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Probing the Fission Barrier of ^{230}Ac with the ISOLDE Solenoidal Spectrometer

The study of nuclear fission remains a critical area of research, not only for understanding fundamental nuclear properties but also for its implications in the production of heavy elements in astrophysical environments. In r-process nucleosynthesis, fission barriers play a crucial role as they ultimately limit the mass of nuclei that can be produced. Currently, very limited data on fission barriers of neutron-rich nuclei are available. Moreover, studying fission barriers is essential for investigating the effects governing fission dynamics, such as shell structure and collective excitations.

At ISOLDE-CERN, the ISOLDE Solenoidal Spectrometer (ISS) is used to investigate the fission probabilities of neutron-rich actinides via (d,pF) reactions using Radioactive Ion Beams. This approach utilizes a novel setup designed to enhance the detection efficiency for fission fragments in coincidence with transfer-like protons in the 2T solenoidal field. This optimized method will provide access to fission barrier heights as a function of excitation energy. Additionally, complementary γ-ray measurements will offer insight into the total energy and multiplicity of γ-rays emitted during the fission process.

In this context, the first-ever measurement of the fission barrier of ^{230}Ac is being performed, further extending our understanding of fission in neutron-rich actinides.

In this contribution, this novel experimental setup will be presented, and the status of the experiment will be discussed, highlighting its potential for advancing our understanding of neutron-rich fission.
Beyond this study, the method can be extended to investigate even more exotic nuclei farther from the valley of stability, opening new opportunities to explore fission in regions of the nuclear chart that have so far remained experimentally inaccessible.

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