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Mass effects on the QCD beta-function

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In this study we present lattice results on the QCD β-function in the presence of a quark mass. The β-function is calculated to three loops in perturbation theory and for improved lattice actions; it is extracted from the renormalization of the coupling constant Z_g. The background field method is used to compute Z_g, where it is simply related to the background gluon field renormalization constant Z_A. We address quark mass effects on the background gluon propagator; its dependence on the number of colors N_c, the number of fermionic flavors N_f and the quark mass, m, is shown explicitly. The perturbative results for the QCD β-function will be applied to the precise determination of the strong coupling constant, calculated by Monte Carlo simulations, removing the mass effects from the nonperturbative Green's functions.

Topical area

Hadronic and Nuclear Spectrum and Interactions

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