

Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Accurate Evaluation of Numerical Derivatives for the Grad-Shafranov Equation JEFFREY FREIDBERG, PAUL NERENBERG, MIT Plasma Science and Fusion Center — To carry out an axisymmetric toroidal MHD stability analysis one needs an accurate numerical evaluation of the flux function and its first and second derivatives. While there are standard numerical techniques for solving the Grad-Shafranov equation for the flux function, numerical evaluation of the first and second derivatives leads to increasing levels of inaccuracy. Often, very high resolution is needed for the flux function to obtain satisfactory accuracy in the second derivatives. A numerical technique is presented that allows one to calculate the first and second derivatives to the same accuracy as the flux function, using the same resolution for all calculations. The technique makes use of a novel application of Green's theorem. Specific examples are presented demonstrating the technique and the improved accuracy of the first and second derivatives.

Jeffrey Freidberg
MIT Plasma Science and Fusion Center

Date submitted: 25 Jul 2005

Electronic form version 1.4