we have a theory that is shown to be correct in the first order. In studying the first-order effects it will be of primary interest to examine the data for information on the long-range correlations predicted by the shell model and to look for evidence of cluster effects. In this context it will be specially interesting to understand the close relationship observed between the momentum transfer dependence of the (p, pd) reaction and that for p-d elastic scattering, since this might be interpreted as implying equivalent sizes for the free deuteron and the struck n-p pair inside the nucleus.

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MEASUREMENT OF PROTON-PROTON POLARIZATION AT 20 MeV

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The (p,p) polarization asymmetry has been measured at 20.2-MeV laboratory energy with an accuracy as good as ±0.001. The results are consistent with the phase-shift analyses at this energy.

A recent measurement of (p,p) polarization asymmetry at 19.7 MeV has been performed by Slobodrian and co-workers,[1] the results of which are in contradiction with other types of (p,p) data at this energy and with the phase-shift analyses of Mac Gregor, Wright, and Arndt.[2] It seemed to be necessary to perform a new measurement of this polarization asymmetry with as good an accuracy as possible.

The polarized proton beam of the Saclay azimuthally varying field cyclotron was used for this experiment at an energy of 20.2 ± 0.2 MeV. Its intensity, usually 50 nA, was reduced to 4 nA. Its polarization was 85 ± 10 % alternately up and down five times a second with the two adiabatic transitions of the ion source.[3]

The target was a 4.3-mg/cm² foil of CH_2 and the beam spot was about 2 mm in diameter. Four solid-state detectors were at θ_{left}, θ_{right} (5×10^{-4} sr) and 45° left, 45° right (2.3×10^{-3} sr) in the laboratory system (Fig. 1).

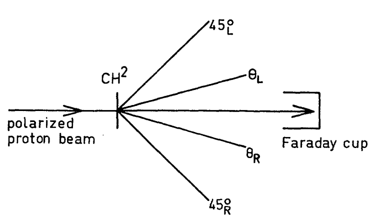

FIG. 1. Schematic drawing of the experimental setup.

The energy spectra of θ_{left} and θ_{right}, the (45° left + 45° right) coincidences, and the integrated current of the Faraday cup through a voltage-to-frequency converter were registered on a 4096-channel pulse-height analyzer. The spectra were registered in the first or in the second half of the analyzer according to the direction (up or down) of the incident beam polarization. So that a wrong asymmetry, due to an unequal dead time in the two

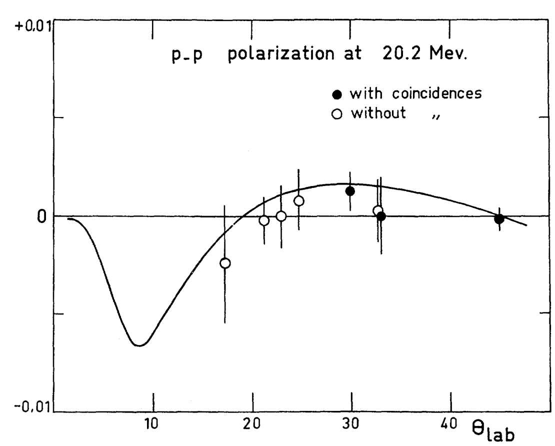

FIG. 2. p-p polarization at 20.2 MeV. Solid circles, with coincidences; open circles, without coincidences; the curve is from MacGregor (Ref. 2).

Table I. Experimental results.

θ_{lab}	$10^4 P$	Accuracy
17°3	−24	±30
21°3	−2	±12
23°	0	±16
24°8	+8	±16
30°	+13	±10
32°8	+3	±16
33°	0	±20
45°	−1	± 6

polarization states, should be detected, a common blocking system for the different amplifiers gave the same dead time on every spectrum. In that manner the equality of the integrated currents in the two polarization states was tested with the Faraday cup, the 45° coincidences, and the (left + right) counts and was found correct with a statistical accuracy better than 5×10^{-4}.

At 33° the experiment was made with two counters in coincidence at 33° left and 57° right. For the 30° point, six counters were used in coincidence at 30° left and 60° right, 45° left and right, and 60° left and 30° right.

The results are shown in Fig. 2 and given in Table I. They are in contradiction with the Berkeley data but consistent with the phase-shift analysis of Ref. 2 shown in Fig. 2.

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