



## Laser Safety Plan

San José State University  
One Washington Square  
San José, California

Facilities Development and Operations Department  
Environmental Health and Safety

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## I. INTRODUCTION

### A. PURPOSE

San José State University (SJSU) is home to a rich culture of scientific exploration and innovation aimed at pushing the bounds of scientific knowledge in our teaching and research laboratories. As part of our mission to train the next generation of scientists, we take pride in providing our students, researchers, and staff with the tools needed for a lifetime of success, which includes a solid foundation in how to innovate and experiment safely.

The purpose of the SJSU Laser Safety Plan is to provide guidance and expectations for safely using lasers, laser systems, and high intensity light sources in teaching and research at SJSU. The Laser Safety Plan provides direction on the types of procedures, equipment, work practices, and personal protective equipment that are combined to protect our laser users from the potential health and physical hazards inherent to working with lasers.

### B. SCOPE

The policies in this Laser Safety Plan apply to all departments, laboratories, and individuals using, possessing, or storing Class 3B or 4 lasers or laser systems. This includes lower class lasers and laser systems that produce an output power that qualifies as a Class 3B or 4 laser system (e.g. a focused Class 3R laser). The Laser Safety Plan also applies to Class 1 systems with embedded Class 3B or 4 lasers if they are to be used, aligned, serviced, or otherwise operated with interlocks defeated. The Laser Safety Plan applies to all laser use at the main SJSU campus, South Campus, Moss Landing Marine Lab, and any affiliated satellite facilities.

## II. ROLES AND RESPONSIBILITIES

### A. UNIVERSITY LEADERSHIP: PRESIDENT, PROVOST, AND VICE PRESIDENTS

- Provide institutional leadership to promote a culture of safety at San José State University.
- Have the ultimate responsibility to ensure compliance with the Laser Safety Plan. The President has delegated this authority via Executive Order 1039 to Environmental Health & Safety and the Campus Laser Safety Officer to maintain and enforce compliance with the Laser Safety Plan.

### B. LASER SAFETY OFFICER

The Laser Safety Officer works with and is part of Environmental Health & Safety (EH&S). The Laser Safety Officer has the “authority and responsibility to monitor and enforce the control of laser hazards and effect the knowledgeable evaluation and control of laser hazards,” as defined by American National Standards Institute (ANSI) Z136.1-2014: Safe Use of Lasers. To this end, the Laser Safety Officer is charged with:

- Developing and implementing laser safety policy.

- Ensuring compliance with laser safety regulations put forth by Federal and State Agencies, and all relevant ANSI standards.
- Providing consultation to laser users on laser hazard evaluation, safety controls, and training programs for personnel.
- Assuring that ANSI-prescribed control measures are in effect, and recommending or approving alternate control measures when primary controls are not feasible or practical.
- Ensuring that adequate laser safety training is provided to all laser users and personnel who may be exposed to laser energy levels above the Maximum Permissible Exposure limit.
- Determining the Nominal Hazard Zone for Class 3B and 4 laser systems and approving the establishment of contained Nominal Hazard Zones in laser work areas.
- Maintaining an inventory of all Class 3B and 4 lasers at SJSU.
- Classifying researcher-built laser systems or verifying classification of lasers and laser systems. Reclassification of lasers and laser systems can only be completed by the Laser Safety Officer.
- Recommending personal protective equipment (PPE) that may be required to ensure safety of personnel.
- Approving laser systems operations as described in laser-specific Standard Operating Procedures, as well as procedures for alignment, maintenance, and servicing.
- Approving wording on area signs and equipment labels.
- Conducting periodic safety audits at least annually for all Class 3B and 4 laser equipment and systems, and associated personnel and facilities.
- Ensuring that required records are maintained.
- Direct individuals to obtain medical examinations when necessary.
- Investigating known or suspected incidents/accidents involving laser equipment in collaboration with the direct line supervisor of the injured party (e.g. Principal Investigator, department chair) to identify root cause and correctives necessary.
- The Laser Safety Officer shall have final authority in determining laser control measures and may approve alternate controls when appropriate based on the judgement of the Laser Safety Officer.
- Class 3B and 4 lasers shall be operated only with the written approval of the Laser Safety Officer. The Laser Safety Officer shall have authority to terminate laser operations at any time.
- In the absence of the Laser Safety Officer, the Director of Environmental Health & Safety (EH&S) may perform these duties as acting Laser Safety Officer.

