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## Study of np correlations via two-nucleon removal reactions

Developing a unified description of finite nuclei based on the underlying interactions between individual nucleons is a long-sought goal in nuclear physics. Two-nucleon removal reactions offer a promising tool to investigate nucleon-nucleon correlations, the fundamental ingredients in nuclear forces. A well-documented case is the electron-induced ( $e, e'pN$ ) pair removal measurements on a C target at 4.6 GeV that selected high momentum transfer and large missing momentum events, suggesting that np pairs are about 20 times more prevalent than that like-nucleon pairs in short-range correlations [1]. The systematic ( $e, e'pN$ ) measurements with medium-to-heavy stable nuclei revealed a marked increase of the fraction of high-momentum protons with the neutron excess in nucleus [2].

To study how the np correlations evolve towards unstable nuclei with large isospin asymmetry, two-nucleon removal reactions in inverse kinematics are desired [3]. In this talk, we will present the results of np removal from  $^{12}\text{C}$  with a Be target at 190 MeV/u together with the ( $p,2pn$ ) reactions from neutron-rich nuclei at 250 MeV/u. Both measurements were performed at the RIBF with the BigRIPS and SAMURAI spectrometers. Significant two-step contributions from the evaporation were observed and subtracted in both cases. The partial cross sections to the individual final states of  $^{10}\text{B}$  were achieved and compared with the calculations using the ab-initio structure inputs. The reaction kinematics of ( $p,2pn$ ) is under analysis and will be compared with the sequential picture discovered in the ( $p,3p$ ) reactions [4].

[1] R. Subedi et al., *Science* 320, 1476(2008).

[2] M. Duer, et al., *Nature* 560, 7720 (2018).

[3] M. Patsyuk, et al., *Nature Physics* 17, 693(2021).

[4] A. Frotscher et al., *Phys. Rev. Lett.* 125, 012501(2020).

### Collaboration

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