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Towards color superconductivity on the lattice — perturbative predictions and the complex Langevin method

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The phase structure of QCD at finite density is expected to be revealed by the complex Langevin method (CLM), which is a promising approach to overcome the sign problem. In particular, we discuss the possibility of investigating the color superconductivity (CSC) on the lattice by the CLM. Towards that end, we predict the parameter region in which CSC occurs in lattice perturbation theory based on the gap equation. Our perturbative calculations are justified by considering a small spatial volume due to the asymptotic freedom. Most notably, we can predict the explicit form of the Cooper pairs without imposing any ansatz.

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