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Matched Guiding and Controlled Injection in Dark-Current-Free, 10-GeV-Class, Channel-Guided Laser Plasma Accelerators

Monday, 14 April 2025 09:10 (30 minutes)

A pre-formed plasma channel can be used to maintain laser pulse intensity over the full dephasing/pump depletion length of a laser plasma accelerator and maximize electron beam energy for a given drive laser. In this talk we present recent results[1] that show high quality guiding of ~0.5PW (20J) laser pulses in a 30cm-long, hydrodynamic optical-field-ionized (HOFI) plasma channel. By varying the length of the plasma channel, we observed the transport of higher-order modes, quasimatched propagation, and the dark-current-free transfer of laser energy to the wake. By introducing a localized region of nitrogen dopant, electron beams were generated with energy up to ~10GeV.

[1] Picksley et al., Phys. Rev. Lett., **133**, 255001 (2024).

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