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Investigating efficient methods for computing four-quark correlation functions

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Abstract

We discuss and compare the efficiency of various methods, combinations of point-to-all propagators, stochastic timeslice-to-all propagators, the one-end trick and sequential propagators, to compute two-point correlation functions of two-quark and four-quark interpolating operators of different structure including quark-antiquark type, mesonic molecule type, diquark-antidiquark type and two-meson type. Although we illustrate our methods in the context of the $a_0(980)$, they can be applied for other multi-quark systems, where similar diagrams appear. Thus our results could provide helpful guidelines on the choice of methods for correlation function computation for future lattice QCD studies of meson-meson scattering and possibly existing tetraquark states.

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