**C. COLLEGE DEANS AND ASSOCIATE DEANS**

- Supports the development and continuous improvement of the safety culture within the departments under their jurisdiction.
- Establishes and maintains programs that provide a safe and healthy work environment, such as safety committees and a laboratory inspection program.
- Ensures compliance with all safety-related policies and aids in the enforcement of such policies.

**D. DEPARTMENT CHAIRS**

- Aids in the provision of resources necessary to mitigate risk from lasers and laser systems within research and teaching laboratories.
- Works with Principal Investigators in their department found to be in violation of the Laser Safety Plan or other health and safety policy to ensure corrective action in a timely manner.
- Ensures that training requirements are met.
- Reviews incident/accident reports and works with the Principal Investigator, lab personnel, and EH&S to ensure appropriate changes to standard operating procedures or controls are made to prevent future incidents.

**E. PRINCIPAL INVESTIGATORS**

Principal Investigators are ultimately responsible for all aspects of laser safety and laser use in their laboratory or classroom. It is the responsibility of the Principal Investigator to implement this laser safety program in their laboratory or classroom for all staff and students working with or potentially exposed to lasers or laser systems. To this end, Principal Investigators are charged with:

- Supervising the safe use of lasers and ancillary equipment in their laboratory. This includes training all Laser Users on safe use of lasers in their laboratory. This lab and laser-specific training shall be documented.
- Registering all Class 3B and 4 lasers and laser systems in their lab or under their jurisdiction with EH&S and the Laser Safety Officer. Lasers are registered by notifying the Laser Safety Officer of the laser and meeting with the Laser Safety Officer to complete the registration process.
- Notifying EH&S and the Laser Safety Officer of the intent to acquire or fabricate a Class 3B or 4 laser.
- Notifying the Laser Safety Officer of the intent to service or align an enclosed Class 3B or 4 laser within a Class 1 system.
- Creating and implementing appropriate procedures for laser use including Standard Operating Procedures, alignment procedures, maintenance and servicing operations for all Class 3B and 4 lasers.

- Ensuring that all Laser Users and Non-Users have satisfactorily completed required laser safety training (general and laser-specific) before working within a laser Nominal Hazard Zone.
- Meeting University requirements for equipment and laboratory posting, access control, personal protective equipment, and training.
- Reporting any known or suspected incidents or injuries involving laser equipment to the Laser Safety Officer.
- Informing the Laser Safety Officer prior to relocating, purchasing, or acquiring a Class 3B or 4 laser or laser system. The Laser Safety Officer should be notified in advance of any laser acquisition in order to ensure the intended laser location meets the minimum requirements for a Class 3B or 4 laser.
- Notifying the Laser Safety Officer of any modifications to lasers, changes in operating procedures, or changes in control measures.
- Notifying the Laser Safety Officer prior to disposal of a laser.

#### F. LASER USERS

Laser users are any researcher, scientist, staff, or student operating Class 3B or 4 lasers or laser systems in research or to support research on the SJSU campus. Laser Users are responsible for:

- Completing required training.
- Following approved Standard Operating Procedures and alignment procedures.
- Wearing appropriate personal protective equipment.
- Conducting all laser use in a safe manner.

#### G. LASER NON-USERS AND INCIDENTAL PERSONNEL

Laser Non-users and Incidental Personnel are those individuals whose work makes it possible, though unlikely, that they may be exposed to enough laser energy that they could incur injury to the eyes or skin. Unless arranged beforehand with the approval of the Laser Safety Officer, no Class 3B or 4 lasers or laser systems may be used while maintenance or custodial staff are in the room.

#### H. VISITORS

Visitors are individuals being escorted into a Laser Control Area by a fully trained Laser User in a strictly observational capacity. Visitors are individuals that may visit the lab once (e.g. lab tour), but otherwise have no affiliation with any laser laboratories or laser work at SJSU. Visitors shall be provided with appropriate personal protective equipment and provided a basic safety orientation (e.g. do not remove laser protective eyewear, do not stare at the beam, etc.) by a trained and authorized Laser User.

