Thermalization and typicality in integrable systems

Abstract: "Integrable systems, despite their extensive number of conservation laws, often display thermodynamic behavior at the level of macroscopic observables. Numerical and analytical studies of integrable models such as the harmonic chain, the Toda chain, and a class of disordered quadratic systems, show that thermalization of global observables typically occurs in the large-system limit, even when starting from far-from-equilibrium states. A key insight from this analysis is that thermalization depends on the observable considered. These results highlight the relevance of Khinchin's weak ergodicity property, suggesting that the validity of statistical mechanics in high-dimensional systems stems from the collective nature of observables rather than from dynamical chaos. "

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