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Non-resonant Particle Heating due to Collsional Separatrix Crossings[1] F. ANDEREGG, M. AFFOLTER, D.H.E. DUBIN, C.F. DRISCOLL, UCSD — We observe weak plasma heating when a pure ion column is "sloshed" back and forth across a partial trapping barrier, and coherent laser diagnostics characterize the resulting particle distributions. Here, an externally applied theta-symmetric "squeeze" potential creates a velocity separatrix between trapped and passing particles, and weak collisions at rate ν_c cause separatrix crossings. The trapped particles are repeatedly compressed and expanded (by δL) whereas the passing particles counter-stream and Debye shield the resultant potential variations. The LIF diagnostics then clearly determine the separatrix energy $E_{sep}(r)$, since the trapped and passing particle distributions are in-phase and out-of-phase with the plasma motion. The measured $E_{sep}(r)$ is in agreement with that calculated from a (r, z) Boltzmann-Poisson equilibrium solution. Theory predicts heating from separatrix crossings scaling as $\nu_c^{1/2} E_{sep}^2 (\delta L/L)^2$, distinct from bulk viscosity heating scaling as ν_c^1. Experimental scalings with density and temperature will allow direct comparison to theory.

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Francois Anderegg
UCSD

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