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Transverse single-spin asymmetry of weak bosons and Drell-Yan production in p+p collisions at STAR: present and future

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Accessing the Sivers TMD function in proton+proton collisions through the measurement of transverse single spin asymmetries (TSSAs) in Drell-Yan and weak boson production is an effective path to test the fundamental QCD prediction of the non-universality of the Sivers function. Furthermore, it provides data to study the spin-flavor structure of valence and sea quarks inside the proton and to test the evolution of parton distributions.

The TSSA amplitude, A_N , has been measured at STAR in proton+proton collisions at $\sqrt{s} = 500$ -GeV, with a recorded integrated luminosity of 25 pb^{-1} .

Within relatively large statistical uncertainties, the current data favor theoretical models that include change of sign for the Sivers function relative to observations in SIDIS measurements, if TMD evolution effects are small.

RHIC plans to run proton+proton collisions of transversely polarized beams at $\sqrt{s} = 510$ -GeV in 2017, delivering an integrated luminosity of 400 pb^{-1} . This will allow STAR to perform a precise measurement of TSSAs in both Drell-Yan and weak boson production. The present status and future plans for the Sivers function program at STAR will be discussed as well as other observables sensitive to the non-universality of the Sivers function via Twist-3, e.g. the TSSA of direct photons.

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