Quantum search algorithm with many bosons in optical lattices
DAVID FEDER, University of Calgary — One approach to implementing quantum
algorithms is the quantum walk (QW). In the continuous-time formulation, the
QW is equivalent to the time-evolution of a quantum state under the influence of
a discrete-space Hamiltonian. Building on a duality between many boson systems
and weighted graphs, I will discuss how one can implement a QW search algorithm
with ultracold bosons confined in optical lattices. By applying a specified external
potential (using an external laser), the atoms in a shallow lattice will evolve from the
uniformly populated ground state to all occupying one particular site. The results
indicate that quantum algorithms exhibiting polynomial speed-up should be feasible
with current experimental technology.

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