Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Accuracy of the Time-Averaged Ponderomotive Approximation for Modeling Laser-Plasma Accelerators[1] DAVIDE TERZANI, CARLO BENEDETTI, CARL SHROEDER, ERIC ESAREY, Lawrence Berkeley National Laboratory — Reliable modeling of laser-plasma accelerators (LPAs), where a short and intense laser pulse propagates in an underdense plasma over long distances, is a computationally challenging task. This is due to the great disparity among the scales involved in the modeling, ranging from the micron scale of the laser wavelength to, for instance, the meter scale of the laser-plasma interaction length for a 10 GeV-class LPA. To reduce such imbalance the time-averaged ponderomotive approximation (TAPA) may be used. Here, plasma particle dynamics is analytically averaged over the laser frequency, and only spatio-temporal scales associated with the laser envelope are retained in the calculations, resulting in significant computational savings. In this talk, we characterize the accuracy and robustness of the TAPA for a range of laser parameters of interest for present and future LPAs, and we show that the error introduced by the averaging process is small in all relevant cases.

[1]Supported by the U.S. Department of Energy under Contract No. DE- AC02-05CH11231

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Date submitted: 27 Jun 2020 Electronic form version 1.4