

Expansion dynamics in the one-dimensional Fermi-Hubbard model

Expansion dynamics of interacting fermions in a lattice are simulated within the one-dimensional (1D) Hubbard model, using the essentially exact time-evolving block decimation (TEBD) method. In particular, the expansion of an initial band-insulator state is considered. We analyze the simulation results based on the dynamics of a two-site two-particle system, the so-called Hubbard dimer. Our findings describe essential features of a recent experiment on the expansion of a Fermi gas in a two-dimensional lattice. We show that the Hubbard-dimer dynamics, combined with a two-fluid model for the paired and non-paired components of the gas, gives an efficient description of the full dynamics. This should be useful for describing dynamical phenomena of strongly interacting Fermions in a lattice in general.