Self-consistent Study of Excitation of Alfvén Eigenmodes During Ion Cyclotron Resonance Heating

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Fast ions can excite Alfvén Eigenmodes (AEs) and lead to increased transport of these ions which degrade the heating. Ion cyclotron resonance heated ions are often used in experiments to simulate the effect of destabilisation of Alfvén eigenmodes and the associated redistribution of the fast particles. Excitation of AEs by cyclotron heated ions differs from excitation by fusion born α particles not only by that the distribution functions of the former are strongly anisotropic but also by the decorrelation of the interaction between the fast ions and the AE by cyclotron interactions. The ICRH will also partly restore the locally inverted distribution functions. Interactions with ICRH will lead to discrete kicks of the orbit invariants in phase space and consequently alter the phase between the particle and EA. Stronger interactions lead to larger phase changes hence decreasing the AE interaction time and therefore increasing the extent of the resonant regions in phase space. This affects the growth rate and amplitude of the modes and can also lead to overlapping of modes which lead to a larger redistribution of the resonant particles. A self-consistent treatment of the interactions of fast ions with several AEs during ICRH has been implemented in the SELFO code. The SELFO code consists of the orbit averaged Monte-Carlo code FIDO, which solves the distribution function of the RF heated ions given the wave field, and the global wave code LION which solves the wave field given the dielectric tensor of the distribution function.