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1.75 D-State effects in the $(\vec{d},t)$- and $(\vec{d},{}^3He)$-Reactions on ^{40}Ca at E_d = 20 MeV+)

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With the improved polarized deuteron facility using a spin filter[1] we have investigated the one-nucleon pickup reactions on ^{40}Ca at 20 MeV incident deuteron energy.

This experiment, with emphasis on high accuracy in the determination of analyzing powers in the forward scattering angle range completes previous studies[2]. The new data are shown in Figs. 1 and 2 with full finite range DWBA calculations (code PTOLEMY).

The optical potentials have been taken from literature[3,4], with minor adjustments of the imaginary part. The wave-function of the mass-3 particles was calculated in a Woods-Saxon potential with the depth fitted to the binding energy and a geometry (r_o = 1.5 fm, a = 0.5 fm) to reproduce the finite range parameter[5] β^{-1} = 1.5 fm of the triton wave function of Sasakawa[6]. The same r_o and a-values have been used for the ^3He wave function.

The dashed curves in Figs. 1 and 2 are obtaiend without inclusion of D-state for the mass-3 particles. For the full line within the shaded area the D-state has been included with a D-state parameter D_2 = -.22 fm^2; the shaded area corresponds to -.28 fm < D_2 < -.16 fm^2 with

$$D_2 = \frac{1}{15} \frac{\int U_2(r) r^4 dr}{\int U_o(r) r^4 dr}$$

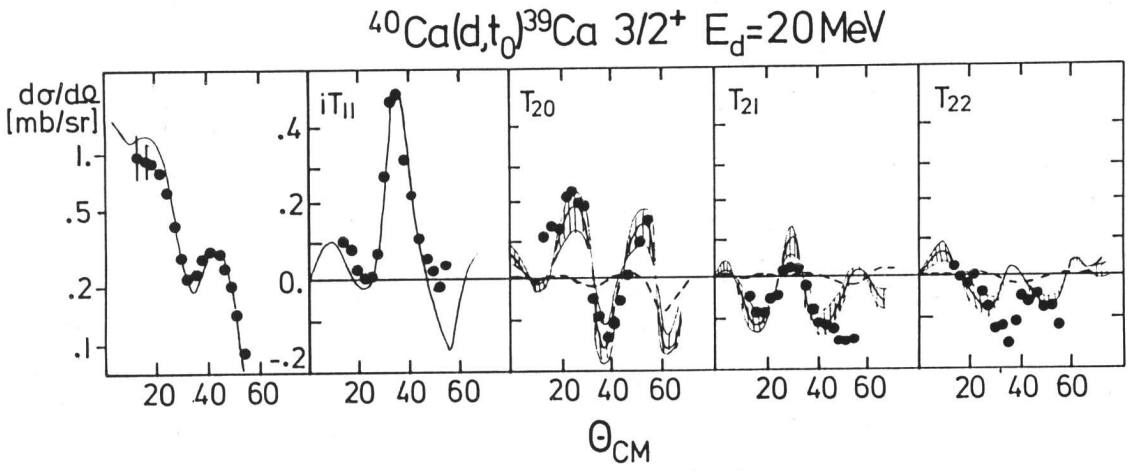

Fig. 1. Angular distributions for $^{40}Ca(\vec{d},t_o)$;
the dashed line is without D-state (D_2 = 0);
the shaded area corresponds to -.28 fm^2 < D_2 < -.16 fm^2

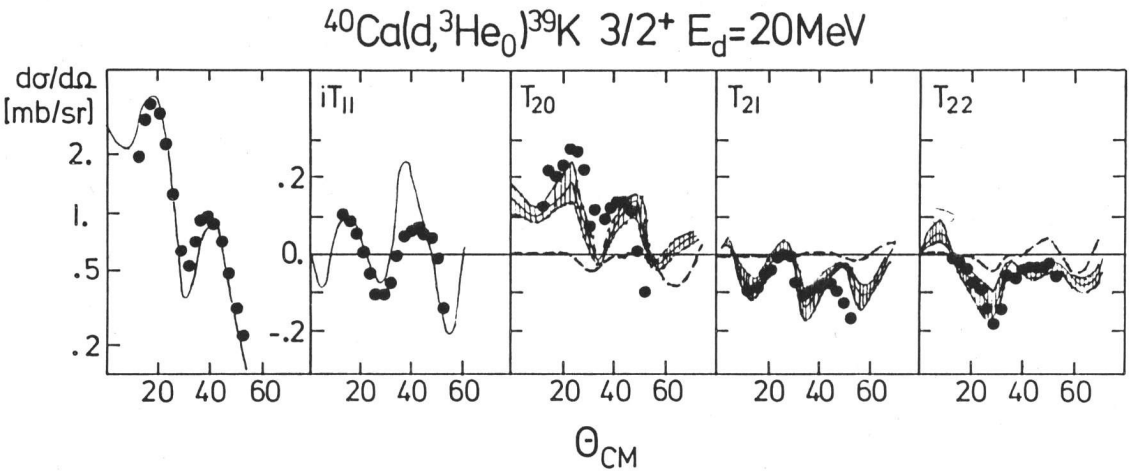

Fig. 2. Angular distributions for $^{40}Ca(\vec{d},{}^{3}He_{o})$; the dashed line is without D-state ($D_2 = 0$); the shaded area corresponds to $-.28\ fm^2 < D_2 < -.16\ fm^2$

For the differential cross section and the vector analysing power these curves can not be distinguished; the tensor analysing powers however show quite large D-state effects at this energy. These first calculations do not include a tensor-potential in the deuteron channel, which is known to have some influence, especially on T_{21}; from previous studies[2] this influence is known to be rather small for the forward angles.

The reproduction of the data is semi quantitative. This may be due to some deficiencies in the DWBA or may be caused by higher order effects. But as the over-all features of the data are reproduced, our analysis supports a D_2-value for the t and ^{3}He of $D_2 = -.22\ fm^2 \pm 0.6\ fm^2$, in agreement with the observations of Refs. 7), 8) and also Faddeev calculations[9].

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