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**Collision Rate Measurements in Mildly Correlated Ion Plasmas.**[1]
F. ANDEREGG, D.H.E. DUBIN, C.F. DRISCOLL, T.M. O'NEIL, UCSD — In strongly magnetized single component plasmas, collisional equipartition of $T_\parallel$ and $T_\perp$ is strongly suppressed by an adiabatic invariant, but enhanced by correlation effects.[2] In essence, equipartition occurs only due to rare close collisions, and correlated particle Coulomb-screening makes them somewhat more likely. We conduct experiments with $10^6$ to $10^8$ $Mg^+$ ions in a Penning-Malmberg trap at $B = 3$T. For density $n = 10^6$, laser cooling parallel to $B$ gives $T_\parallel = 0.1$K and $T_\perp = 1$K, resulting in a correlation parameter $\Gamma = 3$. When the cooling is halted, $T_\parallel$ rises slowly ($\sim 1$K/sec) due to weak neutral collisions, then rises abruptly as the equipartition rate becomes large. The abrupt equipartition is sometimes observed to occur spontaneously, especially when the plasma is contaminated by multiple ion species. Alternately, we can trigger the equipartition with an applied local heat pulse, and measure the "burn front" propagation. Experimental results will be compared to theories of correlation-enhanced equipartition, including the effects of heat transport due to long-range collisions.

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[2]D.H.E. Dubin, Phys. Rev. Lett. **94**, 025002 (2005); M.J. Jensen *et al.*, Phys. Rev. Lett. **94**, 025001 (2005).

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