UCL Laser Safety Guidance

Introduction

This guidance supplements the UCL Artificial Optical Radiation Safety Standard, and is for use by Principal Investigators and other laser users. Further guidance and advice is available by contacting the Laser Protection Officer.

This guidance contains the following sections:

- Step 1: Register your Laser
- Step 2: Complete a Risk Assessment
- Step 3: Implement Control Measures
- Step 4: Appoint a Laser Safety Officer
- Step 5: Write a Scheme of Work
- Step 6: Designate a Laser Controlled Area
- Step 7: Laboratory Design
- Step 8: Experiment Design
- Step 9: Warning Signs and Labels
- Step 10: Use of Personal Protective Equipment
- Step 11: Training
- Step 12: Know What to Do in an Emergency
- Step 13: Be Prepared for Audits
- Step 14: Create a Laser Safety Folder
Step 1: Register your Laser

All Class 3R, 3B and 4 lasers must be registered with the University Laser Protection Officer (ULPO) by completing a laser registration form (Appendix C), and added to the Department’s Artificial Optical Radiation Inventory managed by the Laser Safety Officer (LSO).

Step 2: Complete a Laser Risk Assessment

Document a risk assessment. Consider:

- Level, wavelength and duration of exposure
- The Exposure Limit Values (ELVs)
- The effects of exposure on employees or groups of employees whose health is at particular risk from exposure
- Any possible effects on the health and safety of employees resulting from interactions between artificial optical radiation and photosensitising chemicals
- Any indirect effects of exposure such as temporary blinding, explosion or fire
- Both beam and non-beam hazards (e.g. electrical, chemical, fume)
- The availability of equipment designed to reduce levels of exposure
- Justification for not enclosing the system (if applicable)

Specialist risk assessment forms for Class 1&2, and Class 3R, 3B & 4, are available on riskNET under the ‘Specialist Risk Areas’ tab (see below).

The University Laser Protection Officer or a UCL appointed Laser Safety Officer must approve the risk assessment.
Step 3: Implement Control Measures

Your risk assessment needs to implement adequate controls measures to address the hazard. You should prioritise good design and equipment to reduce the risk (engineering controls), followed by management (administrative controls) and, as a last resort, Personal Protective Equipment (PPE).

The flowchart below provides guidance on the process of carrying out a risk assessment and the selection of appropriate control measures.

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Step 4: Write a Scheme of Work

Once the risk assessment is complete and you have decided on the most appropriate control measures, the next step is to write a scheme of work. A scheme of work describes safe procedures, the use of controls identified in the risk assessment, and plans for any reasonably foreseeable incidents. You should keep a copy available near the laser set-up for easy reference. Principle Investigators must ensure that all users read and sign as having understood the scheme of work.

Your scheme of work should contain (Appendix D):

- Contact details for the Laser Safety Officer
- Description of Lasers (Class, wavelength etc.)
- Description of the Laser Controlled Area
- Persons authorised to do the work
- Pre-use checks and safety procedures
- Information on any other hazards
- Plans for all reasonably foreseeable incidents identified in the risk assessment

The hazard will be different depending on how the laser is being used, so you need to write a system of work for each task to ensure that the risk is adequately controlled.
The five main activities have been identified as:

- Setting up
- Beam alignment
- Adding new elements (such as optics)
- Normal operation
- Maintenance of the laser system

You can decide whether to complete separate schemes of work for all activities, or incorporate them into one document.

**Step 5: Appoint a Laser Safety Officer**

Departments must have at least one UCL appointed Laser Safety Officer if it uses Class 3B or 4 lasers. The role of the Laser Safety Officer is to supervise the safety of artificial optical radiation (AOR), and to ensure work is in accordance with the UCL AOR Safety Standard and associated guidance. To become an appointed Laser Safety Officer you must:

- Complete the Laser Safety Officer’s course (1-day), which can be booked via the UCL Single Training Booking System or any other recognised provider of such training
- Receive a letter of appointment from the University Laser Protection Officer

**Step 6: Designate a Laser Controlled Area**

You must designate your work space as a Laser Controlled Area if you are using Class 3B or 4 lasers. The area should have restricted entry and warning signs posted at all points of access. It should be separated from non-controlled areas by suitable partitions or construction.

