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Angular distribution measurement of proton-induced Drell–Yan process by the SeaQuest experiment at Fermilab

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The structure of the proton has been studied by measuring the parton distribution function, which is the parton density distribution as a function of the longitudinal momentum of the parton, for long time. In the last few decades, the three-dimensional imaging of nucleon, such as the transverse momentum dependent parton distribution functions (TMDs), has received attention to better understand the structure of the nucleon. The Boer–Mulders function is one of the TMDs that represents the correlation between the transverse spin and the transverse momentum of the quark. The Boer–Mulders function can be extracted from the azimuthal angular distribution of the Drell–Yan process. In the naive Drell–Yan model, the angular distribution of the Drell–Yan process has a $\cos\theta$ modulation ($\lambda = 1$) while no $\cos 2\phi$ ($\nu = 0$) modulation, where θ and ϕ denote the polar and azimuthal angle, respectively. However, the sizable $\cos 2\phi$ modulation has been observed by NA10 and E615 experiments, which are pion-induced Drell–Yan experiments. The E866 experiment reported the first and only results of the angular distribution of the proton-induced Drell–Yan process using 800 GeV proton beam. In contrast to pion-induced Drell–Yan experiments, E866 shows significantly smaller $\cos 2\phi$ modulation.
The SeaQuest experiment is a Drell–Yan experiment at Fermilab that measured the Drell–Yan dimuons using the 120 GeV proton beam colliding with liquid hydrogen and deuterium targets. We have measured the angular distribution of the proton-induced Drell–Yan dimuons in a kinematics region different of E866. In this talk, the progress of the angular distribution analysis will be presented.

Submitted on behalf of a Collaboration?

Yes

Participate in poster competition?

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