

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	East 0.03
Name of Assessor	Anthony J Hayes	Date of Original Assessment	26/05/2006	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 of confocal laser scanning microscopes, employing class 3B lasers, within Cardiff School of Biosciences Bioimaging Facility (BIOSI 2; E/0.03)

This risk assessment covers the use of the following confocal systems:

1. Leica TCS SP2 AOBs
2. Zeiss LSM 880 Airyscan

Both systems belong to laser hazard **class 3B** and are designed, manufactured and maintained to comply with all applicable performance standards for Class 3B laser products including:

- 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

Laser specifications:

Zeiss LSM 880 Airyscan			Leica SP2 AOBs		
Laser	Power	Lines	Laser	Power	Lines
Diode 405 cw	15mW	405nm	Diode 405 cw	25mW	405nm
Diode 440 ps	15mW	405nm	Argon Multi-line cw	100mW	458nm
Diode 483 ps		483nm			476nm
Argon multi-line cw	25mW	458nm			488nm
		488nm			496nm
		515nm			514nm
DPSS 561 cw	20mW	561nm	HeNe 543 cw	1mW	543nm
HeNe 594 cw	5mW	594nm	HeNe 633 cw	10mW	633nm
HeNe 633 cw	2mW	633nm			

cw, continuous wave; ps, pulsed

All lasers are connected via shielded fibres to their respective microscope systems. Lasers are activated by key switches and via software control. Beam paths are shielded except for a fixed open beam between objective and specimen. All systems are equipped with remote safety interlocks and integrated beam-splitters that prevent stray laser light if the user switches from confocal observation to eyepiece observation. Warning labels have been affixed near all apertures or removable parts where exposure to laser light is possible. Warning notices and safety guidance notes have been positioned around the microscope for maximum visibility to the user.

Further safety information can be found in the safety guidance notes for each system (kept in lab E/0.03):

- Leica SP2 system: “Leica Safety Notes”; section 6.5 of the Leica TCS SP2 User manual
- Zeiss LSM 880 system: “LSM 880 and LSM 880 NLO: Notes on Device Safety and installation requirements”

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. A separate risk assessment has been carried out for visitors - refer to “Tour of the Bioimaging facility involving demonstrations of the confocal laser scanning microscope (E/0.03) and widefield microscope systems (E/0.04)”
Visitor	<input checked="" 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 should 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.
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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.
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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
Laser scanning confocal microscopy	Class 3B laser radiation; Eye strike	<p>1. Physical measures:</p> <p>Both microscopes are housed within a room (BIOSI 2; E/0.03) dedicated for purpose, with clearly labelled door signage to prevent unauthorised access. Within the room, the microscopes are shielded behind blackout curtains.</p> <p>Laser power is adjusted to the minimum necessary to produce a signal.</p> <p>Laser light is fed through optical waveguides 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>	1	4	4

		<p><i>Never change a specimen during scanning,</i></p> <p><i>Never change objectives during scanning,</i></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 Leica Microsystems, 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.	1	2	2
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. <i>These must be evaluated by the user and the resultant risk assessment approved by the Technical Support Manager & Safety representative.</i> A copy of the risk assessment should be filed within the room E/0.03 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>	*	*	*

		All live samples should be removed from room E/0.03 after microscopical observation and disposed of appropriately by the user.			
Fluorescence microscopy (refer also to Fluorescence microscopy risk assessment)	Mercury lamp burst (Leica TCS SP2 only)	Administrative measures to monitor lamp usage (record of lamp usage) and replacement of Hg lamps approaching the end of their lifespan (i.e. before 300hrs). In the extremely unlikely event of a lamp burst, the room will be vacated immediately and the tours will cease.	1	3	3

* 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).	1	2	2
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 TCS SP2 safety guidance notes; Zeiss LSM 880 safety guidance safety notes; Lasernet 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 immediately to the Facility Manager: Anthony Hayes (ext 76611). Non-emergency medical attention call 111; medical emergency call 999. Follow OSHEU guidance (ext 74910). 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 must be reviewed by (date): 23.9.2016

Name of Reviewer:	Dr Anthony J. Hayes	Date of Review:	29.1.19
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?	No		
What changes to the Control Measures are required?	None		

15. Signatures for printed copies:

Assessor:	Dr Anthony J. Hayes	Signature:		Date:	23.9.15
Approved by: If assessor inexperienced		Signature:		Date:	
Reviewed by:	Dr Anthony J. Hayes	Signature		Date:	29.1.19
Person involved on risk assessment or issued to		Signature		Date:	