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High-β Alfvén Eigenmodes Excited by Energetic Particles in Toroidal Plasmas[1] SHUANGHUI HU, University of California at Irvine, LIU CHEN, University of California at Irvine, GUOYONG FU, Princeton Plasma Physics Laboratory — We have further generalized the theoretical formalism of αTAE [*Hu and Chen*, 2005] to the high-β regime by including the energetic-particle compressional dynamics in the perpendicular Ampere's law. The αTAEs are high-n discrete Alfvén eigenmodes trapped by the α-induced potential wells in high-β second-balloning-mode stable toroidal plasmas and, hence, can exist independently of the toroidal Alfvén frequency gap; in contrast to the usual TAE (toroidicity-induced Alfvén eigenmode) [*Cheng, Chen, and Chance*, 1985]. Here, α denotes the ballooning drive due to pressure gradient and curvature, β is the ratio of plasma to magnetic pressures, and n is the toroidal wavenumber. Adopting the usual toroidal plasma orderings, we follow the standard linear gyrokinetic approach [*Chen and Hasegawa*, 1991] to obtain a set of equations for both the perpendicular and parallel magnetic perturbations along with the nonadiabatic response of energetic particles. While the sound waves are suppressed due to shortening of the parallel electric field by core electrons, both shear Alfvén and slow magnetic compressional modes (*e.g.*, mirror mode) are retained. Implications of αTAE to advanced tokamaks with negative magnetic shear and ITER parameter regime will also be presented.

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