

Lawrence Berkeley National Laboratory

Recent Work

Title

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

Permalink

<https://escholarship.org/uc/item/5w17s8rt>

Author

Roy, R.

Publication Date

1975-06-01

0 0 0 0 4 3 0 0 7 3 7 1

Presented at the 4th International
Symposium on Polarization Phenomena
in Nuclear Reactions, Zürich, Switzerland,
August 25 - 29, 1975

LBL-4053

c1

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

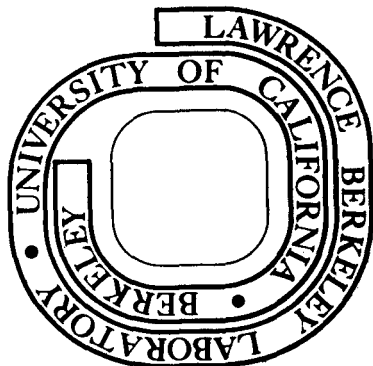
R. Roy, F. Seiler, H. E. Conzett,
F. N. Rad, and R. M. Larimer

June 1975

Prepared for the U. S. Energy Research and
Development Administration under Contract W-7405-ENG-48

For Reference

Not to be taken from this room



LBL-4053

c1

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

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

R. Roy⁺, F. Seiler[‡], H. E. Conzett,
 F. N. Rad and R. M. Larimer

Lawrence Berkeley Laboratory, University of California
 Berkeley, California 94720

Differential cross-sections and angular distributions of the vector analyzing power iT_{11} were obtained for the $^3\text{He}(\text{d},\text{p})^4\text{He}$ 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 energies¹⁾. 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-section²⁾. 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 $^3\text{He}(\text{d},\text{d})^3\text{He}$ elastic scattering data⁴⁾ 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

- * Work performed under the auspices of the U. S. Energy Research and Development Administration.
- + 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.

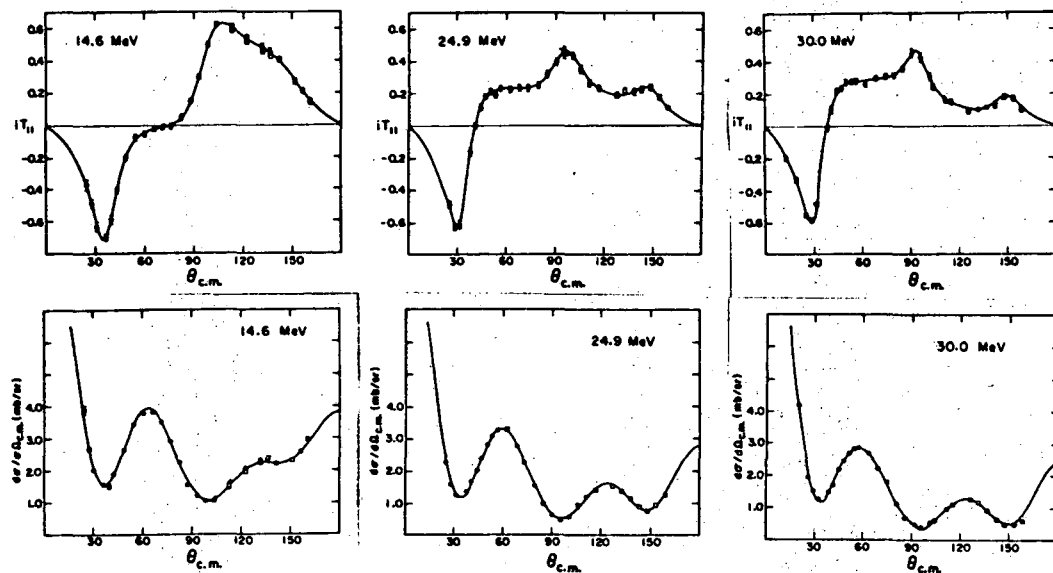


Fig. 1

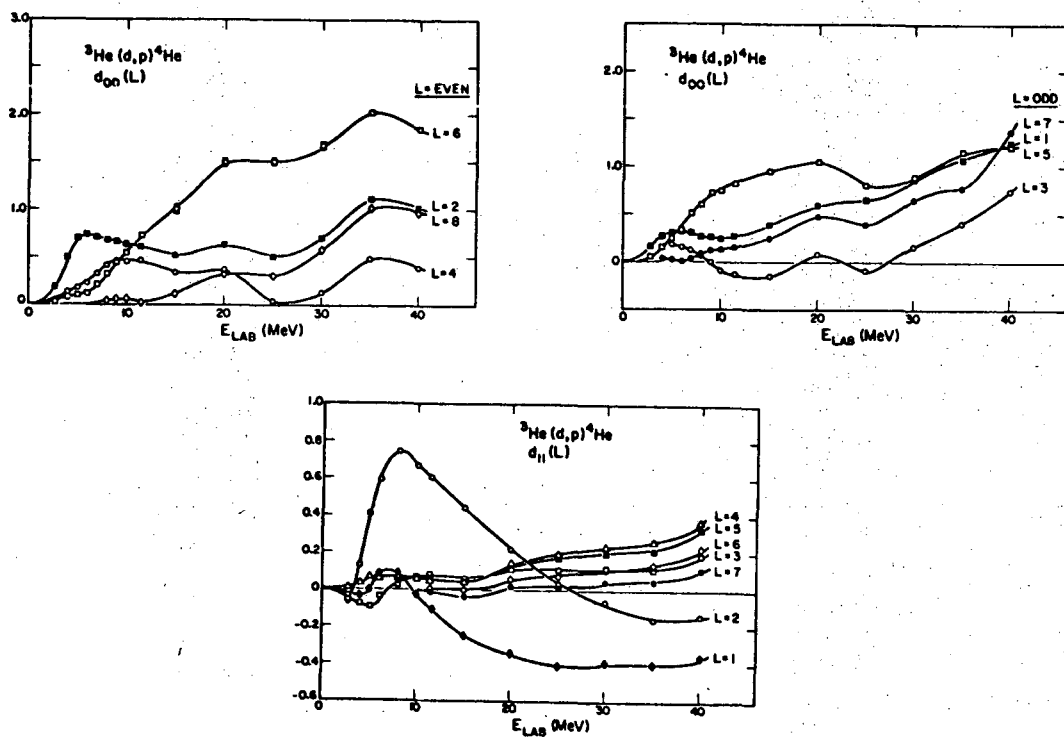


Fig. 2 Energy dependence of the coefficients $d_{00}(L)$ and $d_{11}(L)$.
The smooth curves are drawn to guide the eye.

LEGAL NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

TECHNICAL INFORMATION DIVISION
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720