



RUBRIK
Lab Practice and Safety Guidelines
Fastställt av
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Dokumentansvarig
1:e Fo.Ing. Tillämpad Fysik

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Lab Practice and Safety Guidelines

Purpose

This is a guideline document concerning lab safety and good lab practice for those working in experimental facilities at the Department of Applied Physics, KTH.

Scope and limitations

This document concerns all people that work or study in an experimental environment at the Department of Applied Physics. This document does not concern SciLifeLab, the cleanroom facilities in Kista, and the Nanolab at Albanova. These labs have their own safety routines. Routines for specific equipment and instruments are described in the manuals and other supporting documents.

Responsibilities

Person in charge: Peter Unsbo, head of department.

Implementation

This document is presented during the introduction of new staff to the laboratories. The group leader or advisor presents the document and the new staff signs the Declaration at the end of this document.

Appendix

Declaration and signatures form

Version history

Version number	Date of change	Modifications	Name
8	2018-03-20	Document updates	Björn Hessmo
5-7	2016-01-25	Document updates	Thomas Frisk
2-4	2012-01-01	Document updates	Pia Mattsson
1	2008-01-01	Document created	Hans Hertz

Contents

Purpose	1
Scope and limitations	1
Responsibilities	1
Implementation	1
Appendix	1
Version history	1
Contents.....	2
Phone numbers	2
General rules	3
Safety regulations.....	4
Lasers and light sources.....	4
X-ray radiation	4
High voltages	4
Gases and gas bottles handling	4
Vacuum equipment	5
Chemicals.....	5
Cryogenic liquids.....	5
Radioactive substances	6
Bio hazardous substances	6
Computer safety	6
In Case of Fire	6
Declaration and signatures.....	7

Phone numbers

SOS Alarm: **112**

KTH Emergency:

08-790 77 00

Should always be called when incident or accident occurs.

The Poison Information Centre - Giftinformationscentralen:

08-331 231 (Mondays - Fridays 09-17)

<http://www.giftinformation.se>

S:t Erik's Eye Hospital - S:t Eriks Ögonsjukhus:

08-672 31 00

<http://www.sankterik.se>

General rules

1. Keep labs and other work areas **clean and tidy**. This reduces the risk of accidents and allows you to find items you need for your work.
2. Wear the appropriate **protection gear** for your work.
3. **Report** accidents, incidents, and hazards to the person in charge as soon as possible for follow-up actions.
4. Only operate equipment that you are familiar with. All rooms/cupboards/equipments/tools have been assigned a person who is **responsible** for them. He or she can be consulted for advice or information.
5. All **chemicals** are to be kept in space designated for chemicals. Many chemicals are hazardous and require special handling. Obtain **information** about possible toxicities and safety regulations regarding the handling of the chemicals.
6. When not in use, **tools and other instrument** are to be placed at the proper storage place.
7. When you borrow equipment or components first **ask for permission**. **Disassemble** your set-up and **return** borrowed items when the experiment is completed.
8. Equipment, which is **broken** or behaves abnormally, should be **labelled** and the person responsible for it **informed** immediately.
9. If you need help from the **mechanical workshop**, contact the workshop staff. Operation of bench-drilling machines or similar should only be performed by personnel who have the proper knowledge of the risks and operation.
10. Entry to some laboratories may be restricted for various reasons (on-going measurements, hazardous equipment, etc.). **No-entry signs** on the door indicate forbidden access. Nobody is allowed to enter such a laboratory without permission from lab responsible.
11. **Students** working on their diploma thesis may not purchase items in their own name. Ask your **advisor**.
12. Work with **lasers, high voltage, gases, bio-hazardous materials, radioactive materials** and **chemicals**, can be dangerous and is regulated by law. Therefore, safety rules and good lab practice are to be followed. If there is any doubt, contact an experienced staff member for advice.
13. The larger machines/systems must only be operated with the consent and possibly training by the person responsible for the system.
14. Before you leave the lab in the **evening**, check that all the equipment, including cooling water, gases and compressed air supply, are **turned off** or **operating properly**. Turn off the lights and lock the door.
15. Consume food and beverages only at sensible places to avoid contamination/poisoning.
16. Working alone (ensamarbete) in laboratories under circumstances implying even the slightest risk should be avoided. If you decide to work alone, inform somebody of your plans. Make arrangements so that you can contact help.
17. Group meetings are typically held once a week. This is in many cases the only way of keeping everyone informed. Attendance is expected.

