Title

CROSS-SECTIONS and VECTOR ANALYZING POWERS IN THE 3He(d,p) 4He REACTION BETWEEN 15 and 40 MeV

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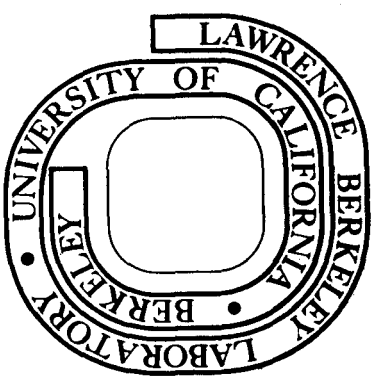

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CROSS-SECTIONS AND VECTOR ANALYZING POWERS IN THE $^{3}\vec{He}(\vec{d},p)^{4}He$ REACTION BETWEEN 15 AND 40 MeV.*

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Differential cross-sections and angular distributions of the vector analyzing power iT_{11} were obtained for the $^{3}\vec{He}(\vec{d},p)^{4}He$ reaction in intervals of 5 MeV between 15 and 40 MeV. At each energy data were taken at 25-35 angles. Figure 1 shows the results at three energies. The statistical errors are shown wherever they are larger than the symbols. The scale of the cross-sections is subject to a systematic error, estimated to be less than 6%. The data at 15 MeV join smoothly to measurements of lower energies[1]. The solid curves are the results of fitting with a Legendre polynomial expansion. Figure 2 shows the expansion coefficients $d_{kq}(L)$, normalized to yield 4π for the total cross-section[2]. The points below 12 MeV are taken from ref. 1).

The coefficients of the cross-section for unpolarized particles $d_{00}(L)$ for even degree L show some evidence of a broad structure near 20 and 40 MeV, while the odd-degree coefficients repeat only the 20 MeV structure. This coincides with a shift away from a predominance of the coefficients $d_{11}(2)$ to $d_{11}(1)$. The latter indicates large interference terms between reaction matrix elements of opposite parity. This is also visible in the angular distributions of iT_{11}, which shift from antisymmetry with respect to 90°, to a more symmetric distribution. This observation adds support to the result of two recent analyses[2,3] which postulate mostly interference between d-wave levels below 11.5 MeV and a strong $d_{7/2^+} - f_{7/2^-}$ interference at higher energies.

The Legendre coefficients from an analysis of the $^{3}\vec{He}(\vec{d},d)^{3}He$ elastic scattering data[4] lend support to these tentative conclusions because similar variations are found near 20 and 40 MeV. Clearly, measurements of the analyzing tensors $T_{2q}(\theta)$ are needed in order to provide the data for a more definite analysis.

References

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+ Research Council of Canada, Postdoctoral Fellow.
‡ On leave from the University of Basel, Switzerland.

1) W. Grüebler, V. König, A. Ruh, P. A. Schmelzbach, R. E. White and P. Marmier, Nucl. Phys. A176 (1971) 631.
2) F. Seiler, Nucl. Phys. A244 (1975) 236.
3) D. D. Dodder and G. M. Hale, Fourth Polarization Symp.
4) R. Roy , H. E. Conzett, F. N. Rad, R. Seiler and R. M. Larimer, Fourth Polarization Symp.

