Universal aspects of neutron halos in light exotic nuclei

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The theoretical few-body aspects associated with the universal properties of weakly-bound neutron-rich light nuclei close to the drip line will be reviewed [1]. We will address the low-energy properties of the one- and two-neutron halo of light exotic nuclei, which are dominated by s-wave two-body intezractions. We will discuss exotic nuclei, like ^{11}Li, ^{14}Be, ^{20}C and ^{22}C, as two neutrons plus a core. The representative works on the large two-neutron halos in light exotic nuclei modeled with short-range interactions will be revised, with emphasis to the model independent properties associated to the halo neutrons, which obey universal scaling laws. These scaling functions depend on the low-energy observables of the neutron-neutron and neutron-core subsystems and one additional short range parameter. That quantity carries the physics of the three-body system at short-ranges. It has the information on the two-neutron separation energy, which results from the complex many-body physics and nuclear force. We discuss how the scaling laws for the s-wave two-neutron halo observables are identified with limit-cycles in a zero-range three-body model and the relation with the Thomas-Efimov effect. The basic tools to investigate the physics of large s-wave halos with the treatment of the zero-range interaction in few-body systems common to cold atoms [2] will be given as well.

[1] T. Frederico, M. T. Yamashita, A. Delfino, L. Tomio. "Universal aspects of light halo nuclei". Prog. Part. Nucl. Phys. 67 (2012) 1.

[2] N. T. Zinner, A. S. Jensen. "Comparing and contrasting nuclei and cold atomic gases". J. Phys. G: Nucl. Part. Phys. 40 (2013) 053101

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