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Three-body resonances and two-nucleon decays

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Nuclei that present a three-body character have attracted particular interest over the past few decades. Of particular relevance is the case of two-neutron halo nuclei, e.g., ^{6}He, ^{11}Li or ^{14}Be, which exhibit exotic features in nuclear collisions. These are Borromean systems, or three-body systems in which all binary subsystems cannot form bound states. The correlations between the valence neutrons, often described in terms of pairing, are known to play a fundamental role in shaping the properties of these systems [2,3]. The evolution of these correlations beyond the driplines gives rise to two-neutron emitters, e.g., ^{13}Li, ^{16}Be or ^{26}O [4]. A similar situation can be found for proton-rich nuclei. For instance, the Borromean ^{17}Ne nucleus has been proposed to exhibit a two-proton halo, while other exotic systems, such as ^{6}Be and ^{11}O, are two-proton emitters [5]. Since they have a marked core+N+N character, three-body models are a natural choice to describe their structure and processes involving them [6]. The description of the continuum in three-body nuclei, however, is not an easy task. In Ref. [7] we proposed a method to characterize few-body resonances by studying the time dependence of the lowest eigenstates of a resonant operator, with the aim of studying the population of resonances of two-nucleon emitters. The method was applied to ^{16}Be, obtaining a remarkable agreement with calculations of the actual three-body continuum [8] for the 0^+ ground-state resonance, and predicting an excited 2^+ resonance. A summary of this work will be presented, and the calculation of the corresponding relative-energy distributions in the decay dynamics will be shown [9]. Results will be compared with recent experimental observations [10], with focus on the initial-state neutron-neutron correlations.

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