STOPPING OF RELATIVISTIC ELECTRONS IN PARTIALLY DEGENERATE ELECTRON FLUID

K.I. Starikov, Department of Physics, Kazakh State University, Tole Bi 96. ALMATY 480012, Kazakhstan

C. Deutsch, LPGP, Bât. 210, University Paris-Sud, 91405 ORSAY Cedex, France

The stopping mechanisms of relativistic electron beams (REB) in superdense and partially degenerate electron fluid targets are investigated in the framework of the fast ignitor concept for inertial confinement fusion. ln order to comply with specific demands in this area, we focus attention on the target partial degeneracy parameter $\theta = T_e/T_f$, in terms of thermal to Fermi temperature ratio. Target electron fluid (TEF) is thus modelled very accurately with a RPA dielectric function. Stopping results are shown very weakly θ-dependent. However, a quantum target description is needed to recover their correct and increasing trend with increasing projectile energy.

Ranges and effective penetration depths in precompressed thermonuclear fuels are shown to be nearly a factor of two shorter compared to earlier classical estimates in same conditions. Overall conclusions pertaining to the feasibility of fast ignition thus remain unchanged.