Contribution ID: **292** Type: **Oral**

Role of zero-point transverse oscillations in the Langevin description of nuclear fission

Sunday 6 July 2025 14:30 (20 minutes)

Modern approaches to describe the dynamics of nuclear fission make extensive use of the Langevin formalism [1,2], which effectively accounts for the stochastic nature of the process. However, the problem of correctly determining the parameters of the random force in this approach remains unresolved. This issue becomes particularly relevant for low-energy fission, where quantum effects [3] play a significant role and traditional estimates of the random force amplitude by the zero-point oscillation energy (≈1 MeV) need to be revised.

In this work, the model [4] based on Fourier parameterization of the nuclear surface and macroscopic-microscopic description of the potential energy is further developed. The main improvement is the use of refined values of the zero-point transverse vibrational modes obtained from the analysis [5] of the spin distributions of the fission products from both the induced fission of Th and U and the spontaneous fission of Cf.

The main research results focus on model verification by comparison with experimental data on mass distributions and total kinetic energies of the fission fragments for actinide nuclei. Particular attention is paid to the analysis of the influence of zero point oscillations upon the system dynamics during the stage of descent from the outer fission barrier.

References

1. F. A. Ivanyuk, C. Ishizuka, S. Chiba, Phys. Rev. C **109**, 034602 (2024)
2. Y. Jaganathen, M. Kowal, K. Pomorski, Phys. Lett. B **862**, 139302 (2025)
3. K. Pomorski, H. Hofmann, J. Physique **42**, 381 (1981)
4. P. V. Kostryukov, A. Dobrowolski, Phys. Rev. C **108**, 024605 (2023)
5. D. E. Lyubashevsky et al., arXiv:2412.04410 (2024)

Primary author: KOSTRYUKOV, Pavel (Voronezh State University of Forestry and Technologies / Voronezh State University)

Presenter: KOSTRYUKOV, Pavel (Voronezh State University of Forestry and Technologies / Voronezh State University)

Session Classification: 2. Experimental and theoretical studies of nuclear reactions

Track Classification: Section 2. Experimental and theoretical studies of nuclear reactions.