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New ISOLDE Setup for Laser Polarization and for Studies Using Spin-polarized Nuclei

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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 have recently developed the experimental setup which allows to polarize with lasers the ions and atoms of interest, detect their polarization via beta-decay asymmetry and in addition, use these beams for various studies, including beta-detected NMR and fundamental interaction investigations.

The experimental setup for spin-polarization with lasers and for beta-asymmetry studies was designed at the beginning of 2016. It was installed at ISOLDE in the summer of 2016 and successfully commissioned with spin-polarized radioactive beam of $^{26,28}\text{Na}$ in autumn 2016 [2]. The next stages of the project include a system to perform studies in liquid hosts as well as a setup for beta-gamma and decay spectroscopy on spin-polarized nuclei.

This contribution will briefly review the principles of laser spin polarization and beta-NMR spectroscopy, it will present in detail the newly installed experimental setup and the results of the commissioning beamtime, and will close by the presentation of the planned experiments [1, 3].

References:

- [1] R. Garcia Ruiz et al., Perspectives for the VITO beam line at ISOLDE, CERN, EPJ Web of Conferences 93, 07004 (2015)
- [2] M. Kowalska et al., New laser polarization line at the ISOLDE facility, submitted to J. Phys. G (2016)
- [3] A. Jansco et al., TDPAC and β -NMR Applications in Chemistry and Biochemistry, submitted to J. Phys. G (2016)

Primary author: Dr KOWALSKA, Magdalena (CERN)

Co-authors: Dr ZAKOUCY, Dalibor (Nuclear Physics Institute of AS); WIENHOLTZ, Frank (CERN); Prof. NEYENS, Gerda (KU Leuven); Dr HEYEN, Hanne (KU Leuven); Dr BISSELL, Mark Lloyd (University of Manchester); Mr WALCZAK, Michal (Poznan University of Technology); Dr BARANOWSKI, Mikolaj (A. Mickiewicz University); Prof. SEVERIJNS, Nathal (KU Leuven); Dr VELTEN, Philippe (KU Leuven); Mr HARDING, R. D. (CERN, University of York); Ms PALLADA, Stavroulla (CERN); Mr GINS, Wouter (KU Leuven); Dr YANG, Xiaofei (KU Leuven); Dr XU, Zhengyu (KU Leuven)

Presenter: Dr KOWALSKA, Magdalena (CERN)

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