

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

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Abstract

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