NUMERICAL CALCULATION OF SCREW PINCH STABILITY[+)]

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Abstract: A calculation of the M = 1 MHD long wavelength Kruskal-Shafranov mode of instability is presented for experimental conditions corresponding to the Garching toroidal and linear screw pinch experiments.

The Method used, first introduced by Freiberg / 1 /, involves solving the linearized dynamical equations of MHD for diffuse magnetic field and density profiles. A particular eigenvalue problem along with boundary conditions must be solved by numerical means yielding the growth rate and the form of the plasma perturbation as a function of radius. Results for growth rates, from the analysis based on a straight plasma column, agree to within 10 percent with experimental values obtained from the toroidal experiment. The calculated form or shape of the disturbance also seems to agree with what is observed experimentally. We conclude that the method is applicable for the calculation of the m = 1 type of instability. Information concerning growth rates for the higher m numbers is being obtained using this method and will be presented.

Finally we are using the method to study a family of magnetic field and density profiles which can be produced in the Garching device. These profiles are parametrised with β in an attempt to find more stable plasma configurations to the m = 1 mode of instability. These results will also be presented.

References:

/ 1 / J.P. Freidberg, Los Alamos Rep. LA-DC-10793

+) This work was performed as part of the joint research program between the Institut für Plasmaphysik, Garching and Euratom.