

UT Health Science Center: LS01 Laser Safety Procedure	
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## Objective

This procedure outlines the requirements of the University of Tennessee Health Science Center (UTHSC) for tracking and managing 3B and 4 lasers on campus. This policy incorporates the requirements of ANSI Z136.1, The American National Standard for Safe Use of Lasers (2022) and ANSI Z136.3, Safe Use of Lasers in Health Care Facilities (2018).

This policy provides recommended training for the safe use and handling of class 2, 2M, and 3R lasers.

## Scope

This procedure applies to all class 3b and 4 lasers used on campus in research, education, service and teaching activities.

Instruments that contain enclosed class 3b and 4 lasers must be registered with the UTHSC Radiation Safety Office and inventoried in Environmental Health and Safety Assistant (EHSA) database. Operators of these instruments must comply with the safety requirements established in this procedure, the applicable ANSI standard, complete general laser safety training provided by Research Safety Affairs and receive hands-on training in the proper use of the instrument from the instrument owner.

## Roles

Laser Safety Officer (LSO) and designee responsibilities-

- Assure proper classification of all lasers
- Assess class 3b and 4 open laser work areas and specify appropriate control measures
- Review procedures and Standard Operating Procedures (SOPs)
- Conduct routine inspections of work areas, signs, and Personal Protective Equipment (PPE).
- Develop basic laser safety and compliance training for users
- Maintain program records, including the laser inventory, basic laser safety training records, and inspection results

Principal Investigator (PI)/Owner responsibilities-

- Register all class 3B, class 4, embedded class 3B, and embedded class 4 lasers with the UTHSC radiation safety office

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- Review his/her inventory of lasers at least quarterly to ensure the inventory is accurate. Promptly report any discrepancies to the LSO for resolution and correction.
- Ensure all persons authorized to operate the laser or laser containing instruments have completed required training, including hands-on training by the PI/owner.
- Maintain the correct PPE for use by operators.
- Maintain a safe working environment for laser operators and other persons in the area around the laser.
- Ensure all visitors and other personnel in the room when the laser is operating have been advised on the hazards present and measures are in place to protect them from all laser-related hazards.

#### Laser Operator responsibilities-

- Ensure you have completed all required laser safety training
- Follow established SOPs and applicable SOPs
- Use required PPE properly and consistently
- Is authorized by the laser or laser-containing device PI/owner to operate the unit.
- Promptly reports all accidents, incidents, or near misses involving a laser immediately (on the shift of occurrence)

## Definitions

Administrative Controls are measures implemented by administrative means. Examples include training, safety approval, and laser safety officer designation, as well as standard operating procedures (SOPs) to mitigate the potential hazards associated with laser use.

Class 1 laser systems are incapable of producing damaging radiation levels during regular operation and are exempt from any control measures. Class 1 laser systems may contain higher-class lasers and may produce laser hazards if operated with interlocks defeated or if the equipment is modified or dismantled. Only authorized personnel may operate class 1 laser systems with interlocks defeated. Operators of class 1 laser systems with embedded class 3B or class 4 lasers shall receive a laser safety briefing.

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Class 1M laser systems are incapable of producing hazardous exposure conditions during regular operation unless the beam is viewed with optical instruments. Operators of class 1M laser systems shall receive a laser safety briefing.

Class 2 laser systems emit visible light only at a power level of 1 milliwatt(mW) or less. The normal aversion response to bright light is adequate protection. Staring into the beam of a class 2 laser is hazardous. Operators of class 2 laser systems shall receive a laser safety briefing.

Class 2M laser systems emit visible light only. The normal aversion to bright light provides adequate protection for unaided viewing. However, viewing the beam with optical aids is potentially hazardous. Operators of class 2M laser systems shall receive a laser safety briefing.

Class 3R laser systems are potentially hazardous under certain viewing conditions; however, the probability of an actual injury is small, and the control measures for safe use are straightforward. Most laser pointers fall in this class. Operators of class 3R laser systems shall receive a laser safety briefing. (Most lasers previously classified as class 3a fall in this category.)

Class 3B laser systems pose eye hazards for intrabeam viewing and specular reflections, even for momentary exposures; however, diffuse reflections are generally not hazardous. Class 3B laser systems shall be operated only in laser-controlled areas by authorized operators. Operators of class 3B laser systems shall receive approved laser safety training.

