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Relaxation Dynamics Of Bose-Fermi Doublons In Optical Lattices[1] ARGHAVAN SAFAVI-NAINI, MARTIN GÄRTTNER, JOHANNES SCHACHENMAYER, MICHAEL L. WALL, JACOB P. COVEY, STEVEN A. MOSES, MATTHEW T. MIECNIKOWSKI, ZHENGKUN FU, ANA MARIA REY, DEBORAH S. JIN, JUN YE, JILA, NIST, Univ of Colorado - Boulder — Motivated by a recent experiment at JILA [1] we investigate the out-of-equilibrium dynamics of a dilute Fermi-Bose mixture, starting from a well-defined initial state, where each lattice site is either empty or occupied by a Bose-Fermi doublon. Utilizing analytical techniques and numerical simulations using the t-DRMG method, we identify the leading relaxation mechanisms of the doublons. At short times strong interactions tend to hold the doublons together, as previously reported in similar type of experiments made with identical bosons or two component fermions. Since the fermions feel a much shallower lattice than the bosons, the bosons can be visualized as random localization centers for the fermions. However, at longer times the boson tunneling cannot be ignored and additional decay channels unique to Bose-Fermi mixtures become relevant. While cluster expansion allows us to characterize the short time dynamics for dilute arrays, the long time relaxation dynamics at higher densities is strongly correlated. In this regime exact numerical techniques are employed.
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