

Risk Assessment Form

Cardiff School of Biosciences

IMPORTANT: Before carrying out the assessment, please read the Guidance Notes

1. General Information

Department	Cardiff School Of Biosciences	Building	Sir Martin Evans (BIOSI 2)	Room No	E/0.03
Name of Assessor	Dr Anthony J Hayes	Date of Original Assessment	29/06/2015	Assessment No or practical module No	1

Status of Assessor: Staff Postgraduate Undergraduate Other:
(Specify)

2. Brief Description of Procedure/Activity including its Location and Duration

Operation and use of the Zeiss LSM 880 Airyscan confocal laser scanning microscope with PicoQuant FCS (Fluorescence Correlation Spectroscopy) and FLIM (Fluorescence Lifetime Imaging) modules.

This risk assessment should be read in conjunction with the risk assessment for fluorescence microscopy.

This instrument is designed and manufactured to comply with all applicable performance standards for Class 3B laser products. In summary, the equipment meets the requirements of the following standards:

- DIN EN 61010-1 (IEC 61010-1) "Safety requirements for electrical equipment for measurement, control and laboratory use", taking relevant CSA and UL specifications into account,
- DIN EN 60825-1 (IEC publication 60825-1) "Safety of laser equipment",
- 21 CFR 1040.10: "Performance Standards for light emitting products - laser products",
- DIN EN 61326-1 "Electrical equipment for measurement, control and laboratory use - EMC requirements",
- Low voltage directive: 2006/95/EC,
- EMC directive: 2004/108/EC

Description of equipment:

Zeiss LSM 880 airyscan confocal laser scanning microscope system, installed and maintained (fully comprehensive service cover) by Zeiss technical staff in a room (E/0.03) dedicated for the purpose.

Laser specifications:

- Diode 405nm CW/Pulsed for FLIM
- Diode 488nm Pulsed for FLIM
- Argon multiline 458/488/514nm (25mW)
- DPSS 561nm (20mW)
- HeNe 594nm (2mW)
- HeNe 633nm (5mW)

All lasers are connected via shielded fibres to a Zeiss Axiolmager upright microscope. Lasers are activated by key switch and software control.

Beam paths are shielded except for a fixed open beam between objective and specimen.

Warning labels have been affixed near all apertures or removable parts where exposure to laser light is possible. Warning notices and safety notes have been positioned around the microscope for maximum visibility to the user.

The microscope has remote safety interlocks and integrated beam-splitters that prevent stray laser light if the user

switches from confocal observation to eyepiece observation. For full details refer to “Notes on Device Safety” of the Zeiss LSM 880 Operating Manual (room E/0.03).

2a. Is your work governed by specific legislation i.e:

(Tick as appropriate, see guidance notes)

Human Tissue (HTA-work involving human tissue):

GM (any genetically modified organism including plant and animals):

Radiation (radioisotopes, sealed sources):

Controlled Drugs:

Non ionising radiation (lasers, magnetism):

Use of human subjects (Ethics):

- | | | |
|-------------------------------------|------------------------------|--------------------------|
| <input type="checkbox"/> | Approval compliance obtained | <input type="checkbox"/> |
| <input type="checkbox"/> | Approval compliance obtained | <input type="checkbox"/> |
| <input type="checkbox"/> | Approval compliance obtained | <input type="checkbox"/> |
| <input type="checkbox"/> | Approval compliance obtained | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | Approval compliance obtained | <input type="checkbox"/> |
| <input type="checkbox"/> | Approval compliance obtained | <input type="checkbox"/> |

3. Persons at Risk

Are they

Notes

Staff	<input checked="" type="checkbox"/>	Trained	<input checked="" type="checkbox"/>	Trained staff/students (unsupervised) and staff/students undergoing training (supervised) are potentially at risk. Untrained users are not permitted access to the instrument.
Visitor	<input type="checkbox"/>	Disabled	<input type="checkbox"/>	
Contractor	<input type="checkbox"/>	Inexperienced	<input type="checkbox"/>	
Students	<input checked="" type="checkbox"/>	Competent	<input type="checkbox"/>	
Vulnerable groups	<input type="checkbox"/>			

