

The Variational-Iteration Method to Solve the Nonlinear Boltzmann Equation

Essam M. Abulwafa, Mohammed A. Abdou, and Aber H. Mahmoud

Physics Department, Faculty of Science, Mansoura University, Mansoura 35516, Egypt

Reprint requests to E. M. A.; E-mail: abulwafa@mans.edu.eg

Z. Naturforsch. **63a**, 131 – 139 (2008); received September 18, 2007

The time-dependent nonlinear Boltzmann equation, which describes the time evolution of a single-particle distribution in a dilute gas of particles interacting only through binary collisions, is considered for spatially homogeneous and inhomogeneous media without external force and energy source. The nonlinear Boltzmann equation is converted to a nonlinear partial differential equation for the generating function of the moments of the distribution function. The variational-iteration method derived by He is used to solve the nonlinear differential equation of the generating function. The moments for both homogeneous and inhomogeneous media are calculated and represented graphically as functions of space and time. The distribution function is calculated from its moments using the cosine Fourier transformation. The distribution functions for the homogeneous and inhomogeneous media are represented graphically as functions of position and time.

Key words: Time-Dependent Nonlinear Boltzmann Equation; Homogeneous and Inhomogeneous Media; Moments of Distribution Function; Variational-Iteration Method.