Abstract Submitted
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Regions of tunneling dynamics for few bosons in an optical lattice subjected to a quench of the imposed harmonic trap[1] SIMEON MISTAKIDIS, GEORGIOS KOUTENTAKIS, PETER SCHMELCHER, Univ Hamburg, THEORY GROUP OF FUNDAMENTAL PROCESSES IN QUANTUM PHYSICS TEAM — Recent experimental advances have introduced an interplay in the trapping length scales of the lattice and the harmonic confinement. This fact motivates the investigation to prepare atomic gases at certain quantum states by utilizing a composite atomic trap consisting of a lattice potential that is embedded inside an overlying harmonic trap. In the present work, we examine how frequency modulations of the overlying harmonic trap stimulate the dynamics of an 1D few-boson gas. The gas is initially prepared at a highly confined state, and the subsequent dynamics induced by a quench of the harmonic trap frequency to a lower value is examined. It is shown that a non-interacting gas always diffuses to the outer sites. In contrast the response of the interacting system is more involved and is dominated by a resonance, which is induced by the bifurcation of the low-lying eigenstates. Our study reveals that the position of the resonance depends both on the atom number and the interaction coupling, manifesting its many body nature. The corresponding mean field treatment as well as the single-band approximation have been found to be inadequate for the description of the tunneling dynamics in the interacting case.

[1]Deutsche Forschungsgemeinschaft, SFB 925 "Light induced dynamics and control of correlated quantum systems".

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