Physics Lab
ETH zürich

Physics Lab P3 / P4

Introduction for Teaching Assistants

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https://p3p4.phys.ethz.ch

Version 20. August 2025

Physics Lab P3 / P4

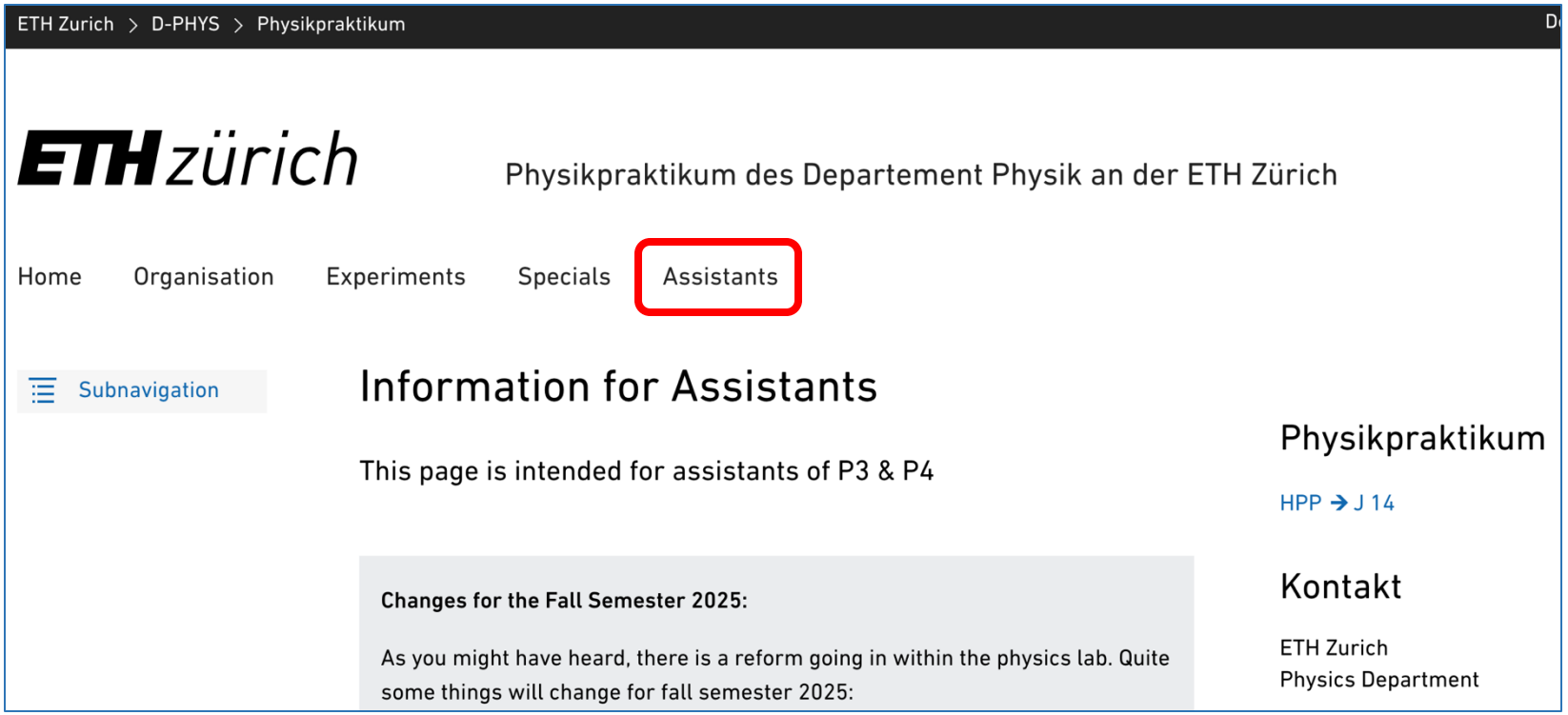
There was a reform in 2024/2025 for all the physics labs:

- One physics lab responsible for *all* courses (>1000 students)
- P3 (and P4) should be more aligned to P1 / P2
- Students have more choices
- Student number rise: >150% compared to 2018!
- Structural changes compared to the last years
- ***It is run for the first time in this current mode: Please give feedback, help to improve, be attentive for mistakes!***

All these information are online!

https://p3p4.phys.ethz.ch!

