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Cutoff effects in short-distance quantities in lattice QCD

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We propose a method to help control cutoff effects in the short-distance contribution to integrated correlation functions, such as the hadronic vacuum polarization, using the corresponding screening correlators computed at finite temperature. The strategy is investigated with Wilson fermions at leading order, which reveals a logarithmically-enhanced lattice artifact in the short-distance contribution, whose coefficient is determined at this order. We also perform a numerical study with $N_{\rm f} = 2$ O(a)-improved Wilson fermions and a temperature $T \approx 250$ MeV, with lattice spacings down to $a = 0.03$ fm, which suggests good control can be achieved on the short distance contribution to the hadronic vacuum polarization and the Adler function at large virtuality. Finally, we put forward a scheme to compute the complete hadronic vacuum polarization function at large virtualities using a step-scaling in the temperature.

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