Sorting Category: 5.6.8 (Experimental/Observational)

Calculation of Free Boundary SSX Doublet Equilibria Using the FEM[1] J.A. LEUER, M.J. SCHAFFER, P.B. PARKS, General Atomics, M.R. BROWN, Swarthmore College — A finite element method (FEM) is presented for computation of the free boundary, axisymmetric equilibrium of a compact torus (CT) for use in guiding modifications to the Swarthmore Spheromak Experiment (SSX). This experiment will investigate creation and stability of a doublet shaped, field reversed configuration (FRC) formed from the merger of two counter-helicity spheromaks. The Grad-Shafranov equation is solved within a closed, cylindrical flux conserving boundary with a boundary shaping flux defined by a set of external coils. The free plasma boundary (separatrix) makes the problem non-linear. Adaptive mesh techniques and a non-linear Newton iteration method are used to solve the partial differential equations. The algorithm is validated against several analytic models. Several doublet CT configurations typical of those expected in SSX are presented.

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