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Hamiltonian Map for Guiding Center Orbits in Tokamak Plasmas

One of the primary challenges associated with plasma confinement in tokamaks is the escape of energetic particles at the plasma edge. One approach to managing the flux of these particles is modifying the electric and magnetic fields in this region, thereby establishing conditions that reduce transport. To investigate which configurations of electric and magnetic fields create transport barriers that mitigate transport and improve confinement, this study employed an area-preserving map describing the guiding center orbits of particles in the plasma. This map, derived from a Hamiltonian description of particle dynamics in the plasma, enabled the construction of Poincaré sections, which made it possible to analyze the characteristics of the system's dynamics under different configurations.

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