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## Polarization of Nuclei in Direct Interaction Processes

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The residual nuclei following a direct interaction process are left in a polarized state in general. The observation of an up-down asymmetry in the emission of beta-particles, the polarization of internal conversion electrons, the circular polarization of gamma rays emitted from the residual nucleus depend on the nuclear polarization moments. The experiment of CHASE and IGO [1] is an example of the first type of observation. The theories of the second and third type of measurement have been developed by BECKER and ROSE [2] and by SATCHLER [3] respectively. The angular correlation of an inelastically scattered particle or reaction product with a gamma ray emitted from the residual nucleus also depends on the polarization moments. An example is the  $(p, p'\gamma)$  reaction which has been summarized by LEVINSON and BANERJEE [4].

In a  $(d, p)$  reaction, the distorted wave direct interaction (DWDI) theory predicts the polarization of the residual nucleus  $B(\theta)$  may reach 100% whereas the proton polarization cannot exceed  $33\frac{1}{3}\%$ . However the proton polarization in the  $C^{12}(d, p)C^{13}$  reaction at MeV at a scattering angle of 70 degrees has been found to exceed  $33\frac{1}{3}\%$  [5]. There is also evidence from the  $Be^9(d, p)Be^{10}$  reaction [3] and the  $C^{12}(d, p\gamma)C^{13}$  correlation [3] that the DWDI theory is inadequate without at least the addition of spin orbit coupling.

A test of the DWDI theory can be made by measuring the asymmetry  $A(\theta)$  of the scattered deuterons in the  $N^{14}(p, d)N^{13}$  when polarized protons are incident on  $N^{14}$ , and the polarization  $B(\theta)$  of  $N^{13}$  in the  $H^1(N^{14}, N^{13})H^2$  reaction at the same center of mass energy. The DWDI theory predicts that  $A(\theta)/B(\theta)$  is a constant independent of the scattering angle  $\theta$ . A source of  $10^6 \text{ sec.}^{-1}$  100% polarized protons has been prepared at Berkeley to study the pick-up reaction.

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