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Radial drift to diffusion ratio in asymmetry-induced transport[1]

D.L. EGGLESTON, Occidental College — We are using a single-particle code with collisional effects to study asymmetry-induced radial transport in a non-neutral plasma. By following the time variation of the mean change and mean square change in radial position we can obtain the radial drift velocity v_D and the diffusion coefficient D as defined by the flux equation $\Gamma = -D\nabla n + nv_D$. As previously noted,[2] for asymmetries of the form $\phi_1(r)\cos(kz)\cos(\omega t - l\theta)$ and low collisionality there are two sources for the observed transport: resonant particle transport and transport produced by axially trapped particles. This latter type, which is often dominant, occurs near radii where $\omega = l\omega_R$, where ω_R is the azimuthal rotation frequency. For resonant particle transport, we find that v_D and D satisfy $v_D/D = r\omega_c(l\omega_R - \omega)/l\overline{v}^2$, a generalization of the Einstein relation for $\omega \neq 0$. For the transport produced by axially trapped particles, however, v_D/D is significantly larger than this prediction. In constrast, our experiment[3] indicates that v_D/D is significantly *smaller* than predicted. We suspect that these discrepancies indicate the need for a non-local determination of v_D and D.

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[2]D.L. Eggleston, Bull. Am. Phys. Soc. **55**, 74 (2010).
[3]D.L. Eggleston, Phys. Plasmas **17**, 042304 (2010).

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