

Abstract Submitted
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Plasma Source with Density Step for Proton Bunch Self-Modulation JAN PUCEK, FABIAN BATSCH, Max Planck Inst for Phys, DANIEL EASTON, JUSTIN PISANI, JIM UNCLES, Wright design limited, ROBERTO SPERONI, ENRIQUE BLANCO VINUELA, CERN, PATRIC MUGGLI, Max Planck Inst for Phys — Numerical simulation results¹ suggest that placing a positive plasma density step along the self-modulation process of a long proton bunch leads to wakefields that remain at near saturation values over long plasma distances, instead of rapidly decaying after saturation. We describe the development of a plasma source based on a laser-ionized rubidium vapor² that allows for imposing a density step in the 0 to 10% range at different locations, every 50 cm over the first 4 m. This source will be used to optimize the effect of the step on wakefields' amplitude at the end of the 10 m-long plasma. The source thus includes ports for a THz plasma density diagnostic³ to directly image the plasma electron density perturbation that sustains wakefields. The source design and parameters for the AWAKE experiment⁴

¹A. Caldwell and K.V. Lotov, Phys. Plasmas 18, 103101 (2011)

²E. Oz, P. Muggli, NIMA 740(11), 197 (2014)

³A. Gopal, private communication

⁴P. Muggli (AWAKE Collaboration), accepted for publication in J. of Phys.: Conference Series (JPCS) arXiv:1911.07534 [physics.acc-ph]

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