Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Merging and directional drift of electron spots during the nonlinear evolution of the current filamentation instability.[1] XIAO-JUAN WANG, ZHANGHU HU, YOUNIAN WANG, Dalian University of Technology, PLASMA SIMULATION AND EXPERIMENT GROUP TEAM — The transport and energy deposition of relativistic electron beams in the radially non-uniform plasmas are investigated with two-dimensional electromagnetic particle-in-cell simulations. For the beam with the radius much larger than plasma skin depth, the current filamentation instability excited by the relativistic electron beam can be clearly observed, which breaks the electron beam into a large number of filaments and leads to the formation of strong magnetic field consequently. As the beam-plasma system evolves self-consistently, asymmetric transverse magnetic field, which is associated with plasma density gradient, contributes to the directional drift of electron focal spots and thus can enhance the merge effectively. The effects of different plasma distributions on transport and energy deposition of the eletron beam are compared. Furthermore, an axial electric field is generated in the middle of two filaments and causes the corresponding energy step change when they merge under the action of the magnetic field. The energetic plasma jet, vertical to the merging direction, is shown to result from the defocusing effect of the magnetic field.

[1]This work was supported by the National Natural Science Foundation of China (Project Nos. 11775042 and U1532263)

Xiao-Juan Wang
Dalian University of Technology

Date submitted: 11 Jul 2019 Electronic form version 1.4