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Fighting topological freezing in $SU(N)$ Yang–Mills theories with the PTBC algorithm

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We discuss two applications of the Parallel Tempering on Boundary Conditions (PTBC) algorithm to fight topological freezing in the simulation of $SU(N)$ Yang–Mills theories on the lattice: the determination of the renormalized coupling in the Twisted Gradient Flow scheme and the scale setting via gradient flow. We show that the PTBC algorithm is much more efficient in decorrelating the topological charge compared to standard algorithms, largely reducing statistical uncertainties at same computational effort. Also, it allows not to rely on the projection to the trivial topological sector, used as a workaround to topological freezing, thus avoiding the power-like finite-volume corrections arising from a fixed topology. Moreover, we discuss an implementation of the Multicanonical Monte Carlo method to improve the efficiency of the PTBC algorithm when topological modes are highly suppressed.

Special requests

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