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Anisotropic Thermodynamic Response of Two-Flavor Quark Matter in a Nonlocal NJL Model

We investigate the effects of a strong and uniform external magnetic field on cold, strongly interacting quark matter within a nonlocal two-flavor Nambu–Jona-Lasinio (nlNJL) model. Nonlocal interactions are essential to capture key qualitative features obtained with lattice QCD, including inverse magnetic catalysis. Working at zero temperature in the mean-field approximation, we analyze the anisotropy induced by the magnetic field in thermodynamic quantities, distinguishing between longitudinal and transverse components of the pressure and speed of sound. We further study the magnetization and its dependence on the quark chemical potential and magnetic field strength. Our results show that both the equation of state and thermodynamic response are strongly modified by the magnetic field, with potential implications for the physics of magnetized compact stars.

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