4. Level of Supervision

Notes

None <input type="checkbox"/>	Constant <input type="checkbox"/>	Periodic <input type="checkbox"/>	Training is required for independent usage of the confocal microscope. Untrained users are not permitted independent access to the instrument.
Training Required <input checked="" type="checkbox"/>			

5. Will Protective Equipment Be Used? Please give *specific* details of PPE

Head <input type="checkbox"/>	Eye <input type="checkbox"/>	Ear <input type="checkbox"/>	For live cell imaging applications (see below), the use of a lab coat and protective gloves are essential. Safety goggles would severely hamper routine use of the microscope, but may be necessary for some live cell imaging applications (see below).
Body <input checked="" type="checkbox"/>	Hand <input checked="" type="checkbox"/>	Foot <input type="checkbox"/>	

6. Is the Environment at Risk?

Notes

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Specimens should be sealed before observation under the microscope and handled with care using the appropriate level of protection (see above). Leaky or cracked samples must not be examined. Samples on glass histology slides must be mounted under coverslips with hard-set mountant, or sealed with nail varnish to prevent leakage. Live cells grown within tissue culture plastics should be sealed with Parafilm to prevent spillage. Any spillages should be cleaned up immediately and the area swabbed with 95% alcohol. Broken glass slides should be disposed of in the contaminated sharps bin - broken fragments of glass should be brushed on to paper and disposed of in a similar fashion.

7. Will Waste be generated?

If 'yes' please give details of disposal

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	All biological samples and hazardous waste must be appropriately-disposed of by the user. Potential risks associated with the waste material should be addressed by the user in a separate risk assessment form.

8. Hazards involved

Work Activity / Item of Equipment / Procedure / Physical Location	Hazard	Control Measures and Consequence of Failure	Likelihood (0 to 5) ×	Severity (0 to 5) =	Level of Risk
Routine use of the Zeiss LSM880 confocal laser scanning microscope	Class 3B laser radiation; Eye strike	<p>1. Physical measures:</p> <p>The microscope is housed in a room dedicated for purpose, with clearly labelled door signage to prevent unauthorised access.</p> <p>Laser power is adjusted to the minimum necessary to produce a signal.</p> <p>Laser light is fed through an optical waveguide and, therefore, completely shielded until it leaves the microscope objective and reaches the specimen. Remote safety interlocks and integrated beam-splitters on the device prevent stray laser light during scanning and should never be defeated.</p> <p>Further shielding, beyond that incorporated by the manufacturer, cannot be employed without hampering normal operation of the instrument.</p> <p>2. Administrative measures:</p> <p>Safety notices and precautions on and around the microscope should always be observed before and during operation.</p> <p>Standard safety procedures are compulsory for all users and must be incorporated into all experimental protocols. In summary, users should:</p> <p><i>Never look directly into the laser beam or a reflection of the beam,</i></p> <p><i>Never interfere with the beam path,</i></p> <p><i>Never change a specimen during scanning,</i></p> <p><i>Never change objectives</i></p>	1	4	4

		<p>during scanning,</p> <p><i>Never change filter cubes during scanning.</i></p> <p>A register of users is maintained and the use of the equipment is restricted to: Trained staff (unsupervised) Staff under training (supervised).</p> <p>Training includes safety provisions based on information supplied by Zeiss; Lasermet, OSHEU and AURPO.</p> <p>A laminated Emergency information card in room E/0.03 gives information for emergency medical treatment.</p>			
	Broken glass	Broken glass from histology slides or coverslips should be disposed of in the contaminated sharps bin.	2	2	4
Observation of live cells/tissues	Biological contaminants	<p>For individual research application involving live cells/tissues, appropriate control measures should be in place to reflect the potential risk of the organism/tissue under study. These must be evaluated by the user and the resultant risk assessment approved by the Technical Support Manager & Safety representative, where necessary. A copy of the risk assessment should be filed within office E/0.14 and subject to periodic review.</p> <p>All samples should be clean and sealed to prevent leakage/spillage during observation on the confocal microscope. Leakages and spillages should be cleaned up immediately and the area swabbed with 95% alcohol.</p> <p>All live samples should be removed from room E/0.03 after microscopical observation and disposed of in</p>	*	*	*

		an appropriate fashion by the user.			
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* application dependent (requires additional risk assessment)

