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Dynamics of a trapped 1D Bose gas for finite interaction strength

DOMINIK MUTH, ALEXANDER MERING, MICHAEL FLEISCHHAUER, Fachbereich Physik, Technische Universität Kaiserslautern — We investigate the dynamics of a 1D Bose gas in a harmonic trap with point like interactions, recently studied experimentally in [1]. Starting from a discretisation of this model we calculate the groundstate properties and time evolution in the resulting Bose-Hubbard model using the time-evolving block decimation algorithm, TEBD. Both the case of vanishing interaction strength corresponding to the trivial case of free bosons, and the quasi integrable hard core case are well understood [2]. Furthermore recently exact solutions have been found in the absence of a trap potential and few particles [3]. We are focusing on the dynamics in the region with finite repulsive interaction and in a trap. For all cases, using TEBD, we are able to calculate the propagation in both momentum and real space.

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- [2] M. Rigol, V. Dunjko, V. Yurovsky, M. Olshanii, Phys. Rev. Lett. 98, 050405 (2007)
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