

Module 4 of the IFA Challenge Track is concerned with experimental physics and takes place in weeks 16-25.

You will be working in groups, but will be writing individual reports. Emphasis will be placed on good experimental practices in the laboratory (e.g. logbook keeping) and on the correct treatment of measurement uncertainties and systematic errors in data analysis.

List of experiments

1. Measure the speed of relativistic electrons emitted by a radioactive source.
2. Measure the speed (and potentially the direction) of cosmic-ray muons.
3. Reenact the Fizeau experiment.
4. Study the motion of solid bodies in viscous liquids.
5. Study the rotational motion of a gyroscope.

Module aims

In this module you are asked to:

- To plan and perform a laboratory experiment and produce a laboratory script which will guide others to perform the same experiment.
- Carry out the experiment of another group, following the script they have provided.
- Analyse experimental data, including thorough treatment of measurement uncertainties.
- Write a report on your experiment.

Script, report and evaluation

Each group will produce a laboratory script describing the execution and analysis of an experimental program which they have devised. Clear guidance should be provided on the experimental procedure to be followed and the analysis to be carried out. The level of detail should be sufficient that a group is able to execute and analyse the experiment described without any additional help. There is a limit of maximum 10 pages. The experiment should be planned to clearly illustrate specific physics concepts, and this should be reinforced by the data analysis. The lab script must be written in English and include objective, introduction and theory, description of the experiment, results, discussion, and conclusion. The results must be illustrated by well-prepared figures, and uncertainties and measurement errors must be accounted for. In order to pass the module, the instructors must find that the lab scripts are of sufficient quality. The scripts must be written in a well-formulated language and the experiments (and their interpretation) should be discussed carefully at an appropriate scientific level.

Each group will then carry out one of the experiments developed by their peers. Each student is to write a lab journal, of maximum 10 pages, on this topic.

You will receive feedback on the quality of both your joint lab script and individual journal, but will not receive an actual grade. The course is graded as Pass/Not Pass based on the quality of both the script and journal.

Acquired skills

By the conclusion of this module you should be able to:

- Plan and carry out an experiment as part of a group.
- Produce a clear written record of how to recreate your experiment and its analysis.
- Apply concepts of special relativity to interpret experimental data.
- Identify and quantify sources of error and correctly treat experimental uncertainties.
- Communicate the results of an experiment to your peers in written form.

Important dates

Deadline for signing up to the module: 8/4 at noon

Send an email to Søren Ulstrup (ulstrup@phys.au.dk), including your student number and FYS-team number.