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# Investigation of dineutron correlations at the surface of Borromean nuclei

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The correlation among the valence neutrons in Borromean halo nuclei are a key element to explain the stability of such loosely bound systems [1,2]. The characterization of the dineutron correlation is therefore an important step in the description of the neutron dripline.

We present here a comparative study of three different two-neutron halos, $^{11}$Li, $^{14}$Be and $^{17}$B, simultaneously studied in a quasi-free scattering experiment performed at the RIBF facility in RIKEN. For the three nuclei, data suggest dineutron correlation always appears at low intrinsic momenta. This constitutes the first experimental proof of the universality of the dineutron correlation in the low-density nuclear surface of Borromean nuclei, which had been previously suggested [3-6]. Overall, a progressive damping of the dineutron correlation going from $^{11}$Li to $^{17}$B is observed.

The experimental results are compared to calculations based on a three body model for the structure and a quasi-free sudden model for the reaction [7,8]. The structure inputs for $^{11}$Li ($^{9}$Li$+n+n$) and $^{14}$Be ($^{12}$Be$+n+n$) are based on previous $(p, pn)$ calculations [9,10]. The former includes the splitting due to the finite spin of the $^{9}$Li core, and the latter incorporates further the excitation to the first $2^+$ state of $^{12}$Be. For $^{17}$B ($^{15}\mathrm{B}+n+n$), a simple model is built to reproduce the main features observed in a recent experiment [11], which points towards dominance of $d$-waves. In all cases, the dineutron correlation appears due to mixing between different-parity components, even if small. The maximum correlation angle corresponds in all cases to the same intrinsic momentum region, in agreement with the data. For $^{14}$Be, calculations suggest that, in spite of the large mixing in the model, core excitations diminish the dineutron correlations noticeably. These results pave the path for future studies on the correlations in heavier dripline nuclei.

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## Topic

Theory

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