

Towards a Dual Representation of Lattice QCD

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Lattice QCD in a color singlet representation has been studied since decades in the limit $\beta \rightarrow 0$. In this limiting case it is possible to integrate out analytically the partition function at finite density which is then written in terms of dual, integer, degrees of freedom representing mesons and baryons. The partition function can be then sampled by means of Worm algorithms. It turned out that within this dual representation the finite density sign problem is so mild such that the phase diagram could be established. The challenge at this point is to introduce dynamical gluons which will allow us to study the system for larger beta values in order to make the lattice finer. Having in mind the systematic inclusion of higher order correction to the strong coupling limit, we will introduce a new representation for the partition function of pure $(S)U(N_c)$ Yang-Mills theory, which is more suitable for the extension of SC-LQCD to non-zero β . We will first show how to systematically compute the gauge integrals needed to obtain such representation then possible sampling strategies of the partition function will be discussed.

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