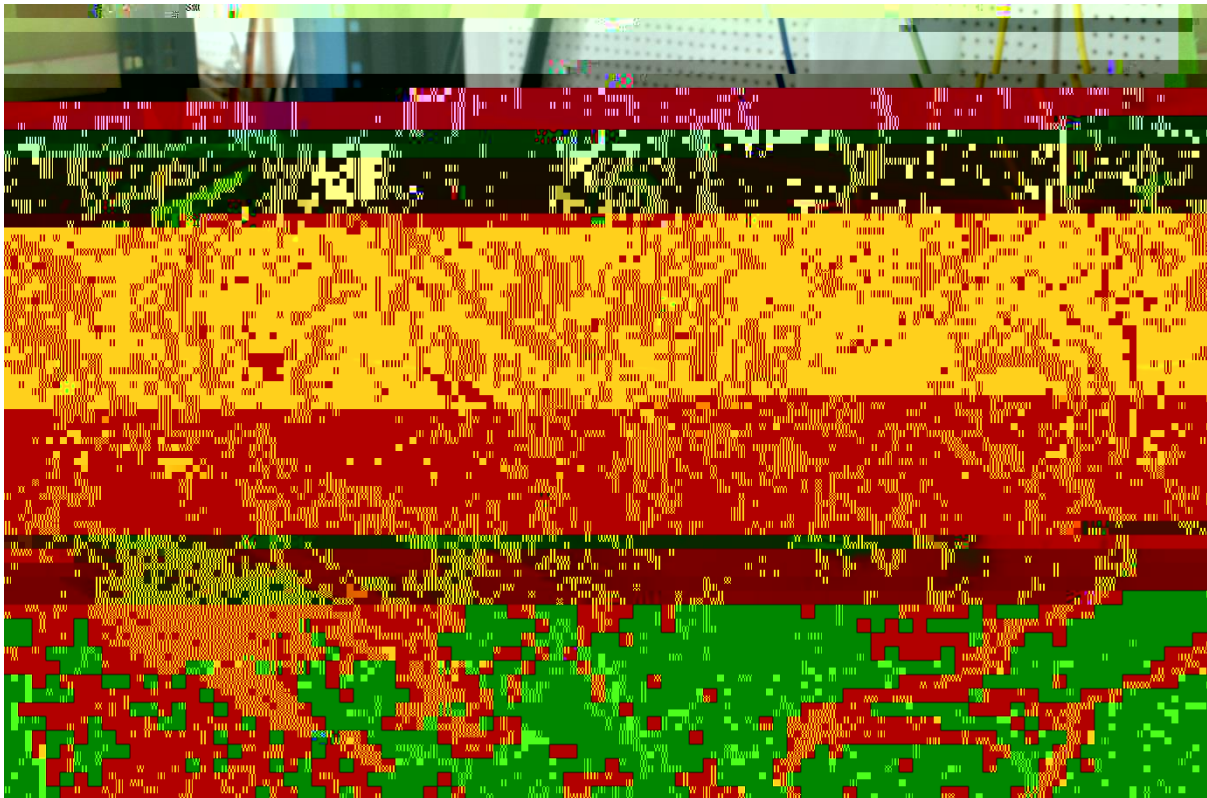


Safety Code of Practice 21

Edition 7, April 2023

User guide to safe use of **LASERS**



Summary

This Guide is concerned with the safe use of lasers and laser-based equipment in the University. It incorporates information on the scheme used to classify lasers; gives guidance on risk assessment for laser applications; and gives guidance on the need for registration of certain types of equipment and certain types of work with lasers. Figure 1 at the start of this document summarises the key responsibilities by function.

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Figure 1

SCOPE

1.2. The University Laser Safety Officer (ULSO)

The University Laser Safety Officer (ULSO) is appointed by the University to advise on all safety matters concerned with the use of lasers. The duties are as specified in Appendix 2 to this Code.

Guidance:

The University Laser Safety Officer is a member of H&SS. They may be contacted on tel. extension 4625.

1.3. Duties of the School Laser Supervisor (SLS)

A detailed list of duties of an SLS is given in Appendix 1 to this Code. In summary, the SLS is responsible for ensuring that:

- A comprehensive risk assessment is undertaken before any new laser is brought into use;
- All relevant lasers are registered on the University database of lasers via the ULSO;
- Members of the School/Department are correctly advised on matters of laser safety and that they have appropriate safe working procedures to follow;
- Members of the School/Department receive adequate information and training with respect to laser safety matters;
- There is adequate monitoring to check that precautions are suitable and effective, including equipment maintenance, the design of the lab, the staff/student training, and risk assessments;
- Monitor the use of PPE for adequacy and care.

