UNIVERSITY OF SUSSEX

Safety Procedures and Guidance number 8 revised 2013

PROCEDURES AND GUIDANCE FOR WORK WITH ARTIFICIAL OPTICAL RADIATION (INCLUDING LASERS)

INTRODUCTION

The operation of intense artificial optical radiation sources, including medium and high power lasers, may give rise to both beam and non-beam hazards. The University of Sussex is subject to the provisions of health and safety legislation in relation to its operation of intense artificial optical radiation sources and has a responsibility to protect its employees and others from the hazards associated with them.

This document sets out the University's policy with respect to the management of artificial optical radiation safety.

SCOPE

This policy applies to all activities carried out on University premises or by University staff involving the use of artificial optical radiation sources that could create a reasonably foreseeable risk of adverse health effects to the eyes or skin of an exposed person. This includes:

- All work involving the operation of lasers or laser products of classes other than Class 1 or Class 2 (see annex 1 for details of the laser classification scheme);
- All work involving the operation of non-laser optical sources falling into Risk Group 3 (see annex 2 for details of the non-laser classification scheme); and
- All work involving the operation of laser or non-laser optical sources not classified under the schemes described in annexes 1 or 2 where exposure could exceed one or more of the Exposure Limit Values defined in the Control of Artificial Optical Radiation at Work Regulations 2010.

For the avoidance of doubt, this policy does not apply to lasers of Class 1 or Class 2 unless:

- they have been incorrectly classified and should actually fall into a higher class; or
- they contain embedded lasers of higher class, the beams from which are accessible during servicing or other activities.

OPTICAL RADIATION SAFETY POLICY STATEMENT

The University of Sussex is committed to the protection of all its employees and students from the adverse effects of exposure to beam and non-beam hazards arising from the use of hazardous artificial optical radiation equipment on its premises.

The University of Sussex will extend these safeguards to its visitors, neighbours, subcontractors and suppliers so far as is reasonably practicable and will expect them to do the same for its employees.

In order to achieve these aims University management will:

- Comply with all relevant legislation and authoritative guidance;
- Develop and implement artificial optical radiation safety management programmes that deal effectively with the routine uses of hazardous artificial optical radiation sources and reasonably foreseeable abnormal events;
- Identify priorities for artificial optical radiation safety, define performance indicators, and monitor to assess success in meeting these;
- Implement best practice in relation to artificial optical radiation health and safety;
- Enlist specialist support to provide advice and ensure that keep policies and procedures are kept up to date;
- Ensure that hazardous artificial optical radiation equipment and associated safety equipment is properly maintained, inspected and serviced; and
- Co-operate with and monitor the performance of contractors who work on the University's premises.

The University requires the full and active participation of all employees to assist it in meeting these objectives. The University regards the statutory duties placed on it as the minimum standard required and aims to achieve best practice in the management of laser safety.

APPLICABLE LEGISLATION

Health and safety legislation

The University's work with lasers is subject to the provisions of the Health and Safety at Work etc Act 1974 and Regulations made under the Act. The following Regulations are likely to be relevant in most situations where hazardous artificial optical radiation equipment is in use and staff are required to assist the University to achieve compliance:

- Control of Artificial Optical Radiation at Work Regulations 2010
- Management of Health and Safety at Work Regulations 1999
- Provision and Use of Work Equipment Regulations 1998
- Health and Safety (Safety Signs and Signals) Regulations 1996
- Personal Protective Equipment at Work Regulations 1992

However, this list is not necessarily exhaustive and other Regulations may be relevant in particular situations.

