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Modeling of Laser wakefield accelerator in Lorentz boosted frame using EM-PIC code with spectral solver PEICHENG YU, UCLA, XINLU XU, Tsinghua University, VIKTOR DECYK, WEIMING AN, UCLA, JORGE VIEIRA, IST Portugal, FRANK TSUNG, UCLA, RICARDO FONSECA, IST Portugal, WEI LU, Tsinghua University, LUIS SILVA, IST Portugal, WARREN MORI, UCLA, UCLA COLLABORATION, TSINGHUA UNIVERSITY COLLABORATION, IST PORTUGAL COLLABORATION — Simulating laser wakefield acceleration (LWFA) in a Lorentz boosted frame can reduce the computational time over existing fully explicit methods tremendously. In these simulations the relativistic drifting plasma inevitably induces a high frequency numerical instability that contaminates the interested physics, which we mitigate by solve Maxwell equations in Fourier space (a spectral solver) plus using a low pass or ring filter in Fourier space. We describe the development of UPIC-EMMA that uses a spectral solver and that includes the ability to launch a laser using a moving antenna. We show that using UPIC-EMMA LWFA simulations in boosted frames with arbitrary γ_b can be conducted without any evidence on the numerical instability. We also benchmark the results with lab frame simulations using OSIRIS. These simulations include the modeling cases where there are no self-trapped electrons, and modeling the self-trapped regime. Detailed comparison among Lorentz boost ed frame results and lab frame results obtained from OSIRIS shows the feasibility of using UPIC-EMMA to conduct LWFA simulation at high γ_b.

Peicheng Yu
UCLA

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