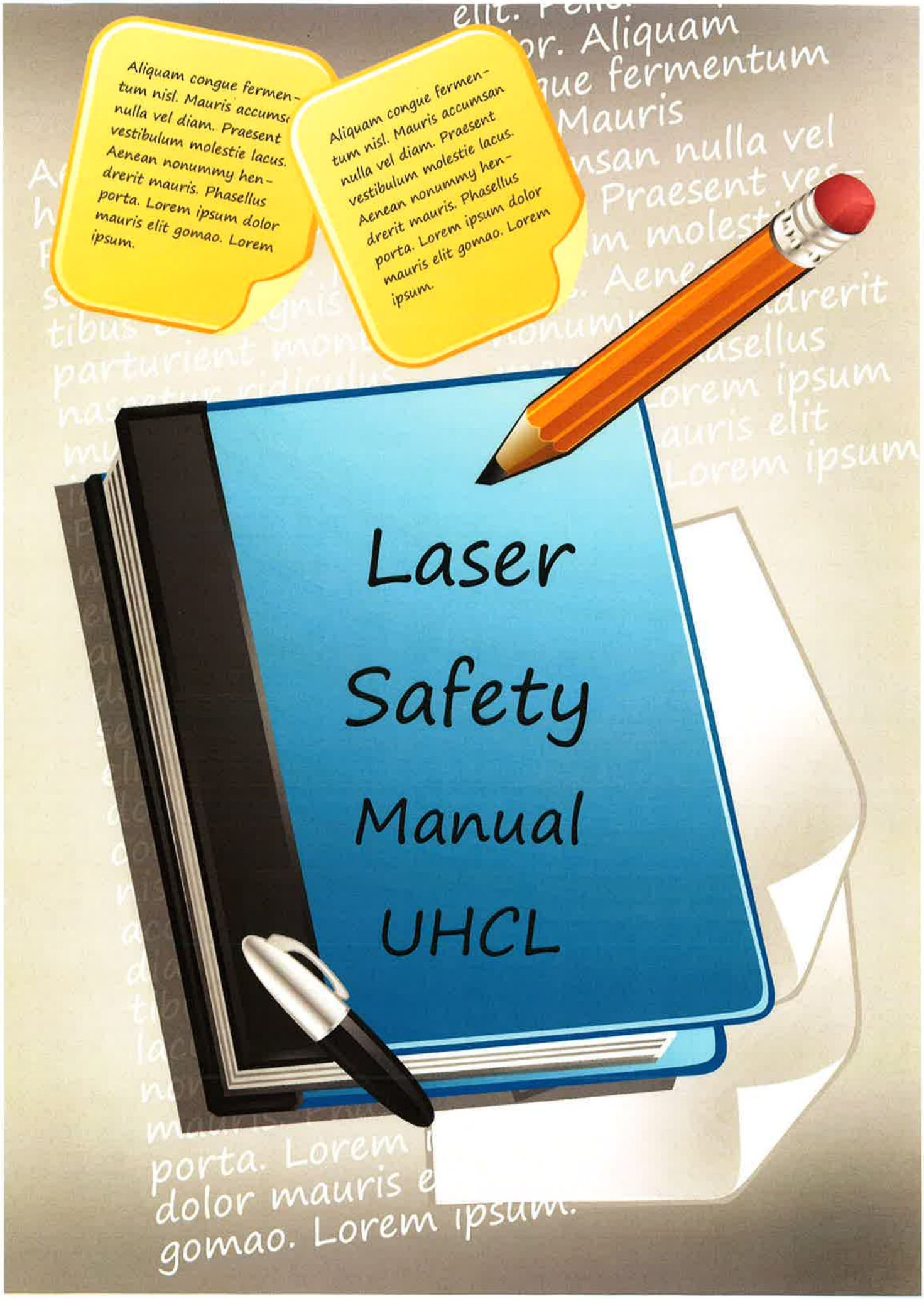
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Laser
Safety
Manual
UHCL

Laser Safety Manual Approval:

Radiation Safety Committee (Laser Specific) Chairperson:

Dennis Cossey — 4/5/12

Signature of Laser Safety Officer — Date

Hugh C. Stewart — 04/05/2012

Signature of Radiation Safety Committee (Laser Specific) Chairperson — Date

Paul F. Meyer — 4/5/12

Signature of Radiation Safety Committee (Laser Specific) member — Date

Robert Cobb — 4/5/12

Signature of Radiation Safety Committee (Laser Specific) member — Date

Greg Cozy — 4/5/12

Signature of Radiation Safety Committee (Laser Specific) member — Date

Lenpham — 4/5/2012

Signature of Radiation Safety Committee (Laser Specific) member — Date

_____ — _____

Signature of Radiation Safety Committee (Laser Specific) member — Date

RC FORM 203-1
(February 2010)

Department of State Health Services
1100 West 49th Street
P.O. Box 149347
Austin, Texas 78714-9347

NOTICE TO EMPLOYEES

TEXAS REGULATIONS FOR CONTROL OF RADIATION

The Department of State Health Services has established standards for your protection against radiation hazards, in accordance with the Texas Radiation Control Act, Health and Safety Code, Chapter 401.

