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**	30/06/2017	**Assessment No or practical module No**	4

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 Lightsheet Z.1 microscope.

The Zeiss Lightsheet Z.1 is a fully-enclosed, turn-key single plane illumination microscope system. The instrument is designed and manufactured by Zeiss to comply with all relevant performance and safety standards products, as follows.

- DIN EN 61010-1 (IEC 61010-1) "Safety requirements for electrical equipment for measurement, control and laboratory use" in observance of the relevant CSA and UL regulations.
- DIN EN 60825-1 (IEC 60825-1) "Safety in laser equipment"
- 21 CFR 1040.10: "Performance standards for light emitting products – Laser products" (US safety guidelines for safety 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, KN 61000-6-2, KN11
- Further information available through the Zeiss Lightsheet Z.1 "Notes on device safety and installation requirements"

There are no open beam paths and all user access ports are protected with safety-interlocks.

Description of equipment:

The Zeiss Lightsheet Z.1 microscope system was installed and is maintained annually by Zeiss technical staff in a room (E/0.03) which is dedicated for purpose. It is supported by Bioimaging Hub staff who have been trained by Zeiss in its use. All new users must be trained by hub staff in basic instrument operation before using the microscope and must be familiar with the risks associated with its routine use.

The Lightsheet system has full environmental control and is supplied with 5% CO2 in air from a gas cylinder that is securely fixed to the wall. Replacement of the cylinder is carried out only by trained staff and is detailed in another risk assessment procedure (refer to 'Removal and fitting gas cylinder regulator')

Laser specifications:

405nm (20mW), 445nm (25mW), 488nm (30mW), 515nm (25mW), 561nm (20mW), 638nm (5mW) – all continuous wavelength. Lasers are connected via a shielded fibre to the lightsheet microscope. Lasers are activated by key switch and via software control.

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 lightsheet 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 all live imaging applications (see below), the use of a lab coat and protective gloves are essential. Each research application should be accompanied by a specific risk assessment.

6. Is the Environment at Risk? Notes

Yes ☒ No ☐	Any spillages should be contained and cleaned up immediately and the area swabbed with an appropriate disinfectant (refer to specific risk assessment). Broken glass should be disposed of in the contaminated sharps bin – broken fragments of glass should be brushed on to paper and disposed as above.

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
Preparation and presentation of samples for lightsheet microscopy	Microwave preparation of low melting point agarose solutions (typically 1-3%) required for sample immobilisation.	Lab coat and gloves should be used when preparing LMP agarose solutions. Care should be taken not to boil the agarose (LMP agarose melts at 65.5ºC). Burns or scalds should be irrigated immediately with copious amounts of cold water and reported to the facility manager.	2	3	3
	Broken glass from sample capillaries or coverslips.	Lab coat and gloves should be used when handling glass. Lacerations should be reported to the facility manager. A first aid box is in close proximity to the lightsheet microscope and another close to the sample preparation area.	2	2	3
	Biological contaminants	For individual research applications involving cells, tissues, organs or whole organisms, appropriate control measures should be in place to reflect the nature of each biological hazard. 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 the facility and be subject to periodic review. Lab coat, gloves (and eye protection where necessary) should be routinely used for handling any hazardous biological material. All biological samples should be removed from the facility after lightsheet observation and disposed of in an appropriate manner consistent with the level of risk identified by the user.	*	*	*

** application dependent (requires additional risk assessment where necessary)*

9. Chemical Safety (COSHH Assessment)

Hazard	Control Measures	Likelihood ×	Severity =	Level of

		(0 to 5)	(0 to 5)	Risk
• Anaesthetics (e.g., trichloroethane; tricaine methanesulfonate etc) used to anaesthetise and immobilise live samples for lightsheet visualisation, or other metabolically active compounds capable of exerting a physiological effect. • Chemical fixatives and preservatives used for sample preparation (e.g., formaldehyde, sodium azide etc). • Fluorescent dyes, stains or probes used for sample contrast (e.g DAPI, Hoechst, fluorescent phallotoxins e.g., phalloidin etc). • Chemical agents used for sample clearing (e.g., Dibenzyly ether, Benzyl alcohol, Methyl salicylate, Dichloromethanol, Boric Acid etc) including commercial preparations such as BABB, DISCO and CLARITY variants etc.	All applications involving hazardous chemicals required for anaesthesia, fixation, sample contrast and/or sample clearing *must be fully evaluated by individual users and the resultant risk assessment approved by the Facility Manager*. A copy of the risk assessment should be filed within office E/0.14 and be subject to periodic review. Lab coat, gloves (and eye protection where necessary) should be routinely used for handling any hazardous biological material. Any leakages or spillages should be cleaned up immediately and the area swabbed with an appropriate disinfectant, as outlined in the specific risk assessment. Sample preparations should be handled with care and disposed of appropriately (see above).	*	*	*

** application dependent (requires additional risk assessment where necessary)*

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
		No Injury / Illness	First Aid Required	Minor Injury	Major Injury	Death
	Severity	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….

WWW, MSDS. 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 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 Latest 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?	Updated contact details for accident or emergency (29/06/2023)		
What changes to the Control Measures are required?	None		

15. Signatures for printed copies:

Assessor:	Dr Anthony J. Hayes	Signature:	AJH	Date:	30.6.17
Reviewed by:	Dr Anthony J. Hayes	Signature:	AJH	Date:	29.1.19
Reviewed by:	Dr Anthony J. Hayes	Signature:	AJH	Date:	14.2.2022
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:	