Internship in nuclear instrumentation

Modelling of a plasma ion source for accelerators using highly charged ions

The GANIL laboratory, at Caen, is one of the few laboratories in the world delivering stable and radioactive ion beams to worldwide physicists, notably at the SPIRAL1 and the new SPIRAL2 installations. Stable ion beams as well as radioactive ion beams are the tools of physicists to probe nuclear matter and its organization at the atomic nucleus scale. The understanding of the physical properties of the atomic nuclei is essential to give elements of answer to the formation of our universe and the stars composing it.
GANIL has a long tradition in the use and development of low-pressure off-balance ion sources based on the Electron Cyclotron Resonance (ECR) process feeding the GANIL accelerators with highly charged ions. One of the challenges of this type of sources used upstream of the accelerator is to deliver high charge state ions at high intensity specifically for the production of metal ions. A first simulation tool (PhD Thesis of Alexandre Leduc) has been developed to better understand how the ECR Phoenix V3 source works. A new collaboration with LAPLACE laboratory has been starting with the goal to adapt their numeric tools developed for thrusters for ECR ion sources.

Work to be done during the training
The trainee will begin with a literature review on the topic. He will have to work on the electron dynamics. Prior to apply LAPLACE numeric tools to a regular ECR ion source, he will have to do simulation on an existing axisymmetric ion source. With two softwares, SIMION and TrapCad, he will calculate the initial Electron Energy Distribution Function in the whole ion source and he will analyze the EEDF at different locations into the source.

Candidate's profile
6-month training, Master - 2nd/3rd engineer school year

Expected skills
Great interest in coding (Fortran, C/C++), Basic of plasma Physics

This work can be pursued by the PhD-thesis entitled *Study and Modelling of an axisymmetric electron cyclotron resonance ion source*.

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