

Abstract Submitted
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Recent progress in simulation and theory towards using nonlinear plasma wakefields to drive a compact X-FEL¹ XINLU XU, Univ of California - Los Angeles, WEI LU, Tsinghua University, Beijing, CHAN JOSHI, WARREN MORI, Univ of California - Los Angeles — Plasma-based wakefield accelerators can generate and accelerate electrons with 10 100 GV/m acceleration gradient. Compared with conventional radio frequency based accelerators, plasma accelerators can much shrink the size and reduce the cost of X-ray Free-electron-lasers which require high quality and high energy electrons. However there are many challenges needed to be overcome before plasma wakefields can generate electron beams with the required beam quality (brightnesses and low energy spreads) inside the plasma and before these beams can be transported from the plasma to the undulator without beam quality degradation. In this talk, we will present our recent progress from PIC simulations and theory on this topic, including concepts for producing beams with unprecedented normalized brightnesses using density down ramp injection in the nonlinear blowout regime, matching the beam out of the plasma using longitudinally tailored plasma profiles, and start-to-end simulations of such plasma wakefield accelerators driven X-FELs.

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