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The ELI-IGISOL radioactive ion beam facility at ELI-NP

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The Extreme Light Infrastructure for Nuclear Physics (ELI-NP) facility will make available in the near future two new photon installations: a high-power laser system and a high-brilliance gamma beam system, which can be used together or separately.
The ELI-IGISOL project [1] will use the primary gamma beam to generate a Radioactive Ion Beam (RIB) via photofission in a stack of Uranium targets placed at the center of a gas cell [2]. The particular technology used for this gas cell is the High Areal Density with Orthogonal extraction Cryogenic Stopping Cell (HADO-CSC) [3] featuring ion extraction orthogonal to the primary beamline. The gas cell is coupled to a radio-frequency quadrupole for beam formation. The exotic neutron-rich nuclei will be separated, and their mass measured, by a high-resolution Multiple-Reflection Time-of-Flight (MR-ToF) mass spectrometer. The isomerically pure RIBs [4] obtained with the MR-ToF will be further measured by a β-decay tape station and a collinear laser spectroscopy station.
The latest developments in the simulation and design of the gas cell are presented. We report benchmark calculations of the production rates and of the extraction time and efficiency from the gas cell. Starting from these studies, the optimal design of the cell and its state-of-the-art technologies is discussed. Various testing units for the HADO-CSC components that are being developed at ELI-NP will be presented.

1. D.L. Balabanski et al., "Photofission Experiments at ELI-NP", *Rom. Rep. Phys.* **68**, S621 (2016).
2. P. Constantin et al., "Design of the gas cell for the IGISOL facility at ELI-NP", *Nucl. Inst. Meth. B* **397**, 1 (2017).
3. T. Dickel et al., "Conceptual design of a novel next-generation cryogenic stopping cell for the Low-Energy Branch of the Super-FRS", *Nucl. Inst. Meth. B* **376**, 216 (2016).
4. T. Dickel et al., "First spatial separation of a heavy ion isomeric beam with a multiple-reflection time-of-flight mass spectrometer", *Phys. Lett. B* **744**, 137 (2015).

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