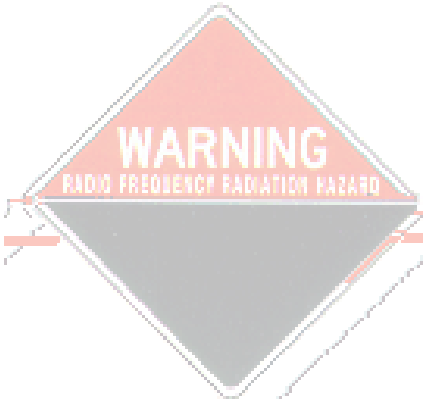
Revised September 2009

SAFETY PROCEDURES FOR NON-IONIZING RADIATION



Louisiana State University

System Radiation Safety Committee

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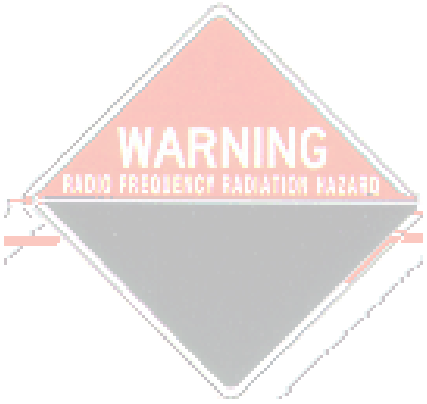

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1 GENERAL

This procedure sets forth the Louisiana State University (LSU) System non-ionizing radiation safety policy and procedural requirements of the program. The use of the term non-ionizing radiation in this document is defined as meaning non-ionizing radiation produced as a result of normal equipment use and which is at such a level that is recognized as harmful to humans. **NOTE:** This procedure does not cover non-ionizing radiation generated during welding, cutting, or burning activities.

The LSU System policy is to limit exposure to personnel from non-ionizing radiation to levels as low as reasonably achievable; however, under no circumstances is exposure to exceed appropriate Louisiana or Federal regulatory limits.

To implement this policy, LSU System has set up a non-ionizing radiation safety program to ensure:

a. The use of equipment which produces non-ionizing radiation within LSU System for official business is used in a manner that will minimize risks to health and safety of the faculty, staff, students, and the general public.

b. The identification of non-ionizing radiation source hazards.

c. The prompt investigation of all reported non-ionizing radiation over-exposures and the establishment of immediate corrective action to prevent their recurrence.

d. The maintenance of an accurate inventory for accountability of the hazardous non-ionizing radiation sources within the LSU System.

2 SAFETY PROCEDURES FOR MICROWAVE AND RADIOFREQUENCY RADIATION

Microwave energy, frequently referred to as microwave radiation, is sometimes confused with ionizing radiation. This is unfortunate since the two

radiation include:

a. Frequency or wavelength of the radiation from the generating equipment.

b. Period of exposure time.

c. Air currents and ambient temperatures.

d. Body weight or mass in relation to the exposed area.

e. The irradiation cycle rate, referring to the individual ON-OFF periods during a unit time interval (one minute), when total time of irradiation per minute is kept constant.

f. Orientation or position of the body or its parts.

g. D vidual ON

g. All microwave and radiofrequency systems capable of generating fields greater than 10% of Table 1 values will be registered with the corresponding Radiation Safety Office. Registration will include the following information:

   (1) Manufacturer and model number.

   (2) Power output.

   (3) Frequency range.

   (4) Intended use.

   (5) Location.

   (6) Contact information of the principal investigator and person in charge.

h. Exposure of employees to microwave and radiofrequency radiation shall not exceed, under normal operating conditions, those levels specified in Table 1.

   (1) The above guide applies whether the radiation is continuous or intermittent, or whether whole-body or partial body irradiation is involved.

   (2) An exposure exceeding the above limitations in Table 1 shall be reported in writing to the Radiation Safety Committee.

