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# Experimental progress towards the Plasma-modulated plasma accelerator (P-MoPA)

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Progress towards high-repetition (≥1kHz) GeV-scale electrons from a LWFA source is held back by the lack of laser sources capable of providing joule-level sub-100 fs pulses at high repetition rates. A possible trajectory is to replace Ti:sapphire lasers with Yb:YAG thin-disk lasers. The narrow bandwidth of Yb:YAG only allows direct compression to ~1 ps, however. Although spectral broadening techniques are available, they are limited to approximately 100 mJ. The Plasma-Modulated Plasma Accelerator (P-MoPA) addresses this issue by utilizing a low-energy, sub-100-fs pulse to seed spectral modulation of a multi-joule picosecond pulse in a free-standing plasma waveguide. A resulting pulse train then resonantly drives a high-amplitude wakefield in a second plasma channel, accelerating electrons.

We describe the results of two experimental campaigns: (i) low-energy experiments at Oxford, which utilize filtered pulses from a Ti:sapphire laser to mimic the drive laser pulse, and (ii) high-energy experiments at the Centre for Advanced Laser Applications (CALA) with joule-scale thin-disk lasers. We demonstrate guiding of joule-level Yb:YAG pulses in a 60mm long plasma channel and the spectral broadening and compression of the "seed" pulse in an argon-filled Herriott cell. We then show the results of the modulation campaign.

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