On the positive influence of MHD instability on neutron yield from Z-pinches [[1]](#footnote-1)\*)

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In Z-pinches, the creation, confinement, and heating of plasma are carried out due to the discharge current only [1]. At the final stages of the discharge, a column of high-temperature plasma is formed, which is disrupted due to MHD instability. In the Z-pinch, MHD instability leads to a significant increase in the plasma temperature in some regions (constrictions). Plasma radiation can contribute to the achievement of high plasma parameters as a result of radiation compression of the pinch. These features fundamentally distinguish Z-pinches from many thermonuclear systems, for which the MHD instability of the plasma column and radiation, on the contrary, have a negative effect.

Cases of the positive influence of MHD instability on the magnitude of the neutron yield in Z-pinches are presented and analyzed. The first of these is the creation of plasma focus type discharges with an increased influence of MHD instability. The second case is an increase in the instability effect due to the radiation compression of the Z-pinch. And the third one is the formation of a power-law distribution in the energy spectrum of the plasma ions due to plasma outflow from the compression zone [2]. The appearance of high-energy particles leads to the fact that the neutron yield significantly exceeds the value corresponding to the characteristic temperature of the surrounding plasma [3].

A theoretical analysis of all three cases is given and the reasons for such a plasma behavior in Z-pinch discharges are considered. It is shown that the main reason for the positive influence of MHD instability in these devices is the generation of kinetic energy of ions due to the dissipation of the magnetic field energy of the Z-pinch.

References

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