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2.5 Double-Folding Interactions and Break-Up Effects in Scattering of $^6\vec{Li}$ and $^7\vec{Li}$ by ^{58}Ni

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Scattering of polarized $^7Li(^6Li)$ by ^{58}Ni at $E_{lab} \sim 20$ MeV has been successfully analyzed by cluster models for the projectiles[1], where $^7Li(^6Li)$ is assumed to consist of an α-particle and a triton(deuteron) and projectile-target interactions are calculated by folding α-Ni and t-Ni(d-Ni) optical potentials into relevant intrinsic states of the colliding pair. Since the cluster model has limited validity, examinations of more general models will be valuable. As one of the alternatives, we will investigate the double folding(DF) model in the same scattering to test its applicability. In this model, the projectile-target real interaction is calculated by folding the M3Y inter-nucleon potential using suitable nucleon densities of the projectile and the target[2]. The imaginary interaction is taken to have the same shape as the real one, the depth being multiplied by a constant N_I. The nucleon densities of the projectiles are calculated from the microscopic wave functions based on the cluster model. For the target nucleus, the charge densities obtained by the electron-scattering data are used, the correction due to the proton charge distribution being made.

The calculations take account of effects of projectile virtual excitation, which includes break-up processes, by the coupled-channel method, where the ground state, the lowest $1/2^-$, $7/2^-$ and $5/2^-$ (3^+, 2^+ and 1^+) excited states and P and F(S, P and D) non-resonant continuum states up to k=1 fm^{-1}(0.8 fm^{-1}) are considered for $^7Li(^6Li)$. The discretization of the continuum is schematically shown, for example for ^7Li, in Fig.1, where the representative energy of each momentum section is indicated in MeV. The calculated cross section and vector and second-rank tensor analyzing powers are compared with those by the cluster-folding (CF) model obtained earlier[1] and with the experimental data[3] for both of the elastic scattering and inelastic one. Typically, they are shown for ^7Li in Figs.2(elastic) and 3(inelastic), where N_I=0.7. In the four-channel calculation with the ground state and the $1/2^-$, $7/2^-$ and $5/2^-$ excited states, the DF result is very close to the CF one except for a few details. The comparisons with the experimental data are quite successful, showing the DF model to be useful. The calculation which includes non-resonant break up describes small corrections due to the continuum coupling, which have appreciable magnitudes in the vector analyzing power and the tensor one T_{21}. Effects of momentum-dependent tensor interaction have been discussed for tensor analyzing powers[4]. Contributions of the non-resonant break up may affect their conclusion. For ^6Li, similar successful results are obtained with the same N_I. More details will be given elsewhere.

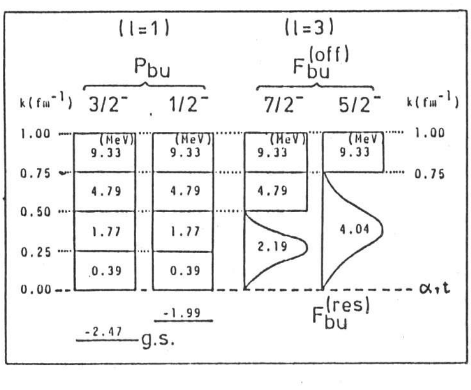

Fig. 1. Discretization of continuum states.

References

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3) Z. Moroz et al.:Nucl.Phys. A381(1982)294.
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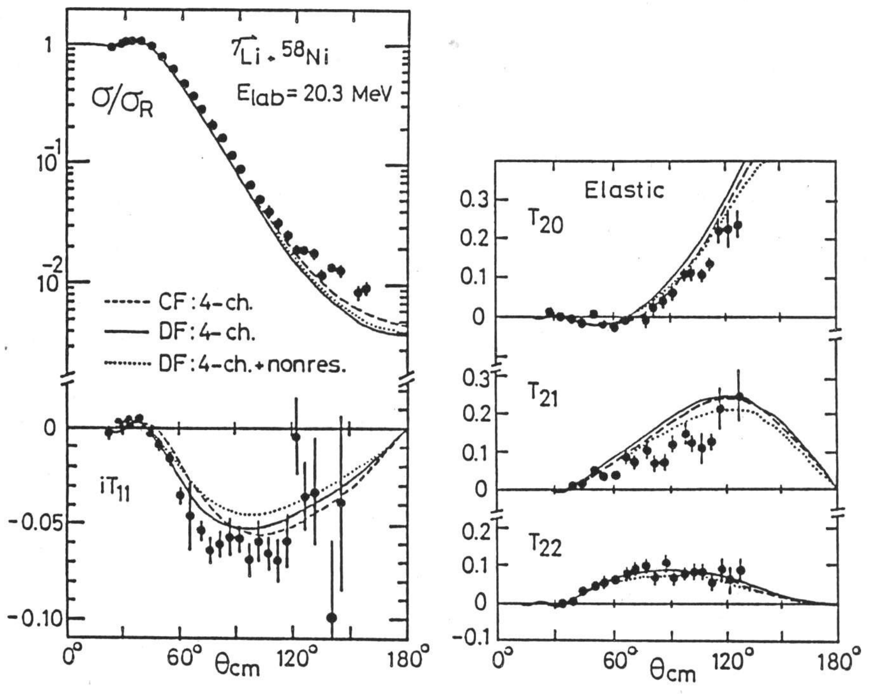

Fig. 2. Cross section, vector and tensor anayzing powers in elastic scattering of $^7\vec{\mathrm{Li}}$ by ^{58}Ni.

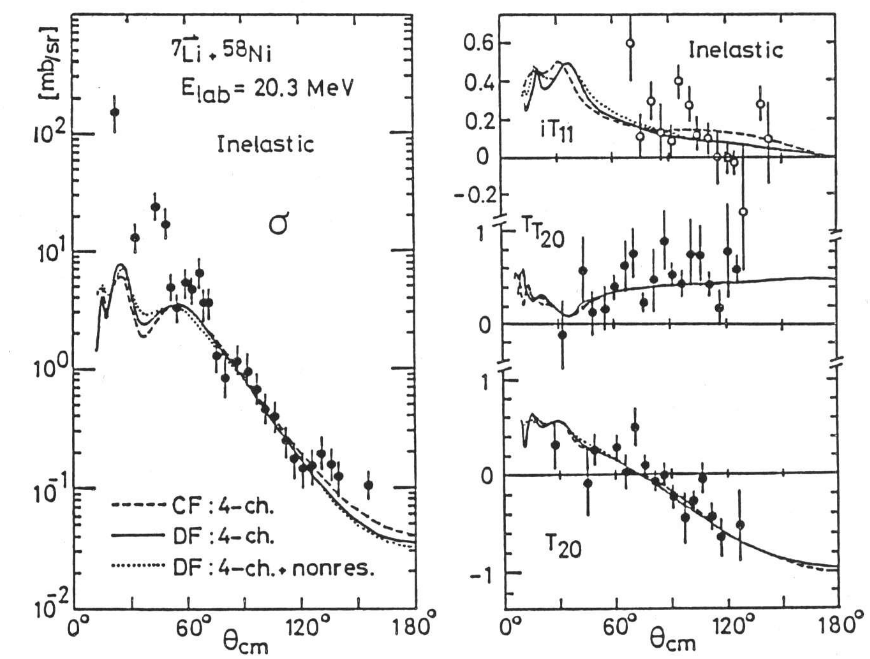

Fig. 3. Cross section, vector and tensor analyzing powers in inelastic scattering of $^7\vec{\mathrm{Li}}$ by ^{58}Ni leading to the $1/2^-$ excited state of ^{7}Li.