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Generalized Thermalization in Integrable Systems[1]

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Once only of theoretical interest, integrable models of one-dimensional quantum many-body systems can now be realized with ultracold gases. The possibility of controlling the effective dimensionality and the degree of isolation in the experiments have allowed access to the quasi-1D regime and to the long coherence times necessary to realize integrable models. In general, in integrable quantum systems that are far from equilibrium, observables cannot relax to the usual thermal expectation values. This is because of the constraints imposed by the non-trivial set of conserved quantities that make these systems integrable. Experimentally, relaxation of an observable to a non-thermal expectation value was recently observed in a cold-atom system close to integrability. At integrability, it is natural to describe the observables after relaxation by an updated statistical mechanical ensemble: the generalized Gibbs ensemble (GGE), which is constructed by maximizing the entropy subject to the integrability constraints. In recent studies, the GGE has been found to accurately describe various observables in the steady state of integrable systems, but a microscopic understanding of its origin and applicability remains elusive. In this talk, we review some of the early results on this topic and discuss the justification of the GGE based on a generalized view of the eigenstate thermalization hypothesis, which was originally introduced to explain thermalization in nonintegrable systems.

References:

[1] M. Rigol, V. Dunjko, V. Yurovsky, and M. Olshanii, Phys. Rev. Lett. **98**, 050405 (2007).
[2] M. Rigol, A. Muramatsu, and M. Olshanii, Phys. Rev. A **74**, 053616 (2006).
[3] A. C. Cassidy, C. W. Clark, and M. Rigol, arXiv:1008.4794.

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