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Kinetic effects of energetic particles on resistive MHD stability[1]
RYOJI TAKAHASHI, DYLAN BRENNAN, University of Tulsa, CHARLSON KIM, University of Washington — It is shown that the 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 β is high. Using model equilibria based on experimental reconstructions from DIII-D, the non-ideal MHD stability, linear, and nonlinear evolution of the 2/1 mode is investigated including a delta-f kinetic model for the energetic particles coupled to the MHD solution. The growth of unstable modes is calculated at a series of $\beta_N/4l_i$ and S, spanning from the resistive to the ideal unstable regime of the mode. It is observed that energetic particles have significant damping and stabilization effects at higher energetic paricle fractions (β_{frac}) and S, and cause precession of the 2/1 mode. Furthermore, our extrapolated results are discussed for implications to ITER, where the effects are projected to be significant.

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