Product safety legislation

Equipment capable of generating artificial optical radiation may fall within the scope of European product directives that specify essential health and safety requirements to be met. In general conformity with applicable harmonised standards (see below) carries a presumption of conformity with the essential health and safety requirements in the relevant directive, whilst conformity with the requirements of the directive is indicated by 'CE' marking of the product. Directives are implemented within the UK by a range of statutory instruments and the following should be considered in relation to products emitting optical radiation that are likely to be used at the University:

- Electrical Equipment (Safety) Regulations 1994, which apply to all equipment operating at voltages between 50 and 1000 V AC or 75 and 1500 V DC;
- the Radio Equipment and Telecommunications Terminal Equipment Regulations 2000 (as amended), which apply to equipment intended for connection to a public network;
- Supply of Machinery (Safety) Regulations 2008; and
- the Medical Devices Regulations 2002 apply to medical lasers, which are specifically excluded from the scope of the Electrical Equipment (Safety) Regulations 1994.

The University requires that all equipment capable of generating artificial optical radiation that is acquired for use on its premises must comply with the requirements of relevant product legislation and be 'CE' marked.

It is the responsibility of any member of staff who constructs artificial optical radiation generating equipment that is to be made available for use by a third party to ensure that the equipment complies with the requirements of all relevant product legislation, making use of harmonised standards where possible.

BRITISH STANDARDS AND GUIDANCE DOCUMENTS

Harmonised standards

Conformity with harmonised standards carries a presumption of conformity with the essential health and safety requirements of the European Directives to which they are harmonised.

The University requires that all equipment acquired for use on University premises or by University staff or students and capable of generating hazardous artificial optical radiation must conform to a current version of any applicable harmonised standards listed in annex 3, regardless of whether it falls within the scope of the product directives given in the preceding section:

The University requires that all personal protective equipment acquired for use on University premises or by University staff or students must be 'CE' marked to show it complies with the Personal Protective Equipment Regulations 2002 and must conform to a current version of all applicable harmonised standards listed in annex 3. New personal protective equipment that does not comply with these regulations cannot be suitable for use as personal protective equipment as defined in the Personal Protective Equipment at Work Regulations 1992.

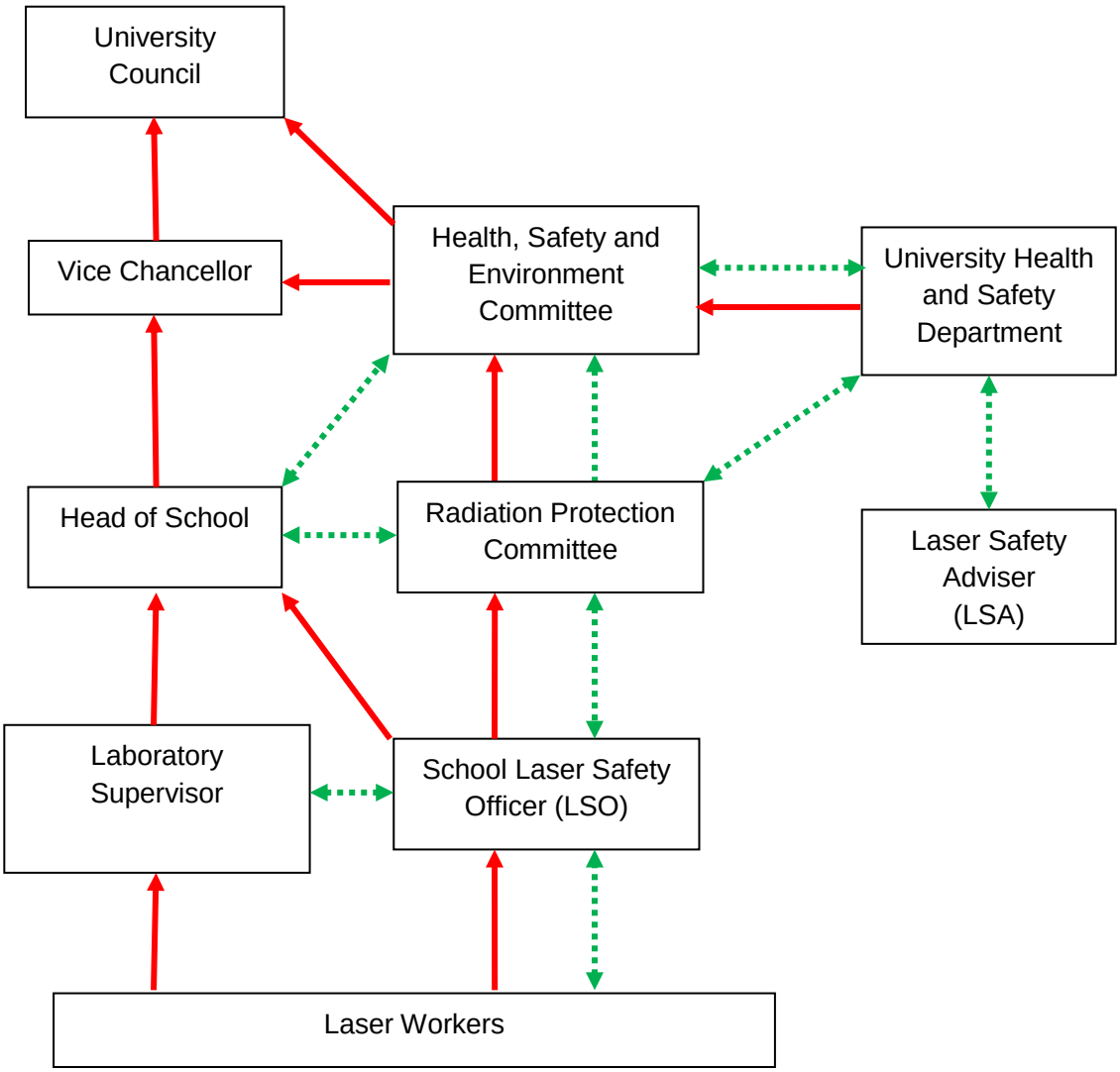
The University Laser Safety Adviser must always be consulted regarding the specification of personal protective equipment prior to its acquisition.

