PHYSICS OF PLASMAS **18**, 052506 (2011)

Electromagnetic effects of kinetic geodesic acoustic mode in tokamak plasmas

Lingfeng Wang,[1,a)] J. Q. Dong,[1,2] Y. Shen,[1] and H. D. He[1]
[1]*Southwestern Institute of Physics, Chengdu 610041, China*
[2]*Institute for Fusion Theory and Simulation, Zhejiang University, Hangzhou 310027, China*

(Received 15 February 2011; accepted 24 April 2011; published online 27 May 2011)

Electromagnetic effects of the kinetic geodesic acoustic modes (KGAMs) are numerically studied in low β(= plasma pressure/magnetic pressure) tokamak plasmas. The parallel component of the perturbed vector potential is considered along with the electrostatic potential perturbation. The finite Larmor radius and finite orbit width of the ions as well as electron parallel dynamics are all taken into account. Systematic harmonic and ordering analysis is performed for collisionless damping of the KGAMs, assuming $\beta \sim (\kappa\rho_i)^2$, where $\kappa$and $\rho_i$are the radial component of the KGAM wave vector and the Larmor radius of the ions, respectively. It is found that the electron parallel dynamics enhances the damping of the electrostatic KGAM modes when the safety factor is high. In addition, the electromagnetic (finite β effect is revealed to enhance and weaken the damping of the modes in plasmas of low and high safety factor $\sim$2.0 and 5.5, respectively. The harmonic features of the KGAMs are discussed as well. © *2011 American Institute of Physics*. [doi:10.1063/1.3590892]