Mechanisms for Electron Transport Barrier Formation in the DIII–D Tokamak

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The E×B shear stabilization paradigm explains much of the phenomenology of ion thermal transport in tokamaks. Behavior in the electron channel, however, has continued to challenge our understanding. Recent experiments in DIII–D and elsewhere produce regions where electron thermal transport is almost completely eliminated with intense, localized, direct electron heating. Simulations of DIII–D discharges identify α-stabilization, local magnetic shear stabilization due to the Shafranov shift, as the dominant turbulence reduction mechanism in these experiments and may point the way toward regimes with simultaneous electron and ion internal transport barriers.

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