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Application of mass reweighting in (2+1)-flavor QCD thermodynamics with Mo¨bius Domain Wall fermions

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One of the motivation for studying QCD thermodynamics is to understand the chiral symmetry restoration at finite temperature. Lattice QCD (LQCD) calculations with chiral fermions at finite temperature can be carried out on modern supercomputers nowadays. M\"{o}bius Domain Wall fermions in 5-d represent one realization of chiral fermions, with slight chiral symmetry breaking due to the finite size in the fifth dimension. Therefore, we refer to them as "almost" chiral fermions.

In this poster, we will examine the use of "almost" chiral fermions to evaluate the effectiveness and usefulness of the mass reweightingin the light quark sector on finite temperature lattices. In the "almost" chiral fermion case, one needs to perform the configuration generation twice. The first step involves identifying the small amount of chiral symmetry breaking (m_{res}), and the second step involves correcting the input quark masses by subtracting the m_{res} effect. The mass reweighting method allows for reweighting observables generated using one mass value to obtain the value in other mass values, thus eliminating the need to generate new configurations with corrected input masses. we will be using the mass reweighting on ensembles generated by the JLQCD collaboration that utilizes 5-d M\"{o}bius Domain Wall fermions.

We will use the Bridge++: 2.0 code base on the Fugaku supercomputer to calculate reweighting factors with practical parameters and demonstrate when it is successful and when it fails. This is important because we only have a limited number of configurations available. Additionally, we will apply the reweighting method to real calculations and present the observables before and after reweighting.

Recording and publishing

yes

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