Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Characteristic time for halo current growth and rotation[1] ALLEN BOOZER, Columbia University — Halo currents, I_h, flow in part through plasma on open magnetic lines and in part through the walls. A halo current has the same function as the wall current of a resistive wall mode and arises when a kink cannot be wall stabilized. When flowing in the plasma, the halo current can produce no forces, so $\vec{j}_h = (j_{||}/B)\vec{B}$ with $\vec{B}\cdot\vec{\nabla}j_{||}/B = 0$. To avoid too strong a coupling to stable kinks, the wall interception must be of sufficient toroidal extent, which implies the width of the halo current channel $\Delta_h \approx aI_h/I_p$, where aI_h/I_p is the amplitude of the kink, a is the minor radius, and I_p is the plasma current. The equation for the growth of the halo current is $dI_h/dt = I_p/\tau_g$, where $\tau_g \approx (\mu_0/\eta_h)(a^2/4)/s_{eff}$ and s_{eff} is a dimensionless stability coefficient. The rocket effect of the plasma flowing out of the two ends of the magnetic field lines in the halo can set the magnetic perturbation into toroidal rotation at a Mach number, M_h, comparable to unity. The rotation period is $\tau_r = (2\pi R_0/C_s)/M_h$, where R_0 is the major radius and $C_s = \sqrt{(T_e+T_i)/m_i}$ is the speed of sound. NSTX results appear consistent for $s_{eff} \sim 0.5$, $M_h \sim 1$, and $T_{e,i} = 10$eV.

[1]This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Fusion Energy Sciences under Award Number De-FG02-03ER54696.

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Date submitted: 23 Jul 2015

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