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Laser spectroscopy offline studies at the GISELE-GANIL laboratory for preparation of the S3-LEB commissioning

Some properties of the nuclear interaction manifest in the neutron deficient nuclei and in the heavy and super-heavy elements. Therefore, measurements of nuclear observables of these nuclei will serve to constrain available nuclear models. At GANIL-SPiRAL2, these nuclei will be produced with unprecedented yields, thanks to the combined action of the high intense primary beams delivered by the LINAC together with the Super Separator Spectrometer (S3) [1]. The Low Energy Branch (S3-LEB) set-up will be located at the final focal plane of S3. This set up will allow to measure charge radii, nuclear moments, masses and decay properties simultaneously, of ground and long-lived isomeric states of the very exotic nuclei produced. The LEB set-up makes use of the In-Gas Laser Ionisation and Spectroscopy technique; the ions from S3 are stopped and neutralized in a gas cell for further extraction in a supersonic jet where the laser light interacts [2, 3, 4]. Afterwards, the ionized ions are sent to a MR-TOF-MS PILGRIM device [5] and a decay station. This contribution focuses on the laser work performed at the GISELE laboratory at GANIL. At GISELE, studies of the sensitivity of a given laser ionization scheme for extraction of the nuclear observables are performed, focusing on the first online experiments planned at S3-LEB. This contribution will describe the existing laser set-up installed at GISELE, the set-ups to be installed, the results obtained of laser scheme investigations of some elements and the forthcoming plans.

[1] F. Déchery et al., Nucl. Instrum. Meth. B 376, 125-130 (2016)

[2] R. Ferrer et al., Nat. Comm. 8, 14520 (2017)

[3] J. Romans, et al., Nucl. Instrum. Meth. B 536, 72 (2023)

[4] A. Ajayakumar, et al., NIM B 539, 102 (2023)

[5] P. Chauveau et al., NIM B 376, 211 (2016)

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