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to-
1. Apply these rules to work involving sources of radiation.
2. Post or otherwise make available to you a copy of the Department of State Health Services rules, licenses, certificates of registration, notices of violations, and operating procedures that apply to your work, and explain their provisions to you.

YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with those provisions of the rules and the operating procedures that apply to your work. You should observe the rules for your own protection and protection of your co-workers.

WHAT IS COVERED BY THESE RULES

1. Limits on exposure to sources of radiation in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Individual monitoring devices, surveys and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports;
6. Options for workers regarding agency inspections; and
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The rules require that your employer give you a written report if you receive an exposure in excess of any applicable limit as stated in the rules, license, or certificate of registration. The basic limits for exposure to employees are stated in 25 Texas Administrative Code (TAC)§289.202(f), (k), (l), and (m) (relating to Standards for Protection Against Radiation from Radioactive Materials) and 25 TAC §289.231(m)(relating to General Provisions and Standards for Protection Against Machine-Produced Radiation). These subsections specify limits on exposure to radiation and exposure to concentrations of radioactive material in air and water.
2. If you work where individual monitoring devices are provided in accordance with 25 TAC §289.202 or §289.231:
(a) your employer must furnish to you, upon your written request, an annual written report of your exposure to radiation; and
(b) your employer must give you a written report, upon termination of your employment, of your radiation exposures if you request the information on your radiation exposure in writing.

INSPECTIONS

All licensed or registered activities are subject to inspection by representatives of the Department of State Health Services. In addition, any worker or representative of the workers who believe that there is a violation of the Texas Radiation Control Act, the rules issues there under, or the terms of the employer's license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of the alleged violation to the Department of State Health Services. The request must state the specific grounds for the notice, and must be signed by the worker or the representative of the workers. During inspections, agency inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition that the individual believes contributed to or caused any violation as described above.

POSTING REQUIREMENT

Copies of this notice shall be posted in a sufficient number of places in every establishment where employees are employed in activities licensed or registered, in accordance with 25 TAC §289.252 (relating to Licensing of Radioactive Material) and 25 TAC §289.226 (relating to Registration of Radiation Machine Use and Services), to permit employees to observe a copy on the way to or from their place of employment. Applicable sections of 25 TAC Chapter 289 may be reviewed online, at www.dshs.state.tx.us/radiation/rules.shtm

NOTICE OF DOCUMENTS LOCATION

AS REQUIRED BY THE TEXAS REGULATIONS FOR THE CONTROL OF RADIATION TITLE 25 TAC CHAPTER 289, THE DOCUMENTS BELOW MAY BE EXAMINED AT THE:

Risk Management Department
North Office Annex, Room 107
2700 Bay Area Blvd., Box 362
Houston, Texas 77058
MONDAY THROUGH THURSDAY, FROM 8:00 AM TO 5:00 PM

TEXAS REGULATIONS FOR THE CONTROL OF RADIATION
OPERATING AND SAFETY PROCEDURES
LASER REGISTRATION,
CONDITIONS AND AMENDMENTS
STATE INSPECTIONS
AND
CORRESPONDENCE WITH THE TEXAS DEPARTMENT OF STATE HEALTH SERVICES

Laser Subregistration Application and Amendment Guidelines

All Class IIIb and IV lasers at the University of Houston - Clear Lake must be approved by the Laser Safety Officer and authorized by the Radiation Safety Committee.

Only Class IIIb and IV lasers are required to be registered with the Texas Department of State Health Services under the University of Houston - Clear Lake's Laser Registration. Low power lasers including Class I, II and IIIa lasers are not required to be registered.

New Principal Investigators (PIs) must fill out an Application for Laser Subregistration and send it to UHCL Box 362, for review by the Laser Safety Officer (LSO). Application forms can be found in the Laser Safety Manual. This subregistration application must include all lasers, laser users, and equipment locations and procedures. Anyone not listed on the subregistration permit **must not** be allowed to work with lasers for any reason. The lasers must not be used until final approval is given by the LSO.

The use of lasers often requires specialized safeguards. Investigative procedures vary widely as do applicable safety techniques. The information provided on the application will enable the Laser Safety Officer to formulate necessary safety measures and assist the Principal Investigator in implementing these measures. It is important that all pertinent information be included and the application fully completed. Laser Safety Personnel will perform a compliance inspection prior to allowing laser use.

