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Probing the fluctuation of fission observables

The nuclear energy-density-functional (EDF) is a successful theoretical tool to describe many properties of a fissioning nucleus up to the generation of the primary fragments [1]. A core ingredient in the EDF-based many-body approaches is the Bogoliubov vacuum wavefunction. Expectation values of observables such as total binding energies or primary fragments mass are widely computed on Bogoliubov vacuua. On the other hand, only a few papers report the whole probability distributions of such observables. Recent studies involving their computation include efforts toward the prediction of the primary fragments number of protons and neutrons [2] and their spin distribution [3]. Yet the computational cost of such a task quickly becomes prohibitive.

In this presentation, I will present the development of a Monte-Carlo method to compute the whole probability distribution of some observables when the system of interest is described by a Bogoliubov vacuum. I will first show the algorithmic and numerical aspects of the method and then emphasize a first application to the fission of ^{252}Cf . We will finally discuss the current limitations and future prospects of the method.

[1] N. Schunck and D. Regnier, Prog. Part. Nuc. Phys. 125 (2022)

[2] M. Verriere et al., Phys. Rev. C 103 (2021)

[3] A. Bulgac et al., Phys. Rev. Lett. 128 (2022)

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