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Scheme variations of the QCD coupling and phenomenological applications

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The Quantum Chromodynamics (QCD) coupling, α_s , is not a physical observable of the theory since it depends on conventions related to the renormalization procedure. We introduce a definition of the QCD coupling, denoted by $\hat{\alpha}_s$, whose running is explicitly renormalization scheme invariant. The scheme dependence of the new coupling $\hat{\alpha}_s$ is parameterized by a single parameter C , related to transformations of the QCD scale Λ . It is demonstrated that appropriate choices of C can lead to substantial improvements in the perturbative prediction of physical observables. As phenomenological applications, we study e^+e^- scattering and decays of the τ lepton into hadrons, both being governed by the QCD Adler function, as well as the scalar correlation function.

Summary

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