RP GN 102 – Guidance on Artificial Optical Radiation: Local Procedural Controls

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1 Introduction

This document has been produced to facilitate the generation of a Local Procedural Controls document (these may also be referred to as Local Rules), which describes the arrangements for Artificial Optical Radiation (AOR) safety that the University has integrated in areas where AOR sources (lasers or broadband optical sources) are used. Where an area requires procedures to be followed to prevent harm when working with sources of AOR, that area must have a Local Procedural Controls document in place. The Local Procedural Controls document must be specific to that particular area. If an area contains more than one hazardous AOR source, e.g. a laser laboratory, or a manufacturing workshop, there should be one Local Procedural Controls document for that area. This document is separate to specific instructions on how to operate a specific piece of equipment. A template Local Procedural Control document and associated documents have been included in the appendix.

Prior to conducting any work with AOR sources at the University of Edinburgh, a suitable and sufficient risk assessment must be completed (see Radiation Protection Guidance Note RP GN 101 "*AOR Risk Assessment Guidance*"). The risk assessment will identify the work with AOR that requires the implementation of Local Procedural Controls.

For further assistance, contact your Departmental Laser Supervisor (DLS). A list of all University DLSs can be found here (EASE Login required):

https://www.ed.ac.uk/health-safety/radiation-protection/supervisors

2 Local procedural controls

Where the risk assessment has determined that those working with AOR sources are required to follow procedures to work safely, these procedures must be documented in a Local Procedural Controls document. **It is expected that for all work with Class 3B lasers, Class 4 lasers, and Risk Group 3 lamps, local procedural controls will be required.**

Adherence to the local procedural controls will help ensure that work with AOR will be carried out safely and in compliance with the relevant legislation. As such, a hard copy of the Local Procedural Controls document must be kept and clearly displayed in the area for which they apply.

The Local Procedural Controls document must be completed and implemented in accordance with the University's Non-Ionising Radiation (NIR) Code of Practice:

https://www.ed.ac.uk/health-safety/radiation-protection/codes-of-practice-and-guidance/codes-of-practice

The Local Procedural Controls document must be reviewed at least every two years or if there is a significant change in the work or environment, or if the risk assessment is changed, and updated as necessary.

A template Local Procedural Controls document can be downloaded from the 'forms' area of the RPU website:

https://www.edweb.ed.ac.uk/health-safety/radiation-protection/radiation-protection-management/forms-and-checklists

3 Responsibilities

This section describes the responsibilities of those concerned with the Local Procedural Controls document.

- Drawing up of the Local Procedural Controls document and implementation of the requirements of the document is the responsibility of the Principal Investigator, Manager or Supervisor, or whoever is in charge of the laser or AOR equipment.
- Approval and sign off of the Local Procedural Controls document must be sought from the Departmental Laser Supervisor (DLS).
- Personnel whose work is affected by the presence of the AOR sources must sign a declaration to confirm that they have read and will work in accordance with the Local Procedural Controls document.

The name and contact details for the University RPA (URPA) and the DLS must be present on the Local Procedural Controls document.

The duties for the relevant roles must be included in the Local Procedural Controls document.

4 AOR Equipment and Operation

The Local Procedural Controls document must contain detailed sections that are specific to the equipment and its use, such as:

- The operating parameters;
    - Including wavelength (or spectral range of emissions), pulse length, pulse frequency, output power/energy, etc.
- The risk group or laser classification (whichever is applicable);
- A description of the work associated with the equipment, including accessibility of the AOR hazard;
- A description of the hazards associated with the use of the equipment;
- A list of personnel who are approved to use the equipment.

5 Controls

Controls that have been implemented in order to ensure safe work with AOR must be described in the Local Procedural Controls document. This would include a description of the designated area if there is one. Where the effectiveness of the control requires personnel to behave in a certain way, the description must provide them with sufficient information that they can fulfil the requirements of that control.

