject: Laser Safety Standard Procedure	

7. Work practices.

7.1 Laser Preparation

- 1) Always observe the General Laser Safety Rules (Section 6.1) before operating the laser
- 2) Lock the room to prevent unauthorized access during laser operations.
- 3) Ensure the room has the appropriate warning signs for laser activities.
- 4) Ensure the optical set-up is free of foreign objects.
- 5) Ensure required laser safety barriers or curtains are in place.
- 6) Ensure windows and doors are properly covered to prevent laser beam transmission.
- 7) Ensure the emergency egress from the Laser Control Area (LCA) is not obstructed.
- 8) Ensure all laser operations are performed in accordance with the system instructions or Standard Operating Procedure.

7.2 Laser System Operation

- 1) If required, ensure all personnel present are wearing protective eyewear (appropriate Optical Density for wavelength/power).
- 2) Ensure all jewelry which may reflect beams is removed.
- 3) Issue a verbal warning prior to starting the laser operation.
- 4) Inspect the system to determine if there are stray beams, specular or diffuse reflections, emanating from each laser and its optics and block such reflections.
- 5) Ensure all laser operations are performed in accordance with the Operational Procedure system approved by the Laser Safety Officer, including controlled access, system set up, start up, operation, and shutdown procedures.

7.3 Laser alignment

Procedures outlining alignment methods are to be approved by the LSO. Alignment of laser optical systems (mirrors, lenses, beam deflectors, etc.) shall be performed in such a manner that the primary beam, or a specular or diffuse reflection of a beam, does not expose the eye to a level above the applicable MPE.

- 1) Exclude all unnecessary personnel from the **LCA** during alignment procedures.
- 2) During alignment, the laboratory doors will be closed, and a sign posted stating “**Laser Alignment in Progress. Do Not Enter. Eye Protection Required**”
- 3) Only trained laser operators are permitted to perform laser alignments.
- 4) If possible, use a low power alignment laser or use the lowest possible laser power setting.
- 5) Always wear the proper laser protective eyewear during alignment.
- 6) For aligning invisible (IR, UV) beams, use beam display devices (i.e., image converter viewers or phosphor cards) to locate beams.
- 7) Use a shutter or beam block to block the high-power beams except when needed for alignment.



Date Issued: May 17, 2021	Page No.: 5	Document No.: SOP-Radiation-02
Revision: 3.0	Subject: Laser Safety Standard Procedure	

- 8) Use a laser rated beam block to terminate high power beams downstream of the optics.
- 9) Locate and block all specular reflections as close to the source as possible.
- 10) Ensure all beams and specular reflections are terminated before high power operation.
- 11) Include below the specific beam alignment instructions, including PPE to be worn and any applicable signs to be used.
- 12) Ensure all laser operations are performed in accordance with the system operational procedure/ instructions.

7.4 Laser Emergency

Laboratory Laser Supervisors or PIs are responsible for reporting accidents and incidents involving lasers or laser systems. They must complete and sign an Incident Report and submit to the Environmental Health and Safety Department as soon as possible.

In the event of a critical injury or life-threatening event DIAL 911

For other emergencies including minor injuries, incidents, accidents

Role	Full Name	Contact number
ERC	Emergency Response Center	613 -533- 6111
University LSO	Raico Laria Lamela	X 78820
Medical Emergencies	Walsh and Associate	613-966-4114

- 1) In the event of a fire:
 - a. If possible, shut the laser off immediately and remove the interlock key.
 - b. Alert everyone to exit the room.
 - c. If you are properly trained, use the appropriate fire extinguisher to contain the fire, otherwise pull the alarm fire station and leave the room using the nearest fire exit.
 - d. Notify the Authorized Laser Operator and the Laser Safety Officer immediately

- 2) In the event of severe injuries from beam exposure such as suspected eye exposure, vision loss, bleeding from the eye, and burns to areas around the eyes and/or on the face.
 - Shut the laser off immediately and remove the interlock key.
 - Remove the person to a safe area.
 - Do not alter the laser setup. It is important to analyze the setup as it existed at the time of injury so we can help find the cause of accident and develop corrective actions to prevent a recurrence.
 - Notify the Authorized Laser Operator and the Laser Safety Officer immediately
 - Any laser worker with known or suspected eye injury will be referred to the University Occupational and Health Services (Walsh and Associates). (main office in Belleville at 613-



Date Issued: May 17, 2021	Page No.: 6	Document No.: SOP-Radiation-02
Revision: 3.0	Subject: Laser Safety Standard Procedure	

966-4114)

Outside of those defined incident types, or if unable to contact Walsh and Associates, **if there is an exposure incident requiring urgent medical attention then workers should go to the Kingston Health Sciences Centre – Kingston General Hospital (KHSC – KGH) Emergency.** Location of the [Emergency Room Entrance](#) at Kingston General Hospital.

8. Education and Training

Laser workers must complete the online EHS-Laser Safety Training, be familiar with the Laser Standard Operating Procedure and read this procedure before commencing to work with a laser or laser system.

9. References

- Laser Use Standard Operating Procedure. California State University. FULLERTON Environmental Health and Safety. Rev 11/2022. URL: <https://ehs.fullerton.edu/resources/pdfs/programs/laser-standard-operating-procedure.pdf>

10. Revision History

Date	Revised by	Changes
04/08/2024	Raico Lamela	Format and Section 4.
10/28/2025	Raico Lamela (LSO)	Content updated to reflect safe practices and using the SOP template. Previous content moved to Laser Safety Manual

11. Appendix

N/A