

Description of correlations between fission observables in the spontaneous fission of ^{252}Cf

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Abstract

Recently, a large body of experimental data on the angular momenta of fission fragments has become available. The main observed features include the absence of correlations between the angular momenta of partner fragments, a weak dependence of fragment angular momentum on the total kinetic energy, and a pronounced sawtooth dependence of fragment angular momentum on mass. To investigate these phenomena, we propose a model describing the evolution of fissioning nucleus from the outer fission barrier toward scission. The model assumes that, after tunneling through the fission barrier, the nuclear state can be represented as a superposition of dinuclear-system (DNS) configurations. The angular motion of the DNS is treated quantum mechanically, yielding the angular-momentum distributions of the fragments at scission [1]. Within the same framework, we calculate the principal observables of the spontaneous fission of ^{252}Cf , including the fragment-mass, total-kinetic-energy, and prompt-neutron-multiplicity distributions. The correlations between these observables and the angular momenta of the fission fragments are analyzed and explained [2].

References

- [1] T. M. Shneidman, A. Rahmatinejad, G. G. Adamian and N. V. Antonenko, Phys. Rev. C **111**, 064621 (2025).
- [2] A. Rahmatinejad, T. M. Shneidman, G. G. Adamian and N. V. Antonenko, Phys. Rev. C **112**, 044610(2025).