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Excitation of Low Frequency Alfven Eigenmodes in Toroidal Plasmas ZHIHONG LIN, University of California, Irvine — Low frequency Alfven eigenmodes in toroidal geometry, such as beta-induced Alfven-acoustic eigenmode (BAAE) and beta-induced Alfven eigenmode (BAE), can cause significant loss of energetic particles in fusion plasmas. Our global gyrokinetic toroidal code (GTC) simulations find that unstable BAAE and BAE can be simultaneously excited with similar radial mode width and comparable linear growth rates even though the damping rate of BAAE is much larger than BAE in the absence of energetic particles. This surprising result is attributed to non-perturbative effects of the energetic particles that modify ideal MHD mode polarizations and nonlocal geometry effects that invalidate radially local acoustic dispersion relation. GTC simulations with various tokamak sizes show that dominant mode changes from the BAAE in a larger tokamak to the BAE in a smaller tokamak due to the dependence of wave-particle resonance condition on the tokamak size. In nonlinear GTC simulations, the lower frequency BAAE is nonlinearly driven after BAE saturates in the realistic simulation of a DIII-D experiment where low frequency Alfven eigenmodes are responsible for half of the fast ion loss. In collaborations with Yaqi Liu, Huasen Zhang, Wenlu Zhang.

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