

M2 Internship in experimental nuclear physics

Nuclear structure and reaction studies of very heavy and superheavy nuclei

A. Framework

The internship will serve as preparation of PhD thesis in the framework of the research field of superheavy nuclei, employing the present GANIL cyclotron facility as well as the in the context of the new separator-spectrometer S3, presently being constructed at the new linear accelerator facility SPIRAL2 at GANIL. It will deal with the preparation, execution and analysis of experiments as well as with the development of photon detection schemes aimed at the identification of the atomic charge Z of the superheavy species to be produced and studied at the GANIL/SPIRAL2 facility.

B. Experimental studies envisaged for the thesis

i. Multi-nucleon transfer reactions

An experiment to study reaction dynamics in the reaction $^{238}\text{U}+^{238}\text{U}$ is envisaged to be performed at the magnetic spectrometer VAMOS in conjunction with the AGATA Ge-detector array and dedicated X-ray detectors. The task of the Ph.D. candidate will be the participation in the preparation of the experiment, the execution and data analysis of this experiment. In particular the implementation of the X-ray techniques as well as the investigation of the production cross sections of heavy neutron-rich species will be the focus of the thesis work.

ii. Decay spectroscopy of very heavy and superheavy nuclei

One of the major fields of activity of S3 will be the study of the nuclear structure of the heaviest nuclear species. The detection scheme will be based on a comprehensive particle and photon detection system in the focal plane of the set-up, including reaction product, alpha-particle, electron, gamma- and X-ray detection. The development of X-ray detection performed in the framework of the thesis shall lead to the integration of these techniques in the focal plane detection system of S3.

C. Task to be fulfilled during the internship

Germanium and silicon detectors will be the major tools employed for the research to be followed by the Ph.D. thesis work described above. During a preparatory period of a 4 month internship, the candidate has to develop a detector test set-up with which source measurements shall be performed in order to prepare detector components, data acquisition electronics and analysis software to be employed for the envisaged experiment.

Expected skills:

- detection techniques (semiconductors germanium, silicon)
- experiment electronics (signal processing) and mechanics
- computing skills (C++, analytic programming)
- team work capabilities

This internship leads to a PhD thesis.

Contact: Dieter ACKERMANN
GANIL, BP 55027, F-14 076 Caen cedex 05
Phone: +33 (0)2 31 45 47 42
e-mail: ackermann_at_ganil.fr