The procedure for routine checks on the safety control systems (e.g. interlocks, warning lights, condition of guarding etc.) must also be described in the Local Procedural Controls document. This includes the checks that need to take place and how frequently.

6 Use of Personal Protective Equipment

The requirement for Personal Protective Equipment (PPE) will be informed by the outcome of the risk assessment for the work. Where PPE is required, the Local Procedural Controls document must note in what circumstances it is required and what level of protection must be provided by the PPE. The Local Procedural Controls document should inform the user of the routine checks required on the condition of the PPE, to confirm it is fit for use. It must be clear that inappropriate or damaged PPE must not be used and must be removed from service and replaced. The Local Procedural Controls document must detail the required storage arrangements for the PPE. Appropriate storage will help keep the PPE clean, reduce the chance of the PPE being damaged and help prevent the wrong PPE being selected.

7 Special Procedures

There are certain tasks associated with work with AOR that require particular care, and particular control measures, in order for the work to be completed safely. For example, a certain task may need to take place with an engineering control removed. In this case, additional control measures will be required to minimise the risk of exposure to AOR. This section gives common examples where special procedures may be required.

- Alignment of a laser beam which involves removal of enclosure or overriding of interlocks to access the beam.
- Servicing and Maintenance, which involves normal control systems to be bypassed.

7.1 Laser Alignment

If beam alignment is expected to take place routinely, procedures for this (as identified in the risk assessment for the work) must be included in the Local Procedural Controls document. If it is a one-off task, it must be fully risk assessed and additional procedural controls must be drawn up and documented prior to the work commencing.

As detailed in the University's NIR Code of Practice and in the AOR risk assessment guidance, open beam laser alignment is considered to be the exception rather than the norm and is only permitted if a robust justification has been made supporting the case against using control measures further up the hierarchy of control measures. It is **never acceptable** for personal protective equipment (e.g. laser protective eyewear) to be chosen as a control measure before consideration is given to the hierarchy of control measures.

The first consideration should be to engineer out the hazards associated with laser beam alignment, such as using remote viewing and motorised systems, rather than relying on open beam alignment. This is certainly something that should be considered when designing a new laser system.

If the alignment is to be carried out with open laser beams, it should be carried out with a low power laser (Class 2 or below) if possible, or by reducing the beam power to a safe level (it should be noted that it may not be possible to reduce the power of a laser to a level that is safe). It may be that even part of the alignment procedure could be done with a low power laser to check alignment of the main optics.

If the laser alignment must be carried out in an open beam configuration with a hazardous laser beam, this must be robustly justified in the risk assessment for the work. Control measures for this work should include, where practicable:

- Allowing the alignment to only be carried out by individuals who have undertaken appropriate, **additional**, laser safety training and who are deemed competent to do this work by the individual responsible for the laser system;
- Properly planning the work before it begins, including individual responsibilities of those involved;
- Designating the area as a 'laser controlled area' and putting measures in place to restrict access;
- Ensuring beams are not at eye level;
- Avoiding the use of periscopes if possible;
- Considering where stray beams may occur and ensuring they are terminated;
- Removing all unnecessary items from the bounds of the laser equipment, including the user's jewellery;
- Removing all persons from the room except those directly involved in the work;
- Checking on the condition of equipment involved e.g. optical mounts etc.;
- Alignment of one section and wavelength at a time, keeping areas of the beam that are not being aligned enclosed;
- Using laser protective eyewear that is suitable for the laser being aligned.

7.2 Servicing

If the servicing is to be carried out by an outside organisation, the University must obtain and review copies of the service engineers risk assessment and method statement, prior to the work commencing. In some situations, it may be appropriate to hand over control of an area to a service engineer for the duration of their work. If this is the case, the handover form in the Appendix 3 to this GN must be completed.

8 Emergency Arrangements

It is expected that where Class 3B and Class 4 lasers and Risk Group 3 lamps are in use, emergency arrangements for reasonably foreseeable accidents (e.g. eye or skin exposure and injury) must be drawn up and documented in the Local Procedural Controls document.

