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Active non-perturbative Stabilization of the laser-plasma-accelerated electron beam source

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Laser plasma accelerators have the ability to produce high-quality electron beams in compact, all-optical-driven configurations, with the electron beams uniquely suited for a wide variety of accelerator-based applications. However, fluctuations and drifts in the laser delivery to the mm-scale plasma target (the electron beam source) will translate into electron beam source variations that can limit their utility for demanding applications like light sources. Based on previous work developing a non-perturbative diagnostic for the high-power laser delivery at focus, we present experimental commissioning results of a full four-dimensional PID-active-stabilization system for stabilizing a 100TW pulse-laser system and show that by doing so, the electron beam source is stabilized. This is confirmed through the use of an energy resolved imaging system for the electron beam that directly monitors the jitter in transverse electron beam source location.

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