Good practice guides

There are a number of British Standards and other guidance documents that provide useful guidance to the safe use of lasers and other hazardous optical radiation sources (see annex 3). The University requires staff and students to follow this advice where applicable and relevant.

ORGANISATIONAL ARRANGEMENTS

Optical radiation safety is managed within the overall framework of safety management within the University. The organisational structure for managing optical radiation safety is illustrated in the diagram below.



Notes:

Indicates lines of responsibility / reporting

Indicates provision of advice / support

The ultimate legal responsibility for the safe use of artificial optical radiation generating equipment within the University resides with the Vice-Chancellor. The Vice-Chancellor is advised by the University Health and Safety Committee, which is in turn advised by the University Radiation Protection Committee.

The principal responsibility for the operational management of artificial optical radiation safety is exercised through normal line management arrangements, with each Head of School responsible for implementing this policy within their School. The Head of each School where work falling within the scope of this policy is carried out must appoint a Laser Safety Officer to provide specialist advice on matters of optical radiation safety. Where work takes place across organisational boundaries within the University,

managers are expected to liaise and co-operate to ensure that the objectives stated above are met. Each Laser Safety Officer is able to call upon the assistance of the University Laser Safety Adviser. Further details on each of these appointments are given below.

University Radiation Protection Committee

To ensure consistency in compliance with optical radiation safety requirements and encourage the dissemination of good practice in this field, optical radiation safety will be a standing item at meetings of the University Radiation Protection Committee.

Terms of reference

To advise on and monitor the use of ionising and non-ionising radiation within the University. In particular, to advise the Health, Safety and Environment Committee on compliance with statutory regulations and the health implications for users of ionising and non-ionising radiation.

Membership

Chair appointed by the Health, Safety and Environment Committee from amongst the members of the Radiation Protection Committee; Radiation Protection Advisor; Radiation Protection Officer; Radiation Protection Supervisors.

University Laser Safety Adviser (LSA)

The University has appointed an external Laser Safety Adviser (Public Health England) which provides advice to the Health and Safety Office, and Faculties on matters of artificial optical radiation safety and on compliance with relevant legislation, standards and guidance.

School Laser Safety Officers (LSO)

To assist Heads of Schools in the implementation of this policy when work within a School falls within its scope, they will appoint one or more Laser Safety Officers. Heads of Departments may consult with the Director of Health and Safety and University Laser Safety Adviser in making appointments.