Safety regulations

Lasers and light sources

1. All work with lasers should follow the regulations laid down by the [Strålsäkerhetsmyndigheten](#).
2. The warning lights at the entrance to the laboratory should be turned on **before** lasers are turned on. Low power lasers (<5 mW) are excluded.
3. Align your setup with low-power beams whenever possible. Do not place any new components in the beam path without first knowing the paths of the new reflected beams. Block off unwanted reflections to keep all optical beams confined to the optical table or designated beam paths, preferably confined to one plane below eye level.
4. Ensure that your optical components can be identified. Whenever possible **label** your components and store optics in labelled containers.
5. Reflections from many surfaces can also be dangerous. **Wristwatches, jewellery**, and other reflective objects must not be worn during work with lasers. **Large glass areas** in laboratories, e.g., glass cupboard doors, should be avoided. If such glass exists temporarily, it must be covered with a non-reflective material. Work with the highest possible ambient light intensity in the lab to acquire small eye pupils.
6. Protective goggles must **always** be worn when working at high power lasers. Ensure that the goggles block the correct wavelengths. Reflections should be blocked. The use of protective goggles in other situations is governed by safety requirements and the kind of work being performed. Make sure you understand the safety requirements for your laser.
7. Conventional UV lamps and high-power UV-LEDs can radiate UV light at a level that quickly leads to a strong eye and skin irritation. Wear protective goggles when using such sources.

X-ray radiation

1. All work with ionizing radiation should follow the rules and regulations of “Strålskyddsinstitutet”.
2. If there is any chance of exposure individual dosimeters should be used.
3. Whenever a lab setup is rebuilt, measure the radiation and document the results.

High voltages

1. Qualified electricians must perform modifications of electrical power lines. Do not under any circumstance perform work on 230/400V mains.
2. All work involving voltages over 230 volts shall be carried out under conditions such that proper help can be given immediately in the case of an accident. Remove wristwatches, bracelets and necklaces before starting work. Only senior (not diploma project students) personnel with proper knowledge of risks and accident prevention are allowed to work with high voltage installations. This restriction also applies to 230 volt equipment.
3. Open high-voltage contacts should be avoided. If they must be used, they must be labelled and the voltage disconnected before leaving the laboratory. Be especially aware of the risks to cleaning staff and security personnel.
4. Always disconnect power supplies and **discharge capacitors** before attempting to carry out any work on electrical and electronic equipment.

Gases and gas bottles handling

1. All gas bottles must be securely fastened so that they cannot fall. Use a fire-resistant fastener.

2. Gas bottles are delivered with information on the contents and the type of gas regulator to be used. Use correct valves and fittings.
3. Make sure that you have good ventilation in areas where gas bottles are used to avoid asphyxiation. If ventilation is insufficient, install an oxygen alarm in that area.
4. Take special care when working with explosive gases such as acetylene, hydrogen, etc.
5. Poisonous gases are to be kept in the fume hood. Beware of the difference between a fume hood and a laminar flow bench.

Vacuum equipment

1. Exhaust gases from (rotary vane) vacuum pumps are to be led to the exhaust vent of the air ventilation system. The highly poisonous substance dioxin is formed from the oily mist produced by rotary pumps. Use dry pumps whenever possible.
2. Keep clean vacuum parts wrapped up in aluminium foil, preferably also stored in a labelled plastic bag. Use clean gloves when handling vacuum parts.
3. When baking UHV systems, ensure that you use an isolation transformer or a ground circuit breaker to avoid electrical accidents. Inspect your heating elements for faults before using them.

