LASER SAFETY MANUAL

Scope

In order to protect the University of Georgia's faculty, staff, researchers, students, and visitors, from potentially hazardous levels of radiation associated with laser use, a laser safety program must be implemented. This laser safety manual applies to all students, researchers, faculty, staff, and visitors using lasers or lasersyssyss, ass [(f)-10(ro)]TJiTj -0.033l49 0 Td nTj (

- assuring lab personnel and authorized users within the laser control area receive adequate laser safety training, and access to laser safety manuals, SOP, MSDS, and any other information pertinent to laser safety before operation of laser equipment
- implementing appropriate control measures to reduce exposure to harmful levels of laser radiation, and assuring all feasible safety precautions are taken ensure safe use of laser equipment
- providing lab personnel and authorized users with personal protective equipment in good condition that is appropriate for the laser being used
- posting of signs and labels according to ANSI Z136.1 standards
- writing and updating standard operating procedures for laser equipment
- documenting of laser safety training for lab students and laser personnel
- reporting of accidents and possible exposures to the DSO and ESD

AUTHORIZED USERS

Authorized users include those working with or around lasers (i.e. operators, technicians, maintenance, and service personnel.) Lay e

2. The operator must have proof of qualification of the laser equipment present.
3. Employees shall be provided eye protection when an exposure greater than 5 mW exists.
4. Standard laser warning placards shall be posted in all areas where lasers are used.
5. Beam shutters or caps shall be utilized, or laser turned off when laser transmission is not actually required. Laser must be shut off when left unattended for a substantial period of time.
6. Only mechanical or electronic means shall be used for internal alignment procedures (viewing scopes, cards, ect.)
7. Laser beams shall not be directed at employees.
8. Operation of laser systems is prohibited when rain, snow, fog, or dust (in large quantities) is present in the air. Employees should be kept out of range of the area of source and target during such weather conditions.
9. Laser equipment shall bear a label indicating maximum output.
10. Employees shall not be exposed to light intensities above:
    a. 1 µW/cm² - direct staring
    b. 1 mW/cm² - incidental observing
    c. 2½ W/cm² - diffused reflected light
11. When possible, laser unit should be set at a level that will avoid direct eye exposure to those seated or standing in the vicinity of the laser during operation.

AMERICAN NATIONAL STANDARD FOR SAFE USE OF LASERS (ANSI Z136.1 - 2000)

The American National Standard Institute, Inc. published the laser standards to be used as a guideline for the safe use of lasers and laser systems. There are standards that specifically pertain to lasers used in medical applications (ANSI Z136.3) and fiber optics (ANSI Z136.2) however, this manual will make reference only to ANSI Z136.1. Entities using lasers for fiber optics and medical applications should confer with those manuals.

The ANSI laser standards are intended to make recommendations for those using lasers and laser systems that operate at wavelengths between 180 nm and 1 mm. Lasers and laser systems are classified according to potential hazards and are assigned appropriate controls. There should be no need for calculations to meet the standard unless a change is r e r s(

2. used solely at the place where constructed
3. used by the same employees who constructed them
4. not made on a recurring basis
5. constructed on a one-time basis by a particular entity, and made for use in that entity's manufacturing process in the place where constructed

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

The IEC is a global organization that prepares and publishes international standards for all electronic and related technologies. These standards also apply to those manufacturing or assembling lasers.

JOINT COMMISSION OF ACCREDITATION OF HEALTHCARE ORGANIZATIONS (JCAHO)

JCAHO is a credentialing organization. Regarding laser safety, they follow standards of care as outlined in ANSI Z136.3. JCAHO applies to all outpatient surgery facilities including hospital-based facilities, freestanding centers, and office based surgical suites. Any lasers used for medical reasons on campus should be in compliance with these standards.

Classification of Lasers and Laser Systems

The purpose of the laser classification system is to assign lasers to

BEAM HAZARDS

Beam hazards are those from direct and iHAZARDS H/06J /TT0 1 Ts 0 Tc 0 Tw 5.1 0 Td ( )T n 04 Tc 0.0

High-pressure arc

radiation above the MPE. A separate mechanism to prevent access to laser radiation above the MPE when the protective housing is opened should also be used. Protective housing interlocks should not be defeated during operation.

Lockout/Tagout

OSHA 1910.147 applies to lockout/tagout systems for controlling energy release. Lockout/tagout systems are an effective way of safeguarding against accidental start -up of a machine that is supposed to be turned off. Lockout systems use locks to prevent access to the energy-isolating device, and tagout systems use securely fastened signs to warn against reenergizing the equipment. Tagout systems should only be used when lockout systems are not feasible.

Some devices that may be used are chains, locks, tags, wedges, key blocks, adapter pins, and self-locking fasteners. They should be attached in a manner that will hold the isolating device in an “off” position, and substantial enough to prevent inadvertent removal. Only the employee who applied the lockout/tagout device should remove it. The proper lockout procedure sequence for energy control should b prevent transmission of laser light during alignment and use. Laser beams should never be directed at windows or doors.

Ventilation and Respiratory Protection

Hazardous vapors, smoke, fumes, and/or dusts can emanat

Tagout device – A warning device that can be securely fastened to an energy-isolating device to indicate that the energy isolating device and equipment may not be operated until the tagout device is removed.
Threshold limit values (TLV) – degree of exposure to which one may be exposed to laser radiation without risk of adverse effects.
Threshold limit (of PPE) – degree of exposure to which the personal protective equipment can stand before degradation occurs.
Tunable laser – Laser adjustable over several wavelengths of light or degrees of power.
Ultraviolet (UV) Light – Invisible radiation wavelengths between X ray and violet light (from about 200 to 380nm).
Visible light – Light within the visible wavelengths of the spectrum (400 to 700nm).
Wavelength – Distance between two peaks of a periodic wave.
X rays – High-energy photons with wavelengths between .01 to 10 nanometers.