A FEW STEPS BEYOND THE NEUTRON DRIPLINE

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The investigation of the light neutron-rich dripline nuclei, including in particular those exhibiting halos, is a central theme of nuclear structure physics. Of particular interest in terms of few-body physics are the heaviest candidate two-neutron halo systems, ^{19}B and ^{22}C [1,2,3], and the associated unbound sub-systems ^{18}B and ^{21}C, the continuum states of which are critical to the defining of the ^{17}B-n and ^{20}C-n interactions for three-body models. In addition to being of direct importance to halo physics, these systems are of considerable interest in terms of the evolution of shell structure far from stability, as they span the N=14 and 16 sub-shell closures below doubly-magic ^{22,24}O. Motivated by these considerations, we have undertaken an investigation of the structure of these systems using invariant mass spectroscopy and direct reactions of high-energy secondary beams provided by the RIKEN RIBF, as part of the initial phase of operation of the SAMURAI spectrometer [4] coupled to the large area neutron array NEBULA [5].

In this talk, the principles of the first SAMURAI campaign will be presented, and some results on the most neutron-rich isotopes of Boron, Carbon, Nitrogen and Oxygen [6], discussed. These include the first observation of ^{20}B, ^{21}C, and ^{24}N. The success of the campaign has motivated an extension aiming to expand our knowledge around the neutron dripline to even more exotic systems, like ^{21}B, ^{23}C and ^{25}N, that will take place at RIKEN in a near future using the improved neutron detection capabilities of the ensemble NeuLAND+NEBULA. Finally, the plans to extend this experimental approach to the lightest end of the neutron dripline will be also presented. The capabilities of the RIBF coupled with the very efficient neutron array will provide a precise measurement of the low-lying spectrum of ^{7}H [7], the highest A/Z nucleus that can be presently reached, and at the same time of its decay into a triton and a possible tetraneutron state [8,9].

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