1. Purpose and Scope
To protect the health of staff, students and visitors to the University from the effects of non-ionising radiation and to minimise adverse environmental consequences from non-ionising radiation usage at UNSW.
A risk management approach (hazard identification, risk assessment and control) is being taken to the management of radiation safety at UNSW.
- To ensure the University complies with all legislation and Australian Standards relevant to non-ionising radiation.
- To create and sustain a high level of radiation safety awareness throughout the University.
- To facilitate best practice in radiation safety in the University.
• To ensure safe systems of work involving potential exposure to non-ionising radiation.
• To evaluate the effectiveness of the University's non-ionising radiation safety management system.

This document applies to all University staff, students, contract workers and visitors (including those working in teaching hospitals and other locations off-campus).

2. Definitions
For the purpose of this procedure, the definitions below apply.

2.1 Non-ionising radiation:

Any electromagnetic radiation of wavelength greater than 100nm in air or vacuum, sound or ultrasound

2.1.1 Extremely low frequency (ELF) radiation
Electromagnetic energy with frequencies between 10 to 300 Hz, eg the 50Hz electric field associated with domestic mains electricity supply.

2.1.2 Radiofrequency (RF) radiation
Electromagnetic energy with frequencies in the range 300 Hz to 300 GHz, including microwave radiation.

2.1.3 Microwave (MW) radiation
Electromagnetic energy with frequencies in the range 1 GHz to 300 GHz are commonly referred to as microwaves.

2.1.4 Infra red (IR) radiation
Electromagnetic energy with a wavelength of 700nm to approximately 1mm. (Near IR – 700 nm to 1400 nm. Far IR – 1400 nm to 1 mm)

2.1.5 Visible light radiation
Electromagnetic energy with a wavelength of 400nm to 700nm.

2.1.6 Ultra violet (UV) radiation
Electromagnetic energy with a wavelength of 100nm to 400nm which is present in sunlight as well as produced from artificial sources such as arc welding.

2.1.4 Lasers
Laser is an acronym for Light amplification by stimulated emission of radiation. Lasers produce coherent intense levels of radiation from IR, visible and UV light sources.

2.2 Accident:

An accident is here defined as in Australian Standard AS 2243.5-2004 Safety in Laboratories Part 5: Non-ionizing radiations- Electromagnetic, sound and ultrasound as:

“An occurrence which results in personal injury, disease or death or property damage through exposure to non-ionizing radiation.”

(The definition of a Radiation Accident in the Radiation Control Regulation is not applicable to NIR.)

2.3 Incident:

An incident is defined here as in Australian Standard AS 2243.5-1993 Safety in Laboratories Non ionising radiation as:
“Any occurrence involving exposure to non-ionising radiation, which has the potential to cause personal injury, disease or death, or property damage.”

(There is no definition of incident in the Radiation Control Regulation.)

2.4 RSC

Radiation Safety Committee

2.5 RSS

Radiation Safety Supervisor

2.6 LSO

Laser Safety Officer

3. Procedure

3.1 Risk Management

Before any work involving the risk of potential exposure to non-ionising radiation is undertaken, the responsible person, with the assistance of the local RSS/LSO, and the RSC where appropriate, should prepare a risk assessment. Further assessments should be made if the scope of work is to be modified.

A generic risk assessment may be made in cases where identical risk factors apply.

The Risk Assessment should take the following format.

1. Hazard Identification
2. Risk Assessment
3. Risk Control.

3.2 Hazard Identification

3.3.1 Hazard identification factors

These may include:

- The nature of the potential radiation exposure based on the type of the radiation source(s)
- The type of work
- The procedures involved
- The facilities required
- The personnel involved
- Work involving planned exposure (eg outdoor exposure to UV radiation in sunlight)
- Credible incident scenarios
- Any non-radiological hazards associated with the proposed work.

3.3 Risk Assessment

Non-ionising radiation exposure limits are available in Australian Standards and Radiation Protection Series documents. There is however debate about some exposure limits. The adequacy of levels recommended for exposure to ELF magnetic fields has been argued in
the public arena for some time and more recently the RF limits have come under scrutiny following concerns about the safety of mobile phones. While health authorities argue that there is no firm scientific evidence to suggest that the existing exposure levels are inadequate, this ongoing debate makes risk assessment difficult. To address these concerns, the "as low as reasonably achievable" (ALARA) principle can be used. Although this principle was developed for ionising radiation, where there is no threshold level for an effect, it can be used for non-ionising radiation. The difficulty is quantifying what is reasonably achievable.

### 3.3.1 Risk assessment factors

Risk assessment factors to be taken into account may include:

- The nature of potential radiation exposure based on the type of the radiation source
- The nature of potential radiation exposure based on the intensity of the radiation source
- The recommended exposure limits of the specified type of non-ionising radiation
- Maximum potential health consequences from normal operations and credible accidents
- Non-radiological hazards associated with the proposed work.

### 3.4 Risk Control Methods

In no case should relevant exposure limits be exceeded. Values for these limits should be obtained from the appropriate current Australian Standard or NHMRC Radiation Health Series Document as listed in the references (Section 10). The University supports the ALARA principle for NIR sources.

