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Fast Ignition with Ultra-High Intensity Lasers JOHN TONGE, M. TZOUFRAS, F.S. TSUNG, W.B. MORI, UCLA, C. REN, University of Rochester, M. MARTI, L. SILVA, Instituto Superior Tecnico — Energy transport within over-dense plasma with a fast ignition target is explored by examining the interaction of different intensity ignition lasers with a 50 μ radius target using two-dimensional Particle-In-Cell simulation. In fast ignition schemes the ignition energy must be delivered to a small region ($\sim$ 20 μ in radius) of dense plasma within the target in order to create a localized region where fusion occurs. The electron stopping length in the core and the energy spectrum of the ignition electrons determines the depth of this region. This depth is sensitive to the spectrum of the energy flux of fast electrons generated as a function of laser intensity at the critical surface. Coupled with current assumptions of the spectrum of electrons generated by high intensity lasers this limits ignition laser intensity to $5x10^{19}$ W/cm^2. Our simulations show that the peak energy flux of the ignition electrons is significantly lowered as the electrons traverse the collisionless plasma from the critical density surface of the plasma to the high density target core where ignition occurs. This allows higher intensity lasers to be used thus delivering power to a narrower region. In addition we find that a higher percentage of the ignition lasers energy is delivered to the core with the higher intensity laser.

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