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Probing nucleon spin structure with inclusive DIS at EIC-ATHENA

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Understanding the spin of the proton is one of the fundamental questions in QCD, which is also one of central pillars of the Electron-Ion-Collider (EIC) physics program. The existing data from fixed-target polarized lepton-nucleon DIS experiments and polarized proton-proton experiments, provided us with good knowledge on the quark spin contribution $\Delta\Sigma$ and gluon spin contribution ΔG in the momentum fraction range $0.005 < x < 0.6$. The EIC measurements with unprecedented precision and wider kinematic coverage will lead to a revolution in our understanding of nucleon spin structure. In particular, the inclusive DIS measurements will drastically reduce the uncertainties on $\Delta\Sigma$ and ΔG in the range of $x < 0.05$. These studies will be performed through the double spin asymmetry A_{LL}, from inclusive DIS data with different beam polarizations at high luminosities. The impact of pseudo-data with the proposed ATHENA detector in constraining quark and gluon helicity distributions has been studied with different global analysis frameworks including the DSSV and JAM collaborations. The ATHENA experiment will provide significant constraints on the gluon helicity distribution in the small x region ($\sim 0.0001 < x < 0.05$), and also on the quark singlet spin contribution $\Delta\Sigma$ in the intermediate x region.

Submitted on behalf of a Collaboration?

Yes

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