Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Acceleration of polarized electron beams in plasma-based accelerators JORGE VIEIRA, RICARDO FONSECA, LUÍS SILVA, Instituto Superior Técnico, CHENGKUN HUANG, University of California, Los Angeles, WARREN MORI — The acceleration of highly polarized particle beams is critical not only to test and validate current physical models, but it is also critical in the search for new physics in high-energy physics (HEP) experiments. Plasma-based accelerators can play an important role in next generations of accelerators, as they can reduce the size of standard acceleration structures by two-three orders of magnitude. However, for high-energy physics applications, and in addition to beam quality requirements such as the emmittance, luminosity, energy, or energy spread, the evolution of the electron beam polarization is also crucial for the use of future linear plasma based colliders in HEP experiments. In this work, the spin-precession in plasma-based acceleration scenarios is examined using the Thomas– Bargmann-Michel-Telegdi equations. Analytical expressions which show that lower depolarizations can be achieved by using narrower beams, with lower initial energies, are derived. In addition, it is found that mildly relativistic regimes lead to lower depolarizations in comparison to strongly relativistic regimes. Our findings are confirmed with 3D particle-in-cell simulations using QuickPIC.

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Date submitted: 22 Jul 2009 Electronic form version 1.4