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Relativistic simulation of the Vlasov equation for plasma expansion into vacuum

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Abstract

In this study, relativistic Vlasov simulation of plasma for expansion of collisionless plasma for into vacuum is presented. The model is based on 1+1 dimensional phase space and electrostatic approximation. For this purpose, the electron dynamics is studied by the relativistic Vlasov equation. Regardless of the ions temperature, fluid equations are used for their dynamics. The initial electrons distribution function is the relativistic Maxwellian. The results show that due to the electrons relativistic temperature, the process of the plasma expansion takes place faster, the resulting electric field is stronger and the ions are accelerated to higher velocities, in comparison to the non-relativistic case.

Keywords: Vlasov equation, relativistic effects, plasma expansion, simulation

For full article, refer to the Persian section