Internship in Laser spectroscopy – low-energy nuclear physics

Laser spectroscopy developments at the GISELE laboratory for S3-LEB experiments

The Super Separator Spectrometer (S3) at GANIL-Spiral2 will start its commissioning and first experimental runs in the coming years, with first data taking on radioactive isotopes for the Low Energy Branch (S3-LEB). S3-LEB relies on the technique of resonant laser ionization, both for direct laser spectroscopy and for production for subsequent experiments, such as atomic mass measurements or nuclear decay spectroscopy. Via laser spectroscopy, several nuclear ground state properties can be extracted, such as the nuclear size, shape and electromagnetic moments.
In order to conduct experiments on radioactive ions, knowledge of laser ionization schemes for each element is required. When doing laser spectroscopy, added information about the sensitivity of the ionization scheme to the underlying nuclear observables is also needed. This requires developing and testing of ionization schemes on the stable isotope(s) of the element of interest, which can be performed at the GISELE laser laboratory in GANIL. GISELE has the same laser system as will be available at S3, and in addition an Atomic Beam Unit (ABU), in which material can be evaporated for subsequent laser ionization tests.
So far ionization schemes for erbium, tin and palladium have been tested at GISELE, but other elements will be studied at S3, such as silver, actinium, cadmium… The main goal of the internship will be to investigate existing laser ionization schemes, or develop new schemes where needed, for elements of interest for the first experimental campaigns at S3-LEB. This will also involve testing of new laser systems which have been recently put in place at GISELE, such as a home-built continuous wave Ti:sapphire laser. The intern will be fully involved in all aspects of the operation of GISELE. This means testing new laser developments, e.g. temperature control for laser frequency doubling; preparing the laser system for the experiments, e.g. tuning the lasers to the required wavelengths; setting up the ABU with its MCP detector; running the experiments with the LabVIEW-based data acquisition system; and analyzing the data using Python-based code.

Expected skills
- Programming

This work can be pursued by a PhD-thesis

Contact: Sarina Geldhof
GANIL, BP 55027, 14076 Caen France

Phone: +33 (0)2 31 45 49 14
mail: Sarina.geldhof@ganil.fr