**Step 7: Check your Laboratory is Suitable for Laser Use**

- If practicable, the laser laboratory should have a high level of illumination that will minimise pupil size
- To enhance illumination and reduce specular reflections, walls, ceiling and fittings should be painted with light coloured matt paint
- Reflecting surfaces, such as glass, should be avoided
- Windows should be kept to a minimum, and may need to be covered with blinds. These blinds should be non-reflective and adequately fire-resisting, where higher-powered lasers are used.
- Ventilation needs to be considered:
  - if cryogens are used
  - if toxic fumes need to be extracted (in which case the extraction should be located as close to the source as possible)
  - if it is determined that heat gain from equipment requires cooling
  - if there are fumes or dust that require extraction
- Consider the facilities and arrangements for the handling of toxic chemicals that are associated with some dye lasers
• Positioning of electrical supplies, and laser switch and control gear should:
  - enable the laser to be made safe in an emergency from outside the laser area
  - enable personnel to stand in a safe place during work
  - prevent accidental firing of lasers
  - give an indication as to whether the laser is powered up
  - enable a person standing next to the laser to switch it off easily

Step 8: Experiment Design

Consider:

• Whether the laser could be substituted for one that is of a lower power
• Whether the laser output can be restricted
• Whether the system can be fully, or partially, enclosed

Ensure that:

• Beam paths are as short as possible
• The beam is terminated with an appropriate beam stop (energy absorbing and non-reflective)
• Beam paths are not at eye level
• The laser is facing away from doors
• Optical benches are kept clear of clutter
• Lower power lasers are used for alignment if practicable

Step 9: Warning Signs and Labels

All points of access into areas containing lasers must be marked with a clearly visible warning sign that incorporates the following information:

• Laser warning ‘starburst’
• Denotes the highest class of laser in the area
• Contact details for the designated Laser Safety Officer

Labelling of Lasers

Explanatory labels are required for all lasers other than Class 1. In addition, each Class 3R, Class 3B and Class 4 laser must have ‘Laser Aperture’ labels affixed close to each aperture through which laser radiation is emitted.

Lasers that are safe within reasonably foreseeable conditions of operation in Class 1 do not need warning labels. Supplementary information describing the laser product as a ‘Totally Enclosed System’ with details of the embedded laser clearly displayed is required when there is frequent access to the system (for example, for cleaning or maintenance).
Examples of explanatory labels are given in Appendix E. Normally labels are attached by the manufacturer, but lasers should be labelled, or re-labelled, if required.

**Step 10: Training**

All users and supervisors must complete ‘The ‘Safe User of Laser Devices’ course, which can be booked via the UCL Single Training Booking System. The Laser Safety Officer also needs to provide a laser safety brief, to explain local safety arrangements and procedures to all new users.

**Step 11: Use of Personal Protective Equipment**

In addition to periodic LSO audits, users must check their Personal Protective Equipment (PPE) before each use to ensure that it is undamaged and fit for purpose. PPE audits and maintenance should be recorded in a PPE log.

**Eyewear**

Safety eyewear is designed to provide protection in case of accidental viewing and not to protect against deliberate exposure. It should be provided if, despite the implementation of all other control measures, there is still a risk that eyes could be exposed to laser radiation above the ELV:

- Eyewear must be appropriate for the power and wavelength of the laser used, and must conform to the relevant European Standards (EN207 (Safety eyewear) or EN208 (Alignment eyewear)). The department need to ensure that the appropriate eyewear is selected, and should not rely on suppliers to advise on this
- The eyewear should be CE marked
- Eyewear should be clearly marked with Scale number (L), the wavelength and the lasers it is suitable for
- Where multiple lasers are used in an area, each set of eyewear must be labelled (colour coding is preferable) to prevent users inadvertently selecting incorrect PPE
- Protective eyewear should be stored in the protective case or suitable racking to prevent damage, and should not be left on benches
- If damage is suspected, the eyewear should be immediately discarded and reported to the LSO
- Selection, fitting, storage, and inspection of protective eyewear should be included in the laser safety brief

**Other PPE**

- Class 4 lasers present a fire hazard and protective clothing made from suitably flame-retardant and heat-resistant material may be required
- Skin protection may also be required for work with lasers emitting in the ultraviolet region (Class 4, and some Class 3B)
- Gloves should be worn when preparing chemicals for dye lasers, optics cleaning chemicals, handling cryogenic materials and filters from extraction systems used for materials processing
Step 12: Know What to Do in an Emergency

- Schemes of work should detail the steps to be taken in the event of all foreseeable incidents identified in the risk assessment
- All accidents, incidents and ‘near-misses’ must be reported on riskNET as soon as possible after the event
- A Laser Incident Grab Sheet (Appendix H) should be available for all laser setups, and easily accessible in case of emergency
- If an incident involves a known, or suspected, eye injury an emergency medical examination must be carried out as soon possible

Step 13: Be Prepared for Audits

The Laser Safety Officer should complete a Laser Safety Audit (see Appendix G) before you can work with your laser. Additional audits should be completed:

- Annually
- If anything significant changes with the laser setup
- After any incidents involving the laser

Step 14: Create a Laser Safety Folder

Every laser setup should have an associated Laser Safety Folder with fully completed copies of all the forms listed below. This folder can be held electronically, but should be easily accessible in the event of an inspection by Safety Services or a regulatory body.

