

Phase Diagram of One-Dimensional Bosons in an Array of Local Nonlinear Potentials at Zero Temperature

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(Received: 2000-8-4; Revised: 2001-2-27)

Abstract: The Gaussian wave functional method is applied to a boson system with an array of local nonlinear potentials $\cos[\beta\phi(nR)]$ to study the phase diagram of its ground state. The stable ground state is determined by the renormalized mass μ which is a function of the parameter $\gamma=\beta^2/4\phi$, the strength of potential α and the potential concentration c . In different cases $\gamma<\gamma_1$, $\gamma_1<\gamma<\gamma_2$ and $\gamma>\gamma_2$, μ can have different multiplicities, the phase diagram in parameter space is thus depicted. The value $\gamma=\gamma_1$ depends on the concentration c , for $c\rightarrow 0$, it coincides with that of the single impurity model; while $\gamma_2=2$ coincides with the conclusion of the continuous model.

PACS: 72.10.Fk, 75.15.Qm, 71.28.+d

Key words: one-dimensional electrons, doping, phase transition

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