Nonlinear Tearing Modes in Finite-Beta Tokamaks with Noncircular-Cross Sections

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The numerical calculations have been performed for nonlinear interactions of tearing modes in finite-beta tokamaks and we have investigated effects of finite beta and triangularity of the plasma poloidal cross section on them. In tokamaks it is observed that these modes are destabilized in a pre-disruption phase and believed to form ergodic magnetic fields that often lead to major disruptions. Typically finite-beta effects lower the growth rate of tearing modes. However, when the beta value increases, the shift of magnetic axis can decrease the distance between magnetic islands, which can enhance their nonlinear interactions and result in ergodic magnetic fields. In the present work, we have evaluated these effects by varying beta values and the shape of the plasma poloidal cross section, using a three-dimensional code to solve reduced MHD equations in toroidal geometry. The code is based on the finite-element method (FEM) with unstructured triangular elements in the poloidal plane and the fourier decomposition in the toroidal direction.
*deceased

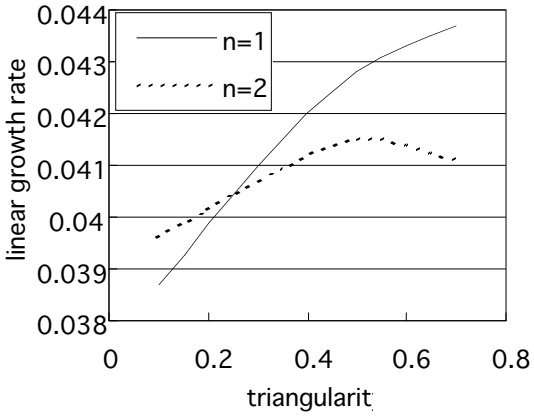

Fig.1
The linear growth rates for the n=1 and n=2 modes vs. triangularity.

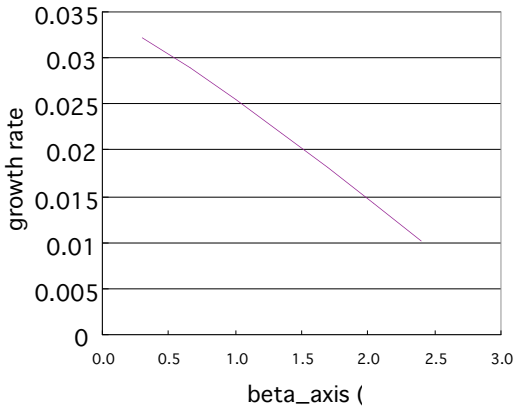

Fig.2
The linear growth rate for the n=1 mode vs. .