The specific duties of School Laser Safety Officers will be agreed by the Radiation Protection Committee and recorded in the University Laser Safety Management Programme File.

Each School Laser Safety Officer will be appointed in writing and will be based in the University Health and Safety Department while carrying out their artificial optical radiation safety duties.

Supervisors

Supervisors have responsibility for day to day management of work with artificial optical radiation sources within laboratories for which they are responsible.

Authorised Users

Academic and research staff must be authorised by the School Laser Safety Officer prior to undertaking work falling within the scope of this policy and will be designated as

‘Authorised Users’. Criteria for authorisation are recorded in the University Laser Safety Management Programme File.

Technical Users

Technical support staff and external contractors may need to operate equipment falling within the scope of this policy in connection with maintenance and servicing activities. These personnel must be authorised by the School Laser Safety Officer prior to carrying out any work and will be designated as ‘Technical Users’. Criteria for authorisation are recorded in the University Laser Safety Management Programme File.

General duty on all persons

All University staff, students, visitors and contractors have a duty to observe the requirements of relevant University safety documents, permits and warning notices. No one may recklessly interfere with or misuse any artificial optical radiation generator, or any equipment provided to control risks associated with the operation of such generators. All persons must exercise reasonable care and to avoid exposure of themselves and others to hazardous artificial optical radiations and non-beam hazards arising from the use of sources. Any person observing a deficiency in safety equipment or a failure to follow relevant safety instructions must report this to the relevant School Laser Safety Officer, who will attempt the resolve the issue. If the LSO cannot resolve the issue they will escalate it to an appropriate member of senior management.

TRAINING AND COMPETENCE

Individuals will only be appointed to positions of responsibility in relation to artificial optical radiation safety if they have sufficient knowledge, experience, and authority to be effective in the role to which they are being appointed. Staff appointed will receive suitable initial and refresher training to enable them to discharge their responsibilities. University management shall satisfy themselves as to the competence and performance of appointed staff and shall formally record evidence of this assessment. The names of those appointed will be promulgated via Laser Safety Management Files, Local Rules and other relevant documents.

Line managers have responsibility for ensuring that all staff, students or visitors required to work with or close to hazardous artificial optical radiation equipment have received adequate information, instruction and training to enable them to work safely. Normally the syllabus given in Annex 4 should provide adequate basic training and this should be supplemented by information and instruction on local arrangements. All new, temporary or transferred personnel are expected to have a personal interview with the relevant School LSO prior to commencing work. This interview should assess the knowledge and competence of the individual and should be used as a basis to decide on the training needs of the individual concerned. Attendance at training sessions and the outcome of interviews should be recorded as an input to measuring the successful implementation of the laser safety management programme.

Communication

Standing instructions in relation to the management of artificial optical radiation safety are provided in this policy document and amplified in Laser Safety Management Files and Local Rules that are available for each of the areas where artificial optical radiations are in use. The Supervisor for each area is responsible for ensuring that copies of the

relevant Local Rules and other documents are available and that staff comply with all requirements within them. University management will ensure that School LSOs and Supervisors have the necessary delegated authority and support to enforce the requirements of the Local Rules.

Changes to policy or its implementation will be promulgated via the normal line management routes.

POLICY IMPLEMENTATION

Laser safety management programme

The University has set in place an overarching laser safety management programme to organise the management of artificial optical radiation safety across all sites and departments. The overarching programme is based on this policy document and provides for University wide management arrangements. However, it is recognised that individual departments will often have unique applications and will consequently have very specific needs that have to be reflected in the local arrangements. It is therefore helpful for each department (or even each individual laboratory within a department) to have its own laser safety management programme that is consistent with the University's overall programme but tailored to local needs. It is noted that staff are more likely to 'buy in' to the programme if they can see the relevance to their work. The principal elements of both the overarching programme and individual local programmes are recorded in laser safety management programme files.

