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Contribution ID: **19** Type: **not specified**

Microscopic description of collective inertias for fission

Thursday, 31 October 2024 11:25 (25 minutes)

The theoretical description of nuclear fission is a challenging quantum many body problem since it involves quantum tunneling of the nuclei through fission barriers. This tunneling is very sensitive to the collective inertia along the fission path. In most of the fission calculations, the collective inertia is evaluated using cranking approximation which neglects the dynamical residual effects. In this work, we are developing a scheme to compute collective inertias using finite amplitude method - quasiparticle random phase approximation (FAM-QRPA) method which also takes into account the consistent treatment of dynamical effects [1]. In this contribution, I will discuss the status of FAM-QRPA code that is being developed using the finite range Gogny energy density functionals and axial symmetry preserving Hartree-Fock-Bogoliubov framework [2]. The completed FAM-QRPA code will be then used to study the role of collective inertia in fission probabilities and the role of fission in r-process nucleosynthesis. Once the code is developed, it can also be used to study electromagnetic response of nuclei.

1. K. Washiyama, N. Hinohara, and T. Nakatsukasa, Phys. Rev. C 103, 014306 (2021).
2. L. M. Robledo, T. R. Rodríguez, and R. R. Rodríguez-Guzmán, J. Phys. G: Nucl. Part. Phys. 46, 013001 (2018).

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Session Classification: Oral contributions VIII