Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Dynamic evolutions of toroidal Alfven eigenmodes driven by energetic particles ZHIWEI MA, JIA ZHU, Zhejiang University, GUOYONG FU, PPPL, Princeton University — A kinetic simulation code based on a reduced model is developed to study dynamic evolutions of a single/multiple toroidicity-induced shear Alfven eigenmode (TAE) driven by energetic particles. In single TAE simulations, it is found for zero background damping that the wave amplitude in nonlinear phase can either saturate for weak particle drives or slowly increase for strong drives. This slow nonlinear growth in strong drive cases is found to be associated with broadening and overlapping of resonances between the wave and trapped particles. For the near-marginal-stability case with a large background damping, the mode nonlinear evolution exhibits strong upward and downward frequency chirping in multiple branches. An hole/clump formation is observed clearly in the corresponding evolution of particle distribution. In multiple TAE simulations, passing particles are found to cause a longer duration of the linear growth phase if resonant regions of two modes are quite perfectly overlapped. But deeply trapped particles play a dominant role on the nonlinear growth no matter whether the resonant regions of two modes are overlapped or not. From anisotropic and isotropic simulations, it is suggested that passing particles have a negative effect on the mode nonlinear development. For the near marginal stability case, the upward and downward frequency chirping in multiple branches are affected due to multiple mode interaction effect.

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Date submitted: 04 Jul 2013 Electronic form version 1.4