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Threshold for electron self-injection in a nonlinear laser-plasma accelerator[1] CARLO BENEDETTI, CARL SCHROEDER, ERIC ESAREY, WIM LEEMANS, Lawrence Berkeley National Laboratory — The process of electron self-injection in the nonlinear bubble-wake generated by a short and intense laser pulse propagating in an uniform underdense plasma is investigated. A detailed analysis of particle orbit in the wakefield is performed by using reduced analytical models and numerical simulations carried out with the 2D cylindrical, envelope, ponderomotive, hybrid PIC/fluid code INF&RNO. In particular, we consider a wake generated by a frozen (non-evolving) laser driver traveling with a prescribed velocity, which then sets the properties of the wake, so the injection dynamics is decoupled from driver evolution but a realistic structure for the wakefield is retained. We investigate the dependence of the injection threshold on laser intensity, plasma temperature and wake velocity for a range of parameters of interest for current and future laser plasma accelerators. The phase-space properties of the injected particle bunch will also be discussed.

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