On Theoretical Research for Nonlinear Tearing Mode

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The analytical approaches for nonlinear tearing mode have been reviewed. It is shown that Rutherford' model has triggered numerous studies on the nonlinear tearing mode.

Its physical picture was clear meanwhile its mathematical method is ingenious but still puzzling to understand. It is trying to find how the "nonlinear behavior" resulted from the linear equation by a nonlinear transform. It is indicated that Li' model for the tearing mode includes the linear growth, Rutherford's behavior and the new behavior. It was found that the quasilinear modification of magnetic field provided a new damping mechanism for nonlinear growth. The new behavior $w \sim t^{1/2}$ becomes dominant if the mode is weakly unstable. It is shown that many analytical methods have been developed to calculate the criterion parameter Δ' of the tearing mode. Li's instability criterion can cover the previous results in the limit cases.