

η and η' mesons from lattice QCD

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Understanding the masses of η and η' mesons as well as the mixing between the original flavor singlet state and the neutral octet state is an important topic in low-energy strong-interaction physics. We determine masses and mixing angle of the η and η' mesons in lattice QCD. The calculations are carried out on a set of 13 CLQCD gauge ensembles with $N_f = 2 + 1$ Wilson-Clover quarks. These ensembles cover three values of the lattice spacing $a = 0.105, 0.077, 0.052\text{fm}$ and pion masses from 136 to 317MeV, including two ensembles at physical pion mass. In all ensembles, we used all-to-all quark propagators, named perambulators, generated via a distillation smearing algorithm to improve signal quality. The fitting results indicate that the perambulators perform well for both connected and disconnected diagrams of the correlation function, without requiring too many configurations. This provides a solid foundation for accurately calculating the masses of the η and η' mesons, especially the η' .

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