This document provides guidance regarding the arrangements that Colleges / Professional Services should put in place to protect staff and students operating science-based equipment that generates ultraviolet (UV) light and to ensure compliance with the Control of Artificial Optical Radiation at Work Regulations.

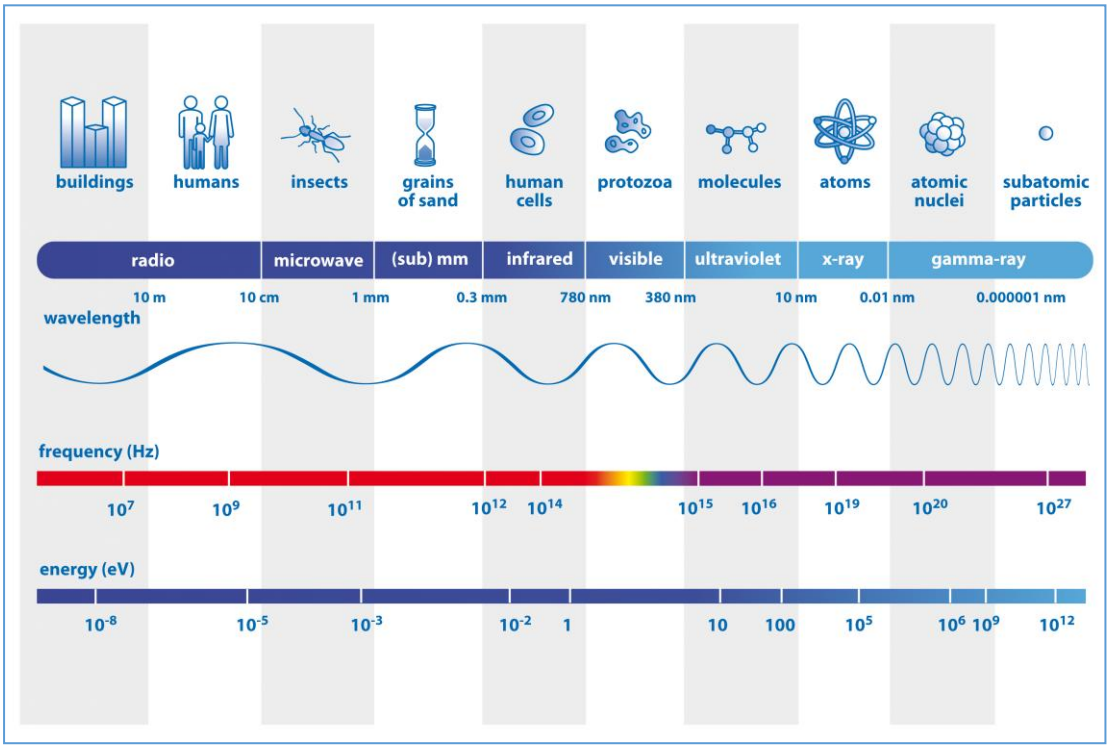
General, daily exposure, for example, to sunlight are considered by other sources of information, available on the central Health and Safety.

WHAT IS ULTRAVIOLET LIGHT?

Ultraviolet light (UV) is a form of radiation which is an invisible part of the "electromagnetic spectrum".

This electromagnetic radiation is not visible to the human eye, because it has a shorter wavelength and higher frequency than the light our brain perceives as images.

Common designations are radio waves, microwaves, infrared (IR), visible light, ultraviolet (UV), X-rays and gamma rays.



NATURAL SOURCES OF ULTRAVIOLET LIGHT

Most of the UV light people encounter comes from the sun. However, only about 10 percent of sunlight is UV, and only about one-third of this penetrates the atmosphere to reach the ground.

Celestial sources of UV radiation also exist, for example, very large young stars shine most of their light in ultraviolet wavelengths, but the Earth's atmosphere blocks much of this UV radiation.

ARTIFICIAL SOURCES OF ULTRAVIOLET LIGHT

A number of artificial sources have been devised which produce UV radiation. For example, tanning booths, black lights, curing lamps, germicidal lamps, mercury vapour lamps, halogen lights, high-intensity discharge lamps, fluorescent and incandescent sources and some types of lasers.

The University also operates a range of science-based equipment, which create artificial UV radiation, examples of which are available on page 4.

RISKS FROM ULTRAVIOLET LIGHT

Too much exposure to UV radiation is damaging to living tissue. The majority of us have experienced sunburn whilst sunbathing to get the elusive tan. Other risks to health from ultraviolet light include burns or reddening (erythema) of the skin or surface of the eye (photokeratitis) and burns to the eye's retina, lens and cornea.

LEGISLATION: ARTIFICIAL SOURCES

The Control of Artificial Optical Radiation at Work Regulations came into effect on 27th April 2010. The Regulations require employers to protect the eyes and skin of workers exposed to hazardous sources of artificial optical radiation. Ultraviolet light falls under the remit of the Regulations.

GENERAL COLLEGE / PROFESSIONAL SERVICE REPONSIBILITIES

Colleges and Professional Services operating science-based equipment, which could produce ultraviolet light, have an obligation under the Control of Artificial Optical Radiation at Work Regulations to:

- Identify equipment that produces artificial ultraviolet light.
- Assess the risk to operators and others from these.
- Put in place appropriate controls to reduce the risk of harm to the eyes and skin of operators and others who could be affected, to as low as reasonably practicable.

