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**A Non-Perturbative Eigenvalue Code for Gyrokinetic Simulation of Alfven Instabilities in Tokamaks** YUE-YAN LI, Institute for Fusion Theory and Simulation, Department of Physics, Zhejiang University, SHUANG-HUI HU, College of Physics, Guizhou University, YONG XIAO, Institute for Fusion Theory and Simulation, Department of Physics, Zhejiang University — Drift Alfven Energetic Particle Stability (DAEPS), a non-perturbative eigenvalue code under intense development, is a comprehensive linear instability FEM code to investigate the physics of various unstable Alfven modes observed in toroidal fusion plasmas., which can be excited by either energetic particle or thermal particles. The energetic particle and thermal particles are treated on an equal footing in DAEPS. DAEPS can calculate accurately and efficiently eigen frequency and growth rate, as well as the asymptotic behavior of drift Alfven wave instability based on an eigenvalue approach for different boundary conditions. The model equations of DAEPS include essential physics ingredients such as plasma non-uniformity, pressure anisotropy, field line curvature, finite Larmor radius, wave-particle interaction, and etc. We here show the current development status of the DAEPS code and its capabilities on a number of prominent physics scenarios, e.g., BAE, BAAE and KBM excited by thermal particle, TAE excited by passing energetic particle, and $\alpha$TAE excited by trapped energetic particle, which are carefully benchmarked with other codes and theories within satisfactory accuracy.

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