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TITLE: Adiabatic quantum simulations with bosonic phase transitions

ABSTRACT:

Within the Bose Einstein condensate setup we study the phase transitions that employ optical lattices with a special potential configuration along the lattice sites, induced by laser radiation or by atomic chip technology. In this way, the transition from the superfluid BEC state to the Mott insulator state results to a special ground state configuration with different occupancy numbers per lattice site. This can be the result of an algorithmic problem or the simulation of a complex quantum system. We present physical conditions for the phase transition into a general insulator pattern as well as a study of the quantum speedup gained by this approach.