(not „vp.phys.ethz.ch“ anymore!)



Overview: Where does the P3 take place?

1st Semester:	---
2nd Semester:	Data Analysis Lecture
3rd Semester:	Physics Lab P1
4th Semester:	Physics Lab P2
5th/6th Semester:	- P3 (currently mandatory) choose 1 - P4 - P+ (project-based physics lab) - IGP (InGroup Projects, former ASL) - Semester Thesis - Proseminar (Theory Course)

Goal of P3 and P4

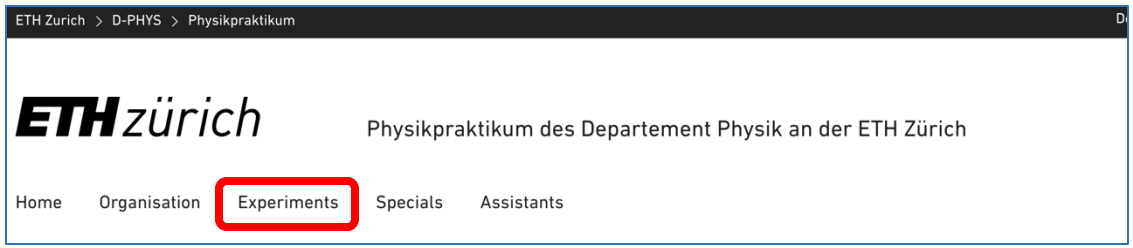
Help the students to learn how to **perform** and **document** complex experiments with larger **autonomy** with respect to P1/P2. It's a first step in a "research-like" project and prepares them for the next projects

Students should learn how to:

- (Plan / build experiments)
- Perform measurements and solve associated problems
- Keep a useful log-book
- Analyze data (error propagation, proper fits)
- Interpret the data and draw conclusions
- Write scientific reports
- Keep track of their time

These are bachelor students in physics BSc, often very motivated. They typically enjoy the interaction with real scientists, so you might want to talk with them about your research. Maybe they'll want to join your group!

Available Experiments



Available Physics Lab Experiments

Name of the Experiment	Manual	Poster	Lab (HPP)	Topic	Comment
AD-flash converter	Manual	*no poster available*	H 41	E	no comment
Alphaabsorption	Manual	Poster	G 12	N	no comment

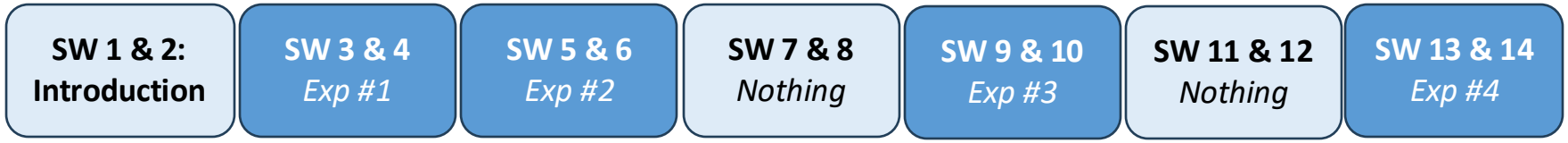
About 45 experiments, >100 places, covering most fields of physics

If possible: Keep TAs on the same experiment for several semester

Many experiments could benefit from an „update“ (mostly the manual). Please help me!

New Structure

After the introduction(s), the fall semester consists of **6 blocks à 2 weeks**:



- Choosing experiments can be done via a **web application**. Students can sign up once they passed a safety test.
- Students are mostly **free to decide** which experiment they want to perform. Some experiments can be performed in **groups of 2**, others have to be performed **alone**.
- The labs are **open daily** (no closed labs on Thursday anymore!) from 8.00 – 18.00. The helpdesk (HPP J14) is occupied from 8.00 – 18.00
- **Monday is the mandatory** day: We expect students and assistants to be in the labs, at least for some hours! (There is an assistant room in HPP G21…)

New Structure

- You are in charge of your experiment:
  - Make sure you know how to operate it **before the semester**
  - Please check whether somethings is missing / faulty -> tell the helpdesk!
  - Make sure you are familiar with the **safety regulations** for your experiment!