The folder should contain:

- Laser risk assessment(s)
- Scheme of work for normal operation and alignment, including the associated user signing sheet
- Completed audit forms
- Plans for all incidents identified in the risk assessment
- Manuals for the laser (if applicable)
- PPE log
- Justification statement (for open beam work only)
Legislation, Standards and Guidance

- Artificial Optical Radiation Regulations 2010
- The Management of Health & Safety at Work Regulations 1999
- The Provision and Use of Work Equipment Regulations 1998
- The Personal Protective Equipment Regulations 2002
- The Control of Substances Hazardous to Health Regulations 2002
- The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
- BS EN 60825-12: 2004 – Safety of laser products. Part 12: Safety of free space optical communication systems used for transmission of information
- BS EN 207: 2009: Personal eye protection – filters and eye protectors against laser radiation (laser eye protectors)
- BS EN 208: 2009 – Personal eye protection – eye protectors for adjustment work on lasers and laser systems (laser adjustment eye protectors)
- Guidance on the Safe Use of Lasers in Education and Research – Association of University Radiation Protection Officers
Appendix A - What is Artificial Optical Radiation?

The optical radiation spectrum ranges from 100 nm through to 1 mm in wavelength. The visible part of the optical radiation spectrum lies between approximately 400 nm to 700 nm. The ultra-violet part of the spectrum ranges from approximately 100 nm to 400 nm, while infra-red ranges from 700 nm to 1 mm.

Sources of Artificial Optical Radiation (AOR) are those which are artificially created by human activity as opposed to natural sources such as the sun or incandescent flame. AOR can be divided further into two broad categories: lasers (coherent) and broadband optical sources (non-coherent).

Lasers

AOR emitted from lasers has the following properties:

- It is or is nearly monochromatic – one pure wavelength or colour depending on the material used in the laser. Although some lasers can produce multiple wavelengths.
- It is very intense and of high power per unit area (irradiance)
- It has low divergence – which means the laser beam does not spread out very much.
- It is coherent - this means that all of the photons have the same frequency, polarisation, direction and the same speed and phase

Laser beams can be visible or invisible and depending on the properties of the laser can be highly focussed and traverse large distances. Containment of a laser beam is therefore one of the key safety considerations when applying AOR safety to laser installations

Broadband optical sources

AOR emitted from broadband optical sources has the following properties:

- It is polychromatic – a range of different wavelengths (if visible we perceive these as colours) can be produced
- It has high intensity – at the point of origin and close to the source, but reduces as you move further away.
- It has high divergence – which means that light ‘spreads out’ over an increasingly large area with the increase in distance from the source of light
- It is incoherent - the emitted photons are out of phase with one another (not identical)

Although broadband sources of optical radiation can be highly intense at the point of origin, the irradiance produced by the sources can decrease rapidly with increasing distance. Due to the spectrum of wavelengths produced by these types of sources, they are often difficult to assess in a simplistic manner.

Beam hazards

Beam hazards can exist when an AOR interacts directly with an individual. The two most sensitive organs to optical damage are the eye and the skin. Optical radiation does not generally penetrate far enough into the body to affect the major internal organs.

The two different types of biological effects that can occur in the eye or skin are photochemical or thermal damage. Optical radiation can cause this damage as it has the ability of depositing a large amount of energy into a small volume.
Non-beam hazards

AOR sources can be made up of a number of components, which in turn can present their own hazards. The environment in which some sources are used can also present hazards. These types of hazards are termed non-beam hazards and can often be more harmful than beam hazards. The hazards can also exist at different stages of the lifetime of an AOR source. A number of categories exist for non-beam hazards; these include:

- Electrical
- Temperature - (hot surfaces and components)
- Fire (for Class 4 laser products)
- Chemical
- Mechanical

In addition to beam hazards, the non-beam hazards should also be considered when carrying out a risk assessment.
Appendix B - Laser Classifications

Lasers are grouped into eight Classes depending on the potential for the beam to cause harm. The hazard, and hence the Classification, depends on the wavelength, power, energy and pulse characteristics.

