

TOWARDS KINETIC MODELING OF ION TRANSPORT IN AN ECRIS PLASMA

P. J. Mullaney, Y. Choi, D. W. Fillmore, P. Messmer, D. S. Smithe, Tech-X, Boulder, Colorado

Abstract

Next generation heavy ion beam accelerators require intense, high charge state ion currents of exotic materials. ECRIS devices can generate these currents however detailed kinetic simulations are needed to optimize the loading of these materials into the plasma. Full Particle-In-Cell simulations of the plasma are highly challenging due to the large discrepancy between length and time scales. However separation of time-scales provides a means of making progress. Electrostatic simulations on ion timescales, though demanding, are capable of modeling the kinetic behavior of the ions. Similarly, electromagnetic simulations on electron time scales can provide the non-thermal kinetic properties of the electron population. In this work, we treat the electrons as a simplified fluid for the longer time-scale evolution of the ions. We characterize and diagnose the electron distribution for use in the ion simulations. Ionization and recombination processes are then modeled in a hybrid fluid-electron / kinetic-ion formulation using the prescribed electron distribution as one of the interaction partners. Progress in the electrostatic modeling of the ion dynamics is also presented.

**PAPER NOT
RECEIVED**