Particle Dynamics in Asymmetry-Induced Transport: a Computational Study  
D.L. EGGLESTON, Occidental College — We have developed a simple computer code as an aid to resolving the discrepancies between our experiments\(^1\) and the theory\(^2\) of asymmetry-induced transport. The code employs the fourth-order Runge-Kutta method to advance the particles in prescribed fields matching our experiment. For a single helical asymmetry \(\phi(r) \cos(kz + l\theta - \omega t)\), significant motion in the radial direction is restricted to those particles near the resonant velocity. Both the location and the width of this resonance are consistent with expectations. When a standing wave asymmetry is used (i.e., two counter-propagating helical waves), additional dynamical behaviors are observed. Stochastic motion occurs when the resonant regions of the two waves overlap, allowing a larger population of particles to undergo large radial excursions. There is also a class of particles with restricted axial motion, as in trapped particle modes\(^3\). These particles, which also make large radial excursions, are located near the radius where \(\dot{\theta} = \omega/l\). Further progress in understanding asymmetry-induced transport may require inclusion of these effects.