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Type: **Talk**

Investigating Quark Mass Dependence of Nuclear Binding

Friday 7 November 2025 14:50 (20 minutes)

We present preliminary results from a lattice QCD study of the lowest energy levels of light nuclei—specifically the deuteron, dineutron, helium-3, and helium-4 systems—and compare those with their respective thresholds for investigating their binding energies. We utilize a set of $N_f = 2 + 1$ flavor gauge ensembles, generated by the HotQCD Collaboration with the HISQ action at the physical sea quark masses and at lattice spacing $a = 0.076$ fm, while the valence sector employs clover fermions.

Calculations are performed at three valence pion masses $m_\pi \approx 140$ MeV, 300 MeV and 700 MeV, employing both asymmetric and symmetric source-sink setup using a large statistics, with a goal to explore the quark-mass dependence of nuclear bindings. The resulting correlation functions are analyzed using the standard vanilla fitting, ratio correlators, as well as by employing the recently proposed transfer-matrix generalized eigenvalue problem (TGEVP) formalism.

Parallel Session (for talks only)

Hadronic and nuclear spectrum and interactions

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