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Simulation of Laser Wakefield Acceleration Experiments C.G.R. GEDDES, E.H. ESAREY, B.A. SHADWICK, C.B. SCHROEDER, W.P. LEEMANS, LBNL, E. MICHEL, LBNL/UNR, D. BRUHWILER, Tech-X, J. CARY, Tech-X/U. Colorado — We present particle in cell simulations of recent experiments[1] which demonstrate the tuning of laser driven wakefield accelerators to produce high energy electron bunches with low emittance and energy spread, and of upcoming experiments designed to scale these accelerators towards GeV energies. Numerical effects in the simulations as well as comparison to experiments and fluid simulations are discussed. Data and simulations show that the high quality bunch in recent experiments was formed when beam loading turned off injection after initial self trapping, creating a bunch of electrons isolated in phase space. A narrow energy spread beam was then obtained by extracting the bunch as it dephased from the wake. These simulations are being used to understand and optimize trapping stability and accelerator performance. Numerical resolution and dimensional effects are important for application of the simulations to experiments. Using the simulations of recent experiments as a reference, simulations of upcoming 1 GeV acceleration experiments are presented. [1] Geddes et al., Nature, Sept 30 2004, p 538. Work supported by the US DE-AC02-05CH11231, NSF, and AFOSR

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