Probes of nucleon single-particle configurations and correlations

J.A. Tostevin
NSCL, Michigan State University, East Lansing, Michigan 48824-1321, USA and Department of Physics, Faculty of Engineering and Physical Sciences, University of Surrey, Guildford, Surrey GU2 7XH, UK

Our theoretical understanding of the behaviour of nucleon single-particle states in the most highly-asymmetric nuclei has prospered from quantitative information derived from direct knockout (nucleon removal) and transfer reactions. Recent reaction studies propose both more quantitative assessments and links to microscopic structure models, e.g. [1], and probes of developments in shell-model effective interactions. Of particular value at intermediate energies have been the fast one- and two-nucleon removal mechanisms and transfer reactions. In particular, studies of well-bound and loosely-bound nucleon removal and the fast two-nucleon removal mechanism are now available, e.g. [2], providing quantitative predictions and experimental tests for both ab initio and truncated-basis structure models and of their inclusion of two-nucleon correlation effects [3,4]. Fast nucleon pickup reactions have also recently been suggested [5] as a probe for the migration/fragmentation of high-L intruder states, e.g. near traditional closed shells. This talk will review recent analyses and future possibilities for both spectroscopy and as probes of wave functions calculated with modern many-body methods.

References

[1] G.F. Grinyer et al., Phys. Rev. Lett. 106, 162502 (2011); Ø. Jensen, G. Hagen, M. Hjorth-Jensen, B. Alex Brown, and A. Gade, Phys. Rev. Lett. 107, 032501 (2011)

[2] D. Santiago- Gonzalez et al., Phys. Rev. C 83 061305 (2011); N. Kobayashi, T. Nakamura, J.A. Tostevin et al., submitted (2012)

[3] E.C. Simpson and J.A. Tostevin, Phys. Rev. C 82, 044616 (2010)

[4] E.C. Simpson, J.A. Tostevin, Phys. Rev. C 83, 014605 (2011)

[5] A. Gade, J.A. Tostevin et al., Phys. Rev. C 83, 054324 (2011); S. McDaniel, A. Gade, J. A. Tostevin et al., Phys. Rev. C 85, 014610 (2012)