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Lattice QCD study of the I=0 scalar channel using four-quark operators

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We study the possible significance of four-quark states in the isosinglet scalar mesons ($J^{PC} = 0^{++}$, I=0) by performing two-flavor full lattice QCD simulations on an $8^3¥times16$ lattice using the improved gauge action and the clover-improved Wilson quark action. In particular, we evaluate the propagators of molecular and tetraquark operators together with singly disconnected diagrams. In the computation of the singly disconnected diagrams we employ the Z_2-noise method with the truncated eigenmode approach. We show that the quark loops given by the disconnected diagrams play an essential role in propagators of tetraquark and molecular operators.

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