β-decay spectroscopy of laser-polarised ^{47}K at VITO-ISOLDE

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β-decay spectroscopy is a powerful technique for investigating the properties of exotic nuclei and probe nuclear phenomena that occur far from stability, such as β-delayed particle emission and shell evolution. Moreover, β-decay plays a crucial role in understanding astrophysical processes, especially the rapid neutron-capture process [1-3].

A fundamental limitation of conventional β-decay studies is the difficulty in determining the spins and parities of states involved in the decay. This can be overcome when beams of spin-oriented nuclei are utilised [4,5]. For such nuclei − having a directional orientation of the nuclear spins with respect to the axis of an applied magnetic field − the asymmetric emission of β-particles reveals spins and parities of nuclear states involved in allowed transitions.

A novel approach to β-decay experiments, pioneered by a group from the University of Osaka [4,5], has been recently adopted at the VITO beamline [6] at the ISOLDE facility at CERN. A new decay-spectroscopy station, called "DeVITO", has been integrated with the state-of-the-art setup for laser-induced spin polarisation [6], allowing measurements of β-particle emission asymmetry in coincidence with γ-rays and/or neutrons.

The new setup was recently commissioned with beams of neutron-rich potassium isotopes, including strong β-delayed neutron emitters. In particular, measurements with a ^{47}K beam demonstrated the capability of DeVITO to measure β-decay asymmetry in coincidence with γ-rays. This also served as a first demonstration of the application of this novel technique at CERN-ISOLDE, which brings exciting opportunities for further developments in β-decay studies.

In this contribution, details on the new experimental setup, as well as preliminary results from the commissioning runs [7] will be presented.

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