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Collision methods for particle simulations[1] F.L. HINTON, UCSD, C.S. CHANG, NYU, E.S. YOON, PPPL — Particle-in-cell simulations of magnetically confined plasmas require a method for incorporating the effects of Coulomb collisions, especially near the plasma edge, where these are especially important. We compare two possible types of methods: (1) Langevin, or Monte-Carlo, methods, which scatter the velocities of the particles, and (2) methods which change only the particle weights as a result of collisions. The weight-changing methods which we discuss use grid-based solutions of the Fokker-Planck equation, with interpolation between the grid and the particle velocities. For the Langevin methods, the errors in momentum and energy conservation are due to time-discretization, and accumulate in time. The weight-changing methods we discuss conserve momentum and energy exactly, assuming certain properties of the velocity-space shape functions for the particles. The details of these methods and their conservation laws will be presented. Also of interest are the effects of noise due to finite numbers of particles per grid cell. These are being investigated, and the results will be presented.

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