

NANOMAG (LOW-T) LABORATORY ACCESS RULES

This document defines safety rules and procedures for the equipment of the NANOMAG Laboratory.

LOCATION OF THE LABORATORY:
SFIM Dept., Physics Building, Room MO-17-02-004, II floor

RESPONSABILITY

- R.S.P.P. CNR – Istituto Nanoscienze: Dr. Milena Toselli
- Responsible of the Laboratory (Preposto): Prof. Marco Affronte

ACCESS TO THE LABORATORY

Access is restricted to:

- USERS with regular authorization
- GUESTS with a supervisor

AUTHORIZATION OF THE USERS

The authorization can be granted to employees/collaborators with atypical/affiliation contract who have followed and passed the training course to the General Prevention and Safety at Work.

The authorization is granted by the Responsible of the Laboratory who assesses the knowledge and training of the employee and performs a specific training course on the procedures and working methods of the laboratory / equipment / materials. This training also includes the principal rules and safety measures in the laboratory.

USERS and **GUESTS** may ask the **Workers Health and Safety Representative (RLS)**, Dr. Andrea Bertoni, for assistance in case they perceive any hazard-related issue not properly managed by the Laboratory Responsible

NANOMAG (LOW-T) LABORATORY ACCESS RULES

GENERAL SAFETY RULES AND GUIDELINES

All USERS and GUESTS must comply with the following general rules of prevention and safety. Please note that failure will result in disciplinary actions against the defaulters, in addition to the expected legal sanctions.

IMPORTANT

- Memorize the location of access and output routes.
- Check safety signs.
- Find the location of the first aid kit and of the personal protective equipment (PPE).
- Find the location of the waste containers.
- Promptly advise the Responsible of the Laboratory in case of unusual conditions encountered in the operation of the equipment.
- Collaborate with the Responsible and other users for maintaining efficient safety conditions.

ALWAYS

- Carefully read the instruction manual of the instrumentation and strictly adhere to the specific rules of usage.
- Before using any chemicals, read the information on the safety data sheets concerning risk phrases, safety advices and strictly follow the instruction for the handling, storage and disposal.
- Keep electrical devices as far away as possible from sources of moisture and / or vapors of flammable solvents.
- Always use the protective equipment (PPE) reported by the procedures, keep them carefully and avoid the tampering or removal.
- Dispose the residuals of each process in the suitable container.
- Follow the prevention and safety measures in force for the laboratory and strictly adhere to the provisions given by the Responsible of the Laboratory.
- Leave the laboratory in case of alarm, following the procedure provided for evacuation in case of emergency.

DO NOT

- Store food, eat or drink in the Laboratory.
- Use electrical equipment not in accordance with EC
- Perform any operation for which you have not been authorized for and previously trained by the Responsible of the Laboratory.

NANOMAG (LOW-T) LABORATORY ACCESS RULES

PERSONAL PROTECTIVE EQUIPMENT LOCATED IN THE LABORATORY

Nitrile gloves, cryogenic gloves, face shield, laser eyewear, vapor masks.

EMERGENCY EVACUATION PROCEDURES

In case of emergency and warning, users and/or guests attending to the Laboratory must respect the building evacuation procedure and in particular the following rules:

- Proceed in an orderly way in order to leave the building by following the shortest route indicated by relevant signs, and gather at the meeting point
- Do not use elevators
- Do not perform any operations for which you have not been previously trained.
- Do not reenter in the building before the authorization of the Director or Safety coordinator.

NANOMAG (LOW-T) LABORATORY ACCESS RULES

SPECIFIC RULES RELATED TO THE USE OF THE INSTRUMENTATION OF THE LABORATORY

General remarks

High pressure bottles

- Close the main cylinder valve whenever the cylinder is not in use.
- Always secure cylinders, whether empty or full, to prevent them from falling over and damaging the valve (or falling on your foot). Secure cylinders by firmly chaining or strapping them to a wall, lab bench, or other fixed support.
- Remove regulators from unused cylinders and always put the safety cap in place to protect the valve.
- Always use the appropriate regulator on a cylinder. If a regulator will not fit a cylinder's valve, replace the cylinder, not the regulator. Do not attempt to adapt or modify a regulator to fit a cylinder it was not designed for. Regulators are designed to fit only specific cylinder valves to avoid improper use.
- Inspect regulators, pressure relief devices, valves, cylinder connections, and hose lines frequently for damage.
- To use the pressure cylinder:
 - make sure that the gas pressure regulator is well mounted and closed
 - make sure that the gas line is connected to the instrument
 - open the gas faucet and regulate the exit pressure using the regulator
 - close the pressure regulator and the gas faucet after use
- At the end of the experiment or at the end of a working day, high pressure cylinders must be disconnected from the instrument and immediately placed into the external cabinet.
- To transport a cylinder, put on the safety cap and strap the cylinder to a hand truck in an upright position. Never roll a cylinder.

