

Internship in experimental nuclear structure and reactions

Study of nuclear tensor forces through the $^{19}\text{N}(d, ^3\text{He})^{18}\text{C}$ transfer reaction

It has been proposed about 15 years ago that the tensor force plays a major role in describing the dramatic shell evolutions (and changes in magicity) far from stability. However, there is no direct determination of its strength, as the shell evolutions observed so far could also be attributed to other components of the nuclear force. The evolution of the proton spin-orbit splitting between the $p_{1/2}$ and $p_{3/2}$ orbitals, as the neutron orbital $d_{5/2}$ is filled from ^{14}C and ^{18}C , is supposed to be a very sensitive probe.

Experimental context:

In this work, we plan to determine this spin-orbit splitting by means of the proton removal $^{19}\text{N}(d, ^3\text{He})^{18}\text{C}$ reaction in inverse kinematics. A radioactive beam of ^{19}N nuclei will be produced at the GANIL/LISE facility. These nuclei will undergo transfer reaction in an active target filled with deuterium gas and operated in a Time projection Chamber mode. This way, the trajectories of the incoming beam and reaction products will be detected in order to reconstruct the spectroscopy of ^{18}C , using proper kinematical reconstructions.

Depending on the start of the date of the internship, the student will participate to the test and calibrations of the detectors, radioactive beam production and selection, running the experiment and in parallel do some on-line analysis.

Expected skills: Ideally basic knowledge on gaseous detectors and associated electronics, C++/ROOT

This work can be pursued by the PhD-thesis entitled *Study of drip-line phenomena in neutron-rich nuclei*.

Contact:

Olivier Sorlin
+33 (0)2 31 45 45 25
sorlin@ganil.fr

Thomas Roger
+33 (0)2 31 45 49 25
roger@ganil.fr

GANIL, BP 55027, 14076 Caen France