Onset of quantum chaos in one-dimensional many-body systems and its relation to thermalization

L. Santos
Yeshiva University

By means of exact diagonalization, we study level statistics, the structure of the eigenvectors, and few-body observables of one-dimensional bosonic and fermionic systems across the transition from integrability to quantum chaos. These systems are integrable in the presence of only nearest-neighbor terms, whereas the addition of next-nearest interaction may lead to the onset of chaos. We show that the eigenstate thermalization hypothesis, which is accompanied by the thermalization of the system, is valid whenever quantum chaos develops and even if the system is in the gapped phase. We discuss the dependence of signatures of nonintegrability on system size and particle statistics, and the use of delocalization measures as main indicators for the crossover from integrability to chaos.