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Magnetic Field Dependence of the Diffusion Coefficient in Asymmetry-Induced Transport[1] D.L. EGGLESTON, J.M. WILLIAMS, Occidental College — The dependence of the asymmetry-induced radial particle flux Γ on axial magnetic field B is complicated by the fact that the field enters the physics in at least two places: in the asymmetry-induced first order radial drift velocity $v_r = E_\theta/B$ and in the zeroth order azimuthal drift velocity $v_\theta = E_r/B$. To separate these, we assume the latter always enters the physics in the combination $\omega - l\omega_R$ where $\omega_R(r) = v_\theta/r$ is the column rotation frequency and ω and l are the asymmetry frequency and azimuthal mode number, respectively. We then select from a Γ vs r vs ω data set those points where $\omega - l\omega_R = 0$, thus insuring that any function of this combination is constant. When the selected flux is plotted versus the density gradient ∇n, a roughly linear dependence is observed, showing that our assumption is valid and that we have isolated the diffusive contribution to the transport. The slope of a least-squares fitted line then gives the diffusion coefficient D. Varying the magnetic field, we find $D \propto B^{-1.33\pm0.12}$. This does not match the scaling predicted by resonant particle transport theory[2].

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[2]D.L. Eggleston and T.M. O'Neil, Phys. Plasmas 6, 2699 (1999).

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