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Collisional Relaxation of a Strongly Magnetized, Two-Isotope, Pure Ion Plasma[1] C.Y. CHIM, T.M. O'NEIL, D.H.E. DUBIN, UCSD — The collisional relaxation of a strongly magnetized pure ion plasma[2] that is composed of two species with slightly different mass is discussed. We assume the ordering $\Omega_{C1}, \Omega_{C2} \ll |\Omega_{C1} - \Omega_{C2}| \ll v/b$, where Ω_{C1} and Ω_{C2} are the two cyclotron frequencies, v is the thermal velocity, and b is the classical distance of closest approach. We find that the total cyclotron action for the two species I_1 and I_2 are adiabatic invariants conserved on the timescale of a few collisions, so the Gibbs distribution relaxes to the form $\exp[-H/T - \alpha_1 I_1 - \alpha_2 I_2]$, where α_1 and α_2 are thermodynamic variables like the temperature T. On a timescale longer than the collisional timescale, the two species share action so that α_1 and α_2 relax to a common value α. During this process, $< I_1 > + < I_2 >$ remains constant. On an even longer timescale, the total action ceases to be a good constant of the motion and α relaxes to zero, yielding the usual Gibbs distribution $\exp[-H/T]$.

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[2]P.J. Hjorth and T.M. O'Neil, Phys. Fluids **26**, 2128(1983); M.E. Glinsky, *et al.*, Phys. Fluids B **4**, 1156 (1992).

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