

2-loop additive mass renormalization with clover fermions and Symanzik improved gluons

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Abstract: We calculate the critical value of the hopping parameter, κ_c , in Lattice QCD, up to two loops in perturbation theory. We employ the Sheikholeslami-Wohlert (clover) improved action for Wilson fermions and the Symanzik improved gluon action for 4- and 6-link loops.

The quantity which we study is a typical case of a vacuum expectation value resulting in an additive renormalization; as such, it is characterized by a power (linear) divergence in the lattice spacing, and its calculation lies at the limits of applicability of perturbation theory.

Our results are polynomial in c_{sw} (clover parameter) and cover a wide range of values for the Symanzik coefficients c_i . Furthermore, the dependence on the number of colors N and the number of fermionic flavors N_f is shown explicitly. In order to compare our results to non perturbative evaluations of κ_c coming from Monte Carlo simulations, we employ an improved perturbation theory method for improved actions.