The warning signs (Fig. 1 and Fig. 2) for microwave and radiofrequency radiation hazards will consist of the appropriate signal word, symbol, and pertinent sign information. The inclusion and choice of warning information or precautionary instructions is at the discretion of the user.

Table 1. Limits for Maximum Permissible Exposure (47 CFR 1.1310)

Frequency Range (MHz)	Electric Field (V/m)	Magnetic Field (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63		

3 SAFETY PROCEDURES FOR LASER RADIATION

The term Laser is an acronym derived from "Light Amplification by Stimulated Emission of Radiation." The effects of laser radiation are essentially the same as light generated by more conventional ultraviolet, infrared, and visible light sources. The unique biological implications attributed to laser radiation are generally those resulting from the very high intensities and monochromaticity of laser light. Such sources differ from conventional light emitters primarily in their ability to attain highly coherent light (in phase). The increased directional intensity of the light generated by a laser results in concentrated light beam intensities at considerable distances.

The fundamental objective of the control methods as outlined in this section is to limit the possibility of a potentially hazardous exposure, particularly to unaware transient personnel, and to provide reasonable and adequate guidance for the safe use of lasers and laser systems. **NOTE:** Associated non-beam hazards such as electrical shock, chemicals, and fire are excluded from this procedure.

In establishing laser control measures, the following factors determine the type and amount of control necessary:

a. Power or energy output.

b. Pulse length.

c. Pulse repetition rate.

d. Wavelength.

e. Beam path.

f. Beam shape (divergence, hot spots, atmospheric effects).

g. Number of laser systems at a particular location.

h. Laboratory layouts, position of windows, doors, etc.

i. Degree of isolation of location.

j. Type of population (informed staff in control, local knowledgeable personnel, uninformed

d. A Class 2M laser system is one that emits in the visible portion of the spectrum (0.4 to 0.7 μm), and eye protection is normally afforded by the aversion response for unaided viewing. However, it is potentially hazardous if viewed with certain optical aids.

e. A Class 3R laser system is one that is potentially hazardous under some direct and specular reflection viewing conditions if the eye is appropriately focused and stable, but the probability of an actual injury is small. This class of laser will not pose either a fire hazard or a diffuse-reflection hazard.

f. A Class 3B laser system is one that may be hazardous under direct and specular reflection viewing conditions. This class of laser is normally not a diffuse reflection or fire hazard.

g. A Class 4 laser system is one that is a hazard to the eye or skin from the direct beam and may pose a diffuse reflection or fire hazard.

h. Use the above information and applicable sections of ANSI Z136.1-2007 as official guidelines in providing safe practices for laser operations.

Table 2 summarizes the safety requirements by laser classification. The table may not be applicable for unique applications. For specialized applications refer to ANSI Z136.1-2007.

For those campuses using Class 3B or Class 4 lasers, a Laser Safety Officer shall be appointed by the Campus Radiation Safety Committee. This person shall be properly indoctrinated in laser safety and will have the vested authority to supervise the control of laser hazards.

Table 2. Control Measures by Laser Classification (ANSI Z136.1-2007)

Class	Procedural & Administrative Controls	Training	Medical Surveillance	LSO

Spectators shall not be permitted into a laser controlled area, unless appropriate supervisory approval has been obtained, the degree of hazard and the avoidance procedure have been explained, and appropriate protective measures are taken.

The Laser Safety Officer shall have the responsibility and authority to:

a. Provide consultation services on laser hazard evaluation and control.
b. Suspend, restrict, or terminate the operation of a laser system if s(he) deems that the laser hazard control is inadequate.
c. Recommend protective equipment to control laser hazards when necessary.
d. Survey approved laser laboratories periodically.
e. Review plans for installation and/or modification of laser equipment relative to laser hazards control.
f. Investigate upon notification of a real or suspected incident resulting from laser operation and initiate corrective action.
g. Post warning signs in appropriate locations and ascertain that warning systems are functional.
h. Use the above procedures and applicable sections of ANSI Z136.1-2007 as official guidelines in providing safe practices for laser operations.

