UNIVERSITÄT SIEGEN

Regulations for Laser Laboratory

1 Area of Application

These Laboratory Regulations are valid for working in the Laboratory of Nano-Optics in the department of Physics, Faculty IV at University of Siegen.

2 Responsible Persons

Professor Mario Agio is the responsible supervisor of the Laboratory of Nano-Optics. His responsibilities include ensuring the entrepreneurial duties and working conditions act (Arbeitsschutzgesetz) and ordinance on hazardous substances (Gefahrstoffverordnung). The following are contact persons for the laboratory:

Name	Function
Assegid Flatae	Yearly Instruction of employees working in the lab.
Assegid Flatae	Yearly Instruction of students working in the lab.
Assegid Flatae	Purchase and hand out of personal safety equipment.
Assegid Flatae	Preparation of operating instructions for hazardous substances or machines.
Assegid Flatae	Laser safety and protection, should be informed immediately of any changes to the test setups, faults, etc.

Mario Agio	Prepare or update the risk assessment together with the contact persons.
Jan Krause / Administration	Arranging the necessary regular checks of machines and laboratory-waste removal protocols.
Jan Krause / Administration	Refilling any used first-aid-equipment in the laboratory.
Jan Krause / Administration	Initiation / execution of the test of portable electrical equipment and gas sources.

3 Conduct in case of technical faults

- In the event of faults on the lasers, contact the laser safety officer.
- In the event of any malfunction of machinery, the responsible persons must be contacted immediately.
- Disruptions to the technical infrastructure (gas, water, electricity, sewage, ventilation, etc.) must be reported to the central control center (ZLT) of the university (Tel -4321) without delay.

4 Tidiness and cleanliness

- Order and cleanliness are important foundations of occupational safety.
- All used materials should be cleaned after use and cleared in the appropriate cabinets etc.
- It is best to avoid placing materials on the floor throughout the laboratory so that there are no tripping hazards. Connecting cables (electricity, water, gas, telephone, test leads) should be routed above the traffic areas (at a minimum height of 2 m). If this is not possible, they must be covered with cable bridges.
- Spilled liquids must be absorbed immediately.
- The storage of required materials at the workplace must be carried out in such a way that there are no increased hazards (especially risks of cuts and stabs).
- Especially above 1.4 m height, all materials should be stored in such a way that they do not fall accidentally but can be removed safely.
- At the end of work, the used equipment (if possible) should be switched off, cleaned and stowed so that the cleaning staff can safely clean the laboratory. If this cannot be guaranteed, a message to Department 5.4 (Tel 3280) is required so that the room is taken off the cleaning list.

5 Access permission

- Access to the laboratories is only permitted to those who received expressed permission of the responsible persons.
- Persons who are not affiliated with the laboratory may only be present in a laboratory with the permission of the person responsible for the laboratory in question or in the company of a laboratory worker.
- Unauthorized persons are to be expelled from the laboratory.

6 Operating hours

- Operation in the laboratory is only permitted at the following times:
- Monday to Saturday from 07:00 until 22:00
- Working on Sunday and public holidays is prohibited!

For activities outside of these times, the expressed consent of the responsible persons is required. For these times, make sure that:

- First responders are available at all times
- Personnel is available, who could instruct the rescue service.

7 First Aid

7.1 First-aid equipment

The locations of the nearest first-aid kits as well as the nearest emergency terminal are noted on the emergency notice on the laboratory doors.

7.2 First responders

There is a list of the closest first responders on the emergency call sign on the laboratory doors.

7.3 Emergency/conduct in case of accident

In case of emergencies / accidents, the following procedure should be followed:

1. **Ensure Self-protection!**
2. Secure the danger area or take people out of danger area.
   Consult first responder / paramedic, if necessary make emergency call
   Emergeny call: to the university's central control centre, emergency no. (0271 / 740) 2111. who will redirect the emergency call to the rescue service and organizes further measures, such as
   - Informing the Rescue Assistant of the University
   - Opening of the entrance gates for the rescue service
   - Informing the caretaker who will instruct the rescue services,
   - Notify more First-responders.

