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Beam-Driven Plasma-Wakefield Experiments at FACET II

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The FACET-II facility at SLAC National Accelerator Laboratory conducts a broad science program based on the interaction of low-emittance high-current 10 GeV electron beams with lasers, plasmas and solids. FACET-II operates as a National User Facility while engaging a broad User community to develop and execute experimental proposals that advance the development of plasma wakefield accelerators. I will highlight recent breakthroughs achieved at FACET-II such as the generation of 100-kA class beams by laser-electron beam shaping, the demonstration of a brightness and energy transformer, and efficient plasma acceleration with percent-level field uniformity. The extreme beams delivered for plasma wakefield accelerator experiments have enabled additional opportunities such as the most precise measurements of quantum radiation reaction to date and extreme beam focusing by leveraging intense coherent transition radiation in the near field or plasma fields and these results will also be highlighted.

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