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A global simulation for laser driven MeV electrons in fast ignition

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A comprehensive examination of the interaction of a picosecond-long ignition pulse with high-density (40 times critical density) pellets using a two- simensional particle-in-cell model is described. The global geometry consists of a 50-diameter pellet surrounded by a corona which is isolated by a vacuum region from the boundary. Due to the significant spread in the transverse momentum of the hot electrons created during the laser-plasma interactions, the electron distribution is only marginally unstable to the Weibel instability. We find that the return current as well as the forward-going hot electron flux contributes to the instability, with the ions playing an important role of neutralizing the space charge. No global current filament coalescence has been observed. We find also that the simulation size and boundary condition can have profound effects on the nonlinear evolution of the filaments. This work is supported by the US DoE through the Fusion Science Center for Extreme States of Matter and Fast Ignition Physics at University of Rochester. [In collaboration with M.A.Tzoufras, J.Tonge, F.S.Tsung and W.B.Mori (UCLA); M.Fiore, R.A.Fonseca and L.O.Silva (IST, Portugal); and J.C.Adam and A.Heron (Ecole Polytechnique, France)]