Analytical description of poloidally diverted tokamak equilibrium with linear stream functions

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Abstract

The tokamak plasmas in most of the present experiments and those considered for the future reactors are up-down asymmetric in nature. This asymmetry arises due to external coils and conducting structures which surround the plasma. The analytical description of these equilibria are useful for the theoretical study of stability and transport. Such a tokamak equilibrium has been constructed analytically for arbitrary aspect ratio. The asymmetric nature arises through the homogeneous part of exact solution of the Grad-Shafranov equation with a choice of pressure and toroidal function as linear in poloidal flux. These solutions can describe both single- and double-null divertor plasma with appropriate choice of plasma boundary. This has been used to construct DIII-D and ITER like equilibrium and compared with those computed numerically.

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