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Gyrokinetic investigation of the dynamics of Alfvénic instabilities in ASDEX Upgrade

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In the present work, Alfvén modes are investigated by means of simulations performed with the global, gyrokinetic, particle-in-cell code **ORB5**. The obtained results are compared with the outcomes from the gyrokinetic, non-perturbative, eigenvalue solver **LIGKA**.
Results of global, collisionless simulations with both analytical and experimental Tokamak magnetic equilibria are discussed. Comparison with analytical predictions is shown for equilibria with small and realistic inverse aspect ratio. The principal studies performed have been focused on the understanding of the two main damping mechanisms of the Alfvénic instabilities, i.e. the continuum damping and the Landau damping.
The dependence of the dispersion relation and of the damping rate on the finite electron mass has also been analyzed. As an application, the experimental magnetic equilibrium and plasma profiles of the **NLED AUG case** have been considered. The frequency spectra of the Alfvén modes have been investigated with **ORB5**. The energetic particle's density profile has been modified, considering both on-axis and off-axis profiles and varying their slope. Toroidal Alfvén Eigenmodes (TAE) and energetic-particle-driven modes (EPM) have been observed. The study of their main damping mechanisms is also discussed.

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