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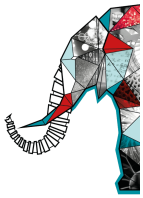

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Miniaturisation of a beam-driven plasma wakefield accelerators by using relativistic electron beams produced in laser-driven plasma wakefield

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Plasma wakefield acceleration is a promising concept for a compact electron accelerator with broad range of future applications, such as high energy physics or secondary light sources. Plasma can sustain accelerating fields > 100 GeV/m, driven by intense laser pulses (LWFA) or relativistic particle beams (PWFA). The latter one allows to overcome limitations on the accelerating length caused by the speed difference between laser and accelerated beam in LWFA, but requires a dense beam of relativistic particles to drive the wakefield, which are produced by expensive large scale conventional accelerators.
Here we report on the novel approach to generate PWFA by utilising relativistic electron beams accelerated by laser (LWFA), with a thin solid target between the two stages to block the laser. This hybrid concept opens the way for miniature PWFA accelerators that can allow to tackle important physics challenges for plasma accelerators, such as beam quality preservation and high energy efficiency, and to generate ultra-bright beams of electrons.
We will present results of a hybrid plasma wakefield acceleration experiments, recently performed in LOA (France) using 60 TW laser system, in particular showing the importance of electromagnetic plasma instabilities developing in the thin foil for the dynamics of the electron beam, as well as first experimental demonstration of successful acceleration of electron beam in a hybrid accelerator, observed in HZDR (Germany) using 100 TW laser.

Choix de session parallèle

5.1 Plasmas et accélérateurs: éta de l'art et machines du futur 2

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