It is considered good practice to have a copy of the emergency arrangements on a “grab card”, which can be quickly accessed in the case of an incident. See Appendix 4 for a template grab card. This grab card should be one or two sides of A4 at most and a laminated copy must be kept close to the entrance of the lab so that it can be easily accessed in an emergency.

The grab card must be updated alongside the Local Procedural Controls document.

Appendix 1: Template Local Procedural Controls Document

Local Procedural Controls for the [Equipment] used in [Department]

University Campus, School, and building			
Room/area where work activity will be carried out			
Ref. No.:			
Date of issue:		**Date of next review:**	

	Name	Title	Signature	Date
Author				
Approver		DLS		

1. Introduction

These Local Procedural Controls have been prepared for work carried out using [equipment]. Adherence to these procedural controls will help ensure that work with lasers and other AOR sources at the University of Edinburgh is carried out safely, and will assist the University in meeting the requirements of the relevant Legislation, Standards and Guidance; in particular the Control of Artificial Optical Radiation at Work Regulations 2010.

This document must be read by all individuals who are involved in work with the [equipment] in [facility/building/room/etc]. Each individual must read and sign the 'Declaration' appended to this document. A record of those signed on is kept by the DLS. Any matters requiring clarification must be discussed with the document author or Departmental Laser Supervisor (DLS) prior to signing the Declaration. Any laser safety matters that the DLS requires assistance with must be raised with the University Radiation Protection Adviser (URPA).

2. Departmental Laser Supervisor

The University of Edinburgh has appointed DLSs to oversee AOR safety across the University and to liaise with the University RPA. The University RPA is:

Mr Mark Green Acting University RPA Health and Safety Department Charles Stewart House 9-16 Chambers St. Edinburgh, EH1 1HT.	Office: 0131 650 2819 Mobile: 07736302598 Email: mark.green@ed.ac.uk

The DLS for [area covered by the DLS] is:

[Name & Address]	[Contact Details]

The DLS is assigned the following duties:

[Add/delete as appropriate – bullets below from Appendix D of the NIR Code of Practice Part 2: AOR]

- To liaise with and bring to the attention of management any inadequacies identified in working practice or failures in AOR safety procedures;
- To act as a responsible person for the purposes of securing compliance with the requirements of the relevant AOR safety legislation, standards and guidance and Parts One and Two of the University Non-Ionising Radiation Code of Practice;
- To be aware of the scope of the departments AOR risk assessments and assist in drawing up and approving risk assessments for hazardous AOR sources;
- To supervise the implementation of the Local Procedural Controls document;
- Keep an inventory of hazardous AOR sources and submit an annual summary to the RPU;
- Check that those working with hazardous AOR sources have undertaken appropriate training;
- Notify management where a member of staff deliberately disregards procedures or where the working practice is inadequate or likely to place the University in breach of its legal requirements;
- Ensure that suitable records relating to AOR safety are being kept (as described in the Local Procedural Controls document);
- Liaise with the RPU and LPA (if appointed) as necessary;
- Implement the recommendations of the LPA (if appointed) as discussed with management from time to time;
- Seek the advice and consult with the RPU as necessary where circumstances are out of your area of knowledge or confidence.

3. Description of Equipment

[Description of the equipment and set up]

[Where relevant, include details of the Class, Risk Group, type, wavelength and output. Also include details of any aiming beams]

[Include details of the set up e.g. fully enclosed laser cutter, research laser set up on an optical table, etc. Include details of the accessibility of the beam, including any maintenance or alignment procedures.]

