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# Investigation of Shell Effect Damping in Nuclear Fission Using VAMOS and PISTA

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Studying nuclear fission provides insight into the interplay between the dynamic evolution of the compound nucleus and microscopic effects such as shell structure and pairing correlations. Measuring fission fragment yields not only advances our understanding of nuclear structure but also has important applications in nuclear reactor physics.

This work focuses on the evolution of fission fragment yields as a function of the excitation energy (E*) of the fissioning system. As E* increases, the symmetric component of the yield becomes more pronounced, indicating the gradual suppression of nuclear structure effects. Precise measurements of this effect are crucial for constraining state-of-the-art fission models and have direct implications for the development of Generation-IV fast neutron nuclear reactors.

To precisely investigate the evolution of fission yield with the excitation energy, a dedicated experimental campaign was conducted, integrating the Particle Identification Silicon Telescope Array (PISTA), alongside enhancements to the VAMOS++ spectrometer at GANIL. The experiment employed the inverse kinematics technique, where a beam of $^{238}$U impinged on a $^{12}$C target, inducing transfer reactions that populated various fissioning systems alongside their associated light recoils. This setup allows for the study of shell effect damping in nuclei near $^{238}$U within an excitation energy range of 6 to 20 MeV, achieving an excitation energy resolution of $\sim$700 keV (FWHM).

This work presents the experimental setup as implemented at GANIL with a particular focus on the first-time use of the PISTA array. We will discuss the ongoing data analysis from two acquisition campaigns conducted between 2023 and 2024. Particular focus will be given to the $^{242}$Pu fissioning system, populated via the $^{12}$C($^{238}$U,$^{242}$Pu)$^{8}$Be$\rightarrow 2\alpha$ reaction, as PISTA is highly efficient at detecting these events due to its high granularity. Preliminary results on the evolution of mass and charge distributions will also be presented.

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