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Application of laser-plasma accelerators to future linear colliders

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Laser-driven plasma accelerators have demonstrated ultra-high accelerating gradients, offering the potential to reduce the size and cost of a future energy-frontier linear collider. In this presentation, I will discuss the design considerations for the application of laser-driven plasma-based accelerator technology to a multi-TeV linear collider. Plasma accelerators naturally accelerate short bunches using large longitudinal and transverse wakefields in plasma, and this presents unique beam dynamics challenges. I will discuss several of these challenges, including staging laser-plasma accelerators, scattering with background plasma, and beam transverse stability. Key to the realization of the collider application is the development of high average and high peak power laser systems, operating with high efficiency. Coherent combination of fiber lasers is a promising solution to achieve high average and high peak power lasers suitable for high-energy physics applications, and I will describe recent progress and outline the R&D path toward a collider based on laser-plasma accelerator technology.

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