MHD SIMULATIONS OF TURBULENT DEVELOPMENT OF THE Z-PINCH SAUSAGE INSTABILITY [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2023.50.2023.1.1.101

Garanin S.F., Dolinskii V.Yu.

FSUE RFNC-VNIIEF, Sarov, Nizhniy Novgorod region, Russia, [VYuDolinskij@vniief.ru](mailto:VYuDolinskij@vniief.ru)

Two-dimensional axially symmetric MHD simulations were used to study Z-pinch waisting in the presence of small-scale short-wavelength perturbations, i.e. considering two-dimensional turbulence development. Effects of magnetic diffusion and thermal conduction were supposed to be minor and treated as significant only in the regions where they must be incorporated (at plasma/vacuum interfaces and near the axis). We considered the evolution of a cylindrical plasma column with a sinusoidal boundary perturbation and small-scale random density perturbations driven by constant current. The calculations demonstrated that the growing turbulence does not allow narrowing of the waist to an arbitrarily small radius and axial outflow of the plasma from the waist region. The amplitude of initial perturbations has some effect on the maximum compression parameters, because, with its increase, waisting develops faster, so the short-wavelength perturbations are able to grow to a smaller extent, and the generated turbulent plasma shields the compression region less effectively. During the compression of the waist there is no generation of high voltages near the axis, which could promote ion beam formation and neutron generation by the beam-target mechanism. The calculations also predict rather fast MHD arrangement of a marginally stable Kadomtsev equilibrium. Since no unlimited compression is possible in the Z-pinch waist, it seems that plasma fusion ignition will hardly be attainable there even at multi-mega-ampere driver currents.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/It/ru/DP-Garanin.docx) [↑](#footnote-ref-1)