

Nonperturbative Determination of Collins-Soper Kernel from Quasi Transverse-Momentum Dependent Wave Functions

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In the framework of large-momentum effective theory at one-loop matching accuracy, we perform a lattice calculation of the Collins-Soper kernel which governs the rapidity evolution of transverse-momentum-dependent (TMD) distributions. We first obtain the quasi TMD wave functions at three different meson momenta on a lattice with valence clover quarks on a dynamical HISQ sea and lattice spacing $a = 0.12\text{fm}$ from MILC, and renormalize the pertinent linear divergences using Wilson loops. Through one-loop matching to the light-cone wave functions, we determine the Collins-Soper kernel with transverse separation up to 0.6fm . We study the systematic uncertainties from operator mixing and scale dependence, as well as the impact from higher power corrections. Our results potentially allow for a determination of the soft function and other transverse-momentum dependent quantities at one-loop accuracy.

Summary

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