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Parton Distributions and small-x physics with the LHeC and the FCC-eh

Energy-frontier DIS can be realised at CERN through an energy recovery linac that would produce 60 GeV electrons to collide with the HL-LHC or later HE-LHC (LHeC) or eventually the FCC hadron beams (FCC-eh). It would deliver electron-proton collisions with centre-of-mass energies in the range 0.3-3.5 TeV, and luminosities exceeding 10ˆ34 cmˆ−2sˆ−1. In this talk we will present new studies on the prospects for the precise and complete determination of parton distributions in the proton in inclusive deep inelastic scattering. We will then discuss possible ways for establishing the existence of new QCD physics at small x, of BFKL type, through the discovery of a new regime beyond the dilute one described by fixed-order perturbation theory.

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