Abstract Submitted
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Dynamics and evaporation of defects in Mott-insulating clusters of boson pairs[1] DOMINIK MUTH, FB Physik und Forschungszentrum OPTIMAS, TU Kaiserslautern, Germany, DAVID PETROSYAN, Institute of Electronic Structure and Laser, FORTH, Heraklion, Crete, Greece, MICHAEL FLEISCHHAUER, FB Physik und Forschungszentrum OPTIMAS, TU Kaiserslautern, Germany — Repulsively bound pairs of particles in a lattice governed by the Bose-Hubbard model can form stable clusters corresponding to finite-size Mott insulators. Here we study the dynamics of hole defects in such clusters corresponding to unpaired particles which can resonantly tunnel out of the cluster into the lattice vacuum. Because of bosonic statistics, the unpaired particles have different effective mass inside and outside the cluster, and "evaporation" from the cluster boundaries is allowed only when their quasi-momenta are within a certain range of transparency. We show that quasi-thermalization of hole defects occurs in the presence of catalyzing defects of triple occupied sites which thereby purify the Mott insulating clusters. We study the dynamics of 1D systems, verifying the analytical reasoning by numerically exact t-DMRG simulations. We derive an effective strong-interaction model that enables simulations of the system dynamics for longer times and allows checking with a higher number of defects. We also discuss a more general case of two bosonic species which for equal tunneling rates reduces to the special case of the fermionic Hubbard model in the strong interaction limit, where dynamical purification has been discussed before [2].

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