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Resonant Excitations of Alfven Modes in Burning Plasmas

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Energetic particle physics and Alfven waves play crucial roles in magnetic confinement fusion studies. Experimentally observed Alfven activities have been indicating potential destabilization mechanisms upon different components of particles with varied range of energy in burning plasmas. Theoretical investidgations and simulation efforts have demonstrated kinetic excitation process via wave-particle resonance conditions over the toroidal precessional frequency, the bounce frequency, and the transit frequency of ions/electrons of energetic and core plasmas. Referred to the initial value scheme of numerical simulations on alfvenic instabilities, the eigenvalue algorithm within the gyrokinetic framework is also a powerful candidate to delineate the stability characteristics of Alfven modes and the associated instabilities, including kinetic evolution interacted with particles. The present studies are preliminary efforts to detail kinetic compressions with resonance contributions upon trapped as well as passing particles with specific examples of kinetically excited Alfven waves.