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P1.2008 Relativistic polarized electron generation via plasma wakefield acceleration

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See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.2008.pdf

Spin-polarized electron beams are extensively used for spin-dependent high energy physics and material science. Here we propose a new approach based on plasma wakefield acceleration (PWFA) for generating high-energy polarized electron beams. In a pre-polarized gas target, we found the restrictions to preserve the electron beam polarization for beam-driven PWFA and further proposed to use a new structure of laser pulse to resolve the depolarization issue of injected electrons in LWFA. The theoretical predictions for PWFA and LWFA to generate relativistic polarized electron beams are confirmed in full three-dimensional particle-in-cell simulations incorporating spin dynamics (the Thomas-Bargmann Michel Telegdi equation), where the latter preserves the electron spin polarity by more than 80% at high beam charge and flux. The proposed method releases the limit on beam flux for polarized electron acceleration and promises more than an order of magnitude boost in peak flux, as compared to ordinary Gaussian beams. These results suggest a promising table-top all-optical method to produce energetic polarized electron beams.

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