### III. LASER CLASSIFICATIONS

All lasers are classified by the manufacturer and labeled with the appropriate warning labels. Any modification of an existing laser, fabrication of a custom laser, or an unclassified laser must be classified by the Laser Safety Officer prior to use. The following criteria are used to classify lasers:

#### A. CLASS 1

Class 1 lasers and laser systems are those which under normal operating conditions cannot produce damaging light radiation, and are therefore exempt from control measures. Class 1 systems may contain higher class lasers that could cause injury if the laser is operated with interlocks defeated. The interlocked service panels or protective housings are only meant to be removed by authorized service personnel. If repairs or adjustments are needed, the Laser Safety Officer shall be notified to ensure that requirements of this Plan are maintained. Class 1M lasers cannot produce damaging light radiation during normal operation unless viewed with optical enhancing instruments (e.g. microscope, binoculars).

#### B. CLASS 2

Applicable to visible lasers only, Class 2 lasers and laser systems emit a maximum power of 1 milliwatt (mW) or less. Lasers in this class can be hazardous if the eye's normal aversion to bright light is ignored (i.e. intentionally staring at the beam). Class 2M lasers conform to the same conditions, but may be hazardous if viewed with optical enhancing instruments (e.g. microscope, binoculars).

#### C. CLASS 3R

Class 3R lasers and laser systems have an accessible output above 1 mW and up to 5 mW. These lasers are potentially hazardous, but the probability for injury is small and the measures to control the hazards straightforward. Most laser pointers are Class 3R lasers. Class 3a lasers (older nomenclature) fall into this category.

#### D. CLASS 3B

Class 3B lasers and laser systems emit power greater than 5 mW and up to 500 mW for continuous wave lasers, or 0.125 Joules (J) or less for pulsed lasers with pulse duration less than 0.25 seconds. These lasers pose an eye hazard from intrabeam (direct) viewing and specular (mirrored) reflections. Class 3B lasers shall only be operated in Class 3B (or higher) Laser Control Areas by appropriately trained and authorized users. A written Standard Operating Procedure should be written for the normal operation of Class 3B lasers and alignment procedures shall be documented and approved by the Laser Safety Officer.

#### E. CLASS 4

Class 4 lasers and laser systems emit power greater than 500 mW for continuous wave lasers or 0.125 J for pulsed lasers with pulse duration less than 0.25 seconds. These lasers pose the greatest threat of injury to the eye and skin by intrabeam exposure, and by specular or diffuse (rough surface) reflection. Class 4 lasers are capable of starting fires and may produce laser generated air contaminants (e.g. toxic gases, fumes, biohazards). Class 4 lasers shall only be



operated inside of Class 4 Laser Control Areas by appropriately trained and authorized users. A written Standard Operating Procedure shall be approved by the Laser Safety Officer for all Class 4 laser or laser system operations.

## IV. LASER SAFETY AND USE PROGRAM

### A. LASER SAFETY TRAINING

Prior to working with Class 3B and 4 lasers or laser systems, all Laser Users (including the Principle Investigator) must complete laser safety training. Laser safety training at SJSU consists of two parts:

1. General laser safety training. This training is available online through CSULearn (Course title: Fundamentals of Laser Safety) or in person with the Laser Safety Officer. Some departments and Colleges may have their own laser safety training specifically available to students.
2. Lab and laser-specific training. This requires Principal Investigator to develop and implement a laboratory-specific training program for the lasers that are in their work area. Written Standard Operating Procedures make excellent training tools, especially as a guide for hands-on training.
  - a. For all individuals working in the laser laboratory: The lab and laser-specific training shall incorporate beam and non-beam hazards, safety precautions associated with each laser, and the proper use of protective eyewear.
  - b. For those individuals operating the lasers or laser systems: Specific hands-on instruction in the use of each laser or laser system.
  - c. This safety training must be documented and kept on record for three years. Documentation of training must be made available during safety audits.

