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Numerical studies of fast ion slowing down rates in cool magnetized plasma using LSP[1] EUGENE S. EVANS, ELIJAH KOLMES, SAMUEL A. COHEN, Princeton Plasma Physics Laboratory, TOM ROGNLIEN, BRUCE COHEN, Lawrence Livermore National Laboratory, ERIC MEIER, College of William and Mary, DALE R. WELCH, Voss Scientific — In MFE devices, rapid transport of fusion products from the core into the scrape-off layer (SOL) could perform the dual roles of energy and ash removal. The first-orbit trajectories of most fusion products from small field-reversed configuration (FRC) devices will traverse the SOL, allowing those particles to deposit their energy in the SOL and be exhausted along the open field lines. Thus, the fast ion slowing-down time should affect the energy balance of an FRC reactor and its neutron emissions. However, the dynamics of fast ion energy loss processes under the conditions expected in the FRC SOL (with $\rho_e < \lambda_{De}$) are analytically complex, and not yet fully understood. We use LSP, a 3D electromagnetic PIC code, to examine the effects of SOL density and background B-field on the slowing-down time of fast ions in a cool plasma. As we use explicit algorithms, these simulations must spatially resolve both ρ_e and λ_{De}, as well as temporally resolve both Ω_e and ω_{pe}, increasing computation time. Scaling studies of the fast ion charge (Z) and background plasma density are in good agreement with unmagnetized slowing down theory. Notably, Z-scaling represents a viable way to dramatically reduce the required CPU time for each simulation.

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