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Plasma rotation in a quasisymmetric stellarator[1] ANDREI SIMAKOV, Los Alamos National Laboratory, USA, PER HELANDER, Max-Planck-Institut fur Plasmaphysik, Germany — The equilibrium plasma rotation in a general toroidal magnetic field is nearly always subsonic and is determined by the requirement that the collisional particle transport should be ambipolar in lowest order in the small-ion-gyroradius expansion [1]. Gyrokinetic turbulence can only appreciably modify the rotation on radial length scales of order the ion gyroradius [1,2]. Only in quasisymmetric fields, where collisional particle transport is intrinsically ambipolar, can the plasma rotate freely and then only in the quasisymmetry direction [1]. In particular, sonic rotation velocities are allowed in this case [3]. However, the quasisymmetry is broken when the rotation speed exceeds the diamagnetic speed appreciably, leading to reappearance of the non-intrinsically-ambipolar $1/\nu$-transport regime. Herein, we explicitly evaluate the electron radial particle flux caused by such a quasisymmetry breaking. We find that this flux scales with the fourth power of the rotation Mach number and is therefore expected to be modest in most plasmas of interest.

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[3] P. Helander, Phys. Plasmas **14** 104501 (2007).

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