Analysing powers of the $\vec{d}p \to \vec{d}p$ reaction at 1.2 and 2.27 GeV*

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The vector and tensor analysing powers of the $\vec{d}p \to \vec{d}p$ reaction were evaluated using the ANKE data from the 2006 beam time. The main purpose of this experiment was to measure the deuteron charge-exchange process on hydrogen, though useful data were obtained on various other reactions including the deuteron-proton elastic scattering. Measurements were performed using eight different configurations of the polarised ion source at COSY. The deuteron beam was prepared at two energies, $T_d = 1.2$ and 2.27 GeV. Several measurements of the analysing powers of the dp elastic process exist close to 1.2 GeV. These include old ANKE measurements at 1170 MeV, Saturne at 1198 MeV and Argonne at 1194 MeV. New ANKE results at 1.2 GeV are in good agreement with that obtained from these experiments. This therefore provides a check of the COSY beam polarimetry. Despite the fact that the COSY ion source was not optimised to measure the $\vec{d}p \to \vec{d}p$ reaction, polarised states were successfully combined in a way to measure the A_y and A_{yy} separately (see details in the ANKE internal report).

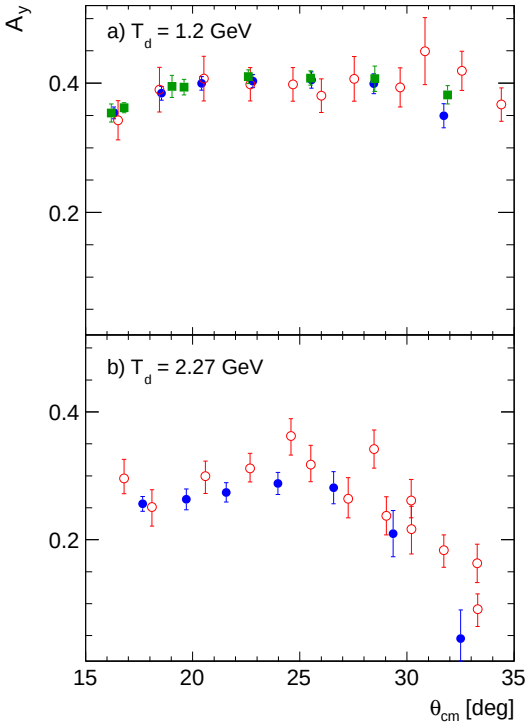

Fig. 1:

Vector analysing power of the $\vec{d}p \to \vec{d}p$ reaction at two energies. New results (points) are compared with existing measurements at close energies including Argonne at 1194 and 2000 MeV (circles) and ANKE at 1170 MeV (squares).

Results are presented in Fig. 1 and 2 as functions of deuteron θ_{cm} angle together with other data, obtained at close energies. The vector analysing power signal at 2.27 GeV is significantly smaller than at 1.2 GeV, and is also smaller than that measured at Argonne at 2 GeV. This is in agreement with Argonne data at 1.2, 1.6 and 2 GeV, that clearly show a dilution of the vector analysing power signal as energy increases. Due to a very asymmetric acceptance of the ANKE forward detector it was not possible to measure the A_{xx} analysing power with reasonable accuracy. Hence, only the A_{yy} was obtained. Similarly to A_y, the new results for A_{yy} well agrees with existing data at 1.2 GeV. At 2.27 GeV, the difference from the Argonne data at 2 GeV is negligible, at least up to 27° in CM, if the error bars are taken into account. It should be noted, that the zero-crossing point tends to move towards the smaller angles as energy increases. This effect can be easily observed in the Argonne data at 1.2, 1.6 and 2 GeV, and by new ANKE results.

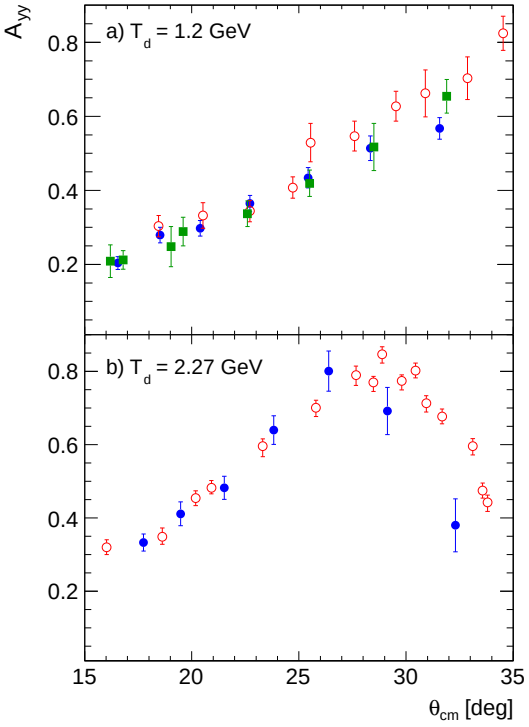

Fig. 2:

Tensor analysing power of the $\vec{d}p \to \vec{d}p$ reaction at two energies. New results (points) are compared with existing measurements at close energies including Argonne at 1194 and 2000 MeV (circles) and ANKE at 1170 MeV (squares).

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