

# Transverse Single Spin Asymmetry of Electromagnetic Jets for Inclusive and Single Diffractive Process at Forward Rapidity in $p^\uparrow+p$ Collisions at $\sqrt{s} = 200$ GeV at STAR

Xilin Liang, for the STAR Collaboration

University of California, Riverside, CA, USA

## Abstract

In recent decades, there have been numerous efforts to unravel the origin of the unexpectedly significant transverse single spin asymmetry ( $A_N$ ) observed in inclusive hadron productions at forward rapidities in  $p^\uparrow+p$  collisions at various center-of-mass energies ( $\sqrt{s}$ ). Several theories have been proposed to explain this phenomenon, including the twist-3 contributions within the collinear factorization framework, the transverse-momentum-dependent contributions from the initial-state quark and gluon (Sivers functions), and/or final-state Collins fragmentation functions. However, there are indications that diffractive processes might also play a role in the observed significant  $A_N$ , based on the previous analyses of  $A_N$  for forward  $\pi^0$  and electromagnetic jets (EM-jets) in  $p^\uparrow+p$  collisions at STAR [1].

The STAR experiment provides an ideal opportunity to investigate the  $A_N$  in single diffractive processes at forward rapidity using the Forward Meson Spectrometer and Roman Pot detectors. This talk will present the preliminary findings on  $A_N$  for both inclusive and single diffractive EM-jets at forward rapidity ( $2.6 < \eta < 4.2$ ) in  $p^\uparrow+p$  collisions at  $\sqrt{s} = 200$  GeV at STAR. The discussion will include a multi-dimensional analysis of  $A_N$  for EM-jets in inclusive processes, with a focus on presenting the first preliminary results for  $A_N$  in single diffractive processes. Additionally, there will be a discussion on the contribution of  $A_N$  from single diffractive processes to the overall inclusive processes.

## References

- [1] (STAR) J. Adam *et al.*, Phys. Rev. D 103, 092009 (2021)