Class 4 laser systems pose significant eye and skin hazards, including those from intrabeam exposures, specular reflections, and diffuse reflections. They are also fire hazards and may produce laser-generated air contaminants. Class 4 laser systems shall be operated only in laser-controlled areas by authorized operators. Operators of class 4 laser systems shall receive

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approved laser safety training. Written SOPs are required for class 4 laser operation.

Laser Operator is any person allowed to operate the laser or instrument by the PI/Owner.

Laser Safety Officer (LSO) is the person designated by the UTHSC Chief Safety Officer to manage the laser safety Program.

Principal Investigator/Owner is the UTHSC employee designated to oversee and manage the instrument or laser. The department head or chair will be designated if no one else fills the role. The PI/Owner will be listed with the device in EHSA database.

Clinical use of lasers is the use of a laser device on a patient by or under the supervision of a licensed practitioner, physician, or dentist within the scope of their practice for diagnostic, preventive, aesthetic, or therapeutic purposes, where bodily structure or function is altered, or symptoms are relieved. This includes prescription use of the medical laser device and over-the-counter indications for use.

Diffuse reflection is the change of the spatial distribution of a laser beam of radiation when it is reflected in many directions by a surface or by a medium.

Embedded Class 3B and Class 4 laser system refers to a higher-powered laser (Class 3B or 4) contained within an enclosure that limits accessible emissions, effectively reducing the overall hazard classification of the system to a lower level, such as Class 1 or Class 2. This lower classification is appropriate because engineering features within the enclosure prevent users from being exposed to the laser's full power output.

Engineering control measures are control measures designed or incorporated into the laser system. Examples include interlocks, shutters, and a watchdog timer. Other examples may include protective barriers, area warning devices, class 4 entryway controls, and an emergency stop.

Intrabeam viewing is the viewing condition whereby the eye is directly exposed to all or part of a laser beam.

The Laser Control Area (LCA) is the designated area for laser use, where access and activities are controlled and supervised. This area may be defined

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by walls, barriers, or other means. Potentially hazardous beam exposure is possible with the LCA.

Laser Generated Air Contaminants (LGAC) are toxic fumes, gases, and particulates produced when laser beams interact with various materials.

Laser Target Interaction Radiation (LTIR) is non-laser radiation, including ionizing radiation, emitted by material because of the exposure of the material to laser radiation.

Maximum Permissible Exposure (MPE) is the level of laser radiation to which an unprotected person may be exposed without experiencing any adverse biological effects, specifically in the eyes or skin.

Nominal Hazard Zone (NHZ) is the space within which the level of the direct, reflected, or scattered radiation may exceed the applicable MPE. Exposure levels beyond the boundary of the NHZ are below the applicable MPE.

## Procedure

### I. Registering a laser or laser-enclosed Instruments

- A. The PI/owner must complete a laser registration form in Appendix E when a new class 3b laser, class 4 laser, enclosed 3b laser, or enclosed 4 laser is purchased or received.
- B. The completed registration form must be email to [safety@uthsc.edu](mailto:safety@uthsc.edu) within 3 working days upon arrival onto campus.
- C. The LSO or designee will enter the registration data into EHSA database.

### II. Medical Surveillance

- A. Baseline eye exams are not required by UTHSC.
- B. Any laser incident must be reported.
  - 1. An incident that results in an injury, including minor first aid injuries to a UTHSC employee, must be reported through [CORVEL](#).

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2. An incident that results in property damage only, such as damaged equipment, minor fires, etc., must be reported as [property damage](#).
3. An incident that results in an injury to a student or campus visitor must be reported as a [general liability incident](#).

### III. Training

- A. Training and communication of hazard requirements are provided in Appendix D, Table 3.
- B. Research Safety Affairs training records will be maintained in EHSA database.
- C. The PI/owner providing operator training must maintain training records and provide them upon request during audits or inspections.

### IV. Signage

- A. Laser use and clinical treatment room entrances must be labeled with appropriate signage.
- B. Sample signage is shown in Appendix C, Figure 1.

### V. Control Measures and Work Practices

- A. Work practices and control measures for lasers used in research facilities, education, and animal treatment rooms are summarized in Appendix A
- B. Work practices and control measures for lasers in clinical areas are summarized in Appendix B.
- C. Signage examples are in Appendix C.
- D. Training requirements are in Appendix D.

