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Towards a non-perturbative determination of b_g at small couplings

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The extraction of the QCD coupling via non-perturbative decoupling methods has been recently shown to be a compelling strategy for high-precision determinations [Eur. Phys. J. C 82 (2022) 12, 1092]. One of the key ingredients of this strategy is the determination of a (finite-volume) non-perturbative massive coupling at large values of the quark-mass, M. Robust continuum limit extrapolations for this coupling require control over potentially large $O((aM)^n)$ discretization errors. In the case of Wilson-fermions, particular care must be taken, as $O(aM)$ effects are in principle also present. Once the quark-mass has been properly renormalized and $O(a)$-improved, the remaining $O(aM)$ effects can be eliminated by the proper tuning of a single $O(aM)$-improvement coefficient, $b_g(g_0^2)$. Following a novel strategy [see S. Sint parallel talk], in this poster we present first preliminary results for $b_g(g_0^2)$ for $N_f = 3$ non-perturbatively $O(a)$-improved Wilson-fermions and Lüscher-Weisz gauge action in the range of bare couplings $g_0^2 < 1.5$.

Topical area

Theoretical Developments

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