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Neoclassical Poloidal and Toroidal Velocities of Impurity Ions[1]
S.K. WONG, San Diego Mesa College, V.S. CHAN, General Atomics, W.M. SOLOMON, Princeton Plasma Physics Laboratory — The poloidal and toroidal velocities of impurity ions in a two-ion species plasma for large aspect ratio circular flux surfaces are calculated in the banana and Pfirsch-Schulter regimes of neoclassical theory. The toroidal velocity is allowed to be comparable to the thermal speed of the impurity ions. Closed form expressions are obtained for these velocities in terms of the radial electric field as well as density and temperature gradients. The standard kinetic derivation adopted is compared with the moment approach to the same problems in the case of small toroidal velocities. Comparisons of the calculated poloidal velocity with experimental observations in DIII-D [1] show improved agreement due to the allowance of larger toroidal flows.

[1] W.M. Solomon, Phys. Plasmas 13, 056116 (2006).

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