24aYG-7 Stabilization mechanism of the double tearing modes in the presence of sheared flows

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The revised magnetic shear (RMS) configuration is beneficial for improving confinement performance due to the stabilization of the pressure driven instabilities. However such configuration can produce double current sheets so that a very violent MHD instability, referred as to the double tearing mode (DTM), can be excited [1]. On the other hand, sheared flows are generated in tokomak plasmas, The flow shear usually plays a key role in stabilizing various micro-instabilities and also macro-scale MHD fluctuations, including the kink/tearing modes and the DTM.

The DTM is characterized by both symmetrical and asymmetrical islands, which shows two eigen mode states. These can coexist and the asymmetrical mode is always more unstable than the symmetrical one. In this work, the evolution of DTM in the presence of asymmetric sheared flow profile is numerically simulated based on a reduced MHD model in slab geometry to understand the stabilization mechanism of the sheared flows. It is found that small sheared flow stabilizes DTM with asymmetrical island and destabilizes the symmetrical DTM through distorting the eigen mode structure of the magnetic fluctuation. When the distortion makes two eigen modes have the same structures, an oscillating growth of fluctuation energy appears, and the growth rates increase slightly. It is identified that this oscillatory growth results from the superposition of the two linearly-independently propagating eigen-modes in opposed directions due to the asymmetrical flows. Furthermore, the effect of the Alfven resonance[2] on the stabilization/destabilization mechanism due to the flow effects is also discussed.

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