Laser Users, including the Principal Investigator, must participate in periodic refresher training, no less than every three years. Retraining may be accomplished by re-completing the online Fundamentals of Laser Safety course or attending an in-person training with the Laser Safety Officer.

### B. LASER ACQUISITION, REGISTRATION, AND TRACKING

All Class 3B and 4 lasers or laser systems must be registered with the Laser Safety Officer for tracking and to obtain a Laser Use Authorization. To this end, the Laser Safety Officer must be notified when Class 3B or 4 lasers are purchased, transferred to SJSU, donated to SJSU, modified, moved, or loaned to a different department or Principal Investigator.

### C. LASER USE AUTHORIZATION

A Laser Use Authorization is required for the use or storage of Class 3B and 4 lasers or laser systems at SJSU. A Laser Use Authorization must be obtained before laser use commences. A Laser Use Authorization is obtained by the following stepwise process:

1. The Principle Investigator will provide the Laser Safety Officer with a completed Laser Registration Form for each Class 3B and 4 laser or laser system in their inventory, including lasers in storage.
2. The Laser Safety Officer will contact the Principal Investigator to discuss the laser system and application.
3. The Laser Safety Officer, with consultation of the Principal Investigator, will determine what controls must be in place in the proposed use/storage location. These controls must be in place before the Laser Use Authorization will be approved. The Laser Safety Officer will also determine the types of personal protective equipment required for laser use. This equipment must be available prior to approval of the Laser Use Authorization.
4. The Principal Investigator will provide Standard Operating Procedures and alignment procedures for approval by the Laser Safety Officer. The Principal Investigator must also have completed a Laser Safety Training course within the past three years.
5. The Laser Safety Officer will provide the Principal Investigator a Laser Use Authorization for each laser or laser system in their inventory. The Laser Use Authorization will be stored in the laboratory and made available during Laser Safety Audits or to regulatory inspectors.

The Laser Use Authorization will be reviewed at least annually during the Laser Safety Audit. The Principal Investigator may also request termination of a Laser Use Authorization. The Laser Use Authorization may be revoked or suspended by the Laser Safety Officer or acting Laser Safety Officer if use of the laser poses excessively hazardous or dangerous working conditions for students or staff.

#### D. CLASS 3B LASER CONTROL AREAS

Class 3B and 4 lasers and laser systems may only be operated inside designated Laser Control Areas approved by the Laser Safety Officer. A Laser Control Area is a facility or room that is used to confine laser hazards to a defined area under the control of the Laser User. The Laser Control Area shall have locked doors to restrict access by unauthorized personnel while the laser is in operation.

The following controls are required for operation of Class 3B (and 4) lasers or laser systems:

- A defined and contained Nominal Hazard Zone for open laser beams. The Nominal Hazard Zone defines where increased control measures are required (e.g. laser eyewear, skin protection). The Laser Safety Officer will calculate the Nominal Hazard Zone for each laser as part of the Laser Use Authorization registration process.
- Light containment. All windows, doorways, or other openings must be closed or covered in such a way that laser light above the Maximum Permissible Exposure cannot escape the Laser Control Area. Special controls are required for use of lasers outdoors; contact the Laser Safety Officer for outdoor laser use.
- Authorization to use the laser or laser system. Principal Investigators are responsible for ensuring their Laser Users have completed all required laser safety training and have

received sufficient hands-on instruction to prove competence in order to be authorized to use a Class 3B and 4 laser or laser system.

