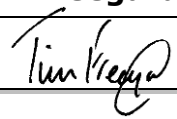
Risk Assessment				
Risk Assessment for the activity of	**Lab 1012/1017 Quantum Control experiments**		**Date**	**28 Nov 2025**
Unit/Faculty/Directorate	**School of Physics & Astronomy**	**Assessor**	**Tim Freegarde**	
Line Manager/Supervisor	**Tim Freegarde**	**Signed off**		

Emergency, Safety & Health Telephone Numbers

from:	internal phone	external phone incl. cellphone	availability
Fire / Police / Ambulance	**91-999**	**999 or 112**	**24 hours**
Police – non-emergency		101	
First Aiders: Damon Grimsey	**2-2040**	**023 8059 2040**	**Main Workshop (room 1005)**
Kath Leblanc	**2-2106**	**023 8059 2106**	**Teaching Lab (room 3040)**
Sanja Barkovic	**2-2065**	**023 8059 2065**	**Teaching Lab (room 3087)**
University security – all emergencies	**2-3311**	**023 8059 2311**	**24 hours**
University security – non-emergency	2-2811	023 5055 8477	
Highfield health emergency		023 8055 8577	
Highfield health reception	2-5545	023 8055 0050	
University health service reception		023 8055 7531	
Building emergencies (electricity, gas, water etc.)	2-7474	023 8059 7474	Mon – Fri, 8am – 4pm
Building emergencies (electricity, gas, water etc.)	2-2811	023 5055 8477	Outside above hours
Nightline	2-5236	023 8059 5236	Term-time, 8pm – 8am
Student Life		023 8059 8180	24 hours
University switchboard	0	023 8059 5000	Mon – Fri, 8.30am – 5pm

Please report all accidents or incidents to

	internal phone	external phone incl. cellphone	email
Supervisor Tim Freegarde	2-2347	023 8059 2347 / 07766 914346	timf@soton.ac.uk
School Safety Coordinator Justin Harris	2-3936	023 8059 3936	j.p.harris@soton.ac.uk
Head of School Seb Hoenig			hodphys@soton.ac.uk

and submit a report online via https://www.southampton.ac.uk/healthandsafety/incident-report.page

PART A											
(1) Risk identification			**(2) Risk assessment**				**(3) Risk management**				
Hazard	**Potential Consequences**	**Who might be harmed** **(user; those nearby; those in the vicinity; members of the public)**	**Inherent**			**Control measures (use the risk hierarchy)**	**Residual**			**Further controls (use the risk hierarchy)**
			Likelihood	**Impact**	**Score**		**Likelihood**	**Impact**	**Score**	
General laboratory hazards	Risk of tripping, burns, electrocution	Users and those nearby or in the vicinity	**3**	**2**	**6**	• Laboratory should be kept reasonably tidy. • Trailing leads should be avoided or covered securely to avoid tripping. • Unused cardboard boxes etc. should not be stored in lab. • No power sockets or mains electrical items should be powered whilst at floor level in case of flooding. • Hotplates should be covered in use with signage to warn others of hot surfaces. • Lone laboratory users should avoid potentially hazardous work, and if unavoidable should notify colleagues and laboratory manager.	**1**	**1**	**1**	

Alignment and use of high-power mid-IR fibre laser amplifier **1560nm, 15W**	Corneal and skin exposure: burns and corneal damage potentially resulting in partial to complete blindness from exposure to **direct beam** or **diffuse reflections**.	Users and those nearby.	4	5	20	• Beams should be confined to fibres when possible. • Open fibres and connectors should be securely blocked by caps or beam guards. • Open or damaged fibres and connectors should be treated as potentially hazardous within 1 m. • Free-space beams should be restricted to a plane securely bounded by solid beam-guards. • Unusual beam paths should be securely blocked by solid beam-guards. • Beam paths not requiring frequent adjustment should be fully enclosed. • Optics and hardware should be secure during alignment. • Suitable protective eyewear shall be worn during beam alignment and by all temporary lab visitors while free-space beams are exposed; note that eyewear may be insufficient to block high intensity beams. • Rings, wristwatches and reflective jewellery on hands and arms shall be removed before carrying out optical alignment. • Lasers shall be interlocked to the lab door through their controllers or via a mechanical shutter close to the beam source. A clear warning light above the door shall indicate when the interlock is engaged.	1	5	5	• Alignment should as far as possible be done at low power. • Free-space sections should be fully enclosed in regular operation, and opened only for alignment.

