



Internship in experimental nuclear physics

Ion trajectory simulations for laser spectroscopy behind S³

Description:

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. To enable the detection of single short-lived alpha emitters, such as neutron deficient lawrencium isotopes, a more sensitive and background free ion detection method has to be implemented. To this end, an assembly of an ion steerer and a double-sided silicon strip detector (DSSD) will be developed and used as the detection front-end of a laser spectroscopy instrument at S³.

During the internship, the successful candidate will perform ion trajectory simulations using the SIMION package to extract optimal working parameters for ion transport through the different instrument sections and during flight within the Steerer-DSSD assembly.

The internship can be followed by a PhD thesis on the development of an alpha decay detection system for laser spectroscopy experiments at S³.

[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++, ROOT, and Python will be considered an added qualification.

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