"Energetic Particle Stability and Confinement Issues in 3D Configurations"

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Configurations with three-dimensional equilibrium variations cover a full spectrum of systems ranging from optimized, compact stellarators to tokamaks with low levels of TF (toroidal field) ripple. Symmetry-breaking effects in the magnetic field structure can lead to new couplings in the Alfvénic mode structure and enhanced energetic particle loss rates. A number of numerical tools have recently been developed for understanding and evaluating these effects. The STELLGAP and AE3D codes calculate the shear Alfvén gap structure and compute the Alfvén eigenmode spectrum for aribitrary configurations. The DELTA5D guiding center collisional slowing down code follows energetic ions in parallel and can be applied either to quiescent plasmas or plasmas with externally imposed Alfvén turbulence. The applications of these models to experiments (such as HSX, LHD, and CHS) where Alfvén instabilities have been observed will be discussed. Also, the evaluation and implications of ripple and other symmetry-breaking effects in ITER, using self-consistent finite beta VMEC equilibria will be described.

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