

Abstract Submitted
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Extended 3D MHD simulations of q-profile evolution spheromaks

SIMON WOODRUFF, NATHAN MATTOR, JENNIFER BAERNY, JAMES STUBER, Woodruff Scientific Inc — The profile evolution of spheromaks from $S \sim 10^3$ to $S \sim 10^7$ is examined by use of the NIMROD code [1] for the PBX (minor radius, $a \sim 6$ cm, $B \lesssim 0.1$ T) and ACE ($a \sim 10$ cm, $B \lesssim 0.5$ T) experiments [2], and a next-step device that compresses a plasma from $a_0 \simeq 0.5$ m to $a_f = 0.15$ m (with a convergence ratio, $C = a_0/a_f$ of 3), and following usual adiabatic scaling relations to $T_e \sim 5$ keV. q-profile evolution is determined mainly by resistive decay, observing the evolution of toroidal modes as mode-rational surfaces enter the plasma and grow islands (like [3][4]). However, at high S , resistive dissipation times are long, so dq/dr is compared with tilt growth rate for conformal walls to the no wall limit. Evidence of pressure-limiting behavior is presented. Dynamic simulations of spheromaks undergoing a compression are also presented, and predicted effects [5] of toroidal rotation are examined due to conservation of momentum during compression.

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