

Bifurcation-driven vertical plasma displacement

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The vertical motion of the plasma current during the current quench phase of the uncontrolled major disruption is described analytically. The presented filament-based model interprets the vertical displacement event in the ideal wall limit as an adiabatically slow evolution of the plasma equilibrium. The initial pre-disruption equilibrium becomes unstable in a pitchfork bifurcation. The bifurcation occurs when the decaying plasma current passes a critical value determined by the external magnetic field. Minimizing the threshold plasma current is desirable to reduce the disruption-induced mechanical and heat loads on the first wall.

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