<table>
<thead>
<tr>
<th>Class</th>
<th>Basis for Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td><strong>SAFE</strong> Lasers which are safe under reasonably foreseeable conditions of operation. Generally a product that contains a higher Class laser system but access to the beam is controlled by engineering means.</td>
</tr>
<tr>
<td>Class 1C</td>
<td><strong>SAFE WITHOUT VIEWING AIDS</strong> Lasers designed explicitly for contact application to the skin or non-ocular tissue (e.g. home use hair removal products). The irradiance or radiant exposure levels may exceed the skin MPE as necessary for the intended treatment procedure. During operation, the ocular hazard is prevented by engineering means.</td>
</tr>
<tr>
<td>Class 1M</td>
<td><strong>SAFE WITHOUT VIEWING AIDS</strong> 302.5 to 4000nm Safe under reasonable conditions of operations. Beams are either highly divergent or collimated but with a large diameter. May be hazardous if user employs gathering optics within the beam.</td>
</tr>
<tr>
<td>Class 2</td>
<td><strong>LOW POWER</strong> For CW lasers, protection of the eyes is normally provided by the natural aversion response, including the blink eye reflex, which takes approximately 0.25s (These lasers are not intrinsically safe). AEL= 1mW for the CW laser</td>
</tr>
<tr>
<td>Class 2M</td>
<td><strong>LOW POWER</strong> Laser products that emit visible laser beams and are safe for short-term exposure only for the naked eye, but possible eye injury for exposures when using loupes or telescopes. Eye protection is normally provided by aversion responses, including the blink reflex.</td>
</tr>
<tr>
<td>Class 3R</td>
<td><strong>LOW/MEDIUM POWER</strong> Risk of injury is greater than the lower Classes but not as high as for Class 3B. Up to 5 times the AEL for Class 1 or Class 2.</td>
</tr>
<tr>
<td>Class 3B</td>
<td><strong>MEDIUM/HIGH POWER</strong> Direct intra-beam viewing of these devices is always hazardous. Viewing diffuse reflections is normally safe provided the eye is no closer than 13cm from the diffusing surface and the exposure duration is less than 10 seconds. AEL = 500mW for a CW laser</td>
</tr>
<tr>
<td>Class 4</td>
<td><strong>HIGH POWER</strong> Direct intra-beam viewing is hazardous. Specular and diffuse reflections are hazardous. Eye, skin and fire hazard</td>
</tr>
</tbody>
</table>

*Table adapted from Public Health England*
Laser Registration Form (Appendix C)

This form should be completed for all 3R, 3B and 4 lasers, and submitted to the University Laser Protection Officer (lasersafety@ucl.ac.uk). Complete for new acquisitions, changes of use, and disposal. For new acquisitions complete boxes A&B, for changes/disposals complete boxes A&C.

<table>
<thead>
<tr>
<th>A. Laser Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make and Model:</td>
</tr>
<tr>
<td>Power (mW):</td>
</tr>
<tr>
<td>Wavelength and band:</td>
</tr>
<tr>
<td>Pulse Frequency (Hz) (if applicable):</td>
</tr>
<tr>
<td>Department:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. New Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of first use:</td>
</tr>
<tr>
<td>Brief outline of work to be undertaken and the status of individuals involved (e.g UG,PG,Staff):</td>
</tr>
</tbody>
</table>

Is the laser beam fully enclosed? (Yes/No)

If no, provide a justification statement outlining why enclosure is not possible, and describe the control measures in place to shield the beam.
<table>
<thead>
<tr>
<th>Risk Assessment Completed (Yes/No)</th>
<th>Scheme of Work Completed (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### C. Changes/disposal

Please provide details below of any changes relating to the use of the laser or if it is to be taken out of use:
# Scheme of Work: Class 3B&4 Lasers (Appendix D)

Before beginning work with Class 3B/4 lasers, users must read this document, and confirm through either signature or email to the Laser Safety Officer, that they have understood and agree to follow the safety precautions and procedures outlined.