Authorized Principal Investigators planning to make a change to their subregistration must fill out a Laser Subregistration Amendment Form and send it to the LSO for review. This includes additions or deletions to the subregistration.

The Laser Safety Officer will submit all applications to the Radiation Safety Committee for approval. The Laser Safety Officer may give interim approval to Principal Investigators until the next Radiation Safety Committee meeting. When the LSO finds reason to give an interim authorization to a new PI prior to Radiation Safety Committee's approval, the authorization will be limited to 90 days to allow sufficient time for a committee meeting (with quorum) to discuss and then approve, deny, or issue conditionally a new subregistration to the PI. A temporary

subregistration permit with a 90 day expiration date will be issued with the LSO's signature until the Radiation Safety Committee approval is obtained. A new permit will then be issued which includes the Chair's signature.

Approved Principal Investigators will receive an Authorization Permit to work with lasers,which is proof of Laser authorization at the University of Houston - Clear Lake and may be submitted with Research Grant Proposals. Once authorized, the Principal Investigator will remain authorized until either subregistration termination by the Principal Investigator or the sublicense is revoked by the Radiation Safety Committee for noncompliance.

Laser Procurement Procedures

Class IIIb and IV lasers can only be ordered on a Purchase Requisition through the Purchasing Department per the University of Houston - Clear Lake Laser Safety Manual. All Purchase Requisitions for Class IIIb and IV lasers must be approved in advance by the Laser Safety Officer. Transferred equipment and donations must also be approved. The Laser Safety personnel will verify that the Principal Investigators are authorized for the lasers.

Purchase Requisitions may be brought to Risk Management located in the North Office Annex Building, Room 107; faxed to 281-226-7195; or mailed to UHCL Box 362. Please call 281-283-2106 before bringing orders over for approval to ensure the Laser Safety Officer or representative will be available to sign-off on your order. Every order should be accompanied by an Addendum B per the Purchasing Department. Laser Safety personnel will stamp and sign each order. Normally orders will be promptly approved unless there are some issues to be addressed. Purchasing Department will reject orders without the Laser Safety personnel's approval. Also, Purchase Requisitions lacking the necessary information, improperly filled out, or outside the Principal Investigator's authorization will be delayed.

Laser safety devices should be purchased with the laser if possible, and installed with the laser when received. Failure to plan and install safety devices as required will delay the final approval for use of the laser.

Purchase Order information must include:

- Laser, Type, Model and other pertinent information for each laser ordered
- Brief Description or Copy of Brochure/Manual
- Name of the Principal Investigator
- Directions to deliver shipment

Laser Safety Requirements for Class IIIb and IV Lasers

The University of Houston - Clear Lake's Laser Safety Program sets forth controls and safety guidance for research and educational activities involving lasers. The procedures herein are adapted from the regulations in Title 25 of the Texas Administration Code (TAC), Chapter 289, Section 301. This program is established to institute prudent safety practices and to meet the regulatory requirements. If any conflict occurs between this program and the state regulations, the latter shall prevail.

These requirements apply to lasers that operate at wavelengths between 180 nm and 1 mm. All lasers and Intense-Pulsed Light (IPL) device use at the University of Houston - Clear Lake must be approved by the Laser Safety Officer and authorized by the Radiation Safety Committee.

There are certain general prohibitions:

- Individuals shall not use lasers on humans unless under the supervision of a licensed practitioner of the healing arts and unless the use of lasers is within the scope of practice of their professional license.
- Individuals shall not be intentionally exposed to radiation above the maximum permissible exposure levels (MPE) unless such exposure has been authorized by a licensed practitioner of the healing arts.
- Exposure of an individual for training, demonstration or other non-healing arts purposes is prohibited unless authorized by a licensed practitioner of the healing arts.
- Exposure of an individual for the purpose of healing arts screening is prohibited, except as authorized by the Texas Department of State Health Services.
- Exposure of an individual for the purpose of research is prohibited, except as authorized in research studies.
- Any research using radiation producing devices on humans must be approved by an institutional review board (IRB) as required by the Code of Federal Regulations. The IRB must include at least one practitioner of the healing arts to direct use of the laser.

Registration Requirements

The university is required to notify the agency in writing within 30 days of any increase in the number of lasers authorized by the Registration. Each new use of a Class IIIb or Class IV laser in the healing arts or for animal use must be submitted to the agency within 30 days after beginning operation of the laser. An application for laser use in the healing arts shall be signed by a licensed practitioner of the healing arts. Also, an application for veterinary medicine shall be signed by a licensed veterinarian. .

No person shall make, sell, lease, transfer, or lend lasers unless such machines and equipment, when properly placed in operation and used, shall meet the applicable requirements. The university is required to inventory all Class IIIb and Class IV lasers in their possession at an interval not to exceed one year.