Risk Management

Each local laser safety management programme is strongly influenced by the outcome of the risk assessment undertaken on each artificial optical radiation application. This is used as a tool to decide priorities and set objectives for elimination of optical radiation hazards and risk reduction. All employees have a responsibility to ensure that a suitable and sufficient risk assessment has been carried out prior to commencing any activity associated with hazardous artificial optical radiation, and this assessment must take account of the matters specified in Regulation 3(5) of the Control of Artificial Optical Radiation at Work Regulations 2010 (see Annex 5). Where new or modified facilities are being considered, risk assessments should be carried out at the design, installation and commissioning stages of the life cycle in order to identify inadequately controlled risks and implement additional control measures where necessary. Where new equipment is being procured the procedures detailed below should ensure that safe operation is a key selection criterion. Where a need for additional controls has been identified an action plan will be drawn up to guide their implementation.

Hierarchy of controls

Where possible, work with artificial optical radiation should be planned so that the radiated power or energy does not present a reasonably foreseeable risk of adverse effects to the eyes or skin, taking account of the wavelength(s) and duration(s) of emission. Consideration should be given to temporary reductions in beam power when operation with open beams is essential.

Where it is essential to use radiated powers or energies that are potentially hazardous, engineered solutions must be used to control risks associated with the operation of artificial optical radiation equipment. In particular the University requires that wherever

reasonably practicable potentially hazardous artificial optical radiations must be enclosed using the following hierarchy of enclosures:

1. total enclosure of all individual beam paths and optical components using localised enclosures such as flight tubes and turrets for laser beams or opaque panels for non-laser sources;
2. where it is not reasonably practicable to enclose individual beam paths then consideration should be given to localised enclosure of spatially adjacent beam paths and associated optical components;
3. where there is no other practical alternative, enclosure of optical tables using side shields is acceptable, but in these cases the enclosures should also be provided with top covers that should be used whenever possible; and
4. where localised enclosures are unlikely to change on a regular basis, consideration should be given to interlocking the enclosure to a shutter or power supply.

However, given the nature of the work undertaken, it is recognised that it may not always be possible to fully enclose hazardous artificial optical radiations or may not be possible to enclose them all of the time. In these situations appropriate administrative arrangements must be implemented, which must include:

- a written justification for open beam work that must explain why hazardous radiations cannot be enclosed and must be supported by a suitable and sufficient risk assessment;
- the designation of a laser controlled area with restricted access and appropriate signage as required by the Control of Artificial Optical Radiation at Work Regulations; and
- preparation and implementation of local rules for the area in question.

Additional administrative controls should be considered where appropriate.

The use of personal protective equipment (particularly laser protective eyewear) should be avoided so far as reasonably practicable. Where there is an assessed requirement for laser protective eyewear, it must be ‘CE’ marked, conform to an appropriate British or European Standard and be appropriately specified according to the procedure in that standard. The University Laser Safety Adviser must be consulted regarding specification.

Maintaining effectiveness of controls

Where controls have been implemented, appropriate actions must be taken to ensure their continued effectiveness. Depending on the nature of the control measure adopted, this may include:

- Preventative maintenance
- Routine inspection and/or testing
- Routine review of administrative procedures
- Formal reviews of training

All of these actions must be recorded in writing to provide a permanent record that is amenable to audit.

Procurement

The University will ensure that its procedures for procurement of equipment and contractors takes proper account of the need to ensure that artificial optical radiation safety requirements are met.

Prior to the purchase, lease or loan of any potentially hazardous artificial optical radiation equipment the School LSO together with the Supervisor must carry out a formal review of the engineering controls and design features with a view to assessing the potential for human exposure. The ULSA should be consulted as part of this review process. Once the equipment is installed it should be subjected to a further examination to ensure that all engineering controls and other safety features are functioning effectively.

Contractors carrying out work on equipment capable of generating hazardous artificial optical radiation must be asked to provide copies of their Risk Assessment and Method Statement to the relevant School LSO prior to being allowed to commence work. They should also be asked to provide details of their laser or optical radiation safety training, which should be recorded.

