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The continuum limit with various discretized fermion actions

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We present the leading order mixed-action effect $\Delta_{\rm mix} \equiv m^2_{\pi,\rm vs} - \frac{m^2_{\pi,\rm vv}+m^2_{\pi,\rm ss}}{2}$ using HISQ, clover or overlap valence fermion actions on the gauge ensembles with kinds of sea fermion actions among a widely used lattice spacing range $a \in [0.04, 0.19]$~fm. The results suggest that $\Delta_{\rm mix}$ decreases on the forth order of the lattice spacing on the gauge ensembles with the dynamical chiral sea fermion, likes the Domain wall or HISQ fermion. When the clover sea fermion action which has explicit chiral symmetry breaking is used in the ensemble, $\Delta_{\rm mix}$ can be much larger regardless of the valence fermion action used.

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