- Laser Control Area labeling. All access doors to rooms that contain Class 3B or 4 lasers or laser systems shall be posted with a warning sign, and defined based on the highest powered laser in the Laser Control Area. The sign denotes the level of hazard (“CAUTION” or “DANGER”) and provides a description of laser or laser systems. A room containing more than one laser may include information for several lasers on the same sign. Signs are printed and posted by Laser Safety Officer with input from the Principal Investigator.
- All Class 3B and 4 lasers are required to be marked with the appropriate labels indicating the laser class, laser hazard, and identifying the laser aperture. The appropriate labels are available from the Laser Safety Officer.
- Beam stop. All laser beams, except those used in surgery or for therapeutic purposes, must terminate in a beam stop or dump. The beam stop shall be constructed out of a material that is non-reflective and fire resistant.
- Eye protection.
  - Beam control is an essential component to preventing injuries. Lasers should be mounted such that the beam path is not at eye level of personnel while seated or standing. Ensure that open laser beams are kept in the plane of the laser table. Beams that leave the laser table must be marked and covered in some way to prevent accidental exposure to personnel.
  - Never stare directly at a beam (intrabeam viewing) or at the reflection of a beam, even while wearing laser protective eyewear.
  - Laser protective eyewear must be of sufficient optical density and threshold limit to prevent accidental laser exposure above the Maximum Permissible Exposure. The filters in laser safety eyewear only provide protection over a specific, filter-dependent wavelength range, therefore selecting eyewear based on the wavelength(s) of the beam being manipulated is essential. All individuals present within the Nominal Hazard Zone must be provided adequate eyewear if a laser exposure could theoretically exceed the Maximum Permissible Exposure. The Principal Investigator is responsible for obtaining and providing appropriate eyewear for their authorized Laser Users.
  - If a laser is to be used in as medical treatment, the patient, the laser operator and any other personnel present must be provided adequate laser eye protection.
  - Laser safety eyewear should be inspected periodically to ensure that it remains in good, functional condition (e.g. no bleaching or clouded spots on lenses).
  - The Laser Safety Officer can provide assistance in selecting appropriate laser safety eyewear.

- Skin protection. UV lasers and laser systems can present severe hazards to exposed skin. If the UV source cannot be enclosed, it may be necessary to wear appropriate skin protection (e.g. gloves, UV face shield, lab coat).

#### E. CLASS 4 LASER CONTROL AREAS

It is essential that Class 4 Laser Control Areas be restricted to only properly trained personnel during laser operation. Appropriate eye protection is mandatory and must be available to all personnel working within the Nominal Hazard Zone of a Class 4 laser or laser system. **Class 4 Laser Control Areas must meet all requirements for a Class 3B Laser Control Area as well as the following:**

- Emergency Stop. In case of emergency, an emergency stop or “panic button” must be available and capable of deactivating the laser or reducing emission to below the Maximum Permissible Exposure. If a Class 4 laser or laser system is not equipped with an emergency stop, the power must be turned off or reduced quickly in some other manner.
- Rapid Egress and Emergency Access. Class 4 lasers pose a greater risk of fire or other emergency conditions. As such, requirements for rapid egress from the Laser Control Area must be maintained at all times. Interlock systems must not interfere with emergency egress nor shall Entryway Control measures prevent access by emergency personnel (fire, paramedical, police) to the Laser Control Area.
- Entryway Controls. Procedural area or entry way controls must be in place to prevent inadvertent exposure to Class 4 Laser Control Area or exposure to the active laser beam. Entryway controls shall incorporate one of the following control methods:
  - Non-defeatable Interlock Systems. An interlock system is used at the entryway of the Laser Control Area that will deactivate or reduce the output power of the laser to below the Maximum Permissible Exposure should there be an unexpected entry to the Laser Control Area.
  - Defeatable Interlock System. Where a non-defeatable interlock system limits the intended use of the laser or laser system, a defeatable interlock system shall be used that allows temporary override of the interlock.
  - Procedural Entryway Safety Controls. Where interlock systems are not feasible, contact the Laser Safety Officer for approval of procedural entryway controls. At the minimum, training of all personnel, blocking the entryway to reduce laser radiation (e.g. with a door or curtain), providing adequate personal protective equipment outside of the Nominal Hazard Zone or Laser Control Area, and an appropriate Laser Emission Warning Device.
- Laser Emission Warning Device. Class 4 lasers shall have a visible or audible laser emission warning outside the Laser Control Area to indicate that the laser is on. A Laser Emission Warning Device is recommended for Class 3B Laser Control Areas.

## F. TEMPORARY LASER CONTROL AREA

Service, maintenance, and alignment of Class 3B or 4 lasers embedded within Class 1 systems shall require a temporary Laser Control Area to be established and approved by the Laser Safety Officer. Temporary Laser Control Areas are subject to the normal Standard Operating Procedure approval process and training requirements.

