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A Detailed Study of Kinetic Effects of Energetic Particles on Resistive MHD Stability[1] R. TAKAHASHI, D.P. BRENNAN, University of Tulsa, C.C. KIM, University of Washington — Kinetic effects of energetic particles can play a crucial role in the stability of the 2/1 tearing mode in tokamaks such as JET, JT-60U, and DIII-D, where the fraction of energetic particle $\beta_{frac} = \beta_h/\beta$ is high. Using model equilibria based on experimental reconstructions, the non-ideal MHD stability, linear, and nonlinear growth and evolution of the 2/1 mode is investigated including a δf PIC model for the energetic particles coupled to the MHD solution. The linear growth of eigenfunctions is calculated at various $\beta_N$and S ranging from the resistive unstable to the ideal unstable regime. Initial nonlinear effects are also investigated. It has been observed that energetic particles have significant damping and stabilizing effects at experimentally relevant β_N, β_{frac}, and S, and less weaker damping and stabilizing effects inat the ideal unstable regime, and cause a real frequency of the 2/1 mode. These results suggest that a qualitative extrapolation is reasonable for what to expect from energetic particle effects on resistive MHD modes in ITER.

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