

The $T - \mu$ phase diagram and chiral singularities of two color lattice QCD at strong coupling.

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Abstract: We use a modified directed path algorithm to study the $T - \mu$ phase diagram in the chiral limit and the chiral singularities of two color lattice QCD with staggered fermions at strong coupling. In addition to the results that the finite temperature transition at zero chemical potential is a weakly first order transition and the zero temperature transition is a mean field transition, which were already presented in lattice05, we further discover that the finite temperature transition at a fixed $\mu = 0.3$ is second order and belongs to the $3dXY$ universality class. With our new algorithm, we also study the finite temperature chiral singularities by performing our lattice calculations at a fixed finite temperature in the broken phase with a variety of different quark masses. We find that the behavior of some of our observables are consistent with the predictions of three dimensional χ PT. But in order to see the consistency, the quark masses need to be quite small.