

Risk assessment for working in the NMR Facility, effective October 2022

List the significant hazards	Describe what might go wrong - that is, say who might be hurt and how.	Is the risk high medium or low	Please list the existing and/or intended control measures which will reduce the likelihood of this happening	Suggest here any further actions which may be beneficial. Say who will carry them out and by when if not yet complete.	
Infection from Covid-19 virus by any means or by ignoring the advice given by the University and Head of Department.	Covid-19 can still be serious and loss of life can occur in any individual (although mostly elderly, vulnerable and unvaccinated people are known to be at greater risk).	Medium	All users of the Facility should be mindful of ways to mitigate the spread of Covid-19. Do not use the facility if you are suffering from or suspect you might have Covid. Wear a mask if you have respiratory symptoms, and sanitise equipment after use. Room occupancy should be kept to a minimum. Use of facility instruments will only be allowed if this document specific to working in the NMR Facility has been read, signed, scanned/photographed and returned as a PDF electronically.	This document will be regularly updated as new guidance becomes available about Covid. Latest update: October 2022 by Andrew Mason	
Asphyxiation due to cryogenic gas release.	NMR magnets are cooled using liquid nitrogen and helium. Uncontrolled release of these gases either in a quench (failure of the magnet) or at a higher rate than expected (boil-off) can lead to a low oxygen content in the room which can be fatal.	Medium	Oxygen depletion alarms are fitted to all NMR rooms and calibrated/serviced regularly. Please obey all alarms, lights or warning messages and leave rooms immediately. DO NOT enter a room where an alarm is sounding. Follow the instructions on the laminated signs on the doors to raise the alarm/report to the NMR Facility staff.	Any non-compliance with alarms should be reported to nmr@ch.cam.ac.uk in the first instance. If a timely response is not had, please report the incident to safety@ch.cam.ac.uk - ignoring alarms can be fatal. If repeated alarms are noted, please report them to the DSO, Richard Turner, as there may be a calibration or drift issue with the sensor.	
Electric shock from interfering with consoles, cables or power sockets or from wires and cables in dangerous condition.	Electric shocks can lead to cardiac arrest and loss of life. Interfering with wires and cables can lead to a shock especially with high power solid-state instruments such as those in B12 (Clare Grey/Melinda Duer instruments) and B17 (Melinda Duer/Alex Forse instruments). NMR consoles can be dangerous if users are not familiar or trained to work with them. Power sockets can be dangerous if they are interfered with and carry mains power at 240V (single and three phase).	Medium	Warning signs, barriers and doors are deployed to keep users away from areas where electrical shock may be encountered. Wires and cables will be monitored by the NMR Facility team in order that any wear and damage is spotted before it becomes a hazard.	Use of commando sockets mitigates accidental disconnection of power supplies to spectrometers and reduces the chance of contact with high voltages. Covers can be used to reduce the risk of tripping on high power cables and causing an electric shock. Wires and cables should be tidied and cable tied to avoid trip hazards and the possibility of friction due to chafing which can lead to the outer sheath being damaged. The NMR Facility team are in process of tidying all the rooms and this will be complete by January 2023.	
Falls from height when using ladders and access platforms	Most instruments in the NMR Facility have ladders, step stools or access platforms to enable users to reach the sample changer or magnet bore. Falls from height can cause injury or in rare cases, loss of life.	Low	All step stools, ladders and access platforms are checked annually by the Safety Technician and should have a tag affixed to show they have passed the check. All ladders are aluminium and are built to the appropriate British Standard in force at the present time. Ladders should only be high enough for the particular instrument, and should not be moved from one room to another. Common sense should be employed and suitable footwear should be worn at all times. Chairs should be used appropriately and not mis-adjusted. Do not bring your own steps, step-stools or other equipment into NMR rooms.	The NMR Facility staff will continue to check the condition of all ladders, platforms and step stools as they work in the rooms. Any users with concerns about ladders should report them to the team on nmr@ch.cam.ac.uk and then to safety@ch.cam.ac.uk if a response is not forthcoming. Any chairs that are reaching the end of their useful life due to wear and tear will be removed and replaced. The NMR team will remove any equipment without a safety check tag.	
