Gyrokinetic simulations of anisotropic energetic particle driven geodesic acoustic modes in tokamaks

B. Rettino[1], T. Hayward-Schneider[1], A. Biancalani[2,1], A. Bottino[1], Ph. Lauber[1], I. Chavdarovski[3], M. Weiland[1], F. Vannini[1], F. Jenko[1]

[1]Max-Planck-Institut für Plasmaphysik, 85748 Garching, Germany
[2]Léonard de Vinci Pôle Universitaire, Research Center, 92916 Paris la Défense, France
[3]Korea Institute of Fusion Energy, 34133 Daejeon, South Korea

Abstract

Energetic particles produced by neutral beams are known to excite energetic-particle-driven geodesic acoustic modes (EGAMs) in tokamaks. We study the effects of anisotropy of distribution function of the energetic particles on the excitation of such instabilities with ORB5, a gyrokinetic particle-in-cell code. Numerical results are shown for linear electrostatic simulations with ORB5. The growth rate is found to be sensitively dependent on the phase-space shape of the distribution function. The behavior of the instability is qualitatively compared to the theoretical analysis of dispersion relations. Realistic neutral beam energetic particle anisotropic distributions are obtained from the heating solver RABBIT and are introduced into ORB5 as input distribution function. Results show a dependence of the growth rate on the injection angle. A qualitative comparison between the numerical results and experimental measurements in ASDEX Upgrade is presented. An explanation for the remaining quantitative difference is proposed.