Measurement of the analyzing powers for $\vec{p} + CH_2 \to p + X$ up to 5.3 GeV/c

I. M. Sitnik

for the JINR (Dubna, Russia)-DAPNIA (Saclay, France)- College of William and Mary, Norfolk State University, Jefferson Lab (Virginia, USA)- Rutgers University (New Jersey, USA)- INRNE (Sofia, Bulgaria) collaboration

Measurements of the analyzing power for $\vec{p} + CH_2 \to p + X$ were performed at the JINR synchrophasotron with secondary polarized proton beams of momenta p_p=1.75, 3.8, 4.5 and 5.3 GeV/c. This study is especially important to optimize a polarimeter necessary to extend the measurement of the proton electric form factor at Jefferson Laboratory [1]. At 3.8 GeV/c the dependence of the efficiency of the reaction on the CH_2-target thickness (41, 56, 71 and 86 cm) was studied in detail. The results confirm the prediction [2] that taking a target thicker than average length of nuclear scattering (56.9 cm) does not increase the figure of merit. The analyzing powers versus $p_\perp = p_p \sin\theta$, (where θ is the detected particle polar angle) are presented in Fig. 1. In this representation all data can be well approximated by a common 5-degree polynomial with a global normalization coefficient fitted for each energy. Similarly (with the same polinomial) data on a Carbon target [3], could be fitted. The average values of analyzing power for both sets of data have a behavior close to linear as a function of p_{cm}^{-1} (see Fig. 2), where p_{cm} is the center of mass momentum for the $p + p$ reaction.

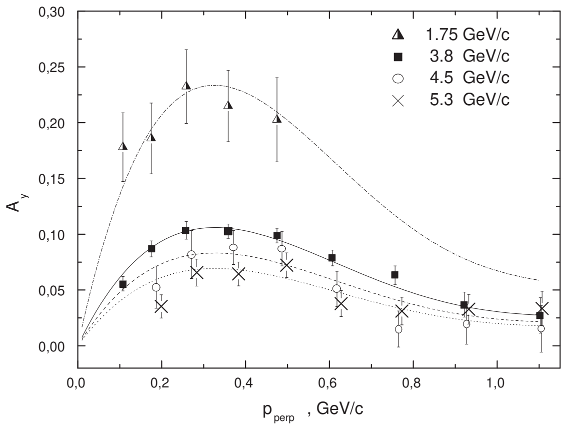

Figure 1: Analyzing Power as function of $p_\perp$.

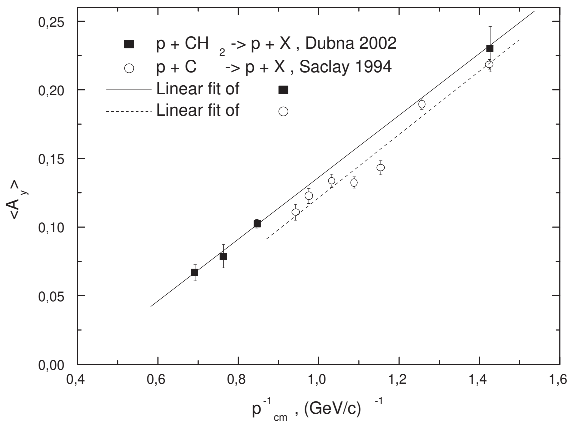

Figure 2: Energy dependence of average Analyzing Power.

References

1. Approved JLab experiment 01-109: 'Measurement of G_{Ep}/G_{Mp} to Q^2=9 GeV^2 via Recoil Polarization', (Spokepersons: C.F. Perdrisat, V. Punjabi, M.K. Jones and E. Brash).
2. I.M.Sitnik, SPIN-2001 (Dubna Intern. Workshop, July 2001).
3. E. Cheung *et al*, Nucl. Inst. Meth., A **363**, 561 (1995).