Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Results in Guiding-center Kinetic Theory (Applicable to Antimatter Synthesis)[1] R. STOWELL, MIT — Three new results are presented. (1) The first expression valid at all points in space for the dynamical Debye response of a plasma to a moving charged particle is presented. Previous results (Oberman '70) are valid very far from a super- thermal charged particle in a thermally equilibrated plasma without a magnetic field. In contrast, the present result is valid everywhere and for a particle of any velocity in a guiding-center ($\omega_p^2/\omega_c^2 \ll 1$) plasma with any distribution function. (2) Of several new collision operators derived, the one corresponding to the spatially localized generalization to multiple species of the Dubin-O'Neil operator (Dubin and O'Neil '97) is studied in detail. For the first time, the integral over wave number is removed by evaluation from an analog (the present analog) of the Balescu-Guernsey-Lenard (BGL) operator. While this operator provides the leading-order contribution due to collisions, it is found not to thermally equilibrate most plasmas. (3) Using a result from differential topology, the Penrose criterion for kinetic stability (Penrose '60) is generalized to give the number of unstable modes of a plasma for any given wave number. In contrast, the Penrose criterion indicates whether at least one unstable mode exists.

[1]Research supported by the U.S. Dept. of Energy and, in part, by the Office of Naval Research

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Date submitted: 22 Jul 2005 Electronic form version 1.4