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Low noise particle in cell simulations of laser plasma accelerator 10 GeV stages[1] ESTELLE CORMIER-MICHEL, DAVID L. BRUHWILER[2], ERIC J. HALLMAN, BENJAMIN M. COWAN, JOHN R. CARY, Tech-X Corporation, CAMERON G.R. GEDDES, JEAN-LUC VAY, CARL B. SCHROEDER, ERIC ESAREY, WIM P. LEEMANS, Lawrence Berkeley National Laboratory — Because of their ultra-high accelerating gradient, laser plasma based accelerators (LPA) are contemplated for the next generation of high-energy colliders and light sources. The upcoming BELLA project will explore acceleration of electron bunches to 10 GeV in a 1 meter long plasma, where a wakefield is driven by a PW-class laser. Particle-in-cell (PIC) simulations are used to design the upcoming experiments. As criteria on energy spread and beam emittance become more stringent, PIC simulations become more challenging as high frequency noise artificially increases those quantities. We show that calculating the beam self-fields using a static Poisson solve in the beam frame dramatically reduces particle noise, allowing for more accurate simulation of the beam evolution. Here, we will focus particularly on beam emittance evolution, where boosted frame simulations are used to model the full scale stages.

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[2]Present address: 1348 Redwood Ave., Boulder CO 80304

Estelle Cormier-Michel
Tech-X Corporation

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