

Spin-Polarized Particle Beams from Laser-Plasma Based Accelerators

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Spin-polarized particles with high energies are needed for various experiments, *i.e.* to examine the structure of protons and neutrons for further insight of QCD or to probe the nuclear spin structure. A promising option is the acceleration of pre-polarized particles from plasma using a high-intensity laser [1]. We give a brief overview of the state-of-the-art for this subject, for which proof-of-principle experiments are currently being prepared. Further, we will present the acceleration of protons via magnetic vortex acceleration (MVA) in more detail and discuss the effects of density down-ramps on the proton yield studied by means of particle-in-cell simulations [2]. We show that the beam's average spin polarization remains robust against moderate changes of the down-ramp length and is only affected by changes in the collimation process for a significant increase in length.

References

- [1] M Büscher, A Hützen, LL Ji and A Lehrach, High Power Laser Sci. Eng. **8**, E36 (2020)
- [2] L Reichwein, A Hützen, M Büscher and A Pukhov, Plasma Phys. Control. Fusion (2021); DOI:10.1088/1361-6587/ac0614