- Every 2 weeks, students beginn a new experiment. You see in the webtool who

- After the first meeting with you, students are free to work in the lab as they please.

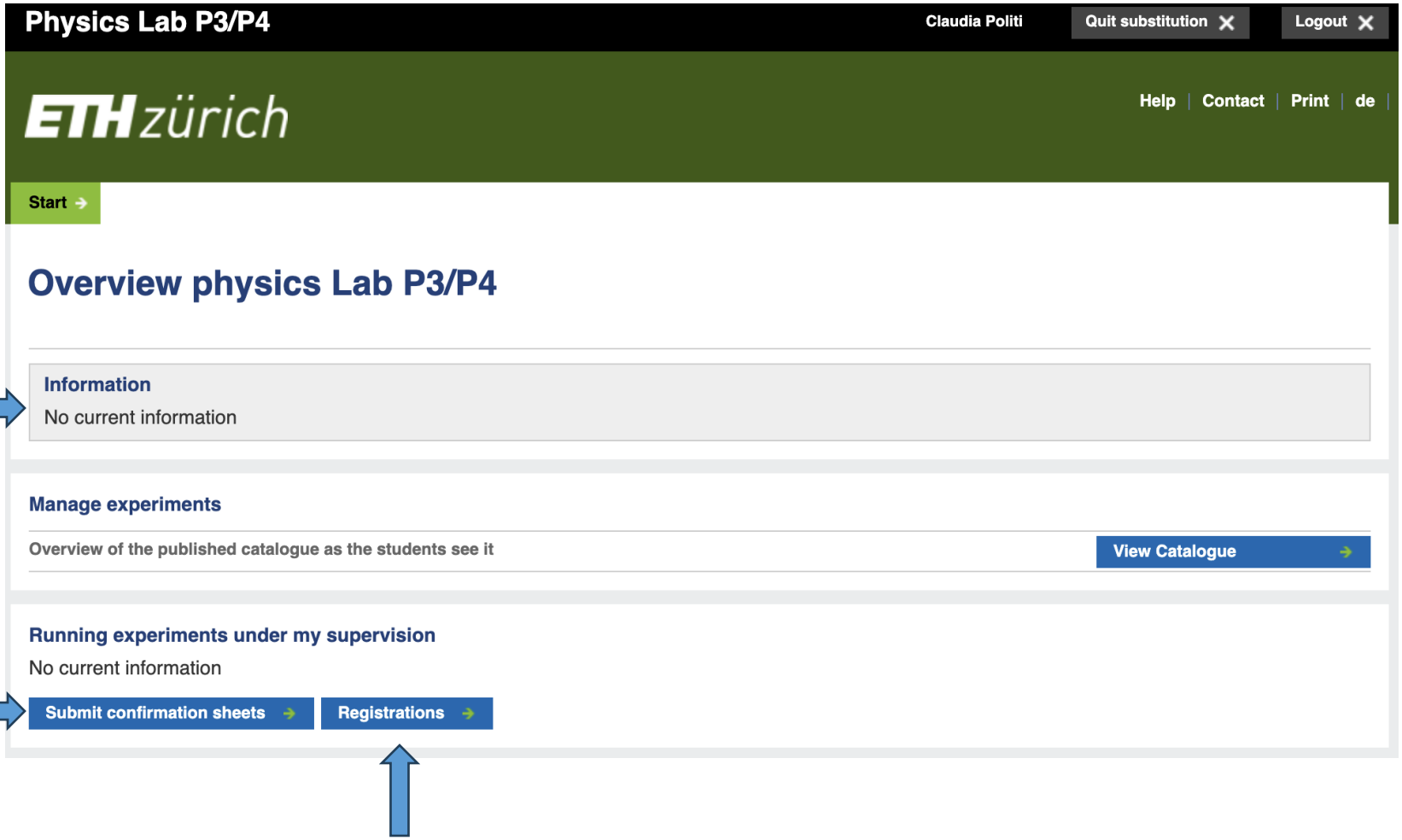
- Experiments with a higher risk level require special rules:
  - Students are not allowed to work alone *unless* you and the student(s) sign a form that they have been instructed accordingly
  - The signed form remains in the lab until the students are done *(more on that later!)*

- Some experiments need 2 students for safety reasons.