The inventory shall be maintained for inspection and include:

Manufacturer's Name
Model and Serial Number of the laser
Description of the laser
Location of the laser

The University is required to maintain records of receipt, transfer, and disposal of all Class IIIb and Class IV lasers for inspection to include:

Manufacturer's Name
Model and Serial Number of the laser
Date of receipt, transfer, and disposal
Name and address of person laser(s) received from, transferred to, or disposed by,
Name of individual recording the information

Laser Safety Officer (LSO) duties

The University Laser Safety Officer is a designated staff member who has the knowledge and responsibility to apply appropriate laser radiation protection rules, standards, and practices. The LSO is named and specifically authorized to perform duties specified on the Certificate of Laser Registration issued by the Texas Department of State Health Services, Bureau of Radiation Control. The duties of the LSO include:

- Ensure that users of lasers are trained in laser safety, as applicable for the class and type of lasers the individual uses.

- Assumes control and has the authority to institute corrective actions including shutdown of operations when necessary in emergency situations or unsafe conditions.
- Specify whether any changes in control measures are required following any service and maintenance of lasers that may affect the output power or operating characteristics or whenever deliberate modifications are made that could change the laser class and affect the output power or operating characteristics.
- Ensure maintenance and other practices required for the safe operation of the lasers are performed.
- Ensure the proper use of protective eyewear and other safety measures.
- Ensure compliance with the laser requirements and with any engineering or operational controls specified by the university.

General Requirements for protection against laser radiation

These requirements are for Class IIIb and Class IV lasers in their intended mode of operation and include special requirements for service, testing, maintenance, and modification.

- In situations where engineering controls may be inappropriate, such as medical procedures, the LSO shall specify alternate controls to obtain equivalent laser safety protection.
- Each university or user of any laser shall not permit any individual to be exposed to levels of laser or collateral radiation higher than the Maximum Permissible Exposure (MPE) limits.
- Personnel operating each laser shall be provided with written instructions for safe use, including clear warnings and precautions to avoid possible exposure to laser or collateral radiation in excess of the MPE.

Engineering Controls

Protective Housing

Each laser shall have a protective housing that prevents human access during the operation of the laser and collateral radiation that exceeds the limits of Class I laser.

Safety Interlocks

A safety interlock, that shall ensure that radiation is not accessible above the MPE limits, shall be provided for any portion of the protective housing that by design can be removed or displaced during normal operation or maintenance, and thereby allows access to radiation above the MPE limits.

Adjustment during operation, service, testing, or maintenance of a laser containing interlocks shall not cause the interlocks to become inoperative or the radiation to exceed MPE limits outside the protective housing except where a laser controlled area is established.

For pulsed lasers, interlocks shall be designed so as to prevent firing of the laser; for example, by dumping the stored energy into a dummy load.

For continuous wave lasers, the interlocks shall turn off the power supply or interrupt the beam; for example, by means of shutters.

An interlock shall not allow automatic accessibility of radiation emission above MPE limits when the interlock is closed. Either multiple safety interlocks or a means to preclude removal or displacement of the interlocked portion of the protective housing upon interlock failure shall be provided, if failure of a single interlock would allow human access to high levels of laser radiation.

Viewing Optics and Windows

All viewing ports, viewing optics, or display screens included as an integral part of an enclosed laser or laser product shall incorporate suitable means, such as interlocks, filters, or attenuators, to maintain the laser radiation at the viewing position at or below the applicable MPE under any conditions of operation of the laser.

All collecting optics, such as lenses, telescopes, microscopes, endoscopes, etc., intended for viewing use with a laser shall incorporate suitable means, such as interlocks, filters, or attenuators, to maintain the laser radiation transmitted through

the collecting optics to levels at or below the appropriate MPE. Normal or prescription eyewear is not considered collecting optics.

Warning Systems

Each class IIIb, or IV laser or laser product shall provide visual or audible indication during the emission of accessible laser radiation. For Class IIIb lasers except for those less than 5 mW peak visible laser radiation, and Class IV lasers, this indication shall be sufficient prior to emission of such radiation to allow appropriate action to avoid exposure. Any visible indicator shall be clearly visible through protective eyewear designed specifically for the wavelength(s) of the emitted laser radiation. If the laser and laser energy source are housed separately and can be operated at a separation distance of greater than two meters, both laser and laser energy source shall incorporate visual or audible indicators. The visual indicators shall be positioned so that viewing does not require human access to laser radiation in excess of the MPE.

Controlled Area

For Class IIIb lasers, except those less than 5 mW visible peak power, or Class IV lasers, a controlled area shall be established when exposure to the laser radiation in excess of the MPE or the collateral limits is possible. Each controlled area shall be posted by proper laser signage and access to the controlled area shall be restricted.

For Class IV indoor controlled areas, latches, interlocks, or other appropriate means shall be used to prevent unauthorized entry into controlled areas.

