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Three-body correlations as a key to the structure of light unbound nuclei

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The neutron dripline as being defined by the heaviest, proton-deficient, bound isotopes, determines the limit of nuclear stability at the neutron-rich side of the nuclear chart. Neutron or proton knockout from light dripline nuclei leads to the formation of unbound nuclear systems with extreme A/Z ratios, followed by their immediate decay. An experiment of this kind has been performed at GSI (Darmstadt). A relativistic beam consisting of the halo nuclei ^{11}Li and ^{14}Be with energies of 280 and 305 MeV/nucleon, respectively, impinged on a liquid
hydrogen target. The experimental setup, consisting of the neutron detector LAND, the dipole spectrometer ALADIN and different types of tracking detectors, allows the reconstruction of the momentum vectors of all reaction products measured in coincidence.

The properties of unbound nuclei were investigated by reconstructing the relative-energy spectra as well as by studying the energy and angular correlations between their
decay products. The relative energy spectra were reconstructed for unbound nuclei ^{9,10}He and ^{10,12,13}Li. In addition, three-body $^{8}\mathrm{He} + \mathrm{n} + \mathrm{n}$ and $^{11}\mathrm{Li} + \mathrm{n} + \mathrm{n}$ energy and angular correlations in ^{10}He and ^{13}Li were studied using the hyperspherical harmonics formalism, providing information about their structure. The talk is devoted to a discussion of the obtained results for these unbound isotopes and a physics interpretation of the data.

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