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New developments in the statistical approach of parton distributions: tests and predictions up to LHC energies

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The quantum statistical parton distributions approach proposed more than one decade ago is revisited by considering a larger set of recent and accurate Deep Inelastic Scattering experimental results. It enables us to improve the description of the data by means of a new determination of the parton distributions. This global next-to-leading order QCD analysis leads to a good description of several structure functions, involving unpolarized parton distributions and helicity distributions, in a broad range of x and Q^2 and in terms of a rather small number of free parameters. There are several challenging issues and in particular the confirmation of a large positive gluon helicity distribution. The predictions of this theoretical approach will be tested for single-jet production and charge asymmetry in W^\pm production in $\bar{p}p$ and pp collisions up to LHC energies, using recent data and also for forthcoming experimental results.

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