Where safety latches or interlocks are not feasible or are inappropriate, for example during medical procedures, the following shall apply:

- All authorized personnel shall be trained in laser safety and appropriate personnel protective equipment shall be provided upon entry;
- A door blocking barrier, screen, or curtains shall be used to block, screen, or attenuate the laser radiation at the entryway.
- The level at the exterior of these devices shall not exceed the applicable MPE, nor shall personnel experience any exposure above the MPE immediately upon entry.
- At the entryway there shall be a visible or audible signal indicating that the laser is energized and operating at Class IV levels.

For Class IV indoor controlled areas, during tests requiring continuous operation, the individual in charge of the controlled area shall be permitted to momentarily override the safety interlocks to allow access to other authorized personnel if it is

clearly evident that there is no optical radiation at the point of entry, and if necessary protective devices are being worn by the entering personnel.

For Class IV indoor controlled areas, optical paths from an indoor facility shall be controlled in such a manner as to reduce the transmitted values of the laser radiation to levels at or below the appropriate MPE and the collateral limits.

When the removal of panels or protective covers and/or overriding the interlocks becomes necessary, such as for servicing, testing, or maintenance, and accessible laser radiation exceeds the MPE and the collateral limits, a temporary controlled area shall be established.

Key Control

Each Class IIIb and Class IV laser shall incorporate a key-actuated or computer-actuated master control. The key shall be removable and the Class IIIb and Class IV laser shall not be operable when the key is removed. When not being prepared for operation or is unattended, the key will be removed from the device and stored in a location away from the machine.

Additional Requirements for Safe Operation

Infrared Laser

The beam from an infrared laser shall be terminated in a fire-resistant material where necessary. Inspection intervals of absorbent material and actions to be taken in the event or evidence of degradation shall be specified in the laboratory operating and safety procedures.

Eye Protection

Protective eyewear shall be worn by all individuals with access to Class IIIb and/or Class IV levels of laser radiation. Protective eyewear devices shall provide a comfortable and appropriate fit all around the area of the eye; be in proper condition to ensure the optical filter(s) and holder provide the required optical density or greater at the desired wavelengths and retain all protective properties during its use; be suitable for the specific wavelength of the laser and be of optical density adequate for the energy involved; have the optical density or densities and associated wavelengths(s) permanently labeled on the filters or eyewear; and examined, at intervals not to exceed 12 months, to ensure the reliability of the protective filters and integrity of the protective filter frames. Unreliable eyewear shall be removed from use and discarded.

Skin Protection

When there is a possibility of exposure to laser radiation that exceeds the MPE limits for the skin, the university shall require the appropriate use of protective gloves, clothing, or shields.

Nominal Hazard Zone (NHZ)

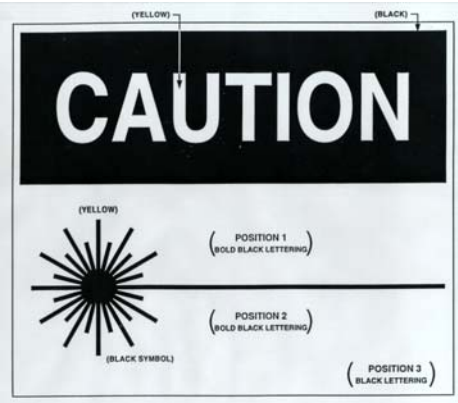
Where applicable, in the presence of unenclosed Class IIIb and Class IV laser beam paths, an NHZ shall be established. If the beam of an unenclosed Class IIIb and Class IV laser is contained within a region by adequate control measures to protect personnel from exposure to levels of radiation above the appropriate MPE, that region may be considered to be the NHZ.

Caution Signs, Labels, and Posting for Lasers

The laser controlled area shall be conspicuously posted with a sign or signs as specified by the regulations. The regulatory philosophy for laser postings and labels are as well as the UHCL laser safety program is to notify individuals of the hazards present. As such all access points to a laser facility with Class IIIb or Class IV lasers must be marked with approved laser warning signs. Laser hazard signs are available from the Laser Safety Officer.

All signs and labels associated with Class II, IIIa, IIIb, and IV lasers shall contain the following wording:

(A) The signal word **"CAUTION"** shall be used with all signs and labels associated with all Class II lasers and all Class IIIa lasers that do not exceed the appropriate MPE as in the figure below.

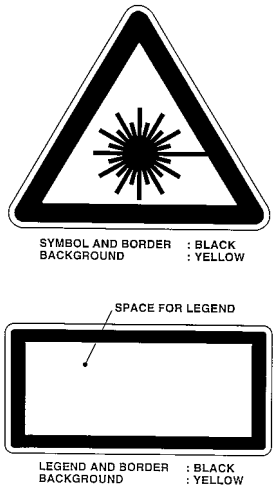


Sample Warning Sign for Class II and Class IIIa Lasers.

