



Contribution ID: 324

Type: **not specified**

Taste symmetry and QCD thermodynamics with improved staggered fermions

Monday, 14 June 2010 15:50 (20 minutes)

Taste symmetry violations in staggered fermion formulations correlate strongly with the cut-off (lattice spacing) dependence in physical observables. Better taste symmetry on the lattice can be achieved either by decreasing the lattice spacing and going to larger temporal extent in finite-temperature calculations, or by further improving the action. The Highly Improved Staggered Quark (HISQ) action offers further degree of improvement and substantially reduces taste violations. We report on our studies of the 2+1 flavor QCD thermodynamics with HISQ. By systematically comparing HISQ, asqtad, p4 and stout calculations we quantify how the cut-off effects manifest themselves in different physical observables, including the renormalized Polyakov loop, chiral condensate, various fluctuations and correlations of conserved charges. The implications for the equation of state and comparison to the Hadron Resonance Gas model are also discussed. The chiral aspects of the QCD transition are discussed in a separate HotQCD presentation by W. Soeldner.

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talk

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Session Classification: Parallel 03: Nonzero temperature and density

Track Classification: Nonzero temperature and density