- You are responsible for the manual and the poster (I cannot…). Please contact me if revisions are needed. I will support as good as possible.

Webtool

https://www.lehrbetrieb.ethz.ch/laborpraktika/



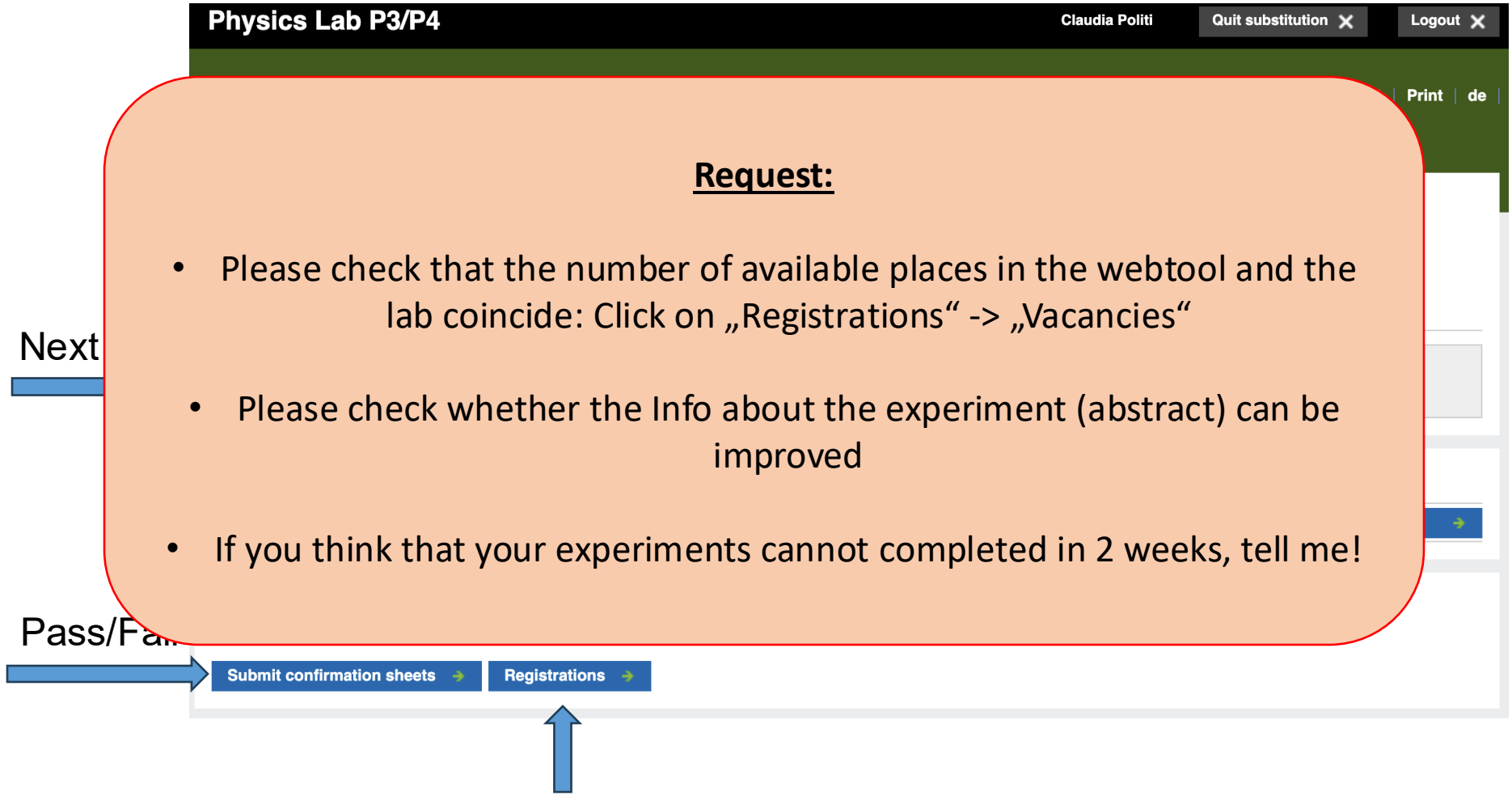
Next lab

Pass/Fail

Scheduled Students

Webtool

https://www.lehrbetrieb.ethz.ch/laborpraktika/



Request:

