

Abstract Submitted
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Plasma Wakefield Accelerator Driven by a Train of Electron Bunches¹ PATRIC MUGGLI, BRIAN ALLEN, University of Southern California, VITALY YAKIMENKO, JANGHO PARK, KARL KUSCHE, MARCUS BABZIEN, Brookhaven National Laboratory — We study experimentally the physics of the interaction between a train of electron bunches and a plasma whose density can be varied. The train of electron bunches consists of equidistant (~ 300 microns) drive bunches followed by a witness bunch (~ 450 microns from the last drive bunch). Each bunch length is about half the drive bunch spacing (~ 150 microns). The bunch train is produced using a masking technique recently demonstrated (P. Muggli et al., Phys. Rev. Lett. 101, 054801, 2008). The plasma density is varied by changing the arrival time of the bunch train with respect to the capillary discharge. At low density ($< 1 \times 10^{16}/\text{cc}$) the wakefields are driven by the envelope of the bunch train. At resonance, when the plasma density is such that the plasma wavelength is equal to the drive bunches spacing, large energy loss and energy gain is observed. The resonance also disappears at higher densities, or when the bunch train is replaced by a continuous electron bunch with a length equal to that of the train. Detailed experimental results will be presented.

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