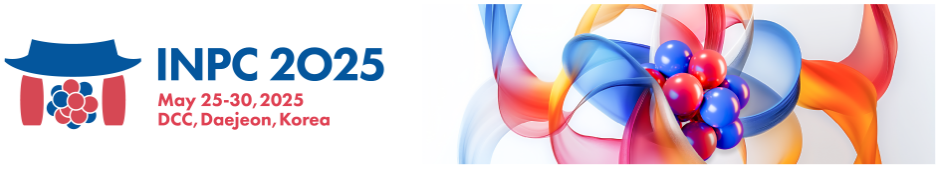

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Measurement of the finite transverse single spin asymmetry for very forward neutral pion production in diffractive and non-diffractive processes

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The Transverse Single-Spin Asymmetry (A_{N}) provides valuable insights into the motion and structure of quarks and gluons within a nucleon. The RHICf experiment, in collaboration with the STAR experiment, measured neutral particles in very forward ($\eta > 6$) regions in transversely polarized $p + p$ collisions at $\sqrt{s}$ = 510 GeV during the 2017 data-taking period. Previous results from the RHICf Collaboration indicated that the A_{N} of inclusive neutral pions is non-zero within $\eta > 6$ and $p_{\mathrm{T},\pi^0} < 1$ GeV/c. The result also hinted a potentially large contribution from soft processes, such as diffractive reactions. On the other hand, it raises a new question of whether contributions from non-diffractive processes are completely excluded. In this study, we present and compare the A_{N} for neutral pions in Diffractive-Like and Non-Diffractive-Like events. Event classification is performed based on the particle distribution measured by the STAR detector system. The results highlight the trends in A_{N} for neutral pions between diffractive and non-diffractive processes.

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