(B) The signal word **"DANGER"** shall be used with all Class IIIa lasers that exceed the appropriate MPE and all Class IIIb and IV lasers.

Sample Warning Sign for Class IIIb and Class IV Lasers

Equipment warning labels (see figure below) with the sunburst logo and the appropriate cautionary statement will be conspicuously affixed to the laser housing or control panel by the manufacturer. Laser enclosures must be labeled to alert users to laser hazards. Labels are also available from the Laser Safety Officer.



IEC Warning Logo and Information Label.

Lasers, except lasers used in the practice of medicine, shall have a label(s) in close proximity to each aperture through which is emitted accessible laser or collateral radiation in excess of the limits with the following wording as applicable:

> "AVOID EXPOSURE - Laser radiation is emitted from this aperture," if the radiation emitted through such aperture is laser radiation.
>
> "AVOID EXPOSURE - Hazardous electromagnetic radiation is emitted from this aperture," if the radiation emitted through such aperture is collateral radiation.
>
> "AVOID EXPOSURE - Hazardous x-rays radiation is emitted from this aperture," if the radiation emitted through such aperture is collateral x-ray radiation.

Each non-interlocked or defeatably interlocked portion of the protective housing or enclosure that is designed to be displaced or removed during normal operation or servicing, and that would permit human access to laser or collateral radiation shall have labels as follows:

> Class IIIb accessible laser radiation, the wording; "DANGER - LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM".
>
> Class IV accessible laser radiation, the wording; "DANGER - LASER RADIATION WHEN OPEN. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION".
>
> Collateral radiation in excess of the emission limits, the wording "CAUTION - HAZARDOUS ELECTROMAGNETIC RADIATION WHEN OPEN" and "CAUTION - HAZARDOUS X-RAY RADIATION." as applicable.

For protective housings or enclosures that provide a defeatable interlock, the words "and interlock defeated" shall be included in the labels.

The word "invisible" shall immediately precede the word "radiation" on labels and signs for wavelengths of laser and collateral radiation outside the range of 400 to 700 nm.

The words "visible and invisible" shall immediately precede the word "radiation" on labels and signs for wavelengths of laser and collateral radiation that are both within and outside the range of 400 to 700 nm.
Labels shall be clearly visible, legible, and permanently attached to the laser or facility. Signs shall be clearly visible, legible, and securely attached to the facility.

Surveys

Lasers inspections are conducted by Laser Safety personnel to ensure regulatory compliance at intervals not to exceed 12 months. The inspections include a determination that all laser protective devices are labeled correctly, and functioning within the design specifications, and properly chosen for lasers in use; a determination that all warning devices are functioning within their design specifications; a determination that the controlled area is properly controlled and posted with accurate warning signs; a re-evaluation of potential hazards from surfaces that may be associated with beam paths; and additional surveys that may be required to evaluate the primary and collateral Laser hazard incident to the use of lasers.

Records

Laser Safety will maintain compliance records for regulatory review. Applicable records must be submitted by the Laser PI or designated personnel to the Laser Safety upon request.

Injury or Medical Event

Each PI shall immediately seek appropriate medical attention for the injured individual and notify the LSO by telephone of any exposure injury involving a laser possessed by the university.

The LSO shall be notified within 48 hours of any non-injury incident (near miss) which involves potential exposure to laser radiation exceeding the MPE. A written summary of an injury or non-injury incident shall be forwarded to the LSO no later than five (5) working days following the incident. Records of any incident shall be maintained by the Principal Investigator.

The LSO shall, within 24 hours of discovery of an injury, report to the agency each injury involving any laser possessed by the university, other than intentional exposure of patients for medical purposes, that may have caused, or threatens to

cause, an exposure to an individual with second or third-degree burns to the skin or potential injury and partial loss of sight.

The LSO shall make a report in writing to the agency within 30 days and a notice to the individual shall be transmitted at the same time. The LSO shall also notify the agency of any medical event involving a patient as required.

Basic Laser Safety Guidelines

Measures necessary for controlling laser hazards normally concentrate upon making the beam path inaccessible, such as enclosing the laser in a box or controlled room to prevent unauthorized access. As this is not always possible, other Administrative and Engineering Controls are used to lessen the possibility of injury.

The Safety Procedures necessary for any laser operation vary with 3 aspects:

- Laser hazard classification
- Environment where the laser is used (outside vs. inside a controlled area)
- People operating or within the vicinity of the laser beam (Desks in lab)

Safety procedures are best presented by relating them to the laser hazard class. All laser products above Class I, manufactured after August 1976, must have labels that indicate the class to which they belong. FDA Regulatory Standard for all lasers divides laser products into 4 classes, based on the potential for injuring people and the intensity of the radiation in the laser beam (power of beam measured in watts).

