

Prospects of Open-Charm Asymmetry Measurements at the SPD

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The Spin Physics Detector (SPD) at the Nuclotron based Ion Collider Facility (NICA) is designed to study nucleon spin structure in the three dimensions. With capabilities to collide polarized protons (up to $\sqrt{s} = 27$ GeV) and deuterons (up to $\sqrt{s} = 13.5$ GeV) with peak design luminosity $10^{32} \text{cm}^{-2} \text{s}^{-1}$ for protons (an order of magnitude less for deuterons), the experiment will allow measurements of cross-sections and spin asymmetries sensitive to the unpolarized and various polarized (helicity, Sivers, Boer-Mulders) gluon distributions inside the nucleons. Studies of heavy flavor mesons probe gluon distributions directly. The leading mechanism of charm meson pair production in proton-proton collisions is the gluon fusion. In the perturbative QCD framework, the cross-sections of the open-charm pair production are directly proportional to the product of gluon densities in the two colliding protons and the asymmetries are proportional to the ratio of the polarized gluon distribution to that of the unpolarized one. At the SPD, charmed mesons can be detected via their hadronic decay channels. While these measurements are challenging due to orders of magnitude larger hadronic background from other hard processes, we demonstrate the capacity to obtain meaningful asymmetry measurements that can make an impact on the present understanding of gluon Transverse Momentum Dependent (TMD) distributions inside protons.

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