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Simulations of Energetic Particle Driven Geodesic Acoustic Mode and Global Alfven Eigenmode in 3-dimensional LHD Equilibrium

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Energetic particle driven geodesic acoustic mode (EGAM) and Global Alfven eigenmode (GAE) in a 3-dimensional Large Helical Device (LHD) equilibrium are investigated using MEGA code. MEGA is a hybrid simulation code for energetic particles interacting with a magnetohydrodynamic (MHD) fluid. It is found that the n=10 harmonics of the 3-dimensional LHD equilibrium bring about the coupling between the n=0 and 10 harmonics for the spatial profile of the EGAM. In addition to the EGAM with the frequency ˜75kHz, a GAE with the dominant harmonic m/n=1/0 and the frequency ˜480kHz is discovered in the simulation. The emergence of the n=0 GAE can be attributed to the avoidance of the continuum damping with the n=0 shear Alfven continua in the LHD plasma with the negative monotonic magnetic shear. In the nonlinear evolution, the frequency chirping of the EGAM, which is observed in the LHD experiments, and the frequency splitting of the GAE to the multiple peaks take place. The average of the poloidal flow takes a positive value, which indicates the generation of the negative radial electric field due to the redistribution of energetic ions.

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