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Theoretical and Simulation Studies on the Wave and Particle Dynamics Associated with Alfvén Eigenmodes in Tokamak Plasmas

Thursday, October 16, 2014 2:00 PM (4h 45m)

In this work, we present analytical and simulation results of the wave and energetic particle (EP) dynamics associated with Alfvén Eigenmodes (AE) in tokamak fusion plasmas. It is found that (i) both the nonlinear saturation and the wave-frequency chirping dynamics of toroidal Alfvén eigenmodes (TAE) depend crucially on the EP velocity anisotropy, and exhibits features of wave-EP phase/resonance locking; (ii) the finite frequency geodesic acoustic modes (GAMs) could be spontaneously excited by TAEs and could, consequently, leading to effective saturation of TAEs; and (iii) both kinetic effects associated with short perpendicular wavelengths and current gradient term play crucial roles in the existence of downward frequency sweeping reverse shear Alfvén eigenmodes (RSAEs) in consistence with HL-2A experimental observations.

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