

WPCF 2023 - XVI Workshop on Particle Correlations and Femtoscopy & IV Resonance Workshop 2023



Contribution ID: 46

Type: **Invited**

Three-body resonances and two-nucleon decays

Wednesday, 8 November 2023 10:15 (25 minutes)

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., ${}^6\text{He}$, ${}^{11}\text{Li}$ or ${}^{14}\text{Be}$, 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., ${}^{13}\text{Li}$, ${}^{16}\text{Be}$ or ${}^{26}\text{O}$ [4]. A similar situation can be found for proton-rich nuclei. For instance, the Borromean ${}^{17}\text{Ne}$ nucleus has been proposed to exhibit a two-proton halo, while other exotic systems, such as ${}^8\text{Be}$ and ${}^{11}\text{O}$, 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 ${}^{16}\text{Be}$, 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.

- [1] I. Tanihata, et al., Prog. Part. Nucl. Phys. 68, 215 (2013).
- [2] Esbensen H., Bertsch G. F. and Hencken K., Phys. Rev. C, 56 (1997) 3054.
- [3] Hagino K. and Sagawa H., Phys. Rev. C, 72 (2005) 044321.
- [4] Z. Kohley, et al., Phys. Rev. Lett. 110, 152501 (2013).
- [5] T.B. Webb, et al., Phys. Rev. Lett. 122, 122501 (2019).
- [6] M. V. Zhukov, et al., Phys. Rep. 231, 151 (1993).
- [7] J. Casal and J. Gómez-Camacho, Phys. Rev. C 99, 014604 (2019).
- [8] A. E. Lovell, F. M. Nunes and I. J. Thompson, Phys. Rev. C 95, 034605 (2017).
- [9] J. Casal and J. Gómez-Camacho, in preparation (2023).
- [10] B. Monteagudo et al., submitted (2023).

Primary author: CASAL, Jesús (University of Seville)

Presenter: CASAL, Jesús (University of Seville)

Session Classification: Day 3 - Morning