Pairing correlations in nuclei on the neutron-drip line

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Paring correlations in weakly bound nuclei on the edge of neutron drip line is studied by using a three-body model[1, 2]. A density-dependent contact interaction is employed to calculate the ground state of halo nuclei ^{6}He and ^{11}Li, as well as a skin nucleus ^{24}O. Dipole excitations in these nuclei are also studied within the same model. We point out that the di-neutron type correlation plays a dominant role in the halo nuclei ^{6}He and ^{11}Li having the coupled spin of the two neutrons S=0, while the correlation similar to the BCS type is important in ^{24}O. Contributions of the spin S=1 and S=0 configurations are separately discussed in the low energy dipole excitations. Figures 1 and 2 show the (total) two-particle density (the top panels) for the ^{6}He and ^{11}Li, respectively, and their spin decompositions (the middle and the bottom panels). These are plotted as a function of the radius $r_1 = r_2 \equiv r$ and the angle θ_{12}, and with a weight of $4\pi r2 \cdot 2\pi r2 \sin\theta_{12}$. As has been pointed out in Refs. [1, 3, 4], one observes two peaks in the two-particle densities, although the two peaked structure is somewhat smeared in ^{24}O. The peaks at smaller and larger θ_{12} are referred to as "di-neutron" and "cigar-like" configurations in Refs. [3, 4], respectively.

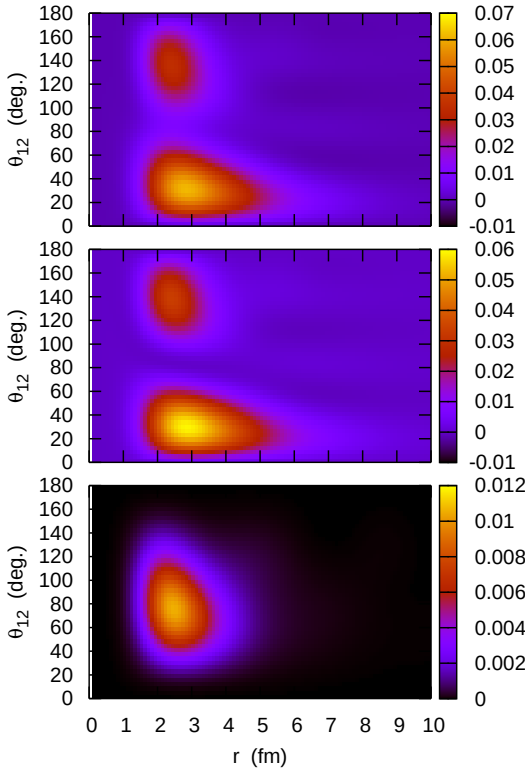

FIG. 1: (Color online) The two-particle density for ^{6}He as a function of $r_1 = r_2 = r$ and the angle between the valence neutrons, θ_{12}. The two-particle density is weighted with a factor $4\pi r2 \cdot 2\pi r2 \sin\theta_{12}$. The top panel shows the total density, while the middle and the bottom panels show the S=0 and the S=1 components in the LS-coupling scheme, respectively.

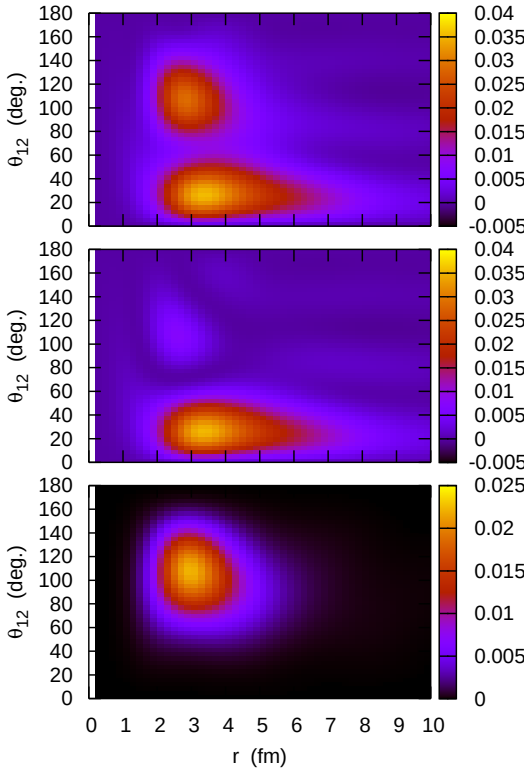

FIG. 2: (Color online) Same as fig. 1, but for ^{11}Li.

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