Lasers Policy

Applicable Legislation:

Occupational Health and Safety Act (OHSA), R.S.O. 1990

Relevant Standards:

American National Standard for the *Safe Use of Lasers*, ANSI Z136.1-2000

International Commission on Non-Ionizing Radiation Protection. *Guidelines on Limits of Exposure to Laser Radiation of Wavelengths Between 180 nm and 1000 µm*. Health Physics 71:804-819, 1996.

Intent:

To define University policy on the safe use of lasers and to prescribe control measures to eliminate laser and associated hazards.

Definitions:

Class 1 laser

incapable of producing damaging radiation levels (typically CW: 0.4 Fwatts at visible lengths) during operation and maintenance and is exempt from control measures and other forms of surveillance.

Class 2 laser

a low power visible laser (0.4 to 0.7 Fm) which emits above Class 1 but not above 1 mW. Eye protection is normally afforded by the aversion response including the blink reflex.

Class 3 laser

may be hazardous under direct and specular reflection viewing conditions, but diffuse reflection is usually not a hazard. Class 3 lasers are not normally a fire hazard.

Class 3A laser

an intermediate power laser (CW: 1-5 mW). Hazardous for intrabeam viewing.

Class 3B laser

a moderate power laser (CW: 5-500 mW, pulsed: 10 J/cm2 or the diffuse reflection limit, which ever is lower). Diffuse reflections may be hazardous close to the diffuser.

Class 4 laser

a high power laser (CW: $ 500 mW) which is hazardous to view under any condition (i.e. direct beam or diffusely scattered) and is a potential skin or fire hazard.

continuous wave (cw)

the output of a laser which is operated in a continuous rather than a pulsed mode. In the ANSI standard, a laser operating with a continuous output for a period $ 0.25 s is regarded as cw laser.

laser

a device which produces an intense, coherent directional beam of light by stimulating electronic or molecular transitions to lower energy levels. An acronym for Light Amplification by Stimulated Emission of Radiation.

pulsed laser

a laser which delivers its energy in the form of a single pulse or a train of pulses. In this standard, the duration of a pulse < 0.25 s.

Q-switched laser

a laser that emits short (.10-25 ns), high-power pulses by means of a Q-switch.

maximum permissible exposure (MPE)

the level of laser radiation to which a person may be exposed without hazardous effect or adverse biological changes in the eye or skin. The criteria for MPE for the eye and skin are detailed in Section 8 of the ANSI standard.

nominal hazard zone (NHZ)

the nominal hazard zone describes the space within which the level of the direct, reflected or scattered radiation during operation exceeds the applicable MPE. Exposure levels beyond the boundary of the NHZ are below the applicable MPE level.

Policy:

1. The University shall adopt ANSI Z136.1 requirements for laser hazard management.
2. Laser supervisors are responsible for implementing the ANSI Z136.1 class specificlaser control measures and standard operating procedures, and authorizing personnel.
3. Laser supervisors are responsible for compliance costs associated with ANSI Z136.1.
4. Laser supervisors shall document their laser-specific hazard management initiatives and review the control measures annually. Documentation shall be submitted to Environmental Health and Safety.
5. Laser supervisors shall submit (annually) the names of authorized users of Class 3A, Class 3B, and Class 4 lasers to Environmental Health and Safety.

Guidelines:

The basis of the ANSI laser safety standard is a hazard classification system that is applied to all lasers. Reasonable engineering and administrative controls appropriate for the laser hazard class and the operating environment are to be applied for the protection of users and the public. Details maybe found inANSI Z136.1-2000. The Ontario Ministry of Labour has adopted this document as the workplace laser safety standard for Ontario.

Despite precautions, serious eye and skin injuries from lasers are not uncommon. The most frequently occurring laser injuries to research investigators are to the interior tissues of the eyes from thermal effects of visible and near infrared wavelengths. These accidents often occur during beamalignment procedures. The most effective controls include a rigorous alignment protocol at low output power and total enclosure of the laser and all beam paths. When this is not possible, partial beam enclosure, restricting access to beam paths, administrative controls, and laser wavelength-specific eye protection may be necessary. Burns, fire and electrical shock are other potentialhazards associated withhighpower Class 4 laser systems used for research. Beam stops and protective enclosures are standard preventative measures.

The College of Physical and Engineering Science has a laser safety committee to review the engineering and administrative controls used in laser research laboratories. Inspections of Class 3B and Class 4 lasers installations

are undertaken periodically to monitor compliance with ANSI standards and to evaluate the levelof safetyprovided by the laser supervisor's standard operating procedures (SOPs).

College of Physical and Engineering Science Laser Safety Committee

G.G. Byford: Environmental Health and Safety

J. Dutcher: Physics

B.R. Henry: Chemistry and Biochemistry

N. Westwood: Chemistry and Biochemistry

For more information about laser safety, see the web site of the University of Guelph Physics Department: www.physics.uoguelph.ca/dutcher/lasesafe/lasesafe.html [1].

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Links
[1] http://www.physics.uoguelph.ca/dutcher/lasesafe/lasesafe.html [2] https://www.uoguelph.ca/hr/page-category/policy