

Policy Subject: Non-Ionizing Radiation	Effective: 8/1/11
Affected Area: Any areas on campus	Reviewed/Revised: 8/1/11

1.0 Purpose, Applicability, and Scope

- 1.1 Purpose - To provide a guide for protecting individuals on campus from occupational exposure to non-ionizing radiation. Potential hazards will be identified and appropriate exposure control measures will be implemented.
- 1.2 Applicability - The policy guidelines shall apply to all faculty, visiting faculty, staff, research associates, and students on the Knoxville campus of the University of Tennessee.
- 1.3 Scope - Applies to all individuals on campus who have the potential to encounter non-ionizing radiation as part of their job responsibilities, with worker health protection and OSHA regulations in mind. This policy does not include lasers, since lasers are covered under Radiation Safety's jurisdiction.

2.0 Abbreviations, Acronyms, and Definitions

2.1 Acronyms

EHS: Environmental Health and Safety
 IEEE: Institute of Electrical and Electronics Engineers
 NIR: Non-Ionizing Radiation
 OSHA: Occupational Safety and Health Administration
 PPE: Personal Protective Equipment
 UTK: University of Tennessee, Knoxville

2.2 Definitions

Non-ionizing Radiation: form of electromagnetic radiation with varying effects on the body, depending largely on the particular wavelength of the radiation. The types of non-ionizing radiation are: power transmission and radio frequencies (including radar and microwave); infrared (IR), visible light, and ultraviolet (UV) radiation.

3.0 Roles and Responsibilities

- a. Employees

- i. Report all unintended or improper exposure incidents, near misses or unsafe equipment to your supervisor in the operation of NIR sources or related equipment.
 - ii. Follow all recommended work practices and specific operating procedures.
 - iii. Use PPE and equipment provided to decrease exposure to NIR hazards in the work area.
 - iv. Comply with all university policies, OSHA requirements and regulations to assure a safe and healthful working environment.
 - v. Attend all required safety training and seek additional training or information if a NIR hazard is likely.
 - vi. Immediately terminate any work that is deemed unsafe or could lead to personal injury.
- b. Supervisors shall:
- i. Ensure that all employees receive safety training before using NIR equipment.
 - ii. Provide employees with appropriate PPE and other controls. Ensure that employees properly use PPE and other control measures.
 - iii. Ensure that employees are familiar with the hazards associated with NIR.
 - iv. Develop operating procedures specific to the NIR equipment.
 - v. Ensure that proper warning signs are posted (if needed).
 - vi. Enroll the employee in a medical surveillance program, if needed.
- c. EHS shall:
- i. Provide on-site hazard analysis upon request, and assist in determining appropriate methods to minimize NIR exposure to within acceptable limits.
 - ii. Develop and implement UTK's NIR policy and update the policy as needed.
 - iii. Provide, or arrange for, exposure testing and monitoring, as appropriate.
 - iv. Investigate accidents involving NIR and initiate appropriate action.

4.0 Procedure

Basic Information: The hazards associated with non-ionizing radiation depend on wavelength, its strength (field intensity) and its frequency of the radiation involved. List below are some hazards associated with non-ionizing radiation, based on the wavelength and frequency.

Low frequency:

Examples include: power-line transmission, broadcast radio and short wave radios. There is little risk of health hazard to this type of radiation, unless a person is in very close proximity to powerful radio transmitter aerials.

Microwaves:

These are found in radar, communications, some types of cooking, and diathermy applications. Microwave intensities may be sufficient enough to cause significant heating of tissues.

Infrared Radiation:

Electric welding arcs and germicidal lamps are the most common high-level sources of UV radiation in industry. This type of radiation does not penetrate below the superficial layer of the skin, so it's only effect on the skin is to heat the heat the skin and the tissues below it. Exposure without proper eye protection can cause injuries to the eyes. Excessive exposure can cause "heat cataracts".

Visible Radiation:

This is the portion of electromagnetic radiation that is visible to the human eye, responsible for the sense of sight. There can be some injury to the eyes and skin from intense visible radiation emitted from sources, such as the sun, artificial light sources and arc-welding processes.

Ultraviolet Radiation:

UV radiation can only penetrate the top layer of skin. It does not penetrate deep into the skin tissue. Exposure to UV radiation can result in sunburned skin, painful reddening and blisters. Some wavelengths of UV radiation can be absorbed by the cornea of the eye, causing keratitis (tiny lesions).

Examples of sources from industry include electrical welding arcs and germicidal lamps. The major source of UV energy on earth is from the sun. Personal protection against UV radiation may be achieved through the use of eyeglasses, goggles, plastic face shields, protective clothing and/or sub screen creams and lotions.

Controls:

The following general controls should be used to minimize exposure to NIR at UTK:

- a. ALARA - Occupational exposures to NIR shall be kept as low as reasonably achievable (ALARA).
- b. Engineering Controls - Technical protective measures, such as engineered controls, shall be applied to the source of the NIR.

- c. Administrative Controls - Operations protective measures, such as administrative controls, shall be implemented as appropriate for the emitter. Examples of administrative controls include warning signs, zoning, restricting access, and limiting exposure time.
- d. Procedures - Source-specific safety instructions shall be developed or implemented.
- e. Manufacturer Specification's - Manufacturer's guideline must be followed.
- f. Access Control - Controlled (including forbidden where necessary) or restricted access near emitters shall be delineated, posted and secured.
- g. Training and Information - Potentially exposed personnel shall be provided training about the safe use of an emitter or safe work procedures near an emitter, and shall be informed about any appropriate health protection precautions.
- h. Exposure Limits - Personnel involved with NIR sources shall contact EHS to identify appropriate limits for occupational exposures and to discuss controls and protective measures where injury is likely. The most recent version of the TLV's and BEI, published by the American Conference of Governmental Industrial Hygienist (ACGIH) may be used with respect to limits.
- i. Personal Protective Equipment - Personal protective equipment shall be used where necessary.

5.0 Recordkeeping

EHS will maintain any monitoring records for a minimum of 30 years. Any medical records will be kept for a minimum of 30 years. Records of shall be maintained in accordance with policy number GS 43 (Records Retention for Safety Health and Environmental Protection) found in the safety manual.

6.0 Training

EHS can provide guidance and training on exposures to various types of NIR upon request. Training shall be conducted in accordance with policy GS 25 (Safety Training) found in the safety manual. In addition, supervisors need to provide on-the-job training to communicate any potential hazards to employees. Employees should have access to MSDSs, chemical hygiene plans, and other safety-related information.

7.0 Associated Standards and Guidelines

ACGIH TLV and BEI

OSHA: 29 CFR 1910.97 (Non-Ionizing Radiation)

OSHA: 29 CFR 1903.1 (General Duty Clause)

OSHA, 29 CFR 1926.54 (Non-Ionizing Radiation- Safety and Health Regulations for Construction)

IEEE: C95.1-2005 (human exposure)

IEEE: C95.3-1999 (measurement practices)

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