

Pairing in weakly bound systems

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The evolution of pairing correlations in exotic nuclei is a subject which has received much attention in recent years, as RIB's accelerator facilities are providing unique isotopes to study. Of particular interest is the role of pairing in neutron-rich systems where the appearance of a low-density surface may induce a transition from the well known BCS Cooper-pairing mechanism to a BEC di-neutron condensate[1].

While the observation of this interesting crossover might not be within the current reach of RIBF, Skyrme-Hartree-Fock mean field and continuum RPA calculations predict a significant change in the neutron pair-addition/removal strength to low-lying excited 0^+ states (pairing vibrations) in the Sn nuclei for $N = 82 - 90$ nuclei [2].

Here we propose to study ^ASn (p,p2n) and (-2n) KO reactions combining FRANKENBall with MINOS, SAMURAI, and NEBULA to carry-out exclusive cross-section and momentum distribution measurements to low-lying 0^+ and 2^+ states in the (A-2) system. (Relative) Comparison of QFS and KO results should also serve as a proxy of the pair-correlation length in the volume and the surface.

Preliminary estimates suggest that for ^{136}Sn , delivered at ~400 pps on target, we will obtain approximately 400 counts/day for gs-to-gs transitions and 40/day to the 2^+ , a feasible experiment.

[1] M. Matsuo PRC 73, 044309 (2006)

[2] H. Shimoyama and M. Matsuo. Phys. Rev. C, 84:044317, 2011.

Primary authors: CRAWFORD, Heather (Lawrence Berkeley National Laboratory); FALLON, Paul (Lawrence Berkeley Laboratory)

Presenter: CRAWFORD, Heather (Lawrence Berkeley National Laboratory)

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