# Spin correlation in $\vec{p}\vec{d} \to t\pi^+$

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We have measured $\Delta\sigma_L$ and $\Delta\sigma_T$ in $\vec{p}\vec{d} \to t\pi^+$ at 250 and 275 MeV incident proton energy. At these energies only a small number of partial waves contribute and center-of-mass energies of the participating nucleons are low enough to justify non-relativistic Faddeev calculations. Data were taken during two runs in December 2001 and January 2002 resulting in $\sim$ 80,000 events at each energy for both vertical and longitudinal beam polarization. The polarization direction of the vector-polarized deuterium target was cycled between horizontal, vertical and longitudinal.

The PINTEX [?] detector was modified to facilitate detection of the forward going triton down to laboratory angles of 3°. The modification consisted of an extension to the existing scattering chamber and placement of the detector stack as far downstream as possible. The detector stack consisted of a thin start scintillator, a pair of wire chambers, a stopping scintillator and finally a veto detector. The trigger was at least one charged particle in the forward detector.

Background from pd elastic scattering and pd breakup was greatly reduced by only triggering on events with energy deposition above a certain threshold in the thin start scintillator. Fig.1a shows the time-of-flight of the forward going charged particle vs the scattering angle in 0.1 degrees at an incident beam energy of 250 MeV. Fig.1b is the projection of fig.1a onto the $\theta$ axis. The tritons are clearly visible above the background. Triton angles up to 7.5 ° are kinematically allowed.

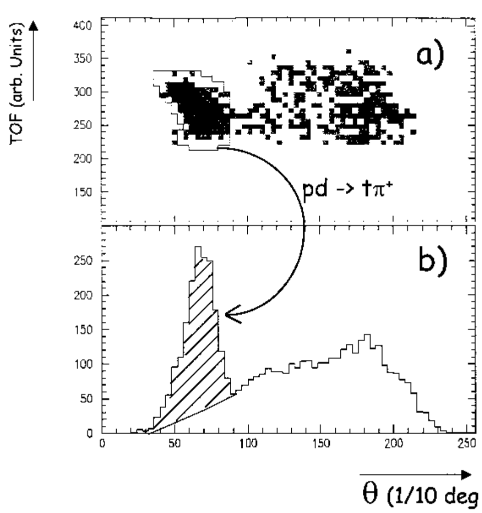


FIG. 1. Time-of-flight in the forward detector vs forward scattering angle (a) and projection onto the $\theta$ axis (b) at 250 MeV.

It should be emphasized that Fig.1 shows online spectra and that the background can be expected to be suppressed as additional cuts are applied in offline analysis.

The polarization of both beam and target was measured by simultaneously recording pd elastic scattering events. Elastic events were recorded when charged particles were present in both the forward detector and the silicon barrel which surrounds the target and detects the recoil. Since beam and target analyzing powers in pd elastic scattering are not known at 250 and 275 MeV, dedicated calibration data had to be taken. The target analyzing power is known at the injection energy of 200 MeV. Since the target polarization does not change during the energy ramp, data taking before and after the ramp transports the target analyzing power to the higher energy.

Calibration of the beam analyzing power was achieved by acquiring a data sample with a mixture of unpolarized hydrogen and deuterium in the target cell. Since the analyzing power for elastic pp scattering is known, the beam polarization can be determined. The analyzing power for pd scattering is then obtained by dividing the concurrently measured asymmetry by the beam polarization. In the case of longitudinal beam polarization, the longitudinal component was inferred from the measured, albeit small, vertical and horizontal polarization components.

At present, the data are under analysis by W.W. Daehnick at the University of Pittsburgh.

[1] Polarized INternal Target EXperiments, www.iucf.indiana.edu/∼pintex