



EPR FACILITY SAFETY POLICIES

The policies regarding chemicals and hazardous waste were written to comply with the latest Environmental Health and Safety regulations.

Safe use of instrument

An annual training class will be available as needed. All users have to be trained to work safely in a lab environment through the classes/courses available on Campus.

Users whose projects have received approval by institutional human subjects, animal welfare or biosafety committees need to provide the required documentation.

Chemicals

Users will be reminded that they can bring only small quantities of chemicals in the EPR facility. The users bringing in chemicals are required to bring a copy of the Material Safety Data Sheet (MSDS) for filing in the EPR Facility MSDS Notebook. No chemicals will be stored at the EPR Facility. Large quantities of chemicals will not be allowed. Disposal of chemicals will be performed at the PI's labs. Users who are doing experiments which generate any waste will be expected to know and follow all EH&S regulations. Failure to clean up biowaste will result in denial of access to the EPR Facility. All other materials and/or sharps will be cleaned up by the individual user and disposed of properly in their own labs.

Cryogenic Liquids

Cryogenic liquids such as liquid nitrogen, helium, and oxygen are, by definition, extremely cold. Contact between cryogenic liquids and exposed skin can produce a painful burn. A splash of cryogenic liquid to the eye can cause loss of vision. Always wear proper personal protective equipment including a buttoned lab coat and pants or a long skirt, heavy gloves, and a face shield, or at least safety goggles, whenever handling cryogenic liquids.

Other Hazards Associated With Cryogenic Liquids

* Pressure buildup. Boiling of liquefied gases within a closed system increases pressure. Users must make certain that cryogenic liquids are never contained in a closed system. Cold fingers and similar devices have exploded when either an ice dam is formed within the apparatus or when users create a closed system by shutting off all valves. Users should also tape exposed glass parts to minimize the hazard of flying glass shards in the event of an explosion.

* Oxygen enrichment. Liquid nitrogen and liquid helium may fractionally distill air, causing liquid oxygen to collect in the cryogenic container. Liquid oxygen increases the combustibility of many materials, creating potentially explosive conditions. Make sure to provide adequate venting when working with cryogenic liquids in a closed system or enclosed space.

* Asphyxiation. If vented into a closed space, a cryogenic liquid will vaporize, displacing oxygen and possibly causing asphyxia. For this reason, never store a container of cryogenic liquid in a closed space.

* Embrittlement. Do not dispose of cryogenic liquids down the drain! Ordinary materials such as metal or polyvinylchloride (PVC) piping in laboratory sinks may not be able to withstand cryogenic temperatures. Allow cryogenic liquids to evaporate in a fume hood or other well ventilated area. Materials exposed to cryogenic temperatures for long periods or materials that have undergone periodic warming and freezing must be examined regularly for cracks and warping.

* Cryotube Explosions. Cryotubes used to contain samples stored under liquid nitrogen may explode without warning. Tube explosions are caused by liquid nitrogen entering the tube through minute cracks and then expanding rapidly as the tube thaws. In addition to wearing proper safety equipment, when thawing cryotubes place the cryotube in a heavy walled container (e.g., a desiccator) or behind a safety shield to protect yourself in the event that the tube shatters.

Sharps

Containers for broken glass and sharps will be provided by the EPR facility. This expense will be shared equally among the users.

Biohazards

If user's experiments require the use of human or infectious materials, which would create a potential biohazard, a proposal that will adhere to the documented biosafety regulations with an appropriate containment plan must be submitted to the biosafety committee for their approval.

Animal Surgery

A small area on the countertop will be assigned to animal surgery (if needed). Failure to clean the area properly, including immediate cleaning of any blood spills and proper disposition of animal carcasses, will be reported to the Campus veterinarian. He/she is entitled to suspend the animal protocols of those who violate safety and cleanliness regulations.

Electromagnetic Radiation Hazards

Equipment found in laboratories that can produce hazardous amounts of electromagnetic radiation includes ultraviolet lamps, arc lamps, heat lamps, lasers, microwave and radio-frequency sources, and x-rays and electron beams.

Radio-frequency and Microwave Sources

Devices, other than EPR, in the laboratory can also emit harmful microwave or radio-frequency emissions. People working with these types of devices should be trained in their proper operation as well as measures to prevent exposure to harmful emissions. Shields and protective covers should be in proper position when the equipment is operating. People with heart pacemakers should never be near these devices.

Magnetic Fields

If an object moves into the attractive field of a strong magnet, it can become a projectile when it is pulled rapidly toward the magnet. Therefore, objects ranging from keys, scissors, knives, wrenches, and other tools to oxygen cylinders, buffing machines, and wheelchairs and other ferromagnetic objects must be excluded from the immediate vicinity of the magnet, for the sake of both safety and data quality, in the case of EPR. Even relatively small peripheral magnetic fields can adversely affect credit cards, computer disks, and other magnetic objects, as summarized in

Table 1. Users must stay behind the 5-gauss (G) line around the magnet (marked in yellow-black tape) when the magnet is running. People wearing heart pacemakers and other electronic or electromagnetic prosthetic devices should be kept away from strong electromagnetic sources. Superconducting magnets use liquid nitrogen and liquid helium coolants. Thus, the precautions associated with the use of cryogenic liquids must be observed as well.