- Please check that the number of available places in the webtool and the lab coincide: Click on „Registrations“ -> „Vacancies“
- Please check whether the Info about the experiment (abstract) can be improved
- If you think that your experiments cannot completed in 2 weeks, tell me!

How does one 2-week-cycle look like?

1. Students sign up for an experiment (at least 4 days = 96hrs in advance)
2. You meet the students on Monday: Agree with them where/when!
3. Introduction to the experiment and the specific safety regulations
4. Mandatory presence in HPP: Either Monday, 10-12 or Monday, 14-16 (#)
5. Stay available during the week (upon request)
6. Students work «independently» (as good as possible)
7. Ask students: Do they need help? Are the results reasonable?
8. Report hand-in 2 weeks after the experiment is finished

(#) Let me know if you are not here!

Correct the report **within 1 week!**(*)

(*) this is the major point of criticism, complaints and problems!

How does the first meeting with the student look like?

1. Check that they are prepared (else: send them home, meet another time)
2. Ask them some questions
3. Tell them what *you* expect from them in terms of measurements, reports, additional material, …
4. Train them on safety aspects for that particular experiment!
5. Agree on at least one meeting during the 2 weeks!
6. When they claim they are done, check the result! It's not possible to return to the setup!

7. Remind them about the report (2 week deadline)

Report Writing

Students have to submit a report containing:

- Abstract
- Physics issues and experimental issues
- Description of the measurements (procedure, variables …)
- Description of the results AND error estimates
- Discussion: What was learned…
- Summary
- A brief appendix with the summary of safety rules they had to comply with

Students are allowed to:

- Do the measurements in common;
- Write down the data and notes into one common logbook
- Discuss physics and any potential issues in common.

But:

