

# 2024 Meeting on Lattice Parton Physics from Large Momentum Effective Theory (LaMET2024)



Contribution ID: 13

Type: **not specified**

## Non-perturbative Collins-Soper kernel from a Coulomb-gauge-fixed quasi-TMD

*Tuesday 13 August 2024 09:50 (25 minutes)*

We present the first lattice QCD calculation of the rapidity anomalous dimension of transverse-momentum-dependent distributions (TMDs), i.e. the Collins-Soper (CS) kernel, employing the recently proposed Coulomb-gauge-fixed quasi-TMD formalism as well as a chiral-symmetry-preserving lattice discretization. This unitary lattice calculation is conducted using the domain wall fermion discretization scheme, a fine lattice spacing of approximately 0.08 fm, and physical values light and strange quark masses. The CS kernel is determined analyzing the ratios of pion quasi-TMD wave functions (quasi-TMDWFs) at next-to-leading logarithmic (NLL) perturbative accuracy. We observe significantly slower signal decay with increasing quark separations compared to the established gauge-invariant method with a staple-shaped Wilson line. This enables us to determine the CS kernel at large nonperturbative transverse separations and find its near-linear dependence on the latter. Our result is consistent with the recent lattice calculation using gauge-invariant quasi-TMDWFs, and agrees with various recent phenomenological parametrizations of experimental data.

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**Session Classification:** Presentations