



Call for candidates at CEA Saclay PhD position in nuclear physics

The Nuclear Physics Division (DSM/IRFU/DPhN) of the French Atomic Energy and Alternative Energies Commission (CEA) at Saclay invites applications **for a PhD position in experimental low-energy nuclear structure physics.**

Research at DPhN is conducted in four areas: nucleon and hadron structure, quark-gluon plasma, nuclear reactions and their applications and nuclear structure. Concerning the latter, The Laboratoire d'Études du Noyau Atomique (LENA, Laboratory for nuclear structure study) has three research axes: the study of the shapes of nuclei, of the exotic nuclei, and of heavy and super-heavy elements. The candidate will work on this last topic.

Understanding the shell structure of nuclei, and the location of next shell gap beyond lead 208, is one of the key objectives of nuclear physics. Nevertheless, the structure in this extreme region of the nuclear chart is largely unknown. The predictions vary considerably between different models. For that purpose, we study the structure of Transfermiums via various spectroscopy methods (alpha, gamma, electron) in order to gain insight of the level scheme of these nuclei. In this context, we are involved in experimental programs at GANIL (and in the future at SPIRAL2/S³), JYFL (Finland). Fusion-evaporation are paramount reactions to produce very heavy and superheavy elements, with more than 104 protons. But those nuclei are produced at very low recoil energy, and several reaction channels may be open. It is then very complex to unambiguously identify those nuclei. One possibility is to measure their decay properties, either atomic ones (X rays, electrons) or nuclear ones (proton, alpha, electron or gamma emission). In this activity we propose to focus on the use of silicon detectors to detect and measure the decay particles. The new focal plane detector system SIRIUS has been designed for S³ spectrometer. The main task aims at the test and commissioning of the SIRIUS detection set-up for the atomic signature and decay spectroscopy.

The student will be deeply involved in the technical development for the new SIRIUS focal plane detector system. The student will take an active part in the final tests of the whole SIRIUS detector to be carried out at GANIL under in-beam condition. The student will also take part in the scientific activities of the group having as primary aim the investigation of nuclear structure in the heavy elements at VAMOS GAS FILLED at GANIL. Indeed, in the next future we will propose a large physics campaign aiming to study, via prompt and decay gamma ray spectroscopy, very heavy elements from Uranium to Rf ($Z=104$). In more details, we will propose an extensive investigation of Californium, Curium, Plutonium isotopes, produced via fusion-evaporation reactions and deep inelastic reactions with relatively high cross-section. This will allow a detailed study of the relevant nuclear structure. The main goal will be to measure the ground state rotational band and the non-Yrast structure, i.e. excitation energies, half-life of the isomeric state, parity and quantum number J and K and the rotational band built upon the isomeric state.

The candidate should be independent, creative, and with a strong ability to work problem oriented. She/he should also enjoy interdisciplinary research and take keen interest in learning and working in teams. Familiarity with data-analysis tools especially ROOT; C/C++ programming skills is also desirable.

Interested candidates could contact Barbara Sulignano at barbara.sulignano@cea.fr and Antoine Drouart at antoine.drouart@cea.fr.

The position is completely funded. The contract could start from September 2018.