Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Drift of circulating orbits due to toroidal electrical field XIAOYIN GUAN, HONG QIN, NATHANIEL J. FISCH, Princeton University — The drift orbit of circulating particles in a tokamak geometry with a toroidal electric field is studied. Unlike trapped particles, which move significantly due to the Ware-pinch effect, circulating particles deviate far less across flux surfaces. The orbits of circulating particles drift away from the center of tokamak with a velocity smaller than the ware pinch velocity, but larger than the $\mathbf{E} \times \mathbf{B}$ drift velocity. For trapped particles, the Ware pinch effect is accompanied by acceleration in the parallel direction. Thus, trapped particles first are pinched inward, then untrapped and then the resulting untrapped particles drift outwards. Thus, trapped particles first are pinched inward, are then untrapped, and then the resulting untrapped particles drift outwards. This effect may be relevant to toroidal rotation observed in the presence of lower hybrid (LH) waves, where resonant trapped particles may be pinched inward, whereas resonant circulating particles may drift away from the center of tokamak. Both transport mechanisms could affect the radial electric field, which generates the rotation in the toroidal direction.

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Date submitted: 17 Jul 2009 Electronic form version 1.4