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Spin Alignment, Phase Transition and Transportation of QGP at Finite Temperature in the Presences of Magnetic and Vorticity Fields

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We study the two-flavor Nambu-Jona-Lasinio model under the rotation and chiral chemical potential μ5. First, the influence of chiral imbalance on the chiral phase transition in the Tpc – ω plane is investigated.
And then by incorporating AMM at the quark level, we find that AMM significantly alters the magnetic field dependence of constituent quark masses, inducing first-order phase transitions for light quarks at critical fields, while strange quarks exhibit non-monotonic mass behavior. The inclusion of AMM reshapes the QCD phase diagram, suppressing chiral transition temperatures and shifting critical endpoints (CEP) toward lower μ and T. Notably, crossover transitions observed without AMMare replaced by first-order transitions under strong fields, aligning with lattice QCD predictions for IMC. For mesons, AMM triggers abrupt mass collapses and enhances flavor mixing, accelerating chiral restoration for K and η mesons via thresholds tied to strange quark masses.

The impact of rotation on the deconfinement phase transition under the Einstein-Maxwell system of the soft and the hard wall models in holographic quantum chromodynamics is studied. The metric by cylindrical coordinates with rotation is introduced into the system to calculate the Hawking temperature. The first holographic study on the influence of the radius of a homogeneous rotating system on the phase diagram is proposed.

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