

Abstract Submitted
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Non-linear Ion-Wake Excitation by Plasma Electron Wakefields of an Electron or Positron Beam for Positron Acceleration¹ THOMAS KATSOULEAS, AAKASH SAHAI, Duke Univ — The excitation of a non-linear ion-wake by a train of non-linear electron wake of an electron and a positron beam is modeled and its use for positron acceleration is explored. The ion-wake is shown to be a driven non-linear ion-acoustic wave in the form of a cylindrical ion-soliton similar to the solution of the cKdV equation. The phases of the oscillating radial electric fields of the slowly-propagating electron wake are asymmetric in time and excite time-averaged inertial ion motion radially. The radial field of the electron compression region sucks-in the ions and the field of space-charge region of the wake expels them, driving a cylindrical ion-soliton structure with on-axis and bubble-edge density-spikes. Once formed, the channel-edge density-spike is driven radially outwards by the thermal pressure of the thermalized wake energy. Its channel-like structure due to the flat-residue left behind by the propagating ion-soliton, is independent of the energy-source driving the non-linear electron wake. We explore the use of the partially-filled channel formed by the cylindrical ion-soliton for a novel regime of positron acceleration. PIC simulations are used to study the ion-wake soliton structure, its driven propagation and its use for positron acceleration (arXiv:1504.03735).

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