

Interacting bosons in an optical lattice: Bose-Einstein condensates and Mott insulator

A dense Bose gas with hard-core interaction is considered in an optical lattice. We study the phase diagram in terms of a special mean-field theory that describes a Bose-Einstein condensate and a Mott insulator with a single particle per lattice site for zero as well as for non-zero temperatures. We calculate the densities, the excitation spectrum and the static structure factor for each of these phases.