PPPS 2019



Contribution ID: 574

Type: Poster

4P21 - Propagation of an intense relativistic electron beam through plasma.

Thursday 27 June 2019 16:00 (1h 30m)

In the framework of X-Ray Flash Radiography, we investigate the propagation of an intense (2 kA), pulsed (60 ns) relativistic (4 MeV) electron beam (REB) through a cold plasma. The REB electrons interact with the plasma through binary collisions and collective response, whose importance depends on the ratio of plasma over beam density. Under some conditions, the collective response induces partial or total charge and/or current neutralization of the beam, breaking the near-perfect cancellation of self-forces and leading to a noticeable modification of its propagation. We present a simple model of this phenomenon based on an axisymmetric envelope equation. According to this calculation, a significant gain in the focusing of the REB can be achieved in a broad range of plasma density $(10^{10} \text{ to } 10^{13} \text{ cm}^{-3})$, but special care should be taken regarding the plasma current diffusion and the ionization of the residual gas. We will also present some detailed Particle In Cell simulations as well as a dedicated experiment designed to validate our understanding of the physical situation.

Author: FOURMENT, claude (CEA-CESTA, Le Barp, F-33116 France)

Co-authors: LAHENS, Thomas (CEA-CESTA, Le Barp, F-33116 France); MAISONNY, Rémi (CEA, DAM, GRA-MAT, F-46500 Gramat, France); DORCHIES, Fabien (Universite de Bordeaux-CNRS-CEA, CELIA, Talence F-33405 France)

Presenter: FOURMENT, claude (CEA-CESTA, Le Barp, F-33116 France)

Session Classification: Poster - Charged Particle Beams and Accelerators and High Energy Density Plasmas and Applications

Track Classification: 3.2 Intense Electron and Ion Beams