Abstract Submitted
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Energetic Particle-induced Geodesic Acoustic Mode GUOYONG FU, Princeton University — A new n=0 Energetic Particle-induced Geodesic Acoustic Modes (EGAM) is shown to exist based on analytic theory and numerical simulation [1]. Unlike the conventional GAMs driven nonlinearly by plasma microturbulence, the new mode is found to be linearly driven by energetic particles with free energy associated with anisotropic particle distribution function. An integral differential equation is derived for EGAM including the non-perturbative effects of energetic particles with finite orbit width. Analysis shows that when the energetic particle pressure is comparable to the thermal pressure, the frequency of EGAM is substantially lower than the local GAM frequency associated with thermal species. Furthermore, the new mode has a global radial structure with the mode width determined by the energetic particle drift orbit width. For typical experimental parameters in reversed shear plasmas, the mode width can be quite large. Nonlinear simulation results show initial saturation due to the flattening of particle distribution function in velocity space. A bursting feature of the mode amplitude is found following the initial saturation. These results are consistent with the recent experimental results of the beam-driven GAM-like n=0 mode in DIII-D [2]. In particular, the calculated mode frequency and the global radial structure agree well with the experimental observations. [1] G. Y. Fu, Phys. Rev. Letts. 101, 185001 (2008) [2] R. Nazikian et al., Phys. Rev. Letts. 101, 185001 (2008).

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