

## Measurement of the transverse single spin asymmetry for forward neutral pions in (non-)diffractive like events at RHICf and STAR

The transverse single-spin asymmetry ( $A_N$ ) serves as a crucial probe for understanding the mechanisms of particle production in polarized high energy particle collisions as well as the internal dynamics of quarks and gluons within a polarized nucleon. The RHICf collaboration measured a non-zero transverse single-spin asymmetry ( $A_N$ ) for very forward ( $\eta > 6$ ) neutral pions ( $\pi^0$ ) in transversely polarized  $p + p$  collisions at  $\sqrt{s} = 510$  GeV within the STAR experiment. This measurement, along with a similar analysis performed at STAR for forward  $\pi^0$ s,  $2.7 < \eta < 4.0$ , suggests that diffractive interactions could be primarily responsible for the observed  $A_N$ . To quantitatively determine the extent to which diffractive and non-diffractive processes contribute to the RHICf  $A_N$ , we conduct a joint analysis of the very forward  $\pi^0$   $A_N$  using both RHICf and STAR detector systems from the same collisions. We report preliminary results of  $\pi^0$   $A_N$  in diffractive-like and non-diffractive-like event categories, and discuss the current status of this ongoing analysis.

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