A measurement of *S*pin-*TR*ansfer coefficients *I*n the fusion reaction $D(\vec{d},\vec{p})^3H$ @ 58 keV

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Understanding the four-nucleon system is of fundamental importance. Recent theoretical progress allows realistic predictions of four-nucleon observables with microscopic methods (Faddeev-Yakubovsky and/or effective-field theory) using modern precision nucleon-nucleon potentials as input. The low-energy $D(d,n)^3He$ and $D(d,p)^3H$ fusion reactions are important in the context of (polarized) fusion energy production as well as big-bang nucleosynthesis (BBN). Recent high-precision observations of blackbody background radiation (WMAP) give a much improved value of the baryon density Ω_b in the universe [1].

For a complete understanding of the two *dd* fusion reactions it is important that it was possible to determine all 16 (up to D waves) complex low-energy transition amplitudes [2,3]. In this analysis the minimum model-dependent assumption of the energy dependence being entirely governed by the Coulomb barrier was made. With these results arbitrary low-energy observables of these reactions can be predicted, e.g., the quintet suppression factor, important for fusion-energy considerations.

However, in the data base observables such as polarization-transfer coefficients (PTC) are missing. Therefore, we have installed a double-scattering experiment directly behind the polarized ion source injector at the Cologne FN tandem accelerator.

The elastic scattering reaction $^{28}Si(\vec{p},p)^{28}Si$ was used as analyzer reaction in an energy range between E_p=3.20 MeV and E_p=3.31 MeV. Channeling effects caused by the silicon crystal orientation had to be taken into account. Because of the rapidly decreasing cross section with decreasing energy and low count rates due to the nature of every double-scattering experiment, a small number of protons were scattered into the polarimeters, placed at a scattering angle of $\theta = 45°$.

The comparison of the experimental result to Faddeev-Yakubovsky calculations [4] and an angular distribution, which is based on a reaction-matrix analysis of the world data base on D+D-reactions [2,3], will be presented.

References

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