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Accurate Modeling of Laser-Plasma Accelerators with Particle-In-Cell Codes[1] E. MICHEL, UNR, B. SHADWICK, C. SCHROEDER, C. GEDDES, E. ESAREY, W.P. LEEMANS, LBNL, H. RUHL, Bochum U., T. COWAN, UNR — Recent experiments have demonstrated the production of high quality electron bunches at 1 GeV by a laser plasma accelerator.[2] Here the bunch electrons are self-trapped and accelerated from the background plasma. The degree of self-trapping can be a strong function of plasma temperature. We investigate numerical heating and macro-particles push errors due to the grid in 2D PIC simulations. The effects of grid resolution, laser polarization and particle shape on the plasma momentum spread are studied. We find that particle smoothness improves the particle push description and reduces numerical heating. Reducing the phase-space errors associated with numerical heating is essential for a detailed modeling of self-trapping in laser-plasma accelerators. Simulations of high quality bunch production for self-trapping and for laser injection methods will be presented.

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[2]W.P. Leemans et al., submitted.

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