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Error field penetration and locking to the backward wave JOHN FINN, Los Alamos National Laboratory, ANDREW COLE, Columbia University, DYLAN BRENNAN, Princeton University — Error field penetration involves driving a stable tearing mode in a rotating toroidal plasma. In this paper it is shown that locking for modes with real frequencies ω_r differ from conventional results. The reconnected flux for modes with frequencies $\pm\omega_r$ in the plasma frame is maximized when the frequency of the stable backward mode ($-\omega_r$) in the lab frame is zero, i.e. when $v = \omega_r/k$. Notably, the locking torque is exactly zero at $v = \omega_r/k$, with a pronounced peak at just higher rotation, leading to a locked state with plasma velocity just above ω_r/k. Real frequencies are known to occur due to the Glasser effect for modes in the resistive-inertial (RI) regime. This therefore leads to locking of the plasma velocity to just above $v = \omega_r/k$. Also, similar real frequencies can occur in the visco-resistive (VR) regime with pressure, and the locking torque is similar to the RI result. Real frequencies occur due to diamagnetic effects in other tearing mode regimes and also show this effect. Nonlinear effects on the mode amplitude and torque for weakly stable modes or large error fields are discussed. We discuss the possibility of applying external fields of different helicities to drive sheared flows.

John Finn
Los Alamos National Laboratory

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