

Towards spin-polarised electron beams from a laser-plasma accelerator

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Polarised beams are indispensable for many experiments in particle, atomic and nuclear physics where spin-dependent processes are to be studied. Unlike RF accelerators, Laser-Plasma-Accelerators (LPA) are not limited by material breakdown and can therefore support thousand times higher accelerating fields, which make them a promising alternative to conventional accelerators.

The LEAP (Laser Electron Acceleration with Polarisation) project at DESY aims to generate and measure spin-polarised electron beams from a compact LPA for the first time.

Spin-polarised electron beams can be generated from an LPA by employing a pre-polarised plasma source, where hydrogen halide molecules are dissociated by a circularly polarised UV laser pulse. For the subsequent polarisation measurement photon transmission polarimetry will be used due to the expected beam energy of tens of MeVs. The basic concept is to pass circularly polarised gamma rays generated by bremsstrahlung of the longitudinally polarised electrons through a magnetised iron absorber, where the transmission is spin dependent. The transmission asymmetry with respect to the magnetisation direction is proportional to the initial electron polarisation, which can be measured with a calorimeter. This poster provides an overview of the LEAP project, the physics of polarised LPA and experimental progress.

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