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Research Towards Hybrid Accelerators

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Beam-driven wakefield accelerators have various advantages over laser-driven wakefield accelerators, but the requirements on the particle driver are challenging and met by only a few large-scale accelerators worldwide. However, electron beams from a laser-plasma accelerator are usually inherently well suitable as a driver, which potentially allows studying the physics of beam-driven wakefield acceleration in small-scale laser facilities.

In this talk we present the first direct observation of laser-accelerated electron bunches driving their own wakefields in an independent gas target, which is a first step towards a table-top plasma wakefield accelerator. Furthermore, we show measurements of a controlled injection technique that can be used to generate stable driver and witness bunches, for which simulations indicate the possibility of actual beam-driven wakefield acceleration of the witness bunch in our upcoming experiments.

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