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Initial-state dependence of the quench dynamics in integrable quantum systems[1] MATTIAS FITZPATRICK, Middlebury College, MARCOS RIGOL, Georgetown University — We identify and study classes of initial states in integrable quantum systems that, after the relaxation dynamics following a sudden quench, lead to near-thermal expectation values of few-body observables. In the systems considered here, those states are found to be insulating ground states of lattice hard-core boson Hamiltonians. We show that, as a suitable parameter in the initial Hamiltonian is changed, those states become closer to Fock states (products of single site states) as the outcome of the relaxation dynamics becomes closer to the thermal prediction. At the same time, the energy density approaches a Gaussian. Furthermore, the entropy associated with the generalized canonical and generalized grand-canonical ensembles, introduced to describe observables in integrable systems after relaxation, approaches that of the conventional canonical and grand-canonical ensembles. We argue that those classes of initial states are special because a control parameter allows one to tune the distribution of conserved quantities to approach the one in thermal equilibrium. This helps in understanding the approach of all the quantities studied to their thermal expectation values.

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