## G. STANDARD OPERATING PROCEDURES

A written Standard Operating Procedure is required for all Class 3B and 4 lasers or laser systems. The Standard Operating Procedure must be written by the Principal Investigator and be provided to the Laser Safety Officer for approval as part of the Laser Use Authorization registration process. Updates or changes to approved Standard Operating Procedures must also be approved by the Laser Safety Officer.

The Standard Operating Procedure will cover laser operations (i.e. description of activities/experiments, hazards and hazard mitigation, alignment procedures, schematics of laser set-up), non-beam hazards (e.g. potential for fire, high voltage equipment, laser-generated air contaminants, laser dyes), and other relevant hazards in the laser environment (e.g. compressed gases, chemicals, biohazards). The Standard Operating Procedure may also be used to document any lab-specific administrative controls relevant to laser activities. Standard Operating Procedures should be used to train laser users in the facility.

Standard Operating Procedures become exceptionally useful and a basis for consistent safe work practices when they are kept up-to-date and are reinforced by the Principal Investigator through example and action.

## H. LASER SAFETY AND USE AUDITS

All laser facilities are inspected by the Laser Safety Officer at least annually to assure that the lasers are being operated in a safe manner. The Laser Safety Officer maintains records of all inspections performed. Copies of the inspection reports are provided to the Principal Investigator for review and, if necessary, corrective action. The Laser Safety Officer will also re-inspect laser facilities to verify the correction of unsafe condition(s). The Laser Safety Officer reviews the compliance status for all Laser Use Authorizations on an annual basis. Principal Investigators with consistently uncorrected safety violations will be asked to work with their department chair or college dean to ensure the violations are resolved.

## V. LASER INCIDENTS

Most of the major causes of laser incidents are eye exposure during alignment, misaligned optics and upwardly directed beams, available laser eye protective eyewear not used, improper handling of high-voltage circuits, and fires. It is essential that all beam and non-beam hazards are addressed **prior** to commencing work with lasers. The safety precautions described in the Laser Safety Plan have been put in place to safeguard our Laser Users.

The Laser Safety Officer and the Principal Investigator must be informed immediately (or as soon as practical) of any suspected laser incidents. Following the incident, the Principal Investigator (or direct supervisor) is responsible for filing the appropriate injury report forms.

- For employees: follow [directions on the University Personnel website](#) and submit the [Employer's Report of Occupational Injury](#) form within 24 hours.
- For students or Visitors: Follow [Risk Management's guidelines](#) for submitting the [Student and Visitor Accident Report](#) form within 24 hours.

The Laser Safety Officer, with collaboration of the Principal Investigator (or direct line supervisor), is responsible for investigating any suspected laser incidents. The Laser Safety Officer maintains a record of incidents and distributes lessons learned reports as appropriate.

#### A. INJURY AND EMERGENCY RESPONSE PROTOCOL:

1. Shut down the laser system.
2. Check the scene to ensure it is safe: Do not become the next victim!
  - a. If it is safe to do so, provide first aid for injured personnel or evacuation as needed.
  - b. **NOTE: If a laser-caused eye injury is suspected, have the injured person keep their head upright and still to restrict any bleeding in the eye. A physician should evaluate laser eye injuries as soon as possible.**
3. Injuries: Obtain medical assistance for injured personnel.
  - a. Call 4-2222 from any campus phone or (408) 924-2222 from a cell phone for SJSU police dispatch, who will coordinate emergency response.
  - b. Provide the dispatch operator with the nature of the injury and the exact location (building, floor, and room number).
  - c. Provide your name and contact phone number to the dispatch operator.
  - d. Don't hang up until the operator tells you to.
  - e. Have someone meet the emergency responders outside the building.
4. Fire:
  - a. Evacuate the area and pull the fire alarm as you exit the building.
  - b. Call 4-2222 from any campus phone or (408) 924-2222 from a cell phone for SJSU police dispatch, who will coordinate emergency response.
  - c. Do not try to fight the fire yourself unless the incipient fire is extremely small, contained, and you have been trained to do so. A small fire can become out of control quickly.
5. Inform the Laser Safety Officer as soon as possible at (408) 924-1939.
6. Inform the Principal Investigator as soon as possible. If there is an injury, the Principal Investigator must submit the appropriate injury report form within 24 hours.
7. Do not resume use of the laser until the incident has been investigated by the Laser Safety Officer and all corrective actions have been implemented.