Alignment and use of high-power near-IR SHG sources **780nm, <10W**	Retinal, corneal and skin exposure: burns and mild to very severe retinal damage potentially resulting in partial to complete blindness from exposure to **direct beam** or **diffuse reflections**.	Users and those nearby.	4	4	20	• Beams should be confined to fibres when possible. • Open fibres and connectors should be securely blocked by caps or beam guards. • Open or damaged fibres and connectors should be treated as potentially hazardous within 1 m. • Free-space beams should be restricted to a plane securely bounded by solid beam-guards. • Unusual beam paths should be securely blocked by solid beam-guards. • Beam paths not requiring frequent adjustment should be fully enclosed. • Optics and hardware should be secure during alignment. • Suitable protective eyewear shall be worn during beam alignment and by all temporary lab visitors while free-space beams are exposed; note that eyewear may be insufficient to block high intensity beams. • Rings, wristwatches and reflective jewellery on hands and arms shall be removed before carrying out optical alignment. • Lasers shall be interlocked to the lab door through their controllers or via a mechanical shutter close to the beam source. A clear warning light above the door shall indicate when the interlock is engaged.	1	4	4	• Alignment should as far as possible be done at low power.

Alignment and use of near/mid-IR diode and fibre lasers and SHG sources **FP diode** **780 nm, 100 mW** **Tapered amplifier** **780 nm, 80 mW** **DBR diode** **780 nm, 200 mW** **Fibre laser** **1560 nm, 50 mW**	Retinal exposure: mild to very severe retinal damage potentially resulting in partial to complete blindness from **direct beam exposure**. Minor skin burns from **direct exposure to focused beam**.	Users	4	3	12	• Open fibres and connectors should be securely blocked by caps or beam guards. • Open or damaged fibres and connectors should be treated as potentially hazardous at close range. • Free-space beams should be restricted to a plane securely bounded by solid beam-guards. • Unusual beam paths should be securely blocked by solid beam-guards. • Beam paths not requiring frequent adjustment should be fully enclosed. • Optics and hardware should be secure during alignment. • The use of suitable protective eyewear is strongly advised and encouraged, especially during beam alignment and by all temporary lab visitors while free-space beams are exposed; visual alignment without goggles should be conducted with care. • Rings, wristwatches and reflective jewellery on hands and arms shall be removed before carrying out optical alignment. • Lasers shall be interlocked to the lab door, either through their controllers or via a mechanical shutter close to the beam source. A clear warning light above the lab door shall indicate when the interlock is engaged.	1	3	3	• Alignment should as far as possible be done at low power.

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High voltage supplies to ion pumps, Pockels cells, and photomultipliers ; mains supplies to general lab equipment.	Electric shock, electrical fire, electrical burns, paralysis, fire.	Users and those nearby.	**4**	**5**	**20**	• Electrical shielding and earthing of mains and high voltage supplies shall be intact and secure. • Mains electrical equipment should be raised above the floor to avoid electrical hazards in case of spillage or flooding. • Construction, repair and alteration of electrical items should be carried out or checked by competent persons. • Mains apparatus shall be tested regularly by qualified persons.	**1**	**5**	**5**	CO_2 fire extinguishers, first-aid kits and trained first-aiders located within immediate vicinity of laboratory.

