STUDYING NON-PERTURBATIVE QCD WITH JET SUBSTRUCTURE MEASUREMENTS IN 200 GEV *pp* COLLISIONS AT STAR

YOUQI SONG
YALE UNIVERSITY
(FOR THE STAR COLLABORATION)

Non-perturbative QCD processes have significant effects on jet evolution but remain poorly understood. To study these effects, we measure two novel jet observables, the CollinearDrop (CD) jet mass and the charge correlation ratio (r_c), with jets reconstructed in *pp* collisions at $\sqrt{s} = 200$ GeV at the STAR experiment.

In this talk, we present measurements of the CD jet mass, which is related to the difference of the jet mass and the SoftDrop groomed mass, and so is by construction sensitive to soft radiation within jets. We compare the measurements with predictions from the NLL SCET calculations and event generator simulations. A multi-dimensional unfolding technique, MultiFold, allows us to further access the fully corrected correlations among the CD jet mass and the SoftDrop jet observables to probe the interplay between different stages of the parton shower. Our measurement indicates that there is a correlation between the amount of early-stage non-perturbative radiation and the time at which the first hard splitting happens.

We also present the r_c measurement that probes the contributions of string-like hadronization, by distinguishing the charge signs of leading and subleading charged particles within jets. Compared with event generator predictions, our measurement shows that both PYTHIA and HERWIG over-predict the string-like correlation between the leading hadrons. Finally, we discuss the physics implications from these model comparisons.

Date: November 6, 2024.