<table>
<thead>
<tr>
<th>Laser specifications:</th>
<th>Experiment(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Responsible person(s):</th>
<th>Department:</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Location of work:</th>
<th>Planned start date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

## Scope:

Provide a brief description of the work activity in this section. (Examples of activities: Laser setup, adding new elements, normal operation, maintenance, alignment)

## General precautions:

As a minimum, the below points should be included in this section:

- Only named personnel are permitted to use this laser
- When not in use the key to the laser should be kept separately to prevent unauthorised use
- All beam paths should be kept as short as possible and enclosed whenever reasonably practicable
- The area in which this laser is used should be designated as a laser controlled area, and have a warning sign on the door

Add or amend as necessary

## Specific considerations relating to this work:
When completing this section, consider:

- Location of the laser from windows, considering the Nominal Ocular Hazard Distance (NOHD)
- Arrangements for leaving the laser unattended (if permitted)
- Optimum and max power setting for use
- Access arrangements – e.g. access tags
- PPE (including specifications)
- The divergence of the laser
- Whether there is a skin or eye hazard
- Other hazards

**Procedure:**

**Add to and amend below as necessary**

**Before lasers are switched on:**

- All unauthorised persons must vacate the room
- Activate exterior warning light(s), and close all doors
- Remove bracelets, watches and other reflective jewellery
- Inspect beam paths for foreign objects
- Inspect PPE for damage

**During Activity:**

**Incident plans:**

Add/amend
# Appendix E – Warning Signs and Labels

Note: All labels should conform to BS EN 60825-1 (Safety of Laser Products)

| Class 1                      | No laser hazard warning symbol  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanatory label bearing the words:</td>
<td>&quot;CLASS 1 LASER PRODUCT&quot;</td>
</tr>
<tr>
<td>Class 1 (by engineering design)</td>
<td>Explanatory label bearing the words:</td>
</tr>
</tbody>
</table>
| ![Class 1M Label](image.png) | No laser hazard warning symbol  
| Explanatory label bearing the words: | |
| Class 2                      | Label with laser hazard warning symbol  
| Explanatory label bearing the words: | |

![Class 2 Label](image.png)
<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2M</td>
<td>Label with laser hazard warning symbol</td>
</tr>
<tr>
<td></td>
<td>Explanatory label bearing the words:</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Class 2M Laser Product Label" /></td>
</tr>
<tr>
<td>Class 3R</td>
<td>Label with laser hazard warning symbol</td>
</tr>
<tr>
<td></td>
<td>Explanatory label bearing the words:</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Class 3R Laser Product Label" /></td>
</tr>
<tr>
<td>Class 3B</td>
<td>Label with laser hazard warning symbol</td>
</tr>
<tr>
<td></td>
<td>Explanatory label bearing the words:</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Class 3B Laser Product Label" /></td>
</tr>
<tr>
<td>Class 4</td>
<td>Label with laser hazard warning symbol</td>
</tr>
<tr>
<td></td>
<td>Explanatory label bearing the words:</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Class 4 Laser Product Label" /></td>
</tr>
<tr>
<td>Class 3R, 3B &amp; 4</td>
<td>Laser Contractors Statement or Instructed on Non-Dependent Staff</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Laser Aperture" /></td>
</tr>
</tbody>
</table>
### Appendix F – Summary of Warnings & Protective Measures

<table>
<thead>
<tr>
<th>CLASS</th>
<th>Summary of Control Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No protective measures in normal use. Special precautions may be needed for service work.</td>
</tr>
</tbody>
</table>
| 1M    | Prevent direct viewing with magnifying optics  
|       | Warning label |
| 2     | Do not stare into beam  
|       | Do not direct towards people  
|       | Should not be used in public areas  
|       | Warning label  
|       | Risk assessment  
|       | Local induction and training |
| 2M    | Do not stare into beam  
|       | Do not direct towards people or into public areas  
|       | Terminate beam at end of useful path with appropriate beam stop  
|       | Warning label  
|       | Risk assessment  
|       | Local induction and training |
| 3R    | Prevent direct eye exposure to the beam  
|       | Do not direct towards people or into public areas  
|       | Risk assessment  
|       | Scheme of work  
|       | Warning label  
|       | Users must complete ‘Safe use of laser devices’ training  
|       | Local induction and training |
| 3B & 4| Risk assessment to identify the control measures for safe use  
|       | Engineering to fully enclosure the laser beam path (if practicable)  
|       | Beam enclosures if full enclosure is not practicable  
|       | Scheme of work  
|       | Scheme of work for alignment  
|       | Emission indicators  
|       | Access to the area where the laser is operated should be controlled either via an interlock or key control  
|       | Users must complete ‘Safe use of laser devices’ training  
|       | Local induction training  
|       | Appointment of trained Laser Safety Officer  
|       | Designate work area as Laser Controlled Area  
|       | Warning signs/lights clearly visible at all access points  
|       | The use of eye protection and protective clothing when appropriate |
# UCL Laser Audit Form (Appendix G)

