Resistive Interchange Modes in Negative Central Shear Tokamaks with Peaked Pressure Profiles

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Abstract

Resistive interchange modes can be driven unstable by large pressure gradients in the negative central magnetic shear (NCS) region of advanced tokamaks. Localized stability analysis reveals that the resistive interchange stability criterion ($D_{\mathrm{R}} \leqslant 0$) is violated in this region, and unstable $n = 1$ localized resistive magnetohydrodynamic (MHD) modes are computed using the resistive MHD code MARS. In DIII–D NCS plasmas these instabilities appear as bursting MHD activities, constituting the first identification of resistive interchange in a high temperature tokamak experiment. These bursts also appear to play a role in triggering disruptions.

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