Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Momentum transport in stellarators and rippled tokamaks[1]
ANDREI SIMAKOV, LANL, USA, PER HELANDER, Max-Planck-Institut für Plasmaphysik, Germany — Drift kinetic formalism is employed to demonstrate that quasi- axisymmetry or quasi-helical symmetry is a necessary condition for intrinsic ambipolarity of collisional plasma transport in toroidal magnetic confinement configurations [1]. Only in magnetic fields possessing such a symmetry can plasma of arbitrary collisionality rotate freely and then only in the symmetry direction. In practice, the quasi-symmetry requirement sets an upper bound on the helical field ripple magnitude, which is difficult to achieve in low-collisionality plasmas. In non-quasi-symmetric cases the averaged radial electric field is expected to be primarily governed by collisional processes through parallel ion viscosity. Electrostatic turbulence that obeys the conventional gyrokinetic ordering may only affect the radial electric field locally, but not on a radial average taken over a few ion gyroradii. Finally, two-fluid equations [2] are employed to estimate the size of a tokamak toroidal field ripple capable of modifying the axisymmetric Pfirsch- Schlüter radial electric field predictions [3]. [1] P. Helander and A. N. Simakov, submitted to Phys. Rev. Lett. [2] P. J. Catto and A. N. Simakov, Phys. Plasmas **11**, 90 (2004). [3] P. J. Catto and A. N. Simakov, Phys. Plasmas **12**, 012501 (2005).

[1]Work supported in part by US DOE grant DE-AC52-06NA-25396 at LANL.

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Date submitted: 14 Jul 2008 Electronic form version 1.4