   Outside the duty of the ZLT (Mon-Fri 06:00-22.00, Sat. 08-12:00) this emergency number is forwarded to the security service, which then causes the alarm of the external rescue workers. The briefing of the rescue service as well as the alerting of first-aiders must be organized in this time!
   If the number cannot be reached, the fire-brigade and rescue control center be contacted directly from all internal telephones at 6-112.
3. Provide first aid, care for injured persons
4. Alert and guide Emergency Service (if necessary via caretaker/porter).
5. Inform your supervisor.
6. All injuries (incl. minor injuries) must be documented in the first-aid-book!
7. If it is necessary to consult a doctor or in case of absence from work for more than 3 days, the responsible person for Laboratories must prepare an accident report. This report will be sent first to department 1.1 and then on to Unfallkasse NRW.
8. Refill any used first-aid-equipment. All refill materials can be obtained at department 1.1

8 Fire Protection

More details concerning fire protection can be found in part A and B of fire protection regulations (Brandschutzordnung) of the University of Siegen.

8.1 Emergency/Conduct in case of fire

Always:

- Ensure Self-Protection!
- EMERGENCY CALL -2111 (ZLT) or press emergency button (in corridor).
- If possible, switch off exp. setups and energy sources (emergency stop, fuse).
- In case of incipient fires try to put out the fire with suitable extinguishing agents.
- Keep distance to electrical equipment / voltage sources!
- In case of larger fires please exit the area quickly but calmly whilst
  - closing doors and windows, but not locking these (Fire service would need to break them open)
  - warning others and helping them to exit,
  - not using lifts
  - exit building by following the indicated escape routes to the meeting area (In front of building C).

At the meeting point count and check if all persons belonging to working group (including students) are present.

8.2 Fire protection equipment

- The building is equipped with an automatic fire alarm system for the early detection of fires and the rapid alerting of affected persons.

- If the bell / horn / siren sounds, the building must be left immediately via the signposted escape routes to the meeting point.
- Fire extinguishers are in the corridors

8.3 Fire protection measures

- All persons in the laboratory must be familiar with the locations of emergency stop facilities (electricity / gas), escape routes, first aid facilities (first aid kit, emergency shower, eye shower) and fire extinguishing equipment.
- Always keep escape routes clear to full extent (doors + windows!)
- Easily combustible materials (paper, wood, etc.) must not be placed in escape routes.
- Storage rooms for wood, paper, flammable liquids or gases or other easily flammable substances must not be entered with an open flame. Smoking bans must be followed.
- Flammable liquids may only be kept in the workplace up to the amount of daily requirement. The provision of combustible packaging material should not exceed the need for one working day.
- Remove waste and shavings regularly.
- Used, oily cleaning cloths must be collected in the designated, closed refractory containers due to their risk of auto-ignition.
- At the end of working time make sure that lights and all electrical appliances are switched off. Excluded are devices that are in continuous operation.
- Safety, telecommunication and fire alarm systems remain permanently operational and must not be switched off. Close all the windows and doors.
- Burning candles (for example on Advent wreaths or arrangements) are prohibited in all offices and service areas.
- Welding, cutting. Soldering and cutting work requires special safety measures and (except in the designated workshops) written permission (welding permit). The permit must be obtained from the responsible site supervisor or the responsible departmental head of the building department.
- The installation and use of other than official electrical equipment is prohibited without special permission.
- Defects in fire protection equipment and damage to electrical installations as well as signs (flickering light, stench, etc.) must be reported immediately to the fire prevention officer or supervisor.
- Blown fuses, defective sockets and cables must only be repaired by authorized specialists (Department 5.2).
- In the event of fires on electrical systems, the power must be switched off immediately by means of an emergency stop switch, provided that emergency stop switches are available in the premises.
- Smoke and fire doors are always kept closed unless they are equipped with self-closing devices. Laboratory doors should always be kept closed to prevent the dangerous spread of smoke in case of fire.
- The use of wooden wedges or other objects to keep doors open is prohibited.

