

Drell-Yan Physics with Negative Pion Beams and Polarized Proton Targets at COMPASS

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The proton is a complex composite object. Its structure, the dynamics of its constituents and its mass presently cannot be calculated from Quantum Chromo Dynamics without simplifying model assumptions. Momentum- and spin-dependent distributions of the constituent partons, quarks and gluons, have been determined from the QCD analysis of data sets taken in deep inelastic lepton-proton scattering experiments and in high energy proton-proton collider experiments. Despite the very significant experimental and theoretical effort, there remain important shortcomings in the knowledge of proton structure.

COMPASS at CERN aims to improve the knowledge of Generalized Parton Distributions (GPDs) through exclusive muon-proton scattering. Using Drell-Yan production of muon pairs with negative pion beams on polarized proton targets, COMPASS will constrain transverse momentum dependent quark distributions of the proton.

The Drell-Yan process is a well-understood electromagnetic effect in which a beam-hadron quark/anti-quark annihilates with a target hadron anti-quark/quark. It is well suited to explore the sea quark structure of the proton, transverse momentum- and transverse spin-dependent quark distributions (TMDs) and nuclear effects in proton quark structure. The presentation will introduce the Drell-Yan process and discuss the latest results on TMD observables from COMPASS. The talk will conclude with a discussion of plans for future Drell-Yan experiments with high-intensity meson and anti-proton beams at the CERN SPS.

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