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# P1.1024 Long range frequency sweeping of global Alfven eigenmodes

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In magnetic fusion devices, unstable Alfvén eigenmodes (AEs) may lead to frequency sweeping events and enhanced particle transport. Refs. [1, 2] explain the frequency sweeping events in terms of evolution of coherent structures, namely holes and clumps, in the energetic particles (EPs) phase-space using a perturbative approach. This approach implies small deviations of frequency from the initially unstable linear mode, as the spatial structure of the mode is fixed. A nonperturbative adiabatic model was then developed in Ref. [3] to study the long range frequency chirping [4, 5] of a plasma wave whose spatial structure is notably affected by EPs. The model was subsequently extended to describe the effects of EPs collisions [6, 7] and equilibrium drift orbits [8].
In the present work, we use a Lagrangian formalism and finite element method to study the hard nonlinear frequency sweeping of a Global Alfvén eigenmode (GAE). We focus on the evolution of the radial structure of the eigenfunction. The eigenfunction is represented by a single poloidal and toroidal mode number. Toroidal effects are retained on EPs dynamics in a high aspect ratio tokamak limit. We track the evolution of frequency using the balance between the energy extracted from the EPs distribution function and the energy deposited into the bulk plasma. The model can be used to study the adiabatic frequency chirping of the Alfvén gap modes observed in experiments.

References

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