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Direct reactions with exotic nuclei, recent results and future plans at HIE-ISOLDE

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Spectroscopic factors provide unique information on the structure of nuclei, and can be probed by direct reactions. Medium-energy knock-out reactions were the first direct reactions to be applied to the study of exotic nuclei about ten years ago. More recently the availability of post-accelerated ISOL beams has allowed the use of transfer reactions at various facilities like GANIL, TRIUMF, ORNL and ISOLDE. These measurements have provided important information on shell migration and persistency of magic numbers far from stability.
At ISOLDE such studies have been performed successfully in various regions of the chart of nuclei. Keys to this success are the unique range of radioactive species available for post-acceleration, and the coupling of particle and gamma-ray detection at the T-REX/Miniball setup [1,2]. We will review the results, focusing on new ones obtained in the neutron-rich Ni region where theoretical efforts have also been recently produced.
HIE-ISOLDE, with the increase in beam energy, will extend the possibility of direct reaction studies to regions of heavier nuclei.
Several letters of intent and proposals have been presented for measurements around the doubly-magic 132Sn nucleus and in the Pb region.
Proton-transfer reactions with negative Q-values, such as (d,3He), will also be accessible, as well as measurements employing isomeric-pure beams. Plans for new instrumentations include an upgrade of the present T-REX setup, the use of an active target, and possibly a solenoidal spectrometer. On a longer term, the coupling of the post-accelerator to a storage ring could further improve the optical and intensity properties of the ISOLDE beams.
[1] V. Bildstein et al., Eur. Phys. J. A 48 (2012) 85 [2] N. Warr et al., Eur. Phys. J. A 49 (2013) 40

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