Low-density nuclear matter at the driplines

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Nuclear halos are a fascinating manifestation of quantum physics. They belong to a subset of low-density clustering for which most of the probability to find the halo nucleon extends to a region of space that is classically forbidden. Their properties show universal aspects of few-body systems such as scaling laws. Advances in the production of radioactive isotope beams give access to loosely-bound neutron-rich systems at the nuclear driplines, where halos are found.

The Radioactive Isotope Beam Facility (RIBF) of RIKEN, Japan, provides unique opportunities to explore the neutron drip line in light nuclei. Recent highlights based on quasifree scattering experiments in inverse-kinematics will be presented.

Low-energy antiprotons offer a very unique sensitivity to the neutron and proton densities in the tail of the nuclear density. Such studies with short-lived nuclei at ISOLDE, CERN, are the motivation of the recently-accepted experiment PUMA (antiProton Unstable Matter Annihilation). The concept and status of the experiment will be briefly introduced.

Halos are expected to extend in the strangeness sector. The hypertriton, composed of a Lambda hyperon, a neutron and a proton, is a halo candidate. A FAIR-0 program at the R3B experiment aims at determining the size of the hypertriton by revisiting the historical experiment at the origin of the discovery of halos. The challenges and sensitivity of such a measurement will be discussed.