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Understanding the chiral transition in 2+1 flavor QCD with Mobius domain wall fermions

We report our new results on the chiral crossover transition in 2+1 flavor QCD on $N_\tau = 8$ lattice using the Mobius domain wall fermion (MDWF) discretization scheme. By performing a high statistics study of the disconnected part of the chiral susceptibility, χ_{disc} , we extract a pseudo-critical temperature, $T_{pc} = 158.9(-2.1)(+2.6)$ MeV. This is in very good agreement with the pseudo-critical temperature estimated after performing a careful continuum extrapolation of different chiral observables using highly improved staggered quarks [1]. More remarkably the continuum extrapolated data for χ_{disc} obtained using highly improved staggered quarks are in excellent agreement with those obtained with MDWF on a finite lattice, highlighting the importance of the role of exact chiral symmetry of lattice fermion operators for the study of crossover transition. We also show our new results on the topological susceptibility in 2+1 flavor QCD with MDWF in the temperature range between $T_{pc}-1.2 T_{pc}$, and from its temperature dependence and comparison with χ_{disc} we discuss about the effective restoration of the singlet $U_A(1)$ and the non-singlet parts of chiral symmetry corresponding to the two light quark flavors [2].

References

1. HotQCD collaboration, Phys.Lett.B 795 (2019)
2. Mischa Jaensch et. al., e-Print: 2411.10217 [hep-lat]

Category

Theory

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