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【802】Non-linear model-based optimization of stationary tokamak plasma profiles using RAPTOR

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The coupled dynamics of the radial profiles (magnetic and kinetic) in a tokamak are described by a set of non-linear partial differential equations. RAPTOR is a control-oriented core transport code, solving these equations based on empirical or first-principle-based models for the heat transport. The present work presents the extension of RAPTOR to allow rapid calculation of consistent stationary solutions, either imposing all actuator inputs, or the plasma loop voltage. The fast stationary state solver is embedded in a numerical optimization algorithm, yielding a valuable tool for optimization of the flat-top phase of tokamak discharges. Formulating different parameter optimization problems, this tool can rapidly explore advanced tokamak scenarios, optimizing confinement and external power requirements.

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