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Comparison of 1D stagnation solutions to 3D wire-array Z pinch simulations in absence of radiation[1] EDMUND YU, Sandia National Laboratory, ALEXANDER VELIKOVICH, Naval Research Laboratory, YITZHAK MARON, Weizmann Institute of Science — In the idealized picture of a Z pinch, a cylindrically symmetric plasma shell implodes towards axis. In this 1D (radial) picture, the resulting stagnation is very efficient: all the kinetic energy of the shell converts to internal energy, as for instance in the Noh shock solution or the homogeneous stagnation flow. If we generalize the problem to 2D by deforming the shell from perfectly circular to oblate, the resulting stagnation will not be as efficient. As in the Hiemenz flow, in which a jet of fluid strikes a rigid flat boundary and squirts out to the sides, the more complicated flows allowed in 2D allow flow kinetic energy to redirect rather than stagnate. With this picture in mind, we might expect the stagnation of a wire-array Z pinch, which in actuality forms a highly distorted 3D imploding plasma, to dissipate its kinetic energy inefficiently due to the lack of symmetry, and be indescribable by means of the idealized 1D stagnation solutions. On the other hand, one might expect that if the imploding plasma is sufficiently messy, the non-uniformities might "wash out," allowing a quasi-1D description of the averaged quantities of plasma. In this work we explore this idea, comparing predictions of 1D stagnation solutions with 3D simulation.

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