Laser Classifications (ANSI Z136.1)

Class I - Exempt Lasers

- Produce levels of radiation that have not been found to cause biological damage
- This group is normally limited to gallium-arsenide lasers or certain enclosed lasers
- Incorporated into consumer or office machine equipment

Safety Precautions

- *No laser specific rules, however general lab safety rules still apply*

Class II - Low power and low risk

- Produce radiation that could cause eye damage after direct, long term exposure

- Hazardous only if viewer overcomes natural aversion response to bright light and continuously stares into source (Natural aversion response is the movement of the eyelid or the head to avoid an exposure to a noxious stimulant or bright light and can occur within 0.25 sec). Like blinding oneself by forcing oneself to stare at the sun for more than 10 to 20 seconds.

Safety Precautions

- *Never permit a person to stare into the laser source*
- *Never point the laser at an individual's eye*

Class IIIa – Low Risk or Medium Power

- Higher irradiance than Class II lasers with danger safety precautions requiring strict adherence to safety precautions.

Safety Precautions

- *Never permit a person to stare into the laser source*
- *Never point the laser at an individual's eye*
- *Operate the laser only in a controlled area*

Class IIIb - Moderate Risk or Medium Power

- Produce radiation powerful enough to injure human eye tissue with 1 short exposure to the direct beam or its direct reflections off a shiny surface.
- Does not produce hazardous diffuse reflections under normal use,
- Not usually capable of causing serious skin injury.

Safety Precautions

- *Do not aim the laser at an individual's eye*
- *Permit only experienced personnel to operate the laser*
- *Enclose the beam path as much as possible.*
- *Even a transparent enclosure will prevent individuals from placing their head or reflecting objects within the beam path*
- *Termination should be used at the end of the useful paths of the direct and any secondary beams*
- *Operate the laser only in a restricted area*

- *Place the laser beam path well above or well below the eye level of any sitting or standing observers whenever possible*
- *The laser should be mounted firmly to assure that the beam travels only along its intended path*
- *Always use proper laser eye protection for the direct beam or a specular reflection*
- *Key switch to prevent tampering by unauthorized individuals*
- *Remove all unnecessary mirror-like surfaces from within the vicinity of the laser beam path*

Class IV - High Power, High risk of injury and can cause combustion of flammable materials.

- May also cause diffuse reflections that are eye hazards and may also cause serious skin injury from direct exposure

Safety Precautions

- *Class IIIb safety precautions and;*
- *Should only be operated within a localized enclosure or in a controlled workplace*
- *If complete local enclosure is not possible, Interlocking of room*
- *Eye wear is needed for all individuals working within the controlled area*
- *Backstops should be diffusely reflecting - fire resistant target materials*

ANSI Z136.1 emphasizes that “It must be recognized that this classification scheme relates specifically to the laser device and its potential hazard, based on operating characteristics. However, the conditions under which the laser is used, the level of safety training of persons using the laser, and other environmental and personnel factors are important considerations in determining the full extent of safety control measures.”

Lasers Receipt, Setup, Documents, and Use

The Laser Safety Officer must be notified when a laser arrives and when it is set up. The Laser Safety Officer must document installation within 30 days of to maintain current registration information for the Laser Registration. Laser Safety personnel will provide assistance to any Principal Investigator who has special situations.

The Laser Safety Officer will require specific documentation for review. All records should be clearly identified, neatly organized, and kept together in one location in the lab. This will enable Principal Investigators to meet regulatory requirements and maintain compliance.

Normal Documentation

- Equipment Manuals
- Purchase records*
- Receipt/Installation records* (Includes transfers or donations)
- Written stand-alone operational procedures for each Class IIIb and IV laser including start-up, shut-down, safety device by-pass, alignment, and emergency *
- Calibration, maintenance, and modification records
- Safety glasses
- Safety devices (interlocks, warning lights, etc.)
- Other requested information

* Copies of these documents are required to be sent to the LSO at UHCL Box 362.

Laser Safety personnel will inspect the laser setup before operation begins. The Principal Investigator may only turn on the laser for test procedures in the initial setup. All safety devices must be installed and operational. The laser **must not** be used without the final approval of the Laser Safety Officer. The Laser Safety Officer will give final approval for use upon full compliance.

Lasers must be inspected by Laser Safety personnel at initial installation, after a move, and whenever maintenance or modifications affect the output. It is the responsibility of the Principal Investigator to promptly notify the Laser Safety Officer. Door signage will always be supplied and posted by Laser Safety personnel. Please call Risk Management at 281-283-2110, if laser signage is missing, defaced or needs updating.

