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Free boundary three-dimensional anisotropic pressure equilibria
W.A. COOPER, J.P. GRAVES, M. JUCKER, Ecole Polytechnique Federale de Lausanne CRPP, Association Euratom-Suisse, Lausanne, Switzerland, S.P. HIRSHMAN, Oak Ridge National Laboratory, Oak Ridge TN, J. KISSLINGER, P. MERKEL, H. WOBIG, Max Planck Institut fuer Plasma Physik, Garching, Germany, Y. NARUSHIMA, S. OKAMURA, K.Y. WATANABE, National Institute for Fusion Science, Toki, Japan — An anisotropic pressure model for three-dimensional magnetohydrodynamic equilibria with nested magnetic flux surfaces has been implemented in a free boundary version of the VMEC code. The energetic particles are described with a modified Bi-Maxwellian distribution function that satisfies the constraint $\mathbf{B} \cdot \nabla \mathcal{F}_h = 0$. Applications to 2-field period quasiaxisymmetric stellarator reactor system at large $\langle\beta\rangle \sim 5\%$ with large pressure anisotropy and off-axis hot particle deposition have been explored to test the limits of the code. The hot particle pressure distributions reproduce the structures previously obtained under fixed boundary conditions. For example, for $p_\perp > p_{||}$ and high field side hot particle deposition, the $p^h_\perp$ distribution localises also on the high field side contrary to the $p^h_{||}$ structure which concentrates on the low field side. For low field side deposition, both hot particle components appear on the low field side. A radially outward shift of the entire plasma column constitutes the dominant finite $\langle\beta\rangle$ effect. Plasma shape alterations are also observable.

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