Contingency planning

Supervisors are required to put in place contingency arrangements to deal with all reasonably foreseeable accident scenarios identified through risk assessment. These should include actions to make equipment safe, provide medical assistance to any injured personnel and reporting of the incident to the Health and Safety Office.

MEASURING PERFORMANCE

Management will adopt a proactive approach to monitoring the implementation of the Laser Safety Management Programme. Measurement of performance against pre-determined standards is a key tool in demonstrating successful implementation. The following endpoints will be assessed as part of this process:

- Formal review of maintenance and servicing records
- Formal review of records of inspections and tests carried out on equipment, safety systems, and personal protective equipment.
- Formal review of laser safety training and staff interview records for staff involved with laser work
- Formal review of records of checks on administrative procedures
- Formal review of risk assessments for activities involving work with hazardous artificial optical radiation equipment
- Formal review of reports of suspected accidental exposure to hazardous artificial optical radiation (procedures detailed in Local Rules).

Artificial optical radiation safety documentation will be audited at approximately annual intervals by the University Laser Safety Adviser. The successful implementation of the Laser Safety Management Programme will be reviewed by the Radiation Protection Committee on a six-monthly basis.

ANNEX 1

LASER CLASSIFICATION SYSTEM

Lasers are grouped into classes in order to give an indication of their potential to cause harm. These classes are specified in the British Standard BS EN 60825-1: 2007. The classification of a laser is determined by its Accessible Emission Limit (AEL), which is the maximum level of laser radiation that is accessible under all reasonably foreseeable single fault conditions. The classification system applies to laser systems (i.e., the laser itself and an appropriate energy source) and laser products (i.e., any product or assembly of components which constitutes, incorporates or is intended to incorporate a laser or laser system).

The laser classes are:

Class 1

Visible and invisible lasers. Class 1 lasers are considered safe under reasonably foreseeable conditions of operation and present no hazards to the eye or skin. Class 1 lasers may contain embedded lasers of higher class that could be accessible during servicing.

Class 1M

302.5 nm to 4000 nm only. The difference between a Class 1 and a Class 1M laser is that the total power in the beam can be much higher for the latter. However, the beam will be either highly divergent or collimated and of large diameter. Class 1M laser beams are considered safe to the skin. However, class 1M lasers may present a hazard to the eye if viewed using magnifying optics, e.g., lenses.

Class 2

Visible lasers only (400 nm to 700 nm only). Class 2 are low powered lasers and emit continuous or pulsed radiation. They do not present a hazard to the skin. Protection of the eye is afforded by the human blink reflex, i.e., the ‘Aversion’ response. The maximum power into the eye is 1mW.

Class 2M

The difference between a Class 2 and a Class 2M laser is that the total power in the beam can be much higher for the latter. However, the beam will be either highly divergent or collimated and of large diameter so that the proportion of the beam that can normally enter the eye is small. Class 2M laser beams are considered safe to the skin. However, class 2M lasers are not safe to the eye if the beam is viewed using magnifying optics.

Class 3R

302.5 nm to 1 mm. These are medium power lasers where the AEL is generally five times larger than that of a class 1 laser. Class 3R lasers present a higher risk to the eye than Class 1 or 2 lasers, but do not pose a hazard to the skin.

Class 3B

Visible and invisible lasers. Medium/high power lasers where the maximum power can be up to 500 mW. Although not hazardous to the skin, direct viewing of a beam from a class

3B laser is always hazardous. Specularly reflected beams (reflections off shiny surfaces) present a hazard to the eye.

Class 4

These lasers are high powered lasers and are considered extremely hazardous. Class 4 lasers present a hazard to both eye and skin. Direct beam or reflected beam viewing is always hazardous and is likely to result in injury. Environmental damage (e.g. fire) is also a serious possibility. The use of class 4 lasers requires extreme caution.

ANNEX 2

NON-LASER CLASSIFICATION SYSTEM

The classes for non-laser optical radiation sources are specified in BS EN 62471:2008.

