POLARIZATION OF PROTONS SCATTERED FROM O^{16}

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Submitted to JETP Editor March 12, 1960

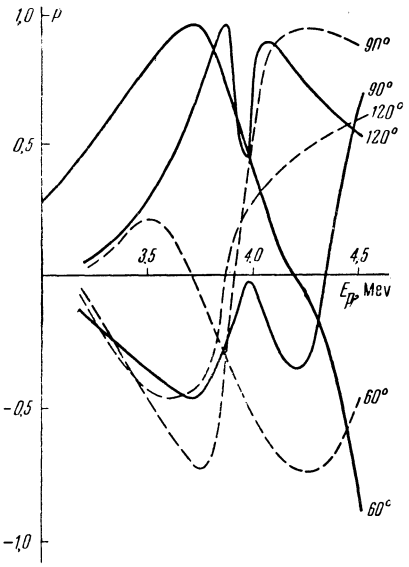
J. Exptl. Theoret. Phys. (U.S.S.R.) **39**, 416-417 (August, 1960).

The polarization of protons elastically scattered from O^{16} has been calculated for protons in the energy range 3—4.5 Mev and for three scattering angles: 60°, 90° and 120°. It is shown that the polarization is very sensitive to the choice of level parameters for the F^{17} nucleus.

At the present time, only conflicting data are available in the literature on the energy levels of the F^{17} nucleus for excitation energies in the range 4 — 5.5 Mev.[1] According to the analysis of Laubenstein,[2] the experimental data given in reference[3] imply the following levels in this energy range: $3/2^+$ at 4.35 Mev and $3/2^+$ at 4.73 Mev. On the other hand, Sempert et al.[4] give different levels: $3/2^-$ at 4.5 Mev, $3/2^+$ at 4.6 Mev and $1/2^+$ at 5.1 Mev.

Measurements of the polarization in elastic scattering should resolve these difficulties. We have calculated the polarization P of protons elastically scattered from O^{16} for protons having energy in the range 3 — 4.5 Mev and for scattering angles 60°, 90° and 120° in the center-of-mass frame. The calculations were carried out within the framework of the resonance theory developed by Wigner and Eisenbud.[5] The results are shown on the figure. The solid curves are based on the energy levels given in reference,[2] while the dotted curves were calculated from the phases given in reference 4. It is evident that the polarization is quite sensitive to the choice of level parameters for the nucleus F^{17}.

The following points should be noted. In reference 2, the assumption was made that the S phase shift was large throughout a wide energy range. According to the Laubensteins, this might be connected with the existence of a wide, low lying $1/2^+$ level at 0.5 Mev. However, according to the data given by Sempert et al., the S-wave phase shift is no greater than would be expected from potential scattering. Our calculations indicate that this difference has very little effect on the magnitude of the polarization. The differences among the polarization curves are almost entirely due to the differences in assumed energies, spins and parities for the high-lying levels of F^{17}.



[1] F. Ajzenberg-Selove and T. Lauritsen, Nuclear Phys. 11, 1 (1959).

[2] R. A. Laubenstein and M. J. W. Laubenstein, Phys. Rev. 84, 18 (1951).

[3] Laubenstein, Laubenstein, Koester, and Mobley, Phys. Rev. 84, 12 (1951).

[4] Sempert, Schneider, and Martin, Helv. Phys. Acta 27, 313 (1954).

[5] E. P. Wigner and L. Eisenbud, Phys. Rev. 72, 29 (1947).

Translated by R. Krotkov
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