Computing Ground State Solution of Bose-Einstein Condensates Trapped in One-Dimensional Harmonic Potential

 YUAN Qing-Xin[1] and DING Guo-Hui[2]

[1] Department of Mathematics and Physics, Zhengzhou Institute of Aeronautical Industry Management, Zhengzhou 450015, China
[2] Department of Physics, Shanghai Jiao Tong University, Shanghai 200030, China
(Received: 2005-12-20; Revised: 2006-3-1)

Abstract: For Bose-Einstein condensates trapped in a harmonic potential well, we present numerical results from solving the time-dependent nonlinear Schrödinger equation based on the Crank-Nicolson method. With this method we are able to find the ground state wave function and energy by evolving the trial initial wave function in real and imaginary time spaces, respectively. In real time space, the results are in agreement with [Phys. Rev. A 51 (1995) 4704], but the trial wave function is restricted in a very small range. On the contrary, in imaginary time space, the trial wave function can be chosen widely, moreover, the results are stable.

[Full text: PDF]

Close