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Stable Beam driven wakefield in structured plasmas

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Wakefield excitation by structured electron bunches in hollow gaps between plasma wedges, Fig.1, is studied using three-dimensional particle-in-cell simulations. The main part of the electron bunch has a triangular current distribution in the longitudinal direction with a smooth head and short tail. These bunches propagate stably in the hollow gap while being attached to cusps of the plasma wedges. The excited wakefield profile may have a very high transformer ratio and allows to accelerate witness bunches to energies much higher than that of the driver bunch. Unlike round hollow channels, where asymmetric wakefields are difficult to avoid, no deleterious transverse beam break-up (BBU) is observed in the gap between cusp-shaped plasma layers.

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