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β -decay spectroscopy with laser-polarised beams at VITO

β -decay spectroscopy is a powerful experimental tool for studying complex phenomena emerging in exotic neutron-rich nuclei, such as β -delayed one- and multi-neutron emission [1-3].

A novel approach to β -decay experiments, pioneered by a group from the University of Osaka [4,5], has recently been implemented at the VITO beamline [6] at ISOLDE. The new end station, called DeVITO [7], has been integrated with a laser polarisation setup, enabling β -decay spectroscopy studies with spin-oriented nuclei. This unique combination allows measurements of β -particle emission asymmetry in coincidence with γ -rays and/or neutrons, providing a solid foundation for unambiguous spin-parity assignments for states involved in allowed β transitions. This poster contribution presents the setup used in the first DeVITO experiment [8] as well as its physics motivation and preliminary results.

[1] Z. Xu, R. Grzywacz et al., Phys. Rev. Lett. 133, 042501 (2024).

[2] Z. Y. Xu, M. Madurga et al., Phys. Rev. Lett. 131, 022501 (2023).

[3] V. H. Phong et al., Phys. Rev. Lett. 129, 172701 (2022).

[4] H. Miyatake et al., Phys. Rev. C 67, 014306 (2003).

[5] H. Nishibata et al., Phys. Rev. C 99, 024322 (2019).

[6] M. Kowalska et al., Phys. G: Nucl. Part. Phys. 44, 084005 (2017).

[7] M. Piersa-Silkowska and N. Azaryan, CERN EP Newsletter, September 2024. <https://ep-news.web.cern.ch/content/isoldes-new-beta-decay-station-unlocks-advanced-decay-spectroscopy-experiments-laser>

[8] M. Piersa-Silkowska, M. Madurga, M. Kowalska et al., CERN-INTC-2023-026 ; INTC-P-662.

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