Abstract Submitted
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Positive and negative quenches induced excitation dynamics for ultracold bosons in one-dimensional lattices[1] SIMEON MISTAKIDIS, LUSHUAI CAO, PETER SCHMELCHER, Zentrum für Optische Quantentechnologien, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — The correlated non-equilibrium dynamics of few-boson systems in one-dimensional finite lattices is investigated. Focusing on the low-lying modes of the finite lattice we observe the emergence of density-wave tunneling, breathing and cradle-like processes. In particular, the tunneling induced by the quench leads to a global density-wave oscillation. The resulting breathing and cradle modes are inherent to the local intrawell dynamics and related to excited-band states. Positive interaction quenches couple the density-wave and the cradle modes allowing for resonance phenomena [1]. Moreover, the cradle mode is associated with the initial delocalization and following a negative interaction quench can be excited for setups with filling larger than unity. For subunit fillings it can be accessed with the aid of a negative quench of the lattice depth [2]. Finally, our results shed light to possible controlling schemes for the cradle and the breathing modes. The evolution of the system is obtained numerically using the ab-initio multi-layer multi-configuration time-dependent Hartree method for bosons.

[1] S. I. Mistakidis, L. Cao, and P. Schmelcher, J. Phys. B: At. Mol. Opt. Phys. 47 225303 (2014).
[2] S. I. Mistakidis, L. Cao, and P. Schmelcher, arXiv preprint arXiv:1412.1375 (2014).

[1](1)Hamburgisches Gesetz zur Förderung des wissenschaftlichen und künstlerischen Nachwuchses (HmbNFG), (2,3) Deutsche Forschungsgemeinschaft (DFG)

Simeon Mistakidis
Univ Hamburg

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