

RESEARCH ARTICLE |
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Analytical solutions for Tokamak equilibria with reversed toroidal current

Caroline G. L. Martins; M. Roberto;
I. L. Caldas; F. L. Braga



+ [Author & Article Information](#)

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Article history 

In tokamaks, an advanced plasma confinement regime has been investigated with a central hollow electric current with negative density which gives rise to non-nested magnetic surfaces. We present analytical solutions for the magnetohydrodynamic equilibria of this regime in terms of non-orthogonal toroidal polar coordinates. These solutions are obtained

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density profiles. The zero order solution of the poloidal magnetic flux function describes nested toroidal magnetic surfaces with a magnetic axis displaced due to the toroidal geometry. The first order correction introduces a poloidal field asymmetry and, consequently, magnetic islands arise around the zero order surface with null poloidal magnetic flux gradient. An analytic expression for the magnetic island width is deduced in terms of the equilibrium parameters. We give examples of the equilibrium plasma profiles and islands obtained for a class of current density profile.

Topics

[Magnetic fields](#), [Coordinate system](#), [Perturbation theory](#), [Series expansion](#), [Magnetohydrodynamics](#), [Plasma confinement](#), [Plasma properties and parameters](#), [Tokamaks](#)

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