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Experimental measurement of transverse wakefields in hollow plasma channels

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Plasma wakefield acceleration (PWFA) is a promising technology for a compact TeV-scale electron-positron collider. While great progress has been made on PWFA for electrons, the same is not true for positrons. Hollow channel plasma wakefield acceleration (HC-PWFA) is a promising alternative approach for accelerating positrons, where energy is transferred from a drive bunch to a trailing bunch in a hollow tube of plasma via a strong longitudinal wakefield. However, an offset drive beam also excites a transverse wakefield, whereby the drive and trailing beams are strongly deflected away from the axis. This sets stringent limits on alignment tolerances; one of the main challenges for a HC-PWFA-based collider. We present experimental measurements of the longitudinal profile of this transverse wakefield, based on data from the FACET 2016 positron run, and compare these to theoretical predictions.

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