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Higgs physics 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 Higgs physics studies at the LHeC. We present the standalone determination of the Higgs couplings. We then explore the impact of the improved extraction of PDFs+α_s at the LHeC on Higgs coupling determination at the HL-LHC, as well as the implications on the Higgs mass extracted in EW fits, and on the cross section through gluon-gluon fusion. We finally discuss the comparison of the extraction of couplings in different combinations of future accelerators, highlighting the role of the combination HL-LHC+LHeC.

[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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