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Intrinsic phase space discretization of charge in laser-triggered ionization injection in plasma accelerators XINLU XU, Univ of California - Los Angeles, WEI LU, Tsinghua University, WARREN MORI, CHAN JOSHI, Univ of California - Los Angeles — Ionization injection is attractive as a controllable injection scheme for generating high quality electron beams in plasma wakefield acceleration. Due to the phase dependent tunneling ionization rate and the ultra-high accelerating fields, the discrete injection of electrons within the wake is nonlinearly mapped to the final phase space of the beam where the electrons are relativistic. This unique phase space structure is theoretically analyzed and examined by three-dimensional particle-in-cell simulations. The period of the modulation varies from $> 2k_0$ to about $5k_0$ depending on the initial range of phases of ionization and the final phases where the electrons become trapped, where k_0 is the wavenumber of the injection laser. Such a pre-bunched beam can be diagnosed through coherent transition radiation upon its exit from the plasma and may find use in generating high-power ultraviolet radiation upon passage through a resonant undulator. Work supported by NSF and DOE.

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