Spin yields from deep-inelastic reactions.

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Rapid rotation offers a unique opportunity to study nuclei under the influence of strong perturbations. A typical means of generating large amounts of angular momentum is by fusion reactions, however, due to the low N/Z ratio of the projectile-like and target-like nuclei and neutron evaporation access to neutron-rich nuclei is limited. The deep inelastic reaction mechanism, on the other hand, has the ability to access these nuclei with the additional prospect of generating large amounts of rotational angular momentum [1], but until recently has not been pursued in high spin nuclear structure studies [2, 3].

Although it has been demonstrated that the deep inelastic mechanism is capable of generating high spins in neutron-rich nuclei [2], little is known about the dependence of the cross sections on beam-target combinations or energy. In another abstract we address these issues and provide experimental details. How well deep inelastic reactions can generate angular momentum in deformed nuclei is taken up in here as we discuss the spin populations as a function of nucleon transfer. By increasing the projectile mass from ^{48}Ca in the first experiment to ^{154}Sm in the last two experiments, we expect to bring in greater angular momentum in the transfer process.

In the first experiment spin states as high as $22\hbar$ were seen in two neutron-transfer to ^{174}Yb. High spin states were also seen in the latter two experiments, although Doppler broadening limiting our sensitivity to the highest spins. Figure 1 shows the highest spins as a function of neutron transfer for all three experiments. The relative flatness of these yields are indicative of the deep inelastic process. Spin yields for Ytterbium-like and Samarium-like nuclei are shown in Figure 2. The upturn in the spin yields of ^{154}Sm and ^{176}Yb at high spins cannot be accounted for in

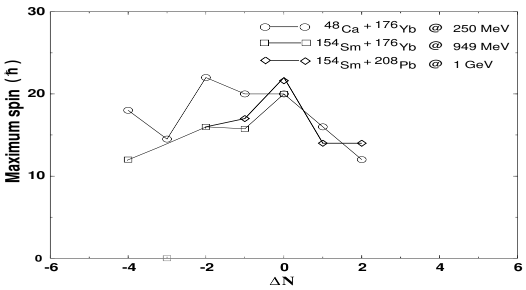

Figure 1: Highest spin versus neutron transfer.

Coulomb excitation plus transfer calculations, nor can the flatter slope in the spin yields of the transfer products [4]. This behavior, again indicative of the deep inelastic process, has previously been seen [2], although not until many nucleons have been transfered.

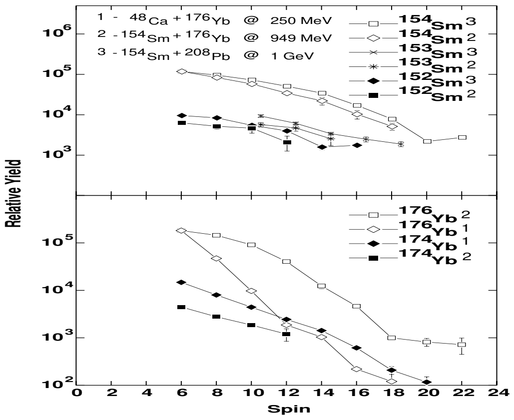

Figure 2: Ytterbium-like and Samarium-like spin yields.

References

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