9. Chemical Safety (COSHH Assessment)

Hazard	Control Measures	Likelihood (0 to 5)	Severity (0 to 5)	Level of Risk
Seepage of mountant from broken or leaky sample preparations. Aqueous mountants often contain DNA-binding probes (e.g. DAPI; 4',6-diamidino-2-phenylindole) used for counterstaining of cell nuclei.	Users should use hard-set mountant, or seal sample preparations with nail varnish to prevent leakage. Gloves recommended for use with aqueous mountants. Sample preparations should be handled with care and disposed of appropriately (see above).	2	2	4
Lens cleaning solution containing 90% petroleum ether and 10% isopropanol (working volume of 250ml)	Use gloves to avoid skin contact. Users should take care to avoid any spillages when cleaning microscope objective lenses. Any spillages should be reported immediately to The Facility Manager. No more than a 250ml working volume should be made up at any one time in a sealed, clearly labelled container. All solvent stocks should be kept in a locked solvent cabinet.	1	2	2

Scoring Criteria for Likelihood (chance of the hazard causing a problem) Likelihood

Scoring Criteria for Severity of Injury (or illness) resulting from the hazard

Likelihood

5	Almost Certain	5	10	15	20	25
4	Very Likely	4	8	12	16	20
3	Likely	4	6	9	12	16
2	Unlikely	2	4	6	8	10
1	Very Unlikely	1	2	3	4	5
Severity		No Injury / Illness	First Aid Required	Minor Injury	Major Injury	Death
		1	2	3	4	5

Score Action to be taken:

- 0-5 Low Risk** No further action needed.
- 6-9 Medium Risk** Appropriate additional control measures should be implemented
- 10-25 High Risk** Additional control measures **MUST** be implemented. Work **MUST NOT** commence until such measures are in place. If work has already started it must **STOP** until adequate control measures are in place

10. Source(s) of information used to complete the above e.g Supervisor, Web etc....

Leica safety guidance notes; Lasermet laser safety course notes; AURPO guidance Note 7: Guidance on the safe use of lasers in education and research; Cardiff University OSHEU Guidance document NIRP2: Working with lasers and other optical radiations.

11 Additional Control Measures - Likelihood and Severity are the values with the additional controls in place

Work Activity / Item of Equipment / Procedure / Physical Location	Hazard and Existing Control Measures	Additional Controls needed to Reduce Risk	Likelihood (0 to 5) ×	Severity (0 to 5) =	Level of Risk

After the implementation of new control measures the procedure/activity should be re-assessed to ensure that the level of risk has been reduced as required.

12. Action in the Event of an Accident or Emergency

Report to Facility Supervisor/Manager immediately: Dr Anthony J. Hayes (E/0.14A; ext 76611). Follow OSHEU guidance (ext 74910). Non-emergency medical attention call 111; medical emergency call 999. Cardiff eye unit (direct line): 02920 743862; Cardiff A&E (direct line): 02920 748025/8031. Provide details of the laser(s) in use to medical staff.

13. Arrangements for Monitoring the Effectiveness of Control

Ad-hoc visual checks and periodic review of existing risk assessments. School Safety inspections, internal and external safety audits.

14. Review: This assessment will be reviewed following any changes to procedure or three years from last review date.

Name of Reviewer:	Dr Anthony J. Hayes	Date of Review:	29/06/2023
Have the Control measures been effective in controlling the risk?	Yes		
Have there been any changes in the procedure or in information available which affect the estimated level of risk?	Added lens cleaning solution as a potential risk Updated contact details for accident or emergency (29/06/2023)		
What changes to the Control Measures are required?	Added control measures to avoid skin contact		

15. Signatures for printed copies:

Assessor:	Dr Anthony J. Hayes	Signature:	AJH	Date:	29.6.15
Reviewed by:	Dr Anthony J. Hayes	Signature	AJH	Date:	29.1.2019
Reviewed by:	Dr Anthony J. Hayes	Signature:	AJH	Date:	29/06/2023
Person involved on risk assessment or issued to	Risk assessment must be read and understood by all new CD7 users during induction. A copy will be available online via SOP repository. Hard copies in lab and office.	Signature		Date:	