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WarpX: efficient modeling of plasma-based accelerators with mesh refinement[1] LIGIA DIANA AMORIM, JEAN-LUC VAY, ANN ALMGREN, JOHN BELL, REVATHI JAMBUNATHAN, REMI LEHE, ANDREW MYERS, JAEHONG PARK, OLGA SHAPOVAL, MAXENCE THEVENET, WEIQUN ZHANG, Lawrence Berkeley National Laboratory, DAVID GROTE, Lawrence Livermore National Laboratory, MARK HOGAN, LIXIN GE, CHO-KUEN NG, SLAC National Accelerator Laboratory — Plasma-based accelerators are being developed to provide a more compact and economical alternative to standard accelerator technology. High accelerating gradients were demonstrated in centimeter long plasmas. Recent studies focus on mitigating multiple non-linear, fast processes and instabilities that deteriorate the quality of plasma-based accelerated beams. High-fidelity numerical codes that can model beam propagation in plasma fields are necessary to study those nonlinear processes. Simulations are typically computationally demanding because they resolve small structures over large distances. The Adaptive Mesh Refinement (AMR) technique, where selected regions are modeled with higher resolution, can make simulations more efficient. For the Exascale Computing Project, we have been developing the WarpX tool that incorporates AMR through the AMReX framework in the Particle-In-Cell (PIC) code Warp. We present recent studies of beam evolution in consecutive plasma stages, done with and without using mesh-refinement.

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