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 3.15
Name of Assessor	Anthony J Hayes	**Date of Original Assessment**	26/05/2006	**Assessment No or practical module No**	3

Status of Assessor: Staff ☒ Postgraduate ☐ Undergraduate ☐ Other: (Specify) .....

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

Operation of Leica TCS SP2 confocal laser scanning microscopes, employing class 3B lasers (BIOSI 2; E/3.15). Spoke system administrator: Dr Peter Watson (ext 79042).

This risk assessment covers the use of the Leica TCS SP2 AOBS confocal**.** This system belongs to laser hazard **class 3B** and is 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:

Leica TCS SP2		
Laser	**Power**	**Lines**
Diode 405 *cw*	25mW	405nm
Argon Multi-line *cw*	100mW	458nm
		476nm
		488nm
		496nm
		514nm
HeNe 543 *cw*	1mW	543nm
HeNe 633 *cw*	10mW	633nm

cw, continuous wave; *ps*, pulsed

All lasers are connected via shielded fibres to the microscope. 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

2a. Is your work governed by specific legislation i.e:
(Tick as appropriate, see guidance notes)

Human Tissue (HTA-work involving human tissue):	☐	Approval compliance obtained ☐
GM (any genetically modified organism including plant and animals):	☐	Approval compliance obtained ☐
Radiation (radioisotopes, sealed sources):	☐	Approval compliance obtained ☐
Controlled Drugs:	☐	Approval compliance obtained ☐
Non ionising radiation (lasers, magnetism):	☒	Approval compliance obtained ☐
Use of human subjects (Ethics):	☐	Approval compliance obtained ☐

3. Persons at Risk	Are they		Notes
Staff ☒	Trained	☒	Trained staff/students (unsupervised) and staff/students undergoing training (supervised) are potentially at risk. Untrained users are not permitted access to the instrument.
Visitor ☐	Disabled	☐	
Contractor ☐	Inexperienced	☐	
Students ☒	Competent	☐	
Vulnerable groups ☐			

4. Level of Supervision	Notes
None ☐ Constant ☐ Periodic ☐ Training Required ☒	**Training is required for independent usage of the confocal microscope. Untrained users are not permitted independent access to the instrument.**

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

Head ☐ Eye ☐ Ear ☐ Body ☒ Hand ☒ Foot ☐	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).

6. Is the Environment at Risk?	Notes
Yes ☒ No ☐	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.

7. Will Waste be generated?	If 'yes' please give details of disposal
Yes ☒ No ☐	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
Laser scanning confocal microscopy	Class 3B laser radiation; Eye strike	**1. Physical measures:** The microscope is housed within a low light area shielded by a blackout curtain with clearly labelled signage to identify risk and prevent unauthorised access. Laser power is adjusted to the minimum necessary to produce a signal. 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. Further shielding, beyond that incorporated by the manufacturer, cannot be employed without hampering normal operation of the instrument. **2. Administrative measures:** Safety notices and precautions on and around the microscope should always be observed before and during operation. Standard safety procedures are compulsory for all users and must be incorporated into all experimental protocols. In summary, users should: *Never look directly into the laser beam or a reflection of the beam,* *Never interfere with the beam path,* *Never change a specimen during scanning,* *Never change objectives during scanning,* *Never change filter cubes during scanning.*	1	4	4

		A register of users is maintained via user log and the use of the equipment is restricted to: Trained staff (unsupervised) Staff under training (supervised). Training includes safety provisions based on information supplied by Leica Microsystems, Lasermet, OSHEU and AURPO. A laminated emergency information card in room gives information for emergency medical treatment.			
	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	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.** A copy of the risk assessment should be kept within the room E/3.15 and subject to periodic review. 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. All live samples should be removed from room E/3.15 after microscopical observation and disposed of appropriately by the user.	*	*	*
Fluorescence microscopy utilising a mercury vapour illumination lamp (Leica TCS SP2 only)	Eye damage	Avoid eye contact with light emitted from objective lens; when rotating the objective turret to increase/decrease magnification a shutter should be placed in beam path to prevent stray light; neutral density filter should be used wherever possible to attenuate light.	1	3	3

	Burning	Avoid physical contact with mercury lamp housing at the rear of microscope stand.	1	3	3
	Mercury vapour inhalation	Administrative measures to monitor lamp usage (record of lamp usage) and regular replacement of lamps approaching the end of their lifespan. In the extremely unlikely event of a lamp burst, the room should be vacated immediately, and the room supervisor (Dr Peter Watson) informed. **Do not return to the room for 24 hours.** Appropriate protective clothing should be worn before attempting lamp replacement. Effete or broken lamps should be disposed of appropriately in accordance with Cardiff School of Bioscience chemical waste procedures.	1	4	4

** 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
Aqueous mountants containing DNA-binding probes (e.g., DAPI; 4',6-diamidino-2-phenylindole) used for counterstaining of cell nuclei should be treated as potential carcinogens	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
The cleaning solution for microscope objective lenses contains 90% petroleum ether and 10% isopropanol (working volume of 250ml) and is therefore flammable.	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. Cleaning solution should be kept in a sealed, clearly labelled container. All solvent stocks should be kept in a locked solvent cabinet.	1	2	2
The immersion oil used for microscope objectives is an irritant.	Users should take care to avoid contact with the immersion oil. Wash contaminated skin with soap and water.	1	1	1

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; 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. Laser safety training, Cardiff University, Online module, 2018.

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 system administrator, Dr Peter Watson (ext 79042). Non-emergency medical attention call 111; medical emergency call 999. Follow OSHEU guidance (ext 74910). 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 must be reviewed by (date):

Name of Reviewer:	Anthony 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?	Relocation of microscope to new site: BIOSI 2; E/3.15; risk assessment updated accordingly (1.2.22) Updated contact details for accident or emergency (29/06/2023)		
What changes to the Control Measures are required?			

15. Signatures for printed copies:

Assessor:	Dr Anthony J. Hayes	Signature:	AJH	Date:	23.9.15
Reviewed by:	Dr Anthony J. Hayes	Signature:	AJH	Date:	1.2.22
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 microscope users during induction. A copy will be available online via SOP repository. Hard copies in lab and office.	Signature		Date:	