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A Renormalization-Group Consistent approach to Color Superconductivity in the NJL model

The Nambu–Jona-Lasinio (NJL) model and particularly its extension to color superconductivity is a powerful framework for explorative studies of dense, but not asymptotically dense quark matter. However, its reliability is limited by regularization artifacts that emerge near the cutoff energy scale. Unfortunately, this already affects the phenomenologically most interesting density regime, relevant for compact-star cores and mergers. In this talk, I show how these artifacts can effectively be removed by employing an approach that is based on the principle of renormalization-group (RG) consistency. Our study reveals qualitative modifications of previous NJL-model results for the phase diagram of color superconducting matter. Notably, this also resolves an old puzzle about the melting pattern of the Color-Flavor Locked phase, which is now in agreement with earlier Ginzburg-Landau predictions. Furthermore, the approach allows to extend the model studies into density regions where a comparison with perturbative QCD is possible. Results for the pairing gaps, the equation of state and the speed of sound will be discussed.

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