9 General security regulations

9.1 Clothing/protective gear

- Always wear closed, appropriate shoes in the laboratories.
- Normal clothes must be tightly fitting, especially when working on rotating parts.
- Due to the risk of accidents (reflections) take off jewellery (rings, chains, watches).
- When working with laser beams of classes 3R, 3B and 4, appropriate laser safety goggles must be worn for the wavelength.
- The required protective equipment is available with: Assegid Flatae
- As a general rule: Protective equipment must be visually inspected before use. Damaged protective equipment may not be used further!
- In case of increased noise, ear protection must be worn.

9.2 Eating, drinking, smoking

- Food may not be eaten or stored in the laboratory rooms.
- Beverages may only be introduced in closed bottles / containers. Smoking is - as in all rooms of the university - prohibited.

9.3 Youths, pregnancy

Note: Special restrictions apply to women, pregnant women and adolescents in accordance with the Maternity Protection Act, the Hazardous Substance Ordinance and the Youth Employment Protection Act.

9.4 Safety measures whilst operating lasers

9.4.1 General

- Never consciously look into the laser beam
- All persons in the room must be informed about risks and protective measures.
- You are obliged to attend laser safety training once a year to operate the lasers in the laboratory.

9.4.2 Laser classes 1, 1M and 2

In addition to the above listed measures, the following points should be noted:

- Through the use of optical instruments, the laser beam may be bundled so that the protective measures of the higher laser classes apply.

9.4.3 Laser classes 3R, 3B and 4

In addition to the above listed measures, the following points should be noted:

- In case the laser beam is not completely encapsulated, the door must be provided with a doorknob from the outside and the operation of the laser must be signalled by a warning light.
- On the corridor side of the laboratory door a sign "warning against laser danger" with the types of the used lasers (wavelength, class) must be attached.
- The warning light "Caution laser operation" must be switched on, if this does not happen automatically.
- The experimental setup must be checked by the laser safety officer (see above) when major changes have been done before the laser is switched on.
- Before switching on the lasers or opening the shutters, the operator must make sure that the necessary protective measures have been taken.
- All persons in the room must wear the appropriate laser safety goggles (suitable for the wavelength), insofar as the laser beam is not safely shielded.
- It must be ensured that laser beams cannot reach outside the room (darkening of the windows, closed doors).
- Rings, watches, jewellery, etc. should be removed when working with open laser beams to avoid accidental reflections.
- The use of flammable hazardous substances or other readily flammable substances (such as paper) in the area of the laser beam increases the risk of fire. The use of these substances should therefore be avoided.
- When making adjustments
    - If possible, use auxiliary laser,
    - If possible, wear the appropriate safety goggles,
    - shield unnecessary beam paths with shutters or radiation traps,
    - accidental intervention in the beam should be avoided by appropriate arrangement of the components, protective covers or the use of assistive devices (tools).

9.5 Experimental Setups

9.5.1 General

- Experimental Setups must be sufficiently steadfast, stable and suitable for the applied temperatures and mechanical movements.
- In case of unattended endurance tests, protective measures for incidents (power failure, cooling failure, unexpected reactions) should be provided.
- All experimental setups are to be designed in such a way that they can be easily put into a safe state in the event of danger by emergency stop switches (or similar devices).
- Test setups may only be put into operation for the first time if they have been checked by a responsible person (see above).

9.5.2 Protection against electrical hazards

- In setups containing electrical equipment, it must be ensured that they are undamaged and suitable for the purpose of the experiment.
- In areas where there is a possibility of liquid splash, only splash proof (water protected) equipment may be used (for example, next to sinks).
- Experimental setups must never be put into operation in which contact parts with dangerous voltages (such as main voltage) are freely accessible.
- Repairs and maintenance work on electrical equipment may only be carried out by suitably qualified persons (electricians).

