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Simulating the Generalized Gibbs Ensemble (GGE): A Hilbert space Monte Carlo approach VINCENZO ALBA, SISSA — By combining classical Monte Carlo and Bethe ansatz techniques we devise a numerical method to construct the Truncated Generalized Gibbs Ensemble (TGGE) for the spin-1/2 isotropic Heisenberg (XXX) chain. The key idea is to sample the Hilbert space of the model with the appropriate GGE probability measure. The method can be extended to other integrable systems, such as the Lieb-Liniger model. We benchmark the approach focusing on GGE expectation values of several local observables. As finite-size effects decay exponentially with system size, moderately large chains are sufficient to extract thermodynamic quantities. The Monte Carlo results are in agreement with both the Thermodynamic Bethe Ansatz (TBA) and the Quantum Transfer Matrix approach (QTM). Remarkably, it is possible to extract in a simple way the steady-state Bethe-Gaudin-Takahashi (BGT) roots distributions, which encode complete information about the GGE expectation values in the thermodynamic limit. Finally, it is straightforward to simulate extensions of the GGE, in which, besides the local integral of motion (local charges), one includes arbitrary functions of the BGT roots. As an example, we include in the GGE the first non-trivial quasi-local integral of motion.

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