



Return-current formation in the electron beam-plasma system

M. Karlicky and M. Barta

Astronomical Institute, Solar Department, 251 65 Ondrejov, Czech Republic (karlicky@asu.cas.cz)

Using a 3-D electromagnetic particle-in-cell model, the plasma systems with electron beams are studied. We consider a plasma system with spatially homogenous beam and a neutralizing return current. The models with low initial magnetic field revealed an importance of the Weibel instability that very efficiently transferred the beam energy to the heating of plasma electrons in the direction perpendicular to that of the beam propagation. In this case, the return current evolved from the initially shifted Maxwell distribution to the distribution with a broad flat maximum. On the other hand, in the models with a sufficiently strong magnetic field in the beam propagation direction the Weibel instability is reduced, and the electron distribution function mainly evolved in the beam-propagation direction (as in 1-D case) and the return current was given by a shift of some bulk electrons and an extended tail.