Ion acceleration in a non-equilibrium plasma flow expanding from a magnetic mirror

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The formation of the ambipolar potential profile in a plasma flow expanding from a mirror magnetic trap is a challenging problem in plasma physics [1–6]. Here we focus on a particular case of non-equilibrium plasma with hot electrons expanding from a gas dynamic trap that is important for a number of applications [7–10]. The main feature of such a plasma is that the electron velocity distribution is isotropic inside the trap and near the magnetic throat but acquire strong anisotropy with the density decrease in the expansion region. We consider a transition from quasi-gasdynamic to fully kinetic regime inside the expander. The analysis of ion acceleration by a self-consistent ambipolar potential profile is performed for a wide range of the plasma parameters and magnetic fields.

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