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Fission dynamics Investigation using VAMOS++ spectrometer and Second Arm

The fission process is strongly determined by both the nuclear structure and the nuclear dynamics, which drives the system from its initial state to final break-up through various stages of extreme deformation. The resultant fission fragments, along with the neutron evaporation emerge as promising parameters for elucidating the underlying mechanisms governing the fission process. The VAMOS++ [1, 2] spectrometer is a large solid-angle, ray-tracing magnetic spectrometer, that benefits from inverse kinematics to provide complete isotopic identification of the fission fragments. Conversely, The FALSTAFF [3, 4] spectrometer, employing low-pressure gaseous detectors, is designed to provide constraining data from neutron-induced fission. An experiment was conducted at GANIL with VAMOS++ spectrometer in conjunction with the Second arm (Modified version of FALSTAFF for inverse kinematics) – to simultaneously measure both fission fragments in coincidence. In this experiment, a 238U beam at coulomb energies was impinged on the beryllium (9Be) target to produce different fissioning systems via fusion and transfer reactions. This study accomplished full isotopic identification of fission fragments from Cm, Pu, and U fissioning systems, with the identification of fissioning systems based on coincident nuclear charge measurements from the two arms. The masses of the fragments before and after neutron evaporation, along with their kinetic energy and proton content, will be presented. Additionally, a comparison of the neutron excess across different isotopes of Cm will be discussed. These results will be compared with state-of-the-art fission models and analyzed in terms of fission modes and nuclear structure.

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