of data, in good agreement with the more extensive and precise results at lower energy. A polynomial extrapolation using the Coulomb-corrected extrapolation function is shown in Fig. 5.

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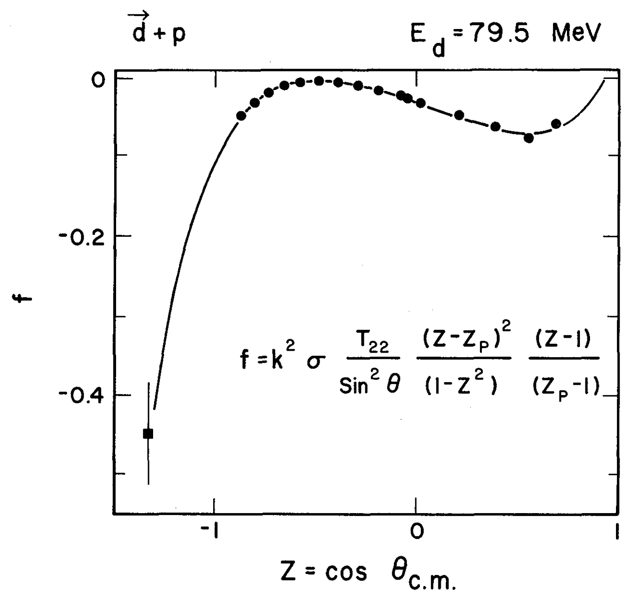

Figure 5. Measurements of the Coulomb-corrected extrapolation function f. The curve is a polynomial fit of order 5. The data point at $z_p = -1.313$ is the extrapolated measurement of $f(z_p)$. This corresponds to an asymptotic D- to S-state ratio of $\rho_D = 0.0242 \pm 0.0034$.

POLARIZATION IN THREE-NUCLEON $\vec{d}$+p BREAKUP AT E_d = 79 MeV

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During 1983 we have continued the series of kinematically complete three-nucleon breakup measurements d + p → p + p + (n) using a 79 MeV, polarized deuteron beam at IUCF. The initial measurements of the tensor analyzing power A_{yy} made in the so-called symmetric, constant-relative-energy (SCRE) geometry have been reported previously.[1] The new results include data on the tensor parameter A_{xx} for two noncoplanar SCRE configurations

The SCRE geometry attracted attention as a result of Faddeev calculations performed by Kloet and Tjon[2] and was first studied experimentally by van Oers.[3] It is characterized by equal polar angles of the two identical, detected particles (here, protons) and equal relative energies between all pairs of particles. In such a geometry, a single breakup amplitude (I = 1/2, S_{pp} = 0) is expected to be of major importance,[4] and this amplitude is believed to be particularly sensitive to the short-range features of the NN interaction. The ultimate motivation of our three-nucleon breakup measurements is to test the relevant features of various nucleon-nucleon (NN) interactions used in Faddeev calculations of three-body observables at elevated energies.

As in the A_{yy} measurements, the breakup protons were detected in coincidence by two solid-state detector systems placed at symmetric, out-of-plane angles (θ,ϕ) appropriate to the detection of the protons originating from the SCRE geometry. The detector systems each consisted of a ΔE-E telescope having a 0.5-mm Si detector plus a 10-mm hyper-pure Ge detector in LN_2 cryostats. The target was CH_2 plastic, about 10-mg/cm^2 thick. The out-of-plane scattering facility[5] used to support the detectors consists of left and right detector platforms that can rotate independently about the incident beam directions, thus allowing independent adjustment of the polar and azimuthal angles θ, ϕ of each detector system. For the A_{xx} measurements, the orientation of both the scattering platforms (when in-plane, ϕ=0) and the deuteron spin quantization axis was vertical in the laboratory.

The various SCRE configurations can be specified by the angle α that the center-of-mass reaction plane makes with the incident beam direction. To date we have measured A_{xx} at α=40° and 120°. These preliminary results are shown in Fig. 1, along with the previous measurements of A_{yy} at α=75°, 120°, 142° and 150°.

The initial approach we have taken to the theoretical analysis is to compare our results with two

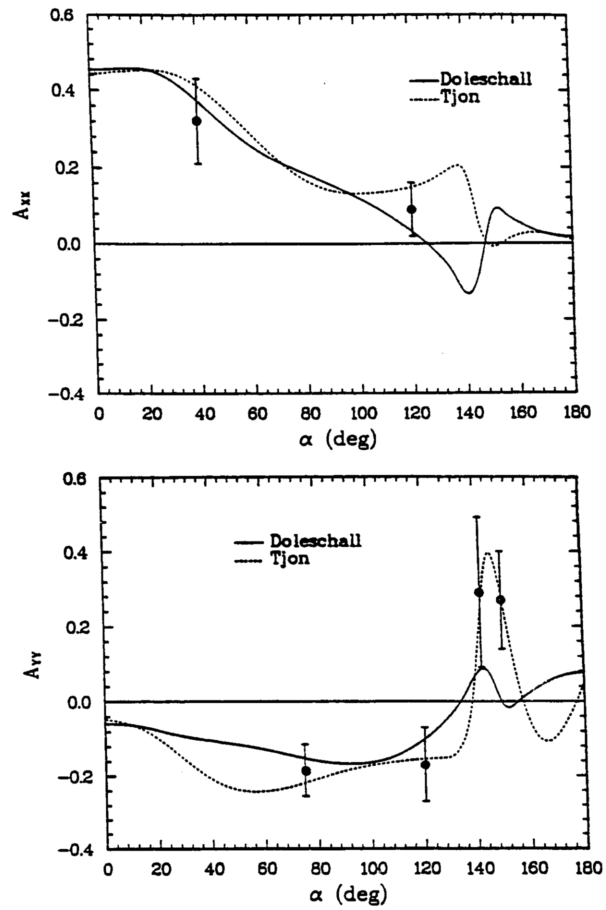

Figure 1. $^1H(d,pp)n$ tensor analyzing powers A_{xx} and A_{yy} vs. rotation angle α for the symmetric, constant-relative-energy (SCRE) geometry. The points are the present preliminary data, and the curves are results of Faddeev calculations.

Faddeev calculations[6,7] that employ different methods. On the one hand, Stolk and Tjon[6] use the Reid soft-core NN interaction, but only solve the S-wave part of the interaction exactly, using a perturbative method for the higher NN partial waves, while on the other hand, Doleschall[7] employs a separable NN interaction that fits the NN data and solves all NN partial waves exactly. The curves in Fig. 1 show the results of these calculations. It is clear from the A_{yy} results that, even with the rather large uncertainties in the data, the Stolk and Tjon calculation is to be preferred over the Doleschall result. This is no doubt due to some defect in the Doleschall NN interaction, and further calculations necessary to discover the source of the problem are in progress. Elastic d+p analyzing powers have been measured recently at IUCF[8], and it is interesting to note that the Doleschall calculation reproduces those results quite well (we have, as yet, no elastic results at the present energy from Stolk and Tjon). Thus we have here an instance in which a problem with the interaction that is not at all obvious in elastic scattering shows up quite markedly in breakup.

In order to complete this phase of our three-nucleon studies at IUCF, we hope to obtain A_{xx} data at several other α angles, to reduce the errors for the data at the present angles, and to carry out further Faddeev calculations

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