### VI. Personal Protective Equipment (PPE)

- A. Eyes
  1. The optical density for eyewear can be calculated in accordance with ANSI Z136.1 - 2022 or determined in some cases by using Table 1 in Appendix A.
  2. All eyewear used for laser protection must be
    - a) Marked by the manufacturer with the wavelength(s) and Optical Density rating

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- b) Supplied with manufacturer's recommendations on shelf life, storage conditions, cleaning, and use
  - c) Laser damage threshold ( $\text{Watt}\cdot\text{cm}^{-2}$ ) for the material of construction.
  - d) Must be inspected routinely for the following:
    - (1) Damaged coating and light leaks
    - (2) Frame mechanical integrity
    - (3) Lost ventilation ports, deformation of facepiece, and stretching of head strap for goggles
    - (4) Inspection of attenuation material for pitting, crazing, cracking, discoloration, delamination, or lifting of dielectric coating
    - (5) Cleaning in accordance with the manufacturer's guidelines
  - e) Damaged or compromised eyewear must be repaired by the manufacturer or replaced.
- B. Skin
  - 1. Maximum permissible exposure limits for skin have been established in ANSI Z136.1-2022.
  - 2. Engineering controls should be used, when possible, to control skin exposure.
  - 3. Depending on the laser characteristics and power levels, PPE such as lab coats and gloves may provide protection. Consideration must be given when flame retardant fabrics and heavy gloves, such as welder's gloves, are appropriate. (Section VI.C of this policy provides guidance on fire hazards.)
- C. Other laser hazards
  - 1. Fire
    - a) Appendix A, Table 2 provides guidance on threshold fire hazards.
  - 2. Vapors, gases, and fumes production
    - a) Appendix A, Table 2 provides guidance on threshold production limits.
  - 3. Plasma
    - a) Appendix A, Table 2 provides guidance on threshold production limits.



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4. Production of ionizing radiation
  - a) Produced in laser system components and/or from target interactions with a high energy laser beam.
  - b) Appendix A, Table 2 provides guidance on threshold production limits.

VII. Audits/Inspections

- A. Research Safety Affairs will conduct inspections of the laser storage and use areas quarterly.

VIII. Records and documentation

- A. All associated records will be stored in EHSA database.

## Penalties/Disciplinary Action for Non-Compliance

Describe the appropriate sanctions for non-compliance, if any, such as disciplinary action of employees or students and/or civil or criminal penalties.

## Responsible Official & Additional Contacts

This Responsible Official and Additional Contacts section contains those who are responsible or share certain policy responsibilities, organized by subject matter, such as monitoring compliance with the policy, providing additional guidance on policy clarifications, organizing policy training, updating the policy, etc.

Subject Matter	Office Name	Telephone Number	Email/Web Address
Policy Clarification and Interpretation	Research Safety Affairs	(901) 448-6114	safety@uthsc.edu
Policy Training	Research Safety Affairs	[(901) 448-6114	safety@uthsc.edu
Inspection and registration	Research Safety Affairs	(901) 448-6114	safety@uthsc.edu



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## **Related Policies/Guidance Documents**

ANSI Z136.1 The American National Standard for Safe Use of Lasers (2022)

ANSI Z136.3, Safe Use of Lasers in Health Care Facilities (2018)

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## **Appendix A**

### **Research Facilities, Education, and Animal Treatment Rooms**

#### **Work Practices and Control Measures**

##### **Class 4 Open Beam Lasers**

- I. Standard Operating Procedures (SOPs)
  - a. Written SOPs for all maintenance, alignment, and service activities must be written by or under the supervision of the PI/owner of the laser. The procedures must be reviewed and approved by the UTHSC LSO or designee.
  - b. Written SOPs for all operations that require a bypass, including a temporary bypass of a safety feature or interlock on the laser system.
  - c. Written SOPs must include the following elements:
    - i. Summary of the activity to be performed
    - ii. PPE required by personnel performing the work
    - iii. Any safety features or interlocks that will be bypassed.
    - iv. Power level of the laser required for work
    - v. Number of personnel required.
- II. Education and Training
  - a. Refer to section III of this procedure for standard operator training.
  - b. The PI/owner must ensure UTHSC personnel receive sufficient additional training to perform any maintenance and service activities that will be conducted in-house on the unit as recommended by the manufacturer.
- III. Authorized Personnel
  - a. Must be authorized by the laser PI/owner to operate the laser or be in the laser-controlled area when the laser is operating
  - b. Must complete all training required by this policy.
  - c. Must follow all approved lab laser SOP and the requirements of this policy when operating the laser.
- IV. Laser Controlled Area (LCA)
  - a. The laser-controlled area must be established by the laser PI/owner in consultation with the LSO.
  - b. The LSA must be clearly identified.

