

Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Study of Transverse and Longitudinal Wakefields Driven by a Long Proton Bunch PATRIC MUGGLI, Max Planck Institute for Physics, MARLENE TURNER, Lawrence Berkeley National Laboratory, Berkeley, USA, AWAKE COLLABORATION — Self-modulation of a long, relativistic, charged particle bunch in a dense plasma is an interesting beam/plasma interaction mode and a means to drive large amplitude wakefields (>1 GV/m) for particle acceleration.¹ By measuring the effect of transverse wakefields on the drive proton bunch, we learn about the development of transverse wakefields over the first 4 m of plasma. By measuring energy gain by externally injected electrons, we learn about longitudinal wakefields over the last 5 m of plasma. Combining these results for various experimental parameters, we conclude that experimental results are consistent with simulation ones that show the SM process saturates before the end of the 10 m plasma.² This is a key piece of information for future AWAKE experiments³ that will use a first, 10 m-long plasma as self-modulator. Acceleration will occur in a second plasma. We present detailed experimental and simulation results.

¹N. Kumar et al., Phys. Rev. Lett. 104, 255003 (2010)

²M. Turner, P. Muggli et al., (AWAKE Collaboration) submitted to PR-AB (2020)

³P. Muggli et al., (AWAKE Collaboration) Plasma Phys. and Contr. Fus., 60(1) 014046 (2017)

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Date submitted: 29 Jun 2020

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