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Numerical implementation of action angle variables for guiding center motion

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Abstract

This work presents a numerical procedure for transforming Littlejohn's Lagrangian for charged particles in tokamak to the action-angle variables. This transformation involves construction of orthogonal magnetic field aligned coordinates. The orthogonal coordinates render a Hamiltonian description of the guiding center motion with two canonical angular momenta and corresponding angles. This procedure helps to identify the energetic particle resonances in the presence of perturbations, which simplifies simulation of the fast ion dynamics.