

1 **Measurements of Transverse Spin Dependent $\pi^+\pi^-$ Azimuthal Correlation**
2 **Asymmetry and Unpolarized $\pi^+\pi^-$ Cross Section in pp Collisions at $\sqrt{s} = 200$**
3 **GeV at STAR**

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5 **Abstract**

6 The transversity distribution function, $h_1^q(x)$, encapsulates the transverse spin structure of the proton at the leading twist, where x represents the longitudinal momentum fraction carried by the quark
7 q . The extraction of $h_1^q(x)$ poses a formidable challenge due to its chiral-odd nature. Measurements of
8 final-state di-hadron pairs in transversely polarized proton-proton ($p^\uparrow p$) collisions directly probe the
9 collinear quark transversity via coupling with a chiral-odd interference fragmentation function, $H_1^{\langle, q}$.
10 This coupling results in an experimentally measurable azimuthal correlation asymmetry, A_{UT} . The
11 asymmetry originates from the interplay between the spin orientation of the fragmenting quark and
12 the resulting di-hadron in the final state. Thus, it necessitates precise knowledge of unpolarized di-
13 hadron fragmentation functions (FFs) to achieve a model-independent extraction of the transversity
14 from these measurements. These FFs can be obtained by measuring the unpolarized di-hadron cross
15 section in pp collisions. We will present preliminary results on the A_{UT} for $\pi^+\pi^-$ pairs using $p^\uparrow p$ data
16 collected by the STAR experiment at center-of-mass energy of $\sqrt{s} = 200$ GeV in 2015. Additionally,
17 we will present preliminary results of the unpolarized $\pi^+\pi^-$ cross section using pp data at $\sqrt{s} = 200$
18 GeV collected in 2012.
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