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Warp-X: a new exascale computing platform for Beam-Plasma Simulations

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Turning the current experimental plasma accelerator state-of-the-art from a promising technology into mainstream scientific tools depends critically on high-performance, high-fidelity modeling of complex processes that develop over a wide range of space and time scales. As part of the U.S. Department of Energy's Exascale Computing Project, a team from Lawrence Berkeley National Laboratory, in collaboration with teams from SLAC National Accelerator Laboratory and Lawrence Livermore National Laboratory, is developing a new powerful plasma accelerator simulation tool. The new software will harness the power of future exascale supercomputers for the exploration of outstanding questions in the physics of acceleration and transport of particle beams in chains of plasma channels. This will benefit the ultimate goal of compact and affordable high-energy physics colliders, and many spinoff applications of plasma accelerators along the way. We will present the various components of the codes such as the new Particle-In-Cell Scalable Application Resource (PICSAR) and the redesigned adaptive mesh refinement library AMReX, which are combined with redesigned elements of the Warp codes, in the new WarpX software. The status, examples of applications and future developments will be discussed.

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