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Lasers for Plasma Accelerators[1]

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Laser-driven plasma-based accelerators are capable of generating ultra-high accelerating gradients, several orders of magnitude larger than conventional accelerators. These high gradients offer the potential for extremely compact devices delivering high energy particle beams. In a laser-plasma accelerator, ultra-short, intense lasers drive relativistic plasma waves that accelerate charged particle beams. In this talk, I will describe recent experimental progress on laser-plasma accelerators. Applications of these accelerators are limited by laser technology, and, in particular, the availability of high peak and high average power, short-pulse lasers. Today's laser-plasma accelerator experiments use Ti:sapphire lasers, which are presently limited to a few Hz repetition rates. Recent technology advances have made kHz repetition rates possible. Beyond kHz, new laser technologies must be employed. Coherent combining of fiber lasers offer the possibility to achieve high average and high peak power lasers suitable for high-energy physics applications. I will describe the recent progress in coherent combining of fiber lasers as well as other possible laser technology options, such as TmYLF, to achieve high average power laser-plasma accelerators.

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