



REGULATION OF NON-IONISING RADIATION

OVERVIEW



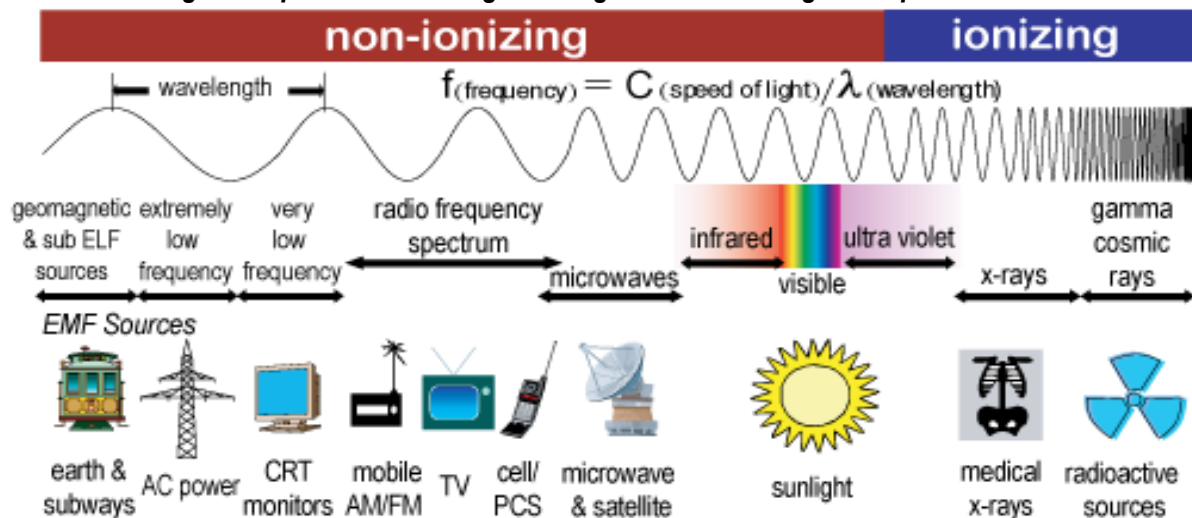
Non ionising radiation is the electromagnetic radiation that does not carry enough energy photon energy to cause ionisation in matter. It's a relatively low energy radiation that has sufficient energy to only excite electrons without knocking them off from the outer shells of atoms.

Non-ionizing radiation is found in a wide range of occupational settings and can pose a considerable health risk to potentially exposed workers if not properly controlled.

It's applied in very wide range of applications which include;

- Lasers applied in industries for trimming, engraving, marking, drilling, welding, entertainment laser light show and medical for plastic surgery, ophthalmic, obstetrics and gynaecology applications.
- Medical diagnostic, surgical & therapeutic ultrasonic devices
- Electronic gadgets e.g. phones, computers, printers and others

The electromagnetic spectrum showing the ranges of electromagnetic spectrum



Examples of sources of non-ionising radiation with some of the risks

Example of non-ionising radiation	Major sources	Risks
Extremely low frequency (ELF) (0 - 300 Hz) & very low frequency(VLF) (300 Hz - 10 MHz) radiation	<ul style="list-style-type: none"> ➤ ELF induction furnaces ➤ High-voltage power lines 	❖ Electric shock
Radiofrequency and microwave radiation (10 MHz - 300 GHz)	<ul style="list-style-type: none"> ➤ Radio emitters ➤ Cell phones. ➤ Transmission masts 	❖ Exposure to the radio & microwave fields causes warming of body tissues whose penetration is dependent on the energy. This is most dangerous