Electronic prototyping & assembly	Contact of soldering iron with skin or flammables; electric shock; burns, paralysis, fire	Users	3	4	12	• Devices should be disconnected from power supplies and high voltage/capacity capacitors discharged safely and shorted before working on them. • High voltage circuitry should not be exposed unnecessarily. • Components, cables and circuit boards should when possible be positioned securely for soldering and testing to minimize the chances of shocks and soldering iron burns. • Exposed metalwork should be earthed during testing and operation for protection should high voltage wiring come loose. • Testing should only be carried out by appropriately briefed or experienced personnel, and not while working alone. • Mains, high voltage and high power devices should be checked after construction, servicing or modification by competent personnel before being connected to a supply.	1	4	4	

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Solvent storage and use **Acetone** **Iso-Propyl Alcohol (IPA)**	Spillage, skin exposure, ingestion: skin irritation, eye damage, poisoning, fire.	Users	3	4	12	• Solvents should be stored in appropriate containers at a low level to reduce the risk of breakages. • Storage and distribution vessels should be no larger than required and appropriately labelled. • The use of low flow-rate-outlet plastic bottles is advised to reduce the risk of spillage. • Goggles and protective gloves should be worn to avoid eye/skin contact if otherwise likely. Glove compatibility should be checked before use. • Inhalation should be avoided.	1	3	3	

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			Likelihood	**Impact**	**Score**		**Likelihood**	**Impact**	**Score**	
SAES Rubidium dispensers used in experimental chamber contain Zirconium and Rb Chromate	Inhalation or skin exposure: may cause irritation or cancer	Users and those nearby	2	4	8	• SAES dispensers are enclosed in metal boats which only expose carcinogens upon activation by heating to >400°C. • Gloves should be worn when handling dispensers, which shall be activated only when enclosed and under vacuum. • Dust inhalation shall be avoided on the rare occasions that the chambers are opened.	1	4	4	
Solder, flux and inhalation fumes	Inhalation, irritation and poisoning	Users and those nearby	3	3	9	• Minimize inhalation of solder, flux and fumes when soldering • For big jobs, use fume extraction apparatus • Keep iron tips clean using foam pad dampened with water • Use lead-free solder with lower-hazard flux whenever possible • Follow guidance at https://sotonac.sharepoint.com/teams/HealthSafetyRisk/SitePages/Soldering.aspx	1	3	3	

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			Likelihood	**Impact**	**Score**		**Likelihood**	**Impact**	**Score**	
High-pressure gas cylinders	Asphyxiation, explosion	Users and those nearby	**3**	**4**	**12**	• Use and manoeuvring by trained persons only • Low output pressure (<2 bar) to be used • Cylinders must be securely chained/strapped to wall or bench to avoid toppling • No modifications should be made to cylinders or regulators unless by certified personnel • Cylinders should be considered pressurized regardless of gauge indications • Room must be well ventilated when venting gases to avoid asphyxiation risk • Cylinders should be as small, and retained as briefly, as feasible to minimize explosion hazard in case of building fire.	**1**	**4**	**4**	

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Oven 200°C	Burns	Users	**3**	**2**	**6**	• Users must be trained in use of oven • Lab users should be made aware when oven is in use • Oven should if possible not be left running overnight; if unavoidable for baking out, over-temperature safeguards should be set • Users should wear appropriate gloves when removing hot or warm items, noting that they may remain hot for some time after the oven has been switched off • No flammable objects or items likely to melt or produce noxious fumes should be present within the oven during operation.	**1**	**1**	**1**	

PART B – Action Plan

Risk Assessment Action Plan

Part no.	Action to be taken, incl. Cost	By whom	Target date	Review date	Outcome at review date

Responsible manager's signature: Print name: Date:	Responsible manager's signature: Print name: Date

Revision record

Date	Document owner	email
03.04.24	Tim Freegarde	timf@soton.ac.uk

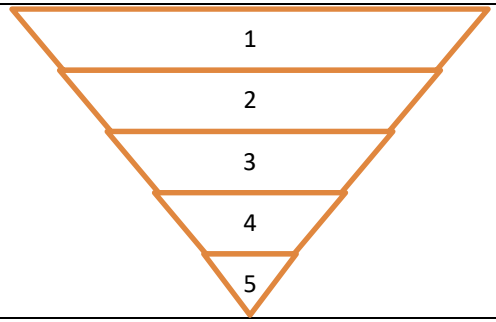
Please send all suggestions for revision to the current document owner.

