Proc. Sixth Int. Symp. Polar. Phenom. in Nucl. Phys., Osaka, 1985
J. Phys. Soc. Jpn. 55 (1986) Suppl. p. 862-863

3.30 The Depolarization Parameter in p-d Elastic Scattering at 65 MeV

M. Nakamura, H. Sakaguchi, H. Ogawa†, M. Yosoi, T. Ichihara††, N. Isshiki†††, M. Ieiri, Y. Takeuchi, S. Kobayashi, H. Sakamoto*, T. Noro**, H. Ikegami** and P. Schwandt***

Department of Physics, Kyoto University
* Institute of Physics, University of Tsukuba
** Research Center for Nuclear Physics, Osaka University
*** Indiana University Cyclotron Facility

Polarization transfer coefficients in the N-d scattering are expected to provide more important and different aspects of the spin dependent nature of the N-N forces than from the more simple experiment. The three nucleon system can also provide off-shell information. The depolarization parameter K in the elastic scattering of 65 MeV polarized protons from deuterons was measured using the polarization spectrograph "DUMAS"[1] and the efficient proton polarimeter "MUSASHI"[2] at Research Center for Nuclear Physics, Osaka University. A polarized beam of 65 MeV protons from a cyclotron struck the primary target in a scattering chamber attached to the DUMAS. The target was a 18.7 mg/cm^2 thick CD_2 foil. The beam polarization was about 80% and it was monitored continuously during the experiment by a beam polarimeter. We limited the beam current within 200 nA because the high intensity beam decomposed the CD_2 target. Elastically and inelastically scattered protons were transferred to the first focal line (the dispersive focal line) of the DUMAS where they hit a multi-wire proportional chamber (MWPC), and their momenta were measured. The MWPC (named the tagging counter) tagged the magnitude of the momentum to the scattered protons. Typical position spectrum of the first focal line is shown in Fig.1. Passed protons were then transferred to the second focal point (the achromatic focal point)$_2$ of the DUMAS where they struck seven graphite sheet secondary targets (157 mg/cm^2 each). Protons scattered from these targets were detected in right and left MWPCs and ΔE(5 mm)-ΔE(3 mm)-E(25 mm) plastic scintillators telescope stacks. Using the position information at the nearside and farside MWPCs, we got the second scattering position (the number of the graphite sheet target) and the second scattering angle. From the energy information at the scintillators, we got the lost energy at the second scattering. Using these proton lost energy spectra we extracted the number of counts of protons which were scattered elasctically by the second carbon target.

We calculated the effective analyzing powers of the polarimeter using the angular distributions of the cross section and the analyzing power for proton elastic scattering from carbon at energies of 35, 40, 45, 50, 55, 60, 65 and 70 MeV.[3] The analyzing power Ay of the first scattering and the polarization Py' that would result from the first scattering of an unpolarized beam were measured simultaneously with the depolarization K. The fact that the data gives K = 1.0 for the elastic and inelastic (0^+, 7.65 MeV) scattering from ^{12}C serves as a check on the measurement technique, since this must be exactly true for the scattering on spin-0 nuclei. The K data for elastic scattering from deuterons are shown in Fig. 2.[4]

The cross section and the analyzing power in the elastic scattering of protons from deuterons were previously measured at 65 MeV.[5] The data were compared with a three-body calculation based on the Faddeev theory by Koike and Taniguchi.[6] They showed that differences in the $^3s_1$-$^3d_1$ interactions appear distinctly especially on polarization transfer measurements. The curves calculated by Koike and Taniguchi are also shown in Fig. 2. The measured values agree well with the calculation using the Doleschall's separable potential (1Y-4T4B) but disagree with the calculation using the Gratz separable potential (2G-3G5).

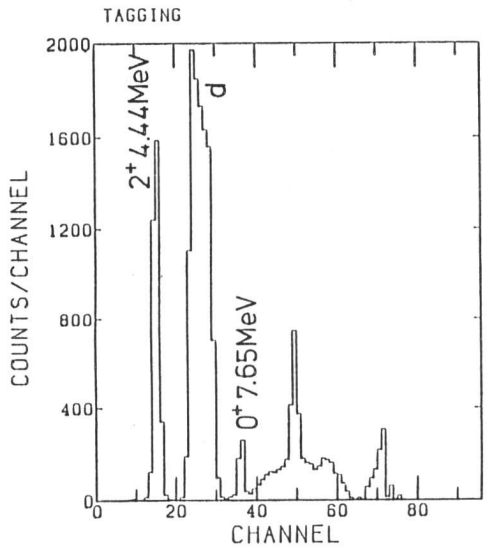

Fig.1 Tagging counter position spectrum.

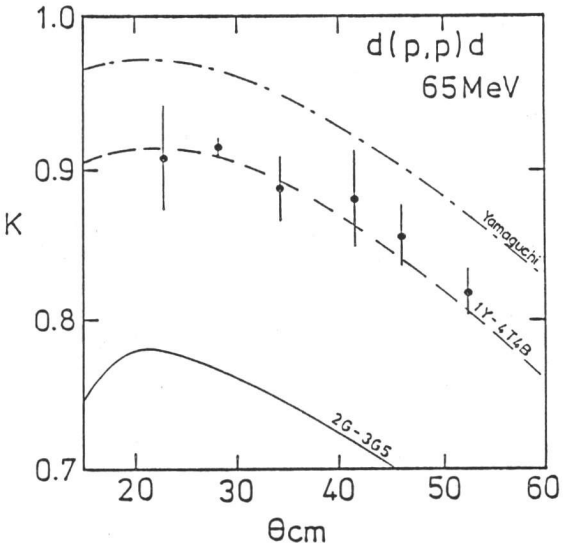

Fig.2 Results of K for the elastic scattering from deuterons. Curves show the results calculated by Koike and Taniguchi. (ref. 6)

†Present address: Department of Physics, Nara Women's University
††Present address: Institute of Physical and Chemical Research
†††Present address: Research Center, SANYO Electric Co., Ltd.

References

1) H. Ikegami et al., RCNP Annual Report 1981, p.179.
2) M. Ieiri et al., RCNP Annual Report 1983.
3) M. Ieiri et al., RCNP Annual Report 1983.
4) The data are slightly different from the preliminary data which were distributed at the conference. The peak fitting method for the spectrum of protons elastically and inelastically scattered by the second target (the graphite sheet) has been improved. The multihit loss and the dead time loss of the MWPCs have been taken into account more carefully. The details will be described elsewhere.
5) H. Shimizu et al., Nucl. Phys. A382 (1982) 242.
6) Y. Koike and Y. Taniguchi, Phys. Lett. 118B (1982) 248.