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Multi-GeV Witness Acceleration with High Field Uniformity at FACET-II

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At the Facility for Advanced Accelerator Experimental Tests II (FACET-II) at SLAC, we are undertaking experiments in plasma wakefield acceleration using a 10 GeV electron beam configured as a drive and witness pair. We will share our progress towards the ultimate goal of doubling the energy of the 10 GeV witness bunch by PWFA, with high efficiency and while preserving beam quality. Our latest results demonstrate multi-GeV acceleration of the witness bunch, with energy gains exceeding 5 GeV and sub-percent energy spread, using a 40 cm long plasma source. Additionally, we have achieved near-complete charge capture of the witness bunch and are actively working to minimize emittance growth through careful control of the transverse properties of the bunches.

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