CONTINUOUS WAVE LAMPS

Exempt Group

The basis for the exempt group classification is that the lamp does not pose any photobiological hazard under any conditions. The requirement is met by any lamp that does not pose:

- An actinic ultraviolet hazard within 8-hours exposure
- A near-ultraviolet hazard within 1,000 s (about 16 min)
- A retinal blue-light hazard within 10,000 s (about 2.8 h)
- A retinal thermal hazard within 10 s
- An infrared radiation hazard for the eye within 1,000 s
- Lamps that emit infrared radiation without a strong visual stimulus (< 10 cd m-2) and also do not pose a near-infrared retinal hazard within 1,000 s.

Risk Group 1 (low risk)

The basis for the Risk Group 1 classification is that the lamp does not pose a hazard due to normal behavioural limitations on exposure. This requirement is met by any lamp that exceeds the limits for the Exempt Group but does not pose:

- An actinic ultraviolet hazard within 10,000 s
- A near-ultraviolet hazard within 300 s
- A retinal blue-light hazard within 100 s
- A retinal thermal hazard within 10 s
- An infrared radiation hazard for the eye within 100 s
- Lamps that emit infrared radiation without a strong visual stimulus (< 10 cd m-2) and also do not pose a near-infrared retinal hazard within 100 s.

Risk Group 2 (moderate risk)

The basis for the Risk Group 2 classification is that the lamp will not pose a hazard due to the aversion response to very bright sources or due to thermal discomfort. This requirement is met by any lamp which exceeds the Risk-Group 1 limits but does not pose:

- An actinic ultraviolet hazard within 1,000 s
- A near ultraviolet hazard within 100 s
- A retinal blue-light hazard within 0.25 s (aversion response time)
- A retinal thermal hazard within 0.25 s

- An infrared radiation hazard for the eye within 10 s
- Lamps that emit infrared radiation without a strong visual stimulus (< 10 cd m-2) and also do not pose a near-infrared retinal hazard within 10 s.

Risk Group 3 (high risk)

The basis for Risk Group 3 is that the lamp may pose a hazard for even momentary or brief exposure. Lamps that exceed the limits for Risk Group 2 are therefore in Risk Group 3.

PULSED LAMPS

The risk group determination of a pulsed lamp is made as follows:

- A lamp that exceeds the exposure limit is classified as belonging to Risk Group 3.
- For single pulsed lamps, if the weighted radiant exposure or weighted radiance dose is below the exposure limit the lamp is classified as 'Exempt'.
- For repetitively pulsed lamps, if the weighted radiant exposure or weighted radiance dose is below the exposure limit, the lamp is evaluated against the criteria for continuous wave lamps (see Annex 3, Section 1), using time averaged values of the pulse emission.

ANNEX 3

BRITISH STANDARDS AND GUIDANCE DOCUMENTS RELEVANT TO ARTIFICIAL OPTICAL RADIATION SAFETY

HARMONISED STANDARDS

Laser equipment

- BS EN 60825-1 *Safety of laser products – Part 1: Equipment classification and requirements*
- BS EN 60825-2 *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*
- BS EN 60825-12 *Safety of laser products – Part 12: Safety of free space optical communication systems used for transmission of information*
- BS EN 60601-2-22 *Medical electrical equipment Part 2. Particular requirements for safety. Section 2.22 Specification for diagnostic and therapeutic laser equipment*
- BS EN 60065 *Audio, video and similar electronic apparatus. Safety requirements*

Non-laser equipment

- BS EN 62471 *Photobiological safety of lamps and lamp systems*
- BS EN 12198 *Safety of machinery – assessment and reduction of risks arising from radiation emitted by machinery*

Personal protective equipment

Laser protective eyewear

- BS EN 207 *Personal eye-protection – Filters and eye protectors against laser radiation (laser eye-protectors)*
- BS EN 208 *Personal eye-protection – Eye protectors for adjustment work on lasers and laser systems (laser adjustment eye-protectors)*

Eyewear conforming to BS EN 208 may only be used for alignment work on visible laser beams.

