

Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Plasma and Beam Measurements for Multi-bunch PWFA Experiments¹

P. MUGGLI, B. ALLEN, University of Southern California, V. YAKIMENKO, J. PARK, K. KUSCHE, M. BABZIEN, Brookhaven National Laboratory — We study for the first time the excitation of plasma wakefields by a train of electron bunches. The wakefields amplitude strongly depends on the plasma density and the spacing between the electron bunches. In particular, resonant excitation is expected when the plasma density is such that the plasma wavelength is equal to the drive bunch train spacing. The bunch spacing and plasma density therefore need to be accurately measured. We describe the time resolved measurement of the capillary discharge plasma density using Stark broadening of the hydrogen H_α line. The plasma density is adjusted by varying the delay between the bunch train arrival time and the plasma discharge time. We also describe the method used to produce the electron bunch train, as well as the measurement of the train spacing using coherent transition radiation interferometry. The bunch train consists of a variable number of equidistant drive bunches followed by a witness bunch. The spacing between the drive bunches is $\approx 300\mu\text{m}$, and the spacing between the last drive bunch and the witness bunches is $\approx 450\mu\text{m}$. These spacings can be varied through the beam parameters. Detailed experimental results will be presented.

¹Work supported by the US Department of Energy

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Date submitted: 17 Jul 2009

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