## PLATAN 2024 - Merger of the Poznan Meeting on Lasers and Trapping Devices in Atomic Nuclei Research and the International Conference on Laser Probing



Contribution ID: 131

Type: Poster Presentation

# Status of the Fast Radioactive Ion Extraction and Neutralization Device for S3 (FRIENDS3)

SPIRAL2 facility located at GANIL in Caen has recently been commissionned. Combined with the Super Separator Spectrometer ( $S^3$ ), which is currently being prepared for commissionning, it will be able to produce high intensity beams of neutron-deficient isotopes close to the proton dripline [1]. Ions produced by SPIRAL2/ $S^3$  will be studied with the experimental setup  $S^3$  Low Energy Branch ( $S^3$ -LEB) [2, 3, 4] which is currently being installed at the focal plane of  $S^3$ . The ions will be first thermalized in a gas stopping cell and then guided out by the gas flow, neutralized and extracted in a supersonic gas-jet. The extracted species will then be studied using laser spectroscopy, mass spectrometry and decay spectroscopy.

The current  $S^3$ -LEB gas cell extraction time is on the order of a few hundred milliseconds. Thus, the most short-lived isotopes will be lost before being extracted. In order to improve the  $S^3$ -LEB gas cell, a test bench was designed at IJCLab in Orsay within the scope of FRIENDS<sup>3</sup> project [5]. This test bench will be dedicated to the development of a fast extraction gas cell as well as an improvement of the neutralization techniques in order to enable nuclear structure studies on the most short-lived isotopes.

The present contribution will focus on the simulations, design and construction of the new setup as well as the first tests performed with it and also with a simplified version operated during the design process.

#### References

[1] F. Déchery, et al., Nucl. Instrum. Meth. B 376 (2016).

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[4] A. Ajayakumar, et al., NIM B 539 (2023).

[5] V. Manea, et al., 'Fast radioactive ion extraction and neutralization device for S<sup>3</sup>', project ANR-21-CE31-0001 (2021).

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### Session Classification: Poster Sessions