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Eigenstate Thermalization Hypothesis and Quantum Thermodynamics[1]

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One of the open questions in quantum thermodynamics reads: how can linear quantum dynamics provide chaos necessary for thermalization of an isolated quantum system? To this end, we perform an ab initio numerical analysis of a system of hard-core bosons on a lattice and show [Marcos Rigol, Vanja Dunjko & Maxim Olshanii, Nature 452, 854 (2008)] that the above controversy can be resolved via the Eigenstate Thermalization Hypothesis suggested independently by Deutsch [J. M. Deutsch, Phys. Rev. A 43, 2046 (1991)] and Srednicki [M. Srednicki, Phys. Rev. E 50, 888 (1994)]. According to this hypothesis, in quantum systems thermalization happens in each individual eigenstate of the system separately, but it is hidden initially by coherences between them. In course of the time evolution the thermal properties become revealed through (linear) decoherence that needs not to be chaotic.

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