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Rotation Effect of a Fissile Nucleus (ROT Effect) for Prompt γ-Rays in Binary Fission of 235U by Polarized Neutrons of Different Energies

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The present work provides a detailed examination of a series of studies [1,2] dedicated to investigating the effect of rotation of the fissile nucleus of the isotope ^{236}U in the ^{235}U(n,f) process induced by monochromatic polarized neutrons with energies of 62 meV and 270 meV. The main focus is on the analysis of the anisotropic angular distribution of γ-rays emitted by the excited fission fragments and its shift by a small angle relative to the deformation axis of the fissile nucleus when the neutron beam polarization direction is reversed.
The studied effect represents an important aspect in understanding the dynamics of the nuclear fission process, especially near the rupture point. The shift in the angular distribution of γ-rays can provide valuable information about the internal structure of fissioning nuclei and the mechanisms governing the fission process. This, in turn, may contribute to the development of a more comprehensive quantum-mechanical model of fission, which has yet to be established.
All experiments were conducted at the Heinz Mayer Leibniz Research Neutron Source (FRM II reactor) at the Technical University of Munich, located in Garching. A beam of polarized neutrons from the POLI facility was used for the measurements.
Additionally, the work includes a comprehensive analysis of results obtained in previous studies by the ITEP group [3] concerning ROT effects for fission γ-rays, which were obtained using cold neutrons. Furthermore, the results obtained by the PNPI group [4] for thermal neutrons are presented, allowing for a comparative analysis and the identification of common trends in the behavior of γ-rays under different experimental conditions.

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