Single-particle states outside the $N=82$ core

BENJAMIN KAY, JOHN SCHIFFER, Argonne, SEAN FREEMAN, Manchester, JASON CLARK, CATHERINE DEIBEL, ANDREAS HEINZ, ANUJ PARIKH, CHRIS WREDE, Yale — A systematic study of the high-$\ell$ single-neutron states outside the $N=82$ isotones was carried out with the $(\alpha,^3\text{He})$ reaction on $^{138}\text{Ba}$, $^{140}\text{Ce}$, $^{142}\text{Nd}$ and $^{144}\text{Sm}$ at a beam energy of 51 MeV. The separation between the $i_{13/2}$ and $h_{9/2}$ single-neutron states, was measured. Spectroscopic factors for the states populated in the high-$\ell$ transfers indicate significant fragmentation for the $\ell=5$ and $\ell=6$ strength, but the summed strengths on these targets are constant. The centroids of the single-particle strength display a change in the relative energies of these two nodeless single-particle orbits, similar to the trend observed in the Sb isotopes\textsuperscript{1}. The centroid shifts with neutron number are in agreement with those expected from the monopole term in the tensor component of the residual interaction between nucleons of Otsuka et al.\textsuperscript{2}. This research was supported by the DOE Office of Nuclear Physics under Contract Nos. DE-FG02-91ER-40609 and DE-AC02-06CH11357. \textsuperscript{1}J.P. Schiffer et al. Phys. Rev. Lett. 92, 162501 (2004). \textsuperscript{2}T. Otsuka et al. Phys. Rev. Lett. 95, 232502 (2005).