

Precision Neutrino DIS at CERN's Forward Physics Facility (and Beyond)

Wednesday 1 May 2024 17:50 (20 minutes)

Building on the successes of the FASER and SND@LHC experiments, proposed programs at CERN's Forward Physics Facility (FPF) can build the world's largest dataset of neutrino deep-inelastic scattering (ν DIS) in the TeV range for all neutrino flavors. These data will enable novel tests of neutrino-matter interactions but also complement ongoing short-baseline programs at FNAL as well as charged-lepton DIS programs at JLAB and BNL. To fully utilize these data, developments on the theory side will be needed. This includes state-of-the-art calculations at next-to-leading order in QCD and beyond, as well as higher twist corrections that extend the validity of the Factorization Theorem for inclusive DIS.

In this talk, we present the complete set of so-called "target mass corrections" (TMCs) to structure functions in ν and ℓ^\pm DIS off arbitrary nuclei. TMCs are formally beyond leading twist and are critical for correctly describing DIS at ultra-high rapidities, i.e., large Bjorken x and small Q^2 . We show their relation to TMCs for DIS off protons, their numerical impact, as well as interesting conceptual connections.

arXiv:2301.07715

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Session Classification: Talks