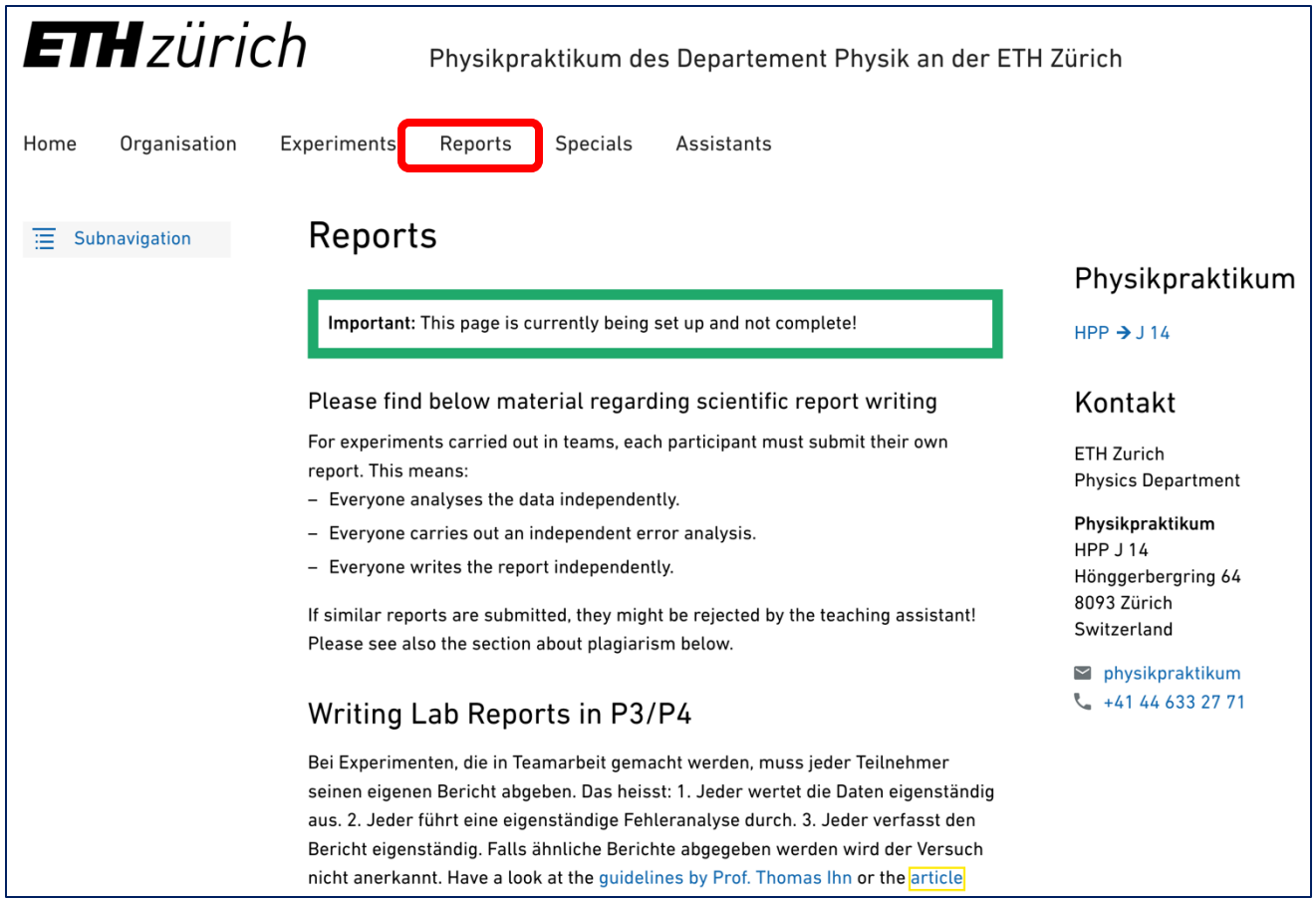
- They have to analyze and interpret the data **individually**, and have to write an **independent** report in their own phrasing!

Resources for Report Writing

Please have a look at the website, to learn what material we provide the students!

If you have additional input or resources, please let me know!

Students attended the data analysis lecture in their 1st year, and passed P1/P2



Report Writing, Corrections and Testats

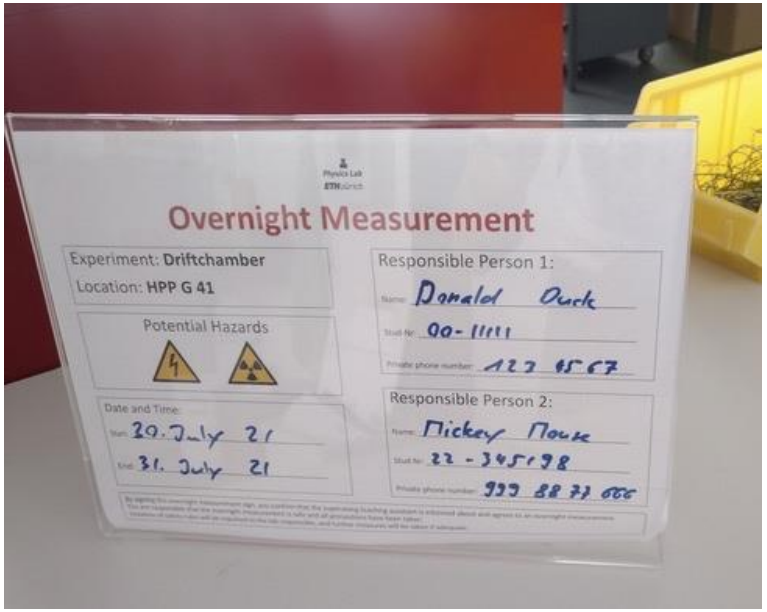
After you've received a report:

- Immediately check it: Is **anything missing**? If yes -> tell the students *asap*
- Correct the report within **one** week. If you cannot make it (you're on a conference) -> tell the students
- The students should hand in the corrected version of the report again after **one** week.
- Once you are satisfied with the report, **meet the students** (in person / online) to discuss their performance: Lab work / Analysis / Report. This is crucial for them!
- After this meeting, grant the students the testat in the webtool!

