

Rui Zhang – HEP Seminar – April 16, 2024
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Title: Lattice QCD calculation of the pion distribution amplitude with domain wall fermions at physical pion mass

Abstract:

Pion distribution amplitude (DA) describes the wave function of pion as a quark-antiquark pair in the infinite-momentum frame. The pion DA has rich phenomenology due to its universality as inputs to exclusive processes and form factors at large momentum transfer. So far, it is weakly constrained by experiments, thus a first-principle calculation from lattice QCD is highly desirable to understand the strong interaction and the chiral symmetry breaking effect inside pion.

In this talk, I will present our recent lattice QCD calculation of pion DA on a chiral-symmetric domain-wall fermion ensemble at physical pion mass through the large momentum effective theory (LaMET) approach. I will discuss the theoretical improvements within the LaMET framework, especially the first application of threshold resummation in the perturbative matching onto the light-cone DA, which resums the large logarithms in the soft gluon limit at next-to-next-to-leading order. Applying the same analysis to data from a similar ensemble but with explicit chiral-breaking term, we find with 2σ confidence level that the DA obtained from chiral fermions is flatter and lower near $x=0.5$, with a larger second Mellin moment extracted through operator product expansion.