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The QCD phase structure and its signatures from functional approaches

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The phase structure of QCD remains an open fundamental problem of standard model physics. In particular at finite density, where importance sampling based methods like lattice QCD are severely restricted, our knowledge is limited. Yet, numerous model studies point towards a rich and complex phase diagram at large density. In addition to their fundamental relevance, the thermodynamic and transport properties of QCD in this regime are crucial for our understanding of the fireball created in heavy-ion collisions, as well as neutrons stars and their mergers. Functional methods like the functional renormalization group and Dyson-Schwinger equations offer a way to study hot and dense QCD matter directly from first principles. I will discuss the phase structure of QCD and its experimental signatures through the lens of these methods.

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