

Abstract Submitted
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Teaching an Old Dog an Old Trick: FREE-FIX and Free-Boundary Axisymmetric MHD Equilibrium¹ LUCA GUAZZOTTO, Auburn University — A common task in plasma physics research is the calculation of an axisymmetric equilibrium for tokamak modeling. The main unknown of the problem is the magnetic poloidal flux ψ . The easiest approach is to assign the shape of the plasma and only solve the equilibrium problem in the plasma / closed-field-lines region (the “fixed-boundary approach”). Often, one may also need the vacuum fields, i.e. the equilibrium in the open-field-lines region, requiring either coil currents or ψ on some closed curve outside the plasma to be assigned (the “free-boundary approach”). Going from one approach to the other is a textbook problem [1], involving the calculation of Green’s functions and surface integrals in the plasma. However, no tools are readily available to perform this task. Here we present a code (FREE-FIX) to compute a boundary condition for a free-boundary equilibrium given only the corresponding fixed-boundary equilibrium. An improvement to the standard solution method, allowing for much faster calculations, is presented. Applications are discussed.

[1] S. Jardin, *Computational Methods in Plasma Physics*, Taylor & Francis, Boca Raton, FL, 2010.

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