The low energy beamline of the FISIC experiment: current status of construction and performance

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Synopsis Ion-ion collisions between slow (kev/u) and fast (MeV/u) ions play an important role in for example astrophysical or inertial fusion plasmas as well as in ion-matter interaction. In this regime the energy transfer is maximum, as all primary electronic processes reach their maximum. At the same time up to today no reliable experimental data exists while being difficult to treat accurately by theory. We present the current status and performance of the low energy beam-line of the FISIC experiment which aims at filling in the blanks in this regime.

So far, ion-ion collisions in atomic physics were performed mainly in the context of magnetically confined plasmas using crossed beam devices in the low-energy domain where electron capture is the dominant process [1, 2] or fast-ion/plasma-discharge experiments with a charge state distribution as target [3, 4]. Up to today no reliable experimental data exists for fast (MeV/u) and slow (keV/u) ion collisions in the regime where the ion stopping power (energy transfer) is maximum. There all the primary electronic processes (electron capture, -loss and -excitation) reach their maximum and therefore the role of the individual processes on the collision is almost impossible to disentangle, while being of high importance in ion-matter interaction, including biological materials. To fill in the blanks we are designing a new ion-ion collision experiment, the FISIC project (**F**ast **I**on **S**low **I**on **C**ollisions) [5], a mobile experimental set-up, although being quite complex, being able to conduct crossed beam ion-ion collisions at different high energy ion beam facilities. Today we present the current status of the set-up and performance of the low-energy branch of FISIC, which will deliver a medially- to highly-charged pure low-energy ion beam which will then be crossed with high energy ions. Test results, mainly on the charge state purification [7], carried out at the ARIBE beam-line at the GANIL facility in Caen and at Sorbonne Université in Paris, utilizing the SIMPA ion source, will be presented. The obtained experimental data can be favourably compared with numerical simulation. Proposed experiments at different facilities such as CRYRING@ESR [8] or S3/Spiral2/GANIL [9] and the status of the integration of our beam-line into the existing infrastructure will be discussed.

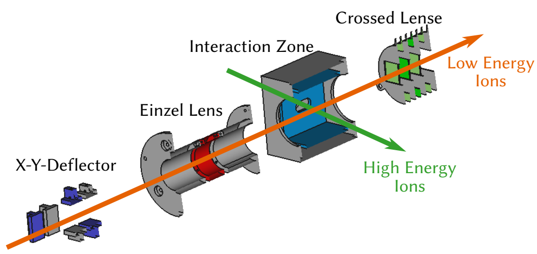

Figure 1. 3D model of the experimental area with indicated ion beams.

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