

Zeitschrift: Helvetica Physica Acta
Band: 34 (1961)
Heft: [6]: Supplementum 6. Proceedings of the International Symposium on polarization phenomena of nucleons

Artikel: Left-right asymmetries in the D(d, p)T reaction with polarized deuterons
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DOI: <https://doi.org/10.5169/seals-513271>

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

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A 1.4 ± 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

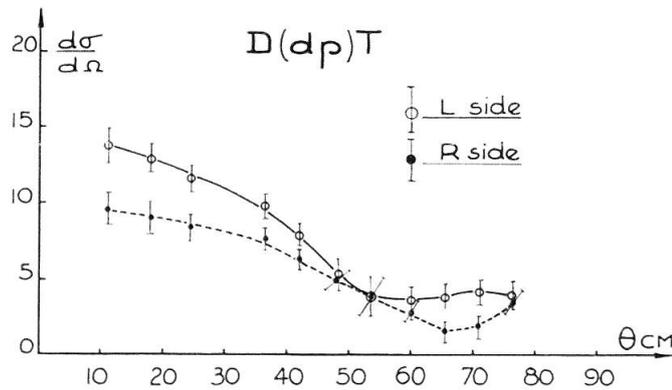


Figure 1

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]: $\varepsilon = 3/2 P_d P'_d \cong P'_d/2$. Moreover 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 $\varepsilon = 3 P_d P_p \cong P_p$ (broken curve in figure 2).

¹⁾ On leave from Los Alamos.

For $35^\circ < \Theta_{C.M.} < 45^\circ$, 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.

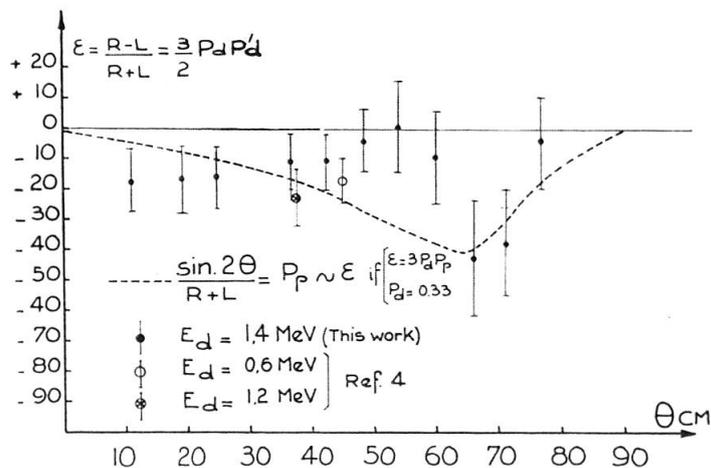


Figure 2

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