

# Application of nuclear covariance matrix in nuclear TMD effects

In this work, we investigate the nuclear modification effects in transverse momentum dependent (TMD) observables by implementing a nuclear covariance matrix in the treatment of theoretical uncertainties. Global QCD analysis is performed with the aforementioned nuclear covariance matrix to verify its equivalence with the traditional approach of including a nuclear correction parameter. The data analyzed are the Drell-Yan  $q_T$ -differential data in  $pA$  and  $\pi A$  collisions. In addition, we also perform global QCD analysis with no treatment for the nuclear effects, verifying the necessity of implementing the nuclear corrections.

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