

## **Investigating influence of ions temperature on plasma expansion into vacuum using kinetic theory**

**Reza Shokoohi\*, Ebrahim Mohammadi Razi**

Department of Physics, Faculty of Science, University of Bojnord, Bojnord, Iran

Received: 30.03.2017    Final revised: 08.04.2018    Accepted: 07.05.2018

### **Abstract**

In this paper, the effects of initial temperature of ions on the expansion of a one-dimensional collisional plasma into vacuum are studied using kinetic theory. The particle dynamics is determined by the Vlasov equation for the electrons and ions based on a simulation code. In this simulation code, the Vlasov equation is solved by the characteristics method. The initial temperature effect of the ions with comparison of different temperature ratio ions per electrons ( $T_i/T_e$ ), is investigated in the simulation. The results show that, the increase in the temperature of the ions leads to the higher velocity of the ions which cause the proximity of ions to electrons and then the faster decrease of the electric field. In addition, due to the initial temperature of the ions, the rate of expansion of plasma increases.

**Keywords:** Plasma expansion, Kinetic theory, Vlasov equation

---

\* Corresponding Author: shokoohi@ub.ac.ir