The SLS must ensure that he/ she is fully familiar with all relevant statutory provisions; the requirements of any non-statutory provisions (for example, relevant parts of the IEC BS/EN 60825 Standard on laser safety, BS EN 207:2009 and BSEN 208:2009 laser safety eye protection); the University's Health & Safety Policy; and any Local Rules regarding laser safety.

1.4. Duties of supervisors of laser laboratories and I

such operations.

The risk assessment must identify and take account of all hazards, including “non-beam” hazards – see Section 6.

The risk assessment process for the use of lasers follows the same principles as for any other risk assessment:

- Identify the hazards i.e. the potential for causing harm;
- Identify those at risk of being exposed to the hazards;

5.2. Mechanical and physical hazards

Some of the equipment associated with high power lasers is very heavy, and crushing accidents have been reported when units were inadequately secured. The hazards associated with pumps and motors must be given adequate consideration *e.g.* guarding, venting of exhausts, etc. The

No (registered) laser may be taken away from the University *e.g.* for a lecture, a demonstration, or for research purposes, without the permission of the Head of School. The SLS should be consulted before the first occasion on which a particular use off-campus is intended. The operator concerned will be held directly responsible.

13.FURTHER ADVICE AND INFORMATION

References in the text

- 1A: *Safety in Universities: Notes of Guidance. Part 2:1 Lasers.* Committee of Vice Chancellors and Principals, London 1992. ISBN 0948890 19 7.
- 1B: *Guidance on the safe use of lasers in education and research.* Association of University Radiation Protection Officers, 2007.
- 2. Health & Safety at Work (etc.) Act, 1974.
- 3. *Management of Health and Safety at Work Regulations 1999.* Approved Code of Practice and Guidance L21 HSE Books 2000 ISBN 0 7176 2488 9.
- 4.
- 5. ety of Laser Products
London, 2007.
- 6. *Laser safety Videos:* Introduction to Laser Safety E-Learning available on UoRlearn

- o systems are set-up and maintained to check that laser safety facilities such as monitors, shielding, beam stops, interlocks, etc are provided where necessary and maintained in a readily usable condition; and
 - o other laser safety aspects that legislation or university/area/departmental policy may dictate are catered for.
- Co-ordinating the implementation of advice from the University Laser Safety Officer.
- Periodically reviewing laser safety procedures within the area/department.
- Such other laser safety duties that may be assigned by the Head of Department.

The SLS must ensure that training records are kept of laser safety training received by individuals, plus a copy of the worker registration form where a worker is required to register as a laser user.

CLASS	PROPERTIES	LABELS	NOTES
Class 1	Inherently safe, Accessible Emission Limit (AEL) 700		

CLASS	PROPERTIES	LABELS	NOTES
302.5 nm – 1mm			

Laser Registration and Required Controls

Please detach and retain this page for future reference

An individual who controls the use of any piece of equipment consisting of, or

School: _____

—

School Laser

Supervisor: _____ Extension: _____

Laser Supervisor: _____ Extension: _____

Laser location:

Laser details:

Make:

Model: _____ Serial Number _____

Type: _____

Mode: _____

EG, CO₂, ARGON-ION, HELIUM, DIODE, NdYAG, etc

EG, CW - CONTINUOUS WAVE, PULSED

Max Power (mW/J): _____ Wavelength(s) (nm):

GIVE RANGE FOR TUNEABLES, EG UV, IR

Class: 1 2 2M 3R 3B 4 DELETE AS APPROPRIATE

Date acquired: _____ Date of
disposal: _____

H&SS USE ONLY

This registration form is linked to the risk assessment reference
no.....as described on the attached form RA-2L

*Do not forget to include details of beam expanders, secondary optics etc, and
associated hazards such as cryogenics, high voltage; cooling water; gas supplies etc. on
the completed RA-2L form.*

CONTINU./RC

Please tick the appropriate boxes below for the class of laser that you are registering. Transfer the information to form RA-2L and include any additional controls that will be required to prevent exposure to risk. Boxes that are shaded out do not require the controls listed in that row of the table.

