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High-brightness electron beams from hybrid LWFA-PWFA staging

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Plasma wakefield accelerators can provide gigavolt-per-centimetre energy gain, offering a promising path towards compact electron sources. They rely on the generation of plasma waves driven by either a high-current charged particle beam (PWFA) or an intense laser pulse (LWFA).
PWFAs offer particularly attractive regimes of injecting and accelerating a new high-quality electron beam, but typically require a large preceding accelerator providing the drive beam. However, compact laser-driven wakefield accelerators have recently demonstrated their capability of delivering such high-current electron beams with ideal drive beam properties.
This allows to combine both methods into a staged LWFA-driven PWFA, which effectively operates as a beam quality transformer.
Such a hybrid staging thus offers an attractive approach which promises to deliver high-brightness electron beams within a centimetre-scale accelerating structure.
The talk will summarise the unique aspects LWFA-driven PWFA and will present recent results of a first experimental implementation.
It will furthermore discuss current strategies for controlled injection towards the generation of high-brightness beams suitable for applications such as future compact light sources.

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