

3.13 Measurements of the Spin Correlation Parameter A_{LL} for
 the Reaction $\bar{p} \bar{p} \rightarrow d \pi^+$ at Forward Deuteron Angles

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The reaction $\bar{p} \bar{p} \rightarrow d \pi^+$ has been the subject of extensive experimental^{1,2} and theoretical³ studies over the past decade. Measurements performed so far have concentrated on large-angle scattering, $40^\circ \lesssim \theta_{c.m.} \lesssim 120^\circ$, due to the difficulties associated with small angle measurements (Ref. 4).

During the summer of 1984 we performed an experiment to measure the spin correlation parameter A_{LL} at 1.46 and 1.28 GeV/c for center-of-mass angles $\lesssim 45^\circ$. In these measurements, deuterons scattered forward in the angular range $2.0^\circ - 7.5^\circ$ in the laboratory system were detected in the High Resolution Spectrometer (HRS) at the Los Alamos Meson Physics Facility (LAMPF). The KEK frozen spin cryostat⁵ together with the Argonne superconducting solenoid provided the proton target, polarized in the longitudinal direction (L). The cryostat was modified to accommodate very thin windows along the direction of the incident, as well as the scattered, particle direction (a total of 0.3 mm copper, 0.06 mm Teflon, and 0.1 mm aluminized Mylar). These windows were of great value in improving the peak-to-background ratio. Momentum, time-of-flight, and pulse-height information from the detection system provided a clean separation of the deuteron signal from the background.

The aim of these measurements is to provide high-quality data in an angular range not accessible to the previous measurements. When combined with available data they will contain:

1. complete angular distributions useful for testing existing theories and for imposing tighter constraints on current partial-wave analyses (PWA's) (Refs. 2, 6, 7); and
2. total reaction cross sections for the $\bar{p} \bar{p} \rightarrow d \pi^+$ reaction in pure spin states, from integration of the complete angular distributions.

Furthermore, at forward angles, A_{LL} and the deuteron tensor prediction T_{20} are simply related, so that these data will provide a good estimate of the latter observable.

Preliminary data at 1.46 and 1.28 GeV/c, together with previous measurements¹ at angles $\gtrsim 40^\circ$ c.m. are shown in Fig. 1. The results of a recent partial wave amplitude analysis* by Hiroshige, which includes our data sets, are also shown.

These measurements complement our previous measurements for the spin correlation parameter A_{NN} (Ref. 8). Measurements for A_{SS} , A_{LL} , A_{SL} , A_{LS} and K_{SS} are planned for the near future.

*N. Hiroshige, Osaka City University, April 12, 1985.

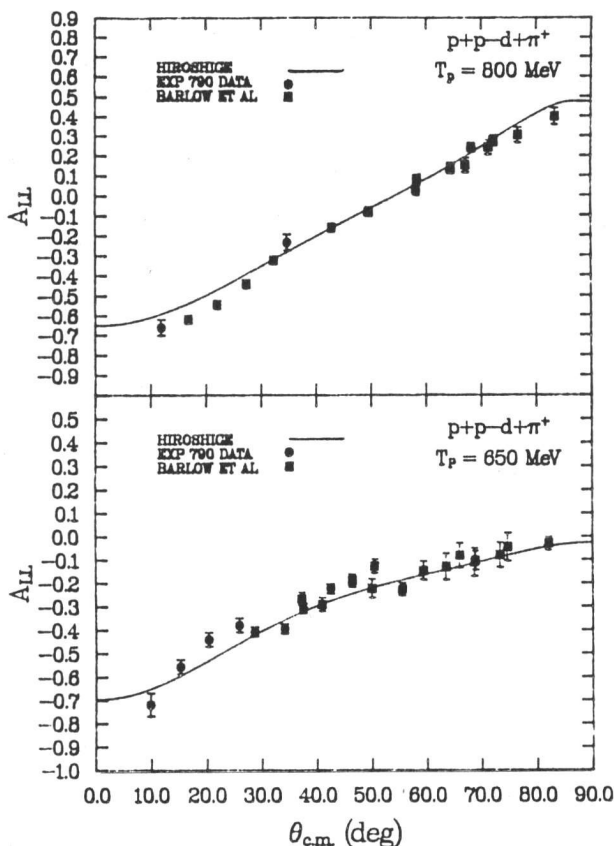


Fig. 1. Preliminary angular distributions for the spin correlation parameter A_{LL} .

References

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