

PhD position in accelerator physics

Heavy ions beam dynamics in the SPIRAL2 linac and in the S³ separator

The SPIRAL2 linear accelerator is optimized for light ions (protons, deuterons, helium), but it will also deliver heavier ions (O, Ne, Ar,...Ni) with high intensity for their use in the S3 Super Separator Spectrometer, for the research on new elements produced on earth, like super-heavy elements.

The first objective of the Ph.D. is to propose and study the methods allowing to tune a heavy ion beam in the 26 independent accelerating RF cavities of the linear accelerator, in a fast and reproducible way (extrapolated tuning, energy dispersion control, study of a modification of high-energy lines).

The S3 electromagnetic separator will use the beams from the linac to create and purify radioactive ions with a high efficiency. The complexity of its superconducting magnets requires an optimization of many parameters. Thanks to numerous hexapolar and octupolar corrections, we will be able to reduce the beam optical aberrations. The commissioning of the separator will require numerous measurements with beams and the development of an algorithm to optimize the optics for the 2 different operating modes (convergent mode for optimum transmission and dispersive mode for the measurement of the ratio M/ Q radioactive ions). The second objective is to provide the simulation tools to nuclear physicists allowing them to prepare their experiments on S³ and to adjust the parameters of the spectrometers during the experiments. The thesis work will be based on beam dynamics simulations and experimental measurements with beams.

Expected skills:

good knowledge in accelerator physics, scientific computing (C++), math skills.

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