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Galilean PIC code: towards real-time wake field simulations

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We use Galilean transformation to the co-moving coordinates s=x, ξ=x−ct. This allows to overcome the huge scale disparity otherwise present in wake field simulations. Different from the standard quasi-static codes, the new Galilean PIC code accurately simulates the laser pulse wave structure, because the full set of Maxwell's equations is solved. The code treats all numerical macroparticles uniformly and does not distinguish between "beam" and "background" or "jet" particles. This allows to incorporate the self-trapping process in a natural way. In addition, the code uses flexible gridding, so that even short wavelength radiation can be resolved at a particular location within the large scale simulation domain.

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