The inevitable power-law decay of quantum systems at long times: a dynamical criterion for predicting thermalization[1] MARCO TAVORA, Yeshiva University, JONATHAN TORRES-HERRERA, Universidad Autonoma de Puebla, Mexico, LEA SANTOS, Yeshiva University — Any quantum system with a bounded spectrum shows a power-law decay of the survival probability at long times. Such time scales are accessible to experiments with cold atoms. We show that the value of the power-law exponent contains information about the spectrum, the initial state structure, and the number of particles that interact simultaneously. From this value, we infer the degree of delocalization of the initial state in the energy eigenbasis and therefore determine whether it can thermalize or not. Our analysis is developed for integrable and chaotic, interacting and non-interacting, clean and disordered isolated lattice many-body quantum systems. The initial states considered can be prepared in current experiments with cold atoms and ion traps.

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