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Effective mass-improvement of heavy valence Wilson quarks

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We extend an established strategy to non-perturbatively determine mass-improvement coefficients for heavy valence Wilson fermions in $N_f = 3$ massless QCD to effectively cancel higher-order mass-dependent cut-off effects. Using Schrödinger functional simulations in physical volumes of $L \simeq 0.25, 0.5\,\mathrm{fm}$ we test our strategy by simulating relativistic b-quarks at lattice spacings of $0.008 \leq a/\mathrm{fm} \leq 0.021$, and compare it to results obtained with the traditional method for tuning the b-quark hopping parameter. The new strategy significantly enhances the window for which a predominantly $O(a^2)$ scaling behaviour of physical quantities is observed, comparable to that of massless sea quarks.

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