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- c. All persons (including unauthorized individuals) with access to the area must be made aware of the potential hazards, boundaries and safety requirements.
- V. Spectators
  - a. Spectators must be approved by the laser PI/owner.
  - b. Spectators must be advised of the hazards present and measures in place to prevent exposures.
- VI. Personal Protective Equipment (PPE)
  - a. Required PPE must be provided by the laser PI/owner.
  - b. Required PPE must be designated in the lab-specific standard operating procedure.
  - c. All laser operators and others in the nominal hazard zone must wear the required PPE when operating the laser.
  - d. All required PPE must be inspected before each use and discarded or repaired when damage is identified.
- VII. Alignment Procedure
  - a. Alignment procedures must only be conducted by authorized laser operators.
  - b. Alignment procedures must be specified in a laboratory SOP and must always be followed.
- VIII. Service personnel
  - a. Laser service activities that require exposing the beam, inserting an object in the beam, or disabling one or more interlocks must be performed by factory-authorized and factory-trained service technicians.
- IX. Protective Housing
  - a. Manufactured protective housing
    - i. All manufacturer installed housing must be maintained in good condition.
  - b. Without protective housing
    - i. Third-party housing/shielding that serves as a beam blocker is an engineering option to reduce or eliminate the beam hazard.
    - ii. The housing/shielding must be suitable for the wavelength(s) and must be evaluated by the LSO.

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- iii. If the laser beam power is sufficient to pose a fire ignition hazard, then the selection process, curtain or beam blocker materials of construction, must be taken into consideration
- X. Service access panels
  - a. Ensure panels are closed when the machine is energized.
  - b. Panels must only be opened by authorized service technicians.
- XI. Facility window protection
  - a. When the beam might reach a window in the laser control area, a suitable beam blocker or laser curtain must be used.
  - b. If the laser beam power is sufficient to pose a fire ignition hazard, then the selection process, curtain or beam blocker materials of construction, must be taken into consideration
- XII. Collecting optics
  - a. Collecting optics must be used by authorized personnel only.
  - b. The use of collecting optics must be reviewed and approved by the LSO.
  - c. The use of laser collecting optics must be documented in a lab specific SOP. Safety requirements must be specified in the SOP.
- XIII. Laser controlled area authorized personnel
  - a. Must be authorized by the laser PI/owner to operate the laser or be in the LCA when the laser is operating
  - b. Must complete all training required by this policy.
  - c. Must follow all approved lab laser SOPs and the requirements of this policy when operating the laser.
- XIV. Entryway controls
  - a. Entryway controls approved by the LSO and complying with ANSI Z136.1, The American National Standard for Safe Use of Lasers (2022) requirements must be employed
  - b. Adopted warning systems must be documented in the laboratory-specific SOP and included in the laboratory-specific training.
- XV. Laser radiation emission warning
  - a. Laser emission warnings for the LCA must be approved by the LSO, and complying with ANSI Z136.1, The American National Standard for Safe Use of Lasers (2022) requirements must be employed

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- b. Adopted warning systems must be documented in the laboratory-specific SOP and included in the laboratory-specific training.

XVI. Non-laser emission hazards

- a. Non-beam hazards must be assessed by the laser PI/owner and the LSO.
- b. Any hazards deemed significant and the requirements to mitigate the hazard must be implemented and documented in a laboratory-specific SOP.

Class 3B Open Beam Lasers

I. Education and Control

- a. Refer to section III of this procedure for standard operator training.
- b. The PI/owner must ensure UTHSC personnel receive sufficient additional training to perform any maintenance and service activities that will be conducted in-house on the unit as recommended by the manufacturer.