The laser hazard symbol shall be a sunburst pattern consisting of two sets of radial spokes of different length and one longer spoke radiating from a common center (Fig. 3). The color, dimensions, and location of the symbol within the sign shall be consistent with the specifications in ANSI Z136.1-2007.

a. An employee shall not energize or work with or near a laser unless authorized to do so by the supervisor of that laser.
b. Employees must comply with safety rules and procedures as well as applicable regulations prescribed by the laser supervisor and the D f. 7ItETBT-2( )-3(SIG)-4(NT1 0 0 1 90.pNw3f)4

Proper ventilation shall be provided to remove excessive amount of toxic gases that may be created when ultraviolet radiation reacts with air and atmospheric contamination.

Supervisors shall inform all employees that ultraviolet radiation is present in areas where such devices capable of producing ultraviolet radiation are used and shall inform those employees of the potential hazards from ultraviolet radiation.

Warning signs (Fig. 4) shall be placed to alert workers and the general public in areas where there are high-intensity ultraviolet light emitting sources.

Warning signs are available from commercial suppliers or may be available from the manufacturer of the ultraviolet light product.

Each employee shall:

a. Be familiar with the procedures outlined above and avoid all unnecessary exposure to ultraviolet radiation.

b. Use all required protective equipment and clothing when operating ultraviolet radiation producing equipment.

c. Check the ventilation system for adequate performance before starting work on tasks that require ventilation systems.

d. Report any ill effects on skin and eye resulting from the exposure to ultraviolet radiation due to the official business use of such ultraviolet radiation producing equipment to her/his supervisor and the Radiation Safety Office.

e. Report to her/his supervisor about any malfunctions of the ultraviolet radiation producing equipment.

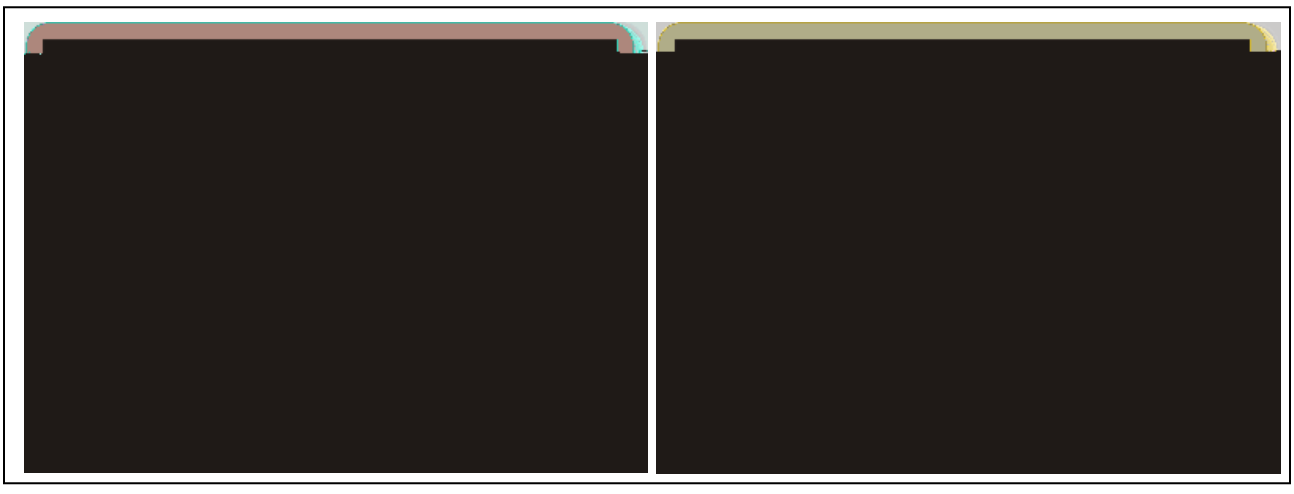

Figure 4. Typical Warning Signs for Ultraviolet Radiation