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BSM physics at the LHeC and the FCC-eh

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 possibilities for BSM studies at the LHeC and FCC-eh. We highlight the possibilities for scenarios that are difficult to constrain in hadron colliders, particularly those implying short-lived displaced vertices. The case for ALPs, dark photons, sterile neutrinos and scalars from Higgs are shown. We also discuss the impact of the improved determination of PDFs+α_s at the LHeC and FCC-eh on the extension of high-mass searches at the HL-LHC and future hadron colliders.
[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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