<table>
<thead>
<tr>
<th>Date</th>
<th>Department</th>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Laser Safety Officer</th>
<th>Room no.</th>
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</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td>Model</td>
</tr>
<tr>
<td>Wavelength</td>
<td>Max. power</td>
</tr>
</tbody>
</table>

## Engineering Controls

<table>
<thead>
<tr>
<th>Engineering Controls</th>
<th>1M</th>
<th>2</th>
<th>2M</th>
<th>3R</th>
<th>3B</th>
<th>4</th>
<th>1(E)*</th>
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</thead>
<tbody>
<tr>
<td>Remote Interlocks</td>
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<td>Safety Interlocks</td>
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<td>Key Control</td>
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<td>Emission Indicator</td>
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<tr>
<td>Beam Terminator (Beam dump)</td>
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<tr>
<td>Beam Enclosure</td>
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<tr>
<td>Beam level (not at eye level)</td>
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<tr>
<td>Beam positioning</td>
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<tr>
<td>Laser mounted on stable platform</td>
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<tr>
<td>Warning system (visual or aural)</td>
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<tr>
<td>Emergency stop/disconnect available</td>
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<td></td>
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<tr>
<td>Access into laser area restricted</td>
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</tbody>
</table>

## Administrative Controls

<table>
<thead>
<tr>
<th>Administrative Controls</th>
<th>1M</th>
<th>2</th>
<th>2M</th>
<th>3R</th>
<th>3B</th>
<th>4</th>
<th>1(E)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasers registered with UCL Laser Protection Officer</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lasers added to the departmental AOR inventory</td>
<td></td>
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<tr>
<td>Appointed Laser Safety Officer</td>
<td></td>
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<tr>
<td>All lasers and barriers clearly labelled</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Door/area signs</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>All users completed ‘Safe use of laser devices’ course and local safety induction</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Training records</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Suitable and sufficient risk assessment</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
**Scheme of work**

**Scheme of work for alignment**

**Incident plans**

**Justification statement (open beam work)**

### Personal Protective Equipment

<table>
<thead>
<tr>
<th></th>
<th>1M</th>
<th>2</th>
<th>2M</th>
<th>3R</th>
<th>3B</th>
<th>4</th>
<th>1(E)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate eye protection available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyewear in good condition</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Eyewear suitable for the correct wavelength(s)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Eyewear worn inside Nominal Hazard Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documented periodic eyewear inspections</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Gloves and protective clothing available</td>
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</tbody>
</table>

### Other Hazards

<table>
<thead>
<tr>
<th></th>
<th>1M</th>
<th>2</th>
<th>2M</th>
<th>3R</th>
<th>3B</th>
<th>4</th>
<th>1(E)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eg Fire, Chemical, electrical, slips trips and falls</td>
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</tbody>
</table>

*1(E) are lasers that are Class 1 by engineering controls only

**Further comments/actions:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
EMERGENCY PROCEDURE IN THE EVENT OF ACCIDENTAL EYE EXPOSURE TO CLASS 3 OR CLASS 4 LASER

Report to **MOORFIELDS EYE HOSPITAL** as soon as possible and within 24 hours of the incident.

The information contained in this sheet should be made available to anyone treating the injury

**DO NOT DRIVE YOURSELF**

<table>
<thead>
<tr>
<th>Emergency Ophthalmic Examination</th>
<th>LASER Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report to:</td>
<td>Moorfield’s Eye Hospital</td>
</tr>
<tr>
<td></td>
<td>162 City Road</td>
</tr>
<tr>
<td></td>
<td>London</td>
</tr>
<tr>
<td></td>
<td>EC1V 2PD</td>
</tr>
<tr>
<td></td>
<td>Tel: 020 7253 3411</td>
</tr>
</tbody>
</table>

**Laser Details:**

Type: Continuous Wave / Pulsed*

Wavelength: ........................................ nm

Power Output (CW), or Pulse Energy, Duration and Rate (pulsed):

Laser Classification: .....................................

**School / Centre:**

**Name of Injured Party:**

**Exposure Details:**

Circumstances of accident / injury:

Time / Date of Injury: ................................................

Eye affected: Left / Right / Both*

Laser settings at time of injury: ................................................

Were protective goggles worn? Yes / No* *delete as appropriate

All accidents, incidents and near misses must be reported on riskNET