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QCD at the LHeC

The Large Hadron electron Collider (LHeC) is the proposal to deliver electron-proton/nucleus collisions at CERN using the LHC hadron or nuclear beams and a 50 GeV electron beam from an Energy Recovery Linac (ERL) in racetrack configuration. While the 2021 update of its CDR [1] contemplated concurrent operation of electron-hadron and hadron-hadron collisions at the HL-LHC followed by standalone electron-hadron collisions, we propose, in view of the current HL-LHC schedule, an LHeC program extending the regular HL-LHC program with only a standalone electron-hadron operation phase [2]. In this way, the LHeC becomes a bridge from the HL-LHC to the next flagship project at CERN.

In this talk we review the QCD studies at the LHeC. The impact of DIS on the extraction of parton densities of proton and nuclei and on the determination of α_s is analysed. The implications for such extraction on EW parameters and Higgs couplings at the HL-LHC, and on the extension of high-mass searches, is discussed. The combination with EIC data is also shown. Finally, the possibilities for unraveling the existence of a new non-linear regime of QCD are discussed.

[1] P. Agostini et al. (LHeC/FCC-he Study Group), J. Phys. G 48, 110501 (2021), arXiv:2007.14491 [hep-ex].
[2] F. Ahmadova et al., e-Print: 2503.17727 [hep-ex].

Secondary track

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