Azimuthal Asymmetry in Meson Productions in Electron-Nucleon Deep Inelastic Scattering by HERMES

T.-A. Shibata for the HERMES Collaboration

Tokyo Institute of Technology

The azimuthal asymmetry in $\pi^{\pm}$ and π^0 productions[1,2] in electron-proton deep-inelastic scattering measured by HERMES are reported. Recently the measurements have been extended to the deuterium target and also to Kaon productions. HERMES is an experiment to study the spin structure of the nucleon. It uses 27.6 GeV electron (positron) beam of DESY-HERA and a longitudinally polarised hydrogen and deuterium targets. The azimuthal angle is the angle between the electron scattering plane and the plane determined by the exchanged virtual photon direction and the produced meson's momentum vector.

The observation of the significant azimuthal asymmetry by HERMES attracted attentions both from experimental and theoretical sides as it may provide access to the so far unmeasured spin structure function $h_1(x)$. $h_1(x)$ is called transversity and is chiral-odd. It describes the quark transverse spin distribution in a transversely polarised nucleon. The $h_1(x)$, together with the helicity distribution $g_1(x)$ and the unpolarized structure function $f_1(x)$, constitutes a complete set of structure functions at the leading order (twist-2). Therefore, the measurement of $h_1(x)$ is a basic and important task to understand the spin structure of the nucleon. Comparisons of the results from the proton and dueterium targets could help us to study the flavour(u,d,s) dependence of the transversity distribution. Kaon detection with Ring Imaging CHerenkov counter(RICH) provided us a new tool for studies of flavour dependence.

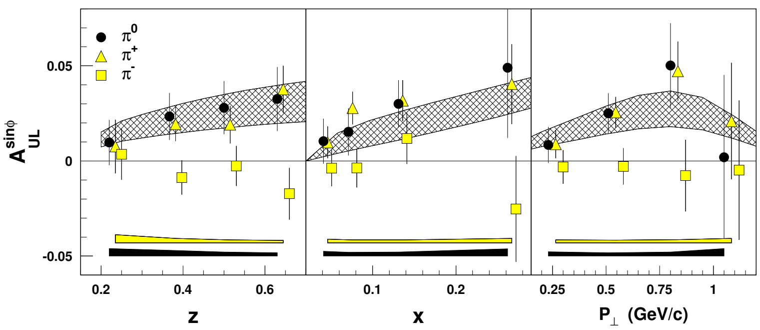

Figure 1: Analysing power in the sinϕ moment for π^0(circle), π^+(triangle), and π^-(square)[2]. The bands at the bottom represent systematic uncertainties. The shaded areas correspond to model predictions. The plots are shown as functions of z, Bjorken x and p_T.

References

[1] HERMES Collaboration, A. Airapetian et al, Phys. Rev. Lett. **84** (2000) 4047.
[2] HERMES Collaboration, A. Airapetian et al, Phys.Rev. **D64** (2001) 097101.