

Proposal for a project in Applied Physics

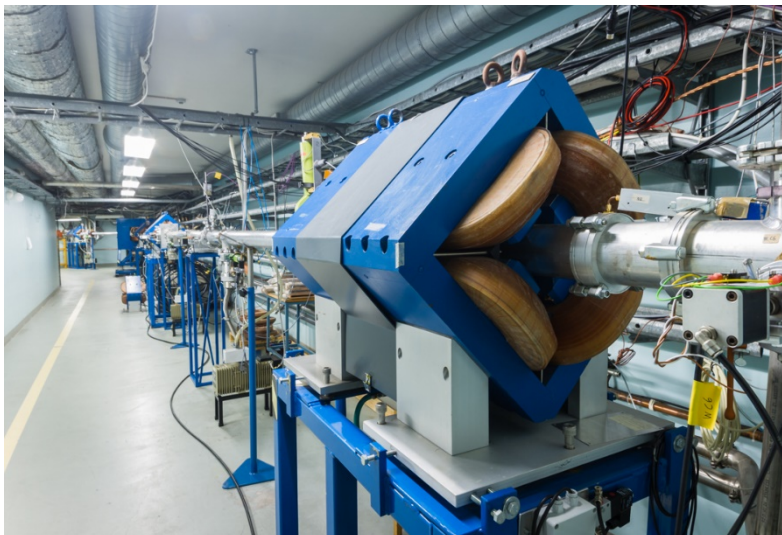
Course 1FA492, Autumn 2019

Measurements and analyses of induced radioactivity in beam line magnets from a particle accelerator

What is the background for the project?

The Svedberg Laboratory (<https://www.tsl.uu.se/>) at Uppsala University is an accelerator facility which currently is being decommissioned. The material of the beam line components in the facility has been activated when the accelerator was in operation, either because it was struck by the beam itself or by secondary neutrons produced when the beam hit material along the beam lines. An important part of the decommissioning work is to determine the radioactivity of all artificially produced nuclides in the equipment. To aid the work of characterising such radioactivities, it is common to create and use so called nuclide vectors, which contain information about the relative abundance of radioactive nuclides in the material. With the help of well determined nuclide vectors it is possible to significantly reduce the amount of work spent on measurements and analysis of samples taken from the equipment.

In Sweden and in many other countries there are a large number of projects for decommissioning of nuclear power plants, accelerator laboratories and other facilities where ionising radiation has been present during the operation. For such projects, there is a strong demand for physicists who are experienced with nuclide specific measurements and decommissioning work. The gained knowledge for the students who have completed this project will be useful for future work in similar projects.



View of one of the beam lines at The Svedberg Laboratory at Uppsala University

What are the problem formulations to be solved?

In this project, the students will use nuclide specific measurements based on gamma-ray spectroscopy to determine the nuclide vectors of the materials of two quadrupole magnet which are installed in the beam line at TSL and to investigate if the nuclide vectors are useful for the decommissioning and clearance work performed at the facility.

How will the project investigate the problems identified in the previous question?

Outline of investigations performed within the project:

- Make a plan for which material samples should be taken from the magnets.
- Take the samples.
- Prepare the samples for nuclide specific measurements.
- Perform gamma-ray spectroscopy measurements of the samples with an HPGe detector.
- Analyse the results of the spectroscopy measurements.
- Determine the nuclide vectors.
- Evaluate the results and present them both orally and as a scientific report.

Number of students

1-2 students.

Do you have any requirements on the students' prior knowledge or skills, specific for the suggested project? If yes, please specify.

It is desirable that the students have taken a basic nuclear physics course.

Project manager/supervisor

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Managing/supervising time

8 hours/week