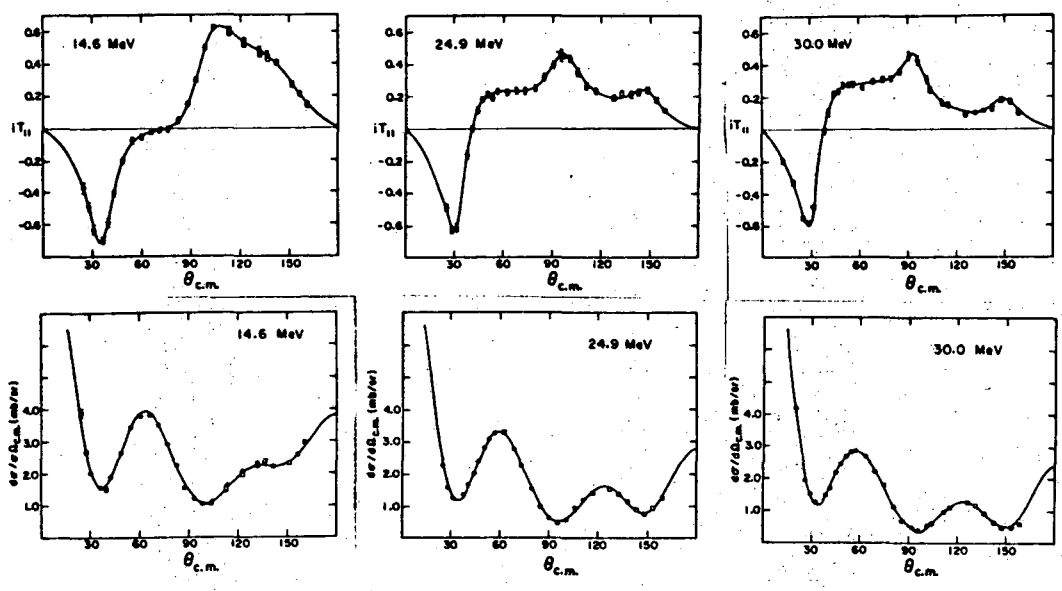

Fig. 1

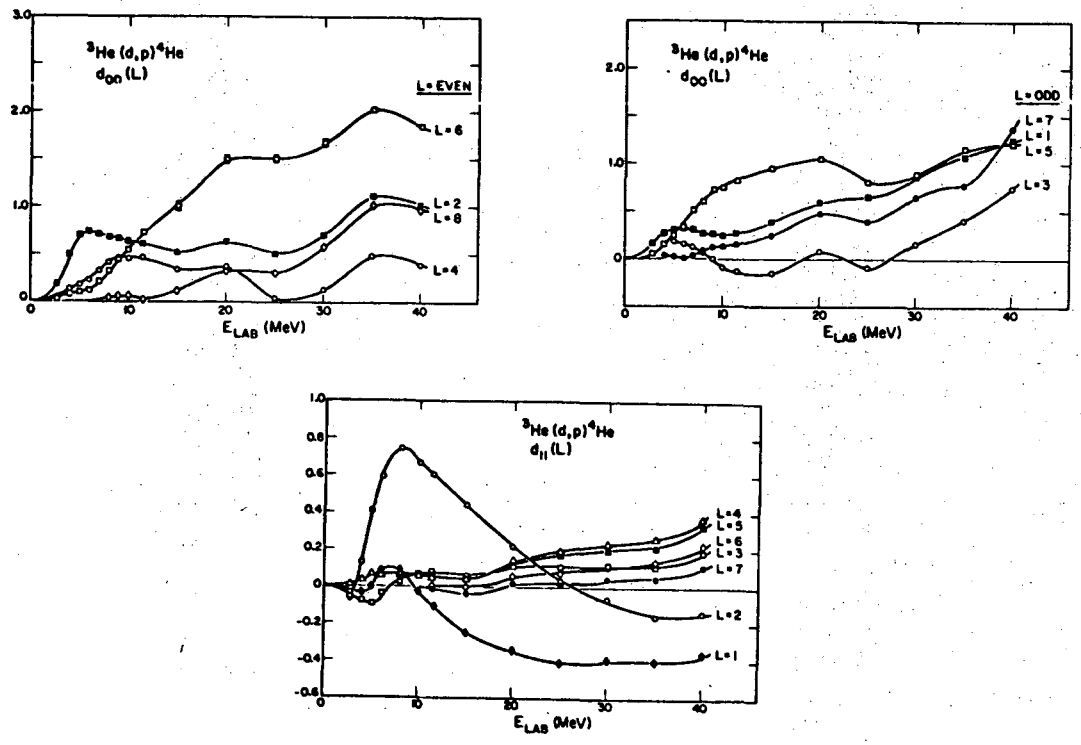

Fig. 2 Energy dependence of the coefficients $d_{00}(L)$ and $d_{11}(L)$. The smooth curves are drawn to guide the eye.

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