HIGH ENERGY ION DEPLETION IN THE
CHARGE EXCHANGE SPECTRUM OF ALCATOR C

by

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ABSTRACT

A three-dimensional, guiding center, Monte Carlo code is developed to study ion orbits in ALCATOR C. The highly peaked ripple of the magnetic field of ALCATOR is represented by an analytical expression for the vector potential. The analytic ripple field is compared to the resulting magnetic field generated by a current model of the toroidal plates; agreement is excellent. Ion-Ion scattering is simulated by a pitch angle and an energy scattering operator. The equations of motion are integrated with a variable time step, extrapolating integrator.

The code produces collisionless banana and ripple trapped loss cones which agree well with present theory. Global energy distributions have been calculated and show a slight depletion above 8.5 keV. Particles which are ripple trapped and lost are at energies below where depletion is observed. It is found that ions pitch angle scatter less as energy is increased. The result is that, when viewed in velocity space, ions form "probability lobes" the shape of mouse ears which are fat near the thermal energy. Therefore, particles enter the loss cone at low energies near the bottom of the cone.

Recommendations for future work include improving the analytic model of the ripple field, testing the effect of $\nabla \cdot B=0$ on ion orbits, and improving the efficiency of the code by either using a spline fit for the magnetic fields or by creating a vectorized Monte Carlo code.

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