

## QCD and low-x physics at a Large Hadron electron Collider

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The Large Hadron electron Collider (LHeC) is a proposed facility which will exploit the new world of energy and intensity offered by the LHC for electron-proton scattering, through the addition of a new electron accelerator. This contribution, which is derived from the draft CERN-ECFA-NuPECC Conceptual Design report (due for release in 2011), addresses the expected impact of the LHeC precision and extended kinematic range for low Bjorken- $x$  and diffractive physics, and detailed simulation studies and prospects for high precision QCD and electroweak fits.

Numerous observables which are sensitive to the expected low- $x$  saturation of the parton densities are explored. These include the inclusive electron-proton scattering cross section and the related structure functions  $F_2$  and  $F_L$ , as well as exclusive processes such as deeply-virtual Compton scattering and quasi-elastic heavy vector meson production and diffractive virtual photon dissociation.

With a hundred times the luminosity that was achieved at HERA, salient expectations for the LHeC include the complete determination of all light and heavy quark parton distributions for the first time, the high precision extraction of the gluon density, the determination of the strong coupling constant to per-mil accuracy and the precision study of the running of the electroweak mixing angle.

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