II. Authorized Personnel

- a. Must be authorized by the laser PI/owner to operate the laser or be in the LCA when the laser is operating
- b. Must complete all training required by this policy.
- c. Must follow all approved lab laser SOPs and the requirements of this policy when operating the laser.

III. Laser controlled area (LCA)

- a. The LCA must be established by the laser PI/owner in consultation with the LSO.
- b. Area must be clearly identified.
- c. All persons (including non-authorized individuals) with access to the area must be made aware of the boundaries and safety requirements

IV. PPE

- a. Required PPE must be provided by the laser PI/owner.
- b. Required PPE must be designated in the lab-specific SOP.
- c. All laser operators and others in the nominal hazard zone must wear the required PPE when operating the laser.
- d. All required PPE must be inspected before each use and discarded or repaired when damage is identified

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- V. Alignment Procedures
  - a. Alignment procedures must only be conducted by authorized laser operators.
  - b. Alignment procedures must be specified in a laboratory SOP and must always be followed.
- VI. Service personnel
  - a. Laser service activities that require exposing the beam, inserting an object in the beam, or disabling one or more interlocks must be performed by factory-authorized and factory-trained service technicians.
- VII. Protective Housing
  - a. Manufactured protective housing
  - b. Without protective housing
- VIII. Service access panels
  - a. Ensure panels are closed when the machine is energized.
  - b. Panels must only be opened by authorized service technicians.
- IX. Facility window protection
  - a. When the beam might reach a window in the laser control area, a suitable beam blocker or laser curtain must be used.
  - b. If the laser beam power is sufficient to pose a fire ignition hazard, then the selection process of curtain or beam blocker materials of construction must take this into consideration
- X. Collecting optics
  - a. The use of laser collecting optics must be documented in a lab specific SOP. Safety requirements must be specified in the SOP.

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Q-Switched Laser 10 <sup>-9</sup> - 10 <sup>-2</sup> second		Non-Q-Switched Lasers (0.4x10 <sup>-3</sup> – 10 <sup>-2</sup> second)		Continuous Wave Lasers Momentary (0.25-10 seconds)		Continuous Wave Lasers Long-Term Staring ( less than 1 hour)		Attenuation	
Maximum Output Energy (J)	Maximum Beam Radiant Exposure (J·cm <sup>2</sup> )	Maximum Laser Output Energy (J)	Maximum Beam Radiant Exposure (J·cm <sup>2</sup> )	Maximum Power Output (Watts)	Maximum Beam Irradiance (W·cm <sup>-2</sup> )	Max Power Output (W)	Maximum Beam Irradiance (W·cm <sup>-2</sup> )	Attenuation Factor	OD
10	20	100	200	10 <sup>5 b</sup>	2x10 <sup>5 b</sup>	100 <sup> b</sup>	200 <sup> b</sup>	10 <sup>8</sup>	8
1	2	10	20	10 <sup>4 b</sup>	2x10 <sup>4 b</sup>	10 <sup> b</sup>	20 <sup> b</sup>	10 <sup>7</sup>	7
10 <sup>-1</sup>	2x10 <sup>-1</sup>	1	2	10 <sup>3 b</sup>	2x10 <sup>3 b</sup>	1	2	10 <sup>6</sup>	6
10 <sup>-2</sup>	2x10 <sup>-2</sup>	10 <sup>-1</sup>	2x10 <sup>-1</sup>	100 <sup> b</sup>	200 <sup> b</sup>	10 <sup>-1</sup>	2x10 <sup>-1</sup>	10 <sup>5</sup>	5
10 <sup>-3</sup>	2x10 <sup>-3</sup>	10 <sup>-2</sup>	2x10 <sup>-2</sup>	10	20	10 <sup>-2</sup>	2x10 <sup>-2</sup>	10 <sup>4</sup>	4
10 <sup>-4</sup>	2x10 <sup>-4</sup>	10 <sup>-3</sup>	2x10 <sup>-3</sup>	1	2	10 <sup>-3</sup>	2x10 <sup>-3</sup>	10 <sup>3</sup>	3
10 <sup>-5</sup>	2x10 <sup>-5</sup>	10 <sup>-4</sup>	2x10 <sup>-4</sup>	10 <sup>-1</sup>	2x10 <sup>-1</sup>	10 <sup>-4</sup>	2x10 <sup>-4</sup>	10 <sup>2</sup>	2
10 <sup>-6</sup>	2x10 <sup>-6</sup>	10 <sup>-5</sup>	2x10 <sup>-5</sup>	10 <sup>-2</sup>	2x10 <sup>-2</sup>	10 <sup>-5</sup>	2x10 <sup>-5</sup>	10	1

