Numerical simulation of plasma jet generation using conical multi-wire array

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The results of scaling calculations of plasma jet parameters are provided. The jet is generated in the axial direction as a result of a radial implosion of a conical array made of aluminum wires. The array is powered by a current pulse of 2 MA amplitude and 1 μs rise-time. Numerical studies were performed using three-dimensional radiative magnetohydrodynamics code FLUX-3D. A generalized model of plasma formation in multi-wire Z-pinches [1] was used at the numerical simulation of prolonged substance ablation of current carrying wires. The parameters of the conical lattice affect both the ablation process and the final plasma implosion, which determine the magnetohydrodynamic characteristics of the pre-axial jet (density, axial and angular velocities, temperature, magnetization parameter). An opening angle of the conical array, a diameter of an axial exit hole in a disk electrode, and a value of an external longitudinal magnetic field were varied in a series of scaling calculations. The performed calculation research can be useful for low-scale experimental simulations of astrophysical phenomena, such as observed outflows from star objects, with use of multi-wire Z-pinches on the pulsed power facilities.

[1] Repin B G and Orlov A P 2022 *Phys. Plasmas* **29** 052713