

Laser-polarization and beta-NMR at VITO-ISOLDE

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Spin-polarized beams of radioactive nuclei can be of interest for studies in different fields, such as nuclear structure, fundamental interactions, or material science and life sciences. This is the motivation behind a recent initiative to build a permanent ISOLDE beamline, called VITO, devoted to various studies with polarized and non-polarized beams, as described in Ref. [1]. Within this initiative, we are presently working on the experimental setup which will allow to polarize with lasers the ions and atoms of interest, detect their polarization via beta-decay asymmetry and in addition, to use these beams for beta-detected NMR.

Three proposals using the VITO laser polarization line have been already approved. One of them [2] concerns the measurement of the beta asymmetry parameter in ³⁵Ar which will contribute to the determination of the V_{ud} matrix element. Two other proposals [3,4] are devoted to the NMR studies with ³¹Mg in liquid samples aiming to record the first biologically relevant chemical shifts and to do polarization tests of Cu isotopes, with the same aim as for ³¹Mg.

The experimental setup is presently under preparation and we the commissioning with radioactive beams is planned for late summer 2016. It allows polarizing with circularly polarised light the spins of ions or atoms (thanks to a neutralisation cell) and detecting the polarization via beta-decay asymmetry, as well as performing beta-NMR studies.

This contribution will review briefly the principles of laser spin polarization and beta-NMR spectroscopy, it will present the already approved studies, and it will close by the detailed description of the experimental setup and its status. Prospects in light of the EURISOL DF will be also presented.