

Effects of the Anomaly on the QCD Chiral Phase Transition

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Abstract: We study a lattice field theory described by two flavors of staggered fermions interacting with gauge fields in the strong coupling limit. We show that the lattice model has an $SU(2) \times SU(2) \times U(1)$ chiral symmetry and can be used to model the two-flavor QCD chiral phase transition in the absence of the anomaly. We construct an efficient directed loop algorithm to study the system in the chiral limit. We show that the chiral phase transition in this case is indeed first order as expected. We then switch on a coupling which mimics the effects of the instantons in QCD and breaks the chiral symmetry to $SU(2) \times SU(2)$. We show evidence that the phase transition now becomes second order as expected.