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Solutions and challenges for a multi-stage plasma accelerator

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Particle physics requires high energies, beyond what is possible in a single plasma-accelerator stage. Coupling of stages is, however, very challenging due to chromatic aberrations and tight tolerances on synchronization. A new beam-optics scheme is proposed, based on nonlinear plasma lenses, promising to enable compact staging without degrading emittance, as well as improving tolerances on synchronization via a self-stabilization mechanism. We discuss the implications of this concept, the challenges ahead, and propose new test facilities to overcome them.

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