Overnight Data Taking

Some experiments take rather long (background measurements, radioactive decays, …)
In this case: Students can fill out an «overnight measurement sign» (it's in the lab).
Without this sign, the technical team switches off the experiment (-> data might get lost…)

- Compton
- Environmental radioactivity
- e+e- annihilation
- Driftchamber
- X-ray diffraction
- Gamma-Spectroscopy



If students want to take data overnight and the experiment is not listed, let me know!

Access to the Labs

For TAs:

- All the labs are locked with a CardLink-System
- Your ETH-Card opens the door
- *Update your CardLink every 30 days in HPP F-Floor (next to the elevator)*
- It has to say «Update erfolgreich» on the screen
- You have access until the last day of the semester
- The access is granted from 8am to 6pm, every day

For students:

(just that you know in case they forget and ask you)

It’s the same as for you!

Experiments using Liquid Helium

- We don’t have a continuous stock of LHe in the physics lab, but we order the LHe when it’s needed. It takes about 2-3 days until the LHe arrives in the lab.
- Send an mail to me (egandrea@phys.ethz.ch) with the desired LHe delivery date well in advance.
- Please coordinate with the students when they want to do the experiment. Students performing a cryo experiment should perform the measurements time-efficient!
- You are responsible to make sure the Dewar's don’t get empty/warm. Count for about 1.5 L per day of LHe consumption when a Dewar is not used.
- Please check the LHe level regularly if you have a Dewar on your experiment. Inform me if a Dewar is not needed, or when you want to have a refill. Please calculate generously and rather ask for a refill earlier than later. It again takes 2-3 days until you have the new Dewar. A warm Dewar, however, costs us quite some money and time, and maybe privileges!

Your Presence in HPP

In recent years, sometimes the contact between TAs and Technical Team was “difficult”.

We ask you to be in HPP on Monday either **between 10am and 12am**, or **between 2pm and 4pm**

This is the time where we can discuss about questions/problems/safety aspect

Students know you are here and can find you

There is an assistant room (HPP G 21) or you stay in the lab

If you have no students: Correct reports, make suggestions for the manual etc.

If you are not at ETH, let me know (by mail). Also, let **the students know!**

Outside these 2 hours, we expect you to be available for the students during the week. Keep in mind that your students have to finish within 2 weeks!

Important Dates

- Experiments start on Mondays:
  - 29th of September
  - 13th of October
  - 27th of October
  - 10th of November
  - 24th of November
  - 8th of December

- 2 TA Meetings during the semester:
  - Monday, 3rd of November, 10 am, HPP K 25
  - Monday, 15th of December, 10 am, HPP K 25

- Helpdesk (HPP J 14) is occupied daily from 8am – 6pm

- We make a “patrol tour” every evening after 6pm to check:
  - Nobody is in the lab
  - No experiment is running (except for those with overnight sign)

Absences

Planned (conference, military service, etc…):
It's your responsibility to organize somebody to replace you, early enough. If it's just for *a few* days (1, 2, …), please organize with the students, maybe no replacement is needed.
Please instruct the replacement accordingly!

Unplanned (sickness, accident, …):
Send me a mail or via PHYS-Element-Chat. Can be *very* informal, I just need to know.

In any case:
- communicate with the students!
- Tell me (most important!)

"… I cannot find my assistant!" is NOT acceptable !

ECTS for Students

- In order for the students to pass an experiment, they need:
  - Take data in the lab (2 weeks)
  - Analyse the data at home
  - Write a report (~2 weeks) and hand it in
  - Correct the report according to your instructions

- Once they have a report you accept, please **submit the confirmation sheet in the webtool**! (bottom left button)

- You can add comments / grades (they are only a feedback!) for students

- Students have to work ~250hrs for P3/P4, so ~60 hours per experiment (including report and corrections!)

Logbook

We insist on a „real lab-journal“ (preferably paper), which must contain:

- Experimental topic
- Relevant parameters of the instruments
- Progress of the experiment (special observation or events)
- Rough analysis + first estimates of results (is it feasible?)
- Signatures of the assistant

Maybe show them how you keep a log book!

