University of Crete
Department of Physics

Physics Colloquium

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Generalized thermalization in integrable lattice systems

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ABSTRACT

Integrable quantum many-body systems, paradigms of exact solvability and mathematical beauty, are now routinely realized in ultracold gases experiments. Control of the effective dimensionality and the degree of isolation in those experiments have given access to the quasi-1D regime and long coherence times necessary to observe (near) integrability and study its effects in the quantum dynamics far from equilibrium [1]. During the latter, the constraints imposed by the non-trivial set of conserved quantities that make a system integrable generally preclude observables from equilibrating to thermal values [2]. In integrable systems, it is natural to describe observables after equilibration by means of an updated (generalized) statistical mechanical: the generalized Gibbs ensemble (GGE), constructed by maximizing the entropy subject to the constraints imposed by integrability [2,3]. We review experimental and theoretical results on this topic, and discuss a justification of the GGE based on the generalization of the eigenstate thermalization hypothesis [3].

References:

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[2] M. Rigol, V. Dunjko, V. Yurovsky, and M. Olshanii. Relaxation in a Completely Integrable Many-Body Quantum System: An Ab Initio Study of the Dynamics of the Highly Excited States of 1D Lattice Hard-Core Bosons. Phys. Rev. Lett. 98, 050405 (2007).

[3] L. Vidmar and M. Rigol. Generalized Gibbs ensemble in integrable lattice models. J. Stat. Mech. 064007 (2016).

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