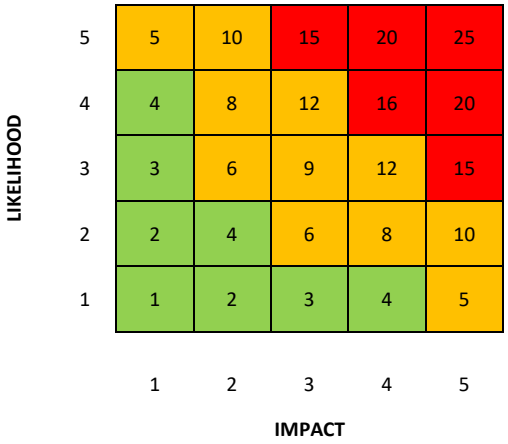
Version	Date	Pages	Changes
1.0	03.04.24		
1.1	26.02.25	14	Revision record added
		16	Users updated
1.2	28.11.25	4-6	Full enclosure of beam paths added
		9	Soldering hazard mitigations revised
		16	Users updated

University of Southampton Health & Safety Risk Assessment

Version: 2.3/2017

Assessment Guidance

1. Eliminate	Remove the hazard wherever possible which negates the need for further controls	If this is not possible then explain why	
2. Substitute	Replace the hazard with one less hazardous	If not possible then explain why	
3. Physical controls	Examples: enclosure, fume cupboard, glove box	Likely to still require admin controls as well	
4. Admin controls	Examples: training, supervision, signage		
5. Personal protection	Examples: respirators, safety specs, gloves	Last resort as it only protects the individual	



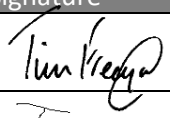
Risk process

1. Identify the impact and likelihood using the tables above.
2. Identify the risk rating by multiplying the Impact by the likelihood using the coloured matrix.
3. If the risk is amber or red – identify control measures to reduce the risk to as low as is reasonably practicable.
4. If the residual risk is green, additional controls are not necessary.
5. If the residual risk is amber the activity can continue but you must identify and implement further controls to reduce the risk to as low as reasonably practicable.
6. If the residual risk is red do not continue with the activity until additional controls have been implemented and the risk is reduced.
7. Control measures should follow the risk hierarchy, where appropriate as per the pyramid above.
8. The cost of implementing control measures can be taken into account but should be proportional to the risk i.e. a control to reduce low risk may not need to be carried out if the cost is high but a control to manage high risk means that even at high cost the control would be necessary.

Impact		Health & Safety
1	Trivial - insignificant	Very minor injuries e.g. slight bruising
2	Minor	Injuries or illness e.g. small cut or abrasion which require basic first aid treatment even in self-administered.
3	Moderate	Injuries or illness e.g. strain or sprain requiring first aid or medical support.
4	Major	Injuries or illness e.g. broken bone requiring medical support >24 hours and time off work >4 weeks.
5	Severe – extremely significant	Fatality or multiple serious injuries or illness requiring hospital admission or significant time off work.

Likelihood	
1	Rare e.g. 1 in 100,000 chance or higher
2	Unlikely e.g. 1 in 10,000 chance or higher
3	Possible e.g. 1 in 1,000 chance or higher
4	Likely e.g. 1 in 100 chance or higher
5	Very Likely e.g. 1 in 10 chance or higher

Declaration by users: I confirm that I have read this risk assessment, will implement the controls outlined herein, and will report to the responsible manager any incidents that occur or any shortcoming I find in this assessment.

Name	Signature	Date
Tim Freegarde		28 November 2025
Joel Abraham		28 November 2025
Alfie Preston		01 December 2025
Tommy Roe		28 November 2025
Rupayan Das		28 November 2025
Jack Saywell		28 November 2025