



ID de Contribution: 25

Type: Non spécifié

Fission Studies in Inverse Kinematics Using the SOFIA/R3B Experimental Setup at the GSI/FAIR Facility

mardi 10 mars 2026 14:00 (25 minutes)

The SOFIA/R3B experimental setup at the GSI/FAIR facility (Darmstadt, Germany) is designed to exploit relativistic heavy-ion beams produced at the Fragment Separator (FRS), and in the future at the Super-FRS. These spectrometers deliver intense beams of exotic heavy nuclei, which are used as projectiles in inverse kinematics for fission studies performed with the SOFIA/R3B setup. Building on the pioneering fission experiment carried out at the FRS by K.-H. Schmidt and collaborators, where the identification of the fission fragments was limited to their nuclear charge, the experimental approach has evolved significantly. The present SOFIA/R3B configuration allows for the complete kinematic characterization of the fission process through the simultaneous measurement of the charge, mass, and total kinetic energy of both fission fragments. This is achieved through the use of a double ionization chamber, which provides an excellent charge resolution of $\Delta Z \approx 0.34$ (FWHM), in combination with tracking detectors and a high-resolution time-of-flight wall (40 ps FWHM), allowing an accurate determination of the fragment trajectories and velocities. Together with the large-acceptance superconducting GLAD dipole magnet, these measurements yield fragment masses with a resolution of about 0.6–0.8 mass units (FWHM), enabling detailed studies of fission-fragment yields. This talk will focus on the results obtained from the various SOFIA/R3B fission campaigns at GSI, covering fission induced by Coulomb, spallation, and quasi-free ($p,2p$) reactions. Finally, perspectives and new ideas for future fission experiments at FAIR will be discussed.

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Classification de Session: Measurements for Fission Data

Classification de thématique: Challenges of Nuclear Data: Experiments for Nuclear Data