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The two-pole nature of the $\Lambda(1405)$ from lattice QCD

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The PDG lists the $\Lambda(1405)$ state, a baryon with quantum numbers $I(J^P) = 0(\frac{1}{2}^-)$ and strangeness $S = -1$, an object of interest given the difficulties encountered in obtaining this state from quark models. There are discrepancies in the literature whether experimental data is compatible with one or two nearby poles in this region, and what the position of those poles in the complex plane would be. This work presents results of a lattice QCD computation of the coupled channel $\Sigma\pi - N\bar{K}$ scattering amplitude in the $\Lambda(1405)$ region, representing the first coupled channel meson-baryon computation in lattice QCD. The calculation was carried out using a single CLS ensemble with a heavier-than-physical pion mass of $m_\pi = 200\,\mathrm{MeV}$. The scattering amplitude analysis was based on Lüscher's formalism and finite-volume stationary-state energies, and was extracted using several parametrizations of the two-channel K-matrix. The results support the two-pole picture exhibiting a virtual bound state below $\Sigma\pi$ threshold and a resonance pole below the $N\bar{K}$ threshold.

Parallel Session

Hadron Spectroscopy

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