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Testing Eigenstate Thermalization Hypothesis for Non-Abelian Gauge Theories

Tuesday 5 September 2023 11:00 (20 minutes)

We report on progress in understanding thermalization in QCD at the full quantum level. Previous studies of thermalization of highly excited states in QCD, as they arise in heavy ion collisions, have either involved the (semi-)classical evolution of highly occupied gluon states or kinetic theory. Both approaches omit or approximate essential properties of quantum mechanical systems including coherence and entanglement. An alternative paradigm of understanding thermalization of an isolated quantum system is the eigenstate thermalization hypothesis (ETH), which states that matrix elements of local observables in the energy eigenstate basis are equal to the corresponding microcanonical ensemble values, up to random corrections that decrease exponentially with the system size. In this talk, we will show results of testing this hypothesis for the 2+1 dimensional SU(2) non-Abelian gauge theory on a lattice. The results indicate a subset of physical states in QCD also satisfy the ETH. We will then discuss physical implications of these results. Finally, the simplifications of the Hamiltonian formulation used in this work will be useful for future quantum simulations of non-Abelian lattice gauge theories.

Category

Theory

Collaboration (if applicable)

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