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Plasma Wakefield Acceleration Science at FACET-II

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FACET-II is a new National User Facility at SLAC National Accelerator Laboratory scheduled to begin operating in 2020. The PWFA collaboration has proposed an ambitious series of experiments consistent with the US DOE Advanced Accelerator R&D Roadmap. A photoinjector in a configuration similar to that of LCLS will enable FACET-II to investigate acceleration and beam quality preservation utilizing beams with an emittance two-orders of magnitude lower than what was routinely available at FACET. The resulting improvement in beam density will enable FACET-II to study new effects like the motion of plasma ions and unintended beam ionization in the plasma sources. Additional plasma-based experiments have been proposed for generating bunches with orders of magnitude lower emittance that will ultimately be needed for both an early application of a PWFA and for a plasma-based future linear collider. Phased upgrades to FACET-II are expected to provide high-intensity positron bunches, a capability unique in the world, to experimentally investigate the optimal technique for high-gradient positron acceleration in plasma. The high-intensity beams open the door to an even broader experimental program including dielectric wakefield acceleration (DWA). The status of the facility and expected initial experimental program will be discussed.

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