Table 1 – Simplified Method for Selecting Laser Protective Eyewear from a Point Source (wavelengths between 400 nm and 1400 nm) <sup>a,c</sup>

Table 1 – Simplified Method for Selecting Laser Protective Eyewear from a Point Source (wavelengths between 400 nm and 1400 nm)<sup>a,c</sup>

<sup>a</sup> Use of this table may result in OD greater than necessary. For other wavelengths consult, ANSI Z136.1 -2022.

<sup>b</sup> Not recommended as a control procedure at these levels. Those levels of power could damage or destroy the attenuating material used in the eye protection. Skin protection is also required at these levels.

<sup>c</sup> Taken from ANSI Z136.1-2022



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None beam hazard	Approximate Minimum Irradiance ( $W \cdot cm^{-2}$ )	Laser Target Material	Potential Control Measure
Ignition of flammable materials	1 to 10	Flammable or combustible material	Noncombustible barrier materials
LGAC production	$10^3$	Low boiling point materials	Adequate building ventilation
	$10^3$ to $10^6$	Plastics	Local exhaust ventilation (LEV)
	$10^6$ to $10^7$	High boiling point material; composites, metals, tissue	LEV, respiratory protection where LEV cannot be implemented or while it is being implemented
Plasma production	$\sim 10^{12}$	Metals	Limit personnel exposure to plasma radiation
	$\sim 10^{13}$	Dielectrics	
Production of ionizing radiation may approach regulatory exposure limits (occupational)	$\sim 10^5$ (depending on wavelength, target material, and focusing parameters)		Monitoring, shielding, restrict personnel access

Table 2 – Irradiance Dependence of Specific Nonbeam Hazards (NBH) from ANSI Z136.1 - 2022

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## **Appendix B**

### **Clinical Facilities**

#### **Work Practices and Control Measures**

##### **Class 4 and Class 3b Lasers**

- I. General Requirements
  - a. Engineering, administrative (procedural) controls, and protective equipment must be used as required to maintain a safe work environment for the medical professionals as well as the patient.
  - b. All medical personnel utilizing the laser or assisting during laser use must be appropriately trained in laser safety, the treatment protocol requirements, and provided and use the correct personal protective equipment.
  - c. Policies and procedures must be developed and kept up to date. These policies and procedures must be followed during laser treatments.
  - d. Laser devices must be maintained in accordance with US FDA and manufacturer requirements.
    - i. Policies and procedures must be reviewed and updated as needed when equipment repairs and updates are made.
  - e. Laser use facilities must be designed and maintained to prevent laser radiation transmission out of the operating/treatment room.
    - i. Materials must be flame-retardant in class 4 laser use locations.
  - f. The patient's eyes must be protected from laser radiation when an exposure potential exists. The method of protection must be suitable for the wavelength of the laser emission and must be sufficient to reduce the beam to a level less than the maximum permissible exposure.
- II. Laser Protective Eyewear
  - a. When possible, eyewear should be obtained from the manufacturer of the laser device or the specifications provided by the manufacturer.
  - b. Optional density (OD) must be appropriate for the wavelength of operation.

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- c. Eyewear must be maintained in accordance with the manufacturer's recommendations for shelf life, storage conditions, and appropriate cleaning methods.
  - d. Eyewear must be inspected before each use. If damage is observed, the eyewear must not be used and must be removed from service.
  - e. Recommendations for eyewear specifications can be found in Appendix A, Table 1, if the manufacturer is unable to provide recommendations.
- III. Skin protection
  - a. When there is a potential for skin exposure, an appropriate skin protective cover must be used.
- IV. Treatment/operating room signage
  - a. When use of the laser is underway, signage shown in Appendix C must be displayed. Signage should be removed or covered once work has been completed.
- V. Non-Laser hazards
  - a. Reference Appendix A, Table 2 for non-laser light hazards that may be present in the workplace when lasers are being operated.
  - b. Laser Generated Airborne Contaminants (LGAC) can be produced when tissues are vaporized or disrupted during treatment. Plumes have the potential to contain aerosolized blood, blood by-products, and pathogens.
    - i. Local ventilation, use of PPE, and good bloodborne pathogen control practices should be employed. Consult with Research Safety Affairs for additional recommendations and monitoring.
  - c. Class 4 lasers may introduce a fire hazard depending on the power level of the laser.
- VI. Consult Appendix D, Table 3 for training requirements for laser operators and personnel assisting with medical procedures involving the use of lasers.

