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Two-neutron decays within the hyperspherical framework: Application to ^{13}Li, ^{16}Be and ^{21}B

Neutron-neutron correlations, specifically in light exotic systems such as two-neutron halo nuclei, is a topic that has attracted a revived interest [1,2]. These correlations are known to play a key role in binding the Borromean system [3,4], thus shaping their properties and dynamics in nuclear collisions. The particular features of these nn correlations extend beyond the driplines and may give rise to two-neutron emitters, such as 26O [5], which exhibit an unbound ground-state resonance. Their main characteristic is being bound with respect to 1n emission but unbound with respect to 2n emission. Therefore, the decay is expected to proceed as a direct two-neutron emission, rather than the sequential decay that may be available for their excited states. The structure properties and decay dynamics of these systems can be studied within the three-body hyperspherical model [6,7], focusing on the relative-energy (or momentum) distributions, which can be then confronted to experimental data.

In Ref. [8] we proposed a method to characterize few-body resonances from the time evolution of the lowest eigenstates of a resonance operator in a discrete basis, with the aim of studying the population of these systems in knockout reactions. The relative-energy distributions in their decay can be computed by solving an inhomogeneus equation with a source term involving the resonance eigenstate [9,10]. In the computed distributions, the mixing of different hypermomenta is found to be crucial for their shape, reflecting different possible asymptotics. The method has been applied to ^{16}Be [11] and ^{13}Li [12], showing signatures of direct two-neutron decay, and in reasonable agreement with recent experimental observations. Calculations for ^{21}B are ongoing.

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