PhD position in theoretical nuclear physics

Systematic studies of the continuum-coupling correlations in near-threshold states

Light weakly bound or resonant nuclei play an important role in various stellar nucleosynthesis processes. The comprehensive understanding of these nuclei requires a correct description of the multi-particle continuum. In this context, recent studies demonstrated an importance of the residual continuum-coupling correlation energy for the understanding of eigenstates, their energy and decay, in the vicinity of the decay channel(s).

It is proposed to study salient effects of the coupling between discrete and continuum states near various particle-emission thresholds using the Gamow Shell Model, i.e. the shell model in the complex-energy plane. This model provides the unitary formulation of a standard nuclear shell model in the open quantum system framework for the description of well bound, weakly bound and unbound nuclear states.

The residual continuum-coupling correlation energy has not yet been studied systematically. It is believed that the dependence of this residual continuum energy correction on the particle separation energy and on different components of the nucleon-nucleon continuum couplings, allows to understand the basic features of many near-threshold nuclear phenomena, such as the clusterization, or the change of effective spectroscopic factors in knock-out reactions with the asymmetry of proton-neutron separation energies.

Expected skills:
Advanced quantum mechanics I/II, nuclear structure and reaction theory
Good programming skills in C++ and/or Python

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