Trial Wave Function Approach to Calculate the Ground State Energy of Nonlinear Schrodinger Equation in Many Bodies Physics

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Abstract

In this paper, we have studied some nonlinear Schrodinger equations appearing in many bodies systems such as a nanowire with a soft polar layer, a quantum well in the presence of the electron-electron interactions, Grass-Pitaevskii equation for Bose-Einstein condensate in the presence on the two and three body interactions. Calculation of the ground state energy of these systems by analytical methods is very difficult. Solution of these equations through numerical methods like self-consistent ones also needs complicated computer programming. In this paper, Ground state energy has been obtained by means of the Euler-Lagrange Variational method as well as simple and appropriate trial wave-functions. Comparison of the result obtained by the Varational technique and the available methods in the literature shows the high accuracy of this method.

Keywords: Euler-Lagrange Variational method, One dimensional nonlinear Schrodinger equations, Nano-wire with a soft polar molecular layer, Quantum well in the presence of the electron-electron interactions, Bose-Einstein condensate

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