Cryogenic Hazard

- Make sure that an over pressure safety valve is mounted to the Dewar and that the valve is in a state of proper operation.
- Always use caution when working with cryogenic coolants. Use temperature resistant gloves and a face shield during transfer of cryogenic liquids.
- Make sure that there is good ventilation. Open a door and/or a window.
- Footwear shall provide secure footing, protection from spilled cryogenic liquids, and protection from falling objects. Bare feet and open toed shoes shall not be worn when working in areas with potential foot hazards.
- Do not pour cold liquid onto the edge of a glass Dewar flask when filling because the flask may break and implode.

NANOMAG (LOW-T) LABORATORY ACCESS RULES

Strong Magnetic Field

- Access to the Laboratory is not allowed to visitors with implanted pacemakers, metal plates, pins or staples.
- The 100 gauss lines are marked on the floor around each magnet. Users and visitors shall not stand inside the inner circle when the magnet is energized.
- Compressed gas cylinders shall be secured at all times. Tools shall be non-magnetic in nature if used within the 100 gauss lines. Steel, iron and other magnetic objects shall be secured and fastened down or kept behind the 100 gauss line.

Laser

- Never direct the laser beam in the free space. Always connect the fiber glass cable and switch on the laser when the probe is installed into the cryostat.
- The orientation of a laser should not be modified while it is being used.
- Install the laser at a height different from that of your eyes and avoid sitting zones in the laser area.
- Make sure that the optical elements in the beam path are firmly fixed.
- Make sure you are wearing laser safety glasses.
- Take into account that the elements of the optical path may be sources of beam reflection.
- Never start the laser if all the elements (source, optical elements, target) has not been properly stabilized.
- Do not direct the laser beam towards the room entrance or position it at eye-height for the users.

Vacuum Pumps

- Do not place pumps in an enclosed, unventilated cabinet allowing heat and exhaust to build up.
- During operation the pump can become so hot that there is a danger of burns. Do not operate pumps near containers of flammable chemicals, flammable chemical wastes, or combustible materials such as paper or cardboard.
- Always close the valve between the vacuum vessel and the mechanical pump before shutting off the pump to avoid sucking vacuum oil into the system.
- With oil rotary pumps many vapors condense in the pump oil. Solvents in the oil degrade its performance (and eventually ruin the pump), and are emitted in an oil mist vented from the system. Other vapors pass directly into the exhaust stream. To avoid these problems always trap evaporated materials with a suitable trap and vent the pump exhaust properly.
- Turbo pumps are not suitable for pumping liquids or gases containing dust or particulates; pumping aggressive, explosive or reactive gasses, operation without a forevacuum pump. Exposure of the pump to accelerating forces must be avoided or reduced to such an extent that the rotor unit will not be excited by vibrations. Never

NANOMAG (LOW-T) LABORATORY ACCESS RULES

touch the rotor. Touching the rotor may cause injury and damage the rotor bearing. If foreign objects could pass from the vacuum chamber into the pump, install a wire mesh splinter guard. Foreign objects which enter the pump through the intake would cause serious damage to the rotor. Damage resulting from foreign objects in the rotor section are excluded from guarantee coverage.

Electrical Hazard

- Properly ground all electrical equipment.
- If sparks are noticed while plugging or unplugging equipment or if the power cord feels hot, do not use the equipment until it can be serviced by an electrician.
- Do not run electrical cords along the floor where they will be a tripping hazard and be subject to wear. If a cord must be run along the floor, protect it with a cord cover.
- Do not plug too many items into a single outlet. Cords that enable you to plug more than one item in at a time should not be used.
- Multi-plug strips can be used if they are protected with a circuit breaker. Do not overuse or daisy-chain in a series.
- Do not use extension cords for permanent wiring. If you must use extension cords throughout the lab, then it is time to have additional outlets installed.

Chemical procedures

Chemical procedures for sample preparation and/or cleaning process using solvents or acids are strictly forbidden in the Laboratory. All these operations must be performed in the Chemical Laboratory (Ground floor, Room MO-17-00-074). Small quantities of ethanol, isopropanol and acetone are tolerated.

Instrumentation

Always read the manual before using the instrumentation. Manuals are placed on the shelf next to the computers bench.

Quantum Design PPMS

- Always press “vent continuously” before opening the sample chamber.
- Always run “purge and seal” before cooling down.
- Never run the magnetic field when the liquid helium level is below 50%.
- Always refill the liquid nitrogen vessel twice a week.
- Periodically empty the oil filter on the exhaust line of the rotary pump.

Oxford Magnet and Heliox cryostat

- Never disconnect the over pressure safety valves.
- Never run the magnetic field when the liquid helium level is below 10%.

NANOMAG (LOW-T) LABORATORY ACCESS RULES

- Always turn on the switch heaters for all the x, y, and z coils before charging the magnetic field in any direction.
- Do not exceed the recommended sweeping rates and maximum fields.

Turbo Pump Bench Varian

- Always double-check the proper installation of flanges and fittings.
- To switch on the pump: switch on the mains, switch on the scroll pump, open the valve between scroll and turbo-pump, switch on the vacuum meter, wait to reach <1 mBar, start the turbo controller.

To switch off the pump: stop the turbo controller, close the valve, stop the scroll, switch off the vacuum meter, wait until the turbo slows than open slightly the venting valve behind the