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Current interchange tearing modes as explanation of tokamak anomalous transport: intermittent/blob formation and transport barrier[1]
L.J. ZHENG, J.W. VAN DAM, University of Texas at Austin, Institute for Fusion Studies — We show that, in addition to usual neoclassical tearing modes, another type of non-classical tearing mode exists in tokamaks: viz., current interchange tearing modes (CITMs). CITMs are directly driven by unstable electromagnetic and electrostatic modes of the interchange type (e.g., interchange/ballooning modes, drift waves, etc.). Since interchange-type modes exchange not only thermal and magnetic energies, but also current, between flux tubes, a current sheet can be created at a mode resonance surface and a CITM can be excited. The CITMs might provide an alternative explanation for certain aspects of tokamak anomalous transport. Instabilities of the interchange type could be directly converted into CITMs, instead of forming turbulent eddies through nonlinear coupling as in conventional transport theories. In that case, the radial transport step-size would be enlarged via the formation of magnetic islands and their reconnection. In particular, CITMs could help explain the formation of blob filamentary (or intermittent) structures and of transport barriers in reversed-shear configurations, as observed experimentally.

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