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Modeling of Particle Orbits in 3D MHD Equilibria[1] MATTHEW MCMILLAN, Wheaton College/PPPL, SAMUEL LAZERSON, ELIOT FEIBUSH, Princeton Plasma Physics Laboratory — Modern Tokamaks and stellarators have significant auxiliary fast ion heating systems which must be accounted for in equilibrium calculations. Direct measurement of fast ion profiles is difficult, so often in Tokamaks they are provided by forward modeling. The 3D nature of fields from Tokamaks with resonant magnetic perturbations (RMPs) and from stellarators necessitates a fully 3D model. The BEAMS3D code uses guiding center approximations to find particle trajectories in 3D fields, and can include the physical effects of hot ion collisions and scattering, charge-exchange and recombination, pitch angle and energy scattering, and viscous velocity reduction. We benchmark the code for beam deposition, charge exchange, and collisionless particle orbits, with positive results. We apply the code to MHD solutions representing the geometry of DIII-D and NCSX, and extract the hot ion pressure profiles. While currently designed to work with the equilibria produced by VMEC or with vacuum fields, the code easily could be modified to work with other equilibria.

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