[Include an annotated drawing/sketch/photo of the room layout to indicate where the lasers/AOR sources are located]

4. AOR Hazards

The hazards associated with this equipment have been identified in the Risk Assessment (ref), and are summarised below:

[Describe the main hazards associated with this equipment as identified by the risk assessment for the work. Examples are given below:

The principle hazards presented by the above laser(s)/AOR sources are:

- Eye hazard - The laser beams/AOR are capable of causing damage to the eyes. At the wavelengths of the laser/AOR, damage would occur primarily to the retina/lens/cornea (delete as appropriate).
- Skin hazard – The laser beams/AOR are capable of causing skin damage. Any resulting skin injury will be localised to the beam interaction site.
- Reflections - the laser radiation will be reflected from any shiny surface (and for long wavelength lasers, non-shiny surfaces) and this reflected beam may be hazardous to both the eyes and skin.
- Fire - the Class 4 lasers are capable of initiating a fire if the laser beam interacts with combustible or flammable material.
- Include details of any non-beam hazards such as electrical, fume, hazardous chemicals, gas bottles, mechanical etc.]

5. Designation of Laser/AOR Controlled Area

[If there is a laser/AOR controlled area designated, describe the location and extent of the controlled area. Describe the control measures designed to restrict access to this area e.g. warning lights, interlocked doors, laser curtains etc.]

6. Persons Permitted to Enter the Laser/AOR Controlled Area

The only persons permitted to enter the Laser/AOR Controlled Area are Authorised Users. These are individuals recorded on the Register of Authorised Users who are authorised and trained to work with the laser(s)/AOR sources. These individuals must have read this local procedural controls document and signed the Declaration in Appendix 1.

7. Key Security (lasers)

[Describe the procedure for preventing unauthorised use of the equipment. For example:]

The operating key for the laser(s) must be removed from the laser once laser use has finished. The Authorised User issued with the key is responsible for the key. The authorised user must return the key to the DLS or secure key safe when the laser use is finished.

8. Routine Checks of the Safety Systems

[Add the appropriate safety system checks that are required for the equipment or facilities. Examples are given below. Select only the checks that are appropriate for the equipment or facilities to which these procedural controls apply.]

The following routine checks of the safety systems are carried out at the frequency stated in Column 2. Records of these checks are kept and inspected by the DLS.

[Add/delete examples as appropriate to the laser/AOR system]

Check	Frequency
• Check the operation of the warning light on the door(s) to the room	[week/month/etc.]
• Check the operation of the door interlocks	[week/month/etc.]
• Check the overall condition of the laser equipment	[week/month/etc.]
• Check the operation of the interlocks on the equipment access panels	[week/month/etc.]
• Check the operation of the warning lights on the equipment	[week/month/etc.]
• Check the condition of laser protective filters on the laser equipment, noting any damage including scratches, burns and pock marks	[week/month/etc.]
• Check the operation of emergency stop buttons	[week/month/etc.]

Check	Frequency
• Check the operation of the fume extraction system	[week/month/etc.]
• Check the process for controlling the operating key for the laser equipment	[week/month/etc.]
• Check the condition of the laser protective eyewear, noting any damage on the frame or filters	[week/month/etc.]

If deficiencies are found when carrying out the safety checks above, the equipment must not be used until the defective safety system has been rectified.

9. Safe Working Procedures

[List the safe working procedures for work with the equipment. This is not to be a process for how to carry out the experiment or operate the equipment, but the safety critical procedures. Examples are given below. Ensure that the procedures included are specific for the equipment to which these local procedural controls apply.]

[add/delete examples as appropriate to the laser/AOR system]

- Check that the room is free from clutter and any unnecessary combustible materials and that there are no reflective objects in the in the vicinity of the equipment.
- Check that the temporary safety signs, namely the: 'Laser/AOR Controlled Area' sign, 'Prohibition of Access' sign and the 'Protective eyewear must be worn' sign are displayed on the door(s) to the room.
- Verify that a fire extinguisher, of the right type, is readily to hand within the room. If this is not practicable, verify that there is a fire extinguisher in an easily accessible location (e.g. in the corridor outside the room) and record the location of this fire extinguisher in these Local Procedural Controls.
- Confirm that all personnel present have appropriate protective eyewear for the equipment being used and wear the correct protective eyewear if required during use.
- When a laser is in use, ensure the number of people in the room is kept to a minimum.
- The laser must not be left unattended with the key in the key switch (if this is not possible see below).
- Where the laser equipment needs to be left running for long periods and will not be attended at all times, the key may be left in the equipment as long as the following control measures are implemented:

- [List the measures used (as identified in the risk assessment) to ensure there can be no unauthorised access to the laser equipment, and other persons in the area are adequately protected].

