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The temperature of the QCD chiral transition at its tricritical point

The nature of the QCD phase transition in the chiral limit constitutes a challenging problem for lattice QCD as it is not directly simulable. Its study, however, provides constraints on the phase diagram at the physical point. Recently, the lattice chiral limit was approached by mapping out the chiral critical surface separating the first-order region from the crossover region in an enlarged parameter space, which consists of the gauge coupling, a variable number of quark flavours, their masses, and the lattice spacing. Based on simulations of lattice QCD with standard staggered quarks, it was found that for all $N_f \leq 7$ there exists a minimal and tricritical lattice spacing a^{tric}, where the chiral transition changes from first order (above) to second order (below). The first-order region thus constitutes a cutoff effect and the transition in the continuum chiral limit is of second order for all $N_f \leq 7$. In the current work we determine the associated temperatures $T^{tric}(N_f, a^{tric})$ at those lattice spacings. Further simulations on finer lattices will allow us to determine the location of the tricritical point in the continuum limit.

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