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Precision Predictions for Three-Dimensional Nucleon Tomography

We present an analysis of lepton-jet azimuthal decorrelation in deep-inelastic scattering (DIS) at next-to-next-to-next-to-leading logarithmic (N^3LL) accuracy, combined with fixed-order corrections at $\mathcal{O}(\alpha_s^2)$. In this study, jets are defined in the lab frame using the anti-k_T clustering algorithm and the winner-take-all recombination scheme. The N^3LL resummation results are derived from the transverse-momentum dependent factorization formula within the soft-collinear effective theory, while the $\mathcal{O}(\alpha_s^2)$ fixed-order matching distribution is calculated using the NLOJET++ event generator. The azimuthal decorrelation between the jet and electron serves as a critical probe of the three-dimensional structure of the nucleon. Our numerical predictions provide a robust framework for precision studies of QCD and the nucleon's internal structure through jet observables in DIS. These results are particularly significant for analyses involving jets in HERA data and the forthcoming electron-ion collider experiments.

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