



Contribution ID: 39

Type: 4th week (Nuclear matter under extreme conditions)

Surprises on the way to the QCD phase diagram

Wednesday, November 6, 2024 11:00 AM (1 hour)

Lattice constraints on the QCD phase diagram

A strong fermion sign problem prohibits direct lattice simulations of QCD at finite baryon density, so that knowledge of the phase diagram is limited to small chemical potentials. On the other hand, the phase diagram is severely constrained by information about the chiral limit.

I discuss recent lattice results at vanishing density, which show the chiral phase transition for theories with $N_f=2-7$ degenerate massless quarks to be of 2nd order, contrary to the predictions of the seminal 1984 paper by Pisarski and Wilczek. Current work in progress demonstrates that this 2nd order nature of the chiral transition does not change as a function of imaginary chemical potential, for which there is no sign problem. On the other hand, at zero density an emergent chiral-spin symmetric temperature regime has been identified at the physical point, which must continue to finite density. Implications of both findings for the physical QCD phase diagram are discussed.

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