

Semi-analytic approach to diverted tokamak equilibria with incompressible toroidal and poloidal flows

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Abstract

Generalized Grad–Shafranov equation for tokamak equilibrium with incompressible toroidal and poloidal flows is solved to obtain a double-null diverted configuration based on an approach presented before (Shi 2008 *Plasma Phys. Control. Fusion* **50** 085006). This solution consists of only two terms of base functions obtained from the variable-separating method and suitable for describing both the internal region within the separatrix and a scrape-off layer region. Dependences of the main equilibrium properties, such as the magnetic field, plasma pressure and the equilibrium radial electric field and the plasma current on flows are revealed. In particular, we find that the presence of poloidal flow causes a deviation of the current surface from the magnetic surface and the sheared poloidal flow produces a non-zero toroidal current component that possibly affects the peeling–ballooning stability of the pedestal.

(Some figures in this article are in colour only in the electronic version)