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P2.2010 Shaping laser-wakefield beams through magnetic controlled particle injection

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Plasma based acceleration (PBA) is seen as a promising candidate for future accelerators. While magnetic fields are commonly used in conventional accelerators, our previous work [1] has shown that magnetic fields can be used for controlling injection in PBA scenarios. On this paper we extend this work by using the recent 3D extension of the ponderomotive guiding center (PGC) solver [2] in OSIRIS [3] to examine the contribution of different shaped magnetic profiles on the injected electron beams in laser-wakefield acceleration (LWFA) scenarios through parametric studies. In particular, we analyze scenarios involving magnetic quadrupoles, that can only be accurately modelled through three-dimensional simulations. The use of the PGC algorithm allows for speedups on the order of ~ (λ_p/ λ_0)^2 when compared to a full PIC algorithm, allowing for a much wider parametric scan. We will present the effects on the injected charge, final beam energy and emittance. We will also discuss the possibility of multi-beam injection and experimental realization of these scenarios.
References
[1] J. Vieira et al., Phys. Rev. Lett., vol. 106(22), 2250014 (2011)
[2] A. Helm et al., to be submitted J. Comput. Phys.
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