

HIGH-ORDER ALGORITHMS FOR SIMULATION OF LASER WAKEFIELD ACCELERATORS

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Abstract

Electromagnetic particle-in-cell (PIC) simulations of laser wakefield accelerator (LWFA) experiments have shown great success recently, qualitatively capturing many exciting features, like the production of ~ 1 GeV electron beams with significant charge, moderate energy spread and remarkably small emittance. Such simulations require large clusters or supercomputers for full-scale 3D runs, and all state-of-the-art codes are using similar algorithms, with 2nd-order accuracy in space and time. Very high grid resolution and, hence, a very large number of time steps are required to obtain converged results. We present preliminary results from the implementation and testing of 4th-order algorithms, which hold promise for dramatically improving the accuracy of future LWFA simulations.

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