

Exploring the Hadron Mass Spectrum at Finite Density with Two-Color Lattice QCD

We analyze hadron masses for 2-color 2-flavor QCD at low temperatures and finite densities using lattice numerical simulations.

Based on the previous study [1], we complete the extrapolation of the diquark source term to zero, enabling rigorous measurements of hadron masses. This allows us to obtain more detailed and conclusive results for hadron property. In the superfluid phase, meson masses exhibit distinct behavior: The pseudo-scalar meson mass (namely pion in QCD) increases linearly with density, while the vector meson mass decreases. As a result, the pseudo-scalar becomes heavier than the vector meson in the superfluid phase. Another notable result is that the mass of diquark with $I = 0, J^P = 0^+$ is observed to approach zero in the same region. This phenomenon indicates a characteristic of NG boson, which is caused by the breaking of $U(1)_B$ symmetry. Furthermore, we discuss the hadron mixing associated with the hadron-superfluid phase transition.

Reference

[1] K.Murakami, D.Suenaga, K.Iida, E.Itou, arXiv:2211.13472

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