RECOMMENDED CONTROL MEASURES

The following detail types of control measures to protect operators and others from the risks associated with artificial sources of ultraviolet light.

- Use an alternative, safer light source that achieves the same result.
- Use filters, screens, curtains.
- Arrange remote viewing or dedicated rooms.
- Restrict access to rooms with equipment to trained, authorised operators e.g. keypads, SALTO.
- Use equipment fitted with safety interlocks, remote controls or time delays.
- Check relevant safety signage displayed.
- Train operators in best practice and provide appropriate information to them.
- Issue Personal Protective Equipment (PPE) e.g.

Warning Optical Radiation Symbol

clothing, UV resistant goggles or face shield.

- Display an Authorised Operators List i.e. those trained how to operate the equipment.

INSPECTIONS / CHECKS

Formally check all safety critical devices, every 3 months to confirm their efficacy e.g. safety interlocks, access controls, time delays.

In addition, undertake regular inspections of the equipment and immediate working area to confirm controls remain in place. For example, relevant warning signs are displayed, Safe Operating Procedures are available, and the Authorised Operator Lists up to date.

As part of the inspection process always check PPE provided to protect operators is available and remains in good condition.

RECORDS

Maintain records of all safety critical device checks i.e. safety interlocks and inspections.

Records of operator training should be kept, with a list of Authorised Users displayed and maintained by the machine.

In addition, dependent on the potential for UV exposure when using the equipment relevant information should be made available by the machine. For example, warning about no safety interlocks, Safe Operating Procedures, what PPE to wear etc.

EXAMPLES OF SOME UNIVERSITY SCIENCE EQUIPMENT AND CONTROLS

Note: Highlighted items are higher risk

ITEM	RISKS	REQUIRED CONTROLS
Trans-illuminators  	Severe burns to skin and eyes from UV Exposure to hazardous substances	• **No safety interlock (higher-risk)** • Only trained personnel to operate • Display safety warning notices • UV resistant safety glasses, full face shield and gloves must be worn at all times • Display warning signs stating operators must be trained and what PPE to wear • Item placed and shield lowered before the machine is operated • Ensure lab coat cuffs and gloves overlap • Refer to COSHH Assessments as required
UVP High Performance Trans-illuminator 	Severe burns to skin and eyes from UV Exposure to hazardous substances	• **No safety interlock (higher-risk)** • Operator training required • UV resistant safety glasses, full face shield and gloves must be worn at all times • Item to be placed in equipment and doors shut before UV light turned on • All viewing must take place through the viewing panel at the top of the machine • Refer to COSHH Assessments as required
UVP Illuminator 	Severe burns to skin and eyes from UV Exposure to hazardous substances	• Refer to COSHH Assessments as required e.g. ethidium bromide • Operation of UV light interlocked with door to protect against UV exposure • Periodically confirm interlock operation • Nitrile gloves worn when handling gels containing ethidium bromide
CL1000 UV Crosslinker 	Severe burns to skin and eyes from UV Exposure to hazardous substances	• Operation of UV light interlocked with door to protect against UV exposure • Periodically confirm interlock operation • Refer to COSHH Assessments as required
Cabinets with UV Facility  	Severe burns to skin and eyes from UV Exposure to hazardous substances	• Operation of UV light interlocked with sash to protect against UV exposure • Periodically confirm interlock operation • UV light should only be used when closing panel i.e. sash in place • Refer to COSHH Assessments as required

ITEM	RISKS	REQUIRED CONTROLS
Gel Doc Imagers 	Severe burns to skin and eyes from UV Exposure to hazardous substances	• Operation of UV light interlocked with doors to protect against UV exposure • Periodically confirm interlock operation • Refer to COSHH Assessments as required

EXAMPLES OF SOME UNIVERSITY ENGINEERING EQUIPMENT AND CONTROLS

Note: Highlighted items are higher risk

ITEM	RISKS	REQUIRED CONTROLS
EVG 630 Mask Aligner 	Severe burns to skin and eyes from UV Exposure to hazardous substances	• **Machine is interlocked** • Periodically confirm interlock operation • Operator training required • UV resistant safety glasses, Cleanroom apparel and gloves to be worn at all times • Ensure lab suit and gloves overlap • UV exposure only takes place under machine control • Direct viewing is not possible until exposure is finished • Refer to individual COSHH Assessments and Risk Assessment as required
Electric Arc Welding and Cutting  	Severe burns to skin and eyes from UV Exposure to hazardous substances	• **Higher-risk equipment / activity** • Only trained personnel to operate • Ensure suitable ventilation / extraction • Ensure other persons are shielded from the arc, including passers-by and colleagues who may be assisting welding operations • UV resistant safety face-shield and gloves must be worn at all times. Do not allow skin to be exposed to the arc • Display warning signs and/or have local procedures stating operators must be trained, that PPE is required, and welding fumes must be extracted away from face • Refer to COSHH and Risk Assessments as required

NOTE: UV is generated by all arc processes. Excess exposure to UV causes skin inflammation, and possibly even skin cancer or permanent eye damage. However, the main risk amongst welders is for inflammation of the cornea and conjunctiva, commonly known as 'arc eye' or 'flash' – this includes all arc, MIG, TIG and plasma welding/cutting activity.