#### 3.4.1 Risk Control Methods – Planning Phase

Where a risk assessment identifies a risk it shall be eliminated or minimised. This can be done by applying the Hierarchy of Hazard Control Methods in the following order of priority:

1. **Elimination** – removal of the radiation risk entirely
2. **Isolation** – containment of the hazard (eg special remote operation facilities)
3. **Engineered controls** – (eg permanent shielding, interlocks)
4. **Administrative controls** – (eg standard operating procedures)
5. **Personal protective equipment** – often a mandatory, but by itself an insufficient, control method (eg gloves, eye protection)

### 3.5 Administrative controls

#### 3.5.1 Health surveillance

For those working with lasers, eye examinations are required to be carried out: before commencing any work with class 3b or class 4 lasers and shall be carried out:

- following any apparent or suspected exposure to laser radiation in excess of the maximum permitted exposure
- following any serious injury to, or illness of the eye.
- Prior to leaving employment/studies at UNSW.
For staff or students involved in the use of lasers, eye examinations can be arranged through the School of Optometry (x54624).

### 3.5.2 Registration of apparatus

At present, the Environment Protection Authority (EPA) is intending to introduce compulsory registration of class 3b and class 4 lasers. Compliance conditions are not yet available and will be advised by the HS Unit when they are introduced. There are no plans at this stage to introduce registration of other types of non-ionising radiation apparatus.

#### 3.5.3 Project /Program form

- A Project/Program form must be submitted to the Radiation Safety Committee for their approval before any new research involving potential for adverse consequences from exposure to non-ionising radiation is undertaken.

Forms are available on the HS website  

### 3.5.2 Safe Work Procedures

For all work involving the use of or potential exposure to non-ionising radiation, *the responsible person* should write Safe Work Procedures. The task should be divided into a logical sequence of work steps/events, with due consideration given to the risk assessment to ensure the risk associated with that work step/event has had the Hierarchy of Hazard Controls applied to eliminate or reduce the risk. Risks should be rated according to the UNSW risk rating procedure.  

Safe Work Procedures should be approved by the local RSS/LSO and be made available to all staff and students as appropriate.

Issues addressed should include:

- Methods to reduce or eliminate the risk of personal exposure
- Monitoring and recording
- Use of personal protective equipment and safety devices
- Labeling and warning signs
- Emergency procedures.

### 3.5.3 Registers

Laboratory Managers or Departmental Radiation Safety Supervisors must maintain the following registers, where appropriate:

1. Register of radiation researchers, laboratories and research projects
2. Register of risk assessments
3. Register of radiation apparatus purchase and disposal
4. Registers of accidents and incidents involving radiation
5. Radiation safety training register.

A copy should be made available to the Radiation Safety Officer.

### 3.5.4 Monitoring of non ionising radiation apparatus

Laboratory managers or the responsible person shall ensure that non ionising radiation apparatus is surveyed at appropriate intervals, or after any maintenance or repair, and that records are kept.

*Researchers using transilluminators must ensure that risk assessments have assessed the transmission characteristics of viewing screens and goggles using a UV emission device.*
All PPE must comply with AS/NZS 1138 Filters for eye protectors- Filters for protection against ultraviolet radiation.

### 3.5.5 Purchasing procedures

Purchases of radiation apparatus should be authorised by the School or Departmental Radiation Safety Supervisor/ Laser Safety Officer before an order is placed. Records of receipt and use must be kept. (See section 3.5.3) The RSS or LSO should ensure that equipment complies with relevant standards or that it does not permit access to radiation levels in excess of recommended exposure limits.

### 3.6 Security and signage

Access to designated radiation apparatus and work areas shall be restricted to authorised personnel. Appropriate warning signs shall be in place designating the type of radiation hazard and any personal protective equipment to be worn.

### 3.7 Disposal of radiation apparatus

Before disposal of non-ionising radiation apparatus, it shall be rendered inoperative, and all radiation warning signs shall be removed. Notification of disposal must be given to the Radiation Safety Officer.

### 3.8 Training

Training is required by the following groups of persons:

- New staff and students who have not received UNSW training and who will be working with non-ionising radiation or in laboratories or work situations where exposure to such radiations is possible
- Workers who require additional specialised training
- Radiation Safety Supervisors / Laser Safety Officers

The aim of the non-ionising radiation safety training program is:

To ensure that participants have the knowledge to work safely with radiation apparatus and to comply with legislative requirements. In particular after undergoing the appropriate level of training:

**New staff and students** and others who have not received UNSW training will be able to:

- Distinguish the type of hazard
- Use appropriate methods to minimise their exposure

**Workers requiring specialised training** will be able to:

- Safely undertake specific specialised work
- Minimise associated hazards

**Radiation Safety Supervisors / Laser Safety Officers** will be able to:

- Advise colleagues on School or Departmental safety matters involving non-ionising radiation
- Develop and approve standard operating procedures and emergency procedures for work involving non-ionising radiation

Details of training in laser safety are available from the HS Unit web page or by contacting Radiation Safety Officer (x52912).
3.9 Inspection

The Head of School or the Radiation Safety Supervisor should undertake regular inspection of laboratories where non-ionising radiation apparatus is being used to ensure that safe work practices are being followed.

The Radiation Safety Officer may provide advice on compiling risk assessments.

3.10 Reporting of accidents involving radiation

Every radiation accident involving actual injury requiring medical attention or potential serious injury shall be reported immediately to the Radiation Safety Officer via the Laboratory Manager or RSS/LSO as appropriate. An accident is defined in section 2.2.

3.11 Emergency procedures

Written emergency procedures based on the risk assessment results shall be available in each laboratory where non-ionising radiation is used.

4. Review & History

Appendix A: History

The authorisation and amendment history for this document must be listed in the following table. Refer to information about Version Control on the Policy website.

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