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Drift kinetic analysis of alpha particle transport in tokamaks with Alfvén eigenmodes and ripple[1] ELIZABETH TOLMAN, PETER CATTO, NUNO LOUREIRO, Massachusetts Institute of Technology — Tokamak experiments fueled with deuterium and tritium have a significant population of energetic alpha particles; loss of these particles before they slow down is detrimental to experiment performance. Two powerful mechanisms for this loss are transport by Alfvén eigenmodes and ripple. Insight into alpha behavior in cases where both of these mechanisms are important in determining device alpha transport is an area of current interest. We develop a theory that can simultaneously treat alpha transport by Alfvén eigenmodes and ripple. Starting from the kinetic equation, a drift kinetic formulation capable of treating arbitrary perturbation frequency and toroidal and poloidal periodicity is derived. This formulation allows resonance between parallel streaming and ripple or mode periodicity. The resulting alpha flux is a sum of resonant contributions from ripple and Alfvén eigenmodes, showing similarity between these mechanisms. This similarity allows insight into transport in cases when ripple and mode transport simultaneously affect device alpha transport. Consequences for next-generation tokamak experiment performance are considered.

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