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Development of delta-f particle code for 3D neoclassical transport calculations in tokamaks KIMIN KIM, JONG-KYU PARK, GERRIT J. KRAMER, Princeton Plasma Physics Laboratory, ALLEN H. BOOZER, Columbia University — A new delta-f particle code has been developed in order to calculate neoclassical transport precisely and efficiently in 3D tokamak configurations. Neoclassical transport becomes not only highly complex in 3D tokamaks, but also important in establishing a self-consistent 3D equilibrium. The new code calculates guiding-center orbits on flux coordinates, to efficiently provide viable information to a 3D equilibrium solver, as well as to obtain fundamental properties of 3D neoclassical transport such as Neoclassical Toroidal Viscosity (NTV). Also in the new code, collisions are modeled with modified Lorentz operator to study the essence of pitch-angle scattering while preserving momentum conservation, which is critical to separate 3D effects from 2D effects in transport. The code will be able to test complex parametric dependency that is predicted by analytic NTV theories, and also will be able to improve the predictability by including more precise orbits for both passing and trapped particles. Detailed progress will be presented, and preliminary simulation and benchmark results will be discussed. This work was supported by the US DOE Contract #DE-AC02-09CH11466.

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