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# The chiral phase transition temperature in (2+1)-flavor QCD

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We present a lattice QCD calculation with (2+1)-flavor of highly improved staggered quarks (HISQ). The light quark masses are chosen predominantly lighter than physical, i.e. they correspond to a Goldstone pion mass in the range of 58 MeV < $m_\pi$ < 163 MeV. The strange quark mass is kept at its physical value. We propose two novel estimators for the transition temperate, based on the scaling behavior of the chiral susceptibility. We extrapolate our results to the thermodynamic, chiral and continuum limit by making use of universal scaling functions. In the extrapolation we control finite size effects by using spatial lattice extents in the range of 2.8-4.5 times the inverse of the pion mass. The lattice cut-off is controlled by using lattices with temporal extent $N_\tau = 6, 8$ and 12. After thermodynamic, continuum and chiral extrapolations we find the chiral phase transition temperature $T_c^0 = 132^{+3}_{-6}$ MeV. We also comment on implications of this findings for the location of a possible chiral critical point in the QCD phase diagram at non-zero baryon chemical potential.

**Author:** SCHMIDT, Christian (University of Bielefeld)

**Presenter:** SCHMIDT, Christian (University of Bielefeld)

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