

HAW14-2014-000174

Abstract for an Invited Paper  
for the HAW14 Meeting of  
the American Physical Society

### **A search for unexpected bound states in $^{15}\text{B}$ <sup>1</sup>**

CALEM R. HOFFMAN, Argonne National Laboratory

Bound states in  $^{15}\text{B}$  are to be populated through the one proton removal reaction from a  $^{16}\text{C}$  beam produced at the RCNP EN Course through  $^{18}\text{O}$  fragmentation.  $\gamma$ -decays from these states will be identified by an array of Compton-suppressed HPGe Clover detectors (CAGRA). The goals consist of i) identifying any previously unobserved and unexpected bound states in  $^{15}\text{B}$  and ii) to assign total angular momenta to known excited states for the first time. At present only two bound states have been observed in  $^{15}\text{B}$ , neither with firm spin or parity assignments [1]. The present work to be discussed is aimed at determining whether an excited  $3/2^-$  state, a state with identical spin-parity as the ground state, resides below the neutron separation energy in  $^{15}\text{B}$ . Such an excited  $3/2^-$  state is not predicted to appear below the  $^{15}\text{B}$   $S_n$  by shell-model calculations using various  $p$ - $sd$  interactions. However, a robust systematic, probably related to the  $s$ -wave trends found in the single-neutron states in this region [2], has been observed for neutron-rich  $N=10$  nuclei and it suggests that the state may appear lower in excitation energy than expected. Providing some measure of validation for the  $N=10$  prediction is a similar trend noticed in the energy differences between ground ( $p$ )<sup>2</sup> neutron states and excited ( $sd$ )<sup>2</sup> neutron states in the  $N=8$  neutron-rich isotones [3]. In addition to a search for this unexpected state, additional spectroscopic information on  $^{15}\text{B}$  will better aid in the understanding of the  $N=10$  isotones when transitioning from  $^{16}\text{C}$  into sparsely probed  $^{14}\text{Be}$ . Details of the experimental procedures and motivation will be presented and discussed.

[1] Y. Kondo, T. Nakamura, N. Aoi et al., Phys. Rev. C 71, 044611 (2005).

[2] C. R. Hoffman, B. P. Kay, J. P. Schiffer, Phys. Rev. C 89, 061305(R) (2014).

[3] H. Iwasaki, A. Dewald, C. Fransen et al., Phys. Rev. Lett. 102, 202502 (2009)

<sup>1</sup>Supported by the U.S. DOE, under Contract No. DE-AC02-06CH11357