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Random matrix study of the time scale of thermalization after a quantum quench TATSUHIKO IKEDA, The University of Tokyo and Boston University, YU WATANABE, Yukawa Institute for Theoretical Physics, Kyoto University — Thermalization in isolated quantum systems has been theoretically predicted and actually observed in experiments by using, for example, the cold atoms. However, the time scale, which the theories of thermalization require as a sufficient condition, is exponentially large in the number of particles and thus too large compared with that observed in experiments. We study thermalization after a quantum quench which is described by random matrices, in particular the sparse Gaussian Unitary Ensemble, and show that the time scale is given by $\tau_{\mathrm{eq}} = \hbar/[2\sigma(H)]$, where $\sigma(H)$ is the energy fluctuation of the initial state. Since the energy fluctuation grows only polynomially in the number of particles, this time scale can be regarded as more realistic one than the sufficient condition mentioned above. We also conduct numerical simulations of quantum quenches in the hard-core Bose-Hubbard model to validate the result in physically realistic situations.

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