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The DCON3D Code for the Ideal MHD Stability of Stepped-Pressure Stellarators[1] ALAN GLASSER, Fusion Theory Computation, Inc. — In a recent publication, [Phys. Plasmas 27, 042509 (2020); https://doi.org/10.1063/1.5143455], a procedure was presented to determine the ideal MHD stability of stepped-pressure stellarators by the generalized Newcomb method. The Euler-Lagrange equation (ELE) for making the energy functional δW stationary is derived as a high-order ordinary differential equation for the complex Fourier components $\mathbf{U}$ of the perturbed vector potential α and its derivatives. The related Hermitian Riccati matrix $\mathbf{P} = \mathbf{U}_{22}\,\mathbf{U}_{11}^{-1}$ is derived. The vanishing of the real scalar $D_C = \det \mathbf{P}^{-1}$ is the condition for the existence of a fixed-boundary instability. This procedure has been implemented in a new Fortran 95 code DCON3D. Data are read from a SPEC stellarator equilibrium file. [Phys. Plasmas 19, 112502 (2012); https://doi.org/10.1063/1.4765691] In each volume and each interface, components of the Euler-Lagrange coefficients are computed and the equation is numerically integrated. There are two departures from the paper: native SPEC coordinate (s,θ,ζ) are used throughout rather than straight-fieldline coordinates; and the Riccati equation for $\mathbf{P}^{-1}$ rather than the ELE for $\mathbf{U}$ is integrated for improved numerical stability. Examples will be presented for an equilibrium with periodicity l = 5, 8 volumes, and finite β, in which a Newcomb crossing is found in the second interface. The code runs in two minutes of cpu time on a MacBook Pro.

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