Chemicals

1. Wear appropriate **protection gear**, such as goggles, apron facemasks, gloves, and lab coat. If your lab coat is contaminated, put it in the laundry and get a clean one.
2. Try to use the least hazardous chemical for you work if alternatives are available.
3. The danger with many chemicals used in research labs is **unknown**. Handle them with appropriate care.
4. Always change gloves after handling the chemicals to avoid spreading to other areas. Never touch the handle of the door with a dirty glove to ensure the safety of others.
5. Always leave your chemical workbench clean and tidy. Put **labels** on beakers, containers, vials, test tubes, etc. that you plan to use later.
6. Before bringing a new chemical substance into the lab, a safety risk assessment has to be carried out. Contact the person responsible for KLARA (the chemical inventory/repository system) on how to do this and how to upload the document to KLARA.
7. All chemicals **must** be accompanied by an MSDS (Material Safety Data Sheet) regarding their physical, chemical and toxic properties ("Varuinformationsblad" or "Säkerhetsdatablad"). When you order chemicals ask explicitly for such information. Any special recommendations in such information regarding the safety must be followed. Make sure you have read and understood the properties of a new chemical substance before using it. Information can be found at www.kemi.se.
8. If the substance that you will work with is classified as a CMR (Carcinogenic, Mutagenic, Reproduction disturbing) substance: 1. Try to find a substitute that is not CMR classified. 2. Make sure your name is noted in your labs' CMR list.
9. Dispose of your chemical **waste** in the appropriate way. This means that you use the correct waste container. The container is clearly labelled with (content, name, phone number, section/group). Glass waste is to be collected in a labelled plastic container or a suitable box. Do not allow build-up of waste chemicals in the labs. Take the waste containers to disposal room at "Godsmottagningen" on a regular basis.

Cryogenic liquids

1. Wear appropriate **protection gear** (face mask, fully covering clothing, shoes, and gloves) when handling cryogenic liquids such as liquid nitrogen.

2. Avoid direct contact with cryogenic liquids. They can cause **frostbite** on **skin** and **eyes**. The reaction on the skin is similar to that caused by burns. Permanent damage to the eyes can result from splashes of cryogenic liquids or gases.
3. Ensure good ventilation when handling liquid nitrogen. This avoids asphyxiation. When liquid nitrogen evaporates, the nitrogen content in the air increases and there is a risk of oxygen deficiency.
4. Ensure that containers allow evaporated gas to escape. This avoids explosions.
5. Transport of liquid nitrogen together with people in elevators is forbidden due to the risk of asphyxiation in confined areas. Ensure that containers remain standing during transport.
6. Transports outside the labs should follow the rules for transporting dangerous goods. Do not use public transport.

Radioactive substances

1. If using radioactive materials, inform yourself about handling procedures. An excellent starting point can be found here: <https://internwebben.ki.se/en/laboratory-safety>
2. Before bringing radioactive materials into the labs, ensure that you have the compulsory permits. These permits come from Strålsäkerhetsmyndigheten but are applied for through KTH centrally.
3. It is mandatory to attend a radiation safety course before working with radioactive material.

Bio hazardous substances

1. If using cells, antibiotics etc., inform yourself about handling procedures. An excellent starting point can be found here: <https://internwebben.ki.se/en/laboratory-safety>

Computer safety

1. Comply with existing legislation concerning file-sharing, copyrights, etc.
2. Lab computers quite often run on out-dated operative systems, and use special software dedicated to a specific piece of equipment. Think twice before connecting these computers to networks, or when updating software.
3. Make sure that you protect your computer systems from viruses, malware, Trojans, etc. Ensure that your computer has appropriate protection. Backup important data to avoid permanent loss.

In Case of Fire

1. Note the nearest exits for your lab and office area. Larger labs have two exits. In case of power outage, do not panic, let your eyes adjust to the darkness and slowly move toward the nearest exit. There is emergency lighting in the corridor.
2. Please observe that doors facing stairwells always are fireproof doors and should automatically close in case of fire to prevent smoke from spreading.
3. In case of fire alarm, everyone must evacuate the building and go the assembly area ("återsamlingsplats").



Declaration and signatures

I have read and understood “Lab Practice and Safety guidelines” for the Department of Applied Physics and have discussed its content with my supervisor/group leader.

Signature

Date

Name

Supervisor/Group leader

Date

Name