Application for Class IIIb and IV Laser Subregistration

Principal Investigator: _____ Department: _____

Office Location: _____ Office Phone #: _____ E-Mail: _____

Emergency After Hours Contact: _____ Phone #: _____

Lasers Use Locations & Phone #s: _____

_____

Lasers Data:

Manufacturer	Model	Serial #	Type	Class	Max Time	Max Output	Wavelength	Active Y/N

Summary of Laser procedures:

_____
_____
_____
_____
_____

Summary of control measures proposed:

_____
_____
_____
_____
_____

Summary of Principal Investigator's training and experience with lasers including locations, courses, laser types, and duration. Principal Investigators must attend the UHCL Laser Safety Short Course.

_____
_____
_____
_____
_____
_____

List of Authorized Users*:

_____
_____
_____

* Authorized Users must have read the Laser Safety Manual and must verify by signing their initials. _____
* Authorized Users must have received specific Laser safety training for the Laser hazards in their labs from their Principal Investigator and must verify by signing their initials.
_____
* Authorized Users must have attended and passed the UHCL Laser Safety Short Course and must verify by signing their initials. _____
(Other Authorized Users may be added later by amendment after completing these requirements)

If the Principal Investigator receives interim approval by the LSO or is approved by the Radiation Safety Committee (Laser Specific) prior to taking the UHCL Laser Safety Short Course (LSSC), then the Principal Investigator agrees to attend and pass the next scheduled LSSC.

I certify that the information contained herein and attached hereto is true and correct to the best of my knowledge.

_____ _____
Signature of Principal Investigator Date

_____ _____
Signature of Laser Safety Officer Date

_____ _____
Signature of Radiation Safety Committee Chair Date

Return to Laser Safety at UHCL Box 362

Class IIIb and IV Laser Subregistration Amendment Form

Principal Investigator:_____ Department_____
Add: Authorized User* _____ Location _____ Machine _____ Laser Procedure _____
Delete: Authorized User _____ Location _____ Machine _____ Laser Procedure _____
(Final disposition of deleted equipment must be given including scrapped, cannibalized, or final destination)

Details:
_____
_____
_____
_____
_____

*New Authorized Users must have read the Laser Safety Manual and must verify by signing their initials. _____
*New Authorized Users must have received specific Laser safety training for the Laser hazards in their labs from their Principal Investigator and must verify by signing their initials.
_____
*New Authorized Users must have attended and passed the UHCL Laser Safety Short Course and must verify by signing their initials. _____

Lasers Data:

Manufacturer	Model	Serial #	Type	Class	Max Time	Max Output	Wavelength	Active Y/N

I certify that the information contained herein and attached hereto is true and correct to the best of my knowledge.

_____ _____
Signature of Principal Investigator Date

_____ _____
Signature of Laser Safety Officer Date

Approved by Radiation Safety Committee (Laser specific)

_____
Date

Return to Laser Safety at UHCL Box 362

Audit Methods for Laser Labs

All laser labs require facility/enclosure safety lights and interlocks, and laser warning/safety devices reviews per the Texas Regulations for the Control of Radiation (TRCR). These reviews are required upon initial installation, following any change in the arrangement or components of the equipment, following maintenance requiring disassembly, following alignments requiring disassembly, and when a visual inspection reveals an abnormal condition. The details for the reviews are in the Laser Safety Manual. In addition to the required facility/enclosure safety lights and interlocks, and laser warning/safety devices reviews; proper eyewear protection, written laser safety procedures for each machine, and recordkeeping of all associated documentation for each machine by the Principal Investigators (PIs) are required according to the TRCR and Laser Registration Conditions. Laser Safety will also require copies of the written Laser safety procedures and associated documentation according to the Laser Safety Manual and laser subregistration conditions.

In order to assure regulatory compliance in other areas of the Laser Safety Program pertaining to laser labs, complete lab inspections referred to as audits are conducted by Laser Safety Personnel at least annually. The audit includes the review of subregistration conditions, Laser safety procedures, records, equipment inventory, signage, facility and laser safety devices, eyewear protection, etc. Verification of Laser safety training of Authorized Users is recommended as part of the audit. When the Laser Safety staff perform audits or other health physics duties, they will evaluate appropriate security. A formal report detailing the results of the audit is sent to the PIs. PIs must resolve all noncompliance items within a specified time limit which may require written documentation. A follow-up inspection will be conducted to assure that the response is adequate and that compliance is achieved. Laser Safety Personnel will assist PIs with noncompliance items upon request. Failure by any PI to comply within the specified time limit will require that Escalation Procedures be implemented. These procedures involve higher administration and Radiation Safety Committee (Laser Specific) notification, and may ultimately lead to suspension.

Audits provide additional visibility and availability of the Laser Safety Personnel to Authorized Users that allows for questions to be answered, specific Laser safety issues to be addressed, additional Laser safety education and other safety areas support. Every opportunity should be utilized by Laser Safety Personnel to provide optimum service to the campus.