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QCD thermodynamics by numerical simulations of Lattice QCD with Wilson-type quarks

We report results on thermodynamic properties of the quark matter obtained by numerical simulations of lattice QCD with dynamical Wilson-type quarks. So far, most of the lattice QCD studies at finite temperature and chemical potential have been performed using staggered-type quark actions with the fourth-root trick for the quark determinant. To control and estimate systematic errors due to lattice discretization, it is indispensable to carry out simulations adopting different lattice quark actions, e.g. the Wilson-type quark action.

In this talk, we discuss the following topics performing simulations with the Iwasaki improved gauge action and the clover improved Wilson quark action: (1) The Equation of state computed by a fixed scale approach and a comparison with previous results by staggered quark actions. (2) The scaling properties around the chiral phase transition point. Assuming the scaling function is the same as the O(4) spin model, we determine the phase transition line in the temperature and chemical potential plane. (3) The quark mass dependence of the nature of the QCD transition through the histogram of physical quantity.

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