



Internship in experimental nuclear physics

Ion trajectory simulations for laser spectroscopy behind S³

Spectroscopy of superheavy elements (SHEs) provides fertile ground for advancing our understanding of the properties of matter at the limits of existence. Our experiments focus on elucidating the atomic and nuclear properties of these elements using laser spectroscopy. Since conventional spectroscopic approaches practically reach their limits at the element nobelium ($Z=102$), a novel type of laser spectroscopy, called laser resonance chromatography (LRC) [1], was conceived to extend the frontier of optical spectroscopy to even heavier elements such as lawrencium ($Z=103$) and the superheavy element rutherfordium ($Z=104$). The technique has been proven to work in offline experiments [2] and is currently being prepared for first online experiments at the S³ facility of GANIL/SPIRAL2. In order to efficiently stop and extract sample ions online, a gas catcher is necessary. To this end, a cryogenic helium gas cell will be developed to connect the LRC instrument to S³.

During the internship, the successful candidate will perform ion trajectory simulations using the SRIM and the SIMION packages to extract optimal working parameters for ion stopping and extraction. The internship can be followed by a PhD thesis on the development of this stopping cell, which will be installed at the S³ focal plane.

[1] M. Laatiaoui *et al.*, Phys. Rev. Lett. 125 (2020) 023002.

[2] E. Kim *et al.*, Nucl. Instrum. Methods Phys. Res. B 555 (2024) 165461.

Expected skills

Good level in atomic and nuclear physics academic knowledge. Affinity for experimental work. Good communication skills in English (both verbal and written). Knowledge of scientific programming such as C++ and Python will be considered an added qualification.

This work [leads to a PhD-thesis](#).

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