CONTROLS	1	2	2M	3R	3B	4
Remote Interlock - interlocked to the door or the enclosure						
Key Control - to ensure only authorised personnel use the laser						
Emission Indicator - may also be sited outside laboratory to give warning of laser in use (Interlock with beam shutter)						
Beam Shutter - to allow interruption of the beam						

Beam Stop
- to stop the beam within the confines of experimental bench or area

Appendix 5 Example risk assessment

Laser activity RISK ASSESSMENT FORM (RA2L)

This form must be completed in respect of each registered laser used on University premises.

School / Dept / Unit	Science Studies
A: Laser associated hazards and existing controls	
1. Give brief details of the laser to be used, and its location. Refer to University Laser Number (ULN) where this has already been issued. If this form is used to record a review of a previous assessment, you may refer to that assessment and just note changes.	Class 3B/ 1M solid state CW laser, max. 50 mW at 532 nm [Frequency-doubled Nd:YAG], ref. number ULN SS1/ 2006. Laser to be set up in incubator room in Microbiology suite. Laser rated as 3B during set up process before beam expanders fitted, when rated as 1M. Class 1 sighting laser (633 nm) to be used as a guide for setting up the green laser/ beam expander.
2. Give a brief summary of the work activity. State whether open beam work is proposed.	Laser to be used to examine the effects of intense green light on the photosynthetic ability of various cyanobacteria and the evolution of oxygen during the period of exposure. Work will involve laser beam directed into cultures of the various organisms held in purpose-designed apparatus [incubation temperature 30°] located in microbial growth room. Possibility of specular reflections from internal and external surfaces of culture tubes during set-up process. Experiments predicted to take up to 3 weeks, with samples (10 l) taken from the culture tubes at intervals over this period. Samples will be analysed to examine the effects of the laser light on pigment formation as well as oxygen evolution. Evolved oxygen will be continuously measured via gas analyser linked to the culture tube. Alignment of the laser in the correct location with respect to the culture tube occurs in the absence of the beam expander, which has to be adjusted to ensure even illumination of the tube contents. Samples can then be taken without disturbing the alignment of the laser or the beam expander [laser to remain in operation during sampling.]

operation during beam adjustment or laser servicing, etc.	
6. How might they be harmed? (type(s) of injury or health problem that might result). Please use a separate entry for each type of potential injury that could be caused by exposure to a hazard	Main injury related to laser beam is eye- injury, caused by primary or reflected beam entering the eye of the operator. Could cause permanent eye- injury with partial or total loss of sight in the affected eye. Possible microbiological/ toxic hazards related to particular organisms to be studied could include infection [unlikely] or toxicity from exposure to toxins produced.
7. List control measures in place to reduce risks Use the information from the checklist on the registration form to compile the list of control measures. Group controls under the headings of Personal protective Note that controls should fail to safety, for	Engineering controls: During normal operation, laser / apparatus totally enclosed. Access to hazardous beam(s) only possible during alignment as part of the set - up process. Culture of cyanobacteria enclosed in culture tube; tube fitted with without disruption of irradiation. Administrative controls: During set - Admittance Laser- up completed, warning notice may be removed. Microbiological / toxic hazards controlled by adherence to GMLP and training/ experience of the operators Personal Protective Equipment:

example failure of a bulb in an illuminated sign should be interlocked to a beam shutter. For each control identified above, assess whether this is adequate, is actually used in practice and state whether this is regularly checked, where appropriate. Note that protective eyewear must not be relied upon as a primary control measure.	Laser goggles rated for 75mW exposure at 532 nm to be worn as a precaution during alignment. Standard microbiological PPE lab coat, non-latex gloves to be worn during set-up, sampling and analysis of samples.
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B: Assessing the residual level of risk and further action needed

(See Safety Guide 4 pages 10–11 for an explanation of the terms in this table)

7.1 How severe is any injury or health effect likely to be?	Tick one box (S=score given in brackets)	Minor (1)	Serious (2)	Major (3)	Fatal (4)
7.2. How likely is exposure to the hazard?	Tick one box (P=score given in brackets)	Very unlikely (1)	Unlikely (2)	Possible (3)	

7.3. Calculate the risk score by multiplying the 2 scores in Q7.1 & 7.2	Risk Score (S x P) =	Low (1–3)	Medium (4–6)	High (8–9)	Very High (12–16)
8. Immediate further action to be taken to make the situation safe / reduce risk to health				Action to be taken by whom?	Implementation date

VERSION CONTROL LOG OF DOCUMENT CHANGES

Version	Changes	Author
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