Left-Right Asymmetries in the D(d, p)T Reaction with Polarized Deuterons

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A 1.4 $\pm$ 0.3 MeV deuteron beam, almost purely vectorially polarized, obtained by α–D elastic scattering [1], has been used to study the angular dependence of left-right asymmetry for protons from $D(d,p)T$. Protons emitted right (R) and left (L) from a 0.8 mg/cm^2 heavy paraffin target were detected by nuclear emulsions. A separate run, with a 1 mg/cm^2 polytene target, made under identical experimental conditions, gave the contribution from $C^{12}(d,p)C^{13}$ protons. Figure 1 gives the R and L

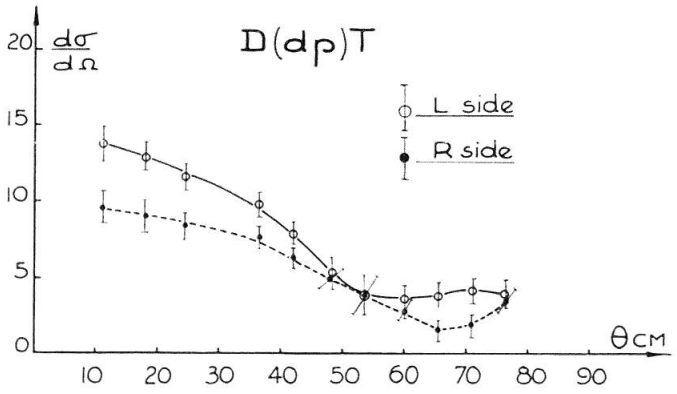

Figure 1

angular distributions, showing that the deuterons are effectively polarized, and figure 2 gives the angular dependence of $\varepsilon = (R - L)/(R + L)$. If $P_d \sim + 0.33$ is the deuteron vector polarization [1], P'_d the deuteron polarization for $T(p,d)D$ with unpolarized protons, we must have rigorously [2, 3]: $\varepsilon = 3/2\ P_d P'_d \simeq P'_d/2$. Moerover if P_p is the proton polarization for $D(d,p)T$ with unpolarized deuterons ($P_p \sim \sin 2\Theta/(R + L)$ [3]), the stripping approximation [2] without symmetrization for d–d reaction shows that $\varepsilon = 3\ P_d P_p \simeq P_p$ (broken curve in figure 2).

[1]) On leave from Los Alamos.

For $35° < \Theta_{C.M.} < 45°$, P_p values so deduced are in fair agreement with previous measurements [4] but the stripping approach does not seem to hold for all angles.

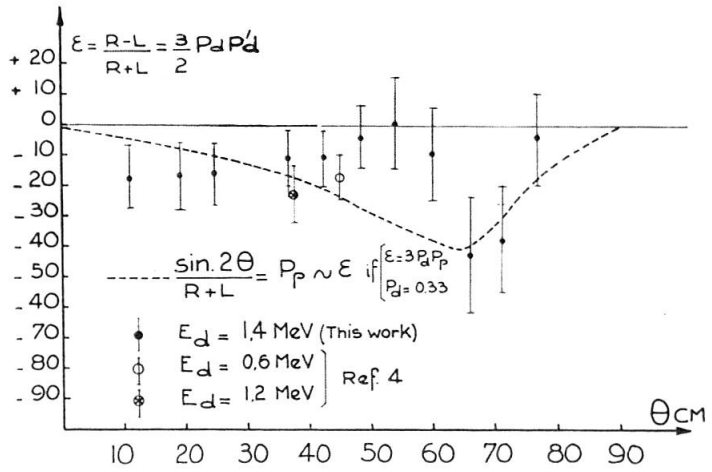

Figure 2

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