9.5.3 Protection against mechanical hazards

- If there is a risk of parts could spin out of the experimental setup, solid protective covers must be installed.
- With motions that occur at a speed of more than 10 mm / s, protective measures must be taken to prevent person from reaching into the crushing zone or shear point. This can be prevented by means of fixed covers directly at the danger spots or an effective shut-off of the entire danger area.
- Take special care in the area of rotating rollers, shafts or gear parts. Due to entanglement hazard, these are to be secured in any case.
- Before carrying out any work on the set-ups, the relevant driver must be stopped and secured against being switched on again.

9.6 Operating machines

9.6.1 Instructions

- Machines and devices may only be put into operation by those who have been instructed by one of the above responsible persons in correct handling.
- Instruction must be repeated annually. The instruction has to be documented by signature.
- Handling of machines and devices are to be carried out as work-related and due to their necessity.

9.6.2 Operational instructions for machines

For the handling of dangerous machines and equipment rules of conduct have been prepared by the responsible persons. These operating instructions list the most important protective measures and rules of conduct. These operating instructions must be observed!

9.6.3 Protective devices

- Machines may only be put into operation if the protective devices provided are in place and effective.

- The manipulation of protective devices is prohibited and may result in criminal prosecution!

9.7 Dangerous activities

Activities with an increased risk of fire or injury (e.g., working with circular saws, corrosive hazardous substances, dangerous electrical voltages, lasers of classes 3B and 4) may only be carried out if at least one other person is present, even if the specially required protective measures are taken who is not allowed to do the same job. This person must be able to provide first aid or get help in case of danger.

9.8 Unsupervised Experiments

Unsupervised experiments are only permitted, if it is guaranteed that

- other people cannot intervene in the experiment or be endangered by it,
- dangerous conditions cannot occur, even in the event of power failure, cooling water etc.,
- there is no increased risk of fire due to overheating, for example.

10 Waste

- Expendable waste must be placed in the designated waste containers.
- Electronic waste, toner and used batteries should be taken to the collecting boxes.
- For residues of hazardous substances or contaminated equipment, contact Christoph Grebe, tel. -2222, to receive information on correct disposal.

Siegen, date
20.01.2021

Prof Mario Agio
Supervisor of Laboratory of Nano-Optics

11 Annex

11.1 Observe the rules of conduct according to the notice

11.1.1 In the room where the laser is located

- The room should have the external lamp “Laser in Betrieb” on. (see picture).
- Apply a beam stopper to the laser or use a flipping mirror to make sure the beam is not in the area where you install the laser bridge. Alternatively, switch the laser off. In this case, switch off also the external lamp “Laser in Betrieb” if no other lasers are operating in the room.
- Open the aperture in the wall by sliding the metal lid apart (see picture).
- Insert the laser bridge by sliding one of its ends in the position where the metal lid originally was (see picture).
- Align the laser bridge with the laser beam path to make sure that the beam can go through without touching the bridge.

11.1.2 In the room where the laser beam is being used

- The room should have the external lamp “Laser in Betrieb” off if no other laser sources are in use.
- Open the aperture in the wall by sliding the metal lid apart (see picture).
- Insert the laser bridge by sliding one of its ends in the position where the metal lid originally was (see picture). The lamp “Laser in Betrieb” will automatically switch on for that room if the laser in the other room is on.
- Remove the beam stopper or use the flipping mirror to let the laser beam pass through the laser bridge. Alternatively, switch the laser on, but before you do so switch the external lamp “Laser in Betrieb” on. The lamp will automatically switch on also for the room where the laser bridge delivers the laser beam.
- Center the laser bridge with the laser beam as desired.

Laser in Betrieb


Aperture in the wall


Laser bridge