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Energy Deposition, Penetration, Blooming of Energetic Electrons in Fast Ignition and Preheat Scenarios R.D. PETRASSO, C.K. LI, MIT — For plasmas of arbitrary Z and density, the penetration, energy deposition, blooming, and straggling of energetic electrons are analytically modeled. Calculations spanning 25 orders of magnitude in density apply to fast ignition (n$\sim 10^{26}$/cc), electron preheat (n$\sim 10^{23}$/cc) and relativistic astrophysical jets (n$\sim$ 10/cc). It is shown that ρ <x>, the product of density and linear penetration, is a basic parameter and that blooming and straggling have a strong Z dependence. For fast-ignition with 1-MeV electrons in DT plasma, ρ <x> = 0.42 g/cm^2, <x> = 14 μm and bloom = 5 μm; the blooming-to-penetration ratio is 0.35; in Cu (Z=29) plasma of the same electron density, the ratio is 1.1. For preheat with 100 keV electrons in DT ice, ρ <x> = 0.007 g/cm^2, <x> = 280 μm, close to the 300-μm ice-layer thickness prescribed for NIF direct-drive designs. For the astrophysical jet, ρ <x> = 0.42 g/cm^2 and <x> $\sim 10^4$ light years. These calculations will be used to establish requirements for fast ignition and tolerable levels of electron preheat for ICF targets. This work was supported in part by LLE, LLNL, the U.S. DoE, the Univ. of Rochester Fusion Science Center.

Fredrick Seguin
MIT

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