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# Simulations of Alfven Eigenmode Destabilized by Energetic Electrons and Energetic Electron Effects on Energetic-Ion Driven Alfven Eigenmode

*Thursday, 5 September 2019 12:00 (25 minutes)*

Energetic electron driven toroidal Alfven eigenmodes (TAEs), which have been observed in many devices (COMPASS-D[1], C-MOD[2], HL-2A[3]) with high-power ECW and LHW heating, are investigated using a hybrid simulation code MEGA in a tokamak plasma [4]. Considering the interaction between energetic electrons and Alfven eigenmodes, energetic electron effects on TAE excited by energetic ions are further investigated, as active control of Alfven eigenmodes using ECH can also produce a considerable number of energetic electrons. Firstly, an energetic electron driven TAE propagating in the electron diamagnetic drift direction is found using MEGA. The resonance condition for energetic electrons shows both passing and trapped energetic electrons can resonate with TAE. However, the energy transfer from energetic electrons to bulk plasma shows that only trapped energetic electrons contribute to the mode destabilization. Main reasons for little energy transfer of passing energetic electrons are the spatially localized resonance region and small orbit width. Only those passing energetic electrons located closely to rational surfaces can resonate with the mode. In order to investigate the energetic electron effects on energetic ion driven TAE, both energetic ions and energetic electrons described by kinetic equations are included in the simulation model. An obvious stabilization of TAE is found when an off-axis peaked energetic electron beta profile is employed. Further increasing the energetic electron beta can even fully suppress the energetic ion driven TAE. It is found that the stabilizing effect comes from the energetic electron beta profile, as shown in Fig. 1. The decrease of the linear growth rate is mainly due to the decrease of energetic ion driving rate, rather than the increase of the damping rate. Besides, the energetic electron beta profile can also affect the TAE frequency. Both downshift and upshift of mode frequency are found, which is dependent on the gradient of energetic electron beta profile.

**References**

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