LEA SANTOS, Yeshiva University

Nonequilibrium many-body quantum dynamics: from full random matrices to real systems

We study numerically and analytically the quench dynamics of isolated many-body quantum systems. Using full random matrices from the Gaussian orthogonal ensemble, we obtain analytical expressions for the evolution of the survival probability, density imbalance, and out-of-time-ordered correlator. They are compared with numerical results for many-body quantum systems with two-body interactions and shown to bound the decay rate of these realistic systems. Power-law decays are seen at intermediate times, and dips below the infinite time averages (correlation holes) occur at long times for all three quantities when the systems exhibit level repulsion. For the real systems, we also study the number of states participating in the evolution after a quench. It increases exponentially in time, provided the eigenstates are delocalized in the energy shell. The rate of the exponential growth is defined by the width Γ of the local density of states (LDOS) and is associated with the Kolmogorov-Sinai entropy for systems with a well defined classical limit.