		for the brain, eyes, genitals, stomach, liver and kidneys.
Infra-red radiation and Visible light (0.4 - 1000 μ m Hz) This can be thermal radiation	<ul style="list-style-type: none"> ➤ Furnaces ➤ Heat lamps ➤ Infra-Red lasers ➤ Sun ➤ Filament, gas discharge & halogen lamps 	<ul style="list-style-type: none"> ❖ Retinal damage and ashen cataract ❖ Cornea damage after prolonged exposure ❖ Skin burns
Ultraviolet radiation (100– 400 nm Hz)	<ul style="list-style-type: none"> ➤ Sun ➤ black lights ➤ welding arcs 	<ul style="list-style-type: none"> ❖ Short term effects include sunburn & cornea inflammation ❖ Long-term effects are skin cancer, skin thickening, premature aging of the skin cataract
Lasers which emit optical (UV, visible light, IR) radiations	<ul style="list-style-type: none"> ➤ CO₂ IR laser; ➤ helium – neon ➤ Nitrogen UV laser 	<ul style="list-style-type: none"> ❖ Skin burns
Blackbody radiation The frequency ranges from low to high frequencies	<ul style="list-style-type: none"> ➤ Sun 	<ul style="list-style-type: none"> ❖ Skin cancers

General risks and hazards associated with the use of non-ionising radiation

Dependent on the energy and exposure time, non-ionising radiation can cause localised heating, or photochemical reactions can occur with possible permanent harm. Inappropriate or incorrect use and a wrong design of the non-ionising radiation devices can increase the chances of physical harm.

- In the lower frequency range (300Hz to 1MHz), induction currents may interfere with the functioning of the central nervous system
- In the intermediate frequency range (100 KHz to 10GHz) the absorption of electromagnetic energy generates heat.
- At the upper frequency range (10GHz to 300GHz) heating of superficial tissues is possible.
- From optical radiations (infra-red, visible light and ultra-violet) there can be the harmful consequences of heating of tissues and of damage to the eyes.

However the nature, extent and physiological importance of biological effects from non-ionising radiation exposure is generally dependant on factors such as;

- a) Energy of incident radiation which determines the penetration depth,
- b) The power density of a field or beam
- c) Source emission characteristics
- d) Duration of exposure
- e) Environmental conditions
- f) Spatial orientation and biological characteristics of the irradiated tissue e.g. molecular composition, blood flow, pigmentation, functional importance

STATUS OF REGULATION OF NON-IONISING RADIATION IN UGANDA

Introduction

International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an International Commission mandated to provide scientific advice and guidance on the health and environmental effects of non-



ionising radiation to protect people and environment from detrimental NIR exposure. The organization's activities include determining exposure limits for electromagnetic fields used by devices such as cellular phones, screening and evaluating scientific knowledge and recent findings toward providing protection guidance on non-ionizing radiation, i.e. radio, microwave, UV and infrared, producing reviews of the current scientific knowledge and guidelines summarizing the evaluation of scientific knowledge, etc.



The ICNIRP is the basis of the regulatory framework for its partner states on protection of the public and of workers from established adverse health effects caused by exposure to non-ionizing radiation.

In Uganda, the Atomic Energy Act No. 24, Section 2 (3) gives a mandate to Atomic Energy Council to apply the provisions of this Act to sources of electromagnetic radiation other than X-rays and gamma rays by a statutory order.

The Council has established a unit in charge of non-ionising radiation to spearhead the acquisition of a statutory order and oversee the regulation of non-ionising radiation in Uganda.

How Non-ionising radiation will be regulated by AEC?

- Drafting regulations of Non-Ionising radiation,
- Drafting Safety guides and procedures on operating installations that emit NIR and/or use of devices that emit NIR.
- Monitoring the occupationally exposed workers
- Licensing all the activities which involve use of non-ionising radiation and its devices
- Carrying out scientific research on exposure limits and protection of adverse effects of non-ionising radiation.
- Sensitising the public about the dangers of non-ionising radiation
- Forming local, national and international integrations and cooperation for technical expertise and proper information exchange.
- Inspections on facilities which use non-ionising radiation devices
- Enforcement of non-complaint facilities