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On the evaluation of a neoclassical radial electric field in the edge of a tokamak[1] MIKHAIL DORF, RONALD COHEN, Lawrence Livermore National Laboratory, Livermore, California, 94550 — The use of the standard approaches for evaluating a neoclassical radial electric field E_r, i.e., the Ampere (or gyro-Poisson) equation, requires accurate calculation of the difference between the electron and ion particle fluxes (or densities). In the core of a tokamak, the nontrivial difference appears only in high-order corrections to a local Maxwellian distribution due to the intrinsic ambipolarity of particle transport. The evaluation of such high-order corrections may be inconsistent with the accuracy of the standard first-order drift kinetic equation (DKE), thus imposing limitations on the applicability of the standard approaches [e.g., F. I. Parra and P. J. Catto, Phys. Plasmas **17**, 056106 (2010)]. However, in the edge of a tokamak, charge-exchange collisions with neutrals and prompt ion orbit losses can drive non-ambipolar particle fluxes for which a nontrivial (E_r-dependent) difference between the electron and ion fluxes appears already in a low order and can be accurately predicted by the first-order DKE. The parameter regimes where the radial electric field dynamics in the tokamak edge region is dominated by the nonambipolar processes, thus allowing for the use of the standard approaches, are discussed.

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