

Abstract Submitted
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Emittance Preservation of Positron Beams Traveling in Hollow Plasma Channels¹ XIAOYING LI, PATRIC MUGGLI, University of Southern California, SAMUEL MARTINS, WARREN MORI, University of California, Los Angeles, WAYNE D. MORI, STI Optonics — Emittance preservation of the incoming beam is essential for all accelerators. In the blowout regime of plasma wakefield accelerator (PWFA), the electron bunch propagates in a uniform ion column and its emittance is preserved along the plasma. For a positron bunch propagating in a uniform plasma, the beam suffers emittance growth [P. Muggli et al., Phys. Rev. Lett. 2008]. However, it has been shown that when a positron bunch propagates in a hollow plasma, the axial accelerating field can be enhanced when compared to the uniform plasma case [S. Lee, PRE, 64, 045501(R), 2001]. We explore through numerical simulations the possibility of preserving emittance of positron beams by using a hollow plasma channel instead of a uniform plasma. We consider in particular the case of a drive/witness bunch train, necessary to accelerate the witness bunch with a high gradient and a narrow final energy spread. We explore a range of beam and channel parameters to maximize the acceleration and minimize the final energy spread and emittance of the witness bunch. Detailed simulation results will be presented.

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Xiaoying Li
University of Southern California

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