Transverse Spin Dependent Azimuthal Correlations of Charged Pion Pairs in $p^\uparrow p$ Collisions at $\sqrt{s} = 200$ GeV at STAR

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Abstract

At leading twist, the transversity distribution function, $h_1^q(x)$, where x is the longitudinal momentum fraction of the proton carried by quark q, encodes the transverse spin structure of the nucleon. Extraction of it is difficult because of its chiral-odd nature. In polarized proton-proton ($p^\uparrow p$) collisions, it can be coupled with a spin-dependent fragmentation function. This coupling leads to experimentally measurable oppositely charged hadron-pair (di-hadron) azimuthal correlations, A_{UT}, between the spin of the fragmenting quark and the final state di-hadron, which directly probes $h_1^q(x)$. The STAR experiment at RHIC has previously measured non-zero A_{UT} for $\pi^+\pi^-$ pairs using $p^\uparrow p$ collisions at $\sqrt{s} = 200$ GeV from 2006, corresponding to an integrated luminosity, L, of 1.8 pb^{-1}. In 2015, STAR collected $L \sim 48$ pb^{-1} of $p^\uparrow p$ data at $\sqrt{s} = 200$ GeV. This dataset provides highest precision A_{UT} measurements at $\sqrt{s} = 200$ GeV to date, which covers quark momentum fractions $0.1 < x < 0.4$, sensitive to valence quark $h_1^q(x)$. We will present preliminary results on A_{UT} for $\pi^+\pi^-$ pairs based on this dataset.