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Beyond the Standard Model Kaon Mixing from Mixed-Action Lattice Simulations

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We calculate matrix elements for beyond-the-Standard-Model contributions to neutral kaon mixing from mixed-action lattice simulations with staggered sea quarks and domain-wall valence quarks. We analyze the (2+1)-flavor MILC asqtad ensembles with multiple light sea-quark masses corresponding to staggered pions as light as 220 MeV on three different lattice spacings $a \sim 0.12, 0.09,$ and 0.06 fm, and extrapolate our data to the physical light-quark masses and continuum using mixed-action chiral perturbation theory. We renormalize the matrix elements using mean-field improved lattice perturbation theory at one loop to obtain continuum values in the $\overline{\text{MS}}$ scheme. Once our analysis is finalized, our results will help to improve constraints on new physics from experimental measurements of neutral kaon mixing.

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