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Nuclear Structure and Dynamics in Relativistic Density Functional Theory

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Abstract

The development of radioactive ion beam facilities has opened new frontiers for exploring exotic nuclear phenomena. In particular, nuclei with exotic deformation have attracted considerable interest due to their fundamental importance in understanding the emergence of collective behavior in finite quantum many-body systems. Relativistic density functional theory has achieved remarkable success in describing nuclear structure and dynamics by providing a self-consistent microscopic framework.

In a series of our recent works [1–3], we have developed lattice relativistic density functional theory without imposing spatial symmetry restrictions, enabling a unified description of exotic nuclear shapes and large-amplitude collective dynamics. We have investigated higher-order deformation degrees of freedom, including tetrahedral symmetry, and revealed their signatures in nuclear observables. Furthermore, the time-dependent relativistic density functional theory has been applied to nuclear fission dynamics, uncovering the role of nonaxial degrees of freedom in the generation and correlation of fission fragment angular momenta.

In this talk, I will review recent progress in the development of lattice relativistic density functional theory and its applications to exotic nuclear shapes and dynamical evolution, with particular emphasis on high-order deformation and fission dynamics.

References

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