Abstract Submitted
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Recent advances in the modeling of plasmas with the Particle-In-Cell methods JEAN-LUC VAY, REMI LEHE, HENRI VINCENTI, Lawrence Berkeley Natl Lab, BRENDAN GODFREY, U. Maryland/Lawrence Berkeley Natl Lab, PATRICK LEE, University of Paris-Sud Orsay, IRV HABER, University of Maryland — The Particle-In-Cell (PIC) approach is the method of choice for self-consistent simulations of plasmas from first principles. The fundamentals of the PIC method were established decades ago but improvements or variations are continuously being proposed. We report on several recent advances in PIC related algorithms, including: (a) detailed analysis of the numerical Cherenkov instability and its remediation, (b) analytic pseudo-spectral electromagnetic solvers in Cartesian and cylindrical (with azimuthal modes decomposition) geometries, (c) arbitrary-order finite-difference and generalized pseudo-spectral Maxwell solvers, (d) novel analysis of Maxwell's solvers' stencil variation and truncation, in application to domain decomposition strategies and implementation of Perfectly Matched Layers in high-order and pseudo-spectral solvers.

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