Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Simulation methods for laser-plasma based x-ray sources[1] BENJAMIN COWAN, ESTELLE CORMIER-MICHEL, DAVID BRUHWILER, Tech-X Corporation, SERGUEI KALMYKOV, BRADLEY SHADWICK, KYLE BUNKERS, DONALD UMSTADTER, University of Nebraska, Lincoln — Laser-plasma accelerators (LPAs) hold great promise for compact, bright x-ray sources due to the extraordinary field strengths available. The longitudinal fields in a relativistic plasma wave enable acceleration of high-quality electron bunches up to several hundred MeV in just a few mm of plasma. The strong transverse focusing fields enable betatron radiation in the x-ray regime. Design of these x-ray sources requires large-scale particle-in-cell simulations. We describe new algorithms that improve the accuracy and reliability of PIC simulations of LPA x-ray sources. These include a perfect dispersion algorithm, which allows use of lower resolution without loss of accuracy for greater efficiency; post-processing routines for evaluation of betatron radiation, and methods for reducing the statistical noise in the simulation of the self-injection process.

[1]Work supported by U.S. Department of Energy, Office of Science/Basic Energy Sciences grant DE-SC0006245 (SBIR).

Benjamin Cowan
Tech-X Corporation

Date submitted: 20 Jul 2011 Electronic form version 1.4