- Door warning signs must be removed/reversed and illuminated signs switched off upon completion of work.

- Any fault affecting the equipment or safety system, any suspected accidental exposure to laser radiation or any other dangerous occurrence must be reported to the DLS as soon as possible. The equipment must not be used until the issue has been investigated and rectified.

10. Special Procedures

10.1. Laser Alignment

[If laser alignment is carried out, include procedures for carrying out the alignment. This should be a detailed step by step process including details of the controls used, e.g. use of low power alignment beams, use of laser safety alignment eyewear, use of beam stops and beam covers etc. See the further information given section 7.1 of the main guidance document].

10.2. Servicing/Maintenance/Repair

Servicing or repair of equipment must only be carried out by a qualified service engineer. If this work is to take place on the University premises, then the service engineer must be asked for a risk assessment and method statement prior to work commencing.

Where additional hazards will be introduced through this work, University staff must not access the area. In particular, if additional laser beam hazards will be introduced, University staff must not have access to areas where there could be stray/errant beams. If it is necessary to prevent University staff from accessing an area when servicing is being carried out, the area must be handed over to the service engineer and the transfer of control form in Appendix [enter appropriate appendix reference] must be completed and kept on file.

11. Use of Personal Protective Equipment (PPE)

[If PPE is required for the work, describe the situations where the PPE must be worn e.g. laser beam alignment.]

The PPE required for work with the [equipment/area] is as follows:

[Describe the PPE required, e.g. for laser protective eyewear detail the specifications of the eyewear required e.g. wavelength range, output type (D, I, R or M) and protection factor (LB number).]

[Describe the storage arrangements for the PPE]

Personal Protective Equipment (PPE) must be checked by the user before use. The following checks must take place to assure the user the PPE is fit for use:

[Add/delete examples as appropriate]

- The PPE is appropriate for the work e.g. it meets the minimum required level of protection and covers the correct wavelengths for the laser/AOR source being used.
- The PPE is not damaged [e.g. look for: pitting, scratches or discolouration on the lens of laser safety eyewear, and mechanical integrity of the frame].

The outcome of the pre-use checks does not need to be recorded each time the PPE is used, but must be recorded every [week/month] along with the safety systems checks in Part 8 of this Local Procedures Document. Damaged PPE must be removed from service. The document author or DLS must be informed where PPE needs to be replaced.

12. Emergency Procedures

12.1. Fire

In the event of fire, the normal fire evacuation procedures will apply.

12.2. Eye Injury

In the event of a suspected eye injury arising from an accidental exposure:

- Switch off the laser/AOR source by normal means or use the emergency stop if necessary.
- [Add the School's normal procedure for contacting a first aider/initiating an emergency procedure. Also consider an out of hours injury if this is a possibility.]
- Immediately arrange for the individual to be taken to the Accident and Emergency Department at:
- [include address of nearest, most appropriate A&E]
- Retrieve the Grab Card from the laser/AOR controlled area and, in the case that there are multiple lasers/sources of AOR, indicate which equipment was involved.
- This must be followed by an examination carried out by an Ophthalmologist within 24 hours.
- A record must be kept of any examinations carried out.
- The DLS and the URPA must be informed of the event and an investigation into the circumstances of the exposure must be carried out. **The equipment must not be turned back on until the University RPA has given permission.**

12.3. Skin Injury

Any skin injuries must be treated in the same way as they would be for non-laser sources. Follow normal first aid procedures.

