SEARCH FOR INTRUDER STATES IN ^{66,67}Co*

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In the region below ^{68}Ni, competition between states associated with near-spherical shapes and with deformed proton-intruder configurations has been proposed recently for ^{64,66}Mn [1] and ^{66,67}Co [2-4], where large spin differences between the states result in distinctive isomers. In ^{66}Co, two 1^+ states below 1 MeV were identified; these were attributed to (possibly mixed) spherical and deformed intruder configurations. In ^{67}Co, observed $1/2^-$, $3/2^-$, and $5/2^-$ levels were suggested to be low-lying members of a collective $K^\pi=1/2^-$ band (of $\pi p_{3/2}$ intruder origin) amid the spherical states [3]. The intruder nature of such states in both nuclei was not confirmed, however. Doing so would provide valuable input for tuning the single-particle energies and interactions needed for large-scale shell-model calculations of nuclei requiring the full $fpg_{9/2}$ (or even larger) model space, particularly addressing excitations across the Z = 28 shell gap.

Deep-inelastic reactions between a 440-MeV ^{70}Zn beam and a thick ^{208}Pb target were recently studied with Gammasphere at ATLAS to search for evidence at higher spins supporting the assignment of intruder configurations for low-lying states. Beam timing of one pulse every ~410 ns allowed the data to be separated into prompt and delayed time regions with which gamma-ray coincidences above, across, and below isomers could be examined. Furthermore, cross-coincidences between the beam-like (Co) and target-like (At) reaction products, of which many of the latter have known isomers, are observable in combinations of prompt/delay gating in our data. In this way, the level schemes of ^{66,67}Co can be extended to higher spins despite a lack of known high-spin coincidences within the Co nuclei themselves. Results of this search will be presented.

*Supported in part by the US DoE, Office of Nuclear Physics, under Grant No. DE-FG02-94-ER40834 and Contract No. DE-AC02-06CH11357.

[1] S. N. Liddick *et al.*, Phys. Rev. C **84**, 061305 (2011).

[2] S. N. Liddick *et al.*, Phys. Rev. C **85**, 014328 (2012).

[3] D. Pauwels *et al*., Phys. Rev. C **78**, 041307(R) (2008).

[4] D. Pauwels *et al*. Phys. Rev. C **79**, 044309 (2009).