

Abstract Submitted
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Electron Bunch Injection in Plasma Wakefields Driven by a Fully Self-Modulated Proton Bunch LIVIO VERRA, EDDA GSCHWENDTNER, GIOVANNI ZEVI DELLA PORTA, CERN, PATRIC MUGGLI, Max Planck Inst for Phys, AWAKE COLLABORATION — The AWAKE experiment [1] relies on the self-modulation of a long proton bunch in plasma [2] to effectively drive wakefields and accelerate an externally injected electron bunch to GeV-level energies [3]. In future experiments we will use a first 18 MeV, short electron bunch placed ahead of the proton bunch to seed self-modulation of the entire bunch in a first plasma section. To accelerate a second, 150 MeV bunch with narrow energy spread and preserved incoming emittance, we will exploit full blow-out of plasma electrons, loading of wakefields and beam matching to the plasma ion column [4]. Parameters of both beams must be adjusted to produce suitable seed and accelerating wakefields. We will present the requirements for the two bunches to effectively seed the self-modulation process and to produce a high-quality, high-energy electron bunch. We will also discuss necessary preliminary experimental studies, diagnostics and experimental setup to achieve these goals.

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

[2]M. Turner et al. (AWAKE Collaboration), Phys. Rev. Lett. 122, 054801 (2019)

[3]AWAKE Collaboration, Nature 561, 363 (2018)

[4]V.B. Olsen et al., Phys. Rev. Accel. Beams 21, 011301 (2018)

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