

The fate of axial U(1) and the topological susceptibility in QCD with two light quarks

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The region of the Columbia plot with two light quark flavors is not yet conclusively understood. Non-perturbative effects, e.g. the magnitude of the anomalous U(1) axial symmetry breaking decides on the nature of the phase transition in this region. We report on our study of this region of the Columbia plot using lattice techniques. We use gauge ensembles generated within the Highly Improved Staggered Quark discretization scheme, with the strange quark mass fixed at its physical value and the light quark mass varied such that $m_l = m_s/27$, $m_s/40$, $m_s/80$, where $m_l = m_s/27$ corresponds to the physical light quark mass.

We study the eigenvalue spectrum of QCD at finite temperature around the chiral transition temperature T_c , as the light quark masses approach towards the chiral limit and infer about the fate of anomalous U(1) symmetry. We also show how the topological susceptibility of QCD at finite temperature varies as one goes towards the chiral limit.

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