



Polarized Beam Conditioning in Plasma Based Acceleration

J. Vieira, C.-K. Huang, W.B. Mori, L.O. Silva

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The acceleration of polarized electron beams in the blowout regime of plasma-based acceleration is explored. An analytical model for the spin precession of single beam electrons, and depolarization rates of zero emittance electron beams, is derived. The role of finite emittance is examined numerically by solving the equations for the spin precession with a spin tracking algorithm. The analytical model is in very good agreement with the results from 3D particle-in-cell simulations in the limits of validity of our theory. Our work shows that the beam depolarization is lower for high-energy accelerator stages, and that under the appropriate conditions, the depolarization associated with the acceleration of 100-500 GeV electrons can be kept below 0.1-0.2%.

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