Abstract Submitted
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Equilibrium and Stability Properties of Low Aspect Ratio Mirror Systems: from Neutron Source Design to the Parker Spiral[1] ETHAN PETERSON, JAY ANDERSON, MIKE CLARK, JAN EGEDAL, DOUGLASS ENDRIZZI, KEN FLANAGAN, Univ of Wisconsin, Madison, ROBERT HARVEY, CompX, JACOB LYNN, JASON MILHONE, JOHN WALLACE, ROGER WALEFFE, VLADIMIR MIRNOV, CARY FOREST, Univ of Wisconsin, Madison — Equilibrium reconstructions of rotating magnetospheres in the lab are computed using a user-friendly extended Grad-Shafranov solver written in Python and various magnetic and kinetic measurements. The stability of these equilibria are investigated using the NIMROD code with two goals: understand the onset of the classic "wobble" in the heliospheric current sheet and demonstrating proof-of-principle for a laboratory source of high-β turbulence. Using the same extended Grad-Shafranov solver, equilibria for an axisymmetric, non-paraxial magnetic mirror are used as a design foundation for a high-field magnetic mirror neutron source. These equilibria are numerically shown to be stable to the m=1 flute instability, with higher modes likely stabilized by FLR effects; this provides stability to gross MHD modes in an axisymmetric configuration. Numerical results of RF heating and neutral beam injection (NBI) from the GENRAY/CQL3D code suite show neutron fluxes promising for medical radioisotope production as well as materials testing. Synergistic effects between NBI and high-harmonic fast wave heating show large increases in neutron yield for a modest increase in RF power.

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