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Pion and proton PDFs at the physical point from lattice QCD with NNLO matching

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Parton distribution functions (PDFs) are defined from matrix elements of operators separated along the light cone, which cannot be determined directly from calculations performed in Euclidean space. Despite this, various approaches for extracting information on PDFs from lattice QCD have been developed, all of which involve a factorization of the lattice QCD computed matrix element with perturbatively calculable matching coefficients. We will present recent work on the extraction of the valence pion PDF in the continuum and the unpolarized isovector quark PDF of the nucleon using two main strategies. While the first one is based on factorization in position space, the second one relies on factorization in momentum space. We extract the x-dependent PDFs using both methods and compare these results with those obtained from the phenomenological global fits. We then present independent calculations of the moments of the PDFs based on the operator product expansion of the lattice QCD computed matrix elements in position space and show comparisons with the corresponding phenomenological global fit results. All lattice QCD calculations were carried out with the physical value of the pion mass, and all analyses used perturbative matching coefficients computed at next-to-next-to-leading order (NNLO) in the strong coupling.

Submitted on behalf of a Collaboration?

No

Participate in poster competition?

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