Appendix 2: Declaration Form

[Add the title of the local procedural controls document, including the AOR equipment/area covered and the location within the University]

DECLARATION

I confirm that I have read this local procedural controls document and I agree to work in accordance with them:

Name	Position	Signed

Appendix 3: Example Transfer of Control Form

TRANSFER OF CONTROL OF A LASER/AOR CONTROLLED AREA

The facility/room/area containing the [laser/AOR equipment] will be designated as a Laser/AOR Controlled Area when servicing is being carried out.

Completed by UoE	**Part A: Transfer of Control** University of Edinburgh hereby transfers control of the Laser/AOR Controlled Area to _____, service engineer employed by _____ for the duration of their work. Signed on behalf of the University: _____ Name: _____

Completed by Service Engineer	**Part B: Acceptance of Control** I agree to liaise with the University contact named above and hereby accept control of the Laser/AOR Controlled Area for the duration of my work. I have provided copies of: • Risk Assessment for my work • Method statement that governs my activities in the Laser/AOR Controlled Area My signature on this document attests that I have received sufficient training in laser/AOR safety to understand the laser hazards introduced by my work, the controls required to mitigate those hazards and I agree to work in a safe manner at all times. Signed:_____ Name: _____ Dated: _____ Time of transfer of control:_____

Completed by Service Engineer	**Part C: Return of Control (1)** I hereby return control of the Laser/AOR Controlled Area to the University. I certify that I have left the laser/AOR equipment in a safe condition fit for use. Signed:_____ Dated: _____

Completed by UoE	**Part D: Return of Control (2)** The University hereby accepts control of the Laser/AOR Controlled Area. • I have filed a copy of the service/maintenance work done by the engineer. Signed on behalf of the University: _____ Date: _____ Name: _____ Time of transfer of control: _____

Appendix 4: Template Emergency Grab Card

Emergency Grab Card – Page 1 of [X]

[AOR equipment/area covered and the location within the University]

In the case of a laser/AOR eye strike, follow the procedure below:

- Call Security: 2222 and make them aware of the incident
- Call the Acute Referral Clinic at the Princess Alexandra Eye Pavilion (number below), explain the incident, and ask to speak to an ***Ophthalmologist***.

  Acute Referral Clinic
  The Princess Alexandra Eye Pavilion (PAEP)
  Chalmers Street
  Edinburgh
  EH3 9HA
  Telephone: 0131 536 3751

- The Injured person **must not drive themselves to the clinic/hospital**

- Alternatively, the injured person can be taken to:

  Emergency Department
  Royal Infirmary of Edinburgh
  51 Little France Crescent
  Old Dalkeith Road
  Edinburgh
  EH16 4SA
  Telephone: 0131 536 1000

- **NOTE: They MUST be seen by an Ophthalmologist who is trained to assess the seriousness of the eye strike.**

Details about the laser can be found on the back of this card.

Emergency Grab Card – Page 2 of [X]

Details of the Laser/AOR Source(s)

Details of the laser(s) are given below. In the case of an eye injury, indicate which item of equipment was responsible:

[Add more lasers as required by copy/pasting table below]

Responsible for injury?	☐ YES	☐ YES
	LASER 1	**LASER 2**
LASER DETAILS *(record these details on the grab card)*		
Type:	☐ CW ☐ Pulsed	☐ CW ☐ Pulsed
Class of Laser:	☐ 3B ☐ 4	☐ 3B ☐ 4
Lasing Medium (e.g. CO_2)		
Wavelength/range (nm):		
Max Power or Pulse Energy:		
Pulse duration:		
Pulse Repetition Frequency:		
EXPOSURE DETAILS: *(record these details on way to hospital)*		
Circumstances of injury:		
Date/time of injury:		
Eye affected:	☐ Left ☐ Right ☐ Both	☐ Left ☐ Right ☐ Both
Was laser safety eyewear being worn?	☐ YES ☐ NO	☐ YES ☐ NO