Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Full-scale modeling of ionization seeding in the AWAKE experiment at CERN[1] ANTON HELM, JORGE VIEIRA, RICARDO FONSECA, LUIS SILVA, Instituto Superior Tecnico, Lisbon, Portugal, PATRIC MUGGLI, Max Planck Institute for Physics, Munich, Germany — Current modeling for laser-plasma accelerators is often performed with the help of particle-in-cell (PIC) codes. While accurate, these codes require to resolve the smallest spatial/temporal scales, usually corresponding to the laser wavelength/frequency. As a result, full PIC simulations are computationally expensive. Reduced models such as the ponderomotive guiding center solver (PGC) can overcome this limitation and provide significant speedup. This technique, for example, enables computational speedups of several orders of magnitude for the modeling of the seeded self-modulation instability (SSM), which is the core principle of the AWAKE experiment at CERN. Here, we present 3d simulations of the full 10m AWAKE experiment using the massively parallel, fully relativistic PIC code OSIRIS with a self-consistent ionization model for PGC to model the SSM. We compare with results obtained from simulations using half-cut proton bunches. We also discuss the growth of hosing instability arising from misalignment between the laser pulse and the proton beam.

[1]Work partially supported by Portuguese FCT (Fundao para a Cincia e a Tecnologia) through grant PD/BD/105882/2014 (PD-FAPPLAuSE) and PTDC/FIS-PLA/2940/2014.

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Date submitted: 29 Jun 2020 Electronic form version 1.4