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- VII. The department or college that owns the laser must develop a procedure for designating personnel to operate lasers utilized in the department.

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## **Appendix C**

### **Signage for Entrances to Laser Use Areas**

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 <h1>WARNING</h1>	
	<p>&lt;POSITION 1&gt;</p>
	<p>&lt;POSITION 2&gt;</p>
	<p>&lt;POSITION 3&gt;</p>
<p><b>POSITION 1</b> "CLASS 4 LASER" OR "CLASS 3B LASER"</p> <p><b>POSITION 2</b>  A. (CLASS 4) "LASER RADIATION - AVOID EYE EXPOSURE TO DIRECT OR SCATTERED RADIATION- AVOID SKIN CONTACT TO DIRECT RADIATION"  (CCLASS 3B) - "LASER RADIATION - AVOID DIRECT EXPOSURE TO BEAM"  B. ADD ADDITIONAL INFORMATION SUCH AS - (1) "LASER SURGERY IN PROGRESS - EYE PROTECTION REQUIRED", "ENTER ONLY WITH PERMISSION", " LASER EYE PROTECTION REQUIRED: OD&gt;= X@ YYY NM", "INVISIBLE LASER RADIATION"  C. LASER WAVELENGTH AND POWER OUTPUT </p> <p><b>POSITION 3</b> NAME OF LASER OWER/PRINCIPAL INVESTIGATOR AND CONTACT NUMBER</p>	

Figure 1 – Laser signage

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## **Appendix D**

### **Training Requirements**



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<b>Laser Class</b>	<b>Training</b>	<b>Provider</b>	<b>Documentation</b>
<b>Class 4 Open Beam</b>	Basic Laser Safety (Blackboard)	Research Safety Affairs	Completed training documented in EHSA
<b>Class 4 Open Beam</b>	Hands-on and SOP training	PI/Owner	Documentation maintained by lab for review by LSO or designee
<b>Class 3B open beam</b>	Basic Laser Safety (Blackboard)	Research Safety Affairs	Completed training documented in EHSA
<b>Class 3B open beam</b>	Hands-on and SOP training	PI/Owner	Documentation maintained by lab for review by LSO or designee
<b>Class 3B or 4 enclosed beam</b>	Review safe use and handling information sheet	Research safety affairs and PI/Owner	Documentation maintained by lab for review by LSO or designee
<b>Class 3R</b>	Review safe use and handling information sheet	Research safety affairs and PI/Owner	Documentation maintained by lab for review by LSO or designee
<b>Class 2</b>	Review safe use and handling information sheet	Research safety affairs and PI/Owner	Documentation maintained by lab for review by LSO or designee

*Table 3 – Training requirements for operators of a laser or a laser-containing device*

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## **Appendix E**

### **Laser Registration Form**

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Laser receipt date  Laser registration date:

PI Name

PI Department  PI College

Building housed  Room housed

### UTHSC Property Inventory Information

Laser Source Inventory #	<input style="width: 100%;" type="text"/>	Associated equip. inventory #	<input style="width: 100%;" type="text"/>
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### Device Use

<input type="checkbox"/> Confocal Microscope	<input type="checkbox"/> Flow Cytometry	<input type="checkbox"/> Imaging Reader	<input type="checkbox"/> Other:
<input style="width: 100%;" type="text"/>			

Used for ☐ Dental or medical clinic ☐ Education ☐ Research

### Laser Information

Class ☐ 3B Open Beam ☐ 3B enclosed ☐ 4 Open Beam ☐ 4 enclosed

Manufacturer  Model number

Serial #  ☐ Fixed ☐ Mobile

Emission Duration ☐ Continuous ☐ Pulsed ☐ Other:

Beam characteristics			
wavelength	Visible?	Max power mW	Ave Power mW

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Entered in EHSA by:		Date:	
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