Contribution ID: **38**   Type: **Student Poster**

Programmable-Velocity Dephasingless Laser Wakefield Acceleration

Tuesday, 8 November 2022 17:00 (2h 30m)

In a laser wakefield accelerator, the ponderomotive force of an intense laser pulse propagating through a plasma excites a large amplitude plasma wakefield that can trap and accelerate electrons to relativistic energies. To prevent the electrons from outrunning the accelerating phase of the wakefield, spatiotemporal pulse shaping can be used to propagate the laser intensity at the vacuum speed of light in the plasma over long distances without the need for guiding structures. We present simulations of a novel optical configuration for spatiotemporal pulse shaping that combines a deformable mirror (DM), a spatial light modulator (SLM), and a reflective axiparabola. The DM imparts a radial group delay that controls the time at which each radius reaches its focus. The SLM corrects the unwanted phase front curvature imparted by the DM while retaining the desired delay. The axiparabola controls the longitudinal location at which each radius focuses. This flying focus improves upon previous designs by offering flexible programmability of the focal velocity with the DM and SLM.

Acknowledgments

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Session Classification: Poster Session and Reception

Track Classification: Poster Session: WG7 Poster: Radiation Generation and Advanced Concepts