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Probing the origin of the Isospin Dependence of Nucleon Correlations and Asymmetry of Parallel Momentum Distribution using (p, pN) reaction at intermediate energy

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Single-nucleon knockout reactions of fast radioactive beams have been shown to be a powerful tool for identifying single-particle structure in exotic nuclei and forinvestigating effects of correlations in the nuclear wave functions. The knockout crosssections can be used to infer spectroscopic factors based on the associated reaction models. For the deeply-bound nucleon removal on C/Be target, a strong reduction in the spectroscopic factor deduced using Glauber-based reaction model from experiment relative to the shell-model calculations is found [1]. Such large disagreement has not been explained and is inconsistent with results from systematic studies of transfer reactions [2]. The recently developed INC model has provided a new reaction mechanism resulting in such large disagreement [3], however, our experiment performed at RCNP does not support the INC explanation [4]. Such long-standing puzzle of large disagreement still remains. In addition, the origin of the observed asymmetric parallel momentum distribution (P//) of the residual nuclei, with shape characterized by a steep fall-off on the high momentum side and a long-ranged tail on the low momentum side, is still not understood Instead of C/Be, using hydrogen target structureless probe) for one-nucleon removal leads to a simpler reaction mechanism which can be more accurately described by the three-body breakup reaction dynamics. A recent theoretical work with (p,pN) reaction model provides the first quantitative explanation on the origin of the asymmetric parallel momentum distribution [5]. This model [5], if proved as successful, could resolve the long-standing puzzle of the large disagreement and the origin of asymmetric P// mentioned above, and consequently could serve as a reliable theoretical framework to extract structure information.We therefore propose to perform the cross section and P// measurements of 14O(p,2p)13N reaction at 100 MeV/nucleon in inverse kinematics. Data will be used to assess the reaction model quantitatively. We assume the beam intensity of 14O of 1x105 pps (from LISE++), the cross section to 13N (g.s.) of 10 mb, solid hydrogentarget of 2 mm and other detection efficiency. So to achieve enough statistics for detailed study of P//, 1-day beam time (including 8 hr beam time for empty target measurement) is required. The proposed measurement is considered as a campaign experiment with an approved SAMURAI experiment (NP1206-SAMURAI12: Cluster structure of Beryllium isotopes and study of multineutron systems, spokesperson: Didier Beaumel). Same experimental setup and same primary beam will be used. Tuning the secondary beam from 10,12,14Be to 14O is needed in between two experiments.

[1] A. Gade et al., Phys. Rev. C77, 044306 (2008) and reference therein.
[2] J. Lee et al., Phys. Rev. Lett. 104, 112701 (2010).
[3] C. Louchart et al., Phys. Rev. C 83, 011601 (R) (2011).
[4] Y. Sun, J.Lee et al., paper in preparation
[5] K. Ogata et al., arXiv:1505.06624 (2015)

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