Table 1: Threshold of magnetic field effect on several devices*

	Level at which effects occur (G)
Effects on electron microscopes	1
Disturbance of color computer displays	1-3
Disturbance of monochrome computer displays	3-5
Erasure of credit card and bank card coding	10
Effects on watches and micromechanical devices	10
Lowest known field effect on pacemakers	17
Saturation of transformers and amplifiers	50
Erasure of floppy disks	350

*Adapted from Site Planning for Superconducting NMR Systems, Bruker Instruments, 1992.

SAFETY RULES FOR WORKING IN LARGE MAGNETIC FRINGE FIELDS

The following are rules for working in magnetic fields.

- 1) People with medical implants should check with Facility personnel before entering the EPR Facility.**
- 2) All magnetic objects should be kept outside the 5 gauss line of each magnet. This includes keys, wallets, pocketknives, tools, etc. ASSUME ANY PIECE OF METAL IS MAGNETIC UNTIL PROVEN OTHERWISE.**
- 3) Keep electronics outside of the 5 gauss line.**

- 4) Use only non-magnetic tools inside the 5 gauss line.
- 5) When in doubt, ask EPR Facility personnel. The EPR system costs at least \$500,000. Do not risk damage to the instruments or harm to yourself. If you have any questions, get assistance from Facility Staff.
- 6) No one is to be present in the EPR Facility unless they have read and signed this form AND are present with the knowledge and explicit approval of EPR Facility Staff.

Magnetic fields can generate large attractive forces on ferromagnetic objects. Such objects include, but are not limited to, most tools, highpressure gas cylinders, pocketknives, key rings, perfusion apparatus, mechanical ventilators, and most electronics. Any such object, which gets too close to the magnet, will be drawn towards the magnet with great force. A best-case scenario is simply lost time and expense of removing the object from the magnet. Worst case is the death of the user or innocent bystanders which could occur if an object is pulled with great acceleration towards the magnet striking someone, causing injury or death. In summary, **keep all magnetic objects outside the 5 gauss line, which are clearly marked with yellow-black tape on the floor. If you are in doubt, get clearance from Facility Staff.**

Definitions:

Medical implants, electronic - Medical implants which have electronics (such as pacemakers) are set and/or reset through the use of magnetic fields. Thus exposure to magnetic fields can cause such devices to operate in an unintended manner or stop working altogether. People with such implants should **never** enter the EPR Facility. Signs are posted at all entrances to that effect.

Medical implants, non-electronic - Medical implants such as pins, surgical clips, etc. may be magnetic and maybe subject to the same forces described above. People with such implants should stay outside the 5 gauss line described above.

Wallets, credit cards, watches, magnetic media - While not strictly a safety issue, large magnetic field scan wipe out the magnetic information on ATM and credit cards and magnetic media like computer discs. Keep your ATM

and credit cards and magnetic media outside the 5 gauss line. Mechanical watches may also be permanently affected by large fields and thus should also be kept outside the 5 gauss line. Digital watches are usually okay within high magnetic fields, although some may have magnetic material. Each user is responsible for knowing if their watch is magnetic.

EMERGENCY PROCEDURES

The following emergency procedures are recommended in the event of a fire, explosion, spill, or medical or other laboratory accident. These procedures are intended to limit injuries and minimize damage if an accident should occur. Telephone numbers to call in emergencies should be posted clearly at all telephones in hazard areas.

1. Have someone call for emergency help. State clearly where the accident has occurred and its nature. Summon medical help immediately.
2. Do not move an injured person unless he or she is in danger of further harm.
3. Keep the injured person warm. If feasible, designate one person to remain with the injured person. The injured person should be within sight, sound, or physical contact of that person at all times.
4. If clothing is on fire and a safety shower is immediately available, douse the person with water; otherwise, move the person to the floor and roll him or her around to smother the flames.
5. If harmful chemicals have been spilled on the body, remove them, usually by flooding the exposed area with sufficient running water from the safety shower, and immediately remove any contaminated clothing.
6. If a chemical has splashed into the eye, immediately wash the eyeball and the inner surface of the eyelid with plenty of water for 15 minutes. An eyewash fountain should be used if available. Forcibly hold the eye open to wash thoroughly behind the eyelids.

7. If possible, determine the identity of the chemical and inform the emergency medical personnel attending the injured person.
8. Ascertain the safety of the situation. Do not enter or reenter an unsafe area.
9. Render assistance to the people involved and remove them from exposure to further injury.
10. Warn personnel in adjacent areas of any potential risks to their safety.
11. Render immediate first aid; appropriate measures include washing under a safety shower, administration of CPR by trained personnel if heartbeat and/or breathing have stopped, and special first aid measures.
12. Extinguish small fires by using a portable extinguisher. Turn off nearby equipment and remove combustible materials from the area. For larger fires, contact the appropriate fire department promptly.
13. Provide emergency personnel with as much information as possible about the nature of the hazard.
14. In case of medical emergency, laboratory personnel should remain calm and do only what is necessary to protect life.

I HAVE READ THIS HANDBOOK, UNDERSTOOD THE ABOVE WARNINGS OF WORKING WITH THIS SPECTROMETER, AND I WILL COMPLY WITH THE USER GUIDELINES. I HAVE BEEN SHOWN THE WARNING SIGNS IN THE FACILITY, WHERE THE MAGNET IN THE EPR FACILITY IS, AND WHERE THE 5 GAUSS LINE AROUND THE MAGNET IS.

PRINT NAME

SIGNATURE & DATE

Keep a copy of this page for your own records; give the original to Giulivi Staff