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From C to Parton Sea: Bjorken-x dependence of the PDFs

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Studying the structure of nucleons is not only important to understanding the strong interactions of quarks and gluons, but also to improving the precision of new-physics searches.

Since a broad class of experiments, including the LHC and dark-matter detection, require Standard-Model backgrounds with parton distribution functions (PDFs) as inputs for disentangling SM contributions from potential new physics.

For a long time, lattice calculations of the PDFs (as well as many hadron structures) has been limited to the first few moments.

In this talk, we present a first direct calculation of the Bjorken-x dependence of the PDFs using Large-Momentum Effective Theory

(LaMET). An exploratory study of the antiquark/sea flavor asymmetry of these distributions will be discussed. This breakthrough opens an exciting new frontier calculating more complicated quantities, such as gluon

structure and transverse-momentum dependence, which will complement existing theoretical programs for the upcoming Electron-Ion Collider (EIC) or Large Hadron-Electron Collider (LHeC).

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