Numerical studies on spin-polarised electron beam generation from a laser-driven plasma accelerator

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Laser-driven plasma acceleration (LPA) offers the possibility to accelerate charged particles with average acceleration gradients of the order of tens to hundreds GV/m [1]. Successful experiments of LPA have confirmed the relevance of this acceleration technology for various applications through the demonstration of GeV-class electron beam generation [2], Free-Electron Laser gain [3] and sustained 30 h operation [4]. With the progress made in LPA technology over the past decades, generation of spin-polarised electron beams is of great interest now. The LEAP (Laser Electron Acceleration with Polarization) project underway at DESY aims at proof-of-principle experiments to demonstrate generation of spin-polarised electron beams from LPAs. In this paper we present numerical studies using Bayesian optimisation to optimise the charge and polarisation of the electron beam generated in a LPA and present the resulting experimental setup.

References

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