Iranian Journal of Physics Research, Vol. 10, No. 1, 2010

Ion separation in a Paul trap in the presence of damping force

I Ziaeian and H Noshad

Physics Department, Nuclear Science Research School, Nuclear Science and Technology Research Institute, P.O. Box 14399-51113, Tehran, Iran
E-mail: iziaeian@aeoi.org.ir

(Received 8 February 2008 ; in final form 22 February 2010)

Abstract
Dynamical behavior of particles in a Paul trap has been investigated by solving the set of differential equations considering the effect of damping force. Positions of the trapped ions as a function of time, ion trajectories and the phase space curves in the first stability region have been obtained in the presence of the damping force. The region of stability for r and z components as well as the first stability region with and without the damping force have been computed using the fourth-order Runge-Kutta method. Furthermore, for a Paul trap with specified dimensions and a typical RF frequency, the first stability region for $^3H^+$ and $^1H^+$ ions has been determined in the $V_{dc} - V_{ac}$ plane. It is worthwhile to note that computation of the stability region in the presence of damping force through the use of this method has been reported for the first time.

Keywords: Paul trap, damping force, fourth-order Runge-Kutta method, Mathieu equation, stability region

For the full article refer to the Persian section

Downloaded from ijpr.iut.ac.ir at 3:20 IRDT on Friday March 22nd 2019