Simulation of Finite-Beta Effects in Gyrokinetic Plasmas

EDWARD STARTSEV, WEI-LI LEE, Princeton Plasma Physics Laboratory — A generalization of the original split-weight scheme for finite-beta plasmas [W. W. Lee, J. Lewandowski, Z. Lin and T. S. Hahm, Phys. Plasmas 8, 4435 (2001)] to multidimensional plasmas is developed. The scheme is based on the concept of perturbative particle simulation, where only the non-adiabatic response of the electrons, $\delta h$, is followed in time, where $\delta h = F - (1 + \psi)F_0$, $F$ is the electron distribution function, $F_0$ is the background electron distribution function, $\psi = \phi + \int A_\parallel dx_\parallel/c$, and $\phi$ and $A_\parallel$ are the perturbed potentials. The procedure involves the Poisson solvers for $\phi$, $A_\parallel$, $\partial \phi/\partial t$, $\partial A_\parallel/\partial t$, and $\partial^2 A_\parallel/\partial t^2$, which, in turn, need up zeroth, first, second and third velocity-space moments for input. The use of the scheme for turbulence and MHD studies [Lee and Qin, Phys. Plasmas 10, 3196 (2003)] will be presented.

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