Contribution ID : **222** Type : **Oral talk**

Double-humped fission barrier and statistical mechanism of formation of angular anisotropy of fission fragments

Thursday, 24 October 2024 10:15 (15)

Fission of heavy nuclei by neutrons at low and intermediate energies (up to 100 MeV) occurs at relatively low angular momenta, which has little effect on the dynamics of nuclear deformation. Due to this, the anisotropy of the angular distribution of fission fragments relative to the direction of motion of incident neutrons is determined by the distribution over the projection K of the spin of the fissioning nucleus onto the deformation axis. This distribution is formed at the fission barrier [1,2]. At sufficiently high excitation energies, the distribution over quantum number K is determined by statistical mechanism [3] and depends on the deformation and temperature of the nucleus. However, due to various difficulties, experimental and theoretical studies of the angular anisotropy of fission fragments by neutrons have not received sufficient attention for a long time. In particular, there is a lack of understanding of the role of the the internal and external humps of fission barrier in the formation of the K-distribution in each fissionable nucleus. Meanwhile, the answer to this question depends on various factors that determine the energy dependence of the nuclear fission cross section for neutrons. Over the past decade, we have conducted measurements on a neutron time-of-flight spectrometer based on the GNEIS neutron complex at the 1 GeV proton synchrocyclotron of the National Research Centre "Kurchatov Institute" - PNPI (Gatchina) . We have obtained significant data on fission cross sections and the angular distributions of fission fragments for low and intermediate energy neutrons. In addition, we have developed new approaches to the analysis of these characteristics [4,5]. In this paper, we demonstrate that in the area of applicability of the statistical model, it is possible to determine from the angular distribution of fragments which hump of the fission barrier is responsible for the formation of the K-distribution.

[1] A. Bohr. Proceedings of the International Conference on the Peaceful Uses of Atomic Energy, 1955. V. 2. United Nations, New York, 1956. P. 151.

[2] A. L. Barabanov, W. I. Furman. Z. Phys. A 357, 411 (1997).

[3] R. Vandenbosch, J. R. Huizenga. Nuclear Fission. New York, Academic Press, Inc., 1973.

[4] A. S. Vorobyev et al. Phys. Rev. C 108, 014621 (2023).

[5] A. S. Vorobyev et al. Eur. Phys. J. A 60, 117 (2024).

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Session Classification : Nuclear

Track Classification : Nuclear physics