## B. MEDICAL EXAMINATIONS

If you have an actual or suspected laser-induced eye injury, seek medical attention as soon as practical (usually within 24-48 hours). Do not drive yourself to the clinic. To ensure appropriate medical referral, you will need to provide characteristics of the laser, including exposure wavelength, emission characteristics, and exposure situation. Exposures to lasers in the retinal hazard region (visible and near infrared; roughly 380-1400 nm) shall be examined by an ophthalmologist (see contact below). Skin injuries should be seen by a physician.

### [Concentra Urgent Care & Occupational Medical Center](#)

- 1901 Monterrey Rd. #10 San Jose, CA (408) 477-8080
- 1887 Monterey Rd. #200 San Jose, CA (408) 288-3800
- 315 S. Abbott Avenue Milpitas, CA (408) 790-2900
- 2737 Walsh Avenue, Santa Clara, CA (408) 228-8400

## VI. REGULATIONS GOVERNING THE LASER SAFETY PLAN

The contents of the Laser Safety Plan are based on the guidelines set forth by the American National Standards Institute (ANSI) Z136.1-2014: Safe Use of Lasers. California Occupational Safety and Health Administration (Cal/OSHA) uses ANSI Z136.1 as a guideline to inspect and enforce SJSU's Injury and Illness Prevention Program (California Code of Regulations, Title 8, Subchapter 7 General Industry Orders, Section 3203), which includes the safe use of lasers in the workplace.

## VII. DEFINITIONS

**Diffuse reflection.** Viewing the reflection of a laser beam off a rough surface, which causes the beam to diffuse. Also called scattered reflection.

**Interlock.** An interlock is an engineering control used to prevent laser light radiation or laser operation while the doorway, laser enclosure, or laser housing is open.

**Intrabeam viewing.** Viewing the laser directly in the path of the beam (which should never be done). Also known as "staring at the beam."

**Laser Control Area.** A facility or room that is used to confine laser hazards to a defined area under the control of the Laser User.

**Laser-Generated Air Contaminant (LGAC).** High powered lasers can vaporize materials such as living tissue, metals, and other materials, which creates an inhalation hazard. Lasers producing laser-generated air contaminants should be used with adequate ventilation to remove the laser-generated air contaminants from the workspace.

**Maximum Permissible Exposure (MPE).** The maximum level of laser radiation a person may be exposed to without adverse biological effect to the skin or eyes.

**Nominal Hazard Zone (NHZ).** The area around the open beam where direct, scattered, or indirect laser radiation exceeds the Maximum Permissible Exposure (MPE).



**Optical Density (OD).** Optical density describes the protective factor laser eyewear (or other laser viewing material) provides to the user. It is based on a logarithmic scale, such that OD 1 allows 1/10<sup>th</sup> of the laser light through, OD 2 lets 1/100<sup>th</sup> of the laser light through, and so on.

**Specular reflection.** Viewing the reflection of a laser beam off of a mirrored surface.

## VIII. REFERENCES

This Laser Safety Plan was created with reference to the laser safety manuals at University of California, Davis and University of Connecticut as well as the 2014 edition of the American National Standards Institute (ANSI) standard governing the safe use of lasers (Z136.1).

## IX. REVISION HISTORY

<b>Laser Safety Plan</b>	
Author: Alexi Ball-Jones, Ph.D.	Date: 10/14/2019
Version 1.0	Next Review: 10/14/2020
Version 2.0	Next Review: 10/14/2021

<b>Version</b>	<b>Date Published</b>	<b>Author</b>	<b>Publication Notes:</b>
1.0	10/14/2019	Alexi Ball-Jones	Inaugural Laser Safety Plan
2.0	10/15/2020	Alexi Ball-Jones	Plan review, broadened training methods to include college-level general laser safety training.