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Kinematically complete measurements of Coulomb breakup of Borromean halo nuclei at the SAMURAI facility at RIBF

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We report here on some of the first results on kinematically complete measurements of breakup of neutron drip line nuclei using the recently commissioned large-acceptance multi-purpose spectrometer SAMURAI (**S**uperconducting **A**nalyser for **MU**lti-particles from **Ra**dio-**I**sotope Beam) facility, at the new-generation RI beam facility, RIBF, at RIKEN. The experiment was aimed at probing the two-neutron Borromean halo nuclei, focusing on ^{19}B and ^{22}C, the exclusive measurements of which were only made possible by the use of the large-acceptance SAMURAI facility, coupled with secondary beams of unequaled intensity (100 and 15 pps, respectively). In the case of ^{22}C much attention has focused on the possibility that it has the largest halo known, as inferred from an extremely large reaction cross section [1]. In addition, ^{22}C may also exhibit features consistent with the new magic number N=16, as was recently suggested by our inclusive measurement of the momentum distribution of ^{20}C following breakup on a C target [2]. In the case of ^{19}B, in addition to a Borromean character, interest centers on the possibility of a 4-neutron halo-like structure. Coulomb breakup is a powerful probe of haloes owing to the unique strong low-energy electric dipole strength (soft $E1$ excitation), sensitive to the halo part of the radial wave function. It has also been demonstrated that a kinematically complete measurement of Coulomb breakup can be used to study the halo neutron correlations [3,4]. The Coulomb breakup of ^{22}C and ^{19}B was studied, as part of the first round of SAMURAI experiments, in May 2012. The momenta of all the beam-like reaction products ^{20}C(^{17}B)+n+n were measured in coincidence following breakup on a thick Pb target at about 240 MeV/nucleon. In this presentation, in addition to the results from this work, those obtained for ^{14}Be, with the highest statistics ever obtained, will be discussed. Finally, we will also present some perspectives on future projects using the SAMURAI facility.

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