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Non-perturbative determination of couplings in Polyakov loop effective theories

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Polyakov loop effective theories have been shown to successfully describe the thermodynamics of QCD. Furthermore, due to the sign problem, they represent an alternative avenue to investigate the physics at non-zero chemical potential. However, when working with these effective theories, a new set of couplings appear whose expressions in terms of the gauge coupling and N_τ are only known from strong-coupling expansions. Using the finite-cluster method, we can show how one can efficiently compute high-order expressions for correlators of Polyakov loops in the effective theory which are directly mapped to those in full lattice QCD. These can then be in turn be used to determine the effective couplings as a function of temperature. Furthermore, the inclusion of heavy quarks allows one to investigate the cold and dense regime.

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