Safety

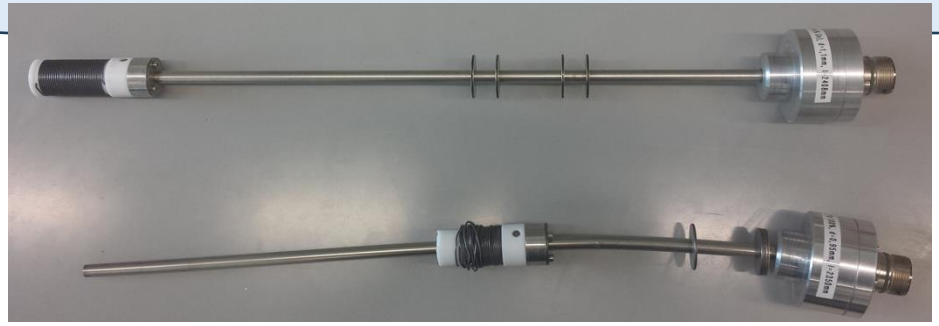
Safety: Are you familiar with the safety rules ?

- Radiation
- Cryogenics
- Lasers
- High voltages
- Chemicals
- Experiments involving cryoliquids / lasers must be performed in a team of 2

Students need to write a safety paragraph / appendix! You should help them, teach them, instruct them. In the end, a “risk assessment” will be compiled.

A lecture on safety is available on the p3p4-page. If you are uncertain talk to us and your supervisor.

You are responsible for your setup and must know its hazards!



Working alone in the lab

For “dangerous” experiments

(LHe, Laser, **NOT Radioactivity**):

- Students are only allowed to work alone (without you!) once they have been trained on the setup.
- This is documented on paper which you find next to your experiment.
- You *and* the student sign that:
  - They know about the specific dangers
  - How to safely operate the specific experiment
  - Students document when they work at the setup
- The sheet remains in the lab until the students are done. Then, it’s brought to HPP J14 (letter box)

Sicherheits- und Bestätigungsformular für Experimente mit Lasern

Experimentname: _____

Bestätigung durch Studierende und Assistierende

Studierende	Assistent:in
☐ Ich wurde über die Gefahren von Laserstrahlen im Allgemeinen und den hier verwendeten Lasern im Speziellen aufgeklärt.	☐ Ich habe die Studierenden über die Gefahren von Laserstrahlen im Allgemeinen und den hier verwendeten Lasern im Speziellen aufgeklärt.
☐ Ich kenne den hier verwendeten Laser, die Wellenlänge, den Strahlengang, und wie erkennbar ist ob der Laser eingeschaltet ist oder nicht.	☐ Ich habe den Studierenden aufgeklärt über den hier verwendeten Laser, die Wellenlänge, den Strahlengang, und wie erkennbar ist ob der Laser eingeschaltet ist oder nicht.
☐ Ich weiß, wie die Schutzbrille zu verwenden ist und wann sie zu tragen ist. Ich überprüfe die Schutzbrille auf mögliche Schäden.	☐ Ich habe erklärt, wie die Schutzbrille zu verwenden ist und wann sie zu tragen ist. Ausserdem habe ich erklärt, wie die Schutzbrille auf mögliche Schäden zu überprüfen ist.
☐ Ich kenne die Position des Lasers im Aufbau sowie die notwendigen Handgriffe zur sicheren Durchführung des Experiments.	☐ Ich habe die Studierenden über die Position des Lasers im Aufbau sowie die notwendigen Handgriffe zur sicheren Durchführung des Experiments aufgeklärt.
	☐ Der/die Studierende wurde ausreichend instruiert, das Experiment ohne Beisein der Assistenz durchzuführen.

Unterschrift Student/in: _____ **Datum:** _____

Unterschrift Assistent/in: _____ **Datum:** _____

Logbuch für die Arbeiten im Labor

Datum	Zeit von	Zeit bis	Student/in 1	Student/in 2

Suggestions for improvements are welcome!

Lab Team & Helpdesk

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Find us in HPP J 14

Questions?