The University requires eyewear to be selected according to the guidance in Annex B of the appropriate harmonised standard. The University Laser Safety Adviser must be consulted in relation to eyewear specification.

Non-laser protective eyewear

- BS EN 166 *Personal eye protection – specifications*
- BS EN 175 *Personal protection – equipment for eye and face protection during welding and allied processes*

Note that where non-laser protective eyewear is in use the requirement for skin protection should also be considered. Protective eyewear should be fitted with filters affording appropriate protection and specified against one of the following standards where approprite:

- BS EN 169 *Personal eye-protection – filters for welding and related techniques – transmittance requirements and recommended use*
- BS EN 170 *Personal eye-protection – ultraviolet filters – transmittance requirements and recommended use*
- BS EN 171 *Personal eye-protection – infrared filters – transmittance requirements and recommended use*
- BS EN 379 *Personal eye-protection – automatic welding filters*

GOOD PRACTICE GUIDES

There are a number of British Standards and other guidance documents that provide useful guidance to the safe use of lasers and the University requires staff and students to follow this advice where applicable and relevant.

General laser safety

- PD IEC TR 60825-14 *Safety of laser products – Part 14: A User's Guide*
- AURPO Guidance Note No 7 *Guidance on the safe use of lasers in education and research*

Medical laser safety

- PD IEC/TR 60825-8 *Safety of laser products – Part 8: Guidelines for the safe use of medical laser equipment*
- Medicines and Healthcare Products Regulatory Agency (MHRA) DB2008 (03) *Guidance on the safe use of lasers, intense light source systems and LEDs in medical, surgical, dental and aesthetic practices*

Safety of entertainment displays

- PD IEC/TR 60825-3 *Safety of laser products – Part 3: Guidance for laser displays and shows*
- HS(G) 95 The radiation safety of lasers used for display purposes

ANNEX 4

LASER SAFETY TRAINING FOR LASER USERS

This following syllabus is to be followed in the provision of training for all laser users. It is not considered to be sufficiently detailed for the training of School Laser Safety Officers all of whom should attend a more advanced course. The following subject matter should be covered:

a) Characteristic features of laser radiation emitted from different types of laser;

- Generation of laser radiation and hazards;
- Laser-tissue interactions;
- Effects of exposure of eye and skin to laser radiation;
- Laser safety management, role of the ULSA, School LSO and investigation of suspected cases of accidental exposure;
- Laser Controlled Areas – boundaries, warning signs, access control etc.;
- Personal protective equipment;
- Hazards from reflection or absorption of the laser beam;
- Precautions to ensure that exposure of unprotected skin and eye of those present is less than the Exposure Limit Values;
- Associated hazards, such as electrical hazards, fire and explosion risks, cryogenic liquids, fume;
- Relevant legislation;
- Relevant standards and guidelines;
- Principles of laser risk assessment and management.

ANNEX 5

MATTERS THAT MUST BE CONSIDERED IN ANY ASSESSMENT OF RISKS FROM WORK WITH ARTIFICIAL OPTICAL RADIATION

It is requirement of Regulation 3(5) of the Control of Artificial Optical Radiation at Work Regulations that the following matters must be considered in any assessment of risks. This does not preclude consideration of matters not listed below.

a) the level, wavelength and duration of exposure;

b) the exposure limit values;

c) the effects of exposure on employees or groups of employees whose health is at particular risk from exposure;

d) any possible effects on the health and safety of employees resulting from interactions between artificial optical radiation and photosensitising chemical substances;

e) any indirect effects of exposure on the health and safety of employees such as temporary blinding, explosion or fire;

f) the availability of alternative equipment designed to reduce levels of exposure;

g) appropriate information obtained from health surveillance, including where possible published information;

h) multiple sources of exposure;

i) any class 3B or 4 laser that is classified in accordance with the relevant IEC standard that is in use by the employer and any artificial optical radiation source that is capable of presenting the same level of hazard; and

j) information provided by the manufacturers of artificial optical radiation sources and associated work equipment in accordance with the relevant European Union Directives.