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Determination of the strong coupling constant from inclusive jet cross sections

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Measurements of inclusive jet cross sections have been performed by a number of experiments in proton—proton, proton—anti-proton, and electron—proton collisions and at different center-of-mass energies. Since inclusive jets are directly sensitive to the strong coupling constant, and exhibit a high sensitivity to the gluon content of the proton, a thorough understanding of the available experimental data is needed for precision QCD phenomenology. For instance, the strong coupling constant, $\alpha_s(M_Z)$, has been determined recently by the H1, CMS and D0 experiments from their inclusive jet data.

Here, we present a study of the methodology of the α_s -determinations as used by the H1, CMS and D0 Collaborations. We also investigated data by the ATLAS, CDF, STAR and ZEUS Collaborations. Using predictions at NLO QCD, values of the strong coupling constant are determined from each individual data set, and from a simultaneous fit to all inclusive jet data, which improves the experimental precision as compared to an extraction from a single experiment only. The study examines the consistency of the data sets and paves the way for precision QCD phenomenology using inclusive jet data in the future.

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