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Nucleon Tomography with 0-jettiness

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We propose a novel strategy to systematically isolate the nucleon ' s intrinsic non-perturbative three-dimensional structure by employing 0-jettiness to suppress initial-state radiation in transverse momentum-dependent (TMD) observables. Applying this method to transverse single spin asymmetries (SSAs) in $W^{\pm}$ and Z^0 boson production at RHIC, we demonstrate a substantial enhancement of the asymmetry signal (e.g., by 83% for Z^0 SSA at q = 5 GeV), enabling a more definitive test of the predicted sign change of the Sivers function–a key prediction of TMD factorization. We further explore its applicability to spin-dependent measurements at the Electron-Ion Collider. Our analysis is formulated within a joint resummation framework that systematically resums large logarithms associated with both the veto scale and the gauge boson ' s transverse momentum.

Primary authors: FANG, Shen; 林, 硕 (山东大学); SHAO, Dingyu (Fudan University); ZHOU, jian (Shandong University)

Presenter: 林, 硕 (山东大学)

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