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Non-Resonant Particle Heating Due to Collisional Separatrix Crossings[1] F. ANDEREGG, M. AFFOLTER, D.H.E. DUBIN, C.F. DRISCOLL, University of California San Diego — We observe plasma heating when a pure ion column is forced back and forth across a partial trapping barrier. Here, an externally applied axisymmetric "squeeze" potential V_s creates a velocity separatrix between trapped and passing particles. Weak collisions between these two populations at rate ν_c causes diffusion across the separatrix, leading to irreversible heating. The observed heating rate scales as $\dot{T}/T \propto (\delta L/L)^2 \ \sqrt{\nu_c \ f_{sl}} \ \ V_s^2/T^2$, where $\delta L/L$ is the amplitude of the forced "sloshing" oscillation, and f_{sl} is the applied sloshing frequency. These experiments verify the $(\delta L/L)^2$, and the $\sqrt{f_{sl}}$ dependence that is characteristic of collisional separatrix crossing. The particle velocity distribution function of the oscillating plasma is measured directly with coherent Laser Induced Fluorescence, and shows passing and trapped particles having an out of phase response with respect to the applied oscillations which is responsible for the observed heating.

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