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External injection of electron beams into laser excited wakefields

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We present results of a probing experiment where two Laser-Plasma-Accelerator stages are coupled at a short distance by a plasma mirror. Stable electron beams were focused by a discharge capillary-based active plasma lens to a micrometer spot size in a H₂ plasma, such that they interact with a dark-current-free, quasi-linear wakefield excited by the laser of the second stage. Changing the arrival time of the electron beam allowed reconstruction of the temporal field structure excited by the wake and determination of the on-axis plasma density. Injection into the wakefield of the second stage was verified by a momentum gain of the electron beam.

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