

## Lattice-QCD Calculations of Collins-Soper Kernel through TMD Wave Function

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We will present the first lattice QCD calculation of transverse momentum dependence wave function of pion using large momentum effective theory. We use the clover fermion action on three ensembles with 2+1+1 flavors of highly improved staggered quarks (HISQ) action, generated by MILC collaboration, at pion mass 670 MeV and 0.12 fm lattice spacing, choose three different hadron momenta  $P_z = \{1.72, 2.15, 2.58\}$  GeV. Our target is to extract Collins-Soper kernel from quasi transverse momentum dependence wave function (quasi-TMDWF), which is computed on lattice calculation. For quasi-TMDWF, we use non perturbative renormalization in  $\overline{\text{MS}}$  scheme by using Wilson-loop renormalization. We find the Collins-Soper is positive when transverse momentum is small. This is different from other groups results.

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