Abstract Submitted
for the MAS21 Meeting of
The American Physical Society

Development and Implementation of a Numerical Laser Energy-Deposition Model for the PSC particle-in-cell code[1] ABDULLAH HYDER, Stevens Institute of Technology, WILL FOX, Princeton Plasma Physics Laboratory, DEREK SCHAEFFER, Princeton University, SOPHIA MALKO, Princeton Plasma Physics Laboratory — PSC, a particle-in-cell (PIC) code, is being used to directly simulate experiments involving high-energy-density (HED) plasma plumes. Such simulations are being used for fundamental plasma studies including collisionless magnetized shocks and magnetic reconnection. HED plasma plumes are formed in the laboratory by using high-intensity lasers which ablate solid-density targets. Previously in PSC, an ad hoc plasma heating operator was used to represent the heating of the plasma by the laser, which was manually fitted to match simulations with more well-developed laser absorption models (W. Fox, et al, Phys. Plasmas 2018). To expand the scope of experiments that the code can run, a numerically calculated ray-tracing laser energy-deposition model was developed for and implemented into PSC using existing theory on optical absorption by a plasma. The energy deposited per cell was benchmarked against DRACO, a radiation hydrodynamic model with a well-developed energy absorption model, for both shallow and highly oblique laser incidence angles. The numerical model for PSC was found to be in excellent agreement with DRACO and analytical solutions.

[1]This work was made possible by funding from the DOE for the Science Undergraduate Laboratory Internship (SULI) program.

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Date submitted: 07 Nov 2021 Electronic form version 1.4