Danger from the large magnetic fields generated by NMR magnets	All NMR magnets have a degree of stray field, although modern designs employ shielding technology to minimise the extent of this. Larger and older magnets have wider stray fields. The recommended safe distance is the 5 Gauss line. Outside this point there should be no danger from attraction of large metal objects or to users operating the instruments. Users with metal implants such as replacement joints, or those people with pacemakers should not enter the NMR rooms without a full risk assessment of their implant or device. There is danger of injury from metallic objects attracted to magnets at high velocity. Localised heating of metallic implants can occur and pacemakers could malfunction leading to serious medical issues or in extreme cases, fatality.	Medium	Stray field shielding technology reduces the extent of the 5 Gauss line. This is denoted using red and white chains in places, but mostly with yellow dots around the magnet. Users should remain outside this area unless they need to change or insert samples into the sample changers or carry out work beneath the magnet.	NMR Facility staff will continue to update the rooms with the yellow sprayed dots to denote the 5G line where this has not been done yet, and maintain those once completed. We will finish this by November 2022. Users should try to minimise the time spent within the 5G area, although studies have shown there is no danger from these static magnetic fields, even during pregnancy.	
			Large metal objects such as toolboxes, tools and steel cylinders should be kept well clear of the 5 Gauss line to avoid unwanted attraction to the magnet. All contractors should receive a safety briefing prior to starting a job in the NMR rooms. This should include checking for implants and pacemakers.		Contractors briefings should always be undertaken by a member of staff familiar with the NMR Facility and the dangers of the unseen magnetic fields. If in any doubt, always consult a member of the NMR team or email nmr@ch.cam.ac.uk. Visitors to the department must always be accompanied by a trained user so that the hazards can be pointed out if they are unaware.
			Pacemakers and metallic implants are to be considered at risk until proven otherwise by consultation with documentation and medical expert advice. Anyone with an implant or pacemaker must not enter the rooms prior to receiving clearance from the DSO, Dr Richard Turner or the Head of Department.		
Potential for injury/poisoning from chemicals of known and unknown toxicity held in fragile glass tubes. Potential of injury from breakage of tubes. Potential of injury/death from use of needles during reaction monitoring/titration experiments at instruments.	Great care should be taken with the glass NMR tubes; they are fragile and cut/stab injuries occur each year in small numbers. The tubes must only be handled by those aware of the hazards involved including accidental ingestion/inhalation/contact with the contents. A suitable carrier should be used to transport NMR tubes to the instruments from rooms/labs. Carrying tubes in lab coat pockets is dangerous. Use of needles during experiments at the instrument gives potential of injury to the user or needlestick injuries to cleaners or other users if they are not disposed of correctly.	Medium	NMR tubes should be checked carefully for cracks or chips. Any that are cracked should be disposed of immediately. Chipped tubes can be cut down by the glassblower. Take great care when putting caps on tubes and when inserting into spinners.	The NMR Facility have been removing damaged or badly chipped NMR tubes out of the supply of abandoned ones we collect from the rooms. Some of these are cut down by the glassblower and returned to service with the groups free of charge to improve safety.	
			Carriers for NMR tubes are available commercially or a suitable container can be employed to hold multiple tubes. This avoids the danger of accidental skin puncture from tubes carried in lab coat or other pockets. Don't run in corridors or on stairs when carrying NMR tubes.	The NMR Facility and DSO/Safety Technician will include these warnings in the presentations given to new starters in October, and at other times when new starters receive NMR training/safety induction.	
			Chemicals considered to be extremely hazardous should not be brought anywhere where a proper Hazardous Substance Risk Assessment form has not been completed. In NMR rooms this would include radioactive materials, nerve agents, chemicals which if spilt would cause a hazard over a distance (eg. toxic gas) or where lasting contamination of the location would be incurred if residue is spilt. Dispose of needles and contaminated sharps in the bin provided. Eyes should be washed immediately if contaminated.	Consult the Departmental Safety Officer/Biological safety officer (DSO/BSO) if in doubt. The NMR Facility staff will remove access to instruments if there is repeated failure to carry out an appropriate risk assessment. Contaminated sharps bins and eye wash bottles have been provided at all user-operated instruments as of September 2022.	

I declare that I have read, understood and will abide by the principles in this risk assessment when working in/visiting the NMR Facility

Please print your name, sign and date (physically or electronically) this risk assessment and then scan/photograph (or save as PDF) and send as a PDF to nmr@ch.cam.ac.uk

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Printed Name, Signature, Date