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Recent modifications to WAKE and effect of plasma temperature on energy gain and spread in plasma wake field acceleration NEERAJ JAIN, J.P. PALASTRO, T.M. ANTONSEN, University of Maryland, College Park, MD — WAKE (previously 2D, now 2.5D) provides an efficient simulation platform for plasma wake field acceleration (PWFA) by utilizing the quasi-static approximation (QSA), in which the beam driver remains unchanged during the transit time of rest electrons. We implement 2.5D evolution and thermalization of the background plasma, driver beam evolution, and field ionization of plasma in WAKE. Simulations of PWFA are performed for a single bunch and two bunch (corresponding to experiments at FACET) electron beam driver. In two bunch experiments, the witness bunch behind the driver bunch flattens the axial wake field profile allowing for mono-energetic acceleration of the witness bunch. Finite plasma temperature modifies the wake field profile thereby affecting the energy gain and spread. Thermal modifications to plasma wake fields, and resulting energy gain and spread are examined for a range of temperatures relevant to experiments both for single and two bunch drivers.

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