Internship in experimental nuclear physics

FIssion Studies at VAMOS in Inverse Kinematics

During the fission process, a heavy nucleus splits into lighter fragments due to the competition between the attractive strong nuclear force and the electrostatic repulsion. The nuclear fission process is driven by a complex interplay between the dynamical evolution of a quantum system composed of a large number of nucleons and the intrinsic nuclear structure of the system at extreme deformations as well as heat flows. Despite almost 80 years of intense research, fission is still far from being fully understood, and the theoretical and experimental knowledge remains incomplete.

At GANIL, the inverse kinematics technique is used to produced in-flight fission. Accelerated heavy fissioning system is excited through nuclear reactions, in particular multi-nucleon transfer reactions and the produced fission fragments are emitted at forward angles. The VAMOS large-acceptance magnetic spectrometer [2] is used to identify, in mass and nuclear charge, the full distribution of fragments while a silicon telescope is used to characterize the fissioning system by detecting the residual recoil emitted in the transfer reaction [3,4].

The fission@VAMOS project is undergoing a detection upgrade of the silicon detection system used to tag the fissioning systems produced by transfer reactions. The existing setup will be replaced by a state-of-art device based on highly-segmented silicon detectors (PISTA). This will result in an improved selectivity and precision of the formation condition of the fissioning system (Mass, Atomic charge, and Excitation energy).
The main goal of the M2 internship will be the characterisation of the prototype of the PISTA detection silicon detection and analysis of experimental data from the VAMOS spectrometer.

[1] M. Rejmund et al., Nucl. Instrum. Methods A **646**, 184 (2011)
[2] M. Caamaño et al. Phys. Rev. C 88 (2013) 024605
[3] D. Ramos, M. Caamaño, A. Lemasson, Phys. Rev. Lett. **123**, 092503 (2019)
[4] D. Ramos, M. Caamaño, A. Lemasson, et al. Phys. Rev. C **101**, 034609 (2020)

Expected skills

- Good english communication skills and with a basic background in nuclear physics
- Experimental profile and skill in data analysis (C++/ ROOT).

This work can be pursued by a PhD-thesis

Contact: Antoine LEMASSON
GANIL, BP 55027, 14076 Caen France

mail: lemasson@ganil.fr
phone: +33(0)2 31 45 47 24