

XXVI International Workshop on Deep Inelastic Scattering and Related Subjects



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VHEeP: A very high energy electron–proton collider

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Based on current CERN infrastructure, an electron–proton collider is proposed at a center-of-mass energy of about 9 TeV. A 7 TeV LHC bunch is used as the proton driver to create a plasma wakefield which then accelerates electrons to 3 TeV, these then colliding with the other 7 TeV LHC proton beam. Although of very high energy, the collider has a modest projected integrated luminosity of 10-100 inverse pb. For such a collider, with a center-of-mass energy 30 times greater than HERA, parton momentum fractions, x , down to about 10^{-8} are accessible for photon virtualities, Q^2 , of 1 GeV². The energy dependence of hadronic cross sections at high energies, such as the total photon-proton cross section, which has synergy with cosmic-ray physics, can be measured and QCD and the structure of matter better understood in a region where the effects are completely unknown. Searches at high Q^2 for physics beyond the Standard Model will be possible, in particular the significantly increased sensitivity to the production of leptoquarks.

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