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Envelope Model Simulation of Laser Wakefield Acceleration with Realistic Laser Pulses from the Texas Petawatt KATHLEEN WEICHMAN, UT-Austin, Austin, TX, Tech-X Corp., Boulder, CO, ADAM HIGUERA, CU-Boulder, Boulder, CO, Tech-X Corp., Boulder, CO, DAN ABELL, BEN COWAN, Tech-X Corp., Boulder, CO, NEIL FAZEL, UT-Austin, Austin, TX, JOHN CARY, CU-Boulder, Boulder, CO, Tech-X Corp., Boulder, CO, MICHAEL DOWNER, UT-Austin, Austin, TX — In a laser wakefield accelerator (LWFA), diffraction of an overfocused laser pulse can provide localized electron injection, leading to the production of a monoenergetic electron bunch. While electron energies up to several GeV have been reported at the Texas Petawatt Laser facility, near-Gaussian beam simulations predict energies higher than have been observed. Experimentally measured laser profiles are non-Gaussian, indicating that closer agreement with experimental conditions is needed to predictively model this experiment. The implementation of the envelope model in the particle-in-cell code VORPAL lowers the computational cost of capturing injection dynamics during the early evolution of laser wakefields. We compare VORPAL envelope model simulations using laser pulses based on experimentally measured profiles versus a corresponding a two-Gaussian approximation.

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