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P5.1101 Numerical study of linear dynamics of a confined plasma by a spherical tokamak

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The study of plasma dynamics is the main tool for both the description and control of Tokamak devices for thermonuclear fusion systems, which has been carried out mainly by computational simulation techniques. The magnetohydrodynamic (MHD) equilibrium of the plasma is the starting point for the study of macroinstabilities, which is obtained from the solution of the force balance equation. For axially symmetric systems, the force balance equation leads to theGrad-Shafranov equation [1]. In this work, we present the results of the numerical study of linear dynamics of a confined plasma by a spherical Tokamak of aspect ratio A ~ 1.6. This study is carried out in two sequential stages: (i) numerical solution of the Grad-Shafranov equation in the poloidal plane, using the finite difference method and the successive over-relaxation scheme (SOR) as is described in reference [2], and (ii) simulation of the plasma dynamics in the linear regime by using the MHD model, starting from the perturbation of the equilibrium state. For this stage, a fourth order finite difference scheme for the spatial derivatives is used, and the Runge-Kutta algorithm is implemented as the temporal integrator. In order to guarantee the fulfillment of the equation $\nabla \cdot B = 0$ in each time step, the restricted flow transport scheme is implemented [3]. For the MHD equilibrium state, the poloidal magnetic flux, pressure, safety factor and magnetic field profiles are presented. For the perturbed state, the results show that the perturbations are located mainly in the outer edge of the plasma; however, some poloidal modes move toward the central zone around the magnetic axis.

References

[1] V.D. Shafranov. Soviet Phys. JETP, 6, 1013 (1958)
[2] J.E. López, E. A. Orozco and V. D. Dougar-Zhabon, J. Phys. Conf. Ser., 1159 (1), 012017 (2019).
[3] C.R. Evans and J.F. Hawley. The Astrophysical Journal, 332:659-677, (1998)

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Presenter: LÌ_PEZ, J.E. (EPS 2019)

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