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Role of the hard-core nucleon-nucleon interactions on the structure of three-body weakly bound systems

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Various nucleon-nucleon interactions are used to study the ground state structure of weakly bound three-body systems. It is found that when a hard-core nucleon-nucleon is used, a strongly attractive three-body force is required to keep the system bound in the case of a light system. However, the strength of the three-body force is substantially reduced as the atomic mass of the system increases. Also, for a light system, as the two peripheral nucleons strongly repel at short distance, they carry the whole system toward the peripheral region. Consequently, in this case, the 6He system is found to have a large matter radius compared to the 22C. This work serves to emphasis that indeed in a three-body system, the halo nucleons only interact at rather short distance. This distance can be estimated to be around the radius of the of the interaction core.

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