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Characterizing Strongly Interacting Matter at Finite Temperature: (2+1)-Flavor QCD with MDWF Fermions

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Quantum chromodynamics (QCD) which is the theory of strong interactions describes the thermodynamics of strongly interacting matter at finite temperatures and densities. At low temperatures, chiral symmetry is broken in the QCD vacuum and as temperature increases, a transition occurs where chiral symmetry is restored, resulting in the formation of the quark gluon plasma (QGP). It is found that for the vanishing values of the light quark masses this is a
true phase transition from low to high temperatures. However, for the finite values of light quark masses, it is a smooth crossover transition from hadronic bound states to the quark gluon plasma (QGP).

In this talk, we will report our ongoing calculations of the (2+1)-flavor QCD thermodynamics with Mobius Domain Wall fermions. We consider a fifth dimension with a length of twelve, which controls the effect of the residual mass (m_{res}) reasonably well[1,2]. We will present chiral condensate and chiral susceptibilities calculated on several lattice spacings and lattice
volumes along the line of constant physics. Furthermore, we will also present preliminary results of quark number susceptibilities and conserved charge fluctuations.
[1] Thermodynamics with Möbius domain wall fermions near physical point (I), Y. Aoki, Lattice2022
[2] Thermodynamics with Möbius domain wall fermions near physical point (II), I. Kanamori, Lattice2022, PoS LATTICE2022 (2023) 176

Topical area

QCD at Non-zero Temperature

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