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Exploration of LWFA Parameter Regimes Using Truncated Azimuthal Modal Geometry in the OSIRIS Simulation Framework ASHER DAVIDSON, UCLA — In plasma based accelerators (LWFA and PWFA), the methods of injecting high quality electron bunches into the accelerating wakefield is of utmost importance for various applications. Numerous particle-in-cell (PIC) simulations are conducted in order to study various methods of injection and the ideal parameters thereof. 2D slab-geometry simulations are computationally inexpensive, but they are quantitatively, and sometimes even qualitatively inaccurate. One method for reducing the computational load of a 3D simulation is by utilizing a truncated azimuthal mode expansion into the OSIRIS simulation framework [A. Lifschitz et. al 228 (5) (2009)]. Comparison with 3D LWFA simulations shows a great degree of consistency in the characteristics of the self-trapped beam. In addition, higher order cylindrical modes may capture effects such as beam hosing and asymmetric spot size modulation. With this highly efficient 2D-hybrid algorithm it is possible to simulate parameter regimes and scaling laws that are difficult to do in a full 3D Cartesian simulation. Relativistic spot-size self-focusing, which cannot be accurately described in a 2D slab geometry, is also studied.

Asher Davidson
UCLA

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