

Dense quark matter: effective model approach

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Dense quark matter has been under debate for more than 40 years. This kind of matter appears in heavy-ion collision experiments and could exist in some types of compact stars. Its fundamental theory is quantum chromodynamics (QCD). But as a consequence of the asymptotic freedom, the perturbative technique is not applicable to investigate the condensed quarks (long-range phenomenon).

There are two approaches to investigating dense quark matter. QCD on the lattice and effective field theories (EFT). The first one is a potent numerical tool from the first principles. But due to the sign problem, it can't describe the region of the QCD phase diagram with non-zero density and low temperature. So to achieve this region, EFT is the most common tool.

Although the EFT method has been developed for several decades, it is still commonly applied and developing. We will review the milestones of EFT as a tool for investigating dense quark matter, especially the Nambu–Jona-Lasinio model and its applications.

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